

NORSOK STANDARD

PRESERVATION

Z-006
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Please note that whilst every effort has been made to ensure the accuracy of the NORSOK standards neither OLF nor TBL or any of their members will assume liability for any use thereof.

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FOREWORD

NORSOK (The competitive standing of the Norwegian offshore sector) is the industry initiative to add value, reduce cost and lead time and remove unnecessary activities in offshore field developments and operations.

The NORSOK standards are developed by the Norwegian petroleum industry as a part of the NORSOK initiative and are jointly issued by OLF (The Norwegian Oil Industry Association) and TBL (The Federation of Norwegian Engineering Industries). NORSOK standards are administered by NTS (Norwegian Technology Standards Institution).

The purpose of this industry standard is to replace the individual oil company specifications for use in existing and future petroleum industry developments, subject to the individual company's review and application.

The NORSOK standards make extensive references to international standards. Where relevant, the contents of this standard will be used to provide input to the international standardisation process. Subject to implementation into international standards, this NORSOK standard will be withdrawn.

Annex A is normative.

1 SCOPE

This standard defines the principles and structure to ensure that equipment and systems are kept preserved during all phases of the project, before taken into use.

2 NORMATIVE REFERENCES

FEAM Regulation for Electrical Installations, Maritime Installations.

3 DEFINITIONS AND ABBREVIATIONS

3.1 Definitions

Executor: An organisation, supplier, contractor that performs a predefined scope of work.

Preservation: The protection, and preventive maintenance carried out on equipment and systems before it is taken into use.

Initial Preservation: The application of specified preservatives and fitting of specified protection to any equipment/system by suppliers prior to delivery, to maintain the equipment/system unimpaired.

Preservation Maintenance: The periodic activities to confirm that the initial preservation is intact and functioning. This also includes repair of deteriorated initial preservation.

Preservation Record: The different forms for each discipline, which together with this standard defines and records the preservation requirements and activities.

Preservation Dossier: Preservation documentation compiled in MC packages. (Paper or electronic format)

Preservation Check List: The preservation check list, which defines the minimum requirements to maintain the initial preservation.

Suppliers Additional Maintenance Preservation Requirement: Defines suppliers additional requirements to keep the initial preservation intact.

Preservation Program: Is a computerised system which identifies the preservation requirements and the last and the next date for preservation based on periodic intervals for the equipment.

MC package: A practical unit of the scope of work for one discipline within a Commissioning package.

Commissioning package: A practical scope of work unit within a System or Subsystem for Commissioning, constituting a functional unit which can be tested by commissioning to confirm its suitability for operation.

3.2 Abbreviations

HVAC	Heating, Ventilation and Air Conditioning
MC	Mechanical Completion

4 PRESERVATION PRINCIPLES

4.1 Functional requirements

The functional requirements for preservation is to apply and maintain the preservation condition and operability of systems and equipment before taken into use.

4.2 Preservation Phases

4.2.1 Supplier phase

Supplier shall be responsible for:

- Identification and description of initial and any additional preservation requirements.
- Performing initial preservation.
- Performing preservation maintenance.
- Filling out preservation labels and fix it to the equipment.
- Documenting preservation activities on preservation records.
- Filing of toxicological data sheets in the preservation dossier for all preservation products being used.
- Preparation of preservation dossier.
- Establishing procedure for packing, marking and protection of skid / equipment including list of preservation materials and methods used.
- Preparation of a procedure for storage of the skid / equipment and for maintenance preservation during the construction period at the fabrication site. This procedure shall also include method for removal of the preservation used on the skid / equipment, and shall be included in the preservation dossier.

4.2.2 Preservation maintenance phase

Executor shall be responsible for:

- Timely issue of requisite preservation record sheets and labels to equipment suppliers.
- Inspection of equipment on receipt.
- Filling out preservation labels and fix it to the equipment.
- Preservation maintenance according to requirements and suppliers additional maintenance preservation requirements.
- Updating the computer based preservation program.
- Reinstating preservation in accordance with requirements.
- Filing of toxicological data sheets in the preservation dossier for all preservation products being used.
- Recording preservation activities on preservation records.
- Preparation of preservation dossier where applicable.

