

OVERHEAD CATENARY WIRE


WE BRING YOU FORWARD



STRANDED

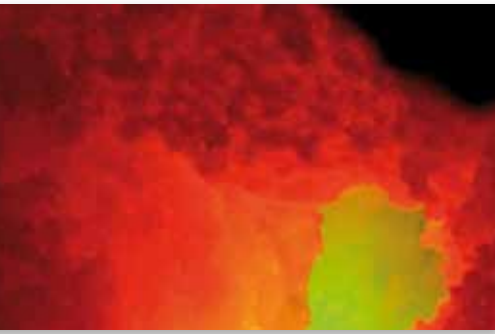


CONTACT



STATE OF THE ART





FROM CATHODE TO OVERHEAD

PRODUCT QUALITY FROM THE VERY BEGINNING

TRADITIONAL VALUES WITH AN INTERNATIONAL FOCUS

Liljedahl Bare Wire is an important supplier for numerous on-going infrastructural investments for energy transmission - a leading supplier of copper wire rod, wires, stranded conductors, profiles and overhead catenary systems in aluminium, copper and copper alloys.

Liljedahl Bare Wire consists of AB Elektrokoppar, based in Helsingborg (Sweden), Isodraht GmbH in Mannheim (Germany) and Liljedahl Wire in Taicang (China).

This strong and innovative group forms a vital production and sales division within the Swedish privately owned Liljedahl Group (www.liljedahlgroup.com).

With many decades of experience in copper rod and copper wire production, we have developed a solid platform for many applications. One important focus of our activities is sophisticated solutions with bare conductors for railway electrification.

Our product range - produced in accordance with international specifications - covers the demands for commuter services and long-distance routes for national and international railway companies. Contact wire made of copper and copper alloys (silver, magnesium or tin) are our core competence; cable conductors made of copper, copper-silver and copper-magnesium (Bzll) round off the product range.

Today, Liljedahl Bare Wire offers a competent sales team providing professional project support. Liljedahl Bare Wire is a player in the international market with a portfolio of successful performed projects and high competence in project coordination. With a well-developed logistics system, we work swiftly and precisely with flexibility and attentiveness towards our customers. The final acceptance test with the client (FAT) is a valued service!

We consider ourselves an active partner in our clients' project work.

THE ALLOY IS YOUR ALLY

Liljedahl Bare Wire products benefit from decades of copper expertise. Permanent process developments, particularly in the field of alloys, guarantee availability of innovative drawing stock; close cooperation with our copper suppliers ensure constant availability of grade A cathodes.

This teamwork stands for ongoing improvements in the manufacturing process - from the mine to the contact wire! We are committed to ensuring selection of only the best cathode quality. Liljedahl Bare Wire only processes grade A copper cathodes with a purity level of 99.99%. This guarantees IACS conductivity of well above 100%!



CATENARY SYSTEMS



We manufacture more than 140,000 tonnes of continuous cast wire from Cu-ETP. A capacity of more than 10,000 tonnes per year of alloyed wire (CuAg, CuMg and CuSn) is available specifically for use in catenary systems.

The quality of the contact wire is already ensured by selecting the right raw materials. The close cooperation between our rod- and contact wire production teams ensures optimal conditions for consistently good product attributes. Only high-standard quality products are produced.

We maintain our long-term commitments towards our customers thanks to genuine knowledge of copper processing and focus on research and development.

INNOVATIVE SOLUTIONS FOR OUR CLIENTS

Liljedahl Bare Wire stands for many years of experience in the manufacture of contact wires. It is your guarantee and our basis for superior products.

40 years of contact wire production is accompanied by ongoing development of our production processes and increased demands on continually improved raw material properties.

Our history in contact wires is closely connected with the development of alloys for catenary systems.

In 1985, Liljedahl Bare Wire delivered CuAg contact wire for the first time, manufactured from continuous cast drawing stock without any welding used, for the world record track near Würzburg at that time (IC-E with 406 km/h).

In 1992, the development of CuMg contact wire began. Liljedahl Bare Wire was one of the pioneers in the production of this alloy for high-speed routes, together with today's Balfour Beatty Rail and Siemens. We provided 70% of the CuMg contact wire for the new high-speed track between Hannover and Berlin.

In 2006, Liljedahl Bare Wire provided all 120 mm² CuMg contact wire for the new track between Nuremberg and Ingolstadt for Balfour Beatty Rail. In 2007, the first high-speed route in the Netherlands from Schiphol to be Belgian border, the HSL ZUID by Siemens, was equipped with our 120 mm² CuMg contact wire.

Our clients' confidence in the quality of our trolley wire, particularly in the regularity of the mechanical properties and the straightness of the contact wire, was the deciding factor for the selection of Liljedahl Bare Wire as the contact wire supplier of the projects mentioned.



STATE-OF-THE-ART CONTACT WIRE PRODUCTION

KNOW-HOW IN PROCESS AND APPLICATION

The manufacture of contact wire from copper or copper alloy is our core competence. Development and continuous improvement in our production process for decades, guarantee high-performance products.

Our range includes contact wire with cross sections of 80-150 mm² for all types of catenary constructions.

The main uses of our product range:

PURE COPPER, Cu-ETP CONTACT WIRE

Cross section 80-150 mm²

For conventional use in commuter systems:
Speeds up to 160 km/h.

