

SPECIFICATION

FOR

**CONTROL PANELS USING PROGRAMMABLE MICRO CONTROLLER
FOR NITROGEN PLANT**

IN

**PETROCHEMICAL PLANT, FACT UC
KOCHI, INDIA**

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1.0 GENERAL

- 1.1 The Fertilisers and Chemicals Travancore Limited (herein after referred to as "FACT") is a large Central Public Sector Undertaking in Kerala, engaged in manufacture and sale of Fertilisers/ Chemicals/ Petrochemicals, Consultancy Services, Engineering Fabrication etc, with its major manufacturing units located at Udyogamandal and Ambalamugal in Kochi, Kerala.
- 1.2 FACT UC proposed to upgrade the existing relay based control and interlock system of sub sections of Nitrogen Plant in its Petrochemical Plant, viz. Instrument Air compressor system, Instrument Air drier system, Plant Air drier system and Nitrogen generation section into state of the art programmable micro controller based Interlock System.
- 1.3 This specification covers the minimum user requirements for the design, manufacture, inspection, testing, supply, Installation & commissioning and warranty services of the proposed Programmable Micro Controller based control systems with accessories for installing in Instrument Air compressor system, Instrument Air drier system, Plant Air Dryer System and Nitrogen generation section of Petrochemical Plant. The specification also covers the requirement of Documentation, Accessories, Training etc as per sections that follow. The intent of this document is to describe the minimum acceptable parameters from user point of view.
- 1.4 The entire work has to be carried out adhering to all relevant industrial standards, regulations and the best engineering practices, utilizing best quality materials and workmanship. The absence of specification on any aspect shall imply that the best engineering practices and statutory requirements shall prevail.
- 1.5 It may be noted that compliance to this document alone does not absolve the supplier from supplying a system/equipment that does not meet all the specified operating and service requirements.
- 1.6 In the event of any conflict between data given in the specification and the requirements with respect to standards/regulations, the bidder may quote as per standards/regulations. The same shall be intimated to the purchaser before the bid due date and also this is to be specifically mentioned in the technical bid.
- 1.7 Bidder is advised to visit the site and collect / obtain all details, prior to submitting the offer.
- 1.8 The specification attached herewith is the general requirement of Programmable Micro Controller system. Refer Data sheets for more details regarding specific requirements of each section with regard to interconnectivity, field system interfacing, accessories requirements, logic requirement etc. as applicable.
- 1.9 Bidder has to comply with FACT's standard rules and practices applicable for contract works.
- 1.10 The offers that are meeting the PQ Criteria will only be considered for Technical evaluation.
- 1.11 For price evaluation, the total cost including supply (Complete system for four sub sections viz. Instrument air compressor , Instrument air drier, Plant air drier and Nitrogen generation unit, Documentation, Commissioning spares, Consumables) & service part (installation & commissioning, training) of total Programmable Micro Controller based system will be considered.

2.0 PROJECT REQUIREMENTS

2.1 SYSTEM PHILOSOPHY

2.1.1 FACT intends to upgrade the existing relay based Control Panels of Instrument Air compressors, Instrument Air drier, Plant Air Dryer and Nitrogen generation section of Nitrogen plant in Petrochemical Plant with state of the art Programmable Micro Controller based Control Panel.

2.1.2 Each system shall be independent and self standing with respect to its desired functionality. Each system shall have independent hardware and software programs.

Bidder shall provide necessary accessories required for meeting the specified functionality of each system. All components shall be of reputed make only. Alarm Annunciator shall be of GIC /Honeywell/Minilec.

2.1.3 Proper lugs and cross ferrules shall be used for wiring and cabling. Any power looping at panel instrument side is not permitted. For looping of signals/power, proper connectors or looping jumpers to be used, looping of cables with joint crimping of two cables or termination of two wires in same terminal is not permitted.

2.1.4 Refer data sheets and GA drawings attached for more details regarding specific requirements of each section as applicable. The operational requirements of each system shall be as follows.

2.1.5 Circuit breaker, Push buttons, Lamps, terminals etc. shall be of Siemens/Schenider/ Legrand/ ABB/Telemecanique/Connectwell/Phoenix.

