

Load cell with one replaceable amplifier

**KOSD-RA**

**KIMD-RA**

Load cell with two replaceable amplifiers

**KOSD-RAD**

**KIMD-RAD**



**FEROX™**

CE



User manual



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# PRECAUTIONS

READ this manual BEFORE operating or servicing this unit.  
FOLLOW these instructions carefully.  
SAVE this manual for future reference.



## WARNING

Only permit qualified personnel to install and service this unit. Exercise care when making checks, tests and adjustments that must be made with power on. Failing to observe these precautions can result in bodily harm.

DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this unit.

# INTENDED USE

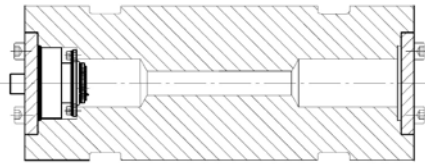
KxxD-RA(D) line of load cells are intended for industrial systems. Its basic function is force measuring or weighing applications. The built in replaceable transducer(s) converts the measured mechanical load to an outgoing 4 to 20 mA signal with HART<sup>®</sup> communication.

## Changes to current manual version

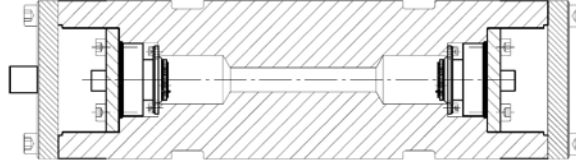
The lower temperature has been extended to -45°C. Certificates have updated. Reference to IECEx certificate added.

## General

KxxD-RA(D) is a line of load cells (LC) with a high degree of protection. They incorporate resistive strain gauges, measuring the shear force. They can be delivered with different types of replaceable amplifiers (LCAMP) with 2-wire 4 - 20 mA current loop output. The load cell and amplifier is powered over the current loop.



RA configuration example



RAD configuration example with protection lids

The load cell contains all necessary calibration data to allow easy amplifier replacement without recalibration. The amplifier includes HART communication and NAMUR error signalling. These load cells are approved for use in an explosive gas or dust area, provided that suitable intrinsic safety barriers or insulators are used. The RA-version is a single bridge and single current loop unit and the RAD-version is a dual bridge and dual current loop unit.

The load cell can be used with replaceable signal amplifiers as follows:

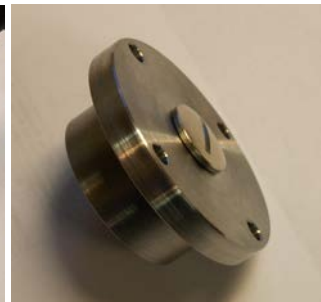
- KxxD-RA : Primary LCAMP110 with 4-pin M12 connector.
- KxxD-RA : Primary LCAMP120 with fixed shielded 4-wire cable.
- KxxD-RAD : Primary LCAMP110 and 120 with Secondary LCAMP110,120 or 130.  
(when using secondary LCAMP110 or 120, see Note on page 6)



LCAMP110



LCAMP120



LCAMP130



LC amplifier interface

CE-marking according to ATEX and EMC Directives, see appendix 1.

HART<sup>®</sup> is a registered trademark of the HART Communication Foundation.

## Mechanical data

KxxD-RA(D) load cells are often custom made for specific applications. For complete mechanical data on these load cells, refer to the detailed technical specification from Vishay Nobel AB.

