



DELTA Test Report



Type examination and testing of NHB non-automatic weighing instrument according to EN 45501

Performed for Taiwan Scale Mfg. Co., Ltd.

DANAK-1911302

Project no.: A530947

Page 1 of 99

including 4 annexes

25 February 2011

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Title Type examination and testing of NHB non-automatic weighing instrument according to EN 45501

Test object NHB non-automatic weighing instrument

Report no. DANAK-1911302

Project no. A530947

Examination period 3 January - 24 February 2011

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Manufacturer Taiwan Scale Mfg. Co., Ltd.

Specifications EN 45501:1992/AC:1993

Results The tested equipment fulfilled the requirements

Date 25 February 2011

Responsible



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	Table of contents	Page
1.	Résumé and conclusion	4
	Annex 1 OIML R 76 checklist for NHB non-automatic weighing instrument	5
	Annex 2 OIML R 76 test report for NHB 150 balance	15
	Annex 3 OIML R 76 test report for NHB 1500 balance	66
	Annex 4 OIML R 76 test report for NHB 6000 balance	83

1. Résumé and conclusion

The report is about type examination and testing of the non-automatic weighing instrument NHB manufactured by Taiwan Scale Mfg. Co., Ltd.

The manufacturer also markets the NHB balances with a slightly modified enclosure under the name EHB.

The following models are manufactured:

Model	Capacity	e =	d =	Load cell	E _{max}
NHB 150 / EHB 150	150 g	0.02 g	0.002 g	HBM SPL	200 g
NHB 300 / EHB 300	300 g	0.05 g	0.005 g		300 g
NHB 600 / EHB 600	600 g	0.1 g	0.01 g		600 g
NHB 1500 / EHB 1500	1500 g	0.2 g	0.02 g		1500 g
NHB 3000 / EHB 3000	3000 g	0.5 g	0.05 g		3000 g
NHB 6000 / EHB 6000	6000 g	1 g	0.1 g	HBM PW6K	10 kg

The NHB balance was tested as a complete weighing instrument.

As NHB 150 is the model with the smallest verification scale interval, requiring the smallest $v_{\min}$ for the load cell and the highest number of scale intervals it was selected for complete testing. Supplementary testing was performed on NHB 1500 as it has ten times higher capacity and on NHB 6000 as it uses another type of load cell.

The scales were tested as accuracy class II and for the temperature range. +5 °C to +40 °C

The test item fulfilled EN 45501:1992 / OIML R76:1992 for non-automatic weighing instruments, as described in Annex 1, 2, 3 and 4.

Annex 1

OIML R 76 checklist for NHB non-automatic weighing instrument

OIML R76 Checklist

Application / task: A530947
 Type: NHB
 Manufacturer: Taiwan Scale Mfg. Co. Ltd.

(*) Additional remarks may appear following the checklist.

Conclusion: Passed

17.1 All types of weighing instruments except non-self-indicating instruments (6.1-6.9, R 76-1)

Requirement	Testing procedures		Passed	Failed	Remarks (*)
Descriptive markings					
7.1.1	A.3	Compulsory in all cases:			
		manufacturer's mark or name	X		
		accuracy class	X		
(+3.3.1)		maximum capacity, Max, Max ₁ , Max ₂ ,...	X		
		minimum capacity, Min	X		
(+3.3.1)		verification scale interval, e, e ₁ , e ₂ ,...	X		
7.1.2	A.3	Compulsory if applicable:			
		name or mark of manufacturer's agent	/	/	
		serial number	X		
		identification marks on separate but associated units	/	/	
		pattern approval mark	X		
		scale interval d (d < e)	X		
		maximum tare effect T (subtractive tare only if T ≠ Max)	X		
		maximum safe load, Lim (if Lim > Max + T)	/	/	
		special temperature limits	X		+5°C to +40°C
		counting ratio	/	/	
		ratio between weight platform and load platform	/	/	
		range of plus/minus indication	/	/	
7.1.3	A.3	Additional markings:			
		not to be used for direct sales to the public	/	/	
		to be used exclusively for:	/	/	
		the stamp does not guarantee / guarantees only...	/	/	
		to be used only as follows:	/	/	
3.2		special applications clearly marked: weighings ranges in classes (I and II) or (II and III)	/	/	
4.16		near display "not to be used for direct sales to the public" (for instruments similar to those used for direct sales to the public)	/	/	
7.1.4	A.3	Presentation of markings:			
		indelible	X		
		easily readable	X		
		grouped together in a clearly visible place	X		
		Max, Min, e and d (d ≠ e) near display	X		
		possible to seal and apply a control mark/removal will result in destruction	X		
7.1.5.1	A.3	Instruments with several load receptors and load measuring devices:	Existent	☐	Non-existent ☒
		Identification mark, Max, Min and e of each load receptor on relating load measuring device (Lim and T = + if applicable)	/	/	
7.1.5.2	A.3	Separately-built main parts:	Existent	☐	Non-existent ☒
		identification mark repeated in descriptive markings			
4.1.1.3		Identification of devices:			
		which have been subject to separate type examination	/	/	
Verification marks and sealing					
7.2.1	A.3	Verification mark:			
		cannot be removed	X		
		easy application	X		
		visibility without the instrument to be moved when it is in service	X		
7.2.2		Verification mark support or space:	Existent	☒	Non-existent ☐
		which ensures conservation of the mark	X		
		for stamp, stamping area ≥ 200 mm ²	/	/	
		for self-adhesive type, Ø ≥ 25 mm	X		
4.1.2.4	A.3	Securing/sealing:			
		location	X		
		form	X		

4.1.2.5		Span adjustment device(automatic and semi-automatic):	Existent	☐	Non-existent	☒
		external influence impossible after sealing				
4.1.2.6		Gravity compensation:	Existent	☒	Non-existent	☐
		external influence on or access to impossible after sealing	X			
Documentation						
8.2.1.1	A.1	Technical information and data:				
		specifications of modules	X			
		specifications of components	X			
3.5.4.2	A.1	fractions pi (modules tested separately)	/	/		
8.2.1.2	A.1	drawings	X			
		functional description	X			
		technical description with schematic diagrams for internal processing and exchange via interface	X			
5.3.7		manufacturer's lower limit of battery voltage	X			
8.2.2	A.2	Examination of:				
		documents	X			
		functions (spotchecks)	X			
		test reports from other authorities	/	/		
Indicating device						
4.2.1		Reading:				
4.3.1		reliable, easy and unambiguous	X			
		overall inaccuracy $\leq 0.2 e$ (analogue indication)	/	/		
		size, shape and clarity	X			
		by simple juxtaposition	X			
4.2.2.1	A.3	Units of:				
		mass	X			
		price	/	/		
		Form of indications:				
		for one indication, one unit of mass	X		g and ct	
		scale interval in the form $(1, 2 \text{ or } 5) \times 10^k$	X			
		same scale interval for all indicating devices, printing devices and tare weighing devices	X			
4.2.2.2		Form of digital indication:				
		at least one figure at right	X			
		Decimal sign.				
		shall maintain its position (scale interval changed automatically)	X			
		separate at least one figure to the left and all to the right	X			
		Zero:				
		indication of zero figures	X			
		only one non-significant zero to the right	X			
		for values with decimal sign, non-significant zero only in third position	X			
4.2.3		Limits:				
		preventing of indication above $\text{Max} + 9 e$	X			
4.2.4		"Approximate" indication:	Existent	☐	Non-existent	☒
		scale interval $> \text{Max}/100$ without being smaller than $20 e$				
4.2.5		Semi-self indicating instruments:	Existent	☐	Non-existent	☒
		extension of self-indication range $\leq$ self-indication capacity				
4.3.1		Analogue indication:	Existent	☐	Non-existent	☒
4.3.2		thickness and length of scale marks				
4.3.3		scale spacing				
4.3.4		limit of movement below zero and above capacity of self-indication				
4.4.1		damping of oscillations of indicating component				
4.4.1		Changing of digital indication:				
		after change in load, previous indication not longer than 1 s	X			
4.4.3		Extended digital indication:	Existent	☐	Non-existent	☒
		not allowed when there is a differentiated scale division				
		while pressing key or				
		at most, 5 s after manual command				
		prevention of printing				
4.4.4		Digital indications other than primary indications:	Existent	☐	Non-existent	☒
		quantities identified by units or symbols or signs thereof				
		weight values (not weighed) shall be clearly identified or				
		display only temporarily on manual command and				
		shall not be printed				
4.4.5		Digital printing:	Existent	☒	Non-existent	☐
		clear and permanent	/	/	simple CE marked printer	
		figures $\geq 2 \text{ mm}$ high	/	/		
		name or symbol of units				
		above column of values				
		behind column of values	X			
		printing impossible when equilibrium not stable	X			

4.4.6		Memory storage:	Existent	☒	Non-existent	☐
		storage, transfer, totalizing, etc. inhibited when equilibrium not stable	X			
3.4.1		Auxiliary indicating device (Classes I and II only; not allowed on multi-interval instruments)	Existent	☒	Non-existent	☐
		If existent, type:				
		rider	☐	interpolation	☐	
		complementary			☐	
		differentiated scale division			☒	
3.4.2		only to the right of decimal sign	X			
		$d < e \leq 10 d$, $e = 10^k$ kg or $e = 1$ mg for class I with $d < 1$ mg	X			According to 4.2.2.1
Differences between results						
3.6.3		Differences:				
		between multiple indications: $\leq mpe$	/	/		
		between digital indications and printout: zero	X			
3.6.4		between two results: $\leq mpe$ for same load when method of balancing changed (semi-self-indicating)	/	/		
Level indicator						
			Existent	☒	Non-existent	☐
3.9.1.1.		Indicator:				
		fixed firmly	X			
		visible to the user	X			
		Limiting value:				
		shows that maximum tilt is being exceeded	X			
Zero-setting, -tracking and -indicating						
			Existent		Non-existent	
		Initial zero-setting	☒		☐	
		Semi-automatic zero-setting	☒		☐	
		Nonautomatic zero-setting	☐		☒	
		Zero-tracking	☒		☐	
		Zero-indicating	☒		☐	
4.5.1	A.4.2.1	Effect:				
		shall not alter Max	X			
		Overall effect of:				
		zero-setting	X			± 2 %
		zero-tracking	X			± 2 %
		initial zero-setting	X			± 10 %
4.5.2	A.4.2.3	Accuracy:				
		deviation $\leq 0.25 e$	X			
		deviation $\leq 0.5 d$ (auxiliary indicating device)	/	/		
4.5.3		Multiple range:	Existent	☐	Non-existent	☒
		effective for greater weighing range (if, when loaded, switching is possible)				
4.5.4		Control of zero-setting:				
		separate from that of tare weighing device	X			
		Semi-automatic zero-setting: functions only				
		in stable equilibrium and	X			
		if it cancels any previous tare operation	X			
4.5.5	A.4.2.2	Zero-indicating device "lamp" (by digital indication):	Existent	☒	Non-existent	☐
		shows deviation $\leq 0.25 e$	X			
		not mandatory if auxiliary indicating device or rate of zero-tracking $> 0.25 d/s$	/	/		
4.5.6		Automatic zero-setting:	Existent	☐	Non-existent	☒
		operates only when equilibrium stable and				
		indication has remained stable below zero at least 5 seconds				
4.5.7		Zero-tracking:	Existent	☒	Non-existent	☐
		operates only when indication at zero or	X			
		at negative net value equivalent to gross zero and	X			
		equilibrium stable	X			
		corrections $\leq 0.5 d/s$	X			
		when operates after tare, the overall effect may be 4 % of Max	X			

		Tare devices		Existent	Non-existent
		Tare weighing	☒	☐	
		Tare balancing	☒	☐	
		Combined zero-setting and tare balancing	☐	☒	
		Tare indicating	☒	☐	
		Type:			
		Additive	☐	Subtractive	☒
4.6.1		4.1 through 4.4 apply	☒		
4.6.2		Tare weighing device:	Existent	☒	Non-existent ☐
		$d_T = d$	☒		
4.6.3	A.4.6.2	Accuracy:			
		better than $\pm 0.25 e$ (electronic instruments and instruments with analogue indication), $e = e_1$ for multi-interval	☒		
		better than $\pm 0.5 d$ (mechanical instruments with digital indication and instruments with auxiliary indicating device)	/	/	
4.6.4		Operation range:			
		prevention of operation at or at	☒		
		below its zero effect below	/	/	
		prevention of operation above its maximum indicated effect	☒		
4.6.5		Visibility of operation:			
		operation indicated	☒		
		net with sign "NET", "Net", "net" or complete word (digital indication)	☒		NET
		NET disappears if gross displayed temporarily	/	/	
		tare value or letter "T" (mechanical adding tare)	/	/	
4.6.6		Subtracting tare:			
		prevention of use above Max or indication that capacity is reached	☒		
4.6.7		Multiple range:	Existent	☐	Non-existent ☒
		operation effective in greater weighing ranges if switching, when loaded, is possible			
4.6.8		Semi-automatic or automatic tare:			
		operation only in stable equilibrium	☒		
4.6.9		Combined zero/tare:	Existent	☐	Non-existent ☒
		accuracy (4.5.2)			
		zero-indicating device (4.5.5)			
		zero-tracking (4.5.7)			
4.6.10		Consecutive tare operations:	Existent	☐	Non-existent ☒
		indicated or printed tare weight values clearly designated (if tare devices operative at the same time)			
4.6.11		Printing net or gross:	Existent	☒	Non-existent ☐
		without designation	/	/	
		designation: by G or B (gross)	☒		GS
		by N (only net printed)	☒		NT
		designation of net and tare by N and T (if net printed with gross and/or tare)	/	/	
		instead of G, B, N and T, complete words	/	/	
		printing separately net and tare with identification (different tare devices)	/	/	
		Preset tare	Existent	☐	Non-existent ☒
4.7.1		$d_T = d$ or automatically rounded to d			
		transferred from one range to another one with larger e_1 , shall be rounded to the latter (multiple range)			
		tare value $\leq$ Maxi for the same net weight value (multi-interval) and calculated net value rounded to the scale interval for the same net weight value			
4.7.2		4.6.10 applies			
		cannot be modified/cancelled if tare operated after the preset tare is still in use			
4.7.3		operates automatically if clearly identified with load			
		4.6.5 applies			
		possibility to indicate preset tare			
		if calculated net printed then preset tare value is printed as well			
		4.6.11 applies			
		designation of preset tare by PT or complete word			
		Locking devices	Existent	☐	Non-existent ☒
4.8.1		Positions:			
		only two stable positions			
		weighing only in "weigh" position			
4.8.2		positions clearly shown			

		Multiple ranges		Existent	☐	Non-existent	☒
4.10		Weighing ranges:					
		range in operation clearly indicated					
		selection from smaller to greater range possible at any load (manual)					
		selection from smaller to the following greater range (automatic)					
		possible only for load $\geq$ Maxi of smaller range					
		selection from a greater to a smaller range only when no load (manual)*					
		selection only from a greater to the smallest range only when no load (automatic)*					
		when no load tare cancelled and zero to $\pm 0.25 e_1$ (both automatically)					
		(manual and/or automatic selection) (applicable only to the two above requirements marked*)					
		Selection between load receptors, transmitting and measuring devices		Existent	☐	Non-existent	☒
4.11							
4.11.1		compensation for unequal no-load effect					
4.11.2		zero-setting without ambiguity and in accordance with 4.5					
4.11.3		weighing impossible while selection					
4.11.4		combinations easy identifiable					
		Load cells		Existent	☐	Non-existent	☒
4.12.1		$E_{max} \geq Q_{max} \cdot R/N$					Not tested separately
4.12.2		$n_{LC} \geq n$					
		$n_{LC} \geq n_i$ (multiple range/multi-interval)					
		multi-interval:					
		$DR \leq 0.5 e_1 R/N$ or					
		$n_{LC} \geq Max_x / e_1$ if DR unknown					
		multiple range:					
		$DR \leq e_1 R/N$ or					
		$n_{LC} \geq 0.4 Max_x / e_1$ if DR unknown					
4.12.3		$V_{min} \leq e R / \sqrt{N}$ ($e = e_1$ multiple range / multi-interval)					
		"Plus" and "minus" comparator instruments		Existent	☐	Non-existent	☒
4.13.1		Distinction of zones:					
		by "+" and "-" signs (analogue indication)					
		by inscription (digital indication)					
4.13.2		Scale:					
		with at least one scale division $d = e$ on either side of zero and					
		value of $d = e$ shown at either end					
		Mechanical counting instruments with unit weigh receptor		Existent	☐	Non-existent	☒
4.18.1		Scale:					
		with at least one scale division $d = e$ on either side of zero and					
		value of $d = e$ shown on the scale					
4.18.2		Counting ratio:					
		shown clearly above each counting platform or					
		each counting scale mark					

17.2 Instruments for direct sales to the public and price computing and labelling instruments

				Existent	☐	Non-existent	☒
Requirement	Testing procedures	Passed	Failed	Remarks			
Miscellaneous checkings (direct sales to the public)							
4.5.4		Combined semi-automatic zero-setting device and semi-automatic tare-balancing device operated by the same key:					
		not allowed					
4.8.1		"Preweigh" position:					
		not allowed					
4.14.10		Counting ratio:					
		1/10 or 1/100 (mechanical counting instrument)					
4.14.5		Impossibility of weighing during:					
		locking operation					
		adding or subtracting weights					
4.14.7		Auxiliary and extended indicating device:					
		not allowed					
4.14.9		When significant fault has been detected (electronic instruments):					
		visible or audible alarm provided for customer and (1)					
		data transmission prevented (1)					
		until user takes action or cause disappears					

(1) Checked by verifying the compliance with documents [] or by simulating faults []; this check does not duplicate the disturbance tests 12.1 through 12.4.

4.15.4.1		Prices-to-pay (positive or negative) of non-weighed articles:			
		weight indication zero or			
		weighing mode inoperative			
		prices shall be shown on price-to-pay display			
		Prices for more than one equal articles:			
		number of articles shown on weight or supplementary display and			
4.15.4.2		without being taking for a weight and			
		article price shown on unit price or supplementary display			
		Totalization of transactions on one or several tickets:			
		price total indicating on price-to-pay display and			
		printed accompanied by a special word or symbol and			
		reference to commodities whose prices are totalized if a separate			
4.15.4.3		ticket is issued for total			
		all prices-to-pay shall be printed and price total shall be the			
		algebraic sum of these prices			
4.15.4.4		Totalization of transactions from linked instruments:			
		price-to-pay scale intervals of all connected instruments identical			
		Instrument used by several vendors or to serve more than one customer at the same time:			
4.15.4.5		connection between transactions and vendor or customer identified			
		Cancelling previous transactions:			
		price-to-pay cancelled shall be printed with comment (transaction			
4.15.5		already printed)			
		transaction clearly differentiated from normal transactions			
		(transaction displayed to customer)			
4.15.5		Printing additional information:			
		clearly correlated to transaction and			
		does not interfere with assignment of weight value to unit symbol			
4.15.5		Self-service instruments:			
		designation of product			
Price labelling instruments			Existent	☐	Non-existent ☒
4.17		Display:			
		for weight			
		possibly to verify values of unit price and preset tare during the			
		use of the instrument			
		Printing:			
		prevention of printing below Min			
4.17		labels with fixed values of weight, unit price and price-to-pay			
		allowed provided weighing mode made inoperative			

17.3 Electronic weighing instruments

Requirement	Testing procedures		Passed	Failed	Remarks
Disturbances					
5.2		Acting upon significant faults in case 5.1.1, b):			
		instrument made automatically inoperative (2), or	/	/	
		visual or audible indication until user takes action or fault disappears (2)	X		Error code
Display check					
5.3.1		Upon switch-on:			
		signs of indication are active and non-active long enough to be checked by operator	X		
External equipment					
5.3.6		Interface shall not allow:	Existent	☒	Non-existent ☐
5.3.6.1		- functions and measuring data to be inadmissibly influenced by peripheral devices or other connected instrument or disturbance	X		
		- displaying data which could be mistaken for weighing result	X		
		- falsifying weighing results (displayed, processed, stored)	X		
		- changing adjustment factor or adjusting the instrument (except authorized cases)	X		
5.3.6.2		- falsifying displayed primary indications (direct sales)	X		
		need not be secured if functions in 5.3.6.1 cannot be performed or initiated	X		
5.3.6.3					
5.3.6		shall transmit data so that peripheral device can meet requirements	X		
5.3.7		functions performed or initiated through the interface meet relevant requirements of clause 4	X		
		Battery operated instrument:	Existent	☒	Non-existent ☐
		if voltage below manufacturer's specified value			
		continues to function correctly	X		
		or indicates no weight	X		

(2) Checked by verifying the compliance with documents [] or by simulating faults []; this check does not duplicate the disturbance tests 12.1 through 12.4.

Manufacturer's additional remarks on the checklist

Note1: The electronics and the load cell has been tested as one unit as documented in the test reports

Software version: 1.05

Annex 2

OIML R 76 test report for NHB 150 balance

OIML R 76 TEST REPORT

ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE

INTERNATIONAL RECOMMENDATION

OIML R 76

Non-automatic weighing instruments

Test item

NHB 150g

manufactured by

Taiwan Scale Mfg. Co., Ltd.