CuAg 0.1% CONTACT WIRE

Cross section 80-150 mm²

For use in long-distance passenger systems:
Speeds up to 250 km/h.

CuMg 0.2 AND 0.5% CONTACT WIRE

Cross section 100-150 mm²

For high-speed routes:
Speeds up to 400 km/h.

CuSn 0.2% AND 0.4% CONTACT WIRE

Cross section 100-150 mm²

For high-speed routes:
Speeds up to 300 km/h.

The use of state-of-the-art production procedures is not the only strength of Liljedahl Bare Wire. The manufacture of drawing tools has also been among our core competences for decades.

We guarantee fulfilment of the special requests of our clients and provide the shortest delivery times for non-standardised dimensions!

Liljedahl Bare Wire produces contact wire with a high consistency of all properties, which provides a large degree of reliability during handling and assembly:

- Consistency in shape and dimensions through intensive tool maintenance.
- Perfect, flawless surfaces inline eddy-current checked.
- Optimal processing of the contact wire with up to 5 in-line drawing steps.
- Highest mechanical stability.
- Clean layers wound with even tension.

We accept the increasing product demands of our clients and constantly develop our production process and quality management.

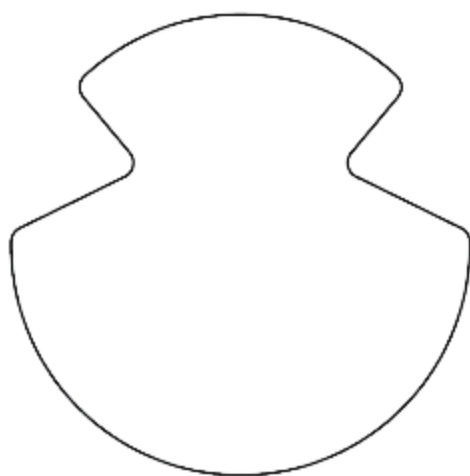
Liljedahl Bare Wire guarantees product properties far beyond the requirements of EN 50149.

In national and international competition, we are always a welcome partner for our customer needs in maintenance and development!

CONTACT WIRE Cu-ETP ACCORDING TO EN 50149



MARKING OF Cu-ETP



MATERIAL PROPERTY

E- module	kN/mm ²	120
Specific conductivity at 20°C	m/(Ohm*mm ²)	≥56,3
Electric conductivity	% IACS	≥97
Linear expansion coefficient	10 ⁻⁵ /K	1,7
Density	10 ³ kg/m ³	8,89

MECHANICAL AND ELECTRICAL PROPERTIES OF Cu-ETP

CROSS-SECTION	mm ²	80	100	107	120	150
Min. tensile strength R _m ²⁾	N/mm ²	355	355	350	330	310
Min. breaking load F _m ¹⁾	kN	27,5	34,5	36,3	38,4	45,1
Elongation at break A ₂₀₀	%	3 - 10	3 - 10	3 - 10	3 - 10	3 - 10
Yield strength R _{p0,2}	N/mm ²	>310	>310	>310	>300	>280
Electrical resistance R	Ohm/km	≤0,229	≤0,183	≤0,171	≤0,153	≤0,122

¹⁾ at min. cross- section

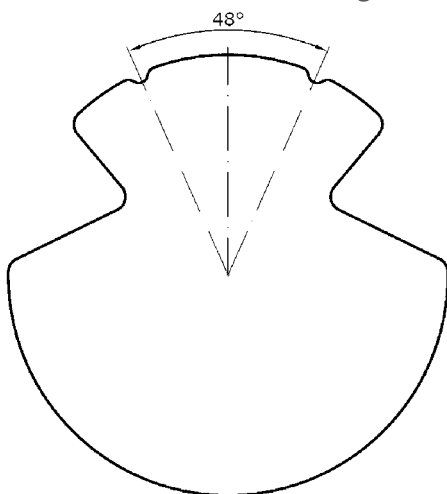
²⁾ other properties upon request





CONTACT WIRE CuAg 0,1 ACCORDING TO EN 50149

MARKING OF CuAg



MATERIAL PROPERTY

E- module	kN/mm ²	120
Specific conductivity at 20°C	m/(Ohm*mm ²)	≥56,3
Electric conductivity	% IACS	≥97
Linear expansion coefficient	10 ⁻⁵ /K	1,7
Density	10 ³ kg/m ³	8,89

MECHANICAL AND ELECTRICAL PROPERTIES OF CuAg 0,1-ALLOYED

CROSS-SECTION	mm ²	80	100	107	120	150
Min. tensile strength R _m ²⁾	N/mm ²	375	375	360	360	360
Min. breaking load F _m ¹⁾	kN	29,1	36,4	37,4	41,9	52,2
Elongation at break A ₂₀₀	%	3 - 8	3 - 8	3 - 8	3 - 8	3 - 8
Yield strength R _{p0,2}	N/mm ²	>310	>310	>310	>310	>310
Electrical resistance. R	Ohm/km	≤0,229	≤0,183	≤0,171	≤0,153	≤0,122

