

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Data transmission cables and systems

with type designation(s)
AT-V(ZN)H(ZN)H n....

Issued to

Leoni Fiber Optics GmbH
Roth Bayern, Germany

is found to comply with

DNV GL rules for classification – Ships and offshore units

Application :

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

This Certificate is valid until **2021-06-05**.

Issued at **Hamburg** on **2016-06-13**

DNV GL local station: **Augsburg**

for **DNV GL**

Approval Engineer: **Carsten Hunsalz**

Duy Nam Le
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

Halogen free rugged breakout fiber optic cable with FRNC jacket
Design:

Subcable:

- Semi-tight buffered fibre, outer diameter 0.9 mm
colour: yellow (E9/125), green (G50/125), blue (G62.5/125)
- Strain relief elements (aramid)
- Subcable-jacket, halogen-free and flame-retardant material with approx. 0.5 mm wall
- Diameter 2.9 mm with numeric coding

Stranding:

- FRP-element in centre, break-out-subcables stranded in layers (number of fibres 2-12)

Strain relief:

- Aramid yarns, wrapped in two layers (left and right spin)

Cable jacket:

- Halogen-free and flame-retardant material (SHF1, IEC 60092 - 360)
- Outer diameter and wall see table below

Part – No.	No. of fibres	Outer diameter in mm	Wall thickness in mm
84950481#	2	10.1	1.0
84950478#	4	10.1	1.0
84950482#	6	11.8	1.0
84950483#	8	13.6	1.0
84950484#	10	15.6	1.1
84950485#	12	17.4	1.1

Type of fibres

Part – No.	Type	Optical quality	Definition in IEC	Definition in ISO 11801	Definition ITU-T
84#####A	E9/125	0.38F3.5 / 0.28H18	60793-2-50 B1.3	OS2	G.652D/ G.657A1
84#####E	E9/125	0.38F3.5 / 0.28H18	60793-2-50 B6_a1	OS2	G.657A1
84#####U	E9/125	0.38F3.5 / 0.28H18	60793-2-50 B6_a2	OS2	G.657A2/B2
84#####K	E9/125	0.38F3.5 / 0.28H18	60793-2-50 B6_b3	OS2	G.657B3
84#####X	G50/125 BIMF	3.0B500 / 1.0F500	60793-2-10 A1a.1	OM2	G.651.1
84#####G	G50/125	2.7B500 / 0.8F1000	60793-2-10 A1a.1	OM2	G.651.1
84#####H	G50/125	2.7B600 / 0.7F1200	60793-2-10 A1a.1	OM2	G.651.1
84#####V	G50/125 BIMF	2.5B1500 / 0.7F500	60793-2-10 A1a.2	OM3	G.651.1
84#####S	G50/125 BIMF	2.5B1500 / 0.7F500	60793-2-10 A1a.2	OM3	G.651.1
84#####W	G50/125 BIMF	2.5B3500 / 0.7F500	60793-2-10 A1a.3	OM4	G.651.1
84#####R	G50/125 BIMF	2.5B3500 / 0.7F500	60793-2-10 A1a.3	OM4	G.651.1
84#####L	G62.5/125	3.2B200 / 0.9F500	60793-2-10 A1b	OM1	without
84#####M	G62.5/125	3.0B300 / 0.8F800	60793-2-10 A1b	OM1	without

Application/Limitation

Job Id: **262.1-011642-3**
Certificate No: **TAE0000152**

Temperature Window
Installation: -5°C to +50°C
Operation: -20°C to +80°C
Storage: -25°C to +80°C

Maximum Tensile Load 1200N

Minimum Bend Radius
Installation: 15 x outside diameter
Operation: 10 x outside diameter

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
DNV TAP 6-800 App. A; 827.50-1	2001	DNV Type approval program for fiber cables	
IEC 60794-1-2	2014-07	Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures	G7 Tube kinking E1 Tensile Strength F1 Temperature Cycling E3 Crush G1 Bend test for cable elements E4 Impact
DNVGL-CP-0402	2016-02	DNV GL Type approval program for optical fiber cables	
IEC 60794-1-21	2015-04	Optical fibre cables - Part 1-21: Generic specification - Basic optical cable test procedures - Mechanical tests methods	E4 Impact E7 Torsion E10 Kink E11 Cable bend E11 Cold bend E6 Repeated bending
IEC 60793-2-10	2015-12	Optical fibres - Part 2-10: Product specifications - Sectional specification for category A1 multimode fibres	
IEC 60793-2-50	2015-12	Optical fibres - Part 2-50: Product specifications - Sectional specification for class B single-mode fibres	
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 60811-201/202/203	2012-04	Electric and optical fibre cables Test methods for non-metallic materials Part 201/202/203: General tests Measurement of insulation thickness of thickness of non-metallic sheath of overall dimensions	Dimensions

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Standard	Release	General description	Limitation
IEC 60332-3-24	2009-02	Tests on electric and optical fibre cables under fire conditions – Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category C	Bunch test Category C
IEC 60754-2	2011-12	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: pH > 4,3 Conductivity < 10µS
IEC 61034-1/2	2013-07/09	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke

Marking of product

LEONI-FO FiberConnect DNV GL AT-V(ZN)H(ZN)H (No. of fibre), (fibre type) - IEC 60332-3-24 - batch no. - meter marking

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.

Assessment to be performed at least every second year.
END OF CERTIFICATE