

Stainless Steels

DATA SHEET

B-35

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317L STAINLESS STEEL

Alloy type

19%Cr-13%Ni-3.5%Mo (317L) austenitic stainless steel.

Materials to be welded

| | wrought | cast |
|------------------|---------------------------|------------------|
| ASTM/UNS | 317/S31700 317L/S31703 | CG8M CG3M |
| DIN/BS EN | 1.4438 | |
| BS | 317S16 317S12 | 317C16 317C12 |

Applications

Use to weld 317/317L stainless steels in which the raised Mo level provides improved resistance to pitting in high chloride environments and to some acids (not nitric acid). These steels are used in **marine, chemical process, papermaking, and food processing** applications.

Also suitable for 316/316L and their stabilised versions when the benefits of higher molybdenum weld metal are required to maximise weld area pitting resistance.

Not suitable for structural service above about 400°C, or for cryogenic applications.

Microstructure

Austenite with 3-10FN (3-9% ferrite), typically 5FN.

Welding guidelines

No preheat required, and a maximum interpass of 150°C is desirable. Normally used in the as-welded condition.

Additional information

The 317LM and 1.4539 alloys, with 4-5%Mo, can be welded with the overmatching 904L consumables (data sheet B-40).

Related alloy groups

317L falls between the lower alloyed 316L (data sheet B-32) and the higher alloyed 904L (data sheet B-40) materials.

Products available

| Process | Product | Specification |
|---------|------------------------|-----------------|
| MMA | Ultramet 317L | AWS E317L-16 |
| TIG/MIG | ER317L | AWS ER317L |
| FCW | Supercore 317LP | AWS E317LT1-1/4 |

ULTRAMET 317L

All-positional MMA electrode for 317L stainless steel

| Product description | <p>Rutile flux on high purity 304L core wire giving very low (<0.025%) typical carbon levels. A controlled addition of nitrogen, in conjunction with ~3.8%Mo, provides improved pitting corrosion resistance compared to 316L. Ultramet 317L gives both welder and weld metal all the benefits of advanced rutile electrode design. These features include optimum versatility for downhand and positional welding, combined with high cosmetic finish and full volumetric weld metal integrity. The smaller electrode sizes are particularly suited to vertical and overhead welding applications including fixed pipework. Low hydrogen manufacturing technology ensures high resistance to weld metal porosity.</p> <p>Recovery is about 115% with respect to core wire, 65% with respect to whole electrode.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------------|---|---------|--|------|-----|----|--------------------------|----|----|----|---|----|------|-----|---------|------------------|-----------|-----|-------------------|--------------------------|-----------|------------------|------|------|------------------|-----|-----|-------------------|----|----|---------------|--------|----|--------|----|
| Specifications | AWS A5.4 BS EN 1600 BS 2926 | | E317L-16 E 19 13 4 N L R 32 (19.13.4.L.R) nearest equivalent | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ASME IX Qualification | QW432 F-No 5, QW442 A-No 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Composition (weld metal wt %) | | C | Mn | Si | S | P | Cr | Ni | Mo | Cu | N | FN | | | | | | | | | | | | | | | | | | | | | | | |
| All-weld mechanical properties | As welded | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th></th> <th>min</th> <th>typical</th> </tr> </thead> <tbody> <tr> <td>Tensile strength</td> <td>550</td> <td>620</td> </tr> <tr> <td>0.2% Proof stress</td> <td>350</td> <td>470</td> </tr> <tr> <td>Elongation on 4d</td> <td>30</td> <td>38</td> </tr> <tr> <td>Elongation on 5d</td> <td>25</td> <td>36</td> </tr> <tr> <td>Reduction of area</td> <td>--</td> <td>45</td> </tr> <tr> <td rowspan="2">Impact energy</td> <td>+ 20°C</td> <td>55</td> </tr> <tr> <td>- 50°C</td> <td>30</td> </tr> </tbody> </table> | | | | | | | | | | | | | min | typical | Tensile strength | 550 | 620 | 0.2% Proof stress | 350 | 470 | Elongation on 4d | 30 | 38 | Elongation on 5d | 25 | 36 | Reduction of area | -- | 45 | Impact energy | + 20°C | 55 | - 50°C | 30 |
| | min | typical | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tensile strength | 550 | 620 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.2% Proof stress | 350 | 470 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Elongation on 4d | 30 | 38 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Elongation on 5d | 25 | 36 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reduction of area | -- | 45 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Impact energy | + 20°C | 55 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | - 50°C | 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating parameters | DC +ve or AC (OCV: 50V min) <div style="float: right; text-align: right;">  </div> <table border="1"> <thead> <tr> <th>ø mm</th> <th>2.5</th> <th>3.2</th> <th>4.0</th> </tr> </thead> <tbody> <tr> <td>min A</td> <td>60</td> <td>75</td> <td>100</td> </tr> <tr> <td>max A</td> <td>90</td> <td>120</td> <td>155</td> </tr> </tbody> </table> | | | | | | | | | | | | ø mm | 2.5 | 3.2 | 4.0 | min A | 60 | 75 | 100 | max A | 90 | 120 | 155 | | | | | | | | | | | |
| ø mm | 2.5 | 3.2 | 4.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| min A | 60 | 75 | 100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| max A | 90 | 120 | 155 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Packaging data | <table border="1"> <thead> <tr> <th>ø mm</th> <th>2.5</th> <th>3.2</th> <th>4.0</th> </tr> </thead> <tbody> <tr> <td>length mm</td> <td>300</td> <td>350</td> <td>350</td> </tr> <tr> <td>kg/carton</td> <td>12.0</td> <td>13.5</td> <td>13.5</td> </tr> <tr> <td>pieces/carton</td> <td>669</td> <td>381</td> <td>225</td> </tr> </tbody> </table> | | | | | | | | | | | | ø mm | 2.5 | 3.2 | 4.0 | length mm | 300 | 350 | 350 | kg/carton | 12.0 | 13.5 | 13.5 | pieces/carton | 669 | 381 | 225 | | | | | | | |
| ø mm | 2.5 | 3.2 | 4.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| length mm | 300 | 350 | 350 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| kg/carton | 12.0 | 13.5 | 13.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| pieces/carton | 669 | 381 | 225 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Storage | <p>3 hermetically sealed ring-pull metal tins per carton, with unlimited shelf life. Direct use from tin is satisfactory for longer than a working shift of 8h. Excessive exposure of electrodes to humid conditions will cause some moisture pick-up and increase the risk of porosity.</p> <p>For electrodes that have been exposed: Redry 200 – 300°C/1-2h to restore to as-packed condition. Maximum 400° C, 3 cycles, 10h total. Storage of redried electrodes at 50 – 200°C in holding oven or heated quiver: no limit, but maximum 6 weeks recommended. Recommended ambient storage conditions for opened tins (using plastic lid): < 60% RH, > 18°C.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fume data | Fume composition, wt % typical: <table border="1"> <thead> <tr> <th>Fe</th> <th>Mn</th> <th>Ni</th> <th>Cr</th> <th>Cu</th> <th>Mo</th> <th>F</th> <th>OES (mg/m³)</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>6</td> <td>1</td> <td>6</td> <td><0.2</td> <td>0.6</td> <td>16</td> <td>0.8</td> </tr> </tbody> </table> | | | | | | | | | | | | Fe | Mn | Ni | Cr | Cu | Mo | F | OES (mg/m ³) | 8 | 6 | 1 | 6 | <0.2 | 0.6 | 16 | 0.8 | | | | | | | |
| Fe | Mn | Ni | Cr | Cu | Mo | F | OES (mg/m ³) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 6 | 1 | 6 | <0.2 | 0.6 | 16 | 0.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

