

Operating Manual

BROSA Type 0120 Force Sensor Washer

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1 General information

Read the operating instructions and the product-specific documents carefully before commissioning the sensor.

Make sure that the sensor is fully suitable for the applications in question.

Improper use or any use other than intended may result in a malfunction of the sensor or undesirable effects in your application. For this reason, installation, electrical connection, commissioning and maintenance of the sensor may only be carried out by trained personnel authorized by the plant operator.

We also expressly point out that any liability is excluded if instructions in this documentation are disregarded.

Current certificates can be downloaded from the BROSA AG website.

Only the German version of this operating manual represents the original document.

1.1 Safety instructions – Explanation of symbols:



WARNING! This symbol indicates dangers that can lead to personal injury and property damage!

2 Description of the BROSA force sensor washer

2.1 Structure and functionality

The BROSA type 0120 force sensor washer transmits and measures the compressive force between two plane-parallel surfaces, the distance between which is mechanically bridged by the force sensor washer.

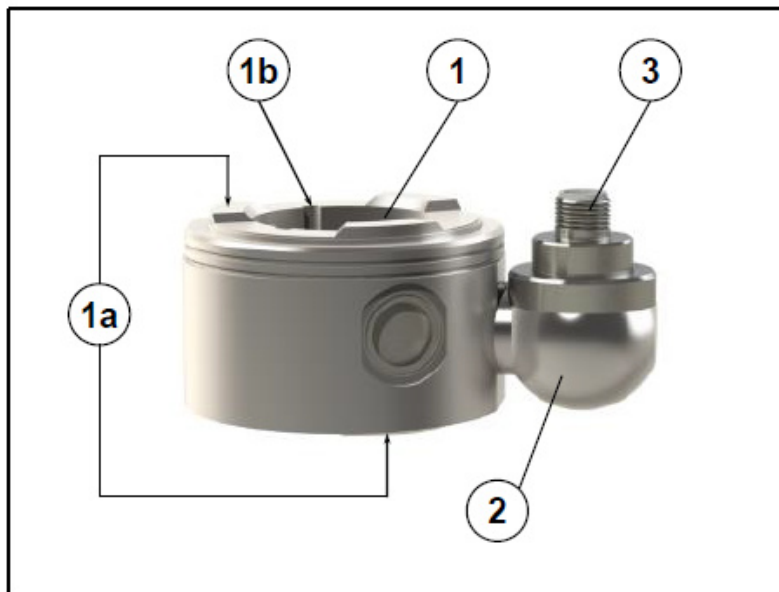


Fig. 1: Force sensor washer

The force sensor washer consists of a ring-shaped measuring body (1) that absorbs the load to be measured, the end faces of which have elevations to guide the force (1a). Elements for radial fixation and/or anti-twist protection (e.g., keyways (1b) or pin bores) can be attached to the inner and outer surfaces as well as to the end faces, depending on the application. In some cases, there is a connection support (2) firmly connected to the measuring body, 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. The measuring body and connection support, if applicable, are made of stainless steel.

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

The use below the water surface is generally possible after testing and approval by BROSA, special requirements are the used materials, the tightness and the electrical connections. In addition, there is the possibility that the water pressure impacts the measurement result.

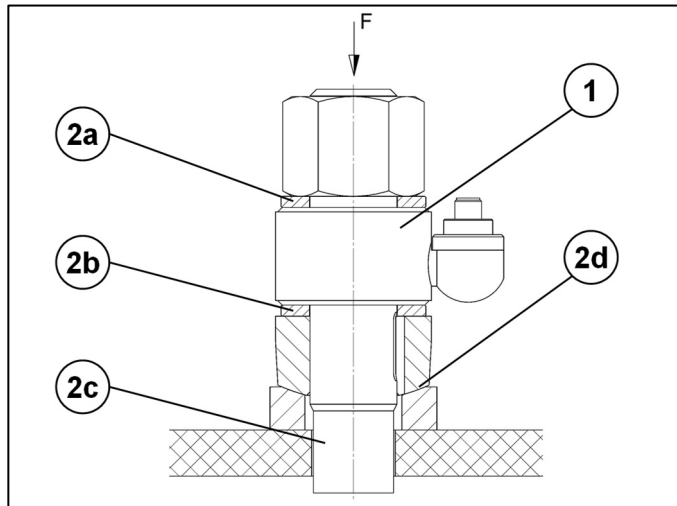


Figure 2: Installation conditions

The force sensor washer (1) lies between the two force-transmitting surfaces of the surrounding structure (2a, 2b). Due to the ring shape, force-carrying elements (2c) can be fed through the interior of the sensor to save space. The force F applied via the force sensor washer is transmitted to the measuring electronics by evaluating the resulting deformation of the measuring body and output as an electrical signal.

The two force-transmitting surfaces must be aligned plane-parallel to one another and maintain this property even under load. The surrounding structure should therefore be designed to be as rigid as possible. A spherical thrust bearing (2d) is advantageous for optimizing the force transmission.

The following properties are recommended for the properties of the force-transmitting surfaces:

- Flatness deviation max. 0.05 mm
- Surface roughness max. Rz 6.3 or Ra 0.8
- Surface hardness min. 50 HRC



WARNING! An insufficiently rigid surrounding construction, inadequate force transmission or inadequate surface condition of the force-carrying surfaces affect the measurement result!

