

INTRODUCTION

Metal Braids

**FLAT • ROUND • ROPES •
BONDING LEADS •
POWER SHUNTS.**

**The answer to your cable
management needs.**

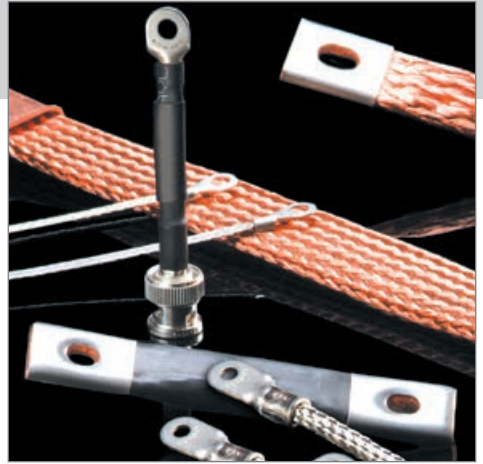
From specialist manufacturers of high performance metal braid and earth bonding leads designed and approved for aerospace, defence, industrial and energy market applications.

The comprehensive range of high quality metallic products includes customised and market approved bonding leads, flat, round and rope braids, with various options of materials, terminations, insulation and identification:

Custom Projects

In addition to the standard materials used to produce braids and bonding leads it is also possible to utilise even higher performance materials such as stainless steel, silver plated copper and pure nickel.

These 'specialist' materials exhibit properties suitable for the most demanding applications, such as those requiring extreme temperature and corrosion resistance.



Market Approvals

The manufacturer is a supplier of bonding leads and metal braid to many of the major aerospace and defence companies of Europe and an influential contributor to the development and promotion of the EN4199 European standard for metal braid and bonding leads.

In addition to EN4199, they manufacture products to a comprehensive range of aerospace and defence specifications, some of which are detailed below.

Airbus

ASNE0088 to 0092

Round braid bonding leads, Tin and nickel plated

Typhon (Eurofighter)

JN1061 Flat braid bonding leads, Ni plated Cu

JN1151 Flat and rope bonding leads, Ni plated Cu

JN1006 Quick release bonding leads, Sn plated Cu

JN1077 Quick release bonding leads, Ni plated Cu

JN1068 Rope bonding leads, Al

Typhon, Tornado and Hawk

PAN6619 Quick release bonding leads, Sn plated Cu

General

LN9264, CSP48 and AGS2097

Please contact us for more details.

Aerospace and Defence

Round bonding leads	CFBA4199-004 Series	page 370
Flat bonding leads	CBL150 & 260 Series	page 372
High flex bonding leads	CRL260 Series	page 374
Lightweight bonding leads	CFBA1068 Series	page 375
Quick release bonding leads	QBL150 Series	page 376

Industrial and Energy

Custom bonding leads	CFBA Series	page 378
Rope bonding leads	RBL Series	page 380



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Bonding Leads

CFBA4199-004 Series

Tin and Nickel-plated Copper Round Bonding Leads

CFBA4199-004 bonding leads are designed specifically for Aerospace and Military applications. They have undergone extensive mechanical and electrical testing, including flex testing to 250,000 cycles, sinusoidal and random vibration cycles, salt mist testing and temperature cycling.

CFBA4199-004 bonding leads are manufactured from multi-layer round braid and are available in tin-plated and nickel plated copper in a variety of cross-sectional areas, lengths and termination options.

Features & Benefits

- Choice of terminal sizes

Operating Temperature

- Tin-plated copper: -65°C to +150°C
- Nickel-plated copper: -65°C to +260°C



Specifications/Approvals

- Tested to EN4199-004
- Aerospace and Defence Industries Association of Europe (ASD) approved.

