DANAK
PROD Reg. nr 7026

FORCE Certification

EU Type Examination Certificate

No. 0200-NAWI-04801

225

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
P.O. Box 151
Webb City, MO 64870
USA

In respect of Non-automatic weighing instrument designated 225 with variants of modules of load receptors, load cells and peripheral equipment.
Accuracy class III or IIII, single-interval or dual-interval
Maximum capacity, Max: From 1 kg up to 999 999 kg
Verification scale interval: $e_i = Max_i / n_i$
Maximum number of verification scale intervals: $n_i = 10000$ for Class III, $n_i = 1000$ for class IIII (however, dependent on environment and the composition of the modules).

Variants of modules and conditions for the composition of 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 and OIML R76:2006.

Note: This certificate is a revised edition of certificate DK0199.397.

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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Valid until **2024-02-25**

Jens Hovgård Jensen
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FORCE Certification references:
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Descriptive annex

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1. Name and type of instrument

The weighing instrument is designated Model 225, which is a system of modules consisting of an electronic indicator connected to a separate load receiver 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 or multi-interval and an internal AC mains power supply.

The modules are listed in Sections 3.1 to 3.4. The principle of composition is set out in Section 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.

2.1.2 Enclosures and keyboard

The Model 225 is housed in a stainless steel enclosure 276 mm wide x 208 mm high x 79 mm deep. This enclosure can be mounted either on a vertical or horizontal surface and is designed to meet an IP66 rating. It is designed primarily for industrial use, but may also be used in an office environment.

The Model 225 keyboard contains 60 membrane keys used to enter data into the indictor and to control its functions. The keyboard contains a 43-key QWERTY key arrangement, 8 function keys, 4 arrow keys, 1 special function key, and 4 soft-keys (programmable).

The front panel of the indicator contains the keyboard and a display. The display consists of a 240 x 64 pixel matrix 132 mm wide x 39 mm high. It is a monochrome display with a white LED backlight.

The rear panel of the indicator contains 9 gland connectors:

- 1 gland connector for the power cord
- 3 gland connectors for the load cell input from the load receptors
- 5 gland connectors for I/O including digital isolated inputs and outputs and serial I/O.

2.1.3 Electronics

The Model 225 weight-indicating instrument uses a single printed circuit board, which contains all of the instrument circuitry. Two option boards are available. One option board provides two additional load receiver inputs allowing a total of three load receivers to be connected to the indicator. The second option board can be one of several types that contain additional I/O circuitry like serial interfaces or digital I/O circuitry. The weight-indicator will accept a maximum of two option boards.

The weight-indicating instrument uses dual microcontrollers. An Atmel ATMEGA 2560 14.7 MHz microcontroller with 256 KB of flash program memory and 4 KB of EEPROM is used as the main processor, while an Atmel ATMEGA 32 16.0 MHz microcontroller with 32 KB of flash program memory and 1 KB of EEPROM is used to control the display. All instrument calibration and metrological setup data are contained in non-volatile memory. The power supply is a universal switching type and can accept an input voltage of from 100 to 240VAC 50/60 Hz. The indicator produces a load cell excitation voltage of 12 VDC when powered from the power mains.

2.1.4 Load receptors, load cells, and load receptor supports

Set out in Section 3.2.

2.1.5 Interfaces and peripheral equipment

Set out in Section 4.

2.2 Function

The Model 225 weight-indicating instrument is a microcontroller 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 indicator is powered from the power mains at 90 to 264 VAC 50 or 60 Hz.

The primary functions are described below:

2.2.1 Power up

On power up the indicator will perform a display test, then show the instrument model number followed by the software revision level for 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.

2.2.2 Test function

On power up the indicator will test all memory functions followed by a display test. The display tests consist of turning on all pixel elements for approximately one second followed by turning all of the pixel elements off for approximately one second. At the conclusion of the display test, the indicator displays the Cardinal logo and model number and software version. The test sequence may also be manually initiated by pressing the ASTERISK key followed by pressing the UNITS key.

2.2.3 Displayed range

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

2.2.4 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.
Initial zero-setting range: ≤ 20% of Max.
Zero setting can only take place when the load receptor is not in motion.

2.2.5 Zero-tracking

The weight indicators is 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.

2.2.6 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. The Model 225 can be configured to display in units of pounds, kilograms, grams, tonnes, ounces, and tons. A custom unit of measure may also be selected, however only kilograms, grams, and tonnes are allowed.

2.2.7 Tare

The weight indicator is provided with a semi-automatic tare and a keyboard preset tare feature.

2.2.7.1 Semi-automatic tare

When the semi-automatic tare feature has been selected, 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 net 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 print operation is taking place.

2.2.7.2 Preset (numeric) tare

The preset or numeric tare feature allows the manual entry of a known tare value. Press the appropriate numeric keys to enter the known tare weight, then press the TARE key. When the TARE key is pressed, the numeric value entered will be accepted as the new tare weight and the display will automatically enter the net weight display mode as indicated by turning the NET annunciator on. The tare value entered must agree with the verification scale interval, e.

