UDC 621.882 : 621.713

August 1993

Fasteners

Product grades for bolt/nut assemblies for service temperatures from −200 °C to +700 °C

DIN 267 Part 29

Mechanische Verbindungselemente;
Produktklassen für Teile für Schraubenverbindungen zum Einsatz bei Temperaturen von −200 °C bis +700 °C

This standard, together with DIN 267 Part 13, August 1993 edition, supersedes DIN 267 Part 13, March 1980 edition.

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.

1 Scope and field of application

This standard specifies product grades for bolt/nut assemblies for use at temperatures ranging from −200 °C to +700 °C.

NOTE: Mechanical properties of bolts and nuts are specified in DIN 267 Part 13. DIN 267 Part 29 shall also apply where, in any existing documentation, reference is made to product grades T1, T2 or T3 as specified in DIN 267 Part 13, March 1980 edition.

2 Product grades

Since the limits of thread size and the geometrical tolerances specified in ISO 4759-1 do not apply to fasteners designed for service temperatures from −200 °C to +700 °C, this standard specifies product grades T1, T2 and T3 as a function of limits of thread size, dimensional tolerances, geometrical tolerances and surface roughness.

NOTE: The indication of product grades in the standard designation is identical to that given in ISO 4759-1.

Table 1 applies to dimensions without tolerance indication.

Table 1: General tolerances

Product grade	General tolerances
T1	ISO 2768 - fH
T2	ISO 2768 - mK
T3	ISO 2768 - cL

3 Screw thread

Table 2: Thread tolerances

Feature	Product grade		
	T1	T2	T3
Thread profile	Thread profile as in DIN 13 Part 19		
Internal thread (nut)	Tolerance zone 6H as in DIN 13 Part 14		
External thread (bolt)	Limits of thread size as in DIN 2510 Part 2		

NOTE: Where bolts or screws (e.g. hexagon head screws as specified in DIN EN 24 014 with a thread as specified in DIN 2510 Part 2) are mated with nuts of heights not less than 0,8 d, as specified in DIN EN 24 032, a greater clearance between bolt and nut is produced which reduces the resistance of the thread to stripping. This should be checked by calculation where necessary.

Continued on pages 2 to 8

4 Surfaces

Table 3: Ten point height of irregularities[1]), R_z, maximum height of the profile, R_{max}, and maximum profile peak height[2]), P_t (values given in µm)

