PRODUCT DATA BULLETIN

TRAN-COR® H

GRAIN ORIENTED ELECTRICAL STEELS

H-0 CARLITE
H-1 CARLITE
H-2 CARLITE

H-0 CARLITE DR
H-1 CARLITE DR
H-2 CARLITE DR

AK Steel

PRODUCT DESCRIPTION

AK Steel's electrical steel products contain approximately 75-85% of post-consumer and post-industrial recycled materials. This content comes largely from the re-melting of scrap steel products. Not only does the electrical steel contain a high percentage of post-consumer and post-industrial recycled materials, at the end of its useful life, it is likely to be 100% recyclable.

TRAN-COR H CARLITE® high permeability electrical steels offer an outstanding degree of grain orientation, This combination of higher permeability with low residual stress offers the potential for lower core losses and less noisy transformer core structures, particularly at higher operating inductions, when compared to conventional grain oriented electrical steels. The core loss characteristics are further enhanced in the TRAN-COR H CARLITE DR® (Domain Refined) products where laser scribing is employed. In this process, a precisely focused laser beam is rapidly scanned across the steel surface. The micro-strain imparted into the material forces the pre-existing magnetic domains to subdivide. The finer domain structure reduces the distance that the domain walls must move during AC magnetization, thereby reducing eddy current losses. The result is far lower core loss than possible with conventional grain oriented electrical steels of comparable thickness.

TRAN-COR H CARLITE products are suitable for all types of transformers while TRAN-COR H DR products are suitable for those types of transformers where a stress relief annealing treatment of the magnetic core is not used. Stress relief annealing will result in the eradication of the effect provided by the laser treatment and will result in a significant increase in core loss.

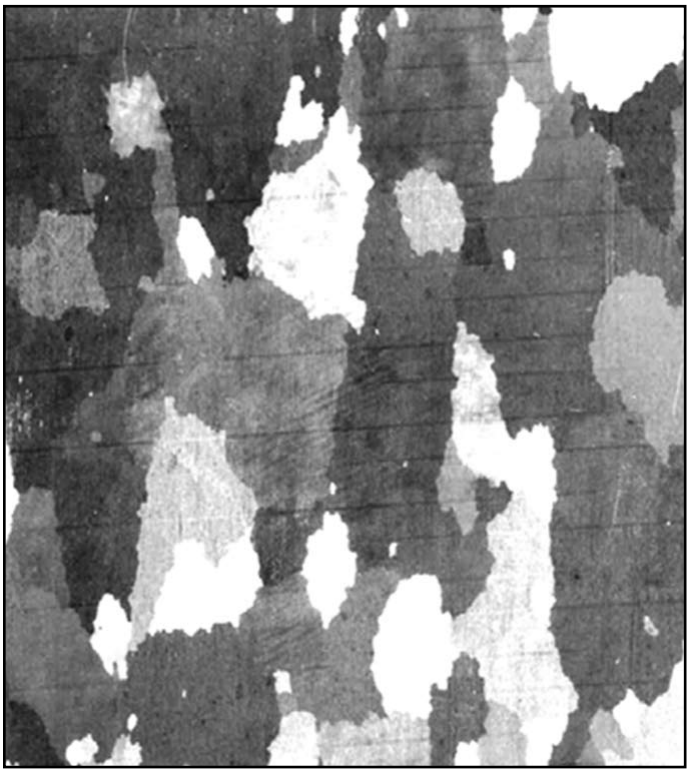
FORMS AND STANDARD SIZES

Thickness	
H-0:	0.23 mm (0.009 in.)
H-1:	0.27 mm (0.011 in.)
H-2:	0.30 mm (0.012 in.)
Width	
Standard:	914 mm (36.00 in.)
Maximum:	920 mm (36.22 in.)
Minimum:	19 mm (0.75 in.)
Inside Coil Diameter	
Master Coil	508 mm (20.0 in.)
Slit Width Coil	406, 508 mm (16.0, 20.0 in.)

CARLITE 3 SURFACE INSULATION

AK Steel's TRAN-COR H products are supplied with CARLITE 3 insulative coating, an inorganic coating equivalent to ASTM A 976 C-5. CARLITE 3 insulation is ideal for materials that will be used in the form of sheared laminations for power transformers and other apparatus with high volts per turn. In addition to supplying all the benefits of C-5 insulation, CARLITE 3 provides other important advantages which include:

- Potential for reduced transformer building factor from added resistance to elastic strain damage.
- Potential for reduction of magnetostriction related transformer noise
- High stacking factor
- Easy assembly due to smoothness of coating (low coefficient of friction)



Sample chemically etched to reveal laser scribe trace

SPECIFICATIONS

In terms of maximum core loss, TRAN-COR H specifications are determined at 1.7T at either 50Hz or 60Hz. Core loss grading is conducted using as-sheared single sheet test samples which are tested in accordance with ASTM test method A 804. Induction is specified at 800 A/m. Induction grading is conducted using stress relief annealed Epstein samples tested in accordance with ASTM test method A 343. Samples are secured from each end of the coil and the higher core loss value is used for certification of conformance to product grade guarantees.

Guaranteed Core Loss and Lamination Factor

AK Steel Product Name	Approximate Equivalent International Grade	Thickness, mm (in.)	Assumed Density, gm/cm³	Resistivity, Ω-m, x10⁻⁸	Maximum Core Loss, Watts per kilogram				Maximum Core Loss, Watts per pound				Minimum Induction at 800 A/m, T	Minimum Lamination Factor, %
					50 Hz		60Hz		50 Hz		60Hz			
					15kG	17kG	15kG	17kG	15kG	17kG	15kG	17kG		
H-0 CARLITE DR	M080-23P5	0.23 (0.009)	7.65	50	---	0.80	---	1.06	---	0.363	---	0.480	1.880	94.5%
H-1 CARLITE DR	M090-27P5	0.27 (0.011)			---	0.90	---	1.20	---	0.408	---	0.543	1.880	95.0%
H-2 CARLITE DR	M100-30P5	0.30 (0.012)			---	1.00	---	1.33	---	0.454	---	0.603	1.880	95.5%
H-0 CARLITE	M090-23P5	0.23 (0.009)			---	0.90	---	1.19		0.408		0.540	1.880	94.5%
H-1 CARLITE	M100-27P5	0.27 (0.011)			---	1.00	---	1.33		0.454		0.603	1.880	95.0%
H-2 CARLITE	M105-30P5	0.30 (0.012)			---	1.05	---	1.40	---	0.476	---	0.633	1.900	95.5%

Typical Core Loss and Lamination Factor

AK Steel Product Name	Approximate Equivalent International Grade	Thickness, mm (in.)	Assumed Density, gm/cm³	Resistivity, Ω-m, x10⁻⁸	Typical Core Loss, Watts per kilogram				Typical Core Loss, Watts per pound				Typical Induction at 800 A/m, T	Typical Lamination Factor, %
					50 Hz		60Hz		50 Hz		60Hz			
					15kG	17kG	15kG	17kG	15kG	17kG	15kG	17kG		
H-0 CARLITE DR	M080-23P5	0.23 (0.009)	7.65	50	0.57	0.77	0.75	1.01	0.256	0.350	0.339	0.460	1.916	96.6%
H-1 CARLITE DR	M090-27P5	0.27 (0.011)			0.65	0.87	0.86	1.16	0.295	0.396	0.391	0.525	1.918	97.0%
H-2 CARLITE DR	M100-30P5	0.30 (0.012)			0.70	0.95	0.93	1.26	0.320	0.431	0.423	0.570	1.917	97.3%
H-0 CARLITE	M090-23P5	0.23 (0.009)			0.62	0.85	0.83	1.12	0.282	0.384	0.376	0.509	1.917	96.6%
H-1 CARLITE	M100-27P5	0.27 (0.011)			0.70	0.95	0.92	1.25	0.316	0.431	0.419	0.567	1.918	97.0%
H-2 CARLITE	M105-30P5	0.30 (0.012)			0.74	0.99	0.98	1.31	0.335	0.450	0.447	0.596	1.920	97.3%

Typical single sheet core loss values versus test induction for TRAN-COR H CARLITE and CARLITE DR are provided on page 10. Typical SRA Epstein core loss values versus test induction for TRAN-COR H CARLITE are provided on page 12. SRA Epstein testing is not applicable to TRAN-COR CARLITE DR products since the domain refinement treatment is eradicated upon annealing at temperatures greater than 600°C.

The core loss and exciting power of the AK Steel TRAN-COR H grades are determined by magnetic tests performed in accordance with general procedures approved by the American Society for Testing and Materials. The following conditions apply:
1. Results for as-sheared single sheet specimens from fully processed material cut parallel to the rolling direction of the coil and tested per ASTM A 804
2. Density of all grades (7.65 gm/cm³) per ASTM A 34

ASTM A 664 is a grade identification system for electrical steels. While this system has not been widely adopted by manufacturers and consumers of electrical steels, it is used in ASTM A 876 to designate various grades of grain oriented electrical steel. The following is a listing of AK Steel and equivalent ASTM grades:
AK Steel grades H-0 CARLITE and H-0 CARLITE DR are approximately equivalent to ASTM Core Loss Types 23P060 and 23Q054, respectively.
AK Steel grades H-1 CARLITE and H-1 CARLITE DR are approximately equivalent to ASTM Core Loss Types 27P066 and 27Q057, respectively.
AK Steel grades H-2 CARLITE and H-2 CARLITE DR have no equivalent ASTM Core Loss Type designations

Surface Insulation Curves

Figure 1 shows the variation of surface insulation resistance versus pressure and provides a guide to users interested in knowing the relative insulative capabilities of the available surface finishes. Resistance values are typical of those which should be equaled or surpassed in most tests made on such surfaces by the Franklin Test (ASTM A717). However, the user should recognize that the normally small variations in mill oxide and coating thickness within a lot necessitate allowing for some test values lower as well as higher than those shown in the curves.

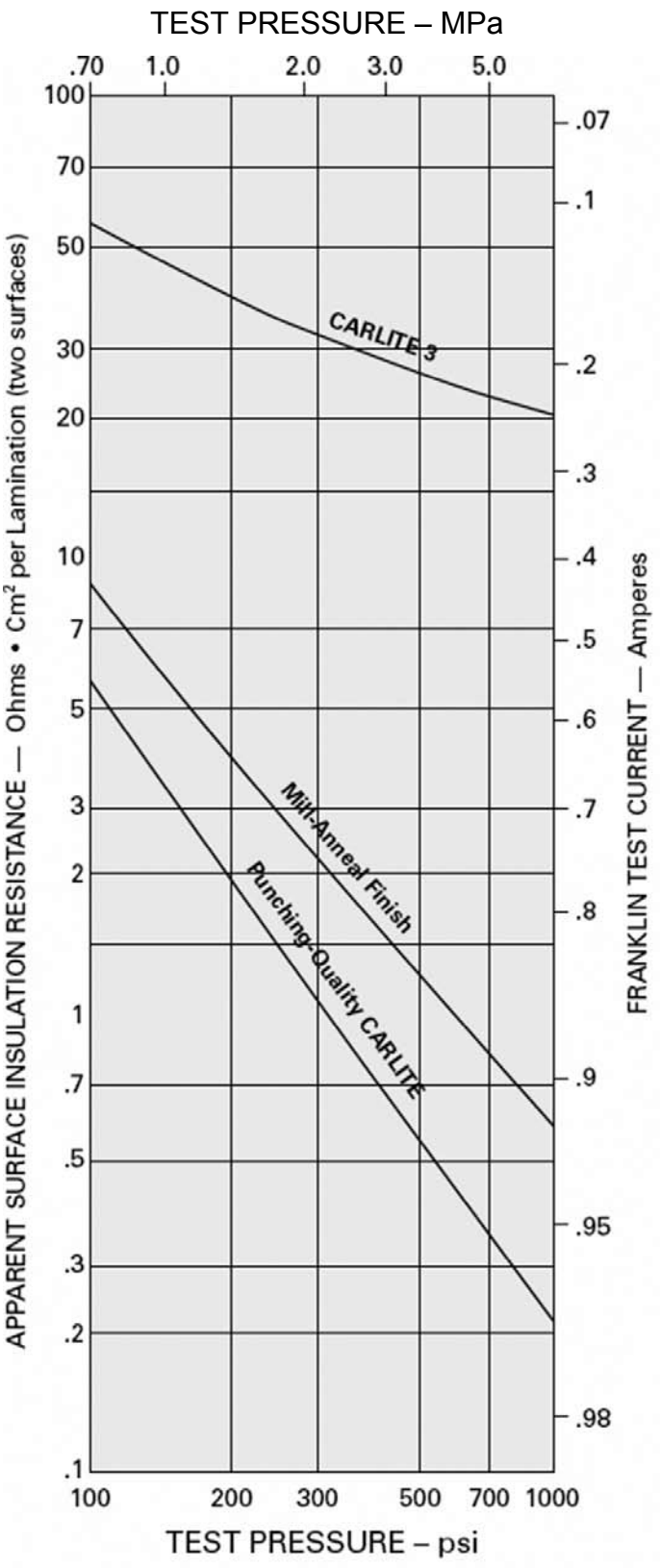


Figure 1 *Typical surface insulation characteristics of AK Steel Oriented Electrical Steels at various pressures as determined by the Franklin Test.*

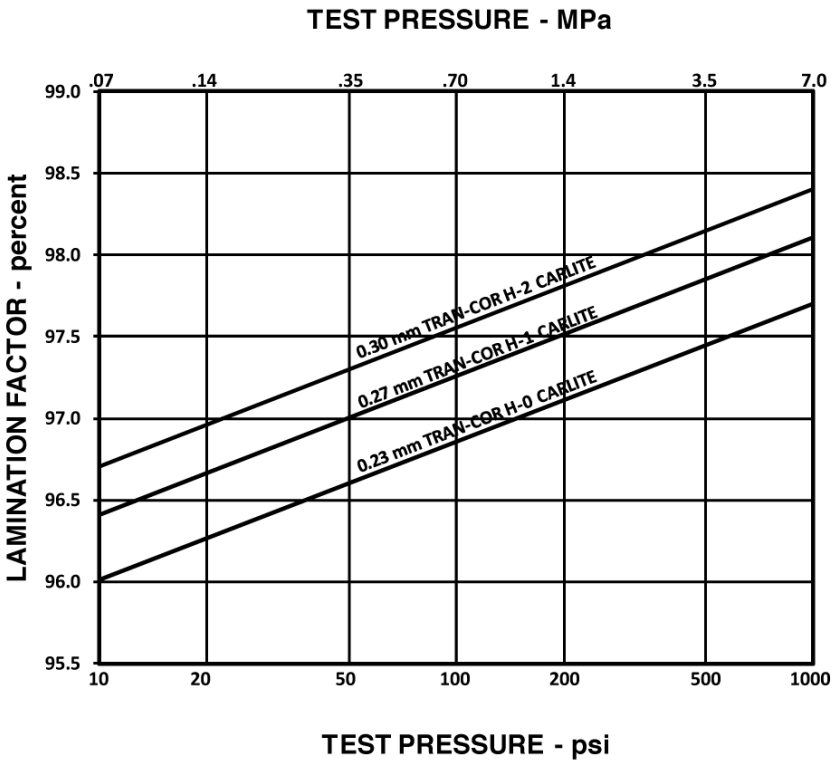


Figure 2 *Representative lamination factors for AK Steel Oriented Electrical Steels at various pressures.*

Lamination Factor

Lamination factor is the measure of compactness of an electrical steel core. This is also referred to as "stacking factor" and "space factor." Lamination factor is the ratio of the equivalent "solid" volume, calculated from weight and density of the steel, to the actual volume of the compressed pack, determined from its dimensions. Special processing gives AK Steel's Oriented Electrical Steels exceptionally and consistently high lamination factors.

