



## 1. SCOPE

This technical specification has the objective to define the delivery conditions for Stainless steel according to the grade which is defined in point 5. The purpose of this specification is to define the metallurgical cleanliness requirements and material composition of 316L stainless steel Billets, Rounds Rectangular and square bars required for use in Semiconductor Industry. The finished goods are primarily used as sealing parts. Other applications consists of thin wall hollow stressed parts. This material is intended for subsequent fabrication processes such as forging fabrication and then after machining, mechanical polishing, TIG/AOW operation and electro polish.

## 2. Material Designation

X2CrNiMo18-14-3  
AISI 316L  
1.4435 modified

## 3. Manufacturing

- The stainless steel shall usually be manufactured with primary melting process of Electric Arc Furnace( EAF) or Vacuum Induction Melting (VIM), with refining process of Argon Oxygen Decarburization(AOD) or Vacuum Oxygen Decarburization (VOD), followed by secondary melting process of Electro-slag Remelting (ESR) or Vacuum Arc Remelting (VAR) when needed.

## 5. General Requirements

Round Bars up to OD 76.20mm (OD 3.00")  
ASTM A276, ASTM A479/A479 M, ASME SA479, SEMI-F20-latest version,

## 6. Chemical composition (weight %)

|     | C     | Si    | Mn    | P     | S     | Cr     | Mo    | Ni     | Cu    | Nb    | Al    | Ca    | Ti    |
|-----|-------|-------|-------|-------|-------|--------|-------|--------|-------|-------|-------|-------|-------|
| Min | 0.015 | 0.400 | -     | -     | 0.005 | 16.500 | 2.300 | 12.000 | -     | -     | -     | -     | -     |
| Max | 0.030 | 0.600 | 0.500 | 0.025 | 0.010 | 18.000 | -     | -      | 0.300 | 0.050 | 0.010 | 0.020 | 0.020 |

|     | Se    | Co    | N     |
|-----|-------|-------|-------|
| Min | -     | -     | -     |
| Max | 0.020 | 0.100 | 0.060 |



## 7. Mechanical Properties

According to ASTM A479-strain hardened level 2 or ASTM A276 condition S, ASTM A370

AMS delivers random length 3,000mm – 6,000mm (-0/+200)

Fixed length can be supplied on customers request, tolerance fix length (-0/+50mm, surcharge applies)

|  | Tensile Strength | Yield Strength (0.2% offset) | Elong. in 2" or 4D | Red. Area | Hardness, (Mid radius) | TOL. OD   | Grain Size  |
|--|------------------|------------------------------|--------------------|-----------|------------------------|-----------|-------------|
| Round Bars<br>OD 5.00- OD 25.40mm      | 675.00           | 520.00                       | 25.00              | 40.00     | 240-280                | h9        | 6 and finer |
| Round Bars<br>OD 26.00 – OD<br>50.80mm | 650.00           | 500.00                       | 25.00              | 40.00     | 200-280                | h10 / k10 | 5 and finer |
| Round Bars<br>Above OD 51.00mm         | 600.00           | 480.00                       | 25.00              | 40.00     | 190-280                | k10       | 5 and finer |
| UNITS                                  | MPa min.         | MPa min.                     | % min              | % min     | HB                     | -         | -           |

## 8. Cleanliness

The inclusion content of the material shall be determined from representative samples of the material heat in accordance with ASTM E 45 Method A, but with ratings based on Plate III. Maximum allowable JK ratings at the billet stage are shown below.

| TYPE | THIN | HEAVY |
|------|------|-------|
| A    | 1.00 | 0.50  |
| B    | 1.00 | 0.50  |
| C    | 1.00 | 0.50  |
| D    | 1.00 | 1.00  |

## 9. Metallurgy

Grain size per ASTM E112 shall be 6 or finer.

Intergranular corrosion test according to ASTM A 262 practice E.

Macro etch test to be conducted for one sample per heat / size , in accordance with ASTM A604/604 M.

## 10. Surface Condition

Smooth, bright, no corrosion points,

no rust,

no cracks,

no scores no surface defects,

100% eddy current according DIN EN 10277 CLASS 3,



## 11. Internal Defect(s)

State-of-the-art measures are to be taken in order to avoid the occurrence of macroscopic internal defects.

Delivery condition: no internal defects,  
no cracks,  
no blow holes,  
no non-metallic inclusions.  
100% ultrasonic test on bars according to DIN EN 10308 quality class 3.

## 12. Delivery condition,

Printed on bars or stamped on bar end (one side only), heat# and size (applies to bars above 1")

Bars are packed in wooden crates suitable for export,

## 13. Material Test Reports,

Test certificate acc. to standards specified in the order complying to DIN EN 10204/3.1

Heat number,

Chemical composition,

Grade,

All further treatment,

Quantity delivered,

Inclusions test result,

Material free of Mercury contamination statement & Material free of Radioactivity statement

ROHS and REACH compliance,

Results, third party test(s),