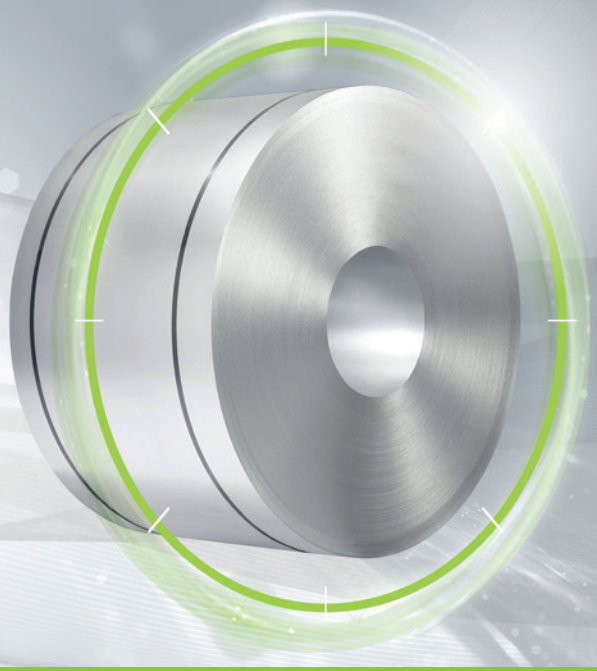
isovac®

FULLY PROCESSED



isovac 350-50 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 350-50 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 350-50 A HF is additionally characterized by slightly higher strengths.
Upon request, isovac 350-50 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 350-50 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	JIS	GOST	ASTM	AISI	IS648	GB/T2521.1
	Material No.	Abbreviation	60404-8-4	C2552	21427.2	A677			
isovac 350-50 A HF	1.0810	M350-50A	M350-50A 5	50A350	2411	47F200	M-36	50C350	50W350

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 R_{eH} [MPa]	0.2 %-Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation A_{80} [%]	Hardness HV5 [-]
isovac 350-50 A HF	390	370	510	30	185

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

	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
Grade named according to isovac®	50 Hz [W/kg]	60 Hz [W/lb]	50 Hz [W/kg]	60 Hz [W/lb]	[T]	[T]	[T]	[-]
isovac 350-50 A HF	1.30	0.74	3.00	1.71	1.58	1.66	1.78	1200

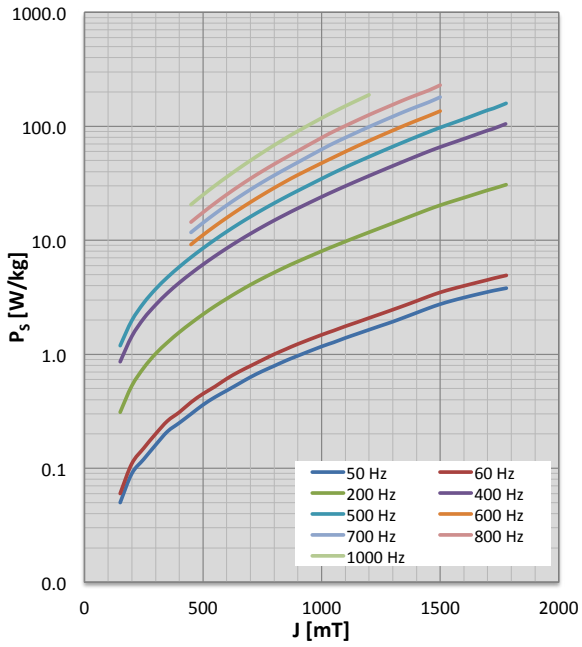
Physical properties:

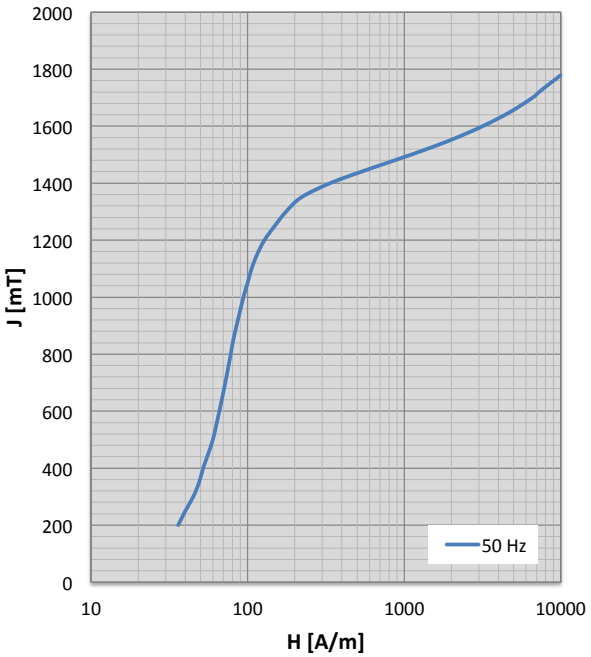
Typical values

Grade named according to isovac®	Density ρ [g/cm³]	Specific electrical resistance ρ_s [μΩcm]	Thermal conductivity λ [W/mK]
isovac 350-50 A HF	7.68	52.0	25

