

Steel

# perform<sup>®</sup>

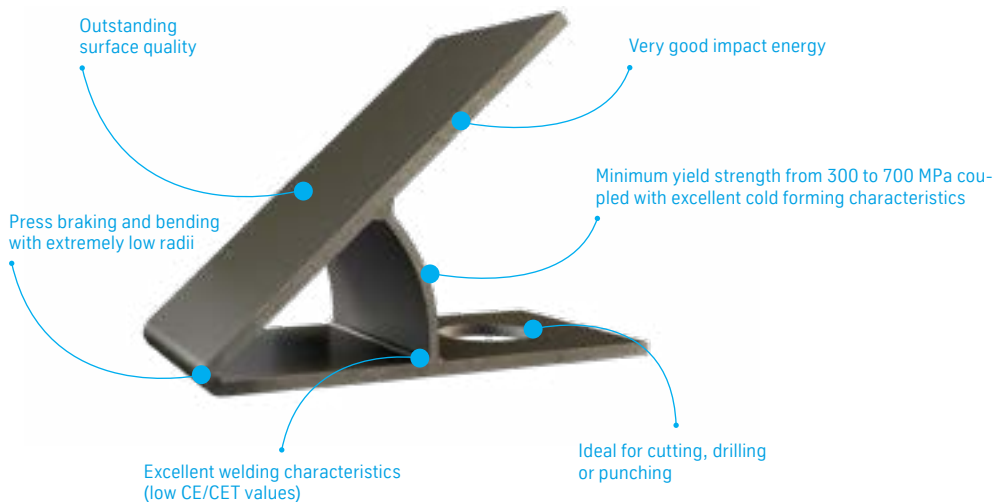
Product information for high-strength thermomechanically hot-rolled strip and cut-to-length plate



thyssenkrupp

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## Brief profile



perform<sup>®</sup> from thyssenkrupp is a micro-alloyed steel which is thermomechanically rolled and available as uncoated wide hot strip and cut-to-length plate in the sizes listed in the section “Available dimensions”.

perform<sup>®</sup> steels are characterized by a very low levels of sulfur and a low carbon content, micro-alloying with niobium, vanadium, titanium as well as their combination. perform<sup>®</sup> steels have excellent cold formability and weldability. The extremely fine-grain microstructure additionally results in very good toughness level.

The surface of the micro-alloyed steels is characterized by a thin, homogeneous, firmly adhering scale layer – and can be painted without any problems. thyssenkrupp supplies perform<sup>®</sup> steels in various yield strengths from 300 to 700 MPa.

perform<sup>®</sup> steels are used primarily for complex component geometries in vehicle construction, in the chassis in the area of the axles or wheel suspension, for axle beams, transverse or longitudinal control arms, and for special profiles and formed parts. In commercial vehicle construction, the micro-alloyed steels are used in axle structures of trailers or in steel wheels, and in special vehicle construction in on-board cranes and their booms.

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## Available steel grades

### Steel grade designation and delivery form

Steel grade	Reference grade DIN EN 10149-2	Reference grade VDA 239-100	Material No.	Delivery form	
				Hot-rolled strip	Cut-to-length plate
perform® 300	–	HR300LA	–	●	–
perform® 315	S315MC	–	1.0972	●	–
perform® 340	–	HR340LA	–	●	–
perform® 355	S355MC	–	1.0976	●	–
perform® 380	–	HR380LA	1.0978	●	–
perform® 420	S420MC	HR420LA	1.0980	●	–
perform® 460	S460MC	HR460LA	1.0982	●	–
perform® 500	S500MC	HR500LA	1.0984	●	●
perform® 550	S550MC	HR550LA	1.0986	●	●
perform® 600	S600MC	HR600LA	1.8969	●	●
perform® 650	S650MC	HR650LA	1.8976	●	●
perform® 700	S700MC	HR700LA	1.8974	●	●

● Available

## Comments

By arrangement the grades perform® 300 to 700 can be also supplied with category A galvanizing properties based on DIN EN 10149-2.

Wide hot strip<sup>1)</sup> and cut-to-length<sup>1)</sup> plate can be ordered in pickled or non-pickled condition and with mill or trimmed edges. For surface quality requirements of cut-to-length plate DIN EN 10163 is applicable.

The admissible tolerances are based on DIN EN 10051 for wide hot strip and cut-to-length plate.

In derogation from DIN EN 10051 cut-to-length plate is supplied with flatness tolerances in accordance with DIN EN 10029, table 4. Reduced flatness tolerances in accordance with DIN EN 10029, table 5 can be agreed separately when ordering.

Unless otherwise agreed upon in the order, the delivery will be governed by the conditions outlined in DIN EN 10021.

Orders can also be placed for micro-alloyed steels to DIN EN 10149-2 or VDA 239-100.

<sup>1)</sup> For trimmed edges and/or pickled conditions not all thickness and width combinations are possible.

## Technical characteristics

Mechanical properties – test direction longitudinal to rolling direction, delivery condition: thermomechanically rolled, for all thicknesses

	Yield strength $R_{eH}$ [MPa]	Tensile strength $R_m$ [MPa]	Elongation		Notch impact energy		Bend test, mandrel diameter <sup>2)</sup> D [t = specimen thickness]
			A [%] min. $L_0 = 80$ mm Nominal thickness < 3.0 mm	$L_0 = 5.65 \sqrt{S_0}$ ≥ 3.0 mm	KV [J] at a test temperature of -20 °C	KV [J] at a test temperature of -40 °C	
Stahlsorte							
perform® 300	300–400	380–460	21	25	40	27	0 t
perform® 315	315–415	390–480	20	24	40	27	0 t
perform® 340	340–450	420–510	19	23	40	27	0.5 t
perform® 355	355–465	430–550	19	23	40	27	0.5 t
perform® 380	380–490	450–580	17	21	40	27	0.5 t
perform® 420	420–530	480–610	16	19	40	27	0.5 t
perform® 460	460–570	520–670	14	17	40	27	1.0 t
perform® 500	500–640	550–700	12	14	40	27	1.0 t
perform® 550	550–690	600–750	12	14	40	27	1.5 t
perform® 600	600–780	650–810	11	13	40	27	1.5 t
perform® 650 <sup>1)</sup>	650–820	700–860	10	12	40	27	2.0 t
perform® 700 <sup>1)</sup>	700–880	750–930	10	12	40	27	2.0 t

<sup>1)</sup> For thicknesses > 8 mm yield strengths may be 20 MPa lower.

<sup>2)</sup> Bend test in accordance with ISO 7438 is performed by using transverse specimens.