## Specifications

<b>Approvals:</b>				
ATEX intrinsic safety	EN 60079-0, EN 60079-11, EN 50303 Ex ia I Ma, Ex ia IIC T4 Ga, Ex ia IIIC T79°C Da			
U <sub>i</sub>	30V			
P <sub>i</sub>	0.7W			
I <sub>i</sub>	100mA			
C <sub>i</sub>	57nF (≤66nF including cable)			
L <sub>i</sub>	4.4 μH			
IECEX intrinsic safety	IEC 60079-0, IEC 60079-11			
Electromagnetic compatibility (EMC)	EN 61326-1			
Emission	CISPR 11 class B			
Immunity	EN 61000-4-2 Electrostatic discharge EN 61000-4-3 RF electromagnetic field EN 61000-4-4 Fast transients EN 61000-4-6 RF conducted disturbances EN 61000-4-8 Power frequency magnetic field			
<b>Environmental conditions:</b>				
PARAMETER	Min.	Typ.	Max.	UNIT
Environmental protection / IP rating (assembled load cell)		IP 67		
Operating Temperature (T <sub>amb</sub> )	-45		+70	°C
	-49		+158	°F
In intrinsic-safe application (T <sub>amb</sub> )	-45		+70	°C
	-49		+158	°F
<b>Analog output:</b>				
Current	3.2		22.8	mA
Rated output (RO)		20		mA
Zero		4		mA
<b>System parameters:</b>				
Accuracy	See LC datasheet			
Response time				
Fast mode		5		ms
HART <sup>®</sup> compliant mode		50		ms
Noise				
Fast mode		0.05		% of RO
HART <sup>®</sup> compliant mode		0.02		% of RO
Supply voltage (E)	V			
Standard application	E = 0.0236*R+10.5	24	42	V
Intrinsic-safe application		24	30	V
Load impedance (R)	Ohm			
Standard application	0		R = (E-10.5)/0.0236 (HART max 600)	Ohm
HART <sup>®</sup> communication	230	250		Ohm
Insulation resistance	4			Gohm
<b>Load cell strain gauge:</b>				
Impedance		2000		Ohm
<b>ATEX conditions:</b>				
Cable length (L) for Ex ia IIC			L = 9.0 / (nF/m) <sup>(1)</sup>	m
Cable length (L) for Ex ia IIB			L = 503 / (nF/m) <sup>(1)</sup>	m
Insulation test		500		Vrms

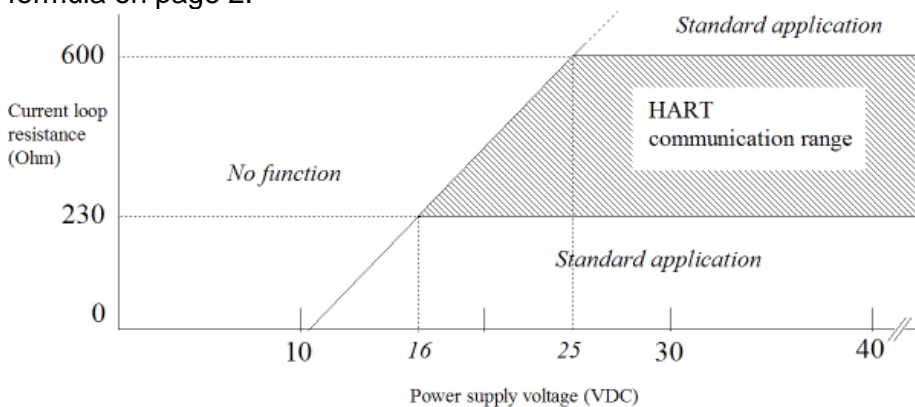
(1) Cable capacitance value per meter in nF

## Electrical connection and supply voltage

A two-wire circuit is used to connect the load cell amplifier to a suitable power supply and measuring equipment. The amplifier in the load cell has a current loop output, calibrated to 4 mA at zero load and 20 mA at nominal load.

Connector Pin-out and wires color code:	
<u>External electrical connection:</u>	
<b>LCAMP110:</b> M12 (Binder p/n:09-3431-700-04 or equivalent)	
<b>LCAMP120:</b> Shielded 4-wire 0,35mm <sup>2</sup> cable through cable gland	
<b>LCAMP130:</b> None	
<u>LCAMP110: Connector pin number</u>	<u>LCAMP120: Cable wire colour</u>
<b>1:</b> Secondary Current loop - (KxxD-RAD)	<b>Yellow:</b> Secondary Current loop - (KxxD-RAD)
<b>2:</b> Secondary Current loop + (KxxD-RAD)	<b>Green:</b> Secondary Current loop + (KxxD-RAD)
<b>3:</b> Primary Current loop +	<b>White:</b> Primary Current loop +
<b>4:</b> Primary Current loop -	<b>Brown:</b> Primary Current loop -

A current loop resistance over 600 Ohm can be used, provided the supply voltage is high enough, see figure below. For correct current loop resistance, use load impedance calculation formula on page 2.



