



Bundesrepublik Deutschland
Federal Republic of Germany

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency



Conformance test report of an

integrated GPS receiver module

Equipment under test: AMEC AIS SART
Type: PLOMO-500
Applying test standards: IEC 61108-1:2003
Sections: 4.3.3.1/5.6.4.1.1, 5.6.4.2.1

Test Report No.: BSH/4615/4361928/11-2

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by order

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Hamburg, 30th June 2011
Federal Maritime and
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by order

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nach DIN EN 17025
akkreditiertes Prüflaboratorium



DAT-PL-086/98-02



DATEch Deutsche Akkreditierungsstelle Technik in der TGA GmbH
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Deutschen AkkreditierungsRat



Akkreditierung

The TGA GmbH, represented by the DATEch Deutsche Akkreditierungsstelle Technik in der TGA GmbH, confirms that the Testing Laboratory

**Federal Maritime and Hydrographic Agency
Department Shipping
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Bernhard-Nocht-Straße 78
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is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out testing in the fields of

Marine Equipment (Navigation Equipment, Radio-Communication Equipment, Life-Saving Appliances)

according to the annexed list of standards and specifications.

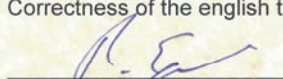
The accreditation is valid until: **2013-12-22**

The annex is deemed part of this certificate and comprises **8** pages.

DAR-Registration No.: **DAT-PL-086/98-02**

Frankfurt/Main, 2008-12-23

Correctness of the english translation confirmed: Frankfurt/Main, 2008-12-23


i.V. Dipl.-Ing. (FH) R. Egner
Head of the Accreditation Body

Member in EA, ILAC, IAF

Translation for information purposes only. The German Accreditation Certificate is authoritative

See notes overleaf

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1 General

1.1 Summary

Test standard: IEC 61108-1 : 2003

Test No.	Reference	Section	Result (passed/ not passed / not applicable / not tested)
--	IEC 61108-1	4.1 Object compliance with IEC 61162-1:2007 Interface output compliance with IEC 60945:2002	N/T N/T
--	IEC 61108-1	4.2 GPS receiver equipment	N/T
--	IEC 61108-1	4.3.1 General	N/T
--	IEC 61108-1	4.3.2 Equipment output	N/T
1/2,3	IEC 61108-1	4.3.3 Accuracy	Passed
--	IEC 61108-1	4.3.4 Acquisition	N/T
--	IEC 61108-1	4.3.5 Protection	N/T
--	IEC 61108-1	4.3.6 Antenna design	N/T
--	IEC 61108-1	4.3.7 Dynamic range	N/T
--	IEC 61108-1	4.3.8 Effects of specific interfering signals	N/T
--	IEC 61108-1	4.3.9 Position update	N/T
--	IEC 61108-1	4.3.10 Differential GPS input	N/T
--	IEC 61108-1	4.3.11 Failure warnings and status indications	N/T
--	IEC 61108-1	4.3.12 Output of COG, SOG and UTC	N/T
--	IEC 61108-1	4.3.13 Typical interference conditions	N/T

Note

EUT is an AIS SART transponder with an integrated GPS module. The integrated GPS modul is identical to the type used in AMEC AtoN, Mando-30x. The GPS module of the AMEC AtoN Mando-30x was tested by BSH under filesign BSH/46162/4321542/11-2.

This test report is to ensure GPS functionality according to IEC61108-1:2003 under the employment of the previously tested GPS module in an AIS SART. The GPS module integrated in an AIS SART is only powered once per minute to save energy and extend battery life.

This test was carried out to ensure that the GPS receiver module is capable of locking to the GPS signals and calculate a position according to the specifications of IEC61108-1:2003 when used in an AIS SART transponder.

1.2 Equipment history

Main Unit				
Type	PLOMO-500		Part No.:	--
Delivery date	24 th June 2011		Serial number:	A1K500004
HW Version (GPS module)	Delivery date	24 th June 2011	Version no	UBX-G5xxx
	Installation date	24 th June 2011		
HW Version:	Delivery date	--	Version no	--
	Installation date	--		
SW Version (GPS module)	Delivery date	24 th June 2011	Version no	ROM core 5.00
	Installation date	24 th June 2011		
SW Version:	Delivery date	--	Version no	--
	Installation date	--		
SW Version:	Delivery date	--	Version no	--
	Installation date	--		

GPS Antenna				
Type	AMEC SART internal		Part No.:	--
Delivery date	24 th June 2011		Serial number:	--
HW Version:	Delivery date	24 th June 2011	Version no	--
	Installation date	24 th June 2011		

1.3 Test environment

Documentation of equipment tests and dates of tests.

