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## Areas of application

The non-oriented electrical steel grade powercore® 035-220Y300 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 300 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.

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## Magnetic properties

Guaranteed values to DIN EN 10303

Steel grade	Reference grade DIN EN 10303	Max. core loss		Min. polarization		
		[W/kg] at		[T] at		
		400 Hz	1.0 T	2,500	5,000	10,000
				[A/m]	[A/m]	[A/m]
powercore® 035-220Y300	N035-22	22	1.55	1.64	1.76	

## Mechanical properties

Guaranteed min. yield strength to DIN EN ISO 6892-1 is **300 MPa**.

Typical average values for grade

Test direction in rolling direction at room temperature	Yield strength*	Tensile strength	Elongation	Micro-hardness
	R <sub>p0.2</sub>	R <sub>m</sub>	A <sub>80</sub>	HV5
	[MPa]	[MPa]	[%]	[-]
Steel grade				
powercore® 035-220Y300	315	463	26	157

## Physical properties

Steel grade	Density
	$\rho$
	[kg/dm <sup>3</sup> ]
powercore® 035-220Y300	7.65

## Insulation types

IEC 60404-1-1/04 thyssenkrupp		
Steel grade		
powercore® 035-220Y300	–	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® 035-220Y300	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]	$\mu_a$	$P_s$ [W/kg]	$S_s$ [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.5	60	6,646	0.37	0.62
0.6	67	7,101	0.49	0.83
0.7	76	7,369	0.63	1.07
0.8	86	7,442	0.79	1.34
0.9	97	7,359	0.95	1.67
1.0	113	7,060	1.14	2.07
1.1	135	6,488	1.34	2.59
1.2	172	5,560	1.58	3.32
1.3	248	4,164	1.86	4.62
1.4	460	2,421	2.19	7.84
1.5	1222	978	2.60	19.96
1.6	3211	398	2.99	57.85
1.7	6,606	206	3.31	135.13
1.8	11,652	124	3.63	265.46
1.9	18,918	81	4.04	469.03

60 Hz				
J [T]	H [A/m]	$\mu_a$	$P_s$ [W/kg]	$S_s$ [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.5	60	6,600	0.46	0.76
0.6	68	7,058	0.61	1.01
0.7	76	7,332	0.79	1.30
0.8	86	7,423	0.98	1.64
0.9	98	7,341	1.19	2.03
1.0	113	7,031	1.43	2.52
1.1	135	6,481	1.69	3.14
1.2	171	5,572	1.98	4.02
1.3	248	4,168	2.33	5.58
1.4	461	2,418	2.75	9.46
1.5	1,224	976	3.27	24.04
1.6	3,201	399	3.75	69.23
1.7	6,578	207	4.21	161.46
1.8	11,530	125	4.64	315.25

200 Hz				
J [T]	H [A/m]	$\mu_a$	$P_s$ [W/kg]	$S_s$ [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.5	70	5,665	2.15	3.02
0.6	79	6,053	2.94	4.06
0.7	88	6,327	3.83	5.25
0.8	98	6,505	4.83	6.61
0.9	109	6,573	5.95	8.20
1.0	122	6,528	7.19	10.08
1.1	140	6,242	8.50	12.32
1.2	174	5,500	10.07	15.45
1.3	248	4,181	11.87	20.70
1.4	462	2,415	14.09	33.92

## Typical values for information

400 Hz				
J [T]	H [A/m]	$\mu_a$	$P_s$ [W/kg]	$S_s$ [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.2	49	3,280	1.08	1.66
0.3	62	3,874	2.29	3.17
0.4	73	4,341	3.82	5.03
0.5	84	4,722	5.65	7.23
0.6	96	4,997	7.79	9.80
0.7	107	5,185	10.25	12.79
0.8	120	5,285	13.06	16.25
0.9	135	5,323	16.26	20.26
1.0	150	5,312	19.90	24.98
1.1	167	5,250	24.08	30.64
1.2	192	4,985	28.87	37.90
1.3	250	4,138	34.39	49.12
1.4	459	2,427	41.02	75.39

