STATE STANDARD	GOST 2685-75
	SHEET 1 OF 15
ALUMINIUM CASTING ALLOYS GRADES, SPECIFICATION AND TESTS METHODS	GOST 2685-75 supersedes GOST 2685-63

This standard pertains to the aluminium casting Alloys, used for section casting.

Requirements recommended by CMEA as per standardisation PC 1591-73 are described in standard.

1. GRADES

1.1. Groups, grades and chemical composition of aluminium alloys should correspond to the indications in table 1.

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Group of alloys	Grades of alloys	Chemical composition %: Basic components: Aluminium	Magnesium	Silicon	Manganese	Copper	Nickel	Titanium	Beryllium	Zirconium	Other elements	Admixtures not more than: Iron З.О.Б	K	A
I Alloys on alum and silicon base	АЛ2	Base	—	10.0-13.0	—	—	—	—	—	—	—	0.70	1.00	1.50
	АЛ4	"	0.17-0.3	8.0-10.5	0.2-0.5	—	—	—	—	—	—	0.60	0.90	1.00
	АЛ4-1	"	0.23-0.3	9.0-10.5	0.2-0.35	—	—	0.08-0.15	—	—	—	0.30	0.30	0.30
	АЛ9	"	0.2-0.4	6.0-8.0	—	—	—	—	—	—	—	0.60	1.00	1.50
	АЛ9-1	"	0.25-0.45	7.0-8.0	—	—	—	0.08-0.15	—	—	—	0.30	0.30	0.30
	АЛ34 (ВАЛ5)	"	0.35-0.55	6.5-8.5	—	—	—	0.1-0.3	0.15-0.4	—	—	0.60	0.60	—
	АК9 (АЛ4В)	"	0.2-0.4	8.0-11.0	0.2-0.5	—	—	—	—	—	—	0.50	1.20	1.30
	АК7 (АЛ9В)	"	0.2-0.5	6.0-8.0	—	—	—	—	—	—	—	1.10	1.20	1.30
II (Alloys on alum. silicon-copper base)	АЛ3	Base	0.35-0.6	4.5-5.5	0.6-0.9	1.5-3.0	—	—	—	—	—	0.60	1.20	1.60
	АЛ5	"	0.35-0.6	4.5-5.5	—	1.0-1.5	—	—	—	—	—	0.60	1.00	1.50
	АЛ5-1	"	0.40-0.55	4.5-5.5	—	1.0-1.5	—	0.08-0.15	—	—	—	0.30	0.30	0.30
	АЛ6	"	—	4.5-6.0	—	2.0-3.0	—	—	—	—	—	1.10	1.40	1.60
	АЛ32	"	0.3-0.5	7.5-8.5	0.3-0.5	1.0-1.5	—	0.1-0.3	—	—	—	0.70	0.80	0.60
	АК5М2 (АЛ3В)	"	0.2-0.8	4.0-6.0	0.2-0.8	1.5-3.5	—	—	—	—	—	1.00	1.30	1.30
	АК5М7 (АЛ10В)	"	0.2-0.5	4.5-6.5	—	6.0-8.0	—	—	—	—	—	[illegible]	1.20	—
	АК7М2 (АЛ14В)	"	[illegible]	[illegible]	0.2-0.6	1.5-3.0	—	—	—	—	—	1.10	1.30	1.30
	АК4М4 (АЛ15В)	"	—	3.0-5.0	0.2-0.6	3.5-5.0	—	—	—	—	—	1.20	1.30	—
III Alloys on alum copper base	АЛ7	Base	—	—	—	4.0-5.0	—	—	—	—	—	1.00	1.00	—
	АЛ19	"	—	—	0.6-1.0	4.5-5.3	—	0.15-0.35	—	—	—	0.20	—	—
	АЛ33 (ВАЛ1)	"	—	—	0.6-1.0	5.5-6.2	0.8-1.2	—	—	0.05-0.20	Cerium 0.15-0.30	0.30	0.30	—
IV Alloys on aluminium-magnesium base	АЛ8	Base	9.5-10.0	—	—	—	—	—	—	—	—	0.30	0.20	—
	АЛ13	"	4.5-5.5	0.8-1.3	0.1-0.4	—	—	—	—	—	—	0.50	0.50	1.50
	АЛ22	"	10.5-13.0	0.8-1.2	—	—	—	0.05-0.15	0.03-0.07	—	—	0.50	1.00	1.20
	АЛ23	"	6.0-7.0	—	—	—	—	—	0.02-0.10	0.05-0.20	—	0.20	0.20	—
	АЛ23-1	"	6.0-7.0	—	—	—	—	—	0.02-0.10	—	—	0.05	0.05	—
	АЛ27	"	9.5-10.5	—	—	—	—	—	0.05-0.15	—	—	0.20	0.20	1.20
	АЛ27-1	"	9.5-10.5	—	—	—	—	—	0.05-0.15	—	—	0.05	0.05	0.05
	АЛ28	"	4.8-6.3	—	0.4-1.0	—	—	—	—	—	—	0.30	0.40	0.05
V Alloys on alum. and other compound base	АЛ1	Base	1.25-1.75	—	—	3.75-4.5	1.75-2.25	—	—	—	—	0.70	0.80	[illegible]
	АЛ11	"	0.1-0.3	6.0-8.0	—	—	—	—	—	—	Zinc 7.0-12.0	0.70	1.20	[illegible]
	АЛ21	"	0.8-1.3	—	0.15-0.25	4.6-6.0	2.6-3.6	—	—	—	Chrom 0.1-0.2	0.50	0.60	0.50
	АЛ24	"	1.5-2.0	—	0.2-0.5	—	—	0.1-0.2	—	—	Zinc 3.5-4.5	0.50	[illegible]	[illegible]
	АЛ25	"	0.8-1.3	11.0-13.0	0.3-0.6	1.5-2.0	0.8-1.3	0.05-0.20	—	—	—	[illegible]	0.80	—
	АЛ30	"	0.8-1.3	11.0-13.0	—	0.8-1.5	0.8-1.3	—	—	—	—	[illegible]	0.70	—
	АК21М2,5Н2,5 (ВКЖЛС-2)	"	0.20-0.50	20.0-22.0	0.2-0.4	2.2-3.0	2.2-2.8	0.1-0.3	—	—	Chrom 0.2-0.4	[illegible]	0.90	—

