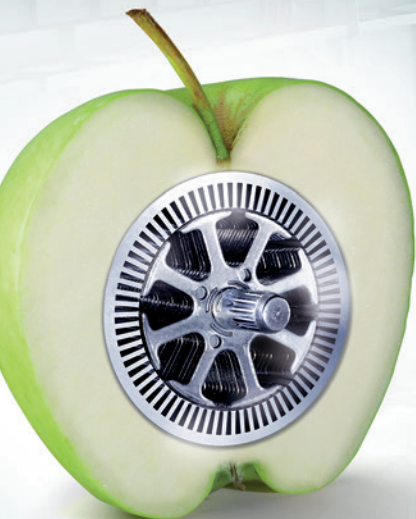


isovac®



Electrical steel



FULL-FINISHED ELECTRICAL STEEL

SEMI-FINISHED ELECTRICAL STEEL

isovac high-perm 310-35 A

Data sheet • February 2015

The specialist with the highest permeability

isovac® is the electrical steel made by voestalpine and stands for highest energy efficiency. With its excellent attribute profile, isovac® provides a higher level of quality that will help you remain a step ahead of the competition.

This non-grain-oriented, full-finished isovac® grade is produced on one of the world's most modern continuous annealing lines and features a specially adjusted microstructure and texture achieved by a special annealing process that increases both flux density and magnetizability across the entire range of the magnetic field. The higher permeability of isovac HP 310-35 A makes it possible to reduce machine size while maintaining the same amount of torque.

Convincing advantages

- Production in one of the world's most modern continuous annealing lines with widths of up to 1650 mm
- Higher rotational speeds/torques with increased output based on higher magnetizability (up to 0.06 T at J25/50/100)
- Machine downsizing for reduced material consumption, lower weight and minimized space requirements

voestalpine supplies isovac HP 310-35 A, 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.

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 310-35 A	285	265	415	32	130

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 HP 310-35 A	1.25	0.70	2.70	1.51	1.67	1.76	1.88	3400

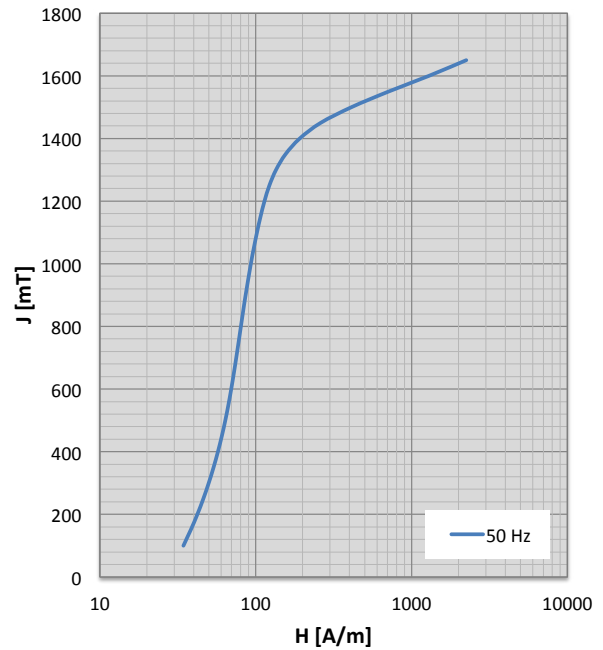
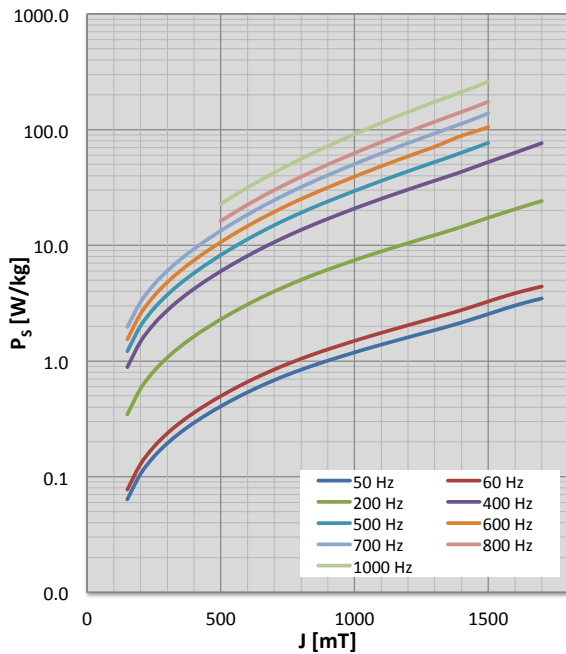
Physical properties

(Typical values)

Grade named according to isovac®	Density ρ [g/cm ³]	Specific electrical resistance ρ_s [$\mu\Omega\text{cm}$]	Thermal conductivity λ [W/mK]
isovac HP 310-35 A	7.76	35.8	33

