



**Caledonian**

# Caledonian Coaxial Cables for Railway Application

[www.caledonian-cables.co.uk](http://www.caledonian-cables.co.uk)  
[www.addison-cables.com](http://www.addison-cables.com)

 **ADDISON**





## Registration Certificate

*This document certifies that the administration systems of*

*Caledonian Cables Limited / Addison Technology Limited*

*Marchants Industrial Centre, Mill Lane, Laughton, Lewes, Sussex, BN8 6AJ, United Kingdom*

*have been assessed and approved by QAS International  
to the following management systems, standards and guidelines:*

**ISO 9001 : 2008**

*With the permitted exclusion of clauses 7.3 Design and Development*

**The approved administration systems apply to the following:**

*The manufacture and supply of electrical cables and  
ancillary power equipment to customers internationally.*

Original Approval ..... 6<sup>th</sup> September 1997 .....  
Current Certificate ..... 7<sup>th</sup> February 2013 .....  
Certificate Expiry ..... 7<sup>th</sup> February 2014 .....  
Certificate Number ..... A6211 .....

**On behalf of QAS International**

This certificate remains valid while the holder maintains their quality administration systems in accordance with the standards and guidelines stated above, which will be audited annually by QAS International. The holder is entitled to display the above registration mark for the duration of this certificate. This certificate must be returned to QAS International on reasonable request.  
Issuing Office: QAS International, 20A Oxford Street, Malmesbury, Wiltshire, SN16 9AX



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## FRA 316 SW4

### Applications

These cables are designed for flexible installations, inside and outside railway rolling stock.

### Standards

- DIN 5510-2

### Construction

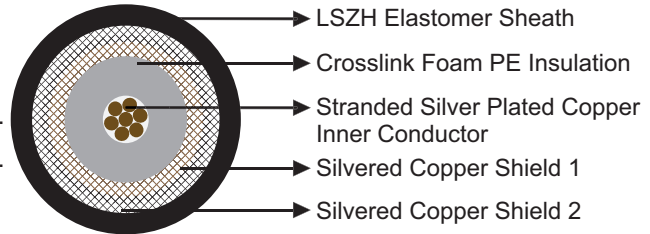
**Inner conductor:** Stranded silver plated copper.

**Insulation:** Crosslink Foam PE (SPEX).

**Outer conductor (shield 1):** Silver plated copper.

**Outer conductor (shield 2):** Silver plated copper.

**Sheath:** LSZH Elastomer.



### Electrical Characteristics at 20°C

Impedance	$\Omega$	50+/-2
Nominal Capacitance	pF/m	94.5
Minimum Insulation Resistance	M $\Omega$ .km	100000
Inner Conductor Resistance	M $\Omega$ /km	29.9
Outer Conductor Resistance	M $\Omega$ /km	7.5
Attenuation		
@10MHz	dB/100m	7
@50MHz	dB/100m	17
@100MHz	dB/100m	24
@150MHz	dB/100m	30
@200MHz	dB/100m	35
@300MHz	dB/100m	44
@400MHz	dB/100m	52
@450MHz	dB/100m	56
@500MHz	dB/100m	59
@600MHz	dB/100m	66
@800MHz	dB/100m	78
@850MHz	dB/100m	81
@900MHz	dB/100m	83
@950MHz	dB/100m	86
@1000MHz	dB/100m	89
@1800MHz	dB/100m	127
@1900MHz	dB/100m	131

@2000MHz	dB/100m	135
@2400MHz	dB/100m	152
@3000MHz	dB/100m	175
@4000MHz	dB/100m	211
@5000MHz	dB/100m	245
@6000MHz	dB/100m	277
Velocity of propagation	%	70.7

➤ **Mechanical and Thermal Properties**

Minimum Bending Radius: 5mm (static)

Temperature Range: -40°C ~ +105°C

➤ **Dimensions and Weight**

Conductor Construction No/mm	Nominal Inner Conductor Diameter mm	Nominal Outer Conductor Diameter mm	Nominal Overall Diameter mm	Nominal Weight kg/km
7/0.18	0.54	2.5	3.16	21



Impact Resistant



Oil Resistant



Acid&Alkaline Resistant



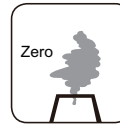
Highly Flexible



Flame Retardant  
NF C32-070-2.1(C2)  
IEC 60332-1/EN 50265-2-1



Fire Retardant  
NF C32-070-2.2(C1)  
IEC 60332-3/EN50266



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



Low Smoke Emission  
IEC 61034/NFC20-902  
EN 50268/NF C32-073



Low Corrosivity  
EN 50267-2-2/NF C32-07  
IEC 60754-2/NF C20-455



Low Toxicity



## FRA 400 SW4

### Applications

These cables are designed for flexible installations, inside and outside railway rolling stock.

