

Supplementary Specification to API Standard 672 Packaged, Integrally Geared Centrifugal Air Compressors

Revision history

VERSION	DATE	PURPOSE
2.0	May 2022	Second Edition
1.0	November 2018	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 December 2018.

Due to technical writing requirements leading to extensive changes, this second edition should be treated as a new document.

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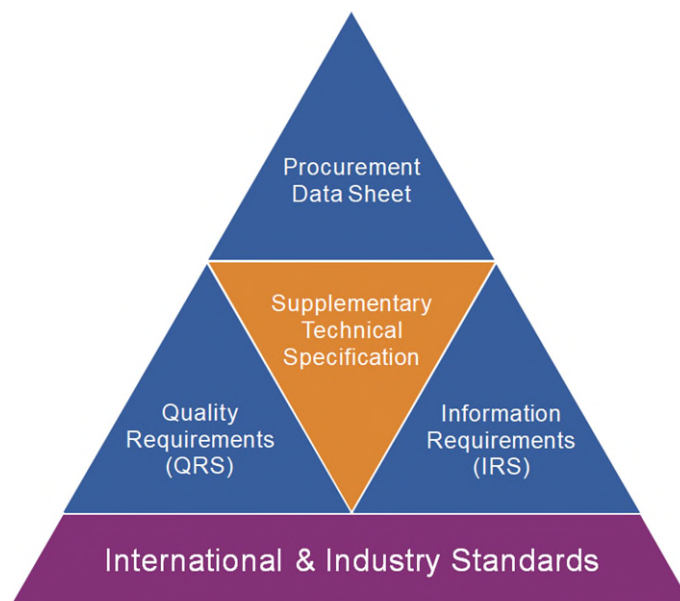
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Introduction

The purpose of this specification is to define a minimum common set of requirements for the procurement of packaged, integrally geared centrifugal air compressors in accordance with API Standard 672, 5th Edition, August 2019, Packaged, Integrally Geared Centrifugal Air Compressors for Petroleum, Chemical, and Gas Industry Services for application in the petroleum and natural gas industries.

This specification follows a common document structure comprising the four documents as shown below, which together with the purchase order define the overall technical specification for procurement.



JIP33 Specification for Procurement Documents Supplementary Technical Specification

This specification is to be applied in conjunction with the supporting procurement data sheet, information requirements specification (IRS) and quality requirements specification (QRS) as follows.

IOGP S-612: Supplementary Specification to API Standard 672 Packaged, Integrally Geared Centrifugal Air Compressors

This specification defines the technical requirements for the supply of the equipment and is written as an overlay to API Standard 672, following the API Standard 672 clause structure. Clauses from API Standard 672 not amended by this specification apply as written to the extent applicable to the scope of supply.

Modifications to API Standard 672 defined in this specification are identified as Add (add to clause or add new clause), Replace (part of or entire clause) or Delete.

IOGP S-612D: Procurement Data Sheet for Packaged, Integrally Geared Centrifugal Air Compressors (API)

The procurement data sheet defines application specific requirements, attributes and options specified by the purchaser for the supply of equipment to the technical specification. The procurement data sheet may also include fields for supplier provided information attributes subject to purchaser's technical evaluation. Additional purchaser supplied documents may also be incorporated or referenced in the procurement data sheet to define scope and technical requirements for enquiry and purchase of the equipment.

IOGP S-612L: Information Requirements for Packaged, Integrally Geared Centrifugal Air Compressors (API)

The IRS defines the information requirements, including contents, format, timing and purpose to be provided by the supplier. It may also define specific conditions which invoke information requirements.

IOGP S-612Q: Quality Requirements for Packaged, Integrally Geared Centrifugal Air Compressors (API)

The QRS defines quality management system requirements and the proposed extent of purchaser conformity assessment activities for the scope of supply. Purchaser conformity assessment activities are defined through the selection of one of four generic conformity assessment system (CAS) levels on the basis of evaluation of the associated service and supply chain risks. The applicable CAS level is specified by the purchaser in the data sheet or in the purchase order.

The terminology used within this specification and the supporting procurement data sheet, IRS and QRS follows that of API Standard 672 and is in accordance with ISO/IEC Directives, Part 2 as appropriate.

The procurement data sheet and IRS are published as editable documents for the purchaser to specify application specific requirements. The supplementary specification and QRS are fixed documents.