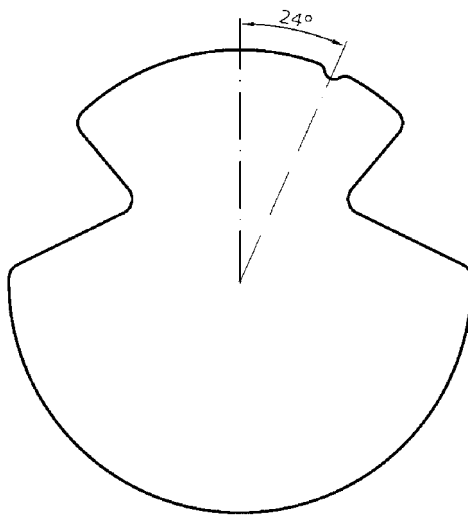
¹⁾ at min. cross- section

²⁾ other properties upon request

CONTACT WIRE CuSn 0,2 ACCORDING TO EN 50149



MARKING OF CuSn



MATERIAL PROPERTY

E-Module	kN/mm ²	120
Specific conductivity at 20°C	m/(Ohm*mm ²)	≥44,6
Electric conductivity	% IACS	≥72
Linear expansion coefficient	10 ⁻⁵ /K	1,7
Density	10 ³ kg/m ³	8,92

MECHANICAL AND ELECTRICAL PROPERTIES OF CuSn 0,2-ALLOYED

CROSS-SECTION	mm ²	80	100	107	120	150
Min. tensile strength R_m ²⁾	N/mm ²	460	450	430	420	420
Min. breaking load F_m ¹⁾	kN	35,7	43,6	44,6	48,9	61,1
Elongation at break A_{200}	%	3 - 8	3 - 8	3 - 8	3 - 8	3 - 8
Yield strength $R_{p0,2}$	N/mm ²	>370	>370	>370	>370	>370
Electrical resistance. R	Ohm/km	≤0,309	≤0,247	≤0,231	≤0,206	≤0,165

¹⁾ at min. cross- section

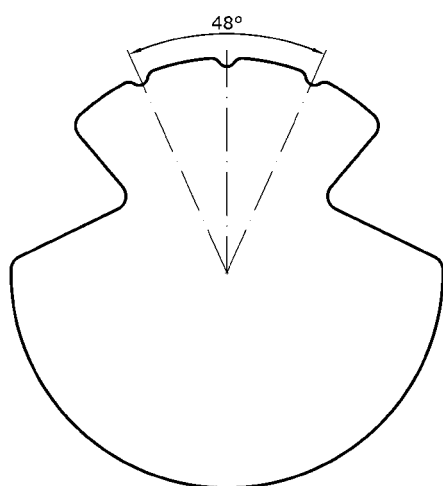
²⁾ other properties upon request





CONTACT WIRE CuMg 0,2 ACCORDING TO EN 50149

MARKING OF CuMg



MATERIAL PROPERTY

E-Module	kN/mm ²	120
Specific conductivity at 20°C	m/(Ohm*mm ²)	≥44,6
Electric conductivity	% IACS	≥77
Linear expansion coefficient	10 ⁻⁵ /K	1,7
Density	10 ³ kg/m ³	8,89

MECHANICAL AND ELECTRICAL PROPERTIES OF CuMg 0,2-ALLOYED

CROSS-SECTION	mm ²	80	100	107	120	150
Min. tensile strength R _m ²⁾	N/mm ²	460	450	440	430	420
Min. breaking load F _m ¹⁾	kN	35,7	43,6	45,7	50,1	61,1
Elongation at break A ₂₀₀	%	3 - 10	3 - 10	3 - 10	3 - 10	3 - 10
Yield strength R _{p0,2}	N/mm ²	>370	>370	>370	>370	>370
Electrical resistance. R	Ohm/km	≤0,289	≤0,231	≤0,216	≤0,192	≤0,154

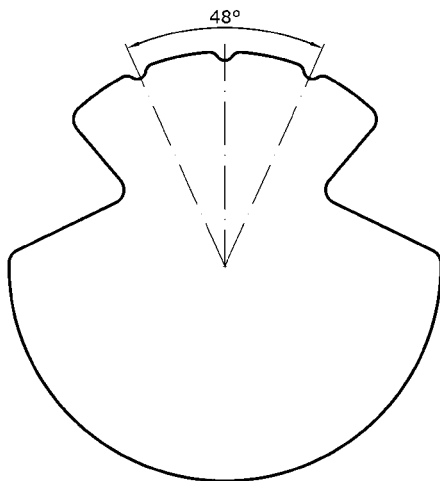
¹⁾ at min. cross- section.

²⁾ other properties upon request.

