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Automation, Software and Information Technology

Test report about the inspection of the changes to the K Safe System from AIM release 7.2.0 to AIM release 7.3.8 KONGSBERG MARITIME AS

Report-No.: 968/EL 161.02/08
Date: 2008-07-08

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Report-No.:	968/EL 161.02/08
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Test object:	Changes to the K Safe System from AIM release 7.2.0 to AIM release 7.3.8
Customer/Manufacturer:	KONGSBERG MARITIME AS Kirkegardsveien 45, Carpus N-3601 Kongsberg Norway
Order-No./Date:	JB-70371 dated 2007-08-13
Test Institute:	TÜV Rheinland Industrie Service GmbH Am Grauen Stein 51105 Köln (Poll) Germany
Department	Automation, Software and Information Technology
TÜV-Offer-No./Date:	968/150/07 dated 2007-06-04
TÜV-Order-No./Date:	9772965 dated 2007-07-04
Inspector(s):	Dr.-Ing. Peter Kocybik Dipl.-Ing. Robert Heinen
Test Location:	see Test Institute
Test Duration:	July 2007 until July 2008

The test results are exclusively related to the test samples.

This report must not be copied **in an abridged version** without the written permission of the Test Institute.

2008-07-08

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1. Scope

Object of this inspection is the Albatross Integrated Multifunction System (AIM Safe) from Kongsberg Maritime, N-3601-Kongsberg, Norway, which has previously been type approved for release 7.2.0 (see /U 21/). In the meantime the manufacturer has changed the name for the system from AIM Safe to K Safe.

This report summarizes the results of the type approval with regard to the safety relevant changes in the AIM software release 7.2.1, 7.2.2, 7.2.3, 7.2.4, 7.3.1, 7.3.2, 7.3.3, 7.3.4, 7.3.5, 7.3.6, 7.3.7 and 7.3.8 and the replacement of the RDIO400S I/O module through the RDIO401S I/O module.

This report must also be considered for design, installation and setting into operation of all safety related applications.

Purpose of this type approval is to clarify, that the K Safe-System with the above mentioned changes still fulfils the requirements up to SIL 3 in accordance with the standard /N 1/ for the use in safety relevant applications with low demand mode of operation.

2. Standards and regulations for the type approval

/N 1/ IEC 61508 Part 1 - 7, 1998 and 2000
Functional safety of electrical/electronic/programmable electronic safety-related systems

/N 2/ EN 61131-2:2007
Programmable Controllers
Part 2: Equipment requirements and tests

/N 3/ IEC 61511-1:2003+Corrigendum 2004
Functional safety - Safety instrumented systems for the process industry sector
Part 1: Framework, definitions, system, hardware and software requirements

/N 4/ IEC 61511-2:2003
Functional safety - Safety instrumented systems for the process industry sector
Part 2: Guidelines for the application of IEC 61511-1

/N 5/ IEC 60945:2002
Maritime navigation and radio communication equipment and systems
General Requirements-Methods of testing and required test results

3. Identification of the test object

3.1. Test object

The K Safe System from Kongsberg Maritime, Kirkegardsveien 45, N-3601-Kongsberg, Norway, is a PLC-system based on hardware and software components.

Object of the inspection are the incremental changes from AIM 7.2.0 to AIM 7.3.8 which are described in /U 3/. The AIM 7.2.0 is already approved, see /U 26/.

3.2. Documentation

The following documents were used inter alia for the type approval:

/U 1/ Safety Requirement Specification AIM Safe revision D of 2004-10-11
Kongsberg Maritime AS

/U 2/ AIM - release notes and criticality analyses version 7.2.0 – 7.3.8 revision A
Kongsberg Maritime AS

/U 3/ **AIM - release notes and criticality analyses version 7.2.0 – 7.3.8 revision C**
Kongsberg Maritime AS

/U 4/ **Scope of Work and Testplan for COT0501-U6 / AIM 7.3._.**
Kongsberg Maritime AS

/U 5/ **AIM 2000 Basic Function Test 7.3.7 revision K of 2005-10-01**
Kongsberg Maritime AS

/U 6/ **AK Software Test Report revision C of 2003-09-03**
Kongsberg Maritime AS

/U 7/ **Release readiness review AIM 7.3.4.38 of 2006-08-15**
Kongsberg Maritime AS

/U 8/ **Release Readiness Certificate AIM Software Release 7.2.1 of 2005-01-17**
Kongsberg Maritime AS

