GOST	:	491-76
Title	:	BRASS TUBES
Translated and Edited by	:	K.A. PARTHASARATHY PVR Associates.
Date	:	MAY 1984

Checked/Authenticated by [illegible]
Name: K. Appa Rao.
Signature:
Date: 27.3.85

UDC 669.35'5 - 462:66.045.1:006.354 GROUP B 64
(V 64)

USSR STATE STANDARD

BRASS TUBES

GOST
494-76
This supercedes
GOST 494-69
in respect of
general purpose tubes

By order No. 685 dated the 25th of March 1976, of the USSR State Committee on standards this standard is valid.

FROM 01.01.1977
TO 01.01.1982

NONOBSERVANCE OF THIS STADARD IS PUNISHABLE BY LAW.

The present standard relates to general purpose, round section, drawn, cold-rolled and extruded brass tubes.

This standard is in conformity with the CMEA requirements PC 2473-70 on standardization.

1. ASSORTMENT

1.1 Dimensions of drawn and cold-rolled tubes and tolerances in them must conform to the values shown in Table 1.

1.2 Dimensions of extruded tubes and tolerances in them must conform to the values shown in Table 2.

1.3 Tubes are made in two varieties as to length;

a) Non uniform length;

1 to 6 m long

Note: Tubes of length not less than 0.5 m may be supplied upto 10% of the batch by weight.

Official Edition

Reissued May 1979

DRAWN AND COLD-ROLLED TUBES

Theoretical linear density, kg/m for wall thickness, mm.

Tolerances in tube diameter, mm for manufacturing accuracy

Таблица 4

O.D. mm	Предельные отклонения по диаметру труб, мм, точности изготовления		Теоретическая линейная плотность, кг/м					
	повышенной	нормальной	0,8±0,07	0,9±0,08	1,0±0,09	1,5±0,13	2,0±0,20	2,5±0,22
3	−0,16	−0,20	0,0304	—	—	—	—	—
4			0,0407	—	—	—	—	—
5			0,0564	0,080	0,107	—	—	—
6			0,0734	0,110	0,134	0,190	0,213	—
7			0,0868	0,131	—	—	—	—
8			0,100	0,153	0,187	0,259	0,320	—
9			0,113	0,174	0,214	0,300	0,374	—
10			0,127	0,194	0,240	0,340	0,427	—
11	−0,18		—	—	0,267	0,381	0,480	0,634
12			0,154	0,238	0,294	0,420	0,534	
13			0,167	0,259	0,320	0,460	0,587	—
14	−0,20	−0,24	0,180	—	0,347	0,500	0,641	0,852
15			0,194	—	0,374	0,540	0,694	0,891
16			0,207	0,322	0,400	0,581	0,747	0,967
17			0,220	—	—	—	—	—
18			—	—	0,454	0,661	0,854	—
19	−0,24	−0,30	0,247	0,388	0,480	0,701	0,907	—
20			—	—	0,507	0,741	0,961	1,168
21			—	—	—	—	1,014	1,234
22			—	—	0,560	0,821	1,068	1,301
23			—	—	0,587	0,861	—	1,368
24			—	—	0,614	—	1,174	—
25			—	—	0,641	0,941	1,228	1,561
26			—	—	0,667	—	1,281	1,568
27			—	—	0,694	—	1,334	—
28			—	—	0,721	1,061	1,388	—
29			—	—	0,747	—	1,441	—
30			—	—	0,774	1,141	1,495	1,885
31	−0,30	−0,34	—	—	—	—	—	—
32			—	—	0,827	1,221	1,601	—
33			—	—	—	1,271	—	—
34			—	—	0,907	1,341	1,761	2,158
35			—	—	—	—	—	—
36			—	—	—	—	—	2,302
37			—	—	0,988	1,461	1,922	2,369
38	−0,36		—	—	1,041	—	2,028	2,502
39			—	—	1,094	—	2,135	—
40			—	—	—	—	—	—
42			—	—	1,147	—	—	—
44		−0,40	—	—	1,174	1,741	2,295	—
45			—	—	1,201	—	—	—
46			—	—	1,228	—	—	—
47			—	—	—	—	—	—
48			—	—	1,388	—	2,862	3,159
50	−0,40		—	—	—	—	—	—

DRAWN AND COLD-ROLLED TUBES

Theoretical linear density, kg/m for wall thickness, mm.

Table 1
Таблица 1

Холоднокатаные трубы

При толщине стенки, мм

3,00±0,25	3,50±0,30	4,00±0,35	4,50±0,35	5,00±0,40	5,50±0,50	7,00±0,60	8,50±0,70	10,00±0,90
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
0,721	—	—	—	—	—	—	—	—
0,861	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
0,961	—	—	—	—	—	—	—	—
1,041	—	—	—	—	—	—	—	—
—	1,261	—	—	—	—	—	—	—
1,201	—	1,495	—	—	—	—	—	—
—	—	—	1,741	—	—	—	—	—
1,361	—	—	—	2,092	—	—	—	—
—	—	—	1,932	—	—	—	—	—
1,521	—	1,922	—	—	2,552	—	—	—
1,601	1,922	—	2,222	—	—	—	—	—
1,681	—	2,156	—	—	2,882	3,176	—	—
1,761	2,108	2,242	—	—	—	—	—	—
1,842	—	2,749	—	2,842	3,203	3,559	—	—
1,922	2,193	—	—	2,936	—	—	—	—
2,002	2,289	2,862	—	3,056	3523	—	—	—
—	—	—	—	—	—	—	—	—
2,162	2,461	2,775	3,044	—	3434	—	—	—
2,242	—	2,862	3,188	—	—	—	—	—
—	2,649	2,989	3,303	3,603	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	3,870	4484	—	—	—
2,562	—	3,309	3,663	—	4544	—	—	—
2,642	—	3,416	—	4,137	4804	5,418	—	—
—	—	—	—	—	—	6,065	—	—
2,802	—	3,630	4,023	4,404	—	—	—	7,479
—	3,103	3,843	—	—	5444	—	—	—
3,123	3,356	—	—	4,937	—	—	—	—
—	—	—	—	—	—	—	—	—
3,363	3,376	4,377	—	—	6245	—	—	—
—	—	—	—	5,471	—	—	—	—
—	—	—	—	—	—	—	—	—
3,603	—	—	—	6,005	—	—	—	—
3,763	4,349	4,911	—	—	—	8,937	—	—

Tolerances in tube diameter, mm for manufacturing accuracy

Theoretical linear density, kg/m for wall thickness, mm.

