

# DRAFT INTERNATIONAL STANDARD

## ISO/DIS 13469

ISO/TC 44/SC 6

Secretariat: DIN

Voting begins on:  
2013-08-23

Voting terminates on:  
2013-11-23

---

---

## Mechanical joining — Form-fit blind rivets and (lock) bolt joints — Specifications and qualification of testing procedures

*Assemblage mécanique — Rivets aveugles et boulons à filetage autofreinant — Spécifications et qualification des modes opératoires d'essai*

ICS: 25.160.40;25.160.10

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/cfd2beaf-9016-41b6-a2ea-c79a8c4ca573/iso-13469-2014>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.



Reference number  
ISO/DIS 13469:2013(E)

© ISO 2013

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/cfd2beaf-9016-41b6-a2ea-c79a8c4ca573/iso-13469-2014>

### Copyright notice

This ISO document is a Draft International Standard and is copyright-protected by ISO. Except as permitted under the applicable laws of the user's country, neither this ISO draft nor any extract from it may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, photocopying, recording or otherwise, without prior written permission being secured.

Requests for permission to reproduce should be addressed to either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Reproduction may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.

## Contents

Page

Foreword .....	iv
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms and definitions .....</b>	<b>1</b>
<b>4 Technical contents of the joining procedure specification (JPS) .....</b>	<b>2</b>
4.1 General .....	2
4.2 Related to the fastener manufacturer .....	3
4.3 Related to parent materials .....	3
4.3.1 Composition and characteristics of parent materials .....	3
4.3.2 Dimension of parent materials/ test pieces .....	3
4.4 Common to all joining processes .....	3
4.4.1 Joining process .....	3
4.4.2 Machine specification .....	3
4.4.3 Joint design .....	4
<b>5 Requirements for joints .....</b>	<b>4</b>
5.1 General .....	4
5.2 Test specimen .....	4
5.3 Joining of assembly components, test pieces or test specimens .....	4
<b>6 Testing and examinations .....</b>	<b>4</b>
6.1 General .....	4
6.2 Visual examination .....	4
6.3 Macro-section / Macroscopic examination .....	4
6.4 Tensile shear test .....	7
6.5 Cross tension test .....	7
6.6 Mechanized peel test .....	8
6.7 Fatigue and/or endurance tests .....	8
6.7.1 General .....	8
6.7.2 Cyclic load tests .....	9
6.7.3 Failure criterion in fatigue testing .....	11
6.8 Re-testing .....	11
<b>7 Evaluation of the test results .....</b>	<b>11</b>
<b>8 Single Point Joint Test report .....</b>	<b>11</b>
<b>Annex A (informative) Examples of joining procedures for blind rivets and lock bolts .....</b>	<b>13</b>
A.1 Equipment for the joining .....	13
A.2 Joining procedures/ Joining processes .....	13
A.2.1 Blind rivets .....	13
A.2.2 Lock bolts .....	14
A.2.3 Setting operation –clearance fit lock bolts .....	14
A.2.4 Setting operation – lock bolts with interference fit /form fit .....	14
<b>Annex B (informative) Example for a test report .....</b>	<b>16</b>
<b>Bibliography .....</b>	<b>17</b>

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 13469 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 6, *Resistance welding and allied mechanical joining*.

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)  
Full standard available on  
<https://standards.iteh.ai/catalog/standards/sist/cfd1e3eaf-9016-41b6-a2ea-c79a8c4ca573/iso-13469-2014>

# Mechanical joining — Form-fit blind rivets and (lock) bolt joints — Specifications and qualification of testing procedures

## 1 Scope

This international standard specifies the requirements for the testing procedures for interference fit/form-fit blind rivet joints and lock bolt joints made of metallic and non-metallic materials.

The tests required for a particular joint depend upon the performance requirements of the component/assembly and shall be established before any testing is undertaken.

The term sheet as used in this standard includes extrusions, cast material, plastics and fibre reinforced plastics, e. g. carbon and glass fibre reinforced plastics.

