Length of engaged thread

Recommended minimum lengths of engaged thread in cutted internal threads on components

from information provided by manufacturer's, based on trail values M6 to M16

Where screws have to be screwed into internal threads and where full load-bearing capacity is required, then minimum lengths of engaged thread have to be defined which depend on the strength of the material from which the component is made.

There is normally less flexibility compared with standard nuts, so that when tightening up there is no need to worry about any resulting enlargement which might mean that the threads would not grip.

On the other hand, in many cases the internal threads on the components are less strong than standard nuts of the same property class for the screws which are being used.

This means that special attention must be given to achieving the required minimum length of engaged thread, in order to ensure adequate durability of the screwed connection.
The following recommended values have been determined from practical trials.

Component material with incised internal thread		Recommended minimum length of engaged thread without countersinking for the property class of the screw				
tolerance 6g/6H	R_m in [N/mm²]	8.8 coarse thread	fine thread	10.9 coarse thread	fine thread	12.9 coarse thread
S235 (St37-2) 2C15 N (C15)	> 360 (ferrite/perlite structure)	1,0 · d [1,5 · d][1)]	1,25 · d	1,25 · d [1,8 · d][1)]	1,4 · d	1,4 · d [2,1 · d][1)]
E 285 (St50-2) S 355 (St52-3) 2C35 N (C35 N)	> 500 (ferrite/perlite structure)	0,9 · d [1,3 · d][1)]	1,0 · d	1,0 · d [1,6 · d][1]	1,2 · d	1,2 · d [1,8 · d][1)]
C45 V 35Cr4 V 34CrMo4 V 42CrMo4 V	> 800 (heat-treated structure)	0,8 · d [0,9 · d][1)]	0,8 · d	0,9 · d [1,1 · d][1)]	0,9 · d	1,0 · d [1,2 · d][1)]
GJL 250 (GG-25)	> 220	1,0 · d [1,3 · d][1)]	1,25 · d	1,25 · d [1,6 · d][1)]	1,4 · d	1,4 · d [1,8 · d][1)]
Al 99,5	> 180	–	–	2,0 · d	2,5 · d	–
AlMg3 F18	> 180	2 · d [3 · d][1)]	2 · d [3 · d][1)]	–	–	–
AlMgSi1 F32	> 330	1,4 · d	1,4 · d	1,6 · d	2,0 · d	–
AlMg4,5Mn F28	> 330	1,4 · d	1,4 · d	1,6 · d	2,0 · d	–
AluMg1 F40 1	> 550	1,1 · d	–	–	–	–
AlZn MgCu 0,5 F50	> 550	1,0 · d	–	–	–	–
GMgAl9 Zn1	> 230	1,4 · d	1,4 · d	1,6 · d	2,0 · d	–

[1)] Values in brackets are based on the formula from VDI 2230 [theoretical values]

Tables for the approximate values of minimum length of engagement with thread tolerances of 6g/6H require a sufficient wall thickness for the nut thread. For exact values a calculation according to VDI 2230 are required.

The minimum length of engagement means effective sufficient overlapping of the threads without countersink at the construction unit and without thread run out at the bolt end.

For lengths of engaged thread above 1,5 d, external or internal threads at the extreme tolerance limits can lead to the screw becoming jammed.

ISO 965-1 defines the grades of tolerance for external and internal threads; compliance with these will ensure a problem-free assembly of the screwed fastening.

Marking of the thread depth according to ISO 965-1
S small
N normal
L large