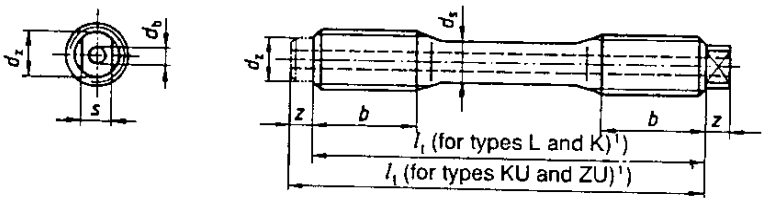
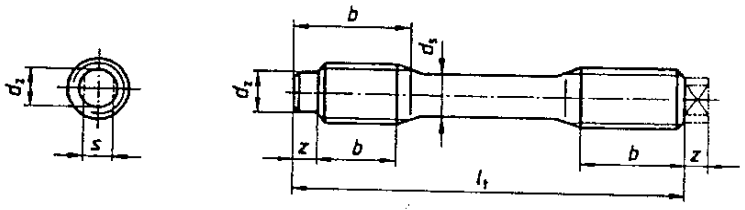
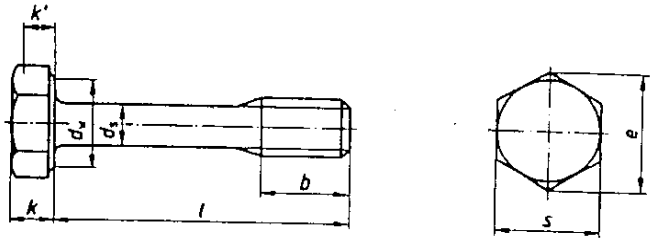
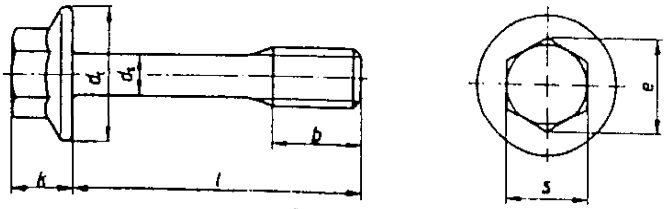
Surfaces			Surface roughness parameter								
			T1			T2			T3		
Feature	Thread sizes Over	Thread sizes Up to	Bolt	Nut	Extension sleeve	Bolt	Nut	Extension sleeve	Bolt	Nut	Extension sleeve
Thread flanks	-	M39	0,5/P_t 6,3	0,5/P_t 10	-	0,5/P_t 6,3	0,5/P_t 10	-	0,5/P_t 6,3	0,5/P_t 25	-
	M39	M56	1,5/P_t 6,3	1,5/P_t 10		1,5/P_t 6,3	1,5/P_t 10		1,5/P_t 6,3	1,5/P_t 25	
	M56	-				1,5/P_t 10			1,5/P_t 10		
Thread core	-	M56	0,5/P_t 6,3	0,5/P_t 63	-	0,5/P_t 6,3	0,5/P_t 63	-	0,5/P_t 6,3	Optional	-
	M56	-				0,5/P_t 10			0,5/P_t 10		
Bearing faces	-	M30	1,5/P_t 10	1,5/P_t 10	-	1,5/P_t 10	1,5/P_t 16	1,5/P_t 10	1,5/P_t 10	1,5/P_t 25	-
	M30	M80 × 6	5/P_t 10	5/P_t 16		5/P_t 10	5/P_t 16	R_z 10	5/P_t 10	5/P_t 25	
	M80 × 6	-	R_z 10	R_z 16		R_z 10	R_z 16		R_z 10	R_z 25	
Shank and underhead fillet	All		R_{max} 10	-	-	R_{max}16	-	-	R_{max} 16	-	-
Flats (for spanner)	All		R_z 100	R_z 63	-	R_z 100	R_z 63	-	Optional	Optional	-
Bore	All		R_{max} 25	-	-	R_{max} 25	-	-	-	-	-
Other surfaces[3])	All		R_z 40 or 0,5/P_t 40	R_z 25 or 0,5/P_t 25	-	R_z 40 or 0,5/P_t 40	R_z 25 or 0,5/P_t 25	R_z 25 or 0,5/P_t 25	R_z 100 or 0,5/P_t 100	R_z 100 or 0,5/P_t 100	-

[1]) See DIN 4768.
[2]) See DIN 4771.
[3]) The values specified for P_t apply only where the evaluation length, l_m, as specified in DIN 4768, is adequate for measuring R_z.

5 Dimensional tolerances

The bolts, nuts and extension sleeves shown in the table are given by way of example. For other types of bolts, screws, nuts and extension sleeves, the tolerances specified shall apply analogously.

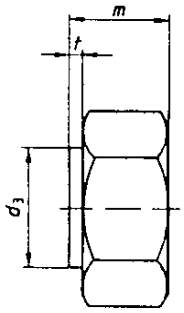
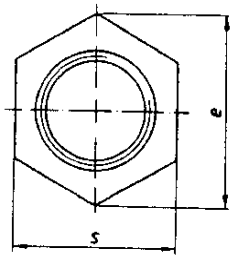
Table 4: Dimensional tolerances

