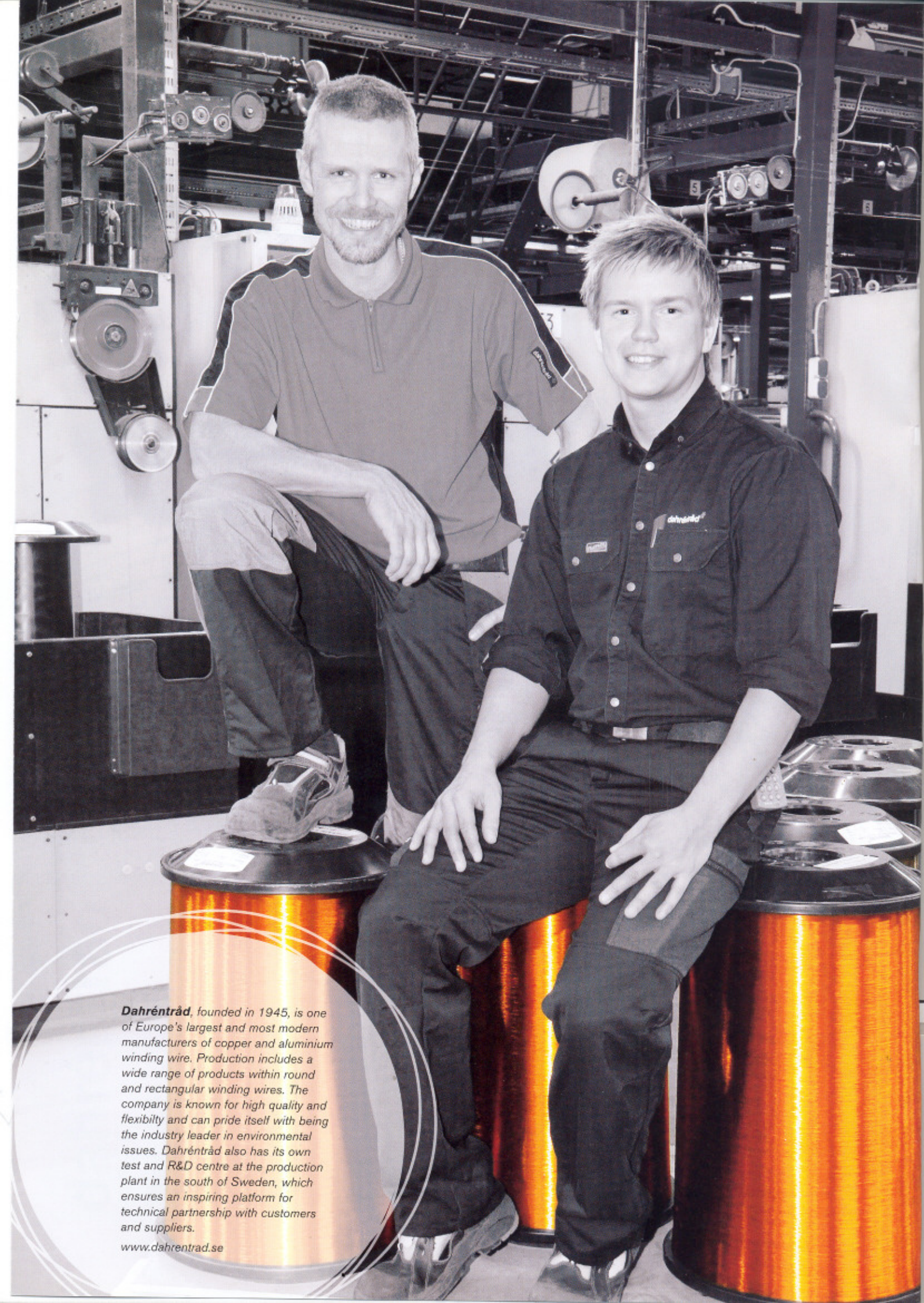
TECHNICAL DATA FOR WINDING WIRE

dahréntråd



***Dahréntråd**, founded in 1945, is one of Europe's largest and most modern manufacturers of copper and aluminium winding wire. Production includes a wide range of products within round and rectangular winding wires. The company is known for high quality and flexibilty and can pride itself with being the industry leader in environmental issues. Dahréntråd also has its own test and R&D centre at the production plant in the south of Sweden, which ensures an inspiring platform for technical partnership with customers and suppliers.*

www.dahrentrad.se

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 Dahréntråd. 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 m

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 μ m or, more clearly, mm^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.

