

## TYPE APPROVAL CERTIFICATE

**This is to certify:****That the Data transmission cables and systems**with type designation(s)  
**QFCI or QFCI MUD**

Issued to

**AP Solutions Oy**  
**Rovaniemi, Finland**

is found to comply with

**Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards**  
**Type Approval Programme No. 6-827.50-1****Application :****Fire resistant Fiber optic cable.**This Certificate is valid until **2017-12-31**.Issued at **Høvik** on **2015-12-16**DNV GL local station: **Milan**Approval Engineer: **Ivar Bull**for **DNV GL**

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**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. If any person suffers loss or damage which is proven to have been caused by any negligent act or omission of the Society, then the Society shall pay compensation to such person for his proven direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question. The maximum compensation shall never exceed USD 2 million. In this provision the "Society" shall mean DNV GL AS as well as all its direct and indirect owners, affiliates, subsidiaries, directors, officers, employees, agents and any other person or entity acting on behalf of DNV GL AS.

Certificate No: **TAE00000UE**  
 File No: **827.50**  
 Job Id: **262.1-020772-1**

## Product description

Cable type: QFCI or QFCI MUD

### Construction

Fiber type	See tables below
Fire resistance layer type	Mica tape
Central strength element	Loose tube
Inner sheath	Steel wire (plastic coated)
Metal covering	SHF1
Outer sheath	Braid of Galvanised Steel Wire, Tinned Copper wire or Bronze Wire SHF1 or SHF MUD

MULTIMODE FIBRES			Multimode MM62,5 62.5/125/250	Multimode MM50 50/125/250	Multimode OM3 50/125/250
ITU-T type			-	G.651	-
Core Diameter		µm	62.5 ± 2.5	50 ± 2.5	50 ± 2.5
Cladding Diameter		µm	125 ± 2	125 ± 2	125.0 ± 1.0
Coating Diameter		µm	245±10	242 ± 10	242 ± 7.0
Numerical Aperture			0.275 ± 0.015	0.275 ± 0.015	0.200 ± 0.015
Attenuation	at 850 nm	dB/km (max)	≤ 3.5	≤ 2.8	≤ 2.8
	at 1300 nm	dB/km (max)	≤ 1.0	≤ 0.8	≤ 1.0
Bandwidth	at 850 nm	MHz x km	≥ 200	≥ 500	≥ 1500
	at 1300 nm	MHz x km	≥ 500	≥ 500	≥ 500

MULTIMODE FIBRES (continued)			Multimode OM1+ 62.5/125/250	Multimode OM4+ 50/125/250
ITU-T type			-	-
Core Diameter		62.5 ± 2.5	62.5 ± 2.5	50 ± 2.5
Cladding Diameter		125 ± 1	125 ± 1	125 ± 1
Coating Diameter		242±7	242±7	242 ± 7.0
Numerical Aperture			0.275 ± 0.015	0.200 ± 0.015
Attenuation	at 850 nm	dB/km (max)	≤ 2.8	≤ 2.4
	at 1300 nm	dB/km (max)	≤ 0,7	≤ 0,6
Bandwidth	at 850 nm	MHz x km	≥250	≥ 3500
	at 1300 nm	MHz x km	≥ 1000	≥ 500

SINGLE MODE FIBRES			Single Mode SMR 9,6/125/250	Single Mode SMR LWP 9,6/125/250	Non-Zero Dispersion
ITU-T type			G652.B	G652.D	G655
Mode Field Diameter (MFD)	at 1310 nm	Mm	9.2 ± 0.4	9.2 ± 0.4	-
	at 1550 nm	µm	-	-	9.2 ± 0.5
Cladding Diameter		µm	125 ± 1	125 ± 0,7	125 ± 1
Coating Diameter		µm	245 ± 10	245±5	245 ± 10
Attenuation	at 1310 nm	dB/km (max)	≤ 0,38	≤ 0,35	-
	at 1383 nm		-	≤ 0,33	-
	at 1550 nm	dB/km (max)	≤ 0,25	≤ 0,25	≤ 0,25
	at 1625 nm	dB/km (max)	-	≤ 0,28	≤ 0,28
Zero dispersion wavelength		λ0	1302-1322	1302-1322	-
Chromatic Dispersion	at 1285 ÷ 1330 nm	ps/nm x km	≤ 3,5	≤ 3,5	-
	at 1550 nm	ps/nm x km	≤ 18,0	≤ 18,0	-
	at 1530 ÷ 1565 nm	ps/nm x km	-	-	5,5 to 10,0
	at 1565 ÷ 1625 nm	ps/nm x km	-	-	7,5 to 13,0
PDM	at 1550 nm	Ps/vkm	-	-	≤ 0,20

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### Manufactured by

TecniKabel S.P.A.  
10088 - VOLPIANO (TO)  
ITALY

### Application/Limitation

This type of cable is fire resistant in accordance with IEC Publication 60331-25 and flame retardant according to IEC Publication 60332-3-24.

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

**Datasheet**      **APS Fiber optic cable QFCB/QFOB/QFPB MUD dated 15.05.2015.**  
                      **APS Fiber optic cable QFCI SHF1 dated 15.05.2015.**  
**Test reports**    **No 033/FO10 12-2009**  
                      **No 565/F09**  
                      **Csi No DC01/072F08**  
                      **Imq no 01SI0069**  
                      **FO-2013-036 dated 16/Apr/2013**  
                      **MUD Test: TecniKabel Test report no. 108 dated 30-03-2010.**  
                      **2015 Type test report OM1+**  
                      **Technicabel 229577 OM4**

### Tests carried out

Standard/ req. reference	Year of release	Description
DNV TAP ; 6-827.50-3	2001	Type approval of optical fibre cables
IEC 60092-359	1999	Electrical installations in ships - Part 359: Sheathing materials for shipboard power 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%

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### **Marking of product**

APS Finland - ww/yy - Fiber Optic Cable QFCI "fiber count and type" - SHF1 IEC60332-3-22 Cat A - TK/lot +m or

APS Finland ww/yy - Fiber Optic Cable QFCI or QFOB or QFPB "fiber count and type" - SHF2 MUD RESISTANT NEK606 - IEC60332-3-22 Cat A - TK/lot + m

### **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.

Assessment to be performed at least every second year.

END OF CERTIFICATE