/U 9/ **Release Readiness Certificate AIM Software Release 7.2.2 of 2005-06-30**
Kongsberg Maritime AS

/U 10/ **Release Readiness Certificate AIM Software Release 7.2.3 of 2005-08-05**
Kongsberg Maritime AS

/U 11/ **Release Readiness Certificate AIM Software Release 7.2.4 of 2006-03-09**
Kongsberg Maritime AS

/U 12/ **Release Readiness Certificate AIM Software Release 7.3.1 of 2007-11-27**
Kongsberg Maritime AS

/U 13/ **Release Readiness Certificate AIM Software Release 7.3.2 of 2007-11-27**
Kongsberg Maritime AS

/U 14/ **Release Readiness Certificate AIM Software Release 7.3.3 of 2006-06-27**
Kongsberg Maritime AS

/U 15/ **Release Readiness Certificate AIM Software Release 7.3.4 of 2006-09-01**
Kongsberg Maritime AS

/U 16/ **Release Readiness Certificate AIM Software Release 7.3.5 of 2007-11-23**
Kongsberg Maritime AS

/U 17/ **Release Readiness Certificate AIM Software Release 7.3.6 of 2007-11-23**
Kongsberg Maritime AS

/U 18/ **Release Readiness Certificate AIM Software Release 7.3.7 of 2007-11-23**
Kongsberg Maritime AS

/U 19/ **Release Readiness Certificate AIM Software Release 7.3.8 of 2007-11-23**
Kongsberg Maritime AS

/U 20/ **Phase I Report RDIO400S Modification revision A of 2004-01-28**
Kongsberg Maritime AS

/U 21/ **Specification RDIO401S revision A of 2005-12-02**
Kongsberg Maritime AS

/U 22/ **FMEA and Reliability Calculation RDIO401S revision A of 2007-07-18**
Kongsberg Maritime AS

/U 23/ **Environmental Test Specification document no. 319791a**
Kongsberg Maritime AS

/U 24/ **Environmental Test Report document no. A505138 of 2008-03-27**
Delta

3.3. Previous test reports

The following documents were prepared during previous type approvals.

/U 25/ **Type approval of Albatross Integrated Multifunction System (AIM Safe) Fault Tolerant and Fail Safe Controller System of Kongsberg Simrad**
Report-No.: 968/EL 161.00/02, Date: 2002-01-31
TÜV Anlagentechnik GmbH

/U 26/ **Test report of the type approval of Remote Control Unit RCU including the upgrade of the AIM Safe System**
Report-No.: 968/EL 161.01/04, Date: 2004-12-01
TÜV Industrie Service GmbH

4. Tests and test results

4.1. General

The measuring and test equipment, which has been used by the TÜV Rheinland Group in the tests described in the following, is subject to regular inspection and calibration. Only devices with valid calibration have been used. The devices used in the various tests are recorded in the inspector´s documentation.

All considerations concerning uncertainty of the measurements, so far applicable, are stated in the inspector´s documentation, too.

In cases where tests have been executed in an external test lab or in the test lab of the manufacturer and where the results of these tests have been used within the here documented approval, this has occurred after a positive assessment of the external test lab and the achieved test results in detail according to the Quality Management procedure QMA 3.310.05.

4.2. Inspection of the "AIM release notes and criticality analyses version 7.2.0 - 7.3.8" and referenced intranet-pages, revision A and C, Doc. No. 1052492

The above mentioned document gives an overview over the software changes after AIM version 7.2.0. It uses references (hyperlinks) to further documents which provide the detailed information of the changes in the various revisions since release 7.2.0. The referenced files include basically release notes of distinct software sub-systems and track-lists describing all the detailed changed items including so called criticality overviews.

Due to the large extent of the referenced documents only a representative subset of the referenced release notes and track-lists with their corresponding tracks and further documentation were examined. During the course of the inspection it was found that information was missing. As a result the document has been updated and the missing information has been added to revision C of the document.

Even if the criticality overviews do not represent a classical change impact analysis, a schematic classification of the assumed safety criticality of the planned and performed changes has been performed.

Results:

It can be concluded that tests have been performed according to the procedure approved during previous certifications. The verification and validation activities have been carried out corresponding to the "Problem Report Handling Process" using the company's process-management computer-database-system.