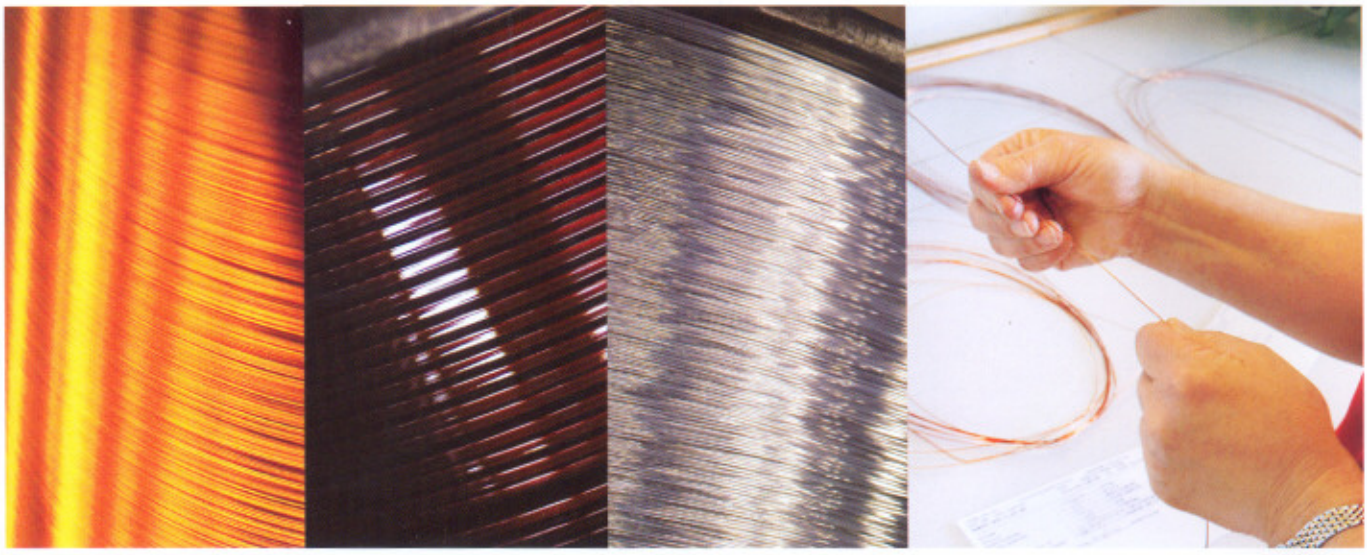
MAXIMUM RECOMMENDED WIRE TENSION

Automated take-up of winding wire to the winding process involves mechanical stresses that may affect the quality. A critical limit known as the recommended maximum wire tension is therefore specified. If this limit is exceeded, there is a risk of elongation, wear of the enamel and clogging of braking eyes. The wire brake should therefore be adjusted so that the recommended maximum tension is not exceeded.

FILL FACTOR

The fill factor is a term for the number of conductors that will theoretically fit into a given cross-section with optimal geometrical distribution, calculated for nominal conductor diameter and enamel dimensions.

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 49-90; EN13601 Cu-ETP
Resistivity (ρ_{Cu}):	0,01709 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:	ASTM B 233; DIN 1712
Resistivity (ρ_{Al}):	0,02789 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)

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

Conductor diameter and tolerances			Cross section	Resistance/length, 20°C			Wire tension
	mm		mm²	/m			N
nominal	min	max	nominal	nominal	min	max	max
0,200	0,197	0,203	0,03146	0,5441	0,5237	0,5657	2,67
0,212	0,209	0,215	0,03530	0,4843	0,4667	0,5026	2,98
0,224	0,221	0,227	0,03941	0,4338	0,4188	0,4495	3,28
0,236	0,232	0,240	0,04374	0,3908	0,3747	0,4076	3,61
0,250	0,246	0,254	0,04909	0,3482	0,3345	0,3628	4,02
0,265	0,261	0,269	0,05516	0,3099	0,2982	0,3223	4,46
0,280	0,276	0,284	0,06158	0,2776	0,2676	0,2882	4,95
0,300	0,296	0,304	0,07069	0,2418	0,2335	0,2506	5,54
0,315	0,311	0,319	0,07793	0,2193	0,2121	0,2270	6,05
0,335	0,331	0,339	0,08814	0,1939	0,1878	0,2004	6,80
0,355	0,351	0,359	0,09898	0,1727	0,1674	0,1782	7,49
0,375	0,370	0,380	0,1104	0,1548	0,1494	0,1604	8,30
0,400	0,395	0,405	0,1257	0,1360	0,1316	0,1407	9,28
0,425	0,420	0,430	0,1419	0,1205	0,1167	0,1244	10,2
0,450	0,445	0,455	0,1590	0,1075	0,1042	0,1109	11,4
0,475	0,470	0,480	0,1772	0,09646	0,09366	0,09938	12,3
0,500	0,495	0,505	0,1963	0,08706	0,08462	0,08959	13,7
0,530	0,524	0,536	0,2206	0,07748	0,07512	0,07995	15,4
0,560	0,554	0,566	0,2463	0,06940	0,06736	0,07153	16,4
0,600	0,594	0,606	0,2827	0,06046	0,05876	0,06222	18,9
0,630	0,624	0,636	0,3117	0,05484	0,05335	0,05638	20,6
0,650	0,643	0,657	0,3318	0,05151	0,04999	0,05310	21,8
0,670	0,663	0,677	0,3526	0,04848	0,04708	0,04994	23,1
0,710	0,703	0,717	0,3959	0,04318	0,04198	0,04442	25,3
0,750	0,742	0,758	0,4418	0,03869	0,03756	0,03987	27,8
0,800	0,792	0,808	0,5027	0,03401	0,03305	0,03500	31,1
0,850	0,841	0,859	0,5674	0,03012	0,02925	0,03104	34,5
0,900	0,891	0,909	0,6362	0,02687	0,02612	0,02765	38,1
0,950	0,940	0,960	0,7088	0,02412	0,02342	0,02484	41,7
1,000	0,990	1,010	0,7854	0,02176	0,02116	0,02240	45,4
1,060	1,049	1,071	0,8825	0,01937	0,01881	0,01995	50,2
1,120	1,109	1,131	0,9852	0,01735	0,01687	0,01785	54,9
1,180	1,168	1,192	1,094	0,01563	0,01519	0,01609	60,3
1,250	1,237	1,263	1,227	0,01393	0,01353	0,01435	66,7
1,320	1,307	1,333	1,368	0,01249	0,01215	0,01285	73,1
1,400	1,386	1,414	1,539	0,01110	0,01079	0,01143	80,6
1,500	1,485	1,515	1,767	0,009673	0,00940	0,00995	90,2
1,600	1,584	1,616	2,010	0,008502	0,00826	0,00875	100
1,700	1,683	1,717	2,270	0,007531	0,00732	0,00775	110
1,800	1,782	1,818	2,545	0,006718	0,00653	0,00691	122
1,900	1,881	1,919	2,835	0,006029	0,00586	0,00620	132
2,000	1,980	2,020	3,142	0,005441	0,00529	0,00560	145
2,120	2,099	2,141	3,530	0,004843	0,00471	0,00498	163
2,240	2,218	2,262	3,941	0,004338	0,00422	0,00446	181
2,360	2,336	2,384	4,374	0,003908	0,00380	0,00402	197
2,500	2,475	2,525	4,909	0,003482	0,00338	0,00358	216
2,650	2,663	2,677	5,515	0,003099	0,00301	0,00319	245
2,800	2,772	2,828	6,158	0,002776	0,00270	0,00286	270
3,000	2,970	3,030	7,069	0,002418	0,00235	0,00249	292
3,150	3,118	3,182	7,793	0,002193	0,00213	0,00226	325
3,350	3,316	3,384	8,814	0,001939	0,00188	0,00200	363
3,550	3,514	3,586	9,898	0,001727	0,00168	0,00178	384
3,750	3,712	3,788	11,04	0,001548	0,00150	0,00159	432
4,000	3,960	4,040	12,57	0,001360	0,00132	0,00140	492
4,250	4,207	4,293	14,19	0,001205	0,00117	0,00124	555
4,500	4,455	4,545	15,90	0,001075	0,00104	0,00111	608
4,750	4,702	4,798	17,72	0,0009646	0,00094	0,00099	667
5,000	4,950	5,050	19,63	0,0008706	0,00085	0,00090	736

