| MATERIAL DATA SHEET | | | MDS T02 | Rev. 4 |
|---|---|---|---|---|
| ***TYPE OF MATERIAL:*** Titanium Grade 2 | | | | |
| ***PRODUCT*** | ***STANDARD*** | ***GRADE*** | ***ACCEPT. CLASS*** | ***SUPPL. REQ.*** |
| Castings | ASTM B 367 | C2 | - | S2 |
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|---|---|
| *1. SCOPE* | This MDS specifies the selected options in the referred standard and additional requirements which shall be added or supersede the corresponding requirements in the referred standard. |
| *2. QUALIFICATION* | Manufacturers of product to this MDS shall be qualified in accordance with NORSOK Standard M-650. |
| *3. MANUFACTURING PROCESS* | The manufacturing of products according to this MDS shall be carried out according to the M-650 qualified manufacturing procedure. |
| *4 HOT ISOSTATIC PRESSING* | All castings shall be subject to Hot Isostatic Pressing (HIP).<br>All castings, which due to size limitations cannot be HIP, shall be heat treated and radiographed.<br>Heat treatment is also required for all weld repairs carried out after HIP. |
| *5. α-CASE* | For castings manufactured to this MDS α-case in the casting surface shall be completely removed at the foundry from following locations:<br>- All surfaces, which shall be machined.<br>- All weld bevels including an area of 20 mm on each side of the bevel.<br>- All highly stressed areas including areas prone to fatigue.<br>Otherwise the acceptance of α -case shall be agreed between the foundry and the customer at order placement.<br>Procedure for removal of α-case shall be established.<br>*NOTE: Alpha-case (TiO) is a very hard and brittle surface layer, which is formed as a result of reaction between the molten titanium and some type of mould binders, e.g. periclase.*<br>*The thickness of the alpha-case is dependent on the cooling rate during solidification. The heavier the casting wall, the thicker the alpha-case layer.*<br>*The alpha case makes machining difficult, may cause cracking during welding and shallow micro cracks may appear during liquid penetrant examination.* |
| *6. EXTENT OF TESTING* | Tensile testing is required for each heat and HIP batch or heat treatment load. |
| *7. TEST SAMPLING* | Samples for mechanical testing shall realistically reflect the properties in the actual components.<br>Samples for production testing shall be cut from the gating system of the casting. For castings with weight 150 kg and above the test blocks shall be integrally cast with the casting.<br>Size of the test block shall be 140 mm in length and 80 mm in height with thickness (T):<br>- T = 22 mm for t ≤ 30 mm.<br>- T = 50 mm for 30 < t ≤ 60mm<br>- T = 75 mm for t > 60 mm<br>*NOTE: t = section (shell) thickness of castings. For flanged components the largest flange thickness is the ruling thickness.*<br>Test samples shall accompany the castings through HIP and any heat treatment, chemical cleaning process or any other operation that may alter metallurgical or mechanical properties. |

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*8. NON DESTRUCTIVE TESTING*

NDT operators shall be qualified in accordance with EN 473 or equivalent.

*Liquid penetrant testing:*

- Supplementary requirement S2 shall apply to all surfaces (including internal surfaces) of all castings.
- The testing shall be carried out after final machining.
- Non-machined surfaces shall be pickled prior to the testing.
- The acceptance criteria shall be to ASME VIII, Div. 1, Appendix 7.

*Radiographic testing (RT):*

- Castings shall be tested in accordance with ASME VIII div.1 Appendix 7.
- The number of casting to be tested per lot shall be according to table below.

| *Extent of RT based on pressure class and nominal size:* | | | |
|---|---|---|---|
| *Pressure Class:* | | *≤ 150* | *300* |
| Extent of RT | 10% | ≥ 10” | ≥ 10” |
| | 100% | Not applicable | Not applicable |

- Pilot cast of each pattern shall be 100% RT.
- Castings shall be tested in the critical areas as defined by ANSI B16.34, abrupt changes in sections and at the junctions of risers, gates or feeders to the casting.
- When spot examination (10%) is specified, minimum one casting in any order shall be examined. If one test fails two more components shall be tested, and if any of these two fail all items shall be tested.

*9. MARKING*

The component shall be marked to ensure full traceability to melt and heat treatment lot.

*10. CERTIFICATION*

The material manufacturer shall have a quality system certified in accordance with ISO 9001 and the system shall have undergone a specific assessment for the relevant materials.

The material certificate shall be issued in accordance with EN 10204 Type 3.1 and shall include the following information:

- Name of HIP manufacture.
- HIP parameters (e.g. temperature, time at temperature and pressure).
- If HIP is replaced by radiography.
- If heat treated according to sect. 3, the heat treatment conditions shall be stated.