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

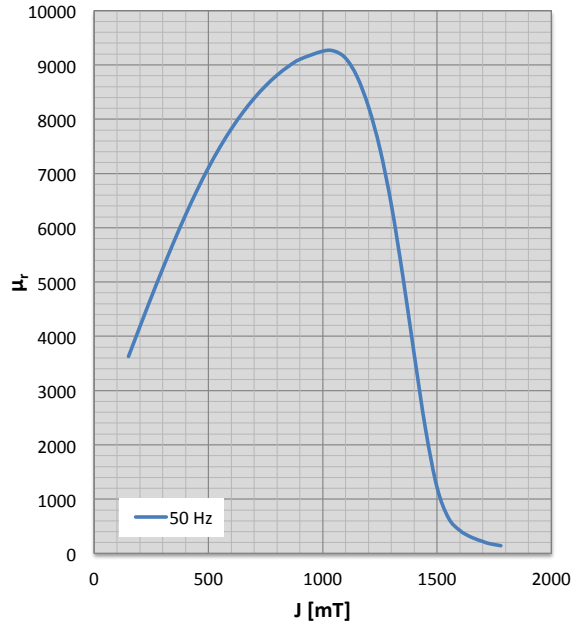
Test direction: Mean value from longitudinal and transverse measurements at indicated frequencies, single-sheet test





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 [-]
150	32	0.05	3626	150	32	0.06	3626	150	35	0.31	3266
200	36	0.09	4179	200	36	0.11	4166	200	41	0.53	3650
250	40	0.12	4722	250	41	0.15	4697	250	47	0.76	4025
300	45	0.16	5249	300	45	0.20	5212	300	52	1.01	4388
350	49	0.21	5757	350	49	0.26	5708	350	58	1.27	4732
400	52	0.25	6239	400	53	0.31	6178	400	63	1.56	5055
450	56	0.30	6691	450	57	0.38	6618	450	68	1.88	5351
500	60	0.36	7107	500	60	0.45	7024	500	73	2.24	5616
550	63	0.42	7484	550	63	0.52	7390	550	78	2.64	5847
600	66	0.48	7822	600	66	0.61	7717	600	82	3.07	6043
650	69	0.55	8122	650	70	0.70	8005	650	87	3.55	6206
700	72	0.63	8386	700	73	0.79	8255	700	91	4.07	6336
750	75	0.71	8615	750	76	0.89	8467	750	96	4.62	6434
800	78	0.79	8811	800	79	1.00	8641	800	101	5.21	6500
850	81	0.88	8974	850	83	1.11	8779	850	106	5.85	6537
900	85	0.97	9103	900	87	1.23	8885	900	112	6.52	6549
1000	94	1.17	9253	1000	96	1.48	9014	1000	125	8.02	6523
1050	100	1.27	9254	1050	101	1.61	9032	1050	131	8.85	6491
1100	106	1.39	9122	1100	108	1.76	8949	1100	139	9.75	6428
1150	115	1.51	8783	1150	116	1.91	8692	1150	146	10.71	6315
1200	128	1.64	8228	1200	129	2.08	8206	1200	157	11.75	6157
1250	149	1.78	7455	1250	150	2.26	7450	1250	174	12.88	5936
1300	176	1.93	6420	1300	177	2.46	6409	1300	194	14.12	5521
1350	220	2.11	5110	1350	218	2.68	5103	1350	227	15.49	4778
1400	337	2.31	3664	1400	338	2.93	3662	1400	335	16.99	3692
1450	599	2.53	2277	1450	612	3.21	2268	1450	596	18.62	2358
1500	1108	2.75	1212	1500	1133	3.49	1195	1500	1109	20.29	1212
1550	1954	2.95	651	1550	1980	3.74	640	1550	1960	21.92	628
1600	3172	3.14	421	1600	3194	3.98	420	1600	3181	23.61	420
1650	4757	3.33	298	1650	4777	4.23	301	1650	4767	25.47	310
1700	6603	3.52	220	1700	6624	4.49	223	1700	6613	27.47	230
1726	7500	3.62	183	1726	7500	4.64	183	1726	7500	28.46	183
1779	10000	3.80	142	1779	10000	4.92	142	1778	10000	30.72	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	32	0.29	2557								
150	40	0.86	2851	150	42	1.19	2699				
200	47	1.44	3140	200	50	1.98	2964				
250	55	2.06	3420	250	58	2.82	3217				
300	62	2.71	3684	300	66	3.73	3456				
350	69	3.44	3929	350	74	4.73	3674				
400	77	4.24	4150	400	82	5.84	3865	400	88	7.37	3705
450	84	5.13	4341	450	90	7.10	4026	450	95	9.18	3824
500	91	6.13	4497	500	98	8.51	4150	500	104	11.12	3917
550	98	7.25	4616	550	107	10.11	4234	550	113	13.30	3963
600	105	8.50	4699	600	115	11.90	4282	600	123	15.75	3966
650	112	9.89	4749	650	124	13.89	4298	650	134	18.51	3934
700	120	11.42	4770	700	133	16.09	4286	700	146	21.58	3876
750	128	13.10	4764	750	143	18.50	4253	750	159	24.99	3801
800	137	14.93	4736	800	154	21.15	4202	800	173	28.77	3718
850	146	16.91	4688	850	165	24.04	4138	850	187	32.92	3634
900	157	19.08	4624	900	178	27.21	4062	900	203	37.43	3550
1000	180	24.02	4465	1000	207	34.65	3877	1000	236	47.51	3382
1050	193	26.82	4377	1050	223	38.99	3772	1050	255	53.32	3291
1100	205	29.86	4284	1100	239	43.66	3670	1100	275	59.86	3196
1150	219	33.15	4188	1150	255	48.61	3577	1150	293	66.93	3111
1200	234	36.72	4094	1200	275	53.98	3482	1200	317	74.55	3014
1250	253	40.62	4003	1250	299	59.88	3377	1250	352	82.83	2896
1300	267	44.88	3885	1300	314	66.30	3290	1300	364	91.85	2839
1350	283	49.54	3666	1350	323	73.22	3197	1350	349	101.66	2858
1400	372	54.61	3126	1400	397	80.74	2842	1400	425	112.06	2632
1450	624	60.08	2149	1450	628	88.91	2050	1450	698	123.07	1929
1500	1142	65.73	1175	1500	1124	97.43	1196	1500	1117	135.90	1207
1550	2013	71.44	634	1550	1978	106.14	672				
1600	3258	77.56	410	1600	3213	115.64	416				
1650	4860	84.43	290	1650	4810	126.51	279				
1700	6713	91.90	215	1700	6663	138.42	206				
1724	7500	95.17	183	1725	7500	143.49	183				
1776	10000	104.83	141	1778	10000	158.84	141				

