

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Data transmission cables and systems

with type designation(s)
U-D(ZN)BH 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

Fire resistant flame retardant and halogen free universal fibre optic cable with circuit integrity and FRNC outer jacket

Design:

Cable core:

- yelly-filled loose tube outer diameter 3.5 mm with 2-12 optical fibres and outer diameter 4.0 mm with 14-24 optical fibres
Tube colour: yellow (E9/125), green (G50/125), blue (G62.5/125)
- Fibre colours (1-12): red, green, blue, yellow, white, grey, brown, violet, turquoise, black, orange, pink
(13-24): red, green, blue, yellow, white, grey, brown, violet, turquoise, transparent, orange, pink (with black ring-marking)

Fire protection:

- Inner fire barrier: Fire protection tape made of woven glass
- Outer fire barrier: E-glass yarns, two layers (S and Z), as strain relief element and non-metallic rodent protection

Outer jacket:

- Halogen-free and flame-retardant material (SHF1, IEC 60092 Part 360), with approx. 1.2 mm wall
- Outer diameter 2 to 12 fibres 10.3 mm and 14 – 24 fibres 10.8 mm

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 / 0.22H18	60793-2-50 B1.3	OS2	G.652D/ G.657A1
84#####B	E9/125	0.36F3.5 / 0.22H18	60793-2-50 B1.3	OS2	G.652D
84#####C	E9/125	0.38F3.5 / 0.22H18	60793-2-50 B1.3	OS2	G.652D
84#####E	E9/125	0.38F3.5 / 0.22H18	60793-2-50 B6_a1	OS2	G.657A1
84#####U	E9/125	0.38F3.5 / 0.22H18	60793-2-50 B6_a2	OS2	G.657A2/B2
84#####K	E9/125	0.38F3.5 / 0.22H18	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

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

The requirements of SOLAS Amendments Chapter II-1, Part D, Reg. 45, 5.2 (provision to be taken to limit Fire Propagation along Bundles of Cables or Wires) are fulfilled without any additional measures.

Temperature Window

Job Id: **262.1-011642-4**
Certificate No: **TAE0000156**

Installation:	-5°C to +50°C
Operation:	-40°C to +60°C
Storage:	-40°C to +70°C
Maximum Tensile Load	2500N
Minimum Bend Radius	
Installation:	20 x outside diameter
Operation:	15 x outside diameter

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
EN 50200	2006-05	Method of test for resistance to fire of unprotected small cables for use in emergency circuits	

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Standard	Release	General description	Limitation
EC 60331-25	1999-04	Tests for electric cables under fire conditions – Circuit integrity – Part 25: Procedures and requirements – Optical fibre cables	
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	Bunch test Category A
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

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Marking of product

LEONI-FO FiberConnect® fire resistant DNV GL U-D(ZN)BH (No. of fibre) (fibre type)
- IEC 60332-3-22 - IEC 60331-25 - 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