Test environment is completely equipped as described in Annex A.

Room	BSH room 908 / Roof of BSH
Test engineer	T. Ehlers (S3301)
Location	BSH, Hamburg

Equipment no	Start of test	End of test	Test engineer
1	2011/06/24	2011/06/29	T. Ehlers (S3301)

1.4 Legend

Result marking (in the "result" column)²:

Passed	Item was OK, test successful No colour marking
Not passed	Test of a required item was not successful, change required
N/T	Not Tested
N/A	Not Applicable

Specific remarks (in the "remark" column, marked "bold italic"):

REC	recommendation (in terms of IEC17025 "opinion"); an improvement or change is recommended
Note	Note or comment (in terms of IEC17025 "interpretation"); rationale for specific results or interpretation of requirements as appropriate

1.5 General observations

General observations unrelated to any paragraphs of applied test standards.

None

² Test items maybe colour marked in draft versions of the report as follows:

Passed	no colour marking
Not passed	yellow
N/T	blue
N/A	no colour marking
REC	green

2 Functional Tests

2.1 IEC 61108-1

No. of test	IEC 61108-1	Requirement/Condition	Remark	Result
	4	Minimum Performance Standards		
	4.3.3	Accuracy		
1	4.3.3.1	Static Accuracy (M.112/A3.4) The GPS receiver equipment shall have static accuracy such that the position of the antenna is determined to 100 m (95 %) with horizontal dilution of position (HDOP) ≤ 4 (or PDOP ≤ 6). Since Selective Availability has been set to zero, the static accuracy has been determined to be within 13 m (95 %) as specified by the GPS SPS Performance Standards of October 2001.	See test results under test no. 3	Passed
	5.6.4 (4.3.3)	Accuracy		
	5.6.4.1 (4.3.3.1)	Static accuracy		
2	5.6.4.1.1	GPS Position fix measurements shall be taken over a period of not <24 h. The absolute horizontal accuracy shall be within 13 m (95 %), having discarded measurements taken in conditions of HDOP ≥ 4 and PDOP ≥ 6.	NOTE The measurements were evaluated with regard to the precisely measured reference position on the roof of BSH. Accuracy requirements are met - see Annex B for printouts of the measurements for static accuracy in GPS mode.	Passed
3	5.6.4.2.1	Angular movement of the antenna The static tests specified in 5.6.4.1.1 and 5.6.4.1.2 shall be repeated with the antenna performing an angular displacement of ±22.5 (simulating roll) in a period of about 8 s (see IEC 60721-3-6) during the duration of the tests.	see Annex B for printouts of the measurements	Passed

Annex A - Test equipment

A.1 Reference position

Made by FREIE UND HANSESTADT HAMBURG
 Vermessungsamt –VA311-

Description of point	geocentrically co-ordinates (WGS84)		geodetical geographical co-ordinates (WGS84)		Gauß-Krüger (Bessel)	
North	x(m)	3740601.680	N	53° 32' 49".49049	x(m)	5935502.790
	y(m)	657439.492	E	9° 58' 6".10408	y(m)	³ 564257.804
	z(m)	5107029.673	Height over Ellipsoid	95.900 m	Altitude above sea level	55.969 m
South	x(m)	3740618.106	N	53° 32' 48".81889	x(m)	5935482.027
	y(m)	657442.338	E	9° 58' 6".10189	y(m)	³ 564258.046
	z(m)	5107017.296	Height over Ellipsoid	95.849 m	Altitude above sea level	55.917

Accuracy of survey = 0.02 m - last survey dated 2009-05-04

A.2 Simulation of $\pm 22^\circ$ roll

Angular movement of antenna – Motor driven device



Annex B - Test diagrams

B.1 § 5.6.4.1 Static accuracy

B.1.1 § 5.6.4.1.1 Static accuracy – GPS

Position fix measurements shall be taken over a period of not <24 h. The absolute horizontal position accuracy shall be within 13m (95 %), having discarded measurements taken in conditions of HDOP ≥ 4 and PDOP ≥ 6 .

