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FOREWORD

This standard shall become effective on the date printed on the cover but may be used voluntarily from the date of distribution. Standards referenced herein may be replaced by other international or national standards that can be shown to meet or exceed the requirements of the referenced standard. Manufacturers electing to use another standard in lieu of a referenced standard are responsible for documenting equivalency. This American National Standard is under the jurisdiction of the API Subcommittee on Drilling Well Control Systems.

In this American National Standard technical modifications and corrections will be incorporated. A complete list of these modifications and corrections can be found in Annex J.

This American National Standard replaces the repair and remanufacturing chapter from API 16A edition.

Please note that Annex I, API Monogram, has been amended to clarify what equipment is eligible for the repair/remanufacture monogram.

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API Specification 16A / ISO 13533
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1. Scope

1.1 General

This American National Standard specifies requirements for repair, remanufacturing, testing, inspection, welding, marking, certification, recertification, handling, storing and shipping of drill-through equipment used for drilling for oil and gas build under API-16A. When desired this standard can also be voluntary adopted for other well control equipment build under a different specification, but this will not automatically make them API products. This standard defines Repair Service Levels for the below listed equipment and the required equipment traceability that is required to proof compliance. The repair and remanufacturing supported under this standard requires that the associated service conditions of the equipment in terms of internal pressure, temperature and wellbore fluids and ambient temperature limits for which the equipment is designed remains unchanged and is supported by the Original Product Definition.

This American National Standard is applicable to and establishes requirements for the following specific equipment:

a) ram blowout preventers;

b) ram blocks, operators, packers and top seals;

c) annular blowout preventers;

d) annular packing units;

e) hydraulic connectors;

f) drilling spools;


g) adapters;

h) loose connections;

i) clamps.

j) drilling riser

Dimensional interchangeability is limited to end and outlet connections. Typical equipment defined by this American National Standard is shown in Figures 1 and 2.

Recommendations for failure reporting are outlined in Annex F.

This API standard supports the requirements of life cycle management systems for new, individual, API monogrammed products or system parts throughout their functional life cycle.
Key:
1. Ring gaskets ISO 10423
2. Annular BOP
3. Clamp
4. Ram BOP
5. Drilling spool
6. Valve ISO 10423
7. Wellhead
8. Casing
9. End and outlet connections
10. Drill-through equipment ISO 13533
11. Wellhead equipment ISO 10423

Figure 1 — Typical surface drill-through equipment
Key:

1. Riser connector
2. Flex/ball joint
3. Annular BOP
4. Hydraulic connector
5. Adapter
6. Ram BOP
7. Valve ISO 10423
8. Hydraulic connector
9. Wellhead
10. Riser equipment, including kill, choke, booster and control fluid conduit lines.
11. Drill-through equipment ISO 13533
12. Wellhead equipment ISO 10423

Figure 2 — Typical subsea drill-through equipment
2. Normative References

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this American National Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards. When the latest edition is specified it may be used on issue and shall become mandatory 6 months from the date of the revision.

Standards referenced in this specification may be replaced by other international or national standards that can be proven to meet or exceed the requirements of the referenced standard. Product manufacturers, product owner/operators and repairers who use other standards in lieu of standards referenced herein are responsible for documenting the equivalency of the standards in order to provide traceability for compliance to this standard.

1) ISO 2859-1:1989, Sampling procedures for inspection by attributes — Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection  
2) ISO 6506-1, Metallic materials, Brinell hardness test, Part 1: Test method  
3) ISO 6507-1, Metallic materials, Vickers hardness test, Part 1: Test method  
5) ISO 6892, Metallic materials , Tensile testing at ambient temperature  
7) ISO 11961:1996, Petroleum and natural gas industries — Steel pipes for use as drill pipe — Specification  
8) ISO 13665, Seamless and welded steel tubes for pressure purposes — Magnetic particle inspection of the tube body for the detection of surface imperfections  
9) API Bulletin 6AF, Capabilities of API flanges under combinations of load  
10) ASME Boiler and Pressure Vessel Code Section V, Article 5, UT Examination Methods for Materials and Fabrication  
11) ASME Boiler and Pressure Vessel Code Section VIII, Division 1, Appendix 4, Rounded Indication Charts Acceptance Standard for Radiographically Determined Rounded Indications in Welds  
12) ASME Boiler and Pressure Vessel Code Section VIII, Division 2, Pressure Vessel — Alternate Rules, Appendix 4, Design Based on Stress Analysis  
13) ASME Boiler and Pressure Vessel Code Section VIII, Division 2, Pressure Vessel — Alternate Rules, Appendix 6, Experimental Stress Analysis  
14) ASME Boiler and Pressure Vessel Code Section IX, Articles I, II, III and IV  
17) ASTM A 370:1997, Test Methods and Definitions for Mechanical Testing of Steel Products  
18) ASTM A 453:1999, Specification for Bolting Materials, High Temperature, 50 to 120 ksi Yield Strength, with Expansion Coefficients Comparable to Austenitic Steels
27) ASTM E 140:1999, Hardness Conversion Tables for Metals
29) ASTM E 569:1997, Standard Practice for Acoustic Emission Monitoring of Structures During Controlled Simulation
31) Quality Indicators (IQI) used for Radiography
32) ASNT-SNT-TC-1A:1992, Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing
33) NACE MR0175–2000, Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment
37) API Specification 16A / ISO 13533

