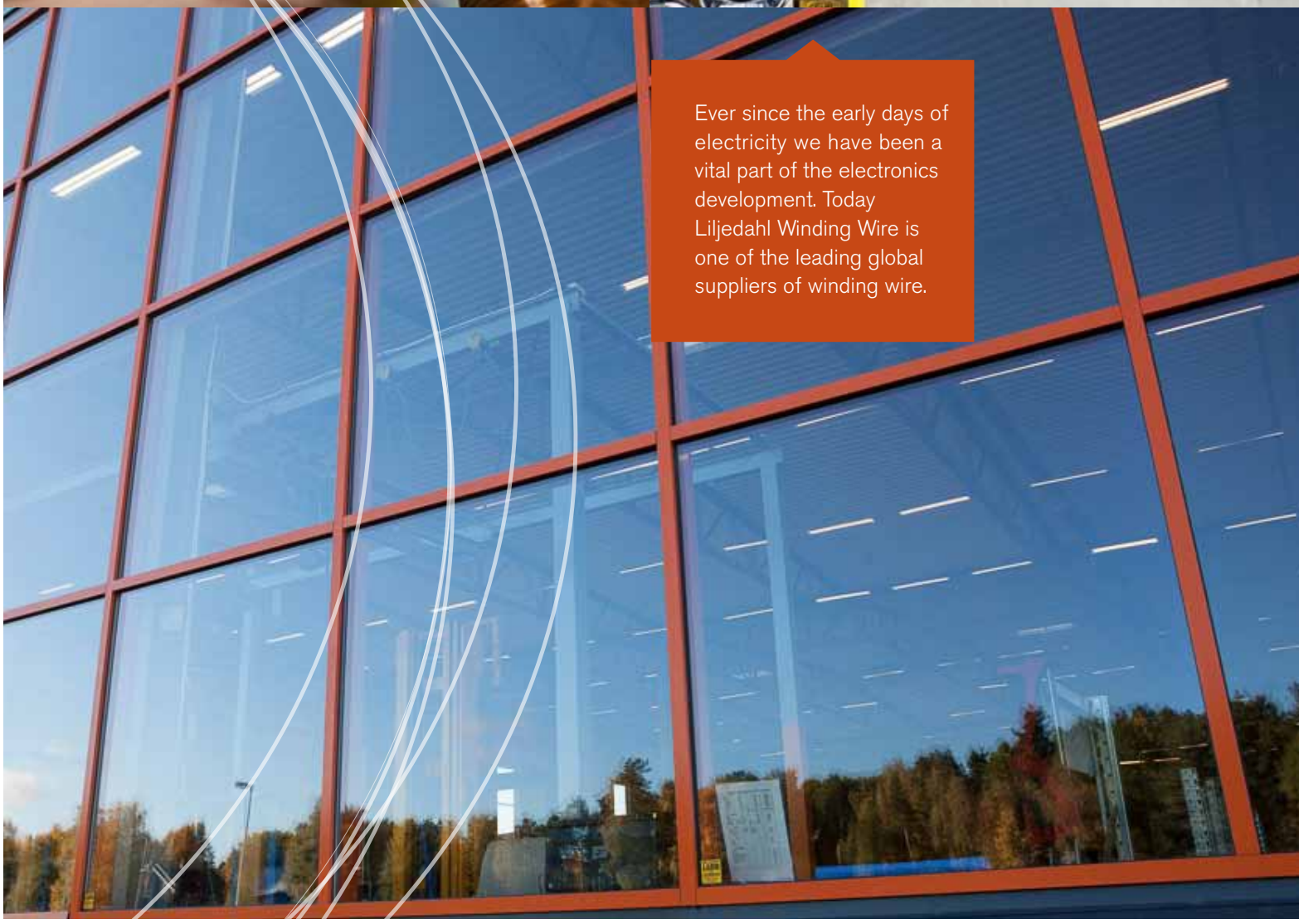
TECHNICAL DATA FOR **WINDING WIRE**

Liljedahl Winding Wire

dahréntråd
isodraht
śląska
利里达尔线材
liljedahl wire



Ever since the early days of electricity we have been a vital part of the electronics development. Today Liljedahl Winding Wire is one of the leading global suppliers of winding wire.

LILJEDAHL WIRE POWER

Whatever your product, you can rest assured that we can provide you with the right winding wire, made from fully recyclable copper and aluminium. We have been a partner to the electronics industry since the early days of electricity and today you will find our high quality wire in a wide range of applications; from drilling machines and vacuum cleaners to trains and wind turbines. Driven by future-oriented development, adaptability and sustainability, we have grown into a leading global supplier of winding wire. We call it Liljedahl wire power.

GLOBAL

Liljedahl Winding Wire is a leading global supplier of copper and aluminium winding wire solutions. With business and production units in Sweden, Germany, Poland and China we offer a complete product range and a wide geographical presence. This makes us a true global partner with in-depth local knowledge as well as the capability and flexibility to handle complex worldwide orders.

EXPERIENCED

With more than a century in business, we have extra-ordinary experience of producing winding wire. From a number of small, independent businesses, we have grown into one of the largest and most modern manufacturers with a global capacity of more than 100,000 tons per year.

Along with our sister companies in the Liljedahl Group, we cover the entire process from raw material to customer applications. We have full control of the production and logistics chain, thereby ensuring punctual delivery and precision quality.

FLEXIBLE

Our production facilities make all types of winding wire – copper or aluminium; round or rectangular – which makes us very flexible. Production is mainly done to order and our production system is designed to handle customer needs.

SUSTAINABLE

We are proud to be industry leader when it comes to minimising our production's environmental impact. Solvent emissions are far below EU directives, the copper and aluminium waste are 100 per cent recycled and all packing is reused. There is no discharge of copper or aluminium into water supplies and excess energy is used to heat our premises. Our environmental management system is certified in accordance with ISO 14000.

Liljedahl Winding Wire is part of the Liljedahl Group – an industrial and commercial group with operations in Europe and China. The Group is organised in seven divisions; Bare Wire, Winding Wire, Steel Wire, Machine Tools, Trucks, Cars and Real Estate. All of the companies in Liljedahl Group represent strong brands and hold leading positions in their markets. The Group has annual sales of SEK 10 billion and 1,200 employees.

BUILT-IN QUALITY

Quality is not only a question of control – it is something you create and integrate in everyday work. We are driven by our vision of anticipating our customer's needs and exceeding their expectations – in product quality, as well as in customer service.

The raw material for rectangular as well as round winding wire is rolled copper or aluminium wire. The rectangular wire is made in an extrusion process, in which the wire rod is pressed through a die to its final dimension. The wire is then enamelled or covered with yarn, foil or other insulating material, or a combination of materials.

The round wire is being given its dimension through one or more stages of cold drawing. The manufacturing is an in-line process, which means that the final drawing, annealing, enamelling and paraffin waxing are done in a single machine. Altogether, these features dramatically shorten lead times and increase our flexibility and availability.

Our patented paraffin wax method includes the advanced procedure of melting the wax directly on the wire. This method has influenced a whole industry into giving up benzine for this more environmentally friendly lubrication method.

The commonly used LWW process assures that customers are supplied with the right quality every time. The system includes advanced quality control systems, full traceability and real-time monitoring of production.

We are certified in accordance with international quality management systems such as ISO 9001, ISO 14001, ISO/TS 16949, OHSAS 18001, ISO 50001 to mention some. For more detailed information, please visit www.lww.se, where you also can download certificates and documents.

DEFINITIONS

STANDARDS

The standards for enamelled and glass-fibre covered winding wire are published by the international standardisation body IEC, *International Electrotechnical Commission*. The set of specifications, which covers packaging, test methods, dimensions and product performance, are internationally established and are applied by Liljedahl Winding Wire. For tape-insulated special products (DAMIC, DAKAP etc) internal standards based on established customer requirements are used.

