

sij

Electrical steels
SIWATT





SIJ is a vertically integrated holding company, the leading steel manufacturer in Slovenia, and one of the largest stainless and special steel manufacturers in Europe. SIJ Group consists of the two largest steel companies in Slovenia (SIJ Acroni and SIJ Metal Ravne), other manufacturing and processing companies (SIJ Ravne Systems, SIJ SUZ), specialized service and sales centers across Europe and the USA, and companies for scrap steel collection and sales.

www.sij.si

SIJ Acroni specialises in the production of flat steel products and belongs among the most important European suppliers of electrical steel. Long years of experience in development and production enable us to offer our customers most standard grades of non-oriented electrical steels produced in the world today. SIJ Acroni guarantees a constant level of quality by focusing on constant development and improvement of processes and materials. We are certified according to ISO 9001, ISO 14001, OHSAS 18001, ISO 50001 and EN ISO/IEC 17025.

www.acroni.si



INCREASE YOUR PRODUCT'S LIFE SPAN

The highest steel quality, based on world class production equipment and more than 400 years of experience in steel making.



DECREASE MACHINING COSTS

Narrow dimensional tolerances, exceeding international standards.



OPTIMIZE YOUR MANUFACTURING PROCESSES

Extensive range of mechanical treatment possibilities to find the best fit for your production process.



EXCEED YOUR CUSTOMERS' EXPECTATIONS

Strong in-house R&D Department and broad applied knowledge helps you get the best solutions for your customers' needs.



