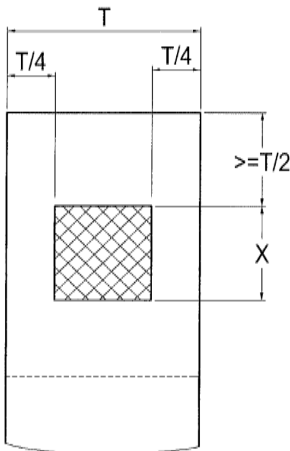
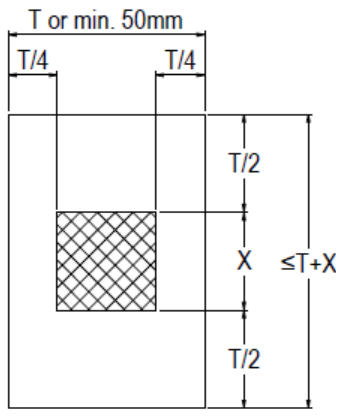


<b>MATERIAL DATA SHEET</b>			<b>MDS D46</b>	<b>Rev. 4</b>
<b>TYPE OF MATERIAL:</b> Ferritic / Austenitic Stainless Steel, Type 22Cr duplex				
<b>PRODUCT</b>	<b>STANDARD</b>	<b>GRADE</b>	<b>ACCEPT. CLASS</b>	<b>SUPPL. REQ.</b>
Castings	ASTM A 995	4A (UNS J92205)	-	S6, S8, S20
				Page 1 of 2
1. SCOPE	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 and the manufacturing process used for manufacturing of product to this MDS shall be qualified in accordance with NORSOK standard M-650.			
3. MANUFACTURE	The manufacturing of products according to this MDS shall be carried out according to the M-650 qualified Manufacturing Procedure.			
4. STEEL MAKING	The steel melt shall be with AOD or equivalent refining.			
5. HEAT TREATMENT	<p>The castings shall be solution annealed followed by water quenching.</p> <p>Components shall be placed in such a way as to ensure free circulation of air and water around each component during the heat treatment process including quenching.</p>			
6. CHEMICAL COMPOSITION	N = 0.14 - 0.30 %			
7. IMPACT TESTING	<p>Charpy V-notch testing to ASTM A 703 supplementary requirement S8 is required and the test temperature shall be - 46 °C.</p> <p>The minimum absorbed energy shall satisfy 45 J average and 35 J single.</p>			
8. MICROGRAPHIC EXAMINATION	<p>The test specimens shall be extracted from the same area as specimens for mechanical testing and near surface. The test area shall be minimum 10 x 10 mm. The ferrite content shall be determined according to ASTM E 562 or equivalent and shall be within 35 - 55 %. The microstructure, as examined at minimum 200 X magnification on a suitably etched specimen and shall be free from intermetallic phases and precipitates.</p>			
9. EXTENT OF TESTING	A full set of tensile, impact, hardness tests and microstructure examinations shall be made for each heat and heat treatment load including any PWHT. A test lot shall not exceed 5 000 kg.			
10. TEST SAMPLING	<p>Samples for mechanical testing shall realistically reflect the properties in the actual components. Thickness of the test block shall be equal to the thickness of the actual components. For flanged components the largest flange thickness is the ruling section.</p> <p>Dimensions of test blocks and location of test specimens within the test blocks are shown in figures 1 and 2 for integral and gated test blocks, respectively. The test specimens shall be taken within the cross hatched area and in a distance of T/4 from the ends. When thickness "T" of test block is <math>\leq 50\text{mm}</math> the longitudinal axis of test specimens shall be located in the centre of test blocks.</p> <p>During any PWHT the test block shall be tack welded onto the casting.</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>Fig.1 - Integral test block</p> </div> <div style="text-align: center;">  <p>Fig. 2 - Gated test block</p> </div> </div>			

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<b>11. NON DESTRUCTIVE TESTING</b>	<p>NDT operators shall be certified in accordance with EN 473 or equivalent.</p> <p><i>Liquid penetrant testing:</i> Supplementary requirement S6 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.</p> <p><i>Radiographic testing (RT):</i></p> <ul style="list-style-type: none"> <li>- Castings shall be tested in accordance with ASME VIII div.1 appendix 7.</li> <li>- The number of castings to be tested per lot shall be according to table below.</li> </ul> <table border="1"> <thead> <tr> <th colspan="8">Extent of RT based on pressure class and nominal size:</th> </tr> <tr> <th colspan="2">Pressure Class:</th> <th>≤ 150</th> <th>300</th> <th>600</th> <th>900</th> <th>1500</th> <th>≥ 2500</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Extent of RT</td> <td>10%</td> <td>≥ 10"</td> <td>≥ 10"</td> <td>≥ 2"</td> <td>≥ 2"</td> <td>≥ 2"</td> <td>≥ 2"</td> </tr> <tr> <td>100%</td> <td>Not applicable</td> <td>Not applicable</td> <td>≥ 20"</td> <td>≥ 16"</td> <td>≥ 6"</td> <td>≥ 6"</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>- Pilot cast of each pattern shall be 100% RT.</li> <li>- Castings shall be tested in the critical areas as defined by ASME B16.34, abrupt changes in sections and at the junctions of risers, gates or feeders to the casting.</li> <li>- When spot examination (10%) is specified, minimum one casting in any order shall be tested. If one test fails, two more components shall be tested, and if any of these two fail all items represented shall be tested.</li> </ul>						Extent of RT based on pressure class and nominal size:								Pressure Class:		≤ 150	300	600	900	1500	≥ 2500	Extent of RT	10%	≥ 10"	≥ 10"	≥ 2"	≥ 2"	≥ 2"	≥ 2"	100%	Not applicable	Not applicable	≥ 20"	≥ 16"	≥ 6"	≥ 6"
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<b>12. SURFACE FINISH</b>	White pickled. Machined surfaces do not require pickling.																																				
<b>13. REPAIR OF DEFECTS</b>	<p>ASTM A 703 supplementary requirement S20 shall apply.</p> <p>Post weld heat treatment (PWHT) is required after all weld repairs. For minor weld repairs, as defined by ASTM A995, the PWHT may be excluded provided the welding procedure qualification shows that all specified properties, as specified in this MDS, can be fulfilled.</p> <p>The repair welding procedure shall be qualified in accordance with ASTM A 488 or ISO 11970 and this MDS. The repair welding procedure qualification shall include the following:</p> <ul style="list-style-type: none"> <li>- Qualified on a cast plate of the same grade (UNS-number) which shall be welded;</li> <li>- Change of specific make of filler metal (brand name) requires re-qualification;</li> <li>- Examination of microstructure of base material and weld zone. The ferrite content shall be 35 % to 55 % for the base material and 35 % to 65 % for the weld metal;</li> <li>- Charpy V-notch testing as specified above, with two sets each 3 specimens, with notch located in weld metal and fusion line, respectively.</li> </ul>																																				
<b>14. MARKING</b>	The component shall be marked to ensure full traceability to melt and heat treatment lot.																																				
<b>15. CERTIFICATION</b>	<p>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.</p> <p>The material certificate shall be in accordance with EN 10204 Type 3.1, and shall include the following information:</p> <ul style="list-style-type: none"> <li>- Steel manufacturer, melting and refining practice;</li> <li>- Heat treatment condition. (Solution annealing temperature and holding time shall be stated.)</li> </ul>																																				