telefication bv
The Netherlands
Chamber of Commerce
51565536
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telefication

Test report

20123557300 rev 1.0

based on:
IEC 61993-2, first edition (clauses 12 and 13 only)

Automatic Identification System (AIS)
SAAB
R5 Supreme AIS system

Contents

This report comprises of five modules. The total number of pages is: 68.

Main module

1 Introduction

This report contains the result of tests performed by:

Telefication B.V.
Edisonstraat 12a
6902 PK Zevenaar
The Netherlands

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

Ordering party:

Company name	:	Saab TransponderTech AB
Address	:	Läsblecksgatan 3
Zipcode	:	589 41
City/town	:	Linköping
Country	:	Sweden
Date of order	:	24 May 2012

2 Product

A sample of the following product was submitted for testing:

Product category	:	Class A AIS Transponder system
Manufacturer	:	Saab TransponderTech AB
Trade mark	:	SAAB R5
Type designation	:	SUPREME
Hardware version	:	R5 Supreme 0 (Transponder); 0 (CDU)
Software version	:	R5 1.0.3d (Transponder); R5 Supreme CDU 0.5 (CDU)
Serial number	:	000007 (Transponder); R5 Supreme 000000 (CDU)

The Saab R5 transponder system is a category b (protected) system.

3 Test schedule

The tests are carried out at the following locations:

- Telefication, Zevenaar
- Thales, Hengelo (vibration test)

The sample of the product was received on:

- 29 May 2012

The tests are carried out between:

- 29 May 2012 and 5 July 2012

4 Product documentation

For production of this report the following product documentation is used.

Description	Identification	Date
Operation & Installation manual	Doc. No. 7000 118-200, A	Not dated

The above mentioned documentation will be filed at Telefication B.V. Zevenaar for a period of 10 years following the issue of this report.

5 Observations and comments

The R5 Supreme AIS system consists of two parts.

- The R5 Supreme transponder;
- The R5 Supreme Control and Display Unit (CDU)

The R5 Supreme transponder has not been subjected to tests according to section 12 of IEC 61993-2 edition 1, since it is claimed to be a variant of the previously tested R5 Solid transponder.

During the tests two different software versions have been used.

Test	**S/W version**
ESD	1.0.3d
Radiated immunity	1.0.3d
All other immunity	1.0.2
Conducted emissions	1.0.3d
Radiated emissions > 30 MHz	1.0.3d
Radiated emissions < 30 MHz	1.0.2

For details of the software modification, see the manufacturer's Technical Construction File (TCF) in section 'Additional information module' in this report.
In this document also the rationale for not repeating certain immunity and emission tests performed with software marked 1.0.2 can be found.

For the purpose of vibration tests, the CDU was mounted in two different ways:

- Gimbal mounting frame (for example ceiling installation);
- Panel mounting frame

6 Modifications to the sample

Initially the sample (S/N 000006) did not fulfil the requirement for conducted emissions (ref. EN 60945, § 9.2) when operating on 24 Vdc.
The same sample was modified with additional capacitors in the EMC filter.
For details of this hardware modification, see the manufacturer's Technical Construction File (TCF) in section 'Additional information module' in this report.

7 Summary

The product is intended for use in the following application area:

Automatic Identification System (AIS)

The sample is tested according to the following specification:

IEC 61993-2, first edition (clauses 12 and 13 only)

8 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specification stated in chapter 7 of this report.

The results of the tests as stated in this report are exclusively applicable to the product item as identified in this report. Telefication accepts no responsibility for any stated properties of product items in this test report, which are not supported by the tests as specified in section 7 "*Summary*".

All tests are performed by:

name : ing. P.A. Suringa

function : Senior Test Engineer

signature :

Review of test methods and report by:

name : G.J. Gort

function : Senior Test Engineer

signature :

The above conclusions have been verified by the following signatory:

date : 27 August 2012

name : ing. A. van der Valk

function : Manager Laboratory

Signature : i.a. ing. H. Rutjes

Function : Director Laboratory

Test results module

1 Durability and resistance to environmental conditions according to EN60945 clause 8

EN 60945 sub clause	Cate-gory	Test	Phenomena	Result	Reference to remark
8.1	a b c d		Pre test and visual inspection	P	--
8.2	a c d a b c	Storage Functional	Dry heat 70°C Dry heat 55°C	NA P	-- --
8.3	a b c	Functional	Damp heat 40°C 95% rel. hum.	P	--
8.4	a a b c	Storage Functional Functional Functional	Low temperature -30°C Low temperature -20°C Low temperature -15°C Low temperature -25°C	NA NA P NA	-- -- -- --
8.5	a		Thermal shock 70°C -> 25°C	NA	--
8.6	a a		Drop on hard surface 1.00 m Drop into water 20 m	NA NA	-- --
8.7	a b c d	Functional	Vibration 2 - 13.2 Hz 1mm, ≥ 13.2 - 100Hz 7m/s^2, resonance 2h	P	--
8.8	c		Rain 100 l/m, 30 minutes	NA	--
8.9	c		Immersion 600kPa 12h Immersion 100kPa 5min. Temporary immersion 1m 5min.	NA	--
8.10	a		Solar radiation 1120W/m^2 80h	NA	--
8.11	a		Oil resistance immersion 3h	NA	--
8.12	a b c d	Corrosion	Salt mist 5% NaCl 2h -> 40°C 95% humidity 7 days	NP	1

Category:

a	=	portable	c	=	exposed
b	=	protected	d	=	submerged

Legend:

P	=	Pass	NA	=	Not applicable
NP	=	Not performed			

Remark:

1 The applicant provided a waiver, see the Report/Directive in the ‘Additional information module’.

2 Environmental Tests Clause 8

2.1 Vibration Test (R5 Supreme CDU in gimbal mounting frame)

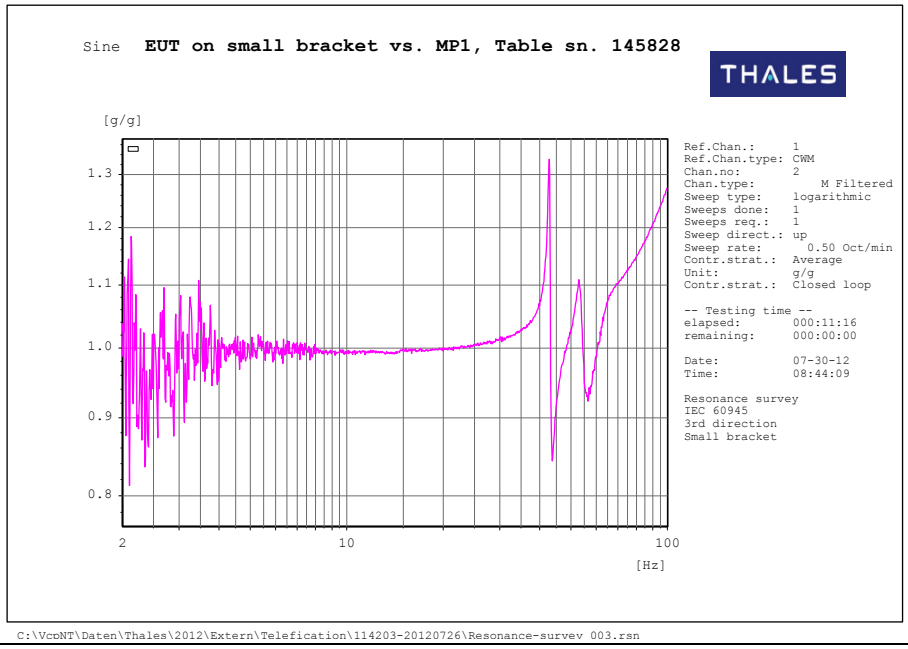
2.1.1 Resonance frequencies

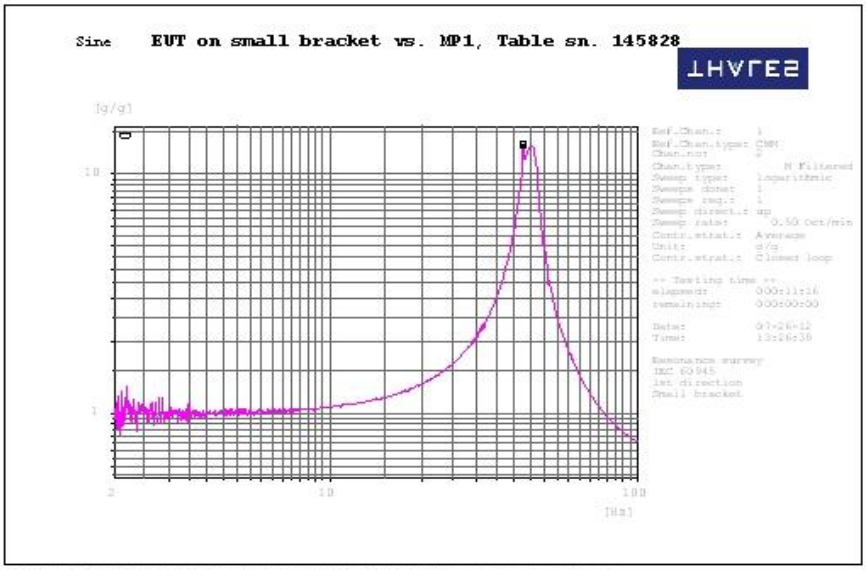
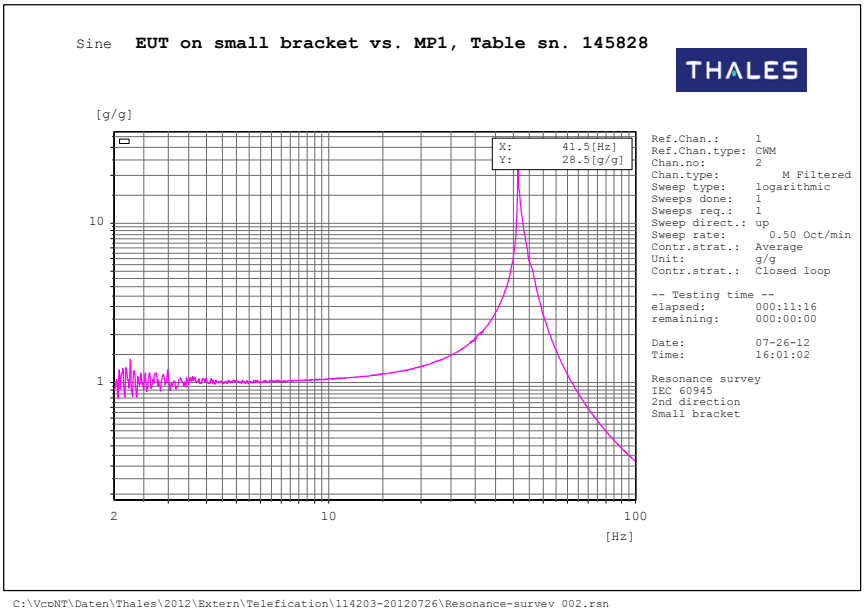
Resonance reaction: Q = Acceleration (EUT) – Acceleration (Resonator platform)

Vibration direction	Resonance frequency (Hz)	Resonance reaction (Q)
Vertical	43	1.34
1st horizontal	42.62 (around)	13.26
2nd horizontal	41.5	28.5

Graphs of response on vibration in vertical direction and two mutually perpendicular directions in the horizontal plane:

