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## ADDENDUM 1

This addendum (Version 2.01) replaces Edition 2.0 published in January 2023.

### List of updates

Section	Update
2	References MSS SP-137 and NORSOK M-601 added
3.1	New term 3.1.71 "system pressure design" added Term 3.1.71 * renumbered to 3.1.72
6.1.15	New addition to section
6.6.14.1	Section amended
6.7.2	New addition to section
6.9.3	New section 6.9.3.6 added
6.12.1.8	List item g) added to replacement of first sentence
7.3.3	New addition to list item a)
7.4.19	New addition to section
7.6.2.5	Two new additions to section
8.3.3.2	New section 8.3.3.2.8 added
8.3.3.6	New section 8.3.3.6.6 added
* Clause/subclause number from Edition 2.0.	

# Supplementary Specification to API Standard 610 for Centrifugal Pumps

## Revision history

VERSION	DATE	PURPOSE
2.01	December 2025	Addendum 1
2.0	January 2023	Second Edition
1.0	January 2019	First Edition

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## Acknowledgements

This IOGP Specification was prepared by a Joint Industry Programme 33 Standardization of Equipment Specifications for Procurement organized by IOGP with support by the World Economic Forum (WEF).

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## Foreword

This specification was prepared under Joint Industry Programme 33 (JIP33) "Standardization of Equipment Specifications for Procurement" organized by the International Oil & Gas Producers Association (IOGP) with the support from the World Economic Forum (WEF). Companies from the IOGP membership participated in developing this specification to leverage and improve industry level standardization globally in the oil and gas sector. The work has developed a minimized set of supplementary requirements for procurement, with life cycle cost in mind, resulting in a common and jointly agreed specification, building on recognized industry and international standards.

Recent trends in oil and gas projects have demonstrated substantial budget and schedule overruns. The Oil and Gas Community within the World Economic Forum (WEF) has implemented a Capital Project Complexity (CPC) initiative which seeks to drive a structural reduction in upstream project costs with a focus on industry-wide, non-competitive collaboration and standardization. The CPC vision is to standardize specifications for global procurement for equipment and packages. JIP33 provides the oil and gas sector with the opportunity to move from internally to externally focused standardization initiatives and provide step change benefits in the sector's capital projects performance.

This specification has been developed in consultation with a broad user and supplier base to realize benefits from standardization and achieve significant project and schedule cost reductions.

The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2020).

This second edition cancels and replaces the first edition published in January 2019. Due to technical writing requirements leading to extensive changes, this second edition should be treated as a new document.

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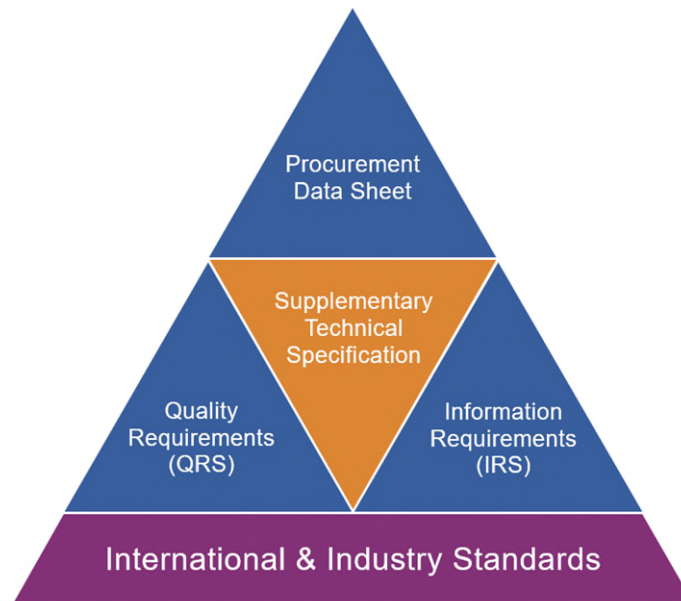
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## Introduction

The purpose of this specification is to define a minimum common set of requirements for procurement of centrifugal pumps in accordance with API Standard 610, 12<sup>th</sup> Edition, January 2021, Centrifugal Pumps for Petroleum, Petrochemical, and Natural Gas Industries for application in the petroleum and natural gas industries.

This specification follows a common document structure comprising the four documents as shown below, which together with the purchase order define the overall technical specification for procurement.



### JIP33 Specification for Procurement Documents Supplementary Technical Specification

This specification is to be applied in conjunction with the supporting procurement data sheet, information requirements specification (IRS) and quality requirements specification (QRS) as follows.

