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EC Type-Approval Certificate

No. DK 0199.377

MWI / MCI / LKI

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 **Bosche GmbH & Co. KG**
Reselager Rieden 3
49401 Damme
Germany

In respect of Non-automatic weighing instrument designated MWI / MCI / LKI all based on BDU10-M analog-to-digital data processing unit with variants of modules of load receptors, load cells and peripheral equipment.
Accuracy class III and IIII
Maximum capacity, Max: From 1 kg up to 999 950 kg
Verification scale interval: $e_i = Max_i / n_i$
Maximum number of verification scale intervals: $n_i \leq 10000$ for single-interval and multi-range (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, WELMEC 2.1:2001 and OIML R76:2006.

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

The annex comprises 16 pages.

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Descriptive annex

Contents

1. Name and type of instrument and modules

The weighing instrument is designated MWI / MCI / LKI. It is a system of modules consisting of an electronic digital indicator communicating with an analog to digital data processing unit BDU10-M, which is connected to the load cell(s) of the load receptor. The indicator can have a built-in printer or it can be connected to 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, multi-range or multi-interval. Power supplied from 230 VAC or from an external AC/DC mains adapter, and an internal rechargeable battery (optional).

The modules appear from Sections 3.1, 3.2, and 3.3; the principle of the composition of the modules is set out in Sections 6.1 and 10.

2. Description of the construction and function

2.1 Construction

2.1.1 Indicator

The indicator is specified in Section 3.1.

Enclosures and keyboard

The indicators are housed in an enclosure made of either ABS plastic, stainless steel or aluminium.

The front panels of the indicator comprise:

- Either a LCD display with appropriate state indicators and 6 digits weight display and further displays and indicators for supplementary information.
- A keyboard containing 9 keys (model LKI) or 21 keys (model MWI / MCI) used to enter commands or data into the weight indicator, plus a key for turning the indicator on/off. Each key is identified with a name and/or pictograph.

Electronics

The indicator uses a mainboard and a display board. The BDU10-M consists of a single printed circuit board, but it needs a special socket board, when installed outside the indicator.

All the metrological circuitry for the models of weighing instruments is located in the BDU10-M.

All instrument calibration and metrological setup data are contained in non-volatile memory. The power supply accepts an input voltage of 12 VDC from the external AC/DC adapter or supplied from 100 - 240 VAC 50-60 Hz directly. The BDU10-M is power supplied from the indicator.

2.1.2 Load receptors, load cells, and load receptor supports

Set out in Section 3.2.

2.1.3 Interfaces and peripheral equipment

Set out in Section 4.

2.2 Functions

The weight indicating instruments are microcontroller based electronic digital weight indicators utilizing the BDU10-M analog to digital data processing unit that require the external connection of strain gauge load cell(s). 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 primary functions provided are detailed below.

2.2.1 Display test

A self-test routine is initiated by pressing the on/off key to turn the instrument off, then pressing it again to turn the instrument on. The test routine first shows the software version then turns on all of the display segments, turns them off again and shows the company name for finally cycling the numbers 6 down to 1 in the digit positions.

2.2.2 Display range

The weight indicators will display weight from –Max to Max (gross weight) within the limits of the display capacity.

2.2.3 Zero-setting

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

Semi-automatic zero-setting range: ±2% of Max.
Automatic zero-tracking range: ±2% of Max.
Initial zero-setting range: ±10% of Max.

Zero-setting is only possible when the load receptor is not in motion.

2.2.3.1 Semi-automatic zero-setting

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

2.2.3.2 Zero-tracking

The indicators are equipped with a zero-tracking feature, which operates over a range of 4% of Max and only when the indicator is at gross zero and there is no motion in the weight display.

2.2.4 Tare

The instrument models are provided with a semi-automatic subtractive tare as well as a preset tare.

2.2.4.1 Semi-automatic subtractive tare

Pressing the “TARE” key will enter the currently weight value as the new tare weight value. The weight display will automatically change to the net weight display mode and turn on the NET annunciator. This tare value can be cleared by pressing the TARE key, when there is no load on the load receptor. This tare entry cannot take place, if the load receptor is in motion.