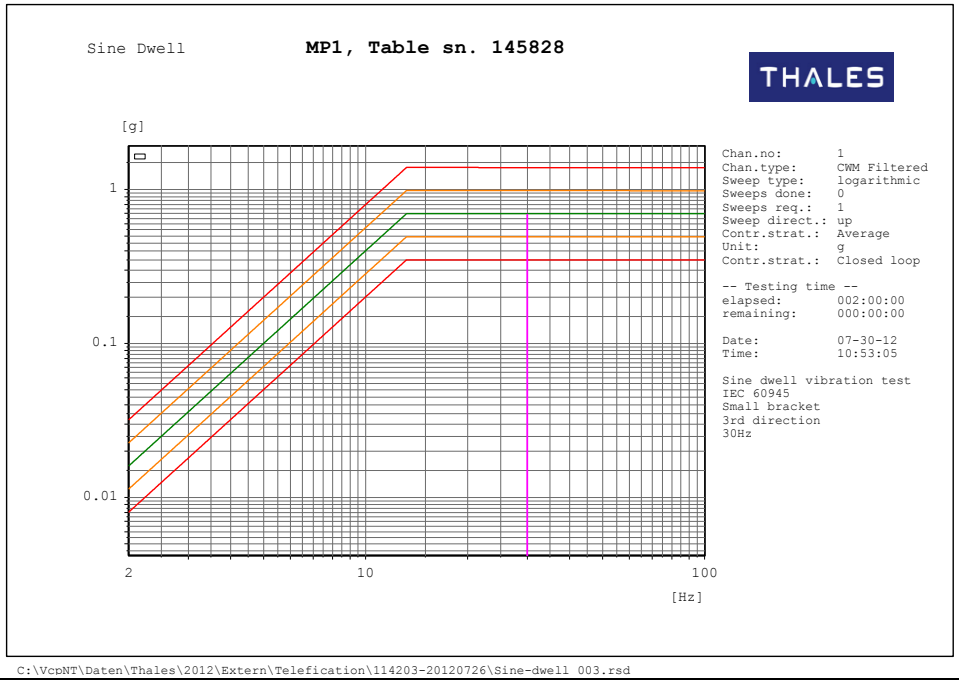
RESONANCE SEARCH

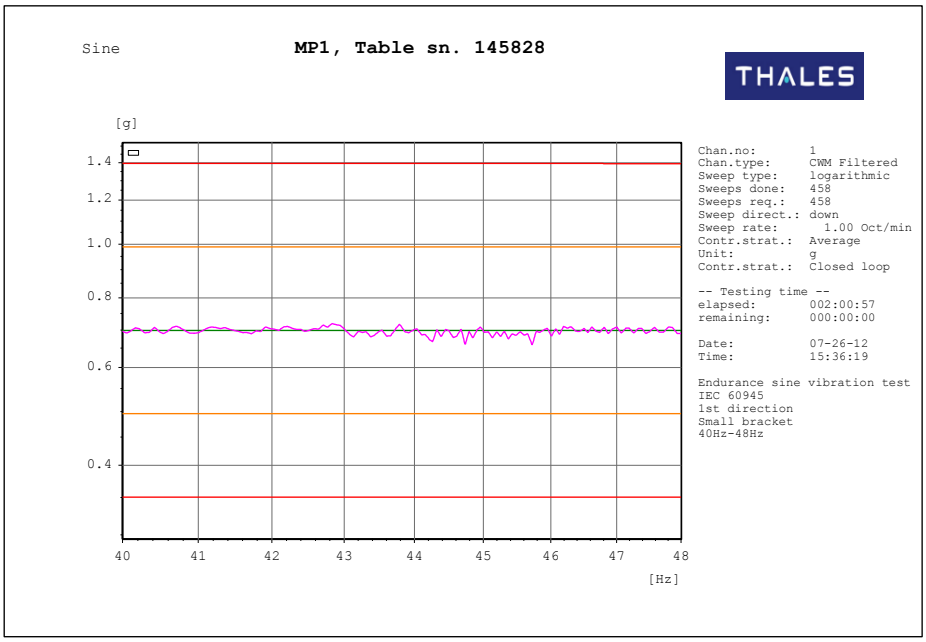
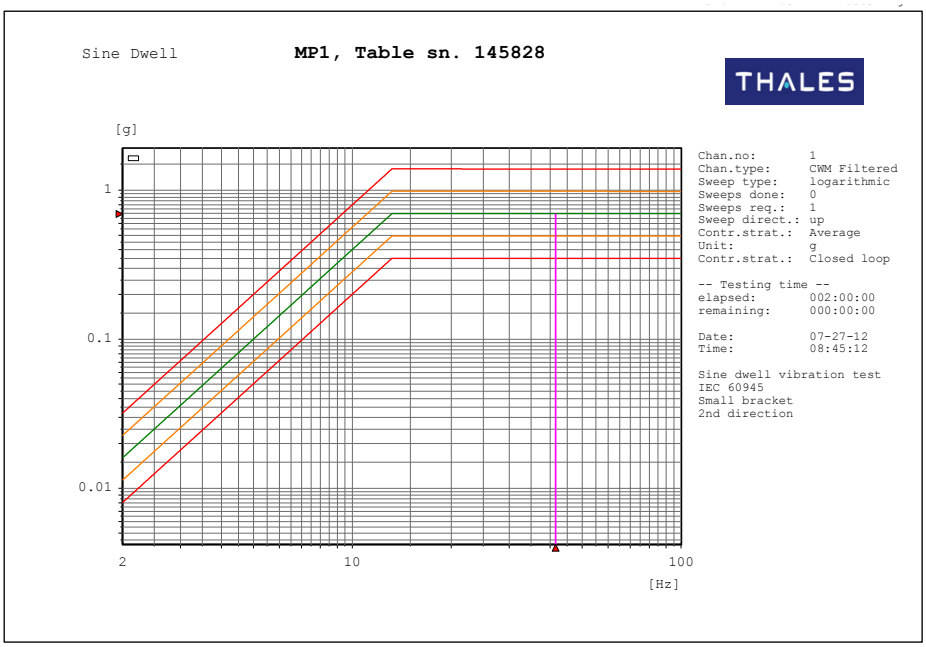
VIBRATION DIRECTION	RESONANCE FREQUENCIES (Hz)
Vertical	

VIBRATION DIRECTION	RESONANCE FREQUENCIES (Hz)
1st horizontal	
2nd horizontal	

ENDURANCE TESTS

	Vibration frequencies (Hz) applied during endurance tests (2 hrs)		
	Vertical	1st horizontal	2nd horizontal
R5 Supreme CDU	30	40-48	41.5

VIBRATION DIRECTION	
Vertical	

VIBRATION DIRECTION	
1st horizontal	 C:\VcpNT\Daten\Thales\2012\Extern\Telefication\114203-20120726\Sine-sweep 001.rsn
2nd horizontal	 C:\VcpNT\Daten\Thales\2012\Extern\Telefication\114203-20120726\Sine-dwell 002.rsd

Note: during the endurance test in 1st horizontal direction restricted frequency sweeping was applied, since the actual critical frequency was not clearly evident.

During each endurance test period performance checks were carried out.
The performance check consists of manually operating the touch screen and push buttons (in random order).
No degradation of performance was observed.

Test equipment used: (Item numbers)	92, 93, 94, 95, 96, 97

2.1.2 Performance checks at the end of the endurance test periods

At the end of each endurance test period performance checks were carried out.
The performance check consists of manually operating the touch screen and push buttons (in random order).
No degradation of performance was observed.

2.2 Vibration test (R5 Supreme CDU in panel mounting frame)

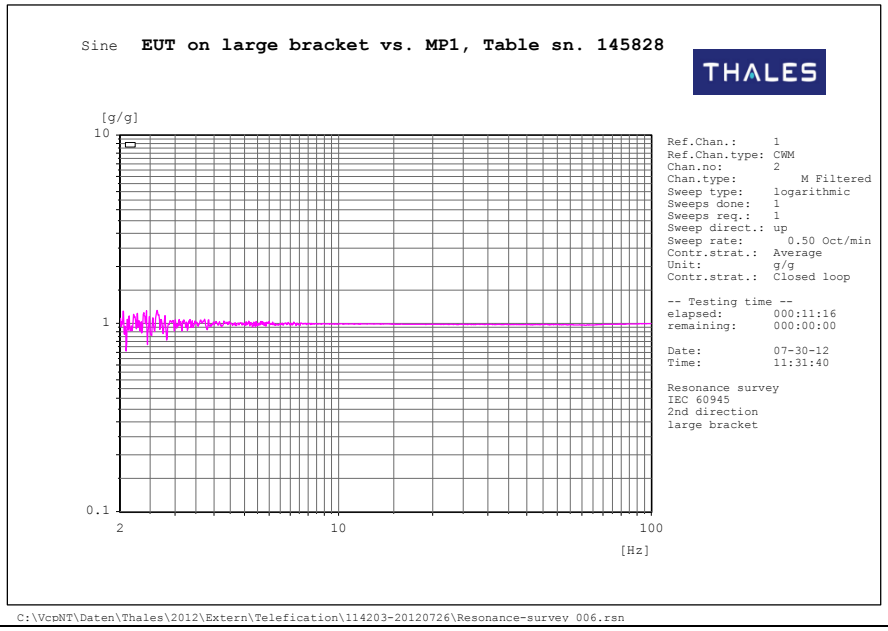
2.2.1 Resonance frequencies

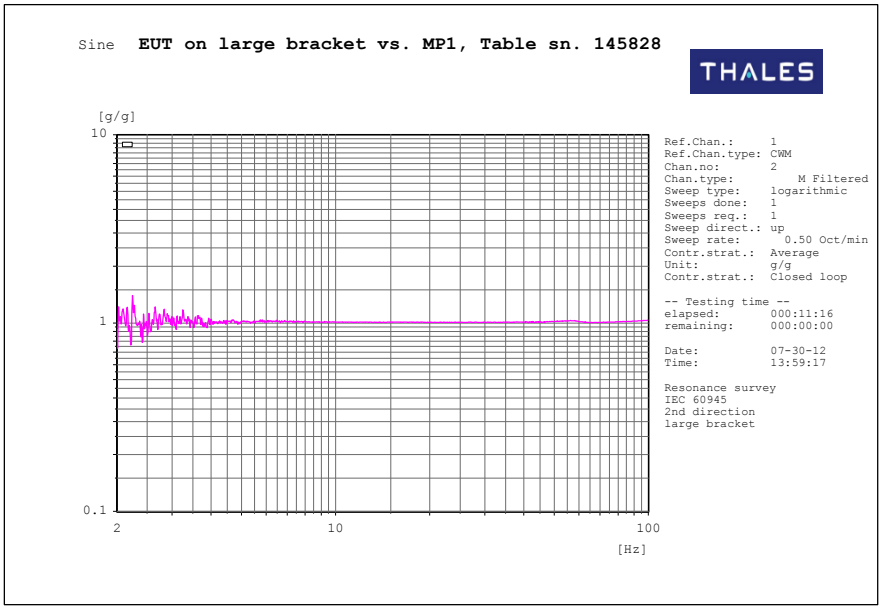
Resonance reaction: Q = Acceleration (EUT) – Acceleration (Resonator platform)

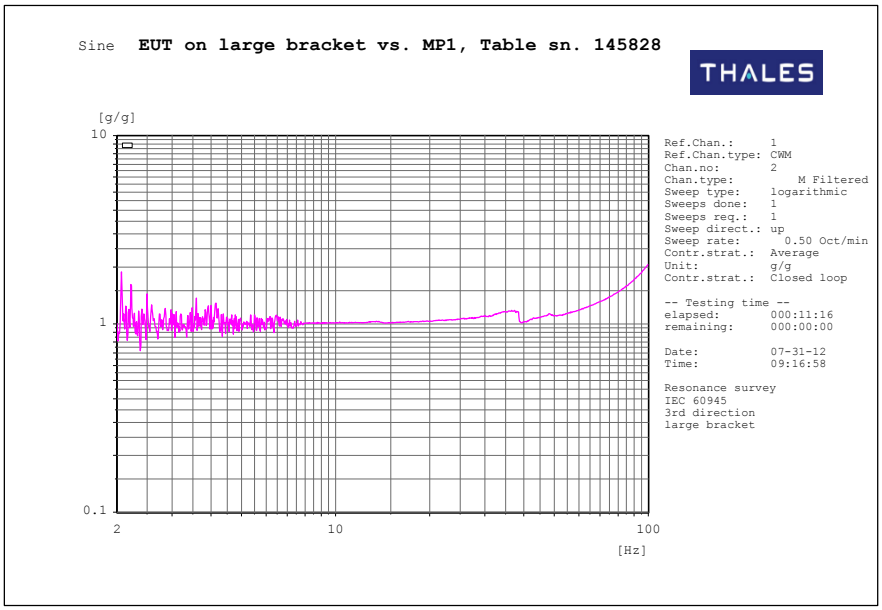
Vibration direction	Resonance frequency (Hz)	Resonance reaction (Q)
Vertical	--	--
1st horizontal	--	--
2nd horizontal	--	--

Graphs of response on vibration in vertical direction and two mutually perpendicular directions in the horizontal plane:

RESONANCE SEARCH

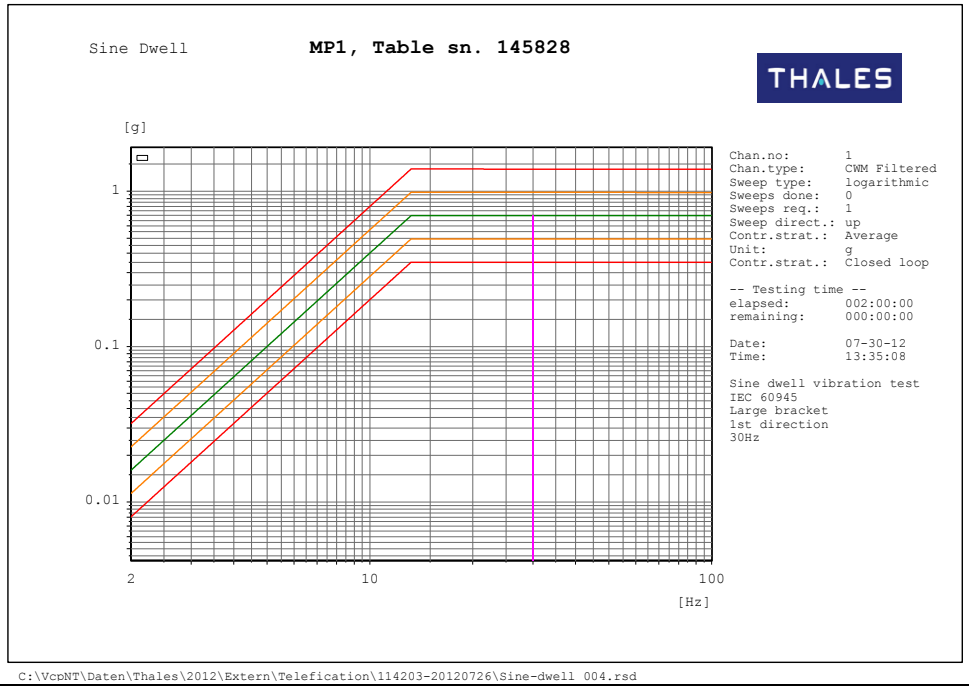
VIBRATION DIRECTION	RESONANCE FREQUENCIES (Hz)
Vertical	

