

# Stainless Steels

## DATA SHEET

## B-34

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## 318 STAINLESS STEEL

### Alloy type

Nb stabilised, Mo-bearing stainless steel.

### Materials to be welded

|             | wrought                         | cast          |
|-------------|---------------------------------|---------------|
| ASTM/ASME   | 316Ti, 316Cb                    | CF10MC        |
| DIN & BS EN | 1.4571/1.4573,<br>1.4580/1.4583 | 1.4579/1.4581 |
| BS          | 320S31/33                       | 318C17        |
| UNS         | S31635, S31640                  |               |

### Applications

Use to weld titanium or niobium-stabilised grades of molybdenum-bearing austenite stainless steels, or as an alternative electrode for unstabilised grades such as 316/316L. It is not recommended for structural service above about 400°C.

It is also used for depositing **corrosion resistance overlays** and valve seat inlays on medium carbon alloy steels, and for this reason the electrode is normally supplied with a typical ferrite content of 3-14FN.

### Microstructure

Austenite with 3-14FN (3-12% ferrite), typically 10FN.

### Welding guidelines

No preheat, maximum interpass temperature 250°C.

### Additional information

Supermet 318 is not recommended for cryogenic applications, nor elevated temperature structural service.

### Related alloy groups


The 316L consumables can be used for many of the same base materials and applications (data sheet B-32). For cryogenic applications see controlled ferrite 316L consumables (data sheet B-32) and for elevated temperature see 316H (C-13) or 16.8.2 (C-12) consumables.

### Products available

| Process     | Product             | Specification  |
|-------------|---------------------|----------------|
| MMA         | <b>Supermet 318</b> | AWS E318-17    |
| TIG/MIG/SAW | <b>318S96</b>       | AWS ER318      |
| SAW flux    | <b>SS300</b>        | BS EN SA AF2   |
|             | <b>SSB</b>          | BS EN SA AF2   |
|             | <b>LA491</b>        | BS EN SA FB255 |