4.3 Status reporting

4.3.1 Preservation Program

An electronic based system should be used to administrate the periodic preservation requirements of equipment and systems, and to record the status of the same. The engineering indices/registers shall be used for identification of items for which preservation is required. Executor shall keep the preservation system updated.

4.3.2 Status reporting

Executor shall report initial preservation status by signing the applicable preservation record sheets. Executor shall, when they receive these documents, register the status indicated on the records, into the preservation program.

4.4 Common requirements

4.4.1 Common requirements

Ensuring that preservation requirements are included in purchase orders.

4.4.2 Suppliers instructions

Equipment suppliers shall establish preservation instructions based on this standard, covering all project phases.

4.4.3 Initial preservation

Initial preservation shall be based on specified storage conditions and for applicable duration.

Any supplier additional preservation requirements specific to particular equipment during storage and construction shall be identified and details given by the supplier on “Suppliers additional maintenance preservation requirements”.

4.4.4 Preservation maintenance

The Executors minimum requirements for preservation maintenance shall be as detailed on the preservation check lists included in Annex A.

Preservation maintenance check lists have been developed for the mechanical, electrical and instrument disciplines.

The mechanical check list also covers preservation for HVAC, piping, insulation, surface protection, structural, architectural and safety equipment.

Instrument check list also covers preservation of fire and gas equipment, telecommunication equipment and computer related equipment.

4.4.5 Interval

Interval used on the check list are as follows:

Interval

1	(1 week)
2	(2 weeks)
3	(3 weeks)
4	(4 weeks)
8	(8 weeks)
12	(12 weeks)
24	(24 weeks)

Calls for interval higher than 1 week shall include the checks covered by the lower interval(s) in the “Preservation maintenance check list”.

For each interval it is a description of the check to be carried out. These descriptions are meant to be self-explanatory. I.e. no equipment tag number is specified.

If preservation is removed or damaged due to normal construction or commissioning activities, or for any other reason, Executor shall rectify or reinstate the preservation.

4.4.6 Inspection of equipment on receipt

All equipment shall, on delivery to the next phase, be checked with respect to the condition of the preservation. Any anomalies shall be rectified according to requirements.

For equipment packages supplied internally preserved, hermetically sealed with humidity detectors fitted, no further action except external inspection is required during storage period.

4.4.7 Storage

Executor shall be solely responsible for the care and cleanliness of the equipment during off-loading, handling, storage and construction period and shall ensure a standard of care and cleanliness appropriate to the type and duty of the equipment. Outdoor storage is only acceptable for equipment prepared for it by the supplier. Maintenance preservation according to this standard shall be performed during storage period.

For special or sensitive equipment, designated store rooms shall be heated, vented and clean. The storage environment have to fulfil suppliers requirements.

4.4.8 Protective coating

Exposed external machined surfaces shall be coated with a rust preventive wax.

Drinking water units / systems shall not be coated internally with wax, oil, antifreeze or toxic materials or any other preservation material that may jeopardize the health of personnel using the drinking water.

4.4.9 Construction / weather protection

During fabrication, installation and construction, a temporary protective slanting roof with sidings shall be erected around equipment skids and such special equipment as inline instr. valves, pumps, electric motors, etc. This temporary protection shall be non-flammable.

Other types of equipment as instruments shall be protected with aluminium sheeted glass fibre cloth, min. 0.3 kg/m² or equal, and sealed.

The executor shall design and install a temporary covering enclosure for protection. The enclosure must be provided with access for lifting, hook up of piping, hook up of electrical/instrument cables and access for periodic maintenance of preservation without removal of the entire enclosure.

4.5 Documentation

4.5.1 General

The physical documentation and recording of preservation activities shall be carried out using the preservation record sheets. Purchase orders for bulk equipment deliveries such as pipefittings, valves and untagged instruments, etc. can be dealt with differently from equipment with individual equipment tag numbers, i.e. one check list per equipment type for each release note on a bulk package.

