API PLAN 76

SEAL SYSTEMS

Installation, Operation & Maintenance Instructions

1. General

1.1 INTRODUCTION

Plan 76 system may only be installed, commissioned and maintained by an authorized plant machinery specialist, paying close attention to these instructions and all other relevant regulations. Failure to do this relieves the manufactures from any liability or warranties.

This Instruction Manual is provided to familiarize the user with the Plan 76 system arrangement and its use. The instructions must be used in combination with the GA drawing and System Summary Form and applied whenever work is done on the Plan 76 system, and must be available to the operating and maintenance personnel.

These instructions will help to avoid danger and increase reliability. They should be used with the appropriate mechanical seal Instruction Manual.

With a Plan 76 there is a containment seal chamber leakage collection system for non-condensating leakage on Arrangement 2 seals.

The following important terms and definitions are used in this document.

1.2 EUROPEAN AND/OR UK DECLARATION OF INCORPORATION (MACHINERY DIRECTIVE 2006/42/EC, AND UK SI 2008 NO. 1597)

If appropriate this is attached.

1.3 EUROPEAN AND/OR UK DECLARATION OF CONFORMITY (PRESSURE EQUIPMENT DIRECTIVE 2014/68/EU, AND UK SI 2016 NO. 1105)

In assessing the hazard classification for the European or UK pressure equipment directive/regulations the process fluid, the coil volume and the design pressure will define the hazard classification.

If appropriate this is attached.

1.4 EUROPEAN AND/OR UK DECLARATION OF CONFORMITY (ATEX 2014/34/EU, AND EQUIPMENT AND UK SI 2016 NO. 1107)

These instructions are intended for use with the system operating in Equipment Group II, category 2GD and 3GD.

The Declaration covers the complete seal and system and the Maximum Surface temperature is recorded in the Mechanical Seal instruction manual.

If appropriate this is attached.

2. Safety and environment

The safety notes refer to the system supplied. They can never be exclusive, and must be used in connection with the relevant safety regulations for the machine, auxiliary equipment, plant and sealed product.

2.1 WARNING SYMBOLS

The following symbols are used in this instruction manual to highligh information of particular importance:

Danger - Mandatory instructions designed to prevent personal injury or extensive damage.

Warning of electric current.

ATTENTION Special instructions or information to avoid damage to the system or its surroundings.

NOTE Information for easy installation and efficient operation.

Environmental note

Please comply with any additional warning signs on the system.

2.2 SAFETY INSTRUCTIONS

ATTENTION

Every working practice that compromises personal safety is to be avoided. All safety requirements in this document must be strictly adhered to.

In the event of an operating problem, the machinery must be switched off immediately and made safe! Problems must be solved promptly.

Ensure suitable protective clothing is used when maintaining the system.

During normal and abnormal operation the system will become contaminated with the process and must be handled accordingly. The liquid must therefore be considered as potentially hazardous and appropriate precautions taken to ensure safety. During any maintenance operation operators must thus assume they will be exposed to the liquid or gaseous properties of the process fluid and have suitable protective gloves, clothing, respirators and equipment.

Particular note must be taken of the relevant guidelines for the electrical installations.

A slight leakage will occur during normal seal operation. Depending on the duty, this leakage can appear as a gas, a liquid or a solid. In case of a worn or defective seal the leakage will increase. The leakage may be hazardous or toxic, and a safe collection system is required.

Surface temperatures above 60°C/140°F should be protected against accidental contact.

The equipment sealed by this seal system must be operated within its recommended design limits.

Compounds containing PTFE, fluorocarbons and perfluoroelastomers should never be burnt as the fumes and residues are highly toxic. If this accidentally occurs protective equipment should be worn as hydrofluoric acid may be present.

Additional equipment/flanges/joint seals used within the system are to be rated for the appropriate electrical and pressure requirements and are to be chemically compatible with the buffer gas and process fluid.

- During venting or draining of the buffer region it should be piped to a vent or reservoir where it can be safely contained or disposed.
- All above according to the local legislation.
- For further information and safe operating limits contact John Crane
- All periodical maintenance checks have to be in accordance with local legislation and rules.

All welding or cutting operations are forbidden without permission from John Crane.

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If you are in any doubt, please contact your local John Crane office for further information before proceeding.