PRODUCT RANGE
COPPER WINDING WIRE, ROUND

	DAMID	DAMID PE	DASOL
Class	200	200	155
Standard	IEC 60317-13 NEMA MW 35-C	IEC 60317-13 NEMA MW 35-C	IEC 60317-20 NEMA MW 79-C
Insulation	THEIC-modified polyester imide overcoated with polyamide-imide	THEIC-modified polyester overcoated with polyamide-imide	Modified polyurethane
UL approval	E101843,MW35-C	E101843,MW35-C	E101843,MW79-C
Dimension range/mm			
Grade 1	0,20 ≤ Ø > 0,71	0,71 ≤ Ø ≤ 0,95	0,20 ≤ Ø ≤ 2,00
Grade 2	0,20 ≤ Ø > 0,71	0,71 ≤ Ø ≤ 5,00	On request
Properties	Heat-resistant Resistant to transformer oil Resistant to mechanical stress Resistant to impregnating agents Freon-resistant	Heat-resistant Resistant to transformer oil Resistant to mechanical stress Resistant to impregnating agents Freon-resistant	Directly solderable Short solder time
Temperature index/°C	≥ 200	≥ 200	≥ 155
Heat shock 1xø/°C	≥ 220	≥ 220	≥ 175
Solder temperature/°C	-	-	≥ 375
Cut-through/°C	≥ 340	≥ 340	≥ 220
Field of application	Automotive applications Oil-filled transformers Dry transformers Small transformers Generators Electric motors Chokes for fluorescent tubes Coils	Oil-filled transformers Dry transformers Small transformers Current meters Generators Chokes for fluorescent tubes Coils	Small transformers Solenoids Relays Coils Inductors Components with automatic soldering

