

For welding steel such as:

Outokumpu	EN	ASTM	SS*	BS*	NF*
353 MA®	1.4845	S35315	-	-	-

\* Obsolete national standards, replaced by EN 10088.

### CHARACTERISTICS

AVESTA 353 MA is designed for welding Outokumpu 353 MA, which is the highest alloyed steel with the best high temperature properties in Outokumpu Stainless' family of MA-steels. 353 MA's chemical composition is balanced to give optimal properties at temperatures above 1000°C. The steel, as well as the weld metal, has superior resistance to carbon and nitrogen pick-up at elevated temperatures. This is, among other things, achieved with an addition of rare earth metals (REM).

Due to the fully austenitic structure, the weld metals is somewhat more sensitive to hot cracking than for example 253 MA.

### WELDING DIRECTIONS

Welding is performed using direct current negative polarity (DC-). Welding can also be performed using pulsed current, which can be advantageous when welding in positions and for the welding of thin gauges.

253 MA has a tendency of getting a thick oxide layer during hot rolling and welding. Black plates as well as previous weld beads should be carefully brushed or ground prior to welding.

The joint should be prepared with a sufficient root gap to ensure full penetration. The fully austenitic structure makes the weld metal somewhat susceptible to hot cracking. High welding currents and big weld pools should be avoided. The heat input should be maximised to 25.4 kJ/in (1.0 kJ/mm) and the material should be allowed to cool to below 212°F (100°C) between successive passes.

### WELDING DATA

Ø (inch)	Ø (mm)	Current (A)	Voltage (V)
1/16"	1.60	80-110	10-12
3/32"	2.40	130-160	16-18
1/8"	3.20	160-200	17-19

For further recommendations, please contact Avesta Welding.

### Shielding gas recommendations

The most frequently used shielding gas is pure argon (Ar) with a gas flow of 12-17 ft<sup>3</sup>/hour (6-8 l/min).

Addition of about 30% helium (He) or 1-5% hydrogen (H<sub>2</sub>) will increase the energy of the arc. This will give a wider weld and better fluidity of the melt pool. It is also advantageous because the welding speed can generally be increased why these kind of shielding gases are often used in automatic welding.

### Standard designations

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### Chemical composition – Typical values, %

C	0.05	Ni	35.0
Si	0.8	N	0.15
Mn	1.6	Others	REM
Cr	27.5		
Ferrite: 0 FN			

### Mechanical properties – Typical values, IIW

	Typ. values	
Yield strength, R <sub>p0.2</sub>	420 N/mm <sup>2</sup>	61 ksi
Tensile strength, R <sub>m</sub>	640 N/mm <sup>2</sup>	93 ksi
Elongation, A <sub>5</sub>	37 %	37 %
Hardness	200 Brinell	

**Interpass temperature:** Max. 212°F (100°C)

**Heat input:** Max. 25.4 kJ/in (1.0 kJ/mm)

**Heat treatment:** Generally none.

**Structure:** Fully austenitic.

**Scaling temperature:** Approx. 2147°F (1175°C) (air).

**Corrosion resistance:** Superior properties for constructions running at service temperatures above 1832°F (1000°C). Not intended for applications exposed to wet corrosion.

**Approvals:** -