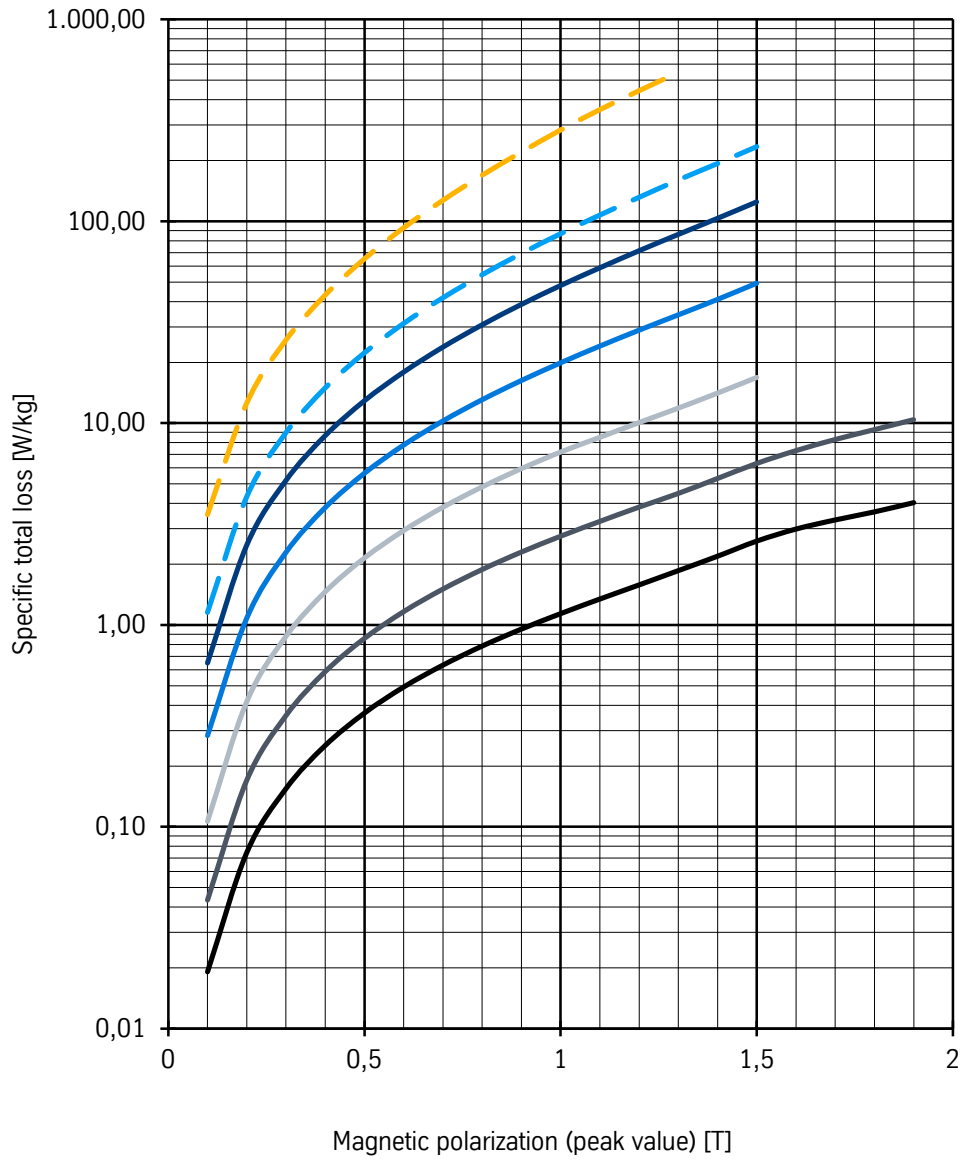
500 Hz				
J [T]	H [A/m]	$\mu_a$	$P_s$ [W/kg]	$S_s$ [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.2	52	3,086	1.51	2.19
0.3	66	3,610	3.17	4.23
0.4	79	4,034	5.28	6.75
0.5	91	4,360	7.84	9.75
0.6	104	4,594	10.83	13.27
0.7	118	4,736	14.31	17.39
0.8	132	4,806	18.29	22.19
0.9	149	4,819	22.88	27.81
1.0	166	4,788	28.16	34.39
1.1	186	4,717	34.25	42.26
1.2	208	4,600	41.29	52.18
1.3	255	4,063	49.37	66.77
1.4	466	2,390	59.02	99.76
1.5	1,199	996	70.81	225.75

1,000 Hz				
J [T]	H [A/m]	$\mu_a$	$P_s$ [W/kg]	$S_s$ [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0,2	66	2,411	4.32	5.55
0,3	86	2,771	8.97	10.92
0,4	104	3,052	14.95	17.66
0,5	123	3,238	22.30	25.90
0,6	143	3,331	31.18	35.90
0,7	166	3,350	41.78	47.92
0,8	192	3,318	54.35	62.35
0,9	220	3,253	69.23	79.56
1,0	252	3,164	86.77	100.06
1,1	286	3,058	107.34	124.47
1,2	325	2,935	131.45	154.01
1,3	369	2,801	160.22	192.63
1,4	477	2,335	193.34	263.00

