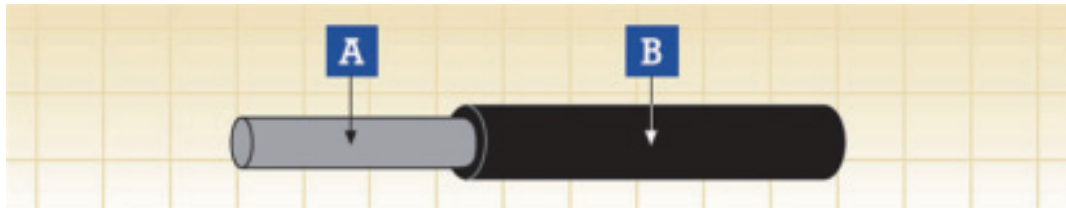


FIREROL Thin Wall Single Core Unsheathed Cables

300/500 V

EN 50306-2 (FRL-TW-05SU)



A. Conductor B. Insulation

Application

- Used as signal and control cable for protected installations inside and outside of rail and transport vehicles, where space and weight are an important factor.
- Used in cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Tinned annealed copper wires as defined in EN 50306-2

Insulation

LSZH special compound

Electrical & Mechanical Properties

Nominal Voltage	300/500 V
Max. Conductor Temperature	90 °C /105 °C (fixed installation)
Min. Permissible Ambient Temperature	-25/-40 °C (fixed installation)
Bending Radius	3 x Overall Diameter (fixed installation); 5 x Overall Diameter (flexible installation)

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 50306 Rolling Stock Cables



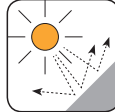
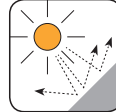











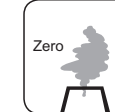
FRL-TW-05SU 300/500 V

Nominal Cross-Sectional Area	Number X Nominal Diameter of Wire	Diameter		Min. Mean Thickness of Insulation	Overall Diameter		Weight	Max. Conductor Resistance
		Min.	Max.		Min.	Max.		20 °C
		mm	mm		mm	mm		mm
0.5	19 x 0.18	0.80	0.95	0.18	1.15	1.45	7	40.1
0.75	37 x 0.16(a)	1.00	1.15	0.18	1.35	1.65	8	26.7
1.0	37 x 0.18(a)	1.10	1.30	0.18	1.45	1.80	10	20.0
1.5	37 x 0.23(a)	1.45	1.65	0.22	1.95	2.30	20	13.7
2.5	37 x 0.30(a)	1.85	2.15	0.28	2.50	2.85	25	8.21

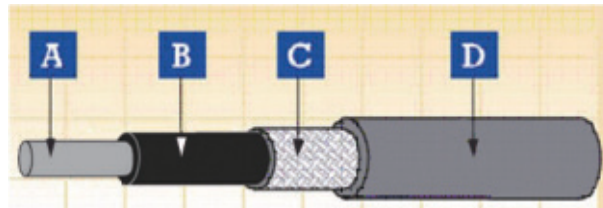
(a) =This cable may be supplied in 19 strand conductor providing all product performance requirements in the specification are met



EN 50306 Rolling Stock Cables

 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/EN50265-2-1	 Low Toxicity EN 50305; NF X70-100/NF F63 809/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 Zero Halogen IEC 60754-1/EN 50267-2-1 NF C20-454

FIREROL Thin Wall Single Core Screened & Sheathed Cables 300/500 V EN 50306-3 (FRL-TW-05S-OS)



A Conductor B. Insulation C. Screen D. Sheath

Application

- Used as signal and control cable for protected installations inside and outside of rail and transport vehicles, where space and weight are an important factor.
- Used in cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Tinned annealed copper wires as defined in EN 50306-2

Insulation

LSZH special compound

Overall Screen

Tinned annealed copper wires

Outer Sheath

LSZH special compound (S1 & S2)

Electrical & Mechanical Properties

Nominal Voltage	300/500 V
Max. Conductor Temperature	90 °C /105 °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



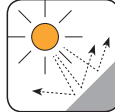
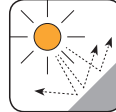











