

For welding steel such as:

Outokumpu	EN	ASTM	SS*	BS*	NF*
904L	1.4539	904L	2562	904S13	Z2 NCDU 25-20

Also for welding similar steels of the 2+25 CrNiMoCu-type.

* Obsolete national standards, replaced by EN 10088.

CHARACTERISTICS

AVESTA 385 is intended for welding Outokumpu 4539 (904L) and similar grades. By a combination of high content of Cr, Ni, Mo and Cu both steel and filler offer very good corrosion resistance to general, pitting and crevice corrosion as well as stress corrosion cracking. AVESTA 385 may well be used in type ASTM 316 constructions where a ferrite free weld metal is required, e.g. cryogenic or non-magnetic applications. The impact strength at low temperature is excellent.

385 can also be used for welding 904L to ASTM 304 and 316. Welding 904L to mild steel should preferably be performed using AVESTA NiCrMo-3 or 309MoL.

WELDING DIRECTIONS

The weldability of 385 is good, especially when using pulsed arc. The weldability using short arc is somewhat limited and the welding of thin gauges <0.12" (<3 mm) and in-position is best performed using pulsed arc.

A fully austenitic structure is somewhat more prone to hot or solidification cracking than type ASTM 316 welds. However, due to its extra low content of impurities, e.g. sulphur and phosphorus, AVESTA 385 has relatively good resistance, provided that welding has been carried out carefully, i.e. by minimising the dilution and by keeping the heat input at maximum 38.1 kJ/in (1.5 kJ/mm). The material should also be allowed to cool down to 212°F (100°C) before the next run is welded.

The joint preparation should be designed with a root gap of 0.08-0.1" (2-2.5 mm) to ensure full penetration and the lowest possible dilution with the base materials.

It is also essential to perform a good post weld cleaning of weld and heat affected zone, e.g. brushing, followed by pickling.

WELDING DATA

	Ø (inch)	Ø (mm)	Current (A)	Voltage (V)
Short arc	0.035"	0.89	110-140	19-22
Spray arc	0.035"	0.89	160-220	25-29
	0.045"	1.14	200-270	26-30
Pulsed arc	0.045"	1.60	250-330	29-32
			I _{peak} = 350-450 A I _{bg} = 50-150 A Freq = 80-120 Hz	

For further recommendations, please contact Avesta Welding.

Standard designations

EN 12072	20 25 5 Cu L
AWS A5.9	ER385

Shielding gas recommendations

Ar + 30% He + 2.5% CO₂

Helium increases the energy in the arc and the heat should therefore be kept at a lower level than welding without helium to compensate for the higher temperature in the arc. Addition of helium will increase the blackening slightly.

Gas flow rate: 25-34 ft³/hour (12-16 l/min).

Chemical composition - Typical values, %

C	0.01	Cr	20.0
Si	0.35	Ni	25.5
Mn	1.7	Mo	4.5
Cu	1.5		
Ferrite:	0 FN		

Mechanical properties – Typical values, IIW

	Typ. values	Typ. values
Yield strength, R _{p0.2}	340 N/mm ²	49 ksi
Tensile strength, R _m	570 N/mm ²	83 ksi
Elongation, A ₅	38 %	38 %
Impact strength, KV	+20°C	130 J
	-196°C	100 J
Hardness	170 Brinell	96 ft·lb

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

Heat input: Max. 38.1 kJ/in (1.5 kJ/mm)

Heat treatment: Generally none. In special cases quench annealing at 1962-2012°F (1070-1100°C).

Structure: Fully austenitic with extra low content of impurities.

Scaling temperature: Approx. 1832°F (1000°C) (air).

Corrosion resistance: Very good in non-oxidising environments such as sulphuric or phosphoric acids. Very good resistance to pitting and crevice corrosion in chlorine containing environments. Excellent resistance to general corrosion and stress corrosion cracking.