4.3. Inspection of the "Scope of Work and Testplan for COT0501-U6 / AIM 7.3._."

The Scope-of-Work document describes the planned software configuration of the AIM 7.3.6 software release. For the various software sub-systems there are different updates (tracks) available. In the Scope-of-Work document it is decided which updates will be included into the upcoming AIM release. Further on the document briefly defines who shall perform what kind of test related to the affected software packages.

Results:

The document fulfils its organisational function. But the document does not contain an explicit identification, revision nor date.

4.4. Inspection of the "AIM 2000 Basic Function Test 7.3.7", revision K, Doc. No. 161747

The Basic Function Test document describes the system tests, which shall be performed after each change of the AIM Basis Software in the manner of a regression test. The document also serves partly as an integration test description. Additional test cases are written in the respective track documentation (see also 4.2) and in the Scope of Work document (see also 4.3). The Basic Function Test document and the handwritten test results from 2007-04-24 were examined in spot-checks.

Results:

It was discovered, that the used development process can not assure the accomplishment of all necessary tests, because the process does not guarantee that additional required test cases are added in the respective documentation. The test-cases are also not traceable back to the requirements. It was agreed to enhance the process, but the improvements cannot get effective anymore for the changes of AIM 7.2 to 7.3.

4.5. Inspection of the "AK Software Test Report", revision C, SourceSafe database for AK: $baseline\Doc\Test\STB.doc

The Software-Test-Report template describes how to perform the Factory-Acceptance-Test and Manufacture-Test while using automatic test equipment. The necessary test-setup for hardware and software is specified. Space is reserved in tables, in order to register the final test results of the different automatic test-steps. The real test cases are not described in documents, but only in hidden code which was not inspected. The tests are used as a set of regression tests to detect negative impact of changed functionality.

Results:

The development process does not assure that all necessary additional test cases will be added to the automatic regression test suite (see also 4.4). It can be assumed however that this will usually take place.

4.6. Inspection of the "Release readiness review", AIM 7.3.4.38, Project COT0501-U4"

The Release-Readiness-Review Form and Checklist will be filled out just before project conclusion while the final meeting. The Release-Readiness-Review must successfully be finished before the Manager-Quality-Management is allowed to sign the according Release-Readiness-Certificate. There are neither explanations nor references given to the companies quality management system.

Results:

The information contained in the Release-Readiness-Review Form and Checklist does not contain sufficient information to make an informed judgement on the effectiveness of the review process. The checklist should therefore be improved in the future. However it can be assumed that the experienced meeting members would have ensured a proper conduction of the review process and would have placed meaningful further inquiries if necessary.

4.7. Inspection of the "Release Readiness Certificates"

The Release-Readiness-Certificates attest the respective AIM Software release the ability to be used also in a Safety System because the released software has been tested and checked according the to the customer's quality management system.

Results:

All expected Release-Readiness-Certificates of the examined releases are present.

4.8. Inspection of the Replacement of the RDIO400S Module through the RDIO401S Module

The previously certified RDIO400S I/O module has been found to cause problems when used with certain types of relays. The monitoring current for the output of the RDIO400S causes these types of relays to remain in the on-state when an attempt is undertaken to turn the relay off. The behaviour of the RDIO400S module in detail is described in /U20/. The replacement module RDIO401S contains an additional switch for every 4 outputs, which will turn the monitoring current off when a demand to shut down the outputs is executed. The monitoring current will then be turned on again after 1 second thus ensuring that all types of relays can safely be turned off and that the turned off state can be verified by the RDIO401S module.

During the cause of the inspection besides other documents the module specification has been inspected, see /U21/. Further the module FMEA and the reliability calculations performed by the manufacturer have been inspected, see /U22/.

The manufacturer performed intensive functional and environmental tests for the modified module, see /U24/, at the accredited test laboratory Delta. The test specification is detailed in /U23/. The environmental testing has been performed according to IEC 60945 as agreed with the test institute because of the application environment relevant to the K Safe system. The EMC testing has been performed according to IEC 60945 and for the functional safety according to EN 62061.

Results:

It was found that the specification correctly describes the intended changes to the module. The FMEA performed by the manufacturer is accepted by the test institute. The inspection of the FMEA showed that the intended modification has no negative impact on the safety of the module. The reliability calculations performed by the manufacturer are accepted by the test institute. The calculations show that no significant influence on the reliability values is caused by the intended modifications.

The test results show that the requirements of the above standards are met and that the modified functionality has been successfully implemented. The test results are accepted by the test institute. The inspection of the changes further showed no negative impact on the electrical safety of the system. The RDIO401S module is supplied through a 24 V power supply.