4.5.2 Suppliers

Initial preservation shall be carried out and documented by the suppliers according to the record sheets. The suppliers shall complete record sheets and give input for "inspection items" which are applicable. Suppliers shall prepare and complete preservation dossiers. These shall include all preservation documentation (preservation records and supplier's preservation maintenance requirements) completed by the suppliers. At completion of their work suppliers shall submit these dossiers to the organizational unit responsible for the next phase. A copy of suppliers additional maintenance preservation requirement and preservation records shall follow the skid/equipment.

The preservation dossier shall include:

- Preservation records
- Tagged equipment list per MC package
- Toxicological datasheets for preservation products being used
- Additional maintenance preservation requirement
- Procedure for removal of preservation products used
- Supplier procedure for packing of the skid/equipment
- Interval for additional preservation requirement
- Supplier instruction for preservation during construction at fabrication site
- Record of Suppliers' resistance measurements on motors, heaters etc

4.5.3 Construction/assembly phase

The original preservation dossier from the suppliers shall be handed over to construction/assembly executor for updating of the preservation program.

On receipt of equipment executor shall immediately check the equipment preservation.

Executor shall prepare and complete preservation dossier. These shall include all preservation documentation for equipment and systems. All documentation prepared and completed by suppliers, and any new revised requirements due to installation activities shall be included. These dossiers shall be submitted to the next executor.

The preservation dossier shall include the same as for Suppliers above.

4.5.4 Succeeding phase

Preservation maintenance and documentation shall be maintained by succeeding executor.

5 PRESERVATION EXECUTION

5.1 General requirements

Supplier have the full responsibility for preservation of the equipment until delivery, and to deliver the equipment initially preserved according to his own additional requirements, minimum according to this Standard.

- Necessary periodical survey to be carried out as per preservation maintenance check lists.
- Sensitive equipment shall be stored indoors in heated and humidity controlled storage areas.
- All in/outlets from units/skids shall be plugged/blanked. Flanges shall be blanked with oil resistant rubber gaskets and steel or water resistant plywood plate with galvanised bolts sufficient to provide mechanical protection and water/dust tight sealing.
- Threaded openings to have metal plugs of metallurgy equal to the component being capped or plugged. If IP rating is maintained, plastic plugs are acceptable for non hydraulic/pneumatic systems.
- Flush through system with preservation medium.
- Drain out ensuring that no water is trapped in system.
- Bulk carbon steel piping to be delivered coated with corrosion inhibitor (inside and outside) and fitted with end caps. The corrosion inhibitor shall be an easily removable preservation agent.
- Lubricate door hinges, grease nipples and fastener.
- All exposed unpainted machined surfaces shall be coated with rust preventive wax.
- Cover all glasses in instruments/panel fronts, with minimum 6mm plywood.
- Aluminium sheeted glass fibre cloth shall be used to envelope pressure gauges, controllers, panels, junction boxes, temp. instruments, telecom equipment, detectors, transmitters, heaters, pushbuttons, and connection boxes.
- Apply thin layer of acid free vaseline to gaskets on door covers.
- All ball valves to be locked in open position.
- All valves spindles exposed shall be covered with grease tape.
- Packing of equipment for transportation and under erection shall protect the equipment against humidity, dust and mechanical strain which may occur during outdoor storage, loading and construction. The enclosure used for this purpose shall allow access for stripping down the unit, enable receipt control, maintenance preservation and be provided with hatches for lifting, hook-up of piping, electrical/instrument cables and tubing without removing the entire enclosure.
- All surfaces exposed to welding and grinding splatter shall be protected with aluminium sheeted glass fibre cloths or similar fire resistant material.
- General clean up routine and good housekeeping is a prerequisite for successful execution of preservation.
- For equipment or pipe systems where water is used for cleaning or pressure testing, the water shall have antifreeze medium added unless the water is completely drained off. If ambient temperature is below 4°C during any of these operations, the water shall have antifreeze medium added.
- Desiccant shall not be in direct contact with stainless steel.