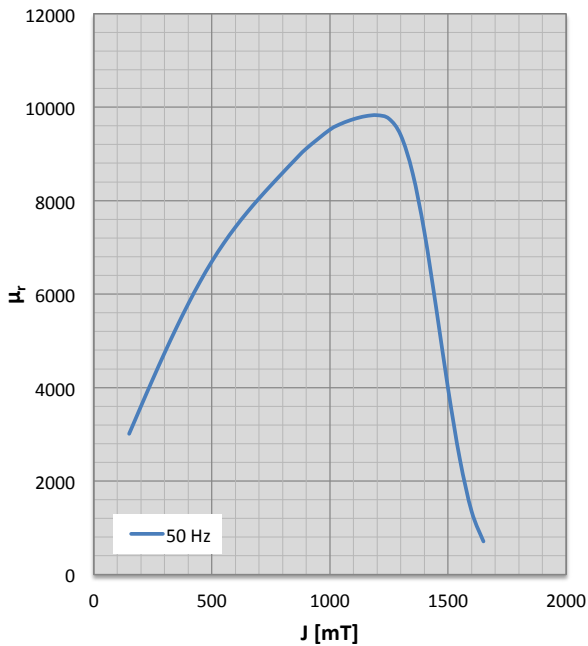
Characteristics P_s/J loss curve and characteristics J/H magnetization curve

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			
J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
100	34	0.02	2411
150	38	0.06	3008
200	42	0.11	3600
250	46	0.15	4179
300	50	0.19	4741
350	54	0.24	5280
400	57	0.29	5789
450	61	0.35	6263
500	64	0.41	6696
550	67	0.47	7085
600	70	0.54	7434
650	72	0.61	7752
700	75	0.68	8047
750	78	0.76	8325
800	80	0.84	8596
850	83	0.92	8862
900	86	1.01	9113
1000	93	1.19	9519
1050	97	1.28	9651
1100	102	1.39	9743
1150	107	1.49	9806
1200	114	1.60	9827
1250	122	1.72	9753
1300	135	1.85	9398
1350	155	1.99	8590
1400	192	2.15	7327
1450	261	2.34	5698
1500	412	2.55	3982
1550	713	2.78	2472
1600	1293	3.02	1349
1650	2243	3.25	709
1700	3469	3.47	425

60 Hz			
J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
100	35	0.03	2367
150	39	0.08	2935
200	44	0.13	3500
250	48	0.18	4057
300	52	0.24	4603
350	55	0.30	5133
400	59	0.36	5645
450	62	0.43	6134
500	65	0.50	6597
550	68	0.58	7030
600	71	0.66	7435
650	73	0.75	7813
700	76	0.84	8165
750	78	0.94	8493
800	80	1.05	8798
850	83	1.15	9082
900	86	1.26	9340
1000	93	1.49	9765
1050	96	1.62	9924
1100	101	1.75	10045
1150	106	1.89	10118
1200	112	2.04	10086
1250	121	2.20	9874
1300	135	2.36	9373
1350	155	2.55	8488
1400	192	2.76	7213
1450	263	3.00	5612
1500	414	3.27	3934
1550	719	3.56	2448
1600	1310	3.85	1336
1650	2286	4.13	699
1700	3552	4.41	416

200 Hz			
J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
100	36	0.12	2309
150	42	0.35	2744
200	47	0.58	3175
250	52	0.82	3601
300	58	1.07	4016
350	63	1.34	4420
400	67	1.63	4808
450	72	1.95	5177
500	76	2.29	5525
550	80	2.67	5848
600	83	3.08	6145
650	86	3.52	6415
700	90	4.00	6656
750	93	4.50	6868
800	96	5.03	7049
850	100	5.58	7197
900	104	6.17	7311
1000	114	7.44	7429
1050	119	8.13	7432
1100	125	8.86	7407
1150	131	9.63	7362
1200	138	10.45	7276
1250	147	11.32	7133
1300	159	12.27	6954
1350	175	13.29	6722
1400	205	14.46	6232
1450	265	15.82	5300
1500	411	17.31	4013
1550	718	18.87	2566
1600	1314	20.54	1337
1650	2293	22.31	642
1700	3556	24.16	370

400 Hz			
J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
150	44	0.88	2538
200	51	1.47	2879
250	58	2.09	3214
300	65	2.74	3538
350	71	3.44	3849
400	77	4.21	4143
450	83	5.05	4417
500	89	5.97	4667
550	94	6.99	4891
600	99	8.11	5086
650	104	9.33	5251
700	109	10.65	5386
750	114	12.07	5489
800	120	13.59	5559
850	126	15.21	5595
900	133	16.95	5598
1000	148	20.81	5518
1050	157	22.96	5441
1100	166	25.25	5357
1150	176	27.70	5278
1200	186	30.34	5208
1250	196	33.18	5141
1300	206	36.23	5061
1350	219	39.50	4934
1400	243	43.23	4680
1450	295	47.60	4203
1500	429	52.42	3421
1550	723	57.53	2346
1600	1312	63.15	1331
1650	2295	69.48	713
1700	3572	76.35	426

