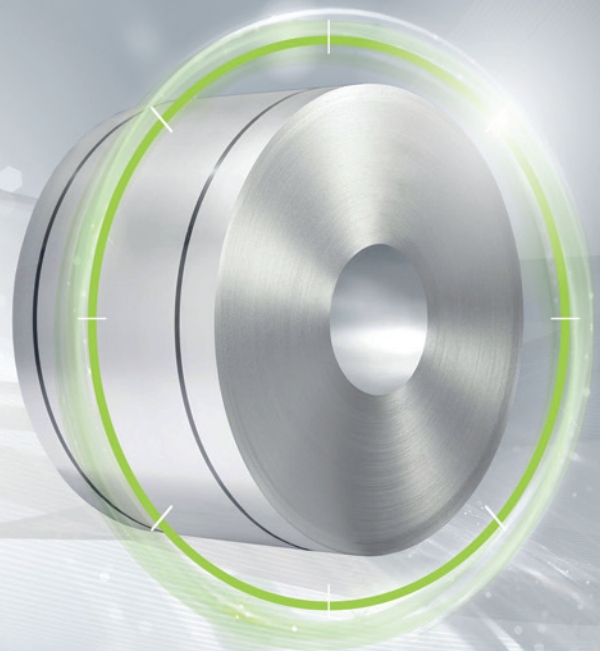


FULLY  
PROCESSED

## isovac high-perm 310-50 A HC

### **The specialist for high permeability with high thermal conductivity**

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. Its high thermal conductivity and optimized texture make isovac HP 310-50 A HC (high-perm/high-conductivity) ensure rapid heat dissipation in combination with increased magnetizability and low specific total loss. This makes innovative design strategies possible for electrical machinery.

Upon request, isovac HP 310-50 A HC can be supplied with an electrical steel insulation system and can be used directly in as-delivered condition.

#### **Convincing advantages:**

- » Lower cooling power necessary through higher thermal conductivity than that of standard isovac® grades (conductivity increased by up to 20%)
- » Increased performance achieved by increasing torque based on higher magnetizability (improvement by up to 0.05 T at J25, J50, J100)
- » 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 HP 310-50 A HC, 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 HP 310-50 A HC	1.0808	M310-50A	M310-50A 5	50A310	2412	47F180	M-22	50C310	50W310

**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 HP 310-50 A HC	305	300	450	32	160

**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 1.5 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 HP 310-50 A HC	1.20	0.68	2.75	1.57	1.63	1.72	1.83	2500

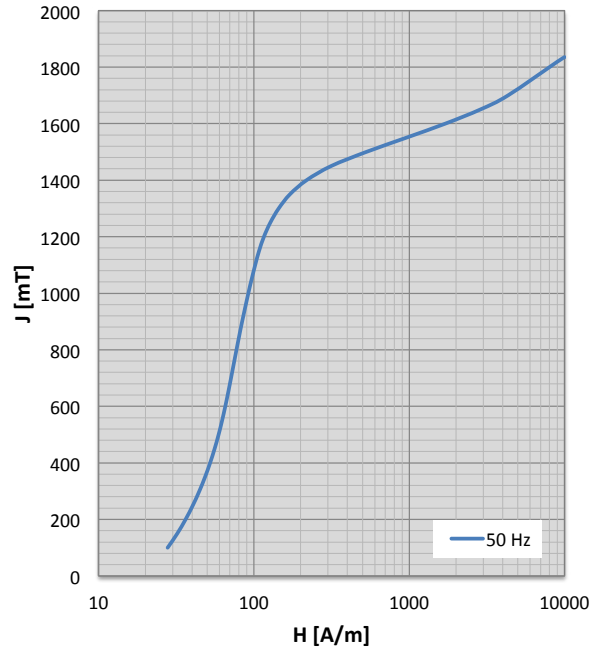
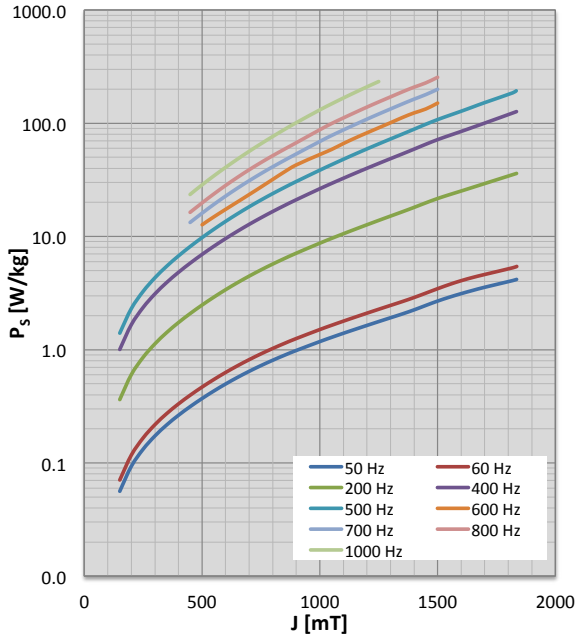
**Physical properties:**

