CLAASGUSS®

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Technical information No. 7

General dimensional and geometrical tolerances and machining allowance for casting designed since 1998 (according to DIN ISO 8062-3)

Introduction

This standard is a geometrical product specification standard and defines a system of tolerance grades and machining allowance grades for cast metals and their alloys.
The standard shall be applied to all materials whereas in former times separate standards were valid for different materials. DIN 1685 referred to spheroidal graphite cast iron whereas as a second standard – DIN 1686 – referred to lamellar graphite cast iron.

In DIN ISO 8062 grades of tolerances and machining allowance are defined and typical values are given in the informative annex.

Tolerance grades

DIN ISO 8062 defines 16 tolerance grades (CT1 to CT 16) for linear dimensional casting tolerances. For wall thicknesses in grades CT1 to CT15, one grade coarser shall be applicable. Grade CT16 exists only for wall thickness of castings generally specified to CT 15.

In general the surface mismatch is controlled indirectly by the control of the linear dimensions and shall stay within this tolerance. If it is necessary to restrict further the value of the surface mismatch, the maximum value shall be indicated individually.

For the grades CT13 to CT15 no values for the linear dimensional casting tolerances are given for wall thicknesses below 16 mm.
If necessary, individual tolerances shall be agreed between the manufacturer and the purchaser.

Besides the linear dimensional casting tolerances geometrical casting tolerance grades like straightness, flatness, roundness, parallelism, perpendicularity and symmetry as well as coaxiality are defined.

Required machining allowance (RMA)

As a general condition, the specified required machining allowance applies to the entire final moulded part, i.e. only one value is specified for all surfaces to be machined and this value shall be selected from the appropriate dimension range according to the largest overall dimension.

10 grades of required machining allowance grades are defined and designated from A to K (see table below). In sand castings the top surfaces may need more machining allowance than other surfaces. For these surfaces individual coarser RMA grades can be selected.

Annotation

In the annex of DIN ISO 8062 it is pointed out that the accuracy of a casting process depends on a variety of factors:

- Complexity of the design
- Type of the pattern equipment or die
- The metal or alloy concerned
- The condition of patterns or dies
- The foundry working method

For long series of repetitive work it may be possible to make adjustments and to control core positions carefully to achieve dimensional tolerance grades finer than those indicated in the table on the next page. In sand casting for shorter production series this however is generally impracticable and uneconomic.

Required machining allowance for raw castings (RMA)

For hand moulded sand castings made of lamellar graphite iron or spheroidal graphite iron the RMA grades F-H are generally applied. Only for castings with overall dimensions greater than 6300 mm, grades F to K apply. For machine moulded sand castings RMA grades E to G apply.
Usually a machining allowance of **2.5 mm** is regarded as a minimum value for sand moulded cast iron designs.

Largest overall dimension [mm]		Required machining allowance grade, RMAG [mm]									
Over	Up to and including	A	B	C	D	E	F	G	H	J	K
0	40	0,1	0,1	0,2	0,3	0,4	0,5	0,5	0,7	1	2
40	63	0,1	0,2	0,3	0,3	0,4	0,5	0,7	1	1,4	3
63	100	0,2	0,3	0,4	0,5	0,7	1	1,4	2	2,8	4
100	160	0,3	0,4	0,5	0,8	1,1	1,5	2,2	3	4	6
160	250	0,3	0,5	0,7	1	1,4	2	2,8	4	5,5	8
250	400	0,4	0,7	0,9	1,3	1,8	2,5	3,5	5	7	10
400	630	0,5	0,8	1,1	1,5	2,2	3	4	6	9	12
630	1000	0,6	0,9	1,2	1,8	2,5	3,5	5	7	10	14
1000	1600	0,7	1	1,4	2	2,8	4	5,5	8	11	16
1600	2500	0,8	1,1	1,6	2,2	3,2	4,5	6	9	13	18
2500	4000	0,9	1,3	1,8	2,5	3,5	5	7	10	14	20
4000	6300	1	1,4	2	2,8	4	5,5	8	11	16	22
6300	10000	1,1	1,5	2,2	3	4,5	6	9	12	17	24

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Linear dimensional casting tolerances
Unless specified differently the casting tolerances shall be symmetrically disposed with respect to the nominal dimension.

Due to technical reasons for cast iron – especially for short-series or single-production – the tolerance grades CT8 shall be treated as special tolerance grade. For guidance the out-dated standards DIN 1685 and DIN 1686 may still be used.

Nominal dimensions related to the moulded part [mm]		Dimensional casting tolerance grades, DCTG [mm]															
Over	Up to and including	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	10	0,09	0,13	0,18	0,26	0,36	0,52	0,74	1	1,5	2	2,8	4,2	-	-	-	-
10	16	0,1	0,14	0,2	0,28	0,38	0,54	0,78	1,1	1,6	2,2	3	4,4	-	-	-	-
16	25	0,11	0,15	0,22	0,3	0,42	0,58	0,82	1,2	1,7	2,4	3,2	4,6	6	8	10	12
25	40	0,12	0,17	0,24	0,32	0,46	0,64	0,9	1,3	1,8	2,6	3,6	5	7	9	11	14
40	63	0,13	0,18	0,26	0,36	0,5	0,7	1	1,4	2	2,8	4	5,6	8	10	12	16
63	100	0,14	0,2	0,28	0,4	0,56	0,78	1,1	1,6	2,2	3,2	4,4	6	9	11	14	18
100	160	0,15	0,22	0,3	0,44	0,62	0,88	1,2	1,8	2,5	3,6	5	7	10	12	16	20
160	250	-	0,24	0,34	0,5	0,7	1	1,4	2	2,8	4	5,6	8	11	14	18	22
250	400	-	-	0,4	0,56	0,78	1,1	1,6	2,2	3,2	4,4	6,2	9	12	16	20	25
400	630	-	-	-	0,64	0,9	1,2	1,8	2,6	3,6	5	7	10	14	18	22	28
630	1000	-	-	-	-	1	1,4	2	2,8	4	6	8	11	16	20	25	32
1000	1600	-	-	-	-	-	1,6	2,2	3,2	4,6	7	9	13	18	23	29	37
1600	2500	-	-	-	-	-	-	2,6	3,8	5,4	8	10	15	21	26	33	42
2500	4000	-	-	-	-	-	-	-	4,4	6,2	9	12	17	24	30	38	49
4000	6300	-	-	-	-	-	-	-	-	7	10	14	20	28	35	44	56
6300	10000	-	-	-	-	-	-	-	-	-	11	16	23	32	40	50	64

Geometrical casting tolerance for cast iron materials (informative)

Long-series production raw castings		
Method	Grey lamellar cast iron (EN-GJL-...)	Spheroidal graphite cast iron (EN-GJS-...)
Sand cast, machine moulded	DCTG 8-12	

Short-series or single-production raw castings		
Method	Grey lamellar cast iron (EN-GJL-...)	Spheroidal graphite cast iron (EN-GJS-...)
Sand cast, hand moulded (Clay bonded)	DCTG 13 – 15	
Sand cast, hand moulded (Chemically bonded)	DCTG 11 – 14	