

# AVESTA 4D ELECTRODES


## extreme weldability in difficult positions



## Ideal all-position electrode for thin stainless steel

The welding of thin stainless steel, e.g. sheets and pipes, places extreme demands on the filler metal. Avesta's 4D electrodes provide the perfect answer in all welding positions. Thanks to the highly controllable weld pool and slag, welding is rapid and the quality is excellent.

### Avesta 4D

 Avesta's 4D range of covered electrodes has been specially developed for flexibility in the welding of thin stainless steel. Because 4D electrodes have a very wide parameter box, they have a large working range. Suitable metal thicknesses are 2 mm upwards.

The weldability of 4D electrodes is extremely good and the arc and weld pool are both stable. The thin coating gives a small weld pool. However, the slag is very compliant and easy to control. A short arc is to be used for welding. The slag is self-releasing and leaves an even, beautiful weld finish.

Welding with 4D covered electrodes is often a quick and cost-efficient alternative to TIG. There are Avesta 4D electrodes for welding: austenitic stainless steels (with or without molybdenum); duplex stainless steels; and, stainless steels to carbon steels. Avesta 4D electrodes can be used for, amongst other things, the

on-site welding, in the vertical-up and vertical-down positions, of thin-walled pipes. In the workshop, the electrodes can, of course, tackle this job in the flat position.

The supreme quality given by the electrodes is maintained in the workshop and on-site welding of sheet steel as well as in repair welding.

Suitable applications for the electrodes include storage tanks, process vessels, pipe systems, etc. in, for example, the pulp, paper and chemical industries.

As they place severe demands on filler metal performance, single-sided root beads are one of the specialities of the 4D range. The arc, weld pool and slag are all highly controllable. Consequently, Avesta 4D ensures top-class root beads every time.

**Avesta**  
Welding

## Weld metal composition

## Standard designations

Avesta 4D electrode	Chemical composition, typical values, %							Typical ferrite*	EN 1600	AWS A5.4
	C	Si	Mn	Cr	Ni	Mo	Other			
308L/MVR-4D	0.02	0.7	0.6	19.4	9.6	–	–	8	E 19 9 L R	E308L-17
316L/SKR-4D	0.02	0.7	0.8	18.2	12.1	2.6	–	8	E 17 11 2 L R	E316L-17
2205-4D	0.02	0.8	0.8	23.0	9.3	3.0	N 0.18	34	E 22 9 3 N L R	E2209-17
309L-4D	0.02	0.8	1.1	23.0	12.8	–	–	15	E 23 13 L R	E309L-17
P5-4D	0.02	0.7	1.1	23.0	12.8	2.5	–	20	E 22 12 2 L R	E309MoL-17

\* The ferrite content of pure weld metal. FN 0-18 as per Schaeffler-DeLong, FN >18 as per WRC-92.

## Mechanical properties, typical values

Avesta 4D electrode	R <sub>p0,2</sub>	R <sub>m</sub>	A <sub>5</sub>	Impact strength, KV, J		Brinell hardness
	N/mm <sup>2</sup>	N/mm <sup>2</sup>	%	+20°C	Low temp.	
308L/MVR-4D	440	560	38	50	28 (-196°C)	200
316L/SKR-4D	440	570	34	60	56 (-40°C)	210
2205-4D	630	820	25	49	40 (-20°C)	240
309L-4D	500	600	29*	55	50 (-20°C)	200
P5-4D	530	660	28*	45	38 (-40°C)	200

\* Elongation values do not meet AWS A5.4.

## Choice of filler metals

EN	ASTM	Outokumpu steel designation	Recommended Avesta 4D electrode
1.4301	304	4301	308L/MVR
1.4307	304L	4307	
1.4311	304LN	4311	
1.4541	321	4541	
1.4436	316	4436	316L/SKR
1.4432	316L	4432	
1.4429	316LN	4429	
1.4571	316Ti	4571	
1.4462	S32205	2205	2205
Joints between molybdenum free stainless steels and carbon or low-alloy steels. Overlay welding of carbon or low-alloy steels.			309L
Joints between molybdenum alloyed stainless steels and carbon or low-alloy steels. Overlay welding of carbon or low-alloy steels.			P5

## Dimensions and packaging data

Avesta 4D electrode	Diameter and length, mm			
	1.60	2.00	2.50	3.25
308L/MVR-4D	250	250/300	300	350
316L/SKR-4D	250	250/300	300	350
2205-4D	–	300	300	350
309L-4D	–	300	300	350
P5-4D	–	300	300	350

Avesta Welding's covered electrodes are delivered in moisture-proof, plastic capsules packed in cartons. The electrodes can also be supplied vacuum-packed.

## Welding recommendations

Avesta 4D electrode	Diameter mm	Flat (PA) Current, A	Vertical-up (PF) Current, A	Vertical-down (PG) Current, A
308L/MVR-4D 316L/SKR-4D	1.6	25– 45	20–30	25– 45
	2.0	30– 55	20–35	30– 55
	2.5	40– 70	25–40	40– 70
2205-4D 309L-4D P5-4D	3.25	50–110	35–40	50–110
	4.0	35– 55	25–40	35– 45
	5.0	45– 70	30–45	45– 70
	3.25	55–110	40–45	55–110

Welding current can be either DC+ or AC. However, DC+ always gives the best weldability. A very short arc and slight weaving motion are to be used for welding. When welding l-joints in sheet steel, the gap should be slightly larger than the electrode diameter. For example, if a 2.0 mm electrode is used to weld 2.0 mm sheet, the gap should be 2.0–2.5 mm. With larger gaps, it may be advantageous to weld with the electrode connected to the negative terminal. This is also true when using 309L-4D or P5-4D to weld mixed joints between carbon and stainless steels. The weld pool and penetration are then very easy to control.

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