## Chemical composition

Mass fractions in ladle analysis	C [%] max.	Si [%] <sup>1)</sup> max.	Mn [%] max.	P [%] max.	S [%] max.	Al [%] min.	Nb [%] <sup>3)</sup> max.	V [%] <sup>3)</sup> max.	Ti [%] <sup>3)</sup> max.	Mo [%] max.	B [%] max.
Steel grade											
perform® 300	0.10	0.10	1.30	0.025	0.010 <sup>2)</sup>	0.015	0.050	0.08	0.100	–	–
perform® 315	0.10	0.10	1.30	0.025	0.010 <sup>2)</sup>	0.015	0.050	0.08	0.100	–	–
perform® 340	0.10	0.10	1.50	0.025	0.010 <sup>2)</sup>	0.015	0.060	0.08	0.100	–	–
perform® 355	0.10	0.10	1.50	0.025	0.010 <sup>2)</sup>	0.015	0.060	0.08	0.100	–	–
perform® 380	0.10	0.10	1.50	0.025	0.010 <sup>2)</sup>	0.015	0.065	0.08	0.100	–	–
perform® 420	0.10	0.10	1.60	0.025	0.010 <sup>2)</sup>	0.015	0.070	0.10	0.100	–	–
perform® 460	0.10	0.10	1.60	0.025	0.010 <sup>2)</sup>	0.015	0.080	0.15	0.100	–	–
perform® 500	0.10	0.10	1.70	0.025	0.006	0.015	0.080	0.15	0.100	–	–
perform® 550	0.10	0.10	1.80	0.025	0.006	0.015	0.080	0.15	0.100	–	–
perform® 600	0.10	0.10	1.90	0.020	0.006	0.015	0.080	0.20	0.200	0.50	0.0050
perform® 650	0.10	0.30	2.00	0.020	0.006	0.015	0.080	0.20	0.200	0.50	0.0050
perform® 700	0.10	0.30	2.00	0.020	0.006	0.015	0.080	0.20	0.200	0.50	0.0050

<sup>1)</sup> By arrangement the grades perform® 300 to 700 can be supplied with category A galvanizing properties based on DIN EN 10149-2 (Si content ≤ 0.03%).

<sup>2)</sup> Ein Schwefel-Gehalt von max. 0,006% kann bei Bestellung vereinbart werden.

<sup>3)</sup> For perform® 300 to 700: The sum of the alloying components Nb, V and Ti must not exceed 0.22%.

## Number of tests

### Wide hot strip

Unless otherwise agreed upon in the order, for the inspection certificate 3.1 to DIN EN 10204 the scope of testing applies in accordance with DIN EN 10149-1 and 2. The notch impact energy is optional. The test temperature,  $-20\text{ °C}$  or  $-40\text{ °C}$ , has to be agreed when ordering.

### Cut-to-length plate

Unless otherwise agreed upon in the order, the tests listed below will be performed during inspection:

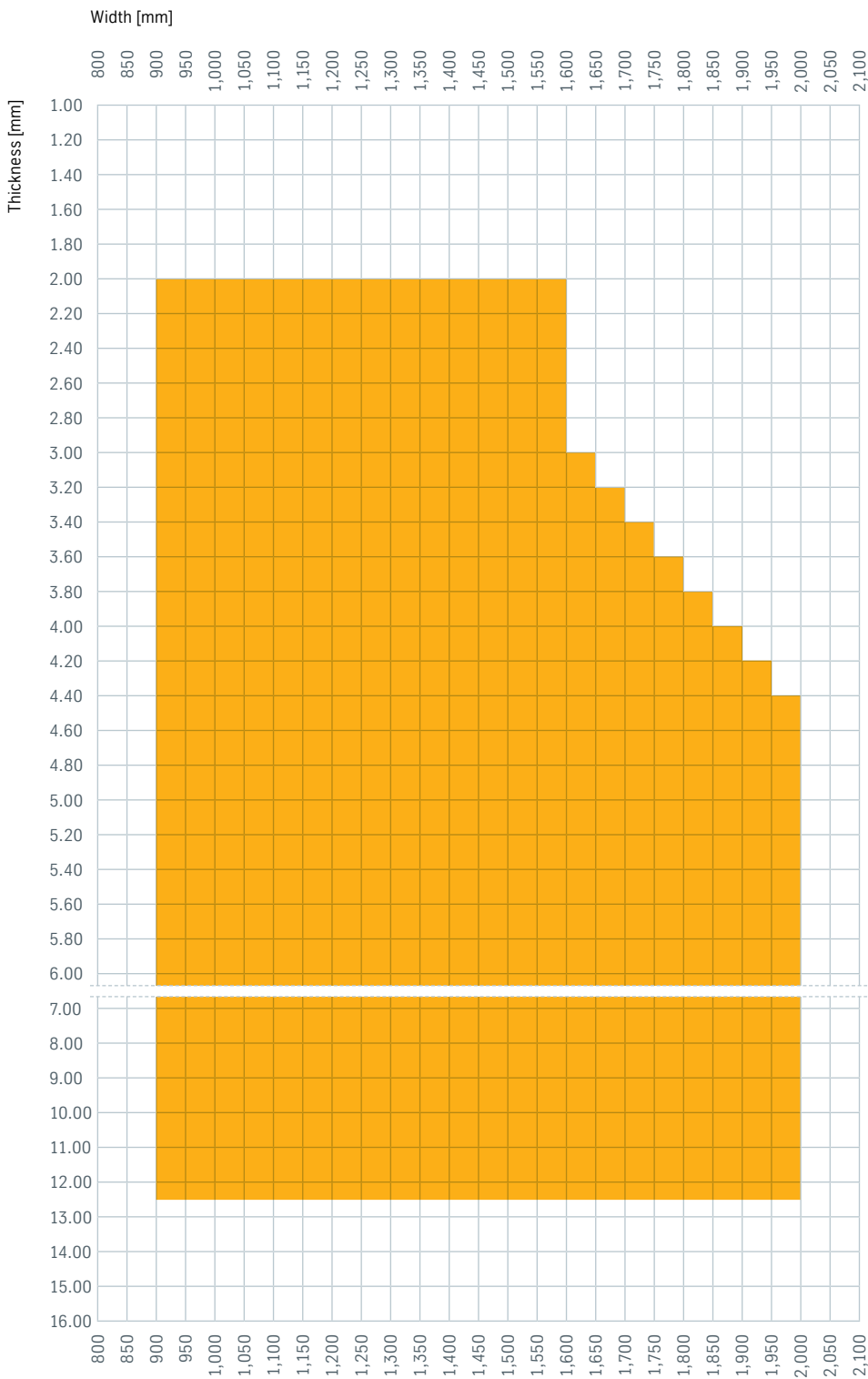
Test	Scope of testing
1 tensile test	1 specimen per 40 t from each heat
1 notched bar impact test <sup>6)</sup>	1 set (3 specimens) per 40 t from each heat
1 bend test	1 specimen per 40 t from each heat

The notched bar impact test will be carried out at a test temperature of  $-20\text{ °C}$  by default. By special arrangement the notched bar impact test can be carried out at a test temperature of  $-40\text{ °C}$ .