TECHNICAL DATA
DAMID, DAMID PE AND DASOL
ACCORDING TO IEC 60317-0-1

Conductor diameter	Grade 1		Grade 2		Fill factor		Length	
mm	mm		mm		number of conductors/cm²		m/kg	
nominal	min increase due to ins.	min overall diameter	min increase due to ins.	max overall diameter	Grade 1	Grade 2	Grade 1	Grade 2
0,200	0,014	0,226	0,027	0,239	2251	2012	3354	3247
0,212	0,015	0,240	0,029	0,254	1996	1784	2990	2900
0,224	0,015	0,252	0,029	0,266	1813	1623	2682	2600
0,236	0,017	0,267	0,032	0,283	1615	1434	2419	2354
0,250	0,017	0,281	0,032	0,297	1455	1303	2188	2137
0,265	0,018	0,297	0,033	0,314	1303	1165	1949	1906
0,280	0,018	0,312	0,033	0,329	1180	1060	1750	1713
0,300	0,019	0,334	0,035	0,352	1029	927	1524	1493
0,315	0,019	0,349	0,035	0,367	943	852	1385	1358
0,335	0,020	0,372	0,038	0,391	830	752	1224	1200
0,355	0,020	0,392	0,038	0,411	748	679	1093	1072
0,375	0,021	0,414	0,040	0,434	669	608	979	961
0,400	0,021	0,439	0,040	0,459	594	544	862	846
0,425	0,022	0,466	0,042	0,488	528	481	765	748
0,450	0,022	0,491	0,042	0,513	477	434	683	670
0,475	0,024	0,519	0,045	0,541	426	391	613	602
0,500	0,024	0,544	0,045	0,566	387	357	553	544
0,530	0,025	0,576	0,047	0,600	346	318	493	484
0,560	0,025	0,606	0,047	0,630	312	289	442	435
0,600	0,027	0,649	0,050	0,674	271	252	385	379
0,630	0,027	0,679	0,050	0,704	247	230	350	345
0,650	0,028	0,702	0,053	0,729	232	215	328	324
0,670	0,028	0,722	0,053	0,749	219	204	309	305
0,710	0,028	0,762	0,053	0,789	197	183	276	273
0,750	0,030	0,805	0,056	0,834	176	164	247	244
0,800	0,030	0,855	0,056	0,884	155	146	218	215
0,850	0,032	0,909	0,060	0,939	137	128	193	191
0,900	0,032	0,959	0,060	0,989	124	116	172	170
0,950	0,034	1,012	0,063	1,044	110	104	154	153
1,000	0,034	1,062	0,063	1,094	100	95	140	138
1,060	0,034	1,124	0,065	1,157	89	84	124	123
1,120	0,034	1,184	0,065	1,217	80	76	111	110
1,180	0,035	1,246	0,067	1,279	73	69	100	100
1,250	0,035	1,316	0,067	1,349	65	62	90	89
1,320	0,036	1,388	0,069	1,422	59	56	80	80
1,400	0,036	1,468	0,069	1,502	52	50	72	71
1,500	0,038	1,570	0,071	1,606	45	43	62	62
1,600	0,038	1,670	0,071	1,706	40	38		54
1,700	0,039	1,772	0,073	1,809	36	34		48
1,800	0,039	1,872	0,073	1,909	32	30		43
1,900	0,040	1,974	0,075	2,012	29	27		39
2,000	0,040	2,074	0,075	2,112	26	25		35
2,120	0,041	2,196	0,077	2,235	23	22		31
2,240	0,041	2,316	0,077	2,355	20	19		28
2,360	0,042	2,438	0,079	2,478	19	18		25
2,500	0,042	2,578	0,079	2,618	16	16		22
2,650	0,043	2,730	0,081	2,772	15	14		20
2,800	0,043	2,880	0,081	2,922	13	13		18
3,000	0,045	3,083	0,084	3,126	11	11		16
3,150	0,045	3,233	0,084	3,276	10	10		14
3,350	0,046	3,435	0,086	3,479	9	9		13
3,550	0,046	3,635	0,086	3,679	8	8		11,2
3,750	0,047	3,838	0,089	3,883	7	7		10,0
4,000	0,047	4,088	0,089	4,133	6	6		8,8
4,250	0,049	4,341	0,092	4,387	5	5		7,8
4,500	0,049	4,591	0,092	4,637	5	5		7,0
4,750	0,050	4,843	0,094	4,891	4	4		6,3
5,000	0,050	5,093	0,094	5,141	4	4		5,7

PRODUCT RANGE
COPPER WINDING WIRE, ROUND

DAMIDBOND

Class	200
Standard	IEC 60317-38 NEMA MW 102-C
UL approval	E101843, MW102-C
Insulation	THEIC-modified polyester imide, overcoated with polyamid-imide with a bonding layer
Dimension range/mm	
Grade 1B	0,20 ≤ Ø ≤ 1,50
Grade 2B	0,20 ≤ Ø ≤ 1,50

Properties	Can be baked with hot air or electric resistance heating at 180 °C - 200 °C High re-softening temperature
Temperature index/°C	≥ 200
Heat shock 1xø/°C	≥ 220
Cut-through	≥ 340
Field of application	Electric motors Solenoids Relay coils Automatic bonding

TECHNICAL DATA
DAMIDBOND
ACCORDING TO IEC 60317-0-1

Conductor-diameter	Dimensions for Grade 1B			Dimensions for Grade 2B		Fill factor		Length	
mm	mm			mm		number of conductors/cm²		m/kg	
nominal	min increase due to ins.	max overall diameter	min increase bonding layer	min increase due to ins.	max overall diameter	Grade 1B	Grade 2B	Grade 1B	Grade 2B
0,200	0,025	0,243	0,011	0,038	0,256	1952	1755	3289	3189
0,212	0,027	0,258	0,012	0,041	0,272	1729	1556	2941	2858
0,224	0,027	0,270	0,012	0,041	0,284	1577	1427	2646	2575
0,236	0,030	0,286	0,013	0,045	0,302	1406	1262	2393	2332
0,250	0,030	0,300	0,013	0,045	0,316	1276	1151	2141	2090
0,265	0,031	0,316	0,013	0,046	0,333	1151	1036	1909	1866
0,280	0,031	0,331	0,013	0,046	0,348	1049	948	1716	1680
0,300	0,033	0,354	0,014	0,049	0,372	917	830	1495	1463
0,315	0,033	0,369	0,015	0,049	0,387	843	767	1360	1332
0,335	0,035	0,393	0,015	0,053	0,412	742	733	1202	1177
0,355	0,035	0,413	0,015	0,053	0,432	673	615	1074	1053
0,375	0,037	0,436	0,016	0,056	0,456	603	552	962	943
0,400	0,037	0,461	0,016	0,056	0,481	540	494	848	831
0,425	0,038	0,489	0,016	0,058	0,511	478	438	753	736
0,450	0,038	0,514	0,016	0,058	0,536	434	399	673	660
0,475	0,041	0,543	0,017	0,062	0,565	389	359	604	593
0,500	0,041	0,568	0,017	0,062	0,590	356	328	546	537
0,530	0,042	0,600	0,017	0,064	0,624	318	293	486	478
0,560	0,042	0,630	0,017	0,064	0,654	289	267	436	429
0,600	0,045	0,674	0,018	0,068	0,699	252	235	380	374
0,630	0,045	0,704	0,018	0,068	0,729	230	215	346	341
0,650	0,047	0,728	0,018	0,072	0,755	215	199	324	320
0,670	0,047	0,748	0,019	0,072	0,775	204	190	306	301
0,710	0,047	0,788	0,019	0,072	0,815	183	172	273	270
0,750	0,050	0,832	0,020	0,076	0,861	164	153	244	242
0,800	0,050	0,882	0,020	0,076	0,911	146	137	215	213
0,850	0,052	0,937	0,020	0,080	0,967	130	121	191	189
0,900	0,052	0,987	0,020	0,080	1,017	116	110	171	169
0,950	0,055	1,041	0,021	0,084	1,073	105	98	153	151
1,000	0,055	1,091	0,021	0,084	1,123	95	90	138	137
1,060	0,056	1,154	0,022	0,087	1,187	85	80	123	122
1,120	0,056	1,214	0,022	0,087	1,247	76	73	111	110
1,180	0,057	1,276	0,022	0,089	1,309	69	66	100	99
1,250	0,057	1,346	0,022	0,089	1,379	62	59	89	88