ER317L

Solid wire for TIG and MIG welding 317L stainless steel

| | | | | | | | | | | | | |
|---------------------------------------|---|------------|-----------------|-----------------|------|-------|------------------------|--------------------------|-----|------|----|-----|
| Product description | Solid wire for TIG and MIG welding of 317L stainless steel. | | | | | | | | | | | |
| Specifications | AWS A5.9 | | ER 317, ER 317L | | | | | | | | | |
| | BS 2901: Pt2 | | 317S92 | | | | | | | | | |
| | BS EN ISO 14343-A | | 19 13 4 L | | | | | | | | | |
| | BS EN ISO 14343-B | | SS317, SS317L | | | | | | | | | |
| ASME IX Qualification | QW432 F-No 6, QW442 A-No 8 | | | | | | | | | | | |
| Composition (wire wt %) | | C | Mn | Si | S | P | Cr | Ni | Mo | Cu | FN | |
| | min | -- | 1.0 | 0.30 | -- | -- | 18.5 | 13.0 | 3.0 | -- | 2 | |
| | max | 0.03 | 2.5 | 0.65 | 0.02 | 0.030 | 20.0 | 15.0 | 4.0 | 0.3 | 10 | |
| | typ | 0.015 | 1.5 | 0.4 | 0.01 | 0.02 | 19 | 14 | 3.5 | 0.15 | 5 | |
| All-weld mechanical properties | Typical values as welded | | | | | | TIG | | | | | |
| | Tensile strength | | | | | | MPa | | | | | 630 |
| | 0.2% Proof stress | | | | | | MPa | | | | | 450 |
| | Elongation on 4d | | | | | | % | | | | | 35 |
| | Impact energy | | | | | | + 20°C J | | | | | 75 |
| Typical operating parameters | | TIG | | | | | MIG | | | | | |
| | Shielding | Argon * | | | | | Ar+2%O ₂ ** | | | | | |
| | Current | DC- | | | | | DC+ | | | | | |
| | Diameter | 2.4mm | | | | | 1.2mm | | | | | |
| | Parameters | 100A, 12V | | | | | 220A, 26V | | | | | |
| | * Also required as a purge for root runs. | | | | | | | | | | | |
| | ** Proprietary Ar and Ar-He gas mixtures with <3%CO ₂ also suitable. | | | | | | | | | | | |
| Packaging data | ø mm | TIG | | | | | MIG | | | | | |
| | 1.2 | -- | | | | | 15kg spool | | | | | |
| | 1.6 | 2.5kg tube | | | | | -- | | | | | |
| | 2.4 | 2.5kg tube | | | | | -- | | | | | |
| Fume data | MIG fume composition (wt %) (TIG fume negligible) | | | | | | | | | | | |
| | | Fe | Mn | Cr ³ | Ni | Mo | Cu | OES (mg/m ³) | | | | |
| | | 28 | 12 | 15 | 12 | 2 | <0.5 | 3.3 | | | | |