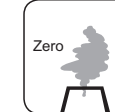
EN 50306 Rolling Stock Cables

FRL-TW-05S-OS 300/500 V

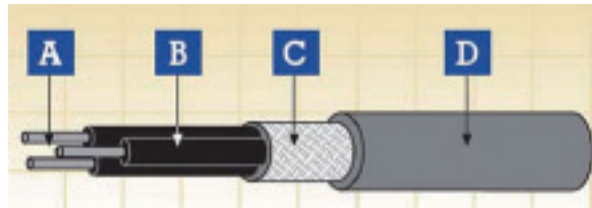
Number of Cores and Nominal Cross Section	Min. Thickness of Sheath at any Point	Overall Diameter		Weight
		Min.	Max.	
n x mm ²	mm	mm	mm	kg/km
1 x 0.5	0.20	2.3	2.8	10
1 x 0.75	0.20	2.5	3.0	20
1 x 1	0.20	2.7	3.2	25
1 x 1.5	0.20	3.1	3.6	30
1 x 2.5	0.20	3.6	4.4	40



EN 50306 Rolling Stock Cables

 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/EN50265-2-1	 Low Toxicity EN 50305; NF X70-100/NF F63 809/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 Zero Halogen IEC 60754-1/EN 50267-2-1 NF C20-454

FIREROL Thin Wall Multicore Overall Screened Cables 300/500 V EN 50306-3 (FRL-TW-05M-OS)



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

Application

- Used as signal and control cable for protected installations inside and outside of rail and transport vehicles, where space and weight are an important factor.
- Used in cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Tinned annealed copper wires as defined in EN 50306-2

Insulation

LSZH special compound

Overall Screen

Tinned annealed copper wires

Outer Sheath

LSZH special compound (S1 & S2)

Electrical & Mechanical Properties

Nominal Voltage
Max. Conductor Temperature
Min. Permissible Ambient Temperature
Bending Radius

300/500 V
90 °C/105 °C (fixed installation)
-25 °C/-40 °C (fixed installation)
Fixed installation:
3 x Overall Diameter (D<12mm);
4 x Overall Diameter (D>12mm)
Flexible installation:
5 x Overall Diameter (D<12mm);
6 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;

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 50306 Rolling Stock Cables

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

Low Corrosivity (Acidity & Conductivity)

Low Toxicity
 Smoke Index

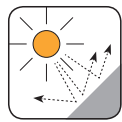
Number of Cores and Nominal Cross Section	Min. Thickness of Sheath at any Point	Overall Diameter		Weight
		Min.	Max.	
n x mm ²	mm	mm	mm	kg/km
2 x 0.5	0.20	3.5	4.3	28
3 x 0.5	0.20	3.7	4.5	35
4 x 0.5	0.20	4.0	5.0	40
2 x 0.75	0.20	3.9	4.7	35
3 x 0.75	0.20	4.0	5.0	40
4 x 0.75	0.20	4.5	5.5	60
2 x 1	0.20	4.2	5.2	40
3 x 1	0.20	4.5	5.5	55
4 x 1	0.20	5.0	6.0	70
2 x 1.5	0.20	5.1	6.1	60
3 x 1.5	0.20	5.4	6.4	80
4 x 1.5	0.20	6.0	7.0	100
2 x 2.5	0.20	6.4	7.4	90
3 x 2.5	0.20	6.8	7.8	120
4 x 2.5	0.20	7.5	8.5	140



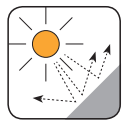
Corona Resistant



Highly Flexible



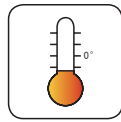
UV Resistant



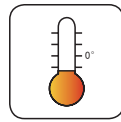
Ozone Resistant



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



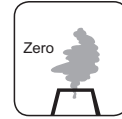
Low Toxicity
EN 50305; NF X70-100/NF
F63 808/TM1-04/BS 6853



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

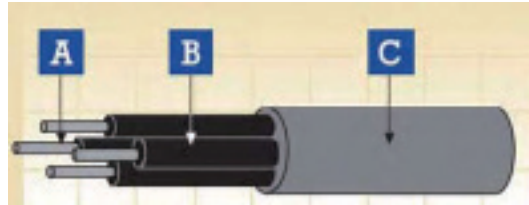


Low Smoke Emission
IEC 61034-2 / EN 50268-2
NF C32-073/NF C 20-902



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

FIREROL Thin Wall Multicore Cables with Standard Wall Sheath 300/500 V EN 50306-4 (FRL-TW-05M-SW)



A. Conductor B. Insulation C. Sheath

Application

- Used as signal and control cable for protected installations inside and outside of rail and transport vehicles, where space and weight are an important factor.
- Used in cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Tinned annealed copper wires as defined in EN 50306-2