CONTACT WIRE CuMg 0,5 ACCORDING TO EN 50149



MARKING OF CuMg



MATERIAL PROPERTY

E-Module	kN/mm ²	120
Specific conductivity at 20°C	m/(Ohm*mm ²)	≥36,0
Electric conductivity	% IACS	≥62
Linear expansion coefficient	10 ⁻⁵ /K	1,7
Density	10 ³ kg/m ³	8,89

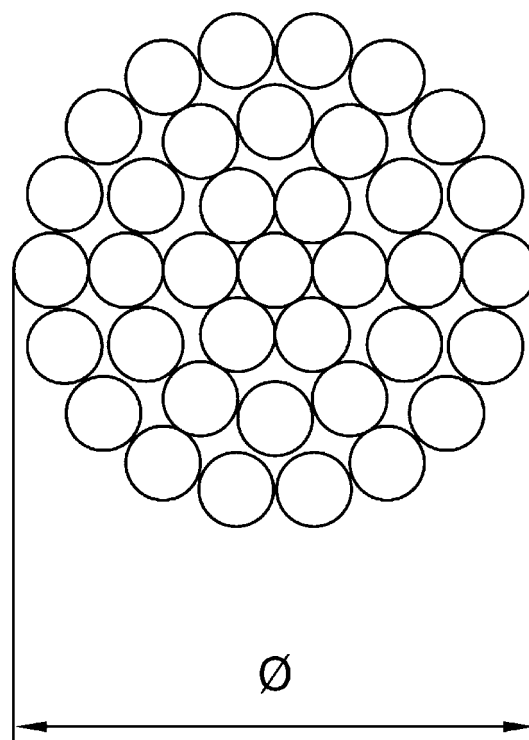
MECHANICAL AND ELECTRICAL PROPERTIES OF CuMg 0,5-ALLOYED

CROSS-SECTION	mm ²	80	100	107	120	150
Min. tensile strength R _m ²⁾	N/mm ²	520	510	500	490	470
Min. breaking load F _m ¹⁾	kN	40,4	49,5	51,9	57,0	68,4
Elongation at break A ₂₀₀	%	3 - 10	3 - 10	3 - 10	3 - 10	3 - 10
Yield strength R _{p0,2}	N/mm ²	>430	>430	>430	>430	>430
Electrical resistance. R	Ohm/km	≤0,385	≤0,286	≤0,268	≤0,239	≤0,191

¹⁾ at min. cross- section.

²⁾ other properties upon request.

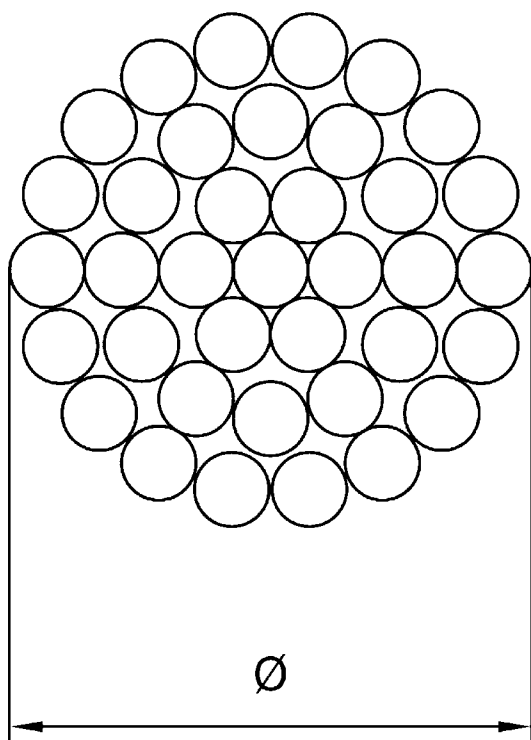




STRANDED CONDUCTORS CuETP¹⁾ ACCORDING TO DIN 48201 PART 1

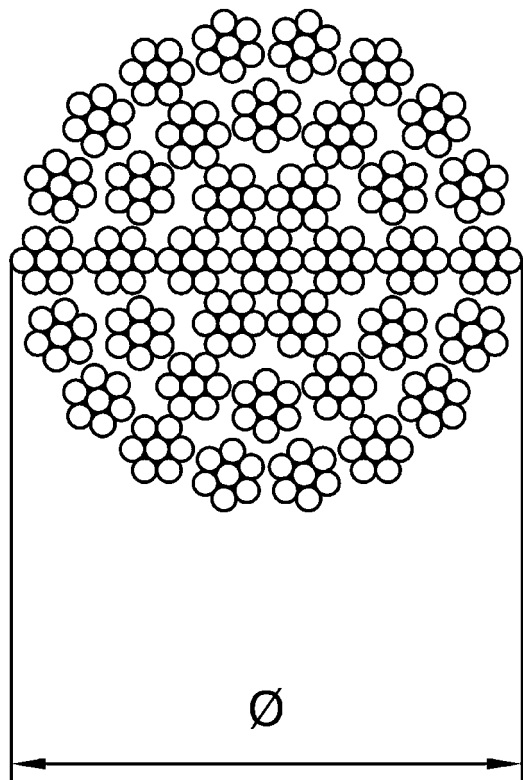
NOMINAL SECTION mm ²	REAL CROSS SECTION mm ²	NUMBER OF WIRES	WIRE Ø mm	STRAND Ø mm	WEIGHT kg/km	CALC. BREAK UP LOAD kN	PERMANENT CROSS CURRENT CAPACITY A
10	10,02	7	1,35	4,1	90	4,02	90
16	15,89	7	1,70	5,1	143	6,37	125
25	24,25	7	2,10	6,3	218	9,72	160
35	34,36	7	2,50	7,5	310	13,77	200
50	49,48	7	3,00	9,0	446	19,84	250
50	48,35	19	1,80	9,0	437	19,38	250
70	65,81	19	2,10	10,5	596	26,38	310
95	93,27	19	2,50	12,5	845	37,39	380
120	116,99	19	2,80	14,0	1060	46,90	440
150	147,11	37	2,25	15,8	1337	58,98	510
185	181,62	37	2,50	17,5	1649	72,81	585
240	242,54	61	2,25	20,3	2209	97,23	700
300	299,43	61	2,50	22,5	2725	120,04	800
400	400,14	61	2,89	26,0	3640	160,42	960
500	499,83	61	3,23	29,1	4545	200,38	1110

¹⁾ Upon request. The strands can be made of CuAg 0,1 with identical properties.



