EPs Contractor:	ZANJAN UREA FERTILIZER PROJECT	Owner:
Petrochemical Industries Design & Engineering Company (PIDEC) Project No. : 1231	Cover Sheet	ZANJAN Agricultural & Fertilizer Industries Co. Project No.: 214

REQUISITION FOR : REFRIGERATION UNIT	ALWAYS REFER TO REQ. NO.	Rev.
	REQ No.: **1231-DE-10-RE-REQ-330**	**05**
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This Purchase Requisition in conjunction of all correspondences and Hamoon Rah proposal is issued for design and supply of:

REFRIGERATION UNIT

as per this Requisition and its attachments.

Requisition Contents

1. Scope of Work
2. Scope of Supply
3. Requisition Notes
4. List of Attachments

DE	EXT	IFP		A	
Eng. Phase	**Purpose of Distribution (POD)**	**Purpose of Issue (POI)**		**Owner's Action**	
05	28.10.2024	Issued for purchase (Partially revised)	H.Shafiei	M.Shahsavarifard	M. Shahsavarifard	A.Kazemi
04	14.08.2023	Issued for purchase (Partially revised)	M.Rahimi	F.Dianatkhah	F.Dianatkhah	A.Kazemi
03	12.06.2023	Issued for purchase	M.Rahimi	F.Dianatkhah	F.Dianatkhah	A.Kazemi
02	21.07.2020	Issued For Inquiry (Partially revised)	M.Rahimi	F.Dianatkhah	F.Dianatkhah	A.Kazemi
01	07.07.2020	Issued For Inquiry (Partially revised)	M.Rahimi	F.Dianatkhah	F.Dianatkhah	A.Kazemi
00	06.06.2020	Issued For Inquiry	M.Rahimi	F.Dianatkhah	F.Dianatkhah	A.Kazemi
Rev.	**Date**	**Description**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**

1. SCOPE OF WORK

Hamoon Rah's scope of work includes but not limited to the following items with requirements stated in the requisition and all its attachments.

1.1. GENERAL

Main Quotation	Options		
■	☐	1.1.1	Design & Engineering
■	☐	1.1.2	Fabrication /Manufacturing
■	☐	1.1.3	Documentation
■	☐	1.1.4	Assembly
■	☐	1.1.5	Shop test and inspection
■	☐	1.1.6	Painting
■	☐	1.1.7	Packing
■	☐	1.1.8	Marking
☐	■	1.1.9	Site supervision and start up services
☐	■	1.1.10	Training
■	☐	1.1.11	Mechanical guarantee
■	☐	1.1.12	Performance guarantee

1.2. OTHERS

■	☐	1.2.1	Shipping and Transportation According to Delivery Term
■	☐	1.2.2	HAZOP and SIL study
■	☐	1.2.3	Review of Purchaser's Drawings of Process Flow Diagram, Piping and Instrumentation Diagrams
■	☐	1.2.4	Export Customs Clearance
■	☐	1.2.5	Obtaining any Export License or other Official Authorization for Exportation
■	☐	1.2.6	All the required facilities within the battery limit which are necessary based on project requirements for safe and proper operation of package
■	☐	1.2.7	Coordination work with driver manufacturer
■	☐	1.2.8	As-built drawings
☐	☐		
☐	☐		
☐	☐		
☐	☐		
☐	☐		

2. *SCOPE OF SUPPLY*

Hamoon Rah's scope of supply shall include but not limited to the followings with all accessories and as required according to this requisition, its attachments and references:

2.1. GENERAL

Main Quotation	Options		
■	☐	2.1.1	Items and quantities as stated in the material summary list. (point 2.3)
■	☐	2.1.2	Installation / Mounting accessories
■	☐	2.1.3	Spare parts for pre-commissioning and commissioning.
☐	■	2.1.4	Spare parts for two years operation
☐	■	2.1.5	Capital spare parts (if any)
☐	■	2.1.6	Consumables for site erection
☐	■	2.1.7	Flushing and first oil filling
■	☐	2.1.8	Special erection and maintenance tools (if any)
■	☐	2.1.9	Special calibration tools (if any)
■	☐	2.1.10	Test equipment (during shop test)
■	☐	2.1.11	Name Plate (s)
■	☐	2.1.12	Documents as per the attached RFD (requirements for documents) form
■	☐	2.1.13	Final vendor data book (quality dossier and mechanical book)

2.2. OTHERS

■	☐	2.2.1	All components (mechanical, electrical, instrumentation, pipes and any accessory for safe start-up, running and shut-down) and other devices, which is not mentioned in para. 2.3 "Material Summary List" and "scope of article", but necessary for safe and smooth running of the package, shall be included in the scope of supply.
■	☐	2.2.2	Anchor bolt design and supply (For all parts of package)
☐	☐		
☐	☐		
☐	☐		
☐	☐		
☐	☐		
☐	☐		
☐	☐		

2.3. MATERIAL SUMMARY LIST

below mentioned Refrigeration unit will be supplied completely with all the following accessories, attachment, instruments, control, electrics, and others to enable it to work smoothly and economically as package. These accessories, attachment, etc. shall include but not limit to the items listed in paragraph 2.3.1 and any requirements specified on requisition notes. Major items and quantities are as follows:

Sr. No.	Item No.	Item Description	QTY	Unit (m/kg/ set/ ...)
1	PU-5001	Ammonia Refrigeration unit	1	Set

In the following tables, items marked with “X” will be within vendor’s scope of supply. Those marked with “R” will be within Vendor’s scope of supply if Vendor requires them. Meanwhile, those marked with “S” are quoted separately by vendor and will be of Purchaser’s option. Price for items marked with (*) is broken down in Vendor’s proposal.

2.3.1 Scope of Articles

	Items	Required by Purchaser	Proposed by Vendor	Remarks
1	Screw compressor with capacity control	X *		Vendor standard
2	Main driver (electric motor) with its accessories	X *		
3	Coupling(s) and guard(s)	X		Vendor standard
4	Common baseplate	X		
5	Suction drum	X		
6	Suction strainer	X		
7	Condenser & Receiver	X		
8	Suction trap with level indicator, switch and heater	X		
9	Economizer	X		
10	Lube and injection oil system:	X *		
10.1	- Oil separator & oil reservoir	X		
10.2	- Main and standby oil pumps and related drivers	X		
10.3	- Oil cooler With TRV,TG and valve on cooling water lines	X		
10.4	- Oil filters (twin)	X		
10.5	- Oil heater	X		
11	All piping with its supports and all cabling within baseplate	X		
12	All controls and instrumentation within baseplate including junction box	X		
13	Local control panel and gauge board with annunciators , interlock circuits and signal output modules	X		

14	TUV approved SIL 3 PLC	X		
15	Materials for insulation within baseplate	X		Just MTO is provided by Hamoon Rah
16	relief valves and/or pressure control valves	X		
17	Acoustic Enclosure (if needed): sound level should be less than 85 dBA at 1 m from package in any direction	X		
18	Spare parts			
18.1	Erection and commissioning	X		
18.2	Two years operation	X		
19	Special tools	X		
20	Mating flanges with bolts, nuts and gaskets (for special mating flange)	X		

Notes:

2.4. EXCLUSION

Following are excluded from vendor's scope of work:

1. Cabling between local control (electrical & instrumentation) panels, junction boxes and central control room, switchgear room locating outside the confines of the compressors battery limit.
2. Off-skid lighting, telephone, paging and fire alarm system design, layout and supply of material.
3. Off skid tray, ladder and supporting material.
4. Cable glands connected to motor and motor control stations related to purchaser cables.
5. Supply of minor materials of instrument erection & supporting such as erection consumables, cable lugs, steel plate, sunshades, auxiliary supports, 2” pipes, U-bolts, nut & bolts, screws, clamps, clips, plastic belts, insulating tape, fire proof sealing compound and so on.
6. Installation and commissioning work.
7. Mating flanges (except special type).
8. MCC

3. *REQUISITION NOTES*

3.1 Hamoon Rah shall supply all items in the package as defined in the P&IDs considering the specified battery limits (as minimum requirements). For all items, the OVERALL RESPONSIBILITY as to their suitability and performance is in Hamoon Rah's scope. Hamoon Rah shall ensure that all requirements of inspection, testing, drawing and documentation are followed by sub-vendor.

3.2 Any proposed change in the supplier's scope of supply shall be highlighted for purchaser approval.

3.3 Primary consideration in the design and construction of the unit must provide high efficiency, high reliability, safe operation and maximum life expectancy.

3.4 Package data sheet as well as all other attachments listed herein after shall be considered as integrated part of this material requisition. In case of any confliction between these documents, the matter shall be raised to purchaser for resolution before any further action.

3.5 Hamoon Rah's clarifications and exceptions from this requisition and the documents/drawings referred hereto have been clearly stated in the quotation. Any deviations or exceptions stated anywhere in the vendor's proposal except "Deviation List" shall not be accepted. Vendor's design and works excluding above-mentioned deviation and/or exception shall be deemed strictly in compliance with purchaser's requirements. Vendor's deviation and exception after placing the purchase order shall not be accepted in general.

No.	Spec. No. and Para. No.	Specification Requirement	Proposed Clarification, Exception & Deviation	Reason	Purchaser's Judgment

3.6 Environmental Conditions

Unless otherwise stated, all requirements shall be designed suitable for an outdoor location; particular consideration should be given to following:

- Rapid changes of temperature and pressure
- Condensation due to high humidity
- Air laden with dust and salt
- Exposure to direct sunlight
- Sand storm, thunder & lightning, and sea breeze

3.7 Unproven, prototype or "first off" equipment is **not** acceptable. Only proven equipment shall be used. Proven equipment is defined as equipment that has been in continuous operation elsewhere for a minimum two years trouble-free running experience in similar duty and environment to those specified for this project.

3.8 Noise level shall be limited to 85 dBA at one meter distance. If necessary, silencers/ acoustic insulations and/ or noise hood should be provided to meet the noise limit.

3.9 Materials of construction and corrosion allowance for all EQUIPMENT and machinery shall be for a design life of 25 years (except for heat exchanger tubes). However, minimum corrosion allowance shall be for carbon steel (including 0.5 Mo alloy steels) as per following:

- CS Pressure vessels and other applicable EQUIPMENT : 3 mm
- Low alloy Steel vessels and other applicable EQUIPMENT : 1.5 mm
- Storage tanks : 1.5 mm
- Piping : 1.5 mm
- Removable parts or internals (on each side in contact with operating fluid) : 0.75 mm

No copper or copper alloy are permitted.

3.10 SI metric system of measurement including °C and bar are used in the design except for pipe, pipefittings and flanges sizes, pipe threading, nozzle dimensions and flange ratings. (See 1231-BE-00-PR-ESS-003 "Engineering standard specification for units of measurement" - attached to requisition).

3.11 Filled out and signed letter of conformity submitted by Hamoon Rah is attached to this purchase requisition.

3.12 Every connection and item shall be flanged to allow easy and safe maintenance; day to day operation and maintenance operation should be conducted in an easy and safe way; this is a must that vendor must follow during design.

3.13 Connecting flanges at package battery limit shall be located at the edge of the skid.

3.14 All valves and controlling devices shall be within easy reach for convenient and quick attention by operators.

3.15 Vendor will supply all piping supports, insulation supports (If necessary), guides and electrical / instrumental cables as required by good engineering practice for package construction.

3.16 No threaded connections are allowed on process side.

3.17 The packages shall be designed, engineered so that the units can operate for two years without major overhaul and/or inspection, except for short periods and/or for minor repairs.

3.18 INSTRUMENTATION

3.18.1 General

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1. The control and monitoring of the overall Plant is performed by a Distributed Control System (DCS). Plant safety protection is performed by a SIL 3 PLC-based emergency shutdown system (ESD).

2. Vendor shall design and supply all the instrumentation necessary for the safe and efficient operation of the package units to fulfill the process requirements specified in this requisition. This includes, but not limited to all the instruments and control / protection system required for safe and satisfactory start up, control and shut down of the package units.

3. Multi-core cabling between refrigeration unit field junction boxes/local panels and marshalling cabinets in central auxiliary room is excluded from vendor scope of supply.

4. All instruments in hazardous area shall be of intrinsically safe (IS) type. Using of explosion proof devices are only acceptable if IS type is not commercially available.

5. Signals from/to MCC's shall be considered as non-IS.

6. All local panels, enclosures and junction boxes shall be explosion protected according to their area classification.

7. All field mounted instruments, enclosures and junction boxes shall be protected to IP-65.

8. SIL STUDY shall be performed by vendor for refrigeration unit based on IEC-61508 and ESD loops shall be classified accordingly. Necessary provisions to meet the results of SIL study shall be considered for PLC and instruments.

9. The process override or maintenance override switches shall be shown on relating diagram (if required) and the required facilities shall be foreseen as per Vendor's common practice.

10. The available power supply in the field is 110 V AC +10%,50 Hz + 5% UPS. Purchaser will provide redundant 110V AC ±5%, 50Hz ±1 power feeders (2 feeders) from UPS to control/protection panel inside control room. Further power distribution for all system/marshaling cabinets shall be in vendor scope. Furthermore any power conversion to other voltage levels shall be done by the vendor. Ventilation system (fans) shall feed through 110 VAC UPS. The work station, Printer (if any) power supply shall be compatible with 110 VAC UPS. Vendor shall specify the number and consumption of the necessary feeders of 110 VAC as the consumer list. Also one 230VAC, non UPS will be made available by purchaser for internal lamps and socket outlets in PLC cabinets of package.

11. Vendor shall specify his grounding requirements, instrument air and power consumption on 230 V AC, 110 V AC (UPS) power.

12. Air supply to pneumatic instruments will be from the outside of package battery limits. Instrument air distribution inside the package units is in vendor scope of work.

13. All instruments and control / protection systems shall be calibrated/ configured, programmed and debugged completely before delivery to minimize field works. Control / protection system and related equipment, barriers, power distributions etc. as well as cabinets, local panels shall be shop fabricated and wired up to the terminals, ready for installation and interconnection at site.

14. The commissioning & two years spare parts for the field instruments and control/protection system shall be provided by vendor as per spare part list approved by Owner.

15. All instruments and devices shall be supplied with nameplates indicating tag no., type, model no., serial no., range, type of protection, certifying authority, etc.

16. The instruments selection and control/protection systems design shall be in accordance with document No. 1231-DE-00-IN-ESS-603, “Engineering Standard Specification for Package Instrumentation” and “Engineering Standard Specification for Programmable Logic Controller”, Doc. No.: 1231-DE-00-IN-MSS-673.

17. Document No. 1231-DE-00-IN-SKT-007, “Instrument/Electrical Connection Details” should be followed by vendor for electrical interface with MCC's.

18. All instruments and control/protection systems shall be supplied from client approved sub-vendor list.Ñ9. Items agreed between Owner & Vendor regarding Instrumentation" has been attached to this REQUISITION as one Document.

3.18.2 Control / Protection system

1. PLC system, and a lap-top as engineering / operation interface, shall be dedicated to refrigeration unit to perform monitoring, control and safety.

2. Vendor shall use type C of control system block diagram (Refer to “ESS for instrumentation of package units”).

3. If PLC's are used for shutdown of the refrigeration unit, they shall be fully redundant (CPU, bus, communication modules, power supply, I/O cards, etc). PLC system shall be TUV approved for SIL3.

4. Galvanic isolator barriers (with HART feature for analog signals) shall be used.

5. The PLC's shall have the capabilities to integrate and work with the main instrumentation and control and shall have the communication capabilities to exchange data from and to other external PLC based control equipment, (such as MMS) and Plant DCS.

6. Each PLC system shall communicate with Plant DCS by redundant bi-directional Modbus TCP/IP based on Ethernet (with proper Firewall in order to reach a suitable cyber security). Plant DCS will act as the master. Coordination with Plant DCS vendor has to be carried out.

7. The PLC's shall be provided with all required system software including application/utility programs, engineering/configuration tools, self-checking and self-diagnostic fault detection capabilities.

8. Vendor shall supply one PC stations (desktop computers) for the package unit.

9. The required shutdown, start-up and inter-lock diagrams based on IEC 61131 shall be provided and implemented in refrigeration unit PLC's by Vendor.

10. The system logic shall be `fail safe'. All instruments shall be considered for fail to safe action upon loss of instrument air or electrical power. The input contacts to alarm, interlock and emergency shutdown system shall be close (make contact) during normal operation and open on alarm or trip. The solenoids shall be energized during normal operation and de-energized to trip.

11. The status of all switches in normal operating conditions shall be logic high “1”.

12. Comprehensive system status information shall be available on standard displays. The PLC shall be capable of on-line replacement of any faulty module without requiring system shutdown.

13. Sensors for shutdown shall be separated from sensors provided for measurement, control or pre-alarms.

14. PLC system shall receive synchronization signal from main Plant DCS, Time synchronization shall take place at least once a day @ 6 o’clock A.M.

15. All the system hardware (including monitoring, control, protection, communications, communication with Plant DCS, etc.) complete with all software (including application software) installed and loaded on the corresponding hardware, are subject to Factory Acceptance Test (FAT). FAT procedure shall be prepared by Vendor, approved by Owner and used as the guideline for performing FAT. Owner reserves the right to modify Vendor's standard procedure.

16. When Factory Acceptance Test (FAT) is over, the following features shall be available for future expansion:

    - a minimum of 20% installed spare breakers/fuses,
    - a minimum of 20% installed spare cores/pairs/triples terminals,
    - a minimum of 20% installed input/output spare points,
    - a minimum of 10% free space in cabinets,
    - 45% spare capacity for communication buses
    - 50% spare capacity for memory
    - 30% spare capacity for power supplies

- 40% spare capacity for process controller unit

17. All NIS digital input/output shall be isolated by relay.

18. The interconnection cables between the PLC cabinets are in Vendor scope of supply.

19. All terminal strips shall be suitable for rail mounting and compression knife type.

20. PLC system shall communicate with Plant DCS by redundant bi-directional Modbus TCP/IP based on Ethernet (with proper Firewall in order to reach a suitable cyber security). Plant DCS will act as the master.

3.18.3 Field Instruments

1. Design and supply of all package instruments, including process/air tubing and cabling up to junction boxes are within Vendor's scope of supply.

2. All skid mounted instruments shall be cabled up to the relevant junction boxes/local panels at refrigeration unit battery limits. Junction boxes, local panels and all cable glands shall be in vendor's scope of supply. Single cable shall be armored cable.

3. For off-skid loose and skid mounted instruments, all related Single Cables (40 meter for each item), Cable Glands, open conduits, pipe, tube (in SS316), fittings (in SS316), isolation and drain valves, manifolds, junction boxes, cable trays, instrument support, etc. shall be supplied by vendor based on Process & air Instrument Hook-ups and Instrument Field layout which shall be supplied by him. Separated junction boxes shall be used for different categories of signals. (Segregate JBs in accordance with signal type.)

4. Transmitters/Positioner shall be 4~20 mA, HART with integral indicator and switches shall be potential free contacts. All of them shall be suitable for area classification.

5. Solenoid valves shall be 24 VDC voltage rating suitable for area classification.

6. All limit switches for automatic valves shall be proximity (NUMOR) type and intrinsically safe.

7. All instrument/automatic valves wetted parts and process/air tubing materials shall be S.S. 316 as minimum, other materials as per process conditions.

8. All electronic instruments shall be supplied with threaded electrical connection of M20x1.5 with explosion-proof cable glands.

9. Isolating valves shall be provided for all instruments. Multi-port gauge valves for pressure switches and gauges and 5-valve manifold for DP transmitters shall be considered.

10. The system panels shall be equipped with Plant Earth (PE), Instrument Earth (IE). They shall be isolated from each other.

11. The instrumentation shall be rated to withstand the tropical, dust, humid environmental conditions.

12. Body of transmitter shall be die-cast aluminum.

3.19 ELECTRICAL

3.19.1 The electric motors shall be selected, sized and supplied as per specification for electric motors as attached: Material standard specification for low voltage induction electric motors : 1231-DE-01-EL-MSS-521 and Material standard specification for medium voltage induction electric motors: 1231-DE-01-EL-MSS-522.

3.19.2 Electrical Installation / Electrical design within the package battery limit shall be as per project specification “Material standard specification for electrical equipment as part of package” No. 1231-DE-01-EL-MSS-524.

3.19.3 Control and power electrical panel board design and preparation as per the project specification No. 1231-DE-01-MSS-508 (Material Standard Specification For Electrical Panel Boards).

3.19.4 All Electrical equipment such as motors, heaters, LCP in field,... shall be designed for Min. temp. -30ºC, Max. temp. indoor/outdoor: 40/48ºC, Altitude +1846 meter above Sea Level, Earthquake zone 3 as per UBC and... as per doc. "Ambient and site condition" attached to this requisition.

3.19.5 Motors shall be sized taking into consideration of the followings:

a. Motors shall be capable to operate continuously at rated horsepower for the specified altitude and ambient temperature and other conditions of SITE.

b. Motors driving centrifugal pumps shall have output power rating at least equal to the following percentage of pump design point brake hose power:

Motor Rating KW	Percent of Pump BKW
18.5 and Less	125%
22 to 55	115%
75 and Above	110%

3.19.6 All the electric motors shall have insulation class “F” and temperature rise of electric motors shall be limited to class “B” considering 48°C as ambient temperature.

3.19.7 Vendor shall complete and submit the purchaser electrical motor data sheets attached to the requisition for each motor separately. This data sheet is typical and shall be copied by vendor and filled out completely for all motors.
Note that manufacturer shall fill out “purchaser requirement” part of data sheet completely.

3.19.8 Motor rating (name plate rating at 48°C and altitude +1846 meter above sea level) shall be suitable for continuous operation at full load at specified site condition. Also motors shall be suitably sized so as to deliver required out put under frequency variations between -5 % and +2 %, coincidental with voltage variation of ±5%.

3.19.9 Test and inspection of electric motors shall be performed by motor vendor as per scope of inspection forms attached to the requisition.

3.19.10 Electric motors shall be suitable for direct on-line starting and for re-acceleration with any voltage between 80% and 100% of the rated voltage at terminals of the motor. So if there should be any Soft Starter, VSD panel, charger ... please specify and be noted that they will be in vendor scope of supply

3.19.11 Supply of cable trays, ladders, conduits, installation and fixing materials required for proper installation of the electrical equipment on skid c/w related drawings is in the vendor scope.
These items should be installed on the skid before shipment, by vendor.

3.19.12 Vendor shall provide cable list based on cables type lengths, source and destination points together with, voltage and tag no's. The special cable is in vendor scope of supply.

3.19.13 Supply of cable glands for purchaser cables will be by purchaser. Size of cables and cable gland threads will be specified during detail engineering stage. Cable glands entry shall be with ISO metric threads and 1.5mm pitch. Vendor shall confirm terminal boxes of motors, oil heaters and control/ammeter stations (size of thread and entry and terminals) are suitable for termination of power and control cable(s) directly. Supply of interconnecting cables between on skid mounted electrical equipment will be by vendor.

3.19.14 Each skid shall be equipped with at least two earth bosses at opposite sides. In addition to this, electric motor shall be equipped with earth terminal. Earth continuity of all on skid electrical equipment, instrumentation and metallic part to the skid is in vendor scope of work and supply. Earthing points shall be shown either in equipment layout or in general arrangement drawing. Purchaser will only connect the skids to plant earth grids at these points.

3.19.15 All electrical equipment including motor should be according to sub-vendor list of requisition.

3.19.16 The "High" and "High-High" contacts of the oil heaters-if any- will be connected to PLC by vendor. Dry contacts must be provided on heaters for this purpose by Vendor. These contacts must be isolated (and suitably separated) from power terminals.

Note that start/stop push buttons shall be installed on the package local control panel. If it is a separate push button stations, it will be provided by purchaser.

3.19.17 There should be an LCP (local control panel) for each compressor which will be in vendor scope of work/supply and all motors (main or auxiliaries) and heaters shall be controlled via this Local Control Panel. No separate LCS will be supplied by purchaser

for this requisition. All control signals- commands and indications- will be sent from this vendor local control panel to the UCP and then will be transferred to MCC from UCP based on agreement between electrical and instrument department. The only direct connection between MCC and loads will be their power and Ammeter cables.
Ammeters shall supplied by vendor and be fitted to the mentioned local control panel for each motors 4kW and above and they will be fed directly from MCC. The ammeter will be operated from a 1A secondary winding current transformer. And the Ammeters shall be suitable for hazardous area classification Zone2, gas group IIC and temperature class T3.

3.19.18 All electrical consumers of the package shall be summarized in a consumer list, showing consumer tag number, description, rated power, absorbed power (considering coincidence factor) and voltage.

3.19.19 Design and supply of electrical heat tracing inside package is in vendor's scope of work and supply.

3.19.20 All electrical Equipment shall be suitable for hazardous area classification Zone2, gas group IIC and temperature class T3.
For motors, it means that MV motors shall be Exd or it can be Ex “ec” and LV motors shall be EEx “eb” or EEx "ec" or EEx “d” with EEx “eb’’ terminal boxes. Also note that related validate EX certificates shall be submitted by the vendor.

3.19.21 Preparation of the following drawings / document in addition to the drawings and documents specified in RFD forms attached to the requisition:
a) Fixing and installation details for all electrical works, such as cabling and lighting system.

b) Logic diagram for offered systems, if applicable.
c) Control, schematic and wiring diagram for all motors, control panels, control stations and electrical consumers, motor control units, switches & ammeters.
d) List of all electrical consumers within the package. (a preliminary consumer list shall be given with quotation).
e) General arrangement drawing of electrical equipment showing connection & tie in points of earthing, electrical and control cables.
f) List of material take-off for lighting system equipment, installation and fixing materials, control stations and switches- if applicable.
g) Catalogue information for all electrical system, equipment and materials.
h) All required documents for electrical heat tracing inside the package.

3.19.22 Only 6000VAC and 400VAC, 3phase line to line could be provided for loads. Any further power voltages (like: 24V, 110V Dc voltages, UPS voltages,…) shall be foreseen by vendor and respective DC-charger to feed DC oil pump is in vendor scope.

3.19.23 Based on clause 9.1 from MV motor specification attached to this requisition, 6 RTD Pt100 (two per phase) for winding and also one RTD for each bearing (2 RTDs for bearings) shall be considered.

3.19.24 For MV motors, space heater should also be considered.

3.19.25 Starting current of MV motors shall not exceed 5.5 times the motor rated current and also starting current for LV motors with a rated output in excess of 55 KW shall not exceed 7 times the motor rated current.

3.19.26 Finished color of motor shall be RAL 7038. Also finished color of vendor's LCP shall be RAL 6021.

3.19.27 Test and inspection of all electrical items (motors, heaters, LCP,…) should be done as per our SOI attached to this requisition.

3.19.28 Two years spare parts for all electrical equipment (each type of electric motors, Heaters, LCP,...) shall be consider as per Specific List of Spare Parts, attachment no. 4 of this requisition.

3.20 MECHANICAL

3.20.1. General

3.20.1.1. Design, fabrication and material selection of all pressure containing equipment e.g. Shell & Tube Heat Exchangers, pressure vessels, air coolers, filters etc. shall be according to following editions of the reference codes and standards:

- ASME BPVC Sec. VIII Div. 1 & 2 _ 2017 edition
- ASME BPVC Sec. IX _ 2017 edition
- ASME BPVC Sec. I _ 2017 edition
- ASME BPVC Sec. II _ 2017 edition
- ASME BPVC Sec. V _ 2017 edition
- TEMA 9th edition
- API 660 _ latest edition
- ASME B 16.5 _ compatible with ASME 2017
- ASME B 16.47_ compatible with ASME 2017
- ASTM Standard _ compatible with ASME 2017
- AWS Standard _ latest edition
- UBC 1997
- ANSI/ASCE7 _ 2010
- “Engineering standard specification for shell and tube heat exchanges” specification no. “1231-BE-00-HM-ESS-286”.
- “Engineering standard specification for air cooled heat exchanges” specification no. “1231-BE-00-HM-ESS-290”.
- Deleted

3.20.1.2. The gaskets used for hydro-test shall be of the same type as those used for operation. Supply of blind, bolts and gaskets for test are in vendor’s responsibility.