Conditions of tests performed

Period of position fix measurements:	~24 h
Position fix measurements :	>87000
Accuracy:	HDOP ≤ 4 (or PDOP ≤ 6)

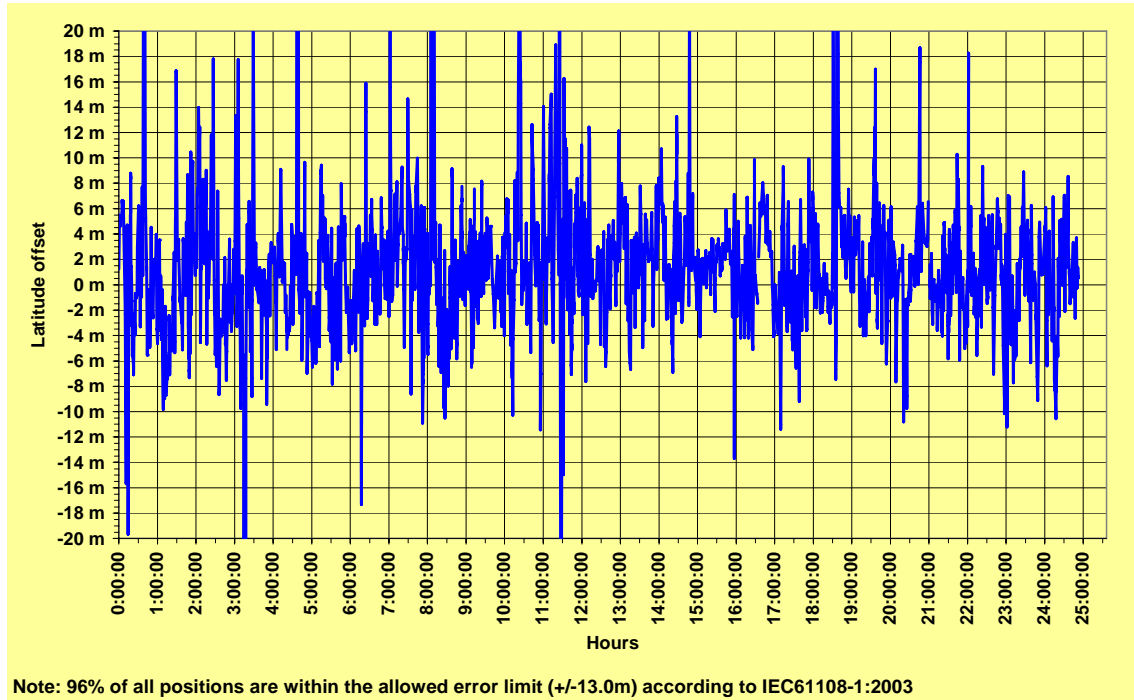
Test results

All deviations of measured positions from reference position are $<\pm 13$ m (95 %).
2 sigma value of position data: 14.25m.

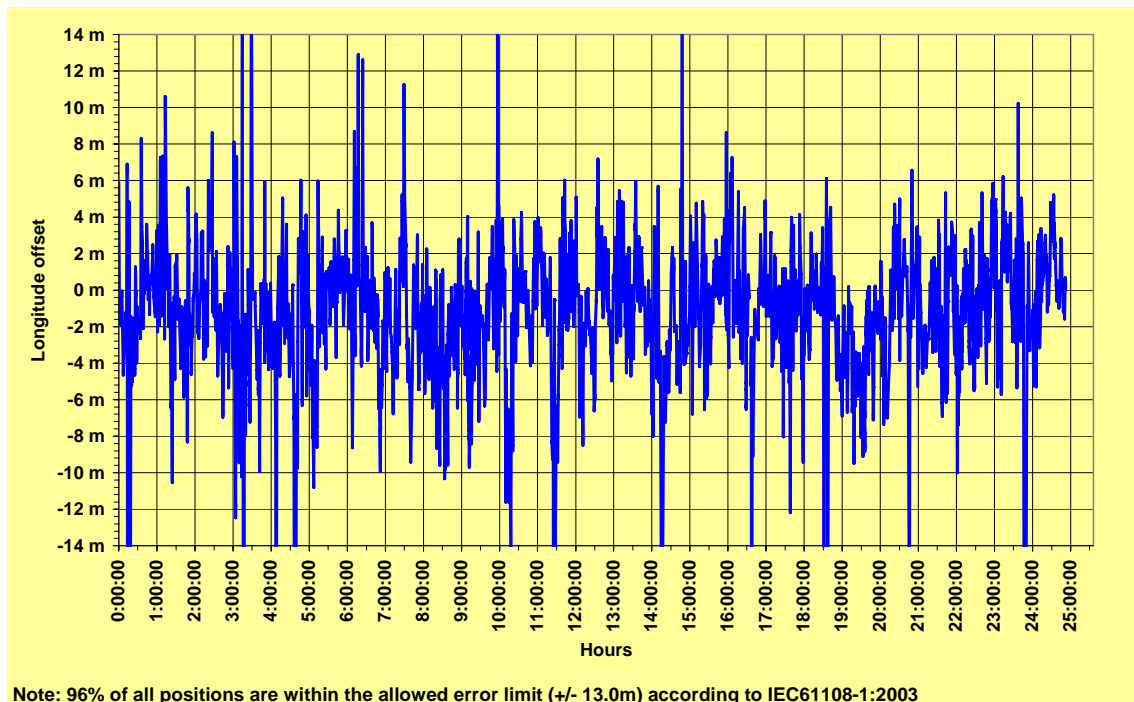
Test result: Passed

For details of validation of recorded data see the following pages.

