DNV·GL

Certificate No:
TAE00002DB

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Low Voltage Cable

with type designation(s)
BFOU(i) S103, BFOU(c) S104, BFOU(i), BFCU(i), BFBU(i), BFOU(c), BFCU(c), BFBU(c), BFOU(i&c), BFCU(i&c), BFBU(i&c), FX-BFOU(i) S103, FX-BFOU(c) S104, FX-BFOU(i), -BFCU(i), -BFBU(i), -BFOU(c), -BFCU(c), -BFBU(c), -BFOU(i&c), -BFCU(i&c), -BFBU(i&c)

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 60092-376 (2003-05)
IEC 60331-1/2 (2009-05)
IEC 60331-21 (1999-04)
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 :

Control and instrumentation. Flame retardant Cat.A. Fire resistant. 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 (V) 250
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: **TAE00002DB**

Product description

Type: 250V BFOU(i) S103, BFOU(i), BFCU(i), BFBU(i)
250V BFOU(c) S104, BFOU(c), BFCU(c), BFBU(c)
250V BFOU(i&c), BFCU(i&c), BFBU(i&c)
250V FX-BFOU(i) S103, FX-BFOU(i), -BFCU(i), -BFBU(i)
250V FX-BFOU(c) S104, FX-BFOU(c), -BFCU(c), -BFBU(c)
250V FX-BFOU(i&c), -BFCU(i&c), -BFBU(i&c)

Conductors:	Tinned stranded copper, Class 2 or Class 5(FX-types)
Fire resisting layer:	Mica/glass tape
Core insulation:	EPR
Inner covering:	Halogen free compound
Metal covering:	Tinned copper wire braid(O), Galvanized steel wire braid(C) or Bronze wire braid(B)
Outer sheath:	SHF2 or SHF Mud

PAIR TYPE

No. of Cores	Conductor Nominal Area (㎟)
*1 P	0.75
2 P	0.75
3 P	0.75
4 P	0.75
5 P	0.75
6 P	0.75
7 P	0.75
8 P	0.75
10 P	0.75
12 P	0.75
14 P	0.75
16 P	0.75
19 P	0.75
24 P	0.75
32 P	0.75
*1 P	1.0
2 P	1.0
3 P	1.0
4 P	1.0
5 P	1.0

No. of Cores	Conductor Nominal Area (㎟)
6 P	1.0
7 P	1.0
8 P	1.0
10 P	1.0
12 P	1.0
14 P	1.0
16 P	1.0
19 P	1.0
24 P	1.0
32 P	1.0
*1 P	1.5
2 P	1.5
3 P	1.5
4 P	1.5
5 P	1.5
6 P	1.5
7 P	1.5
8 P	1.5
10 P	1.5
12 P	1.5

No. of Cores	Conductor Nominal Area (㎟)
14 P	1.5
16 P	1.5
19 P	1.5
24 P	1.5
32 P	1.5
*1 P	2.5
2 P	2.5
3 P	2.5
4 P	2.5
5 P	2.5
6 P	2.5
7 P	2.5
8 P	2.5
10 P	2.5
12 P	2.5
14 P	2.5
16 P	2.5
19 P	2.5
24 P	2.5
32 P	2.5

* marked: individual screen omitted for (i&c) types

TRIAD TYPE

No. of Cores	Conductor Nominal Area (㎟)
*1 T	0.75
2 T	0.75
3 T	0.75
4 T	0.75
5 T	0.75
6 T	0.75
7 T	0.75
8 T	0.75
10 T	0.75

No. of Cores	Conductor Nominal Area (㎟)
12 T	0.75
14 T	0.75
16 T	0.75
19 T	0.75
24 T	0.75
32 T	0.75
*1 T	1.0
2 T	1.0

No. of Cores	Conductor Nominal Area (㎟)
3 T	1.0
4 T	1.0
5 T	1.0
6 T	1.0
7 T	1.0
8 T	1.0
10 T	1.0
12 T	1.0
14 T	1.0

No. of Cores	Conductor Nominal Area (㎟)
16 T	1.0
19 T	1.0
24 T	1.0
32 T	1.0
*1 T	1.5
2 T	1.5
3 T	1.5
4 T	1.5
5 T	1.5
6 T	1.5
7 T	1.5
8 T	1.5

No. of Cores	Conductor Nominal Area (㎟)
10 T	1.5
12 T	1.5
14 T	1.5
16 T	1.5
19 T	1.5
24 T	1.5
32 T	1.5
*1 T	2.5
2 T	2.5
3 T	2.5
4 T	2.5

No. of Cores	Conductor Nominal Area (㎟)
5 T	2.5
6 T	2.5
7 T	2.5
8 T	2.5
10 T	2.5
12 T	2.5
14 T	2.5
16 T	2.5
19 T	2.5
24 T	2.5
32 T	2.5

* marked: individual screen omitted for (i&c) types

Application/Limitation

This type of cable is fire resistant in accordance with IEC Publication 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	2008-02	General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications	
IEC 60092-360	2014	Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telocommunication cables	
IEC 60092-376	2003-05	Cables for control and instrumentation circuits 150/250 V (300 V)	
IEC 60331-21	1999-04	Tests for electric cables under fire conditions - Circuit integrity - Part 21: Procedures and requirements - Cables of rated voltage up to and including 0,6/1,0 kV	90 min. test
IEC 60331-1/2	2009-05	Tests for electric cables under fire conditions – Part 1 : Test method for fire with shock at a temperature of at least 830ºC for cables of rated voltage up to and including 0,6/1 kV and with an overall diameter exceeding 20mm Part 2 : Test method for fire with shock at a temperature of at least 830ºC for cables of rated voltage up to and including 0,6/1 kV and with an overall diameter not exceeding 20mm	120 min. test
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

Standard	Release	General description	Limitation
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
NEK TS 606	2016	Cables for offshore installations – Halogen-free low smoke and flame-retardant / fire-resistant (HFFR-LS)	Only for BFOU(i) S103, BFOU(c) S104, FX-BFOU(i) S103 and FX-BFOU(c) S104 cables IEC 60331-1/2 test and Water spray test acc. to EN 50200:2015 Annex E or Water jet test acc. to BS 8491

Marking of product

BFOU(i) S103, BFOU(c) S104, BFOU(i), BFCU(i), BFBU(i), BFOU(c), BFCU(c), BFBU(c), BFOU(i&c), BFCU(i&c), BFBU(i&c), FX-BFOU(i) S103, FX-BFOU(c) S104, FX-BFOU(i), FX-BFCU(i), FX-BFBU(i), FX-BFOU(c), FX-BFCU(c), FX-BFBU(c), FX-BFOU(i&c), FX-BFCU(i&c), FX-BFBU(i&c) – Size – IEC 60331-1(120) or IEC 60331-2(120) – 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