

## 1. Description of BROSA tension load cells

### 1.1 Structure and function

The BROSA type 0111 and 0113 tension load cells transmit and measure the tensile and / or compressive force between two pins, which are connected by the tension load cell. Figure 1 shows the typical structure:

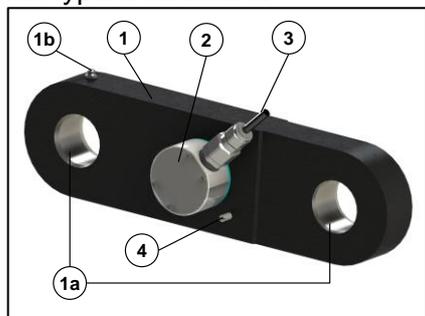


Figure 1: Structure of the tension load cell

The tension load cell consists of a rectangular measuring body which takes on the load (1), the ends of which have holes (1a) for mounting connecting pins. By default, the bore axes are parallel, special designs with holes arranged at an angle to each other (e.g. 90°) are possible. Fork ends (single- or double-sided) are available. In some cases, a connection support (2) firmly connected to the measuring body exists, on which - if not placed directly on the measuring body - the necessary elements for the electrical connection (plug or cable, 3) are attached and which - if not placed in the measuring body - contains the measurement electronics. Optionally, the measuring body can contain elements to lubricate the bearing (1b). The Ex d type 0113 tension load cell is always equipped with a threaded pin (4) for electrical potential equalisation (optional in the other types). On special request, the holes can be provided with plain or spherical bearings. BROSA tension load cells are by default equipped with a surface coating (primer or paint for use in continental or maritime environments); by special order, tension load cells made of stainless steel are available.

Figure 2 shows the typical installation conditions:

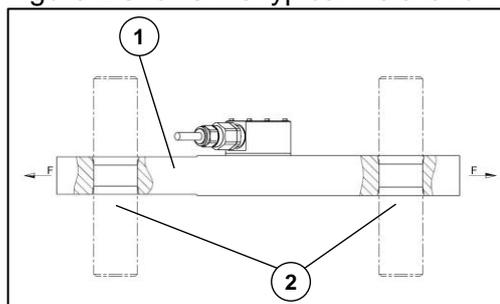


Figure 2: Installation conditions

The tension load cell (1) is connected to the adjacent components with bolts (2). Force F transmitted from the connection is transmitted to the measuring electronics through analysis of the resulting deformation of the measuring body and output as an electric signal.

Versions with two measuring systems, either with output signals on separate connectors / cables or combined in one plug / cable, are available as options. More information can be found in the technical data sheets, which may be obtained free of charge from BROSA.

### 1.2 Information on explosion protection

The type 0111 tension load cell is optionally available in an intrinsically safe version for use in potentially explosive atmospheres. The following specifications apply:

- Ignition protection type:
- Ex II2G Ex ib IIC T4 Gb
- Certificate number:
- BVS 03 ATEX E 241
- Safety-related limit values:
  - o Maximum voltage  $U_i = 26.4V$
  - o Maximum current  $I_i = 51mA$
  - o Internal capacitance  $C_i = 24nF + \text{cable capacitance}$
  - o Internal inductance  $L_i = \text{cable capacitance}$

**⚠ WARNING!** Use of intrinsically safe tension load cells in zone 0 is not allowed.

The Ex d type 0113 tension load cell is designed to be pressure-resistant and flameproof, and thus suitable for use in potentially explosive atmospheres. The following specifications apply:

- Ignition protection types:
  - o II 2G Ex d IIC T4 Gb / Ex d IIC T4 Gb
  - o II 2G Ex d IIB T4 Gb / Ex d IIB T4 Gb
- Certificate numbers:
  - o ATEX: BVS 10 ATEX E 156
  - o IECEx: IECEx BVS 15.0021
- Safety-related limit values:
  - o Active operational mode:
    - Input voltage  $U_E = 9 \dots 36 V DC$
    - Input current  $I_E = 5 \dots 100 mA$
  - o Passive operational mode:
    - Input voltage passive  $U_E = 1 \dots 10 V DC$
    - Input current  $I_E = 3 \dots 30 mA$

**⚠ WARNING!** Use of the Ex d tension load cell in zone 0 is not allowed.

### 1.3 Label (nameplate)

Each BROSA tension load cell is provided with a nameplate containing the information applicable for each variety. It is mounted on one of the outer surfaces of the tension load cell (see Fig. 3).