NOTE: Must check if the required standards for welding, welder qualification and inspection are included, including those for CRA low and high alloys like, Super Duplex and MP35N. Other applicable standards missed must be added to the list.

NOTE: Must check the references for applicability and latest revisions.
3. Definitions

3.1 Decommissioning:
Removing a product or system from service and make it safe by dismantling, and rendering it inoperative.

3.2 Design Status:
The status of a traceable product with regard to changes to elements of the Original Product Definition (OPD) as well as improvements to the OPD or obsolescence of the product.

3.3 Life Cycle Management Plan (LMP):
A plan developed by the Life Cycle Management Service Provider (LCMSP) and approved by the owner/operator developed to provide for the traceability of monogrammed products throughout the product life cycle. The plan requires the identification, service configuration, service environment, maintenance and service requirements and interval, service personnel competency, design status review, repair and remanufacture requirements and decommissioning requirements for the traceable API monogrammed product.

3.4 Life Cycle Management Service Provider (LCMSP):
The LCMSP is responsible for compliance with the LMP specification. The LCMSP may be any company, individual, owner/operator or OEM licensed by API to this specification. LCMSP’s providing services in compliance with this API specification are required to meet the requirements of API Specification Q2: Specification for Quality Programs for the Petroleum, Petrochemical and Natural Gas Industry.

3.5 Original Product Definition (OPD):
The complete definition of the requirements for the original assembled product, single equipment unit or component part, including specified limits and tolerances, health, safety and environmental requirements, limitations of use, customer specific requirements, design acceptance criteria, materials of construction, materials processing requirements and physical properties, physical dimensions and requirements for manufacturing process controls, inspection, assembly and testing, marking, handling, storage, maintenance, service and records requirements.

3.6 Original Equipment Manufacturer (OEM):
The original producer of the product and keeper of the Original Product Definition (OPD).

3.7 Product Owner/Operator:
The owner or operator of the product repaired or remanufactured in compliance with this specification.

3.8 Product History File (PHF):
The composite file of records from a traceable API product. The PHF includes all records associated with the original API product (including Monogram requirements) and those certification records required by this specification.

3.9 Traceable Product:
An API product managed under the requirements of this specification.

3.10 Acceptance criteria
Defined limits placed on characteristics of materials, products or service

3.11 Adapter
Pressure-containing piece of equipment having end connections of different nominal size designation and/or pressure rating

3.12 Annular blowout preventer
Blowout preventer that uses a shaped elastomeric sealing element to seal the space between the tubular and the wellbore or an open hole

3.13 Blind connection
End or outlet connection with no centre bore, used to completely close off a connection

3.14 Blind-Shear Ram (BSR)
Closing and sealing component in a ram blowout preventer that first shears the tubular in the wellbore and then seals off the bore or acts as a blind ram if there is no tubular in the wellbore

3.15 Blind ram
Closing and sealing component in a ram blowout preventer that seals the open wellbore API Specification 16A / ISO 13533

3.16 Blowout preventer (BOP)
Equipment (or valve) installed at the wellhead to contain wellbore pressure either in the annular space between the casing and the tubulars or in an open hole during drilling, completion, testing or workover operations

3.17 Body
Any portion of equipment between end connections, with or without internal parts, which contains wellbore pressure.

