



Certificate No:  
**TAE000049V**

# TYPE APPROVAL CERTIFICATE

## This is to certify:

**That the Low Voltage Cable**

with type designation(s)

**SFOI, SFOI(C), SFOI(I), SFOI(I&C), SFBI, SFBI(C), SFBI(I), SFBI(I&C), SFNI, SFNI(C), SFNI(I), SFNI(I&C)**

Issued to

**LS Cable & System Ltd (Donghae Plant)**  
**Donghae-si, Gangwon-do, Republic of Korea**

is found to comply with

**DNV GL rules for classification – Ships, offshore units, and high speed and light craft**

## Application :

**Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.**

**Rated voltage (V) 150/250**

**Temp. class (°C) 90**

Issued at **Busan** on **2021-05-28**

This Certificate is valid until **2025-06-04**.

for **DNV**

DNV local station: **Seoul**

Approval Engineer: **Eun Jin Lee**

.....  
**Andreas Kristoffersen**  
**Head of Section**

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.  
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Form code: TA 251

Revision: 2021-03

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## Product description

Type designation :

Cable type letter 1 : 250V SFOI, SFOI(C), SFOI(I), SFOI(I&C), SFBI, SFBI(C), SFBI(I), SFBI(I&C), SFNI, SFNI(C), SFNI(I), SFNI(I&C)

Cable type letter 2 : FRT-TTCCBO, FRT-TTCCBO(C), FRT-TTCBBO, FRT-TTCBBO(C), FRT-TTCTBO, FRT-TTCTBO(C), FRT-TTCCBO(I), FRT-TTCCBO(I/C), FRT-TTCBBO(I), FRT-TTCBBO(I/C), FRT-TTCTBO(I), FRT-TTCTBO(I/C), FRT-MCCBO, FRT-MCCBO(C), FRT-MCBBO, FRT-MCBBO(C), FRT-MCTBO, FRT-MCTBO(C)

|                     |                                                                                      |
|---------------------|--------------------------------------------------------------------------------------|
| Conductor :         | Stranded annealed copper conductor, Class 2                                          |
| Insulation :        | XLPE + Mica tape                                                                     |
| Individual screen : | Aluminum/polyester tape w/drain wire ('-I') type)                                    |
| Overall screen :    | Aluminum/polyester tape w/drain wire ('-C') type only)                               |
| Inner covering :    | Taped inner covering                                                                 |
| Aarmor :            | Copper wire(CB or O)/Copper alloy wire(BB or B)/Tinned annealed copper wire(TB or N) |
| Outer sheath :      | SHF1                                                                                 |

| Cable type          | No. of Pairs | Conductor size(mm <sup>2</sup> ) |
|---------------------|--------------|----------------------------------|
| 'none' and (C) type | 1P ~ 48P     | 0.75~2.5                         |
|                     | 1T ~ 48T     |                                  |
|                     | 1Q           |                                  |
|                     | 2~48         |                                  |
| (I) and (I&C) type  | 2P~48P       | 0.75~2.5                         |
|                     | 2T~48T       |                                  |

## Application/Limitation

This cable is fire resistant according to IEC 60331.

The requirements of SOLAS Chapter II-1 Part D Reg. 45.5.2 to limit Fire Propagation along Bunches of Cables or Wires are fulfilled without any additional measures.

## Type Approval documentation

### Tests carried out

| Standard             | Release | General description                                                                                                            | Limitation                                               |
|----------------------|---------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| IEC 60092-376        | 2017    | Cables for control and instrumentation circuits 150/250V(300V)                                                                 |                                                          |
| IEC 60092-360        | 2014    | Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation, telecommunication cables |                                                          |
| IEC 60331-21         | 1999    | Fire with shock-Electric cables under fire conditions-Circuit integrity                                                        | @750°C (90min)                                           |
| IEC 60331-1/-2       | 2018    | Fire with shock-Electric cables under fire conditions                                                                          | @830°C(120min) with shock                                |
| IEC 60332-3-22       | 2018    | Test for vertical flame spread of vertically mounted bunched wires or cables                                                   | Cat. A                                                   |
| IEC 60754-1/2        | 2019    | Determination of the amount of halogen acid gas/ Determination of acidity (by pH measurement) and conductivity                 | Low Halogen<br><0,5%<br>Halogen free<br>≥4,3pH, ≤10μS/mm |
| IEC 60684-2          | 2011    | Determination of low levels of fluorine                                                                                        | fluorine content <0.1%                                   |
| IEC 61034-1/2        | 2019    | Measurement of smoke density of cables burning under defined conditions                                                        | Low smoke<br>>60%                                        |
| UL 1581              | 2020    | Sunlight(UV) resistance                                                                                                        | 720hrs                                                   |
| IEC60092-350 Annex E | 2020    | Additional test at low temperature                                                                                             | Bending -40°C                                            |
|                      |         | Additional test at low temperature                                                                                             | Impact -35°C                                             |

## Marking of product

Voltage rating – Cable type – Size – LS Cable – Year of manufacture – IEC 60331-1(or-2)(120) – IEC 60332-3A – Length

### **Periodical assessment**

The scope of the periodical assessment is to verify that the conditions stipulated for the Type approval are complied with and that no alterations are made to the product design or choice of materials.

The main elements of the assessment are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Routine tests (RT) and selected type tests (ref. to applicable class programs) checked (if not available these tests shall be carried out)
- Review of type approval documentation
- Review of possible change in design, materials and performance
- Ensuring traceability between manufacturer's product type marking and Type Approval Certificate.

Periodical assessment is to be performed after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate.

END OF CERTIFICATE