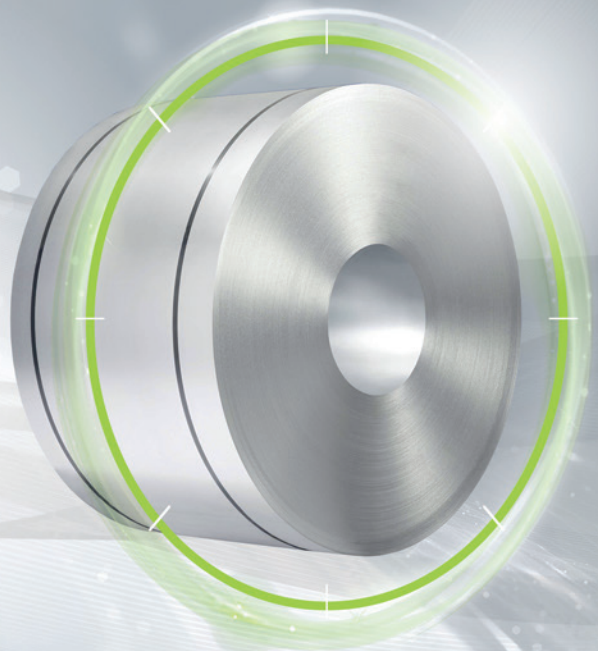


FULLY  
PROCESSED

## isovac 235-35 A

### The perfect solution for direct application

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. Upon request, isovac 235-35 A can be supplied with an electrical steel insulation system and can be used directly in as-delivered condition.

#### Convincing advantages:

- » 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 235-35 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.

**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 235-35 A	1.0890	M235-35A	M235-35A 5	35A230	-	-	-	-	35W230

**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 <sub>eH</sub> [MPa]	R <sub>p0.2</sub> [MPa]	R <sub>m</sub> [MPa]	A <sub>80</sub> [%]	HV5 [-]
isovac 235-35 A	455	445	550	15	210

**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 <sub>r</sub>
	50 Hz [W/kg]	60 Hz [W/lb]	50 Hz [W/kg]	60 Hz [W/lb]	[T]	[T]	[T]	[-]
isovac 235-35 A	0.80	0.45	2.10	1.18	1.51	1.61	1.74	600

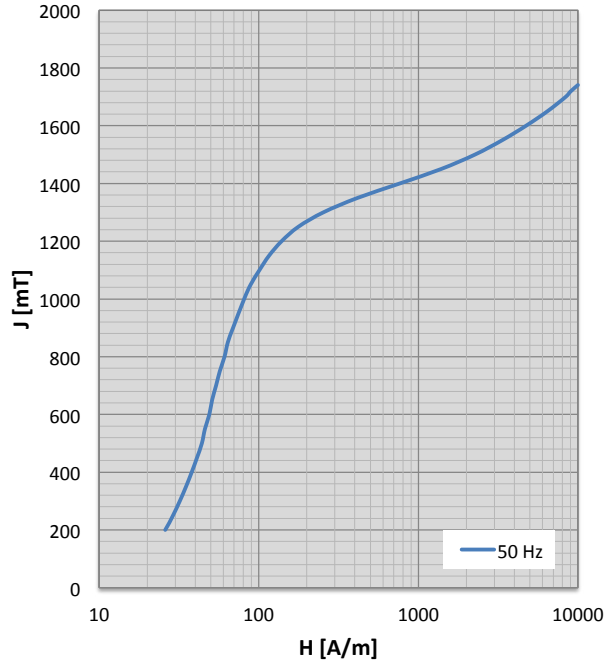
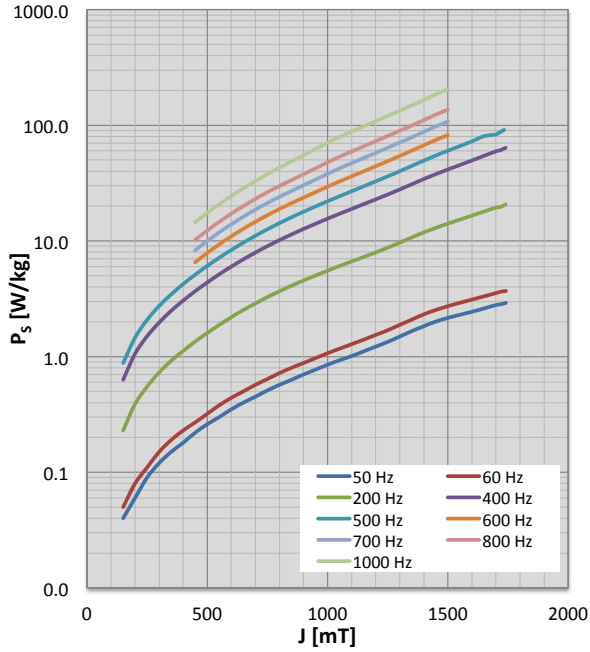
**Physical properties:**

