

Operating Manual

BROSA Type 0620 Limit switch

Translation of the original German Operating Manual

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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.

The specified properties apply exclusively in the unchanged delivery condition. Applicable standards and guidelines must be observed, especially when recoating.

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 Limit switch

2.1 Structure and function

A quick limit switch is required for the use of force-measuring sensors in time-critical switching processes. This has the job of quickly detecting an overload of a force measuring sensor with 4-20mA output ($T_{RSP} < 1\text{ms}$, or $T_{RSP} 30\text{ms}$) in order to be able to trigger an external switching element via transistor output (depending on the software version).

The limit switch is preferably installed in a machine housing (control cabinet) and operated at ambient temperatures of -20°C to 50°C .



Figure 1: Limit switch

2.2 Features / functions

- Input: measuring of a 4-20mA current signal (actual value), connected sensor can be in 2 or 3 wire technology
- Output: Output of this actual value also as corresponding 4-20mA signal
- Faster transistor switching output (24V DC for OK, 0V DC for error), see "2.5 Common functionality" reaction either $T_{RSP} < 1\text{ms}$ or $T_{RSP} 30\text{ms}$
- Supply 24V DC $\pm 10\%$, reverse polarity protection integrated (24V/GND line)
- Plastic housing for standard rail fitting NS35
- Display of 24V supply voltage present: green LED

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- Display "Overload/underload detection": red LED
 - Sensor power supply 24V DC/GND connection terminals
 - Analogue input for determining the switching point (limit value)
2V \triangleq 4mA, 10V \triangleq 20mA
 - Service interface: 2 voltage outputs referenced to ground for actual signal and current switching point "A" or "B" with pin strip or socket accessible from the outside
 - Terminal assignment - see "2.4 Commissioning / External connections"
 - Auto reset delay of the switching output approx. 1s if overload or wire breakage or short circuit is no longer present.

2.3 Functional description

2.3.1 Operating mode

A continuous monitoring of the activated limit value, wire breakage or short circuit takes place in operation mode. If a limit value is exceeded or wire breakage or short circuit take place (error events) the alarm output within a response time of $T_{RSP} < 1\text{ms}$ or $T_{RSP} 30\text{ms}$. If there are no longer any error events, the alarm output is reset after approx. 1s after an auto-reset delay of T_{SRZ} approx. 1s. The user is shown the status of the alarm output via a red LED. The limit value can be set via an analogue input of 0-10V. The wire breakage or short circuit is detected via a fixed, specified threshold value (3mA, not configurable).

Error events are:

- Limit value exceeded (current input)
- Wire breakage or short circuit (current input)
- Internal error

2.3.2 Bootloader mode

This mode is required for an update of the application software. The mode is activated via the corresponding connection on DV_Progbox and link to SensorCON. Using SensorCON, a new application software can now be downloaded. After successfully downloading the software, it starts automatically.

2.4 Commissioning / External connections

Schematic overview of the connection terminals of the limit switch.

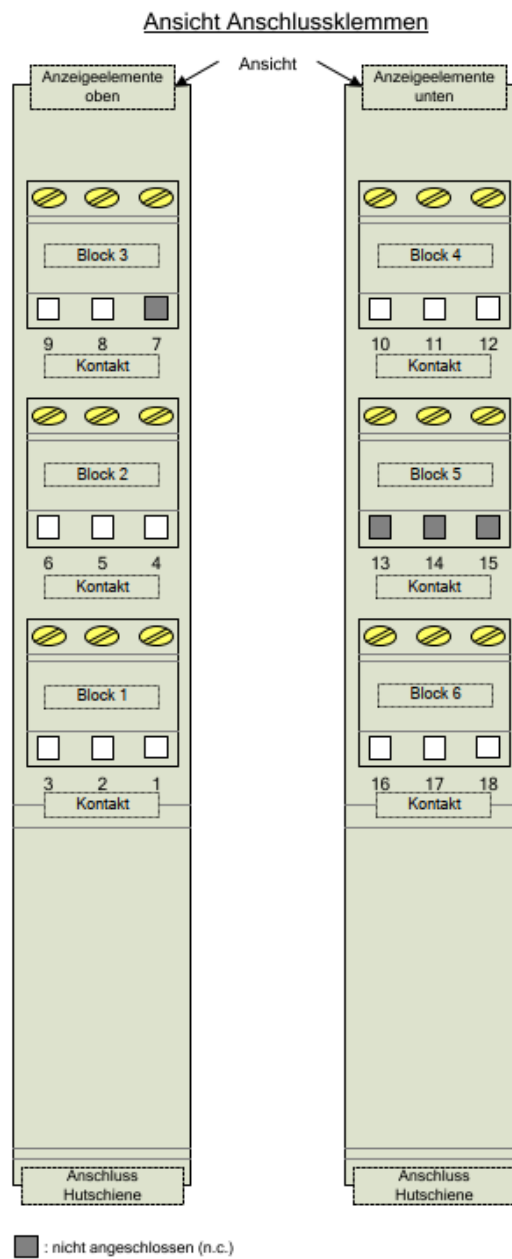


Figure 2: External connections

Description contacts / terminal blocks:

| Description / Drawing | Description | E-plan (120-1020/3a) No. / Identifier |
|-----------------------|--|---------------------------------------|
| Contact1 / Block1 | 24 volt power supply / VDD (DC 24V) power supply | "1" |
| Contact2 / Block1 | GND input power supply / GND power supply | "2" |
| Contact3 / Block1 | PE (ground terminal) / PE earthing <u>Note:</u> PE is also contacted via a top hat rail. | "PE" |
| Contact4 / Block2 | 24 volt output / Ub + (DC 24V) | |
| Contact5 / Block2 | GND for analogue input 0..10V / GND analogue voltage input ground | |
| Contact6 / Block2 | Analogue input 0..10Volts Input for target value of the switching point (limit value) / Analogue voltage Input (2-10V \pm 0..100%) Standardisation: 0V \pm 0mA 2V \pm 4mA \pm 0% 10.0V \pm 20mA \pm 100% | "6" |
| Contact7 / Block3 | not connected (n.c.) | n.c. |
| Contact8 / Block3 | GND digital switching output / GND digital output ground | |
| Contact9 / Block3 | Digital switching output 0V/24V. / pnp digital output Output of the switching output <ul style="list-style-type: none"> • 24 Volts: The limit value has not been exceeded nor cable break detection has been triggered. • 0 Volt: Limit value is exceeded or cable break detection has been triggered. | "9" |
| Contact10 / Block4 | 24 volt output sensor power supply / Ub+ (DC 24V) analogue input power | "10" |
| Contact11 / Block4 | GND analogue input (4-20mA) / GND analogue input ground | "11" |
| Contact12 / Block4 | Analogue input (4-20mA) Current input Sensor actual value [I _{SIG}] / Analogue Signal Input (4..20mA \pm 0..100%) | "12" |

| | | |
|-----------------------|---|------|
| Contact13 / Block5 | not connected (n.c.) | n.c. |
| Contact14 / Block5 | not connected (n.c.) | n.c. |
| Contact15 / Block5 | not connected (n.c.) | n.c. |
| Contact16 / Block6 | 24 volt output / Ub+ analogue output power | |
| Contact17 / Block6 | GND current output / GND analogue output ground | |
| Contact18 / Block6 | Current output 4-20 mA (input current is output mirrored here). / Active analogue Output (4-20mA) | "18" |

2.5 General functionality

2.5.1 Overview Control and indicator elements

Description of the indicator elements:

- Error LED (red)
Display an error (e.g. cable break).
Flashes when an error occurs.
- Output LED (red) on when switching output status overloaded. Reflects the status of the switching output.
- Power LED (green)
24 volt supply present.

Measuring points:

- SIG
Actual value measuring signal [0..2Volt] \cong 0..20mA [I_{SIG}]
- SW
Setpoint measuring signal (switching point) [0..2Volt] \cong 0..1
- Service interface:
- BE
Bootloader enable. Activates the bootloader (active with GND potential).
- PRG
Programming input
- GND
Earth (ground) for PRG and BE

Note:

The service interface is not generally accessible but intended only for service technicians (e.g. for firmware update). The interface is located behind the cover and is not visible to the customers!

