Norsk
Elektroteknisk
Komite

NEK TS 606:2022

Cables for offshore installations

- halogen-free low smoke flame-retardant / fire-resistant (HFFR-LS)

Technical Specification

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CABLES FOR OFFSHORE INSTALLATIONS –

Halogen-free low smoke and flame-retardant / fire-resistant (HFFR-LS)

FOREWORD

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NEK principally supports the development of International Standards. NEK TS 606 has been developed due to the following circumstances:

- the required support cannot be obtained for an International Standard, despite repeated efforts; and
- there is the future but no immediate possibility of an agreement on an International Standard.

Technical specification NEK TS 606 has been prepared by NEK Technical Committee NK 18A: Electric cables for ships and mobile and fixed offshore units. The NEK/NK 18A is the Norwegian mirror committee of IEC TC 18A.

This 6th edition cancels and replaces the 5th edition published in 2016 and constitutes a technical revision.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This edition includes the following significant technical changes with respect to the previous edition:

a) Requirement for cables in hazardous areas aligned with IEC 60079-14 9.3.2 a).

b) References to fire resistant cable standards are updated.

c) Acceptance criteria for fire resistant tests are updated

d) Updated procedure for fire resistant cables with water spray/jet test

e) Split cold properties test in two categories: Cold climate - 25 °C and Arctic climate - 40 °C.

INTRODUCTION

NEK TS 606 specifies several cable types, generally based on the IEC 60092-350, -360 and -370 series, intended for use on offshore installations. The purpose of this Technical Specification is to give the user a selection of cables, which meets the requirements for installation on mobile and fixed offshore units. The predecessor of the Technical Specification was the publication “Recommended Practice for Specification of Cables”, issued by the Norwegian Oil Industry Association” (OLF). The background for that specification was the need of the industry to limit and standardize the number of cable types being used by the offshore industry in the late 1980s. The responsibility for the standard was taken over by the Norwegian Electrotechnical Committee (NEK), and the first edition was issued by NEK as “Norwegian electrotechnical standard” NEK 606 in 1993.

CABLES FOR OFFSHORE INSTALLATIONS –

Halogen-free low smoke and flame-retardant / fire-resistant (HFFR-LS)

1 Scope

This technical specification covers the basic requirements for halogen-free and/or mud resistant low and high voltage power, control, lighting, instrumentation, and telecommunication, optical fibre cables, Hydro Carbon Fire resistant (HCF) cables and Jet Fire (JF) resistant cables.

2 Normative references

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

IEC 60092-350, Electrical installations in ships – Part 350: General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications.

IEC 60092-352, Electrical installations in ships – Part 352: Choice and installation of electric cables IEC 60092-353 Electrical installations in ships – Part 353: Single and multicore cables with extruded solid insulation for rated voltages 1kV and 3 kV

IEC 60092-354, Electrical installations in ships – Part 354: Single and three-core power cables with extruded solid insulation for rated voltages 6 kV(Um = 7,2kV) up to 30 kV (Um=36 kV).

IEC 60092-360, Electrical installation in ships – Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication cables

IEC 60092-376, Electrical installations in ships – Part 376: 150/250 V cables for Control and instrumentation Circuits

IEC 60228, Conductors of insulated cables

IEC 60331-1, Test for electrical cables under fire conditions – Circuit integrity – Part 1: Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0,6/1,0 kV and with overall diameter exceeding 20 mm

IEC 60331-2, Test for electrical cables under fire conditions – Circuit integrity – Part 2: Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0,6/1,0 kV and with overall diameter not exceeding 20 mm

IEC 60331-21, Test for electrical cables under fire conditions – Circuit integrity – Part 21: Procedures and requirements – Cables of rated voltage up to and including 0,6/1,0 kV

IEC 60331-25, Test for electrical cables under fire conditions – Circuit integrity – Part 25: Procedures and requirements – Optical fibre cables

IEC 60332-1-1, Tests on electric and optical fibre cables under fire conditions – Part 1-1: Test for vertical flame propagation for a single insulated wire or cable - Apparatus.

IEC 60332-1-2, Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame.

IEC 60332-2-1, Tests on electric and optical fibre cables under fire conditions – Part 2-1: Test for vertical flame propagation for a single small insulated wire or cable - Apparatus.

IEC 60332-2-2, Tests on electric and optical fibre cables under fire conditions – Part 2-2: Test for vertical flame propagation for a single small insulated wire or cable – Procedure for diffusion flame.

IEC 60332-3-10, Tests on electric and optical fibre cables under fire conditions – Part 3-10: Test for vertical flame spread of vertically-mounted bunched wires or cables - Apparatus.

IEC 60332-3-22, Tests on electric and optical fibre cables under fire conditions – Part 3-22: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category A.

IEC 60332-3-23, Tests on electric and optical fibre cables under fire conditions – Part 3-23: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category B.

IEC 60332-3-24, Tests on electric and optical fibre cables under fire conditions – Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category C.