3.18 Bolting
Threaded fasteners used to join end or outlet connections

3.19 Calibration
Comparison and adjustment to a standard of known accuracy

3.20 Cast, verb
Pour molten metal into a mould to produce an object of desired shape

3.21 Casting, noun
Object at or near finished shape obtained by solidification of a substance in a mould

3.22 Chemical analysis
Determination of the chemical composition of material
3.23 **Clamp, noun**  
Device with internal angled shoulders used to fasten mating hubs

3.24 **Clamping load**  
Axial load applied to clamp hubs by the clamp due to bolt tightening

3.25 **Closure bolting**  
Threaded fasteners used to assemble pressure-containing parts other than end and outlet connections

3.26 **Conformance**  
Compliance with specified requirements in every detail

3.27 **Certificate Of Compliance:**  
Document in which the OEM, OEM licensed facility, Repairer, Remanufacturer, or recognized technical authority certifies that the equipment and / or system meets the required standards or rules as depicted in the relevant area of operations regulatory requirement. Check with respect to S53 or CFR 250.416

3.28 **Certificate Of Conformance (COC):**  
Document in which the OEM, OEM licensed facility, Repairer, Remanufacturer, or recognized technical authority certifies that the assembly or part has been manufactured / remanufactured in conformance to the mentioned standard(s), specifications and guidelines in accordance with the Original Product Definition, including design changes resulting from a malfunction or failure history of drill-through equipment manufactured, remanufactured and / or repaired to the appropriate American National Standard / Specification.

3.29 **Certificate Of Compatibility:**  
Document in which a Manufacturer, Repairer, Remanufacturer, or recognized technical authority certifies that the part or system is compatible with the Original Product Definition, including design changes resulting from a malfunction or failure history of drill-through equipment manufactured, remanufactured and / or repaired to the appropriate American National Standard / Specification and is fully compatible and / or can be integrated into other systems guaranteeing the operations envelope as defined by the OEM. Check alignment with S53

3.30 **Statement Of Fact (SOF):**  
Document in which the OEM, OEM licensed facility, Repairer, Remanufacturer, or recognized technical authority certifies that the maintenance / repair performed on a part or system is either not covered by a full service history and required traceability, or the maintenance / repair was made with limited scope defined by the Owner. The OEM, OEM licensed facility, Repairer, Remanufacturer, or recognized technical authority can therefore not provide the required guarantee that the whole part / system is in conformance with the Original Product Definition, including design changes resulting from a malfunction or failure history of drill-through equipment manufactured, remanufactured and / or repaired to the appropriate American National Standard / Specification.

3.31 **Certificate Of Service:**  
Document in which the equipment OEM, OEM licensed facility, Repairer, Remanufacturer, recognized technical authority / Owner or Operator certifies that the equipment has been inspected, properly maintained and tested in accordance with Original Equipment Manufacturer (OEM) specifications.
3.32 Corrosion-resistant ring groove
Ring groove lined with metal resistant to metal-loss corrosion

3.33 Critical component
Part having requirements specified in this American National Standard

3.34 Data acquisition system
System for storing and/or providing permanent copies of test information, like strip chart recorders, circular chart recorders or computer systems.

3.35 Date of manufacture
Date of the manufacturer's final acceptance of finished equipment

3.36 Drilling spool
Pressure-containing piece of equipment having end connections, used below or between drill-through equipment, manufactured in compliance with API-16A.

3.37 End connection
Flange (studded or open-face), hub connection or other end connection (3.47) used to join together equipment and integral to that equipment.

3.38 Equipment
Any single completed unit that can be used for its intended purpose without further processing or assembly

3.39 Fabrication weld
Weld joining two or more parts

3.40 Flange
Protruding rim, with holes to accept bolts and having a sealing mechanism, used to join pressure-containing equipment together by bolting to another flange

3.41 Forge, verb
Plastically deform metal, usually hot, into desired shapes with compressive force, with open or closed dies

3.42 Forging, noun
Shaped metal part formed by the forging method

3.43 Full-penetration weld
Weld that extends throughout the complete wall section of the parts joined

3.44 Gasket-seating load
That portion of the clamping load required to seat the gasket and bring the hub faces into contact

3.45 Gasket-retaining load
That portion of the clamping load required to offset the separating force the gasket exerts on the hubs when pressurized

3.46 Heat-Affected Zone (HAZ)
That portion of the base metal which has not been melted, but whose mechanical properties or microstructure has been altered by the heat of welding or cutting

3.47 Heat
Cast lot material originating from a final melt
NOTE For remelted alloys, a heat is defined as the raw material originating from a single remelted ingot.