3.20.1.3. All required repair work shall be reported to the purchaser, and repair work will only proceed after approval by the purchaser. The repaired weld shall be subjected, as a minimum requirement to the same testing and inspection requirements as the original weld. If during final inspection additional defects are discovered, the total weld seam or area shall be examined. If second repair is necessary, purchaser's permission must be obtained prior to proceeding with the repairs.

3.20.1.4. When full radiography is required, any non-radiographable welds shall be inspected by magnetic particle and / or ultrasonic methods.

3.20.1.5. Radiographic / ultrasonic examination and / or other non-destructive tests before / after PWHT and during welding / edge preparation shall be strictly conducted by vendor in accordance with Engineering Specification attached to requisition and relevant ASME code. Also MT/PT examination to be done after final PWHT.

3.20.1.6. Equipment normally operated under vacuum shall be designed for full vacuum and for the highest pressure it can experience in case of vacuum failure. Hydro-test of such equipment must be performed as requested in paragraph UG-99 of ASME code, Sec. VIII, Div.1.

3.20.1.7. Nozzle loads shall be according to "Engineering Standard Specification for Nozzle Loads on Static Equipment attached to requisition (1231-GN-00-PV-ESS-242).

3.20.1.8. Filters and silencers shall be designed, fabricated, tested and inspected in accordance with vendor standard. Pressurized bodies must be designed, fabricated, tested and inspected based on ASME code by the way. Various elements shall be standardized as far as possible. Uniform sizing and selection shall be done for various parts to reduce inventory of spares, better interchangeability and ease of maintenance.

3.20.1.9. All parts must be perfectly dried and sealed after final hydro-test and nitrogen filled prior to shipment providing with valve, nitrogen bottle etc.

3.20.1.10. Environmental loads such as Wind and Seismic loads must be considered in design of all parts and supporting elements. The most stringent load combination / load case will govern.

3.20.2. Shell and Tube Heat Exchanger

3.20.2.1. Vendor shall follow attached "Engineering Standard Specification for Shell and Tube Heat Exchangers" to the requisition (1231-BE-00-HM-ESS-286).

3.20.2.2. Girth joint gaskets shall be solid metal type, spiral wound metal non-asbestos (graphite) filled type, double-jacketed metal non-asbestos (graphite) filled type, Kammprofile type.

3.20.2.3. Tube-sheets shall be designed based on ASME Code. Under specified design conditions and vendor shall submit appropriate design: Design by rule / Design by analysis.

3.20.2.4. Tube-sheets shall be fabricated from forged material.

3.20.2.5. For shell and tube HE, tubesheets shall be designed according to ASME Code. All ASME requirements for pressure parts just same as vessels must be fulfilled. TEMA requirements must be strictly followed in all aspects of the job. Girth joint gaskets shall be solid metal type, spiral wound with non-asbestos (graphite) filler, double-jacketed metal non-asbestos (graphite) filled type, Kammprofile type whichever applicable considering design pressure.

3.20.2.6. For plate type HE, all requirements of API 662 must be fully considered by the manufacturer in all steps of the job.

3.20.2.7. Vendor shall design Expansion Joints according to ASME Section VIII, Division1, "Appendix 5" and "Appendix 26". FEA reports (Design by Analysis) shall be based on ASME code (Section VIII, Division2, Part5) and TEMA 9th Edition. Also be noted that designed expansion joint cycles (at least 1000 cycles) shall cover life time of surface condenser.

3.20.3. Pressure vessels

All pressure vessels within the package boundary must be designed, fabricated, tested and inspected based on operating conditions and for safe operation of at least 20 years. ASME requirements as well as Engineering Specifications and Standard Drawings must be the only references to comply with. Any deviation and alternatives could be applied just after client approval is granted.

3.21 PIPING

3.21.1 Piping design with the inlet strainers (main & temporary) and outlet special check valves on main streams, is in vendor's scope of supply.

3.21.2 All piping system shall be terminated at package B.L. (edge of skid), with an ANSI flange and should be anchored at this point. For flange equal or smaller than 24", ANSI B16.5 and for flange equal or greater than 26", B16.47 Series B shall be used. In any case the flange does not conform to purchaser spec. the mating flanges, gasket and bolts shall be supplied by vendor. Also all internal flanges should be according to ANSI standard.

3.21.3 The design, fabrication, and testing of piping material shall be as per ANSI B31.3.

3.21.4 All main and auxiliary piping shall be laid out in neat fashion to allow adequate clearances for operation and maintenance (Min 900 mm), and head rooms (Min 2200 mm) for working personnel. Design shall allow maintenance of parts without dismantling piping or supports.

3.21.5 RTJ flanges shall be considered by vendor for rating 900# and above at B.L.

3.21.6 Short radius elbow, plate flanges and nonstandard fittings, not covered in ANSI B16.5, 16.47-B, B16.11, and B16.9 shall be avoided.

3.21.7 Piping shall be terminated at the coordinates specified in the drawings and as approved by the purchaser.

3.21.8 All main operating valves, control valves, motor operated valves, etc. shall be located in an accessible way, from platform or grade.

3.21.9 Asbestos gaskets shall not be used.

3.21.10 All utility pipe lines such as CWR, CWS, LPS will be provided at battery limit as the single point headers, vendor to distribute of the headers for the package.

3.21.11 Carbon steel pipes used for process and/ or steam lines shall be manufactured by open hearth, electric furnace or basic oxygen process.

3.21.12 In general connections, piping, valves and fittings of 1 ¼", 2 ½", 3 ½", 5", 7", 9", 22", and 26" shall not be used. In case their use is unavoidable, vendor shall provide reducers with bigger size other than listed above at purchaser's battery limit connection.

3.21.13 Pipe sizes smaller than 1/2" shall not be used except for instrumentation and analysis.

3.21.14 Corrosion allowance shall be added to the calculated thickness consistent with the design service conditions.

3.21.15 Piping shall be supported such that pipes have no rotation/ movements at battery limit.

3.21.16 Any special supports such as springs, expansion joints, ... inside the package, are in the vendor's scope of supply and related data sheets or vendor drawings must be delivered to Purchaser.

3.21.17 All piping between skids are in vendor scope of design and supply.

3.22 STRUCTURAL (FOUNDATION DESIGN)

3.22.1 Loading diagram (static & dynamic) of equipment and general arrangement of FDN shall be prepared by vendor according to ACI351.3R.

3.22.2 Design and supply of all type of anchor bolts and/ or expansion bolts necessary for installation of the whole package, including main items or its all auxiliary parts and units, shall be done by Vendor. Meanwhile, project engineering standard specification for anchor bolt, document No. “1231-DE-00-ST-ESS-746”, is attached to this requisition just as a guideline”. Vendor shall submit Anchor bolts detail (size and location).

3.22.3 Design and supply of all necessary anchor bolts/expansion bolts shall be in such a way that it would make no delay in civil work for construction of the foundations for main equipment and auxiliary items which are in vendor’s scope.

3.22.4 Vendor shall prepare a separate document containing list of all necessary anchor bolts/expansion bolts indicating type, quantities, material of construction, and necessary detail sketches. Such document shall be issued and submitted to purchaser in early stage of the work.

3.22.5 No increase in allowable stress shall be taken, when wind or earthquake (or other similar loads which increase in allowable stresses are allowed) are considered.

3.22.6 Anchor bolts shall be galvanized, in case of galvanizing is prohibited, anchor bolts diameter determined by calculation, shall be increased by 3 mm as corrosion allowance.

3.22.7 Vendor should define grout specification (preferably cement base type shall be used), or choose grout type based on “Engineering Standard Specification for Grouting”, document No.: “1231-DE-00-ST-ESS-748”.

3.22.8 Following information shall be prepared by vendor:

1. Compressor rotor weight
2. Compressor operating speeds
3. Compressor critical speeds
4. Compressor unbalanced mass eccentricity
5. Location of C.G of package
6. Permissible amplitude
7. Total weight including all items in the package and baseplate weight
8. Seismic and wind loads on foundation.

3.22.9 Vendor shall specify any recommendation regarding required torque for tightening of anchor bolts. Whenever there is a no recommendation from the manufacturer, Table A-1 in Appendix A of API 686 will be considered as applicable guide.

3.22.10 Anchor bolts shall comply with API 686 and ACI 351.Two nuts shall be used for anchor bolts.

3.23 SPARE PARTS

3.23.1 Hamoon Rah shall provide spare parts lists (priced list) separately for Commissioning, Start-Up and 2-Years Operation as per spare part list submitted during bid stage as per attached vendor's quotation.

3.23.2 After placing the order, Hamoon Rah shall complete Spare Part Interchangeability Record form (SPIR) and submit it at the kick-off meeting

3.24 INSPECTION, TESTING AND EXPEDITING

3.24.1 Inspection and testing of all equipment shall be as specified in equipment data sheets, specified codes, enclosed specifications and "Scope of Inspection" of the equipment, attached to this requisition.

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3.24.2 Purchaser shall have access to all vendor and sub-vendor plants, where work on or testing of the equipment is in progress except MYCOM compressor's inspection which will be done by client representative or inspector at vendor's shop.

3.24.3 Hamoon Rah shall furnish a bar chart covering important production and procurement activities giving the current position of the job (monthly).

3.24.4 Hamoon Rah shall provide the provisional test schedule and notify to purchaser period of test to restrict any interference.

3.25 SPECIAL TOOLS

Special tools required for assembling, dismantling, testing and calibration during erection, commissioning, operation and maintenance proposed and shall be provided by Hamoon Rah.

3.26 ENGINEERING DOCUMENTS

Hamoon Rah shall supply all of the documents according to attached requirements for documents (RFD) forms (attachment 3).
Vendor's drawings which are specifically prepared for this project shall be numbered according to Purchaser's Numbering Procedure specified in "Vendor Document Management procedure" (i.e., attachment 8).

3.27 PAINTING

Painting of all equipment and steel surfaces for all items in confines of package battery limit will be as per purchaser painting specification (1231-BE-00-PI-ESS-002).

3.28 SUPERVISION

Hamoon Rah to quote daily rate base of supervision as optionally.

3.29 ENGINEERING COORDINATION

Hamoon Rah shall coordinate for engineering coordination for the complete package

3.30 GUARANTEE

Hamoon Rah is responsible for total guarantee of package (material, design, performance and noise level). Vendor shall give guarantee for performances, thermal and mechanical design of all items within his scope of supply, for the use of materials specified as well as against any defect in design, defective material, poor workmanship, failure from normal usage, duly inspected and accepted by Purchaser or his designated representative.

3.31 PACKING LIST AND TAGGING

Hamoon Rah shall submit the master and detailed (break down) packing list, and shall attach tags to all materials / parts, in order to enable to perform correct / easy identification and quantity inspection at both vendor's shop and job site.
If the packing list is not detailed enough for site receiving inspection, vendor is responsible to send any shortage materials / parts at his cost as soon as a notice from the job site is issued. Any mis-indication on the packing list is considered as vendor's responsibility.

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4. *LIST OF ATTACHMENTS*

Att. No.	Description	Document No.	Rev.	No. of Pages
1	DELETED	--------	---	-----
2	Letter of Conformity (Technical)	--------	02	1
3	Requirement For Documents (RFD)	1231-DE-10-RE-RFD-330	05	10
4	Specific List of Spare Parts	--------	05	5
5	List of spare parts	--------	05	2
6	Spare Parts List and Interchangeability Record (SPIR) – 1/2, 2/2	--------	05	2
7	Scope of Inspection for Refrigeration Unit	1231-DE-10-QC-SOI-330	01	10
8	Vendor Document Management Procedure	1231-DE-00-DC-PCJ-001	02	33
9	Shop Inspection Procedure	1231-DE-00-QC-PCJ-001	01	21
10	Project HSE Requirements Manual	1231-DE-00-QA-MNL-002	00	14
11	Project Numbering procedure	1231-GN-00-PM-PCJ-002	00	23
12	**Data Sheets**			
12.1	Data sheet for PU-5001 Ammonia refrigeration unit	1231-DE-50-PR-DSH-002	01	5
12.2	Data sheet for Low Voltage electric motors	--------	00	2
12.3	Data sheet for Medium Voltage electric motors	--------	00	2
13	**Specification**			
13.1	Engineering Standard Specification for Ambient and Site Condition	1231-BE-00-PR-ESS-001	01	7
13.2	Engineering Standard Specification for utility data	1231-BE-00-PR-ESS-002	01	12
13.3	Engineering Standard Specification for units of Measurement	1231-BE-00-PR-ESS-003	01	6
13.4	Engineering Standard Specification for Rotary compressors	1231-BE-00-RE-ESS-303	01	21
13.5	Engineering Standard Specification for lubrication, shaft sealing and control oil system	1231-BE-00-RE-ESS-317	02	27
13.6	Engineering Standard Specification for Package Instrumentation	1231-DE-00-IN-ESS-603	01	44
13.7	Material Standard Specification for Emergency Shutdown System	1231-DE-00-IN-MSS-602	02	32
13.8	Material Standard Specification for Programmable Logic Controllers	1231-DE-00-IN-MSS-673	01	31
13.9	Engineering Standard Specification for Painting	1231-DE-00-PI-ESS-406	02	43
13.10	Material Standard Specification for Piping Material Specification	1231-DE-00-PI-MSS-401	01	248
13.11	Material Standard Specification for Low Voltage Induction Electric Motors	1231-DE-00-EL-MSS-521	01	14
13.12	Material Standard Specification for Medium Voltage Induction Electric Motors	1231-DE-00-EL-MSS-522	01	20
13.13	Material Standard Specification for Electrical Equipment as Part of Package	1231-DE-00-EL-MSS-524	02	17
13.14	Material Standard Specification for Electrical panel boards	1231-DE-00-EL-MSS-508	01	17
13.15	DELETED			
13.16	DELETED			
13.17	Material Standard Specification for Local Control Stations	1231-DE-00-EL-MSS-528	01	13

Att. No.	Description	Document No.	Rev.	No. of Pages
13.18	Engineering Standard Specification for Grouting	1231-DE-00-ST-ESS-748	01	11
13.19	Engineering Standard Specification for Anchor Bolts	1231-DE-00-ST-ESS-746	01	36
13.20	Engineering standard specification for shell and tube heat exchangers	1231-DE-00-HM-ESS-286	01	31
13.21	Piping Allowable Nozzle Loads for Static Equipment	1231-DE-00-PI-LST-402	00	4
13.22	Engineering standard Specification for Pressure Vessels	1231-DE-00-PV-ESS-241	01	26
13.23	Engineering standard Specification for Air cooled heat exchangers	1231-DE-00-HM-ESS-290	01	25
14	**Drawings**	-		
14.1	P&ID for Ammonia storage tank and refrigeration package	1231-DE-50-PR-PID-501	02	1
14.2	Instrument/Electrical Connection Details	1231-DE-00-IN-SKT-007	03	16
14.3	Standard drawing for shell and tube heat exchangers	1231-DE-00-HM-SDG-285	02	49
14.4	Standard drawing for pressure vessels	1231-DE-00-PV-SDG-243	02	68
15	Hamoon Rah's PROPOSAL			64
16	Items agreed between Owner & Vendor regarding Instrumentation.			2

EPs Contractor: Petrochemical Industries Design & Engineering Company (PIDEC) Project No. : 1231	ZANJAN UREA FERTILIZER PROJECT	Attachment No. : 02
	Letter of Conformity	Owner: ZANJAN Agricultural & Fertilizer Industries Co. Project No.: 214
REQUISITION FOR : REFRIGERATION UNIT		ALWAYS REFER TO REQ. NO. / Rev.
		REQ No.: 1231-DE-10-RE-REQ-330 / 02
		Page 1 of 1

TO : **TexTrade Maschinen-Handels GmbH (TTM)**

FROM: HAMOON RAH/ HAMIAN SANATE ENERGY

Herewith we confirm that our quotation ...HS-ZNPC-10222023-Option B-Rev 03....in response to your inquiry...1231-DE-10-RE-REQ-330.. dated .....21.07.2020.....is fully in accordance with the conditions as stated therein and we confirm that all **Technical** requirements as stipulated in the above mentioned inquiry documents, have been adhered to, except deviations stated as per following notes.

☐ No Deviation

☑ Deviation (Refer to Letter No. .....)

Project will be executed based on MYCOM Standard and Technical offer Dated 23.06.2024 along with latest technical clarification and minutes of Meeting agreed between parties

Date, Signature

(VENDOR)

ESE GROUP

HAMOON RAH
Reg. No.: 54984

NOTES:

1) Deviations shall be listed separately with brief explanations.

2) If no deviation exists, vendor shall specify by writing "No Deviation".

REQUIREMENT FOR DOCUMENTS (RFD)

OF

REFRIGERATION UNIT

Code	Document Title	With Bid		After Order award		Notes
		Copy	CD	Purpose of issue: I=Information R= Review A= Approval	No. of week for Issuing	
SCHEDULING DOCUMENTS						
PN01	Engineering, procurement , Manufacturing and production schedule	2		R		2
PN02	Drawing/ Document schedule			R		1,2
PN03	Sub-order schedule			R		2
PN04	Periodical status report			R		3

Notes:

1- The scope and extend of vendor reporting and scheduling document shall be set forth and agreed with purchaser.
2- Updated schedule shall be attached to periodical reports.
3- Periodical reports shall be furnished as outlined in project specific procedure for vendor reporting and expediting.

QUALITY DOCUMENTS						
QC01	Quality management system manual	1	1			
QC02	Inspection & test plan			A	4	
QC03	Inspection and test procedures (Hydro test, NDT, PWHT, Paint, etc.)			A	4	
QC04	Vendor quality control records (Test reports, VT, DT, etc.)			R		2
QC05	Material Certificate			R		2
QC06	Welding procedures and NDT personnel Certificates (WPS,PQR, Weld /NDT map, if applicable)			A	4	
QC07	Welder qualification records (if applicable)			R		2
QC08	Inspection Release Notes and Inspection Certificate			R		2
QC09	NDT records (if any)			R		2
QC10	PWHT records and Hardness test reports (if any)			R		2
QC11	Alloy verification / PMI records / Ferrite check (if any)			R		2

Notes:
1-Above mentioned documents also to be included in sub-supplier or sub-contractor if applicable.
2-To be issued in Fabrication process and shall be endorsed by inspector in workshop before shipment.

1.EXPORT DOCUMENTS						
1.General Documents						
PQ01	Bill of Lading (Draft)			A		2
PQ02	Certificate Of Origin (Draft)			A		2
PQ03	Master Packing List			A		2
PQ04	Detailed Packing List			A		2
PQ05	Commercial Invoice			A		2
PQ06	Material Handling Procedure (If applicable)			R		2
PQ07	Material Storage Procedure (If applicable)			R		2
PQ08	List of Sub-supplier			A		2
PQ09	Drawing for Oversize/Overweight Packages (If applicable)			R		3
PQ10	Transportation Drawing(If applicable)			R		3
PQ11	Handling, Transport Protective Measures at Site (If applicable)			R		3

Code	Document Title	With Bid		After Order award		Note
		Copy	CD	Purpose of issue: I=Information R= Review A= Approval	No. of week for Issuing	
2.Shipping Documents						
PQ01	**Bill of Lading (Original)**			**R**		**4**
PQ02	**Certificate Of Origin (Original)**			**A**		**4**
PQ03	**Master Packing List (Original)**			**A**		**4**
PQ04	**Detailed Packing List (Original)**			**A**		**4**
PQ05	**Commercial Invoice (Original)**			**I**		**4**
PQ00	**Inspection Certificate / Release Note**			**I**		**4**

Notes:

1-To be issued periodically.
2-To be issued before shipment.
3-Need not to be approved by Purchaser.
4-Original should be sent by postal courier services (TNT/DHL).

	SAFETY DOCUMENTS					
SA01	**HSE (Health, Safety and Environmental) Plan**	**3**	**1**	**I**	**1**	**1**
SA02	**Material Safety Data Sheet (MSDS)**			**R**	**8**	**2**
SA03	**Safety Manual**			**R**	**8**	**3**
SA04	**HAZOP Study Report**			**A**	**12**	**4**
SA05	**HAZOP Action close out Sheets**			**A**	**16**	**4**
SA06	**SIL Assignment Report**			**A**	**12**	**5**
SA07	**SIL Verification Report**			**A**	**24**	**5**

Notes:

1- The HSE Plan shall be provided for those manufacturers that our personnel may perform audit or inspection in their workshops. The HSE Plan should include an establishment of the HSE Management system; implementation of the HSE policy, and achievement of the HSE objectives effectively.
2- MSDS shall be provided for all potentially dangerous materials such as: Chemicals, Catalysts, Lubrication Oil, Foam, Portable extinguishers (all types),Gases (CO_2, Clean Agent, …), Paint, Solvent, Insulation material (PU, mineral wool, …), Perlite, Electrode, Resin, Coating material, Lining material (rubber, epoxy, …), Ionization heat detectors (including radioactive source), Nuclear Level elements (including radioactive source), All radioactive sources, All Laser sources.
3- The Safety Manual shall be provided for all items that may be harmful to human health or safety. Guidelines should be provided for safety measures, safety precautions, behavior in case of incidents and first aid.
4- For those package items that P&ID preparation or development to be in Vendor's scope of work.(e.g. Compressors, Turbine, Reformer, Heater, ...)
5- For those package items that considering or development of safety instrumented function loops (emergency shutdown system (ESD), safety shutdown systems, interlock systems, emergency trip systems) to be in Vendor's scope of work (e.g. machine monitoring systems, burner managements systems, ...)

	TECHNICAL DOCUMENTS					
T1	Installation Manual (including alignment data/drawings)			**A**		Note 1
T2	Operation Manual			**A**		Note 1
T3	Maintenance Manual			**A**		Note 1
T4	Technical data Manual			**A**		Note 1
SPARE PARTS LISTS						
T5	Spare Parts list for erection, pre-commissioning, commissioning and start-up			**A**		
T6	Spare Parts list for 2 years of operation			**A**		
T7	Capital Spare parts			**A**		

T8	List of special tools and devices			**A**		
	TECHNICAL DOCUMENTS (COMPRESSOR)					
T1	General Index			**A**		
T2	P & I diagram with supply limit and connections			**A**		
T3	Filled-in data sheets (proposal/as-built) for Compressor, Gear, Noise, Coupling, control valves, etc.			**A**		
T4	Performance curve for operating conditions			**A**		
T5	Start-stop sequences including data on operating restrictions to protect equipment during start-up operation and shutdown			**A**		
T6	Utility consumption list			**A**		
T7	Lubricant list including type and consumption			**A**		
T8	Estimated/ exact weight (machine/ rotor), dimension and max. maintenance weight (proposal/as-built)			**A**		
T9	Part list and bill of material for package			**A**		
T10	List of exceptions to API-619, and other purchase specifications			**A**		
T11	Vendors standard surface preparation and painting specifications			**A**		
T12	Catalogue and Brochure			**I**		
T13	Technical data and reference list			**A**		
T14	Statement of manufacturer's testing capabilities			**A**		
T15	Unpriced copies of sub-order(s) (main parts)			**A**		
T16	Shipping weights and dimensions (estimated/as-built)			**A**		Note 1
T17	Weather protection and winterization required at job site			**A**		
	CALCULATIONS:					
T18	Mechanical design calculations/ analysis			**A**		
T19	Lateral analysis report			**R**		
T20	Torsional Vibration report			**R**		
T21	Vibration analysis report			**R**		
T22	Thermal design calculation			**A**		
T23	Anchor bolt detail (Material/size/calculation)			**A**		
T24	Foundation load diagram and calculation			**A**		
T25	External load calculation			**A**		
T26	Allowable forces and moments for piping connections			**A**		
T27	Foundation block diagram with weights, forces and moments			**A**		
T28	Calculation for conditions of maximum thrust During start up and various operating cases.			**A**		
T29	Seal leakage rates			**A**		
T30	Balance piston leakage rates			**A**		
T31	Minimum length of straight pipe required at machine inlet or side inlets			**A**		
T32	Maximum and minimum allowable seal pressure for each compressor			**A**		
	DRAWINGS:					
T33	General arrangement drawing showing following items as min. : -Dimensioned location, weights, size, rating, and facing of nozzles and all other connections for hookup by others, properly indicated and listed (composite for compressor, turbine, etc.) including list of connections. - Min. height and max. weight for maintenance - Maintenance platform for better access			**A**		

	- Location of terminal boxes and control panels - Name plate format - Grounding detail - Direction of rotation - Center of gravity and listing points					
T34	Equipment drawings included all auxiliaries with bill of quantities			**A**		
T35	Equipment part list with bill of materials			**A**		
T36	Dimensional and weight drawings for all equipment in package			**A**		
T37	Auxiliary piping & Equipment plant drawing with loads and estimated moments for foundations and supply limits			**A**		
T38	Foundation drawing with distribution of load and moments, location and anchor bolts detail of compressor and auxiliaries with direction & magnitude of all rotating forces and location of C.G. ,limits of amplitudes and partial deflections			**A**		
T39	Vibration and condition Monitoring documents including, warning and shut down limits, wiring diagram and bill of materials			**A**		
T40	Anti -surge control diagram			**A**		
T41	Cross-sectional drawing of compressor , seal, coupling, gear, and etc. including all tolerances and necessary information			**A**		
T42	Seal System detail drawings			**A**		
T43	Assembly drawing of compressor, seal, coupling, gear, and etc. including all tolerances and necessary information			**A**		
T44	Thrust and radial bearing assembly drawing with parts list and loading data			**A**		
T45	Rotor assembly drawing with bill of materials and part number			**A**		
	PROCEDURES/ REPORTS :					
T46	Site acceptance test procedure			**A**		
T47	Shop performance test procedures			**A**		Note 2
T48	Run test procedures			**A**		Note 2
T49	Hydro/helium testing procedure			**A**		Note 2
T50	Painting Procedure			**A**		
T51	Impeller overs-peed test report			**R**		Note 3
T52	Mechanical running test report			**R**		Note 3
T53	Performance test data and curves			**R**		Note 3
T54	Rigging and lifting instructions.			**A**		Note 1
T55	Preservation Procedure			**A**		Note 1
T56	Preparation for storage at job site before installation			**A**		Note 1
	TECHNICAL DOCUMENTS/LUBE OIL SYSTEM					
T1	General Index			**A**		
T2	P & I diagram with supply limit and connections			**A**		
T3	Filled-in component data sheets including utility consumption list			**A**		
T4	Catalogue and Brochure			**I**		
	DRAWINGS:					
T5	General arrangement drawing showing, weights, dimensioned location, size, rating, and facing of all connections for hookup by others, properly indicated and listed including list of connections.			**A**		
T6	Component out line drawings and bill of material			**A**		
T7	system schematics			**A**		
	PROCEDURES :			**A**		
T8	Site acceptance test procedure			**A**		

