

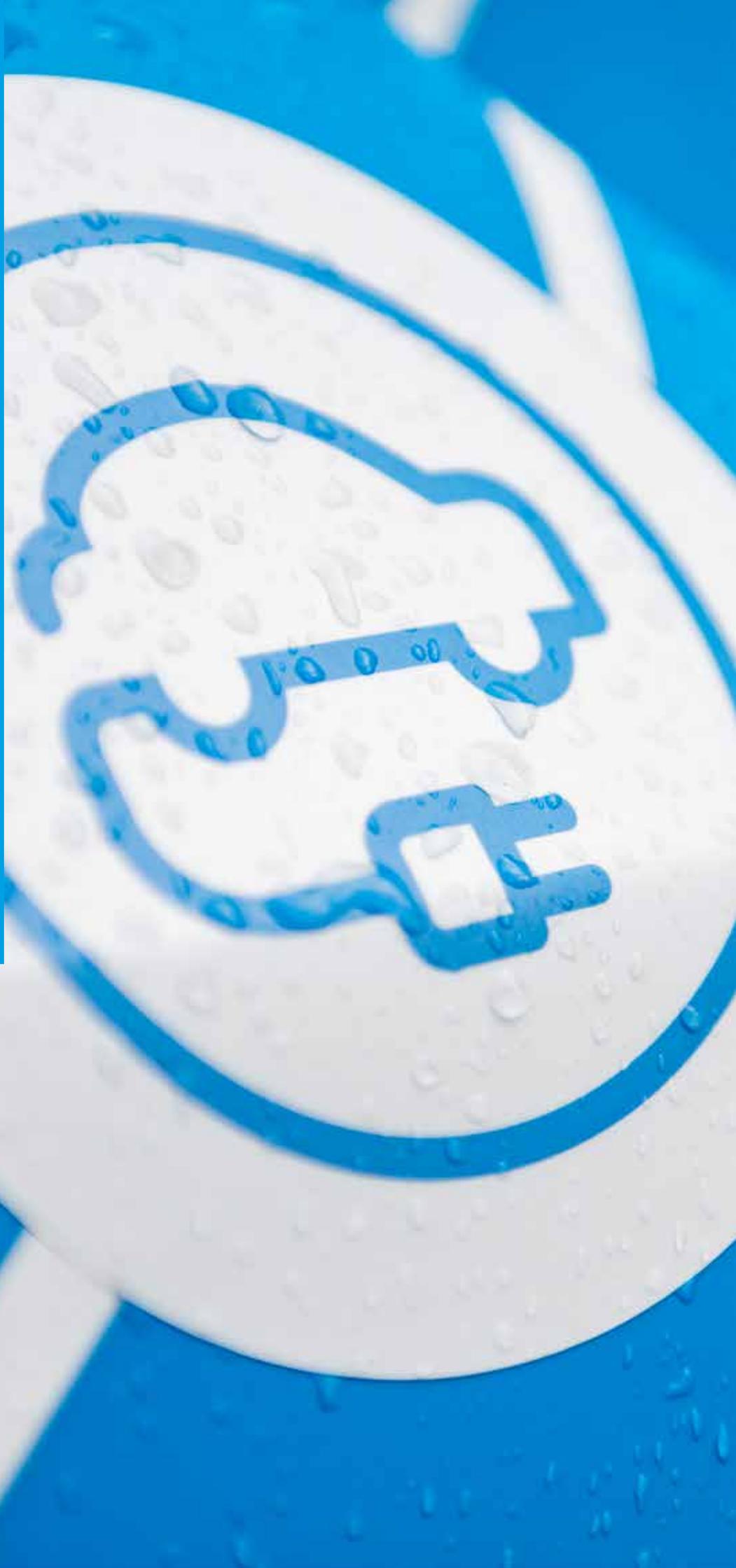
Steel

powercore[®] traction NGO 025-125Y420

Newcomer:
High-performance electrical steel
for electric mobility. Super-thin,
high mechanical strength with
minimum core loss.



thyssenkrupp



The electric motor is the heart of the electric vehicle, and its performance and efficiency depend on the non-grain-oriented electrical steel used.

Our non-grain-oriented powercore[®] traction grades have been specially optimized for the high demands of sustainable electric mobility.