The order of precedence (highest authority listed first) of the documents shall be:

- a) regulatory requirements;
- b) contract documentation (e.g. purchase order);
- c) purchaser defined requirements (procurement data sheet, IRS, QRS);
- d) this specification;
- e) API Standard 672.

1 Scope

1.1

Add to section

This specification covers integrally geared centrifugal air compressor driven by a constant speed electric induction motor with a shaft power range of up to 1,500 kW for plant and instrument air application.

NOTE This specification can also be applied to steam turbine driven air compressor packages. However, the requirements for the steam turbine driver are not covered within this specification.

1.2

Add to section

This specification applies to spared basic duty packages.

2 Normative References

The following publications are referred to in this document, the procurement data sheet (IOGP S-612D) or the IRS (IOGP S-612L) in such a way that some or all of their content constitutes requirements of this specification.

Delete from section

API Standard 614, *Petroleum, Petrochemical and Natural Gas Industries—Lubrication, Shaft-sealing and Oil-control Systems and Auxiliaries*

Add to section

ANSI/API Standard 614:2008, *Petroleum, Petrochemical and Natural Gas Industries—Lubrication, Shaft-sealing and Oil-control Systems and Auxiliaries*

API Recommended Practice 687:2001, *Rotor Repair*

ASME B1.20.1, *Pipe Threads, General Purpose, Inch*

ASME BTH-1, *Design Of Below-The-Hook Lifting Devices*

ASTM A350/A350M, *Standard Specification for Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components*

BS 4235-1, *Specification for metric keys and keyways - Part 1: Parallel and taper keys*

IEC 60034-1, *Rotating Electrical Machines – Part 1: Rating and Performance*

IEC 61043, *Electroacoustic – Instruments for the measurement of sound Intensity – Measurements with pairs of pressure sensing microphone*

IOGP S-715, *Supplementary Specification to NORSOK M-501 Coating and Painting for Offshore, Marine, Coastal and Subsea Environments*

ISO 281, *Rolling bearings — Dynamic load ratings and rating life*

ISO 4406, *Hydraulic fluid power — Fluids — Method for coding the level of contamination by solid particles*

ISO 2151, Acoustics — Noise test code for compressors and vacuum pumps — Engineering method (Grade 2)

ISO 9614-2, Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 2: Measurement by scanning

ISO 12944-2, Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 2: Classification of environments

ISO 12944-5, Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 5: Protective paint systems

ISO 12944-6, Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 6: Laboratory performance test methods

ISO 12944-9, Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 9: Protective paint systems and laboratory performance test methods for offshore and related structures

ISO 14691, Petroleum, petrochemical and natural gas industries — Flexible couplings for mechanical power transmission — General-purpose applications

ISO 19901-5:2021, Petroleum and natural gas industries — Specific requirements for offshore structures — Part 5: Weight control during engineering and construction

ISO 20816 (all parts), Mechanical vibration — Measurement and evaluation of machine vibration

ISO 21457, Petroleum, petrochemical and natural gas industries — Materials selection and corrosion control for oil and gas production systems

ISO 21940-11, Mechanical vibration — Rotor balancing — Part 11: Procedures and tolerances for rotors with rigid behaviour

ISO 21940-32, Mechanical vibration — Rotor balancing — Part 32: Shaft and fitment key convention

SAE AS4059, Aerospace Fluid Power - Cleanliness Classification for Hydraulic Fluids

3 Terms, Definitions, Acronyms, and Abbreviations

3.1 Terms and Definitions

Add new term

3.1.59

undesirable speed

Critical speed up to three times the operating speed of each shaft.

Add new term

3.1.60

carbon steel

Alloy of carbon and iron containing up to 2 % mass fraction carbon and up to 1.65 % mass fraction manganese and residual quantities of other elements, except those intentionally added in specific quantities for deoxidation (usually silicon and/or aluminium).

Add new term

3.1.61

low alloy steel

Steel containing a total alloying element content of less than 5 % mass fraction, or steels with less than 10.5 % mass fraction chromium but more than that specified for carbon steel.