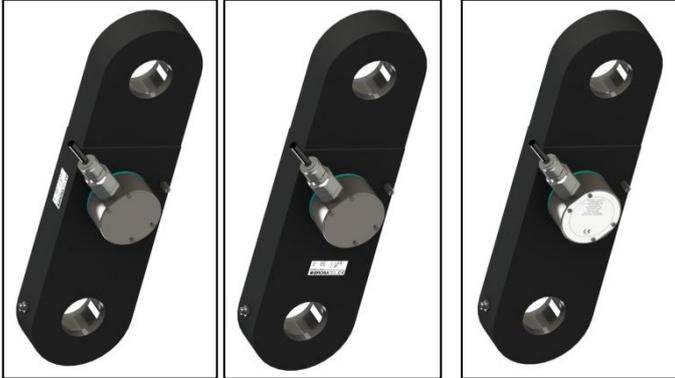


Figure 3: Nameplate positions

## 2. Advice on safe handling of BROSA tension load cells

**⚠ WARNING!** Non-compliance with the following instructions can lead to damage to the sensor and / or impaired measurement results. The analysis of an erroneous measurement can result in personal injury or material damage.

**⚠ WARNING!** Despite their sturdy design, BROSA tension load cells may not be used for any other than the intended purpose (see. Section 1.1). With improper use, dangers to life and limb of the user or third parties and / or impairment of the device in which the tension load cell is implemented or other material assets can arise.

### 2.1 Handling

**⚠ WARNING!** BROSA sensors contain quality measurement electronics. Make sure you handle them carefully.

- BROSA tension load cells are delivered in transport-safe packaging. We recommended that you remove the sensors from the package immediately prior to installation.
- The mass of the tension load cell is to be observed when selecting appropriate handling equipment and / or lifting gear; it is indicated on the nameplate.
- BROSA tension load cells must be secured against falling. Do not throw sensors!
- Use as a tool (e.g. striking, slotting or lever tool) is not permitted; it can cause damage to the sensor and thus falsify the measurement results.

## 2.2 Installation and commissioning

### 2.2.1 General

We recommended taking the following actions in the given order using the four-eye principle.

- a) Inspecting the sensor - measuring point assignment: It must be ensured that the sensor to be installed is designed for use at the intended measuring point. For this purpose, check information on the nameplate, in particular the item or the identification number and the measuring range, against the data of the measuring point.

**⚠ WARNING!** A sensor not designed for the respective measuring point must not be installed.

- b) Inspection of the sensor for intactness and function: It must be ensured that the sensor to be incorporated is free of damage of any kind.

**⚠ WARNING!** A damaged sensor must not be installed!

- c) Installation of the sensor in the measuring point: The holes of the tension load cell must be aligned flush with the corresponding holes in the measuring point; the bolts provided for the connection are to be inserted and secured in the holes.

**⚠ WARNING!** The tension load cell must not be installed using percussion or lever tools! Driving the bolts in by means of percussion tools is not permitted!

After installation, the bolts are to be secured against unwanted movement with the provided elements

**⚠ WARNING!** An incorrectly installed sensor leads to erroneous measurement results!

- d) Establishment of electrical connection: The elements on the sensor for the electrical connection are to be connected to the power supply and the evaluation system of the device. In doing so, the information given on the nameplate for plug or cable assignment and, if applicable, the installation guidelines of the cable are to be observed.

**⚠ WARNING!** An incorrect or incomplete electrical connection impairs or prevents measurement.

- e) Functional check: After completed mechanical (see c) and electric (see d) installation, load on the sensor is to be applied over the entire measuring range; the output measurement signals are to be subjected to a plausibility check.

**⚠ WARNING!** If, due to unusual events (e.g. deformation or unusual noise), measurement results are considered implausible or there is suspicion that

the sensor is malfunctioning for any other reason, it must not be put into operation.

## 2.2.2 Additional information for operation in areas subject to explosion hazards

**!** Only those sensors with the corresponding labels are approved for use in areas subject to explosion hazards.

If the open cable end is connected inside an area subject to explosion hazards, the connection must be inside a terminal box / switching cabinet certified in accordance with directive 94/9 EC. If it is connected outside an area subject to explosion hazards, it must be in line with the general requirements for electrical equipment.

