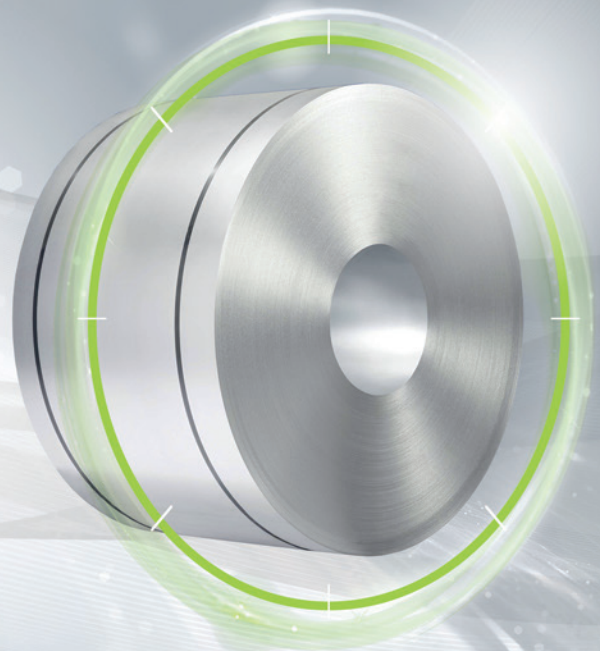


FULLY
PROCESSED

isovac 470-50 A HF

The specialist for high frequencies

Manufactured in the most modern production lines, this fully processed isovac® grade exhibits highly homogeneous properties across the width and length of the entire strip. The result is excellent and consistent processability in the manufacture of highly efficient electrical components. The use of isovac 470-50 A HF (high-frequency) guarantees optimum utilization of the machinery at higher frequencies. High-precision adjustment of the microstructure and adaptation of the alloy content make it possible to keep losses low in the high-frequency range. isovac 470-50 A HF is additionally characterized by slightly higher strengths. Upon request, isovac 470-50 A HF can be supplied with an electrical steel insulation system and can be used directly in as-delivered condition.

Convincing advantages:

- » Use in high-speed motors because of low losses at high frequencies (up to 10% at 1.5 T and 400/1000 Hz)
- » Larger freedom of design and component size optimization resulting from higher strengths as compared to standard isovac® grades
- » Best processability through consistent mechanical properties and homogeneous, clean surfaces
- » Excellent stackability resulting from high dimensional accuracy in rolling direction and perpendicular to rolling direction (thickness tolerance)
- » Innovative electrical steel insulation systems upon request

voestalpine supplies isovac 470-50 A HF, an electrical steel of the highest quality. We offer you a customer-focused overall 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 10106		IEC 60404-8-4	JIS C2552	GOST 21427.2	ASTM A677	AISI	IS648	GB/T2521.1
	Material No.	Abbreviation							
isovac 470-50 A HF	1.0812	M470-50A	M470-50A 5	50A470	2214	47F280	-	50C470	50W470

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®	Yield strength	0.2 %-Yield strength	Tensile strength	Elongation	Hardness
	R _{eH} [MPa]	R _{p0.2} [MPa]	R _m [MPa]	A ₈₀ [%]	HV5 [-]
isovac 470-50 A HF	380	360	520	33	170

Magnetic properties:

in as-delivered condition (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 μ _r
	50 Hz [W/kg]	60 Hz [W/lb]	50 Hz [W/kg]	60 Hz [W/lb]	[T]	[T]	[T]	[-]
isovac 470-50 A HF	1.60	0.91	3.80	2.17	1.60	1.69	1.81	1700