#### **IOGP S-615: Supplementary Specification to API Standard 610 for Centrifugal Pumps**

This specification defines the technical requirements for the supply of the equipment and is written as an overlay to API Standard 610, following the API clause structure. Clauses from API Standard 610 not amended by this specification apply as written to the extent applicable to the scope of supply.

Modifications to API Standard 610 defined in this specification are identified as Add (add to clause or add new clause), Replace (part of or entire clause) or Delete.

#### **IOGP S-615D: Procurement Data Sheet for Centrifugal Pumps (API)**

The procurement data sheet defines application specific requirements, attributes and options specified by the purchaser for the supply of equipment to the technical specification. The procurement data sheet may also include fields for supplier provided information attributes subject to purchaser's technical evaluation. Additional purchaser supplied documents may also be incorporated or referenced in the procurement data sheet to define scope and technical requirements for enquiry and purchase of the equipment.

#### **IOGP S-615L: Information Requirements for Centrifugal Pumps (API)**

The IRS defines the information requirements, including contents, format, timing and purpose to be provided by the supplier. It may also define specific conditions which invoke information requirements.

### **IOGP S-615Q: Quality Requirements for Centrifugal Pumps (API)**

The QRS defines quality management system requirements and the proposed extent of purchaser conformity assessment activities for the scope of supply. Purchaser conformity assessment activities are defined through the selection of one of four generic conformity assessment system (CAS) levels on the basis of evaluation of the associated service and supply chain risks. The applicable CAS level is specified by the purchaser in the data sheet or in the purchase order.

The terminology used within this specification and the supporting procurement data sheet, IRS and QRS follows that of API Standard 610 and is in accordance with ISO/IEC Directives, Part 2 as appropriate.

The procurement data sheet and IRS are published as editable documents for the purchaser to specify application specific requirements. The supplementary specification and QRS are fixed documents.

The order of precedence (highest authority listed first) of the documents shall be:

- a) regulatory requirements;
- b) contract documentation (e.g. purchase order);
- c) purchaser defined requirements (procurement data sheet, IRS, QRS);
- d) this specification;
- e) API Standard 610.

## 1 Scope

### Add to section

This specification does not apply to all pumps, services and auxiliaries within the scope of API 610. The following ones are excluded from this specification.

a) Types:

- OH4, BB4 and BB5 pumps;
- single volute overhung pumps requiring a driver rated in excess of 150 HP (112 kW);
- overhung pumps with two or more stages;
- double suction overhung pumps.

b) Services:

- pumps in cryogenic services (less than -148 °F (-100 °C));
- pumps in multi-phase (liquid, gas, solid) service.

c) Auxiliaries:

- pumps with drivers (greater than 1475 HP (1100 kW));
- pumps with pressure-lubrication systems (force feed).

## 2 Normative References

### Add to start of section

The following publications are referred to in this document, the procurement data sheet (IOGP S-615D) or the IRS (IOGP S-615L) in such a way that some or all of their content constitutes requirements of this specification.

### Add to section

ASME B1.20.1, *Pipe Threads, General Purpose, Inch*

EN 10204, *Metallic products - Types of inspection documents*

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 80079-36, *Explosive atmospheres — Part 36: Non-electrical equipment for explosive atmospheres — Basic method and requirements*

MSS SP-137, *Quality Standard for Positive Material Identification of Metal Valves, Flanges, Fittings, and Other Piping Components*

NORSOK M-601:2016, *Welding and inspection of piping*

Delete from section

EN 13463-1, *Non-electrical equipment for use in potentially explosive atmospheres—Part 1: Basic method and requirements*

### 3 Terms, Definitions, Acronyms, and Abbreviations

#### 3.1 Terms and Definitions

##### 3.1.40 observed

Delete term 3.1.40

##### 3.1.46 pressure casing

In definition, replace "connections" with

process-liquid piping permanently attached to the pump casing

Replace NOTE with

NOTE The atmospheric side of the seal gland, the seal quench (piping) plan, auxiliary piping and valves not permanently attached to the pump casing are not part of the pressure casing.

##### 3.1.68 witnessed

Replace definition with

Point, in the chain of activities, at which the supplier notifies the purchaser or purchaser's representative before the operation or process.

NOTE The operation or process may proceed without witness if the purchaser does not attend after the agreed notice period.

Add new term 3.1.69

##### 3.1.69 extremely hazardous service

Service with process fluids that are defined by the applicable national codes and standards or by the purchaser or process licensor as extremely hazardous.

Add new term 3.1.70

##### 3.1.70 major weld repair

Weld repair where castings have leaked on hydrostatic test, the depth of the cavity after preparation for repair exceeds 20 % of the actual wall thickness, or 1 in. (25 mm), whichever is smaller, or where the extent of the cavity exceeds 10 % of the surface area or 10 in.<sup>2</sup> (65 cm<sup>2</sup>), whichever is smaller.