Стр. 4 ГОСТ 494—76

Наружный диаметр, мм	Предельные отклонения по наружн. диам. в зависимости от точности изготовления		Теоретическая линейная плотность, кг/м.					
	повышенной	нормальной	0,60±0,07	0,80±0,09	1,00±0,10	1,60±0,15	2,00±0,20	2,50±0,25
51	Inc.	Nor.	—	—	—	—	2,618	—
52		−0,50	—	—	1,351	2,109	—	—
54			—	—	—	—	2,776	—
55			—	—	—	—	2,829	—
58	−0,40		—	—	—	—	2,989	—
60		−0,60	—	—	1,573	—	3,096	—
64			—	—	—	—	3,309	—
65			—	—	—	2,741	3,368	—
70			—	—	—	—	—	4,670
75			—	—	—	—	—	—
76			—	—	—	—	4,168	5,171
80			—	—	—	—	4,296	—
84			—	—	—	—	—	—
85			—	—	—	—	—	—
90		−0,80	—	—	—	—	4,857	—
93	−0,50		—	—	—	—	—	—
95			—	—	—	—	5,071	—
97			—	—	—	—	—	—
100			—	—	—	—	—	—

Extruded Tubes

Прессованные

Theoretical linear density, kg/m for wall thickness, мм.

O.D. mm Nom.	Наружный диаметр, мм		Теоретическая линейная плотность, кг/м.					
	Номин.	Пред. откл.	1,60±0,24	2,00±0,30	2,50±0,40	3,00±0,45	3,50±0,30	4,00±0,35
21	±0,22		0,781	—	—	—	—	—
22			—	1,068	—	—	—	—
23			0,861	—	1,368	—	—	—
24	±0,25		—	1,174	—	1,681	2,008	—
25			0,941	—	1,501	—	—	2,349
26			—	1,281	—	1,841	—	—
27	±0,30		—	—	1,635	—	2,195	2,562
28			—	—	—	2,002	2,382	—
29			—	—	1,768	—	—	—
30	±0,35		—	1,495	—	—	2,569	2,776
31			—	—	1,902	2,322	—	—
32			—	—	—	—	2,756	—
33			—	—	—	—	—	—

Tolerance

Theoretical linear density, kg/m for wall thickness, mm.

Table 1 contd.

Продолжение табл. 1

При толщине стенки, мм

3,00±20,25	3,50±20,30	4,00±±0,40	4,50±0,35	5,00±0,40	6,00±0,60	7,00±0,80	8,00±0,70	10,0±0,90
3,848	4,437	—	—	—	—	—	—	—
—	—	—	5,705	—	7,358	—	—	—
—	—	—	5,845	6,039	7,385	—	—	—
4,163	—	5,444	—	6,672	—	—	—	—
4,494	5,091	9,765	—	7,672	—	—	—	—
4,554	5,223	5,978	—	—	—	—	—	—
—	5,691	—	—	—	—	—	—	—
—	5,745	—	—	—	—	10,840	—	—
5,854	—	7,046	—	—	—	—	—	—
—	—	7,413	—	—	—	—	—	—
6,845	—	7,686	—	—	—	—	—	17,01
—	—	8,113	—	—	—	13,64	—	—
—	—	—	—	—	—	—	16,958	20,782
6,966	—	8,754	—	10,898	—	—	17,51	—
—	—	9,181	—	—	—	—	—	—
7,466	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
7,766	—	10,25	—	—	—	—	—	—

Extruded Tubes

Трубы

Таблица 2

Table 2

При толщине стенки, мм

4,50±0,55	5,00±0,55	5,50±0,55	6,00±0,60	6,50±0,6	7,00±0,70	7,50±±0,75	8,00±±0,80	8,50±±0,85
—	—	—	—	—	—	—	—	—
—	—	—	2,561	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	2,862	—	—	—	3,603	—	—
—	—	—	—	—	—	—	—	—
2,702	—	—	3,362	—	—	—	—	—
2,942	3,069	—	—	—	—	—	4,483	—
—	—	—	—	—	—	—	—	—
3,133	3,339	—	3,843	—	—	—	—	—
—	3,593	—	4,163	—	4,570	—	—	—
—	—	—	—	—	—	—	—	—

Theoretical linear density, kg/m for wall thickness, mm.

Theoretical linear density, kg/m for wall thickness, mm.

O.D. mm Nom	Наружный диаметр, мм		Теоретическая линейная плотность, кг/м.					
	Номин.	Пред. откл.	1,65±0,15	2,08±0,20	2,50±0,25	3,00±0,45	3,50±0,50	4,00±0,60
Tolerance								
34			—	1,708	2,102	—	—	3,203
35		±0,40	—	—	2,168	2,642	—	—
36			—	—	—	—	3,129	—
37			—	—	—	—	—	3,696
38			—	—	2,368	—	—	—
39			—	—	—	—	—	—
40		±0,45	—	—	2,502	—	3,596	4,163
42			—	—	—	—	—	—
43			—	—	2,836	—	—	—
45			—	—	—	3,442	—	—
46		±0,50	—	—	—	—	4,063	4,697
47			—	—	—	—	—	—
48			—	—	—	—	—	—

Theoretical linear density, kg/m for wall thickness, mm.

O.D. mm Nom	Наружный диаметр, мм		Теоретическая линейная плотность, кг/м.						
	Номин.	Пред. откл.	2,00±0,06	10,60±1,00	11,62±1,16	12,5±1,20	14,0± ±1,40	15,0± ±1,50	17,5± ±1,75
Tolerance									
21		±0,22	—	—	—	—	—	—	—
22			—	—	—	—	—	—	—
23			—	—	—	—	—	—	—
24		±0,25	—	—	—	—	—	—	—
25			—	—	—	—	—	—	—
26			—	—	—	—	—	—	—
27			—	—	—	—	—	—	—
28		±0,30	—	—	—	—	—	—	—
29			—	—	—	—	—	—	—
30			—	—	—	—	—	—	—
31		±0,35	—	—	—	—	—	—	—
32			—	—	—	—	—	—	—
33			—	—	—	—	—	—	—
34			—	—	—	—	—	—	—
35		±0,40	—	—	—	—	—	—	—
36			—	7,070	—	—	—	—	—
37			—	—	—	—	—	—	—
38			—	7,473	—	—	—	—	—
39		±0,45	—	—	—	—	—	—	—
40			—	8,606	—	—	—	—	—
42			—	—	—	—	—	—	—

Theoretical linear density, kg/m for wall thickness, mm.