Task:	A530947
Report No:	DANAK-1911302
Date of Issue:	25 February 2011
Test laboratory:	DELTA Danish Electronics, Light & Acoustics
Evaluator / Responsible:	Jens Hovgård, DELTA Weighing Laboratory 03 January 2011 to 14 February 2011

Authorized user of DTPR76: DELTA

CONTENTS

	PAGE
Summary of results	18
Information concerning the instrument	19
Test specification	21
Information concerning the tests	22
Setup of load cell simulator, calibration and traceability	23
Test equipment	24
Estimation of measurement uncertainty	25
Photographs	26
Tests:	
Initial Intrinsic error test	27
Temperature tests	
Initial test	28
High temperature test	29
Low temperature test	30
Final temperature test	31
Temperature effect on no-load indication	32
Eccentricity	33
Repeatability	34
Zero return and Creep	35
Stability of Equilibrium	36
Tilting	37
Tare	
Tare analysis based on Intrinsic data	38
Warm-up time	40
Variations of voltage	42
Electrical disturbances, summary	43
Electrical disturbances, tests	44
Damp heat, steady state	
Test before humidity	54
Test during humidity	55
Test after humidity	56
Span stability	
Span measurement No: 1, Reference condition	57
Span measurement No: 2, After temperature test	58
Span measurement No: 3, No change of condition	59
Span measurement No: 4, After humidity test	60
Span measurement No: 5, After power interruption	61
Span measurement No: 6, No change of condition	62
Span measurement No: 7, No change of condition	63
Span measurement No: 8, After power interruption	64
Result of span stability test	65

Summary of results

Application / Task: A530947
 Applicant name: Taiwan Scale Mfg. Co., Ltd.
 Type: NHB 150g
 OIML: R76 accuracy Class II

R76 N°	Tests	Input impedance	Report sheet	PASS	FAIL	Remarks
	Checking of zero setting	N/A	-	X		
1	Calculation of intrinsic error	High	Intrinsic	X		Made: 2011-1-3
	Initial test at ref. temp. 20 °C	High	T(1)	X		Conclusion for n = 7500
	Test at high temperature 40 °C	High	T(2)	X		
	Test at low temperature 5 °C	High	T(3)	X		
	Test at 20°C	High	T(4)	X		
	Final test at ref. temp.	High	-			
	Supplementary test	-	-			
		-	-			
		-	-			
2	Temperature effect on no-load indication	High	-	X		
3	Eccentricity	High	Ecc	X		
4	Discrimination		-			N.A. e = 10 d
5	Repeatability	High	Rep	X		
6.1	Zero return	High	Creep	X		
6.2	Creep	High	Creep	X		
7	Stability of equilibrium	High	Equil	X		
8	Tilting	High	Tilt	X		Tilt: Level indicator limit
9	Tare	H//	Tare(-)	X		Based on a tare analysis
10	Warm-up time	High	W	X		
11	Voltage variations	High	Var	X		
12.1	Short time power reductions	High	EMC	X		
12.2	Electrical bursts a) Power supply lines	High	EMC	X		
	b) I/O circuits and comms. Lines	High	EMC	X		
12.3	Electrostatic discharges a) Direct application	High	EMC	X		
	b) Indirect application	High	EMC	X		
12.4	Immunity to RF fields a) Radiated 3 V/m test	High	EMC	X		
	b) Conducted 10 V test		-			
	Surge a) Power supply lines 2 [kV]		-			
	b) I/O lines - [kV]		-			
	Powered from vehicle battery a) Power supply lines		-			
	b) Other lines	High	EMC	X		
13	Damp heat, steady state a) Initial test at ref. conditions	High	H(1)	X		
	b) Test at high humidity and temp.	High	H(2)	X		
	c) Final test at ref. conditions	High	H(3)	X		
14	Span stability	High	SP(res)	X		
*)	Temperature effect on span	High	Span_T1	X		
*)	Load cell interface: Maximum cable length to the junction box for load cells		-			
			-			
	Sense interruptions		-			
15	Endurance a) Test before at ref. conditions	High	-			
	b) Test after at ref. Conditions	High	-			
Examinations						
16	Examination of the construction		-			
17	Checklist		-			

In all: PASSED

*) WELMEC 2.1, Annex 5.

Information concerning the instrument

Information submitted by the manufacturer.

Applicant name:	Taiwan Scale Mfg. Co., Ltd.		
address:	99 Shuchang Road, Zhoushi Town, Kunshan City 215300 Jiangsu Province, China		
Contact person:	Tom Hong		
e-mail:	service@taiwanscale.com		
Telephone:	+86-13328050320		
Manufacturer name:	Taiwan Scale Mfg. Co., Ltd.		
address:	99 Shuchang Road, Zhoushi Town, Kunshan City 215300 Jiangsu Province, China		
Type:	NHB 150g		
Test item device:	Non-automatic weighing instrument		
S/N:			
Type subject to EMC tests:			
S/N for test item subject to EMC tests:			
Separate load receptor, if submitted	Type:	Capacity [kg]: 0,15	S/N:
Load cell(s), if submitted:	Type: SPL	Manuf.: HBM	Number: 1 S/N:
	Load cell class:	Capacity [kg]: 0,2	Cable[m]:
	Rated output:	0,9 [mV/V]	$\Delta_{\text{min}} =$ [μV] per VSI
Accuracy class:	OIML R76: II		
Optional for AWI, if applied:	AWI class:	0	
"R61: Specified Ref. Class"	(Not used)	0,5	
Weighing range(s) specified:	Single-interval		
Number (i) of Intervals / ranges specified:	1		
Change-over point for multi-range, if available:	$\text{Max}_i + 9 e_i$		
Unit marked on test item:	[g]		
Internal resolution of measurements:	>100000		
Number of Verification Scale Intervals (n_i):	7500		$n_i = \text{Max}_i / e_i$
Maximum capacity of partial ranges (Max_i):	150	[g]	Min: 0,4 [g]
Verification Scale Interval (e_i):	0,02	[g]	d: 0,002 [g]
Fractional factor (p_i):	1		
Excitation voltage:		[Vdc]	
Minimum input-voltage per VSI (Δ_{min}):		[μV]	
Minimum dead load (D_{min}):		[mV]	
Maximum input range:		[mV]	
Rated maximum input-impedance for load cells:		[ohm]	
Rated minimum input-impedance for load cells:	420	[ohm]	
Sense (6-wires) or no-sense (4-wires):	No-sense		
Maximum resistance of cable to JB for load cells:	each wire	[ohm]	
Zero-setting devices	Range [% of Max]	Tare devices	
Nonautomatic: ☐		Tare balancing: ☒	
Semi-automatic: ☒	-2 +2	Tare Weighing: ☐	
Automatic zero-setting: ☐		Preset tare device: ☐	
Initial zero-setting: ☒	20	Subtractive tare: ☒	
Zero-tracking (+/- 0.25e): ☒	-2 +2	Additive tare: ☐	
Combined zero/tare device: ☐		Max. Tare effect: 100,0 [% of Max]	
Operating temperature range			
Min:	5		
Max:	40		
Power voltage supply [Vac]			
Un:	230	50/60 [Hz]	External supply
Umin:			
Umax:			
Battery supply [Vdc]			
Un:			
Umin:	9		
Umax:	12		
Load cell linearizing, if available:			

Printer subject to test: Non present, but connectable

No. of interfaces: 1

Specification of interfaces available

Connections during electrical disturbance tests:

Interface No. 1 (applied for recording of measurements during tests)

format / standard: RS-232C

protective or not: Protective

Connecting cables

cable length: 2

shield/no shield: shielded



x

Peripheral equipment:

Remarks:

Serial interface

RS 232 setup	
Com port	5
Baud rate	9600
Data bits	8
Stop bits	1
Parity	None
EOS	13
Buffer size	100

Input filter	
PreRead	
Min. Length	8
Search position	2
Filter: Mean of #	1
Line select pos.	0
Line select char	

Test specification

OIML:

R76

Application / Task:

A530947

Applicant name:

Taiwan Scale Mfg. Co., Ltd.

Manufacturer name:

Taiwan Scale Mfg. Co., Ltd.

Type

NHB 150g

Test item device:

Non-automatic weighing instrument

S/N:

Type subject to EMC tests:

S/N for test item subject to EMC tests:

Maximum permissible errors apply to:

Initial verification

Accuracy class:

II

Unit of measurement:

[g]

Weighing range(s) subject to test:

Single interval

Number of intervals / ranges:

1

Change-over point for multi-interval, if available:

Max_i +:e_i

Not Applicable

Number of Verification Scale Intervals (n_i):

7500

Maximum indication during test (Max_i):

150

[g]

Maximum capacity (Max):

7500

[e_i]

Indication for one (e) during test:

0,02

[g]

Min:

0,4 [g]

Resolution during test:

0,002

Fractional factor (p_i):

1

Initial zero-setting range

20 [%]

Excitation voltage:

[Vdc]

Minimum input-voltage per VSI ($\Delta U_{\min}$):

[μV]

Minimum dead load (D_{min}):

[mV]

Dead load used for the tests (zero offset):

[mV]

Proposal to begin with

Minimum number of load cells (each 350 ohm):

1

Impedance:

350 [ohm]

Maximum number of load cells (each 350 ohm):

1

Impedance:

350 [ohm]

Sense (6-wires) or no-sense (4-wires):

No-sense

Operating temperature range:

Min / Max = 5 °C / 40 [°C]

Power voltage supply:

External supply

U _n	U _{min}	U _{max}
230		
	9	12

[Vac]

50/60 [Hz]

Battery supply:

[Vdc]

Submitted Documentation.

Manuals

Drawings

Other

Remarks:

Information concerning the tests

Ref.: OIML R76

Test	Worksheet	Load source	Load values	Influence factors
Initial intrinsic error	Intrinsic	Weights	See Equip for table of weights	
Static temperature test 20°C	T(1)	Weights	See Equip for table of weights	x
Static temperature test 40°C	T(2)	Weights	See Equip for table of weights	x
Static temperature test -10°C	T(3)	Weights	See Equip for table of weights	x
Static temperature test 5°C	T(4)	Weights	See Equip for table of weights	x
Static temperature test 20°C	T(5)	Weights	See Equip for table of weights	x
Temperature effect on no-load	Z	Weights	See Equip for table of weights	x
Eccentricity using weights	Ecc	Weights	See Equip for table of weights	
Tilting	Tilt	Weights	See Equip for table of weights	x
Tare #1	Tare(1)	Weights	See Equip for table of weights	
Warm-up test	W	Weights	See Equip for table of weights	x
Voltage variations	Var	Weights	See Equip for table of weights	x
Electrical disturbances	EMC	Weights	See Equip for table of weights	
Damp heat, steady state #1	H(1)	Weights	See Equip for table of weights	x
Damp heat, steady state #2	H(2)	Weights	See Equip for table of weights	x
Damp heat, steady state #3	H(3)	Weights	See Equip for table of weights	x
Span stability #1	SP(1)	Weights	See Equip for table of weights	
Span stability #2	SP(2)	Weights	See Equip for table of weights	
Span stability #3	SP(3)	Weights	See Equip for table of weights	
Span stability #4	SP(4)	Weights	See Equip for table of weights	
Span stability #5	SP(5)	Weights	See Equip for table of weights	
Span stability #6	SP(6)	Weights	See Equip for table of weights	
Span stability #7	SP(7)	Weights	See Equip for table of weights	
Span stability #8	SP(8)	Weights	See Equip for table of weights	
Span stability results	SP(Res)	Weights	See Equip for table of weights	
Maximum load cell cable length	Cable(1)			x
	Cable(2)			x
	Cable(3)			x

Input simulation:

Built-in simulated input	
DebugMode	Off
Simulator noise: e multiplied by	0,13
Noise: [g]	0,0025

Remarks:

Setup of load cell simulator

Ref.: OIML R76

Before the formal start of a type test the A/D device and the load cell simulator shall be calibrated together.

The A/D device should be calibrated with minimum input impedance and the maximum number of verification scale intervals and the minimum input-voltage per verification scale interval.

A procedure for finding the best fit of the setup based on the manufacturer's specifications is given below.

Test item:

Non-automatic weighing instrument

Manufacturer:

Taiwan Scale Mfg. Co., Ltd.

Type and serial no.:

NHB 150g S/N:

Number of intervals / ranges:

1

Maximum indication during test (Max_i):

150

[g]

One verification scale interval (VSI equals e):

0,02

[g]

Number of Verification Scale Intervals (n):

7500

Resolution during test:

0,002 [g]

Excitation voltage:

[Vdc]

Minimum input-voltage per VSI (Δ_{min}):

[μV]

Minimum dead load (D_{min}):

0 [mV]

=

[mV/V]

Span scale range (n * Δ_{min}):

#VALUE! [mV]

=

[mV/V]

Scale range (span + D_{min}):

#VALUE! [mV]

=

[mV/V]

Fractional factor (p):

1

Maximum permissible error at zero (Mpe * p):

0,5 * e

≡

0,01 [g]

Minimum number of load cells (each 350 ohm):

1

Maximum number of load cells (each 350 ohm):

1

≡

350,0 [ohm]

Sense (6-wires) or no-sense (4-wires):

No-sense

Load cell simulator

Load cell simulator applied:

Type: HBM, K3608

S/N: 90220004

Specified setup:

Length of cable between indicator and simulator:

2,5 [m]

Lowest value of the scale (mV/V):

#VALUE! [mV/V]

≡

0 [mV]

Highest value of the scale (mV/V):

#VALUE! [mV/V]

≡

[mV]

Span range (mV/V):

#VALUE! [mV/V]

≡

[mV]

Simulator values used as Load values:

Initial Intrinsic values

Setup for best fit

Selected calibration range:

#VALUE! [mV/V]

Selected lowest value of the scale (mV/V):

#VALUE! [mV/V]

≡

[%] of the range

Selected highest value of the scale (mV/V):

#VALUE! [mV/V]

≡

[%] of the range

Selected span test range (mV/V):

#VALUE! [mV/V]

≡

[mV]

Re-calculated Δ_{min} (best fit):

#VALUE! [μV]

Simulator calibration values

#VALUE!

Range	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
[%]	[mV/V]	[mV/V]	[mV/V]	[mV/V]	[mV/V]
0		0,000000			
10		0,099998			
20		0,199995			
30		0,299991			
40		0,399987			
50		0,499983			
60		0,599978			
70		0,699975			
80		0,799971			
90		0,899969			
100		0,999968			

Simulator Load

Range	Linear	Calibrated	Initial intrinsic	Load
[%]	[mV/V]	[g]	[mV/V]	[g]
				Selected
0	#VALUE!	#VALUE!	#VALUE!	0
10	#VALUE!	#VALUE!	#VALUE!	2
20	#VALUE!	#VALUE!	#VALUE!	4,6
30	#VALUE!	#VALUE!	#VALUE!	9,6
40	#VALUE!	#VALUE!	#VALUE!	29,598
50	#VALUE!	#VALUE!	#VALUE!	49,596
60	#VALUE!	#VALUE!	#VALUE!	69,596
70	#VALUE!	#VALUE!	#VALUE!	89,6
80	#VALUE!	#VALUE!	#VALUE!	109,598
90	#VALUE!	#VALUE!	#VALUE!	129,598
100	#VALUE!	#VALUE!	#VALUE!	149,598

Remarks:

Test equipment

Ref.: OIML R76
 Evaluator: Jens Hovgård, DELTA Weighing Laboratory
 Application / Task: A530947

Test loads

See the table below

Accuracy class: F2
 Other information:

Simulator

Simulator not applied

Type and serial number: HBM, K3608, S/N: 90220004
 Traceability:

Laboratory for the performance tests

Test laboratory conditions: Air conditioned 20 °C, 50 % RH
 Test laboratory location: 2A12

Facilities for influence factor testing

Temperature chamber: Climatic container
 Humidity chamber: VKF10

Equipment applied for the performance tests

Name	Manufacture	Type	No.
Multimeter	Fluke	27	23778

Facilities for electrical disturbance testing

See page EMC(T)

Photograph of test equipment and setup

See page Photographs

Loading using Weights

Accuracy class: F2

No. of uploadings: 10

Enter Load:

No.	Load [g]	Load used [g]	n	n ₁	Accuracy %
0	0,4	0,4	20	1	OIML R 111
1	2,4	2,4	120	1	OIML R 111
2	5	5	250	1	OIML R 111
3	10	10	500	1	OIML R 111
4	30	30	1500	1	OIML R 111
5	50	50	2500	1	OIML R 111
6	70	70	3500	1	OIML R 111
7	90	90	4500	1	OIML R 111
8	110	110	5500	1	OIML R 111
9	130	130	6500	1	OIML R 111
10	150	150	7500	1	OIML R 111

Maximum value: 150

Intervals in use: 1
 $e1 = 0,02$
 $50 * e1 = 1$
 $5000 * e1 = 100$
 $20000 * e1 = 400$

Estimation of measurement uncertainty

See page Equip

Measuring chain for determination of errors of measurements

Weight normals class F2 with traceability to FORCE in Denmark

Uncertainty of measurements

u	Used weight normals	0,00025	[%]
k	Coverage factor:	2	
Expanded uncertainty : U = 0,0005 [%]			
		$k \sqrt{(u)^2}$	

Everything considered the accuracy and stability of the measurements are sufficient good to comply with R76 paragraph 3.7.1 and A.4.4.4.
The evidence is given by the Intrinsic error curve (see Intrinsic).

Photographs



Remarks:

TEST: Initial intrinsic error (OIML R76: T.5.5.3, figure 2)

Application / Task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II

	Begin	End
Temp.[°C]:	20,3	20,3
Rel. H.[%]:	47	
Time:	16:20	
Date:	03-01-2011	

Max: 7500 [e]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

1 interval selected

Aut. Zero-setting and zero-tracking device is: Not in operation

Initial zero-setting (> 20% of Max): No

Load cell number and input impedance: 1 load cell 350 [Ohm]

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L			Indication I		Add. Load ΔL		Error E		Corrected error Ec		MPE * p _i	P / F
			↓	↑	↓	↑	↓	↑	↓	↑	[g]	
0		0,4	0,4	0,396			0	-0,004	0	-0,004	0,5	P
1		2,4	2,4	2,396			0	-0,004	0	-0,004	0,5	P
2		5	5	4,996			0	-0,004	0	-0,004	0,5	P
3		10	10	9,996			0	-0,004	0	-0,004	0,5	P
4		30	29,998	29,996			-0,002	-0,004	-0,002	-0,004	0,5	P
5		50	49,996	49,996			-0,004	-0,004	-0,004	-0,004	0,5	P
6		70	69,996	69,996			-0,004	-0,004	-0,004	-0,004	0,5	P
7		90	90	89,998			0	-0,002	0	-0,002	0,5	P
8		110	109,998	109,998			-0,002	-0,002	-0,002	-0,002	0,5	P
9		130	129,998	130			-0,002	0	-0,002	0	0,5	P
10		150	149,998	149,998			-0,002	-0,002	-0,002	-0,002	0,5	P

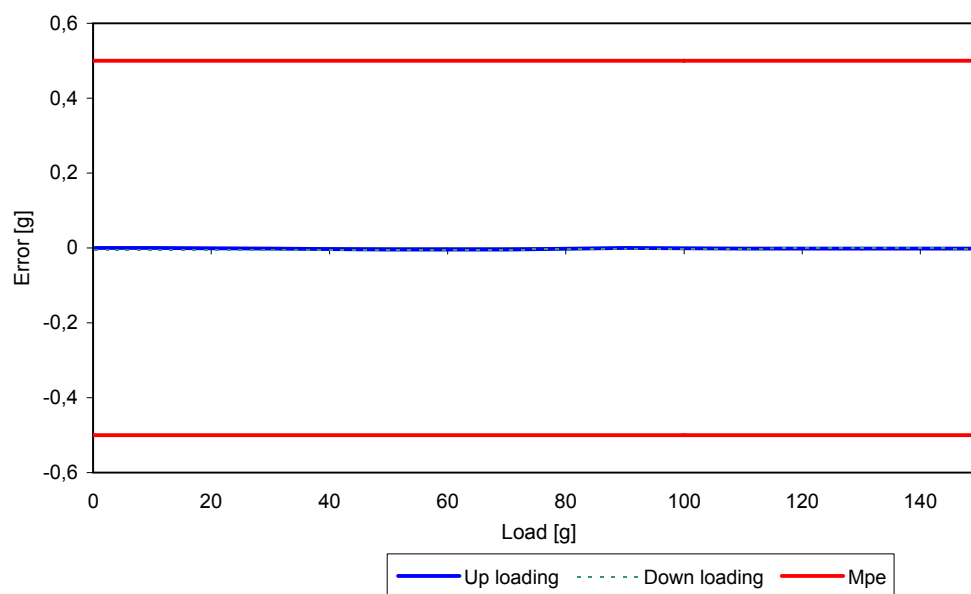
Passed / Failed:

PASSED

Observer:

Jens Hovgård

Remarks:

Initial intrinsic error curve

TEST: Weighing Performance (OIML R76: T.5.5.3 (figure 2) & A.5.3.1)

Application / task:	A530947	Room temp.[°C]:	Begin	End
Type designation:	NHB 150g	Temp.[°C]:	40,2	40,4
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	31	
Serial No.:	0	Time:	16:50	
Accuracy class:	II	Date:	05-01-2011	
Max:	150	Temp. Test:	2	High T
Verification scale interval, e:	0,02	1 interval selected		
No. of verification scale intervals, n:	7500			
Resolution during test:	0,002 [g]			

Simulator applied: No Placed outside the climatic chamber.