CFBA4199-004-N-7.0-250-E

PART NUMBER EXAMPLE

Terminal Code:

E See table opposite

Standard Lengths:

250 See table opposite

Cross Sectional Area

-1.5 1.5mm² | **-3.5** 3.5mm² | **-4.5** 4.5mm²

-7.0 7.0mm² | **-13.0** 13mm²

Material:

T Tin-plated copper

N Nickel-plated copper

Product standard:

EN4199-004

Part Reference:

EN4199

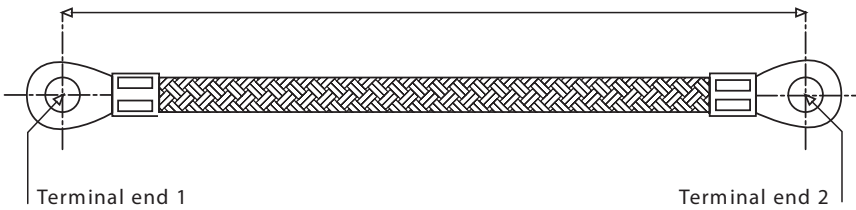
Ordering Example

CFBA4199-004-N-7.0-E is for a round un-insulated braid with 7.0mm² cross sectional area, nickel-plated copper, 250mm in length between hole centres, 4.34mm terminal hole diameter (#8 stud).

If the product you require is not listed here as standard please contact us as we can have your custom part manufactured to order, subject to confirmation.

Terminal Code	End One		End Two		Availability for Cross-Sectional Area				
	Stud	Hole Ø	Stud	Hole Ø	1.4mm ²	3.5mm ²	4.5mm ²	7.0mm ²	13.0mm ²
A	#6	3.68mm	#6	3.68mm	✓	✓	✓		
B	#8	4.34mm	#8	3.68mm	✓	✓	✓		
C	#10	5.00mm	#6	3.68mm	✓	✓	✓		
D	1/4"	6.73mm	#6	3.68mm	✓	✓	✓		
E	#8	4.34mm	#8	4.34mm	✓	✓	✓	✓	
F	#10	5.00mm	#8	4.34mm	✓	✓	✓	✓	
G	1/4"	6.73mm	#8	4.34mm	✓	✓	✓	✓	
H	#10	5.00mm	#10	5.00mm	✓	✓	✓	✓	✓
J	1/4"	6.73mm	#10	5.00mm	✓	✓	✓	✓	✓
K	1/4"	6.73mm	1/4"	6.73mm	✓	✓	✓	✓	✓
L	5/16"	8.33mm	#10	5.00mm	✓			✓	✓
M	5/16"	8.33mm	5/16"	8.33mm	✓			✓	✓
N	5/16"	8.33mm	1/4"	6.73mm					✓

Length 'L'



'L' mm	Availability for Cross-Sectional Area				
	1.4mm ²	3.5mm ²	4.5mm ²	7.0mm ²	13.0mm ²
63	✓			✓	
80	✓	✓	✓	✓	✓
100	✓	✓	✓	✓	✓
125	✓	✓	✓	✓	✓
160	✓	✓	✓	✓	✓
200	✓	✓	✓	✓	✓
250	✓	✓		✓	✓
315	✓			✓	
400	✓	✓	✓	✓	
500		✓		✓	
630				✓	
800				✓	

Other lengths are available

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Bonding Leads

CBL150 and CBL260

Tin & Nickel-plated Copper Flat Bonding Leads

The CBL range of flat style bonding leads are designed for aerospace and military applications, but are also suitable for higher performance industrial uses.

Available with or without insulation in both tin-plated and nickel-plated copper in a range of cross-sectional areas. They are highly flexible, robust and reliable.

Features & Benefits

- Flexible robust and reliable
- Choice of terminal sizes

Operating Temperature

- Tin-plated copper: -65°C to +150°C
- Nickel-plated copper: -65°C to +260°C
- Insulated -65°C to +150°C



Specifications/Approvals

- Manufactured to EN4199-003 design.
- Aerospace and Defence Industries Association of Europe (ASD) approved.

CBL260-10-CC-200-S

PART NUMBER EXAMPLE

Insulated:

S Insulated sleeve
Leave blank if insulation is not required

Lengths:

xxx Min. 50mm to Max. 300mm
Available in 25mm increments

Terminal Reference:

CC Refer to tables opposite

Cross Sectional Area

-1.5 1.5mm² | **-4.0** 3.5mm² | **-6.0** 6.0mm²
-10.0 10mm² | **-16.0** 16mm² | **-25.0** 25mm²

Part Reference:

CBL150 = Tin-plated copper
CBL260 = Nickel-plated copper

Ordering Example

CBL260-10-CC-200-S is for a flat insulated braid with 10.0mm² cross sectional area, nickel-plated copper, 200mm in length between hole centres, 5.00mm terminal hole diameter (#10 stud).