Insulation

LSZH special compound

Sheath

LSZH special compound (S2. EM101- EM104)

Electrical & Mechanical Properties

Nominal Voltage

300/500 V

Max. Conductor Temperature

90 °C/105 °C (fixed installation)

Min. Permissible Ambient Temperature

-25 °C/-40 °C (fixed installation)

Bending Radius

Fixed installation:

3 x Overall Diameter (D<12mm);

4 x Overall Diameter (D>12mm)

Flexible installation:

5 x Overall Diameter (D<12mm);

6 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 50306 Rolling Stock Cables

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

Low Corrosivity (Acidity & Conductivity)

Low Toxicity
 Smoke Index

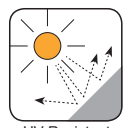
Number of Cores and Nominal Cross Section	Min. Thickness of Sheath at any Point	Overall Diameter		Weight
		Min.	Max.	
n x mm ²	mm	mm	mm	kg/km
4 x 0.5	0.42	4.1	5.1	30
7 x 0.5	0.42	4.9	5.9	50
13 x 0.5	0.56	7.3	8.3	100
19 x 0.5	0.56	8.1	9.1	140
37 x 0.5	0.56	10.8	12.0	250
4 x 0.75	0.42	4.6	5.6	40
7 x 0.75	0.42	5.5	6.5	70
13 x 0.75	0.56	8.2	9.2	130
19 x 0.75	0.56	9.0	10.2	180
37 x 0.75	0.56	12.2	13.4	340
48 x 0.75	0.56	13.9	15.5	440
4 x 1.0	0.42	4.9	5.9	50
7 x 1.0	0.42	6.0	7.0	90
13 x 1.0	0.56	8.7	9.9	160
19 x 1.0	0.56	9.8	11.0	230
37 x 1.0	0.56	13.3	14.5	430
4 x 1.5	0.42	6.0	7.0	80
7 x 1.5	0.56	7.7	9.8	140
13 x 1.5	0.56	10.7	11.9	250
19 x 1.5	0.56	12.0	13.2	350
37 x 1.5	0.56	16.2	17.8	650
2 x 2.5	0.56	6.7	7.7	70
3 x 2.5	0.56	7.7	8.1	110
4 x 2.5	0.56	7.9	8.9	140



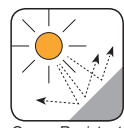
Corona Resistant



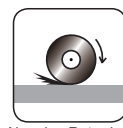
Highly Flexible



UV Resistant



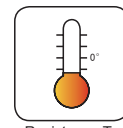
Ozone Resistant



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



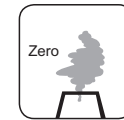
Low Toxicity
EN 50305; NF X70-100/NF
F63 808/TM1-04/BS 6853



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

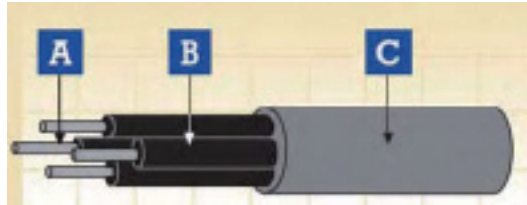


Low Smoke Emission
IEC 61034-2 / EN 50268-2
NF C32-073/NF C 20-902



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

FIREROL Thin Wall Multicore Cables with Exposed Standard Wall Sheath 300/500 V EN 50306-4 (FRL-TW-05M-ESW)



A. Conductor B. Insulation C. Sheath

Application

- Used as signal and control cable for protected installations inside and outside of rail and transport vehicles, where space and weight are an important factor.
- Used in cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Tinned annealed copper wires as defined in EN 50306-2

Insulation

LSZH special compound

Outer Sheath

LSZH special compound (S2. EM101-EM104)

Electrical & Mechanical Properties

Nominal Voltage	300/500 V
Max. Conductor Temperature	90 °C/105 °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 50306 Rolling Stock Cables