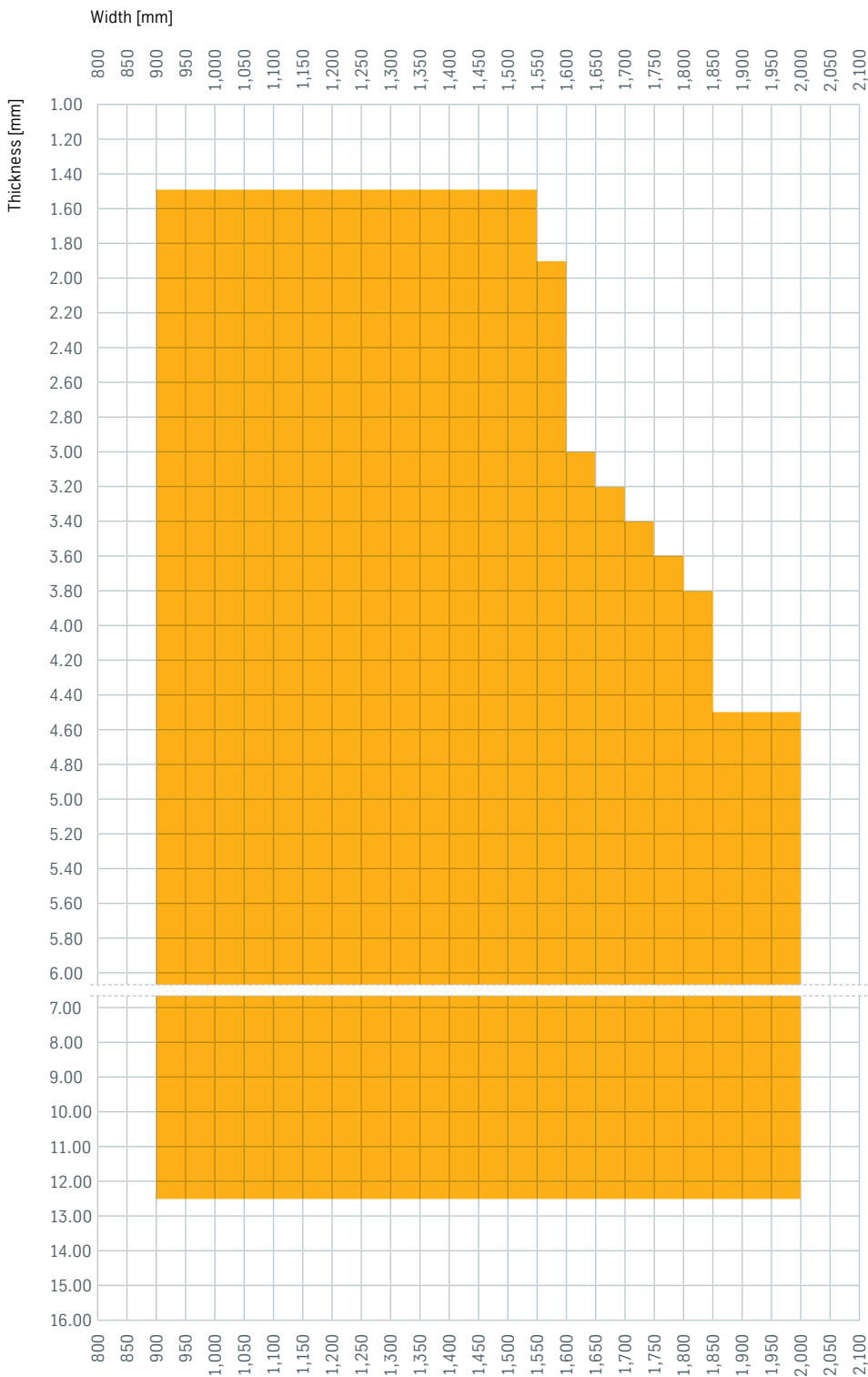
<sup>1)</sup>The notched bar impact tests in accordance to EN ISO 148 are carried out by using longitudinal specimens. The values for the impact energy are minimum values obtained as the average of three specimens, no single value being less than 70% of the value stated in the table. The values apply to plate thicknesses from 10 to 20 mm. For thicknesses below 10 mm the required minimum impact value is reduced proportionally to the specimen width (product thickness). No impact test is performed on products below 6 mm in thickness.