Typical values

Grade named according to isovac®	Density ρ [g/cm³]	Specific electrical resistance ρ <sub>s</sub> [μΩcm]	Thermal conductivity λ [W/mK]
isovac 235-35 A	7.60	64.5	22

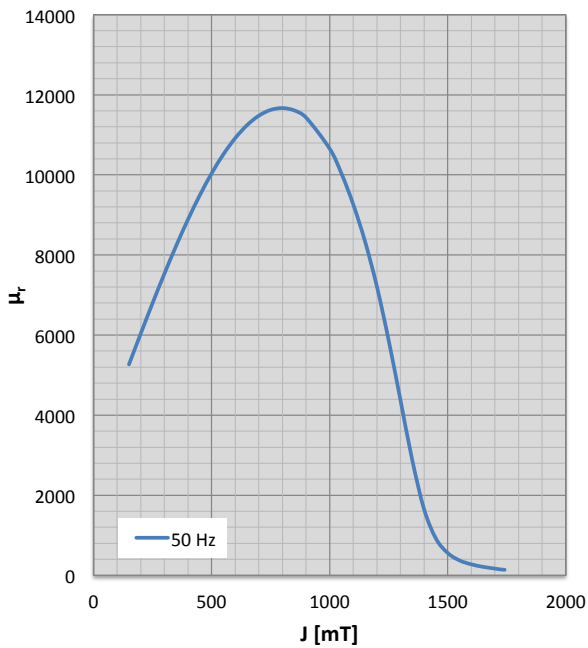
**Characteristics  $P_s/J$  loss curve and characteristics  $J/H$  magnetization curve**

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	23	0.04	5265	150	23	0.05	5211	150	25	0.23	4629
200	26	0.06	6040	200	26	0.08	5956	200	29	0.39	5135
250	29	0.09	6799	250	29	0.11	6685	250	34	0.55	5630
300	32	0.12	7532	300	33	0.15	7390	300	38	0.73	6107
350	35	0.15	8231	350	36	0.19	8063	350	42	0.92	6562
400	38	0.18	8887	400	39	0.23	8696	400	46	1.12	6988
450	41	0.22	9492	450	42	0.27	9281	450	50	1.35	7380
500	44	0.26	10037	500	44	0.32	9809	500	54	1.60	7732
550	46	0.30	10515	550	47	0.38	10274	550	57	1.88	8040
600	49	0.35	10918	600	50	0.44	10670	600	60	2.19	8305
650	51	0.40	11241	650	52	0.50	10991	650	64	2.53	8529
700	54	0.45	11478	700	55	0.57	11232	700	67	2.88	8717
750	57	0.51	11622	750	58	0.64	11389	750	70	3.27	8869
800	61	0.57	11668	800	61	0.72	11455	800	74	3.67	8989
850	64	0.63	11609	850	65	0.80	11423	850	78	4.10	9078
900	69	0.70	11430	900	70	0.88	11277	900	82	4.55	9131
1000	81	0.85	10654	1000	82	1.07	10564	1000	92	5.53	9103
1050	89	0.93	10032	1050	90	1.17	9966	1050	98	6.07	8987
1100	101	1.01	9259	1100	101	1.28	9214	1100	107	6.65	8681
1150	116	1.11	8333	1150	117	1.40	8315	1150	121	7.27	8074
1200	139	1.22	7211	1200	139	1.54	7218	1200	141	7.96	7138
1250	177	1.34	5863	1250	176	1.69	5885	1250	176	8.75	5889
1300	254	1.49	4368	1300	253	1.88	4393	1300	251	9.66	4425
1350	416	1.66	2870	1350	416	2.09	2883	1350	411	10.72	2904
1400	765	1.83	1646	1400	764	2.32	1646	1400	760	11.85	1646
1450	1388	2.01	918	1450	1384	2.53	916	1450	1387	12.98	910
1500	2261	2.16	558	1500	2258	2.73	558	1500	2266	14.12	554
1550	3356	2.30	373	1550	3360	2.92	373	1550	3363	15.30	372
1600	4731	2.44	275	1600	4742	3.11	275	1600	4741	16.57	274
1650	6434	2.61	213	1650	6445	3.32	212	1650	6449	17.96	212
1700	8377	2.79	169	1700	8382	3.54	169	1700	8397	19.43	168
1719	9000	2.83	152	1719	9000	3.64	152	1717	9000	19.67	152
1741	10000	2.91	139	1741	10000	3.69	139	1740	10000	20.64	138

