

Operating Manual

BROSA Type 0910 A-2-B Switch

English translation of German original operating manual

Version: 01/2022

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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 on 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 GmbH 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 A-2-B switch

2.1 Structure and function

The BROSA type 0910 A-2-B switch is a safety relay and is used on machines and systems, especially cranes, where it is necessary to trigger a safe stop command when the maximum permissible position of the hook block is reached. Figure 1 shows the typical structure:

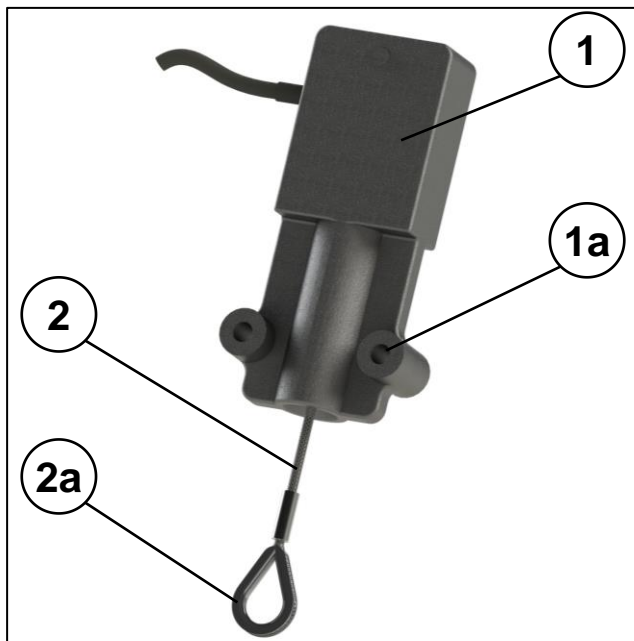


Figure 1: A-2-B switch

The A-2-B switch consists of a housing (1) that contains elements (1a) for connection to the surrounding structure and accommodates the mechanical and electrical switching system. The switching system is actuated via a pull cable (2), at the end of which there is a retaining ring (2a) for attaching a counterweight. The housing is made of aluminium alloy, the traction cable of galvanised steel. A special version with a pull cable made of stainless steel is available.

The A-2-B switch is connected to the surrounding structure using appropriate fasteners (e.g. screws). In operation, the weight attached to the retaining ring keeps the normally closed contact closed. When the crane block reaches the highest permissible position, the weight is lifted, the contact opens and the circuit is broken.

2.2 Technical data

Regulations:	EN 60947-5-1
Switching system:	Slow action, 1 NC or 1 NO / 1 NC
Connection type:	Shielded cable 4 x 1 mm ² , Core identification 1 - 4
Mech. lifespan:	1 million switching cycles
Actuation speed:	60 mm / min
Spring preload:	40.4 ± 3.6 N
After 7 mm travel:	48.5 ± 3.8 N
Weight force F _G :	Max. 5 kN
Utilisation category:	DC-13
U _e /I _e :	24 VDC / 1 A; 36 VDC / 0.8 A
Thermal continuous current I _{the} :	1 A
Protection class:	IP54, Switching element: IP67
Ambient temperature:	-40 to +80°C
Storage and transport temp.:	-40 to +80°C
Relative humidity:	Approx. 93%, non-condensing
Fatigue strength:	10 - 150 Hz (0.5 mm / 5 g)
Shock resistance:	30 g
Continuous shock:	10 g
Protection class:	II
Overvoltage category:	III
Degree of contamination:	3
Rated impulse withstand voltage U _{imp} :	2.5 kV
Rated insulation voltage U _i :	40 V
Short circuit protection:	6A gG type D fuse
Conditional rated short-circuit current:	1000 A


2.3 Safety consideration


Regulations:	EN ISO 13849-1
B _{10d} (NC contact) at 10% ohmic contact load:	2,000,000
Service life:	20 years

$$MTTF_d = \frac{B_{10d}}{0.1 \cdot n_{op}} \quad n_{op} = \frac{d_{op} \cdot h_{op} \cdot 3600s/h}{t_{cycle}}$$


((Data may vary depending on the application-specific parameters h_{op}, d_{op}, t_{cycle} and the load))

3 Advice on safe handling of BROSA A-2-B switches

 **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 and/or material damage.

 **WARNING!** Despite their sturdy design, BROSA A-2-B switches 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 angle sensor is implemented or other material assets can be caused.

