

Quality Requirements for Centrifugal Pumps (API)

Revision history

VERSION	DATE	PURPOSE
2.0	January 2023	Second Edition
1.0	January 2019	First Edition

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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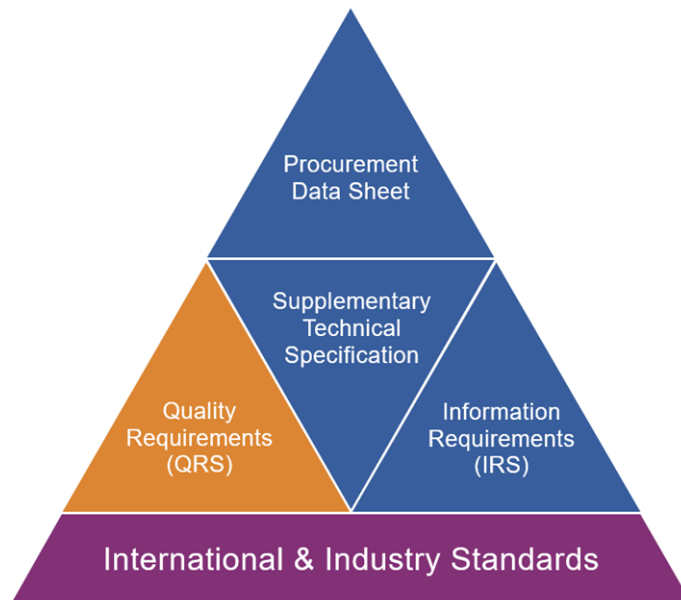
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Introduction

The purpose of this quality requirements specification (QRS) is to specify quality management requirements and the proposed extent of purchaser intervention activities for the procurement of centrifugal pumps in accordance with IOGP S-615 for application in the petroleum and natural gas industries.

Purchaser intervention activities are identified through the selection of one of four conformity assessment system (CAS) levels based on a risk and criticality assessment. The applicable CAS level is specified by the purchaser in the procurement data sheet or purchase order.

This QRS shall be used in conjunction with the specification (IOGP S-615), the procurement data sheet (IOGP S-615D) and the information requirements specification (IOGP S-615L) which together comprise the full set of specification documents. The introduction section in the specification provides further information on the purpose of each of these documents and the order of precedence for their use.



**JIP33 Specification for Procurement Documents
Quality Requirements Specification**

1 Scope

To specify quality management requirements for the supply of centrifugal pumps to IOGP S-615 including:

- a) supplier quality management system requirements;
- b) purchaser conformity assessment (surveillance and inspection) activities;
- c) traceability requirements.

2 Normative references

For the purpose of this document, the documents referenced in IOGP S-615 and those listed below, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Specification Q1, *Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*

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

ISO 9001, *Quality management systems — Requirements*

ISO 29001, *Petroleum, petrochemical and natural gas industries — Sector-specific quality management systems — Requirements for product and service supply organizations*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in IOGP S-615 and ISO 9000 (normative to ISO 9001), and the following shall apply.

3.1

conformity assessment

demonstration that specified requirements are fulfilled

Note 1 to entry: Conformity assessment (or assessment) includes but is not limited to review, inspection, verification and validation activities.

Note 2 to entry: Assessment activities may be undertaken at a supplier/sub-supplier's premises, virtually by video link, desktop sharing, etc. or by review of information.

3.2

conformity assessment system

CAS

system that provides different levels of purchaser interventions to assess and verify supplier conformance to specified requirements

Note 1 to entry: CAS A applies to the highest risk and associated extent of verification. CAS D is the lowest.

3.3

hold point

H

<conformity assessment> point in the chain of activities beyond which an activity shall not proceed without the approval of the purchaser or purchaser's representative

3.4

witness point

W

<conformity assessment> point in the chain of activities that the supplier shall notify the purchaser or purchaser's representative before proceeding

Note 1 to entry: The operation or process may proceed without witness if the purchaser does not attend after the agreed notice period.

3.5

surveillance

S

<conformity assessment> observation, monitoring or review by the purchaser or purchaser's representative of an activity, operation, process, product or associated information

3.6

review

R

<conformity assessment> review of the supplier's information to verify conformance to requirements

4 Symbols and abbreviations

For purposes of this document, the following symbols and abbreviations apply.

CAS	conformity assessment system
IRS	information requirements specification
QMS	quality management system
QRS	quality requirements specification (this document)

5 Quality requirements

5.1 Quality management system

The vendor shall operate and maintain a quality management system (QMS) that conforms with ISO 9001, ISO 29001, API Specification Q1 or an equivalent quality management system standard.

5.2 Conformity assessment system (CAS)

5.2.1

The conformity assessment system (CAS) provides different levels of assessment of the vendor control activities. The CAS level is defined by the purchaser, using a risk-based approach, and included in the purchase order/contract. The defined CAS level may be adjusted by the purchaser during manufacture based on vendor performance and re-assessment of risk.

