



AlAl up to 24 fibers, tight buffered, armoured dielectric, SHF1, Fire Retardant IEC60332-3-22 Cat.A



Store at : -40 to +70 °C

Install at : -10 to +50 °C, **Bend minimum :** 15 times : O.D.

Operate at : -30 to +70 °C, **Bend minimum :** 10 times O.D.

Crush maximum : 2000N/100mm

Impact maximum : 25J

Design

Bare fiber : 250µm

Buffer : 900µm tight buffer

Colour code : See table

Cable core : up to 24 tight buffered fibers are stranded together. The core is filled with waterblocking glass yarns.

Inner sheath : black SHF1 material

Armour : antirodent glass yarns. Coverage $\geq 80\%$.

Outer jacket : black SHF1 UV-Resistant material, LSZH

Marking : APS Finland ww/mm – Fiber Optic Cable AIAI “fiber count and type” – SHF1 IEC60332-3-22 Cat A – TK/lot + meter

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2 (pH value $\geq 4,3$ and Conductivity $\leq 10\mu\text{S}/\text{mm}$)

Halogen acid gas : IEC 60754-1, IEC 60754-2 (Halogen acid gas emission $\leq 0.5\%$)

Smoke Emission : IEC 61034-2, EN 50268-2 (Transmittance) $\geq 60\%$

Toxicity of evolved gas : EN 50305 9.2

Flame retardant : IEC 60332-1-2

Fire retardant : IEC 60332-3-22 Cat.A

Fire resistant : NO

Ozone resistant : upon request

Weather resistant : upon request

LSZH SHF2 : upon request

Oil resistant : intermittent splash – permanent resistance available upon request

MUD resistant : upon request

Water absorption : IEC60502

Water penetration : IEC 60794-1-2-F5-B (inner core only)

UV resistant : IEC60811-2-1, ASTM-D-2565-92A

Ordering and delivery information

Fiber count	SM	OM1	OM2	OM3	OM4	Packaging
2	OAI02S21	OAI02M11	OAI02M21	OAI02M31	OAI02M41	drum 2000m (+/-5%)
4	OAI04S21	OAI04M11	OAI04M21	OAI04M31	OAI04M41	drum 2000m (+/-5%)
8	OAI08S21	OAI08M11	OAI08M21	OAI08M31	OAI08M41	drum 2000m (+/-5%)
12	OAI12S21	OAI12M11	OAI12M21	OAI12M31	OAI12M41	drum 2000m (+/-5%)
24	OAI24S21	OAI24M11	OAI24M21	OAI24M31	OAI24M41	drum 2000m (+/-5%)

Colour code of fibers

Tube	2 fibers	4 fibers	8 fibers	12 fibers	24 fibers	48 fibers
1	Red (2 fibers)	Red (2 fibers)	Red (4 fibers)	Red (4 fibers)	Red (6 fibers)	Red (12 fibers)
2	Filler	Green (2 fibers)	Green (4 fibers)	Green (4 fibers)	Green (6 fibers)	Green (12 fibers)
3	Filler	Filler	Filler	Natural (4 fibers)	Natural (6 fibers)	Natural (12 fibers)
4	Filler	Filler	Filler	Filler	Natural (6 fibers)	Natural (12 fibers)
5	Filler	Filler	Filler	Filler	Filler	Filler
6	Filler	Filler	Filler	Filler	Filler	Filler

Features

Fiber count	Inner jacket thickness (mm)	Inner jacket diameter (mm)	Outer jacket thickness (mm)	Cable Diameter (mm)	Cable weight (kg/km)	Pulling tension (N)
2	1.0	4.8	1.0	8.0	95	1000
4	1.0	5.2	1.0	8.5	105	1000
8	1.0	6.0	1.0	9.4	125	1000

Fiber count	Inner jacket thickness (mm)	Inner jacket diameter (mm)	Outer jacket thickness (mm)	Cable Diameter (mm)	Cable weight (kg/km)	Pulling tension (N)
12	1.2	6.7	1.3	10.3	145	1500
24	1.2	8.5	1.3	12.1	185	2000

Other standards of reference

IEC 60092-370	Electrical installations in ships: Guidance on the selection of cables for telecommunication and data.
DNV TAP 827.50/1	Type Approval Program - Optical Fibre Cables
ABS SVR	Rules for building and classing. Steel Vessels.
ABS SMR	Rules for building and classing. Steel vessels under 90 meters.
IEC 60793	General specifications for both multimode and single-mode optical fibres
IEC 60794	general specifications for optical fibres cables

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AICB up to 24 fibers tight buffered armoured SHF2 MUD NEK606, Fire Retardant IEC60332-3-22 Cat.A



Store at : -40 to +70 °C

Install at : -10 to +50 °C, **Bend minimum :** 15 times O.D.

Operate at : -30 to +70 °C, **Bend minimum :** 10 times O.D.

Crush maximum : 2000N/100mm

Impact maximum : 25J

Design

Bare fiber : 250µm

Buffer : 900µm tight buffer

Colour code : See table

Cable core : up to 24 tight buffered fibers are stranded together. The core is filled with waterblocking glass yarns.

Inner sheath : black SHF1 material

Armour : galvanized steel, bronze or tinned copper wired braid. Coverage $\geq 80\%$.

Outer jacket : black MUD Resistant SHF2 material, UV-Resistant, LSZH

Marking : APS Finland - ww/mm - Fiber Optic Cable AICB "fiber count and type" - SHF1 IEC60332-3-22 Cat A - TK/lot + meter

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2 (pH value $\geq 4,3$ and Conductivity $\leq 10\mu\text{S}/\text{mm}$)

Halogen acid gas : IEC 60754-1, IEC 60754-2 (Halogen acid gas emission $\leq 0.5\%$)

Smoke Emission : IEC 61034-2, EN 50268-2 (Transmittance) $\geq 60\%$)

- Toxicity of evolved gas :** EN50305 9.2
- Flame retardant :** IEC 60332-1-2
- Fire retardant :** IEC 60332-3-22 Cat.A
- Fire resistant :** IEC 60331-25
- Ozone resistant :** IEC60811-2-1, DIN VDE 0472 part 805 B
- Weather resistant :** YES - ASTM G 154, EN 11507
- LSZH SHF2 :** IEC 60092-360
- Oil resistant :** IEC60811, IRM 903
- MUD resistant :** NEK606:2009, IEC60092-350
- Water absorption :** IEC60811-1-3
- Water penetration :** IEC 60794-1-2-F5-B (inner core only)
- UV resistant :** IEC60811-2-1, ASTM-D-2565-92A
- Cold bend & impact :** CSA C22.2

Ordering and delivery information

Fiber count	SM	OM1	OM2	OM3	OM4	Packaging
2	OAICB02S21	OAICB02M11	OAICB02M21	OAICB02M31	OAICB02M41	drum 2000m (+/-5%)
4	OAICB04S21	OAICB04M11	OAICB04M21	OAICB04M31	OAICB04M41	drum 2000m (+/-5%)

Fiber count	SM	OM1	OM2	OM3	OM4	Packaging
8	OAICB08S21	OAICB08M11	OAICB08M21	OAICB08M31	OAICB08M41	drum 2000m (+/-5%)
12	OAICB12S21	OAICB12M11	OAICB12M21	OAICB12M31	OAICB12M41	drum 2000m (+/-5%)
24	OAICB24S21	OAICB24M11	OAICB24M21	OAICB24M31	OAICB24M41	drum 2000m (+/-5%)

Note : for bronze braid add "B" at the end of the P/N, for tinned copper braid add "T" at the end of the P/N.