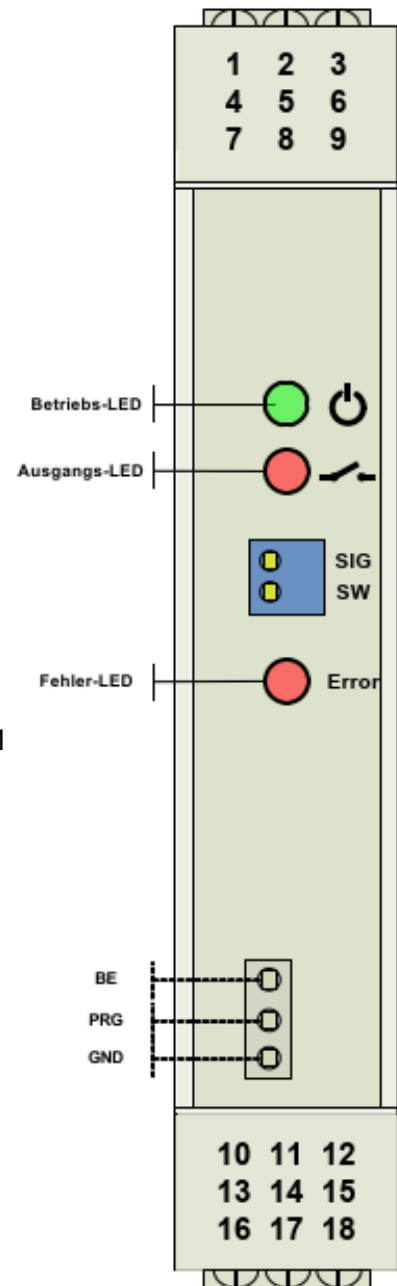


Figure 3: Front view
Display elements above

| | |
|---------------------------------|--|
| Alarm LED (red) | Display element: Displays the current status of the alarm output on. LED ON: Alarm is pending. LED OFF: No alarm is pending. |
| Power LED (green) | Display element: Displays the current status of the supply voltage output. LED ON: present. LED OFF: not present. |
| Measuring point: S | Measuring point : Output of the target value for the current limit value. Connection for voltmeter (based on GND). Is required for the setting and control of the limit values. |
| Measuring point: I | Measuring point : Output of the actual value. For connection to voltmeter (based on GND). Is required for control measurements of the actual value. Assignment of voltage to input power 0.1 volts = 1mA |
| Measuring point : GND | Measuring point : Reference potential for measurement on S and I as well as for the programming interface PRG |
| Measuring point: PRG | Measuring point : Programming interface for the programming unit (based on GND). <u>Caution:</u> No voltage must be present here which exceeds 5 volts, this will damage the processor. |

2.5.2 Visualisation of current modes of operation

The visualisation is done via the internal LED on the processor board.

| Operational modes | Description |
|-------------------|--|
| • Operating mode | cyclic blinking 1 sec. |
| • Start-up | <ul style="list-style-type: none"> • Variant $T_{RSP} < 1\text{ms}$: 2x flashing • Variant $T_{RSP} \sim 30\text{ms}$: 5x flashing |
| • Mode bootloader | <ol style="list-style-type: none"> 1. cyclic blinking with 0.5 sec. 2. After 5 sec. is branched in the bootloader. 3. LED remains on after that. 4. Then you have to set the operating modes in service mode or operating mode, otherwise the boot loader will restart after loading a new application software! 5. Download and start a new application software via SensorCON. |

Note:
 If the bootloader is unintentionally started, the current application can only be restarted through the interruption of the supply voltage!
Before this, make sure the operating modes are set to service mode or operating mode, otherwise the bootloader will restart!

2.5.3 Visualisation in the event of an error

The visualisation of an internal error has priority. In other words, the current operating mode is not shown until the error is fixed!

The error bit / priority and error number assignment is shown in the table below.

Overview table:

| Error byte (8-bit) | Meaning | Priority 1: highest | Error number (Display) |
|---------------------------|--|------------------------|---------------------------|
| 0x01 | | 1 | 1 |
| 0x02 | | 2 | 2 |
| 0x04 (ERROR_HW_EEPROM) | Flash data corrupt (e.g. CRC sum error) | 3 | 3 |
| 0x08 | | 4 | 4 |
| 0x10 | | 5 | 5 |
| 0x20 | | 6 | 6 |
| 0x40 | | 7 | 7 |
| 0x80 | | 8 | 8 |

It only displays the errors with the highest priority. If an error is eliminated, the error is represented with the next priority. If there is no error, the current mode of operation is displayed again.

Example of the display of error bit 0x04 / error number 3:

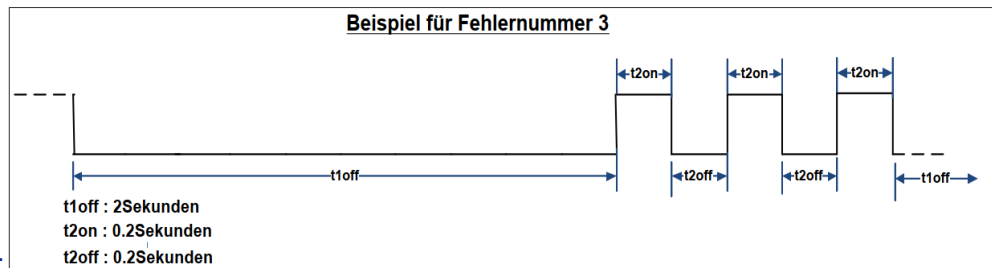


Figure 4: Example
for error bit
representation

3 Advice on safe handling of BROSA limit 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 limit 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 limit switches are delivered in transport-safe packaging. We recommend that you remove the safety relays from the package immediately prior to installation.
- BROSA limit 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 recommend 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!



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



WARNING! An incorrect or incomplete electrical connection impairs or prevents the switching operation.



WARNING! If, due to the perception of unusual circumstances, in particular implausibility of the switching state or for other reasons, there is a suspicion that there is a malfunction of the safety relay, it must not be put into operation.

3.3 Operation and maintenance

3.3.1 Operation

BROSA limit switches operate automatically; 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 requirements towards the device in which the limit switch is installed must be observed.

BROSA limit switches emit neither airborne noise nor electromagnetic radiation.

Operation of BROSA limit 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

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 limit switches can operate without maintenance. Nevertheless, each limit switch must be checked regularly for proper 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 recommend 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

3.5 Disposal

If the end of the service life is reached, the limit switch is to be taken to an environmentally-friendly disposal facility.

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 limit 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.