



International  
Association  
of Oil & Gas  
Producers

SPECIFICATION  
IOGP S-713Q

May 2024  
Version 1.1

# Quality Requirements for Special-purpose Gears (API)

Public Review Draft



## Revision history

VERSION	DATE	PURPOSE
1.1	May 2024	Issued for Public Review
1.0	July 2020	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).

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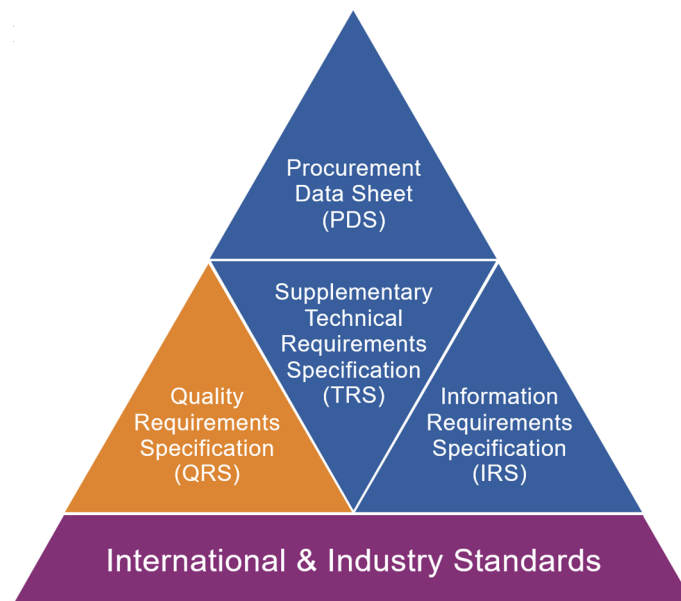
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## Introduction

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 special-purpose gears in accordance with IOGP S-713 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 (PDS) or purchase order.

The IOGP S-713 specification documents follow a common structure (as shown below) comprising a specification, also known as a technical requirements specification (TRS), a PDS, an information requirements specification (IRS) and this QRS. These four specification documents, together with the purchase order, define the overall technical specification for procurement.



### **JIP33 Specification for Procurement Documents Quality Requirements Specification (QRS)**

This QRS is to be applied in conjunction with the specification, the PDS and the IRS, referred to in this document as IOGP S-713, IOGP S-713D and IOGP S-713L respectively. Further information on the purpose of these documents and the order of precedence for their use is provided in the introduction of the specification.

## 1 Scope

This QRS specifies quality management requirements for the supply of special-purpose gears to IOGP S-713 including:

- a) vendor quality management system (QMS) 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-713 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.

ANSI/AGMA/ISO 1328-1, *Cylindrical Gears - ISO System Of Accuracy - Part 1: Definitions And Allowable Values Of Deviations Relevant To Corresponding Flanks Of Gear Teeth*

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

API Standard 670, *Machinery Protection Systems*

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

IOGP S-713, *Supplementary Specification to API Standard 613 for Special-purpose Gears*

ISO 9000, *Quality management systems — Fundamentals and vocabulary*

ISO 9001, *Quality management systems — Requirements*

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

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

## 3 Terms, definitions and abbreviated terms

For the purpose of this document, the terms and definitions given in IOGP S-713 and ISO 9000:2015 (normative to ISO 9001:2015) and the following shall apply.

### 3.1 Terms and definitions

#### 3.1.1

##### **conformity assessment**

demonstration that specified requirements are fulfilled

Note 1 to entry: "Conformity assessment" is also referred to as "assessment".

Note 2 to entry: Conformity assessment includes review, inspection, verification and validation activities.

Note 3 to entry: Conformity assessment activities may be undertaken at a vendor/sub-vendor premises, virtually by video link, desktop sharing, etc. or by review of information.

### 3.1.2 conformity assessment system

#### CAS

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

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

### 3.1.3 hold point

#### H

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

### 3.1.4 witness point

#### W

<conformity assessment> point in the chain of activities at which the vendor 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.