2.2.4.2 Preset tare

Entering a tare weight using the numeric keys and then pressing the “TARE” key, while there is no load on the load receptor, will take the entered weight value as a preset tare weight value. The weight display will automatically change to the net weight display mode and turn on the PT and NET annun-

ciators. This preset tare value can be cleared by pressing the TARE key, when there is no load on the load receptor.

2.2.5 Printing

A printer may be connected to the optional serial data port or the indicator may have a built-in printer. The weight indicator will transmit the current weight to the printer when the "PRINT" key is pressed.

The printing will not take place if the load receptor is not stable, if the gross weight is less than zero, or if the weight exceeds Max.

2.2.6 Counting

The MCI scale is primarily intended for counting.
The count shown in counting mode however, is not to be regarded as an approved weighing result.

2.2.7 Check weighing

The scales have a non-automatic check weighing function where the weighing result is compared against an upper and a lower limit.

2.2.8 Real time clock

If it is available in the instrument, the real time clock can be activated to get printout with day and time information.

2.2.9 Operator information messages

The weight indicator has a number of general and diagnostic messages, which are described in detail in the user's guide.

2.2.10 Software version

The software revision level is displayed during the power-up sequence of the instrument.
The approved software version is: 3.0.

2.2.11 Totalisation

The indicator can be configured with a totalisation function, adding actual weight display values to the memory when pressing "M+" key if the equilibrium is stable.

The number of added weights and the totalised weight are displayed as secondary information.

2.2.12 Alibi memory

The scales may be configured with an alibi memory (data storage device) in which the weight is stored when printed.

2.2.13 Battery operation

The indicator can be operated from an internal rechargeable battery, if this option is installed.

3. Technical data

The MWI / MCI / LKI weighing instruments are composed of separate modules, which are set out as follows:

3.1 Indicator

The digital indicators have the following characteristics:

Type:	MWI / MCI / LKI
Accuracy class:	III and IIII
Weighing range:	Single-interval or multi-range (3 ranges)
Maximum number of Verification Scale Intervals:	≤ 10 000 (class III), ≤ 1000 (class IIII) for single-interval or for each range
Maximum tare effect:	-Max within display limits
Mains power supply:	100-240 VAC 50-60 Hz or 12 VDC using external AC/DC adapter. 6 V internal rechargeable battery (optional).
Operational temperature:	-10 °C to +40 °C
Peripheral interface:	Set out in section 4

3.2 Analog to digital data processing unit

The BDU10-M analog to digital data processing unit have the following characteristics:

Type:	BDU10-M
Accuracy class:	III and IIII
Weighing range:	Single-interval or multi-range (3 ranges)
Maximum number of Verification Scale Intervals:	≤ 10 000 (class III), ≤ 1000 (class IIII) for single-interval or for each range
Maximum tare effect:	-Max within display limits
Fractional factor:	p'i = 0.5
Minimum input voltage per VSI:	0.2 μV
Excitation voltage:	5 VDC
Circuit for remote sense:	present on the model with 7-terminal connector
Minimum input impedance:	87 ohm
Maximum input impedance:	1200 ohm
Mains power supply:	6 – 8 VDC using Bosche's socket board
Operational temperature:	-10 °C to +40 °C
Peripheral interface:	RS-485 for communication with digital indicator

3.2.1 Connecting cable between the indicator and junction box for load cell(s)

3.2.1.1 4-wire system

Cable between BDU10-M and junction box:	4 wires (no sense), shielded
Maximum length:	10 m/mm^2

3.2.1.2 6-wire system

In a 6-wire system, a 6 wire cable (plus shield) is used between the BDU10-M and the junction box, while load cell(s) may be with either a 4 wire or a 6 wire cable.

Cable between BDU10-M and junction box:	6 wires, shielded
Maximum length:	1520 m / mm²

3.3 Load receptors, load cells and load receptor supports

Removable platforms shall be equipped with level indicators.

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.

3.3.2 Platforms, 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	Load cell according to Section 3.3.1
Drawings	Various

3.3.3 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	Load cell according to Section 3.3.1
Drawings	Various

3.3.4 Crane scales

Construction in brief	Hook or similar arrangement suspended from the load cell.
Reduction ratio	1
Load cell	Load cell according to Section 3.3.1
Drawings	Various

3.4 Composition of modules

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

3.5 Documents

The documents filed at DELTA (reference No. T203811) are valid for the weighing instruments described here.

