

# BÖHLER 308L and 316L Type Welding Consumables with Controlled Delta Ferrite Content

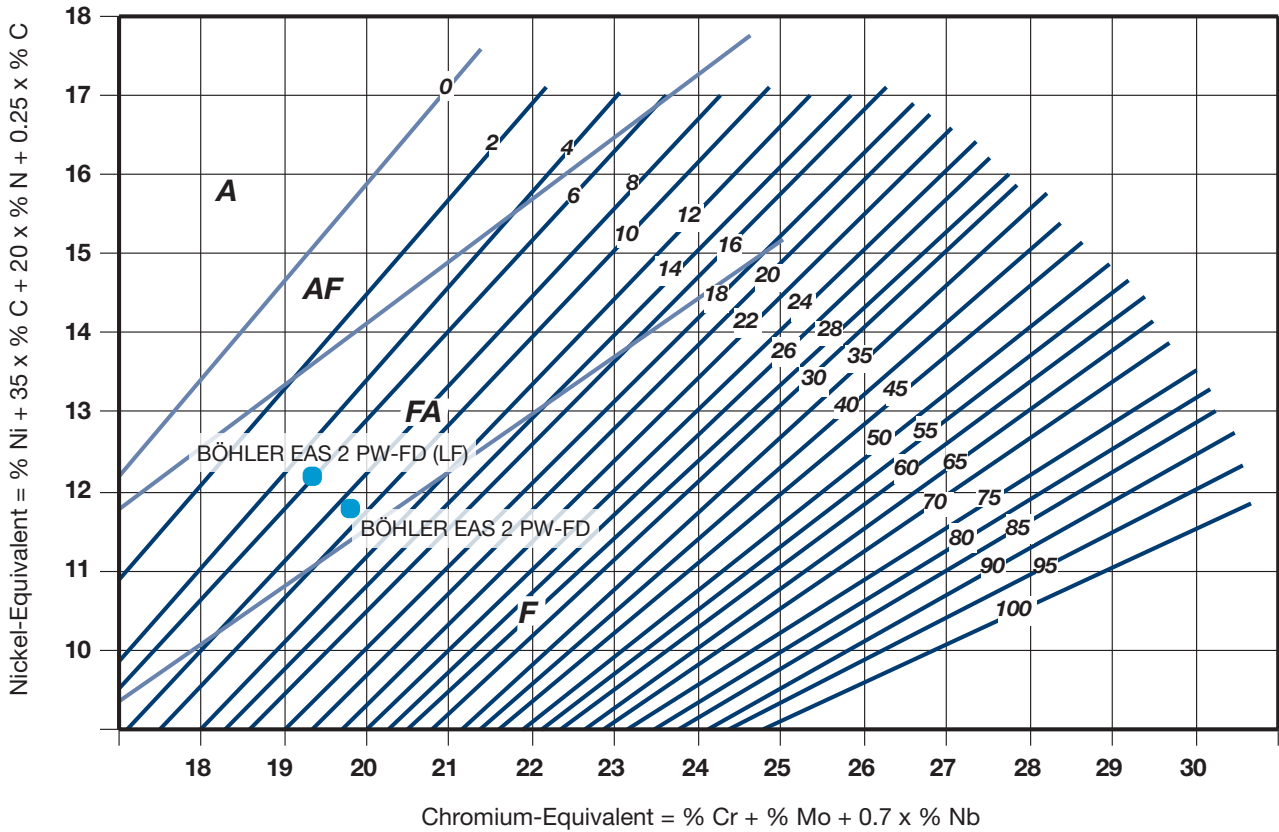


# BÖHLER Welding consumables for Austenitic Stainless Steel with controlled Ferrite Content

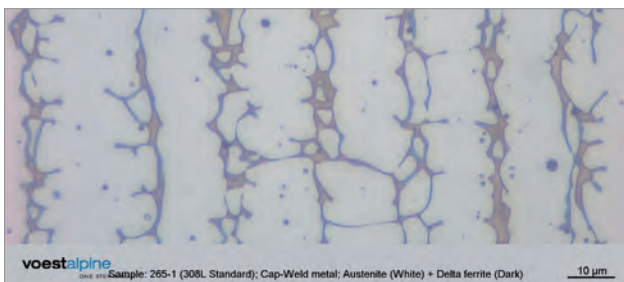
BÖHLER AWS type 308L and 316L welding consumables with a controlled weld metal ferrite content are designed to produce first class welds with reliable CVN impact toughness and lateral expansion at cryogenic temperatures. Despite the lower ferrite content, hot cracking resistance is good, also in the case of thick-walled constructions. The ferrite number in the as welded condition is 3-8 FN. At -196°C test temperature, all weld metal CVN impact

toughness is guaranteed to be  $\geq 27$  J and lateral expansion  $> 0.38$  mm. The consumables enable fabricators to meet engineering and end user specifications. Typical applications are found in LNG processing, storage and transportation equipment, as well as other constructions for cryogenic service. The BÖHLER range of LF products cover all commonly applied arc welding processes.

WRC Constitution Diagram with standard 308L type cored wire and low ferrite variant indicated.

