

## isovac 420-50 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 420-50 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 420-50 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.

**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 420-50 K HE	400	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
	1.0 T P10		1.5 T P15		2500 A/m J25	5000 A/m J50	10000 A/m J100	1.5 T $\mu_r$
	50 Hz [W/kg]	60 Hz [W/lb]	50 Hz [W/kg]	60 Hz [W/lb]	[T]	[T]	[T]	[-]
isovac 420-50 K HE	1.50	0.86	3.60	2.05	1.61	1.70	1.82	1750

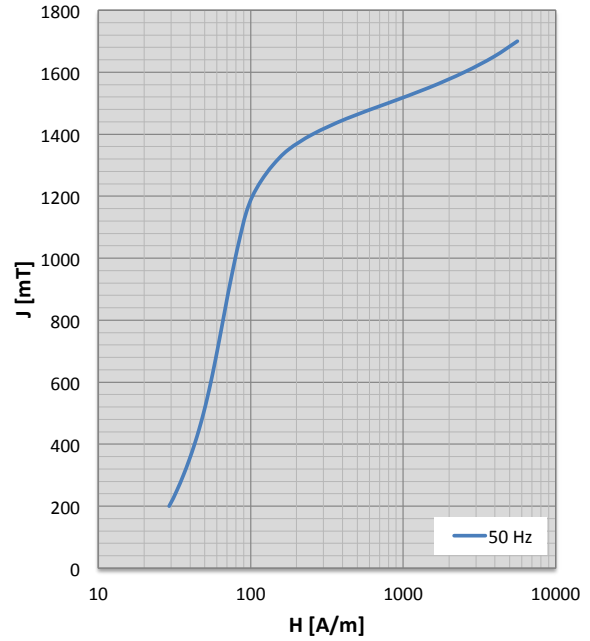
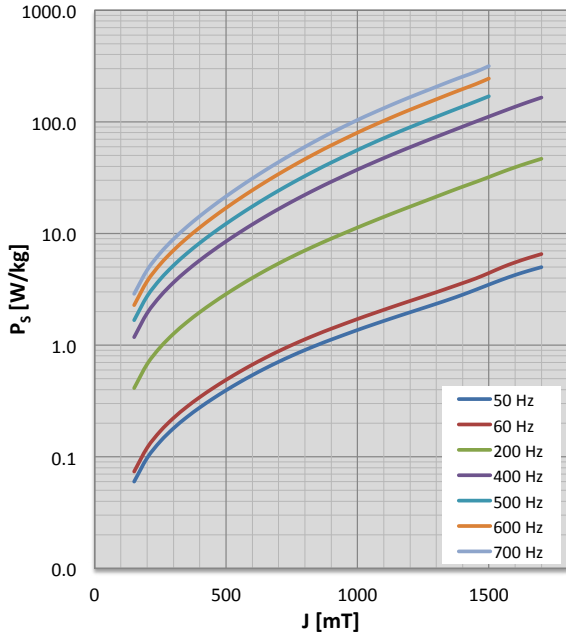
**Physical properties:**

Typical values

Grade named according to isovac®	Density $\rho$ [g/cm <sup>3</sup> ]	Specific electrical resistance $\rho_s$ [ $\mu\Omega\text{cm}$ ]	Thermal conductivity $\lambda$ [W/mK]
isovac 420-50 K HE	7.8	28	41

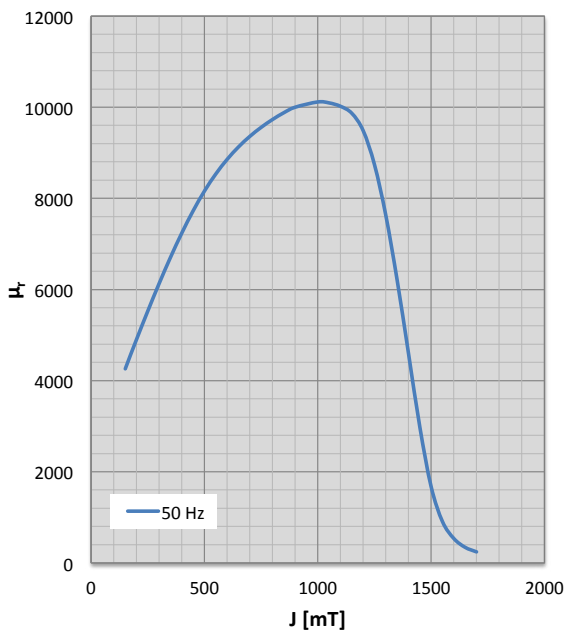
**Characteristics  $P_s/J$  loss curve and characteristics  $J/H$  magnetization curve**