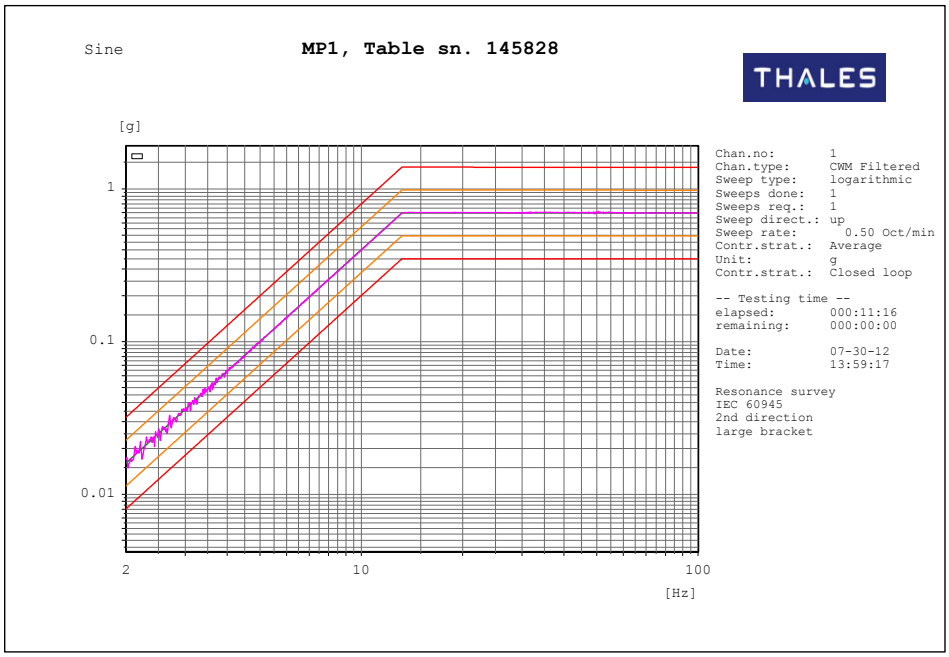
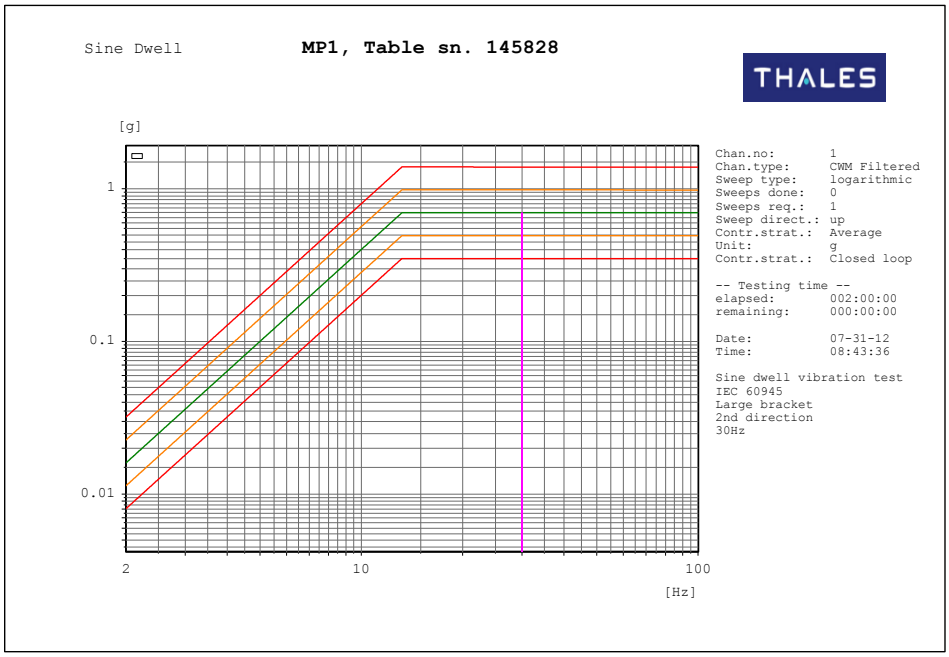
VIBRATION DIRECTION	RESONANCE FREQUENCIES (Hz)
1st horizontal	 C:\VcpNT\Daten\Thales\2012\Extern\Telefication\114203-20120726\Resonance-survey 007.rsn

VIBRATION DIRECTION	RESONANCE FREQUENCIES (Hz)
2nd horizontal	 C:\VcpNT\Daten\Thales\2012\Extern\Telefication\114203-20120726\Resonance-survey 008.rsn

ENDURANCE TESTS *:*

	Vibration frequencies (Hz) applied during endurance tests (2 hrs)		
	Vertical	1st horizontal	2nd horizontal
R5 Supreme CDU	30	30	30

VIBRATION DIRECTION	
Vertical	

VIBRATION DIRECTION	
1st horizontal	 C:\VcpNT\Daten\Thales\2012\Extern\Telefication\114203-20120726\Resonance-survey 007.rsn
2nd horizontal	 C:\VcpNT\Daten\Thales\2012\Extern\Telefication\114203-20120726\Sine-dwell 005.rsd

During each endurance test period performance checks were carried out.
The performance check consists of manually operating the touch screen and push buttons (in random order).
No degradation of performance was observed.

Test equipment used: (Item numbers)	94, 95, 96, 97, 98, 99

2.2.2 Performance checks at the end of the endurance test periods

At the end of each endurance test period performance checks were carried out.
The performance check consists of manually operating the touch screen and push buttons (in random order).
No degradation of performance was observed.

2.3 Dry heat functional test

EN 60945 reference : 8.2
Basic standard : IEC 60068-2-2

Temperature : 55°C
Duration : 10-16h
EUT : R5 Supreme CDU

Power supply : 12/24 Vdc

Power supply variation	**Voltage (V)**	**Result**
Normal Power supply	24	P
Normal Power supply	12	P
Upper extreme power supply	31.2	P

Comments: The EUT was switched on and kept operational for sixteen hours. At the end the EUT was subjected to a performance check. The EUT operated in accordance with its equipment standard.

2.4 Damp heat functional test

EN 60945 reference : 8.3
Basic standard : IEC 60068-2-30

Temperature : 40°C
Relative humidity : 95%
Duration : 10-16h
EUT : R5 Supreme CDU
Power supply : 12/24 Vdc

Power supply variation	**Voltage (V)**	**Result**
Normal Power supply	24	P
Normal Power supply	12	P

Comments : The performance check was carried out immediately after the EUT was switched on and the EUT was kept operational for two hours. During the performance check the EUT operated in accordance with its equipment standard.

2.5 Low temperature functional test

EN 60945 reference : 8.4
Basic standard : IEC 60068-2-1

Temperature : -15°C
Duration : 10-16h
EUT : R5 Supreme CDU
Power supply : 12/24 Vdc

Power supply variation	**Voltage (V)**	**Result**
Normal Power supply	24	P
Normal Power supply	12	P

Comments: The performance check was carried out immediately after the EUT was switched on and the EUT was kept operational for two hours. During the performance check the EUT operated in accordance with its equipment standard.

3 Electromagnetic emission clause 9

3.1 Summary

According to EN 60945: 2002 the following tests are performed:

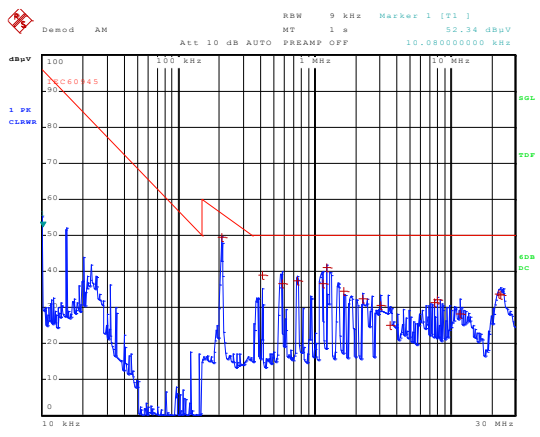
Port	Sub clause	Category	Phenomenon	Result
DC-input	9.2	b c d	Conducted emissions	P
AC-input	9.2	b c d	Conducted emissions	NA
Enclosure	9.3	a b c	Radiated emissions	P

Result:
P = pass NA = not applicable
F = fail NP = not performed

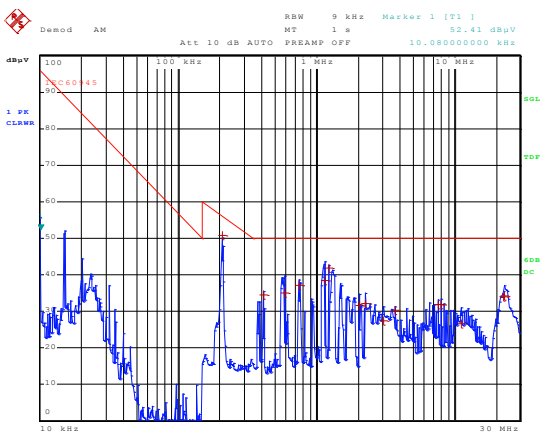
Category:
a = portable c = exposed
b = protected d = submerged

3.2 Conducted emissions

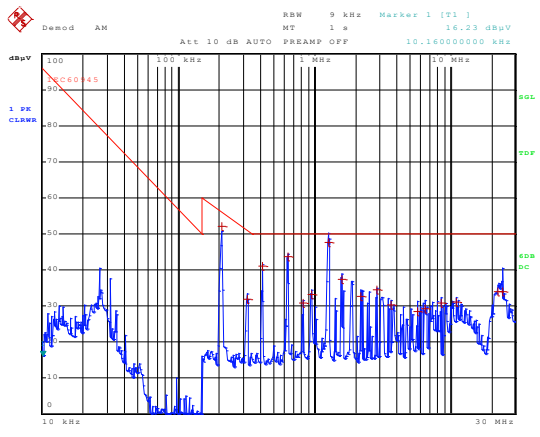
EN 60945 ref. : 9.2
Basic standard : CISPR 16-1-1: 2006; CISPR 16-1-4: 2007
Cable length AMN↔ EUT : 1 m
Mode of operation : Normal



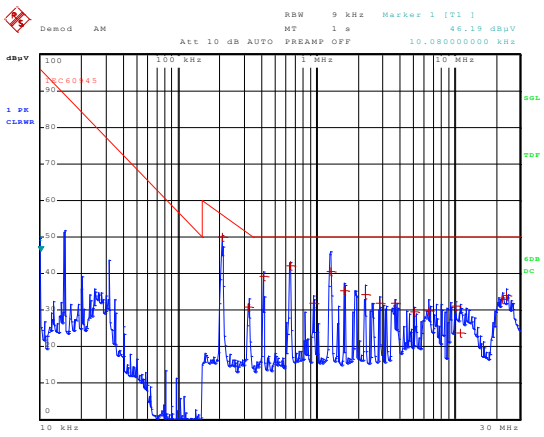
+12 Vdc



-12 Vdc



+24 Vdc



-24 Vdc

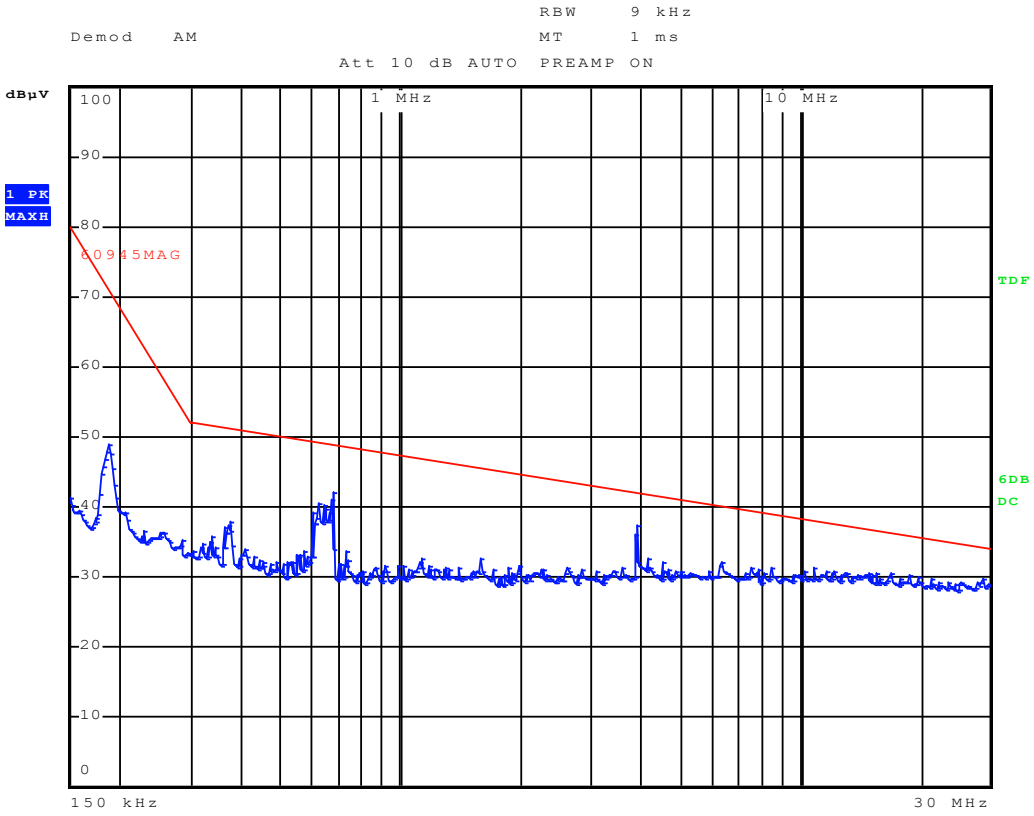
Measurement uncertainty	+3.7/-3.7 dB
Limit: see plot	

Test equipment used: (Item numbers)	24, 26, 27

3.3 **Radiated emissions 150 kHz – 30 MHz**

EN 60945 ref.	:	9.3
Basic standard	:	CISPR 16-1-1: 2006; CISPR 16-1-4: 2007
Distance ant.↔ EUT	:	3m
Mode of operation	:	Silent
EUT power	:	12 Vdc

Field measurement results were obtained with Active Loop Antenna (units in dBµV/m).

