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Requirements

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## TR3128 Offshore topside cables and onshore cables

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Project development

Requirements, TR3128, Version 1.02,

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Document replaces version 1.01

### Relevant versions:

- [1.01](#) (2017-09-08 14:45)
- [1.02](#) (2019-05-28 08:02)

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## 1 Objective, target group and provision

### 1.1 Objective

The objective of this document is to specify minimum requirements for power and instrument cables for offshore installations and onshore plants for production and processing of oil and gas.

Cabling onshore in office facilities is not a part of this objective.

The specification is based on NEK TS 606, IEC 60502 and IEC 60840, and the content specifies:

- In more detail specific requirements.
- Which one of several optional alternatives to be used.
- Requirements not covered in the standards.
- Alternative requirements to be used instead of requirements described in the standards.

### 1.2 Target group

The target group for this specification is personnel involved in project development, maintenance and modifications requiring electrical and instrument offshore/land cables.

### 1.3 Provision

Provision is made in Governing System (TR3020; Electrical, Technical Requirements and Standards).

## 2 Requirements

### 2.1 Offshore cables and onshore cables above ground

#### 2.1.1 General

Offshore cables and land cables above ground means cables in an offshore installation or in an onshore plant.

#### 2.1.2 Instrument cables (up to 250V) and FO cables

**SR-48588** - All instrument cables shall be designed and tested in accordance with /1/.

#### 2.1.3 Power cables up to and including U0/U (Um) = 18/30 (36) kV

**SR-48590** - Offshore power cables shall be designed and tested in accordance with /1/.

**SR-48591** - Onshore power cables shall either be designed and tested in accordance with /1/ or be designed and tested in accordance with /2/ with the following addition:

1. The low voltage cables shall be halogen free.

#### 2.1.4 Power cables above $U_0/U (U_m) = 18/30 (36)$ up to and including $U_0/U (U_m) = 87/150 (170)$ kV

**SR-48594** - All cables offshore and onshore shall be designed and tested in accordance with /3/, with the following additions:

1. Flame retardant cables shall be in accordance with /6/.
2. Fire resistant cables above  $U_0/U (U_m) = 18/30 (36)$  kV shall be in accordance with /1/, see cl 4.5.1.1 fig.2.

### 2.2 Buried onshore cables

#### 2.2.1 General

**SR-48598** - Buried cables means cables directly buried in ground, installed in cable ducts, trenches or in pull-tubes, either inside the onshore plant or feeding into the plant.

1. If cables may be exposed to oil/chemicals in the ground, then the cable outer material shall be compatible to the oil/chemical exposure.

#### 2.2.2 Instrument cables (up to 250V) and FO cables

**SR-48601** - All buried instrument cables shall be in accordance with /5/.

#### 2.2.3 Power cables up to and including $U_0/U (U_m) = 18/30 (36)$ kV

**SR-48603** - All buried power cables shall be in accordance with /2/, with the following clarification:

1. If some parts of the cable are not buried then these cable parts shall be flame retardant. Flame retardant paint may be used to obtain a flame retardant installation. Requirements for testing are given in /6/.

#### 2.2.4 Power cables above $U_0/U (U_m) = 18/30 (36)$ kV up to and including $U_0/U (U_m) = 87/150 (170)$ kV

**SR-48606** - All buried power cables shall be in accordance with /3/, with the following clarification:

1. If some parts of the cable are not buried then these cable parts shall be flame retardant. Flame retardant paint may be used to obtain a flame retardant installation. Requirements for testing are given in /6/.

## 3 Routine tests and Factory Acceptance Tests (FAT)

### 3.1 Routine tests for cables below and including $U_0/U (U_m) = 18/30(36)$ kV

**SR-48610** - Instrument and power cables below and including 18/30(36) kV shall be tested in accordance with /1/, /2/ or /5/-

### 3.2 Routine tests for cables above U<sub>0</sub>/U (U<sub>m</sub>) = 18/30(36) kV

**SR-48612** - Power cables above 18/30(36) kV shall be tested in accordance with /3/.

### 3.3 Sample tests for cables above U<sub>0</sub>/U (U<sub>m</sub>) = 18/30(36) kV

**SR-48614** - Samples of for cables above U<sub>0</sub>/U (U<sub>m</sub>) = 18/30(36) kV shall be tested in accordance with /3/.

### 3.4 Factory Acceptance Tests for cables above U<sub>0</sub>/U (U<sub>m</sub>) = 18/30(36) kV

**SR-48616** - Factory Acceptance Tests shall be performed on each delivery length and shall be in accordance with /3/, and shall as a minimum include:

1. Partial discharge test.
2. Voltage test at power frequency.

## 4 Type tests

### 4.1 Instrument cables and power cables below and including U<sub>0</sub>/U (U<sub>m</sub>) = 18/30(36) kV

**SR-48620** - Instrument cables and power cables below and including 18/30(36) kV shall be tested in accordance with /1/ and /2/.