2.3 ENVIRONMENTAL ASPECTS

2.3.1 COMPANY POLICY EXTRACT

"It is the policy of John Crane to manage its business activities in an environmentally responsible manner, comply with all relevant laws and regulations, prevent pollution, and continually improve its environmental performance, certification to the latest issue of ISO 14001 ensures compliance."

John Crane adopts the '**Design For the Environment**' **(DFE)** principle in making this product. Using this product will benefit the environment **directly** by:

- **Reducing waste** of precious resources through decreasing the risk of leakage and minimizing energy consumption.
- **Preventing pollution** through controlling harmful emissions to the atmosphere and ground contamination.
- **Preserving valuable materials** through the use of high quality durable materials.

2.3.2 RECYCLING

PRODUCT REFURBISHMENT

This product has been designed for long life.

DISPOSAL

When the product is considered to be beyond economical repair and potential reuse, it should be disposed of by **environmentally beneficial** means. The product can be disassembled with ease.

SCRAPPED COMPONENTS

These should be handled with extra care due to possible contamination. They should be **recycled** through **local** industrial recycling plants.

PACKAGING

All packaging materials used are made from **recyclable**, environmentally friendly materials.

When in doubt or for further information and advice on this subject, please consult **John Crane**.

3. Transportation and storage

Transport and store the system where possible in its original packaging.

It is necessary to protect and preserve the integrity of the equipment between shipment and installation/start-up at site. This is particularly important when extended periods of storage are envisaged.

Plan 76 systems may be shipped first to the rotating equipment vendor to be mounted on the rotating equipment baseplate complete with the connecting product pipework. In this event follow the instructions as given in the rotating equipment IOM.

Plan 76 systems, which are to be mounted off the rotating equipment baseplate, shall be shipped directly to site and shall be packed in suitable crates or cases to protect them from damage during shipment. All openings to the system are closed and sealed for shipping. In this event follow the following instructions.

On arrival at site and before unloading for storage, a visual inspection of the crate/case should be carried out for signs of damage during shipment. In the event of any damage the crate/case must be opened, and the contents thoroughly examined for signs of equipment damage. All bolts and threaded connections should be checked for signs that they have come loose during transport. If any seals are broken, then the system is assumed to be contaminated and shall be cleaned accordingly. All loose connections or bolts should be correctly tightened to eliminate any loosening which has occurred during transportation or as part of the cleaning process.

If the parts are considered acceptable with no visual signs of damage, the crate/case should be properly closed again prior to storage.

After checking for shipment damage, the following recommendations should be undertaken to prevent deterioration arising from long term storage.

- Plan 76 system should be replaced in their original packaging and if possible, the crate/case should be stored away from direct sunlight, in a well-ventilated building with a hard floor.
- Temperature control is not normally necessary, but large temperature fluctuations (>40°C/72°F) should be avoided.
- If stored outdoors, it is recommended that the crate/case be placed on square timber bearers resting on a concrete or similar hard surface.
- The crate/case must then be wrapped with waterproof tarpaulin to prevent ingress of water and dirt.
- Loose components or accessories in the case should be stored as above, after proper itemisation.
- A weekly visual external inspection of the protection and preservation should be undertaken, and any deficiencies noticed should be corrected without delay.
- The system must be stored far from backwater to avoid the MIC phenomenon (microbial corrosion).

NOTE Should water, condensation, sand, dirt or other contaminant enter the system, through package/ tarpaulin damage or improperly positioned covers, the cause of the problem must be eliminated and the equipment thoroughly dried and cleaned before re-storing.

If used system parts are to be transported to the manufacturer or a third party they have to be cleaned, decontaminated and require safe handling instructions externally attached.

ATTENTION The system normally does not require any preservatives; it is resistant against most environmental conditions.

Ensure preservatives and cleaning agents do not affect the elastomers.

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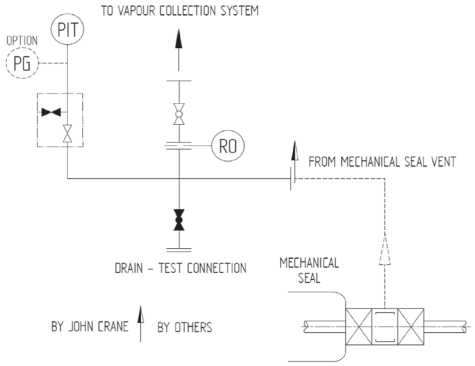
4. Description of the system

4.1 FUNCTION OF THE SYSTEM

Plan 76 is intended to work as follows. Leakage from the inner seal is restricted from escape by the containment seal and goes out the containment-seal vent. An orifice in the outlet line of the collector restricts flow such that high leakage of the inner seal will cause a pressure increase and trigger the pressure transmitter to alarm at a gauge pressure of 0,7 bar (10 psi). The block valve in the outlet serves to isolate the system for maintenance. It may also be used to test the inner seal by closing while the pump is in operation and noting the time/ pressure build up relationship in the collector. A drain connection on the piping harness may be used to inject nitrogen or other gas for the purpose of testing the containment seal as well as for checking for any liquid build-up.



