International Association of Oil & Gas Producers

SPECIFICATION
S-612Q

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Quality Requirements for Packaged, Integrally Geared Centrifugal Air Compressors

Revision history

VERSION	DATE	AMENDMENTS
1.0	November 2018	Issued for Publication

Acknowledgements

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

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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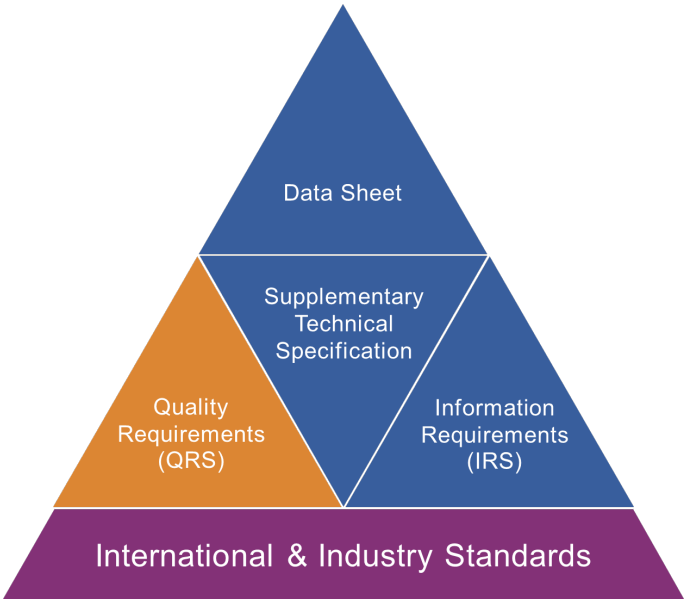
Introduction

The purpose of this quality requirements specification (QRS) is to define quality management requirements for the supply of packaged, integrally geared centrifugal air compressors in accordance with IOGP S-612 Supplementary Specification to API Standard 672 Packaged, Integrally Geared Centrifugal Air Compressors.

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

This QRS shall be used in conjunction with the supplementary requirements specification (IOGP S-612), the information requirements specification (IOGP S-612L) and the equipment data sheets (IOGP S-612D) 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 packaged, integrally geared centrifugal air compressors to IOGP S-612 Supplementary Specification to API Standard 672 packaged, integrally geared centrifugal air compressors including:

a) vendor quality management system requirements;

b) purchaser conformity assessment (surveillance and inspection) activities;

c) traceability requirements;

d) evidence of conformity;

e) factory acceptance.

2 Normative references

For the purpose of this document, the documents referenced in IOGP S-612 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 Industries
API Std 672 4th Edition	Packaged, Integrally Geared Centrifugal Air Compressors
IOGP S-612	Supplementary Specification to API Standard 672 Packaged, Integrally Geared Centrifugal Air Compressors

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 API Std 672 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 (API Std 672, 3.36).

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 (API Std 672, 3.18).

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 documentation 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 9001:2015, API Specification Q1 or equivalent quality management system standard agreed with the purchaser.

5.2 Conformance assessment

Quality plans and 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 conformance with the specified requirements.

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

Quality plans or 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 (ISO 9001, 8.1 and 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 manufacturer prior to or during the delivery of the products and services shall be corrected such that the specified requirements are satisfied or the user's acceptance of the nonconformance agreed in accordance with purchase order conditions. See ISO 9001, 8.2.3, 8.2.4, 8.5.6 and 8.7.