3.48 Heat treatment / heat treating
Alternate steps of controlled heating and cooling of materials for the purpose of changing physical or mechanical properties

3.49 heat treatment load
That material moved as a batch through one heat treatment cycle

3.50 Hot-work, verb
Deform metal plastically at a temperature above the recrystallization temperature

3.51 Hub
Protruding rim with an external angled shoulder and a sealing mechanism used to join pressure-containing equipment

3.52 Hydraulic connector
Hydraulically actuated drill-through equipment that locks and seals on end connections

3.53 Indication
Visual sign of cracks, pits or other abnormalities found during liquid penetrant and magnetic particle examinations

3.54 Integral, adj
(parts) joined by the forging, casting or welding process

3.55 Job-lot traceability
Ability for parts to be traced as originating from a job lot which identifies the included heat(s)

3.56 Leakage
Visible passage of pressurized fluid from the inside to the outside of the pressure-containment area of the equipment being tested

3.57 Linear indication
(liquid penetrant or magnetic particle examination) indication whose length is equal to or greater than three times its width
3.58 **Loose connection**
Flange (studded or open-face), hub connection or other end connection (3.47) used to join together equipment, but not integral to the equipment

3.59 **Major repair weld**
Weld whose depth is greater than 25% of the original wall thickness or 25 mm, whichever is less

3.60 **Non-pressure-containing weld**
Weld whose failure will not reduce the pressure-containing integrity of the component

3.61 **Original Equipment Manufacturer (OEM)**
The design owner or manufacturer of the traceable assembled equipment, single equipment unit, or component part.
NOTE: If any alterations to the original design and/or assembled equipment or component part are made by anyone other than the OEM, the assembly, part, or component is not considered an OEM product. The party that performs these alterations is then designated as the OEM.

3.62 **Other End Connection (OEC)**
Connection which is not specified in an API / ISO standard
NOTE: This includes API / ISO flanges and hubs with non-API / ISO gasket preparations and manufacturer’s proprietary connections.

3.63 **Part**
Individual piece used in the assembly of a single unit of equipment

3.64 **Pipe ram**
Closing and sealing component in a ram blowout preventer that seals around tubulars in the wellbore

3.65 **Post-Weld Heat Treatment (PWHT)**
Any heat treatment subsequent to welding, including stress relief

3.66 **Pressure-containing part**
Pressure-containing member part exposed to wellbore fluids whose failure to function as intended would result in a release of wellbore fluid to the environment
EXAMPLES: Bodies, bonnets and connecting rods.

3.67 **Pressure-containing weld**
Weld whose failure will reduce the pressure-containing integrity of the component

3.68 **Pressure-controlling part / pressure-controlling member**
Parts intended to control or regulate the movement of wellbore fluids
EXAMPLES: Packing elements, rams, replaceable seats within a pressure-containing member or part.

3.69 **Pressure end load**
Axial load resulting from internal pressure applied to the area defined by the maximum seal diameter
3.70 **Pressure-retaining part / pressure-retaining member**
Part not exposed to wellbore fluids whose failure to function as intended will result in a release of wellbore fluid to the environment

EXAMPLES: Closure bolts and clamps.

3.71 **Product family**
Model or type of specific equipment listed in clause 1 of this American National Standard

3.72 **Qualified personnel**
Individual with characteristics or abilities gained through training, experience or both, as measured against the manufacturer's established requirements

3.73 **Ram blowout preventer**
Blowout preventer that uses metal blocks with integral elastomer seals to seal off pressure on a wellbore with or without tubulars in the bore

3.74 **Rated working pressure**
Maximum internal pressure that the equipment is designed to contain and/or control

3.75 **Record, noun**
Retrievable information

3.76 **Recognized Technical Authority**
The OEM, or registered professional engineer, or a technical classification society, or engineering firm in which its employees hold appropriate licenses to perform the verification in the appropriate jurisdiction, and evidence to demonstrate that the individual, society, or firm has the expertise and experience necessary to perform the required verifications.

3.77 **Relevant indication**
(liquid penetrant or magnetic particle examination) any indication with a major dimension over 1.6 mm (0.062 in)

3.78 **Remanufacture**
Process of disassembly, reassembly and testing of drill-through equipment, with or without the replacement of parts, in which machining, welding, heat treatment or other manufacturing operation is employed

3.79 **Repair**
Process disassembly, reassembly and testing of drill-through equipment, with or without the replacement of parts

NOTE Repair does not include machining, welding, heat treating, or other manufacturing operation of component parts and does not include the replacement of pressure-containing part(s) or member(s). Repair may include replacement of parts other than pressure-containing part(s) or member(s).

3.80 **Rounded indication**
(liquid penetrant or magnetic particle examination) any indication that is approximately circular or elliptical and whose length is less than three times its width
3.81 Serialization
Assignment of a unique code to individual parts and/or pieces of equipment to maintain records

3.82 Special process
Operation which converts or affects material properties

3.83 Stabilized
(pressure testing) in a state in which the initial pressure-decline rate has decreased to within the manufacturer's specified rate
NOTE: Pressure decline can be caused by such things as changes in temperature, setting of elastomer seals or compression of air trapped in the equipment being tested.
3.84 **Stabilized**
(temperature testing) in a state in which the initial temperature fluctuations have decreased to within the manufacturer's specified range

NOTE Temperature fluctuation can be caused by such things as mixing of different-temperature fluids, convection or conduction.