2.2 Instrument Air compressor system

Reference Date sheet no. INST-PETRO-N2PLANT-DA-001 and GA Drawing no. INST-PETRO-N2PLANT-DWG-001.

2.2.1 The Instrument Air compressor system consists of three Air compressors viz Compressor A, B & C. Independent relay based control system for each compressor is housed in a single control panel located in Nitrogen Plant Control room. The control panel is installed with necessary indication lamps, push buttons, selector switches and a common Alarm annunciator for the safe startup, continues operation and safe shutdown of each compressors.

2.2.2 It is proposed to replace the existing control panel covering all components with new control panel housed with three independent standalone Programmable Micro Controller based interlock system, a common Alarm Annunciator and required indication lamps & Push buttons.

2.2.3 Following are the list of major components envisaged in the new system.

Sl No	Description	Qty	Remarks
1	Control panel	1 no	
2	Programmable Micro Controller based system (3 independent system+1 spare)	1 set	
3	Alarm Annunciator	1 no	
4	Push buttons	18 nos	

5	Indication lamps	27 nos	
6	Selector Switches	3 Nos	
6	Trip Amplifiers	6 Nos	
7	Compressor loading/unloading solenoid valves, ASCO, 110 V AC, 3 way, 1/2" Port.	4 Nos	
8	Accessories – Relays, MCB, Cable Glands, Terminals, lugs, ferrules, cable duct, DIN Rail, other wiring accessories etc	1 lot	

2.2.4 The control panel shall be free standing type with top cable entry. The panel shall have doors at back side, the panel shall house all components required for implementing the interlock system of three Instrument Air compressors.

2.2.5 The panel shall be provided with necessary illumination, utility socket, cooling fan, dust filter etc. The panel is proposed to be installed inside the existing Nitrogen Plant Air conditioned control room after removing the existing panel. The field cables and power supply cables (around 25 nos.) shall be removed from existing panel and glanded and terminated in the new panel.

2.2.6 Bidder has to provide a common incomer MCB (Redundant) for Power supply termination. Further distribution to all other components shall be in vendor's scope.

2.2.7 The interlocks of each compressor need to be implemented in each Programmable Micro Controller with its I/Os and the total integrated system shall be housed in the control panel. Each Programmable Micro Controller system shall be provided with power supply isolators and each system shall work independent to each other in all respects.

2.2.8 It shall be possible to isolate and remove each Programmable Micro Controller and its accessories from service without affecting the operation of other units.

2.2.9 Provision for Installation of three Ammeters to be provided in the Panel. The Ammeters shall be supplied by FACT at the time of Installation & commissioning. Necessary wiring shall be in vendor's scope.

2.2.10 Trip Amplifiers: Six nos. of P&F trip Amplifiers to be supplied and installed in the new panel for termination of temperature signals from Compressors. The relay contact of these trip amplifiers shall be wired to the Programmable Micro Controller system for interlocking purpose.

2.2.11 The scope of work include disconnecting field cables from existing panel, removal of panel, installation of new panel, termination of removed cables, loop testing from field and commissioning. Any re-glanding, if required to be done by the bidder.

2.3 Instrument Air drier system

Reference Date sheet no. INST-PETRO-N2PLANT-DA-002 and GA Drawing no. INST-PETRO-N2PLANT-DWG-002.

2.3.1 The Instrument Air Drier system consists of a dedicated single local control panel for its operation and control. The system is installed with necessary indication lamps and push

buttons for the safe startup, continues operation and safe shutdown of the unit. The system is provided with an electronic hooter for alarming of any cyclomatic failure.

2.3.2 It is proposed to install the new wall mounting type control panel housed with Programmable Micro Controller based Interlock system with indicating lamps, push buttons, selector switch, Panel indicators etc.

2.3.3 Following are the list of components envisaged in the new system.

Sl No	Description	Qty	Remarks
1	Control panel	1 no	
2	Programmable Micro Controller based system	1 set	
3	Push buttons	2 nos	
4	Indication lamps	12 nos	
5	Selector Switches	4 Nos	
6	Temperature Indicator	2 Nos	
7	Accessories – Relays, MCB, Cable Glands, Terminals, lugs, ferrules, cable duct, DIN Rail, other wiring accessories etc	1 lot	

2.3.4 The Programmable Micro Controller system for the drier shall have soft retentive timers with setting up to 24 Hrs. are needed for the operation of the unit.

