

STEEL GUIDE

Hot-rolled steel products

January 2000

RAEX AR 400 and RAEX AR 500 are wear-resistant steels for applications calling for high resistance to wear. The milder steel grade, RAEX AR 400, is flangeable and more suitable for machining. RAEX AR 500 is harder and therefore better against abrasive wear.

RAEX AR steels are excellent material for welded structures exposed to conditions such as abrasive wear caused by coarse soil or rock material, high surface pressures or strain caused by rolling contact.

RAEX AR steels are also suitable for structures for burglary prevention.

RAEX AR 400 is particularly suitable for structures such as the edges of excavator blades and bucket components manufactured by bending.

RAEX AR 500 is most suitable for wearing pads and for unbent parts exposed to the highest degree of wear.

CHEMICAL COMPOSITION

Steel grade	Plate thickness		Typical composition %, maximum									
	mm		C	Mn	Si	Cr	Ni	P	S	B	Al	Mo
	Strip	Plate										
RAEX AR 400	3-12	12-30	0,20	1,70	0,70	1,00	0,40	0,030	0,015	0,004	0,050	-
		>30-60	0,24	1,70	0,70	1,00	0,70	0,030	0,015	0,004	0,050	0,500
RAEX AR 500	5-16	12-60	0,30	1,70	0,70	0,80	0,80	0,030	0,015	0,004	0,050	0,500

In addition, aluminium (Al) and/or titanium (Ti) is used for binding nitrogen (N).

MECHANICAL PROPERTIES

Steel grade	Mechanical properties at room temperature								
	Plate thickness		Yield strength R _{0,2}	Tensile strength R _m	Elongation A ₅	Hardness HB	Impact strength		
	mm						R _{0,2} N/mm ²	R _m N/mm ²	A ₅ %
	Strip	Plate							
RAEX AR 400	3-12	-	1000	1250	10	360-420	-40	30	
		-	12-30	1000	1250	10	380-450	-40	20
		-	>30-60	1100	1400	8	380-480	-40	20
RAEX AR 500	5-16	12-60	1250	1600	8	450-530	-30	20	

The values in the table are typical rates. The maximum plate size is 1500mm x 6000mm; for plates under 5mm thickness, flatness is not guaranteed and they are manufactured by special agreement only.

BENDING

RAEX AR 400 steel is flangeable. If required, flangeability can be improved by raising the working temperature to ca 200°C.

Limiting values for bending

Steel grade	Plate thickness mm	Free bending <90°				Bending to 90° in V-channel
		Plunger radius/plate thickness R/t		Width of clear opening/plate thickness W/t		
		Bend line position v. rolling direction		Bend line position v. rolling direction		W/t
		Transversal	Longitudinal	Transversal	Longitudinal	
RAEX AR 400	<6	2,5	3,0	8,5	10,0	15
RAEX AR 400	6–20	3,0	4,0	10,0	10,0	15
RAEX AR 500	5–20	10,0	12,0	12,0	14,0	–

FLAME CUTTING

Any flame cutting of plates over 40 mm in thickness is recommended to be carried out at an elevated working temperature of approximately 80°C.

The working temperature should not be raised to exceed 200°C.

WELDING

Welding instructions for RAEX AR steels are the same as for other high strength steels. The use of elevated working temperature is recommended for combined plate thicknesses of over 40 mm. A pre-heating temperature below 100°C is usually sufficient. In heavy-gauge plates, the cold cracking of the weld can be avoided even under exacting conditions through pre-heating to approx. 150°C.

If the welds can be positioned so that they are not exposed to hard wear or loads, common non-alloy filler materials can be used. The use of alloyed filler material is necessary when the weld is exposed to hard wear or when a weld of equal strength as the parent metal is required. When alloyed filler material is used, the need for preheating is greater than with non-alloy filler materials.

With great material thicknesses, double-sided rivet welded joints are recommended. It is also recommended that the welding be carried out continuously without letting the workpiece get cold during the process.

MACHINING

RAEX AR steels can be successfully machined with heavy-duty machines and hard metal tools; with tools of high speed steel, given proper tool geometry and using a suitable cutting fluid, it is even possible to drill holes.

HEAT-TREATMENT

The micro structure of RAEX AR steel being martensitic, its mechanical properties change during heat treatment. Stress relief at 400°C...450°C reduces both strength and hardness by 25%...30%, but increases ductility significantly. Stress relief at 650°C restores the mechanical properties of RAEX AR steels close to those of structural steels thus rendering them unfit for use as wear-resistant material.

INSPECTION DOCUMENT

A Standard EN 10204-2-2 test report is issued upon request. The test report verifies the chemical composition of the product in the hot rolled condition but not the results of mechanical tests. As an annex, the test report includes a statement of the hardness of hardened plate.