

**Maritime navigation and radiocommunication equipment  
and systems - Global navigation satellite systems  
(GNSS) - Part 3: Galileo - Receiver equipment -  
Performance requirements, methods of testing and  
required test results**

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61108-3:2010 sisaldab Euroopa standardi EN 61108-3:2010 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 31.08.2010 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 04.06.2010.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 61108-3:2010 consists of the English text of the European standard EN 61108-3:2010.

This standard is ratified with the order of Estonian Centre for Standardisation dated 31.08.2010 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 04.06.2010.

The standard is available from Estonian standardisation organisation.

ICS 47.020.70

### Standardite reprodutseerimis- ja levitamiseõigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonilisse süsteemi või edastamine ükskõik millises vormis või millisel teel on keelatud ilma Eesti Standardikeskuse poolt antud kirjaliku loata.

Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:  
Aru 10 Tallinn 10317 Eesti; [www.evs.ee](http://www.evs.ee); Telefon: 605 5050; E-post: [info@evs.ee](mailto:info@evs.ee)

### Right to reproduce and distribute Estonian Standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without permission in writing from Estonian Centre for Standardisation.

If you have any questions about standards copyright, please contact Estonian Centre for Standardisation:  
Aru str 10 Tallinn 10317 Estonia; [www.evs.ee](http://www.evs.ee); Phone: +372 605 5050; E-mail: [info@evs.ee](mailto:info@evs.ee)

**Maritime navigation and radiocommunication equipment and systems -  
Global navigation satellite systems (GNSS) -  
Part 3: Galileo receiver equipment -  
Performance requirements, methods of testing and required test results  
(IEC 61108-3:2010)**

Matériels et systèmes de navigation  
et de radiocommunication maritimes -  
Système mondial de navigation  
par satellite (GNSS) -  
Partie 3 : Equipement pour récepteur  
Galileo -  
Exigences d'exploitation  
et de fonctionnement, méthodes d'essai  
et résultats d'essai exigés  
(CEI 61108-3:2010)

Navigations-  
und Funkkommunikationsgeräte  
und -systeme für die Seeschifffahrt –  
Weltweite Navigations-Satellitensysteme  
(GNSS) -  
Teil 3: Galileo – Empfangsanlagen –  
Leistungsanforderungen, Prüfverfahren  
und geforderte Prüfergebnisse  
(IEC 61108-3:2010)

This European Standard was approved by CENELEC on 2010-06-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

**CENELEC**

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Management Centre: Avenue Marnix 17, B - 1000 Brussels**

## Foreword

The text of document 80/590/FDIS, future edition 1 of IEC 61108-3, prepared by IEC TC 80, Maritime navigation and radiocommunication equipment and systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61108-3 on 2010-06-01.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

- |  |       |            |
|--|-------|------------|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2011-03-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn   | (dow) | 2013-06-01 |

Annex ZA has been added by CENELEC.

---

## Endorsement notice

The text of the International Standard IEC 61108-3:2010 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61108 series	NOTE	Harmonized in EN 61108 series (not modified).
IEC 61162-2	NOTE	Harmonized as EN 61162-2.

---

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60721-3-6	1987	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Ship environment	EN 60721-3-6 <sup>1)</sup>	1993
IEC 60945	-	Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results	EN 60945	-
IEC 61108-1	2003	Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) - Part 1: Global positioning system (GPS) - Receiver equipment - Performance standards, methods of testing and required test results	EN 61108-1	2003
IEC 61108-4	-	Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) - Part 4: Shipborne DGPS and DGLONASS maritime radio beacon receiver equipment - Performance requirements, methods of testing and required test results	EN 61108-4	-
IEC 61162	Series	Maritime navigation and radiocommunication equipment and systems - Digital interfaces	EN 61162	Series
IEC 61162-1	-	Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners	EN 61162-1	-
IEC 62288	-	Maritime navigation and radiocommunication equipment and systems - Presentation of navigation-related information on shipborne navigational displays - General requirements, methods of testing and required test results	EN 62288	-
IMO Resolution A.694(17)	-	General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids	-	-

