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APPLICABLE PRODUCT LINES	
<input checked="" type="checkbox"/> Subsea Drilling Systems <input type="checkbox"/> Surface Pressure Control <input type="checkbox"/> Flexible Pipe Systems (FPS) & Wellstream Construction Services (WCS) <input checked="" type="checkbox"/> Subsea Production Systems (SPS), Subsea Services (SRV) & Offshore	Subsea Production Systems (SPS), Subsea Services (SRV) & Offshore <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input checked="" type="checkbox"/> Well Systems  <input checked="" type="checkbox"/> Subsea Services  <input checked="" type="checkbox"/> Global Fabrication &amp; Distribution Systems                             </div> <div style="width: 45%;"> <input type="checkbox"/> Controls  <input checked="" type="checkbox"/> Projects  <input checked="" type="checkbox"/> Offshore                             </div> </div>

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## Table of Contents

<b>1</b>	<b>PURPOSE</b> .....	<b>5</b>
<b>2</b>	<b>SCOPE &amp; APPLICABILITY</b> .....	<b>5</b>
<b>3</b>	<b>HIERARCHY OF BAKER HUGHES DOCUMENTS</b> .....	<b>5</b>
3.1	OUTSOURCED PROCESSES – OSP MACHINING, WELDING AND COATING.....	5
3.2	BAKER HUGHES SPECIFICATION REVISION CODES.....	5
<b>4</b>	<b>SUPPLIER QUALIFICATION</b> .....	<b>5</b>
<b>5</b>	<b>SOURCE INSPECTION AND INSPECTION AND TEST PLAN (ITP)</b> .....	<b>6</b>
<b>6</b>	<b>PACKAGING AND PRESERVATION</b> .....	<b>6</b>
<b>7</b>	<b>PERSONNEL QUALIFICATION</b> .....	<b>7</b>
7.1	WELDING INSPECTORS QUALIFICATION .....	7
7.2	NON-DESTRUCTIVE INSPECTORS QUALIFICATION.....	7
7.3	PAINTING INSPECTORS QUALIFICATION.....	8
7.4	QUALITY INSPECTOR QUALIFICATION.....	8
<b>8</b>	<b>SPECIAL PROCESS REQUIREMENTS</b> .....	<b>8</b>
8.1	WELDING PROCESS.....	9
8.2	NDE.....	10
8.3	COATING.....	10
8.4	RAW MATERIAL.....	11
<b>9</b>	<b>CONTROL OF MEASURING INSTRUMENTS AND TESTING</b> .....	<b>11</b>
9.1	CALIBRATION CONTROL OF MACHINING MACHINES .....	11
9.2	CALIBRATION CONTROL PLAN.....	12
9.3	THERMAL TREATMENT INSTRUMENT CALIBRATION.....	12
9.4	CLEAN ROOM ASSEMBLY AND DISASSEMBLY OF EQUIPMENT.....	12
<b>10</b>	<b>PRODUCT AND PROCESS SPECIFIC REQUIREMENTS</b> .....	<b>12</b>
10.1	STUDS AND FASTENERS .....	12
10.2	CERTIFIED LABORATORIES .....	13
10.3	ASSEMBLIES OPERATIONS.....	13
10.4	INTEGRITY TEST PROCEDURES .....	13
<b>11</b>	<b>SUPPLIER QUALITY DOCUMENTATION</b> .....	<b>14</b>
11.1	QUALITY DOCUMENTATION.....	14
11.2	DATABOOKS.....	14



**12 TRACEABILITY.....16**

**13 MARKING.....16**

13.1 RAW MATERIAL.....17

13.2 TURNKEY.....17

13.3 MACHINING.....17

13.4 FABRICATION.....17

13.5 FASTENERS.....17

**14 ROLES & RESPONSIBILITIES .....19**

**15 QUALITY RECORDS.....19**

**16 REFERENCES, TERMS, DEFINITIONS & ACRONYMS .....19**

16.1 REFERENCES.....19

16.2 TERMS, DEFINITIONS & ACRONYMS.....19

**17 APPENDIX.....21**

**Notice**

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## 1 Purpose

Baker Hughes is committed to driving Quality excellence and customer satisfaction with your products and services manufactured or produced through Suppliers and Sub-Suppliers.

The purpose of this specification is to establish a set of procedures and practices pertaining to the quality of items purchased by Baker Hughes. The requirements set forth herein will ensure a consistent, quality-based relationship between Baker Hughes and its direct material Suppliers.

This specification provides complementary quality requirements for Brazil, beyond the Global Procedure BH-SOU-001, ISO 9001 and API Q1 requirements and other industrial standards for external Suppliers.

Full compliance to this procedure required immediately after publication.

