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EC Type-Approval Certificate

No. DK 0199.299

190EU / 190DC

NON-AUTOMATIC WEIGHING INSTRUMENT

Issued by **DELTA Danish Electronics, Light & Acoustics**
EU - Notified Body No. 0199

In accordance with the requirements for the non-automatic weighing instrument of EC Council Directive 2009/23/EC.

Issued to Cardinal Scale Manufacturing Company
203 East Daugherty
P.O. Box 151
Webb City, MO 64870
USA

In respect of Non-automatic weighing instrument designated 190EU / 190DC with variants of modules of load receptors, load cells and peripheral equipment.
Accuracy class III, single interval or multi-interval (2 intervals)
Maximum capacity, Max: From 1 kg up to 200 000 kg
Verification scale interval: $e_i = Max_i / n_i$
Maximum number of verification scale intervals: $n = 10000$ (however, dependent on environment and the composition of the modules).
Variants of modules and conditions for the composition of the modules are set out in the annex.

The conformity with the essential requirements in annex 1 of the Directive is met by the application of the European Standard EN 45501:1992/AC:1993.

The principal characteristics and approval conditions are set out in the descriptive annex to this certificate.

The annex comprises 13 pages.

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Descriptive annex

Contents

1. Name and type of instrument

The weighing instrument is designated the 190EU / 190DC series which is a system of modules consisting of an electronic indicator, connected to a separate load receptor and peripheral equipment such as printers or other devices, as appropriate. The instrument is a Class III or IIII, self-indicating weighing instrument with single-interval and an external AC mains power supply.

The indicator consists of analog to digital conversion circuitry, microprocessor control circuitry, power supply, keyboard, non-volatile memory for storage of calibration and weight data, and a weight display contained within a single enclosure.

The modules are listed in sections 3.1 to 3.4. The principle of composition is set out in section 6.1.

2. Description of the construction and function

2.1 Construction

Indicator

The indicator is specified in section 3.1.

Enclosure

The Model 190EU / 190DC is housed in a polycarbonate enclosures 239 mm wide x 163 mm high x 93 mm deep and can be mounted either on a vertical or horizontal surface. This enclosure is designed to meet an IP69K rating. It is designed primarily for industrial use but may also be used in an office environment.

Keyboard

The Model 190EU / 190DC keyboard contains 7 capacitive touch keys used to control the functions of the instrument.

Displays

The front panel of the indicator is comprised of:

- A 7-segment LCD display 25.4 mm in height with a total of six digits and appropriate status indicators. The display is equipped with a backlight.
- A keyboard containing 7 keys used to enter commands or data to the weight indicator. Each key is identified with a name and / or pictograph.

The rear panel of the enclosure contains the following:

- A power cord with associated power cord gland connector
- Access for connection of serial ports
- A load cell gland connector.

Electronics

The Model 190EU / 190DC weight indicating instruments use a single printed circuit board which contains all of the instrument circuitry. The weight-indicating instrument uses a Freescale MC9S08LL64 microcontroller which has 64 Kb of flash program memory. All instrument calibration and metrological setup data is contained in non-volatile memory. The power supply is internal and can accept an input voltage from the power mains from 100 to 240 VAC 50 or 60 Hz. Alternatively the indicator may be powered from an optional 8.4 LI-ON 2600 mAH internal battery. The indicator produces a load cell excitation voltage of 5.18 VDC when powered either from the power mains or from batteries.

2.2 Load cells

Set out in section 3.3.

2.3 Load receptors

Set out in section 3.4.

2.4 Interfaces and peripheral equipment

Set out in section 4.

2.5 Function

The Model 190EU / 190DC weight indicating instrument is a micro-controller based electronic weight indicator that requires the external connection of one or more strain gauge load cells. The weight information appears in the digital display located on the front panel and may be transmitted to peripheral equipment for recording, processing or display. The weight-indicating instrument can operate from mains at 100 to 240 VAC 50 or 60 Hz or from an optional internal LI-ON 2600mAH battery.

The primary functions provided are detailed below:

2.5.1 Power-up

On power up, the weight indicator will perform a display test then show the instrument model number followed by the software revision level for about three seconds. After that it will display the current weight using either the previously established zero reference or, if configured to do so, will automatically establish the current weight as a new zero reference.

