DNV·GL

Certificate No:
TAE00000UH

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Fiber optical cable

with type designation(s)
QFCI-FV, QFCI-MICA

Issued to
OPTRAL, S.A.
Sant Iscle de Vallalta BARCELONA, Spain

is found to comply with
DNV GL rules for classification – Ships and offshore units
Type Approval Programme No. 6-827.50-1

Application :

Fibre Optical Cable for use in Marine and Offshore installations. Fire Resistant - Flame Retardant – Armoured.

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

This Certificate is valid until **2021-02-15**.

Issued at **Høvik** on **2016-02-16**

for **DNV GL**

DNV GL local station: **Barcelona**

Approval Engineer: **Marta Alonso Pontes**

Marit Laumann
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.

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Job Id: **262.1-017460-1**
Certificate No: **TAE00000UH**

Product description

Construction :	PTB loose-tubes (up to 12 fibres per tube)
Loose Tube	Gel Filled
Fire resistant layer	mica tape (-MICA) or fibre glass wire braid (-FV)
Central strength element	Glass fibre reinforced plastic rod (FRP)
Peripheral strength element	Reinforced fibreglass yams WB (Water Blocking)
Inner Sheath	SHF1
Armour	Galvanized steel wire braiding
Outer Sheath	SHF1

Optical fibre		MM50/OM2 MM50/OM3		MM62/OM1	SM10/G652.D
Core diameter		50 ± 2.5 µm		62.5 ± 2.5 µm	-
Core non-circularity		≤ 5%		≤ 6%	-
Core/Cladding concentricity error		≤ 1 µm		≤ 1.5 µm	≤ 0.5 µm
Cladding diameter		125 ± 1.0 µm		125 ± 2 µm	125 ± 0.7 µm
Cladding non-circularity		≤ 0.7%		≤ 1%	≤ 0.7%
Primary coating diameter		242 ± 5 µm		245 ± 10 µm	242 ± 7 µm
Coating non-circularity		≤ 5%		≤ 6%	≤ 5%
Coating concentricity error		≤ 12.5 µm		≤ 12.5 µm	≤ 12 µm
Proof test		≥8.8 N / ≥ 1 % / ≥ 100 Kpsi			
Mode Field Diameter (µm)	1310 nm	-	-	-	9.0 ± 0.4
	1550 nm	-	-	-	10.1 ± 0.5
Attenuation Coefficient (dB/Km)	850 nm	≤ 2.5	≤ 2.5	≤ 2.7	-
	1300 nm	≤0.7	≤0.7	≤0.7	-
	1310 nm	-	-	-	≤ 0.35
	1383 nm	-	-	-	≤ 0.35
	1460 nm	-	-	-	≤ 0.25
	1550 nm	-	-	-	≤ 0.21
	1625 nm	-	-	-	< 0.23
Bandwidth (MHz.Km)	850 nm	≥700	≥ 1500	≥ 160	-
	1300 nm	≥ 500	≥ 500	≥ 500	-
Numerical Aperture		0.200 ± 0.015		0.275 ± 0.015	-
Group Index of Refraction	850 nm	-	-	-	-
	1300 nm	-	-	-	-
	1310 nm	-	-	-	1.467
	1550 nm	-	-	-	1.468
Chomatic Dispersion Coefficient (ps/nm.Km)	1285 – 1330 nm	-	-	-	≤ |3|
	1550 nm	-	-	-	≤ 18
	1625 nm	-	-	-	≤ 22
Zero Dispersion Wavelength (nm)		-	-	-	1300 - 1322
Zero Dispersion Slope (ps / nm^2 Km)		-	-	-	≤ 0.090
Cable Cut-Off Wavelength (nm)		-	-	-	≤ 1260
PMD (ps/√ Km)	1550 nm	-	-	-	< 0.1

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.
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/ req. reference	Year of release	Description	Limitation
DNV TAP 6-827.50-1	2010	Type approval of fibre optical cables	
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	Minimum 90 min. During the course of the test, the maximum increase in attenuation shall not exceed the value stated in the relevant specification (1,5 dB per fibre).
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	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 - Part 1: Determination of the halogen acid gas content	Low Halogen: <0,5% Halogen
IEC 60754-2	2011-11	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 61034-1/2	2005-04	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke Light transmittance $\geq$60%
NEK TS 606	2009-05	Cables for offshore installations (cable type F1 QFCI)	

Marking of product

OPTRAL [manufacturingYear] QFCI-FV or QFCI-MICA – FIBER OPTIC CABLE [numCores]FO[ModeFieldDiameter] [Fibre type] / IEC 60331-25 / IEC 60332-3-22 – [Lot. No] / [meterMarking]m

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 Production Sample Tests (PST) and Routines (RT) checked (if not available tests according to PST and 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