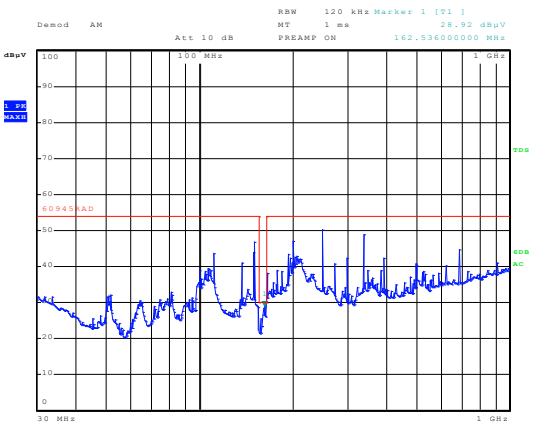


Measurement uncertainty	+1.9 / -2.1 dB
Limit: 80 dBµV/m @ 150 kHz descending to 52 dBµV/m @ 300 kHz 52 dBµV/m @ 300 kHz descending to 34 dBµV/m @ 30 MHz	

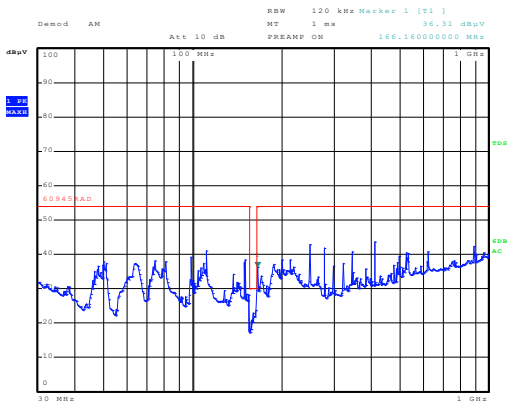
Test equipment used: (Item numbers)	82, 88

3.4 Radiated emissions 30 MHz – 1 GHz

EN 60945 ref.	:	9.3
Basic standard	:	CISPR 16-1-1: 2006; CISPR 16-1-4: 2007
Distance ant.↔ EUT	:	3m
Mode of operation	:	Silent
EUT power	:	12 Vdc



Horizontal polarization



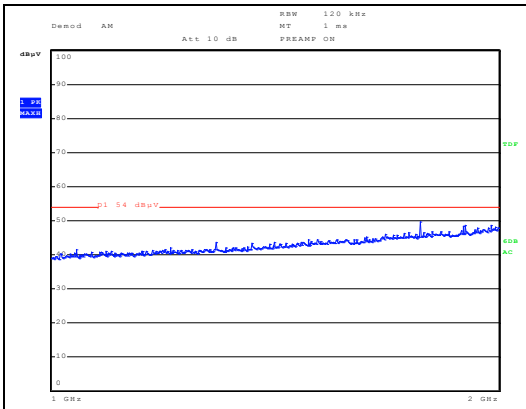
vertical polarization

Measurement uncertainty	
Horizontal polarization	
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
Vertical polarization	
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB

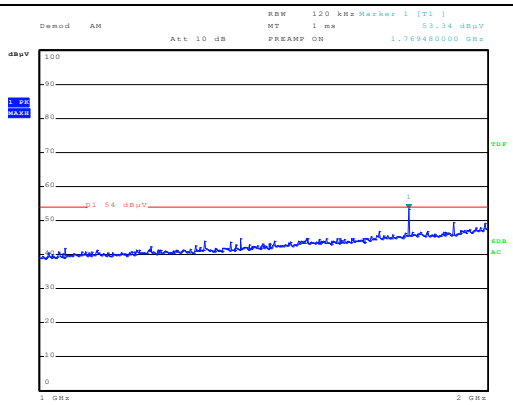
Test equipment used: (Item numbers)	55, 82, 88

3.5 **Radiated emissions 1 – 2 GHz**

EN 60945 ref.	:	9.3
Basic standard	:	CISPR 16-1-1: 2006; CISPR 16-1-4: 2007
Distance ant.↔ EUT	:	3m
Mode of operation	:	Silent
EUT power	:	12 Vdc



Horizontal polarization



vertical polarization

Measurement uncertainty	+4.5 dB / -6.1 dB

Test equipment used: (Item numbers)	22, 25, 56, 88

4 Immunity to electromagnetic environment clause 10

4.1 Summary

According to EN 60945: 2002 the following tests are performed:

Port	Sub clause Category	Phenomena	Performance criterion (ref. IEC 61993-2, clause 13)	Result
AC-input	10.3 b c d	Conducted RF CM 0.15 - 80.00 MHz, 3 V*), AM80% 400Hz	A	NA
DC-input	10.3 b c d	Conducted RF CM 0.15 - 80.00 MHz, 3 V*), AM80% 400Hz	A	P
Signal/control line(s)	10.3 b c d	Conducted RF CM 0.15-80.00 MHz, 3 V*), AM80% 400Hz	A	P
Enclosure	10.4 a b c	RF-field 10 V/m, AM80% 400Hz 80 - 2000 MHz	A	P
AC-input	10.5 b c d	EFT +/- 2 kV common mode	B	NA
DC-input	10.5 b c d	EFT +/- 1 kV common mode	B	NA
Signal/control line(s)	10.5 b c d	EFT +/- 1 kV common mode	B	P
AC-input	10.6 b c d	Surges 1 kV line-earth 0.5 kV line-line	B	NA
AC-input	10.7 b c d	Power supply short-term variation volt. +/-20%, freq. +/-10%	B	NA
AC-input	10.8 b c d	Power supply failure, 60sec common mode	C	NA
DC-input	10.8 b c d	Power supply failure, 60sec common mode	C	P
Enclosure	10.9 a b c	ESD, 6 kV contact 8 kV air	B	P

*) 10 V level applies to spot frequencies 2, 3, 4, 6.2, 8.2, 12.2, 16.5, 18.8, 22 & 25 MHz

Result:
P = pass NA = not applicable
F = fail NP = not performed

Category:
a = portable c = exposed
b = protected d = submerged

Performance criterion A/B

The EUT shall be set into autonomous mode using channels AIS1 and AIS2 with a reporting interval of 2 s in the standard test environment. The contents of the reports and the reporting intervals shall not be degraded during or after the test, as appropriate for the considered criterion.

Performance criterion C

Performance criterion C is to be taken to mean that the functions of the EUT are self-recoverable i.e. without operation of controls (automatically restart of the unit without any help).

4.2 Immunity to conducted radio frequency disturbance

EN 60945 ref. : 10.3
Basic standard : IEC 61000-4-6: 2006
Modulation : 400 Hz 80% AM
Dwell time : 2 seconds
Performance criterion : A, ref. IEC 61993-2, clause 13
Mode of operation : Normal

Port	**Frequency (MHz)** Note 1	**Coupl. dev.** Note 2	**Test Level (V_{rms})**	**Comments**	**Result**
RS 422 (CDU)	0.15 – 80 range 1 % step size	43, 44	3	1	P
GPS	0.15 – 80 range 1 % step size	45	3	1	P
GPS	0.15 – 80 range 1 % step size	45	3	3	P
RS 422 (Transponder)	0.15 – 80 range 1 % step size	43, 44	3	1	P
I/O (Transponder)	0.15 – 80 range 1 % step size	43, 44	3	1	P
24 Vdc (Transponder)	0.15 – 80 range 1 % step size	46	3	1	P
12 Vdc (Transponder)	0.15 – 80 range 1 % step size	46	3	1	P
VHF (Transponder)	0.15 – 80 range 1 % step size	45	3	1	P
Ethernet (CDU)	0.15 – 80 range 1 % step size	49	3	1	P
Ethernet (Transponder)	0.15 – 80 range 1 % step size	49	3	1	P
24 Vdc (CDU)	0.15 – 80 range 1 % step size	46	3	1	P
12 Vdc (CDU)	0.15 – 80 range 1 % step size	46	3	1	P

Comments:
1. There is no degradation of performance or loss of function of the EUT during the test.
2. There is no degradation of performance or loss of function of the EUT after the test.
3. No unintentional change of GPS received data.

Uncertainty of pre calibrated level:	+/- 1.3 dB The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approx. 95%, but excluding the effect of measurement system repeatability.

Note 1: includes spot frequencies 2, 3, 4, 6.2, 8.2, 12.2, 16.5, 18.8, 22, 25 MHz
Note 2: numbers refer to the used test equipment list.

Test equipment used: (Item numbers)	3, 23, 43, 44, 45, 46, 49, 61

4.3 Immunity to radiated radio frequency disturbance

EN 60945 ref.	:	10.4
Basic standard	:	IEC 61000-4-3: 2006
Modulation	:	400 Hz 80% AM
Dwell time	:	2 seconds
Performance criterion	:	A, ref. IEC 61993-2, clause 13
Mode of operation	:	Normal

Frequency (MHz)	Test Level (V/m)	Illuminated side of EUT	Polarisation H/V for each side	Com-ments	Result
Range 80 – 2000 1 % frequency steps	10	Rear	V	3	P
Range 80 – 2000 1 % frequency steps	10	Rear	H	3	P
Range 80 – 2000 1 % frequency steps	10	Rear	H	1	P
Range 80 – 2000 1 % frequency steps	10	Rear	V	1	P
Range 80 – 2000 1 % frequency steps	10	Front	V	1	P
Range 80 – 2000 1 % frequency steps	10	Front	H	1	P

Comments:
1. There is no degradation of performance or loss of function of the EUT during the test.
2. There is no degradation of performance or loss of function of the EUT after the test.
3. No unintentional change of received GPS data.

Uncertainty of pre calibrated level: +1.8/ -1.8 dB (80 – 1000 MHz)
+2.1/-6.1 dB (1000 – 2000 MHz)

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approx. 95 %, but excluding the effect of measurement system repeatability.

Test equipment used: (Item numbers)	21, 31, 32, 33, 35, 56, 74, 76

4.4 Immunity to Fast Transients

EN 60945 ref. : 10.5
Basic standard : IEC 61000-4-4: 2004
Performance criterion : B, ref. IEC 61993-2, clause 13
Mode of operation : Normal

Port	Test duration for each polarity	Coupl. Dev.	Test Volt. (kV)	Comments	Result
Ethernet (CDU)	3 min.	40	+1/-1	1	P
RS 422 (CDU)	3 min.	40	+1/-1	1	P
RS 422(Transponder)	3 min.	40	+1/-1	1	P
I/O (Transponder)	3 min.	40	+1/-1	1	P
Ethernet (Transponder)	3 min.	40	+1/-1	1	P
GPS (Transponder)	3 min.	40	+1/-1	1	P
GPS (Transponder)	3 min.	40	+1/-1	2	P
VHF (Transponder)	3 min.	40	+1/-1	1	P

Comments:
1. There is no degradation of performance or loss of function of the EUT after the test.
2. No unintentional change of received GPS data.

Measurement uncertainty: It has been demonstrated that EFT generator and its coupling networks meet the specified requirements in the standard with at least a 95% confidence.

