



<b>NEW WORK ITEM PROPOSAL</b>	
Date of presentation <b>2002-10-02</b>	Reference number (to be given by the Secretariat)  <b>ISO/TC 104 N 940</b>
Proposer <b>United States</b>	
Secretariat <b>ANSI</b>	

A proposal for a new work item within the scope of an existing committee shall be submitted to the secretariat of that committee with a copy to the Central Secretariat and, in the case of a subcommittee, a copy to the secretariat of the parent technical committee. Proposals not within the scope of an existing committee shall be submitted to the secretariat of the ISO Technical Management Board.

The proposer of a new work item may be a member body of ISO, the secretariat itself, another technical committee or subcommittee, or organization in liaison, the Technical Management Board or one of the advisory groups, or the Secretary-General.

The proposal will be circulated to the P-members of the technical committee or subcommittee for voting, and to the O-members for information.

See overleaf for guidance on when to use this form.

**IMPORTANT NOTE: Proposals without adequate justification risk rejection or referral to originator.**

Guidelines for proposing and justifying a new work item are given overleaf.

**Proposal** (to be completed by the proposer)

<p><b>Title of proposal</b> (in the case of an amendment, revision or a new part of an existing document, show the reference number and current title)</p> <p>English title      <b>Freight Containers – Mechanical Seals</b></p> <p>French title (if available)      <b>Réceptients de Fret -- Joints Mécaniques</b></p>	
<p><b>Scope of proposed project</b></p> <p><b>This Publicly Available Specification (PAS) establishes uniform procedures for the acceptance, and withdrawal of acceptance, of freight container seals and provides a single source of information on seals which are acceptable for securing freight containers in international commerce.</b></p>	
<p><b>Concerns known patented items</b> (see ISO/IEC Directives Part 1 for important guidance)</p> <p><input type="checkbox"/> Yes      <input checked="" type="checkbox"/> No      If "Yes", provide full information as annex</p>	
<p><b>Envisaged publication type</b> (indicate one of the following, if possible)</p> <p><input type="checkbox"/> International Standard    <input type="checkbox"/> Technical Specification    <input checked="" type="checkbox"/> Publicly Available Specification    <input type="checkbox"/> Technical Report</p>	
<p><b>Purpose and justification</b> (attach a separate page as annex, if necessary)</p> <p><b>The security seal primarily serves as a tamper indicating device, which offers a reliable indication of an unauthorized removal or attempted removal of the security seal. In addition, by virtue of its construction, the security seal provides limited resistance to an intentional or unintentional physical attack.</b></p> <p><b>Increased container security provides deterrents against terrorism and enhances international trade.</b></p> <p><b>Target date for availability</b> (date by which publication is considered to be necessary) <b>2003-01-15</b></p> <p><b>Relevant documents to be considered</b></p> <p><b>World Customs Organization guidelines</b></p>	
<p><b>Relationship of project to activities of other international bodies</b></p> <p><b>It is expected that this PAS will serve as a requisite mechanical seal standard for ISO TC 104, ISO TC 8, ISO TC 204, IMO, and WCO until such time as the International Standard can be completed.</b></p>	
<p><b>Liaison organizations</b></p> <p><b>ISO TC 104, ISO TC 8, ISO TC 204, IMO, and WCO</b></p>	<p><b>Need for coordination with:</b></p> <p><input type="checkbox"/> IEC      <input type="checkbox"/> CEN      <input type="checkbox"/> Other (please specify)</p>