Makes it possible to go the extra mile: Our premium product 025-125Y420

High efficiency, the smallest possible core losses combined with high strength – and consequently ideal suitability for high-performance automotive traction motors – this is what distinguishes our 025-125Y420 material. One further significant advantage is the ability to use it with different stacking techniques and insulation systems. Its advantages:



Least possible core loss and high strength – ideal for ultra-efficient high-speed drives



Top grade for electric mobility in high-volume series production



Maximum efficiency in the electric motor when combined with our adhesive insulating varnishes



Maximum sustainability: Available as CO₂-reduced bluemint[®] steel



The highest demands are placed on the performance and efficiency of modern traction motors.

To achieve this, the electrical steel strip must have the lowest possible core losses, as well as high magnetic polarization and strength. Some of these requirements are mutually exclusive –

but thyssenkrupp Steel has resolved the conflicting interests with a newly developed top grade for electric mobility, using an optimized alloy concept.



Requirements of the electric motor

- High efficiency
- High speeds
- High torque

- Low core losses
- High strength
- High magnetic polarization

Properties of the electrical steel

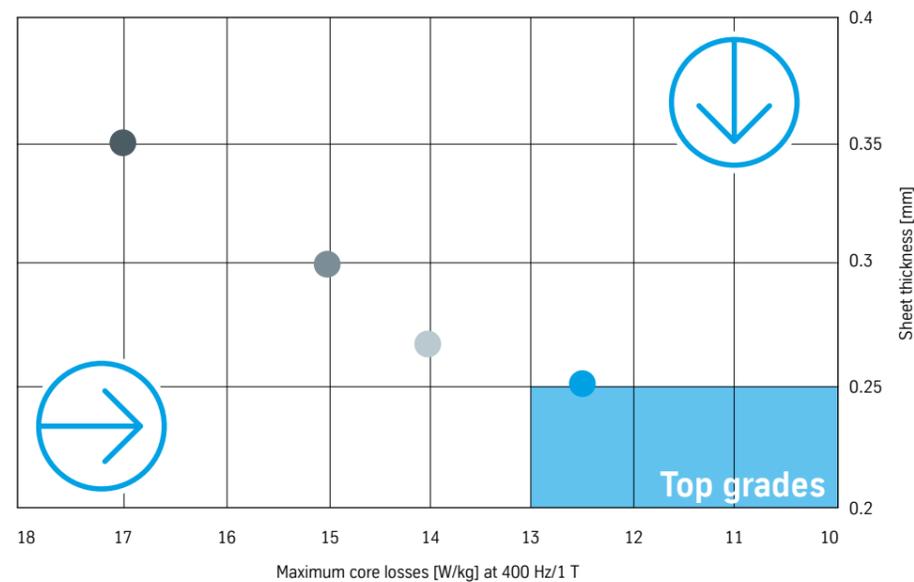
Electric drives

require customized properties of the electrical steel in the electric motor

The newly developed top grade for electric mobility 025-125Y420 – which is particularly thin at just 0.25 millimeters – features minimum core losses and a high mechanical strength ($R_{p0.2}$) of at least 420 MPa thanks to an optimized alloy concept. It has proven possible to reduce core losses from max. 14 W/kg (027-140Y420) to max. 12.5 W/kg (at 400 Hz and 1 T) compared

to the previously best grade, in the same strength class from thyssenkrupp Steel.

With these values, the new grade is one of the leading contenders among all options available in Europe, making it the top grade in the electric mobility segment.



powercore® traction NGO portfolio with 420 MPa strength ($R_{p0.2}$)

- 035-170Y420
- 030-150Y420
- 027-140Y420
- 025-125Y420

New premium grade achieves top magnetic and strength properties

Improved efficiency for electric motors: Greater range or smaller battery with 025-125Y420

Core losses are significantly influenced by the sheet thickness, alloy and material production process. It determines how efficiently a motor can utilize electrical energy and convert it into rotational energy.

High-speed drive motors in modern electric vehicles not only require excellent magnetic properties, they also place exacting demands on the mechanical properties of the electrical steel – primarily on the strength of the material. The high strength of 420 MPa offers the necessary reserves of strength even for high-performance drives, with the possibility of positively influencing the motor design, for example in terms of compactness.

