INTERNATIONAL STANDARD

ISO
6157-3

First edition
1988-08-01

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Fasteners — Surface discontinuities —

Part 3:
Bolts, screws and studs for special requirements

Éléments de fixation — Défauts de surface —

Partie 3: Boulons, vis et goujons pour applications particulières

Reference number
ISO 6157-3 : 1988 (E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6157-3 was prepared by Technical Committee ISO/TC 2, *Fasteners.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Printed in Switzerland

Fasteners — Surface discontinuities —

Part 3:
Bolts, screws and studs for special requirements

1 Scope and field of application

1.1 This part of ISO 6157 establishes limits for various types of surface discontinuities on bolts, screws and studs for special requirements.

It applies to bolts, screws and studs with

- nominal thread diameters 5 mm and larger;
- product grades A and B;
- nominal lenghts $l \leqslant 10d$ (or longer if specified);
- property class 12.9;
- property classes 8.8, 9.8 and 10.9 when specified in product standards or agreed between supplier and purchaser.

1.2 Where the permissible limits for surface discontinuities indicated in clause 3 occur, the minimum values for the mechanical and functional properties specified in ISO 898-1 should still be met.

When fatigue strength requirements are specified, the fatigue strength should not be lower than that obtained on bolts without defects taken from the same lot.

NOTES

1 The figures in clause 3 are examples only. They apply correspondingly also to other types of bolts, screws and studs.

2 The individual figures show the surface discontinuities exaggerated in some cases for clarity.

2 References

ISO 468, *Surface roughness — Parameters, their values and general rules for specifying requirements.*

ISO 898-1, *Mechanical properties of fasteners — Part 1: Bolts, screws and studs.*

ISO 2859, *Sampling procedures and tables for inspection by attributes.*

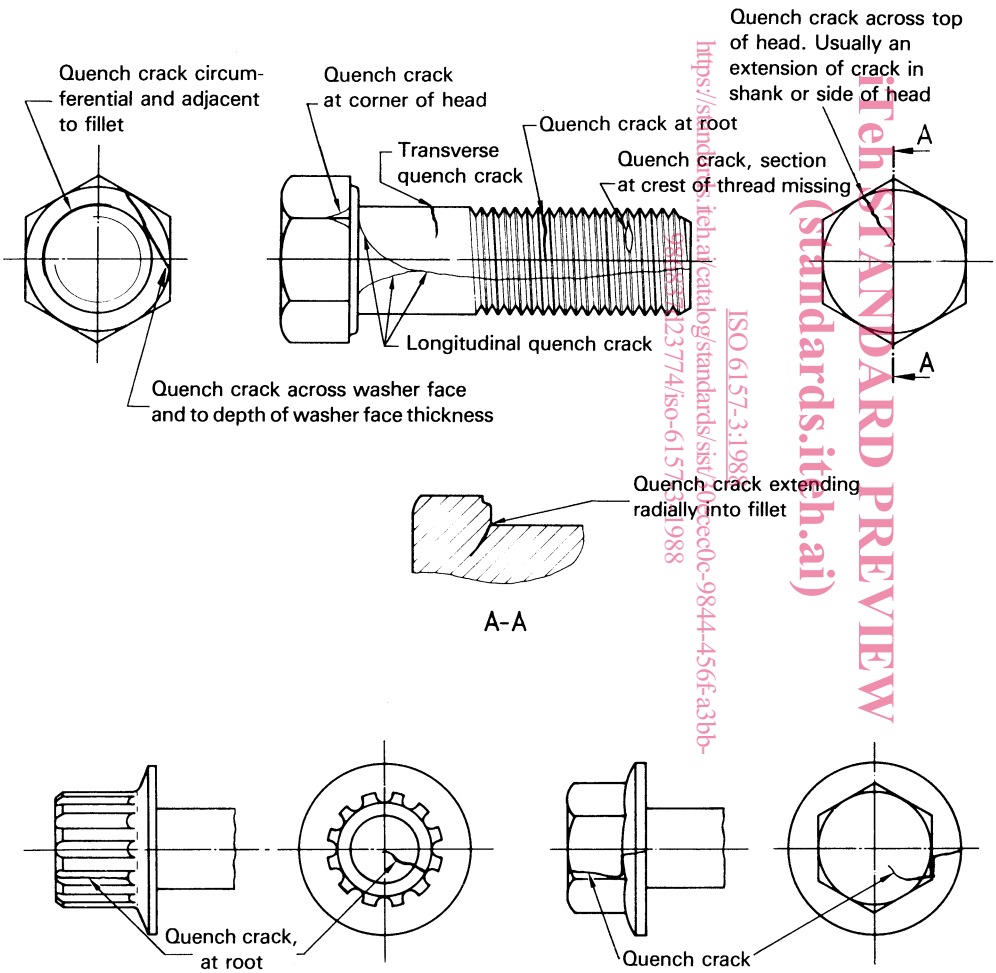
ISO 3269, *Fasteners — Acceptance inspection.*