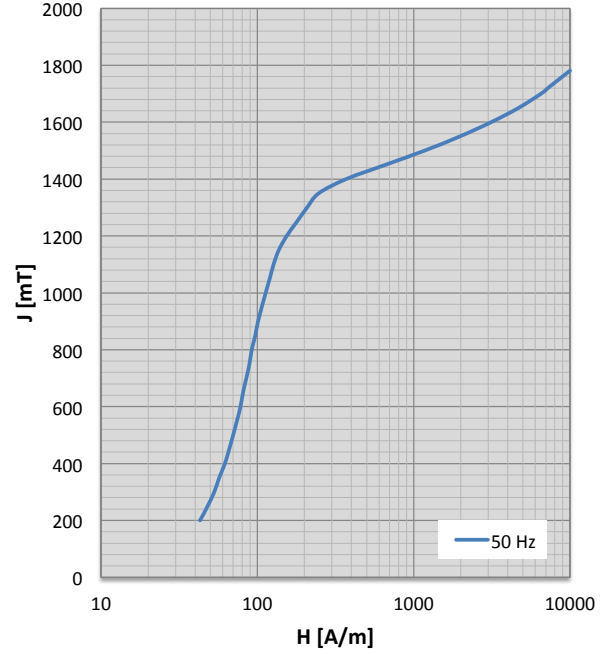
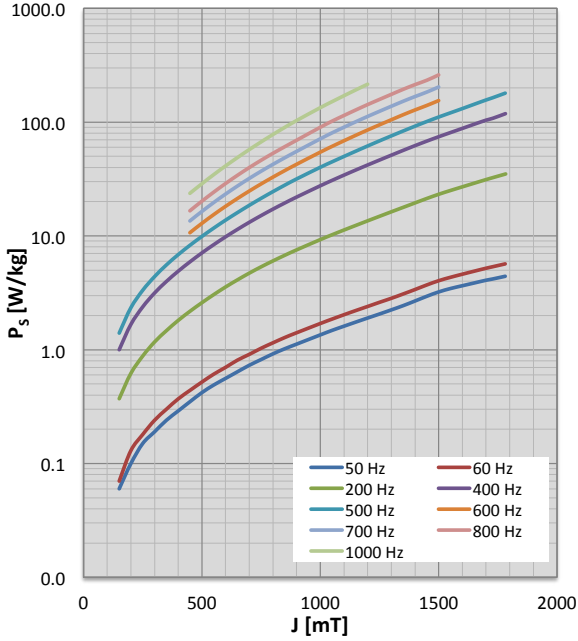
Physical properties:

Typical values

Grade named according to isovac®	Density ρ [g/cm³]	Specific electrical resistance ρ _s [μΩcm]	Thermal conductivity λ [W/mK]
isovac 470-50 A HF	7.70	45.0	28

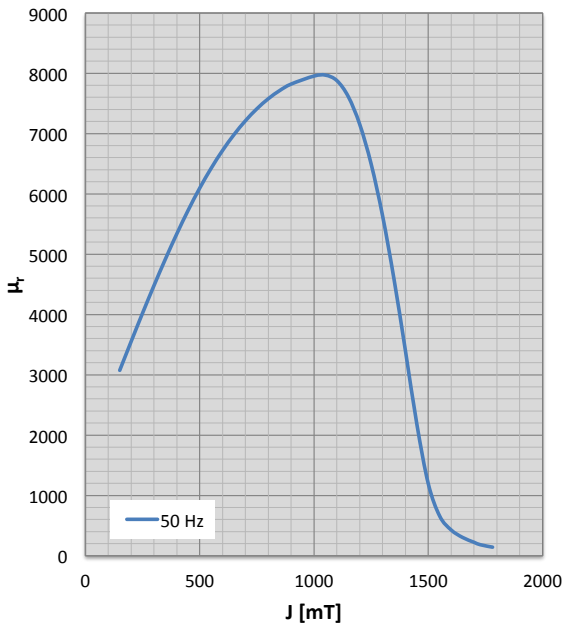
Characteristics P_s/J loss curve and characteristics J/H magnetization curve