3.2 Acronym and Abbreviations

Add to section

MT magnetic particle testing

PT penetrant testing

PTFE polytetrafluoroethylene

6 Basic Design

6.1 General

6.1.3 Sound Pressure Level

6.1.3.1

Delete first sentence

Add new section

6.1.3.4 The sound pressure level shall be measured at 1.0 m (3.3 ft) from the skid boundary.

Add new section

6.1.3.5 Sound pressure level measurements shall be taken at 1.0 m (3.3 ft) from the discharge blow-off silencer outlet.

6.1.8 Motors and Electrical Components

6.1.8.4

Delete second sentence

6.1.9 Performance Criteria

Add new section

6.1.9.4 The turndown capacity of the compressor shall be greater than or equal to 15 % of the rated capacity.

6.1.10 Purchaser Connections

In first sentence, replace "DN 12 (NPS ½)" with

DN 20 (NPS ¾)

Add to section

Nozzles for purchaser connections DN 50 (NPS 2) or larger shall be flanged in accordance with ASME B16.5.

Add to section

Nozzles for purchaser's connections smaller than DN 50 (NPS 2) shall be threaded in accordance with ASME B1.20.1 or flanged in accordance with ASME B16.5.

6.2 Pressure Casings

Add new section

6.2.5 Jackscrews, guide rods and cylindrical casing-alignment dowels shall be in accordance with 6.12.1.

Add new section

6.2.6 Jackscrews shall be in accordance with 6.12.1.3.

Add new section

6.2.7 Guide rods shall be in accordance with 6.12.1.1.

Add new section

6.2.8 Lifting lugs shall be in accordance with 6.12.1.2.

6.3 Casing Connections

Add new section

6.3.11 Each compressor section shall have a drain.

6.5 Rotating Elements

6.5.1 Shafts

6.5.1.2

6.5.1.2.3

Replace list item a) with

a) for radial sensing areas 6 μm (0.25 mil) peak to peak;

6.5.1.4

Replace section with

Fillet radii of shaft keyways shall be in accordance with ASME B17.1 or BS 4235-1.

Add new section

6.5.1.5 Shaft and fitment key conventions shall be in accordance with ISO 21940-32.

6.5.2 Impellers

Add new section

6.5.2.3 The impeller construction and attachment method shall retain the impeller-to-shaft connection with a locking arrangement.

6.7 Dynamics

6.7.2 Lateral Analysis

Delete second sentence

6.8 Bearings and Bearing Housings

6.8.1 Bearings—General

6.8.1.1

Replace section (including note) with

Pinion shaft rotors shall have hydrodynamic radial bearings and thrust bearings or hydrodynamic radial bearings and thrust collar.

Add new section

6.8.1.4 Basic L10 rating life rolling element bearing defined by ISO 281 shall be 50,000 hours or more.

6.9 Lubrication

6.9.2

Replace "API 614" with

ANSI/API Standard 614:2008

Add new section

6.9.7 Lube Oil Cooler

6.9.7.1 Air-cooled lube oil coolers design shall be a single-bay with 2 x 100 % fans.

6.9.7.2 Air-cooled lube oil cooler header box design shall be removable cover plate or plug type construction.

Add new section

6.9.8 Lube Oil Filter

6.9.8.1 Each lube oil filter shall be sized for at least 100 % of the flow.

6.9.8.2 Lube oil filters shall be equipped with a differential pressure local indicating transmitter.

Add new section

6.9.9 Lube Oil Reservoir

6.9.9.1 The lube oil reservoir capacity retention time shall be greater or equal to three minutes.

6.9.9.2 The lube oil reservoir shall have a temperature-controlled electric immersion heater.

Add new section

6.9.10 Gearbox

The compressor gear box shall have a breather and a screen.

6.10 Materials

6.10.3 Castings

6.10.3.3

Delete 'if specified'

Add new section

6.10.5 Material Selection

6.10.5.1 Material selection shall be in accordance with the recommendations and guidelines of ISO 21457, unless specified in Table 2.

6.10.5.2 Intercooler and aftercooler exchangers shall use fresh water or a glycol-water mixture.

Add new section

6.10.6 Coating

6.10.6.1 Non-marine coating systems shall be selected in accordance with ISO 12944-5.

6.10.6.2 Offshore and marine coastal coating systems shall be in accordance with ISO 12944-9 or IOGP S-715.

6.10.6.3 Stainless steel equipment items and piping shall be coated when operating at a temperature greater than 60 °C (140 °F) in a marine atmosphere.