Table 2 Contd

Продолжение табл. 2

при толщине стенки, мм								
4.50±0.25	5.00±0.25	5.50±0.25	6.00±0.30	6.50±0.35	7.00±0.30	7.50±0.75	8.00±0.80	8.50±0.85
—	—	—	4.484	—	—	—	—	—
3.663	4.093	—	4.642	—	—	—	—	—
3.909	—	—	—	—	5.418	—	—	—
—	—	—	4.964	—	—	—	—	8.465
4.143	—	—	5.124	—	5.791	—	—	—
—	4.678	—	—	—	5.976	—	—	—
—	4.937	—	5.765	—	6.165	6.903	8.259	—
—	—	—	—	—	—	—	7.259	—
—	5.338	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	5.945	—	—	—	—	—	8.113	—
—	—	—	6.565	—	—	—	—	—
—	—	—	—	7.19	—	—	—	—

Table 2 Contd

Продолжение табл. 2

Theoretical linear density, kg/m for wall thickness, mm.

при толщине стенки, мм								
20.0±1.20	22.5±1.35	25.0±1.70	27.5±1.75	30.0±1.8	32.5±1.95	35.0± 2.10	37.5± 2.78	40.0± 2.85
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—

2*

Theoretical linear density, kg/m for wall thickness, mm.

O.D. mm Nom / Tolerance	Наружный диаметр, мм Номин.	Пред. откл.	Теоретическая линейная плотность, кг/м. 9,00±0,90	10,00±1,00	11,0±1,10	12,5±1,25	14,0±1,40	15,0±1,50	17,5±1,75
43		±0,45	—	—	—	—	—	—	—
45			—	—	—	—	—	—	—
46			—	9,508	—	—	—	—	—
47		±0,50	—	—	—	—	—	—	—
48			9,367	—	—	—	—	—	—

Theoretical linear density, kg/m for wall thickness, mm.

O.D. mm Nom / Tolerance	Наружный диаметр, мм Номин.	Пред. откл.	Теоретическая линейная плотность, кг/м. 1,80±0,25	2,00±0,30	2,50±0,40	3,00±0,45	3,50±0,55	4,00±0,50
50		±0,60	—	—	—	—	—	—
51		±0,65	—	—	—	3,843	—	—
52			—	—	—	—	4,530	5,231
53			—	—	—	—	—	—
54		±0,60	—	—	—	—	—	—
55			—	—	—	—	—	5,765
58			—	—	—	—	—	—
59			—	—	—	—	—	—
60			—	—	—	—	—	—
62		±0,70	—	—	—	—	—	6,298
63			—	—	—	—	—	6,465
64			—	—	—	—	—	—
65			—	—	—	—	—	6,832
68			—	—	—	—	—	—
70			—	—	—	—	—	—
72		±0,80	—	—	—	—	6,398	—
75			—	—	—	—	—	7,355
78			—	—	—	—	—	—
80			—	—	—	—	—	—
85		±0,90	—	—	—	—	—	—
90			—	—	—	—	—	—
92			—	—	—	—	—	—
95		±1,0	—	—	—	—	—	—
100			—	—	—	—	—	10,477
101			—	—	—	—	—	—
105		±1,1	—	—	—	—	—	—
110			—	—	—	—	—	—

Theoretical linear density, kg/m for wall thickness, mm.

Table 2 Contd
Продолжение табл. 2

при толщине стенки, мм								
20,0±2,00	22,5±2,25	25,0±2,50	27,5±2,75	30,0±3,00	32,5±3,25	35,0±3,50	37,5±3,75	40,0±4,00
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—

Table 2 Contd
Продолжение табл. 2

при толщине стенки, мм									Theoretical linear density, kg/m for wall thickness, mm.
4,50±0,36	5,00±0,35	5,50±0,36	6,00±0,60	7,0±0,56	7,00±0,70	7,50±0,75	8,00±0,80	8,50±0,85	
—	6,085	—	—	—	—	8,807	—	—	
—	—	—	7,336	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	
5,945	—	—	—	—	8,780	—	—	—	
—	6,672	7,187	—	4,934	—	9,268	—	—	
—	—	—	—	—	—	—	—	—	
6,545	—	—	—	—	—	—	—	—	
—	7,339	—	—	—	—	10,51	—	—	
—	—	—	—	—	—	—	—	12,135	
—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	
—	8,086	—	—	—	—	11,51	—	—	
—	—	—	—	9,67	—	—	—	—	
—	8,671	—	—	—	—	12,51	—	—	
—	—	—	—	9,402	—	—	—	14,40	
—	—	—	—	—	—	—	—	—	
—	9,341	—	10,98	—	—	13,51	—	—	
—	10,01	—	—	—	—	14,51	—	—	
—	10,66	—	—	8,617	—	15,51	—	—	
—	11,34	—	13,77	—	—	16,51	—	—	
—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	17,51	—	—	
—	—	—	—	—	—	18,51	—	—	
—	12,962	—	—	—	—	—	—	—	
—	—	—	—	—	—	19,82	—	—	
—	14,01	—	—	—	—	20,82	—	—	

Theoretical linear density, kg/m for wall thickness, mm.

O.D., mm Nom	Наружный диаметр, мм Номин.	Пред. откл.	Теоретическая линейная плотность, кг/м. 9.00±0.90	10.66±1.06	11.5±1.15	12.5±1.25	14.0± 1.40	15.0± ±1.50	17.5± 1.75
Tole-rance	50	±0.50	—	10.68	—	12.51	—	14.01	—
	51	±0.55	—	—	—	—	—	—	—
	52		—	—	—	—	—	—	—
	53		—	—	—	—	—	—	—
	54	±0.60	—	—	—	—	—	—	—
	55		11.76	12.01	—	14.13	—	16.01	—
	56		—	—	—	—	—	—	—
	57		—	—	—	—	—	—	—
	58		—	13.34	—	16.85	—	18.01	—
	59		—	—	—	—	—	—	—
	60	±0.70	—	—	—	—	—	—	—
	61		—	—	—	—	—	—	—
	62		—	—	—	—	—	—	—
	63		—	—	—	17.51	—	20.02	—
	64		—	14.98	17.34	—	—	—	—
	65		14.17	—	—	19.13	—	—	—
	66		—	16.01	—	—	—	—	—
	70		—	—	—	—	—	—	—
	72	±0.80	—	—	18.86	—	2.04	22.02	—
	73		—	—	—	20.85	—	24.02	26.85
	75		—	17.35	—	22.92	—	26.02	29.19
	80		—	18.68	—	—	—	—	—
	85	±0.90	—	20.02	—	21.18	—	28.02	31.47
	90		—	21.35	—	25.83	—	30.02	33.85
	92		—	—	—	—	—	—	—
	95	±1.0	—	22.68	—	27.52	—	32.03	36.20
	100		—	24.00	—	29.19	—	34.03	38.43
	101		—	24.67	—	—	—	—	—
	105	±1.1	—	25.35	—	30.86	—	36.03	40.87
	110		—	26.69	—	32.53	—	38.03	43.00

Theoretical linear density, kg/m for wall thickness, mm.