If the product you require is not listed here as standard please contact us as we can have your custom part manufactured to order, subject to confirmation.

CBL150 and CBL 260

Tin & Nickel-plated Copper

Flat Bonding Leads

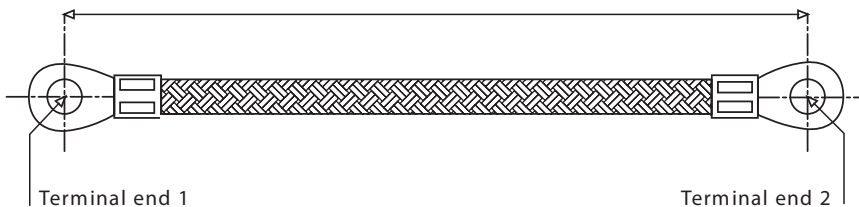
Terminal Availability: CBL150 tin-plated copper

Terminal Code	End Terminals		Availability for Cross-Sectional Area					
	Stud	Hole Ø	1.5mm ²	4.0mm ²	6.0mm ²	10.0mm ²	16.0mm ²	25.0mm ²
A	#6	3.68mm	✓					
B	#8	4.34mm	✓	✓	✓			
C	#10	5.00mm	✓	✓	✓	✓	✓	✓
D	1/4"	6.73mm	✓	✓	✓	✓	✓	✓
E	5/16"	8.33mm		✓	✓	✓	✓	✓
F	3/8"	9.91mm				✓	✓	✓

Terminal Availability: CBL260 nickel-plated copper

Terminal Code	End Terminals		Availability for Cross-Sectional Area					
	Stud	Hole Ø	1.5mm ²	4.0mm ²	6.0mm ²	10.0mm ²	16.0mm ²	25.0mm ²
A	#6	3.68mm	✓	✓				
B	#8	4.34mm	✓	✓	✓			
C	#10	5.00mm	✓	✓	✓	✓		
D	1/4"	6.73mm	✓	✓	✓	✓	✓	
E	5/16"	8.33mm			✓	✓	✓	
F	3/8"	9.91mm					✓	✓

Length 'L'



Technical Information for Uninsulated CBL260 (Nickel-plated copper) Leads

Braid cross-section	Min. Tensile Strength	Nom. resistance 100mm Length	Braid Resistance	Nom. Mass 100mm Length	Braid Mass
mm ²	N	mΩ	mΩ per 25mm	g	g per 25mm
1.5	250	1.32	0.308	2.6	0.40
4	600	0.4	0.112	6.3	1.10
6	800	0.24	0.076	10.7	1.63
10	1200	0.14	0.046	18.4	2.90
16	1700	0.09	0.030	28.9	3.93
25	2200	0.06	0.015	43.2	7.85

For information on nominal resistance and mass for non standard lengths please contact us

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Bonding Leads

CRL260 Series

Nickel-plated Copper

High Flex Bonding Leads

CRL260 bonding leads are designed to withstand exceptional levels of flexing in combination with outstanding resistance to corrosion and salt attack. When tested to the flex endurance test detailed in EN4199-001, they withstand over 5 million cycles. Outperforming other existing aerospace standard leads by more than 5 times.

Particularly suited for dynamic applications in exposed areas such as external aircraft doors and flaps.

Features & Benefits

- Flex endurance to EN4199-001
- Choice of 5 cross sectional areas
- Choice of terminal sizes

Operating Temperature

- Nickel-plated copper: -65°C to +260°



Ordering Example

CRL260-5.0-200-A high flex bonding lead, 200mm long (between hole centres) and 3.68mm terminal hole size.

