

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Fiber optical cable**

with type designation(s)

**TKSEA MULTI LOOSETUBE QFCI or QFCU or QFCU MUD,
TKSEA MULTI LOOSETUBE QFAI or QFAU or QFAU MUD,
TKSEA SINGLE LOOSETUBE QFAI or QFAU or QFAU MUD**

Issued to

**TecniKabel S.p.A.
Torino, TO, Italy**

is found to comply with

DNV GL rules for classification – Ships, offshore units, and high speed and light craft**Application :****Fire resistant Fiber optic cable. Loose tube.****Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.**Issued at **Høvik** on **2018-07-30**This Certificate is valid until **2023-07-15**.for **DNV GL**DNV GL local station: **Milan**Approval Engineer: **Ivar Bull**

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Marta Alonso Pontes
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

TKSEA MULTI LOOSETUBE QFCI or QFCU or QFCU MUD,

Fiber type	See tables below
Fire resistance layer	Mica tape
Type	Loose tube
Central strength element	Galvanized steel rope or thermoplastic coated glassline
Inner sheath	SHF1
Metal covering	GSWB (Galvanised steel wire braid) or TCWB (Tinned copper wire braid)
Outer sheath	SHF1 or SHF2 or SHF2 MUD resistant

TKSEA MULTI LOOSETUBE QFAI or QFAU or QFAU MUD,

Fiber type	See tables below
Fire resistance layer	Mica tape
Type	Loose tube
Central strength element	thermoplastic coated glassline
Inner sheath	SHF1
Armour	Glass- or aramidic yarns
Outer sheath	SHF1 or SHF2 or SHF2 MUD resistant

TKSEA SINGLE LOOSETUBE QFAI or QFAU or QFAU MUD

Fiber type	See tables below
Fire resistance layer	Mica tape
Type	Loose tube
Central strength element	-
Inner sheath	-
Armour	Longitudal glass yarns or aramidic yarns
Outer sheath	SHF1 or SHF2 or SHF2 MUD resistant

Available fiber types:

Single Mode fibers	Multi Mode fibers
SM-LWP ITU-T G.652.0	MM62.5 OM1
SM ITU-T G.657.A1	MM50 OM2
SM ITU-T G.657.A2	MM50 OM3
SM 200µm ITU-T G.657.A2	MM50 OM4
SM NZD ITU-T G.655.D	

Application/Limitation

This type of cable is fire resistant in accordance with IEC Publication 60331-25.

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.

Operation Temperature Window	-40°C + 70°C (SHF1) -40°C + 90°C (SHF2 & SHF2 MUD resistant)
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Type Approval documentation

Tests carried out

Job Id: **262.1-027414-1**
Certificate No: **TAE0000226**

Standard/ req. reference	Year of release	Description	
DNVGL-CP-0402	2016-02	Class Programme DNVGL-CP-0402 Type approval of optical fibre cables	Includes attenuation test, tensile strength test, crush test, impact test, torsion test, kink test and cable bend test.
IEC 60794-1	2011	Optical fibre cables - Part 1-2: Generic specification - Basic optical cable test procedures, selected test E1, E3, E4, E6, E7, E10, E11, E11B,	
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 60331-25	1999	Tests for fibre optic cables under fire conditions - Circuit integrity - Fire alone at a flame temperature of at least 750 °C. Optional Fire Tests at elevated temperature 1000°C.	750°C 3hours Attenuation increase ≤ than 1 dB/fiber @1000°C 3hours < Attenuation increase ≤ than 1,5 dB/fiber
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	
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
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 606 Ed. 5	2016	Cables for offshore installations - halogen-free low smoke flame-retardant / fire-resistant (HFFR-LS). Technical specification.	IRM903 100C 7d. Calc. Brom 70C 56d. Oil based CarboSea @ 70C 56d. Maximum variations: TS & E@B: +30% Veight &vol.: +30%
ASTM-D2565-99(2008)	2008-04	UV Resistance. Standard Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications	720 hours, cycle 1. Maximum change allowed in eleongation after the test ±40 %
CEI EN 50305:2003 - 9.2	2003-06	Railway applications - Railway rolling stock cables having special fire performance - Test methods - Toxicity	In accordance with specification (toxicity of evolved gas ≤3)
CAN/CSA-C22.2 No. 210.2-M90:2005 CAN/CSA-C22.2 No. 0.3-01:2014	2005 2014	Appliance Wiring Material Products Test methods for electrical wires and cables. Cold bend.	In accordance with specification (-40 °C)

Job Id: **262.1-027414-1**
Certificate No: **TAE00002Z6**

Marking of product

TECNIKABEL (A) – ITALY - month/year - TKSEA FIRE RESISTANT OPTICAL CABLE - Cable type G n° and type of fibres SHF1 or SHF2 or SHF2 MUD RESISTANT - DNV GL TAE00002Z6 – IEC 60331-25 (180+15min) @750° C – IEC 60332-3-22 - metric marking

TECNIKABEL (A) – ITALY - month/year - TKSEA FIRE RESISTANT OPTICAL CABLE - Cable type G n° and type of fibres SHF1 or SHF2 or SHF2 MUD RESISTANT - DNV GL TAE00002Z6 – IEC 60331-25 (180+15min) @1000° C – IEC 60332-3-22 - metric marking

(A) = Manufactured at Almese plant

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