<sup>1)</sup> EN 60721-3-6 includes A1 to IEC 60721-3-6.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IMO Resolution A.915(22)	-	Revised maritime policy and requirements for a future Global Navigation Satellite System (GNSS)	-	-
IMO Resolution A.953(23)	-	World-wide radionavigation system	-	-
IMO Resolution MSC.233(82)	-	Adoption of the Performance Standards for Shipborne GALILEO Receiver Equipment	-	-
ITU-R Recommendation M.823-3	-	Technical characteristics of differential transmissions for global navigation satellite systems from maritime radio beacons in the frequency band 283.5-315 kHz in Region 1 and 285-325 kHz in Regions 2 and 3	-	-
RTCM 10402 version 2.4	-	RTCM Recommended Standards for Differential GNSS (Global Navigation Satellite Systems) Service	-	-

## CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references .....	7
3 Terms, definitions and abbreviations .....	8
3.1 Terms and definitions .....	8
3.2 Abbreviations .....	8
4 Minimum performances standards .....	9
4.1 Object .....	9
4.2 Galileo receiver equipment.....	10
4.2.1 Minimum facilities .....	10
4.2.2 Configuration.....	10
4.2.3 Quality assurance.....	10
4.3 Performance standards for Galileo receiver equipment.....	10
4.3.1 General .....	10
4.3.2 Equipment output .....	11
4.3.3 Accuracy .....	12
4.3.4 Acquisition.....	12
4.3.5 Antenna and input/output connections .....	13
4.3.6 Antenna design .....	13
4.3.7 Dynamic range .....	13
4.3.8 Protection from specific interfering signals.....	13
4.3.9 Position update .....	14
4.3.10 Differential Galileo input .....	14
4.3.11 Navigational warnings and status indications .....	14
4.3.12 Output of COG, SOG and UTC .....	18
4.3.13 Typical interference conditions .....	19
5 Methods of testing and required test results .....	19
5.1 Test sites .....	19
5.2 Test sequence.....	20
5.3 Test signals.....	20
5.4 Determination of accuracy .....	21
5.5 General requirements and presentation requirements.....	21
5.5.1 Normal conditions.....	21
5.5.2 General requirements .....	21
5.5.3 Presentation requirements.....	21
5.6 Receiver tests .....	21
5.6.1 Galileo receiver equipment .....	21
5.6.2 Position output .....	22
5.6.3 Equipment output .....	22
5.6.4 Accuracy .....	22
5.6.5 Acquisition.....	23
5.6.6 Antenna and input/output connections .....	24
5.6.7 Antenna design .....	24
5.6.8 Sensitivity and dynamic range .....	24
5.6.9 Protection from other shipborne transmitters .....	25
5.6.10 Position update .....	25

5.6.11 Differential Galileo input .....	26
5.6.12 Navigational warnings and status indications .....	26
5.6.13 Accuracy of COG and SOG .....	29
5.6.14 Validity of COG and SOG information .....	29
5.6.15 Output of UTC .....	30
5.7 Tests for typical RF interference conditions .....	30
5.7.1 Simulator conditions .....	30
5.7.2 Navigation solution accuracy test .....	30
5.7.3 Re-acquisition test .....	31
Annex A (informative) Galileo navigation signals characteristics .....	33
Annex B (informative) The Galileo integrity concept .....	35
Annex C (informative) Receiver autonomous integrity monitoring (RAIM) .....	41
Annex D (normative) Galileo standard received signals and interference environment .....	51
Annex E (informative) Galileo RAIM testing .....	56
Bibliography .....	58
Figure B.1 – Graphical illustration of SISA and SISMA [GIC05] .....	37
Figure C.1 – Navigation alerts and FDE events .....	42
Figure C.2 – RNP parameters .....	43
Figure C.3 – Receiver autonomous integrity monitoring (RAIM) .....	44
Figure C.4 – Position errors .....	45
Figure C.5 – Decision threshold and minimum detectable bias for the (W)SSE statistic .....	46
Figure C.6 – Maximum residual test statistic .....	47
Figure C.7 – Geometry screening .....	48
Figure D.1 – E5 in-band and near-band maximum CW RFI levels .....	52
Figure D.2 – E1 in-band and near-band maximum CW RFI levels .....	53
Figure D.3 – E5 Maximum in-band CW/NBI RFI levels .....	54
Figure D.4 – E1 Maximum in-band CW/NBI RFI levels .....	54
Table 1 – Acquisition time limits .....	13
Table 2 – RAIM integrity states .....	17
Table 3 – Integrity states corresponding to the Galileo integrity message .....	18
Table 4 – Accuracy of COG .....	19
Table 5 – RF interference values .....	31
Table A.1 – General characteristics of the Galileo navigation signals .....	33
Table A.2 – General characteristics of Galileo observables .....	34
Table B.1 – Integrity flag values .....	38
Table C.1 – Galileo satellite failure [GIC05] .....	49
Table C.2 – RAIM-FDE parameters .....	50
Table D.1 – Minimum and maximum receiver power levels on ground .....	51
Table D.2 – Minimum and maximum levels at antenna port and receiver input .....	51
Table D.3 – Table of main characteristics of Figure D.1 above .....	52
Table D.4 – Table of main characteristics of Figure D.2 .....	53
Table D.5 – E5 maximum in-band RFI levels versus bandwidth .....	54