4. Interfaces and peripheral equipment

4.1 Interfaces

The interfaces are characterised “Protective interfaces” according to paragraph 8.4 in the Directive.

4.1.1 Input from load receptor

4.1.1.1 Load cell input

A 5-terminal connector or 7-terminal connector for the load cell is positioned on the back of the indicator enclosure, when the BDU10-M is installed inside the indicator enclosure.

4.1.1.2 RS-485

A connector with RS-485 and DC voltage supply for connection to the BDU10-M is positioned on the back of the indicator enclosure, when the BDU10-M is placed in the load receptor or junction box.

4.1.2 Other interfaces

The indicator may be equipped with the following protective interfaces located on the main board.

- RS-232C

The interfaces do not have to be secured.

4.2 Peripheral equipment

Connection between the 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 Counting operation is not approved for NAWI

The count shown as result of the counting function is not covered by this NAWI approval.

5.3 Totalised weight is not a legal value.

When using the totalisation function creating a sum of several weighing results, this sum is only informative, as it is not a legal value.

5.4 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 5.4.

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 BDU10-M, event counter

The type and device specific parameters of the scales are stored in the BDU10-M and are secured with a kind of event counter (TAC). Each time a change in the parameters has occurred a new 6-digit value of the TAC is generated by a special algorithm ensuring a unique value without just incrementing the former value.

7.1.2 Indicator – BDU10-M pairing

As part of the setup and configuration of the weighing instrument, the digital indicator and the BDU10-M must be paired together. This is an irreversible operation ensuring that these two specimens will work together and that they will not work together with other specimens.

7.1.3 Sealing of BDU10-M against exchange

If the BDU10-M is installed in a junction box, the access to the box is sealed with brittle plastic stickers as shown in Figure 8.

If the BDU10-M is installed in the digital indicator, it is sealed against exchange with brittle plastic stickers as shown in Figure 9.

7.1.4 Sealing of the digital indicator boards against exchange

The digital indicator boards can either be sealed against exchange sealed with brittle plastic stickers as shown in Figure 10, or the enclosure of the indicator can be sealed against opening with brittle plastic stickers across the assembly of the enclosure.

7.1.5 Peripheral interface

The interface for peripherals is “protective”, it neither allows manipulation with weighing data or legal setup, nor change of 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 shall be placed next to the CE mark on the inscription plate.

The sticker with verification marks may be placed on or next to the inscription plate or on the front of the indicator.

7.2.2 Printers used for legal transactions

Printers covered by this type approval and other printers according to Section 4.2, which have been subject to the conformity assessment procedure, shall not bear a separate green M-sticker in order to be used for legal transactions.

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 enclosure of the weight indicator.

8.1.2 Inscriptions

Manufacturer’s trademark and/or name and the type designation is located on the front panel overlay.

Indelibly printed on a brittle plastic sticker located on the front panel overlay:

- Max, Min, e =

On the inscription plate:

- Manufacturer’s name and/or logo, model no., serial no., type-approval certificate no., accuracy class, BDU10-M serial number, electrical data and other inscriptions.

8.1.2.1 Load receptors

On a data plate:

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

9. Pictures

Figure 1 MWI indicator in ABS housing.

Figure 2 MWI indicator in stainless steel housing with built-in printer.

Figure 3 MCI indicator in ABS housing.

Figure 4 MCI indicator in stainless steel housing.

Figure 5 MCI indicator in stainless steel housing with built-in printer with cover.

Figure 6 LKI indicator.