2.2 Information on explosion protection

The type 0120 force sensor washer can be optionally obtained in an intrinsically safe design for use in environments subject to explosion hazards. This is done using a 2-wire amplifier ExDANGmicro2W_***. The following specifications apply:

Certificate number:	BVS 16 ATEX E 041	IECEX BVS 16.0031
Ignition protection type:	Ex II 2G Ex ib IIC T4 Gb	Ex ib IIC T4 Gb
Voltage	30 V DC	30 V DC
Current	100 mA	100 mA
Power	750 mW	750 mW
Effective internal capacitance	24 nF + 0.3 nF/m	24 nF + 0.3 nF/m
Effective internal inductance	3 μ H + 1 μ H/m	3 μ H + 1 μ H/m
Ambient temperature	-40 to +80°C	-40 to +80°C



The use of an intrinsically safe force sensor washer is not admissible in zone 0.

Current certificates can be downloaded from the BROSA AG website.


2.3 Label (nameplate, indication of measuring direction)


Each BROSA force sensor washer is equipped with a nameplate containing the respective information applicable for the given product. It is attached to one of the outer surfaces of the measuring body or the connection support (see figure 3).




Figure 3: Nameplate position

3 Advice on the safe handling of BROSA force sensor washers

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

 **WARNING!** Despite their sturdy design, BROSA force sensor washers 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 force sensor washer is implemented, or other material assets can be caused.

3.1 Handling

 **WARNING!** BROSA sensors contain high-quality measurement electronics. Make sure they are handled carefully.

- BROSA force sensor washers are delivered in transport-safe packaging. We recommended that you remove the sensors from the package immediately prior to installation.
- The mass of the force sensor washer is to be observed when selecting appropriate handling equipment and/or lifting gear; it is indicated on the nameplate.

- BROSA force sensor washers must be secured against falling. Do not throw sensors!
- Use as a tool (e.g., impact, slotting or lever tool) is not permitted; it can cause damage to the sensor and thus falsify the measurement results.

3.2 Installation and commissioning

3.2.1 General information

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 particular 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 force sensor washer is to be aligned on the intended contact surface according to the offer drawing.



WARNING! The force sensor washer must not be aligned using impact tools!

After alignment, the force sensor washer must be secured against movement and rotation using the elements provided for this purpose. Ensure that the force sensor washer is correctly aligned with the intended measuring direction (see marking on the face, see section 1.2)



WARNING! A misaligned 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, the earth connection if necessary, 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.

3.2.2 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 the ATEX-directive. If it is connected outside an area subject to explosion hazards, it must be in line with the general requirements for electrical equipment.

3.3 Operation and maintenance

3.3.1 Operation

BROSA force sensor washers operate automatically; attaching tools is not required for operation. Direct manual intervention by the operator is not necessary; there are therefore no requirements for the operator to wear protective equipment during operation. However, the requirements towards the device in which the force sensor washer is installed must be observed.

BROSA force sensor washers emit neither airborne acoustic noise nor non-ionizing radiation.

Operation of BROSA force sensor washers is permitted only within the parameters and properties given in the technical datasheets and on the nameplate. These are, among others:

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

It must be ensured that no parasitic influences such as forces or torques transverse to the direction of measurement are transmitted via the force sensor washer.

Inductive or capacitive coupling with the connection cable(s) of the sensor can distort the measurement result and must be avoided. Some examples of these kinds of couplings can be 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 can damage the sensor and cause it to fail or lead to faulty measuring results. If the sensor is overloaded, this can lead to the whole machine being equally overloaded and possibly endangering its stability.


3.3.2 Maintenance

In its capacity as a sensor, BROSA force sensor washers are maintenance-free. As load-transmitting elements, however, they are subject to mechanical stress, requiring regular inspections of the fault-free state of each force sensor washer. The intervals between inspections depend 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 contamination.
- Function test/plausibility check


The causes of existing 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 may 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 guarantee and warranty.


3.4 Disassembly

We recommend performing the following actions in the order given.

a) Ensuring freedom from loads at the measurement position: The force sensor washer should be unloaded before disassembly.

 **WARNING!** The disassembly of a force sensor washer under load leads to high risks to the life and limb of bystanders and can cause severe material damage. This is therefore not permitted.

- b) Undoing the electrical connection
- c) Remove the mechanical securing elements
- d) Removal of the force sensor washer

 **WARNING!** If the force sensor washer is to be reused, it must not be removed using impact tools!

3.5 Disposal

If the end of the service life is reached, the force sensor washer is to be disposed of in an environmentally friendly way. Since the non-metallic components constitute a small part of the mass of the force sensor washer, the rod may be recycled as a whole as scrap steel. BROSA sensors are usually made of stainless steel and can be disposed of accordingly.

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 force sensor washers contain traces of environmentally hazardous substances. This is also true of the impurities created during use. Contamination of the environment by these substances is to be prevented.

Translation of the original



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 Tettang

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

Force sensor washer type 0120
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.

Tettang, April 20th, 2016

Martin Wagner
CEO

Translation of the original



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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End of EC Declaration of Conformity