

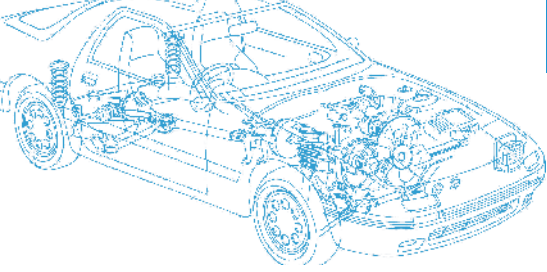


*Caledonian Cables*



# *Automotive Cables*





# Automotive Cable

## Company Profile

Caledonian, established in 1978, offers one of the most complete lines of fiber and copper cabling system solutions with over hundreds of different cabling system products. Our superior products provide leading edge within every cable series and for every application.

Among the national and international standards with which our cables could comply are: BS - British Standard; LPCB Fire Performance Standard, ISO Standard etc. Caledonian Cables offers a comprehensive stock of cables and cabling products through its nationwide network of resellers and distributors. Caledonian Cables has continually expanded its global presence in Europe and Asia.

Caledonian & Addison, produces a wide range of cables for communication, power and electronics in its primary plants in UK, Italy and Spain. To stay in front, we continually keep expanding our manufacturing capabilities in more low cost region such as Romania, Taiwan, Malaysia etc. This low-cost manufacturing facilities enable us provide a flexible, scalable global system that delivers superior operational performance and optimal results for our customers.

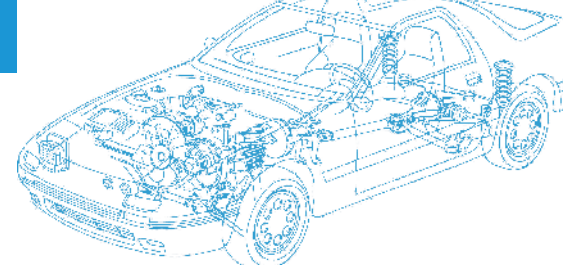
Our extensive global network of manufacturing facilities gives us significant scale and the flexibility to fulfill our customer requirements. This global presence provides design and consultancy solutions that are combined with core cable manufacturing, logistic services, and vertically integrated with our E commerce technologies, to optimize customer operations by lowering costs and reducing time to market.

Caledonian & Addison has been respected for its high standards of quality, excellent service level, competitive pricing and a unique and innovative spirit. With our latest technologies, we are both inspired and well-positioned to meet the changing needs of our customers. We have the resources to diversify and to enhance our product lines and services. We understand the need for change and with our accurate planning, we are ready for the future and the promise of new marketing opportunities. Our tradition of growth through excellence is assured.

Our Design Centers work closely with customers to constantly improve its standard range of products and technologies and to develop customized, country and industryspecific solutions. Caledonian & Addison has established an extensive network of design, manufacturing, and logistics facilities in the world's major markets to serve the growing outsourcing needs of both multinational and regional customers.



