Steel

powercore® 035-190Y390

Product information for electrical steel for e-mobility

thyssenkrupp

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Areas of application

The non-oriented electrical steel grade powercore® 035-190Y390 from thyssenkrupp is ideal for use in highly efficient automotive drive systems. The steel grade is characterized by very good processing properties, providing advantages in final application regardless of whether it is used in hybrid or electric vehicles or other high-speed motors.

All powercore® grades for e-mobility meet requirements for high permeability, high magnetizability and low eddy current losses.

Product advantages

- Application-optimized texture to minimize influence of processing on soft magnetic properties
- Guaranteed yield strengths of up to 390 MPa at room temperature
- Extended magnetic properties beyond standard DIN EN 10303

In addition to the grades for e-mobility and the fully finished standard grades, there are a large number of application-oriented grades for electric motors and generators, such as our high-permeability AP grades and our re-annealable PP grades.

powercore® Explorer

In addition to the figures presented in the product information, the powercore® Explorer gives developers the following possibilities:

- Tabular and graphic presentations of magnetic properties
- Visual comparison of the magnetic properties of different powercore® electrical steel grades based on standard measurements at various frequencies
- Export of material data to common simulation programs for machine design and calculations

We would be pleased to provide you with powercore® Explorer on request.

Content

Magnetic properties

Guaranteed values to DIN EN 10303

		Max. core loss	Min. polarization		
		[W/kg] at	[T] at		
		400 Hz	2,500	5,000	10,000
		1.0 T	[A/m]	[A/m]	[A/m]
Steel grade	Reference grade DIN EN 10303				
powercore® 035-190Y390	NO35-22	19	1.52	1.61	1.73

Mechanical properties

Guaranteed min. yield strength to DIN EN ISO 6892-1 is **390 MPa**.

Typical average values for grade

	Yield strength*	Tensile strength	Elongation	Micro-hardness
Test direction in rolling direction at room temperature	$R_{p0.2}$	R_m	A_{80}	HV5
	[MPa]	[MPa]	[%]	[–]
Steel grade				
powercore® 035-190Y390	412	545	18	194

Physical properties

	Density
	ρ
	[kg/dm³]
Steel grade	
powercore® 035-190Y390	7.60

Insulation types

	IEC 60404-1-1/04	thyssenkrupp
Steel grade		
powercore® 035-190Y390	–	uncoated
	EC-3	stabolit® 10
	EC-5-P	stabolit® 20
	EC-4	stabolit® 30
	EC-6	stabolit® 40
	EC-5	stabolit® 60
	–	stabolit® 70

Please refer to the product information on stabolit® for more exact data on insulation coatings.

Dimensions

	Form of supply	Thick-ness	Width	Inside diameter	Outside diameter
		[mm]	[mm]	[mm]	[mm]
Steel grade					
powercore® 035-190Y390	Narrow strip	0.35	20 – 500	508	max. 1,360
	Wide strip	0.35	500 – 1,250	508 / 610	max. 1,360

Frequency-dependent properties

Typical values for information

50 Hz

J [T]	H [A/m]	μ_a	P_S [W/kg]	S_S [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.5	48	8,375	0.30	0.50
0.6	54	8,901	0.41	0.67
0.7	60	9,211	0.53	0.86
0.8	69	9,265	0.66	1.09
0.9	79	9,033	0.80	1.37
1.0	94	8,450	0.96	1.71
1.1	116	7,550	1.15	2.18
1.2	155	6,152	1.36	2.89
1.3	248	4,170	1.62	4.34
1.4	573	1,946	1.95	9.05
1.5	1,682	711	2.31	27.61
1.6	3,950	323	2.62	73.67
1.7	7,397	184	2.90	155.00
1.8	12,714	114	3.18	291.50