**New work item proposal**

<p><b>Preparatory work</b> (at a minimum an outline should be included with the proposal)</p> <p><input checked="" type="checkbox"/> A draft is attached      <input type="checkbox"/> An outline is attached. It is possible to supply a draft by</p> <p>The proposer or the proposer's organization is prepared to undertake the preparatory work required    <input checked="" type="checkbox"/> Yes    <input type="checkbox"/> No</p>	
<p><b>Proposed Project Leader</b> (name and address)</p> <p><b>Michael Bohlman</b>          TC 104, c/o CSX Lines, LLC          1700 Galloping Hill Road          Kenilworth, NJ 07033          USA</p>	<p><b>Name and signature of the Proposer</b>          (include contact information)</p> <p><b>USA</b>  <b>Michael Bohlman</b>          1700 Galloping Hill Road          Kenilworth, NJ 07033</p>
<p><b>Comments of the TC or SC Secretariat</b></p> <p><b>Supplementary information relating to the proposal</b></p> <p><input checked="" type="checkbox"/> This proposal relates to a new ISO document;</p> <p><input type="checkbox"/> This proposal relates to the amendment/revision of an existing ISO document;</p> <p><input type="checkbox"/> This proposal relates to the adoption as an active project of an item currently registered as a Preliminary Work Item;</p> <p><input type="checkbox"/> This proposal relates to the re-establishment of a cancelled project as an active project.</p> <p>Other:</p> <p><b>Voting information</b></p> <p>The ballot associated with this proposal comprises a vote on:</p> <p><input type="checkbox"/> Adoption of the proposal as a new project</p> <p><input type="checkbox"/> Adoption of the associated draft as a committee draft (CD)          (see ISO Form 5, question 3.3.1)</p> <p><input type="checkbox"/> Adoption of the associated draft for submission for the enquiry vote (DIS or equivalent)          (see ISO Form 5, question 3.3.2)</p> <p>Other: <b>The vote on this proposal is for approval for the text to be published as a Publicly Available Specification (PAS). This is a joint NP and approval ballot for publication.</b></p>	

**Annex(es) are included with this proposal** (give details)

Date of circulation	Closing date for voting	Signature of the TC or SC Secretary
2002-10-02	2003-01-03	Matt Deane

**Use this form to propose:**

- a) a new ISO document (including a new part to an existing document), or the amendment/revision of an existing ISO document;
- b) the establishment as an active project of a preliminary work item, or the re-establishment of a cancelled project;
- c) the change in the type of an existing document, e.g. conversion of a Technical Specification into an International Standard.

This form is not intended for use to propose an action following a systematic review - use ISO Form 21 for that purpose.

Proposals for correction (i.e. proposals for a Technical Corrigendum) should be submitted in writing directly to the secretariat concerned.

**Guidelines on the completion of a proposal for a new work item**

(see also the ISO/IEC Directives Part 1)

- a) **Title:** Indicate the subject of the proposed new work item.
- b) **Scope:** Give a clear indication of the coverage of the proposed new work item. Indicate, for example, if this is a proposal for a new document, or a proposed change (amendment/revision). It is often helpful to indicate what is not covered (exclusions).
- c) **Envisaged publication type:** Details of the types of ISO deliverable available are given in the ISO/IEC Directives, Part 1 and/or the associated ISO Supplement.
- d) **Purpose and justification:** Give details based on a critical study of the following elements wherever practicable. *Wherever possible reference should be made to information contained in the related TC Business Plan.*
  - 1) The specific aims and reason for the standardization activity, with particular emphasis on the aspects of standardization to be covered, the problems it is expected to solve or the difficulties it is intended to overcome.
  - 2) The main interests that might benefit from or be affected by the activity, such as industry, consumers, trade, governments, distributors.
  - 3) Feasibility of the activity: Are there factors that could hinder the successful establishment or general application of the standard?

## New work item proposal

---

4) Timeliness of the standard to be produced: Is the technology reasonably stabilized? If not, how much time is likely to be available before advances in technology may render the proposed standard outdated? Is the proposed standard required as a basis for the future development of the technology in question?

5) Urgency of the activity, considering the needs of other fields or organizations. Indicate target date and, when a series of standards is proposed, suggest priorities.

6) The benefits to be gained by the implementation of the proposed standard; alternatively, the loss or disadvantage(s) if no standard is established within a reasonable time. Data such as product volume or value of trade should be included and quantified.

7) If the standardization activity is, or is likely to be, the subject of regulations or to require the harmonization of existing regulations, this should be indicated.

If a series of new work items is proposed having a common purpose and justification, a common proposal may be drafted including all elements to be clarified and enumerating the titles and scopes of each individual item.

**e) Relevant documents:** List any known relevant documents (such as standards and regulations), regardless of their source. When the proposer considers that an existing well-established document may be acceptable as a standard (with or without amendment), indicate this with appropriate justification and attach a copy to the proposal.

**f) Cooperation and liaison:** List relevant organizations or bodies with which cooperation and liaison should exist.



VOTE ON NEW WORK ITEM PROPOSAL	
Date of circulation 2002-10-02	Reference number <b>ISO/TC 104</b> <b>N 940</b>
Closing date for voting 2003-01-03	
Member body voting	

<b>ISO/TC 104</b>
Title <b>Freight Containers</b>
Secretariat <b>ANSI</b>

Circulated to P-members of the committee for vote and to O-members for information.  <b>P-members of the technical committee or subcommittee concerned have an obligation to vote.</b>
--

**Please send this form, duly completed at all points, to the Secretariat indicated above** (not to ISO Central Secretariat). P-members voting "Abstain" need only complete Question 3.1. All other P-members need to respond to all questions.  
**Important Note:** Incomplete forms may be considered invalid and not be counted when assessing results.