Frequency dependence of magnetic properties

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

500 Hz			
J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
100	39	0.44	2085
150	46	1.21	2406
200	54	2.01	2724
250	61	2.85	3034
300	68	3.74	3332
350	75	4.70	3616
400	82	5.76	3880
450	89	6.94	4122
500	95	8.24	4338
550	101	9.69	4525
600	107	11.29	4681
650	113	13.04	4807
700	119	14.93	4901
750	126	16.96	4965
800	132	19.14	4998
850	140	21.47	5000
900	148	23.96	4974
1000	168	29.53	4855
1050	178	32.66	4773
1100	189	36.04	4685
1150	201	39.71	4601
1200	214	43.66	4510
1250	227	47.90	4409
1300	240	52.50	4342
1350	249	57.52	4320
1400	268	63.18	4175
1450	320	69.65	3740
1500	453	76.78	3032
1550	739	84.48	2150
1600	1318	93.11	1336
1650	2294	102.95	801
1700	3569	113.71	497

700 Hz			
J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
150	52	1.96	2130
200	59	3.24	2446
250	67	4.58	2750
300	74	6.02	3035
350	82	7.58	3297
400	90	9.31	3527
450	98	11.23	3722
500	106	13.37	3873
550	114	15.77	3979
600	123	18.43	4044
650	131	21.36	4076
700	140	24.58	4085
750	150	28.07	4079
800	159	31.86	4066
850	169	35.96	4051
900	180	40.40	4030
1000	204	50.45	3941
1050	219	56.15	3863
1100	234	62.35	3773
1150	250	69.10	3685
1200	267	76.39	3597
1250	285	84.26	3507
1300	304	92.86	3419
1350	323	102.24	3348
1400	346	112.63	3231
1450	386	124.46	2967
1500	494	138.10	2554

600 Hz			
J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
100	40	0.53	2048
150	47	1.53	2360
200	55	2.56	2666
250	62	3.64	2963
300	70	4.79	3244
350	78	6.05	3504
400	85	7.43	3738
450	93	8.96	3942
500	100	10.66	4109
550	107	12.57	4236
600	115	14.67	4327
650	122	16.98	4386
700	130	19.48	4417
750	138	22.20	4426
800	147	25.11	4418
850	156	28.24	4396
900	167	31.62	4365
1000	188	39.27	4295
1050	198	43.61	4259
1100	210	48.30	4208
1150	224	53.32	4129
1200	239	58.81	4035
1250	254	64.82	3941
1300	270	71.14	3852
1350	290	79.59	3725
1400	316	88.60	3525
1450	365	96.23	3191
1500	474	105.11	2758

800 Hz			
J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
450	103	13.47	3573
500	110	16.16	3716
550	118	19.14	3817
600	127	22.42	3875
650	136	26.05	3899
700	147	30.02	3896
750	158	34.37	3872
800	169	39.11	3836
850	181	44.26	3792
900	194	49.87	3741
1000	223	62.67	3608
1050	239	69.96	3524
1100	257	77.89	3434
1150	275	86.49	3347
1200	294	95.86	3260
1250	315	106.04	3172
1300	336	116.98	3088
1350	360	128.94	3008
1400	384	142.25	2912
1450	410	157.01	2755
1500	512	174.61	2406

Frequency dependence of magnetic properties

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

1000 Hz			
J [mT]	H [A/m]	P _s [W/kg]	μ _r [-]
450	113	18.86	3228
500	122	22.68	3339
550	132	26.89	3415
600	142	31.56	3457
650	153	36.75	3467
700	165	42.50	3451
750	178	48.86	3412
800	193	55.88	3355
850	209	63.61	3284
900	226	72.08	3204
1000	264	91.45	3035
1050	285	102.44	2954
1100	306	114.41	2876
1150	329	127.48	2797
1200	353	141.70	2720
1250	378	157.11	2644
1300	404	173.72	2570
1350	435	191.74	2488
1400	461	211.50	2421
1450	476	233.61	2370
1500	569	261.08	2122

Available dimensions

Grade named according to isovac®	Delivery form	Width [mm]	Length [mm]
isovac HP 310-35 A	Wide strip/Slit strip	19 – 1450	-
	Cut-to-length sheets	300 – 1450	300 – 6000

Deliverable coating systems

Grade named according to isovac®	Uncoated	C-3	Backlack	C-5	C-6	Blue
isovac HP 310-35 A	X	X	On request	X	X	-

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



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