MATERIAL AND EQUIPMENT STANDARD

FOR

LUBRICATION, SHAFT-SEALING, OIL-CONTROL SYSTEM

AND AUXILARIES

FIRST EDITION

JUNE 2002

This standard specification is reviewed and updated by the relevant technical committee on March 2011(1). The approved modifications are included in the present issue of IPS.

FOREWORD

The Iranian Petroleum Standards (IPS) reflect the views of the Iranian Ministry of Petroleum and are intended for use in the oil and gas production facilities, oil refineries, chemical and petrochemical plants, gas handling and processing installations and other such facilities.

IPS are based on internationally acceptable standards and include selections from the items stipulated in the referenced standards. They are also supplemented by additional requirements and/or modifications based on the experience acquired by the Iranian Petroleum Industry and the local market availability. The options which are not specified in the text of the standards are itemized in data sheet/s, so that, the user can select his appropriate preferences therein.

The IPS standards are therefore expected to be sufficiently flexible so that the users can adapt these standards to their requirements. However, they may not cover every requirement of each project. For such cases, an addendum to IPS Standard shall be prepared by the user which elaborates the particular requirements of the user. This addendum together with the relevant IPS shall form the job specification for the specific project or work.

The IPS is reviewed and up-dated approximately every five years. Each standards are subject to amendment or withdrawal, if required, thus the latest edition of IPS shall be applicable

The users of IPS are therefore requested to send their views and comments, including any addendum prepared for particular cases to the following address. These comments and recommendations will be reviewed by the relevant technical committee and in case of approval will be incorporated in the next revision of the standard.

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GENERAL DEFINITIONS

Throughout this Standard the following definitions shall apply.

COMPANY :

Refers to one of the related and/or affiliated companies of the Iranian Ministry of Petroleum such as National Iranian Oil Company, National Iranian Gas Company, National Petrochemical Company and National Iranian Oil Refinery And Distribution Company.

PURCHASER :

Means the “Company" where this standard is a part of direct purchaser order by the “Company”, and the “Contractor” where this Standard is a part of contract document.

VENDOR AND SUPPLIER:

Refers to firm or person who will supply and/or fabricate the equipment or material.

CONTRACTOR:

Refers to the persons, firm or company whose tender has been accepted by the company.

EXECUTOR :

Executor is the party which carries out all or part of construction and/or commissioning for the project.

INSPECTOR :

The Inspector referred to in this Standard is a person/persons or a body appointed in writing by the company for the inspection of fabrication and installation work.

SHALL:

Is used where a provision is mandatory.

SHOULD:

Is used where a provision is advisory only.

WILL:

Is normally used in connection with the action by the “Company” rather than by a contractor, supplier or vendor.

MAY:

Is used where a provision is completely discretionary.

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0. INTRODUCTION

This specification gives amendment and supplement to API Standard 614, latest edition for Lubrication, Shaft-Sealing, Oil-Control Systems and auxiliaries for petroleum, petrochemical and natural gas industries.

It shall be used in conjunction with data/requisition sheets for Present Standard's Subject.

Note 1:

This is a revised version of this standard, which is issued as revision (1)-2002. Revision (0)-1993 of the said standard specification is withdrawn.

Note 2:

This standard specification is reviewed and updated by the relevant technical committee on Mar. 2011. The approved modifications by T.C. were sent to IPS users as amendment No. 1 by circular No 336 on Mar. 2011. These modifications are included in the present issue of IPS.

Guidance for Use of this Standard

For ease of reference, the clause or section numbering of API Standard 614 has been used throughout this specification.

Clause in API Std. 614 not mentioned, remain unaltered.

For the purpose of this specification, the following definitions shall hold:

Sub (Substitution)	**:**	The API Std. Clause is deleted and replaced by a new clause.
Del (Deletion)	**:**	The API Std. Clause is deleted without any replacement.
Add (Addition)	**:**	A new clause with a new number is added.
Mod (Modification)	**:**	Part of the API Std. Clause is modified, and/or a new description and/or condition is added to that clause.

PART 1 – GENERAL REQUIREMENTS

1. SCOPE

1.1 This standard contains the minimum technical requirements for Lubrication, Shaft-sealing and Oil-control Systems and Auxiliaries for petroleum, petrochemical and Natural Gas Industries, for use in refinery services, chemical and petrochemical plants and where applicable in exploration and production.