T9	Testing procedure			**A**		Note 2
T10	Painting procedure and rust prevention			**A**		
TECHNICAL DOCUMENTS/STATIC EQUIPMENT						
	GENERAL:			**A**		
T1	General index			**A**		
T2	Filled out data sheet (Condensers, coolers, ejectors, vessels, etc.			**A**		
	TECHNICAL DOCUMENT:			**A**		
T3	General Index			**A**		
T4	Heat treatment of plates at mill (chart)			**A**		
T5	Part list / MTO			**A**		
T6	Catalogue and brochure including instruments, control and electrical			**I**		
T7	Un-priced copy of suborders			**A**		
	CALCULATIONS:			**A**		
T8	Mechanical design calculations/analysis			**A**		
T9	Thermal design calculation (If applicable)			**A**		
T10	Anchor bolt detail (Material size and calculation)			**A**		
T11	Foundation load diagram and calculation			**A**		
T12	Expansion Joint calculation (If applicable)			**A**		
T13	Nozzle load calculation			**A**		
T14	Total volume of fabrication and erection welding at site in kilograms			**A**		
T15	Dynamic analysis of the exchanger			**A**		
	DRAWINGS/ DOCUMENTS:			**A**		
T16	General arrangement drawings			**A**		
T17	Tube bundle drawings (including tube layout)			**A**		
T18	Detail drawings			**A**		
T19	Nozzle detail drawing			**A**		
T20	Dimensional and weight Drawings			**A**		
T21	Erection drawing			**A**		
T22	Welding map			**A**		
T23	NDT map			**A**		
T24	Name plate drawings			**A**		
T25	Gasket drawings			**A**		
T26	Shipping drawing			**A**		Note1
T27	Expansion joint drawing			**A**		
T28	WPS/WPQ/PQR			**A**		
	PROCEDURES :			**A**		
T29	Site test procedure			**A**		
T30	Heat treatment procedure (if applicable)			**A**		
T31	Erection procedure (if deemed necessary)			**A**		
T32	Repair procedure (if applicable)			**A**		
T33	Tube rolling procedure			**A**		

T34	Hydro-testing procedure			A		
T35	NDT procedures (RT, UT, PT, MT, VE)			A		
T36	Tube to tubesheet mock up test procedure			A		
T37	Painting procedure			A		
T38	Pickling & Passivation procedure (if applicable)			A		
T39	Internal lining procedure (if applicable)			A		
T40	Dimensional control procedure			A		
T41	Air soap procedure			A		
T42	Helium leak test procedure			A		
T43	Ferroxyl test procedure			A		
T44	Weld Overlay procedure			A		
	TECHNICAL DOCUMENTS/INSTRUMENTATION					
T1	General Index			A		
T2	P & I diagram with supply limit and connections			A		
T3	Filled-in Instrument data sheets			A		
T4	Instruments materials certificate and Instrument inspection and calibration certificate ,Certificate for use of Instrument in hazardous area			I		
	CALCULATIONS:					
T5	Calculation data (where applicable) for noise& control valves			A		
T6	Flow elements calculations (Issued by related sub vendor)			A		
T7	Safety valves calculations (Issued by related sub vendor)			A		
T8	Stress analysis and calculation for thermos-wells (Issued by related sub vendor)			A		
	GENERAL DRAWINGS:					
T9	Deleted.			A		
T10	Electrical wiring connection and junction boxes terminal arrangements diagrams			A		
T11	Process and Air Hook Up Drawing (For Skid & off-skid loose instruments)			A		
T12	Control valves pneumatic diagram			A		
T13	Field layout indicating skid & off-skid loose instruments and junction boxes location and cable routing			A		
T14	Unit Control panel (UCP) & Local Panel (LP) (Dimensions specifications, front and internal general arrangement, etc.)			A		
T15	Instruments and valves dimensional and weight drawing/ documents (including main scope of package vendor and all items supplied by sub-vendors)			A		
T16	Local gauge board (dimensions, general arrangements, list of materials)			A		
	LIST:					
T17	Alarm/trip/controller & monitor switches set point lists.			A		
T18	Bulk MTO (including Qty. & specification of single cables & cable glands & JBs) (For Skid & off-skid loose instruments)			A		
T19	Instrument list indicating type, make , characteristics and specification			A		
T20	Cable list indicating cable type, length, source and destinations			A		
T21	Instrument air and power requirements			A		
T22	List of Vendor documents and drawings			A		

	CONTROL CABINET:					
T23	Certifications and approvals for PLC's and other peripheral hardware			**A**		
T24	List of consumables for erection, commissioning and start-up +two years spare part lists			**A**		
T25	Sub-Vendor's and main Supplier's listings			**A**		
T26	Bill of material (hardware and software)			**A**		
T27	Technical data sheets with part No. for each component of the control system			**A**		
T28	A proposed layout for the control and cabinet room based on outline required dimensions and weight of all components indicating the required access space for door opening , removal of cover plates,) , the requirements for construction and installation (fixing details, weights, minimum clearance to other items of equipment or walls), etc.			**A**		
T29	Control philosophy (narratives) and proposed control system block diagram showing all system main hardware/equipment and their interconnections			**A**		
T30	Electrical power consumption ,heat dissipation (including 230 VAC, 110 VAC and 24 VDC)			**A**		
T31	Electrical power supply distribution diagram which indicates cables size and fusing capacity for each feeder			**A**		
T32	Detailed grounding and shielding requirements for all equipment			**A**		
T33	Cabinet's dimensions/ general arrangement and cabinets internal arrangements drawings.			**A**		
T34	Deleted.			**A**		
T35	Deleted.			**A**		
T36	Interconnecting cable schedule with cable list			**A**		
T37	Termination list for input/outputs including system internal terminal strips/system cables.			**A**		
T38	Loop wiring diagram specifying for each tag No. all relevant components and connections, including power supply and field instruments terminals, barriers/relays, I/O channels, installed spares, etc.			**A**		
T39	Logic diagram and functional charts of the interlocks and sequences controls (according to IEC 61131-3/IEC 61848)			**A**		
T40	Panel nameplates and drawings			**A**		
T41	Hardware assignments including assignments of terminals, isolators, boards, I/O modules and channels, etc. (system data base).			**A**		
T42	Factory / Site acceptance test procedure			**A**		
T43	Painting Specification			**A**		
T44	Modbus list (including exchange signals with DCS system, address…)			**A**		
T45	Calculation of overall system availability/reliability including the failure mode and effect analysis			**A**		
T46	A fault finding/trouble shooting narrative for the complete system(Recommended format is an "if-then" connection diagram			**A**		
T47	A list of special tools/ instruments Owner needs to operate the system.			**A**		
T48	Catalogue and Brochure			**I**		
T49	Test records (vendor's quality control)			**A**		
T50	Test records (factory acceptable test)			**A**		
T51	Proposed Graphic display pages based on purchaser initial information (if any)+ proposed logging and report formats (if any)			**A**		
T52	Deleted.			**A**		

T53	Installation Manual			A		
T54	Operation Manual			A		
T55	Maintenance Manual			A		
T56	Engineering and user's manual			A		
T57	Cause and effects diagrams			A		
T58	I/O List (Signal input/output to Plant DCS/ESD (if any) & Package PLC)			A		
T59	HAZOP/SIL reports and relevant certificates			R		
T60	Special complicated control documents/drawings (including complex loops descriptions)(if any)			A		
	TECHNICAL DOCUMENTS/ELECTRICAL					
	GENERAL:					
T1	On-skid earthing layout with detail for all skids			A		
T2	Electrical heaters specification and drawings			A		
T3	Electrical Connection and all junction boxes diagram			A		
T4	Cable list			A		
T5	Motor List / Electrical Load List			A		
T6	Installation Manual			A		
T7	Operation Manual			A		
T8	Maintenance Manual			A		
T9	Catalogue and Brochure			I		
T10	Electrical equipment layout & cable routing drawing			A		
T11	List of special tools and devices (if any)			I		
T12	List of deviations to the purchase specifications			A		
	LV & MV MOTORS:					
T13	Technical Data & Specifications			A		
T14	Bearing type/ lubrication/ oil pressure/ flow rate / lubrication intervals			A		
T15	List of deviations to the purchase specifications			A		
T16	Reference list			A		
T17	Data sheet Completed by vendor with actual equipment data			A		
T18	Motor General arrangement drawing showing dimensions and weight			A		
T19	Main terminal box drawing showing main connections, size and No. of entries, etc.			A		
T20	Motor Outline drawing			A		
T21	Motor Name plate			A		
T22	Static & dynamic foundation loadings & anchor bolt locations			A		
T23	Torque/speed curves with internals & accelerating times at 80 & 100% voltage			A		
T24	Thermal capability curve for MV motors			A		
T25	Current/speed curves			A		
T26	Rotor drawing and data for torsional analysis			A		
T27	Connection diagrams for main motors, RTDs & other auxiliaries			A		
T28	EX. Certificate for all certified equipment			A		
	Local panel					
T29	Local control panel/ Local panel (dimensions, general arrangements, list of materials , wiring diagram) and Graphic			A		

	Display					
T30	Electrical Wiring Diagram such as One-Line Diagram, Interlock System,etc.			**A**		
T31	Control Logic Diagram and Description / Control philosophy Block diagram			**A**		
T32	Test reports of the performance tests			**R**		

Notes:

1. To be issued 4 weeks before shipment.
2. To be issued at least two months before performing the shop test
3. To be issued after performing the test

Sr. No.	PART DESCRIPTION	ERECTION, PRE, COMMISSIONING & START UP SPARES	TWO YEARS SPARES	CAPITAL SPARES
1	**Rotary Compressors**			
1.1	Dry gas seal		100%	
1.2	Radial bearings		100%	
1.3	Thrust bearings		100%	
1.4	Thrust Bearing Pads complete with thermo-elements (Sets)		2	
1.5	Journal bearing pads complete with thermo-elements (Sets)		1	
1.6	Coupling assembly (Sets)		1	
1.7	Oil Filter Elements (a)		10	
1.8	Instrument parts (sets)		1	
1.9	Accumulator Bladder Labyrinths		100 %	
1.10	Gaskets + O-rings for compressor casing (Sets)		4	
1.11	Gaskets + O-rings for internal piping (sets)		4	
1.12	Oil Pumps		1	
1.13	Flushing Nozzles Oil Cooler (Sets)		1	
1.14	Bolt ,Nut, Screw & washers (Sets)		1	
1.15	Bypass and screening for oil flushing (Sets)		1	
	a) Quantities for washable oil filter elements can be reduced to 5. b) The Parts listed are the principal parts only. Other parts shall be considered for recommendation in quantities consistent with the above table.			
6	**Electrical Equipment**			
6.1	**LV Switchgear and Motor Control Center/ Local control panel:**			
6.1.1	LV Fuses		15%	
6.1.2	Time Delayed Relays		8%	
6.1.3	Lamps		10%	
6.1.4	Space Heaters		10%	
6.1.5	Terminal Blocks		7%	
6.1.6	Auxiliary relays		10%	
6.1.7	Contactors for Control Circuits (each type)		20%	
6.1.8	Thermal overload Relays (each type)		20%	
6.1.9	Isolators for each type		20%	
6.1.10	Current Setting Earth Fault Relays		11%	
6.1.11	Motor Circuit Breakers (Complete Unit for Each Type & size)		15% (min 1 No.)	
6.1.12	Main Contactors (each type)		20%	
6.1.13	Metering		10%	
6.1.14	CT		20%	
6.1.15	PT		20%	
6.1.16	Main circuit breaker (incoming and bus tie)		One per each type	
6.2	**Motors (No. of machines)**		**1/2/3/4/5/More**	
6.2.1	Set of bearings		1/1/1/2/2/40%	
6.2.2	Fan, terminal blocks, space heater (MV) per type		5%/5%/5%/5%/5 %/ 5%	
6.3	**DELETED**			
6.4	**Battery Charger**			

6.4.1	Fuse		30 %	
6.4.2	MCB		15 %	
6.4.3	SCR		30 %	
6.4.4	Diode		10 %	
6.4.5	Signaling lamps		15 %	
6.4.6	Control cards		one per each type	
6.4.7	Batteries		5 %	
6.5	**Local Control stations for control motors**			
6.5.1	Selector switch		20 %	
6.5.2	A meter		20 %	
6.5.3	Terminal blocks		20 %	
6.5.4	Push button		30 %	
Note: The Quantities indicated are only preliminary estimation, so the firm quantities will be specified later in conjunction with recommendations of EQUIPMENT VENDORS.				
7	**Instruments**			
7.1	Flow instruments		Refer to Note 1	
7.2	Level instruments		Refer to Note 1	
7.3	Temperature instruments		Refer to Note 1	
7.4	Pressure Instruments		Refer to Note 1	
7.5	Analyzers		Refer to Note 1	
7.6	Control valves: valve bodies		Refer to Note 2	
7.7	Valve plugs		15 % (min 1) of each type and size	
7.8	Seat rings		25 % (min 1) of each type and size	
7.9	Valve stems		Refer to Note 3	
7.10	Stem packing		20 % (min 3 boxes) of each type and size	
7.11	Grease		20 % (min 3 boxes) of each type and size	
7.12	Diaphragms		20 % (min 1) of each type and size	
7.13	Blank orifice plates		10 % (min 1) of each type and size	
7.14	Dial thermometers		10 % (min 1) of each type and size	
7.15	Manual loading stations		10 % (min 1) of each type and size	
7.16	Instrument air filters (regulation sets)		10 % (min 1) of each type and size	
7.17	Pressure gauges		10 % (min 1) of each type and size	
7.18	Pressure switches		10 % (min 1) of	

			each type and size	
7.19	Plug-in assemblies for elect. instr.		10 % (min 1) of each type and size	
7.20	Plug-in assemblies for pneum. instr.		10 % (min 1) of each type and size	
7.21	Seal, condensate and vent pots		10 % (min 1) of each type and size	
7.22	Solenoid and trip valves		10 % (min 1) of each type and size	
7.23	Thermocouples		10 % (min 1) of each type and size	
7.24	Thermowells		10 % (min 1) of each type and size	
7.25	Signal lights		10 % (min 1) of each type and size	
7.26	Valve positioners		10 % (min 1) of each type and size	
7.27	I/P convertors		10 % (min 1) of each type and size	
7.28	Bonnet gasket		20% (min2 for each type)	
7.29	O-rings		20% (min2 for each type)	
7.30	Seat ring		10% (min2 for each type)	
7.31	Fire safe gasket		10% (min2 for each type)	
7.32	Limit switch		10% (min1) of each type and size	
	For PLC following items:			
7.33	I/O cards		5 % min 1 for each type	
7.34	CPU Card (Sets)		2	
7.35	Communication Card (Sets)		1	
7.36	Other Main cards (Sets)		1	
7.37	power supply (AC If any) (Sets)		1	
7.38	power supply (DC, of any) (Sets)		1	
7.39	Relay, Barrier,…		15%	
7.40	Relay, Fuse, Terminal, IS Barriers		10% Min 1 for each type	

Note 1: Quantities To be determined in conjunction with the EQUIPMENT VENDOR (based on VENDOR'S experience on similar type of PLANT)
Note 2: None unless service is corrosive or erosive. For corrosive or erosive service, shall be determined in conjunction with the EQUIPMENT VENDOR.

Note 3: 1 of each diameter. These vary in length depending on valve size. Purchase the longest of each dia. These can be cut to the correct size.

8	**Spare parts for pressure vessels ,Heat exchangers**			
8.1	**Heat Exchangers-Shell and Tube**			
8.1.1	Tubes		Straight tubes sufficient to retube the largest bundle of, each tube size and material.	
8.1.2	Bolts		(Special or Alloy) of each exchanger minimum one number	
8.1.3	Gaskets		200 %	
8.2	**Pressure Vessels**			
8.2.1	Gaskets		200 %	
8.2.2	Bolts		10 % (Special, Alloy or size 2" diam. or greater), minimum one number.	
8.3	**Plate Type Exchanger (If applicable)**			
8.3.1	Plate Gasket		100 %	
8.3.2	Flow Plate		10 %	
8.3.3	Nozzle Gasket		200 %	
8.3.4	Glue (1 kg Pot)		1	
8.3.5	Special Spanner tool		1 for each size/type	
Note: The parts listed are the principal parts only. Other parts shall be considered for recommendation in quantities consistent with the above table.				
9	**Fan (If applicable)**			
9.1	Set Of Bearing		1	
9.2	Oil Level Glass		1	
9.3	Set Of Louver Guide Busing		1	
9.4	Repair list for lover contract		1	
9.5	Set of gasket and o-ring		2	
9.6	Set of shaft seal		1	
10	**Piping (If applicable)**			
10.1	Valves up to 1½" complete units		5 % for each size, type and material minimum 1 piece	
10.2	Valves from 2" to 6"		2 % (minimum 2 pieces) for each size, type and material	
10.3	Valves above 6" to 10" complete units		1 piece for each size, type and material	
10.4	Valves above 10"		1 only if installed valves quantity is greater than 30	
10.5	Valves up to 10" gland packing and bonnet gasket		10 % for each type, size and material	
10.6	Valves from 2" to 10" set of changeable inner parts		2 sets for each	

			type, size and material	
10.7	Valves above 10" set interchangeable inner parts: bonnet gasket and stem packing		1 set for each type, size and material	
10.8	Piping gaskets and bolts set for each size, type		10 %	
10.9	Permanent Strainers (Extra screen, cover gasket)		10% of total quantity (min one piece) for each size, type and material	

REMARKS: This list specify minimum requirements for spare parts. Vendor shall recommend any further spare parts if required. In addition, Erection, pre- commissioning and start up spares for all equipment of package shall be recommended by vendor.

LIST OF SPARE PARTS

Attachment No. : 05

EPs Contractor: Petrochemical Industries Design & Engineering Company (PIDEC) Project No. : 1231	ZANJAN UREA FERTILIZER PROJECT **List of Spare Parts**	Owner: ZANJAN Agricultural & Fertilizer Industries Co. Project No.: 214

REQUISITION FOR : REFRIGERATION UNIT	ALWAYS REFER TO REQ. NO.	Rev.
	REQ No.: **1231-DE-10-RE-REQ-330**	**05**
	Page 2 of 2	

Sr. No.	Equipment	Spare Part Specifications			
	Tag No.	Part Number	Part Description	Unit Price ☐EURO ☐IRR	Total Price ☐EURO ☐IRR

		Attachment No. : 06
EPs Contractor: Petrochemical Industries Design & Engineering Company (PIDEC) Project No. : 1231	ZANJAN UREA FERTILIZER PROJECT **Spare Parts List and Interchangeability Record**	Owner: ZANJAN Agricultural & Fertilizer Industries Co. Project No. : 214
REQUISITION FOR : **REFRIGERATION UNIT**	ALWAYS REFER TO PIDEC REQ. NO.	REV.
	REQ No.: 1231-DE-10-RE-REQ-330	05
	Page 1 of 2	

THE COMPLETION OF THE SPIR FORM (S) BY MANUFACTURER (S) / SUPPLIER (S)

The SPIR consists of main sheet and continuation sheets. The completed forms shall be distributed on A3 formats as specified in the purchase order. The manufacturer/supplier is requested to complete columns 1 to 11 and 20 of the form as described below.

All information should be given in the English language.

Column 1 : EQUIPMENT REG. or TAG NO.

Enter the same equipment registration- or tag number for each place of equipment as stated in the requisition -or purchase order.

Column 2 : MANUFACTURER'S MODEL or TYPE

State model, Type or other positive identification reference of the equipment / instrument ordered.

Column 3 : Manufacturer's serial No.

State serial number or other indication reference of the equipment / instrument ordered (each)

Column 4 : NO. OF UNITS

Enter the total number of pieces of identical equipment /instruments as quoted in columns 1, 2 and 3.

Column 5 : NUMBER OF PARTS PER UNIT

For each unit (including identical units) enter in the appropriate space the number of parts listed in each unit of equipment / instrument.

Column 6 : REQUISITION/ ORDER REF. NO.

State company's requisition number or order reference number.

Column 6a : UNIT

Enter the weight to kg of such items such as adhesives and grease .If items are supplied as sets state "ST", if in pairs "PR " and if it is single item (piece) state "PC ".

Column 7 : TOTAL NUMBER OF IDENTICAL PARTS INSTALLED

Enter the total number of identical parts covered by the equipment specified. In the case of identical units multiply the quantity of columns 5 by the number of units given in column 4.

Column 8 : DESCRIPTION OF PARTS

List all parts which should be carried in stock for each of the three categories of spares. Including slow wearing parts. If an item is interchangeable between two or more units it should be listed only once (refer to columns 10 and 20)

Column 9 : DRAWING NUMBER

For each part in column 8 enter the manufacturer's parts list and / or drawing number.

Documents referred to must always be attached to the SPIR form by the manufacturer or supplier.

Column 10 : MANUFACTURER'S PART NUMBER

Enter the manufacturer's unique reference number or other information which specifically identifies each part in the manufacture's organization.

NOTES FOR 10 & 20

In view of the wide variety of systems in use for identification of parts, It is not possible to lay down firm rules for completion of those columns.

Manufacturers/ suppliers should give whatever identification system they use to positively identify parts and to show interchangeability with other existing equipment.
Manufacturer's/ supplier's final cross sectional drawings. Workshop drawings and real part numbers may not always be available in the early stage of manufacture.
This should not delay the completion of the SPIR form and subsequent ordering (see column 1)
In such cases it is recommended that reference is to manufacturer's documentation which is readily available such as brochures, exploded views, typical drawings of similar equipment in which the parts can be identified. As soon as final drawings etc. become available the SPIR from should be revised immediately.

Column 11 : MATERIAL SPECIFICATION

Enter material specification in terms of full international standards and accepted conversions not manufacturer's or sub-manufacturer's reference.

Column 12 : thru 14 OPERATIONAL SPEAR PARTS RECOMMENDED BY MANUFACTURER

Enter manufacture's /supplier's recommended quantities of operational spare parts which are required for :

a) Erection and pre- commissioning .col. 12

b) Two years operation -col. 13

c) Commissioning and start -up .col. 14

Column 18 : APROXIMATE UNIT PRICE

State the ex works price per piece of each part in the currency shown at the top of the column, only for those parts not included in the requisition / order for the original equipment.

Column 20 : REMARKS- SUPPLIERS PART NUMBER

Enter the supplier's unique identification number or items from third party manufacturers (bought- out items) such as ball bearings oil, seals mechanical seals, Gaskets, couplings, Instruments electrical parts, fuses relays etc, identifying sizes etc.

Attachment No. : 06

EPs Contractor :

Petrochemical Industries Design & Engineering Company (PIDEC)

Project No. : 1231

ZANJAN UREA FERTILIZER PROJECT

Spare Parts List and Interchangeability Record

Owner:

ZANJAN Agricultural & Fertilizer Industries Co.

Project No.: 214

REQUISITION FOR :

REFRIGERATION UNIT

ALWAYS REFER TO REQ. NO.	Rev.
REQ No.: 1231-DE-10-RE-REQ-330	05

SPARE PARTS LIST AND INTERCHANGEABILITY RECORD — فهرست قطعات یدکی و اقلام مشابه

SPARE PARTS ORDER NO.	شماره سفارش قطعات یدکی
Subject :	دستگاه
Manufacturer :	سازنده
Address :	آدرس
Date :	تاریخ

NOTES: توضیحات

1) All equipment having interchangeable items to be stated on same form.
2) Quote in column 10 part numbers showing interchangeability within equipment manufacturer's organization.
3) Quote in column 20 the original identification numbers for items of third party manufacture.("bought-out items") such as ball bearings, mechanical seals, couplings, fuses, auxiliaries.
4) Quote in column 11 name and type of material, e.g. bronze, cast iron, Stainless steel 304, Rubber, Buna Viton , etc.

1 کلیه قطعاتی که دارای اقلام مشابه هستند باید در فرم یکسان درج گردد
2 در ستون ۱۰ شماره حقیقی قطعه ای ذکر گردد که با سایر دستگاه های اولین کارخانه سازنده تشابه داشته باشد
3 در ستون ۲۰ شماره های حقیقی سازنده فرعی(ثالث) مانند بلبرینگ، آب بند های مکانیکی، اتصالات و فیوزها درج گردد
4 در ستون ۱۱ اسم و نوع جنس بکار رفته در کالا ذکر گردد(مانند مفرغ، چدن، فولاد درجه ۳۰۴، لاستیک و غیره)

Required on site date: تاریخ مورد نیاز

REMINDER : ATTACH TO THIS FORM ALL PART LISTS AND DRAWINGS AS LISTED IN COLUMN 9 AND 10

کلیه کتابچه های قطعات یدکی و نقشه های ذکر شده در ستونهای ۹، ۱۰ پیوست گردد

Approved for purchase by: تایید خرید توسط

21	Equipment Class
1	Equipment reg. No. or Tag No. شماره دستگاه/شماره برچسب
2	Manufacturer's Model مدل کارخانه سازنده
3	Reference / Serial No. شماره سریال سازنده
4	No. of Units تعداد دستگاه
5	NUMBER OF PARTS PER UNIT تعداد قطعات در هر دستگاه
6	Equipment Purchase Order No. شماره سفارش خرید دستگاه

UNIT (Kg, No., Pair, Set) واحد جنس (کیلوگرم، عدد، جفت، ست)	Total No. of identical parts installed تعداد کل قطعات مشابه نصب شده	Manufacturer's Data اطلاعات مربوط به سازنده — DESCRIPTION OF PARTS: to include all parts recommended to be kept for normal operation and slow wearing parts. شرح قطعات شامل کلیه قطعات پیشنهادی که بطور عادی یا بصورت تدریجی مصرف در انبار نگهداری میشود	Drawing / Ref. No. شماره نقشه / مرجع سازنده	Manufacturer's Real Part No. (See note 2 above) شماره حقیقی کارخانه سازنده (رجوع شود به بند ۲ توضیحات)	Material (See note 4 above) نوع جنس (رجوع شود به بند ۴ توضیحات)	Operational Spare Parts قطعات مورد نیاز عملیات — Recommended by manufacturer پیشنهاد سازنده	Recommended by contractor پیشنهاد پیمانکار	Commissioning Spares قطعات یدکی در مرحله راه اندازی	Quantity to be supplied تعداد مورد سفارش	MESC شماره طبقه بندی کالا	Classification of parts رده بندی قطعات	Approximate Unit price in قیمت واحد به تقریب	Approximate Total price in قیمت کل به تقریب	Remarks (See note 3 above) ملاحظات (رجوع شود به بند ۳ توضیحات)	Item No. شماره ردیف
6a	7	8	9	10	11	12	13	14	15	16	17	18	19	20	22

PROJECT / PLANT :	پروژه / واحد :	Rev. :	تجدید نظر
CONSIGNEE :	تحویل گیرنده :	Date:	تاریخ
ENGINEERED BY : PIDEC	طراحی توسط :	Sign	امضاء

Approximate total value	قیمت کل	Delivery time	مدت زمان تحویل :

EPs Contractor:	ZANJAN UREA FERTILIZER PROJECT		Owner:
Petrochemical Industries Design & Engineering Company (PIDEC)	Data Sheet for LV Motors		ZANJAN Agricultural & Fertilizer Industries Co.
	Owner Doc. No.: -		
Project No. : 1231	Doc. No.: TYPICAL	Rev.: xx	Project No. : 214

General	Tag(s)		Motor Manufacturer	
	Service		Vendor	
	Purchase Order		Owner	
	Power System		**Site Conditions**	
	Voltage	400V ± 5%	Plant Location	Zanjan, Iran
	Frequency	50Hz ± 2%	Area	☐ Indoor ■ Outdoor
	Earthing	Solidly Earthed (TNS)	Ambient Air Temperature	Min. -30 ºC Max. 48 ºC
	Applicable Documents		Humidity	71%
	Project Specification	1231-DE-00-EL-MSS-521	Altitude	+ 1846 meter above Sea Level
	Applicable Standards	IEC 60034, IEC 60079, IEC 60529	Area Classification	☐ Safe ☐ Zone 2, IIC, T3
	Paint Specification	Acc. to Manufacturer's Standards	Corrosive gases	Ammonia

	Particulars of Equipment	Unit	Purchaser's Requirements	Vendor's Data
Basic Design	Rated Voltage (Un)	V	400	
	Rated Frequency	Hz	50	
	Mechanical Load Driven by Motor (BHP)	kW	-	
	Rated Power at Site Conditions & Continuous Duty	kW	-	
	Rated Synchronous Speed / No. of Poles	RPM	-	
	No. of Phases, Stator Connection, Rotor Type		3 Ph, Y, Cage Rotor	
Thrmal Spec	Insulation Class		Class F	
	Temperature Rise		Class B	
Frame & Construction	Frame Size		-	
	Frame Material		-	
	Fan Material		Bronze, Copper-Free-Aluminum or Steel	
	Frame Ingress Protection acc. to IEC 60529		IP54	
	Main Terminal Box Ingress Protection acc. to IEC 60529		IP55	
	Cooling Type acc. to IEC 60034-6		TEFC, IC411	
	Mounting Type acc. to IEC 60034-7		-	
	Painting Color (RAL)		RAL 7038	
	Motor / Rotor Weight	kg	-	/
	Noise Level at Distance of 1m	dB(A)	At Most 85	
Bearings	DE Bearing Manufacturer and Code		-	
	NDE Bearing Manufacturer and Code		-	
	Lubrication Interval for DE / NDE Bearings	Hours	>4000 if Horizontal; >2000 if Vertical	
	Lubricant Type		-	
Load Spec	Direction of Rotation, Facing Shaft End		-	☐ Bidirectional ☐ CW ☐ CCW
	Run-up Time at Un & 0.8Un (Loaded)	S	-	
	Load Duty (S1…S9)		-	
Electrical Performance	Full Load Current at Site Conditions & Continuous Duty	A	-	
	Efficiency at Pn, 0.75Pn & 0.5Pn at Site Conditions & Continuous Duty	%	-	
	No-load Losses	kW	-	
	Power Factor at Pn, 0.75Pn & 0.5Pn at Site Conditions & Continuous Duty	%	-	
Mechanical Performance	Full Load Torque	Nm	-	
	Breakdown Torque	%	-	
	Pull-up Torque	%	-	
	Full Load Speed	RPM	-	
	Slip at Pn & 0.75Pn	%	-	
	Over-speed Capability	%	-	
Starting Characteristics	Starting Method		Direct-On-Line	
	Allowable Stall Time at Hot and Cold Conditions	S	-	
	Maximum No. of Harmless Successive Starts		At Least 3 from Cold / 2 from Hot State	
	Starting Current at Un & 0.8Un	A	For motors > 55kW, At Most 700% at Un	
	Locked Rotor Power Factor at Un & 0.8Un	%	-	
	Locked Rotor Torque at Un & 0.8Un	%	-	
	Allowable Run-up Time at Un & 0.8Un	S	-	
EX Type	EX Type, Gas Group & Temp. Class (If Area is Hazardous)		EExeb / EExec / EExd / EExde; IIC T3	
	Is Pre-start Gas Purging or Any Other Provision Required?		NO	
	Te Time (for EExe Motors)	S	-	
	Certificate Number		-	

Remark: Un means rated voltage, Pn means motor rated power at standard conditions.