### 2.2.2.1 Type 0111 in an intrinsically safe version

The sensors are to be installed in accordance with the following specifications:

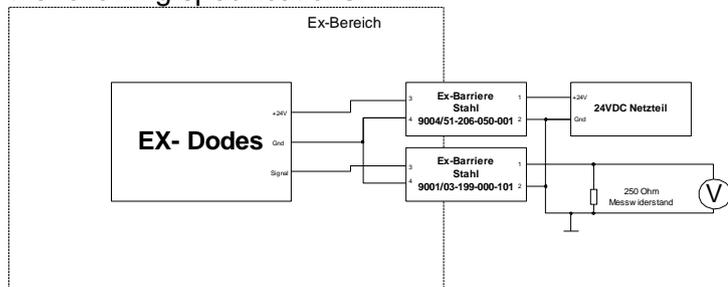


Figure 4: Connection example of Ex i sensor with EX-Dodes amplifier

The supply and the measurement signal are guided over barriers or isolation amplifiers in the areas subject to explosion hazards. Barriers from other manufacturers can also be used if they satisfy the safety-related limit values.

The connection cables in areas subject to explosion hazards must be approved for this application.

The 250 ohm resistor with parallel voltmeter in Figure 5 symbolises the input of the flow meter.

### 2.2.2.2 Type 0113

Close attention must be paid to the connection of the potential equalisation.

Cables supplied from BROSA are approved for use if they are fastened (strain-relieved) in areas subject to explosion hazards.

## 2.3 Operation and maintenance

### 2.3.1 Operation

BROSA tension load cells operate automatically; attaching tools is not required for operation. Direct manual intervention by the operator is not necessary; therefore, there are no requirements for the operator to wear protective equipment during operation. However, the relevant requirements for the device in

which the tension load cell is implemented must be observed.

BROSA tension load cells emit neither airborne acoustic noise nor non-ionising radiation.

Operation of BROSA tension load cells is permitted only within the parameters and properties given in the technical data sheets and on the nameplate. Among others, these are:

- Measuring range
- Temperature range
- Permissible supply voltage
- Electrical protection class
- Material

It must be ensured that no parasitic influences such as forces transverse to the measuring direction are led over the tension load cell.

Inductive or capacitive couplings to the connection cable(s) of the sensor can distort the measurement result and must be avoided. Some examples of these kinds of couplings are caused e.g. by unfavourable cable routing (parallel power lines, frequency converters, transformers, motors, incorrect grounding / shielding and the like).

When performing electric welding in the vicinity of the sensor, all connections must be disconnected and isolated. It must be ensured that no welding current is flowing through the sensor.

**!** **WARNING!** Operation outside the specified parameters or contrary to existing properties or improper use may damage the sensor and cause it to fail or output faulty measuring results. If the sensor is overloaded, this can lead to the overall machine being equally overloaded and possibly endangering its stability.

### 2.3.2 Maintenance

In its capacity as a sensor, BROSA tension load cells are maintenance-free. However, as load-transmitting elements, they are subject to mechanical stress, so every tension load cell must be checked regularly for proper condition and the bearing must be relubricated if necessary. The time between the inspections and, if necessary, the lubrication intervals depends on the intensity of use and must be determined by the end user.

An inspection includes the following points:

- Visual inspection for damage to the measuring body and wiring as well as soiling
- Function test / plausibility check

The causes of any errors are to be identified and remedied. If the test indicates an improper sensor state, it must be taken out of operation. If a malfunction or damage is detected on the sensor, it must be sent to the manufacturer's factory for diagnosis and, if necessary, repaired.

**!** **WARNING!** The sensor must only be repaired at the factory. Intervention (e.g. opening, mechanical

processing and the like) done by parties other than the manufacturer means the safe operation of the sensor is no longer ensured and voids the warranty.

## 2.4 Disassembly

We recommended performing the following actions in the given order.

- a) Establishment of load-free state in the measuring point: The tension load cell is to be unloaded before removal.

 **WARNING!** Removal of a tension load cell under load poses serious dangers to life and limb of bystanders and can cause major damage. This is therefore not permitted.

