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EC Type-Approval Certificate

No. DK 0199.55 Revision 1

204 / 204S

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 204 / 204S 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 999,999 kg
Verification scale interval: e = Max / n
Maximum number of verification scale intervals: n ≤ 5000 for class III and n ≤ 1000 for class IIII (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 and WELMEC 2.1:2001.

Note: This certificate is a revised edition, which replaces previous revisions and extends the validation period of the certificate

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

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1. Name and type of instrument and modules

The weighing instrument is designated the 204 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 weight indicating instrument is available in two models: Model 204 a desk or wall mount instrument with basic keyboard and Model 204S an IP66 enclosure instrument.

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 appear from Sections 3.1, 3.2.1, and 3.2.2; 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 is specified in Section 3.1.

Different versions may be found in the following.

Enclosures and keyboard

The Model 204 is housed in stainless steel enclosures 204 mm wide x 168 mm high x 54 mm deep and can be mounted either on a vertical or horizontal surface. This enclosure is designed to meet an IP55 rating and can be exposed to dust. It is designed primarily for industrial use but may also be used in an office environment.

The Model 204S is housed in a stainless steel enclosure 216 mm wide x 162 mm high x 76 mm deep and is to be mounted on a vertical or horizontal surface. This enclosure is designed to meet an IP66 rating and can be exposed to both dust and water. It is designed for industrial use.

The Model 204 and 204S keyboards contain 7 membrane keys used to control the functions of the instrument.

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.
- 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 12 VDC power cord input connector.
- A 9-pin connector for input of the load cell signal.
- A 9-pin connector for access to the serial data interface (RS232).

Electronics

The Model 204 and 204S weight indicating instruments use a single printed circuit board which contains all of the instrument circuitry. The weight indicating instrument uses a SI Microelectronic 8-bit microcontroller which has 32 Kb of flash program memory, 1 Kb of static ram and 2 Kb of EEPROM.

All instrument calibration and metrological setup data is contained in non-volatile memory. The power supply is an external modular type and can accept an input voltage from the power mains of from 90 to 260 VAC 50 or 60 Hz. Alternatively the indicator may be powered from six internal "C" size batteries.

The indicator produces a load cell excitation voltage of 5 VDC when powered either from the power mains or from batteries.

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 Model 204 and 204S weight indicating instruments are 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. All weight indicating instrument can operate from mains at 220 to 260 VAC 50 or 60 Hz or from six internal "C" size batteries.

The primary functions provided are detailed below.

2.2.1 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 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 weight indicator will test all memory functions followed by a display test. The display test consists of turning on all horizontal segments followed by turning on all vertical segments and decimal points then turning on all annunciators. Each test segment takes about one second. At the conclusion of the display test, the indicator displays the 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 Display range

The weight indicators will display 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 ZERO annunciator to turn on indicating the display is at the centre of zero.

Zero-setting range: 4% of Max.

Initial zero-setting range: 4% of Max.

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

2.2.5 Zero-Tracking

The Model 204 and 204S weight 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.

2.2.6 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.

2.2.7 Tare

The Models 204 and 204S weight indicating instruments are provided with a semi-automatic subtractive tare.

2.2.7.1 Semi-automatic Tare

The initial press of the TARE key will cause the currently stored weight value to be displayed and identified by turning the TARE annunciator on. Pressing the TARE key a second time 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.

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 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.

2.2.9 Printing

A printer may be connected to the serial data port. In the net display mode, the Model 204 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.

2.2.10 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 ASTERISK key then pressing the UNITS key. The test routine consists of turning on and off all of the display segments in sequence to verify that the display is fully functional.

2.2.11 Operator Information messages

The Model 204 and 204S weight indicators have a number of general and diagnostic messages which are described in detail in the Model 204 Owner's Manual.