CRL260-5.0-200-A

PART NUMBER EXAMPLE

Terminal Reference:

A Refer to table below

Lengths:

xxx Min. 50mm to Max. 250mm
Available in 25mm increments

Cross Sectional Area

-3.5 1.5mm² | **-5.0** 3.5mm² | **-7.0** 6.0mm²
-10.0 10mm² | **-13.0** 16mm²

Part Reference:

CRL260 = Nickel-plated copper

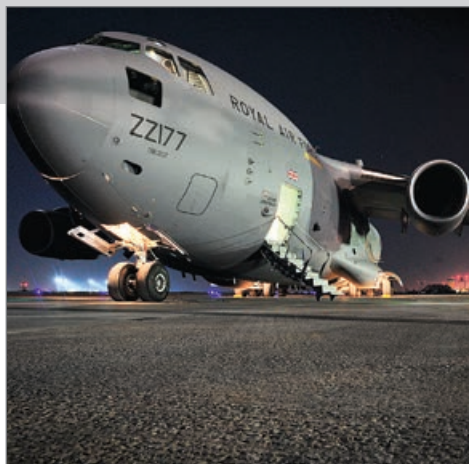
Terminal Availability: CRL260

Terminal Code	Terminals	Availability for Cross-Sectional Area				
	Hole Ø	3.5mm ²	5.0mm ²	7.0mm ²	10.0mm ²	13.0mm ²
A	3.68mm	✓	✓			
B	5.00mm	✓	✓	✓		
C	6.73mm	✓	✓	✓	✓	✓
D	8.33mm	✓	✓	✓	✓	✓
E	9.91mm			✓	✓	✓

CFBA1068 Series

Aluminium

Lightweight Bonding Leads



Ordering Example

CFBA1068-BB-76.2 Aluminium bonding lead, 5mm², insulated, terminal hole size 4.90 to 5.16mm each end, 76.2mm length (between hole centres).

The CFBA1068 aluminium bonding leads are designed for aerospace applications requiring electrical bonding in combination with lightweight. They are supplied insulated and with a protective chromate conversion coating, making them particularly suited to applications in contact with aviation fuels.

CFBA1068 bonding leads are available in a range of lengths and two sizes of specially formed aluminium terminals.

Features & Benefits

- Aluminium
- Lightweight 5mm² cross-sectional area
- MIL-C-5541 Class 3

Operating Temperature

- Aluminium: -65°C to +200°

CFBA1068-B B-76.2

PART NUMBER EXAMPLE

Lengths:

xxx See table below

Terminal Reference - End B

A M3 hole size, 3.61mm to 3.86mm

B M4 hole size, 4.90mm to 5.16mm

Terminal Reference - End B

A M3 hole size, 3.61mm to 3.86mm

B M4 hole size, 4.90mm to 5.16mm

Part Reference:

CFB1068 = Aluminium bonding lead

Technical Information (nominal values)

Bonding Lead length (L)	Resistance (between terminals)	Mass (uninsulated)
mm	mΩ	(g)
76.2	2.36	4.0
101.6	2.78	4.4
127.5	3.20	4.9
152.4	3.62	5.3
177.8	4.04	5.8
203.2	4.46	6.3
228.6	4.88	6.7
254.0	5.30	7.2

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Bonding Leads

QBL150 Series

Tin-plated Copper

Quick Release Bonding Leads

The QBL150 quick release bonding lead provides an effective hand-releasable method of earth bonding electrical equipment. They are particularly useful for applications where a temporary connection is required when equipment needs to be removed quickly over multiple times. QBL bonding leads comprise of a flat tin-plated copper braid with a crimped ring terminal at one end and a BNC or TNC connector at the other. Connection to equipment is via a mating receptacle, mounted on the equipment being earthed.