Colour code of fibers

01	02	03	04	05	06	07	08	09	10	11	12
Blue	Orange	Green	Brown	Grey	White	Red	Black	Yellow	Violet	Pink	Turquoise
13	14	15	16	17	18	19	20	21	22	23	24
Blue/BR	Orange/BR	Green/BR	Brown/BR	Grey/BR	White/BR	Red/BR	Black/BR	Yellow/BR	Violet/BR	Pink/BR	Turq./BR

Features

Fiber count	Inner jacket thickness (mm)	Inner jacket diameter (mm)	Outer jacket thickness (mm)	Cable Diameter (mm)	Cable weight (kg/km)	Pulling tension (N)
2	1.0	4.8	1.0	8.0	95	1000
4	1.0	5.2	1.0	8.5	105	1000
8	1.0	6.0	1.0	9.4	125	1000
12	1.2	6.7	1.3	10.3	145	1500
24	1.2	8.5	1.3	12.1	185	2000

Other standards of reference

IEC 60092-370	Electrical installations in ships: Guidance on the selection of cables for telecommunication and data.
DNV TAP 827.50/1	Type Approval Program - Optical Fibre Cables
ABS SVR	Rules for building and classing. Steel Vessels.
ABS SMR	Rules for building and classing. Steel vessels under 90 meters.
IEC 60793	General specifications for both multimode and single-mode optical fibres
IEC 60794	general specifications for optical fibres cables

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AICI up to 24 fibers tight buffered, armoured metallic, LSZH, Fire Retardant IEC60332-3-22 Cat.A



Store at : -40 to +70 °C

Install at : -10 to +50 °C, **Bend minimum :** 15 times O.D.

Operate at : -30 to +70 °C, **Bend minimum :** 10 times O.D.

Crush maximum : 2000N/100mm

Impact maximum : 25J

Design

Bare fiber : 250µm

Buffer : 900µm tight buffer

Colour code : See table

Cable core : up to 24 tight buffered fibers are stranded together. The core is filled with waterblocking glass yarns.

Inner sheath : black SHF1 material

Armour : galvanized steel, bronze or tinned copper wired braid. Coverage ≥80%.

Outer jacket : black SHF1 UV-Resistant material, LSZH

Marking : APS Finland - ww/mm - Fiber Optic Cable AICI "fiber count and type" - SHF1 IEC60332-3-22 Cat A - TK/lot + meter

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2 (pH value ≥ 4,3 and Conductivity ≤10µS/mm)

Halogen acid gas : IEC 60754-1, IEC 60754-2 (Halogen acid gas emission ≤ 0.5%)

Smoke Emission : IEC 61034-2, EN 50268-2 (Transmittance) ≥ 60%)

Toxicity of evolved gas : EN 50305 9.2

Flame retardant : IEC 60332-1-2

Fire retardant : IEC 60332-3-22 Cat.A

Fire resistant : NO

Ozone resistant : upon request

Weather resistant : upon request

LSZH SHF2 : upon request

Oil resistant : intermittent splash – permanent resistance available upon request

MUD resistant : upon request

Water absorption : IEC60502

Water penetration : IEC 60794-1-2-F5-B (inner core only)

UV resistant : IEC60811-2-1, ASTM-D-2565-92A

Ordering and delivery information

Fiber count	SM	OM1	OM2	OM3	OM4	Packaging
2	OAICI02S21	OAICI02M11	OAICI02M21	OAICI02M31	OAICI02M41	drum 2000m (+/-5%)
4	OAICI04S21	OAICI04M11	OAICI04M21	OAICI04M31	OAICI04M41	drum 2000m (+/-5%)
8	OAICI08S21	OAICI08M11	OAICI08M21	OAICI08M31	OAICI08M41	drum 2000m (+/-5%)
12	OAICI12S21	OAICI12M11	OAICI12M21	OAICI12M31	OAICI12M41	drum 2000m (+/-5%)

Fiber count	SM	OM1	OM2	OM3	OM4	Packaging
24	OAICI24S21	OAICI24M11	OAICI24M21	OAICI24M31	OAICI24M41	drum 2000m (+/-5%)

Colour code of fibers

01	02	03	04	05	06	07	08	09	10	11	12	
Blue	Orange	Green	Brown	Grey	White	Red	Black	Yellow	Violet	Pink	Turquoise	
13	14	15	16	17	18	19	20	21	22	23	24	
Blue/BR	Orange/BR	Green/BR	Brown/BR	Grey/BR	White/BR	Red/BR	Black/BR	Yellow/BR	Violet/BR	Pink/BR	Turquoise/BR	

Features

Fiber count	Inner jacket thickness (mm)	Inner jacket diameter (mm)	Outer jacket thickness (mm)	Cable Diameter (mm)	Cable weight (kg/km)	Pulling tension (N)
2	1.0	4.8	1.0	8.0	95	1000
4	1.0	5.2	1.0	8.5	105	1000
8	1.0	6.0	1.0	9.4	125	1000
12	1.2	6.7	1.3	10.3	145	1500
24	1.2	8.5	1.3	12.1	185	2000

Other standards of reference

IEC 60092-370	Electrical installations in ships: Guidance on the selection of cables for telecommunication and data.
DNV TAP 827.50/1	Type Approval Program - Optical Fibre Cables
ABS SVR	Rules for building and classing. Steel Vessels.
ABS SMR	Rules for building and classing. Steel vessels under 90 meters.
IEC 60793	General specifications for both multimode and single-mode optical fibres
IEC 60794	general specifications for optical fibres cables

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BO1 fiber optic cable breakout SHF1



Store at: -40 to +70 °C

Install at: -10 to +50 °C, **Bend minimum:** 15 times O.D.

Operate at: -40 to +70 °C, **Bend minimum:** 10 times O.D.

Crush maximum: 1000N/100mm

Impact maximum: 10J

Design

Bare fiber : 250µm

Buffer : 900µm tight buffer

Colour code : white

Protection : aramide yarns

Inner sheath : blue SHF1 material, nominal diameter 2.0mm, each numbered for identification

Cable core : up to 24 tight buffered fibers are stranded together around a central member and wrapped by a synthetic tape.

Outer jacket : blue SHF1 UV-Resistant material, nominal thickness 1.2mm

Marking : APS Finland ww/mm – BO1 Fiber Optic Cable BREAKOUT “fiber count and type” – SHF1 IEC60332-3-22 Cat A – lot + meter

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2 (pH value $\geq 4,3$ and Conductivity $\leq 10\mu\text{S}/\text{mm}$)

Halogen acid gas : IEC 60754-1, IEC 60754-2 (Halogen acid gas emission $\leq 0.5\%$)

Smoke Emission : IEC 61034-2, EN 50268-2 (Transmittance) $\geq 60\%$

Toxicity of evolved gas : EN 50305 9.2

Flame retardant : IEC 60332-1-2

Fire retardant : IEC 60332-3-22 Cat.A

Oil resistant : intermittent splash – permanent resistance available upon request

UV resistant : IEC60811-2-1, ASTM-D-2565-92A

Features

Fiber count	Inner jacket thickness (mm)	Inner jacket diameter (mm)	Outer jacket thickness (mm)	Cable Outer Diameter (mm)	Cable weight (kg/km)	Pulling tension (N)
2	0,5	2,0	1,2	7,5	70	500
4	0,5	2,0	1,2	8,5	75	1000
8	0,5	2,0	1,2	9,0	85	1000
12	0,5	2,0	1,2	10,0	110	1500
24	0,5	2,0	1,2	12,4	210	2000

Ordering and delivery information

Fiber count	SM	OM1	OM2	OM3	OM4	Packaging
2	OBO102S21	OBO102M11	OBO102M21	OBO102M31	OBO102M41	drum 2000m (+/-5%)
4	OBO104S21	OBO104M11	OBO104M21	OBO104M31	OBO104M41	drum 2000m (+/-5%)
8	OBO108S21	OBO108M11	OBO108M21	OBO108M31	OBO108M41	drum 2000m (+/-5%)
12	OBO112S21	OBO112M11	OBO112M21	OBO112M31	OBO112M41	drum 2000m (+/-5%)

Fiber count	SM	OM1	OM2	OM3	OM4	Packaging
24	OBO124S21	OBO124M11	OBO124M21	OBO124M31	OBO124M41	drum 2000m (+/-5%)

Other standards of reference

IEC 60092-370	Electrical installations in ships: Guidance on the selection of cables for telecommunication and data.
DNV TAP 827.50/1	Type Approval Program - Optical Fibre Cables
ABS SVR	Rules for building and classing. Steel Vessels.
ABS SMR	Rules for building and classing. Steel vessels under 90 meters.
IEC 60793	General specifications for both multimode and single-mode optical fibres
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BOA1 fiber optic cable breakout armoured SHF1



Store at: -40 to +70 °C

Install at: -10 to +50 °C, **Bend minimum:** 15 times O.D.

