

## Classifications

**EN ISO 21952-A**
**AWS A5.28 / SFA-5.28**

G CrMoWV 12 Si

ER90S-G (ER90S-B92(mod.))

## Characteristics and typical fields of application

Thermanit MTS 4 is a solid filler wire electrode for gas metal arc welding. The 11Cr-1Mo-0.5W-V type weld metal exhibits a fully tempered martensitic microstructure with favorable mechanical properties in post weld heat treated condition and after quench and temper treatment. The range of application covers joint welding of similar alloyed creep strength enhanced ferritic steels like X20CrMoW12-1 tube, pipe, forgings and castings, used in the thermal power industry. The chemical composition is optimized in order to provide a high creep resistant and ductile weld metal after post weld heat treatment.

## Base materials

Similar alloyed creep resistant steels and castings like

1.4922 X20CrMoV11-1 (T550 Extra), 1.4935 X20CrMoWV12-1, 1.4923 X22CrMoV12-1, 1.4926 X21CrMoV12-1, 1.4913 X19CrMoNbVN 11-1 (T560 Extra), 1.4931 GX23CrMoV12-1

## Typical analysis

|       | C    | Si  | Mn  | Cr   | Ni  | Mo  | W   | V   |
|-------|------|-----|-----|------|-----|-----|-----|-----|
| wt.-% | 0.20 | 0.3 | 0.6 | 11.0 | 0.4 | 1.0 | 0.5 | 0.3 |

## 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                    | MPa                         | 20 °C                    |
| s         | 585 ( $\geq 550$ )        | 780 ( $\geq 690$ )     | 16 ( $\geq 15$ )            | 45 ( $\geq 34$ )         |

s heat treated, tempered 760 °C / 4 h - shielding gas Ar + 2.5 % CO<sub>2</sub>

## Operating data

|  |                                     |            |                     |
|--|-------------------------------------|------------|---------------------|
|  | <b>Polarity</b>                     | DC +       | <b>Dimension mm</b> |
|  | <b>Shielding gas (EN ISO 14175)</b> | M12, (M13) |                     |

Preheat and interpass temperature should be controlled to 250 - 350 °C (martensitic welding). 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 4 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. Cooling down to 80 °C after welding and holding for at least 2 h is highly recommended for restrained components, bridging the gap between welding and final PWHT.

## Approvals

DB (42.132.91), CE