Compliance by the vendor with the provisions of this Standard does not relieve him of the responsibility of furnishing the equipment of proper design, mechanically suited to meet operating guarantees at the specified operating conditions. **(Mod.)**

2. NORMATIVE REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-GN-100 “Engineering Standard for Units”

IPS-G-ME-220 “General Standard for Shell & Tube Heat Exchangers”

IPS-G-ME-245 “Engineering & Material Standard for Air Cooled Heat Exchangers”

IPS-C-PM-216 “Construction standard for Process Machinery Installation and installation Design”

IPS-M-PM-105 "Centrifugal Pumps for Process Services"

IPS-M-PM-140 "Positive Displacement Pumps-rotary"

IPS-M-PM-240 "Steam Turbine, General Purpose"

IPS-G-SF-900 "Noise and Vibration Control"

3.1.29 Owner

Final recipient of the equipment, who may delegate another agent as the purchaser of the equipment which will be equal to COMPANY in General Definitions. **(Mod.)**

4. GENERAL

4.1 Dimensions and Units

Data, drawings, hardware and maintenance dimensions shall be in the SI system of measurements and requirements of IPS-E-GN-100 shall be followed. Use of an ISO Standard data sheet (see Annex A) indicates the SI system of measurements shall be used. **(Sub.)**

4.2 Conflicting Requirements

4.4 The pressure design shall be considered as per ASME Sec. VIII. **(Mod.)**

4.5.1 Equipment shall be designed for installation in accordance with IPS-C-PM-216**.** **(Sub.)**

4.5.2 Unless otherwise specified, the system shall be suitable for outdoor operation in dusty atmosphere and shall be winterized for the particular plant atmosphere including the minimum temperature specified on the data sheets. **(Mod.)**

4.6.1 Welding of piping and pressure-containing parts, as well as any dissimilar-metal welds and weld repairs, shall be Performed and inspected by operators and procedures qualified in accordance with ASME relevant codes. **(Mod.)**

4.7.1 In the case of conflict between documents relating to the inquiry order, the following priority documents shall apply:

- First priority: purchase order and variations there to.
- Second priority: Data sheets and drawings.
- Third priority: this standard.

All conflicting requirements shall be referred to the purchaser in writing. the purchaser will issue confirmation document if needed for clarification. **(Add.)**

4.7.2 Selected equipment shall be in all respects well within the range of the Manufacture's proven experience and shall not involve the use or application of any prototype design or components. **(Add.)**

5.1.35 If specified, a permanent Y-type strainer shall be installed in the steam supply line to steam turbines. The strainer screen shall be monel with openings of approximately 3 mm. Strainers shall be provided with a blow-off connection. **(Add.)**

5.5.5 Water cooled and tube intercoolers and after coolers shall be designed and constructed in accordance with IPS-G-ME-220. **(Mod.)**

5.5.8 When air coolers are specified, they shall be in accordance with IPS-G-ME-245. **(Mod.)**

7. INSPECTION, TESTING, AND PREPARATION FOR SHIPMENT

The Vendor shall operate a quality management system to ensure that the technical requirements of this Standard are achieved. Purchaser may require demonstration of the quality system, but this may be waived if the system has been verified recently by an accreditation scheme acceptable to purchaser.

The Vendor shall ensure that QA requirements specified in the inquiry and purchase documents are applied to all materials, equipment and services provided by sub-contractors and to any free-issue materials. **(Mod.)**

7.2 Inspection

7.2.1 The manufacturer shall furnish assurance by means of appropriate certificates that the materials of construction used for all pressure vessels, pressure containing parts and other specified equipment or components are in accordance with the requirements of the purchase order.