<b>Title of proposal</b>
English title <b>Freight Containers – Mechanical Seals</b>
French title (optional) <b>Réceptiers de Fret -- Joints Mécaniques</b>

**1 Evaluation of market relevance of the proposal**

*(P-members intending to vote 'We abstain' should not respond to this question)*

*It is recommended that this evaluation be carried out by a reasonably large number of stakeholders and the average of the various points given be subsequently reflected on the voting forms.)*

		low			high	
		1	2	3	4	5
1.1	What is the potential of this project to contribute to international trade and production?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2	What is the potential of this project to contribute to economic efficiency, health, safety, or the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3	How great is the need to harmonize national approaches in this subject area that may serve as barriers to international trade?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.4	What is the feasibility of achieving consensus on International Standard(s) in this subject area by the proposed target dates?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.5	What priority should be assigned to the development of International Standard(s) in this subject area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(Comments, including proposals for modification of the scope, may be annexed)

**Total points**

---

**2 Justification of proposal**

*(P-members intending to vote 'We abstain' should not respond to this question)*

Do you agree, as the voting member body, that the requirements in the ISO/IEC Directives, Annex C, 2001 on the *Justification of proposals for the establishment of standards* have been met by this proposal?

Yes       No

ISO/TC 104 N 940

---

**3 Vote**

**(Response required from all P-members)**

*(P-members intending to vote 'We abstain' need only respond to 3.1)*

**3.1** We agree to the addition of the proposed New work item to the programme of work of the committee:

Yes     No     We abstain / have no interest

**3.2** We are prepared to participate actively in the development of the project (even if voting "No"), i.e. to make an effective contribution at the preparatory stage, at least by commenting on working drafts:

Yes\*     No

NOTE 1    All P-members voting "Yes" to questions 3.1 and 3.2 need to nominate an expert.

NOTE 2    P-members voting "No" to question 3.1 may nevertheless nominate experts.

\* Name(s) and address(es) of nominated expert(s)

**3.3 Additional vote on an associated draft**

NOTE    Question 3.3 is applicable only in those cases where an additional vote for adoption of a draft is indicated by the committee secretariat on the ISO Form 4 in the section "Voting information".

In such cases, answer **either** 3.3.1 **or** 3.3.2, as indicated on the New work item proposal.

**3.3.1** We agree to direct submission of the draft associated with the New work item proposal for publication as a PAS:

Yes     No

**4 Relevant documents**

Standard(s), regulation(s), and other relevant documentation existing in our country, with any remarks concerning their application if necessary, are attached:

Yes     No

If "Yes", please give references here, or as a separate annex:

**5 Comments**

**An annex is attached to this form**

Member body voting	
Date	Name

Reference number of working document: **ISO/TC 104 N 940**

Date: 2002-10-02

Reference number of document: **ISO/PAS mm-n**

Committee identification: **ISO/TC 104**

Secretariat: **ANSI**

**Freight Containers — Mechanical Seals**

*Réceptacles de Fret -- Joints Mécaniques*

**Warning**

This document is a Publicly Available Specification, not an ISO International Standard. It is distributed for review and comment. It is subject to change without notice and may not be referred to as an International Standard.

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.

Document type: **Publicly Available Specification**

Document subtype: **if applicable**

Document stage: **(20) Preparation**

Document language: **E**

**Copyright notice**

This ISO document is a Publicly Available Specification (PAS) and is copyright-protected by ISO. While the reproduction of a PAS in any form for use by participants in the ISO standards development process is permitted without prior permission from ISO, neither this document nor any extract from it may be reproduced, stored or transmitted in any form for any other purpose without prior written permission from ISO.

Requests for permission to reproduce this document for the purpose of selling it should be addressed as shown below or to ISO's member body in the country of the requester:

*Copyright Manager  
ISO Central Secretariat  
1 rue de Varembe'  
1211 Geneva 20 Switzerland  
tel. + 41 22 749 0111  
fax + 41 22 749 0947  
internet: iso@iso.ch*

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

Violators may be prosecuted.