2.5.2 Test function

The test function can be accessed by pressing the UNITS / LEFT ARROW key while pressing the Fn / UP ARROW key. This action will initiate the test sequence that consists of the following displays each lasting about one second:

1. Display model number (190EU or 190DC)
2. Display software version (r #.#.#)
3. Turn on and off all horizontal display segments
4. Turn on and off all vertical segments and decimal points
5. Turn on and off all key status arrow annunciators
6. Turn on and off each weight mode annunciator
7. Check the operation of the internal memory to verify it is functional, verify that the setup parameters are within range and check the voltage of the internal battery (if equipped with this option) is within the normal range of operation and display any errors
8. Display ‘PASS” if all diagnostic tests are within the range of acceptance.
9. Display the calibration numbers (C1 through C4).

2.5.3 Display range

The weight indicators will display weight from –99,999e to Max +9e (gross weight) within the limits of the display capacity.

2.5.4 Zero-setting

Pressing the ZERO key causes a new zero reference to be established and the ZERO annunciator to turn on indicating the display is at the center of zero.

Zero-setting range: 4% of Max.

Zero-setting can only take place when the weight display is not in motion.

2.5.5 Zero-tracking

The Model 190EU / 190DC weight indicator is equipped with a zero-tracking feature which operates over a range of +/- 2% of Max and only when the indicator is at gross zero and there is no motion in the weight display.

2.5.6 Units

The UNITS key may be used to select the units in which the weight is displayed. The selected unit of measure is indicated in the weight display. Available units of measure include kilograms, grams, pounds, and ounces.

2.5.7 Tare

The Model 190EU / 190DC weight-indicating instrument is provided with a semi-automatic subtractive tare.

2.5.7.1 Semi-automatic tare

Pressing the TARE / ENTER key will store the current GROSS weight as the new TARE weight and will automatically change to the net weight display mode turning the NET annunciator on. A new TARE weight value can only be entered when the weight display is stable and there is no motion on the load receptor and a print operation is not taking place. Pressing the TARE / ENTER key while in the net weight display mode will cause the Tare Weight value to be displayed and the Tare Weight display annunciator to turn on.

2.5.8 Net / Gross indication

Once a valid tare weight, other than zero, has been stored, the weight display can be switched from a gross weight display mode to a net weight display mode by pressing the NET / GROSS key. Each time the key is pressed, the display will alternate between the net and gross display modes. If no tare weight has been entered, pressing this key will cause the display to momentarily show NO TARE and then return to the gross weight display mode.

2.5.9 Printing

A printer may be connected to the serial data port. In the net display mode, the Model 190EU / 190DC weight indicator will transmit the gross, tare and net weights to the printer each time the PRINT key is pressed. In the gross mode, only the gross weight is transmitted. The print will not take place if the load receptor is not stable, if the gross weight is less than zero, if the weight exceeds Max or during data entry from the keyboard.

2.5.10 Display test

A self-test routine is initiated by pressing the ON / OFF key to turn the instrument on. A self-test can also be initiated by simultaneously pressing the UNITS / LEFT ARROW and Fn / RIGHT ARROW keys. See section 2.2.2.

2.5.11 Operator information messages

The Model 190EU / 190DC weight indicator has a number of general and diagnostic messages that are described in detail in the Model 190EU / 190DC Owner's Manual.

2.5.12 Software version

The software revision level is displayed during the power up sequence of the instrument and each time a test sequence is performed.
The tested software version is: r.1.0.3.

2.6 Available options

2.6.1 Options

The only optional feature available for the Model 190EU / 190DC weight-indicating instrument is the internal LI-ON 2600 mAH battery for operation independent of the power mains.

3. Technical data

The Model 190EU / 190DC weighing instrument is composed of separate modules, which are set out as follows:

3.1 Indicator

The indicator models have the following characteristics:

Type:	190EU / 190DC
Accuracy class:	III and IIII
Weighing range:	Single-interval
Maximum number of Verification Scale Intervals:	10000 (class III). 1000 (class IIII)
Internal resolution:	> 100,000 counts
Maximum tare effect:	-Max within display limits
Factional factor:	p'I = 0.5
Minimum input-voltage per VSI:	0.5 µV
Minimum signal voltage for dead load:	0.5 mV
Excitation voltage:	5.18 VDC
Maximum analogue range:	0.5 to 40 mV
Circuit for remote sense:	Remote sense using 6-wires in the load cell cable
Minimum input-impedance:	58 ohms (6 load cells of 350 ohm)
Maximum input-impedance:	1100 ohm
Maximum line resistance between indicator and junction box for load cell(s), if any:	179 ohms for each wire
Mains power supply:	100 to 260 VAC, 50 or 60 Hz (190EU) or 12 to 24 VDC (190DC)
Peripheral interface:	Set out in section 4

3.2 Connecting cable between the indicator and the junction box for load cells

3.2.1 4-wire system

Line	4 wires, shielded
Maximum length	The certified length of the load cell cable, which shall be connected directly to the indicator.