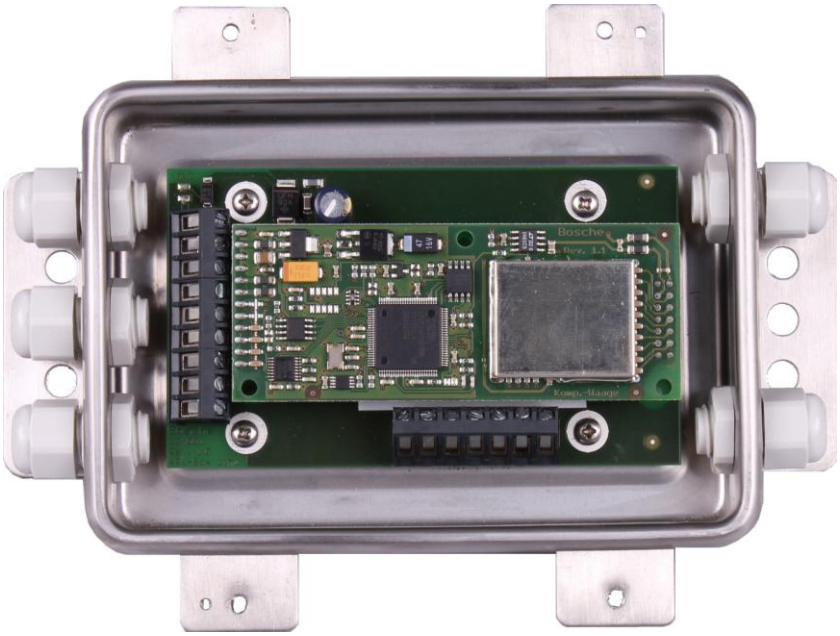

Figure 7 BDU10-M analog to digital data processing unit placed in a junction box.

Figure 8 Sealing of junction box with BDU10-M.

Figure 9 Sealing of access to BDU10-M, when installed inside indicator.

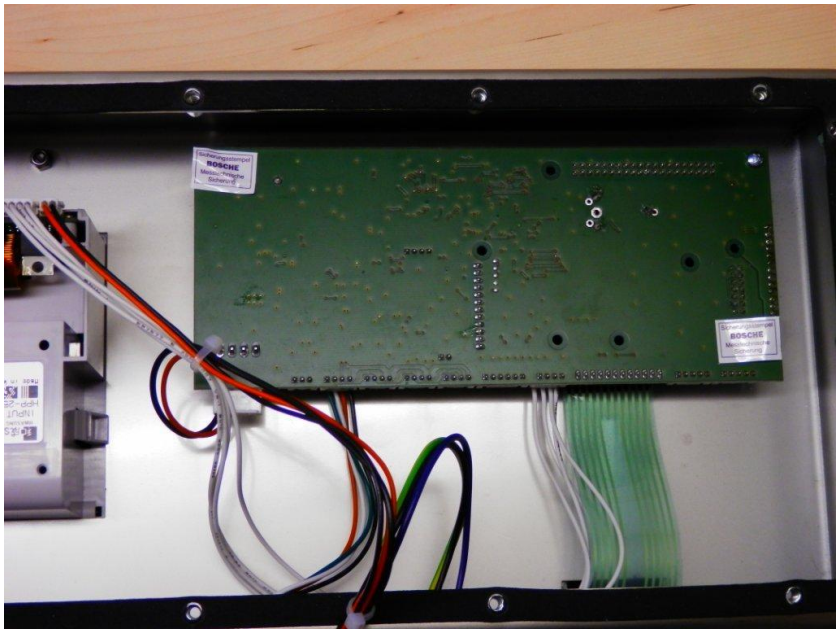

Figure 10 Sealing of the indicator boards against exchange.

