

For welding steel such as:

Outokumpu	EN	ASTM	SS*	BS*	NF*
SAF 2304®	1.4362	S32304	2327	–	Z3 CN 23-04 Az

* Obsolete national standards, replaced by EN 10088.

CHARACTERISTICS

AVESTA 2304 is primarily designed for welding the duplex steel Outokumpu 2304 (UNS S32304) and similar grades.

AVESTA 2304 has a balanced chemical composition producing a ferritic-austenitic weldment that combines many of the good properties of both ferritic and austenitic stainless steels. The duplex microstructure offers high tensile strength and hereby also good resistance to stress corrosion cracking.

AVESTA 2304 is “over alloyed” with respect to Nickel to ensure the right ferrite balance in the weld metal.

AVESTA 2304 has a low content of molybdenum, which makes it well suited for nitric acid environments.

WELDING DIRECTIONS

The weldability of 2304 is excellent. However, duplex steel is somewhat more difficult to weld compared to austenitic steels such as 316L, mainly with respect to fluidity and penetration into the parent metals.

To utilise the good properties of a duplex steel it is of utmost importance to obtain a good ferrite content in the weld. This is best achieved by welding with sufficient root gap of 0.08-0.1” (2–2.5 mm), by using the right amount of filler metal and by welding with a controlled heat input.

Welding without filler metal (TIG-dressing) is not advisable, as the ferrite content will increase drastically, which will have a negative effect on both mechanical and corrosion properties.

WELDING DATA

Ø (inch)	Ø (mm)	Current (A)	Voltage (V)
0.045”	1.20	60– 80	9–11
3/32”	2.40	130–180	16–19
1/8”	3.20	160–220	17–20

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 ft³/hour (6–8 l/min).

Addition of up to 2% nitrogen (N₂) is advantageous and will affect the mechanical as well as the corrosion properties in a positive way.

Addition of about 30% helium (He) will increased the energy of the arc. This will produce a wider weld and a better fluidity of the melt pool and is often used in automatic welding.

Welding tubes, pipes etc often requires a purging gas protection. Common purging gases are pure Ar, Ar+2%N₂ and Formier gas (90%N₂+10%H₂), with a flow of 20-42 ft³/hour (10–20 l/min).

Standard designations

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Chemical composition - Typical values, %

C	0.02	Ni	7.0
Si	0.4	Mo	<0.3
Mn	0.5	N	0.14
Cr	23.0		

Ferrite: 40 FN WRC-92

Mechanical properties – Typical values, IIW

	Typ. values	Typ. values
Yield strength, R _{p0.2}	460 N/mm ²	68 ksi
Tensile strength, R _m	640 N/mm ²	93 ksi
Elongation, A ₅	25 %	25 %
Impact strength, KV	+20°C	160 J
	–20°C	120 J
		118 ft·lb
		88 ft·lb

Interpass temperature: Max. 300°F (150°C)

Heat input: 12.7-63.5 kJ/in (0.5–2..5 kJ/mm)

Heat treatment: Generally none. If requested; quench annealing at 2012-2100°F (1100–1150°C.)

Structure: Austenite with 45–55 % ferrite.

Scaling temperature: Approx. 1562°F (850°C) (air).

Corrosion resistance: Very good resistance to pitting and stress corrosion cracking in nitric acid environments.

Approvals: TÜV