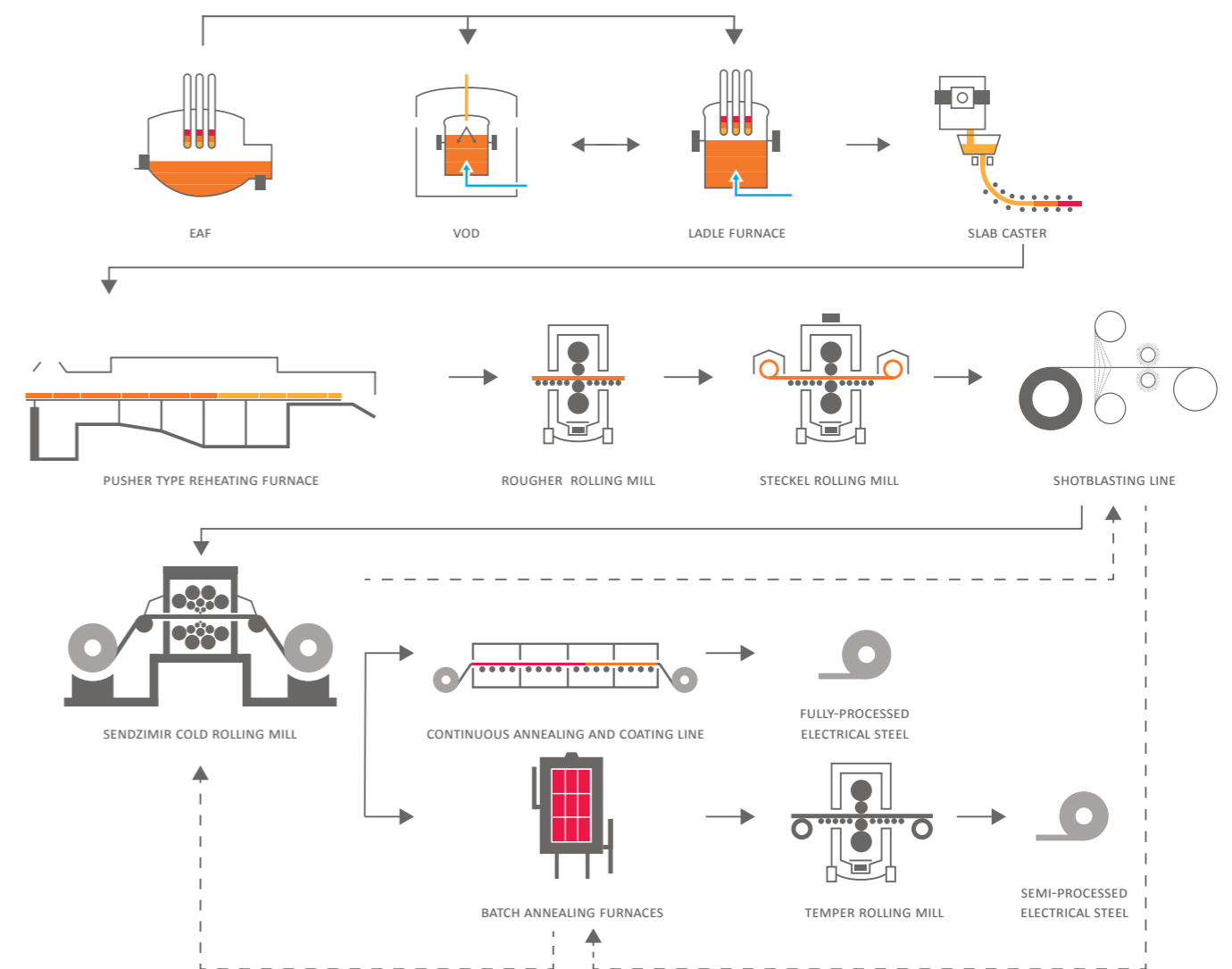
SIWATT – NON-ORIENTED ELECTRICAL STEELS

Electrical steels have special physical properties which make them suitable for application in the manufacture of electric equipment and appliances with rotating magnetic fields. The use of fully-processed steels is also widespread in construction of electrical static devices. Without electrical steels the production, transformation and utilisation of electrical energy would not be practical and would prove uneconomic.

We produce two main types of electrical steels:

- cold-rolled fully-processed electrical steels
- cold-rolled semi-processed electrical steels

PRODUCTION PROCESS FOR ELECTRICAL STEEL





TRUSTED BY THE BEST



R. Bourgeois

»SIJ Acroni is a historical partner in the silicon steel industry like the R.BOURGEOIS group ... and naturally we have been cooperating together for many years, especially for the demanding requirements of our industry, where we can find a common understanding with the mill and its teams.«



DOMEL

Domel

»SIJ Acroni is a reliable business partner whose adaptability and responsiveness enables it to adequately fulfil Domel's requirements.«



MAHLE

SECOP



COLD-ROLLED FULLY-PROCESSED ELECTRICAL STEELS

Cold-rolled fully-processed electrical steels may be delivered without insulation or with insulation on both sides in order to achieve desired properties for various fields of application (higher surface insulation resistance, improvement of punchability and corrosion resistance, annealing).

Steel grades representing the entire assortment are designated with the following grades:

FULLY-PROCESSED ELECTRICAL STEELS (GUARANTEED VALUES)

SIJ grade SIWATT EN 10106	Nominal thickness [mm]	Specific total loss ^{1), 4)} (max.)		Magnetic polarisation (min.) for field strength ^{2), 4)} [A/m]			Stacking factor (min.)	Density (assumed) [kg/dm ³]
		at 1.5 T	at 1.0 T ³⁾	2500	5000	10000		
		[W/kg]	[W/kg]	[T]	[T]	[T]		
M270-35A	0.35	2.7	1.10	1.49	1.60	1.70	0.95	7.65
M300-35A		3.0	1.20	1.49	1.60	1.70		7.65
M330-35A		3.3	1.30	1.49	1.60	1.70		7.65
M310-50A	0.50	3.1	1.25	1.49	1.60	1.70	0.97	7.65
M330-50A		3.3	1.35	1.49	1.60	1.70		7.65
M350-50A		3.5	1.50	1.50	1.60	1.70		7.65
M400-50A		4.0	1.70	1.53	1.63	1.73		7.70
M470-50A		4.7	2.00	1.54	1.64	1.74		7.70
M530-50A		5.3	2.30	1.56	1.65	1.75		7.70
M600-50A		6.0	2.60	1.57	1.66	1.76		7.75
M700-50A		7.0	3.00	1.60	1.69	1.77		7.80
M800-50A		8.0	3.60	1.60	1.70	1.78		7.80
M400-65A		0.65	4.0	1.70	1.52	1.62		1.72
M470-65A	4.7		2.00	1.53	1.63	1.73	7.65	
M530-65A	5.3		2.30	1.54	1.64	1.74	7.70	
M600-65A	6.0		2.60	1.56	1.66	1.76	7.75	
M700-65A	7.0		3.00	1.57	1.67	1.76	7.75	
M800-65A	8.0		3.60	1.60	1.70	1.78	7.80	

1) In accordance with IEC 60404-8-4 and EN 10106, the values are specified and guaranteed for magnetic polarisation at 1.5 T unless otherwise agreed.

