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DATA SHEET

Low-Melting (Fusible) Alloys

Low-Melting or Fusible Alloys are generally the alloys that melt below 450°F (233°C). The most useful are the alloys containing high percentages of Bismuth combined with Lead, Tin, Cadmium, Indium and other metals. Many of the Bismuth alloys melt below the boiling point of water and some melt below 150°. The low melting temperature and unique growth/shrinkage characteristics or these alloys lead to a greater diversity in useful applications than almost any other alloy system . From the machining of aircraft engine turbine blades to the application or radiation therapy shielding, from the trigger-ing of a life-saving sprinkler system to the spring-release or a turkey roast's pop-up "thermometer," Low-Melting alloys continue o have a quiet yet profound impact on our lives.

The alloys shown in the following data table are the most popular alloys. Many fusible alloys are "eutectic," having a single melting point (the freezing point and melting point are the same), while others are "non-eutectic" alloys which start to melt at one temperature but are not fully molten until they reach a higher temperature. (For non-eutectic alloys, "yield" temperatures are shown.) There are hundreds of non-eutectic alloys with known temperature ranges. Other alloys can be formulated to meet special temperature requirements.

Since the effects of varying percentages of Bismuth are well known, alloys can be accurately modified to specific demands. For example, alloys with less than 48% Bismuth normally shrink during solidification, those with 48% o 55 % Bismuth have little dimensional change, while alloys above 55% usually row during solidification. Lead and other elements can be added to alter the solidification/growth characteristics and melting range. Alloys containing Indium have the ability to adhere to glass and ceramics, adding yet another useful property.

As one of the first commercial manufacturers of Low-melting Alloys, NASCO has over 65 years of experience in this field, producing both standard and custom alloys for numerous applications. Recent years have shown a marked increase in demand for NASCO's Low-Melting Alloys, especially Bismuth-Tin, due in part to their low environ-mental impact.

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Data Table

Also Known	Melting Point Solidus °C	°F	liquidus °C	°F	Weight lbs/cu. in.	Specific Gravity	Nominal Composition % Bi	% Pb	% Sn	% Cd	% Others	Short-Term Tensile Strength lbs/sq. in.	Yield Temp. °F	% Elongation in 2"-slow loading	Brinell Hardness No. (500 kg.)	Coefficient or Expansion in./in./°C	% Volume Change (liquid to solid)	% Volume Change (after solidification)	Growth/Shrinkage nme After Casting After 2 min.	After 1 hr.	After 24 hr.	After 500 hr.
Low 117	117	47	117	47	.32	8.9	44.7	22.6	8.3	5.3	In 19.1	5400	117	1.5	12.0	.000025	−1.4	>0.05	+.0005	−.0001	−.0002	−.0002
Low 136	136	58	136	58	.31	8.8	49.0	18.0	12.0	—	In 21.0	6300	136	S0	14.0	.000023	−1.35	>0.05	+.0003	.0000	−.0002	−.0002
Bend	158	70	158	70	.339	9.4	50.0	26.7	13.3	10.0		5990	158	—200	9.2	.000022	−1.7	+0.60	+.0025	+.0051	+.0051	+.0057
Woods	158	70	169	76	.347	9.6	50.0	25.0	12.5	12.5		6100	158	"" 190	9.3	.000022	−1.8	+0.4	−.0001	+.0002	+.0031	+.0035
Sare	160	71	190	88	.341	9.4	42.5	37.7	11.3	8.5		5400	162.5	—220	9.0	.000024	−2.0	+0.3	−.0004	.0000	+.0022	+.0025
Roses	203	95	203	95	.350	9.7	52.5	32.0	15.5	—		6100	203	"'213	9.0	.000020	−1.7	+0.4	−.0002	+.0055	+.0057	+.0061
Rose	203	95	239	115	.3365	9.3	50.0	25.0	25.0	—		6200	203	—200	9.5	.000020	-1.6	+0.4	−.0001	+.0045	+.0052	+.0060
Matrix	218	103	440	227	.343	9.5	48.0	28.5	14.5		Sb 9.0	13000	240	>I	19	.000022	−1.5	+0.5	+.0008	+.0048	+.0051	+.0061
B;tse	255	124	255	1M	.38	10.3	55.S	44.5				6400	255	—65	10.2	.000021	1.5	+0.3	.0008	−.0008	+.0008	+.0022
Tru	281	138	281	138	.315	8.7	58.0		42.0	—		8000	281	...200	22	.000015	+0.77	+0.05	+.0007	+.0006	+.0005	+.0005
Cast	281	138	338	170	.296	8.2	40.0		60.0	—		8000	302	—200	22	.000015	+0.5	0	−.0001	−.0001	−.0001	−.0001

Eutectic Alloy

Bi=Bismuth • Cd=Cadmium • In=Indium • Pb=Lead • Sb=Antimony • Sn=Tin

=Approximate Values

data sheet

Low-Melting (Fusible) Alloys

—Continued —

Typical Uses

Intricate compound foundry cores
Metalizing, repairing, and altering patterns & core boxes
-Lost wax" pattern dies
Fusible cores for compound wax patterns
Molds for duplicating plaster or plastic patterns
Anchoring patterns in foundry match plates
Repairing masonite plaster, plastic and Wood tooling
Heat transfer medium in constant-temperature baths
Heat treating and tempering baths
Seals in bright annealing and nitriding furnaces
Anchoring magnets in chucks, instruments and holding devices
Anchoring glass pans in metal and metal palls in glass
Chucks for grinding lenses and other optical components
Chucks for holding special or irregular contoured parts during machining, grinding, etc.
Chucks for gem culling
Fusible element in automatic fire sprinklers, fire alarms, fire doors and other thermal safety devices
Safety plugs for tanks and cylinders for compressed gas, gasoline and diesel fuel
Automatic shut-offs for hot water heaters and furnaces
Molds for false teeth, dental models
Cores for electroforming external & internal shapes of copper, nickel, etc.
Encapsulating jet engine turbine blades for machining
Filler for bending of pipes, tubes, extrusions
Fishing lures to replace Lead-base lures
As master alloys for addition of Lead, Bismuth, or Tin to Aluminum and other metals
Molds for vacuum forming plastic sheet
Dies for sheet metal embossing
Proof casting for accurate internal measurements of machined parts, molds & dies
Counter electrode alloy in selenium rectifier's
Prosthetic device pattern s
Shielding blocks for radiation and X-ray therapy
Low temperature solders for delicate instruments, assemblies, etc.
Sealing glass to glass or glass to ceramic in electronic devices, vacuum systems, laboratory apparatus etc.
Cores for forming fiberglass laminates and plastic parts

Additional Data Sheets for Special Alloys & Applications

Radiation Therapy Alloys I
Tube Bending with Low-Melting Alloys

Forms & Shapes Available

Bar Ingot Stick & Wire