PRODUCT RANGE
ALUMINIUM WINDING WIRE, ROUND

DAMID PE AL

Also available on reel 400/630

Class	200
Standard	IEC 60317-25 NEMA MW 35-A
Insulation	THEIC-modified polyester overcoated with polyamide-imide
UL approval	E101843, MW 35-A
Dimension range/mm Grade 2	1,18 ≤ Ø ≤ 4,00
Properties	Suitable in lightweight designs Resistant to transformer oil Heat-resistant

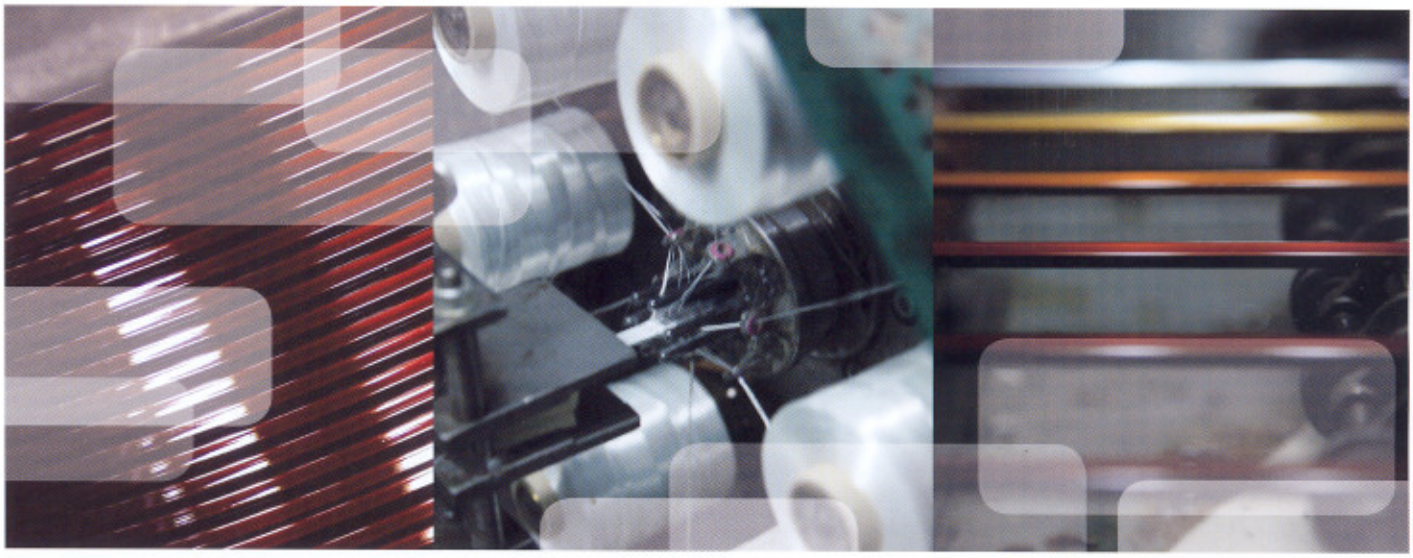
Temperature index/°C	≥ 200
Heat shock 3xø/°C	≥ 220
Cut-through/°C	> 300
Field of application	Oil-filled transformers Dry transformers Small transformers Welding transformers