3 Types, causes, appearance and limits of surface discontinuities

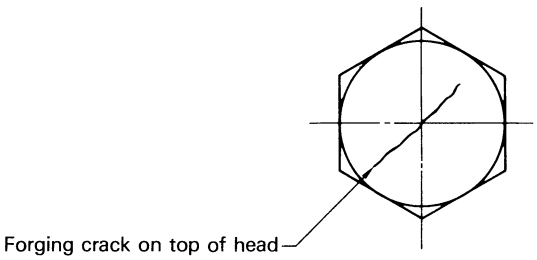
3.1 Cracks

A crack is a clean (crystalline) fracture passing through or across the grain boundaries and may possibly follow inclusions of foreign elements. Cracks are normally caused by overstressing the metal during forging or other forming operations, or during heat treatment. Where parts are subjected to significant reheating, cracks usually are discoloured by scale.

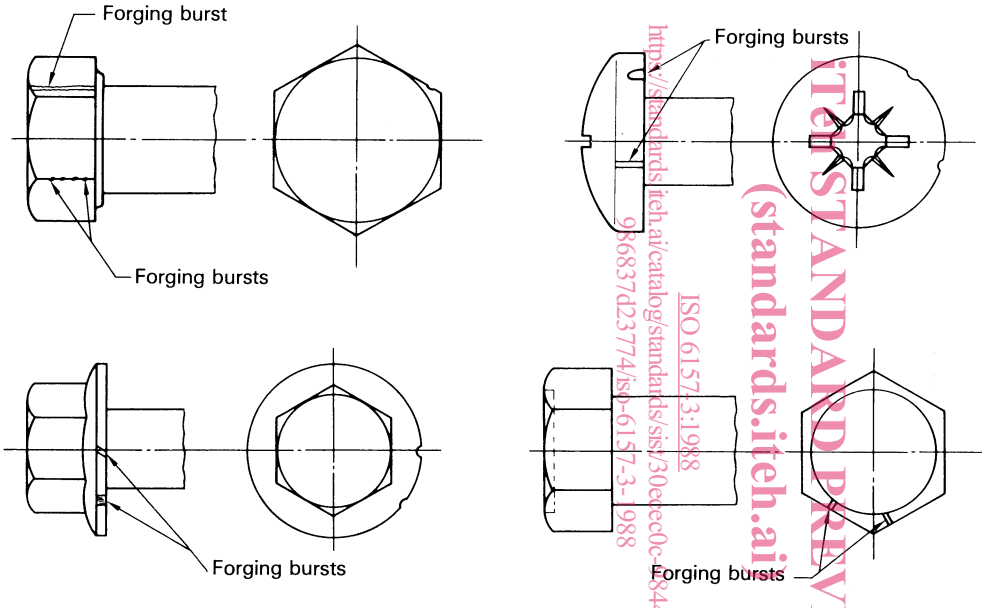
3.1.1 Quench cracks

Cause	Quench cracks may occur during hardening due to excessively high thermal and transformation stresses. Quench cracks usually follow an irregular and erratic course on the surface of the fastener.
Appearance	
Limits	Quench cracks of any depth, any length, or in any location are not permitted.