2.3.5 The control panel shall be of wall mounting type with bottom cable entry. The panel shall have door at front side, the panel shall house all components required for implementing the interlock system of Instrument Air Drier system. The field cables and power supply cables (around 10 nos) shall be removed from existing panel and glanded and terminated to the new panel.

2.3.6 The scope of work include disconnecting field cables from existing panel, removal of panel, installation of new panel, termination of removed cables, loop testing from field and commissioning. Any re-glanding, if required to be done by the bidder.

2.3.7 The panel shall be of suitable for external installation at field near to the Instrument Air drier.

2.4 **Plant Air Dryer System**

Reference Date sheet no. INST-PETRO-N2PLANT-DA-003 and GA Drawing no. INST-PETRO-N2PLANT-DWG-002.

2.4.1 The Plant Air Drier system consists of a dedicated single local control panel for its operation and control. The system is installed with necessary indication lamps and push buttons for the safe startup, continuous operation and safe shutdown of the unit. The system is provided with an electronic hooter for alarming of any cyclomatic failure.

2.4.2 It is proposed to install the new wall mounting type control panel housed with Programmable Micro Controller based Interlock system with indicating lamps, push buttons, selector switch, Panel indicators etc.

2.4.3 Following are the list of components envisaged in the new system.

Sl No	Description	Qty	Remarks
1	Control panel	1 no	
2	Programmable Micro Controller based system	1 set	
3	Push buttons	2 nos	
4	Indication lamps	12 nos	
5	Selector switches	4 Nos	
6	Temperature Indicator	2 Nos	
7	Accessories – Relays, MCB, Cable Glands, Terminals, lugs, ferrules, cable duct, DIN Rail, other wiring accessories etc	1 lot	

2.4.4 The Programmable Micro Controller system for the drier shall have soft retentive timers with setting up to 24 Hrs. are needed for the operation of the unit.

2.4.5 The control panel shall be of wall mounting type with bottom cable entry. The panel shall have door at front side, the panel shall house all components required for implementing the interlock system of Plant Air Drier system. The field cables and power supply cables (Around 10 nos) to be removed from existing panel, glanded and terminated to the new panel.

2.4.6 The scope of work include disconnecting field cables from existing panel, removal of panel, installation of new panel, termination of removed cables, loop testing from field and commissioning. Any re-glanding if required to be done by the bidder.

2.4.7 The panel shall be of suitable for external installation at field near to the Instrument Air drier.

2.5 Nitrogen generation section

Reference Date sheet no. INST-PETRO-N2PLANT-DA-004 and GA Drawing no. INST-PETRO-N2PLANT-DWG-002.

2.5.1 The Nitrogen Generation section of Nitrogen Plant is installed with a dedicated control panel housing variety of electronic instruments and analyser and a relay based Interlock system for its sequential and logical operation and control. An alarm Annunciator is installed for annunciation of any process/system alarms.

2.5.2 It is proposed to retain the existing control panel with electronic instruments as such and to replace the existing relay based interlock system with a Programmable Micro Controller based interlock system. Also new alarm annunciator shall be mounted on the existing cut out with suitable modification, if any required after removing the existing alarm Annunciator. New electronic hooter shall be provided, mounted suitably and terminated along with new Annunciator. Its mounting and wiring shall be in Bidder's scope.

2.5.3 Following are the list of components envisaged in the new system.

Sl No	Description	Qty	Remarks
1	Programmable Micro Controller based system mounted on a mounting plate	1 set	
2	Alarm Annunciator	1 no	
3	Push buttons	3 nos	
4	Indication lamps	3 nos	
5	Trip Amplifiers	6 Nos	
6	Accessories – Relays, MCB, Cable Glands, Terminals, lugs, ferrules, cable duct, DIN Rail, other wiring accessories etc	1 lot	

2.5.4 The Programmable Micro Controller system shall be assembled on a mounting plate of suitable size so that the same shall be mounted inside the existing panel after removing the existing relay base system. The field cables shall be disconnected from the existing system and shall be connected to the new system with new ferrules and lugs.