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: load cell(s) [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L			Indication I		Add. Load ΔL		Error E		Corrected error E _c		MPE * p _i	P / F
see Equip for table of weight			↓	↑	↓	↑	↓	↑	↓	↑	[g]	
0		0,4	0,376	0,382			-0,024	-0,018	0	0,006	0,5	P
1		2,4	2,376	2,382			-0,024	-0,018	0	0,006	0,5	P
2		5	4,978	4,982			-0,022	-0,018	0,002	0,006	0,5	P
3		10	9,976	9,982			-0,024	-0,018	0	0,006	0,5	P
4		30	29,976	29,982			-0,024	-0,018	0	0,006	0,5	P
5		50	49,978	49,984			-0,022	-0,016	0,002	0,008	0,5	P
6		70	69,98	69,986			-0,02	-0,014	0,004	0,01	0,5	P
7		90	89,984	89,986			-0,016	-0,014	0,008	0,01	0,5	P
8		110	109,988	109,988			-0,012	-0,012	0,012	0,012	0,5	P
9		130	129,99	129,992			-0,01	-0,008	0,014	0,016	0,5	P
10		150	149,99	149,99			-0,01	-0,01	0,014	0,014	0,5	P

New no-load indication: (if it has changed from the first recorded value)

Passed / Failed: **PASSED**

Additional measurements to cover the whole impedance range:

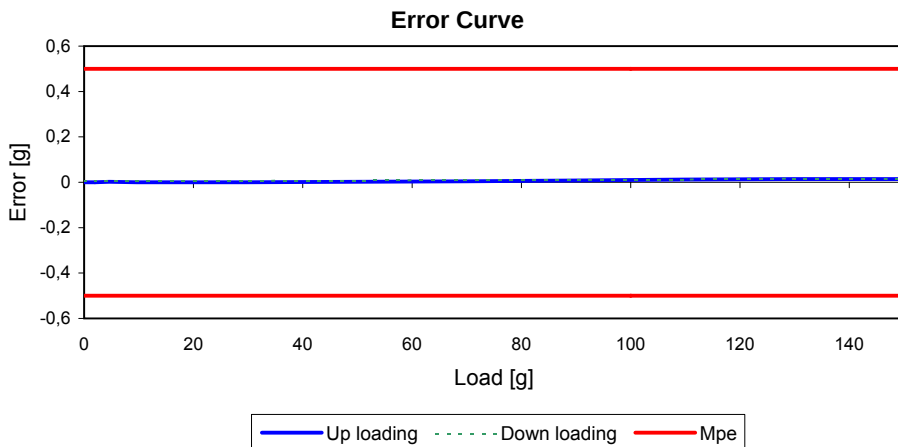
Load cell number and input impedance: 1 ≈ 350 [Ohm]

0		0,4										
10		150										

Corrected for init span:

Observer: Jens Hovgård

Remarks:



TEST: Weighing Performance (OIML R76: T.5.5.3 (figure 2) & A.5.3.1)

Application / task:	A530947	Room temp.[°C]:	Begin	End
Type designation:	NHB 150g	Temp.[°C]:	6,5	6,5
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	58	
Serial No.:	0	Time:	17:15	
Accuracy class:	II	Date:	06-01-2011	
Max:	150	Temp. Test:	3	Low T
Verification scale interval, e:	0,02	1 interval selected		
No. of verification scale intervals, n:	7500			
Resolution during test:	0,002 [g]			
Simulator applied:	No			

Placed outside the climatic chamber.

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: load cell(s) [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L	Indication I		Add. Load ΔL		Error E		Corrected error E _c		MPE * p _i	P / F
	g	g	g	g	g	g	g	g		
0	0,4	0,418			0,018		0		0,5	P
1	2,4	2,418			0,018		0		0,5	P
2	5	5,018			0,018		0		0,5	P
3	10	10,016			0,016		-0,002		0,5	P
4	30	30,014			0,014		-0,004		0,5	P
5	50	50,014			0,014		-0,004		0,5	P
6	70	70,016			0,016		-0,002		0,5	P
7	90	90,02			0,02		0,002		0,5	P
8	110	110,02			0,02		0,002		0,5	P
9	130	130,022			0,022		0,004		0,5	P
10	150	150,022			0,022		0,004		0,5	P

New no-load indication: (if it has changed from the first recorded value)

Passed / Failed: **PASSED**

Additional measurements to cover the whole impedance range:

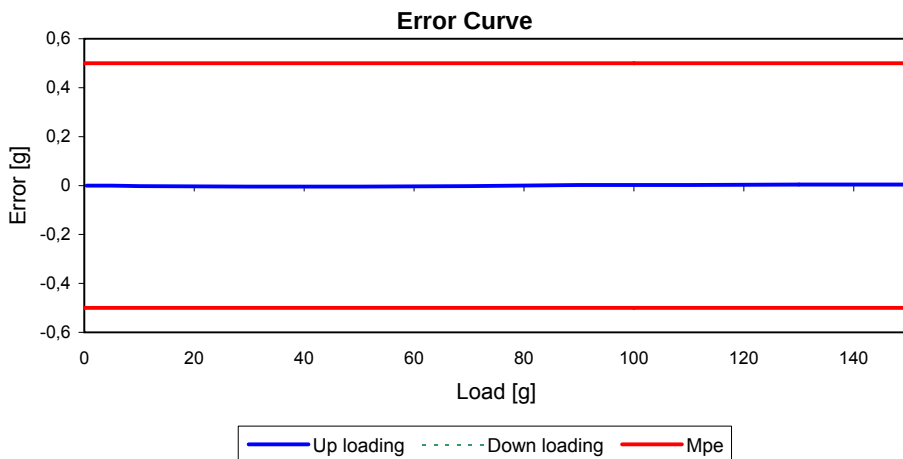
Load cell number and input impedance: 1 ≈ 350 [Ohm]

0	0,4									
10	150									

Corrected for init span:

Observer: Jens Hovgård

Remarks:



TEST: Weighing Performance (OIML R76: T.5.5.3 (figure 2) & A.5.3.1)

Application / task:	A530947	Room temp.[°C]:	Begin	End
Type designation:	NHB 150g	Temp.[°C]:	20,3	20,5
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	53	
Serial No.:	0	Time:	09:55	
Accuracy class:	II	Date:	07-01-2011	
Max:	150	Temp. Test:	4	5 °C
Verification scale interval, e:	0,02	1 interval selected		
No. of verification scale intervals, n:	7500			
Resolution during test:	0,002 [g]			
Simulator applied:	No			

Placed outside the climatic chamber.

Aut. Zero-setting and zero-tracking device is: Out of working range

Load cell number and input impedance: 1 load cell(s) 350 [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L	Indication I	Add. Load ΔL	Error E	Corrected error Ec	MPE * p _i	P / F
g	g	g	g	g	g	
0	0,4	0,376	-0,024	0	0,5	P
1	2,4	2,376	-0,026	-0,002	0,5	P
2	5	4,978	-0,026	0,002	0,5	P
3	10	9,976	-0,026	0	0,5	P
4	30	29,972	-0,03	-0,006	0,5	P
5	50	49,972	-0,028	-0,004	0,5	P
6	70	69,974	-0,028	-0,004	0,5	P
7	90	89,976	-0,026	0	0,5	P
8	110	109,976	-0,024	0	0,5	P
9	130	129,976	-0,022	0	0,5	P
10	150	149,974	-0,026	-0,002	0,5	P

New no-load indication: (if it has changed from the first recorded value)

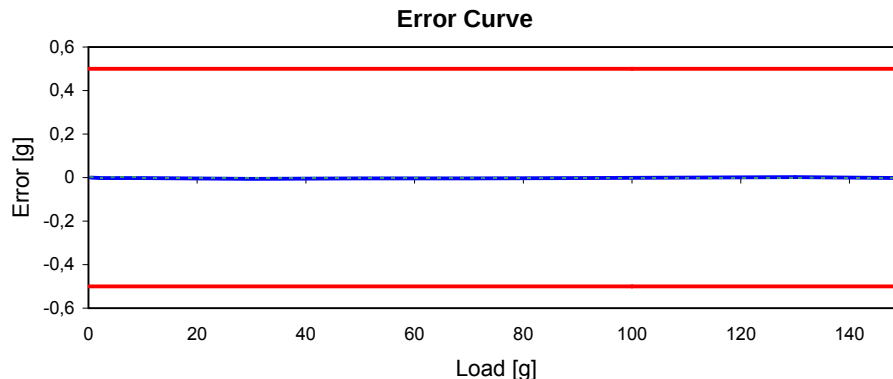
Passed / Failed: PASSED

Additional measurements to cover the whole impedance range:

Load cell number and input impedance: 1 ≈ 350 [Ohm]

0	0,4								
10	150								

Corrected for init span:

Observer: Jens Hovgård
Remarks:

— Up loading - - - Down loading — Mpe

TEST: Temperature Effect on No-load Indication (OIML R76: A.5.3.2)

Application / task: : A530947
 Type designation: : NHB 150g
 Test item: : Non-automatic weighing instrument
 Serial number: : 0
 Observer: : Jens Hovgård
 Accuracy class: : II
 Max: : 150 [g]
 Verification scale interval, e: : 0,02 [g]
 No. of Verification scale intervals, n: : 7500
 Resolution during test (smaller than e): : 0,002 [g]
 Requirement: : 0,02 [g]
 Fraction (p_i): : 1

Aut. Zero-setting and zero-tracking device is : Not in operation

$P = I + \frac{1}{2}e - \Delta L$

See Work sheet	Date	Time	Temp	Zero indication (I)	Add. load (ΔL)	(P)	(ΔP)	Temp. diff.	Zero-change per 5 °C	Requirement (p _i * VSI)	Passed / Failed
	2011	hh:mm	[°C]	[g]	[g]	[g]	[g]	[K]	[g]	[g]	
T (1)	05-jan	09:45	20	0,4	0	0,41	-0,024	20,2	0,006	0,02	PASSED
	05-jan	16:50	40,2	0,376	0	0,386					
T (2)	05-jan	16:50	40,4	0,376	0	0,386	0,042	33,9	0,006	0,02	PASSED
	06-jan	17:15	6,5	0,418	0	0,428					
T (3)	06-jan	17:15	6,5	0,418	0	0,428	-0,042	13,8	0,015	0,02	PASSED
	07-jan	09:55	20,3	0,376	0	0,386					
T (4)	07-jan	09:55	20,5	0,376	0	0,386		-0,2		0,02	
T (5)	07-jan	09:55	20,3	0	0						

Passed / Failed: PASSED

Remarks:

TEST: Eccentricity (OIML R76: A.4.7 & 3.6.2)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Recommended Load (L): 50 [g]

	Begin	End
Temp.[°C]:	19,9	
Rel. H.[%]:	49	
Time:	15:35	
Date:	14-01-2011	

Load receptor: Type: Capacity [kg]: 0,15 S/N:

Aut. Zero-setting and zero-tracking device is: In operation

Load cell number and input impedance: 1 load cell(s)

350 [Ohm]

Model for eccentric loading: 4-quarter segments

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

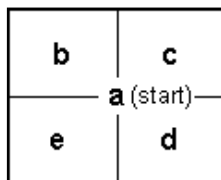
$$E_c = E - E_0$$

$$p_i = 1$$

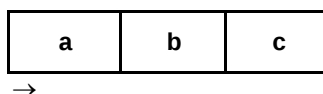
Pos.	Load (See Equip for table of weights)		Indication I		Add. Load ΔL		Error E		Corrected error E_c	MPE	P / F
	L_0	L	I_0	I_L			E_0	E			
	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
a	0		0				0				
		50		49,994				-0,006	-0,006	0,5	P
b	0		0				0				
		50		49,994				-0,006	-0,006	0,5	P
c	0		0				0				
		50		49,994				-0,006	-0,006	0,5	P
d	0		0				0				
		50		49,994				-0,006	-0,006	0,5	P
e	0		0				0				
		50		49,992				-0,008	-0,008	0,5	P

Location of loads:

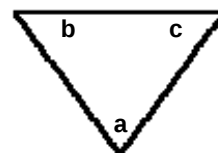
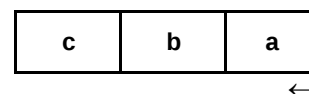
4-quarter segments



Rolling load, normal direction



Rolling load, reverse direction



3-points of support

Passed / Failed:

Passed

Observer:

Jens Hovgård

Remarks:

TEST: Repeatability (OIML R76: A.4.10)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	19,9	
Rel. H.[%]:	48	
Time:	15:00	
Date:	25-01-2011	

Aut. Zero-setting and zero-tracking device is: Out of working range

Load cell number and input impedance: load cell(s)

[Ohm]

No load (L_0): 0 [g]

Load about half Max: (See Equip for table of weights)

Load about Max: (See Equip for table of weights)

No.	Load	Indication		Add. Load ΔL	P $= I - I_0$
	L	I_0	I		
	[g]	[g]	[g]	[g]	[g]
1	70	0,1	70,094		69,994
2	70	0,1	70,094		69,994
3	70	0,1	70,094		69,994
4	70	0,1	70,094		69,994
5	70	0,1	70,094		69,994
6	70	0,1	70,092		69,992
7	70	0,1	70,094		69,994
8	70	0,1	70,094		69,994
9	70	0,1	70,094		69,994
10	70	0,1	70,092		69,992

No.	Load	Indication		Add. Load ΔL	P $= I - I_0$
	L	I_0	I		
	[g]	[g]	[g]	[g]	[g]
1	150	0,1	150,09		149,99
2	150	0,1	150,09		149,99
3	150	0,1	150,09		149,99
4	150	0,1	150,09		149,99
5	150	0,098	150,088		149,99
6	150	0,1	150,09		149,99
7	150	0,1	150,088		149,988
8	150	0,1	150,09		149,99
9	150	0,1	150,09		149,99
10	150	0,098	150,088		149,99

Pmax: [g]

Pmin: [g]

Pmax - Pmin: [g]

$p_i = 1$

Mpe: [g]

Passed / Failed:

Pmax: [g]

Pmin: [g]

Pmax - Pmin: [g]

Mpe: [g]

Passed / Failed:

Overall Passed / Failed: **Passed**

Observer: Jens Hovgård

Remarks: 0.1 g used for disabling zero-tracking

TEST: Creep & Zero return (OIML R76: A.4.11.1 and 2)

Application / task:	A530947	Begin	End
Type designation:	NHB 150g	Temp.[°C]:	19,4 19,4
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	45
Serial No.:	0	Time:	14:53
Accuracy class:	II	Date:	08-02-2011
Max:	150		
Verification scale interval, e:	0,02		
No. of verification scale intervals, n:	7500		
Resolution during test:	0,002 [g]		

Aut. Zero-setting and zero-tracking device is: In operation

Load cell number and input impedance: load cell(s) [Ohm]No load (L_0): 1 [g] 0,7 [%] of the range**Zero return**

$P = I + \frac{1}{2}e - \Delta L$					$p_i = 1$	
Time of reading	Load L_0	Indication of zero I_0	Add.load ΔL	P	Requi.	Result
	[g]	[g]	[g]	[g]	[g]	$ \Delta P $
14:53	1	1,002		1,002		
After loading for 0.5 h (with load close to Max) Load =					0.5 * e1	
Unload quickly:						
15:23	1	1		1	0,01	0,002

Passed / Failed: **Passed**Remarks: **10 sec unload & stabilization time (OIML R60:2000)****Creep**

Load close to Max			$P = I + \frac{1}{2}e - \Delta L$			$p_i = 1$
Time of reading	Load L	Indication I	Add.load ΔL	P	ΔP	Requirement
	[g]	[g]	[g]	[g]	[g]	[g]
14:53:00	0 min	150	150	150		0,01
14:58:00	5 min	149,998		149,998	0,002	
15:08:00	15 min	150		150	0	
15:23:00	30 min	150		150	0	
	1 h					0,5
	2 h					
	3 h					
	4 h					

Passed / Failed: **Passed**

Observer:

Remarks:

TEST: Stability of Equilibrium (OIML R76: A.4.12)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	19,9	
Rel. H.[%]:	48	
Time:	11:25	
Date:	27-01-2011	

Aut. Zero-setting and zero-tracking device is: In operation

Load cell number and input impedance: load cell(s)

[Ohm]

No load (L_0): 0 [g]

Load about half Max: (See Equip for table of weights)

No.	Load	First printed value after disturbance and command	Reading after print-out during 5 s		Error E	Req. [g]	P / F
	L		Minimum	Maximum			
	[g]	[g]	[g]	[g]	[g]		
1	70	69,994	69,992	69,996	0,004	1	P
2	70	69,996	69,996	69,996	0	1	P
3	70	69,996	69,992	69,996	0,004	1	P
4	70	69,996	69,994	69,996	0,002	1	P
5	70	69,994	69,992	69,994	0,002	1	P

Passed / Failed: **Passed**

Observer:

Remarks:

TEST: Tilting (OIML R76: A.5.1 & 3.9.1)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]

	Begin	End
Temp.[°C]:	18,9	
Rel. H.[%]:	48	
Time:	11:10	
Date:	14-02-2011	

Load receptor: Type: Capacity [kg]: 0,15 S/N:

Tilted to: Level indicator limit

Aut. Zero-setting and zero-tracking device is: Out of working range

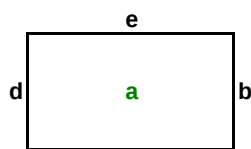
Load cell number and input impedance: 1 load cell(s) 350 [Ohm]

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

$$E_c = E - E_0$$

$$p_i = 1$$

Tilt	Load (See Equip for table of weights)		Indication I		Add. Load ΔL		Error E		Corrected error E_c	MPE	P / F
	L_0	L	I_0	I_L			E_0	E	[g]	[g]	
	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
a	1		1				0				
ref.		100		100				0	0	0,5	P
no tilt		150		150				0	0	0,5	P
Raise	1		1				0		0	0,04	P
b		100		99,998				-0,002	-0,002	0,5	P
		150		149,996				-0,004	-0,004	0,5	P
Raise	1		1				0		0	0,04	P
c		100		100,002				0,002	0,002	0,5	P
		150		150,002				0,002	0,002	0,5	P
Raise	1		0,998				-0,002		-0,002	0,04	P
d		100		100				0	0,002	0,5	P
		150		150				0	0,002	0,5	P
Raise	1		0,996				-0,004		-0,004	0,04	P
e		100		99,992				-0,008	-0,004	0,5	P
		150		149,988				-0,012	-0,008	0,5	P



Tilt figure

Passed / Failed: **Passed**

Observer: Jens Hovgård

Remarks: Tested with level indicator type "H"

TEST: Tare "Weighing test" (OIML R76: A.4.6.1 & 3.5.3.3)
Analysis based on Initial Intrinsic data.

Application / task:	A530947	Begin	End
Type designation:	NHB 150g	Temp.[°C]:	20,3 20,3
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	47
Serial No.:	0	Time:	16:20
Accuracy class:	II	Date:	03-01-2011
Max:	150 [g]		
Verification scale interval, e:	0,02 [g]	1 interval selected	
No. of verification scale intervals, n:	7500		
Resolution during test:	0,002 [g]		
Simulator applied:	No		
Simulator range:			
Aut. Zero-setting and zero-tracking device is:	Not in operation		
Load cell number and input impedance:	1 load cell(s)	350 [Ohm]	
Tare load applied:	2,4 [g]	Max. Tare:	100 %
Indication of tare load:	2,4 [g]	Max. for analysis:	100 %

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L	Indication of NET		Add. Load ΔL		Error E		Corrected error E _c		MPE * p _i	P / F
	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
0										
1	0	0	-0,004		0	-0,004	0	-0,004	0,5	P
2	2,6	2,6	2,596		0	-0,004	0	-0,004	0,5	P
3	7,6	7,6	7,596		0	-0,004	0	-0,004	0,5	P
4	27,6	27,598	27,596		-0,002	-0,004	-0,002	-0,004	0,5	P
5	47,6	47,596	47,596		-0,004	-0,004	-0,004	-0,004	0,5	P
6	67,6	67,596	67,596		-0,004	-0,004	-0,004	-0,004	0,5	P
7	87,6	87,6	87,598		0	-0,002	0	-0,002	0,5	P
8	107,6	107,598	107,598		-0,002	-0,002	-0,002	-0,002	0,5	P
9	127,6	127,598	127,6		-0,002	0	-0,002	0	0,5	P
10	147,6	147,598	147,598		-0,002	-0,002	-0,002	-0,002	0,5	P

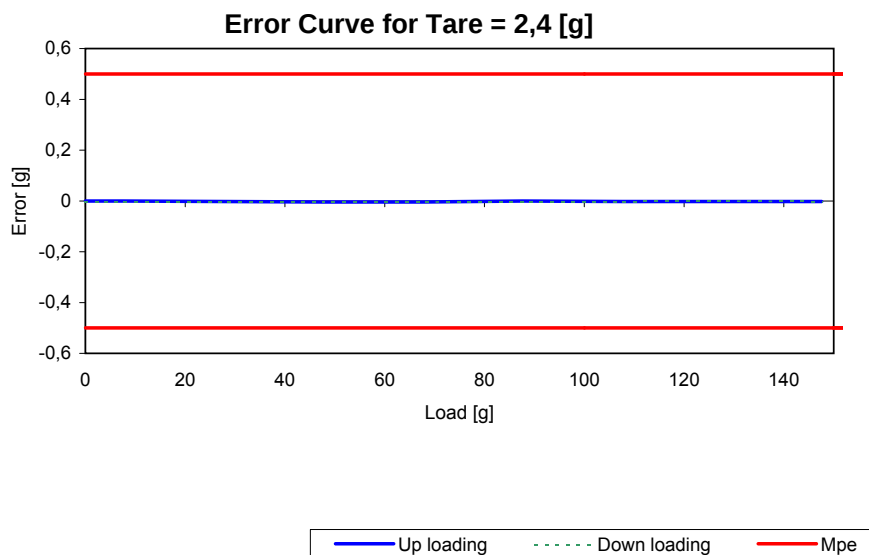
Passed / Failed:

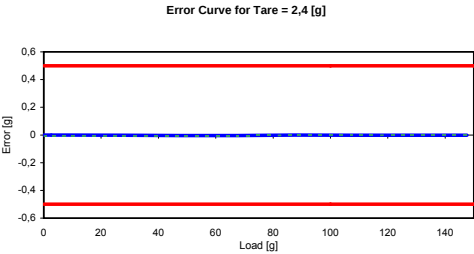
PASSED

Remarks:

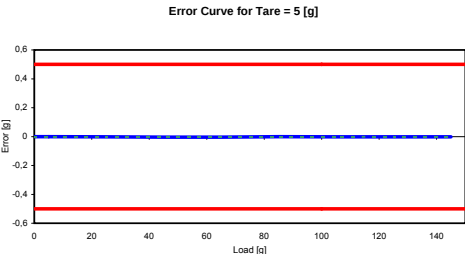
Observer:

Jens Hovgård

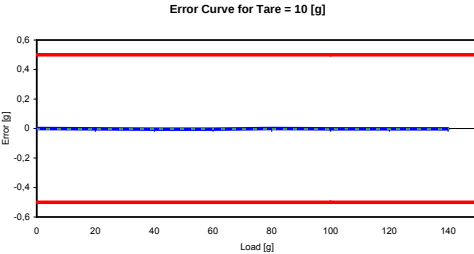




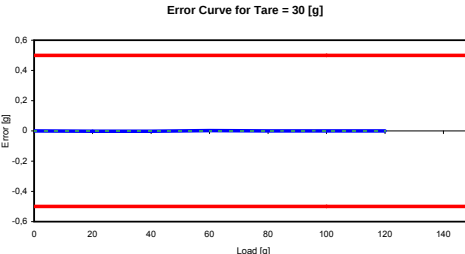
Passed/Failed: PASSED



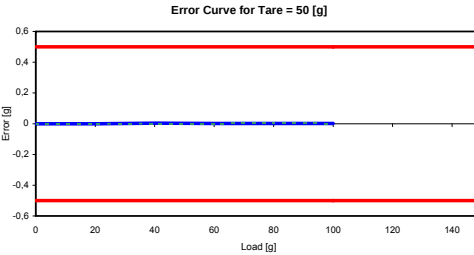
Passed/Failed: PASSED



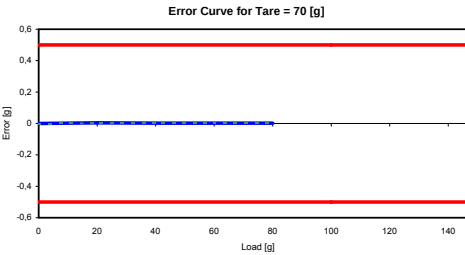
Passed/Failed: PASSED



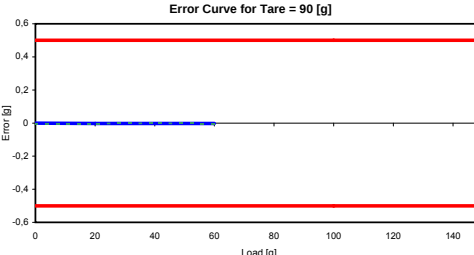
Passed/Failed: PASSED



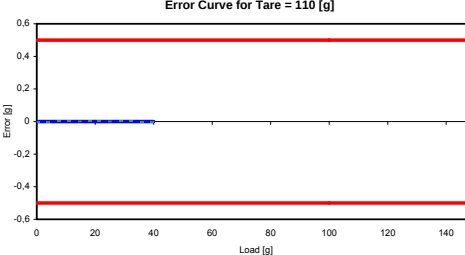
Passed/Failed: PASSED



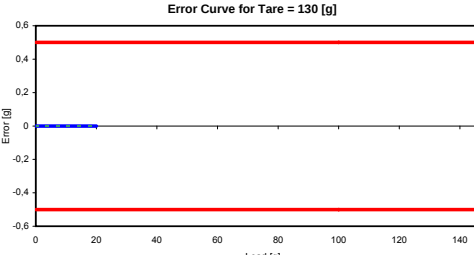
Passed/Failed: PASSED



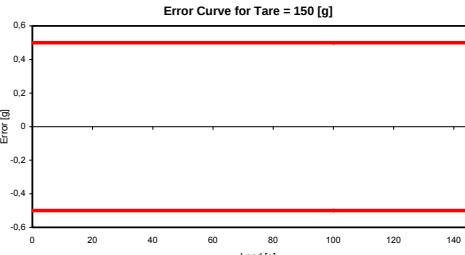
Passed/Failed: PASSED



Passed/Failed: PASSED



Passed/Failed: PASSED



Passed/Failed: PASSED

TEST: Warm-up time (OIML R76: A.5.2)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	19,6	19,6
Rel. H.[%]:	52	
Time:	09:00	
Date:	20-01-2011	

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s) 350 [Ohm]

Duration of power off before the test: >16 hours

Time from power on until the first measurement is readable: 0,1 minutes

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

$$E_c = E_L - E_0$$

$$p_i = 1$$

Time (*)		Load		Indication I		Add. Load ΔL		Error E		Corrected error Ec	mpe = MPE * p _i	P / F
Lapse	Real	L ₀	L	I ₀	I _L			E ₀	E _L			
mm:ss	hh:mm:ss	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
0:00	09:00:00	1	150	1	149.99			0	-0.01	-0.01	0.5	P
	09:01:00	1	150									
	09:02:00	1	150									
	09:03:00	1	150									
	09:04:00	1	150									
5:00	09:05:00	1	150	1	149.99			0	-0.01	-0.01	0.5	P
	09:06:00	1	150									
	09:07:00	1	150									
	09:08:00	1	150									
	09:09:00	1	150									
	09:10:00	1	150									
	09:11:00	1	150									
	09:12:00	1	150									
	09:13:00	1	150									
	09:14:00	1	150									
15:00	09:15:00	1	150	0.998	149.986			-0.002	-0.014	-0.012	0.5	P
	09:16:00	1	150									
	09:17:00	1	150									
	09:18:00	1	150									
	09:19:00	1	150									
	09:20:00	1	150									
	09:21:00	1	150									
	09:22:00	1	150									
	09:23:00	1	150									
	09:24:00	1	150									
	09:25:00	1	150									
	09:26:00	1	150									
	09:27:00	1	150									
	09:28:00	1	150									
	09:29:00	1	150									
30:00	09:30:00	1	150	0.994	149.982			-0.006	-0.018	-0.012	0.5	P

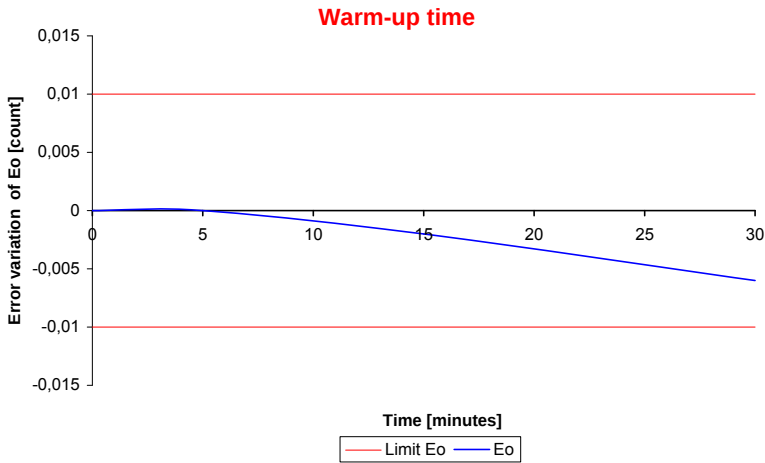
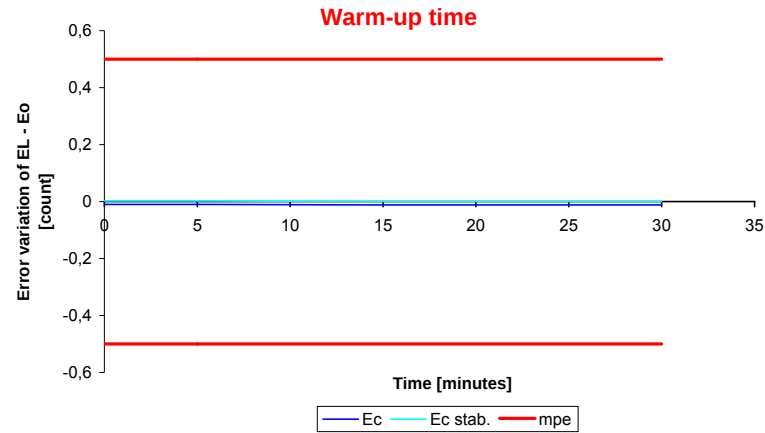
(*) Counted from the moment an indication has first appeared.

Passed / Failed: Passed

Initial zero-setting error:	E_{0init}	0		mpe	P / F	
				0,005	(P)	← No requirement,
Maximum value of error unloaded:	$ E_0 $	0,006	[g]	0,01	(P)	← for information only.
Maximum span error:	$ E_L - E_0 $	0,012		0,5	P	

Observer: Jens Hovgård

Remarks:



TEST: Voltage variations (OIML R76: A.5.4 & 3.9.3)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	18,7	
Rel. H.[%]:	48	
Time:	13:25	
Date:	09-02-2011	

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s) 350 [Ohm]

AC Power voltage supply:

U_n: 230 [Vac]
 Marked AC voltage range: U_{min} - U_{max}: - [Vac]

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

$$E_c = E - E_0$$

$$p_i = 1$$

	U	Load		Indication I		Add. Load ΔL		Error E		Corrected error E _c	MPE	P / F
		L ₀	L	I ₀	I _L			E ₀	E			
	[Vac]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1	230	0,4	150									
2	195,5	0,4	150									
3	253	0,4	150									
4	230	0,4	150									

Maximum value:

Passed / Failed:

Remarks:

DC Power voltage supply:

U_n: [Vdc]
 Marked DC voltage range: U_{min} - U_{max}: 9 - 12 [Vdc]
 Lowest limit of voltage for indication: 7,3 [Vdc]

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

$$E_c = E - E_0$$

$$p_i = 1$$

	U	Load (See Equip for table of weights)		Indication I		Add. Load ΔL		Error E		Corrected error E _c	MPE	P / F
		L ₀	L	I ₀	I _L			E ₀	E			
	[Vdc]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1	10,5	0,4	150	0,4	149,998			0	-0,002	0	0,5	P
2	7,3	0,4	150	0,4	149,998			0	-0,002	0	0,5	P
3	13,2	0,4	150	0,4	149,998			0	-0,002	0	0,5	P
4	10,5	0,4	150	0,4	149,998			0	-0,002	0	0,5	P
5	Batt. 5,4	0,4	150	0,398	149,994			-0,002	-0,006	-0,002	0,5	P

Maximum value:

0,004

Passed / Failed: Passed

Remarks:

Observer: Jens Hovgård

Overall Passed/Failed: Passed

TEST: Electrical Disturbances (OIML R76: B.3)

WELMEC 2.1

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied:

Test load: See the respective tests.

Note: See "Set(T)" page for the configuration of the test setup.

Load cell number and input impedance: load cell(s) corresponding to [Ohm]**Summary of results**

Section	Test	Max. Error [g]	MPE [g]	P/F	Remarks
B.3.1	Short time power reductions	0	0,03	P	
B.3.2	Electrical bursts				
	a) Power supply lines: 1 [kV]	0,004	0,03	P	
	b) I/O circuits and data lines: 0,5 [kV]	0,004	0,03	P	
B.3.3	Electrostatic discharges				
(B.3.4)	a) Direct application:	0,008	0,03	P	
	b) Indirect application:	0,002	0,03	P	
B.3.4	Immunity to electromagnetic fields (emc)				
(B.3.5)	a) Radiated Field strength: 3 [V / m]	0,03	0,03	P	
(B.3.6)	b) Conducted Level 10 [V]		0,03		
(B.3.3)	Surge				
	a) Power supply lines: 2 [kV]		0,03		
	b) I/O circuits and data lines: - [kV]		0,03		
(B.3.7)	Electrical transients, road vehicles				
	a) Conduction along supply lines: 12 [V battery]		0,03		
	b) Capacitive and inductive couplin 12 [V battery]	0	0,03	P	

Overall: Passed / Failed: **Passed**

Test location: DELTA Hørsholm
 Test laboratory: EMC_room1 and Midilab
 EMC report no.: -
 Date of EMC report: -
 Responsible person: Jens Hovgård
 Remarks:

TEST: Short time power reductions (OIML R76:2006 B.3.1)

WELMEC 2.1

Application / task:	A530947	Temp.[°C]:	Begin	End
Type designation:	NHB 150g	Rel. H.[%]:	21,7	
Test item:	Non-automatic weighing instrument	Time:	14:25	
Serial No.:	0	Date:	20-01-2011	
Accuracy class:	II			
Max:	150			
Verification scale interval, e:	0,02			
No. of verification scale intervals, n:	7500			
Resolution during test:	0,002 [g]			
Simulator applied:	No			

Input-voltage per VSI ($\Delta U_{\min}$): [μV]

Note: See "Set(T)" page for the configuration of the test setup.

Load cell number and input impedance: 1 load cell(s) 350 [Ohm]

Marked nominal voltage U_n or voltage range: 230 [V]

Load: 100 [g]

No disturbance	Disturbance				Result		
Indication I1 [g]	Amplitude % of U_n	Duration cycles	Number of disturbances	Repetition interval [s]	Indication I2 [g]	Error I2-I1 [g]	Remarks
1	0	0,5	10	10	1	0	
1	50	1	10	10	1	0	
	0	1	10	10			Not applicable
	40	10	10	10			Not applicable
	70	25	10	10			Not applicable
	80	250	10	10			Not applicable
0,998	0	250	10	10	0,998	0	

/Max. Error/: 0

Passed / Failed: **Passed**

Tested in accordance with the method specified in OIML R76

Observer: Jens Hovgård

Remarks:

TEST: Electrical bursts (OIML R76:2006 B.3.2)

WELMEC 2.1

Application / task:	A530947	Temp.[°C]:	Begin	End
Type designation:	NHB 150g	Rel. H.[%]:	21,8	25
Test item:	Non-automatic weighing instrument	Time:	14:35	
Serial No.:	0	Date:	20-01-2011	
Accuracy class:	II			
Max:	150			
Verification scale interval, e:	0,02			
No. of verification scale intervals, n:	7500			
Resolution during test:	0,002 [g]			
Simulator applied:	No			

Input-voltage per VSI (Δu_{min}): [µV]

Note: See "Set(T)" page for the configuration of the test setup.

Load cell number and input impedance: load cell(s) [Ohm]
 Load: [g]

a) Power supply linesPower supply lines: test voltage : kV, duration of the test 1 minute at each polarity

No disturbance	Disturbance			Polarity	Result		
Indication I1 [g]	phase ↓ ground	neutral ↓ ground	protec.earth ↓ ground		Indication I2 [g]	Error I2-I1 [g]	Remarks
1	X			pos	1,004	0,004	
1	X			neg	1,004	0,004	
1		X		pos	1	0	
1		X		neg	1,002	0,002	
			X	pos			Not applicable
			X	neg			Not applicable

Max. Error: 0,004

Passed / Failed: **Passed**

Tested in accordance with the method specified in OIML R76

Observer: Jens Hovgård
 Remarks: No PE

b) I/O circuits and communication lines.I/O signals, data and control lines: test voltage : kV, duration of the test 1 minute at each polarity

No disturbance	Cable/Interface	Polarity	Result		
Indication I1 [g]			Indication I2 [g]	Error I2-I1 [g]	Remarks
1,002	DC cable	pos	0,998	-0,004	1 kV
1,002		neg	1,006	0,004	1 kV
0,998	RS-232C cable	pos	1	0,002	
1		neg	1,002	0,002	

Max. Error: 0,004

Passed / Failed: **Passed**

Tested in accordance with the method specified in OIML R76

Observer: Jens Hovgård
 Remarks:

TEST: Electrical Surge (OIML R76:2006 B.3.3)

WELMEC 2.1

Application / task:	A530947	Temp.[°C]:	Begin	End
Type designation:	NHB 150g	Rel. H.[%]:		
Test item:	Non-automatic weighing instrument	Time:		
Serial No.:	0	Date:		
Accuracy class:	II			
Max:	150			
Verification scale interval, e:	0,02			
No. of verification scale intervals, n:	7500			
Resolution during test:	0,002 [g]			
Simulator applied:	No			

Input-voltage per VSI ($\Delta u_{\min}$): [µV]

Note: See "Set(T)" page for the configuration of the test setup.

Load cell number and input impedance: load cell(s) [Ohm]
 Load: [g]

a) Power supply lines

Power supply lines: 3 positive and 3 negative surges

No disturbance	Applied on	Disturbance	Polarity	Result	Remarks
Indication I1 [g]		amplitude [kV] angle [°]		Indication I2 [g] Error I2-I1 [g]	
	L - N	1 0° 90° 180° 270°	pos		
	L - N	1 0° 90° 180° 270°	neg		
	L - PE	2 0° 90° 180° 270°	pos		
	L - PE	2 0° 90° 180° 270°	neg		
	N - PE	2 0° 90° 180° 270°	pos		
	N - PE	2 0° 90° 180° 270°	neg		

Max. Error:

Passed / Failed:

Tested in accordance with the method specified in OIML R76

Observer:

Remarks: Not applicable for EN 45501:1992

b) I/O circuits and communication lines.

I/O signals, data and control lines: Only for industri and cables > 30m, test voltage 0.5 kV.

No disturbance	Cable/Interface	Test voltage	Polarity	Result	Remarks
Indication I1 [g]		[kV]		Indication I2 [g] Error I2-I1 [g]	
	Connection to load receptor m, shielded		pos		
			neg		
	RS-232C cable		pos		
	2		neg		

Max. Error:

Passed / Failed:

Tested in accordance with the method specified in OIML R76

Observer:

Remarks: Not applicable for EN 45501:1992

TEST: Electrostatic discharges (OIML R76:2006 B.3.4)

WELMEC 2.1

Application / task:	A530947	Begin	End
Type designation:	NHB 150g	Temp, [°C]:	20,9
Test item:	Non-automatic weighing instrument	Rel. H. [%]:	48
Serial No.:	0	Time:	15:25
Accuracy class:	II	Date:	21-01-2011
Max:	150		
Verification scale interval, e:	0,02		
No. of verification scale intervals, n:	7500		
Resolution during test:	0,002 [g]		
Simulator applied:	No		

Input-voltage per VSI ($\Delta u_{\min}$): [µV]

Note: See "Set(T)" page for the configuration of the test setup.

Load cell number and input impedance: load cell(s) [Ohm]
 Load: [g]

a) Direct application.Contact discharges Paint penetration Air discharges Polarity(*): pos neg

(*) IEC 801-2 specifies that the test shall be conducted in the most sensitive polarity

No disturbance	Disturbance			Result		Remarks
Indication I1 [g]	Test Voltage [kV]	Number of discharges ≥ 10	Repetition interval [s]	Indication I2 [g]	Error I2-I1 [g]	
1	2	10	10	1	0	
1	4	10	10	0,996	-0,004	
1	6	10	10	0,992	-0,008	see remark
1	8 (air discharge)	10	10	1	0	

Max. Error: 0,008

Passed / Failed: **Passed**

Tested in accordance with the method specified in OIML R76

Observer: Jens Hovgård
 Remarks: On top side, but not RS232 connector

b) Indirect application (contact discharges only)Polarity(*): pos neg

(*) IEC 801-2 specifies that the test shall be conducted in the most sensitive polarity

Horizontal coupling plane

No disturbance	Disturbance			Result		Remarks
Indication I1 [g]	Test Voltage [kV]	Number of discharges ≥ 10	Repetition interval [s]	Indication I2 [g]	Error I2-I1 [g]	
1	2	10	10	1	0	
1	4	10	10	1	0	
1	6	10	10	1,002	0,002	

Vertical coupling plane

No disturbance	Disturbance			Result		Remarks
Indication I1 [g]	Test Voltage [kV]	Number of discharges ≥ 10	Repetition interval [s]	Indication I2 [g]	Error I2-I1 [g]	
1	2	10	10	1	0	
1	4	10	10	1	0	
1	6	10	10	1,002	0,002	

Max. Error: 0,002

Passed / Failed: **Passed**

Tested in accordance with the method specified in OIML R76

Observer: Jens Hovgård
 Remarks:

TEST: Radiated electromagnetic fields (OIML R76:2006 B.3.5)

WELMEC 2.1

Application / task:	A530947	Temp.[°C]:	Begin	End
Type designation:	NHB 150g	Rel. H.[%]:	21	29
Test item:	Non-automatic weighing instrument	Time:	11:00	
Serial No.:	0	Date:	20-01-2011	
Accuracy class:	II			
Max:	150			
Verification scale interval, e:	0,02			
No. of verification scale intervals, n:	7500			
Resolution during test:	0,002 [g]			
Simulator applied:	No			

Input-voltage per VSI ($\Delta u_{\min}$): [μV]

Note: See "Set(T)" page for the configuration of the test setup.