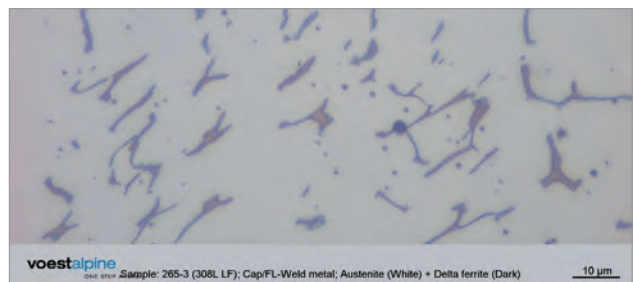


BÖHLER EAS 2 PW-FD



Etching: Microstructure weld metal 308L with standard ferrite content 9.9%

BÖHLER EAS 2 PW-FD (LF)



Etching: Microstructure weld metal 308L with controlled low ferrite content 5.5%

	Product name Classification	Typical tensile properties/ chemical analyses, all weld metal			CVN impact energy		Lateral expansion	Approvals
		R <sub>p0.2</sub> [MPa]	R <sub>m</sub> [MPa]	A <sub>5</sub> * [%]	[°C]	[J]		
MMA / SMAW	<b>BÖHLER FOX EAS 2 (LF)</b> EN ISO 3581-A: E 19 9 L B 2 2 AWS A5.4: E308L-15	410	560	40	+20	125	≥ 0.38	CE
		(≥ 320)	(≥ 520)	(≥ 30)	-196	60 (≥ 34)		
		<b>C</b>	<b>Si</b>	<b>Mn</b>	<b>Cr</b>	<b>Ni</b>	<b>Mo</b>	<b>FN</b>
		0.03	0.4	1.3	19.5	10.5	-	3-8
MMA / SMAW	<b>BÖHLER FOX EAS 4 M (LF)</b> EN ISO 3581-A: E Z 19 12 3 L B 2 2 AWS A5.4: E316L-15	430	570	38	+20	100	≥ 0.38	-
		(≥ 320)	(≥ 510)	(≥ 25)	-120	≥ 32		
		<b>C</b>	<b>Si</b>	<b>Mn</b>	<b>Cr</b>	<b>Ni</b>	<b>Mo</b>	<b>FN</b>
		0.03	0.4	1.2	18.5	12.8	2.4	3-8
FCAW	<b>BÖHLER EAS 2 PW-FD (LF)</b> EN ISO 17633-A: T 19 9 L P M21 1/ T 19 9 L P C1 1 AWS A5.22: E308LT1-4 / E308LT1-1 Shielding gas: M21 (Ar/CO <sub>2</sub> 80/20)	390	550	40	+20	78	≥ 0.38	-
		(≥ 350)	(≥ 520)	(≥ 35)	-196	45 (≥ 32)		
		<b>C</b>	<b>Si</b>	<b>Mn</b>	<b>Cr</b>	<b>Ni</b>	<b>Mo</b>	<b>FN</b>
		0.03	0.6	1.4	19.3	10.9	-	3-8
FCAW	<b>BÖHLER EAS 4 PW-FD (LF)</b> EN ISO 17633-A: T Z 19 12 3 L P M21/ T Z 19 12 3 L P C1 1 AWS A5.22: E316LT1-4/E316LT1-1 Shielding gas: M21 (Ar/CO <sub>2</sub> 80/20)	400	550	36	+20	75	≥ 0.38	TÜV, CE
		(≥ 320)	(≥ 510)	(≥ 30)	-196	35 (≥ 32)		
		<b>C</b>	<b>Si</b>	<b>Mn</b>	<b>Cr</b>	<b>Ni</b>	<b>Mo</b>	<b>FN</b>
		0.03	0.7	1.4	18.1	12.5	2.1	3-8
MAG / GMAW	<b>BÖHLER EAS 2-IG (LF)</b> EN ISO 14343-A: G 19 9 L AWS A5.9: ER308L** Shielding gas: M12 (Ar + max 2.5% CO <sub>2</sub> )	410	540	38	+20	110 (≥ 100)	≥ 0.38	-
		(≥ 320)	(≥ 510)	(≥ 25)	-196	(≥ 32)		
		<b>C</b>	<b>Si</b>	<b>Mn</b>	<b>Cr</b>	<b>Ni</b>	<b>Mo</b>	<b>FN</b>
		≤0.02	0.45	1.8	20.0	10.0	-	3-8
TIG / GTAW	<b>BÖHLER EAS 2-IG (LF)</b> EN ISO 14343-A: W 19 9 L AWS A5.9: ER308L** Shielding gas: I1 / argon	430	550	38	+20	150 (≥ 100)	≥ 0.38	-
		(≥ 320)	(≥ 510)	(≥ 25)	-196	65 (≥ 32)		
		<b>C</b>	<b>Si</b>	<b>Mn</b>	<b>Cr</b>	<b>Ni</b>	<b>Mo</b>	<b>FN</b>
		0.02	0.45	1.8	20.0	10.0	-	3-8
SAW	<b>BÖHLER EAS 2-UP (LF) / BB 203</b> EN ISO 14343-A: S 19 9 L AWS A5.9: ER308L**	410	580	36	+20	85 (≥ 80)	≥ 0.38	-
		≥ 320	≥ 550	≥ 25	-100	(≥ 50)		
		<b>C</b>	<b>Si</b>	<b>Mn</b>	<b>Cr</b>	<b>Ni</b>	<b>Mo</b>	<b>FN</b>
		≤ 0.020	0.55	1.3	19.5	9.8	-	3-8

\* Values are based on the EN standard. AWS elongation requirements are also satisfied.

\*\* AWS 316 L type consumables with controlled ferrite content are available on request.

Steels to be welded with 308L welding consumables (left) and with 316L welding consumables.

ASTM	Material nr.	ASTM	Material nr.
304L	1.4306	316L	1.4404 / 1.4401
304	1.4301	316	1.4436
304LN	1.4311	316LN	1.4406 / 1.4429
CF3	1.4308	CF3M	1.4408
CF8		CF8M	1.4437



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