



FUNCTIONAL SAFETY CERTIFICATE

This is to certify that the

Proximity switch models: 10 & 20 Series

manufactured by

Topworx, Inc.

3300 Fern Valley Road

Louisville

Kentucky 40213

USA

have been assessed by CSA Group Testing UK Ltd with reference to the CASS methodologies and found to meet the requirements of

IEC 61508-2:2010 Routes 1_H & 1_s Systematic Capability (SC3)

as an element/subsystem suitable for use in safety related systems performing safety functions up to and including

SIL 2 capable with HFT=0 (1oo1)*

when used in accordance with the scope and conditions of this certificate.

* This certificate does not waive the need for further functional safety verification to establish the achieved Safety Integrity Level (SIL) of the safety related system

Certification Decision:

James Lynskey

Initial Certification : 12th June 2012
This certificate re-issued : 23rd September 2022
Renewal date : 11th June 2027

This certificate may only be reproduced in its entirety, without any change.



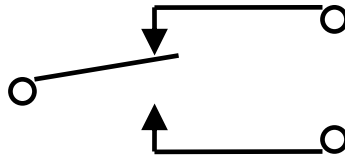
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Form 7016 issue 7
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Product description and scope of certification

The magnetic proximity switches incorporate a permanent magnet to create a magnetic field which is interrupted by an external ferrous or magnetic object as it comes within the switch's sensing range. This interaction causes an armature in the switch to snap to its alternative position and thereby change the state of the electrical contacts.



Form C - SPDT

Figure 1: Electrical contacts used in safety functions

The 10 & 20 series are available with SPDT switch contacts as shown in Figure 1 above. All switches use the same mechanism and are housed in a stainless steel or brass rectangular enclosure.

Element Safety Function

The product's functionality which has been assessed for use in safety functions is:

- To close the normally open (N/O) contacts in response to the proximity of a ferrous object
- To open the normally closed (N/C) contacts in response to the proximity of a ferrous object



Certified Data in support of use in safety functions

The assessment has been carried out with reference to the *Conformity Assessment of Safety-related Systems (CASS)* methodology using the Route 1_H approach.

A Failure Mode and Effect Analysis (FMEA) has established the failure modes and predicted the random hardware failure rates. Summary details are shown below.

10 & 20 Series of proximity switch		
<u>Safety Function:</u> <i>'To open the normally closed (N/C) contacts in response to the proximity of a ferrous object'</i>		
10, 20 Series		
Architectural constraints:	Type A HFT = 0 (SPDT only) SFF = 63%	SIL 2
Probability of Dangerous failure on safety function:	PFH = 3.40E ⁻⁰⁷	SIL 2
Overall SIL-capability achieved ^[3]	SIL 2 (Based on SPDT variant)	
Hardware safety integrity compliance ^[1]	Route 1 _H	
Systematic safety integrity compliance ^[1]	Route 1 _s	
Systematic Capability ^[2]	SC 3	
<u>Safety Function:</u> <i>'To close the normally open (N/O) contacts in response to the proximity of a ferrous object'</i>		
10, 20 Series		
Architectural constraints:	Type A HFT = 0 (SPDT only) SFF = 30%	SIL 1
Probability of Dangerous failure on safety function:	PFH = 6.40E ⁻⁰⁷	SIL 2
Overall SIL-capability achieved ^[3]	SIL 1 (Based on SPDT variant)	



Hardware safety integrity compliance ^[1]	Route 1 _H
Systematic safety integrity compliance ^[1]	Route 1 _s
Systematic Capability ^[2]	SC 3

^[1] These are parameters used in IEC61508 Part 2 Sections 7.4.2 & 7.4.4.

^[2] This is a measurable scale for the systematic safety integrity level; refer to IEC61508 Part 4 Section 3.5.9.

^[3] This is determined by the lowest SIL indicated by each of the parameters given above.



The failure data above is supported by the base information given in Table 2 below.

Table 2: Base information

1	Product ID:	Leverless limit switch series 10 & 20, as described in Manufacturer's product catalogue BR000163ENUS-01_08-20 Rev 1, and Manufacturer's Installation, Operations & Maintenance (I, O & M) manual ES-08799-1 Rev AB
2	Functional specification:	SPDT switch contacts change state in response to the proximity of a ferrous object. Full specification given in Manufacturer's product catalogue.
3	Environment / stress criteria:	Failure rates modelled using 'Ground; stationary; non-weather protected' conditions.
4	Environment limits:	Operational temperature range: -40 to +105°C standard -40 to +204°C extended
5	Lifetime limits:	The mechanical lifetime limit is 10 years or 10 million cycles (whichever occurs first) and the electrical lifetime limit is 200,000 cycles. Details are given in CSA report R80040385A.
6	Maintenance requirements:	Refer to I,O & M ES-08799-1 Rev AB
7	Repair constraints:	Refer to I,O & M ES-08799-1 Rev AB
8	Hardware fault tolerance:	0 (SPDT variant)
9	Highest SIL:	SIL 2
10	Systematic fault tolerance measures:	None other than compliance with user instructions (Table 1 above)
11	Validation records:	Refer to Manufacturers validation documents assessed in Sira report R56A17769A and in CSA report R80040385A
12	Type A / Type B:	Type A (simple)
13	Proof Test Interval:	Refer to table above
14	Mean Time to Repair (MTTR):	User defined / application dependent
15	Systematic Capability:	SC3
16	Systematic fault avoidance measures:	Refer to the lifecycle and management report 56A24114B
17	Systematic fault tolerance measures:	Refer to the lifecycle and management report 56A24114B