3.85 **Standard connection**
flange, hub or studded connection manufactured in accordance with an ISO standard, including dimensional requirements

3.86 **Stress relief**
Controlled heating of material to a predetermined temperature for the purpose of reducing any residual stresses

3.87 **Studded connection**
Connection in which thread-anchored studs are screwed into tapped holes

3.88 **Surface finish**
Ra measurement of the average roughness of a surface

NOTE 1 It is expressed in micrometres (μm).

NOTE 2 All of the surface finishes given in this American National Standard are to be considered maxima.

3.89 **Trepan, verb**
Produce a hole through a part by boring a narrow band or groove around the circumference of the hole and removing the solid central core of material

3.90 **Variable-bore ram (VBR)**
Closing and sealing component in a ram blowout preventer that is capable of sealing on a range of tubular sizes

3.91 **Visual examination**
Examination of parts and equipment for visible defects in material and workmanship

3.92 **Volumetric non-destructive examination**
Examination for internal material defects by radiography, acoustic emission or ultrasonic testing

3.93 **Weld groove**
Area between two metals to be joined that has been prepared to receive weld filler metal

3.94 **Weld, verb**
Act of fusing materials, with or without the addition of filler materials

3.95 **Weld joint**
Fitting together of components in order to facilitate their joining by welding
3.96 **Wrought structure**
Structure that contains no cast dendritic structure

3.97 **Yield strength**
Stress level, measured at room temperature, at which material plastically deforms and will not return to its original dimensions when the stress is released

NOTE 1 It is expressed in Newton’s per square millimeter (pounds per square inch) of loaded area.

NOTE 2 All yield strengths specified in this American National Standard are considered as being the 0.2 % yield offset strength in accordance with ISO 6892.

3.98 **Remanufacturing Service Level (RSL)**
The a

3.99 **Product Specification Licensee**
OEM licensed facility that has access to the required details of the Original Product Specification, Product History File, Product Data Book, technical support, processes and procedures to perform specific remanufacturing and / or repairs as listed in the agreement.
## 4. Abbreviated terms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Name</th>
</tr>
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<tbody>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>AQL</td>
<td>Acceptance Quality Level</td>
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<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
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<tr>
<td>ASNT</td>
<td>American Society for Nondestructive Testing</td>
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<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>AWS</td>
<td>American Welding Society</td>
</tr>
<tr>
<td>BSR</td>
<td>Blind Shear Ram</td>
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<tr>
<td>BOP</td>
<td>Blowout Preventer</td>
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<tr>
<td>COC</td>
<td>Certificate Of Conformance</td>
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<tr>
<td>COS</td>
<td>Certificate Of Service</td>
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<tr>
<td>HAZ</td>
<td>Heat-Affected Zone</td>
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<tr>
<td>ID</td>
<td>Inside Diameter</td>
</tr>
<tr>
<td>LP</td>
<td>Liquid Penetrant</td>
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<tr>
<td>LMP</td>
<td>Lifecycle Management Plan</td>
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<tr>
<td>LCMSP</td>
<td>Life Cycle Management Service Provider</td>
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<tr>
<td>MP</td>
<td>Magnetic Particle</td>
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<tr>
<td>NACE</td>
<td>National Association of Corrosion Engineers</td>
</tr>
<tr>
<td>NDE</td>
<td>Non-Destructive Examination</td>
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<tr>
<td>OD</td>
<td>Outside Diameter</td>
</tr>
<tr>
<td>OEC</td>
<td>Other End Connection</td>
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<tr>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
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<tr>
<td>OPD</td>
<td>Original Product Definition</td>
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<tr>
<td>OS</td>
<td>Operating System</td>
</tr>
<tr>
<td>PHF</td>
<td>Product History File</td>
</tr>
<tr>
<td>PQR</td>
<td>Procedure Qualification Record</td>
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<tr>
<td>PWHT</td>
<td>Post-Weld Heat Treatment</td>
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<tr>
<td>RSL</td>
<td>Remanufacturing Service Level</td>
</tr>
<tr>
<td>SOF</td>
<td>Statement Of Fact</td>
</tr>
<tr>
<td>VBR</td>
<td>Variable-Bore Ram</td>
</tr>
<tr>
<td>WPS</td>
<td>Welding Procedure Specification</td>
</tr>
</tbody>
</table>
5. **API license(s)**