NOTE Repairs that do not comply with these criteria are minor repairs.

Add new term 3.1.71**3.1.71**  
**system design pressure**

Pressure rating of the piping system components upstream and downstream of the pump (e.g. heat exchangers, piping, valves).

Add new term 3.1.72**3.1.72**  
**unless otherwise specified**

Statement indicating that the default requirement is applied unless the owner specifies otherwise.

NOTE This is intended to prevent a specification change or deviation without proper consent by the owner when the order is issued by one of their agents (i.e. by a contractor).

**6 Basic Design****6.1 General****6.1.1 Equipment Reliability****6.1.1.1**Add to section

The vendor's proposal shall provide details of at least two units of the equipment model, offered from the proposed point of manufacture, having comparable power and power per stage, speed, operating and design pressures, operating and design temperatures, pumped fluid, installation location (onshore/offshore) and environment, that have been delivered between 5 and 15 years ago.

**6.1.1.2**Delete "If specified,"**6.1.5**Add to section

For pumps with variable speed drives, the pump, motor and variable speed device shall be selected to give the maximum overall unit efficiency.

Add to section

For pumps with variable speed drives, when the selected impeller is of maximum size for the casing, the driver and pump shall be capable of a speed increase necessary to give a 5 % increase in head.

**6.1.11**Replace second sentence with

With the exception of OH6 type pumps, suction-specific speed values shall not exceed 12000 usgpm, rpm, ft (232 m<sup>3</sup>/s, rpm, m).

Add to section

With the exception of OH6 type pumps, suction inducers shall not be used unless approved by the owner.

Add to section

When an inducer is provided, the suction-specific speed shall be stated for the impeller only.

Add to section

A suction side restriction ring, i.e. bull ring, located near the impeller eye to reduce suction recirculation shall not be used.

### 6.1.13

In list item c), replace 3 % with

2 %

### 6.1.14

Add to section

Discharge orifices shall only be used when accepted by the owner.

Add to section

When a pump with a discharge orifice is proposed, the pump predicted performance curve with the orificed pump performance curve overlaid shall be included in the vendor's proposal.

### 6.1.15

Delete "If specified,"

Add to section

The head rise from rated point to shutoff shall be at least 10 % for an individually operated pump that is not flow controlled.

Add to section

The maximum discharge pressure as defined by 3.1.23 shall not exceed the system design pressure as defined by 3.1.71.

### 6.1.22

Add before first sentence

Pump lubricating oil and bearing temperatures shall not exceed the limits specified in 6.10.2.7.

Add to section

Pumps with fan cooling, wet sump lubrication and pumping temperatures over 500 °F (260 °C) shall have provision for one of the following:

- a) external oil circulation system;

- b) bearing housing cooling coil;
- c) bearing housing water jacket.

Add to section

The bearing housing connections for external oil circulation systems, bearing housing cooling coils or bearing housing water jackets shall be plugged unless cooling is required.

Add to section

When provision for connecting an external oil circulation system is specified, the oil return connection shall be aligned with the normal sump oil level to maintain proper oil level in the sump.

#### **6.1.31**

Add to section

Non-rotating maintainable parts weighing more than 51 lbs (23 kg) shall feature provisions for the attachment of lifting accessories for safe mechanical lifting.

#### **6.1.36**

Add to section

For floating applications, the proposed design shall conform to the specified vessel motion design criteria.

Add to section

Unproven design variations necessary to meet the specified vessel motion design criteria shall not be proposed.

#### **6.1.37 Bolting and Threads**

##### **6.1.37.1**

In first sentence, add after "ISO 261"

or another equivalent international standard

Add new section

#### **6.1.42 Insulation and Heat Tracing**

##### **6.1.42.1**

When specified, thermal insulation or guarding shall be applied as personnel protection to any part accessible to personnel during operation and maintenance when the non-insulated surface temperature of the part is greater than 140 °F (60 °C) or less than 0 °F (-18 °C).

##### **6.1.42.2**

When insulation is applied to the pump, the specified stand-offs and clearances from the insulated surface for pipe flanges, valves and instrument equipment shall be provided throughout.

**6.1.42.3**

Requirements for heat tracing and/or insulation necessary for the safe and reliable start-up, operation and standby of the pumping unit under the specified process and environmental conditions shall be stated in the vendor's proposal.

Add new section

**6.1.43**

Pump hydraulic designs utilizing impeller vane machining techniques of underfiling, overfiling, V-cutting or similar shall not be permitted.

