DNV·GL

Certificate No:
TAE00002D5

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Electric Power Cable

with type designation(s)
RFOU P101, FX-RFOU P101, RFOU, RFCU, RFBU, FX-RFOU, -RFCU, -RFBU

Issued to
TMC Co., Ltd
Cheonan-si Chungcheongnam-do, Korea

is found to comply with
DNV GL rules for classification – Ships, offshore units, and high speed and light craft
IEC 60092-353 (2016-09)
IEC 60332-3-22 (2009-02)
IEC 60754-1/2 (2011-11)
IEC 61034-2 Ed. 3.1 (2013-06)
NEK TS 606 (2016)

Application :

General power and lighting. Flame retardant Cat.A. Low smoke. Halogen free. 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.
Rated voltage (kV) 0.6/1
Temp. class (°C) 90

Issued at **Busan** on **2017-07-01**
This Certificate is valid until **2022-06-30**.
DNV GL local station: **Seoul**

for **DNV GL**

Approval Engineer: **Eun Sook Kim**

Michael Jost Auf der Stroth
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.

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Job Id: **262.1-007573-5**
Certificate No: **TAE00002D5**

Product description

Type: 0.6/1 kV RFOU P101, FX-RFOU P101, RFOU, RFCU, RFBU, FX-RFOU, -RFCU, -RFBU

Conductors:	Tinned stranded copper, Class 2 or Class 5(FX-types)
Core insulation:	EPR
Inner covering:	Halogen free compound
Metal covering:	Tinned copper wire braid(O) or Bronze wire braid(B) Galvanized steel wire(C) for multicore cables only.
Outer sheath:	SHF2 or SHF Mud

No. of Cores	Conductor Nominal Area (㎟)
1	1.5
1	2.5
1	4
1	6
1	10
1	16
1	25
1	35
1	50
1	70
1	95
1	120
1	150
1	185
1	240
1	300
1	*400
1	*500
1	*630
2	1.5
2	2.5
2	4
2	6
2	10
2	16
2	25
2	35
2	50
2	70
2	95
2	120
2	150
2	185
2	240
2	300
2C+E	1.5
2C+E	2.5
2C+E	4
2C+E	6
2C+E	10
2C+E	16

No. of Cores	Conductor Nominal Area (㎟)
2C	25
Earth	16
2C	35
Earth	25
2C	50
Earth	25
2C	70
Earth	35
2C	95
Earth	50
2C	120
Earth	70
2C	150
Earth	95
2C	185
Earth	95
2C	240
Earth	120
3	1.5
3	2.5
3	4
3	6
3	10
3	16
3	25
3	35
3	50
3	70
3	95
3	120
3	150
3	185
3	240
3	300
3C+E	1.5
3C+E	2.5
3C+E	4
3C+E	6
3C+E	10
3C+E	16

No. of Cores	Conductor Nominal Area (㎟)
3C	25
Earth	16
3C	35
Earth	25
3C	50
Earth	25
3C	70
Earth	35
3C	95
Earth	50
3C	120
Earth	70
3C	150
Earth	95
3C	185
Earth	95
3C	240
Earth	120
4	1.5
4	2.5
4	4
4	6
4	10
4	16
4	25
4	35
4	50
4	70
4	95
4	120
4	150
4	185
4	240
4	300
4C+E	1.5
4C+E	2.5
4C+E	4
4C+E	6
4C+E	10
4C+E	16
4C	25

No. of Cores	Conductor Nominal Area (㎟)
Earth	16
4C	35
Earth	25
4C	50
Earth	25
4C	70
Earth	35
4C	95
Earth	50
4C	120
Earth	70
4C	150
Earth	95
4C	185
Earth	95
4C	240
Earth	120
5	*1.5
5	*2.5
5	*4
5	*6
5	*10
5	*16
5	*25
5	*35
5	*50
5	*70
5	*95
5	*120
5	*150
5	*185

No. of Cores	Conductor Nominal Area (㎟)
5	*240
*2	1.0
5	1.0
7	1.0
*8	1.0
9	1.0
*10	1.0
12	1.0
14	1.0
16	1.0
19	1.0
24	1.0
27	1.0
30	1.0
37	1.0
44	1.0
*2	1.5
5	1.5
7	1.5
*8	1.5
9	1.5
*10	1.5
12	1.5
14	1.5
16	1.5
19	1.5
24	1.5
27	1.5
30	1.5
37	1.5
44	1.5

No. of Cores	Conductor Nominal Area (㎟)
*2	2.5
5	2.5
7	2.5
*8	2.5
9	2.5
*10	2.5
12	2.5
14	2.5
16	2.5
19	2.5
24	2.5
27	2.5
30	2.5
37	2.5
44	2.5
*2	4
5	4
7	4
*8	4
9	4
*10	4
12	4
14	4
16	4
19	4
24	4
27	4
30	4
37	4
44	4

* marked: Class 2 only (No Class 5)

Application/Limitation

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	2008-02	General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications	
IEC 60092-353	2011-08	Single and multicore non-radial field power cables with extruded solid insulation for rated Voltages of 1 kV and 3 kV	
IEC 60092-360	2014	Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telocommunication cables	
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	2011-11	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	2011-11	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 condctivity	Halogen free ≥4,3pH, ≤10µS/mm
IEC 61034-1/2	2013-06	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke >60%
CSA C22.2 No.0.3	2010	Test methods for electrical wires and cables	Cold bend (-40°C) Cold impact (-35°C)
UL 1581	2008-07	Sunlight resistant	
ASTM D 2863	2009	Oxygen index	Min. 32
NEK TS 606	2016	Cables for offshore installations – Halogen-free low smoke and flame-retardant / fire-resistant (HFFR-LS)	Oil & Mud resistant – Category a/b/c/d

Marking of product

0.6/1 kV RFOU P101, FX-RFOU P101, RFOU, RFCU, RFBU, FX-RFOU, FX-RFCU, FX-RFBU – Size - IEC 60332-3 Cat.A – 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.

END OF CERTIFICATE