5.2 Discipline requirements

5.2.1 Special instructions for electrical and electronic equipment

- All electrical and electronic equipment exposed to humidity shall be protected with desiccant or vapour corrosion inhibitor.
- Special precaution to be taken on el.heaters. To be specified in supplier's preservation instruction.
- Shafts on electrical motor and mechanical seal to be protected with grease tape.
- Electrical equipment shall be insulation resistance measured according to FEAM and results for motors, heaters, generators, converters and transformers measurements shall be recorded on EP-02. Measurements must not be older than 1 month at delivery date.
- All non terminated cable ends have to be fitted with shrinking shroud.
- All spare cable entrances in panels and boxes to be plugged.
- All space/motor heaters on motors, generators, panels etc. should be energized.

5.2.2 Special instructions for instrument equipment

- The instrument discipline includes also the following disciplines: Fire & Gas and Telecom.
- Instrument equipment containing electronics shall be protected with desiccant or vapour corrosion inhibitor.

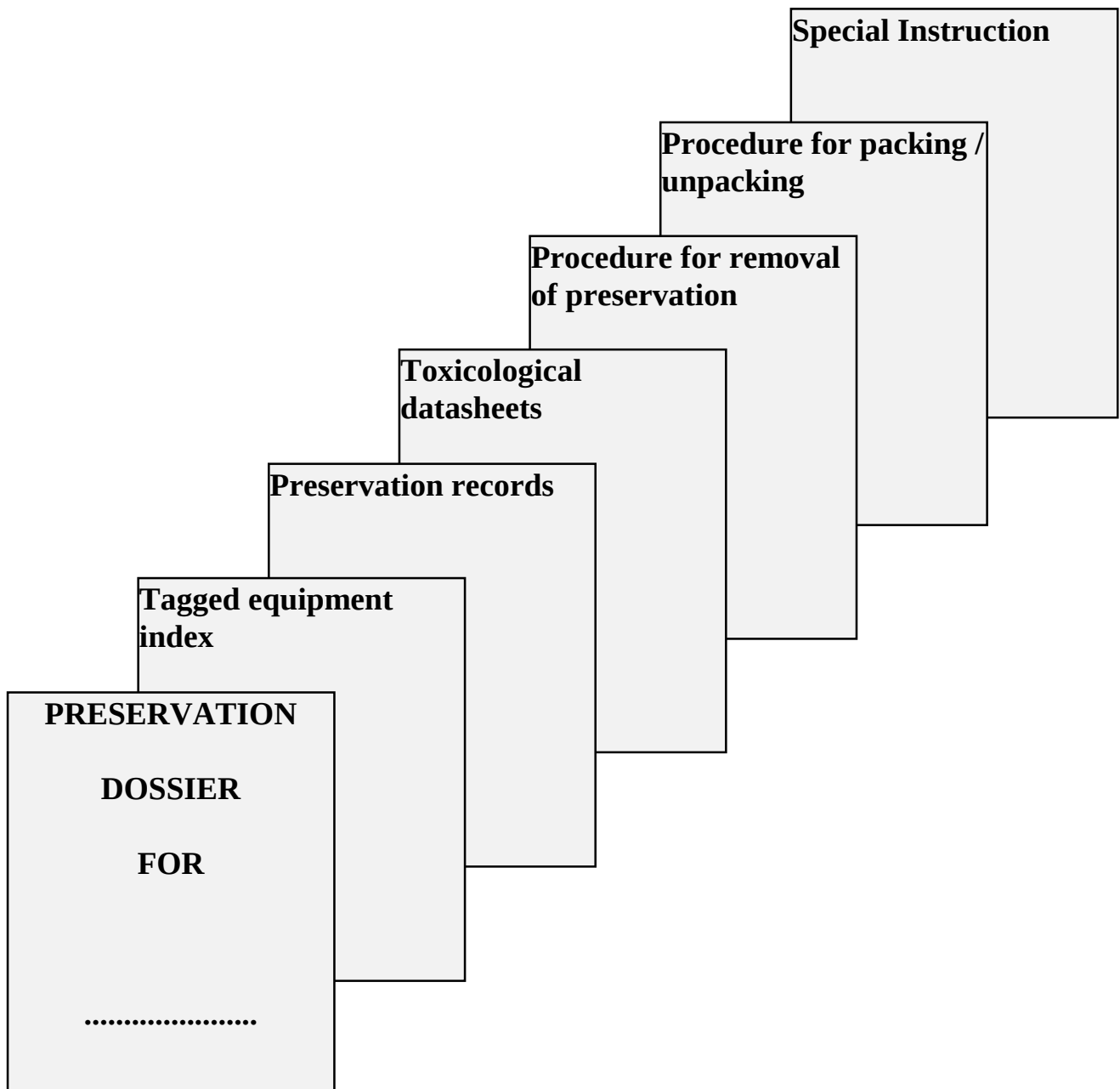
- All openings in hydraulic/pneumatic tubing shall be provided with steel caps or solid shank steel plugs of metallurgy equal to the metallurgy of the component being capped or plugged. Non-metallic plugs shall not be used.
- Gaskets/O-rings on instrument equipment to be greased with acid free vaseline.
- All non terminated cable ends have to be fitted with shrinking shroud.
- All spare cable entrances in panels and boxes to be plugged.