Operate at: -40 to +70 °C, **Bend minimum:** 10 times O.D.

Crush maximum: 2000N/100mm

Impact maximum: 20J

Design

Bare fiber : 250µm

Buffer : 900µm tight buffer

Colour code : white

Protection : aramide yarns

Inner sheath : blue SHF1 material, nominal diameter 2.0mm, each numbered for identification

Cable core : up to 24 tight buffered fibers are stranded together around a central member and wrapped by a synthetic tape.

Intermediate jacket : blue SHF1 UV-Resistant material, nominal thickness 1.0mm

Armour : galvanized steel wire braid, coverage $\geq 85\%$ (tinned copper or bronze braid available upon request)

Outer jacket : blue SHF1 UV-Resistant material, nominal thickness 1.2mm

Marking : APS Finland ww/mm - Fiber Optic Cable BREAKOUT BOA1 "fiber count / type" - ARMoured SHF1 IEC60332-3-22 Cat A - lot + meter

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2 (pH value $\geq 4,3$ and Conductivity $\leq 10\mu\text{S}/\text{mm}$)

Halogen acid gas : IEC 60754-1, IEC 60754-2 (Halogen acid gas emission $\leq 0.5\%$)

Smoke Emission : IEC 61034-2, EN 50268-2 (Transmittance) $\geq 60\%$)

Toxicity of evolved gas : EN 50305 9.2

Flame retardant : IEC 60332-1-2

Fire retardant : IEC 60332-3-22 Cat.A

Fire resistant : NO

Oil resistant : intermittent splash - permanent resistance available upon request

UV resistant : IEC60811-2-1, ASTM-D-2565-92A

Features

Fiber count	Simplex outer diameter (mm)	Intermediate jacket diameter (mm)	Outer jacket thickness (mm)	Cable Outer Diameter (mm)	Cable weight (kg/km)	Pulling tension (N)
2	2,0	7,5	1,2	10,0	120	1000
4	2,0	8,5	1,2	11,0	180	2000
8	2,0	9,0	1,2	12,0	230	2000
12	2,0	10,0	1,2	12,5	360	2000
24	2,0	12,4	1,2	14,9	450	2500

Ordering and delivery information

Fiber count	SM	OM1	OM2	OM3	OM4	Packaging
2	OBOA102S21	OBOA102M11	OBOA102M21	OBOA102M31	OBOA102M41	drum 2000m (+/-5%)
4	OBOA104S21	OBOA104M11	OBOA104M21	OBOA104M31	OBOA104M41	drum 2000m (+/-5%)
8	OBOA108S21	OBOA108M11	OBOA108M21	OBOA108M31	OBOA108M41	drum 2000m (+/-5%)
12	OBOA112S21	OBOA112M11	OBOA112M21	OBOA112M31	OBOA112M41	drum 2000m (+/-5%)
24	OBOA124S21	OBOA124M11	OBOA124M21	OBOA124M31	OBOA124M41	drum 2000m (+/-5%)

Other standards of reference

IEC 60092-370	Electrical installations in ships: Guidance on the selection of cables for telecommunication and data.
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DNV TAP 827.50/1	Type Approval Program - Optical Fibre Cables
ABS SVR	Rules for building and classing. Steel Vessels.
ABS SMR	Rules for building and classing. Steel vessels under 90 meters.
IEC 60793	General specifications for both multimode and single-mode optical fibres
IEC 60794	general specifications for optical fibres cables

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BOXA1 fiber optic cable breakout armoured SHF1 Fire Resistant



Store at: -40 to +70 °C

Install at: -10 to +50 °C, **Bend minimum :** 20 times O.D.

Operate at : -40 to +70 °C, **Bend minimum :** 15 times O.D.

Crush maximum : 2000N/100mm

Impact maximum : 20J

Design

Bare fiber : 250µm

Buffer : 900µm tight buffer

Colour code : white

Protection : aramide yarns

Inner sheath : Blue SHF1 material, nominal diameter 2.0mm, each numbered for identification (1 to 48)

Cable core : up to 48 single sheathed fibers are assembled together (around a central member if needed) and wrapped by a fire protection tape.

Overall protection : glass yarns

Intermediate jacket : Blue SHF1 UV-Resistant material, nominal thickness 1.0mm

Armour : galvanized steel wire braid, coverage ≥80%

Outer jacket : Blue SHF1 UV-Resistant material, nominal thickness 1.2mm

Marking : APS Finland ww/mm - ARMOURED Fiber Optic Cable BREAKOUT "fiber count / type" + "P/N" - SHF1 IEC60331-25 IEC60332-3-22 Cat A - lot + meter

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2 (pH value ≥ 4,3 and Conductivity ≤10µS/mm)

Halogen acid gas : IEC 60754-1, IEC 60754-2 (Halogen acid gas emission ≤ 0.5%)

Smoke Emission : IEC 61034-2, EN 50268-2 (Transmittance) ≥ 60%)

Toxicity of evolved gas : EN 50305 9.2

Flame retardant : IEC 60332-1-2

Fire retardant : IEC 60332-3-22 Cat.A

Fire resistant : IEC 60331-25

Oil resistant : intermittent splash - permanent resistance available upon request

Water absorption : IEC60502

Water penetration : NO

UV resistant : IEC60811-2-1, ASTM-D-2565-92A

Features

Fiber count	Simplex outer diameter (mm)	Intermediate jacket diameter (mm)	Outer jacket thickness (mm)	Cable Outer Diameter (mm)	Cable weight (kg/km)	Pulling tension (N)
2	2,0	7,5	1,2	10,0	120	1000
4	2,0	8,5	1,2	11,0	180	2000
8	2,0	9,0	1,2	12,0	230	2000
12	2,0	10,0	1,2	12,5	360	2000
24	2,0	12,4	1,2	14,9	450	2500
36	2,0	16,4	1,2	20,0	670	2000
48	2,0	22,0	1,2	26,0	774	2500