6.10.6.4 Insulated stainless steel equipment and piping shall be coated.

6.10.6.5 Coating under insulation shall be in accordance with IOGP S-715.

6.10.6.6 Onshore and non-marine coating systems shall be qualified to ISO 12944-6.

Add new Table 2

Table 2—Material Selection

Item	Material of Construction (Base Case) ^a	Material of Construction (Harsh Environment) ^b
Diffuser	Manufacturer's standard	Stainless steel
Inlet air filter/silencer	Carbon steel (hot dip galvanized)	316 stainless steel
Intercooler/Aftercooler (Water Cooled)		
Shell	Carbon steel or cast iron (coated)	Carbon steel or cast iron (coated) or 316 stainless steel
Tube	316 stainless steel or 90/10 Cu-Ni or admiralty brass	316 stainless steel or 90/10 Cu-Ni or admiralty brass
Tube sheet / baffle	Compatible with the tube material	Compatible with the tube material
Intercooler/Aftercooler/Lube Oil Cooler (Air Cooled)		
Tube	Carbon steel with aluminium fins	316 stainless steel
Tube sheet / header box / tube support	Carbon steel (coated)	316 stainless steel
Lube Oil System Components		
Lube Oil Cooler		
Shell	Carbon steel	316 stainless steel
Tube	90/10 Cu-Ni or admiralty brass	90/10 Cu-Ni or admiralty brass
Tube sheet	Brass	Brass
Lube oil reservoir	Carbon steel (coated)	316 stainless steel
Lube oil piping	Carbon steel	316 stainless steel
Lube oil piping (downstream of lube oil filter)	Stainless steel	316 stainless steel
Lube oil filter	Carbon steel (coated)	316 stainless steel
Piping, Tubing and Miscellaneous Items		
Air / cooling water piping	Carbon steel (coated)	
Tubing and fittings	316 stainless steel	316 stainless steel
Blow-off silencer housing	Carbon steel (hot dip galvanized)	316 stainless steel
Blow-off silencer internals	316 stainless steel	316 stainless steel
Base frames	Carbon steel (coated or hot dip galvanized)	Carbon steel (coated or hot dip galvanized)
Instrument housing	Stainless steel or aluminium	316 stainless steel or aluminium
Junction box	Carbon steel (hot dip galvanized) or 304 stainless steel or aluminium	316 stainless steel or aluminium
Noise enclosure	Carbon steel (coated)	Carbon steel (coated)
Local control cabinet	Carbon steel (coated)	Carbon steel (coated)
^a Base case applies to atmospheric corrosion category C1 to C3 (low to medium corrosivity) defined by ISO 12944-2. ^b Harsh environments applies to corrosion category C4 to CX (high to extreme corrosivity) defined by ISO 12944-2.		

7 Accessories

7.1 Drivers

7.1.1 General

7.1.1.5

Delete "If specified,"

7.1.2 Electric Motors

7.1.2.1

Delete section 7.1.2.1

Add new section

7.1.2.3 Electric Motor Construction Features

7.1.2.3.1 For general outdoor environments, motors shall have a minimum ingress protection class of IP55.

7.1.2.3.2 For environments with areas exposed to powerful water jets and deluge or offshore open deck, motors shall have a minimum ingress protection class of IP56.

7.1.2.3.3 Motors shall be supplied with a minimum of Class F insulation.

7.1.2.3.4 The main driver motor shall be supplied with stator winding anti-condensation type space heater.

7.1.2.3.5 The stator winding space heater shall be energized when the main drive motor is not running.

7.1.2.3.6 Motors with sleeve bearings shall be equipped with one x and one y radial proximity probes per bearing.

7.1.2.3.7 Lube oil for motors equipped with sleeve bearings shall be fed through the common pressurized lube oil system used by the compressor and gearing.

7.1.2.3.8 Motors equipped with sleeve bearings shall have one dual element bearing metal resistance temperature detector per bearing.

7.1.2.3.9 Medium voltage motors shall have a minimum of two embedded 3-wire Pt100 resistance temperature detectors for windings per each phase of stator windings.

Add new section

7.1.2.4 Electric Motor Testing

7.1.2.4.1 When low-voltage motors less than 600 V have been type tested in accordance with IEC 60034-1, routine tests may be omitted.

7.1.2.4.2 Medium voltage motors shall be no-load tested.

7.1.2.4.3 The stator-winding resistance of medium voltage motors shall be tested.

7.1.2.4.4 The insulation resistance of medium voltage motors shall be tested.

7.1.2.4.5 The efficiency of medium voltage motors shall be determined for 50 %, 75 % and 100 % of rated load.

7.1.2.4.6 The vibration of medium voltage motors shall be measured and assessed against the agreed criteria in ISO 20816.