# SUPERMET 318

## Nb stabilised Mo-bearing stainless steel MMA electrode

| <b>Product description</b>            | <p>Rutile-aluminosilicate flux on high purity 304L core wire giving very low (&lt;0.025%) typical carbon levels. Designed for ease of use, exceptional weld bead appearance, and high weld metal integrity, primarily in the downhand and H-V welding positions. Smaller sizes up to 3.2mm offer excellent all-positional operability.</p> <p>Low hydrogen manufacturing technology ensures high resistance to weld metal porosity.</p> <p>Recovery is about 120% with respect to core wire, 65% with respect to whole electrode.</p>   |   |     |      |       |         |                          |         |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|---------------------------------------|---|---|-----|------|-------|---------|--------------------------|---------|-----|--------|------|----|----|----|----|----|----|----|---|--------------------------|---|---|---|---|-----|------|----|---|
| <b>Specifications</b>                 | <b>AWS A5.4</b><br><b>BS EN 1600</b><br><b>BS 2926</b><br><b>DIN 8556</b>   | E318-17<br>E 19 12 3 Nb R 32<br>19.12.3Nb.AR<br>E 19 12 3 Nb R 23 |     |      |       |         |                          |         |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
| <b>ASME IX Qualification</b>          | <b>QW432</b> F-No 5, <b>QW442</b> A-No 8  |   |     |      |       |         |                          |         |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
| <b>Composition (weld metal wt %)</b>  |   | C   | Mn  | Si   | S     | P       | Cr                       | Ni      | Mo  | Nb     | Cu   | FN |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | min   | --  | 0.5 | --   | --    | --      | 17.0                     | 11.0    | 2.5 | 10 x C | --   | 6  |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | max   | 0.04  | 2.0 | 0.90 | 0.025 | 0.030   | 20.0                     | 13.0    | 3.0 | 1.0    | 0.50 | 13 |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | typ   | 0.025   | 0.8 | 0.7  | 0.01  | 0.02    | 19                       | 11.5    | 2.7 | 0.6    | 0.1  | 9  |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
| <b>All-weld mechanical properties</b> | As welded   |   |     |      |       | min     |                          | typical |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | Tensile strength  |   |     |      |       | MPa     |                          | 560 630 |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | 0.2% Proof stress   |   |     |      |       | MPa     |                          | 350 500 |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | Elongation on 4d  |   |     |      |       | %       |                          | 25 36   |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | Elongation on 5d  |   |     |      |       | %       |                          | 25 35   |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | Reduction of area   |   |     |      |       | %       |                          | -- 55   |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | Impact energy   |   |     |      |       | + 20C J |                          | -- 65   |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
| <b>Operating parameters</b>           | DC +ve or AC (OCV: 55V min)   |   |     |      |       |         |                          |         |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       |    |   |     |      |       |         |                          |         |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | ø mm  | 2.5   |     | 3.2  |       | 4.0     |                          | 5.0     |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | min A   | 60  |     | 75   |       | 100     |                          | 130     |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | max A   | 90  |     | 120  |       | 155     |                          | 210     |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
| <b>Packaging data</b>                 | ø mm  | 2.5   |     | 3.2  |       | 4.0     |                          | 5.0     |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | length mm   | 300   |     | 350  |       | 350     |                          | 450     |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | kg/carton   | 11.4  |     | 14.1 |       | 13.2    |                          | 18.0    |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
|                                       | pieces/carton   | 564   |     | 387  |       | 237     |                          | 165     |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
| <b>Storage</b>                        | <p><b>3 hermetically sealed ring-pull metal tins</b> 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:<br/> <b>Redry</b> 200 – 300°C/1-2h to restore to as-packed condition. Maximum 400° C, 3 cycles, 10h total.<br/> <b>Storage</b> 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): &lt; 60% RH, &gt; 18°C.</p> |   |     |      |       |         |                          |         |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
| <b>Fume data</b>                      | Fume composition, wt % typical: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Fe</th> <th>Mn</th> <th>Ni</th> <th>Cr</th> <th>Mo</th> <th>Cu</th> <th>F</th> <th>OES (mg/m<sup>3</sup>)</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>7</td> <td>1</td> <td>5</td> <td>0.5</td> <td>&lt;0.2</td> <td>16</td> <td>1</td> </tr> </tbody> </table>  |   |     |      |       |         |                          |         |     |        |      |    | Fe | Mn | Ni | Cr | Mo | Cu | F | OES (mg/m <sup>3</sup> ) | 8 | 7 | 1 | 5 | 0.5 | <0.2 | 16 | 1 |
| Fe                                    | Mn  | Ni  | Cr  | Mo   | Cu    | F       | OES (mg/m <sup>3</sup> ) |         |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |
| 8                                     | 7   | 1   | 5   | 0.5  | <0.2  | 16      | 1                        |         |     |        |      |    |    |    |    |    |    |    |   |                          |   |   |   |   |     |      |    |   |