O.D., mm Nom	Наружный диаметр, мм Номин.	Пред. откл.	Теоретическая линейная плотность, кг/м. 6.00±0.60	7.00±0.70	12.0± ±1.20	14.0± ±1.40	12.5± ±1.25	14.0± ±1.40	15.0± ±1.50	17.5± ±1.75
Tole-rance	112	±1.4	16.97	—	—	—	—	—	—	—
	115		—	21.52	28.02	31.51	34.9	—	40.03	45.54
	120		—	—	29.36	—	—	—	42.03	47.47
	125		—	—	—	—	—	46.72	—	—
	129	±1.5	—	—	—	—	37.9	—	44.04	50.21
	130		—	—	32.89	—	—	—	46.04	—

Theoretical linear density, kg/m for wall thickness, mm.

Table 2 Contd
Продолжение табл. 2

при толщине стенки, мм								
23,0±2,00	22,5±2,25	25,0±2,50	27,5±2,75	30,0±3,00	22,5±2,25	25,0±2,50	27,5±2,75	27,5±3,00
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
32,02	—	—	—	—	—	—	—	—
34,58 37,85	37,53 40,83	— 43,37	—	—	—	—	—	—
— 40,05 42,79	— 43,35 46,54	— 46,70 50,04	— 49,54 53,21	— —	— 56,64	— —	— —	— —
— 45,37 48,04	— 49,54 52,54	— 53,38 56,71	— 56,88 60,55	— —	— 60,65 64,65	— —	— —	— —

Table 2 Contd
Продолжение табл. 2

при толщине стенки, мм								
30,0±2,00	22,5±2,25	25,0±2,50	27,5±2,75	30,0±3,00	2,5±2,25	35,0±3,50	37,5±3,75	42,5±4,25
—	—	—	—	—	—	—	—	—
50,71 53,28	55,54 58,55	59,21 63,08	64,22 67,89	68,65 72,06	—	—	—	—
— 56,04 58,71	— 61,55	— 65,72 70,06	— 71,56 76,23	— 76,06 80,06	—	—	—	—

Theoretical linear density, kg/m for wall thickness, mm.

Theoretical linear density, kg/m for wall thickness, mm.

O.D. mm Nom / Tolerance	Наружный диаметр, мм: Номин. / Пред. откл.	Теоретическая линейная плотность, кг/м: 6,00±0,60	7,00±0,75	10,0 ±1,00	11,5± 1,15	12,5± 1,25	14,0± 1,40	15,0± 1,50	17,5± 1,75
135 140	±1,6	— —	— —	— 34,69	— —	40,87 —	— —	— 50,04	54,88 —
145 150	±1,7	— —	— —	— 37,36	— —	44,20 —	— —	— 54,03	59,45 —
155	±1,8	—	—	—	—	47,54	—	—	64,22
160	±1,9	—	—	40,03	—	—	—	58,03	—
165 170	±2,0	— —	— —	— 42,70	— —	50,87 —	— —	— 62,03	68,89 —
175 180	±2,1	— —	— —	— 45,37	— —	54,21 —	— —	— 66,05	73,56 —
185	±2,2	—	—	—	—	57,55	—	—	78,23
190 195	±2,3	— —	— —	— —	— —	— —	— —	— —	— —

Note: Theoretical linear density is calculated on the basis of nominal diameter and minimum wall thickness. Density of brass has been taken as 8.5/cm³.

b) Uniform length or its multiples :
drawn and cold-rolled tubes within the limits of non-uniform length.
extruded tubes - by agreement between manufacturer and customer;

c) Tubes of length not less than 10 m - drawn and cold-rolled with outside diameter upto 10 mm and wall thickness upto 1.5 mm in bundles weighing not more than 150 kg.

1.4 Tolerances in length of uniform tubes must conform to values shown in Table 3.

Outside diameter	Tolerance in length for tubes of length	
	Less than 2000	2000 and over
Upto and incl. 12	+ 10	+ 10
Over 12 upto 50	+ 6	+ 10
Over 50 upto 100	+ 10	+ 15

Note: Tolerances in length for extruded tubes are fixed by mutual agreement between manufacturer and customer.

Theoretical linear density, kg/m for wall thickness, mm.

Table 2 Contd
Продолжение табл. 2

При толщине стенки, мм									
20,0±2,00	21,5±2,15	25,0±2,50	27,5±2,75	30,0±3,00	32,5±3,25	35,0±3,50	37,5±3,75	42,5±4,25
—	67,55	—	—	—	—	—	—	—
64,35	—	76,73	73,98	88,67	—	—	102,6	—
—	73,53	—	—	—	—	—	—	—
69,36	—	88,40	85,24	96,08	—	—	107,5	—
—	79,50	—	93,57	—	—	—	—	—
74,73	—	90,07	—	104,1	—	—	—	—
—	85,57	—	100,9	—	—	—	—	—
80,46	—	95,74	—	112,1	—	—	—	—
—	91,57	—	108,9	—	—	—	—	—
85,40	—	103,4	—	120,1	—	—	—	—
—	97,53	—	115,6	—	132,8	—	147,6	—
—	—	110,1	119,2	—	—	—	—	—
—	—	—	122,9	—	140,9	144,6	—	173,0

Tubes of length in multiples of uniform length must be supplied with an allowance of 5 mm at each cut end with the tolerance on total length specified for tubes of uniform length.

Example of conventional designation of tubes.

Conventional designations are based on the following scheme.