Test Method

The lamination factor of electrical steels is determined from measurements of a stack of Epstein strips under known pressure in accordance with ASTM A 719. Figure 2 illustrates how the lamination factor varies as a function of pressure for AK Steel TRAN-COR H Electrical Steels. The values shown are representative of the lamination factor determined by this test.

REPRESENTATIVE MECHANICAL PROPERTIES

Ultimate Tensile Strength in rolling direction, MPa (psi)	359	(52,000)
Yield Strength in rolling direction, MPa (psi)	345	(50,000)
Percent Elongation in 50.8 mm (2 inches) in rolling direction	11	
Microhardness (Knoop Hardness Number, HK)	173	
Equivalent Rockwell B Scale Hardness	83	
Modulus of Elasticity, MPa (psi)*		
in rolling direction	113,800	(16,500,000)
at 20 degrees to rolling direction	138,000	(20,000,000)
at 45 degrees to rolling direction	241,000	(35,000,000)
at 55 degrees to rolling direction	276,000	(40,000,000)
at right angles to rolling direction	203,000	(29,500,000)

*Values may vary as much as plus or minus 5%

MAGNETOSTRICTION

Low magnetostriction coefficients are inherent to TRAN-COR H owing to the combination of the high degree of grain orientation, low residual strain after thermal flattening and high degree of residual tension imparted by the CARLITE 3 coating. The information below, while purely comparative in nature, is considered to be representative of AK Steel's TRAN-COR H products.

Comparative Magnetostriction

Grade	Thickness, mm (in.)	Magnetostriction times x 10^8			
		1.4T	1.5T	1.6T	1.7T
H-0 CARLITE DR	0.23 (.009)	-18	-20	-20	-21
H-1 CARLITE DR	0.27 (.011)	-22	-25	-26	-28
H-2 CARLITE DR	0.30 (.012)	-31	-32	-34	-34
H-0 CARLITE	0.23 (.009)	-32	-37	-40	-44
H-1 CARLITE	0.27 (.011)	-39	-40	-44	-48
H-2 CARLITE	0.30 (.012)	-45	-48	-53	-55

Test Method

The above data is meant for comparative purposes only and was developed using Epstein specimens from representative samples which were prepared in accordance with ASTM A 876. The samples were subjected to domain refinement (where required) and were tested using AK Steel Research laboratory facilities. While there are no agreed upon standard test methods for magnetostriction, these data were acquired using an accelerometer-based measurement of crossover-to-tip displacement of many individual Epstein strips which were tested at a frequency of 60Hz over the range of induction shown above. The magnetostriction values are, to our best knowledge, believed to be representative of commercially produced materials.

THICKNESS, WIDTH, CAMBER AND FLATNESS TOLERANCES

Thickness Tolerances

	Thickness, millimeters	Thickness, mm		
Grade	Nominal	Aim	Minimum	Maximum
H-0	0.23	0.22	0.20	0.24
H-1	0.27	0.26	0.24	0.28
H-2	0.30	0.29	0.27	0.31

The aim thickness values are based on the test sample weight plus typical coating thickness such as would be measured using a contacting micrometer caliper. The typical coating thickness is 0.005-0.010 mm (0.0002-0.0004 in.). Thickness measured at any point on the sheet not less than 10 mm (0.375 inch) from an edge shall not deviate more than +/- 0.020 mm (0.0008 inch) from the average thickness of the test lot or coil.

Width Tolerances

Specified Width, mm	Tolerance over, mm	Tolerance under, mm
To 100 mm incl.	0.00	0.25
Over 100 mm to 225 mm, incl.	0.00	0.25
Over 225 mm to 375 mm, incl.	0.00	0.38
Over 375 mm to 914 mm, incl.	0.00	0.50
914 mm, exact	1.50	1.50

Camber Tolerances

The deviation of a side edge from a straight line over a length of 2 meters (80 inches), or a fraction thereof, shall not exceed 2.54 mm (0.1 inch).

Flatness Tolerances

Because of the wide range of processing treatments employed to meet the published core loss values for the various types and classes of flat rolled electrical steels, and because ordinary supplemental flattening operations employed on other steel products cannot be used due to their effects on magnetic quality, it has not been feasible to prepare flatness tolerance tables for flat rolled electrical steel. Some applications, and certain types of fabricating techniques for construction of magnetic cores, are tolerant of certain flatness deviations. However, it is generally recognized that sharp, short waves and buckles are objectionable and should be avoided as much as possible. The producer should determine the flatness requirements for its particular application and the suitability of this electrical steel.

MANUFACTURING LIMITS

All dimensions in mm/kg (inches/pounds)

Thickness	0.23 (0.009 in.) H-0 0.27 (0.011 in.) H-1 0.30 (0.012 in.) H-2	
Width	Master coils are available in widths of 914 mm (36 in.) and 920 mm (36.22 in.).	
Coils—Slit	Minimum width Inside diameters	19 mm (0.75 in.). Narrower – Inquire 406 mm (16 in.) 508 mm (20 in.)
Coils—Not Slit	Inside diameter	508 mm (20 in.)
Approximate coil weight	600 kg per 100 mm of width (335 pounds per inch of width)	

PAGE FINDER FOR DESIGN TABLES AND CURVES

Product Thickness	H-0 0.23 mm		H-1 0.27 mm		H-2 0.30 mm	
Magnetic Characteristic	**CARLITE**	**DR**	**CARLITE**	**DR**	**CARLITE**	**DR**
TABLES						
Core Loss	10,12	10	10,12	10	10,12	10
Exciting Power	11,12	11	11,12	11	11,12	11
CURVES						
Core Loss	13	14	15	16	17	18
Exciting Power	19	20	21	22	23	24
D-C Magnetization Curve	25	26	27	28	29	30
D-C Hysteresis Loop	31	32	33	34	35	36

Typical Values of Core Loss at 50 and 60 Hz for Typical Sheet Specimens of AK Steel TRAN-COR® H Electrical Steels (SI Units)

Flux Density	Core Loss (watt per kilogram) - ASTM A 804					
	0.23 mm H-0 CARLITE® DR®		0.27 mm H-1 CARLITE® DR®		0.30 mm H-2 CARLITE® DR®	
(Tesla)	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
0.1	0.00289	0.00385	0.00328	0.00441	0.00361	0.00487
0.2	0.01082	0.01451	0.01246	0.01680	0.01382	0.01871
0.3	0.0236	0.0317	0.0274	0.0370	0.0305	0.0413
0.4	0.0413	0.0554	0.0479	0.0647	0.0533	0.0720
0.5	0.0635	0.0852	0.0738	0.0996	0.0818	0.1103
0.6	0.0903	0.1210	0.1050	0.1413	0.1159	0.1559
0.7	0.1218	0.1628	0.1415	0.1900	0.1556	0.209
0.8	0.1578	0.211	0.1837	0.246	0.201	0.269
0.9	0.1984	0.265	0.231	0.309	0.252	0.337
1.0	0.244	0.325	0.284	0.380	0.310	0.413
1.1	0.296	0.394	0.344	0.459	0.374	0.498
1.2	0.354	0.470	0.410	0.547	0.444	0.592
1.3	0.418	0.555	0.483	0.644	0.522	0.696
1.4	0.487	0.648	0.562	0.749	0.607	0.809
1.5	0.565	0.750	0.649	0.865	0.702	0.936
1.6	0.655	0.867	0.748	0.994	0.811	1.079
1.7	0.773	1.017	0.872	1.154	0.946	1.252
1.8	0.967	1.264	1.067	1.405	1.145	1.506
1.9	1.365	1.766	1.440	1.876	1.551	2.02

Flux Density	Core Loss (watt per kilogram) - ASTM A 804					
	0.23 mm H-0 CARLITE®		0.27 mm H-1 CARLITE®		0.30 mm H-2 CARLITE®	
(Tesla)	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
0.1	0.00326	0.00430	0.00362	0.00486	0.00423	0.00569
0.2	0.01230	0.01638	0.01390	0.01873	0.01586	0.0214
0.3	0.0272	0.0363	0.0308	0.0414	0.0343	0.0463
0.4	0.0476	0.0634	0.0539	0.0723	0.0593	0.0799
0.5	0.0731	0.0972	0.0826	0.1105	0.0902	0.1211
0.6	0.1035	0.1374	0.1168	0.1558	0.1267	0.1699
0.7	0.1389	0.1841	0.1563	0.208	0.1687	0.226
0.8	0.1792	0.237	0.201	0.267	0.216	0.289
0.9	0.225	0.297	0.252	0.334	0.269	0.360
1.0	0.275	0.364	0.308	0.409	0.329	0.439
1.1	0.332	0.438	0.371	0.492	0.395	0.527
1.2	0.394	0.521	0.441	0.584	0.468	0.625
1.3	0.463	0.611	0.518	0.686	0.548	0.732
1.4	0.539	0.711	0.602	0.798	0.636	0.849
1.5	0.625	0.824	0.698	0.924	0.737	0.982
1.6	0.720	0.947	0.805	1.064	0.846	1.126
1.7	0.852	1.115	0.950	1.250	0.992	1.313
1.8	1.065	1.384	1.168	1.523	1.222	1.596
1.9	1.558	2.00	1.622	2.09	1.718	2.22

Typical Values of RMS Exciting Power at 50 and 60 Hz for Typical Sheet Specimens of AK Steel TRAN-COR® H Electrical Steels (SI Units)

Flux Density	Exciting Power (rms volt-ampere per kilogram) - ASTM A 804					
	0.23 mm H-0 CARLITE® DR®		0.27 mm H-1 CARLITE® DR®		0.30 mm H-2 CARLITE® DR®	
(Tesla)	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
0.1	0.00578	0.00717	0.00542	0.00683	0.00583	0.00741
0.2	0.02000	0.0250	0.01918	0.0244	0.0208	0.0268
0.3	0.0417	0.0523	0.0405	0.0518	0.0438	0.0566
0.4	0.0693	0.0873	0.0681	0.0874	0.0736	0.0952
0.5	0.1022	0.1293	0.1015	0.1306	0.1092	0.1416
0.6	0.1402	0.1776	0.1402	0.1808	0.1505	0.1954
0.7	0.1834	0.233	0.1845	0.238	0.1974	0.257
0.8	0.232	0.295	0.235	0.303	0.251	0.326
0.9	0.288	0.367	0.292	0.377	0.312	0.405
1.0	0.354	0.450	0.359	0.463	0.383	0.498
1.1	0.433	0.551	0.439	0.565	0.466	0.605
1.2	0.529	0.671	0.534	0.685	0.563	0.730
1.3	0.648	0.819	0.650	0.829	0.679	0.877
1.4	0.795	1.000	0.789	0.999	0.818	1.053
1.5	0.980	1.225	0.954	1.200	0.993	1.271
1.6	1.228	1.524	1.162	1.453	1.234	1.566
1.7	1.660	2.04	1.526	1.887	1.635	2.05
1.8	2.87	3.48	2.64	3.21	2.70	3.31
1.9	9.93	12.19	9.17	11.15	9.88	12.25

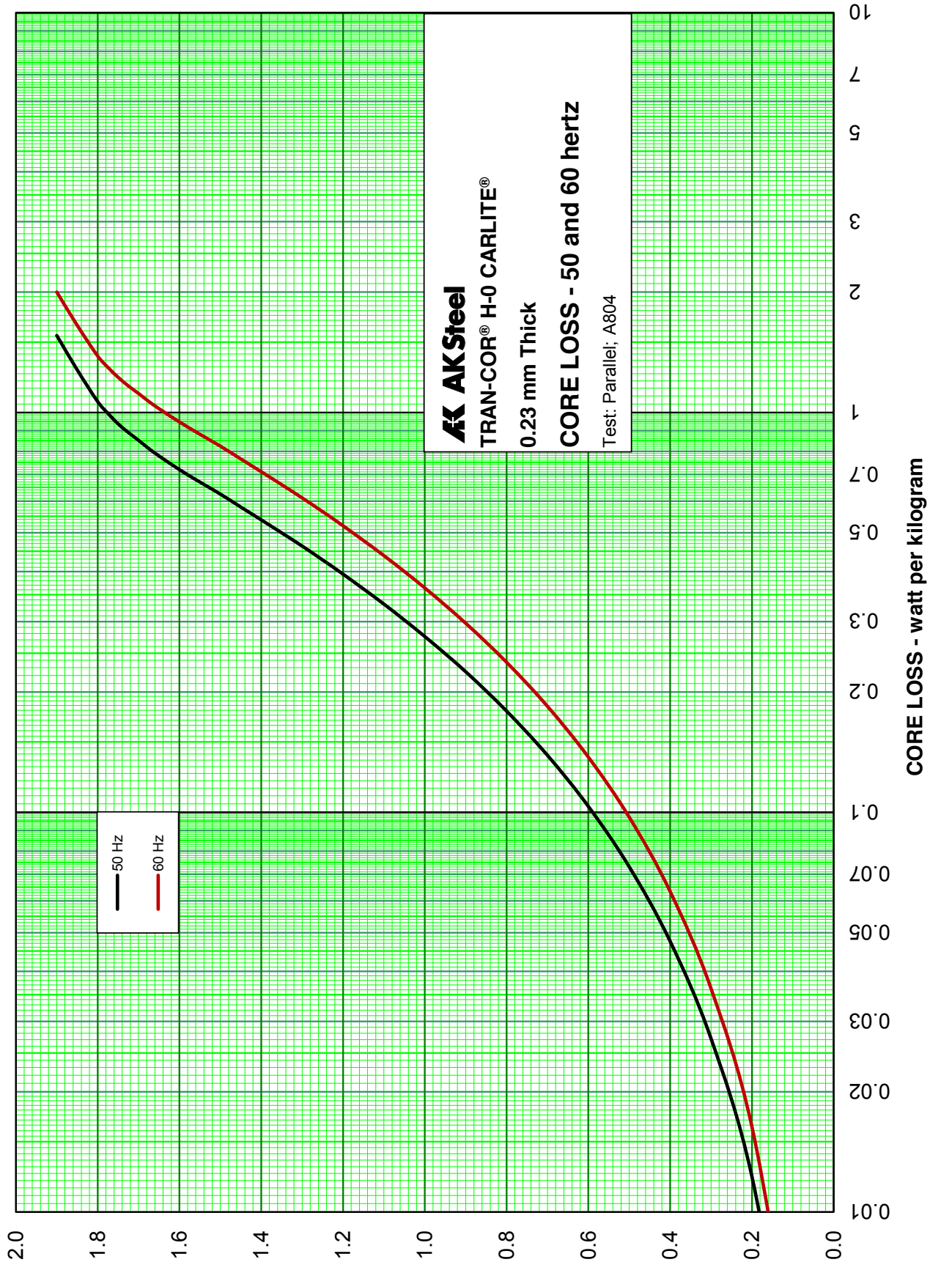
Flux Density	Exciting Power (rms volt-ampere per kilogram) - ASTM A 804					
	0.23 mm H-0 CARLITE®		0.27 mm H-1 CARLITE®		0.30 mm H-2 CARLITE®	
(Tesla)	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
0.1	0.00648	0.00811	0.00724	0.00912	0.00742	0.00946
0.2	0.0223	0.0281	0.0252	0.0319	0.0251	0.0323
0.3	0.0459	0.0580	0.0517	0.0657	0.0512	0.0659
0.4	0.0753	0.0955	0.0847	0.1079	0.0839	0.1083
0.5	0.1095	0.1391	0.1229	0.1569	0.1224	0.1584
0.6	0.1479	0.1884	0.1659	0.212	0.1660	0.215
0.7	0.1905	0.243	0.213	0.273	0.215	0.279
0.8	0.237	0.303	0.265	0.341	0.269	0.350
0.9	0.288	0.370	0.322	0.414	0.328	0.429
1.0	0.344	0.442	0.384	0.495	0.394	0.515
1.1	0.405	0.521	0.451	0.583	0.465	0.609
1.2	0.474	0.609	0.526	0.680	0.544	0.713
1.3	0.554	0.710	0.612	0.791	0.633	0.830
1.4	0.640	0.823	0.708	0.915	0.732	0.960
1.5	0.750	0.961	0.830	1.069	0.856	1.120
1.6	0.901	1.146	0.989	1.268	1.024	1.331
1.7	1.211	1.530	1.309	1.664	1.311	1.683
1.8	2.10	2.60	2.22	2.75	2.17	2.71
1.9	8.67	10.59	9.03	11.02	9.38	11.62