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 HP 310-50 A HC	7.71	45.0	28

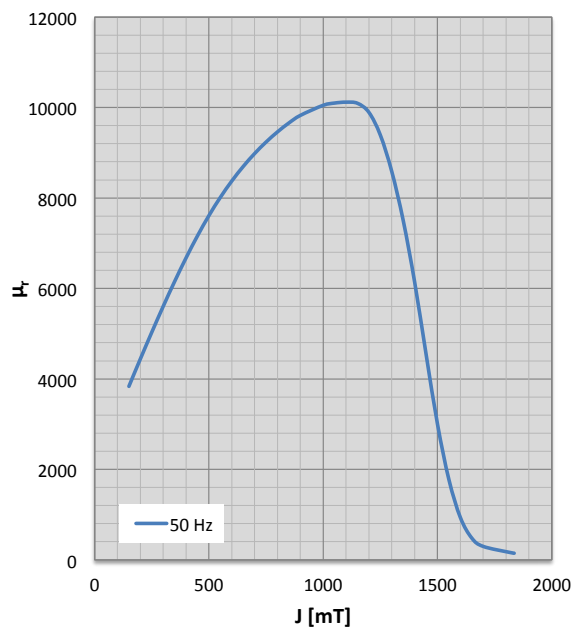
**Characteristics  $P_s/J$  loss curve and characteristics  $J/H$  magnetization curve**

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



**Characteristics  $\mu_r/J$  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> [-]
100	28	0.02	3232					100	30	0.12	2900
150	32	0.06	3839	150	32	0.07	3817	150	37	0.36	3275
200	36	0.09	4441	200	36	0.12	4401	200	43	0.60	3646
250	40	0.13	5031	250	41	0.17	4974	250	49	0.86	4007
300	45	0.17	5604	300	45	0.22	5529	300	55	1.13	4355
350	48	0.22	6154	350	49	0.27	6062	350	61	1.42	4685
400	52	0.26	6676	400	53	0.33	6567	400	66	1.74	4993
450	56	0.31	7163	450	56	0.40	7037	450	72	2.09	5274
500	59	0.37	7610	500	60	0.47	7467	500	77	2.48	5523
550	62	0.43	8014	550	63	0.55	7853	550	82	2.91	5737
600	65	0.50	8375	600	66	0.63	8196	600	87	3.39	5917
650	68	0.57	8696	650	69	0.72	8500	650	92	3.90	6063
700	71	0.64	8983	700	72	0.82	8768	700	97	4.46	6175
750	74	0.72	9237	750	75	0.92	9003	750	102	5.07	6257
800	77	0.81	9461	800	78	1.03	9207	800	107	5.71	6307
850	80	0.89	9659	850	82	1.14	9383	850	113	6.39	6328
900	84	0.98	9826	900	85	1.25	9529	900	119	7.12	6325
1000	92	1.18	10049	1000	94	1.51	9711	1000	132	8.73	6264
1050	97	1.29	10099	1050	98	1.64	9744	1050	139	9.62	6216
1100	102	1.40	10118	1100	104	1.79	9746	1100	147	10.57	6157
1150	108	1.51	10093	1150	110	1.94	9715	1150	155	11.59	6087
1200	116	1.64	9892	1200	118	2.10	9590	1200	163	12.68	6000
1250	128	1.77	9389	1250	128	2.28	9283	1250	172	13.87	5882
1300	144	1.91	8583	1300	144	2.46	8654	1300	186	15.14	5693
1350	170	2.07	7501	1350	170	2.66	7597	1350	207	16.51	5380
1400	218	2.25	6140	1400	217	2.89	6184	1400	245	18.06	4862
1450	314	2.46	4546	1450	313	3.16	4561	1450	324	19.82	4076
1500	530	2.69	2997	1500	529	3.46	3006	1500	526	21.64	3054
1550	954	2.91	1771	1550	955	3.77	1776	1550	952	23.39	1904
1600	1707	3.13	935	1600	1707	4.07	938	1600	1712	25.20	934
1650	2867	3.34	481	1650	2865	4.35	483	1650	2873	27.20	409
1700	4327	3.56	297	1700	4323	4.62	300	1700	4331	29.34	241
1819	9000	4.08	161	1819	9000	5.29	163	1817	9000	35.05	160
1835	10000	4.18	146	1836	10000	5.44	146	1835	10000	36.04	146