Features & Benefits

- Fast and easy release.
- Rear and front mounted mating receptacle

Operating Temperature

- Nickel-plated copper: -55°C to +120°
- Insulated: -55°C to +120°



QBL150-B-50-A-S

PART NUMBER EXAMPLE

Insulated:

S Insulated sleeve
Leave blank if insulation is not required

Terminal Reference

A 5mm hole diameter
B 6.73mm hole diameter

Lengths:

xxx Min. 50mm to Max. 200mm
Available in 25mm increments

Connector Reference

B BNC
T TNC

Part Reference:

QBL150 = Tin-plated copper

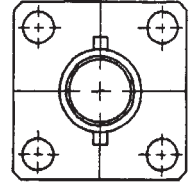
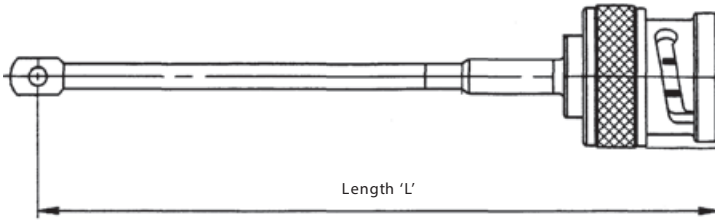
Ordering Example

QBL150-B-50-A-S Quick release bonding lead, BNC type connector, 50mm long ('L'), 5mm terminal hole diameter insulated.

QBL150 Series

Tin-plated Copper

Quick Release Bonding Leads



Front mounted receptacle

Technical Details: QBL150B (BNC Type)

Connector	BNC, MIL-C-39012 B (class 2, category c)
Braid	2.64mm ² , Tin plated copper
Current rating	36 amps (for 60 seconds)
Operating temperature	-55°C to +120°C
Insulation	PAN6480K04
Front panel mounting receptacle	QBL150-BF
Rear panel mounting receptacle	QBL150-BR
Ring terminal hole diameter	5mm or 6.73mm

Nominal	Length (mm) Terminals						
	50	75	100	125	150	175	200
Mass (g) 5mm hole	-	26.5	27.0	27.5	28.2	28.5	29.5
Mass (g) 6mm hole	-	26.9	27.4	27.9	28.6	28.9	29.9
Resistance (mΩ)	0.4	0.6	0.8	1.0	1.2	1.4	1.6

Technical Details: QBL150T (TNC Type)

Connector	TNC, PAN6444A
Braid	2.64mm ² , Tin plated copper
Current rating	36 amps (for 60 seconds)
Operating temperature	-55°C to +120°C
Insulation	PAN6480K04
Front panel mounting receptacle	QBL150-TF
Ring terminal hole diameter	5mm or 6.73mm

Nominal	Length (mm) Terminals						
	50	75	100	125	150	175	200
Mass (g) 5mm hole	26.0	26.5	27.0	27.5	28.2	28.5	29.5
Mass (g) 6mm hole	26.4	26.9	27.4	27.9	28.6	28.9	29.9
Resistance (mΩ)	0.4	0.6	0.8	1.0	1.2	1.4	1.6

Bonding Leads

CFBA Custom Series

Material Options

Customised Bonding Leads

In addition to our standard products we provide a comprehensive design and build service producing fully customised bonding leads, each with its own unique part number.

Our bonding leads are constructed from an extensive range of manufactured braids and ropes combined with components from a multitude of termination, insulation and identification options, resulting in bonding leads specifically tailored to meet the demands of your application.

We aim to keep the minimum order quantities low, lead times short and ensure that our product quality and customer service levels consistently high.

Features & Benefits

- Broad range of materials and options
- Wide selection of terminal sizes
- Insulation and identification options
- Low MOQs
- Short lead times
- Designed to meet your exact requirements

Terminations

- Crimped terminal
- Pressed ferrules

Braid Styles

- Flat
- Round
- Rope
- Layered

Cross-sectional Area

- 1.5mm² to 10mm²

Insulation and Identification

- Various materials systems available



In addition to the standard materials, specialist high performance materials are also available including;

Silver plated Copper - For applications needing excellent conductivity at up to 200°C.

Stainless Steel - Outstanding corrosion resistance compared to many materials, particularly with salt water.






Nickel - Pure nickel strand can be used at up to 649°C, ideal for extreme industrial conditions such as welding, furnaces and power stations.