### Standards

- DIN 5510-2

### Construction

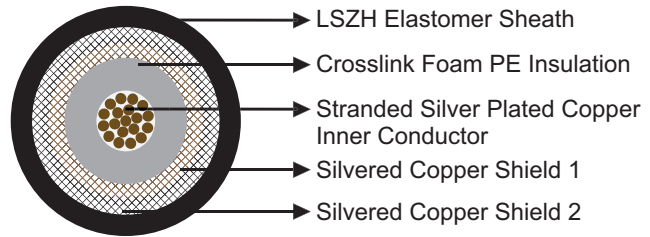
**Inner conductor:** Stranded silver plated copper.

**Insulation:** Crosslink Foam PE (SPEX).

**Outer conductor (shield 1):** Silver plated copper.

**Outer conductor (shield 2):** Silver plated copper.

**Sheath:** LSZH Elastomer.



### Electrical Characteristics at 20°C

Impedance	$\Omega$	50+/-2
Nominal Capacitance	pF/m	94.5
Minimum Insulation Resistance	M $\Omega$ .km	100000
Inner Conductor Resistance	M $\Omega$ /km	29.45
Outer Conductor Resistance	M $\Omega$ /km	7.6
Attenuation		
@10MHz	dB/100m	5
@50MHz	dB/100m	11
@100MHz	dB/100m	16
@150MHz	dB/100m	20
@200MHz	dB/100m	23
@300MHz	dB/100m	29
@400MHz	dB/100m	34
@450MHz	dB/100m	36
@500MHz	dB/100m	38
@600MHz	dB/100m	42
@800MHz	dB/100m	50
@850MHz	dB/100m	51
@900MHz	dB/100m	53
@950MHz	dB/100m	55

@1000MHz	dB/100m	56
@1800MHz	dB/100m	79
@1900MHz	dB/100m	82
@2000MHz	dB/100m	84
@2400MHz	dB/100m	94
@3000MHz	dB/100m	107
@4000MHz	dB/100m	128
@5000MHz	dB/100m	147
@6000MHz	dB/100m	165
Velocity of propagation	%	70.7

### ➤ Mechanical and Thermal Properties

Minimum Bending Radius: 25mm (static)

Temperature Range: -40°C ~ +105°C

### ➤ Dimensions and Weight

Conductor Construction No/mm	Nominal Inner Conductor Diameter mm	Nominal Outer Conductor Diameter mm	Nominal Overall Diameter mm	Nominal Weight kg/km
19/0.2	1.0	4.24	5.0	60



Impact Resistant



Oil Resistant



Acid & Alkaline Resistant



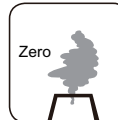
Highly Flexible



Flame Retardant  
NF C32-070-2.1(C2)  
IEC 60332-1/EN 50265-2-1



Fire Retardant  
NF C32-070-2.2(C1)  
IEC 60332-3/EN 50266



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



Low Smoke Emission  
IEC 61034/NFC20-902  
EN 50268/NF C32-073



Low Corrosivity  
NF 50267-2-2/NF C32-07  
IEC 60754-2/NF C20-455



Low Toxicity



## FRA 213D SW4

### Applications

These cables are designed for flexible installations, inside and outside railway rolling stock.

### Standards

- DIN 5510-2

### Construction

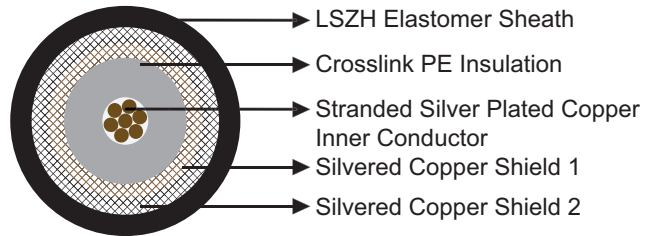
**Inner conductor:** Stranded silver plated copper.

