

	Technical Delivery Condition (TDC) FOR SEAMLESS STEEL PIPES	Doc Ref:	TDC:RTF:303
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1.0 SCOPE

1.1. This TDC specifies the requirements for supply of seamless steel pipes for use as fan shafts.

1.2. Steel grades covered are:

- a) P235TR2 of EN 10216-1
- b) SA 106 Gr B/C
- c) 13 Cr Mo4-5 of EN 10216-2
- d) 16 M03 of EN 10216-2
- e) SA 335 P12 and P22

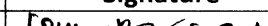
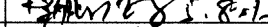
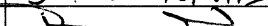
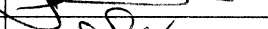
2.0 Chemistry and mechanical properties

2.1. Chemistry shall be as per specification.

2.2. Mechanical properties and heat treatment required shall be as per following table and acceptance norm is as per respective specifications.

Material	Heat Treatment Condition	Mechanical Properties at room Temp.	Additional mechanical properties	Remarks
*P235TR2 of EN 10216-1	Normalized or normalizing formed	Tensile, yield, % elongation	--	Old designation St 37
SA 106 Gr B/C	Normalizing	Tensile, yield, % elongation	--	--
*16M03 of EN 10216-2	Normalized or normalizing formed	Tensile, yield, % elongation and impact at + 20°C	Yield strength at 450°C	Old designation 15 M03
*13Cr M04-5 of EN 10216-2	Normalizing/ Hardening and tempering	-do-	-do-	Old designation 13 Cr Mo44
SA 335 P12 & SA 335 P22	Normalizing and tempering	Tensile, yield, % elongation	--	--

*Note: Mechanical proprieties for the tube thickness above 60 mm shall be same as that of 60 mm thick tube.

Prepared By	Reviewed By	Signature	Approved By
	Engineering (fans)	 12/8/13	 12/08/2013
	QC (Proc)	 10/8/13	
	Material Planning		
	Purchase		
	QA		
Issued By QUALITY ASSURANCE			

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3.0 Dimensional Control

3.1. The pipes may be machined/treated both on the inner and outer diameter to meet the tolerances as mentioned below.

- Internal diameter shall be within $\pm 1\%$ of specified value subject to maximum of $\pm 4\text{mm}$.
- External diameter shall be within 0 to +3 mm of specified value.
- Concentricity of the bore shall be within 0.5 mm and out of straightness shall not be more than 1 mm on entire length.
- Surface roughness shall be Ra 6.3 microns or finer.
- Pipe ends shall be square to the pipe axis.

4.0 Ultrasonic examination

- Reference standard: ASTM E 213.
- Scanning direction: Both circumferential directions.
- Calibration notch:
 - V or U type
 - Depth: 5% of specified tube thickness subject to minimum of 0.3mm and maximum of 1.5 mm.
 - Width: Maximum 1.5 mm.

5.0 Marking, Preservation and Packing:

5.1. Pipe shall be stamped either on the face or at a distance of 300 mm from pipe end with the following details.

- Supplier name/emblem
- Specification and grade
- Melt No.
- Size

5.2. Each pipe shall be supplied loose with rust inhibitive **paint** on inner and outer surfaces to withstand marine corrosion.

6.0 Test Certificate

6.1. The supplier shall furnish test certificate in English as per 3.1 of EN 10204 for the following properties.

- Chemistry - melt wise
- Tensile strength, yield strength, % of elongation, impact energy, Elevated temperature yield strength --- (see Cl.2.2.)
- Ultrasonic examination results -- (see Cl.4.0)

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Record of revisions

Rev No.	Clause	Revision made	Date
00	--	Original issue	15 12 93
01	--	Title Modified	16 08 95
	1.3	Deleted	
	2.1	Mechanical requirements are Brought under this clause.	
	2.2	Pipe machining requirements Included	
	3.1	Normalizing for St.37 and SA 106 Gr.B/C included.	
	4.0	UT requirements are detailed	
02	8.0	Clause modified to include 3.1 Format of TC	23 05 97
	--	Clause Nos. are updated	
	1.3	Clause added	
	2.2	Editorial correction	
	5.1	Tolerance on thickness removed & tolerance on OD is included	
03	5.2	Deleted	08 12 98
	1.3	Clause Added	
	1.2 & 2.1	SA 106 Gr.C added	
	2.2	Ra for surface roughness is included	
04	5.3	Straightness requirement added	02 05 02
	--	Totally modified	
05	--	Material designation modified inline with revised standard. Grades SA 335 P22 and P12 are added and St 35.8 is deleted.	01 06 07
06	5.2	Revised as Rust inhibitive paint.	05 08 13