## Available dimensions

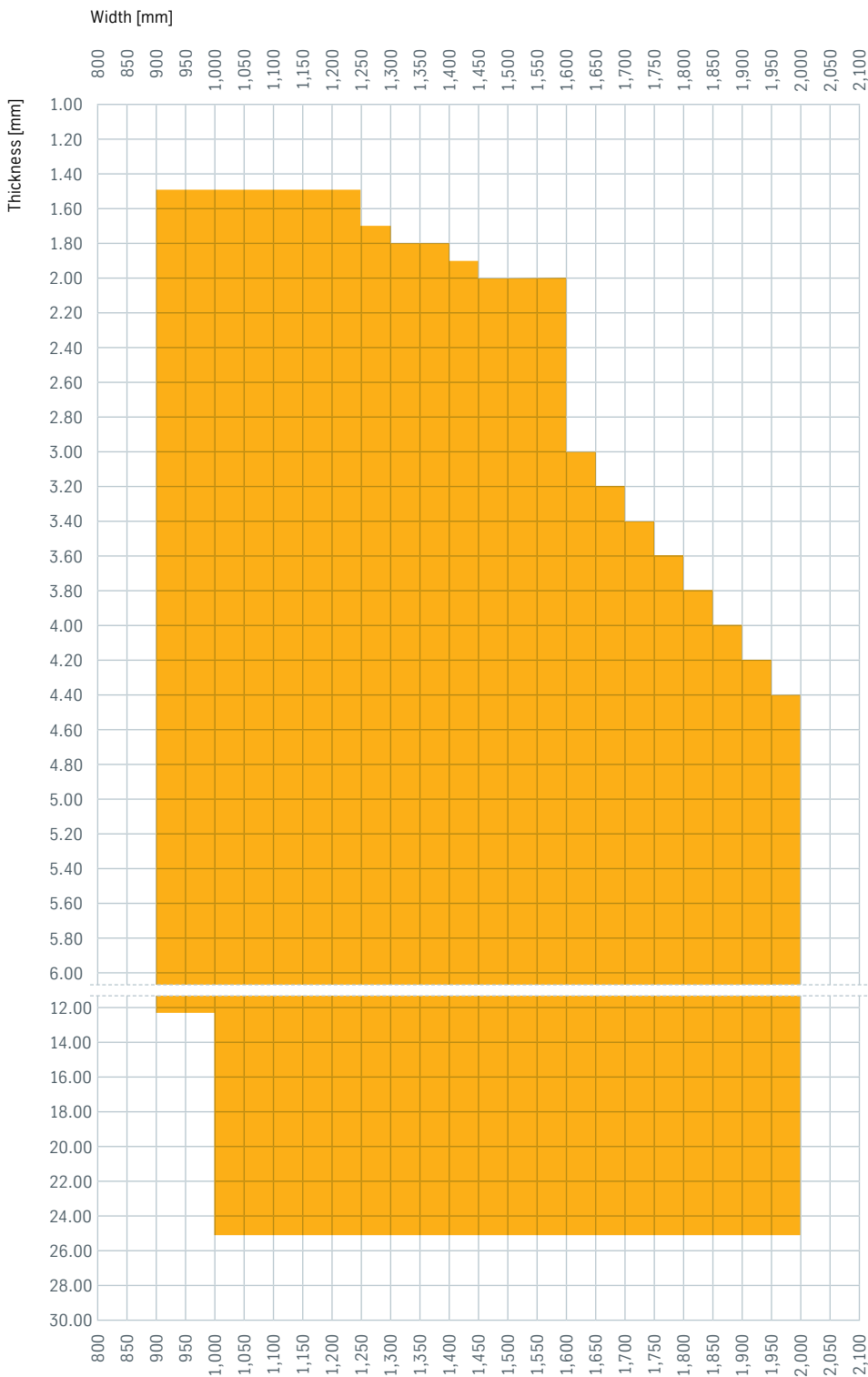
### Wide hot strip perform® 300



Wide hot strip  
perform® 315



Wide hot strip  
perform® 340

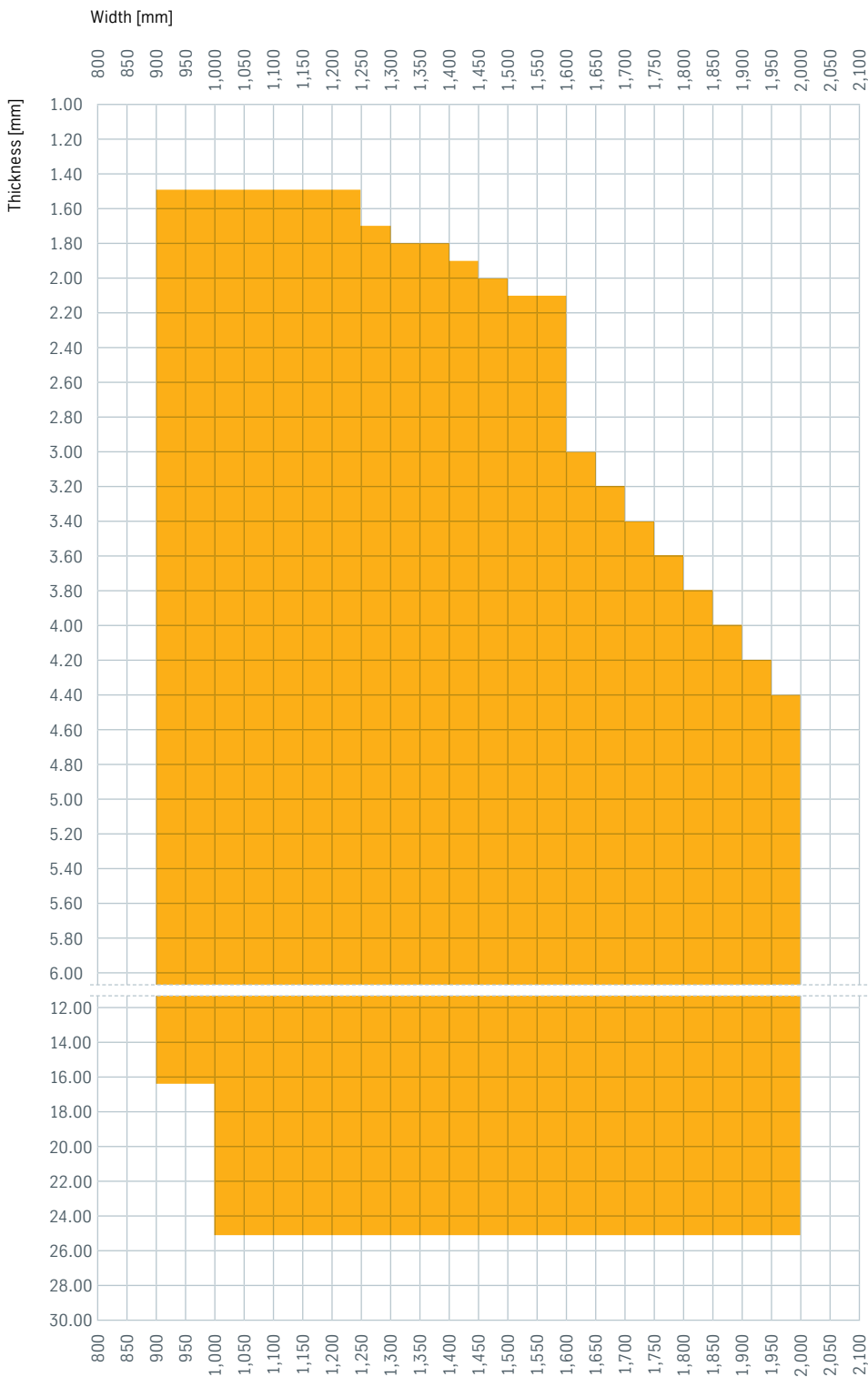


Wide hot strip

Other dimensions on request.

Tolerances to DIN EN 10051 or narrower by arrangement.

