

Oilfield Hammer Unions

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Oilfield Hammer Unions

1 Scope

1.1 Purpose

This standard specifies minimum requirements for the dimensional and functional interchangeability, design, materials, inspection, marking, storing, and shipment of hammer union parts and assemblies for use in the petroleum and natural gas industries.

This standard does not address the manner (i.e. integral, weld or thread) in which hammer unions are attached to other parts. Requirements for repair and remanufacture of hammer union parts are not included in this standard.

WARNING — Hammer unions manufactured under the requirements of this standard are only to be considered interchangeable with hammer unions also manufactured to the requirements of this standard. Hammer unions manufactured under the requirements of this standard are assumed to not be interchangeable with hammer unions not conforming to this standard.

1.2 Applicability

This standard is applicable only to the following figures, nominal sizes, temperatures, and service conditions of hammer unions:

- Figure Numbers: 602, 1002, and 1502
 - Nominal Size: 1 in., 1.5 in., 2 in., 3 in., and 4 in.
- Figure Numbers: 2002 and 2202
 - Nominal Size: 2 in. and 3 in.
- Temperature Range: -75 °F to 250 °F (-60 °C to 121 °C)
- Service: Standard and Sour Service

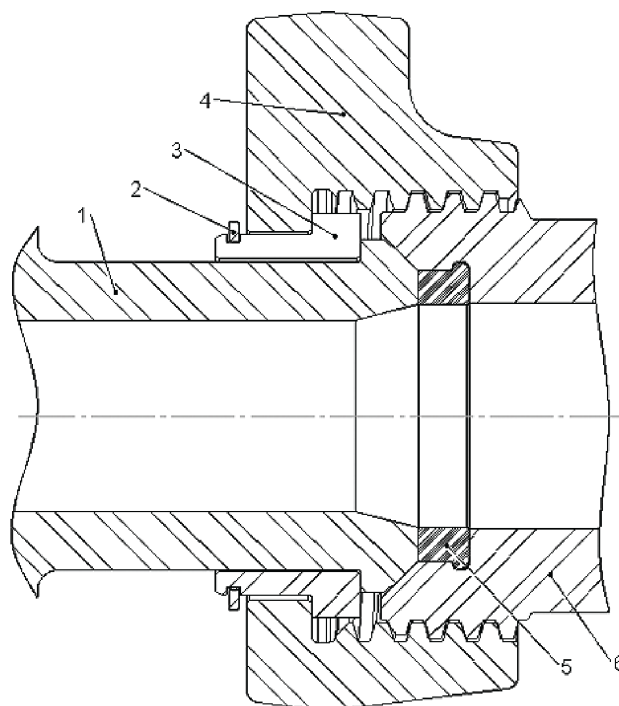
This standard is only applicable to surface installations that are not intended to be insulated, buried, or otherwise denied direct exposure to atmosphere.

1.3 Service Conditions

This standard defines service and operating conditions in terms of pressure, temperature, and sour classification for the retained fluids.

1.4 Hammer Union Assembly Nomenclature

Figure 1 and Figure 2 are examples of hammer union types within the scope of this standard. Typical figure callouts in this standard are nominal size and figure (e.g. 3" Figure 1502).