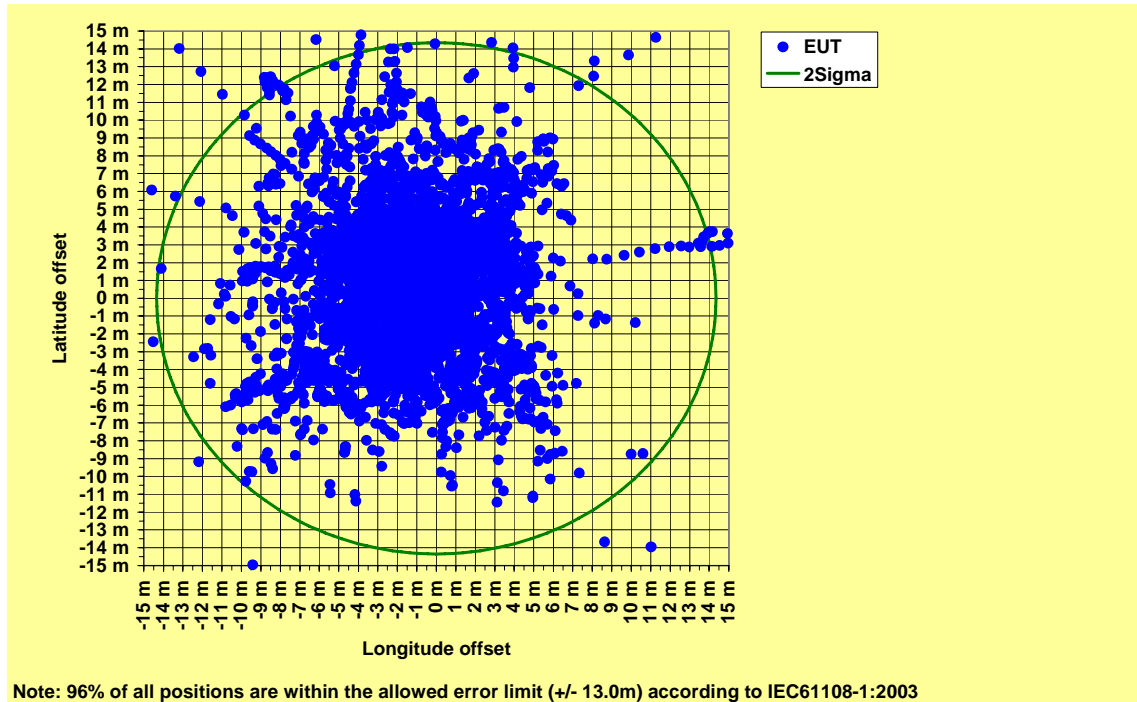
Latitude offset – GPS static accuracy



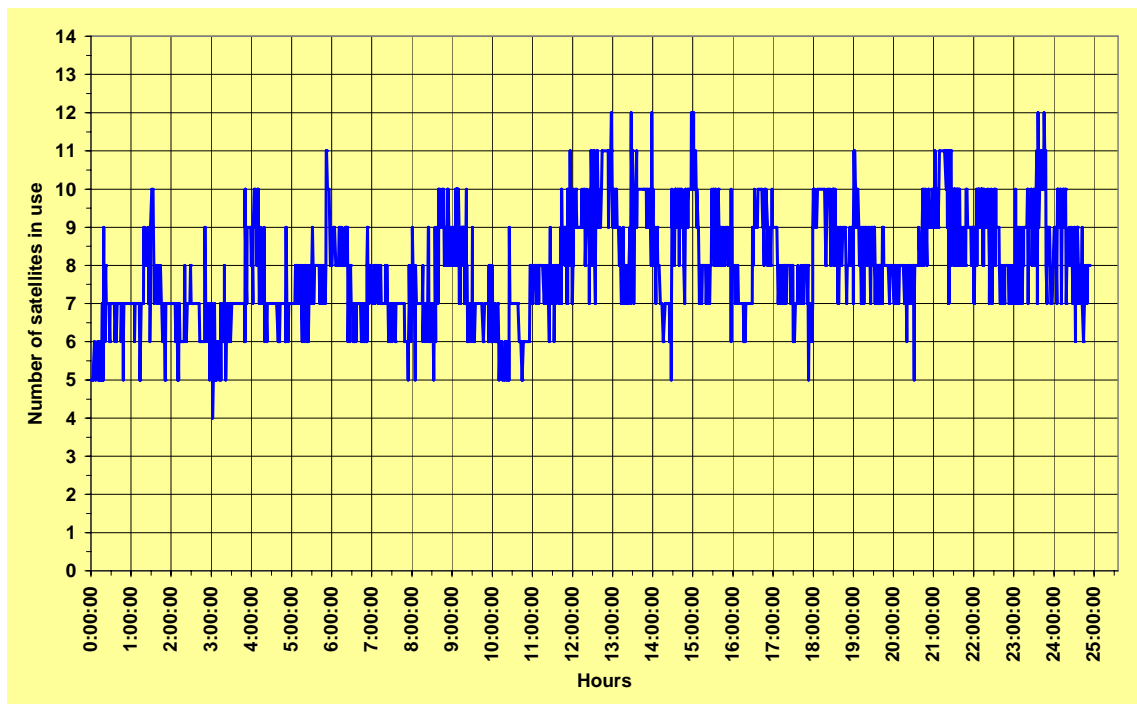
Longitude offset – GPS static accuracy



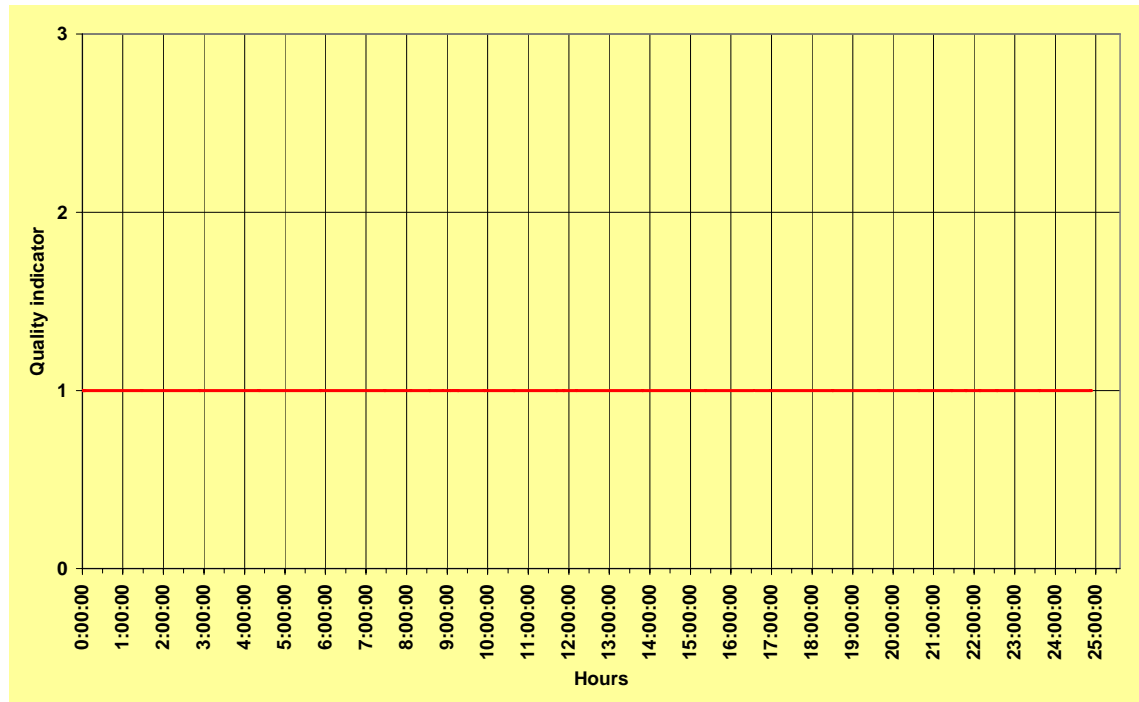
Position offset – GPS static accuracy



Number of SV's in use



GPS quality indicator



B.2 § 5.6.4.2 Angular movement of the antenna

B.2.1 § 5.6.4.2 Angular movement of the antenna – GPS

The static test(s) specified in 5.6.4.1.1 (and 5.6.4.1.2) shall be repeated with the antenna performing an angular displacement of $\pm 22.5^\circ$ (simulating roll) in a period of about 8 s during the duration of the test.