Wide hot strip  
perform® 355



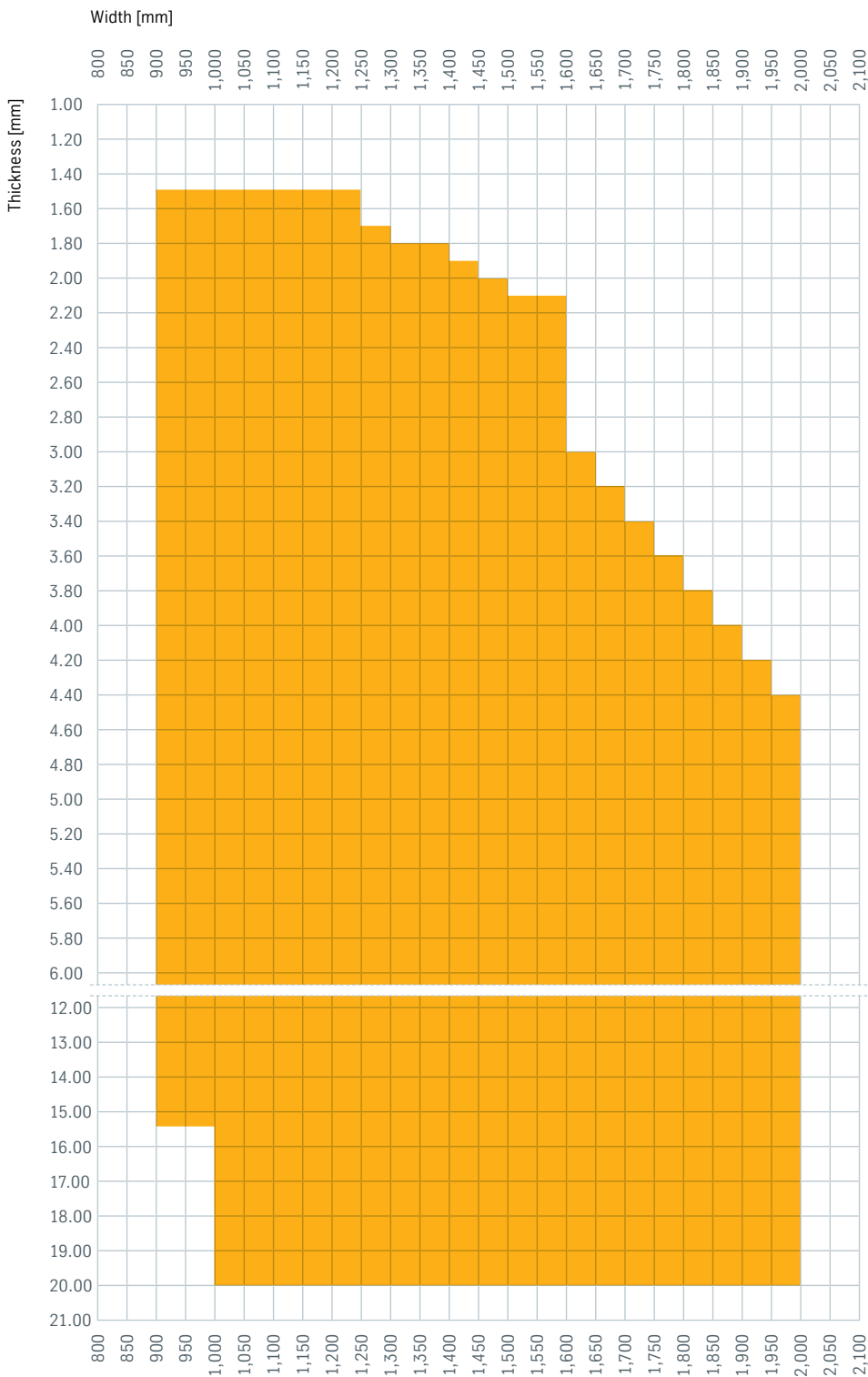
Wide hot strip

Other dimensions on request.

Tolerances to DIN EN 10051 or narrower by arrangement.



Wide hot strip  
perform® 380, perform® 420

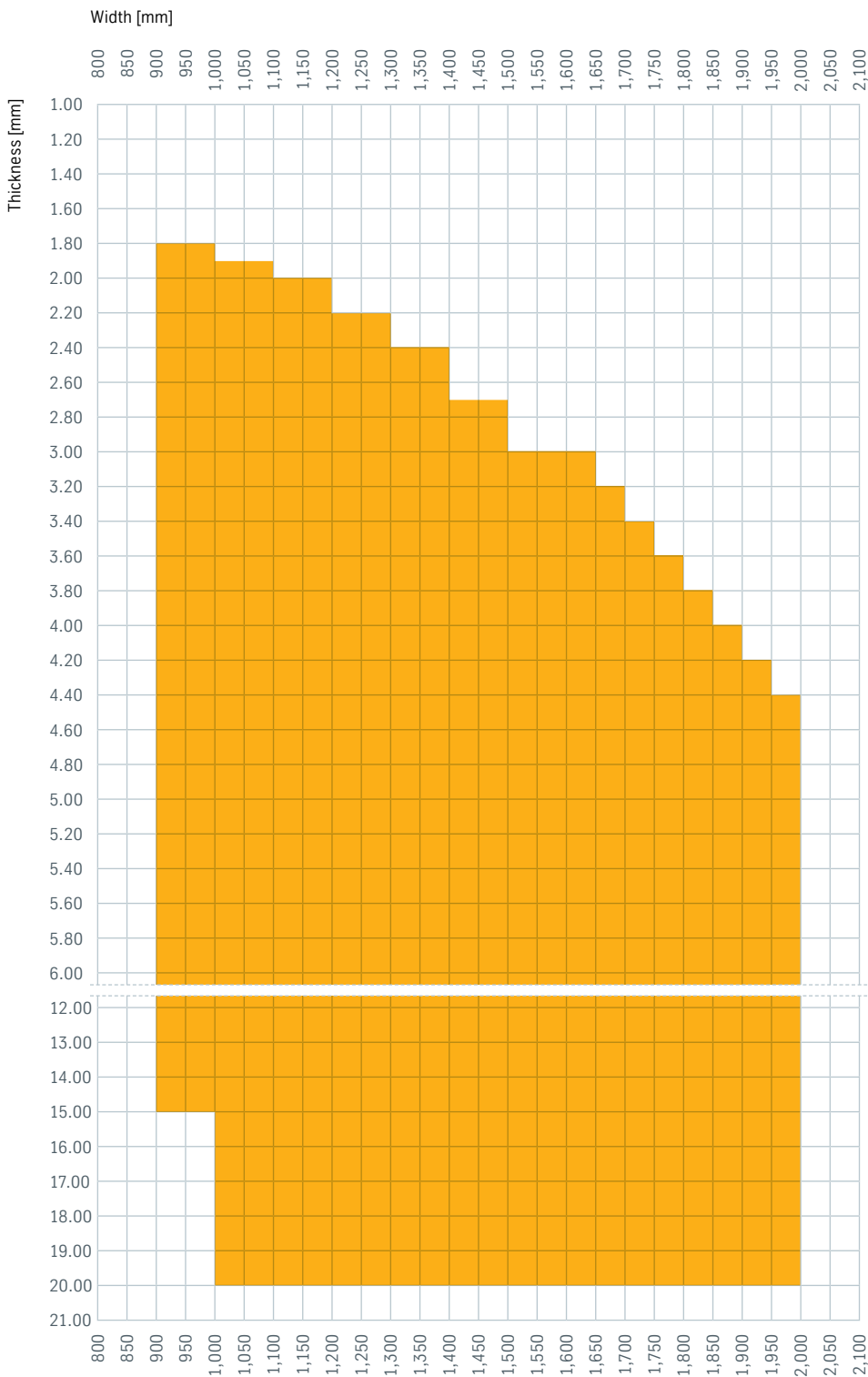


Wide hot strip

Other dimensions on request.

Tolerances to DIN EN 10051 or narrower by arrangement.