Test equipment used: (Item numbers)	40, 72

4.5 Immunity to electrostatic discharge, air

EN 60945 ref.	:	10.9
Basic standard	:	IEC 61000-4-2: 2001
Ambient temp	:	24 ºC
R.H	:	50%
Performance criterion	:	B, ref. IEC 61993-2, clause 13
Mode of operation	:	Normal

Position	Test Volt. (kV)	Number of discharges on each position	Polarity +/-	Comments	Result
Front side of the Transponder (random positions)	8	10	+	1	P
	8	10	-	1	P
Any position on the front side of the CDU	8	0	+	3	P
	8	0	-	3	P

Comments:
1. There is no degradation of performance or loss of function of the EUT after the test.
2. No unintentional change of received GPS data.
3. No discharges were possible.

Measurement uncertainty: It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least a 95% confidence.

Test equipment used: (Item numbers)	38, 68, 70

4.6 Immunity to electrostatic discharge, indirect contact

EN 60945 ref. : 10.9
Basic standard : IEC 61000-4-2: 2001
Performance criterion : B, ref. IEC 61993-2, clause 13
Mode of operation : Normal

Position	Test Volt. (kV)	Number of discharges on each position	Polarity +/-	Comments	Result
Each of four sides of the CDU illuminated by VCP	6	10	+	1, 2	P
	6	10	-	1, 2	P
CDU illuminated by HCP	6	10	+	1, 2	P
	6	10	-	1, 2	P
Each of four sides of the Transponder illuminated by VCP	6	10	+	1	P
	6	10	-	1	P
Transponder illuminated by HCP	6	10	+	1	P
	6	10	-	1	P

Comments:
1. There is no degradation of performance or loss of function of the EUT after the test.
2. No unintentional change of received GPS data.

Measurement uncertainty: It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least a 95 % confidence.

Test equipment used: (Item numbers)	68, 69

4.7 Immunity to electrostatic discharge, direct contact

This test was not feasible since no metal surfaces are used on the front side of the Transponder/CDU.

4.8 Immunity to power supply failure.

EN 60945 ref. : 10.8
Basic standard : IEC 61000-4-11: 2004
Performance criterion : C, ref. IEC 61993-2, clause 13
Mode of operation : Normal

Test			Supply voltage	Comments	Result
nr.	**Supply**	time			
1	break	60 s	12 Vdc	1	P
2	break	60 s	12 Vdc	1	P
3	break	60 s	12 Vdc	1	P
4	break	60 s	24 Vdc	1	P
5	break	60 s	24 Vdc	1	P
6	break	60 s	24 Vdc	1	P

Comments:
1. The transponder functions are self-recoverable.

Measurement uncertainty: Not applicable

Test equipment used: (Item numbers)	--

Used test equipment module

Item	Description	Manufacturer	Type	ID
1	RF probe	R & S	URV5-Z2	TE 00009
2	T-network	R & S	ESH3-Z4	TE 00026
3	Signal generator	Marconi	2042	TE 00030
4	Pre-amplifier 10 dB	R & S	ESV-Z3	TE 00097
5	Pre-amplifier 10 dB	R & S	ESV-Z3	TE 00098
6	Spectrum analyser	HP	8562^{E}	TE 00099
7	Artificial mains network	R & S	ESH2-Z5	TE 00130
8	Arbitrary waveform generator	HP	33120A	TE 00144
9	Artificial mains network	R & S	ESH3-Z5	TE 00208
10	Digital multimeter	HP	3438A	TE 00215
11	Pulse generator	HP	8012 B	TE 00225
12	Pulse limiter	R & S	ESH3-Z2	TE 00227
13	Digital multimeter	Fluke	87	TE 00329
14	Spectrum analyser	HP	8563^{E}	TE 00359
15	Digital thermometer	Fluke	51	TE 00388
16	Modulation analyzer	R & S	FAM	TE 00412
17	Power meter	R & S	NRVS	TE 00414
18	Measurement probe	R & S	URV5-Z4	TE 00415
19	Distortion meter	HP	8903 B	TE 00416
20	Signal generator	HP	8642B	TE 00424
21	Signal generator	Marconi	2042	TE 00427
22	Spectrum analyser	HP	8563^{E}	TE 00481
23	RF amplifier	Amplifier Research	25A250A	TE 00515
24	Audio amplifier	Solar Electronics	6552-1A	TE 00517
25	Horn antenna	EMCO	3115	TE 00531
26	Biconilog antenna	EMCO	3143	TE 00700
27	RF voltmeter	Boonton	9200B	TE 00707
28	Pulse modulator	Schaffner	CPM9830	TE 00708
29	RF power amplifier	Schaffner	CBA9546	TE 00714

Item	Description	Manufacturer	Type	ID
30	Log periodic antenna	EMCO	3147	TE 00744
31	Field probe	Holaday	HI-4422	TE 00748
32	System readout	Holaday	HI-4416	TE 00749
33	RF power amplifier	Kalmus	737FC	TE 00750
34	Attenuator 3 dB, 100 W	Tenuline	8343-030	TE 00751
35	40 dB coupler	Kalmus	DC100HHR	TE 00752
36	RF probe	Boonton	952001B	TE 00753
37	RF probe	Boonton	952001B	TE 00754
38	ESD air discharge tip	Keytek	TPA-2	TE 00755
39	Pulse limiter	R & S	ESH3-Z2	TE 00756
40	Capacitive clamp	Keytek	CCL-4/S	TE 00761
41	AC power simulator	Kikusui	PCR4000L	TE 00762
42	Power analyzer	Xitron Technologies	2501AH	TE 00763
43	EM clamp	Lüthi	EM101	TE 00764
44	Ferrite tube	Lüthi	FTC101	TE 00765
45	Coaxial coupl./dec. Network	Telefication	CDN-S1	TE 00766
46	Mains coupl./dec. Network	Telefication	CDN-M2/M3	TE 00767
47	Mains coupl./dec. Network	Telefication	9403S1	TE 00768
48	100 µF decoupling capacitor	Telefication	JOZ	TE 00769
49	Coupl./dec. device for screened cables	MEB	CDN-S25	TE 00771
50	Audio isolation transformer	Solar	6220-2	TE 00772
51	Current probe	Eaton	93686-2	TE 00773
52	Acoustic pipe coupler	Telefication	JOZ110395	TE 00775
53	Absorbing clamp	R & S	MDS 21	TE 00777
54	Power supply	Delta Elektronika	E030-1	TE 00851
55	Biconilog antenna	Chase	CBL6112A	TE 00967
56	Full anechoic chamber	Euroshield	RFD-F-100	TE 01064
57	Triple loop antenna	Telefication	--	TE 01066
58	Coupling Decoupling Network	Schaffner	USB/p	TE 01068
59	Coupling Decoupling Network	Schaffner	A401	TE 01069
60	Multifunction synthesizer	HP	8904A	TE 01070

Item	Description	Manufacturer	Type	ID
61	Attenuator 6 dB	Aeroflex /Weinschel	24-6-34	TE 01071
62	Coupling Decoupling Network	Schaffner	A201	TE 01074
63	Isotropic field sensor	Holaday	HI-6005	TE 01075
64	Fibre optic RS232 interface	Holaday	HI-4460	TE 01094
65	Antistatic brush	Precision brush	55320	TE 01107
66	Signal line CDN	Keytek	CM-I/OCD	TE 01108
67	Telecom line CDN	Keytek	CM-TELCD	TE 01109
68	ESD simulator	Keytek	MiniZap	TE 01110
69	ESD contact discharge tip	Keytek	TPC-2a	TE 01111
70	ESD air discharge tip	Keytek	TPA-2	TE 01112
71	Temp / RH logger	MicroLog	EC 650	TE 01114
72	Ultra Compact Simulator	EM Test AG	UCS 500N	TE 01170
73	CDN for data/signal lines	EM Test AG	CNV 504N	TE 01170
74	Stacked double LogPer antenna	Schwarzbeck	STLP 9128D	TE 01171
75	Isotropic electric field probe	Holaday	HI-440	TE 01172
76	RF power amplifier	Teseq	CBA 3G-050	TE 01173
77	Directional 30 dB coupler	Bird	100-CC-FFN-30	TE 01175
78	Current generator	Fischer	F-1000-1000-4-8-G-125A	TE 01181
79	Loop antenna	Fischer	F-1000-4-8/9/10-1M	TE 01182
80	Antenna cable	Belden	H2000-flex	TE 01192
81	Spectrum analyser	R & S	FSP40	TE 11125
82	EMI test receiver	R & S	ESCI	TE 11128
83	Antenna tower	Heinrich Deisel	AS 620P	ANEC
84	Turntable	Heinrich Deisel	DS-412	ANEC
85	Turntable controller	Heinrich Deisel	HD-050	ANEC
86	Antenna mast	EMCO	1070	SAR
87	Turn table	EMCO	1060-2M	SAR
88	Semi Anechoic Room	Comtest	--	SAR
89	Adjustable transformer	KSL	RU8	--
90	800 mm strip line	Telefication	--	--
92	Preamplifier 1 – 26.5 GHz	HP	8449B	TE 00092
93	Active loop antenna	R & S	HFH2-Z2	TE 00746

Test equipment used for vibration testing.

This equipment is the property of Thales BV, Environmental Competence Centre, Hengelo

Ref	Description	Manufacturer	Model
94	Conditioning amplifier	Ling Dynamics	SPAK 24
95	Accelerometer	PCB Piezotronics	33353B
96	Controller	M+P International	VibPilot Oros
97	Shaker	Ling Dynamics	2860
98	Acceleration sensor	Brüel & Kjaer	4384
99	Amplifier	Kistler	5011

Photographs module

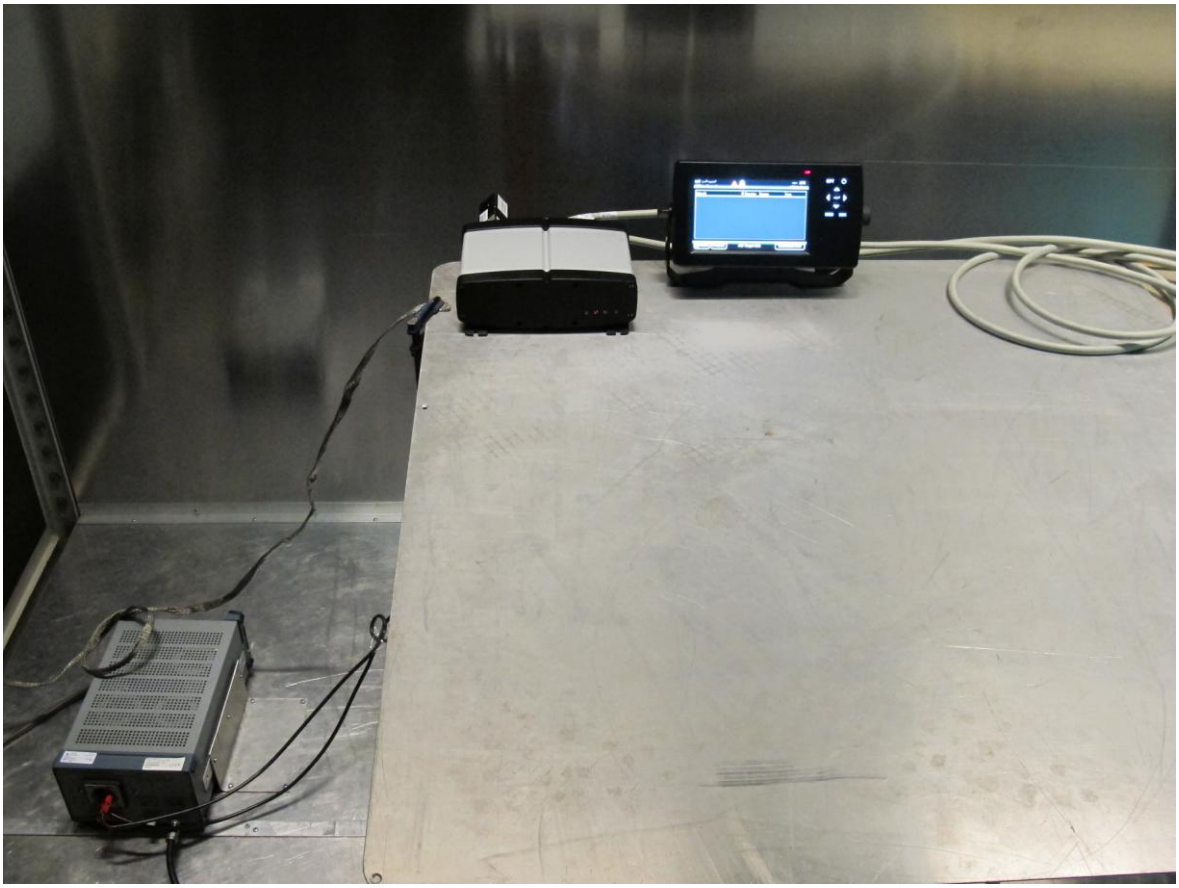
Photograph 1: Front view R5 Supreme transponder

