

Single channel Load cell

KOSD

KIMD

KISD

Double channel Load cell

KOSD-D

KIMD-D



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 qualified personnel are permitted 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 could result in bodily harm.

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

# INTENDED USE

KxxD (-D) line of load cells are intended for industrial systems. Its basic function is force measuring or weighing applications. The strain gauge bridge output wiring is connected to an overall measurement system.

## Changes to current manual version

Detailed application, intrinsic safety and functional safety information added.

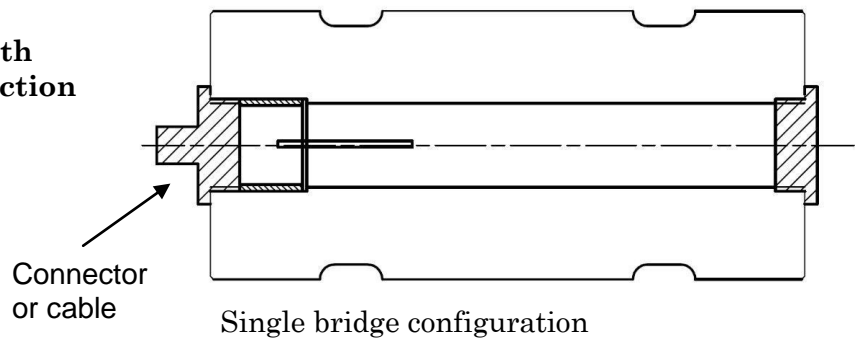
## General

KxxD-(D) is a line of load cells (KOSD-(D), KIMD-(D) and KISD-(D)) with a high degree of protection. They incorporate resistive strain gauges, measuring the shear force or tension.

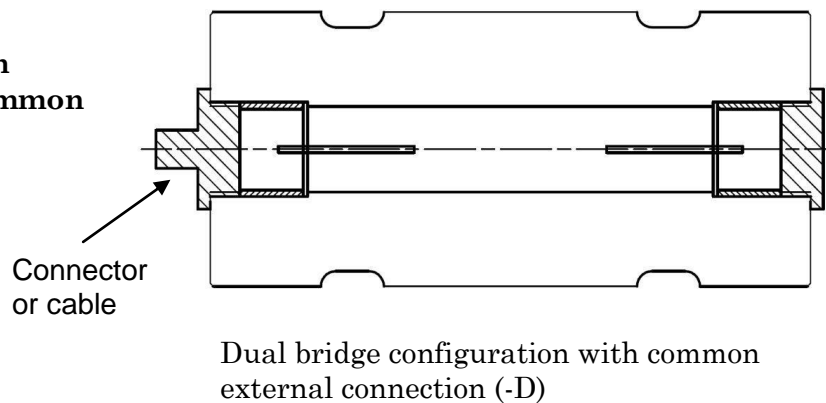
The KxxD-versions have one electrical circuit and the KxxD-D-version two separate electrical circuits. For the KxxD-D-version the safety parameters are applicable to each circuit individually. The two separate electrical circuits are insulated from each other.

The following KxxD-D load cell configurations are available:

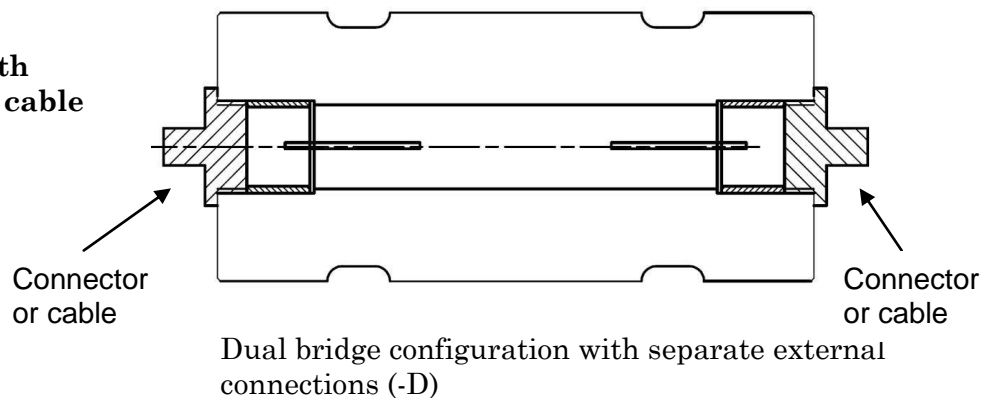
### Single bridge load cell with connector or cable connection



### Dual bridge load cell with common connector or common cable connection



### Dual bridge load cell with individual connector or cable connections.



The load cells can be supplied with connector or cable connection (see also page 6 and 7).