SUPERCORE 317LP

All-positional rutile flux cored wire for 317L

| | | | | | | | | | | | | | |
|---------------------------------------|--|---------------------------------|-----|--------|-----------------|-----------------|---------|-----------|--------------------------|-----|------|----|--|
| Product description | Flux cored wire made with an austenitic stainless steel sheath and rutile flux system. Supercore 317LP is designed for all-positional welding including fixed pipework but provides excellent operability in the flat and HV positions as well. Metal recovery is about 90% with respect to the wire. | | | | | | | | | | | | |
| Specifications | AWS A5.22 | E317LT1-1/4 | | | | | | | | | | | |
| | BS EN ISO 17633-A | (nearest T 19 13 4 N L P C/M 2) | | | | | | | | | | | |
| | BS EN ISO 17633-B | TS317L-FB1 | | | | | | | | | | | |
| ASME IX Qualification | QW432 F-No 6, QW442 A-No 8 | | | | | | | | | | | | |
| Composition (weld metal wt %) | | C | Mn | Si | S | P | Cr | Ni | Mo | Cu | N | FN | |
| | min | -- | 0.5 | 0.2 | -- | -- | 18.0 | 12.0 | 3.0 | -- | -- | 3 | |
| | max | 0.04 | 2.5 | 1.0 | 0.025 | 0.030 | 20.0 | 14.0 | 4.0 | 0.5 | 0.20 | 10 | |
| | typ | 0.03 | 1 | 0.6 | 0.02 | 0.02 | 19 | 13 | 3.5 | 0.1 | 0.07 | 6 | |
| All-weld mechanical properties | As welded | | | | | | | min | typical | | | | |
| | Tensile strength | | | | | MPa | 550 | 570 | | | | | |
| | 0.2% Proof stress | | | | | MPa | 350 | 440 | | | | | |
| | Elongation on 4d | | | | | % | 20 | 27 | | | | | |
| | Elongation on 5d | | | | | % | 20 | 25 | | | | | |
| | Reduction of area | | | | | % | -- | 30 | | | | | |
| | Impact energy | | | + 20°C | J | -- | 55 | | | | | | |
| | | | | -50°C | J | -- | 45 | | | | | | |
| Hardness | | | | | HV | -- | 220 | | | | | | |
| Operating parameters | Shielding gas: 80%Ar-20%CO ₂ or 100% CO ₂ at 20-25l/min. Proprietary gases may be used but argon should not exceed 85%. | | | | | | | | | | | | |
| | Current: DC+ve ranges as below for Ar-20%CO ₂ . Welding with 100%CO ₂ requires approx 3V higher: | | | | | | | | | | | | |
| | ø mm | amp-volt range | | | | | typical | | stickout | | | | |
| 1.2 | 120 – 280A, 22 – 34V | | | | | 180A, 29V | | 15 – 20mm | | | | | |
| Packaging data | Spools vacuum-sealed in barrier foil with cardboard carton: 15kg spool. The as-packed shelf life is virtually indefinite. Resistance to moisture absorption is high, but to maintain the high integrity of the wire surface and prevent any possibility of porosity, it is advised that part-used spools are returned to polythene wrappers. Where possible, preferred storage conditions are 60% RH max, 18°C min. | | | | | | | | | | | | |
| Fume data | Fume composition (wt %) | | | | | | | | | | | | |
| | | Fe | Mn | Ni | Cr ³ | Cr ⁶ | Cu | F | OES (mg/m ³) | | | | |
| | | 17 | 10 | 1.5 | 3 | 5 | < 1 | 5 | 1 | | | | |