Typical Values of Core Loss at 50 and 60 Hz for Typical Epstein Specimens of AK Steel TRAN-COR® H Electrical Steels (SI Units)

Flux Density	Core Loss (watt per kilogram) - ASTM A 343					
	0.23 mm H-0 CARLITE®		0.27 mm H-1 CARLITE®		0.30 mm H-2 CARLITE®	
(Tesla)	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
0.1	0.00377	0.00497	0.00383	0.00514	0.00436	0.00586
0.2	0.01337	0.01781	0.01439	0.01938	0.01613	0.0218
0.3	0.0289	0.0385	0.0317	0.0426	0.0350	0.0472
0.4	0.0499	0.0665	0.0551	0.0739	0.0603	0.0812
0.5	0.0761	0.1013	0.0844	0.1129	0.0917	0.1232
0.6	0.1074	0.1426	0.1192	0.1589	0.1288	0.1727
0.7	0.1435	0.1902	0.1593	0.212	0.1717	0.230
0.8	0.1847	0.245	0.205	0.272	0.220	0.295
0.9	0.231	0.306	0.257	0.341	0.275	0.368
1.0	0.283	0.374	0.314	0.417	0.337	0.450
1.1	0.341	0.450	0.378	0.502	0.405	0.540
1.2	0.405	0.534	0.449	0.595	0.479	0.640
1.3	0.475	0.627	0.526	0.698	0.561	0.748
1.4	0.552	0.729	0.612	0.811	0.650	0.868
1.5	0.639	0.843	0.707	0.936	0.750	0.999
1.6	0.741	0.974	0.817	1.080	0.864	1.149
1.7	0.871	1.141	0.956	1.258	1.007	1.333
1.8	1.092	1.420	1.177	1.534	1.245	1.629
1.9	1.596	2.05	1.637	2.11	1.746	2.26

Flux Density	Exciting Power (rms volt-ampere per kilogram) - ASTM A 343					
	0.23 mm H-0 CARLITE®		0.27 mm H-1 CARLITE®		0.30 mm H-2 CARLITE®	
(Tesla)	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
0.1	0.00637	0.00797	0.00677	0.00853	0.00689	0.00878
0.2	0.0221	0.0278	0.0242	0.0307	0.0242	0.0311
0.3	0.0458	0.0579	0.0507	0.0645	0.0502	0.0647
0.4	0.0757	0.0959	0.0841	0.1071	0.0831	0.1073
0.5	0.1108	0.1408	0.1233	0.1574	0.1218	0.1577
0.6	0.1505	0.1917	0.1676	0.214	0.1660	0.215
0.7	0.1947	0.248	0.217	0.278	0.215	0.280
0.8	0.243	0.311	0.270	0.347	0.270	0.352
0.9	0.296	0.379	0.329	0.424	0.330	0.431
1.0	0.354	0.454	0.393	0.507	0.396	0.518
1.1	0.417	0.536	0.463	0.597	0.469	0.614
1.2	0.488	0.627	0.539	0.697	0.549	0.720
1.3	0.568	0.729	0.625	0.809	0.638	0.837
1.4	0.660	0.848	0.725	0.937	0.741	0.972
1.5	0.778	0.996	0.848	1.092	0.867	1.134
1.6	0.944	1.201	1.017	1.304	1.039	1.351
1.7	1.239	1.557	1.309	1.655	1.329	1.706
1.8	2.07	2.55	2.08	2.58	2.17	2.71
1.9	8.37	10.23	8.04	9.82	9.36	11.62

DESIGN CURVES



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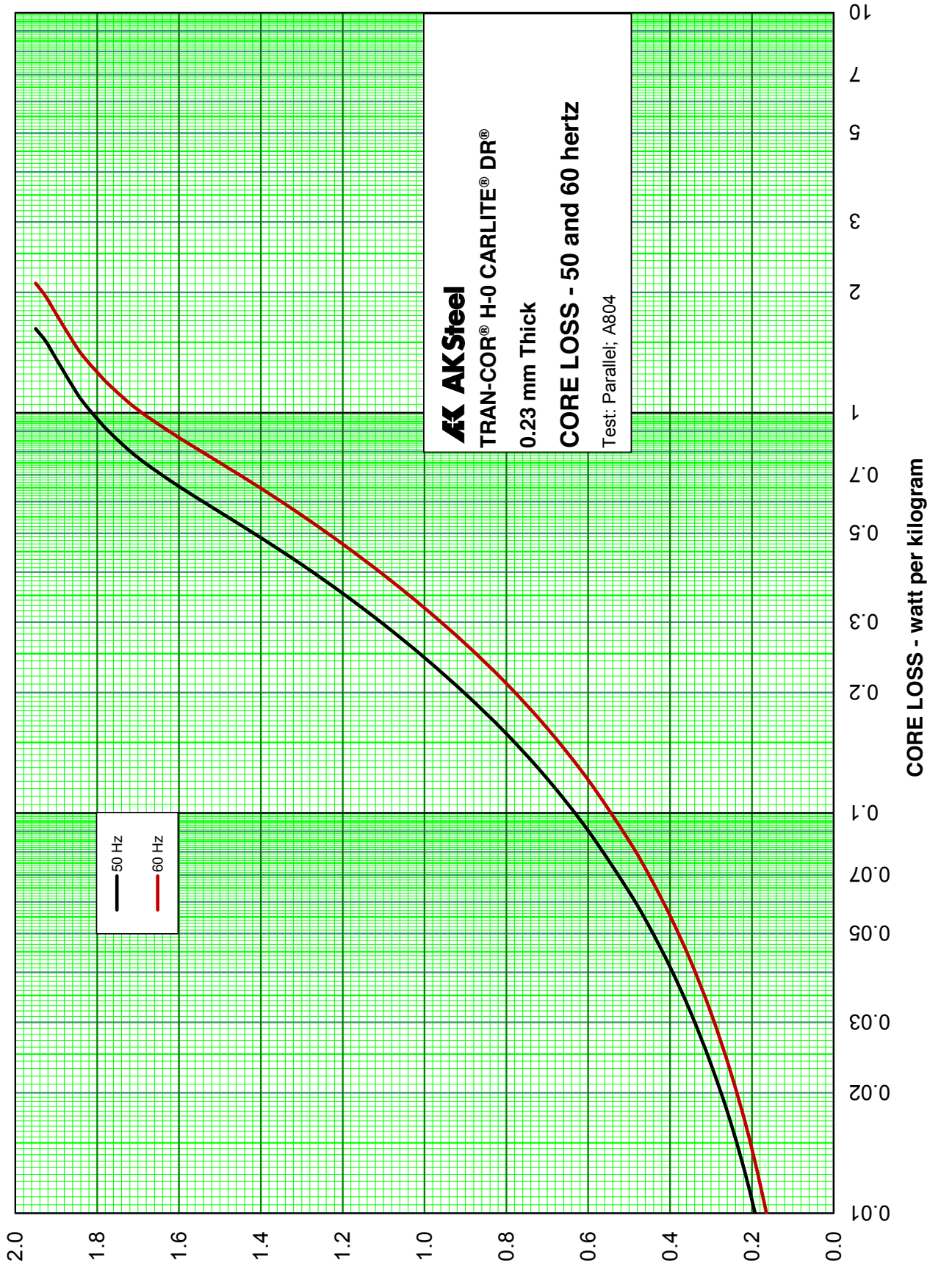