**Key****Pressure-containing**

- 1 male-end connector
- 5 resilient seal
- 6 female-end connector

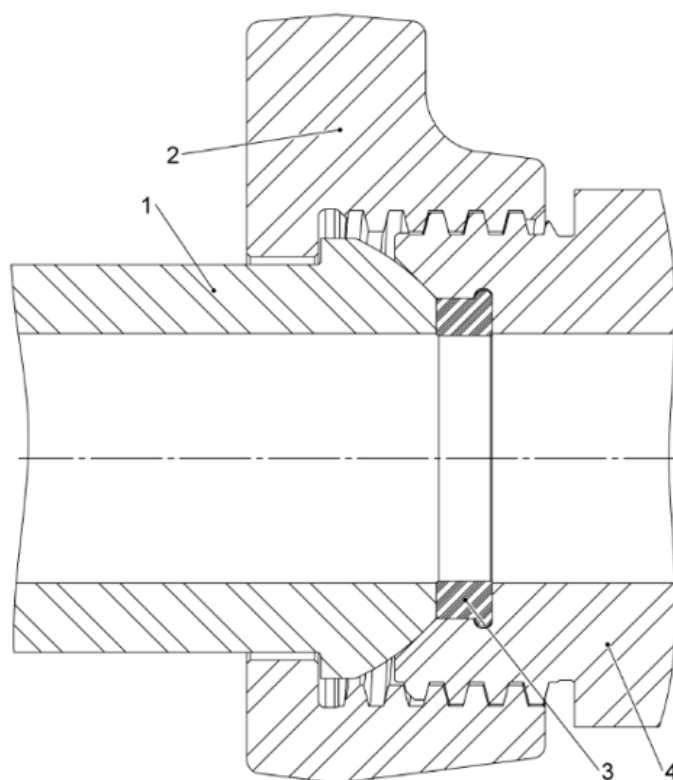
Pressure-retaining

- 3 nut retainer segments
- 4 union nut

Miscellaneous

- 2 segment retainer ring

Figure 1—Typical Removable Nut Hammer Union Assembly

**Key****Pressure-containing**

- 1 male end connector
- 3 resilient seal
- 4 female end connector

Pressure-retaining

- 2 union nut

Figure 2—Typical Non-removable Nut Hammer Union Assembly

2 Normative References

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

API Recommended Practice 7HU1, *Safe Use of 2-inch Hammer Union for Oilfield Applications*

API Specification 6A, *Specification for Wellhead and Tree Equipment*

NACE MR0175/ISO 15156¹, *Petroleum and natural gas industries—Materials for use in H₂S-containing environments in oil and gas production—Parts 1, 2, and 3*

ASME B1.5, *ACME Screw Threads*

ASME B1.8, *Stub ACME Screw Threads*

¹ NACE International (formerly the National Association of Corrosion Engineers), 1440 South Creek Drive, Houston, Texas 77084-4906, www.nace.org

ASNT SNT-TC-1A², *Personnel Qualification and Certification in Nondestructive Testing*

ASTM A370³, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

ASTM E10, *Standard Test Method for Brinell Hardness of Metallic Materials*

ASTM E18, *Standard Test Methods for Rockwell Hardness of Metallic Materials*

ASTM E110, *Standard Test Method for Rockwell and Brinell Hardness of Metallic Materials by Portable Hardness Testers*

ASTM E140, *Standard Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness*

ASTM E165, *Standard Test Method for Liquid Penetrant Testing for General Industry*

ASTM E709, *Standard Guide for Magnetic Particle Testing*

ISO 2859-1:1999, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 6506⁴, *Metallic materials — Brinell hardness test, (all parts)*

ISO 6508, *Metallic materials — Rockwell hardness test, (all parts)*

ISO 9712, *Non-destructive testing — Qualification and certification of personnel*

ISO 18265, *Metallic materials — Conversion of hardness values*

3 Terms, Definitions, and Abbreviations

3.1 Terms and Definitions

For the purposes of this standard, the following terms and definitions apply.

3.1.1

acceptance criteria

Defined limits placed on characteristics of materials, products, processes or services.

3.1.2

accessible surface

Surface readily available for purposes of nondestructive examination that can be viewed by direct line of sight.

3.1.3

chemical analysis

Determination of the chemical composition of material.

3.1.4

date of manufacture

Date of manufacturer's final acceptance of finished part or equipment.

² American Society for Nondestructive Testing, 1711 Arlingate Lane, P.O. Box 28518, Columbus, Ohio 43228, www.asnt.org

³ ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org

⁴ International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, www.iso.org

3.1.5**figure number**

Number that designates the dimensional compatibility for a given size.

NOTE The figure number alone is not indicative of pressure rating. It is the user's responsibility to assure that unions are only assembled such that service and pressure ratings are compatible.

