

## DIN 17121-84 SEAMLESS CIRCULAR STEEL TUBES FOR STRUCTURAL STEEL WORK

## 1. Field of application

1.1 This standard applies to seamless circular tubes made from the steels listed in tables 1 and 2 These tubes are used in structural steelwork (as in building and civil engineering, tubular steel construction, bridge and crane construction, etc.).

## 1.2 This standard does not apply to

a) - welded circular unalloyed steel tubes not subject to special requirements (see DIN 1629, at present at the stage of draft);

- welded circular unalloyed steel tubes subject to special requirements (see DIN 1626, at present at the stage of draft);

- high-performance welded circular unalloyed steel tubes (see DIN 1630, at present at the stage of draft);

- welded circular fine grain steel tubes for structural steelwork (see DIN 17124, at present at the stage of draft);

b) steel tubes for working scaffolds (see DIN EN 39),

Grade	Mfg. Process	Chemical composition (%)								
		C	Si	Mn	P	S	Ni	Cr	Mo	Others
RSt37-2	S	0.17Max	-	-	0.050Max	0.050Max	-	-	-	N 0.009Max
St37-3	S	0.17Max	-	-	0.040Max	0.040Max	-	-	-	-
St44-2	S	0.21Max	-	-	0.050Max	0.050Max	-	-	-	N 0.009Max
St44-3	S	0.20Max	-	-	0.040Max	0.040Max	-	-	-	-
St52-3	S	0.23Max	-	-	0.040Max	0.040Max	-	-	-	-

Grade	Material number	Tensile Test MPa or N/mm <sup>2</sup>		Remarks (Similar to JIS)
		Min Yield point	Tensile Strength	
RSt37-2	1.0038	t 16mmMax 235 16mm<t 40mmMax 225 40mmmax<t 65mmMax 215	340~470	-
St37-3	1.0116	t 16mmMax 275 16mm<t 40mmMax 225 40mmmax<t 65mmMax 215	340~470	-
St44-2	1.0044	t 16mmMax 275 16mm<t 40mmMax 265	410~540	STK400

		40mmmax<t 65mmMax 255		
St44-3	1.0144	t 16mmMax 275 16mm<t 40mmMax 265 40mmmax<t 65mmMax255	410~540	STK400
St52-3	1.0570	t 16mmMax355 16mm<t 40mmMax 345 40mmmax<t 65mmMax 335	490~630	STK500

4.2.3. If special requirements are made on the tubes (e.g. with regard to galvanizing) this shall be agreed at the time of ordering.

Steel grade		Type of deoxidation  1)	Chemical composition, % by mass								
Symbol	Material number		Cast analysis				Addition of nitrogen mixing elements (e.g. not less than 0.020%) Al total)	Product analysis			
			C	P	S	N 2)		C	P	S	N 2)
			max					max			
RSt 37-2	1.0038	R	0.17	0.050	0.050	0.009	-	0.19	0.060	0.060	0.010
St 37-3	1.0116	RR	0.17	0.040	0.040	-	Yes	0.19	0.050	0.050	-
St 44-2	1.0044	R	0.21	0.050	0.050	0.009	-	0.24	0.060	0.060	0.010
St 44-3	1.0144	RR	0.20	0.040	0.040	-	Yes	0.23	0.050	0.050	-
St 52-3 3)	1.0570	RR	0.22	0.040	0.040	-	Yes	0.24	0.050	0.050	-
1) R killed (including semi-killed), RR fully killed.											
2) A content in excess of the maximum value stated is permitted if a phosphosphorus content less than the maximum specified by 0.005% P per 0.001% N is observed. The nitrogen content shall not, however, exceed a value of 0.012% N in the cast analysis and 0.014% N in the product analysis.											
3) The content shall not exceed 0.55% Si and 1.60%Mn in the cast analysis or 0.60% Si and 1.70% Mn in the product analysis.											

#### 4.3. Chemical composition

The values specified in table 1 shall apply for the chemical composition of the steels (cast analysis 1) and product analysis) (the values are in accordance with the specifications for the corresponding steel grades given in DIN 17 100), Slight deviations from the values stated are permitted if the mechanical properties of the tube conform to the present standard and weldability is not impaired.

#### 4.4. Mechanical properties

The values listed in table 2 and obtained under the test conditions specified in clause 5 shall apply for the yield stress, tensile strength, elongation after fracture and impact energy of the tubes in the as delivered condition.