### 4.2 Power cables above U<sub>0</sub>/U (U<sub>m</sub>) = 18/30(36) kV

**SR-48622** - Power cables above 18/30(36) kV shall be tested in accordance with /3/.

### 4.3 Cables in cold environment

**SR-48624** - Instrument cables and power cables below and including 18/30(36) kV in cold environment shall be tested in accordance with /4/ clause 8.9.

**SR-48625** - Cables with minimum ambient design temperature below -15 deg C, shall have documented bend/impact test for this ambient temperature in accordance with annex E in /4/.

Such cables shall be tested for cold bend/impact at -40 C/-35 C in accordance with annex E in /4/.

## 5 Additional information

### 5.1 Definitions

|                         |                                                                                                                                                                                                                                                                                                                |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Shall (requirement)     | Requirement strictly to be followed in order to conform to the document and from which no deviation is permitted, unless a deviation permit is approved.                                                                                                                                                       |
| Should (recommendation) | Indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required, or that (in the negative form) possibility or course of action is deprecated but not prohibited. |
| May                     | Indicates a course of action permissible within the limits of the document.                                                                                                                                                                                                                                    |

|                |                                                                                                                               |
|----------------|-------------------------------------------------------------------------------------------------------------------------------|
| Can            | Statements of possibility and capability, whether material, physical or causal.                                               |
| Supplier       | Manufacturer or manufacturer's agent that supplies the equipment and is normally responsible for service support.             |
| Manufacturer   | Original manufacturer of the equipment.                                                                                       |
| U              | Rated power frequency voltage between conductors for which the cable and accessories are designed                             |
| U <sub>0</sub> | Rated power frequency voltage between conductor and earth or metallic screen for which the cable and accessories are designed |
| U <sub>m</sub> | Maximum value of the "highest system voltage" for which the cable and accessories may be used                                 |

## 5.2 Abbreviations

|      |                                           |
|------|-------------------------------------------|
| AC   | Alternating Current                       |
| FAT  | Factory Acceptance Test                   |
| FO   | Fibre Optical                             |
| HCF  | Hydrocarbon Fire                          |
| IEC  | International Electrotechnical Commission |
| NCS  | Norwegian Continental Shelf               |
| NDT  | Non Destructive Testing                   |
| NEK  | Norsk Elektroteknisk Komite               |
| PD   | Partial Discharge                         |
| TDR  | Time Domain Reflectometry                 |
| XLPE | Cross-linked Polyethylene                 |

## 5.3 Changes from previous version

Ver 1.02: Document updated from Statoil template to template. Wording "Statoil" changed to "". Insignificant changes, performed by system administrator, on behalf of author/owner.

### Changes in version 1.01:

Published in new minor version as part of the GEM-project (Governing Element Management). TR-document is digitalized, and each requirement element is now identified with a unique ID.

## 5.4 References

**SR-48636** - The following standards include provisions and guidelines which, through reference in this specification, constitute provisions and guidelines of this specification. Latest issue of the referred documents shall be used unless otherwise agreed. Other recognized standards may be used provided it can be shown that they meet or exceed the requirements and guidelines of the standards referenced below.

Note that references in this specification (e.g. references to clause numbers in standards) are based on year of issue as listed below.

| Ref | Standard        | Year | Title                                                                                                                                                    |
|-----|-----------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | NEK TS 606:2009 | 2009 | Cables for offshore installation halogen-free and/or resistant Technical specification                                                                   |
| 2.  | IEC 60502-1     | 2009 | Power cables with extruded insulation and their accessories for rated voltages from 1kV (U <sub>m</sub> = 1.2 kV) up to 30 kV (U <sub>m</sub> = 36 kV) – |

|    |                                    |      |                                                                                                                                                                        |
|----|------------------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | IEC 60502-2                        | 2014 | Part 1: Cables for rated voltages of 1 kV (Um = 1.2 kV) and 3 kV (Um = 3,6 kV)<br>Part 2: Cables for rated voltages of 6 kV (Um = 7.2 kV) and 30 kV (Um = 36 kV)       |
| 3. | IEC 60840                          | 2011 | Power cables with extruded insulation and their accessories for rated voltages above 30 kV (Um = 36 kV) up to 150 kV (Um = 170 kV) – Test methods and requirements.    |
| 4. | IEC 60092-350                      | 2014 | Electrical installation in ships. Part 350: General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications |
| 5. | IEC 60092-376                      | 2003 | Electrical installation in ships. Part 376: Cables for Control and instrumentation circuits 150/250 V (300 V)                                                          |
| 6. | IEC 60332-3-10, -22, -23, -24, -25 | 2009 | Tests on electric cables under fire conditions - Test for vertical flame spread of vertically-mounted bunched wires or cables                                          |