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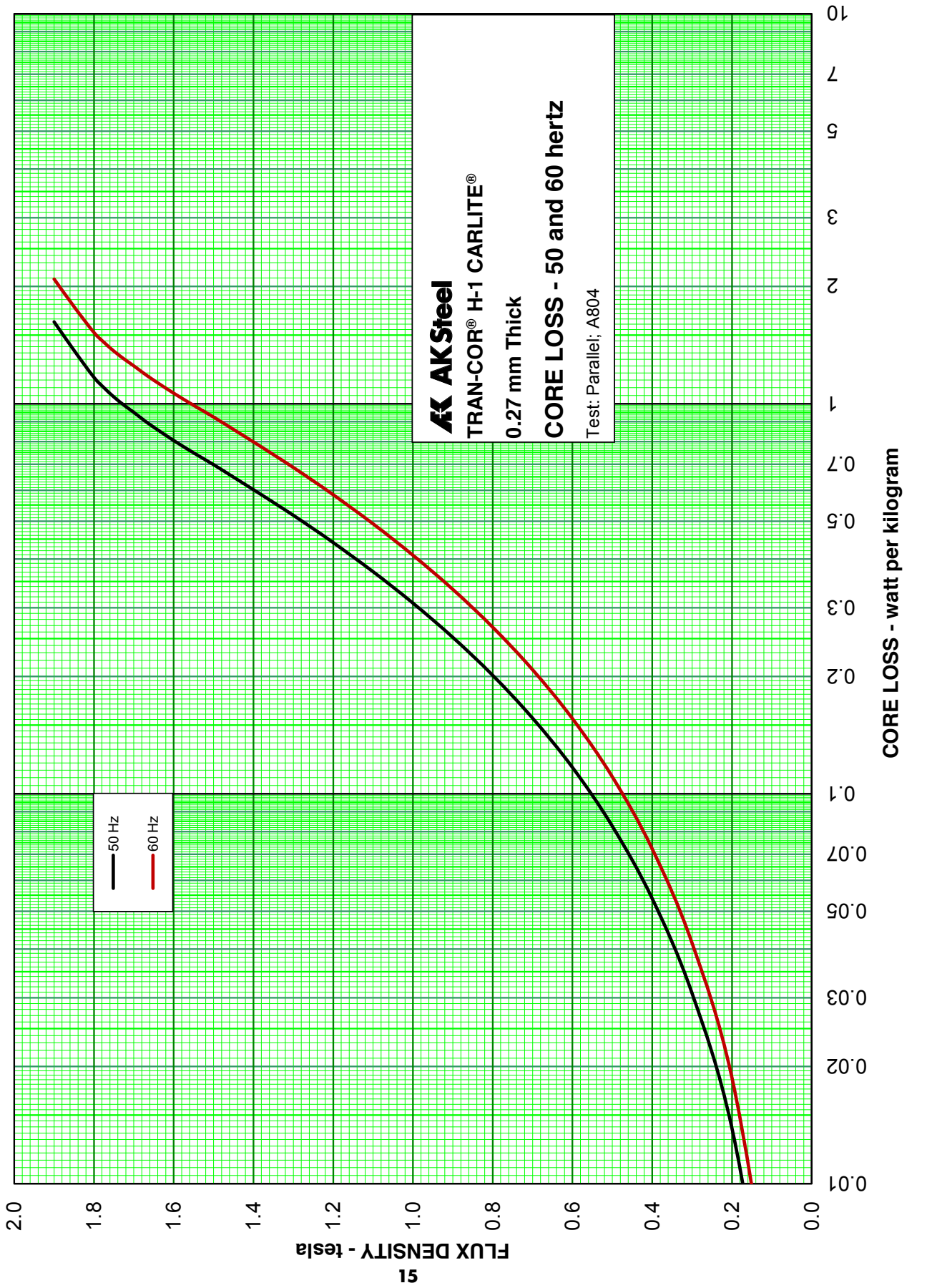
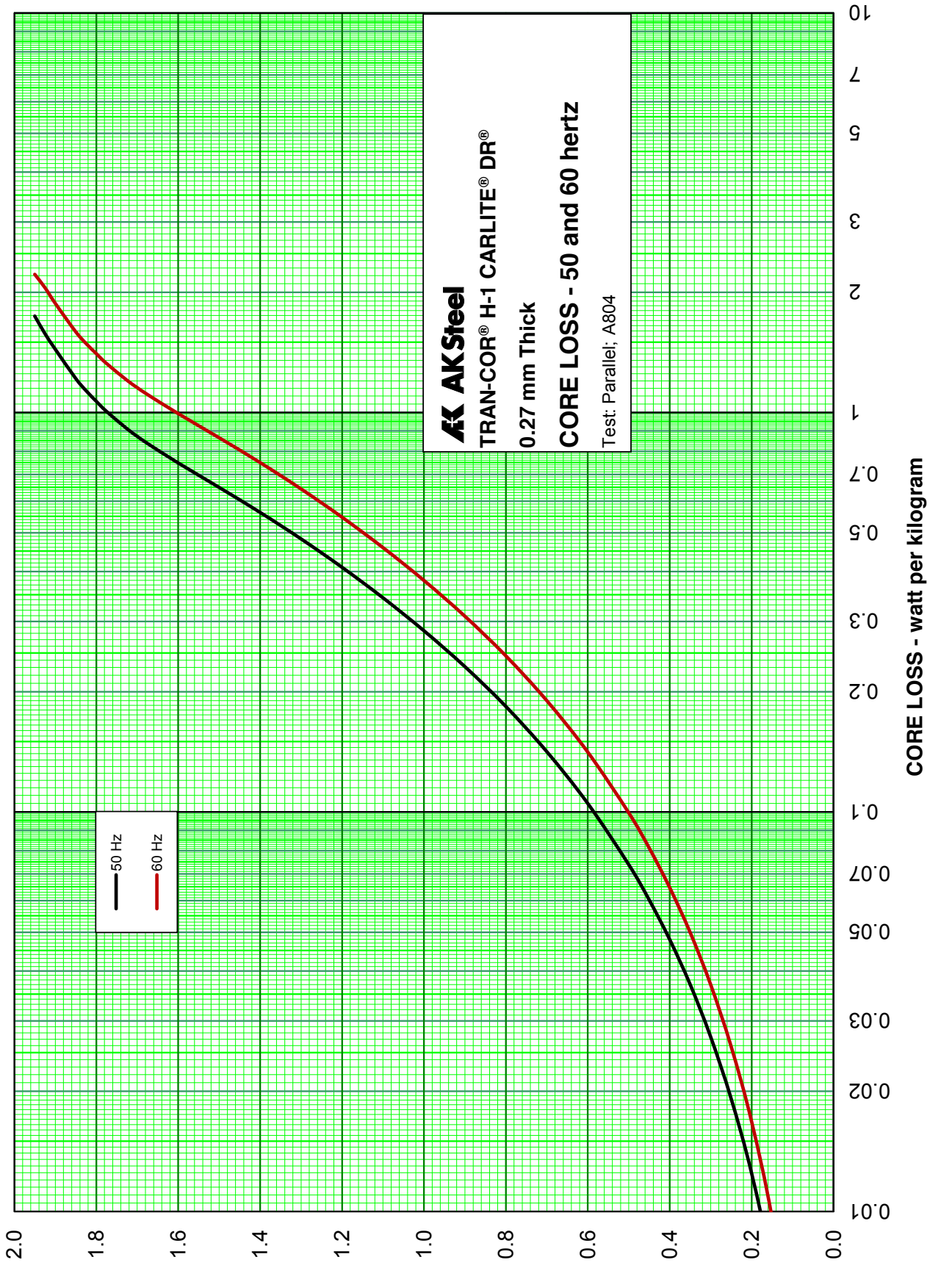
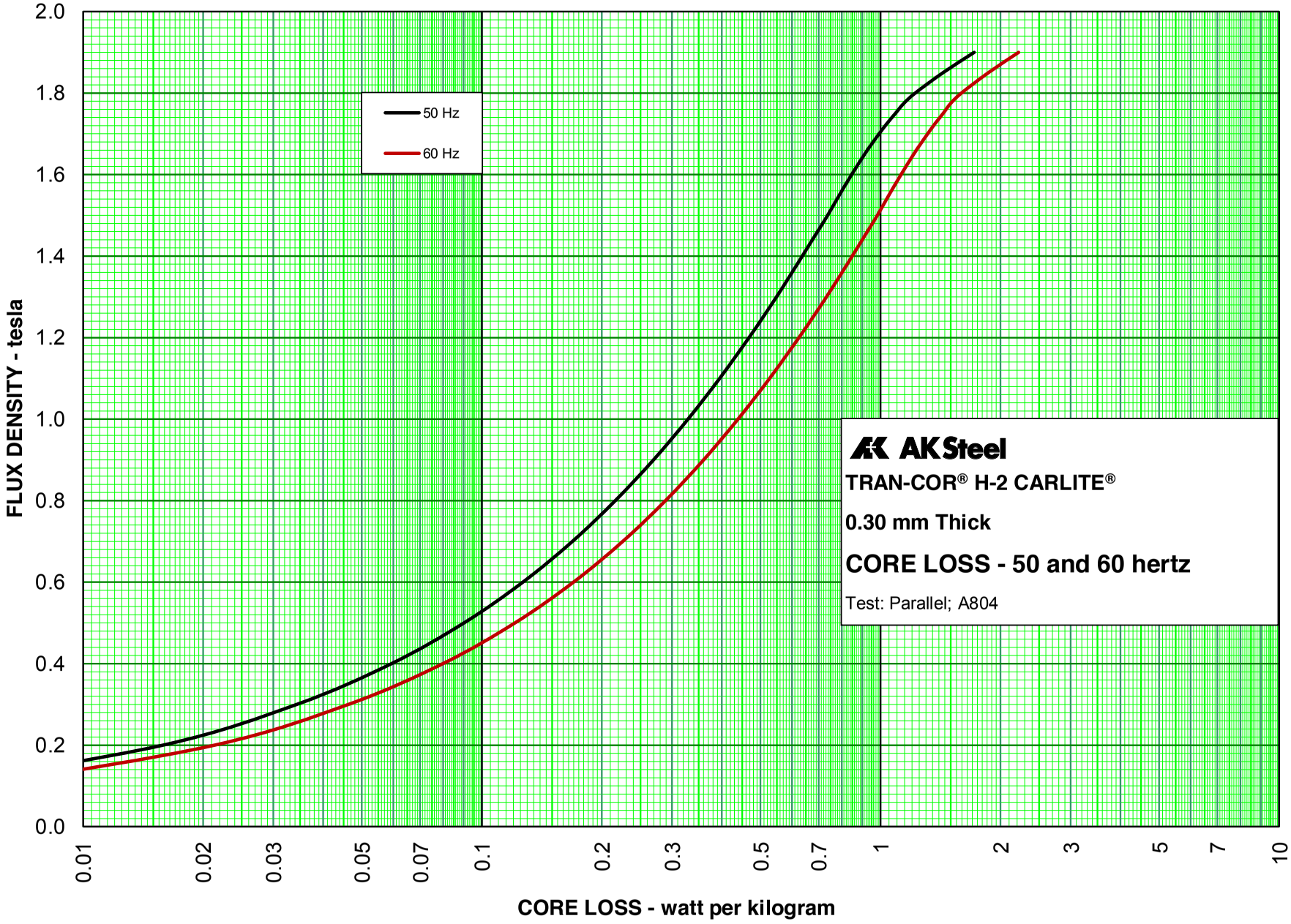
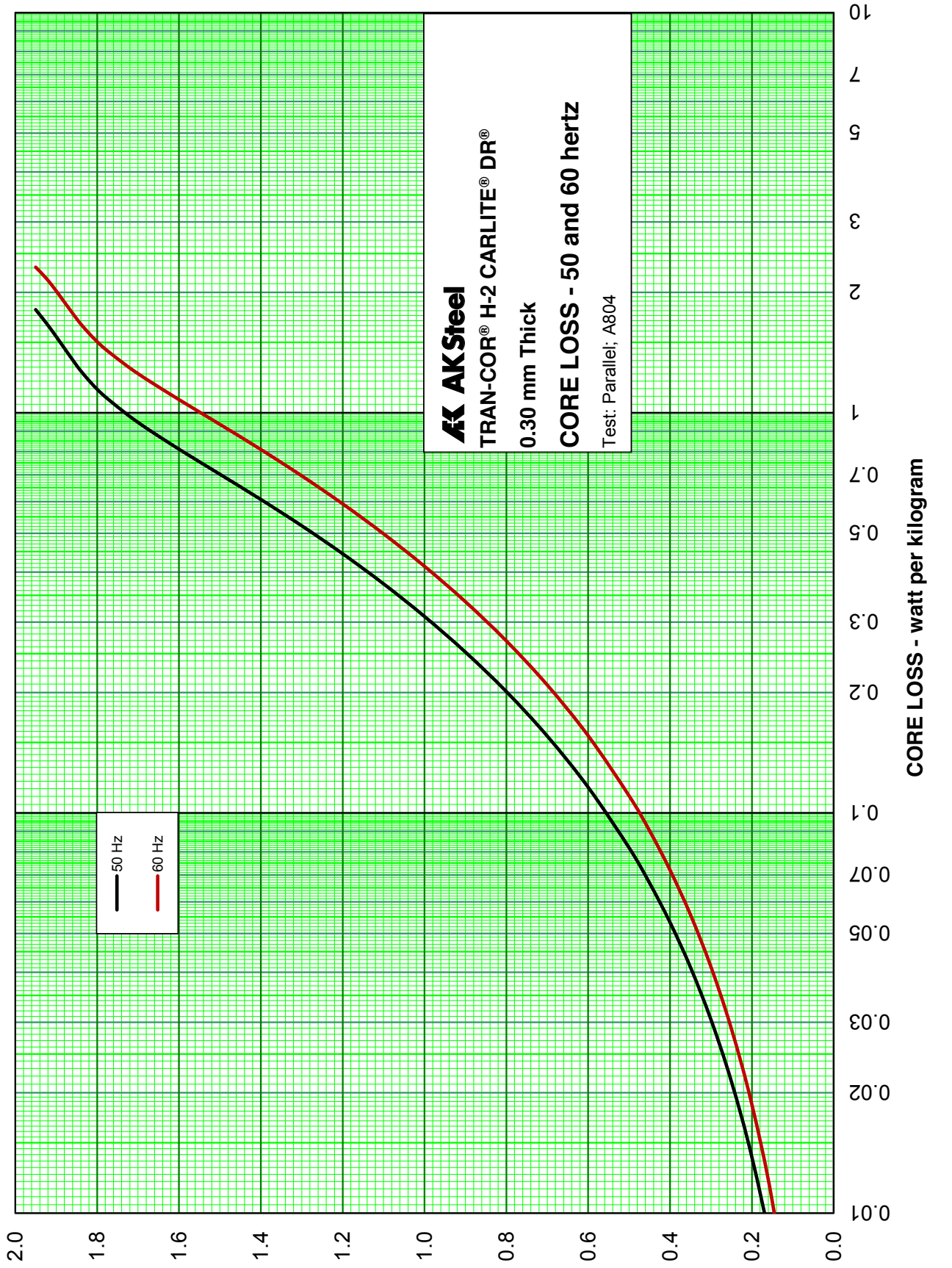


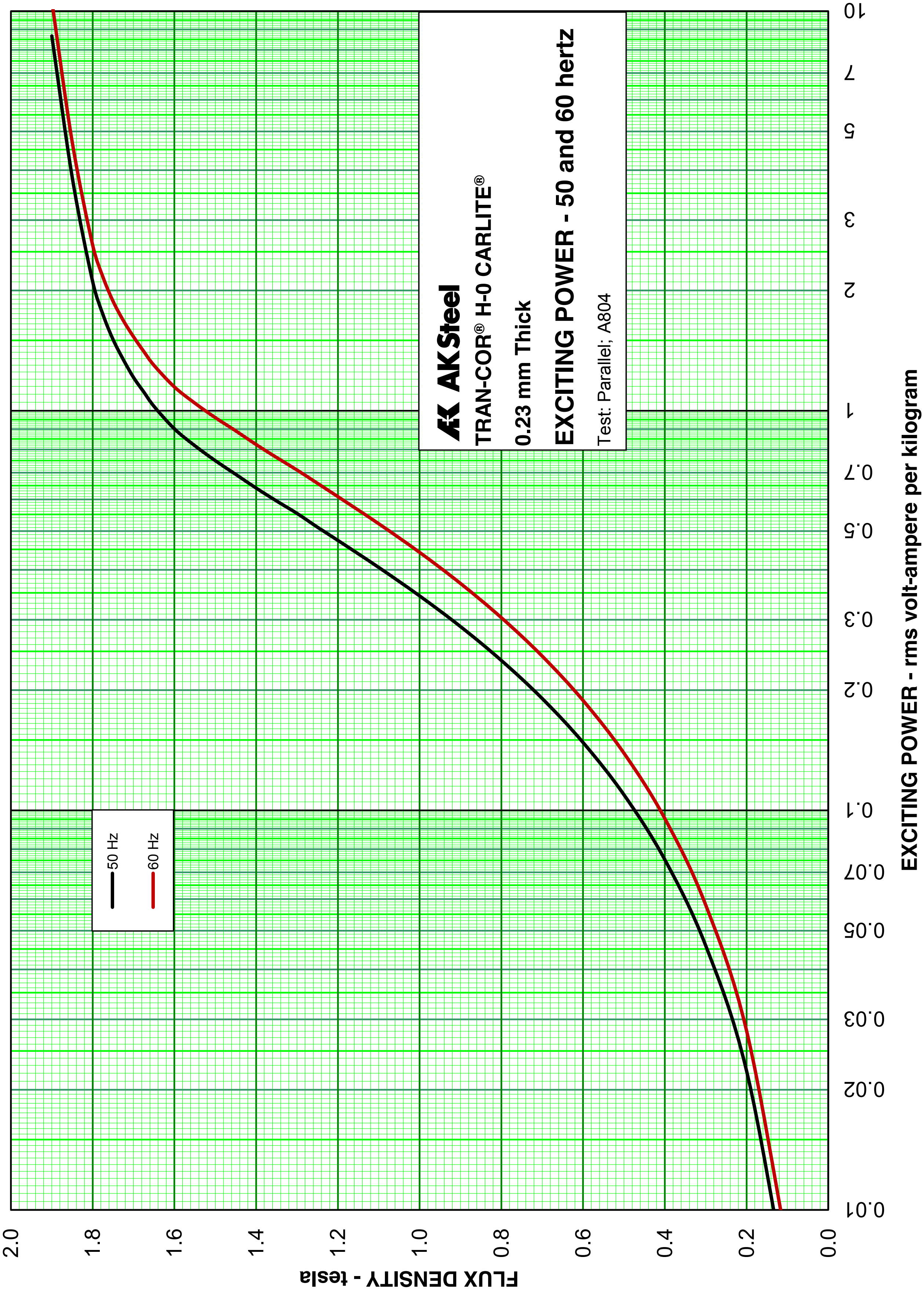
DESIGN CURVES



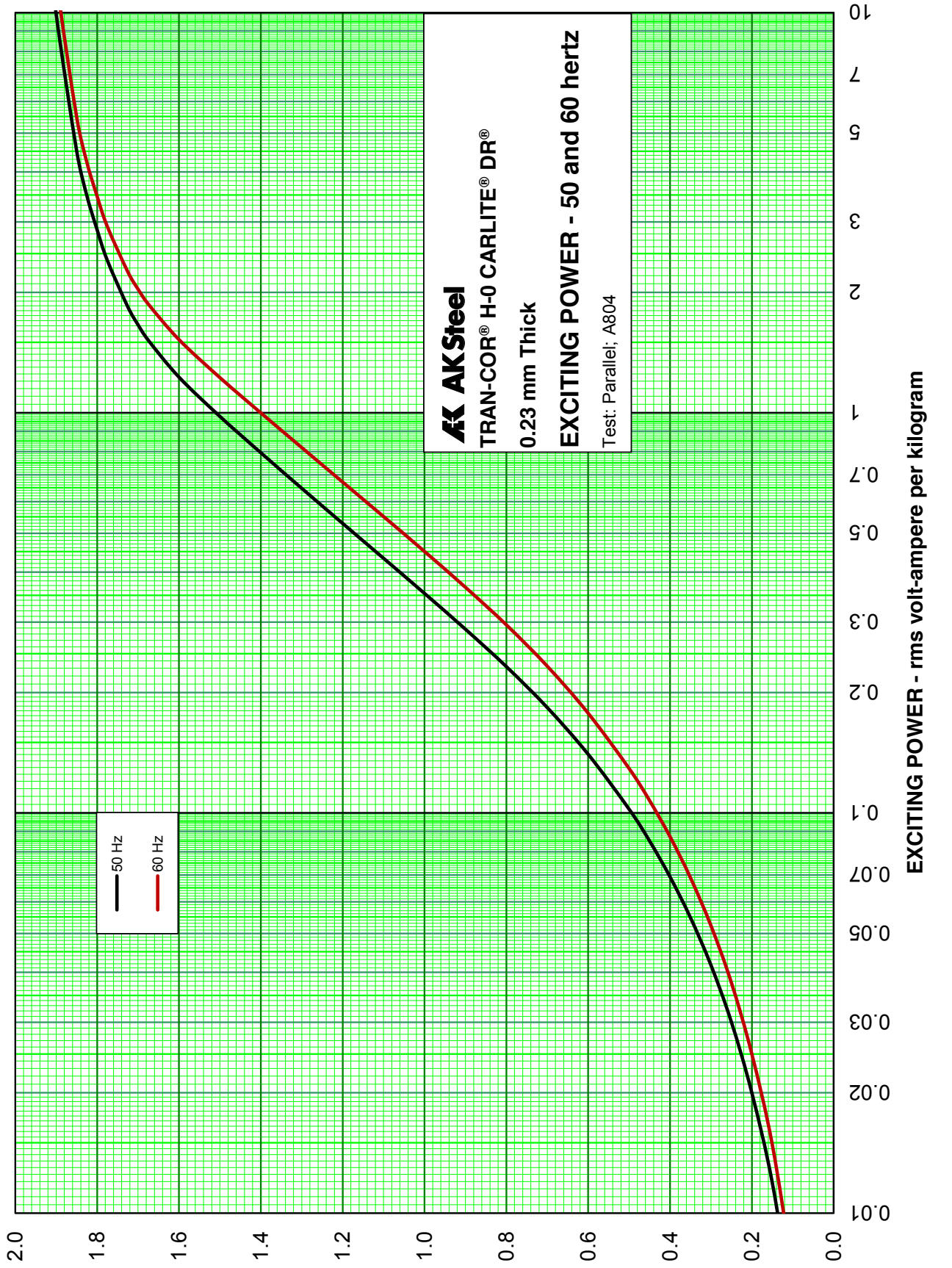

50 Hz
60 Hz
AK Steel
TRAN-COR® H-2 CARLITE®
0.30 mm Thick
CORE LOSS - 50 and 60 hertz
Test: Parallel; A804
FLUX DENSITY - tesla
B7
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.01
0.02
0.03
0.05
0.07
0.1
0.2
0.3
0.5
0.7
1
2
3
5
7
10
CORE LOSS - watt per kilogram

