

Quality Requirements for Air-cooled Heat Exchangers

Revision history

VERSION	DATE	PURPOSE
1.0	June 2020	Issued for Use

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 2014).

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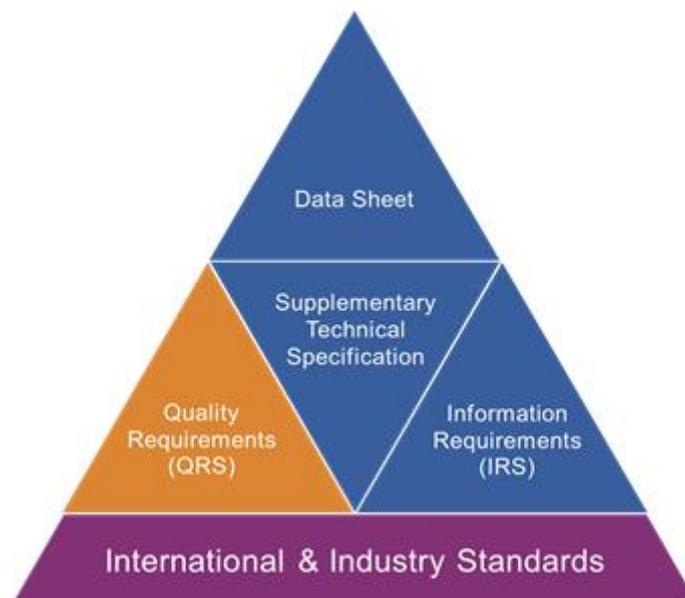
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Introduction

The purpose of this quality requirements specification (QRS) is to define quality management requirements for the procurement of air-cooled heat exchangers in accordance with IOGP S-710 for application in the petroleum and natural gas industries.

The QRS includes definition of 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 data sheet or purchase order.

This QRS shall be used in conjunction with the supplementary requirements specification IOGP S-710, the information requirements specification IOGP S-710L and the equipment data sheet IOGP S-710D 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 air-cooled heat exchangers to IOGP S-710 Supplementary Specification to API Standard 661 Air-cooled Heat Exchangers including:

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

2 Normative references

For the purpose of this document, the documents referenced in IOGP S-710, API 661 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*

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

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

API 661:2013, *Petroleum, Petrochemical and Natural Gas Industries -- Air-cooled Heat Exchangers*

IOGP S-710, *Supplementary Specification to API Standard 661 Air-cooled Heat Exchangers*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in IOGP S-710, API 661, ISO 9000:2015 (normative to ISO 9001) and the following shall apply.

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/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)

System 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

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

3.3 Conformity assessment - Hold point (H)

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 Conformity assessment - Witness point (W)

Point in the chain of activities that the Vendor shall notify the Purchaser or Purchaser's representative before proceeding. The operation or process may proceed without witness if the Purchaser does not attend after the agreed notice period.

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 to verify conformance 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 symbols and abbreviations apply:

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 and services conform to ISO 9001, ISO 29001, API Specification Q1 or an equivalent quality management system standard.

5.2 Conformance assessment

5.2.1

Quality plans and inspection and test plans developed as outputs to operational planning and control shall define the specific controls to be implemented by the Vendor to ensure conformance with the specified requirements.

5.2.2

Controls shall address both internally and externally sourced processes products and services.

5.2.3

Quality plans and inspection and test plans shall include provision for the purchaser conformity assessment system (CAS) as specified in the data sheet. See Annex A.

5.2.4

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

NOTE 2 Irrespective of conformity assessment requirements defined by the Purchaser, either, by reference to standard or 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 9001:2015, 8.1 and 8.2.

6 Certification and traceability

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

7 Control of nonconforming products and services

Nonconformance with specified requirements identified by or to the Vendor 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 and 8.7.