Tube X XX X X
- X — Manufacturing process
- XX — Section
- X — Manufacturing accuracy
- X — Condition

The following abbreviations are used:

Д	D	for drawn, cold-rolled;
Г	G	for extruded;
КР	KR	for round section;
Н	N	for nominal accuracy;
П	P	for increased accuracy;
М	M	for soft;
Т	T	for hard;
П	P	for medium hard;
НД	ND	for nonuniform length;
КД	KD	for multiple length;
А	A	for nonmagnetic.

Note. The symbol X takes the place of unspecified data.

Drawn or cold-rolled, tube of round section, 28 mm outside diameter, 3 mm wall thickness, of nominal manufacturing accuracy, soft, with length in multiples of 1500 mm made out of Л63 (L63) grade brass:

Tube Д,КРН М 28 х 3К Д1500 Л63 ГОСТ 494-76

Tube DKRNM 29 x 3 KD 1500 L 63 GOST 494-76

-Do- of increased manufacturing accuracy:

Tube Д,КРПМ 28 х 3 К,Д 1500 Л63 ГОСТ 494-76

Tube DK RPM 28 x 3 KD 1500 L 63 GOST 494-76

-Do- of uniform length 3500 mm:

Tube Д,КРПМ28х 3 3500 Л63 ГОСТ 494-76

Tube DKRPM 28 x 3 3500 L63 GOST 494-76

-Do- medium hard, nonuniform length, non-magnetic:

Tube Д,КРПА 28 х 3 НД,Л63А ГОСТ 494-76

Tube DKRPA 28 x 3 ND L63 GOST 494-76

-Do- extruded:

Tube ГКРХХ 28 х 3 Н Д,Л63А ГОСТ 494-76

Tube GKRXX 28 x 3 ND L63A GOST 494-76

2. Technical Requirements

2.1 Drawn and cold-rolled tubes are manufactured out of Л63 (L63) and Л68 (L68) grades of brass and extruded tubes out of Л60 (L60), Л63 (L63), ЛС-59-1 (LS-59-1), ЛЖМц59-1-1 (L2hMTs 59-1-1) grades.

At the customer's request tubes made out of Л 63, Л 68 and Л 059-1 (L 63, LB and LS 59-1) must be made non-magnetic.

2.1.1. Chemical composition of the material must conform to the requirements of GOST 15527-70.

2.2. Drawn and cold-rolled tubes are manufactured in soft-M and medium hard - П Т (PT) (with internal tensile stress relieving) varieties.

2.3. Tube surface (external as well as internal) must be clean, and free from cracks, peeling, roll slips, blisters and scale pits. Isolated surface defects namely slight scales, dents, grooves scratches and scores are permitted provided they do not result in dimensional tolerances being exceeded when they are dressed for inspection.

Ring marks, temper colour and reddening do not constitute reasons for rejection.

2.4 Tubes must be cut evenly without burrs. Obliquity in the cut must not be such as to exceed the tolerance in length and must not be more than:

2 mm for tubes of outside diameter upto and including 50 mm;

4 mm for tubes of outside diameter over 50 mm upto and including 100 mm;

5 mm for tubes of outside diameter over 100 mm upto and including 170 mm;

7 mm for tubes of outside diameter over 170 mm.

2.5 Ovality and variation in wall thickness must not be such as to exceed the tolerance in outside diameter and wall thickness.

Ovality must be established by mutual consent in the case of tubes with wall thickness less than 1/30 of the outside diameter and of extruded tubes tubes with wall thickness less than 1/15 of the outside diameter.

Ovality is not specified in the case of soft tubes and tubes supplied in bundles.

2.6. Drawn and cold-rolled tubes, medium hard tubes and extruded tubes must be straightened.

Local curvature (arc of bending) per 1 m of tube length must not exceed the values shown in Table 4.

Table 4.

Tube manufacturing process	Outside diameter mm	Maximum local curvature per meter, mm, not more than
Drawn and cold-rolled (Medium-hard)	13 and over	5
Extruded	Upto 150 incl.	3
	Over 150	15

Note: Tubes of diameter upto 60 mm may, by mutual consent between manufacturer and customer, be supplied with a maximum deviation of upto 3 mm in curvature per metre of length.

The maximum curvature of soft tubes as also medium hard tubes of diameter upto 12 mm and less is settled by consent between manufacturer and customer.

Total curvature in the tube must not exceed the product of permissible local curvature per metre and the tube length in metres.

2.7. The metal of extruded tubes must be dense and free from extraneous impurities, shrinkage cavities and peeling. Tubes extruded out of Л059-1 (ЛС59-1), ЛЖМц59-1-1 (ЛЖМц59-1-1) with outside diameter upto and including 150 mm must be tested for fracture at the end in contact with the press residue.

2.8. Mechanical properties of tubes should conform to the requirements given in Table 3.

Table 5.

Tube Manufacturing process	Brass grade	Condition of material	Ultimate strength tensile σ_t (σ_B) kgf/mm^2, not less than	Relative elongation δ_{10}, % not less than
Drawn and cold-rolled	L 63 (Л63)	Soft	30	40
		Medium hard	38	25
	L 68 (Л68)	Soft	30	40
		Medium hard	35	35
Extruded	L 60 (Л66)		35	20
	L 63 (Л63)		28	38
	LS59-1 (ЛС59-1)		40	20
	LAMLL59-1-1 (ЛЖМц59-1-1)		44	28

2.9 At the customer's request drawn and cold-rolled tubes with wall thickness 3 mm and less must be subjected to a flattering test after they are annealed to a soft condition. They must be flattened till the walls meet. No cracks or rupture should be noticed after such flattening.

2.10. Tubes must be subjected to a test for leak proofness hydraulic test at 50 kgf/cm^2 hydraulic pressure.

3.Acceptance Rules

3.1. Tubes are accepted in batches of not more than 5000 kg.

A batch must consist of tubes of single grade of brass, a single size, a single manufacturing process and condition of material and must be supported by a single quality certificate.

3.2. Each tube must be subjected to inspection of external surface.

3.3. One tube from a batch must be subjected to inspection of internal surface in the case of tubes of inside diameter upto 20 mm.

Five tubes from a batch must be subjected to inspection of internal surface when inside diameter is upto 40 mm. All tubes of inside diameter over 40 mm must be subjected to inspection of internal surface.

3.4. One fifth of the tubes of a batch is selected for checking outside diameter.

The quantitites to be checkel for wall thickness are:
Five tubes - out of a batch of tubs of inside diameter 2 mm and below;
20% of the number out of a batch of tubes of diameter over 12 mm.