**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	35	0.36	2452	100	37	0.51	2276				
150	43	1.00	2725	150	46	1.40	2523				
200	51	1.67	2993	200	55	2.31	2766				
250	59	2.36	3252	250	64	3.28	2998				
300	67	3.11	3497	300	73	4.32	3216				
350	75	3.92	3723	350	82	5.46	3413				
400	83	4.82	3926	400	91	6.73	3584				
450	91	5.82	4101	450	100	8.16	3726	450	106	10.53	3504
500	99	6.94	4242	500	109	9.77	3832	500	115	12.66	3593
550	106	8.19	4348	550	118	11.57	3899	550	124	14.89	3645
600	114	9.58	4419	600	128	13.59	3932	600	134	17.35	3659
650	122	11.11	4460	650	137	15.83	3936	650	145	20.16	3640
700	130	12.79	4474	700	147	18.29	3916	700	158	23.44	3592
750	139	14.63	4464	750	158	20.98	3879	750	172	27.32	3519
800	148	16.62	4434	800	170	23.92	3830	800	188	31.91	3426
850	158	18.77	4387	850	182	27.10	3774	850	207	37.22	3319
900	169	21.11	4327	900	196	30.57	3710	900	226	42.85	3215
1000	193	26.41	4178	1000	226	38.52	3561	1000	259	52.93	3086
1050	206	29.41	4096	1050	242	43.08	3476	1050	278	58.70	3022
1100	220	32.67	4012	1100	260	48.05	3389	1100	300	66.20	2923
1150	235	36.20	3927	1150	278	53.46	3302	1150	324	74.05	2835
1200	251	40.02	3833	1200	298	59.33	3213	1200	347	82.27	2758
1250	268	44.17	3728	1250	319	65.70	3120	1250	372	91.18	2683
1300	285	48.67	3646	1300	341	72.60	3041	1300	398	101.02	2603
1350	299	53.56	3594	1350	363	80.14	2982	1350	426	112.21	2532
1400	324	59.04	3439	1400	390	88.56	2860	1400	456	123.37	2448
1450	389	65.24	3049	1450	446	97.95	2587	1450	502	133.65	2273
1500	573	71.68	2424	1500	612	107.71	2131	1500	648	150.58	1931
1550	976	77.99	1641	1550	994	117.38	1514				
1600	1717	84.64	933	1600	1721	127.67	929				
1650	2871	92.14	511	1650	2878	139.36	556				
1700	4332	100.31	323	1700	4355	152.15	358				
1817	9000	122.77	161	1819	9000	185.49	161				
1835	10000	126.71	146	1834	10000	193.48	146				



### Available Dimensions

Grade named according to isovac®	Delivery form	Width [mm]	Length [mm]
isovac HP 310-50 A HC	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 HP 310-50 A HC	✔	✔	☰	✔	✔

✔ Available ☰ On request

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