4.2 INSTRUMENTATION AND FITTINGS

The system is usually supplied with the following:

- Vapor collection system connection (flanged or threaded)
- Panel inlet from seal connection (flanged or threaded)
- Pressure indicating transmitter (PIT)

And, upon request with the following options:

- Pressure gauge
- Pressure switch (PS) instead of a Pressure indicating transmitter

5. Installation and assembly

5.1 BEFORE INSTALLATION

Prior to installation ensure that internally all connecting pipe work has been thoroughly cleaned. Remove protection caps from pipes and connections. Check all fittings/connections for damage replacing if necessary.

5.2 PANEL MOUNTING

Refer to the appropriate arrangement drawing for mounting details. The panel must be mounted above the position of the mechanical seal.

It is recommended that piping between the pressure control panel and the seal should be kept below 2 meters/72 inches wherever possible. If this length is exceeded consideration should be given to increased frictional losses and if necessary allowances must be made when setting the seal pressure, if a Plan 72 panel is used in combination with the Plan 76.

Connect the vent connection to the appropriate vapour collection system and the mechanical seal vent connection to the inlet connection on the panel.

5.3 ELECTRICAL CONNECTIONS

Only authorized and qualified personnel are permitted to carry out work on electrical systems. International and local safety regulations must be followed in all cases.

Before connecting cables, check the electrical data on the name plate matches the available power supply and complies with the area hazard classification.

Refer to the diagrams in the terminal housing and the supplier's instruction manual for wiring instructions. Connect the electrical component using flexible conduit or armoured cable to assist removal of the component for maintenance purposes.

If passive switching elements are installed in potentially explosive areas you should add suitable protective devices, following the pertinent rules.

6. Commissioning and Decommissioning

6.1 COMMISSIONING

Before starting the machine (pump or mixer) carry out the following operations:

ATTENTION Before commencing the start-up procedure, review and become familiar with all the available instructions concerning the equipment, especially the safety warnings.

A. Ensure all connections are tight.

B. Close the system isolation drain valve.

C. Open the vapour collection system isolation valve.

D. Open the pressure gauge (if fitted), and the pressure transmitter isolating valves.

E. Check that the pressure transmitter alarm set point is correctly adjusted to suit the duty: Alarm point is normally 0.7 bar/10 psi or 0.4 bar/5 psi above the normal flare pressure unless stated otherwise on system nameplate, drawing, or specification sheet. The instrument should be set to alarm on rising pressure.

F. Close instrument vent valves.

G. Check that any isolating valves in the circuit between the system and the seals are locked fully open.

H. If the Plan 76 is used in combination with a Plan 72, ensure the Plan 72 is also commissioned and ready for the machine to start (see Plan 72 IOM).

I. Check that all electrical instruments are correctly connected and in compliance with the area classification. **This should be carried out by a qualified electrician.**

Before startup, ensure that all personnel and assembly equipment have been moved to a safe distance and that any safety guards are refitted.

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J. Start the machine.

K. During initial start-up it is recommended that the gas pressure is regularly monitored for correct operation. Fine tune pressure setting if necessary.

6.2 NORMAL RUNNING

The equipment shall be kept clean and free from debris to allow ease of access and reading of the instrumentation. Care should be taken to prevent damage to the system from accidental knocks and/or exposure to excessive sources or heat. Disconnection of any part of the system should not be undertaken without the appropriate authorisation and until all pressure has been completely discharged and system allowed to cool. All joints broken for maintenance should be plugged off to prevent ingress of dirt.

During normal operation the only attention required is to monitor the pressure in the Plan 76 and, if used in combination with a Plan 72, the buffer gas flow. Periodic visual checking (at least every 48 hours) of the pressure/flow within the system is recommended the buffer gas flow. Periodic visual checking (at least every 48 hours) of the pressure/flow within the system is recommended.

