DANAK
PROD Reg. nr 7026

FORCE Certification

EU Type-Examination Certificate

No. 0200-NAWI-03187 Revision 1

185

NON-AUTOMATIC WEIGHING INSTRUMENT

Issued by **FORCE Certification**
EU - Notified Body No. 0200

In accordance with the requirements in Directive 2014/31/EU of the European Parliament and Council.

Issued to **Cardinal Scale Manufacturing Company**
203 East Daugherty Street
Webb City
Missouri 64870
USA

In respect of Non-automatic weighing instrument designated 185 with variants of modules of load receptors, load cells and peripheral equipment.
Accuracy class III, single-interval
Maximum capacity, Max: n × e
Verification scale interval: e = Max / n
Maximum number of verification scale intervals: n ≤ 6000
(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 EN 45501:2015, OIML R76:2006. and WELMEC 2.1:2001.

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

The annex comprises 13 pages.

Issued on **2018-12-03**
Valid until **2028-10-25**

Jens Hovgård Jensen
2018-12-03

Digitally signed by Jens Hovgård Jensen
jhje@force.dk
Certification Manager

FORCE Certification references:
Task no.: 118-35298.90.10 and ID no.: 0200-NAWI-05272

Signatory: J. Hovgård

Descriptive annex

Contents

1. Name and type of instrument

The weighing instrument is designated as the 185 series which is an electronic indicator that is connected to a separate load receiver and peripheral equipment such as printers or other devices as appropriate. The non-automatic weight indicator is a Class III, self-indicating weight indicator with single-interval and an external AC mains power supply or optional 9VDC power source.

The weight indicator consists of analog to digital conversion circuitry, microprocessor control circuitry, load cell excitation voltage regulator, non-volatile memory for storage of calibration and weight data, seven pushbutton keys and a weight display contained within a single enclosure.

The name of the instrument may be followed by alphanumeric characters for technical, legally or commercial characterization of the instrument.

The modules appear from Sections 3.1, and 3.2; 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 specifications are found in section 3.1.

Enclosure
The indicator circuitry is contained in one thermoplastic wall- or desk-mount enclosure; the circuitry consists of that used for the analog processing, weight display processing, display, and keys. The enclosure is 7.7in (196mm) wide X 4.7in (119mm) high X 2.6in (66mm) deep, and has an environmental rating specification IP66 according to information from the manufacturer.

Keys
There are a total of seven separate membrane-type keys located on the display enclosure. The membrane keys on the display enclosure consist of the following:

POWER ON/OFF
ZERO
TARE ENTER
GROSS / NET
UNITS
FUNCTION
PRINT

Display
The display consists of a 1” high, six (6) digit, 7 (seven) segment LCD display and appropriate state indicators. The total display size is 1.5in (38.1mm) high X 6in (152.4mm) wide.

Interconnections
The processing circuitry is equipped with several connectors. A circular connector is used for the input of 12 VDC (at 1A maximum) power from the mains power adapter, a bi-directional RS232 port is used for optional communications, and a spring clamp wire connector for connection to the load cell(s). All interfaces are protective in nature and have no effect on the metrological functions of the indicator.

Electronics
All versions use a single printed circuit board in the processing unit. The processing unit printed circuit board contains a Holtek HT66F2370 processor. This processor contains 512 Kb of flash memory and has a maximum clock speed of 16 MHz. A Texas Instrument s ADS1231 24-bit A/D converter is included in the processor.

The power supply is a universal switching type wall transformer and can accept an input voltage of from 100 to 240 VAC 50/60 Hz. There is no battery charging circuitry. The indicator produces a load cell excitation voltage of 5 VDC and is capable of powering four 350-ohm load cells.

2.1.2 Load receptors, load cells and load receptor support

Set out in Section 3.2.

2.1.3 Interfaces and peripheral equipment

Set out in Section 4.

2.2 Functions

This weight indicator is a microcontroller based electronic weight indicator that requires the external connection of strain gauge load cells. The weight information appears in the digital display located in the display unit enclosure. The weight information may be transmitted to peripheral equipment for recording purposes or display.

The primary functions provided are detailed below.

2.2.1 Power up

On power up, the weight indicator will test all calibration-related memory functions, then perform a display test, then show the instrument model number followed by the software revision level. 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.

2.2.2 Test function

On power up, the display test consists of turning on all display elements or pixels followed by turning off all display elements. At the conclusion of the display test, the indicator will display the model number and software version.