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	26	0.06	4258	150	25	0.07	4307	150	34	0.41	3262
200	29	0.10	4900	200	29	0.12	4933	200	40	0.68	3595
250	33	0.14	5527	250	33	0.17	5544	250	46	0.96	3916
300	36	0.18	6131	300	36	0.22	6133	300	52	1.26	4218
350	40	0.23	6704	350	40	0.28	6691	350	59	1.60	4496
400	43	0.28	7238	400	43	0.34	7211	400	65	1.97	4743
450	46	0.33	7726	450	46	0.41	7685	450	71	2.39	4954
500	49	0.39	8160	500	49	0.49	8106	500	78	2.87	5122
550	52	0.46	8535	550	52	0.57	8468	550	84	3.40	5243
600	55	0.54	8855	600	55	0.67	8776	600	91	4.00	5321
650	57	0.62	9127	650	58	0.77	9034	650	98	4.66	5362
700	60	0.71	9359	700	61	0.88	9250	700	105	5.39	5371
750	63	0.80	9557	750	64	1.00	9430	750	112	6.18	5354
800	66	0.90	9729	800	67	1.13	9579	800	120	7.04	5317
850	69	1.01	9879	850	70	1.26	9702	850	128	7.97	5265
900	72	1.12	9999	900	73	1.40	9799	900	138	8.99	5198
1000	79	1.37	10115	1000	81	1.71	9908	1000	159	11.30	5020
1050	83	1.50	10094	1050	85	1.89	9912	1050	171	12.63	4910
1100	88	1.65	10020	1100	89	2.07	9862	1100	183	14.08	4798
1150	94	1.80	9866	1150	94	2.27	9731	1150	195	15.66	4688
1200	103	1.97	9486	1200	102	2.49	9480	1200	210	17.39	4553
1250	117	2.15	8738	1250	113	2.72	9029	1250	229	19.28	4383
1300	139	2.35	7625	1300	131	2.98	8162	1300	242	21.38	4280
1350	176	2.57	6203	1350	161	3.27	6723	1350	245	23.72	4265
1400	255	2.83	4596	1400	239	3.59	4934	1400	284	26.24	3921
1450	424	3.14	2981	1450	412	3.96	3134	1450	424	28.93	2918
1500	793	3.48	1669	1500	759	4.42	1750	1500	761	32.02	1742
1550	1473	3.86	905	1550	1438	4.98	954	1550	1451	35.55	924
1600	2516	4.25	535	1600	2532	5.51	483	1600	2553	39.19	445
1650	3931	4.63	342	1650	3941	6.03	252	1650	3965	42.92	219
1700	5612	4.99	242	1700	5560	6.54	182	1700	5585	46.70	163
				1750	7284	7.05	193	1750	7309	50.50	192

**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	43	0.88	1838
150	44	1.18	2495	150	49	1.67	2245	150	55	2.28	1991
200	53	1.94	2706	200	59	2.75	2423	200	67	3.74	2140
250	62	2.75	2907	250	69	3.90	2591	250	79	5.32	2280
300	71	3.64	3091	300	80	5.17	2744	300	91	7.07	2406
350	81	4.63	3255	350	91	6.60	2878	350	104	9.05	2515
400	91	5.75	3391	400	103	8.23	2987	400	118	11.31	2601
450	101	7.03	3496	450	115	10.09	3066	450	133	13.93	2660
500	112	8.50	3563	500	128	12.23	3111	500	148	16.94	2688
550	123	10.16	3590	550	142	14.68	3118	550	165	20.42	2682
600	135	12.06	3581	600	156	17.47	3093	600	183	24.40	2647
650	148	14.19	3542	650	172	20.64	3041	650	202	28.94	2589
700	161	16.58	3481	700	189	24.22	2971	700	223	34.08	2515
750	176	19.24	3405	750	208	28.22	2888	750	246	39.86	2432
800	192	22.20	3320	800	228	32.69	2799	800	271	46.35	2347
850	209	25.46	3232	850	249	37.66	2711	850	298	53.57	2264
900	228	29.05	3143	900	273	43.16	2624	900	327	61.57	2185
1000	269	37.36	2961	1000	324	55.95	2454	1000	390	80.04	2039
1050	291	42.12	2870	1050	353	63.33	2372	1050	424	90.59	1971
1100	315	47.34	2781	1100	382	71.36	2294	1100	459	102.14	1906
1150	340	53.05	2695	1150	411	80.04	2222	1150	497	114.75	1843
1200	366	59.25	2609	1200	444	89.45	2151	1200	535	128.37	1784
1250	394	66.00	2520	1250	481	99.69	2075	1250	574	143.02	1727
1300	424	73.39	2442	1300	514	110.94	2012	1300	619	159.17	1670
1350	455	81.55	2375	1350	543	123.38	1968	1350	674	177.19	1611
1400	491	90.57	2272	1400	595	137.03	1873	1400	716	196.64	1556
1450	558	100.52	2068	1450	699	152.10	1674	1450	753	217.76	1490
1500	775	111.44	1672	1500	857	169.51	1456	1500	931	244.33	1301
1550	1358	123.45	1179								
1600	2415	136.58	816								
1650	3829	150.53	554								
1700	5482	165.05	358								
1750	7257	179.85	197								



## Available Dimensions

Grade named according to isovac®	Delivery form	Width [mm]	Length [mm]
isovac 420-50 K HE	Wide strip / Slit strip	19 – 1560	-
	Cut-to-length sheets	300 – 1560	300 – 5000

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