

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Fiber optical cable**with type designation(s)
QFCI, QFCU and QFCB

Issued to

**Kukdong Electric Wire Co., Ltd.
Jincheon-gun, Chungcheongbuk-do, Republic of Korea**

is found to comply with

**DNV GL rules for classification – Ships, offshore units, and high speed and light craft
DNV GL class programme DNVGL-CP-0402 – Type approval – Optical fibre cables****Application :****Fiber optic cable.****Flame retardant Cat. A. Fire resistant. Halogen free. Low smoke. UV resistant.****Product(s) approved by this certificate is/are accepted for installation on all vessels classed
by DNV GL.**Issued at **Busan** on **2018-12-10**This Certificate is valid until **2023-06-30**.for **DNV GL**DNV GL local station: **Seoul**Approval Engineer: **Dong Ho Park**

**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

Fiber optic cable: QFCI (LT-SM or MM-HFSWB) and QFOI (LT-SM or MM-HFCWB)

Number of fibers	Max 48 - SM : Optical fiber : 9.5/125 μm - MM : Optical fiber : 62.5/125 μm
Number of fiber per tube	Max 4 (for 2~24C) Max 8 (for 25 ~ 48C)
Central strength element	FRP (Fibre reinforced plastic)
Loose Tube	Gel filled loose tube made from PBT (Polybutylene Terephthalate)
Fire resisting layer	Each tube is protected with fire resistant mica tape
Moisture barrier	Swellable tape
Inner sheath	SHF1
Metal covering	Galvanized steel wire braid (QFCI) tinned copper wire braid (QFOI)
Outer sheath	SHF1

Fiber optic cable: QFCU (LT-SM or MM-HFSWB) and QFOU (LT-SM or MM-HFCWB)

Number of fibers	Max 48 - SM : Optical fiber : 9.5/125 μm - MM : Optical fiber : 62.5/125 μm
Number of fiber per tube	Max 4 (for 2~24C) Max 8 (for 25 ~ 48C)
Central strength element	FRP (Fiber reinforced plastic)
Loose Tube	Gel filled loose tube made from PBT (Polybutylene Terephthalate)
Fire resisting layer	Each tube is protected with fire resistant mica tape
Moisture barrier	Swellable tape
Inner sheath	SHF2
Metal covering	Galvanized steel wire braid (QFCU) tinned copper wire braid (QFOU)
Outer sheath	SHF2

Fiber optic cable: QFCB (LT- SM or MM-HFBSWB) and QFOB (LT-SM or MM-HFBCWB)

Number of fibers	Max 48 - SM : Optical fiber : 9.5/125 μm - MM : Optical fiber : 62.5/125 μm
Number of fiber per tube	Max 4 (for 2~24C) Max 8 (for 25 ~ 48C)
Central strength element	FRP (Fiber reinforced plastic)
Loose Tube	Gel filled loose tube made from PBT (Polybutylene Terephthalate)
Fire resisting layer	Each tube is protected with fire resistant mica tape
Moisture barrier	Swellable tape
Inner sheath	SHF1
Metal covering	Galvanized steel wire braid (QFCB) tinned copper wire braid (QFOB)
Outer sheath	SHF1
Sheath covering	Polyimide covering

Application/Limitation

Installation: -30 to +60°C
Operation: -40 to +70 °C
Storage : -40 to +70 °C

Cable is considered to be 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
DNVGL-CP-0402	2016-02	DNV GL Class Programme for Optical fibre cables	
IEC 60793-2-10	2017-08	IEC 60793-2-10 Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres	Design standard; MM cables
IEC 60793-2-50	2015-11	IEC 60793-2-50 Optical fibres – Part 2-50: Product specifications – Sectional specification for class B singlemode fibres	Design standard; SM cables
IEC 60794-1-1	2015-11	Optical fibre cables - Part 1-1: Generic specification - General	
IEC 60794-1-2	2017-01	Optical fibre cables - Part 1-2: Generic specification - Basic optical cable test procedures	
IEC 60092-360	2014-04	Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation, telecommunication cables	
IEC 60332-1-2	2015-07	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 (AS/NZS 1660.5.1)	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 60331-25	1999-04	Tests for electric cables under fire conditions - Circuit integrity - Part 25: Procedures and requirements - Optical fibre cables	90 min. test
IEC 60684-2	2011-08	Flexible insulating sleeving – Part 2: Methods of test.	Fluorine content <0,1%
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 conductivity	Halogen free ≥4,3pH, ≤10µS/mm
IEC 61034-1/2 Amd.1	2013-06	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke >60%
NEK 606	2009	Cables for offshore installations halogen-free and/or mud resistant Technical specification	Mud resistant

Marking of product

NEXANS KUKDONG LT-SM-HFSWB(QFCI) or LT-SM-HFCWB(QFOI) or LT-MM-HFSWB(QFCI) or LT-MM-HFCWB(QFOI) - no of cores x mode field diameter IEC 60332-3 A – IEC 60331-25 – year - length

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Certificate No: **TAE000031H**

NEXANS KUKDONG LT-SM-HFSWB(QFCU) or LT-SM-HFCWB(QFOU) or LT-MM-HFSWB(QFCU) or LT-MM-HFCWB(QFOU) - no of cores x mode field diameter IEC 60332-3 A – IEC 60331-25 – year - length
NEXANS KUKDONG LT-SM-HFBSWB(QFCB) or LT-SM-HFBCWB(QFOB) or LT-MM-HFBSWB(QFCB) or LT-MM-HFBCWB(QFOB) - no of cores x mode field diameter (SM) OR core diameter (MM) IEC 60332-3 A – IEC 60331-25 – year - length

Periodical assessment

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

The main elements of the assessment are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Routine tests (RT) and selected type tests (ref. to applicable class programs) checked (if not available these tests shall 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