NOTE Specific service, material or manufacturing conditions may require more comprehensive testing than specified in this standard. Such tests may include macro and micro sections, fatigue and/or endurance tests.

This International Standard does not apply to civil engineering applications such as metal building and steel construction which are covered by other applicable standards.

## 2 Normative references

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

ISO 12996, *Mechanical joining — Destructive testing of joints — Specimen dimensions and test procedure for tensile shear testing of single joints*

ISO/DIS 16237, *Mechanical joining — Destructive testing of joints — Specimen dimensions and test procedure for cross-tension testing of single joints*

ISO 14588, *Blind rivets — Terminology and definitions*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14588 and the following apply.

### 3.1

#### **interference fit joint**

#### **form fit joint**

property of a joint in which the transmission of external forces, in particular shear forces, is effected by geometrical elements which prevent the movement of the components relative to one another

NOTE 1 This condition is frequently achieved by the fastener's outer diameter surface having complete contact with the joint's component holes.

[SOURCE ISO 12996 – modified, Figure 1 added]

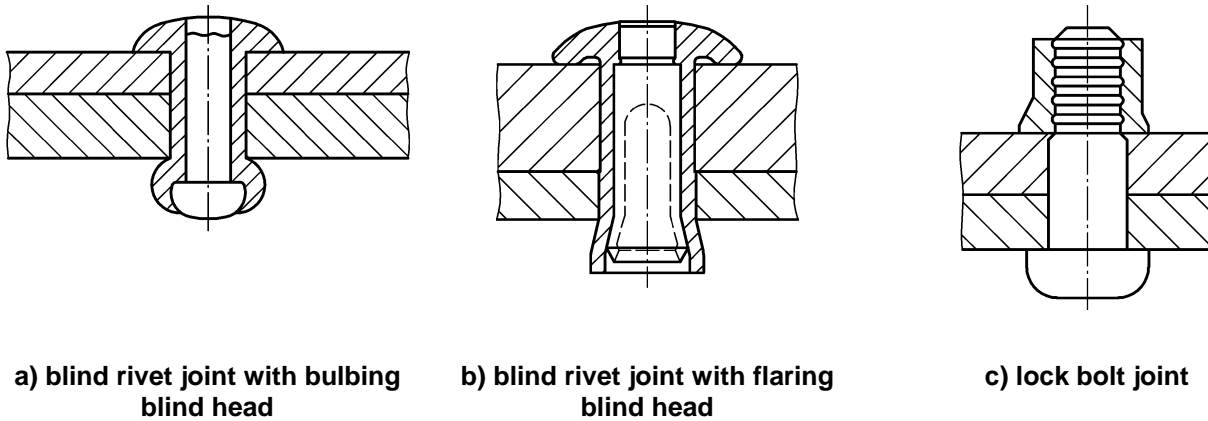


Figure 1 — Examples of interference fit /form fit joints

**3.2**  
**clearance fit joint**  
**force fit joint**  
**non-interference fit joint**

property of a joint in which external forces, in particular shear forces, are transmitted through friction and if the force to be transmitted is greater than the frictional force, then frictional locking is overcome and the components move relative to one another

NOTE 1 to entry This condition is frequently achieved by the fastener's outer diameter surface having incomplete contact with the joint's component holes.

[SOURCE: ISO 12996 – modified, Figure 2 added]