## 2 Scope & applicability

This specification and the BH-SOU-001 is part of Brazil Baker Hughes purchase order and it is fully applicable to Suppliers of direct materials used in Baker Hughes delivered goods and services.

## 3 Hierarchy of Baker Hughes Documents

*Baker Hughes specification follows the hierarchy of documents per sequence:*

- 1. Purchase Order Additional Requirements (Including NCRs)*
- 2. Part Info (supplementary and mandatory)*
- 3. Engineering Specifications (VGS, Drawings, Engbz, etc.)*

*All of them, the BHGE-SOU-001 and this document shall be considered during the critical analysis. In case of divergences, the Baker Hughes representative shall be consulted.*

### 3.1 Outsourced Processes – OSP Machining, Welding and Coating

For subcontracted services, the Baker Hughes manufacturing router shall be followed. The vendor is responsible to review the router specification and to inform Baker Hughes SQE in case of doubts.

### 3.2 Baker Hughes Specification Revision Codes

*Supplier must comply with the latest revision of all applicable documents in the purchase order requirements. The only exception is if Supplier is notified during his manufacturing stages of a revision of a Baker Hughes specification with revision code 111, original Purchase order requirements may be accepted. In case of doubts, Supplier shall contact Baker Hughes SQE.*

## 4 Supplier Qualification

In order to receive a Baker Hughes production purchase order, a Supplier must be approved and qualified per Baker Hughes Global Sourcing Quality Management System procedures.

For critical products, materials and processes, an additional technical qualification is required by Baker Hughes Engineering. If an approved vendor list is defined in the VGS (Vetco Gray Specifications), only the VENDORS and manufacturing *facilities* listed in that VGS are considered qualified to supply the parts. The vendor is responsible to review the specification and to inform Baker Hughes Sourcing representative or SQE if the process/part Supplier is not approved to supply the products, materials and/or processes described in the specification.

## 5 Source Inspection and Inspection and Test Plan (ITP)

Baker Hughes Brazil implemented the Source Inspection program to critical Suppliers defined by SQE team.

The inspection and Test Plan (ITP) is a document prepared by Baker Hughes or Suppliers if requested at Baker Hughes specifications, to define the Baker Hughes inspections and interventions at Supplier stages during the cycle of production. For hold point and witness point (HP/WP) defined in the ITP, the Supplier is responsible to notify Baker Hughes in advanced of *at least 5 working days* for *brazilian* Suppliers and 20 working days for *non-brazilian* Suppliers when the material will be available for inspection based on PO/ITP requirements. If a witnessed inspection needs to be repeated by Baker Hughes due to Suppliers's responsibility, Baker Hughes will charge all costs related to the additional inspection to Supplier.

## 6 Packaging and Preservation

Components designed by Supplier shall have specific procedures/instructions for handling, preservation, packing and transport of all components and equipment foreseen in supply scope. These procedures shall establish maintenance warnings for long-term storage, determine applicable tests, change of elastomeric rings, protection on sealing areas, protection against ultra-violet rays, temperature, change of control fluids, movements during manufacturing and further applicable procedure.

Valve seats, gates and other sealing surface shall be protected against impact or other mechanical damage, dust, debris also during assembling and internal tests periods.

Procedures shall foresee components preservation conditions, specially after final tests performance, draining and lubrication, when applicable.

Supplier must submit "tubings" in appropriate place and with the extremities closed to avoid the entry of contaminating elements, as well as to provide protection against contamination by carbon steel.

*Supplier shall only ship parts to Baker Hughes after confirmation of Shipping Authorization through iSupplier or other means defined by Baker Hughes.*

Baker Hughes Brazil implements Packaging and preservation procedure QW-OFE-BRA-SOU-006. This procedure is applicable to all Suppliers that receive purchase orders from Jandira or Macaé sites.

Goods arriving without previous Shipping Authorization, marked incorrectly or in disagreement with Packaging and Preservation procedure shall be returned to the source at Supplier's cost.

All exports, imports and in transit shipments, from international Suppliers to Baker Hughes Brazil is not accepted to apply wooden packages. All Suppliers shall replace the wooden package by plastic ones or other materials previously agreed with Baker Hughes Sourcing team.

## 7 Personnel Qualification

### 7.1 Welding Inspectors Qualification

Welding inspectors shall be certified by an independent institution on the proper supplying level required by Baker Hughes. The following personnel level is accepted on the welding area:

Brazil: Level I and II Welding Inspector according to SEQUI/FBTS, standard NBR 14842.

Europe: Certified Welding Engineer, Certified Welding Technologist, Certified Welding Expert, and Certified Welding Inspector, according to EN45013 or ISO/IEC 17024.

