

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.

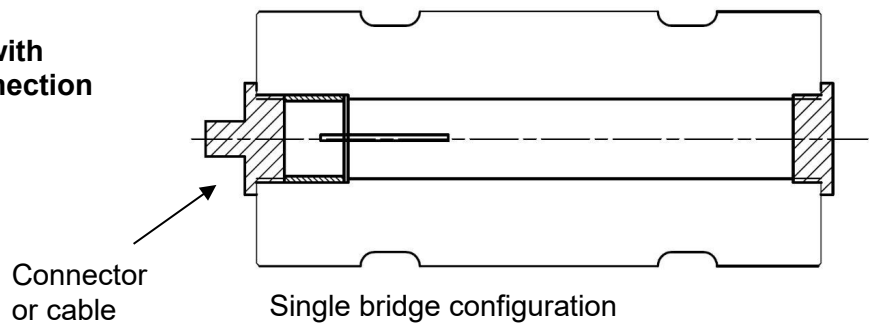
## General

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.

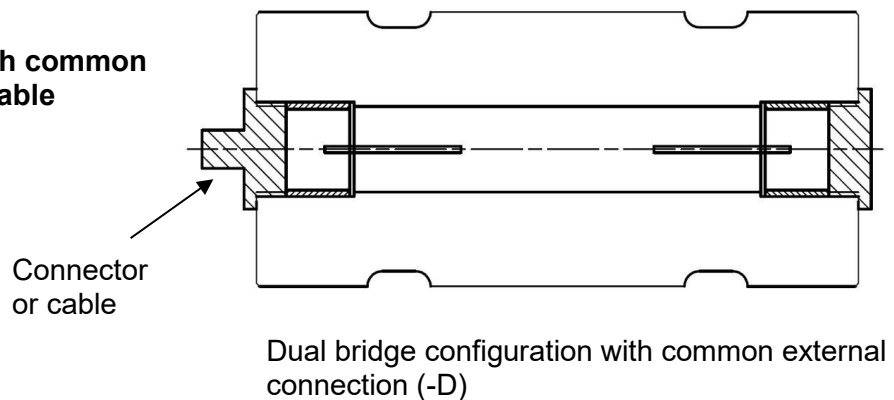
The KxxD-versions have one electrical circuit and the KxxD-D-version two separate electrical circuits. For the KxxD-D-version the safety parameters are applicable to each circuit individually. The two separate electrical circuits are insulated from each other.

The following KxxD-D load cell configurations are available:

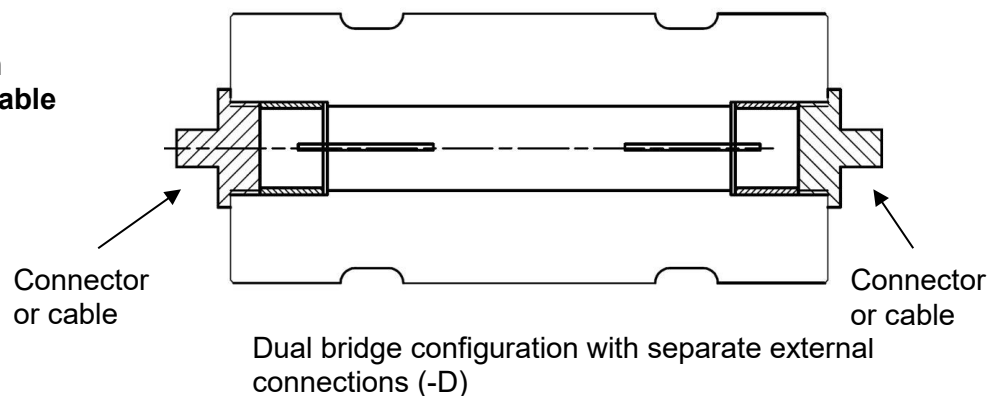
### Single bridge load cell with connector or cable connection



### 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).



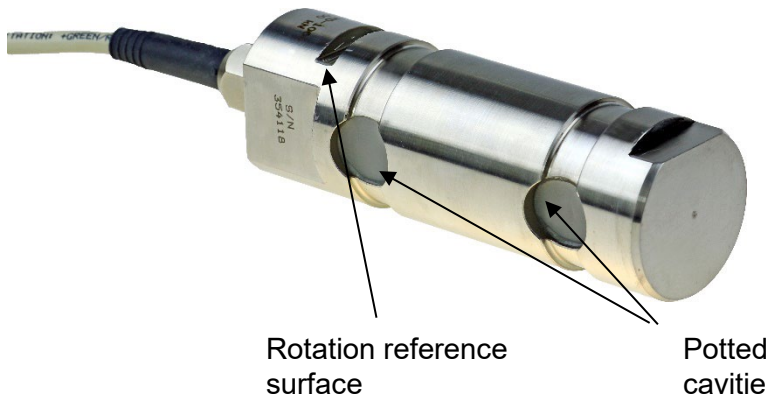
4-pin connector



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 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 <sub>amb</sub> ) | -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.