FRL-TW-05M-ESW 300/500 V

Number of Cores and Nominal Cross Section	Min. Thickness of Sheath at any Point	Overall Diameter		Weight
		Min.	Max.	
n x mm ²	mm	mm	mm	kg/km
4 x 0.5	1.0	5.5	6.5	50
7 x 0.5	1.0	6.3	7.3	70
13 x 0.5	1.0	8.3	9.3	120
19 x 0.5	1.0	9.0	10.2	150
37 x 0.5	1.0	12.3	13.5	290
4 x 0.75	1.0	6.0	7.0	60
7 x 0.75	1.0	6.9	7.9	90
13 x 0.75	1.0	9.1	10.3	150
19 x 0.75	1.0	10.0	11.2	200
37 x 0.75	1.0	13.2	14.4	360
48 x 0.75	1.0	14.8	16.4	460
4 x 1.0	1.0	6.3	7.3	70
7 x 1.0	1.0	7.3	8.3	110
13 x 1.0	1.0	9.7	10.9	180
19 x 1.0	1.0	10.7	11.9	250
37 x 1.0	1.0	14.0	15.6	450
4 x 1.5	1.0	7.4	8.4	100
7 x 1.5	1.0	8.6	9.8	150
13 x 1.5	1.0	11.7	12.9	270
19 x 1.5	1.0	13.0	14.2	370
37 x 1.5	1.0	17.2	18.8	690
2 x 2.5	1.0	7.7	8.7	90
3 x 2.5	1.0	8.1	9.1	120
4 x 2.5	1.0	8.8	10.0	150

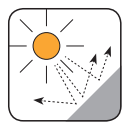
EN 50306 Rolling Stock Cables



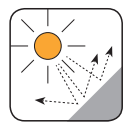
Corona Resistant



Highly Flexible



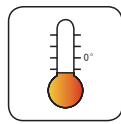
UV Resistant



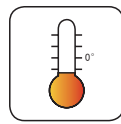
Ozone Resistant



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



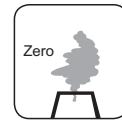
Low Toxicity
EN 50305; NF X70-100/NF
F63 808/TM1-04/BS 6853



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

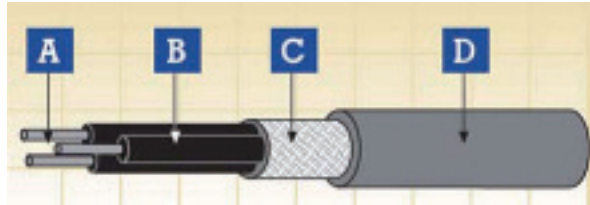


Low Smoke Emission
IEC 61034-2 / EN 50268-2
NF C32-073/NF C 20-902



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

FIREROL Thin Wall Multicore Overall Screened Cables with Standard Wall Sheath 300/500 V EN 50306-4 (FRL-TW-05M-SW-OS)



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

Application

- Used as signal and control cable for protected installations inside and outside of rail and transport vehicles, where space and weight are an important factor.
- Used in cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Tinned annealed copper wires as defined in EN 50306-2

Insulation

LSZH special compound

Overall Screen

Tinned annealed copper wires

Outer Sheath

LSZH special compound as defined in EN 50264-1 (S2. EM 101 - EM 104)

Electrical & Mechanical Properties

Nominal Voltage	300/500 V
Max. Conductor Temperature	90 °C/105 °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

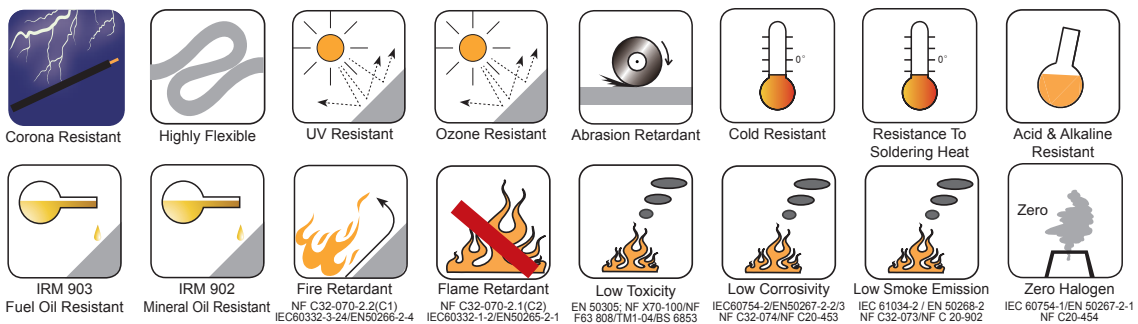
EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)	Vertical flame propagation for a single insulated wire or cable
EN 50266-2-4 + EN 50305; IEC 60332-3-24;	Vertical flame spread of vertically mounted bunched wires or cables
NF C 32-070 2.2 (C1); VDE 0472 Teil 804	
EN 50268-2; IEC 61034-2; NF C 32-073 ;	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

