FUNCTIONAL SAFETY CERTIFICATE

This is to certify that the

GKM-Series Global Miniature Safety Key Operated Switch

Manufactured by

Honeywell International Inc.

315 East Stephenson Street,
Freeport, Illinois,
IL61032,
USA.

Has been assessed by Sira Certification Service with reference to the Hardware and Systematic Safety Integrity 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)*
SIL 3 capable with HFT=1 (1oo2)*

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 Manager:
Mr. W Thomas

Initial Certification:	25/03/2010
This certificate issued:	03/07/2015
Renewal date:	15/06/2020

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Product description and scope of certification

The GKM-Series Global Miniature Safety Key Operated Switch is a key operated switch intended for small doors and apertures in industrial machinery. The switch is fitted with two pairs of switching contacts (available in several configurations), has a glass filled polyester housing sealed to IP67 and is provided with either an integral cable or with direct terminations.

Figure 1: Final Assembly of the GKM-Series Global Miniature Safety Key Operated Switch.

Use in safety function(s)

The functionality of the certified device that has been assessed for use by safety functions is to open the normally closed (NC) switch contacts on removal of the key.

The user should note the number of cycles for which the safety-related data is valid.

Certified Data in support of use in safety functions

The assessment has been carried out with reference to IEC61508:2010 for Hardware Safety Integrity using the Route 1_H approach and the *Conformity Assessment of Safety-related Systems* (CASS) methodology for Systematic Safety Integrity using the Route 1s approach.

Based on the documents submitted by Honeywell Control Systems Ltd, the Failure Mode and Effect analysis (FMEA) of the GKM-Series Global Miniature Safety Key Operated Switch has verified the documents as evidence of conformity to IEC61508-2:2010 in respect of hardware and systematic safety integrity. Component failure rates have been sourced using Item software reliability package and RIAC automated data book. The table below summarizes the FMEA assessment.

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Table 1; FMEA results of the GKM-Series Global Miniature Safety Key Operated Switch

Define Safety Function: The functionality of the certified device that has been assessed for use by safety functions is to open the normally closed (NC) switch contacts on removal of the key. The user should note the number of cycles for which the safety-related data is valid.					
Summary of IEC 61508-2 Clauses 7.4.2 and 7.4.4		GKM-Series Global Miniature Safety Key Operated Switch		**Verdict**	
Architectural constraints & Type of product A/B		**HFT=0**	**HFT=1**	**Type A**	
Safe Failure Fraction (SFF)		**83%**	**83%**	**HFT=0** SIL 2	**HFT=1** SIL 3
Random hardware failures: [h^{-1}]	λ_{DD} λ_{DU}	**0.00E+00** **2.85E-08**	**0.00E+00** **2.86E-09**		
Random hardware failures: [h^{-1}]	λ_{SD} λ_{SU}	**0.00E+00** **1.41E-07**	**0.00E+00** **1.43E-08**		
Diagnostic coverage (DC)		**0.00%**	**0.00%**		
PFD @ PTI = 730Hrs MTTR = 8 Hrs		**1.25-E-04**	**1.25-E-05**		
Probability of Dangerous failure (High Demand - PFH) [h^{-1}]		2.85E-08	2.86E-09		
Hardware safety integrity compliance		Route 1_H			
Systematic safety integrity compliance		See report R70017229C (Route 1_s)			
Systematic Capability (SC1, SC2, SC3, SC4)		**SC3**			
Hardware safety integrity achieved		**SIL 2 achieved with HFT=0** **SIL 3 achieved with HFT=1**			

Note 1: The failure data:

1) Failure rates stated in the above tables are in units of failures per hour
2) The PFD_{AVG} figure shown is for illustration only assuming a proof test interval of 8760 hours and MTTR of 8 hours. Refer to IEC 61508-6 for guidance on PFD_{AVG} calculations from the failure data.
3) The failure rates do not include no parts failures.

Table 2: Conditions for maintaining safety integrity capability

1	Product identification:	GKM-Series Global Miniature Safety Key Operated Switch
2	Functional specification:	The functionality of the certified device that has been assessed for use by safety functions is to open the normally closed (NC) switch contacts on removal of the key. The user should note the number of cycles for

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		which the safety-related data is valid.
3-5	Random hardware failure rates:	Refer to table 1 above.
6	Environment limits:	Temperature Range: -25°C to +85°C Operational
7	Lifetime/replacement limits:	Mechanical endurance: Sira TA 09001/02 Electrical endurance: Sira TA 09011/02
8	Proof Test requirements:	Refer to Installation Instructions (GKM Series), document number XP-4042.
9	Maintenance requirements:	Refer to Installation Instructions (GKM Series), document number XP-4042.
10	Diagnostic coverage:	0%, no diagnostics are available.
11	Diagnostic test interval:	No diagnostic testing is available.
12	Repair constraints:	Refer to Installation Instructions (GKM Series), document number XP-4042.
13	Safe Failure Fraction:	83%.
14	Hardware fault tolerance (HFT):	HFT=0 is SIL2. HFT=1 is SIL3.
15	Highest SIL (architecture/type A/B):	SIL3 with HFT=1, Type A product.
16	Systematic failure constraints:	Refer to Installation Instructions (GKM Series), document number XP-4042.
17	Evidence of similar conditions in previous use:	Not applicable – product is proven by design type.
18	Evidence supporting the application under different conditions of use:	Not applicable – product is proven by design type.
19	Evidence of period of operational use:	Not applicable – product is proven by design type.
20	Statement of restrictions on functionality:	Not applicable – product is proven by design type.
21	Systematic capability:	SC3.
22	Systematic fault avoidance measures:	See report R70017229C.
23	Systematic fault tolerance measures:	See report R56A19357A.
24	Validation records:	See reports R70017229C and R56A19357A.

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 R70017229C.

Identification of certified equipment

A full list of certified equipment documents are defined below:

Document no.	Rev	Date	Document description
MTG-GK-207	18	10/07/2014	Installation drawing for switch, variants & keys
ASSY-GK-206	17	03/11/2010	Assembly drawing for switch, including variants
XP-4042	11	NA	Installation instructions (GKM Series)

Conditions of Certification

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

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1. The manufacturer shall analyze failure data from returned products on an on-going basis. Sira 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. Sira 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. Sira 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 Sira in accordance with 'Regulations Applicable to the Holders of Sira Certificates'.

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. Selection of this equipment for use in safety functions and the installation, configuration, overall validation, maintenance and repair shall only be carried out by competent personnel, observing the manufacturer's conditions and recommendations in the user documentation.
2. 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.
3. 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 Sira Test & Certification Assessment Reports R70017229A, R70017229C and R56A19357A.
2. If the certified product is found not to comply, Sira Certification Service should be notified immediately at the address shown on this certificate.
3. The use of this Certificate and the Sira Certification Mark that can be applied to the product or used in publicity material are subject to the 'Regulations Applicable to the Holders of Sira Certificates' and 'Supplementary Regulations Specific to Functional Safety Certification'.
4. This document remains the property of Sira and shall be returned when requested by the issuer.
5. No part of the Functional safety related aspects stated in the installation instructions 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	Project No.	Comment
02	03/07/2015	70017229	Revision 2 of this certificate to support recertification of the GKM – series Global miniature safety key operated switch to IEC61508:2010.

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