10. Composition of modules – an example

COMPATIBILITY OF MODULES

Ref.: WELMEC 2

Non-Automatic Weighing Instrument, multi-interval

Certificate of EU Type-Approval N°: TAC: DK0199.377

INDICATOR	A/D (Module 1)	Type:	MWI with BDU10-M			
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} or lower):		n_{ind}			10000	
Fraction of maximum permissible error (mpe):		p_1			0,5	
Load cell excitation voltage:		U_{exc}	[Vdc]		5	
Minimum input-voltage per verification scale interval:		Δu_{min}	[µV]		0,2	
Minimum load cell impedance:		R_{Lmin}	[Ω]		87,5	
Coefficient of temperature of the span error:		Es	[% / 25°C]			
Coefficient of resistance for the wires in the J-box cable:		Sx	[% / Ω]			
Specific J-box cable-Length to the junction box for load cells		$(L/A)_{max}$	[m / mm²]	1520		
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	
Non uniform distribution of the load:		NUD	[% of Max]		20	
Correction factor:	Q = 1 + (DL + T^+ + IZSR$^+$ + NUD) / 100				1,33	
LOAD CELL	ANALOG (Module 3)	Type:	K30N			
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]		3	
Input resistance of single load cell:		R_{LC}	[Ω]		400	
Minimum load cell verification interval:	($v_{min\%}$ = 100 / Y)	$v_{min\%}$	[% of Emax]		0,01	
Rated capacity:		E_{max}	[kg]		1000	
Minimum dead load, relative:		(E_{min} / E_{max}) * 100	[%]		0	
Minimum dead load output return:	($DR_{\%}$ = 50 / Z)	$DR_{\%}$	[% of Emax]		0,00833	
Temperature range:		T_{min} / T_{max}	[°C]	-10	/	40
Test report (TR) or Test Certificate (TC/OIML) as appropriate			DK0199-R60-12.23			
COMPLETE WEIGHING INSTRUMENT			**Multi-interval**			
Manufacturer:	Bosche GmbH & Co. KG	Type:	MWI platform scale			
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]	>>>>>>>>>>>>>>>>>		3000
Maximum capacity for each partial weighing range:		Max_1 / Max_2	[kg]	1500		3000
Number of verification scale intervals for each weighing range		n_1 / n_2		3000		3000
Verification scale interval for each weighing range		e_1 / e_2	[kg]	0,5		1
Utilisation ratio of the load cell:		$\alpha = (Max_i / E_{max}) * (R / N)$		0,38		0,75
Input voltage (from the load cels):		$\Delta_u = C * U_{exc} * \alpha * 1000 / n$	[µV/e]	1,875		3,75
Cross-section of each wire in the J-box cable:		A	[mm²]	>>>>>>>>>>>>>>>>>		0,5
J-box cable-Length to the junction box for load cells		L	[m]	>>>>>>>>>>>>>>>>>		20
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	
p_i	<=	1	(R76: 3.5.4.1)	1 - pi =	>>>>>>>>>>>>>>>>>	0,0
n_i	<=	n_{max} for the class	(R76: 3.2)	n_{max} for the class - n_i =	7000	7000
n_i	<=	n_{ind}	(WELMEC 2: 4)	n_{ind} - n_i =	7000	7000
n_i	<=	n_{LC}	(R76: 4.12.2)	n_{LC} - n_i =	0	0
E_{min}	<=	DL * R / N	(WELMEC 2: 6d)	(DL * R / N) - E_{min} =	22,5	<<<<<<<<<<<<<<<<
$v_{min} * \sqrt{N} / R$	<=	e_i	(R76: 4.12.3)	e_i - (v_{min} * √N / R) =	0,300	0,800
or (if v_{min} is not given)				Alternative solutions:	↑ ↓	
(E_{max} / n_{LC}) * (√N / R)	<=	e_i	(WELMEC 2: 7)	e_i - ((E_{max} / n_{LC}) * (√N / R)) =		
Δu_{min}	<=	Δu	(WELMEC 2: 8)	Δu – Δu_{min} =	1,68	3,55
R_{Lmin}	<=	R_{LC} / N	(WELMEC 2: 9)	(R_{LC} / N) - R_{Lmin} =	>>>>>>>>>>>>>>>>>	13
L / A	<=	$(L / A)_{max}^{WI}$	(WELMEC 2: 10)	$(L / A)_{max}^{WI}$ - (L / A) =	>>>>>>>>	1480
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) =	>>>>>>>>>>>>>>>>>	2,5
$DR_{\%}$	<=	50 * e_i / Max	(WELMEC 2: 6b)	(50 * e_i / Max) - $DR_{\%}$ =	0,0000	<<<<<<<<<<<<<<<<
or (if DR% is not given)				Alternative solutions:	↑ ↓	
Max / e_i	<=	n_{LC}	(WELMEC 2: 6b)	n_{LC} - (Max / e_i) =		

Signature and date:

Conclusion . . . . . ***PASSED***

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