# 318S96

Solid 318 stainless steel wire for TIG, MIG and SAW

|                                       |   |            |                              |                 |                        |       |         |                          |     |      |     |    |
|---------------------------------------|---|------------|------------------------------|-----------------|------------------------|-------|---------|--------------------------|-----|------|-----|----|
| <b>Product description</b>            | Solid wire for TIG, MIG and SAW.                                    |            |                              |                 |                        |       |         |                          |     |      |     |    |
| <b>Specifications</b>                 | <b>AWS A5.9</b>   |            | ER318                        |                 |                        |       |         |                          |     |      |     |    |
|                                       | <b>BS 2901: Pt2</b>   |            | 318S96                       |                 |                        |       |         |                          |     |      |     |    |
|                                       | <b>DIN 8556</b>   |            | SG X5CrNiMoNb 19 12 (1.4576) |                 |                        |       |         |                          |     |      |     |    |
|                                       | <b>BS EN ISO 14343-A</b>  |            | 19 12 3 Nb                   |                 |                        |       |         |                          |     |      |     |    |
|                                       | <b>BS EN ISO 14343-B</b>  |            | SS318                        |                 |                        |       |         |                          |     |      |     |    |
| <b>ASME IX Qualification</b>          | <b>QW432</b> F-No 6, <b>QW442</b> A-No 8                            |            |                              |                 |                        |       |         |                          |     |      |     |    |
| <b>Composition (wire wt %)</b>        |   | C          | Mn                           | Si              | S                      | P     | Cr      | Ni                       | Mo  | Nb   | Cu  | FN |
|                                       | min   | --         | 1.0                          | 0.30            | --                     | --    | 18.5    | 11.0                     | 2.5 | 10xC | --  | 3  |
|                                       | max   | 0.07       | 2.0                          | 0.65            | 0.02                   | 0.030 | 20.0    | 13.0                     | 3.0 | 1.0  | 0.3 | 12 |
|                                       | typ   | 0.035      | 1.8                          | 0.45            | 0.01                   | 0.02  | 19.5    | 11.5                     | 2.5 | 0.6  | 0.2 | 10 |
| <b>All-weld mechanical properties</b> | Typical values as welded  |            |                              |                 |                        |       | TIG     |                          |     |      |     |    |
|                                       | Tensile strength  |            |                              |                 |                        | MPa   | 655     |                          |     |      |     |    |
|                                       | 0.2% Proof stress   |            |                              |                 |                        | MPa   | 440     |                          |     |      |     |    |
|                                       | Elongation on 4d  |            |                              |                 |                        | %     | 42      |                          |     |      |     |    |
|                                       | Elongation on 5d  |            |                              |                 |                        | %     | 35      |                          |     |      |     |    |
|                                       | Impact energy   |            |                              |                 | + 20°C                 | J     | 90      |                          |     |      |     |    |
|                                       | Hardness cap/mid  |            |                              |                 |                        | HV    | 200/215 |                          |     |      |     |    |
| <b>Typical operating parameters</b>   |   | TIG        |                              |                 | MIG                    |       |         | SAW                      |     |      |     |    |
|                                       | Shielding   | Argon *    |                              |                 | Ar+2%O <sub>2</sub> ** |       |         | SS300 ***                |     |      |     |    |
|                                       | Current   | DC-        |                              |                 | DC+                    |       |         | DC+                      |     |      |     |    |
|                                       | Diameter  | 2.4mm      |                              |                 | 1.2mm                  |       |         | 2.4mm                    |     |      |     |    |
|                                       | Parameters  | 100A, 12V  |                              |                 | 260A, 26V              |       |         | 350A, 28V                |     |      |     |    |
|                                       | * Also required as a back purge for root runs.                      |            |                              |                 |                        |       |         |                          |     |      |     |    |
|                                       | ** Also proprietary Ar and Ar-He mixtures with <3%CO <sub>2</sub> . |            |                              |                 |                        |       |         |                          |     |      |     |    |
|                                       | *** <b>SSB, LA491</b> and <b>L2N</b> also suitable.                 |            |                              |                 |                        |       |         |                          |     |      |     |    |
| <b>Packaging data</b>                 | ø mm  | TIG        |                              |                 | MIG                    |       |         | SAW                      |     |      |     |    |
|                                       | 1.2   | --         |                              |                 | 15kg spool             |       |         | --                       |     |      |     |    |
|                                       | 1.6   | 2.5kg tube |                              |                 | --                     |       |         | --                       |     |      |     |    |
|                                       | 2.4   | 2.5kg tube |                              |                 | --                     |       |         | 25kg coil                |     |      |     |    |
| <b>Fume data</b>                      | MIG fume composition (wt %) (TIG and SAW fume negligible):          |            |                              |                 |                        |       |         |                          |     |      |     |    |
|                                       |   | Fe         | Mn                           | Cr <sup>3</sup> | Ni                     | Mo    | Cu      | OES (mg/m <sup>3</sup> ) |     |      |     |    |
|                                       |   | 30         | 12                           | 15              | 11                     | 1.5   | <0.5    | 3.3                      |     |      |     |    |