Single channel Load cell
KOSD
KIMD
KISD
Double channel Load cell
KOSD-D
KIMD-D

SIL/PL Capability
TÜVRheinland CERTIFIED
www.tuv.com ID 0600000000

User manual

BLH NOBEL
A VPG Brand

Content

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.

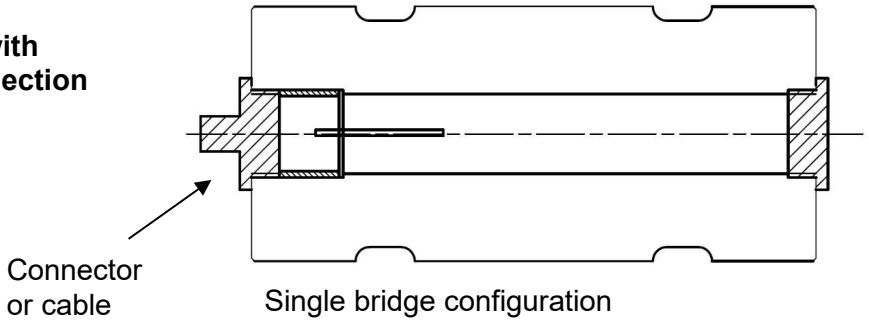
General

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.

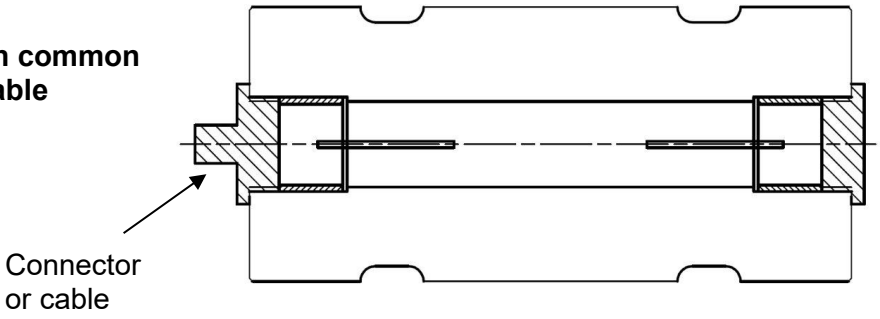
The following KxxD-D load cell configurations are available:

Single bridge load cell with connector or cable connection



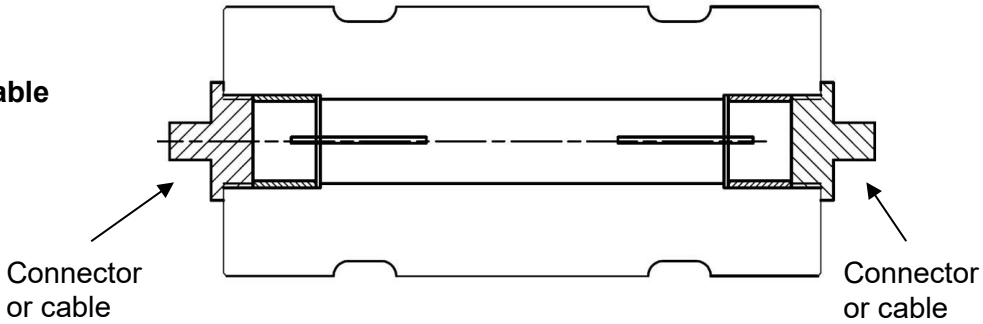
Single bridge configuration

Dual bridge load cell with common connector or common cable connection



Dual bridge configuration with common external connection (-D)

Dual bridge load cell with individual connector or cable connections.



Dual bridge configuration with separate external connections (-D)

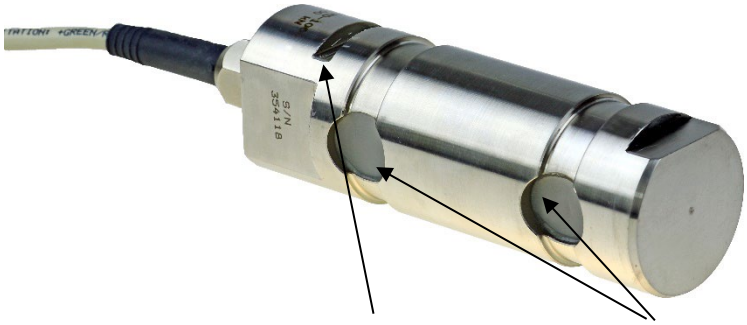
The load cells can be supplied with connector or cable connection (see also page 6 and 7).

