February 2017

DIN 7190-1

ICS 17.040.10; 21.120.10

Together with
DIN 7190-2:2017-02,
supersedes
DIN 7190:2001-02

Interference fits –
Part 1: Calculation and design rules for cylindrical self-locking pressfits, English translation of DIN 7190-1:2017-02

Pressverbände –
Teil 1: Berechnungsgrundlagen und Gestaltungsregeln für zylindrische Pressverbände, Englische Übersetzung von DIN 7190-1:2017-02

Assemblages frettés –
Partie 1: Bases de calculs et règles de construction pour assemblages frettés cylindriques autoadhérents,
Traduction anglaise de DIN 7190-1:2017-02

Document comprises 46 pages

Translation by DIN-Sprachendienst.

In case of doubt, the German-language original shall be considered authoritative.

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A comma is used as the decimal marker.

Contents

Foreword

This document has been prepared by Working Committee NA 060-34-32 AA "Shafts and shaft-hub connections" of Section "Gear" of *DIN-Normenausschuss Maschinenbau (NAM)* (DIN Standards Committee Mechanical Engineering).

This document contains the revised edition of DIN 7190:2001-02. The new standard, DIN 7190-2, expands the scope of this series of standards to include conical, self-locking interference fits. In this way, it provides the basis for calculations for this type of interference fits, which are becoming ever more important, especially in terms of assembly with larger shaft diameters.

The calculation equations in the previous edition, DIN 7190:2001-02, for the elastic-plastic design of interference fits have been retained. Only the smoothening factor has been halved, as experience and new research show that the previous procedure was too conservative.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. DIN [and/or DKE] shall not be held responsible for identifying any or all such patent rights.

Amendments

This standard differs from DIN 7190:2001-02 as follows:

a) the standard has been divided into two parts: DIN 7190-1 replaces DIN 7190:2001-02 in terms of content and DIN 7190-2 expands the scope of this series of standards to include conical, self-locking interference fits;

b) the document has been editorially revised;

c) the normative references have been updated;

d) the smoothening factor has been reduced from 0,8 to 0,4 to reflect practical experience.

Previous editions

DIN 7182-3: 1942-06, 1977-08
DIN 7190: 1943-08, 1977-08, 1981-03, 1988-07, 2001-02

1 Scope

This standard specifies the calculation bases for interference fits with cylindrical effective surfaces whose parts consist of metallic materials. This standard applies primarily to mechanical engineering. It can be applied by analogy in other fields (e.g. precision engineering).

The objective of this standard is to improve the reliability of the interference fits and reduce manufacturing costs.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

DIN 743-1, *Calculation of load capacity of shafts and axles — Part 1: General*

DIN 743-2, *Calculation of load capacity of shafts and axles — Part 2: Theoretical stress concentration factors and fatigue notch factors*

DIN 743-3, *Calculation of load capacity of shafts and axles — Part 3: Strength of materials*

DIN EN 10052, *Vocabulary of heat treatment terms for ferrous products*

DIN EN ISO 286-1, *Geometrical product specification (GPS) — ISO code system for tolerances on linear sizes — Part 1: Basis of tolerances, deviations and fits*

DIN EN ISO 1101, *Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

DIN EN ISO 1302, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*

DIN EN ISO 4287, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*

DIN EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

3 Symbols and abbreviated terms

3.1 Symbols

Symbol	Term	Unit
A	elongation after fracture	%
a	axial projection	mm
b	bore shoulder	mm
A_o	upper deviation of the joint diameter D_F	mm
A_u	lower deviation of the joint diameter D_F	mm
D_a	outer diameter	mm
D_i	inner diameter	mm
D_F	diameter of the joint (nominal dimension)	mm
D_P	plasticity diameter	mm
D_w	diameter of the shaft shoulder	mm
E	elasticity modulus	N/mm^2
e	natural logarithm base (Euler number)	—
F_{ax}	transferable axial force	N
F_e	press-in force	N
g_F	smoothening factor	—
K	auxiliary variable for the design of elastic interference fits	—
l_F	length of the joint	mm
l_e	length of the assembly chamfer	mm
n	rotational speed	1/s
p	joint pressure at rest	N/mm^2
p_n	joint pressure at rotational speed n	N/mm^2
p_{PA}	joint pressure limit for fully plastic outer part	N/mm^2
p_{PI}	joint pressure limit for fully plastic inner part	N/mm^2
Q	diameter ratio	—
q_A	ring zone of the outer part	mm^2
q_{PA}	plastic ring zone of the outer part	mm^2
Ra	arithmetical roughness average	µm
R_{eL}	lower yield strength	N/mm^2
$R_{p,0,2}$	0,2-% elongation limit	N/mm^2
Rz	mean height of roughness of the joint surface	µm

Symbol	Term	Unit
r	transition radius	mm
S_P	safety against plastic strain (desired value)	—
S_r	safety against sliding (desired value)	—
T	transferable torque	Nmm
u	peripheral speed of the outer contour of the outer part	mm/s
u_{ab}	peripheral speed of the outer contour of the outer part, where the outer part lifts up	mm/s
U	interference	mm
U_i	actual interference	mm
U_{max}	maximum interference that can be fitted	mm
U_g	maximum interference	mm
$U_{s,\vartheta}$	clearance	mm
U_k	minimum interference	mm
U_F	interference during joining	mm
U_w	effective interference	mm
Z	reduction in area after fracture	%
α	coefficient of linear expansion	1/°C
ζ	reference plasticity diameter	—
ζ_{zul}	permissible reference plasticity diameter of the outer part	—
ϑ_A	temperature of the outer part while joining	°C
ϑ_{Aerf}	required temperature of the outer part while joining	°C
ϑ_{Azul}	permissible temperature of the outer part while joining	°C
ϑ_I	temperature of the inner part while joining	°C
ϑ_R	room temperature	°C
μ	Poisson's ratio	—
ν	coefficient of adhesion (general)	—
ν_l	coefficient of adhesion for separation	—
ν_r	coefficient of adhesion for sliding	—
ξ_w	reference effective interference	—
ρ	density	kg/dm^3
φ	chamfer angle	degree