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



Characteristics μ_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 _s [W/kg]	μ _r [-]	J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]	J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
								100	34	0.12	2460
150	38	0.06	3074	150	38	0.07	3071	150	41	0.37	2807
200	43	0.10	3553	200	43	0.13	3542	200	47	0.62	3151
250	48	0.15	4024	250	48	0.18	4004	250	54	0.88	3486
300	53	0.19	4481	300	53	0.24	4454	300	60	1.17	3809
350	57	0.24	4921	350	58	0.30	4887	350	67	1.47	4116
400	62	0.29	5340	400	62	0.37	5298	400	73	1.81	4403
450	66	0.35	5733	450	67	0.44	5684	450	79	2.18	4666
500	70	0.42	6096	500	71	0.52	6040	500	84	2.59	4901
550	74	0.49	6425	550	75	0.61	6363	550	90	3.05	5105
600	78	0.56	6721	600	79	0.70	6652	600	95	3.56	5277
650	81	0.64	6983	650	82	0.81	6908	650	100	4.11	5419
700	85	0.73	7213	700	86	0.91	7131	700	105	4.71	5531
750	89	0.82	7411	750	90	1.03	7322	750	111	5.35	5615
800	92	0.92	7578	800	94	1.15	7481	800	117	6.03	5670
850	97	1.02	7714	850	98	1.28	7609	850	123	6.76	5699
900	101	1.12	7821	900	103	1.41	7705	900	130	7.54	5705
1000	113	1.35	7954	1000	114	1.70	7809	1000	144	9.28	5664
1050	120	1.48	7969	1050	121	1.86	7809	1050	152	10.24	5623
1100	127	1.61	7878	1100	129	2.03	7742	1100	161	11.27	5563
1150	137	1.75	7612	1150	139	2.21	7559	1150	170	12.37	5471
1200	154	1.90	7152	1200	154	2.40	7180	1200	183	13.57	5327
1250	179	2.06	6493	1250	176	2.61	6541	1250	203	14.87	5109
1300	208	2.24	5634	1300	208	2.83	5661	1300	226	16.29	4784
1350	247	2.44	4583	1350	258	3.09	4588	1350	260	17.82	4298
1400	370	2.68	3395	1400	371	3.38	3396	1400	359	19.50	3500
1450	659	2.95	2177	1450	611	3.71	2194	1450	595	21.33	2340
1500	1175	3.22	1191	1500	1096	4.04	1224	1500	1076	23.22	1257
1550	1976	3.45	655	1550	1935	4.33	678	1550	1901	25.08	670
1600	3133	3.65	427	1600	3149	4.61	426	1600	3102	27.00	434
1650	4685	3.86	303	1650	4719	4.90	291	1650	4670	29.06	308
1700	6525	4.08	223	1700	6539	5.20	214	1700	6498	31.25	227
1727	7500	4.18	183	1728	7500	5.36	183	1729	7500	32.54	183
1781	10000	4.42	142	1781	10000	5.68	142	1783	10000	35.03	142