3.2.2 6-wire system

Line 6 wires, screened

Option 1:

Maximum length 11433 m/mm^2 (for n = 10,000)
Maximum resistance per wire 179.1 ohm

In case the (n) for the weighing instrument is less than (n) mentioned above, the following apply:

Option 2:

Coefficient of temperature of the span error of the indicator: Es = 0.0034 [%/25K]
Coefficient of resistance for the wires in the J-box cable: Sx = 0.0001 [%/ohm]

L/A_{max} = 295.86 / Sx * (emp/n - Es) [m/mm²] in which emp = p'i * mpe * 100/e

From this, the maximum cable length for the weighing instrument may be calculated with regard to (n) for the actual configuration of the instrument.

Reference: See section 10.

The calculation program is obtainable by downloading at www.delta.dk/weighing.

3.3 Load cells

3.3.1 General acceptance of modules

Any load cell(s) may be used for instruments under this certificate of type approval provided the following conditions are met:

1) A test certificate (EN 45501) or OIML Certificate of Conformity (R60) respectively issued for the load cell by a Notified Body responsible for type examination under the Directive 2009/23/EC.

2) The certificate contains the load cell types and the necessary load cell data required for the manufacturer's declaration of compatibility of modules (WELMEC 2, Issue 5, 2009), and any particular installation requirements). A load cell marked NH is allowed only if humidity testing to EN 45501 has been conducted on this load cell.

3) The compatibility of load cells and indicator is established by the manufacturer by means of the compatibility of modules form, contained in the above WELMEC 2 document, or the like, at the time of EC verification or declaration of EC conformity of type.

4) The load transmission must conform to one of the examples shown in the WELMEC 2.4 Guide for load cells.

The load cells, which are set out below are approved as modules in the weighing instrument:

Manufacturer	Load cell type
Cardinal	CB6
Cardinal	TSP
Cardinal	SB
Cardinal	TB
Cardinal	LFB
Cardinal	DB

3.4 Load receptors

Mechanical platforms, whether mentioned in this type-approval or not, are allowed to have any size and capacity, the number of load cells not exceeding 6.

The load receptors may be equipped with appropriate load cells as specified in section 3.3 as alternatives to those mentioned in sections 3.4.1 to 3.4.3.

3.4.1 Weigh bridge platforms

Construction in brief	All-steel or steel-reinforced concrete construction, surface or pit mounted
Reduction ratio	1
Junction box	Mounted in or on the platform
Load cells	Cardinal DB or other authorised alternative
Drawings	no. 3500-B089-0A and no. 3500-B018-0A (50,000 lb) no. 3500-B094-0A (100,000 lb)

3.4.2 Mechanical lever platform – load cell conversion

Any mechanical lever platform or weigh bridge previously approved for trade use but with mechanical headworks removed and replaced by an approved load cell mounted in tension and secured to the dead structure of the platform. The load cell is connected to the transfer lever or connecting rod by a link assembly.

3.4.3 Bin, Tank, Hopper and non-standard systems

Construction in brief	Load cell assemblies each consisting of a load cell stand assembly to support one of the mounting feet bin, tank or hopper.
Reduction ratio	1
Junction box	Mounted on dead structure
Load cell	Any R60 certified load cell according to section 3.3
Drawings	Various

3.4.4 Authorised alternatives

Other mechanical mountings are also allowed provided that they comply with EN 45501 paragraph 6 or section 3.3.

Various load cell support assemblies are contained in the drawings LC 00-3, LC 01-3, LC 02-3 and LC 03-3.

3.5 Composition of modules

In case of composition of modules, EN 45501 paragraph 3.5 and 4.12 shall be satisfied.

3.6 Documents

The documents filed at DELTA (reference No. A530965) are valid for the weighing instruments described here.