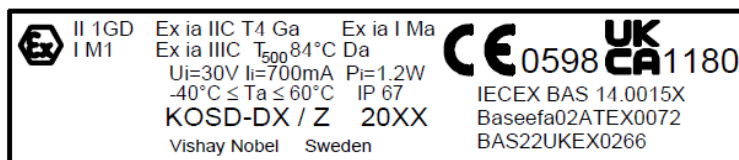
The last 'X' in the type code (see load cell ATEX label) is a number to identify the specific model. They can be ordered either with a cable connector or with an integrated cable. The safety description is labelled on the load cell.

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

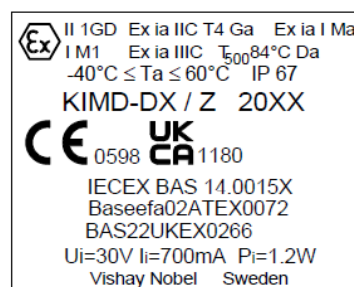
Internal capacitance and inductance see ATEX approvals.

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

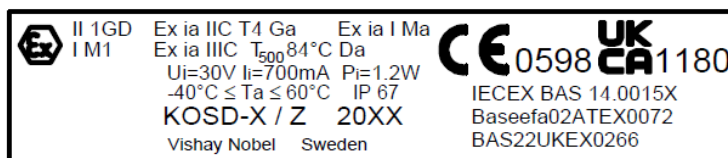
## Load cell ATEX-label



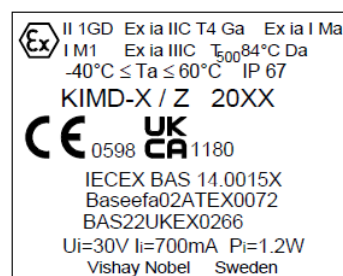
KOSD-D



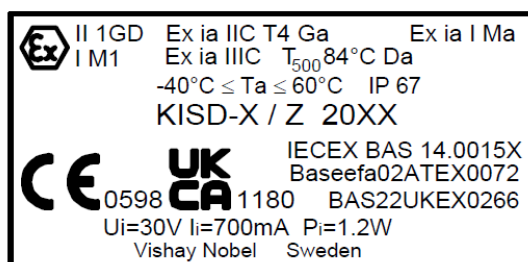
KIMD-D



KOSD



KIMD

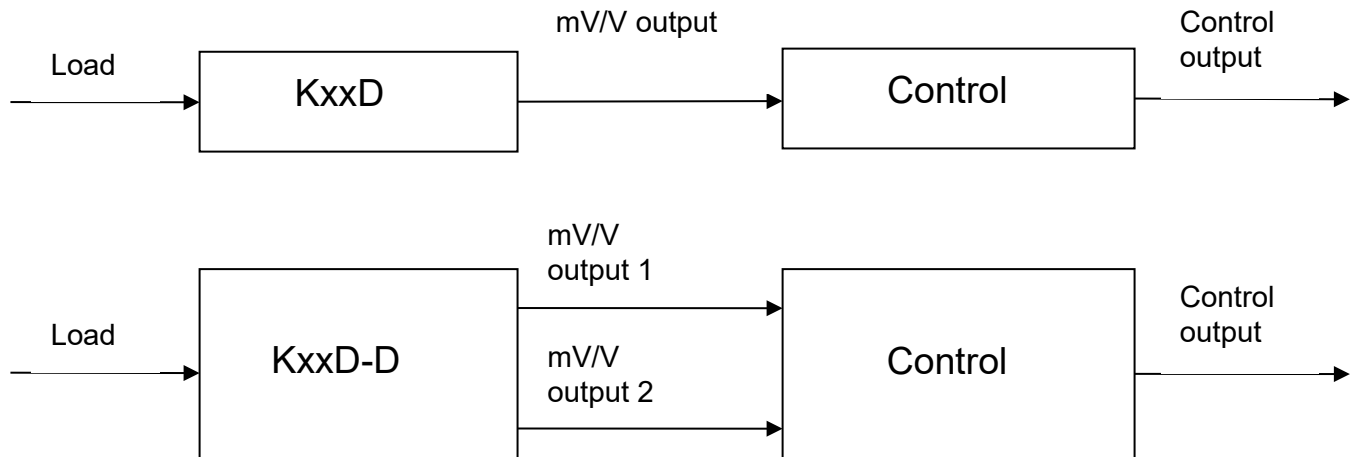


KISD

## 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
- 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 ≥ 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.

