

**Classifications**

<b>EN ISO 17634-B</b>	<b>AWS A5.28 / SFA-5.28:</b>
T 69 T15-1G-9C1MV	E90C-B91-H4

**Characteristics and typical fields of application**

Metal cored wire for high temperature, creep resistant martensitic 9 – 12% chromium steels in turbine and boiler fabrication and in the chemical industry. Especially designed for the ASTM steels T91 / P91. For optimised toughness values a welding technology should be applied which produces thin welding layers (approx. 2 mm), also a decisive influence on toughness values is given by the used shielding gas.

**Base materials**

Similar alloyed creep resistant steels  
1.4903 X10CrMoVNB9-1, GX12CrMoVNB9-1  
ASTM A 335 Gr. P91, A 336 Gr. F91, A 369 Gr. FP91, A 387 Gr. 91, A 213 Gr. T91

**Typical analysis**

	Gas	C	Si	Mn	Cr	Ni	Mo	V	Nb	N
wt.-%	M21	0.10	0.3	0.6	9.0	0.7	1.0	0.2	0.05	0.04

**Mechanical properties of all-weld metal - typical values (min. values)**

Condition	Yield strength R <sub>p0.2</sub>	Tensile strength R <sub>m</sub>	Elongation A (L <sub>0</sub> =5d <sub>0</sub> )	Impact energy ISO-V KV J
	MPa	MPa	%	20°C
s	650 (≥ 565)	760 (≥ 690 – 890)	18 (≥ 14)	55 (≥ 32)

s stress relieved 760 °C/3 h / furnace down to 300 °C / air – shielding gas Argon + 2.5 % CO<sub>2</sub>

**Operating data**

	<b>Polarity</b>	DC +	<b>Dimension mm</b>
	<b>Shielding gas (EN ISO 14175)</b>	Ar + 2,5 % CO <sub>2</sub>	1.2

Welding with conventional or pulsed power sources (preferably slightly trailing torch position, angle appr. 80°). Recommended stick out 18 – 20 mm and length of arc 3 – 5 mm.

Preheating and interpass temperature 200 – 300°C. After welding, the weld joint should cool down below 80°C to finish the martensite transformation. In case of greater wall thickness or complex components the possibility of residual stresses must be considered.

The following post weld heat treatment is recommended: annealing 760°C 2 h min max. 10 hrs, heating and cooling rates below 550°C max. 150°C / h, > above 550°C max. 80°C / h.

Positional weldability of metal-cored wires is similar to solid wires.

**Approvals**

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