TECHNICAL DATA
ALUMINIUM WIRE
ACCORDING TO IEC 60317-0-3

Data for bare conductor				Data for enamelled conductor DAMID PE - AL Grade 2			
Conductor diameter mm nominal	Cross section mm² nominal	Resistance/length, 20°C Ω/m nominal	Wire tension N max	mm min increase due to insulation	mm max overall diameter	Fill factor number of conductors/cm²	Length m/kg
1,18	1,094	0,02550	30,4	0,067	1,279	69	318
1,25	1,227	0,02273	34,3	0,067	1,349	62	284
1,32	1,368	0,02038	38,2	0,069	1,422	56	255
1,40	1,539	0,01812	42,2	0,069	1,502	50	228
1,50	1,767	0,01578	49,0	0,071	1,606	43	199
1,60	2,011	0,01387	55,9	0,071	1,706	38	175
1,70	2,270	0,01229	62,8	0,073	1,809	34	155
1,80	2,545	0,01096	70,6	0,073	1,909	30	139
1,90	2,835	0,009837	78,5	0,075	2,012	27	125
2,00	3,142	0,008879	86,3	0,075	2,112	25	113
2,12	3,530	0,007901	95,1	0,077	2,235	22	101
2,24	3,940	0,007078	106	0,077	2,355	19	91
2,36	4,374	0,006375	118	0,079	2,478	18	82
2,50	4,909	0,005683	132	0,079	2,618	16	79
2,65	5,515	0,005057	149	0,081	2,772	14	65
2,80	6,157	0,004530	166	0,081	2,922	13	60
3,00	7,069	0,003946	190	0,084	3,126	11	52
3,15	7,793	0,003579	210	0,084	3,267	10	48
3,35	8,814	0,003164	237	0,086	3,479	9	42
3,55	9,898	0,002818	267	0,086	3,679	8	37
3,75	11,05	0,002525	298	0,089	3,883	7	34
4,00	12,57	0,002220	339	0,089	4,133	6	29

OVERVIEW
RECTANGULAR PRODUCTS

	Process insulation material class	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
	Conductor						
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 overlappings

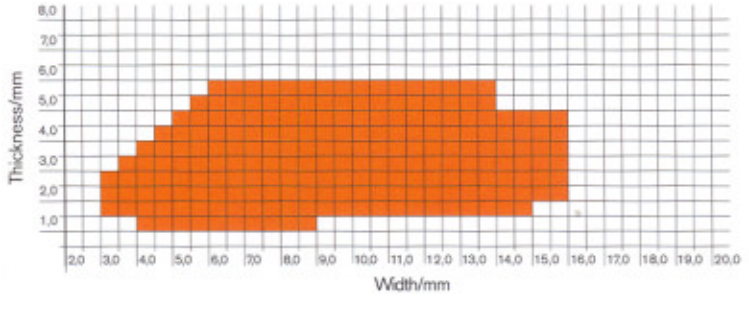


PRODUCT RANGE
COPPER WINDING WIRE, RECTANGULAR




	DAMID	DAMIDFIBRE		DAMIDOGLAS	DAMIDFIBRE EPOXY
Class	200	155	180	155	155
Standard	IEC 60317-29 NEMA MW 36-C	IEC 60317-32/-31 NEMA MW 42-C/52-C		Internal standard	Internal standard
Insulation	THEIC-modified polyester-imide overcoated with polyamide-imide	THEIC-modified polyester-imide overcoated with polyamide-imide covered 1-3 times with glass fibre yarn impregnated with varnish of polyurethane type (155) or polyester-imide type (180)		THEIC-modified polyester-imide overcoated with polyamide-imide covered with 1-2 layers of mixed yarn glass-polyester.	THEIC-modified polyester-imide overcoated with polyamide-imide covered 1-3 times with glass fibre yarn impregnated with polyurethane and a top layer of epoxy
UL approval	E101843, MW 36-C	-		-	-
Dimension range	See below	See below		See below	See below
Properties	Heat-resistant Resistant to transformer oil Freon-resistant	Resistant to mechanical stress Heat-resistant		Excellent adhesion between conductor and outer insulation Resistant to mechanical stress	Semi-cured (B-stage) adhesive layer allows stacking of coils
Temperature index/°C	> 200	≥ 155	≥ 180	≥ 155	≥ 155
Heat shock/°C	≥ 220	≥ 175	≥ 200	-	-
Field of application	Electric motors Dry transformers Oil-filled transformers Welding transformers	Electric motors Generators Dry transformers		Electric motors Generators	Large generators

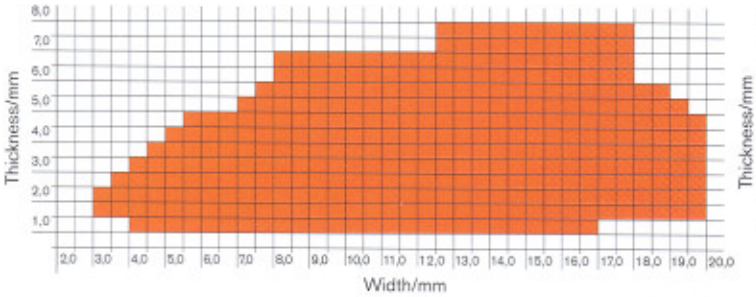
DAMID, DAMIDFIBRE, DAMIDOGLAS, DAMIDFIBRE EPOXY



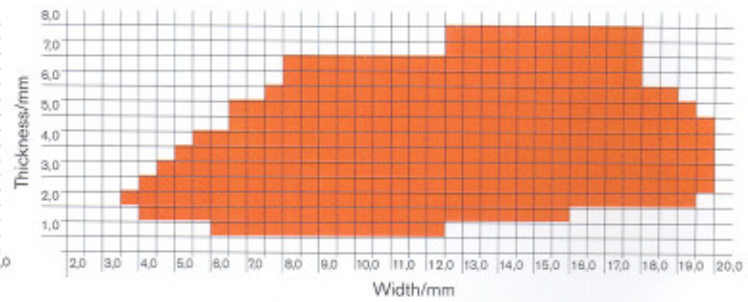
PRODUCT RANGE
COPPER WINDING WIRE, RECTANGULAR