Validate map

- Licenses are per definition voluntary
- Licenses have value for the owner and user.
- Standards provide framework for compliance verification, traceability and transparency.
- Valid License + Valid API Q1QMS allows equipment to be monogrammed

<table>
<thead>
<tr>
<th>Monogram</th>
<th>Equipment design, manufacturing, repair and remanufacturing is in compliance with API-16A requirements and fully traceable in the Product History File.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid API Quality Management System: 1) Selected OEM repair shop has a valid and active API-Q1 certificate (API yearly audit) 2) Selected OEM repair shop is working with an API approved Quality Management System that meets the requirements of API-Q1 under the registration. (API three yearly audit)</td>
<td>Quality Management System</td>
</tr>
<tr>
<td>Valid API-16A license certificate and required product listing(s) without exclusions for manufacturing / remanufacturing of the equipment.</td>
<td>Design Requirements</td>
</tr>
<tr>
<td>Valid API-16AR license</td>
<td>Equipment repair and remanufacturing is in compliance with API-16A requirements.</td>
</tr>
<tr>
<td>No License</td>
<td>Equipment design, manufacturing, repair and remanufacturing may be in compliance with API-16A requirements</td>
</tr>
</tbody>
</table>

6. **Responsibilities**

**OEM:**

- The original product manufacturer (OEM) of the API product is responsible for compliance to the standard in manufacturing, documentation Product data book and certification.
- The OEM is responsible for the definition of the original product definition (OPD) and the ongoing product design status, **when required by this standard.**
- The OEM is responsible for documenting design changes resulting from a malfunction or failure history of drill-through equipment manufactured, remanufactured and / or repaired in the Original Product Definition. **The OEM is responsible failure reporting as documented in Annex-F. (see Standard 53 Annex B)**
- If applicable, the OEM is responsible for monogramming equipment in accordance with the appropriate API standard and the requirements of API Q1 and the requirements of the manufacturer’s API monogram license agreement.
- The OEM is responsible to audit OEM approved repair facilities in compliance with the requirements of API-Q1 and this product standard to assure compliance.
- The OEM shall in accordance with the applicable API standard for manufacturing retain documents required for repair and remanufacturing for ten years after the last unit of that model, size and rated working pressure is manufactured.
Repairer / Remanufacturer

- On request and in agreement with the equipment owner, the Repairer / Remanufacturer will maintain the Manufacturing data book for periods exceeding the record keeping requirement as listed under the applicable API specification for manufacturing.
- The repairer / Remanufacturer shall provide the product owner with an overview of equipment traceability and compliance to the OPD before selecting the Remanufacturing Specification Level (RSL).
- The repairer / remanufacturer shall in accordance with the applicable API standard for manufacturing retain documents required for repair and remanufacturing for ten years after the last unit of that model, size and rated working pressure is manufactured.

Product Owner:

- The product owner is responsible to keep an up to date Product History File (including the manufacturing data book).
- On request and in agreement with the equipment owner, the OEM will maintain the Manufacturing Data File for periods exceeding the record keeping requirement as listed under the applicable API specification for manufacturing.
- The product owner is responsible to keep accurate records of product use and exposure to Sulfide Stress Cracking environment.
- The product owner is responsible for scheduling the required maintenance for the product, including the recommendations from the OEM.
- Maintenance performed by third parties

The product owner/operator is responsible for the approval of the life cycle management plan, developed by the life cycle management service provider (LCMSP), including: product status verification and traceability, field configuration assessment and service conditions, maintenance and service procedures, inspection and test procedures, design status assessment and disposition, usage and performance history evaluation, repair and remanufacture procedures, and decommissioning procedures as described in this standard. The LCMSP and the owner/operator are responsible for the execution of the LCMP plan and the maintenance of records of all activities associated with this standard for 5 years following documented decommissioning of the traceable products. The following graphic depicts an example of the responsibilities outlined in this standard.

7. Verification of Initial Product Status

The LCMSP is responsible for the analysis of the initial product status and shall approve and document the compliance status of the product including:

- Verification and documentation of the product API Monogram and the date of manufacture
- Verification and documentation of API records in compliance with the appropriate API standard
- Verification and documentation of the product as new, and unused
- Verification of the product OPD definition
- Verification and documentation of the current product design status and compliance

Products that are unable to be verified to these requirements are considered outside the scope of this standard.