In an electric motor, a low core loss is synonymous with high efficiency. If the efficiency increases, an electric vehicle can cover more miles on one battery charge or the battery capacity can be reduced while maintaining the same range. This saves weight and costs. Our new development, powercore® traction 025-125Y420, is characterized by a very low core loss of max. 12.5 W/kg (400 Hz, 1 T).



The new grade really comes into its own at high frequencies.

The combination is the trick: maximum efficiency with our adhesive insulating varnishes

In addition to the quality of the electrical steel grade used, its processing into rotor and stator stacks plays a decisive role in gaining maximum efficiency from the electric motor.

Whereas methods such as interlocking and lamination welding are commonly employed in large-scale production, adhesive stacking ensures that the material properties of the electrical steel strip are optimally retained for the end product, namely the motor: bonding systems avoid the disadvantageous effects of mechanical joining of laminations, which include material damage and short circuits. With adhesive stackings, losses due to unwanted current paths and disturbances in the magnetic flux can be minimized, making it possible to build electric motors with significantly higher efficiency and power density.

All in all, motor losses can be significantly reduced through adhesive stacking compared to interlocking. Tests with prototypes developed in-house on our own motor test bench have demonstrated that, depending on the operating point, motor losses can be reduced by up to 16% through adhesive stacking. Further potential for improvement is possible.

➔ Adhesive stacking: Significant reduction in motor losses possible, up to 16% already proven

➔ Reduction of CO₂ emissions in the use phase



Top grade for electric mobility in high-volume series production – Made in Europe

The bar is set high for our modern production facilities to achieve the demanding product characteristics and the high quality of the electrical steel strips.

This is why thyssenkrupp Steel is investing in a state-of-the-art double reversing stand and a coupled annealing and isolating line at its Bochum site. With this configuration, thin electrical steel strips can be rolled with great flatness and the tightest thickness tolerances. They will be manufactured with particularly homogeneous mechanical and magnetic properties. The series ramp-up of the new N025 grade will take place on new lines at the Bochum site starting in early 2025. Sampling and homologation inquiries can be made immediately.

With the modern and energy-saving units, thyssenkrupp Steel is expanding its capabilities in the production of non-grain-oriented electrical steel so as to meet the increasing demand for thinner and highly silicized materials in the best possible way.

And with the "Made in Europe" cachet – the best quality with top-notch local advisory service and a reliable supply chain for the whole of Europe.

➔ Available in series production from January 2025 – homologation quantities are available immediately

➔ After ramp-up, the capacities will be sufficient for high-volume series production on state-of-the-art lines



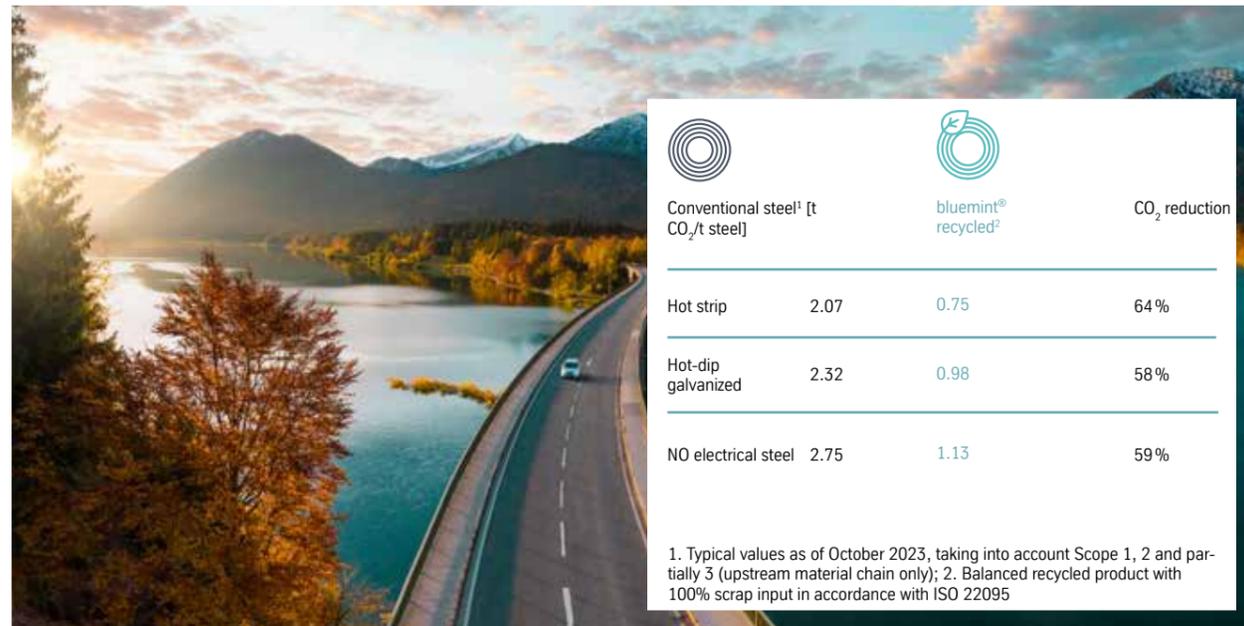
Optimum footprint: 025-125Y420 is also available as bluemint®

