



Certificate no.:
TAE000052J

TYPE APPROVAL CERTIFICATE

This is to certify:

that the **Fiber optical cable**

with type designation(s)

QFA-I/U/B Single loose tube, QFA-I/U/B Single loose tube Type 2, QFA-I/U/B Multi loose tube, QFC/O-I/U/B Single loose tube, QFC/O-I/U/B Multi loose tube

issued to

Yanger (Shanghai) Marine Technology Co., Ltd
SHANGHAI, China

is found to comply with

DNV rules for classification – Ships, offshore units, and high speed and light craft

Application:

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

Issued at **Hamburg** on **2025-05-20**

This Certificate is valid until **2030-05-19**.

for **DNV**

DNV local unit: **Shanghai**

Approval Engineer: **Carsten Hunsalz**

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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to USD 300 000.

Product description

Type: QFA-I/U/B Single loose tube, QFA-I/U/B Single loose tube Type 2

Cable construction:

No. of fibers: up to 24 fibers in Loose tube
Loose tube diameter: Ø 2.8 mm up to 12 fibers, Ø 3.5 mm above 12 fibers
Fire resistant layer: Mica Tape
Inner sheath: SHF1 Type 2 only (thickness min. 1.0 mm)
Armor: Dielectric strengthen yarn
Outer sheath: QFAI – SHF1, QFAU – SHF2, QFAB – SHF2 MUD (thickness min. 1.5 mm)

Type: QFA-I/U/B Multi loose tube

Cable construction:

No. of tubes x fibers: up to 48 fibers with 6 tubes in maximum
Loose tube diameter: Normal Ø 2.2 mm
Fire resistant layer: Mica Tape around loose tube
Inner sheath: SHF1 (thickness min. 1.0 mm)
Armor: Dielectric strengthen yarn
Outer sheath: QFAI – SHF1, QFAU – SHF2, QFAB – SHF2 MUD (thickness min. 1.8 mm)

Type: QFC/O-I/U/B Single loose tube

Cable construction:

No. of fibers: up to 24 fibers in Loose tube
Loose tube diameter: Ø 2.8 mm up to 12 fibers, Ø 3.5 mm above 12 fibers
Fire resistant layer: Mica Tape + water blocking yarn
Inner sheath: SHF1 (thickness min. 1.2 mm)
Armor: C= Galvanized steel wire braid or Corrugated steel tape
O= Tinned copper wire braid
Outer sheath: QFCI-SHF1, QFOI-SHF1, QFCU-SHF2, QFOU-SHF2, QFCB-SHF2 MUD, QFOB- SHF2 MUD (thickness min. 1.7mm)

Type: QFC/O-I/U/B Multi loose tube

Cable construction:

No. of tubes x fibers: up to 48 fibers with 6 tubes in maximum
Loose tube diameter: Normal Ø 2.2 mm
Fire resistant layer: Mica Tape around loose tube
Inner sheath: SHF1 (thickness min. 1.2 mm)
Armor: C= Galvanized steel wire braid or Corrugated steel tape
O= Tinned copper wire braid
Outer sheath: QFCI-SHF1, QFOI-SHF1, QFCU-SHF2, QFOU-SHF2, QFCB-SHF2 MUD, QFOB- SHF2 MUD (thickness min. 1.5mm)

Type of fibres:

Type	Definition in IEC
B-652.D (B1.3)	IEC 60793-2-50:2018
B-657.A1 (B6_a1)	IEC 60793-2-50:2018
B-657.A2 (B6_a2)	IEC 60793-2-50:2018
B-657.B3 (B6_b3)	IEC 60793-2-50:2018
A1-OM1 (A1b)	IEC 60793-2-10:2022
A1-OM2 (A1a.1)	IEC 60793-2-10:2022
A1-OM3 (A1a.2)	IEC 60793-2-10:2022
A1-OM4 (A1a.3)	IEC 60793-2-10:2022

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.

This type of cable is fire resistant in accordance with IEC Publication 60331.

Fire resistance test carried out according to:

-IEC 60331-2 (120 minutes, 830°C, with shock) + EN 50200 (Water Spray last 15 minutes of test).
Changes in attenuation $\leq 1,5$ dB during test.

-IEC 60331-2 (180 minutes, 1000°C, with shock). Changes in attenuation $\leq 1,5$ dB during test.

Fiber optical cable

Fire resistant. Flame retardant in bunch Cat. A. Halogen free. Low smoke. MUD resistant. UV resistant

Temperature range: -40°C to +70°C (SHF1), +80°C (SHF2 and SHF2 MUD)

Other technical data according to manufacturer's instruction and test report.

The cable designation is partly based on the "Cable code designation" of NEK TS 606.

Type Approval documentation

Tests carried out

Standard	Release	General description	Limitation
DNV-CP-0402	2021-09	DNV Type approval program for optical fibre cables	
IEC 60794-1-21 IEC 60794-1-22 IEC 60794-1-23 IEC 60794-1-24	2020-03 2017-10 2020-01 2014-05	Optical fibre cables - Part 1-21/22/23/24: Generic specification - Basic optical cable test procedures	E1 Tensile strength E3 Crush E4 Impact E6 Repeated bending E7 Torsion E10 Kink E11 Cable bend E11 Cold bend F1 Temperature cycling F5 Water penetration G1 Bend test of cable element H3 Electrical continuity
IEC 60793-1-40	2019-03	Optical fibres - Part 1-40: - Attenuation	
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 – Procedure for 1 kW pre-mixed flame	
IEC 60332-3-22	2018-07	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	Charred portion of sample does not exceed 2,5m above bottom edge of burner.
IEC 60331-2	2018-03	Tests for electric cables under fire conditions - Circuit integrity - Part 2: Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0,6/1,0 kV	120 minutes + EN 50200 (Water Spray last 15 minutes of test) and 180 minutes, 1000°C Changes in attenuation $\leq 1,5$ dB during test.
IEC 60754-1	2019-11	Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content	Low Halogen: <0,5% Halogen

Standard	Release	General description	Limitation
IEC 60754-2	2019-11	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
IEC 60684-2	2011-08	Clause 45.2 Methods of determination of low levels of fluorine	Fluorine content < 0,1%
IEC 61034-1/2	2019-11	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke Light transmittance >60%
UL 1581	2023-11	UL Standard for Safety Reference Standard for Electrical Wires, Cables, and Flexible Cords	SHF1, SHF2, SHF-MUD UV resistant acc. UL 1581 Cl.1200 min. 85% after 300h in the tensile strength and elongation
NEK TS 606	2022	Cables for offshore installations. Halogen-free and/or mud resistant. Technical specification.	SHF2-MUD resistance test: IRM902+IRM903 100°C 7d. Calcium Bromide 70°C 56d. Oil based mud: EDC 95/11 70°C 56d

Marking of product

Example:

YANGER® QFAI - (No of fibers) - (model of optical fiber) - IEC 60331-2 - IEC 60332-3-22 - batch no. - meter marking

Place of Production

DNV id: 10781141

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) checked (if not available tests according to 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