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.



Rotation reference surface

Potted cavitie

CE-marking and UKEX-marking according to ATEX and EMC Directives, see appendix 1 and 2.

Specifications

Approvals:				
ATEX intrinsic safety	For KxxD-X, Baseefa02ATEX0072 Issue 4, see appendix 1			
	For KxxD-X, BAS22UKEX0266 Issue 0, see appendix 2			
IECEx intrinsic safety	For Kxx(D)-(D) X, IECEx BAS 14.0015X Issue 2, see appendix 4			
Functional safety	TÜV 968/FSP 1462.00/22, see appendix 4			
Environmental conditions:				
PARAMETER	**Min.**	**Typ.**	**Max.**	**UNIT**
Environmental protection / IP rating		IP67		
Operating Temperature (T_{amb})	-40		+60	°C
System parameters:	See LC calibration data sheet			
Load cell strain gauge:				
Impedance		350		Ohm
ATEX conditions:				
Insulation test		500		Vrms
Input parameters	See appendix 1 & 2			

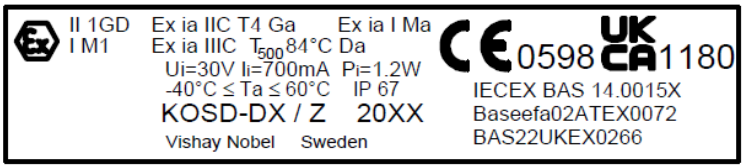
Intrinsic safety

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.

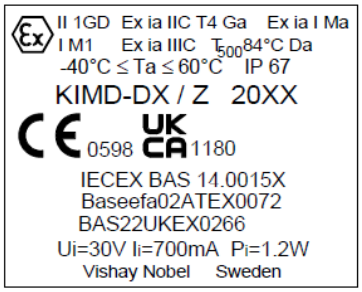
Internal capacitance and inductance see ATEX approvals.