All certificates shall contain the following information :

- Name of manufacturer
- Purchase order number and date
- Manufacturer's order number
- Identification number of certificate and its date of issue
- Dimensions in SI units
- Material charge number, batch number or heat-lot number
- Chemical composition recorded from results of chemical analyses
- Mechanical properties recorded from test results
- NDT methods and results, where applicable
-Heat treatment procedures, furnace charge number and heat treatment records, where applicable
-Such supplementary or additional information as may be required **(Mod.)**

7.3.2 Hydrostatic Tests

7.3.2.1 Wetting agent shall be added to water whenever it is used as test liquid. **(Mod.)**

7.4 Preparation for Shipment

7.4.10 When shipping limitations dictate disassembly of components, the vendor shall furnish a drawing showing how the items are tagged and how the items shall be reassembled. **(Add)**

8.2 Proposals

8.2.3 Technical Data

Add following statement to 8.2.3.1 as new item. **(Add.)**

8.2.3.2 The purchaser, procurement of components shall not proceed without the purchaser's review and acceptance of the components selected. If specified by the purchaser, the manufacture of the console shall not proceed without the purchaser's review of the layout of components and piping. **(Mod.)**

8.2.3.3 Vendor shall state type of rust preventive to be applied to interior surfaces of components and piping. **(Add.)**

8.3 Contract Data

8.3.1 General

8.3.1.1 All drawings and other data shall be in accordance with specific requirements. Additional drawings required to completely define the unit and accessories being furnished shall be supplied in time. **(Mod.)**

PART 2 – SPECIAL – PURPOSE OIL SYSTEMS

2. NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

ISO 10438-1:2007	Petroleum, petrochemical and natural gas industries — Lubrication, shaft-sealing and control oil systems and auxiliaries — Part 1: General requirements
ISO 13706:2005	Petroleum, petrochemical and natural gas industries — Air-cooled heat exchangers
ISO 13709	Centrifugal pumps for petroleum, petrochemical and natural gas industries
ISO 4572	Hydraulic fluid power — Filters — Multipass method for evaluating filtration performance

API (AMERICAN PETROLEUM INSTITUTE)

API STD 611	General- Purpose Steam Turbines for Petroleum, Chemical and Gas Industry Services
API RP 686-96	Machinery RP Installation and Installation Design

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

ASTM A240/A240M	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications **(Mod.)**

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-G-ME-220	General Standard for Shell & Tube Heat Exchangers
IPS-G-ME-245	Engineering & Material Standard for Air Cooled Heat Exchangers
IPS- M-PM-140	Material and Equipment Standard for Positive Displacement Pumps-Rotary
IPS- M-PM-240	Material and Equipment Standard for General Purpose Steam Turbines
IPS-G-SF-900	General Standard for Noise Control and Vibration **(Mod.)**

4. GENERAL REQUIREMENTS

4.1 General

4.1.5 Equipment furnished shall comply with IPS-E-SF-900, "Noise and Vibration Control".

Unless otherwise specified, the following limits shall be met at any measuring location not less than 1 m from the equipment surface:

SOUND PRESSURE LIMIT IN dB RE 20 μPa	
OIL PUMP	87 dB (A)
OIL PUMP + DRIVER	90 dB (A)

If the equipment produces impulsive and / or narrow band noise, the above limits shall be taken 5 dB(A) lower, thus 82 dB(A) for the oil pump and 85 dB(A) for the oil pump and driver.

Noise levels shall have an upper tolerance of + 0 dB.

The above requirements apply in absence of reverberation and background noise from other sources, and for all operating conditions between minimum flow and rated flow . **(Sub.)**

4.1.6 Where the process gas contains H2S, separate lubricating oil and seal systems shall be provided.

As a general rule, turbine control oil shall be combined with the lubricating oil system. **(Mod.)**

4.1.21 The complete lube and seal oil systems piping arrangement shall be submitted to purchaser for approval. **(Add.)**

4.1.22 The system shall be designed to permit safe shutdown of all equipment in the event of lube/seal oil supply failure. **(Add.)**

4.2.6 Baseplates Shall Be Suitable For Installation In Accordance with IPS-C-PM-216. **(Mod.)**

4.3 Oil Reserviors

4.3.2.2 General

If the height of reservoir is more than 70 cm, no equipment shall be mounted on top of reservoirs. **(Mod.)**

4.3.3 Oil Conditioners and Internal Piping

4.3.3.6 The main and stand by lube and seal oil pumps shall each have a separate suction line from the reservoirs. **(Add.)**

4.3.5 Features and Appendages

4.3.6.1 An internal float type low level alarm shall be furnished; mounted in a stainless steel stilling well. The float shall be protected by a static conducting shield. The alarm shall be set at minimum operating level. **(Mod.)**

