

Classifications

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| EN ISO 21952-A | AWS A5.28 / SFA-5.28 |
| G Z CrMo 9 1 | ER90S-B91 |

Characteristics and typical fields of application

Thermanit MTS 3 is a solid filler wire electrode for gas metal arc welding. The 9Cr-1Mo-VNb type weld metal exhibits a fully tempered martensitic microstructure with favorable mechanical properties in post weld heat treated condition. The range of application covers joint welding of similar alloyed creep strength enhanced ferritic steels like ASTM grade 91 tube, pipe, plate, forgings and castings, used in the thermal power and petrochemical industry. The chemical composition is optimized in order to provide a high creep resistant and ductile weld metal after post weld heat treatment along with low level of trace elements. Mn+Ni < 1.2 wt. %. Service temperatures up to 650°C.

Base materials

Similar alloyed creep resistant steels and castings like
 1.4903 X10CrMoVNb9-1, 1.4955 GX12CrMoVNbN9-1
 ASTM Grade 91, T91, P91, F91, FP91, WP91, C12A
 10Cr9Mo1VnbN
 STPA28, STBA28

Typical analysis

| | C | Si | Mn | Cr | Ni | Mo | V | Nb |
|-------|-----|-----|-----|-----|-----|-----|-----|------|
| wt.-% | 0.1 | 0.3 | 0.5 | 9.0 | 0.5 | 1.0 | 0.2 | 0.06 |

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

| Condition | Yield strength R _{p0.2} | Tensile strength R _m | Elongation A (L ₀ =5d ₀) | Impact energy ISO-V KV J |
|-----------|----------------------------------|---------------------------------|---|--------------------------|
| | MPa | MPa | % | 20 °C |
| s1 | 590 (≥ 520) | 730 (≥ 620) | 20 (≥ 17) | 60 (≥ 47) |
| s2 | 585 (≥ 520) | 720 (≥ 620) | 20 (≥ 17) | 50 (≥ 47) |
| s3 | 570 (≥ 520) | 710 (≥ 620) | 19 (≥ 17) | 35 (≥ 27) |

s1 heat treated, tempered 760 °C / 2 h - shielding gas Ar + 2.5 % CO₂

s2 heat treated, tempered 760 °C / 2 h - shielding gas Ar + 5 % CO₂

s3 heat treated, tempered 760 °C / 2 h - shielding gas Ar + 18 % CO₂

Operating data

|  | Polarity | DC + | Dimension mm |
|--|-------------------------------------|------------|---------------------|
| | Shielding gas (EN ISO 14175) | M12 M13 | 0.8 |
| | | | 1.0 |
| | | | 1.14 |
| | | | 1.2 |

Preheat and interpass temperature should be controlled between 200 and 350 °C. In order to optimize impact energy, a multi-layer welding technique that ensures small layer thickness and low heat input is recommended. After welding the weld seam must be cooled below 100°C in order to complete the martensitic transformation prior to PWHT which is typically carried out between 750 and 770°C for at least 2 h. The un-tempered martensitic microstructure is very sensitive to cold and stress corrosion cracking. Residual welding and external stresses must be reduced to a minimum. Any exposure to moisture must be avoided in the as welded condition. Keeping a temperature above the dew point or storage in humidity controlled atmosphere is highly recommended bridging the gap between welding and final PWHT. For heavy wall components conducting a dehydrogenating heat treatment between 260 and 400°C before cooling down to room temperature can be recommended.

Approvals

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