Fireflix

Fire Resistant Power & Control Cables

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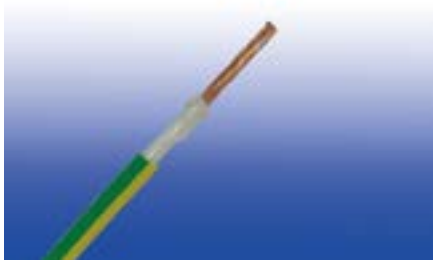
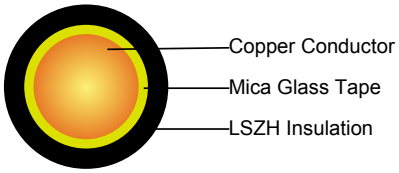
300/500V Mica+LSZH Insulated, Non-sheathed Power Cables to BS EN 50525-3-31 (Single Core)

FFX100 05mZ1-U/R/K (CU/MGT+LSZH 300/500V Class 1/2/5)





APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS EN 50525-3-31

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

300/500V

CABLE CONSTRUCTION

Conductor: Copper conductor according to BS EN 60228 class 1/2/5.
Fire Barrier: Mica glass tape.
Insulation: Thermoplastic compound of type TI 7 to EN 50363-7.
Insulation Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Black, Blue, Brown, Grey, Orange, Pink, Red, Turquoise, Violet, White, Green and Yellow. Bi-colours of any combination of the above mono-colours are permitted.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 70°C

Maximum short circuit temperature (5 Seconds): 160°C

Minimum bending radius: 4 x Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX100 05mZ1-U/R/K			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Min. Overall Diameter	Max. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	kg/km
1×0.5	1	0.6	2.9	3.3	13.5
1×0.75	1	0.6	3.1	3.5	16.5
1×1.0	1	0.6	3.2	3.7	19.7
1×0.5	2	0.6	3.0	3.4	14.4
1×0.75	2	0.6	3.2	3.6	17.3
1×1.0	2	0.6	3.3	3.8	21.3
1×0.5	5	0.6	3.1	3.5	14.2
1×0.75	5	0.6	3.2	3.7	17.7
1×1.0	5	0.6	3.4	3.8	20.7

ELECTRICAL PROPERTIES

Conductor operating temperature: 70°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp)

Conductor Cross-sectional Area	Single-phase a.c.	Three-phase a.c.
mm^2	A	A
0.5	3	3
0.75	6	6
1.0	10	10

Note: These values apply to the majority of cases. Further information should be sought in unusual cases eg.:
(i) When high ambient temperatures are involved, ie. above 30°C
(ii) Where long lengths are used
(iii) Where ventilation is restricted
(iv) Where the cords are used for other purposes, ego internal wiring of apparatus.

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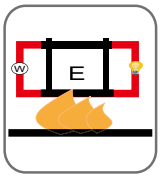
Voltage Drop (Per Amp Per Meter)

Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.			3 or 4 cables, three-phase a.c.			
		Ref. Methods A&B (enclosed in conduit or trunking)	Ref. Methods C, F&G (clipped direct, on trays or in free air)		Ref. Methods A&B (enclosed in conduit or trunking)	Ref. Methods C, F&G (clipped direct, on trays or in free air)		
			Cables touching	Cables spaced*		Cables touching, Trefoil	Cables touching, Flat	Cables spaced*, Flat
1	2	3	4	5	6	7	8	9
mm^2	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m
0.5	93	93	93	93	80	80	80	80
0.75	62	62	62	62	54	54	54	54
1.0	46	46	46	46	40	40	40	40

Note: *Spacings larger than one cable diameter will result in a large voltage drop.

Rated Voltage

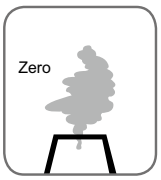
Standard



Circuit Integrity
IEC 60331-21/BS 6387

Flame Retardancy
IEC 60332-1-2

Reduced Fire Propagation
IEC 60332-3-24



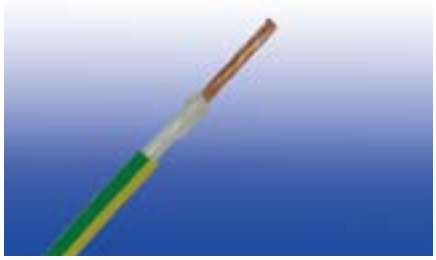
Halogen Free
IEC 60754-1

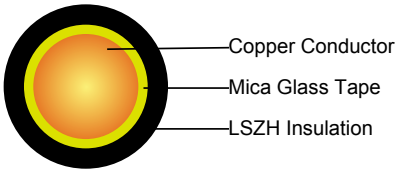
Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

300/500V Mica+LSZH Insulated, Non-sheathed Power Cables to BS EN 50525-3-41 (Single Core)

FFX100 05mZ-U/K (CU/MGT+LSZH 300/500V Class 1/5)





APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS EN 50525-3-41(formerly BS 7211)

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

300/500V

CABLE CONSTRUCTION

Conductor: Copper conductor according to BS EN 60228 class 1/5.
Fire Barrier: Mica glass tape.
Insulation: Crosslinked polyolefin material type EI 5 according to EN 50363-5.
Insulation Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

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COLOUR CODE

Black, Blue, Brown, Grey, Orange, Pink, Red, Turquoise, Violet, White, Green and Yellow. Bi-colours of any combination of the above mono-colours are permitted.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius: 4 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX100 05mZ-U/K			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Min. Overall Diameter	Max. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	kg/km
1×0.5	1	0.6	2.9	3.4	13.5
1×0.75	1	0.6	3.1	3.6	16.5
1×1.0	1	0.6	3.2	3.8	19.7
1×0.5	5	0.6	3.1	3.6	14.2
1×0.75	5	0.6	3.2	3.8	17.7
1×1.0	5	0.6	3.4	3.9	20.7

ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp)

Conductor cross-sectional area	Single-phase a.c.	Three-phase a.c.
mm^2	A	A
0.5	3	3
0.75	6	6
1.0	10	10

Note: These values apply to the majority of cases. Further information should be sought in unusual cases eg.:
(i) When high ambient temperatures are involved, ie. above 30°C
(ii) Where long lengths are used
(iii) Where ventilation is restricted
(iv) Where the cords are used for other purposes, ego internal wiring of apparatus.

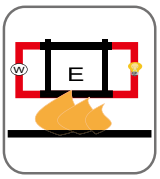
Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E1B

Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.			3 or 4 cables, three-phase a.c.			
		Ref. Methods A&B (enclosed in conduit or trunking)	Ref. Methods C, F&G (clipped direct, on trays or in free air)		Ref. Methods A&B (enclosed in conduit or trunking)	Ref. Methods C, F&G (clipped direct, on trays or in free air)		
			Cables touching	Cables spaced*		Cables touching, Trefoil	Cables touching, Flat	Cables spaced*, Flat
1	2	3	4	5	6	7	8	9
mm^2	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m
0.5	101	101	101	101	87	87	87	87
0.75	68	68	68	68	59	59	59	59
1.0	50	50	50	50	44	44	44	44

Note: *Spacings larger than one cable diameter will result in a large voltage drop.

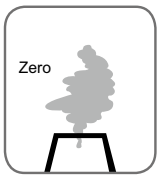
Rated Voltage

Standard



Circuit Integrity
IEC 60331-21/BS 6387


Flame Retardancy
IEC 60332-1-2



Halogen Free
IEC 60754-1


Low Corrosivity
IEC 60754-2


Low Smoke Emission
IEC 61034-2

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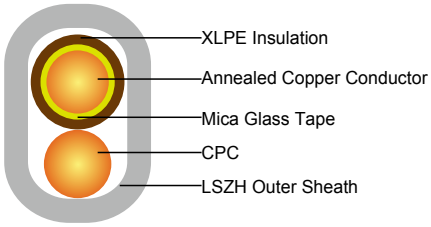
300/500V Mica+XLPE Insulated, LSZH Sheathed Power Cables to BS 7211 (Single Core)

FFX300 05mRZ1-U (CU/MGT+XLPE/LSZH 300/500V Class 1)



APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS 7211:2012

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

300/500V

CABLE CONSTRUCTION

Conductor: Annealed copper conductor, solid according to BS EN 60228 class 1.
Fire Barrier: Mica glass tape.
Insulation: XLPE type GP 8 according to BS 7655-1.3. Crosslinked polyolefin material type EI 5 according to EN 50363-5 can be offered as option.
CPC (Circuit Protective Conductor): Uninsulated copper conductor.
Outer Sheath: Extruded LSZH type LTS 2 according to BS 7655-6.1.

Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Insulation Colour: Brown or blue.

Sheath Colour: White; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius: 4 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX300 05mRZ1-U						
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Cross-sectional Area of CPC	Class of CPC	Nominal Sheath Thickness	Min. Overall Dimensions	Max. Overall Dimensions	Approx. Weight
No.×mm^2		mm	mm^2		mm	mm	mm	kg/km
1×1.0	1	0.70	1.0	1	0.9	5.1x6.2	6.0x7.3	66
1×1.5	1	0.70	1.0	1	0.9	5.4x6.4	6.3x7.6	74

ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E1A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil
1	2	3	4	5	6	7
mm^2	A	A	A	A	A	A
1.0	14	13	17	15	19	17.5
1.5	19	17	23	20	25	23

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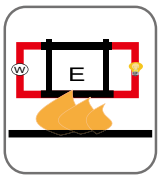
Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E1B

Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.			3 or 4 cables, three-phase a.c.			
		Ref. Methods A&B (enclosed in conduit or trunking)	Ref. Methods C, F&G (clipped direct, on trays or in free air)		Ref. Methods A&B (enclosed in conduit or trunking)	Ref. Methods C, F&G (clipped direct, on trays or in free air)		
			Cables touching	Cables spaced*		Cables touching, Trefoil	Cables touching, Flat	Cables spaced*, Flat
1	2	3	4	5	6	7	8	9
mm^2	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m
1.0	46	46	46	46	40	40	40	40
1.5	31	31	31	31	27	27	27	27

Note: *Spacings larger than one cable diameter will result in a large voltage drop.

Rated Voltage

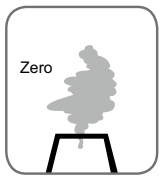
Standard



Circuit Integrity
IEC 60331-21/BS 6387

Flame Retardancy
IEC 60332-1-2

Reduced Fire Propagation
IEC 60332-3-24



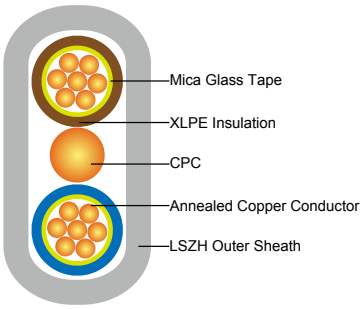
Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

300/500V Mica+XLPE Insulated, LSZH Sheathed Power Cables to BS 7211 (2-3 Cores)

FFX200 05mRZ1-U/R (CU/MGT+XLPE/LSZH 300/500V Class 1/2)



APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS 7211:2012

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

300/500V

CABLE CONSTRUCTION

Conductor: Annealed copper conductor, solid or stranded according to BS EN 60228 class 1 or class 2.
Fire Barrier: Mica glass tape.
Insulation: XLPE type GP 8 according to BS 7655-1.3. Crosslinked polyolefin material type EI 5 according to EN 50363-5 can be offered as option.
CPC (Circuit Protective Conductor): Uninsulated copper conductor.
Outer Sheath: Extruded LSZH type LTS 2 according to BS 7655-6.1.
Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

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COLOUR CODE

Insulation Colour:

Twin: Brown and blue or, for 2x1.0 and 2x1.5 cables, brown and brown.

Three cores: Brown, black (centre core) and grey.

Position of CPC:

Twin: Centrally placed between cores in same plane.

Three cores: Centrally placed between black and grey cores in same plane.

Sheath Colour: White; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius

OD<8mm: 4 × Overall Diameter

8mm≤OD≤12mm: 5 × Overall Diameter

OD>12mm: 6 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX200 05mRZ1-U/R						
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Cross-sectional Area of CPC	Class of CPC	Nominal Sheath Thickness	Min. Overall Dimensions	Max. Overall Dimensions	Approx. Weight
No.×mm^2		mm	mm^2		mm	mm	mm	kg/km
2×1.0	1	0.7	1.0	1	0.9	5.1×9.6	6.0×11.2	84
2×1.5	1	0.7	1.0	1	0.9	5.4×10.1	6.3×11.7	101
2×2.5	1	0.7	1.5	1	1.0	5.9×11.3	7.0×12.2	136
3×1.0	1	0.7	1.0	1	0.9	5.1×13.0	6.0×15.1	108
3×1.5	1	0.7	1.0	1	0.9	5.4×13.7	6.3×15.9	135
3×2.5	1	0.7	1.5	1	1.0	5.9×15.0	7.0×17.6	190
2×1.0	2	0.7	1.0	1	0.9	5.2×9.8	6.1×11.4	89
2×1.5	2	0.7	1.0	1	0.9	5.5×10.3	6.4×12.0	107
2×2.5	2	0.7	1.5	1	1.0	6.0×11.5	7.1×13.4	141
2×4	2	0.7	1.5	1	1.0	6.5×12.4	7.7×14.6	181
2×6	2	0.7	2.5	1	1.1	7.2×14.0	8.5×16.6	256
2×10	2	0.7	4.0	2	1.2	8.3×16.5	9.8×19.5	406
2×16	2	0.7	6.0	2	1.3	9.4×19.0	11.1×22.5	576
3×4	2	0.7	1.5	1	1.0	6.5×17.0	7.7×19.9	216
3×6	2	0.7	2.5	1	1.1	7.2×19.2	7.5×22.5	311
3×10	2	0.7	4.0	2	1.2	8.3×22.5	9.8×26.6	460
3×16	2	0.7	6.0	2	1.3	9.4×25.8	11.1×30.6	690

ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E2A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)		Ref. Method E (free air or on a perforated cable tray etc. horizontal or vertical)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.0	14.5	13	17	15	19	17	21	18
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42
6	42	38	51	44	58	52	63	54
10	57	51	69	60	80	71	86	75
16	76	68	91	80	107	96	115	100

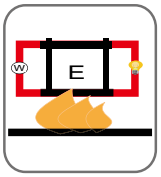
Note: *With or without a protective conductor.

Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E2B

Conductor cross-sectional area	Two-core cable, d.c.	Two-core cable, single-phase a.c.	Three- or four-core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
1.0	46	46	40
1.5	31	31	27
2.5	19	19	16
4	12	12	10
6	7.9	7.9	6.8
10	4.7	4.7	4.0
16	2.9	2.9	2.5

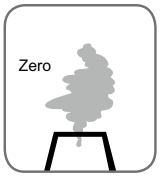
Rated Voltage

Standard



Circuit Integrity
IEC 60331-21/BS 6387


Flame Retardancy
IEC 60332-1-2



Halogen Free
IEC 60754-1


Low Corrosivity
IEC 60754-2


Low Smoke Emission
IEC 61034-2

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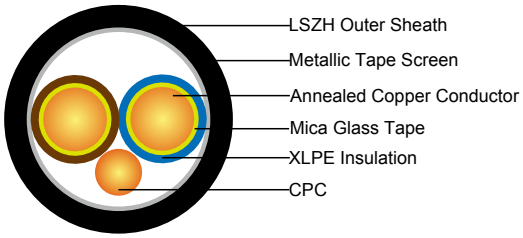
300/500V Mica+XLPE Insulated, LSZH Sheathed, Screened Power Cables to BS 8436 (2-4 Cores)

FFX200 05mROZ1-U/R/K (CU/MGT+XLPE/OSCR/LSZH 300/500V Class 1/2/5)



APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS 8436:2011

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

300/500V

CABLE CONSTRUCTION

Conductor: Tinned annealed copper conductor, solid or stranded according to BS EN 60228 class 1, class 2 or class 5.

Fire Barrier: Mica glass tape.

Insulation: Thermosetting XLPE type GP 8 according to BS 7655-1.3. Crosslinked polyolefin material type EI 5 according to EN 50363-5 or crosslinked elastomeric GP 4/GP 6 according to BS 7655-1.2 can be offered as option.

CPC (Circuit Protective Conductor): Uninsulated tinned annealed copper conductor conforming to BS EN

13630:2002.

Screen: One or more metallic or laminated metallic tape(s) shall be applied, either longitudinally or helically or as a combination of both, with the metallic element in contact with the uninsulated circuit protective conductor.

Outer Sheath: LSZH type LTS 3 according to BS 7655-6.1.

Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Insulation Colour:

2-core + uninsulated circuit protective conductor: Brown, blue or brown, brown.

3-core + uninsulated circuit protective conductor: Brown, black, grey.

4-core + uninsulated circuit protective conductor: Blue, brown, black, grey.

Sheath Colour: White; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 70°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius: 6 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX200 05mROZ1-U/R/K			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	kg/km
2×1.0	1/2/5	0.6	0.9	9.1	104
2×1.5	1/2/5	0.7	0.9	10.0	127
2×2.5	1/2/5	0.7	1.0	11.0	169
2×4	1/2/5	0.7	1.1	12.3	229
3×1.0	1/2/5	0.6	0.9	9.6	126
3×1.5	1/2/5	0.7	0.9	10.6	159
3×2.5	1/2/5	0.7	1.0	11.7	214
3×4	1/2/5	0.7	1.1	13.1	297
4×1.0	1/2/5	0.6	1.0	10.5	153
4×1.5	1/2/5	0.7	1.0	11.6	195
4×2.5	1/2/5	0.7	1.1	12.8	263
4×4	1/2/5	0.7	1.2	14.4	366

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ELECTRICAL PROPERTIES

Conductor operating temperature: 70°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4D2A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc)		Ref. Method B (enclosed in conduit on a wall or in trunking etc)		Ref. Method C (clipped direct)		Ref. Method E (in free air or on a perforated cable tray etc. horizontal or vertical)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three -phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three -phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three -phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three -phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.0	11	10	13	11.5	15	13.5	17	14.5
1.5	14	13	16.5	15	19.5	17.5	22	18.5
2.5	18.5	17.5	23	20	27	24	30	25
4	25	23	30	27	36	32	40	34

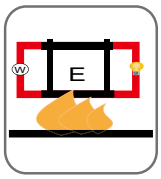
Note: *With or without a protective conductor.

Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4D2B

Conductor cross-sectional area	Two-core cable d.c.	Two-core cable single-phase a.c.	Three- or four-core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
1.0	44	44	38
1.5	29	29	25
2.5	18	18	15
4	11	11	9.5

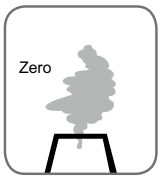
Rated Voltage

Standard



Circuit Integrity
IEC 60331-21/BS 6387

Flame Retardancy
IEC 60332-1-2



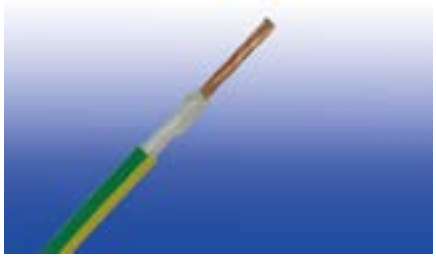
Halogen Free
IEC 60754-1

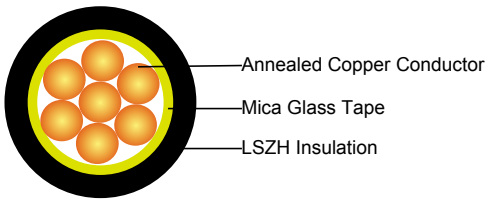
Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

450/750V Mica+LSZH Insulated, Non-sheathed Power Cables to BS EN 50525-3-31 (Single Core)

FFX100 07mZ1-U/R/K (CU/MGT+LSZH 450/750V Class 1/2/5)





APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS EN 50525-3-31

Approvals：

TUV Certification（B 098200 0026 Rev.00）

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

450/750V

CABLE CONSTRUCTION

Conductor: Copper conductor according to BS EN 60228 class 1/2/5.

FFX100 07mZ1-U: 1.5-10mm^2 Class 1 solid copper conductor to BS EN 60228.

FFX100 07mZ1-R: 1.5-630mm^2 Class 2 stranded copper conductor to BS EN 60228.

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FFX100 07mZ1-K: 1.5-240mm^2 Class 5 stranded copper conductor to BS EN 60228.

Fire Barrier: Mica glass tape.

Insulation: Thermoplastic compound of type TI 7 to EN 50363-7.

Insulation Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Black, Blue, Brown, Grey, Orange, Pink, Red, Turquoise, Violet, White, Green and Yellow.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 70°C

Maximum short circuit temperature (5 Seconds): 160°C

Minimum bending radius

OD<8mm: 4 × Overall Diameter

8mm≤OD≤12mm: 5 × Overall Diameter

OD>12mm: 6 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX100 07mZ1-U/R/K			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Min. Overall Diameter	Max. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	kg/km
1×1.5	1	0.7	3.6	4.2	26
1×2.5	1	0.8	4.2	4.9	40
1×4	1	0.8	4.6	5.4	57
1×6	1	0.8	5.1	6.0	78
1×10	1	1.0	6.3	7.4	128
1×1.5	2	0.7	3.7	4.3	28
1×2.5	2	0.8	4.3	5.0	42
1×4	2	0.8	4.8	5.6	59
1×6	2	0.8	5.3	6.2	81
1×10	2	1.0	6.6	7.7	133
1×16	2	1.0	7.4	8.8	197
1×25	2	1.2	9.1	10.7	308
1×35	2	1.2	10.0	11.9	412
1×50	2	1.4	11.6	13.8	558
1×70	2	1.4	13.1	15.6	782
1×95	2	1.6	15.1	18.1	1078
1×120	2	1.6	16.6	19.8	1342
1×150	2	1.8	18.3	21.9	1650
1×185	2	2.0	20.3	24.3	2067
1×240	2	2.2	23	27.6	2703
1×300	2	2.4	25.5	30.6	3378
1×400	2	2.6	28.5	34.2	4267

Conductor		FFX100 07mZ1-U/R/K			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Min. Overall Diameter	Max. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	kg/km
1×500	2	2.8	31.5	37.9	5359
1×630	2	2.8	35	42.1	6884
1×1.5	5	0.7	3.8	4.4	27
1×2.5	5	0.8	4.4	5.1	42
1×4	5	0.8	4.9	5.8	59
1×6	5	0.8	5.4	6.3	81
1×10	5	1.0	6.7	7.8	134
1×16	5	1.0	7.7	9.1	197
1×25	5	1.2	9.4	11.2	304
1×35	5	1.2	10.7	12.7	410
1×50	5	1.4	12.5	14.9	585
1×70	5	1.4	14.2	17.0	811
1×95	5	1.6	16.1	19.2	1075
1×120	5	1.6	17.7	21.2	1341
1×150	5	1.8	19.6	23.5	1670
1×185	5	2.0	21.6	25.9	2042
1×240	5	2.2	24.5	29.4	2672

ELECTRICAL PROPERTIES

Conductor operating temperature: 70°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4D1A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray horizontal or vertical)				
							Touching			Spaced by one diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
1.5	14.5	13.5	17.5	15.5	20	18	-	-	-	-	-
2.5	20	18	24	21	27	25	-	-	-	-	-
4	26	24	32	28	37	33	-	-	-	-	-
6	34	31	41	36	47	43	-	-	-	-	-
10	46	42	57	50	65	59	-	-	-	-	-
16	61	56	76	68	87	79	-	-	-	-	-

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Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray horizontal or vertical)				
							Touching			Spaced by one diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
25	80	73	101	89	114	104	131	114	110	146	130
35	99	89	125	110	141	129	162	143	137	181	162
50	119	108	151	134	182	167	196	174	167	219	197
70	151	136	192	171	234	214	251	225	216	281	254
95	182	164	232	207	284	261	304	275	264	341	311
120	210	188	269	239	330	303	352	321	308	396	362
150	240	216	300	262	381	349	406	372	356	456	419
185	273	245	341	296	436	400	463	427	409	521	480
240	321	286	400	346	515	472	546	507	485	615	569
300	367	328	458	394	594	545	629	587	561	709	659
400	-	-	546	467	694	634	754	689	656	852	795
500	-	-	626	533	792	723	868	789	749	982	920
630	-	-	720	611	904	826	1005	905	855	1138	1070

Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4D1B

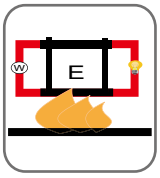
Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.						3 or 4 cables, three-phase a.c.													
		Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C & F(clipped direct, on trays or in free air)						Ref. Methods A & B (enclosed in conduit or trunking)			Ref. Methods C & F (clipped direct, on trays or in free air)								
					Cables touching			Cables spaced*						Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			4			5			6			7			8			9		
mm^2	mV/A/m				mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
1.5	29	29			29			29			25			25			25			25		
2.5	18	18			18			18			15			15			15			15		
4	11	11			11			11			9.5			9.5			9,5			9.5		
6	7.3	7.3			7.3			7.3			6.4			6.4			6.4			6.4		
10	4.4	4.4			4.4			4.4			3.8			3.8			3.8			3.8		
16	2.8	2.8			2.8			2.8			2.4			2.4			2.4			2.4		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.75	1.80	0.33	1.80	1.75	0.20	1.75	1.75	0.29	1.80	1.50	0.29	1.55	1.50	0.175	1.50	1.50	0.25	1.55	1.50	0.32	1.55
35	1.25	1.30	0.31	1.30	1.25	0.195	1.25	1.25	0.28	1.30	1.10	0.27	1.10	1.10	0.170	1.10	1.10	0.24	1.10	1.10	0.32	1.15
50	0.93	0.95	0.3	1.0	0.93	0.19	0.95	0.93	0.28	0.97	0.81	0.26	0.85	0.8	0.165	0.82	0.8	0.24	0.84	0.8	0.32	0.86
70	0.63	0.65	0.29	0.72	0.63	0.185	0.66	0.63	0.27	0.69	0.56	0.25	0.61	0.55	0.16	0.57	0.55	0.24	0.6	0.55	0.31	0.63

Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.									3 or 4 cables, three-phase a.c.											
		Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C & F(clipped direct, on trays or in free air)						Ref. Methods A & B (enclosed in conduit or trunking)			Ref. Methods C & F (clipped direct, on trays or in free air)								
					Cables touching			Cables spaced*						Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			4			5			6			7			8			9		
mm^2	mV/A/m				mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
95	0.46	0.49	0.28	0.56	0.47	0.18	0.50	0.47	0.27	0.54	0.42	0.24	0.48	0.41	0.155	0.43	0.41	0.23	0.47	0.4	0.31	0.51
120	0.36	0.39	0.27	0.47	0.37	0.175	0.41	0.37	0.26	0.45	0.33	0.23	0.41	0.32	0.15	0.36	0.32	0.23	0.4	0.32	0.3	0.44
150	0.29	0.31	0.27	0.41	0.3	0.175	0.34	0.29	0.26	0.39	0.27	0.23	0.36	0.26	0.15	0.3	0.26	0.23	0.34	0.26	0.3	0.40
185	0.23	0.25	0.27	0.37	0.24	0.17	0.29	0.24	0.26	0.35	0.22	0.23	0.32	0.21	0.145	0.26	0.21	0.22	0.31	0.21	0.3	0.36
240	0.18	0.195	0.26	0.33	0.185	0.165	0.25	0.185	0.25	0.31	0.17	0.23	0.29	0.16	0.145	0.22	0.16	0.22	0.27	0.16	0.29	0.34
300	0.145	0.16	0.26	0.31	0.15	0.165	0.22	0.15	0.25	0.29	0.14	0.23	0.27	0.13	0.14	0.19	0.13	0.22	0.25	0.13	0.29	0.32
400	0.105	0.13	0.26	0.29	0.12	0.16	0.20	0.115	0.25	0.27	0.12	0.22	0.25	0.105	0.14	0.175	0.105	0.21	0.24	0.1	0.29	0.31
500	0.086	0.11	0.26	0.28	0.098	0.155	0.185	0.093	0.24	0.26	0.1	0.22	0.25	0.086	0.135	0.16	0.086	0.21	0.23	0.081	0.29	0.30
630	0.068	0.094	0.25	0.27	0.081	0.155	0.175	0.076	0.24	0.25	0.08	0.22	0.24	0.072	0.135	0.15	0.072	0.21	0.22	0.066	0.28	0.29

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance

Rated Voltage

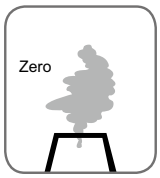
Standard



Circuit Integrity
IEC 60331-21/BS 6387/BS 8491

Flame Retardancy
IEC 60332-1-2

Reduced Fire Propagation
IEC 60332-3-24



Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

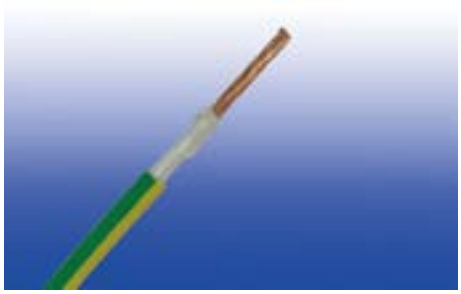
Caledonian

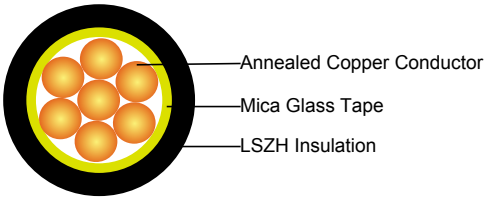
FIREFLIX Fire Resistant Power & Control Cables

www.caledonian-cables.co.uk www.addison-cables.com

450/750V Mica+LSZH Insulated, Non-sheathed Power Cables to BS EN 50525-3-41 (Single Core)

FFX100 07mZ-U/R/K (CU/MGT+LSZH 450/750V Class 1/2/5)





APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS EN 50525-3-41(formerly BS 7211)

Approvals：

TUV Certification（B 098200 0026 Rev.00）

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

450/750V

CABLE CONSTRUCTION

Conductor: Copper conductor according to BS EN 60228 class 1/2/5.

FFX100 07mZ-U: 1.5-10mm^2 Class 1 solid copper conductor to BS EN 60228.

FFX100 07mZ-R: 1.5-630mm^2 Class 2 stranded copper conductor to BS EN 60228.

FFX100 07mZ-K: 1.5-240mm^2 Class 5 stranded copper conductor to BS EN 60228.

Fire Barrier: Mica glass tape.

Insulation: Crosslinked polyolefin material type EI 5 according to EN 50363-5.

Insulation Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Black, Blue, Brown, Grey, Orange, Pink, Red, Turquoise, Violet, White, Green and Yellow.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius

OD<8mm: 4 × Overall Diameter

8mm≤OD≤12mm: 5 × Overall Diameter

OD>12mm: 6 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX100 07mZ-U/R/K			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Min. Overall Diameter	Max. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	kg/km
1×1.5	1	0.7	3.6	4.3	22
1×2.5	1	0.8	4.2	5.0	35
1×4	1	0.8	4.6	5.6	52
1×6	1	0.8	5.1	6.2	73
1×10	1	1.0	6.3	7.6	122
1×1.5	2	0.7	3.7	4.4	24
1×2.5	2	0.8	4.3	5.1	37
1×4	2	0.8	4.8	5.7	54
1×6	2	0.8	5.3	6.4	76
1×10	2	1.0	6.6	8.0	127
1×16	2	1.0	7.4	9.0	191
1×25	2	1.2	9.1	11.1	301
1×35	2	1.2	10.0	12.3	405
1×50	2	1.4	11.6	14.2	550
1×70	2	1.4	13.1	16.1	774
1×95	2	1.6	15.1	18.6	1069
1×120	2	1.6	16.6	20.4	1333
1×150	2	1.8	18.3	22.6	1640
1×185	2	2.0	20.3	25.1	2055
1×240	2	2.2	23.0	28.5	2690
1×300	2	2.4	25.5	31.6	3364
1×400	2	2.6	28.5	35.3	4252

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Conductor		FFX100 07mZ-U/R/K			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Min. Overall Diameter	Max. Overall Diameter	Approx. Weight
No.×mm²		mm	mm	mm	kg/km
1×500	2	2.8	31.5	39.2	5343
1×630	2	2.8	35.0	43.5	6868
1×1.5	5	0.7	3.8	4.5	23
1×2.5	5	0.8	4.4	5.3	37
1×4	5	0.8	4.9	5.9	54
1×6	5	0.8	5.4	6.5	76
1×10	5	1.0	6.7	8.1	128
1×16	5	1.0	7.7	9.4	191
1×25	5	1.2	9.4	11.6	297
1×35	5	1.2	10.7	13.1	403
1×50	5	1.4	12.5	15.4	577
1×70	5	1.4	14.2	17.6	803
1×95	5	1.6	16.1	19.8	1066
1×120	5	1.6	17.7	21.9	1332
1×150	5	1.8	19.6	24.3	1660
1×185	5	2.0	21.6	26.8	2030
1×240	5	2.2	24.5	30.4	2659

ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E1A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc)		Ref. Method B (enclosed in conduit on a wall or in trunking etc)		Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray, horizontal or vertical etc) Touching			Ref. Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm²	A	A	A	A	A	A	A	A	A	A	A
1.5	19	17	23	20	25	23	-	-	-	-	-
2.5	26	23	31	28	34	31	-	-	-	-	-
4	35	31	42	37	46	41	-	-	-	-	-
6	45	40	54	48	59	54	-	-	-	-	-
10	61	54	75	66	81	74	-	-	-	-	-
16	81	73	100	88	109	99	-	-	-	-	-
25	106	95	133	117	143	130	161	141	135	182	161

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc)		Ref. Method B (enclosed in conduit on a wall or in trunking etc)		Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray, horizontal or vertical etc) Touching			Ref. Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
35	131	117	164	144	176	161	200	176	169	226	201
50	158	141	198	175	228	209	242	216	207	275	246
70	200	179	253	222	293	268	310	279	268	353	318
95	241	216	306	269	355	326	377	342	328	430	389
120	278	249	354	312	413	379	437	400	383	500	454
150	318	285	393	342	476	436	504	464	444	577	527
185	362	324	449	384	545	500	575	533	510	661	605
240	424	380	528	450	644	590	679	634	607	781	719
300	486	435	603	514	743	681	783	736	703	902	833
400	-	-	683	584	868	793	940	868	823	1085	1008
500	-	-	783	666	990	904	1083	998	946	1253	1169
630	-	-	900	764	1130	1033	1254	1151	1088	1454	1362

Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E1B

Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.						3 or 4 cables, three-phase a.c.														
		Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)						Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)								
					Cables touching			Cables spaced*						Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			4			5			6			7			8			9		
mm^2	mV/A/m				mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
1.5	31	31			31			31			27			27			27			27		
2.5	19	19			19			19			16			16			16			16		
4	12	12			12			12			10			10			10			10		
6	7.9	7.9			7.9			7.9			6.8			6.8			6.8			6.8		
10	4.7	4.7			4.7			4.7			4.0			4.0			4.0			4.0		
16	2.9	2.9			2.9			2.9			2.5			2.5			2.5			2.5		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.85	1.85	0.31	1.90	1.85	0.190	1.85	1.85	0.28	1.85	1.60	0.27	1.65	1.60	0.165	1.60	1.60	0.190	1.60	1.60	0.27	1.65
35	1.35	1.35	0.29	1.35	1.35	0.180	1.35	1.35	0.27	1.35	1.15	0.25	1.15	1.15	0.155	1.15	1.15	0.180	1.15	1.15	0.26	1.20
50	0.99	1.00	0.29	1.05	0.99	0.180	1.00	0.99	0.27	1.00	0.87	0.25	0.90	0.86	0.155	0.87	0.86	0.180	0.87	0.86	0.26	0.89
70	0.68	0.70	0.28	0.75	0.68	0.175	0.71	0.68	0.26	0.73	0.60	0.24	0.65	0.59	0.150	0.61	0.59	0.175	0.62	0.59	0.25	0.65
95	0.49	0.51	0.27	0.58	0.49	0.170	0.52	0.49	0.26	0.56	0.44	0.23	0.50	0.43	0.145	0.45	0.43	0.170	0.46	0.43	0.25	0.49
120	0.39	0.41	0.26	0.48	0.39	0.165	0.43	0.39	0.25	0.47	0.35	0.23	0.42	0.34	0.140	0.37	0.34	0.165	0.38	0.34	0.24	0.42

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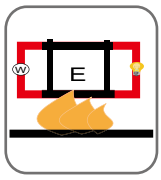
Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.									3 or 4 cables, three-phase a.c.												
		Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)						Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)								
					Cables touching			Cables spaced*						Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			4			5			6			7			8			9		
mm^2	mV/A/m				mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
150	0.32	0.33	0.26	0.43	0.32	0.165	0.36	0.32	0.25	0.41	0.29	0.23	0.37	0.28	0.140	0.31	0.28	0.165	0.32	0.28	0.24	0.37
185	0.25	0.27	0.26	0.37	0.26	0.165	0.30	0.25	0.25	0.36	0.23	0.23	0.32	0.22	0.140	0.26	0.22	0.165	0.28	0.22	0.24	0.33
240	0.190	0.21	0.26	0.33	0.20	0.160	0.25	0.195	0.25	0.31	0.185	0.22	0.29	0.170	0.140	0.22	0.170	0.165	0.24	0.170	0.24	0.29
300	0.155	0.175	0.25	0.31	0.160	0.160	0.22	0.155	0.25	0.29	0.150	0.22	0.27	0.140	0.140	0.195	0.135	0.160	0.21	0.135	0.24	0.27
400	0.120	0.140	0.25	0.29	0.130	0.155	0.20	0.125	0.24	0.27	0.125	0.22	0.25	0.110	0.135	0.175	0.110	0.160	0.195	0.110	0.24	0.26
500	0.093	0.120	0.25	0.28	0.105	0.155	0.185	0.098	0.24	0.26	0.100	0.22	0.24	0.090	0.135	0.160	0.088	0.160	0.180	0.085	0.24	0.25
630	0.072	0.100	0.25	0.27	0.086	0.155	0.175	0.078	0.24	0.25	0.088	0.21	0.23	0.074	0.135	0.150	0.071	0.160	0.170	0.068	0.23	0.24

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance

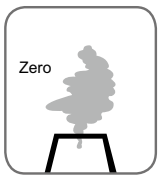
Rated Voltage

Standard



Circuit Integrity
IEC 60331-21/BS 6387/BS 8491


Flame Retardancy
IEC 60332-1-2



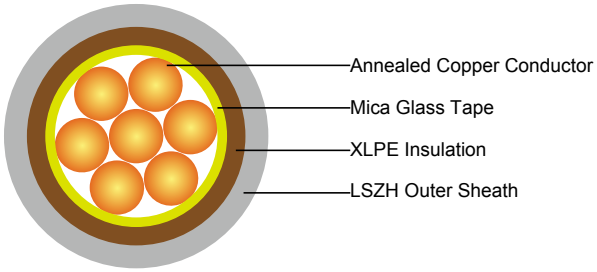
Halogen Free
IEC 60754-1


Low Corrosivity
IEC 60754-2


Low Smoke Emission
IEC 61034-2

450/750V Mica+XLPE Insulated, LSZH Sheathed Power Cables to BS 7211 (Single Core)

FFX300 07mRZ1-U/R (CU/MGT+XLPE/LSZH 450/750V Class 1/2)



APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS 7211:2012

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

450/750V

CABLE CONSTRUCTION

Conductor: Annealed copper conductor, solid or stranded according to BS EN 60228 class 1 or class 2.
Fire Barrier: Mica glass tape.
Insulation: XLPE type GP 8 according to BS 7655-1.3. Crosslinked polyolefin material type EI 5 according to EN 50363-5 can be offered as option.
Outer Sheath: Extruded LSZH type LTS 4 according to BS 7655-6.1.
Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

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COLOUR CODE

Insulation Colour: Brown or blue.

Sheath Colour: White; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius

OD<8mm: 4 × Overall Diameter

8mm≤OD≤12mm: 5 × Overall Diameter

OD>12mm: 6 × Overall Diameter

CONSTRUCTION PARAMETER

Conductor		FFX300 07mRZ1-U/R				
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Sheath Thickness	Min. Overall Diameter	Max. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	mm	kg/km
1×1.0	1	0.7	0.8	4.9	5.8	30
1×1.5	1	0.7	0.8	5.2	6.0	38
1×2.5	1	0.7	0.8	5.6	6.5	51
1×4	1	0.7	0.8	6.2	7.3	70
1×6	1	0.7	0.8	6.7	7.8	95
1×1.0	2	0.7	0.8	5.0	5.9	35
1×1.5	2	0.7	0.8	5.3	6.2	43
1×2.5	2	0.7	0.8	5.7	6.6	56
1×4	2	0.7	0.9	6.3	7.4	77
1×6	2	0.7	0.9	6.9	8.1	104
1×10	2	0.7	0.9	7.7	9.1	147
1×16	2	0.7	0.9	8.6	10.2	211
1×25	2	0.9	1.0	10.4	12.4	325
1×35	2	0.9	1.1	11.6	13.8	489

ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E1A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc)		Ref. Method B (enclosed in conduit on a wall or in trunking etc)		Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray, horizontal or vertical etc) Touching			Ref. Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
1.0	14	13	17	15	19	17.5	-	-	-	-	-
1.5	19	17	23	20	25	23	-	-	-	-	-
2.5	26	23	31	28	34	31	-	-	-	-	-
4	35	31	42	37	46	41	-	-	-	-	-
6	45	40	54	48	59	54	-	-	-	-	-
10	61	54	75	66	81	74	-	-	-	-	-
16	81	73	100	88	109	99	-	-	-	-	-
25	106	95	133	117	143	130	161	141	135	182	161
35	131	117	164	144	176	161	200	176	169	226	201

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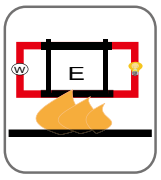
Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E1B

Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.									3 or 4 cables, three-phase a.c.											
		Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)						Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)								
					Cables touching			Cables spaced*						Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			4			5			6			7			8			9		
mm^2	mV/A/m				mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
1.0	46	46			46			46			40			40			40			40		
1.5	31	31			31			31			27			27			27			27		
2.5	19	19			19			19			16			16			16			16		
4	12	12			12			12			10			10			10			10		
6	7.9	7.9			7.9			7.9			6.8			6.8			6.8			6.8		
10	4.7	4.7			4.7			4.7			4.0			4.0			4.0			4.0		
16	2.9	2.9			2.9			2.9			2.5			2.5			2.5			2.5		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.85	1.85	0.31	1.90	1.85	0.190	1.85	1.85	0.28	1.85	1.60	0.27	1.65	1.60	0.165	1.60	1.60	0.190	1.60	1.60	0.27	1.65
35	1.35	1.35	0.29	1.35	1.35	0.180	1.35	1.35	0.27	1.35	1.15	0.25	1.15	1.15	0.155	1.15	1.15	0.180	1.15	1.15	0.26	1.20

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance

Rated Voltage

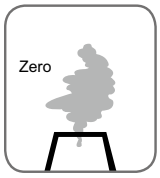
Standard



Circuit Integrity
IEC 60331-21/BS 6387

Flame Retardancy
IEC 60332-1-2

Reduced Fire Propagation
IEC 60332-3-24



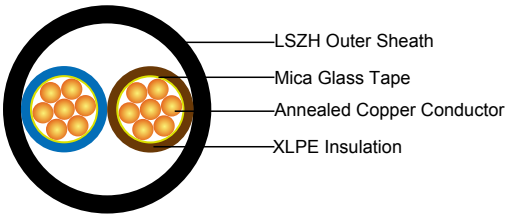
Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

450/750V Mica+XLPE Insulated, LSZH Sheathed Power Cables to BS 7211 (2-5 Cores)

FFX200 07mRZ1-U/R (CU/MGT+XLPE/LSZH 450/750V Class 1/2)



APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS 7211:2012

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

450/750V

CABLE CONSTRUCTION

Conductor: Annealed copper conductor, solid or stranded according to BS EN 60228 class 1 or class 2.
Fire Barrier: Mica glass tape.
Insulation: XLPE type GP 8 according to BS 7655-1.3. Crosslinked polyolefin material type EI 5 according to EN 50363-5 can be offered as option.
Inner Covering Option: The optional inner covering, where used, shall consist of an extruded layer of synthetic polymeric material. It shall surround the laid-up two, three, four or five cores, giving the assembly a practically circular shape.

Outer Sheath: Extruded LSZH type LTS 4 according to BS 7655-6.1.

Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Insulation Colour:

2-core: Brown and blue.

3-core: Brown, black and grey.

4-core: Blue, brown black and grey.

5-core: Green/yellow, blue, brown black and grey.

Sheath Colour: White; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius

OD<8mm: 4 × Overall Diameter

8mm≤OD≤12mm: 5 × Overall Diameter

OD>12mm: 6 × Overall Diameter

CONSTRUCTION PARAMETER

Conductor		FFX200 07mRZ1-U/R					
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Inner Covering Thickness	Nominal Sheath Thickness	Min. Overall Diameter	Max. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	mm	mm	kg/km
2×1.0	1	0.7	0.4	1.2	9.1	11.5	102
2×1.5	1	0.7	0.4	1.2	9.6	12.1	129
2×2.5	1	0.7	0.4	1.2	10.4	13.0	174
2×4	1	0.7	0.4	1.2	11.2	14.1	221
2×6	1	0.7	0.4	1.2	12.2	15.2	281
2×10	1	0.7	0.4	1.4	14.1	18.0	458
2×1.0	2	0.7	0.4	1.2	9.3	11.7	122
2×1.5	2	0.7	0.4	1.2	9.8	12.3	146
2×2.5	2	0.7	0.4	1.2	10.5	13.3	192
2×4	2	0.7	0.4	1.2	11.5	14.4	248
2×6	2	0.7	0.4	1.2	12.6	15.7	318
2×10	2	0.7	0.6	1.4	14.7	18.7	508
2×16	2	0.7	0.6	1.4	16.4	20.8	692
2×25	2	0.9	0.8	1.4	19.7	25.2	1063
2×35	2	0.9	0.8	1.6	22.0	28.0	1155
3×1.0	1	0.7	0.4	1.2	9.7	12.2	122
3×1.5	1	0.7	0.4	1.2	10.2	12.8	155
3×2.5	1	0.7	0.4	1.2	11.0	13.8	212

Conductor		FFX200 07mRZ1-U/R					
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Inner Covering Thickness	Nominal Sheath Thickness	Min. Overall Diameter	Max. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	mm	mm	kg/km
3×4	1	0.7	0.4	1.2	12.0	14.9	274
3×6	1	0.7	0.4	1.2	13.4	16.6	401
3×10	1	0.7	0.6	1.4	15.0	19.1	574
3×1.0	2	0.7	0.4	1.2	9.9	12.4	140
3×1.5	2	0.7	0.4	1.2	10.4	13.1	168
3×2.5	2	0.7	0.4	1.2	11.2	14.1	227
3×4	2	0.7	0.4	1.2	12.3	15.3	296
3×6	2	0.7	0.4	1.4	13.8	17.2	401
3×10	2	0.7	0.6	1.4	15.7	19.9	624
3×16	2	0.7	0.6	1.4	17.5	22.1	867
3×25	2	0.9	0.8	1.4	21.1	26.8	1338
3×35	2	0.9	0.8	1.6	23.5	29.8	1585
4×1.0	1	0.7	0.4	1.2	10.5	13.1	146
4×1.5	1	0.7	0.4	1.2	11.1	13.8	186
4×2.5	1	0.7	0.4	1.2	12.0	15.0	258
4×4	1	0.7	0.4	1.2	13.1	16.2	348
4×6	1	0.7	0.4	1.4	14.6	18.5	463
4×10	1	0.7	0.6	1.4	16.5	20.8	710
4×1.0	2	0.7	0.4	1.2	10.7	13.4	166
4×1.5	2	0.7	0.4	1.2	11.3	14.1	201
4×2.5	2	0.7	0.4	1.2	12.3	15.2	274
4×4	2	0.7	0.4	1.2	13.4	16.6	362
4×6	2	0.7	0.6	1.4	15.1	19.1	508
4×10	2	0.7	0.6	1.4	17.2	21.6	770
4×16	2	0.7	0.6	1.4	19.3	24.2	1078
4×25	2	0.9	0.8	1.6	23.6	29.9	1602
4×35	2	0.9	1.0	1.6	25.9	33.1	2076
5×1.0	1	0.7	0.4	1.2	11.5	14.2	177
5×1.5	1	0.7	0.4	1.2	12.1	15.0	228
5×2.5	1	0.7	0.4	1.2	13.2	16.3	318
5×4	1	0.7	0.4	1.4	14.7	18.6	445
5×6	1	0.7	0.6	1.4	16.0	20.2	574
5×10	1	0.7	0.6	1.4	18.1	22.7	887
5×1.0	2	0.7	0.4	1.2	11.7	14.6	203
5×1.5	2	0.7	0.4	1.2	12.4	15.3	247
5×2.5	2	0.7	0.4	1.2	13.4	16.6	340
5×4	2	0.7	0.6	1.4	15.1	19.1	483
5×6	2	0.7	0.6	1.4	16.5	20.8	633
5×10	2	0.7	0.6	1.4	18.9	23.6	968
5×16	2	0.7	0.8	1.4	21.2	26.9	1,359
5×25	2	0.9	1.0	1.6	26.0	33.2	1,899
5×35	2	0.9	1.0	1.6	28.6	36.3	2,539

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FIREFLIX Fire Resistant Power & Control Cables

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ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E2A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)		Ref. Method E (in free air or on a perforated cable tray etc. horizontal or vertical)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.0	14.5	13	17	15	19	17	21	18
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42
6	42	38	51	44	58	52	63	54
10	57	51	69	60	80	71	86	75
16	76	68	91	80	107	96	115	100
25	99	89	119	105	138	119	149	127
35	121	109	146	128	171	147	185	158

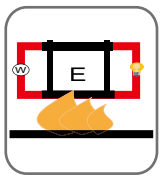
Note: *With or without a protective conductor.

Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E2B

Conductor cross-sectional area	Two-core cable, d.c.	Two-core cable, single-phase a.c.			Three- or four-core cable, three-phase a.c.		
1	2	3			4		
mm^2	mV/A/m	mV/A/m			mV/A/m		
1.0	46	46			40		
1.5	31	31			27		
2.5	19	19			16		
4	12	12			10		
6	7.9	7.9			6.8		
10	4.7	4.7			4.0		
16	2.9	2.9			2.5		
		r	x	z	r	x	z
25	1.85	1.85	0.160	1.90	1.60	0.140	1.65
35	1.35	1.35	0.155	1.35	1.15	0.135	1.15

Rated Voltage

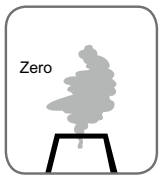
Standard



Circuit Integrity
IEC 60331-21/BS 6387/BS 8491

Flame Retardancy
IEC 60332-1-2

Reduced Fire Propagation
IEC 60332-3-24



Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

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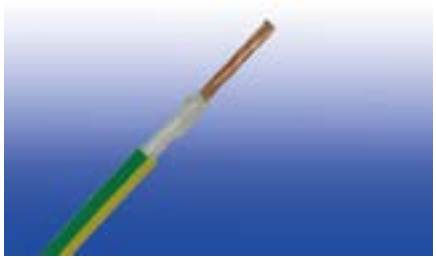
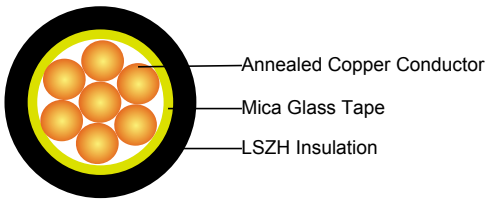
600/1000V Mica+LSZH Insulated, Non-sheathed Power Cables to BS EN 50525-3-31 (Single Core)

FFX100 1mZ1-R(CU/MGT+LSZH 600/1000V Class 2)





APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS EN 50525-3-31

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

600/1000V

CABLE CONSTRUCTION

Conductor: Copper conductor according to BS EN 60228 class 2.
Fire Barrier: Mica glass tape.
Insulation: Thermoplastic compound of type TI 7 to EN 50363-7.
Insulation Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Black, Blue, Brown, Grey, Orange, Pink, Red, Turquoise, Violet, White, Green and Yellow.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 70°C

Maximum short circuit temperature (5 Seconds): 160°C

Minimum bending radius

OD<8mm: 4 × Overall Diameter

8mm≤OD≤12mm: 5 × Overall Diameter

OD>12mm: 6 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX100 1mZ1-R			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Min. Overall Diameter	Max. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	kg/km
1×1.5	2	0.7	3.7	4.3	28
1×2.5	2	0.8	4.3	5.0	42
1×4	2	0.8	4.8	5.6	59
1×6	2	0.8	5.3	6.2	81
1×10	2	1.0	6.6	7.7	133
1×16	2	1.0	7.4	8.8	197
1×25	2	1.2	9.1	10.7	308
1×35	2	1.2	10.0	11.9	412
1×50	2	1.4	11.6	13.8	558
1×70	2	1.4	13.1	15.6	782
1×95	2	1.6	15.1	18.1	1078
1×120	2	1.6	16.6	19.8	1342
1×150	2	1.8	18.3	21.9	1650
1×185	2	2.0	20.3	24.3	2067
1×240	2	2.2	23	27.6	2703
1×300	2	2.4	25.5	30.6	3378
1×400	2	2.6	28.5	34.2	4267
1×500	2	2.8	31.5	37.9	5359
1×630	2	2.8	35	42.1	6884

ELECTRICAL PROPERTIES

Conductor operating temperature: 70°C

Ambient temperature: 30°C

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Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4D1A

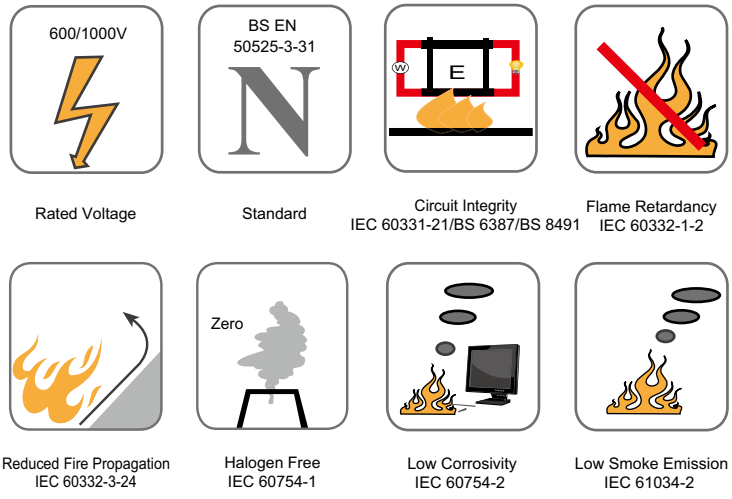
Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray horizontal or vertical)				
							Touching			Spaced by one diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
1.5	14.5	13.5	17.5	15.5	20	18	-	-	-	-	-
2.5	20	18	24	21	27	25	-	-	-	-	-
4	26	24	32	28	37	33	-	-	-	-	-
6	34	31	41	36	47	43	-	-	-	-	-
10	46	42	57	50	65	59	-	-	-	-	-
16	61	56	76	68	87	79	-	-	-	-	-
25	80	73	101	89	114	104	131	114	110	146	130
35	99	89	125	110	141	129	162	143	137	181	162
50	119	108	151	134	182	167	196	174	167	219	197
70	151	136	192	171	234	214	251	225	216	281	254
95	182	164	232	207	284	261	304	275	264	341	311
120	210	188	269	239	330	303	352	321	308	396	362
150	240	216	300	262	381	349	406	372	356	456	419
185	273	245	341	296	436	400	463	427	409	521	480
240	321	286	400	346	515	472	546	507	485	615	569
300	367	328	458	394	594	545	629	587	561	709	659
400	-	-	546	467	694	634	754	689	656	852	795
500	-	-	626	533	792	723	868	789	749	982	920
630	-	-	720	611	904	826	1005	905	855	1138	1070

Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4D1B

Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.			3 or 4 cables, three-phase a.c.			
		Ref. Methods A&B (enclosed in conduit or trunking)	Ref. Methods C & F(clipped direct, on trays or in free air)		Ref. Methods A & B (enclosed in conduit or trunking)	Ref. Methods C & F (clipped direct, on trays or in free air)		
			Cables touching	Cables spaced*		Cables touching, Trefoil	Cables touching, Flat	Cables spaced*, Flat
1	2	3	4	5	6	7	8	9
mm^2	mV/A/m		mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m
1.5	29	29	29	29	25	25	25	25
2.5	18	18	18	18	15	15	15	15
4	11	11	11	11	9.5	9.5	9,5	9.5
6	7.3	7.3	7.3	7.3	6.4	6.4	6.4	6.4

Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.									3 or 4 cables, three-phase a.c.											
		Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C & F(clipped direct, on trays or in free air)						Ref. Methods A & B (enclosed in conduit or trunking)			Ref. Methods C & F (clipped direct, on trays or in free air)								
					Cables touching			Cables spaced*						Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			4			5			6			7			8			9		
mm^2	mV/A/m				mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
10	4.4	4.4			4.4			4.4			3.8			3.8			3.8			3.8		
16	2.8	2.8			2.8			2.8			2.4			2.4			2.4			2.4		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.75	1.80	0.33	1.80	1.75	0.20	1.75	1.75	0.29	1.80	1.50	0.29	1.55	1.50	0.175	1.50	1.50	0.25	1.55	1.50	0.32	1.55
35	1.25	1.30	0.31	1.30	1.25	0.195	1.25	1.25	0.28	1.30	1.10	0.27	1.10	1.10	0.170	1.10	1.10	0.24	1.10	1.10	0.32	1.15
50	0.93	0.95	0.3	1.0	0.93	0.19	0.95	0.93	0.28	0.97	0.81	0.26	0.85	0.8	0.165	0.82	0.8	0.24	0.84	0.8	0.32	0.86
70	0.63	0.65	0.29	0.72	0.63	0.185	0.66	0.63	0.27	0.69	0.56	0.25	0.61	0.55	0.16	0.57	0.55	0.24	0.6	0.55	0.31	0.63
95	0.46	0.49	0.28	0.56	0.47	0.18	0.50	0.47	0.27	0.54	0.42	0.24	0.48	0.41	0.155	0.43	0.41	0.23	0.47	0.4	0.31	0.51
120	0.36	0.39	0.27	0.47	0.37	0.175	0.41	0.37	0.26	0.45	0.33	0.23	0.41	0.32	0.15	0.36	0.32	0.23	0.4	0.32	0.3	0.44
150	0.29	0.31	0.27	0.41	0.3	0.175	0.34	0.29	0.26	0.39	0.27	0.23	0.36	0.26	0.15	0.3	0.26	0.23	0.34	0.26	0.3	0.40
185	0.23	0.25	0.27	0.37	0.24	0.17	0.29	0.24	0.26	0.35	0.22	0.23	0.32	0.21	0.145	0.26	0.21	0.22	0.31	0.21	0.3	0.36
240	0.18	0.195	0.26	0.33	0.185	0.165	0.25	0.185	0.25	0.31	0.17	0.23	0.29	0.16	0.145	0.22	0.16	0.22	0.27	0.16	0.29	0.34
300	0.145	0.16	0.26	0.31	0.15	0.165	0.22	0.15	0.25	0.29	0.14	0.23	0.27	0.13	0.14	0.19	0.13	0.22	0.25	0.13	0.29	0.32
400	0.105	0.13	0.26	0.29	0.12	0.16	0.20	0.115	0.25	0.27	0.12	0.22	0.25	0.105	0.14	0.175	0.105	0.21	0.24	0.1	0.29	0.31
500	0.086	0.11	0.26	0.28	0.098	0.155	0.185	0.093	0.24	0.26	0.1	0.22	0.25	0.086	0.135	0.16	0.086	0.21	0.23	0.081	0.29	0.30
630	0.068	0.094	0.25	0.27	0.081	0.155	0.175	0.076	0.24	0.25	0.08	0.22	0.24	0.072	0.135	0.15	0.072	0.21	0.22	0.066	0.28	0.29

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance



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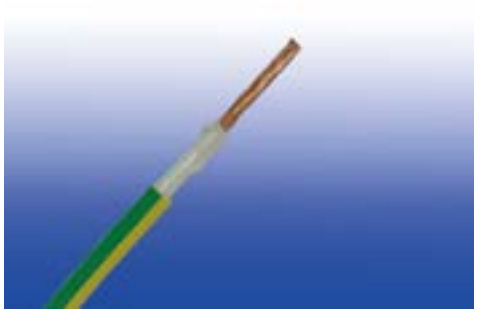
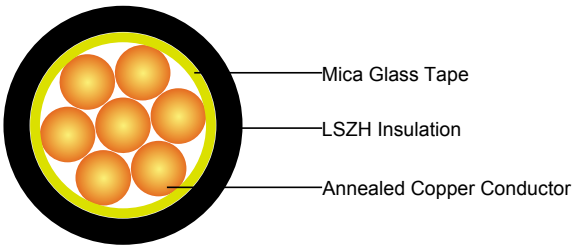
600/1000V Mica+LSZH Insulated, Non-sheathed Power Cables to BS EN 50525-3-41 (Single Core)

FFX100 1mZ-R (CU/MGT+LSZH 600/1000V Class 2)





APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS EN 50525-3-41

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

600/1000V

CABLE CONSTRUCTION

Conductor: Annealed copper conductor, stranded according to BS EN 60228 class 2.
Fire Barrier: Mica glass tape.
Insulation: Crosslinked polyolefin material type EI 5 according to EN 50363-5.
Insulation Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Black, Blue, Brown, Grey, Orange, Pink, Red, Turquoise, Violet, White, Green and Yellow. Bi-colours of any combination of the above mono-colours are permitted.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius

OD<8mm: 4 × Overall Diameter

8mm≤OD≤12mm: 5 × Overall Diameter

OD>12mm: 6 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX100 1mZ-R		
No. of Cores x Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
No.xmm^2		mm	mm	kg/km
1x1.5	2	0.7	4.1	27
1x2.5	2	0.8	4.7	39
1x4.0	2	0.8	5.3	57
1x6.0	2	0.8	5.8	78
1x10	2	1.0	7.2	125
1x16	2	1.0	8.2	186
1x25	2	1.2	10.0	291
1x35	2	1.2	11.2	382
1x50	2	1.4	13.0	517
1x70	2	1.4	15.0	728
1x95	2	1.6	17.0	1003
1x120	2	1.6	19.0	1239
1x150	2	1.8	21.0	1529
1x185	2	2.0	23.0	1910
1x240	2	2.2	26.0	2492
1x300	2	2.4	29.0	3113
1x400	2	2.6	32.5	3964
1x500	2	2.8	36.0	4965
1x630	2	2.8	40.0	6376

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ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E1A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray, horizontal or vertical etc.) Touching			Ref. Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
1.5	19	17	23	20	25	23	-	-	-	-	-
2.5	26	23	31	28	34	31	-	-	-	-	-
4.0	35	31	42	37	46	41	-	-	-	-	-
6.0	45	40	54	48	59	54	-	-	-	-	-
10	61	54	75	66	81	74	-	-	-	-	-
16	81	73	100	88	109	99	-	-	-	-	-
25	106	95	133	117	143	130	161	141	135	182	161
35	131	117	164	144	176	161	200	176	169	226	201
50	158	141	198	175	228	209	242	216	207	275	246
70	200	179	253	222	293	268	310	279	268	353	318
95	241	216	306	269	355	326	377	342	328	430	389
120	278	249	354	312	413	379	437	400	383	500	454
150	318	285	393	342	476	436	504	464	444	577	527
185	362	324	449	384	545	500	575	533	510	661	605
240	424	380	528	450	644	590	679	634	607	781	719
300	486	435	603	514	743	681	783	736	703	902	833
400	-	-	683	584	868	793	940	868	823	1085	1008
500	-	-	783	666	990	904	1083	998	946	1253	1169
630	-	-	900	764	1130	1033	1254	1151	1088	1454	1362

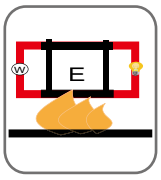
Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E1B

Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.									3 or 4 cables, three-phase a.c.											
		Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)						Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)								
					Cables touching			Cables spaced*						Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			4			5			6			7			8			9		
mm^2	mV/A/m				mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
1.5	31	31			31			31			27			27			27			27		
2.5	19	19			19			19			16			16			16			16		
4.0	12	12			12			12			10			10			10			10		
6.0	7.9	7.9			7.9			7.9			6.8			6.8			6.8			6.8		
10	4.7	4.7			4.7			4.7			4.0			4.0			4.0			4.0		
16	2.9	2.9			2.9			2.9			2.5			2.5			2.5			2.5		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.85	1.85	0.31	1.90	1.85	0.190	1.85	1.85	0.28	1.85	1.60	0.27	1.65	1.60	0.165	1.60	1.60	0.190	1.60	1.60	0.27	1.65
35	1.35	1.35	0.29	1.35	1.35	0.180	1.35	1.35	0.27	1.35	1.15	0.25	1.15	1.15	0.155	1.15	1.15	0.180	1.15	1.15	0.26	1.20
50	0.99	1.00	0.29	1.05	0.99	0.180	1.00	0.99	0.27	1.00	0.87	0.25	0.90	0.86	0.155	0.87	0.86	0.180	0.87	0.86	0.26	0.89
70	0.68	0.70	0.28	0.75	0.68	0.175	0.71	0.68	0.26	0.73	0.60	0.24	0.65	0.59	0.150	0.61	0.59	0.175	0.62	0.59	0.25	0.65
95	0.49	0.51	0.27	0.58	0.49	0.170	0.52	0.49	0.26	0.56	0.44	0.23	0.50	0.43	0.145	0.45	0.43	0.170	0.46	0.43	0.25	0.49
120	0.39	0.41	0.26	0.48	0.39	0.165	0.43	0.39	0.25	0.47	0.35	0.23	0.42	0.34	0.140	0.37	0.34	0.165	0.38	0.34	0.24	0.42
150	0.32	0.33	0.26	0.43	0.32	0.165	0.36	0.32	0.25	0.41	0.29	0.23	0.37	0.28	0.140	0.31	0.28	0.165	0.32	0.28	0.24	0.37
185	0.25	0.27	0.26	0.37	0.26	0.165	0.30	0.25	0.25	0.36	0.23	0.23	0.32	0.22	0.140	0.26	0.22	0.165	0.28	0.22	0.24	0.33
240	0.190	0.21	0.26	0.33	0.20	0.160	0.25	0.195	0.25	0.31	0.185	0.22	0.29	0.170	0.140	0.22	0.170	0.165	0.24	0.170	0.24	0.29
300	0.155	0.175	0.25	0.31	0.160	0.160	0.22	0.155	0.25	0.29	0.150	0.22	0.27	0.140	0.140	0.195	0.135	0.160	0.21	0.135	0.24	0.27
400	0.120	0.140	0.25	0.29	0.130	0.155	0.20	0.125	0.24	0.27	0.125	0.22	0.25	0.110	0.135	0.175	0.110	0.160	0.195	0.110	0.24	0.26
500	0.093	0.120	0.25	0.28	0.105	0.155	0.185	0.098	0.24	0.26	0.100	0.22	0.24	0.090	0.135	0.160	0.088	0.160	0.180	0.085	0.24	0.25
630	0.072	0.100	0.25	0.27	0.086	0.155	0.175	0.078	0.24	0.25	0.088	0.21	0.23	0.074	0.135	0.150	0.071	0.160	0.170	0.068	0.23	0.24

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance

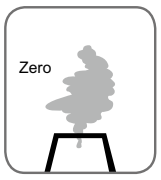
Rated Voltage

Standard



Circuit Integrity
IEC 60331-21/BS 6387/BS 8491


Flame Retardancy
IEC 60332-1-2



Halogen Free
IEC 60754-1


Low Corrosivity
IEC 60754-2


Low Smoke Emission
IEC 61034-2

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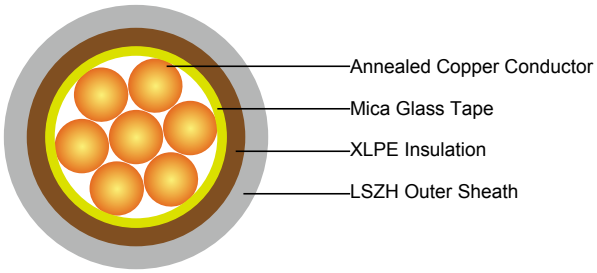
600/1000V Mica+XLPE Insulated, LSZH Sheathed Power Cables to BS 8573 (Single Core)

FFX300 1mRZ1-R (CU/MGT+XLPE/LSZH 600/1000V Class 2)



APPLICATION

These XLPE insulated and LSZH sheathed cables are generally used for fixed installation. Suitable for building wiring, especially in areas where smoke and fume emissions may cause a potential threat to life but not for burial in the ground, either directly or in ducts.

STANDARDS

Basic design adapted from BS 8573:2012

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

600/1000V

CABLE CONSTRUCTION

Conductor: Annealed copper conductor, stranded according to BS EN 60228 class 2.
Fire Barrier: Mica glass tape.
Insulation: XLPE type GP 8 according to BS 7655-1.3. HEPR type GP 6 according to BS 7655-1.2 or crosslinked polyolefin material type EI 5 according to BS EN 50363-5 can be offered as option.
Inner Covering Option: The optional inner covering, where used, shall consist of an extruded layer of synthetic polymeric material. It shall surround the single core and the laid-up two, three, four or five cores, giving the assembly a practically circular shape.

Outer Sheath: Extruded layer of polymeric material LTS 4 according to BS 7655-6.1.

Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Insulation Colour: Brown or blue.

Sheath Colour: Black; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius

circular copper conductors OD≤25mm: 4 × Overall Diameter

circular copper conductors OD>25mm: 6 × Overall Diameter

shaped copper conductors: 8 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX300 1mRZ1-R				
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Inner Covering Thickness	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	mm	kg/km
1×1.5	2	0.7	0.4	1.4	6.8	58
1×2.5	2	0.7	0.4	1.4	7.2	71
1×4	2	0.7	0.4	1.4	7.8	92
1×6	2	0.7	0.4	1.4	8.3	118
1×10	2	0.7	0.4	1.4	9.3	168
1×16	2	0.7	0.4	1.4	10.3	238
1×25	2	0.9	0.4	1.4	12.0	352
1×35	2	0.9	0.4	1.4	13.2	463
1×50	2	1.0	0.6	1.4	14.7	606
1×70	2	1.1	0.6	1.4	16.7	843
1×95	2	1.1	0.6	1.5	18.8	1139
1×120	2	1.2	0.8	1.5	20.6	1416
1×150	2	1.4	0.8	1.6	22.8	1736
1×185	2	1.6	0.8	1.6	25.0	2154
1×240	2	1.7	1.0	1.7	28.1	2798
1×300	2	1.8	1.0	1.8	30.9	3479
1×400	2	2.0	1.2	1.9	34.5	4419
1×500	2	2.2	1.2	2.0	38.2	5535
1×630	2	2.4	1.4	2.2	43.0	7113
1×800	2	2.6	1.6	2.3	47.9	9026
1×1000	2	2.8	1.6	2.4	53.0	11302

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ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

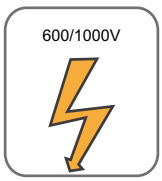
Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E1A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray, horizontal or vertical etc.) Touching			Ref. Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
1.5	19	17	23	20	25	23	-	-	-	-	-
2.5	26	23	31	28	34	31	-	-	-	-	-
4	35	31	42	37	46	41	-	-	-	-	-
6	45	40	54	48	59	54	-	-	-	-	-
10	61	54	75	66	81	74	-	-	-	-	-
16	81	73	100	88	109	99	-	-	-	-	-
25	106	95	133	117	143	130	161	141	135	182	161
35	131	117	164	144	176	161	200	176	169	226	201
50	158	141	198	175	228	209	242	216	207	275	246
70	200	179	253	222	293	268	310	279	268	353	318
95	241	216	306	269	355	326	377	342	328	430	389
120	278	249	354	312	413	379	437	400	383	500	454
150	318	285	393	342	476	436	504	464	444	577	527
185	362	324	449	384	545	500	575	533	510	661	605
240	424	380	528	450	644	590	679	634	607	781	719
300	486	435	603	514	743	681	783	736	703	902	833
400	-	-	683	584	868	793	940	868	823	1085	1008
500	-	-	783	666	990	904	1083	998	946	1253	1169
630	-	-	900	764	1130	1033	1254	1151	1088	1454	1362
800	-	-	-	-	1288	1179	1358	1275	1214	1581	1485
1000	-	-	-	-	1443	1323	1520	1436	1349	1775	1671

Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E1B

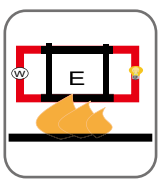
Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.									3 or 4 cables, three-phase a.c.											
		Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)						Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)								
					Cables touching			Cables spaced*						Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			4			5			6			7			8			9		
mm^2		mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
1.5	31	31			31			31			27			27			27			27		
2.5	19	19			19			19			16			16			16			16		
4	12	12			12			12			10			10			10			10		
6	7.9	7.9			7.9			7.9			6.8			6.8			6.8			6.8		
10	4.7	4.7			4.7			4.7			4.0			4.0			4.0			4.0		
16	2.9	2.9			2.9			2.9			2.5			2.5			2.5			2.5		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.85	1.85	0.31	1.90	1.85	0.190	1.85	1.85	0.28	1.85	1.60	0.27	1.65	1.60	0.165	1.60	1.60	0.190	1.60	1.60	0.27	1.65
35	1.35	1.35	0.29	1.35	1.35	0.180	1.35	1.35	0.27	1.35	1.15	0.25	1.15	1.15	0.155	1.15	1.15	0.180	1.15	1.15	0.26	1.20
50	0.99	1.00	0.29	1.05	0.99	0.180	1.00	0.99	0.27	1.00	0.87	0.25	0.90	0.86	0.155	0.87	0.86	0.180	0.87	0.86	0.26	0.89
70	0.68	0.70	0.28	0.75	0.68	0.175	0.71	0.68	0.26	0.73	0.60	0.24	0.65	0.59	0.150	0.61	0.59	0.175	0.62	0.59	0.25	0.65
95	0.49	0.51	0.27	0.58	0.49	0.170	0.52	0.49	0.26	0.56	0.44	0.23	0.50	0.43	0.145	0.45	0.43	0.170	0.46	0.43	0.25	0.49
120	0.39	0.41	0.26	0.48	0.39	0.165	0.43	0.39	0.25	0.47	0.35	0.23	0.42	0.34	0.140	0.37	0.34	0.165	0.38	0.34	0.24	0.42
150	0.32	0.33	0.26	0.43	0.32	0.165	0.36	0.32	0.25	0.41	0.29	0.23	0.37	0.28	0.140	0.31	0.28	0.165	0.32	0.28	0.24	0.37
185	0.25	0.27	0.26	0.37	0.26	0.165	0.30	0.25	0.25	0.36	0.23	0.23	0.32	0.22	0.140	0.26	0.22	0.165	0.28	0.22	0.24	0.33
240	0.190	0.21	0.26	0.33	0.20	0.160	0.25	0.195	0.25	0.31	0.185	0.22	0.29	0.170	0.140	0.22	0.170	0.165	0.24	0.170	0.24	0.29
300	0.155	0.175	0.25	0.31	0.160	0.160	0.22	0.155	0.25	0.29	0.150	0.22	0.27	0.140	0.140	0.195	0.135	0.160	0.21	0.135	0.24	0.27
400	0.120	0.140	0.25	0.29	0.130	0.155	0.20	0.125	0.24	0.27	0.125	0.22	0.25	0.110	0.135	0.175	0.110	0.160	0.195	0.110	0.24	0.26
500	0.093	0.120	0.25	0.28	0.105	0.155	0.185	0.098	0.24	0.26	0.100	0.22	0.24	0.090	0.135	0.160	0.088	0.160	0.180	0.085	0.24	0.25
630	0.072	0.100	0.25	0.27	0.086	0.155	0.175	0.078	0.24	0.25	0.088	0.21	0.23	0.074	0.135	0.150	0.071	0.160	0.170	0.068	0.23	0.24
800	0.056	-			0.072	0.150	0.170	0.064	0.24	0.25	-			0.062	0.130	0.145	0.059	0.155	0.165	0.055	0.23	0.24
1000	0.045	-			0.063	0.150	0.165	0.054	0.24	0.24	-			0.055	0.130	0.145	0.050	0.155	0.165	0.047	0.23	0.24

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance



Rated Voltage

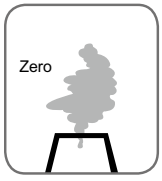
Standard



Circuit Integrity
IEC 60331-21/BS 6387/BS 8491


Flame Retardancy
IEC 60332-1-2


Reduced Fire Propagation
IEC 60332-3-24



Halogen Free
IEC 60754-1


Low Corrosivity
IEC 60754-2


Low Smoke Emission
IEC 61034-2

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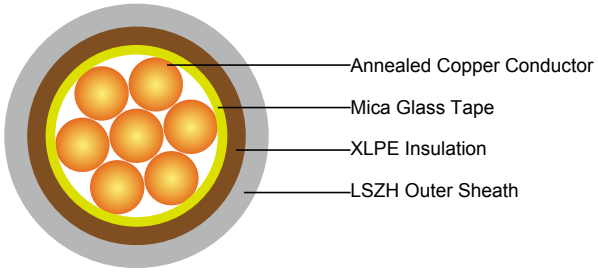
600/1000V Mica+XLPE Insulated, LSZH Sheathed Power Cables to IEC 60502-1 (Single Core)

FFX300 1mRZ1-R (CU/MGT+XLPE/LSZH 600/1000V Class 2)



APPLICATION

These XLPE insulated and LSZH sheathed cables are generally used for fixed installation. Suitable for building wiring, especially in areas where smoke and fume emissions may cause a potential threat to life but not for burial in the ground, either directly or in ducts.

STANDARDS

Basic design adapted from IEC 60502-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

600/1000V

CABLE CONSTRUCTION

Conductor: The conductors shall be class 2 plain or metal-coated annealed copper in accordance with IEC 60228. Class 1 and class 5 conductor can be offered as option.

Fire Barrier: Mica glass tape.

Insulation: Thermosetting XLPE compound as per IEC 60502-1.

Outer Sheath: Thermoplastic halogen free compound ST_8 as per IEC 60502-1.

Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Insulation Colour: Brown or blue; other colours can be offered upon request.

Sheath Colour: Black; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius:

circular copper conductors OD≤25mm: 4 × Overall Diameter

circular copper conductors OD>25mm: 6 × Overall Diameter

shaped copper conductors: 8 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX300 1mRZ1-R			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	kg/km
1×1.5	2	0.7	1.4	6.8	58
1×2.5	2	0.7	1.4	7.2	71
1×4	2	0.7	1.4	7.8	92
1×6	2	0.7	1.4	8.3	118
1×10	2	0.7	1.4	9.3	168
1×16	2	0.7	1.4	10.3	238
1×25	2	0.9	1.4	12.0	352
1×35	2	0.9	1.4	13.2	463
1×50	2	1.0	1.4	14.7	606
1×70	2	1.1	1.4	16.7	843
1×95	2	1.1	1.5	18.8	1139
1×120	2	1.2	1.5	20.6	1416
1×150	2	1.4	1.6	22.8	1736
1×185	2	1.6	1.6	25.0	2154
1×240	2	1.7	1.7	28.1	2798
1×300	2	1.8	1.8	30.9	3479
1×400	2	2.0	1.9	34.5	4419
1×500	2	2.2	2.0	38.2	5535
1×630	2	2.4	2.2	43.0	7113

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Conductor		FFX300 1mRZ1-R			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	kg/km
1×800	2	2.6	2.3	47.9	9026
1×1000	2	2.8	2.4	53.0	11302

ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E1A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray, horizontal or vertical etc.) Touching			Ref. Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
1.5	19	17	23	20	25	23	-	-	-	-	-
2.5	26	23	31	28	34	31	-	-	-	-	-
4	35	31	42	37	46	41	-	-	-	-	-
6	45	40	54	48	59	54	-	-	-	-	-
10	61	54	75	66	81	74	-	-	-	-	-
16	81	73	100	88	109	99	-	-	-	-	-
25	106	95	133	117	143	130	161	141	135	182	161
35	131	117	164	144	176	161	200	176	169	226	201
50	158	141	198	175	228	209	242	216	207	275	246
70	200	179	253	222	293	268	310	279	268	353	318
95	241	216	306	269	355	326	377	342	328	430	389
120	278	249	354	312	413	379	437	400	383	500	454
150	318	285	393	342	476	436	504	464	444	577	527
185	362	324	449	384	545	500	575	533	510	661	605
240	424	380	528	450	644	590	679	634	607	781	719
300	486	435	603	514	743	681	783	736	703	902	833
400	-	-	683	584	868	793	940	868	823	1085	1008
500	-	-	783	666	990	904	1083	998	946	1253	1169
630	-	-	900	764	1130	1033	1254	1151	1088	1454	1362
800	-	-	-	-	1288	1179	1358	1275	1214	1581	1485

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray, horizontal or vertical etc.) Touching			Ref. Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
1000	-	-	-	-	1443	1323	1520	1436	1349	1775	1671

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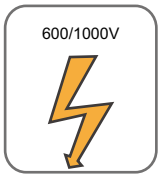
Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E1B

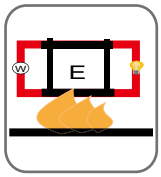
Conductor cross-sectional area	2 cables d.c.	2 cables, single-phase a.c.									3 or 4 cables, three-phase a.c.											
		Ref. Methods A&B (enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)						Ref. Methods A&B(enclosed in conduit or trunking)			Ref. Methods C, F&G (clipped direct, on trays or in free air)								
					Cables touching			Cables spaced*						Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			4			5			6			7			8			9		
mm^2		mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
1.5	31	31			31			31			27			27			27			27		
2.5	19	19			19			19			16			16			16			16		
4	12	12			12			12			10			10			10			10		
6	7.9	7.9			7.9			7.9			6.8			6.8			6.8			6.8		
10	4.7	4.7			4.7			4.7			4.0			4.0			4.0			4.0		
16	2.9	2.9			2.9			2.9			2.5			2.5			2.5			2.5		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.85	1.85	0.31	1.90	1.85	0.190	1.85	1.85	0.28	1.85	1.60	0.27	1.65	1.60	0.165	1.60	1.60	0.190	1.60	1.60	0.27	1.65
35	1.35	1.35	0.29	1.35	1.35	0.180	1.35	1.35	0.27	1.35	1.15	0.25	1.15	1.15	0.155	1.15	1.15	0.180	1.15	1.15	0.26	1.20
50	0.99	1.00	0.29	1.05	0.99	0.180	1.00	0.99	0.27	1.00	0.87	0.25	0.90	0.86	0.155	0.87	0.86	0.180	0.87	0.86	0.26	0.89
70	0.68	0.70	0.28	0.75	0.68	0.175	0.71	0.68	0.26	0.73	0.60	0.24	0.65	0.59	0.150	0.61	0.59	0.175	0.62	0.59	0.25	0.65
95	0.49	0.51	0.27	0.58	0.49	0.170	0.52	0.49	0.26	0.56	0.44	0.23	0.50	0.43	0.145	0.45	0.43	0.170	0.46	0.43	0.25	0.49
120	0.39	0.41	0.26	0.48	0.39	0.165	0.43	0.39	0.25	0.47	0.35	0.23	0.42	0.34	0.140	0.37	0.34	0.165	0.38	0.34	0.24	0.42
150	0.32	0.33	0.26	0.43	0.32	0.165	0.36	0.32	0.25	0.41	0.29	0.23	0.37	0.28	0.140	0.31	0.28	0.165	0.32	0.28	0.24	0.37
185	0.25	0.27	0.26	0.37	0.26	0.165	0.30	0.25	0.25	0.36	0.23	0.23	0.32	0.22	0.140	0.26	0.22	0.165	0.28	0.22	0.24	0.33
240	0.190	0.21	0.26	0.33	0.20	0.160	0.25	0.195	0.25	0.31	0.185	0.22	0.29	0.170	0.140	0.22	0.170	0.165	0.24	0.170	0.24	0.29
300	0.155	0.175	0.25	0.31	0.160	0.160	0.22	0.155	0.25	0.29	0.150	0.22	0.27	0.140	0.140	0.195	0.135	0.160	0.21	0.135	0.24	0.27
400	0.120	0.140	0.25	0.29	0.130	0.155	0.20	0.125	0.24	0.27	0.125	0.22	0.25	0.110	0.135	0.175	0.110	0.160	0.195	0.110	0.24	0.26
500	0.093	0.120	0.25	0.28	0.105	0.155	0.185	0.098	0.24	0.26	0.100	0.22	0.24	0.090	0.135	0.160	0.088	0.160	0.180	0.085	0.24	0.25
630	0.072	0.100	0.25	0.27	0.086	0.155	0.175	0.078	0.24	0.25	0.088	0.21	0.23	0.074	0.135	0.150	0.071	0.160	0.170	0.068	0.23	0.24
800	0.056	-			0.072	0.150	0.170	0.064	0.24	0.25	-			0.062	0.130	0.145	0.059	0.155	0.165	0.055	0.23	0.24
1000	0.045	-			0.063	0.150	0.165	0.054	0.24	0.24	-			0.055	0.130	0.145	0.050	0.155	0.165	0.047	0.23	0.24

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance



Rated Voltage

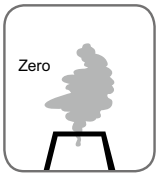
Standard



Circuit Integrity
IEC 60331-21/BS6387/BS 8491

Flame Retardancy
IEC 60332-1-2

Reduced Fire Propagation
IEC 60332-3-24



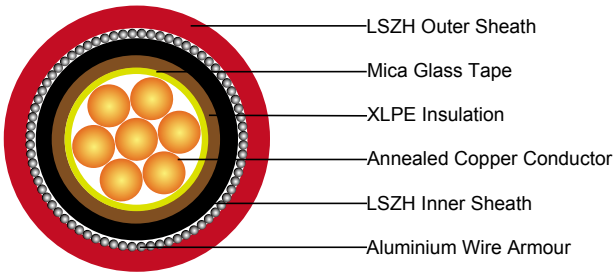
Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

600/1000V Mica+XLPE Insulated, LSZH Sheathed, Armoured Power Cables to BS 6724 (Single Core)

FFX300 1mRZ1MAZ1-R (CU/MGT+XLPE/LSZH/AWA/LSZH 600/1000V Class 2)



APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS 6724

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

600/1000V

CABLE CONSTRUCTION

Conductor: Annealed copper wire, stranded according to BS EN 60228 class 2.
Fire Barrier: Mica glass tape.
Insulation: XLPE type GP 8 according to BS 7655-1.3. HEPR type GP 6 according to BS 7655-1.2 or crosslinked polyolefin material type EI 5 according to BS EN 50363-5 can be offered as option.
Bedding: Extruded layer of polymeric material.
Armouring: Aluminium wire.

Outer Sheath: Extruded layer of polymeric material LTS 1 according to BS 7655-6.1.

Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Insulation Colour: Brown or blue; other colours can be offered upon request.

Sheath Colour: Black; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius: 6 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX300 1mRZ1MAZ1-R					
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Bedding Thickness	Nominal AL Wire Armour Diameter	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm²		mm	mm	mm	mm	mm	kg/km
1×50	2	1.0	0.8	0.9	1.5	18.5	696
1×70	2	1.1	0.8	1.25	1.5	21.2	949
1×95	2	1.1	0.8	1.25	1.6	23.3	1253
1×120	2	1.2	0.8	1.25	1.6	25.2	1533
1×150	2	1.4	1.0	1.6	1.7	28.4	1863
1×185	2	1.6	1.0	1.6	1.8	31.0	2304
1×240	2	1.7	1.0	1.6	1.8	33.8	2938
1×300	2	1.8	1.0	1.6	1.9	36.6	3626
1×400	2	2.0	1.2	2.0	2.0	41.5	4668
1×500	2	2.2	1.2	2.0	2.1	45.2	5795
1×630	2	2.4	1.2	2.0	2.2	49.8	7357
1×800	2	2.6	1.4	2.5	2.4	56.4	9380
1×1000	2	2.8	1.4	2.5	2.5	61.6	11660

ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E3A

Conductor cross-sectional area	Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray, horizontal or vertical)								
	Touching		Touching			Spaced by on cable diameter					
	2 cables, single-phase a.c. or d.c. flat	3 or 4 cables, three-phase a.c. flat	2 cables, single-phase a.c. or d.c. flat	3 or 4 cables, three-phase a.c. flat	3 cables three-phase a.c. trefoil	2 cables, d.c.		2 cables, single-phase a.c.		3 or 4 cables, three-phase a.c.	
						Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
50	237	220	253	232	222	284	270	282	266	288	266
70	303	277	322	293	285	356	349	357	337	358	331
95	367	333	389	352	346	446	426	436	412	425	393
120	425	383	449	405	402	519	497	504	477	485	449
150	488	437	516	462	463	600	575	566	539	549	510
185	557	496	587	524	529	688	660	643	614	618	574
240	656	579	689	612	625	815	782	749	714	715	666
300	755	662	792	700	720	943	906	842	805	810	755
400	853	717	899	767	815	1137	1094	929	889	848	797
500	962	791	1016	851	918	1314	1266	1032	989	923	871
630	1082	861	1146	935	1027	1528	1474	1139	1092	992	940
800	1170	904	1246	987	1119	1809	1744	1204	1155	1042	978
1000	1261	961	1345	1055	1214	2100	2026	1289	1238	1110	1041

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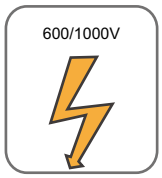
Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E3B

Conductor cross-sectional area	2 cables d.c.	Ref. Methods C&F (clipped direct, on trays or in free air)														
		2 cables, single-phase a.c.						3 or 4 cables, three-phase a.c.								
		Touching			Spaced*			Trefoil and touching			Flat and touching			Flat and spaced*		
1	2	3			4			5			6			7		
mm^2	mV/A/m				mV/A/m			mV/A/m			mV/A/m			mV/A/m		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
50	0.98	0.99	0.21	1.00	0.98	0.29	1.00	0.86	0.180	0.87	0.84	0.25	0.88	0.84	0.33	0.90
70	0.67	0.68	0.20	0.71	0.69	0.29	0.75	0.59	0.170	0.62	0.60	0.25	0.65	0.62	0.32	0.70
95	0.49	0.51	0.195	0.55	0.53	0.28	0.60	0.44	0.170	0.47	0.46	0.24	0.52	0.49	0.31	0.58
120	0.39	0.41	0.190	0.45	0.43	0.27	0.51	0.35	0.165	0.39	0.38	0.34	0.44	0.41	0.30	0.51
150	0.31	0.33	0.185	0.38	0.36	0.27	0.45	0.29	0.160	0.33	0.31	0.23	0.39	0.34	0.39	0.45
185	0.25	0.27	0.185	0.33	0.30	0.26	0.40	0.23	0.160	0.28	0.26	0.23	0.34	0.29	0.29	0.41
240	0.195	0.21	0.180	0.28	0.24	0.26	0.35	0.180	0.155	0.24	0.21	0.22	0.30	0.24	0.28	0.37
300	0.155	0.17	0.175	0.25	0.195	0.25	0.32	0.145	0.150	0.21	0.170	0.22	0.28	0.20	0.27	0.34
400	0.115	0.145	0.170	0.22	0.180	0.24	0.30	0.125	0.150	0.195	0.160	0.21	0.27	0.20	0.27	0.33
500	0.093	0.125	0.170	0.21	0.165	0.24	0.29	0.105	0.145	0.180	0.145	0.20	0.25	0.190	0.24	0.31
630	0.073	0.105	0.165	0.195	0.150	0.23	0.27	0.092	0.145	0.170	0.135	0.195	0.24	0.175	0.23	0.29
800	0.056	0.090	0.160	0.190	0.145	0.23	0.27	0.086	0.140	0.165	0.130	0.180	0.23	0.175	0.195	0.26
1000	0.045	0.092	0.155	0.180	0.140	0.21	0.25	0.080	0.135	0.155	0.125	0.170	0.21	0.165	0.180	0.24

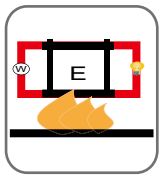
Note: *Spacings larger than one cable diameter will result in a large voltage drop.

r = conductor resistance at operating temperature
x = reactance
z = impedance



Rated Voltage

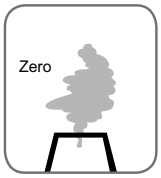
Standard



Circuit Integrity
IEC 60331-21/BS 6387/BS 8491

Flame Retardancy
IEC 60332-1-2

Reduced Fire Propagation
IEC 60332-3-24



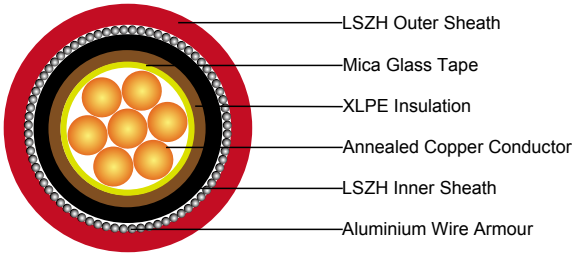
Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

600/1000V Mica+XLPE Insulated, LSZH Sheathed, Armoured Power Cables to IEC 60502-1 (Single Core)

FFX300 1mRZ1MAZ1-R (CU/MGT+XLPE/LSZH/AWA/LSZH 600/1000V Class 2)



APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from IEC 60502-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

600/1000V

CABLE CONSTRUCTION

Conductor: The conductors shall be class 2 plain or metal-coated annealed copper in accordance with IEC 60228. Class 1 and class 5 conductor can be offered as option.
Fire Barrier: Mica glass tape.
Insulation: Thermosetting XLPE compound as per IEC 60502-1.
Inner Covering Option: Thermoplastic halogen free compound ST_8 as per IEC 60502-1.
Armouring: Aluminium wire.
Outer Sheath: Thermoplastic halogen free compound ST_8 as per IEC 60502-1.

Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Insulation Colour: Brown or blue; other colours can be offered upon request.
Sheath Colour: Black; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C
Maximum short circuit temperature (5 Seconds): 250°C
Minimum bending radius: 6 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX300 1mRZ1MAZ1-R					
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Inner Covering Thickness	Nominal AL Wire Diameter	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm²		mm	mm	mm	mm	mm	kg/km
1×4	2	0.7	1.0	0.8	1.8	12.2	205
1×6	2	0.7	1.0	0.8	1.8	12.7	238
1×10	2	0.7	1.0	0.8	1.8	13.7	300
1×16	2	0.7	1.0	0.8	1.8	14.7	383
1×25	2	0.9	1.0	0.8	1.8	16.4	520
1×35	2	0.9	1.0	1.25	1.8	18.5	695
1×50	2	1.0	1.0	1.25	1.8	20.0	864
1×70	2	1.1	1.0	1.25	1.8	22.0	1132
1×95	2	1.1	1.0	1.6	1.8	25.0	1530
1×120	2	1.2	1.0	1.6	1.8	26.8	1840
1×150	2	1.4	1.0	1.6	1.8	28.8	2186
1×185	2	1.6	1.0	1.6	1.8	31.4	2680
1×240	2	1.7	1.0	1.6	1.9	34.5	3380
1×300	2	1.8	1.0	2.0	2.0	38.5	4255
1×400	2	2.0	1.2	2.0	2.2	42.3	5298
1×500	2	2.2	1.2	2.0	2.3	46.4	6551

ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E3A

Conductor cross-sectional area	Ref. Method C (clipped direct)		Ref. Method F (in free air or on a perforated cable tray, horizontal or vertical)								
	Touching		Touching			Spaced by on cable diameter					
	2 cables, single-phase a.c. or d.c. flat	3 or 4 cables, three-phase a.c. flat	2 cables, single-phase a.c. or d.c. flat	3 or 4 cables, three-phase a.c. flat	3 cables three-phase a.c. trefoil	2 cables, d.c.		2 cables, single-phase a.c.		3 or 4 cables, three-phase a.c.	
						Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
50	237	220	253	232	222	284	270	282	266	288	266
70	303	277	322	293	285	356	349	357	337	358	331
95	367	333	389	352	346	446	426	436	412	425	393
120	425	383	449	405	402	519	497	504	477	485	449
150	488	437	516	462	463	600	575	566	539	549	510
185	557	496	587	524	529	688	660	643	614	618	574
240	656	579	689	612	625	815	782	749	714	715	666
300	755	662	792	700	720	943	906	842	805	810	755
400	853	717	899	767	815	1137	1094	929	889	848	797
500	962	791	1016	851	918	1314	1266	1032	989	923	871

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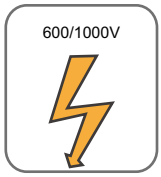
Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E3B

Conductor cross-sectional area	2 cables d.c.	Ref. Methods C&F (clipped direct, on trays or in free air)														
		2 cables, single-phase a.c.						3 or 4 cables, three-phase a.c.								
		Touching			Spaced*			Trefoil and touching			Flat and touching			Flat and spaced*		
1	2	3			4			5			6			7		
mm^2	mV/A/m	mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
50	0.98	0.99	0.21	1.00	0.98	0.29	1.00	0.86	0.180	0.87	0.84	0.25	0.88	0.84	0.33	0.90
70	0.67	0.68	0.20	0.71	0.69	0.29	0.75	0.59	0.170	0.62	0.60	0.25	0.65	0.62	0.32	0.70
95	0.49	0.51	0.195	0.55	0.53	0.28	0.60	0.44	0.170	0.47	0.46	0.24	0.52	0.49	0.31	0.58
120	0.39	0.41	0.190	0.45	0.43	0.27	0.51	0.35	0.165	0.39	0.38	0.34	0.44	0.41	0.30	0.51
150	0.31	0.33	0.185	0.38	0.36	0.27	0.45	0.29	0.160	0.33	0.31	0.23	0.39	0.34	0.39	0.45
185	0.25	0.27	0.185	0.33	0.30	0.26	0.40	0.23	0.160	0.28	0.26	0.23	0.34	0.29	0.29	0.41
240	0.195	0.21	0.180	0.28	0.24	0.26	0.35	0.180	0.155	0.24	0.21	0.22	0.30	0.24	0.28	0.37
300	0.155	0.17	0.175	0.25	0.195	0.25	0.32	0.145	0.150	0.21	0.170	0.22	0.28	0.20	0.27	0.34
400	0.115	0.145	0.170	0.22	0.180	0.24	0.30	0.125	0.150	0.195	0.160	0.21	0.27	0.20	0.27	0.33
500	0.093	0.125	0.170	0.21	0.165	0.24	0.29	0.105	0.145	0.180	0.145	0.20	0.25	0.190	0.24	0.31

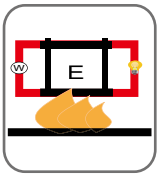
Note: *Spacings larger than one cable diameter will result in a large voltage drop.

r = conductor resistance at operating temperature
x = reactance
z = impedance



Rated Voltage

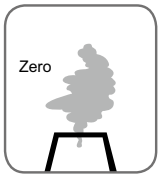
Standard



Circuit Integrity
IEC 60331-21/BS 6387/BS 8491

Flame Retardancy
IEC 60332-1-2

Reduced Fire Propagation
IEC 60332-3-24



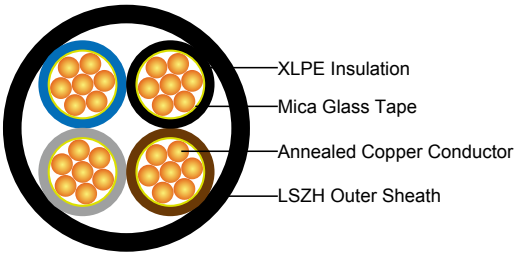
Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

600/1000V Mica+XLPE Insulated, LSZH Sheathed Power Cables to BS 8573 (2-5 Cores)

FFX400 1mRZ1-R (CU/MGT+XLPE/LSZH 600/1000V Class 2)



APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from BS 8573:2012

Approvals：

TUV Certification（B 098200 0027 Rev.00）

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

600/1000V

CABLE CONSTRUCTION

Conductor: Annealed copper conductor, stranded according to BS EN 60228 class 2.

Fire Barrier: Mica glass tape.

Insulation: Thermosetting insulation XLPE Type GP 8 according to BS 7655-1.3. HEPR Type GP 6 according to

BS 7655-1.2 or crosslinked polyolefin material type EI 5 according to BS EN 50363-5 can be offered as option.

Inner Covering Option: The optional inner covering, where used, shall consist of an extruded layer of synthetic polymeric material. It shall surround the single core and the laid-up two, three, four or five cores, giving the assembly a practically circular shape.

Outer Sheath: Extruded layer of polymeric material LTS 4 according to BS 7655-6.1.

Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Insulation Colour

2-core: Brown and blue.

3-core: Brown, black and grey.

Alternatively, green-and-yellow, blue, brown.

4-core: Blue, brown black and grey.

Alternatively, green-and-yellow, brown, black, grey.

5-core: Green-and-yellow, blue, brown black, grey.

Sheath Colour: Black; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius

circular copper conductors OD≤25mm: 4 × Overall Diameter

circular copper conductors OD>25mm: 6 × Overall Diameter

shaped copper conductors: 8 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX400 1mRZ1-R				
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Inner Covering Thickness	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	mm	kg/km
2 Cores						
2×1.5[a]	2	0.7	0.4	1.8	11.6	139
2×2.5[a]	2	0.7	0.4	1.8	12.4	167
2×4[a]	2	0.7	0.4	1.8	13.5	211
2×6[a]	2	0.7	0.4	1.8	14.6	265
2×10[a]	2	0.7	0.6	1.8	16.5	370
2×16[a]	2	0.7	0.6	1.8	18.6	515
2×25[a]	2	0.9	0.8	1.8	22.0	756
2×35[a]	2	0.9	0.8	1.8	24.3	983

Conductor		FFX400 1mRZ1-R				
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Inner Covering Thickness	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	mm	kg/km
2×50[a]	2	1.0	1.0	1.8	27.4	1281
2×70[a]	2	1.1	1.0	1.8	31.4	1771
2×95[a]	2	1.1	1.2	1.9	35.4	2379
2×120[a]	2	1.2	1.2	2.0	39.2	2971
2×25[b]	2	0.9	0.6	1.8	18.1	695
2×35[b]	2	0.9	0.6	1.8	19.9	917
2×50[b]	2	1.0	0.8	1.8	22.6	1209
2×70[b]	2	1.1	0.8	1.8	25.5	1684
2×95[b]	2	1.1	1.0	1.9	28.2	2273
2×120[b]	2	1.2	1.0	2.0	31.0	2844
3 Cores						
3×1.5[a]	2	0.7	0.4	1.8	12.2	152
3×2.5[a]	2	0.7	0.4	1.8	13.1	192
3×4[a]	2	0.7	0.4	1.8	14.3	253
3×6[a]	2	0.7	0.4	1.8	15.5	329
3×10[a]	2	0.7	0.6	1.8	17.5	479
3×16[a]	2	0.7	0.6	1.8	19.8	687
3×25[a]	2	0.9	0.8	1.8	23.5	1033
3×35[a]	2	0.9	0.8	1.8	26.0	1364
3×50[a]	2	1.0	1.0	1.8	29.3	1798
3×70[a]	2	1.1	1.2	1.9	33.8	2532
3×95[a]	2	1.1	1.2	2.0	38.3	3421
3×120[a]	2	1.2	1.2	2.1	42.4	4284
3×25[b]	2	0.9	0.6	1.8	20.7	1001
3×35[b]	2	0.9	0.8	1.8	23.3	1334
3×50[b]	2	1.0	0.8	1.8	25.9	1757
3×70[b]	2	1.1	1.0	1.9	29.8	2479
3×95[b]	2	1.1	1.2	2.0	33.2	3351
3×120[b]	2	1.2	1.2	2.1	36.0	4191
4 Cores						
4×1.5[a]	2	0.7	0.4	1.8	13.2	183
4×2.5[a]	2	0.7	0.4	1.8	14.2	234
4×4[a]	2	0.7	0.4	1.8	15.5	313
4×6[a]	2	0.7	0.6	1.8	16.9	412
4×10[a]	2	0.7	0.6	1.8	19.2	608
4×16[a]	2	0.7	0.6	1.8	21.7	881
4×25[a]	2	0.9	0.8	1.8	25.8	1335
4×35[a]	2	0.9	1.0	1.8	28.6	1773

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Conductor		FFX400 1mRZ1-R				
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Inner Covering Thickness	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	mm	kg/km
4×50[a]	2	1.0	1.0	1.8	32.3	2344
4×70[a]	2	1.1	1.2	2.0	37.5	3329
4×95[a]	2	1.1	1.2	2.1	42.3	4505
4×120[a]	2	1.2	1.2	2.3	47.1	5667
4×25[b]	2	0.9	0.8	1.8	23.3	1305
4×35[b]	2	0.9	0.8	1.8	25.9	1740
4×50[b]	2	1.0	1.0	1.8	29.4	2307
4×70[b]	2	1.1	1.2	2.0	33.5	3271
4×95[b]	2	1.1	1.2	2.1	36.9	4424
4×120[b]	2	1.2	1.2	2.3	40.9	5565
5 Cores						
5×1.5[a]	2	0.7	0.4	1.8	13.5	218
5×2.5[a]	2	0.7	0.4	1.8	14.5	281
5×4[a]	2	0.7	0.6	1.8	16.9	378
5×10[a]	2	0.7	0.6	1.8	20.2	700
5×16[a]	2	0.7	0.8	1.8	24.3	1042
5×25[a]	2	0.9	1.0	1.8	27.3	1594
5×35[a]	2	0.9	1.0	1.8	30.9	2132
5×50[a]	2	1.0	1.2	1.9	34.6	2855
5×70[a]	2	1.1	1.2	2.1	38.4	4055
5×95[a]	2	1.1	1.4	2.2	43.7	5503
5×120[a]	2	1.2	1.4	2.4	46.9	6916

[a] Circular or compacted circular stranded conductors (class 2).
[b] Shaped stranded conductor (class 2).

ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E2A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)		Ref. Method E (in free air or on a perforated cable tray tec. horizontal or vertical)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42
6	42	38	51	44	58	52	63	54
10	57	51	69	60	80	71	86	75
16	76	68	91	80	107	96	115	100
25	99	89	119	105	138	119	149	127
35	121	109	146	128	171	147	185	158
50	145	130	175	154	209	179	225	192
70	183	164	221	194	269	229	289	246
95	220	197	265	233	328	278	352	298
120	253	227	305	268	382	322	410	346

Note: *With or without a protective conductor.

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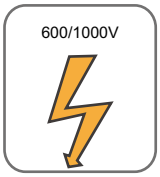
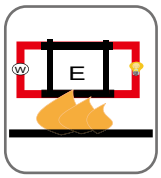
Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E2B

Conductor cross-sectional area	Two-core cable, d.c.	Two-core cable, single-phase a.c.			Three- or four-core cable, three-phase a.c.		
1	2	3			4		
mm^2	mV/A/m	mV/A/m			mV/A/m		
1.5	31	31			27		
2.5	19	19			16		
4	12	12			10		
6	7.9	7.9			6.8		
10	4.7	4.7			4.0		
16	2.9	2.9			2.5		
		r	x	z	r	x	z
25	1.85	1.85	0.160	1.90	1.60	0.140	1.65
35	1.35	1.35	0.155	1.35	1.15	0.135	1.15
50	0.98	0.99	0.155	1.00	0.86	0.135	0.87
70	0.67	0.67	0.150	0.69	0.59	0.130	0.60
95	0.49	0.50	0.150	0.52	0.43	0.130	0.45
120	0.39	0.40	0.145	0.42	0.34	0.130	0.37



Rated Voltage

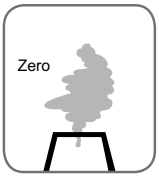
Standard



Circuit Integrity
IEC 60331-21/BS 6387/BS 8491

Flame Retardancy
IEC 60332-1-2

Reduced Fire Propagation
IEC 60332-3-24



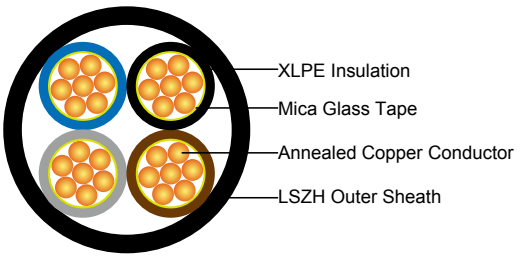
Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

600/1000V Mica+XLPE Insulated, LSZH Sheathed Power Cables to IEC 60502-1 (2-5 Cores & Multicore)

FFX400 1mRZ1-R (CU/MGT+XLPE/LSZH 600/1000V Class 2)



APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings. This product type is CE and TUV approved.

STANDARDS

Basic design adapted from IEC 60502-1

Approvals：

CE Certification (GB 1067 5743 16)

TUV Certification（B 098200 0027 Rev.00）

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

600/1000V

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CABLE CONSTRUCTION

Conductor: The conductors shall be class 2 plain or metal-coated annealed copper in accordance with IEC 60228. Class 1 and class 5 conductor can be offered as option.

Fire Barrier: Mica glass tape.

Insulation: Thermosetting XLPE material and thickness shall be as per IEC 60502-1.

Outer Sheath: Thermoplastic halogen free compound ST_8 as per IEC 60502-1.

Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Insulation Colour

2-core: Brown and blue.

3-core: Brown, black and grey.

4-core: Blue, brown, black and grey.

5-core: Green-and-yellow, blue, brown, black, grey.

Above 5 Cores: Black cores with white numerals.

Other colours can be offered upon request.

Sheath Colour: Black; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius

circular copper conductors OD≤25mm: 4 × Overall Diameter

circular copper conductors OD>25mm: 6 × Overall Diameter

shaped copper conductors: 8 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX400 1mRZ1-R			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	kg/km
2 Cores					
2×1.5	2	0.7	1.8	11.6	139
2×2.5	2	0.7	1.8	12.4	167
2×4	2	0.7	1.8	13.5	211
2×6	2	0.7	1.8	14.6	265
2×10	2	0.7	1.8	16.5	370
2×16	2	0.7	1.8	18.6	515

Conductor		FFX400 1mRZ1-R				
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness		Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm		mm	mm	kg/km
2×25	2	0.9		1.8	22.0	756
2×35	2	0.9		1.8	24.3	983
2×50	2	1.0		1.8	27.4	1281
2×70	2	1.1		1.8	31.4	1771
2×95	2	1.1		1.9	35.4	2379
2×120	2	1.2		2.0	39.2	2971
2×150	2	1.4		2.2	43.5	3655
2×185	2	1.6		2.3	48.3	4546
2×240	2	1.7		2.5	54.3	5901
2×300	2	1.8		2.6	59.8	7308
2×400	2	2		2.9	67.1	9318
3 Cores						
3×1.5	2	0.7		1.8	12.2	168
3×2.5	2	0.7		1.8	13.1	208
3×4	2	0.7		1.8	14.3	269
3×6	2	0.7		1.8	15.5	345
3×10	2	0.7		1.8	17.5	495
3×16	2	0.7		1.8	19.8	704
3×25	2	0.9		1.8	23.5	1052
3×35	2	0.9		1.8	26.0	1384
3×50	2	1.0		1.8	29.3	1819
3×70	2	1.1		1.9	33.8	2556
3×95	2	1.1		2.0	38.3	3467
3×120	2	1.2		2.1	42.4	4335
3×150	2	1.4		2.3	46.8	5305
3×185	2	1.6		2.4	52.1	6638
3×240	2	1.7		2.6	58.5	8624
3×300	2	1.8		2.7	64.4	10700
3×400	2	2.0		3.0	72.1	13601
3 Cores + 1 Core Earth Conductor						
		3 Cores	1 Core			
3×16/10	2	0.7	0.7	1.8	20.4	818
3×25/16	2	0.9	0.7	1.8	24.3	1228
3×35/16	2	0.9	0.7	1.8	26.9	1560
3×50/25	2	1.0	0.9	1.8	30.3	2097
3×70/35	2	1.1	0.9	2.0	35.2	2935
3×95/50	2	1.1	1.0	2.1	39.7	3978
3×120/70	2	1.2	1.1	2.3	44.2	5067
3×150/70	2	1.4	1.1	2.4	48.8	6038
3×185/95	2	1.6	1.1	2.6	54.3	7643
3×240/120	2	1.7	1.2	2.8	61.1	9891
3×300/150	2	1.8	1.4	3.0	67.4	12260
3×400/185	2	2.0	1.6	3.2	75.4	15560

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Conductor		FFX400 1mRZ1-R			
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	kg/km
4 Cores					
4×1.5	2	0.7	1.8	13.2	201
4×2.5	2	0.7	1.8	14.2	253
4×4	2	0.7	1.8	15.5	332
4×6	2	0.7	1.8	16.9	431
4×10	2	0.7	1.8	19.2	628
4×16	2	0.7	1.8	21.7	901
4×25	2	0.9	1.8	25.8	1358
4×35	2	0.9	1.8	28.6	1796
4×50	2	1.0	1.8	32.3	2369
4×70	2	1.1	2.0	37.5	3358
4×95	2	1.1	2.1	42.3	4537
4×120	2	1.2	2.3	47.1	5703
4×150	2	1.4	2.4	52.0	6984
4×185	2	1.6	2.6	57.9	8740
4×240	2	1.7	2.8	65.1	11362
4×300	2	1.8	3.0	71.8	14145
4×400	2	2.0	3.2	80.4	17984
Multicore					
5×1.5	2	0.7	1.8	14.3	260
5×2.5	2	0.7	1.8	15.4	1544
7×1.5	2	0.7	1.8	15.5	322
7×2.5	2	0.7	1.8	16.7	2116
10×1.5	2	0.7	1.8	19.4	438
10×2.5	2	0.7	1.8	21.1	3000
12×1.5	2	0.7	1.8	20.0	494
12×2.5	2	0.7	1.8	21.8	3565
14×1.5	2	0.7	1.8	21.0	554
14×2.5	2	0.7	1.8	22.9	4135
19×1.5	2	0.7	1.8	23.4	701
19×2.5	2	0.7	1.8	25.5	5556
21×1.5	2	0.7	1.8	24.5	763
21×2.5	2	0.7	1.8	26.8	6128
24×1.5	2	0.7	1.8	27.3	866
24×2.5	2	0.7	1.8	29.8	6998
30×1.5	2	0.7	1.8	28.9	1030
30×2.5	2	0.7	1.8	31.6	8689
40×1.5	2	0.7	1.8	32.4	9942
40×2.5	2	0.7	1.9	35.7	11540
48×1.5	2	0.7	1.8	35.8	11900
48×2.5	2	0.7	1.9	39.4	13813
61×1.5	2	0.7	1.9	39.4	15082
61×2.5	2	0.7	2.0	43.3	17505

ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E2A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc.)		Ref. Method B (enclosed in conduit on a wall or in trunking etc.)		Ref. Method C (clipped direct)		Ref. Method E (in free air or on a perforated cable tray etc. horizontal or vertical)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42
6	42	38	51	44	58	52	63	54
10	57	51	69	60	80	71	86	75
16	76	68	91	80	107	96	115	100
25	99	89	119	105	138	119	149	127
35	121	109	146	128	171	147	185	158
50	145	130	175	154	209	179	225	192
70	183	164	221	194	269	229	289	246
95	220	197	265	233	328	278	352	298
120	253	227	305	268	382	322	410	346
150	290	259	334	300	441	371	473	399
185	329	295	384	340	506	424	542	456
240	386	346	459	398	599	500	641	538
300	442	396	532	455	693	576	741	621
400	-	-	625	536	803	667	865	741

Note: *With or without a protective conductor.

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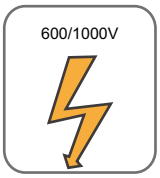
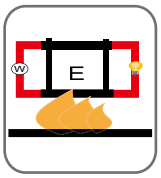
Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E2B

Conductor cross-sectional area	Two-core cable, d.c.	Two-core cable, single-phase a.c.			Three- or four-core cable, three-phase a.c.		
1	2	3			4		
mm^2	mV/A/m	mV/A/m			mV/A/m		
1.5	31	31			27		
2.5	19	19			16		
4	12	12			10		
6	7.9	7.9			6.8		
10	4.7	4.7			4.0		
16	2.9	2.9			2.5		
		r	x	z	r	x	z
25	1.85	1.85	0.160	1.90	1.60	0.140	1.65
35	1.35	1.35	0.155	1.35	1.15	0.135	1.15
50	0.98	0.99	0.155	1.00	0.86	0.135	0.87
70	0.67	0.67	0.150	0.69	0.59	0.130	0.60
95	0.49	0.50	0.150	0.52	0.43	0.130	0.45
120	0.39	0.40	0.145	0.42	0.34	0.130	0.37
150	0.31	0.32	0.145	0.35	0.28	0.125	0.30
185	0.25	0.26	0.145	0.29	0.22	0.125	0.26
240	0.195	0.200	0.140	0.24	0.175	0.125	0.21
300	0.155	0.160	0.140	0.21	0.140	0.120	0.185
400	0.120	0.130	0.140	0.190	0.115	0.120	0.165



Rated Voltage

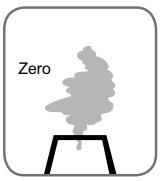
Standard



Circuit Integrity
IEC 60331-21/BS 6387/BS 8491

Flame Retardancy
IEC 60332-1-2

Reduced Fire Propagation
IEC 60332-3-24



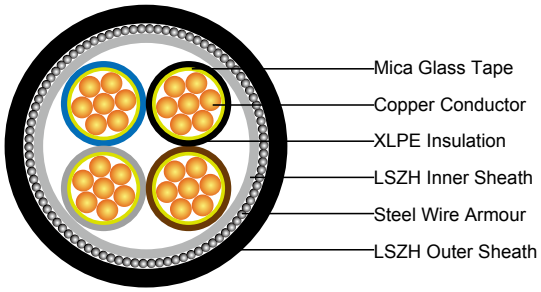
Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

600/1000V Mica+XLPE Insulated, LSZH Sheathed, Armoured Power Cables to BS 7846 (2-5 Cores & Multicore)

FFX400 1mRZ1MZ1-R (CU/MGT+XLPE/LSZH/SWA/LSZH 600/1000V Class 2)



APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design to BS 7846

Approvals：

TUV Certification（B 18 07 98200 025）

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

600/1000V

CABLE CONSTRUCTION

Conductor: Annealed copper wire, stranded according to BS EN 60228 class 2.

Fire Barrier: Mica glass tape.

Insulation: XLPE type GP 8 according to BS 7655-1.3. HEPR type GP 6 according to BS 7655-1.2 or

crosslinked polyolefin material type EI 5 according to BS EN 50363-5 can be offered as option.

Bedding: Extruded layer of polymeric material.

Armouring: Galvanized steel wire.

Outer Sheath: Extruded layer of polymeric material LTS 1 according to BS 7655-6.1.

Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Insulation Colour

2-core: Brown and blue.

3-core: Brown, black and grey.

4-core: Blue, brown, black and grey.

5-core: Green-and-yellow, blue, brown, black, grey.

Sheath Colour: Black; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius: 8 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX400 1mRZ1MZ1-R					
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Bedding Thickness	Nominal Steel Wire Armour Diameter	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm²		mm	mm	mm	mm	mm	kg/km
2 Cores							
2×1.5[a]	2	0.6	0.8	0.9	1.3	13.5	345
2×2.5[a]	2	0.7	0.8	0.9	1.4	14.9	413
2×4[a]	2	0.7	0.8	0.9	1.4	16.0	478
2×4[a&c]	2	0.7	0.8	1.25	1.4	16.7	581
2×6[a]	2	0.7	0.8	0.9	1.4	17.2	555
2×6[a&c]	2	0.7	0.8	1.25	1.4	17.9	666
2×10[a]	2	0.7	0.8	0.9	1.5	19.2	708
2×10[a&c]	2	0.7	0.8	1.25	1.5	19.9	832
2×16[a]	2	0.7	0.8	1.25	1.5	22.0	1036
2×25[a]	2	0.9	0.8	1.25	1.6	25.7	1386
2×25[b]	2	0.9	0.8	1.25	1.6	23.5	1311
2×35[a]	2	0.9	1.0	1.6	1.7	29.0	1918
2×35[b]	2	0.9	1.0	1.6	1.7	26.5	1814

Conductor		FFX400 1mRZ1MZ1-R					
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Bedding Thickness	Nominal Steel Wire Armour Diameter	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm²		mm	mm	mm	mm	mm	kg/km
2×50[b]	2	1.0	1.0	1.6	1.8	28.5	2330
2×70[b]	2	1.1	1.0	1.6	1.9	32.0	2968
2×95[b]	2	1.1	1.2	2.0	2.0	36.0	4085
2×120[b]	2	1.2	1.2	2.0	2.1	39.0	4846
2×150[b]	2	1.4	1.2	2.0	2.2	42.0	6223
2×185[b]	2	1.6	1.4	2.5	2.4	48.0	7479
2×240[b]	2	1.7	1.4	2.5	2.5	52.0	9137
2×300[b]	2	1.8	1.6	2.5	2.6	57.0	10937
2×400[b]	2	2.0	1.6	2.5	2.8	62.0	13316
3 Cores							
3×1.5[a]	2	0.6	0.8	0.9	1.3	14.1	384
3×2.5[a]	2	0.7	0.8	0.9	1.4	15.6	467
3×4[a]	2	0.7	0.8	0.9	1.4	16.8	551
3×4[a&c]	2	0.7	0.8	1.25	1.4	17.5	659
3×6[a]	2	0.7	0.8	0.9	1.4	18.0	652
3×6[a&c]	2	0.7	0.8	1.25	1.4	18.7	768
3×10[a]	2	0.7	0.8	1.25	1.5	20.9	985
3×16[a]	2	0.7	0.8	1.25	1.6	23.4	1269
3×25[a]	2	0.9	1.0	1.6	1.7	28.4	1953
3×25[b]	2	0.9	1.0	1.6	1.7	26.5	1874
3×35[a]	2	0.9	1.0	1.6	1.8	31.0	2393
3×35[b]	2	0.9	1.0	1.6	1.8	28.5	2286
3×50[b]	2	1.0	1.0	1.6	1.8	32.0	2952
3×70[b]	2	1.1	1.0	1.6	1.9	35.0	3852
3×95[b]	2	1.1	1.2	2.0	2.1	40.0	5312
3×120[b]	2	1.2	1.2	2.0	2.2	44.0	6364
3×150[b]	2	1.4	1.4	2.5	2.3	49.0	8113
3×185[b]	2	1.6	1.4	2.5	2.4	53.0	9706
3×240[b]	2	1.7	1.4	2.5	2.6	58.0	12045
3×300[b]	2	1.8	1.6	2.5	2.7	63.0	14536
3×400[b]	2	2.0	1.6	2.5	2.9	70.0	17866
4 Cores							
4×1.5[a]	2	0.6	0.8	0.9	1.3	15.1	433
4×2.5[a]	2	0.7	0.8	0.9	1.4	16.7	532
4×4[a]	2	0.7	0.8	0.9	1.4	18.1	637
4×4[a&c]	2	0.7	0.8	1.25	1.4	18.8	856

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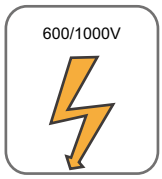
Conductor		FFX400 1mRZ1MZ1-R					
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Bedding Thickness	Nominal Steel Wire Armour Diameter	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm²		mm	mm	mm	mm	mm	kg/km
4×6[a]	2	0.7	0.8	1.25	1.5	20.3	901
4×10[a]	2	0.7	0.8	1.25	1.5	22.6	1159
4×16[a]	2	0.7	0.8	1.25	1.6	25.3	1516
4×25[a]	2	0.9	1.0	1.6	1.7	30.8	2341
4×25[b]	2	0.9	1.0	1.6	1.7	29.5	2286
4×35[a]	2	0.9	1.0	1.6	1.8	33.7	2898
4×35[b]	2	0.9	1.0	1.6	1.8	32.0	2824
4×50[b]	2	1.0	1.0	1.6	1.9	35.0	3628
4×70[b]	2	1.1	1.2	2.0	2.1	41.0	5188
4×95[b]	2	1.1	1.2	2.0	2.2	45.0	6585
4×120[b]	2	1.2	1.4	2.5	2.3	50.0	8520
4×150[b]	2	1.4	1.4	2.5	2.4	55.0	10071
4×185[b]	2	1.6	1.4	2.5	2.6	60.0	12149
4×240[b]	2	1.7	1.6	2.5	2.7	66.0	15217
4×300[b]	2	1.8	1.6	2.5	2.9	70.0	18373
4×400[b]	2	2.0	1.8	3.15	3.2	81.0	23960
5 Cores							
5×1.5	2	0.6	0.8	0.9	1.4	16.3	495
5×2.5	2	0.7	0.8	0.9	1.4	18.0	603
5×4	2	0.7	0.8	0.9	1.5	19.7	739
5×4[b]	2	0.7	0.8	1.25	1.5	20.4	869
5×6	2	0.7	0.8	1.25	1.5	21.9	1031
5×10	2	0.7	0.8	1.25	1.6	24.6	1356
5×16	2	0.7	1.0	1.6	1.7	28.7	2010
5×25	2	0.9	1.0	1.6	1.8	33.6	2762
5×35	2	0.9	1.0	1.6	1.9	36.9	3440
5×50	2	1.0	1.2	2.0	2.0	42.4	4700
5×70	2	1.1	1.2	2.0	2.2	48.2	6186
Multicore							
7×1.5	2	0.6	0.8	0.9	1.4	17.5	574
7×1.5[c]	2	0.6	0.8	1.25	1.4	18.2	687
7×2.5	2	0.7	0.8	0.9	1.4	19.3	711
7×2.5[c]	2	0.7	0.8	1.25	1.4	20.0	837
7×4	**2**	0.7	0.8	1.25	1.5	21.8	1024
12×1.5	2	0.6	0.8	1.25	1.6	22.7	968
12×2.5	2	0.7	0.8	1.25	1.6	25.5	1218
12×4	2	0.7	0.8	1.25	1.5	28.8	1725
19×1.5	2	0.6	1.0	1.6	1.6	26.1	1255
19×2.5	2	0.7	0.8	1.6	1.7	30.5	1844
19×4	2	0.7	1.0	1.6	1.7	33.2	2285

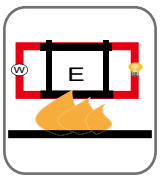
Conductor		FFX400 1mRZ1MZ1-R					
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Bedding Thickness	Nominal Steel Wire Armour Diameter	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm²		mm	mm	mm	mm	mm	kg/km
27×1.5	2	0.6	1.0	1.6	1.7	31.7	1856
27×2.5	2	0.6	1.0	1.6	1.7	35.7	2367
27×4	2	0.7	1.0	1.6	1.9	39.2	2993
37×1.5	2	0.7	1.0	1.6	1.7	34.9	2223
37×2.5	2	0.7	1.0	1.6	1.7	39.4	2878
37×4	2	0.7	1.2	2.0	2.0	44.8	4109

[a] Circular or compacted circular stranded conductor (Class 2).
[b] Shaped stranded conductor (Class 2).
[c] Cables with alternative armour wire size.



Rated Voltage

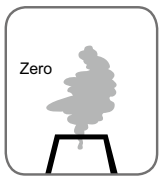
Standard



Circuit Integrity
IEC 60331-21/BS 6387/BS 8491


Flame Retardancy
IEC 60332-1-2


Reduced Fire Propagation
IEC 60332-3-24



Halogen Free
IEC 60754-1


Low Corrosivity
IEC 60754-2


Low Smoke Emission
IEC 61034-2

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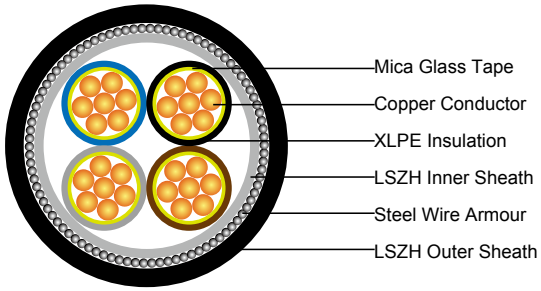
600/1000V Mica+XLPE Insulated, LSZH Sheathed, Armoured Power Cables to IEC 60502-1 (2-5 Cores)

FFX400 1mRZ1MZ1-R (CU/MGT+XLPE/LSZH/SWA/LSZH 600/1000V Class 2)



APPLICATION

The cables are mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals and high-rise buildings.

STANDARDS

Basic design adapted from IEC 60502-1

CE

Approvals:

CE Certification (GB 1067 5743 16)

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS6387; BS 8491
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

600/1000V

CABLE CONSTRUCTION

Conductor: The conductors shall be class 2 plain or metal-coated annealed copper in accordance with IEC 60228. Class 1 and class 5 conductor can be offered as option.

Fire Barrier: Mica glass tape.

Insulation: Thermosetting XLPE material as per IEC 60502-1.

Inner Covering: Thermoplastic halogen free compound ST_8 as per IEC 60502-1.

Armouring: Steel wire armour.

Outer Sheath: Thermoplastic halogen free compound ST_8 as per IEC 60502-1.

Outer Sheath Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

COLOUR CODE

Insulation Colour

2-core: Brown and blue.

3-core: Brown, black and grey.

4-core: Blue, brown, black and grey.

5-core: Green-and-yellow, blue, brown, black, grey.

Other colours can be offered upon request.

Sheath Colour: Black; other colours can be offered upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 90°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius

circular copper conductors: 6 × Overall Diameter

shaped copper conductors: 8 × Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX400 1mRZ1MZ1-R					
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Inner Covering Thickness	Nominal Armour Wire Diameter	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	mm	mm	kg/km
2 Cores							
2×1.5	2	0.7	1.0	0.8	1.8	15.2	393
2×2.5	2	0.7	1.0	0.8	1.8	16	440
2×4	2	0.7	1.0	0.8	1.8	17.1	507
2×6	2	0.7	1.0	1.25	1.8	19.1	732
2×10	2	0.7	1.0	1.25	1.8	21.0	894
2×16	2	0.7	1.0	1.25	1.8	23.1	1103
2×25	2	0.9	1.0	1.6	1.8	27.2	1622
2×35	2	0.9	1.0	1.6	1.8	29.5	1936
2×50	2	1.0	1.0	1.6	1.9	32.8	2368
2×70	2	1.1	1.0	2.0	2.0	37.8	3311
2×95	2	1.1	1.2	2.0	2.1	42.2	4157

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Conductor		FFX400 1mRZ1MZ1-R					
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Inner Covering Thickness	Nominal Armour Wire Diameter	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	mm	mm	kg/km
2×120	2	1.2	1.2	2.0	2.3	46.2	4950
2×150	2	1.4	1.2	2.5	2.4	51.3	6286
2×185	2	1.6	1.4	2.5	2.6	56.7	7551
2×240	2	1.7	1.4	2.5	2.7	62.5	9218
2×300	2	1.8	1.6	2.5	2.9	68.6	11064
2×400	2	2.0	1.6	2.5	3.1	75.7	13459
3 Cores							
3×1.5	2	0.7	1.0	0.8	1.8	15.8	436
3×2.5	2	0.7	1.0	0.8	1.8	16.7	495
3×4	2	0.7	1.0	0.8	1.8	17.9	581
3×6	2	0.7	1.0	1.25	1.8	20.0	838
3×10	2	0.7	1.0	1.25	1.8	22.0	1050
3×16	2	0.7	1.0	1.25	1.8	24.3	1328
3×25	2	0.9	1.0	1.6	1.8	28.7	1973
3×35	2	0.9	1.0	1.6	1.8	31.2	2398
3×50	2	1.0	1.0	1.6	1.9	34.7	2976
3×70	2	1.1	1.0	2.0	2.1	40.2	4200
3×95	2	1.1	1.2	2.0	2.2	44.9	5346
3×120	2	1.2	1.2	2.0	2.3	49.0	6402
3×150	2	1.4	1.4	2.5	2.5	55.0	8187
3×185	2	1.6	1.4	2.5	2.7	60.3	9822
3×240	2	1.7	1.4	2.5	2.8	66.5	12141
3×300	2	1.8	1.6	2.5	3.0	73.0	14682
3×400	2	2.0	1.6	3.15	3.3	82.2	19088
3 Cores + 1 Core Earth Conductor							
		3 Cores	1 Core				
3×16/10	2	0.7	0.7	1.0	1.6	1.8	25.6	1442
3×25/16	2	0.9	0.7	1.0	1.6	1.8	29.5	2148
3×35/16	2	0.9	0.7	1.0	1.6	1.9	32.3	2573
3×50/25	2	1.0	0.9	1.0	1.6	2.1	36.1	3254
3×70/35	2	1.1	0.9	1.2	2	2.2	42.0	4578
3×95/50	2	1.1	1.0	1.2	2	2.3	46.6	5857
3×120/70	2	1.2	1.1	1.2	2	2.5	51.0	7135
3×150/70	2	1.4	1.1	1.4	2.5	2.7	57.2	8920
3×185/95	2	1.6	1.1	1.4	2.5	2.8	62.5	10826
3×240/120	2	1.7	1.2	1.6	2.5	3.1	69.9	13407
3×300/150	2	1.8	1.4	1.6	2.5	3.2	76..0	16243
3×400/185	2	2.0	1.6	1.6	3.15	3.6	85.7	21047
4 Cores							
4×1.5	2	0.7	1.0	0.8	1.8	16.8	491
4×2.5	2	0.7	1.0	0.8	1.8	17.8	565
4×4	2	0.7	1.0	0.8	1.8	19.1	702
4×6	2	0.7	1.0	1.25	1.8	21.4	968
4×10	2	0.7	1.0	1.25	1.8	23.7	1233

Conductor		FFX400 1mRZ1MZ1-R					
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	Nominal Inner Covering Thickness	Nominal Armour Wire Diameter	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm	mm	mm	mm	kg/km
4×16	2	0.7	1.0	1.6	1.8	26.9	1755
4×25	2	0.9	1.0	1.6	1.8	31.0	2369
4×35	2	0.9	1.0	1.6	1.9	34.0	2928
4×50	2	1.0	1.0	2.0	2.1	38.9	3972
4×70	2	1.1	1.2	2.0	2.2	44.3	5233
4×95	2	1.1	1.2	2.0	2.3	49.1	6636
4×120	2	1.2	1.4	2.5	2.5	55.3	8608
4×150	2	1.4	1.4	2.5	2.7	60.4	10203
4×185	2	1.6	1.4	2.5	2.8	66.1	12264
4×240	2	1.7	1.6	2.5	3.1	73.9	15427
4×300	2	1.8	1.6	2.5	3.2	80.4	18565
4×400	2	2.0	1.8	3.15	3.6	91.1	24233
5 Cores							
5x1.5	2	0.7	1.0	0.8	1.8	17.9	578
5×2.5	2	0.7	1.0	0.8	1.8	19.0	668
5×4	2	0.7	1.0	0.8	1.8	20.5	799
5×6	2	0.7	1.0	1.25	1.8	22.9	1140
5×10	2	0.7	1.0	1.25	1.8	25.4	1465
5×16	2	0.7	1.0	1.6	1.8	29.0	2083
5×25	2	0.9	1.0	1.6	1.9	33.8	2853
5×35	2	0.9	1.0	1.6	2.0	37.1	3544

ELECTRICAL PROPERTIES

Conductor operating temperature: 90°C

Air ambient temperature: 30°C

Ground ambient temperature: 20°C

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Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4E4A

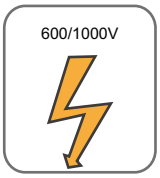
Conductor cross-sectional area	Ref. Method C (clipped direct)		Ref. Method E (in free air or on a perforated cable tray etc. horizontal or vertical)		Ref. Method D (direct in in groud or in ducting in groud. in or around buildings)	
	1 two-core cable, single-phase a.c. or d.c.	1 three- or four-core cable, three-phase a.c.	1 two-core cable, single-phase a.c. or d.c.	1 three- or four-core cable, three-phase a.c.	1 two-core cable, single-phase a.c. or d.c.	1 three- or four-core cable, three-phase a.c.
1	2	3	4	5	6	7
mm^2	A	A	A	A	A	A
1.5	27	23	29	25	25	21
2.5	36	31	39	33	33	28
4	49	42	52	44	43	36
6	62	53	66	56	53	44
10	85	73	90	78	71	58
16	110	94	115	99	91	75
25	146	124	152	131	116	96
35	180	154	188	162	139	115
50	219	187	228	197	164	135
70	279	238	291	251	203	167
95	338	289	354	304	239	197
120	392	335	410	353	271	223
150	451	386	472	406	306	251
185	515	441	539	463	343	281
240	607	520	636	546	395	324
300	698	599	732	628	446	365
400	787	673	847	728	-	-

Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4E4B

Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.			Three- or four-core cable, three-phase a.c.		
1	2	3			4		
mm^2	mV/A/m	mV/A/m			mV/A/m		
1.5	31	31			27		
2.5	19	19			16		
4	12	12			10		
6	7.9	7.9			6.8		
10	4.7	4.7			4.0		
16	2.9	2.9			2.5		
		r	x	z	r	x	z
25	1.85	1.85	0.160	1.90	1.60	0.140	1.65
35	1.35	1.35	0.155	1.35	1.15	0.135	1.15
50	0.98	0.99	0.155	1.00	0.86	0.135	0.87
70	0.67	0.67	0.150	0.69	0.59	0.130	0.60
95	0.49	0.50	0.150	0.52	0.43	0.130	0.45

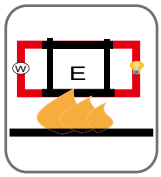
Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.			Three- or four-core cable, three-phase a.c.		
1	2	3			4		
mm^2	mV/A/m	mV/A/m			mV/A/m		
120	0.39	0.40	0.145	0.42	0.34	0.130	0.37
150	0.31	0.32	0.145	0.35	0.38	0.125	0.30
185	0.25	0.26	0.145	0.29	0.22	0.125	0.26
240	0.195	0.200	0.140	0.24	0.175	0.125	0.21
300	0.155	0.160	0.140	0.21	0.140	0.120	0.185
400	0.120	0.130	0.140	0.190	0.115	0.120	0.165

Note: r = conductor resistance at operating temperature
x = reactance
z = impedance



Rated Voltage

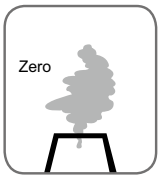
Standard



Circuit Integrity
IEC 60331-21/BS 6387/BS 8491

Flame Retardancy
IEC 60332-1-2

Reduced Fire Propagation
IEC 60332-3-24



Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

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FIREFLIX Fire Resistant Power & Control Cables

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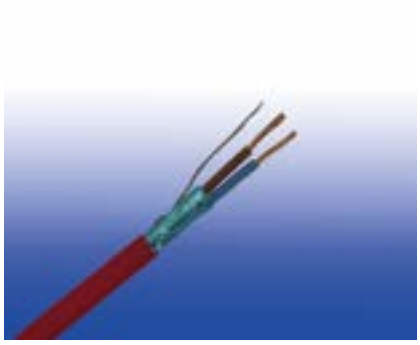
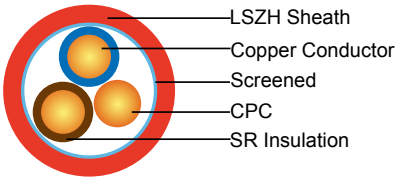
300/500V SR Insulated, LSZH Sheathed, Screened Power Cables to BS 7629-1 (2-4 Cores & Multcore)

FFX200 05SOZ1-U/R PH30/PH60 (CU/SR/OSCR/LSZH 300/500V Class 1/2)





APPLICATION

The cables are primarily intended for use in the following applications:

BS 5266-1 for emergency lighting of premises.

BS 5839-1 for fire detection and fire alarm systems in and around building.

BS 5839-8 for voice alarm systems.

BS 5839-9 for emergency voice communication systems.

STANDARDS

Basic design to BS 7629-1:2015

Approvals：

TUV Certification（B 098200 0035 Rev.00）

FIRE PERFORMANCE

Circuit Integrity	BS 6387; BS EN 50200
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

300/500V

CABLE CONSTRUCTION

Conductor: Copper conductor according to BS EN 60228 class 1/2.

Insulation: Fire resistant special ceramized silicone rubber compound type EI 2 as per BS EN 50363-1.

Screened: One or more metallic or laminated metallic tape(s) shall be applied, either longitudinally or helically or a combination of both, with the metallic element in contact with the uninsulated circuit protective conductor or drain wire.

Circuit Protective Conductor: Uninsulated tinned copper conductor of the same section and class as the insulated conductors in the two, three and four cores cables.

Sheath: Extruded LSZH type LTS 3 according to BS 7655-6.1.

Insulation Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

INSULATION COLOUR CODE

Number of cores	Core colours or numbering
2 cores+uninsulated circuit protective conductor	Brown, Blue or Brown, Brown
3 cores+uninsulated circuit protective conductor	Brown, Black, Grey
4 cores+uninsulated circuit protective conductor	Brown, Blue, Black, Grey
7, 12 and19 cores+uninsulated drain wire	Numbers 1, 2, 3, 4, 5, 6, 7 and upwards or, for identification by colour, an identical colour(excluding brown and black),except for two adjacent cores in each layer distinctively coloured brown and black.

Sheath Colour: Colours upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 70°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius: 6 x Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX200 05SOZ1-U/R PH30/PH60				
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	CPC Nominal Cross-sectional Area	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm^2	mm	mm	kg/km
2 Cores						
2x1.0	1/2	0.6	1.0	0.9	8.0	78
2x1.5	1/2	0.7	1.5	0.9	8.5	103
2x2.5	1/2	0.8	2.5	1.0	10.5	150
2x4.0	1/2	0.8	4.0	1.1	12.5	212
3 Cores						
3x1.5	1/2	0.7	1.5	0.9	9.5	130
3x2.5	1/2	0.8	2.5	1.0	11.5	191
3x4.0	1/2	0.8	4.0	1.1	13.5	273
4 Cores						
4x1.5	1/2	0.7	1.5	1.0	10.5	165
4x2.5	1/2	0.8	2.5	1.1	12.0	242
4x4.0	1/2	0.8	4.0	1.2	15.0	344

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Conductor		FFX200 05SOZ1-U/R PH30/PH60				
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	CPC Nominal Cross-sectional Area	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm^2	mm	mm	kg/km
7 Cores						
7x1.5	1/2	0.7	0.5	1.1	12.5	257
7x2.5	1/2	0.8	0.5	1.2	15.0	568
12 Cores						
12x1.5	1/2	0.7	0.5	1.2	16.0	414
12x2.5	1/2	0.8	0.5	1.4	20.0	886
19 Cores						
19x1.5	1/2	0.7	0.5	1.3	19.0	617

ELECTRICAL PROPERTIES

Conductor operating temperature: 70°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4D2A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc)		Ref. Method B (enclosed in conduit on a wall or in trunking etc)		Ref. Method C (clipped direct)		Ref. Method E (in free air or on a perforated cable tray etc. horizontal or vertical)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three -phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.0	11	10	13	11.5	15	13.5	17	14.5
1.5	14	13	16.5	15	19.5	17.5	22	18.5
2.5	18.5	17.5	23	20	27	24	30	25
4	25	23	30	27	36	32	40	34

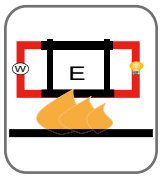
Note: *With or without a protective conductor.

Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4D2B

Conductor cross-sectional area	Two-core cable d.c.	Two-core cable single-phase a.c.	Three- or four-core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
1.0	44	44	38
1.5	29	29	25
2.5	18	18	15
4	11	11	9.5

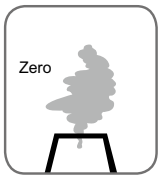
Rated Voltage

Standard



Circuit Integrity
BS 6387/BS EN 50200

Flame Retardancy
IEC 60332-1-2



Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

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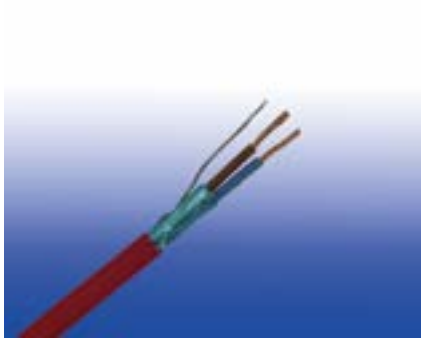
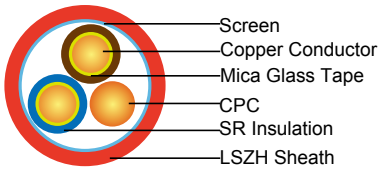
300/500V Mica+SR Insulated, LSZH Sheathed, Screened Power Cables to BS 7629-1 (2-4 Cores & Multcore)

FFX200E 05mSOZ1-U/R PH120 (CU/MGT+SR/OSCR/LSZH 300/500V Class 1/2)





APPLICATION

The cables are primarily intended for use in the following applications:

BS 5266-1 for emergency lighting of premises.

BS 5839-1 for fire detection and fire alarm systems in and around building.

BS 5839-8 for voice alarm systems.

BS 5839-9 for emergency voice communication systems.

STANDARDS

Basic design to BS 7629-1:2015

FIRE PERFORMANCE

Circuit Integrity	BS 6387; BS EN 50200; BS 8434-2
Flame Retardance (Single vertical wire or cable test)	IEC 60332-1-2; EN 60332-1-2
Reduced Fire Propagation (Vertically-mounted bundled wires & cables test)	IEC 60332-3-24; EN 60332-3-24
Halogen Free	IEC 60754-1; EN 50267-2-1
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2
Minimum Smoke Emission	IEC 61034-2; EN 61034-2

VOLTAGE RATING

300/500V

CABLE CONSTRUCTION

Conductor: Copper conductor according to BS EN 60228 class 1/2.

Fire Barrier: Mica glass tape.

Insulation: Fire resistant special ceramized silicone rubber compound type EI 2 as per BS EN 50363-1.

Screened: One or more metallic or laminated metallic tape(s) shall be applied, either longitudinally or

helically or a combination of both, with the metallic element in contact with the uninsulated circuit protective conductor or drain wire.

Circuit Protective Conductor: Uninsulated tinned copper conductor of the same section and class as the insulated conductors in the two, three and four cores cables.

Sheath: Extruded LSZH type LTS 3 according to BS 7655-6.1.

Insulation Option: UV resistance, hydrocarbon resistance, oil resistance, anti-rodent and anti-termite properties can be offered as option.

INSULATION COLOUR CODE

Number of cores	Core colours or numbering
2 cores+uninsulated circuit protective conductor	Brown, Blue or Brown, Brown
3 cores+uninsulated circuit protective conductor	Brown, Black, Grey
4 cores+uninsulated circuit protective conductor	Brown, Blue, Black, Grey
7, 12 and19 cores+uninsulated drain wire	Numbers 1, 2, 3, 4, 5, 6, 7 and upwards or, for identification by colour, an identical colour(excluding brown and black),except for two adjacent cores in each layer distinctively coloured brown and black.

Sheath Colour: Colours upon request.

PHYSICAL AND THERMAL PROPERTIES

Maximum temperature range during operation: 70°C

Maximum short circuit temperature (5 Seconds): 250°C

Minimum bending radius: 6 x Overall Diameter

CONSTRUCTION PARAMETERS

Conductor		FFX200E 05mSOZ1-U/R PH120				
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	CPC Nominal Cross-sectional Area	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm^2	mm	mm	kg/km
2 Cores						
2x1.0	1/2	0.6	1.0	0.9	10.0	103
2x1.5	1/2	0.7	1.5	0.9	10.5	130
2x2.5	1/2	0.8	2.5	1.0	12.5	181
2x4.0	1/2	0.8	4.0	1.1	14.5	246
3 Cores						
3x1.5	1/2	0.7	1.5	0.9	11.7	166
3x2.5	1/2	0.8	2.5	1.0	13.7	232
3x4.0	1/2	0.8	4.0	1.1	15.7	318
4 Cores						
4x1.5	1/2	0.7	1.5	1.0	12.9	211
4x2.5	1/2	0.8	2.5	1.1	14.4	294
4x4.0	1/2	0.8	4.0	1.2	17.4	403
7 Cores						
7x1.5	1/2	0.7	0.5	1.1	15.5	331
7x2.5	1/2	0.8	0.5	1.2	18.0	698
12 Cores						
12x1.5	1/2	0.7	0.5	1.2	20.2	537

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Conductor		FFX200E 05mSOZ1-U/R PH120				
No. of Cores × Cross-sectional Area	Conductor Class	Nominal Insulation Thickness	CPC Nominal Cross-sectional Area	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight
No.×mm^2		mm	mm^2	mm	mm	kg/km
12x2.5	1/2	0.8	0.5	1.4	24.2	1093
19 Cores						
19x1.5	1/2	0.7	0.5	1.3	24.0	802

ELECTRICAL PROPERTIES

Conductor operating temperature: 70°C

Ambient temperature: 30°C

Current-Carrying Capacities (Amp) according to BS 7671:2008 table 4D2A

Conductor cross-sectional area	Ref. Method A (enclosed in conduit in thermally insulating wall etc)		Ref. Method B (enclosed in conduit on a wall or in trunking etc)		Ref. Method C (clipped direct)		Ref. Method E (in free air or on a perforated cable tray etc. horizontal or vertical)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core or 1 four-core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.0	11	10	13	11.5	15	13.5	17	14.5
1.5	14	13	16.5	15	19.5	17.5	22	18.5
2.5	18.5	17.5	23	20	27	24	30	25
4	25	23	30	27	36	32	40	34

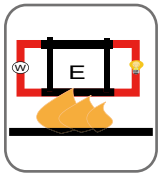
Note: *With or without a protective conductor.

Voltage Drop (Per Amp Per Meter) according to BS 7671:2008 table 4D2B

Conductor cross-sectional area	Two-core cable d.c.	Two-core cable single-phase a.c.	Three- or four-core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
1.0	44	44	38
1.5	29	29	25
2.5	18	18	15
4	11	11	9.5

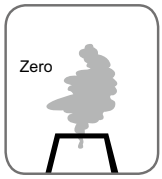
Rated Voltage

Standard



Circuit Integrity
BS 6387/BS EN 50200/BS 8434-2

Flame Retardancy
IEC 60332-1-2



Halogen Free
IEC 60754-1

Low Corrosivity
IEC 60754-2

Low Smoke Emission
IEC 61034-2

Type Codes for Fire Resistant Power & Control Cables

FFX A-B-C-D-E-F-G-H-I

I Conductor
U: Solid to BS EN/IEC 60228 class 1
R: Stranded to BS EN/IEC 60228 class 2
K: Stranded to BS EN/IEC 60228 class 5

H Outer Sheath
Z1: Thermoplastic LSZH
Z: Crosslinked LSZH

G Armour
M: Steel wire armour
MA: Aluminium wire armour
F: Steel tape armour
FA: Aluminium tape armour
F2: Double steel tape armour
F3: Flat steel wire armour

F Inner Sheath
Z1: Thermoplastic LSZH
Z: Crosslinked LSZH

E Screen
O: Overall aluminium screen
C: Overall copper braiding

D Insulation
R: XLPE
Z1: Thermoplastic LSZH
Z: Crosslinked LSZH
S: Silicone Rubber

C Fire Barrier
m: Mica glass tape

B Voltage
05: 300/500V
07: 450/750V
1: 600/1000V

A Type
100: Single core unsheathed
200: 300/500V & 450/750V multicore/multipair
300: Single core sheathed
400: 600/1000V multicore

Technical Information for Fire Properties

FIRE RESISTANT CABLES

In all fire disasters, fire smoke, heat and toxic fumes are the main obstacles to safe evacuation of a building or area. A major contribution towards overcoming these hazards is the use of fire resistant and non-halogenated cables.

Caledonian fire resistant cables, branded under Fireflix, provide the following features:

- Fire resistance
- Long-term circuit integrity in a fire
- Minimum smoke emission
- Flame retardance
- Reduced fire propagation
- Zero halogen

Fireflix cables are mainly used in the wiring of:

- Fire resistant safety circuits
- Public address and emergency voice communication systems in high-rise building
- Control and instrumentation services in industrial, commercial and residential complexes
- High-temperature installation conditions

CABLE CONSTRUCTION

Fireflix cables have been developed to maintain circuit integrity in a fire and to ensure maximum safe evacuation of personnel with no detrimental effects like toxic gases or smoke.

Fireflix cables are constructed in the following typical design:

- Solid/stranded annealed copper conductor
- Glass mica tape/silicone rubber as flame barrier
- XLPE/silicone rubber as insulation
- LSZH/flame retardant PVC as sheath
- Fireflix cables are offered in either single core, multicore or multi-pair constructions. The insulation material can be elastomeric(EPR, SR), thermosetting (XLPE, LSZH) or thermoplastic (EVA, PVC) to meet different stringent environment requirement. The cables may be armoured or braided, with or without metallic screen, depending on different applications. Caledonian can provide PE, PU, PVC, SHF1, SHF2 or LSZH materials as outer sheath for different applications.

INTERNATIONAL STANDARD COMPLIANCE

The fire resistant cables manufactured by caledonian comply with either one or combination of the following standards.

What is Fire Resistance

In a fire, the electrical systems must be able to keep functioning for a suitable length of time. This is particularly important for safety equipments used in emergency ventilation, emergency lighting, and alarm systems, together with the power supply to transport facilities and elevators.

Fire resistance means that the cable or the cable system where the cable is installed is capable to continue to operate even in case of fire for a specific period of time from 30 to 180 minutes.

Circuit integrity (Insulation integrity) refers to tests for the cables only. This is denoted by FE180 in some European countries such as Germany and Belgium. Functional integrity refers to tests on cables and systems (ladders, cable tray, clamps etc). It is denoted by E30, E60, E90 indicating the cable resistance for 30, 60 and 90 minutes according to a specific test and different installation systems.

The functional integrity and the circuit integrity are not related in any way as regards their content. The former is a system test and the circuit (insulation) integrity is an individual cable test. The integrated system test for functional integrity is regarded as a technical benchmark in the cable industry.

DESIGN STANDARD IN ACCORDANCE WITH DIFFERENT STANDARDS

BS 7629-1:2015 – Electric cables. Specification for 300/500V fire resistant screened, fixed installation cables having low emission of smoke and corrosive gases when affected by fire. Part 1: Multicore Cables.

This standard apply to cables with thermosetting insulation of rated voltage 300/500V which conform to the performance requirements for cables required to maintain limited circuit integrity under those fire conditions of BS 6387 specified as C, W and Z. Those cables are intended for use in fire alarm and emergency lighting applications.

The cables are suitable for operation at a maximum sustained conductor temperature of 70°C although the insulation is suitable for operation at higher temperatures. Use at a temperature not exceeding 90°C is allowed for terminations within an enclosure providing the cable conductor temperature outside the enclosure does not exceed 70°C.

The standards apply to cables with a rated voltage of 300/500V, and
-two, three and four-core circular cables with uninsulated circuit protective conductor
-7,12 or 19 cores with an uninsulated drain wire

They contain a metallic layer which provides electrostatic screening.

BS 7846:2015 – Electric cables. Thermosetting insulated, armoured, fire resistant cables of rated voltage 600/1000V for fixed installation, having low emission to smoke and corrosive gases when affected by fire.

Some circuits requiring an equivalent level of fire resistance need to be designed for larger cables than are found in BS 7629-1. Such circuits may be for the main emergency supply, fire fighting lifts, sprinkler system and water pumps, smoke extraction fans, fire shutters or smoke dampers. These larger cables are standardized in BS 7846 which covers the size range and LSZH performance under BS 6724. Through the use of mica tape to supplement the insulation, the cables can pass BS 6387 CWZ and additionally the ‘standard’ or ‘enhanced’ grade as specified in BS 5839-1.
The cables are intended for use in fixed installations in industrial areas, buildings and similar applications, where maintenance of power supply during a fire is essential and where the evolution of smoke and corrosive gases must be kept to a minimum.

The circuit integrity performance under fire conditions is assessed on the basis of various tests where resistance to fire, resistance to fire with water, and resistance to fire with mechanical shock are assessed separately or in combination. The cables are designated by the following categories:

Category F1- resistance to fire alone
Category F2- resistance to fire, resistance to fire with water, resistance to fire with mechanical shock, assessed separately.
Category F3- resistance to fire with mechanical shock and water assessed in combination.
The cables are wire armoured and
-two, three, four and five-core stranded copper conductor
-multicore auxiliary stranded copper conductor.

BS EN 60702 – Mineral insulated cables with a rated voltage not exceeding 750V.

BS EN 60702-1:2002 applies to mineral insulated general wiring cables with copper or copper alloy sheath and copper conductors and with rated voltage of 500V (light duty grade) and 750V(heavy duty grade). Provision is made for a corrosion resistant extruded outer covering over the copper sheath, when required. The standard sets out requirements for the optional outer covering, which includes requirements for halogen free covering and the thickness of the covering. The standard includes routine tests including a spark test on the outer covering. Sample tests includes such as flame retardance, emission of acidic and corrosive gases and smoke emission. Type tests such as fire resistance are included.

Mineral insulated cables are extremely resistant but rigid and a particular care has to be paid during installation to prevent moisture absorption by the mineral oxide.

500V grade cable includes the following conductor sizes:
- single and twin conductor cables up to 4mmsq csa
- three, four and seven conductor cables up to 2.5mmsq csa

750V grade cable provides for:
- single conductor cables up to 400mmsq csa
- two, three and four conductor cables up to 25mmsq csa
- seven conductor cables up to 4mmsq csa
- twelve conductor cables up to 2.5mmsq csa
- nineteen conductor cables up to 1.5mmsq csa

The fire related properties by the cable standards are summarised in the following table:

Cable Standard and type		Fire related properties	
BS 7629	Thermosetting insulated cables with limited circuit integrity when affected by fire	BS EN 60332-1	Tests on electric cables under fire conditions - single core cable.
		BS EN 61034-2	Measurement of smoke density of electric cables burning under defined conditions.
		BS 6387 Cat C, W and Z	Performance requirements for cables required to maintain integrity under fire conditions. Fire burning under defined conditions.
		BS EN 60754-1	Gases evolved during combustion of electric cables.
BS 7846	600/1000 V armoured electric cables having low emissions of smoke and corrosive gases when affected by fire	BS EN 60332-1	Tests on electric cables under fire conditions - single core cable.
		BS EN 60332-3-24	Tests on electric cables under fire conditions - bunched cables.
		BS EN 61034-2	Measurement of smoke density of electric cables burning under defined conditions.
		BS EN 60754-1	Gases evolved during combustion of electric cables.
		BS 7846 Cat F1, F2 or F3	Performance requirements for cables required to maintain integrity under fire conditions.
BS EN 60702	Mineral insulated cables with a rated voltage not exceeding 750V	BS EN 60332-1	Tests on electric cables under fire conditions - single core cable.
		BS EN 61034-2 (for zero-halogen coverings)	Measurement of smoke density of electric cables burning under defined conditions.
		BS EN 60754-1(for zero-halogen coverings)	Gases evolved during combustion of electric cables.
		BS 6387 Cat C, W and Z	Performance requirements for cables required to maintain integrity under fire conditions.

BS 5839-1:2013 (Fire detection and fire alarm systems for buildings. Code of practice for system design, installation, commissioning and maintenance).

This standard provides recommendations for the planning, design, installation, commissioning and maintenance of fire detection and fire alarm systems in and around building, other than dwellings. It recommends the use of fire resisting cables for mains power supply circuit and all critical signal path in such systems. It does not recommend whether or not a fire alarm system should be installed in any given premises. Cables are described in clause 26. This standard introduces two different levels of resistance of cables during a fire (standard and enhanced grade).

BS 5839-6:2013 - Fire detection and fire alarm systems for buildings. Code of practice for the design, installation and maintenance of fire detection and fire alarm systems in dwellings.

This code of practice covers every type of fire detection ‘system’, from a simple self-contained battery smoke alarm right through to major hard wired 24V systems.

BS 5839-6 also covers almost every conceivable type of premises, including:
Bungalows
Multi-storey houses
Individual flats
Individual maisonettes
Mobile homes
Individual sheltered accommodation
Houses in multiple occupation (HMOs)
NHS housing in the community

BS 5839-6 is primarily concerned with saving lives and reducing injuries. BS 5839-6 grades fire detection systems from Grade F up to Grade A. Generally speaking, the greater the fire risk and the more demanding the application, the more comprehensive the system needs to be.

BS 5839-8:2013 - Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of voice alarm systems.

Many people believe they can simply use their PA system to provide a voice message in the event of an emergency like a fire. Unfortunately PA systems, whilst very good for providing music and messages, are not guaranteed to work when there is an emergency. This is where the British Standard BS 5839 - 8:2013 on

Voice Alarm comes into use, as it clearly defines the requirements of a true VA system. A true VA system is a highly secure public address system which has the following features;

-All internal and external circuits are monitored for faults
-A minimum battery back up of 24 hours standby and 30 minutes alarm.
-A monitored secure link to a fire alarm panel
-A number of pre-recorded emergency messages
-Incorporates an emergency ‘firemans’ microphone

BS 5839-9:2011 - Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems.

An emergency voice communication systems(EVCS) is a fixed, secure, bi-directional, full duplex voice communication system to assist fire fighters in an emergency in high rise buildings or large sites where radio communication may not work, and covers the operation of both fire telephones and disabled refuge systems. Where both systems are fitted to a building, BS 5839-9 specifies these should be a single system.

BS 5266-1:2005 - Emergency lighting. Code of practice for the emergency lighting of premises.

The purpose of emergency lighting, anti-panic lighting and standby lighting is to ensure that the main fire exit routes from a building or open and high risk areas are sufficiently lit in the case of a mains failure, in order to allow persons to safely evacuate the areas or premises. Manual fire alarm points, first aid points, fire fighting and safety equipment should also be clearly lit, so that it can be clearly identified.

Cables installed for these systems have to withstand to fire for at least 60 minutes according to BS EN 50200.

BS 8519:2010- Selection and installation of fire resistant power and control cable systems for life safety and fire fighting applications. Code of practice.

BS 8519 was introduced specifically to apply only to large and complex buildings and has been widely welcomed within the industry. The new standard offers guidance for the selection of fire resistant power and control cables in life safety and firefighting systems such as smoke barriers, sprinkler systems, fire fighting and evacuation lift supplies. Consequently, BS 8519 should increase the protection of emergency and fire personnel, as well as evacuees who may be inside a large or complex building when fire breaks out.

CIRCUIT (INSULATION) INTEGRITY IN ACCORDANCE WITH DIFFERENT STANDARDS

Circuit (insulation) Integrity in accordance with IEC 60331

IEC 60331 specifies tests for electric cable for circuit integrity under fire conditions. It is divided in following parts that describe the test modes, the conditions, and the equipment to use. The test was originally carried out only in fire alone for a period of 180 minutes at a temperature of 750°C. To better simulate the real fire conditions, with mechanical stresses due to the fall of materials and with the presence of water, the testing conditions have been modified by changing the duration, increasing the temperature of the flame and by adding mechanical stresses and water spray.

IEC 60331-1 ed 1.0 (2009-05)- Part 1: Test method for fire with shock at a temperature of at least 830°C for cables of rated voltage up to and including 0.6/1KV and with an overall diameter exceeding 20mm.

IEC 60331-2 ed 1.0 (2009-05)- Part 2: Test method for fire with shock at a temperature of at least 830°C for cables of rated voltage up to and including 0.6/1KV and with an overall diameter not exceeding 20mm.

IEC 60331-3 ed 1.0 (2009-05)- Part 3: Test method for fire with shock at a temperature of at least 830°C for cables of rated voltage up to and including 0.6/1KV tested in a metal enclosure.

IEC 60331-11 ed1.01 Consol. with am1 (2009-07) – Part 11: Apparatus – Fire alone at a flame temperature of at least 750°C.

IEC 60331-12 ed1.01 Consol. with am1 (2009-07) – Part 12: Apparatus – Fire with shock at a flame temperature of at least 830°C.

IEC 60331-21 ed1.0 (1999-04) – Part 21: Procedures and requirements – Cables of rated voltage up to and including 0.6/1KV.

IEC 60331-23 ed1.0 (1999-04) – Part 23: Procedures and requirements – Electric Data Cables.

IEC 60331-25 ed1.0 (1999-04) – Part 25: Procedures and requirements – Optic Fiber Cables.

IEC 60331-31 ed1.0 (1999-04) – Part 31: Tests for electric cables for fire conditions and shock- Circuit integrity. Procedures and requirements for fire with shock – Cables of rated voltage up to and including 0.6/1KV.

IEC 60331-21/60331-23 A sample of the cable length of 1200mm sustained by two metal rings is mounted horizontally in a special ventilated cabin. During the test, to the wire cores of cable a voltage of the nominal value is applied (for telecommunication cables equal to 110 V), thereby creating a closed electric circuit.

The sample is subjected to an action of linear gas burner with a length of 500mm and the flame temperature equal to 750°C till 800°C. The time of the fire is 180 minutes. Result of the test is considered positive if at that time will not be considered a short circuit in the circuit being researched.

IEC 60331-25 details a method to assess the circuit integrity of optical fiber cables. The standard specifies a ribbon burner and the recommended flame temperature is 750°C. The optical power meter is zeroed and the changes in attenuation during the 180 minutes burner application period are monitored. The maximum change in attenuation (a change from zero) is recorded during the burner application period. In the 15 minutes period after the flame application, a maximum attenuation is also recorded. Result of the test is considered positive if at that time will not be considered a short circuit in the circuit being tested.

IEC 60331-31 applies to the cables with a diameter greater than 20mm, and introduces the standards and procedures for testing of cables exposed to fire and mechanical shock (equipment according to 60331-12). The test sample provides cable fragment length at least 1500mm. Bent wire on the U-shaped with a radius equal to the smallest permissible by the manufacturer, is mounted on a metal assay ladder. During the study, through all the cable wires is passed current with rated voltage and these cables are subjected to fire during 120min, where fire source is a gas burner set in conformity with standards, as well the mechanical shock of the 5 minutes interval. Result of the test is considered positive if at that time will not be considered a short circuit in the circuit being tested.

Circuit (insulation) Integrity in accordance with BS 6387:2013

BS 6387:2013 specifies the requirements for cables required to maintain circuit integrity under fire conditions. This is the first standard to include also mechanical stress and water stress in the fire resistance test of electric cables. BS 6387 standard is still used in many countries. Being different from EN 50200, Its limits is to require three different tests on three different cable samples.

The fire resistant cables are categorized by a letter symbol (e.g. A) or series of symbols (e.g. CWZ) according to the requirements for fire resistance characteristics which they meet, the test temperature selected and the duration of the test for resistance to fire alone in according to BS 6387 as below:

The test provides the basis for the following categories:

Test	Category
(1) Resistance to fire alone 650°C for 3 hours (withdrawn in 2013 version) 750°C for 3 hours (withdrawn in 2013 version) 950°C for 3 hours 950°C for 20 minutes (short duration) (withdrawn in 2013 version)	 A B C S
(2) Resistance to fire with water Exposed to fire @ 650°C for 15 mins then exposed to fire @ 650°C with water for another 15 mins.	W

Test	Category
(3) Resistance to fire with mechanical shock Exposed to fire @ 650°C for 15 mins then exposed to fire @ 650°C with mechanical shock for 15 mins (withdrawn in 2013 version). Exposed to fire @ 750°C for 15 mins then exposed to fire @ 750°C with mechanical shock for 15 mins (withdrawn in 2013 version). Exposed to fire @ 950°C for 15 mins then exposed to fire @ 950°C with mechanical shock for 15 mins.	X Y Z

The most common test comprises the three categories C, W and Z.

–Category C is a fire resistance test in which the cable is exposed to a fire at a temperature of 950°C with a duration of 3 hours under realistic conditions.

– Category W is a fire and water resistance test in which the cable is exposed to a fire at a temperature of 650°C and then for another 15 minutes to fire with water that is poured over the area around the cable. This simulates effect of water from a sprinkler that is activated during the fire.

-Category Z is a fire and mechanical stroke test in which the cable is installed in a defined manner on a vertical wall with three cable clips and subject to heat from a gas burner; mechanical shock is simulated by striking the cable with a hammer. The cable is exposed to a fire at a temperature of 950°C and then for another 15 minutes to fire with mechanical shock at a frequency of 2 strikes per minute.

During testing in all three categories, the cable is connected to a 400V three-phase power supply protected with a 3 A fuse on each phase. The test is regarded as successful if none of the fuses blow during the test period.

Circuit (insulation) Integrity in accordance with EN 50200:2006

EN 50200:2006 defines method of test for resistance to fire of unprotected small cables (up to 20mm) for use in emergency circuits.

In the adapted chamber is mounted a cable sample with a length of 1200mm, to which wire cores during the test a nominal value voltage is applied, creating thereby a closed circuit. During the test the cable is subjected to actions of the fire at conventional temperature 842°C and mechanical stroke for a specified period of time. The measured time of proper functioning of the cable corresponds to the so-called cable fire resistance class PH, which is also mentioned in the standard PN-B-02851-1 - Fire resistance tests of elements of buildings (Test method for thin wires with an outside diameter not greater than 20mm).

The test duration is expressed in minutes and is recorded in the following classification:

Test	Category
Flame exposure for 15 minutes	PH 15
Flame exposure for 30 minutes	PH 30
Flame exposure for 60 minutes	PH 60

Test	Category
Flame exposure for 90 minutes	PH 90
Flame exposure for 120 minutes	PH 120

EN 50200 annex E also foresees the water stress (fire, mechanical shock & water spray), as previously provided by BS 8434-1 standard. EN 50200 is similar to IEC 60331-2. Being different from BS 6387, EN 50200 test the same samples simultaneously stressed by the flame action, by the mechanical shock and by water spray.

Circuit (insulation) Integrity in accordance with EN 50362:2003

EN 50362:2003 / BS EN 50362:2003 / DIN EN 50362:2003 / CEI EN 50362:2003 (CEI 20-36/5-0) defines method of test for resistance to fire of larger unprotected power and control cables for use in emergency circuits. This standard provides the same tests foreseen by IEC 60331-31 standards. (Flame Temperature of 830°C).

Circuit (insulation) Integrity in accordance with BS 5839-1:2002

The new edition of BS 5839-1:2013 (Fire detection and fire alarm systems for buildings. Code of practice for system design, installation, commissioning and maintenance) describes two level of fire performance for fire rated cabling for fire alarm system: Standard Grade and Enhanced Grade. In order to confirm the compliance of the cable to both categories, BS 5839-1 refers to EN 50200 and BS 8434-2003 Part 1 & 2. (Method of tests for the assessment of fire integrity of electricity cables). These tests are carried out to verify the circuit integrity of small cables exposed to flame, mechanical shock and water in accordance with the new fire alarm code of practice.

Standard Grade clause 26.2d
Maintenance of circuit integrity:
BS 8434-1:2003 at 830°C for 30 minutes,
15 minutes with fire and mechanical shock plus.
15 minutes with fire, mechanical shock and water.
BS EN 50200 PH30.
30 minutes at 830°C with fire and mechanical shock.

Enhanced Standard Grade clause 26.2e
Maintenance of circuit integrity:
BS 8434-2:2003 at 930°C for 60 minutes,
60 minutes with fire and mechanical shock plus.
60 minutes with fire, mechanical shock and water.
BS EN 50200 PH120 (improved).
120 minutes at 930°C with fire and mechanical shock.

Circuit (insulation) Integrity in accordance with BS 8434-1:2003 & BS 8434-2:2003 + A2:2009

BS 8434- Methods of test for assessment of the fire integrity of electric cables Part1: Test for unprotected small cables for use in emergency circuits - BS EN 50200 with the addition of water spray. Part 2: Test for unprotected

small cables for use in emergency circuits- BS EN 50200 with a 930°C flame and with water spray.

BS 8434-1:2003 defines test which is equivalent to BS EN 50200 with a 830°C flame and water spray. The cable is stressed by the flame at 830°C with mechanical shocks for 15 minutes and further 15 minutes with the addition of water spray. BS 8434-2:2003 defines test which is equivalent to BS EN 50200 with a 930°C flame and water spray. The cable is stressed by the flame at 930°C with mechanical shocks for 60 minutes and further 60 minutes with the addition of water spray. The tests for BS 8434-2 have not been covered in the BS EN 50200 standard yet and are still in force. (BS 8434-1 was replaced by BS EN 50200).

Circuit (insulation) Integrity in accordance with BS 8491:2008

BS8491:2008 Method for assessment of fire integrity of large diameter power cables for use as components for smoke and heat control systems and certain other active fire safety systems. This standard is related to cables included in BS 7346-6 and certain other active fire safety systems. It is applicable to cables of rated voltage not exceeding 600/1000V and overall diameter greater than 20mm. The test method in BS 8491-2008 includes subjecting the cable under test to radiation via direct impingement corresponding to a constant temperature attack of 842°C, to direct mechanical impacts corresponding to a force of approximately 10N and to direct application of a water jet simulating a water fire fighting jet. The test method given in this standard includes three different test durations to allow testing of cables intended for different applications.

Circuit (insulation) Integrity in accordance with DIN VDE 0472-814

DIN VDE 0472-814:1991 - Testing of cables. wires and flexible cords; continuance of insulation effect under fire conditions.

A test fire is applied horizontally from a distance of 60cm to a single suspended cable during a specified time. The test is passed when there was continuous circuit integrity and no extremely increased attenuation values during and after the test respectively. For instance FE 90 cables can endure at least 90 minutes, “FE” stands for flame exposure. The fire test with circuit integrity shows how many minutes a mechanically unstressed connection at a flame exposure of minimum 750°C keeps minimum insulation efficiency (circuit integrity) in a dry environment.
Similar standard is IEC 60331 (FE) and BS 6387 Cat C. This is a fire test for insulation integrity without any mechanical and water stress.

Circuit (insulation) Integrity in accordance with NBN C30-004 (cat. F3)

NB N C30-004 – Fire Resistance of electric cables. Classification and test method.
The cable is stressed by the flame at 900°C with mechanical shocks every 30 seconds for a duration of 3 hours. The cable is deemed to pass the test if the current leakage does not exceed 1 amp per conductor. The test must be passed by 4 successive samples.

Circuit (insulation) Integrity in accordance with SS299-1

SS299-1 Fire resistant cables - Performance requirements for cables required to maintain circuit integrity under fire conditions.

Circuit (insulation) Integrity in accordance with CEI 20-36/2-1

CEI 20-36/2-1 Tests for electric cables under fire conditions-Circuit integrity - Part 21: Procedures and requirements- Cables of rated voltage up to and including 0.6/1KV.
This is equivalent to IEC 60331-21.

Circuit (insulation) Integrity in accordance with CEI 20-36/4-0

CEI 20-36/4-0 Method of test for fire resistance of small cables unprotected for use in emergency circuits. This is equivalent to CEI EN 50200.

Circuit (insulation) Integrity in accordance with NF C32-070-2.3(CR1)

The cable is installed in a stainless steel conduit and heated to 920°C ± 20°C according to a specified time curve. A voltage of 500 V AC or 1,000 V AC respectively is applied to the cable. To simulate mechanical shock, a small hammer strikes the pipe at a frequency of 2 strikes / min.

SYSTEM CIRCUIT (FUNCTIONAL) INTEGRITY IN ACCORDANCE WITH DIFFERENT STANDARDS

System Circuit (functional) Integrity in accordance with DIN 4102-12

Maintaining the function of electrical cable during the fire, defined as the concept of cable system is characterized by the German DIN 4102, part 12. DIN 4101-12 is a testing for functional integrity of entire electrical cable systems together with fastener components and shall be considered as the most rigorous, but on the other hand, as most closely simulating the real fire conditions,
DIN 4102-12 defines the requirements and testing method for fire resistance of electric cable system required to maintain circuit integrity. The standard defines testing for the functionality of so-called cable set, which consists of a group set of power cables, telecommunications, data cables etc. to be fixed to the support structure consisting of channels, ladders, cable tray ,items to hang, handles, etc. Cables attached to this structure are powered by their work voltage. Functional integrity will be tested for short-circuit of insulation or discontinuity of any wire core.

DIN 4102-12 is a realistic fire-chamber testing with minimum dimensions 2 x 3 x 2.5 m. (width/length/height). A complete cable installation is tested under realistic conditions. The effects of thermal expansion and mechanical load during a fire are taken into account. The temperature must follow the standard fire curve (ETK): At E 90, the system is tested for 90 minutes, with a flame temperatures reaching up to 1000°C during the test. The cable is installed in a furnace and mounted with cable trays and cable clips with guides. A voltage of 400 V AC is applied to the cable (or 110 V AC for telecommunications cables)
There are three categories of function maintenance as follows:
E30 - cable system function maintenance in case of fire for 30 minutes

E60 - cable system function maintenance in case of fire for 60 minutes
E90 - cable system function maintenance in case of fire for 90 minutes
The numbers in each case designate the period of time for which the integrity of the power circuit must be maintained.

It is worth noting that duration of the cable operation under test is determined not only by design and selection of used cable materials, but also and often primarily, the construction and selection of supporting structure materials, which is subject to deformation in high temperatures, and these deformations in turn tighten the cables attached to the structure.

System Circuit (functional) Integrity in accordance with NBN 713 020

The test specifies fire performance of building materials and products. The cables are installed in 3 x 3 testing room They are installed on cable trays and undergo the flame action up to 1000°C. The cables are then classified according to the maximum time for resistance to fire (denoted by Rf1, Rf 1 1/2, Rf2 in which the number represents the time duration).

FLAME RETARDANCE IN ACCORDANCE WITH DIFFERENT STANDARDS

The following standards specify a method for flame propagation test for single core cables. The single cable sample undergoes the flame action of a bunsen burner. The test only lasts few minutes.

The IEC 60332-1 standards are taken over as EN standards and transferred to national standards. Example: IEC 60332-1 becomes EN 60332-1 and introduced in Germany as DIN EN 60332-1.

Flame retardance in accordance with EN 60332:2004

EN 60332:2004 Tests on electrical and optical cables under fire conditions. The standard applies to single insulated wires (cables) and requires a vertical flame test with a maximum flame climb of 450mm. The test lasts between 1 and 8 minutes, depending on the cable diameter.

EN 60332-1-1:2004 / BS EN 60332-1-1:2004 / IEC 60332-1-1:2004 / DIN EN 60332-1-1:2004 / VDE 0482-1-1:2005-06 Test on electrical and optical cables under fire conditions. Test for a vertical flame propagation fo a single insulated wire or cables.

EN 60332-1-2:2004 / BS EN 60332-1-2:2004 / IEC 60332-1-2:2004 / DIN EN 60332-1-2:2004 / VDE 0482-1-2:2005-06 / CEI 60332-2-2 (CEI 20-35/2-2) Tests on electrical and optical fiber cables under fire conditions. Test for a verticalflame propagation for a single insulated wire or cable – Procedure for 1kW premixed flame.
This standard specifies a method of test for resistance to vertical flame propagation for a single insulated wire or cable. Part 1-1 specifies the test apparatus and Part 1-2 specifies the test procedure.

The cable sample is deemed to pass the test if the distance between the lower edge of the top support and the onset of charring is greater than 50mm. In addition, a failure shall be recorded if burning extends downward to a point greater than 540mm from the lower edge of the top support.

EN 60332-1-2:2004 specifies the use of 1kW premix flame and is for general use, except that the procedure may not be suitable for the testing of small insulated conductors or cables of less than 0.5mm sq cross section because the conductor melts before the test is completed, or for the testing of small optic fiber cables because the fiber will be broken before the test is completed. In this case, the procedure given by EN 60332-2-1/2 is recommended.

EN 60332-2-1:2004 / BS EN 60332-2-1:2004 / IEC 60332-2-1:2004 / DIN EN 60332-2-1:2004 / VDE 0482-2-1:2005-06 Tests on electrical and optical cables under fire conditions. Test for a vertical flame propagation for a single small insulated wire or cable.

EN 60332-2-2:2004 / BS EN 60332-2-2:2004 / IEC60332-2-2:2004 / DIN EN 60332-2-2:2004 / VDE 0482-2-2:2005-06 / CEI 60332-2-2 (CEI 20-35/2-2) Test on electric and optical fiber cables under fire conditions. Tests for vertical flame propagation for a single small insulated wire or cable. Procedure for diffusion flame.
This test applies to small dimensions cables.
This standard specifies a method of test for resistance to vertical flame propagation for a single insulated wire or cable. Part 2-1 specifies the test apparatus and Part 2-2 specifies the test procedure.

Flame retardance in accordance with NF C32-070-2.1(C2)

NF C32-070:2001 Insulated conductors and cables for installation - Classification tests on conductors and cables with regard to fire behavior.

NF C32-070 2.1 Procedure for 1 kW pre-mixed flame.

The NF F 32070 2.1 (Category C2) and IEC 60332-1-2 are very similar. The sole difference is the time during which the flame is applied.

Flame retardance in accordance with EN 50265-1:1999 (replaced by EN 60332)

EN 50265-1:1999 / BS EN 50265-1:1999 / DIN EN 50265-1:1999 / VDE 0482-265-1:1999-04– Common test methods for cables under fire conditions. Test for resistance to a vertical flame propagation for a single insulated conductor or cable. Apparatus (Replaced by EN 60332-1-1:2004 and EN 60332-2-1:2004).

EN 50265-2-1:1999 / BS EN 50265-2-1:1999 / DIN EN 50265-2-1:1999 / VDE 0482-265-2-1:1999-04 – Common test methods for cables under fire conditions. Test for resistance to a vertical flame propagation for a single insulated conductor or cable. Part 2-1: Procedure 1kW pre-mixed flame (Replaced by EN 60332-1-2:2004).

EN 50265-2-2:1999 / BS EN 50265-2-2:1999 / DIN EN 50265-2-2:1999 / VDE 0482-265-2-2:1999-04 – Common test methods for cables under fire conditions. Test for resistance to a vertical flame propagation for

a single insulated conductor or cable. Part 2-2: Procedure Diffusion flame (Replaced by EN 60332-2-2:2004).

Flame retardance in accordance with BS 4066 Part 1 & 2 (replaced by EN 60332)

BS 4066-2:1980 (superseded) – Tests on electic cables under fire conditions. Method of test on a single vertical insulated wire or cable.

This standard is no longer in force and is replaced by BS EN 50265-2-1 which was also superseded by BS EN 60332-1:2009.

Flame retardance in accordance with NBN C 30-004 (cat. F1)

NBN C 32-004 specifies a method of test for measuring the vertical flame propagation characteristics of a single wire or cable. The cable specimen is deemed to have passed the test and categorized as F1 if after burning has ceased, the charred or affected portion does not reach within 50mm of the lower edge of the top clamp which is equivalent to 425mm above the point of flame application.

Flame retardance in accordance with IEEE 383

In the IEEE 383 test, cables are supported by a one foot wide vertical rack eight feet high. The cables are positioned in the centre six inches of the rack, spaced one-half diameter apart. The rack is centered in an eight foot enclosure. A ten inch ribbon burner ignites the cable with a 21kW (70000 BTU). The burner is positioned 2 feet above the floor and 9 to 12 inches of cables are exposed to direct flames for 20 minutes. Cables on which flame extends above the top of the 8 foot rack fail the test.

REDUCED FIRE PROPAGATION IN ACCORDANCE WITH DIFFERENT STANDARDS

These standards specify a method for fire propagation test for vertically mounted bunched cables. These tests simulate the chimney effect in vertical installation of bunch of cables. A certain number of cable sections with a length of 3.5m is fastened to a vertical ladder in an adapted chamber. The amount of combustible materials for cables and duration of flame application depends on the category the cable has to meet.

Resistance of the wires bundle arranged vertically to the spread of the flame should be such that after a certain time and stopping the source of ignition, flame is extinguished by itself and the length of charred fragments will not exceed 2.5m in height measured above the lower edge of the burner.

Reduced fire propagation in accordance with IEC 60332-3

This test is the most common one to verify the behaviour of a cables for the fire propagation. The cables are installed on a bunch of vertical ladder inside a metal cabinet and undergo the action of a ribbon flame at 750°C.The standard is subdivided in several parts that differ one from the other for the quantity of cable to be installed, the installation mode and the flame application time.

EN 60332-3-10:2009 / BS EN 60332-3-10:2009 / IEC 60332-3-10 ed1.1 / DIN EN 60332-3-10:2009 / VDE 0482-332-3-10:2010-08 – Common test methods for cables under fire conditions. Tests on electric and optical fiber cables under fire conditions - Part 3-10: Test for vertical flame spread of vertically mounted bunched wires or cables.

EN 60332-3-21:2009 / BS EN 60332-3-21:2009 / IEC 60332-3-21 ed1.1 / DIN EN 60332-3-21 / VDE 0482-332-3-21:2010-08 / CEI EN 60332-3-21:2009 (CEI 20-22/3-1)– Procedures. Tests on electric and optical fiber cables under fire conditions - Part 3-21: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category A . F/R
-Installation in one layer (front).
-Installation in two layers (front and rear)
-The quantity of the Installed cable is equal to 7 litres/m of combustible materials for cables
-The time of application of the flame is 40 minutes

EN 60332-3-22:2009 / BS EN 60332-3-22:2009 / IEC 60332-3-22 ed1.1 / DIN EN 60332-3-22:2009 /VDE 0482-332-3-22:2010-08 / CEI EN 60332-3-22:2009 (CEI 20-22/3-2)– Procedures. Tests on electric and optical fiber cables under fire conditions - Part 3-22: Test for vertical flame spread of vertically-mounted bunched wires or cable - Category A

-Installation in one layer (front).
-The quantity of the installed cable is equal to 7 litres/m of combustible materials for cables
-The time of application of the flame is 40 minutes

EN 60332-3-23:2009 / BS EN 60332-3-23:2009 / IEC 60332-3-23 ed1.1 / DIN EN 60332-3-23:2009 / VDE 0482-332-3-23:2010-08 / CEI EN 60332-3-23:2009 (CEI 20-22/3-3)– Procedures. Tests on electric and optical fiber cables under fire conditions - Part 3-23: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category B

-Installation in one layer (front).
-The quantity of the installed cable is equal to 3.5 litres/m of combustible materials for cables
-The time of application of the flame is 40 minutes

EN 60332-3-24:2009 / BS EN 60332-3-24:2009 / IEC 60332-3-24 ed1.1 / DIN EN 60332-3-24:2009 / VDE 0482-332-3-24:2010-08 / CEI EN 60332-3-24:2009 (CEI 20-22/3-4) – Procedures. Tests on electric and optical fiber cables under fire conditions - Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category C

-Installation in one layer (front).
-The quantity of the installed cable is equal to 1.5 litres/m of combustible materials for cables
-The time of application of the flame is 20 minutes

EN 60332-3-25:2009 / BS EN 60332-3-25:2009 / IEC 60332-3-25 ed1.1 / DIN EN 60332-3-25: 2009 / VDE 0482-332-3-25:2010-08 / CEI EN 60332-3-25:2009 (CEI 20-22/3-5)– Procedures. Tests on electric and optical fiber cables under fire conditions - Part 3-25: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category D
-Installation in one layer (front).
-The quantity of the installed cable is equal to 0.5 litres/m of combustible materials for cables
-The time of application of the flame is 20 minutes.

Summary of test condition:

IEC	60332-3-21	60332-3-22			60332-3-23		60332-3-24		60332-3-25	
BS EN 50266	50266-2-1	50266-2-2			50266-2-3		50266-2-4		50266-2-5	
CEI	20-22/3-1	20-22/3-2			20-22/3-3		20-22/3-4		20-22/3-5	
Category	AF/R	A			B		C		D	
Conductor cross-sectionsmm^2	>35	>35		≤35	>35	≤35	>35	≤35	>35	≤35
NMV(litres per metre of cable)	7	7			3.5		1.5		0.5	
Minimum length of test pieces(m)	3.5	3.5			3.5		3.5		3.5	
Standard ladder (500 mm wide): • number of layers • maximum width of test sample	1front+1rear 300mm	≥1front 300mm	1front 300mm	- -	≥1front 300mm	1front 300mm	≥1front 300mm	1front 300mm	≥1front 300mm	
Wide ladder (800 mm wide): • number of layers • maximum width of test sample	- -	- -	- -	1front 600mm	- -		- -		- -	
Positioning of test pieces	Spaced 0.5×Diameter cable (Max.20mm)	Touching	Spaced 0.5×Diameter cable (Max.20mm)		Touching	Spaced 0.5×Diameter cable (Max.20mm)	Touching	Spaced 0.5×Diameter cable (Max.20mm)	Touching	
Number of burners	1	1	1	2	1		1		1	
Ladder mounting	Front and rear	Front, Wider ladder for larger cables			Front		Front		Front	
Flame application time(min)	40	40	40		40		40		40	
Test conditions	Wind speed: <8 m/s; Ternperature: 5°C - +40°C									
Extent of the charred portion	≤2.5m above the bottom edge of the burner, neither at the front nor at the rear of the ladder.									

Reduced fire propagation in accordance with NF C32-070-2.2(C1)

NF C32-070 :2001 Insulated conductors and cables for installation.
-Classification tests on conductors and cables with regard to fire behavior.

A 1600mm vertically installed bundled of cable is exposed to the effects of a radiating oven (approx 830°C) and forced ventilation. Pilot flames arranged above the oven burn off the emitted gases. The test duration is 30 minutes, with the ventilation stopped for every 10 minutes during the flame application period. The cable sample is classified under Category C1 according to NF F 32070-2.2 if the carbonised part of the cable sample does not extend more than 0.8m above the upper base of the oven.
Depending on the damaged length, they can be further classified into 4 classes A, B, C and D according to NF F 16-101 as follows:

Category	Test Result
A	No damaged length from top of the oven in upper position.
B	Damaged length from top of oven in upper position not extending more than 50mm.
C	Damaged length from top of oven in upper position not extending more than 300mm
D	Damaged length from top of oven in upper position not extending above the top of the chimney

Reduced fire propagation in accordance with EN 50266-1, EN 50266-2-2, EN 50266-2-3, EN 50266-2-4.

EN 50266-1:2001 / BS EN 50266-1:2001 / DIN EN 50266-1:2001 / VDE 0482-266-1:2001-09– Common test methods for cables under fire conditions. Test for vertical flame spread of vertically mounted bunched wires or cables - Part 1: Apparatus (Replaced by EN 60332-3-10:2009)

EN 50266-2-1:2001 / BS EN 50266-2-1:2001 / DIN EN 50266-2-1:2001 / VDE 0482-266-2-1:2001-09 / CEI EN 50266-2-1– Common test methods for cables under fire conditions. Test for vertical flame spread of vertically mounted bunched wires or cables - Part 2-1 : Procedures. Category A F/R (Replaced by EN 60332-3-21:2009)

EN 50266-2-2:2001 / BS EN 50266-2-2:2001 / DIN EN 50266-2-2:2001 / VDE 0482-266-2-2:2001-09 / CEI EN 50266-2-2– Common test methods for cables under fire conditions. Test for vertical flame spread of vertically mounted bunched wires or cables
- Part 2-2: Procedures. Category A (Replaced by EN 60332-3-22:2009)

EN 50266-2-3:2001 / BS EN 50266-2-3:2001 / DIN EN 50266-2-3:2001 / VDE 0482-266-2-3:2001-09 / CEI EN 50266-2-1– Common test methods for cables under fire conditions. Test for vertical flame spread of vertically mounted bunched wires or cables
- Part 2-3: Procedures. Category B (Replaced by EN 60332-3-23:2009)

EN 50266-2-4:2001 / BS EN 50266-2-4:2001 / DIN EN 50266-2-4:2001 / VDE 0482-266-2-4:2001-09 / CEI EN 50266-2-4:2001 – Common test methods for cables under fire conditions. Test for vertical flame spread of

vertically mounted bunched wires or cables - Part 2-4: Procedures. Category C (Replaced by EN 60332-3-24:2009).

Reduced fire propagation in accordance with BS 4066-3

BS 4066-3:1994 (superseded) – Tests on electic cables under fire conditions. Tests on bunched wires or cables. This standard is no longer in force and is replaced by the BS EN 50266-1:2001

Reduced fire propagation in accordance with NBN C 32-004 (F2)

NBN C 32-004 specifies a method of test for measuring the vertical flame propagation characteristics of a bunch of cables. The cable specimen is deemed to have passed the test and categorized as F2 if after burning has ceased, the extent of charred or affected portion does not reach a height exceeding 2.5m above the bottom edge of the burner.

HALOGEN CONTENT TEST IN ACCORDANCE WITH DIFFERENT STANDARDS

In the event of a fire, many fumes are produced. This test is concerned with the possibilities of corrosive acid gases being released from halogen containing cables and the damage such cables can cause (to equipments). These standards specify a method for determination of the amount of halogen acid gas, evolved during combustion of compound.

Halogen content test in accordance with EN 50267-2-1

EN 50267-2-1:1998 / BS EN 50267-2-1:1999 / DIN EN 50267-2-1: 1999 / VDE 0482-267-2-1:1999-04 / CEI EN 50267-2-1:1999 (CEI 20-37/2-1) Common test methods for cables under fire conditions- Test on gases evolved during combustion of materials from cables- Part 2-1: Procedures. Determination of the amount of halogen acid gas. This part of the standard defines the method to measure the amount of halogen acid evolved and which should be expressed in hydrochloric acid. The amount of halogen acid contained in the test solution is determined by a titration method.

If the cables are described as zero halogen or halogen free, it is recommended that the hydrochoric acid yield should be less than 0.5%.

Halogen content test in accordance with IEC 60754-1

IEC 60754-1 ed 2.0 Common test methods for cables under fire conditions. Test on gases evolved during combustion of materials from cables.
Part 1: Procedures. Determination of the amount of halogen acid gas.
Basically, this is same as EN 50267-2-1.

Halogen content test in accordance with BS 6425-1

BS 6425-1:1990(superseded): Test on gases evolved during the combustion of materials from cables. Method for determination of amount of halogen acid gas evolved during combustion of polymeric materials

taken from cables.
This standard is no longer in force and is replaced by the EN 5026

ACID GAS EMISSION TEST IN ACCORDANCE WITH DIFFERE

The following standards specify a method for determination of a of cables by measuring PH and conductivity. This test allows to c es generally halogens, that develop during the electric cable combus

Acid gas emission test in accordance with EN 50267-2-2

EN 50267-2-2:1999 / BS EN 50267-2-2:1999 / DIN EN 50267-2-2:1999 / VDE 0482-267-2-2:1999- 04/ CEI EN 50267-2-2:1999 (CEI 20-37/2-2). Common test methods for cables under fire conditions- Test on gases evolved during combustion of materials from cables- Part 2-2: Procedures. Determination of degree of acidity of gases for materials by measuring PH and conductivity.
The standard states that the pH and the conductivity of a test solution should be measured, using calibrated PH and conductivity meters.

If the cables are described as zero halogen or halogen free, it is recommended that at least both of the following requirements should be met for each of the individual materials of a cable:

-The PH value should not be less than 4.3 when related to 1 litre of water
-The conductivity should not be less than 10us/mm when related to 1 litre of water

EN 50267-2-3:1999 / BS EN 50267-2-3:1999 / DIN EN 50267-2-3:1999 / VDE 0482-267-2-3:1999-04 / CEI EN 50267-2-3:1999 (CEI 20-37/2-3). Common test methods for cables under fire conditions- Test on gases evolved during combustion of materials from cables- Part 2-3:Procedures. Determination of degree of acidity of gases for cables by determination of the weighted average of pH and conductivity.

The standard states that the pH and the conductivity of a test solution should be measured, using calibrated pH and conductivity meters. The results from the different components of the cable are then weighted.

Acid gas emission test in accordance with IEC 60754-2

IEC 60754-2 ed1.0 Test on gases evolved during combustion of electric cables - Part 2 : Determination of degree of acidity of gases evolved during combustion of materials taken from electric cables by measuring pH and conductivity.

Acid gas emission test in accordance with NF C32-074

NF C32-074 Common test methods for cables under fire conditions - Test on gases evolved during combustion of
materials from cables. This standard is equivalent to

IEC 60754-2

Acid gas emission test in accordance with BS 6425-2

BS 6425-2:1993 (superseded) test on gases evolved during the combustion of materials from cables. Determination of degree of acidity (corrosivity) of gases by measuring pH and conductivity. This standard is no longer in force and is replaced by the EN 50267-2-2:1999.

Acid gas emission test in accordance with DIN VDE 0472-813 / VDE 0472-813:1994

DIN VDE 0472-813 / VDE 0472-813:1994 Corrosivity of combustion gases.
The standards are no longer in force and are replaced by the EN 50267-2-2 & VDE 0482-267-2-2.

SMOKE DENSITY TEST IN ACCORDANCE WITH DIFFERENT STANDARDS

The smoke density measurement taken from a material under fire conditions gives an indication of the visibility through the smoke. This is important as reduced visibility in a real fire situation makes it more difficult to escape from the fire thus increasing the threat to human life from the toxic gas, fumes and heat.
The following standards specify the method for measuring the generation of smoke from cables during fire.

Smoke density test in accordance with IEC 61034-1 & IEC 61034-2

IEC 61034-1:2005 / EN 61034-1:2005 / BS EN 61034-1:2005 / DIN EN 61034-1:2006 / VDE 0482-1034-1:2006 Measurement of smoke density of cables burning under defined conditions. Part 1: Test apparatus

IEC 61034-2:2005 / EN 61034-2:2005 / BS EN 61034-2:2005 / DIN EN 61034-2:2006 / VDE 0482-1034-2:2006 / CEI EN 61034-2:2006 (CEI 20-37/3-1) Measurement of smoke density of cables burning under defined conditions.
Part 2: Test procedure and requirements.

The standard specifies a method of measurement of smoke density of cables. Part 1 specifies the test apparatus and Part 2 specifies the test procedure.

The test is usually performed inside a chamber of 3mx3mx3m and the test is sometimes described as 3 metres cube test. The test is performed by monitoring the transmittance reduction of a white light beam, running from one side of the chamber to the other, at a set height, thus monitoring the build up of smoke inside the chamber. The minimum percentage of light transmittance is often used to determine if the cable has passed or failed the test , often a minimum light transmittance of 60% is applied in order to classify a cable as low smoke.

Smoke density test in accordance with NF C32- 073

NF C32 073 Common test methods for cables under fire conditions.

- Measurement of smoke density of cables burning under defined conditions.
This standard is equivalent to IEC 61034-2

Smoke density test in accordance with BS 7622-1 & BS 7622-2

BS 7622-1:1993 (superseded) – Measurement of smoke density of electric cables burning under defined conditions. Test apparatus.
BS 7622-2:1993 (superseded) – Measurement of smoke density of electric cables burning under defined conditions. Test procedure and requirements.
The standards are no longer in force and were replaced by the EN 50268-1:2000 and EN 50268-2:2000 even though they too were superseded by EN 61034-1:2005 and EN 61034-2:2005.

Smoke density test in accordance with EN 50268-1 & EN 50268-2

EN 50268-1:2000 / BS EN 50268-1:2000 / DIN EN 50268-1:2000 / VDE 0482-268-1:2000 (superseded) – Common test methods for cables under fire conditions. Measurement of smoke density of cable burning under defined conditions. Part 1: Apparatus.
EN 50268-2:2000 / BS EN 50268-2:2000 / DIN EN 50268-2:2000 / VDE 0482-268-2:2000 (superseded) – Common test methods for cables under fire conditions. Measurement of smoke density of cable burning under defined conditions. Part 2: Procedure.
The standards are no longer in force and are replaced by the EN 61034-1:2005 and EN 61034-2:2005. Although these standards have been withdrawn, they are still called upon in some specification documents such as in the London Underground specification 1-085.

Smoke density test In accordance with DIN VDE 0472-816 / VDE 0472-816:1994

DIN VDE 0472-816/VDE 0472-816:1994 Testing of cables, wires and flexible cords. Smoke Density.

The standards are no longer in force and are replaced by the EN 50268-1, VDE 0482-268-1, EN 50268-2 & VDE 0482-268-2 which are also replaced by the EN 61034-1:2005 and EN 61034-2:2005.

OXYGEN INDEX TEST IN ACCORDANCE WITH DIFFERENT STANDARDS

The oxygen index is defined as the minimum concentration of oxygen, expressed as volume percentage, in a mixture of oxygen and nitrogen that will just support combustion of a material initially at room temperature under specified test conditions.

Oxygen Index test in accordance with ASTM D 2863

ASTM D 2863-10 Measuring the minimum oxygen concentration to support candle-like combustion of plastics (Oxygen Index).

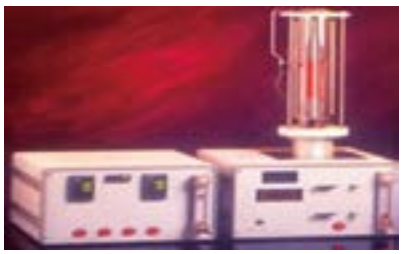
The test is performed in accordance with the procedure specified in ASTM 2863-95 using test piece cut from the outer sheath of the cable. The apparatus holds a small specimen which is clamped vertically in a tube in

an atmosphere where the relative concentration of oxygen and nitrogen can be changed. The aim is to test the flammability of the sample with a small pilot flame to find the minimum oxygen concentration required to just sustain combustion of the sample.

Oxygen index test in accordance with ISO 4589-2

ISO4589-2:1996 Determination of burning behaviour by oxygen index Part 2: Ambient temperature test. Specimens measuring 100mm long by 6mm wide are used for testing. The test is performed in accordance with the procedure specified in the standard.

TEMPERATURE INDEX TEST IN ACCORDANCE WITH DIFFERENT STANDARDS



This is a test for assessing the performance of a material when it is tested in accordance with BS2782: Part 1: Method 143a and 143b. The oxygen index of a material will drop when the temperature rises. When the temperature rises and the oxygen index drops to 21%, the material will burn automatically. This temperature is defined as temperature index. For example, the oxygen index of the coal at room temperature is 50% and when the temperature climbs to 150°C, it's oxygen index drops to 21°C and the coal will burn by itself automatically. The temperature index of the coal is defined as 150°C. In general, the temperature index of fire retardant cable exceeds 250°C.

Temperature index test in accordance with BS 2782

BS 2782: Part 1:1989 Method 143a and 143b Temperature of materials. Determination of flammability. Specimens measuring nominally 100mm long by 6.5mm wide by 3mm thick are used for testing. The specimens are then tested in accordance with the test procedure specified in the standard.

Temperature index test in accordance with ISO 4589-3

ISO4589-3:1996 Determination of burning behaviour by oxygen index Part 3: Elevated temperature test. Specimens measuring 100mm long by 6mm wide are used for testing. The test is performed in accordance with the procedure specified in the standard.

TOXICITY TEST IN ACCORDANCE WITH DIFFERENT STANDARDS

Toxicity test in accordance with NES 02-713

Measuring a fume from a material exposed to a controlled fire conditions gives an indication of the fumes which may be produced in a real fire situation. A standard method of test for determining the toxicity of materials under fire condition is Defense Standard NES 02-713- Toxicity. This method gives the level of toxicity of the fumes produced from the material under test. During the test, the test specimen is heated via direct flame application at 1150°C.

The flame is applied via a bunsen burner with a flame height of between 100m and 125mm formed with a methane gas and an external supply of compressed air. The specimen toxicity is determined from accurate pre-analysis weight (4pp) colorimetric tubes and ion chromatography.
The test may determine the following species: Hydrogen Bromide, Hydrochloric Acid, Hydrogen Fluoride, Formaldehyde, Nitrous gases, Carbon Monoxide, Carbon Dioxide, Acrylonitrile, Phenol,
Hydrogen Sulphide, Sulphur Dioxide, Hydrocyanic Acid, Ammonia. The concentration in ppm for each gas detected are provided. The toxicity index of the speciments summates the toxic gases, taking into account of their level of danger to humans. The smaller the toxicity index, the better the product. A limit of 5 is often applicable.

Toxicity test in accordance with NF C 20-454

NF C 20-454 base environmental testing procedures. Fire behaviour. Analysis and titration of gases evolved during pyrolysis or combustion of materials used in electrotechnics. Exposure to abnormal heat or fire. Tube furnace method.

The test defined by this standard serves to define the conventional toxicity index (cti) of the gases emitted by the insulating or sleeving materials during combustion at 800°C.

Toxicity test in accordance with NF X 70-100

NF X 70-100 Fire Tests; Analysis of gaseous effluents.

The test is conducted within a tube furnace where the temperature is set at either 400°C, 600°C, 800°C (commonly 600°C is used for most of the materials or 800°C for some electrical products) for 40 minutes throughout the test by analysis of the toxicity index of the gases including CO, CO2, HCl, HBr, HCN, HF and SO2.

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