

OUTO KUMPU



RAP™ 2E
Tornio Works

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RAP5 stainless steel technology



Outokumpu Tornio Works' RAP5 - the integrated cold rolling mill for rolling, annealing and pickling consists of a 3-stand tandem mill, continuous annealing and descaling units. The line utilizes both electrolytic and mixed acid pickling as well as mechanical scale removal. Depending on the customer requirements and applications, the products are made in one or two cycles. Skin pass mill and tension leveling are located at the end of the line and are utilized mainly for the second cycle products.

Surface finish RAP™2E

The surface finish RAP™2E features several outstanding properties, and it has the benefits of high quality hot rolled feedstock material and tandem cold rolled material with a minimum thickness reduction of 25 %. This yields to a unique combination of flatness, thickness accuracy, surface quality, corrosion resistance and mechanical uniformity.

RAP™2E technical properties

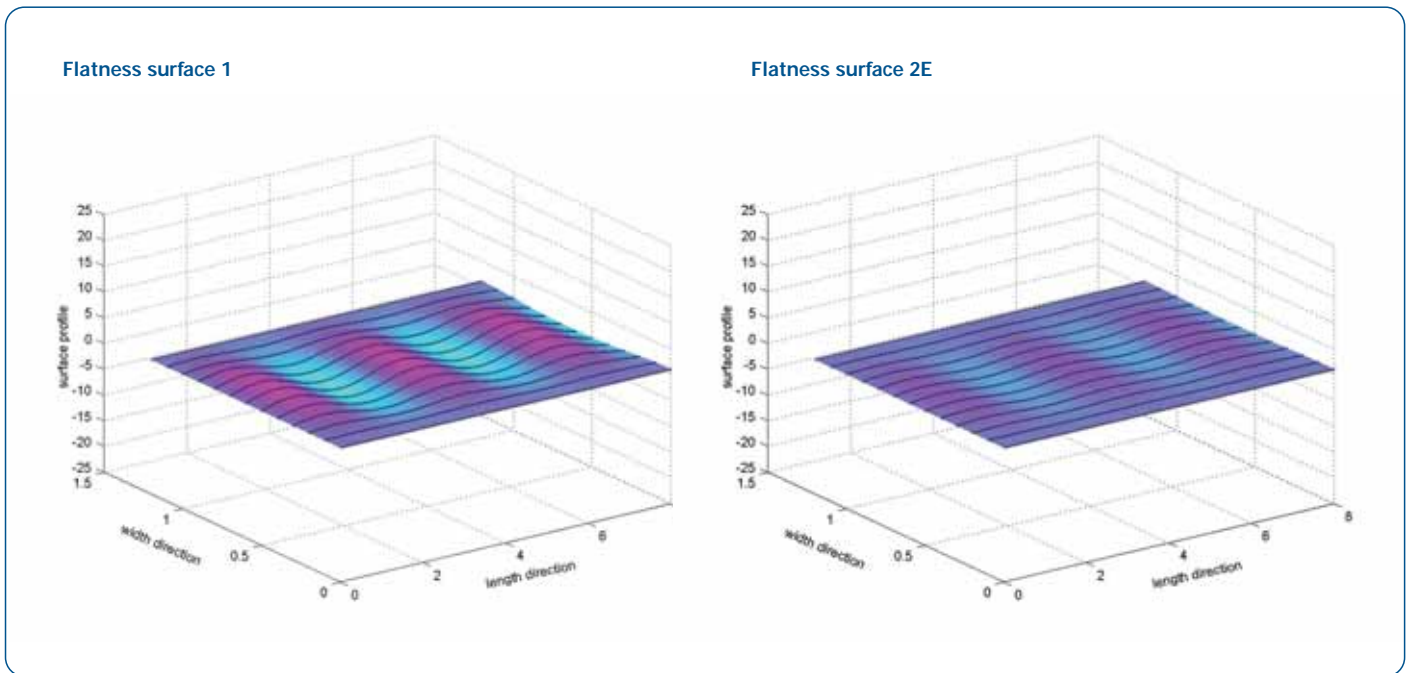


Fig. 2
Proportional flatness comparison between the hot rolled 1D and RAP™2E.

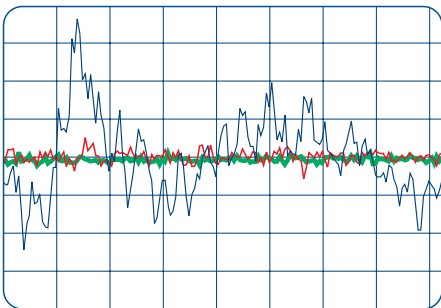


Fig. 1
Typical tolerance graphs in the same scale along the length of coil, gauge 2.40 mm
Red: hot rolled
Green: RAP™2E
Blue: cold rolled

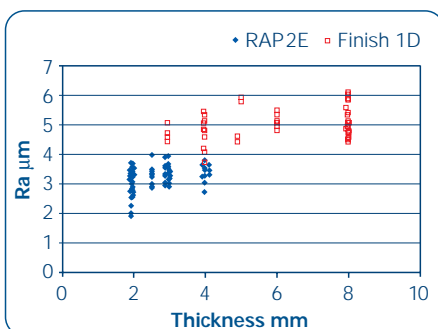


Fig. 3
Comparison of the typical surface roughness values between the surface finishes RAP™2E and 1D.