3.1.6**forge (verb)**

Deform metal plastically into desired shapes with compressive force.

NOTE Forging is usually a hot process. The use of dies is optional.

3.1.7**function**

Operation of a product during service.

3.1.8**heat**

Material originating from a final melt, or for re-melted alloys, the raw material originating from a single re-melted ingot.

3.1.9**heat-treatment****heat-treating**

Specified, timed sequence of controlled heating and cooling of materials for the purpose of changing physical or mechanical properties.

3.1.10**hot-work**

Deform metal plastically at a temperature above the recrystallization temperature.

3.1.11**part**

Individual piece used in a hammer union assembly

EXAMPLE Union nut, segment retainer set, male and female end, etc. are parts of a hammer union.

NOTE A part may also be a piece not in finished form.

3.1.12**pressure-containing part**

Part exposed to retained fluids whose failure to function as intended results in a release of retained fluid to the atmosphere.

3.1.13**pressure-retaining part**

Part not exposed to retained fluids whose failure to function as intended results in a release of retained fluid to the atmosphere.

3.1.14**rated working pressure**

Maximum internal pressure that the pressure-containing part is designed to contain when in operation.

3.1.15**record (noun)**

Retrievable information.

3.1.16**relevant indication**

Surface-rupture NDE indication with major dimensions greater than 1.6 mm ($\frac{1}{16}$ in.).

NOTE Inherent indications not associated with a surface rupture are considered non-relevant.

3.1.17**retained fluid**

Actual fluid contained by pressure-containing parts.

3.1.18**sour service**

Exposure to oilfield environments that contain sufficient H₂S to cause cracking of materials by the mechanisms addressed by NACE MR0175/ISO 15156.

3.1.19**standard service**

Exposure to oilfield environments that do not contain sufficient H₂S to cause cracking of materials by the mechanisms addressed by NACE MR0175/ISO 15156.

3.1.20**wetted surface**

Any surface intended to have contact with retained fluid.

3.1.21**wrought**

Product, structure, or material that contains no cast dendritic elements.

3.1.22**yield strength**

Stress level at which material plastically deforms and does not return to its original dimensions when the load is released.

NOTE All yield strengths specified in this standard are considered as being the 0.2 % yield offset strength in accordance with ISO 6892 or ASTM A370.

3.2 Abbreviations

For the purposes of this standard, the following abbreviated terms apply.

AQL	acceptable quality level
ER	equivalent round
FIG	figure
HBW	Brinell hardness number
MT	magnetic particle test
NDE	nondestructive examination
NPST	non-pressure seal thread
PT	liquid penetrant examination
QTC	qualification test coupon

4 Design and Performance—General Requirements

4.1 Service Conditions

4.1.1 Material Service Ratings

For sour service, the material shall meet the requirements of NACE MR0175/ISO 15156 for chemistry, processing, and properties (e.g. hardness) for the male-end connector, female-end connector, and union nut.

NOTE 1 Choosing specific materials for specific conditions is ultimately the responsibility of the purchaser.

NOTE 2 Resistance to cracking caused by H₂S is influenced by several other factors, some of the limits for which are given in NACE MR0175/ISO 15156. These include, but are not limited to:

- pH;
- temperature;
- chloride concentration;
- elemental sulfur.

NOTE Nut retainer segments are not required to meet the requirements of NACE MR0175/ISO 15156, regardless of standard or sour service.

4.1.2 Pressure Ratings

The rated working pressure for union connectors shall not exceed the pressure ratings in Table 1.

NOTE The hammer unions covered in this standard are capable of withstanding hydrostatic Factory Acceptance Testing at 1.5 times rated working pressure for new assemblies, when the requirements of this standard are followed.