# Automotive Cable



## Code Designation

### 1. Type of wire (German abbreviations)

**FL**=automotive wire

**FLZ**=automotive ignition wire

### 2. Conductor Materials (excluding electrolytic copper)

**M**=materials other than E-Cu or electrical resistance alloys

**W**=resistance wires

### 3. Characteristics of insulation materials

**no abbreviation**=Normal thickness

**R**=reduced insulation thickness

**U**=ultra thin insulation

**S**=Increased insulation

### 4. Insulation and Sheath Materials

#### Germany Standard

**Y**=soft-PVC (polyvinyl chloride)

**YW**=soft-PVC, heat-resistant, hot-pressure resistant

**4Y**=PA (polyamide)

**6Y**=FEP (tetrafluoroethylene hexafluoropropylene)

**7Y**=ETFE (ethylene tetrafluoroethylene)

**11Y**=TPE-U (thermoplastic polyurethane elastomer)

**13Y**=TPE-E (thermoplastic polyester elastomer)

**2X**=XLPE (polyethylene cross-linked)

**4G**=EVA (ethylene/vinyl acetate)

**2G**=SiR(Silicone rubber)

#### Japanese Standard

**A**= automotive Low Tension Cable

**V**=polyvinyl Chloride Insulation

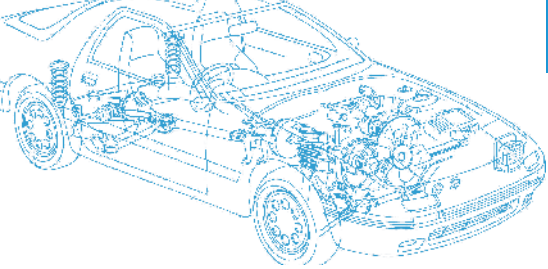
**S**=thin Wall Insulation

**SS**=extreme Thin Wall Insulation

**XX**=cross linked Insulation

**T**=twisted

**E**=polyethylene



# Automotive Cable

**EB**=electric Bond

**HEB**=heavy Duty Electric Bond

**HD**=heavy Duty

**C**=compacted

## American Standard

**TWP**=thin wall, Thermoplastic insulation low-tension cable for Accumulator.

**GPT**=thermoplastic insulation low-tension cable.

**TXL**=thin-wall low-tension cables for automobiles.

**GXL**=cross linked polyolefin insulation low-tension cables for automobiles.

**SXL**=cross linked polyolefin insulation special purpose low-tension cables for automobiles.

**HDT**=heavy Duty, Thermoplastic insulation low-tension cable for automobiles.

**SGT**=starter or Ground, General purpose thermoplastic insulated

## 5. Shielding

**B**=screen (film, foil) shield

**C**=copper wire braiding

## 6. Special Designs

**F**=flat cable

**Z**=Multi-core separable cable

## 7. Number of Cores and Cross Section

indication of number of cores and cross section (mm<sup>2</sup>)

### Examples:

#### 1. Single-core cables

FLY1X0.5

FL	automotive cable
Y	PVC insulation
1X0.5	nominal cross-section 0.5mm <sup>2</sup>

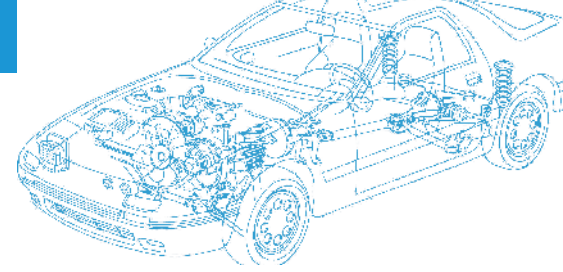
#### 2. Multi-core cables

FLRYCY9X0.08

FL	automotive cable
R	reduced insulation thickness
Y	PVC insulation
C	braiding of copper wires
Y	PVC sheath
9X0.08	9 core, nominal cross-section 0.08mm <sup>2</sup>



# Automotive Cable



## Color Coding

### Basic colour

code	color
Bu	Blue
Bn	Brown
Ye	Yellow
Gn	Green
Gy	Grey
Nt	Nature
Rd	Red
Bk	Black
Pu	Violet
Wh	White

### Color code of wires

#### 1. 1st colour

basic colour (Colors according to DIN 47002 and DIN IEC 304).

#### 2. 2nd colour

2 stripes on opposite sides

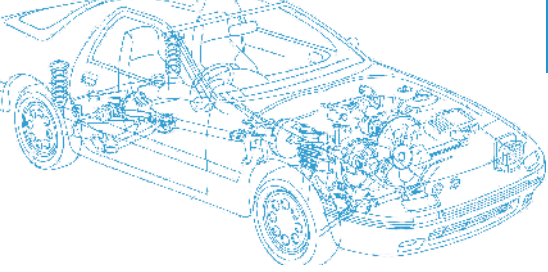
width of stripe: min. 14% of circumference both stripes together max. 35%, Minimum width of one stripe 7%).

