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Quality Requirements for Centrifugal Pumps



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Foreword

This specification was prepared under a Joint Industry Project 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). Ten key oil and gas companies from the IOGP membership participated in developing this specification under JIP33 Phase 2 with the objective to leverage and improve industry level standardization for projects 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, based on the ten participating members’ company specifications, resulting in a common and jointly approved specification, and building on recognized industry and international standards.

This specification has been developed in consultation with a broad user and supplier base to promote the opportunity to realize benefits from standardization and achieve significant cost reductions for upstream project costs. The JIP33 work groups performed their activities in accordance with IOGP’s Competition Law Guidelines (November 2014).

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 vision from the CPC industry is to standardize specifications for global procurement for equipment and packages, facilitating improved standardization of major projects across the globe. While individual oil and gas companies have been improving standardization within their own businesses, this has limited value potential and the industry lags behind other industries and has eroded value by creating bespoke components in projects. This specification aims to significantly reduce this waste, decrease project costs and improve schedule through pre-competitive collaboration on standardization.

Following agreement of the relevant JIP33 work group and approval by the JIP33 Steering Committee, the IOGP Management Committee has agreed to the publication of this specification by IOGP. Where adopted by the individual operating companies, this specification and associated documentation aims to supersede existing company documentation for the purpose of industry-harmonized standardization.

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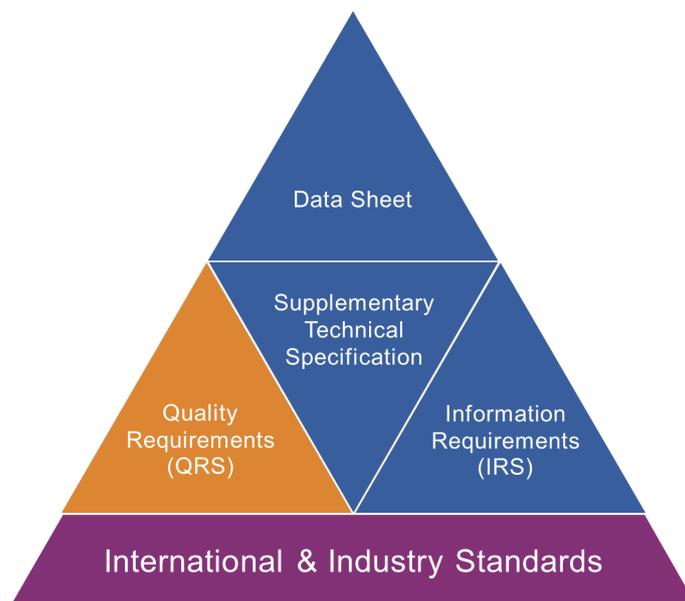
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Introduction

The purpose of this quality requirements specification (QRS) is to define quality management requirements for the supply of centrifugal pumps in accordance with IOGP S-615 Supplementary Specification to ANSI/API Standard 610 Centrifugal pumps for application in the petroleum and natural gas industries.

The QRS includes a conformity assessment system (CAS) which specifies standardized purchaser interventions against quality management activities at four different levels. The applicable CAS level is specified by the purchaser in the equipment datasheet.

This QRS shall be used in conjunction with the supplementary requirements specification (S-615), information requirements specification (S-615L) and equipment data sheets (S-615D) which together comprise the full set of specification documents. The Introduction section in the supplementary requirements 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 Supplementary Specification to ANSI/API Standard 610 Centrifugal Pumps including:

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

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.

ISO 9001:2015	Quality management systems - Requirements
API Specification Q1	Specification for Quality Management System Requirements for Manufacturing Organisations for the Petroleum and Natural Gas Industry
ANSI/API Std 610 11 th Edition	Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries
IOGP S-615	Supplementary Specification to ANSI/API Standard 610 Centrifugal Pumps

3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 9000:2015 (normative to ISO 9001:2015) and the following shall apply. To align with the definitions used in ANSI/API Std 610 the term “purchaser” is used in place of “customer” and the term “vendor” in place of “supplier”.

3.1 Conformity assessment

Demonstration that requirements relating to a product, process, system, person or body are fulfilled.

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

NOTE 2 Assessment activities may be undertaken at a vendor or sub-vendor’s premises, virtually by video link, desktop sharing etc. or by review of information formally submitted for acceptance or for information.