Table 1—Pressure Rating for Union Figure Number and Service

Figure Number	Pressure Rating	
	Standard psi (MPa)	Sour psi (MPa)
602	6000 (41.4)	6000 (41.4)
1002	10,000 (69.0)	7500 (51.7)
1502	15,000 (103.5)	10,000 (69.0)
2002	20,000 (138.0)	N/A
2202	N/A	15,000 (103.5)

4.1.3 Temperature Ratings

Metallic parts shall use one or more of the specified temperature ratings with minimum and maximum temperatures as shown in Table 2 or custom temperature ranges within the range specified in 1.2.

NOTE Minimum temperature is the lowest temperature to which the part may be subjected during operation. Maximum temperature is the highest temperature to which the part may be subjected during operation. Temperatures during assembly and installation are out of scope of these temperature ranges.

Table 2—Temperature Ratings for Metallic Parts

Temperature Classification	Temperature Range ^a			
	°F		(°C)	
	Min. ^b	Max. ^c	Min. ^b	Max. ^c
K	−75	180	−60	82
L	−50	180	−46	82
N	−50	140	−46	60
P	−20	180	−29	82
S	0	140	−18	60
T	0	180	−18	82
U	0	250	−18	121
^a Temperatures during assembly and installation are out of scope of these temperature ranges. ^b Minimum temperature is the lowest temperature to which the part may be subjected during operation. ^c Maximum temperature is the highest temperature to which the part may be subjected during operation.				

4.2 Miscellaneous Design Information

4.2.1 Tolerances

Unless otherwise specified in the appropriate table or figure, the tolerances in Table 3 shall apply:

Table 3—Tolerances, Unless Otherwise Stated

Dimension	Tolerance in.
X.XX	± 0.015
X.XXX	± 0.005
X° or X.X°	± 0.5°

4.2.2 Removable Male Connector

The clearance behind the feature as defined by dimensions F and T in Figure 4/Table 8, and dimensions F, T, and P in Figure 5/Table 9, shall allow space for the assembly and disassembly of the union nut and the nut retainer segments.

4.2.3 Nut Retainer Segments

NOTE Maintaining the nut retainer segments in matched sets of three pieces after slitting is not required by this standard due to currently specified tolerances for segment shoulder thickness.

4.2.4 Segment Retainer Ring

A segment retainer ring shall engage the groove of the nut retainer segments in the assembled condition shown in Figure 1 to keep the union nut and all three retainer segments together under normal make-up and break-down activities.

NOTE Reference A.2 for example groove and retainer ring dimensions that satisfy the requirements of this section.

5 Materials

5.1 General

The materials for segment retainer rings, resilient seals, pressure-containing parts, and pressure-retaining parts shall satisfy the requirements below. All metallic materials shall have a wrought microstructure throughout.

5.2 Segment Retainer Ring

Segment retainer rings shall be made of material meeting the functional requirements of 4.2.4.

5.3 Resilient Seal

The resilient seal shall be made of non-metallic material, though a metallic anti-extrusion ring may be included in the resilient seal. The resilient seal shall require a written material specification. The manufacturer's written specification for resilient seal non-metallic materials shall define the following:

- generic base polymer(s);

NOTE ASTM D1418 provides standardized nomenclature for rubber polymers.

- physical property requirements;

- documentation requirements as specified in 7.5.2.2;

- storage and age-control requirements.

The resilient seal shall be manufactured from materials which meet the requirements in the written material specification. Seals with integral anti-extrusion devices should be used at working pressures of greater than or equal to 15,000 psi (103.5 MPa).

5.4 Metallic Pressure-containing and Pressure-retaining Parts

5.4.1 General

Weld repair of material or product shall not be performed at any point in the manufacturing process.

5.4.2 Written Material Specification Requirements

All metallic pressure-containing and pressure-retaining parts shall require a written material specification. The requirements in 5.4 shall be defined in the written material specification.

All pressure-containing and pressure-retaining parts shall be manufactured from materials which meet the requirements in the written material specification.

5.4.3 Union Nuts

Union nuts shall be produced from a single-piece forging.

5.4.4 Hot-working Practices

Materials formed using hot-working practice(s) shall result in a reduction ratio of at least 3:1. In addition, the reduction ratio shall be documented.