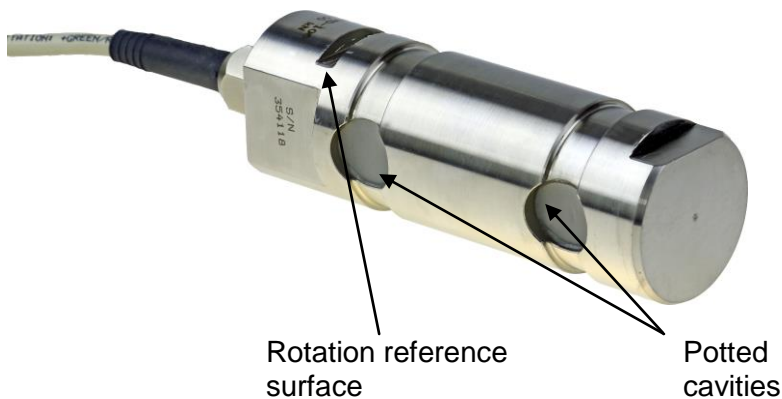
4-pin connector



Cable connection

- KxxD with one 4-pin connector or cable
- KxxD-D with one 8-pin connector or cable connection
- KxxD-D with two 4-pin connectors or dual cable connections
- KxxD-D with one 4-pin connector and single cable connection

These load cells are approved for use in an explosive hazardous area, provided that suitable intrinsic safety barriers or insulators are used and no rubbing with electrostatic materials occurs on outside potted cavities surfaces.



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

# Specifications

<b>Approvals:</b>				
ATEX intrinsic safety	For KxxD-X, Baseefa02ATEX0072 Issue 2, see appendix 2			
IECEX intrinsic safety	For Kxx(D)-(D)X, IECEX BAS 14.0015X, see appendix 2			
Functional safety	TÜV 968/FSP 1462.00/17, see appendix 2			
<b>Environmental conditions:</b>				
<b>PARAMETER</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>UNIT</b>
Environmental protection / IP rating		IP67		
Operating Temperature (T <sub>amb</sub> )	-40		+60	°C
<b>System parameters:</b>				
	See LC calibration data sheet			
<b>Load cell strain gauge:</b>				
Impedance		350		Ohm
<b>ATEX conditions:</b>				
Insulation test		500		Vrms
Input parameters	See appendix 2			