Photograph 2: Rear view R5 Supreme transponder

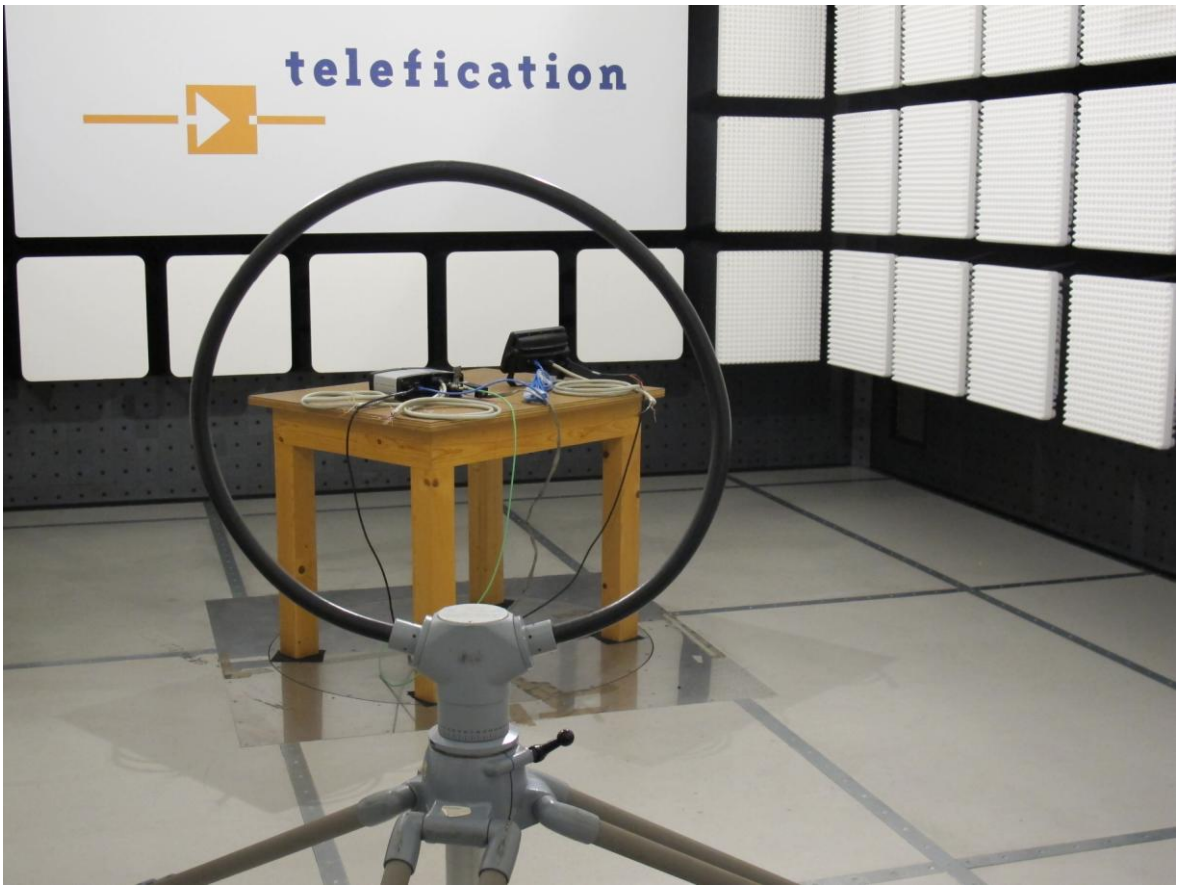
Photograph 3: Front view R5 Supreme CDU

Photograph 4: Rear view R5 Supreme CDU

Photograph 5: conducted emissions test set up (0.01 – 30 MHz)

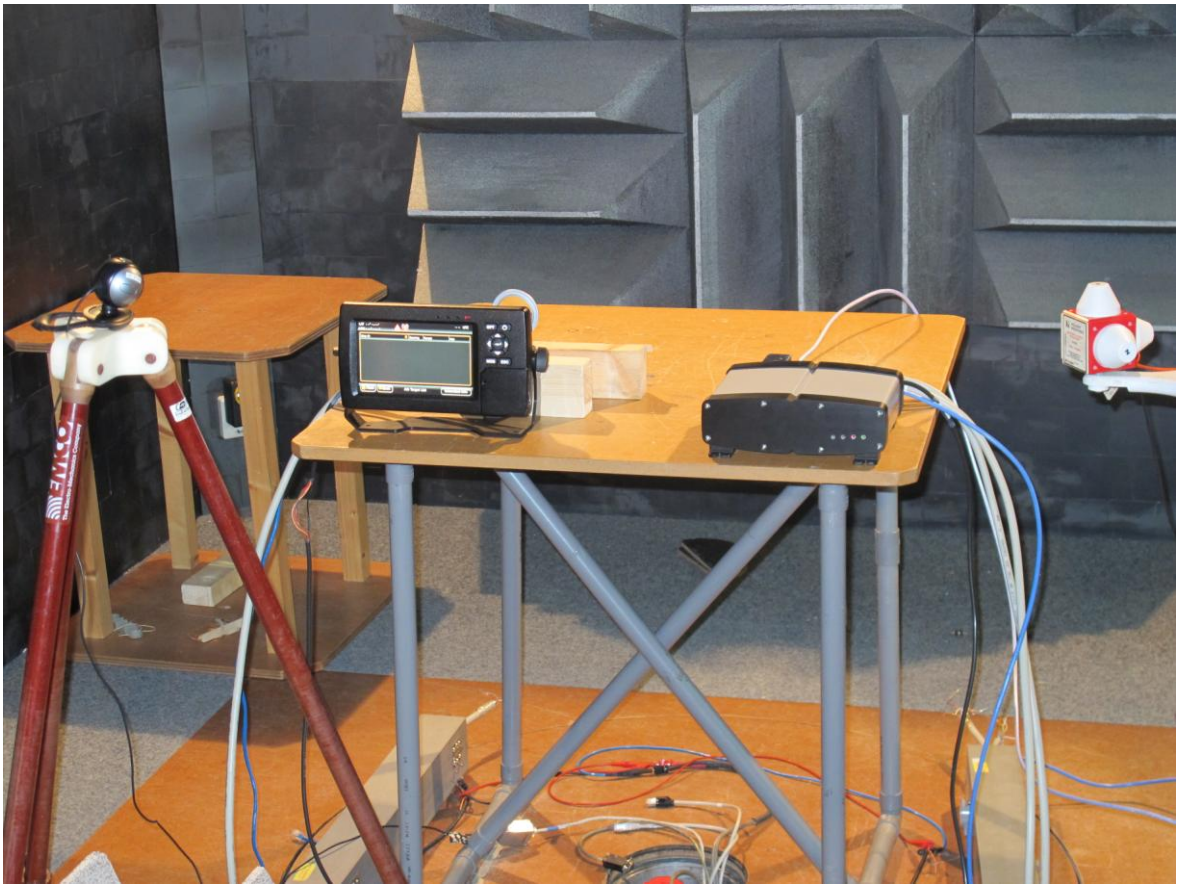


Photograph 6: radiated emissions test set up (0.15 – 30 MHz)



Photograph 7: radiated emissions test set up (0.03 – 1 GHz)

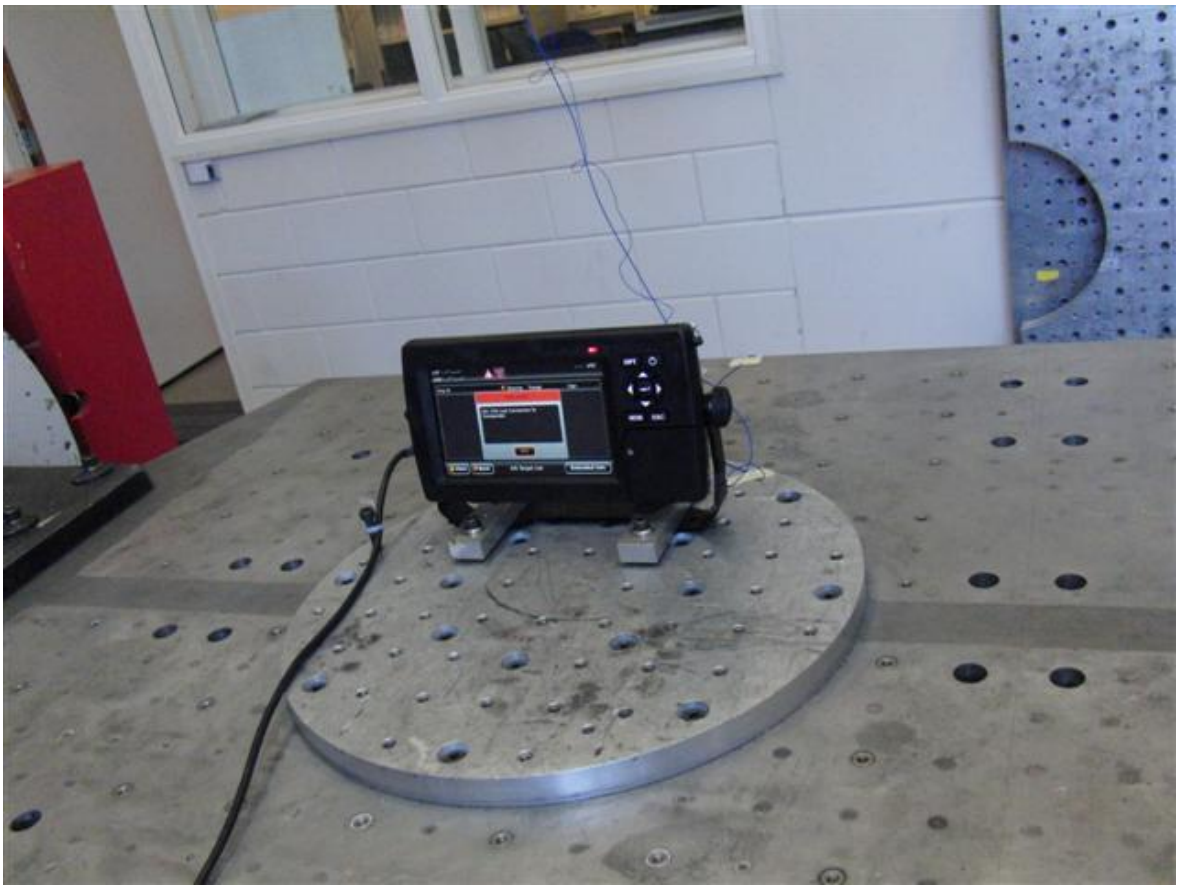
Photograph 8: radiated immunity test set up (0.08 – 1 GHz)



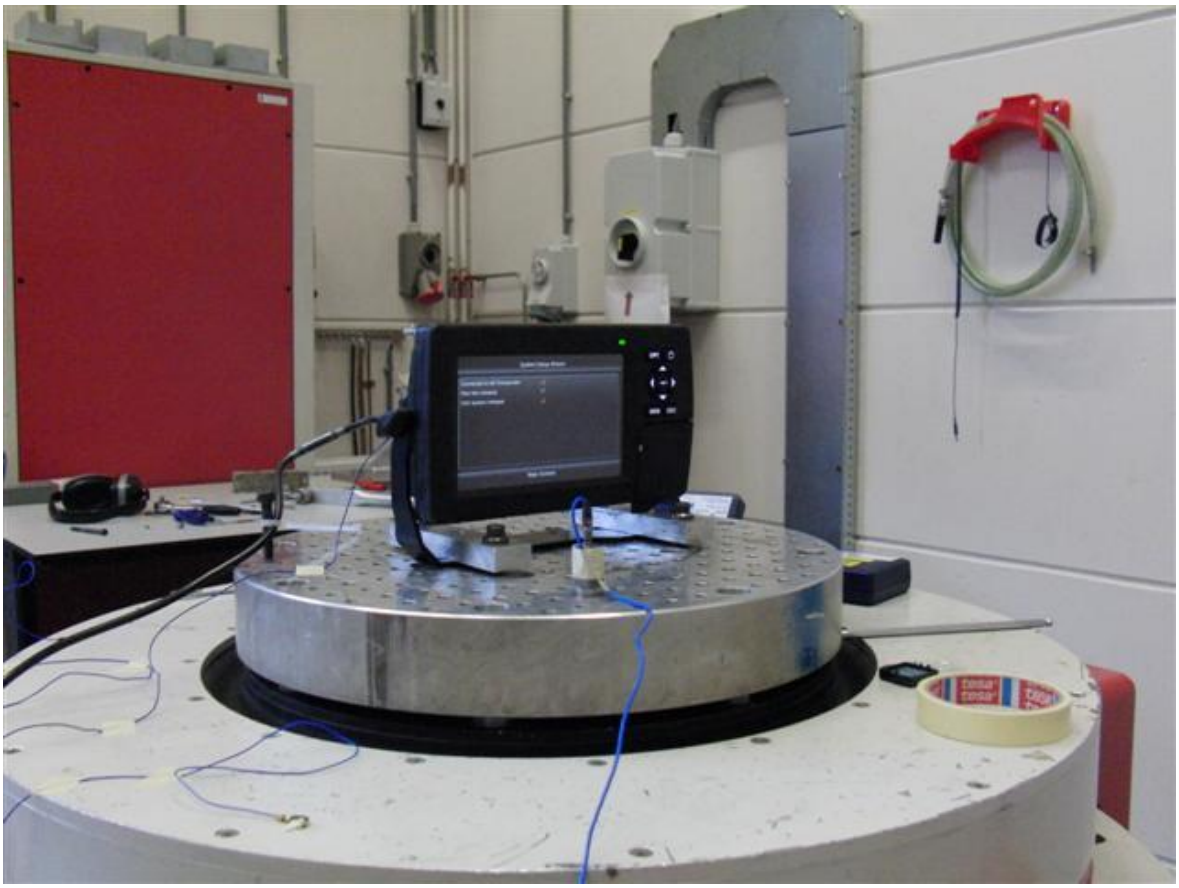
Photograph 9: Conducted immunity test set up (0.15 – 80 MHz)