- b) Loosen the electrical connection
- c) Remove the bolts with the associated securing elements
- d) Remove the tension load cell

 **WARNING!** If the tension load cell is to be reused, it should not be removed by means of percussion or lever tools!

## 2.5 Disposal

If the end of the service life is reached, the tension load cell is to be taken to an environmentally-friendly disposal facility. Since the non-metallic components are a small proportion compared to the mass of the tension load cell, it can be recycled as a whole as scrap steel.

If the sensor is stored before final disposal, an appropriate storage location is to be selected which prevents harmful substances from entering the environment. If necessary, the sensor must be cleaned.

 **WARNING!** BROSA tension load cells contain traces of environmentally hazardous substances. This is also true of the impurities created during use. Contamination of the environment with these substances is to be prevented.

## EC/EU Declaration of Conformity

in terms of Directives  
2006/42/EC, Annex II Part 1 A,  
2014/30/EU, Annex IV and  
2014/34/EU, Annex X

Manufacturer: **BROSA AG**  
Dr.-Klein-Straße 1  
D-88069 Tettngang

On our own responsibility we hereby declare the products according to design/type

**Tension load cell type 0111**  
from serial number 16040001 onwards

to comply with the relevant regulations of the following directives:

**2006/42/EC Machinery Directive**  
**2014/30/EU EMC Directive**

Products according to the mentioned design as an ATEX intrinsically safe version are marked as such and additionally comply with the relevant regulations of the following directive:

**2014/34/EU ATEX Directive**

The type examination related with the latter directive has been carried out by the following notified body:

**DEKRA EXAM GmbH BVS 03 ATEX E 241**  
Dinnendahlstraße 9  
D-44809 Bochum Notified Body No. 0158

The requirements for production and testing of the product are defined in a quality and environmental management system certified according to ISO 9001 and ISO 14001.

Page 2 of this Declaration contains the standards harmonized with the mentioned Directives and applied to the products according to the mentioned design/type.

Tettngang, April 20<sup>th</sup>, 2016

  
**Martin Wagner**  
CEO

## EC/EU Declaration of Conformity

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2006/42/EC, Annex II Part 1 A,  
2014/30/EU, Annex IV and  
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Manufacturer: **BROSA AG**  
Dr.-Klein-Straße 1  
D-88069 Tettngang

On our own responsibility we hereby declare the products according to design/type

**Tension load cell Ex d type 0113**  
from serial number 16040001 onwards

to comply with the relevant regulations of the following directives:

**2006/42/EC Machinery Directive**  
**2014/30/EU EMC Directive**

**2014/34/EU ATEX Directive**

The type examination related with the latter directive has been carried out by the following notified body:

**DEKRA EXAM GmbH BVS 10 ATEX E 156**  
Dinnendahlstraße 9  
D-44809 Bochum Notified Body No. 0158

The requirements for production and testing of the product are defined in a quality and environmental management system certified according to ISO 9001 and ISO 14001.

Page 2 of this Declaration contains the standards harmonized with the mentioned Directives and applied to the products according to the mentioned design/type.

Tettngang, April 20<sup>th</sup>, 2016

  
**Martin Wagner**  
CEO

## List of applied, harmonized standards

2006/42/EG	
EN ISO 13849-1:2008 +AC:2009	Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
2014/30/EU	
EN 61000-6-2:2005 +AC:2005	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
EN 61000-6-3:2007 +A1:2011 +AC:2012	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments
EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
EN 61326-2-3:2013	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning
2014/34/EU	
EN 60079-0:2012 +A11:2013	Explosive atmospheres – Part 0: Equipment – General requirements
EN 60079-11:2012	Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"

Person authorized to compile the technical files:

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Dr.-Klein-Straße 1  
D-88069 Tettngang

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2014/30/EU	
EN 61000-6-2:2005 +AC:2005	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
EN 61000-6-3:2007 +A1:2011 +AC:2012	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments
EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
EN 61326-2-3:2013	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning
2014/34/EU	
EN 60079-0:2012 +A11:2013	Explosive atmospheres – Part 0: Equipment – General requirements
EN 60079-1:2007	Electrical apparatus for explosive gas atmospheres – Part 1: Flameproof enclosures "d"

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