#### 3. 3rd colour

rings 3 mm wide (+/-1mm) halves max. 1 mm displaced

distance between rings: 6 to 20 mm





# Automotive Cable

## Conductor Specifications

### Bare Copper

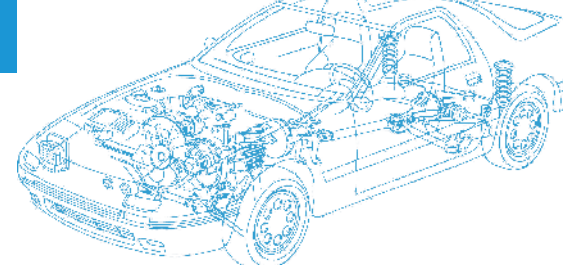
<b>Copper wire</b>	Cu-ETP1 according to DIN EN 13602
<b>Melting point copper</b>	1083 °C
<b>Conductivity at 20 °C</b>	58,5m/(Ωmm <sup>2</sup> )
<b>Density</b>	8,925 kg/dm <sup>3</sup>
<b>Advantages</b>	low priced

### Tin Plated Copper

<b>Copper wire</b>	Cu-ETP1 according to DIN EN 13602
<b>Tin</b>	Sn 99, 90 DIN 1704
<b>Melting point</b>	copper: 1083 °C, Tin: 232 °C
<b>Conductivity at 20 °C</b>	57,5 m/(Ωmm <sup>2</sup> )
<b>Density</b>	8,925 kg/dm <sup>3</sup>
<b>Advantages</b>	good soldering ability
	Protection of insulation mix
	Good protection against corrosion



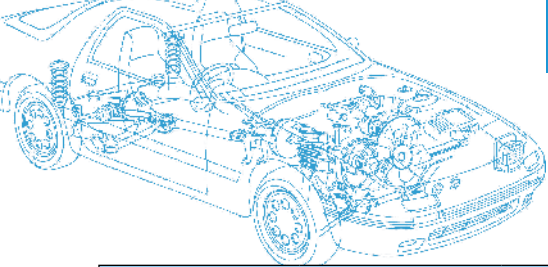
# Automotive Cable



## Insulation and Sheath Materials

Abbreviation	Insulation Material Chemical description	Short symbol Acc. To DIN 76722	Classification Acc. to ISO 6722	Continuous Duty Temperature (3.000h)	Thermal overload capacity	Cold bending Resistance
				°C	°C/48h	°C
PVC	Polyvinyl Chloride	Y(YW)	A/B	90/105	140	-40
PA	Polyamide	4Y	-	105	140	-50
XLPE	Polyethylene, cross-linked	12X		125	150	-40
TPE-E	Thermoplastic Polyester elastomer	13Y	C	100	150	-40
TPE-U (PUR)	Thermoplastic polyether polyurethane	11Y	C	125	150	-50
PVC-P	Hot-pressure resistant, heat- resistant	YW		125	140	-40
EVA	Ethylene-vinyl acetate	4G	C	130	160	-40
ETFE	Ethylene tetrafluoroethylene	7Y	E	180	230	-65
FEP	Tetrafluoroethylene hexafluoropropylene	6Y	F	210	240	-65

Specific resistance at 20°C	Shore hardness	Tensile strength	Elongation at break	Abrasion	Flame Retardant
Ω×cm	A/D	M Pa	%		
>10 <sup>12</sup>	A85-95	>10	>150	+	+
>10 <sup>12</sup>	D72	>40	>300	++	-
>10 <sup>14</sup>	95A	>10	>200	+	+
>10 <sup>10</sup>	D40-78	>25	>300	++	-
>10 <sup>9</sup>	A75-D54	>30	>300	++	-
>10 <sup>12</sup>	92A-97A	>15	>150	+	+
>10 <sup>13</sup>	A80-90	>10	>200	+	-
>10 <sup>16</sup>	D75-80	>30	>150	++	+(+)
>10 <sup>16</sup>	D55-60	>15	>200	++	++