2.2.8 Net / gross indication

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

2.2.9 Printing

A printer may be connected to the selected serial data port. In the net display mode, the gross, tare, and net weights are transmitted to the printer each time the PRINT key is pressed. In the gross mode, only the gross weight is transmitted. The time and date and identification, if selected, will also be transmitted. It is also possible to include additional data in the form of customer name or number on the printed record. 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.

2.2.10 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 or by pressing the SHIFT + ESC key then pressing the UNITS key. The test routine consists of turning on all of the pixel elements in the display for approximately one second followed by turning them all off for approximately one second. After that, the Cardinal logo is displayed along with the model number of the indicator and the software version.

2.2.11 Time and date

The Model 225 weight indicator is equipped with a time and date feature. To view and / or reset the time and date, press the TIME / DATE key. The time and date settings can be viewed and / or reset using the numeric and ENTER keys. The time and date information are retained in battery-backed memory and will continue to be stored during power outages/

2.2.12 Operator information messages

The weight indicator has a number of general and diagnostic messages, which are described in detail in the 225 Series Owner's Manual.

2.2.13 Software version

The software revision level is displayed during the power up sequence of the instrument as:

LCD Rev x.v mm/dd/yy and

DLC Rev x.u.w mm/dd/yyyy (only visible in model for digital load cell)

Revision x.y.z mm/dd/yy

Where x designate the legal revision numbers, v, u, w, y and z revision number are not subject to legal control, and mm/dd/yy the date of the revision.

The released revisions are: LCD Rev 1.vv , DLC rev.1.z.v and Revision 2.z.v.

2.2.14 Multi-interval feature

The weight indicator allows a maximum of two ranges.

2.2.15 Multi-point calibration feature

A maximum of three calibration points (one of which is at no-load or Min) may be used with the Model 225 to compensate for non-linearity within the system.

2.2.16 Electronic tally roll / alibi memory

The Model 225 weight indicator is provided with an electronic tally roll feature – an alibi memory - to store weight and consecutive number for each weight transaction transmitted to an external computing peripheral. This data is stored in non-volatile memory and has a capacity of 7000 transactions. Once capacity has been reached subsequent transactions will replace the earliest transactions. The contents of the file can be displayed on the weight indictor's display screen.

2.2.17 High resolution weight display

This weight indicator is provided with a high-resolution display feature, where the weight is displayed in increments of one-tenth e. The high-resolution mode can only be enabled while the instrument is in the calibration mode.

2.3 Available options

2.3.1 Analogue output card

The analogue output card provides an analogue representation of the displayed weight using a 14-bit D/A converter. The output is provided in both a 0 to 10 V and 4 to 20 mA format. The outputs are accessed via a terminal block within the instrument enclosure.

2.3.2 Data interface card

The data interface card provides a third interface option for special interface types that may be required by the application. This card and the analogue output card are mutually exclusive.

3. Technical data

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

3.1 Indicator

Type:	Model 225
Accuracy class:	III or IIII
Weighing range:	Single-interval or dual-interval
Maximum number of Verification Scale Intervals:	10000 (class III), 1000 (class IIII)
Internal resolution:	>16,000,000 counts
Maximum tare effect:	-Max.
Fractional factor:	$p_i = 0.5$
Minimum input-voltage per VSI:	0.5 μv
Minimum signal voltage for dead load:	1 mV
Excitation voltage:	12 VDC
Analog range:	1 to 40 mV
Circuit for remote sense:	Active
Minimum input-impedance:	43.8 ohms
Maximum input-impedance:	1100 ohms
Mains power supply:	100 to 240 VAC 50/60 Hertz
Peripheral interfaces:	Set out in Section 4

3.1.1 Connecting cable between the indicator and analogue load cell(s) / junction box for analogue load cell(s)

3.1.1.1 4-wire system

Cable between indicator and load cell(s):	4 wires (no sense), shielded
Maximum length:	the certified length of the load cell cable, which shall be connected directly to the indicator.

3.1.1.2 6-wire system

Cable between indicator and load cell(s): 6 wires (sense), shielded.

Maximum cable length between indicator and junction box (J-box) for load cell(s), if any:

- Option 1: 292 m/mm²

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 = 0.0035 [% / 25K]
Coefficient of resistance for the wires in the J-box cable: Sx = 0.0041 [% / 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 https://certification.madebydelta.com/weighing/compatibility-of-modules/.

3.1.2 Connecting cable between the indicator and digital load cell(s)

Digital load cell(s) are connected to the indicator using a 5-wire cable.

3.2 Load receptors, load cells, and load receptor supports

Removable platforms shall be equipped with level indicators

3.2.1 General acceptance of modules

Any analogue 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) 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 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.

3.2.2 Load cells

The load cells, which are listed below, are certified as modules in the weighing instrument.

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

3.2.3 Digital load cells

The digital load cells, which are listed below, are certified as modules in the weighing instrument.