DEFINITION OF DIMENSIONS AND GRADES

When defining round winding wire, the nominal cross-sectional diameter of the conductor material is stated, regardless of the insulation thickness. The actual diameter of the insulated product is then limited by the tolerance range:

$Ø_{min}$ = actual conductor diameter + min increase due to insulation, and
$Ø_{max}$ = max overall diameter

Enamelled products are categorised in accordance with IEC depending on the grade of the applied insulation, where, by definition:

$$Ø_{Grade1} < Ø_{Grade2} < Ø_{Grade3}$$

Properties that depend on the thickness of the insulation (electrical breakdown voltage, resistance to abrasion, springiness etc) therefore vary between grades.

TERMINOLOGY FOR RESISTANCE, RESISTIVITY AND AREA

The resistance of a wire-shaped conductor is:

$$\mathbf{R} = \rho \frac{l}{A}$$

where:
l = length of conductor in metres
A= cross-section of conductor in m^2
ρ= resistivity of conductor material in Ωm

m^2 is not a practical unit for conductor area, so in this brochure A is always stated in mm^2. This unit in the above equation gives ρ expressed in μΩm or, more clearly, $Ωmm^2/m$, which is the unit used in this document. The resistivity is temperature-dependent. All data on the following pages that depend on the resistivity apply at 20 °C.

Subject to modification.
For more detailed information see our product datasheets.

GENERAL TECHNICAL INFORMATION

CORRELATIONS

Proportionalities between aluminium and copper under identical resistance conditions:

Dimension: $\varnothing_{Al} = 1{,}27\ \varnothing_{Cu}$
Area: $A_{Al} = 1{,}63\ A_{Cu}$
Weight: $m_{Al} = 0{,}50\ m_{Cu}$

COPPER

Quality standard:	ASTM B 49; EN1977 ETP/ETP1
Resistivity (ρ_{Cu}):	0,01724 $\Omega mm^2/m$
Specific heat (cp_{Cu}):	0,368 J/(g K)
Temperature coefficient of resistance (α_{Cu}):	3,93 ‰
Coefficient of longitudinal expansion (a_{Cu}):	$18{,}5 \cdot 10^{-6}$/K
Specific gravity:	8,96 g/cm^3
Thermal conductivity (λ_{Cu}):	370 – 400 W/(m K)

ALUMINIUM

Quality standard:	EN 573-3 (EAI 99,7)
Resistivity (ρ_{Al}):	0,02789 $\Omega mm^2/m$
Specific heat (cp_{Al}):	0,207 J/(g K)
Temperature coefficient of resistance (α_{Al}):	4,30 ‰
Coefficient of longitudinal expansion (a_{Al}):	$23{,}8 \cdot 10^{-6}$/K
Specific gravity:	2,70 g/cm^3
Thermal conductivity (λ_{Al}):	200 W/(m K)

TEMPERATURE DEPENDENCE OF THE RESISTANCE

If the resistance R_T is measured at a temperature $T \neq 20$ °C, the resistance R_{20} can be calculated as follows:

$$R_{20} = \frac{R_T}{1 + \alpha\,(T - 20)}$$

where:
T = the actual temperature in °C at the time of measurement
α = the temperature coefficient (see the sections above on copper and aluminium)

The temperature coefficients above only apply in the range: $15 \geq T \geq 25$ (°C)

Winding wire is a core product in everyday products and modern infrastructure, and we offer a complete range of copper and aluminium wire for all kinds of applications.

PRODUCT RANGE
ROUND ENAMELLED COPPER WIRE




	DAMID 180	DAMID 200	DAMID 220	DAMID 240
Class	180	200	220	240
Standard	IEC 60317-8	IEC 60317-13	IEC 60317-57	IEC 60317-46
Insulation	THEIC-modified esterimide	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide	Polyamide-imide	Aromatic polyimid
UL approval	E106565 (Isodraht)	E101843 (Dahréntråd) E106565 (Isodraht) E206884 (Slaska)	Not approved	Not approved
Dimension range				
Grade 1	0,150 - 6,00	0,150 - 6,00	0,250 - 2,00	0,500 - 2,00
Grade 2	0,150 - 6,00	0,150 - 6,00	0,250 - 2,00	0,500 - 2,00
Grade 3	-	0,355 - 4,00	-	-
Properties	Suitable for winding in high speed machines Very good resistance to transformer oils Very good resistance to typical solvent Freon resistant Excellent resistance to mechanical stress	High heat resistance Suitable for winding in high speed machines Very good resistance to transformer oils Very good resistance to typical solvent Freon resistant Excellent resistance to mechanical stress	Very good abrasion resistance Excellent heat resistance Suitable for winding in high speed machines	Very high cut-trough temperature Excellent heat resistance Very good mechanical resistance
Temperatue index	≥ 180 °C	≥ 200 °C	≥ 220 °C	≥ 240 °C
Heat shock	≥ 200 °C	≥ 220 °C	≥ 240 °C	≥ 260 °C
Solder temperature	-	-	-	-
Cut-through	≥ 320 °C	≥ 320 °C	≥ 350 °C	≥ 450 °C
Reels and packaging	www.lww.se			

PRODUCT RANGE
ROUND ENAMELLED COPPER WIRE




	DASOL 155	DASOL 180	DAMIDSOL 180	DAMID SL 200
Class	155	180	180	200
Standard	IEC 60317-20	IEC 60317-51	IEC 60317-23	IEC 60317-13
Insulation	Polyurethane	Polyurethane	Modified esterimide	THEIC-modified polyester or polyesterimide, over-coated with polyamide-imide (selflubricated)
UL approval	E206884 (Slaska)	E101843 (Dahréntråd) E106565 (Isodraht) E206884 (Slaska)	E106565 (Isodraht)	Not approved
Dimension range				
Grade 1	0,180 - 0,750	0,200 - 2,00	0,150 - 1,50	0,150 - 2,50
Grade 2	0,180 - 0,750	0,200 - 2,00	0,150 - 1,50	0,150 - 2,50
Grade 3	-	-	-	-
Properties	Very good mechanical resistance Suitable in high speed winding machines Directly solderable	Suitable in high speed winding machines Directly solderable Very short soldertime Excellent mechanical resistance	Very good hairline crack avoidance Solderable at 470 °C	High heat resistance Suitable for winding in high speed machines Very good resistance to transformer oils Very good resistance to typical solvent Freon resistant Excellent resistance to mechanical stress
Temperatue index	≥ 155 °C	≥ 180 °C	≥ 180 °C	≥ 200 °C
Heat shock	≥ 175 °C	≥ 200 °C	≥ 200 °C	≥ 220 °C
Solder temperature	≥ 375 °C	≥ 375 °C	≥ 470 °C	-
Cut-through	≥ 200 °C	≥ 230 °C	≥ 265 °C	≥ 320 °C
Reels and packaging	www.lww.se			

PRODUCT RANGE
ROUND ENAMELLED COPPER WIRE



	DAMID CR 200	DAPREST 200	DAMIDBOND 200
Class	200	200	200
Standard	IEC 60317-13	IEC 60317-13 + internal LWW	IEC 60317-38
Insulation	THEIC-modified polyesterimide, overcoated with polyamide-imide	THEIC-modified polyesterimide, overcoated with polyamide-imide	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide, with a bonding layer
UL approval	E101843 (Dahréntråd) E206884 (Slaska)	Not approved	E101843 (Dahréntråd) E106565 (Isodraht)
Dimension range			
Grade 1	0,315 - 2,00	0,630 - 2,00	0,200 - 1,50
Grade 2	0,315 - 2,00	0,630 - 2,00	0,200 - 1,50
Grade 3	0,315 - 2,00	-	-
Properties	Excellent corona effect resistance High cut-through temperature Very good heat resistance Very good mechanical resistance	Excellent corona effect resistance Very good heat resistance High cut-through temperature	High heat resistance Suitable for winding in high speed machines Very good resistance to transformer oils Very good resistance to typical solvent Freon resistant Excellent resistance to mechanical stress Bondable at 180°C-220°C High re-softening temperature
Temperatue index	≥ 200 °C	≥ 200 °C	≥ 200 °C
Heat shock	≥ 220 °C	≥ 220 °C	≥ 220 °C
Solder temperature	-	-	-
Cut-through	≥ 320 °C	≥ 340 °C	≥ 320 °C
Reels and packaging	www.lww.se		