EN 50306 Rolling Stock Cables

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

Number of Cores and Nominal Cross Section	Min. Thickness of Sheath at any Point	Overall Diameter		Weight
		Min.	Max.	
n x mm ²	mm	mm	mm	kg/km
2 x 0.5	0.42	4.1	5.1	30
3 x 0.5	0.42	4.3	5.3	40
4 x 0.5	0.42	4.7	5.7	50
6 x 0.5	0.42	5.5	6.5	70
8 x 0.5	0.42	6.0	7.0	90
2 x 0.75	0.42	4.5	5.5	40
3 x 0.75	0.42	4.7	5.7	50
4 x 0.75	0.42	5.2	6.2	60
6 x 0.75	0.42	6.1	7.1	90
8 x 0.75	0.42	6.6	7.6	110
2 x 1.0	0.42	4.7	5.7	50
3 x 1.0	0.42	5.1	6.0	60
4 x 1.0	0.42	5.5	6.5	80
6 x 1.0	0.42	6.6	7.6	110
8 x 1.0	0.56	7.7	8.7	140
2 x 1.5	0.42	5.7	6.7	70
3 x 1.5	0.42	6.0	7.0	90
4 x 1.5	0.42	6.6	7.6	100
6 x 1.5	0.56	8.3	9.3	160
8 x 1.5	0.56	8.9	10.1	200
2 x 2.5	0.56	7.3	8.3	100
3 x 2.5	0.56	7.7	8.7	130
4 x 2.5	0.56	8.4	9.6	160

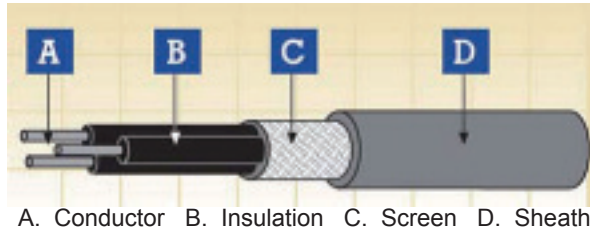
EN 50306 Rolling Stock Cables



FIREROL Thin Wall Multicore Overall Screened Cables with Exposed Standard Wall Sheath

300/500 V

EN 50306-4 (FRL-TW-05M-ESW-OS)



Application

- Used as signal and control cable for protected installations inside and outside of rail and transport vehicles, where space and weight are an important factor.
- Used in cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Tinned annealed copper wires as defined in EN 50306-2

Insulation

LSZH special compound

Overall Screen

Tinned annealed copper wires

Outer Sheath

LSZH special compound as defined in EN 50264-1 (S2. EM 101 - EM 104)

Electrical & Mechanical Properties

Nominal Voltage	300/500 V
Max. Conductor Temperature	90 °C/105 °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

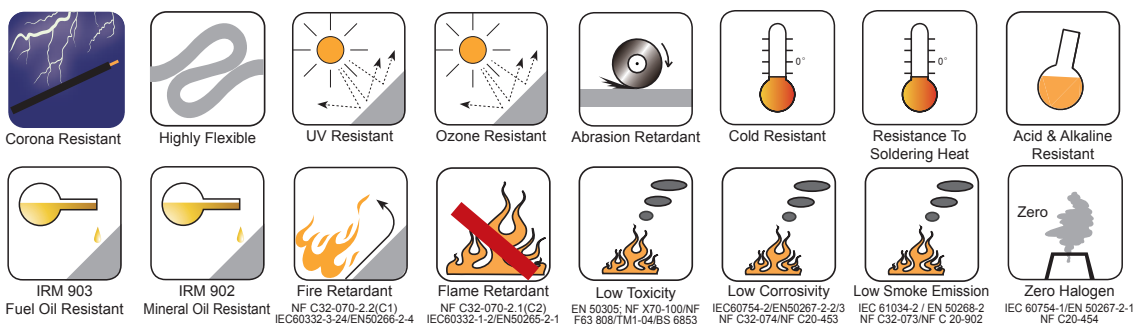
EN 50265-2-1; IEC 60332-1-2; NF C 32-070 2.1 (C2)	Vertical flame propagation for a single insulated wire or cable
EN 50266-2-4 + EN 50305; IEC 60332-3-24; NF C 32-070 2.2 (C1); VDE 0472 Teil 804	Vertical flame spread of vertically mounted bunched wires or cables
EN 50268-2; IEC 61034-2; NF C 32-073 ; 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	Low Toxicity
NF F 63 808; BS6853; NF F 16 101	Smoke Index