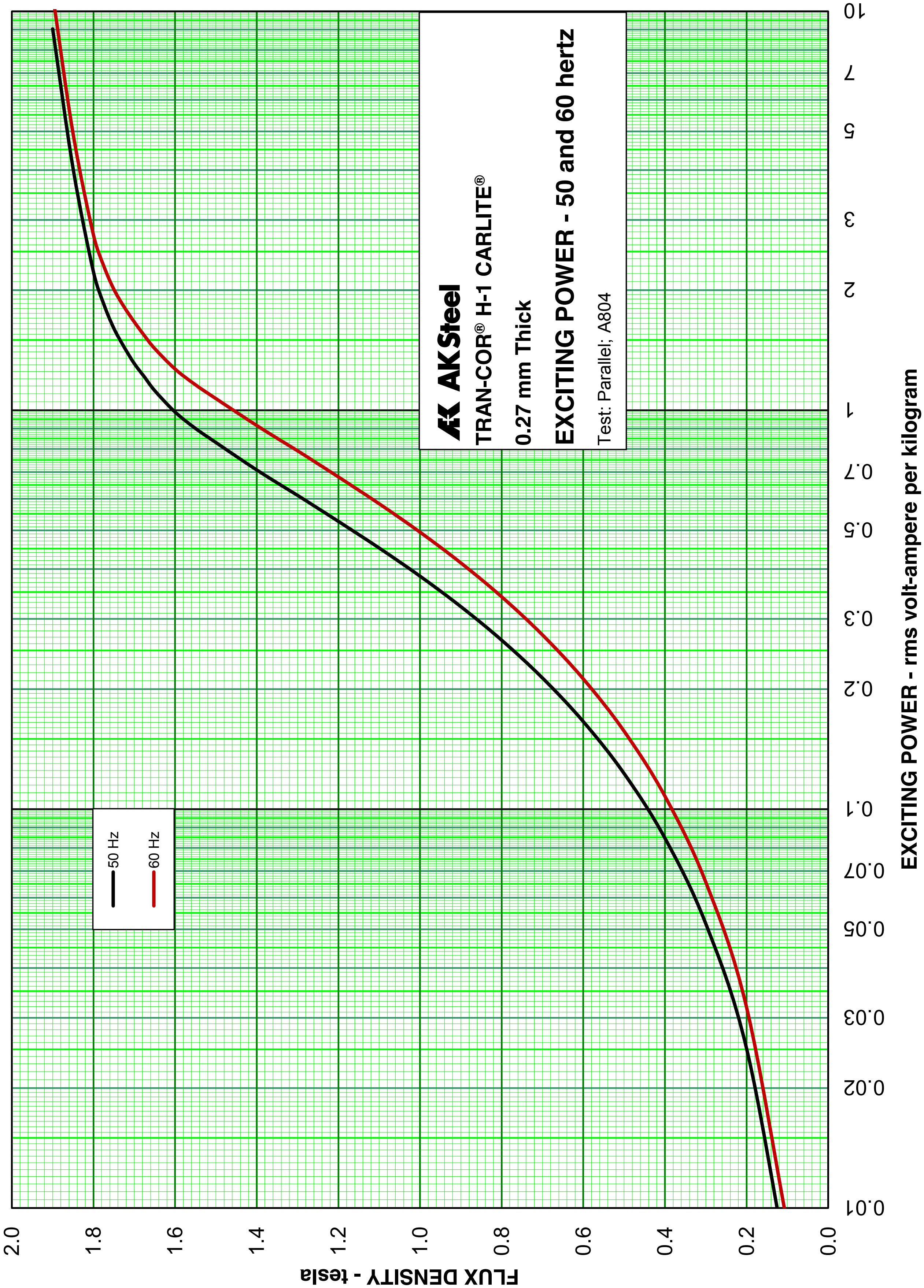
DESIGN CURVES



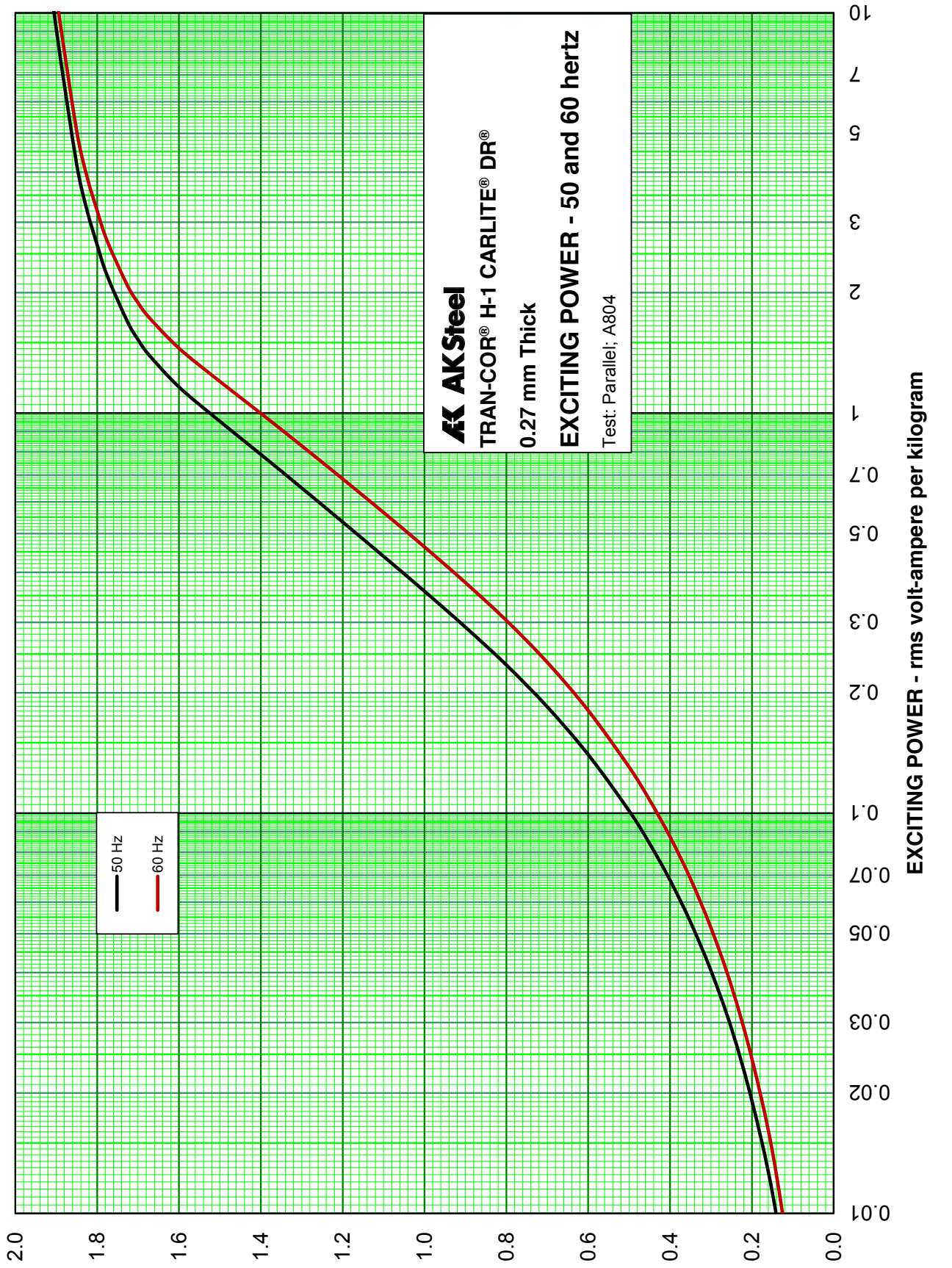

AK Steel
TRAN-COR® H-0 CARLITE®
0.23 mm Thick
EXCITING POWER - 50 and 60 hertz
Test: Parallel; A804
50 Hz
60 Hz
FLUX DENSITY - tesla
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
EXCITING POWER - rms volt-ampere per kilogram
0.01
0.02
0.03
0.05
0.07
0.1
0.2
0.3
0.5
0.7
1
2
3
5
7
10

DESIGN CURVES




AK Steel
TRAN-COR® H-1 CARLITE®
0.27 mm Thick
EXCITING POWER - 50 and 60 hertz
Test: Parallel; A804
50 Hz
60 Hz
FLUX DENSITY - tesla
EXCITING POWER - rms volt-ampere per kilogram
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
0.01
0.02
0.03
0.05
0.07
0.1
0.2
0.3
0.5
0.7
1
2
3
5
7
10

DESIGN CURVES



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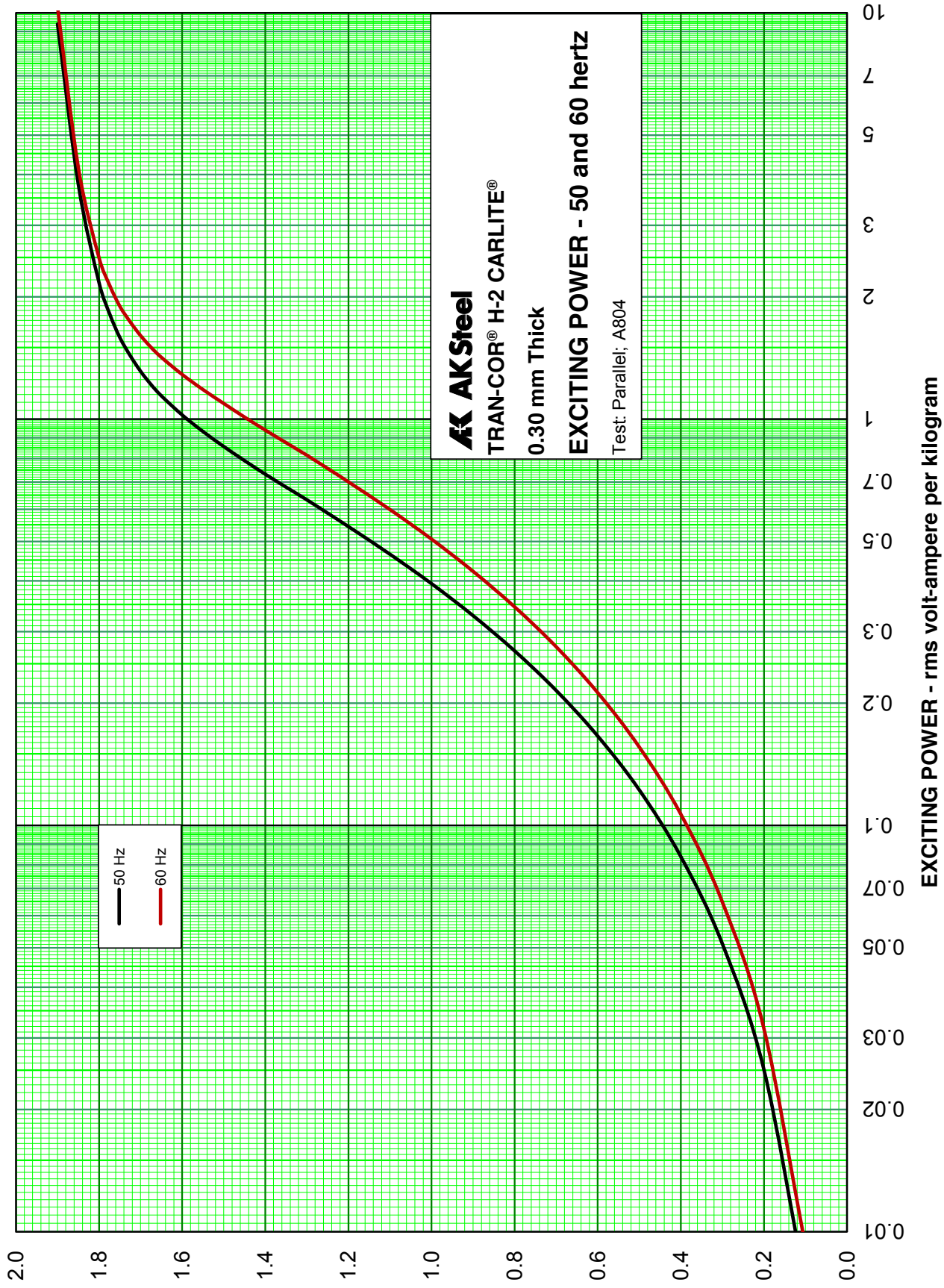

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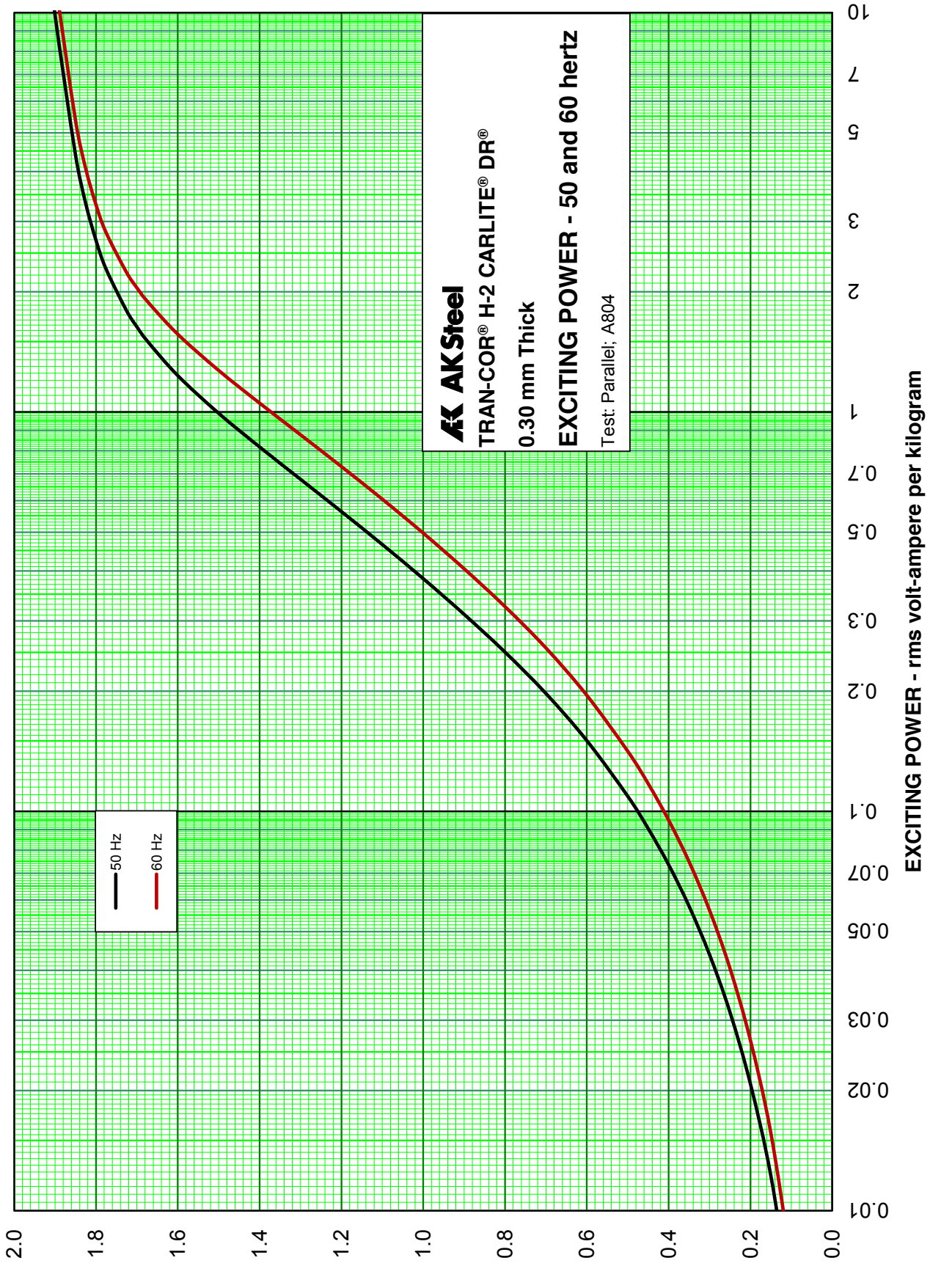