2) In accordance with IEC 60404-8-4 and EN 10106, the values are specified and guaranteed for field strength at 2500 A/m, 5000 A/m and 10000 A/m unless otherwise agreed.

3) These are only informative values.

4) Valid for testing in the AC field in the 25 cm Epstein frame in accordance with IEC 60404-2.

FULLY-PROCESSED HIGH PERMEABILITY ELECTRICAL STEELS (GUARANTEED VALUES)

SIJ grade SIWATT	Nominal thickness [mm]	Specific total loss ²⁾ (max.)		Magnetic polarisation (min.) for field strength ²⁾ [A/m]		
		at 1.5 T	at 1.0 T ¹⁾	2500	5000	10000
		[W/kg]	[W/kg]	[T]	[T]	[T]
M330-35A-HP	0.35	3.30	1.30	1.55	1.64	1.76
M400-50A-HP	0.50	4.00	1.70	1.61	1.70	1.81
M530-50A-HP		5.30	2.30	1.63	1.72	1.83
M600-50A-HP		6.00	2.60	1.64	1.73	1.84
M700-50A-HP	0.65	7.00	3.00	1.67	1.76	1.87
M470-65A-HP		4.70	2.00	1.58	1.67	1.79
M600-65A-HP		6.00	2.60	1.62	1.71	1.82
M700-65A-HP		7.00	3.00	1.65	1.73	1.84
M800-65A-HP		8.00	3.60	1.67	1.76	1.87

1) These are only informative values.

2) Valid for testing in the AC field in the 25 cm Epstein frame in accordance with IEC 60404-2.

INSULATION COATINGS ON FULLY-PROCESSED ELECTRICAL STEELS

AISI Designation ASTM A976	C-3	C-5	C-6
Thermal class (IEC 60085)	H	H	H
Thickness of layer on each side [µm] (ISO 2178)	0.5–3	0.5–3	2–6
Composition	Organic without fillers	Organic/inorganic	Organic with fillers
Surface insulation resistance ¹⁾ [Ohm cm²] (ASTM A717)	Up to 20	Up to 70	10–200
Heat resistance	180 °C ²⁾	180 °C ²⁾ 850 °C ³⁾	180 °C ²⁾
Influence on punchability	Very favourable	Favourable	Favourable
Influence on weldability	Conditional	Good	Conditional
Resistance to mediums ⁴⁾	Good	Good	Good
Colour ⁵⁾	Yellow	Light grey to green	Light grey to dark grey