### 3.1.5 surveillance

#### S

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

### 3.1.6 review

#### R

<conformity assessment> review of the vendor's records, procedures, and supporting information to verify and/or validate conformance to requirements

## 3.2 Abbreviated terms

CAS	conformity assessment system
IRS	information requirements specification
ITP	inspection and test plan
MRT	mechanical running test
PDS	procurement data sheet
PWHT	post-weld heat treatment
QMS	quality management system
QRS	quality requirements specification

## **5 Quality requirements**

### **5.1 Quality management system (QMS)**

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

### **5.2 Conformity assessment system (CAS)**

#### **5.2.1**

The 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 the vendor's 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 PDS or purchase order. See Table A.1.

#### **5.2.3**

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

#### **5.2.4**

If any subcontracted or scope of supply occurs outside of the primary supplier location, it shall include interventions within the primary ITP or secondary ITP. It is discouraged to use "hold" (H) within Table A.1, section 3.0 and recommended to use "surveillance" (S).

## **6 Certification and traceability**

Material certification and traceability shall be maintained in accordance with Table B.1.

## **7 Evidence — conformance records**

Documents and information shall be provided for in accordance with IOGP S-713L.



## Annex A (normative)

### Purchaser conformity assessment requirements

Table A.1 defines four CAS or levels of purchaser assessment.

**Table A.1 — Purchaser conformity assessment requirements**

Purchaser assessment activities		CAS			
		A	B	C	D
<b>1</b>	<b>Operational planning and control activities</b>				
1.1	Attend pre-inspection/pre-production planning meeting (IOGP S-713, 8.1.2.2)	H	H	W	W
1.2	Inspection and test planning (IOGP S-713, 8.1, Annex H)	H	H	R	R
<b>2</b>	<b>Design and development activities</b>				
2.1	Final design				
2.1.1	Design review meeting (IOGP S-713, 8.1.2.2)	H	H	R	R
2.2	Manufacturing qualification				
2.2.1	No applicable activities	-	-	-	-
<b>3</b>	<b>Externally provided products and services (outsourced)</b>				
3.1	Verify external supply scope, if applicable (IOGP S-713, 8.1.2.5, 8.1.2.6)	H	R	R	R
3.2	Gear vendor witness shaft alignment, if specified (IOGP S-713, 6.1.15)	W	W	W	W
<b>4</b>	<b>Production and service provision</b>				
4.1	Inspection and test activities as per IOGP S-713				
4.1.1	Final assembly, maintenance and running clearance measurements (IOGP S-713, 8.2.1.1 i)	W	S	S	S
4.1.2	Painting and coating inspection of gear unit exterior surfaces (IOGP S-713, 8.4.3.2, 8.4.3.4)	S	S	S	S
4.2	Component manufacture				
4.2.1	Major weld repair of gear unit components (IOGP S-713, 6.9.2.1, 6.9.2.3)	H	H	H	H
4.2.2	Non-destructive examinations of component parts (IOGP S-713, 6.7.1.5, 6.9.2.3, 8.2.2.6.1, 8.2.2.7.2)	W	S	S	S
4.2.3	Heat treatments, including post-weld heat treatment (PWHT) and stress relieving (IOGP S-713, 6.9.3.1, 6.9.3.2, 8.2.1.1)	W	S	S	S
4.2.4	Gear and pinion tooth surface finish (IOGP S-713, 6.5.1.2)	W	S	S	S
4.2.5	Gear and pinion tooth hardness verification (IOGP S-713, 8.2.3.3)	W	S	S	S
4.2.6	Gear and pinion tooth contact check and tape lift (IOGP S-713, 6.5.2.2, 8.3.2.1.0)	H	W	S	S