TECHNICAL DATA, COPPER WIRE
DAMID, DASOL, DAMID SL, DAMID CR, DAPREST, DAMIDSOL

ACCORDING TO IEC 60317-0-1

		Grade 1		Grade 2		Grade 3					Area	Resistance
Nominal conductor diameter	**Conductor tolerance +/-**	**min increase**	**max overall diameter**	**min increase**	**max overall diameter**	**min increase**	**max overall diameter**	**Length (m/kg) Grade 1**	**Grade 2**	**Grade 3**	**mm² Nominal**	**20°C Ω/m Nominal**
0,150	0,003	0,012	0,171	0,023	0,182	0,033	0,193	6040	5890	5739	0,018	0,967
0,160	0,003	0,012	0,182	0,023	0,194	0,033	0,205	5313	5179	5054	0,020	0,850
0,180	0,003	0,013	0,204	0,025	0,217	0,036	0,229	4204	4102	4006	0,025	0,672
0,200	0,003	0,014	0,226	0,027	0,239	0,039	0,252	3409	3335	3259	0,031	0,544
0,212	0,003	0,015	0,240	0,029	0,254	0,043	0,268	3032	2965	2897	0,035	0,484
0,224	0,003	0,015	0,252	0,029	0,266	0,043	0,280	2722	2665	2608	0,039	0,434
0,236	0,004	0,017	0,267	0,032	0,283	0,048	0,298	2447	2391	2339	0,044	0,391
0,250	0,004	0,017	0,281	0,032	0,297	0,048	0,312	2186	2139	2095	0,049	0,348
0,265	0,004	0,018	0,297	0,033	0,314	0,050	0,330	1948	1906	1866	0,055	0,310
0,280	0,004	0,018	0,312	0,033	0,329	0,050	0,345	1748	1713	1679	0,062	0,278
0,300	0,004	0,019	0,334	0,035	0,352	0,053	0,36	1524	1493	1479	0,071	0,242
0,315	0,004	0,019	0,349	0,035	0,367	0,053	0,384	1384	1358	1333	0,078	0,219
0,335	0,004	0,020	0,372	0,038	0,391	0,057	0,408	1223	1200	1179	0,088	0,194
0,355	0,004	0,020	0,392	0,038	0,411	0,057	0,428	1091	1072	1054	0,099	0,173
0,375	0,005	0,021	0,414	0,040	0,434	0,060	0,453	978	961	944	0,110	0,155
0,400	0,005	0,021	0,439	0,040	0,459	0,060	0,478	861	847	834	0,126	0,136
0,425	0,005	0,022	0,466	0,042	0,488	0,064	0,508	763	750	738	0,142	0,120
0,450	0,005	0,022	0,491	0,042	0,513	0,064	0,533	682	671	661	0,159	0,107
0,475	0,005	0,024	0,519	0,045	0,541	0,067	0,562	612	603	594	0,177	0,096
0,500	0,005	0,024	0,544	0,045	0,566	0,067	0,587	553	545	537	0,196	0,087
0,530	0,006	0,025	0,576	0,047	0,600	0,071	0,623	492	485	478	0,221	0,077
0,560	0,006	0,025	0,606	0,047	0,630	0,071	0,653	442	436	430	0,246	0,069
0,600	0,006	0,027	0,649	0,050	0,674	0,075	0,698	385	380	375	0,283	0,060
0,630	0,006	0,027	0,679	0,050	0,704	0,075	0,728	350	345	341	0,312	0,055
0,650	0,007	0,028	0,702	0,053	0,729	0,080	0,751	328	324	320	0,332	0,052
0,670	0,007	0,028	0,722	0,053	0,749	0,080	0,774	309	305	301	0,353	0,048
0,710	0,007	0,028	0,762	0,053	0,789	0,080	0,814	276	272	269	0,396	0,043
0,750	0,008	0,030	0,805	0,056	0,834	0,085	0,861	247	244	241	0,442	0,039
0,800	0,008	0,030	0,855	0,056	0,884	0,085	0,911	217	215	212	0,503	0,034
0,850	0,009	0,032	0,909	0,060	0,939	0,090	0,968	193	190	188	0,567	0,030
0,900	0,009	0,032	0,959	0,060	0,989	0,090	1,018	172	170	168	0,636	0,027
0,950	0,010	0,034	1,012	0,063	1,044	0,095	1,074	154	153	151	0,709	0,024
1,000	0,010	0,034	1,062	0,063	1,094	0,095	1,124	139	138	137	0,785	0,022
1,060	0,011	0,034	1,124	0,065	1,157	0,098	1,188	124	123	122	0,882	0,019
1,120	0,011	0,034	1,184	0,065	1,217	0,098	1,248	111	110	109	0,985	0,017
1,180	0,012	0,035	1,246	0,067	1,279	0,100	1,311	100	99	99	1,094	0,016
1,250	0,013	0,035	1,316	0,067	1,349	0,100	1,381	89	89	88	1,227	0,014
1,320	0,013	0,036	1,388	0,069	1,422	0,103	1,455	80	80	79	1,368	0,012
1,400	0,014	0,036	1,468	0,069	1,502	0,103	1,535	71	71	70	1,539	0,011
1,500	0,015	0,038	1,570	0,071	1,606	0,107	1,640	62	62	61	1,767	0,010
1,600	0,016	0,038	1,670	0,071	1,706	0,107	1,740	55	54	54	2,011	0,009
1,700	0,017	0,039	1,772	0,073	1,809	0,110	1,844	49	48	48	2,270	0,008
1,800	0,018	0,039	1,872	0,073	1,909	0,110	1,944	43	43	43	2,545	0,007
1,900	0,019	0,040	1,974	0,075	2,012	0,113	2,048	39	39	38	2,835	0,006
2,000	0,020	0,040	2,074	0,075	2,112	0,113	2,148	35	35	35	3,142	0,005
2,120	0,021	0,041	2,196	0,077	2,235	0,116	2,272	31	31	31	3,530	0,005
2,240	0,022	0,041	2,316	0,077	2,355	0,116	2,392	28	28	28	3,941	0,004
2,360	0,024	0,042	2,438	0,079	2,478	0,119	2,516	25	25	25	4,374	0,004
2,500	0,025	0,042	2,578	0,079	2,618	0,119	2,656	23	22	22	4,909	0,003
2,650	0,027	0,043	2,730	0,081	2,772	0,123	2,811	20	20	20	5,515	0,003
2,800	0,028	0,043	2,880	0,081	2,922	0,123	2,961	18,0	17,9	17,8	6,158	0,003
3,000	0,030	0,045	3,083	0,084	3,126	0,127	3,166	15,7	15,6	15,5	7,069	0,002
3,150	0,032	0,045	3,233	0,084	3,276	0,127	3,316	14,2	14,2	14,1	7,793	0,002
3,350	0,034	0,046	3,435	0,086	3,479	0,130	3,521	12,6	12,5	12,5	8,814	0,002
3,550	0,036	0,046	3,635	0,086	3,679	0,130	3,721	11,2	11,2	11,1	9,898	0,002
3,750	0,038	0,047	3,838	0,089	3,883	0,134	3,926	10,0	10,0	10,0	11,04	0,002
4,000	0,040	0,047	4,088	0,089	4,133	0,134	4,176	8,8	8,8	8,8	12,57	0,001
4,250	0,043	0,049	4,341	0,092	4,387	0,138	4,431	7,8	7,8	7,8	14,19	0,001
4,500	0,045	0,049	4,591	0,092	4,637	0,138	4,681	7,0	7,0	6,9	15,90	0,001
4,750	0,048	0,050	4,843	0,094	4,891	0,142	4,936	6,3	6,2	6,2	17,72	0,001
5,000	0,050	0,050	5,093	0,094	5,141	0,142	5,186	5,7	5,6	5,6	19,63	0,001