Conditions of tests performed for § 5.6.4.2.1

Antenna placed on a motor-driven socket simulating the angular displacement required for the test.

Period of position fix measurements:	~ 24 h
Position fix measurements :	~84600
Accuracy:	HDOP ≤ 4 (or PDOP ≤ 6)

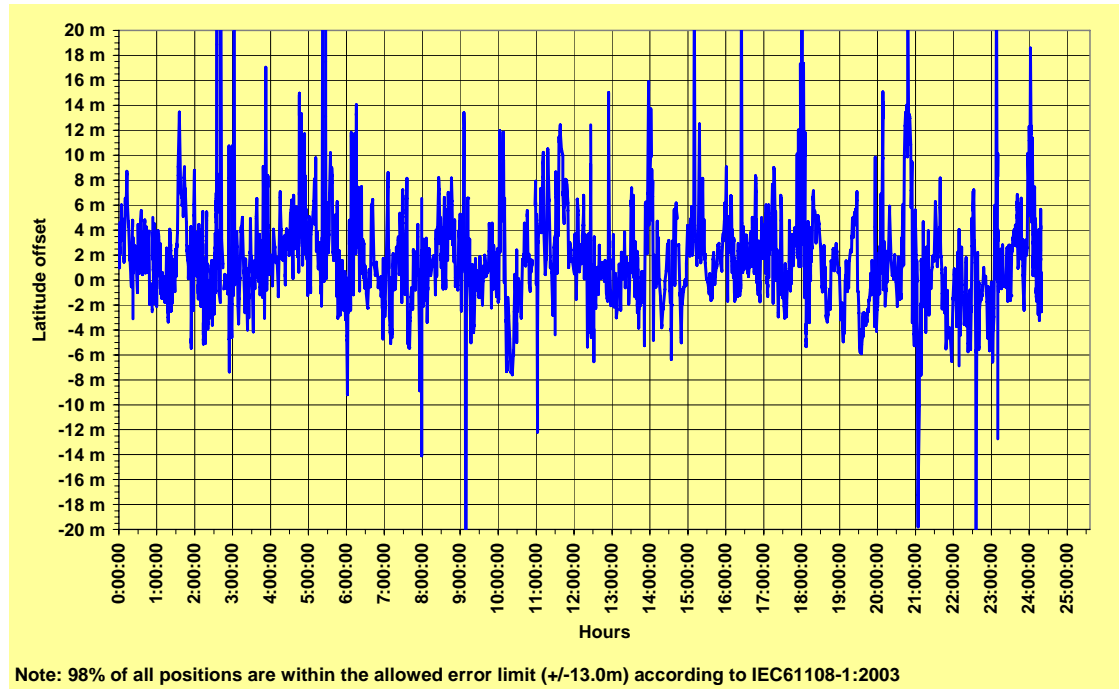
Test results for § 5.6.4.2.1

All deviations of measured positions from reference position are $< \pm 13$ m (95 %).
2 sigma value of position data: 10.45m.

