

BS 6323 : Part 5 : 1982

Seamless and welded steel tubes for automobile, mechanical and general engineering purposes Part 5. Specific requirements for electric resistance welded and induction welded steel tubes

Tolerances

Outside diameter of circular tubes

The tolerance on the outside diameter of circular tubes shall be as given in columns 1,2 or 3 or table 1, dependent on delivery condition and D/a ratio as follows :

- (a) Column 1
 - (1) tubes in the as-welded condition with D/a ratio < 40:1;
 - (2) tubes in the annealed or normalized condition with D/a ratio < 20:1;
- (b) Column 2, tubes in the annealed or normalized condition with D/a ratio >20:1 and <40:1;
- (c) Column 3, tubes of all delivery conditions with D/a ratio >40:1;

The tolerance on outside diameter includes ovality.

Thickness.

The tolerance on thickness, including eccentricity but excluding the weld, shall be:

- (a) for specified thickness less than 3 mm : + 10%;
- (b) for specified thickness 3 mm and over : + 8%;

The minimum thickness in the weld area shall be not less than that permitted in the body of the tube.

The external weld upset shall be removed completely, i.e. flush with the outside surface of the tube.

The maximum height of the weld bead on the internal surface of the tube shall not be greater than 60% of the specified thickness.

If specified on the order, the internal weld upset shall be reduced, so that the residual height shall not exceed 0.25mm.

Length

Tubes shall be supplied in one of the following ways:

- (a) random lengths of 4 m to 7 m ; or
- (b) mill lengths between 3 m and 12 m and subject to a tolerance of \pm^{100}_0 mm; or
- (c) specified cut lengths to the tolerances given in table 3.

Dimensions of non-circular tubes

The tolerance on the outside cross-sectional dimension of non-circular tubes shall be given in column 1 of table 2.

For square or rectangular section tubes, this dimension shall be measured across opposite faces at a position no more than 5 mm from the corner and at a distance not less than 50 mm from the cut end.

The maximum concave or convex deflection of a flat side of a square or rectangular section tube shall not exceed 0.5% of the nominal length of that side.

Table 1. Tolerances on outside diameter

Outside diameter		Tolerance*		
Over	Up to and including	1 KM condition D/a ≤ 40 GKM, GZF, NKM, NZF condition D/a ≤ 20	2 GKM, GZF, NKM, NZF condition 20<D/a≤40	3 All conditions D/a > 40
mm	mm	mm	mm	mm
	20	+0.12	+0.18	+0.24
20	30	+0.15	+0.22	+0.30
30	50	+0.20	+0.30	+0.40
50	70	+0.25	+0.37	+0.50
70	90	+0.30	+0.45	+0.60
90	110	+0.35	+0.52	+0.70
110	130	+0.45	+0.68	+0.90
130	150	+0.55	+0.82	+1.10
150	170	+0.65	+0.97	+1.30
170		+0.75% of outside diameter	+1% of outside diameter	+1.5 % of outside diameter

*Due to the release of internal stress when an as-welded tube is cut, a change in dimensions is usual. Hence this tolerance does not include ovality within 100 mm of the tube end which is in the as-welded (KM) condition and which has a diameter to thickness ratio greater than 20:1.

The mean diameter ($\frac{\text{maximum} + \text{minimum diameter}}{2}$) shall be within these tolerances



Table 3. Chemical composition and mechanical properties (see note)

Designation	Chemical composition (ladle analysis)						Mechanical properties								
	C max. %	Si max. %	Mn max. %	P max. %	S max. %	KM ‡ § (as welded)	GKM and CZF (annealed)			NKM and NZF (normalized)					
						Re min. N/mm ²	Rm min. N/mm ²	A min. D/a ≤ 20 %	D/a > 20 %	Re min. N/mm ²	Rm min. N/mm ²	A min. %	Re min. N/mm ²	Rm min. N/mm ²	A min. %
ERW 1*	0.13	—	0.60	0.050	0.050	200	300	10	20	150	270	27	155	280	25
ERW 2*	0.16	—	0.70	0.050	0.050	250	340	8	15	160	300	27	195	320	25
ERW 3*	0.20	0.35	0.90	0.050	0.050	300	400	7	12	170	340	26	215	360	24
ERW 4†	0.25	0.35	1.20	0.050	0.050	350	450	6	10	200	400	24	235	410	22
ERW 5†	0.23	0.50	1.50	0.050	0.050	420	500	6	8	—	—	—	340	490	20

* If rimming or semi-killed steel is used for grade 1 or 2, the carbon content may be increased by 0.19%, and if used for grade 3, to 0.23%.
 † Grain refining elements may be added to this grade at the option of the manufacturer.
 ‡ If tubes in the KM condition are subsequently welded, brazed or heated, the mechanical properties in the heat affected zones may be reduced to those given for the delivery condition of GKM or NKM.
 § For sizes larger than 274 mm outside diameter, the properties in the KM condition shall be those given for the NKM condition.
 NOTE: Welding of these tubes does not require special techniques but care should be taken and welding carried out in accordance with the guidance given in the appropriate British Standard for welding, e.g. BS 5153.

Table 3. Tolerance on specified cut length

Specified cut length	Tolerance	
	Over mm	Up to and including mm
500	0	+2
2000	0	+3
5000	0	+5
7000	0	+10
	—	0
		by agreement

NOTE: Closer tolerances may be obtained by agreement between the purchaser and the manufacturer.