Ordering and delivery information

Fiber count	SM	OM1	OM1+	OM2	OM3	OM4	Packaging
2	OBOXA102S21	OBOXA102M11	OBOXA102MP1	OBOXA102M21	OBOXA102M31	OBOXA102M41	2000m (+/-5%)
4	OBOXA104S21	OBOXA104M11	OBOXA104MP1	OBOXA104M21	OBOXA104M31	OBOXA104M41	2000m (+/-5%)
8	OBOXA108S21	OBOXA108M11	OBOXA108MP1	OBOXA108M21	OBOXA108M31	OBOXA108M41	2000m (+/-5%)
12	OBOXA112S21	OBOXA112M11	OBOXA112MP1	OBOXA112M21	OBOXA112M31	OBOXA112M41	2000m (+/-5%)
24	OBOXA124S21	OBOXA124M11	OBOXA124MP1	OBOXA124M21	OBOXA124M31	OBOXA124M41	2000m (+/-5%)
36	OBOXA136S21	OBOXA136M11	OBOXA136MP1	OBOXA136M21	OBOXA136M31	OBOXA136M41	2000m (+/-5%)
48	OBOXA148S21	OBOXA148M11	OBOXA148MP1	OBOXA148M21	OBOXA148M31	OBOXA148M41	2000m (+/-5%)

Other standards of reference

IEC 60092-370	Electrical installations in ships: Guidance on the selection of cables for telecommunication and data.
DNV TAP 827.50/1	Type Approval Program - Optical Fibre Cables
ABS SVR	Rules for building and classing. Steel Vessels.
ABS SMR	Rules for building and classing. Steel vessels under 90 meters.
IEC 60793	General specifications for both multimode and single-mode optical fibres
IEC 60794	general specifications for optical fibres cables

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LIACC FO Access cable MTAH 2-72

cores, IN/OUT, SWA Armoured



*All images are indicative

Features

Outdoor, indoor and duct installation

Metallic armour

Low Smoke Zero Halogen

Standards of reference and applications

IEC 60793, IEC 60794

Telecommunication backbones

Intrabuilding Voice and Data/LAN Communication Networks

Installation in Ducts & Conduits

Installation Features

Store at -40 to +70 °C

Install at -10 to +60 °C, **Bend minimum** 20 times O.D. (installation)

Operate at -40 to +70 °C, **Bend minimum** 15 times O.D. (static)

Design

Bare fiber : 250µm, SM or MM

Colour code : See table

Buffer : Loose tube (nom 1.9mm) filled with jelly, housing up to 12 fibers.

Colour code : See table

Central member : Thermoplastic resin coated single strand (FRP)

Cable core : Loose tubes and fillers (when necessary) assembled around the central member.

Wrapping : water blocking tape.

Inner sheath : Black LSZH material.

Armour : single layer of galvanized steel wires. Coverage $\geq 80\%$.

Outer jacket : Black LSZH UV-Resistant material. Nominal outer diameter 14.5mm.

Marking : APS Finland ww/mm - Fiber Optic Cable MTAH "fiber count and type" - LSZH IEC60332-3-24 Cat.C - lot + meter

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2

Halogen acid gas : IEC 60754-1, IEC 60754-2

Smoke Emission : IEC 61034-2, EN 50268-2

Toxicity of evolved gas : EN 50305 9.2

Flame retardant : IEC 60332-1-2

Fire retardant : IEC 60332-3-24 Cat.C

Water penetration : IEC 60794-1-2-F5-B (inner core only)

UV resistant : IEC60811-2-1, ASTM-D-2565-92A

Mechanical properties

Pulling tension : max 3000 N ($\Delta\alpha$ reversible, IEC 60794-1-2-E1)

Crush : 3000N/100mm ($\Delta\alpha$ reversible, IEC 60794-1-2-E3)

Impact : 30J ($\Delta\alpha$ reversible, IEC 60794-1-2-E4)

Water penetration : 3m cable, 1m water, 24 hours (IEC 60794-1-2-F5), inner core only

Colour code

	1	2	3	4	5	6	7	8	9	10	11	12
Tube Colours	Red	Green	Natural	Natural	Natural	Natural						
Fillers	Black											
Fiber Colours	Blue	Orange	Green	Brown	Grey	White	Red	Black	Yellow	Violet	Pink	Aqua

Fiber Optic characteristics

See detailed specification of optical fibers.

Ordering and delivery information

Fiber Count	Part Number	No. of tubes	Fibers per tube	Fillers	O.D. (mm)	Weight (kg/km)	Packaging
2	MTAH3002 xx	1	2	5	14.5	280	Drum 2000m +/-5%
4	MTAH3004 xx	1	4	5	14.5	280	Drum 2000m +/-5%
8	MTAH3008 xx	1	8	5	14.5	280	Drum 2000m +/-5%
12	MTAH3012 xx	1	12	5	14.5	280	Drum 2000m +/-5%
24	MTAH3024 xx	2	12	4	14.5	280	Drum 2000m +/-5%
48	MTAH3048 xx	4	12	2	14.5	280	Drum 2000m +/-5%
72	MTAH3072 xx	6	12	0	14.5	280	Drum 2000m +/-5%

xx = fiber type
OM5=M5

OS2=S2, OM1=M1, OM2=M2, OM3=M3, OM4=M4,

(*) a tolerance of $\pm 5\%$ applies to the delivery length.

Recommended connectivity

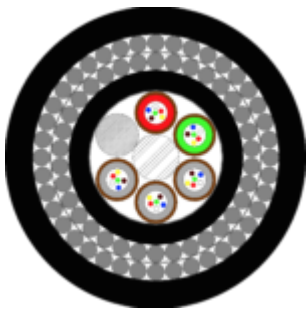
Pigtails : APS LIIN-25 series

Patch cords : APS LIIN-25 series

Adapters : APS LIIN-25 series

Patch Panels : APS LIIN-25 series

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MTA1 Fire Resistant Double Armoured SHF1



Store at : -30 to +70 °C

Install at : - 5 to +50 °C, **Bend minimum :** 25 times O.D.

Operate at : -40 to +70 °C, **Bend minimum :** 20 times O.D.

Pull maximum : 8000N

Crush maximum : 3000N/100mm

Impact maximum : 10J

Cable nominal weight : 590 kg/km

Cable elong. : 0.5%

Fibre elong. : 0.33%

Breaking load: 12 000 N

Design

Bare fiber : 250µm

Buffer : Loose tube (Ø1.9mm) filled with jelly, housing up to 12 fibers

Colour code : See table

Fire protection : A fire barrier is applied over every single tube housing fibers

Central member : Thermoplastic resin coated single strand

Cable core : Loose tubes and fillers (when necessary) assembled around the central member. The core is wrapped by a synthetic tape.

Inner sheath : Black LSZH material 1.0mm thick. Nominal diameter 9.0mm.

Armour : Double layer of galvanized steel wires. Coverage ≥80%.

Outer jacket : Black LSZH SHF1 material 1.5mm thick. Nominal outer diameter 15.7mm.

Marking : APS Finland ww/mm - Fiber Optic Cable MTA1 “fiber count and type” -

SHF1 IEC60331-25 IEC60332-3-22 Cat A - lot + meter

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2 (pH value $\geq 4,3$ and Conductivity $\leq 10\mu\text{S}/\text{mm}$)

Halogen acid gas : IEC 60754-1, IEC 60754-2 (Halogen acid gas emission $\leq 0.5\%$)

Smoke Emission : IEC 61034-2, EN 50268-2 (Transmittance) $\geq 60\%$)

Toxicity of evolved gas : EN 50305 9.2

Flame retardant : IEC 60332-1-2

Fire retardant : IEC 60332-3-22 Cat.A

Fire resistant : IEC 60331-25

Oil resistant : intermittent splash – permanent resistance available upon request

Water absorption : IEC60502

Water penetration : IEC 60794-1-2-F5-B (inner core only)

UV resistant : IEC60811-2-1, ASTM-D-2565-92A

Colour code of fibers

01.	02.	03.	04.	05.	06.	07.	08.	09.	10.	11.	12.
Natural	Red	Green	Yellow	Brown	Blue	Violet	Orange	Grey	White	Black	Pink