Wide hot strip  
perform® 460

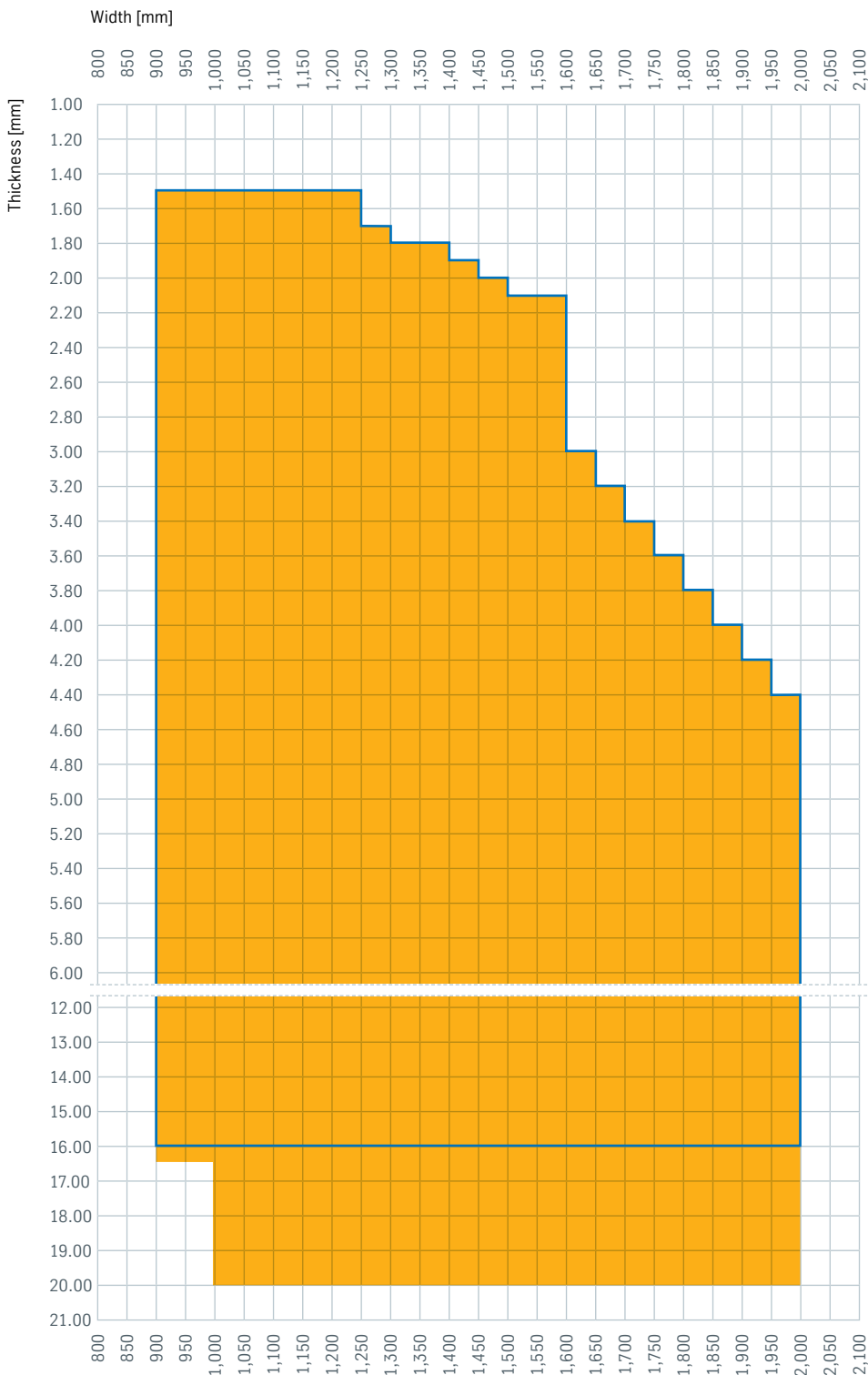


Wide hot strip

Other dimensions on request.

Tolerances to DIN EN 10051 or narrower by arrangement.

Wide hot strip, cut-to-length plate  
perform® 500

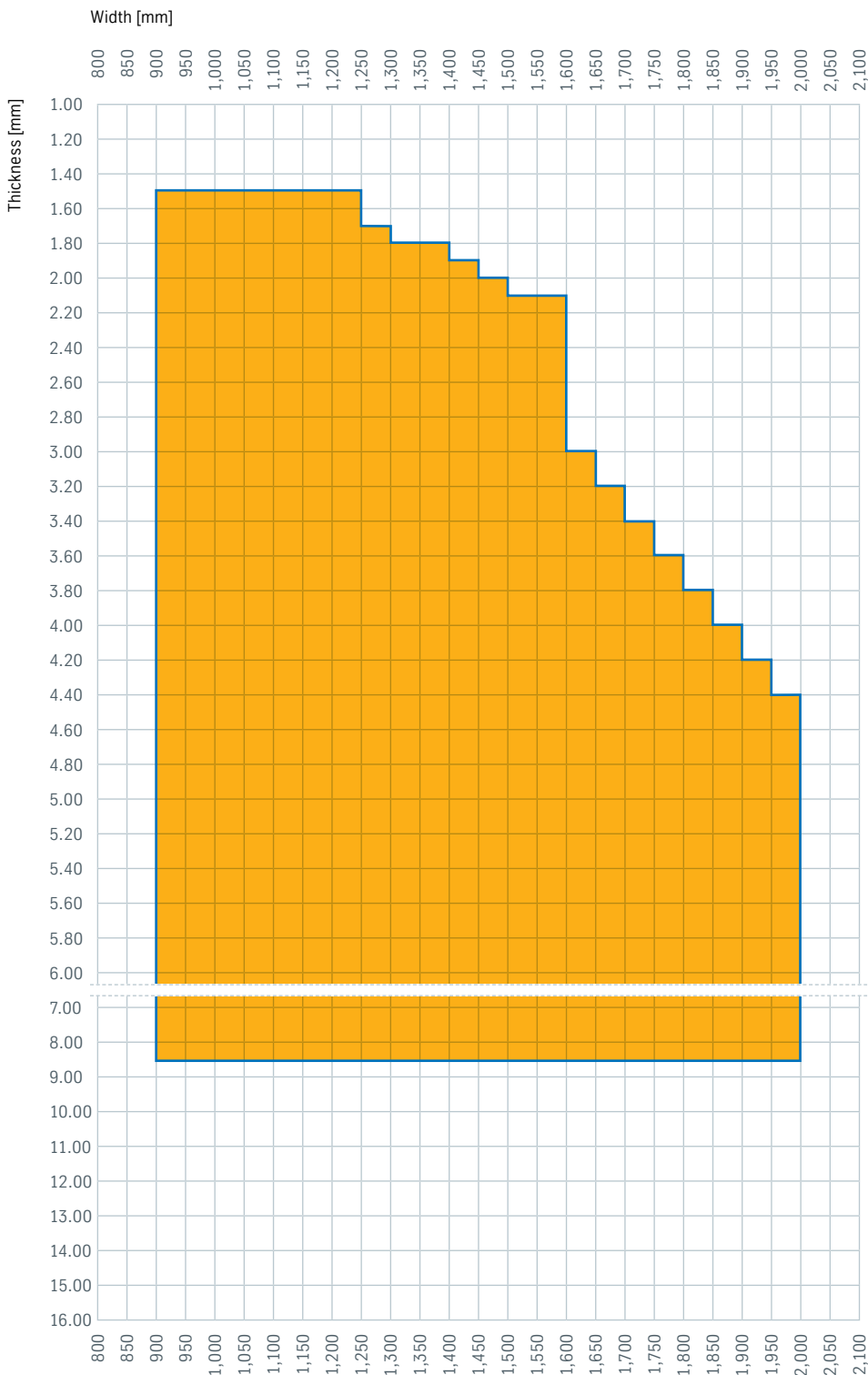


■ Wide hot strip  
▭ Cut-to-length plate  
 Length: 2,000 to 16,000 mm

Other dimensions on request.