## Intrinsic safety

All load cells KxxD-RA(D) can be approved for use in explosive gas or dust area. The last 'X' in the type code (see load cell ATEX label) is a number to identify the specific model. They can be ordered either with a cable connector or with an integrated cable. The safety description is labelled on the load cell and on the replaceable amplifier. For the –RAD version, the safety description is applicable to each circuit (amplifier). Only load cells with assembled amplifier(s) are intrinsically safe for Zone 0 (gas) and protected by enclosure for Zone 10 (dust) with a safety description according to amended certificate Nemko 13ATEX1522X

The 'X' conditions in the ATEX certificate are listed in item 17.

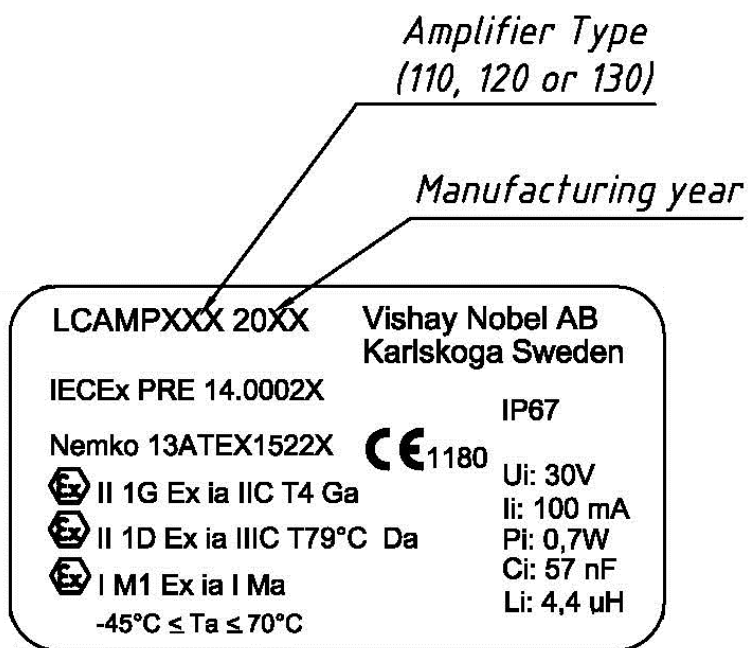
1. Potential electrostatic charging hazard exists on load cell versions with outside potted cavities. No rubbing with electrostatic materials is allowed on these surfaces.
2. The free end of the cable must be installed such that the terminations are afforded a degree of protection of at least IP20.
3. Use of secondary current loop on the primary side when using LCAMP110 or LCAMP120 as secondary amplifier on KxxD-RAD is not allowed.

Internal capacitance and inductance are  $C_i=57\text{nF}$  and  $L_i=4.4\mu\text{H}$ . Following condition applies for external cable connection:

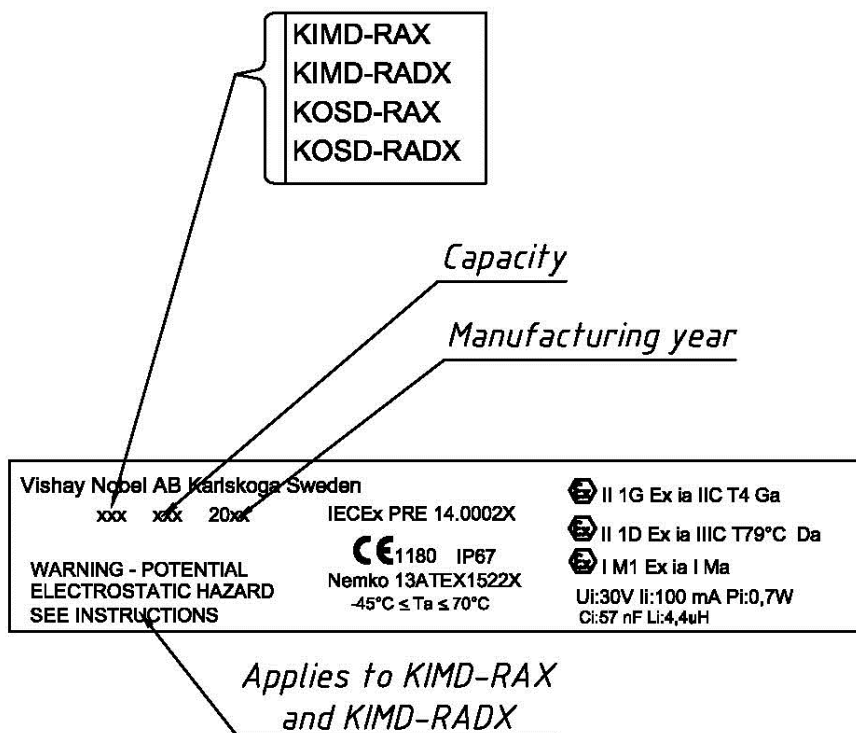
1. Total cable capacitance must not exceed 9.0nF for use in ATEX zone IIC
2. Total cable capacitance must not exceed 503nF for use in ATEX zone IIB.