3.1 Handling

 **WARNING!** BROSA safety relays contain high-quality electronics! Make sure you handle them carefully.


- BROSA A-2-B switch are delivered in transport-safe packaging. We recommended that you remove the safety relays from the package immediately prior to installation.
- BROSA A-2-B switches must be secured against falling. Do not throw safety relays!
- 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.

3.2 Installation and commissioning

3.2.1 General

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

- a) Checking the assignment of the safety relay to the measuring point: It must be ensured that the safety relay to be installed is intended for use at the intended installation location. For this purpose, the information on the technical data sheet and the nameplate, in particular, the item or ID number and the wiring, must be compared with the data of the measuring point.

 **WARNING!** A safety relay not designed for the respective measuring point must not be installed.

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



WARNING! A damaged safety relay must not be installed!

- c) Installation of the safety relay at the installation position: The hoist limit switch should be connected to the surrounding construction using the fasteners provided. The installation of the safety relay must be carried out while it is suspended; the maximum permissible deflection is $\pm 45^\circ$. The counterweight is to be attached to the retaining ring.



WARNING! The A-2-B switch must not be installed or aligned using impact tools!



WARNING! Sufficient space must be provided for the counterweight!

During or after installation, the fasteners may need to be secured against loosening and/or undesired movement using the elements provided for this purpose.



WARNING! An incorrectly installed safety relay will cause faulty switching!

- a) Establishment of electrical connection: The elements on the safety relay 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 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 the switching operation.

- b) Functional check: After the mechanical (see c)) and electrical (see d)) installation has been completed, the safety relay must be routed over the entire switching path; the switching status must be subjected to a plausibility check.



WARNING! If due to unusual events (e.g. deformation or unusual noise), the implausibility of the switching state or for other reasons the suspicion that the safety relay is malfunctioning, it must not be put into operation.

3.3 Operation and maintenance

3.3.1 Operation

BROSA A-2-B switches 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 specifications for the device in which the hoist limit switch is installed must be observed.

BROSA A-2-B switches emit neither airborne noise nor electromagnetic radiation.

Operation of BROSA A-2-B switches is only permitted within the scope of these instructions and the parameters and properties specified on the nameplate. Among others, these are:

- Temperature range
- Permissible supply voltage
- Electrical protection class

It must be ensured that no external loads are routed via the hoist limit switch.

Inductive or capacitive couplings to the connection cable(s) of the safety relay can distort the measurement result and must be avoided. Some examples of these kinds of couplings are: caused 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 safety relay, all connections must be disconnected and isolated. It must be ensured that no welding current is flowing through the safety relay.



WARNING! Operation outside the specified parameters or contrary to existing properties or improper use may damage the safety relay and cause it to fail or output faulty measuring results.


3.3.2 Maintenance

BROSA A-2-B switches are maintenance-free. Nevertheless, they are subject to mechanical stress, which is why every hoist limit switch must be checked regularly to ensure that it is in perfect condition. The inspection intervals 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 housing 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 the safety relay is not in suitable condition, it must be taken out of operation. If a malfunction or damage is detected on the safety relay, it must be sent to the manufacturer's factory for diagnosis and, if necessary, repaired.

 **WARNING!** The safety relay 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 safety relay is no longer guaranteed and voids the warranty.

3.4 Disassembly

We recommended performing the following actions in the given order.


- a) Loosen the electrical connection
- b) Removal of the mechanical fasteners and securing elements
- c) Removal of the hoist limit switch

 **WARNING!** If the A-2-B switch is to be reused, it must not be removed using impact tools!

3.5 Disposal

If the end of the service life has been reached, the hoist limit switch is to be taken to an environmentally-friendly disposal facility. Since the non-metallic components make up a small part of the mass of the force measuring sensor, it can be recycled as a whole as scrap.

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

 **WARNING!** BROSA A-2-B switches 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.