Tolerances to DIN EN 10051 or narrower by arrangement. Flatness tolerances for cut-to-length plates according to DIN EN 10029.

Wide hot strip, cut-to-length plate  
perform® 550

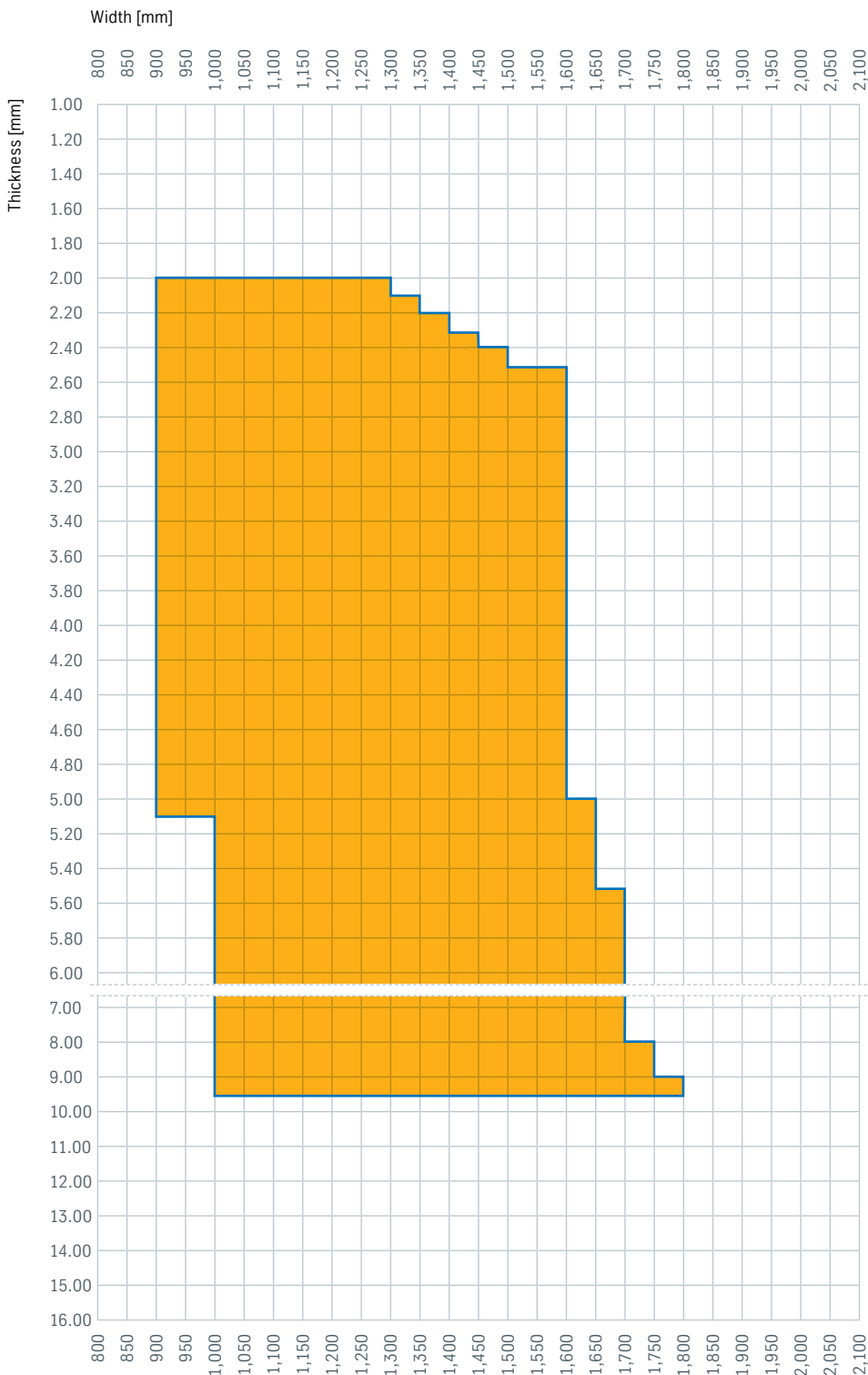


■ Wide hot strip  
□ Cut-to-length plate  
 Length: 2,000 to 16,000 mm

Other dimensions on request.

Tolerances to DIN EN 10051 or narrower by arrangement. Flatness tolerances for cut-to-length plates according to DIN EN 10029.