Group of alloys	Grade of alloys	Chemical composition % — Admixtures not more than											Total of calculated admixtures		
		Magnesium	Silicon	Manganese	Copper	Zinc	Tin	Lead	Nickel	Titanium	[illegible]	Zirconium	[illegible]	K	A
I Alloys of alum. silicon base	АЛ2	0·10	–	0·50	0·60	0·30	–	–	–	0·10	–	0·10	2·10	2·20	2·70
	АЛ4	–	–	–	0·10	0·20	0·01	0·05	–	–	0·10	0·15	1·10	1·40	1·50
	АЛ4-1	–	–	–	0·10	0·30	0·005	0·05	–	Boron 0·10	0·10	0·10	0·60	0·60	0·60
	АЛ9	–	–	0·50	0·20	0·30	0·01	0·05	–	–	0·10	0·15	1·10	1·50	2·00
	АЛ9-1	–	–	0·10	0·10	0·20	0·005	0·05	–	0·10	0·10	0·10	0·60	0·60	0·60
	АЛ34 (ВАЛ5)	–	–	0·10	0·30	0·30	–	–	–	0·10	–	0·20	1·00	1·00	–
	АК9 (АЛ4В)	–	–	–	1·00	0·50	–	–	0·20	–	–	–	2·60	2·80	3·00
	АК7 (АЛ9В)	–	–	0·60	1·50	0·50	–	–	0·30	–	–	–	3·70	3·80	4·10
II Alloys on alum. silicon-copper base	АЛ3	–	–	–	–	0·30	0·01	0·05	–	–	–	0·50	1·10	1·70	1·90
	АЛ5	–	–	0·50	–	0·30	0·01	–	–	–	0·10	0·15	1·00	1·30	1·70
	АЛ5-1	–	–	0·10	–	0·30	0·01	–	–	Boron 0·10	–	0·10	0·60	0·60	0·60
	АЛ6	0·10	–	0·30	–	0·30	–	–	–	–	–	–	1·70	1·90	2·10
	АЛ32	–	–	–	–	0·30	–	–	–	–	–	0·10	0·90	1·00	1·10
	АК5М2 (АЛ3В)	–	–	–	–	0·50	–	–	0·50	–	–	–	2·00	2·10	2·30
	АК5М7 (АЛ10В)	–	–	0·50	–	0·60	–	–	0·50	–	–	–	2·50	2·70	–
	АК7М2 (АЛ14В)	–	–	–	–	0·50	–	–	0·30	–	–	–	1·80	2·00	2·00
	АК4М4 (АЛ15В)	0·50	–	–	–	[illegible]	–	–	0·50	–	–	–	4·00	4·10	
III Alloys on aluminium-copper base	АЛ7	0·05	1·20 [illegible]	0·10	–	[illegible]	0·01	0·01	–	0·20	–	0·10	2·10	2·10	–
	АЛ19	0·05	0·30	–	–	0·20	–	–	0·10	–	–	0·20	0·60	–	–
	АЛ33 (ВАЛ1)	0·05	0·30	–	–	–	–	–	–	–	–	–	0·50	0·56	–
IV Alloys on aluminium-magnesium base	АЛ8	–	0·30	0·10	0·10	0·10	–	–	–	0·07	0·07	0·20	1·00	1·00	–
	АЛ13	–	–	–	0·10	0·20	–	–	–	–	–	0·40	0·60	0·60	–
		–	–	–	–	0·10	–	–	–	–	–	–	0·50	0·50	–
	АЛ23	–	0·20	0·10	0·15	0·10	–	–	–	–	–	–	0·10	0·10	–
	АЛ23-1	–	0·50	0·10	0·05	0·05	–	–	–	–	–	–	0·50	0·50	0·50
	АЛ27	–	0·20	0·10	0·15	0·10	–	–	–	–	–	–	0·10	0·10	0·10
	АЛ27-1	–	0·05	0·10	0·05	0·05	–	–	–	–	–	–			
	АЛ28	–	0·30	–	0·30	–	–	–	–	–	–	0·10	0·50	0·60	0·70
(V) Alloys on the base of alum. and other components	АЛ1	–	0·10	–	–	0·10	–	–	–	–	–	–	1·40	1·40	–
	АЛ11	–	–	0·50	0·60	–	–	–	–	–	–	–	1·70	1·30	2·56
	АЛ21	–	0·50	–	–	0·30	–	–	–	–	–	–	1·20	1·10	–
	АЛ24	–	0·30	–	0·20	–	–	–	–	–	–	–	0·50	–	–
	АЛ25	–	–	–	–	0·50	0·02	0·10	Chrome 0·20	–	0·10	0·10	–	1·10	–
	АЛ30	–	–	0·20	–	0·20	0·01	0·05	–	–	–	–	–	1·10	–
	АК21М2,5Н2,5 (ВКЖЛС-2)	–	–	–	–	0·20	0·01	0·04	–	0·20	–	–	–	1·10	–