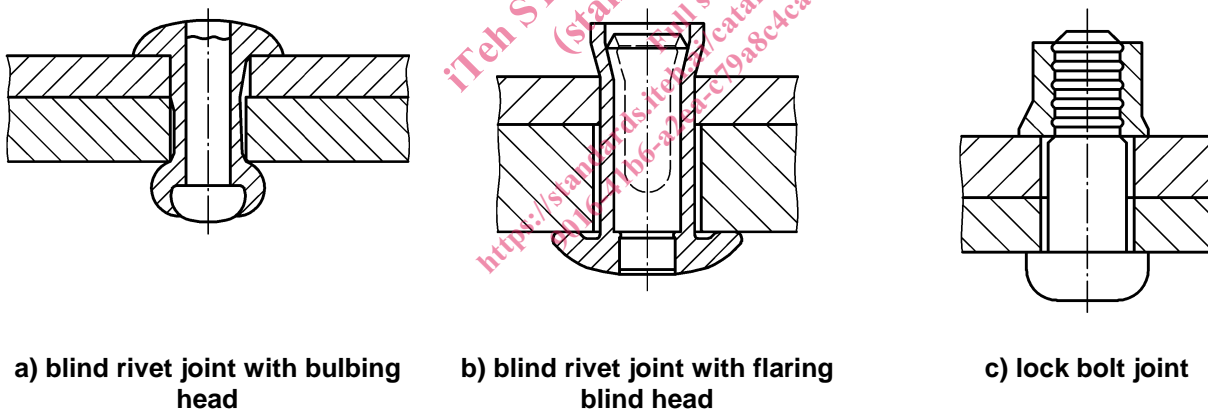


Figure 2 — Examples of clearance fit/force fit joints

**3.3**  
**clearance bridging capability**

the ability to fill the clearance between the rivet and the work piece to eliminate displacement in the shear plane

**4 Technical contents of the joining procedure specification (JPS)**

**4.1 General**

The performance of at least two samples of the joint to be tested shall be evaluated in accordance with the tests specified in this standard and the results recorded.

The following variables affect the performance of the joints and shall be agreed upon by the contracting parties before testing:

- hole diameters in sheets;
- nominal and measured diameters of blind rivets and lock bolt;
- sheets thicknesses;
- mechanical properties of sheets, blind rivets and lock bolts;
- degree of clearance in the rivet or lock bolt joint (see Figure 1 and Figure 2);
- percentages of the sheet thickness over which the clearances are bridged;
- methods of assembly of the joints.

The joining procedure specification (JPS) shall provide the necessary information required to make the joint. The minimum information required in a JPS for riveting processes is listed in 4.2 to 4.4.

For some applications, it may be necessary to supplement the list. All relevant information shall be specified in the JPS.

Permissible tolerance ranges shall be specified.

An example of a JPS form is shown in Annex B; these forms should be modified according to actual practice.

#### **4.2 Related to the fastener manufacturer**

- Identification of the fastener manufacturer;
- identification of JPS.

#### **4.3 Related to parent materials**

##### **4.3.1 Composition and characteristics of parent materials**

- Designation and type(s) of the material(s) and referenced standard(s);
- in the case of coating(s), material(s), types, thicknesses, location, single or double sided.

##### **4.3.2 Dimension of parent materials/ test pieces**

- thickness of material(s);
- dimensions and cross-section(s) of profile(s) or extrusion(s).

#### **4.4 Common to all joining processes**

##### **4.4.1 Joining process**

- Joining process(es) specified shall be designated as manual, mechanized, automated, robotic.

##### **4.4.2 Machine specification**

- Type of setting machine/equipment used and appropriate identification.

#### 4.4.3 Joint design

The overlap, edge distance, distance between two hole axis, sequence and pattern, rivet or bolt design, type and manufacturer, shall be specified and comply with the appropriate standards and/or application, as applicable.

NOTE A sketch can be used showing the joint design/configuration.

### 5 Requirements for joints

#### 5.1 General

The following tests for the joints shall be carried out in accordance the design requirements.

#### 5.2 Test specimen

The dimensions of the test specimens for tensile shear tests shall be in accordance with ISO 12996, for cross tension tests, in accordance with ISO/DIS 16237, for mechanized peel tests see e. g. ISO 14270 and for fatigue tests, see e.g. ISO 18592.

For ease of testing, the use of specimens is to be given preference over the use of any cut pieces taken from actual components.

#### 5.3 Joining of assembly components, test pieces or test specimens

Preparation of assembly components, test pieces taken from an assembly or test specimens and joining of the test pieces or specimens shall be carried out in accordance with the requirements specified.