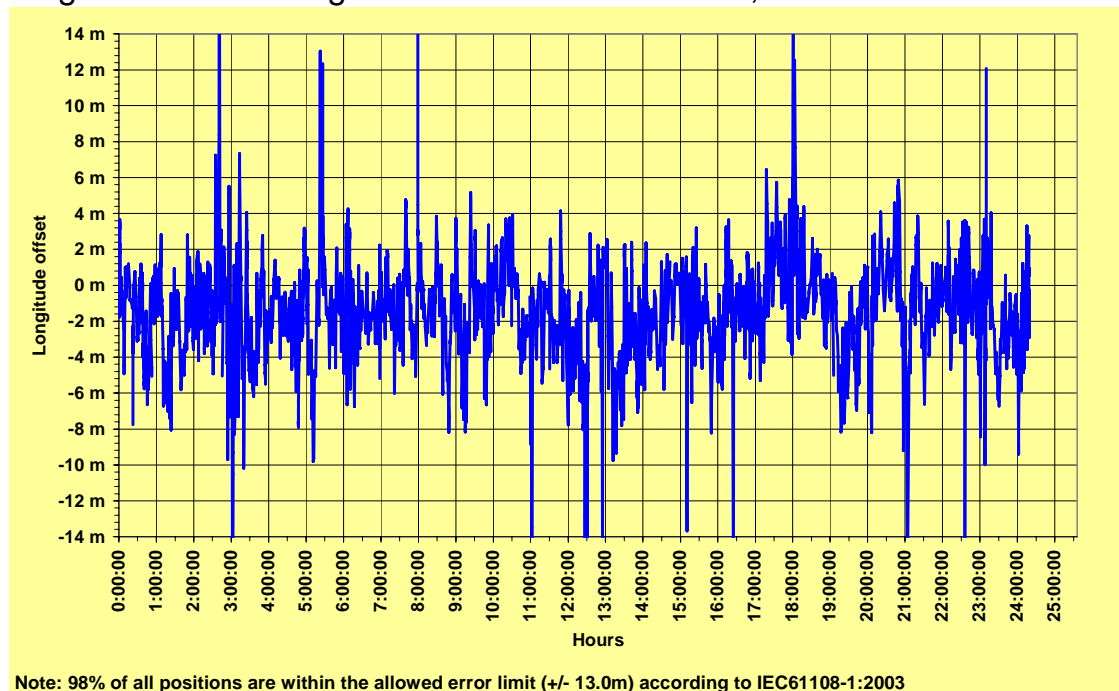
Test result: Passed

For details of validation of recorded data see the following pages.

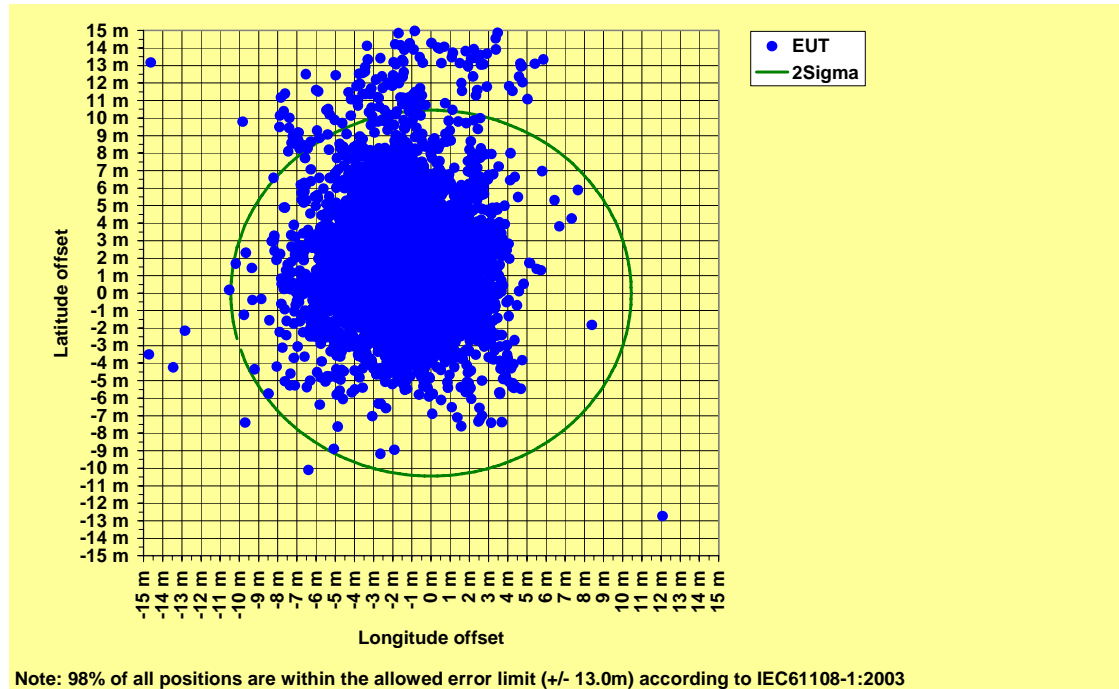
Latitude offset – Angular movement of antenna, GPS