60 Hz

J [T]	H [A/m]	μ_a	P_S [W/kg]	S_S [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.5	48	8,260	0.38	0.61
0.6	54	8,806	0.52	0.82
0.7	61	9,144	0.66	1.05
0.8	69	9,200	0.83	1.33
0.9	80	8,997	1.01	1.67
1.0	94	8,433	1.21	2.09
1.1	116	7,527	1.44	2.65
1.2	155	6,154	1.71	3.51
1.3	248	4,167	2.04	5.24
1.4	574	1,942	2.45	10.91
1.5	1,688	708	2.91	33.26
1.6	3,957	323	3.30	88.58
1.7	7,424	183	3.66	186.76
1.8	12,666	114	4.02	348.81

200 Hz

J [T]	H [A/m]	μ_a	P_S [W/kg]	S_S [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.5	58	6,876	1.84	2.51
0.6	65	7,335	2.52	3.37
0.7	73	7,682	3.29	4.36
0.8	81	7,889	4.15	5.50
0.9	90	7,978	5.11	6.84
1.0	101	7,845	6.19	8.45
1.1	120	7,270	7.42	10.53
1.2	156	6,106	8.74	13.42
1.3	248	4,171	10.42	19.20
1.4	580	1,921	12.57	38.74
1.5	1,699	704	15.09	117.71
1.6	3,938	324	17.61	314.93
1.7	7,487	182	20.44	685.48

Typical values for information

400 Hz

J [T]	H [A/m]	μ_a	P_S [W/kg]	S_S [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.2	41	3,886	0.97	1.40
0.3	52	4,552	2.03	2.71
0.4	63	5,091	3.36	4.31
0.5	72	5,528	4.96	6.20
0.6	82	5,856	6.83	8.41
0.7	92	6,084	8.97	10.96
0.8	102	6,225	11.42	13.91
0.9	114	6,292	14.22	17.35
1.0	126	6,294	17.40	21.41
1.1	142	6,187	21.05	26.40
1.2	168	5,686	25.23	33.18
1.3	253	4,086	30.17	45.10
1.4	568	1,961	36.31	82.12
1.5	1,633	732	43.98	235.30

500 Hz

J [T]	H [A/m]	μ_a	P_S [W/kg]	S_S [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.2	44	3,622	1.35	1.88
0.3	57	4,211	2.82	3.64
0.4	68	4,695	4.67	5.82
0.5	78	5,076	6.91	8.41
0.6	89	5,354	9.51	11.45
0.7	101	5,535	12.56	14.99
0.8	113	5,633	16.06	19.11
0.9	127	5,661	20.07	23.93
1.0	141	5,636	24.68	29.60
1.1	157	5,566	29.94	36.47
1.2	179	5,344	36.05	45.56
1.3	257	4,019	43.21	60.92
1.4	576	1,936	52.20	107.99

