

## Classifications

| EN ISO 3580-A       | EN ISO 3580-B  | AWS A5.5 / SFA-5.5 | AWS A5.5M    |
|---------------------|----------------|--------------------|--------------|
| E Z CrMo91 B 4 2 H5 | E6215-9C1MV H5 | E9015-B91 H4       | E6215-B91 H4 |

## Characteristics and typical fields of application

Thermanit Chromo 9 V Mod is a basic coated stick electrode. 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. Thanks to the restricted Mn+Ni content of less than 1.2 wt. % the  $A_{c1}$  temperature is certainly above 780 °C. The covering concept of Thermanit Chromo 9 V Mod ensures easy handling, designed for welding under difficult conditions in combination with low level of diffusible hydrogen.

## 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   | N    |
|-------|-----|-----|-----|-----|-----|-----|-----|------|------|
| wt.-% | 0.1 | 0.2 | 0.8 | 9.0 | 0.1 | 1.1 | 0.2 | 0.05 | 0.04 |


Content of Mn and Ni in total <1.0 %

## 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<br>20 °C              | MPa<br>550 °C | MPa<br>20 °C           | MPa<br>550 °C | %<br>20 °C                  | %<br>550 °C | 20 °C                    | 0 °C      |
| T         | 595 (≥ 530)               | 415(≥ 280)    | 730 (≥ 620)            | 475 (≥ 330)   | 19 (≥ 17)                   | 17 (≥ 15)   | 80 (≥ 47)                | 45 (≥ 27) |

T: tempered (760 °C / 2 h)

## Operating data

|  | Polarity                 | DC +                                 | Dimension mm | Current A |
|---|--------------------------|--------------------------------------|--------------|-----------|
|   | Electrode identification | Chromo 9V Mod/EZ CrMo91 B/ E9015-B91 | 2.5 × 250    | 70 – 100  |
|   |                          |                                      | 3.2 × 350    | 100 – 145 |
|   |                          |                                      | 4.0 × 350    | 140 – 190 |
|   |                          |                                      | 5.0 × 450    | 160 – 240 |

Preheat and interpass temperature should be controlled between 200 and 350° C. In order to optimize impact toughness, a small layer thickness and low heat input is recommended. After welding the weld seam must be cooled down below 100° C in order to complete the martensitic transformation prior to PWHT, commonly carried out between 750 and 770° C for at least 2 h. The un-tempered martensitic microstructure is very sensitiv 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. We recommend to keep the temperature above the dew point or store in humidity controlled atmosphere until the final post weld heat treatment. For heavy wall components we recommend a dehydrogenating heat treatment between 260 and 400° C before cooling down to room temperature. PWHT of cast components might require lower holding temperature of around 730° C but extended holding time of ≥ 8 h.

## Approvals

CE