### 6 Testing and examinations

#### 6.1 General

The testing and examination can include both non-destructive and destructive tests.

The scope of examination shall be specified by the contracting parties before starting with the tests. These tests and examinations may include visual examination, macro-section, tensile-shear tests, cross tension testing, fatigue testing and/or ultrasonic examination.

#### 6.2 Visual examination

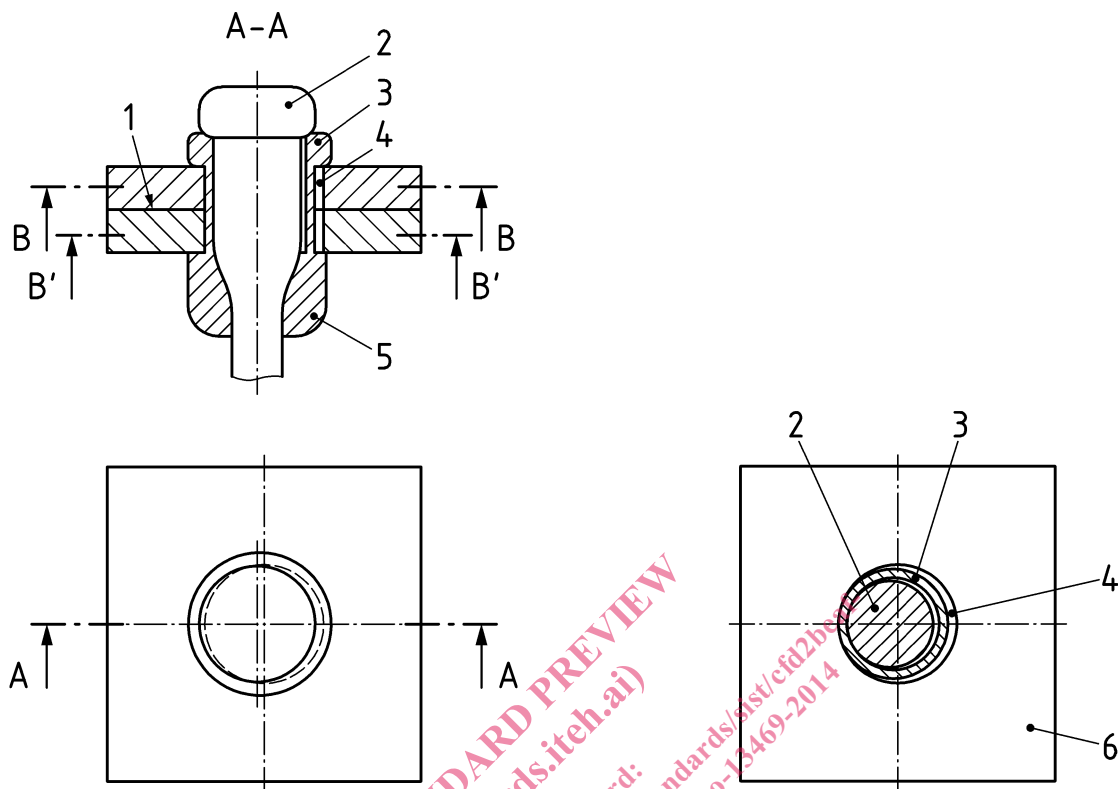
The test pieces or specimens shall be visually examined to check the misalignment of holes and rivet head, rivet end, bolt head or collar end prior to testing the test specimens.

#### 6.3 Macro-section / Macroscopic examination

Macroscopic examination of joint cross-sections, magnification 10x or 20x shall be carried out to verify the presence or the elimination of clearances between rivet and the work piece component holes. The clearance or interference/form fit characteristics of rivet joints can be ascertained by the examination of macrographs of cross-sections of the joints.

Towards this purpose, sections, normal to the mechanical fastener axis, shall be made 0,5 mm from the faying surface or in the middle of the sheet thickness, whichever is smaller. The sections shall show the amount of clearance or absence of radial play between the components of the rivet and the work piece hole. Examples of such macro-sections are shown in Figure 3 and Figure 4.