2.2.12 Software Version

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

3. Technical data

The Model 204 and 204S weighing instruments are composed of separate modules, which are set out as follows:

3.1 Indicator

The indicators have the following characteristics:

Type:	204 / 204S
Accuracy class:	III and IIII
Weighing range:	Single-interval
Maximum number of Verification Scale Intervals:	≤ 5000 (class III), ≤ 1000 (class IIII)
Internal resolution:	> 100,000
Maximum tare effect:	-Max
Fractional factor:	p'i = 0.5
Minimum input-voltage per VSI:	1.2 μV
Minimum signal-voltage for dead-load:	1.2 mμV
Excitation voltage:	5 VDC
Analog range:	0.2 to 17 mV
Circuit for remote sense:	active (see below)
Minimum input impedance:	87 ohm
Maximum input impedance:	1000 ohm
Mains power supply:	220-260 VAC, 50/60 Hz
Battery supply:	9 VDC (6 batteries each 1.5 VDC)
Operational temperature:	-10 °C to +40 °C
Peripheral interface:	Set out in Section 4

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

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: 335 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 = 0.011 [% / 25K]

Coefficient of resistance for the wires in the J-box cable: Sx = 0.0035 [% / 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.

3.2 Load receptors, load cells and load receptor supports

Removable platforms shall be equipped with level indicators.

3.2.1 General acceptance of modules

Any 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.

3.2.2 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 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 SCA, DB or other authorised alternative module
Drawings:	no. 3500-B089-0A and no. 3500-B018-0A (50,000 lb), no. 3500-B094-0A (100,000 lb)

3.2.4 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.

3.2.5 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 bin, 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
Drawings:	Various

3.3 Composition of modules

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

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 Load cell interface

A 9-pin “D” sub-miniature connector for the load cell is positioned on the rear panel of the instrument enclosure.

4.1.2 Printer interface

A 9-pin “D” sub-miniature connector for the printer is positioned on the rear panel of the instrument enclosure.

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.

4.2.1 Cardinal P220 Thermal Label Printer

The Cardinal P220 Thermal Label Printer is a RS232 serial driven label printer. It has a self-test facility which provides information of the software version and setup of the printer.

4.2.2 Cardinal P400 Dot Matrix Ticket Printer

The Cardinal P400 Dot Matrix Ticket Printer is a RS232 serial driven ticket printer. It has a self-test facility which provides information of the software version and setup of the printer.

4.2.3 Cardinal P500 Printer

The Cardinal P500 printer is a RS232 serial driven tally roll printer. It is equipped with automatic paper out detection which signals an error to a lamp on the front panel of the printer and also to the indicator if the printer runs out of paper. The printer has an on / off power switch, a key for paper feed and a key for switching between on-line and off-line. The printer is powered by a mains adapter for 230 Vac / 12 VDC or 110 Vac / 12 VDC.

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

Access to the configuration and calibration facility is achieved by pressing and releasing the internal calibration switch (located on the enclosure rear panel). This is accomplished by removing the calibration switch screw from the rear panel on the instrument enclosure and inserting a small screwdriver or similar device into the opening and pressing the calibration switch button.

Sealing of the access to the switch is accomplished with a lead wire seal. The wire is passed through the hole in the head of the calibration switch screw, the adjacent rear panel retaining screw and an adjacent screw on the enclosure end cap.

7.1.2 Indicator - load cell connector - load receptor

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

- Sealing of the load cell connector with the indicator 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 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 and a sticker with verification marks may be placed on the top side 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.

7.2.3 Non-verified peripheral equipment

If such equipment is connected to the weighing instrument, it shall not 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 back of the enclosure.

8.1.2 Inscriptions

Manufacturer’s trademark and/or 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.

Indelibly printed on a 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.

8.1.2.1 Load receptors

On a data plate:

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

Left to the manufacturer choice as provided in Section 7.1.2:

- Serial no. of the indicator

9. Pictures

Figure 1 Model 204 Front panel.

Figure 2 Model 204 Back panel.

Figure 3 Model 204S Front panel.