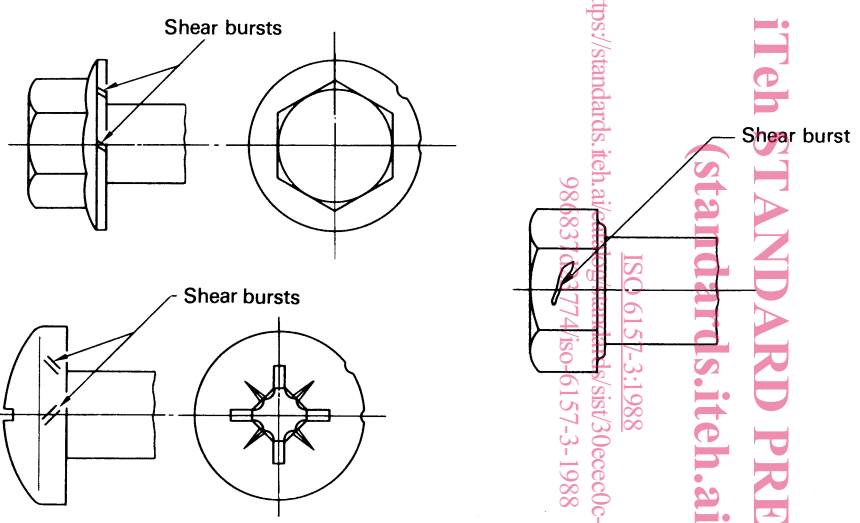
3.1.2 Forging cracks

Cause	Forging cracks may occur during the cut-off or forging operations and are located on the top of the head of screws and bolts.
Appearance	
Limits	Length, l, of forging cracks: $l \leqslant d$ [1)] Depth or width, b, of forging cracks: $b \leqslant 0{,}04d$ NOTE — The limits for forging cracks do not apply to socket head screws (see 3.1.5). 1) d = nominal thread diameter