<b>Contents</b>	<b>Page</b>
<b>Foreword.....</b>	<b>iv</b>
<b>1 Scope .....</b>	<b>1</b>
<b>2 Terms and definitions .....</b>	<b>1</b>
<b>3 Mechanical seal types and requirements.....</b>	<b>1</b>
<b>3.1 Types of mechanical seals .....</b>	<b>1</b>
<b>3.2 General standards . .....</b>	<b>2</b>
<b>3.3 Identification marks .....</b>	<b>2</b>
<b>3.4 Evidence of tampering. ....</b>	<b>3</b>
<b>3.5 Customs acceptance .....</b>	<b>3</b>
<b>3.6 Test fixture configuration.....</b>	<b>3</b>
<b>4 Testing.....</b>	<b>4</b>
<b>4.1 Tensile test .....</b>	<b>4</b>
<b>4.2 Shear test .....</b>	<b>4</b>
<b>4.3 Bending test .....</b>	<b>5</b>
<b>4.4 Impact test .....</b>	<b>5</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 nnn-n was prepared by Technical Committee ISO/TC 104, Freight Containers. It is issued initially as a Publicly Available Specification (PAS) due to the immediate need for clarification and guidance with regard to security seals used in conjunction with freight container transportation. It has been prepared based on existing material available from national customs organizations, national testing bodies and the World Customs Organization.

## Freight Containers — Mechanical Seals

### 1 Scope

This Publicly Available Specification (PAS) establishes uniform procedures for the classification, acceptance, and withdrawal of acceptance of mechanical freight container seals. It provides a single source of information on mechanical seals which are acceptable for securing freight containers in international commerce. Special-purpose seals, such as fiber optic and sophisticated electronic seals, are not covered by this specification.

### 2 Terms and definitions

For the purposes of this document the following terms and definitions apply:

2.1 **security seal**—a passive, one-time locking device that is used to provide a reliable indicator of tampering (unauthorized removal or attempted removal) or entry. In addition, by virtue of its construction, the security seal provides limited resistance to an intentional or unintentional attempt to open it and enter the freight container that is sealed with the seal. They require inspection to indicate whether tampering has occurred or entry has been attempted.

2.2 **high security seals**—security seals that are constructed and manufactured of material such as metal or cable with the intent to delay intrusion; they generally must be removed with quality bolt cutters or cable cutters. They require inspection to indicate whether tampering has occurred or entry has been attempted.

2.3 **indicative seals**—seals that are constructed and manufactured of material that can easily be broken by hand or simple snipping tool or shear. They require inspection to indicate whether tampering has occurred or entry has been attempted.

### 3 Mechanical seal types and requirements

#### 3.1 Types of mechanical seals

3.1.1 **Wire**— Wire seals consist of a length of wire secured in a loop by some type of seizing device. Examples of this type are crimp wire, fold wire, and cup wire seals.

3.1.2 **Padlock**— Padlock seals consist of a locking body with a bail attached. Examples of this type of seal are wire shackle padlock (metal or plastic body), plastic padlock, and keyless padlock seals.

3.1.3 **Strap**— Strap seals consist of a metal or plastic strap secured in a loop by inserting one end into or through a protected (covered) locking mechanism on the other end.

3.1.4 **Cable**— Cable seal consist of a cable and a locking mechanism. On a one-piece seal, the locking or seizing mechanism is permanently attached to one end of the cable. A two-piece cable seal has a separate locking mechanism which slips onto the cable or prefabricated cable end.

3.1.5 **Bolt**— Bolt seals consist of a metal rod, threaded or unthreaded, flexible or rigid, with a formed head, secured with a separate locking mechanism.

3.1.6 **Cinch or Pull-Up**— Cinch or pull-up seals are indicative seals. They consist of a thin strip of material, serrated or non-serrated, with a locking mechanism attached to one end. The free end is pulled through a hole in the locking mechanism and drawn up to the necessary tightness. Cinch or pull-up type seals may have multiple lock positions. These seals are generally made of synthetics such as nylon or plastic. They should not be compared to simple electrical ties.

3.1.7 **Twist**— Twist seals are made of steel rod or heavy gage wire of various diameters, which is inserted through the locking fixture and twisted around itself by use of a tool.

3.1.8 **Scored**— Scored seals consist of a metal strip which is scored perpendicular to the length of the strip. The strip is passed through the locking fixture and bent at the score mark. Removal of the seal requires bending at the score mark which results in breakage of the seal.