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

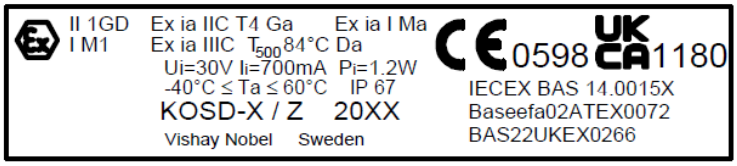
Load cell ATEX-label



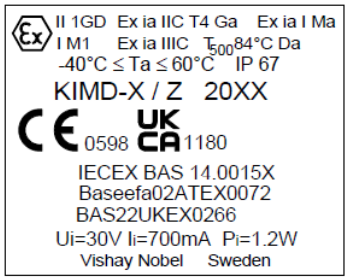
KOSD-D



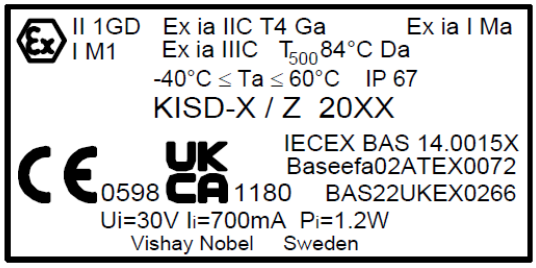
KIMD-D



KOSD



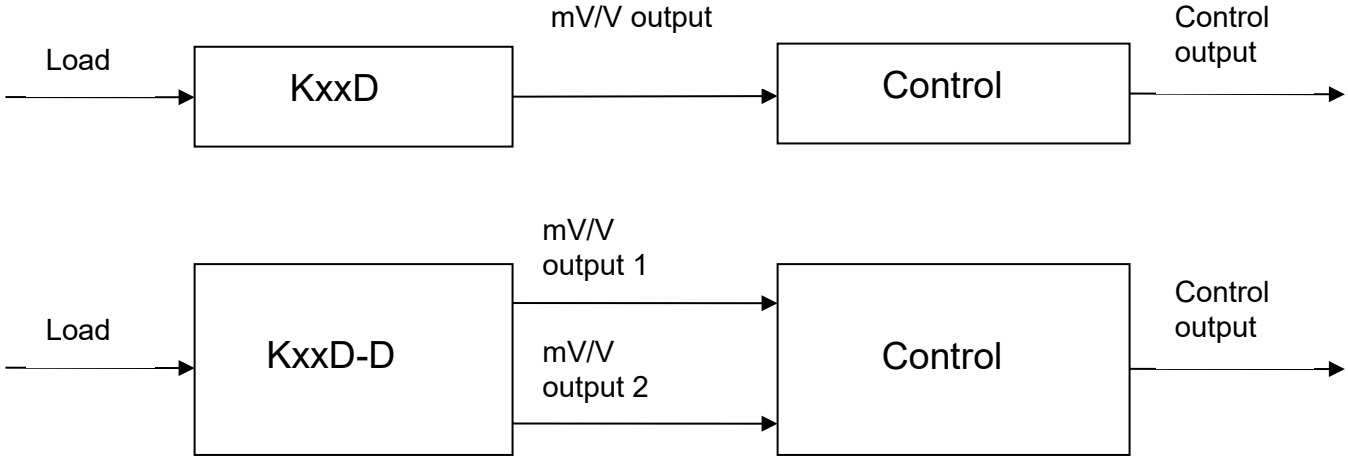
KIMD



KISD

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
- MTTFd = 48 year
- Maximum performance level, PL = c

KxxD-D load cell safety parameters
1. According to EN ISO 13849-1:

- Category = 3
- $MTTF_d$ = 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 ≥ 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 = $1.16*10^{-8}$
- $\lambda_s = 1{,}20*10^{-6}$
- $\lambda_{dd} = 7{,}21*10^{-7}$
- $\lambda_{du} = 4{,}80*10^{-7}$
- Maximum SIL = 2

3. According to EN 61508 with DC High

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

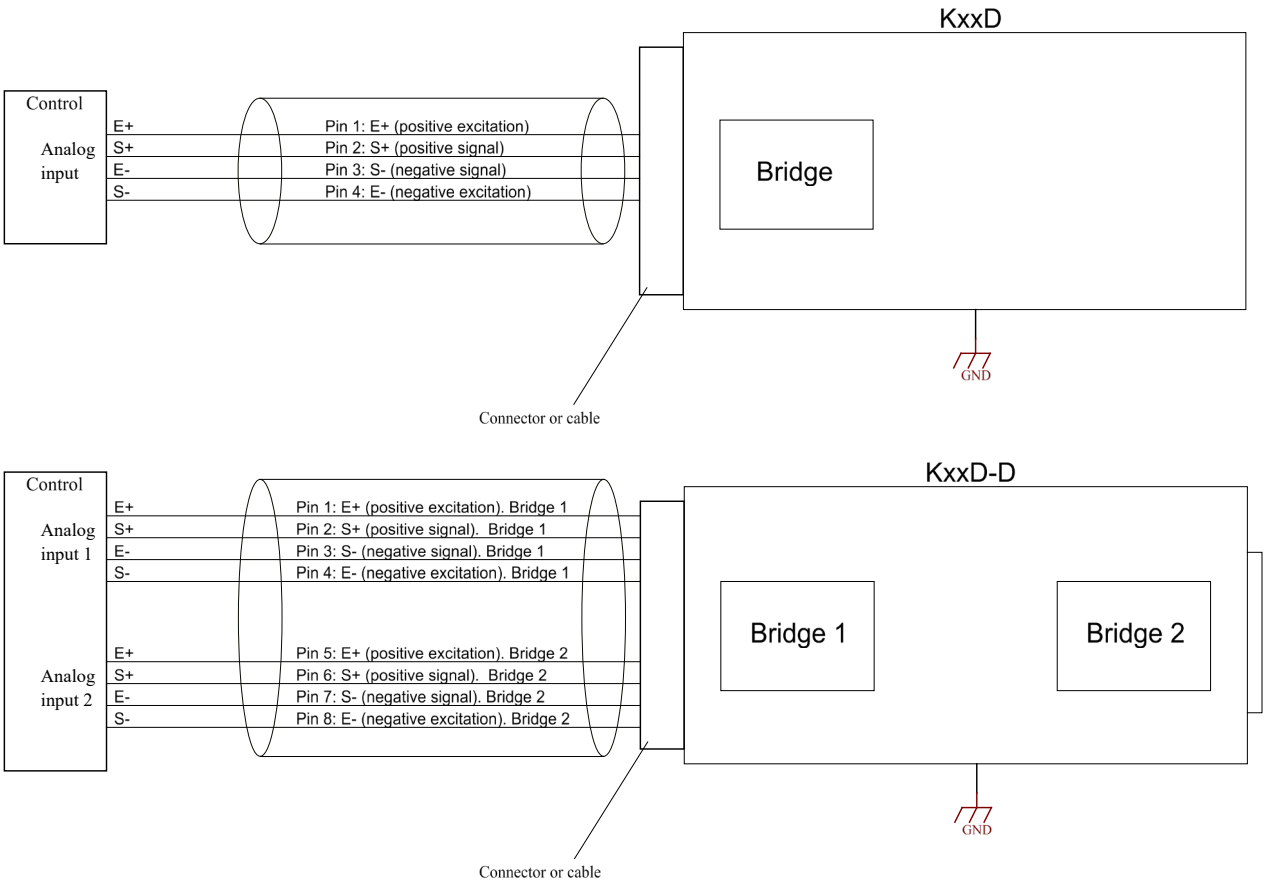
For installation in an explosive gas/dust or mining area, only trained personnel may perform dimensioning of cables and barriers. A descriptive system document should be prepared by the system designer.