Add new section

**6.1.44**

Pump performance curves and performance data for proposal, acceptance (post order) and as-built (tested) shall be based on running clearances inclusive of applicable additional running clearance allowances for the worst-case temperature, viscosity and material galling tendencies.

**6.3 Pressure Casings****6.3.6**

Add new list item c)

- c) for any pump types: the maximum suction pressure plus the maximum differential pressure that the pump is capable of developing at shut off when operating with the maximum specified relative density with:
  - 1) maximum impeller diameter at the rated speed for constant speed applications;
  - 2) rated impeller diameter at the trip speed for variable speed applications.

Add new list item d)

- d) for any pump types: the MAWP as specified by the purchaser.

**6.3.8**

Replace first sentence with

Pressure casing parts defined in 3.1.46 including suction canister on VS6/VS7 pumps shall have the same MAWP.

Delete second sentence

Delete third sentence

**6.3.9**

Replace first sentence with

HPRT pressure casings parts defined in 3.1.46 shall have the same MAWP.

Delete second sentence

#### **6.3.14**

Add to section

Centerline or near-centerline supported pumps operating above 500 °F (260 °C) shall have a guide, key slot or equivalent design feature between the pump and the baseplate at each support pedestal and at the centre of the pressure casing.

Add to section

Centerline or near-centerline supported pumps operating above 500 °F (260 °C) that have four mounting feet shall include the following:

- a) guide, key slot or equivalent design feature between the pump and the baseplate at the non-drive end support pedestals;
- b) drive end mounting feet pinned to the support pedestals.

Add to section

Centerline or near-centerline supported pumps operating above 500 °F (260 °C) that have four mounting feet shall have the drive end mounting feet pinned to the support pedestals.

### **6.4 Nozzles and Pressure Casing Connections**

#### **6.4.1 Casing Opening Sizes**

##### **6.4.1.2**

Add to section

Drain connections of pumps handling fluids with a viscosity greater than or equal to 400 cP, products with a higher than ambient pour point temperature or slurries shall be the largest size possible for the proposed pump and at least NPS 1 (DN 25).

#### **6.4.2 Casing Nozzle Connections**

##### **6.4.2.1**

Delete "One- and two-stage" from second sentence

#### **6.4.3 Auxiliary Connections**

##### **6.4.3.1**

Add to section

Full penetration butt welds shall be used when any of the following apply.

- a) The pump nozzle rating is ASME B16.5, Class 900 and above.
- b) The minimum pumping temperature is 32 °F (0 °C) and below.

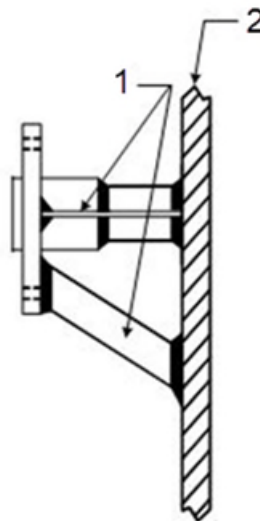
- c) Due to the nature of the pumpage, any of the following apply:
- 1) pump specified to be in hot service;
  - 2) service classed as any of the following:
    - i) extremely hazardous;
    - ii) highly corrosive;
    - iii) compliant with either NACE MR0175 or NACE MR0103.

#### 6.4.3.10

In first sentence, replace "NPS 1" with

NPS 2 (DN 50)

Replace Figure 20 with



#### Key

- 1 Two-plane gusseting (welded to flange)
- 2 Equipment wall

**Figure 20—Typical Gusset Design**

In first sentence of list section c), replace "at or near the connection end of the piping" with

on the back of the flange

In second sentence of list section c), replace "pipe" with

back of the flange

Add to list section c)

Gussets shall not overhang the flange.

## **6.6 Rotors**

### **6.6.3**

Replace third sentence with

Collets shall not be used in vertical pumps.

Add new section

#### **6.6.14**

##### **6.6.14.1**

Double volute pumps whose impellers have an even number of vanes shall not be used.

##### **6.6.14.2**

The proposal shall include technical justification illustrating how vane passing pressure pulses and associated vibrations are minimized.

Add new section

#### **6.6.15 Repairs**

##### **6.6.15.1**

Repairs to machining errors on rotating components shall be subject to owner's acceptance prior to commencement.

##### **6.6.15.2**

Metal plating shall not be used for shaft or impeller repairs.

##### **6.6.15.3**

Weld repair of shaft shall not be permitted.

## **6.7 Wear Rings and Running Clearances**

### **6.7.2**

Add to section

If wear rings have below 400 Brinell hardness numbers, the stationary wear ring shall always be harder than the rotating wear ring.