3.2 Conformity assessment system (CAS)

Systems providing different levels of assessment of the vendor’s control activities by the purchaser (second party) or independent body (third party) based on evaluation of the vendor’s capability to conform to the product or service specification and obligatory requirements. The applicable CAS level is specified by the purchaser in the data sheet.

NOTE CAS A reflects the highest risk and associated extent of verification. CAS D is the lowest.

3.3 Conformity assessment – witness point (W)

Inspection or test where the purchaser is notified of the timing of the inspection or test and a hold is placed on the inspection and test until the purchaser or purchaser's representative is in attendance (ANSI/API Std 610, 3.64)

3.4 Conformity assessment – observed (O)

Inspection or test where the purchaser is notified of the timing of the inspection or test and it is performed as scheduled regardless of whether the purchaser or purchaser's representative is present (ANSI/API Std 610, 3.38).

3.5 Conformity assessment – surveillance (S)

Observation, monitoring or review by the purchaser or purchaser's representative of an activity, operation, process, product or associated information.

3.6 Conformity assessment – review (R)

Review of the vendor's information by the purchaser or purchaser's representative to determine conformity to requirements.

NOTE Information review requirements are managed on a surveillance basis, and as such do not impose schedule constraints, unless specified as hold points in Annex A, or as conditions specified in the associated IRS.

4 Symbols and abbreviations

For purposes of this document, the following abbreviation applies:

CAS	Conformity assessment system
IRS	Information requirements specification
QRS	Quality requirements specification (this document)

5 Quality requirements

5.1 Quality management system

The vendor shall demonstrate that the quality management arrangements established for the supply of products or services conform to ISO 9001, API Specification Q1 or equivalent quality management system standard agreed with the purchaser.

5.2 Conformance assessment

Quality plans or inspection and test plans developed as outputs to operational planning and control for the products or services shall define the specific controls to be implemented by the vendor and when applicable, sub-vendors, to ensure conformity with the specified requirements.

Controls will address both internally and externally sourced processes, products and services

Quality plans and inspection and test plans shall include provisions for the purchaser CAS; see Annex A, as specified in the data sheet or purchase order.

Vendor performance in meeting the requirements will 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.

NOTE 1 For industrial well proven solutions CAS level D is specified unless risk assessment indicates that a more stringent CAS-level is required.

NOTE 2 Irrespective of the CAS level defined by the purchaser, either, by reference to standard and specification requirements or in the scope, the vendor remains responsible for operational planning and control and demonstration of the conformity of products and services with the requirements (see ISO 9001, 8.1, 8.2).

6 Traceability

Material certification and traceability shall be provided in accordance with Annex B.

7 Control of nonconforming products and services

Nonconformance with specified requirements identified by or to the vendor prior to or during the delivery of the products and services shall be corrected such that the specified requirements are satisfied or the purchaser's acceptance of the nonconformance agreed in accordance with purchase order conditions. See ISO 9001, 8.2.3, 8.2.4, 8.5.6, 8.7

8 Evidence (records)

Plans, procedures, methods, resultant records shall be provided in accordance with the associated IRS.

Annex A Purchaser conformity assessment requirements

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

The vendor shall provide for the specified CAS when developing quality plans and inspection and test plans in accordance with Clause 5.