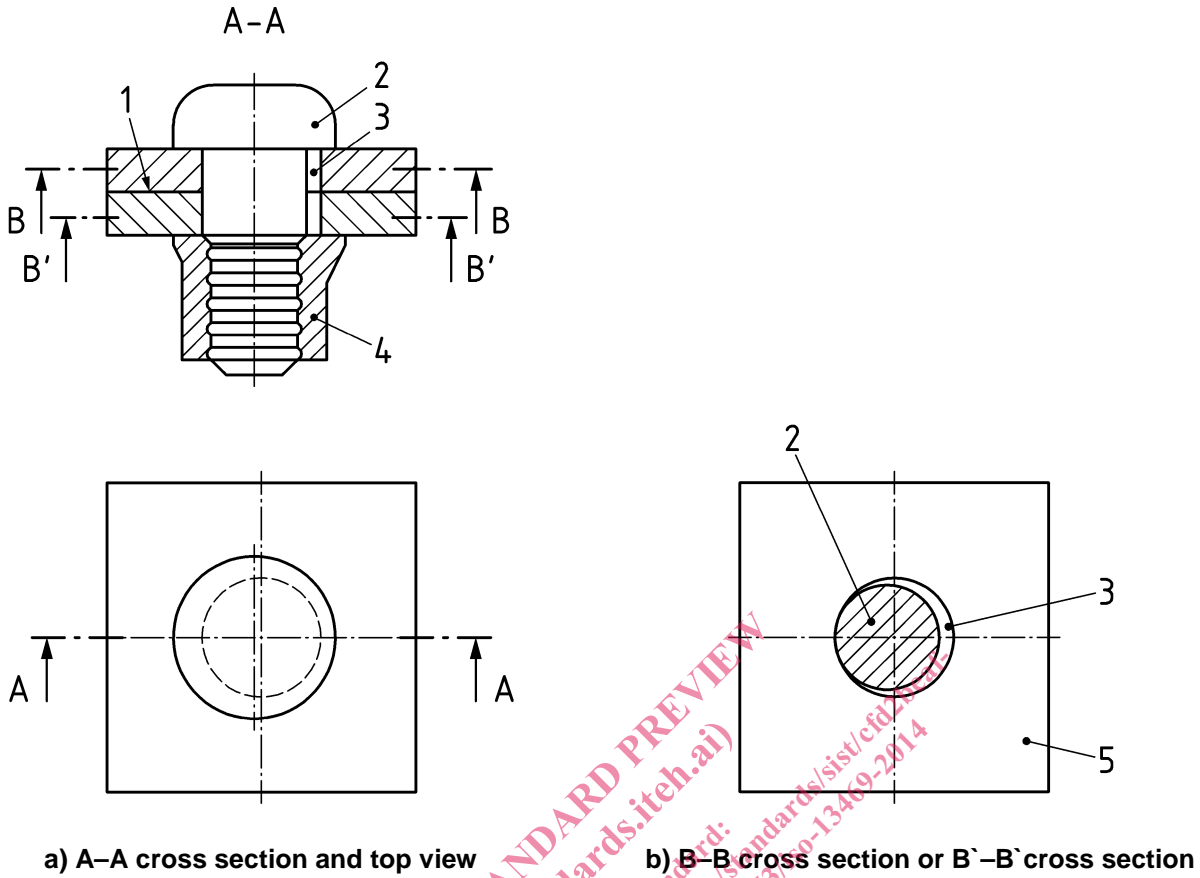
a) A-A cross section (body = sleeve + collar) and top view

c) B-B cross section or B'-B' cross section

**Key**

- 1 faying surface
- 2 mandrel
- 3 sleeve
- 4 clearance
- 5 collar
- 6 sheet

**Figure 3 — An example of an interference fit/form fit blind rivet joint**



**Key**

- 1 faying surface
- 2 bolt
- 3 clearance
- 4 collar
- 5 sheet

Figure 4 — An example of a clearance fit/force fit lock bolt joint