3.1.9 **Label**— Label seals are frangible seals consisting of a paper or plastic backing with adhesive. The combination of backing and adhesive are chosen to cause the seal to tear when removal is attempted.

## 3.2 General standards

3.2.1 Security and High Security Seals shall be strong and durable so as to prevent accidental breakage, early deterioration (due to weather conditions, chemical action, etc.) or undetectable tampering under normal usage;

3.2.2 Seals shall be capable of being affixed easily and quickly;

3.2.3 Seals shall be identified by unique marks (such as a logotype) and numbers that are readily legible; markings intended for unique identification of the seal shall be considered permanent. Any modification of markings shall require irreversible physical, chemical, heat or other destruction of the security seal.

3.2.4 Seals shall be designed and constructed so as to not permit removal or undoing without breaking, or to allow tampering without leaving readily apparent traces;

3.2.5 Seals shall be design so as to not permit use more than once; and

3.2.6 Seals shall be made as difficult as possible to copy or counterfeit.

## 3.3 Identification marks.

3.3.1 Seals intended for use on freight containers moving under customs laws as instruments of international trade shall be separately approved and marked as determined by the relevant customs organization.

- 3.3.2 If the seal is to be purchased and used by customs, the seal or fastening, as appropriate, shall be marked to show that it is a customs seal by application of unique words or markings designated by the appropriate customs organization and a unique identification number.
- 3.3.3 If the seal is to be used by private industry (i.e., a shipper, manufacturer, or carrier), it must be clearly and legibly marked with a unique company name (or logotype) and identification number.

#### 3.4 **Evidence of tampering**

- 3.4.1 Different seal types evidence tampering in different ways but one common test for tampering, regardless of seal type, is easy opening of the seal under hand pressure.
- 3.4.2 Cable and wire seals can also evidence tampering with a frayed appearance at the point where the wire or cable meets the locking portion of the seal.
- 3.4.3 Bolt, rod and padlock type seals can evidence tampering with scratches or nicks on the body of the seal indicating attempted prying or picking of the lock mechanism. Threaded bolts can be bent after installation to upset the threads and prevent undetected removal of the locking mechanism. The use of a plastic coating on these types of seals can promote the detection of tampering.
- 3.4.4 Other types of seals can evidence tampering with scratches or nicks adjacent to the locking mechanism or deformation of the locking mechanism.

#### 3.5 **Customs acceptance**

- 3.5.1 Seals shall be manufactured under a controlled process as evidenced by ISO 9000 series certification or other suitable, externally audited manufacturing and testing processes quality control process.
- 3.5.2 Seals will be considered as acceptable for use and/or purchase as soon as the manufacturer attests that the seals have been tested and meet or exceed the standards provided in 4. They will continue to be considered acceptable until such time as it is demonstrated that they do not meet the standards or they are withdrawn from the marketplace by the manufacturer. A manufacturer should notify the appropriate customs authority whenever a seal is so withdrawn.
- 3.5.3 A manufacturer may attest to the qualification of a specific seal, or to an entire product line of seals as of a certain date. Any addition of a seal to a group of seals attested to as a group would require specific acceptance of that seal by customs.
- 3.5.4 All testing of seals deemed necessary before customs acceptance will be done by the manufacturer or by a private laboratory, and not by customs. However, customs reserves the right to test, or to have tested, seals that have been accepted by customs.
- 3.5.5 Only seals classed as high security or security seals based on the test protocols set forth in 4 shall be acceptable for use as customs seals.

### 3.6 Test fixture configuration

The general type of seal and its configuration shall be used to configure the appropriate test fixture. Seals shall be classified as high security, security or indicative based on their certified performance under the tests described in 4.

## 4 Testing

### 4.1 Tensile test

4.1.1 A pull test shall be conducted to determine the strength of a seal's locking mechanism. The test fixture shall apply a uniform load to the seal in a manner that simulates reversal of the motion used to lock the seal. The load shall be slowly applied until the seal forcibly opens or is otherwise broken.

4.1.2 The seal shall be classified based on the tensile force recorded at the time of failure of the seal based on the criteria set forth in Table 1, Tensile Test Seal Classification Requirements.