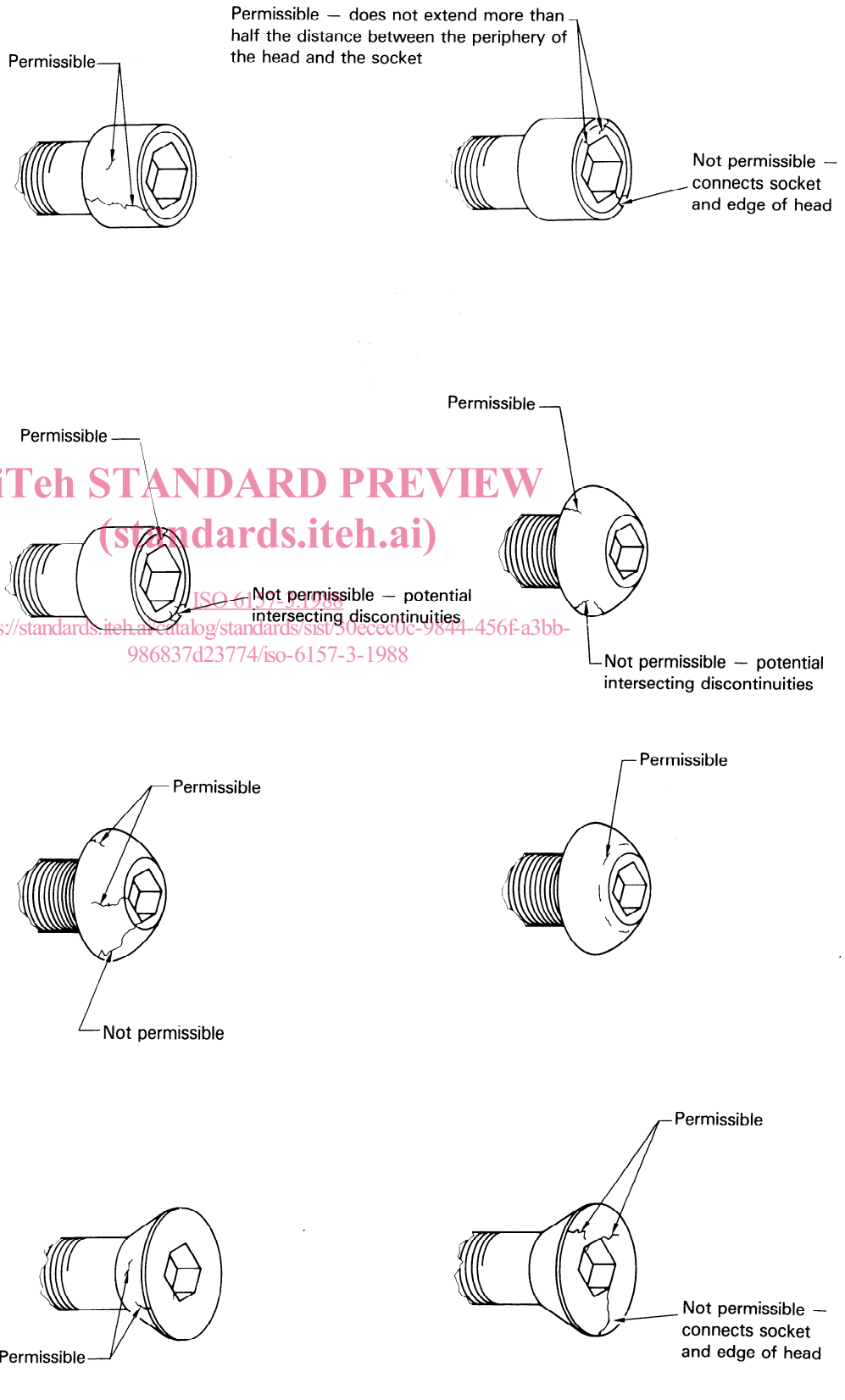
3.1.3 Forging bursts

Cause	Forging bursts may occur for example during forging on the flats or corners of the heads of bolts and screws, at the periphery of flanged or circular head products or on the raised periphery of indented head bolts and screws.
Appearance	
Limits	**Hexagon head screws** No forging burst in the flats of hexagon bolts and screws shall extend into the crown circle on the top of the head surface (chamfer circle) or into the underhead bearing surface. Forging bursts occurring at the intersection of two wrenching flats shall not reduce the width across corners below the specified minimum. Forging bursts in the raised periphery of indented head bolts and screws shall not exceed a width of $0{,}06d$ [1] or have a depth extending below the indented portion. **Circular head screws** Flanges of bolts and screws and peripheries of circular head screws may have forging bursts, but they shall not exceed the following limits: Width of forging bursts: $0{,}08d_c$ [2] (with only one forging burst); $0{,}04d_c$ (with two or more forging bursts, one of which may extend to $0{,}08d_c$). Depth of forging bursts: $0{,}04d$ [1] 1) d = nominal thread diameter 2) d_c = head or flange diameter