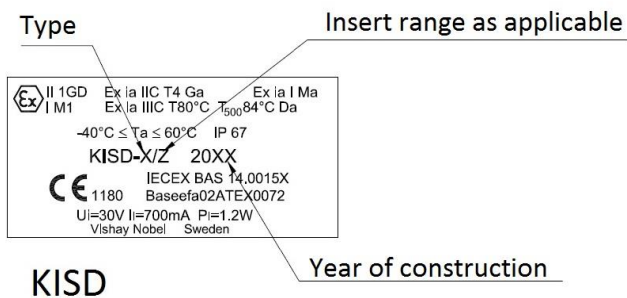
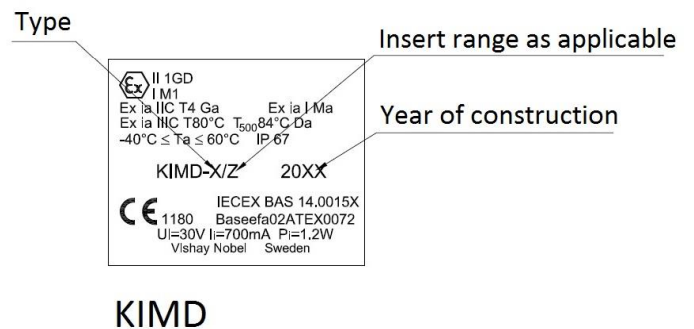
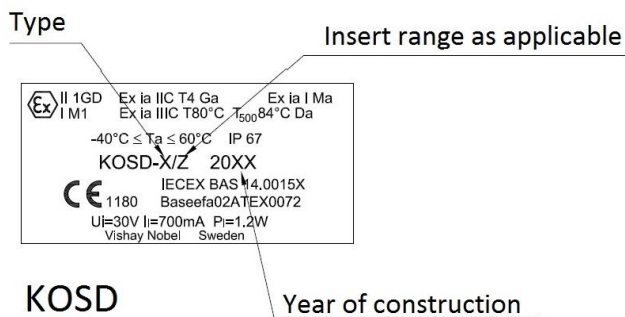
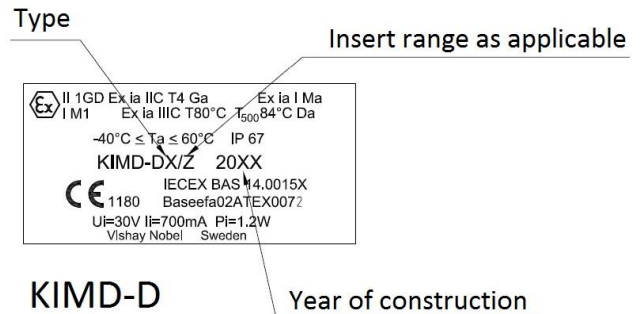
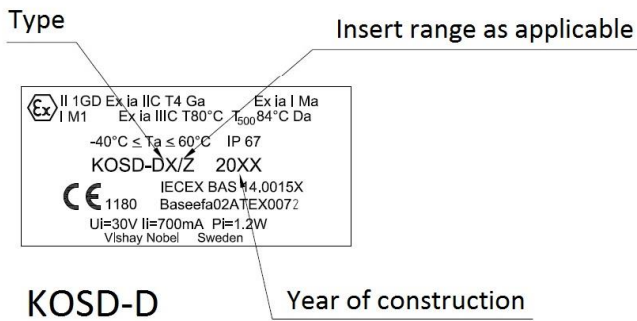
## Intrinsic safety

All load cells KxxD (-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. For the -D version, the safety description and connection is applicable to each load cell bridge output.

Internal capacitance and inductance see ATEX approvals.

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

## Load cell ATEX Label

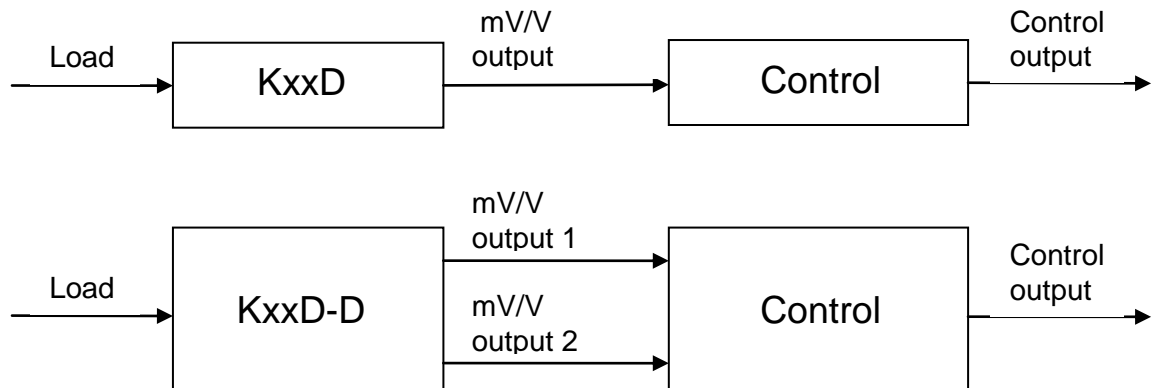




## Functional safety

From a safety point of view is the KxxD-(D) load cell an individual safety component connected to an overall safety control unit. Each individual amplifier strain gauge bridge output shall be connected to separate control system input(s) as view in figure below, see also application examples.

For double channel system, cross monitoring of measurement signals is assumed to be implemented in the overall measuring instrument. The hardware reliability figures for the double channel load cell are valid when the overall measuring instrument is fulfilling correct monitoring of the load cell(s).