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	94	9.39	3452	400	100	11.54	3248	400	112	16.43	2889
450	103	11.71	3538	450	110	14.43	3310	450	124	20.55	2926
500	113	14.22	3601	500	121	17.55	3352	500	137	25.01	2945
550	123	17.06	3624	550	133	21.11	3358	550	151	30.09	2935
600	135	20.27	3610	600	146	25.15	3331	600	167	35.91	2895
650	148	23.86	3566	650	161	29.69	3278	650	185	42.54	2834
700	162	27.85	3503	700	177	34.76	3208	700	204	50.07	2756
750	177	32.26	3427	750	193	40.35	3128	750	225	58.58	2668
800	192	37.08	3347	800	211	46.50	3046	800	249	68.15	2575
850	208	42.37	3269	850	229	53.25	2966	850	273	78.85	2484
900	225	48.28	3187	900	249	60.80	2883	900	300	90.70	2396
1000	269	62.64	2972	1000	299	79.29	2672	1000	356	117.92	2240
1050	293	70.87	2863	1050	326	89.89	2568	1050	386	133.44	2171
1100	314	79.36	2792	1100	350	100.78	2503	1100	417	150.32	2104
1150	336	88.69	2721	1150	376	112.79	2436	1150	449	168.53	2040
1200	363	98.85	2632	1200	406	125.80	2357	1200	483	188.69	1977
1250	398	109.75	2530	1250	440	139.60	2272	1250	521	211.20	1913
1300	417	121.61	2483	1300	465	154.59	2225				
1350	416	134.55	2504	1350	477	171.02	2224				
1400	475	148.01	2347	1400	529	188.05	2106				
1450	690	162.08	1815	1450	700	205.82	1730				
1500	1140	180.06	1176	1500	1117	229.45	1199				

Available Dimensions

Grade named according to isovac®	Delivery form	Width [mm]	Length [mm]
isovac 350-50 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 350-50 A HF	✓	✓	○	✓	✓

✓ Available ○ On request

Please find further information and downloadable files at www.voestalpine.com/isovac

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ONE STEP AHEAD.