EN 50306 Rolling Stock Cables

FRL-TW-05M-ESW-OS 300/500 V

Number of Cores and Nominal Cross Section	Min. Thickness of Sheath at any Point	Overall Diameter		Weight
		Min.	Max.	
n x mm ²	mm	mm	mm	kg/km
2 x 0.5	1.0	5.5	6.5	50
3 x 0.5	1.0	5.7	6.7	55
4 x 0.5	1.0	6.1	7.1	60
6 x 0.5	1.0	6.9	7.9	90
8 x 0.5	1.0	7.5	8.5	110
2 x 0.75	1.0	5.9	6.9	60
3 x 0.75	1.0	6.2	7.2	70
4 x 0.75	1.0	6.5	7.5	80
6 x 0.75	1.0	7.5	8.5	110
8 x 0.75	1.0	8.2	9.2	130
2 x 1.0	1.0	6.2	7.2	60
3 x 1.0	1.0	6.5	7.5	80
4 x 1.0	1.0	6.9	7.9	90
6 x 1.0	1.0	8.0	9.0	130
8 x 1.0	1.0	8.6	9.8	160
2 x 1.5	1.0	7.1	8.1	90
3 x 1.5	1.0	7.4	8.4	110
4 x 1.5	1.0	8.0	9.0	130
6 x 1.5	1.0	9.2	10.4	170
8 x 1.5	1.0	10.2	11.4	220
2 x 2.5	1.0	8.3	9.3	120
3 x 2.5	1.0	8.6	9.8	150
4 x 2.5	1.0	9.4	10.6	180

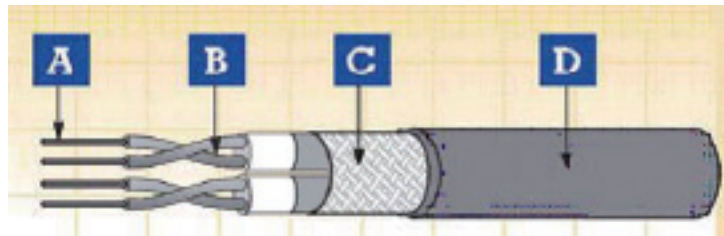
EN 50306 Rolling Stock Cables



FIREROL Thin Wall Multipair Individually Screened Cables, with Overall Screen & Standard Wall Sheath

300/500 V

EN 50306-4 (FRL-TW-05MP-SW-IOS)



A. Conductor B. Insulation+Pair Screen & Sheath C. Overall Screen D. Outer Sheath

Application

- Used as signal and control cable for protected installations inside and outside of rail and transport vehicles, where space and weight are an important factor.
- Used in cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Tinned annealed copper wires as defined in EN 50306-2

Insulation

LSZH special compound

Pair Screen

Individual screened and sheathed; Screened according to EN 50306-3; Sheathed according to EN 50306-3 (S1. S2)

Pair Identification

Pairs numbered according to EN 50306-4

Overall Screen

Tinned annealed copper wires

Outer Sheath

LSZH special compound (S2. EM 101 - EM 104)

Electrical & Mechanical Properties

Nominal Voltage	300/500 V
Max. Conductor Temperature	90 °C/105 °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)
 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
 FRL-TW-05MP-SW-IOS 300/500 V

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

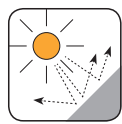
Number of Pairs and Nominal Cross Section	Min. Thickness of Sheath at any Point	Overall Diameter		Weight
		Min.	Max.	
N x n x mm ²	mm	mm	mm	kg/km
2 x 2 x 0.5	0.56	9.0	10.2	90
3 x 2 x 0.5	0.56	9.6	10.8	120
4 x 2 x 0.5	0.56	10.7	11.9	160
7 x 2 x 0.5	0.56	13.0	14.2	240
2 x 2 x 0.75	0.56	9.8	11.0	90
3 x 2 x 0.75	0.56	10.5	11.7	150
4 x 2 x 0.75	0.56	11.6	12.8	180
7 x 2 x 0.75	0.56	14.0	15.6	290
2 x 2 x 1.0	0.56	10.2	11.6	110
3 x 2 x 1.0	0.56	10.9	12.1	160
4 x 2 x 1.0	0.56	12.1	13.3	200
7 x 2 x 1.0	0.56	14.6	16.2	330
2 x 2 x 1.5	0.56	12.2	13.4	150
3 x 2 x 1.5	0.56	13.1	14.3	230
4 x 2 x 1.5	0.56	14.3	15.9	290
7 x 2 x 1.5	0.56	17.6	19.2	490