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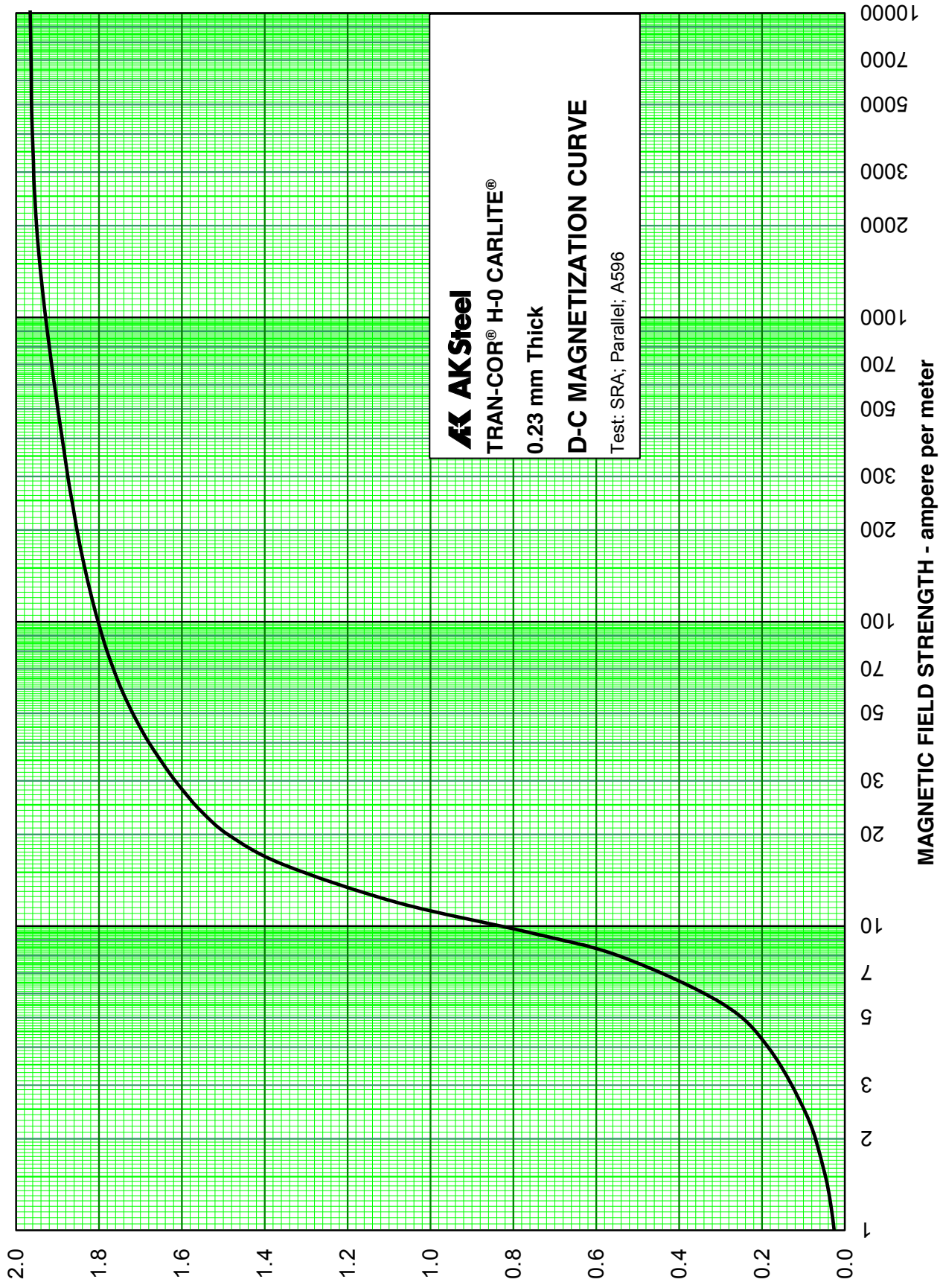
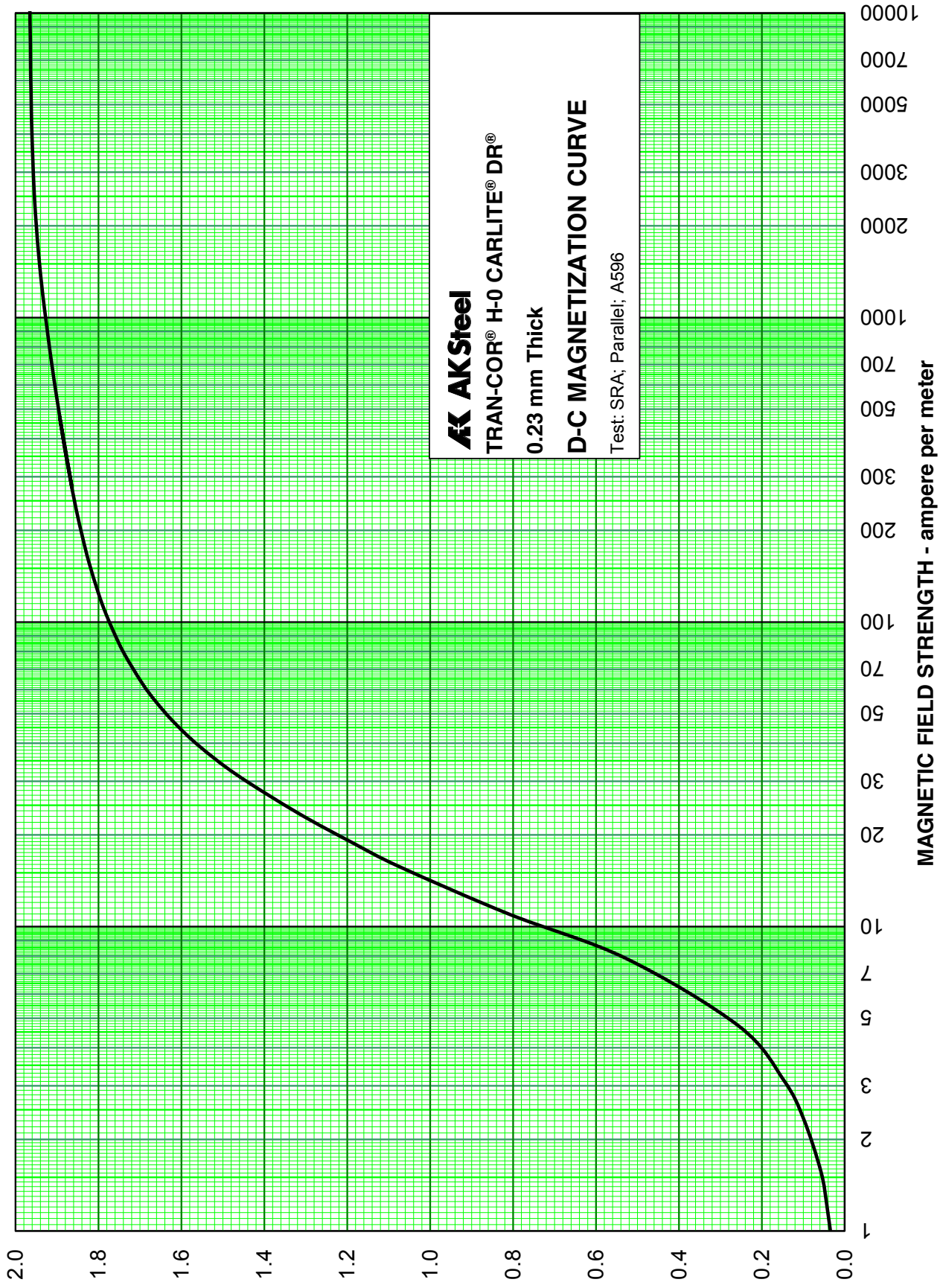
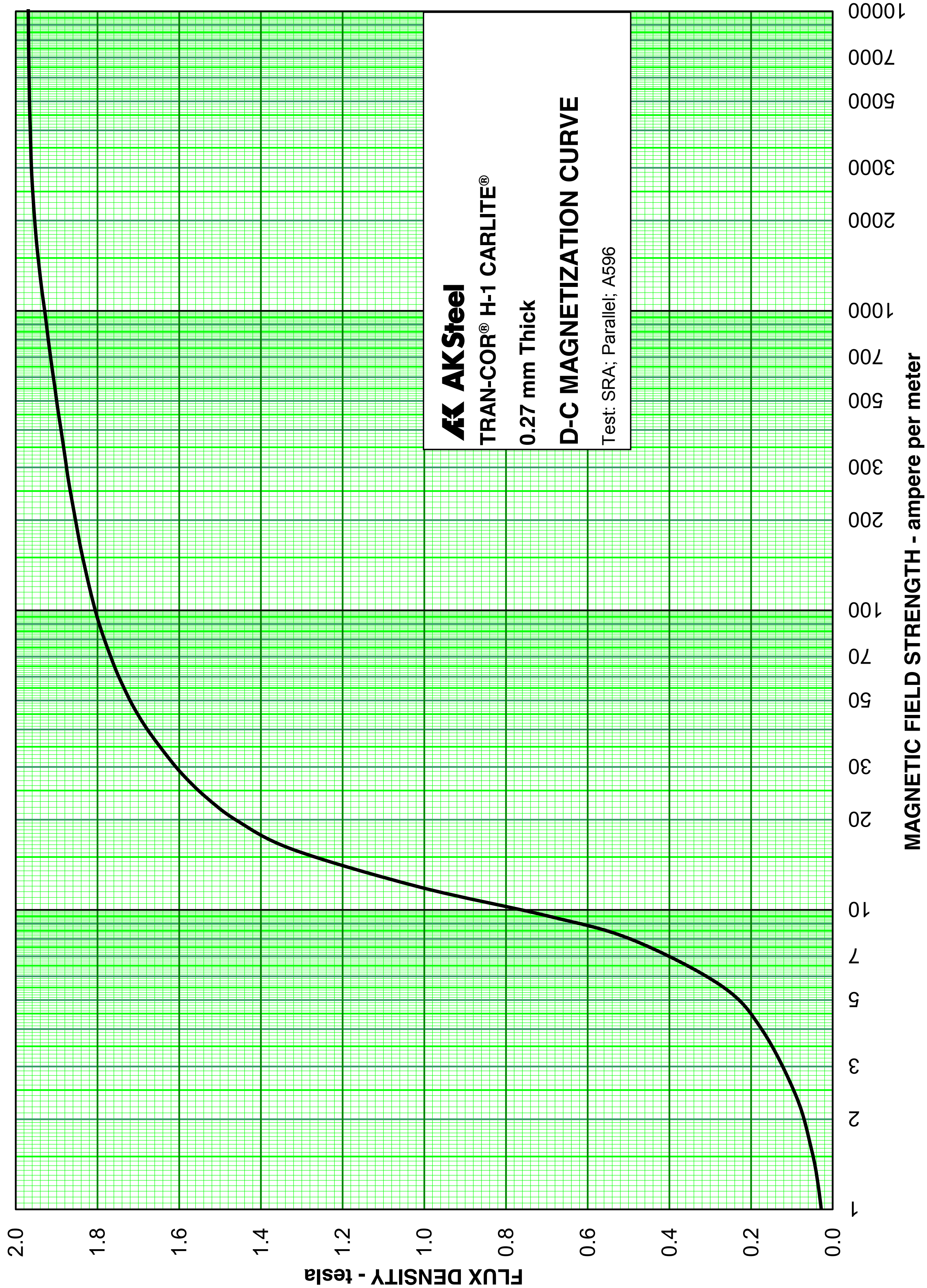
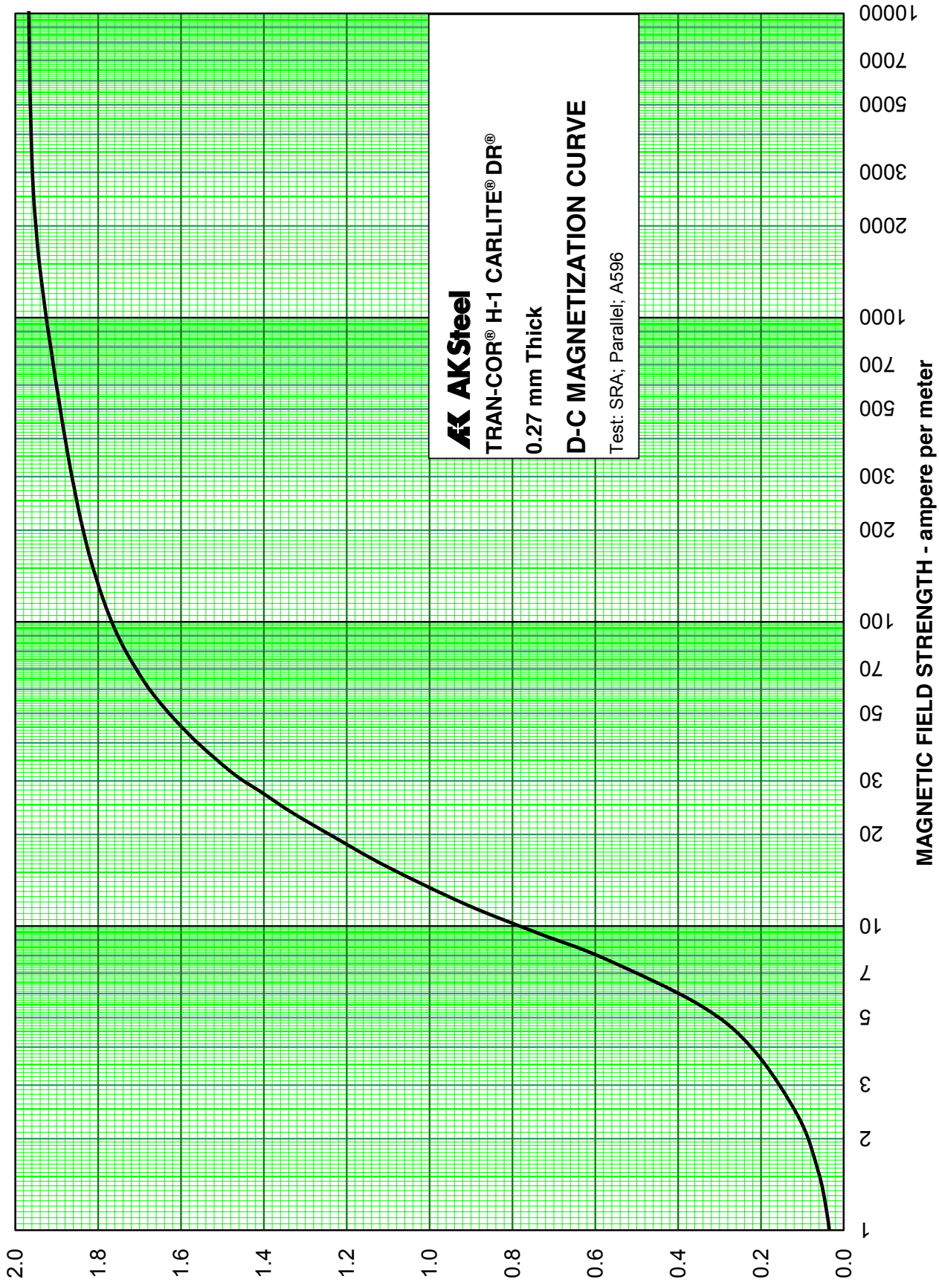