NOTE: 1 conventional denotation of casting methods

3 - Casting in sand mould

O - Casting in shell mould

B - Investment casting

K - Chill mould casting

A - Pressure die casting.

2. while using alloys of grades Ad2 and Ad2e for parts, working in sea water, the contents of copper should not exceed in alloys of grade Ad2 - 0.30%, in alloys of grade Ad-2e - 0.10%

3. while using the alloys for chillmould casting in alloys of grade Ad7 content of silicin upto 2% is permitted, in alloys of grade Ad22, absence of titanium is permitted.

4. while using the alloy of grade Ad7 for sand-mould casting, content of silicon not more than 1.8% is permitted, when content of titanium 0.07-0.20%, during this content of admixtures of iron should be maximum 0.30%

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4. Following are permitted while using the alloys for pressure die-casting: absence of magnisium in the alloy of grade AK11, in the alloy of grade AK22 content of magnisium 8.0-13.0%, silicon 0.8-1.6%, manganes upto 0.5% and absence of titanium.

5. For increasing the mechanical composition by 15-20%, it is necessary in alloy of grade AK8 to limit the content of admixtures of iron and silicon upto 0.03% on each, in alloy of grades AK2 and AK9, add ultrium in limits 0.08-0.20%, in the alloy of grade AK7, add titanium in limits 0.08-0.20%, during this content of admixtures of iron in alloys of grades AK2, AK7 and AK9 should not exceed 0.30%.

6. While working with alloys, content of beriltium, it is necessary to observe sanitary rules on operation with beriltium and its compounds, approved by the Ministry of Health U.S.S.R.

7. For using the alloys of grades AK5M2 (AL13B), AK7 (AL9B) and AK7M2 (AL11B) for utensils, the content of lead should not exceed 0.5%, arsenic - 0.015%, zinc - 0.3%

8. Alloys of grades AL1, AL6, AL13, AL21 are not advised to use in new designs.

9. Use of alloys for manufacturing the utensils in each individual case should be approved by Ministry of Health U.S.S.R.

10. In alloys to be used for utensils, admixtures of beryllium is not permitted.

11. Admixtures, marked with doted lines are calculated in total sum of admixtures in this, content of each of the elements should not exceed 0.020%.

12. For grades of alloys, given in brackets, letter B at the end of code of grade denotes, that alloys are manufactured from scrap and waste.