The owner/operator shall approve the verification of the initial product status. Records of the approval are to be included in the PHF.
8. Design Status

The LCMSP is responsible for determining and documenting the review of Design Status for traceable products at intervals specified in the Life Cycle Management Plan. The design status of traceable products shall be documented to include status of the elements of the OPD, enhancements to the product design or product obsolescence. Changes identified in the OPD and product design shall be reviewed by the product owner/operator and the LCMSP, and the impact on traceable products controlled by the Life Cycle Management Plan shall be dispositioned prior to ongoing use. Actions associated with changes in the OPD or product design shall be planned, implemented and verified by LCMSP and owner/operator in a manner consistent with the safe and reliable use of the traceable product and documented in the PHF.

9. Product Identification, Traceability and Marking

The LCMSP is responsible for determining and documenting the existing identification, traceability and marking of traceable products in accordance with the Life Cycle Management Plan. Identification, traceability and marking of products shall meet as a minimum, the requirements of the appropriate API standards and the requirements specified by the Original Product Definition. Documentation of the acceptance of the existing identification, traceability and marking in accordance with the Life Cycle Management Plan, the product OPD and the requirements of this standard are to be included in the Product History File following approval by the LCMSP and the owner/operator.

Following the documentation of existing identification, traceability and marking, each traceable product shall be uniquely marked for traceability in accordance with the Life Cycle Management Plan. Existing traceability and identification markings may be used for this purpose if appropriate. Documentation of the designated traceability marking and the direct correlation to previous identification and traceability marking are to be included in the Product History File by the LCMSP. The LCMSP shall maintain traceability of the product throughout the product life cycle until decommissioning.

10. Maintenance & Service

The LCMSP is responsible for maintaining and servicing traceable products as defined in the Life Cycle Management Plan. Maintenance and service activities shall act to conserve as nearly and as long as possible, the original condition of traceable products while compensating for normal wear and tear. Maintenance and service requirements shall include:

- Requirements specified in the OPD, the ongoing product design status and the Life Cycle Management Plan
- Routine maintenance/service, preventive maintenance/service and major maintenance/service or overhaul requirements.
- Maintenance and service intervals
- Competency requirements for personnel performing maintenance and service including education, training, skills and experience.
- Acceptable service environment parameters for performing maintenance and service.
- Safe work practices for maintenance and service.
- Condition monitoring requirements, if applicable.
- Recordkeeping and status reporting requirements.
- Field inspection and test requirements including acceptance criteria.
• Field repair and replacement requirements.

11. Remanufacturing Service Levels

The level of traceability of repairs, and remanufacturing from well control equipment define to what Remanufacturing Service Level (RSL) additional work can be certified.

<table>
<thead>
<tr>
<th>RSL</th>
<th>Who</th>
<th>What</th>
<th>Where</th>
<th>History</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>OEM with / API License &amp; API-Q1 or Product Specification Licensee API-16AR + API-Q1</td>
<td>Equipment started with API Monogram + yearly audit</td>
<td>API Licensed Facility with Q1</td>
<td>All previous work shall be traceable and performed by remanufacturer with access to the OPD.</td>
<td>From equipment with a LMP, full traceability and Monogram, status can be maintained through equipment life, until decommissioning.</td>
</tr>
<tr>
<td>3</td>
<td>OEM w/ API License or Product Specification Licensee API-16AR</td>
<td>Equipment met API Spec 16A when new</td>
<td>API Licensed Facility</td>
<td>All previous work shall be traceable and performed by remanufacturer with access to the OPD.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Anyone w/ API-16AR License</td>
<td>Equipment met API Spec 16A when new (All Design Verification &amp; Testing Required)</td>
<td>API Licensed Facility</td>
<td>Traceability of all parts required by API 16A</td>
<td>Only when all repairs and/or remanufacturing is approved by the OEM, repairs can qualify under RSL-3.</td>
</tr>
<tr>
<td>1</td>
<td>Anyone</td>
<td>Equipment met API Spec 16A when new (All Design Verification &amp; Testing Required)</td>
<td>Anywhere</td>
<td>Verification of Material Suitability</td>
<td>Product may meet API-16A requirements. Only when full traceability of all parts exists for repair and remanufacturing, repairs can qualify under RSL 2.</td>
</tr>
</tbody>
</table>
12. Repair and Remanufacture

The LCMSP is responsible for executing and documenting repair and remanufacture of traceable products in accordance with the requirements specified in the Life Cycle Management Plan. The LCMSP and Owner/operator shall approve repair and remanufacture activities and document same in the PHF.