2.2.3 Display range

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

2.2.4 Zero-setting

2.2.4.1 Initial zero-setting

Initial zero-setting range: 4% of Max.

2.2.4.2 Semi-automatic zero-setting

Pressing the "ZERO" key causes a new zero reference to be established and the ZERO annunciator (→0←) to turn on indicating the display is at the center of zero.

Zero setting is only possible, when the load receptor is not in motion, and the new zero reference is within 4% of Max from the initial zero point.

2.2.4.3 Zero-tracking

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

2.2.5 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. The indicator may be configured to display in units of kilograms (kg) and grams (g).

2.2.6 Tare

The weight indicator is equipped with a semi-automatic subtractive tare feature.

2.2.6.1 Semi-automatic tare

Momentarily pressing the TARE key will enter the currently displayed weight value as the new tare weight value. The weight display will automatically change to the new weight display mode and turn the NET annunciator on. 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 or if a data output operation is taking place.

Simultaneously pressing and holding the Fn and TARE key will cause the currently stored tare weight value to be displayed temporary.

2.2.7 Net / Gross indication

Once a valid tare weight, other than zero, has been stored, the weight display can be switched from a gross weight only display 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.

2.2.8 Operator information messages

The weight indictor has a number of general and diagnostic messages that are described in detail in the accompanying owner's manual.

2.2.9 Software version

The software revision level is displayed during the power up sequence of the indicator.
The approved software version is: 1.0.xx, where xx = 04 to 99.

2.2.10 Event counters

The indicator has two non-resettable event counters. One for calibration and one for changes in the configuration. The counters increment each time a calibration has been performed or the configuration is changed.

The value of the event counters can be viewed by pressing the Fn key followed by Net/Gross key.
After this press Tare key and the calibration counter will be displayed
Press twice the Tare key and the configuration counter will be displayed.

2.3 Available options

A “battery board”, installed at the factory, can be added to the main circuit board. This board holds six (6) AA-size re-chargeable batteries for powering the unit without being plugged into the mains power supply.

3. Technical data

The 185 weighing instrument is composed of separate modules, which are set out as follows:

3.1 Indicator

The indicators have the following characteristics:

Type:	185
Accuracy class:	III
Weighing range:	Single-interval
Maximum number of verification scale intervals (n):	6000
Minimum input voltage per VSI:	1.2 µV
Maximum capacity of interval or range (Max):	n × e
Minimum capacity (Min):	20 × e
Verification scale interval, e = :	Max / n
Initial zero-setting range:	± 2 % of Max
Maximum tare effect:	100 % of Max
Fractional factor (pi):	0.5
Excitation voltage:	5 VDC
Minimum input impedance:	87.5 ohm
Maximum input impedance:	1100 ohm
Connecting cable to load cell(s):	4- or 6-wire
Supply voltage:	100-240 VAC, 50/60 Hz using external adapter for 12 VDC, 1 A.
Optional power supply:	Six (6) AA ordinary or rechargeable batteries supplying 9 VDC
Operating temperature range:	-10 °C / +40 °C
Maximum cable length between 185 and junction box for load cells:	858 m/mm^2
Peripheral interface(s)	See Section 4

3.1.1 Connecting cable between the indicator and the junction box for load cell(s), if any

3.1.1.1 4-wire system

The load cell shall be connected directly to the indicator.

3.1.1.2 6-wire system

Line: 6 wires, shielded

Option 1:

Maximum length: 858 m/mm^2 (for n = 6,000)
Maximum resistance per wire: 14.5 ohm

Option 2:

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

Coefficient of temperature of the span error of the indicator: Es = 0.0074 [%/25K]
Coefficient of resistance for the wires in the J-box cable: Sx = 0.0018 [%/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.

3.2 Load receptors, load cells and load receptor supports

Movable platforms shall be equipped with level indicator.

3.2.1 General acceptance of modules

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

1) There is a respective Part / Evaluation / Test Certificate (EN 45501) or an OIML Certificate of Conformity (R60:2000 or R60:2017) issued for the load cell by a Notified Body responsible for type examination under Directive 2014/31/EU.

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 2:2015), 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 EU verification or declaration of EU conformity of type.

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

3.2.2 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 3.2.1
Drawings:	Various

3.2.3 Bin, tank and hopper.

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 3.2.1
Drawings:	Various

3.3 Composition of modules

In case of composition of modules, EN 45501:2015 annex F shall be satisfied.