The technical data included is up to date at the time of printing.
LWW reserve the right to make any amendments deemed necessary

TECHNICAL DATA, COPPER WIRE
DAMIDBOND
ACCORDING TO IEC 60317-0-1

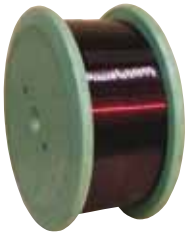
Nominal conductor diameter	Conductor tolerance +/-	min increase bonding	Grade 1B min increase	Grade 1B max overall diameter	Grade 2B min increase	Grade 2B max overall diameter	Length (m/kg) Grade 1B	Length (m/kg) Grade 2B	Area mm² Nominal	Resistance, 20°C, Ω/m Nominal
0,200	0,003	0,011	0,014	0,243	0,027	0,256	3311	3236	0,031	0,544
0,212	0,003	0,012	0,015	0,258	0,029	0,272	2945	2877	0,035	0,484
0,224	0,003	0,012	0,015	0,270	0,029	0,284	2649	2591	0,039	0,434
0,236	0,004	0,013	0,017	0,286	0,032	0,302	2381	2324	0,044	0,391
0,250	0,004	0,013	0,017	0,300	0,032	0,316	2130	2083	0,049	0,348
0,265	0,004	0,013	0,018	0,316	0,033	0,333	1901	1859	0,055	0,310
0,280	0,004	0,013	0,018	0,331	0,033	0,348	1709	1673	0,062	0,278
0,300	0,004	0,014	0,019	0,354	0,035	0,372	1490	1459	0,071	0,242
0,315	0,004	0,014	0,019	0,369	0,035	0,387	1355	1329	0,078	0,219
0,335	0,004	0,015	0,020	0,393	0,038	0,412	1197	1174	0,088	0,194
0,355	0,004	0,015	0,020	0,413	0,038	0,432	1070	1050	0,099	0,173
0,375	0,005	0,016	0,021	0,436	0,040	0,456	959	942	0,110	0,155
0,400	0,005	0,016	0,021	0,461	0,040	0,481	846	831	0,126	0,136
0,425	0,005	0,016	0,022	0,489	0,042	0,511	750	737	0,142	0,120
0,450	0,005	0,016	0,022	0,514	0,042	0,536	671	660	0,159	0,107
0,475	0,005	0,017	0,024	0,543	0,045	0,565	602	592	0,177	0,096
0,500	0,005	0,017	0,024	0,568	0,045	0,590	544	536	0,196	0,087
0,530	0,006	0,017	0,025	0,600	0,047	0,624	485	478	0,221	0,077
0,560	0,006	0,017	0,025	0,630	0,047	0,654	436	429	0,246	0,069
0,600	0,006	0,018	0,027	0,674	0,050	0,699	380	374	0,283	0,060
0,630	0,006	0,018	0,027	0,704	0,050	0,729	345	340	0,312	0,055
0,650	0,007	0,018	0,028	0,728	0,053	0,755	324	319	0,332	0,052
0,670	0,007	0,019	0,028	0,748	0,053	0,775	305	301	0,353	0,048
0,710	0,007	0,019	0,028	0,788	0,053	0,815	272	269	0,396	0,043
0,750	0,008	0,020	0,030	0,832	0,056	0,861	244	241	0,442	0,039
0,800	0,008	0,020	0,030	0,882	0,056	0,911	215	212	0,503	0,034
0,850	0,009	0,020	0,032	0,937	0,060	0,967	190	188	0,567	0,030
0,900	0,009	0,020	0,032	0,987	0,060	1,017	170	168	0,636	0,027
0,950	0,010	0,021	0,034	1,041	0,063	1,073	153	151	0,709	0,024
1,000	0,010	0,021	0,034	1,091	0,063	1,123	138	137	0,785	0,022
1,060	0,011	0,022	0,034	1,154	0,065	1,187	123	122	0,882	0,019
1,120	0,011	0,022	0,034	1,214	0,065	1,247	110	109	0,985	0,017
1,180	0,012	0,022	0,035	1,276	0,067	1,309	100	99	1,094	0,016
1,250	0,013	0,022	0,035	1,346	0,067	1,379	89	88	1,227	0,014
1,320	0,013	0,023	0,036	1,419	0,069	1,453	80	79	1,368	0,012
1,400	0,014	0,023	0,036	1,499	0,069	1,533	71	70	1,539	0,011
1,500	0,015	0,023	0,038	1,602	0,071	1,638	62	61	1,767	0,010

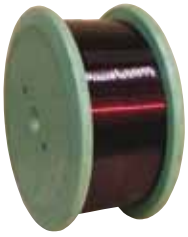
The technical data included is up to date at the time of printing.
LWW reserve the right to make any amendments deemed necessary

PRODUCT RANGE
LITZ COPPER WIRE

	DALITZ (NOMEX LAPPED)
Class	180
Standard	DIN 46 436-1
Insulation	Polyamid-paper
UL approval	E106565 (Isodraht)
Dimension range	Round: 6,00 ≤Ø≤20,00 mm Rectangular: 10-220 mm^2
Properties	High flexibility
Temperatue index	≥180°C
Reels and packaging	www.lww.se

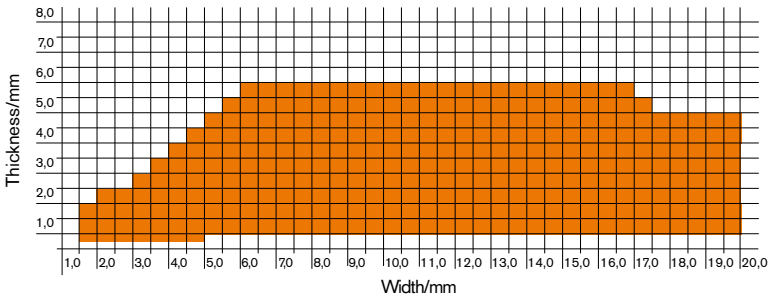
PRODUCT RANGE
RECTANGULAR ENAMELLED COPPER WIRE



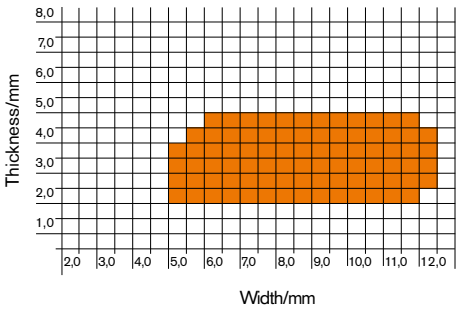


	DAMID 200	DAMIDBOND 200
Class	200	200
Standard	IEC 60317-29	IEC 60317-29 + internal LWW standard
Insulation	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide, with a bonding layer
UL approval	E101843 (Dahréntråd) E106565 (Isodraht)	E101843 (Dahréntråd)
Dimension range	See below	See below
Properties	High heat resistance Very good resistance to transformer oils Very good resistance to typical solvent Freon resistant Excellent resistance to mechanical stress	High heat resistance Very good resistance to transformer oils Very good resistance to typical solvent Bondable at 180°C-220°C High re-softening temperature
Temperature index/°C	≥ 200 °C	≥ 200 °C
Heat shock/°C	≥ 220 °C	≥ 220 °C
Reels and packaging	www.lww.se	