**Insulation:** Crosslink PE (PEX).

**Outer conductor (shield 1):** Silver plated copper.

**Outer conductor (shield 2):** Silver plated copper.

**Sheath:** LSZH Elastomer.



### Electrical Characteristics at 20°C

Impedance	$\Omega$	50+/-2
Nominal Capacitance	pF/m	101
Minimum Insulation Resistance	M $\Omega$ .km	100000
Inner Conductor Resistance	M $\Omega$ /km	5.8
Outer Conductor Resistance	M $\Omega$ /km	4.43
Attenuation		
@10MHz	dB/100m	2
@50MHz	dB/100m	5
@100MHz	dB/100m	8
@150MHz	dB/100m	10
@200MHz	dB/100m	12
@300MHz	dB/100m	15
@400MHz	dB/100m	17
@450MHz	dB/100m	19
@500MHz	dB/100m	20
@600MHz	dB/100m	22
@800MHz	dB/100m	27
@850MHz	dB/100m	28
@900MHz	dB/100m	29
@950MHz	dB/100m	30
@1000MHz	dB/100m	31
@1800MHz	dB/100m	45
@1900MHz	dB/100m	47

@2000MHz	dB/100m	49
@2400MHz	dB/100m	55
@3000MHz	dB/100m	64
@4000MHz	dB/100m	79
@5000MHz	dB/100m	93
@6000MHz	dB/100m	106
Velocity of propagation	%	66

### ↘ Mechanical and Thermal Properties

Minimum Bending Radius: 50mm (static)

Temperature Range: -40°C ~ +105°C

### ↘ Dimensions and Weight

Conductor Construction No/mm	Nominal Inner Conductor Diameter mm	Nominal Outer Conductor Diameter mm	Nominal Overall Diameter mm	Nominal Weight kg/km
7/0.75	2.25	8.7	10.8	202



Impact Resistant



Oil Resistant



Acid&Alkaline Resistant



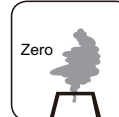
Highly Flexible



Flame Retardant  
NF C32-070-2.1(C2)  
IEC 60332-1/EN 50265-2-1



Fire Retardant  
NF C32-070-2.2(C1)  
IEC 60332-3/EN 50266



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



Low Smoke Emis:  
IEC 61034/NFC20-902  
EN 50268/NF C32-073



Low Corrosivity  
EN 50267-2-2/NF C32-07  
EC 60754-2/NF C20-45C



Low Toxicity



## FRA 213 URM SW4

### Applications

These cables are designed for flexible installations, inside and outside railway rolling stock.

### Standards

- DIN 5510-2

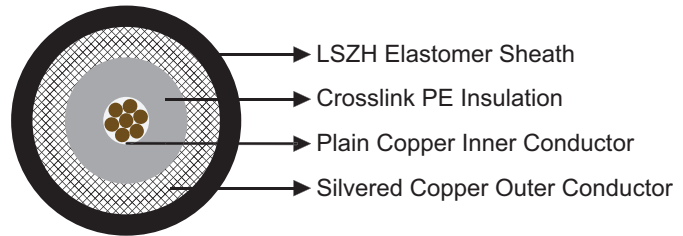
### Construction

**Inner conductor:** Plain copper.

**Insulation:** Crosslink PE (PEX).

**Outer conductor:** Silver plated copper braid.

**Sheath:** LSZH Elastomer.



### Electrical Characteristics at 20°C

Impedance	$\Omega$	50+/-2
Nominal Capacitance	pF/m	101
Minimum Insulation Resistance	M $\Omega$ .km	100000
Inner Conductor Resistance	M $\Omega$ /km	5.74
Outer Conductor Resistance	M $\Omega$ /km	3.7
Attenuation		
@10MHz	dB/100m	2
@50MHz	dB/100m	4
@100MHz	dB/100m	6
@150MHz	dB/100m	8
@200MHz	dB/100m	9
@300MHz	dB/100m	12
@400MHz	dB/100m	14
@450MHz	dB/100m	15
@500MHz	dB/100m	16
@600MHz	dB/100m	18
@800MHz	dB/100m	22
@850MHz	dB/100m	23
@900MHz	dB/100m	24
@950MHz	dB/100m	25
@1000MHz	dB/100m	26
@1800MHz	dB/100m	40
@1900MHz	dB/100m	41
@2000MHz	dB/100m	43
Velocity of propagation	%	66

➤ **Mechanical and Thermal Properties**

Minimum Bending Radius: 50mm (static)

Temperature Range: -40°C ~ +105°C

➤ **Dimensions and Weight**

Conductor Construction No/mm	Nominal Inner Conductor Diameter mm	Nominal Outer Conductor Diameter mm	Nominal Overall Diameter mm	Nominal Weight kg/km
7/0.75	2.25	8.15	10.3	161



Impact Resistant



Oil Resistant



Acid & Alkaline Resistant



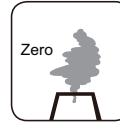
Highly Flexible



Flame Retardant  
NF C32-070-2.1(C2)  
IEC 60332-1/EN 50265-2-1



Fire Retardant  
NF C32-070-2.2(C1)  
IEC 60332-3/EN 50266



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



Low Smoke Emission  
IEC 61034/NFC20-902  
EN 50268/NF C32-073



Low Corrosivity  
EN 50267-2-2/NF C32-07  
IEC 60754-2/NF C20-455



Low Toxicity



## FRA 3002 SW4

### Applications

These cables are designed for flexible installations, inside and outside railway rolling stock.