3.4 Documents

The documents filed at FORCE (reference No. 117-34433) are valid for the weighing instruments described here.

4. Interfaces and peripheral equipment

4.1 Interfaces

4.1.1 Load cell input

A spring clamp wire connector for the load cells is positioned on the processing unit circuitry and is accessed through a gland connector on the rear part of the enclosure.

4.1.2 RS-232

The indicator has one RS232 interface for direct connection to peripheral equipment.

The interface is characterised “Protective interfaces” according to paragraph 8.4 in the Directive and do not have to be secured.

4.2 Peripheral equipment

Connection between the indicator and peripheral equipment is allowed by shielded 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 Compatibility of modules

In case of composition of modules EN 45501:2015 annex F 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 5.2.

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

7. Securing and location of seals

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, module D or F of the Directive 2014/31/EU.

7.1.1 Indicator

Access to the configuration and calibration facility requires that a jumper is enabled on the motherboard. This is accomplished by opening the enclosure, removing the calibration access screw and situating the jumper on the appropriate pins.
Sealing of the enclosure to prevent access to the jumper, the connector for the load cell cable and the electronics is by use of security head fasteners employing wire and seal.
Alternately the sealing can be performed with brittle plastic stickers. The stickers shall either be placed across the assembly of the enclosure or covering minimum two of the enclosure screws in both cases preventing the enclosure to be disassembled.

The indicator has two non-resettable event counters. One for calibration and one for changes in the configuration. The counters increment each time a calibration has been performed or the configuration is changed.
The value of the counters shall be written on a brittle plastic sticker after verification. The stickers shall be placed on or next to the inscription plate.

7.1.2 Junction box for load cells

If present a junction box for load cells shall be sealed against opening with wire and seal or brittle plastic sticker(s).

8. Location of CE mark of conformity and inscriptions

8.1 Indicator

8.1.1 CE mark

CE mark and supplementary metrological marking shall be applied to the scale according to article 16 of Directive 2014/31/EU.

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 a visible place near the front panel:

- Max, Min, e =

On the inscription plate:

- Manufacturer’s name and/or logo, postal address, model no., serial no., type examination certificate no., accuracy class, 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 1 185 indicator.

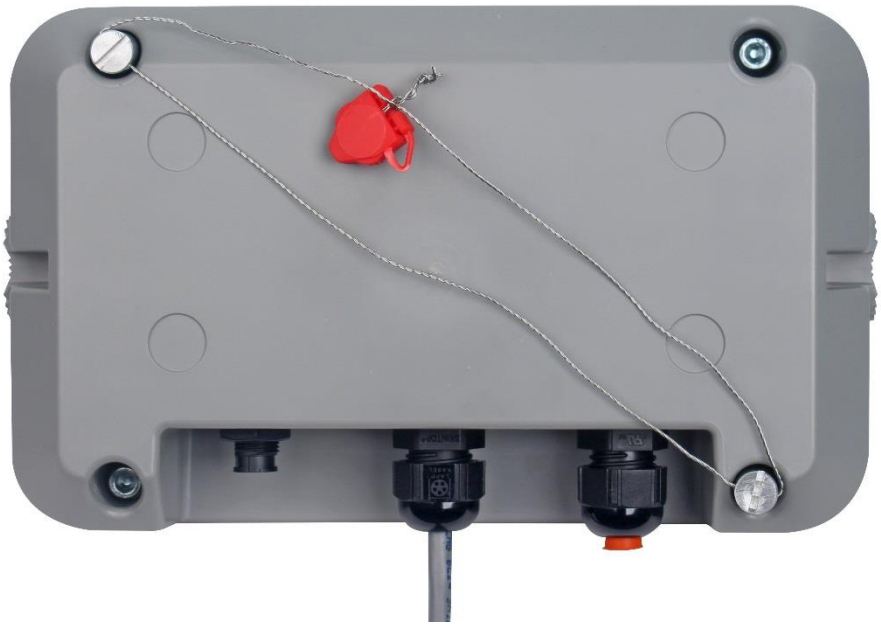

Figure 2 Sealing of 185 indicator.