New CO₂-reduced products are expanding our portfolio under the bluemint® brand name. The special feature: The material properties of these high-quality flat steels and non-grain oriented electrical steel strips are no different from those of conventional steel grades – except for reduced specific CO₂ emissions. The certified steels are produced at the Duisburg site.

Using bluemint® enables the positive effects of our new non-grain oriented premium grade in environmental protection and climate change mitigation to be increased further: In combination with thyssenkrupp bluemint® recycled, a CO₂ reduction of 1.62 metric tons of CO₂ per metric ton of NO electrical steel produced can be achieved in the production of the steel material.

This equates to a reduction of 59% compared to the CO₂ emissions from the conventional production process.

Thanks to the declaration of conformity from TÜV Süd, our customers can participate directly in these CO₂ savings in material production for their Scope 3 emissions.



	 Conventional steel ¹ [t CO ₂ /t steel]	 bluemint® recycled ²	CO ₂ reduction
Hot strip	2.07	0.75	64%
Hot-dip galvanized	2.32	0.98	58%
NO electrical steel	2.75	1.13	59%

1. Typical values as of October 2023, taking into account Scope 1, 2 and partially 3 (upstream material chain only); 2. Balanced recycled product with 100% scrap input in accordance with ISO 22095

Thickness, width, diameter: Product overview and range of dimensions

Product overview of powercore® traction NGO

	Max. core loss	Min. polarization			Guaranteed minimum yield strength according to ISO 6892-1	
	[W/kg] at 400 Hz/1 T	[T] at [A/m]	2,500	5,000	10,000	
powercore® traction NGO 020-130Y320	13		1.48	1.59	1.69	320
powercore® traction NGO 020-130Y350	13		1.48	1.59	1.69	350
powercore® traction NGO 020-150Y320	15		1.48	1.59	1.69	320
powercore® traction NGO 025-140Y400	14		1.52	1.61	1.71	400
powercore® traction NGO 025-125Y420	12.5		1.52	1.61	1.73	420
powercore® traction NGO 027-140Y420	14		1.51	1.61	1.73	420
powercore® traction NGO 027-150Y370	15		1.52	1.61	1.73	370
powercore® traction NGO 027-150Y420	15		1.52	1.61	1.73	420
powercore® traction NGO 027-180Y370	18		1.52	1.61	1.73	370
powercore® traction NGO 030-150Y420	15		1.52	1.61	1.73	420
powercore® traction NGO 030-160Y420	16		1.52	1.61	1.73	420
powercore® traction NGO 032-190Y330	19		1.52	1.62	1.74	330
powercore® traction NGO 035-170Y420	17		1.52	1.61	1.73	420
powercore® traction NGO 035-180Y400	18		1.52	1.61	1.73	400
powercore® traction NGO 035-190Y390	19		1.52	1.61	1.73	390
powercore® traction NGO 035-220Y330	22		1.52	1.62	1.74	330
powercore® traction NGO 035-220Y300	22		1.55	1.64	1.76	300

Insulation and adhesive insulation types on request; all dimensional details can be found in the corresponding powercore® traction product information.

Range of dimensions

	Supply form	Thickness [mm]	Width [mm]	Inside diameter [mm]	Outside diameter [mm]
powercore® traction NGO	Narrow strip	0.25	30 ¹ – 500	508	max. 1,360 ²
	Wide strip	0.25	500 – 1250	508/610	max. 1360

1. Narrower on request; 2. Max. outside diameter depending on the width

Steel

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