	DAKAP	DAKAP CR	DAMIC
Class	240	240	155
Standard	Internal standard	Internal standard	Internal standard
Insulation	Wrapped with teflon-coated polyimide tape Kapton®, one or two layers with overlap. Bonding by sintering of Teflon. Teflon coat on both sides of the polyimide tape	Wrapped with teflon-coated polyimide tape, Kapton CR®, one or two layers with overlap. Bonding by sintering of Teflon coat	Wrapped with Mica-tape based on calcined muscovite impregnated with epoxy and a PET-carrier
Dimension range	See below	See below	See below
Properties	High temperature resistance Excellent humidity resistance Teflon on the outside allows stacking of coils	Good resistance to corona discharge High temperature resistance Excellent humidity resistance	Good resistance to corona discharge
Temperature index/°C	≥ 240	≥ 240	≥ 155
Field of application	Traction motors	Traction motors	Electrical machines

DAKAP, DAKAP CR



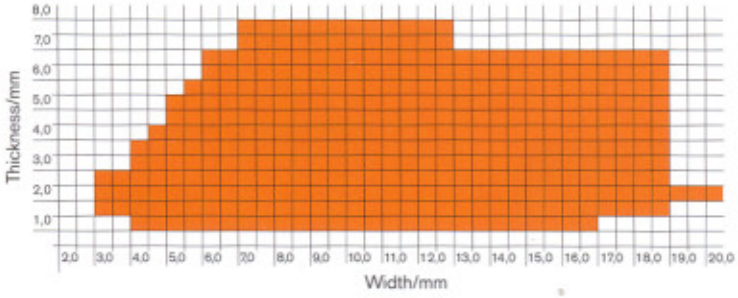
DAMIC



PRODUCT RANGE
COPPER WINDING WIRE, RECTANGULAR

	DAFIBRE		DAFIBRE EPOXY		DAROGLAS
Class	155	180	155	180	155
Standard	NEMA MW 42-C/ MW 52-C		Internal standard		Internal standard
Insulation	Covered 1-3 times with glass fibre yarn Impregnated with varnish of polyurethane type (155) or polyesterimi-detype (180)		Covered 1-3 times with glass fibre yarn Impregnated with varnish of polyurethane type (155) or polyester imide type (180) Coated with a layer of semi-cured epoxy		Covered 2 times with mixed yarn glass-polyester
Dimension range	See below		See below		See below
Properties	Resistant to mechanical stress		Semi-cured adhesive layer allows stacking of windings		Excellent adhesion between conductor and outer insulation Resistant to mechanical stress
Temperature index/°C	≥ 155	≥ 180	≥ 155	≥ 180	≥ 155
Heat shock/°C	≥ 175	≥ 200			
Field of application	Dry transformers Welding transformers Magnet coils Windings with extreme mechanical stress		Generators Windings with extreme mechanical stress		Dry transformers Windings with extreme mechanical stress

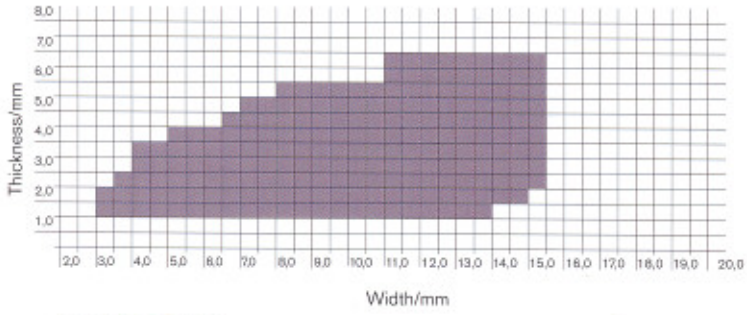
DAFIBRE, DAFIBRE EPOXY, DAROGLAS



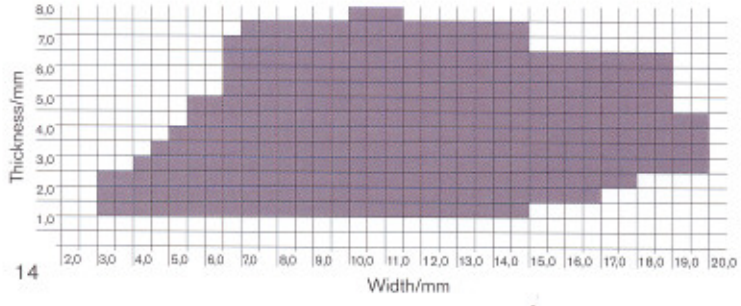
PRODUCT RANGE
ALUMINIUM WINDING WIRE, RECTANGULAR

	DAMID - AL	DAFIBRE - AL		DAMIDFIBRE - AL	
Class	200	155	180	155	180
Standard	Corresponds to IEC 60317-29 NEMA MW 35-A	Corresponds to IEC 60317-32/-31 NEMA MW 42-A/MW 52-A		Corresponds to IEC 60317-32/-31 NEMA MW 42-A/MW 52-A	
Insulation	THEIC-modified polyester-imide overcoated with polyamide-imide	Covered 1-3 times with glass fibre yarn Impregnated with varnish of polyurethane type (155) or polyesterimide type (180)		THEIC-modified polyester-imide with polyamide-imide Covered 1-3 times with glass fibre yarn Impregnated with varnish of polyurethane type (155) or polyester-imide type (180)	
Dimension range/mm Grade 2	See below	See below		See below	
Properties	Heat-resistant Allows lightweight designs	Suitable in lightweight designs High resistance to mechanical stress		High resistance to mechanical stress Heat-resistant	
Temperature index/°C	≥ 200	≥ 155	≥ 180	≥ 155	≥ 180
Heat shock/°C	≥ 220	-	-	-	-
Field of application	Oil-filled transformers Dry transformers Small transformers Welding transformers Coils	Large motors Generators Welding equipment Magnet coils		Electrical machines Generators	