7.1.2.4.7 The phase sequencing, direction of rotation and terminal marking of medium voltage motors shall be performed.

7.2 Couplings and Guards

7.2.1 Couplings

7.2.1.2

In list section d), replace "125 mm (5 in.)" with

200 mm (8 in.)

Add new list section g)

g) Coupling shall conform to ISO 14691.

7.2.1.3

Replace section with

The coupling assembly shall be dynamically balanced to Grade 2.5 in accordance with ISO 21940-11.

7.2.2 Coupling Guards

7.2.2.2

In second sentence, replace "comply with specified standards such as ANSI B11.19, ISO 14120 or other applicable nationally recognized standards." with

be in accordance with ANSI B11.19 or ISO 14120.

7.3 Baseplate/Support Structure

7.3.2

Add to section

Baseplate welding shall be continuous.

7.3.11

In first sentence, delete "If the supported driver weighs more than 225 kg (500 lb)."

7.3.13

Add to section

Baseplates shall be provided with a drain connection of DN 50 (NPS 2) minimum.

Add new section

7.3.14

For offshore installation, the compressor package shall be a complete unit installed on a skid for a single lift.

7.4 Controls and Instrumentation

7.4.1 General

7.4.1.1

Replace "API 614" with

ANSI/API Standard 614:2008

7.4.1.5

Add to section

Interface between the local control panel and the purchaser's safety instrument system shall be through hard-wired signal interface.

7.4.2 Control Systems

7.4.2.3

Add to section

When surge control is based on monitoring motor current, an additional monitoring signal based on discharge pressure or flow shall be provided.

Add new section

7.4.2.7 Field analogue instruments, transmitters and control valves shall be provided with the specified communication protocol.

Add new section

7.4.2.8 When air compressors are operating in parallel, the controller for parallel operation shall be capable of load-sharing.

7.4.3 Instrument and Control Panels

7.4.3.1

Replace list item j) with

j) local and provision for remote read-out of vibration and position data;

7.4.4 Instrumentation

7.4.4.1

Replace "API 614" with

ANSI/API Standard 614:2008

7.4.4.3 Thermowells

7.4.4.3.2

Replace "DN 19" with

DN 20

7.4.4.6 Vibration and Position Detectors

7.4.4.6.2

Replace second sentence with

Accelerometers shall be flush mounted, installed and calibrated in accordance with ANSI/API Standard 670.

Add new section

7.4.4.6.3 Angular orientation of probe mounting holes shall be the same for both ends of each pinion.

Add new section

7.4.4.6.4 Thrust bearings shall have axial position monitoring with two proximity probes.

Add new section

7.4.4.6.5 Proximity probes shall be installed to sense the shaft itself or an integral axial surface of the shaft, within an axial distance of 300 mm (12 in.) from the thrust bearing.

Add new section

7.4.4.6.6 Vibration and axial position transducers shall be in conformance with ANSI/API Standard 670.

Add new section

7.4.4.7 Hydrodynamic bearings shall have dual element bearing metal temperature sensors.

Add new section

7.4.4.8 Pressure-Relief Valves

7.4.4.8.1 Pressure-relief valves shall not discharge to a location within normal operation or maintenance access areas.

7.4.4.8.2 Radial pressure-relief valves shall have guards.

7.4.4.8.3 Pressure-relief valve size, settings and accumulation for each compressor failure mode shall be calculated.

Add new section

7.4.4.9 Gauges

7.4.4.9.1 Local gauges shall be liquid filled.

7.4.4.9.2 Level gauges shall span high and low trip set points as a minimum.

7.4.4.9.3 The scale on level glass or magnetic level gauges shall indicate the percentage or units of length consistent with system of units used in the data sheet.

Add new section

7.4.4.10 Discharge blow-off valves shall have stainless steel internals with soft PTFE seat.

Add new section

7.4.4.11 Pressure transmitters shall be provided with block and bleed manifolds.

Add new section

7.4.4.12 Control valves except blow-off valves shall be mounted to permit servicing and disassembly without removing the valve body from the line.

Add new section

7.4.4.13 Mechanical switches shall not be provided.

Add new section

7.4.4.14 Compression tube fittings shall be flareless, double-ferrule type.

Add new section

7.4.4.15 Compression fittings shall be from a single manufacturer.

7.4.5 Alarms and Shutdowns

7.4.5.1 General

7.4.5.1.2

Delete first sentence

Replace second sentence with

Alarms and shutdowns shall be in accordance with Table 1.