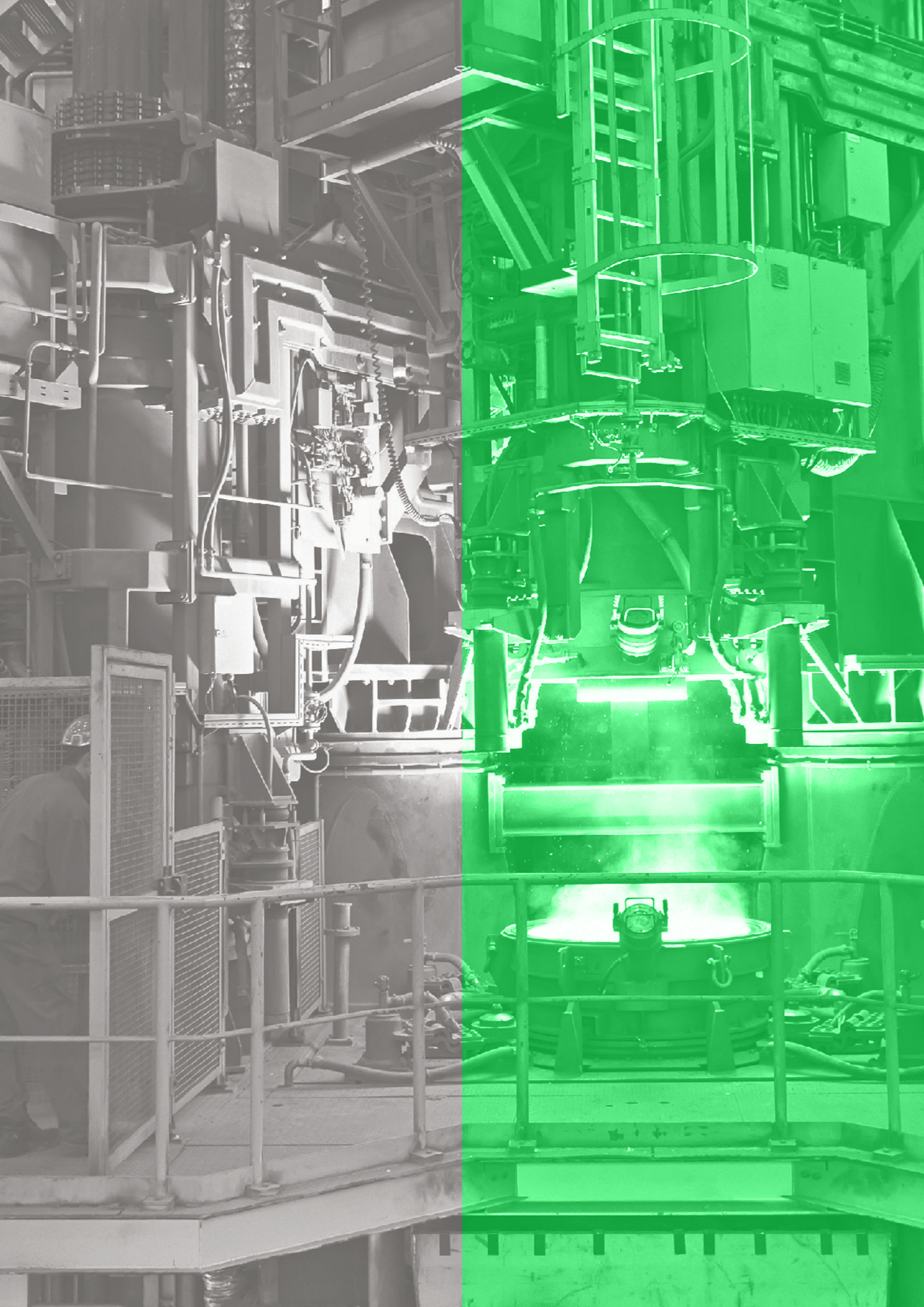
1) Surface insulation resistance depends on coating thickness.

2) In air long time (testing for 20000 hours at a given temperature in accordance with IEC 60085).

3) In protective gas atmosphere (as stress-relief annealing).

4) It relates to the resistance to most different lubricants, refrigerating mediums and oils. The varnish producer tests the resistance to the specific medium only upon the customer's requirement.

5) Colour shades depend on the coating thickness and type of varnish employed.



COLD-ROLLED FULLY-PROCESSED ELECTRICAL STEELS

Semi-processed electrical steels have especially favourable properties for punching. Desirable magnetic properties can be achieved after final annealing by the customer.

With a well-chosen process of final annealing and decarburising we can achieve excellent electromagnetic properties. Upon request, we shall gladly assist in advising the optimal conditions of final annealing. Semi-processed electrical steels are produced with a rough surface. The Ra-value is from 1 to 3 µm.