### **6.7.3**

In first sentence, replace "locking pins, screws (axial or radial), or by tack welding" with

at least three equally spaced axial screws or by tack welding in at least three equally spaced places

Delete second sentence

## **6.8 Mechanical Shaft Seals**

### **6.8.2**

Add to end of sentence

except for vertical pumps type OH5 and for vertical pumps type OH6 with the motor mounted directly on the pump gearbox.

NOTE Refer to 9.1.3.2 for vertical pumps.

### **6.8.11**

Add after "If specified"

or if required by the vendor or seal vendor

## **6.9 Dynamics**

### **6.9.3 Balancing**

Add new section

#### **6.9.3.6**

Impeller balancing correction shall always be carried out by the removal of metal from the impeller shroud as indicated on the component drawing, ensuring that the minimum shroud thickness is maintained with no deviation from the design/manufacturing drawing.

## **6.10 Bearings and Bearing Housings**

### **6.10.2 Bearing Housings**

#### **6.10.2.7**

Add to section

Pump bearing cooling shall not take any credit for the effect of driver cooling air.

#### **6.10.2.9**

In NOTE, replace "EN 13463-1" with

ISO 80079-36

## 6.12 Materials

### 6.12.1 General

#### 6.12.1.8

Replace first sentence with

ISO 10474/EN 10204 type 3.1 material inspection certificates shall be supplied for the following:

- a) process pressure-containing components;
- b) parts welded directly to pressure-containing components;
- c) process pressure-retaining components (e.g. pressure fasteners);
- d) impellers;
- e) shafts;
- f) all lifting points;
- g) shaft sleeves (when used).

Replace second sentence with

ISO 10474/EN 10204 type 3.1 material inspection certificates to NACE MR0175/ISO 15156 (all parts) or NACE MR0103/ISO 17945 as specified shall be supplied for components in wet sour service.

### 6.12.2 Castings

#### 6.12.2.5

Replace first sentence with

Casting repairs made in the vendor's shop shall be carried out in accordance with a weld repair procedure compliant with the component material specification or with the requirements of Table 11.

Delete second sentence

Add to section

For major repairs as defined in 3.1.69, repair procedures shall be subject to owner's acceptance prior to any repair commencing.

Add to section

Castings shall be heat-treated following major weld repairs in accordance with the applicable material standard specification.

Add new section

#### 6.12.2.7

Repairs to casting machining errors shall be subject to owner's acceptance prior to commencement.

### **6.12.3 Welding**

#### **6.12.3.3**

In first paragraph, replace "d)" with

e)

Add new list section e)

- e) joints, including deck plate to structural members and brackets and supports, shall be continuously seal-welded on both sides or full penetration welded to prevent crevice corrosion.

### **6.13 Nameplates and Rotation Arrows**

#### **6.13.2**

Add new list item m)

- m) year of manufacture.

## **7 Accessories**

### **7.1 Drivers**

#### **7.1.3**

Delete "Unless otherwise specified,"

Replace "greater than 500 lb (225 kg), the equipment feet" with

greater than 220 lb (100 kg), the mounting feet

#### **7.1.7**

Delete "Unless otherwise specified,"

Replace "a closed discharge valve" with

the specified mode of pump start-up

#### **7.1.8**

Add to section

For vertical pumps, the motor shall be shop mounted, aligned and match marked.

### **7.2 Couplings**

#### **7.2.2**

Add new list section h)

- h) The minimum coupling service factor shall be 1.5.

## **7.3 Guards**

### **7.3.2**

#### **7.3.2.1**

In first sentence, replace "If specified" with

Unless the pump is installed in a nonhazardous location (safe area)

#### **7.3.2.2**

Replace "EN 13463-1" with

ISO 80079-36

### **7.3.3**

Add to list item a)

shaft guards shall be guarded 360 degrees;

#### **7.3.3.4**

Replace "EN 13463-1" with

ISO 80079-36

## **7.4 Baseplates**

### **7.4.8**

Delete "If specified," from second paragraph

#### **7.4.14**

Replace sixth sentence with

Every bulkhead section of the baseplate shall have a vent hole of at least 0.5 in. (12 mm) diameter located at each corner.

#### **7.4.19**

Add to section

Tabs for alignment screws shall be removable in the field.

Add new section

#### **7.4.25**

##### **7.4.25.1**

The baseplate shall have two grounding lugs/bosses located at diagonally opposite corners.

**7.4.25.2**

The baseplate grounding lugs/bosses shall be provided with 0.5 in. (12 mm) brass studs, nuts and washers.

