Certificate No:
TAE000008X

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Electric Power Cable

with type designation(s)
RFOU(VFD) & FX-RFOU(VFD) 0.6/1(1.8/3) kV, RFBU(VFD) & FX-RFBU(VFD) 0.6/1(1.8/3) kV, RFOU(VFD) & FX-RFOU(VFD) 1.8/3 kV, RFBU(VFD) & FX-RFBU(VFD) 1.8/3 kV

Issued to
TMC Co., Ltd
CHUNGNAM, Republic of Korea

is found to comply with
Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards
IEC 60092-353 (2011-08)
IEC 60332-3-22 (2009-02)
IEC 60754-1/2 (2011-11)
IEC 61034-1/2 Ed. 3.1 (2013-06)

Application :

General power. Flame retardant Cat.A. Halogen free. Low smoke. Mud resistant. Cold bend(-40°C)/Cold impact(-35°C)

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

Type	Voltage class (kV)	Temp. class (°C)
RFOU(VFD) & FX-RFOU(VFD) 0.6/1(1.8/3) kV	0.6/1(1.8/3)	90
RFBU(VFD) & FX-RFBU(VFD) 0.6/1(1.8/3) kV	0.6/1(1.8/3)	90
RFOU(VFD) & FX-RFOU(VFD) 1.8/3 kV	1.8/3	90
RFBU(VFD) & FX-RFBU(VFD) 1.8/3 kV	1.8/3	90

This Certificate is valid until **2019-08-11**.

Issued at **Busan** on **2015-08-12**

for **DNV GL**

DNV GL local station: **Seoul**

Approval Engineer: **Eun Sook Kim**

Baeg Soon Choi
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.

Job Id: **262.1-003906-3**
Certificate No: **TAE000008X**

Product description

Type: RFOU(VFD) & FX-RFOU(VFD) & RFBU(VFD) & FX-RFBU(VFD) 0.6/1(1.8/3) kV
RFOU(VFD) & FX-RFOU(VFD) & RFBU(VFD) & FX-RFBU(VFD) 1.8/3 kV

Conductors:	Tinned stranded copper class 2 or class 5 (FX types)
Core insulation:	HF EPR or EPR
Inner covering:	Halogen free compound
Metal covering:	Tinned copper wire braid or bronze wire braid
Outer sheath:	SHF2 or SHF Mud

Number of cores x conductor cross-section	Overall diameter
mm^2	mm
3 x 10 + 3 x E	27.8±1,4
3 x 16 + 3 x E	29,9±1,5
3 x 25 + 3 x E	31,7±1,6
3 x 35 + 3 x E	34,9±1,7
3 x 50 + 3 x E	38,5±1,8
3 x 70 + 3 x E	42,6±2,0
3 x 95 + 3 x E	48,3±2,2
3 x 120 + 3 x E	52,2±2,4
3 x 150 + 3 x E	55,8±2,5
3 x 185 + 3 x E	60,5±2,7
3 x 240 + 3 x E	66,7±3,0

Number of cores x conductor cross-section	Overall diameter
mm^2	mm
FX type	
3 x 10 + 3 x E	27,9±1,4
3 x 16 + 3 x E	30,8±1,5
3 x 25 + 3 x E	34,5±1,7
3 x 35 + 3 x E	38,1±1,8
3 x 50 + 3 x E	41,9±2,0
3 x 70 + 3 x E	46,8±2,2
3 x 95 + 3 x E	52,0±2,4
3 x 120 + 3 x E	56,0±2,5
3 x 150 + 3 x E	60,7±2,7
3 x 185 + 3 x E	65,0±2,9
3 x 240 + 3 x E	72,5±3,2

Application/Limitation

The requirement 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 60092-350	2014-08	General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications	
IEC 60092-353	2011-08	Power cables for rated voltages 1kV and 3kV	
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%

Standard	Release	General description	Limitation
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 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.03/38	Cold bend (-40°C) / Cold impact (-35 °C)
UL 1581	2009	Sunlight resistant -Section 1200	720 hrs, only for sheath
ASTM D 2863		Standard test method for measuring the minimum oxygen concentration to support candle-like combustion of plastics (Oxygen index)	
NEK TS 606	2009		Mud resistance

Marking of product

Voltage rating – Type designation – Size – 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 Certificate are complied with and that no alterations are made to the design and/or the material of product.

The main elements of the survey are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Check of the results from Production Sample Tests(PST) and Routine Tests(RT) (if not available, PST and RT are to be carried out)
- Review of type approval documentation
- Review of possible changes in design, material and performance
- Ensuring traceability between manufacturer's product type marking and Type Approval Certificate

Survey is to be performed at least every second year.

END OF CERTIFICATE