The oil temperature indicator (required per API 614 Fig. A-22) shall be mounted in a thermowell below the low level alarm oil level. **(Add.)**

i) At the lowest point in the reservoir a piping connection shall be provided for drainage and for the

connection to a portable centrifuge. These connections shall be DN50 flanged minimum with valve and blind flange. A second connection shall be provided a short distance from the normal oil level in the reservoir for the return of centrifuged oil. This connection shall be DN50 flanged minimum, with valve and blind flange. **(Add.)**

j) Any and all connections likely to produce fumes or vapor shall be piped into a suitable point so that there is minimum pollution of the local environment. The vendor shall ensure that the selected connecting point is safe under all conditions and that no adverse pressure or other effects arise in the lube oil system, consequent upon this connection. **(Add.)**

4.3.5.2 A flanged vent, one pipe size larger than the sum of area of incoming seal drain lines shall be furnished for seal oil reservoirs and/or combined lube and seal oil reservoirs. **(Mod.)**

4.4 Pumps and Drivers

4.4.1 Centrifugal type pumps shall conform to IPS-M-PM-105. Rotary type pumps shall conform to IPS-M-PM-140. **(Mod.)**

4.4.10 Steam turbines shall conform to IPS-M-PM-240.

4.4.13 The minimum requirements for sizing motor and steam turbine drivers for oil pumps shall be per the following:

Load factors shall be applied as multipliers to the power required by the pump to insure that the selected driver will be adequate to drive the load.

Driver power rating shall satisfy both of the following requirements:

I) DRIVER RATED POWER = Pump Rated Power × LOAD FACTOR

II) DRIVER RATED POWER = Maximum Pump Power at any alternate Operating condition × LOAD FACTOR

where :

pump type	Electric Motor or Steam Turbine LOAD FACTOR (1)
Positive Displacement	1.05

Note:

1) Other types of drivers require special consideration. Consult purchaser for details. (Mod.)

4.4.18 Seal, lube and control oil header pressures shall be regulated by automatic control valves. Hand control valves or restriction orifices are unacceptable in these services.

If a pressure control bypass line to the reservoir is required , it shall be located at the discharge of the coolers upstream of all filters. **(Mod.)**

4.4.21 The design, location and arrangement of strainers shall permit cleaning without removing the strainer body or interrupting the pumping service. **(Mod.)**

4.4.24 The design, location and arrangement of strainers shall permit cleaning without removing the

strainer body or interrupting the pumping service. **(Mod.)**

4.4.28 Coupling for horizontal pumps shall be of flexible disc type with stainless steel disc. **(Mod.)**

4.4.27 b Coupling rating for motor drivers shall be at least equal to the actual motor power rating. **(Mod.)**

4.4.27 c Coupling guards shall be base mounted, and fabricated from 2. 8 mm galvanized steel sheet. **(Mod.)**

4.5 Coolers

4.5.1.1 Shell and tube type coolers shall be constructed in accordance with. IPS-G-ME-220. **(Mod.)**

4.5.1.7 Utility condition and design requirements are as indicated in the individual heat exchanger data sheets. **(Mod.)**

4.5.4.1 Air coolers shall comply with IPS-G-ME-245. **(Mod.)**

4.5.1.13 Lube oil header temperature shall be controlled automatically by bypassing oil around the coolers. Instrumentation required per API standard 614 Fig. A-17 shall be furnished. **(Mod.)**

4.6 Filters

4.6.1 Filters shall be provided with an indicator mounted on the filter assembly and indicating when the particular filter element in use exceeding the allowable pressure drop. Suitable connection for remote indicating differential pressure sensors shall also be furnished. **(Mod.)**

4.7 Transfer Valves

4.7.1 Transfer valves common to filters and coolers are not acceptable. Piping arrangement of transfer valves shall be in accordance with Fig. A.17 shown in API standard 614. **(Mod.)**

4.9 Overhead Tanks

4.9.1 Seal Oil Tanks

4.9.1.1 Equipment mounted overhead tanks are not permitted. **(Mod.)**

4.9.1.5 Sweet gas buffering shall be supplied where process gas contains poisons or contaminants such as H_2S, and provisions shall be made for sweet gas buffering in other services. **(Mod.)**

