Certificate No:
TAE0000468

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Data transmission cables and systems

with type designation(s)
TKSEA FIRE RESISTANT RS 485 LSZH CABLE

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 :

Data communication cable. Fire resistant.
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 Sjåvåg
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.

Product description

TKSEA FIRE RESISTANT RS 485 LSZH CABLE, 1, 2 or 4 pairs

Rated voltage peak: 100 V

Conductor:	Tinned stranded copper AWG 20 or AWG 24
Insulation:	Cellular polyolefin
Flame barrier:	Mica tape on each conductor
First Screen:	AL/PE tape with tinned stranded copper drain wire
Second Screen:	Tinned copper wire braid >85% coverage
Outer sheath:	SHF1 or SHF2 or SHF2 MUD

IEC 61158-2 ed. 2 (2014) Table 107 Cable specifications. Industrial communication networks. Fieldbus specifications. Part 2: Physical layer specifications and service definition

Cable parameter	**Type A**	**Type B**	**TKSEA RS 485 AWG 20**	**TKSEA RS 485 AWG 24**
Impedance	135 to 165 Ω (f = 3 to 20 MHz)	100 to 130 Ω (f > 100kHz)	100-130 Ω @1 MHz	100-130 Ω @1 MHz
Capacity	< 30 pF/m	< 60 pF/m	42 pF/m @800-1000Hz	42 pF/m @800-1000Hz
Resistance	< 110 Ω/km	not specified	<33 Ω / km	<88 Ω / km
Conductor cross-sectional area	≥ 0,34 mm^2	≥ 0,22 mm^2	0,60 mm^2	0,20 mm^2
Colour of sheath non-IS	Violet	Not specified	Black or Grey or Orange	Black or Grey or Orange

Additional information:

Nominal attenuation			12dB/km @1MHz	20dB/km @1MHz
Insulation resistance @ 20°C			>5000 MΩ x km	>5000 MΩ x km

Application/Limitation

This cable is fire resistant according to IEC 60331-23.

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.

In order to prevent break of thin conductors due to vibrations and vessel movements, cables shall be installed with suitable termination equipment according to manufacturer's recommendations.

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

Type Approval documentation

Tests carried out

Standard	Issued	General description	Limitation
IEC 61158-2	2014-07	Industrial communication networks - Fieldbus specifications - Part 2: Physical layer specification and service definition	Standard test cable 12.8.2 a) to g)
IEC 60331-23	1999-04	Tests for electric cables under fire conditions – Circuit integrity – Part 23: Procedures and requirements – Electric data cables	120 minutes + 15 min cooling down time. Max variations in Charact. Impedance: ± 10% Attenuation: ± 10%
IEC 60332-1-2	2004-07 + AMD1:2015	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 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 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 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 61034-1 IEC 61034-2	2019-11	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke Light transmittance >60%
EN 50305 9.2	2002	Railway applications - Railway rolling stock cables having special fire performance - Test methods	Toxicity of evolved gas <3
ASTM-D 2565	2016	SUNLIGHT RESISTANCE (XENON ARC TEST – Cycle 1)	41,5 W/m^2 300-400nm. Temp. 63 °C. 18min spray/102min dry Duration 720 h. Max change in E@B ±40%
IEC 60092-360	2021-01	Electrical installations in ships - Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication cables.	SHF1. SHF2: IRM 902 _ 100° C 24 h
NEK TS 606 Ed5	2016	Cables for offshore installations. Halogen-free and/or mud resistant. Technical specification.	SHF2 MUD versions: IRM902 100°C 7d. IRM903 100°C 7d. Calcium Bromide 70°C 56d. EDC 95/11 70°C 56d
CAN/CSA C 22-2 210.2 M90	2005	Cold bend test	-40 °C

Marking of product

TECNIKABEL (A) – ITALY - month/year - TKSEA FIRE RESISTANT - RS 485 nn x 20 AWG or 24 AWG -LSZH CABLE SHF1 or SHF2 or SHF2 MUD RESISTANT - DNV GL TAE00003SG – IEC 60331-23 [120+15min] - IEC 60332-3-22 - metric marking

Place of manufacture:
(A) = Almese

nn = number of pairs

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