RAP™2E (2E acc. to EN 10088-2) is produced in the RAP5-line in a streamlined one-cycle process. Based on the unique, high technology and very strictly controlled process, most properties of the RAP™2E correspond to those of the conventional cold rolled materials or even surpass those. This combination of a streamlined process and technical properties makes the surface finish RAP™2E an optimal material especially for the further fabrication and manufacturing of high quality stainless steel products. (Figure 1)

A good flatness and a low level of internal stresses are desired properties whenever stainless steels are a topic. The surface finish RAP™2E provides these properties, and there is a clear benefit when using RAP™2E. (Figure 2)

The guaranteed thickness tolerances are extremely tight, and the dimensional accuracy is close to the cold rolled surface finish 2B. Hence, even the special fine tolerances of the cold rolled materials can be utilized when necessary. (Figure 3)

Surface roughness is crucial in sight of the further processing and visual appearance. Ra-values lie between 2 and 4 µm, which means significantly lower Ra-values compared to the standard hot rolled material. In further processing, this leads to time and cost savings. (Figure 4)

The corrosion resistance and the mechanical properties of the surface finish RAP™2E meet the typical values of the hot rolled finish 1D. Mechanical properties meet the typical values of the surface finish 2B. A low scatter in these values is achieved by using the highly automated and accurate RAP5 process.



RAP™2E availability



Thickness tolerances, RAP™2E

Thickness mm	HR tolerance EN 10051	CR normal tolerance EN 10259	CR special tolerance
1.50-1.99	-	± 0.09 1)	± 0.06 2)
2.00-2.49	-	± 0.10 1)	± 0.06 2)
2.50-2.69	-	± 0.12 1)	± 0.07 2)
2.70-2.99	± 0.26 1)	± 0.12 2)	± 0.07 2)
3.00-3.99	± 0.29 1)	± 0.14 2)	± 0.08 2)
4.00-4.50	± 0.31 1)	± 0.15 2)	± 0.09 2)

Fig. 4 1) As standard 2) On request

RAP™2E is available in most common austenitic stainless steel grades concerning mainly types CrNi and CrNiMo. Gauge range 1,50 to 4,50 mm is available in several product forms, i.e. coils, strips and sheets. The short production chain increases the reliability of deliveries. (Figure 5)

Dimensions, RAP™2E

Grades	CrNi			CrNiMo			Thickness mm	
	Width, mm	1000-1050	1051-1300	1301-1586	1000-1050	1051-1300		1301-1586
		X	X	-	X	-	-	1.50-1.79
		X	X	-	X	X	-	1.80-1.99
		X	X	X	X	X	-	2.00-2.39
		X	X	X	X	X	X	2.40-2.69
		X	X	X	X	X	X	2.70-3.49
		X	X	X	X	X	X	3.50-4.50

Fig. 5



RAP™2E applications



Terästorni Oy



Sampo Rosenlew Oy



Stalatube Oy

RAP™2E is a perfect material for process industry, especially when the cold rolled surface finish 2B is not necessarily required. Due to the excellent properties, RAP™2E is an easy material to weld, form and assemble as well as grind and polish. The main applications for the RAP™2E include process tube manufacturing. The popularity in that field originates from the product properties and from the wide variety of approvals including Pressure Equipment Directive PED, AD 2000-W0, Zulassung Nr. Z-30 3-6 and Bauregelliste A Teil 1. European standard for welded stainless steel tubes for pressure purposes classifies the tubes produced from the finish 2E to the same delivery condition category W2 as the cold rolled finishes 2B and 2D.

Applications in the field of construction and process industry include e.g. constructional tubes, tanks, panels, and process equipment. (Figure 6, Inner stainless steel lining of pulp tower, Figure 7, Industrial cleaner, Figure 8, Structural hollow sections).

The wide variety of new applications in building and construction e.g. exterior covering of concrete pillars and fasteners are seen potential. Additionally, in the transportation industry, new possibilities are seen on several areas like in the manufacturing of various vessels and containers. Automotive industry is one field of application, RAP™2E has awakened increasing interest due to its excellent performance.

Outokumpu is an international stainless steel company. Our vision is to be the undisputed number one in stainless, with success based on operational excellence. Customers in a wide range of industries use our metal products, technologies and services worldwide. We are dedicated to helping our customers gain competitive advantage. We call this promise the Outokumpu factor.

**OUTO
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