



Certificate No:
TAE0000465

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Fiber optical cable

with type designation(s)
**TKSEA MULTITIGHT AICI or AICU or AICU MUD,
TKSEA MULTITIGHT AIAI or AIAU or AIAU MUD**

Issued to

TecniKabel S.p.A.
Volpiano TO, Italy

is found to comply with

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

Application :

Fiber optic cable. Tight buffered.

Products approved by this certificate are accepted for installation on all vessels classed by DNV.

Issued at **Høvik** on **2022-05-04**

This Certificate is valid until **2027-05-03**.

DNV local station: **Milan**

Approval Engineer: **Ivar Bull**

for **DNV**

Trond Sjøvåg
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.

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 300,000 USD.



Form code: TA 251

Revision: 2021-03

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Product description

Tight buffered fiber optic cables:

TKSEA MULTI-TIGHT METALLIC ARMOURED AICI, AICU, AICB, AIOI, AIOU, AIOB
Optional for AICU & AIOU: ARCTIC GRADE -65 °C.

Core: Optical core from 4 to 24 multi tight buffered fibers
Protection: Waterblocking glass or aramidic yarns
Inner sheath: SHF1
Protection: Galvanized steel wire braid (GSWB) or
Tinned copper wire braid (TCWB) or
Bronze wire braid (BWB)
Outer sheath: SHF1 or SHF2 or SHF2 MUD RESISTANT

TKSEA MULTI-TIGHT DI-ELECTRIC ARMOURED AIAI, AIAU, AIAB
Optional for AIAU: ARCTIC GRADE -65 °C

Core: Optical core from 4 to 24 multi tight buffered fibers
Protection: Waterblocking glass or aramidic yarns
Inner sheath: SHF1
Protection: Glass 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 and 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

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: -40°C + 70°C (SHF1)
-40°C + 90°C (SHF2 & SHF2 MUD)
-65°C + 90 °C (Arctic SHF2)

Type Approval documentation

Tests carried out

Standard/ req. reference	Year of release	Description	
DNV-CP-0402	2021-09	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	2021-09	Electrical installations in ships - Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication cables.	
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	
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
IEC 61034-1/2	2019-09	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.	Mud resistance test: Max variations ±: <u>IRM902/903 100°C 7d.</u> TS & E@B, weight & vol.: ±30% Calc. Brom. 70°C 56d. TS & E@B: ±25%, weight: ±15%, vol.: ±20% Oil based mud: EDC 95/11 70°C 56d TS & E@B ±30%, weight & vol.: ±25%
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 elongation 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)
IEC 60092-350	2020-01	Electrical installations in ships - Part 350: General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications Annex E: Cold bend test and impact test for low temperature behaviour	Cold bend: -65°C Cold impact: -55°C

Marking of product

TECNIKABEL (A) – ITALY - month/year - TKSEA OPTICAL CABLE - Cable type (**) G n° and type of fibres SHF1 or SHF2 or SHF2 MUD RESISTANT - Approval marks - IEC 60332-3-22 - metric marking or

TECNIKABEL (A) – ITALY - month/year - TKSEA ARCTIC OPTICAL CABLE - Cable type (**) G n° and type of fibres
SHF2 -65°C/+90°C - Approval marks - IEC 60332-3-22 - metric marking

(A) = Manufactured at Almese plant (Any marking for braid type ie Bronze wire braid?)

(**) cable type

AICI, AICU, AICB (galvanized steel wire braid)

AIOI, AIOU, AIOB (tinned copper wire braid)

AIAI, AIAU, AIAB (strength member of yarn)

AIBWBI, AIBWBU, AIBWBB (bronze wire braid)

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