6.3 DECOMMISSIONING

Work on the seal or system must only be carried out when the machine is stationary, and secured against any unforeseen start-up. Isolation from connections to pressurization sources must be carried out.

Before carrying out any work on the seal or system, the equipment must be shut down and the buffer region must be fully depressurized. Once the buffer region is depressurised, carefully vent any residual pressure from the panel and interconnecting pipe work and drain of any liquids before carrying out any maintenance.

If the pump/panel is to be removed cover any open tubing fittings/ connections to prevent contamination.

If the equipment has been used on toxic or hazardous fluids, ensure all precautions are taken to avoid personnel hazards such as correct decontamination when draining the buffer system and removal of any dangerous gas remaining in the reservoir. Remember fluid is often trapped during draining.

NOTE It is recommended that a pressure test is carried out on the system after any repair and before operation on the equipment.

7. Maintenance

7.1 ROUTINE MAINTENANCE

Check the following as part of regular site walk-around checks for trouble-free operation:

- Buffer pressure. Compare with the operating pressure on the nameplate.
- Condition of alarm signals (see Section 7.2)

7.2 SIGNALS AND ALARMS

The standard instrumentation on the plan 76 system tracks the pressure in the vapour collection system. Pressures greater than this may indicate excessive leakage past the inner seal.

TABLE 1. Alarm Signals

Alarm Name	Instrument	Action	Cause
Rising Pressure	Pressure Gauge (PG) or Pressure Indicating Transmitter (PIT)	A	C to F
Maximum Pressure Alarm	Pressure Indicating Transmitter (PIT)	B	D to F

Actions	
A	Investigate cause, and monitor to ensure values do not breach safe limits
B	Shut down machine to prevent damage or loss of containment

Causes	
C	Leakage from the inboard seal (process side)
D	Abnormal working pressure of the machine
E	Abnormal/excessive leakage from the inboard seal (process side)
F	Rise in flare / vapour collection system header pressure

The signals from the pressure transmitter (or optional DP transmitter) and the level transmitter can be used either:

- LOCALLY (with a Klaxon and/or beacon)
- REMOTELY (in the control room)

On critical items the alarm signal could be utilised as a trip function for the plant machinery.

Consult the specific instrument manufacturers manual should there be a malfunction.

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7.3 INSTRUMENT MAINTENANCE

All instruments require regular calibration, following local processes and regulations. See the supplier's instruction manual for and additional instructions for maintenance of electrical instruments.

7.4 SPARE PARTS

Spare parts must conform to the established technical specifications of the manufacturer. This is guaranteed with John Crane spare parts.

You are advised to stock the most important wear parts on site.
The following data is necessary for spare part orders:

- John Crane code/part number
- John Crane order/ref no.
- Part description
- Quantity

7.5 ANNUAL MAINTENANCE CHECKS

Disconnection shall be made by plant person in charge of authorization.

Before attempting to carry out any maintenance ensure that any internal pressure has been vented and that the equipment has cooled to a temperature where it can be safely handled.

All parts requiring maintenance must be thoroughly decontaminated prior to any work commencing.

To avoid local spillage it is advisable to have a suitable container available in which to drain used fluid.

Check all joints for leakage and retighten, changing gaskets if necessary. Spare gaskets are available from John Crane by quoting the information on the system data plate.

NOTE It is recommended that a pressure test is carried out on the system after any repair and before operation on the equipment.

8. Accompanying Documents

Installation Drawing (job specific) or Typical Drawing and Operational Data Sheet.

A name and data plate is fitted to each gas control panel.
It contains references and part numbers which must be quoted in any communication.

For replacement parts please contact your local John Crane office, quoting the system code number.

9. Cold Environments

For environments with low ambient temperatures, winterisation features may be added to the Plan 76. These may include:

- The panel or instruments may be supplied mounted in a heated enclosure. The heating element requires electrical connection as part of the installation and assembly procedure (see Section 6.2).
- Heat tracing and/or insulation may be required to maintain the temperature of the fluids in the Plan 76. This heat tracing and/or insulation may be supplied with the Plan 76 panel, or may be applied on site around all pipework and components during installation and assembly, leaving room to read instruments and operative valves.
- Care must be taken during commissioning and operation, that the Plan 76 is brought up to operating temperature before the machine is started, and the correct temperature is maintained throughout operation.

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