### KxxD load cell safety parameters

According to EN ISO 13849-1:

- Category = 1
- MTTF<sub>d</sub> = 48 year
- Maximum performance level, PL = c

### KxxD-D load cell safety parameters

1. According to EN ISO 13849-1:

- Category = 3
- MTTF<sub>d</sub> = 48 year
- Maximum performance level, PL = d

The achievable performance level assumes that the double channel load cell shall be connected to an overall measuring instrument in a category 3 structure with a diagnostic coverage, DC  $\geq$  90%. (Value of DC level is according to Annex E, table E.1). The comparison tolerance must be selected with respect to the specified element safety function.

2. According to EN 61508 with DC Low

- HFT = 1
- SFF = 80%
- PFH =  $1.16 \cdot 10^{-8}$
- $\lambda_s = 1,20 \cdot 10^{-6}$
- $\lambda_{dd} = 7,21 \cdot 10^{-7}$
- $\lambda_{du} = 4,80 \cdot 10^{-7}$
- Maximum SIL = 2

3. According to EN 61508 with DC High

- HFT = 1
- SFF = 99.5%
- PFH =  $2,41 \cdot 10^{-10}$
- $\lambda_s = 1,20 \cdot 10^{-6}$
- $\lambda_{dd} = 1,19 \cdot 10^{-6}$
- $\lambda_{du} = 1,20 \cdot 10^{-8}$
- Maximum SIL = 2

The overall measurement system (control) must implement the following diagnostic technique: "Input comparison/voting (1oo2, 2oo3 or better redundancy)" with DC = Low (60%) or DC = High (99%) according to IEC 61508-2 Table A.13.

The comparison tolerance must be selected with respect to the specified element safety function.

## Load cell connection

The load cell single or double strain gauge bridge outputs shall be connected using shielded cable. It shall then be connected to the measuring equipment bridge mV/V input signal channel

The bridge power shall be connected to E+ and E- outputs and the measuring equipment signal input shall be connected to the S+ and S- outputs.

The cable should be routed at least 100 mm from other cables, so that electromagnetic interference is avoided. Cable shield is not connected to the load cell body and shall be grounded in the other end. The load cell connector housing is connected to the load cell body and the cable shield shall not be connected in the cable connector but be grounded in the other end. Cable shield is then grounded in one point only.

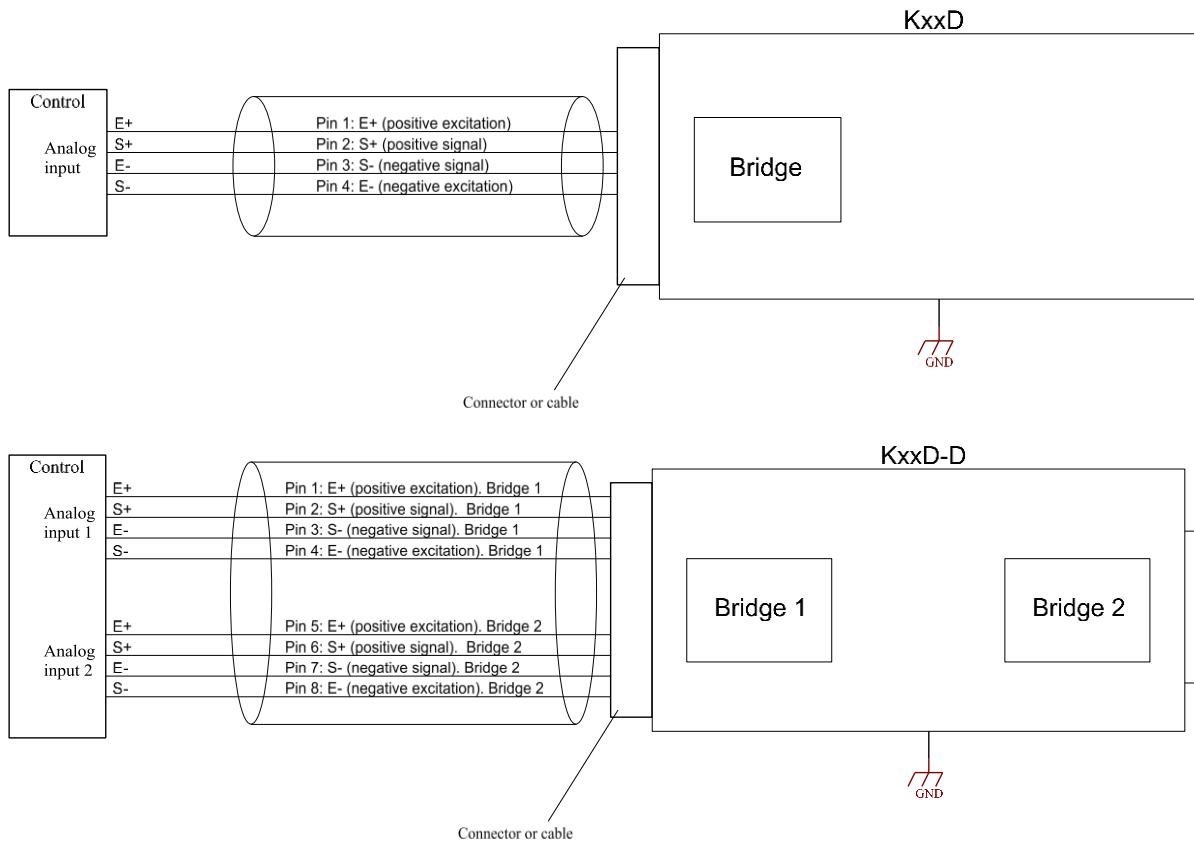
For installation in an explosive gas/dust or mining area, only trained personnel may perform dimensioning of cables and barriers. A descriptive system document should be prepared by the system designer.

