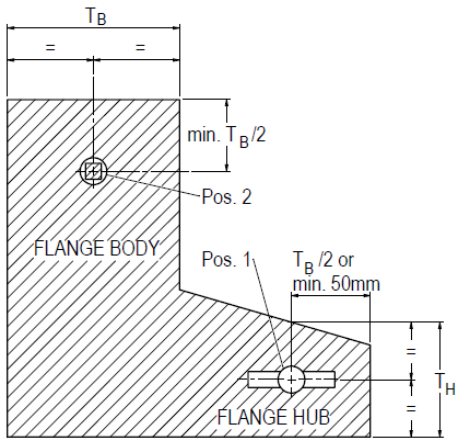


MATERIAL DATA SHEET			MDS C21	Rev. 4
TYPE OF MATERIAL: Carbon Steel Type 360LT				
PRODUCT	STANDARD	GRADE	ACCEPT. CLASS	SUPPL. REQ.
Forgings	ASTM A 694	F52		S55
				Page 1 of 2
1. SCOPE	This MDS specifies the selected options in the referred standard and additional requirements which shall be added or supersede the corresponding requirements in the referred standard.			
2. HEAT TREATMENT	For products delivered in quenched and tempered condition and with weld end thickness > 19.0 mm the minimum tempering temperature shall be 620 °C. Components shall be placed in such a way as to ensure free circulation around each component during the heat treatment process including quenching.			
3. MANUFACTURE	Valves with nominal size NPS 4 and smaller may be machined from solid forgings in the terminology of ASTM A 788 on the following conditions: - Purchasers' acceptance shall be obtained in each case. - The forging shall be tested and certified according to this MDS. - When bar or block forgings with reference thickness 100 mm or greater is used, tensile and impact specimens shall be taken in both longitudinal and transverse direction. Acceptance criteria shall be the same in both directions. All destructive test specimens shall be taken from the centre of the bar/block. - 100 % magnetic particle testing, A 961 SR S55, shall apply to all finished products.			
4. CHEMICAL COMPOSITION	C ≤ 0.20 %; Mn = 0.90 - 1.60 %; Si = 0.10-0.35 %; S ≤ 0.025 %; P ≤ 0.035 %; Ti ≤ 0.05 %; Nb ≤ 0.04 %; Al ≤ 0.06 %; N ≤ 0.015 %; V+Nb+Ti ≤ 0.10 %; CE = C+Mn/6+(Cr+Mo+V)/5+(Cu+Ni)/15 ≤ 0.43.			
5. IMPACT TESTING	Charpy V-notch testing according to ASTM A 370 at - 46 °C is required for the thickness ≥ 6 mm. The minimum absorbed energy for full size specimen shall be 40 J average and 30 J single. Reduction factors for sub-size specimens shall be: 7.5 mm - 5/6 and 5 mm - 2/3.			
6. EXTENT OF TESTING	A test lot shall not exceed 2000 kg for forgings with as forged weight ≤ 50 kg, and 5000 kg for forgings with as forged weight > 50 kg.			

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7. TEST SAMPLING	<p>Samples for production testing shall realistically reflect the properties in the actual components.</p> <p>For products forged by the closed die method, the test specimen shall be obtained from a sacrificial product.</p>  <p>Fig. 1 - Location of test specimens for flanges</p> <p>50mm from the second heat treated surface.</p> <p>Test location other forgings and HIP products: For forgings having maximum section thickness, $T \leq 50$ mm, the test specimen shall be taken at mid thickness and its mid length shall be at least 50 mm from any second surface or at equal distance from the second surfaces.</p> <p>For forgings having maximum section thickness, $T > 50$ mm, the test specimens shall be taken at least $\frac{1}{4} T$ from the nearest surface and mid-length of test specimens at least T or 100 mm, whichever is less, from any second surface. For all forgings sketches shall be established showing type, and size of test samples and location for extraction of test specimens.</p> <p>NOTE: For closed die forged components and flanges exceeding 80 kg it is recognized that alternative test may be used. Such alternative test sampling shall be qualified and shall comprise comparative testing of sacrificial forgings and the proposed alternative test sample.</p> <p>For products forged by the open die or by the ring rolling method, the test specimen shall be obtained from a sacrificial forging or from an integral prolongation. For flanges the thickness of the prolongation shall minimum be equal to the hub thickness (T_H) as shown in fig. 1.</p> <p>Integrated test blocks shall be used for components manufactured by HIP.</p> <p>Test location flanges: The basic test location is mid-thickness of hub (T_H) in a distance $T_B/2$ or minimum 50 mm from weld end, see fig. 1, position 1.</p> <p>If test specimens cannot be extracted from position 1 test specimens shall be extracted from flange body position 2.</p> <p>When prolongations are used test specimens shall be taken in a distance $T_B/2$ or minimum</p>			
8. NON DESTRUCTIVE TESTING	<p>Supplementary requirement A 961 S55, magnetic particle testing, shall apply to 10 % of all forgings per lot, The testing shall be carried out after final machining.</p> <p>The acceptance criteria shall be to ASME VIII Div. 1, Appendix 6.</p> <p>NDT operators shall be certified in accordance with EN 473 or equivalent.</p>			
9. REPAIR OF DEFECTS	Weld repair of base material is not acceptable.			
10. MARKING	The component shall be marked to ensure full traceability to melt and heat treatment lot.			
11. CERTIFICATION	<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 issued in accordance with EN 10204 Type 3.1, and shall include the following information:</p> <ul style="list-style-type: none"> - Heat treatment condition (For QT condition, austenitisation and tempering temperature and quenching medium shall be stated.) 			