Notes:

- a) The above described qualified welding personnel shall be full time in the industry monitoring welding operations. The level II Welding Inspector(s) (or Qualified Welding Engineer(s) according to European Standards) can be available only when necessary to develop the tasks foreseen for their level.
- b) Pressurized subsea equipment, such as: X-Trees, Hangers, etc, shall have their documents for preparation and control of eliding approved by level II welding inspectors with ASME VIII qualification, according to the criteria of sections I or II. The qualification for the structural components of Manifolds, PLETs, etc, must meet the qualifications for the standard specified in the contract. (In case of doubts, Supplier shall contact SQE Team).
- c) For international Suppliers, the welding inspector qualifications requirements are defined in the Standard E-QP-SEQ-073 that could be requested with the SQE team.

### 7.2 Non-destructive Inspectors Qualification

Inspectors of non-destructive testing shall be certified in Brazil as SNQC-END system ABENDI or abroad for international organizations that meet standard ISO9712 / EN473 or ISO/IEC 17024 / EN45013 or requirements established by the VGS of non-destructive testing of Baker Hughes. The auto certification practice per ASNT SNT-TC-1A is *not recommended by Baker Hughes and is not acceptable for Petrobras projects. If auto certification practice per ASNT SNT-TC-1A is considered, Supplier must verify with Baker Hughes representative if purchase order may be used in a Petrobras delivery prior to any manufacture process.*

It is allowed the use of professionals and contract procedures, since established the immediate availability of these resources where necessary, and that the procedures are compatible with the

tests and that meet the needs of supply to Baker Hughes. The use of third-party procedures is only allowed with prior authorization by Baker Hughes.

Note 1: The proof of the level of qualification of the inspectors in Brazil should be consulted on the website of ABENDI (<http://www.abendi.org.br>)

Note 2: Proof of certification of inspectors from overseas can be made through the Inspector's stamp on the document, since the level of qualification, the identification of the Inspector and certifying body were legible. It is recommended to include a copy of inspector Certification in the databook.

### 7.3 Painting Inspectors Qualification

Brazil Painting Inspectors Levels 1 and 2 must be, at least, trained in the standards ABRACO 001 and NBR 15218 and foreign professionals should be trained, at least, by independent international organizations that meet the requirements of EN 45013 or ISO/IEC 17024, being in this case required prior approval of Baker Hughes. One of the accepted professionals is the coating inspector, qualified as Coating Inspector Program (CIP) by NACE. Some Baker Hughes VGS require painting inspectors qualified, in these cases, only professionals qualified are accepted.

### 7.4 Quality Inspector Qualification

All professionals involved in the Quality Assurance and Quality Control (including Third Part) shall be included and approved in the Quality Management System of the Supplier organization. Supplier shall have a procedure that define specific trainings, competencies, records and periodic evaluation of this professionals per each activity. These records can be requested at any time by Baker Hughes representative.

#### 7.4.1 Visual Acuity

Visual Acuity of quality inspectors shall be evaluated annually.

Close view: All quality inspectors shall have an approved visual acuity, natural or with corrective lenses, evaluated by J-1 letters of JAEGER standard far from 40cm or by similar method.

Distant view: All quality inspectors shall have an approved visual acuity, natural or with corrective lenses, equal or higher than 20/40 of SNELLEN scale. This information can be requested at any time by Baker Hughes representative.

#### 7.4.2 Dimensional Inspector Requirement

Unless otherwise agreed with Baker Hughes, inspector must comply with one of requirement below:

- High School, specific industrial course and two years of experience in dimensional inspection.
- Technical course in mechanical, mechatronics or electrical and one year of experience in dimensional inspection.
- Graduated (Technology or Engineering) in the mechanical, mechatronics or electrical and six months experience in dimensional inspection.

This information can be requested at any time by Baker Hughes representative.

## 8 Special Process Requirements



## 8.1 Welding Process

The Product Engineering Part Info defines the welding requirements in the Welding Specification Form (WSF) and/or into engineering documents where applicable. In addition, Baker Hughes engineering also release for each project a list of welded critical items based on the ratings below:

**Pressure Containing Item:** All Pressure Containing items are considered as critical. The qualification standard to be applied to the welding procedures is called out in the WSF or engineering documents. The materials engineering or product engineering must rank the criticality of each component through the list of critical items.

**Non-Pressure Containing item:** For Non-Pressure containing items, qualifying standard applicable to the welding procedures are set out in the WSF or engineering documents. The Materials or Product Engineering must rank the criticality of each non-pressure component containing through the list of critical items as follows:

**High Criticality:** Components and equipment subject to high loads of installation and operation. E.g. lifting rings, supporting structures, etc.

**Moderate Criticality:** Components and equipments subject to small loads of installation and operation. E.g. protection items and handling.

