

## isovac 520-65 K HE

### The specialist for shorter final annealing times

Production in modern continuous annealing lines ensures that this semi-processed isovac® grade exhibits homogeneous mechanical and magnetic properties. High dimensional accuracy and defined degrees of roughness guarantee best punchability and further processing. isovac 520-65 K HE (high-efficiency) is highly decarbonized in as-delivered condition, which means that the final annealing time at the customer can be significantly shortened. Subsequent annealing at the customer for the purpose of adjusting optimum magnetic properties completely eliminates any mechanical damage introduced to the material during the punching process.

#### Convincing advantages:

- » Shorter final annealing made possible by the low carbon content and thus reduced overall costs resulting from lower energy input
- » Best processability through consistent mechanical properties and homogeneous, clean surfaces with defined roughness
- » Excellent stackability resulting from high dimensional accuracy (thickness tolerance)

voestalpine supplies isovac 520-65 K HE, an electrical steel of the highest quality. We offer you a customer-focused over-all package of products, service and logistics in addition to all the advantages of our integrated metallurgical facility and Steel Service Centers.

**Grade named according to conventional international standards:**

Grade named according to isovac®	DIN EN 10341		DIN EN 10126 DIN EN 10165	IEC/CEI 60404-8-3	ASTM A 683 M	ASTM A 683	AISI	IS15391
	Material No.	Abbreviation						
isovac 520-65 K HE	1.0848	M 520-65 K	M 520-65 E	520-65 K5	64S617M	64S280	M-45	65-SP-520 E5

**Mechanical properties:**

Tensile test according to DIN EN ISO 6892-1 and hardness according to DIN EN ISO 6507-1 (Typical values);  
Test direction: Transverse

Grade named according to isovac®	0.2 %-Yield strength $R_{p0.2}$ [MPa]	Tensile strength $R_m$ [MPa]	Elongation $A_{80}$ [%]	Hardness HV5 [-]
isovac 520-65 K HE	390	450	23	170

**Magnetic properties:**

after final annealing according to EN 10341 (Typical values);  
Test direction: Mean value from longitudinal and transverse measurements at 50 Hz (60 Hz), single-sheet test

Grade named according to isovac®	Specific total loss				Magnetic polarization			Relative permeability 1.5 T $\mu_r$ [-]
	1.0 T P10		1.5 T P15		2500 A/m J25	5000 A/m J50	10000 A/m J100	
	50 Hz [W/kg]	60 Hz [W/lb]	50 Hz [W/kg]	60 Hz [W/lb]	[T]	[T]	[T]	
isovac 520-65 K HE	1.80	1.06	4.40	2.60	1.62	1.70	1.82	2100

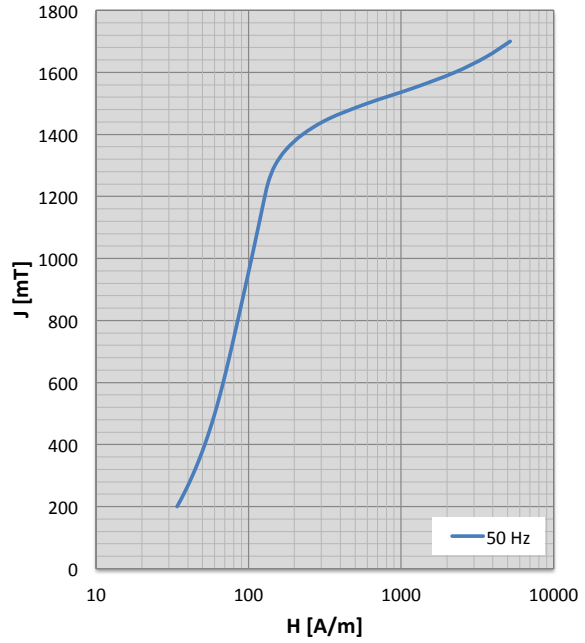
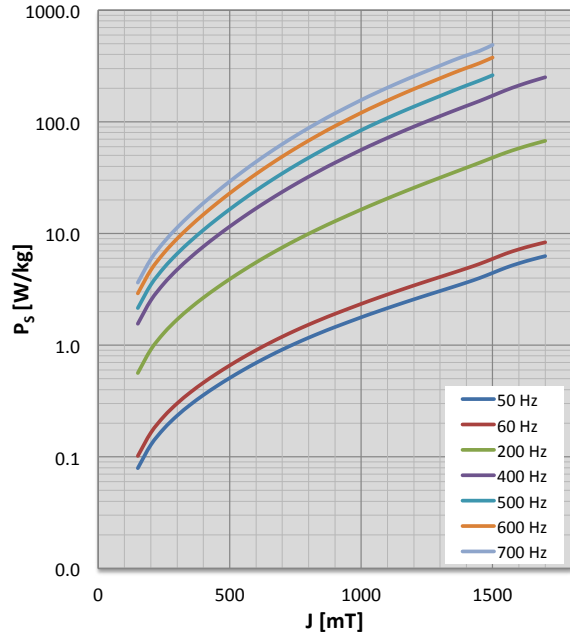
**Physical properties:**