SEMI-PROCESSED ELECTRICAL STEELS (GUARANTEED VALUES)

SIJ grade SIWATT EN 10341	Nominal thickness [mm]	Reference annealing temperature (±10 °C) [°C]	Specific total loss ^{1), 4)} (max.)		Magnetic polarisation (min.) for field strength ^{2), 4)} [A/m]			Density (assumed) [kg/dm ³]
			at 1.5 T [W/kg]	at 1.0 T ³⁾ [W/kg]	2500 [T]	5000 [T]	10000 [T]	
M340-50K	0.50	840	3.40	1.42	1.54	1.62	1.72	7.65
M390-50K		840	3.90	1.62	1.56	1.64	1.74	7.70
M450-50K		790	4.50	1.92	1.57	1.65	1.75	7.75
M560-50K		790	5.60	2.42	1.58	1.66	1.76	7.80
M660-50K		790	6.60	2.80	1.62	1.70	1.79	7.85
M390-65K	0.65	840	3.90	1.62	1.54	1.62	1.72	7.65
M450-65K		840	4.50	1.92	1.56	1.64	1.74	7.70
M520-65K		790	5.20	2.22	1.57	1.65	1.75	7.75
M630-65K		790	6.30	2.72	1.58	1.66	1.76	7.80
M800-65K		790	8.00	3.30	1.62	1.70	1.79	7.85

SEMI-PROCESSED HIGH PERMEABILITY ELECTRICAL STEELS (GUARANTEED VALUES)

SIJ grade SIWATT	Nominal thickness [mm]	Reference annealing temperature (±10 °C) [°C]	Specific total loss ⁴⁾ (max.)		Magnetic polarisation (min.) for field strength ⁴⁾ [A/m]		
			at 1.5 T [W/kg]	at 1.0 T ³⁾ [W/kg]	2500 [T]	5000 [T]	10000 [T]
M340-50K-HP	0.50	840	3.40	1.42	1.58	1.66	1.78
M390-50K-HP		840	3.90	1.62	1.60	1.69	1.80
M400-50K-HP		790	4.00	1.70	1.62	1.71	1.82
M520-65K-HP	0.65	790	5.20	2.20	1.62	1.71	1.82

1) In accordance with IEC 60404-8-3 or EN 10341. The values are specified and guaranteed for magnetic polarisation at 1.5 T unless otherwise agreed.

2) In accordance with IEC 60404-8-3 or EN 10341. The values are specified and guaranteed for field strength at 2500 A/m, 5000 A/m and 10000 A/m, unless otherwise agreed.

3) These are only informative values.

4) Valid for testing in the AC field in the 25 cm Epstein frame in accordance with IEC 60404-2.

5) These values are valid only for test specimens in the reference condition in accordance with IEC 60404-8-3 or EN 10341.

COMPARISON OF GRADE DESIGNATIONS

FULLY-PROCESSED ELECTRICAL STEELS

EN 10106	IEC 60404-8-4	AISI*	ASTM* A677M	JIS C 2552	GOST* 21427
M270-35A	M270-35A 5	M 19	36F348M	35A270	2412
M300-35A	M300-35A 5	M 22	36F370M	35A300	2411
M330-35A	M330-35A 5	M 36	36F419M	-	-
M310-50A	M310-50A 5	M 22	47F419M	50A310	-
M330-50A	M330-50A 5	M 27	47F419M	50A330	-
M350-50A	M350-50A 5	M 36	47F452M	50A350	2411
M400-50A	M400-50A 5	M 43	47F507M	50A400	2312
M470-50A	M470-50A 5	-	47F617M	50A470	2311
M530-50A	M530-50A 5	M 45	47F672M	-	2212
M600-50A	M600-50A 5	-	-	50A600	2112
M700-50A	M700-50A 5	M 47	47F882M	50A700	-
M800-50A	M800-50A 5	-	47F992M	50A800	2111
M400-65A	M400-65A 5	M 27	64F496M	-	-
M470-65A	M470-65A 5	M 43	64F595M	-	-
M530-65A	M530-65A 5	-	-	-	2312
M600-65A	M600-65A 5	M 45	64F705M	-	2212
M700-65A	M700-65A 5	-	64F882M	-	2211
M800-65A	M800-65A 5	-	-	65A800	2112

* Approximately comparable

SEMI-PROCESSED ELECTRICAL STEELS

EN 10341	IEC 60404-8-3	ASTM* A726M
M340-50K	M340-50K 5	47D440M
M390-50K	M390-50K 5	47D510M
M450-50K	M450-50K 5	47D600M
M560-50K	M560-50K 5	47D730M
M660-50D	M600-50K 5	47D600M
M390-65K	M390-65K 5	64D570M
M450-65K	M450-65K 5	64D640M
M520-65K	M520-65K 5	64D790M
M630-65K	M630-65K 5	64D950M
M800-65D	M800-65K 5	64D790M

* Approximately comparable

GENERAL INFORMATION

STRIPS

Coil width	30–1000 mm
Inside nominal diameter	508 mm
Outside nominal diameter	1300 mm (max.)