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2. TECHNICAL REQUIREMENTS

2.1 Mechanical properties of alloys should correspond to the indications of table 2

TABLE 2

Group of alloy	Grade of alloys	Method of casting	Type of Heat treatment	Partial resistance kg/mm²	Specific elongation %	Hardness as per Brinell HB
				not more than		
1	2	3	4	5	6	7
1	AM2	3M, OM, BM, KM	–	15	4	50
		K	–	16	2	50
		A	–	16	1	50
		3M, OM, BM, KM	T2	14	4	50
		K	T2	15	3	50
		A	T2	15	2	50
	AM4	3.0.B.K.A	–	15	2	50
		KA	T1	20	1.5	70
		3M, OM, BM	T6	23	3	70
		K, KM	T6	24	3	70
	AM4-1	3.0.B.K.A	–	16	2	50
		KA	T1	20	1.5	70
		3M, OM, BM	T6	25	3	70
		K, KM	T6	27	3	70
	AM9	3,0,B,K	–	16	2	50
		A	–	17	1	50
		3,0,B,K,A	T2	14	2	45
		KM	T4	19	4	50
		3,0,B	T4	18	4	50

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Table 2 contd.

1	2	3	4	5	6	7
AM9	AM9	K, KM	T5	21	2	60
		3, O, B	T5	20	2	80
		3M, OM, EM	T5	20	2	80
		3M, OM, EM	T6	23	1	70
		3M, OM, EM	T7	20	2	66
		3M, OM, EM	T8	16	3	55
	AM9-1	3, O, B	T4	20	5	50
		K, KM	T4	23	5	50
		3, O, B	T5	24	4	68
		3M, OM, EM	T5	24	4	68
		K, KM	T5	27	4	60
		3M, OM, EM	T6	28	2	70
		K, KM	T6	30	3	70
		A	—	20	1	50
		A	T2	17	2	45
		3M, OM, EM	T7	21	2	60
		3M, OM, EM	T8	17	3	55
	AJ34(LA14B)	3	T5	30	2	85
		3	T4	26	4	70
		K	T5	24	4	90
		K	T4	28	6	60
	AM3(LA14B)	3, A	—	16	—	70
		3	T6	24	0.5	65
		K	T6	25	0.5	50
	AM7(LA19B)	3	—	13	0.5	60
		K	—	16	0.5	60
		3	T5	20	0.5	75
		K	T5	22	0.5	75

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1	2	3	4	5	6	7
Ш	А13	К	—	17	0.5	65
		3,0,Б	—	14	0.5	65
		3,0,Б,К	Т1	17	—	70
		3,0,Б,К	Т2	15	1	65
		3,0,Б	Т5	22	0.5	75
		К	Т5	25	0.5	75
		3,0,Б,К	Т7	21	1	70
		3,0,Б,К	Т8	18	2	65
		А	—	16	0.5	65
	А13	К	—	17	0.5	65
		3,0,Б	—	14	0.5	65
		3,0,Б,К	Т1	17	—	70
		3,0,Б,К	Т2	15	1	65
		3,0,Б	Т5	22	0.5	75
		К	Т5	25	0.5	75
		3,0,Б,К	Т7	21	1	70
		3,0,Б,К	Т8	18	2	65
		А	—	16	0.5	65
	А15	3,0,Б,К	Т1	16	0.5	65
		3,0,Б	Т5	20	0.5	70
		К	Т5	22	0.5	70
		Б,0,Б	Т6	23	0.5	70
		3,0,Б,К	Т7	18	1	65
	А15-1	3,0,Б,К	Т1	18	0.5	65
		3,0,Б	Т5	28	0.5	70
		К,КМ	Т5	30	1	70
		3,0,Б,К	Т7	21	1	65
	А16	3,0,Б,К	Т2	15	1	46
		А	—	15	1	43

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Table 2 contd.

1	2	3	4	5	6	7
	A132	З	Т6	25	1·5	60
		К	Т1	20	1·5	70
		К	Т6	27	2	70
		А	–	26	2	70
	АК5М2С (А132В)	З	–	12	–	65
		К	–	16	0·5	65
		З	Т5	21	–	75
		К	Т5	24	0·5	75
		З	Т3	15	1	65
		К	Т3	18	2	65
		А	–	15	0·5	65
	АК5М7(А-А108)	З	–	13	–	80
		К	–	16	–	80
		К	Т1	17	–	90
		З	Т1	15	–	80
	АК7М2СА(А148)	З	–	13	0·5	70
		К	–	17	0·5	70
		З	Т5	20	0·5	85
		К	Т5	24	0·5	85
	АК4М4 (А-А155)	З	–	15	–	70
		К	–	18	0·5	70
		З	Т5	20	–	80
		К	Т5	22	0·5	85
III	АЛ7	З, О, В	Т4	20	6	60
		К	Т4	21	6	60
		З, О, Б	Т5	22	3	70
		К	Т5	23	3	70

