

# Rough castings of grey cast iron

## General tolerances and machining allowances

### (For replacement purposes only)

**DIN**  
**1686-1**

ICS 77.140.80

Supersedes  
October 1980 edition.

Descriptors: General tolerances, machining allowances, castings, cast iron.

Gußrohteile aus Gußeisen mit Lamellengraphit – 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 grey cast iron which are subject to the technical delivery conditions laid down in DIN 1691.

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 1691        | Grey cast iron – Properties                                            |
| 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 castings of grey cast iron, dimensional deviations are largely dependent on

- the dimensional accuracy of the pattern, the degree of shrinkage dependent on the material type and casting configuration, the care taken during moulding and casting, and the moulding and casting equipment used based on the batch size;
- 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

Limit deviations shall be specified on the basis of the tolerance grades given in tables 1 and 2. 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 the tables for each tolerance grade have been selected on the basis of reliable measurement data. For sizes outside the range for a given grade, the next coarsest grade applies.

## 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 3); see DIN 1680-1 for exceptions.

For sizes up to 500 mm, machining allowances may be reduced to approximately half the values specified in table 3 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 4.

For castings with a mass greater than 1 000 kg or a wall thickness greater than 50 mm, the machining allowances shall be agreed between the manufacturer and client.

## 6 Designation

Where both the tolerance grade and the machining allowance have been selected on the basis of the present standard, the designation of a grade GTB 17 tolerance (GTB 17) in conjunction with a machining allowance of 3,5 for bottom and side surfaces in the die and of 4,5 for top surfaces (BZ 3,5/4,5), for example, shall be designated as follows:

Tolerance and machining allowance DIN 1686 – GTB 17 – BZ 3,5/4,5

See DIN 1680-1 for other examples of designations.

**Table 1: Limit deviations for linear dimensions  
(length, width, height, centreline distance, diameter, radius)\*)**

| Tolerance grade | 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 180 | Over 180 up to 250 | Over 250 up to 315 | Over 315 up to 400 | 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 | Over 4000 up to 6300 | Over 6300 up to 10000 |
| GTB 20          | ± 4,5              | ± 7,5            | ± 8              | ± 8,5            | ± 9               | ± 10               | ± 11               | ± 11               | ± 12               | ± 13               | ± 14               | ± 15               | ± 16                | ± 18                 | ± 19                 | ± 21                 | ± 23                 | ± 25                 | ± 27                 | ± 33                 | ± 39                  |
| GTB 19          | ± 4,5              | ± 4,7            | ± 5              | ± 5,5            | ± 6               | ± 6,5              | ± 7                | ± 7,5              | ± 8                | ± 8,5              | ± 9,5              | ± 10               | ± 11                | ± 12                 | ± 13                 | ± 14                 | ± 15                 | ± 17                 | ± 19                 | ± 22                 | ± 26                  |
| GTB 18          | ± 2,9              | ± 3              | ± 3,2            | ± 3,4            | ± 3,7             | ± 4,1              | ± 4,4              | ± 4,7              | ± 5                | ± 5,5              | ± 6                | ± 6,5              | ± 7                 | ± 7,5                | ± 8,5                | ± 9                  | ± 10                 | ± 11                 | ± 12                 | ± 14                 | ± 17                  |
| GTB 17          | ± 1,8              | ± 1,9            | ± 2              | ± 2,1            | ± 2,3             | ± 2,5              | ± 2,7              | ± 2,9              | ± 3,1              | ± 3,3              | ± 3,5              | ± 3,8              | ± 4,1               | ± 4,4                | ± 4,9                | ± 5,5                | ± 6                  | ± 6,5                | ± 7                  | —                    | —                     |
| GTB 16          | ± 1,1              | ± 1,2            | ± 1,3            | ± 1,4            | ± 1,5             | ± 1,6              | ± 1,8              | ± 1,9              | ± 2                | ± 2,1              | ± 2,3              | ± 2,4              | ± 2,6               | ± 2,8                | ± 3,1                | ± 3,4                | ± 3,6                | ± 3,9                | ± 4,3                | —                    | —                     |
| GTB 15          | ± 0,85             | ± 0,95           | ± 1              | ± 1,1            | ± 1,2             | ± 1,3              | ± 1,4              | ± 1,5              | ± 1,6              | ± 1,7              | ± 1,8              | ± 1,9              | ± 2                 | ± 2,2                | ± 2,3                | ± 2,5                | —                    | —                    | —                    | —                    | —                     |

\*) 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.

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**Table 2: Limit deviations for thicknesses (wall, web and rib thicknesses)\*, \*\*)**

| Tolerance grade | 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 | Over 120 up to 180 |
| <b>GTB 20</b>   | —                  | —               | —                | ± 7,5            | ± 11             | ± 12             | ± 13              | ± 14               |
| <b>GTB 19</b>   | —                  | —               | ± 4,5            | ± 7,5            | ± 8              | ± 8,5            | ± 9               | ± 10               |
| <b>GTB 18</b>   | —                  | ± 2,5           | ± 4,5            | ± 4,7            | ± 5              | ± 5,5            | ± 6               | ± 6,5              |
| <b>GTB 17</b>   | ± 1,5              | ± 2,5           | ± 2,9            | ± 3              | ± 3,2            | ± 3,4            | ± 3,7             | —                  |
| <b>GTB 16</b>   | ± 1,5              | ± 1,8           | ± 1,8            | ± 1,9            | ± 2              | ± 2,1            | ± 2,3             | —                  |
| <b>GTB 15</b>   | ± 0,95             | ± 1             | ± 1,1            | ± 1,2            | ± 1,3            | ± 1,4            | —                 | —                  |

\*) 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.

\*\*) The values specified here are taken from the deviations specified for one full grade coarser in table 1.