Load cell number and input impedance:	1	load cell(s)	350	[Ohm]
Load:	100	[g]		
Size of test item:	Height:	[mm]	Width:	Depth: [mm]
Field strength:	3	[V/m]		
Antenna test distance:	2,5	[m]		
Rate of sweep:	0,005	[oct./s]		
Material load:				
Modulation:	80% AM, 1 kHz sine wave			

Enter Height, Width and Depth

Antenna: Bilog							
No disturbance	Disturbance				Result		
Indication I1 [g]	Frequency range [Mhz]	Polarization	Field lowered to comply [V/m]	Antenna facing EUT	Indication I2 [g]	Error I2-I1 [g]	Remarks
0.998	26-80	Vertical		Front	0.994	-0.004	
0.998				Right	0.994	-0.004	
0.998				Left	0.994	-0.004	
0.998				Rear	0.994	-0.004	
0.996		Horizontal		Front	1	0.004	
0.996				Right	1	0.004	
0.996				Left	1	0.004	
0.996				Rear	1	0.004	

Antenna: Bilog							
No disturbance	Disturbance				Result		
Indication I1 [g]	Frequency range [Mhz]	Polariza- tion	Field lowered to comply [V/m]	Antenna facing EUT	Indication I2 [g]	Error I2-I1 [g]	Remarks
1	80-1000	Vertical		Front	0,994	-0,006	
1				Right	0,994	-0,006	
1				Left	0,994	-0,006	
1				Rear	0,994	-0,006	
1		Horizontal		Front	1,03	0,03	
1				Right	1,03	0,03	
1				Left	1,03	0,03	
1				Rear	1,03	0,03	

Max. Error: 0,03

Passed / Failed: **Passed**Tested in accordance with the method specified in **OIML R76**

Observer:

Remarks:

With horizontal polarization max error is -0,03 at 100 MHz and +0,03 at 980 MHz using a ferrit with 4 turns on the DC power supply cable.

TEST: Conducted electromagnetic fields (OIML R76:2006 B.3.6)

WELMEC 2.1

Application / task:	A530947	Temp.[°C]:	Begin	End
Type designation:	NHB 150g	Rel. H.[%]:		
Test item:	Non-automatic weighing instrument	Time:		
Serial No.:	0	Date:		
Accuracy class:	II			
Max:	150			
Verification scale interval, e:	0,02			
No. of verification scale intervals, n:	7500			
Resolution during test:	0,002 [g]			
Simulator applied:	No			

Input-voltage per VSI ($\Delta u_{\min}$): [µV]

Note: See "Set(T)" page for the configuration of the test setup.

Load cell number and input impedance:	1	load cell(s)	350	[Ohm]
Load:	100	[g]		
Level:	10	[Vrms]		
Rate of sweep:	0,005	[oct./s]		
Modulation:	80% AM, 1 kHz sine wave			

No disturbance	Disturbance			Result		
Indication I1 [g]	Cable / interface	Frequency range [Mhz]	Level lowered to [V]	Indication I2 [g]	Error I2-I1 [g]	Remarks
	Power supply cable	0.15 - 80				
	Connection to load receptor	0.15 - 80				
	RS-232C cable	0.15 - 80				

Max. Error:

Passed / Failed:

Tested in accordance with the method specified in OIML R76

Observer:

Remarks:

Not applicable for EN 45501:1992

**TEST: Electrical transients from a road vehicle power supply
(OIML R76:2006 B.3.7)**

WELMEC 2.1

Application / task:	A530947	Begin	End
Type designation:	NHB 150g	Temp.[°C]:	
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	
Serial No.:	0	Time:	
Accuracy class:	II	Date:	
Max:	150		
Verification scale interval, e:	0,02		
No. of verification scale intervals, n:	7500		
Resolution during test:	0,002 [g]		
Simulator applied:	No		

Input-voltage per VSI ($\Delta u_{\min}$): [µV]

Note: See "Set(T)" page for the configuration of the test setup.

Load cell number and input impedance:

1

 load cell(s)

350

 [Ohm]
Load:

100

 [g]

a) Conduction along supply lines of external 12 V and 24 V batteries (ISO 7637-2:2004)

12 V battery voltage

No disturbance	Disturbance			Result		
Indication I1 [g]	Cable / interface	Test pulse	Conducted voltage [V]	Indication I2 [g]	Error I2-I1 [g]	Remarks
	Power supply cable	2a	+50			
		2b	+10			
		3a	-150			
		3b	+100			
		4	-7			

24 V battery voltage

No disturbance	Disturbance			Result		
Indication I1 [g]	Cable / interface	Test pulse	Conducted voltage [V]	Indication I2 [g]	Error I2-I1 [g]	Remarks
	Power supply cable	2a	+50			
		2b	+20			
		3a	-200			
		3b	+200			
		4	-16			

Max. Error:

Passed / Failed:

Tested in accordance with the method specified in OIML R76

Observer:

Remarks:

Not applicable for EN 45501:1992

b) Capacitive and inductive coupling via lines other than supply lines (ISO 7637-3:1995)

12 V battery voltage

No disturbance	Disturbance			Result		
Indication I1 [g]	Kind or type of other lines (no power supply lines)	Test pulse	Conducted voltage [V]	Indication I2 [g]	Error I2-I1 [g]	Remarks
		a	-60			
		b	+40			
		a	-60			
		b	+40			
		a	-60			
		b	+40			
		a	-60			
		b	+40			
		a	-60			
		b	+40			

24 V battery voltage

No disturbance	Disturbance			Result		
Indication I1 [g]	Kind or type of other lines (no power supply lines)	Test pulse	Conducted voltage [V]	Indication I2 [g]	Error I2-I1 [g]	Remarks
		a	-80			
		b	+80			
		a	-80			
		b	+80			
		a	-80			
		b	+80			
		a	-80			
		b	+80			
		a	-80			
		b	+80			

Max. Error: 0

Passed / Failed: **Passed**

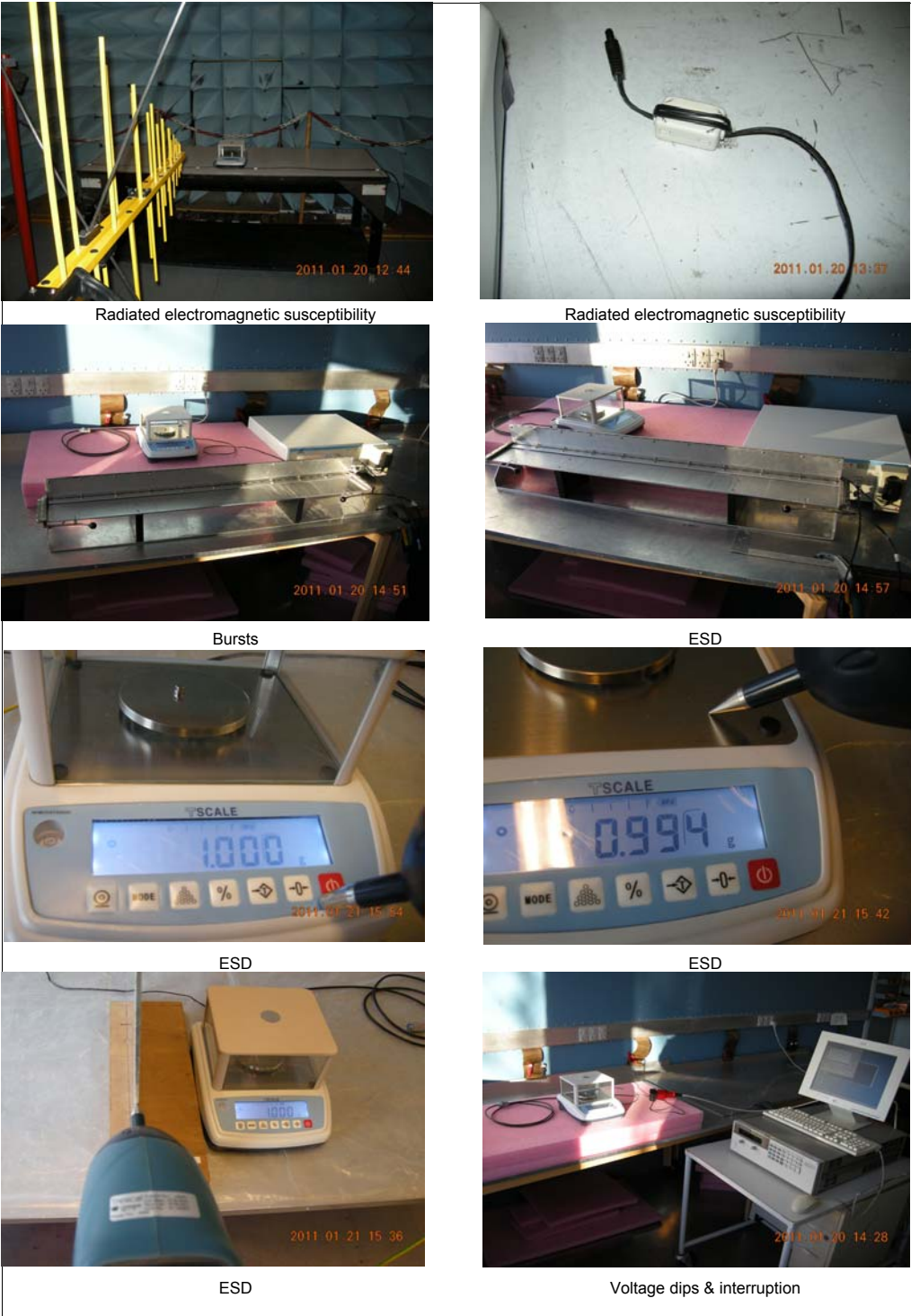
Tested in accordance with the method specified in OIML R76

Observer:

Remarks: Not applicable for EN 45501:1992

Conditional Passed:

Photographs from the electrical disturbance tests.



Remarks:

Before the test item is placed in the anechoic chamber, an isotropic E-field sensor is placed on the spot where the test item is placed later on. An automatic measurement of the generator output, necessary to establish the specified field strength reading on the E-field sensor is performed. The data of the corresponding frequency and generator output is stored for use during the exposure. These data are printed out, saved and kept.

Remarks:

[illegible]

TEST: Damp heat, steady state (OIML R76: B.2.2)

Application / task:	A530947	Room temp.[°C]:	20	Begin	End
Type designation:	NHB 150g	Temp.[°C]:	20	20	
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	50		
Serial No.:	0	Time:	16:20		
Accuracy class:	II	Date:	14-01-2011		
Max:	150	Ref. Test before humidity:	1		
Verification scale interval, e:	0,02	1 interval selected			
No. of verification scale intervals, n:	7500				
Resolution during test:	0,002 [g]				
Simulator applied:	No	Placed outside the climatic chamber.			

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s) 350 [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L			Indication I		Add. Load ΔL		Error E		Corrected error Ec		MPE * p _i	P / F
See Equip for table of weights			↓	↑	↓	↑	↓	↑	↓	↑	[g]	
0		[g]	0,4	0,4			0		0		0,5	P
1		[g]	2,4	2,4			0		0		0,5	P
2		[g]	5	4,998			-0,002		-0,002		0,5	P
3		[g]	10	9,998			-0,002		-0,002		0,5	P
4		[g]	30	29,994			-0,006		-0,006		0,5	P
5		[g]	50	49,994			-0,006		-0,006		0,5	P
6		[g]	70	69,996			-0,004		-0,004		0,5	P
7		[g]	90	89,998			-0,002		-0,002		0,5	P
8		[g]	110	109,998			-0,002		-0,002		0,5	P
9		[g]	130	129,998			-0,002		-0,002		0,5	P
10		[g]	150	149,994			-0,006		-0,006		0,5	P

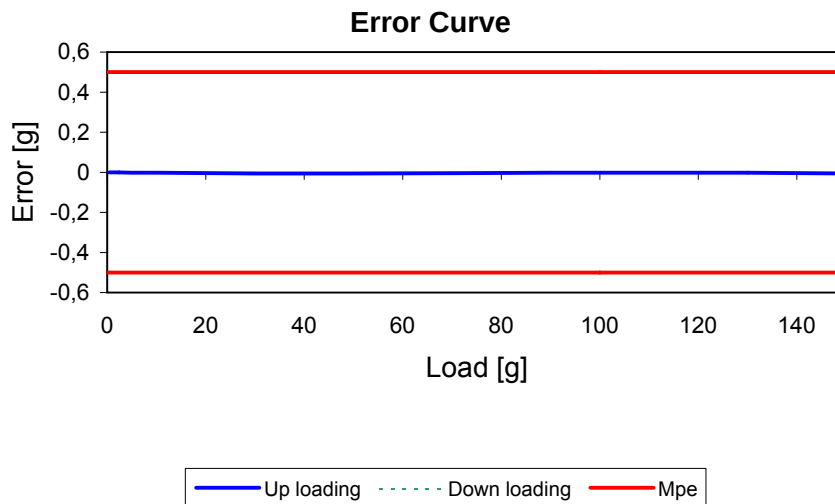
Passed / Failed:

PASSED

Observer:

Jens Hovgård

Remarks:



TEST: Damp heat, steady state (OIML R76: B.2.2)

Application / task:	A530947	Room temp.[°C]:	Begin	End
Type designation:	NHB 150g	Temp.[°C]:	20	20
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	40,1	40,1
Serial No.:	0	Time:	85	85
Accuracy class:	II	Date:	09:30	
Max:	150 [g]	Test during humidity:	17-01-2011	
Verification scale interval, e:	0,02 [g]			
No. of verification scale intervals, n:	7500			
Resolution during test:	0,002 [g]			
Simulator applied:	No			

Test during humidity: 2 days
1 interval selected

Placed outside the climatic chamber.

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s)

350 [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

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

$E_c = E - E_0$

$p_i = 1$

Load L			Indication I		Add. Load ΔL		Error E		Corrected error E_c		MPE $\cdot p_i$	P / F
See Equip for table of weights			↓	↑	↓	↑	↓	↑	↓	↑	[g]	
0		[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
0		0,4	0,434				0,034		0		0,5	P
1		2,4	2,434				0,034		0		0,5	P
2		5	5,034				0,034		0		0,5	P
3		10	10,034				0,034		0		0,5	P
4		30	30,032				0,032		-0,002		0,5	P
5		50	50,03				0,03		-0,004		0,5	P
6		70	70,032				0,032		-0,002		0,5	P
7		90	90,034				0,034		0		0,5	P
8		110	110,03				0,03		-0,004		0,5	P
9		130	130,03				0,03		-0,004		0,5	P
10		150	150,028				0,028		-0,006		0,5	P

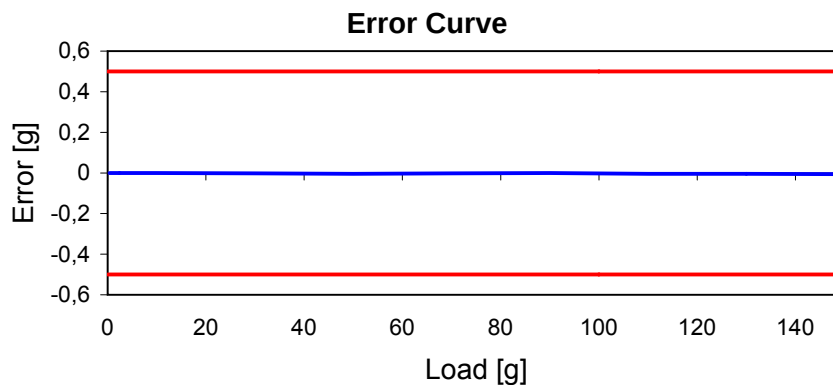
Passed / Failed:

PASSED

Observer:

Jens Hovgård

Remarks:



— Up loading - - - Down loading — Mpe

TEST: Damp heat, steady state (OIML R76: B.2.2)

Application / task:	A530947	Room temp.[°C]:	20	Begin	End
Type designation:	NHB 150g	Temp.[°C]:	20	20,1	
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	50,3	50,5	
Serial No.:	0	Time:	15:55		
Accuracy class:	II	Date:	17-01-2011		
Max:	150	Test after humidity:	3		
Verification scale interval, e:	0,02	1 interval selected			
No. of verification scale intervals, n:	7500				
Resolution during test:	0,002 [g]				
Simulator applied:	No	Placed outside the climatic chamber.			

Aut. Zero-setting and zero-tracking device is: Out of working range

Load cell number and input impedance: 1 load cell(s)

350 [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L			Indication I		Add. Load ΔL		Error E		Corrected error Ec		MPE * p _i	P / F
See Equip for table of weights			↓	↑	↓	↑	↓	↑	↓	↑	[g]	
0		0,4	0,438				0,038		0		0,5	P
1		2,4	2,436				0,036		-0,002		0,5	P
2		5	5,038				0,038		0		0,5	P
3		10	10,036				0,036		-0,002		0,5	P
4		30	30,034				0,034		-0,004		0,5	P
5		50	50,032				0,032		-0,006		0,5	P
6		70	70,034				0,034		-0,004		0,5	P
7		90	90,036				0,036		-0,002		0,5	P
8		110	110,036				0,036		-0,002		0,5	P
9		130	130,036				0,036		-0,002		0,5	P
10		150	150,034				0,034		-0,004		0,5	P

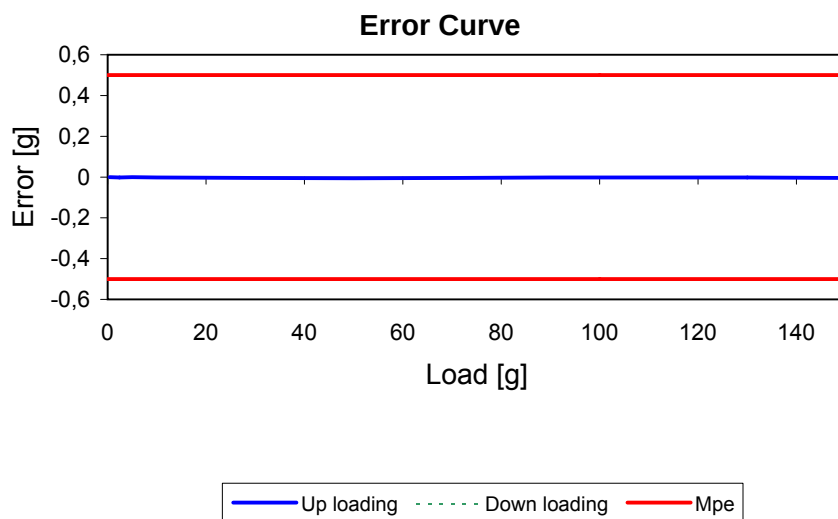
Passed / Failed:

PASSED

Observer:

Jens Hovgård

Remarks:



TEST: Span Stability (OIML R76: B4)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	20,3	20,3
Rel. H.[%]:	47	
Time:	16:30	
Date:	03-01-2011	

1 interval selected

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s)

350 [Ohm]

Span measurement No: 1

Conditions of the measurement: Reference condition

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

$$E_c = E - E_0$$

$$p_i = 1$$

	Load (See Equip for table of weights)		Indication I		Add. Load ΔL		Error E		Corrected error E_c	MPE	P / F
	L_0	L	I_0	I_L			E_0	E			
	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1	0,4		0,4				0				
		150		150				0	0	0,5	P
2	0,4		0,4				0				
		150		149,998				-0,002	-0,002	0,5	P
3	0,4		0,4				0				
		150		149,998				-0,002	-0,002	0,5	P
4	0,4		0,4				0				
		150		150				0	0	0,5	P
5	0,4		0,4				0				
		150		149,998				-0,002	-0,002	0,5	P

Result:

Average error: -0,0012 [g]

 $E_{c_{max}} - E_{c_{min}}$: 0,002 [g]

0.1e = 0,002 [g]

Note: One loading is sufficient for the remaining span measurements.

Passed / Failed: Passed

Observer: Jens Hovgård

Remarks:

TEST: Span Stability (OIML R76: B4)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	20,5	
Rel. H.[%]:	53	
Time:	10:00	
Date:	07-01-2011	

1 interval selected

Aut. Zero-setting and zero-tracking device is: In operation

Load cell number and input impedance: 1 load cell(s)

350 [Ohm]

Span measurement No: 2

Conditions of the measurement: After temperature test

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

$$E_c = E - E_0$$

$$p_i = 1$$

	Load (See Equip for table of weights)		Indication I		Add. Load ΔL		Error E		Corrected error E_c	MPE	P / F
	L_0	L	I_0	I_L			E_0	E			
	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1	0		0				0				
		150		149,998				-0,002	-0,002	0,5	P
2											
3											
4											
5											

Result: Average error: -0,002 [g]

Note: One loading is sufficient for the remaining span measurements.

Passed / Failed: Passed

Observer: Jens Hovgård

Remarks:

TEST: Span Stability (OIML R76: B4)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	19,9	
Rel. H.[%]:	49	
Time:	15:30	
Date:	14-01-2011	

1 interval selected

Aut. Zero-setting and zero-tracking device is: In operation

Load cell number and input impedance: 1 load cell(s)

350 [Ohm]

Span measurement No: 3

Conditions of the measurement: No change of condition

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

$$E_c = E - E_0$$

$$p_i = 1$$

	Load (See Equip for table of weights)		Indication I		Add. Load ΔL		Error E		Corrected error E_c	MPE	P / F
	L_0	L	I_0	I_L			E_0	E			
	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1	0		0				0				
		150		149,994				-0,006	-0,006	0,5	P
2											
3											
4											
5											

Result: Average error: -0,006 [g]

Note: One loading is sufficient for the remaining span measurements.

Passed / Failed: Passed

Observer: Jens Hovgård

Remarks:

TEST: Span Stability (OIML R76: B4)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	20,1	
Rel. H.[%]:	50	
Time:	16:00	
Date:	17-01-2011	

1 interval selected

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s)

350 [Ohm]

Span measurement No: 4

Conditions of the measurement: After humidity test

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

$$E_c = E - E_0$$

$$p_i = 1$$

	Load (See Equip for table of weights)		Indication I		Add. Load ΔL		Error E		Corrected error E_c	MPE	P / F
	L_0	L	I_0	I_L			E_0	E			
	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1	0		0				0				
		150		149,996				-0,004	-0,004	0,5	P
2											
3											
4											
5											

Result: Average error: -0,004 [g]

Note: One loading is sufficient for the remaining span measurements.