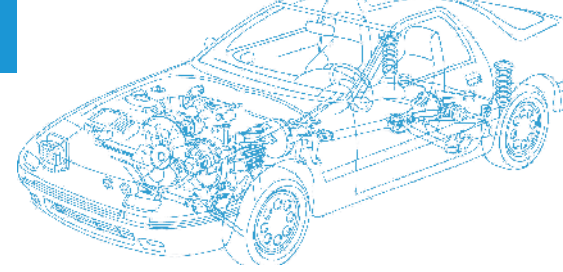
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Resistant against				
Oil	Fuel	Breaking Fluid	Acid/Lye	Organic media
+	+	-	+	-
++	++	+	+	+
+	+	-	+	+
++	++	+	-	+
++	++	+	+	+
+	+	-	+	-
+	+	+	+	+
++	++	++	++	++
++	++	++	++	++





# Automotive Cable



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### Germany Standard

#### Single-Core Cable

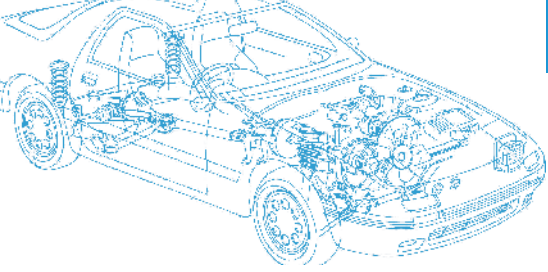
FLY .....	11
FLYY .....	12
FLYY .....	13
FLRY-A .....	14
FLRY-B .....	15
FLR4Y .....	16
FLR6Y .....	17
FLR7Y .....	18
FLR13Y .....	19

#### Multi-Core Cable

FLYY .....	20
FLR13Y11Y .....	21
FLYZ .....	22
FLRYB11Y .....	23
FL4G11Y .....	24
FLR2X11Y .....	25
FLRYCY .....	26
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### Japanese Standard

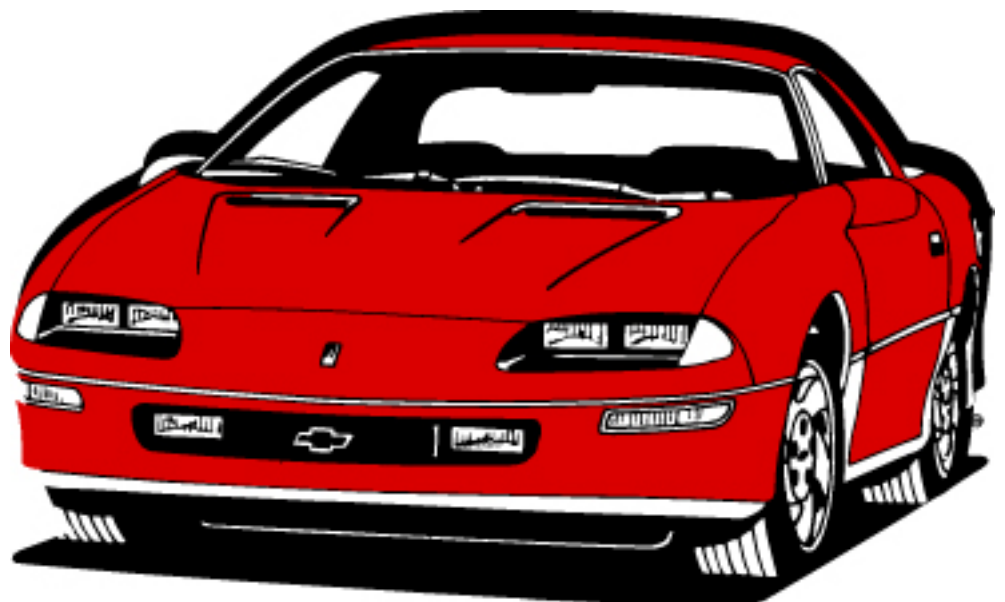
AV .....	28
AVS .....	30
AVSS .....	31
AEX/AVX .....	32
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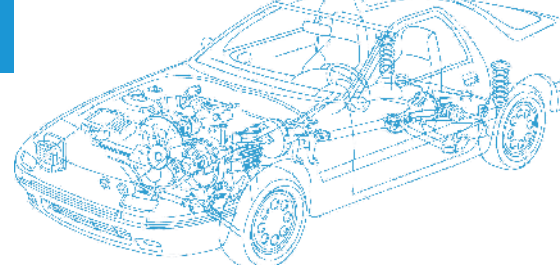
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## American Standard

