
Limit Switch Boxes

SRBC-SRBE-SRBK SERIES

SAFETY MANUAL

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1 Functional Specification

The safety function used in the limit switch boxes object of this Manual is defined as follows:

- a. For all versions, when an unsafe condition is detected in a plant by a process sensor, the controller, via the control panel, drives the overall system in a safety position requested by the plant design and function. The choice of the safety function to be implemented is responsibility of the system integrator.

2 Configuration of the product

The limit switch boxes series are defined as follows:

- a. SRBC/SRBE/SRBK (without EX6) series – Limit switch boxes, technopolymer, aluminum or stainless case, some versions with Exd protection, with electro-mechanical switches or inductive sensor or magnetic sensors, with bottom flange for connection to actuator, EU certifications.
- b. SRBE-...-C1 series – Limit switch boxes, technopolymer, aluminum or stainless case, some versions with Exd protection, with electro-mechanical switches or inductive sensor or magnetic sensors, with bottom flange for connection to actuator, UL/CSA certifications.
- c. SRBC-...-EX6 / SRBK-...-EX6 series – Limit switch boxes, aluminum or stainless case, Exi protection, with electro-mechanical switches or inductive sensor or magnetic sensors, with bottom flange for connection to actuator, ATEX, IECEx, CSA certification

Boxes from all series are provided either in:

- a. Std version

SRBK	-20°C < T ambient < +80°C
SRBC	
SRBE	-20°C < T ambient < +60°C
SRBK-...-EX6	-20°C < T ambient < T depending on sensor/switch type and available voltage/power in the plant – see tech. specifications
SRBC-...-EX6	

- b. Low Temp version

All series	Tmin depending on sensor/switch type and available voltage/power in the plant – see tech. specifications
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For details on specific design and characteristics please refer to user manuals.

3 Service condition limitations (Limitation of Use)

The operating condition limits are defined as follows:

- a. Temperature – Temperature range depends on specific version installed (standard or Low Temp) and is reported on the product label.
- b. Electrical ratings – Electrical ratings depend on specific sensor/switch installed into the housing. Please refer to technical documentation and to label data for exact specifications.

4 Average Frequency of Dangerous Failure per Hour

Limit Switch Box Frequency of Dangerous Failure, closely connected to expected Lifetime, strongly depends on environment conditions, work cycles and plant characteristics. With a FMEDA Analysis, under “High Demand” or “Continuous” service and in case of proper inspections, expected Average Frequency of Dangerous Failure per Hour is:

$$PFH = 6.6736 \times 10^{-8}$$

5 Failure Modes and Estimated Failure Rates

With specific detail on failure mode, FMEDA analysis gives following numbers as per frequency of failures:

λ_{DD} (dangerous detected)	1.3187×10^{-8}
λ_{DU} (dangerous undetected)	4.3958×10^{-9}
λ_S (safe failure)	4.9153×10^{-8}

No internal diagnostic is included in the device.

6 Periodic Proof Test and Maintenance Requirements

Please consider that the information in this paragraph are relevant only in regards of Reliability Tests; please refer to user Manual for information about product management, handling and storage.

Tests may be carried out to increase system reliability.

“On site” tests depend on Project/Plant facilities/requirements; however, a functional test must be executed on site, before actual usage of the device. Carefully verify proper sealing of the device and the use of proper plugs/cable glands.

Limit Switch Boxes series SRBC/SRBE/SRBK (without EX6) and SRBE-...-C1 are supposed to run with “High Demand” or “Continuous” service, so full stroke and/or partial tests makes no sense. However, when disposing the boxes for a long time (> 1 week), provide for a full test before actually restarting it.

For limit switch boxes, there is not a prescribed fixed time interval for maintenance. Wear of internal parts depends on cycle number, so we recommend inspections every 100.000 work cycles, in order to verify correct function. Following parameters shall be verified: proper performance, internal and external wear of moving parts, electrical connections. Harsh environmental conditions or heavy workloads may suggest to increase inspection frequency. For standard servicing, please refer to Manual.

7 Hardware Fault Tolerance

The HFT of the device is 0.

8 Classification

The device is classified type A According to IEC 61508-2.

9 Safe Failure Fraction

The SFF is 93.42%

10 Mean Repair Time

Typical Mean Repair Time is 8h.

11 Mean Time Between Failures

MTBF = MTTF = 1.498×10^7 h

$\beta = 0.10$

12 Systematic Capability

The Systematic Capability of the device is 3.

The Systematic Capability is guaranteed only if the user:

- use the device according to the instructions for use and standard Manual;
- use the device in the appropriate environment (see “Limitation of use”).