4.10 Seal- Oil Drain Traps

4.10.3 Traps shall be vented to the compressor suction system unless otherwise specified. Traps shall be equipped with mist eliminators suitable for the process service and arranged per API standard 614 Fig. A-12. **(Mod.)**

4.10.5 Drains from traps shall be piped to return oil to the degassing drum, or to a holding tank for oil reclamation. **(Mod.)**

4.11 Degassing Drum

4.11.1 A degassing system shall be furnished where inner seal oil drain is returned to the reservoir and the oil contains dissolved process gas which can be readily separated. Arrangement shall be per API standard 614 Fig. 2.4 (including a heating device). Where the inner seal oil is contaminated

with hydrogen sulfide, a sour oil reclamation system shall be provided instead of degassing facilities. **(Mod.)**

4.12 Oil Conditioners

4.12.1 A conditioner (centrifugal type, as specified) for removal of water from the lube oil shall be provided for systems serving steam turbine driven equipment. The equipment shall be permanently connected to reservoir, suitable for outdoor installation and shall be furnished complete with accessory equipment to take oil from and return oil to the reservoir at equal flow rates. **(Add.)**

5.5.14: Intersatge Piping Shall Conform To The Piping Design Code IPS-E-PI-221. **(Mod.)**

7. Inspection, Testing, and Preparation for Shipment

7.3 Testing

7.3.3 Operational Tests

7.3.3.1 Satisfactory operation of all instruments and auxiliary equipment on the lube and seal oil console shall be demonstrated, including the main and standby pumps, control and relief valves, alarm and other safety devices and/or switches and the overall integrity of the system. **(Mod.)**

7.3.3.11 The vendor, by unbolting and re-bolting pump inlet and discharge piping, shall demonstrate that the pump on its baseplate is in compliance with API RP 686 alignment requirements. **(Mod.)**

PART 3 – GENERAL PURPOSE OIL SYSTEMS

2. NORMATIVE REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-G-ME-245 Engineering & Material Standard for Air Cooled Heat Exchangers

IPS G-PM-105 General Standard for centrifugal pumps for Petroleum, Petrochemical and Natural Gas Industries **(Mod.)**

4.2 General

4.2.5 Equipment furnished shall comply with IPS-E-SF-900, "Noise and Vibration Control".

Unless otherwise specified, the following limits shall be met at any measuring location not less than 1 m from the equipment surface:

SOUND PRESSURE LIMIT IN dB RE 20 μPa	
OIL PUMP	87 dB (A)
OIL PUMP + DRIVER	90 dB (A)

If the equipment produces impulsive and / or narrow band noise, the above limits shall be taken 5 dB(A) lower, thus 82 dB(A) for the oil pump and 85 dB(A) for the oil pump and driver.

Noise levels shall have an upper tolerance of + 0 dB.

The above requirements apply in absence of reverberation and background noise from other sources, and for all operating conditions between minimum flow and rated flow . **(Sub.)**

4.2.18 The complete lube and seal oil systems piping arrangement shall be submitted to purchaser for approval. **(Add.)**

4.9.19 The system shall be designed to permit safe shutdown of all equipment in the event of lube/seal oil supply failure. **(Add.)**

4.4 Oil Reserviors

4.4.1 General

If the height of reservoir is more than 70 cm, no equipment shall be mounted on top of reservoirs. **(Mod.)**

4.4.5 Features and Appendages

4.4.6.1 An internal float type low level alarm shall be furnished; mounted in a stainless steel stilling well. The float shall be protected by a static conducting shield. The alarm shall be set at minimum operating level. **(Mod.)**

The oil temperature indicator (required per API 614 Fig. A-22) shall be mounted in a thermowell below the low level alarm oil level. **(Add.)**

i) At the lowest point in the reservoir a piping connection shall be provided for drainage and for the connection to a portable centrifuge. These connections shall be DN50 flanged minimum with valve and blind flange. A second connection shall be provided a short distance from the normal oil level in the reservoir for the return of centrifuged oil. This connection shall be DN50 flanged minimum, with valve and blind flange. **(Add.)**

j) Any and all connections likely to produce fumes or vapor shall be piped into a suitable point so that there is minimum pollution of the local environment. The vendor shall ensure that the selected connecting point is safe under all conditions and that no adverse pressure or other effects arise in the lube oil system, consequent upon this connection. **(Add.)**