Wide hot strip, cut-to-length plate  
perform® 600

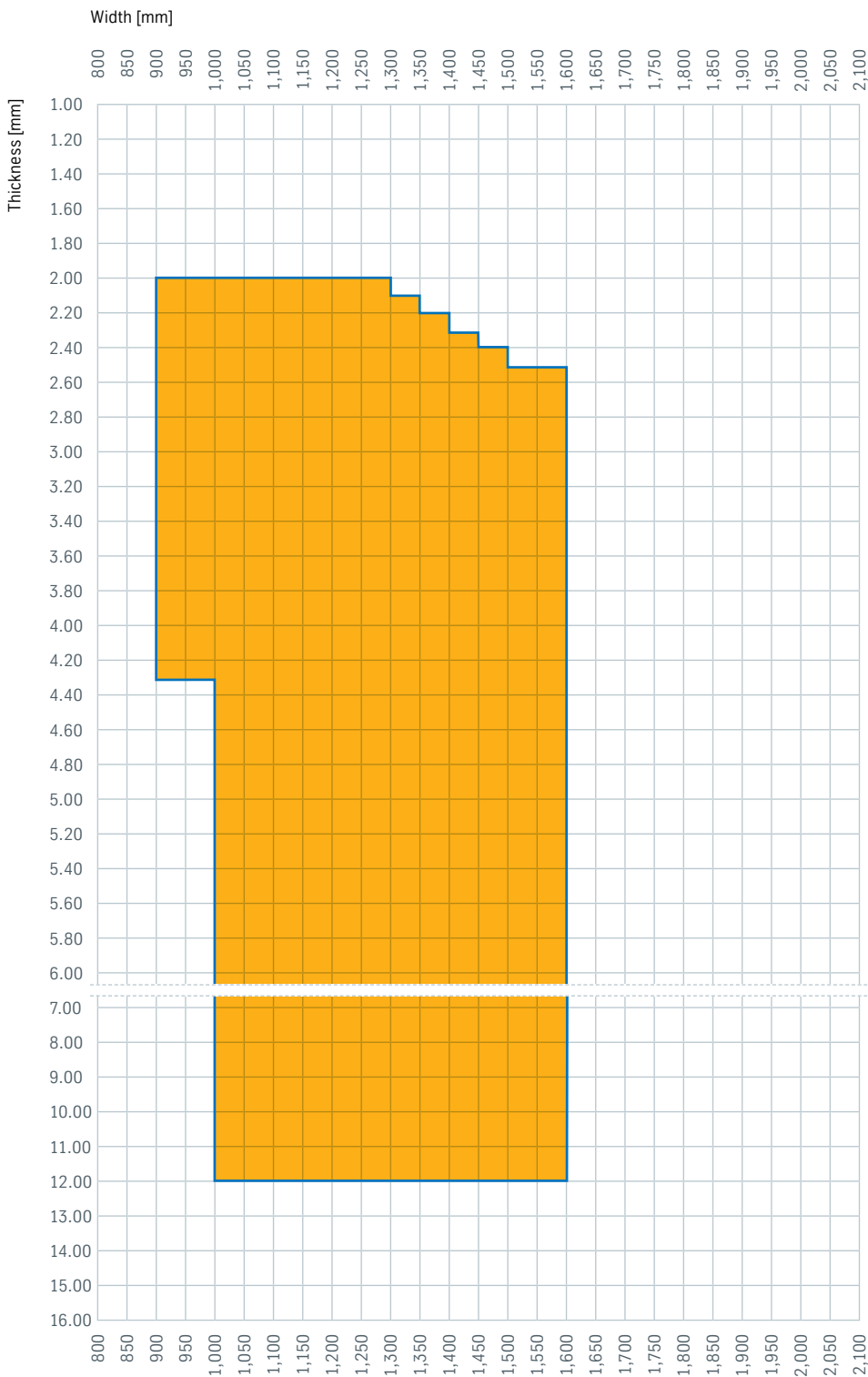


■ Wide hot strip  
□ Cut-to-length plate  
 Length: 2,000 to 16,000 mm

Other dimensions on request.

Tolerances to DIN EN 10051 or narrower by arrangement. Flatness tolerances for cut-to-length plates according to DIN EN 10029.

Wide hot strip, cut-to-length plate  
perform® 650

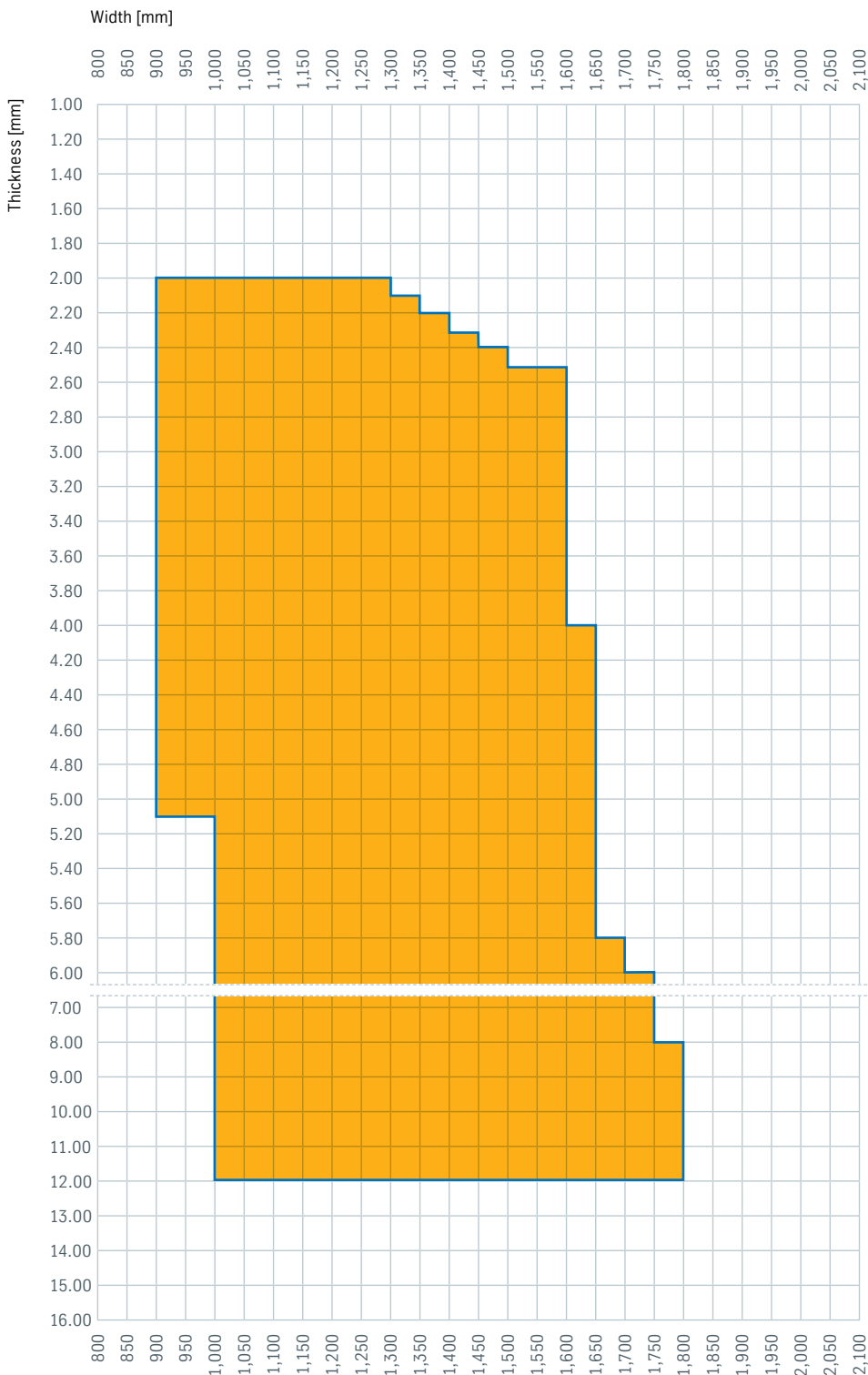


■ Wide hot strip  
□ Cut-to-length plate  
 Length: 2,000 to 16,000 mm

Other dimensions on request.

Tolerances to DIN EN 10051 or narrower by arrangement. Flatness tolerances for cut-to-length plates according to DIN EN 10029.

Wide hot strip, cut-to-length plate  
perform® 700



■ Wide hot strip  
□ Cut-to-length plate  
 Length: 2,000 to 16,000 mm

Other dimensions on request.

Tolerances to DIN EN 10051 or narrower by arrangement. Flatness tolerances for cut-to-length plates according to DIN EN 10029.

## Sample applications



Axle structures and wheel rims in truck manufacturing.



Lifting and working platforms for special-purpose vehicles.

Special mill grades are supplied subject to the special conditions of thyssenkrupp. Other delivery conditions not specified here will be based on the applicable specifications. The specifications used will be those valid on the date of issue of this product information brochure.

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