**Table A.1** (continued)

Purchaser assessment activities		CAS			
		A	B	C	D
4.2.7	Gear accuracy check as per ANSI/AGMA/ISO 1328-1 (IOGP S-713, 6.5.2.1)	H	W	R	R
4.2.8	Double helical gear axial stability check (IOGP S-713, 6.5.2.3)	H	W	S	S
4.2.9	Additional inspection and testing of integral forged gears (IOGP S-713, 6.5.3.3)	H	W	S	S
4.2.10	Gear and pinion dynamic balancing check (IOGP S-713, 6.5.5.1)	H	W	S	S
4.2.11	Residual unbalance check in balancing machine (IOGP S-713, 6.5.5.4, 8.3.2.1.0)	W	W	W	W
4.2.12	Electrical and mechanical run out measured in the shaft (IOGP S-713, 6.5.4.3.8, 8.3.2.1.0)	W	S	S	S
4.3	Sub-assembly				
4.3.1	Cleanliness inspection of equipment prior to final assembly (IOGP S-713, 6.9.1.7, 8.2.3.1)	W	S	S	S
4.3.2	Oil system cleanliness (IOGP S-713, 8.2.3.2)	W	S	S	S
4.3.3	Gear unit nameplate and rotation arrows (IOGP S-713, 6.10)	S	S	S	S
4.3.4	Installation of vibration, position and acceleration detectors, and temperature detectors in accordance with API Std 670 (IOGP S-713, 8.3.2.1.9)	S	S	S	S
4.3.5	Joint and connection tightness test (IOGP S-713, 8.3.2.1.5)	W	-	-	-
4.4	Assembly				
4.4.1	Complete gear unit overall dimensions including holding down bolt hole and connection locations (IOGP S-713, D.2.2.1 e)	W	W	W	W
4.4.2	Special tools with applicable certificates (IOGP S-713, 7.6)	S	-	-	-
4.5	Final tests, including mechanical running test (MRT)				
4.5.1	Mechanical running test of main rotor set including specified optional tests (IOGP S-713, 8.1.2.3, 8.3.2, 8.3.4)	H	H	H	H
4.5.2	Mechanical running test of spare rotor set, if applicable (IOGP S-713, 8.3.2.2.16, 8.3.2.2.17)	H	H	H	H
4.5.3	Review and approval of vibration data taken during mechanical running test as an acceptance criterion before finalizing the test (IOGP S-713, 8.3.2, Table 9)	H	H	H	H
4.5.4	Inspection following test: hydrodynamic bearing removal and inspection (IOGP S-713, 8.3.2.3.3)	H	H	H	H
4.5.5	Inspection following test: dismantle-reassembly inspection of gear unit (IOGP S-713, 8.3.2.3.1, 8.3.2.3.2)	H	H	H	H

Table A.1 (continued)

Purchaser assessment activities		CAS			
		A	B	C	D
<b>5</b>	<b>Final inspection</b>				
5.1	Conformance to purchaser order including the following as applicable				
5.1.1	Spare elements storage container and preservation (if purchased) (IOGP S-713, 8.4.3.11, 8.4.3.17)	S	S	S	S
5.1.2	Verify complete inspection and testing plan (ITP) prior to shipment by inspector, if specified (IOGP S-713, 8.1.2.4)	H	H	H	H
5.2	Verify preservation and storage (IOGP S-713, 8.4)	S	S	S	S
5.3	Verify handling and packaging (IOGP S-713, 8.4)	S	S	S	S
5.4	Release equipment for shipment (IOGP S-713, 8.4.3.1)	H	H	H	H
<b>Key</b> - No intervention performed H Hold point W Witness point R Review S Surveillance					

## Annex B (normative) Certification and traceability requirements

Table B.1 provides the certification and traceability requirements for the equipment and component parts.

**Table B.1 — Certification and traceability requirements**

Item		Certificate type <sup>a</sup>	Traceability level <sup>b</sup>	Additional requirements
Special-purpose gears	Gear unit housings	3.1	Level II	See API 613 Table C.1
	Shafts, pinions and gear wheels	3.1	Level II	See API 613 Table C.2
	Internal and external piping and tubing components	3.1	Level II	Internal piping is 316 stainless steel as per IOGP S-713, 6.3.1.8

<sup>a</sup> Inspection certificates shall be provided in accordance with ISO 10474 or EN 10204.

<sup>b</sup> Traceability levels are defined in the following table.

Level	Traceability	Definition
Level 1	Full traceability	Material is uniquely identified and its history tracked from manufacture through stockists (where applicable) to the vendor and to the actual position on the equipment with the specific location defined on a material placement record (the traceability to a specific location only applies to skids / packaged equipment, not to bulks).
Level 2	Type traceability	The vendor maintains a system to identify material throughout manufacture, with traceability to a material certificate.
Level 3	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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