4.5 Pumps and Drivers

4.5.1 Centrifugal type pumps shall conform to IPS-M-PM-105. Rotary type pumps shall conform to IPS-M-PM-140. **(Mod.)**

4.5.6 The minimum requirements for sizing motor and steam turbine drivers for oil pumps shall be per the following:

Load factors shall be applied as multipliers to the power required by the pump to insure that the selected driver will be adequate to drive the load.

Driver power rating shall satisfy both of the following requirements:

I) DRIVER RATED POWER = Pump Rated Power × LOAD FACTOR

II) DRIVER RATED POWER = Maximum Pump Power at any alternate Operating condition × LOAD FACTOR

where :

Pump type	Electronic Motor or steam Turbine Load Factor (1)
Positive Displacement	1.05

Note:

1) Other types of drivers require special consideration. Consult purchaser for details. (Mod.)

4.5.12 Oil system header pressures shall be regulated by automatic control valves. Hand control valves or restriction orifices are unacceptable in these services.

If a pressure control bypass line to the reservoir is required , it shall be located at the discharge of the coolers upstream of all filters. **(Mod.)**

4.5.14 The design, location and arrangement of strainers shall permit cleaning without removing the strainer body or interrupting the pumping service. **(Mod.)**

4.5.17 Coupling guards shall be base mounted, and fabricated from 2. 8 mm galvanized steel sheet. **(Mod.)**

4.5.18 Coupling for horizontal pumps shall be of flexible disc type with stainless steel disc. **(Mod.)**

4.6 Coolers

4.6.1.2 Utility condition and design requirements are as indicated in the individual heat exchanger data sheets. **(Mod.)**

4.6.1.3 Oil header temperature shall be controlled automatically by bypassing oil around the coolers. Necessary Instrumentation shall be furnished. **(Mod.)**

4.6.2.1 Shell and tube type coolers shall be constructed in accordance with. IPS-G-ME-220. **(Mod)**.

4.6.4.1 Air coolers shall comply with IPS-G-ME-245. **(Mod.)**

4.7 Filters

4.7.1 Filters shall be provided with an indicator mounted on the filter assembly and indicating when the particular filter element in use exceeding the allowable pressure drop. Suitable connection for remote indicating differential pressure sensors shall also be furnished. **(Mod.)**

4.10 Oil Conditioners

4.10.1 A conditioner (centrifugal type, as specified) for removal of water from the lube oil shall be provided for systems serving steam turbine driven equipment. The equipment shall be permanently connected to reservoir, suitable for outdoor installation and shall be furnished complete with accessory equipment to take oil from and return oil to the reservoir at equal flow rates. **(Add.)**

7. INSPECTION, TESTING, AND PREPARATION FOR SHIPMENT

7.1 General

The purchaser's or the vendor's representative shall indicate compliance in accordance with the inspector's checklist (Annex C) by initialing, dating and submitting the completed checklist to the purchaser before shipment. **(Mod.)**

7.3 Testing

7.3.1.4 The vendor, by bolting and unbolting piping, shall demonstrate that the pump on its baseplate is in compliance with 4.5.18 b). **(Mod.)**

PART 4 - SELF–ACTING GAS SEAL SUPPORT SYSTEMS

7.3.1.2 The dry-gas-seal module shall be used during the main equipment's mechanical run test. Gas conditions during the mechanical run of factory performance run should be considered in the dry gas seal module design. **(Mod.)**

7.1.2 The Purchaser's or the vendor's representative or both shall indicate compliance in accordance with the inspector's checklist (Annex C) by initialing , dating and submitting the completed checklist to the purchaser prior to shipment. **(Mod.)**

7.3.3.2 Test gas shall be helium for seal gas of relative molecular mass 12 or less and air or nitrogen for seal gas of relative molecular mass greater than 12. Test gas shall be clean and dry. **(Mod.)**

7.3.3.4 A functional test proposed by the vendor and agreed to by the purchaser of the dry-sealgas module shall be performed at the vendor's shop. **(Mod.)**