EPs Contractor:	ZANJAN UREA FERTILIZER PROJECT		Owner:
Petrochemical Industries Design & Engineering Company (PIDEC)	Data Sheet for LV Motors		ZANJAN Agricultural & Fertilizer Industries Co.
	Owner Doc. No.: -		
Project No. : 1231	Doc. No.: TYPICAL	Rev.: xx	Project No. : 214

	Particulars of Equipment	Unit	Purchaser's Requirements	Vendor's Data
Terminal Box & Cable Connection	Short circuit capacity at input	MVA		
	Power Terminal Box Type	--	Phase Insulated/ Phase Segregated	
	Power Terminal Box Location (IEC 60034-7)	--	Right (looking from drive end) Rotatable by 90° and 180° degree increments	
	Power Cable Type	--	Cu/XLPE/SWA/PVC	
	Power Cable No. & Size	--	*	
	Power Cable Gland & Entries	--	*	
	Power Cable Entry Direction	--	*	
	Heater Cable Type	--	Cu/XLPE/SWA/PVC	
	Heater Cable No. & Size	--	*	
	Heater Cable Gland & Entry	--	*	
	Instrument Cable Type	--	*	
	Instrument Cable No. & Size	--	*	
	Instrument Cable Gland & Entry	--	*	

Note 1: (*) Will be informed to motor vendor by PIDEC after receiving preliminary motor data and sizing the related cables.

EPs Contractor:	ZANJAN UREA FERTILIZER PROJECT		Owner:
Petrochemical Industries Design & Engineering Company (PIDEC)	Data Sheet for MV Motors		ZANJAN Agricultural & Fertilizer Industries Co.
Project No. : 1231	Owner Doc. No.: - / Doc. No.: TYPICAL	Rev.: xx	Project No. : 214

General	Tag(s)		Motor Manufacturer	
	Service		Vendor	
	Purchase Order		Owner	
	Power System		**Site Conditions**	
	Voltage	6kV ± 5%	Plant Location	Zanjan, Iran
	Frequency	50Hz ± 2%	Area	☐ Indoor ■ Outdoor
	Earthing	Low Resistance Earthed (TN)	Ambient Air Temperature	Min. -30 ºC Max. 48 ºC
	Applicable Documents		Humidity	71%
	Project Specification	1231-DE-00-EL-MSS-522	Altitude	+ 1846 meter above Sea Level
	Applicable Standards	IEC 60034, IEC 60079, IEC 60529	Area Classification	☐ Safe ☐ Zone 2, IIC, T3
	Paint Specification	Acc. to Manufacturer's Standards	Corrosive Gases	Ammonia

	Particulars of Equipment	Unit	Purchaser's Requirements	Vendor's Data
Basic Design	Rated Voltage (Un)	kV	6	
	Rated Frequency	Hz	50	
	Mechanical Load Driven by Motor (BHP)	kW	-	
	Rated Power at Site Conditions & Continuous Duty	kW	-	
	Rated Synchronous Speed / No. of Poles	RPM	-	
	No. of Phases, Stator Connection, Rotor Type		3 Ph, Star, Cage Rotor	
Thermal Design	Insulation Class / Temperature Rise		Class F / Class B	/
	Starting Thermal Time Constant	Min.	-	
	Cooling Thermal Time Constant	Min.	-	
	Thermal (Overload) Time Constant	Min.	-	
	Minimum Cool-down Time for One Restart	S	-	
Frame & Construction	Frame Size		-	
	Frame Material		Ferrous Metals	
	Fan Material		Bronze, Copper-Free-Aluminum or Steel	
	Frame Ingress Protection acc. to IEC 60529		IP54	
	Main Terminal Box Ingress Protection acc. to IEC 60529		IP55	
	Cooling Type acc. to IEC 60034-6		IC: 411,511,611 (or 616,7A1W7 if Rating > 2MW)	
	Mounting Type acc. to IEC 60034-7		-	
	Painting Color (RAL)		RAL 7038	
	Motor / Rotor Weight	kg	-	/
	Noise Level at Distance of 1m	dB(A)	At Most 85	
Bearings	DE Bearing Manufacturer and Code		-	
	NDE Bearing Manufacturer and Code		-	
	Lubrication Interval for DE / NDE Bearings	Hours	>4000 if Horizontal; >2000 if Vertical	
	Bearing Life acc. to ISO 281-1	Hours	>40000 if Horizontal; > 16000 if Vertical	
	Lubrication System & Lubricant Type		-	
	Maximum Bearing Temperature Rise	°K	-	
Auxiliaries	Space Heater Rating	W		
	Space Heater Voltage	V	230V if Space Heater Rating <= 3kW; else 400V	
	Stator Winding RTD		Two per Pahse	
	Bearing RTD		Required if Motor >= 1MW or Bearing is Thrust Type	
	CT for Differential Protection	no.	Required if Motor Rating > 1MW	
	CT Burden / Accuracy / Ratio		5P10, 10VA, 50/1 for self balance (5P20, 20VA, 50/1 for 6 CTs)	
Load Spec	Direction of Rotation, Facing Shaft End		-	☐ Bidirectional ☐ CW ☐ CCW
	Total Moment of Inertia (Load + Coupling + Motor)	kg.m2	GD2	
	Run-up Time at Un & 0.8Un (Loaded)	S	-	
	Load Duty (S1…S9)		-	
	Load Type (Centrigugal / Reciprocating / Fan / Mixer / etc)		-	
Electrical Performance	Current at Pn, 0.75Pn & 0.5Pn at Site Conditions & Continuous Duty	A	-	
	Efficiency at Pn, 0.75Pn & 0.5Pn at Site Conditions & Continuous Duty	%	-	
	No-load Losses	kW	-	
	Power Factor at Pn, 0.75Pn & 0.5Pn at Site Conditions & Continuous Duty	%	-	
Mechanical Performance	Full Load Torque	Nm	-	
	Breakdown Torque at Un & 0.8Un	%	-	
	Pull-up Torque at Un & 0.8Un	%	-	
	Full Load Speed	RPM	-	
	Vibration Severity	mm/S	At Most 2.8	
Starting Characteristics	Starting Method		Direct-On-Line	
	Allowable Stall Time at Hot and Cold Conditions	S	-	
	Maximum No. of Harmless Successive Starts		At Least 3 from Cold / 2 from Hot State	
	Starting Current at Un & 0.8Un	A	At Most 550% at Un	
	Locked Rotor Power Factor at Un & 0.8Un	%	-	
	Locked Rotor Torque at Un & 0.8Un	%	-	
	Allowable Run-up Time at Un & 0.8Un	S	-	
EX Type	EX Type, Gas Group & Temp. Class (If Area is Hazardous)		EExd; IIC T3	
	Is Pre-start Gas Purging or Any Other Provision Required?		NO	
	Te Time (for EExe Motors)	S	-	
	Certificate Number		-	

Remark: Un means rated voltage, Pn means motor rated power at standard conditions.

EPs Contractor:	ZANJAN UREA FERTILIZER PROJECT		Owner:
Petrochemical Industries Design & Engineering Company (PIDEC)	Data Sheet for MV Motors		ZANJAN Agricultural & Fertilizer Industries Co.
Project No. : 1231	Owner Doc. No.: - Doc. No.: TYPICAL	Rev.: xx	Project No. : 214

	Particulars of Equipment	Unit	Purchaser's Requirements	Vendor's Data
Terminal Box & Cable Connection	Short circuit capacity at input	MVA		
	Power Terminal Box Type	--	Phase Insulated/ Phase Segregated	
	Power Terminal Box Location (IEC 60034-7)	--	Right (looking from drive end) Rotatable by 90° and 180° degree increments	
	Power Cable Type	--	Cu/XLPE/S/SWA/PVC	
	Power Cable No. & Size	--	*	
	Power Cable Gland & Entries	--	*	
	Power Cable Entry Direction	--	*	
	Heater Cable Type	--	Cu/XLPE/SWA/PVC	
	Heater Cable No. & Size	--	*	
	Heater Cable Gland & Entry	--	*	
	Instrument Cable Type	--	*	
	Instrument Cable No. & Size	--	*	
	Instrument Cable Gland & Entry	--	*	

Note 1: (*) Will be informed to motor vendor by PIDEC after receiving preliminary motor data and sizing the related cables.

1- Two-years and commissioning spare parts list will be finalized by owner.
   Meeting Conclusion (2024/09/14): It was decided that the vendor would send the agreed 2 years spare parts list to ZAFIC.
2- Vendor needs to confirm that there is no deviation on table of scope of supply that is attached to PIDEC MR, section 2.3, otherwise, vendor deviation shall be clearly specified.
   Meeting Conclusion (2024/09/14): It was decided that ZAFIC would send MR Package with last revision of attachment.
3- As per agreement between the owner and vendor, No bearing RTD is considered for compressor bearings, Also there is no vibration sensor on compressor casing.

   Meeting Conclusion (2024/09/14): It was agreed that there is no need to consider RTD and Vibration sensor for compressor casing.
   But it was agreed that vendor to consider RTD for motor as follows:
   One RTD for each bearing (2 RTDs for bearings) and 6 RTDs for windings (2 RTDs per phase) .

4- Regarding scope of inspection, as per owner agreements, vendor ITP will be followed for compressors, for other items, PIDEC scope of inspection will be followed by vendor.

   Meeting Conclusion (2024/09/14): It was agreed that, vendor ITP will be followed for compressors skids, for other items, PIDEC scope of inspection will be followed by vendor.

5- Owner / vendor shall clarify for the possibility of using non-standard flanges inside the refrigeration package. If applicable, mating flanges with bolts, nuts, and gaskets for non-standard flanges shall be provided by vendor.

   Meeting Conclusion (2024/09/14): NO deviation.

6- Regarding the MTO for insulation inside the refrigeration package, final decision will be specified by owner after its coordination with the vendor, please note that as per PIDEC MR, MTO shall be provided by vendor.

   Meeting Conclusion (2024/09/14): NO deviation.

……

General Items

Meeting Conclusion (2024/09/14): All items noted and no deviation.

Electrical Items

1- About test & inspection of all electrical items as per our SOI (vendor's ITP)

   Meeting Conclusion (2024/09/14): It was agreed that, ZAFIC would send SOI to MY COM for review.

2- About EX type of MV motors which is "EX ec IIC T3" in vendor's documents

   Meeting Conclusion (2024/09/14): Noted. (MY COM has confirmed that "EX ec- IIC- T3" is suitable for EX type of MV motors.)

3- About Spare parts for electrical equipment (motors, LCP,..) that we didn't find any specific item.

   Meeting Conclusion (2024/09/14): Noted

Remarks:
1- This TQ sheet shall be exchanged between PIDEC and Bidders in a native file.
2- Each column and cell shall be filled out just by concerning party means Bidders and PIDEC.
3- A telephone conversation may be held to close outstanding issues after 2 times exchanging of comments and clarification.
4- Please care that all cell to be formatted in Wrap Text setting and do not try to change column width.

EPs Contractor: Petrochemical Industries Design & Engineering Company (PIDEC)	ZANJAN UREA FERTILIZER PROJECT	Owner: ZANJAN Agricultural & Fertilizer Industries Co.
	TQ No.:	
Project No. : 1231	REQ No.: 1231-DE-10-RE-REQ-330 Rev	Project No. : 214

E.INSTRUMENT

		PIDEC's 1st Comment/Query	Bidder's 1st Clarification/Reply	PIDEC's second Comment/Query	Conclusion (2024/09/14)	PIDEC's third Comment/Query (any part of PIDEC's second Comment/Query which its reply was not found in Conclusion (2024/09/14) (marked in blue color ,repeated in this column.)	Meeting dated 02.10.2024 (in Shiraz)	Status
E.1		Following Documents shall be followed by vendor for design and supplying of Control & Safety system of Package : Doc. No. : 1231-DE-00-IN-MSS-673-01 Doc. No.: 1231-DE-00-IN-MSS-602-01 (for safety loops which shall be specified based on result of HAZOP and SIL study) Doc. No. : 1231-DE-00-IN-MSS-672-02 As specification of Control & Safety system has not been cleared in Technical Offer clearly ,and there is no vendor confirmation to show that above mentioned Documents will be followed by him for design and supplying of Control & Safety system ,it is expected that any deviation to be judged and advised or confirmed by Owner.	**First of all, we agreed with Owner that reference of project execution will be agreed offer and technical clarification and comments discussed and agreed.** **Doc. No. :** 1231-DE-00-IN-MSS-672-02 **is NOT available in the requisition and therefore, it is NOT considered.** **Comments to Doc. No. :** 1231-DE-00-IN-MSS-673-**01 are listed below:** *** Vendor equipment includes power supply, communication modules of PLC to be redundant and no further redundancy is agreed. Also, offer does NOT include any redundant I/Os same as our design in SABIC, ARAMCO, etc. Only we have ESD push bottom and remote trip signal from client ESD which are wired to separate IO cards..** *** Due to the type of equipment, DELTA offer includes 10% spare on the hardware, and 20% spares of the memory. As specified in agreed offer, Instrumentation and Control will be as per MYCOM STD in Oil and Gas Area.** *** 2oo3 voting is not included.** **Comments to Doc.1231-DE-00-IN-MSS-602-01 (for safety loops which shall be specified based on result of HAZOP and SIL study) are listed below:** *** vendor offer includes Vendor equipment includes power supply, communication modules of PLC to be redundant and no further redundancy is agreed., but does NOT include any redundant I/Os for control nor ESD to protect the system to meet the requirements listed in this specification.** *** Offered equipment does NOT include a dedicated ESD system as DELTA will include special STOP and SHUTDOWN sequences to protect the equipment. This design has been used on all off-shore and on-shore equipment for safe operations.** *** ESD push bottom and remote trip signal from client ESD are wired to separate IO cards.**	Owner to clarify all vendor deviation points to following Project Specifications which approved by him. - Doc. No.: 1231-DE-00-IN-MSS-673-01 - Doc. No.: 1231-DE-00-IN-MSS-602-01 (for safety loops which shall be specified based on result of HAZOP and SIL study) - Doc. No.: 1231-DE-00-IN-ESS-603-01 - Vendor Deviation to Doc. No.s : 1231-DE-00-IN-MSS-673-01 & 1231-DE-00-IN-MSS-602-01 regarding redundancy of CPU & I/O cards is ***NOT acceptable*** in PIDEC Inst. Dept. point of view. Because as per Vendor clarification there is sequential STOP and SHUTDOWN sequences to protect the equipment so it seems the CPU & I/O cards to be redundant to continue sequential STOP and SHUTDOWN sequences in case of failure of one CPU or each of I/O cards. In addition ,it is not clear what redundancy of communication modules means where there is no redundancy regarding I/O cards. - Vendor Deviation to Doc. No. : 1231-DE-00-IN-MSS-673-01 & 1231-DE-00-IN-MSS-602-01 regarding spare capacity is ***NOT acceptable*** in PIDEC Inst. Dept. point of view. Because enough spare on the hardware shall be available during commissioning. And enough spare on the memory is required to be able to open several pages (alarms ,...) at the same time without any problem. - Owner to clarify Spare capacity for communication buses , power supplies based on his agreement with Vendor. - As per section SCOPE OF WORK of REQ No.: 1231-DE-10-RE-REQ-330 ,HAZOP and SIL study shall be done for Package and Vendor is responsible for the safety of package and mandatory recommendations of HAZOP/SIL studies shall be incorporated by Vendor so 2oo3 voting shall be incorporated where required based on result of SIL Study.	_Regarding Hazop and Sill study, it was agreed that The results of the HAZOP and SIL study reports will be necessary to follow for Vendor and OWNER.(WITHOUT COST EFFECT) conclusion of meeting (2024/02/17) mention in block diagram for redundancy is applicable and shall be consider by vendor	Any reply regarding following items were ***NOT*** found ,please clarify. 1. Owner to clarify all vendor deviation points to following Project Specifications which approved by him. - Doc. No.: 1231-DE-00-IN-MSS-673-01 - Doc. No.: 1231-DE-00-IN-MSS-602-01 (for safety loops which shall be specified based on result of HAZOP and SIL study) - Doc. No.: 1231-DE-00-IN-ESS-603-01 2. Vendor Deviation to Doc. No.s : 1231-DE-00-IN-MSS-673-01 & 1231-DE-00-IN-MSS-602-01 regarding redundancy of CPU & I/O cards is NOT acceptable in PIDEC Inst. Dept. point of view. Because as per Vendor clarification there is sequential STOP and SHUTDOWN sequences to protect the equipment so it seems the CPU & I/O cards to be redundant to continue sequential STOP and SHUTDOWN sequences in case of failure of one CPU or each of I/O cards. 3. Vendor Deviation to Doc. No. : 1231-DE-00-IN-MSS-673-01 & 1231-DE-00-IN-MSS-602-01 regarding spare capacity is NOT acceptable in PIDEC Inst. Dept. point of view. Because enough spare on the hardware shall be available during commissioning. And enough spare on the memory is required to be able to open several pages (alarms ,...) at the same time without any problem. 4. Owner to clarify Spare capacity for communication buses , power supplies based on his agreement with Vendor.	As compressor is manufacturer standard mentioned spec. will be followed as far as possible. According to Manufacture standard consideration of one CPU and further consequences are acceptable by Owner. Spare capacity was not discussed between Owner and Vendor and has not finalized yet. Will be finalized in KOM.	OPEN
E.2		Following Documents shall be followed by vendor for instruments selection/supplying and design and supplying of Control & Safety system : Doc. No. : 1231-DE-00-IN-ESS-603-01 Doc. No.: 1231-DE-10-RE-REQ-330 (section 3.18 (INSTRUMENTATION)) As specification of Control & Safety system and instruments have not been cleared in Technical Offer clearly ,and there is no vendor confirmation to show that above mentioned Documents will be followed by him for design and supplying of Control & Safety system and selection/supplying instrument ,it is expected that any deviation to be judged and advised or confirmed by Owner.	**For Doc. No. : 1231-DE-00-IN-ESS-603-01, DELTA design does not allow any auto start for the 2nd compressor. The 2nd compressor shall be brought into operation manually and have both compressor load sharing. Detailed procedure will be provided during detailed engineering.** **Instrument located on the local control station will be hermetically sealed to meet the area class, and the JB will be Ex(ec).** **Locally mounted solenoid valves will be rated for Ex(de), and all transmitters will be rated for Ex(ia).** **Instrument taps on the compressor packages will be per manufacturer standard as shown on offered P&ID.** **Offered pressure gauges are 4.5".** **Offered Temperature gauges are 5".** **Due to space limitation, thermowell installation on the compressor packages are per manufacturer standard based on their common standards based many years of experience.** **Offered panel is per Type C.** **Wire colors inside the package including remotely mounted panel are per manufacturer standard due to 1) the quantity of cable used on the system is extremely small, 2) availability in the market in small quantities.** **Tubing in the compressor package is manufacturer standard and may be less than 1/2".** **All instruments will include only main isolation valves to isolate them during service.** **Instrument installation and supports are per manufacturer standards.**	- However DELTA design is not clear for us and there is no information in Vendor Technical Proposal in this regard ,it is assumed that DELTA design has been approved by Owner. Owner to confirm. - It is assumed that all Vendor deviation points to Doc. No. : 1231-DE-00-IN-ESS-603-01 have been approved by Owner. Owner to confirm. - In PIDEC Inst. Dept. point of view ,2 valve manifolds shall be used with pressure gauges, switches or transmitters. 2 valves in 1 body, 1 is the isolation valve, the other the drain/calibration valve. - In PIDEC Inst. Dept. point of view ,5-valve manifold for DP transmitters are required because of following reasons: *) Blocking a connection to the process *) Equalizing pressure between the two ports of the measuring device and to ensure that the capsule will not be over-ranged *) Bleeding the segment between the instrument and the process	_Regarding LOAD SHARING: two compressors will run automatically and both of them will have same load sharing to keep normal pressure at the ammonia storage. Vendor confirmed: ,2 valve manifolds shall be used with pressure gauges, switches or transmitters. 2 valves in 1 body, 1 is the isolation valve, the other the drain/calibration valve. also,5-valve manifold for DP transmitters are required because of following reasons: *) Blocking a connection to the process *) Equalizing pressure between the two ports of the measuring device and to ensure that the capsule will not be over-ranged *) Bleeding the segment between the instrument and the process	It is assumed that all following Vendor deviation points to Doc. No. : 1231-DE-00-IN-ESS-603-01 have been approved by Owner. Owner to confirm. - Locally mounted solenoid valves will be rated for Ex(de). - Instrument taps on the compressor packages will be per manufacturer standard as shown on offered P&ID. - Offered pressure gauges are 4.5". - Offered Temperature gauges are 5". - Due to space limitation, thermowell installation on the compressor packages are per manufacturer standard based on their common standards based many years of experience. - Wire colors inside the package including remotely mounted panel are per manufacturer standard due to 1) the quantity of cable used on the system is extremely small, 2) availability in the market in small quantities. - Tubing in the compressor package is manufacturer standard and may be less than 1/2". - Instrument installation and supports are per manufacturer standards.	All mentioned deviation items were acceptable by Owner.	CLOSED
			For Doc. No.: 1231-DE-10-RE-REQ-330 (section 3.18 (INSTRUMENTATION)) see below comments. *** SIL Study is normally covered by a 3rd party and not vendor.** *** Machine Monitoring Vibration equipments are not offered due to the size of the equipment and not required.** *** Due to the type of equipment, Vendor offer includes 10% spare on the hardware, and 20% spares of the memory.** *** 2oo3 voting is not included.** *** Vendor equipment includes power supply, communication modules of PLC to be redundant and no further redundancy is agreed.**	Please refer to PIDEC's second Comment/Query to item E.1.				CLOSED
		It is expected that items E.3 ~ E.39 to be followed by Vendor so in case of any deviation ,it should be judged and advised or confirmed by Owner.	**Refer to below reply.**					
E.3		Original software and operating systems with all required licenses (Soft key or Hard key) shall be provided for Engineering Laptop and A copy of all original software with their licenses and also a copy of database of package software on compact disk (CD or DVD) shall be deliver to owner separately.	**Operation software will be provided, configuration software is property of Vendor. DELL/ Lenovo Brand Cori5 laptop will be provided/**	It is **NOT** acceptable in PIDEC point of view. Installation of original engineering/configuration software with their licenses on Engineering Laptop and delivery of copy of database of package software on compact disk (CD or DVD) to Owner are mandatory otherwise the vendor shall be present for any modification in future. It addition it is not clear where Operation software will be installed by Vendor. Any PC station (desktop computer) was not found in Vendor offer.	vendor confirmed that provide and. Install of original engineering/configuration software with their licenses on Engineering Laptop be able to upload and download program without change the program	1. Vendor reply is **NOT** so clear. In our point of view the authorized Engineer should be able to do any modification where required in future. 2. If copy of database of package software on compact disk (CD or DVD) will be delivered to Owner or not? 3. Where Operation software will be installed by Vendor. Any PC station (desktop computer) was not found in Vendor offer.	1&2. Owner clarified that copy of database of package software on compact disk (CD or DVD) will be delivered to Owner. 3. Operation software will be installed on Laptop and acceptable by Owner.	CLOSED
E.4		Since the control cabinets will be installed in control room ,minimum IP42 is required for the cabinets.	**Confirmed**					CLOSED
E.5		Field instruments shall be smart instruments with 4~20 mA signal and HART protocol.	**Confirmed**					CLOSED
E.6		Electronic transmitters in hazardous area shall be basically intrinsic safe. Solenoid valves shall be Exia.	**Confirmed for transmitters, however, solenoid valves, hand switches, push button, and pilot lights are Ex(d)**	Explosion proof cable glands shall be used.	_Confirmed by Vendor			CLOSED
E.7		All limit switches for automatic valves shall be proximity (NUMOR) type and intrinsically safe.	**Housing for compressor slide valve assembly that includes limit switches and potentiometers is indeed Ex(ia) but requires barriers *current convertor) located inside the panel.**	Type of limit switches for automatic valves are NOT clear. Please clarify.	Clarified by vendor and confirmed	Type of limit switches for automatic valves are NOT clear. Please clarify.	Owner clarified that all limit switches for automatic valves are proximity (NUMOR) type and intrinsically safe.	CLOSED
E.8		Solenoid valves shall be IS with 24 VDC voltage rating. The material of body and trim to be SS 316. Coil housing material to be metallic not plastic. It should be noted that : - The distance between PU-5001 (Refrigeration Package) in Field and Package PLC and its marshalling cabinet in auxiliary room is approximately 260 meters. - The multi cable type which will be used for solenoid valves is 10x(2x1.5)+SCR.	**Confirmed**	The multi cable type which will be used for solenoid valves is 10x(2x2.5)+SCR.	Clarified by vendor and confirmed			CLOSED
E.9		All transmitters shall be provided with integral digital indicators.	**Confirmed**					CLOSED
E.10		Isolating valves shall be provided for all instruments. Two valve manifold for pressure switches and gauges and 5-valve manifold for DP transmitters shall be considered.	**All transmitter will be located locally and only route valves will be used for isolation and main fold is not required.**	Please refer to PIDEC's second Comment/Query to item E.2.		Refer to Vendor confirmation in item E.2 ,it was found out that 2 valve manifolds and 5-valve manifolds will be provided by Vendor.		CLOSED
E.11		All cable entries shall be M20X1.5 with explosion-proof cable glands. It shall be suitable for armored cable.	**Confirmed**					CLOSED
E.12		The instrumentation shall be rated to withstand the environmental conditions specified in the engineering standard specification for ambient and site condition.	**Confirmed**					CLOSED
E.13		All instrument/automatic valves wetted parts and process/air tubing materials shall be S.S. 316 as minimum, other materials as per process conditions.	**Tubings will be SS 316**	Since selecting proper material base on process condition is Vendor responsibility it is assumed that SS 316 is suitable.				CLOSED
E.14		Where ever temperature shall be transmitted to the package PLC, temperature transmitter shall be provided by vendor. Direct connection of temperature element to PLC is not acceptable.	**Confirmed with the following clarifications:** *** Winding RTD are wired directly to MCC(if MV motor)** *** Compressor bearing RTDs are not required and agreed.** *** Motor bearing RTDs are not provided since the motor is ant-friction ball bearing**		Refer to meeting conclusion (2024-09-14) it was agreed that vendor to consider RTD for each beaing of motor.	Refer to conclusion meeting (2024-09-14) as one RTD for each bearing of motor will be considered by Vendor ,it is expected that Vendor confirmed to provide temperature transmitters for transmitting temperature values to package PLC (because direct connection of temperature element to PLC is not acceptable). Owner to confirm.	Owner confirmed that RTD for each bearing of motor will be considered by Vendor otherwise RTD signals will be transmitted to MCC directly.	CLOSED
E.15		Emergency shutdown sensors shall not be common with those of control loops.	**Confirmed as for fail safe system, ESD button is a hard wire and normally wired to kill all outputs from PLC.**	Vendor reply is NOT clear ,Owner to clarify based on his agreement with Vendor.		Vendor reply regarding following requirement is **NOT** clear. Please clarify. Emergency shutdown sensors shall not be common with those of control loops.	Owner confirmed that Emergency shutdown sensors are not common with those of control loops.	CLOSED
E.16		All field instruments shall be factory calibrated with calibration certificate.	**Confirmed**					CLOSED
E.17		In addition to isolation valve, dedicated manifold shall be considered and provided by vendor in each instrument hook up (for pressure & diff. pressure instruments).	**All transmitter will be located locally and only route valves will be used for isolation and main fold is not required.**	Please refer to PIDEC's second Comment/Query to item E.2.		Refer to Vendor confirmation in item E.2 ,it was found out that 2 valve manifolds and 5-valve manifolds will be provided by Vendor.		CLOSED
E.18		For off-skid loose and skid mounted instruments, all related Single Cables (40 meter for each item), Cable Glands, open conduits, pipe, tube (in SS316), fittings (in SS316), isolation and drain valves, manifolds, junction boxes, cable trays, instrument support, etc. shall be supplied by vendor based on Process & air Instrument Hook-ups and Instrument Field layout which shall be supplied by him.	**Confirmed and all installation drawing will be shared during design review**					CLOSED
E.19		Skid & off-skid loose instruments and JB locations and cable routing shall be shown on Instrument Field layout.	**Vendor confirms the following in the 3D model:** *** Cable trays routing** *** Instrument hookup with tube routing** *** Instrument location**	In addition to 3D Model following Documents shall be submitted by Vendor. - Instrument Field layout - Instrument Process Hook Up's	3D modeling with Autocad 3D (be able to convert STP format) - that can be implemented in whole plant modeling- shall be provided by vendor	Vendor reply regarding following requirement is **NOT** clear. Please clarify. In addition to 3D Model following Documents shall be submitted by Vendor. - Instrument Field layout - Instrument Process Hook Up's	Owner clarified that this issue will be discussed in KOM.	OPEN
E.20		All panels, enclosures and junction boxes shall be explosion protected according to their area classification. All field mounted instruments, enclosures and junction boxes shall be protected to IP-65.	**Confirmed for skid mounted instruments and junction boxes**	It is expected that mentioned requirement to be followed by Vendor for off-skid loose instruments as well. Owner to clarify based on his agreement with Vendor.	vendor confirmed that All panels, enclosures and junction boxes explosion protected according to their area classification. All field mounted instruments, enclosures and junction boxes shall be protected to IP-65.			CLOSED
E.21		Terminals No. in Package PLC cabinets shall be mirror of terminals in junction boxes/interposing cabinet.	**Confirmed**					CLOSED
E.22		All plant cables shall be fire retardant.	**Confirmed per IEC 331 and IEC 332**					CLOSED
E.23		The available power supply in the control room is 110 V AC, 50 Hz UPS (redundant feeders in control room). Any requirement to another level of voltage , are in vendor scope of supply. Any distribution for 110VAC/UPS inside the package battery limit, are in vendor scope of supply as well. Also one 230VAC, non UPS will be made available by purchaser for Internal lamps and socket outlets in PLC cabinets of package.	**Confirmed and noted**					CLOSED
E.24		Page 6 of 16 of Doc. No.:1231-DE-00-IN-SKT-007 shall be followed by vendor for Instrument/Electrical Connection Details as a typical sketch for signals which are applicable for vendor's electrical motors. Signals from/to MCC's shall be considered as non-IS and hardwire type. All digital inputs/outputs from/to MCC shall be relay type (relays must be in vendor cabinet and shall be powered from vendor cabinet (output contact from these relays shall be wet and powered by 24Vdc inside PLC)).	**Noted.**	It is expected that mentioned requirement to be followed by Vendor. Owner to clarify based on his agreement with Vendor.		As Vendor means of **"Noted"** regarding following query is **NOT** clear ,Owner to clarify based on his agreement with Vendor in conclusion meeting dated 2024-09-14. Page 6 of 16 of Doc. No.:1231-DE-00-IN-SKT-007 shall be followed by vendor for Instrument/Electrical Connection Details as a typical sketch for signals which are applicable for vendor's electrical motors. Signals from/to MCC's shall be considered as non-IS and hardwire type. All digital inputs/outputs from/to MCC shall be relay type (relays must be in vendor cabinet and shall be powered from vendor cabinet (output contact from these relays shall be wet and powered by 24Vdc inside PLC)).	Owner confirmed that mentioned requirements will be followed by Vendor.	CLOSED
E.25		TAG No. of each terminal strip in Package PLC cabinets shall be same as MULTICORES No. which will be specified by purchaser.	**Confirmed**					CLOSED
E.26		IS and NIS signals shall be separated inside panels. (Two rout cables shall be considered). As per IEC-60332-1/BS-5308, IS cables shall be blue and NIS cables shall be gray.	**Confirmed**					CLOSED
E.27		Separate IE/PE earth bar shall be considered inside the panels.	**Confirmed**					CLOSED

