

Rough castings of heavy metal alloys produced by sand casting

General tolerances and machining allowances
(For replacement purposes only)

DIN
1687-1

ICS 77.150.01

Supersedes
October 1980 edition.

Descriptors: General tolerances, machining allowances, castings,
heavy metal alloys.

Gußrohnteile aus Schwermetalllegierungen – Sandguß –
Allgemeintoleranzen, Bearbeitungszugaben
(Nicht für Neukonstruktionen)

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

Dimensions in mm

1 Scope and field of application

This standard specifies general tolerances and machining allowances for rough castings of heavy metal alloys (e.g. copper, zinc, nickel, tin and lead alloys) produced by sand casting.

Users of this standard should note that it now only applies to castings used for repair and replacement purposes. New designs are covered by ISO 8062 : 1994.

Owing to the lack of empirical data, general tolerances have not been specified here for angular dimensions. If angles are to meet accuracy requirements, these shall be indicated as individual tolerances.

2 Normative references

This standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the titles of the publications are listed below. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

DIN 1680-1	Rough castings – General tolerances and machining allowances – General
DIN 1680-2	Rough castings – System of general tolerances
DIN 7182-1	Sizes, deviations, tolerances and fits – Basic concepts
ISO 8062 : 1994	Castings – System of dimensional tolerances and machining allowances

3 Concepts

See DIN 7182-1 and DIN 1680-1 for the terms 'general tolerances' and 'tolerance grade', and DIN 1680-1 for a definition of 'machining allowance'.

4 Tolerance grades

4.1 Dimensional deviations

For rough castings of heavy metal alloys, dimensional deviations are largely dependent on

- the dimensional accuracy of the pattern, the care taken during moulding and casting, and the moulding and casting equipment used based on the batch size;
- the location of the parting line (i.e. dimensions are or are not influenced by the mould; cf. DIN 1680-1);
- the nominal sizes.



Continued on pages 2 to 4.

Translation by DIN-Sprachendienst.

In case of doubt, the German-language original should be consulted as the authoritative text.

4.2 Application of tolerance grades

Permissible limit deviations shall be specified on the basis of the tolerance grades given in table 1. Linear dimensions and thickness shall be specified for the same grade; for exceptions see DIN 1680-1.

4.3 Nominal size ranges

The nominal size ranges shown in table 1 for each tolerance grade have been selected on the basis of reliable measurement data.

5 Machining allowances

The machining allowance, *BZ*, is a function of the largest external dimension of the casting and is the same for all tolerance grades (cf. table 2); see DIN 1680-1 for exceptions.

For sizes up to 350 mm, machining allowances may be reduced to approximately half the values specified in table 2 if the pattern equipment, casting procedure and machining procedure with regard to clamping surfaces and datum surfaces have been optimized, for example, for series production, as agreed between the customer and the foundry. These reduced values are shown in table 3.

6 Designation

Where both the tolerance grade and the machining allowance have been selected on the basis of this standard, the designation of a grade GTA 18 tolerance (GTA 18) in conjunction with a machining allowance of 3,5 (BZ 3,5), for example, shall be designated as follows:

Tolerance and machining allowance DIN 1687 – GTA 18 – BZ 3,5

See DIN 1680-1 for other examples of designations.

Table 1: Limit deviations for linear dimensions (length, width, height, centreline distance, diameter, radius) and thicknesses (wall, web and rib thicknesses)*)