Table D.6 – E5 maximum in-band RFI levels versus bandwidth.....	55
Table E.1 – Scenario overview.....	57

This document is a preview generated by EVS

# **MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) –**

## **Part 3: Galileo receiver equipment – Performance requirements, methods of testing and required test results**

### **1 Scope**

This part of IEC 61108 specifies the minimum performance standards, methods of testing and required test results for Galileo shipborne receiver equipment, based on IMO resolution MSC.233(82), which uses the signals from the Galileo Global Navigation Satellite System in order to determine position. It takes account of the general requirements given in IMO resolution A.694(17) and is associated with IEC 60945. When a requirement in this standard is different from IEC 60945, the requirement in this standard takes precedence. It also takes account, as appropriate, of requirements for the presentation of navigation-related information on shipborne navigational displays given in IMO resolution MSC.191(79) and is associated with IEC 62288.

A description of the Galileo Open Service and Safety of Life Service is given in the Galileo interface control documents (see Bibliography). This receiver standard applies to navigation in ocean waters for the open service and harbour entrances, harbour approaches and coastal waters for the Safety of Life service, as defined in IMO resolution A.953(23).

All text of this standard, whose meaning is identical to that in IMO resolution MSC.233(82), is printed in *italics* and the resolution and paragraph numbers are indicated in brackets i.e. (M.233/A1.2).

The requirements in Clause 4 are cross-referenced to the tests in Clause 5 and vice versa.

### **2 Normative references**

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60721-3-6:1987, *Classification of environmental conditions – Part 3-6: Classification of groups of environmental parameters and their severities – Ship environment*

IEC 60945, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61108-1:2003, *Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 1: Global positioning system (GPS) – Receiver equipment – Performance standards, methods of testing and required test results*

IEC 61108-4, *Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 4: Shipborne DGPS and DGLONASS maritime radio beacon receiver equipment – Performance requirements, methods of testing and required test results*

IEC 61162 (all parts), *Maritime navigation and radiocommunication equipment and systems – Digital interfaces*

IEC 61162-1, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

IEC 62288, *Maritime navigation and radiocommunication equipment and systems – Presentation of navigation-related information on shipborne navigational displays – General requirements – Methods of testing and required test results*

IMO resolution A.694(17), *General requirements for shipborne radio equipment forming part of the Global maritime distress and safety system (GMDSS) and for electronic navigational aids*

IMO resolution A.915(22), *Revised maritime policy and requirements for a future Global Navigation Satellite System (GNSS)*

IMO resolution A.953(23), *World-wide radionavigation system*

IMO resolution MSC.233(82), *Adoption of the Performance Standards for Shipborne GALILEO Receiver Equipment*

ITU-R Recommendation M.823-3, *Technical characteristics of differential transmissions for Global Navigation Satellite Systems from maritime radio beacons in the frequency band 283.5-315 kHz in Region 1 and 285-325 kHz in Regions 2 and 3*

RTCM 10402 RTCM Recommended Standards for Differential GNSS (Global Navigation Satellite Systems) Service, Version 2.4

### 3 Terms, definitions and abbreviations

For the purposes of this document, the following terms, definitions and abbreviations apply.

NOTE All definitions and abbreviations used are the same as those used in the Galileo performance signal specification.

#### 3.1 Terms and definitions

##### 3.1.1 integrity

ability of the system to provide users with warnings within a specified time when the system should not be used for navigation

#### 3.2 Abbreviations

Compass	Beidou-2 GNSS (China)
COG	Course Over Ground
CW	Continuous Wave
dGalileo, dGPS, dGLONASS	Differential Galileo, GPS, GLONASS
EUT	Equipment Under Test
FDE	Fault Detection and Exclusion
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GLONASS	GLOBAL Navigation Satellite System
GTRF	Galileo Terrestrial Reference Frame