4. Interfaces and peripheral equipment

4.1 Interfaces

4.1.1 Load cell interface

A 7-screw terminal strip on the printed circuit board accessed by a gland connector for the load cell positioned on the rear panel of the instrument enclosure.

4.1.2 Printer Interface

A 3-screw terminal strip on the printed circuit board accessed by a gland connector for the serial interface positioned on the rear panel of the instrument enclosure.

4.2 Peripheral equipment

Connection between the weight indicator and peripheral equipment is allowed by screened cable.

The instrument may be connected to any simple peripheral device with a CE mark of conformity.

5. Approval conditions

5.1 Measurement functions other than non-automatic functions

Measurement functions that will enable the use of the instrument as an automatic weighing instrument are not covered by this type approval.

5.2 Piece counting

Piece counting is not covered by this approval.

5.3 Compatibility of modules

In case of composition of modules, WELMEC 2 (Issue 5) 2009, paragraph 11 shall be satisfied.

6. Special conditions for verification

6.1 Composition of modules

The environmental conditions should be taken into consideration by the composition of modules for a complete weighing instrument, for example instruments with load receptors placed outdoors and having no special protection against the weather.

The composition of modules shall agree with section 5.3.

An example of a declaration of conformity document is shown in section 10.

7. Securing and location of seals and verification marks

7.1 Securing and sealing

Seals shall bear the verification mark of a notified body or alternative mark of the manufacturer according to ANNEX II, section 2.3 of the Directive 2009/23/EC.

7.1.1 Indicator

Jumper J4 for Calibration Inhibit must be removed prior to calibration. Access to the setup and calibration mode is achieved by pressing and holding the UNITS / LEFT ARROW and Fn / UP ARROW keys. The red LED annunciators above the keys will flash and the display will show “SetUP” to indicate the setup and calibration mode has been entered and the two keys may be released. Setup parameters and calibration is performed via the indicator keyboard and is fully described in the Owner’s Manual. Security sealing of the indicator can be accomplished using the two event counters (one for configuration parameters and one for calibration parameters) or by use of a lead-wire security seal. If the lead-wire security seal is to be used, Jumper J4 must first be installed. A lead-wire security seal is threaded through the screws at the bottom of the rear panel that hold the front panel in place inhibiting access to the jumper.

7.1.2 Indicator – load cell connector – load receptor

Securing of the indicator, load receptor and load cell combined is done by one of the following ways:

- Sealing of the load cell connector / cable by a lead wire seal.
- Inserting the serial number of the load receptor as part of the principal inscriptions contained on the indicator identification label.
- The load receptor bears the serial number of the indicator on its data plate.

7.1.3 Junction Box for load cells

Access to the junction box, if any, is prevented by the use of lead wire seals or by sealing it with brittle plastic stickers.

7.1.4 Peripheral interfaces

All peripheral interfaces are “protective”; they neither allow manipulation with weighing data or Legal Setup, nor change the performance of the weighing instrument in any way, that would alter the legality of the weighing.

7.2 Verification marks

7.2.1 Indicator

A green M-sticker and a sticker with verification marks may be placed on the topside of the indicator.

7.2.2 Printers used for legal transactions

Printers covered by this type of approval and other printers according to section 4.2 shall bear a green M-sticker, if they are used for legal transactions.

7.2.3 Non-verified peripheral equipment

If such equipment is connected to the weighing instrument, it shall bear a red M-sticker.

8. Location of CE mark of conformity and inscriptions

8.1 Indicator

8.1.1 CE mark

A sticker with the CE mark of conformity and year of production is located on the identification plate which is located on the bottom of the enclosure.

8.1.2 Inscriptions

Manufacturer's trademark and name and the type designation is located on the front panel overlay.