**No Criticality:** Components and equipment that are not subject to installation and operating loads.

Supplier shall consult Baker Hughes prior to commencement of work in order to verify if the welding product are classified in the Baker Hughes Engineering critical list for the project as pressure containing item or high criticality non-pressure containing.

All Weld Supplier documentation (WPS/PQR) for pressure containing and high criticality non-pressure containing shall be approved by Baker Hughes prior to commencement of work. All welding documentation from Suppliers shall be approved by qualified welding professionals according to their level of qualification per defined in the section 7.1.

When Supplier needs to perform a welding qualification for pressure containing and high criticality non-pressure containing, Supplier shall submit previously the qualification plan to be reviewed by Baker Hughes. All welding qualification process shall be accompanied by welding professionals according to their level of qualification per definition in the section 7.1.

The welding documentation shall be in compliance with the standard defined by Baker Hughes engineering design/ requirements and for Petrobras orders shall be also in accordance with the standards PETROBRAS N-2301 and N133. These documents must be available to welders, operators, supervisors and inspectors during fabrication.

Welding procedures used in manufacturing an repairs by welding shall be consisten with the maximum amount or time of heat treatments performed during its components manufacture. It should include at least one additional cycle in procedure to provide the possibility of future repairs during operation of the equipment or component.

Prior to any Welding of raw material supplied by Baker Hughes, Supplier must ensure that a copy of the material certification is available to ensure that parameters of the welding procedure do not exceed the original tempering temperature of the material. Missing certification should bbe requested from the relevant Baker Hughes representative.

With the exception of transportation equipment (skids and container), all welding equipment and subsea structures shall include in the Databook a weld map, this documentation must also be kept by the manufacturer/supplier.

It is Supplier responsibility guarantee that all the tasks for the welding inspector for their level shall be in compliance with NBR 14842 for national Suppliers and the EN45013 and ISO17024 for international welding inspectors.

## 8.2 NDE

NDE requirements are dictated by VGS and any additional requirements that may be called up on the purchase order or relevant drawings. When there is no VGS specified, Supplier shall submit the procedure for Baker Hughes approval.

All procedures of NDE shall be approved by a level III qualified in Brazil by SNQC-ABENDI and for international Suppliers per independent organism per ISO/IEC 17024 that are in conformance with ISO 9712 or EN473.

Note:

- a) All parts/components submitted to magnetization shall be submitted to a demagnetization process.
- b) When specified in the VGS, a Technique Sheet shall be submitted to [nde.approval@ge.com](mailto:nde.approval@ge.com) for review and approval by a Baker Hughes NDE Level 3 or an approved designee. Technique sheets shall include all details note on the VGS attached form. Technique sheets must have reference to component dimensions and may be a representation of many similar part numbers.

## 8.3 Coating

### 8.3.1 Painting for Corrosion Resistance

The Painting specifications are dictated by Baker Hughes VGS requirements. Supplier shall have procedures of painting including systematic control of paints and solvents (which should not be in disagreement with the manufacturer's guidelines). If not specified a VGS for painting, Supplier shall submit the procedure to be approved by Baker Hughes Materials Engineering before the work begins.

Note: Painting for identification (letters, stripes) shall meet the minimum quality requirements defined by Baker Hughes Engineering.

### 8.3.2 Electroless Nickel Plating

Nickel specifications are dictated by Baker Hughes VGS requirements. If not specified a VGS, Supplier shall submit the procedure for approval of Baker Hughes Materials Engineering before the execution of the job. For the use of chemical nickel coating, the vendor shall qualify the process through accelerated corrosion test according to ASTM B117 for process parameters qualification.

The exposure time of this test shall be, at least, 1000 hours in Salt Spray. This test shall be done for the pilot batch supplied and repeated in a 12 month basis or if there is a change in steps/process parameters. The sample of coupons tested shall follow the sample plan defined in Table 3 of ASTM B602. Supplier shall submit the qualification records to be approved by Materials Engineering of Baker Hughes before the work begins.

### 8.3.3 Thermal Coating

The Thermal Coating Specifications are dictated by VGS requirements. If not specified a VGS for thermal coating, Supplier shall submit a procedure to be approved by Baker Hughes Materials Engineering before work begins. Applicators must have been trained to perform the process. Documentation for execution and inspection of plating must be previously submitted for approval of Baker Hughes.

#### 8.3.4 Non-Metallic Coatings

For the use of coating fluopolymer, Supplier shall qualify the process through accelerated corrosion test according to ASTM B117.

The exposure time of this test shall be at least 1000 hours in Salt Spray with the acceptance criteria when submitting samples no more than 5% of Red corrosion evidence in its area. It is a best practice that this test is done in batch supply pilot and repeated if there is change in steps/process parameters.