12.1 Material testing

12.1.1 Material chemical composition

- Spark Emission Spectography (SES)
- Material

12.1.2 Mechanical properties

- Hardness
- Sharpy impact
- Minimum Yield Strength (MYS)
- Ultimate Yield Strength (UYS)
- Elongation
- Heat treatment & Microstructure
- Though wall hardness

12.2 Welding

12.2.1 General

12.2.2 Welder qualification

12.2.3 Welding Process Specification (WPS)

- Production weld
- Repair welding

12.2.4 Welding Process Qualification Record (WPQR)

- Including mechanical properties
- Microstructure

12.2.5 CRA welding

- Stainless steel (316L)
- High nickel alloy (Alloy 625)
- High nickel alloy (Alloy 718), (delta Phase)
- Super Duplex

13. Decommissioning
The LCMSP is responsible for determining and documenting and executing requirements for the decommissioning of traceable products in accordance with the Life Cycle Management Plan. The plan and execution shall include:

A. The decision point(s) that will lead to the decommissioning of the equipment. If there are multiple options for the decommissioning of the equipment, they shall be outlines, along with the process for deciding which one will be chosen.

B. A risk assessment of the hazards associated with decommissioning, with a plan to manage the risks appropriately. This risk assessment shall be updated immediately prior to the actual decommissioning process with the risk management plan updated as necessary, to ensure that it is current.

C. A review of the relevant legal requirements of the jurisdiction where the equipment is planned or expected to be decommissioned from, and a plan to satisfy those requirements as part of the decommissioning process. Such requirements shall include, but not being limited to, disposal of hazardous materials.

D. A plan describing how the equipment will be decommissioned. This shall include the steps to be taken before decommissioning, the activities to decommission. And what will be done with the equipment after decommissioning. The plan shall include removing the equipment from the deployed location, unless a case is made within the plan not to do so.

E. Criteria by which success of the decommissioning process is defined.

If it is not possible to remove the equipment, post-decommissioning actions may be required to ensure compliance to the legal requirements – for example environmental monitoring or access control. If such actions are required, they shall be specified in the decommissioning plan.

At the end of the decommissioning process, a report shall be written capturing the date and location of the decommissioning, the parties involved, and the outcome of the decommissioning process, including the criteria by which success was to be measured, as outlined in the plan.

All documentation shall be retained and available for a minimum of five years past the date of decommissioning of the equipment. The decommissioning report shall be approved by the LCMSP and the owner/operator and included in the PHF.

14. Certification
Annex F

(Formal) Normative?

Failure reporting (Align with S53)

F.1 User recommendations

The operator of drill-through equipment, manufactured, remanufactured and / or repaired to this American National Standard should provide a written report to the equipment manufacturer of any malfunction or failure which occurs. This report should include as much information as possible on the operating conditions that existed at the time of the malfunction or failure, as accurate a description as possible of the malfunction or failure, and any operating history of the drill-through equipment leading up to the malfunction or failure (e.g. field repair, modifications made to the drill-through equipment, etc.).

F.2 Manufacturer’s recommendations

F.2.1 Manufacturer’s internal recommendations

All significant problems experienced with drill-through equipment furnished to this American National Standard noted during its manufacture, remanufacture and / or repair, testing or use should be formally communicated to the individual or group within the manufacturer’s organization responsible for the design and specification documents. The manufacturer should have a written procedure that describes forms and procedures for making this type of communication, and should provide written records of progressive design, material changes or other corrective actions taken for each model and size of drill-through equipment.

F.2.2 Manufacturer’s external recommendations

All significant problems experienced with drill-through equipment furnished to this American National Standard should be reported in writing to each and every operator of the drill-through equipment within six weeks after the occurrence. Design changes resulting from a malfunction or failure history of drill-through equipment manufactured, remanufactured and / or repaired to the appropriate American National Standard should be communicated within thirty days after the design change by the manufacturer to each and every operator using the model or size drill-through equipment having the malfunctions or failures, and all models of other drill-through equipment that could have similar potential problems. API Specification 16A/ISO13533.

F.3 Repairer recommendations

The repairer of drill-through equipment, manufactured, remanufactured and / or repaired to this American National Standard should provide a written report to the equipment operator of any malfunction or non-conformance to the Original Product Definition and non-traceability of the equipment or its parts. This report should include as much information as possible on the conditions that existed at the time of examining the equipment before repair or remanufacturing, including any product design changes that are required to meet the manufacturers design changes resulting from a malfunction or failure history of drill-through equipment manufactured, remanufactured and / or repaired to this American National Standard as listed under F.2.2 of this Annex.
Additional copies are available through Global Engineering Documents at (800) 854-7179 or (303) 397-7956

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