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1	2	3	4	5	6	7
	AM18	3.0.B 3.0.B	T4 T5	30 34	8 4	70 90
	AM33 (BAM1)	3,K 3,K	T4 T5	23 20	2.5 1.5	80 85
IV	AM8	3,0,B,K	T4	29	9	60
	AM13	3,0,B,K A	– –	15 17	1 0.5	55 55
	AM22	3,0,B,K 3,0,B,K	– T4	18 23	1 1.5	90 90
	AM23	3,0 K,A 3,0,K	– – T4	19 22 23	4 6 6	60 60 60
	AM23-1	3,0 K,A 3,0,K	– – T4	20 24 25	5 10 10	60 60 60
	AM27	2,0,K,A	T4	35	15	75
	AM27-1	2,0,K,A	T4	35	15	75
	AM28	3,0,B K A	– – –	20 21 21	4 5.5 5.5	55 55 55
V	AM1	3,0,B,K 3,0,B,K	T5 T7	21 18	0.5 1	95 90

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Table 2 contd.

1	2	3	4	5	6	7
	АЛ11	З, О, В	–	20	2	80
		К	–	21	1	90
		Д	–	18	1	60
	АЛ21	З, О, В	T2	18	1	65
		З, О, В	T7	21	1	75
	АЛ25	K	T1	19	–	90
	АЛ30	K	T1	20	0.5	90
	AK 21M2.5H2.5	K	T2	16.0	–	90
	(BKЖЛС-2)	K	T1	19.0	–	100
	АЛ24	З, О, В	–	22	2	60
		З, О, В	T5	27	2	70

NOTE: Conventional denotation of types of heat treatment

T1 – Artificial ageing without preliminary hardening;

T2 – Annealing;

T4 – Hardening;

T5 – Hardening and short time (incomplete) artificial ageing

T6 – Hardening and complete artificial ageing;

T7 – Hardening and stabilizing tampering.

T8 – Hardening and soft tempering

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2.2 Mechanical properties of alloys already heat treated, are not indicated in table 2 should correspond to the requirements of standards of casting.

3. TESTING METHODS

3.1 Determination of chemical composition of alloys is carried out as per GOST 11739-66, GOST 11760-66 or GOST 7727-75

It is permitted to determine

It is permitted to determine the chemical composition of alloys by other methods in case, if the accuracy of determination is in limits, specified in GOST 11739-66, GOST 11760-66 or GOST 7727-75.

During disagreement in evaluation of the quality, analysis of chemical composition of alloys is carried out as per GOST 11739-66 & GOST 11760-66.

3.2 Mechanical properties of alloys are determined on separately cast specimens or samples turned from poured blanks for casting

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3.3 Shape and dimensions of separately cast specimen

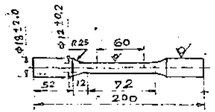

FIG. 1

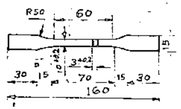

FIG. 2

while casting in sand moulds, in chill moulds and in shell moulds should correspond to the requirements of fig 1 and during pressure die casting - Fig 2.

Permissible difference of maximum and minimum diameter along length of working part of specimen should not be more than 0.2 mm.

It is permitted to reduce the length of the head of sample, during this length of head is determined by the design of clamps of testing machine.

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34 During all type of casting, separately cast specimens are tested with skin of casting. Damage of continuity of cast skin in place of dressing of the specimen surface is permitted.

35 Shape and dimensions of separately cast specimens while casting as per investment casting should be determined by technical document approved in the specified order, calculated length of samples should be $L_0 = 5\,d_0$

36 Samples cut to blanks, should have the dia. 6.0 mm. at calculated length $L_0 = 5\,d_0$

37 While determining the mechanical properties of specimens with calculated length, less than 60 mm for alloys, in which minimum characteristics of relative elongation less than 1% is specified, the relative elongation is not determined.

38. Method of casting and type of heat treatment of samples for testing mechanical properties of alloys,

should correspond to the [redacted] method of casting and heat treatment, specified for casting from these alloys. It is permitted to carry out the checking of mechanical properties of samples, cast in sand-mould, for all types of casting.

3.9 Mechanical properties of samples, cut from castings, must be specified in technical document for castings.

3.10. Mechanical properties are determined as per GOST 1497-73

3.11 Testing for hardness as per Brinell is carried out as per GOST 9012-59 at dia of ball 10 mm. and load 1000 Kg or dia. of ball 5 mm. and load 250 kg.

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