	PURCHASER ASSESSMENT ACTIVITIES	CAS			
		A	B	C	D
1	Planning and Control Activities				
1.1	Quality plan (ISO 9001, 8.1 and ISO 10005)	R	R	R	
1.2	Inspection and test plan (ISO 9001, 8.1 and ISO 10005)	R	R	R	R
1.3	Kick-off, pre-production and pre-inspection meeting	W	O		
2	Design and Development Activities				
2.1	Design verification review as required (ISO 9001, 8.3). Review that manufacture is against accepted revision of documents.	R	R	R	
2.2	Weld procedure specification and procedure qualification records (ANSI/API Std 610, Table 11) or as specified in IOGP S-615D	R	R	R	
2.3	Non-destructive examination procedures (ASME BPVC V, Non-destructive examination and ANSI/API Std 610, Table 15) or as specified in IOGP S-615D	R	R	R	
2.4	Raw materials used in the construction of pump parts comply with requirements of (ANSI/API Std 610, Annex H) or as specified in IOGP S-615D	R	R	R	
3	Control of External Supply				
3.1	External supply scope, risk assessment and controls (ISO 9001, 8.4)	R	R	R	
4	Materials and Component Manufacturing				
4.1	Material certification and traceability (ANSI/API Std 610, 6.12.1.8, 6.12.4.3 and 8.2.2.7, Tables H.2 and H.4 and IOGP S-615, 6.12.1.8 and 8.2.2.7 when specified in IOGP S-615D)	S	R	R	R
4.2	Surfaces of castings (ANSI/API Std 610, 6.12.2.1)	O	S		
4.3	Compliance of welding materials (ASME BPVC.II Part C)	S	S		
4.4	Fabrication				
4.4.1	Baseplate manufacture (ANSI/API 610, 7.3 and IOGP S-615, 7.3) flatness and coplanarity of baseplate equipment mounting pads	O	S	R	
4.5	Inspection, testing and verification activities (ANSI/API Std 610, 8.2 and 8.3 and IOGP S-615, 8.2 and 8.3)				
4.5.1	All welders have been qualified on approved welding procedures (ANSI/API Std 610, Table 11) or as specified in IOGP S-615D	R	R	R	
4.5.2	Weld repair procedure (excluding major weld repairs) (ANSI/API Std 610, 6.12.2 and IOGP S-615, 6.12.2)	R	R	R	R
4.5.3	Weld repair procedure (major) maps and other specified documentation (ANSI/API Std 610, 6.12.2.5 and IOGP S-615, 6.12.2.5) if specified in IOGP S-615D	W	W	R	R
4.5.4	Inspection of major weld repairs (ANSI/API Std 610, 6.12.2.3 and IOGP S-615, 6.12.2.3, 6.12.2.5)	O	O	S	R

	PURCHASER ASSESSMENT ACTIVITIES	CAS			
		A	B	C	D
4.5.5	Non-destructive examination personnel performing non-destructive examinations are qualified and certified in accordance with the requirements of Article 1, Section V of ASME BPVC	R	R	R	
4.5.6	Pressure casing inspection including all welds associated with the casing (ANSI/API Std 610 Table 14 and IOGP S-615, Table 14) or as specified in IOGP S-615D. Inspection timing (ANSI/API Std 610, 8.2.2.3)	O	S	R	
4.6	Non-destructive examinations of component parts (ANSI/API Std 610, 6.12.1.5 and 8.2.1.3) if specified in IOGP S-615D	O	R	R	
4.7	Positive material identification (ANSI/API Std 610, 8.2.2.8 and IOGP S-615, 8.2.2.8) and other parts specified in IOGP S-615D	O	S	R	
4.8	Verify that the heat treatments, including PWHT, have been performed (ANSI/API Std 610, Table 11) or as specified in IOGP S-615D	R	R	R	
4.9	Shaft and rotors (ANSI/API Std 610, 6.6, 9.3.3.1 and 9.3.12.2 d, Tables 17 and 19)	O	O	R	
4.10	Rotating component balancing (ANSI/API Std 610, 6.9.4, 9.1.3.7 and 9.2.4 and IOGP S-615, 6.9.4, 9.1.3.7 and 9.2.4) or as specified in IOGP S-615D	R	R		
4.11	Wear rings and running clearance verification (ANSI/API Std 610, Table 6 and IOGP S-615, 6.7.4)	R	R	R	
4.12	Cleanliness check prior to final assembly (ANSI/API Std 610, 8.2.2.6) if specified in IOGP S-615D	O	S	S	
4.13	Inspection and test equipment calibration certificates	R	R	R	
4.14	Hydrostatic testing activities (ANSI/API Std 610, 8.3.2 and IOGP S-615, 8.3.2)	W	W	O	R
4.15	Performance testing (ANSI/API Std 610, 8.3.3 and IOGP S-615, 8.3.3) or as specified in IOGP S-615D	W	W	O	R
4.16	NPSH or submergence testing (ANSI/API Std 610, 8.3.4.3 and IOGP S-615, 8.3.4.3) if specified in IOGP S-615D	W	O	O	R
4.17	Mechanical run testing (ANSI/API Std 610, 8.3.4.2 and IOGP S-615, 8.3.4.2)	W	O	O	R
4.18	Sound level testing (ANSI/API Std 610, 8.3.4.5) if specified in IOGP S-615D	W	O	S	R
4.19	Complete unit testing (ANSI/API Std 610, 8.3.4.4) if specified in IOGP S-615D	W	W	O	R
4.20	Auxiliary equipment testing (ANSI/API Std 610, 8.3.4.6) if and as specified in IOGP S 615D	O	S	R	R
4.21	Bearing housing resonance test (ANSI/API Std 610, 8.3.4.7) if specified in IOGP S-615D	W	O	R	R
4.22	Structural resonance test (ANSI/API Std 610, 9.3.9.2) if specified in IOGP S-615D	W	O	R	R
4.23	Disassembly after testing (ANSI/API Std 610, 8.3.3.8) if specified in IOGP S-615D	W	O	S	R
4.24	Hydrodynamic bearing inspection after testing (ANSI/API Std 610, 9.2.7.5 and IOGP S-615, 9.2.7.5)	W	O	S	
4.25	Surface preparation and painting (ANSI/API Std 610, 6.12.2.1, 7.3.12, 8.4.2.4 and IOGP S-615, 6.1.37.3, 8.4.2.4, 9.3.8.3.3) or as specified in IOGP S-615D	W	O	R	