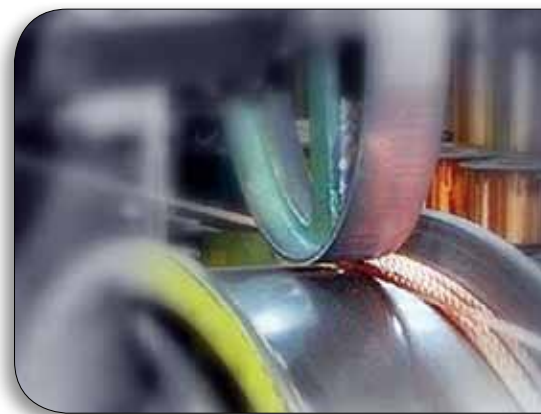
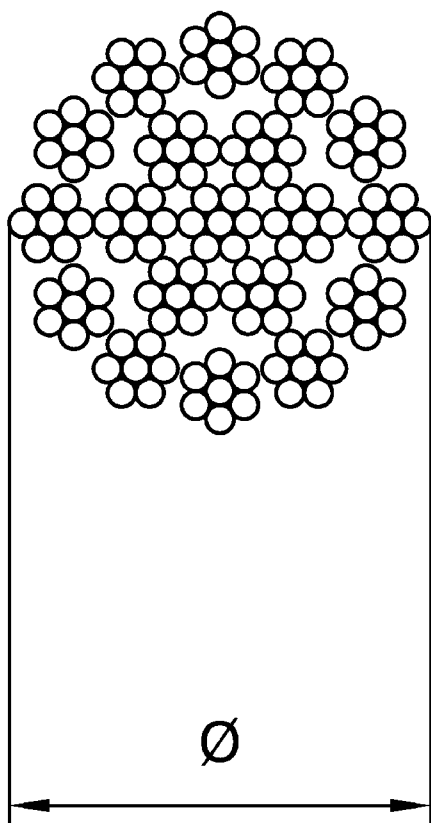
STRANDED CONDUCTORS BzII ACCORDING TO DIN 48201 PART 2

NOMINAL SECTION mm ²	REAL CROSS SECTION mm ²	NUMBER OF WIRES	WIRE Ø mm	STRAND Ø mm	WEIGHT kg/km	CALC. BREAK UP LOAD kN	PERMANENT CROSS CURRENT CAPACITY A
10	10,02	7	1,35	4,1	90	5,88	75
16	15,89	7	1,70	5,1	143	9,33	100
25	24,25	7	2,10	6,3	218	14,24	130
35	34,36	7	2,50	7,5	310	20,17	160
50	49,48	7	3,00	9,0	446	28,58	200
50	48,35	19	1,80	9,0	437	28,39	200
70	65,81	19	2,10	10,5	596	38,64	245
95	93,27	19	2,50	12,5	845	54,76	305
120	116,99	19	2,80	14,0	1060	67,57	350
150	147,11	37	2,25	15,8	1337	86,37	410
185	181,62	37	2,50	17,5	1649	106,63	465
240	242,54	61	2,25	20,3	2209	142,40	560
300	299,43	61	2,50	22,5	2725	175,80	635
400	400,14	61	2,89	26,0	3640	231,12	765
500	499,83	61	3,23	29,1	4545	288,70	880



FLEXIBLE STRANDED CONDUCTORS CuETP ACCORDING TO DIN 43138

NOMINAL CROSS SECTION mm ²	REAL CROSS SECTION mm ²	NUMBER OF WIRES	WIRE Ø mm	STRAND Ø mm	WEIGHT kg/km	CALC. BREAK UP LOAD MPa	CONTINUOUS CURRENT-CARRYING CAPACITY 0,6 m/s	CONTINUOUS CURRENT-CARRYING CAPACITY 1 m/s
16	16,3	49	0,65	5,9	152	<300	135	155
25	26,1	133	0,50	7,5	246	<300	180	205
35	37,6	133	0,60	9,0	353	<300	225	255
50	51,2	133	0,70	10,5	482	<300	280	310
70	72,7	189	0,70	13,0	685	<300	340	370
95	99,7	259	0,70	14,7	935	<300	420	460
120	118,5	336	0,67	16,4	1120	<300	485	535
150	150,9	392	0,70	18,3	1420	<300	570	625
185	185,1	525	0,67	20,4	1745	<300	660	720
210	209,8	595	0,67	21,5	1980	<300	720	780
240	245,2	367	0,70	23,1	2320	<300	785	850
300	296,6	637	0,77	25,4	2800	<300	895	970