3.5. Three tubes are drawn from a batch for tensile test and for determining the presence of residual tensile stresses.

3.6. Three tubes are selected from batch for the flattening test.

3.7. Three tubes are selected from a batch for the leak tests test.

3.8. Two tubes are selected from a batch for conducting chemical analysis. Samples for chemical analysis may be drawn from the molten metal at the manufacturing factory.

3.9. Each extruded tube made out of grade AC 59-1 (LS 59-1) and AKMu59-1-1 (LZhMTs 59-1-1) alloys must be subjected to a leak test. test for leak tightness

3.10. If unsatisfactory results are obtained in respect of even one of the parameters, the test is repeated on twice the number of samples drawn from the same batch.

The results of the repeat test is applicable apply to the whole batch.

4 Test Procedure

4.1. Tube surface must be inspected without the use of magnifying devices.

Samples of length 150 mm must be drawn for inspection of internal surface of tubes of diameter upto 20 mm.

The samples are cut into two logitudinally and examined.

The internal surface of tubes of internal diameter over 20 mm must be inspected against an illuminated screen.

4.2. Outside diameter and wall thickness are measured using a micrometer to GOST 6507-78 (CT СЭВ 344-76, СТ СЭВ 352-76)
ST SMEA ST SMEA

The length of tubes is measured using a tape as per GOST 7502-69 or a metallic rule or tape as per GOST 427-75.

Samples of length 150 mm are cut from tubes of inside diameter 12 mm and below for checking wall thickness. The samples are cut longitudinally into two. Wall thickness is measured using a micrometer with turned jaws as per GOST-6507-78 (OT C·Э B 344-76 and OT C·Э B 352-76).

ST SEV A ST SEV A

4.3. Curvature in tubes is measured as follows:

The tube is placed on a horizontal plane. A rigid steel ruler 1 m long is held against the tube under test and the maximum distance between the ruler and the tube is measured with a feeler gauge.

4.4. Tensile test must be carried out on longitudinal testpieces in accordance with GOST 10006-73.

Testpieces for the tensile test must be:

Cut pieces of tubes of the full section in the case of tubes of outside diameter upto 30 mm.

Unstraightened strips cut from the walls of the tube in the case of tubes of outside diameter over 30 mm.

4.5. Flattening test must be carried out in accordance with GOST 8695-75.

4.6. Leak tests must be conducted with hydraulic pressure in accordance with GOST 3845-75 or by nondestructive testing using a method agreed upon between manufacturer and customer.

4.7. Chemical composition should be determined in accordance with GOST 1652.0-77 to GOST 1652.13-77, GOST 9716.0-75, GOST 9716.1-75, GOST 9716.3-75 or by other methods which are not inferior to the standard methods in accuracy.

4.8. Extruded tubes of wall thickness 3 mm and over are tested for leaks by nondestructive testing using the method described in the mandatory annexure 2. Defective part of the tube is to be cut away. Leakproofness may also be checked by a fracture test at the manufacturing organization. The trailing end in the direction of extrusion in contact with the press residue is cut after making a notch up to 30% of the tube diameter.

The fracture is inspected without using magnifying devices. Tubes cut in this manner may be sent to the customer without further trimming.

4.9. Stress relieving-removal of residual tensile stresses-in tubes is ensured by the production technology of manufacturer.

Check of stress relieving for purposes of arbitration is carried out using the method described in the mandatory annexure 1.

5. Packing, Marking, Transport and Storage

5.1 All tubes with wall thickness less than 1 mm thick, soft tubes with wall thickness upto and including 1.5 mm and tubes with wall thickness 2 mm and diameter 60 mm and over are packed in boxes or crates.

Tubes of other dimensions are not packed.

Tubes of outside diameter not more than 40 mm weighing not more than 25 kg must be supplied in bundles weighing not more than 80 kg each.

If no transhipment en-route is involved tubes may be despatched without packing in closed wagons and railway containers.

For transport by railway wagons or containers, tubes must be placed and secured such that they are not displaced during transit.

Note: Other types of packing may be agreed upon between manufacturer and customer.

5.2 A label containing the following particulars must be fixed to each bundle of tubes:

a) manufacturer's name or trade mark;

b) tube dimensions;

c) material condition;

d) alloy grade

e) batch number

f) number of present standard.

5.3 The particulars mentioned in clause 5.2 must be indicated on every tube supplied without packing.

In the case of tubes of inside diameter over 50 mm these particulars must be indicated on a label glued to the internal surface of the tube.

5.4 Cases must be marked in accordance with GOST 14192-77.

The following additional particulars must be indicated on the cases:

a) alloy grade;

b) tube size;

c) material condition;

d) batch number and

e) number of present standard

5.5 A packing list or a tag containing the following particulars must be placed inside each box or container:

a) manufacturer's name or trade mark;

b) brass grade;

c) tube size;

d) material condition;

e) batch number;

f) number of present standard.

5.6 Each batch of tubes must be accompanied by a certificate attesting to conformity of quality of the tubes with the requirements of the present standard and containing the following particulars.

a) manufacturer's name or trade mark;
b) brass grade;
c) tube size;
d) material condition;
e) manufacturing method and accuracy
f) batch number;
g) nett weight of batch;
h) test results (at customer's request)
i) number of present standard.

5.7 Tubes are to be transported in closed transport media. Tubes must be protected against mechanical damage, moisture and the action of chemical reagents during transport.

5.8 Tubes must be stored in enclosed premises under conditions eliminating mechanical damage and exposure to moisture and active chemical reagents.

ANNEXURE 1
Mandatory

1. A Method for checking Brass Tubes for Residual Stresses by means of Mercuric Nitrite

This is a method for accelerated testing of copper - zinc alloy tubes for residual stresses which cause corrosion- cracking of the alloy. The test is conducted in mercuric nitrate solution. The method has been worked out in conformity with the CMEA recommendations PC 2789-70 on standardisation.

1.1 Terms and Definitions

1.1.1. Corrosion cracking - cracking of a material under the combined action of a corrosive medium and stresses (residual or applied).

1.1.2 Residual stress - stress remaining in a metal as a result of nonuniform plastic deformation.

1.2 Reagents

An aqueous solution containing 10 g of $Hg(NO_3)$ and 10 ml of HNO_3 ($d = 1.40$ to 1.42) in 1 litre of solution

There are two methods for preparing the solution.

