

© Copyright SEK. Reproduction in any form without permission is prohibited.

Elinstallationer i fartyg – Del 401: Installation samt provning av färdig elinstallation

*Electrical installations in ships –
Part 401: Installation and test of completed installation*

Denna svenska standard innehåller den engelska texten i nedan angiven IEC-publikation, utarbetad inom International Electrotechnical Commission, IEC:

- **IEC 60092-401, Third edition, 1980 - Electrical installations in ships - Part 401: Installation and test of completed installation**

jämte

Amendment No. 1, 1987 och Amendment No. 2, 1997

Nationellt förord

Tidigare fastställd svensk standard SS-IEC 92, utgåva 4, 1995, gäller ej fr o m 2017-11-23.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

CONTENTS

	Page
FOREWORD	7
PREFACE	7
INTRODUCTION	11
Clause	
1. Scope	11
SECTION ONE — DEFINITIONS	
2. Definitions	11
SECTION TWO — EARTHING	
3. Parts for which earthing is required	11
4. Methods of earthing	13
5. Earthing connections	13
6. Earthed distribution systems	15
7. Connections to the ship's structure	17
8. Aluminium superstructures	17
9. Single-wire systems with hull return	17
SECTION THREE — SWITCHGEAR AND CONTROLGEAR ASSEMBLIES	
10. Insulating mats	17
11. Passage-ways in front of switchgear and controlgear assemblies.	19
12. Space at the rear and passage-ways	19
13. Position relative to pipes and tanks	19
14. Positions of section and distribution boards	19
SECTION FOUR — TRANSFORMERS	
15. Installation and location	19
SECTION FIVE — SEMICONDUCTOR CONVERTORS	
16. Installation and location	21
SECTION SIX — ACCUMULATOR (STORAGE) BATTERIES	
17. Location	21
18. Access	23
19. Electrical installation in battery compartments	23
20. Protection against corrosion	23
21. Fixing and supports	25
22. Ventilation	25
SECTION SEVEN — LUMINAIRES	
23. Degree of protection	27
24. Discharge lamp luminaires of voltage above 250 V	27
25. Searchlights and arc lamps	29
26. Emergency lighting	29
SECTION EIGHT — HEATING AND COOKING APPLIANCES	
27. Guarding of combustible materials	29
28. Position of controlgear and switchgear	31
29. Mounting of space-heating appliances	31
30. Combustible gases and dust	31

Clause	SECTION NINE — CABLES	Page
31.	Cable-runs — General	31
32.	Cable-runs for essential and emergency services	33
33.	Cable installation methods in relation to electromagnetic interference	33
34.	Cables for submersible permanently installed bilge-pumps	33
35.	Mechanical protection	35
36.	Earthing of metal coverings and of mechanical protection of cables (see Clause 4)	35
37.	Radius of bend	37
38.	Fixing	37
39.	Cables penetrating bulkheads and decks	39
40.	Cables in metallic pipes, conduits or trunking	39
41.	Cables in non-metallic pipes, conduits, trunking, ducts or cappings and casings	41
42.	Cables in store rooms	41
43.	Cables in refrigeration spaces	43
44.	Tensile stress	43
45.	Special precautions for single-core cables	43
46.	Cable ends	45
47.	Joints and tappings (branch circuit)	47
48.	Joint boxes	47
SECTION TEN — LIGHTNING CONDUCTORS		
49.	Ships requiring lightning conductors	49
50.	Size of conductors	49
51.	Wooden ships with steel masts	49
52.	Steel ships with wooden masts	49
53.	Installation details	49
54.	Resistance	51
55.	Earthing in dry dock	51
SECTION ELEVEN — TESTS OF COMPLETED INSTALLATION		
56.	General	51
57.	Insulation-testing instruments	51
58.	Switchboards, section boards and distribution boards	51
59.	Lighting and power circuits	51
60.	Generators	53
61.	Switchgear	53
62.	Insulation resistance of generators and motors	53
63.	Lighting, heating and galley equipment	53
64.	Voltage drop	53
65.	Communication systems	53
66.	Internal communication circuits	55
67.	Earthing	55
68.	Requirements of international conventions on safety of life at sea	55
69.	Tests after commissioning	55

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL INSTALLATIONS IN SHIPS

Part 401 : Installation and test of completed installation

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by IEC Technical Committee No. 18: Electrical Installations in Ships.