Manufacturer	Load cell type	Cert. No.
Cardinal	SCBD Series digital load cell	R60/2000-GB1-17.17
Cardinal	DC Series digital load cell	R60/2000-GB1-17.18

3.2.4 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:	Any R60 certified load cell according to Section 3.2.1, 3.2.2 or 3.2.3
Drawings:	No. 3500-B089-0A and No. 3500-B018-0A (50000 lb), No. 3500-B094-0A (100000 lb)

3.2.5 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 bit, tank or hopper
Reduction ratio:	1
Junction box:	Mounted on dead structure
Load cell:	Any R60 certified load cell according to Section 3.2.1, 3.2.2 or 3.2.3
Drawings:	Various

3.3 Composition of modules

In case of composition of modules, EN 45501 Annex F shall be satisfied.

4. Interfaces and peripheral equipment

4.1 Interfaces

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

4.1.1 Load cell interface

A 7-terminal connector for the analogue load cell is positioned on the instrument circuit board and is accessed through a gland connector on the rear panel of the instrument enclosure.
For digital load cells a 5 terminal connector is mounted in the enclosure and connected to the optional digital load cell board.

4.1.2 Serial I/O interface

10-terminal and 13-terminal connectors serial I/O interfaces are positioned on the instrument circuit board and are accessed through gland connectors on the rear panel of the instrument enclosure.

4.1.3 USB interface

A 5-terminal connector providing a USB-B compatible interface is positioned on the instrument circuit board and is accessed through a gland connector on the rear panel of the instrument enclosure.

4.1.4 Eight logic-level inputs

A 10-terminal connector providing logic-level inputs for the Zero, Tare, Gross/Net, Print, Start, Stop and Dump functions is positioned on the instrument circuit board and is accessed through a gland connector on the rear panel of the instrument enclosure.

4.1.5 Sixteen logic-level outputs

Two 10-terminal connectors are used for the Model 225. Access to the connector is made through a gland connector located on the rear panel of the instrument enclosure.

4.1.6 Analogue output

When provided with the optional analogue output, a 3-terminal connector provides both 0 to 10 volts and 4 to 20 mA analogue representations of the displayed weight. These terminals are positioned on the option card connected to the main printed circuit board and accessed through a gland connector 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 Scale totalizer

Summation of the weights from two or more load receivers is a calculated value and shall be marked as such, if enabled.

5.3 Compatibility of modules

In the 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 5.3

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

Indicator

The 225 indicator provides an audit trail record for securing. At verification, the value of the audit trail counter is written on the inscription plate or on a brittle plastic sticker – sealed with a verification mark next to it.

7.1.1 Indicator – load cell connector – load receptor

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

- 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.

7.1.2 Junction box for load cells

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

7.1.3 Peripheral interfaces

All peripheral interfaces are “protective”; they neither allow 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.

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 indicator according to article 16 of Directive 2014/31/EU

8.1.2 Inscriptions

Manufacturer's trademark and 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 – a single brittle plastic sticker – located on the side of the weight indicator:

- Manufacturers name and/logo
- Manufacturers postal adress
- Model no./Type designation
- Serial no.
- Type examination certificate no.
- Max, Min. e=
- Accuracy class
- Temperature range
- 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 No. of the indicator

9. Pictures

Figure 1 Model 225 Front Panel

Figure No. 2 Model 225 Rear Panel

10. Composition of Modules – an example

COMPATIBILITY OF MODULES

Ref.: WELMEC 2

Non-Automatic Weighing Instrument, single-interval.

Certificate of EU Type Examination N°: TEC: NAWI-0200-04801

INDICATOR A/D (Module 1)		Type:	225		
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]	12	
Minimum input-voltage per verification scale interval:		Δu_{min}	[µV]	0.5	
Minimum load cell impedance:		R_{Lmin}	[Ω]	43.8	
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]	292	
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:	FH 4' x 5'		
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:	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:			TC: DK0199.R60.10		
COMPLETE WEIGHING INSTRUMENT			**Single-interval**		
Manufacturer: Cardinal		Type:	225 + FH		
Accuracy class according to EN 45501 and OIML R76:		$Class_{WI}$	(I, II, III or IIII)	III	
Fractions: $p_i = p1^2 + p2^2 + p3^2$:		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]	6.00	
Cross-section of each wire in the J-box cable:		A	[mm²]	0.5	
J-box cable-Length:		L	[m]	100	
Temperature range to be marked on the instrument:	Not required	T_{min} / T_{max}	[°C]		
Peripheral Equipment subject to legal control:			Cardinal P500 printer		

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} =	11.25
v_{min} * √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}) * (√N / R)	<=	e	(WELMEC 2: 7)	e - ((E_{max} / n_{LC}) * (√N/ R)) =	
Δu_{min}	<=	Δu	(WELMEC 2: 8)	Δu – Δu_{min} =	5.50
R_{Lmin}	<=	R_{LC} / N	(WELMEC 2: 9)	(R_{LC} / N) - R_{Lmin} =	44
L / A	<=	$(L / A)_{max}^{WI}$	(WELMEC 2: 10)	$(L / A)_{max}^{WI}$ - (L / A) =	92
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) =	1.3

Signature and date:

Conclusion . . . . . PASSED

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