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Report on the determination of the safety related reliability of the SmartRadar FlexLine

Report-No.:	968/EL 717.00/10
Date	2010-10-15
Pages:	3
Test objects:	SmartRadar FlexLine
Customer/Manufacturer:	Honeywell Enraf Delftechpark 39 2628 XJ Delft The Netherlands
Order-No./Date:	4400813847 dated 2010-09-20
Test Institute:	TÜV Rheinland Industrie Service GmbH Automation, Software and Information Technology Competence Center Safeguards and Safety Components Am Grauen Stein 51105 Köln Germany
TÜV-Offer-No./Date:	968/308/09 dated 2009-07-28
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Inspectors:	Dipl.-Ing. Andreas Hesse
Test location:	see Test Institute
Test duration:	September 2010 - October 2010

The test results are exclusively related to the test samples.

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1. Scope

The following report contains the results of the review of the FMEA on component level and the results of the calculations of the safety parameters according to IEC 61508 for the SmartRadar FlexLine of Honeywell Enraf.

The inspection of the further requirements defined in IEC 61508 and applicable product standards was not scope of this job.

2. Standards

Functional safety

[S1] IEC 61508, parts 1 - 7:2010 Functional safety of electrical/electronic/programmable electronic safety-related systems

[S2] Bellcore TR-332 Issue 6:1997

3. Test object

The test object is the FMEA of the SmartRadar FlexLine.

The SmartRadar FlexLine consists of different boards:

No.	Hardware	Revision	Firmware	Version
1	ART2A	3 and 4	n.a.	n.a.
2	CAN-XBAND	10	TII-XR (FlexConn)	A1030
3	CAN-XBAND	10	TII-XR (DSP)	A1030
4	CAN-SUPPLY	2	n.a.	n.a
5	FIM-DO	7	FII-DO	A1005

In the system under test two CAN-Relays are used for safety related output.

The device is considered to be a Type B system in the meaning of the IEC61508 [S1]

3.1 Product documents

The following documentation has been provided to the Test Institute electronically.

[D1] FMEA "BB075-1990000-D0P0.xls"; Rev. 0P0 dated 2010-09-17

Additionally the design documentation of each board was submitted to the Test Institute for reference.

The documents are stored at the Test Institute.

3.2 Test samples

No test samples were required.

4. FMEA and results

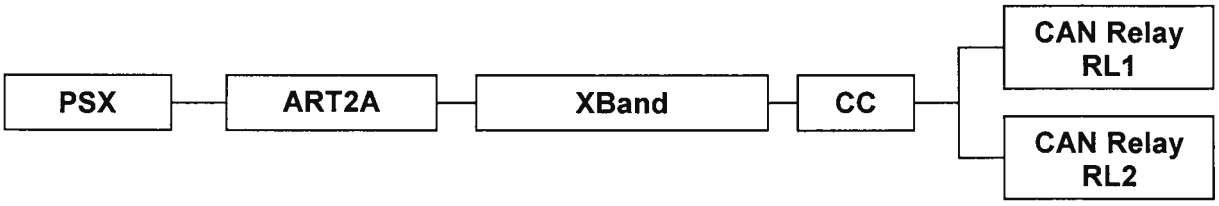
4.1 Assumptions for the FMEA

- For all low complex parts stuck-at failures and drift failures are assumed.
- Failure rates are taken from Bellcore or from the device manufacturer when possible.
- The average maximum ambient temperature has been considered with 40°C. Other temperatures ranges within the operational spec of the manufacturer have no significant influence on the FMEA results.

- The failure distribution for low complex parts has been taken from the IEC 62061, Annex D.
- For the complex components the 50/50 distribution of dangerous and safe failures has been considered.

4.2 Reliability Block Diagram

The SmartRadar FlexLine is a single channel system, except the output relays.



4.3 Review of the FMEA

The FMEA was carried out by the manufacturer together with the Honeywell Safety Center of Excellence (SCOE) and is documented in the Excel File [D1].

The FMEA was reviewed regarding

- correct assumption of failure rates
- correct assumption of diagnostic coverage
- correct assumption of failure distribution

Result

Failure rates, diagnostic coverage and failure distribution were correctly assumed.

The safe failure fraction is: SFF = 97 %

The total failure rate is: Λ_{DU} = 112,8 FIT

4.4 Results of the probability calculation

The results are documented in the attached "Summary of the characteristic data for use of the product in safety-related applications".

5. Conclusion

The safety related reliability data have been determined as shown in the attached "Summary of the characteristic data for use of the product in safety-related applications".

The inspection of the requirements for systematic integrity and documentation stipulated by the IEC 61508 were not part of this evaluation and need to be carried out for a full compliance to the IEC 61508.

If the device is used as above described (Dual redundant configuration), the safety parameters are in the range of SIL 2.

Cologne, 2010-10-15
TIS/ASI/Kst. 968 he-nie

Report released after review:
Date: 2010-10-15

The inspector

Dipl.-Ing. Andreas Hesse

Dipl.-Phys. Erich Janoschek

Appendix 1: Summary of the characteristic data for use of the product in safety-related applications

2010-10-15

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Annex to Report-No.: 968/EL 717.00/10

Summary of the characteristic data for use of the product in safety-related applications

Product: SmartRadar FlexLine

Manufacturer: Honeywell Enraf
Delftechpark 39
2628 XJ Delft
The Netherlands

1. Characteristic data acc. to IEC 61508-1 till -7-Version 2010

1.1 Data for use of the product as a subsystem in safety functions

	Value	Remark
Safety Integrity Level	SIL 2	
PFH	1,15E-07 1/h	PFH = 1,15E-07, corresponds to 11 % of the overall SIL 2 budget
PFD	2,47E-03	corresponds to 25 % of the overall SIL 2 budget; this value is valid for the stated Proof Test Interval T
Proof Test Interval T	5 a	

Remark:

Source of failure rate data: Bellcore Issue 6.

The average maximum ambient temperature has been considered with 40°C. Other temperature ranges within the operational specification of the manufacturer have no significant influence on the SFF.

General assumption that 50 % of the component failures are dangerous failures (λ_d = 0,5 λ, $MTTF_d$ = 2 MTTF).