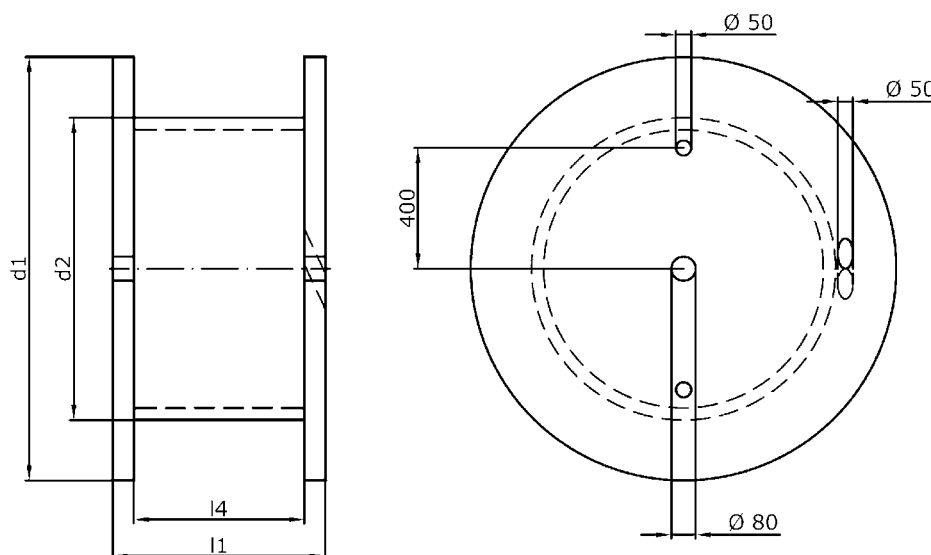


FLEXIBLE STRANDED CONDUCTORS BzII ACCORDING TO DIN 43138

NOMINAL CROSS SECTION mm ²	REAL- CROSS SECTION mm ²	NUMBER OF WIRES	WIRE Ø mm	STRAND Ø mm	WEIGHT kg/km	TENSILE STRENGTH N/mm ²
10	9,6	49	0,50	4,5	89	≥589
16	16,3	49	0,65	5,9	152	≥589
16	16,3	84	0,50	6,2	152	≥589
25	26,1	133	0,50	7,5	246	≥589
35	37,6	133	0,60	9,0	353	≥589
50	51,2	133	0,70	10,5	482	≥589

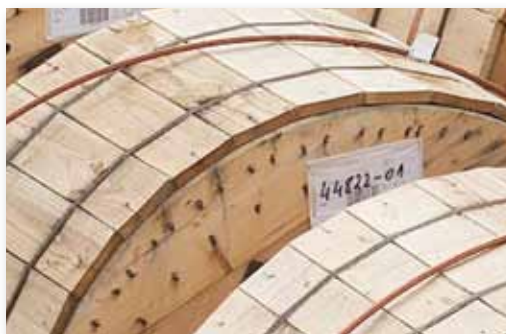


PACKING OF CONTACT WIRE WOODEN DRUMS ACCORDING TO DIN 43139

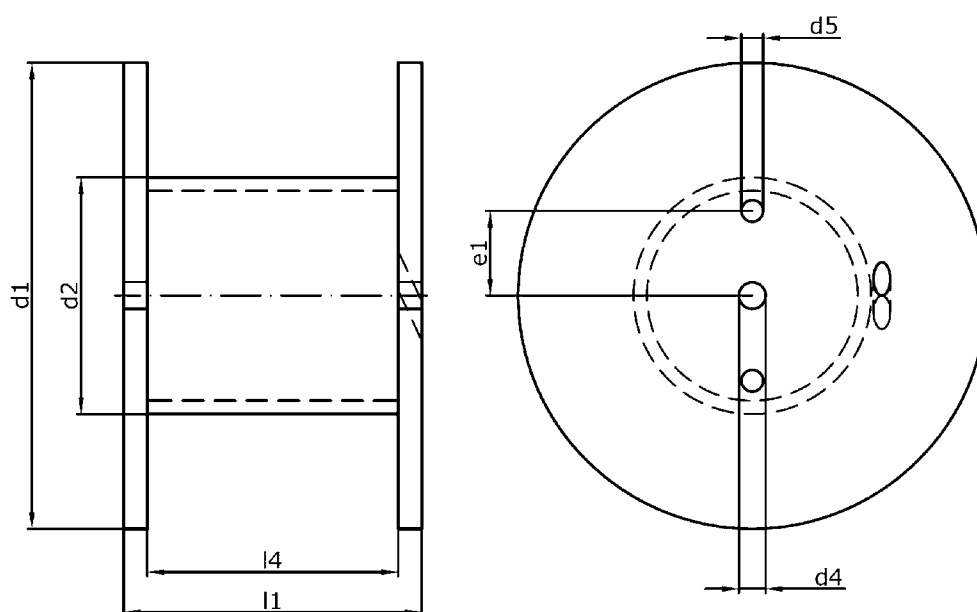


TYPE OF DRUM	MAX LOAD kg	TARE WEIGHT kg (approx.)	FLANGE Ø * d1 mm	CORE Ø * d2 mm	WIDTH* l1 mm	WINDING- WIDTH * l4 mm
F13	1500	160	1300	1000	700	560
F14	2000	190	1400	1000	700	560
F16	3000	220	1600	1000	700	560
F18	2500	260	1800	1500	700	560
F19	3000	290	1900	1500	700	560
F20	3000	320	2000	1500	700	560