**7.4.25.3**

All baseplate mounted equipment shall be earthed to the baseplate.

**7.5 Instrumentation****7.5.2 Vibration, Position, and Temperature Detectors****7.5.2.2**

Replace first sentence with

For equipment with hydrodynamic bearings, i.e. sleeve radial bearing and anti-friction thrust bearing, provision shall be made for mounting two radial-vibration probes in each bearing housing.

Add to section

Mounting points for vibration probes shall be located such that any lube oil spill during probe installation or change-out is minimized.

**7.6 Piping and Appurtenances****7.6.1 General****7.6.1.6**

Delete "If specified,"

Delete NOTE

**7.6.2 Auxiliary Process Liquid Piping****7.6.2.4**

Replace second sentence with

Restriction orifices shall have a tab extending from the orifice plate.

Add after third sentence

Restriction orifices shall have the size and orifice tag number stamped on the upstream side of the orifice tab.

Add after third sentence

The orifice plate shall be removable and flat.

**7.6.2.5**

Add to section

Drains and vents shall be supplied with flanged valves, gaskets and blind flanges.

Add to section

For pumps with one drain connection, a flanged drain valve shall be provided with a blind flange and gasket.

**7.6.2.6**

Replace first sentence with

Threaded vent and drain connections to the casing shall not be permitted.

**7.6.2.8**

Replace second sentence with

Socket-welded unions shall not be used.

## **8 Inspection, Testing, and Preparation for Shipment**

### **8.1 General**

#### **8.1.1**

##### **8.1.1.2**

Delete "or observed" from second sentence of first paragraph

Delete NOTE 2

##### **8.1.5**

Replace "If specified," with

Prior to release for shipment,

Replace ", dating and submitting the completed checklist to the purchaser before shipment" with

and dating the completed checklist

### **8.2 Inspection**

#### **8.2.1 General**

##### **8.2.1.1**

In list item f), replace "(see L.3.1 and L.3.2)" with

(see IOGP S-615L)

## 8.2.2 Pressure Casing and Process Piping Materials Inspection

**Table 14—Pressure Casing and Process Piping Material Inspection Requirements**

Add row "Fabricated casing welds"

Type of Component	Requirements by Inspection Class <sup>a, g</sup>		
	I	II	III
Fabricated casing welds <sup>f</sup>	VI, plus 100 % MT or PT	VI, plus 100 % MT or PT	VI, plus 100 % MT or PT, plus 100 % RT or UT

### 8.2.2.7

Replace first sentence with

Hardness testing of parts, welds and heat-affected zones shall be performed to verify that values are within the allowable limits for sour services or when specified by the purchaser for other applications.

### 8.2.2.8

Delete "If specified," from first sentence

## 8.3 Testing

### 8.3.1 General

#### 8.3.1.1

Replace first sentence with

The detailed procedures for all specified running and optional tests shall be delivered within the timeframe specified in IOGP S-615L.

Add new section

#### 8.3.1.4

Pumps specified for oil mist lubrication shall have all running tests performed while using the vendor's oil mist supply system.

Add new section

#### 8.3.1.5

Seal gland drains connected to the containment seal and quench chambers shall not be plugged during running tests.

### **8.3.2 Hydrostatic Test**

#### **8.3.2.1**

Add to section

The hydrostatic test shall be conducted after completion of pressure casing welding and machining, except when the requirements of 8.3.2.10 apply.

#### **8.3.2.10**

Add to end of second paragraph

with a machining map

#### **8.3.2.11**

Delete fourth sentence

#### **8.3.2.12**

Replace first sentence with

Pump pressure-containing parts shall be tested to the same pressure.

Delete second sentence

Delete third sentence

Delete fourth sentence

Add new section

#### **8.3.2.17**

Pressure boundary repairs that require welding or machining, except when the requirements of 8.3.2.10 apply, after successful hydrostatic test shall be subject to owner's acceptance.

### **8.3.3 Performance Test**

#### **8.3.3.2**

Add new section

#### **8.3.3.2.8**

Mechanical seal flushing liquid coolers shall be hydrostatically tested on the process side to at least the same pressure as the pump casing.

### 8.3.3.3

#### 8.3.3.3.1

Add new NOTE

NOTE The shop buffer/barrier system may be used during the bare-shaft pump performance test.

#### 8.3.3.3.2

Replace section with

Seal leakage that exceeds the permitted rate specified in API 682, 10.3.2.3.1 shall require the assembled pump and seal to be re-run to prove that the seal leakage is below that specified in API 682, 10.3.2.3.1.

### 8.3.3.4

#### 8.3.3.4.3

Add to section

In addition, pumps that operate in parallel and are not individually flow controlled shall comply with the head tolerance allowed in 6.1.13 c).