Supplier Shall submit the qualification records to be approved by Baker Hughes Materials Engineering before the work begins.

### 8.4 Raw Material

Raw Material provided by raw material distributors from starting material forging/milling bars, the greater outer diameter of the bar/forging shall not have the surface machined more than 2" (50.8mm) in radius. In cases where the removal is greater than 2" in radius, Baker Hughes Materials Engineering shall be consulted prior to delivery. Trepanned cores are not accepted by Baker Hughes for the manufacturing of components/parts. *The equivalent round of the QTC shall meet or exceed the equivalent round of the part it represents, prolongation/sacrificial options are mandatory. The use of a separate test bar as QTC must be approved previously by Baker Hughes Engineering.*

In case of questions or deviations, Baker Hughes Materials Engineering shall be consulted prior to accept the order and start production. It is Supplier responsibility to guarantee that the whole cross section/extension of the raw material supplied meets the minimum mechanical properties of the VGS. In case of field failure, test specimens will be removed from the actual part and checked against VGS and Supplier certificate.

#### 8.4.1 Heat Treatment

All Baker Hughes material shall be heat treated in the profile per Baker Hughes Part Info / Drawings in order to guarantee the mechanical properties specified by product/materials engineering. The dimensions at the time of heat treatment shall be no more than 1/4" from the specified ones.

If not otherwise specified by VGS or other Baker Hughes specification, all heat treatment furnaces shall be qualified per API 6A standard last edition. The temperature measuring devices used for heat treatment must meet the API standard 6A. Parts shall be placed in a separate manner equally spaced from each other on grids/racks to avoid contact between them during final quality heat treatment. Minimum spacing distance shall be 100 mm / 4 inch, unless otherwise agreed.

## 9 Control of Measuring Instruments and Testing

### 9.1 Calibration Control of Machining Machines

Supplier shall have a plan of calibration and maintenance intervals of machining machinery according to technical requirements of its manufacturers. The plan shall contemplate the status of the machine such as periodic reviews, machine geometry checks (when applicable) and wear tooling control. Plan report can be requested at any time by Baker Hughes representative.

## 9.2 Calibration Control Plan

Supplier shall have a calibration plan to control device and equipment used at inspection, measuring and testing in compliance with the conditions and regulations contract documents. The instruments must be calibrated to the resolution defined in the project and also the criteria established by RBC – Brazilian Calibration Network or equivalent international organisms such as NIST, NPL, etc.

If Suppliers does not have specific procedures to define calibration parameters, *Supplier shall comply* with provisions of API 6A “Pressure measuring devices” for all instruments and test equipment used.

### 9.2.1 Laboratories Calibration Instruments

Calibrations should be performed in laboratories credited by INMETRO or internation bodies which INMETRO has a mutual recognition agreement. Alternatively, Baker Hughes can accept calibrations performed with standards traceable to RBC, but with the obligation to attach the certificate of calibration standard to the report of the instrument.

## 9.3 Thermal Treatment Instrument calibration

The temperature measuring instruments used for heat treatment must meet the API Standard 6A.

Note: Heat treating furnaces shall be approved as API 6A Standard last edition.

## 9.4 Clean Room Assembly and Disassembly of Equipment

*Supplier for Valves, actuators and Hydraulic systems or similar* must have a clean room and a respective procedure for assembly, disassembly and testing equipment with required cleanliness class. The level at which the particles need to be removed depends on the specific need of each equipment or component to be manufactured in compliance with the degree of cleaning clear defined in Baker Hughes Engineering Specification or other industrial standards.

Supplier must classify and certify the cleanroom compliance with ISO 14644-1 (formerly Federal Standard 209 E), establishing the classification levels of cleanliness. Supplier shall submit the records of the certification of the cleanroom to Baker Hughes before work begins.

Note: If there is a need for wire welding of NO with the CVD’s and SCM sensors, this activity must be performed with limited access in a room with controlled humidity, temperature and positive pressure (ISO 13628-6, item 5.1.2.5).

## 10 Product and Process Specific Requirements

### 10.1 Studs and Fasteners

Studs and Fasteners with yield strength equal or above 105ksi (including ocomponents designed by Supplier) shall request additional process control, tests and inspections dictated by Baker Hughes Specifications. The additional requirements are specified in the Part Information or VGS.

When an approved *vendor is required* or a *vendor* list is defined in the VGS for Studs and fasteners, only the VENDORS and manufacturing *facilities* listed in VGS are qualified to supply these parts. For

Petrobras orders Hold Point for Baker Hughes witnessing is mandatory in the mechanical tests. In case of doubts please contact SQE team.