The 4-wire cable inductance is negligible compared to the allowed upper limit.

**Amplifier ATEX Label:**



**Load cell ATEX Label:**





## Load cell connection

The load cell two-wire 4-20mA current loop shall be connected using a shielded cable. The cable should be routed at least 100 mm from other cables, so that electromagnetic interference is avoided. Cable shield is connected to the load cell body and shall not be grounded in the other end.

For installation in an explosive gas/dust area, only trained personnel may perform dimensioning of cables and barriers. A descriptive system document should be prepared by the system designer.



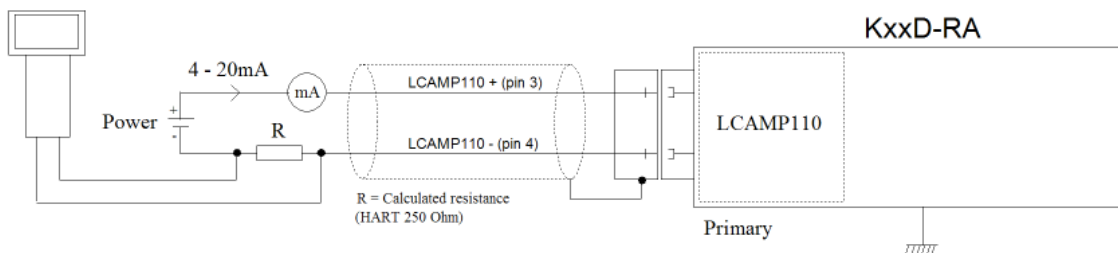
NOTE: When using LCAMP110 or 120 as secondary amplifier (instead of LCAMP130 in figures below) only the primary current loop (pin 3, 4 or white, brown) shall be connected in both ends of the load cell.

If used in a noisy 50Hz..60Hz environment with isolated power, it is recommended to connect plastic 220nF/630V capacitors between current loop return signal (current loop -) and ground. **NOTE: The capacitors shall not be connected in ATEX hazardous area.**

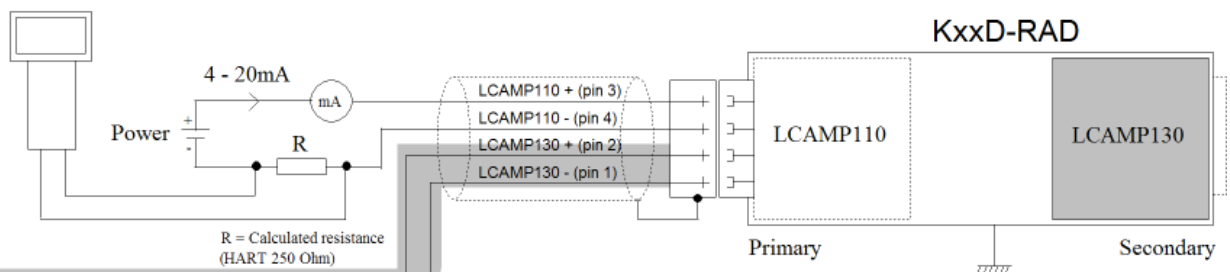
### Application examples:

Load cell KxxD-RA (LCAMP110) and KxxD-RAD (LCANP110 and LCAMP130) with M12 connector, used in a **non-hazardous** area, are shown below. The load cell connector inputs are polarity and over voltage protected.