Method 1: 11.4 g of $Hg\,NO_3\,2H_2O$ or 10.7 g of $HgNO_3\,H_2O$ is dissolved in approximately 40 ml of distilled water acidulated with 10 ml of HNO_3.

After the crystals have completely dissolved, the solution is diluted with distilled water upto 1000 ml.

Method 2: 76 g of mercury is dissolved in 114 ml of dilute HNO_3 (1:1) and stepped upto 1000 ml with water with constant stirring.

In the presence of excess acid, such a solution prevents precipitation of the main mercury salts.

The obtained solution should contain 100 g of $HgNO_3$ and excess (30 ml) of HNO_3 in 1 litre of solution.

100 ml of the solution is drawn for conducting the test. 7 ml of a 10% solution of HNO_3 are added to it and the volume is brought upto 1000 ml by adding water.

3. Preparation of Specimens for Testing

3.1. The specimens must be 100 to 150 mm long.

3.2. The specimens must be prepared such that no additional residual stresses are induced in them. The specimens must not be marked by stamping.

4. Test for Residual Stresses

4.1. The specimens are degreased by immersion in a solvent (benzene, carbon tetrachloride etc) and subsequent cleaning with a cotton cloth. They are then immersed in a 15% (by volume) aqueous solution of H_2SO_4 or a 10% solution of HNO_3 for 30 seconds for removing oxide films. After pickling, the specimens are quickly cleaned with running water. Next all remnants of water are removed from their surface and they are immersed in the mercuric nitrate solution. The test is conducted at room temperature.

Consumption of mercuric nitrate solution must be not less than 1.5 ml per cm^2 of surface of the specimens.

Samples selected for test must be free from surface defects. If the specimens are only partially immersed in mercuric nitrate solution, the immersed portion of the specimens must conform to the length specified in section 3 above.

4.2 The specimen is taken out of the mercuric nitrate solution after 30 minutes and washed with running water. Excess mercury is removed from the surface of the specimen. The specimens are examined not earlier than 30 minutes after the test unless a different interval of time is mentioned in the specifications as holding time before examination. If any doubt about arises about cracks, mercury must be removed from the surface by heating in a furnace with a mercury absorbing substance or in a sealed container with a vacuum pump and a cooler for collecting metallic mercury.

The specimens are examined with a magnifying glass giving 10 to 18 times magnification.

Note: Mercury is highly toxic and it is recommended that appropriate equipment should be used for removing it. Rubber gloves must be used.

5. Accident Prevention

5.1 Metallic mercury and its compounds are exceedingly toxic. The test is carried out in a room specially equipped with effective forced air and exhaust ventilation and an arrangement for trapping mercury vapour. All other sanitary norms envisaged in reference literature on accident prevention in handling metallic mercury must also be observed.

5.2. All operations are carried out by personnel wearing aprons (fastened at the back and without pockets) and rubber gloves and a scarf or other headgear. The special clothes must be changed at least once a week. The special clothing must not be taken home.

5.3. Storage or intake of food in this room is forbidden. Before intake of food and exit from the room, personnel must remove the special clothing and leave it in the laboratory premises. They must wash their hands with soap and brush thoroughly.

5.4. All personnel handling mercury and its compounds must undergo a medical checkpup at least twice a year.

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1. A Method for Inspecting Shrinkage Cavities

1.1. General Requirements for conducting the test.

1.1.1. This is a method for detecting and defining the terminal point of shrinkage cavities in extruded tubes of diameter 10 mm and above and wall thickness not less than 3 mm made out of nonferrous metals and alloys. It employs the technique of ultrasonic flaw detection. The ultransonic wares are introduced by contact process through the cylindrical surface of the article. Any type of ultrasonic flaw detector with appropriate transducer capable of providing the necessary sensitivity may be used. The sensitivity is set by tuning with a standard specimen.

The scanner used for ultrasonic flaw detection may have builtin transducers of either the separatily integrated variety or the directly integrated variety Y3K. The scanner facilitates stable acoustic contact between the peizoelectric convorter of the transducer and the article even while the transducer is moved. This is achieved by a continuous supply of liquid to the transducer.

1.2. Preparation of specimens for the test.

1.2.1. Test specimens must be got ready for tuning the flaw detector. These are prepared from cut pieces of tubes of the same nominal diameter, wall thickness and grade of alloy as the tubes (or tube blanks) to be inspected.

1.2.2. The surface of the test specimen must be identical (on an average) with that of the tubes under test.

1.2.3. The piece of tube (or tube blank) forming the test specimen must be free from internal defects which can be detected by the ultrasonic method.

1.2.4. A 300 mm long blank is cut into two equal parts for making the test specimen. The adjacent ends of both parts are faced. Control reflectors are drilled into one of the faces. These must be holes of diameter 1 mm and length notless than 20 mm drilled parallel to the generatrix of the wall thickness.

Note: The shape and dimensions of the control reflector may be altered with the concurrence of the customer.

1.2.5. Control reflectors are drilled in the centre of the wall of tubes of wall thickness 5 mm and less (equidistant from the outer and inner surfaces). If the wall thickness is greater than 5 mm, two control reflectors are drilled-one each at a distance of 1 mm from the outer and inner surfaces respectively.

1.2.6. The control reflector is filled with dry paper coverd with plasticine to prevent ingress of water into it.

1.2.7. After sealing the control reflector the two halves of the blank are joined such that the control reflector is located in the centre of the test specimen. The joint must be even and must not affect the contact of the detector with the tube surface.

1.2.8. The test specimens are considered valid if the control reflector is clearly detected against the background noise (ie. if the system of automatic defect signalling operates correctly as signified by the signal lamp glowing).

1.2.9 Test specimens must be stored in a place where they are protected against mechanical damage and corrosion. The service life of the control reflector is not standardised.

1.3 Preparation for Inspection.

1.3.1. The articles must be cleared to remove dirt, dust, grease, paint and other impurities before conducting inspection with the flaw detector.

1.3.2. The transducer and the signal lamp are connected into the flaw detector. The scaner is connected to the tank containing the contact liquid. The flow of contact liquid is adjusted by means of the regulating valve in such a manner as to ensure reliable acoustic contact and minimum consumption of contact liquid (water).

1.3.3. Connection of flaw detector to the supply and operation of the instrument must be carried out in accordance with the technical description and operating instructions of the particular type of flaw detector used for inspection.