DIMENSIONS AND WEIGHTS

	Coil weight [kg/mm of width]	Outside diameter [mm]
Entire coil	6–8.6	1100–1300
1/2 coil	3–4.5	870–1000
1/3 coil	2–2.9	770–850

DIMENSIONS AND WEIGHTS

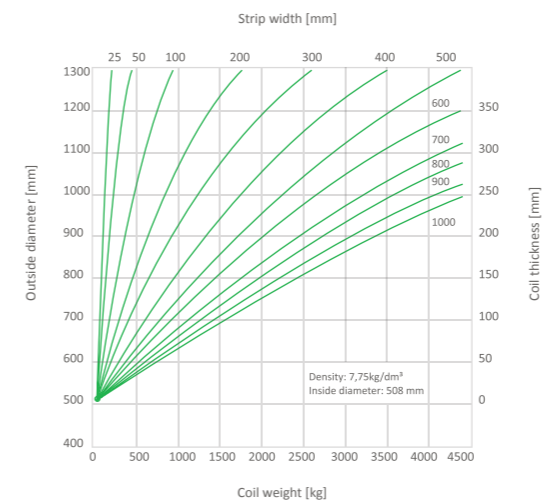
TOLERANCE ON NOMINAL WIDTH		TOLERANCE ON NOMINAL THICKNESS	
Nominal width "w" [mm]	Tolerance [mm]	Nominal thickness [mm]	Tolerance [mm] [%]
w ≤ 150	+0.2 0	0.35	±0.03 [±8]
150 < w ≤ 300	+0.3 0	0.50	±0.04 [±8]
300 < w ≤ 600	+0.5 0	0.65	±0.04 [±6]
600 < w ≤ 1000	+1.0 0	1.00	±0.06 [±6]

SHEETS

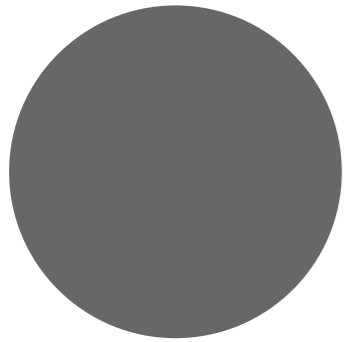
Cut length	600–6000 mm
Cut length tolerance	+0.5 0 %
Width of sheet	420–1000 mm
Package weight	1000–2500 kg

Dimensional and geometrical tolerances are in accordance with standards EN 10106, EN 10341.

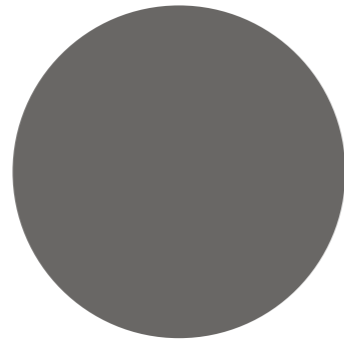
OUTSIDE DIAMETER IN DEPENDENCE ON COIL WEIGHT



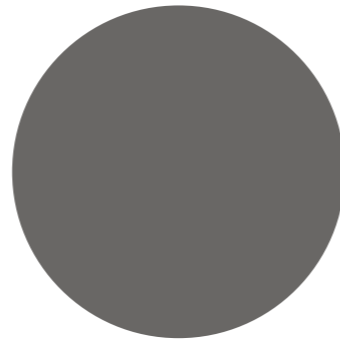
Our work is never truly done; we are a part of an endless process. This is symbolised by the three dots in our corporate logo, and the logos of each SIJ Group product and service brand. Three dots represent three values. Each one stands firmly on its own, and they all stand together, forever. As a sign of trust and quality, they symbolise our three main values, which define who and what we are.



CUSTOMISATION.