E.28		Redundant DI & DO signals shall be foreseen by vendor for communication with plant hardwire console (Supplied by others). HS-50301 (Emergency Stop Signal; Trip PU-5001)(NIS,REDUNDANT,PASSIVE,24 VDC / POTENTIAL FREE CONTACT) HL-50301 (Common shutdown alarm from package PLC (UCP) to Plant HWC)(NIS,REDUNDANT,PASSIVE,24 VDC (CONSUMER LOAD))	**Vendor does offer redundant DI & DO for the following reasons: * Vendor equipment includes power supply, communication modules of PLC to be redundant and no further redundancy is agreed.s, but does NOT include any redundant I/Os. * Offered equipment does NOT include a dedicated ESD system as Vendor will include sequential STOP and SHUTDOWN sequences to protect the equipment. This design has been used on all off-shore and on-shore equipment for safe operations. * ESD push bottom and remote trip signal from client ESD are wired to separate IO cards.. * System will detect a bad PV anytime trip devices are failing. All hardwired signal for ESD will be wired to two different DI card to assure redundancy. DELTA offer requires all signal in dry state.**	- Please refer to PIDEC's second Comment/Query to item E.1. - Refer to Vendor explanation as there is sequential STOP and SHUTDOWN sequences to protect the equipment ,it is assumed that by activation of HS-50301 sequential STOP/SHUTDOWN sequences will be started. To be clarified. - Again it should be noted that : HS-50301 on Plant-Hard wire console (supplied by others) has been considered and related signal will be sent to Package PLC (supplied by Vendor). HL-50301 (Common shutdown alarm (Lamp)) has been considered on Plant-Hard wire console (supplied by others) to indicate activation of Trip signal. Trip signal should be sent from Package PLC (supplied by Vendor) to Plant-Hard wire console (supplied by others) and Signal type to be 24 VDC (CONSUMER LOAD). Digital output modules shall energize output relays by 24 V DC.	_Noted and Confirmed. _Output Relay will be supplied by Vendor. _vendor confirmed that indication TRIP signal sent to Plant-Hard wire console From interposing relay .	Vendor reply regarding following query is **NOT** clear ,Owner to clarify based on his agreement with Vendor in conclusion meeting dated 2024-09-14. It should be clarified that if by activation of HS-50301 sequential STOP/SHUTDOWN sequences will be started or the Package will be STOP/SHUTDOWN immediately.	Owner clarified that sequences to protect the equipment will be done in case of activation of STOP. HS-50301 (Emergency Stop Signal) actives shutdown signal.	**CLOSED**
E.29		The required shut-down, start-up and inter-lock diagrams based on IEC 61131 shall be provided and implemented in packages PLC's by Vendor.	**Vendor standard documents will be provided for the following: * Set point List * C&E * IO List * |Control Narrative + Startup, Stop, and ESD Sequences.**	It is assumed that sequential function charts to be according to IEC-60848 (as per Doc. No.: 1231-DE-00-IN-MSS-602-01). To be clarified. All Documents listed in part "*TECHNICAL DOCUMENTS/INSTRUMENTATION*" of *RFD Form* shall be submitted by VENDOR.	_Cause and Effect and interlock diagram will be add to document list. Proposed VPIS + C&E + Interlock Diagram.	Vendor reply does **NOT** match with following query ,Owner to clarify. It is assumed that sequential function charts to be according to IEC-60848 (as per Doc. No.: 1231-DE-00-IN-MSS-602-01)	Owner clarified that this issue will be discussed in KOM.	**OPEN**
E.30		The system logic shall be 'fail safe'. All instruments shall be considered for fail to safe action upon loss of instrument air or electrical power. The input contacts to alarm, interlock and emergency shutdown system shall be close (make contact) during normal operation and open on alarm or trip. The solenoids shall be energized during normal operation and de-energized to trip.	**Confirmed**					**CLOSED**
E.31		The PLC's shall be provided with all required system software including application/utility programs, engineering/configuration tools, self-checking and self diagnostic fault detection capabilities.	**Operation software will be provided, configuration software is property of Vendor. DELL/ Lenovo Brand Cori5 laptop will be provided/**	It is not clear where system software including application/utility programs, self-checking and self diagnostic fault detection capabilities will be installed based on Vendor agreement with Owner.		Any reply regarding following query was **NOT** found ,please clarify where system software including application/utility programs, self-checking and self diagnostic fault detection capabilities will be installed based on Vendor agreement with Owner.	Owner clarified that all mentioned software will be installed on Laptop and acceptable by Owner.	**CLOSED**
E.32		Vendor shall supply any required software/hardware for configuration of the PLC. The required soft-wares shall be installed on the laptop. The original software/dungle shall be included.	**Operation software will be provided, configuration software is property of Vendor. DELL/ Lenovo Brand Cori5 laptop will be provided/**	Please refer to PIDEC's second Comment/Query to item E.3.				**CLOSED**
E.33		All instrument items which are in vendor scope of supply and will be supplied as loose items by vendor shall be packed in separate box and marked properly "for instrumentation" during packing and shipment stage.	**Confirmed**					**CLOSED**
E.34		The HAZOP and SIL study for package PIDs (vendor scope of work and supply) shall be performed by Vendor through third party. The Vendor quotation shall include all costs of performing HAZOP and SIL Studies for package PIDs including meetings, moderator, documentation, etc. The study results including HAZOP reports, HAZOP action close out sheets, SIL assessment and verification reports shall be submitted by vendor or study moderator as package vendor documents. The HAZOP study shall be performed according to IEC 61882 requirements. The SIL assessment/verification shall be performed according to IEC 61508 and IEC 61511 requirements. Since the Vendor is responsible for safety of package, all mandatory recommendations of HAZOP/SIL studies shall be incorporated without additional cost.	**HAZOP and SIL studies are normally covered by contractor and NOT vendors. We will participate in client meeting with third party**	As refer to section SCOPE OF WORK of REQ No.: 1231-DE-10-RE-REQ-330 ,HAZOP and SIL study shall be considered by Vendor as Main Quotation ,any deviation in this regard shall be confirmed by Owner. Owner to confirm.		Refer to conclusion meeting (2024-09-14) regarding item E.1 ,it was found out that HAZOP and SIL study will be done for Package and mandatory recommendations of HAZOP/SIL studies will be incorporated by Vendor based on result of SIL Study..(WITHOUT COST EFFECT)		**CLOSED**
E.35		All the system hardware (including monitoring, control, protection, communications, communication with DCS, etc.) complete with all software (including application software) installed and loaded on the corresponding hardware, are subject to Factory Acceptance Test (FAT). FAT procedure shall be prepared by Vendor, approved by Owner and used as the guideline for performing FAT. Owner reserves the right to modify Vendor's standard procedure.	**Confirmed**					**CLOSED**
E.36		When Factory Acceptance Test (FAT) is over, the following features shall be available for future expansion: • a minimum of 20% installed spare breakers/fuses, • a minimum of 20% installed spare cores/pairs/triples terminals, • a minimum of 20% installed input/output spare points, • a minimum of 10% free space in cabinets, • 45% spare capacity for communication buses • 50% spare capacity for memory • 30% spare capacity for power supplies • 40% spare capacity for process controller unit	**Refer to 1st item reply, these high requirement are not needed and nor agreed with Owner**	Please refer to PIDEC's second Comment/Query to item E.1.		Owner to clarify Spare capacity regarding following items based on his agreement with Vendor. • a minimum of 20% installed spare breakers/fuses, • a minimum of 20% installed spare cores/pairs/triples terminals, • a minimum of 20% installed input/output spare points, • a minimum of 20% free space in cabinets, • 50% spare capacity for communication buses • 50% spare capacity for memory • 30% spare capacity for power supplies • 40% spare capacity for process controller unit	Spare capacity was not discussed between Owner and Vendor and has not finalized yet. Will be finalized in KOM.	**OPEN**
E.37		Commissioning and two years spare parts for instruments shall be quoted. Two years spare parts shall be according to Att. No. : 4 of Doc. No.: 1231-DE-10-RE-REQ-330 (Specific List of Spare Parts).	**As per list provided by Owner**					**CLOSED**
E.38		Vendor's proposals shall cover the training according to section 12.6 of Doc. No.: 1231-DE-00-IN-MSS-673 (as an option).	**As per agreement with Owner**					**CLOSED**
E.39		As most of Inst. Dept. technical documents were not found in submitted VPIS ,VPIS should be modified according to comments marked in green color. Vendor documentation shall be in PROJECT format.	**Please find our replies**	Owner is kindly requested to review PIDEC Inst. Dept. reply (in red color) to attached Excel file "**Inst. Dept. reply to VPIS (Commented by Instrument Dept.)-Replied 22 July**" and advice regarding documentation based on your agreement with Vendor.		Any reply regarding this query was **NOT** received. Owner to advice regarding documentation based on his agreement with Vendor.	Owner clarified that PIDEC Comments on VPIS will be discussed in KOM.	**OPEN**

Please find bellow PR's comments,

1-Liquid Ammonia will pass through control valve (in vendor scope) and then enters a line routing to the ammonia storage tank at ***-36.5 °C***. Please confirm.

Confirmed.

2-please confirm no copper and copper alloys is used in this package.

Confirmed

3-Please confirm non-condensable gas purging system with automatic control valve (PCV) will be provided on condenser.

As per proven experience Design of MAYEKAWA, We have considered SOV that is working automatically based on volume of NCG using specific timer, and this SOV will be located on top of condenser that density of NCG is lighter than the ammonia.

4-Refrigerator package shall be auto start/stop by remote signal from control room. Please confirm.

Compressors can be started by remote signal from Control System manually before loading/Unloading of the Ammonia Tank.

5-Compressor loading shall be controlled automatically by pressure controller so as to maintain pressure of ammonia storage tank constant.

ULTIM confirms compressor loading is fully automated using suction pressure but on the basis of load sharing.

6-Oil contamination in return ammonia shall be less than 5 ppm(wt).

Confirmed

Confirmed

Confirmed.
PIDEC REPLY: Atmospheric pressure shall be considered 0.82 barA, so inlet pressure shall be modified.
Meeting conclusion:(02.10.2024)
Noted, will be followed by vendor.

Not required

10-package shall be suitable for outdoor.

Confirmed

11- Stream 14 at vendor PFD, has a flow rate of 1042.6 kg/h with a vapor fraction of 0.1182. Therefore, liquid content of this stream will be 1042.6*(1-0.1182)=919.36 kg/h. However, at process

To achieve the liquid flowrate of 1,000 kg at the outlet of the package at 0.05 Barg, the flowrate coming into the system shall be raised 1,142 kg/h.
PIDEC REPLY:inlet flowrate of 1142 kg/h is not consistent with issued PFDs. However presented flowrate for stream 14 is accepted in issued PFDs.
Meeting conclusion:(02.10.2024)
Noted, discrepancy with PFD will be removed by vendor during detail engineering stage.

Second: Suction temperature of ***-36.5 °C*** (Min temperature)

Third: Suction temperature of ***9.5 °C*** (Max temperature), flow rate of 84 m^3/h See note 1 below

Vendor has revised the attached PFD Simulation per above request. LS Compressor rotor length was increased from to L to meet the capacities required

12- Package data sheet shall include process data, operating and design conditions for each case and

VENDOR recommends to use the offered PFD as the guarranteed process conditions.
PIDEC REPLY: data sheet shall be filled out with requested data as per PDF.
Meeting conclusion: (02.10.2024)
Noted, will be followed by vendor.

Vendor confirms corrected the inlet temperature to condenser to match the compressor performance, and to adjust the flow to guarrantee 1,000 kglh liquid outlet during detail engineering based on PFD addressed in item 12 above.

Notes:
1. For the case 3, ULTIM has showed the maximum flow when the gas is entering at suction temperature of 9.5C. However, to meet the required capacity of 84 m3/h, one compressor will be running at low load load using the manual recycle valve(this case is even lower than 25% minimum operation requested before)

Meeting conclusion:(02.10.2024)

All comments Noted and confirm by vendor, will be applied during detail engineer stage.

VEM Motor MV datasheet:

Please consider Ex certification is valid from -20 - +48°C

Three-phase motors with squirrel cage rotor, explosion protected version, protection type 'Ex ec', device group II, category 3G

Type		W52R 355 M2 Ex ec IIC T3 Gc DR PT NS LL HW
Standard marking		Ex ec IIC T3 Gc
Duty type		S1
Design output	(kW)	150
Design torque	(Nm)	1041
Design frequency	(Hz)	50
Design speed	[rpm]	2981
Direction of rotation		right
Design voltage	(V)	6.000
Connection	[-]	Y
Design current	[A]	35.7
Relative pull-in current	[-]	6,2
Relative starting torque	[-]	1
Relative pull-out torque	[-]	2,5
Power factor	[-]	0,92
Efficiency	[%]	95,6
Efficiency determination	[-]	EN 60034-2-1
ATEX-No.		IBExU16ATEXB016 Ausgabe 0
Th. cl.		155(F/B)
Coolant temperature	(°C)	-30 -20...+48
Altitude above sea level	(m)	1850
Degree of protection IP		IP55
Moment of inertia	(kgm^2)	4,22
Motor weight	(kg)	2100
Bearing, D-side		6317 C3
Bearing, N-side		6317 C3
Relubrication interval	(h)	2000
Grease type		ASONIC GHY 72
Grease amount	[cm^3]	57/57
A-sound pressure level	(dB)	

Considering mentioned data, motor current will be 16.4A not 35.7A. Please check it again.

For your convenience, with considering existing motor data, related motor cable size and also cable entry size (which will be considered by motor vendor) will be as follows:

- Main power cable : 3x25mm2 with related **cable entry 1xM50x1.5**
- RTD cable: 6Tx0.75 mm with **cable entry 1xM25x1.5**
- Space Heater cable: 2x2.5mm2 with **cable entry 1xM20x1.5**

Options

Type of mounting	IM B3
Flange	-
Terminal box	Ex - version
Position of terminal box	at an angle / right
Cable gland	M 63x1,5 MS
Position of cable entry	
Shaft	Standard, 1 shaft end
Bearing	Relubrication device, easy bearing arrange
Special details to bearings	Fixed bearing, N-side
Winding protection	3xPt 100 (4-wire-connection, Ex i)
Limit values to vibration velocity	Class A
	Balancing with half key
Colour system	01 Moderate (KK C2),RAL 7031 blue-grey
Delivery conditions and/or official regulations:	IEC / EN 60034-1

This document was produced electronically, all specifications are valid only after confirmation of the manufacturer

Note that based on clause 9.1 from MV motor specification attached to requisition (Doc. no. 1231-DE-00-EL-MSS-522), 6x Pt100 (two per phase) shall be considered for winding.

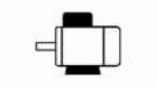
Note that finished color of motor shall be RAL 7038.

Three-phase motors with squirrel cage rotor, explosion protected version, protection type 'Ex ec', device group II, category 3G

W52R 355 M2 Ex ec IIC T3 Gc DR PT NS LL HW

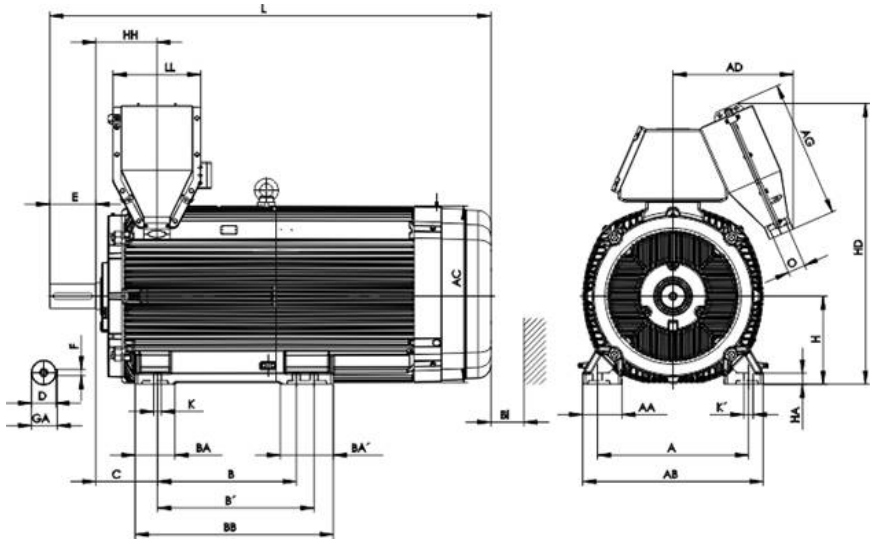
Note that space heater should also be considered for this MV motor.

Mounting position



Type of mounting: IM B3
Flange: -
Position of terminal box: at an angle / right
Brake type:
Forced-ventilation:

Terminal box: EXE-KA 6,6KV 400A
Cable gland O: 3 xM 63x1,5 MS



Motor

A	AA	AB	AC	AD	B	B'	BA	BA'	BB	C	CA	K	K'
610	128	700	704		560	630	139	199	750	254	-	28	35

							Protection cover			Terminal box	
L	LC	H	HA	HD	HH	BI	L	AG	LL	BE	AH
1730	-	355	44	1167	265	110		643	448		

Flange

P	N	LA	M	T	S
-	-	-	-	-	-

Tolerances

H	N	D	DA
-1	h6	m6	m6

Shaft-DS

D	E	GA	F	DB
80	170	85	22	DIN332DS-M20

Shaft-NS

DA	EA	GC	FA
-	-	-	-

DB...Centre hole

Delivery conditions and/or official regulations: IEC / EN 60034-1

PIPING comments are as follows:

- All tie in points should be fixed (No movement) and to be supported accordingly. Confirmed
- Allowable external piping loads for tie in points must be indicated on drawings. Confirmed
- Any special supports such as springs, expansion joints, inside the package, are in the vendor's scope of supply and related data sheets should be sent to PIDEC. Confirmed
- All tie in points should be ANSI flange and according to project PMS. Confirmed
- All tie in points should be delivered at the edge of skid. Confirmed
- All utility services should be collected inside package and deliver as a single tie in point.

Direct cooling water line for each skid to be provided by client.
Also, PSVs will be supplied as loose and to be mounted above the flare header by client.
PIDEC Reply:
Vendor is responsible for utility services inside its package.

Please find supplementary piping comments as follows:

1-Piping between skids are in vendor scope of design and supply.
2-Layout of skids (package) will be finalized during detail engineering.
3-Vendor is requested to submit 3D model in STP format during detail design.
Meeting conclusion:(02.10.2024)
Noted and confirm by vendor.