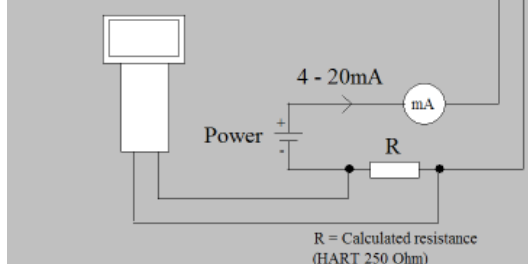
Optional HART terminal



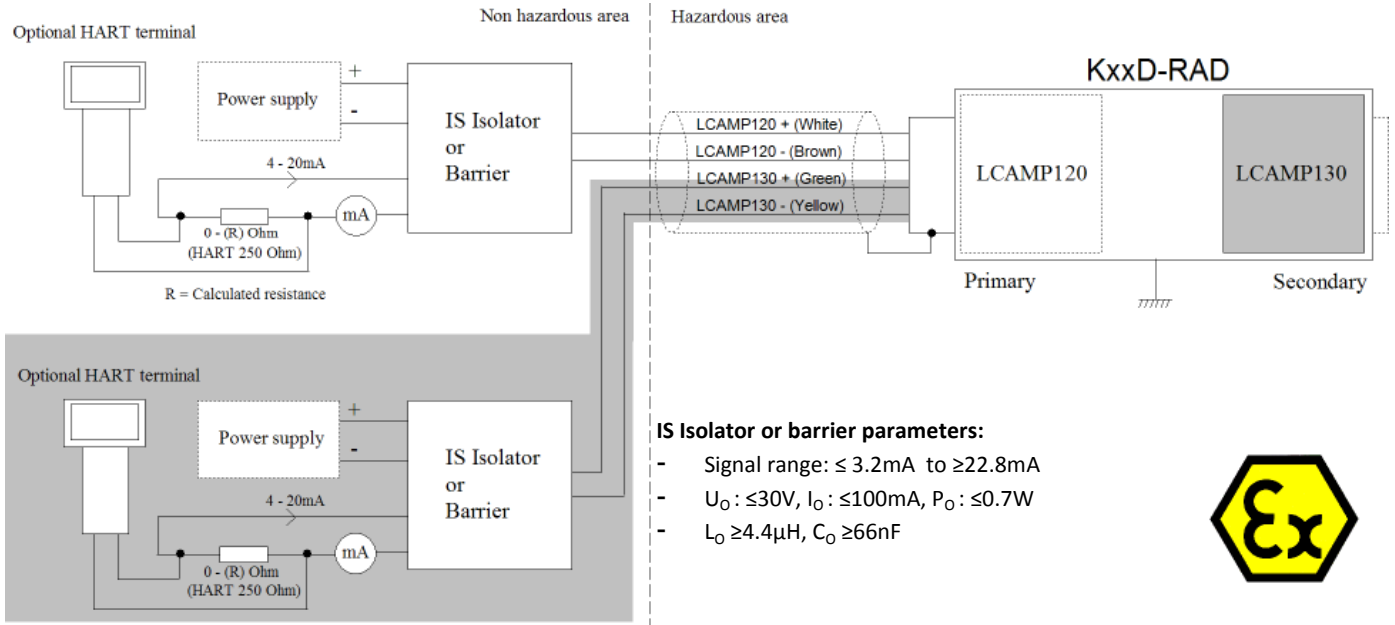
Optional HART terminal



Optional HART terminal



Load cell KxxD-RAD with integrated cable (LCAMP120 and LCAMP 130), used in **hazardous** area, are shown below. The shielded cable is connected to the load cell and must not be connected elsewhere. An isolating IS unit is shown in the example below. The load cell cable parts are polarity and over voltage protected.