DAMID



DAMIDBOND

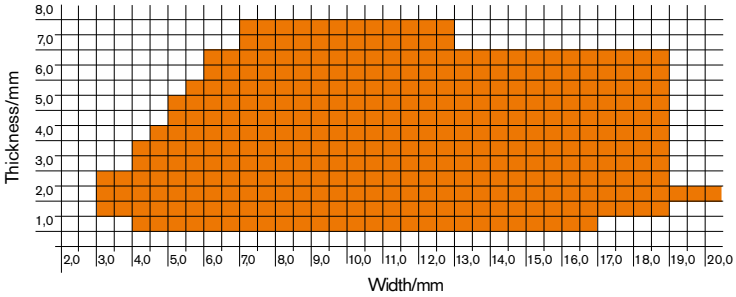


PRODUCT RANGE
RECTANGULAR COVERED COPPER WIRE



	DAFIBRE 155	DAFIBRE 180	DAFIBRE EP 155
Class	155	180	155
Standard	IEC 60317-32	IEC 60317-31	IEC 60317-32 + Internal LWW standard
Insulation	1-3 layers of glassfibre yarn, impregnated with polyurethane varnish	1-3 layers of glassfibre yarn, impregnated with polyester-imide varnish	1-2 layers of glassfibre yarn, impregnated with polyurethane varnish, coated with a layer of semi-cured epoxy
UL approval	Not approved	Not approved	Not approved
Dimension range	See below	See below	See below
Properties	Excellent resistance to mechanical stress	Excellent resistance to mechanical stress	Excellent resistance to mechanical stress B-stage cured epoxy layer allows pre-pressing of windings
Temperatue index	≥ 155 °C	≥ 180 °C	≥ 155 °C
Heat shock	≥ 175 °C	≥ 200 °C	≥ 175 °C
Reels and packaging	www.lww.se		

DAFIBRE, DAFIBRE EPOXY, DAROGLAS



PRODUCT RANGE
RECTANGULAR COVERED COPPER WIRE



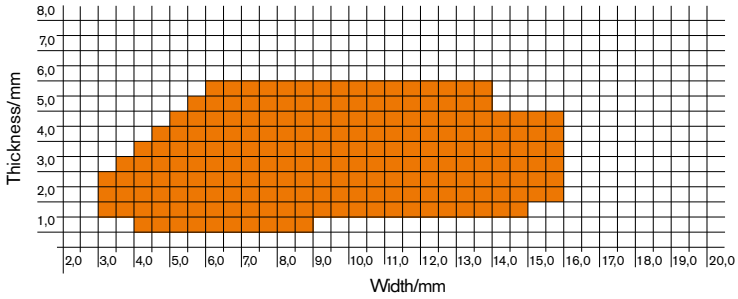
	DAFIBRE EP 180	DAMIDFIBRE 155	DAMIDFIBRE 180
Class	180	155	180
Standard	IEC 60317-31 + Internal LWW standard	IEC 60317-32	IEC 60317-31
Insulation	1-2 layers of glassfibre yarn, impregnated with polyester-imide varnish, coated with a layer of semi-cured epoxy	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide, covered with 1-2 layers of glassfibre yarn, impregnated with polyurethane varnish	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide, covered with 1-2 layers of glassfibre yarn, impregnated with polyester-imide varnish
UL approval	Not approved	Not approved	Not approved
Dimension range	See below	See below	See below
Properties	Excellent resistance to mechanical stress B-stage cured epoxy layer allows pre-pressing of windings	Excellent resistance to mechanical stress Heat resistant	Excellent resistance to mechanical stress Heat resistant
Temperatue index	≥ 180 °C	≥ 155 °C	≥ 180 °C
Heat shock	≥ 200 °C	≥ 175 °C	≥ 200 °C
Reels and packaging	www.lww.se		www.lww.se

PRODUCT RANGE
RECTANGULAR COVERED COPPER WIRE




	DAMIDFIBRE EP 155	DAMIDFIBRE EP 180	DAROGLAS 155	DAMIDOGLAS 155
Class	155	180	155	155
Standard	IEC 60317-32 + Internal LWW standard	IEC 60317-31 + Internal LWW standard	IEC 60317-60	IEC 60317-60
Insulation	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide, covered with 1-2 layers of glassfibre yarn, impregnated with polyurethane varnish, coated with a layer of semi-cured epoxy	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide, covered with 1-2 layers of glassfibre yarn, impregnated with polyester-imide varnish, coated with a layer of semi-cured epoxy	1-2 layers of polyester-glassfibre yarn	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide, covered with 1-2 layers of polyester-glassfibre yarn
UL approval	Not approved	Not approved	Not approved	Not approved
Dimension range	See below	See below	See below	See below
Properties	Excellent resistance to mechanical stress B-stage cured epoxy layer allows pre-pressing of windings	Excellent resistance to mechanical stress B-stage cured epoxy layer allows pre-pressing of windings	Excellent resistance to mechanical stress Very good adhesion to conductor	Excellent resistance to mechanical stress Very good adhesion to conductor
Temperatue index	≥ 155 °C	≥ 180 °C	≥ 155 °C	≥ 155 °C
Heat shock	≥ 175 °C	≥ 200 °C	≥ 155 °C	≥ 155 °C
Reels and packaging				

DAMIDFIBRE, DAMIDOGLAS, DAMIDFIBRE EPOXY

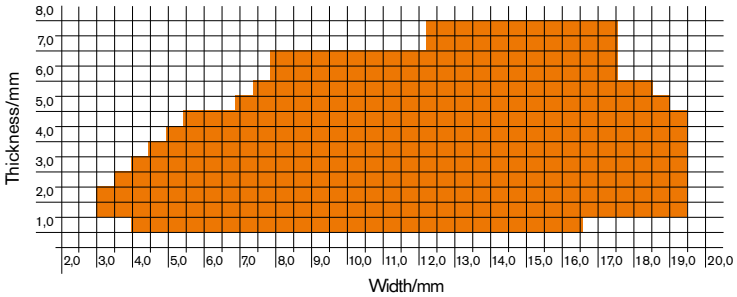


PRODUCT RANGE
RECTANGULAR COVERED COPPER WIRE

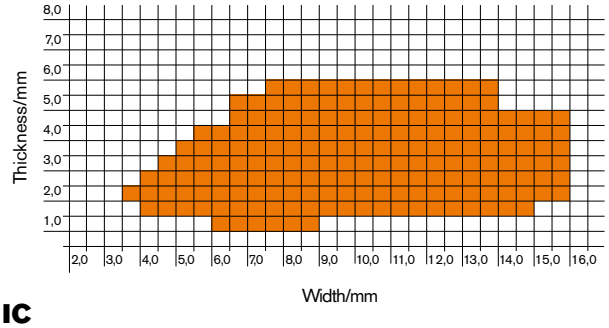



	DAMIC	DAMIDOMIC	DAKAP	DAKAP CR
Class	155	155	240	240
Standard	Internal LWW standard	Internal LWW standard	Internal LWW standard	Internal LWW standard
Insulation	Wrapped with 1-4 layers of mica tape. (Calcined muscovite on PET-carrier impregnated with epoxy)	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide Wrapped with 1-4 layers of mica tape. (Calcined muscovite on PET-carrier impregnated with epoxy)	Wrapped with 1-2 layers of teflon coated polyimide foil (Kapton®). Bonded to conductor by sintering of Teflon coat	Wrapped with 1layer of teflon coated polyimide foil (Kapton CR®). Bonded to conductor by sintering of Teflon coat
UL approval	Not approved	Not approved	Not approved	Not approved
Dimension range	See below	See below	See below	See below
Properties	Very good resistance to partial discharges	Very good resistance to partial discharges	Excellent thermal resistance Excellent resistance to humidity	Outstanding thermal resistance Excellent resistance to humidity Very good resistance to partial discharges
Temperatue index	≥ 155 °C	≥ 155 °C	≥ 240 °C	≥ 240 °C
Heat shock	≥ 155 °C	≥ 155 °C	≥ 260 °C	≥ 260 °C
Reels and packaging	www.lww.se			