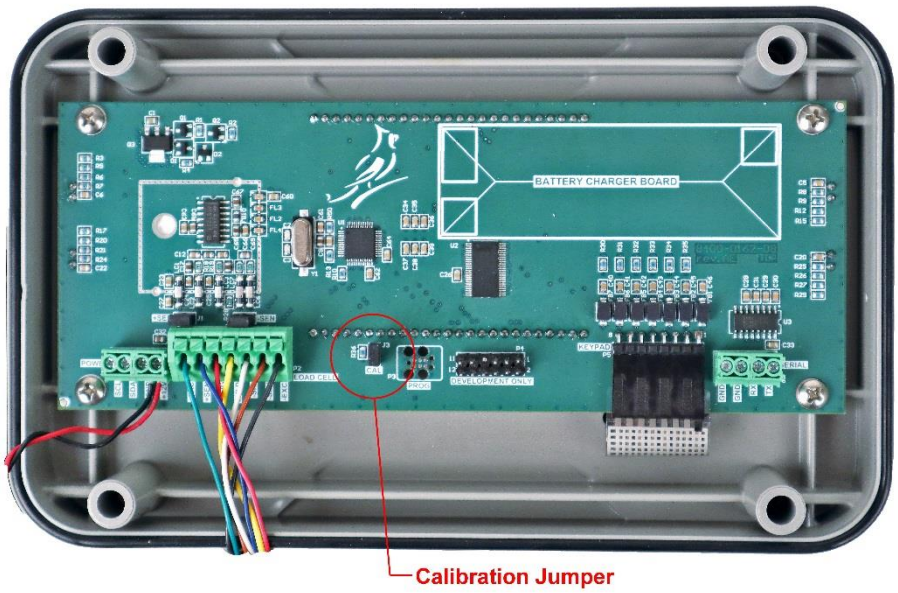

Figure 3 Position of calibration jumper inside 185 indicator.

10. Composition of modules - example

COMPATIBILITY OF MODULES

Ref.: WELMEC 2

Non-Automatic Weighing Instrument, single-interval.

Certificate of EU Type Examination N°: TEC: 0200-NAWI-03187

INDICATOR	A/D (Module 1)	Type:			185		
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}		6000		
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]	1,2		
Minimum load cell impedance:			RL_{min}	[Ω]	87		
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]	858		
Load cell interface:					4-wire (no sense)		
Additive tare, if available:			T	[% of Max]	0		
Initial zero setting range:			IZSR	[% of Max]	-2	/	2
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		1		
Reduction ratio of the load transmitting device:			$R=F_M / F_L$		1		
Dead load of load receptor:			DL	[% of Max]	5		
Non uniform distribution of the load:	(NUD = 0 is acceptable)		NUD	[% of Max]	0		
Correction factor:	$Q = 1 + (DL + T^+ + IZSR^+ + NUD) / 100$				1,07		
LOAD CELL	ANALOG (Module 3)	Type:			H30A		
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]	404		
Minimum load cell verification interval:	$(v_{min} \% = 100 / Y)$		$v_{min} \%$	[% of Emax]	0,0133		
Rated capacity:			E_{max}	[kg]	500		
Minimum dead load, relative:			$(E_{min} / E_{max}) * 100$	[%]	0,0166		
Temperature range:			T_{min} / T_{max}	[°C]	-10	/	40
Test report (TR) or Test Certificate (TC/OIML) as appropriate:					DK0199-R60-12.18		
COMPLETE WEIGHING INSTRUMENT					**Single-interval**		
Manufacturer:	Cardinal	Type:			185 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]	300		
Number of verification scale intervals:			n		3000		
Verification scale interval:			e	[kg]	0,1		
Utilisation ratio of the load cell:	$\alpha = (Max / E_{max}) * (R / N)$				0,60		
Input voltage (from the load cells):	$\Delta u = C * U_{exc} * \alpha * 1000 / n$			[µV/e]	2,00		
Cross-section of each wire in the J-box cable:			A	[mm²]	0,22		
J-box cable-Length:			L	[m]	2		
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 =	3000
n	<=	n_{LC}	(R76: 4.12.2)	n_{LC} - n =	0
E_{min}	<=	DL * R / N	(WELMEC 2: 6d)	(DL * R / N) - E_{min} =	14,917
$v_{min} * \sqrt{N} / R$	<=	e	(R76: 4.12.3)	e - (v_{min} * √N / R) =	0,034
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)	Δu – Δu_{min} =	0,80
RL_{min}	<=	R_{LC} / N	(WELMEC 2: 9)	(R_{LC} / N) - RL_{min} =	317
L / A	<=	$(L / A)_{max}^{WI}$	(WELMEC 2: 10)	$(L / A)_{max}^{WI}$ - (L / A) =	849
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) =	179,0

Signature and date:

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

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