1,000 Hz

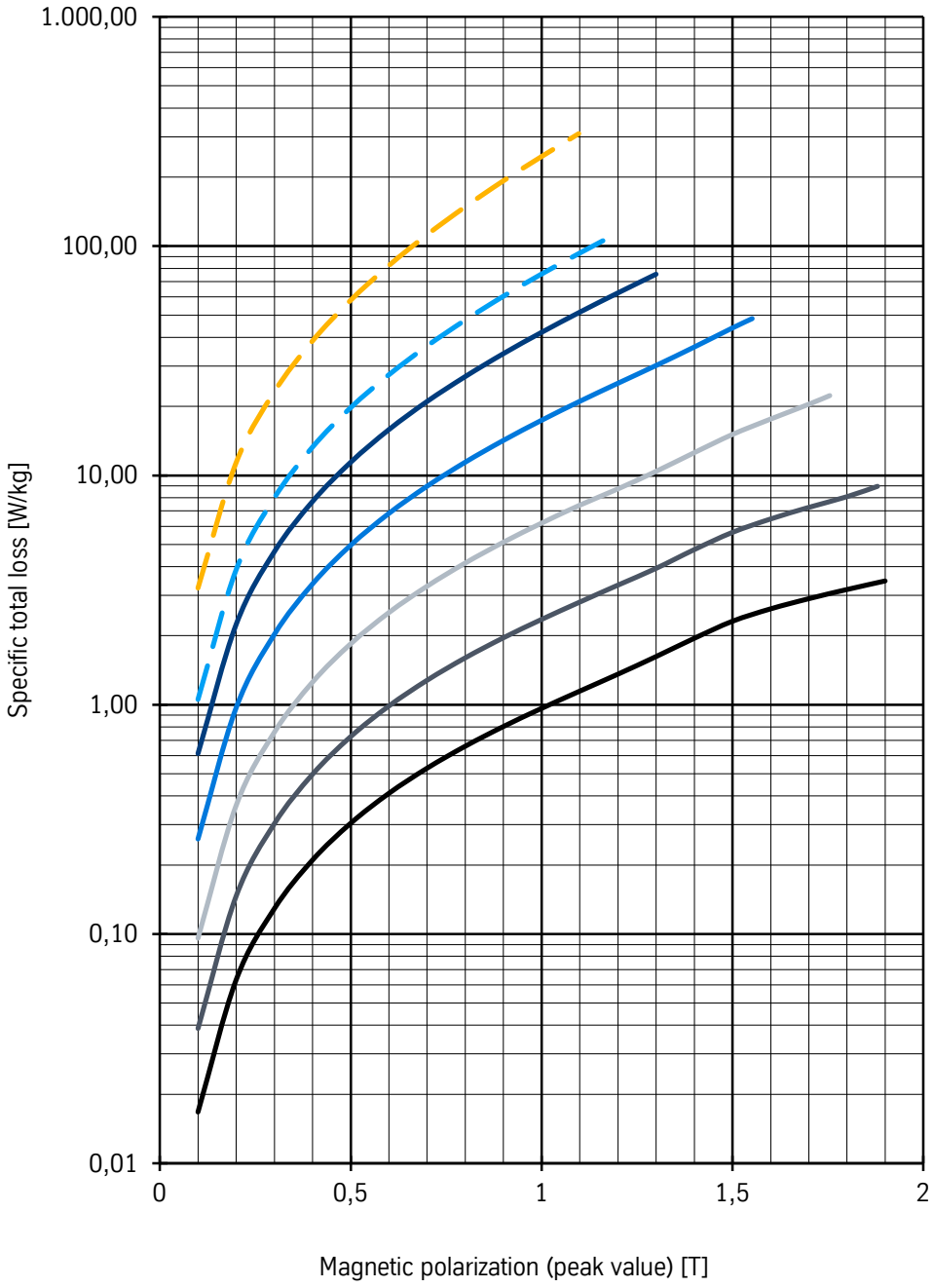
J [T]	H [A/m]	μ_a	P_S [W/kg]	S_S [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.2	57	2,770	3.88	4.86
0.3	75	3,175	7.99	9.57
0.4	91	3,494	13.30	15.50
0.5	107	3,718	19.76	22.69
0.6	124	3,844	27.48	31.34
0.7	143	3,888	36.70	41.71
0.8	165	3,869	47.58	54.06
0.9	188	3,809	60.47	68.78
1.0	214	3,718	75.58	86.25
1.1	244	3,595	93.28	107.23

2,000 Hz

J [T]	H [A/m]	μ_a	P_S [W/kg]	S_S [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.2	79	1,004	11.39	13.36
0.3	104	1,532	23.17	26.41
0.4	128	1,862	38.63	43.32
0.5	155	2,058	58.12	64.70
0.6	186	2,145	82.32	91.44
0.7	221	2,166	112.13	124.67
0.8	260	2,145	148.46	165.41
0.9	305	2,087	192.75	215.48
1.0	356	2,013	245.92	275.65
1.1	79	1,004	11.39	13.36
1.2	104	1,532	23.17	26.41
1.3	128	1,862	38.63	43.32