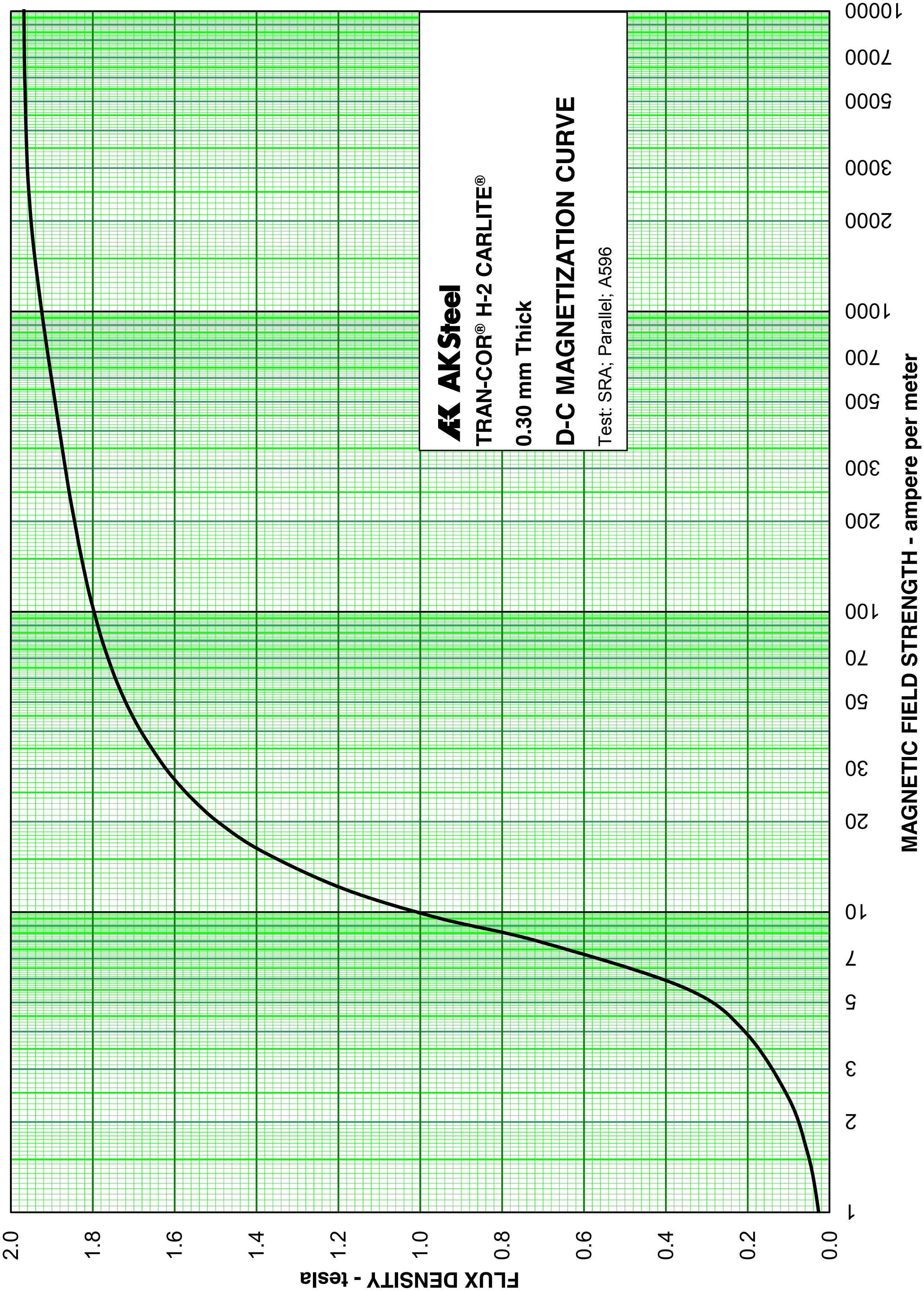
DESIGN CURVES



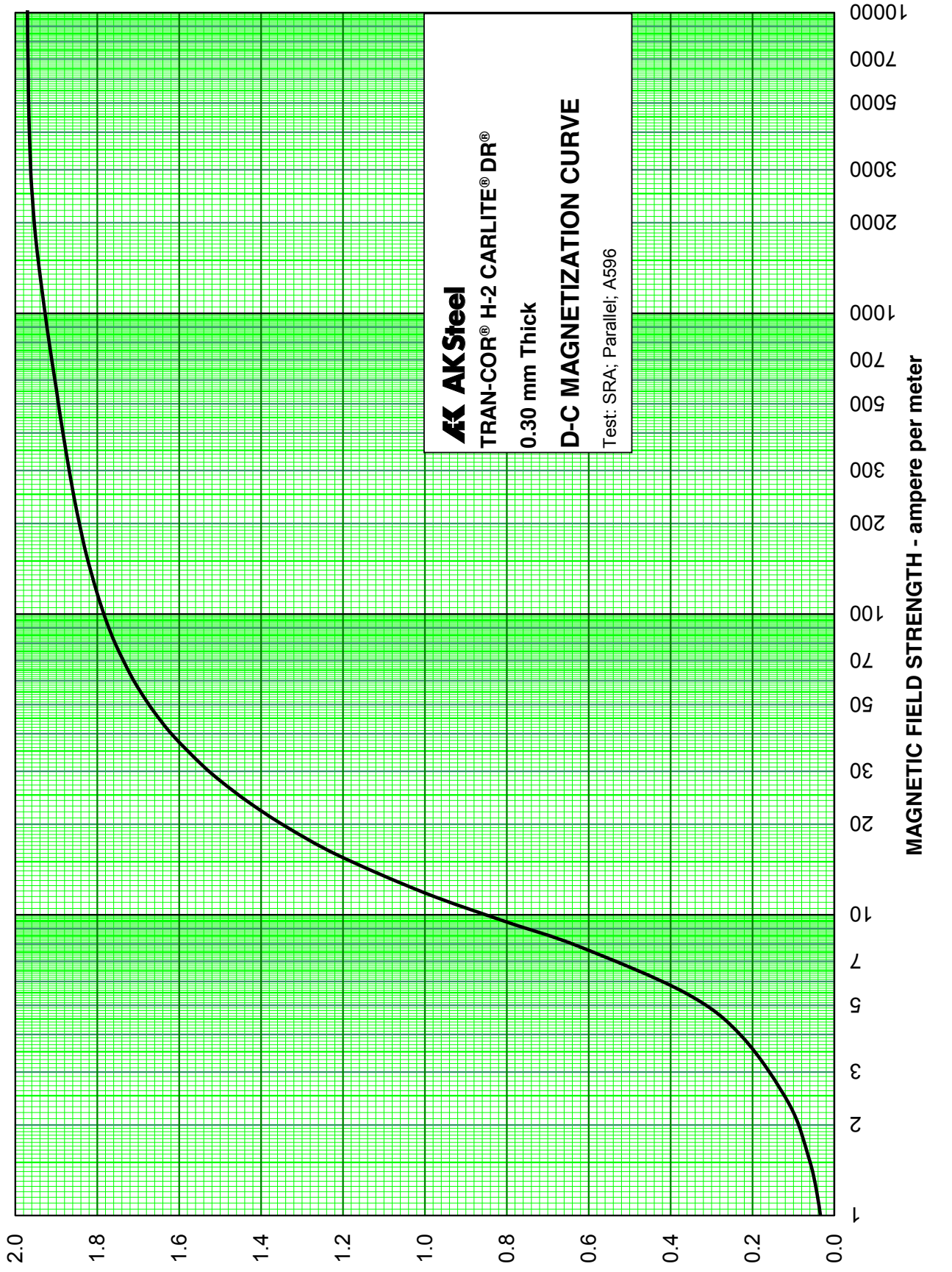

AK Steel
TRAN-COR® H-1 CARLITE®
0.27 mm Thick
D-C MAGNETIZATION CURVE
Test: SRA; Parallel; A596
MAGNETIC FIELD STRENGTH - ampere per meter
1
2
3
5
7
10
20
30
50
70
100
200
300
500
700
1000
2000
3000
5000
7000
10000
FLUX DENSITY - tesla
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0

DESIGN CURVES

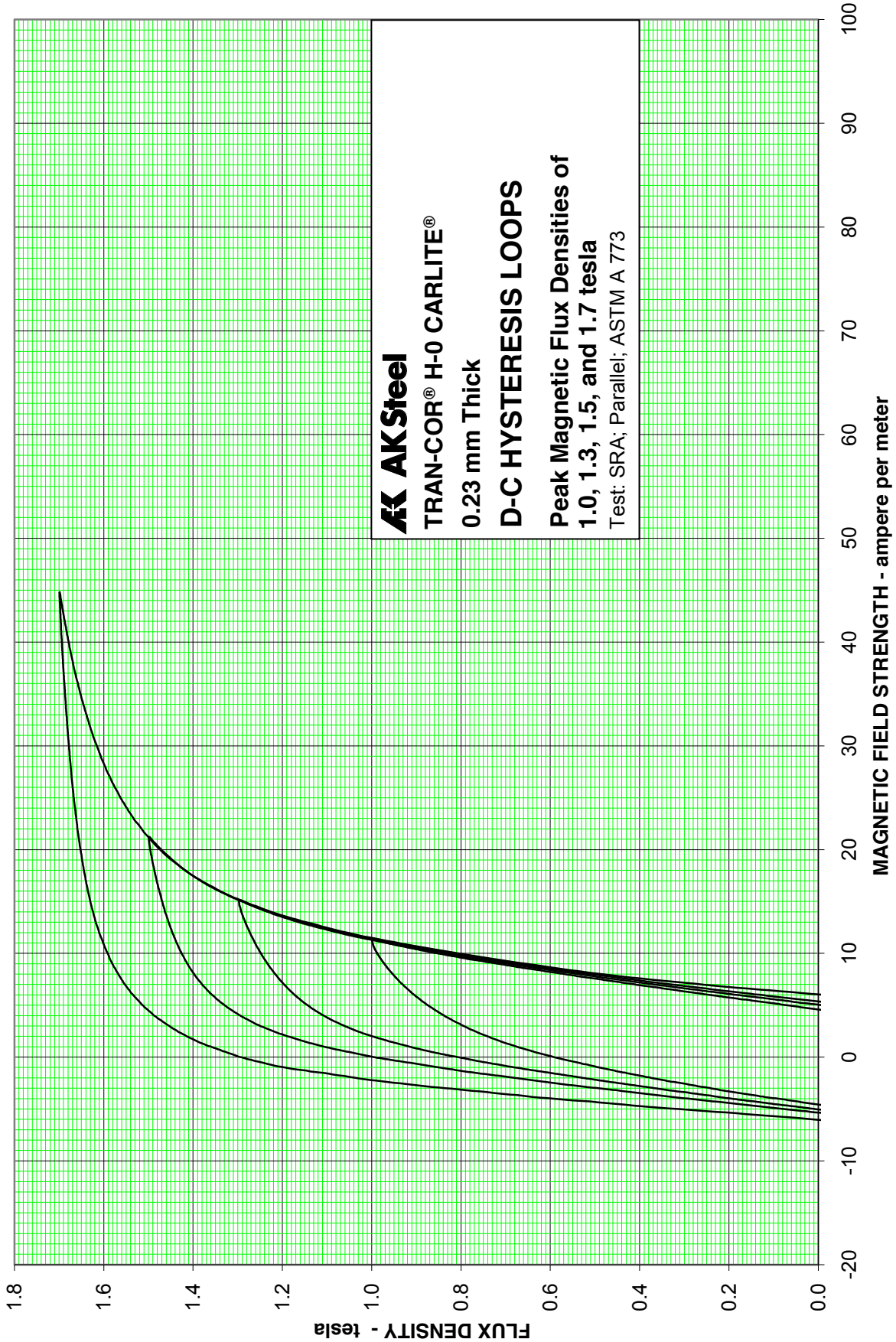



AK Steel
TRAN-COR® H-2 CARLITE®
0.30 mm Thick
D-C MAGNETIZATION CURVE
Test: SRA; Parallel; A596
MAGNETIC FIELD STRENGTH - ampere per meter
1
2
3
5
7
10
20
30
50
70
100
200
300
500
700
1000
2000
3000
5000
7000
10000
FLUX DENSITY - tesla
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0