Typical values

Grade named according to isovac®	Density $\rho$ [g/cm³]	Specific electrical resistance $\rho_s$ [ $\mu\Omega\text{cm}$ ]	Thermal conductivity $\lambda$ [W/mK]
isovac 520-65 K HE	7.8	28.0	41

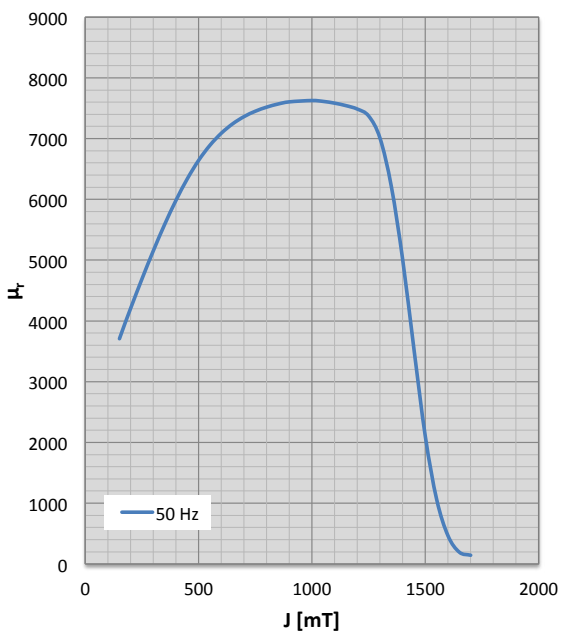
**Characteristics  $P_s/J$  loss curve and characteristics  $J/H$  magnetization curve**

Test direction: Mean value from longitudinal and transverse measurements at indicated frequencies, single-sheet test



**Characteristics  $\mu_r/J$  permeability curve**

Test direction: Mean value from longitudinal and transverse measurements at 50 Hz, single-sheet test



**Frequency dependence of magnetic properties**

Test direction: Mean value longitudinal and transverse at indicated frequencies and polarizations, single-sheet test

50 Hz				60 Hz				200 Hz			
J [mT]	H [A/m]	P <sub>s</sub> [W/kg]	μ <sub>r</sub> [-]	J [mT]	H [A/m]	P <sub>s</sub> [W/kg]	μ <sub>r</sub> [-]	J [mT]	H [A/m]	P <sub>s</sub> [W/kg]	μ <sub>r</sub> [-]
150	29	0.08	3708	150	30	0.10	3597	150	44	0.56	2496
200	34	0.13	4207	200	35	0.16	4054	200	52	0.91	2733
250	38	0.18	4691	250	40	0.23	4498	250	61	1.29	2959
300	43	0.23	5153	300	45	0.30	4921	300	69	1.70	3168
350	47	0.29	5587	350	50	0.38	5316	350	78	2.15	3354
400	52	0.36	5984	400	54	0.46	5677	400	88	2.66	3512
450	56	0.43	6339	450	59	0.55	5997	450	97	3.24	3637
500	60	0.51	6642	500	64	0.66	6269	500	107	3.90	3721
550	64	0.60	6891	550	68	0.77	6487	550	117	4.65	3763
600	68	0.69	7089	600	73	0.90	6657	600	128	5.50	3767
650	72	0.80	7243	650	77	1.04	6786	650	140	6.44	3742
700	76	0.91	7362	700	82	1.19	6879	700	152	7.50	3695
750	81	1.03	7451	750	86	1.35	6943	750	165	8.66	3634
800	85	1.17	7518	800	91	1.52	6986	800	179	9.93	3566
850	90	1.30	7569	850	97	1.71	7012	850	193	11.33	3499
900	94	1.45	7605	900	102	1.91	7024	900	209	12.86	3431
1000	105	1.77	7627	1000	114	2.34	7006	1000	242	16.37	3289
1050	110	1.95	7612	1050	120	2.58	6976	1050	260	18.39	3210
1100	116	2.15	7583	1100	127	2.84	6923	1100	280	20.59	3127
1150	122	2.35	7543	1150	134	3.12	6848	1150	302	23.00	3042
1200	128	2.57	7486	1200	141	3.42	6799	1200	323	25.62	2962
1250	135	2.80	7372	1250	147	3.74	6787	1250	342	28.47	2889
1300	149	3.05	7007	1300	157	4.08	6614	1300	370	31.58	2795
1350	175	3.33	6212	1350	178	4.45	6058	1350	411	35.01	2674
1400	227	3.63	5009	1400	226	4.86	5020	1400	425	38.78	2623
1450	334	3.99	3526	1450	335	5.34	3535	1450	417	42.97	2620
1500	601	4.43	2095	1500	612	5.93	2060	1500	612	47.74	2047
1550	1213	4.93	1061	1550	1240	6.60	1036	1550	1244	52.88	1000
1600	2252	5.40	463	1600	2296	7.21	446	1600	2299	57.87	398
1650	3615	5.85	194	1650	3672	7.78	183	1650	3671	62.73	141
1700	5192	6.27	143	1700	5263	8.33	137	1700	5254	67.51	114
				1750	6962	8.86	201	1750	6943	72.26	201