It forms a part of IEC Publication 92, which deals with electrical installations in ships.

The first edition of this publication was published in 1957.

A second edition consisted of six parts and was published in 1964 (Publication 92-1) and in 1965 (Publications 92-2, 92-3, 92-4, 92-5 and 92-6).

This third edition supersedes the second edition with the exception of Chapter X of Publication 92-3: Part 3: Cables (construction, testing and installation), which is under consideration. (Please see therefore the latest edition of the Catalogue of Publications.)

The series consists of the following publications:

- Publications Nos. 92-101: Electrical Installations in Ships,
Part 101: Definitions and General Requirements.
- 92-201: Part 201: System Design — General.
92-202: Part 202: System Design — Protection.
92-301: Part 301: Equipment — Generators and Motors.
92-302: Part 302: Equipment — Switchgear and Controlgear Assemblies.
92-303: Part 303: Equipment — Transformers for Power and Lighting.
92-304: Part 304: Equipment — Semiconductor Convertors.
92-305: Part 305: Equipment — Accumulator (storage) Batteries.
92-306: Part 306: Equipment — Luminaires and Accessories.
92-307: Part 307: Equipment — Heating and Cooking Appliances.
92-352: Part 352: Choice and Installation of Cables for Low-voltage Power Systems.
92-373: Part 373: Shipboard Telecommunication Cables and Radio-frequency Cables. — Shipboard Flexible Coaxial Cables.
- 92-374: Part 374: Shipboard Telecommunication Cables and Radio-frequency Cables — Telephone Cables for Non-essential Communication Services.
- 92-375: Part 375: Shipboard Telecommunication Cables and Radio-frequency Cables — General Instrumentation, Control and Communication Cables.
- 92-401: Part 401: Installation and Test of Completed Installation.
92-501: Part 501: Special Features — Electric Propulsion Plant.
92-502: Part 502: Special Features — Tankers.

- 92-503: Part 503: Special Features — A.C. Supply Systems with Voltages in the Range Above 1 kV up to and Including 11 kV.
- 92-504: Part 504: Special Features — Control and Instrumentation.
- 92-504A: First Supplement to Publication 92-504 (1974)
Special Features — Control and Instrumentation
Appendices — Specific Control and Instrumentation Installations.
- 92-505: Part 505: Special Features — Mobile Offshore Drilling Units.

Drafts for Part 401 were discussed at the meeting held in Moscow in 1977 and completed at the meeting held in Florence in 1978. As a result of the latter meeting, the draft, Document 18(Central Office)475, was submitted to the National Committees for approval under the Six Months' Rule in July 1979.

The National Committees of the following countries voted explicitly in favour of publication:

Australia	Germany	South Africa (Republic of)
Belgium	Israel	Sweden
Bulgaria	Italy	Turkey
Canada	Japan	United Kingdom
Denmark	Netherlands	United States of America
Egypt	Poland	

Other IEC publications quoted in this standard:

- Publications Nos. 92-101: Definitions and General Requirements.
- 92-201: System design — General.
- 92-301: Equipment — Generators and Motors.
- 533: Electromagnetic Compatibility of Electrical and Electronic Installations in Ships (First edition, 1977).

ELECTRICAL INSTALLATIONS IN SHIPS
Part 401 : Installation and test of completed installation

INTRODUCTION

IEC Publication 92: Electrical Installations in Ships, forms a series of international standards for electrical installations in sea-going ships, incorporating good practice and co-ordinating as far as possible existing rules.

These standards form a code of practical interpretation and amplification of the requirements of the International Convention on Safety of Life at Sea, a guide for future regulations which may be prepared and a statement of practice for use by shipowners, shipbuilders and appropriate organizations.

1. Scope

This standard is applicable to the installation of electrical equipment for use in ships and to the testing of the complete installation.