Passed / Failed: Passed

Observer: Jens Hovgård

Remarks:

TEST: Span Stability (OIML R76: B4)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	19,8	
Rel. H.[%]:	50	
Time:	10:10	
Date:	20-01-2011	

1 interval selected

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s)

350 [Ohm]

Span measurement No: 5

Conditions of the measurement: After power interruption

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

$$E_c = E - E_0$$

$$p_i = 1$$

	Load (See Equip for table of weights)		Indication I		Add. Load ΔL		Error E		Corrected error E_c	MPE	P / F
	L_0	L	I_0	I_L			E_0	E			
	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1	0		0				0				
		150		149,99				-0,01	-0,01	0,5	P
2											
3											
4											
5											

Result: Average error: -0,01 [g]

Note: One loading is sufficient for the remaining span measurements.

Passed / Failed: Passed

Observer: Jens Hovgård

Remarks:

TEST: Span Stability (OIML R76: B4)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	19,9	
Rel. H.[%]:	48	
Time:	11:55	
Date:	31-01-2011	

1 interval selected

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s)

350 [Ohm]

Span measurement No: 6

Conditions of the measurement: No change of condition

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

$$E_c = E - E_0$$

$$p_i = 1$$

	Load (See Equip for table of weights)		Indication I		Add. Load ΔL		Error E		Corrected error E_c	MPE	P / F
	L_0	L	I_0	I_L			E_0	E			
	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1	0		0				0				
		150		149,992				-0,008	-0,008	0,5	P
2											
3											
4											
5											

Result: Average error: -0,008 [g]

Note: One loading is sufficient for the remaining span measurements.

Passed / Failed: Passed

Observer:

Remarks:

TEST: Span Stability (OIML R76: B4)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	19,4	
Rel. H.[%]:	45	
Time:	15:35	
Date:	08-02-2011	

1 interval selected

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s)

350 [Ohm]

Span measurement No: 7

Conditions of the measurement: No change of condition

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

$$E_c = E - E_0$$

$$p_i = 1$$

	Load (See Equip for table of weights)		Indication I		Add. Load ΔL		Error E		Corrected error E_c	MPE	P / F
	L_0	L	I_0	I_L			E_0	E			
	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1	0		0				0				
		150		149,998				-0,002	-0,002	0,5	P
2											
3											
4											
5											

Result: Average error: -0,002 [g]

Note: One loading is sufficient for the remaining span measurements.

Passed / Failed: Passed

Observer:

Remarks:

TEST: Span Stability (OIML R76: B4)

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

	Begin	End
Temp.[°C]:	18,9	
Rel. H.[%]:	8	
Time:	11:25	
Date:	14-02-2011	

1 interval selected

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s)

350 [Ohm]

Span measurement No: 8

Conditions of the measurement: After power interruption

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

$$E_c = E - E_0$$

$$p_i = 1$$

	Load (See Equip for table of weights)		Indication I		Add. Load ΔL		Error E		Corrected error E_c	MPE	P / F
	L_0	L	I_0	I_L			E_0	E			
	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1	0		0				0				
		150		149,998				-0,002	-0,002	0,5	P
2											
3											
4											
5											

Result: Average error: -0,002 [g]

Note: One loading is sufficient for the remaining span measurements.

Passed / Failed: Passed

Observer:

Remarks:

TEST: Span Stability (OIML R76: B4)**Summary**

Application / task: A530947
 Type designation: NHB 150g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II
 Max: 150 [g]
 Verification scale interval, e: 0,02 [g] 1 interval selected
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,002 [g]
 Simulator applied: No

Load cell number and input impedance: 1 load cell(s) corresponding to 350 [Ohm]

Result of span stability test

Measurement no.	Error [g]	Variation [g]	Condition	Date of test
1	-0,0012	0,0088	Reference condition	03-01-2011
2	-0,002	0,008	After temperature test	07-01-2011
3	-0,006	0,004	No change of condition	14-01-2011
4	-0,004	0,006	After humidity test	17-01-2011
5	-0,01	0	After power interruption	20-01-2011
6	-0,008	0,002	No change of condition	31-01-2011
7	-0,002	0,008	No change of condition	08-02-2011
8	-0,002	0,008	After power interruption	14-02-2011

Maximum - minimum = 0,0088

$p_i = 1$

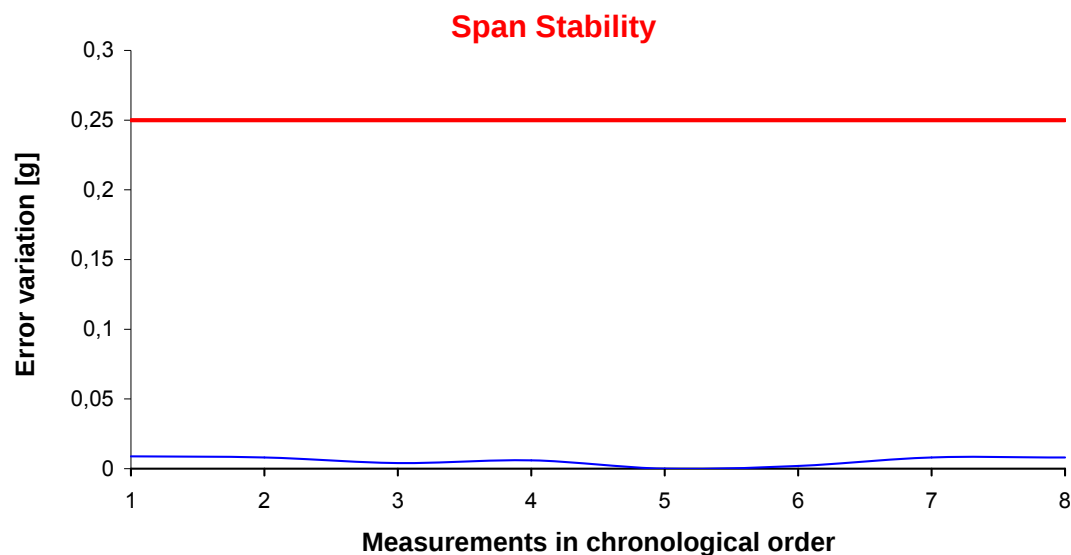
mpe [g]	Passed / Failed
0,5	P
0,5	P
0,5	P
0,5	P
0,5	P
0,5	P
0,5	P
0,5	P

All: P

$p_i = 1$

Maximum permissible difference, mpd: 0,25 [g]

Passed / Failed: Passed



Remarks: The dip in the span was caused by tilt. A more sensitive level indicator was installed for the last part of the measurements.

Annex 3

OIML R 76 test report for NHB 1500 balance

OIML R 76 TEST REPORT

ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE

INTERNATIONAL RECOMMENDATION

OIML R 76

Non-automatic weighing instruments

Test item

NHB 1500g

manufactured by

Taiwan Scale Mfg. Co., Ltd.

Task:	A530947
Report No:	DANAK-1911302
Date of Issue:	25 February 2011
Test laboratory:	DELTA Danish Electronics, Light & Acoustics
Evaluator / Responsible:	Jens Hovgård, DELTA Weighing Laboratory 03 January 2011 to 08 February 2011

Authorized user of DTPR76: DELTA

CONTENTS

	PAGE
Summary of results	69
Information concerning the instrument	70
Test specification	72
Test equipment	73
Estimation of measurement uncertainty	74
Photographs	75
Tests:	
Initial Intrinsic error test	76
Temperature tests	
Initial test	77
High temperature test	78
Low temperature test	79
Final temperature test	80
Temperature effect on no-load indication	81
Zero return and Creep	82

Summary of results

Application / Task: A530947
 Applicant name: Taiwan Scale Mfg. Co., Ltd.
 Type: NHB 1500g
 OIML: R76 accuracy Class II

R76 N°	Tests	Input impedance	Report sheet	PASS	FAIL	Remarks
	Checking of zero setting	N/A	-	X		
1	Calculation of intrinsic error	High	Intrinsic	X		Made: 2011-1-3
	Initial test at ref. temp. 20 °C	High	T(1)	X		Conclusion for n = 7500
	Test at high temperature 40 °C	High	T(2)	X		
	Test at low temperature 5 °C	High	T(3)	X		
	Test at 20 °C	High	T(4)	X		
	Final test at ref. temp.	High	-			
	Supplementary test	-	-			
		-	-			
2	Temperature effect on no-load indication	High	-	X		
3	Eccentricity		-			
4	Discrimination		-			
5	Repeatability		-			
6.1	Zero return	High	Creep	X		
6.2	Creep	High	Creep	X		
7	Stability of equilibrium		-			
8	Tilting		-			
9	Tare		-			
10	Warm-up time	Low	-			
11	Voltage variations	Low	-			
12.1	Short time power reductions		-			
12.2	Electrical bursts	a) Power supply lines	-			
		b) I/O circuits and comms. Lines	-			
12.3	Electrostatic discharges	a) Direct application	-			
		b) Indirect application	-			
12.4	Immunity to RF fields	a) Radiated 3 V/m test	-			
		b) Conducted 10 V test	-			
	Surge	a) Power supply lines 2 [kV]	-			
		b) I/O lines - [kV]	-			
	Powered from vehicle battery	a) Power supply lines	-			
		b) Other lines	-			
13	Damp heat, steady state	a) Initial test at ref. conditions	Low	-		
		b) Test at high humidity and temp.	Low	-		
		c) Final test at ref. conditions	Low	-		
14	Span stability		-			
*)	Temperature effect on span	High	Span_T1			
*)	Load cell interface: Maximum cable length to the junction box for load cells		-			
			-			
	Sense interruptions		-			
15	Endurance	a) Test before at ref. conditions	High	-		
		b) Test after at ref. Conditions	High	-		
Examinations						
16	Examination of the construction		-			
17	Checklist		-			

In all: PASSED

*) WELMEC 2.1, Annex 5.

Information concerning the instrument

Information submitted by the manufacturer.

Applicant name:	Taiwan Scale Mfg. Co., Ltd.		
address:	99 Shuchang Road, Zhoushi Town, Kunshan City 215300 Jiangsu Province, China		
Contact person:	Tom Hong		
e-mail:	service@taiwanscale.com		
Telephone:	+86-13328050320		
Manufacturer name:	Taiwan Scale Mfg. Co., Ltd.		
address:	99 Shuchang Road, Zhoushi Town, Kunshan City 215300 Jiangsu Province, China		
Type:	NHB 1500g		
Test item device:	Non-automatic weighing instrument		
S/N:			
Type subject to EMC tests:			
S/N for test item subject to EMC tests:			
Separate load receptor, if submitted	Type:	Capacity [kg]:	1,5 S/N:
Load cell(s), if submitted:	Type: SPL	Manuf.: HBM	Number: 1 S/N:
	Load cell class:	Capacity [kg]:	1,5 Cable[m]:
	Rated output:	0,9 [mV/V]	$\Delta_{\text{min}} =$ [μV] per VSI
Accuracy class:	OIML R76: II		
Optional for AWI, if applied:	AWI class: 0		
"R61: Specified Ref. Class"	(Not used) 0,5		
Weighing range(s) specified:	Single-interval		
Number (i) of Intervals / ranges specified:	1		
Change-over point for multi-range, if available:	$\text{Max}_i + 9 e_i$		
Unit marked on test item:	[g]		
Internal resolution of measurements:	>100000		
Number of Verification Scale Intervals (n_i):	7500		$n_i = \text{Max}_i / e_i$
Maximum capacity of partial ranges (Max_i):	1500	[g]	Min: 10 [g]
Verification Scale Interval (e_i):	0,2	[g]	dt: [g]
Fractional factor (p_i):	1		
Excitation voltage:	[Vdc]		
Minimum input-voltage per VSI (Δ_{min}):	[μV]		
Minimum dead load (D_{min}):	[mV]		
Maximum input range:	[mV]		
Rated maximum input-impedance for load cells:	[ohm]		
Rated minimum input-impedance for load cells:	420 [ohm]		
Sense (6-wires) or no-sense (4-wires):	No-sense		
Maximum resistance of cable to JB for load cells:	each wire [ohm]		
Zero-setting devices	Range [% of Max]		Tare devices
Nonautomatic: ☐	-2	+2	Tare balancing: ☒
Semi-automatic: ☒			Tare Weighing: ☐
Automatic zero-setting: ☐	20		Preset tare device: ☐
Initial zero-setting: ☒	-2	+2	Subtractive tare: ☒
Zero-tracking (+/- 0.25e): ☒			Additive tare: ☐
Combined zero/tare device: ☐			Max. Tare effect: 100,0 [% of Max]
Operating temperature range	Min: 5 Max: 40		
Power voltage supply [Vac]	Un: 230 Umin: Umax:	50/60 [Hz]	External supply
Battery supply [Vdc]	Un: Umin: 9 Umax: 12		
Load cell linearizing, if available:			

Printer subject to test: Non present, but connectable

No. of interfaces: 1

Specification of interfaces available

Connections during electrical disturbance tests:

Interface No. 1 (applied for recording of measurements during tests)

format / standard: RS-232C

protective or not: Protective

Connecting cables

cable length: 20

shield/no shield: shielded



x

Peripheral equipment:

Remarks:

Serial interface

RS 232 setup	
Com port	5
Baud rate	9600
Data bits	8
Stop bits	1
Parity	None
EOS	13
Buffer size	100

Input filter	
PreRead	
Min. Length	8
Search position	2
Filter: Mean of #	1
Line select pos.	0
Line select char	

Test specification

OIML:

R76

Application / Task:

A530947

Applicant name:

Taiwan Scale Mfg. Co., Ltd.

Manufacturer name:

Taiwan Scale Mfg. Co., Ltd.

Type

NHB 1500g

Test item device:

Non-automatic weighing instrument

S/N:

Type subject to EMC tests:

S/N for test item subject to EMC tests:

Maximum permissible errors apply to:

Initial verification

Accuracy class:

II

Unit of measurement:

[g]

Weighing range(s) subject to test:

Single interval

Number of intervals / ranges:

1

Change-over point for multi-interval, if available:

Max_i +:e_i

Not Applicable

Number of Verification Scale Intervals (n_i):

7500

Maximum indication during test (Max_i):

1500

[g]

Maximum capacity (Max):

7500

[e_i]

Indication for one (e) during test:

0,2

[g]

Min:

10 [g]

Resolution during test:

0,02

Fractional factor (p_i):

1

Initial zero-setting range

20 [%]

Excitation voltage:

[Vdc]

Minimum input-voltage per VSI ($\Delta u_{\min}$):

[μV]

Minimum dead load (D_{min}):

[mV]

Dead load used for the tests (zero offset):

[mV]

Proposal to begin with

Minimum number of load cells (each 350 ohm):

1

Impedance:

350 [ohm]

Maximum number of load cells (each 350 ohm):

1

Impedance:

350 [ohm]

Sense (6-wires) or no-sense (4-wires):

No-sense

Operating temperature range:

Min / Max = 5 °C / 40 [°C]

Power voltage supply:

External supply

AC supply:

Battery supply:

U_nU_{min}U_{max}

230

9

12

[Vac]

[Vdc]

50/60 [Hz]

Submitted Documentation.

Manuals

Drawings

Other

Remarks:

Test equipment

Ref.: OIML R76
 Evaluator: Jens Hovgård, DELTA Weighing Laboratory
 Application / Task: A530947

Test loads

See the table below

Accuracy class: F2
 Other information:

Simulator

Simulator not applied

Type and serial number: HBM, K3608, S/N: 90220004
 Traceability:

Laboratory for the performance tests

Test laboratory conditions: Air conditioned 20 °C, 50 % RH
 Test laboratory location: 2A12

Facilities for influence factor testing

Temperature chamber: Climatic container
 Humidity chamber:

Equipment applied for the performance tests

Name	Manufacture	Type	No.

Facilities for electrical disturbance testing

See page EMC(T)

Photograph of test equipment and setup

See page Photographs

Loading using Weights

Accuracy class: F2

No. of uploads: 10

Enter Load:

No.	Load [g]	Load used [g]	n	n _i	Accuracy %
0	10	10	50	1	OIML R 111
1	30	30	150	1	OIML R 111
2	50	50	250	1	OIML R 111
3	100	100	500	1	OIML R 111
4	300	300	1500	1	OIML R 111
5	500	500	2500	1	OIML R 111
6	700	700	3500	1	OIML R 111
7	900	900	4500	1	OIML R 111
8	1100	1100	5500	1	OIML R 111
9	1300	1300	6500	1	OIML R 111
10	1500	1500	7500	1	OIML R 111

Maximum value: 1500

Intervals in use: 1
 $e1 = 0,2$
 $50 * e1 = 10$
 $5000 * e1 = 1000$
 $20000 * e1 = 4000$

Estimation of measurement uncertainty

See page Equip

Measuring chain for determination of errors of measurements

Weight normals class F2 with traceability to FORCE in Denmark

Uncertainty of measurements

u	Used weight normals	0,00025	[%]
k	Coverage factor:	2	

Expanded uncertainty : U = 0,0005 [%] $k \sqrt{(u)^2}$

Everything considered the accuracy and stability of the measurements are sufficient good to comply with R76 paragraph 3.7.1 and A.4.4.4.
The evidence is given by the Intrinsic error curve (see Intrinsic).

Photographs



Remarks:

TEST: Initial intrinsic error (OIML R76: T.5.5.3, figure 2)

Application / Task: A530947
 Type designation: NHB 1500g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II

	Begin	End
Temp.[°C]:	20,3	20,3
Rel. H.[%]:	47	
Time:	15:55	
Date:	03-01-2011	

Max: 7500 [e]
 Verification scale interval, e: 0,2 [g]
 No. of verification scale intervals, n: 7500
 Resolution during test: 0,02 [g]

1 interval selected

Simulator applied: No

Aut. Zero-setting and zero-tracking device is: Not in operation

Initial zero-setting (> 20% of Max): No

Load cell number and input impedance: 1 load cell 350 [Ohm]

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L			Indication I		Add. Load ΔL		Error E		Corrected error E_c		MPE $\cdot p_i$	P / F
			↓	↑	↓	↑	↓	↑	↓	↑	[g]	
0		[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1		10	10	10			0	0	0	0	0,5	P
2		30	30	30			0	0	0	0	0,5	P
3		50	50	50			0	0	0	0	0,5	P
4		100	100	100			0	0	0	0	0,5	P
5		300	300	300			0	0	0	0	0,5	P
6		500	500	500			0	0	0	0	0,5	P
7		700	700	700			0	0	0	0	0,5	P
8		900	900	899,98			0	-0,02	0	-0,02	0,5	P
9		1100	1099,98	1099,98			-0,02	-0,02	-0,02	-0,02	0,5	P
10		1300	1300	1300			0	0	0	0	0,5	P
11		1500	1500	1500			0	0	0	0	0,5	P

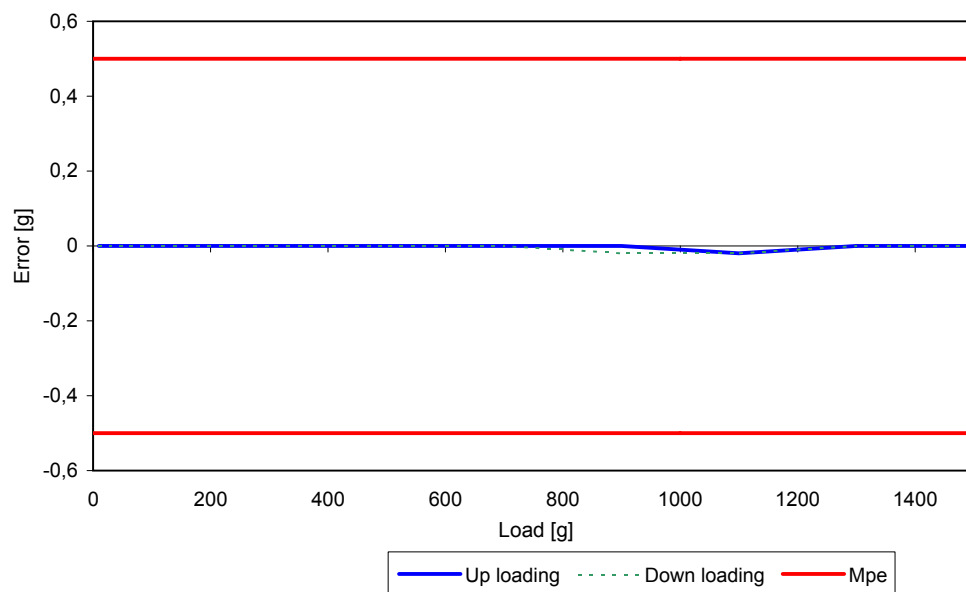
Passed / Failed:

PASSED

Observer:

Jens Hovgård

Remarks:

Initial intrinsic error curve

TEST: Weighing Performance (OIML R76: T.5.5.3 (figure 2) & A.5.3.1)

Application / task:	A530947	Room temp.[°C]:	Begin	End
Type designation:	NHB 1500g	Temp.[°C]:	40,2	40,2
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	28	
Serial No.:	0	Time:	16:40	
Accuracy class:	II	Date:	05-01-2011	
Max:	1500	Temp. Test:	2	High T
Verification scale interval, e:	0,2	1 interval selected		
No. of verification scale intervals, n:	7500			
Resolution during test:	0,02 [g]			
Simulator applied: No		Placed outside the climatic chamber.		

