

Ruukki Laser structural steel



Ruukki Laser™ workshop-friendly structural steels are easy to cut, weld and bend, offering high performance in automated production processes.

Shorter set-up and cutting times and reduced finishing operations on finished components are definite benefits for workshops.

Uniform steel quality ensures uninterrupted production and high quality fabrication properties.

Applications:

- Casings
- Machinery components
- Dimensionally accurate, ready-for-assembly components
- Flangeable components

Dimensions

Product shapes

- Cut lengths in as-rolled or pickled condition.
- Heavy plates in as-rolled and shop-primed condition.
- Coils and slit strip by separate agreement.

Cut lengths with mill edges

Steel grade	Thickness mm	Width mm	Length m
Ruukki Laser 250 C	2 - 15	1000 - 1860	2 - 12
Ruukki Laser 355 MC	2 - 15	1000 - 1860	2 - 12
Ruukki Laser 420 MC	2 - 13	1000 - 1860	2 - 12

Maximum width of each steel grade depends on the thickness.

Heavy plates

Steel grade	Thickness mm	Width mm	Length m
Ruukki Laser 250 C	10-30	1901 - 3300	2 - 15
Ruukki Laser 355 MC	10-30	1901 - 3300	2 - 15
Ruukki Laser 420 MC	10-25	1901 - 3300	2 - 15

Maximum width of each steel grade depends on the thickness.

More detailed information on dimensions is provided in the following technical brochures:

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Tolerances

Tolerances on dimensions and shapes

- Cut lengths: thickness, width and length better than EN 10051. The tolerance guarantee on flatness is 3 mm/metre.
- Ruukki Laser cut lengths are delivered with the Dead Flat guarantee.
- Heavy plates: thickness, width and length: EN 10029. The tolerance guarantee on flatness is 3 mm/metre.

Surface quality

Steel surface quality guarantees high quality laser cutting. The surface scale is thin, adhesive and even, resulting from the choice of alloying materials and optimisation of the manufacturing process. The surface quality of heavy plates meets EN 10163-2.

Cut lengths are delivered in as-rolled condition or pickled condition.

Plates are delivered in as-rolled or shop-primed condition.

Properties

Materials testing

Mechanical testing and sampling are mainly carried out in accordance with EN 10149-2 or EN 10025.

Ruukki Laser 250 C cut lengths comply with the requirements for S235J2C structural steel EN 10025-2:2004. Ruukki Laser 250 C heavy plates comply with the requirements for S235JRC structural steel EN 10025- 2:2004.

The standard steel grades S355MC and S420MC EN 10149 are the reference steels of Ruukki Laser 355 MC and Ruukki Laser 420 MC, respectively. By an exception of the standard requirements, the tensile test of heavy plates is carried out transverse to the rolling direction.

Mechanical properties

	Thickness mm		Yield strength			Impact strength		
			R_{eH} N/mm ²	Minimum Tensile strength R_m MPa	Elongation $A_5\%$	Minimum	Longitudinal minimum	
	Cut length	Heavy plate		Cut length	Heavy plate		t °C	Charpy V J
Ruukki Laser 250 C	2 - (3)		240	360-460		23 ¹⁾	-40	40
Ruukki Laser 250 C	3 - 8		240	360-460		30	-40	40
Ruukki Laser 250 C	(8) - 15		240	360-460		30	-20	40
Ruukki Laser 250 C		10 - 30	240		360-460	29	+20	27
Ruukki Laser 355 MC	2 - 15	10 - 30	355	430-530	430-530	24 ²⁾	-20	40
Ruukki Laser 420 MC	2 - 13	10 - 25	420	490-590	490-590	21 ³⁾	-20	40

Impact strength is tested by the Charpy V impact test in accordance with standard EN 10045-1. The requirement values 40 J and 27 J mean tests carried out with 10 x 10 longitudinal standard test pieces. When testing thicknesses less than 10 mm, the width of the test pieces corresponds with the strip thickness and the requirement values decrease in direct relation to the surface area of the test piece. No impact tests are carried out for thicknesses less than 6 mm.

¹⁾ Elongation is guaranteed as A_{80} value $\geq 23\%$ for thicknesses 2 – (3) mm.

²⁾ Elongation is guaranteed as A_{80} value $\geq 19\%$ for thicknesses 2 – (3) mm.

³⁾ Elongation is guaranteed as A_{80} value $\geq 17\%$ for thicknesses 2 – (3) mm.

Chemical composition

Steel grade	Content % (ladle analysis)					
	C Maximum	Si Maximum	Mn Maximum	P Maximum	S Maximum	Al Minimum
Ruukki Laser 250 C	0.12	0.03	1.20	0.020	0.020	0.015
Ruukki Laser 355 MC	0.12	0.03	1.50	0.020	0.015	0.015
Ruukki Laser 420 MC	0.12	0.03	1.60	0.020	0.015	0.015

In addition, niobium (Nb), vanadium (V), titanium (Ti) and/or boron (B) may be used as an alloying element either singly or in combination.