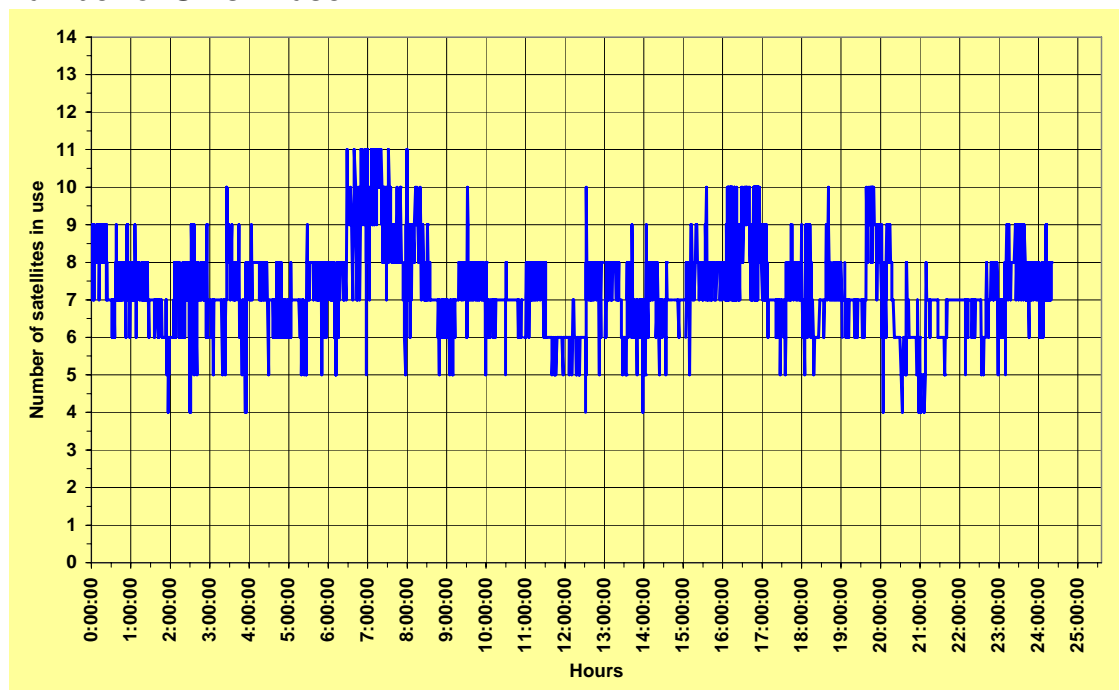
Longitude offset – Angular movement of antenna, GPS



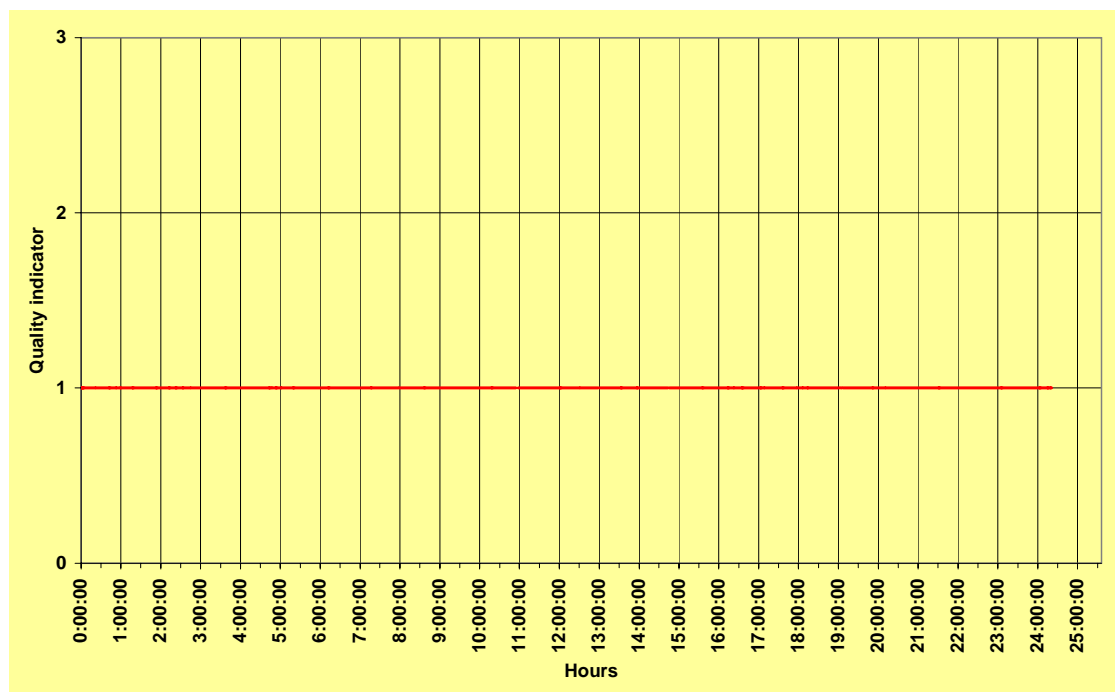
Position offset – Angular movement of antenna, GPS



Number of SV's in use



GPS quality indicator



Annex C - Photos of equipment under test

EUT at testside, BSH Hamburg



EUT – During testing, sample without housing for direct connection to the GPS NMEA output



EUT – ID-tag

