Type:	MAR-FM	REV: 0
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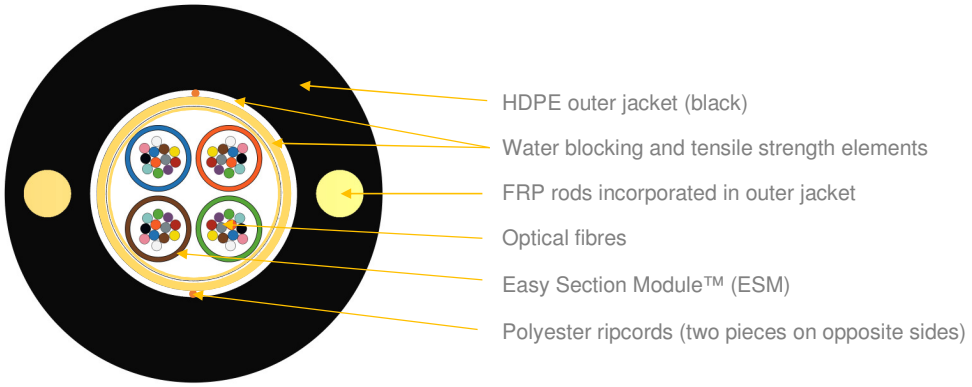
Project:	008-21	

Single HDPE jacket outdoor distribution aerial and duct cable with Easy Section Modules™
MAR-FM *(modulo 12)*



*schematic drawing of 48F configuration, not to scale

APPLICATION

Mixed use duct/aerial
FTTH networks
Fully dielectric
For installation along power lines with an operation voltage below 150 kV and producing space potential below 4 kV.

DESIGN

ESM™ - Easy Section Module with 12 fibres each, 1,3mm.
Water blocking aramid yarns as a strain relief
Water swellable elements
FRP rods as strength and anti-buckling elements
UV resistant black HDPE sheath
Polyester ripcord, two pieces on opposite sides

VARIANTS

Variant	Quantity [pcs]				Ø nominal (±0,5)	Nominal weight (±10%)	Max allowed tension MAT / T_M	Max operating tension MOT / T_L	Max installation tension MIT
	Fibres	Fibres per module	Total elements	Active modules	[mm]	[kg/km]	[N]	[N]	[N]
1M x 12F	12	12	1	1	5,9	29	600	170	145
2M x 12F	24	12	2	2	7,2	38	800	220	190
3M x 12F	36	12	3	3	8,0	45	950	270	220
4M x 12F	48	12	4	4	8,5	48	1000	300	240
6M x 12F	72	12	6	6	10,2	70	1500	400	350
8M x 12F	96	12	8	8	11,5	90	1900	550	500
12M x 12F	144	12	12	12	11,5	95	2000	600	530
16M x 12F	192	12	16	16	13,5	125	2650	800	740
18M x 12F	216	12	18	18	13,5	127	2650	800	740
24M x 12F	288	12	24	24	14,5	143	3000	1000	980

MECHANICAL AND ENVIRONMENTAL CHARACTERISTICS

Test	Specification	Method	Requirements
Tensile strength	IEC60794-1-21 Method E1	**Mandrel diameter**: ≥ 30 x OD **Load T_M**: as provided in the table above	**Fibre strain:** e ≤ 0.3%, during test, reversible **Cable stain:** e ≤ 0.5%, during test, reversible Δα ≤ 0,5dB/km, during test, reversible
		Mandrel diameter: ≥ 30 x OD **Sustained Load T_L**: as provided in the table above	**Fibre strain:** e ≤ 0.1%, no attenuation change
Crush resistance	IEC60794-1-21 Method E3	**Load:** 2000 N / 10 cm / 15 minutes **Plate size:** 100 mm x 100mm **Number of pts**: at 5 different points 200mm apart	Δα ≤ 0.1dB @ 1550nm, during test, reversible No jacket cracking and fibre breakage
		Load: 3000 N / 10 cm / 15 minutes **Plate size:** 100 mm x 100mm **Number of pts**: at 5 different points 200mm apart	Δα reversible, No jacket cracking and fibre breakage

Impact resistance	IEC60794-1-21 Method E4	**Impact energy**: 5J **Striking survace radius**: 10 mm **No. of impacts**: at 3 different points 200mm apart	Δα reversible, No jacket cracking and fibre breakage
Torsion	IEC60794-1-21 Method E7	**Cable length to be twisted:** 1m **No. of cycles:** 20 **Twist angle:** ± 180°	Δα≤0.1dB @ 1550nm, during test, reversible No jacket cracking and fibre breakage
Cable kink	IEC60794-1-21 Method E10	**Loop diameter:** 10 x OD	No cable kink
Repeated bending	EC60794-1-21 Method E6	**Mandrel radius:** 20x OD **No. of cycles:** 20	No jacket cracking and fibre breakage
Bending	IEC60794-1-21 Method E11	**Mandrel radius**: 15 x OD / 5 turns (wrapped and unwrapped) **No. of cycles:** 10	Δα≤0.1dB @ 1550nm, during test No jacket cracking and fibre breakage
Water penetration	IEC 60794-1-22 Method F5B	**Water head**: 1m **Sample length**: 3m **Number of samples**: 10 pcs **Time**: 168 hrs	No water leakage for 9 out of 10 samples
Temperature range	IEC 60794-1-22 Method F1	**Operation:** **Storage:** **Transport:**	-40… +70 [℃]	Δα≤0,1 dB/km @1550nm, during test, reversible

(*) values for single-mode fibres, all optical measurements performed at 1550nm

SUGGESTED MAXIMUM SPAN VALUES CALCULATED FOR THE SPECIFIED CABLE STRAIN AND MIT LIMIT

Suggested max span [m]	**Fibre count / modulo 12**									
Loading conditions (Sag 2,0%)	**12F**	**24F**	**36F**	**48F**	**72F**	**96F**	**144F**	**192F**	**216F**	**288F**
NESC heavy	29	31	36	36	44	55	55	65	65	65
NESC medium	59	61	65	65	80	80	80	80	80	80
NESC light	75	80	80	80	80	80	80	80	80	80

OPTICAL FIBRE AND MODULES COLOUR IDENTIFICATION

For optical fibres and modules identification information please see DSH_Colors_CODE_XXXX document.

FIBRE PARAMETERS

For selected post-production optical fibres parameters please see DSH_OFP document.

MARKING

The following print (hot stamped, laser or other suitable printing method) is applied at 1-meter intervals:

- Supplier: FIBRAIN
- Standard code (product type, fibre type, fibre count)
- Year of manufacture: xxxx
- Length marking in meters
- Cable ID / Drum No

Example: FIBRAIN MAR-FM2 48F SM G657A2 4M12F "YEAR OF MANUFACTURE" "LASER SYMBOL" "LENGTH MARKING" "BATCH NUMBER"

The accuracy of marking is ±0,5%. Remarking is in accordance with Bellcore GR 20 and supersedes earlier markings. Occasional loss of marking is possible. Cables can be supplied with a range of single mode or multimode fibres and customized print.

PACKING

Cables will be shipped on disposable wooden or treated wooden drums. Both ends of the cable will be capped and accessible for testing. Identification information will be placed on the drum.

DELIVERY LENGTH

2000 – 8000 meters ± 5%, with possibility of supplying up to 5% of total contract quantity as short length cables which should be above 1000 meters long. Tolerance of 5 % of order quantity shall be allowed.