Carbon equivalent (CEV)

$$CEV = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$$

Steel grade	CEV maximum	
	Cut length	Heavy plate
Ruukki Laser 250 C	0.24	0.30
Ruukki Laser 355 MC	0.24	0.34
Ruukki Laser 420 MC	0.28	0.38

Prefabrication services

Wide flats from plate and strip

Wide flats from plate and strip are dimensionally accurate and ready for assembly. Wide flats speed up the manufacture of steel structures and avoid wasting of material.

Flat cut shapes

Flat cut shapes will decrease the throughput time of installation. The customer will receive the components ready for installation. So, unnecessary material and storing costs can be avoided. If ordered, the products are delivered as shop-primed, bevelled and bent.

Bevelling

Precision cut lengths and precision cut plates with a bevelled edge are components that can be delivered directly to the installation site, which saves time and reduces transport and storage costs. The dimensionally accurate groove ensures uninterrupted automated welding and fitting.

Bent plate products

Bent plate products are components that are ready to be delivered to the installation site, which is beneficial in terms of schedule as well as transport and storing costs. If needed, the products can be ordered as shop-primed, furnished with welding bevels, and cut to shape. Premarked matchmarks facilitate installation.

Processing instructions

Laser cutting

Ruukki Laser steels can be cut up to 20% faster than ordinary steels. The full capacity of equipment can be utilised during cutting. The uniform quality of these steels means cutting parameters can be maintained from one batch and delivery to another, ensuring stable operations and uniform cutting results. The cutting result is clean and burr-free. Cut products have a good appearance, are dimensionally accurate and can be easily separated from the plate blank. Ruukki Laser grades can also be perfectly cut by plasma or normal flame cutting or mechanical cutting.

Forming

Formability is excellent. Exact dimensions improve the repeatability of bending. The bending angle remains exact because of low residual stresses and uniformity of spring back. Good workshop practices are required in successful forming. Worn tools, scratches on the steel surface and edge burrs all reduce forming quality.

Cut lengths. Minimum permissible bending radius, bending angle $\leq 90^\circ$

Thickness mm	2 - 2.5	(2.5) - 3	(3) - 4	(4) - 5	(5) - 6	(6) - 7	(7) - 8	(8) - 10	(10) - 12	(12) - 14	(14) - 15
Smallest allowable inside bending radius mm:											
Ruukki Laser 250 C	1.5	1.5	2.0	2.5	3.0	5.0	5.5	7.0	8.5	10.0	11.5
Ruukki Laser 355 MC	0.5	0.7	1.0	1.5	2.0	3.5	4.0	5.0	6.0	7.0	8.0
Ruukki Laser 420 MC	1.2	1.5	2.0	2.5	3.0	5.5	6.5	8.0	9.5	11.0	–

No limitations on bending direction.

Heavy plates. Minimum permissible bending radius, bending angle $\leq 90^\circ$

Thickness mm	10 - 12	(12) - 14	(14) - 16	(16) - 18	(18) - 20	(20) - 25	(25) - 30
Smallest allowable inside bending radius mm:							
Ruukki Laser 250 C	12	14	16	18	20	25	30
Ruukki Laser 355 MC	9.5	11.5	13	14.5	16	-	-
Ruukki Laser 420 MC	12	14	16	18	20	-	-

No limitations on bending direction.

Welding

Weldability using all welding methods is excellent. A wide range of heat input can be used. There is no need to use an elevated working temperature under normal workshop conditions. The use of low hydrogen welding consumables and welding methods is recommended.

Heat treatment

Ruukki Laser 355/420 MC steels can be stress relieved at temperatures of 530–580 °C. Heat treating the steel to temperatures higher than 580 °C may reduce the strength of these steel grades. Ruukki Laser 250 C may be heat treated according to EN 10025-2.

Steel grade	Temperature °C	Treatment time and cooling manner
Ruukki Laser 355 MC and	530 – 580	2 minutes / millimetre thickness, minimum 30 minutes.
Ruukki Laser 420 MC	(target 560)	Slow cooling in the furnace.

Ruukki Laser 250 C may be heat treated according to EN 10025-2.

Hot-dip galvanising

The hot-dip galvanising properties are good due to the low silicon and phosphorus content.

Order & delivery

Delivery condition

The Ruukki Laser 250 C steel grade is supplied in hot rolled (as rolled) condition. The symbol “C” in the designation stands for guaranteed flangeability.

The delivery condition of Ruukki Laser 355 MC and Ruukki Laser 420 MC is thermomechanical rolled (symbol “M”). The symbol “C” in the designation stands for guaranteed flangeability.

Inspection document

EN 10204:2004 Inspection certificate 3.1..

Delivery information

Cut lengths are marked with black ink and heavy plates with white paint. Die stamps are used only upon special request by the customer, because die stamping may impair laser cutting and bending. Markings on Ruukki Laser steels are minimised; cut lengths can even be delivered without markings. Cut lengths can be supplied pickled and oiled according to the production programme. Packing ensures the product reaches the customer in the desired condition. Packing also offers protection for temporary storage.

General delivery information can be found from documents *Markings and packing*, *Ultra-sonic testing* and *General terms of sale*.

- Our sales and technical support are happy to give you more information. Visit www.ruukki.com/contact-us.

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