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

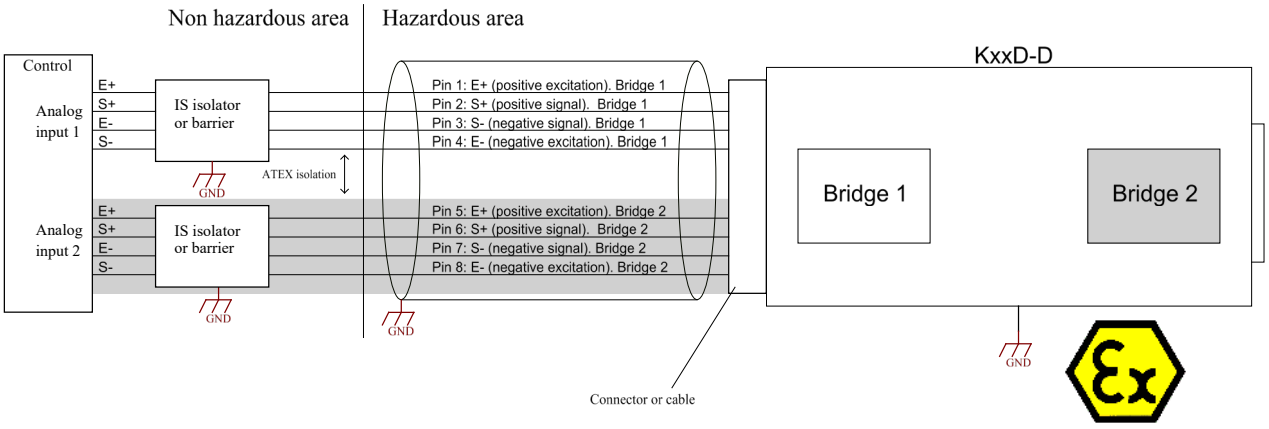
* Deviations may occur in customer specific types.

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 define 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.

Certificate Number
Baseefa02ATEX0072
Issue 4

Issued 12 April 2023

1 # EU - TYPE EXAMINATION CERTIFICATE

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 2014/34/EU**

3 EU - Type Examination Certificate Number: **Baseefa02ATEX0072 – Issue 4**

3.1 In accordance with Article 41 of Directive 2014/34/EU, EC-Type Examination Certificates referring to 94/9/EC that were in existence prior to the date of application of 2014/34/EU (20 April 2016) may be referenced as if they were issued in accordance with Directive 2014/34/EU. Supplementary Certificates to such EC-Type Examination Certificates, and new issues of such certificates, may continue to bear the original certificate number issued prior to 20 April 2016.

4 Product: **Load Cell KXXD-X with variants**

5 Manufacturer: **Vishay Nobel AB**

6 Address: **Box 423, SE-691 27 Karlskoga, Sweden**

7 This re-issued certificate extends EC Type Examination Certificate No. Baseefa02ATEX0072 to apply to product designed and constructed in accordance with the specification set out in the Schedule of the said certificate but having any variations specified in the Schedule attached to this certificate and the documents therein referred to.

8 SGS Fimko Oy, Notified Body number 0598, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

8.1 The original certificate was issued by SGS Baseefa Ltd (UK Notified Body 1180). It, and any supplements previously issued by SGS Baseefa Ltd have been transferred to the supervision of SGS Fimko Oy (EU Notified Body 0598). The original certificate number is retained.