DILIGENCE.

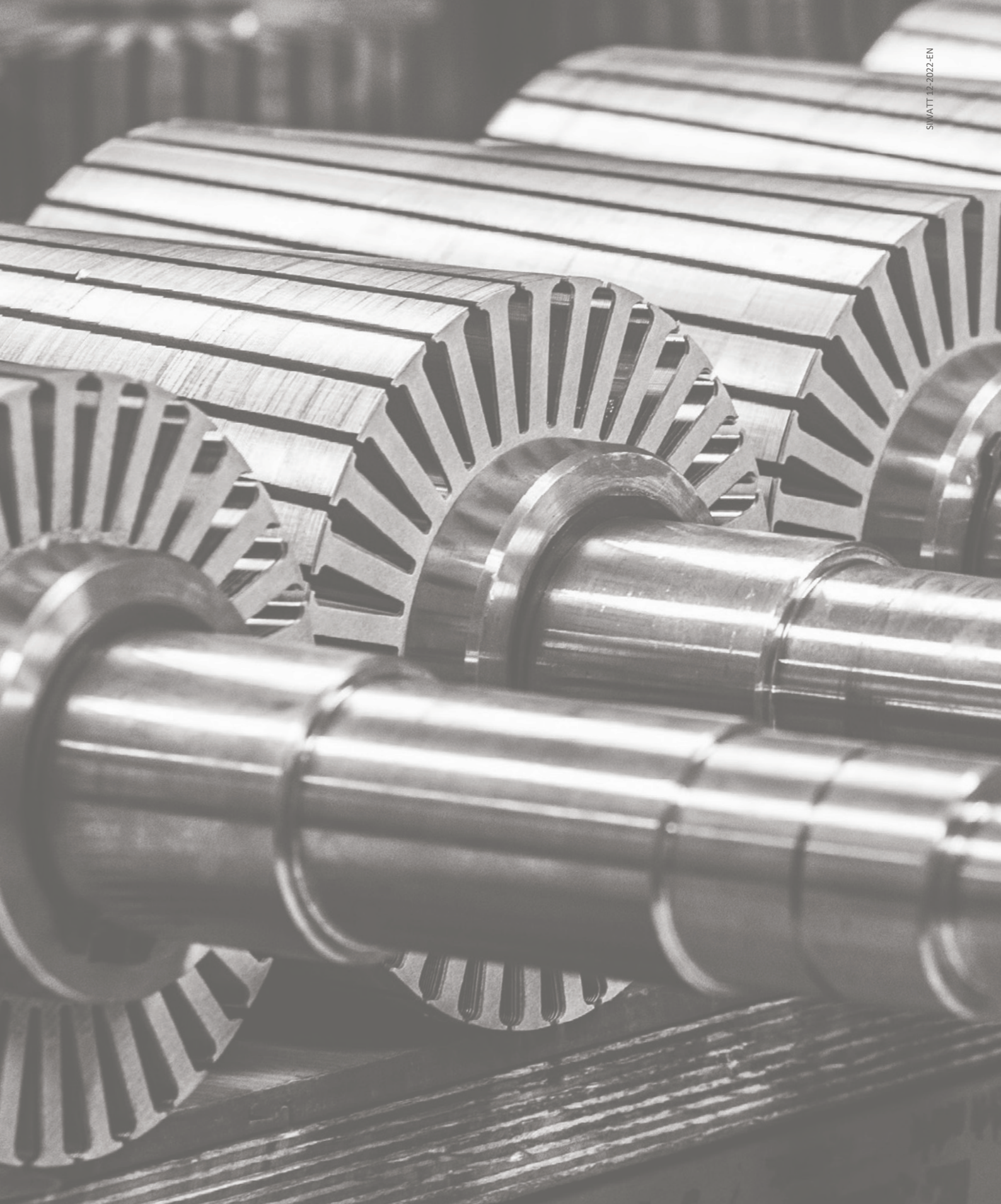


RELIABILITY.

sij | group



**BEST THINGS IN THE WORLD
CONTAIN SLOVENIAN STEEL**



SIJ Group

Gerbičeva 98
1000 Ljubljana
www.sij.si