Management of functional safety

The assessment has demonstrated that the product is supported by an appropriate functional safety management system that meets the relevant requirements of IEC 61508-1:2010 clause 6, see report R56A24114B.



Identification of certified equipment

The certified equipment and its safe use is defined in the manufacturer's documentation listed in Table 3 below.

Table 3: Certified documents

CSA ID	Document no.	Rev	Date	Document description
CERT-ES-08427-1	1	AA	27 Feb 2019	General assembly
ES-08423-1		AA	24 June 2020	MAGNET SUB-ASSEMBLIES 10-20 SERIES SWITCHES
ES-06880-1	1	6	28 March 2019	10/20 SPDT ARMATURE OVERMOLDED ASSEMBLY
ES-08799-1	2	AB	-	Installation, Operations and Maintenance Manual

Conditions of Certification

The validity of the certified base data is conditional on the manufacturer complying with the following conditions:

1. The manufacturer shall analyse failure data from returned products on an on-going basis. CSA Certification Service shall be informed in the event of any indication that the actual failure rates are worse than the certified failure rates. (A process to rate the validity of field data should be used. To this end, the manufacturer should co-operate with users to operate a formal field-experience feedback programme).
2. CSA shall be notified in advance (with an impact analysis report) before any modifications to the certified equipment or the functional safety information in the user documentation is carried out. CSA may need to perform a re-assessment if modifications are judged to affect the product's functional safety certified herein.
3. On-going lifecycle activities associated with this product (e.g., modifications, corrective actions, field failure analysis) shall be subject to surveillance by CSA in accordance with 'Regulations Applicable to the Holders of CSA Group Testing UK Ltd Certificates'.
4. The manufacturer shall perform further testing and/or analysis (e.g. a comparison of the relative wear at different voltage and current ratings) to reinforce or refine the stated electrical lifetime limit for AC and DC switching. Testing should cover the condition/s which are worst for electrical life. This will be assessed by CSA in the next Surveillance/Recertification audit (expected to occur before June 2022).

Conditions of Safe Use

The validity of the certified base data in any specific user application is conditional on the user complying with the following conditions:

1. The user shall comply with the requirements given in the manufacturer's user documentation in regard to all relevant functional safety aspects such as application of use, installation, operation, maintenance, proof tests, maximum ratings, environmental conditions, and repair.
2. Selection of this product for use in safety function and the installation, configuration, overall validation, maintenance and repair shall only be carried out by competent personnel, observing all the manufacturer's conditions and recommendations in the user documentation.
3. All information associated with any field failures of this product should be collected under a dependability management process (e.g., IEC 60300-3-2) and reported to the manufacturer.



4. The safety device is to have an independent power supply, it must not share the same power supply as non-safety devices that may cause a fault to the safety device.
5. A proof test interval of 1 year.

General Conditions and Notes

1. This certificate is based upon a functional safety assessment of the product described in CSA Test & Certification Assessment Report R70118946A and any further reports referenced (R80040385A).
2. If the certified product or system is found not to comply, CSA Group Testing UK Ltd should be notified immediately at the address shown on this certificate.
3. The use of this Certificate and the CSA Certification Mark that can be applied to the product or used in publicity material are subject to the 'Regulations Applicable to the Holders of CSA Group Testing UK Ltd Certificates' and 'Supplementary Regulations Specific to Functional Safety Certification'.
4. This document remains the property of CSA and shall be returned when requested by the issuer.
5. No part of the Functional safety related aspects stated in the instruction manual shall be changed without approval of the certification body.
6. This certificate will remain valid subject to completion of two surveillance audits within the five year certification cycle, and upon receipt of acceptable response to any findings raised during this period. This certificate can be withdrawn if the manufacturer no longer satisfies scheme requirements.

Certificate History

Issue	Date	Report no.	Comment
02	27/06/2017	R70118946A	Certificate reissued as a result of successful recertification.
03	04/09/2018	-	Minor changes to reflect systematic capability.
04	21/09/2021	R80040385A	Certificate updated following the assessment of a design modification to simplify manufacturing.
05	24/06/2022	-	3-month certificate extension for recertification audit.
06	23/09/2022	R80132073A	Certificate renewed following successful recertification audit.