<b>Connector pin-out and wires color code:</b>	
<i>Electrical connection</i>	
<b>Connector type:</b> (M12 or equivalent IP67 qualified)	
<b>Cable:</b> Shielded 4 or 8-wire 0,25mm <sup>2</sup> cable through IP67 qualified cable gland	
<i>Connector pin number *</i>	<i>Cable: Cable wire colour *</i>
<b>Pin 1:</b> E+ (positive excitation). Bridge 1	<b>Red:</b> E+ (positive excitation). Bridge 1
<b>Pin 3:</b> S+ (positive signal). Bridge 1	<b>Green:</b> S+ (positive signal). Bridge 1
<b>Pin 2:</b> S- (negative signal). Bridge 1	<b>White:</b> S- (negative signal). Bridge 1
<b>Pin 4:</b> E- (negative excitation). Bridge 1	<b>Grey:</b> E- (negative excitation). Bridge 1
<b>Pin 5:</b> E+ (positive excitation). Bridge 2	<b>Brown:</b> E+ (positive excitation). Bridge 2
<b>Pin 7:</b> S+ (positive signal). Bridge 2	<b>Blue:</b> S+ (positive signal). Bridge 2
<b>Pin 6:</b> S- (negative signal). Bridge 2	<b>Yellow:</b> S- (negative signal). Bridge 2
<b>Pin 8:</b> E- (negative excitation). Bridge 2	<b>Pink:</b> E- (negative excitation). Bridge 2

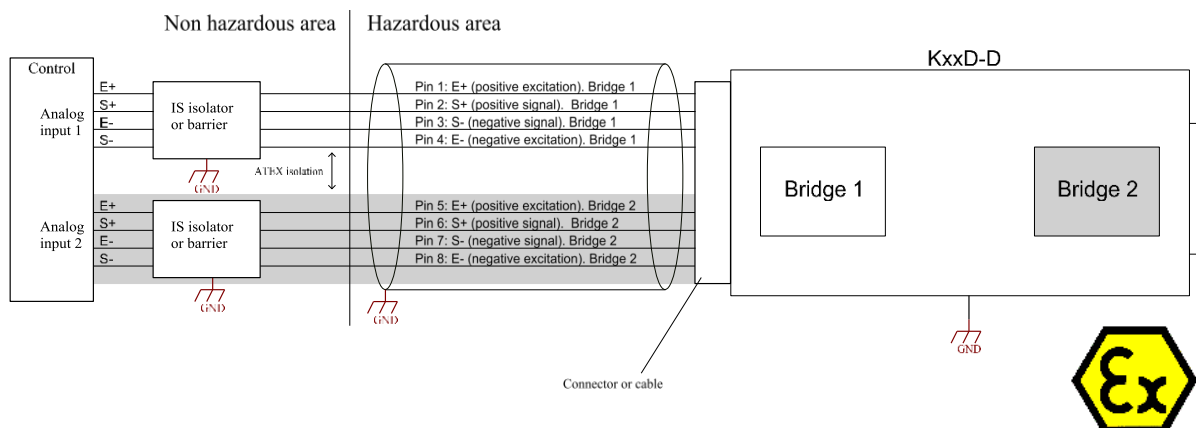
\* Deviations may occur in customer specific types.