## 10.2 Certified Laboratories

In addition to the requirements of laboratories defined in the global BHGE-SOU-001, Baker Hughes requires that all tests performed in studs and fasteners shall be performed by independent laboratories that meet the requirements of ISO17025 or equivalent/higher standards (NADCAP) for the specific mechanical properties. Laboratories need to be certified for each type of mechanical property tests specified by Baker Hughes specifications.

## 10.3 Assemblies Operations

For assembly parts, Supplier shall have registered in a specific sheet all traceabilities (serial number / lot ) used at assembly. Supplier that *performs* assemblies operations that require torque control shall have a procedure to perform the execution of torque in fasteners. This procedure shall also include the report of the torque performed and the sealing wax.

For assemblies using fasteners with diameter of  $\frac{3}{4}$ " (19.05mm) or above (e.g. Flanges, Swivels, Valves, etc) Supplier shall have registered the fasteners lot used in each assembly and the local of use of each fastener. For each assembly serial number is not allowed to use fasteners *from* different lots *for the same assembly feature (e.g. the flange shall have fasteners from the same lot only – fasteners lot consist in items from the same heat and same heat treatment lot)*.

For assemblies with fasteners diameter of  $\frac{3}{4}$ " or above, vendors shall register the application torque and sealing wax used.

The minimum requirement for fasteners traceability shall be the following:

- Part Number;
- Fastener description;
- Manufacturer;
- Fabrication lot (Definition: Fasteners from same Raw Material Heat Number and same Heat Treatment lot, no matter the quantity defined in the purchase order);
- Position of application in the equipment;
- Assembly Torque;
- Sealing Wax in the assembly;
- Torquemeter used (with calibration certification);
- Procedure of pre-charge application;

## 10.4 Integrity Test Procedures

The integrity test procedures, FAT and PVT shall have the following information:

Applicable standards, test description, acceptance criteria, test fluid, chloride contents (for materials subject to chloride-corrosion), use of corrosion inhibitors, filters, conditions / work bench adaptation, lightening, manometers precision and gauging, tools / test support accessories, instruments, safety, etc. The procedure shall be submitted to Baker Hughes approval before application.

- a) Gas tests must be carried out with the equipment submerged.
- b) The use of Teflon tape, paste or sealing is not allowed as auxiliary element to get thread sealing.

The integrity test procedures, FAT and PVT shall be submitted to Baker Hughes approval prior to start work.

## 11 Supplier Quality Documentation

### 11.1 Quality Documentation

The agreed levels of material certification for supplied items/parts shall be detailed per Baker Hughes specifications (PO, Part Info, etc.) including this procedure and when applicable, in the ITP submitted for review/approval of Baker Hughes. Supplier shall ensure that these requirements are included in all associated sub-orders and clarified with Suppliers. Material test reports, certificates of compliance, type test certificates etc. as applicable for materials and items/part shall be available for review and approval of Baker Hughes (electronic copies) at iSupplier or other way defined by Baker Hughes before shipment of goods. All documents shall include Baker Hughes PO and item/Part numbers.

All documentation submitted, if not stated different in the PO, shall be produced / written in the English language or in English and Portuguese for Brazilian Suppliers.

In case of error in any information in the quality records, a transverse line should be drawn about the incorrect text in such a way as to invalidate the information. The correction shall be identified with date, signature and responsible name. If there is not enough space, whole line must be invalidated with a transverse line and the correct must be written on the bottom of that page. In no record of quality is allowed the use of correctives (type ink or tape) to correct errors. Changes can only be made by persons who perform the same activity that the person who generated it.

All electronic files and documents shall be submitted scanned through iSupplier or other way defined by Baker Hughes and preferably in electronic PDF format.

### 11.2 Databooks

Baker Hughes Brazil defines minimum requirements for Databook in procedure QW-OFE-BRA-SOU-008. This procedure is applicable to all Suppliers that receive purchase order from Jandira or Macaé. The procedure shall be requested by Supplier to SQE representative.

Note: Material Certification, NDT, Hardness, Coating, Clad thickness reports, must state the VGS or Standard used for the part/material supplied.

#### 11.2.1 Raw Material Reports

Raw Material certificate shall follow the materials VGS and in addition contain the hot reduction rate used in the material forging/rolling process, Heat Treatment charts including the quench media temperature at the start and completion of the quench, and the Steel Maker Certificate.

#### 11.2.2 Heat Treatment Reports

The Heat Treatment documentation shall include type of heat treatment performed, numbers of parts being heat treated and the respective type of QTC traceability, identification of the heat treatment procedure/standard used, furnace identification, instruments identification (thermocouples, controller and recorder), set points and part thermocouple temperature, cycle time, quenchant utilized, quench media temperature at the start and completion of the quench, heat treatment charts, heat treatment lot number and statement that the furnace meets the standard of API 6A requirements.