In summary it can be said that the replacement of the RDIO400S module through the RDIO401S module has no negative impact on the safety of the K Safe system.

5. Summary

The inspection of the information provided regarding the incremental changes between AIM release 7.2.0 and AIM release 7.3.8 revealed certain deficiencies regarding the fulfilment of some of the requirements of the standard /N1/. The deficiencies concerning the hardware have successfully been remedied during the course of the approval. As far as the software is concerned deficiencies regarding the software development process have been discussed with the manufacturer and the manufacturer has implemented changes to the development process.

The implemented changes will however only become effective for current and future development work. Further additional improvements are required for future release versions.

However the K Safe system has been installed in a high number of applications. Over the course of the last 4 years extensive experience has been gathered with the current software release versions and the major problems caused by the software development process have been revealed and have been corrected in the mean time.

In summary it can be said that although certain deficiencies have been present during the implementation of the incremental changes between AIM release 7.2.0 and AIM release 7.3.8. the incremental changes have been found to have no negative impact on the overall safety of the K Safe system. Therefore the results of the previous certification, see test report /U 26/ can be transferred to the current release version of the K Safe system.

Based on the above it can be concluded that the K system with the release version 7.3.8 still fulfils the requirements of IEC 61508 for a SIL 3 system.

The software and hardware version for the current approval of the K Safe system is documented in appendix A1 of this report.

The system architectures of the K Safe system, which can be used for safety relevant applications, are listed in appendix B1 of this report.

The restrictions and conditions of the previous approvals apply. In particular for all applications a safe state must exist (e.g. de-energized for ESD systems) and the demand to trip must be defined. The frequency of demands must be low (low demand mode of operation according to the IEC 61508). The user has to ensure that the complete safety function for his application conforms to the required Safety Integrity Level.

Cologne, 2008-07-08
TIS/ASI/Kst. 968 ko-hei-nie

The inspectors

Dr.-Ing. Peter Kocybik

Dipl.-Ing. Robert Heinen

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2008-07-08

Reviewed K-Safe System Versions
Appendix A1 of Report-No.: 968/EL 161.02/08

1. Versions of the approved K-Safe System

Component	Version
AIM 7.3.8 (build 54)	
OSK	2.3.6 (build 53)
PCK	1.3.9 (build 56)
AK	3.6.2.1
Profibus	3.4.0
PBUS	3.5.1
VxWorks	5.4

Table 1: AIM version

2. Version of the approved RIO Unit

Component	Version
RDIO401S	A of 2005-12-02

Table 2: RIO version

3. Version of the used tools

Firmware development tool (for TI-DSP):

- Texas instrument Code Composer Studio 2.0.0

Programming tools for the PPC development:

- WindRiver Tornado 2.0.2 (Cummulative patch 3) development system with VxWorks 5.4
- In Circuit Emulator from WindRiver system version 7.9a

Changes / Corrections:

Necessary changes or corrections of the approved hardware and software components can be inserted as follows:

- KM informs the TÜV in case of planned changes / corrections
- TÜV verifies the planned changes / corrections and gives a release for the implementation
- KM implements the planned changes / corrections in the system, and tests the correct implementation (The tests must be documented by KM)
- TÜV verifies the documented tests and gives the permission if ok
- KM revises the document "Reviewed K-Safe System Versions" (Appendix A1) and sends a copy to TÜV

KONGSBERG

TECHNICAL NOTE

Date: **01.07.08**

Issued by: Martin Fredrik Haugdal

Subject: Default set-up of K-Safe systems forming part of an IEC 61508 function.

References:

1. ESD and F&G Manual SW Configuration typicals, document id.: 171931 or its successor.
2. Shutdown SW Configuration typicals, document id.: 162748 or its successor.
3. F&G SW Configuration typicals, document id.: 162739 or its successor.
4. Design Manual for safety systems.
5. KS HW loop typical database, id ks\NOKBG0066.nsf

1 INTRODUCTION

This technical note describes vital set-up data for any K-Safe system forming a part of an IEC 61508 function. Any alteration to set-up described herein must be subject to in depth formal analyses of personnel with in-dept IEC61508 knowledge.

2 DESIGN

The design of safety systems shall follow:

1. Data given in this technical note, in addition appropriate rules, regulations and class society's rules for the specific delivery must be adhered to. Further product and project specific specifications and design manuals shall be followed.