* Upon request. Wooden drums with different dimensions, barrel lagging, heat-treatment according to ISPM/AC is optional



PACKING OF STRANDED CONDUCTOR WOODEN DRUMS ACCORDING TO DIN 46391



TYPE OF DRUM	MAX LOAD kg	TARE WEIGHT kg (approx.)	FLANGE Ø* d1 mm	CORE Ø* d2 mm	WIDTH* l1 mm	WINDING WIDTH l4 mm	e1	d4	d5
81	400	31	800	400	520	400	100	80	40
91	750	47	900	450	690	560	160	80	50
101	900	71	1000	500	710	560	160	80	50
121	1700	140	1250	630	890	670	160	80	65
141	2000	170	1400	710	890	670	160	80	65
161	3000	280	1600	800	1100	850	300	80	65

* Upon request. Wooden drums with different dimensions, barrel lagging, heat-treatment according to ISPM/AC is optional.



FOCUSING ON QUALITY AND ENVIRONMENT

PROCESS KNOWLEDGE AND QUALITY MANAGEMENT SYSTEM

The fields of usage of our wires, such as in demanding electric motors of automotive engineering, in the cable industry, in wind generators and, of course, in high-performance contact wire on fast railway lines with speeds above 350 km/h, demand a professional quality assurance system throughout all sectors of the company. Modern production equipment and high-tech processing experience are the basis for our product quality.

Our laboratories offer the options of metallurgic analysis methods together with all the relevant electrical and mechanical inspections. Our modern production facilities are fitted with the highest level of technical equipment and our materials are state-of-the-art.

Following the demands of our quality management system, we work to continuously improve the entire production chain. For many years we have introduced in all our units the EN ISO 9001 quality management system; in 2002 the Mannheim facility was also certified in accordance with TS 16949, due to major automotive sales.

Liljedahl Bare Wire has built up a strong reputation of innovation: "The power of permanent improvement".

COMPREHENSIVE CONCEPTS OF QUALITY

The elements of our quality management system cover all sectors of the company. Each employee plays a role in the qualitative added value of the end product. Internal communication is decisive: our high quality standards are maintained by providing our employees with information about client satisfaction and quality, along with internal audits.

Our corporate policy, which is applied to all areas of the company, unites all employees in shared concepts of quality and environmental responsibility.

ENVIRONMENTALLY RESPONSIBLE

Liljedahl Bare Wire is at the forefront of environmentally-friendly processes. All companies are certified according EN ISO 14001.

Energy-saving preservation of resources by reducing waste and recycling raw materials are reflections of this. For us, taking responsibility for the environment means: recycling 100% of all scrap metal, keeping the proportion of packaging that can be re-used at >90%, and keeping emissions well below environmental directives. There is no discharge into water supplies, and surplus energy from production is used to heat the facility.

Liljedahl Bare Wire encourages all employees to engage in environmental responsibility by promoting new ideas and working with innovations with regard to the environment. All are encouraged to take an active part in evaluating business partners by taking environmental and ethic aspects into focus.

SUPPLIER ASSESSMENTS

Liljedahl Bare Wire is accredited as a Q1 supplier by Deutsche Bahn and a preferred vendor (CQ) to the Swedish Transport Board. We have also KEMA certification for deliveries to the Netherlands and Achilles certification for deliveries to UK and Scandinavia.

Liljedahl Bare Wire has worked with client satisfaction surveys for many years. We are proud to receive top evaluations with regards to service, product quality and applications technology for our contact wires and cables.




Registered Supplier

Link-up Qualification Scheme

Isdraht GmbH
Supplier Number: 26215



Date Printed: 6 September 2012
Expiry Date: 23 June 2013
Certificate Number: 34521-26215/95226

Peter Brookes
Rail Sector Manager
Achilles Information Limited




transQ
empowered by Achilles

Qualification System for Suppliers to Transport Utilities in Scandinavia

Certificate of Qualification

Awarded to
AB ELEKTROKOPPAR
Company Reg.no: 556027-2095
TransQ ID: 201495

Achilles Information AB hereby confirms that
AB ELEKTROKOPPAR
is qualified in TransQ Qualification System for Suppliers to the below
Scandinavian Transport Utilities for the following product/service categories:

4.11.06 Overhead Line Conductors



Date of Issue: 28 May 2009

Lieferantenbewertung

Das Lieferant

EKS Isdraht GmbH & Co. KG
Hilfenstraße 40 - 44
D 42179 Mönchenlars

Werkstoff: Profilmotoren
Werkstoffe: Profilmotoren, Co = CuMg - Seile und Litzen, Federn

Q1-Lieferant

Seitens Lieferant am gültig bis
04.04.2013

Seitens der DB AG
04.04.2013

Seitens der DB AG
Qualitätsmanagement Entwicklung
System Engineering

KEMA
Rail Transport Certification

CERTIFICATE of compliance

Low Alloy Copper Cables for Overhead Catenary Systems

Application: Low Alloy Copper Cables for Overhead Catenary Systems
Standard: EN 50125-1:2005
Product: Low Alloy Copper Cables for Overhead Catenary Systems
Manufacturer: EKS Isdraht GmbH & Co. KG
Date of Issue: 06.09.2012
Date of Expiry: 06.09.2015