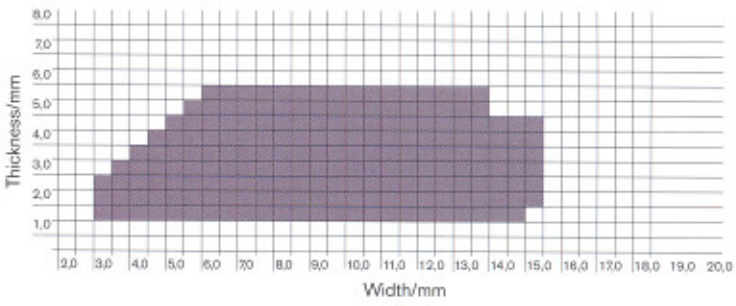
DAMID AL



DAFIBRE AL

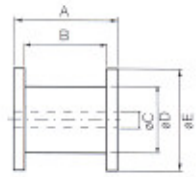


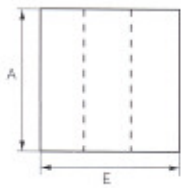
DAMIDFIBRE AL

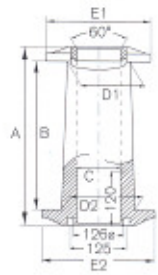


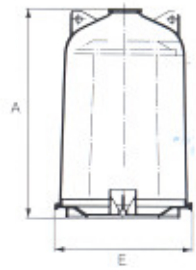
DIMENSIONS AND WEIGHTS
FOR VARIOUS TYPES OF PACKAGING

Type of packaging		Material	Dimension/mm						Tare weight	Wire weight	Wire weight
			A	B	C	D	E1	E2	kg	kg/rl	kg/pallet
Reel	200	plastic	200	160	36	125	200		0,60	12/-	432/-
Reel	250	plastic	200	160	36	160	250		1,35	22/-	572/-
Reel	355	plastic	200	160	36	224	355		3,20	42/-	420/-
Drum	500	plastic	250	180	36	315	500		7,70	88/26	528/156
Drum	630	plastic	230	180	127	315	630		9,40	175/60	875/300
Reel	250/400	plastic	400	335	100		236	250	2,30	42/-	546/-
Reel	315/500	plastic	500	425	100		300	315	4,40	80/-	560/-
Reel	400/630	plastic	630	530	100		375	400	7,30	180/-	720/-
Reel	500/800	plastic	800	670	100		475	500	20,00	400/-	800/-
Reel	630/935	steel	935	850	100		600	630	103,00	800/-	800/-
Pail pack	515	cardboard	550				515		7,40	175/-	350/-
Pail pack	515 eng.	cardboard	550				515		7,40	-/56	-/168
Pail pack	510	cardboard	935				510		10,40	-/120	-/360
Bell	250/400	plastic	475				310				
Bell	315/500	plastic	607				388				
Bell	400/630	plastic	763				490				









STANDARD PACKAGING

Type		Dimension/ mm	Product
Reel	200	0,20 ≤ Ø < 0,63	round wire, Cu
Reel	250	0,63 ≤ Ø < 2,65	round wire, Cu
Reel	355	2,50 ≤ Ø ≤ 5,00	round wire/rectangular wire Cu
Drum	500	4,00 ≤ Ø ≤ 5,00	round wire, Cu
Drum	500	-	rectangular wire Cu/Al
Drum	630	-	rectangular wire Cu/Al
Reel	250/400	0,20 ≤ Ø ≤ 1,80	round wire, Cu
Reel	400/630	0,60 ≤ Ø ≤ 1,80	round wire, Cu
Pail pack	515	1,70 ≤ Ø ≤ 5,00	round wire, Cu
Pail pack	515 eng	1,18 ≤ Ø ≤ 4,00	round wire, Al
Pail pack	510	1,18 ≤ Ø ≤ 4,00	round wire, Al

The packing is loaded on to standard EUR-type pallets. The most common types of transport packaging are shown here. The straps used are steel or plastic straps. Sheets of heavy-duty plywood are used as spacers and supports for the strapping. For additional protection pallets can be fitted with pallet frames.

TRANSPORTPACKAGING

Packaging must:
- be handled with care
- be protected from dirt
- be protected from damp
- be stored indoors
- returned undamaged
- bear the Dahréntråd label or be unmarked

Packaging will be invoiced with delivery and credited when returned in undamaged condition.


Drum


Pail pack


Cylindrical reel


Conical reel

THE POWER OF PERMANENT IMPROVEMENT

The EKS Group is the leading supplier of wire rod, copper profiles and winding wire. With EKS, you get a strong 200,000-ton global partner with a wide geographical presence and a deep knowledge of the local markets. We are driven by the power of permanent improvement – and always with the customer in focus. The result is high quality products, reliability, attention to details and a strong technical partnership.

www.eksgroup.com

eks group

dahréntråd

AB Dahréntråd
Jonslund
SE-465 80 Nossebro
Sweden
Tel: +46 512 300 300
Fax: +46 512 300 400
www.dahrentrad.se
info@dahrentrad.se