2.5.5 The Alarm annunciator need to be disconnected from the system, removed from panel, new Alarm annunciator need to be fixed and connected back. Necessary interconnecting cables, ferules etc shall be in vendor's scope.

2.5.6 In case of Programmable Micro Controller system for Nitrogen generating section, the existing input and output termination strips and DIN rail shall be replaced with new fused terminal strips and DIN rail. Also the field cable with new lugs and ferrules shall be terminated. The cables for connecting field terminal strips in the panel to the supplied mounting plate shall be supplied and terminated by bidder. Six numbers trip amplifiers shall be mounted, configured and terminated to the Programmable Micro Controller inputs. Existing alarm annunciator shall be removed and new alarm annunciator is to be fixed with required modification and wiring.

2.5.7 Trip Amplifiers: Six nos. of P&F trip Amplifiers to be supplied and installed along with the Programmable Micro Controller system for termination of temperature signals from field Heater units. The relay contact of these trip amplifiers shall be wired to the Programmable Micro Controller system for interlocking purpose.

3.0 SPECIFICATION FOR PROGRAMMABLE MICRO CONTROLLER SYSTEM

The following guidelines detail the minimum requirements of the Programmable Micro Controller system.

3.1 GENERAL:

3.1.1 The Programmable Micro Controller shall be a Programmable Logic Controller with Power supply, Processor and I/O units. The base unit shall be expandable by adding modules.

- 3.1.2 Same make and model controllers of Omron/Siemens/Allen Bradley/Schneider need to be supplied for all units viz. Instrument compressor panel, Instrument Air drier system, Plant air drier system and Nitrogen generation unit.
- 3.1.3 The system shall have high noise immunity in order to ensure safe and reliable operation when subjected to RFI and EMI disturbances expected in normal plant operation.
- 3.1.4 The system shall have a data protection scheme for the preservation of data during the power outage and this shall be automatic.
- 3.1.5 Vendor has to engineer all the Interlocks, sequence of operations for safe operation of the system. The final logic diagram shall be handed over to the successful bidder during engineering stage.
- 3.1.6 The Programmable Controller system shall be operational under the worst operating conditions like Voltage variation more than +10%, Frequency variation more than +3%, Ambient temperature up to 45 deg C and relative humidity up to 95%.
- 3.1.7 The Power supply for the Programmable Controller shall be 110 V AC +/- 10%, 50 Hz +/- 3%. If DC power supply model is offered separate power supply shall be provided.
- 3.1.8 A spike protection device to be added in all systems in order to protect the components from lightning spikes and power supply spikes.
- 3.1.9 Separate MCBs shall be provided for each Programmable Logic Controller system for AC and DC power.
- 3.2 **PROCESSOR**
- 3.2.1 The processor shall have the capability to handle arithmetic, logical, sequential, comparison, timing and counting functionalities and analog signals. The Application program and data memory shall be non-volatile and EEPROM/Flash memory shall be available for application and data storage. The storage shall be automatic.
- 3.2.2 The retentive timers and clock functions shall be available for batch operation.
- 3.3 **INPUT and OUTPUT SYSTEM**
- 3.3.1 Omron interposing relays to be provided for all digital inputs and digital outputs. All interposing relays shall be with two Change-over contacts. All input and output interposing relays shall be wired to Programmable Logic Controller, alarm annunciator, Input TB, output TB, LED lamps with proper lugs and cross ferrules according to the requirements. All spare contacts, if any shall also be wired up to the terminal blocks. The interposing relays shall be of DIN rail mountable type with suitable mounting base units.
- 3.3.2 All field input contacts are to be potential free. The interrogation voltage to the field switches shall be 110V AC.
- 3.3.3 For all inputs and Outputs Interposing relays to be provided. For DC Interposing relays, flyback diodes to be provided for the protection against induced surge voltage. Interposing relays shall be individual relays and not relay boards.
- 3.3.4 The power supply for the Digital out puts from Programmable Logic Controller shall be 24 V DC. For field Solenoid valve Energisation 110 V AC is required and the same shall be wired through the output interposing relays.
- 3.3.5 All field terminals (DI/DO) are to be provided with fuses and shall have fuse blown indication. Each field signal shall be provided with two terminals. The power looping can be done at panel side only for the safe isolation of field devices.