### Standards

- DIN 5510-2

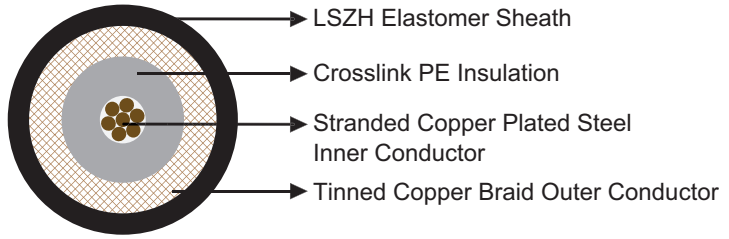
### Construction

**Inner conductor:** Stranded copper plated steel.

**Insulation:** Crosslink PE (PEX).

**Outer conductor:** Tinned copper braid.

**Sheath:** LSZH Elastomer.



### Electrical Characteristics at 20°C

Impedance	$\Omega$	75+/-3
Nominal Capacitance	pF/m	67
Minimum Insulation Resistance	M $\Omega$ .km	100000
Inner Conductor Resistance	M $\Omega$ /km	236
Attenuation		
@10MHz	dB/100m	6
@50MHz	dB/100m	14
@100MHz	dB/100m	20
@150MHz	dB/100m	25
@200MHz	dB/100m	29
@300MHz	dB/100m	36
@400MHz	dB/100m	42
@450MHz	dB/100m	45
@500MHz	dB/100m	47
@600MHz	dB/100m	52
@800MHz	dB/100m	62
@850MHz	dB/100m	64
@900MHz	dB/100m	66
@950MHz	dB/100m	68
@1000MHz	dB/100m	70
Velocity of propagation	%	66

➤ **Mechanical and Thermal Properties**

Minimum Bending Radius: 25mm (static)

Temperature Range: -40°C ~ +105°C

➤ **Dimensions and Weight**

Conductor Construction No/mm	Nominal Inner Conductor Diameter mm	Nominal Outer Conductor Diameter mm	Nominal Overall Diameter mm	Nominal Weight kg/km
7/0.14	0.42	2.9	3.7	21



Impact Resistant



Oil Resistant



Acid&Alkaline Resistant



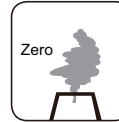
Highly Flexible



Flame Retardant  
NF C32-070-2.1(C2)  
IEC 60332-1/EN 50265-2-1



Fire Retardant  
NF C32-070-2.2(C1)  
IEC 60332-3/EN 50266



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



Low Smoke Emis:  
IEC 61034/NFC20-902  
EN 50268/NF C32-073



Low Corrosivity  
EN 50267-2-2/NF C32-07  
IEC 60754-2/NF C20-455



Low Toxicity



## FRA 59 SW4

### Applications

These cables are designed for flexible installations, inside and outside railway rolling stock.

### Standards

- DIN 5510-2

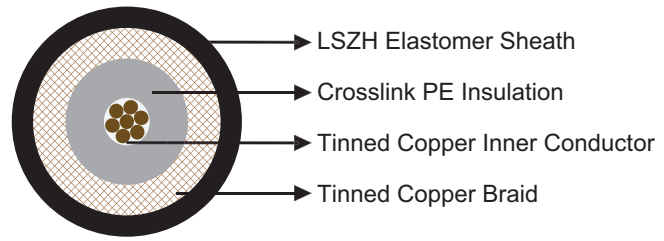
### Construction

**Inner conductor:** Tinned copper.

**Insulation:** Crosslink PE (PEX).

**Outer conductor:** Tinned copper braid.

**Sheath:** LSZH Elastomer.



### Electrical Characteristics at 20°C

Impedance	$\Omega$	75+/-3
Nominal Capacitance	pF/m	67
Minimum Insulation Resistance	M $\Omega$ .km	100000
Inner Conductor Resistance	M $\Omega$ /km	58
Outer Conductor Resistance	M $\Omega$ /km	16.1
Attenuation		
@10MHz	dB/100m	3
@50MHz	dB/100m	8
@100MHz	dB/100m	12
@150MHz	dB/100m	15
@200MHz	dB/100m	18
@300MHz	dB/100m	23
@400MHz	dB/100m	27
@450MHz	dB/100m	29
@500MHz	dB/100m	31
@600MHz	dB/100m	35
@800MHz	dB/100m	42
@850MHz	dB/100m	44
@900MHz	dB/100m	46
@950MHz	dB/100m	47
@1000MHz	dB/100m	49
Velocity of propagation	%	66