2. The design and configuration of K-Safe systems with SIL requirements shall be performed or supervised by safety personnel within the Kongsberg group.

3 HARDWARE REQUIREMENTS

1. With respect to environmental requirements the hardware to be used in IEC 61508 compatible systems must meet the environmental requirements given in the Kongsberg Maritime AS environmental specification.

2. Hardware loop typical qualified for IEC 61508 use can be found in KS HW loop typical database. Modifications or qualifications of additional typical must be subject to qualification through FMEA and subsequent tests.

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3. For each delivery probability calculations shall be prepared in accordance with Kongsberg Maritime AS for all hardware variants used in a Safety Integrity Function (SIL). Maintenance intervals used in these calculations shall be used as recommendations to customers.

4 HARDWARE CONFIGURATIONS

The following hardware configurations can form part of an IEC 61508 function:

Type	Line monitoring	FOST/ ..otest	SIL class
AIM Safe3, 1002 dual IO, SBC or RCU with IO, RIO and/or redundant fire central, NE or NDE outputs.	Active	Active	3
K-Safe 2, 1002 shared IO, SBC or RCU with RIO & fire central. NE or NDE outputs.	Active	Active	2
K-Safe 2, 1002 shared IO, SBC with monitored input signals and NE non-monitored output relays. Single fire central allowed.	Active	No	2
K-Safe 2, 1002 shared IO, SBC redundancy with monitored input signals and NDE output relays. Single fire central allowed.	Active	Active	2
AIM Safe1, Single RCU&RIO, RIO Ex or fire central. Redundant power. NE or NDE outputs.	Active	Optional	1
AIM Safe1,Single SBC and IO or RCU and RIO. Redundant power. NE or NDE outputs	Active	Optional	1

Column FOST/xotest indicates that test for moving of output stage relays or activation of output driver must be enabled.
Column Line monitoring indicates that open- and short-circuit detection must be enabled.

5 SOFTWARE CONFIGURATIONS

1. The safety systems can run with AIM release 7.3. The releases AIM 7.3 has been subject to TÜV inspection.

2. The set-up of the header of the *.ps file is crucial. The name and sequence of the parameters varies somewhat from release to release, but the functionality described below shall be fulfilled.

Section	Ps file	Explanation
Start Section Startup	{ Startup	
Start subsection Modes	(Modes	
	Sim = 0	Safety system shall start in I/O mode
	Passive = 0	Safety system shall start active
	ModuleMode = 31	Safety system shall start with active modules
	SetPsMode = 1	Operator with proper access right can change mode
End subsection Modes	)	
Start subsection Redundancy	(Redundancy	
	RedUpdateDisable = 0	0: Normal settings. 1: This inhibits the redundancy update between master and slave during a RCU load.

Section	Ps file	Explanation
	TbssClaimDO4 = <value>	Specifies whether DO4 should be set when the PS is Master. Not used on RCU5xx. Project specific value may be used. Default = 1.
End subsection Redundancy	)	
Start subsection Misc	(Misc	
	PrintTags = <value>	Project specific value may be used. Valid values are 0 or 1
	AcceptIoConnErr = 0	No I/O connection errors are accepted
	AcceptTermConnErr = 0	No terminal connection errors are accepted.
	IoFileRequired = 1	I/O file required for start-up
	LastUsedModno = <value>	ps file information
	TotalModules = <value>	ps file information
	Checksum = 1	Errors in checksum for modules shall be reported
	HotStart = 0	Flexi modules status shall not be saved
End subsection Misc	)	
End section Startup	}	
Start Section Alarm	{ Alarm	
Start subsection Default	(Default	
	AckLimit = 0	Specifies the lowest priority level of alarms that the operator may acknowledge. The RCU read this from the OS.
End subsection Default	)	
End section Alarm	}	
Start Section CmdGroups	{ CmdGroups	
Start subsection Default	(Default	
	Group = -1	No command group specified. (Safety setting.)
End subsection Default	)	
End section CmdGroups	}	
Start Section PsPsCommunication	{ PsPsCommunication	
Start subsection Default	(Default	
	Task = 1	The default task to use for ps-ps communication. 1 = scan task 1.
End subsection Default	)	
Start subsection Destination	(Destination	
	Station = <value>	ps file information
	Task = <value>	ps file information
End subsection Destination	)	
End section PsPsCommunication	}	
Start Section ModuleGroups	{ ModuleGroups	
Start subsection Definitions	(Definitions	
	StateCollectionInterval = 2.0	The state collection interval is by default 2.0, and must be equal or higher then the cycle time of the display task.

