DNV·GL

Certificate No:
TAE00001HX

TYPE APPROVAL CERTIFICATE

This is to certify:

That the High Voltage Cable

with type designation(s)
RFOU/RFCU-FIRE RESISTANT-MUD RESISTANT

Issued to
Kukdong Electric Wire Co., Ltd.
Chungcheongbuk-do, Republic of Korea

is found to comply with
DNV GL rules for classification – Ships and offshore units
IEC 60092-354 (2014-08)
IEC 60332-3-22 (2009-02)
IEC 60331-21 (1999-04)
NEK TS 606 (2016)

Application :

High voltage power cable. Flame retardant Cat.A and RFOU(or RFCU)+FIRE RESISTANT+MUD RESISTANT(NEK 606 2016).
Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

Voltage (kV)	**3.6/6, 6/10, 8.7/15**
Temp. class (°C)	**90**

This Certificate is valid until **2021-11-16**.

Issued at **Busan** on **2016-11-17**

for **DNV GL**

DNV GL local station: **Seoul**

Approval Engineer: **Byoung So Lee**

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.

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Job Id:
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Product description

Power cables designed according to IEC 60092-354 and NEK TS 606 Ed5 2016.

Type: 3.6/6kV(P120), 6/10kV(P121), 8.7/15kV(P122) RFOU(or RFCU)-FIRE RESISTANT-MUD RESISTANT
Construction:

Conductors:	Tinned, stranded copper Class 2
Conductor screen:	Semiconducting tape and semiconducting compound
Core insulation:	EPR
Insulation screen:	Semiconducting compound and semiconducting tape
Screen:	Annealed or tinned copper wire braid
Fire proof layer:	Mica glass tape and silicon glass tape
Bedding(fire block):	Halogen free special compound
Sheath:	SHF2
Armour:	Copper wire braid(RFOU) or galvanized steel wire braid(RFCU)
Tape over armour:	PET tape
Outer sheath:	SHF2 Mud resistant

Type: 3.6/6kV(P120) RFOU(or RFCU)-FIRE RESISTANT-MUD RESISTANT

Number of core	Nominal sectional area(mm2)
1	16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300, 400, 500, 630
3	16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300
3(double braided)	120, 150, 185, 240
3+E	25+16, 35+25, 50+25, 70+35, 95+50, 120+70, 150+95

Type: 6/10kV(P121) RFOU(or RFCU)-FIRE RESISTANT-MUD RESISTANT

Number of core	Nominal sectional area(mm2)
1	16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300, 400, 500, 630
3	16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300
3(double braided)	120, 150, 185, 240
3+E	25+16, 35+25, 50+25, 70+35, 95+50, 120+70, 150+95

Type: 8.7/15kV(P122) RFOU(or RFCU)-FIRE RESISTANT-MUD RESISTANT

Number of core	Nominal sectional area(mm2)
1	25, 35, 50, 70, 95, 120, 150, 185, 240, 300, 400, 500, 630
3	25, 35, 50, 70, 95, 120, 150, 185, 240, 300
3(double braided)	120, 150, 185, 240
3+E	25+16, 35+25, 50+25, 70+35, 95+50, 120+70, 150+95

Application/Limitation

This type of cable is fire resistant according to IEC 60331-21.

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	

Standard	Release	General description	Limitation
IEC 60092-360	2014-04	Electrical installations in ships - Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication cables.	
IEC 60092-354	2014-08	Electrical installations in ships - Part 354: Single- and three-core power cables with extruded solid insulation for rated voltages 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)	
IEC 60332-3-22	2000	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	
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. successful test at operating voltage without earth fault
IEC 60754-1	2011-11	Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content	Low Halogen: <0,5% Halogen Refer to test report KDE-NB-15079
IEC 60754-2	2011-11	Test on gases evolved during combustion of materials from cables - Part 2: Determination of acidity (by pH measurement) and conductivity	Halogen free: pH ≥ 4,3 Conductivity ≤ 10µS/mm Refer to test report KDE-NB-15079
IEC 61034-1/2	2013-07 2013-09	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke Light transmittance ≥60%
NEK TS606 Ed5	2016	Cables for offshore installations - halogen-free low smoke flame-retardant / fire-resistant (HFFR-LS). Technical specification.	Mud resistance test: IRM 902 & 903 100°C 7d. Calcium Brom. 70°C 56d. Oil based test fluid: EDC 95-11 70°C 56d. Hydraulic/gear oil 100°C 7d.
CSA C 22.2 No 0.3		Cold bend (-40 °C)/impact (-35 °C) test	

Marking of product

Manufacturer's name-Cable code designation-Sheath code(*)-Voltage rating-Number of cores-Cross section of conductors-Cross section of braid(if any)-Year-Length

The marking shall be repeated at least every 1 metre
Example) NEXANS KUKDONG RFOU-FIRE RESISTANT P120 3CX150SQMM E(or M or H-M) 3.6/6KV IEC 60332-3 A IEC 60331-21(90) 2016/03 0010M

* Sheath code

E	Enhanced oil resistant-category b
M	Enhanced oil resistant-category b & mud resistant-category c
H	Enhanced oil resistant-category b & hydraulic/gear oil resistant-category d
H-M	Enhanced oil resistant-category b & mud resistant-category c & hydraulic/gear oil resistant-category d

Periodical assessment

The scope of the periodical assessment 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 periodical assessment 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.

Survey to be performed at least every second year.

END OF CERTIFICATE