Colour code of tubes

Tube	4-12 fibers	24 fibers	36 fibers	48 fibers	72 fibers
1	Red (4-12 fibers)	Red (12 fibers)	Red (12 fibers)	Red (12 fibers)	Red (12 fibers)
2	Filler	Green (12 fibers)	Green (12 fibers)	Green (12 fibers)	Green (12 fibers)
3	Filler	Filler	Natural (12 fibers)	Natural (12 fibers)	Natural (12 fibers)
4	Filler	Filler	Filler	Natural (12 fibers)	Natural (12 fibers)
5	Filler	Filler	Filler	Filler	Natural (12 fibers)
6	Filler	Filler	Filler	Filler	Natural (12 fibers)

Ordering and delivery information

Fiber count	SM	OM1	OM1+	OM2	OM3	OM4	Packaging
4	MTA104S2	MTA104M1	MTA104ME	MTA104M2	MTA104M3	MTA104M4	drum 2000m (+/-5%)

Fiber count	SM	OM1	OM1+	OM2	OM3	OM4	Packaging
8	MTA108S2	MTA108M1	MTA108ME	MTA108M2	MTA108M3	MTA108M4	drum 2000m (+/-5%)
12	MTA112S2	MTA112M1	MTA112ME	MTA112M2	MTA112M3	MTA112M4	drum 2000m (+/-5%)
24	MTA124S2	MTA124M1	MTA124ME	MTA124M2	MTA124M3	MTA124M4	drum 2000m (+/-5%)
36	MTA136S2	MTA136M1	MTA136ME	MTA136M2	MTA136M3	MTA136M4	drum 2000m (+/-5%)
48	MTA148S2	MTA148M1	MTA148ME	MTA148M2	MTA148M3	MTA148M4	drum 2000m (+/-5%)
72	MTA172S2	MTA172M1	MTA172ME	MTA172M2	MTA172M3	MTA172M4	drum 2000m (+/-5%)

Other standards of reference

IEC 60092-370	Electrical installations in ships: Guidance on the selection of cables for telecommunication and data.
DNV TAP 827.50/1	Type Approval Program - Optical Fibre Cables
ABS SVR	Rules for building and classing. Steel Vessels.

ABS SMR	Rules for building and classing. Steel vessels under 90 meters.
IEC 60793	General specifications for both multimode and single-mode optical fibres
IEC 60794	general specifications for optical fibres cables

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MTFH Fire Resistant Single SWA Armoured LSZH



Features

Suitable for duct and underground installation

Rodent protected

Dry core

Waterproof

Fire resistant

Flame retardant

Halogen free and Low smoke emission

UV stabilized

Storage and handling

Store at : -40 to +80 °C

Install at : -10 to +60 °C, **Bend minimum :** 20 times O.D.

Operate at : -40 to +80 °C, **Bend minimum :** 10 times O.D.

Pull maximum : 2500N (installation), 800N (permanent)

Crush maximum : 3500N/100mm

Impact maximum : 10J

Cable nominal weight : 370 kg/km

Design

Bare fiber : 250µm

Colour code : See table

Buffer : Loose tube filled with jelly, housing up to 12 fibers

Colour code : See table

Fire protection : A fire barrier is applied over every single tube housing fibers

Central member : Thermoplastic resin coated single strand

Cable core : Loose tubes and fillers (when necessary) assembled around the central member.

Peripheral strength member : swellable glass yarns.

Wrapping : water blocking tape.

Inner sheath : Black LSZH material.

Armour : single layer of galvanized steel wires. Coverage $\geq 80\%$.

Outer jacket : Black LSZH UV-Resistant material. Nominal outer diameter 14.5mm.

Marking : APS Finland ww/mm - Fiber Optic Cable MTFH "fiber count and type" - LSZH IEC60331-25 IEC60332-3-24 Cat.C - lot + meter

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2

Halogen acid gas : IEC 60754-1, IEC 60754-2

Smoke Emission : IEC 61034-2, EN 50268-2

Toxicity of evolved gas : EN 50305 9.2

Flame retardant : IEC 60332-1-2

Fire retardant : IEC 60332-3-24 Cat.C

Fire resistant : IEC 60331-25

Water penetration : IEC 60794-1-2-F5-B (inner core only)

UV resistant : IEC60811-2-1, ASTM-D-2565-92A

Colour code of fibers

01.	02.	03.	04.	05.	06.	07.	08.	09.	10.	11.	12.
Natural	Red	Green	Yellow	Brown	Blue	Violet	Orange	Grey	White	Black	Pink

Other colour code available upon request.

Colour code of tubes

Tube	4-12 fibers	24 fibers	36 fibers	48 fibers
1	Red (4-12 fibers)	Red (12 fibers)	Red (12 fibers)	Red (12 fibers)
2	Filler	Green (12 fibers)	Green (12 fibers)	Green (12 fibers)
3	Filler	Filler	Natural (12 fibers)	Natural (12 fibers)
4	Filler	Filler	Filler	Natural (12 fibers)

Other colour code available upon request.

Ordering and delivery information

Fiber count	P/N	Packaging
4	MTFH04xx	drum 2000m (+/-5%)

Fiber count	P/N	Packaging
8	MTFH08xx	drum 2000m (+/-5%)
12	MTFH12xx	drum 2000m (+/-5%)
24	MTFH24xx	drum 2000m (+/-5%)
36	MTFH36xx	drum 2000m (+/-5%)
48	MTFH48xx	drum 2000m (+/-5%)

xx = fiber type : OS2=S2, OM1=M1, OM2=M2, OM3=M3, OM4=M4, OM5=M5

Other standards of reference

IEC 60092-370	Electrical installations in ships: Guidance on the selection of cables for telecommunication and data.
DNV TAP 827.50/1	Type Approval Program - Optical Fibre Cables
ABS SVR	Rules for building and classing. Steel Vessels.
ABS SMR	Rules for building and classing. Steel vessels under 90 meters.
IEC 60793	General specifications for both multimode and single-mode optical fibres
IEC 60794	general specifications for optical fibres cables



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MTB1 Fire Resistant Double Braided SHF1



Store at : -30 to +70 °C

Install at : - 5 to +50 °C, **Bend minimum :** 25 times O.D.

Operate at : -40 to +70 °C, **Bend minimum :** 20 times O.D.

Pull maximum : 3000N

Crush maximum : 1500N/100mm

Impact maximum : 10J

Cable nominal weight : 350 kg/km

Design

Bare fiber : 250µm

Buffer : Loose tube (Ø1.9mm) filled with jelly, housing up to 12 fibers

Colour code : See table

Fire protection : A fire barrier is applied over every single tube housing fibers

Central member : Thermoplastic resin coated single strand

Cable core : Loose tubes and fillers (when necessary) assembled around the central member. The core is wrapped by a synthetic tape.

Inner sheath : Black LSZH material 1.0mm thick. Nominal diameter 9.0mm.

Armour : Double layer of galvanized steel, tinned copper or bronze wires separated by a synthetic tape. Coverage $\geq 80\%$.

Outer jacket : Black LSZH SHF1 material 1.5mm thick. Nominal outer diameter 14.5mm.