**Frequency dependence of magnetic properties**

Test direction: Mean value longitudinal and transverse at indicated frequencies and polarizations, single-sheet test

400 Hz				500 Hz				600 Hz			
J [mT]	H [A/m]	P <sub>s</sub> [W/kg]	μ <sub>r</sub> [-]	J [mT]	H [A/m]	P <sub>s</sub> [W/kg]	μ <sub>r</sub> [-]	J [mT]	H [A/m]	P <sub>s</sub> [W/kg]	μ <sub>r</sub> [-]
								100	57	1.20	1393
150	58	1.55	1864	150	65	2.15	1682	150	73	2.91	1488
200	71	2.52	2005	200	79	3.48	1799	200	90	4.71	1580
250	83	3.57	2137	250	93	4.94	1907	250	107	6.70	1665
300	97	4.75	2256	300	108	6.59	2003	300	125	8.99	1740
350	111	6.09	2357	350	125	8.51	2083	350	144	11.65	1801
400	125	7.64	2436	400	142	10.75	2143	400	165	14.80	1844
450	141	9.44	2488	450	161	13.38	2179	450	188	18.52	1868
500	159	11.54	2509	500	182	16.47	2186	500	213	22.91	1867
550	177	13.97	2497	550	205	20.07	2164	550	241	28.07	1841
600	198	16.76	2456	600	230	24.25	2116	600	272	34.07	1793
650	220	19.95	2394	650	257	29.04	2050	650	305	40.97	1731
700	243	23.57	2318	700	286	34.50	1972	700	341	48.84	1659
750	269	27.65	2235	750	318	40.68	1890	750	379	57.77	1585
800	296	32.22	2153	800	352	47.62	1811	800	421	67.80	1513
850	325	37.31	2078	850	388	55.37	1740	850	465	79.02	1450
900	356	42.95	2008	900	426	63.99	1676	900	512	91.49	1395
1000	423	56.04	1880	1000	510	84.03	1562	1000	614	120.41	1297
1050	460	63.57	1819	1050	554	95.55	1508	1050	668	137.00	1251
1100	498	71.79	1760	1100	601	108.14	1456	1100	724	155.12	1208
1150	537	80.75	1703	1150	651	121.82	1407	1150	783	174.87	1169
1200	579	90.46	1649	1200	701	136.60	1361	1200	845	196.30	1130
1250	623	100.95	1597	1250	754	152.57	1319	1250	914	219.57	1088
1300	669	112.41	1547	1300	811	170.25	1275	1300	988	245.22	1048
1350	716	124.97	1498	1350	876	190.01	1227	1350	1063	273.50	1011
1400	769	138.60	1449	1400	946	211.21	1178	1400	1137	303.25	980
1450	830	153.53	1400	1450	1018	233.82	1134	1450	1214	334.85	950
1500	887	171.38	1346	1500	1094	261.36	1091	1500	1316	376.28	907
1550	1207	191.65	1247								
1600	2120	211.52	1061								
1650	3481	231.08	811								
1700	5142	250.41	518								
1750	6952	269.64	203								

**Frequency dependence of magnetic properties**

Test direction: Mean value longitudinal and transverse at indicated frequencies and polarizations, single-sheet test

700 Hz			
J [mT]	H [A/m]	P <sub>s</sub> [W/kg]	μ <sub>r</sub> [-]
150	79	3.63	1385
200	97	5.88	1462
250	116	8.39	1533
300	136	11.28	1595
350	158	14.69	1644
400	181	18.73	1679
450	207	23.54	1695
500	235	29.24	1691
550	267	35.96	1663
600	301	43.79	1617
650	338	52.82	1557
700	379	63.12	1490
750	423	74.80	1420
800	470	87.93	1354
850	521	102.59	1295
900	575	118.89	1244
1000	688	156.67	1156
1050	748	178.34	1117
1100	812	201.99	1078
1150	883	227.69	1037
1200	956	255.36	999
1250	1028	285.13	967
1300	1104	318.24	937
1350	1186	355.21	907
1400	1267	392.67	879
1450	1346	430.78	856
1500	1466	487.83	814

## Available Dimensions

Grade named according to isovac®	Delivery form	Width [mm]	Length [mm]
isovac 520-65 K HE	Wide strip / Slit strip	19 – 1600	-
	Cut-to-length sheets	300 – 1600	300 – 5000

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