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 _s [W/kg]	μ _r [-]	J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]	J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
100	37	0.34	2229	100	39	0.49	2096				
150	46	1.00	2491	150	48	1.40	2334				
200	54	1.67	2748	200	58	2.34	2568				
250	63	2.38	2997	250	67	3.33	2792				
300	71	3.15	3232	300	76	4.39	3003				
350	79	3.98	3451	350	85	5.56	3196				
400	88	4.90	3647	400	95	6.85	3367	400	102	8.58	3201
450	96	5.93	3818	450	104	8.29	3511	450	111	10.67	3308
500	104	7.09	3959	500	113	9.90	3623	500	120	12.90	3393
550	112	8.38	4066	550	123	11.72	3701	550	130	15.40	3440
600	120	9.82	4141	600	132	13.76	3747	600	142	18.20	3450
650	128	11.41	4187	650	142	16.03	3763	650	154	21.32	3431
700	137	13.17	4207	700	153	18.57	3754	700	168	24.79	3389
750	146	15.09	4202	750	164	21.39	3723	750	182	28.63	3332
800	156	17.19	4177	800	177	24.50	3674	800	197	32.86	3265
850	167	19.47	4133	850	190	27.93	3609	850	213	37.50	3195
900	179	21.95	4075	900	205	31.67	3535	900	231	42.61	3122
1000	205	27.58	3933	1000	238	40.10	3376	1000	270	54.46	2954
1050	219	30.77	3855	1050	255	44.80	3300	1050	293	61.24	2866
1100	234	34.22	3774	1100	273	49.93	3225	1100	315	68.58	2789
1150	249	37.96	3690	1150	291	55.55	3146	1150	336	76.61	2716
1200	266	42.01	3605	1200	313	61.71	3058	1200	363	85.30	2631
1250	285	46.41	3522	1250	339	68.42	2961	1250	397	94.65	2534
1300	303	51.21	3421	1300	359	75.69	2886	1300	417	104.88	2480
1350	327	56.46	3246	1350	373	83.57	2820	1350	419	116.09	2485
1400	406	62.11	2827	1400	439	92.09	2557	1400	477	127.86	2337
1450	617	68.10	2064	1450	637	101.23	1948	1450	677	140.10	1860
1500	1079	74.38	1259	1500	1089	110.81	1245	1500	1077	154.63	1256
1550	1904	80.96	726	1550	1908	120.72	734				
1600	3114	88.04	433	1600	3144	131.47	426				
1650	4685	95.79	276	1650	4794	143.50	266				
1700	6510	104.03	202	1700	6730	156.47	198				
1729	7500	108.09	183	1728	7500	163.72	183				
1782	10000	118.63	142	1781	10000	179.65	142				

Frequency dependence of magnetic properties

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

700 Hz				800 Hz				1000 Hz			
J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]	J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]	J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
400	109	10.87	3008	400	115	13.33	2835	400	129	18.86	2533
450	119	13.54	3089	450	126	16.62	2898	450	142	23.62	2568
500	130	16.41	3149	500	138	20.19	2943	500	157	28.75	2588
550	142	19.66	3173	550	152	24.25	2953	550	173	34.57	2580
600	155	23.33	3163	600	167	28.88	2932	600	191	41.22	2547
650	170	27.43	3128	650	183	34.07	2886	650	211	48.79	2494
700	185	32.00	3074	700	201	39.85	2824	700	232	57.35	2427
750	202	37.03	3008	750	220	46.21	2753	750	256	67.00	2350
800	219	42.55	2940	800	240	53.18	2679	800	282	77.83	2269
850	237	48.61	2872	850	261	60.81	2607	850	311	89.91	2189
900	257	55.32	2802	900	283	69.32	2534	900	341	103.28	2112
1000	305	71.30	2622	1000	338	90.07	2359	1000	404	133.93	1977
1050	331	80.48	2530	1050	369	102.02	2272	1050	437	151.36	1916
1100	356	90.18	2465	1100	397	114.37	2210	1100	473	170.61	1853
1150	382	100.74	2399	1150	426	127.92	2149	1150	512	191.93	1789
1200	412	112.18	2323	1200	459	142.59	2081	1200	552	215.20	1730
1250	446	124.46	2241	1250	496	158.22	2013	1250	593	240.11	1679
1300	472	137.84	2192	1300	527	175.32	1963				
1350	486	152.46	2183	1350	553	194.16	1935				
1400	538	167.73	2070	1400	601	213.47	1855				
1450	705	183.70	1724	1450	731	233.23	1637				
1500	1099	203.60	1219	1500	1102	259.95	1221				

Available Dimensions

Grade named according to isovac®	Delivery form	Width [mm]	Length [mm]
isovac 470-50 A HF	Wide strip / Slit strip	19 – 1590	-
	Cut-to-length sheets	300 – 1590	300 – 5000

Deliverable coating systems

Grade named according to isovac®	Uncoated	C-3	Backlack	C-5	C-6
isovac 470-50 A HF	✔	✔	☰	✔	✔

✔ Available ☰ On request

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