Photograph 10: Vibration test setup with R5 CDU in gimbal mounting frame (1st horizontal direction)

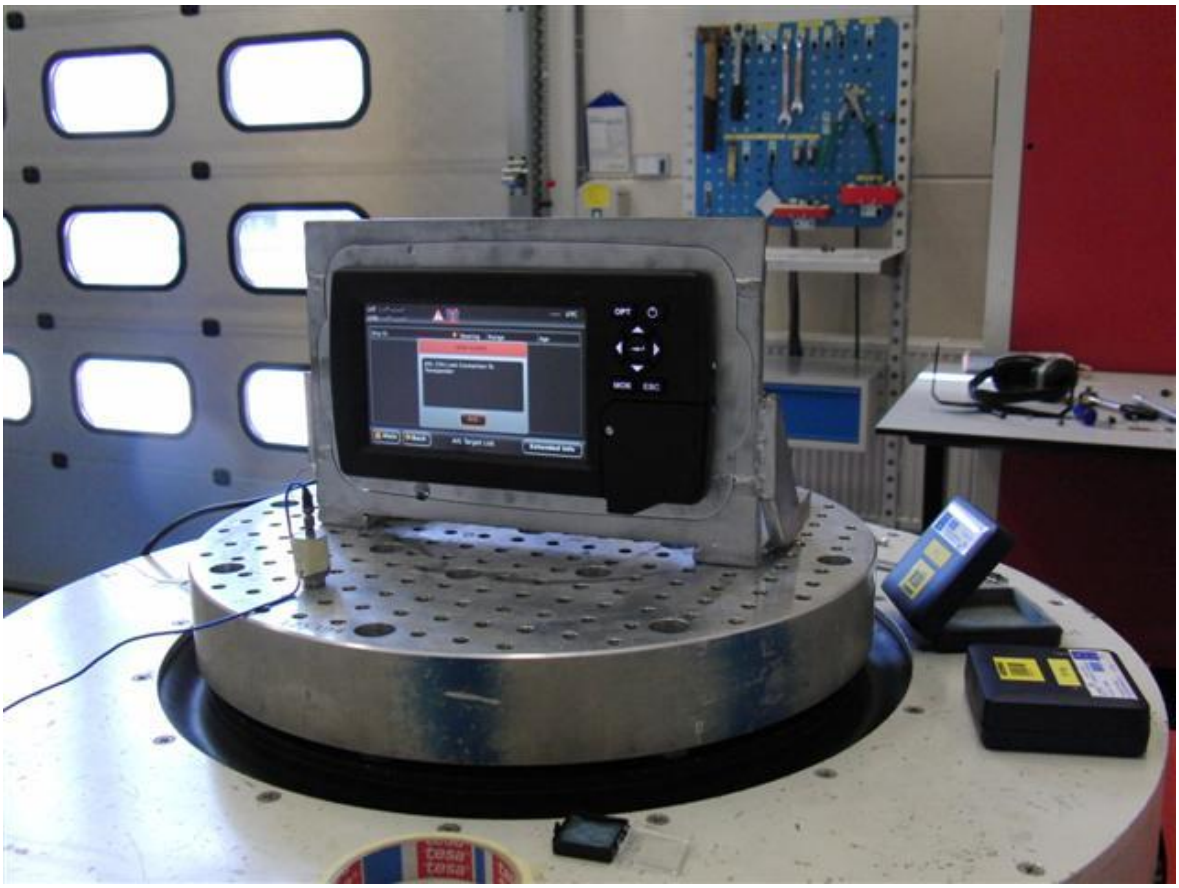
Photograph 11: Vibration test set up with R5 CDU in gimbal mounting frame (2nd horizontal direction)



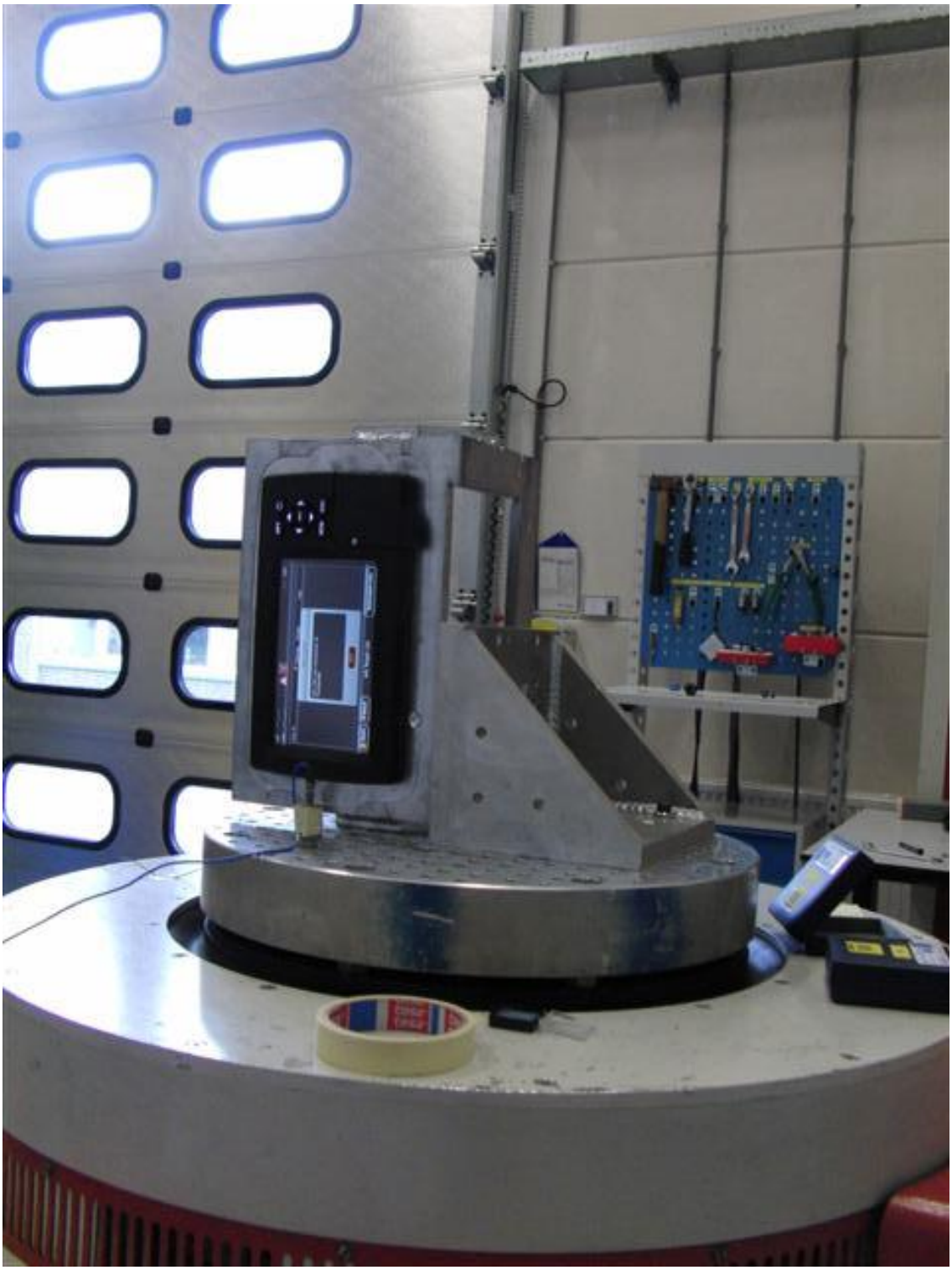
Photograph 12: Vibration test setup with R5 CDU in gimbal mounting frame (vertical direction)



Photograph 13: Vibration test set up with R5 CDU in panel mounting frame (vertical direction)



Photograph 14: Vibration test setup with R5 CDU in panel mounting frame (1st horizontal direction)



Photograph 15: Vibration test setup with R5 CDU in panel mounting frame (2nd horizontal direction)

Additional information module

This module contains 12 (twelve) pages of information provided by the applicant.

TCF

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Document Class
Company Restricted

Document Id 7000-118-0313

Version B

Date 2012-08-02

Saab TransponderTech AB

R5 TECHNICAL CONSTRUCTION FILE (TCF) for R5 Supreme AIS System

2012-08-02

Signatures/Names **Date**

Saab Transpondertech AB

Company

Saab TransponderTech AB

1 Objective

This technical construction file (TCF) is a description of the main changes that are done on the R5 Supreme AIS System during the test period 29/5-6/7 2012 at Telefication. Tests were done with the R5 Supreme AIS System before the modifications described in section 2 were introduced. These tests are listed in table 2 in section 3. The R5 Solid AIS System has been tested by Telefication and the tests that have been done during the time period 19/9-14/10 2011 are listed in table 1 in section 3.

2 Technical documentation

2.1 Description of the modifications of R5 Supreme

2.1.1 Spurious emission from CAN bus clock

A spurious emission 157.288MHz from the CAN bus clock was identified in the test of radiated emission, section 9.3 in EN60945. In software version 1.0.3d the CAN bus clock was switched off and the spurious emission disappeared. The plan from the beginning was that the CAN bus should be switched off, so this action is just according to the plan.

2.1.2 EMC filter

New filtering has been added around the DC/DC-converter to fulfill the EMC requirements in section 9.2 in EN60945. C341 and C344 have been added, see A and B in figure 1 and figure 2.

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2.2 Drawing and scheme

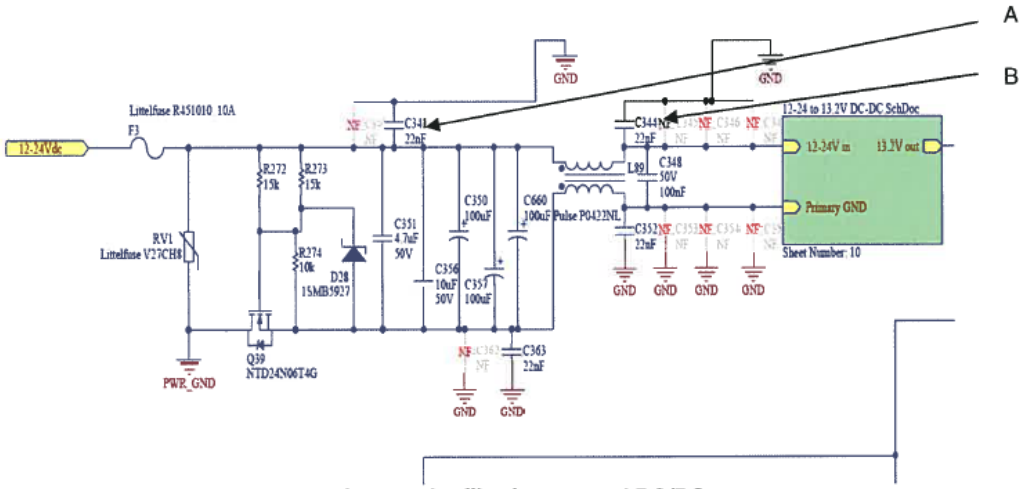

Figure 1: A schematic over the filtering around DC/DC-converter.