IEC 60332-3-25, Tests on electric and optical fibre cables under fire conditions – Part 3-25: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category D.

IEC 60811, Common test methods for insulating and sheathing materials of electric cables

IEC 60079-14, Explosive atmospheres - Part 14: Electrical installations design, selection and erection

IEC 60811-404, Electric and optical fibre cables - Test methods for non-metallic materials - Part 404: Miscellaneous tests - Mineral oil immersion tests for sheaths

EN 1363-2, Fire resistance tests - Part 2: Alternative and additional procedures

ISO 22899-1, Determination of the resistance to jet fires of passive fire protection materials -- Part 1: General requirements

BS 8491, Method for assessment of fire integrity of large diameter power cables for use as components for smoke and heat control systems and certain other active fire safety systems

EN 50200, Method of test for resistance to fire of unprotected small cables for use in emergency circuits

3 Terms and definitions

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

3.1
MUD
Type of drilling liquid present at offshore installations containing additives, which can have a deleterious effect on cable sheathing materials.

3.2
SHF 2 MUD RESISTANT
Designation for cable types with mud resistant outer sheath according to 4.4.

4 Design and test requirements

4.1 Conductor Resistance

The maximum conductor resistance for 250 V cables for control and instrumentation circuits shall be in accordance with IEC 60092-376.

The maximum conductor resistance for cables with voltage rating 0,6/1 kV and above shall be in accordance with IEC 60228 class 2 or class 5

4.2 Types of insulation compounds

The insulation compounds shall be compliant with EPR (ethylene-propylene rubber) or XLPE (cross-linked polyethylene) requirements as stated in IEC 60092-360. The insulation compound for SFOU types shall be compliant with S95 as stated in IEC 60092-360. Detailed designs are listed in Annex A.

4.3 Types of bedding/ inner covering

The bedding / inner covering, if any, shall be extruded and according to IEC 60092-350. The compound shall be halogen free according to assessment of halogens in IEC 60092-360.

Cables intended for hazardous areas shall be circular and any bedding or sheath shall be extruded.

NOTE IEC 60079-14 specifies requirements to selection of cables in hazardous areas

4.4 Types of sheathing compounds – Requirements for oil and mud resistance

4.4.1 General

Sheathing compounds shall be compliant with SHF 2 - halogen-free rubber or SHF 1 - halogen-free thermoplastic, as stated in IEC 60092-360, - together with additional requirements and/or performances as defined in Table 1. Oil & MUD resistance shall be tested according to IEC 60811-404, with the requirements given in Table 1.

Table 1 – Oil and MUD resistant tests

Category a - Minimum required oil resistance	**Unit**	**Requirement**
Mechanical properties after ageing in IRM 902 ***and IRM 903***:		
- Temperature/tolerance of oil	°C	100±2
- Duration of treatment	h	24
Results to be obtained:		
- Tensile strength, variation max	%	***±30***
- Elongation at break, variation max	%	***±30***
Category b - Enhanced oil resistance: (Sheath Code E)		
Mechanical properties after ageing in IRM 902 ***and IRM 903*****:**		
- Temperature/tolerance of oil	°C	100±2
- Duration of treatment	d	7
Results to be obtained:		
- Tensile strength, variation max	%	***±30***
- Elongation at break, variation max	%	***±30***
- Volume swelling, variation max	%	***±30***
- Weight change, variation max	%	***±30***
Category c - Mud resistance: (shall comply with category b and c) (Sheath code M)		
Mechanical properties after ageing in Calcium Bromide:		
- Temperature/tolerance of oil	°C	70±2
- Duration of treatment	d	56
Results to be obtained:		
- Tensile strength, variation max	%	±25
- Elongation at break, variation max	%	±25
- Volume swelling, variation max	%	±20
- Weight change, variation max	%	±15
Mechanical properties after ageing in ***EDC 95-11 base oil:***		
- Temperature/tolerance of oil	°C	***70±2***
- Duration of treatment	d	***56***
Results to be obtained:		
- Tensile strength, variation max	%	***±30***
- Elongation at break, variation max	%	***±30***
- Volume swelling, variation max	%	***±25***
- Weight change, variation max	%	***±25***
Category d - Hydraulic/gear oil resistance: (shall comply with category b and d. May in addition comply with category c) (Sheath code H or H-M)		
Mechanical properties after ageing in relevant hydraulic/gear oil: *		
- Temperature/tolerance of oil	°C	100±2
- Duration of treatment	d	7
Results to be obtained:		
- Tensile strength, variation max	%	±30
- Elongation at break, variation max	%	±30
- Volume swelling, variation max	%	±30
- Weight change, variation max	%	±30
* Test oil shall be agreed between manufacturer and user.		
NOTE 1 Requirements marked in bold and italic text are more demanding than IEC 60092-360:2021.		
NOTE 2 EDC 95-11 is a well-defined base oil often used in oil based drilling fluids.		