Marking : APS Finland ww/mm - Fiber Optic Cable MTB1 "fiber count and type" - SHF1 IEC60331-25 IEC60332-3-22 Cat A - lot + meter

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2 (pH value $\geq 4,3$ and Conductivity $\leq 10\mu\text{S}/\text{mm}$)

Halogen acid gas : IEC 60754-1, IEC 60754-2 (Halogen acid gas emission $\leq 0.5\%$)

Smoke Emission : IEC 61034-2, EN 50268-2 (Transmittance) $\geq 60\%$)

Toxicity of evolved gas : EN 50305 9.2

Flame retardant : IEC 60332-1-2

Fire retardant : IEC 60332-3-22 Cat.A

Fire resistant : IEC 60331-25

Oil resistant : intermittent splash – permanent resistance available upon request

Water absorption : IEC60502

Water penetration : IEC 60794-1-2-F5-B (inner core only)

UV resistant : IEC60811-2-1, ASTM-D-2565-92A

Colour code of fibers

01.	02.	03.	04.	05.	06.	07.	08.	09.	10.	11.	12.
Natural	Red	Green	Yellow	Brown	Blue	Violet	Orange	Grey	White	Black	Pink

Colour code of tubes

Tube	4-12 fibers	24 fibers	36 fibers	48 fibers	72 fibers
1	Red (4-12 fibers)	Red (12 fibers)	Red (12 fibers)	Red (12 fibers)	Red (12 fibers)
2	Filler	Green (12 fibers)	Green (12 fibers)	Green (12 fibers)	Green (12 fibers)

Tube	4-12 fibers	24 fibers	36 fibers	48 fibers	72 fibers
3	Filler	Filler	Natural (12 fibers)	Natural (12 fibers)	Natural (12 fibers)
4	Filler	Filler	Filler	Natural (12 fibers)	Natural (12 fibers)
5	Filler	Filler	Filler	Filler	Natural (12 fibers)
6	Filler	Filler	Filler	Filler	Natural (12 fibers)

Ordering and delivery information

Fiber count	SM	OM1	OM1+	OM2	OM3	OM4	Packaging
4	MTB104S2	MTB104M1	MTB104ME	MTB104M2	MTB104M3	MTB104M4	drum 2000m (+/-5%)
8	MTB108S2	MTB108M1	MTB108ME	MTB108M2	MTB108M3	MTB108M4	drum 2000m (+/-5%)
12	MTB112S2	MTB112M1	MTB112ME	MTB112M2	MTB112M3	MTB112M4	drum 2000m (+/-5%)
24	MTB124S2	MTB124M1	MTB124ME	MTB124M2	MTB124M3	MTB124M4	drum 2000m (+/-5%)

Fiber count	SM	OM1	OM1+	OM2	OM3	OM4	Packaging
36	MTB136S2	MTB136M1	MTB136ME	MTB136M2	MTB136M3	MTB136M4	drum 2000m (+/-5%)
48	MTB148S2	MTB148M1	MTB148ME	MTB148M2	MTB148M3	MTB148M4	drum 2000m (+/-5%)
72	MTB172S2	MTB172M1	MTB172ME	MTB172M2	MTB172M3	MTB172M4	drum 2000m (+/-5%)

For an armour different than Galvanized Steel add “B” for bronze braid or “T” for tinned copper braid at the end of the P/N.

Other standards of reference

IEC 60092-370	Electrical installations in ships: Guidance on the selection of cables for telecommunication and data.
DNV TAP 827.50/1	Type Approval Program - Optical Fibre Cables
ABS SVR	Rules for building and classing. Steel Vessels.
ABS SMR	Rules for building and classing. Steel vessels under 90 meters.
IEC 60793	General specifications for both multimode and single-mode optical fibres
IEC 60794	general specifications for optical fibres cables

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Multi Mode Optical Fiber Specification



Multi Mode Fibres	OM1 MM62.5	OM1 + MM62,5	OM2 MM50	OM3 MM50	OM4 MM50	OM5 MM50
Applicable standards	IEC60793-2-10 Type A1b	IEC60793-2-10 Type A1b	IEC60793-2-10 Type A1a.1	ISO/IEC 11801	ISO/IEC 11801 IEC60793-2-10 Type A1a.3	ISO/IEC 11801-OM5 IEC60793-2-10 Type A1a.4
	Telcordia GR20-CORE	Telcordia GR20-CORE	Telcordia GR20-CORE	IEC60793-2-10 Type A1a.2	Telcordia GR20-CORE	Telcordia GR 20-CORE/409-CORE
			ITU-T G651.1, Am.1	ITU-T G651.1, Am.1	ITU-T G651.1, Am.1	TIA/EIA-492AAAE
Core Diameter	62,5 ± 2 µm	62,5 ± 2.5 µm	50 ± 2 µm	50 ± 2 µm	50 ± 2 µm	50 ± 2.5 µm
Core non-circularity	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Cladding diameter	125 ± 1,0 µm	125 ± 1,0 µm	125 ± 1,0 µm	125 ± 1,0 µm	125 ± 1,0 µm	125 ± 1,0 µm
Coating diameter	242 ± 5 µm	242 ± 7 µm	242 ± 5 µm	242 ± 5 µm	242 ± 5 µm	242 ± 5 µm
Cladding non-circularity	≤ 0,7 %	≤ 1,0 %	≤ 0,7 %	≤ 0,7 %	≤ 0,7 %	≤ 1,0 %
Core/Cladding concentricity error	≤ 1,0 µm	≤ 1,0 µm	≤ 1,0 µm	≤ 1,0 µm	≤ 1,0 µm	≤ 1,5 µm
Coating/Cladding concentricity error	≤ 10 µm	≤ 12 µm	≤ 6 µm	≤ 6 µm	≤ 6 µm	≤ 10 µm
Numerical aperture	0,275 ± 0,015 µm	0,275 ± 0,015 µm	0,200 ± 0,015 µm	0,200 ± 0,015 µm	0,200 ± 0,015 µm	0,200 ± 0,015 µm
Attenuation @ 850 nm	≤ 3,50 dB/km	≤ 2,80 dB/km	≤ 2,80 dB/km	≤ 2,80 dB/km	≤ 2,60 dB/km	≤ 2,40 dB/km
Attenuation @ 1300 nm	≤ 1,00 dB/km	≤ 0,70 dB/km	≤ 0,80 dB/km	≤ 0,80 dB/km	≤ 0,60 dB/km	≤ 0,60 dB/km
Bandwith @ 850 nm	≥ 200 MHz*km	≥ 250 MHz*km	≥ 500 MHz*km	≥ 1500 MHz*km	≥ 3500 MHz*km	≥ 3500 MHz*km
Bandwith @ 1300 nm	≥ 500 MHz*km	≥ 1000 MHz*km	≥ 500 MHz*km	≥ 500 MHz*km	≥ 500 MHz*km	≥ 500 MHz*km
Proof test	≥ 100 kpsi	≥ 100 kpsi	≥ 100 kpsi	≥ 100 kpsi	≥ 100 kpsi	≥ 100 kpsi
Link lenghts						

Multi Mode Fibres	OM1 MM62.5	OM1 + MM62,5	OM2 MM50	OM3 MM50	OM4 MM50	OM5 MM50
100BASE FX	2000m	2000m	2000m	2000m	2000m	2000m
1000BASE SX	275m	500m	550m	1000m	1100m	1100m
1000BASE LX	550m	1000m	550m	550m	550m	550m
10GBASE SW/SR	565m	33m	82m	300m	550m	550m
10GBASE LX4	-	-	300m	300m	300m	300m
40GBASE SR4	-	-	-	100m	150m	150m
100GBASE SR10	-	-	-	100m	150m	100m

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QFCB Armoured MUD NEK606 Fire Resistant IEC60331-25, Fire Retardant IEC60332-3-22 Cat.A



Store at : -40 to +70 °C

Install at : -10 to +50 °C, **Bend minimum :** 20 times O.D.

Operate at : -40 to +70 °C, **Bend minimum :** 15 times O.D.

Pull maximum : 2000N

Crush maximum : 3000N/100mm

Impact maximum : 20J

Cable weight : 260 kg/km

Design

Bare fiber : 250µm

Buffer : Loose tube (Ø2.2mm) filled with jelly, housing up to 12 fibers

Colour code : See table

Fire protection : A fire barrier is applied over every single tube housing fibers

Central member : Steel rope with LSZH sheath

Cable core : Loose tubes and fillers (when necessary) are stranded around the central member. The core is wrapped by a tape.