VPIS DCI

No.	Discipline	Doc. No.	Title	M.H	W.F.	Issue Plan	1st ISSUE							2nd ISSUE							3th ISSUE						
							VPIS Issued Info				Consultant Reply			VPIS Issued Info				Consultant Reply			VPIS Issued Info				Consultant Reply		
							Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date	Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date	Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date
General																											
1			Project Schedule																								
2			Vendor Document & Index Schedule (VDIS)																								
3			Final data book Index																								
4			Final data book																								
5			Packing, Marking & Shipping Procedure																								
6			Sub-Vendor List																								
7			Spare Part List for Commissioning & Start-up and Two Years Operation																								
8			Special Tools List																								
Process																											
9			Process Flow Diagram (PFD)																								
10			Piping And Instrumentation Diagram (P&ID)																								
11			Utility Consumption List including Electrical Load List																								
12			Lubricant List/Grease List																								
Civil																											
13			Skid Foundation Plan																								
Mechanical																											
14			Package / Compressor Data Sheet																								
15			Compressor Package Outline Drawing																								
16			Oil Heater Data Sheet and Drawing																								
17			Reciever Datasheet																								
18			Reciever Drawing																								
19			Condenser Data Sheet																								
20			Condenser Outline Drawing																								
21			Mechanical calculation for Condenser																								
Pipping																											
24			General Arrangement Drawing for Refrigeration Package																								
25			3D Model For Refrigeration Package																								
Quality Control																											
26			Inspection And Test (ITP)																								
27			Painting Procedure																								
28			Compressor Test Procedure																								
29			Test Procedure For Condenser & Reciever																								
30			Weld book WPS/PQR/Weld Map For Condenser and Reciever																								
Instrumentation and control system																											
31			Cause & Effect Diagram																								
32			Control Valve Data Sheet																								

ZANJAN UREA & AMMONIA PLANT

Document Title: Vendor Document & Index Schedule (VDIS) For Refrigeration Package

Document No.:

Rev.: R0

VPIS DCI

No.	Discipline	Doc. No.	Title	M.H	W.F.	Issue Plan	1st ISSUE							2nd ISSUE							3th ISSUE						
							VPIS Issued Info				Consultant Reply			VPIS Issued Info				Consultant Reply			VPIS Issued Info				Consultant Reply		
							Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date	Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date	Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date
General																											
1			Project Schedule																								
2			Vendor Document & Index Schedule (VDIS)																								
3			Final data book Index																								
4			Final data book																								
5			Packing, Marking & Shipping Procedure																								
6			Sub-Vendor List																								
7			Spare Part List for Commissioning & Start-up and Two Years Operation																								
8			Special Tools List																								
Process																											
9			Process Flow Diagram (PFD)																								
10			Piping And Instrumentation Diagram (P&ID)																								
11			Utility Consumption List including Electrical Load List																								
12			Lubricant List/Grease List																								
Civil																											
13			Skid Foundation Plan																								
Mechanical																											
14			Package / Compressor Data Sheet																								
15			Compressor Package Outline Drawing																								
16			Oil Heater Data Sheet and Drawing																								
17			Reciever Datasheet																								
18			Reciever Drawing																								
19			Condenser Data Sheet																								
20			Condenser Outline Drawing																								
21			Mechanical calculation for Condenser																								
Pipping																											
24			General Arrangement Drawing for Refrigeration Package																								

Compressor performance curves to be added

Vendor Reply: Screw Compressor does not have curve, if you mean Motor Curve will be provided.

PIDEC 2nd Reply: Following documents for screw compressor shall be submitted:

-Catalogue and Brochure for compressor
-Compressor coupling assembly drawing.
-Compressor cross-sections with parts list.
-Hydrostatic test procedure for compressor casing
-Balance test procedure for compressor rotor
-Gas Leak Test Procedure for compressor
-NDT procedure for compressor
-Packing and storage procedure for compressor
-WPS and PQR for compressor.
-Material test reports for compressor.
Also please note that all applicable data for lube oil system shall be submitted including:
-oil pumps data sheet and drawing including coupling drawing and part list.
-oil cooler data sheet / drawing.
-oil Filter data sheet / drawing.
-oil separator data sheet and drawing.
-Mechanical / thermal design calculation for oil cooler.

Oil pump datasheet and drawing to be added.

Vendor Reply: Noted.

Pidec 2nd Reply: Revised VDIS considering PIDEC comments shall be submitted.

Document Title: Vendor Document & Index Schedule (VDI

Document No.:

VPIS DCI

No.	Discipline	Doc. No.	Title	M.H	W.F.	Issue	ISSUE Status	Consultant Reply Reply	Reff. No.	Date
25			3D Model For Refrigeration Package							
Quality Control										
26			Inspection And Test (ITP)							
27			Painting Procedure							
28			Compressor Test Procedure							
29			Test Procedure For Condenser & Reciever							
30			Weld book WPS/PQR/Weld Map For Condenser and Reciever							
Instrumentation and control system										
31			Cause & Effect Diagram							
32			Control Valve Data Sheet							
33			Instrument Data Sheet							
34			Local Panel and Junction Box Wiring Diagrams							
35			I/O-list							
36			ON/OFF-Solenoid Valve Data Sheet							
37			Safety / Relief Valve Data Sheet							
38			PLC Drawing							
Electrical										
39			Compressor Motor Data Sheet & Drawing							
40			Oil pump Motor Datasheet & Drawing							

EL Comments:

1- For each motor in this requisition (main motor, main & aux. oil pump motor,...), following documents must be considered separately:

- Motor Data Sheet and related curves (for all motors with related tag no.)
- Motor Outline drawing (for all motors with related tag no.)
- Motor connection and wiring diagram (for all motors with related tag no.)
- Motor name plate (for all motors with related tag no.)
- Rotor drawing and data for torsional analysis
- Test procedure for all motors
- Inspection and test plan for all motors
- Electrical consumer list - Motor test report (for all motors)
- Motor EX certificate (for all motors)
- Catalog of motors (one doc.)

Vendor Reply: Standard documents of VEM is considered in the offer which most of above data is included.

Pidec 2nd reply: Noted. But in the absence of any major data in motor manufacturer's documents (if any), vendor should submit us such required data from manufacturer.

2- Also note that related curve for motors (with motor data sheet or separate document) shall be included all required curves such as :

- Torque/speed curves with internals & accelerating times at 80 & 100% voltage
- Current/speed curves
- Load curve
- Time Speed/Current curve starting curve for 100% & 80% of rated voltage
- Thermal Capability Curve

Vendor Reply: Standard documents of VEM is considered in the offer which most of above data is included.

Pidec 2nd reply: Noted. But in the absence of any major data in motor manufacturer's documents (if any), vendor should submit us such required data from manufacturer.

3- For heaters, min. below doc. should be considered:

- Heater arrangement Drawing
- Heater Terminal Box Wiring Diagram
- Heater Data Sheet

Vendor Reply: Already Provided in above sections.

Pidec 2nd reply: We didn't find any doc. about heaters in vendor's VPIS. Please check again and add them.

Also related documents for electrical heat tracing of the package should be added here. please confirm and add them accordingly.

Note that after finalizing process tag. nos., relevant tag no. for motors/heaters will be defined.

PIDEC 2nd Reply: Please note below documents shall be added to VDIS:

1- K.O Drum data sheet and drawing.
2-Economizer data and drawing.
3-Installation manual including alignment data and drawing.
4-Operation manual.
5-Maintenance manual.

VPIS DCI

No.	Discipline	Doc. No.	Title	M.H	W.F.	Issue Plan	1st ISSUE							2nd ISSUE							3th ISSUE						
							VPIS Issued Info				Consultant Reply			VPIS Issued Info				Consultant Reply			VPIS Issued Info				Consultant Reply		
							Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date	Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date	Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date
33			Instrument Data Sheet																							
34			Local Panel and Junction Box Wiring Diagrams																							
35			I/O List (Signal input/output to Plant-DCS/ESD (if any) & Package PLC)																							
36			ON/OFF-Solenoid Valve Data Sheet																							
37			Safety / Relief Valve Data Sheet																							
38			PLC Drawing																							
39			Control valves pneumatic diagram Reply: Refer to PID *PIDEC Inst. Dept. Reply :* There is difference between PID and Control valves pneumatic diagram. Only Control Valve symbol to be shown on PID but pneumatic connection data (size ,qty ...) regarding positioner ,solenoid valve ,actuator ,... to be shown on Control valves pneumatic diagram.																							
40			Catalogue and Brochure Reply: Part of IOM *PIDEC Inst. Dept. Reply :* Noted.																							
41			Instruments materials certificate and Instrument inspection and calibration certificate Certificate for use of Instrument in hazardous area Reply: Part of MRB *PIDEC Inst. Dept. Reply :* Noted. Vendor to clarify what MRB stands for.																							
42			Flow elements calculations (Issued by related sub vendor) Reply: Not Applicable to RU *PIDEC Inst. Dept. Reply :* Noted.																							
43			Safety valves calculations (Issued by related sub vendor) Reply: Noted *PIDEC Inst. Dept. Reply :* Refer to vendor reply it is expected that safety valves calculations (Issued by related sub vendor) to be received.																							
44			Stress analysis and calculation for thermowells (Issued by related sub vendor) Reply: Not required, this is MYCOM design and responsibility *PIDEC Inst. Dept. Reply :* Although this is MYCOM design and responsibility Stress analysis and calculation for thermowells are required to be sure that there is no stress for each Thermowell.																							
45			Calculation data (where applicable) for noise & control valves (Issued by related sub vendor) Reply: Confirm if applicable *PIDEC Inst. Dept. Reply :* Noted.																							
46			Process and Air Hook Up Drawing (For Skid & off-skid loose instruments) Reply: Only process tubing hook up will be provided *PIDEC Inst. Dept. Reply :* Air Hook Up Drawings for Skid mounted instruments (for any future maintenance) & off-skid loose instruments (for installation of them by others) are required.																							
47			Instrument Field layout indicating skid & off-skid loose instruments and junction boxes location and cable routing. Reply: as per 3D Model *PIDEC Inst. Dept. Reply :* Refer to Vendor reply it is expected that Instrument Field layout indicating skid & off-skid loose instruments and junction boxes location and cable routing to be submitted by Vendor based on 3D Model.																							
48			Unit Control panel (UCP) & Local Panel (LP) (Dimensions specifications, front and internal general arrangement, etc.) Reply: Confirm *PIDEC Inst. Dept. Reply :* Noted.																							
49			Local gauge board (dimensions, general arrangements, list of materials) Reply: Not Applicable as instrument requires to be maximum 1 m away from tap for proper sensing *PIDEC Inst. Dept. Reply :* Noted.																							
50			Instruments and valves dimensional and weight drawing/documents (including main scope of package vendor and all items supplied by sub-vendors) Reply:as per IOM *PIDEC Inst. Dept. Reply :* Noted.																							
51			Instrument list indicating tag number, signal type, service, model and type, make, range, characteristics and specification Reply: Instrument data sheet is provided *PIDEC Inst. Dept. Reply :* Noted.																							
52			Cable list indicating cable type, length, source and destinations Reply: As per wiring diagram *PIDEC Inst. Dept. Reply :* Refer to Vendor reply ,it is expected that all requested data to be shown in Wiring Diagram Document otherwise Cable List shall be submitted by Vendor.																							
53			Instrument air and power requirements Reply: as per utility consumption list *PIDEC Inst. Dept. Reply :* Noted.																							
54			Alarm/trip/controller & monitor switches set point lists Reply: as per set point list *PIDEC Inst. Dept. Reply :* Noted.																							

VPIS DCI

No.	Discipline	Doc. No.	Title	M.H	W.F.	Issue Plan	1st ISSUE							2nd ISSUE							3th ISSUE						
							VPIS Issued Info				Consultant Reply			VPIS Issued Info				Consultant Reply			VPIS Issued Info				Consultant Reply		
							Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date	Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date	Tr. No.	Date	Rev.	Status	Reply	Reff. No.	Date
55			Bulk MTO (including Qty. & specification of single cables & cable glands & JBs) (For Skid & off-skid loose instruments) Reply: for skid mounted packages not applicable ***PIDEC Inst. Dept. Reply :*** Vendor to clarify where specification of single cables & cable glands & JBs for Skid mounted instrumerds can be found.																								
56			List of Vendor documents and drawings Reply: per agreed VPIS ***PIDEC Inst. Dept. Reply :*** Noted.																								
57			List of consumables for erection, commissioning and startup Reply: Not Applicable ***PIDEC Inst. Dept. Reply :*** Noted.																								
58			Sub-Vendor's and main Supplier's listings Reply: as per agreed sub vendor list ***PIDEC Inst. Dept. Reply :*** Noted.																								
59			Bill of Material (Hardware and software) Reply: part of data sheet for instrument and part of wiring diagram ***PIDEC Inst. Dept. Reply :*** Vendor to clarify where List of License & Software can be found.																								
60			Technical data sheets with part No. for each component of the control system Reply: per BOM included in panel layout drawing ***PIDEC Inst. Dept. Reply :*** Noted.																								
61			A proposed layout for the control and cabinet room based on outline required dimensions and weight of all components indicating the required access space for door opening , removal of cover plates,) , the requirements for construction and installation (fixing details, weights, minimum clearance to other items of equipment or walls), etc. Reply: per panel layout ***PIDEC Inst. Dept. Reply :*** Noted.																								
62			Electrical power consumption ,heat dissipation (both 110 VAC , 230 VAC and 24 VDC) Reply: as per utility list ***PIDEC Inst. Dept. Reply :*** Noted.																								
63			Electrical power supply distribution diagram which indicates cables size and fusing capacity for each feeder. Reply: Not applicable because electrical devices located at the edge of skid for client access. ***PIDEC Inst. Dept. Reply*** : Noted.																								
64			Detailed grounding and shielding requirements for all equipment Reply: grounding lugs provided on detail drawing of pressure vessels, heat exchangers, motors, compressor skids, etc. no detail drawing is required. ***PIDEC Inst. Dept. Reply :*** Vendor to clarify where Detailed grounding and shielding requirements of PLC Panels to be shown.																								
			Unit Control panel (UCP) (Dimensions specifications, front and internal general arrangement, etc.) Reply: per local panel layout ***PIDEC Inst. Dept. Reply :*** It is not clear what is Vendor means of local panel layout ,because Unit Control panel (UCP) will be installed in safe area (auxiliary/control room). Anyway Unit Control panel (UCP) (Dimensions specifications, front and internal general arrangement, etc.) shall be issued by PLC Vendor.																								
65			Interconnecting cable schedule with cable list Reply: per wiring diagram ***PIDEC Inst. Dept. Reply :*** Refer to Vendor reply .It is expected that all requested data to be shown in Wiring Diagram Document otherwise Interconnecting cable schedule with cable list shall be submitted by Vendor.																								
66			Termination list for input/outputs including system internal terminal strips/system cables. Reply:per wiring diagram ***PIDEC Inst. Dept. Reply :*** Refer to Vendor reply .It is expected that all requested data to be shown in each CABINET INTERNAL WIRING DRAWING.																								
67			Loop wiring diagram specifying for each tag No. all relevant components and connections, including power supply and field instruments terminals, barriers/relays, I/O channels, installed spares, etc. Reply: per wiring diagram ***PIDEC Inst. Dept. Reply :*** Refer to Vendor reply .It is expected that all requested data to be shown in each CABINET INTERNAL WIRING DRAWING.																								
68			Control philosophy (narratives) and proposed control system block diagram, showing all system hardware/equipment and their interconnections. Reply: Control narrative will be provided. For block diagram refer to wiring diagram ***PIDEC Inst. Dept. Reply :*** There is difference between control system block diagram and wiring diagram. Control system block diagram only showing all system main hardware/equipment and their interconnections.																								
69			Logic diagram and functional charts of the interlocks and sequences controls (according to IEC 61131-3) Reply: part of wiring diagram ***PIDEC Inst. Dept. Reply :*** There is difference between Logic diagram and functional charts of the interlocks and sequences controls and wiring diagram. Logic diagramsare used to show a wide variety of circuit information using logical symbols (AND, OR, NOT, XOR, etc.), and logical inputs and outputs.																								
70			Internal cabinet arrangement and circuit diagram including wiring / termination / boards and complete address realization of all input / output points (System I/O database). Reply: part of wiring diagram ***PIDEC Inst. Dept. Reply :*** Noted.																								
71			Panel nameplates and drawings Reply: per JB and control panel layout ***PIDEC Inst. Dept. Reply :*** Noted.																								

VPIS DCI

							1st ISSUE							2nd ISSUE							3th ISSUE						
							VPIS Issued Info				Consultant Reply			VPIS Issued Info				Consultant Reply			VPIS Issued Info				Consultant Reply		
No.	**Discipline**	**Doc. No.**	**Title**	**M.H**	**W.F.**	**Issue Plan**	Tr. No.	Date	Rev.	Status	**Reply**	**Reff. No.**	**Date**	Tr. No.	Date	Rev.	Status	**Reply**	**Reff. No.**	**Date**	Tr. No.	Date	Rev.	Status	**Reply**	**Reff. No.**	**Date**
72			Factory / Site acceptance test procedure Reply: per panel FAT PIDEC Inst. Dept. Reply : Factory / Site acceptance test procedure describe the test and inspection procedures for Unit Control Panel (UCP) system under test and should cover all vital system functionality tests. It is not clear Vendor means of per panel FAT. Vendor to clarify clearly.																								
73			Modbus list (including exchange signals with DCS system, address, etc.) Reply: Part of IO List PIDEC Inst. Dept. Reply : Refer to Vendor reply it is expected that I/O List and Modbus list to be issued in one Document.																								
74			Calculation of overall system availability/reliability including the failure mode and effect analysis. Reply: no need for calculation based on MAYEKAWA past experience PIDEC Inst. Dept. Reply : Noted.																								
75			A fault finding/trouble shooting narrative for the complete system (Recommended format is an "if-then" connection diagram). Reply: per control narrative and PLC sequence PIDEC Inst. Dept. Reply : Noted.																								
76			A list of special tools/instruments needed for the owner to operate the system Catalogue and Brochure. Reply: Not required. No special tools is offered. PIDEC Inst. Dept. Reply : Noted.																								
77			Catalogue and Brochure Reply: per IOM PIDEC Inst. Dept. Reply : Noted.																								
78			Test records (vendor's quality control) Reply: Part of MRB PIDEC Inst. Dept. Reply : Noted. Vendor to clarify what MRB stands for.																								
79			Test records (factory acceptable test) Reply: Part of MRB PIDEC Inst. Dept. Reply : Noted. Vendor to clarify what MRB stands for.																								
80			Proposed Graphic display pages based on purchaser initial information (if any)+ proposed logging and report formats (if any) Reply: Part of HMI IOM PIDEC Inst. Dept. Reply : Noted.																								
81			Operation Manual Reply: part of IOM PIDEC Inst. Dept. Reply : Noted.																								
82			Maintenance Manual Reply: part of IOM PIDEC Inst. Dept. Reply : Noted.																								
83			Engineering and user's manual Reply: part of IOM PIDEC Inst. Dept. Reply : Noted.																								
84			Painting Specification Reply: part of painting procedure PIDEC Inst. Dept. Reply : Noted.																								
85			Certifications and approvals for PLC's and other peripheral hardware. Reply: Included in MRB PIDEC Inst. Dept. Reply : Noted. Vendor to clarify what MRB stands for.																								
86			HAZOP/SIL reports and relevant certificates Reply: third party report and will be submitted by vendor PIDEC Inst. Dept. Reply : Noted.																								
Electrical																											
39			Compressor Motor Data Sheet & Drawing																								
40			Oil pump Motor Datasheet & Drawing																								

One Common KO drum will considered as inlet for Both Compressor Units

Note that for MV motors, winding & bearing RTD must be considered as per clause 9.1 and 10.3.3 from MV motor specification attached to requisition (Doc. no. 1231-DE-00-EL-MSS-522). Please confirm and consider it in your offer.

Vendor reply: Based on client request will be changed to MV

Pidec 2nd reply: Noted. Also note that space heater should be considered for MV motor.

Meeting conclusion(02.10.2024):

Noted and confirm by vendor, will be applied during detail engineer stage.

vendor Reply: Winding RTD must be connected to motor MCC to interlock restarting

PTC/TE will be considered for Main motors

Note that as mentioned on doc. "Control Block diagram(EI)conclusion meeting 1402.11.28", there is an LCP (local control panel) for each compressor which is in vendor scope of work/supply and all motors (main, aux.) and heaters (main motors and auxiliaries) shall be controlled via this Local Control Panel. All control signals- commands and indications will be sent from this vendor local control panel to the UCP and then will be transferred to MCC from UCP based on agreement between electrical and instrument department. Please confirm.

Vendor reply: Local control Panel is not controlling the package but UCP will be controlled.

Pidec 2nd reply:

1- Your quotation is not related to our comment. Please confirm our above description about transmission of the signals clearly.

2- Also note that ammeter should be supplied by vendor and fitted to the local control panel for each motors 4kW and above and they will be fed directly from our MCC in substation. The ammeter will be operated from a 1A secondary winding current. Please confirm and consider it clearly.

Meeting conclusion(**02.10.2024**):

Items 1 and 2 : Noted and confirm by vendor, will be applied during detail engineer stage.

AMMONIA GAS FROM K.O.D 80-D-6852

6"-RA-68001A-ML3R1-C

OIL FROM OIL SEPARATOR 80-D-6850A

5/16" SS

FROM TY-680101

OIL FROM OIL FILTER 80-F-6850A1/S1

5/8"-OI-68004A-MS3R0-E

FROM PIT-680103

OIL FROM OIL PUMP 80-P-6852A1

2"-OI-68020A-MS3R0-E

6"-RA-68002A-MC3R1-P

AMMONIA GAS TO OIL SEPARATOR 80-D-6850A

5/8"-OI-68005A-MS3R0-E LUBRICATION INLET

OIL INJECTION

PG 680XXX

C

TI 680101

6"x5"

1/2"

TT 680101

NOTE 5

GAT-6802 3/4"

80-TST-6801A SUCTION CONE ELEMENT

GAT-68XX 3/4"

GAT-6801 3/8"

PT 680101

PI 680101 HH H L LL

CHV-6801

TE 680113

TE 680114

TE 680115

MCC

COMPRESSOR

MAIN MOTOR

NOTE 4

ZIC 680101

ZIT 680101

ACITY CONTROL E VALVE

0%

XS 680101

II 680101 AMPERAGE

MOTOR AVAILABLE XS 680101A

MOTOR FAULT XF 680101

MOTOR RUNNING XL

HS 680100 EMERGENCY STOP

XY 680101D

SOV 680101D

XY 680101A

SOV 680101A

XY 680101C

SOV 680101C

XY 680101E

SOV 680101E

LOAD RETURN

UNLOAD SUPPLY

LOAD SUPPLY

UNLOAD RETURN

NOTE 1 NV-6801

NV-6802 NOTE 1

CHV-6802

NV-XXXX NOTE 1

GAT-6806 3/8"

PDI 680101

PI 680102

PT 680102

GAT-6807 3/4"

TT 680102

TI 680102

1/2"

NOTES

1— OPENING DEGREE TO BE SET DURING COMMISIONING AND LOGGED

2— DELETED.

3— TYPE OF THIS VALVE IS SPRING LOAD CHECK VALVE AND IT WILL OPEN WHEN DIFFERENTIAL PRESSURE INCREASE TO 5 BAR.

4— ONE FUNCTIONAL ELEMENT AND ONE SPARE. VENDOR ONLY CONNECTS FUNCTIONAL ELEMENT TO JB ON PACKAGE.

5— SIGNALS ROUT TO DCS.

LEGEND

VENDOR ◆ CUSTOMER

REFERENCE DRAWINGS	DWG. No.
--	--

TAG NO.	
SERVICE	COMPRESSOR
TYPE	OIL FLOODED SCREW
MANUFACTURER	MAYEKAWA
DESIGN DP (BARG)	
DESIGN DUTY (kW)	

Status Code	Eng.	Dept.	Date

Comment status code:

AP	Approved and released for Manufacture	NC	No Comments
CO	Not Approved	AC	Approved with Comments
RE	Rejected		

IMPORTANT: Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligation.

VENDOR:

VENDOR DOC. NO.:

Rev.	Date	Class	Purpose of Issue	Prepared by	Checked by	Approved by

OWNER:

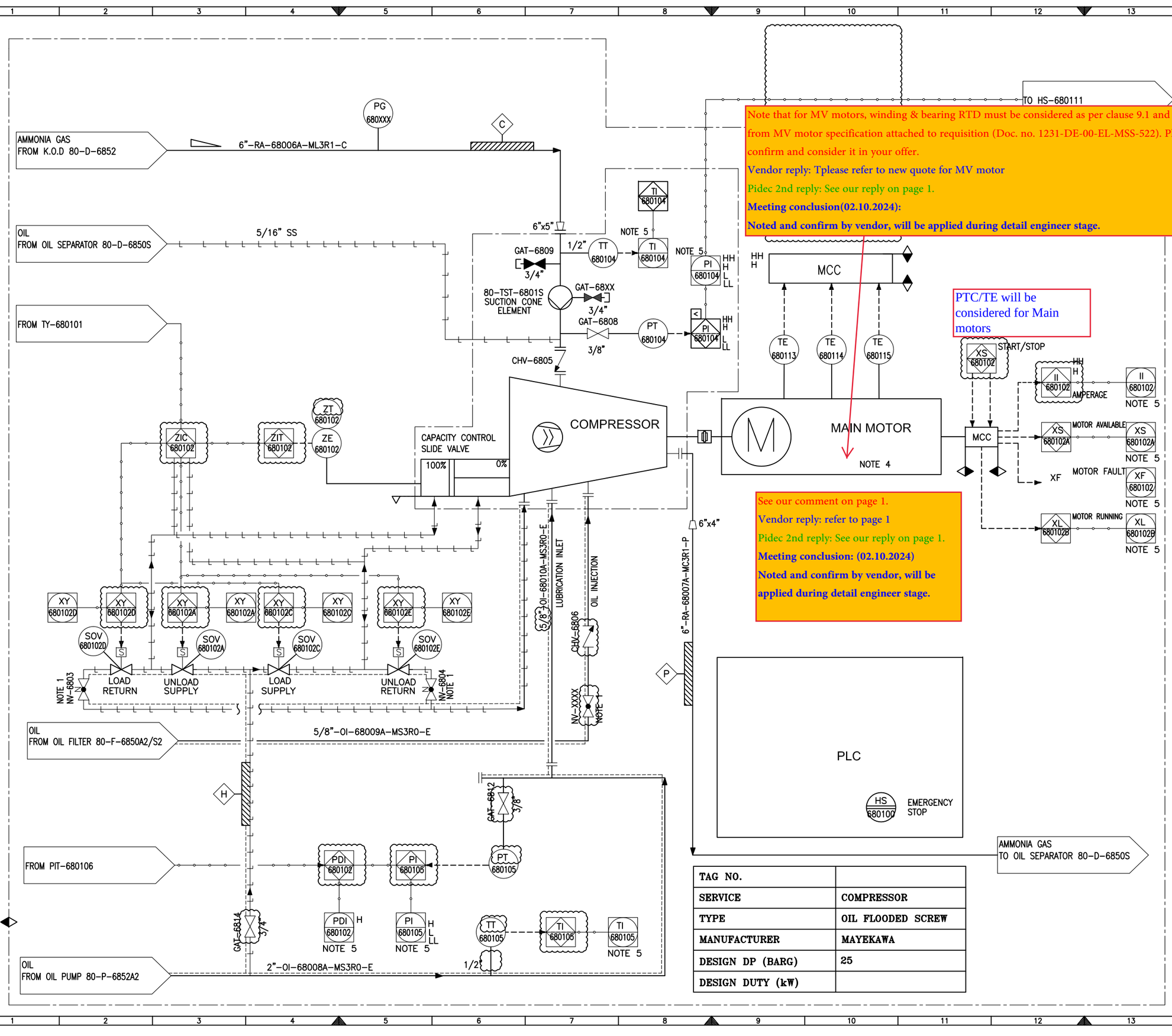
PROJECT:

CONTRACTOR:

DRAWING TITLE:

PROCESS & INSTRUMENTATION DIAGRAM (P&ID)-RU

Rev.	Size.	Scale.	Sheet No.
03a	A3	NTS	2 OF 9



NOTES

1— OPENING DEGREE TO BE SET DURING COMMISIONING AND LOGGED

2—DELETED.

3— TYPE OF THIS VALVE IS SPRING LOAD CHECK VALVE AND IT WILL OPEN WHEN DIFFERENTIAL PRESSURE INCREASE TO 5 BAR.

4— ONE FUNCTIONAL ELEMENT AND ONE SPARE. VENDOR ONLY NNECTS FUNCTIONAL ELEMENT TO JB ON PACKAGE.
GNALS ROUT TO DCS.

LEGEND

VENDOR ◆ CUSTOMER

REFERENCE DRAWINGS	DWG. No.
--	--

TAG NO.	
SERVICE	COMPRESSOR
TYPE	OIL FLOODED SCREW
MANUFACTURER	MAYEKAWA
DESIGN DP (BARG)	25
DESIGN DUTY (kW)	

Status Code	Eng.	Dept.	Date

Comment status code:

AP	Approved and released for Manufacture	NC	No Comments
CO	Not Approved	AC	Approved with Comments
RE	Rejected		

IMPORTANT: Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligation.