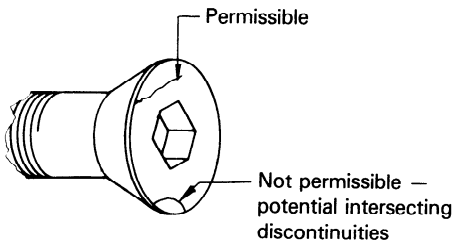
3.1.4 Shear bursts

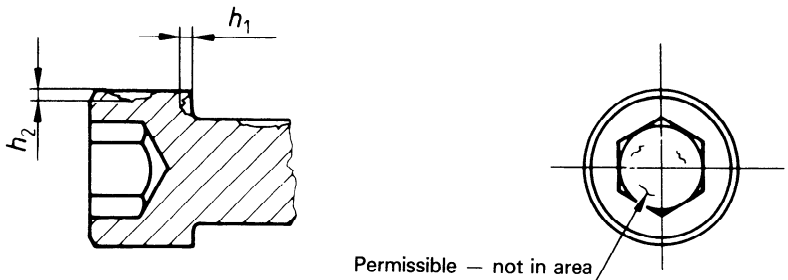
Cause	Shear bursts may occur, for example during forging, frequently at the periphery of products having circular or flanged heads, and are located at approximately 45° to the product axis. Shear bursts may also occur on the sides of hexagon head products.
Appearance	
Limits	**Hexagon head screws** Shear burst limits on the wrenching head are as follows: Width $\leqslant$ 0,25 mm + 0,02s[1] Depth $\leqslant$ 0,04d No shear burst in the flats of hexagon bolts and screws shall extend into the crown circle on the top of the head surface (chamfer circle) or into the underhead bearing surface. Shear bursts, occurring at the intersection of two wrenching flats, shall not reduce the width across corners below the specified minimum. Shear bursts in the raised periphery of indented head bolts and screws shall not exceed a width of 0,06d[2] or have a depth extending below the indented portion. **Circular head screws** Flanges of bolts and screws and peripheries of circular head products may have shear bursts, but shall not exceed the following limits: Width of shear bursts: 0,08d_c[3] (for only one shear burst); 0,04d_c (with two or more forging shear bursts, one of which may extend to 0,08d_c). 1) s = width across flats 2) d = nominal thread diameter 3) d_c = head or flange diameter

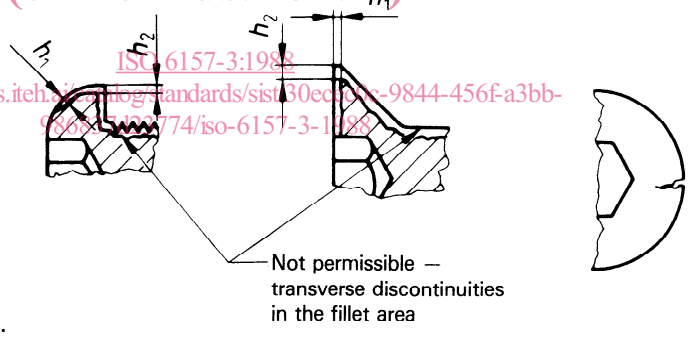
3.1.5 Forging cracks in socket head screws

Cause	Cracks in the periphery, in the top surface and on the indented portion (hexagon socket) may occur on the inner and outer faces due to cut-off of wire section, shear and compressive stress during forging operations and countersinking of head.
Appearance	

Appearance
(*continued*)



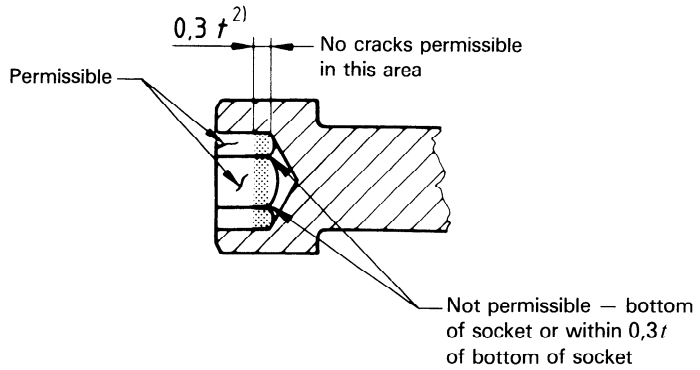




Permissible depths:

$h_1 \leqslant 0{,}03 d_k$[1]: 0,13 mm max.

