

**MAX-FOH**

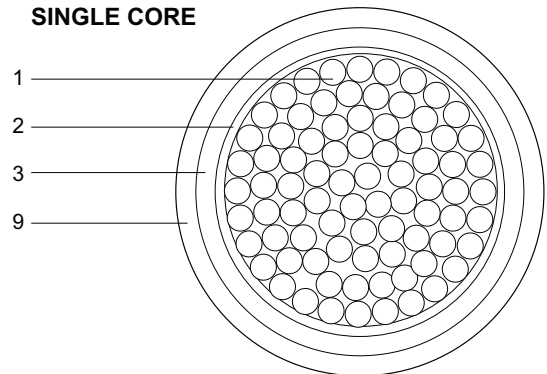


# CONSTRUCTION OF CABLE

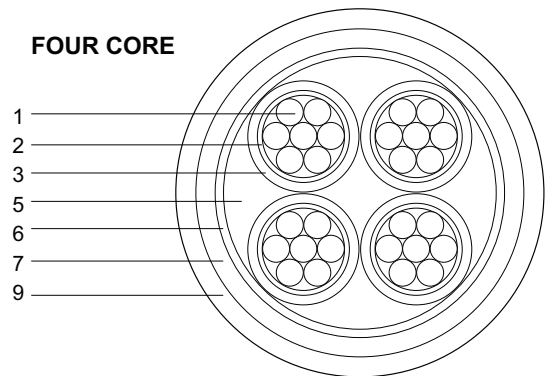
Construction	MAX-FOH	MAX-FOH-EVA
1 - Conductor	Stranded annealed copper	Stranded annealed copper
2 - Fire Barrier	Mica tape	Mica tape
3 - Insulation	Cross-linked polyethylene (XLPE)	Cross-linked EVA ** (XLEVA)
4 - Shield*	Aluminium foil with tinned copper drain wire	Aluminium foil with tinned copper drain wire
5 - Filler*	LSF filler or polypropylene split yarn	LSF filler or polypropylene split yarn
6 - Binder Tape*	Polyester tape	Polyester tape
7 - Bedding*	Low smoke halogen free (LSF) compound (Orange)	Low smoke halogen free (LSF) compound (Orange)
8 - Armour*/#	Galvanised steel wire (aluminium or copper wire for single core)	Galvanised steel wire (aluminium or copper wire for single core)
9 - Sheath	Low smoke halogen free (LSF) compound (Orange)	Low smoke halogen free (LSF) compound (Orange)

\* Optional: Depending on requirement  
 # Braided armour also available on request  
 \*\* XLEVA material used are suitable for operating temperature of up to 125°C

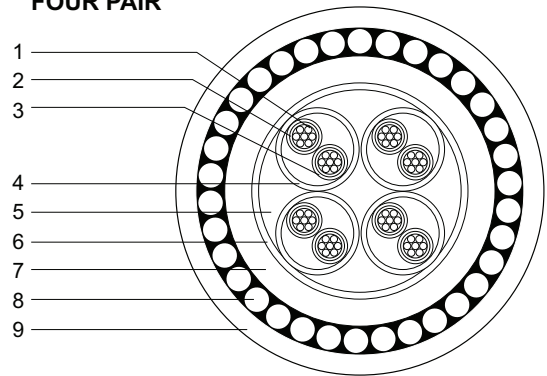
**SINGLE CORE**



**FOUR CORE**



**FOUR PAIR**



## Identification of cores:

No. of cores	Single	Two	Three	Four	Five & above	Pairs
Colour	Natural or other colour on request	Red and Black	Red, Yellow and Blue	Red, Yellow, Blue and Black	Black with white numbering (others on request)	Black with white numbering

Note: Special construction and design to customers' specification can be provided upon request.

## Applicable Standards

IEC 60502 AS 3198	Extruded solid dielectric insulated power cables for rated voltage of 1 kV up to 30 kV
IEC 60228 BS 6360 AS 1125	Conductors of insulated cables
IEC 60754-1 BS 6425-1 AS 1660.5	Test on gases evolved during combustion of electric cables - Determination of the amount of halogen acid gases
IEC 60754-2 BS 6425-2 AS 1660.5.4	Test on gases evolved during combustion of electric cables - Determination of degree of acidity of gases evolved by measuring pH and conductivity
IEC 60331 AS 1660.5.5	Fire resistant characteristics of electric cable (750°C for 3 hours)
IEC 60332 Part 1 BS 4066 Part 1	Test on electric cables under fire conditions - Test on a single vertical insulated wire or cable
IEC 60332 Part 3 BS 4066 Part 3 Category A,B,C/AS 1660.5.1	Test on electric cables under fire conditions - Test on bunched wires or cables
IEC 61034 BS 7622 AS1660.5.2	Measurement of smoke density of electric cables burning under defined conditions
BS 6378 SS 299 Part 1	Performance requirements for cables required to maintain circuit integrity under fire conditions - Category C tested at 950°C for 3 hours Category W: fire with water Category Z: fire with mechanical shock
BS 6724	Armoured cables for electricity supply having thermosetting insulation with low emission of smoke and corrosive gases when affected by fire
BS 7211	Thermosetting insulated cables (non-armoured) for electric power and lighting with low emission of smoke and corrosive gases when affected by fire
BS 7846	600/1000V armoured fire-resistant electric cables having low emission of smoke and corrosive gases when affected by fire
AS 3013	Electrical installations - Classification of the fire and mechanical performance of wiring systems

\* Standards applied will vary depending on cable construction.

## Comparison between test standards IEC 60331 & SS 299 Part 1

Ref	Description of tests	IEC 60331	0.6/1kV cables	Data Cables	Optical fibre cables	SS 299 Part 1	0.6/1kV cables	Data Cables	Optical fibre cables
1	<b>Resistance to FIRE alone</b> Flame temperature / Duration	Part 21 750°C/90 min	✓	✓	✓	Cat A- 650°C/3hr Cat B- 750°C/3hr Cat C- 950°C/3hr Cat S- 650°C/20min	✓ ✓ ✓ ✓		
2	<b>Resistance to FIRE with mechanical shock</b> Flame temperature / Duration Mechanical shock	Part 12 830°C/120 min Every 5 min	✓ ✓			Cat X- 650°C/3hr Cat Y- 650°C/3hr Cat Z- 650°C/3hr Every 30 sec	✓ ✓ ✓ ✓		
3	<b>Resistance to FIRE with water spray</b> Flame temperature / Duration	Not available				Cat W- 650°C/15min	✓		
4	<b>Other tests</b> Electrical requirements for completed cables Bending characteristics Resistance of cable to impact	Not available Not available Not available				Available Available Available	✓ ✓ ✓		

# STANDARDS AND APPROVALS

## BS 6387/SS 299: 1994 - Fire, Fire with Water & Fire with Mechanical Shock Tests

The following test is the nationally recognised United Kingdom and Singapore test used to determine if a cable is capable of maintaining circuit integrity under fire conditions, fire with water and fire with mechanical shock. These tests use a number of alternative time and temperature parameters and depending on the level achieved by the cable, a corresponding letter is assigned to denote the category the cable passed.

Resistance to fire:	Symbol
650°C for 3 hours	A
750°C for 3 hours	B
950°C for 3 hours	C
950°C for 20 minutes	S

Resistance to fire and water:	Symbol
650°C for 15 minutes, then for 15 minutes with fire and water	W

Resistance to fire with mechanical shock:	Symbol
650°C for 15 minutes, with 30 second hammer blows	X
750°C for 15 minutes, with 30 second hammer blows	Y
950°C for 15 minutes, with 30 second hammer blows	Z



During the tests the cables are energised at their rated voltage.

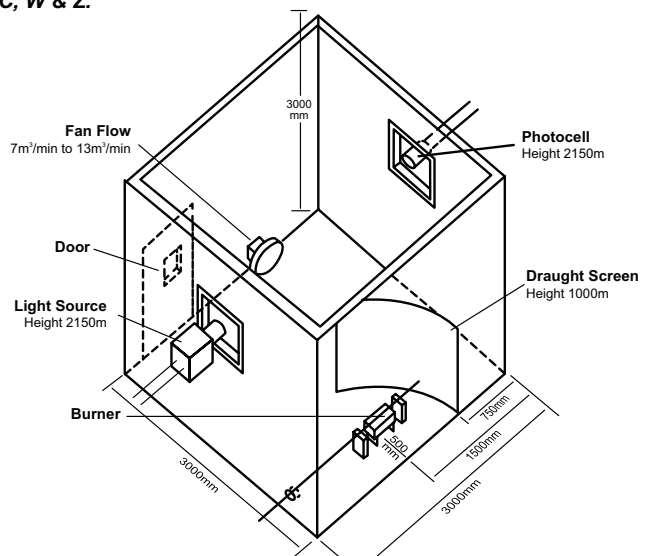
**MAX-FOH cables meet the highest categories of BS 6387 i.e. C, W & Z.**

## IEC 61034 - Smoke Density Test

This test measures the smoke emission from electric cables during fire. The test is carried out in a 3m cubed chamber where a cable sample is subjected to fire.

The smoke emission and density are measured by transmitting a beam of light across the inside of the chambers to a photo electric cell which measures the amount of light received.

**All MAX-FOH cables comply to IEC 61034 requirements.**



## IEC 60754 - Acid Gas Emission Test

Due to the concern regarding the amount of acid gas which could be produced when cables are burnt, this international test was developed to determine the amount of gas evolved by burning cables.

The recommended values of the test state that the weighted pH value should not be less than 4.3, when related to 1 litre of water. The weighted value of conductivity should not exceed 10µs/mm.

**MAX-FOH cables meet the above requirements.**



## IEC 60331 - Fire Test

This international fire test is designed to establish whether a cable can maintain circuit integrity during and after exposure to fire.

A sample of cable is exposed to fire for 3 hours at a temperature of between 750°C and 800°C, after 3 hours the fire is extinguished and the current is turned off. After a further 12 hours, the sample of cable is re-energised and must maintain its circuit integrity.

**MAX-FOH cables meet the requirements of IEC 60331.**



## IEC 60332 Part 3 - Flame Propagation Test

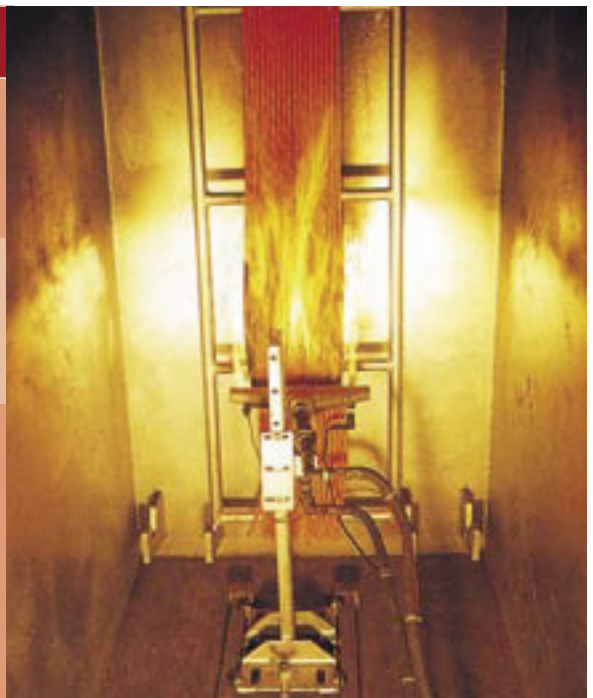
This test defines the ability of bunched cables to restrict vertical flame propagation when laid in trunking, cable trays or conduit. The test comprises of 3 categories each determined by the amount of combustible material in a 1 metre sample, as shown in the table below.

Category	A	B	C	D
No. of litres of combustible material in a 1 metre sample.	7	3.5	1.5	0.5
Exposure (mins)	40	40	20	20

The cable samples are placed vertically next to one another on a vertical ladder where they are exposed to fire from a ribbon gas burner for the pre-arranged times.

After burning, the samples are wiped clean to examine for char (the crumbling) of the cable surface. The charring should not have reached a height exceeding 2.5m above the bottom edge of the burner.

**MAX-FOH cables meet the requirement of IEC 60332 part 3**

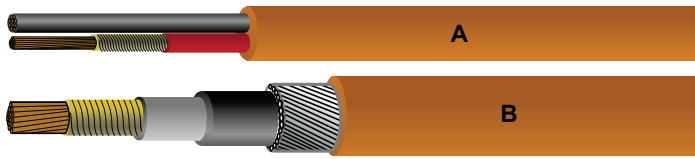


## Additional Considerations

As well as the requirements written into International and British cable standards, there are other essential criteria which designers and consultants need to consider - Is the cable able to withstand voltage spikes, transmit data and prevent flame propagation?

All MAX-FOH cables do comply with these additional benefits, including the added advantage that MAX-FOH requires fewer joints in a cable run compare to mineral, reducing the risk of weak links in the chain. MAX-FOH does not require complicated terminations and is therefore quicker and easier to install.

# TABLE OF CONSTRUCTION

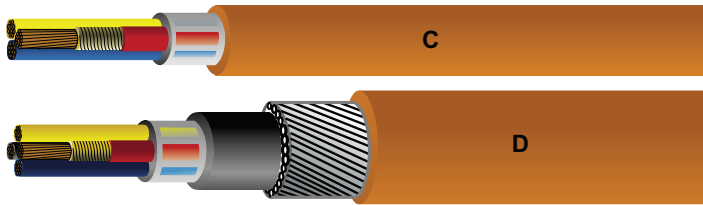


## 600/1000V, Unarmoured and Armoured Fire Resistant Cables

Table 1

	(A) Unarmoured Cables								(B) Armoured Cables				
	Nominal area of conductor	Insulated, non-sheathed			Insulated and Sheathed				Insulated and Sheathed				
		Insulation Thickness	Approx. diameter overall	Approx. weight	Insulation Thickness	Sheath Thickness	Approx. diameter overall	Approx. weight	Bedding Thickness	Armour wire diameter	Sheath Thickness	Approx. diameter overall	Approx. weight
	mm <sup>2</sup>	mm	mm	kg/km	mm	mm	mm	kg/km	mm	mm	mm	mm	kg/km
Single Core	1.5	0.7	3.9	32	0.7	1.4	6.4	55	-	-	-	-	-
	2.5	0.8	4.6	43	0.7	1.4	6.8	70	-	-	-	-	-
	4	0.8	5.1	55	0.7	1.4	7.4	90	-	-	-	-	-
	6	0.8	5.6	85	0.7	1.4	7.9	110	-	-	-	-	-
	10	1.0	7.1	146	0.7	1.4	8.9	160	-	-	-	-	-
	16	1.0	8.1	198	0.7	1.4	9.9	220	-	-	-	-	-
	25	1.2	9.8	320	0.9	1.4	12.2	330	-	-	-	-	-
	35	1.2	10.9	410	0.9	1.4	13.5	430	-	-	-	-	-
	50	1.4	13.4	549	1.0	1.4	15.0	560	1.0	0.90	1.8	2.0	800
	70	1.4	15.2	770	1.1	1.4	17.0	770	1.0	1.25	1.8	22.5	1000
	95	1.6	17.6	1140	1.1	1.5	19.0	1040	1.0	1.25	1.8	24.0	1400
	120	1.6	19.3	1425	1.2	1.5	20.8	1290	1.0	1.60	1.8	27.0	1700
	150	1.8	21.3	1720	1.4	1.6	23.0	1580	1.0	1.60	1.8	29.0	2000
	185	2.0	23.7	2155	1.6	1.6	25.3	1950	1.0	1.60	1.9	31.3	2400
	240	2.2	26.8	2900	1.7	1.7	28.3	2530	1.0	1.60	2.0	35.0	3300
	300	2.4	29.7	3540	1.8	1.8	31.0	3140	1.0	1.60	2.1	37.0	3800
	400	2.6	33.3	4410	2.0	1.9	34.7	3970	1.2	2.00	2.3	42.0	4800
500	2.8	37.2	5660	2.2	2.0	38.5	4970	1.2	2.00	2.4	46.0	5900	
630	2.8	41.3	7140	2.4	2.2	43.5	6400	1.2	2.00	2.5	51.0	7400	
800	-	-	-	-	2.6	2.3	48.0	8000	1.4	2.50	2.8	57.0	9400
1000	-	-	-	-	2.8	2.4	53.2	10200	1.4	2.50	2.9	62.0	11000
Two Cores	1.5	-	-	-	0.7	1.8	10.4	150	1.0	0.90	1.8	15.0	400
	2.5	-	-	-	0.7	1.8	11.2	180	1.0	0.90	1.8	16.0	450
	4	-	-	-	0.7	1.8	12.3	240	1.0	0.90	1.8	17.0	530
	6	-	-	-	0.7	1.8	13.5	300	1.0	0.90	1.8	18.0	620
	10	-	-	-	0.7	1.8	15.7	420	1.0	1.25	1.8	20.0	900
	16	-	-	-	0.7	1.8	17.8	590	1.0	1.25	1.8	22.0	1050
	25	-	-	-	0.9	1.8	21.2	860	1.0	1.60	1.8	26.5	1600
	35	-	-	-	0.9	1.8	23.7	1120	1.0	1.60	1.9	29.0	1964

A Unarmoured cables  
B Armoured cables



## 600/1000V, Unarmoured and Armoured Fire Resistant Cables

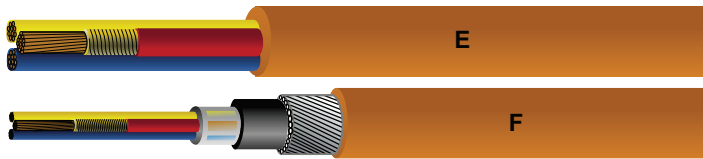
Table 2

	(C) Unarmoured Cables					(D) Armoured Cables				
	Nominal area of conductor	Insulation Thickness	Sheath Thickness	Approx. diameter overall	Approx. weight	Bedding Thickness	Armour wire diameter	Sheath Thickness	Approx. diameter overall	Approx. weight
	mm <sup>2</sup>	mm	mm	mm	kg/km	mm	mm	mm	mm	kg/km
Three Cores	1.5	0.7	1.8	11.4	170	1.0	0.90	1.8	15.9	450
	2.5	0.7	1.8	12.3	215	1.0	0.90	1.8	16.8	510
	4	0.7	1.8	13.44	280	1.0	0.90	1.8	18.0	610
	6	0.7	1.8	14.7	360	1.0	1.25	1.8	20.0	820
	10	0.7	1.8	16.7	510	1.0	1.25	1.8	21.6	1000
	16	0.7	1.8	18.5	740	1.0	1.25	1.8	23.8	1300
	25	0.9	1.8	22.0	1100	1.0	1.60	1.8	28.0	1900
	35	0.9	1.8	25.0	1400	1.0	1.60	1.8	31.0	2400
	50	1.0	1.8	28.0	1900	1.0	1.60	1.9	34.5	3000
	70	1.1	1.9	32.0	2600	1.2	2.00	2.1	40.5	4300
	95	1.1	2.0	37.0	3500	1.2	2.00	2.2	45.0	5400
	120	1.2	2.1	42.0	4400	1.2	2.00	2.3	49.0	6600
	150	1.4	2.4	47.0	5500	1.4	2.50	2.5	55.0	8300
	185	1.6	2.4	52.0	6800	1.4	2.50	2.7	60.0	10000
	240	1.7	2.6	58.0	8800	1.4	2.50	2.9	67.0	12000
300	1.8	2.7	64.0	10000	1.6	2.50	3.0	74.0	15000	
Four Cores	1.5	-	1.8	12.3	200	1.0	0.90	1.8	16.6	500
	2.5	-	1.8	13.3	255	1.0	0.90	1.8	17.7	580
	4	-	1.8	14.6	335	1.0	1.25	1.8	19.5	800
	6	-	1.8	16.0	440	1.0	1.25	1.8	21.0	950
	10	-	1.8	18.2	640	1.0	1.25	1.8	23.0	1200
	16	-	1.8	21.0	915	1.0	1.60	1.8	26.4	1700
	25	-	1.8	25.6	1410	1.0	1.60	1.8	30.5	2300
	35	0.9	1.8	28.6	1500	1.0	1.60	1.9	34.2	2900
	50	1.0	1.8	32.1	1950	1.0	2.00	2.0	39.0	3900
	70	1.1	2.0	37.0	3100	1.2	2.00	2.2	44.0	4900
	95	1.1	2.1	42.0	3600	1.2	2.00	2.3	49.0	6600
	120	1.2	2.3	47.0	5700	1.4	2.50	2.5	45.0	8500
	150	1.4	2.4	51.7	7000	1.4	2.50	2.7	60.0	9900
	185	1.6	2.6	57.7	8700	1.4	2.50	2.8	66.0	12000
	240	1.7	2.8	65.0	11000	1.6	3.15	3.1	75.0	16000
300	1.8	3.0	71.6	14000	1.6	3.15	3.2	82.0	19000	

C Unarmoured cables

D Armoured cables

\* Multicore unarmoured and armoured fire resistant cables are available upon request



## 300/500V, Unarmoured and Armoured Fire Resistant Cables

**Table 3**

	(E) Unarmoured Cables						(F) Armoured Cables				
	Nominal area of conductor	No. & Diameter of wires	Insulation Thickness	Sheath Thickness	Approx. diameter overall	Approx. weight	Bedding Thickness	Armour wire diameter	Sheath Thickness	Approx. diameter overall	Approx. weight
	mm <sup>2</sup>	No./mm	mm	mm	mm	kg/km	mm	mm	mm	mm	kg/km
<b>Single core</b>	0.75	7/0.37	0.55	0.5	4.1	22	0.5	0.9	1.4	8.9	155
	1	7/0.44	0.55	0.5	4.3	26	0.5	0.9	1.4	9.1	165
	1.5	7/0.53	0.55	0.5	4.6	32	0.5	0.9	1.4	9.4	180
	2.5	7/0.67	0.55	0.5	5.0	43	0.5	0.9	1.4	9.8	200
	4	7/0.85	0.55	0.5	5.6	60	0.5	0.9	1.4	10.4	240
<b>Two cores</b>	0.75	7/0.37	0.55	0.5	7.0	64	0.5	0.9	1.4	11.8	285
	1	7/0.44	0.55	0.5	7.4	74	0.5	0.9	1.4	12.2	310
	1.5	7/0.53	0.55	0.5	8.0	92	0.5	0.9	1.4	12.8	345
	2.5	7/0.67	0.55	0.5	8.8	120	0.5	0.9	1.4	13.6	400
	4	7/0.85	0.55	0.5	9.9	165	0.5	0.9	1.4	14.7	475
<b>Three cores</b>	0.75	7/0.37	0.55	0.5	7.5	75	0.5	0.9	1.4	12.3	310
	1	7/0.44	0.55	0.5	7.9	88	0.5	0.9	1.4	12.7	355
	1.5	7/0.53	0.55	0.5	8.5	110	0.5	0.9	1.4	13.3	375
	2.5	7/0.67	0.55	0.5	9.4	150	0.5	0.9	1.4	14.2	445
	4	7/0.85	0.55	0.5	10.6	205	0.5	0.9	1.4	15.4	535
<b>Four cores</b>	0.75	7/0.37	0.55	0.5	8.3	90	0.5	0.9	1.4	13.1	360
	1	7/0.44	0.55	0.5	8.7	105	0.5	0.9	1.4	13.5	380
	1.5	7/0.53	0.55	0.5	9.4	135	0.5	0.9	1.4	14.2	430
	2.5	7/0.67	0.55	0.5	10.4	180	0.5	0.9	1.4	15.2	500
	4	7/0.85	0.55	0.5	11.7	255	0.5	0.9	1.5	16.7	620

E Unarmoured fire resistant cables

F Armoured fire resistant cables

\* Multicore unarmoured and armoured fire resistant cables are available upon request





## 300/500V, Unarmoured and Armoured Shielded Fire Resistant Cables

Table 4

	(E) Unarmoured Cables						(F) Armoured Cables				
	Nominal area of conductor	No. & Diameter of wires	Insulation Thickness	Sheath Thickness	Approx. diameter overall	Approx. weight	Bedding Thickness	Armour wire diameter	Sheath Thickness	Approx. diameter overall	Approx. weight
	mm <sup>2</sup>	No./mm	mm	mm	mm	kg/km	mm	mm	mm	mm	kg/km
Single pair	0.75	7/0.37	0.5	0.8	7.9	65	0.8	0.9	1.4	12.7	300
	1	7/0.43	0.6	0.8	8.5	75	0.8	0.9	1.4	13.3	340
	1.5	7/0.53	0.6	0.8	9.1	90	0.8	0.9	1.4	13.9	370
	2.5	7/0.67	0.6	0.8	9.9	110	0.8	0.9	1.4	14.7	420
Two pairs	0.75	7/0.37	0.5	0.8	10.0	100	0.8	0.9	1.4	14.8	410
	1	7/0.43	0.6	0.9	11.0	125	0.9	0.9	1.4	15.8	460
	1.5	7/0.53	0.6	0.9	11.8	150	0.9	0.9	1.5	16.8	520
	2.5	7/0.67	0.6	1.0	13.1	205	1.0	0.9	1.5	18.1	605
Three pairs	0.75	7/0.37	0.5	1.0	12.2	145	1.0	0.9	1.5	17.2	565
	1	7/0.43	0.6	1.0	13.1	170	1.0	0.9	1.5	18.1	600
	1.5	7/0.53	0.6	1.0	14.1	215	1.0	0.9	1.6	19.3	655
	2.5	7/0.67	0.6	1.1	15.7	290	1.1	1.25	1.6	21.6	920
Four pairs	0.75	7/0.37	0.5	1.0	13.7	180	1.0	0.9	1.5	18.7	600
	1	7/0.43	0.6	1.0	14.7	215	1.0	1.25	1.6	20.6	820
	1.5	7/0.53	0.6	1.1	16.1	280	1.1	1.25	1.6	22.0	920
	2.5	7/0.67	0.6	1.1	17.7	370	1.1	1.25	1.6	23.8	1090

G Unarmoured fire resistant cables

H Armoured fire resistant cables

\* Multipairs unarmoured and armoured shielded fire resistant cables are available upon request