Specific core loss

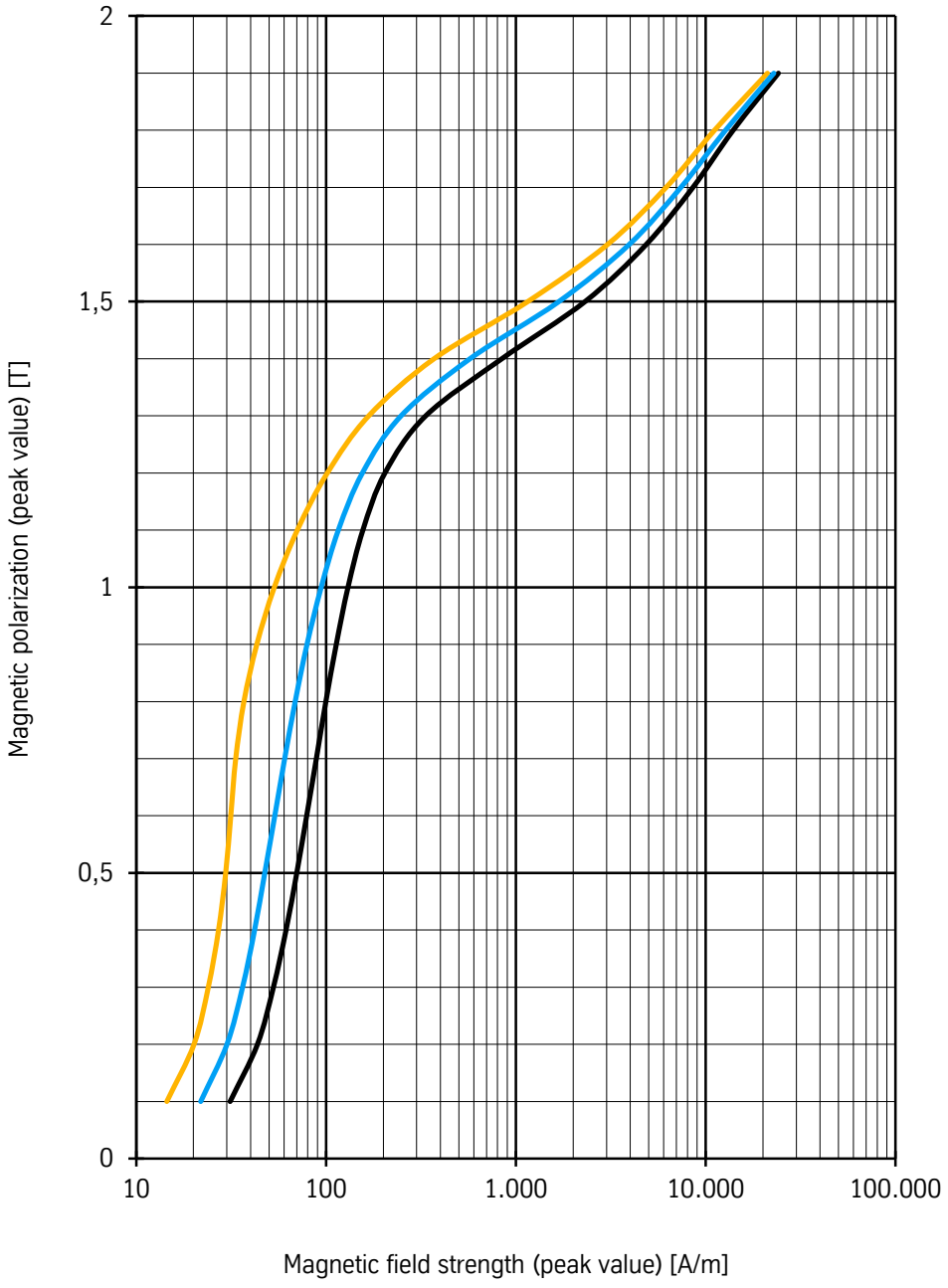
P_S versus J, directional (L/Q/M)



- 035-190Y390/M/50
- 035-190Y390/M/100
- 035-190Y390/M/200
- 035-190Y390/M/400
- 035-190Y390/M/700
- 035-190Y390/M/1000
- 035-190Y390/M/2000

Magnetic polarization

J versus H, directional (L/Q/M), 50 Hz



Angle to rolling direction
- 0°
- 0°/90°
- 90°

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