Table 1—Equipment Monitoring

Delete "Recommended" from third column header

Add rows "Compressor axial position", "Motor radial vibration", "Motor bearing temperature" and "Motor winding temperature"

Add footnote g

Condition	Alarm	Shutdown
Compressor axial position (high / high-high)	X	X
Motor radial vibration ^g (high / high-high)	X	X
Motor bearing temperature ^g (high / high-high)	X	X
Motor winding temperature (high/ high-high)	X	X
^g Applies when the motor is equipped with sleeve bearing.		

7.4.5.3 Alarm and Shutdown Devices

7.4.5.3.1

Delete second sentence

Add new section

7.4.5.3.4 The compressor main drive electric motor shall have a local emergency stop push button.

7.4.6 Electrical Systems

7.4.6.1

Replace "API 614" with

ANSI/API Standard 614:2008

Add new section

7.4.6.8 Cable trays, conduits and transit frames for routing the purchaser's electrical power and control cables to the respective consumer on the skid shall be provided.

Add new section

7.4.6.9 Voltages less than 1 kV shall have a single-point electrical interface.

Add new section

7.4.6.10 Main driver motors greater than 1 kV shall have a separate electrical interface.

Add new section

7.4.6.11 Signal and power cable separation shall conform to API Standard 670, Table 3.

Add new section

7.4.6.12 Instrument intrinsically safe cable and non-intrinsically safe cable shall be separated by separate trays or a metal plate.

7.5 Piping

7.5.1 General

7.5.1.1

Replace "API 614" with

ANSI/API Standard 614:2008

7.5.1.2

Delete "If specified,"

7.5.1.3

Replace "API 614" with

ANSI/API Standard 614:2008

Add new section

7.5.1.8 Seal welding of galvanized pipe shall not be used.

Add new section

7.5.1.9 Utility piping and tubing shall be provided with a single-point tie-in connection with an isolation valve located at skid edge.

Add new section

7.5.1.10 Drain lines shall be terminated to the edge of the baseplate with an isolation valve at the purchaser's tie-in point.

Add new section

7.5.1.11 When the minimum design temperature is less than -9.4 °C (15 °F), carbon steel flanges shall be ASTM A350/A350M Grade LF2 Class 1.

Add new section

7.5.1.12 Slip-on flanges shall be double welded.

Add new section

7.5.1.13 The installation of permanent in-line strainers shall permit dismantling of strainer elements without removing strainer body or housing.

Add new section

7.5.1.14 Expansion joints used in compressed air service shall be metallic bellows type.

Add new section

7.5.1.15 Compressor discharge check valves shall be piston type or dual disk design in 316L stainless steel construction.

Add new section

7.5.1.16 Ball valves constructed so that the ball is held in place with a threaded portion of the valve body shall not be used, unless the valve halves are positively secured together by seal welding by the valve manufacturer.

Add new section

7.5.1.17 Seal welded ball valves shall be hydrotested after welding.

Add new section

7.5.1.18 Quarter turn block valves in isolation services shall have a locking mechanism capable of accepting a car seal or pad lock.

Add new section

7.5.1.19 Valve stems and valve shafts shall be designed for stem retention.

Add new section

7.5.1.20 The weakest link of the valve stem design shall be outside of the pressure boundary.

Add new section

7.5.1.21 The anti -blow-out stem retention configuration shall be located internally to the valve.

Add new section

7.5.1.22 Ball and butterfly valves shall have an anti-static device.

Add new section

7.5.1.23 When the service is air or water, carbon steel piping shall have a corrosion allowance of 1.5 mm ($\frac{1}{16}$ in.) or greater.

7.5.2 Oil Piping

7.5.2.1

In first sentence, replace "API 614" with

ANSI/API Standard 614:2008

Add new section

7.5.2.4 Tubing may be used for sizes DN 15 (NPS $\frac{1}{2}$) and smaller.

Add new section

7.5.2.5 Compression tube fittings shall be flareless, double-ferrule type.

7.5.3 Instrument Piping

In first sentence, replace "API 614" with

ANSI/API Standard 614:2008

Add new section

7.5.5 Pipe support

7.5.5.1 Piping shall withstand reaction forces from pressure-relief and blow-off valves.

7.5.5.2 Small-bore connections DN 50 (NPS 2) and smaller shall have bracing.

Replace section 7.6 title with

7.6 Intercoolers, Aftercoolers, and Other Pressure Equipment

7.6.1

Replace "API 614" with

ANSI/API Standard 614:2008

7.6.2

Add to section

The drain valve shall be fitted at the lowest point of the cooler inclusive of the moisture separator.