#### 11.2.3 Dimensional Reports

Where material is shown as “oversize to guarantee finished dimensions” Baker Hughes will only accept up to a maximum of ¼” per side on dimensions given. Where BOM’s does not state a tolerance, Supplier must contact Baker Hughes for clarification at quotation stage.

#### 11.2.4 Machined Parts

Machined parts with dimensions as follows must have actual results recorded on the report:

- Diameter and Lengths with a tolerance of  $\pm 0.005$ ” or less.
- Angles with a tolerance of  $\pm \frac{1}{2}$  degree or less.
- Surface finishes with 32 microns or less (when accessible)
- Standardized Dimensions by the final customer

Note 1: Other dimensions (such as tolerances above  $\pm 0.005$ ”) need to be inspected and registered in the dimensional report indicating the result of inspection by attribute (OK or a check for each dimension).

Note 2: Supplier shall determine process to define the measuring equipment needed to provide evidence of conformity of product to determined requirements and the instruments used in the inspection should be the identification recorded in the report (if a gauge number has been specified on the Baker Hughes drawing, every effort must be made by the Supplier to obtain the specific gauge from Baker Hughes).

Note 3: All inspection of shape and position (GD&T) shall be performed in tri dimensional machine 3D (CMM) and recorded on the report.

#### 11.2.5 Fabricated Assemblies

Dimensional Reports stating actual dimensions shall be required for all machined areas with a tolerance of  $\pm 0.010$ ” or less, all other dimensions will be verified as acceptable to requirements and documented on suitable format.

#### 11.2.6 Welding Log Reports

The welding documentation shall be in compliance with the standard defined in the Baker Hughes Engineering design / requirements. For Petrobras orders shall be also in accordance with the standards PETROBRAS N-2301. Welding equipment and structures shall have the weld maps and welded joints with their traceability. All these documents shall be approved by a qualified welding inspector per described in 7.1 and shall contain all information related to the welding process.

##### 11.2.6.1 Post Welding Heat Treatment (PWHT)

The PWHT shall always use thermocouples attached to the part/weld according to a plan approved by a qualified welding professional per described in 7.1 and in addition when the PWHT is performed

in furnaces, if not otherwise specified by VGS or other Baker Hughes specifications, the furnaces shall be qualified per API 6A Standards last edition and it shall be included a statement that the furnace meets the standard of API 6A requirements in the report.

For Petrobras orders the PWHT report shall be also in accordance with PETROBRAS N-2301 Standard.

#### 11.2.7 Hardness Reports

Unless Baker Hughes has approved an alternative procedure, hardness verification and process control will be in compliance with VGS8.7.1 (Latest revision). Where hardness verification is a requirement of a proprietary part, VGS is not applicable.

Hardness test shall be performed according to the standard ASTM E10 for hardness “Brinell” or standard ASTM E18 for hardness “Rockwell”. It will not be accepted execution of the test of hardness with equipment type “Poldi”, “Tellebriner” and “Equotip”.

Note: For welding hardness verification, hardness inspection shall be performed by a qualified welding inspector per section 7.1. In case of doubts, Baker Hughes representative shall be consulted.

#### 11.2.8 Painting Reports

Painting process control report shall have a record by layer with the minimum parameters established in standard such as: Manufacture and type of paint, layer thickness, adherence level, paint lot, validity, room temperature, surface treatment grade, layer interval and relative air moisture, surface temperature of the piece, dew point and used procedure. In all cases shall be included the paint certificate with all results of tests. The reports shall be approved by a qualified inspector per described in 7.3 and shall contain all information to the painting process.

Note: Painting for identification (Letters, stripes) does not request reports, but shall follow the minimum quality requirements.

## 12 Traceability

Supplier traceability shall ensure proper identification of finished products down to raw materials. Suppliers shall demonstrate effective material control procedures that can trace materials from its origin through its stages of the manufacturing process until delivery to Baker Hughes. Supplier material control system and traceability procedures shall be made available for review upon Baker Hughes request.

For OSP (Outsourced Process), Supplier shall follow Baker Hughes Work Order Traceability as serial number, including the dash number. In cases of assembly or union of parts, Supplier shall follow the traceability of the products as defined by Baker Hughes. In case of doubts consult Baker Hughes representative.

## 13 Marking

When required to stamp the Part Number and its revision, Supplier must follow the Part Info specification. Baker Hughes does not consider “0” (Zero) in its revision pattern as the first revision level, instead, it must be “NC” (Nothing Contained). Part Info is the mandatory source for revision checking.