## Mechanical installation and maintenance

Load cells of the line KxxD-RA(D) are designed to be supported at both ends and loaded at the middle of the cylindrical body. An arrow on one end plate defines the correct direction of the resulting force from the applied load.

At the cable/connector end of the load cell, a flat reference surface is provided. It should be used to prevent the cylindrical load cell body from rotating in the supports.

Standardised adapters for some load cell types are available, others can be custom designed and produced by Vishay Nobel. On request the mechanical shape of a load cell can also be altered to suit an existing structure.



Potential electrostatic hazard on KIMD-RA(D), do not rub with electrostatic materials.

## HART communication

Standard HART<sup>®</sup> communication on the outgoing current loop signal is supported for external communicating with the replaceable amplifier. A hand held communicator or a PC modem using HART<sup>®</sup> protocol revision 7.3 or later should be used.

Detailed command information is available in the technical documentation.

## EU Declaration of Conformity

We Vishay Nobel AB  
Box 423, SE-691 27 KARLSKOGA  
Skrantahöjdsvägen 40, SE-69146 KARLSKOGA  
SWEDEN

declare under our sole responsibility that the products

**Load Cell KOSD-RA**  
**Load Cell KIMD-RA**  
**Load Cell KOSD-RAD**  
**Load Cell KIMD-RAD**

to which this declaration relates are in conformity with the following standards or other normative documents.

The essential requirements in the EMC Directive 2014/30/EU  
EN 61326-1:2013

The essential requirements in the ATEX Directive 2014/34/EU  
with later amendments

EN 60079-0: 2012 + A11: 2013<sup>1</sup>  
EN 60079-11: 2012  
EN 50303: 2000

Group I Category M1: Ex ia I Ma  
Group II Category 1: Ex ia IIC T4 Ga, Ex ia IIIC T79°C Da

<sup>1</sup>) EN 60079-0 A11: 2013 was compared to EN 60079-0: 2012 that were used for the original certification and no changes in the "state of art" apply to this equipment.

IEC – Type examination Certificate: IECEx PRE 14.0002X  
EC – Type examination Certificate: Nemko 13ATEX1522X

Notified body for EC type Examination: Nemko, NB No. 0470, Oslo Norway  
Notified Body for production: SGS Baseefa, NB No. 1180, Buxton UK

The product is supplied by 42 VDC and is therefore not covered by the requirements in the Low Voltage Directive 2014/35/EU.

On behalf of the above named company, I declare that, on the date the equipment accompanied by this declaration is placed on the market, the equipment conforms to all technical and regulatory requirements of the above listed directives.

KARLSKOGA, 18 of August 2016



Lars Nilsson, Managing Director

Publication 200459R2  
Vishay Nobel AB



200460r3

Page 1 of 3

### [1] EC-TYPE EXAMINATION CERTIFICATE

[2] Equipment or Protected System Intended for use  
in Potentially explosive atmospheres  
Directive 94/9/EC

[3] EC-Type Examination Certificate Number: Nemko 13ATEX1522X Issue 3

[4] Equipment or Protective System: Load cell with amplifier(s)

[5] Applicant/ Manufacturer: Vishay Nobel AB

[6] Address: Box 423  
69127 Karlskoga  
SWEDEN

[7] This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

[8] Nemko AS, notified body number 0470 in accordance with Article 9 of Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report no. D0001187 Rev 1

[9] Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0: 2012, EN 60079-11: 2012 and EN 50303 :2000

[10] If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

[11] This EC-TYPE EXAMINATION CERTIFICATE relates only to the design, examination and tests of the specified equipment or protective system in accordance to the directive 94/9/EC.  
Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

[12] The marking of the equipment or protective system shall include the following:

	I M1	Ex ia I Ma	- 45°C ≤ Ta ≤ +70°C
	II 1G	Ex ia IIC T4 Ga	- 45°C ≤ Ta ≤ +70°C
	II 1D	Ex ia IIIC T79°C Da	- 45°C ≤ Ta ≤ +70°C

Oslo, 2015-01-14

Bjørn Spongsveen  
Certification Manager, Ex-products

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Enterprise number:  
NO 974404532