## Application examples

Load cell KxxD (one strain gauge bridge) and KxxD-D (two strain gauge bridges), used in a **non-hazardous** area, are shown below.



Load cell KxxD-D used in **hazardous** area is shown below. The cable shield is not connected to the load cell body and shall be connected in the other end. Connection to barrier or isolating IS unit is shown in the example below



Load cell as a safety component can be used in both **hazardous** and **non-hazardous** areas and be connected to the measuring control in the same way.

## Mechanical installation and maintenance

Load cells of the line KxxD-(D) are designed to be supported at both ends and loaded at the middle of the cylindrical body (KIMD, KOSD and KISD). An arrow on one or both ends 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 or key slot are provided (KIMD, KOSD and KISD). It should be used to prevent the cylindrical load cell body from rotating in the supports.

Standardized 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-(D), do not rub with electrostatic materials.



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

## Mechanical data

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

## EU Declaration of Conformity

We Vishay Nobel AB  
P.O. Box 423, SE-691 27 KARLSKOGA  
Skrantahöjdsvägen 40, SE-691 46 KARLSKOGA SWEDEN  
declare under our sole responsibility that the products

**Load Cell KOSD**  
**Load Cell KIMD**  
**Load Cell KISD**  
**Load Cell KOSD-D**  
**Load Cell KIMD-D**

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

The essential requirements for safety component in the Machine Directive 2006/42/EC  
EN ISO 13849-1:2015. KxxD up to PLc and KxxD-D up to PLd  
EN 61508:2010. KxxD-D up to SIL 2  
Function safety Certificate: TÜV 968/FSP 1462.00/17

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  
Group I Category M1: Ex ia I Ma  
Group II Category 1 GD: Ex ia IIC T5 Ga, Ex ia IIIC T84°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 BAS 14.0015X  
EC – Type examination Certificate: Baseefa02ATEX0072, Issue 2  
Notified Body for EC type examination / production: SGS Baseefa, NB No. 1180, Buxton UK

The essential requirements in the RoHS Directive 2011/65/EU Restriction of the use of certain  
hazardous substances in electrical and electronic equipment.  
EN 50581:2012

The product is supplied by up to 25 VDC/VAC 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, 21th of August 2017



Per Fredriksson, Managing Director

Publication 200441R3  
Vishay Nobel AB

Spec.: 200418R2

Certificate Number  
Baseefa02ATEX0072  
Issue 2



Issued 11 November 2014  
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1 **EC - TYPE EXAMINATION CERTIFICATE**

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres**  
Directive 94/9/EC

3 EC - Type Examination Certificate Number: **Baseefa02ATEX0072 – Issue 2**

4 Equipment or Protective System: **Load Cell KXXD-X with variants**

5 Manufacturer: **Vishay Nobel AB**

6 Address: **Box 423, SE-691 27 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 Baseefa, Notified Body number 1180, in accordance with Article 9 of the 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's. See Schedule

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

**EN 60079-0:2012 EN 60079-11:2012**

except in respect of those requirements listed at item 18 of the Schedule.

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 and construction of the specified equipment or protective system. 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 :

⊕ II 1 GD Ex ia IIC T4 Ga Ex ia IIIC T80°C T<sub>500</sub>84°C Da (-40°C ≤Ta ≤60°C)  
I MI Ex ia I Ma (-40°C ≤Ta ≤60°C)

Baseefa Customer Reference No. **2054**

Project File No. **13/0709**

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**R S SINCLAIR**  
GENERAL MANAGER

On behalf of SGS Baseefa Limited

Certificate Number  
Baseefa02ATEX0072  
Issue 2



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## Schedule

14

Certificate Number Baseefa02ATEX0072 – Issue 2

### 15 Description of Equipment or Protective System

The Loadcells Type KXXD-X are designed to measure force. Each loadcell comprises a printed circuit board, four dual element strain gauges and two modulus gauges all housed in a stainless steel enclosure. External connections are made via an integral four core cable.