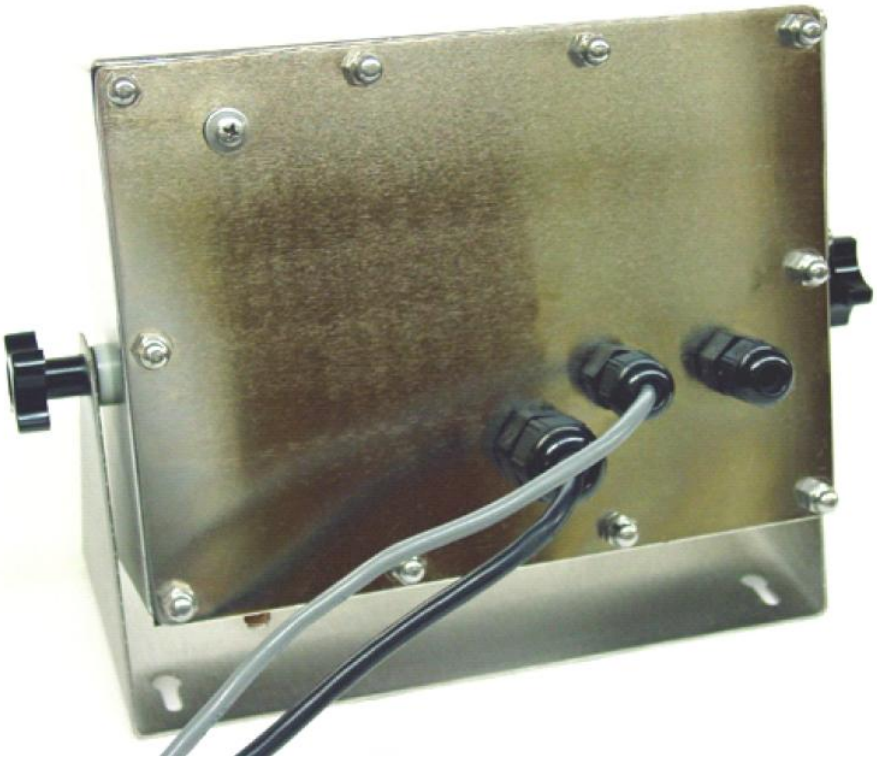

Figure 4 Model 204S Back panel.

10. Composition of modules – an example

COMPATIBILITY OF MODULES

Ref.: WELMEC 2

Non-Automatic Weighing Instrument, single-interval

Certificate of EU Type-Approval N°: TAC: DK0199.55

INDICATOR	A/D (Module 1)	Type:	204			
Accuracy class according to EN 45501 and OIML R76:		$Class_{ind}$ (I, II, III or IIII)		III		
Maximum number of verification scale intervals (t_{max}):		n_{ind}		5000		
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:		R_{Lmin}	[Ω]	87		
Coefficient of temperature of the span error:		Es	[% / 25°C]			0,011
Coefficient of resistance for the wires in the J-box cable:		Sx	[% / Ω]			0,0035
Specific J-box cable-Length to the junction box for load cells		$(L/A)_{max}$	[m / mm²]			338
Load cell interface:		6-wire (remote 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:	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]	10		
Non uniform distribution of the load		NUD	[% of Max]	20		
Correction factor:	$Q = 1 + (DL + T^+ + IZSR^+ + NUD) / 100$			1,32		
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:	204 + FH			
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 cels):		$\Delta_u = C * U_{exc} * \alpha * 1000 / n$	[µV/e]	2,50		
Cross-section of each wire in the J-box cable:		A	[mm²]	0,5		
J-box cable-Length		L	[m]	10		
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 =	2000
n	<=	n_{LC}	(R76: 4.12.2)	n_{LC} - n =	0
E_{min}	<=	DL * R / N	(WELMEC 2: 6d)	(DL * R / N) - E_{min} =	37,5
$v_{min} * \sqrt{N} / R$	<=	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 - $((E_{max} / n_{LC}) * (\sqrt{N} / R))$ =	
Δu_{min}	<=	Δu	(WELMEC 2: 8)	$\Delta u - \Delta u_{min}$ =	1,30
R_{Lmin}	<=	R_{LC} / N	(WELMEC 2: 9)	(R_{LC} / N) - R_{Lmin} =	1
L / A	<=	$(L / A)_{max}^{WI}$	(WELMEC 2: 10)	$(L / A)_{max}^{WI}$ - (L / A) =	1163
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) =	5,0

Signature and date:

.....

Conclusion . . . . . PASSED

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