The examination and test results are recorded in confidential Report No. **See Certificate History**

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

EN IEC 60079-0:2018 **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 product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

11 This EU - TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12 The marking of the product shall include the following:

Ⓔx II 1 GD Ex ia IIC T4 Ga Ex ia IIIC T_{500} 84°C Da (-40°C ≤ Ta ≤ 60°C)

Ⓔx I M1 Ex ia I Ma (-40°C ≤ Ta ≤ 60°C)

SGS Fimko Oy Customer Reference No. **2054** Project File No. **22/0544**

SGS Fimko Oy
Takomotie 8
FI-00380 Helsinki, Finland
Telephone +358 (0)9 696 361
e-mail sgs.fimko@sgs.com
web site www.sgs.fi
Business ID 0978538-5 Member of the SGS Group (SGA SA)

Tuomas Hänninen
SGS Fimko Oy

13 **Schedule**

14 **Certificate Number Baseefa02ATEX0072 – Issue 4**

15 Description of Product

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

U_i	=	30V	C_i	=	2.5nF
I_i	=	1A	L_i/R_i	=	30µH/Ω
P_i	=	1.2W			

16 Report Number

See Certificate History

17 Specific Conditions of Use

None

18 Essential Health and Safety Requirements

In addition to the Essential Health and Safety Requirements (EHSRs) covered by the standards listed at item 9, the following are considered relevant to this product, and conformity is demonstrated in the report:

Clause	Subject
1.2.7	Protection against other hazards (LVD type requirements, etc.)
1.2.8	Overloading of equipment (protection relays, etc.)
1.4.1	External effects
1.4.2	Aggressive substances, etc.

19 Drawings and Documents

New drawings submitted for this issue of certificate:

Number	Sheet	Issue	Date	Description
300138	1 of 1	3	2022-10-05	KIMD Type Double Bridge Connector or Cable
300139	1 of 1	3	2022-10-05	KOSD Type Double Bridge Connector or Cable
300332	1 of 1	5	2022-10-05	KOSD-New Style
600610	1 of 1	6	2022-10-05	ATEX Label KOSD-X
600631	1 of 1	6	2022-10-05	ATEX Label KISD-X

Number	Sheet	Issue	Date	Description
600632	1 of 1	6	2022-10-05	ATEX Label KIMD-X
600633	1 of 1	6	2022-10-05	ATEX Label KOSD-XXX-Z

Current drawings which remain unaffected by this issue:

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

All drawings are held with IECEx BAS 14.0015X and are common to BAS22UKEX0266.

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.. 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°C ≤ Ta ≤+60°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: **Ⓔx II 1D Ex t IIIC T80°C T_{500}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. IEC 60079-31:2008 has been removed and the code changed from Ex t IIIC to Ex ia IIIC. **Ⓔx II 1 GD Ex ia IIC T4 Ga Ex ia IIIC T80°C T_{500}84°C Da** The equipment has been assessed against the requirements for Group I and may also therefore be additionally coded: **Ⓔx I M1 Ex ia I Ma** Test Report No. GB/BAS/ExTR14.0154/00. Project File No. 13/0709.
Baseefa02ATEX0072 Issue 3	11 June 2018	To permit a change in U_i from 25V to 30V (the parameters have been updated accordingly) and to confirm that the equipment meets the requirements of EN 60079-0: 2012+A11:2013. Test Report No. GB/BAS/ExTR18.0071/00. Project File No. 18/0220.
Baseefa02ATEX0072 Issue 4	12 April 2023	To confirm the current design meets the requirements of EN IEC 60079-0:2018. Test Report No: GB/BAS/ExTR23.0022/00 Project File No: 22/0544
For drawings applicable to each issue, see original of that issue.		

Certificate Number
BAS22UKEX0266

Issued 12 April 2023
Page 1 of 3

UK-TYPE EXAMINATION CERTIFICATE

Equipment or Protective System Intended for use in Potentially Explosive Atmospheres
UKSI 2016:1107 (as amended) – Schedule 3A, Part 1

3	UK-Type Examination Certificate Number:	**BAS22UKEX0266**
4	Product:	**Load Cell KXXD-X with variants**
5	Manufacturer:	**Vishay Nobel AB**
6	Address:	**Box 423, SE-691 27 Karlskoga, Sweden**

7 This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 SGS Baseefa, Approved Body number 1180, in accordance with Regulation 43 of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016, UKSI 2016:1107 (as amended), certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Schedule 1 of the Regulations.