8 Evidence (conformance records)

Plans, procedures, methods and 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 section 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)	W	R		
1.2	Inspection and test plan (ISO 9001, 8.1 and ISO 10005)	W	R	R	R
1.3	Kick-off, pre-production and pre-inspection meeting	W	R		
2	**Design and Development Activities**				
2.1	Review of vendor package design	W	R	R	
2.2	Weld procedure specification and procedure qualification records (ASME BPVC IX-2017 or ANSI/ASME B31.3 or AWS D1.1) as per requirements of API Std 672, 6.10.4 and API Std 614 Part 1, 4.6	W	R	R	
2.3	Non-destructive examination procedures (ASME BPVC V-2017 Non-destructive Examination, ASTM E94 , ASTM E709, API RP578) for compressor components, as per requirements of API Std 614 Part 1, 7.2.2	W	R	R	
2.4	Repair procedures for welds and castings (API Std 672, 6.10.4)	W	R	R	
2.5	Test procedures; (API Std 672, 8.3.2, 8.3.3 & 8.3.4; S-612, 8.3.2, 8.3.3, 8.3.4 and IEC 60034-1)	R	R	R	R
3	**Control of External Supply**				
3.1	External supply scope, risk assessment and controls (ISO 9001, 8.4)	W	R	R	
4	**Materials and Component Manufacturing**				
4.1	Review material certification see Annex B	W	R	R	R
4.2	Testing of low voltage electric motors (IEC 60034-1, 19.1)	R	R	R	
4.3	Testing of medium voltage electric motors (IOGP S-612, 7.1.2.3)	O	O	R	
4.4	Hydro test of compressor casing (API Std. 672, 8.3.2 and IOGP S-612, 8.3.2)	O	R	R	R
4.5	Impeller over speed test (API Std 672, 8.3.3.1)	O	R	R	
4.6	Non-destructive examination of impeller post over speed test (API Std 672, 8.3.3.2 and IOGP S-612, 8.3.3.2)	O	R	R	
4.7	Rotor balancing and vibration (API Std 672, 6.7.4 and IOGP S-612, 6.7.4)	O	R		
4.8	Compressor thermodynamic performance test (ASME PTC-10 or ISO 5389 and API Std 672, 8.3.4.1)	O	R	R	
4.9	Hydrotest of pressure casing and fabricated pressure equipment (API Std 672, 8.3.2.1 and IOGP S-612, 8.3.2.1)	O	R	R	R
4.10	Lube oil system flushing (API Std 614 Part 1, D3.3 and API Std 614 Part 3, 7.3.3.8)	O	R	R	
4.11	Review component certification for electrical and control equipment (CE, UL, Hazardous area, type tests)	O	R	R	

	PURCHASER ASSESSMENT ACTIVITIES	CAS			
		A	B	C	D
5	**Fabrication**				
5.1	Baseplate manufacture dimensional verification per drawings (API Std 672, 8.3.5)	O	S		
5..2	Fabricate piping and assemble components (API Std 614 Part 1, Section 5)	S	S	S	
6	**Package Inspection, Testing and Verification Activities**				
6.1	Mechanical completion, assembly and material documentation (API Std 672, 8.2.2 and IOGP S-612, 8.2.2)	W	R	R	R
6.2	Hydro and pneumatically test assembly (API Std 614 Part 1, 7.3.2)	S	R	R	R
6.3	Functional and logic check of control panel and external control interfaces (API Std 672, 8.3.4.5.5)	W	O	R	
6.4	Combine mechanical and performance test, including noise test for package (API Std 672, 8.3.4 and IOGP S-612, 8.3.4)	W	W	O	O
7	**Release of Product or Service**				
7.1	Final inspection, visual and dimensional inspection completeness against PO and approved drawings and ITP, weight and certificate of conformity. (API Std 672, 8.3.5)	W	O	S	S
7.2	Preparation for shipment, preservation and storage, and inspection release. (API Std 672, 8.4)	W	O	R	R
7.3	Final documentation review; as per IOGP S-612L	W	R	R	R
	W is witness point, O is observed point, S is surveillance and R is review. Note: Definitions for these terms are provided in Clause 3.				

Annex B Material traceability and certification requirements

Item		Certificate Type	Material Traceability level	Additional Requirements
Air compressor package	Core compressor components, casing, impellers, pinions, bull gear, rotor shaft	3.1	Level II	
	Remaining materials	2.2	Level III	

Explanatory notes:

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

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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