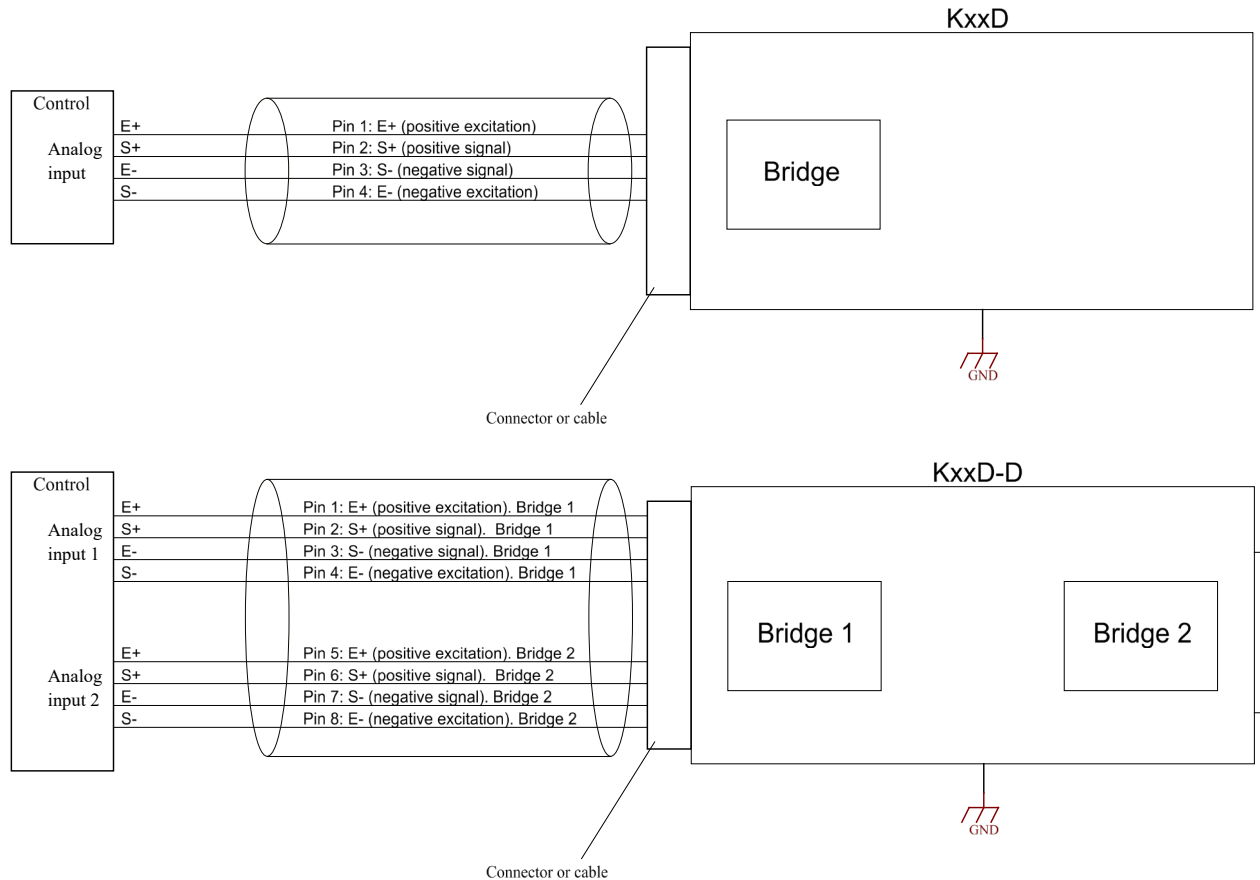
For installation in an explosive gas/dust or mining area, only trained personnel may perform dimensioning of cables and barriers. A descriptive system document should be prepared by the system designer.

| Connector pin-out and wires color code:   |  |
|---|--|
| <u>Electrical connection</u>  |  |
| <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 |  |
| <u>Connector pin number *</u>   | <u>Cable: Cable wire colour *</u>                |
| <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  |

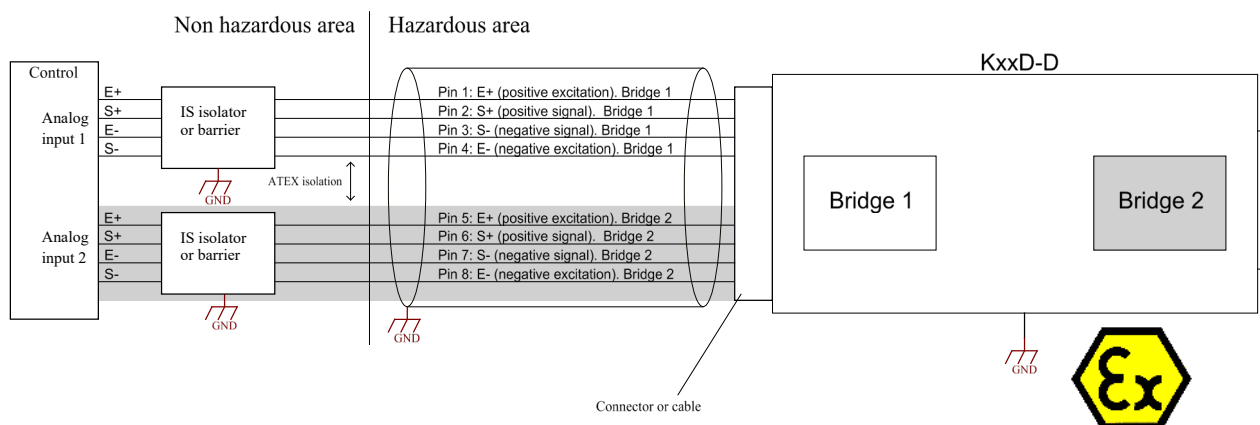
\* Deviations may occur in customer specific types.

# 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 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.