	PURCHASER ASSESSMENT ACTIVITIES	CAS			
		A	B	C	D
5	Release of Product or Service				
	Verify conformity to PO including as applicable				
5.1	Final Inspection				
5.1.1	Complete skid overall dimensions including holding down bolt hole and connection locations	W	W	O	O
5.1.2	Couplings and guards (ANSI/API Std 610, 9.3.8.2.1, 7.2.1.3 and 7.2.3 and IOGP S-615, 7.2.3)	W	W	O	O
5.1.3	Pump nameplate and rotation arrows (ANSI/API Std 610, 6.13 and IOGPS-615, 6.13)	W	W	O	O
5.2	Loose ship items, spares and special tools as applicable	W	W	O	O
5.3	Nozzle force and moments testing (ANSI/API Std 610, 7.3.21) if specified in IOGP S-615D	W	O	R	R
5.4	Preparation of preservation, packing and storage (ANSI/API Std 610, 8.4 and IOGP S-615, 8.4.2) or as specified IOGP S-615D	W	O	S	
5.5	Final documentation review as per IOGP S-615L	R	R	R	R
5.6	Inspection release note	W	W	W	W
	W is witness point, O is observed point, S is surveillance and R is review of documentation. Definitions are provided in Clause 3.				

Annex B Material traceability and certification requirements

Item		Certificate Type	Material Traceability level	Additional Requirements
Centrifugal Pump	Metallic Components ANSI/API Std 610, Annex H or as specified in IOGP S-615D	3.1	Level II	NACE MR0175 (all parts) or NACE MR0103 if and as specified in IOGP S-615D. Refer to IOGP S-615, 6.12.1.8
	Non Metallic Components ANSI/API Std 610 Annex H or as specified in IOGP S-615D	2.2	Level II	Type 3.2 Certification is applicable as per the Design Requirements

Material inspection certificates shall be provided in accordance with Table 1 of ISO 10474 or Table A.1 of EN 10204.

Explanatory notes:

- A. "2.2" Test Report - A document in which the vendor declares that the products supplied are in compliance with the requirements of the PO, and in which test results are supplied based on non-specific inspection and testing.
- B. "3.1" Inspection Certificate - A document with test results based on specific inspection and testing, issued by the vendor and validated by the vendor's authorised inspection representative independent of the manufacturing department.
- C. "3.2" Inspection Certificate - A document prepared by both the vendor's authorised inspection representative, independent of the manufacturing department, and either the purchaser nominated representative or the inspector designated by the regulations in which they declare that the products supplied are in compliance with the requirements of the order and for which test results are supplied.
- D. Additionally, purchaser has specified that all material product testing associated with "3.2" Inspection Certificates be performed in the presence of either a purchaser nominated representative or the inspector designated by the regulations, and the resultant test report stamped as "Witnessed". Failure to adhere to this requirement may lead to rejection of all material(s) being qualified for production.
- E. Level I - Full Traceability - Material is uniquely identified and its history tracked from manufacture through stockist (where applicable) to 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)
- F. Level II - Type Traceability - vendor maintains a system to identify material throughout manufacture, with traceability to a material certificate.
- G. Level III - Compliance Traceability - vendor maintains a system of traceability that enables a Declaration of Compliance to be issued.

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