$h_2 \leqslant 0{,}06 d_k$: 1,6 mm max.



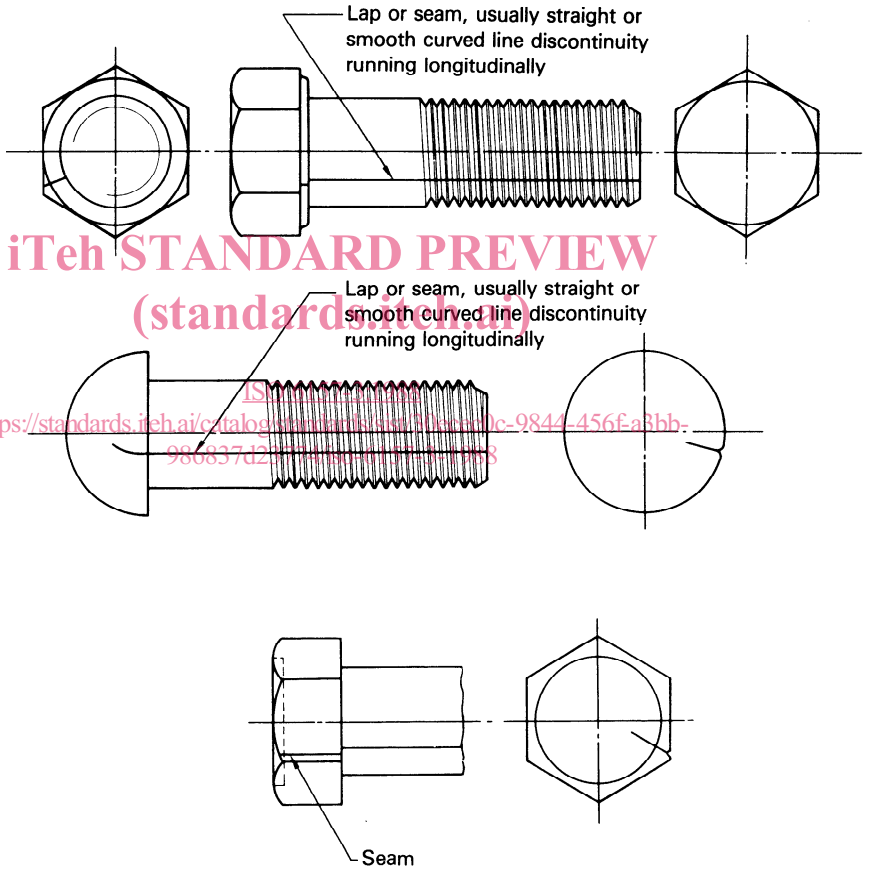
1) d_k = head diameter

2) t = key engagement socket depth

Limits	Cracks extending from the socket to the outer face and cracks with a traverse indicating a potential to intersect are not permissible. Cracks within $0,3t$ of the bottom of the socket are not permissible. Cracks located elsewhere in the socket are permissible, provided that they do not exceed a length of $0,25t$ and a depth of $0,03d_k$ (0,13 mm max.). One crack in the longitudinal direction with a depth not exceeding $0,03d_k$ (0,13 mm max.) at the head/shank intersection and on the top of the head is permissible. Longitudinal cracks with a depth not exceeding $0,06d_k$ (1,6 mm max.) located in the periphery are permissible.

3.2 Raw material seams and laps

A seam or lap is a narrow, generally straight or smooth curved line discontinuity running longitudinally on the thread, shank or head.

Cause	Seams and laps are inherent in the raw material from which fasteners are made.
Appearance	
Limits	Permissible depth: $0,015d$[1] + 0,1 mm: 0,4 mm max. If laps or seams extend into the head, they shall not exceed the permissible limits for width and depth specified for bursts (see 3.1.3). 1) d = nominal thread diameter