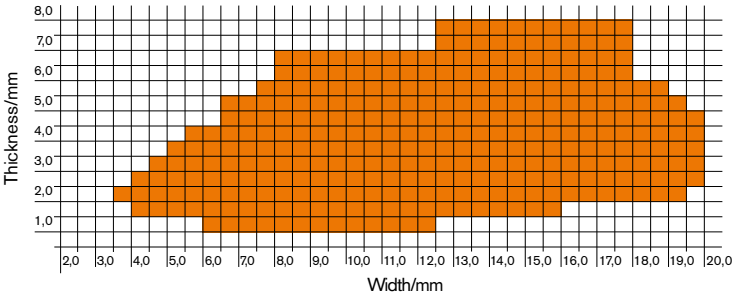
DAKAP, DAKAP CR



DAMIDOMIC



DAMIC



PRODUCT RANGE
ROUND ENAMELLED ALUMINIUM WIRE

DAMID 200 AL

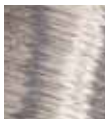
Class	200
Standard	IEC 60317-25
Insulation	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide
UL approval	E101843 (Dahréntråd) E106565 (Isodraht) E206884 (Slaska)
Dimension range/mm	
Grade 1	-
Grade 2	0,375 - 5,00
Grade 3	-
Properties	High heat resistance Suitable in lightweight designs Very good resistance to transformer oils Very good resistance to typical solvent Freon resistant
Temperature index	≥ 200 °C
Heat shock	≥ 220 °C
Cut-through	≥ 320 °C
Reels and packaging	www.lww.se

TECHNICAL DATA, ALUMINIUM WIRE
DAMID

ACCORDING TO IEC 60317-0-3

Nominal conductor diameter	Conductor tolerance +/-	Grade 2 min increase	Grade 2 max overall diameter	Length (m/kg) Grade 2	Area mm² Nominal	Resistance, 20°C, Ω/m Nominal
0,375	0,005	0,040	0,434	2859	0,110	0,253
0,400	0,005	0,040	0,459	2538	0,126	0,222
0,425	0,005	0,042	0,488	2246	0,142	0,197
0,450	0,005	0,042	0,513	2021	0,159	0,175
0,475	0,005	0,045	0,541	1815	0,177	0,157
0,500	0,005	0,045	0,566	1650	0,196	0,142
0,530	0,006	0,047	0,600	1468	0,221	0,126
0,560	0,006	0,047	0,630	1325	0,246	0,113
0,600	0,006	0,050	0,674	1156	0,283	0,099
0,630	0,006	0,050	0,704	1055	0,312	0,089
0,650	0,007	0,053	0,729	987	0,332	0,084
0,670	0,007	0,053	0,749	932	0,353	0,079
0,710	0,007	0,053	0,789	836	0,396	0,070
0,750	0,008	0,056	0,834	748	0,442	0,063
0,800	0,008	0,056	0,884	662	0,503	0,055
0,850	0,009	0,060	0,939	587	0,567	0,049
0,900	0,009	0,060	0,989	527	0,636	0,044
0,950	0,010	0,063	1,044	473	0,709	0,039
1,000	0,010	0,063	1,094	429	0,785	0,036
1,060	0,011	0,065	1,157	382	0,882	0,032
1,120	0,011	0,065	1,217	344	0,985	0,028
1,180	0,012	0,067	1,279	311	1,094	0,026
1,250	0,013	0,067	1,349	279	1,227	0,023
1,320	0,013	0,069	1,422	250	1,368	0,020
1,400	0,014	0,069	1,502	223	1,539	0,018
1,500	0,015	0,071	1,606	195	1,767	0,016
1,600	0,016	0,071	1,706	172	2,011	0,014
1,700	0,017	0,073	1,809	153	2,270	0,012
1,800	0,018	0,073	1,909	137	2,545	0,011
1,900	0,019	0,075	2,012	123	2,835	0,010
2,000	0,020	0,075	2,112	111	3,142	0,009
2,120	0,021	0,077	2,235	99	3,530	0,008
2,240	0,022	0,077	2,355	89	3,941	0,007
2,360	0,024	0,079	2,478	80	4,374	0,006
2,500	0,025	0,079	2,618	72	4,909	0,006
2,650	0,027	0,081	2,772	64	5,515	0,005
2,800	0,028	0,081	2,922	58	6,158	0,005
3,000	0,030	0,084	3,126	50	7,069	0,004
3,150	0,032	0,084	3,276	46	7,793	0,004
3,350	0,034	0,086	3,479	40	8,814	0,003
3,550	0,036	0,086	3,679	36	9,898	0,003
3,750	0,038	0,089	3,883	32	11,04	0,003
4,000	0,040	0,089	4,133	29	12,57	0,002
4,250	0,043	0,092	4,387	25	14,19	0,002
4,500	0,045	0,092	4,637	23	15,90	0,002
4,750	0,048	0,094	4,891	20	17,72	0,002
5,000	0,050	0,094	5,141	18	19,63	0,001

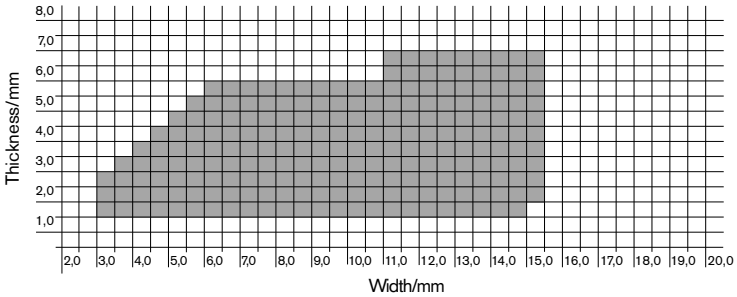
The technical data included is up to date at the time of printing.
LWW reserve the right to make any amendments deemed necessary.



PRODUCT RANGE
RECTANGULAR ENAMELLED ALUMINIUM WIRE

	DAMID 200 AL
Class	200
Standard	Corresponds to IEC 60317-29
Insulation	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide
UL approval	E101843 (Dahréntråd)
Dimension range	See below
Properties	High heat resistance Allows lightweight designs Very good resistance to transformer oil Very good resistance to typical solvent Freon resistant
Temperature index/°C	≥ 200 °C
Heat shock/°C	≥ 220 °C
Reels and packaging	www.lww.se

DAMID AL

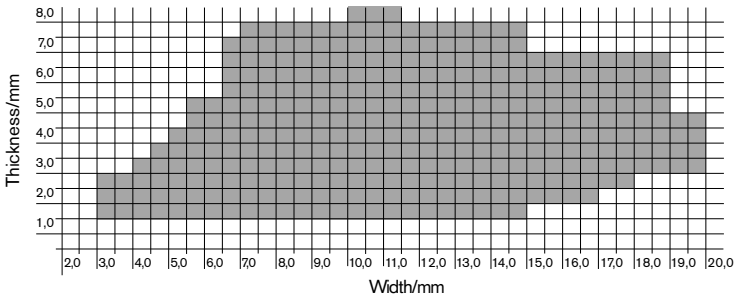


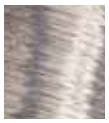
PRODUCT RANGE
RECTANGULAR COVERED ALUMINIUM WIRE




	DAFIBRE 155 AL	DAFIBRE 180 AL	DAFIBRE EP 155 AL	DAFIBRE EP 180 AL
Class	155	180	155	180
Standard	Internal LWW standard	Internal LWW standard	Internal LWW standard	Internal LWW standard
Insulation	1-3 layers of glassfibre yarn, impregnated with polyurethane varnish	1-3 layers of glassfibre yarn, impregnated with polyester-imide varnish	1-2 layers of glassfibre yarn, impregnated with polyurethane varnish, coated with a layer of semi-cured epoxy	1-2 layers of glassfibre yarn, impregnated with polyester-imide varnish, coated with a layer of semi-cured epoxy
UL approval	Not approved	Not approved	Not approved	Not approved
Dimension range	See below	See below	See below	See below
Properties	Excellent resistance to mechanical stress Suitable in lightweight designs	Excellent resistance to mechanical stress Suitable in lightweight designs	Excellent resistance to mechanical stress Suitable in lightweight designs	Excellent resistance to mechanical stress Suitable in lightweight designs
Temperatue index	≥ 155 °C	≥ 180 °C	≥ 155 °C	≥ 180 °C
Heat shock	≥ 175 °C	≥ 200 °C	≥ 175 °C	≥ 200 °C
Reels and packaging	www.lww.se			