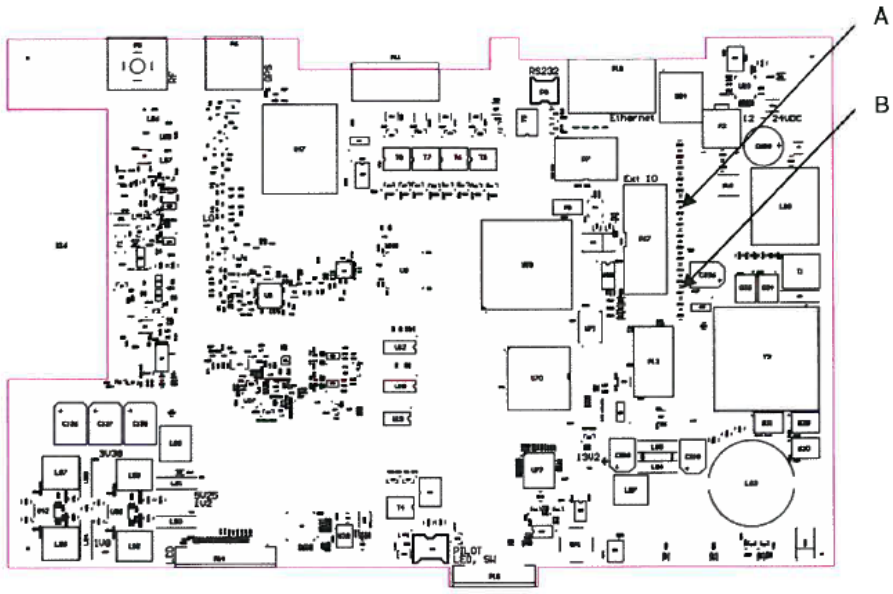

Figure 2: R5 AIS PCB (upper side)

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3 List of tests/requirements:

15.1.1	Frequency Error	IEC 61993-2 ed.1
15.1.2	Carrier Power	IEC 61993-2 ed.1
15.1.3	Modulation spectrum 25kHz channel mode	IEC 61993-2 ed.1
15.1.5	Transmitter attack time	IEC 61993-2 ed.1
15.1.6	Transmitter Release Time	IEC 61993-2 ed.1
15.3.1	Sensitivity – 25 kHz operation	IEC 61993-2 ed.1
15.3.3	Error behaviour at high input levels	IEC 61993-2 ed.1
15.3.6	Adjacent channel selectivity – 25 kHz operation	IEC 61993-2 ed.1
15.3.8	Spurious response rejection	IEC 61993-2 ed.1
15.3.9	Intermodulation response rejection and blocking	IEC 61993-2 ed.1
15.3.10	Transmit to receive switching time	IEC 61993-2 ed.1
15.4.2	Error behaviour at high input levels	IEC 61993-2 ed.1
15.4.3	Co-channel rejection	IEC 61993-2 ed.1
15.4.4	Adjacent channel selectivity	IEC 61993-2 ed.1
15.4.5	Spurious response rejection	IEC 61993-2 ed.1
15.4.6	Intermodulation response rejection	IEC 61993-2 ed.1
15.4.7	Blocking or desensitisation	IEC 61993-2 ed.1
15.5.1	Spurious emissions from the receiver	IEC 61993-2 ed.1

Table 1: Approved tests during time period 19/9-14/10 2011 at Telefication

10.3	Conducted immunity	EN60945
9.3	Radiated emissions < 30 MHz	EN60945
10.5	EFT	EN60945

Table 2: Approved tests during time period 29/5-14/6 2012 at Telefication before the modifications described in section 2.

TCF

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Document Class
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Document Id	Version	Date
7000-118-0313	B	2012-08-02

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Declaration of conformity

Declaration of Conformity

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Document Class

Document Id	Version	Date of Issue
7000-118-0314	B	2012-08-02

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DECLARATION OF CONFORMITY (DoC)

We, Saab TransponderTech AB, Låsblecksgatan 3, Linköping, Sweden, declare under our sole responsibility that the changes described in section 2 for product ***R5 Supreme AIS System*** do not affect the compliance of the requirements in section 3.

2012-08-02

Christian Andersson
Product Manager

Report/Directive

Page 1 (6)

Document Class

Document Id	Version	Date
PT-12-0069	A	2012-08-01

Saab TransponderTech AB

Issued by
Ragnar Wichers

Approved by

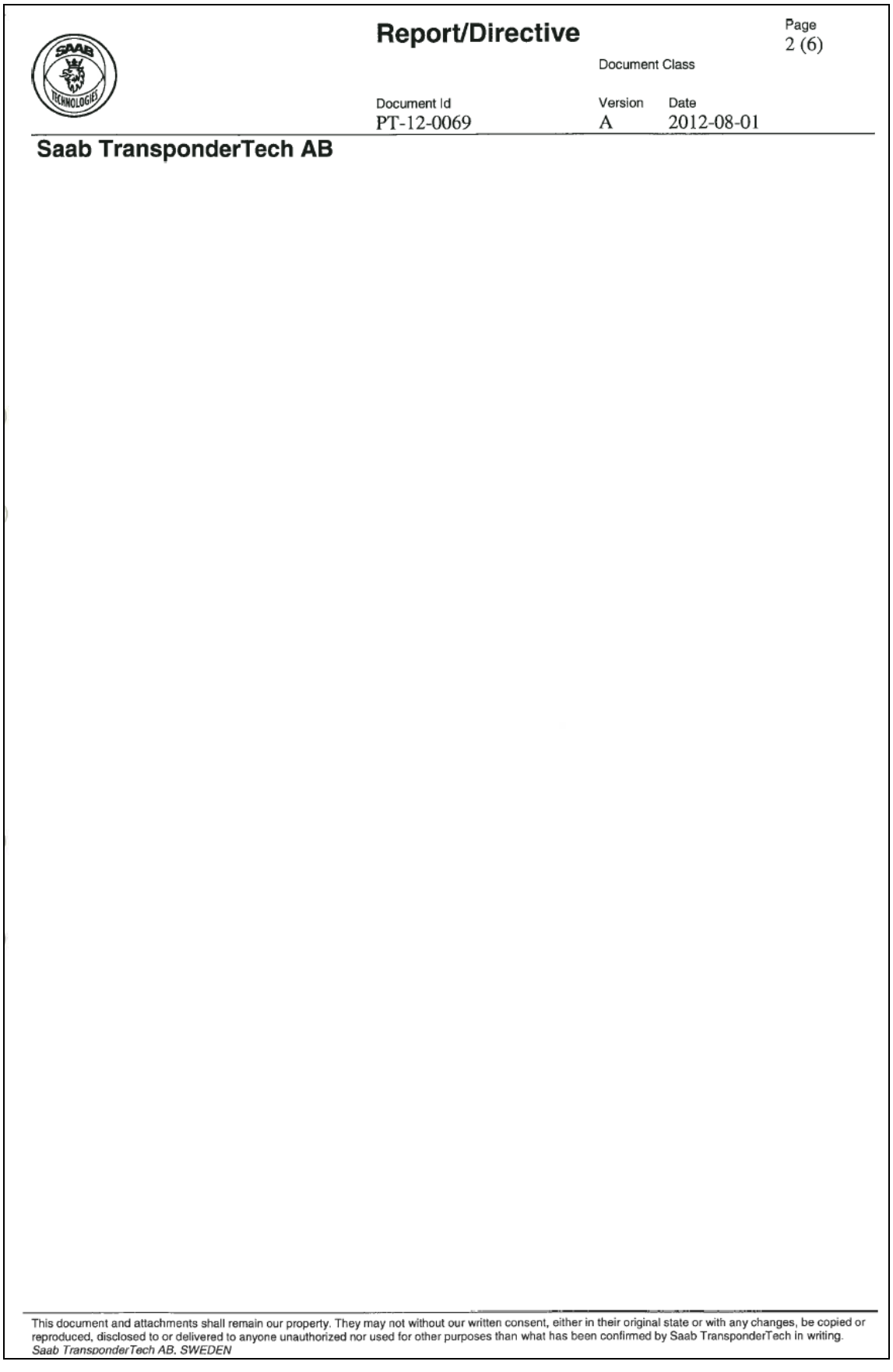
To For information Appendix

R5 Supreme AIS Transponder

Environmental Protection of Enclosure to IEC 60945

Signed:

Christian Andersson
Project Manager
2012-08-02
Linköping, Sweden



Report/Directive

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Document Class

Document Id PT-12-0069

Version A

Date 2012-08-01

Saab TransponderTech AB

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1. GENERAL

1.1 R5 Supreme Enclosures

1.1.1 Transponder Enclosure

The transponder is housed in an extruded aluminium profile with aluminium front and rear covers. Antenna, communication interfaces, GND and power supply connectors are located at the rear cover. Visual indicators are located on the front cover. The cabinet is intended for flat surface mounting.

1.1.2 CDU Enclosure

The CDU is enclosed in a housing consisting of a plastic front and an aluminium rear cover. Visual indicators, buttons and a LCD are located on the front. SD card slot, USB port and Pilot plug are placed under a plastic hatch in the front cover. The housing is intended for flush mount in a panel or gimbal mount on a flat surface.

2 MECHANICAL

2.1 Transponder Profile

The main part of the R5 Supreme transponder enclosure is an extruded aluminium profile. The thickness of the profile is 4mm and aluminium bars inside are used to hold the internal PCB in place. There are eight M4 holes in each end for fastening the front and rear covers. On the bottom side there are six 3mm holes for fastening the aluminium bars on the inside. This assures god heat transfer from the PCB to the outside of the transponder chassis.

2.2 Transponder Rear Cover

The rear cover is an aluminium part with holes for connectors and eight mounting screws. The connectors include RF coaxial (VHF and GPS antenna), GND connector, two 26-pin D-SUB connectors for communication interfaces, an Ethernet connector and a plastic circular 4 pole power connector. All connectors used are plated and/or made of non-corrosive materials to improve the corrosion resistance. There is a stainless steel M6 screw from the inside with two M6 stainless steel nuts on the outside acting as a GND connection. Between the rear cover and the aluminium profile there is a silicone gasket. The rear cover is fastened to the profile with eight stainless steel M4 screws.

2.3 Transponder Front Cover

The front cover is an aluminium part with holes for light guides and mounting screws. There are four light guides and they are all plastic. The front cover is mounted on the aluminium profile with eight stainless steel screws. Between the front cover and the aluminium profile there is a silicone gasket.

2.4 CDU Rear Cover

The rear cover is an aluminium part with holes for connectors and mounting screws. The connectors include a 26-pin D-SUB connector for communication interfaces, an Ethernet connector and a plastic circular 4 pole power connector. All connectors used are plated and/or made of non-corrosive materials to improve the corrosion resistance. The rear cover is fastened to the front with fourteen stainless steel M3 screws. Between the front and the rear cover is a stainless steel frame that the internal PCB in mounted on. There is a silicone gasket between the front and the frame and another gasket between the frame and rear cover.

2.5 CDU Front Assembly

The front is a plastic part with holes for connectors, light guides, a 7" LCD screen and a keypad. There are four light guides and they are all plastic. Between the inside of the front and the edge of the LCD screen is a silicone gasket. The keypad is mounted on the inside of the front and all the exposed parts are made of rubber. The front hatch is a plastic part with a stainless steel hinge pin. The hatch covers the SD card reader, the USB port and Pilot plug. Attached to the inside of the hatch is a rubber gasket that protects the connectors when the hatch is closed. There is also a stainless steel lock that goes through the hatch and into the front.

3 MATERIAL, SURFACE TREATMENT AND PROTECTION

3.1 Material

3.1.1 Transponder Profile

The aluminium profile is made of an extruded aluminium alloy, which has good mechanical properties and provides high resistance to seawater corrosion. The aluminium alloy used is type 6060. The aluminium bars inside the profile are CNC machined in aluminium type EN AW-6082.

3.1.2 Transponder Rear Cover

The rear cover is made of aluminium, which has good mechanical properties and provides high resistance to seawater corrosion. The silicone gasket between the rear cover and the aluminium profile is made from organic silicone rubber.

3.1.3 Transponder Front Cover

The rear cover is made of aluminium, which has good mechanical properties and provides high resistance to seawater corrosion. The silicone gasket between the rear cover and the aluminium profile is made from organic silicone rubber.

3.1.4 CDU Rear Cover

The rear cover is made of aluminium, which has good mechanical properties and provides high resistance to seawater corrosion. The silicone gasket between the rear cover and the stainless steel frame is made from silicone rubber.

3.1.5 CDU Front Assembly

The front cover and plastic front hatch is made from Polyamide 6, reinforced with 30% of glass fibre. The silicone gasket between the front cover and the stainless steel frame is made from silicone rubber. The rubber gasket on the inside of the hatch is made from Thermoplastic Elastomer (TPE 60 Shore).

3.1.6 CDU Gimbal Mount

The gimbal mount is made out of aluminium, which has good mechanical properties and provides high resistance to seawater corrosion.

3.1.7 Assembly Screws

All screws are made out of stainless steel.

3.2 Surface Treatment

3.2.1 Transponder Profile

The cleaned aluminium surface is treated with a powder coating. The coating is Freilacke Freopox powder coating PB1011L, which has very good resistance to salt spray, chemicals and solvents.

3.2.2 Transponder Rear Cover

The cleaned aluminium is E-clps 4600 surface treated and then powder coating. The coating is Carro-Coat PE Series 50 (Jotun), which has very good resistance to salt spray, chemicals and solvents.

3.2.3 Transponder Front Cover

The cleaned aluminium is E-clps 4600 surface treated and then powder coating. The coating is Carro-Coat PE Series 50 (Jotun), which has very good resistance to salt spray, chemicals and solvents.

3.2.4 CDU Rear Cover

The cleaned aluminium is E-clps 4600 surface treated and then powder coating. The coating is Carro-Coat PE Series 50 (Jotun), which has very good resistance to salt spray, chemicals and solvents.

3.2.5 Connector Pins and Sockets

The connector pins and socket materials are gold plated. Connector housings are made of plated, corrosion resistant materials or plastic.

4 SUMMARY

The transponder and CDU enclosures have been designed to withstand operation under harsh marine conditions. The materials and surface protection used in the design have been carefully chosen to fulfil the IEC 60945 environmental requirements and provide long and lasting protection against seawater corrosion. These rugged enclosures ensure that the functionality of the units will not be degraded by corrosion.

Revision history

revision	date	remarks	revised by
1.0	27-08-2012	- results of dry heat functional test at upper extreme voltage added	P.A. Suringa