DNV·GL

Certificate No:
TAE00000NM

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Data transmission cables and systems

with type designation(s)
QFCI or QFCI MUD

Issued to
NEK Kabel AS
LØRENSKOG, Norway

is found to comply with
DNV GL rules for classification – Ships and offshore units

Application :

Fiber optic cable.

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

This Certificate is valid until **2017-12-31**.

Issued at **Høvik** on **2015-11-02**

for **DNV GL**

DNV GL local station: **Station Oslo Maritime and CAP**

Approval Engineer: **Ivar Bull**

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: **262.1-019331-2**
Certificate No: **TAE00000NM**

Product description

Cable type: QFCI or QFCI MUD

Construction

Fiber type	See tables below
Fire resistance layer	Mica tape
type	Loose tube
Central strength element	Steel wire (plastic coated)
Inner sheath	SHF1
Metal covering	Steel wire braid (QFCI)
	Alternative braid materials: Tinned copper wire or Bronze wire
Outer sheath	SHF1 or SHF2 or SHF2 MUD

Multimode fibres			MM 62.5 IEC 60793-2-10 Type A1b Telecordia GR-20-core	MM 62.5 OM1+ advanced	MM50 ITU-T G651.1 IEC 60793-2-10 Type A1a.1 Telecordia GR-20-core	MM50-OM3 ISO/IEC 11801 IEC 60793-2-10 Type A1a.2 Telecordia GR-20-core	MM50-OM4 ISO/IEC 11801 IEC 60793-2-10 Type A1a.2 Telecordia GR-20-core
ITU-T type			-	-	G 651	-	
Core Diameter		µm	62.5 ± 2	62.5 ± 2	50 ± 2	50 ± 2	50 ± 2
Core non-circularity		%	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
Cladding Diameter		µm	125 ± 1,0	125 ± 1,0	125 ± 1,0	125 ± 1,0	125 ± 1,0
Coating Diameter		µm	245 ± 5	245 ± 5	242 ± 5	242 ± 5	242 ± 5
Cladding non-circularity		%	0,7	0,7	0,7	0,7	0,7
Core/cladding concentricity error		µm	≤ 1,0	≤ 1,0	≤ 1,0	≤ 1,0	≤ 1,0
Coating/cladding concentricity error		µm	≤ 10	≤ 10	≤ 6	≤ 6	≤ 6
Numerical Aperture		µm	0.275 ± 0.015	0.275 ± 0.015	0.200 ± 0.015	0.200 ± 0.015	0.200 ± 0.015
Proorf test		kpsi	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100
Attenuation	at 850 nm	db/km (max)	≤ 3,5	≤ 3,0	≤ 2,8	≤ 2,8	≤ 2,8
	at 1300 nm	db/km (max)	≤ 1,0	≤ 0,7	≤ 0,8	≤ 0,8	≤ 0,8
Bandwith	at 850 nm	MHz x km	≥ 200	≥ 500	≥ 500	≥ 1500	≥ 3500
	at 1300 nm	MHz x km	≥ 500	≥ 1000	≥ 500	≥ 500	≥ 500

Single mode fibres			Single mode SMR 9/125/250	Single mode SMR LWP 9/125/250	Non-zero Dispersion	Single mode	
ITU-T type			G652.B	G652.D	G655	G654	
Mode Field diameter (MDF)	at 1310 nm	µm	9.2 ± 0.4	9.2 ± 0.4	-	-	
	at 1550 nm	µm	-	-	9.2 ± 0.5	12 ± 0.5	
Cladding Diameter		µm	125 ± 1	125 ± 0.7	125 ± 1	125 ± 1	
Coating Diameter		µm	245 ± 10	245 ± 5	245 ± 10	245 ± 10	
Attenuation	at 1310 nm	db/km (max)	≤ 0.38	≤ 0.35	-	-	
	at 1383 nm	db/km (max)	-	≤ 0.33	-	-	
	at 1550 nm	db/km (max)	≤ 0.25	≤ 0.25	≤ 0.25	≤ 0.19	
	at 1625 nm	db/km (max)	-	≤ 0.28	≤ 0.28	≤ 0.21	
Zero dispersion wavelength		λ0	1302 - 1322	1302 - 1322	-	-	
Chromatic Dispersion	at 1285 - 1330nm	ps/nm x km	≤ 0.35	≤ 0.35	-	-	
	at 1550 nm	ps/nm x km	≤ 18.0	≤ 18.0	-	-	
	at 1530 - 1565 nm	ps/nm x km	-	-	5.5 to 10.0	22	
	at 1565 - 1625 nm	ps/nm x km	-	-	7.5 to 13.0	-	
PDM	at 1550 nm	ps/vkm	-	-	≤ 0.20	≤ 0.20	

Manufactured by

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Tecnikabel S.p.a.
Via Brandizzo 243
10088 Volpiano (To)
Italy

Application/Limitation

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
DNV TAP ; 6-827.50-3	2001	Type approval of optical fibre 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	Tests for fibre optic cables under fire conditions - Circuit integrity - Fire alone at a flame temperature of at least 750 °C and duration 90 min + 15 min cooling down time
IEC 60332-3-24	2009	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
IEC60754-1	1994	Test on gases evolved during combustion of materials from cables - Part 1: Determination of the amount of halogen acid gas
IEC 60794-1	2011	Optical fibre cables - Part 1-2: Generic specification - Basic optical cable test procedures, selected test E1, E4, E6, E7, E10, E11, E11B,
IEC 61034-1	2005	Measurement of smoke density of cables burning under defined conditions - Part 1: Test apparatus
IEC 61034-2	2006	Measurement of smoke density of cables burning under defined conditions - Part 2: Test procedure and requirements
NEK 606 Ed. 4	2009-05	Cables for offshore installations. Halogen-free and/or mud resistant. Technical specification. Mud resistance test: IRM903 100C 7d. Calcium Bromide 70C 56d. Oil based CarboSea @ 70C 56d. Maximum variations: TS & E@B: +30% Veight & volume.: +30%

Marking of product

NEK Kabel – QFCI or QFCI MUD – FIBER OPTIC CABLE [Fibre type] - IEC 60331-25 - IEC 60332-3-24 – Lot no + meter marking

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the Type approval is complied with and that no alterations are made to the product design or choice of materials.

The main elements of the 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.

Assesssment to be performed at least every second year.

END OF CERTIFICATE