TWP.....	39
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GXL.....	42
SXL.....	43
HDT.....	44
SGT.....	45



# Automotive Cable

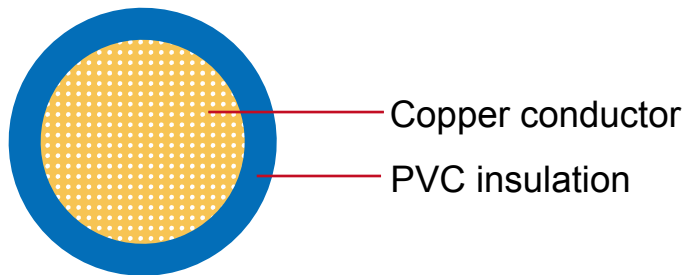


## FLY

### Application:

This PVC insulated single-core unshielded low-tension wire is used for automobiles.

### Construction:



**Conductor:** Cu-ETP1 bare according to DIN EN 13602

**Insulation:** PVC

**Standard Compliance:** ISO 6722 Class B

### Special Properties:

Conductors  $>6\text{mm}^2$  are suitable for use as battery cables

### Technical Parameters:

**Operating temperature:**  $-25^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$

Nominal Cross-section	Conductor			Insulation Thickness Wall nom.	Cable		Weight approx.
	No. and Dia. of Wires	Diameter max.	Electrical Resistance at 20°C max.		Overall Diameter min.	Overall Diameter max.	
mm <sup>2</sup>	No./mm	mm	mΩ/m	mm	mm	mm	kg/km
1x0.50	16 /0.21	1.00	37.10	0.48	2.00	2.30	8
1x0.75	24/0.21	1.20	24.70	0.48	2.20	2.50	12
1x1.00	32/0.21	1.35	18.50	0.48	2.40	2.70	15
1x1.50	30/0.26	1.70	12.70	0.48	2.70	3.00	20
1x2.00	40/0.26	2.00	9.42	0.60	2.90	3.20	26
1x2.50	50/0.26	2.20	7.60	0.70	3.30	3.70	32
1x3.00	60/0.26	2.50	6.00	0.70	3.50	3.90	37
1x4.00	56/0.31	2.75	4.71	0.80	4.00	4.40	49
1x6.00	84/0.31	3.30	3.14	0.80	4.60	5.00	68
1x10.00	80 /0.41	4.50	1.82	0.80	6.00	6.50	117
1x16.00	126/0.41	6.30	1.16	0.80	7.50	8.30	193
1x25.00	196/0.41	7.80	0.74	1.04	9.50	10.40	274
1x35.00	276/0.41	9.00	0.53	1.04	10.60	11.60	397
1x50.00	400/0.41	10.50	0.37	1.20	12.90	13.50	547
1x70.00	555/0.41	12.50	0.26	1.20	14.80	15.50	769
1x95.00	740/0.41	14.80	0.200	1.28	17.00	18.00	990
1x120.00	960/0.41	16.50	0.15	1.60	18.70	19.70	1250

\*Note: Other configurations, sizes, colors and length not specified herein are available upon request.