5.2.3 Special instructions for mechanical equipment

- The mechanical discipline includes also the following disciplines: Piping, HVAC, Safety, Architectural, Surface protection, Insulation and Structure.
- Coat all carbon steel flanges on gasket faces, including access hatch covers with rust preventive wax.
- Open flexible hose connections to be plugged.
- When units is installed and pipes hooked up, all hook up flanges to have 1mm galvanized dustblind with ample size red painted spade handle fitted.
- Greased bearings to be greased. Check supplier information.
- Insulated units, where insulation is exposed to damage during storage installation shall be protected with 10mm plywood plates.
- All spools/lines to be protected with min. 6mm water resistant plywood plate with galvanized bolts sufficient to provide mechanical protection and water/dust tight sealing.
- All factory prepared pipes delivered from pipe supplier shall be capped at both ends with a heavy plastic cap sealed and fixed.
- Carbon steel pipes which are internally sandblasted or chemically cleaned shall be coated internally with a waterbased preservation oil without the content of solvents.
- All threaded openings shall be provided with steel caps or solid-shank steel plugs of metallurgy equal to the metallurgy of the component being capped or plugged. In no case shall non-metallic /for example, plastic) plugs be used.
- All openings that have been bevelled for welding shall be provided with closure designed to prevent entrance of foreign materials and damage to the bevel.

ANNEX A PRESERVATION DOCUMENTATION (NORMATIVE)

Documentation for a preservation dossier



Preservation record

EP-01	Electrical preservation record
EP-02	Electrical preservation record insulation resistance
EP-03	Electrical preservation maintenance check list
IP-01	Instrument preservation record
IP-02	Instrument preservation maintenance check list
MP-01	Mechanical preservation record
MP-02	Mechanical preservation maintenance check list

		PRESERVATION RECORD		Sheet no.	<Project>		
		ELECTRICAL (EP-01)					
PO no. :		Area :		MC Package no.			
Manufacturer :		System :					
Description :		Subsystem :		Tag no. (Applicable Items)			
VALID STATUS CODE = OK, NA							
INSPECTION ITEM		SUPPL.	FABR.	HOOKUP	COMMENTS		
01	Supplier's initial preserv. instructions issued						
02	Preservation performed						
03	Preservation labels fixed						
04	Toxicological data sheets attached						
05	Corrosion inhibitor installed						
06	Frost precautions taken						
07	Storage/transport protection implemented						
08	Ship loose items marked and preserved						
09	Insulation resistance performed (Ref . EP-02)						
10	Periodical preservation carried out						
11							
12							
13							
14							
15							
16							
17							
18	SUPPLIERS ADDITIONAL MAINTENANCE REQUIREMENT LIST				INTERVAL		
VERIFIED		SUPPLIER		FABRICATION		HOOKUP	
Name	Executor		Executor		Executor		
Sign							
Date							
Name	Comp.		Comp.		Comp.		
Sign							
Date							