Where agreed, Supplier may use his own Serial Numbering System to identify the part. The documentation which accompanies the goods must cross reference the Baker Hughes Purchase Order number. Lacking other instructions, the following apply:

### 13.1 Raw Material

All forgings / material shall be identified with hard stamp (labelled for small parts) and stencilled with minimum 1" high letters. Required identification includes the following:

- i- Part Number and Revision Status (at the time of manufacture)
- ii- Baker Hughes Purchase Order, Line item and Serial Number
- iii- Manufacturing Order

### 13.2 Turnkey

Supplier shall use its own traceability procedure and may use his own serial numbering system to identify the part, but shall guarantee the traceability in all steps of the process. *Sharp V-Stamping is not allowed without prior approval from Baker Hughes engineering.*

### 13.3 Machining

For machining services (OSP orders), Supplier shall follow the traceability specified by Baker Hughes in the Purchase Order (Production Order and identification TAG in the part). Low Stress stamps will be used on finished Machined parts, unless otherwise instructed by Purchase Order, drawing or Bill of Material.

### 13.4 Fabrication

Fabricated Assemblies shall have all stamped areas legible even after final paint. Hard Stamps *such as Sharp V-Stamping* will be used for stamping of Fabricated Parts e.g. Tree Frames, *transport Skids, Metallic Protectors* etc., with the exception of Riser Fabrication Components, Connectors, Tubular and any Structural Component subjected to cyclic loadings, which require identification by Low Stress Stamps. (Where the BOM is unclear, clarification must be requested by the Supplier).

### 13.5 Fasteners

Fasteners shall have the proper identification (stamp, tag, etc.).

Studs and Fasteners with yield strength equal or above 105ksi (including components designed by Supplier) shall be marked per ASTM A320 and the following items or as specified at Baker Hughes specifications.

All bolting shall be marked with the bolting manufacturers name and the grade of the material that shall be located (when applicable) on the face having the largest thread length, in the case of studs, and as per ASTM A962 for other bolting.

All bolting with 3/4" diameter and above shall have the manufacturing lot number (MLN) marked in addition to the above described.

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Marking shall be apparent after coating and shall last for the entire life of the component. Vendor shall ensure traceability to heat, heat treatment lot and coating bath.

## 14 Roles & responsibilities

Role	Responsibility
SQE	Issue, review and update this procedure
Buyer	Include this procedure at RFQ and PO with Suppliers
Supplier	Comply with the requirements
SQM	Approve this document

## 15 Quality records

The following is a summary of records produced by this work instruction that shall be maintained and controlled according to the requirements of [BHGE-QUA-013 Control of records](#). All records shall be in line with any Records location map relevant for the site/organization.

Record	Supplier Databook	Supplier Databook
Owner	Baker Hughes Quality Control	Supplier
Identification / Reference	Purchase order, line and shipment number	Purchase order, line and shipment number
Storage Format	Digital	Digital or Hard Copy
Location	Oracle	Supplier database
Retention Time	Unlimited	At least 10 years
Protection	IT	IT
Disposition	N/A	N/A

## 16 References, terms, definitions & acronyms

### 16.1 References

Number	Name
n/a	<a href="#">Baker Hughes QMS Lexicon</a>
n/a	<a href="#">Oilfield Equipment QMS Lexicon</a>
<a href="#">BHGE-QUA-013</a>	<a href="#">Baker Hughes Control of records</a>
BHGE-SOU-001	Supplier Quality Requirements
QW-OFE-BRA-SOU-006	Supplier Packaging and Preservation
QW-OFE-BRA-SOU-008	Supplier Databook

### 16.2 Terms, definitions & acronyms

Italicized terms have been defined in the [Baker Hughes QMS Lexicon](#) for Terms, Definition and Acronyms. In case of conflict with [Baker Hughes QMS Lexicon](#), for this document, the below table will take precedence.

Acronym	Term	Definition
HP	Hold Point	Supplier stop the process for Baker Hughes mandatory inspection
ITP	Inspection and Test Plan	A document that describes inspection and tests
iSupplier	Internet Supplier	Oracle Electronic Business portal for Suppliers
NDT	Non-Destructive Testing	Tests that does not destroy the part

Acronym	Term	Definition
OSP	Outsourced Process	Subcontracted process with Supplier
PVT	Performance Verification Test	Test to verify the performance of a product
RBC	Rede Brasileira de Calibração	A Brazilian bureau of standardization for instrument calibration
RP	Review Point	A process verification point through documentation check
SDRL	Supplier Document Record List	List of documents required to Supplier
SNQC	Sistema Nacional de Qualificação e Certificação de Pessoas	A Brazilian Bureau for personnel qualification and certification
WSF	Welding Specification Form	Requirements of Baker Hughes Specification Welding
WP	Witness Point	Supplier process step notification for Baker Hughes inspection

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**17 Appendix**

N/A