#### 8.3.3.4.5

In second sentence, replace "(see L.2.4, L.3.2.2, and example in Annex M)" with

(see IOGP S-615L and example in Annex M)

#### 8.3.3.4.6

Delete "If specified,"

Replace "L.3.2.2" with

IOGP S-615L

### 8.3.3.6

#### 8.3.3.6.2

Replace first sentence with

For ring-oiled or splash systems including systems with purge-oil mist, the temperatures of the oil sump and bearing housing or bearings fitted with detectors shall be measured and recorded throughout the test.

Replace second sentence with

For pure-oil mist systems, the temperature of the bearing housing or bearings fitted with detectors shall be measured and recorded throughout the test.

Delete third sentence

Add new section**8.3.3.6.6**

Seal chamber pressure shall be measured and recorded at each test point.

**8.3.3.7**Add to section

When specified, for vertical submerged pumps, the performance test shall be conducted with the pumps operated at minimum submergence.

**8.3.3.8****8.3.3.8.1**Add to section

The vendor shall notify the owner when any modifications to the impeller are made.

Add to section

When the impeller is required to be modified after the performance test to achieve the specified hydraulic performance by specific vane machining techniques other than impeller diameter reduction, the proposed modification and a detailed drawing shall be subject to owner's acceptance.

Add to section

If any such specific vane machining techniques are undertaken, the pump shall be fully re-tested.

Add to section

When an impeller, inducer or rotor is post-test machined, the component or complete rotor shall be rebalanced prior to retest or shipment in accordance with 6.9.3 and 9.2.4.2 as applicable.

**8.3.3.8.2**Add to section

If any disassembly or retest is performed, the rotor shall be rebalanced prior to retest in accordance with 9.2.4.2.

**8.3.4 Optional Tests****8.3.4.2 Mechanical Run Test****8.3.4.2.1**Replace first sentence with

The pump shall be run on the test stand for at least 1 hour.

Add to section

During the mechanical run test, the rated flow, pressure, power, speed, vibration, bearing oil or housing temperatures shall be measured and recorded continuously throughout the test.

Add to section

During the mechanical run test, the pump shall operate without visible leaks, other than allowable seal leakage as defined in API 682, 10.3.2.3.1 or as specifically agreed between owner and vendor.

Add to section

During the mechanical run test, the pump shall not display any temperature, vibration or noise non-conformities.

Add to section

If it is necessary to dismantle a pump for any correction such as due to noise, vibration or leakage, the mechanical run test shall be repeated after the correction is made.

### **8.3.4.3 NPSH Required Test**

#### **8.3.4.3.1**

Add to section

For vertical submerged pumps, a minimum submergence test shall be performed instead of an NPSH required test if the minimum submergence test is more restrictive.

Add new NOTE

NOTE A minimum submergence test is more restrictive than an NPSH required test when the required submergence of a pump inlet bell, to avoid the occurrence of free-surface air vortices, is greater than the submergence needed to provide the required NPSH for the pump.

## **8.4 Preparation for Shipment**

### **8.4.3**

#### **8.4.3.1**

Replace first sentence with

Axial movement of rotors with no thrust bearings shall be blocked.

Add to section

Radial movement of rotors with hydrodynamic radial bearings shall be blocked.

#### **8.4.3.7**

Delete "steel caps or steel"

Replace "in accordance with 6.4.3.7" with

in accordance with 6.4.3.5

Add to section

Temporary plastic plugs shall not be permitted.

## 9 Specific Pump Types

### 9.2 Between-bearings Pumps (Types BB1, BB2, BB3, and BB5)

#### 9.2.5 Bearings and Bearing Housings

Add new section

##### 9.2.5.5

On multistage pumps, bearing housings shall be doweled after verification of stuffing box runout.

### 9.3 Vertically Suspended Pumps (Types VS1 Through VS7)

#### 9.3.6 Bushings and Bearings

##### 9.3.6.1

Add to section

Bushings shall maintain dimensional stability for the specified product and temperature for operating, transient and standby conditions.

##### 9.3.6.3

Add after "VS4"

and VS5

#### 9.3.8 Accessories

##### 9.3.8.3 Mounting Plates

###### 9.3.8.3.1

Add to section

When separate from the main body flange, the mounting plate shall be continuously welded to the outer casing on both sides.

Add to section

Contact areas between mounting plate and sole plate(s) shall be flat and perpendicular to the centerline of the shaft.

Add to section

Machining tolerances shall be in accordance with 7.4.8.