On a single brittle plastic sticker located on the back of the indicator enclosure:

- Certificate No. and the accuracy class

On a single brittle plastic sticker located on the front panel overlay:

- Max, Min, e=

On a label located on the back of the weight indicator enclosure:

- Model No., Serial No., electrical data and other inscriptions

8.2 Load receptors

On a data plate:

- Manufacturer's name, type, serial number, capacity

Left to the manufacturer's choice as provided in section 7.1.2:

- Serial number of the indicator

9. Pictures

Figure 1 Model 190EU / 190DC Front Panel

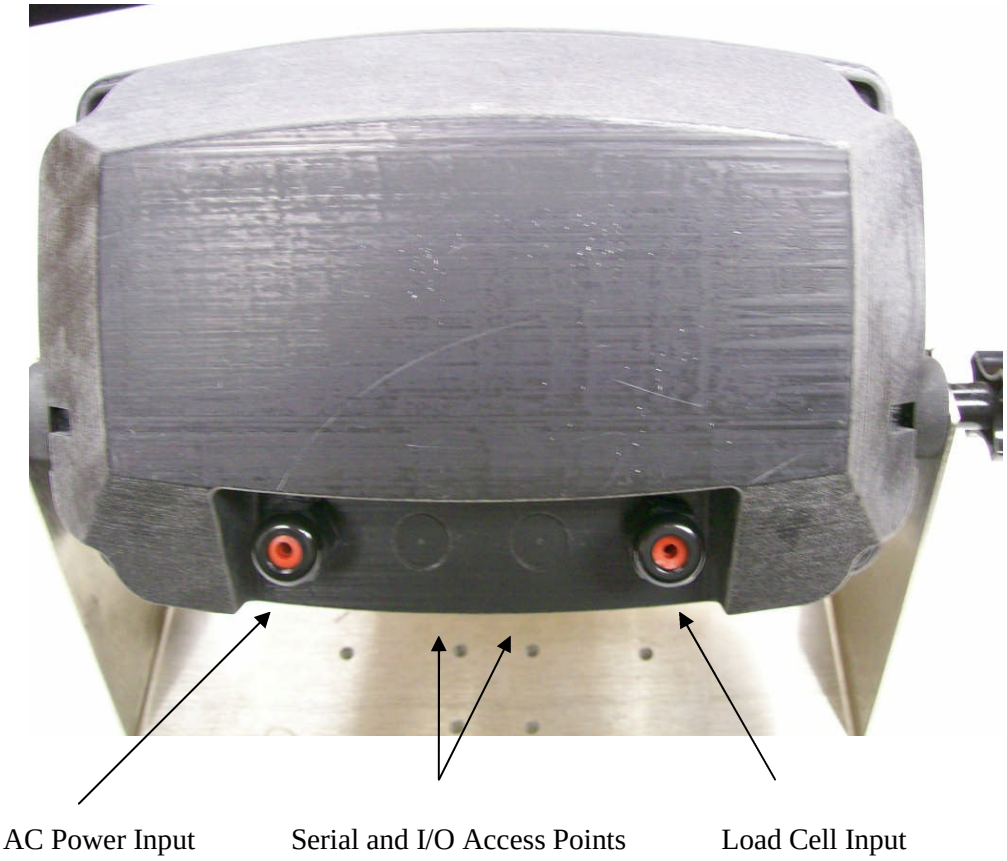

Figure 2 Model 190EU Back Panel

10. Compatibility of modules

COMPATIBILITY OF MODULES

Ref.: WELMEC 2

Non-Automatic Weighing Instrument, single-interval

Certificate of EU Type-Approval N°: TAC: DK0199.299

INDICATOR A/D (Module 1)		Type:	190EU			
Accuracy class according to EN 45501 and OIML R76:		$Class_{ind}$ (I, II, III or IIII)		III		
Maximum number of verification scale intervals (n_{max}):		n_{ind}		10000		
Fraction of maximum permissible error (mpe):		p_1		0,5		
Load cell excitation voltage:		U_{exc}	[Vdc]	5,18		
Minimum input-voltage per verification scale interval:		Δu_{min}	[µV]	0,5		
Minimum load cell impedance:		R_{Lmin}	[Ω]	58		
Coefficient of temperature of the span error:		Es	[% / 25°C]			0,0034
Coefficient of resistance for the wires in the J-box cable:		Sx	[% / Ω]			0,0001
Specific J-box cable-Length to the junction box for load cells:		$(L/A)_{max}$	[m / mm²]			12130
Load cell interface:			6-wire (remote sense)			
Additive tare, if available:		T^+	[% of Max]	0		
Initial zero setting range:		IZSR	[% of Max]	-10	/	10
Temperature range:		T_{min} / T_{max}	[°C]	-10	/	40
Test report (TR), Test Certificate (TC) or OIML Certificate of Conformity:						
LOAD RECEPTOR (Module 2)		Type:				
Construction:			Platform			
Fraction of mpe:		p_2		0,5		
Number of load cells:		N		4		
Reduction ratio of the load transmitting device:		$R=F_M / F_L$		1		
Dead load of load receptor:		DL	[% of Max]	3,3		
Non uniform distribution of the load:		NUD	[% of Max]	20		
Correction factor:	$Q = 1 + (DL + T^+ + IZSR^+ + NUD) / 100$			1,333		
LOAD CELL ANALOG (Module 3)		Type:	TB 500 C3			
Accuracy class according to OIML R60:		$Class_{LC}$ (A, B, C or D)		C		
Maximum number of load cell intervals:		n_{LC}		3000		
Fraction of mpe:		p_3		0,7		