**Table 1 -- Tensile Test Seal Classification Requirements**

Load to Failure (kN <sup>1)</sup> )	Seal Classification
4.45	High Security Seal
2.27	Security Seal
Below 2.27	Indicative Seal

### 4.2 Shear test

4.2.1 A shear test shall be conducted to test the ability of a seal to withstand cutting with shearing blades, as might be implemented with bolt cutters. The cutting blades used in the test fixture shall be sufficiently well aligned that seals are cut and not merely deformed as might occur with a thin, flexible seal and misaligned blades. The compressive load shall be applied slowly until the seal is severed.

4.2.2 The seal shall be classified based on the compressive load recorded at the time of failure of the seal based on the loads set forth in Table 2, Shear Test Seal Classification Requirements.

---

1) 1 J = 0.7375621 ft -lbf  
 1 N = 0.2248089 lbf  
 1 kg-f = 2.2045855 lbf  
 1 Nm = 0.7375621 ft -lbf

**Table 2 -- Shear Test Seal Classification Requirements**

Load to Failure (kg <sup>f</sup> <sup>1</sup> )	Seal Classification
341	High Security Seal
227	Security Seal
Below 227	Indicative Seal

#### 4.3 Bending test

- 4.3.1 The bending test is run to determine the resistance of a seal to failure under bending loads. How the test is run shall be based on the sub-classification of the seal as either flexible or rigid. Flexible seals shall be tested for their ability to resist repeated bending loads without failure. Rigid seals shall be tested to determine their resistance to deformation by bending.
- 4.3.2 For flexible seals, fix the locking end and flex the material adjacent to this fixed end repeatedly through an arc of 180 degrees until failure. Record the number of cycles through this 180 degree arch and base classification of the seal on the number of cycles shown in Table 3, Bending Test Seal Classification Requirements.
- 4.3.3 For single shaft rigid seals, fix the locking end and then fit a tube or other suitable lever over the remaining portion of the seal. Apply a load on the lever so as to bend the seal 90 degrees. Record the load required to bend the seal and the distance above the fixed end of the seal (the moment arm) that the load is applied. Base classification of the seal on the maximum bending moment recorded and that shown in Table 3, Bending Test Seal Classification Requirements.
- 4.3.4 For rigid seals with two shafts such as in a padlock, fix the locking end and then fit a bar or rod through the opening between the two shafts. Rotate the rod or bar until it is in contact with both shafts. Continue to rotate the bar in the same direction an additional 90 degrees. Record the torsional force needed to achieve the 90 degree rotation or to cause failure of the locking mechanism if that occurs prior to achieving the 90 degree rotation. Base classification of the seal on the maximum bending moment recorded and that shown in Table 3, Bending Test Seal Classification Requirements.

---

1) 1 J = 0.7375621 ft · lbf  
 1 N = 0.2248089 lbf  
 1 kg·f = 2.2045855 lbf  
 1 Nm = 0.7375621 ft · lbf

**Table 3 -- Bending Test Seal Classification Requirements**

<b>Cycles to Failure (flexible seals)</b>	<b>Bending Moment to Failure (rigid seals) (Nm<sup>1</sup>)</b>	<b>Seal Classification</b>
501	680	High Security Seal
251	340	Security Seal
Below 251	Below 340	Indicative Seal

#### 4.4 Impact test

4.4.1 The impact test shall be run to determine the resistance of the seal to an impact load at 18 degrees C and minus 27 degrees C. The test fixture shall be devised so the impact load is applied at the locking mechanism of the seal in the direction opposite the direction used in locking the seal. The impact load shall be applied 5 times at a load equivalent to 13.56 J. Subsequent impact test sequences shall be run at a load that is 13.56 J higher than the previous 5 impact loads. Impacts shall be run until the seal fails or successfully withstands 5 impacts at 40.68 J. A second seal shall be tested at the second temperature.

4.4.2 If the seal fails prior to completion of the 5 impact cycles, it shall be classed based on the next lower set of values. The value at which the seal fails shall be recorded and used to determine the seal's classification. The values set forth in Table 4, Impact Test Seal Classification Requirements, shall be the basis for this determination.

**Table 4 -- Impact Test Seal Classification Requirements**

<b>Low Temperature Impact Load (J<sup>1</sup>)</b>	<b>High Temperature Impact Load (J<sup>1</sup>)</b>	<b>Seal Classification</b>
40.68	40.68	High Security Seal
27.12	27.12	Security Seal
Below 27.12	Below 27.12	Indicative Seal

---

1) 1 J = 0.7375621 ft -lbf  
 1 N = 0.2248089 lbf  
 1 kg-f = 2.2045855 lbf  
 1 Nm = 0.7375621 ft -lbf