7.6.3

Replace section (including note) with

Electronically operated automatic drain traps with bypass shall be provided.

When drain traps use a solenoid, the solenoid shall be H-rated, with stainless steel body and soft seal.

7.6.6

Add to section

Air-cooled cooler materials shall be in accordance with Table 2.

Add new section

7.6.9 Non-integral aftercooler, oil cooler and fabricated pressure equipment shall be designed and constructed in accordance with the specified pressure design code.

Add new section

7.6.10 The integrated intercooler and aftercooler part of the compressor casing or extended pressure casing shall be vendor's standard design and construction.

Replace section 7.7 title with

7.7 Inlet Air Filter and Silencer

Add new section

7.7.3 Inlet air filter and silencer materials shall be in accordance with Table 2.

Add new section

7.7.4 The piping between the inlet air filter or silencer and the compressor air inlet flange shall be 316 stainless steel or carbon steel with non-metallic lining or insert.

Replace section 7.9 title with

7.9 Special Tools and Spare Parts

Add new section

7.9.3 Spare parts shall be the same as were supplied for the original component.

8 Inspection, Testing, and Preparation for Shipment

8.1 General

8.1.1

Replace "API 614" with

ANSI/API Standard 614:2008

8.2.2 Material Inspection

8.2.2.1

Replace "API 614" with

ANSI/API Standard 614:2008

8.2.2.3

In second sentence, replace "API 614" with

ANSI/API Standard 614:2008

8.3 Testing

8.3.3 Impeller Overspeed Test

8.3.3.1

Add to second sentence before "Impeller"

Whole

8.3.3.3

Replace section with

On completion of the overspeed test, each impeller shall be examined by magnetic particle or liquid penetrant methods.

Add new section

8.3.3.4 Acceptance criteria for MT and PT inspection of the impeller shall be in accordance with API Recommended Practice 687:2001, Table 1.8-1, Severity level A.

8.3.4 Combined Mechanical and Performance Tests

8.3.4.1

Add to first sentence before "performance"

thermodynamic

Add to section

The thermodynamic performance test shall be performed on at least one machine of multiple order of identical machines.

8.3.4.2

Replace "Aerodynamic" with

Thermodynamic

8.3.4.8.2

In second sentence, replace "API 614" with

ANSI/API Standard 614:2008

Add new section

8.3.4.11 Lube Oil Flushing and Cleanliness Test

8.3.4.11.1 The lube oil flushing and cleanliness test shall be carried out using a 100 mesh stainless steel screen.

8.3.4.11.2 The lube oil flushing and cleanliness test shall be performed at least one hour prior to the combined performance and mechanical run test.

8.3.4.11.3 The flushing test fluid shall have a contamination level of ISO 4406 Grade 17/14/12 or SAE AS4059 Class 8.

Add new section

8.3.4.12 Noise Test

8.3.4.12.1 Noise tests shall be conducted in accordance with ISO 2151.

8.3.4.12.2 For multiple identical compressor packages, noise testing shall be carried out on at least one compressor package.

8.3.4.12.3 The sound intensity scanning method shall be in accordance with ISO 9614-2.

8.3.4.12.4 The sound intensity system shall be in accordance with IEC 61043 Class 1.

8.4 Preparation for Shipment

Add new section

8.4.14 Visible display units and control panel front face shall be protected against visible scratches during transportation and handling.

Add new section

8.4.15 Provision for turning on the anti-condensation heater for motors while they are idle shall be stated in the preservation procedure.

Add new section

8.4.16 Open piping connections shall be blanked with material of compatible metallurgy.

Add new section

8.4.17 The outboard connection of valves open to the atmosphere shall be plugged or blinded.

9 Vendor Data

Add new section

9.2 Weight and Centre of Gravity Data

The weight data of equipment for installation offshore shall be provided in accordance with ISO 19901-5:2021, Section 8.

Bibliography

Add to section

- [12] ISO 10418, *Petroleum and natural gas industries — Offshore production installations — Process safety systems*
- [13] ISO 13880, *Petroleum and natural gas industries — Content and drafting of a technical specification*
- [14] ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

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