### [13] Schedule

#### [14] EC-TYPE EXAMINATION CERTIFICATE No Nemko 13ATEX1522X Issue 3

##### [15] Description of Equipment or Protective System

KxxD-RA(D) is a series of load cells, this certificate covers the KIMD and KOSD types. They incorporate resistive strain gauges, measuring the shear force, and types of replaceable signal conditioning amplifiers with 2-wire 4-20mA current loop output with HART communication and NAMUR high error signalling. Housed in an IP67 approved enclosure. These load cells are approved for use in an explosive gas and dust area, provided that suitable intrinsic safety barriers are used. Two different metallic cylinders are included: KOSD is made of metal and KIMD which also is made of metal but in addition have compound as a part of the external enclosure and therefore includes a Warning – Potential electrostatic hazard.

The load cell consists of replaceable amplifier, housed in the metallic cylinder ends, filled with casting compound. Three different end terminations are included: connector (LCAMP110), cable (LCAMP120) and blind (LCAMP130). In addition the load cell can be equipped with either single or double Bridge.

##### Type Designation

The KxxD load cell can be used with replaceable signal amplifiers as follows :

- KxxD-RA: Primary LCAMP110 with 4-pin M12 connector.
- KxxD-RA: Primary LCAMP120 with fixed shielded 4 wire cable.
- KxxD-RAD: Primary LCAMP110 or 120 and optional Secondary LCAMP110, 120 or blind 130.

The RA-versions have one electrical circuit and the RAD-version two separate electrical circuits. For the RAD-version the safety parameters are applicable to each circuit. Connection to indicator and power supply is made by two-wires in a common external connector or fixed cable for each amplifier.

##### Safety parameters for intrinsically safe connection:

Maximum input voltage,  $U_i=30V$

Maximum input current,  $I_i=100mA$

Maximum input power,  $P_i=0.7W$

Maximum internal capacitance,  $C_i=57nF$

Maximum internal inductance,  $L_i=4.4\mu H$

- Total cable capacitance must not exceed 9.0nF for use in Group IIC.
- Total cable capacitance must not exceed 503nF for use in Group IIB and Group III.
- Total cable capacitance must not exceed 3 $\mu F$  for use in Group I.

##### Degree of protection:

IP67 according to IEC 60529.

##### Additional manufacturing locations.

Manufacturers HQ address:	Manufacturers Production address:
Vishay Nobel AB Skrantahöjdsvägen 40 691 46 Karlskoga SWEDEN	Vishay Nobel AB Gjuterigatan 12 693 35 Degerfors SWEDEN

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Enterprise number:  
NO 974404532



**[16] Report No. D0001187 Rev 1**

**Descriptive Documents**

Name/Number	Rev.	Date	Title/Description	Sheets
270150	3	2014-11-24	ATEX & IECEx DOCUMENT LIST	1

**Certificate History and Associated Nemko Reports**

Issue	Date	Report	Description
0	2013-03-21	204789	Prime certificate released
1	2013-07-09	240583	Design optimization, none of the components on which the intrinsic safety depends were changed. Safety parameter Ci changed from 56.6nF to 57nF.
2	2014-02-13	D0001187	Minor changes of the design, mining approval and issue IECEx certificate.
3	2015-01-13	D0001187 Rev 1	Minor changes of the design and reduction of the ambient temperature from -40°C to -45°C.

**[17] Special Conditions for Safe Use**

The load cell shall only be connected to equipment that has adequate safety parameters according to the load cell's safety parameters [15].

The models KIMD-RA and KIMD-RAD have outside potted cavities. No rubbing on these non-metallic surfaces are allowed.

The free end of the connected external cable must be installed such that the terminations are afforded a degree of protection of at least IP20.

Use of secondary current loop output on primary side when using LCAMP110 or LCAMP120 as secondary amplifier on KxxD-RAD is not allowed.

**[18] Essential Health and Safety Requirements**

See item 9

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## **IECEX Certificate**

The IECEX certificate for the KxxD-FA(D) Load cell can be found on the official IECEX web site: <http://iecex.iec.ch>

Certificate number: IECEX PRE 14.0002X Issue No: 1.







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