Feature		Tolerance for product grade		
		T1	T2	T3
5.1 Double end stud with waisted shank				
 Figure 1	b	+ IT 15	+ IT 15	-
	d_b	H13	H13	-
	d_s	h12	h12	-
	d_z	h13	h13	-
	l_1	js13	js15	-
	s	h13	h13	-
	z	js14	js15	-
5.2 Waisted stud				
 Figure 2	b	+ IT 15	+ IT 15	-
	d_s	h12	h12	-
	d_z	h13	h13	-
	l_1	js13	js15	-
	s	h13	h13	-
	z	js14	js15	-
5.3 Hexagon bolts with waisted shank				
 Figure 3	b	+ IT 15	+ IT 15	+ IT 15
	d_c	h13	h13	h13
	d_s	h12	h12	h12
	d_w	$d_{w\,min} = s_{min}$ – IT 16 for $s < 21$ mm $d_{w\,min} = s_{min} \cdot 0{,}95$ for $s \geq 21$ mm		
	e	$e_{min} \geq 1{,}13 \cdot s_{min}$		
	k	js14	js14	js15
	k'	$k' \geq 0{,}7 \cdot k_{min}$		
 Figure 4	l	js15	js15	js17
	s	h13 for $s \leq 32$ mm h14 for $s > 32$ mm		h14 for $s \leq 19$ mm h15 for $s > 19$ mm

[1]) See DIN 2510 Part 3 for types L, K, KU and ZU.

(continued)

Table 4 (continued)

Feature		Tolerance for product grade		
		T1	T2	T3
5.4 Nuts				
5.4.1 Hexagon nuts				
With spigot				
	d_2 d_3	h13	h13	h13
	e	$e_{min} \geq 1{,}13 \cdot s_{min}$		
Figure 5	m	+ IT 14	+ IT 14	+ IT 15
	s	h13 for $s \leq 32$ mm h14 for $s > 32$ mm		h14 for $s \leq 19$ mm h15 for $s > 19$ mm
	t	js14	js14	js14
With washer-faced portion				

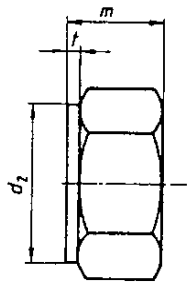
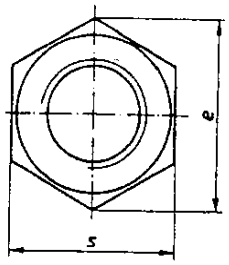
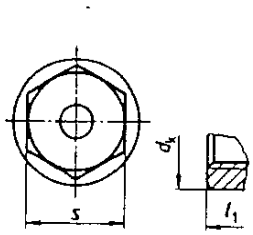
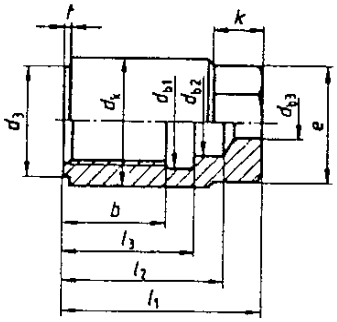
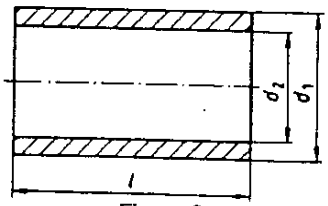

				


Figure 6				
5.4.2 Cap nuts				
	b	JS15	JS15	-
	d_{b1} d_{b2} d_{b3}	H13	H13	-
	d_k	h13	h13	-
	d_w	h13	h13	-
	e	$e_{min} \geq 1{,}13 \cdot s_{min}$		-
	k	js14	js14	-
	l_1	h14	h14	-
	l_2	+ IT 15	+ IT 15	-
	l_3	+ IT 15	+ IT 15	-
	s	h13 for $s \leq 30$ mm h14 for $s > 30$ mm		-
	t	js14	js14	-
Without spigot	With spigot			
Figure 7				

(continued)

Table 4 (concluded)

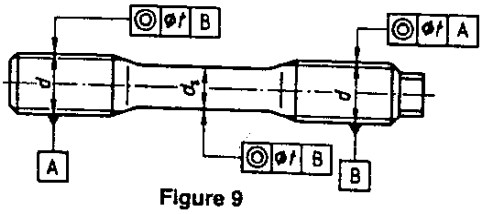
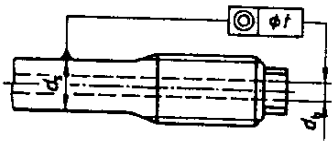
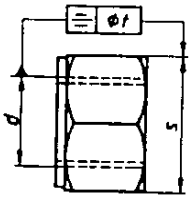
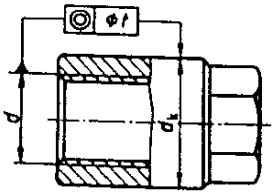
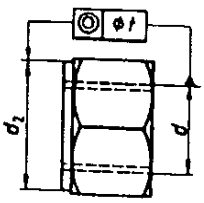
Feature	Tolerance for product grade		
	T1	T2	T3
5.5 Extension sleeves			
 Figure 8			
d_1	-	h13	-
d_2	-	H14	-
l	-	h14	-