		PRESERVATION RECORD						Sheet no.		<Project>													
		INSULATION RESISTANCE (EP-02)																					
								MC Package no.															
TAG.NO.		AREA		INSULATION RESISTANCE M.ohm						SUPPLIER FABRICATION CONTR. HOOK UP		MEGGER TEST DATE											
PHASE TO PHASE			PHASE TO EARTH																				
				R/S	S/T	R/T	R	S	T														
												VERIFIED		SUPPLIER				FABRICATION				HOOKUP	
Name		Executor						Executor		Executor													
Sign																							
Date																							
Name		Comp.						Comp.		Comp.													
Sign																							
Date																							

		Sheet no.	<Project>
PRESERVATION MAINTENANCE CHECK LIST			
ELECTRICAL EQUIPMENT (EP-03)			
INTERVAL IN WEEKS	CHECK DESCRIPTION		
	<u>Note:</u> Ensure that equipment is not energised other than for heating and that safety precautions are followed. <u>GENERAL CHECK ITEMS</u> 1 Shafts on rotating equipment which are not locked shall be rotated 1 1/4 turn in the rotating direction to avoid brinelling when located in one position for long periods. Make sure that the new shaft position varies from check to check. Bearings with lube oil housing, check that oil level is adequate prior to rotation. 2 Inspect for corrosion, cleanliness and moisture and add preservative as required and ensure sealing and protection. 2 Ensure that preservation labels are in position. 1 Inspect and punch list any damage to the equipment. 2 Ensure that heating works using an ammeter or handfeeling the unit. Ensure that indication light on temporary heating distribution panel is working. 4 Inspect connection boxes for moisture and replace corrosion inhibitor if necessary. <u>SPECIAL CHECK ITEMS</u> 4 For switchboard, pull out at least one circuit breaker and inspect. 4 For heaters that are not temporarily energised, measure insulation resistance phase to phase and phase to earth. 4 For motors, generators and transformers measure insulation resistance phase to phase and phase to earth. 4 For batteries, follow suppliers instruction. 4 Ensure that non terminated cables are fitted with shrinking shroud. <u>AREA RELATED CHECK</u> 4 Check for physical damage to cable trays, light fittings, push-button etc. 2 Check that battery, switchboard and electrical equipment rooms are clean and dry. <u>Note:</u> Ensure that shipping stops are fitted on relevant equipment, prior to transfer of equipment.		

		PRESERVATION RECORD		Sheet no.	<Project>
		INSTRUMENT (IP-01)			
PO no. :		Area :		MC Package no.	
Manufacturer :		System :			
Description :		Subsystem :		Tag no. (Applicable Items)	
VALID STATUS CODE = OK, NA					
INSPECTION ITEM		SUPPL.	FABR.	HOOKUP	COMMENTS
01	Supplier's initial preserv. instructions issued				
02	Preservation performed				
03	Preservation labels fixed				
04	Toxicological data sheets attached				
05	Corrosion inhibitor installed				
06	Frost precautions taken				
07	Storage/transport protection implemented				
08	Ship loose items marked and preserved				
09	Periodical preservation carried out				
10					
11					
12					
13					
14					
15					
16					
17					
18	SUPPLIERS ADDITIONAL MAINTENANCE REQUIREMENT LIST				INTERVAL
VERIFIED		SUPPLIER		FABRICATION	
Name		Executor	Name		Executor
Sign			Sign		
Date			Date		
Name		Comp.	Name		Comp.
Sign			Sign		
Date			Date		
Name		Hookup	Name		Hookup
Sign			Sign		
Date			Date		