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: load cell(s) [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

$$E = I + \frac{1}{2}e - \Delta L - L$$
$$E_c = E - E_0$$
$$p_i = 1$$

Load L			Indication I		Add. Load ΔL		Error E		Corrected error Ec		MPE * p _i	P / F
See Equip for table of weight			↓	↑	↓	↑	↓	↑	↓	↑		
		[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
0		10	10,24	10,26			0,24	0,26	0	0,02	0,5	P
1		30	30,24	30,26			0,24	0,26	0	0,02	0,5	P
2		50	50,24	50,26			0,24	0,26	0	0,02	0,5	P
3		100	100,24	100,26			0,24	0,26	0	0,02	0,5	P
4		300	300,24	300,24			0,24	0,24	0	0	0,5	P
5		500	500,2	500,2			0,2	0,2	-0,04	-0,04	0,5	P
6		700	700,18	700,18			0,18	0,18	-0,06	-0,06	0,5	P
7		900	900,16	900,16			0,16	0,16	-0,08	-0,08	0,5	P
8		1100	1100,14	1100,12			0,14	0,12	-0,1	-0,12	0,5	P
9		1300	1300,1	1300,12			0,1	0,12	-0,14	-0,12	0,5	P
10		1500	1500,1	1500,1			0,1	0,1	-0,14	-0,14	0,5	P

New no-load indication: (if it has changed from the first recorded value)

Passed / Failed: **PASSED**

Additional measurements to cover the whole impedance range:

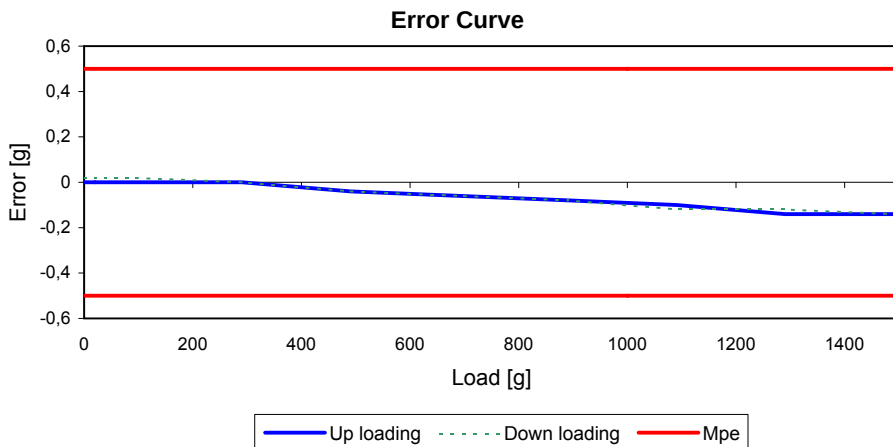
Load cell number and input impedance: 1 $\approx$ 350 [Ohm]

[illegible]

Corrected for init span:

Observer: Jens Hovgård

Remarks:



TEST: Weighing Performance (OIML R76: T.5.5.3 (figure 2) & A.5.3.1)

Application / task:	A530947	Room temp.[°C]:	Begin	End
Type designation:	NHB 1500g	Temp.[°C]:	6,4	6,4
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	56	
Serial No.:	0	Time:	17:05	
Accuracy class:	II	Date:	06-01-2011	
Max:	1500	Temp. Test:	3	Low T
Verification scale interval, e:	0,2	1 interval selected		
No. of verification scale intervals, n:	7500			
Resolution during test:	0,02 [g]			
Simulator applied:	No			

Placed outside the climatic chamber.

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s) 350 [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L	Indication I		Add. Load ΔL		Error E		Corrected error E _c		MPE * p _i	P / F
	g	g	g	g	g	g	g	g		
0	10	10,22			0,22		0		0,5	P
1	30	30,24			0,24		0,02		0,5	P
2	50	50,24			0,24		0,02		0,5	P
3	100	100,24			0,24		0,02		0,5	P
4	300	300,26			0,26		0,04		0,5	P
5	500	500,26			0,26		0,04		0,5	P
6	700	700,26			0,26		0,04		0,5	P
7	900	900,26			0,26		0,04		0,5	P
8	1100	1100,28			0,28		0,06		0,5	P
9	1300	1300,28			0,28		0,06		0,5	P
10	1500	1500,3			0,3		0,08		0,5	P

New no-load indication: (if it has changed from the first recorded value)

Passed / Failed: PASSED

Additional measurements to cover the whole impedance range:

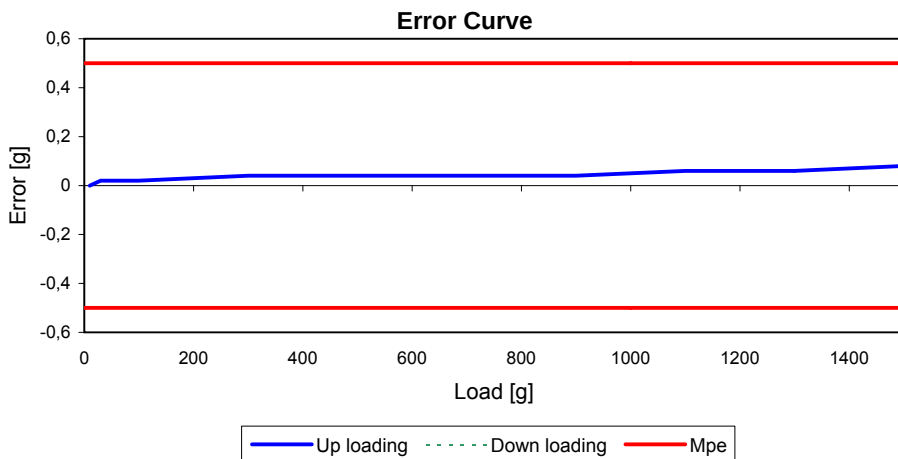
Load cell number and input impedance: 1 ≈ 350 [Ohm]

0	10									
10	1500									

Corrected for init span:

Observer: Jens Hovgård

Remarks:



TEST: Weighing Performance (OIML R76: T.5.5.3 (figure 2) & A.5.3.1)

Application / task:	A530947	Room temp.[°C]:	Begin	End
Type designation:	NHB 1500g	Temp.[°C]:	20,4	20,3
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	52	
Serial No.:	0	Time:	09:45	
Accuracy class:	II	Date:	07-01-2011	
Max:	1500	Temp. Test:	4	5 °C
Verification scale interval, e:	0,2	1 interval selected		
No. of verification scale intervals, n:	7500			
Resolution during test:	0,02 [g]			
Simulator applied:	No			

Placed outside the climatic chamber.

Aut. Zero-setting and zero-tracking device is: Out of working range

Load cell number and input impedance: 1 load cell(s) 350 [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L	Indication I		Add. Load ΔL		Error E		Corrected error E _c		MPE * p _i	P / F
	↓	↑	↓	↑	↓	↑	↓	↑		
0	10	10,32	10,34		0,32	0,34	0	0,02	0,5	P
1	30	30,32	30,34		0,32	0,34	0	0,02	0,5	P
2	50	50,32	50,34		0,32	0,34	0	0,02	0,5	P
3	100	100,34	100,34		0,34	0,34	0,02	0,02	0,5	P
4	300	300,32	300,34		0,32	0,34	0	0,02	0,5	P
5	500	500,32	500,34		0,32	0,34	0	0,02	0,5	P
6	700	700,3	700,3		0,3	0,3	-0,02	-0,02	0,5	P
7	900	900,3	900,3		0,3	0,3	-0,02	-0,02	0,5	P
8	1100	1100,28	1100,26		0,28	0,26	-0,04	-0,06	0,5	P
9	1300	1300,28	1300,28		0,28	0,28	-0,04	-0,04	0,5	P
10	1500	1500,28	1500,28		0,28	0,28	-0,04	-0,04	0,5	P

New no-load indication: (if it has changed from the first recorded value)

Passed / Failed: PASSED

Additional measurements to cover the whole impedance range:

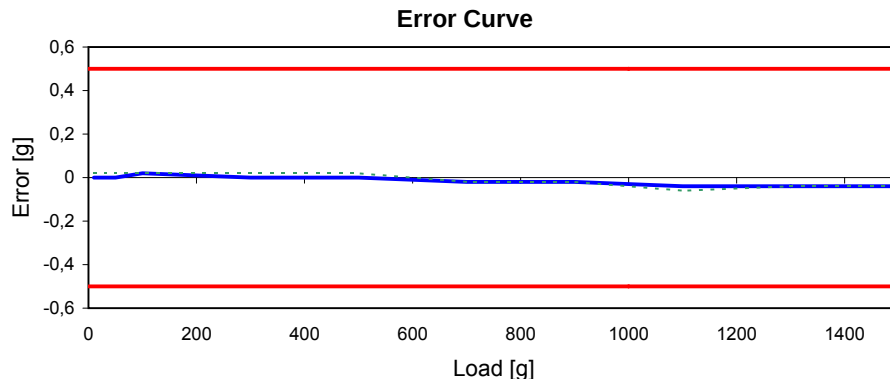
Load cell number and input impedance: 1 ≈ 350 [Ohm]

0	10										
10	1500										

Corrected for init span:

Observer: Jens Hovgård

Remarks:



— Up loading - - - Down loading — Mpe

TEST: Temperature Effect on No-load Indication (OIML R76: A.5.3.2)

Application / task: : A530947
 Type designation: : NHB 1500g
 Test item: : Non-automatic weighing instrument
 Serial number: : 0
 Observer: : Jens Hovgård
 Accuracy class: : II
 Max: : 1500 [g]
 Verification scale interval, e: : 0,2 [g]
 No. of Verification scale intervals, n: : 7500
 Resolution during test (smaller than e): : 0,02 [g]
 Requirement: : 0,2 [g]
 Fraction (p_i): : 1

Aut. Zero-setting and zero-tracking device is : Not in operation

$P = I + \frac{1}{2}e - \Delta L$

See Work sheet	Date	Time	Temp	Zero indication (I)	Add. load (ΔL)	(P)	(ΔP)	Temp. diff.	Zero- change per 5 °C [g]	Require- ment (p _i * VSI) [g]	Passed / Failed
	2011	hh:mm	[°C]	[g]	[g]	[g]	[g]	[K]	[g]	[g]	
T (1)	05-jan	09:10	19,9	10	0	10,1	0,24	20,3	0,059	0,2	PASSED
	05-jan	16:40	40,2	10,24	0	10,34					
T (2)	05-jan	16:40	40,2	10,24	0	10,34	-0,02	33,8	0,003	0,2	PASSED
	06-jan	17:05	6,4	10,22	0	10,32					
T (3)	06-jan	17:05	6,4	10,22	0	10,32	0,1	14	0,036	0,2	PASSED
	07-jan	09:45	20,4	10,32	0	10,42					
T (4)	07-jan	09:45	20,3	10,32	0	10,42		-20,3		0,2	
T (5)			0	0	0						

Passed / Failed: PASSED

Remarks:

TEST: Creep & Zero return (OIML R76: A.4.11.1 and 2)

Application / task:	A530947	Begin	End
Type designation:	NHB 1500g	Temp.[°C]:	19,4 19,4
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	45
Serial No.:	0	Time:	14:54
Accuracy class:	II	Date:	08-02-2011
Max:	1500		
Verification scale interval, e:	0,2		
No. of verification scale intervals, n:	7500		
Resolution during test:	0,02 [g]		

Aut. Zero-setting and zero-tracking device is: Out of working range

Load cell number and input impedance: load cell(s) [Ohm]No load (L_0): 10 [g] 0,7 [%] of the range**Zero return**

$P = I + \frac{1}{2}e - \Delta L$					$p_i = 1$	
Time of reading	Load L_0	Indication of zero I_0	Add.load ΔL	P	Requi.	Result
	[g]	[g]	[g]	[g]	[g]	$ \Delta P $
14:54	10	10		10		
After loading for 0.5 h (with load close to Max) Load =					0,5 * e1	
Unload quickly:						
15:24	10	10,02		10,02	0,1	0,02

Passed / Failed: **Passed**

Remarks:

Creep

Load close to Max			$P = I + \frac{1}{2}e - \Delta L$			$p_i = 1$
Time of reading	Load L	Indication I	Add.load ΔL	P	ΔP	Requirement
	[g]	[g]	[g]	[g]	[g]	[g]
14:54:00	0 min	1500		1500		0,1
14:59:00	5 min	1500		1500	0	
15:09:00	15 min	1500		1500	0	
15:24:00	30 min	1500		1500	0	
	1 h					0,5
	2 h					
	3 h					
	4 h					

Passed / Failed: **Passed**

Observer:

Jens Hovgård

Remarks:

Annex 4

OIML R 76 test report for NHB 6000 balance

OIML R 76 TEST REPORT

ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE

INTERNATIONAL RECOMMENDATION

OIML R 76

Non-automatic weighing instruments

Test item

NHB 6000g

manufactured by

Taiwan Scale Mfg. Co., Ltd.

Task:	A530947
Report No:	DANAK-1911302
Date of Issue:	25 February 2011
Test laboratory:	DELTA Danish Electronics, Light & Acoustics
Evaluator / Responsible:	Jens Hovgård, DELTA Weighing Laboratory 03 January 2011 to 08 February 2011

Authorized user of DTPR76: DELTA

CONTENTS

	PAGE
Summary of results	86
Information concerning the instrument	87
Test specification	89
Test equipment	90
Estimation of measurement uncertainty	91
Photographs	92
Tests:	
Initial Intrinsic error test	93
Temperature tests	
Initial test	94
High temperature test	95
Low temperature test	96
Final temperature test	97
Temperature effect on no-load indication	98
Zero return and Creep	99

Summary of results

Application / Task: A530947
 Applicant name: Taiwan Scale Mfg. Co., Ltd.
 Type: NHB 6000g
 OIML: R76 accuracy Class II

R76 N°	Tests	Input impedance	Report sheet	PASS	FAIL	Remarks
	Checking of zero setting	N/A	-	X		
1	Calculation of intrinsic error	High	Intrinsic	X		Made: 2011-1-3
	Initial test at ref. temp. 20 °C	High	T(1)	X		Conclusion for n = 6000
	Test at high temperature 40 °C	High	T(2)	X		
	Test at low temperature 5 °C	High	T(3)	X		
	Test at 20 °C	High	T(4)	X		
	Final test at ref. temp.	High	-			
	Supplementary test	-	-			
		-	-			
2	Temperature effect on no-load indication	High	-	X		
3	Eccentricity		-			
4	Discrimination		-			
5	Repeatability		-			
6.1	Zero return	High	Creep	X		
6.2	Creep	High	Creep	X		
7	Stability of equilibrium		-			
8	Tilting		-			
9	Tare		-			
10	Warm-up time	Low	-			
11	Voltage variations	Low	-			
12.1	Short time power reductions		-			
12.2	Electrical bursts	a) Power supply lines	-			
		b) I/O circuits and comms. Lines	-			
12.3	Electrostatic discharges	a) Direct application	-			
		b) Indirect application	-			
12.4	Immunity to RF fields	a) Radiated 3 V/m test	-			
		b) Conducted 10 V test	-			
	Surge	a) Power supply lines 2 [kV]	-			
		b) I/O lines - [kV]	-			
	Powered from vehicle battery	a) Power supply lines	-			
		b) Other lines	-			
13	Damp heat, steady state	a) Initial test at ref. conditions	Low	-		
		b) Test at high humidity and temp.	Low	-		
		c) Final test at ref. conditions	Low	-		
14	Span stability		-			
*)	Temperature effect on span	High	Span_T1			
*)	Load cell interface: Maximum cable length to the junction box for load cells		-			
			-			
	Sense interruptions		-			
15	Endurance	a) Test before at ref. conditions	High	-		
		b) Test after at ref. Conditions	High	-		
Examinations						
16	Examination of the construction		-			
17	Checklist		-			

In all: PASSED

*) WELMEC 2.1, Annex 5.

Information concerning the instrument

Information submitted by the manufacturer.

Applicant name:	Taiwan Scale Mfg. Co., Ltd.		
address:	99 Shuchang Road, Zhoushi Town, Kunshan City 215300 Jiangsu Province, China		
Contact person:	Tom Hong		
e-mail:	service@taiwanscale.com		
Telephone:	+86-13328050320		
Manufacturer name:	Taiwan Scale Mfg. Co., Ltd.		
address:	99 Shuchang Road, Zhoushi Town, Kunshan City 215300 Jiangsu Province, China		
Type:	NHB 6000g		
Test item device:	Non-automatic weighing instrument		
S/N:			
Type subject to EMC tests:			
S/N for test item subject to EMC tests:			
Separate load receptor, if submitted	Type:	Capacity [kg]: 6	S/N:
Load cell(s), if submitted:	Type: PW6K	Manuf.: HBM	Number: 1 S/N:
	Load cell class:	Capacity [kg]: 10	Cable[m]:
	Rated output:	0,9 [mV/V]	$\Delta_{\text{min}} =$ [μV] per VSI
Accuracy class:	OIML R76: II		
Optional for AWI, if applied:	AWI class:	0	
"R61: Specified Ref. Class"	(Not used)	0,5	
Weighing range(s) specified:	Single-interval		
Number (i) of Intervals / ranges specified:	1		
Change-over point for multi-range, if available:	$\text{Max}_i + \boxed{9} e_i$		
Unit marked on test item:	[g]		
Internal resolution of measurements:	>100000		
Number of Verification Scale Intervals (n_i):	6000		$n_i = \text{Max}_i / e_i$
Maximum capacity of partial ranges (Max_i):	6000	[g]	Min: 50 [g]
Verification Scale Interval (e_i):	1	[g]	d: 0,1 [g]
Fractional factor (p_i):	1		
Excitation voltage:	[Vdc]		
Minimum input-voltage per VSI (Δ_{min}):	[μV]		
Minimum dead load (D_{min}):	[mV]		
Maximum input range:	[mV]		
Rated maximum input-impedance for load cells:	[ohm]		
Rated minimum input-impedance for load cells:	420	[ohm]	
Sense (6-wires) or no-sense (4-wires):	No-sense		
Maximum resistance of cable to JB for load cells:	each wire	[ohm]	
Zero-setting devices	Range [% of Max]	Tare devices	
Nonautomatic: ☐		Tare balancing: ☒	
Semi-automatic: ☒	-2 +2	Tare Weighing: ☐	
Automatic zero-setting: ☐		Preset tare device: ☐	
Initial zero-setting: ☒	20	Subtractive tare: ☒	
Zero-tracking (+/- 0.25e): ☒	-2 +2	Additive tare: ☐	
Combined zero/tare device: ☐		Max. Tare effect: 100,0 [% of Max]	
Operating temperature range	Min: 5 Max: 40		
Power voltage supply [Vac]	Un: 230 Umin: Umax:	50/60 [Hz]	External supply
Battery supply [Vdc]	Un: Umin: 9 Umax: 12		
Load cell linearizing, if available:			

Printer subject to test: Non present, but connectable

No. of interfaces: 1

Specification of interfaces available

Connections during electrical disturbance tests:

Interface No. 1 (applied for recording of measurements during tests)

format / standard: RS-232C

protective or not: Protective

Connecting cables

cable length: 20

shield/no shield: shielded



x

Peripheral equipment:

Remarks:

Serial interface

RS 232 setup	
Com port	5
Baud rate	9600
Data bits	8
Stop bits	1
Parity	None
EOS	13
Buffer size	100

Input filter	
PreRead	
Min. Length	8
Search position	2
Filter: Mean of #	1
Line select pos.	0
Line select char	

Test specification

OIML:

R76

Application / Task:

A530947

Applicant name:

Taiwan Scale Mfg. Co., Ltd.

Manufacturer name:

Taiwan Scale Mfg. Co., Ltd.

Type

NHB 6000g

Test item device:

Non-automatic weighing instrument

S/N:

Type subject to EMC tests:

S/N for test item subject to EMC tests:

Maximum permissible errors apply to:

Initial verification

Accuracy class:

II

Unit of measurement:

[g]

Weighing range(s) subject to test:

Single interval

Number of intervals / ranges:

1

Change-over point for multi-interval, if available:

Max_i +:e_i

Not Applicable

Number of Verification Scale Intervals (n_i):

6000

Maximum indication during test (Max_i):

6000

[g]

Maximum capacity (Max):

6000

[e_i]

Indication for one (e) during test:

1

[g]

Min:

50 [g]

Resolution during test:

0,1

Fractional factor (p_i):

1

Initial zero-setting range

20 [%]

Excitation voltage:

[Vdc]

Minimum input-voltage per VSI (Δu_{min}):

[μV]

Minimum dead load (D_{min}):

[mV]

Dead load used for the tests (zero offset):

[mV]

Proposal to begin with

Minimum number of load cells (each 350 ohm):

1

Impedance:

350 [ohm]

Maximum number of load cells (each 350 ohm):

1

Impedance:

350 [ohm]

Sense (6-wires) or no-sense (4-wires):

No-sense

Operating temperature range:

Min / Max = 5 °C / 40 [°C]

Power voltage supply:

External supply

U _n	U _{min}	U _{max}
230		
	9	12

[Vac]

50/60 [Hz]

Battery supply:

[Vdc]

Submitted Documentation.

Manuals

Drawings

Other

Remarks:

Test equipment

Ref.: OIML R76
 Evaluator: Jens Hovgård, DELTA Weighing Laboratory
 Application / Task: A530947

Test loads

See the table below

Accuracy class: F2
 Other information:

Simulator

Simulator not applied

Type and serial number: HBM, K3608, S/N: 90220004
 Traceability:

Laboratory for the performance tests

Test laboratory conditions: Air conditioned 20 °C, 50 % RH
 Test laboratory location: 2A12

Facilities for influence factor testing

Temperature chamber: Climatic container
 Humidity chamber:

Equipment applied for the performance tests

Name	Manufacture	Type	No.

