

GOST 9940-81 SEAMLESS HOT-FINISHED STEEL TUBES OF CORROSION-RESISTANT STEEL

This standard specifies both the size range and technical requirements to seamless hot-finished tubes of corrosion-resistant steels.

Tubes to this standard are used for pipelines for aggressive media, as semiproducts for pressure vessels and structures intended for high pressure, high temperature uses.

Size range.

This standard specifies a wide size range of corrosion resistant tubes produced on a large-scale basis with diameters 57 to 325 mm and wall thickness 3.5 to 28 mm (See Table 1).

Tubes with outside diameter over 325 mm are manufactured in separate lots from centrifugally cast billets to separate specifications.

Tubes with outside diameter 57 to 73 mm are not manufactured at present.

Some limitations on the size range of tubes of certain steel grades are imposed:

Марка стали (steel grade)	Предельный диаметр, мм Maximum diameter, mm
08X17T, 15X28, 12X17, 10X17H13M2T	219
8X17H15M3T	159
09X14H19B2BP	168
10X23H18	108
08X18H12B, 08X22H6T, 08X20H14C2	108

Tube length is specified in the order, it can be random (1.5 to 10 m), specified (not over 3.0 to 8.5 m depending on size; shorter length applies to heavier wall tubes, multiple within specified with 5mm allowance per cut with minimum multiplicity of 300 mm).

Table 1 Size range and maximum size deviations of GOST 9940-81

Outside diameter, mm	Wall thickness, mm	Maximum deviations, percent			
		of outside diameter, accuracy		of wall thickness, accuracy	
		Normal	Improved	Normal	Improved
76; 83	3.5; 4.0; 4.5; 5.0; 5.5; 6.0; 6.5; 7.0; 7.5; 8.0; 8.5; 9.0; 9.5; 10.0	± 1.5	(+ 1.00) - (- 1.25)	для S ≤ 8.0 for t ≤ 8.0 (+ 20.0) - (- 15.0)	(+ 12.5) - (- 15.0)
89	3.5-10.0; 11.0; 12.0; 13.0; 14.0			для S > 8.0 for t > 8.0	
95	5.0-14.0; 15.0; 16.0			± 15.0	(+ 12.5) - (- 15.0)
102; 108	5.0-16.0; 17.0; 18.0; 19.0; 20.0				
114	5.0-20.0; 22.0				
121; 127	5.0-22.0; 24.0; 25.0; 26.0				
133; 140	4.0-26.0				
146; 152;		± 1.5	(+ 1.00) - (- 1.25)	для S ≤ 10.0 for t ≤ 10.0	
159	4.0-26.0			(+ 20.0) - (- 15.0)	(+ 12.5) - (- 15.0)
168	6.5-26.0				
180	8.0-26.0; 28.0			для S = 11.0 ÷ 20.0 for t = 11.0 ÷ 20.0	
194	9.0-28.0			± 15.0	(+ 12.5) - (- 15.0)
219	10.0-28.0				
245	11.0-25.0				
237	11.0-20.0				
325	11.0-16.0			для S > 20.0 for t > 20.0 (+ 12.5) - (- 15.0)	± 12.5

Maximum deviations of diameter and wall thickness depend on the size range and are calculated as percent to size specified in Table above. When requested by the customer, tubes shall be delivered with any combination of maximum deviations for the diameter and wall thickness, e.g., normal accuracy for diameter in combination with improved accuracy for wall thickness.

Tolerance for multiple and specified tube lengths: 1.5 mm; tube curvature per meter length shall not exceed the values given below:

- for wall thickness 10 mm and lower: 1.5 mm;
- for wall thickness 10 to 20 mm: 2.0 mm;
- for wall thickness over 20 mm: 4.0 mm.

Technical requirements within the scope of this standard refer to applicable steel grades, mechanical properties and testing requirements.

Tubes can be delivered in steel grades to GOST 5632-72 (table 2).

For heavy-wall tubes of austenitic steel grades with the diameter to wall thickness ratio equal to 8 and less tensile strength of 20 MPa is permissible.

Properties. Tubes of corrosion-resistant steel grades undergo guaranteed hydraulic test; the test pressure is calculated from the existing formulas. The permissible tension (MPa) at hydraulic testing shall be equal to 40 % of the tensile strength for the applicable steel grade.

When requested by the customer, expansion test is carried out for austenitic steel tubes with wall thickness under 10 mm. Tubes of steel grades 04H18N10, 10H23N18, 08H17N15M3T, 08H18N10, 08H18N10T, 08H18N12B, 08H18N12T, 08H20N14C2, 10H17N13M2T, 12H18N9, 12H18N10T, 12H18N12T, 17H18N9, 08H22N6T are expansion-tested up to the moment of 10 % increase of the initial tube diameter.

When requested by the customer, austenitic tubes with wall thickness under 10 mm undergo flattening test.

Table 2 Mechanical properties of seamless hot-finished tubes of corrosion-resistant steel

Steel grade	Tensile strength, MPa	Elongation, %	Steel grade	Tensile strength, MPa	Elongation, %
08X13	373	22	08X18H12B	510	38
08X17T	373	17	08X18H12T	510	40
12X13	392	21	08X20H14C2	510	35
12X17	441	17	10X17H13M2T	530	35
15X28	441	17	12X18H9	530	40
15X25T	441	17	12X18H10T	530	40
04X18H10	441	40	12X18H12T	530	40
10X23H18	490	37	17X18H9	569	40
08X17H15M3T	510	35	08X22H6T	589	24
08X18H10	510	40			
08X18H10T	510	40			

Distance H between the plates is calculated according to the formulas given elsewhere.

Mechanical properties of tubes are given in Table above.

Surface quality is characterized by inadmissible defects such as cracks, deep scratches, tears, laps etc., and admissible ones originating from the method of manufacture and not affecting the minimum specified wall thickness.

Machining (grinding, turning, boring) of tubes for defect elimination is permissible unless the minimum wall thickness and diameter are affected.

On the buyer's request tube surface shall be scale-free.

When specified in the order, inter-crystalline corrosion test is carried out for steel grades 10H17N13M2T, 08H17N15M3T, 04H18N10, 08H18N10, 12H18N9, 08H18N10T, 12H18N10T, 08H18N12T, 12H18N12T, 08H18N12B.

Non-destructive examination of tubes is carried out on customer's request.

Testing procedures are given in the following documents:

- a) chemical composition: GOST 12344-88, 12346-78, 12347-88, 12348-88, 12365-84, 20580-81;
- b) inter-crystalline corrosion test: GOST 6032-89;
- c) non-destructive test: on agreement.