3.3.6 Each I/O shall be protected against the reversal of polarity and shall be provided with filters to filter out any noise in the input line.

3.3.7 Each I/O channels shall have a LED per channel to indicate the status of input / output. The interposing Relays shall be provided with LED for status indication.

3.4 **SYSTEM SOFTWARE REQUIREMENTS**

3.4.1 The basic programming language for Programmable Controller shall be Ladder diagram. However it is preferable to have other languages such as FBD, STL, SFC etc.

3.4.2 The application software shall be modified at site, if sequence of operation needs changes as per site requirement during the commissioning.

3.4.3 Functions, sequence of operations and details of control scheme for safe operation of the system shall be furnished as a part of software.

3.4.4 The complete software package shall be provided with two backup DVD. This shall include all application software and complete documentation of the project.

3.5 **PROGRAMMER UNIT**

The Programmable Controller shall be provided with a portable programmer unit common for all Controllers. The programmer shall be a Laptop loaded with the required software. The programmer unit shall have min. 15" display, Dell or equivalent make, with all accessories and interconnecting cables, latest windows operating system and have following features.

3.5.1 Programmer shall have all diagnostic features and troubleshooting functions. It shall have I/O forcing functions. Forced/masked I/O list shall be available.

3.5.2 The programming terminal shall display logic and/or ladder diagram indicating signal flow and shall show description and status of each contact. It shall also be possible to display process alarms and diagnostic messages as and when they appear. Further it shall also be able to display I/O map in a user defined format.

3.5.3 It shall also be able to display process dynamic interlock sequences. It shall also be possible to start/stop the machinery indicated on the sequence diagram. All such displays shall be user configurable.

3.5.4 The software shall include all programs for the Programmable Logic Controller, which is required to perform all Programmable Logic Controller functions including communication and self-diagnostics.

3.5.5 One number of licensed programming software in CD/DVD shall be supplied along with Programmable Logic Controller system.

3.6 **SPARE PARTS AND CONSUMABLES**

3.6.1 Mandatory spares: One number standalone Controller mounted on Instrument Compressor Panel need to be supplied as standby spare.

3.6.2 Commissioning spares: All commissioning spares required for Installation, testing and commissioning of Programmable micro controller system shall be in the scope of vendor. In addition to that following consumables shall be supplied by the vendor along with the system.

- Fuses and Terminals - 25 nos of each type.
- MCB's - 5 nos.
- Relays - 20 nos of each type

- LED lamps - 10 nos
- Push button - 10 nos

4.0 PERIOD OF COMPLETION

- 4.1 Bidder shall submit relevant drawings within two weeks after placement of PO. FACT will communicate comments, if any within seven working days through e-mail.
- 4.2 Bidder shall complete the supply of the Programmable micro controller system with accessories as per TPS within 16 weeks from the date of issue of LOI/PO. The delivery period is inclusive of drawing approval, if any.
- 4.3 Installation and commissioning Programmable micro controller system with accessories shall be completed within six weeks from the date of site clearance (work-to-proceed notice) by FACT.
- 4.4 For delay in supply and completion of installation activities, liquidated damages / penalty, as applicable shall be imposed as per terms of the enquiry/PO.

5.0 SCOPE OF SUPPLY AND WORK

5.1 BIDDER'S SCOPE OF SUPPLY AND WORK:

Scope of supply and work shall include but not limited to the following:

- i. Design, manufacture, programming, inspection, testing, supply, installation and commissioning of independent Programmable micro controller based control system for Instrument Air compressor systems, Instrument Air Drier system, Plant Air Drier System and Nitrogen generation section with its required accessories as per the enquiry and specification/data sheets.
- ii. Packing, forwarding, transportation, transit insurance, moving and handling at site, un-packing etc of the complete equipment shall be under the scope of the bidder. Lifting equipments and vehicles shall be made available depending upon availability inside the company premises.
- iii. Removal of existing control panel of Instrument Air compressor systems and relay box from Nitrogen generation section. Disconnecting existing cables for the removed panels and retained panels (Instrument air drier system and Plant air drier system Panel), preparation of necessary termination drawings during disconnection, transportation of removed items to scrap yard or suitable location as instructed by Engineer-in-charge of FACT.
- iv. Installation of new panel for Air compressor system, Instrument air drier system and Plant air drier system and mounting of Programmable micro controller fixed mounting plate & alarm annunciator in the existing panel of Nitrogen generating section, cable glanding, wiring and termination of power, interconnecting cables and signal cables, field-testing, loop checking and commissioning of the complete system.
- v. All Site Support & Technical Assistance for successful installation, erection and commissioning of Programmable micro controller system covered in this specification.
- vi. Program modification at site for the process requirements.
- vii. Commissioning spares and consumables during commissioning of the system.
- viii. Drawings and documents as specified.
- ix. Training for FACT personnel at site.

- x. The bidder shall arrange to collect / obtain data/details from the site required for design/configuration of the system by deputing their engineers.
- xi. Accommodation and travel of bidder's personnel deputed to the site for all purposes in connection with this work including warranty period shall be under bidder's scope.
- xii. Special tools, if any required during installation & commissioning.

5.2 ITEMS UNDER PURCHASER'S SCOPE

- 5.2.1 FACT will provide one no. 110 V AC, UPS and 230 V AC Non-UPS power supply at each Programmable micro Controller panel.
- 5.2.2 Provision for mounting Programmable micro controller system for Instrument Air compressor systems, Instrument Air drier system, Process Air Drier System and Nitrogen generation section at each location.

6.0 INSPECTION AND TESTING

- 6.1 Inspection and tests shall be carried out for the entire system in order to ensure conformity to standards & specifications, system performance and that it meets requirements as stipulated in TPS.
- 6.2 Bidder shall test and confirm the functional integrity of the system hardware and software prior to dispatch. The test certificate shall be submitted for review and verification by the purchaser. No material or equipment shall be dispatched until all required tests are successfully completed and the test certificates duly verified by the purchaser.
- 6.3 Pre-Dispatch-Inspection (PDI) shall be done jointly by bidder and purchaser's representative at bidder's facility / factory for the complete system with all accessories as specified in this specification. Facility and necessary arrangements for successful completion of PDI covering all operational & performance aspects of the offered system shall be in the scope of the bidder. The bidder shall inform the purchaser two weeks prior to the commencement of inspection after completion of internal inspection of the complete system as specified in the enquiry. The bidder shall submit the procedure for PDI and results of internal inspections for Purchaser's review well in advance before giving intimation for commencement of PDI. The accommodation and conveyance of the purchaser's representative during the period of inspection shall be under FACT scope. If the internal tests conducted by the bidder are found satisfactory to the purchaser, the PDI can be cancelled at the discretion of the purchaser.
- 6.4 **Site Acceptance Test (SAT)** shall be done, jointly by the bidder and the purchaser, after system installation and commissioning. When the Programmable micro controller systems are completely assembled, this shall be subject to inspection by the Purchaser's representatives. The testing shall be carried out to ensure functional integrity of all hardware and software supplied. Bidder must initiate the remedial action in case unsatisfactory operation of any equipment or item is observed during this testing with intimation to Engineer-in-Charge. A detailed report shall be prepared on the tests and the final takeover of the system shall be based on the conformity to the specifications and functions specified.
- 6.5 All equipment shall be inspected thoroughly by bidder and Purchaser at site. The tests, as a minimum, shall include:
 - i. Hardware verification as per packing list.
 - ii. Visual and mechanical checking.

- iii. Performance, Functioning, display, programming etc.
- iv. Any other checking as per bidder's Quality assurance plan.

6.6 **Continuous Run-in Test (CRT) at site** shall commence for a period of 7 days after satisfactory completion of SAT. For starting CRT, the Programmable micro controller system should be lined up in full for operation. The objective of the CRT is to determine the long-term stability and availability of the system. The system shall have successfully completed the test when:

- i. At least 99% system up-time has been recorded for 7 consecutive days.
- ii. No more than one "significant fault" has occurred during the 7 days period. A "significant fault" is defined as any failure which, in the opinion of the Purchaser, would give rise to questions regarding design, accuracy or reliability of the system.