8 Evidence (conformance records)

Plans, procedures, methods and resultant records shall be provided 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	Planning and control activities				
1.1	Quality planning (ISO 9001, API Q1, ISO 29001, 8.1 and ISO 10005)	H	H	R	-
1.2	Inspection and test planning (ISO 9001, API Q1, ISO 29001, 8.1 and ISO 10005)	H	H	R	R
1.3	Pre-Inspection/Pre-production planning	H	H	W	-
2	Design and development activities				
2.1	Design calculation (S-710, 6.1.3)	H	H	H	W
2.2	General arrangement drawing (S-710, 6.1.1)	H	H	H	W
2.3	Bundle and auxiliary structure detail drawing (S-710, 6.1.2)	H	H	H	W
2.4	Welding procedure specification (WPS) (S-710, 6.1.4)	H	H	R	S
2.5	Procedure qualification record (PQR) (S-710, 6.1.4)	H	H	R	S
2.6	Welder qualification records (S-710, 9.1.1.1)	R	R	R	S
2.7	Non-destructive examination personnel qualification records (S-710, 6.1.1)	R	R	R	S
3	Control of external supply				
3.1	External supply scope, risk assessment and controls (e.g. tube bending, etc.) (ISO 9001, 8.4) (S-710, 6.1.1, 7.1.11.11, 7.1.11.12)	H	R	R	-
4	Production and service provision				
4.1	Starting materials verification				
4.1.1	Component or material thickness or size verification, material traceability to original marking, material certification (including heat treatment certification), chemical and mechanical properties, testing and conformity (S-710, 6.1.1)	H	R	S	S
4.2	Component manufacture				
4.2.1	Cutting, forming and machining applied on plates and nozzles, tube sheets, plugs, plug-sheets, etc. (S-710, 8.1.1)	S	S	-	-
4.2.2	Weld edge preparation, fit-up, tack welding, welding and assembly of fabricated components (header box plates, pass partition plates, nozzle flange to neck, nozzle neck to header box) (S-710, 9.1.1.1)	W	S	S	-
4.2.3	Inspection of tube fin outside diameter, fin thickness, fin density, fin material, mechanical testing (if applicable) on fins (S-710, 7.1.11.14, 7.1.11.15, 7.1.11.8)	S	S	-	-
4.2.4	Repairs of defects in materials (S-710, 4.1)	H	W	R	S
4.2.5	Post weld heat treatment (if applicable) (S-710, 7.1.11.12, 9.2.1)	W	W	R	R
4.3	Assembly				
4.3.1	Dimensional verification including tolerances, ratings sizing, etc. of fan, fan shaft, motor, drive system, fan ring components after assembly (S-710, 9.7)	H	W	W	S

4.3.2	Final assembly or modular design, if applicable (S-710, 9.7)	H	W	W	S
4.4	Inspection and testing				
4.4.1	Non-destructive examination of plate and forging (S-710, 10.1.6)	W	R	S	S
4.4.2	Ferrite testing (S-710, 10.1.13)	W	R	S	S
4.4.3	Production weld hardness testing (S-710, 10.1.7)	W	R	S	S
4.4.4	Inspection and non-destructive examination of all completed pressure welds including tube-to-tubesheet joint (S-710, 10.1.1)	H	W	R	R
4.4.5	Dimensional check of tube wall thickness reduction after tube expansion (S-710, 9.3.3.4, 9.3.3.5)	W	W	R	R
4.4.6	Destructive test results (when applicable), tube-to-tubesheet joint mock up, tube bending qualification (S-710, 9.3.4.3)	W	S	S	-
4.4.7	Hydrostatic test (S-710, 10.2.1)	H	H	W	R
4.4.8	Flatness and surface roughness check of gasket surfaces of plugs, header flanges, nozzle flanges, after completion of all welding and heat treatment (if required) (S-710, 9.4.1, 9.4.2, 9.4.3)	S	S	S	-
4.4.9	Surface preparation, painting and coating (If applicable) (S-710, 10.2.4, 11.1.4)	S	S	S	-
4.4.10	Shop run-in test, as applicable, including vibration and noise. (S-710, 10.3)	H	W	W	R
5	Release of product or service				
5.1	Final inspection including nameplate and stamping (if applicable) (S-710, 10.5.1, 10.5.2, 10.5.3)	W	W	R	-
5.2	Packing of loose ship item, spares parts, special tools as applicable (S-710, 6.1.1, 10.2.4)	W	W	R	-
5.3	Preservation and packing (S-710, 11.1.1, 11.1.2, 11.1.3, 11.1.4)	W	W	S	-
5.4	Final documentation review (S-710, 6.2.1, 6.2.2)	R	R	R	R
5.5	Release note (S-710, 6.2.1, 6.2.2)	H	H	H	H
<p>H is hold point, W is witness point, S is surveillance and R is review. Note: Definitions for these terms are provided in Section 3 of this document.</p>					

Annex B (normative) Material traceability and certification requirements

Item		Certificate Type	Traceability level	Additional Requirements
Heat Exchanger	Pressure Parts	3.1	Level II	
	Structural Components	2.2	Level II	
	External welded attachments	3.1	Level II	
	Welding Consumables - Electrodes, rods and wire	3.1	Level II	
	Welding consumable - Flux	2.2	Level II	

Explanatory notes

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

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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