Section	Ps file	Explanation
	MaxGroups = n	The maximum number of module groups to be subscribed in the system. Set the value to be at least the maximum number of subscribed groups. The value should be set for all PS's in the system.
End subsection Definitions	)	
End section ModuleGroups	}	
Start Section TaskScheduling	{ TaskScheduling	
Start subsection Task	(Task	
	Name = "tPsT1"	Scan task 1.
	ScanGroup = 1	Scan task.
	CycleTime = 1.0	The cycletime of the task (in seconds).
	Displacement = 0.0	The displacement is specified in seconds and must be less than the cycle time, should normally be set to 0.0.
End subsection Task	)	
Start subsection Task	(Task	
	Name = "tPsT2"	Scan task 2.
	ScanGroup = 2	Scan task.
	CycleTime = 0.1	The cycletime of the task (in seconds).
	Displacement = 0.0	See scan task 1.
End subsection Task	)	
Start subsection Task	(Task	
	Name = "tPsTaskRapT"	Scan task 3.
	ScanGroup = 3	Scan task.
	CycleTime = 0.05	The cycletime of the task (in seconds).
	Displacement = 0.0	See scan task 1.
End subsection Task	)	
Start subsection Task	(Task	
	Name = "tPsDispT"	Display task.
	CycleTime = 2.0	The cycletime of the task (in seconds).
	Displacement = 0.0	See scan task 1.
End subsection Task	)	
End section TaskScheduling	}	
Start Section Diagnostics	{ Diagnostics	
Start subsection GeneralWatchdog	(GeneralWatchdog	
	NmiAction = <value>	Specifies the default action whenever the system experiences a watchdog error or a BITE error. Project specific value may be used. Recommended values are 2 or 3.
	MinNmiLimit = <value>	Specifies the minimum NMI limit possible (in ms). Project specific value may be used..
	ReduceShellPriority = <value>	Specifies whether the priority of the task Shell should be low during normal execution or not. Project specific value may be used.
End subsection GeneralWatchdog	)	
Start subsection Bite	(Bite	
	Mode = 3	Stop RCU on any bite failure

Section	Ps file	Explanation
End subsection Bite	)	
End section Diagnostics	}	
Start Section Network	{ Network	
Start subsection Default	(Default	
	ActiveNet = "AB"	
End subsection Default	)	
Start subsection Netstorm	(Netstorm	
	Protection = 1	Net storm protection is enabled
	Frames = <value>	Optional. Project specific value may be used.
	NonUnicast = <value>	Optional. Project specific value may be used.
End subsection Netstorm	)	
End section Network	}	
Start section FloatingPointExceptionHandling	{FloatingPointExceptionHandling	
	(Definitions	
	ForcedSuspendTask = 0	Floating point exception behaviour active
	Schema = "AimStandard"	Alarms and stop computer
	)	
End section FloatingPointExceptionHandling	}	
Start Section EnviromentCheck	{ EnviromentCheck	
Start subsection SbcPowerAlarm	(SbcPowerAlarm	For SBC-PS only, not for RCU.
	Position = 0	Specifies which powers that should be cheked for alarms. On RCU solutins, value set to 0. on SBC solutions, value set to 3.
	Filter = <value>	Specifies filter configuration. This parameter is optional. Not safety critical value. Project specific value may be used.
End subsection SbcPowerAlarm	)	
Start subsection 24VPowerAlarm	(24VPowerAlarm	
	Channel = n	Specifies channel to check.
	Logic = <value>	Not safety critical value. Project specific value may be used. Default = 1. 1: 24V power OK.
End subsection 24VPowerAlarm	)	
Start subsection FanAlarm	(FanAlarm	
	Enable = 1	Fan alarm shall be enabled
End subsection FanAlarm	)	
End section EnviromentCheck	}	

Set-up of the remaining parameters in the header file shall be decided by the delivery project.

6 TEST

1. All generic system solutions shall be subject to product tests according to Kongsberg Maritime AS internal routines.
2. All delivery systems be subject to Internal Acceptance Test (IAT), Factory Acceptance Test and Commissioning/Site Acceptance Test (SAT).
3. For systems subject to class notation the delivery systems may be required to class notation certification test, any safety system subject to class notation shall be in accordance with the class notation type approvals. In cases where class society's rules and IEC 61508 rules are in conflict the customer must be formally addressed.