6.7 The bidder shall not make any adjustments or modifications or perform any maintenance on the system during the CRT, without the knowledge and consent of the purchaser. If two or more significant faults occur during the test or if the uptime is less than 99%, the test shall start altogether from the beginning. If the bidder carries out a major hardware or software modification, then also, the test shall start altogether from the beginning.

6.8 The CRT will be temporarily suspended when the following occur, but system availability shall not be affected during such temporary suspension:

- i. Loss of electric power.

6.9 A detailed report shall be prepared on the tests and the final takeover of the system shall be based on the conformity to the specification and functions specified.

6.10 Purchaser confirmation of successful completion of the CRT shall be a prerequisite for final acceptance/ takeover of the Programmable micro controller systems. For conducting CRT, continuous operation of Plant is not essential.

7.0 TRAINING

7.1 The bidder shall provide satisfactory training to maximum 8 operating/maintenance personnel of FACT UC. The training shall be arranged at the site.

7.2 Bidder shall provide three hard copies and one soft copy in CD/DVD of the training manuals with appropriate details for the Programmable micro controller system supplied.

8.0 WARRANTY & PERFORMANCE GUARANTEE

8.1 Bidder shall provide warranty for the system for 12 months from date of takeover (after CRT) of the system or 18 months from date of supply whichever is earlier covering complete Programmable micro controller systems and bought out items.

8.2 Bidder shall have full defect liability during the warranty period. It shall be obligatory on the part of bidder to modify and/or replace any hardware or software, entirely at his cost, in case any malfunction is revealed during the warranty period.

8.3 Bidder shall provide total maintenance of the system during warranty period including replacement of equipment / component, if any required entirely at his cost.

8.4 In case of a hardware or software malfunction during the warranty period, bidder shall depute his service engineer to the site and rectify the defects within 24 hrs of the receipt of information.

8.5 Performance Guarantee: The bidder shall provide performance guarantee to effect that the system will meet the requirements set forth in the PO with respect to quality, specifications and performance.

8.6 To ensure optimal performance of the system supplied by the bidder, a Performance Bank Guarantee (PBG) of 10% of the total order value shall be submitted in the respective format till the completion of warranty period.

9.0 DOCUMENTS AND DRAWINGS

9.1 Bidder should attach detailed literature/Catalogue, manuals carrying all technical details, specification, ordering information of offered models, Drawing etc along with the technical bid.

9.2 All documents and drawings submitted shall be in readable format and shall be as per the good engineering practices. All dimensions shall be in mm. All soft copies of documents and drawings shall be in standard pdf or ACAD format.

9.3 Bidder has to submit final drawings (GA drawing, Schematic drawing, wiring drawing, Dimensional drawing etc.) within two weeks after placement of LOI/PO for comments by FACT.

9.4 Following documents shall be furnished along with the offer.

- i. BOM [hardware and software] with quantity, make, model and detailed specification of all components and sub-assemblies.
- ii. System configuration, specification and hook up schematic drawings.
- iii. Wiring and Interconnection drawings.

9.5 Following documents shall be furnished along with supply of items (minimum three hard copies and one soft copy).

- i. Final documents in respect of items (i) to (iii) in 9.4. BOM shall have reference with purchaser's PO serial No and PO item code.
- ii. Installation, Operation and maintenance manual, GA Drawings.
- iii. Original test certificates & guarantee certificate
- iv. Three copies of training manual, Installation guide, Operation and maintenance manual along with softcopies

10.0 INSTALLATION AND COMMISSIONING

Bidder's scope shall include:

10.1 Removal of existing Relay based system including panel of Instrument Air compressor system and relay box of Nitrogen generation panel. The same includes disconnecting terminals, removal of glanding, removal of the system from its mounting fixture, transportation to scrap yard or suitable place instructed by FACT.