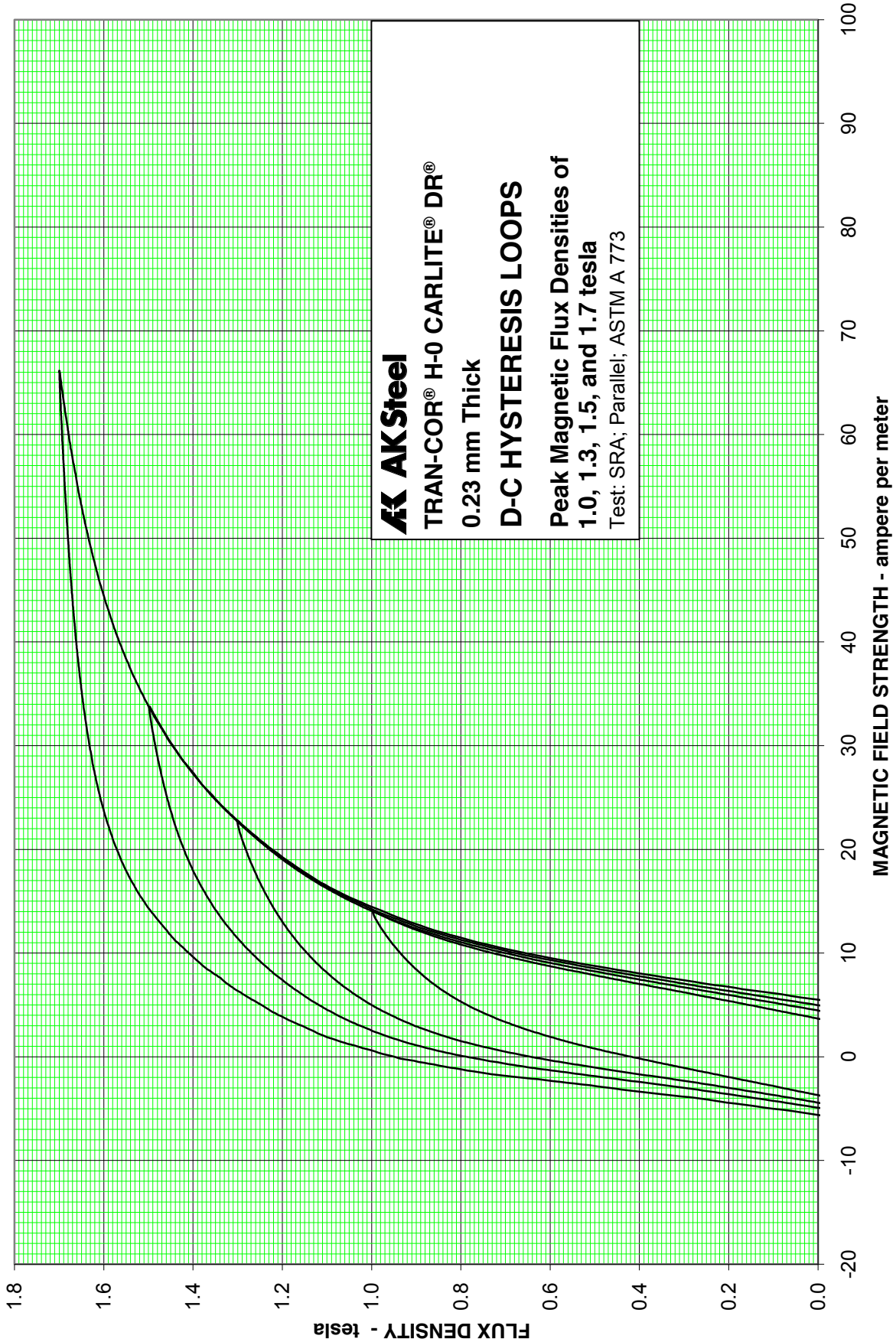
DESIGN CURVES



DESIGN CURVES



DESIGN CURVES



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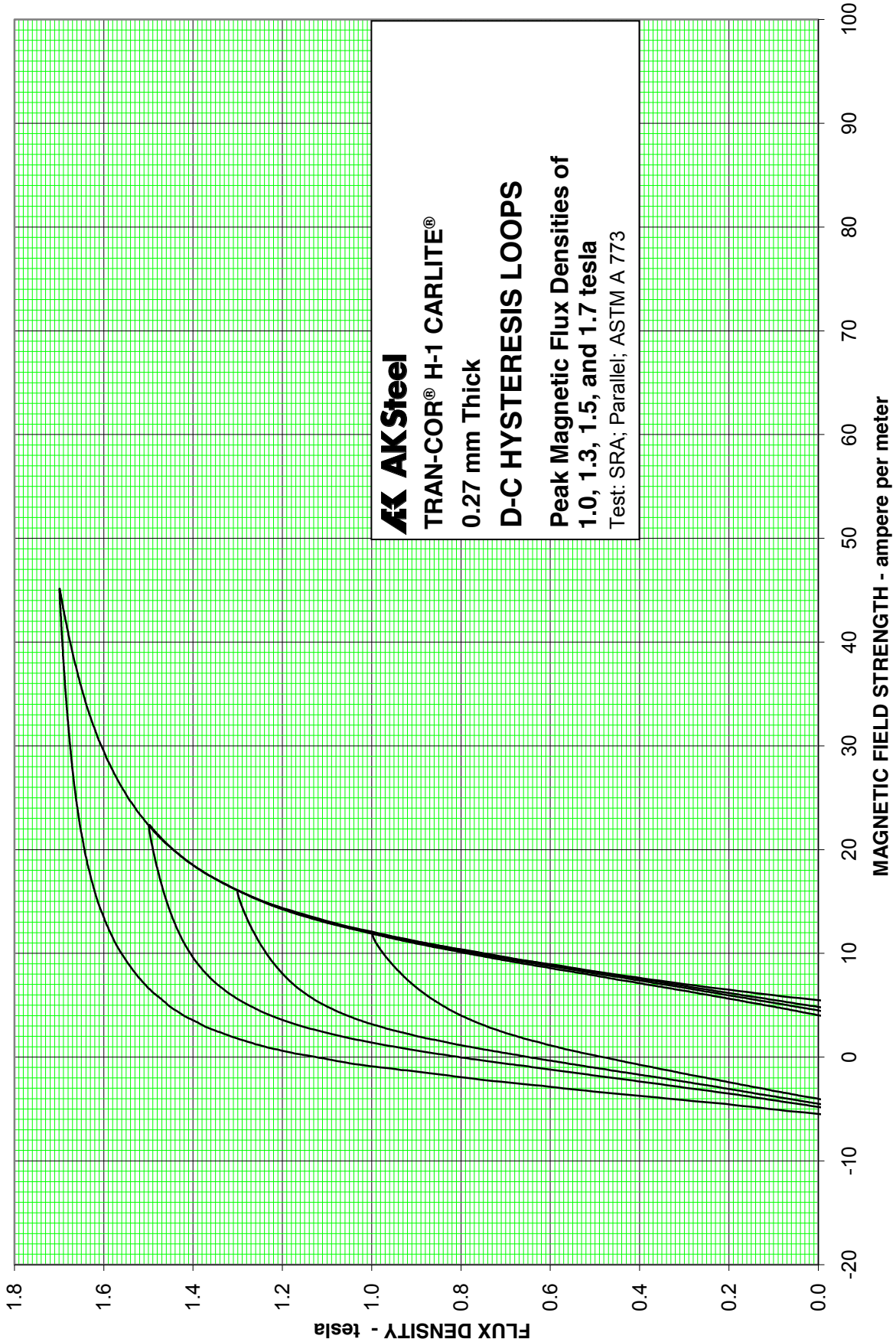

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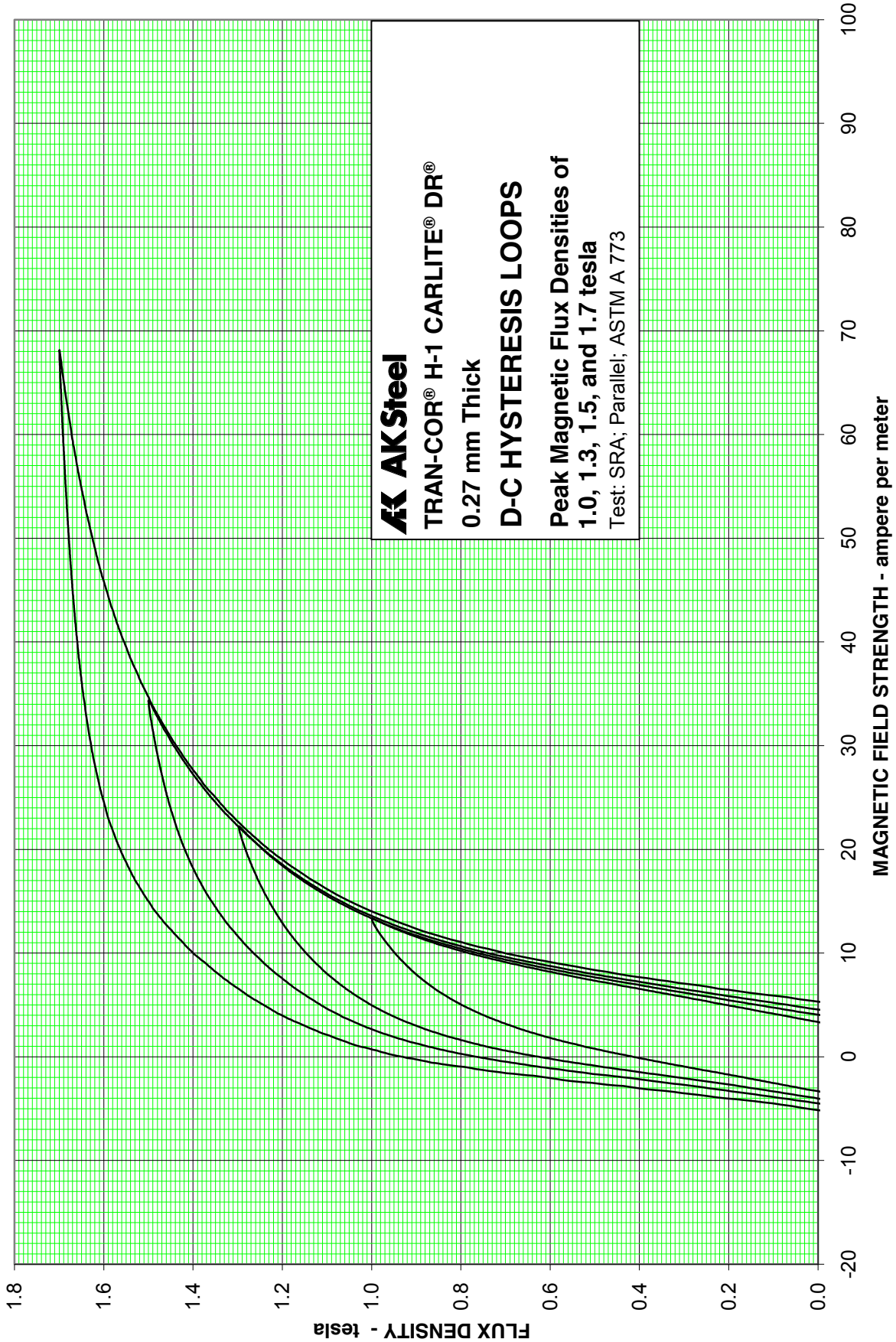

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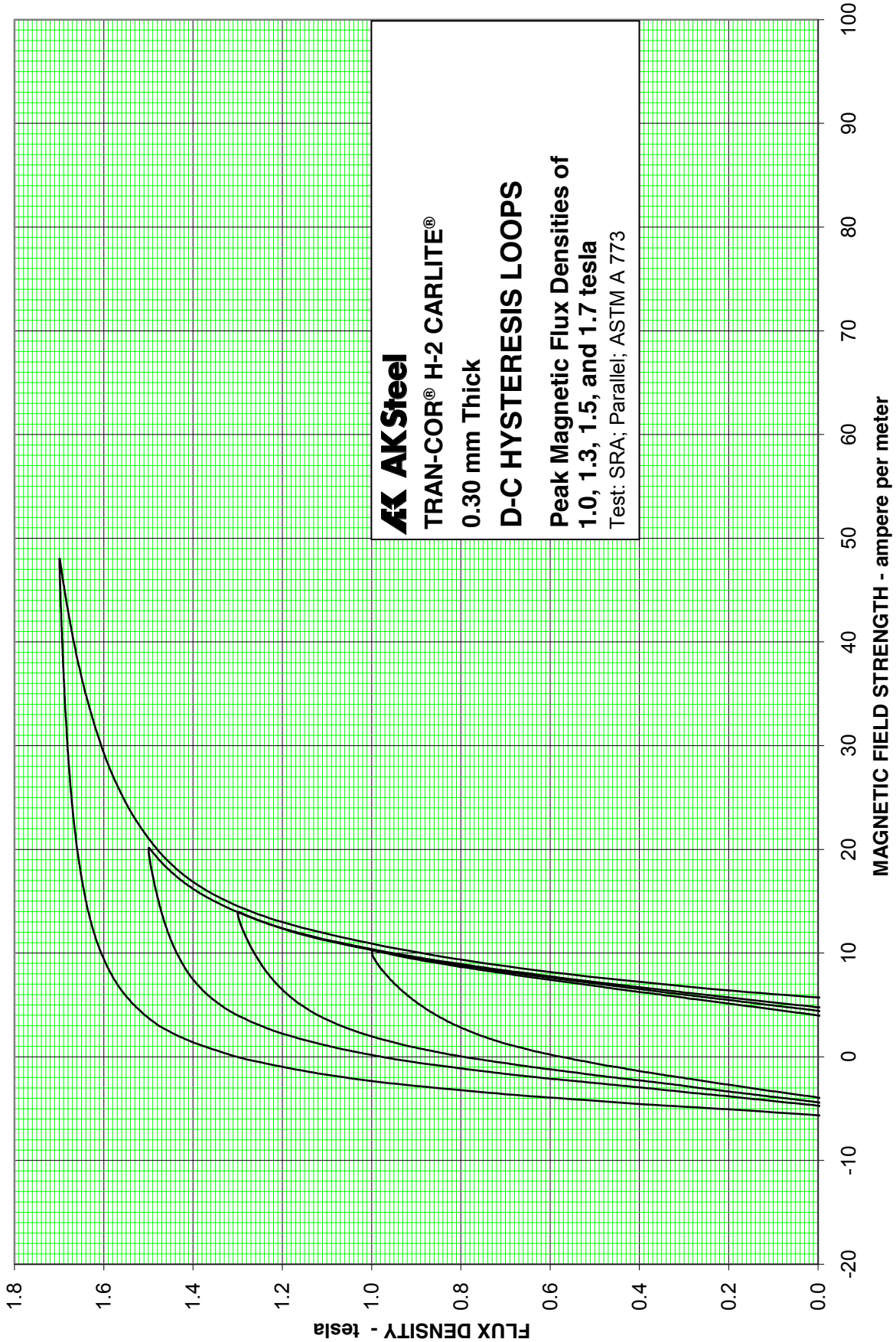
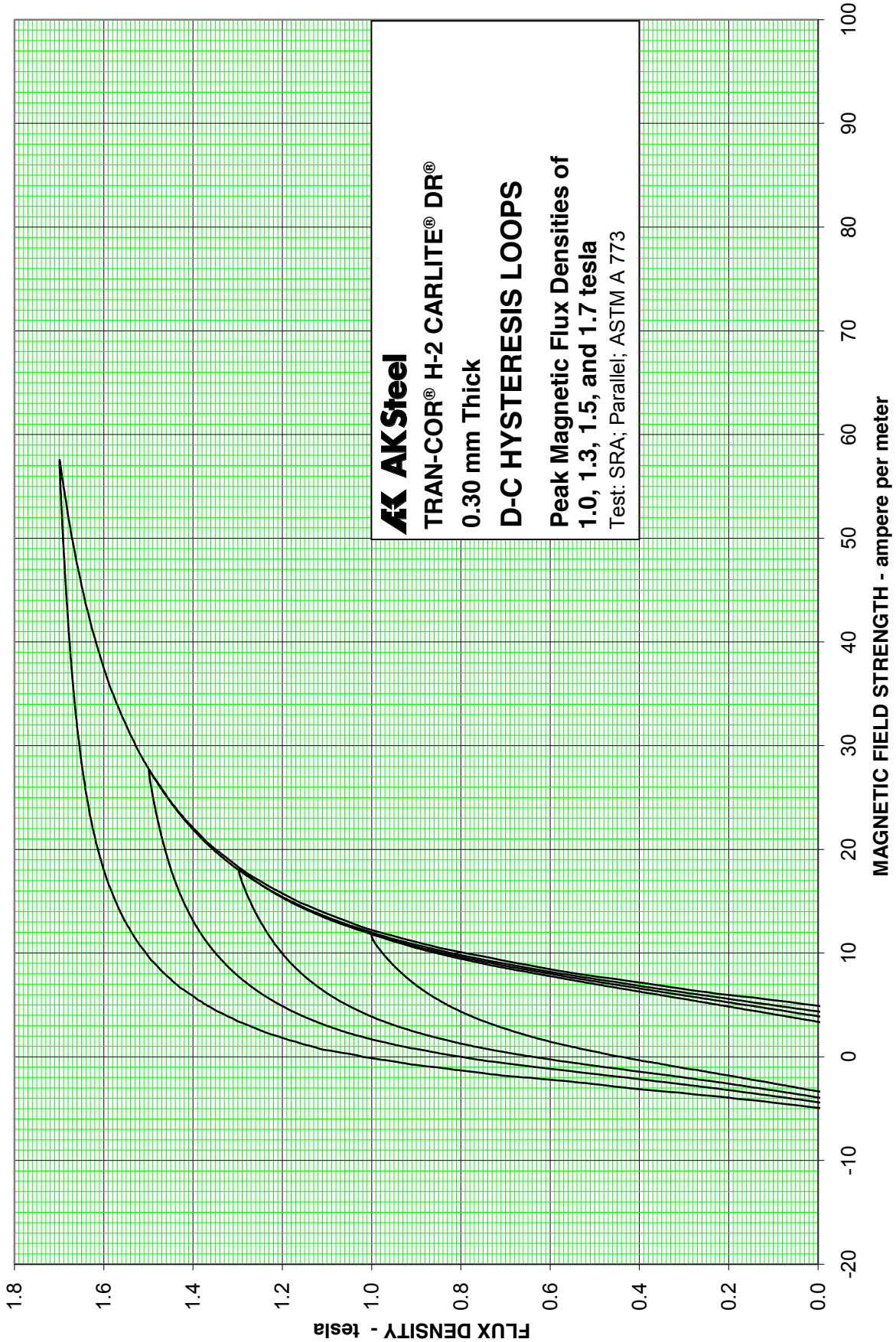


DESIGN CURVES



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