**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	24	0.30	3430				
150	29	0.63	3991	150	30	0.88	3758				
200	34	1.06	4354	200	37	1.46	4082				
250	40	1.50	4707	250	43	2.08	4398				
300	45	1.97	5048	300	49	2.74	4701				
350	51	2.49	5371	350	55	3.45	4988				
400	56	3.05	5672	400	60	4.24	5254	400	63	5.26	5107
450	61	3.68	5946	450	66	5.11	5495	450	69	6.52	5290
500	66	4.37	6189	500	71	6.08	5706	500	74	7.86	5455
550	70	5.15	6398	550	76	7.16	5886	550	80	9.34	5589
600	75	6.00	6574	600	81	8.35	6034	600	85	10.96	5690
650	79	6.93	6720	650	86	9.66	6153	650	91	12.73	5763
700	84	7.93	6838	700	91	11.08	6244	700	97	14.64	5811
750	88	9.01	6931	750	96	12.61	6309	750	104	16.69	5838
800	93	10.16	7002	800	102	14.25	6351	800	110	18.87	5846
850	98	11.39	7052	850	108	16.00	6370	850	117	21.20	5840
900	103	12.69	7078	900	114	17.88	6368	900	124	23.70	5817
1000	115	15.58	7045	1000	128	22.04	6309	1000	140	29.45	5717
1050	121	17.18	6982	1050	135	24.35	6253	1050	149	32.70	5638
1100	129	18.91	6904	1100	143	26.88	6178	1100	158	36.19	5558
1150	139	20.80	6784	1150	153	29.68	6062	1150	167	40.01	5487
1200	153	22.88	6422	1200	166	32.77	5805	1200	179	44.24	5348
1250	181	25.20	5627	1250	189	36.18	5284	1250	201	48.97	5015
1300	252	27.87	4419	1300	256	40.07	4344	1300	259	54.30	4248
1350	414	30.94	2943	1350	415	44.56	2950	1350	404	60.33	2941
1400	763	34.29	1642	1400	768	49.50	1628	1400	763	67.15	1638
1450	1383	37.79	897	1450	1398	54.74	879	1450	1427	74.67	881
1500	2266	41.46	555	1500	2280	60.25	551	1500	2261	82.23	556
1550	3393	45.36	373	1550	3381	66.12	376				
1600	4801	49.64	270	1600	4763	72.72	273				
1650	6512	54.43	206	1650	6475	80.36	207				
1700	8444	59.59	164	1700	8431	83.29	165				
1717	9000	60.73	152	1706	9000	84.60	151				
1740	10000	63.83	138	1734	10000	91.31	138				

**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 <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> [-]
400	68	6.66	4761	400	72	8.20	4452	400	81	11.65	3976
450	74	8.28	4922	450	79	10.20	4594	450	88	14.47	4089
500	80	9.99	5064	500	85	12.31	4718	500	96	17.47	4185
550	86	11.88	5174	550	92	14.65	4811	550	104	20.78	4251
600	92	13.95	5252	600	99	17.23	4874	600	113	24.45	4289
650	99	16.22	5305	650	107	20.05	4911	650	122	28.50	4302
700	106	18.66	5337	700	115	23.09	4927	700	131	32.93	4295
750	113	21.28	5353	750	122	26.36	4927	750	141	37.77	4274
800	120	24.06	5359	800	131	29.86	4916	800	151	43.02	4242
850	127	27.02	5357	850	139	33.60	4895	850	162	48.75	4201
900	135	30.26	5332	900	148	37.72	4855	900	174	55.11	4140
1000	155	38.02	5152	1000	171	47.74	4657	1000	205	70.58	3895
1050	167	42.46	5032	1050	184	53.48	4539	1050	222	79.30	3767
1100	177	47.05	4963	1100	196	59.30	4469	1100	237	88.07	3705
1150	188	52.10	4884	1150	210	65.73	4382	1150	255	97.78	3617
1200	201	57.72	4763	1200	224	72.87	4278	1200	271	108.62	3531
1250	220	63.99	4529	1250	240	80.80	4115	1250	287	120.60	3447
1300	275	70.94	3924	1300	292	89.61	3634	1300	334	133.78	3134
1350	420	78.70	2798	1350	432	99.48	2667	1350	466	148.43	2416
1400	771	87.63	1626	1400	773	110.80	1617	1400	791	165.45	1572
1450	1419	97.76	897	1450	1404	123.66	915	1450	1403	185.26	927
1500	2268	107.71	555	1500	2263	136.67	557	1500	2267	205.62	555

### Available Dimensions

Grade named according to isovac®	Delivery form	Width [mm]	Length [mm]
isovac 235-35 A	Wide strip / Slit strip	19 – 1320	-
	Cut-to-length sheets	300 – 1320	300 – 5000

### Deliverable coating systems

Grade named according to isovac®	Uncoated	C-3	Backlack	C-5	C-6
isovac 235-35 A	✔	✔	☰	✔	✔

✔ Available ☰ On request

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