VENDOR: VENDOR DOC. NO.:

Rev.	Date	Class	Purpose of Issue	Prepared by	Checked by	Approved by

OWNER:

PROJECT:

CONTRACTOR:

DRAWING TITLE:
PROCESS & INSTRUMENTATION DIAGRAM (P&ID)-RU

Rev.	Size.	Scale.	Sheet No.
03a	A3	NTS	3 OF 9

TAG NO.	
SERVICE	**OIL SEPARATOR**
DESIGN PRESS. (BARG)	**22**
DESIGN TEMP. (°C)	**5 / 120**
ID x L (mm)	

NOTES

1– OIL TOP UP & VACUUM CONNECTION.
2– HAND HOLE.
3– INSPECTION HOLE.
4– LOCK OPEN DURING OPERATION LOOKING METHOD AND DEVICE BY SITE OPERATOR.
5– STOP CHECK VALVE FOR PREVENT SPIN BACK.
6– SIZE OF PSV WILL BE FINALIZED ON NEXT STAGE.
7– SIGNAL ROUT TO DCS.

LEGEND

VENDOR ◆ CUSTOMER

REFERENCE DRAWINGS	DWG. No.
--	--

PSV 680101 22 barg 1"02" BY VENDOR
X"-FWG-680XX-ML1R1-N
TO SAFE AREA
X"xX"
X"xX"
AMMONIA GAS AND OIL FROM COMPRESSOR 80-C-6851A
6"-RA-68002A-MC3R1-P
NOTE 7
PI 680103 H L
TO PDI-680101
P
PI 680103 H L
PT 680103
NOTE-1
1/2"
X"-RA-680XX-MC3R1-P
PI 680107 H
NOTE 7
PI 680107 H
PT 680107
2"-RA-68011A-MC3R1-P
P
AMMONIA GAS TO CONDENSER 80-E-6853
CHV-6809 RBL-XXXX 2" NOTE-5
1" 1½"
TI 680103 NOTE-7
TI 680103
TT 680103
1/2"
NOTE-2
OIL SEPARATOR
MXX
SG
SG
NOTE-3
80-M-8650A
X"
MCC
ON/OFF
XS 8
TICSA
XS 680103
See our comment on page 1.
Vendor reply: please clarify your comment
Pidec 2nd reply: Our comment is about LCP & ammeter for motor 4KW and above (same as page 1). Please see our reply on page 1.
Meeting conclusion(02.10.2024):
Noted and confirm by vendor, will be applied during detail engineer stage.
TS 681107C HH
GAT-6818 3/8"
GAT-6819 3/8"
XV 680103
SOV 680103
S
5/16" SS
SG SG-68XX
YST-6801
N
NV-6805
OIL TO COMPRESSOR 80-C-6851A
HEATER AVAILABLE XI 680103A
HEATER FAULT XA 680103
HEATER ON XI 680103B
2"-OI-68012A-MC3R1-E
GAT-68XX
H
OIL TO OIL COOLER 80-E-6852A

Status Code	Eng.	Dept.	Date

Comment status code:

AP	Approved and released for Manufacture	NC	No Comments
CO	Not Approved	AC	Approved with Comments
RE	Rejected		

IMPORTANT: Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligation.

VENDOR: VENDOR DOC. NO.:

Rev.	Date	Class	Purpose of Issue	Prepared by	Checked by	Approved by

OWNER:

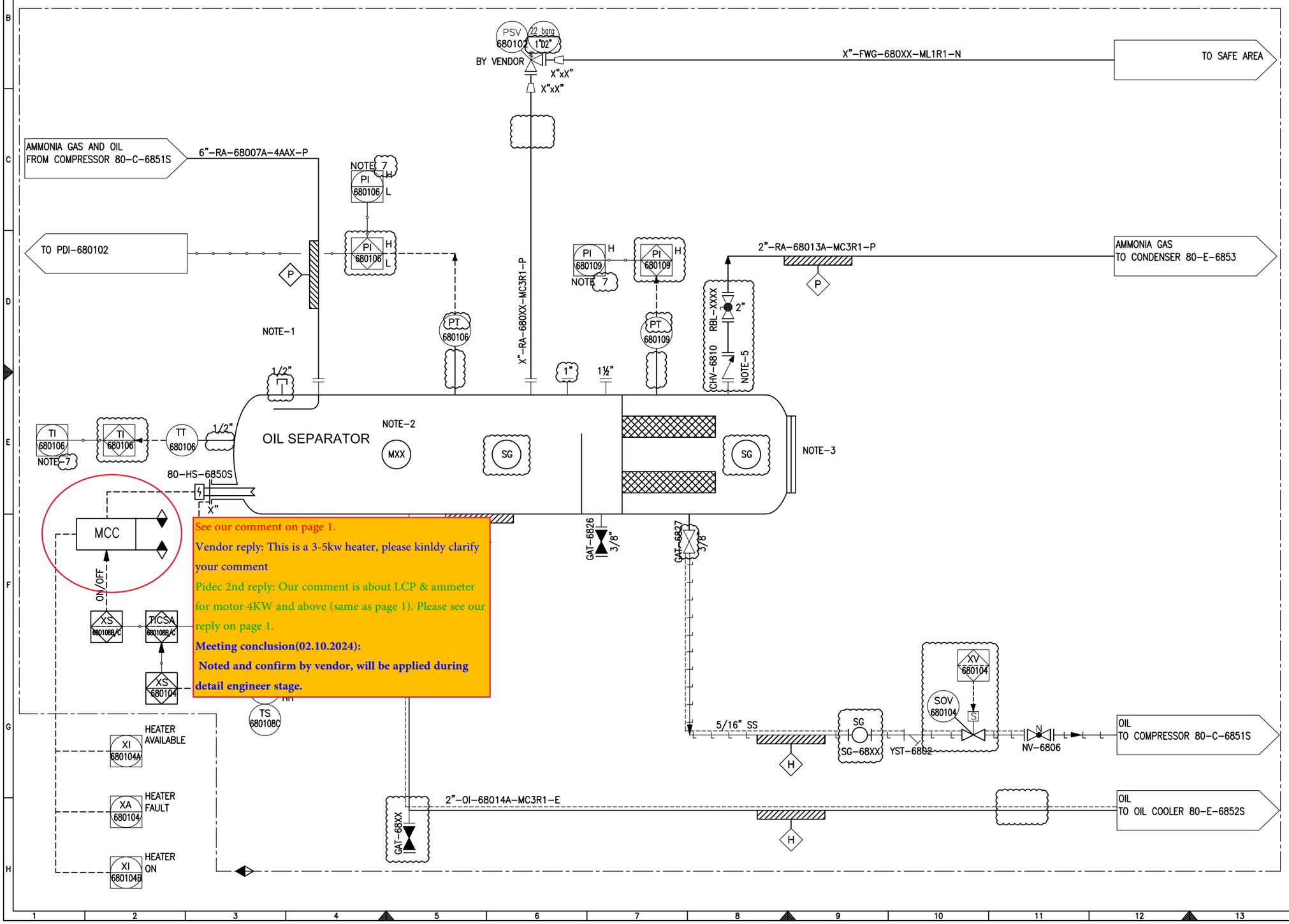
PROJECT:

CONTRACTOR:

DRAWING TITLE:
PROCESS & INSTRUMENTATION DIAGRAM (P&ID)-RU

Rev.	Size.	Scale.	Sheet No.
03a	A3	NTS	4 OF 9

TAG NO.	
SERVICE	**OIL SEPARATOR**
DESIGN PRESS. (BARG)	
DESIGN TEMP. (°C)	
ID x L (mm)	



NOTES

1- OIL TOP UP & VACUUM CONNECTION.
2- HAND HOLE.
3- INSPECTION HOLE.
4- LOCK OPEN DURING OPERATION LOOKING METHOD AND DEVICE BY SITE OPERATOR.
5- STOP CHECK VALVE FOR PREVENT SPIN BACK.
6- SIZE OF PSV WILL BE FINALIZED ON NEXT STAGE.
7- SIGNAL ROUT TO DCS.

LEGEND

VENDOR ◆ CUSTOMER

REFERENCE DRAWINGS	DWG. No.
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Status Code	Eng.	Dept.	Date

Comment status code:

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00						

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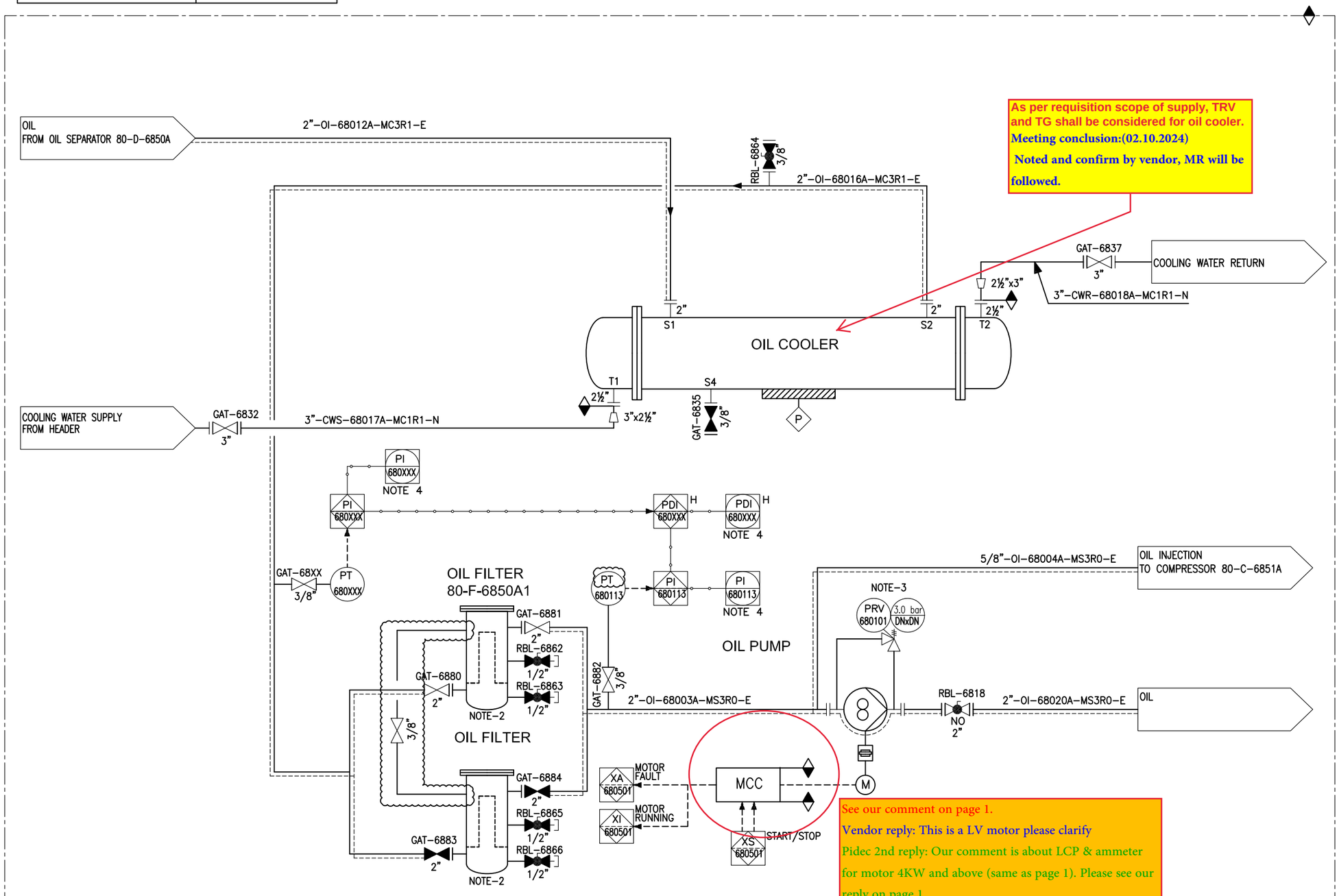
PROCESS & INSTRUMENTATION DIAGRAM (P&ID)-RU

Rev.	Size.	Scale.	Sheet No.
03a	A3	NTS	5 OF 9

TAG NO.	
SERVICE	OIL COOLER
DESIGN PRESS. (BARG)	S: 22, T:17
DESIGN TEMP. (°C)	S:5/120, T:5/85
DESIGN DUTY (kW)	
ID x L (mm)	
TEMA TYPE	

TAG NO.	
SERVICE	OIL PUMP
TYPE	SCREW PUMP
DESIGN PRESS. (BARG)	
DESIGN TEMP. (°C)	5 / 120
RATED POWER (kW)	

TAG NO.	
SERVICE	OIL FILTER
DESIGN PRESS. (BARG)	26
DESIGN TEMP. (°C)	5/120
ID x L (mm)	MAYEKAWA



NOTES

1- COLLECTION POT TO BE EMPTIED ONCE EVERY (HOLD) WEEKS TIME.
2- ONE OPERATING / ONE STAND-BY.
3- DP=3 BAR.
4- SIGNAL ROUT TO DCS.

LEGEND

VENDOR ◆ CUSTOMER

REFERENCE DRAWINGS	DWG. No.
--	--

Status Code	Eng.	Dept.	Date

Comment status code:

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VENDOR DOC. NO.:

Rev.	Date	Class	Purpose of Issue	Prepared by	Checked by	Approved by
				M.A	A.M	N.S
				M.A	A.M	N.S
				M.A	A.M	N.S
				L.H	A.M	N.S

OWNER:

PROJECT:

JSC Contract No: JPC 9387	DRAWING TITLE:
TCM Project No: 3863	PROCESS & INSTRUMENTATION DIAGRAM (P&ID)-RU

JSC Doc No.		Rev.	Size.	Scale.	Sheet No.
TCM Doc No.		03a	A3	NTS	6 OF 9

TAG NO.	80-E-6852S
SERVICE	OIL COOLER
DESIGN PRESS. (BARG)	S: 22, T:17
DESIGN TEMP. (°C)	S:5/120, T:5/85
DESIGN DUTY (kW)	124.75
SHELL ID x TUBE L (mm)	MAYEKAWA
TEMA TYPE	BEM

TAG NO.	
SERVICE	OIL PUMP
TYPE	SCREW PUMP
DESIGN PRESS. (BARG)	26
DESIGN TEMP. (°C)	5 / 120
RATED POWER (kW)	3.7

TAG NO.	
SERVICE	OIL FILTER
DESIGN PRESS. (BARG)	26
DESIGN TEMP. (°C)	5/120
ID x L (mm)	MAYEKAWA

As per requisition scope of supply, TRV and TG shall be considered for oil cooler.
Meeting conclusion:(02.10.2024)
Noted and confirm by vendor, MR will be followed.

OIL FROM OIL SEPARATOR 80-D-6850S
2"-OI-68014A-MC3R1-E
RBL-6869 3/8"
2"-OI-68022A-MC3R1-E
GAT-4850 3" COOLING WATER RETURN
3"-CWR-68024A-MC1R1-N
2½"x3"
2" S1
2" S2
2½" T2
OIL COOLER 80-E-6852S
T1 2½"
S4
3"x2½"
GAT-6848 3/8"
P
COOLING WATER SUPPLY FROM HEADER
GAT-6845 3"
3"-CWS-68023A-MC1R1-N
PI 680XXX NOTE 4
PDI 680XXX H NOTE 4
GAT-68XX 3/8"
PT 680XXX
OIL FILTER
PT 680116
PI 680116 NOTE 4
5/8"-OI-68009A-MS3R0-E
OIL INJECTION TO COMPRESSOR 80-C-6851S
NOTE-3
PRV 680103 3.0 bar DNxDN
OIL PUMP
GAT-6886 2" RBL-6867 1/2"
GAT-6885 2" RBL-6868 1/2"
NOTE-2
3/8"
OIL FILTER
GAT-6887 3/8"
2"-OI-68003A-MS3R0-E
RBL-6826 NO 2"
2"-OI-68008A-MS3R0-E
OIL TO COMPRESSOR 80-C-6851S
GAT-6889 2" RBL-6870 1/2"
GAT-6888 2" RBL-6871 1/2"
NOTE-2
XA 680701 MOTOR FAULT
XI 680701 MOTOR RUNNING
MCC
M
XS 680701 START/STOP

See our comment on page 1.
Vendor reply: This is aLV motor for oil pump
Pidec 2nd reply: Our comment is about LCP & ammeter for motor 4KW and above (same as page 1). Please see our reply on page 1.
Meeting conclusion:(02.10.2024)
Noted and confirm by vendor, will be applied during detail engineer stage.

NOTES

1- COLLECTION POT TO BE EMPTIED ONCE EVERY (HOLD) WEEKS TIME.
2- ONE OPERATING / ONE STAND-BY.
3- DP= 3 BAR.
4- SIGNAL ROUT TO DCS.

LEGEND

VENDOR ◇ CUSTOMER

REFERENCE DRAWINGS	DWG. No.
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03a						
00						

OWNER:

PROJECT:

CONTRACTOR:

DRAWING TITLE: PROCESS & INSTRUMENTATION DIAGRAM (P&ID)-RU

Rev.	Size.	Scale.	Sheet No.
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TAG NO.	
SERVICE	CONDENSER
DESIGN PRESS. (BARG)	
DESIGN TEMP. (°C)	
DESIGN DUTY (kW)	
SHELL ID x TUBE L (mm)	
TEMA TYPE	

TAG NO.	
SERVICE	RECEIVER
DESIGN PRESS. (BARG)	
DESIGN TEMP. (°C)	
ID x L (mm)	

Economizer will be added during detail design

HOT AMMONIA GAS TO OIL RETURN SYSTEM

P

1/2" SS

RBL-XXXX 1/2"

AMMONIA GAS FROM OIL SEPARATOR 80-D-6850A

2"-RA-68011A-MC3R1-P

MC3R1

Not Applicable to ZNPC project

PV 680111

PIC 680111

HS 680111

FROM PI-680101

FROM PI-680104

RBL-XXXX 3/4"

RBL-XXXX NO 1"

RUNNING BYPASS TO EVAPORATOR INLET

GLO-XXXX 1"

MC3R1 ML3R1

RBL-XXXX MC3R1 ML3R1

PSV 680103 22 barg 1"D2"

TO SAFE AREA

X"-FWG-680XX-ML1R1-N

X"x2"

NOTE 1

AMMONIA GAS FROM OIL SEPARATOR 80-D-6850S

2"-RA-68013A-MC3R1-P

2"-RA-680XXA-MC3R1-P

2"x1"

FBB-6833 2"

2"-RA-XXXX-ML3R1-N

RBL-6831 2" V1

2" S1

2" PSV1

2" EL1

RBL-6829 2" V2

2" T2

CONDENSER

GAT-6865 6"

6"-CWR-68030A-MC1R1-N

TO O.S.B.L. CW

3"-CWR-68018A-MC1R1-N COOLING WATER RETURN

3"-CWR-68024A-MC1R1-N COOLING WATER RETURN

D

RBL-6832 2"

2" S2

2" T1

GAT-6864 6"

6"-CWS-68029A-MC1R1-N

CW FROM O.S.B.L.

TO SAFE AREA

X"-FWG-680XX-ML1R1-N

PSV 680105 22 barg 1"D2"

X"x2"

2"x1"

FBB-6833 2"

2"-RA-XXXX-ML3R1-N

RBL-68XX 2" LO

PI 680117

RBL-68XX 2"

RBL-68XX 2" LO

2" PSV2

2" EL2

PI

2" S5

2" LG1

RBL-XXXX 2"

GAT-68XX 3/4"

3"-CWS-68017A-MC1R1-N COOLING WATER SUPPLY

3"-CWS-68023A-MC1R1-N COOLING WATER SUPPLY

R 6"

Reciever

LG 680003

D2

RBL-68XX 2"

S6 1" LG2

RBL-XXXX 2"

GAT-68XX 3/4"

TO LV-680103 SH. 9

TO XV-680110 SH. 9

TO PV-680111 SH. 8

SPARE

GAT-6891 X"

GAT-6892 X"

GAT-6893 X"

GAT-68XX X"

GAT-6869 1/2"

1"-RA-68028A-ML3R1-N

RBL-XXXX

FROM O.S.B.L. IA

GAT-6867 3/4"

3/4"-IA-68031A-MI1R0-N

1"-RA-680XXA-ML3R1-N

ML3R1 MC3R1

1"

RBL-68XX

REFRIGERANT FILLING FROM O.S.B.L.

NOTES

1- SIZE OF PSV WILL BE FINALIZED ON NEXT STAGE.

LEGEND

VENDOR | CUSTOMER

REFERENCE DRAWINGS	DWG. No.
--	--

Status Code	Eng.	Dept.	Date

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Rev.	Date	Class	Purpose of Issue	Prepared by	Checked by	Approved by
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OWNER:

PROJECT:

CONTRACTOR:

DRAWING TITLE: PROCESS & INSTRUMENTATION DIAGRAM (P&ID)-RU

Rev.	Size.	Scale.	Sheet No.
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Datenblat

10.04.2024 ER

1- Based on agreement with owner, it was decided to consider MV motor instead of LV motor (for main motor). So please submit us relevant MV motor data sheet instead of this LV motor data sheet.
Vendor reply: This is technically not recommneded as motor shall be able operate for capacity from 30-100% of compressor and maximum absorbed power is 120KW so using MV motor would be costy and technically not recommended. However, based on client request, we will use MV motor.
Pidec 2nd reply: Noted
2- Please confirm that API factor and also our site condition (max. temp. +48C and altitude +1846 mete a.s.l) is considered in selection of motor rating.
Vendor reply: This has been already requested in VEM Offer as you can see in this page.
Pidec 2nd reply: Noted
3- Please note that all electrical equipment (motors, panels,...) shall be suitable for hazardous area, zone 2, IIC, T3. Which means that the MV motors shall be Exd and LV motors shall be EEx “eb” or EEx "ec" or EEx “d” with EEx “eb” terminal boxes. Please confirm and consider it in your offer.
Vendor reply: We have considered Exec Motors as per agreement with Owner
Pidec 2nd reply: Note to originator: Final decision about this matter should be made by the owner.
3- Note that for MV motors, winding & bearing RTD must be considered as per clause 9.1 and 10.3.3 from MV motor specification attached to requisition (Doc. no. 1231-DE-00-EL-MSS-522). Please confirm and consider it in your offer.
Vendor reply: Considering using LV Motors, these comments are not applicable. in case of MV, Winding will be connected to MCC and Bearing RTD is not needed for this small size motor and not requested before.
Pidec 2nd reply: Noted

Hersteller / *Manufactur*

VEM motors Gmb
Carl-Friedrich-Ga

38855 WERNIGER
Deutschland

Drehstrommoto
"ec", Gerätegru
category 3G

Typ / *Type*			
Norm-Kennzeichnu			
Bemessungsleistu			
Betriebsart / *Duty type*			
IE Klasse / *Class IE*			
Wirkungsgradbesti			
Bemessungsfreque			
Bemessungsdrehz			
Spannung / *Voltage*			
Schaltung / *Connectior*			
Strom / *Current*			
rel. Anzugsstrom / *Relative pull-in current*	[-]	8,8	
rel. Anlaufmoment / *Relative starting torque*	[-]	1,6	
rel. Sattelmoment / *Relative pull-up torque*	[-]	1,5	
rel. Kippmoment / *Relative pull-out torque*	[-]	2,6	
Wirkungsgrad 100/75/50 % / *Efficiency100/75/50 %*	[%]		96,1 / 96,1 / 96,1
Leistungsfaktor / *Power factor*	[-]	0,9	
ATEX-Nr. / *ATEX-No.*		IBExU03ATEXB004	
Th. Kl. / *Th. cl.*		180(H)	
Kühlmitteltemperatur / *Coolant temperature*	[°C]	-30 – 50°C	
Aufstellungshöhe / *Altitude above sea level*	[m]	1800	
Schutzart IP / *Degree of protection IP*		IP55	
Trägheitsmoment / *Moment of inertia*	[kgm^2]	1,76	
Masse / *Motor weight*	[kg]	940	
A-Schalldruckpegel / *A-sound pressure level*	[dB]	76	
Lager DS / *Bearing, D-side*		6316 C3	
Lager NS / *Bearing, N-side*		6316 C3	
Nachschmierfrist / *Relubrication interval*	[h]	2000	
Fett / *Grease type*		BERUTOX FH 28KN	
Fettmenge / *Grease amount*	[cm^3]	52/52	
A-Schalldruckpegel / *A-sound pressure level*	[dB]	76	

Impulsspannungs-Isolationsklasse IVIC nach IEC 60034-18-41 / ***Impulse voltage insulation class IVIC acc. to IEC 60034-18-41***
C(stark)/A(gering)

$U_{pk/pk}$ Ph-Ph (Phase-Phase) / *$U_{pk/pk}$ Ph-Ph (phase-phase)*	[V]	2380
$U_{pk/pk}$ Ph-Earth (Phase-Erde) / *$U_{pk/pk}$ Ph-Earth (phase-earth)*	[V]	1680
t_r Impulsanstiegszeit / *t_r pulse rise time*	[µs]	> 0,3

Optionen / ***Options***

Bauform / *Type of mounting*	IM B3
Flansch / *Flange*	-
Klemmenkasten / *Terminal box*	Ex - Ausführung / *Ex - version*
Klemmkastenlage / *Position of terminal box*	oben / *on the top*
Kabelverschraubung / *Cable gland*	
Lage Kabeleinführung / *Position of cable entry*	rechts / *right*
Welle / *Shaft*	Standard, 1 zyl. Wellenende / *Standard, 1 shaft end*
Lagerung / *Bearing*	Nachschmiereinrichtung, leichte Lagerung / *Relubrication device, easy bearing arrangement*
Sonderangaben zur Lagerung / *Special details to bearings*	Festlager N-Seite / *Fixed bearing, N-side*
	Wuchtung mit halber Passfeder / *Balancing with half key*
Farbsystem / *Colour system*	01 moderate (KK C2),RAL 7031 blaugrau / *01 Moderate (KK C2),RAL 7031 blue-grey*
Lieferbedingungen und/oder amtliche Vorschriften: / *Delivery conditions and/or official regulations:*	IEC / EN 60034-1

Datenblatt / *Data sheet*

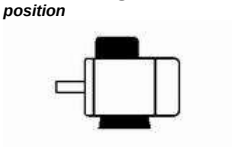
10.04.2024 ERSTELLT MIT VEM EKAT 2024 / *MADE WITH VEM EKAT 2024*

Dieses Dokument wurde elektronisch hergestellt, alle Angaben sind nur nach Bestätigung durch den Hersteller verbindlich. / *This document was produced electronically, all specifications are valid only after confirmation of the manufacturer*

Drehstrommotoren mit Käfigläufer, explosionsgeschützte Ausführung, Zündschutzart erhöhte Sicherheit "ec", Gerätegruppe II, Kategorie 3G / *Three-phase motors with squirrel cage rotor, explosion protected version, protection type 'Ex ec', device group II, category 3G*

