

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Data transmission cables and systems**

with type designation(s)

QFCI or QFCI MUD, QFAI UNI or QFAI UNI MUD, QFAI-2-UNI or QFAI-2-UNI MUD

Issued to

**AP Solutions Oy
Rovaniemi, Finland**

is found to comply with

DNV GL rules for classification – Ships, offshore units, and high speed and light craft**Application :****Fire resistant Fiber optic cable.****Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.**Issued at **Høvik** on **2018-04-30**This Certificate is valid until **2023-04-29**.for **DNV GL**DNV GL local station: **Helsinki**Approval Engineer: **Ivar Bull**

**Andreas Kristoffersen
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.



Manufactured by

Tecnikabel S.p.a.
Via Rivera, 100-
10040 Almese (To)
Italy

Product description

Cable type: QFCI or QFCI MUD

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) or Tinned copper wire or Bronze wire
Outer sheath	SHF1 or SHF2 or SHF2 MUD

Cable type: QFAI UNI or QFAI UNI MUD or QFAI-2-UNI and QFAI-2-UNI MUD

Fiber type	See tables below
Fire resistance layer	Mica tape
Type	Loose tube
Central strength element	-
Inner sheath	SHF1 (Inner sheath only for QFAI-2-UNI and QFAI-2-UNI MUD)
Armour	Glass yarn
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+ HiCap	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			0.275 ± 0.015	0.275 ± 0.015	0.200 ± 0.015	0.200 ± 0.015	0.200 ± 0.015
Proof test		kpsi	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100
Attenuation	at 850 nm	db/km (max)	≤ 3,5	≤ 2,8	≤ 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	≥ 250	≥ 500	≥ 1500	≥ 3500
	at 1300 nm	MHz x km	≥ 500	≥ 1000	≥ 500	≥ 500	≥ 500
1 G BASE Ethernet	SX 850 nm	m	275	500	600	1000	1100
1 G BASE Ethernet	LX 1300 nm	m	550	1000	550	550	600
1 G BASE	SR 850nm	m	35	65	86	300	550
1 G BASE	LX4 1300 nm	m	300	450	300	300	300

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	
1 G BASE Ethernet	SX 1310 nm	m	10000	10000			
1 G BASE Ethernet	LX 1550 nm	m	40000	40000			
1 G BASE	SR 1310nm	m	10000	10000			
1 G BASE	LX 1550 nm	m	40000	40000			

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 Bundles of Cables or Wires) are fulfilled without any additional measures.

Type Approval documentation

Tests carried out

Standard/ req. reference	Year of release	Description	
DNVGL-CP-0402	2016-02	Class Programme DNVGL-CP-0402 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. Optional Fire Tests at elevated temperature 1000°C.	QFAI: 1000°C 90 min Attenuation increase ≤ than 1,80 dB. QFCI: 1000°C 180min Attenuation increase ≤ than 0,25 dB.
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	
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 60794-1	2011	Optical fibre cables - Part 1-2: Generic	

Job Id: **262.1-028795-1**
Certificate No: **TAE00002VD**

		specification - Basic optical cable test procedures, selected test E1, E4, E6, E7, E10, E11, E11B,	
IEC 61034-1/2	2013-07 2013-09	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke Light transmittance >60%
NEK 606 Ed. 5	2016	Cables for offshore installations - halogen-free low smoke flame-retardant / fire-resistant (HFFR-LS). Technical specification.	IRM903 100C 7d. Calc. Brom 70C 56d. Oil based CarboSea @ 70C 56d. Maximum variations: TS & E@B: +30% Weight &vol.: +30%

Marking of product

APS Finland – QFCI or QFCI MUD – FIBER OPTIC CABLE [Fibre type] - IEC 60331-25 [1000°C 180 min]
- IEC 60332-3-22 – Lot no + meter marking – [A] or

APS Finland – QFAI UNI or QFAI UNI MUD or QFAI-2-UNI or QFAI-2-UNI MUD – FIBER OPTIC CABLE [Fibre type] - IEC 60331-25 [1000°C 90 min] – IEC 60332-3-22 - Lot no + meter marking [A]

[A] = Manufactured at Almese plant

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