6 Geometrical tolerances

Geometrical tolerances shall apply as such, i.e. no direct relationship exists between them and the particular method of production, measurement or gauging.

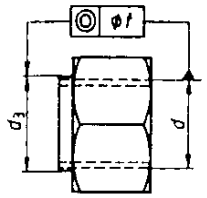
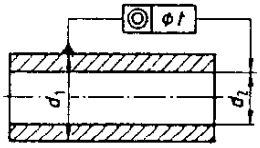
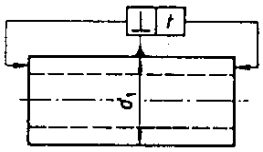
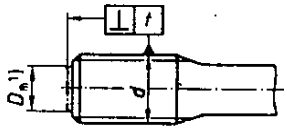
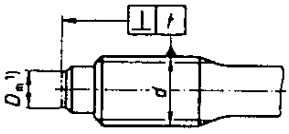
Where the thread major diameter (i.e. the nominal thread diameter), d, is the datum feature, assessment shall be performed or measuring be carried out in the thread flank.

Table 5: Geometrical tolerances

Feature	Tolerance, t, for product grade		
	T1	T2	T3
6.1 Concentricity, symmetry and run-out			
 Figure 9	2 IT 10	2 IT 13	-
 Figure 10	2 IT 13	2 IT 14	-
 Figure 11	2 IT 12	2 IT 13	2 IT 14 (applies only to figure 11)
 Figure 12			
With washer-faced portion  Figure 13	2 IT 12	2 IT 13	2 IT 14

(continued)

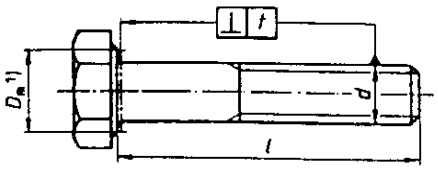
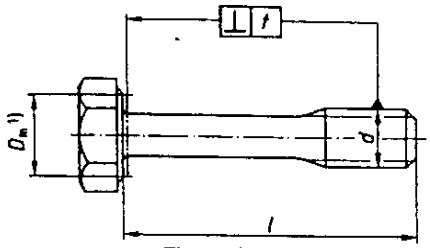
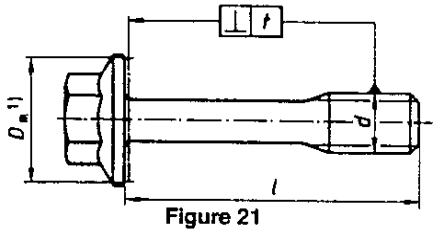
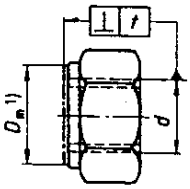
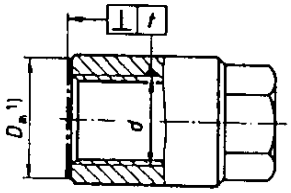
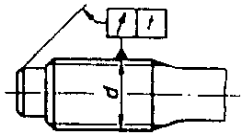
Table 5 (continued)

Feature	Tolerance, t, for product grade		
	T1	T2	T3
With spigot (applies also to cap nuts with spigot)  Figure 14	2 IT 12	2 IT 12	2 IT 12
 Figure 15	-	2 IT 11	-
6.2 Perpendicularity (values of t and d_1 given in mm)  Figure 16	-	d_1 / t Up to 56 / 0,02 Over 56 up to 90 / 0,03 Over 90 up to 125 / 0,04 Over 125 / 0,05	-
 Figure 17	$t = 0{,}0175 \cdot D_m$		-
 Figure 18	$t = 0{,}009 \cdot D_m$	$t = 0{,}0175 \cdot D_m$	-

For [1]), see page 7.