Tolerance grade	Dimensions influenced by mould	Nominal size range											Corresponds to tolerance grade ... as in DIN 1680-2
		Up to 6	Over 6 up to 10	Over 10 up to 18	Over 18 up to 30	Over 30 up to 50	Over 50 up to 80	Over 80 up to 120	Over 120 up to 180	Over 180 up to 250	Over 250 up to 315	Over 315 up to 400	
GTA 20	Yes	—	—	± 4,2	± 4,2	± 5	± 6	± 7	± 8	± 9	± 10	± 11	GTA 20
	No	—	—	± 4,4	± 4,4	± 5,2	± 6,2	± 7,2	± 8,2	± 9,2	± 10,2	± 11,2	GTA 20, plus allowance
GTA 19	Yes	—	± 2,5	± 2,6	± 2,6	± 3,1	± 3,7	± 4,3	± 5	± 6	± 6,5	± 7	GTA 19
	No	—	± 2,5	± 2,8	± 2,8	± 3,3	± 3,9	± 4,5	± 5,2	± 6,2	± 6,7	± 7,2	GTA 19, plus allowance
GTA 18	Yes	± 0,9	± 1,1	± 1,4	± 1,7	± 2	± 2,3	± 2,7	± 3,2	± 3,6	± 4,1	± 4,5	GTA 18
	No	± 1,1	± 1,3	± 1,6	± 1,9	± 2,2	± 2,5	± 2,9	± 3,4	± 3,8	± 4,3	± 4,7	GTA 18, plus allowance
GTA 17	Yes	± 0,6	± 0,75	± 0,9	± 1,1	± 1,3	± 1,5	± 1,8	± 2	± 2,3	± 2,6	± 2,9	GTA 17
	No	± 0,8	± 0,95	± 1,1	± 1,3	± 1,5	± 1,7	± 2	± 2,2	± 2,5	± 2,8	± 3,1	GTA 17, plus allowance
GTA 16	Yes	± 0,4	± 0,45	± 0,55	± 0,65	± 0,8	± 0,95	± 1,1	± 1,3	± 1,5	± 1,6	± 1,8	GTA 16
	No	± 0,6	± 0,65	± 0,75	± 0,85	± 1	± 1,1	± 1,3	± 1,5	± 1,7	± 1,8	± 2	GTA 16, plus allowance

*) Irrespective of the values given in this table, the actual deviation of the linear dimensions of a casting shall in no case be greater than ± 25 % of the nominal size, rounded to one decimal place. This restriction is of particular relevance when applying the deviations in the boxes enclosed by thick lines.

(continued)

Table 1 (concluded)

Tolerance grade	Dimensions influenced by mould	Nominal size range										Corresponds to tolerance grade ... as in DIN 1680-2
		Over 400 up to 500	Over 500 up to 630	Over 630 up to 800	Over 800 up to 1000	Over 1000 up to 1250	Over 1250 up to 1600	Over 1600 up to 2000	Over 2000 up to 2500	Over 2500 up to 3150	Over 3150 up to 4000	
GTA 20	Yes	± 12	± 14	± 16	± 18	± 21	± 25	± 30	± 35	± 43	± 50	GTA 20
	No	± 12,2	± 14,5	± 16,5	± 18,5	± 21,5	± 25,5	± 30,5	± 35,5	± 43,5	± 50,5	GTA 20, plus allowance
GTA 19	Yes	± 8	± 8,5	± 10	± 11	± 13	± 16	± 19	± 22	± 27	± 33	GTA 19
	No	± 8,2	± 9	± 10,5	± 11,5	± 13,5	± 16,5	± 19,5	± 22,5	± 27,5	± 33,5	GTA 19, plus allowance
GTA 18	Yes	± 5	± 5,5	± 6,5	± 7	± 8	± 10	± 12	± 14	± 16,5	± 20	GTA 18
	No	± 5,2	± 6	± 7	± 7,5	± 8,5	± 10,5	± 12,5	± 14,5	± 17	± 20,5	GTA 18, plus allowance
GTA 17	Yes	± 3,2	± 3,5	± 4	± 4,5	± 5,5	± 6,5	± 7,5	± 9	± 11	± 13	GTA 17
	No	± 3,4	± 4	± 4,5	± 5	± 6	± 7	± 8	± 9,5	± 11,5	± 13,5	GTA 17, plus allowance
GTA 16	Yes	± 2	± 2,2	± 2,5	± 2,8	± 3,3	± 3,9	± 4,6	± 5,5	± 7	± 8	GTA 16
	No	± 2,2	± 2,7	± 3	± 3,3	± 3,8	± 4,4	± 5,1	± 6	± 7,5	± 8,5	GTA 16, plus allowance

Table 2: Machining allowances

Nominal size range (based on the largest overall dimension of casting)	Up to 30	Over 30 up to 50	Over 50 up to 120	Over 120 up to 180	Over 180 up to 250	Over 250 up to 350	Over 350 up to 500	Over 500 up to 1000	Over 2000 up to 2500	Over 2500 up to 4000
Machining allowance, <i>BZ</i>	2	2	2,5	2,5	3,5	3,5	4	6	8	10