➤ **Mechanical and Thermal Properties**

Minimum Bending Radius: 30mm (static)

Temperature Range: -40°C ~ +105°C

➤ **Dimensions and Weight**

Conductor Construction No/mm	Nominal Inner Conductor Diameter mm	Nominal Outer Conductor Diameter mm	Nominal Overall Diameter mm	Nominal Weight kg/km
7/0.22	0.66	4.45	6.1	57



Impact Resistant



Oil Resistant



Acid&Alkaline Resistant



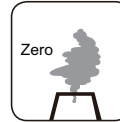
Highly Flexible



Flame Retardant  
NF C32-070-2.1(C2)  
IEC 60332-1/EN 50265-2-1



Fire Retardant  
NF C32-070-2.2(C1)  
IEC 60332-3/EN 50266



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



Low Smoke Emis:  
IEC 61034/NFC20-902  
EN 50268/NF C32-073



Low Corrosivity  
EN 50267-2-2/NF C32-07  
EC 60754-2/NF C20-455



Low Toxicity



## FRA 179 SW4

### Applications

These cables are designed for flexible installations, inside and outside railway rolling stock.

### Standards

- DIN 5510-2

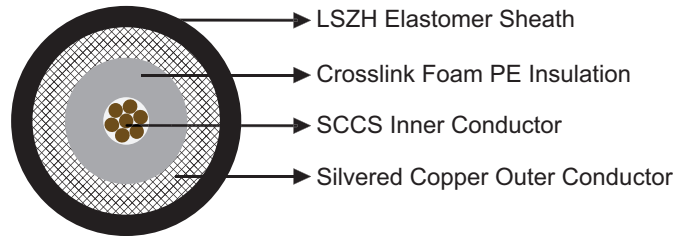
### Construction

**Inner conductor:** Stranded silver plated copper clad steel.

**Insulation:** Crosslink Foam PE (SPEX).

**Outer conductor:** Silver plated copper.

**Sheath:** LSZH Elastomer.



### Electrical Characteristics at 20°C

Impedance	$\Omega$	75+/-3
Nominal Capacitance	pF/m	60
Minimum Insulation Resistance	M $\Omega$ .km	100000
Inner Conductor Resistance	M $\Omega$ /km	800.5
Outer Conductor Resistance	M $\Omega$ /km	27.9
Attenuation		
@50MHz	dB/100m	16
@100MHz	dB/100m	24
@150MHz	dB/100m	30
@200MHz	dB/100m	34
@250MHz	dB/100m	39
@300MHz	dB/100m	43
@350MHz	dB/100m	47
@400MHz	dB/100m	51
@450MHz	dB/100m	54
@500MHz	dB/100m	57
@550MHz	dB/100m	61
@600MHz	dB/100m	64
@650MHz	dB/100m	67
@700MHz	dB/100m	70
@750MHz	dB/100m	72
@800MHz	dB/100m	75
@850MHz	dB/100m	78

@900MHz	dB/100m	81
@950MHz	dB/100m	83
@1000MHz	dB/100m	86
Velocity of propagation	%	69.8

### ↘ Mechanical and Thermal Properties

Minimum Bending Radius: 5mm (static)

Temperature Range: -40°C ~ +105°C

### ↘ Dimensions and Weight

Conductor Construction No/mm	Nominal Inner Conductor Diameter mm	Nominal Outer Conductor Diameter mm	Nominal Overall Diameter mm	Nominal Weight kg/km
7/0.1	0.305	2.13	2.54	11.1



Impact Resistant



Oil Resistant



Acid&Alkaline Resistant



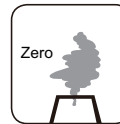
Highly Flexible



Flame Retardant  
NF C32-070-2.1(C2)  
IEC 60332-1/EN 50265-2-1



Fire Retardant  
NF C32-070-2.2(C1)  
IEC 60332-3/EN50266



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



Low Smoke Emis:  
IEC 61034/NFC20-902  
EN 50268/NF C32-073



Low Corrosivity  
NF C32-073  
IEC 60754-2/NF C20-455



Low Toxicity

## **UNITED KINGDOM**

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## **HONG KONG**

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## **SHANGHAI**

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