	PRESERVATION MAINTENANCE CHECK LIST	Sheet no.	<Project>
	INSTRUMENT EQUIPMENT (IP-02)		
INTERVAL IN WEEKS	CHECK DESCRIPTION		
	<u>Note:</u> Ensure that unit is not energised.		
	<u>GENERAL CHECK ITEMS</u>		
1	Ensure that all covers or doors on units are properly secured and sealed. If unit is protected with purge instrument air, ensure that recommended pressure and humidity is maintained.		
1	Inspect and punch list any damage to the equipment.		
4	Inspect units for corrosion damage, moisture etc. Clean and dry unit carefully. Replace corrosion inhibitor where required.		
4	Check that external surfaces or paintwork are not damaged.		
4	Ensure that recommended preservatives are in good condition. Re-apply as necessary to unpainted sliding and static surfaces. Do NOT apply to working electrical parts. Wipe off preservative from non-metallic surfaces.		
4	Ensure that all hinges, cover threads and fasteners are greased.		
4	Ensure that all necessary covers, end caps and plugs are in position on cables, tubing ends and associated control equipment. Replace any missing covers, plugs, caps etc.		
4	Ensure that preservation labels are in position. Correct and update as required.		
2	Check that all sensitive instrumentation exposed to damage are protected.		
	<u>SPECIAL CHECK ITEMS</u>		
8	Check that gas detector heads are stored in their respective factory sealed bags in a suitable storage location.		
4	Ensure that non terminated cables are fitted with shrinking shroud.		
	<u>AREA RELATED CHECK</u>		
4	Check for physical damage and damage of preservation protection.		
2	Check that instrument rooms are clean and dry.		
	<u>Note:</u> Ensure that shipping stops are fitted on relevant equipment, prior to transfer of equipment from suppliers and module contractors.		

		PRESERVATION RECORD		Sheet no.	<Project>	
		MECHANICAL (MP-01)				
PO no. :		Area :		MC Package no.		
Manufacturer :		System :				
Description :		Subsystem :		Tag no. (Applicable Items)		
VALID STATUS CODE = OK, NA						
INSPECTION ITEM		SUPPL.	FABR.	HOOKUP	COMMENTS	
01	Supplier's initial preserv. instructions issued					
02	Preservation performed					
03	Preservation labels fixed					
04	Toxicological data sheets attached					
05	Corrosion inhibitor installed					
06	Frost precautions taken					
07	Storage/transport protection implemented					
08	Ship loose items marked and preserved					
09	Equipment enclosure sealed off					
10	In/outlets sealed off					
11	Insulated part protected					
12	Periodical preservation carried out					
13						
14						
15						
16						
17						
18 SUPPLIERS ADDITIONAL MAINTENANCE REQUIREMENT LIST					INTERVAL	
VERIFIED		SUPPLIER		FABRICATION		
HOOKUP						
Name	Executar		Executar		Executar	
Sign						
Date						
Name	Comp.		Comp.		Comp.	
Sign						
Date						

		PRESERVATION MAINTENANCE CHECK LIST MECHANICAL (MP-02)	Sheet no.	<Project>
INTERVAL IN WEEKS	CHECK DESCRIPTION			
1	Shafts on rotating equipment which are not locked shall be rotated 1 1/4 turn in the rotating direction to avoid brinelling when located in one position for long periods. Make sure that the new shaft position varies from check to check. Bearings with lube oil housing, check that oil level is adequate prior to rotation.			
1	Check that compartment heater is working.			
1	Check and report that preservation of control-, instrument-, switchgear-rooms, quarters and offices are maintained as per preservation requirements.			
1	Inspect and punch list any damage to the equipment.			
4	Check storage and preservation condition on all mechanical shipped loose equipment.			
4	Check that dust blinds are fitted on nozzles in and out from skids on single items of equipment and on free pipe ends and ducts.			
4	Check that painted and machined surfaces, which shall be coated with a rust preventive wax or oil are maintained.			
4	Check that the protective cover are maintained.			
24	Open up access hatch or inspection nozzles, check and report internal condition of surfaces and existing preservation on carbon steel coolers, heater, crude/gas meters, tanks and vessel, centrifugal, screw-reciprocating compressors.			
4	Check for physical damage and damage of preservation protection.			

Plastic label
Front of the label

PRESERVATION CARRIED OUT

MC PACKAGE NO.

TAG NO.

INTERVAL

DATE

SIGN.

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[illegible]

		PRESERVATION CARRIED OUT															
PRESERVATION MAINTENANCE	SIGN. DATE	MC-PACKAGE	TAG NO.	INTERVAL	DATE	SIGN											