1.3.4. The oscilloscope part of the flaw detector must be adjusted before beginning to tune the instrument. Brightness, focus, vertical and horizontal hold of the oscillbscope must be adjusted such that the scanning line occupies a portion below the centre line of the screen by about 1/3 the radius and is well focussed without a bright spot at its starting point.

1.3.5. The knobs in the front panel of the instrument must be set in the following positions while tuning the flaw detector for determining the terminal point of the cavity in the article.

"Frequency" - in the position corresponding to the frequency of the transducer of the УЗК (UZK - Ultra-Sonic Detector);

"Sounding Range" in the position П (P) corresponding to the wall

thickness of the tube.

1.3.6. The sensitivity of the flaw detector is tuned using appropriate standard specimens. Maximum amplitude of the echosignal from the control reflector is obtained by moving the probe in the zone of minimum diameter of the control reflector. The "Sensitivity" knob is rotated to set the amplitude of the echosignal from the control reflector to approximately half the height of the screen.

1.3.7. The leading edge of the gate pulse of the automatic defect signalling system is set to be alongside the trailing edge of the sounding pulse and the trailing edge of the gate pulse alongside the leading edge of the given echosignal.

1.3.8. The correctness of tuning of the flow detector must be checked after every two hours of operation with respect to the standard specimen.

1.4 Inspection Procedure

1.4.1. Inspection should be carried out in the quality control section. The inspection area should be convenient and should provide free access all around the circumference of the end of the tube where the press shrinkage cavity is likely to be found.

1.4.2. Inspection starts with the rear end of the extruded article. The surface of the article through which the ultrasonic oscillations are transmitted must be smooth and free from sharp dents, cavities and scratches.

The temperature of the unit under test must not be over 40°C

1.4.3. Suitable devices of the roller, knife-edge or other type with built-in transducer are recommended to be used for mechanised movement of the transducer along the surface of the unit under test.

1.4.4. Tube blanks with wall thickness upto 15 mm are checked with the flaw detector at a working frequency of ultrasonic oscillations of 5 MHz and those with wall thickness over 15 mm at 2.5 MHz.

1.4.5. Scanners are checked by placing the probe on the cavity end of the tube and pressing it tightly to the surface; the ground echosignal must now appear on the screen. As soon as the ground echosignal appears, the scanner is moved around and along the tube.

1.4.6. The scanning rate of the probe along the surface of the tube is selected so as to secure reliable acoustic contact. This must not be more than 0.5 m/s.

1.4.7. The screen must be watched for the presence of acoustic contact while moving the probe across and along the tube. A reliable ground echosignal indicates satisfactory transmission of ultrasonic oscillations into the tube. If the echosignal is lost in spiteof the probe being serviceable and the tuning being correct, the reliability of acoustic contact is checked by increasing the flow of contact fluid and cleaning the tube surface with cotton waste.

1.4.8. The existence of a cavity in the tube blank can be judged by the widening of the ground echosignal reflected from the inner wall of the tube.

1.4.9 After detecting the cavity, the probe is moved along the article in order to determine the length of the cavity and its terminalpoint. On reaching the zone where the ground echosignal does not widen any more and the signal lamp goes off, the scanner is rotated around the tube in order to make sure that the cavity has ended at all points on the surface of the tube.

1.4.9. After detecting the cavity, the probe is moved along the article in order to determine the length of the cavity and its terminal point. On reaching the zone where the ground echosignal does not widen any more and the signal lamp goes off, the scanner is rotated around the tube in order to make sure that the cavity has ended at all points on the surface of the tube. X

1.4.10. Having detected the extent of the cavity ultrasonically, a clearly visible identification mark is made along the circumference of the tube.

1.4.11. Probes of lower ultrasonic frequencies must be used for checking alloys having non-uniformly elastic coarse-grain structure. It is also necessary to make a thorough inspection of the rear end of the tube first where the structural noise is lower and the ground echosignal is stable. The location of the echosignal from the cavity is observed against the back ground of unstable structural noise and the cavity is tracked till the the echosignal disappears from the CRT of the flaw detector.

If the wall thickness of the tube is smaller than the value mentioned in this standard, i.e. the tube is thinner than the standard specimen, the echosignal reflected from the inner surface of the tube may appear in the zone of automatic inspection in which case the signal lamp would glow just as it would when a cavity is present.

If the cavity lies lower than the minimum permissible wall thickness it may not be detected in this section.

Price 5 Kopecks

BASE SI UNITS

Quantity	Unit		
	Name	Russian symbol	International symbol
Length	metre	м	m
Weight (Mass)	Kilogram	к	kg
Time	second	с	s
Current	ampere	А	A
Thermodynamic temperature	kelvin	К	K
Amount of substance	mole	моль	mol
Intensity of light	candela	кд	cd

SUPPLEMENTARY SI UNITS

Plane angle	radian	рад	rad
Solid angle	steradian	ср	sr

DERIVED SI UNITS WITH PROPRIETORY NAMES

Quantity	Unit		Expression for derived unit	
	Name	Symbol	using other units	using base SI units
Frequency	hertz	Hz	-	s^{-1}
Force	newton	N	-	$m.kg.s^{-2}$
Pressure	pascal	Pa	N/m^2	$m^{-1}.kg.s^{-2}$
Energy, work, heat	joule	J	N.m	$m^2.kg.s^{-2}$
Power, energy, flow	watt	W	J/c	$m^2.kg.s^{-3}$
Quantity of electricity, electric charge	coulomb	C	A.s	s.A
Electric potential	volt	V	W/A	$m^2.kg.s^{-3}.A^{-1}$
Electric capacitance	farad	F	C/V	$m^{-2}.kg^{-1}.s^4.A^2$
Electric resistance	ohm		V/A	$m^2.kg.s^{-3}.A^{-2}$
Conductance	siemens	S	A/V	$m^{-2}.kg^{-1}.s^3.A^2$
Magnetic flux	weber	Wb	V.s	$m^2.kg.s^{-2}.A^{-1}$
Magnetic induction	tesla	T	Wb/m^2	$kg.s^{-2}.A^{-1}$
Inductance	henry	H	Wb/A	$m^2.kg.s^{-2}.A^{-2}$
Luminous flux	lumen	lm	-	cd.sr. *
Illumination	lux	lx	-	$m^{-2}.cd.sr.$*
Nuclear activity	becquerel	Bq	-	s^{-1}
Radiation dosage	grey	Gy	-	$m^2.s^{-2}$

* The supplementary unit steradian figures along with base SI units in these two expressions.