The examination and test results are recorded in confidential Report No. **GB/BAS/ExTR23.0022/00**

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

EN IEC 60079-0:2018 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 product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

11 This UK-TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified product. Further requirements of the Regulations apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12 The marking of the product shall include the following:

Ⓔx **II 1 GD Ex ia IIC T4 Ga Ex ia IIIC T_{500} 84°C Da (-40°C ≤ Ta ≤ 60°C)**

Ⓔx **I M1 Ex ia I Ma (-40°C ≤ Ta ≤ 60°C)**

SGS Baseefa Customer Reference No. **2054** Project File No. **22/0544**

SGS Baseefa Limited
Rockhead Business Park, Staden Lane,
Buxton, Derbyshire SK17 9RZ
Telephone +44 (0) 1298 766600 Fax +44 (0) 1298 766601
e-mail baseefa@sgs.com web site www.sgs.co.uk/sgsbaseefa
Registered in England No. 4305578.
Registered address: Rossmore Business Park, Ellesmere Port, Cheshire, CH65 3EN

UKAS PRODUCT CERTIFICATION
0191

R S SINCLAIR
TECHNICAL MANAGER
On behalf of SGS Baseefa Limited

13 **Schedule**

14 **Certificate Number BAS22UKEX0266**

15 Description of Product

The Loadcells Type KXXD-X are designed to measure force. Each loadcell comprises a printed circuit board, four dual elemer strain gauges and two modulus gauges all housed in a stainless steel enclosure. External connections are made via an integra 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 (coate with silicon rubber compound or varnish) are mounted. Electrical connections are made via a glanded integral cable, th 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

U_i	=	30V	C_i	=	2.5nF
I_i	=	1A	L_i/R_i	=	30µH/Ω
P_i	=	1.2W			

16 Report Number

GB/BAS/ExTR23.0022/00

17 Specific Conditions of Use

None

18 Essential Health and Safety Requirements

In addition to the Essential Health and Safety Requirements (EHSRs) covered by the standards listed at item 9, the followin are considered relevant to this product, and conformity is demonstrated in the report:

Clause	Subject
13	Protection against other hazards (LVD type requirements, etc.)
14	Overloading of equipment (protection relays, etc.)
21(1)	External effects
21(2)	Aggressive substances, etc.

19 Drawings and Documents

New drawings submitted for this issue of certificate:

Number	Sheet	Issue	Date	Description
300138	1 of 1	3	2022-10-05	KIMD Type Double Bridge Connector or Cable
300139	1 of 1	3	2022-10-05	KOSD Type Double Bridge Connector or Cable
300332	1 of 1	5	2022-10-05	KOSD-New Style
600610	1 of 1	6	2022-10-05	ATEX Label KOSD-X
600631	1 of 1	6	2022-10-05	ATEX Label KISD-X

Number	Sheet	Issue	Date	Description
600632	1 of 1	6	2022-10-05	ATEX Label KIMD-X
600633	1 of 1	6	2022-10-05	ATEX Label KOSD-XXX-Z

Refer to Baseefa02ATEX0072 Issue 4 for the full list of applicable drawings.

Appendix 3, 200441r7, Declaration of Conformity

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 KXXD-X with variants
(KOSD-XXX-Z, KOSD-X, KOSD-New Style, KISD-X, KIMD-X, KOSD-DX and KIMD-DX)

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 IEC 60079-0: 2018
EN 60079-11: 2012

Group I Category M1: Ex ia I Ma
Group II Category 1 GD: Ex ia IIC T4 Ga, Ex ia IIIC T_{500}84°C Da

EC – Type examination Certificate: Baseefa02ATEX0072
IEC – Type examination Certificate: IECEx BAS 14.0015X
UKCA – Type Certificate: BAS22UKEX0266

Notified Body for EC type examination / production: SGS Fimko Oy, NB No. 0598, Helsinki FINLAND
Notified Body for UKCA production: SGS Baseefa Limited, 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 30 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 with all technical and regulatory requirements of the above listed directives.

KARLSKOGA, 19th of June 2023

Per Fredriksson, Managing Director

Publication 200441R07
Vishay Nobel AB

IECEx Certificate

The IECEx certificate for the KxxD (-D) Load cell can be found on the official IECEx web site: https://www.iecex.com/

Certificate number: IECEx BAS 14.0015X Issue No. 3.
200498r3

Functional safety Certificate

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

Certificate number: 968/FSP 1462.01/22

Publication: 600659R09

Vishay Nobel AB
Box 423, SE-691 27 Karlskoga, Sweden
Phone +46 586 63000
blhnobel.se@vpgsensors.com
www.blhnobel.com