Rated output (sensitivity):		C	[mV / V]	2		
Input resistance of single load cell:		R_{LC}	[Ω]	350		
Minimum load cell verification interval:	($v_{min\%}$ = 100 / Y)	$v_{min\%}$	[% of Emax]	0,01		
Rated capacity:		E_{max}	[kg]	500		
Minimum dead load, relative:		$(E_{min} / E_{max}) * 100$	[%]	0		
Temperature range:		T_{min} / T_{max}	[°C]	-10	/	40
Test report (TR) or Test Certificate (TC/OIML) as appropriate:						
COMPLETE WEIGHING INSTRUMENT			Single-interval			
Manufacturer: Cardinal		Type:	190EU with platform			
Accuracy class according to EN 45501 and OIML R76:		$Class_{WI}$ (I, II, III or IIII)		III		
Fractions: $p_i = p_1^2 + p_2^2 + p_3^2$:		p_i		1,0		
Maximum capacity:		Max	[kg]	1500		
Number of verification scale intervals:		n		3000		
Verification scale interval:		e	[kg]	0,5		
Utilisation ratio of the load cell:	$\alpha = (Max / E_{max}) * (R / N)$			0,75		
Input voltage (from the load cells):	$\Delta_u = C * U_{exc} * \alpha * 1000 / n$		[µV/e]	2,59		
Cross-section of each wire in the J-box cable:		A	[mm²]	0,22		
J-box cable-Length:		L	[m]	5		
Temperature range to be marked on the instrument:	Not required	T_{min} / T_{max}	[°C]			
Peripheral Equipment subject to legal control:						

Acceptance criteria for compatibility				Passed, provided no result below is < 0	
$Class_{WI}$	<=	$Class_{ind}$ & $Class_{LC}$	(WELMEC 2: 1)	$Class_{WI}$:	PASSED
pi	<=	1	(R76: 3.5.4.1)	1 - pi =	0,0
n	<=	n_{max} for the class	(R76: 3.2)	n_{max} for the class - n =	7000
n	<=	n_{ind}	(WELMEC 2: 4)	n_{ind} - n =	7000
n	<=	n_{LC}	(R76: 4.12.2)	n_{LC} - n =	0
E_{min}	<=	DL * R / N	(WELMEC 2: 6d)	(DL * R / N) - E_{min} =	12,375
$v_{min} * \sqrt{N} / R$	<=	e	(R76: 4.12.3)	e - (v_{min} * √N / R) =	0,400
or (if v_{min} is not given)				Alternative solutions: ↑ ↓	
$(E_{max} / n_{LC}) * (\sqrt{N} / R)$	<=	e	(WELMEC 2: 7)	e - ((E_{max} / n_{LC}) * (√N/ R)) =	
Δu_{min}	<=	Δu	(WELMEC 2: 8)	$\Delta u - \Delta u_{min}$ =	2,09
R_{Lmin}	<=	R_{LC} / N	(WELMEC 2: 9)	(R_{LC} / N) - R_{Lmin} =	30
L / A	<=	$(L / A)_{max}^{WI}$	(WELMEC 2: 10)	$(L / A)_{max}^{WI}$ - (L / A) =	63883
T_{range}	<=	$T_{max} - T_{min}$	(R76: 3.9.2.2)	(T_{max} - T_{min}) - T_{range} =	20
Q * Max * R / N	<=	E_{max}	(R76: 4.12.1)	E_{max} - (Q * Max * R / N) =	0,1

Signature and date:

Conclusion . . . . . PASSED

This is an authentic document made from the program: "Compatibility of NAWI-modules version 3.2".