(continued)

Table 5 (concluded)

Feature	Tolerance, t, for product grade		
	T1	T2	T3
 Figure 19  Figure 20  Figure 21	t = 0,05 for $l \leq 60$ t = 0,1 for $60 < l \leq 120$ t = 0,15 for $l > 120$	For $d \leq$ M39: $t = 0{,}009 \cdot D_m$. For $d >$ M39: $t = 0{,}0045 \cdot D_m$.	
 Figure 22	0,05, for any value of D_m	For $d \leq$ M39: $t = 0{,}009 \cdot D_m$. For $d >$ M39: $t = 0{,}0045 \cdot D_m$.	For $d \leq$ M39: $t = 0{,}0175 \cdot D_m$. For $d >$ M39: $t = 0{,}009 \cdot D_m$.
 Figure 23	0,05, for any value of D_m	For $d \leq$ M39: $t = 0{,}009 \cdot D_m$. For $d >$ M39: $t = 0{,}0045 \cdot D_m$.	-
6.3 Run-out (values of t given in mm)  Figure 24	0,05	0,1	-

[1]) Edges of bolts, screws and nuts not produced by machining but by forming (see figures 19 to 23) need not be perfectly sharp-edged. For such products, the perpendicularity tolerance relates to a diameter, D_m, which is equal to 0,8 times the relevant diameter (i.e. 0,8 × d_k or 0,8 × d_w). The same applies to thread ends produced by machining, as in figures 17 and 18.

Standards referred to

DIN 13 Part 14	ISO metric screw threads; tolerance system for threads 1 mm in diameter and larger
DIN 13 Part 19	ISO metric screw threads; basic profile and manufacturing profiles
DIN 267 Part 13	Fasteners; technical delivery conditions for bolt/nut assemblies with specific mechanical properties, for service temperatures from − 200 °C to + 700 °C
DIN 2510 Part 2	Bolted connections with waisted shank bolts; metric screw thread with large clearance, nominal dimensions and limits
DIN 2510 Part 3	Bolted connections with waisted shank bolts; stud bolts
DIN 4768	Determination of surface roughness parameters R_a, R_z and R_{max}, with electric stylus instruments; concepts and measuring conditions
DIN 4771	Measurement of the profile peak height, P_t, of surfaces
DIN EN 24 014	Hexagon head bolts; product grades A and B
DIN EN 24 032	Hexagon nuts; style 1; product grades A and B
ISO 2768-1 : 1989	Tolerances for linear and angular dimensions without individual tolerance indications
ISO 2768-2 : 1989	Geometrical tolerances for features without individual tolerance indications

Previous editions

DIN 267 Part 13: 07.68, 03.80.

Amendments

The following amendments have been made to DIN 267 Part 13, March 1980 edition.

a) The specifications of the standard have been split between Parts 13 and 29.

b) The scope of the standard has been amended.

c) For general tolerances, ISO 2768-1 : 1989 and ISO 2768-2 : 1989 shall apply.

d) Specific dimensional tolerances for hexagon head screws without waisted shank and for nuts without washer-faced portion or spigot are no longer included.

e) Dimensional tolerances for nuts with washer-faced portion (type NF as in DIN 2510 Part 5) have been specified.

f) For extension sleeves, product grade T1 is no longer specified.

g) The symbols denoting the quantities have been harmonized with those used in the relevant product standards.

Explanatory notes

DIN 267 Part 13 has been split up into two Parts for the following reasons:

1) The mechanical properties (materials, property classes) and product grades (tolerances) for fasteners are normally specified in separate standards and are to be given separately when ordering the products.

2) Each standard can be used independently, i.e. the tolerances specified in DIN 267 Part 29 need not be complied with in the case of products for use at low temperatures as specified in DIN 267 Part 13.

Cross references in both standards make it easier for the standards to be applied, particularly with regard to existing documentation.

International Patent Classification

F 16 B 035/00

F 16 B 037/00