The values of wall thickness exceeding 65mm shall be agreed at the time of ordering.

Steel grade		Upper yield stress ReH 1) for wall thicknesses, in mm.			Tensile strength	Elongation after fracture A 5		Impact energy Av 2) (ISO V-notch longitudinal test pieces)		
Symbol	Material number	≤ 16	>16 ≤40	40 ≤60		Rm N/mm <sup>2</sup>	Longitudinal	Transverse	Test temperature °C	J min
		N/mm <sup>2</sup> min					% min			
RSt 37-2	1.0038	235	225	215	340 to 470	26	24	+20	27	
St 37-3	1.0116	235	225	215	340 to 470	26	24	-20	27	
St 44-2	1.0044	275	265	255	410 to 540	22	20	+20	27	
St 44-3	1.0144	275	265	255	410 to 540	22	20	-20	27	
St 52-3	1.0570	355	345	225	490 to 630	22	20	-20	27	

1) If the yield stress is not marked, the 0.2% proof stress (Rp 0.2) shall be determined.

2) Average value from three only one individual value may fall short of the minimum average value of 27 J, and this by not more than 30%, See subclause 5.4.2. and subclause 5.5.2 for narrower test pieces.

However, as specified in DIN 8528 Part 1, weldability does not only depend on the steel grade, but also on the conditions under which welding is carried out, on the design and on the operating conditions of the structural component.

Table 3. Types of length and permissible deviations in length

Type of length		Permissible deviations mm
Manufacturing length 1)		1)
Specified length		± 500
Exact length	up to 6m	+10 0
	over 6 up to 12m	+15 0

	over 12m	By agreement
1) The products are supplied in the manufacturing lengths occurring in production. The lengths differ according to the diameter, wall thickness and manufacturers works and shall be agreed at the time of ordering.		

Table 4. Permissible deviations in wall thickness

Permissible deviations in wall thickness for outside diameter da								
da ≤ 130mm			130mm < da ≤ 320mm and wall thickness			320mm < da ≤ 660mm		
≤ 2*sn	2*sn < s ≤ 4*sn	> 4*sn	≤ 0.05da	0.05da < s ≤ 0.11da	> 0.11da	≤ 0.05da	0.05da < s ≤ 0.09da	> 0.09da
≤ 15%	+12.5%	+9%	+17.5%	±10%	+20%	10%	+15%	+15%
-10%	-10%		-12.5%		-15%		-12.5 %	-10%
Note Sn is the normal wall thickness as specified in DIN 2448.								

Table 5. Summary of the scope of test programme and documents on materials testing required for tubes supplied with inspection certificate; see figure 1 for sampling points and location of test pieces; see subclause 5.3.2 for batch

Testing			Scope of test programme	Responsibility for carrying out the tests	Type of document on materials testing
No	Type of test	As in subclause			
1	Tensile test	5.4.1 5.5.1	1 sample tube per batch, 1 test piece	By agreement	DIN 50049 - 3.1 B or DIN 50049 - 3.1 C
2	Impact test	5.4.2 5.5.2	At one end of sample tube specified above (No.1) (for a wall thickness ≥ 5mm); 1 set of 3 separate test pieces	By agreement	DIN 50049 - 3.1 B or DIN 50049 - 3.1 C
3	Inspection of surface	5.5.4	All tubes	By agreement	DIN 50049 - 3.1 B or DIN 50049 - 3.1 C
4	Check on dimensions	5.5.5 to 5.5.7	All tubes	By agreement	DIN 50049 - 3.1 B or DIN 50049 - 3.1 C
5	Product analysis 1)	5.4.3 5.5.3	By agreement	Manufacturer	DIN 50049 - 3.1 B
1) The product analysis is only to be carried out subject to agreement between the manufacturer and purchaser.					

4.7.4. Finish of tube ends

The tube ends shall be cut perpendicular to the tube axis; they are not normally deburred.

Deburring may be agreed at the time of ordering.

4.7.5. Masses per unit length and permissible deviations DIN 2448 specifies the values of the mass per unit length for tubes, the calculation of the mass of tubes in non-standard lengths being based on a density of  $7.85 \text{ kg/d m}^3$ .

The following deviations from these values are permitted:

+12  
-8 % for an individual tube,

+10  
% for a batch of tubes not less than 10t by mass.