Inner sheath : Black SHF1 material 1.0mm thick. Nominal outer diameter 10.1mm.

Armour : Galvanized steel, bronze or tinned copper wire braid. Coverage $\geq 85\%$.

Outer jacket 1 : Black SHF1 material 1.2mm thick. Nominal outer diameter 13.5mm.

Outer jacket 2 : Black SHF2 thermoset material MUD Resistant 1.5mm thick. Nominal outer diameter 16.5mm.

Marking : APS Finland ww/yy - Fiber Optic Cable QF_B "fiber count and type" - SHF2 MUD RESISTANT NEK606 IEC60332-3-22 Cat A - lot + m

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2 (pH value $\geq 4,3$ and Conductivity $\leq 10\mu\text{S}/\text{mm}$)

Halogen acid gas : IEC 60754-1, IEC 60754-2 (Halogen acid gas emission $\leq 0.5\%$)

Smoke Emission : IEC 61034-2, EN 50268-2 (Transmittance) $\geq 60\%$)

Toxicity of evolved gas : EN50305 9.2

Flame retardant : IEC 60332-1-2

Fire retardant : IEC 60332-3-22 Cat.A

Fire resistant : IEC 60331-25

Ozone resistant : IEC60811-2-1, DIN VDE 0472 part 805 B

Weather resistant : ASTM G 154, EN 11507

LSZH SHF2 : IEC 60092-360

Oil resistant : IEC60811, IRM 903

MUD resistant : NEK606:2009, IEC60092-350

Water absorption : IEC60811-1-3

Water penetration : IEC 60794-1-2-F5-B (inner core only)

UV resistant : IEC60811-2-1, ASTM-D-2565-92A

Cold bend & impact : CSA C22.2

Ordering and delivery information

Fiber count	SM	OM1	OM2	OM3	OM4	Packaging
2	OQFCI02S2U	OQFCI02M1U	OQFCI02M2U	OQFCI02M3U	OQFCI02M4U	drum 2000m (+/-5%)
4	OQFCI04S2U	OQFCI04M1U	OQFCI04M2U	OQFCI04M3U	OQFCI04M4U	drum 2000m (+/-5%)
8	OQFCI08S2U	OQFCI08M1U	OQFCI08M2U	OQFCI08M3U	OQFCI08M4U	drum 2000m (+/-5%)
12	OQFCI12S2U	OQFCI12M1U	OQFCI12M2U	OQFCI12M3U	OQFCI12M4U	drum 2000m (+/-5%)
24	OQFCI24S2U	OQFCI24M1U	OQFCI24M2U	OQFCI24M3U	OQFCI24M4U	drum 2000m (+/-5%)

Fiber count	SM	OM1	OM2	OM3	OM4	Packaging
48	OQFCI48S2U	OQFCI48M1U	OQFCI48M2U	OQFCI48M3U	OQFCI48M4U	drum 2000m (+/-5%)

Note : for tinned copper braid add "T" at the end of the P/N, for bronze braid add "B" at the end of the P/N.

Colour code of fibers

01	02	03	04	05	06	07	08	09	10	11	12
White	Red	Yellow	Green	Blue	Grey	Brown	Black	Violet	Turquoise	Orange	Pink

Colour code of tubes

Tube	Type A	Type B					
		2 fibers	4 fibers	8 fibers	12 fibers	24 fibers	48 fibers
1	Red (12 fibers)	Red (2 fibers)	Red (2 fibers)	Red (4 fibers)	Red (4 fibers)	Red (6 fibers)	Red (12 fibers)
2	Green (24 fibers)	Filler	Green (2 fibers)	Green (4 fibers)	Green (4 fibers)	Green (6 fibers)	Green (12 fibers)

Tube	Type A		Type B					
3	Natural (36 fibers)		Filler	Filler	Filler	Natural (4 fibers)	Natural (6 fibers)	Natural (12 fibers)
4	Natural (48 fibers)		Filler	Filler	Filler	Filler	Natural (6 fibers)	Natural (12 fibers)
5	- (*)		- (*)	- (*)	- (*)	- (*)	- (*)	- (*)
6	- (*)		- (*)	- (*)	- (*)	- (*)	- (*)	- (*)
	(*) filler only in case of 6 elements design							

Other standards of reference

IEC 60092-370	Electrical installations in ships: Guidance on the selection of cables for telecommunication and data.
DNV TAP 827.50/1	Type Approval Program - Optical Fibre Cables
ABS SVR	Rules for building and classing. Steel Vessels.
ABS SMR	Rules for building and classing. Steel vessels under 90 meters.
IEC 60793	General specifications for both multimode and single-mode optical fibres

IEC 60794

general specifications for optical fibres cables

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QFCI type, loose tube, armoured, SHF1, fire resistant IEC60331, fire retardant IEC60332-3-22 Cat.A



Store at : -40 to +70 °C

Install at : -10 to +50 °C, **Bend minimum :** 20 times O.D.

Operate at : -40 to +70 °C, **Bend minimum :** 15 times O.D.

Pull maximum : 2000N

Crush maximum : 3000N/100mm

Impact maximum : 20J

Cable weight : 240 kg/km

Design

Bare fiber : 250µm

Buffer : Loose tube (Ø2.2mm) filled with jelly, housing up to 12 fibers

Colour code : See table

Fire protection : A fire barrier is applied over every single tube housing fibers

Central member : Steel rope with LSZH sheath

Cable core : Loose tubes and fillers (when necessary) are stranded around the central member. The core is wrapped by a tape.

Inner sheath : Black SHF1 material 1.0mm thick. Nominal outer diameter 10.1mm.

Armour : Galvanized steel, bronze or tinned copper wire braid. Coverage ≥85%.

Outer jacket : Black SHF1 material 1.2mm thick. Nominal outer diameter 13.5mm.

Marking : APS Finland ww/mm – Fiber Optic Cable QF_I “fiber count and type” – SHF1 IEC60332-3-22 Cat A IEC60331-25 – lot + meter

Environmental properties and Fire Performances

Degree of acidity of gases : IEC 60754-1, IEC 60754-2 (pH value ≥ 4,3 and Conductivity ≤10µS/mm)

Halogen acid gas : IEC 60754-1, IEC 60754-2 (Halogen acid gas emission ≤ 0.5%)

Smoke Emission : IEC 61034-2, EN 50268-2 (Transmittance) ≥ 60%)

Toxicity of evolved gas : EN 50305 9.2

Flame retardant : IEC 60332-1-2

Fire retardant : IEC 60332-3-22 Cat.A

Fire resistant : IEC 60331-25 (750°C, 3 hours - 1000°C, 3 hours)

Ozone resistant : upon request

Weather resistant : upon request

LSZH SHF2 : upon request

Oil resistant : intermittent splash – permanent resistance available upon request

MUD resistant : upon request

Water absorption : IEC60502

Water penetration : IEC 60794-1-2-F5-B (inner core only)

UV resistant : IEC60811-2-1, ASTM-D-2565-92A

Ordering and delivery information

Fiber count	SM	OM1	OM1+	OM2	OM3	OM4	Packaging
2	OQFCI02S21	OQFCI02M11	OQFCI02ME1	OQFCI02M21	OQFCI02M31	OQFCI02M41	drum 2000m (+/-5%)
4	OQFCI04S21	OQFCI04M11	OQFCI04ME1	OQFCI04M21	OQFCI04M31	OQFCI04M41	drum 2000m (+/-5%)
8	OQFCI08S21	OQFCI08M11	OQFCI08ME1	OQFCI08M21	OQFCI08M31	OQFCI08M41	drum 2000m (+/-5%)

Fiber count	SM	OM1	OM1+	OM2	OM3	OM4	Packaging
12	OQFCI12S21	OQFCI12M11	OQFCI12ME1	OQFCI12M21	OQFCI12M31	OQFCI12M41	drum 2000m (+/-5%)
24	OQFCI24S21	OQFCI24M11	OQFCI24ME1	OQFCI24M21	OQFCI24M31	OQFCI24M41	drum 2000m (+/-5%)
48	OQFCI48S21	OQFCI48M11	OQFCI48ME1	OQFCI48M21	OQFCI48M31	OQFCI48M41	drum 2000m (+/-5%)

Note : for tinned copper braid add "T" at the end of the P/N, for bronze braid add "B" at the end of the P/N.