###### 9.3.8.3.2

Delete "If specified,"

Add after first sentence

Grout contact surfaces of the sole plate shall be sand-blasted and coated in accordance with the requirements of 7.4.16.

Add to section

The sole plate shall be provided with a total of four removable jacking screws, each located adjacent to a holding down bolt hole.

### **9.3.9 Testing**

#### **9.3.9.1**

Add to section

When a reduced length test is proposed, the length of the pump shall include at least two line shaft bearings.

### **9.3.10 Single-case Diffuser (VS1) and Volute (VS2) Pumps**

Add new section

#### **9.3.10.7**

Single-case diffuser (VS1) and volute (VS2) pump bowls shall have O-ring seals.

Add new section

#### **9.3.10.8**

For single-case diffuser (VS1) and volute (VS2) pumps, multiple bowl stack up tolerances from the rabbeted fits shall be evaluated to ensure that the concentricity of the assembly is maintained during shipping and operation.

### **9.3.11 Single-casing Axial Flow (VS3) Pumps**

Add new section

#### **9.3.11.3**

Single-casing axial flow (VS3) pump bowls shall have O-ring seals.

Add new section

#### **9.3.11.4**

For single-casing axial flow (VS3) pumps, multiple bowl stack up tolerances from the rabbeted fits shall be evaluated to ensure that the concentricity of the assembly is maintained during shipping and operation.

### **9.3.13 Double-casing Diffuser (VS6) and Volute (VS7) Pumps**

#### **9.3.13.2**

Replace section with

A flanged high-point vent connection with a minimum diameter of NPS 1 (DN 25) shall be provided for complete outer case venting.

### 9.3.13.3

#### Replace section with

A flanged high-point vent connection with a minimum diameter of NPS ½ (DN 15) shall be provided for complete venting of the inner assembly, seal chamber and associated auxiliary process-liquid piping.

### 9.3.13.4

#### Replace section with

The suction cannister shall be supplied with an internal drain with a minimum diameter of NPS 1 (DN 25).

#### Add to section

The drain pipe shall extend internally down the length of the pump to the bottom of the suction cannister.

#### Add to section

The drain shall terminate above the top of the mounting plate in a flanged connection.

#### Add to section

The internal drain pipe shall be fixed to the bowl assembly and column.

#### Add to section

The internal drain pipe shall be removable.

#### Add new section

### 9.3.13.7

Double-casing diffuser (VS6) and volute (VS7) pump bowls shall be flanged.

#### Add new section

### 9.3.13.8

Double-casing diffuser (VS6) and volute (VS7) pump bowls shall have metal-to-metal rabbeted fits.

#### Add new section

### 9.3.13.9

Double-casing diffuser (VS6) and volute (VS7) pump bowls shall have O-ring seals.

#### Add new section

### 9.3.13.10

For double-casing diffuser (VS6) and volute (VS7) pumps, multiple bowl stack up tolerances from the rabbeted fits shall be evaluated to ensure that the concentricity of the assembly is maintained during shipping and operation.

## **10 Vendor's Data**

### **10.1**

Replace first sentence with

The contents of IOGP S-615L shall be used to define requirements for proposals, contract documentation and vendor data content.

Delete second sentence

## Bibliography

### Add to Bibliography

- [108] API Specification Q1, *Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*
- [109] API Specification Q2, *Specification for Quality Management System Requirements for Service Supply Organizations for the Petroleum and Natural Gas Industries*
- [110] ASTM E415, *Standard Test Method for Analysis of Carbon and Low-Alloy Steel by Spark Atomic Emission Spectrometry*
- [111] ASTM E1086, *Standard Test Method for Analysis of Austenitic Stainless Steel by Spark Atomic Emission Spectrometry*
- [112] IEC 60034-1, *Rotating Electrical Machines – Part 1: Rating and Performance*
- [113] IOGP S-703, *Supplementary Specification to IEC 60034-1 Low Voltage Three Phase Cage Induction Motors*
- [114] IOGP S-704, *Supplementary Specification to IEC 60034-1 High Voltage Three-phase Cage Induction Motors*
- [115] IOGP S-711, *Specification for Diesel Engines*
- [116] IOGP S-712, *Supplementary Specification to API Standard 677 General Purpose Gear Units*
- [117] IOGP S-715, *Supplementary Specification to NORSOK M-501 Coating and Painting for Offshore, Marine, Coastal and Subsea Environments*
- [118] IOGP S-733D, *Procurement Data Sheet for Low Voltage Motors (IEEE Std 841)*
- [119] ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country code*
- [120] ISO 9001, *Quality management systems — Requirements*
- [121] ISO 10005, *Quality management — Guidelines for quality plans*



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