MATERIAL DATA SHEET MDS D52 Rev. 4

TYPE OF MATERIAL: Ferritic / Austenitic Stainless Steel, Type 25Cr duplex

PRODUCT	***STANDARD***	***GRADE***	***ACCEPT. CLASS***	***SUPPL. REQ.***
Welded pipes	ASTM A 928	UNS S32550 UNS S32750 UNS S32760	Class 1, 3 and 5	S3

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. This MDS is based on the mechanical properties of A 240 UNS S32760.
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. STEEL MAKING	The steel melt shall be refined with AOD or equivalent.
4. MANUFACTURING PROCESS	The manufacturing of products according to this MDS shall be carried out according to the M-650 qualified manufacturing procedure.
5. HEAT TREATMENT	The pipes shall be solution annealed followed by water quenching. Pipes shall be placed in such a way as to ensure free circulation around each pipe during the heat treatment process including quenching.
6. MANUFACTURING	Welding shall be carried out by qualified welders according to qualified procedures approved by a 3rd party organization.
7. CHEMICAL COMPOSITION	PREN = % Cr + 3.3 % Mo + 16 % N ≥ 40.0
8. TENSILE TESTING	$R_{p0.2} \geq 550$ MPa; $R_m \geq 750$ MPa; A ≥ 25 %
9. IMPACT TESTING	Charpy V-notch testing according to ASTM A 370 at - 46 °C is required for thickness ≥ 6 mm. The minimum absorbed energy shall be 45 J average / 35 J single. Two sets, each 3 specimens, shall be carried out with notch located in base material and weld meat, respectively. Reduction factors for sub-size specimens shall be: 7.5 mm - 5/6 and 5 mm - 2/3.
10. CORROSION TEST	Corrosion test according to ASTM G 48 Method A is required. Test temperature shall be 50 °C and the exposure time 24 hours. The test shall expose the external and internal surfaces and a cross section surface including weld zone in full wall thickness. Cut edges shall be prepared according to ASTM G48. The whole specimen shall be pickled before being weighed and tested. Pickling may be performed for 5 minutes at 60 °C in a solution of 20 % HNO_3 + 5 % HF. The acceptance criteria are: - No pitting at 20 X magnification - The weight loss shall be less than 4.0 g/m^2
11. MICROGRAPHIC EXAMINATION	The micrographic examination shall cover the near surfaces and mid-thickness region of the pipe including the weld and heat affected zone. The ferrite content shall be determined according to ASTM E 562 or equivalent and shall be within 35-55 % for base material and 35-65% for weld metal. The microstructure, as examined at minimum 400 X magnification on a suitably etched specimen, shall be free from intermetallic phases and precipitates.
12. EXTENT OF TESTING	Tensile, impact, hardness, corrosion and microstructure examination shall be carried out for each lot. The lot is defined as follows: - For batch furnace a lot is defined as maximum 60 m of pipe of the same heat, size and heat treatment charge. - For continuous heat treatment furnace the lot definition in the ASTM standard applies.
13. TEST SAMPLING	Samples for production testing shall realistically reflect the properties in the actual components.
14. WELDING	The PQR/WPQR shall be qualified in accordance with ASME IX or ISO 15614-1 and shall include the same examinations as for the production testing. The qualification shall be carried out on the same material grade (UNS number) as used in production. Change of specific make (brand name) of welding consumables requires requalification.

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15. NON DESTRUCTIVE TESTING	Supplementary requirement S3, penetrant testing, according to ASME V Article 6 shall apply to the weld of 10 % of the pipes (same test lot as defined for mechanical testing) delivered. The weld of each examined pipe shall be ground flush in a length of 100 mm prior to penetrant testing. The testing shall be carried out after calibration and pickling. Acceptance criteria shall be to ASME VIII, Div 1, Appendix 8. NDT operators shall be certified in accordance with EN 473 or equivalent.
16. SURFACE FINISH	White pickled.
17. REPAIR OF DEFECTS	Weld repair of base material is not acceptable. For repair of welds the same requirements to PQR/WPQR shall apply as for production welding.
18. MARKING	The component shall be marked to ensure full traceability to melt and heat treatment lot.
19. 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 in accordance with EN 10204 Type 3.1, and include the following information: - Manufacturer of the starting material for the finished product. - Steel manufacturer, melting practice and refining method. - Heat treatment condition. (Solution annealing temperature and holding time shall be stated.)