Colour code of fibers

01	02	03	04	05	06	07	08	09	10	11	12
White	Red	Yellow	Green	Blue	Grey	Brown	Black	Violet	Turquoise	Orange	Pink

Colour code of tubes

Tube	Type A	Type B					
		2 fibers	4 fibers	8 fibers	12 fibers	24 fibers	48 fibers

Tube	Type A	Type B					
1	Red (12 fibers)	Red (2 fibers)	Red (2 fibers)	Red (4 fibers)	Red (4 fibers)	Red (6 fibers)	Red (12 fibers)
2	Green (24 fibers)	Filler	Green (2 fibers)	Green (4 fibers)	Green (4 fibers)	Green (6 fibers)	Green (12 fibers)
3	Natural (36 fibers)	Filler	Filler	Filler	Natural (4 fibers)	Natural (6 fibers)	Natural (12 fibers)
4	Natural (48 fibers)	Filler	Filler	Filler	Filler	Natural (6 fibers)	Natural (12 fibers)
5	- (*)	- (*)	- (*)	- (*)	- (*)	- (*)	- (*)
6	- (*)	- (*)	- (*)	- (*)	- (*)	- (*)	- (*)
	(*) filler only in case of 6 elements design						

Other standards of reference

IEC 60092-370	Electrical installations in ships: Guidance on the selection of cables for telecommunication and data.
DNV TAP 827.50/1	Type Approval Program - Optical Fibre Cables

ABS SVR	Rules for building and classing. Steel Vessels.
ABS SMR	Rules for building and classing. Steel vessels under 90 meters.
IEC 60793	General specifications for both multimode and single-mode optical fibres
IEC 60794	general specifications for optical fibres cables

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Single Mode Optical Fiber Specification



Single Mode Fibres	OS2	OS2	OS2	OS2 NZD
Applicable standards	ITU G652.D	ITU G657.A IEC60793-2-50 Type B.1.3 / B.6.A	ITU G657.B	ITU G655.E / G656 IEC60793-2-50 Type B.4 / B5

Single Mode Fibres	OS2	OS2	OS2	OS2 NZD
	IEC60793-2-50 Type B.1.3	Telcordia GR20-CORE	IEC60793-2-50 Type B.1.3 / B.6.A&B	
	Telcordia GR20-CORE			
Mode Field Diameter @ 1310nm	9,0 ± 0,4 µm	9,0 ± 0,4 µm	8,9 ± 0,4 µm	
Mode Field Diameter @ 1550nm	10,1 ± 0,5 µm	10,1 ± 0,5 µm	9,9 ± 0,5 µm	9,2 ± 0,5 µm
Cladding diameter	125 ± 0,7 µm	125 ± 0,7 µm	125 ± 0,7 µm	125 ± 1,0 µm
Coating diameter	242 ± 7 µm	242 ± 7 µm	242 ± 7 µm	242 ± 7 µm
Cladding non- circularity	≤ 0,7 %	≤ 0,7 %	≤ 0,7 %	≤ 1,7 %
Core/Cladding concentricity error	≤ 0,5 µm	≤ 0,5 µm	≤ 0,5 µm	≤ 0,6 µm
Coating/Cladding concentricity error	≤ 12 µm	≤ 12 µm	≤ 12 µm	≤ 12 µm
Cable Cut off wavelength	≤ 1260 µm	≤ 1260 µm	≤ 1260 µm	≤ 1300 µm

Single Mode Fibres	OS2	OS2	OS2	OS2 NZD
Zero dispersion wavelength (λ_0)	1300 ÷ 1322 μm	1300 ÷ 1322 μm	1300 ÷ 1324 μm	$\leq 1440 \mu\text{m}$
Dispersion slope (S0) @ (λ_0)	$\leq 0,090$ ps/(nm ² * km)	$\leq 0,090$ ps/(nm ² * km)	$\leq 0,092$ ps/(nm ² * km)	-
Chromatic dispersion @ 1285—1330 nm	$\leq 3,5$ ps/(nm * km)	$\leq 3,5$ ps/(nm * km)	-	-
Chromatic dispersion @ 1550	≤ 18 ps/(nm * km)	≤ 18 ps/(nm * km)	-	-
Chromatic dispersion @ 1625	≤ 22 ps/(nm * km)	≤ 22 ps/(nm * km)	-	-
Chromatic dispersion @ 1530—1565	-	-	-	5,5 ÷ 10 ps/(nm * km)
Chromatic dispersion @ 1565—1625	-	-	-	7,5 ÷ 13,8 ps/(nm * km)
PMD @ 1550 nm	$\leq 0,1$ ps/ $\sqrt{\text{km}}$	$\leq 0,1$ ps/ $\sqrt{\text{km}}$	$\leq 0,1$ ps/ $\sqrt{\text{km}}$	$\leq 0,2$ ps/ $\sqrt{\text{km}}$
Attenuation @ 1310 nm	$\leq 0,35$ dB/km	$\leq 0,35$ dB/km	$\leq 0,35$ dB/km	$\leq 0,40$ dB/km
Attenuation @ 1383 nm	$\leq 0,35$ dB/km	$\leq 0,35$ dB/km	$\leq 0,35$ dB/km	$\leq 1,00$ dB/km

Single Mode Fibres	OS2	OS2	OS2	OS2 NZD
Attenuation @ 1550 nm	≤ 0,25 dB/km	≤ 0,25 dB/km	≤ 0,25 dB/km	≤ 0,25 dB/km
Attenuation @ 1625 nm	≤ 0,28 dB/km	≤ 0,28 dB/km	≤ 0,28 dB/km	≤ 0,28 dB/km
Attenuation with bending				
Mandrel radius 15mm @ 1550 10 turns	-	≤ 0,25 dB	≤ 0,03 dB	-
Mandrel radius 15mm @ 1625 10 turns	-	≤ 1,0 dB	≤ 0,1 dB	-
Mandrel radius 10mm @ 1550 1 turn	-	≤ 0,75 dB	≤ 0,1 dB	-
Mandrel radius 10mm @ 1625 1 turn	-	≤ 1,50 dB	≤ 0,2 dB	-
Mandrel radius 7,5mm @ 1550 1 turn	-	-	-	≤ 0,5 dB
Mandrel radius 7,5mm @ 1625 1 turn	-	-	-	≤ 1,0 dB
Proof test	≥ 100 kpsi	≥ 100 kpsi	≥ 100 kpsi	≥ 100 kpsi

Single Mode Fibres	OS2	OS2	OS2	OS2 NZD
Link lengths				
1000BASE LX 5000m	5 000m	5 000m	5 000m	
10GBASE L	10 000m	10 000m	10 000m	
10GBASE EW/ER	30 000m	40 000m	40 000m	
40GBASE LR4	10 000m	10 000m	10 000m	
100GBASE ER4	10 000m	10 000m	10 000m	

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