

TYPE APPROVAL CERTIFICATE**This is to certify:****That the Data transmission cables and systems**with type designation(s)
QFCI, QFCU

Issued to

Cavicel S.p.A.
Pioltello MI, Italy

is found to comply with

DNV GL rules for classification – Ships, offshore units, and high speed and light craft**Application :****Fire resistant fibre optic cable.****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.**Issued at **Høvik** on **2021-01-17**for **DNV GL**This Certificate is valid until **2022-10-05**.DNV GL local station: **Italy/Malta CMC**Approval Engineer: **Ivar Bull****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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV GL AS, its parent companies and subsidiaries as well as their officers, directors and employees ("DNV GL") 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.



Job Id: **262.1-021091-5**
 Certificate No: **TAE00000U0**
 Revision No: **2**

Product description

Type QFCI Outer sheath SHF1 or
 Type QFCU Outer sheath SHF2 or SHF2 MUD

TYPE OF FIBRES			Single Mode 9/125	Multimode 62.5/125	Multimode 50/125
Fibre Code (000)			009	062	050
ITU-T type			G.652B/D	-	G.651
Mode Field Diameter (MFD)	at 1310 nm	µm	9.2 ± 0.4	-	-
	at 1550 nm	µm	10.3 ± 0.5	-	-
Core Diameter		µm	-	62.5 ± 2.5	50 ± 2.5
Cladding Diameter		µm	125.0 ± 1.0	125.0 ± 1.0	125.0 ± 1.0
Coating Diameter		µm	242 ± 7.0	242 ± 7.0	242 ± 7.0
Numerical Aperture			0.14	0.275 ± 0.015	0.200 ± 0.015
Attenuation	at 850 nm	dB/km (max)	-	≤ 3.5	≤ 2.8
	at 1300 nm	dB/km (max)	-	≤ 1.0	≤ 1.0
	at 1310 nm	dB/km (max)	≤ 0.40	-	-
	at 1550 nm	dB/km (max)	≤ 0.22	-	-
	at 1625 nm	dB/km (max)	-	-	-
Bandwidth	at 850 nm	MHz x km	-	160 to > 300	400 to > 1000
	at 1300 nm	MHz x km	-	500 to > 1000	400 to > 1500
Chromatic Dispersion	at 1285 ÷ 1330 nm	ps/nm x km	≤ 3.0	-	-
	at 1550 nm	ps/nm x km	≤ 18	-	-
	at 1530 ÷ 1565 nm	ps/nm x km	-	-	-
	at 1565 ÷ 1625 nm	ps/nm x km	-	-	-

Minimum bending diameter of cable(Static) : 10 x outer diameter
 Minimum bending diameter of cable(Dynamic) : 20 x outer diameter

Application/Limitation

Temperature window

Operation: -40°C to +70°C
 Installation: -10°C to +70°C
 Storage: -40°C to +70°C

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

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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

Datasheets: [ST/0203/02](#)

Test reports:

[22228/08](#), [22241/08](#), [22230/08](#), [22232/08](#), [22234/08](#), [22236/08](#), [22253/08](#),
[22238/08](#), [22260/08](#), [22255/08](#), [22257/08](#), [22262/08](#), [3798/08](#), [48SI00005](#),
[3702/07](#), [3710/08](#) and [3703/07](#).

[IMQ test report CN15S0447511-01](#) dated 2015/07/14. Test for Oil based drilling fluid EDC 95/11

[IMQ test report CN15S0523325-01/1](#) dated 2015/10/08. Test for IRM902 and IRM903.

[IMQ test report CN15S0523325-01/2](#) dated 2015/11/13. Test for CALCIUM BROMIDE BRINE.

[Cavical test report no 3702/07](#) witnessed by DNV dated 2007-12-28.

[Cavical test report No 6354/20](#) witnessed by DNV GL dated 29-12-2020.

Tests carried out

DNVGL CP-0402	2016-02	Optical fibre cables	
IEC 60794-1-1	2015-11	Optical fibre cables – Part 1-1: Generic specification – General	
IEC 60794-1-2	2013-09	Optical fibre cables - Part 1-2: Generic specification - Cross reference table for optical cable test procedures	
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	1999-04	Tests for electric cables under fire conditions – Circuit integrity – Part 25: Procedures and requirements – Optical fibre cables	Increased temperature 1000°C for 180 min. Change in attenuation ≤ 1,5 dB for each fibre
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 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	Charred portion of sample does not exceed 2,5m above bottom edge of burner.
IEC 60754-1	2011-11	Test on gases evolved during combustion of materials from cables – Determination of the amount of halogen acid gas	Low Halogen: <0,5% Halogen
IEC 60754-2	2011-11	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	Halogen free: pH > 4,3 Conductivity < 10µS

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		cables by measuring pH and conductivity	
IEC 61034-1/2	2013-07/09	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke
NEK 606 Ed. 4	2009-05	Cables for offshore installations. Halogen-free and/or mud resistant. Technical specification.	Mud resistance test: IRM903 100°C 7d. Calcium Bromide 70°C 56d. <u>Oil based mud:</u> Carbo Sea 70°C 56d or EDC 95/11 70°C 56d

Marking of product

CAVICEL - QFCI - FIBER OPTIC CABLE - MLO-000-**(n)-M1-A1-FR - **** - IEC 60331-25 [180min] – IEC 60332-3-22/24 - Batch No.- Meter marking or

CAVICEL - QFCU - FIBER OPTIC CABLE - MLO-000-**(n)-M1-A1-FR - **** - IEC 60331-25 [180min] – IEC 60332-3-22/24 - Batch No. -Meter marking

000 = Type of fibres
 ** = n° of fibres

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