Facilities for electrical disturbance testing

See page EMC(T)

Photograph of test equipment and setup

See page Photographs

Loading using Weights

Accuracy class: F2

No. of uploads: 10

Enter Load:

No.	Load [g]	Load used [g]	n	n _i	Accuracy %
0	50	50	50	1	OIML R 111
1	100	100	100	1	OIML R 111
2	500	500	500	1	OIML R 111
3	1000	1000	1000	1	OIML R 111
4	2000	2000	2000	1	OIML R 111
5	3000	3000	3000	1	OIML R 111
6	4000	4000	4000	1	OIML R 111
7	4500	4500	4500	1	OIML R 111
8	5000	5000	5000	1	OIML R 111
9	5500	5500	5500	1	OIML R 111
10	6000	6000	6000	1	OIML R 111

Maximum value: 6000

Intervals in use: 1
 e1 = 1
 50*e1 = 50
 5000*e1 = 5000
 20000*e1 = 20000

Estimation of measurement uncertainty

See page Equip

Measuring chain for determination of errors of measurements

Weight normals class F2 with traceability to FORCE in Denmark

Uncertainty of measurements

u	Used weight normals	0,00025	[%]
k	Coverage factor:	2	

Expanded uncertainty :

U =

0,0005 [%]

$k \sqrt{(u)^2}$

Everything considered the accuracy and stability of the measurements are sufficient good to comply with R76 paragraph 3.7.1 and A.4.4.4.
The evidence is given by the Intrinsic error curve (see Intrinsic).

Photographs



Remarks:

TEST: Initial intrinsic error (OIML R76: T.5.5.3, figure 2)

Application / Task: A530947
 Type designation: NHB 6000g
 Test item: Non-automatic weighing instrument
 Serial No.: 0
 Accuracy class: II

	Begin	End
Temp.[°C]:	20,3	20,3
Rel. H.[%]:	47	
Time:	15:40	
Date:	03-01-2011	

Max: 6000 [e]
 Verification scale interval, e: 1 [g]
 No. of verification scale intervals, n: 6000
 Resolution during test: 0,1 [g]

1 interval selected

Simulator applied: No

Aut. Zero-setting and zero-tracking device is: Not in operation

Initial zero-setting (> 20% of Max): No

Load cell number and input impedance: 1 load cell 350 [Ohm]

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L			Indication I		Add. Load ΔL		Error E		Corrected error E_c		MPE $\cdot p_i$	P / F
			↓	↑	↓	↑	↓	↑	↓	↑	[g]	
0		[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
1		50	50	50			0	0	0	0	0,5	P
2		100	100	100			0	0	0	0	0,5	P
3		500	499,9	499,9			-0,1	-0,1	-0,1	-0,1	0,5	P
4		1000	999,9	999,9			-0,1	-0,1	-0,1	-0,1	0,5	P
5		2000	1999,9	1999,8			-0,1	-0,2	-0,1	-0,2	0,5	P
6		3000	3000	2999,9			0	-0,1	0	-0,1	0,5	P
7		4000	4000,1	4000			0,1	0	0,1	0	0,5	P
8		4500	4500	4499,9			0	-0,1	0	-0,1	0,5	P
9		5000	5000	4999,9			0	-0,1	0	-0,1	0,5	P
10		5500	5500	5499,9			0	-0,1	0	-0,1	1	P
11		6000	6000	6000			0	0	0	0	1	P

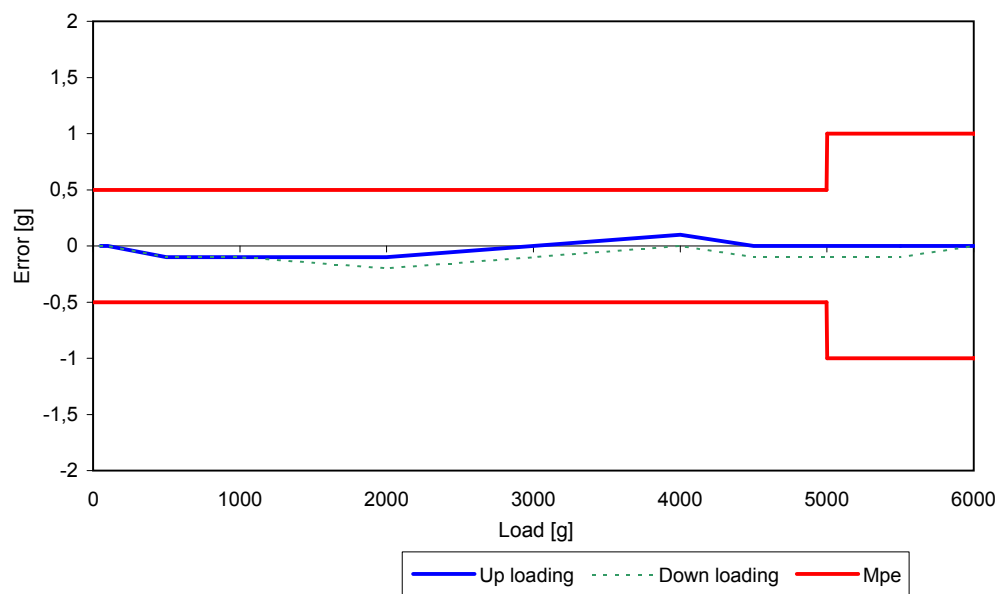
Passed / Failed:

PASSED

Observer:

Jens Hovgård

Remarks:

Initial intrinsic error curve

TEST: Weighing Performance (OIML R76: T.5.5.3 (figure 2) & A.5.3.1)

Application / task:	A530947	Room temp.[°C]:	Begin	End
Type designation:	NHB 6000g	Temp.[°C]:	20	19,9
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	51	
Serial No.:	0	Time:	08:55	
Accuracy class:	II	Date:	05-01-2011	
Max:	6000 [g]	Temp. Test:	1	Ref. 1
Verification scale interval, e:	1 [g]		1 interval selected	
No. of verification scale intervals, n:	6000			
Resolution during test:	0,1 [g]			

Simulator applied: No Placed outside the climatic chamber.

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: load cell(s) [Ohm]Length of cable outside the climatic chamber: [m] 4-wires

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L			Indication I		Add. Load ΔL		Error E		Corrected error Ec		MPE * p _i	P / F
see Equip for table of weight			↓	↑	↓	↑	↓	↑	↓	↑	[g]	
0		[g]	50	50			0		0		0,5	P
1		100	100				0		0		0,5	P
2		500	499,9				-0,1		-0,1		0,5	P
3		1000	999,9				-0,1		-0,1		0,5	P
4		2000	1999,9				-0,1		-0,1		0,5	P
5		3000	3000				0		0		0,5	P
6		4000	4000,1				0,1		0,1		0,5	P
7		4500	4500				0		0		0,5	P
8		5000	5000				0		0		0,5	P
9		5500	5500				0		0		1	P
10		6000	5999,9				-0,1		-0,1		1	P

New no-load indication: (if it has changed from the first recorded value)

Passed / Failed: **PASSED**

Additional measurements to cover the whole impedance range:

Load cell number and input impedance: 1 ≈ 350 [Ohm]

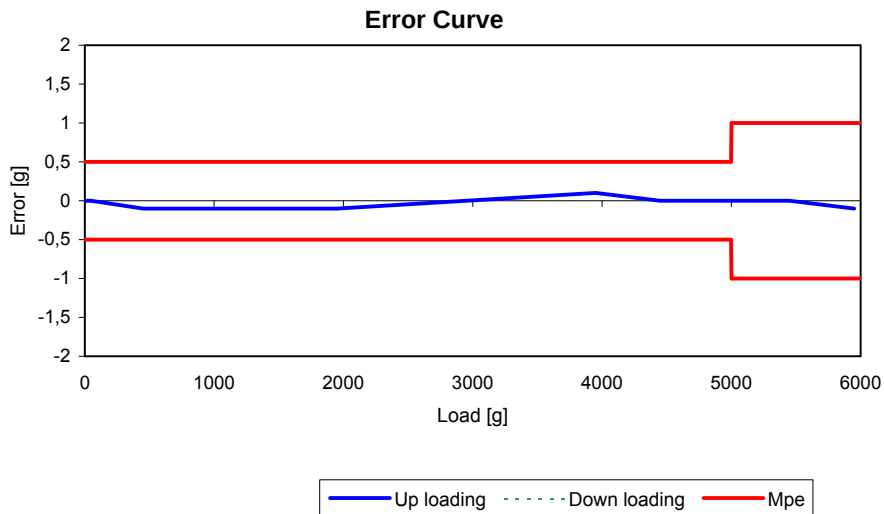
0		50										
10		6000										

Corrected for init span:

Observer:

Jens Hovgård

Remarks:



TEST: Weighing Performance (OIML R76: T.5.5.3 (figure 2) & A.5.3.1)

Application / task:	A530947	Room temp.[°C]:	Begin	End
Type designation:	NHB 6000g	Temp.[°C]:	40,2	40,3
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	29	
Serial No.:	0	Time:	16:30	
Accuracy class:	II	Date:	05-01-2011	
Max:	6000	Temp. Test:	2	High T
Verification scale interval, e:	1	1 interval selected		
No. of verification scale intervals, n:	6000			
Resolution during test:	0,1 [g]			

Simulator applied: No

Placed outside the climatic chamber.

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: 1 load cell(s) 350 [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L			Indication I		Add. Load ΔL		Error E		Corrected error E_c		MPE $\ast p_i$	P / F
see Equip for table of weight			[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	[g]	
0		50	48,9	49			-1,1	-1	0	0,1	0,5	P
1		100	98,9	99			-1,1	-1	0	0,1	0,5	P
2		500	498,8	498,8			-1,2	-1,2	-0,1	-0,1	0,5	P
3		1000	998,7	998,8			-1,3	-1,2	-0,2	-0,1	0,5	P
4		2000	1998,6	1998,6			-1,4	-1,4	-0,3	-0,3	0,5	P
5		3000	2998,6	2998,6			-1,4	-1,4	-0,3	-0,3	0,5	P
6		4000	3998,6	3998,5			-1,4	-1,5	-0,3	-0,4	0,5	P
7		4500	4498,5	4498,5			-1,5	-1,5	-0,4	-0,4	0,5	P
8		5000	4998,4	4998,4			-1,6	-1,6	-0,5	-0,5	0,5	P
9		5500	5498,4	5498,3			-1,6	-1,7	-0,5	-0,6	1	P
10		6000	5998,2	5998,2			-1,8	-1,8	-0,7	-0,7	1	P

New no-load indication: (if it has changed from the first recorded value)

Passed / Failed: PASSED

Additional measurements to cover the whole impedance range:

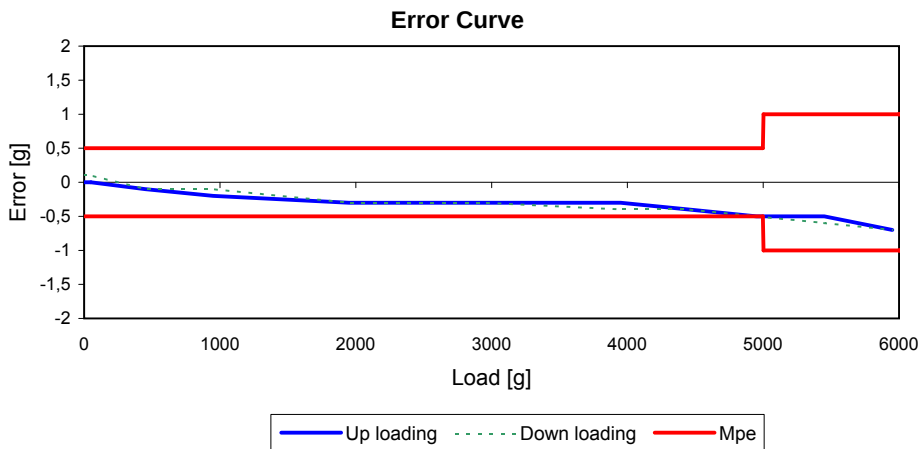
Load cell number and input impedance: 1 $\approx$ 350 [Ohm]

0		50									
10		6000									

Corrected for init span:

Observer: Jens Hovgård

Remarks:



TEST: Weighing Performance (OIML R76: T.5.5.3 (figure 2) & A.5.3.1)

Application / task:	A530947	Room temp.[°C]:	Begin	End
Type designation:	NHB 6000g	Temp.[°C]:	6,3	6,3
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	55	
Serial No.:	0	Time:	16:50	
Accuracy class:	II	Date:	06-01-2011	
Max:	6000	Temp. Test:	3	Low T
Verification scale interval, e:	1	1 interval selected		
No. of verification scale intervals, n:	6000			
Resolution during test:	0,1 [g]			

Simulator applied: No Placed outside the climatic chamber.

Aut. Zero-setting and zero-tracking device is: Not in operation

Load cell number and input impedance: load cell(s) [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L			Indication I		Add. Load ΔL		Error E		Corrected error E _c		MPE * p _i	P / F
see Equip for table of weight			↓ [g]	↑ [g]	↓ [g]	↑ [g]	↓ [g]	↑ [g]	↓ [g]	↑ [g]	[g]	
0		50	51,6				1,6		0		0,5	P
1		100	101,6				1,6		0		0,5	P
2		500	501,6				1,6		0		0,5	P
3		1000	1001,6				1,6		0		0,5	P
4		2000	2001,6				1,6		0		0,5	P
5		3000	3001,9				1,9		0,3		0,5	P
6		4000	4002				2		0,4		0,5	P
7		4500	4502				2		0,4		0,5	P
8		5000	5002				2		0,4		0,5	P
9		5500	5502				2		0,4		1	P
10		6000	6002				2		0,4		1	P

New no-load indication: (if it has changed from the first recorded value)

Passed / Failed: **PASSED**

Additional measurements to cover the whole impedance range:

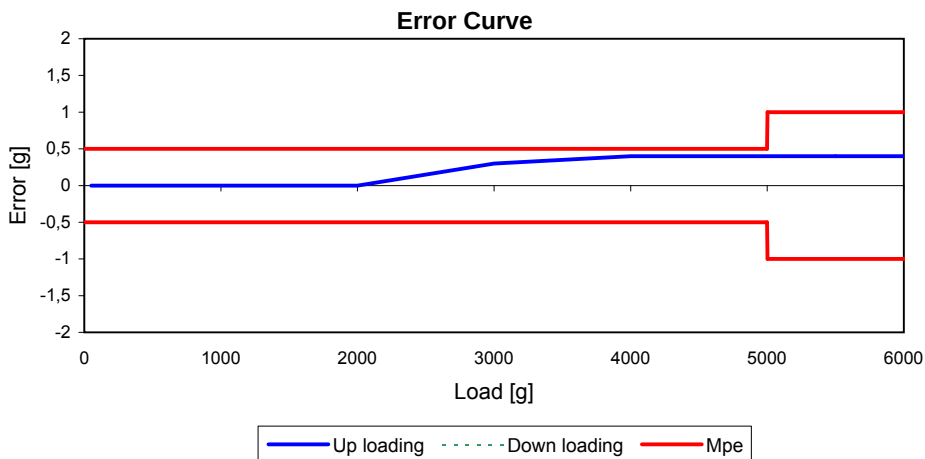
Load cell number and input impedance: 1 ≈ 350 [Ohm]

0		50										
10		6000										

Corrected for init span:

Observer: Jens Hovgård

Remarks:



TEST: Weighing Performance (OIML R76: T.5.5.3 (figure 2) & A.5.3.1)

Application / task:	A530947	Room temp.[°C]:	Begin	End
Type designation:	NHB 6000g	Temp.[°C]:	20,6	20,5
Test item:	Non-automatic weighing instrument	Rel. H.[%]:	51	
Serial No.:	0	Time:	09:35	
Accuracy class:	II	Date:	07-01-2011	
Max:	6000	Temp. Test:	4	5 °C
Verification scale interval, e:	1	1 interval selected		
No. of verification scale intervals, n:	6000			
Resolution during test:	0,1 [g]			
Simulator applied:	No			

Placed outside the climatic chamber.

Aut. Zero-setting and zero-tracking device is: Out of working range

Load cell number and input impedance: 1 load cell(s) 350 [Ohm]

Length of cable outside the climatic chamber: - [m] 4-wires

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

$$E_c = E - E_0$$

$$p_i = 1$$

Load L	Indication I	Add. Load ΔL	Error E	Corrected error E_c	MPE $\pm p_i$	P / F
See Equip for table of weight						
0	50	50	0	0	0,5	P
1	100	100	0	0	0,5	P
2	500	499,9	-0,1	-0,2	0,5	P
3	1000	999,9	-0,1	-0,2	0,5	P
4	2000	1999,9	-0,1	-0,4	0,5	P
5	3000	2999,9	-0,1	-0,3	0,5	P
6	4000	3999,9	-0,1	-0,3	0,5	P
7	4500	4499,9	-0,1	-0,2	0,5	P
8	5000	4999,9	-0,1	-0,2	0,5	P
9	5500	5499,7	-0,3	-0,4	1	P
10	6000	5999,6	-0,4	-0,4	1	P

New no-load indication: (if it has changed from the first recorded value)

Passed / Failed: PASSED

Additional measurements to cover the whole impedance range:

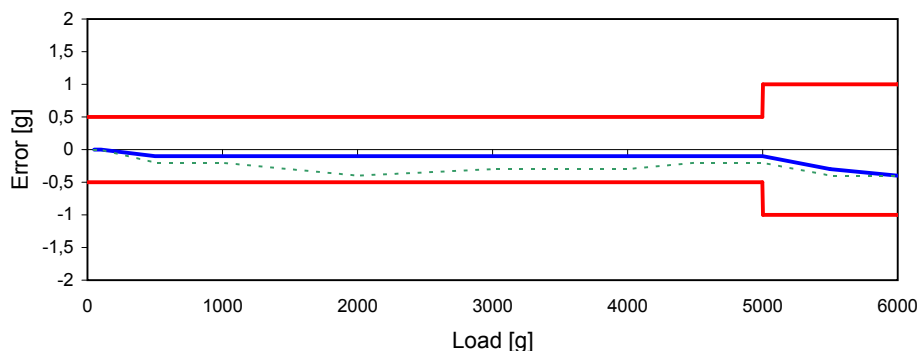
Load cell number and input impedance: 1 ≈ 350 [Ohm]

0	50										
10	6000										

Corrected for init span:

Observer: Jens Hovgård

Remarks:

Error Curve

— Up loading - - - Down loading — Mpe

TEST: Temperature Effect on No-load Indication (OIML R76: A.5.3.2)

Application / task: : A530947
 Type designation: : NHB 6000g
 Test item: : Non-automatic weighing instrument
 Serial number: : 0
 Observer: : Jens Hovgård
 Accuracy class: : II
 Max: : 6000 [g]
 Verification scale interval, e: : 1 [g]
 No. of Verification scale intervals, n: : 6000
 Resolution during test (smaller than e): : 0,1 [g]
 Requirement: : 1 [g]
 Fraction (p_i): : 1

Aut. Zero-setting and zero-tracking device is : Not in operation

$P = I + \frac{1}{2}e - \Delta L$

See Work sheet	Date	Time	Temp	Zero indication (I)	Add. load (ΔL)	(P)	(ΔP)	Temp. diff.	Zero-change per 5 °C	Requirement (p _i * VSI)	Passed / Failed
	2011	hh:mm	[°C]	[g]	[g]	[g]	[g]	[K]	[g]	[g]	
T (1)	05-jan	08:55	20	50	0	50,5	-1,1	20,2	0,272	1	PASSED
T (2)	05-jan	16:30	40,2	48,9	0	49,4					
T (3)	05-jan	16:30	40,3	48,9	0	49,4	2,7	34	0,397	1	PASSED
	06-jan	16:50	6,3	51,6	0	52,1					
	06-jan	16:50	6,3	51,6	0	52,1	-1,6	14,3	0,559	1	PASSED
T (4)	07-jan	09:35	20,6	50	0	50,5					
T (5)	07-jan	09:35	20,5	50	0	50,5		-20,5		1	
			0	0	0						

Passed / Failed: PASSED

Remarks:

TEST: Creep & Zero return (OIML R76: A.4.11.1 and 2)

Application / task:	A530947	Temp.[°C]:	Begin	End
Type designation:	NHB 6000g	Rel. H.[%]:	19,4	19,4
Test item:	Non-automatic weighing instrument	Time:	45	
Serial No.:	0	Date:	14:55	
Accuracy class:	II		08-02-2011	
Max:	6000			
Verification scale interval, e:	1			
No. of verification scale intervals, n:	6000			
Resolution during test:	0,1 [g]			

Aut. Zero-setting and zero-tracking device is: Out of working range

Load cell number and input impedance: load cell(s) [Ohm]No load (L_0): 50 [g] 0,8 [%] of the range**Zero return**

$P = I + \frac{1}{2}e - \Delta L$					$p_i = 1$	
Time of reading	Load L_0	Indication of zero I_0	Add.load ΔL	P	Requi.	Result
	[g]	[g]	[g]	[g]	[g]	$ \Delta P $
14:55	50	50		50		
After loading for 0.5 h (with load close to Max) Load =					0,5 * e1	
Unload quickly:						
15:25	50	50,1		50,1	0,5	0,1

Passed / Failed: **Passed**

Remarks:

Creep

Load close to Max				$P = I + \frac{1}{2}e - \Delta L$		$p_i = 1$
Time of reading	Load L	Indication I	Add.load ΔL	P	ΔP	Requirement
	[g]	[g]	[g]	[g]	[g]	[g]
14:55:00	0 min	6000	5999,4	5999,4		0,5
15:00:00	5 min		5999,3	5999,3	0,1	
15:10:00	15 min		5999,4	5999,4	0	
15:25:00	30 min		5999,5	5999,5	0,1	
	1 h					1
	2 h					
	3 h					
	4 h					

Passed / Failed: **Passed**

Observer:

Remarks: