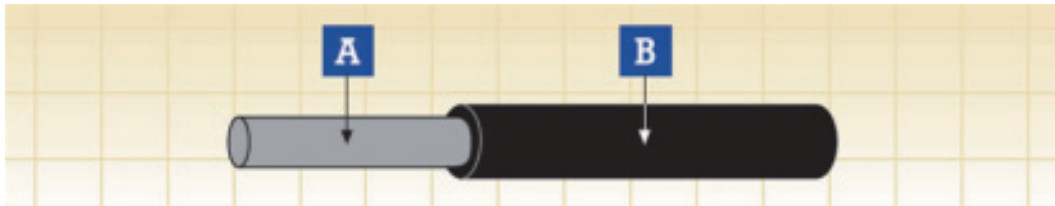


FIREROL Standard Wall Single Core Unsheathed Cables

0.6/1 kV or 1.8/3 kV

EN 50264-2-1 (FRL-SW-1SU/FRL-SW-3SU)



A. Conductor B. Insulation

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxiliary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

LSZH elastomeric compound as defined in EN 50264-1 (EI 101 to EI 104)

Electrical & Mechanical Properties

Nominal Voltage	0.6/1 kV or 1.8/3 kV
Max. Conductor Temperature	90 °C (fixed installation)
Min. Permissible Ambient Temperature	-25 °C/-40 °C (fixed installation)
Bending Radius	3 x Overall Diameter (D<12mm); 4 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

EN 60684-2	No fluorine
EN 50305; EN 60811-2-1	Resistance to mineral oil & fuel oil, acid & alkali
EN 50305	Resistance to ozone

Fire Performance for Rolling Stock Application

EN 50306-2	Hazard levels HL1, HL2/HL3, HL4
DIN 5510-2	Protection level 1/2/3/4
BS 6853	Interior use 1a, 1b, II; Exterior use 1a, 1b, II
NF F 16-101	F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)	Vertical flame propagation for a single insulated wire or cable
EN 50266-2-4 + EN 50305; IEC 60332-3-24; NF C 32-070 2.2 (C1); VDE 0472 Teil 804	Vertical flame spread of vertically mounted bunched wires or cables
EN 50268-2; IEC 61034-2; NF C 32-073 ; NF C 20-902; NF F 16 101; VDE 0472 Teil 816	Low Smoke Emission
EN 50267-2-1; IEC 60754-1; NF C 32-074; NF C 20-454; VDE 0472 Teil 815	Halogen Free
EN 50267-2-2/3; IEC 60754-2; NF C 32-074; NF C 20-453; VDE 0472 Teil 813	Low Corrosivity (Acidity & Conductivity)
EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853 NF F 63 808; BS6853; NF F 16 101	Low Toxicity Smoke Index

EN 50264 Rolling Stock Cables

FRL-SW-1SU 0.6/1 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
			Min.	Max.			20 °C	90 °C
mm ²	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.0	1.25	0.8	2.8	3.2	18	20	65	0.65
1.5	1.5	0.8	3.0	3.5	20	13.7	55	0.55
2.5	1.95	0.8	3.4	3.9	30	8.21	50	0.5
4.0	2.5	0.8	3.9	4.6	50	5.09	40	0.4
6.0	3.0	0.9	4.6	5.4	70	3.39	35	0.35
10	3.9	1.1	5.8	6.8	130	1.95	30	0.3
16	5.0	1.1	7.2	8.5	170	1.24	30	0.3
25	6.4	1.3	8.6	10.0	260	0.795	30	0.3
35	7.7	1.3	10.2	11.5	350	0.565	25	0.25
50	9.2	1.5	11.6	13.5	500	0.393	25	0.25
70	11.0	1.5	13.3	15.5	690	0.277	20	0.2
95	12.5	1.6	14.9	17.4	910	0.210	20	0.2
120	14.2	1.6	16.5	19.3	1120	0.164	20	0.2
150	15.8	1.9	18.5	21.7	1430	0.132	15	0.15
185	17.5	1.9	20.1	23.6	1720	0.108	15	0.15
240	20.1	2.1	22.9	25.8	2290	0.0817	15	0.15
300	22.5	2.2	25.4	29.7	2810	0.0654	10	0.1
400	25.8	2.3	28.7	33.6	3690	0.0495	10	0.1

FRL-SW-3SU 1.8/3 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
			Min.	Max.			20 °C	90 °C
mm ²	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.5	1.5	2.5	6.2	7.3	70	13.70	120	1.2
2.5	1.95	2.5	6.6	7.8	90	8.21	100	1.0
4.0	2.5	2.5	7.1	8.4	110	5.09	90	0.9
6.0	3.0	2.5	7.6	8.9	130	3.39	80	0.8
10	3.9	2.5	8.4	9.9	190	1.95	65	0.65
16	5.0	2.5	9.5	11.1	250	1.24	55	0.55
25	6.4	2.5	10.8	12.7	330	0.795	45	0.45
35	7.7	2.5	12.0	14.1	430	0.565	40	0.4
50	9.2	2.5	13.4	15.7	570	0.393	35	0.35
70	11.0	2.5	15.1	17.7	760	0.277	30	0.3
95	12.5	2.7	16.9	19.8	980	0.210	30	0.3
120	14.2	2.7	18.5	21.7	1210	0.164	25	0.25
150	15.8	2.7	20.0	23.4	1500	0.132	20	0.2
185	17.5	2.7	21.6	25.3	1800	0.1080	20	0.2
240	20.1	2.7	24.1	28.2	2360	0.0817	20	0.2
300	22.5	2.7	26.3	30.8	2840	0.0654	15	0.15
400	25.8	2.9	29.8	34.9	3800	0.0495	15	0.15

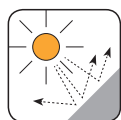
(a) = for information, indicative only



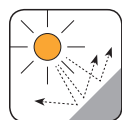
Impact Resistant



Highly Flexible



UV Resistant



Ozone Resistant



Cold Resistant



Resistance To Soldering Heat



Acid & Alkaline Resistant



IRM 903 Fuel Oil Resistant



IRM 902 Mineral Oil Resistant



Fire Retardant
NF C32-070-2.2(C1)
IEC60332-3-24/EN50265-2-4



Flame Resistant
EN50200:2000



Flame Retardant
NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1



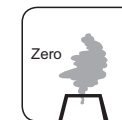
Low Toxicity
EN 50305; NF X 70-100; NF F 63 806; TM11-04; B56853



Low Corrosivity
IEC60754-2/EN50267-2.2/3
NF C32-074/NF C20-453



Low Smoke Emission
IEC 81034-2 / EN 50268-2
NF C32-073/NF C 20-902



Zero Halogen
IEC 60754-1/EN 50267-2-1
NF C20-454

FIREROL Standard Wall Single Core Unsheathed & Fire Resistant Cables 0.6/1 kV or 1.8/3 kV EN 50264-2-1 (FRL-SW-1SU-PH15/30/FRL-SW-3SU-PH15/30)



A. Conductor B. Insulation

Application

- Used as power cable and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxillary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

Mica tape+LSZH elastomeric compound as defined in EN 50264-1 (EI 101 to EI 104)

Electrical & Mechanical Properties

Nominal Voltage	0.6/1 kV or 1.8/3 kV
Max. Conductor Temperature	90 °C (fixed installation)
Min. Permissible Ambient Temperature	-25 °C/-40 °C (fixed installation)
Bending Radius	3 x Overall Diameter (D<12mm); 4 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

EN 60684-2	No fluorine
EN 50305; EN 60811-2-1	Resistance to mineral oil & fuel oil, acid & alkali
EN 50305	Resistance to ozone

Fire Performance for Rolling Stock Application

EN 50306-2	Hazard levels HL1, HL2/HL3, HL4
DIN 5510-2	Protection level 1/2/3/4
BS 6853	Interior use 1a, 1b, II; Exterior use 1a, 1b, II
NF F 16-101	F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)	Vertical flame propagation for a single insulated wire or cable
EN 50266-2-4 + EN 50305; IEC 60332-3-24; NF C 32-070 2.2 (C1); VDE 0472 Teil 804	Vertical flame spread of vertically mounted bunched wires or cables
EN 50268-2; IEC 61034-2; NF C 32-073 ; NF C 20-902; NF F 16 101; VDE 0472 Teil 816	Low Smoke Emission
EN 50267-2-1; IEC 60754-1; NF C 32-074; NF C 20-454; VDE 0472 Teil 815	Halogen Free
EN 50267-2-2/3; IEC 60754-2; NF C 32-074; NF C 20-453; VDE 0472 Teil 813	Low Corrosivity (Acidity & Conductivity)
EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853	Low Toxicity
NF F 63 808; BS6853; NF F 16 101	Smoke Index
EN 50200:2000	Resistance to fire of unprotected small cable for use in emergency circuits.4 classifications are defined: PH 15,30, 60, or 90 (15,30,60, or 90 mins).

EN 50264 Rolling Stock Cables

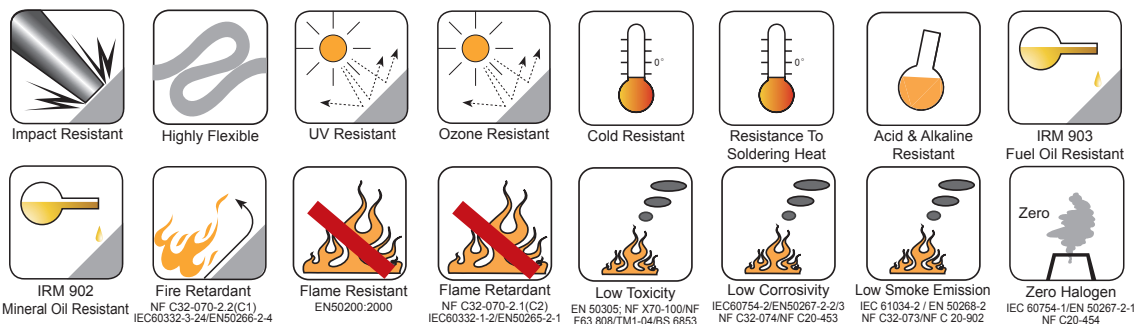
FRL-SW-1SU-PH15/30 0.6/1 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
			Min.	Max.			20 °C	90 °C
mm ²	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.0	1.25	0.8	2.8	3.2	18	20	65	0.65
1.5	1.5	0.8	3.0	3.5	20	13.7	55	0.55
2.5	1.95	0.8	3.4	3.9	30	8.21	50	0.5
4.0	2.5	0.8	3.9	4.6	50	5.09	40	0.4
6.0	3.0	0.9	4.6	5.4	70	3.39	35	0.35
10	3.9	1.1	5.8	6.8	130	1.95	30	0.3
16	5.0	1.1	7.2	8.5	170	1.24	30	0.3
25	6.4	1.3	8.6	10.0	260	0.795	30	0.3
35	7.7	1.3	10.2	11.5	350	0.565	25	0.25
50	9.2	1.5	11.6	13.5	500	0.393	25	0.25
70	11.0	1.5	13.3	15.5	690	0.277	20	0.2
95	12.5	1.6	14.9	17.4	910	0.210	20	0.2
120	14.2	1.6	16.5	19.3	1120	0.164	20	0.2
150	15.8	1.9	18.5	21.7	1430	0.132	15	0.15
185	17.5	1.9	20.1	23.6	1720	0.108	15	0.15
240	20.1	2.1	22.9	25.8	2290	0.0817	15	0.15
300	22.5	2.2	25.4	29.7	2810	0.0654	10	0.1
400	25.8	2.3	28.7	33.6	3690	0.0495	10	0.1

FRL-SW-3SU-PH15/30 1.8/3 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
			Min.	Max.			20 °C	90 °C
mm ²	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.5	1.5	2.5	6.2	7.3	70	13.70	120	1.2
2.5	1.95	2.5	6.6	7.8	90	8.21	100	1.0
4.0	2.5	2.5	7.1	8.4	110	5.09	90	0.9
6.0	3.0	2.5	7.6	8.9	130	3.39	80	0.8
10	3.9	2.5	8.4	9.9	190	1.95	65	0.65
16	5.0	2.5	9.5	11.1	250	1.24	55	0.55
25	6.4	2.5	10.8	12.7	330	0.795	45	0.45
35	7.7	2.5	12.0	14.1	430	0.565	40	0.4
50	9.2	2.5	13.4	15.7	570	0.393	35	0.35
70	11.0	2.5	15.1	17.7	760	0.277	30	0.3
95	12.5	2.7	16.9	19.8	980	0.210	30	0.3
120	14.2	2.7	18.5	21.7	1210	0.164	25	0.25
150	15.8	2.7	20.0	23.4	1500	0.132	20	0.2
185	17.5	2.7	21.6	25.3	1800	0.1080	20	0.2
240	20.1	2.7	24.1	28.2	2360	0.0817	20	0.2
300	22.5	2.7	26.3	30.8	2840	0.0654	15	0.15
400	25.8	2.9	29.8	34.9	3800	0.0495	15	0.15

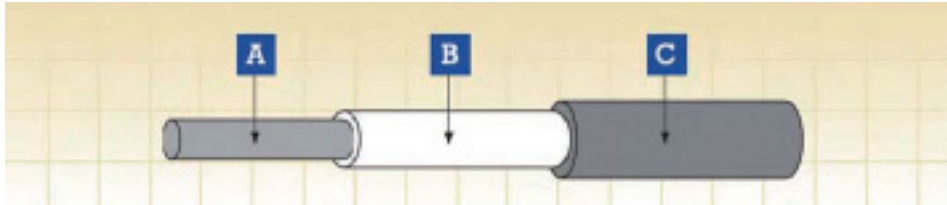
(a) = for information, indicative only



FIREROL Standard Wall Single Core Sheathed Cables

1.8/3 kV or 3.6/6 kV

EN 50264-2-1 (FRL-SW-3S/FRL-SW-6S)



A. Conductor B. Insulation C. Sheath

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxiliary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

LSZH elastomeric compound as defined in EN 50264-1 (EI 101 to EI 104)

Sheath

LSZH elastomeric compound as defined in EN 50264-1 (EM 101 to EM 104)

Electrical & Mechanical Properties

Nominal Voltage	1.8/3 kV or 3.6/6 kV
Max. Conductor Temperature	90 °C (fixed installation)
Min. Permissible Ambient Temperature	-25 °C/-40 °C (fixed installation)
Bending Radius	3 x Overall Diameter (D<12mm); 4 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

EN 60684-2	No fluorine
EN 50305; EN 60811-2-1	Resistance to mineral oil & fuel oil, acid & alkali
EN 50305	Resistance to ozone

Fire Performance for Rolling Stock Application

EN 50306-2	Hazard levels HL1, HL2/HL3, HL4
DIN 5510-2	Protection level 1/2/3/4
BS 6853	Interior use 1a, 1b, II; Exterior use 1a, 1b, II
NF F 16-101	F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)	Vertical flame propagation for a single insulated wire or cable
EN 50266-2-4 + EN 50305; IEC 60332-3-24; NF C 32-070 2.2 (C1); VDE 0472 Teil 804	Vertical flame spread of vertically mounted bunched wires or cables
EN 50268-2; IEC 61034-2; NF C 32-073 ; NF C 20-902; NF F 16 101; VDE 0472 Teil 816	Low Smoke Emission
EN 50267-2-1; IEC 60754-1; NF C 32-074; NF C 20-454; VDE 0472 Teil 815	Halogen Free
EN 50267-2-2/3; IEC 60754-2; NF C 32-074; NF C 20-453; VDE 0472 Teil 813	Low Corrosivity (Acidity & Conductivity)
EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853 NF F 63 808; BS6853; NF F 16 101	Low Toxicity Smoke Index

EN 50264 Rolling Stock Cables

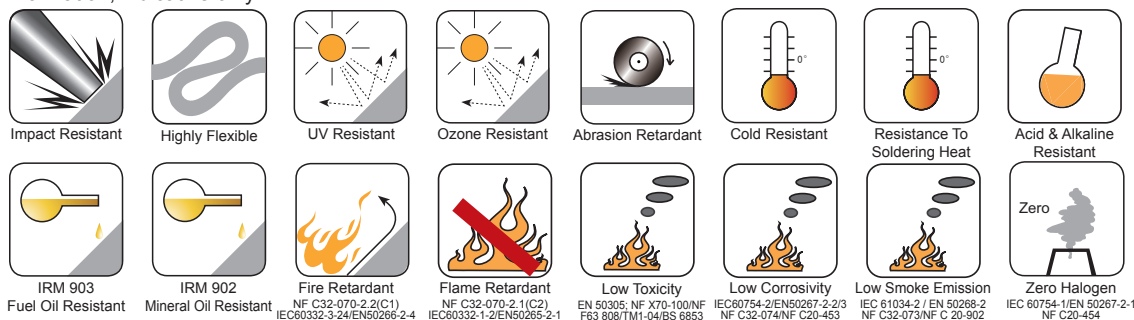
FRL-SW-3S 1.8/3 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Min. Mean Thickness of Sheath	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
				Min.	Max.			20 °C	20 °C
mm ²	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.5	1.5	1.3	1.4	6.7	7.8	80	13.70	960	9.6
2.5	1.95	1.3	1.4	7.1	8.3	100	8.21	850	8.5
4.0	2.5	1.3	1.4	7.6	8.9	120	5.09	750	7.5
6.0	3.0	1.3	1.4	8.1	9.5	140	3.39	670	6.7
10	3.9	2.2	1.4	10.6	12.4	250	1.95	550	5.5
16	5.0	2.2	1.4	11.7	13.6	310	1.24	450	4.5
25	6.4	2.2	1.4	13.0	15.2	410	0.795	390	3.9
35	7.7	2.2	1.4	14.2	16.5	520	0.565	350	3.5
50	9.2	2.2	1.4	15.6	18.3	660	0.393	300	3.0
70	11.0	2.2	1.5	17.5	20.5	880	0.277	260	2.6
95	12.5	2.4	1.6	19.6	22.3	1130	0.210	250	2.5
120	14.2	2.4	1.6	21.1	24.6	1370	0.164	220	2.2
150	15.8	2.4	1.7	22.7	26.6	1690	0.132	210	2.1
185	17.5	2.4	1.7	24.0	28.1	2000	0.1080	200	2.0
240	20.1	2.4	1.8	27.0	31.6	2620	0.0817	180	1.8
300	22.5	2.4	1.9	29.4	34.4	3140	0.0654	170	1.7
400	25.8	2.6	2.0	32.7	38.3	4140	0.0495	150	1.5

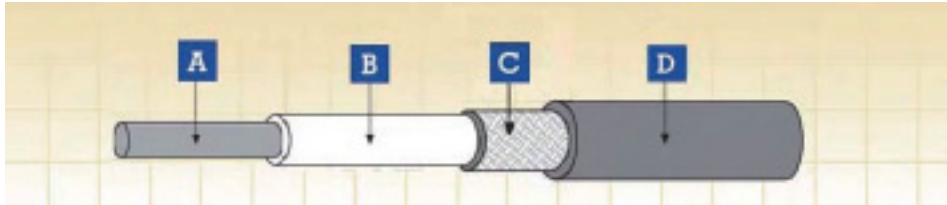
FRL-SW-6S 3.6/6 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Min. Mean Thickness of Sheath	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
				Min.	Max.			20 °C	20 °C
mm ²	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
2.5	1.95	3.0	1.4	10.5	12.3	170	8.21	1300	13
4.0	2.5	3.0	1.4	11.0	12.9	190	5.09	1150	11.5
6.0	3.0	3.0	1.4	11.5	13.4	230	3.39	1050	10.5
10	3.9	3.0	1.4	12.3	14.4	300	1.95	850	8.5
16	5.0	3.0	1.4	13.3	15.6	360	1.24	710	7.1
25	6.4	3.0	1.4	14.7	17.2	450	0.795	630	6.3
35	7.7	3.0	1.4	15.9	18.6	560	0.565	550	5.5
50	9.2	3.0	1.5	17.5	20.5	720	0.393	500	5.0
70	11.0	3.0	1.5	19.2	22.4	930	0.277	430	4.3
95	12.5	3.0	1.6	20.8	24.3	1160	0.210	400	4.0
120	14.2	3.1	1.7	22.7	26.6	1430	0.164	360	3.6
150	15.8	3.1	1.7	24.2	28.4	1740	0.132	340	3.4
185	17.5	3.2	1.8	26.2	30.7	2080	0.108	330	3.3
240	20.1	3.4	1.9	29.2	34.2	2730	0.0817	300	3.0
300	22.5	3.4	1.9	31.5	36.9	3230	0.0654	250	2.5
400	25.8	3.4	2.0	34.8	40.7	4210	0.0495	230	2.3

(a) = for information, indicative only



FIREROL Standard Wall Single Core Screened & Sheathed Cables 1.8/3 kV or 3.6/6 kV EN 50264-2-1 (FRL-SW-3S-OS/FRL-SW-6S-OS)



A. Conductor B. Insulation C. Screen D. Sheath

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxiliary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

LSZH elastomeric compound as defined in EN 50264-1 (EI 101 to EI 104)

Overall Screen

Tinned annealed copper wires

Sheath

LSZH elastomeric compound as defined in EN 50264-1 (EM 101 to EM 104)

Electrical & Mechanical Properties

Nominal Voltage	1.8/3 kV or 3.6/6 kV
Max. Conductor Temperature	90 °C (fixed installation)
Min. Permissible Ambient Temperature	-25 °C/-40 °C (fixed installation)
Bending Radius	3 x Overall Diameter (D<12mm); 4 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

EN 60684-2	No fluorine
EN 50305; EN 60811-2-1	Resistance to mineral oil & fuel oil, acid & alkali
EN 50305	Resistance to ozone

Fire Performance for Rolling Stock Application

EN 50306-2	Hazard levels HL1, HL2/HL3, HL4
DIN 5510-2	Protection level 1/2/3/4
BS 6853	Interior use 1a, 1b, II; Exterior use 1a, 1b, II
NF F 16-101	F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)	Vertical flame propagation for a single insulated wire or cable
EN 50266-2-4 + EN 50305; IEC 60332-3-24; NF C 32-070 2.2 (C1); VDE 0472 Teil 804	Vertical flame spread of vertically mounted bunched wires or cables
EN 50268-2; IEC 61034-2; NF C 32-073 ; NF C 20-902; NF F 16 101; VDE 0472 Teil 816	Low Smoke Emission
EN 50267-2-1; IEC 60754-1; NF C 32-074; NF C 20-454; VDE 0472 Teil 815	Halogen Free
EN 50267-2-2/3; IEC 60754-2; NF C 32-074; NF C 20-453; VDE 0472 Teil 813	Low Corrosivity (Acidity & Conductivity)
EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853 NF F 63 808; BS6853; NF F 16 101	Low Toxicity Smoke Index

EN 50264 Rolling Stock Cables

EN 50264 Rolling Stock Cables

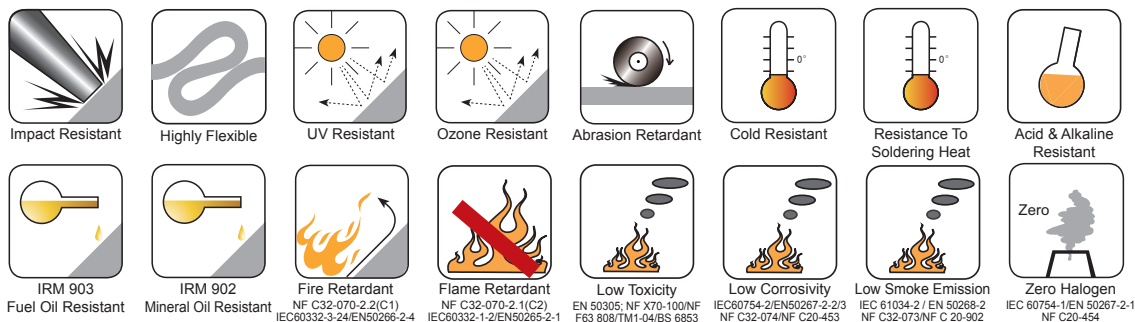
FRL-SW-3S-OS 1.8/3 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Min. Mean Thickness of Sheath	Overall Diameter		Min. Wire Diameter of Screen	Weight	Max. Conductor Resistance	Min. Insulation Resistance	
				Min.	Max.				20 °C	90 °C
mm ²	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.5	1.5	1.3	1.4	7.1	78.2	0.16	99	13.70	960	9.6
2.5	1.95	1.3	1.4	7.5	8.7	0.16	120	8.21	850	8.5
4.0	2.5	1.3	1.4	8.1	9.4	0.21	150	5.09	750	7.5
6.0	3.0	1.3	1.4	8.6	10.0	0.21	175	3.39	670	6.7
10	3.9	2.2	1.4	11.1	12.9	0.21	290	1.95	550	5.5
16	5.0	2.2	1.4	12.3	14.2	0.26	370	1.24	450	4.5
25	6.4	2.2	1.4	13.6	15.8	0.26	480	0.795	390	3.9
35	7.7	2.2	1.4	14.95	17.25	0.31	610	0.565	350	3.5
50	9.2	2.2	1.4	16.35	19.05	0.31	770	0.393	300	3.0
70	11.0	2.2	1.5	18.25	21.25	0.31	1010	0.277	260	2.6
95	12.5	2.4	1.6	10.35	23.05	0.31	1270	0.210	250	2.5
120	14.2	2.4	1.6	21.85	25.35	0.31	1530	0.164	220	2.2
150	15.8	2.4	1.7	23.45	27.35	0.31	1870	0.132	210	2.1
185	17.5	2.4	1.7	24.75	28.85	0.31	2190	0.1080	200	2.0
240	20.1	2.4	1.8	27.75	32.35	0.31	2830	0.0817	180	1.8
300	22.5	2.4	1.9	30.15	35.15	0.31	3375	0.0654	170	1.7
400	25.8	2.6	2.0	33.45	39.05	0.31	4400	0.0495	150	1.5

FRL-SW-6S-OS 3/6 kV

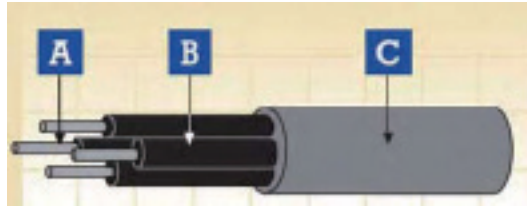
Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Min. Mean Thickness of Sheath	Overall Diameter		Min. Wire Diameter of Screen	Weight	Max. Conductor Resistance	Min. Insulation Resistance	
				Min.	Max.				20 °C	90 °C
mm ²	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
2.5	1.95	3.0	1.4	10.9	12.7	0.16	200	8.21	1300	13
4.0	2.5	3.0	1.4	11.4	13.3	0.16	225	5.09	1150	11.5
6.0	3.0	3.0	1.4	12.0	13.9	0.21	280	3.39	1050	10.5
10	3.9	3.0	1.4	12.8	14.9	0.21	355	1.95	850	8.5
16	5.0	3.0	1.4	13.8	16.1	0.21	420	1.24	710	7.1
25	6.4	3.0	1.4	15.3	17.8	0.26	540	0.795	630	6.3
35	7.7	3.0	1.4	16.5	19.2	0.26	658	0.565	550	5.5
50	9.2	3.0	1.5	18.25	21.25	0.31	850	0.393	500	5.0
70	11.0	3.0	1.5	19.95	23.15	0.31	1080	0.277	430	4.3
95	12.5	3.0	1.6	21.55	25.05	0.31	1320	0.210	400	4.0
120	14.2	3.1	1.7	23.45	27.35	0.31	1600	0.164	360	3.6
150	15.8	3.1	1.7	24.95	28.15	0.31	1930	0.132	340	3.4
185	17.5	3.2	1.8	26.95	31.45	0.31	2290	0.108	330	3.3
240	20.1	3.4	1.9	29.95	34.95	0.31	2970	0.0817	300	3.0
300	22.5	3.4	1.9	32.25	37.65	0.31	3565	0.0654	250	2.5
400	25.8	3.4	2.0	35.55	41.45	0.31	4620	0.0495	230	2.3

(a) = for information, indicative only



FIREROL Standard Wall Multicore Unscreened Cables

300/500 V or 0.6/1 kV
EN 50264-2-2 (FRL-SW-05M/FRL-SW-1M)



A. Conductor B. Insulation C. Sheath

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxiliary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

LSZH elastomeric compound as defined in EN 50264-1 (EI 101 to EI 105)

Outer Sheath

LSZH elastomeric compound as defined in EN 50264-1 (EM 101 to EM 104)

Electrical & Mechanical Properties

Nominal Voltage	300/500 V or 0.6/1 kV
Max. Conductor Temperature	90 °C (fixed installation)
Min. Permissible Ambient Temperature	-25 °C/-40 °C (fixed installation)
Bending Radius	3 x Overall Diameter (D<12mm); 4 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

EN 60684-2	No fluorine
EN 50305; EN 60811-2-1	Resistance to mineral oil & fuel oil, acid & alkali
EN 50305	Resistance to ozone

Fire Performance for Rolling Stock Application

EN 50306-2	Hazard levels HL1, HL2/HL3, HL4
DIN 5510-2	Protection level 1/2/3/4
BS 6853	Interior use 1a, 1b, II; Exterior use 1a, 1b, II
NF F 16-101	F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)	Vertical flame propagation for a single insulated wire or cable
EN 50266-2-4 + EN 50305; IEC 60332-3-24; NF C 32-070 2.2 (C1); VDE 0472 Teil 804	Vertical flame spread of vertically mounted bunched wires or cables
EN 50268-2; IEC 61034-2; NF C 32-073 ; NF C 20-902; NF F 16 101; VDE 0472 Teil 816	Low Smoke Emission
EN 50267-2-1; IEC 60754-1; NF C 32-074; NF C 20-454; VDE 0472 Teil 815	Halogen Free
EN 50267-2-2/3; IEC 60754-2; NF C 32-074; NF C 20-453; VDE 0472 Teil 813	Low Corrosivity (Acidity & Conductivity)
EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853 NF F 63 808; BS6853; NF F 16 101	Low Toxicity Smoke Index

EN 50264 Rolling Stock Cables

FRL-SW-05M 300/500 V

Number and Nominal Cross-Sectional Area (a)	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Diameter of Core (a)		Min. Mean Thickness of Sheath	Overall Diameter		Weight	Max. Conductor Resistance 20 °C	Min. Insulation Resistance	
			Min.	Max.		Min.	Max.			EI 105 20 °C	EI 101-EI 104 20 °C
n x mm ²	mm	mm	mm	mm	mm	mm	mm	Kg/km	Ω/km	MΩ x km	MΩ x km
2x1	1.2	0.6	2.4	2.8	1.4	7.2	8.5	100	20.0	140	70
4x1	1.25	0.6	2.4	2.8	1.4	8.2	9.6	130	20.0	140	70
7x1		0.6	2.4	2.8	1.4	9.6	11.2	180	20.0	140	70
9x1		0.6	2.4	2.8	1.4	11.5	13.4	220	20.0	140	70
12x1		0.6	2.4	2.8	1.4	12.3	14.4	280	20.0	140	70
19x1		0.6	2.4	2.8	1.4	14.5	16.6	400	20.0	140	70
24x1		0.6	2.4	2.8	1.5	16.7	19.6	530	20.0	140	70
32x1		0.6	2.4	2.8	1.6	18.5	21.7	660	20.0	140	70
37x1		0.6	2.4	2.8	1.6	19.2	22.4	720	20.0	140	70
40x1		0.6	2.4	2.8	1.6	19.9	23.3	750	20.0	140	70
4x1.5		1.5	0.7	2.8	3.3	1.4	9.2	10.8	170	13.7	120
7x1.5	0.7		2.8	3.3	1.4	10.9	12.8	250	13.7	120	60
9x1.5	0.7		2.8	3.3	1.4	13.1	15.3	310	13.7	120	60
12x1.5	0.7		2.8	3.3	1.4	14.0	16.4	400	13.7	120	60
19x1.5	0.7		2.8	3.3	1.5	16.5	19.4	570	13.7	120	60
24x1.5	0.7		2.8	3.3	1.6	19.5	22.8	760	13.7	120	60
32x1.5	0.7		2.8	3.3	1.7	21.5	25.2	940	13.7	120	60
37x1.5	0.7		2.8	3.3	1.7	22.4	26.2	1040	13.7	120	60
4x2.5	1.95	0.8	3.4	4.0	1.4	10.7	12.5	240	8.21	90	45
7x2.5		0.8	3.4	4.0	1.4	12.7	14.9	360	8.21	90	45
9x2.5		0.8	3.4	4.0	1.5	15.6	18.3	450	8.21	90	45
12x2.5		0.8	3.4	4.0	1.5	16.7	19.6	590	8.21	90	45
19x2.5		0.8	3.4	4.0	1.6	19.7	23.1	860	8.21	90	45
24x2.5		0.8	3.4	4.0	1.8	23.5	27.5	1150	8.21	90	45

(a) = One earth conductor (green/yellow) can be included upon request

(b) = For information, indicative only



FRL-SW-1M 0.6/1 kV

Number and Nominal Cross-Sectional Area (a)	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Diameter of Core (a)		Min. Mean Thickness of Sheath	Overall Diameter		Weight	Max. Conductor Resistance 20 °C	Min. Insulation Resistance	
			Min.	Max.		Min.	Max.			EI 105 20 °C	EI 101-EI 104 20 °C
TWO CORES											
1.5	1.5	0.8	3.0	3.5	1.4	8.5	9.9	140	13.7	150	75
2.5	1.95	0.8	3.4	3.9	1.4	9.3	10.9	180	8.21	130	65
4	2.5	0.8	3.9	4.6	1.4	10.3	12.1	230	5.09	110	55
6	3.0	0.9	4.6	5.4	1.4	11.8	13.9	300	3.39	90	45
10	3.9	1.1	5.8	6.8	1.4	14.3	16.7	480	1.95	85	45
16	5.0	1.1	7.2	8.5	1.5	16.5	19.4	630	1.24	70	35
25	6.4	1.3	8.6	10.0	1.6	20.1	23.5	920	0.795	65	35
35	7.7	1.3	10.2	11.5	1.7	22.7	26.6	1200	0.565	60	30
50	9.2	1.5	11.6	13.5	1.9	26.7	31.2	1670	0.393	55	30
THREE CORES											
1.5	1.5	0.8	3.0	3.5	1.4	8.9	10.5	160	13.7	150	75
2.5	1.95	0.8	3.4	3.9	1.4	9.9	11.6	210	8.21	130	65
4	2.5	0.8	3.9	4.6	1.4	11.0	12.9	270	5.09	110	55
6	3.0	0.9	4.6	5.4	1.4	12.5	14.6	360	3.39	90	45
10	3.9	1.1	5.8	6.8	1.5	15.3	17.9	600	1.95	85	45
16	5.0	1.1	7.2	8.5	1.6	17.8	20.8	790	1.24	70	35
25	6.4	1.3	8.6	10.0	1.7	21.6	25.3	1170	0.795	65	35
35	7.7	1.3	10.2	11.5	1.8	24.4	28.6	1530	0.565	60	30
50	9.2	1.5	11.6	13.5	1.9	28.2	33.3	2120	0.393	55	30
FOUR CORES											
1.5	1.5	0.8	3.0	3.5	1.4	9.7	11.3	190	13.7	150	75
2.5	1.95	0.8	3.4	3.9	1.4	10.7	12.5	250	8.21	130	65
4	2.5	0.8	3.9	4.6	1.4	11.9	14.0	330	5.09	110	55
6	3.0	0.9	4.6	5.4	1.4	13.7	16.1	450	3.39	90	45
10	3.9	1.1	5.8	6.8	1.5	16.9	19.8	740	1.95	85	45
16	5.0	1.1	7.2	8.5	1.6	19.6	22.9	980	1.24	70	35
25	6.4	1.3	8.6	10.0	1.8	24.1	28.2	1460	0.795	65	35
3X35+25	7.7/6.4	1.3/1.3	10.2/8.6	11.5/10.0	1.9	28.5	34.2	1610	0.565/0.795	60	30
3X50+25	9.2/6.4	1.5/1.3	11.6/8.6	13.5/10.0	2.0	33.4	40.0	2230	0.393/0.795	55	30

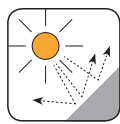
(a)= For information, indicative only



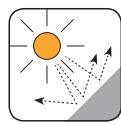
Corona Resistant



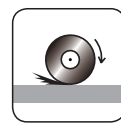
Highly Flexible



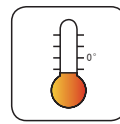
UV Resistant



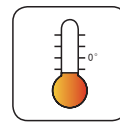
Ozone Resistant



Abrasion Retardant



Cold Resistant



Resistance To Soldering Heat



Acid & Alkaline Resistant



IRM 903
Fuel Oil Resistant



IRM 902
Mineral Oil Resistant



Fire Retardant
NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2.4



Flame Retardant
NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2.1



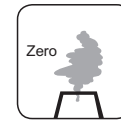
Low Toxicity
EN 50305; NF X70-100/NF
F63 608/TM1-04/BS 6853



Low Corrosivity
IEC60754-2/EN50267-2-2/3
NF C32-074/NF C20-453

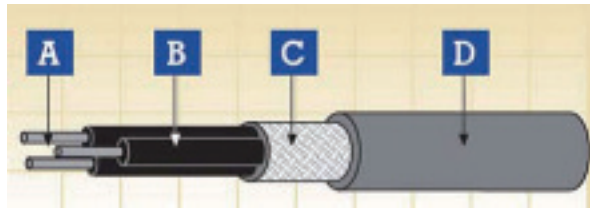


Low Smoke Emission
IEC 61034-2 / EN 50268-2
NF C32-073/NF C 20-902



Zero Halogen
IEC 60754-1/EN 50267-2-1
NF C20-454

FIREROL Standard Wall Multicore Overall Screened Cables 300/500 V or 0.6/1 kV EN 50264-2-2 (FRL-SW-05M-OS/FRL-SW-1M-OS)



A. Conductor B. Insulation C. Screen D. Sheath

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxiliary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

LSZH elastomeric compound as defined in EN 50264-1 (EI 101 to EI 105)

Overall Screen

Tinned annealed copper wires

Outer Sheath

LSZH elastomeric compound as defined in EN 50264-1 (EM 101 to EM 104)

Electrical & Mechanical Properties

Nominal Voltage	300/500 V or 0.6/1 kV
Max. Conductor Temperature	90 °C (fixed installation)
Min. Permissible Ambient Temperature	-25 °C/-40 °C (fixed installation)
Bending Radius	10 x Overall Diameter

Chemical & Environmental Properties

EN 60684-2	No fluorine
EN 50305; EN 60811-2-1	Resistance to mineral oil & fuel oil, acid & alkali
EN 50305	Resistance to ozone

Fire Performance for Rolling Stock Application

EN 50306-2	Hazard levels HL1, HL2/HL3, HL4
DIN 5510-2	Protection level 1/2/3/4
BS 6853	Interior use 1a, 1b, II; Exterior use 1a, 1b, II
NF F 16-101	F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)	Vertical flame propagation for a single insulated wire or cable
EN 50266-2-4 + EN 50305; IEC 60332-3-24; NF C 32-070 2.2 (C1); VDE 0472 Teil 804	Vertical flame spread of vertically mounted bunched wires or cables
EN 50268-2; IEC 61034-2; NF C 32-073 ; NF C 20-902; NF F 16 101; VDE 0472 Teil 816	Low Smoke Emission
EN 50267-2-1; IEC 60754-1; NF C 32-074; NF C 20-454; VDE 0472 Teil 815	Halogen Free
EN 50267-2-2/3; IEC 60754-2; NF C 32-074; NF C 20-453; VDE 0472 Teil 813	Low Corrosivity (Acidity & Conductivity)
EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853 NF F 63 808; BS6853; NF F 16 101	Low Toxicity Smoke Index

FRL-SW-05M-OS 300/500 V

Number and Nominal Cross-Sectional Area (a)	Conductor Diameter (b)	Min. Mean Thickness of Insulation	Diameter of Core (b)		Min. Wire Diameter of Screen	Min. Mean Thickness of Sheath	Overall Diameter		Weight	Max. Conductor Resistance 20 °C	Min. Insulation Resistance	
			Min.	Max.			Min.	Max.			EI 105 20 °C	EI 101-EI 104 20 °C
			mm	mm			mm	mm			Ω/km	MΩ x km
n x mm ²	mm	mm	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
2x1	1.25	0.6	2.4	2.8	0.16	1.4	8.1	9.5	110	20.0	140	70
4x1		0.6	2.4	2.8	0.16	1.4	9.0	10.6	150	20.0	140	70
7x1		0.6	2.4	2.8	0.16	1.4	10.4	12.2	210	20.0	140	70
9x1		0.6	2.4	2.8	0.21	1.4	12.5	14.6	290	20.0	140	70
12x1		0.6	2.4	2.8	0.21	1.4	13.3	15.6	330	20.0	140	70
19x1		0.6	2.4	2.8	0.26	1.5	15.7	18.4	490	20.0	140	70
24x1		0.6	2.4	2.8	0.26	1.6	18.1	21.2	630	20.0	140	70
32x1		0.6	2.4	2.8	0.26	1.6	19.7	23.1	760	20.0	140	70
37x1		0.6	2.4	2.8	0.26	1.7	20.7	24.2	840	20.0	140	70
40x1		0.6	2.4	2.8	0.26	1.7	21.4	25.1	910	20.0	140	70
4x1.5	1.5	0.7	2.8	3.3	0.16	1.4	10.1	11.8	200	13.7	120	60
7x1.5		0.7	2.8	3.3	0.21	1.4	11.9	14.0	290	13.7	120	60
9x1.5		0.7	2.8	3.3	0.21	1.4	14.1	16.5	380	13.7	120	60
12x1.5		0.7	2.8	3.3	0.21	1.5	15.8	18.5	450	13.7	120	60
19x1.5		0.7	2.8	3.3	0.26	1.5	17.8	20.8	660	13.7	120	60
24x1.5		0.7	2.8	3.3	0.26	1.6	20.7	24.2	850	13.7	120	60
32x1.5		0.7	2.8	3.3	0.26	1.7	22.7	26.6	1050	13.7	120	60
37x1.5		0.7	2.8	3.3	0.26	1.7	23.6	27.6	1160	13.7	120	60
4x2.5	1.95	0.8	3.4	4.0	0.21	1.4	11.8	13.9	280	8.21	90	45
7x2.5		0.8	3.4	4.0	0.21	1.4	13.7	16.1	400	8.21	90	45
9x2.5		0.8	3.4	4.0	0.26	1.5	16.8	19.7	560	8.21	90	45
12x2.5		0.8	3.4	4.0	0.26	1.5	18.0	21.1	660	8.21	90	45
19x2.5		0.8	3.4	4.0	0.26	1.6	21.1	24.6	950	8.21	90	45
24x2.5		0.8	3.4	4.0	0.26	1.8	24.7	28.9	1260	8.21	90	45

(a)= One earth conductor (green/yellow) can be included upon request

(b)= For information, indicative only



EN 50264 Rolling Stock Cables

EN 50264 Rolling Stock Cables

FRL-SW-1M-OS 0.6/1 kV

Number and Nominal Cross-Sectional Area (a) mm ²	Conductor Diameter (a) mm	Min. Mean Thickness of Insulation mm	Diameter of Core (b)		Min. Wire Diameter of Screen mm	Min. Average Sheath Thickness mm	Overall Diameter		Weight kg/km	Max. Conductor Resistance Ω/km 20 °C	Min. Insulation Resistance	
			Min.	Max.			Min.	Max.			EI 105 20 °C	EI 101-EI 104 20 °C
			mm	mm			mm	mm			MΩ x km	MΩ x km
TWO CORES												
1.5	1.5	0.8	3.0	3.5	0.16	1.4	9.3	10.9	150	13.7	150	75
2.5	1.95	0.8	3.4	3.9	0.16	1.4	10.2	11.9	180	8.21	130	65
4	2.5	0.8	3.9	4.6	0.21	1.4	11.5	13.4	240	5.09	110	55
6	3.0	0.9	4.6	5.4	0.21	1.4	12.9	15.1	300	3.39	90	45
10	3.9	1.1	5.8	6.8	0.21	1.5	15.5	18.2	460	1.95	85	45
16	5.0	1.1	7.2	8.5	0.26	1.5	17.9	20.9	610	1.24	70	35
25	6.4	1.3	8.6	10.0	0.26	1.7	21.6	25.3	830	0.795	65	35
35	7.7	1.3	10.2	11.5	0.31	1.8	24.4	28.6	1130	0.565	60	30
50	9.2	1.5	11.6	13.5	0.31	1.9	28.2	33.0	1500	0.393	55	30
THREE CORES												
1.5	1.5	0.8	3.0	3.5	0.16	1.4	9.8	11.4	180	13.7	150	75
2.5	1.95	0.8	3.4	3.9	0.16	1.4	10.7	12.5	220	8.21	130	65
4	2.5	0.8	3.9	4.6	0.21	1.4	12.0	14.1	300	5.09	110	55
6	3.0	0.9	4.6	5.4	0.21	1.4	13.6	16.0	380	3.39	90	45
10	3.9	1.1	5.8	6.8	0.26	1.5	16.7	19.6	620	1.95	85	45
16	5.0	1.1	7.2	8.5	0.26	1.6	19.1	22.3	800	1.24	70	35
25	6.4	1.3	8.6	10.0	0.26	1.7	22.9	26.8	1140	0.795	65	35
35	7.7	1.3	10.2	11.5	0.31	1.8	26.0	30.5	1500	0.565	60	30
50	9.2	1.5	11.6	13.5	0.31	2.0	30.3	35.4	2050	0.393	55	30
FOUR CORES												
1.5	1.5	0.8	3.0	3.5	0.16	1.4	10.5	12.3	210	13.7	150	75
2.5	1.95	0.8	3.4	3.9	0.21	1.4	11.8	13.9	280	8.21	130	65
4	2.5	0.8	3.9	4.6	0.21	1.4	13.1	15.3	360	5.09	110	55
6	3.0	0.9	4.6	5.4	0.21	1.4	14.9	17.4	470	3.39	90	45
10	3.9	1.1	5.8	6.8	0.26	1.6	18.4	21.6	780	1.95	85	45
16	5.0	1.1	7.2	8.5	0.26	1.7	21.1	24.6	1020	1.24	70	35
25	6.4	1.3	8.6	10.0	0.31	1.8	25.6	29.9	1490	0.795	65	35
3X35+25	7.7/6.4	1.3/1.3	10.2/8.6	11.5/10.0	0.31	1.9	30.0	35.1	1820	0.565/0.795	60	30
3X50+25	9.2/6.4	1.5/1.3	11.6/8.6	13.5/10.0	0.31	2.1	34.9	40.8	2480	0.393/0.795	55	30

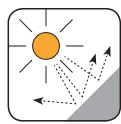
(a)= For information, indicative only



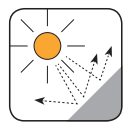
Corona Resistant



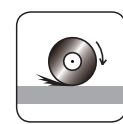
Highly Flexible



UV Resistant



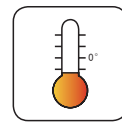
Ozone Resistant



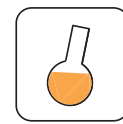
Abrasion Retardant



Cold Resistant



Resistance To Soldering Heat



Acid & Alkaline Resistant



IRM 903
Fuel Oil Resistant



IRM 902
Mineral Oil Resistant



Fire Retardant
NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4



Flame Retardant
NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1



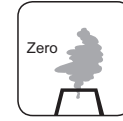
Low Toxicity
EN 50305; NF X70-100/NF
F63 808/TM1-04/BS 6853



Low Corrosivity
IEC60754-2/EN50267-2-2/3
NF C32-074/NF C20-453

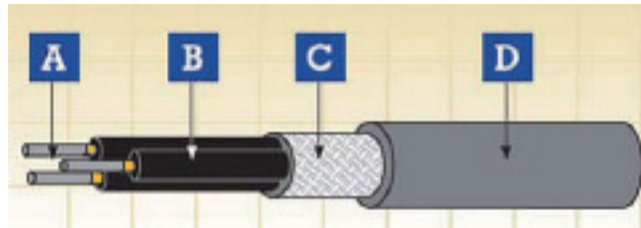


Low Smoke Emission
IEC 61034-2 / EN 50268-2
NF C32-073/NF C 20-902



Zero Halogen
IEC 60754-1/EN 50267-2-1
NF C20-454

FIREROL Standard Wall Multicore Overall Screened & Fire Resistant Cables 300/500 V or 0.6/1 kV EN 50264-2-2 (FRL-SW-05M-OS-AS⁺/FRL-SW-1M-OS-AS⁺)



A. Conductor B. Insulation C. Screen D. Sheath

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxiliary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

Mica tape+LSZH elastomeric compound as defined in EN 50264-1 (EI 101 to EI 105)

Overall Screen

Tinned annealed copper wires

Outer Sheath

LSZH elastomeric compound as defined in EN 50264-1 (EM 101 to EM 104)

Electrical & Mechanical Properties

Nominal Voltage	300/500 V or 0.6/1 kV
Max. Conductor Temperature	90 °C (fixed installation)
Min. Permissible Ambient Temperature	-25 °C/-40 °C (fixed installation)
Bending Radius	10 x Overall Diameter

Chemical & Environmental Properties

EN 60684-2	No fluorine
EN 50305; EN 60811-2-1	Resistance to mineral oil & fuel oil, acid & alkali
EN 50305	Resistance to ozone

Fire Performance for Rolling Stock Application

EN 50306-2	Hazard levels HL1, HL2/HL3, HL4
DIN 5510-2	Protection level 1/2/3/4
BS 6853	Interior use 1a, 1b, II; Exterior use 1a, 1b, II
NF F 16-101	F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)	Vertical flame propagation for a single insulated wire or cable
EN 50266-2-4 + EN 50305; IEC 60332-3-24;	Vertical flame spread of vertically mounted bunched wires or cables
NF C 32-070 2.2 (C1); VDE 0472 Teil 804	
EN 50268-2; IEC 61034-2; NF C 32-073 ;	Low Smoke Emission
NF C 20-902; NF F 16 101; VDE 0472 Teil 816	
EN 50267-2-1; IEC 60754-1; NF C 32-074;	Halogen Free
NF C 20-454; VDE 0472 Teil 815	
EN 50267-2-2/3; IEC 60754-2; NF C 32-074;	Low Corrosivity (Acidity & Conductivity)
NF C 20-453; VDE 0472 Teil 813	
EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853	Low Toxicity
NF F 63 808; BS6853; NF F 16 101	Smoke Index
IEC60331-21	The circuit integrity test under fire of cables rated 0.6/1.0kV and below

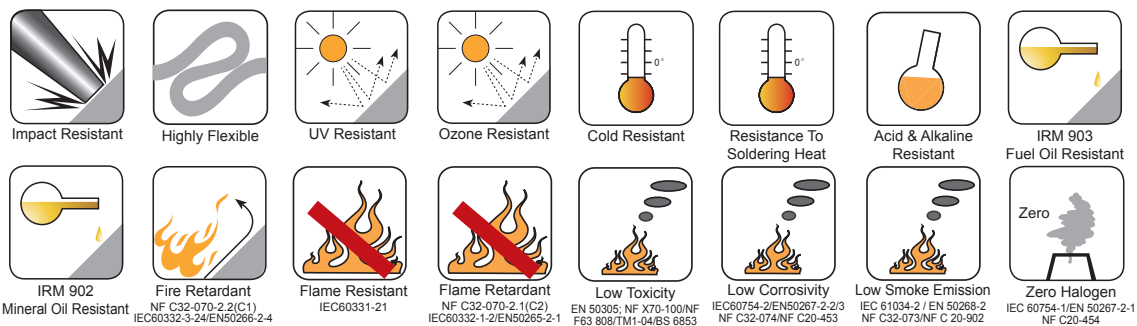
EN 50264 Rolling Stock Cables

FRL-SW-05M-OS-AS+ 300/500 V

Number and Nominal Cross-Sectional Area (a)	Conductor Diameter (b)	Min. Mean Thickness of Insulation	Diameter of Core (b)		Min. Wire Diameter of Screen	Min. Mean Thickness of Sheath	Overall Diameter		Weight	Max. Conductor Resistance 20 °C	Min. Insulation Resistance	
			Min.	Max.			Min.	Max.			EI 105 20 °C	EI 101-EI 104 20 °C
			mm	mm								
n x mm ²	mm	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km	
2x1	1.25	0.6	2.7	3.1	0.16	1.4	8.3	9.8	129	20.0	140	70
4x1		0.6	2.7	3.1	0.16	1.4	9.2	10.9	188	20.0	140	70
7x1		0.6	2.7	3.1	0.16	1.4	10.6	12.5	275	20.0	140	70
9x1		0.6	2.7	3.1	0.21	1.4	12.7	14.9	360	20.0	140	70
12x1		0.6	2.7	3.1	0.21	1.4	13.5	15.9	445	20.0	140	70
19x1		0.6	2.7	3.1	0.26	1.5	15.9	18.7	665	20.0	140	70
24x1		0.6	2.7	3.1	0.26	1.6	18.3	21.5	832	20.0	140	70
32x1		0.6	2.7	3.1	0.26	1.6	19.9	23.4	1043	20.0	140	70
37x1		0.6	2.7	3.1	0.26	1.7	20.9	24.5	1181	20.0	140	70
40x1		0.6	2.7	3.1	0.26	1.7	21.6	25.4	1263	20.0	140	70
4x1.5	1.5	0.7	3.0	3.5	0.16	1.4	10.3	12.1	244	13.7	120	60
7x1.5		0.7	3.0	3.5	0.21	1.4	12.1	14.3	380	13.7	120	60
9x1.5		0.7	3.0	3.5	0.21	1.4	14.3	16.8	476	13.7	120	60
12x1.5		0.7	3.0	3.5	0.21	1.5	16.0	18.8	604	13.7	120	60
19x1.5		0.7	3.0	3.5	0.26	1.5	18.0	21.1	895	13.7	120	60
24x1.5		0.7	3.0	3.5	0.26	1.6	20.9	24.5	1120	13.7	120	60
32x1.5		0.7	3.0	3.5	0.26	1.7	22.9	26.9	1430	13.7	120	60
37x1.5		0.7	3.0	3.5	0.26	1.7	23.8	27.9	1610	13.7	120	60
4x2.5	1.95	0.8	3.6	4.2	0.21	1.4	12.0	14.2	330	8.21	90	45
7x2.5		0.8	3.6	4.2	0.21	1.4	13.9	16.4	500	8.21	90	45
9x2.5		0.8	3.6	4.2	0.26	1.5	17.0	20.0	670	8.21	90	45
12x2.5		0.8	3.6	4.2	0.26	1.5	18.2	21.4	830	8.21	90	45
19x2.5		0.8	3.6	4.2	0.26	1.6	21.3	24.9	1200	8.21	90	45
24x2.5		0.8	3.6	4.2	0.26	1.8	24.9	28.9	1560	8.21	90	45

(a)= One earth conductor (green/yellow) can be included upon request

(b)= For information, indicative only



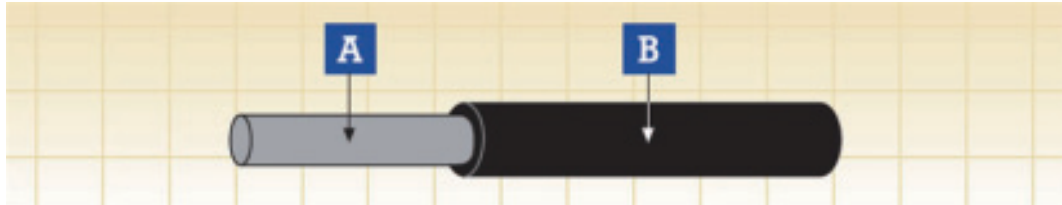
FRL-SW-1M-OS-AS⁺ 0.6/1 kV

Number and Nominal Cross-Sectional Area (a)	Conductor Diameter (b)	Min. Mean Thickness of Insulation	Diameter of Core (b)		Min. Wire Diameter of Screen	Min. Mean Thickness of Sheath	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
			Min.	Max.			Min.	Max.			EI 105	EI 101-EI 104
			mm ²	mm			mm	mm		mm	mm	mm
TWO CORES												
1.5	1.5	0.8	3.3	3.8	0.16	1.4	9.5	11.2	166	13.7	150	75
2.5	1.95	0.8	3.7	4.2	0.16	1.4	10.4	12.2	207	8.21	130	65
4	2.5	0.8	4.2	4.9	0.21	1.4	11.7	13.7	273	5.09	110	55
6	3.0	0.9	4.9	5.7	0.21	1.4	13.1	15.4	351	3.39	90	45
10	3.9	1.1	6.1	7.1	0.21	1.5	15.7	18.5	515	1.95	85	45
16	5.0	1.1	7.5	8.8	0.26	1.5	18.1	21.2	710	1.24	70	35
25	6.4	1.3	8.9	10.3	0.26	1.7	21.8	25.6	1035	0.795	65	35
35	7.7	1.3	10.5	11.8	0.31	1.8	24.6	28.9	1339	0.565	60	30
50	9.2	1.5	11.9	13.8	0.31	1.9	28.4	33.3	1810	0.393	55	30
THREE CORES												
1.5	1.5	0.8	3.3	3.8	0.16	1.4	10.0	11.7	205	13.7	150	75
2.5	1.95	0.8	3.7	4.2	0.16	1.4	10.9	12.8	261	8.21	130	65
4	2.5	0.8	4.2	4.9	0.21	1.4	12.2	14.4	349	5.09	110	55
6	3.0	0.9	4.9	5.7	0.21	1.4	13.8	16.3	457	3.39	90	45
10	3.9	1.1	6.1	7.1	0.26	1.5	16.9	19.9	704	1.95	85	45
16	5.0	1.1	7.5	8.8	0.26	1.6	19.3	22.6	960	1.24	70	35
25	6.4	1.3	8.9	10.3	0.26	1.7	23.1	27.1	1400	0.795	65	35
35	7.7	1.3	10.5	11.8	0.31	1.8	26.2	30.8	1827	0.565	60	30
50	9.2	1.5	11.9	13.8	0.31	2.0	30.5	35.7	2513	0.393	55	30
FOUR CORES												
1.5	1.5	0.8	3.3	3.8	0.16	1.4	10.7	12.6	248	13.7	150	75
2.5	1.95	0.8	3.7	4.2	0.21	1.4	12.0	14.2	335	8.21	130	65
4	2.5	0.8	4.2	4.9	0.21	1.4	13.3	15.6	430	5.09	110	55
6	3.0	0.9	4.9	5.7	0.21	1.4	15.1	17.7	570	3.39	90	45
10	3.9	1.1	6.1	7.1	0.26	1.6	18.6	21.9	896	1.95	85	45
16	5.0	1.1	7.5	8.8	0.26	1.7	21.3	24.9	1200	1.24	70	35
25	6.4	1.3	8.9	10.3	0.31	1.8	25.8	30.2	1815	0.795	65	35
3X35+25	7.7/6.4	1.3/1.3	10.5/8.9	11.8/10.3	0.31	1.9	30.2	35.4	2200	0.565/0.795	60	30
3X50+25	9.2/6.4	1.5/1.3	11.9/8.9	13.8/10.3	0.31	2.1	35.1	41.1	2600	0.393/0.795	55	30

(a)= One earth conductor (green/yellow) can be included upon request

(b)= For information, indicative only

FIREROL Medium Wall Single Core Unsheathed Cables 0.6/1 kV or 1.8/3 kV EN 50264-3-1 (FRL-MW-1SU/FRL-MW-3SU)



A. Conductor B. Insulation

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxillary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

LSZH elastomeric compound as defined in EN 50264-1 (EI 106 to EI 109)

Electrical & Mechanical Properties

Nominal Voltage

0.6/1 kV or 1.8/3 kV

Max. Conductor Temperature

90 °C (fixed installation)

Min. Permissible Ambient Temperature

-25 °C/-40 °C (fixed installation)

Bending Radius

For 0.6/1KV Cables

Fixed installation:

3 x Overall Diameter (D<12mm);

4 x Overall Diameter (D>12mm)

Flexible installation:

6 x Overall Diameter (D<12mm);

8 x Overall Diameter (D>12mm)

For 1.8/3KV Cables

Fixed installation:

5 x Overall Diameter (D<12mm);

6 x Overall Diameter (D>12mm)

Flexible installation:

10 x Overall Diameter (D<12mm);

12 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

EN 60684-2

EN 50305; EN 60811-2-1

EN 50305

No fluorine

Resistance to mineral oil & fuel oil, acid & alkali

Resistance to ozone

Fire Performance for Rolling Stock Application

EN 50306-2

DIN 5510-2

BS 6853

NF F 16-101

Hazard levels HL1, HL2/HL3, HL4

Protection level 1/2/3/4

Interior use 1a, 1b, II; Exterior use 1a, 1b, II

F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)

EN 50266-2-4 + EN 50305; IEC 60332-3-24;

NF C 32-070 2.2 (C1); VDE 0472 Teil 804

EN 50268-2; IEC 61034-2; NF C 32-073 ;

NF C 20-902; NF F 16 101; VDE 0472 Teil 816

EN 50267-2-1; IEC 60754-1; NF C 32-074;

NF C 20-454; VDE 0472 Teil 815

Vertical flame propagation for a single insulated wire or cable

Vertical flame spread of vertically mounted bunched wires or cables

Low Smoke Emission

Halogen Free

EN 50267-2-2/3; IEC 60754-2; NF C 32-074;
 NF C 20-453; VDE 0472 Teil 813
 EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853
 NF F 63 808; BS6853; NF F 16 101

Low Corrosivity (Acidity & Conductivity)

Low Toxicity
 Smoke Index

FRL-MW-1SU 0.6/1 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
			Min.	Max.		20 °C	20 °C	90 °C
mm ²	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.0	1.25	0.6	2.4	2.8	10	20	11.4	0.114
1.5	1.5	0.7	2.8	3.3	20	13.7	11.0	0.110
2.5	1.95	0.7	3.2	3.8	30	8.21	9.1	0.091
4	2.5	0.7	3.8	4.4	50	5.09	7.5	0.075
6	3.0	0.7	4.2	5.0	60	3.39	6.5	0.065
10	3.9	0.7	5.1	5.9	110	1.95	5.2	0.052
16	5.0	0.7	6.1	7.2	160	1.24	4.2	0.042
25	6.4	0.9	7.8	9.1	240	0.795	4.1	0.041
35	7.7	0.9	9.0	10.6	330	0.565	3.5	0.035
50	9.2	1.0	10.6	12.4	460	0.393	3.3	0.033
70	11.0	1.1	12.5	14.6	660	0.277	3.0	0.030
95	12.5	1.1	13.9	16.3	860	0.210	2.7	0.027
120	14.2	1.2	15.7	18.4	1080	0.164	2.7	0.027
150	15.8	1.4	17.6	20.6	1370	0.132	2.7	0.027
185	17.5	1.6	19.6	22.9	1690	0.108	2.6	0.026
240	20.1	1.7	22.2	26.0	2230	0.0817	2.6	0.026
300	22.5	1.8	24.6	28.8	2780	0.0654	2.4	0.024
400	25.8	2.0	28.1	32.9	3740	0.0495	2.4	0.024

FRL-MW-3SU 1.8/3 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
			Min.	Max.		20 °C	20 °C	90 °C
mm ²	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.5	1.5	2.0	5.3	6.2	50	13.7	21.0	0.210
2.5	1.95	2.0	5.7	6.7	60	8.21	18.0	0.180
4	2.5	2.0	6.2	7.3	80	5.09	15.5	0.155
6	3.0	2.0	6.7	7.8	100	3.39	13.7	0.137
10	3.9	2.0	7.5	8.8	150	1.95	11.5	0.115
16	5.0	2.0	8.6	10.0	220	1.24	9.5	0.095
25	6.4	2.0	9.9	11.6	290	0.795	7.9	0.079
35	7.7	2.0	11.1	13.0	390	0.565	6.8	0.068
50	9.2	2.0	12.5	14.6	530	0.393	5.9	0.059
70	11.0	2.0	14.2	16.6	720	0.277	5.0	0.050
95	12.5	2.2	16.0	18.7	940	0.210	4.5	0.045
120	14.2	2.2	17.6	20.6	1160	0.164	4.0	0.040
150	15.8	2.2	19.1	22.3	1440	0.132	3.7	0.037
185	17.5	2.4	20.9	24.4	1760	0.108	3.4	0.034
240	20.1	2.4	23.7	27.5	2350	0.0817	3.0	0.030
300	22.5	2.4	25.6	30.1	2820	0.0654	2.7	0.027
400	25.8	2.6	29.2	34.2	3730	0.0495	2.4	0.024

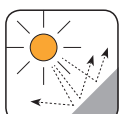
(a)= For information, indicative only



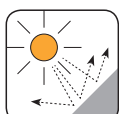
Impact Resistant



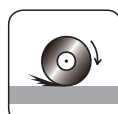
Highly Flexible



UV Resistant



Ozone Resistant



Abrasion Retardant



Cold Resistant



Resistance To Soldering Heat



Acid & Alkaline Resistant



IRM 903
Fuel Oil Resistant



IRM 902
Mineral Oil Resistant



Fire Retardant
NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4



Flame Retardant
NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-1-1



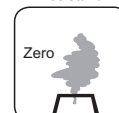
Low Toxicity
EN 50305; NF X70-100/NF
F63 808/TM1-04/BS 6853



Low Corrosivity
IEC60754-2/EN50267-2-2/3
NF C32-074/NF C20-453



Low Smoke Emission
IEC 61034-2 / EN 50268-2
NF C32-073/NF C 20-902



Zero Halogen
IEC 60754-1/EN 50267-2-1
NF C20-454

FIREROL Medium Wall Single Core Unsheathed & Fire Resistant 0.6/1 kV or 1.8/3 kV EN 50264-3-1 (FRL-MW-1SU-PH15/30/FRL-MW-3SU-PH15/30)



A. Conductor B. Insulation

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxiliary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

Mica tape+LSZH elastomeric compound as defined in EN 50264-1 (EI 106 to EI 109)

Electrical & Mechanical Properties

Nominal Voltage

0.6/1 kV or 1.8/3 kV

Max. Conductor Temperature

90 °C (fixed installation)

Min. Permissible Ambient Temperature

-25 °C/-40 °C (fixed installation)

Bending Radius

Fixed installation:

10 x Overall Diameter (D<12mm);

12 x Overall Diameter (D>12mm)

Flexible installation:

20 x Overall Diameter (D<12mm);

25 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

EN 60684-2

EN 50305; EN 60811-2-1

EN 50305

No fluorine

Resistance to mineral oil & fuel oil, acid & alkali

Resistance to ozone

Fire Performance for Rolling Stock Application

EN 50306-2

DIN 5510-2

BS 6853

NF F 16-101

Hazard levels HL1, HL2/HL3, HL4

Protection level 1/2/3/4

Interior use 1a, 1b, II; Exterior use 1a, 1b, II

F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)

EN 50266-2-4 + EN 50305; IEC 60332-3-24;

NF C 32-070 2.2 (C1); VDE 0472 Teil 804

EN 50268-2; IEC 61034-2; NF C 32-073 ;

NF C 20-902; NF F 16 101; VDE 0472 Teil 816

EN 50267-2-1; IEC 60754-1; NF C 32-074;

NF C 20-454; VDE 0472 Teil 815

EN 50267-2-2/3; IEC 60754-2; NF C 32-074;

NF C 20-453; VDE 0472 Teil 813

EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853

NF F 63 808; BS6853; NF F 16 101

EN50200: 2000

Vertical flame propagation for a single insulated wire or cable

Vertical flame spread of vertically mounted bunched wires or cables

Low Smoke Emission

Halogen Free

Low Corrosivity (Acidity & Conductivity)

Low Toxicity

Smoke Index

Resistance to fire of unprotected small cable for use in emergency circuits 4 classifications are defined: PH 15,30,60, or 90 mins;

IEC60331-21

The circuit integrity test under fire of cables rated 0.6/1.0kV and below

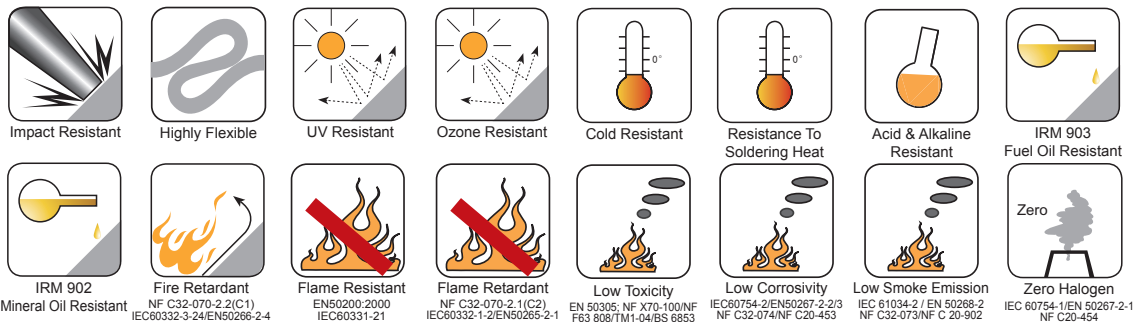
FRL-MW-1SU-PH15/30 0.6/1 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
			Min.	Max.			20 °C	90 °C
mm ²	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.0	1.25	0.6	2.6	3.1	15	20	11.4	0.114
1.5	1.5	0.7	3.0	3.6	24	13.7	11.0	0.110
2.5	1.95	0.7	3.4	4.1	36	8.21	9.1	0.091
4	2.5	0.7	4.0	4.7	54	5.09	7.5	0.075
6	3.0	0.7	4.4	5.3	76	3.39	6.5	0.065
10	3.9	0.7	5.3	6.2	121	1.95	5.2	0.052
16	5.0	0.7	6.3	7.5	184	1.24	4.2	0.042
25	6.4	0.9	8.0	9.4	289	0.795	4.1	0.041
35	7.7	0.9	9.2	10.9	395	0.565	3.5	0.035
50	9.2	1.0	10.8	12.7	563	0.393	3.3	0.033
70	11.0	1.1	12.7	14.9	796	0.277	3.0	0.030
95	12.5	1.1	14.1	16.6	1032	0.210	2.7	0.027
120	14.2	1.2	15.9	18.7	1318	0.164	2.7	0.027
150	15.8	1.4	17.8	20.9	1650	0.132	2.7	0.027
185	17.5	1.6	19.8	23.2	2018	0.108	2.6	0.026
240	20.1	1.7	22.4	26.3	2649	0.0817	2.6	0.026
300	22.5	1.8	24.8	29.1	3291	0.0654	2.4	0.024
400	25.8	2.0	28.3	33.2	3850	0.0495	2.4	0.024

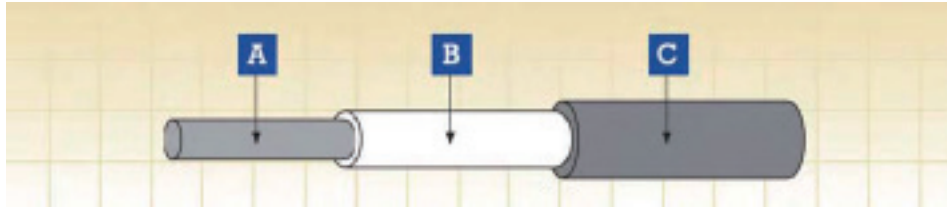
FRL-MW-3SU-PH15/30 1.8/3 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
			Min.	Max.			20 °C	90 °C
mm ²	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.5	1.5	2.0	5.5	6.5	56	13.7	21.0	0.210
2.5	1.95	2.0	5.9	7.0	71	8.21	18.0	0.180
4	2.5	2.0	6.4	7.6	90	5.09	15.5	0.155
6	3.0	2.0	6.9	8.1	114	3.39	13.7	0.137
10	3.9	2.0	7.7	9.1	165	1.95	11.5	0.115
16	5.0	2.0	8.8	10.3	235	1.24	9.5	0.095
25	6.4	2.0	10.1	11.9	320	0.795	7.9	0.079
35	7.7	2.0	11.3	13.3	440	0.565	6.8	0.068
50	9.2	2.0	12.7	14.9	610	0.393	5.9	0.059
70	11.0	2.0	14.4	16.9	850	0.277	5.0	0.050
95	12.5	2.2	16.2	19.0	1110	0.210	4.5	0.045
120	14.2	2.2	17.8	20.9	1400	0.164	4.0	0.040
150	15.8	2.2	19.3	22.6	1710	0.132	3.7	0.037
185	17.5	2.4	21.1	24.7	2110	0.108	3.4	0.034
240	20.1	2.4	23.9	27.8	2750	0.0817	3.0	0.030
300	22.5	2.4	25.8	30.4	3300	0.0654	2.7	0.027
400	25.8	2.6	29.4	34.5	3900	0.0495	2.4	0.024

(a)= For information, indicative only



FIREROL Medium Wall Single Core Sheathed Cables 1.8/3 kV or 3.6/6 kV EN 50264-3-1 (FRL-MW-3S/FRL-MW-6S)



A. Conductor B. Insulation C. Sheath

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxillary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

LSZH elastomeric compound as defined in EN 50264-1 (EI 106 to EI 109)

Sheath

LSZH elastomeric compound as defined in EN 50264-1 (EM 101 to EM 104)

Electrical & Mechanical Properties

Nominal Voltage

1.8/3 kV or 3.6/6 kV

Max. Conductor Temperature

90 °C (fixed installation)

Min. Permissible Ambient Temperature

-25 °C/-40 °C (fixed installation)

Bending Radius

Fixed installation:

5 x Overall Diameter (D<12mm);

6 x Overall Diameter (D>12mm)

Flexible installation:

10 x Overall Diameter (D<12mm);

12 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

No fluorine

Resistance to mineral oil & fuel oil, acid & alkali

Resistance to ozone

EN 60684-2

EN 50305; EN 60811-2-1

EN 50305

Fire Performance for Rolling Stock Application

EN 50306-2

DIN 5510-2

BS 6853

NF F 16-101

Hazard levels HL1, HL2/HL3, HL4

Protection level 1/2/3/4

Interior use 1a, 1b, II; Exterior use 1a, 1b, II

F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)

EN 50266-2-4 + EN 50305; IEC 60332-3-24;

NF C 32-070 2.2 (C1); VDE 0472 Teil 804

EN 50268-2; IEC 61034-2; NF C 32-073 ;

NF C 20-902; NF F 16 101; VDE 0472 Teil 816

EN 50267-2-1; IEC 60754-1; NF C 32-074;

NF C 20-454; VDE 0472 Teil 815

EN 50267-2-2/3; IEC 60754-2; NF C 32-074;

NF C 20-453; VDE 0472 Teil 813

EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853

NF F 63 808; BS6853; NF F 16 101

Vertical flame propagation for a single insulated wire or cable
Vertical flame spread of vertically mounted bunched wires or cables

Low Smoke Emission

Halogen Free

Low Corrosivity (Acidity & Conductivity)

Low Toxicity

Smoke Index

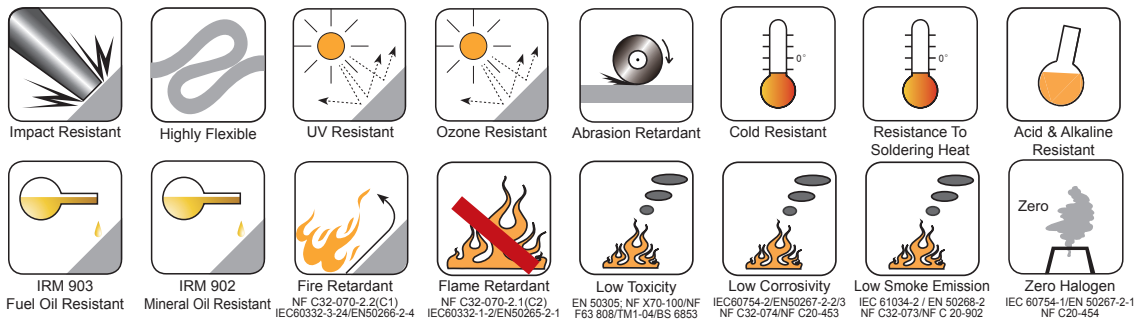
FRL-MW-3S 1.8/3 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Min. Mean Thickness of Sheath	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
				Min.	Max.			20 °C	20 °C
mm ²	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.5	1.5	1.3	0.8	5.7	6.7	60	13.7	21.8	0.218
2.5	1.95	1.3	0.8	6.0	7.0	70	8.21	18.8	0.188
4	2.5	1.3	0.8	6.5	7.6	90	5.09	16.2	0.162
6	3.0	1.3	0.8	7.0	8.1	110	3.39	14.4	0.144
10	3.9	1.5	0.8	8.2	9.6	170	1.95	12.8	0.128
16	5.0	1.5	0.8	9.2	10.8	240	1.24	10.7	0.107
25	6.4	1.8	1.0	11.5	13.4	350	0.795	10.3	0.103
35	7.7	1.8	1.0	12.7	14.9	450	0.565	8.9	0.089
50	9.2	1.8	1.0	14.1	16.5	590	0.393	7.8	0.078
70	11.0	1.8	1.0	15.8	18.5	790	0.277	6.7	0.067
95	12.5	2.2	1.0	18.0	21.0	1050	0.210	6.5	0.065
120	14.2	2.2	1.0	19.6	22.9	1270	0.164	6.1	0.061
150	15.8	2.2	1.2	21.4	25.1	1590	0.132	5.8	0.058
185	17.5	2.4	1.2	23.4	27.4	1900	0.108	5.6	0.056
240	20.1	2.4	1.2	25.9	30.3	2490	0.0817	5.0	0.050
300	22.5	2.4	1.2	28.1	32.9	3010	0.0654	4.5	0.045
400	25.8	2.6	1.4	32.0	37.4	3980	0.0495	4.4	0.044

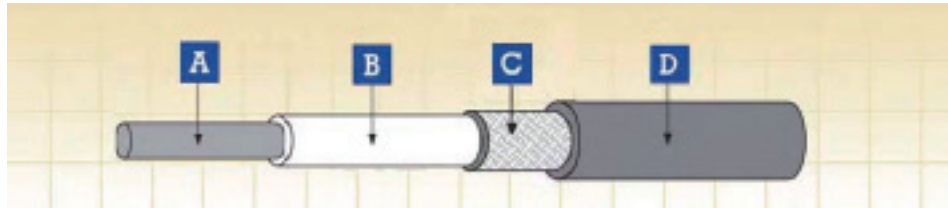
FRL-MW-6S 3.6/6 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Min. Mean Thickness of Sheath	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
				Min.	Max.			20 °C	20 °C
mm ²	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
2.5	1.95	2.6	0.8	8.6	10.1	120	8.21	24.6	0.246
4	2.5	2.6	0.8	9.1	10.7	140	5.09	21.6	0.216
6	3.0	2.6	0.8	9.6	11.2	165	3.39	19.5	0.195
10	3.9	2.6	0.8	10.4	12.2	220	1.95	16.7	0.167
16	5.0	2.6	0.8	11.5	13.4	290	1.24	14.2	0.142
25	6.4	2.9	1.0	13.7	16.1	430	0.795	13.1	0.131
35	7.7	2.9	1.0	14.9	17.5	540	0.565	11.6	0.116
50	9.2	2.9	1.0	16.4	19.1	670	0.393	10.2	0.102
70	11.0	2.9	1.0	18.0	21.1	880	0.277	8.9	0.089
95	12.5	2.9	1.0	19.5	22.8	1100	0.210	8.0	0.080
120	14.2	2.9	1.2	21.4	25.1	1380	0.164	7.5	0.075
150	15.8	2.9	1.2	22.9	26.8	1660	0.132	6.9	0.069
185	17.5	3.2	1.2	25.1	29.4	2010	0.108	6.7	0.067
240	20.1	3.4	1.4	28.3	33.1	2670	0.0817	6.4	0.064
300	22.5	3.4	1.4	30.6	35.8	3170	0.0654	5.9	0.059
400	25.8	3.4	1.4	33.7	39.4	4150	0.0495	5.2	0.052

(a)= For information, indicative only



FIREROL Medium Wall Single Core Screened & Sheathed Cables 1.8/3 kV or 3.6/6 kV EN 50264-3-1 (FRL-MW-3S-OS/FRL-MW-6S-OS)



A. Conductor B. Insulation C. Screen D. Sheath

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxiliary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

LSZH elastomeric compound as defined in EN 50264-1 (EI 106 to EI 109)

Overall Screen

Tinned annealed copper wires

Sheath

LSZH elastomeric compound as defined in EN 50264-1 (EM 101 to EM 104)

Electrical & Mechanical Properties

Nominal Voltage

1.8/3 kV or 3.6/6 kV

Max. Conductor Temperature

90 °C (fixed installation)

Min. Permissible Ambient Temperature

-25 °C/-40 °C (fixed installation)

Bending Radius

Fixed installation:
5 x Overall Diameter (D<12mm);
6 x Overall Diameter (D>12mm)

Flexible installation:
10 x Overall Diameter (D<12mm);
12 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

No fluorine

Resistance to mineral oil & fuel oil, acid & alkali

Resistance to ozone

EN 60684-2

EN 50305; EN 60811-2-1

EN 50305

Fire Performance for Rolling Stock Application

EN 50306-2

DIN 5510-2

BS 6853

NF F 16-101

Hazard levels HL1, HL2/HL3, HL4

Protection level 1/2/3/4

Interior use 1a, 1b, II; Exterior use 1a, 1b, II

F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)

EN 50266-2-4 + EN 50305; IEC 60332-3-24;

NF C 32-070 2.2 (C1); VDE 0472 Teil 804

EN 50268-2; IEC 61034-2; NF C 32-073 ;

NF C 20-902; NF F 16 101; VDE 0472 Teil 816

EN 50267-2-1; IEC 60754-1; NF C 32-074;

NF C 20-454; VDE 0472 Teil 815

EN 50267-2-2/3; IEC 60754-2; NF C 32-074;

NF C 20-453; VDE 0472 Teil 813

EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853

NF F 63 808; BS6853; NF F 16 101

Vertical flame propagation for a single insulated wire or cable

Vertical flame spread of vertically mounted bunched wires or cables

Low Smoke Emission

Halogen Free

Low Corrosivity (Acidity & Conductivity)

Low Toxicity

Smoke Index

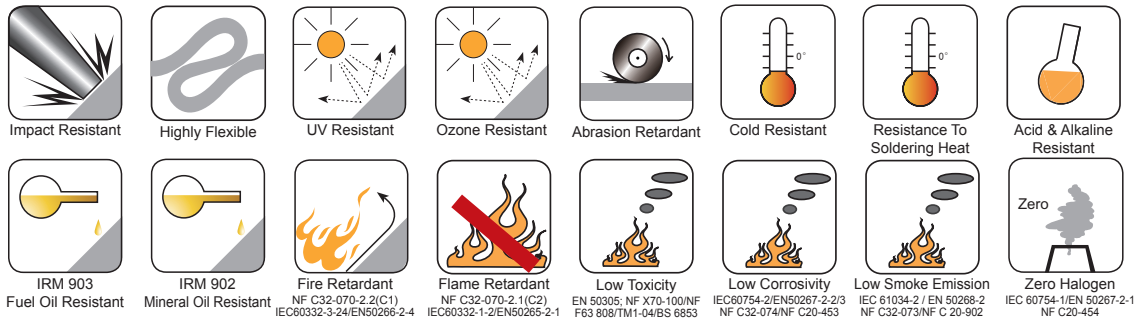
FRL-MW-3S-OS 1.8/3 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Min. Screen Wire Diameter	Min. Mean Thickness of Sheath	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
					Min.	Max.		20 °C	20 °C	90 °C
mm ²	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
1.5	1.5	1.3	0.16	0.8	6.6	7.6	103	13.7	21.8	0.218
2.5	1.95	1.3	0.16	0.8	6.9	8.1	123	8.21	18.8	0.188
4	2.5	1.3	0.21	0.8	7.5	8.8	157	5.09	16.2	0.162
6	3.0	1.3	0.21	0.8	7.9	9.4	189	3.39	14.4	0.144
10	3.9	1.5	0.21	0.8	9.1	10.8	264	1.95	12.8	0.128
16	5.0	1.5	0.26	0.8	10.2	12.0	359	1.24	10.7	0.107
25	6.4	1.8	0.26	1.0	12.1	14.2	510	0.795	10.3	0.103
35	7.7	1.8	0.31	1.0	13.3	15.2	650	0.565	8.9	0.089
50	9.2	1.8	0.31	1.0	14.7	16.8	846	0.393	7.8	0.078
70	11.0	1.8	0.31	1.0	16.6	19.3	1130	0.277	6.7	0.067
95	12.5	2.2	0.31	1.0	18.7	21.1	1436	0.210	6.5	0.065
120	14.2	2.2	0.31	1.0	20.6	23.0	1765	0.164	6.1	0.061
150	15.8	2.2	0.31	1.2	22.0	25.3	2128	0.132	5.8	0.058
185	17.5	2.4	0.31	1.2	24.0	29.0	2541	0.108	5.6	0.056
240	20.1	2.4	0.31	1.2	26.8	30.5	3244	0.0817	5.0	0.050
300	22.5	2.4	0.31	1.2	29.2	33.0	3934	0.0654	4.5	0.045
400	25.8	2.6	0.31	1.4	32.9	38.0	5078	0.0495	4.4	0.044

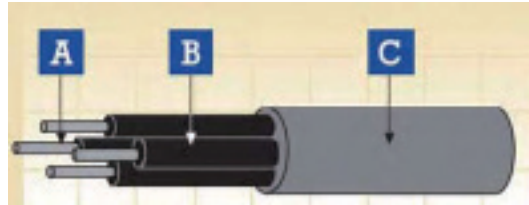
FRL-MW-6S-OS 3.6/6 kV

Nominal Cross-Sectional Area	Conductor Diameter (a)	Min. Mean Thickness of Insulation	Min. Screen Wire Diameter	Min. Mean Thickness of Sheath	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
					Min.	Max.		20 °C	20 °C	90 °C
mm ²	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
2.5	1.95	2.6	0.16	0.8	9.6	10.7	120	8.21	24.6	0.246
4	2.5	2.6	0.21	0.8	10.1	11.3	140	5.09	21.6	0.216
6	3.0	2.6	0.21	0.8	10.6	12.0	165	3.39	19.5	0.195
10	3.9	2.6	0.21	0.8	11.5	13.0	220	1.95	16.7	0.167
16	5.0	2.6	0.26	0.8	12.6	14.0	290	1.24	14.2	0.142
25	6.4	2.9	0.26	1.0	14.4	16.4	430	0.795	13.1	0.131
35	7.7	2.9	0.31	1.0	15.6	18.1	540	0.565	11.6	0.116
50	9.2	2.9	0.31	1.0	17.2	19.7	670	0.393	10.2	0.102
70	11.0	2.9	0.31	1.0	18.9	21.7	880	0.277	8.9	0.089
95	12.5	2.9	0.31	1.0	20.5	23.4	1100	0.210	8.0	0.080
120	14.2	2.9	0.31	1.2	22.1	25.7	1380	0.164	7.5	0.075
150	15.8	2.9	0.31	1.2	23.8	27.4	1660	0.132	6.9	0.069
185	17.5	3.2	0.31	1.2	26.0	30.0	2010	0.108	6.7	0.067
240	20.1	3.4	0.31	1.4	29.0	33.7	2670	0.0817	6.4	0.064
300	22.5	3.4	0.31	1.4	31.4	36.4	3170	0.0654	5.9	0.059
400	25.8	3.4	0.31	1.4	34.8	40.0	4150	0.0495	5.2	0.052

(a)= For information, indicative only



FIREROL Medium Wall Multicore Unscreened Cables 300/500 V or 0.6/1 kV EN 50264-3-2 (FRL-MW-05M/FRL-MW-1M)



A. Conductor B. Insulation C. Sheath

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxiliary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

LSZH elastomeric compound as defined in EN 50264-1 (EM 101 to EI 104)

Outer Sheath

LSZH elastomeric compound as defined in EN 50264-1 (EM 101 to EI 104)

Electrical & Mechanical Properties

Nominal Voltage

300/500 V or 0.6/1 kV

Max. Conductor Temperature

90 °C (fixed installation)

Min. Permissible Ambient Temperature

-25 °C/-40 °C (fixed installation)

Bending Radius

Fixed installation:

4 x Overall Diameter (D<12mm);

5 x Overall Diameter (D>12mm)

Flexible installation:

8 x Overall Diameter (D<12mm);

10 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

No fluorine

Resistance to mineral oil & fuel oil, acid & alkali

Resistance to ozone

EN 60684-2

EN 50305; EN 60811-2-1

EN 50305

Fire Performance for Rolling Stock Application

EN 50306-2

DIN 5510-2

BS 6853

NF F 16-101

Hazard levels HL1, HL2/HL3, HL4

Protection level 1/2/3/4

Interior use 1a, 1b, II; Exterior use 1a, 1b, II

F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)

EN 50266-2-4 + EN 50305; IEC 60332-3-24;

NF C 32-070 2.2 (C1); VDE 0472 Teil 804

EN 50268-2; IEC 61034-2; NF C 32-073 ;

NF C 20-902; NF F 16 101; VDE 0472 Teil 816

EN 50267-2-1; IEC 60754-1; NF C 32-074;

NF C 20-454; VDE 0472 Teil 815

EN 50267-2-2/3; IEC 60754-2; NF C 32-074;

NF C 20-453; VDE 0472 Teil 813

EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853

NF F 63 808; BS6853; NF F 16 101

Vertical flame propagation for a single insulated wire or cable
Vertical flame spread of vertically mounted bunched wires or cables

Low Smoke Emission

Halogen Free

Low Corrosivity (Acidity & Conductivity)

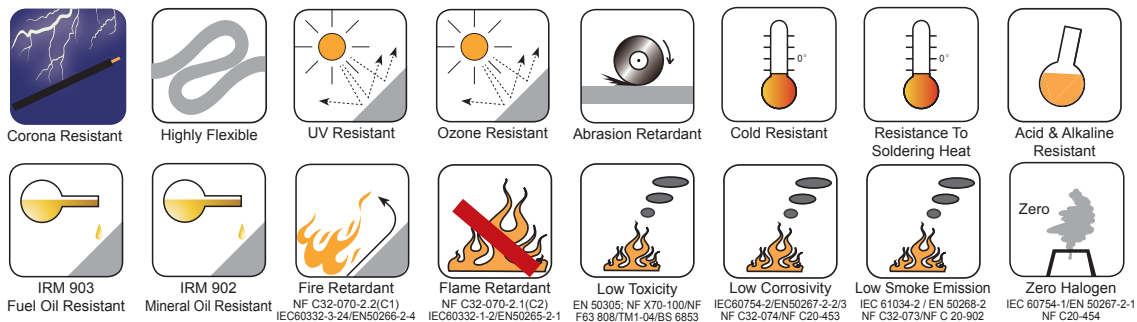
Low Toxicity

Smoke Index

FRL-MW-05M 300/500 V

Nominal Cross-Sectional Area (a)	Conductor Diameter (b)	Min. Mean Thickness of Insulation	Core Dimensions		Min. Average Sheath Thickness	Overall Diameter		Weight	Max. Conductor Resistance 20 °C	Min. Insulation Resistance	
			Min. Acc. to EN	Max. Acc. to EN		Min.	Max.			EI 110 20 °C	EI 106/7/8/9 20 °C
n x mm ²	mm	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
2 x 1	1.25	0.4	2.0	2.4	0.6	5.3	6.2	40	20.0	15.0	7.5
4 x 1	1.25	0.4	2.0	2.4	0.6	6.1	7.2	70	20.0	15.0	7.5
7 x 1	1.25	0.4	2.0	2.4	0.7	7.5	8.7	120	20.0	15.0	7.5
9 x 1	1.25	0.4	2.0	2.4	0.7	9.1	10.6	160	20.0	15.0	7.5
12 x 1	1.25	0.4	2.0	2.4	0.7	9.8	11.5	190	20.0	15.0	7.5
19 x 1	1.25	0.4	2.0	2.4	0.8	11.7	13.7	290	20.0	15.0	7.5
24 x 1	1.25	0.4	2.0	2.4	1.0	14.1	16.5	390	20.0	15.0	7.5
32 x 1	1.25	0.4	2.0	2.4	1.0	15.5	18.2	490	20.0	15.0	7.5
37 x 1	1.25	0.4	2.0	2.4	1.0	16.1	18.9	550	20.0	15.0	7.5
40 x 1	1.25	0.4	2.0	2.4	1.0	16.7	19.6	600	20.0	15.0	7.5
4 x 1.5	1.5	0.5	2.4	2.9	0.7	7.3	8.6	110	13.7	14.0	7.0
7 x 1.5	1.5	0.5	2.4	2.9	0.7	8.7	10.2	170	13.7	14.0	7.0
9 x 1.5	1.5	0.5	2.4	2.9	0.8	10.9	12.7	230	13.7	14.0	7.0
12 x 1.5	1.5	0.5	2.4	2.9	0.8	11.8	13.8	280	13.7	14.0	7.0
19 x 1.5	1.5	0.5	2.4	2.9	1.0	14.2	16.6	440	13.7	14.0	7.0
24 x 1.5	1.5	0.5	2.4	2.9	1.0	16.6	19.5	560	13.7	14.0	7.0
32 x 1.5	1.5	0.5	2.4	2.9	1.2	18.7	21.9	720	13.7	14.0	7.0
37 x 1.5	1.5	0.5	2.4	2.9	1.2	19.5	22.8	820	13.7	14.0	7.0
4 x 2.5	1.95	0.5	2.9	3.4	0.7	8.3	9.8	150	8.21	13.0	6.5
7 x 2.5	1.95	0.5	2.9	3.4	0.8	10.2	11.9	240	8.21	13.0	6.5
9 x 2.5	1.95	0.5	2.9	3.4	1.0	12.9	15.1	350	8.21	13.0	6.5
12 x 2.5	1.95	0.5	2.9	3.4	1.0	13.9	16.3	420	8.21	13.0	6.5
19 x 2.5	1.95	0.5	2.9	3.4	1.0	16.3	19.1	640	8.21	13.0	6.5
24 x 2.5	1.95	0.5	2.9	3.4	1.2	19.6	22.9	840	8.21	13.0	6.5

(a)= One earth conductor (green/yellow) can be included upon request
 (b)= For information, indicative only



EN 50264 Rolling Stock Cables

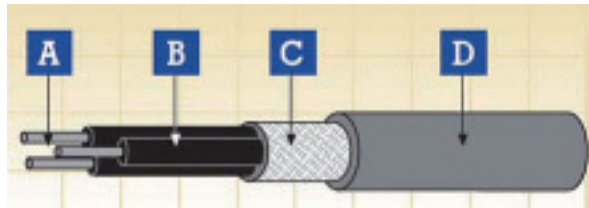
FRL-MW-1M 0.6/1 kV

Nominal Cross-Sectional Area (a)	Conductor Diameter (b)	Min. Mean Thickness of Insulation	Core Dimensions		Min. Average Sheath Thickness	Overall Diameter		Weight	Max. Conductor Resistance 20 °C	Min. Insulation Resistance	
			Min. Acc.to EN	Max. Acc.to EN		Min.	Max.			EI 110 20 °C	EI 106/7/8/9 20 °C
TWO CORES											
1.5	1.5	0.7	2.8	3.3	0.70	7.2	9.0	70	13.7	21.0	10.5
2.5	1.95	0.7	3.2	3.8	0.70	8.0	10.0	100	8.21	17.2	8.6
4	2.5	0.7	3.8	4.4	0.70	9.1	11.3	130	5.09	14.2	7.1
6	3.0	0.7	4.2	5.0	0.80	10.1	12.4	170	3.39	12.2	6.1
10	3.9	0.7	5.1	5.9	1.00	12.5	15.4	290	1.95	9.8	4.9
16	5.0	0.7	6.1	7.2	1.00	14.9	18.4	390	1.24	7.9	3.9
25	6.4	0.9	7.8	9.1	1.20	18.7	23.0	590	0.795	7.3	3.6
35	7.7	0.9	9.0	10.6	1.20	21.2	25.9	790	0.565	6.7	3.3
50	9.2	1.0	10.6	12.4	1.40	25.1	30.7	1140	0.393	6.3	3.1
THREE CORES											
1.5	1.5	0.7	2.8	3.3	0.70	7.7	9.5	100	13.7	21.0	10.5
2.5	1.95	0.7	3.2	3.8	0.70	8.5	10.5	130	8.21	17.2	8.6
4	2.5	0.7	3.8	4.4	0.70	9.7	12.0	180	5.09	14.2	7.1
6	3.0	0.7	4.2	5.0	0.80	10.7	13.2	250	3.39	12.2	6.1
10	3.9	0.7	5.1	5.9	1.00	13.3	16.5	410	1.95	9.8	4.9
16	5.0	0.7	6.1	7.2	1.00	16.0	19.6	570	1.24	7.9	3.9
25	6.4	0.9	7.8	9.1	1.20	20.0	24.7	850	0.795	7.3	3.6
35	7.7	0.9	9.0	10.6	1.40	23.0	28.2	1160	0.565	6.7	3.3
50	9.2	1.0	10.6	12.4	1.60	26.3	32.2	1680	0.393	6.3	3.1
FOUR CORES											
1.5	1.5	0.7	2.8	3.3	0.70	8.5	10.5	120	13.7	21.0	10.5
2.5	1.95	0.7	3.2	3.8	0.70	9.4	11.6	170	8.21	17.2	8.6
4	2.5	0.7	3.8	4.4	0.80	10.9	13.4	240	5.09	14.2	7.1
6	3.0	0.7	4.2	5.0	1.00	12.2	14.9	330	3.39	12.2	6.1
10	3.9	0.7	5.1	5.9	1.00	14.7	18.2	540	1.95	9.8	4.9
16	5.0	0.7	6.1	7.2	1.20	18.0	22.1	750	1.24	7.9	3.9
25	6.4	0.9	7.8	9.1	1.40	22.6	27.6	1140	0.795	7.3	3.6
3 x 35+25	7.7/6.4	0.9/0.9	9.0/7.8	10.6/9.1	1.40	25.7	31.2	1490	0.565/0.795	6.7	3.3
3 x 50+25	9.2/6.4	1.0/0.9	10.6/7.8	12.4/9.1	1.60	30.0	36.5	2110	0.393/1.795	6.3	3.1

(a)= For information, indicative only



FIREROL Medium Wall Multicore Overall Screened Cables 300/500 V or 0.6/1 kV EN 50264-3-2 (FRL-MW-05M-OS/FRL-MW-1M-OS)



A. Conductor B. Insulation C. Screen D. Sheath

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxiliary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

LSZH elastomeric compound as defined in EN 50264-1 (EI 106 to EI 110)

Overall Screen

Tinned annealed copper wires

Outer Sheath

LSZH elastomeric compound as defined in EN 50264-1 (EM 101 to EI 104)

Electrical & Mechanical Properties

Nominal Voltage	300/500 V or 0.6/1 kV
Max. Conductor Temperature	90 °C (fixed installation)
Min. Permissible Ambient Temperature	-25 °C / -40 °C (fixed installation)
Bending Radius	Fixed installation: 4 x Overall Diameter (D<12mm); 5 x Overall Diameter (D>12mm) Flexible installation: 8 x Overall Diameter (D<12mm); 10 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

EN 60684-2	No fluorine
EN 50305; EN 60811-2-1	Resistance to mineral oil & fuel oil, acid & alkali
EN 50305	Resistance to ozone

Fire Performance for Rolling Stock Application

EN 50306-2	Hazard levels HL1, HL2/HL3, HL4
DIN 5510-2	Protection level 1/2/3/4
BS 6853	Interior use 1a, 1b, II; Exterior use 1a, 1b, II
NF F 16-101	F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)	Vertical flame propagation for a single insulated wire or cable
EN 50266-2-4 + EN 50305; IEC 60332-3-24; NF C 32-070 2.2 (C1); VDE 0472 Teil 804	Vertical flame spread of vertically mounted bunched wires or cables
EN 50268-2; IEC 61034-2; NF C 32-073 ; NF C 20-902; NF F 16 101; VDE 0472 Teil 816	Low Smoke Emission
EN 50267-2-1; IEC 60754-1; NF C 32-074; NF C 20-454; VDE 0472 Teil 815	Halogen Free
EN 50267-2-2/3; IEC 60754-2; NF C 32-074; NF C 20-453; VDE 0472 Teil 813	Low Corrosivity (Acidity & Conductivity)

EN 50264 Rolling Stock Cables

EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853
NF F 63 808; BS6853; NF F 16 101

Low Toxicity
Smoke Index

FRL-MW-05M-OS 300/500 V

Nominal Cross-Sectional Area (a)	Conductor Diameter (b)	Min. Mean Thickness of Insulation	Core Dimensions		Min. Screen Wire Diameter	Min. Average Sheath Thickness	Overall Diameter		Weight	Max. Conductor Resistance 20 °C	Min. Insulation Resistance	
			Min.	Max.			Min.	Max.			EI 110 20 °C	EI 106/7/8/9 20 °C
n x mm ²	mm	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km	
2x1	1.25	0.4	2.0	2.4	0.16	0.6	6.0	7.1	70	20.0	15.0	7.5
4x1	1.25	0.4	2.0	2.4	0.16	0.7	7.0	8.2	110	20.0	15.0	7.5
7x1	1.25	0.4	2.0	2.4	0.16	0.7	8.2	9.6	150	20.0	15.0	7.5
9x1	1.25	0.4	2.0	2.4	0.21	0.8	10.2	11.9	220	20.0	15.0	7.5
12x1	1.25	0.4	2.0	2.4	0.21	0.8	10.9	12.7	260	20.0	15.0	7.5
19x1	1.25	0.4	2.0	2.4	0.26	1.0	13.2	15.4	400	20.0	15.0	7.5
24x1	1.25	0.4	2.0	2.4	0.26	1.0	15.2	17.8	500	20.0	15.0	7.5
32x1	1.25	0.4	2.0	2.4	0.26	1.0	16.6	19.4	610	20.0	15.0	7.5
37x1	1.25	0.4	2.0	2.4	0.26	1.0	17.2	20.1	670	20.0	15.0	7.5
40x1	1.25	0.4	2.0	2.4	0.26	1.2	18.2	21.3	740	20.0	15.0	7.5
4x1.5	1.5	0.5	2.4	2.9	0.16	0.7	8.0	9.4	140	13.7	14.0	7.0
7x1.5	1.5	0.5	2.4	2.9	0.21	0.7	9.6	11.3	220	13.7	14.0	7.0
9x1.5	1.5	0.5	2.4	2.9	0.21	1.0	12.1	14.2	290	13.7	14.0	7.0
12x1.5	1.5	0.5	2.4	2.9	0.21	1.0	13.0	15.2	360	13.7	14.0	7.0
19x1.5	1.5	0.5	2.4	2.9	0.26	1.0	15.3	17.9	540	13.7	14.0	7.0
24x1.5	1.5	0.5	2.4	2.9	0.26	1.2	18.1	21.2	700	13.7	14.0	7.0
32x1.5	1.5	0.5	2.4	2.9	0.26	1.2	19.8	23.2	860	13.7	14.0	7.0
37x1.5	1.5	0.5	2.4	2.9	0.26	1.2	20.5	24.0	960	13.7	14.0	7.0
4x2.5	1.95	0.5	2.9	3.4	0.21	0.7	9.2	10.8	200	8.21	13.0	6.5
7x2.5	1.95	0.5	2.9	3.4	0.21	0.8	11.1	13.0	310	8.21	13.0	6.5
9x2.5	1.95	0.5	2.9	3.4	0.26	1.0	13.9	16.3	440	8.21	13.0	6.5
12x2.5	1.95	0.5	2.9	3.4	0.26	1.0	15.0	17.5	520	8.21	13.0	6.5
19x2.5	1.95	0.5	2.9	3.4	0.26	1.2	17.8	20.8	770	8.21	13.0	6.5
24x2.5	1.95	0.5	2.9	3.4	0.26	1.2	20.6	24.1	970	8.21	13.0	6.5

(a)= One earth conductor (green/yellow) can be included upon request

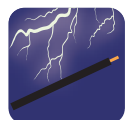
(b)= For information, indicative only



FRL-MW-1M-OS 0.6/1 kV

Nominal Cross-Sectional Area (a)	Conductor Diameter (b)	Min. Mean Thickness of Insulation	Core Dimensions		Min. Screen Wire Diameter	Min. Average Sheath Thickness	Overall Diameter		Weight	Max. Conductor Resistance	Min. Insulation Resistance	
			Min.	Max.			Min.	Max.			20 °C	20 °C
			mm	mm			mm	mm			kg/km	Ω/km
TWO CORES												
1.5	1.5	0.7	2.8	3.3	0.16	0.70	7.9	9.9	90	13.7	21.0	10.5
2.5	1.95	0.7	3.2	3.8	0.16	0.70	8.7	10.7	120	8.21	17.2	8.6
4	2.5	0.7	3.8	4.4	0.21	0.80	10.2	12.7	170	5.09	14.2	7.1
6	3.0	0.7	4.2	5.0	0.21	0.80	10.9	13.6	210	3.39	12.2	6.1
10	3.9	0.7	5.1	5.9	0.21	1.00	13.4	16.6	320	1.95	9.8	4.9
16	5.0	0.7	6.1	7.2	0.26	1.00	16.0	19.8	470	1.24	7.9	3.9
25	6.4	0.9	7.8	9.1	0.26	1.20	19.8	24.6	690	0.795	7.3	3.6
35	7.7	0.9	9.0	10.6	0.31	1.40	22.8	27.9	940	0.565	6.7	3.3
50	9.2	1.0	10.6	12.4	0.31	1.40	26.4	32.3	1260	0.393	6.3	3.1
THREE CORES												
1.5	1.5	0.7	2.8	3.3	0.16	0.70	8.4	10.4	120	13.7	21.0	10.5
2.5	1.95	0.7	3.2	3.8	0.16	0.70	9.2	11.4	160	8.21	17.2	8.6
4	2.5	0.7	3.8	4.4	0.21	0.80	10.8	13.3	230	5.09	14.2	7.1
6	3.0	0.7	4.2	5.0	0.21	0.80	11.6	14.3	300	3.39	12.2	6.1
10	3.9	0.7	5.1	5.9	0.26	1.00	14.4	18.0	500	1.95	9.8	4.9
16	5.0	0.7	6.1	7.2	0.26	1.20	17.4	21.3	680	1.24	7.9	3.9
25	6.4	0.9	7.8	9.1	0.26	1.20	21.3	26.1	970	0.795	7.3	3.6
35	7.7	0.9	9.0	10.6	0.31	1.40	24.5	29.8	1330	0.565	6.7	3.3
50	9.2	1.0	10.6	12.4	0.31	1.60	28.3	34.6	1820	0.393	6.3	3.1
FOUR CORES												
1.5	1.5	0.7	2.8	3.3	0.16	0.70	9.1	11.3	150	13.7	21.0	10.5
2.5	1.95	0.7	3.2	3.8	0.21	0.80	10.4	12.9	220	8.21	17.2	8.6
4	2.5	0.7	3.8	4.4	0.21	0.80	11.8	14.5	290	5.09	14.2	7.1
6	3.0	0.7	4.2	5.0	0.21	1.00	13.1	16.1	400	3.39	12.2	6.1
10	3.9	0.7	5.1	5.9	0.26	1.00	15.9	19.5	640	1.95	9.8	4.9
16	5.0	0.7	6.1	7.2	0.26	1.20	19.3	23.6	860	1.24	7.9	3.9
25	6.4	0.9	7.8	9.1	0.31	1.40	24.0	29.3	1290	0.795	7.3	3.6
3x35+25	7.7/6.4	0.9/0.9	9.0/7.8	10.6/9.1	0.31	1.4	26.9	32.9	1910	0.565/0.795	6.7	3.3
3x50+25	9.2/6.4	1.0/0.9	10.6/7.8	12.4/9.1	0.31	1.6	31.5	38.2	2560	0.393/0.795	6.3	3.1

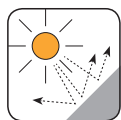
(a)= For information, indicative only



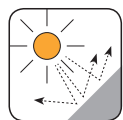
Corona Resistant



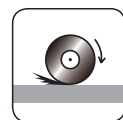
Highly Flexible



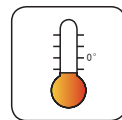
UV Resistant



Ozone Resistant



Abrasion Retardant



Cold Resistant



Resistance To Soldering Heat



Acid & Alkaline Resistant



IRM 903 Fuel Oil Resistant



IRM 902 Mineral Oil Resistant



Fire Retardant
NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4



Flame Retardant
NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1



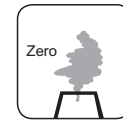
Low Toxicity
EN 50305: NF X70-100/NF F63 808/TM1-04/BS 6853



Low Corrosivity
IEC60754-2/EN50267-2-2/3
NF C32-074/NF C20-453

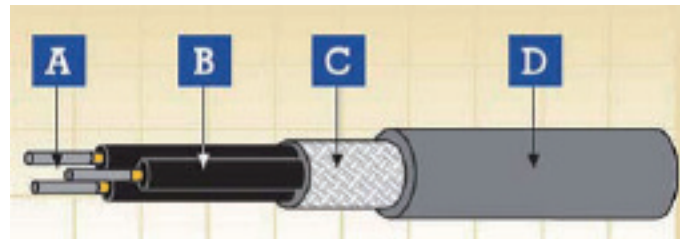


Low Smoke Emission
IEC 61034-2 / EN 50268-2
NF C32-073/NF C 20-902



Zero Halogen
IEC 60754-1/EN 50267-2-1
NF C20-454

FIREROL Medium Wall Multicore Overall Screened & Fire Resistant Cables 300/500 V or 0.6/1 kV EN 50264-3-2(FRL-MW-05M-OS-AS⁺/FRL-MW-1M-OS-AS⁺)



A. Conductor B. Insulation C. Screen D. Sheath

Application

- Used as power and control cable for protected installations inside and outside of rail and transport vehicles, where handling and installation cost are an important factor.
- Used in control, auxiliary and main circuit wiring such as cable harnesses, switchboards and control panels, driver desks etc.c.

Construction

Conductor

Flexible tinned annealed copper wires, stranded as per HD 383 (IEC 60228) class 5

Insulation

Mica tape+LSZH elastomeric compound as defined in EN 50264-1 (EI 106 to EI 110)

Overall Screen

Tinned annealed copper wires

Outer Sheath

LSZH elastomeric compound as defined in EN 50264-1 (EM 101 to EI 104)

Electrical & Mechanical Properties

Nominal Voltage

300/500 V or 0.6/1 kV

Max. Conductor Temperature

90 °C (fixed installation)

Min. Permissible Ambient Temperature

-25 °C /-40 °C (fixed installation)

Bending Radius

Fixed installation:

10 x Overall Diameter (D<12mm);

12 x Overall Diameter (D>12mm)

Flexible installation:

20 x Overall Diameter (D<12mm);

25 x Overall Diameter (D>12mm)

Chemical & Environmental Properties

EN 60684-2

EN 50305; EN 60811-2-1

EN 50305

No fluorine

Resistance to mineral oil & fuel oil, acid & alkali

Resistance to ozone

Fire Performance for Rolling Stock Application

EN 50306-2

DIN 5510-2

BS 6853

NF F 16-101

Hazard levels HL1, HL2/HL3, HL4

Protection level 1/2/3/4

Interior use 1a, 1b, II; Exterior use 1a, 1b, II

F0

Fire Performance in General

EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)

EN 50266-2-4 + EN 50305; IEC 60332-3-24;

NF C 32-070 2.2 (C1); VDE 0472 Teil 804

EN 50268-2; IEC 61034-2; NF C 32-073 ;

Vertical flame propagation for a single insulated wire or cable

Vertical flame spread of vertically mounted bunched wires or cables

Low Smoke Emission

NF C 20-902; NF F 16 101; VDE 0472 Teil 816
 EN 50267-2-1; IEC 60754-1; NF C 32-074;
 NF C 20-454; VDE 0472 Teil 815
 EN 50267-2-2/3; IEC 60754-2; NF C 32-074;
 NF C 20-453; VDE 0472 Teil 813
 EN 50305; NF X 70-100; NF F 63 808; TM1-04; BS6853
 NF F 63 808; BS6853; NF F 16 101
 IEC60331-21

Halogen Free

Low Corrosivity (Acidity & Conductivity)

Low Toxicity

Smoke Index

The circuit integrity test under fire of cables rated 0.6/1.0kV and below

FRL-MW-05M-OS-AS⁺ 300/500 V

Nominal Cross-Sectional Area (a)	Conductor Diameter (b)	Min. Mean Thickness of Insulation	Core Dimensions		Min. Screen Wire Diameter	Min. Average Sheath Thickness	Overall Diameter		Weight	Max. Conductor Resistance 20 °C	Min. Insulation Resistance	
			Min.	Max.			Min.	Max.			EI 110 20 °C	EI 106/7/8/9 20 °C
n x mm ²	mm	mm	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	MΩ x km	MΩ x km
2 x 1	1.25	0.4	2.24	2.64	0.16	0.6	6.24	7.34	81	20.0	15.0	7.5
4 x 1	1.25	0.4	2.24	2.64	0.16	0.7	7.24	8.44	132	20.0	15.0	7.5
7 x 1	1.25	0.4	2.24	2.64	0.16	0.7	8.44	9.84	203	20.0	15.0	7.5
9 x 1	1.25	0.4	2.24	2.64	0.21	0.8	10.44	12.14	275	20.0	15.0	7.5
12 x 1	1.25	0.4	2.24	2.64	0.21	0.8	11.14	12.94	346	20.0	15.0	7.5
19 x 1	1.25	0.4	2.24	2.64	0.26	1.0	13.44	15.64	538	20.0	15.0	7.5
24 x 1	1.25	0.4	2.24	2.64	0.26	1.0	15.44	18.04	667	20.0	15.0	7.5
32 x 1	1.25	0.4	2.24	2.64	0.26	1.0	16.84	19.64	846	20.0	15.0	7.5
37 x 1	1.25	0.4	2.24	2.64	0.26	1.0	17.44	20.34	953	20.0	15.0	7.5
40 x 1	1.25	0.4	2.24	2.64	0.26	1.2	18.44	21.54	1044	20.0	15.0	7.5
4 x 1.5	1.5	0.5	2.64	3.14	0.16	0.7	8.24	9.64	180	13.7	14.0	7.0
7 x 1.5	1.5	0.5	2.64	3.14	0.21	0.7	9.84	11.54	295	13.7	14.0	7.0
9 x 1.5	1.5	0.5	2.64	3.14	0.21	1.0	12.34	14.44	395	13.7	14.0	7.0
12 x 1.5	1.5	0.5	2.64	3.14	0.21	1.0	13.24	15.44	497	13.7	14.0	7.0
19 x 1.5	1.5	0.5	2.64	3.14	0.26	1.0	15.54	18.14	750	13.7	14.0	7.0
24 x 1.5	1.5	0.5	2.64	3.14	0.26	1.2	18.34	21.44	955	13.7	14.0	7.0
32 x 1.5	1.5	0.5	2.64	3.14	0.26	1.2	20.04	23.44	1215	13.7	14.0	7.0
37 x 1.5	1.5	0.5	2.64	3.14	0.26	1.2	20.74	24.24	1372	13.7	14.0	7.0
4 x 2.5	1.95	0.5	3.14	3.64	0.21	0.7	9.44	11.04	249	8.21	13.0	6.5
7 x 2.5	1.95	0.5	3.14	3.64	0.21	0.8	11.34	13.24	398	8.21	13.0	6.5
9 x 2.5	1.95	0.5	3.14	3.64	0.26	1.0	14.14	16.54	539	8.21	13.0	6.5
12 x 2.5	1.95	0.5	3.14	3.64	0.26	1.0	15.24	17.74	681	8.21	13.0	6.5
19 x 2.5	1.95	0.5	3.14	3.64	0.26	1.2	18.04	21.04	1027	8.21	13.0	6.5
24 x 2.5	1.95	0.5	3.14	3.64	0.26	1.2	20.84	24.34	1278	8.21	13.0	6.5

(a)= One earth conductor (green/yellow) can be included upon request

(b)= For information, indicative only

EN 50264 Rolling Stock Cables

FRL-MW-1M-OS-AS+ 0.6/1 kV

Nominal Cross-Sectional Area (a)	Conductor Diameter (b)	Min. Mean Thickness of Insulation	Core Dimensions		Min. Screen Wire Diameter	Min. Average Sheath Thickness	Overall Diameter		Weight	Max. Conductor Resistance 20 °C	Min. Insulation Resistance	
			Min.	Max.			Min.	Max.			EI 110 20 °C	EI 106/7/8/9 20 °C
TWO CORES												
1.5	1.5	0.7	3.04	3.54	0.16	0.70	8.14	10.14	121	13.7	21.0	10.5
2.5	1.95	0.7	3.44	4.04	0.16	0.70	8.94	10.94	157	8.21	17.2	8.6
4	2.5	0.7	4.04	4.64	0.21	0.80	10.44	12.94	224	5.09	14.2	7.1
6	3.0	0.7	4.44	5.24	0.21	0.80	11.14	13.84	287	3.39	12.2	6.1
10	3.9	0.7	5.34	6.14	0.21	1.00	13.64	16.84	424	1.95	9.8	4.9
16	5.0	0.7	6.34	7.44	0.26	1.00	16.24	20.04	606	1.24	7.9	3.9
25	6.4	0.9	8.04	9.34	0.26	1.20	20.04	24.84	909	0.795	7.3	3.6
35	7.7	0.9	9.24	10.84	0.31	1.40	23.04	28.14	1213	0.565	6.7	3.3
50	9.2	1.0	10.84	12.64	0.31	1.40	26.64	32.54	1631	0.393	6.3	3.1
THREE CORES												
1.5	1.5	0.7	3.04	3.54	0.16	0.70	8.64	10.64	156	13.7	21.0	10.5
2.5	1.95	0.7	3.44	4.04	0.16	0.70	9.44	11.64	207	8.21	17.2	8.6
4	2.5	0.7	4.04	4.64	0.21	0.80	11.04	13.54	295	5.09	14.2	7.1
6	3.0	0.7	4.44	5.24	0.21	0.80	11.84	14.54	384	3.39	12.2	6.1
10	3.9	0.7	5.34	6.14	0.26	1.00	14.64	18.24	593	1.95	9.8	4.9
16	5.0	0.7	6.34	7.44	0.26	1.20	17.64	21.54	848	1.24	7.9	3.9
25	6.4	0.9	8.04	9.34	0.26	1.20	21.54	26.34	1251	0.795	7.3	3.6
35	7.7	0.9	9.24	10.84	0.31	1.40	24.74	30.04	1674	0.565	6.7	3.3
50	9.2	1.0	10.84	12.64	0.31	1.60	28.54	34.84	2309	0.393	6.3	3.1
FOUR CORES												
1.5	1.5	0.7	3.04	3.54	0.16	0.70	9.34	11.54	194	13.7	21.0	10.5
2.5	1.95	0.7	3.44	4.04	0.21	0.80	10.64	13.14	280	8.21	17.2	8.6
4	2.5	0.7	4.04	4.64	0.21	0.80	12.04	14.74	371	5.09	14.2	7.1
6	3.0	0.7	4.44	5.24	0.21	1.00	13.34	16.34	503	3.39	12.2	6.1
10	3.9	0.7	5.34	6.14	0.26	1.00	16.14	19.74	752	1.95	9.8	4.9
16	5.0	0.7	6.34	7.44	0.26	1.20	19.54	23.84	1082	1.24	7.9	3.9
25	6.4	0.9	8.04	9.34	0.31	1.40	24.24	29.54	1666	0.795	7.3	3.6
3x35+25	7.7/6.4	0.9/0.9	9.24/8.04	10.84/9.34	0.31	1.40	27.14	33.14	2152	0.565/0.795	6.7	3.3
3x50+25	9.2/6.4	1.0/0.9	10.84/8.04	12.64/9.34	0.31	1.60	31.74	38.44	2946	0.393/0.795	6.3	3.1

(a)= For information, indicative only

 Highly Flexible	 Abrasion Retardant	 UV Resistant	 Ozone Resistant	 Fire Resistant IEC60331-21	 Cold Resistant	 Resistance To Soldering Heat	 Acid & Alkaline Resistant
 IRM 903 Fuel Oil Resistant	 IRM 902 Mineral Oil Resistant	 Low Toxicity EN 50305; NF X70-100/NF F63 808/TM1-04/BS 6853	 Fire Retardant NF C32-070-2.2(C1) IEC 60332-3/EN50266	 Flame Retardant NF C32-070-2.1(C2) IEC 60332-1/EN 50265-2-1	 Low Corrosivity IEC60754-2/EN50267-2-2/3 NF C32-074/NF C20-453	 Low Smoke Emission IEC 61034-2 / EN 50268-2 NF C32-073/NF C20-902	 Zero Halogen IEC 60754-1/EN 50267-2-1 NF C20-454