

Welding Consumables for Pressure Vessels For Cr-Mo Steel

| Steel type | Welding method | Welding consumables | ASME/AWS | Polarity | Flux grain size (mesh) Diameter(mmφ) |
|--|--------------------|---------------------------|---------------|----------|---|
| 1.25Cr-0.5Mo steel ASTM A387 Gr.11 Cl.1 & Cl.2 | SAW (Flux/Wire) | TRUSTARC PF-200/US-511N | SFA/A 5.23 | AC | Flux:10×48 |
| | | TRUSTARC PF-200D/US-511ND | F8P2-EG-B2 | DCEP | 3.2, 4.0 |
| | SMAW | TRUSTARC CM-A96MB | SFA/A 5.5 | AC | 2.6, 3.2 |
| TRUSTARC CM-A96MBD | | E8016-B2 | DCEP | 4.0, 5.0 | |
| GTAW | TRUSTARC TG-S1CM | SFA/A 5.28 | DCEN | 1.2, 1.6 | |
| | | ER80S-G | | 2.0, 2.4 | |
| 2.25Cr-1Mo steel ASTM A387 Gr.22 Cl.1 & Cl.2 | SAW (Flux/Wire) | TRUSTARC PF-200/US-521S | SFA/A 5.23 | AC | Flux:10×48 |
| | | TRUSTARC PF-200D/US-521S | F9P2-EG-B3 | DCEP | 3.2, 4.0 |
| | SMAW | TRUSTARC CM-A106N | SFA/A 5.5 | AC | 2.6, 3.2 |
| TRUSTARC CM-A106ND | | E9016-B3 | DCEP | 4.0, 5.0 | |
| GTAW | TRUSTARC TG-S2CM | SFA/A 5.28 | DCEN | 1.2, 1.6 | |
| | | ER90S-G | | 2.0, 2.4 | |
| 2.25Cr-1Mo-V steel ASTM A387 Gr.22V | SAW (Flux/Wire) | TRUSTARC PF-500/US-521H | ASME Sec.VIII | AC | Flux:10×48 |
| | | TRUSTARC PF-500D/US-521HD | Div.2-2007 | DCEP | 3.2, 4.0 |
| | SMAW | TRUSTARC CM-A106H | ASME Sec.VIII | AC | 3.2, 4.0 |
| TRUSTARC CM-A106HD | | Div.2-2007 | DCEP | 5.0 | |
| GTAW | TRUSTARC TG-S2CMH | ASME Sec.VIII | DCEN | 1.2, 1.6 | |
| | | Div.2-2007 | | 2.0, 2.4 | |

Example of chemical composition of weld metal (mass%)

| Welding consumables | C | Si | Mn | P | S | Cr | Mo | Nb | V |
|---------------------------|------|------|------|-------|-------|------|------|-------|------|
| TRUSTARC PF-200/US-511N | 0.09 | 0.10 | 0.74 | 0.006 | 0.005 | 1.43 | 0.54 | — | — |
| TRUSTARC PF-200D/US-511ND | 0.08 | 0.21 | 0.82 | 0.006 | 0.005 | 1.39 | 0.56 | — | — |
| TRUSTARC CM-A96MB | 0.06 | 0.51 | 0.74 | 0.007 | 0.003 | 1.30 | 0.54 | — | — |
| TRUSTARC CM-A96MBD | 0.06 | 0.37 | 0.76 | 0.007 | 0.003 | 1.29 | 0.57 | — | — |
| TRUSTARC TG-S1CM | 0.06 | 0.45 | 0.98 | 0.007 | 0.006 | 1.22 | 0.54 | — | — |
| TRUSTARC PF-200/US-521S | 0.11 | 0.10 | 0.85 | 0.006 | 0.005 | 2.34 | 1.04 | — | — |
| TRUSTARC PF-200D/US-521S | 0.09 | 0.16 | 0.81 | 0.006 | 0.005 | 2.41 | 1.07 | — | — |
| TRUSTARC CM-A106N | 0.11 | 0.33 | 0.81 | 0.005 | 0.002 | 2.28 | 0.98 | — | — |
| TRUSTARC CM-A106ND | 0.11 | 0.32 | 0.84 | 0.005 | 0.002 | 2.41 | 1.04 | — | — |
| TRUSTARC TG-S2CM | 0.09 | 0.32 | 0.71 | 0.007 | 0.006 | 2.26 | 1.04 | — | — |
| TRUSTARC PF-500/US-521H | 0.08 | 0.13 | 1.16 | 0.004 | 0.004 | 2.53 | 1.03 | 0.015 | 0.35 |
| TRUSTARC PF-500D/US-521HD | 0.07 | 0.17 | 1.26 | 0.005 | 0.004 | 2.44 | 1.02 | 0.012 | 0.32 |
| TRUSTARC CM-A106H | 0.08 | 0.31 | 1.18 | 0.004 | 0.002 | 2.42 | 1.01 | 0.017 | 0.29 |
| TRUSTARC CM-A106HD | 0.08 | 0.24 | 1.12 | 0.004 | 0.002 | 2.48 | 1.05 | 0.012 | 0.27 |
| TRUSTARC TG-S2CMH | 0.10 | 0.14 | 0.42 | 0.005 | 0.006 | 2.30 | 1.04 | 0.034 | 0.28 |

Example of mechanical properties of weld metal

| Welding consumables | PWHT | 0.2%Y.S. (MPa) | T.S. (MPa) | El. (%) | vE (J) |
|---------------------------|-----------|-------------------|---------------|------------|------------|
| TRUSTARC PF-200/US-511N | 690°C×4hr | 480 | 605 | 29 | 120(-18°C) |
| TRUSTARC PF-200D/US-511ND | | 470 | 590 | 27 | 110(-18°C) |
| TRUSTARC CM-A96MB | 690°C×1hr | 490 | 590 | 30 | 180(-18°C) |
| TRUSTARC CM-A96MBD | | 515 | 617 | 27 | 174(-18°C) |
| TRUSTARC TG-S1CM | 690°C×1hr | 540 | 630 | 28 | 270(0°C) |
| TRUSTARC PF-200/US-521S | 690°C×8hr | 470 | 610 | 27 | 150(-29°C) |
| TRUSTARC PF-200D/US-521S | | 480 | 605 | 26 | 160(-29°C) |
| TRUSTARC CM-A106N | 690°C×8hr | 510 | 650 | 28 | 125(-40°C) |
| TRUSTARC CM-A106ND | | 500 | 635 | 26 | 110(-40°C) |
| TRUSTARC TG-S2CM | 690°C×1hr | 610 | 720 | 28 | 250(0°C) |
| TRUSTARC PF-500/US-521H | 705°C×7hr | 620 | 710 | 26 | 120(-18°C) |
| TRUSTARC PF-500D/US-521HD | | 610 | 705 | 27 | 130(-18°C) |
| TRUSTARC CM-A106H | 705°C×7hr | 610 | 710 | 23 | 150(-18°C) |
| TRUSTARC CM-A106HD | | 595 | 705 | 24 | 120(-18°C) |
| TRUSTARC TG-S2CMH | 705°C×7hr | 623 | 718 | 22 | 240(-18°C) |