Material Selection

	Conductivity	Corrosion Resistance	Max. Operating Temperature	Applications
Aluminium	Fair	Fair	371°C	Industrial, Aerospace
Plain Copper	Good	Fair	150°C	Industrial, Rail
Tin-plated Copper	Good	Good	150°C	Industrial, Defence
Stainless Steel	Fair	Excellent	400°C	Industrial, Offshore
Nickel-plated Copper	Excellent	Excellent	260°C	Aerospace, Marine
Pure Nickel	Excellent	Excellent	649°C	Aerospace, Industrial
Silver-plated Copper	Excellent	Good	200°C	Aerospace, Space

Standard Terminal Options (others available)

Ring	Forked	Insulated	Pressed	Quick Release
				
Industrial, Defence, Aerospace	Industrial, Defence	Industrial, Defence, Aerospace	Industrial, Defence, Energy	Aerospace, Defence

For additional information on what is possible or should you have a particular design or application in mind please contact our sales office for details.

Current Rating (Tin-plated Copper)

Cross-sectional Area	Current Rating (amps)
1.5	28
2.5	34
6.0	69
10.0	97
16.0	132
25.0	178
50.0	282
100.0	400

These current ratings are based on a temperature rise of 50°C above ambient

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Bonding Leads

RBL Series

Tin-plated Copper Rope Bonding Leads

RBL bonding leads are stranded rope construction assemblies manufactured from annealed copper ETP1 manufactured to BS EN13602. They are robust, highly flexible and durable, making them perfectly suited to dynamic applications and those in high vibration environments. In addition, RBL bonding leads boast large cross-sectional areas whilst keeping overall diameters to a minimum making them ideal for size restricted applications.

Features & Benefits

- Multi-directional flexibility
- Durable and robust design

Operating Temperature

- Tin-plated copper: -65°C to +150°C
- Insulated: -40°C to +135°C



Specifications/Approvals

- Manufactured to EN4199-003 design.

RBL-4-200-M6-S

PART NUMBER EXAMPLE

Insulated:

S Insulated sleeve
Leave blank if insulation is not required

Hole Size:

Refer to table for options

Lengths:

xxx To be specified

Cross-sectional Area:

Refer to table for options

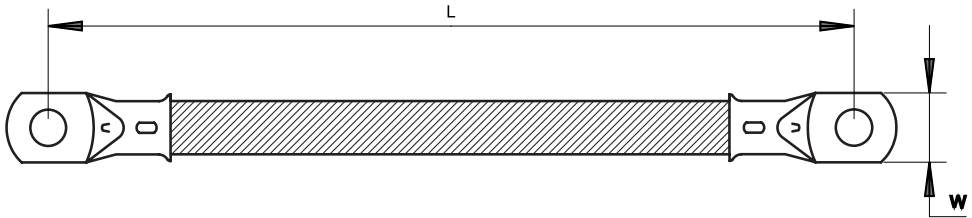
Part Reference:

Rope bonding lead

Ordering Example

RBL-4-200-M6-S Rope bonding lead, made from braid tin-plated copper, with 4mm² cross sectional area, 200mm hole centres, M6 terminal holes, insulated.

If the product you require is not listed here as standard please contact us as we can have your custom part manufactured to order, subject to confirmation.



Terminal Availability

Terminal Code		Cross-sectional Area						
Stud	Hole Ø	4mm ²	6mm ²	10mm ²	16mm ²	25mm ²	35mm ²	50mm ²
M4	4.5	✓						
M5	5.5	✓	✓	✓	✓	✓	✓	✓
M6	6.5	✓	✓	✓	✓	✓	✓	✓
M8	8.5	✓	✓	✓	✓	✓	✓	✓
M10	10.5	✓	✓	✓	✓	✓	✓	✓
M12	13.0		✓	✓	✓	✓	✓	✓
M14	15.0						✓	✓
M16	18.0						✓	✓

Dimension in millimeters unless otherwise stated.

Cross Sectional Area - Technical Information

Cross-sectional Area	Stand Size (mm)	'W' Nominal (mm)	Current Rating (amps)
4	0.15	10	50
6	0.15	11	60
10	0.15	15	80
16	0.20	16	120
25	0.20	16	150
35	0.20	18	200
50	0.20	20	240