

MATERIAL DATA SHEET			MDS C11	Rev. 4
TYPE OF MATERIAL: Carbon Steel Type 235LT				
PRODUCT	STANDARD	GRADE	ACCEPT. CLASS	SUPPL. REQ.
Wrought fittings	ASTM A 420	WPL6	-	S51, S53, S59, S69
Welded pipes	ASTM A 671	CC60, CC70	t ≤ 19 mm: Class 12 t > 19 mm: Class 22, 32, 42	S2, S7, S14 S2, S7, S14
Seamless pipes	ASTM A 333	6	-	-
Forgings	ASTM A 350	LF2	Class 1	S6, S55
Plates	ASTM A 516	60, 70		S5
				Page 1 of 3
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. MANUFACTURING	<p><i>Fittings and forgings:</i> During heat treatment components shall be placed in such a way as to ensure free circulation around each component during the heat treatment process including possible quenching operation.</p> <p><i>Valves:</i></p> <p>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:</p> <ul style="list-style-type: none"> - 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, ASTM A 961 supplementary requirement S55, shall apply to all finished products, ref. Item 8 below. 			
3. CHEMICAL COMPOSITION	<p><i>All products:</i> C ≤ 0.20 %; S ≤ 0.025 %; P ≤ 0.025 %;</p> $CE_{(IIW)} = C + Mn/6 + (Cr+Mo+V)/5 + (Cu+Ni)/15 \leq 0.43.$ <p><i>Seamless pipes to A 333:</i> Cr ≤ 0.40, Ni ≤ 0.40, Mo ≤ 0.15, Cu ≤ 0.40, (Nb+V+Ti) ≤ 0.10.</p>			
4. IMPACT TESTING	Charpy V-notch testing at - 46 °C is required for the thickness ≥ 6 mm. For flanges apply the thickness at the weld neck. The minimum absorbed energy for full size specimens shall be 27 J average and 20 J single. Reduction factors for sub-size specimens shall be: 7.5mm - 5/6 and 5 mm - 2/3.			
5. EXTENT OF TESTING	<p><i>Fittings to A 420:</i> ASTM A 960 supplementary requirement S51 shall apply.</p> <p>Impact testing shall be carried out to the same extent as tensile testing.</p> <p><i>Pipes to A 671:</i> Supplementary requirement S14 shall apply.</p> <p>Supplementary requirement S2 shall apply to the same extent as for tensile testing.</p> <p><i>Forgings to A 350:</i> One set of tensile and impact testing shall be carried out for each heat and heat treatment load. 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.</p>			

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				Page 2 of 3
<p>6. TEST SAMPLING</p> <p>Samples for production testing shall realistically reflect the properties in the actual components. For products forged by the closed die method, the test specimen shall be obtained from a sacrificial product.</p> <div data-bbox="450 768 908 1205" data-label="Image"> </div> <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 50mm from the second heat treated surface.</p> <p>Test location other forgings and HIP products: For forgings having maximum section thickness, $T \leq 50 \text{ mm}$, 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, $T > 50 \text{ mm}$, the test specimens shall be taken at least $1/4 T$ 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>7. NON DESTRUCTIVE TESTING</p> <p>All products: NDT operators shall be certified in accordance with EN 473 or equivalent.</p> <p>Fittings to A 420: Ultrasonic testing is not acceptable as replacement of radiographic testing. ASTM A 960 supplementary requirement, S53 and S69, magnetic particle testing, shall apply to 10 % of all fittings (same test lot as defined for mechanical testing) for nominal thickness $< 12.7 \text{ mm}$ and 100 % of all fittings for nominal thickness $\geq 12.7 \text{ mm}$. The testing shall be carried out after calibration.</p> <p>The acceptance criteria shall be to ASME VIII, Div. 1, Appendix 6.</p> <p>Forgings to A 350: ASTM A 961 supplementary requirement S55, magnetic particle testing, shall apply to 10 % of all forgings (same test lot as defined for mechanical testing) with NPS > 2. The testing shall be carried out after final machining.</p> <p>The acceptance criteria shall be to ASME VIII, Div. 1, Appendix 6.</p>				

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				Page 3 of 3
8. REPAIR OF DEFECTS	Weld repair of base material is not acceptable.			
9. MARKING	Heat treatment load number shall be permanently marked on the component where testing is required per heat treatment load.			
10. 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.) 			