KEMA
Rail Transport Certification

CERTIFICATE of compliance

Contact Wire for Overhead Catenary Systems

Application: Contact Wire for Overhead Catenary Systems
Standard: EN 50125-1:2005
Product: Contact Wire for Overhead Catenary Systems
Manufacturer: EKS Isdraht GmbH & Co. KG
Date of Issue: 06.09.2012
Date of Expiry: 06.09.2015

KEMA
Rail Transport Certification

CERTIFICATE of compliance

Alloy Copper Cables for head Catenary Systems

Application: Alloy Copper Cables for head Catenary Systems
Standard: EN 50125-1:2005
Product: Alloy Copper Cables for head Catenary Systems
Manufacturer: EKS Isdraht GmbH & Co. KG
Date of Issue: 06.09.2012
Date of Expiry: 06.09.2015

Denote

Certificate of Conformity

Product: Contact wires and Cables

Manufacturer: EKS Isdraht GmbH & Co. KG

Date of Issue: 06.09.2012

SGS

EKS Isdraht GmbH & Co. KG

ISO 9001:2008

Product: Contact wires and Cables

SGS

EKS Isdraht GmbH & Co. KG

ISO 14001:2004

Product: Contact wires and Cables

SGS

AB Elektrokoppar

ISO 9001:2008

Product: Contact wires and Cables



REFERENCE LIST

– SELECTION

YEAR	COUNTRY	PROJECT	MATERIAL	QTY METRIC TONS
1995	Germany	High Speed Line Hanover - Berlin	Contact Wire CuMg 120 mm ²	400 t
1995	China	German Chinese Railway Project Harbin - Dalian	Contact Wire Cu 120 mm ²	670 t
1996	Italy	High Speed Line Rome - Naples	Contact Wire Cu 150 mm ²	500 t
2000	China	German Chinese Railway Project Harbin - Dalian	Contact Wire CuAg 100 mm ² Stranded Conductor BzII 50 mm ²	150 t 75 t
2002	Sweden	West Coast Rail Oresund-Crossing	Contact Wire CuAg 120 mm ²	130 t
2002	Portugal	Beira - Beixa	Contact Wire Cu 107 mm ² Stranded Conductor BzII 70 mm ² Stranded Conductor Cu 50 mm ²	103 t 70 t 40 t
2003	Ireland	Dublin	Contact Wire Cu 107 mm ² ASTM Stranded Conductor Cu 70 mm ² Stranded Conductor Cu 95 mm ²	95 t 107 t 54 t
2004	Netherlands	High Speed Line HSL Zuid	Contact Wire CuMg 120 mm ²	250 t
2004	Romania	Bukarest Linie 35	Contact Wire Cu 100	20 t
2005	Germany	High Speed Line Nuremberg - Ingolstadt	Contact Wire CuMg 120 mm ²	220 t
2005	Switzerland	Lotschberg Tunnel	Stranded Conductor CuAg 150 mm ²	78 t
2006	Australia	Perth Suburb	Contact Wire Cu 107 mm ² Stranded Conductor Cu 150 mm ²	173 t 138 t
2006	Brazil	Fortaleza	Contact Wire Cu 107 mm ² Stranded Conductor CU 150 mm ²	100 t 140 t
2007	Taiwan	Intercity Rail Traffic Taiwan Rail	Contact Wire Cu 107 mm ²	290 t
2007	Turkey	High Speed Line Istanbul - Ankara	Contact Wire CuAg 120 mm ² Stranded Conductor BzII 70 mm ²	327 t 242 t
2007	Iran	Tabriz	Contact Wire CuAg 120 mm ² Stranded Conductor CuAg 150 mm ²	104 t 127 t
2008	Malaysia	Malaysian Railway	Contact Wire Cu 107 mm ² Stranded Conductor BzII 70 mm ²	11 t 4 t
2008	Indonesia	Test Supply	Contact Wire CuMg 0,2 % 110mm ²	4 t
2008	Sweden	Botnia Banan	Contact Wire CuAg 120 mm ²	100 t
2008/2009	Brazil	Salvator	Contact Wire Cu 107 mm ² Stranded Conductor BzII 70 mm ²	33 t 43 t
2009	Saudi Arabia	Mecca	Contact Wire CuAg 120 mm ² Stranded Conductor CuAg 150 mm ²	123 t 151 t
2009	India	Tram Line Dehli	Contact Wire CuAg 150 mm ²	87 t
2009	South Africa	Namibia	Contact Wire CuAg 150 mm ² Stranded Conductor Cu 150 mm ² Contact Wire CuAg 150 mm ²	14 t 20 t 14 t
2009	Taiwan	Intercity Rail Traffic Taiwan Rail	Contact Wire Cu 107 mm ²	110 t
2009/2010	Turkey	High Speed Line Ankara - Konya	Contact Wire CuAg 120 mm ² Stranded Conductor BzII 70 mm ² Stranded Conductor BzII 35 mm ² Flexible Stranded Conductor BzII 16 mm ²	725 t 511 t 50 t 16 t
2009/2010	Portugal	Trofa, Beira-Beixa, Covilhã, Barcarena	Contact Wire Cu 107 mm ² Stranded Conductor BzII 65 mm ² Stranded Conductor Cu 150 mm ²	115 t 81 t 45 t



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