NOTE For industrial proven solutions, CAS level D is specified unless risk assessment indicates that a more stringent CAS level is required.

5.2.2

Quality plans and inspection and test plans shall include provision for purchaser intervention activities based on the CAS level selected in the procurement data sheet or purchase order. See Annex A.

5.2.3

Vendor performance in meeting the requirements may be routinely assessed during execution of the scope and where appropriate, corrective action requested and conformity assessment activities increased or decreased consistent with criticality and risk.

6 Certification and traceability

Where material certification and traceability requirements are not specified in the parent standard or supplementary specification, material certification and traceability shall be maintained in accordance with Annex B.

7 Evidence — conformance records

Documents and information shall be provided for in accordance with the associated IRS.

Annex A (normative)

Purchaser conformity assessment requirements

This annex defines four conformity assessment systems (CAS) or levels of purchaser assessment.

	PURCHASER ASSESSMENT ACTIVITIES	CAS			
		A	B	C	D
1	Operational planning and control activities				
1.1	Kick-off, pre-production and pre-inspection meeting (IOGP S-615, 8.1.5)	H	W	W	-
2	Design and development activities				
2.1	No activities applicable for purchaser intervention	-	-	-	-
3	Control of external supply				
3.1	No activities applicable for purchaser intervention	-	-	-	-
4	Production and service provision				
4.1	Material certification and traceability as specified (IOGP S-615, 6.12.1.8, 6.12.3.4, 6.12.4.3, Table H.2, Table H.3, Table H.4)	W	R	R	R
4.2	Surfaces of castings inspection as specified (IOGP S-615, 6.12.2.1)	W	S	-	-
4.3	Fabrication				
4.3.1	Baseplate flatness and coplanarity of baseplate equipment mounting pads inspection (IOGP S-615, 7.4.8, 9.3.8.3.1)	W	R	R	-
4.3.2	Lifting lugs verification (IOGP S-615, 7.4.18, 8.4.5)	W	R	R	R
4.4	Inspection, testing and verification activities				
4.4.1	Inspector verification of materials as specified, production weld process controls and non-destructive examinations (IOGP S-615, 6.12.2, 6.12.3, 8.2.2.7, 6.4.3.10, 6.6.15.1, 7.4.18.3, 8.2.2, 9.3.2.5, 9.3.2.6, Table 11, Table 14, Table 15)	S	S	S	-
4.4.2	Inspection of major weld repairs as specified (IOGP S-615, 6.12.2.3, 6.12.2.4, 6.12.2.5)	H	W	R	-
4.4.3	Pressure casing and auxiliary process-liquid piping inspection as specified, including welded and bolted connections associated with the casing and process fluids (IOGP S-615, 7.6.2, 8.2.2.3, 8.2.2.6, Table 14)	W	S	R	-
4.4.4	Non-destructive examinations of component parts if specified (IOGP S-615, 6.12.3, 6.4.3.10, 8.2.1.3, 8.2.2.1, 8.2.2, 9.3.2.5, 9.3.2.6, Table 14, Table 15)	W	R	R	-
4.4.5	Positive material identification as specified (IOGP S-615, 8.2.2.8)	W	S	R	-
4.4.6	Wear rings and running clearance verification (IOGP S-615, 6.7.5, Table 6)	W	S	S	-
4.4.7	Heat treatment (IOGP S-615, 6.12.2, 6.12.3, 6.4.3.10, Table 11)	S	S	S	-
4.4.8	Hardness testing as specified (IOGP S-615, 8.2.2.7, 6.4.3.10)	W	S	R	-