DAFIBRE AL



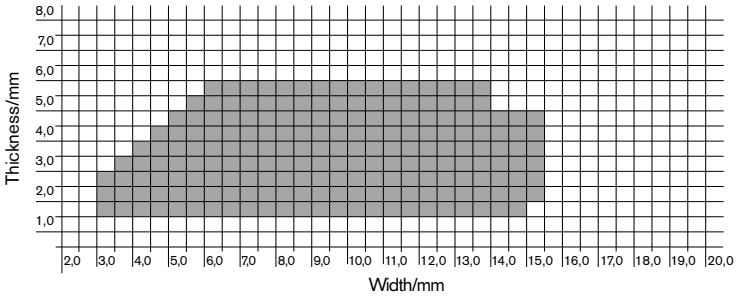


PRODUCT RANGE
RECTANGULAR COVERED ALUMINIUM WIRE



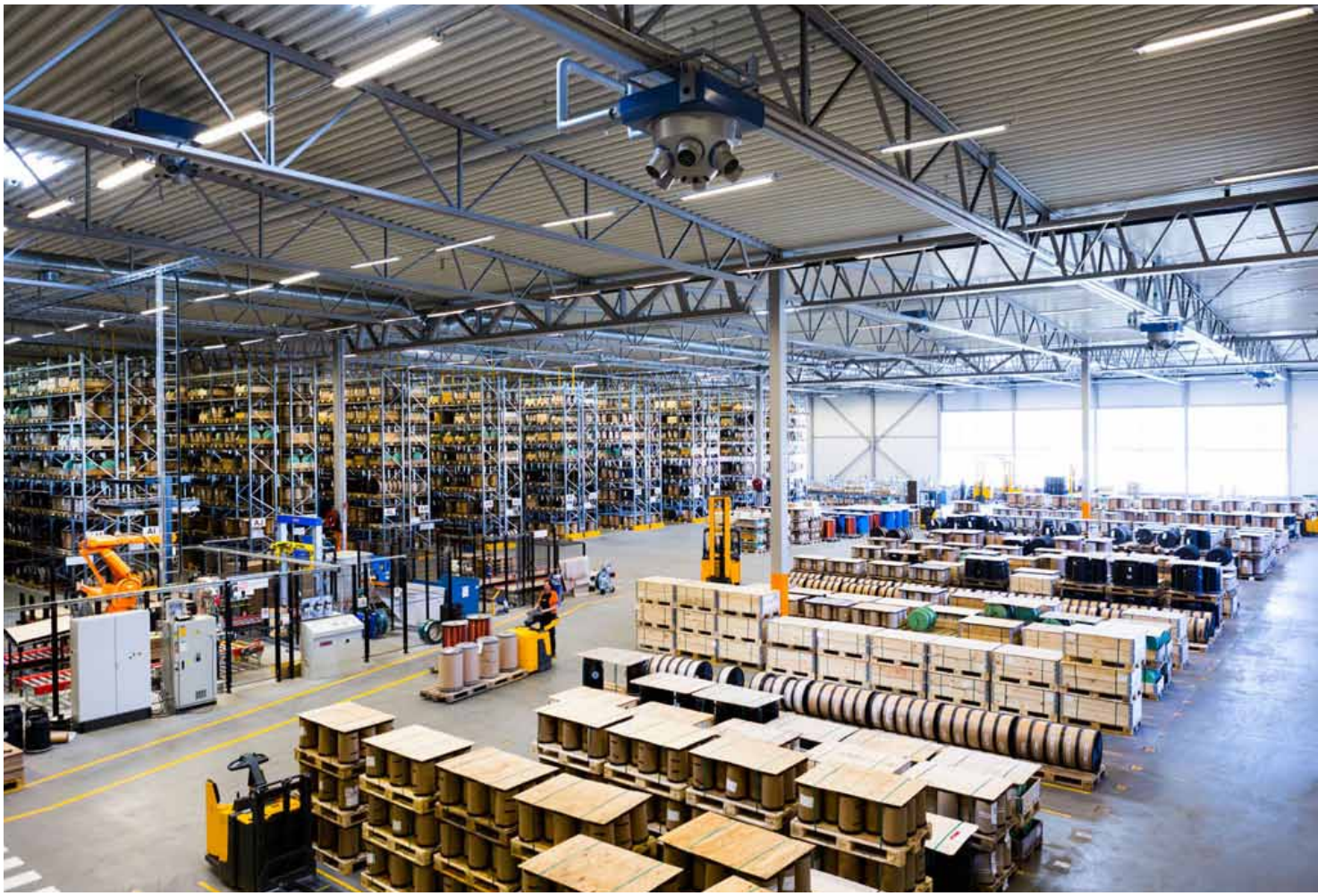

	DAMIDFIBRE 155 AL	DAMIDFIBRE 180 AL	DAMIDFIBRE EP 155 AL	DAMIDFIBRE EP 180 AL
Class	155	180	155	180
Standard	Internal LWW standard	Internal LWW standard	Internal LWW standard	Internal LWW standard
Insulation	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide, covered with 1-2 layers of glassfibre yarn, impregnated with polyurethane varnish	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide, covered with 1-2 layers of glassfibre yarn, impregnated with polyester-imide varnish	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide, covered with 1-2 layers of glassfibre yarn, impregnated with polyurethane varnish, coated with a layer of semi-cured epoxy	THEIC-modified polyester or polyesterimide, overcoated with polyamide-imide, covered with 1-2 layers of glassfibre yarn, impregnated with polyester-imide varnish, coated with a layer of semi-cured epoxy
UL approval	Not approved	Not approved	Not approved	Not approved
Dimension range	See below	See below	See below	See below
Properties	Excellent resistance to mechanical stress Heat resistant	Excellent resistance to mechanical stress Heat resistant	Excellent resistance to mechanical stress Suitable in lightweight designs	Excellent resistance to mechanical stress Suitable in lightweight designs
Temperatue index	≥ 155 °C	≥ 180 °C	≥ 155 °C	≥ 180 °C
Heat shock	≥ 175 °C	≥ 200 °C	≥ 175 °C	≥ 200 °C
Reels and packaging			www.lww.se	

DAMIDFIBRE AL



PRODUCT RANGE
RECTANGULAR COVERED ALUMINIUM WIRE

	DAROGLAS 155 AL	**DAMIDOGLAS 155 AL**
Class	155	155
Standard	Internal LWW standard	Internal LWW standard
Insulation	1-2 layers of polyester-glassfibre yarn	THEIC-modified polyester or polyesterimide, overcoat-ed with polyamide-imide, covered with 1-2 layers of polyester-glassfibre yarn
UL approval	Not approved	Not approved
Dimension range	See below	See below
Properties	Excellent resistance to mechanical stress Very good adhesion to conductor	Excellent resistance to mechanical stress Very good adhesion to conductor
Temperatue index	≥ 155 °C	≥ 155 °C
Heat shock	≥ 175 °C	≥ 175 °C
Reels and packaging	www.lww.se	