2,000 Hz				
J [T]	H [A/m]	$\mu_a$	$P_s$ [W/kg]	$S_s$ [VA/kg]
	0°/90°	0°/90°	0°/90°	0°/90°
0.2	89	891	12.56	14.97
0.3	117	1,360	25.81	29.64
0.4	145	1,648	43.09	48.71
0.5	176	1,808	65.13	73.05
0.6	213	1,869	92.86	103.84
0.7	254	1,880	127.05	142.14
0.8	302	1,844	169.17	189.98
0.9	355	1,794	220.20	247.97
1.0	417	1,719	283.43	319.37
1.1	484	1,645	357.29	404.15
1.2	557	1,572	443.64	504.25

## Specific core loss

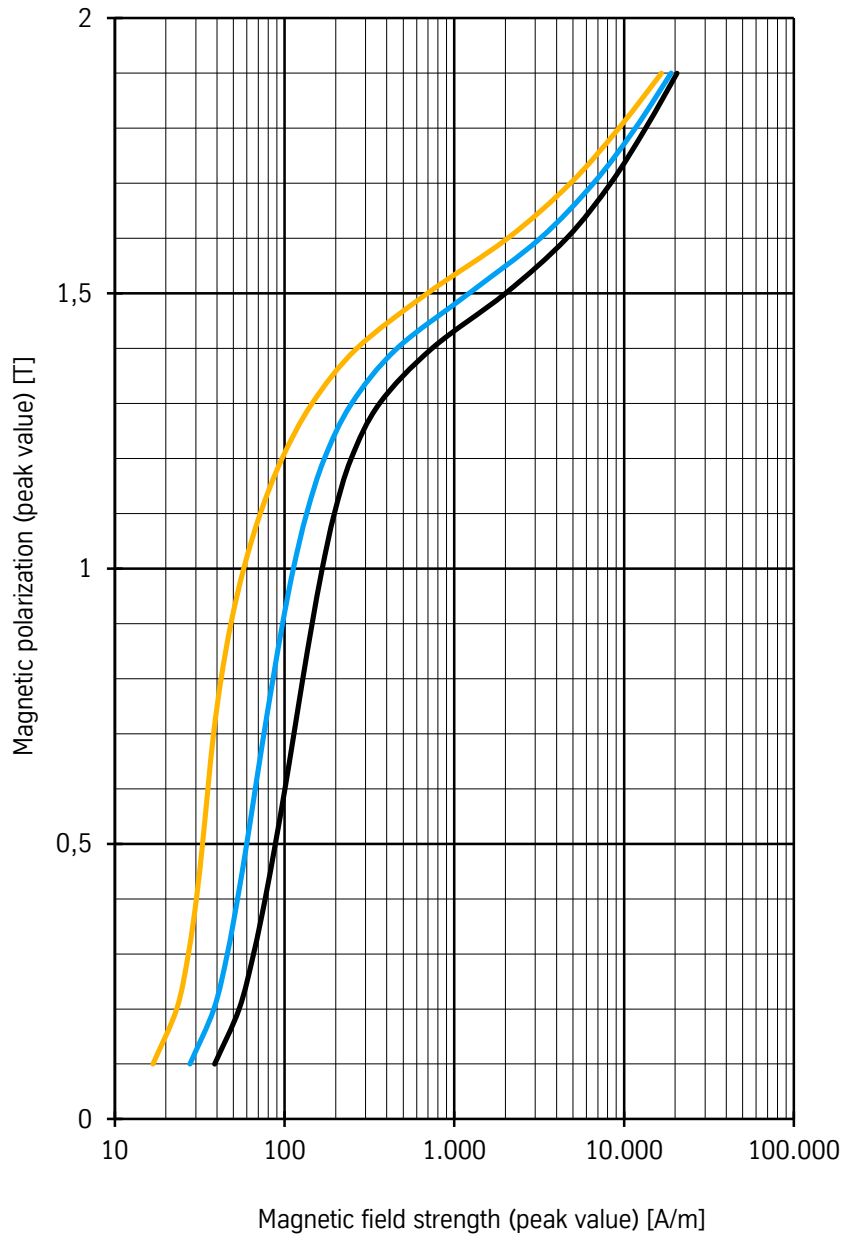
$P_s$  versus  $J$ , directional (L/Q/M)



- 035-220Y300/M/50
- 035-220Y300/M/100
- 035-220Y300/M/200
- 035-220Y300/M/400
- 035-220Y300/M/700
- 035-220Y300/M/1000
- 035-220Y300/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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