10.2 Installation of all Programmable micro controller systems, Panel, cabinet etc with all accessories.

10.3 Cable glanding for removed cables, cable dressing, wiring, and cable terminations, testing and commissioning of the Programmable micro controller based system as per FACT TPS.

10.4 Cleaning of existing panel mounting fixtures, painting etc. Power and signal cable glanding and termination.

- 10.5 Loop checking, testing, software checking, sequence checking, checking of the system functioning during normal operation of Plant.
- 10.6 All commissioning spares required for installation, testing and commissioning of system shall be arranged by bidder. Crane/Lifting equipment will be provided by FACT depending upon availability.
- 10.7 Bidder shall employ only ESI registered workmen for work inside the factory. Bidder's site personnel whose salary exceeds the salary limit prescribed under ESI Scheme for coverage, they should suitably and adequately be covered by an accident policy issued by a nationalized Insurance Company for the entire period of contract. Also bidder shall comply with FACT's standard rules and practices applicable for contract works. Any special tools/accessories required have to be brought by the bidder.
- 10.8 Vendor shall visit site and shall be familiar with the local labour rules and procedures, availability of local labour etc at site.

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11.0 BILL OF MATERIAL(BOM)

Sl No.	Description of Work	Qty
1.0	Programmable Micro controller based Control System for Instrument Air Compressors in Nitrogen plant, Petro-UC as per TPS: INST-PETRO-N2PLANT-PS-001 and Data sheet no: INST-PETRO-N2PLANT-DA-001 with following items.	
1.1	Control panel	1 no
1.2	Programmable micro controller based system (3 independent Programmable logic controller system+1 Installed spare)	1 set
1.3	Alarm Annunciator	1 no
1.4	Push buttons	18 nos
1.5	Indication lamps	27 nos
1.6	Selector Switches	3 Nos
1.7	Trip Amplifiers	6 Nos
1.8	Compressor loading/unloading solenoid valves, 110 V AC, 3 way, 1/2" Port.	4 Nos
1.9	Accessories – Relays, MCB, Cable Glands, Terminals, lugs, ferrules, cable duct, DIN Rail, other wiring accessories etc.	1 lot
2.0	Programmable micro controller based Control System for Instrument Air Dryer in Nitrogen plant, Petro-UC as per TPS: INST-PETRO-N2PLANT-PS-001and Data sheet no: INST-PETRO-N2PLANT-DA-002 with following items.	1 Set
2.1	Control panel	1 no
2.2	Programmable logic controller based system	1 set
2.3	Push buttons	2 nos
2.4	Indication lamps	12 nos
2.5	Selector Switches	4 Nos
2.6	Temperature Indicator	2 Nos
2.7	Accessories – Relays, MCB, Cable Glands, Terminals, lugs, ferrules, cable duct, DIN Rail, other wiring accessories etc	1 lot

3.0	Programmable micro controller based Control System for Plant Air Drier in Nitrogen plant, Petro-UC as per TPS: INST-PETRO-N2PLANT-PS-001and Data sheet no: INST-PETRO-N2PLANT-DA-003 with following items.	1 Set
3.1	Control panel	1 no
3.2	Programmable logic controller based system	1 set
3.3	Push buttons	2 nos
3.4	Indication lamps	12 nos
3.5	Selector switches	4 Nos
3.6	Temperature Indicator	2 Nos
3.7	Accessories – Relays, MCB, Cable Glands, Terminals, lugs, ferrules, cable duct, DIN Rail, other wiring accessories etc	1 lot
4.0	Programmable Micro Controller based Control System for Nitrogen Generation Section in Nitrogen plant, Petro-UC as per TPS: INST-PETRO-N2PLANT-PS-001and Data sheet no: INST-PETRO-N2PLANT-DA-004 with following items.	1 Lot
4.1	Programmable Logic Controller based system mounted on a mounting plate	1 set
4.2	Alarm Annunciator	1 no
4.3	Push buttons	3 nos
4.4	Indication lamps	3 nos
4.5	Trip Amplifiers	6 Nos
4.6	Accessories – Relays, MCB, Cable Glands, Terminals, lugs, ferrules, cable duct, DIN Rail, other wiring accessories etc	1 lot

Notes: For details refer data sheets.