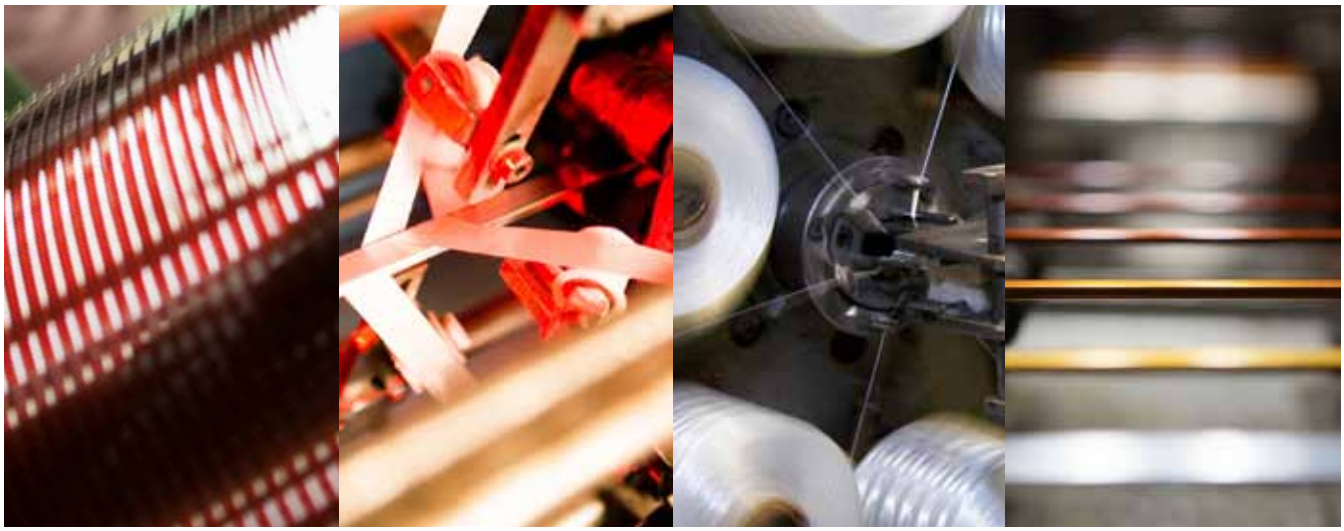


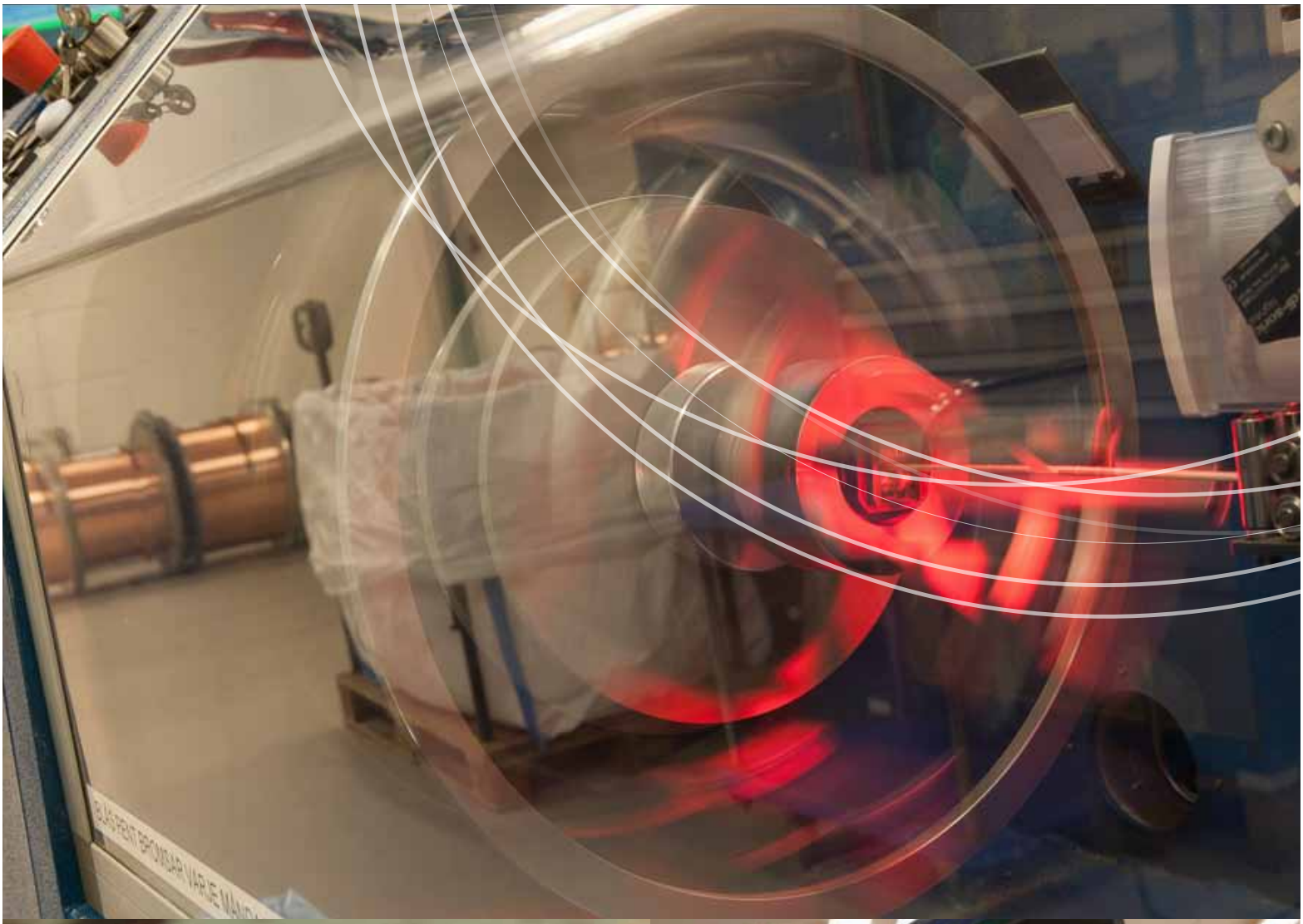
HANDLED WITH CARE

We see packaging as an integrated part of the manufacturing process to secure that the wire arrives in perfect condition to your production line. That's why we have developed a range of tailor-made heavy-duty packaging for transport on EUR-pallets. The packaging is also a part of our environmental system; all packaging are recycled and returned to our production units after use.

OVERVIEW
RECTANGULAR PRODUCTS

	Process insulation material class / Conductor	Enamelling PE(I) + PAI 200	Glass lapping Glass yarn 155/180	Mixed yarn lapping Glass-Polyester 155	Epoxy impregnation Epoxy 155	Tape wrapping PET/Mica 155	Tape wrapping Kapton® (CR) 240
Copper	**Bare Cu Conductor**		**DAFIBRE** 155/180	**DAROGLAS**	**DAFIBRE EP**	**DAMIC**	**DAKAP(CR)**
Cu + Enamel		**DAMID**	**DAMIDFIBRE** 155/180	**DAMIDOGLAS**	**DAMIDFIBRE EP** **DAMIDOGLAS EP**	**DAMIDOMIC**	
Aluminium	**Bare Al Conductor**		**DAFIBRE Al** 155/180	**DAROGLAS Al**	**DAFIBRE Al EP**		**DAKAP Al**
Al + Enamel		**DAMID Al**	**DAMIDFIBRE Al** 155/180	**DAMIDOGLAS Al**	**DAMIDFIBRE Al EP**		
		Grade 2 enamelling available	1-3 layers of glass available	1-2 layers of mixed yarn available	Additional layer of B-staged epoxy	1 PET + 1 Mica or 2-4 layers of Mica butt-lapped	1 or 2 tapes of Kapton® (CR) with different overlap-pings





We are proud to live up to high expectations for quality, properties and precision – today and tomorrow.

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Ever since the early days of electricity Liljedahl Winding Wire has been partner to the electronics industry. Today we are a main global supplier with a complete range of high quality wire in copper and aluminium. You will find our wire in a wide range of applications; from computers and kitchen aids to trains and wind power turbines.

Liljedahl Winding Wire