	PURCHASER ASSESSMENT ACTIVITIES <i>(continued)</i>	CAS			
		A	B	C	D
4.4.9	Shaft and rotors (IOGP S-615 6.6, 7.1.8, 9.2.2.4, 9.3.12.2, 9.3.3.1, Table 17)	W	R	-	-
4.4.10	Rotating component balancing as specified (IOGP S-615, 8.3.3.8, 6.12.1.10, 6.12.1.11, 6.9.3, 7.2.2, 9.1.3.6, 9.2.4.2, Table 19)	W	R	-	-
4.4.11	Cleanliness check prior to final assembly if specified (IOGP S-615, 8.2.2.6)	W	S	S	-
4.4.12	Verify installed instrumentation calibration and installation to applicable standards (IOGP S-615, 7.5.1, 7.5.2)	W	S	R	R
4.4.13	'Ex' verification of equipment and assemblies for compliance with the specified hazardous area classification (IOGP S-615, 6.10.2.9, 6.1.29, 7.1.6, 7.3.2.1, 7.3.2.2, 7.3.3.3, 7.3.3.4)	W	S	S	S
4.4.14	Hydrostatic testing activities (IOGP S-615, 8.3.2)	H	W	W	R
4.4.15	Performance and mechanical run testing as specified (IOGP S-615, 6.1.22, 6.10.2.7, 8.3.3, 8.3.4.2.2, 8.3.4.3.7, 8.3.4.7.3, C.4.1, C.4.2, C.4.3, Table 16, Table 8, Table 9)	H	W	W	R
4.4.16	Net positive suction head required or minimum submergence testing if specified (IOGP S-615, 6.1.22, 9.3.9.1, 6.10.2.7, 8.3.1, 8.3.4)	H	W	W	R
4.4.17	Sound level testing if specified (IOGP S-615, 8.3.4)	H	W	R	R
4.4.18	Complete unit testing if specified (IOGP S-615, 6.1.22, 6.10.2.7, 9.3.9.1, 8.3.1.4, 8.3.1.5, 8.3.4.1, 8.3.4.4.1, 8.3.4.4.2)	H	H	W	R
4.4.19	Auxiliary equipment testing if and as specified (IOGP S-615, 8.3.4.1, 8.3.4.6)	H	W	R	R
4.4.20	Bearing housing resonance test if specified (IOGP S-615, 8.3.4.1, 8.3.4.7)	H	W	R	R
4.4.21	Nozzle force and moments testing if specified (IOGP S-615, 7.4.23, 7.4.24, 8.3.4.1, Table 13)	H	W	R	R
4.4.22	Structural resonance test if specified (IOGP S-615, 8.3.4.1, 9.3.9.2)	H	W	R	R
4.4.23	Disassembly after testing if specified (IOGP S-615, 8.3.3.9, 8.3.4.1, 9.3.3.1)	H	W	S	R
4.4.24	Hydrodynamic bearing inspection after testing if specified (IOGP S-615, 9.2.7.4, 8.3.4.1)	H	W	S	-
4.4.25	Surface preparation and painting as specified (IOGP S-615, 9.3.8.3.2, 7.4.16, 8.2.1.2, 8.4.3.4)	H	W	R	-
5	Release of product or service				
5.1	Verify conformance to the purchase order including as applicable				
5.1.1	Complete skid overall dimensions including holding down bolt hole and connection locations (IOGP S-615, 8.1.5)	H	W	W	W
5.1.2	Couplings and guards inspection (IOGP S-615, 7.2, 7.3.2, 7.3.3, 9.3.8.2.1)	H	W	W	W
5.1.3	Pump nameplate and rotation arrows inspection. Review photograph for CAS C and CAS D. (IOGP S-615, 6.13)	H	W	R	R

	PURCHASER ASSESSMENT ACTIVITIES <i>(continued)</i>	CAS			
		A	B	C	D
5.2	Loose ship items, spares and special tools inspections as applicable (IOGP S-615, 7.7.1, 7.7.2)	H	W	W	R
5.3	Preparation of preservation, packing and storage as specified (IOGP S-615, 8.4)	H	W	S	-
5.4	Release of equipment (IOGP S-615, 6.12.3.3, 7.1.8, 7.5.2.2, 7.6.2.4, 6.4.3.5, 6.8.12, 7.4.25.3, 8.1.5, 8.4.14)	H	H	H	H
Key H: Hold point W: Witness point R: Review S: Surveillance					

Annex B (normative)

Certification and traceability requirements

Item		Certificate type	Traceability level	Additional requirements
Centrifugal pump	Metallic components as per Annex H or as specified. Minimum: pressure casing (including bolting), auxiliary process fluid piping (including all pressure containing components such as fittings, valve bodies), impeller; shaft, sleeve, seal gland plate.	3.1	Level II	NACE MR0175 (all parts) or NACE MR0103 if and as specified. Type 3.2 Certification is applicable as per the design requirements.
	Metallic components as per Annex H or as specified. Minimum: wear rings, throttle bushings, diffusers.	2.2	Level II	NACE MR0175 (all parts) or NACE MR0103 if and as specified. Type 3.1 Certification is applicable as per the design requirements.
	Non-metallic components as per Annex H or as specified. Minimum: wear parts.	2.2	Level II	Type 3.1 Certification is applicable as per the design requirements.

NOTE 1 Certificates

Inspection certificates shall be provided in accordance with ISO 10474 or EN 10204.

NOTE 2 Traceability

A. Level I — Full traceability — Material is uniquely identified and its history tracked from manufacture through stockists (where applicable) to the vendor and to actual position on the equipment with specific location defined on a material placement record (the traceability to a specific location only applies to skids / packaged equipment, not to bulks).

B. Level II — Type traceability — The vendor maintains a system to identify material throughout manufacture, with traceability to a material certificate.

C. Level III — Compliance traceability — The vendor maintains a system of traceability that enables a declaration of compliance to be issued by the vendor.

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