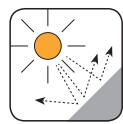
Corona Resistant



Highly Flexible



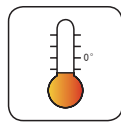
UV Resistant



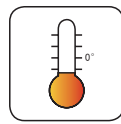
Ozone Resistant



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



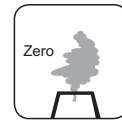
Low Toxicity
EN 50305; NF X70-100/NF
F63 808/TM1-04/BS 6853



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

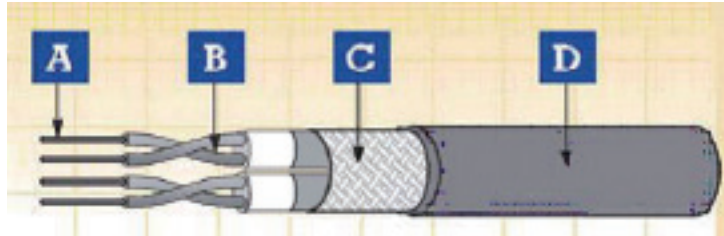


Zero Halogen
IEC 60754-1/EN 50267-2-1
NF C20-454

FIREROL Thin Wall Multipair Individually Screened Cables, with Overall Screen & Exposed Standard Wall Sheath

300/500 V

EN 50306-4 (FRL-TW-05MP-ESW-IOS)



A. Conductor B. Insulation+Pair Screen & Sheath C. Overall Screen D. Outer Sheath

Application

-Used as signal and control cable for protected installations inside and outside of rail and transport vehicles, where space and weight are an important factor.

-Used in cable harnesses, switchboards and control panels, driver desks etc.

Construction

Conductor

Tinned annealed copper wires as defined in EN 50306-2

Insulation

LSZH special compound

Pair Screen

Individual screened and sheathed. Screened according to EN 50306-3; Sheathed according to EN 50306-3 (S1, S2)

Pair Identification

Pairs numbered according to EN 50306-4

Overall Screen

Tinned annealed copper wires

Outer Sheath

LSZH special compound (S2, EM 101 - EM 104)

Electrical & Mechanical Properties

Nominal Voltage

300/500 V

Max. Conductor Temperature

90 °C/105 °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)
 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
 FRL-TW-05MP-ESW-IOS 300/500 V

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

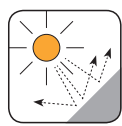
Number of Pairs and Nominal Cross Section	Min. Thickness of Sheath at any Point	Overall Diameter		Weight
		Min.	Max.	
N x n x mm ²	mm	mm	mm	kg/km
2 x 2 x 0.5	1.0	10.1	11.3	100
3 x 2 x 0.5	1.0	10.8	12.0	150
4 x 2 x 0.5	1.0	11.8	13.0	180
7 x 2 x 0.5	1.0	13.9	15.5	270
2 x 2 x 0.75	1.0	10.9	12.1	120
3 x 2 x 0.75	1.0	11.6	12.8	170
4 x 2 x 0.75	1.0	12.8	14.0	220
7 x 2 x 0.75	1.0	15.1	16.7	330
2 x 2 x 1.0	1.0	11.3	12.5	130
3 x 2 x 1.0	1.0	12.0	13.2	190
4 x 2 x 1.0	1.0	13.2	14.4	235
7 x 2 x 1.0	1.0	15.7	17.3	370
2 x 2 x 1.5	1.0	13.3	14.5	180
3 x 2 x 1.5	1.0	14.0	15.6	260
4 x 2 x 1.5	1.0	15.5	17.1	340
7 x 2 x 1.5	1.0	18.7	20.3	540



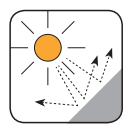
Corona Resistant



Highly Flexible



UV Resistant



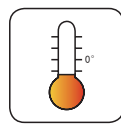
Ozone Resistant



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



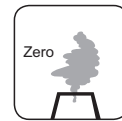
Low Toxicity
 EN 50305; NF X70-100/NF
 F63 808/TM1-04/BS 6853



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