

### R511 Rev C – ASTM A564 630 H1150D / H1150M (UNS S17400)

| Rev | Date     | ECN  | Issue             | Prepared by | Check/Approved |
|-----|----------|------|-------------------|-------------|----------------|
| C   | 11.01.08 | 265  | Revised/Re-issued | T.S.        | J.S.           |
| B   | 23.05.03 | 0086 | Revised/Re-issued | A.K.        | J.S.           |
| A   | 06.05.93 | 0065 | Revised/Re-issued | A.G.        | A.K.           |

| Product Form  | Standard  | Grade            | Acceptable Class |
|---|-----------|------------------|------------------|
| Forged Bar<br>Blank<br>Ring<br>Closed Die Forging<br>Rolled Bar | ASTM A564 | 630 (UNS S17400) | H1150D or H1150M |

|  |  |            |            |           |            |            |           |            |            |
|--|--|------------|------------|-----------|------------|------------|-----------|------------|------------|
| <b>Scope</b>                           | This specification outlines the modifications and additional requirements to the relevant ASTM Specifications and NACE MR-01 75 for the supply of raw material for the manufacture of Vector International sealrings and similar hollow cylindrical parts. This specification is not intended for blank parts subject to pressure loading.   |            |            |           |            |            |           |            |            |
| <b>Other Applicable Specifications</b> | ASTM 370 (Latest Issue)<br>NACE MR-01 75 (Latest Issue)  |            |            |           |            |            |           |            |            |
| <b>Heat Treatment</b>                  | Heat Treatment to be in accordance with ASTM A564 (Latest Issue) and NACE MR-01 75 to conditions H1150D or H1150M<br><b>H1150D:</b> Solution anneal at 1038±14°C (1900±25°F) and air cool or liquid quench to below 32°C (90°F), First precipitation hardening cycle at 621±14°C(1150±25°F) for 4hours min at temp and air cool or liquid quench to below 32°C (90°F).Second precipitation hardening cycle at 621±14°C (1150±25°F) for 4hours min at temp and air cool or liquid.<br><b>H1150M:</b> Solution anneal at 1038±14°C (1900±25°F) and air cool or liquid quench to below 32°C (90°F), First precipitation hardening cycle at 760±14°C(1400±25°F) for 2hours min at temp and air cool or liquid quench to below 32°C(90°F). Second precipitation hardening cycle at 621±14°C (1150±25°F) for 4hours min at temp and air cool or liquid.<br><i>Note: Full Heat Treatment Temperatures and Times to be reported.</i> |            |            |           |            |            |           |            |            |
| <b>Chemical Analysis % (Heat)</b>      |  | <b>Min</b> | <b>Max</b> |           | <b>Min</b> | <b>Max</b> |           | <b>Min</b> | <b>Max</b> |
|  | <b>C</b>   | -          | 0.07       | <b>P</b>  | -          | 0.04       | <b>Cr</b> | 15.00      | 17.50      |
|  | <b>Si</b>  | -          | 1.00       | <b>S</b>  | -          | 0.03       | <b>Cu</b> | 3.00       | 5.00       |
|  | <b>Mn</b>  | -          | 1.00       | <b>Ni</b> | 3.00       | 5.00       |           |            |            |
|  | <i>Note: Nb + Ta = 0.15-0.45</i>   |            |            |           |            |            |           |            |            |

| Mechanical Properties             |   | Min                | Max   |
|-----------------------------------|---|--------------------|-------|
|                                   | <b>Tensile(R<sub>m</sub>):</b>  | 115000psi (793MPa) | -     |
|                                   | <b>Yield (R<sub>p0.2</sub>):</b>  | 75000psi (517MPa)  | -     |
|                                   | <b>Elongation (A %):</b>  | 18                 | -     |
|                                   | <b>R. of A (Z %):</b>   | 55                 | -     |
|                                   | <b>Hardness:</b>  | -                  | 32HRC |
|                                   | <i>Note: Mechanical Testing to be carried out after final heat treatment.</i>   |                    |       |
| <b>Impact Properties</b>          | Charpy V. 27J (Ave), 20J (Min) at -46°C.<br>Lateral Expansion: 0.38mm (min).  |                    |       |
| <b>Test Sampling</b>              | Mechanical testing sampling shall be in accordance with ASTM A564 (Latest Issue), 'Mechanical Properties Requirements'.   |                    |       |
| <b>Surface Finish and Quality</b> | Material to be of sufficient quality for LPI check, LPI on finished machined parts to be undertaken by Vector International Ltd.  |                    |       |
| <b>Repair of Defects</b>          | Weld repair is not acceptable.  |                    |       |
| <b>Marking</b>                    | Material to be marked with Heat Number, Material Grade, and Vector Specification.   |                    |       |
| <b>Certification</b>              | Certification to be in accordance with EN10204-3.1: Chemical Analysis, Mechanical Analysis, Heat Treatment Report (soak times and cooling medium)/ Graphs, Mill Certificate (Wet Stamped).<br>Suppliers are requested to keep certification package as concise as possible. |                    |       |
| <b>Notes</b>                      | 1. Refer to PO for supplemental details.<br>2. Any deviation from this specification must be formally raised as a concession request prior to delivery. Certification must include concession documentation.  |                    |       |