

For welding steel such as:

Outokumpu	EN	ASTM	SS*	BS*	NF*
SAF 2205®	1.4462	S32205	2377	318S13	Z3 CND 22-05 Az

* Obsolete national standards, replaced by EN 10088.

CHARACTERISTICS

AVESTA 2209 primarily designed for welding the duplex grade Outokumpu 2205 and similar steel grades.

AVESTA 2205 provides a ferritic-austenitic weldment that combines many of the good properties of both ferritic and austenitic stainless steels. Due to the high content of both Cr and Mo a very good resistance to general and pitting corrosion is obtained. The duplex microstructure gives a high tensile strength and hereby also an excellent resistance to stress corrosion cracking.

AVESTA 2205 is "over-alloyed" with respect to nickel to ensure the right ferrite balance in weld metal.

WELDING DIRECTIONS

The weldability for 2205 is excellent. However, duplex steels are 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 the 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), 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
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 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

EN 12072	22 9 3 L N
AWS A5.9	ER2209

Chemical composition - Typical values, %

C	0.02	Ni	8.5
Si	0.50	Mo	3.1
Mn	1.6	N	0.17
Cr	23.0		
Ferrite:	50 FN	WRC-92	

Mechanical properties – Typical values, IIW

	Typ. values	Typ. values
Yield strength, R _{p0.2}	610 N/mm ²	88 ksi
Tensile strength, R _m	805 N/mm ²	117 ksi
Elongation, A ₅	31 %	31 %
Impact strength, KV	+20°C	147 ft·lb
	-40°C	125 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. In special cases 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 chloride containing environments.

Approvals: CWB