

TYPE APPROVAL CERTIFICATE

This is to certify:**That the High Voltage Cable**

with type designation(s)

3.6/6kV RFOU-FIRE RESISTANT, 6/10kV RFOU-FIRE RESISTANT, 8.7/15kV RFOU-FIRE RESISTANT

Issued to

TMC Co., Ltd**Cheonan-si, Chungcheongnam-do, Republic of Korea**

is found to comply with

**DNV GL rules for classification – Ships, offshore units, and high speed and light craft
IEC 60092-354 (2014-08)****Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.**

Type	Rated voltage (kV)	Temp. class (°C)
3.6/6kV RFOU-FIRE RESISTANT	3.6/6	90
6/10kV RFOU-FIRE RESISTANT	6/10	90
8.7/15kV RFOU-FIRE RESISTANT	8.7/15	90

Issued at **Busan** on **2018-12-20**This Certificate is valid until **2023-12-19**.for **DNV GL**DNV GL local station: **Seoul**Approval Engineer: **Eun Jin Lee**

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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.



Product description

Type : 3.6/6kV RFO(C/B)U-FIRE RESISTANT, 6/10kV RFO(C/B)U-FIRE RESISTANT, 8.7/15kV RFO(C/B)U-FIRE RESISTANT

*Not applicable for single core cables

Conductors:	Stranded tinned annealed copper wires, Class 2
Conductor screen:	Semi-conducting layer
Core insulation:	EPR
Insulation screen:	Semi-conducting layer /tinned annealed copper wire braid
Fire resisting layer	Fibreglass urethan tape
Inner coving:	Flame retardant halogen free thermoset compound
Fire resisting layer	Fibreglass urethan tape
Metal covering:	Braid of tinned annealed copper wire(O) / galvanized steel wire(C)* / bronze wire(B)
Fire resisting layer:	Fibreglass urethan tape
Sheath:	SHF 2

Number of cores x conductor cross-section mm ²
1 x 50
1 x 70
1 x 95
1 x 120
1 x 150
1 x 185
1 x 240
1 x 300

Number of cores x conductor cross-section mm ²
3 x 50
3 x 70
3 x 95
3 x 120
3 x 150
3 x 185
3 x 240

Number of cores x conductor cross-section mm ²
3 x 50+E
3 x 70+E
3 x 95+E
3 x 120+E
3 x 150+E
3 x 185+E
3 x 240+E

Application/Limitation

This cable is fire resistant according to IEC 60331.

The requirements of SOLAS Amendments Chapter II-1, Part D, Reg. 45, 5.2 (provision to be taken 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 60092-350	2014	General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications	
IEC 60092-354	2014	Single- and three-core power cables with extruded solid insulation for rated voltages 6 kV(U _m =7,2 kV) up to 30 kV(U _m =36 kV)	
IEC 60092-360	2014	Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telocommunication cables	
IEC 60331-21	1999-04	Fire with shock-Electric cables under fire conditions-Circuit integrity	750 °C (120min)

Job Id: **262.1-026434-1**
Certificate No: **TAE00003A3**

Standard	Release	General description	Limitation
BS 8491	2008	Method for assessment of fire integrity of large diameter power cables for use as components for smoke and heat control system and certain other active fire safety systems	750 °C with water spray for 15 minutes.
IEC 60332-1-2	2004-07	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	
IEC 60332-3-22	2009-02	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	Bunch test Category A
IEC 60754-1	2011	Test on gases evolved during combustion of materials from cables – Determination of the amount of halogen acid gas	Low Halogen <0,5%
IEC 60754-2	2011	Test on gases evolved during combustion of materials from cables – Determination of the degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and conductivity	Halogen free ≥4,3pH, ≤10µS/mm
IEC 60684-2	2011	Flexible insulating sleeving – Part 2: Methods of test.	Fluorine content <0.1%
IEC 61034-1/2	2005-04	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke >60%
CSA C22.2 No.0.3, 38	2010	Test methods for electrical wires and cables & Thermosetting – insulated wires and cables	Cold bend (-40°C) Cold impact (-35°C)
NEK 606 Ed. 4	2016	Cables for offshore installations. Halogen-free and/or mud resistant. Technical specification.	Category a/b/c/d.
UL 1581	2017	Sunlight resistant	

Marking of product

Voltage rating – Type designation – Size – IEC 60332-3 Cat.A – IEC 60331-21(120)+BS8491(15) – TMC – Year of manufacture – Length

Periodical assessment

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

The main elements of the survey are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Production Sample Tests (PST) and Routines (RT) checked (if not available tests according to PST and RT to 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.



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END OF CERTIFICATE