Table 3: Reduced machining allowances (see clause 5)

Nominal size range (based on the largest overall dimension of casting)	Up to 30	Over 30 up to 50	Over 50 up to 120	Over 120 up to 180	Over 180 up to 250	Over 250 up to 350
Machining allowance, <i>BZ</i>	1	1	1,5	1,5	2	2

7 Indicating general tolerances on existing drawings

If an existing drawing does NOT refer to the tolerance groups specified in the 1962 edition of this standard (which is no longer valid), then the tolerance grades given in table 1 do not apply. It is recommended that a grade suitable for the casting in question be indicated on such drawings.

If an existing drawing DOES refer to the previously valid tolerance groups, it is recommended that these be converted to the tolerance grades specified in table 1 of the present standard. If this is not possible, the permissible limit deviations are to be taken from tables 4 and 5 below.

Tables 4 and 5 do NOT apply to new drawings.

Table 4: Limit deviations for linear dimensions on existing drawings

Tolerance group		Nominal size range												
		Up to 18	Over 18 up to 30	Over 30 up to 50	Over 50 up to 80	Over 80 up to 120	Over 120 up to 200	Over 200 up to 315	Over 315 up to 500	Over 500 up to 800	Over 800 up to 1250	Over 1250 up to 2500	Over 2500 up to 4000	Over 4000 up to 6000
A	External dimensions	+2 -1	+2,5 -1,5	+2,5 -1,5	+4 -2,5	+4 -2,5	+4 -2,5	+6 -3,5	+6 -3,5	+9 -6	+9 -6	+13 -9	+17 -12	+24 -16
	Internal dimensions	+1 -2	+1,5 -2,5	+1,5 -2,5	+2,5 -4	+2,5 -4	+2,5 -4	+3,5 -6	+3,5 -6	+6 -9	+6 -9	+9 -13	+12 -17	+16 -24
B	External dimensions	+1,5 -0,8	+2 -1	+2 -1	+3 -1,5	+3 -1,5	+3 -1,5	+4,5 -2	+4,5 -2	+6 -3	+6 -3	-	-	-
	Internal dimensions	+0,8 -1,5	+1 -2	+1 -2	+1,5 -3	+1,5 -3	+1,5 -3	+2 -4,5	+2 -4,5	+3 -6	+3 -6	-	-	-
C	External dimensions	+0,7 -0,4	+0,8 -0,5	+1 -0,6	+1,2 -0,7	+1,5 -0,9	+1,8 -1,1	+2,2 -1,3	+2,5 -1,6	+3 -1,9	+3,8 -2,4	-	-	-
	Internal dimensions	+0,4 -0,7	+0,5 -0,8	+0,6 -1	+0,7 -1,2	+0,9 -1,5	+1,1 -1,8	+1,3 -2,2	+1,6 -2,5	+1,9 -3	+2,4 -3,8	-	-	-

For centreline distances, the limit deviations specified for internal dimensions shall be used.

Table 5: Limit deviations for thicknesses on existing drawings

Tolerance group	Nominal size range						
	Up to 6	Over 6 up to 10	Over 10 up to 18	Over 18 up to 30	Over 30 up to 50	Over 50 up to 80	Over 80 up to 120
A	± 1,5	± 2	± 2	± 3	± 3	± 4,5	± 4,5
B	± 1	± 1,5	± 1,5	± 2	± 2	± 3	± 3
C	+0,8 -0,7	+0,9 -0,8	+1,1 -0,9	+1,4 -1,1	+1,7 -1,3	+2 -1,6	-

8 Indicating machining allowances on existing drawings

The machining allowances specified in this standard only apply to drawings on which general tolerances in accordance with clause 4 and table 1 of this standard are indicated.

Previous editions

DIN 1687-1: 1962-11, 1974-08, 1980-10.

Amendments

As compared with the October 1980 edition, the standard now applies only to castings used for replacement purposes.

Other relevant standard

DIN 1690-1 Technical delivery conditions for castings of metallic materials – General



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