This certificate covers types **KOSD-XXX-Z**, **KOSD-X**, **KOSD-New Style**, **KISD-X**, **KIMD-X** and **KXXD-DX**, where X represents type and load rating and the -DX suffix represents a double-bridge type.

The apparatus comprises a stainless steel body, in which the strain and modulus gauges and the printed circuit board (coated with silicon rubber compound or varnish) are mounted. Electrical connections are made via a glanded integral cable, the termination of which, on the internal printed circuit board is encapsulated.

The loadcells are adequately protected against dust ingress; the enclosures offering a degree of protection of not less than IP6X.

#### Input Parameters

$$\begin{array}{ll} U_i = 25V & C_i = 2.5nF \\ I_i = 1A & L_i/R_i = 30\mu H/\Omega \\ P_i = 1.2W & \end{array}$$

### 16 Report Number

GB/BAS/ExTR14.0154/00

### 17 Specific Conditions of Use

None.

### 18 Essential Health and Safety Requirements

All relevant Essential Health and Safety Requirements are covered by the standards listed at item 9.

### 19 Drawings and Documents

New drawings submitted for this issue of certificate:

Number	Sheet	Issue	Date	Description
300138	1 of 1	1	2014-02-19	KIMD Type Double Bridge Connector or Cable
300139	1 of 1	1	2014-02-19	KOSD Type Double Bridge Connector or Cable
300332	1 of 1	3	2014-02-19	KOSD-New Style
600610	1 of 1	4	2014-02-19	ATEX Label KOSD-X
600631	1 of 1	4	2014-02-19	ATEX Label KOSD-X
600632	1 of 1	4	2014-02-19	ATEX Label KIMD-X
600633	1 of 1	4	2014-02-19	ATEX Label KOSD-XXX-Z

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Current drawings also associated with this certificate:

Number	Sheet	Issue	Date	Description
300279	1 of 1	1	10-10-2002	KISD-X
300280	1 of 1	1	10-10-2002	KIMD-X ATEX
300331	1 of 1	1	10-10-2002	KOSD-XXX-Z ATEX
400774	1 of 1	1	10-10-2002	KOSD-X ATEX

## 20 Certificate History

Certificate No.	Date	Comments
Baseefa02ATEX0072	18 October 2002	The release of the prime certificate. The associated test and assessment is documented in Test Report No. 02(C)0290. Project File No. 02/0290.
Baseefa02ATEX0072/1	19 January 2010	To introduce the KXXD-DX double-bridge loadcell, to permit a change to the ambient temperature range to $-40^{\circ}\text{C} \leq T_a \leq 60^{\circ}\text{C}$ , to confirm that the equipment covered by this certificate has been reviewed against the requirements of EN 60079-0:2009 and EN 60079-11:2007 in respect of the differences from EN 50014:1997 + Amds 1 & 2 and EN 50020:2002 and to confirm that the equipment covered by this certificate has been additionally reviewed against the requirements of IEC 60079-31:2008 and may also therefore be coded:  Ⓢ II 1D Ex t IIIC T80°C T <sub>500</sub> 84°C Da  Project File No. 10/0535.
Baseefa02ATEX0072 Issue 2	11 November 2014	This issue of the certificate incorporates previously issued primary & supplementary certificates into one certificate and confirms the current design meets the requirements of EN 60079-0: 2012 & EN 60079-11: 2012 including the revision of the marking in accordance with these standards. The equipment has been assessed against the requirements for Group I and may also therefore be additionally coded:  Ⓢ I M1 Ex ia I Ma  Test Report No. GB/BAS/ExTR14.0154/00. Project File No. 13/0709.
For drawings applicable to each issue, see original of that issue.		



## **IECEX Certificate**

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

Certificate number: IECEX BAS 14.0015X Issue No: 0.

## **Function safety Certificate**

The functional safety certificate for the KxxD (-D) Load cell can be found on TÜV Rheinland web site: [www.fs-products.com](http://www.fs-products.com) and [www.certipedia.com/fs-products](http://www.certipedia.com/fs-products)

Certificate number: 968/FSP 1462.00/17 Issue No: 0

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