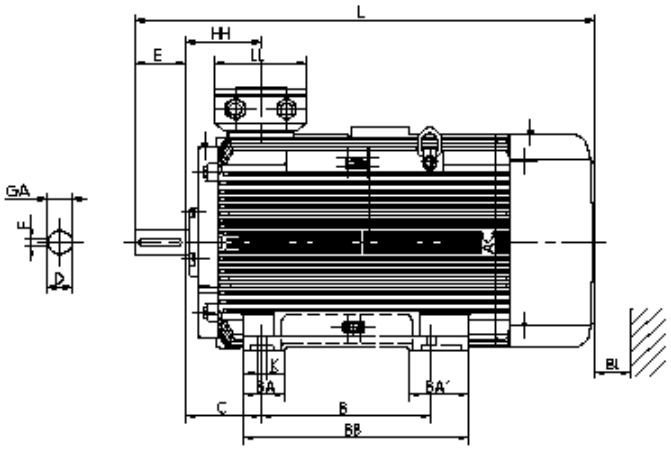
IE3-W43R 315 MX2 Ex ec IIC T3 TPM NS LL HW

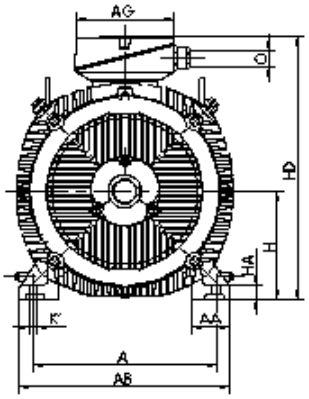
Einbaulage / ***Mounting position***



Bauform: / *Type of mounting:* IM B3
Flansch: / *Flange:* -
Klemmkastenlage / *Position of terminal box* : oben / *on the top*

Klemmenkasten / *Terminal box* : KK 200 A Ex e II
Motorklemmenbrett / *Motor terminal board* : KS18A
Kabelverschraubung / *Cable gland* O: 1 x





Motor / ***Motor***

A	AA	AB	AC	AD	B	B'	BA	BA'	BB	C	CA	K	K'
508	126	590	550	-	457		120	150	554	216	-	28	35

Schutzdach / ***Protection cover*** **Anschlusskasten** / ***Terminal box***

L	LC	H	HA	HD	HH	Bl	L	AG	LL	BE	AH
1185	-	315	44	731	211	100	-	290	252	-	-

Flansch / ***Flange*** **Toleranzen** / ***Tolerances***

P / *P*	N	LA	M	T	S	H	N	D	DA
-	-	-	-	-	-	-1	h6	m6	m6

Welle-DS / ***Shaft-DS*** **Welle-NS** / ***Shaft-NS***

D	E	GA	F	DB	DA	EA	GC	FA
65	140	69	18	DIN 332 DS- M20	-	-	-	-

DB...Zentrierbohrung / ***Centre hole***

Lieferbedingungen und/oder amtliche Vorschriften: / *Delivery conditions and/or official regulations:* IEC / EN 60034-1

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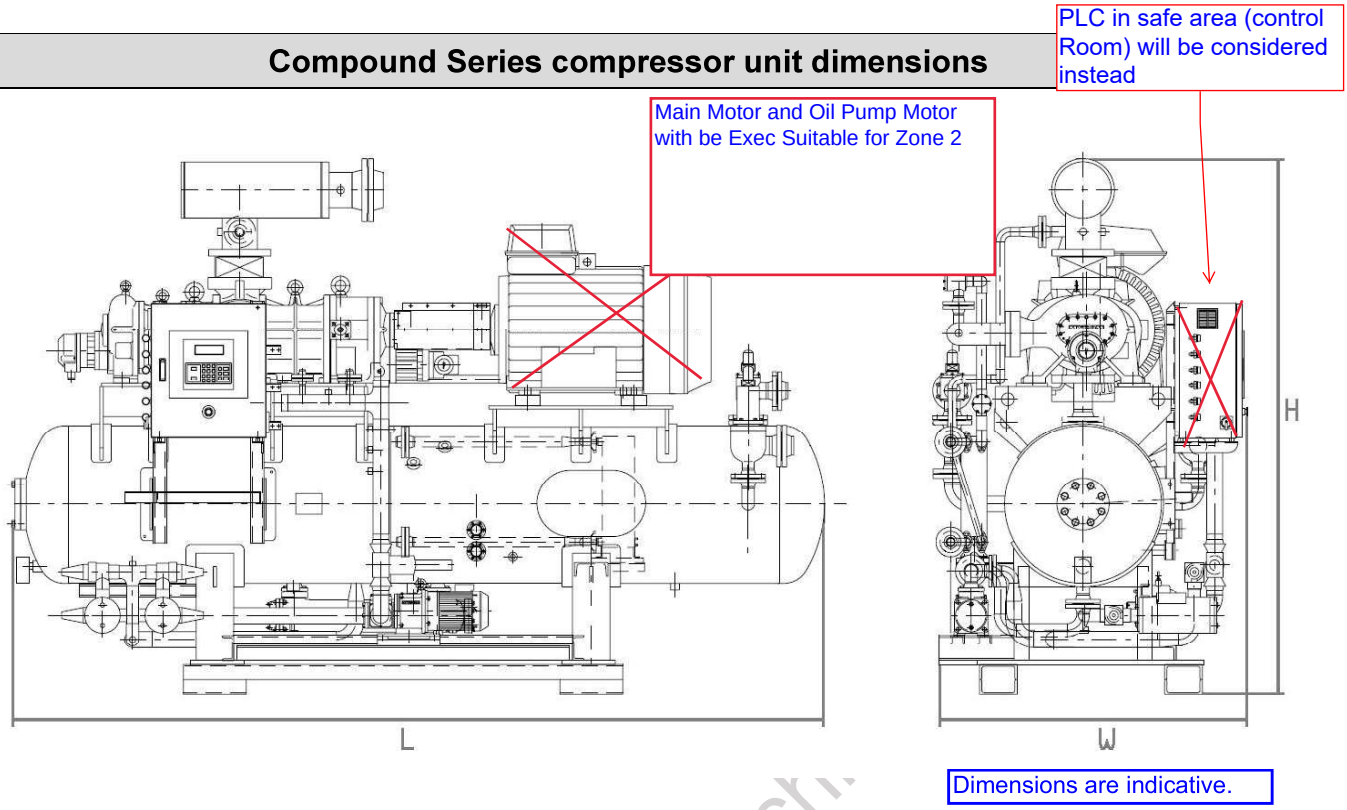
VEM motors GmbH · Carl-Friedrich-Gauß-Straße 1 · 38855 | Geschäftsführer Dr. Joachim Koch, Jianyu Wang | Amtsgericht Stendal · HRB 112964 ·
VEM Sachsenwerk GmbH · Pirnaer Landstraße 176 · 01257 | Geschäftsführer Dr. Torsten Kuntze, Jianyu Wang | Amtsgericht Dresden· HRB 20232
www.vem-group.com

Compound Series compressor unit dimensions



Compound Models	Length (mm)	Width (mm)	Height (mm)	Provisional Weight (kg)
1612LSC-CPDDX-T	3500	1300	2000	4500
2016LSC-CPDDX-T	4000	1500	2600	5500
2520LSC-CPDDX-T	4500	1800	3000	8600
3225LSC-CPDDX-T	6000	2500	4200	21000

Notes:

- Heights are without transport profiles and with the suction strainers mounted. Transport arrangements should be made so that sufficient space is left for transport profiles which allow forklift handling. Suction strainers can be dismounted prior to shipping.
- The weight includes a typical size IP23 drive motor as reference.

The data can change depending on execution of the unit. The above data is an approximation based on reference units.

* Main drive motors are not included in the scope of supply of our compound type units

Standard Compound Series unit component description

Capacity control	Two sets of 4 solenoid valves control the hydraulic unloader slide valves on low stage and high stage for capacity control. The low stage capacity is controlled between 0 and 100%, the high stage capacity between 20 and 100% (the 1612 high stage is always at 100%). Unloader indicator with 2 micro switches (0 and 100%) and potentiometer (0-1000 ohm).
Oil separation	Horizontal type oil separator with 2 separation stages, including: - frame for compressor and motor - oil heater (2000W; 400V) with thermostat - 2 oil level sight glasses Standard models are: HS6022C (1612C), HS7530C (2016), HS7533C (2520), HS10040C (3225).
• Primary separation	Gravity based oil separation in the shell of the oil separator.
• Secondary separation	High efficiency fine filter elements (design 5 ppm) are integrated in the second section of the oil separator. The number of elements is determined based on the compressor size and minimum & maximum operating conditions of the compressor.
Oil circuit	All necessary equipment & piping for lubrication, oil injection, oil draining and capacity regulation of the unit.
• Oil cooler	Standard with a thermo-siphon oil cooler. Alternatively with a water cooled oil cooler shell & tube type. Selection based on max. EG 30% refrigerant; Tin/Tout +35/40 °C. For different refrigerants and temperatures, consult the Mayekawa sales department.
• Oil filter	Double OFC-50 Mycom oil filter set with nylon filter elements (Rating: β20 > 150; Mesh: 15-20 µm). A triple oil filter set will be used if the total oil flow exceeds 300 l/min. Both can be isolated with a stop valve allowing filters to be changed when the unit is in operation.
• Oil pump	Mayekawa F50P/F60P type double helical gear oil pump with relief valve. Flanged motor for oil pump and flexible coupling type. M80P or M100P open type oil pump when required oil flow exceeds F50P/F60P capacity.
Suction side	SSD suction strainer housing with check valve to prevent backspin & gas flow back, counter flange on gas inlet.
• Suction filter	SSD Stainless steel strainer element (filtration grade 200 mesh, maximum particle size: 74 micron)
• Suction check valve	Duo check valve with steel seat.
Discharge side	Stop valve & safety valve dimensions based on the operating conditions of the compressor.
• Discharge check valve	Valve with stop & check function with counter flange on the gas outlet.
• Safety valve	Single (back pressure independent) safety valve on the oil separator.
Controls	MAYEKAWA Mypro-Touch microprocessor control panel.
• Control Panel	Mypro-touch controller offering a complete control and protection of the unit, ea parameter setting via simple keypad, monitoring on a 5,7" LCD display, alarm functions with logging, communication functions with other Mypro-Touch contro panels or PLC/PC. (Optionally available are 7,5" and 12,1" displays)
• Gauges	63 mm gauges for suction, discharge and oil pressure mounted on the unit.
Main drive motor	Main drive motors are not included in the scope of supply of our compound
• Motor	2 pole direct drive method, B3 frame. The terminal box of the motor has an undrilled cable gland plate.
• Motor make	Mayekawa Europe cooperates with the following motor suppliers; ABB, Nidec, Siemens and WEG.

PLC will be considered for Complete skid S7-300

Main Motor and Oil Pump Motor with be Exec Suitable for Zone 2

● Coupling	Rexnord type coupling with flexible elements absorbing minor coupling misalignments and vibrations.	
● Alignment	Easy alignment is guaranteed on the non-flanged motors by means of adjustable motor support elements, pre-alignment done in MAYEKAWA EUROPE, final alignment to be done after installation at site.	
Painting	RAL 7035 epoxy painting on the unit (excluding motor). Average thickness: 120 microns.	
Economizer (option) See also section 5.2	Open flash type	DX type
● Heat exchanger	N.A.	Shell & tube heat exchanger with expansion set.
● Gauges	N.A.	In addition to the standard gauges (see above), a 63mm gauge for the intermediate pressure is mounted on the control panel.
● Control	Motor valve controlled by the Mypro-Touch control panel (if applicable).	Expansion set controlled by the Mypro-Touch control panel (if applicable).
● Gas return	Mayekawa standard open flash equipment according ME-SLS-I-0177.	Via intermediate check valve and gas strainer with connection to the compressor.
Included in delivery	The scope of delivery includes: - Unit fully assembled - Unit with complete cabling on the compressor unit - Pressure vessels with CE-PED approval according EN378: 2001 - Hydraulic pressure tested components - Pneumatic pressure tested unit - MAYEKAWA quality inspection - 1 year guarantee on manufacturing mistakes - Unit manual on CD	
Not included in delivery (unless specified otherwise)	The following items are not included: - Motor starter / frequency inverter and cabling to main motor, pump motor & oil heater - Cable glands on the main motor and the pump motor - Marking for partial unit assembly acc. PED 2014/68 EU - Final motor alignment - Oil charge - Refrigerant charge - Thermal insulation - Commissioning at site - Spare parts recommended for commissioning / maintenance - Anchor bolts, lifting material (lifting lugs / spreader bars) - Unit packaging (shrink packaging / wooden crate) Instruments inside compressor skid will be fully as per MYCOM Standards, Documents for compressor skid also will be also limited to GA for compressor Skid and Compressor Package Datasheet, and PID	
Quality inspection	Quality inspection according to Mayekawa standard. The design and certificates based on CE & DMT/P	

The scope of supply is subject to change without prior notice

		Project: ZANJAN PC REFRIGERATION PACKAGE,	**Document Title: Inspection And Test (ITP)**		**CLIENT/OWNER:**									
		VENDOR NAME: HAMIAN SANAT ENERGY	**VENDOR DOC. NO.:**											
			QUALITY CONTROL / INSPECTION & TEST PLAN (ITP) FOR REFRIGERATION UNIT											
1	**SCOPE**	This Inspection and Test plan covers all activtiies that will be carrived out in design and farbrication of equipment.											DATE: 07.Apr.2024	
2	**LEGEND OF THE TECHNICAL SURVEILLANCE**	1) (H)= INSPECTION NOTIFICATION will be issued by manufacturer and inspection shall be performed at presence of notified party. Next farbication stage is subject to acceptance of inspection. Vendor must notify parties (see inspection activtiy) of the defidcated inspection activity at least fifteen (15) days in advance.											REV.: R2	
		2) (SW)=10% OF TYPE/LOT WITNESSED. Action performed only on a certain number of pieces.											BY : AM	
		3) (W)=WITNESSING. The Supplier shall inform the NOTIFIED PARTY of the date of the activity and the NOTIFIED PARTY reserves the right to witness the test. If the test is conducted at the notified date, the Supplier may proceed with the subsequent phase, even if the NOTIFIED did not witness the test.												
		4) (R/A)=REVIEW OF TECHNICAL DOCUMENTS BEFORE COMMENCEMENT OF CONSTRUCTION. The technical documents shall be reviewed and approved before the commencement of construction												
		5) (R)=REVIEW OF DOCUMENTS. Materials certificates, statement of compliance and reports of inspection and tests conducted by the Supplier shall be revised to assess their conformance with the requirements specified in the Code and Standards, Specifications and/or Purchase Order.												
		6) (D) = Vendor Inspection												
3	**Abbreviations**	O = Owner V = Vendor SV = Sub Vendor TPI = Third Party Inspection on behalf of owner												
Item No.	Inspection Description	References / Specifications / Codes	Verifying Document	Acceptance Criteria		INSPECTION ACTIVITY					REMARKS	R E V		
						SUB-VENDOR(SV)	VENDOR(V)	PE	Client/TPI					
A PROJECT PREPARATION (Before Manufacturing)														
A1	Submission of Project documents				TYPE	H	H	R	R					
					DATE									
					SIGN									
A2	PRE INSPECTION MEETING				PE	H	H	H	H	-				
					TE									
					GN									
A3	BASIC DESIGN DRAFT DOCUMENT LIST P&ID , LAY-OUT				PE	H	H	R	R	-				
					TE									
					GN									
A4	KICK-OFF MEETING CUSTOMER DETAILLED DESIGN				TYPE	H	H	R	R	-				
					DATE									
					SIGN									
B MATERIAL SELECTION / SUBCONTRACTOR OF														
B0	GENERAL	A TEMPERATURE	FABRICATION SCHEDULE QA / QC		TYPE	H	H	R	R	-				
					DATE									
					SIGN									
B1	COMPRESSOR Block MAYEKAWA(MYCOM)	MYCOM STANDARD Procedures	TEST REPORT For Compressor: '- Noise test '- Vibration test '- Perfromance test '-Hydro test	MATERIAL CERTIFICATES	TYPE	H	R	R	R	-				
					DATE									
					SIGN									
B2	MAIN MOTOR - HELMKE/VEM GERMANY	As Per HELMKE GERMANY Test Procedures Hazardous Area Certificates	TEST REPORT (Manuf. Std) - Unwitenssed routine test report		TYPE	H	H	R	R	-				
					DATE									
					SIGN									
B3	Compressor Skids including Oil pump, Oil Filter, Piping, Oil Separator, etc	MYCOM MANUFACTURER STANDARD Test Procedure and Quality Control	Dimensional Check		TYPE	H	H	R	R	-				
					DATE									
					SIGN									
B4	PUMP MOTOR-HELMKE/VEM GERMANY	MANUFACTURER STANDARD with protection class as per Exec HAZARDOUS AREA CERTIFICATE Ex ec	TEST REPORT (Manuf. Std) - Unwitenssed routine test report		TYPE	H	H	R	R	-				
					DATE									
					SIGN									
NOTE :			CERTIFIED COMPLETE:					ENDORSEMENTS:						

Note that test and inspection of electrical equipments (motors, LCP,...) should be done as per our SOI attached to the requisition. Please confirm and consider it in your offer.

Vendor reply: Please kindly specify your comment if any as agreed with owner, test and inspection will be done as per this ITP and no further specification applies.

Pidec 2nd reply: Note to originator:
Final decision about this matter (ITP) should be made by the owner.

Toase-ehe Park Sanati Gohar Ofogh
Petrochemical Co.
CONCEPTUAL, BASIC and DETAIL DESIGN ENGINEERING OF STYRENE PARK OFFSITE

Document Title: Inspection And Test (ITP)

VENDOR DOC. NO.:

QUALITY CONTROL / INSPECTION & TEST PLAN (ITP) FOR REFRIGERATION UNIT

DATE: 07.Apr.2024

REV.:R2

BY : AM

1	**SCOPE**	This Inspection and Test plan covers all activtiies that will be carrived out in design and farbrication of equipment.
2	**LEGEND OF THE TECHNICAL SURVEILLANCE**	1) (H)= INSPECTION NOTIFICATION will be issued by manufacturer and inspection shall be performed at presence of notified party. Next farbication stage is subject to acceptance of inspection. Vendor must notify parties (see inspection activtiy) of the defidcated inspection activity at least fifteen (15) days in advance.
		2) (SW)=10% OF TYPE/LOT WITNESSED. Action performed only on a certain number of pieces.
		3) (W)=WITNESSING. The Supplier shall inform the NOTIFIED PARTY of the date of the activity and the NOTIFIED PARTY reserves the right to witness the test. If the test is conducted at the notified date, the Supplier may proceed with the subsequent phase, even if the NOTIFIED did not witness the test.
		4) (R/A)=REVIEW OF TECHNICAL DOCUMENTS BEFORE COMMENCEMENT OF CONSTRUCTION. The technical documents shall be reviewed and approved before the commencement of construction
		5) (R)=REVIEW OF DOCUMENTS. Materials certificates, statement of compliance and reports of inspection and tests conducted by the Supplier shall be revised to assess their conformance with the requirements specified in the Code and Standards, Specifications and/or Purchase Order.
		6) (D) = Vendor Inspection
3	**Abbreviations**	O = Owner V = Vendor SV = Sub Vendor TPI = Third Party Inspection on behalf of owner

Item No.	Inspection Description	References / Specifications / Codes	Verifying Document	Acceptance Criteria		ATTENDED BY: SUB-VENDOR(SV)	VENDOR(V)	PE	Client/TPI		REMARKS
B MATERIAL SELECTION / SUBCONTRACTOR ORDERING (CONTINUE)											
B5	CONDENSOR / CHILLER	ASME Sec. VIII Div. 1 and TEMA	WPS/PQR – WELDER QUALIFICATIONS WELD - WELDING CHECK NDE REPORTS CLEANLINESS TREATMENT HYDRAULIC & PRESSURE STATIC TEST DIMENSIONAL INSPECTION RT/UT REQUIREMENT Spot (on pressure retaining parts) PAINTING INSPECTION	MANUFACTURING STANDARD & Approved Drawing	TYPE	H	W	R	R		
					DATE						
					SIGN						
B6	BASE FRAME For CHILLER Skid		PT -10 % OF MAJOR STRUCTURAL CONNECTIONS 100 % PT LIFTING LUG WELDS 100 % UT BUTT WELDS IN MAJOR SUPPORTING BEAMS	ACC. Vendor DATASHEET/DRAWING SKID CONNECTION POINTS – ANCHOR BOLT POSITIONS INSPECTION	TYPE	H	H	R	R	-	
					DATE						
					SIGN						
B7	VALVES For Chiller Skid	ASME for Chiller Skid / MYCOM STD	-MANUFACTURER INSPECTION AND TEST RECORD -Manual Valves on Compressor skid is part of MYCOM STD Skid and as per MYCOM quality control System	ACC. Vendor DATASHEET/DRAWING INSPECTION /CERTIFICATE	TYPE	H	W	R	R		Inspection will be at Vendor workshop
					DATE						
					SIGN						
B8	PIPING For Chiller Skid	ASME/MYCOM STD For Compressor skid	1) Carbon oil and refrigerant piping 10% . 2) Instrument air header 10% . Amount will be based on total amount of welded inches.	Material certificates	TYPE	H	W	R	R	-	
					DATE						
					SIGN						
B9	SAFETY VALVES	ASME/MYCOM STD For Compressor skid	MATERIAL CERTIFICATES	INSPECTION REPORT	TYPE	H	W	R	R		
					DATE						
					SIGN						
B10	Smaller components within instrumenetation routing, such asTUBING and GASKETS and bolting For chiller Skid		MATERIAL CERTIFICATES 3.1 For Compressor Skid, as per MYCOM STD quality Control System	INSPECTION CERTIFICATE	TYPE	H	R	R	R		
					DATE						
					SIGN						
B11	INSTRUMENTATION	Pressure and temperature guages are provided with 3.1 material certificates	MATERIAL CERTIFICATES 3.1 DIMENSIONAL AND CONSTRUCTION DWG HAZARDOUS AREA CERTIFICATE CALIBRATION REPORT (3.1 material certificates)		TYPE	H	R	R	R		
					DATE						
					SIGN						

NOTE : CERTIFIED COMPLETE: ENDORSEMENTS:

			Document Title: Inspection And Test (ITP)									
			VENDOR DOC. NO.:									
		QUALITY CONTROL / INSPECTION & TEST PLAN (ITP) FOR REFRIGERATION UNIT										
1	**SCOPE**	This Inspection and Test plan covers all activtiies that will be carrived out in design and farbrication of equipment.										DATE: 07.Apr.2024
2	**LEGEND OF THE TECHNICAL SURVEILLANCE**	1) (H)= INSPECTION NOTIFICATION will be issued by manufacturer and inspection shall be performed at presence of notified party. Next farbication stage is subject to acceptance of inspection. Vendor must notify parties (see inspection activtiy) of the defidcated inspection activity at least fifteen (15) days in advance.										REV.: R2
		2) (SW)=10% OF TYPE/LOT WITNESSED. Action performed only on a certain number of pieces.										BY : AM
		3) (W)=WITNESSING. The Supplier shall inform the NOTIFIED PARTY of the date of the activity and the NOTIFIED PARTY reserves the right to witness the test. If the test is conducted at the notified date, the Supplier may proceed with the subsequent phase, even if the NOTIFIED did not witness the test.										
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3	**Abbreviations**	O = Owner V = Vendor SV = Sub Vendor TPI = Third Party Inspection on behalf of owner										

Item No.	Inspection Description	References / Specifications / Codes	Verifying Document	Acceptance Criteria		ATTENDED BY					REMARKS
						SUB-VENDOR(SV)	VENDOR(V)	PE	Client/TPI		
C INSPECTION											
C1	DIMENSIONAL INSPECTION OF SKID CONNECTION POINTS				TYPE	H	SW	R	W		Timer period of PMI will be informed.No specific dates are consider to be informed in advance by Vendor
					DATE						
					SIGN						
C2	PAINTING	Vendor STANDARD / SUPPLIER_(Painting_Standard)	THICKNESS VISUAL INSPECTION and measurement via instrument. PAINT INSPECTION REPORT		TYPE	H	W	R	R		
					DATE		-	-	-		
					SIGN						
C3	ELECTRICAL WIRING	WIRING CHECK			TYPE	H	W	R	R		
					DATE						
					SIGN						
C4	INSPECTION OF JUCTION BOX, LOCAL PANEL AND PLC	FACTORY ACCEPTANCE TEST FOR PLC 1) VISUAL INSPECTION JUNCTION BOX, LOCAL PANEL AND PLC 2) FUNCTION TEST	TEST REPORT PLC FAT TEST PROCEDURE	CONTROL NARRATIVE DRAWINGS, DATA SHEETS	TYPE	H	W	W	W		
					DATE						
					SIGN						
C5	FINAL INSPECTION		NAME PLATES CONFIRMATION	RELEASE NOTE	TYPE	H	H	W	W		
					DATE						
					SIGN						
C6	APPROVAL OF CONCESSION REQUEST AND NON-CONFORMANCE REPORTS				TYPE	H	R	R / A	R / A		
					DATE						
					SIGN						
D SHIPMENT AND LOADING											
D1	PACKING AND MARKING PREPARATION FOR SHIPMENT DETAILED PACKING LIST	Shrinked Packed	PACKING INSPECTION: VISUAL INSPECTION COMPLETENESS CHECK PACKING LIST		TYPE	H	R	R	R		
					DATE						
					SIGN						
D2	DOCUMENTATION	As per Agreed document List Incl. Final data book, ITP, etc.	A COMPLETE PACKAGE OF INSPECTION AND TEST RECORD/CERTIFICATE MANUFACTURED RECORD		TYPE	H	R/A	R/A	R/A		
					DATE						
					SIGN						

NOTE : CERTIFIED COMPLETE: ENDORSEMENTS:

The PLC shall be based on proven and reliable technology satisfying TUV requirements and approvals for SIL-3 according to IEC-61511 or AK6 according to DIN V 19250.

conclusion meeting (2024/02/17):

S7-300 F is accepted by client for PLC

For shutdown related signals, the IO card shall be fail safe, SIL3 and redundant.

conclusion meeting(2024/02/17):

comment is applicable for ESD signals

Power supply, CPU and communication modules of PLC to be redundant.
For close control loop (If any), the redundant IO card, shall be considered.
conclusion meeting (2024/02/17):
power supply, communication modules of PLC to be redundant.
For close control loop (If any), the redundant IO card, shall be considered.

ESD

DCS

UCP
40-RFU-821A

HMI

POWER SUPPLY
(2X110VAC +230VAC)

MC

One operator station (including PC, monitor, keyboard, mouse and relevant interconnection cables to PLC panel) shall be considered for installation in control room.
conclusion meeting(2024/02/17):
engineering laptop including related software instead of operator station shall be considered
field instrument transmitters shall be considered as EXi

400V 3PH 50HZ

400V 3PH 50HZ

FIELD

JB

LOCAL CONTROL STATION
(40-LCP-821A)

H
OIL HEATER

M
AUX. MOTOR

M
MAIN MOTOR

Please note that LCP (local control panel) is in vendor scope of work/supply and all motors and heaters (main motors and auxiliaries) shall be controlled via this Local Control Panel. All control signals- commands and indications will be sent from this vendor local control panel to the UCP and then will be transferred to MCC from UCP based on agreement between electrical and instrument department. Please confirm.

conclusion meeting (2024/02/17):

noted

Note that this local control panel which is located in field, shall be suitable for hazardous area Zone2, gas group IIC and temp. class T3. Please confirm and consider it in your offer.
Vendor reply: LCP is suitable for Hazardous Area zone 2
Pidec 2nd reply: Please confirm our above description completely (suitable for zone 2 , gas group IIC, temp. class T3).

NOTE

REFERENCE DOCUMENTS	DOC. NO.

LEGEND

- TRANSMITTER
- CONTROL VALVE
- SOLENOID VALVE
- HARDWIRE SIGNALS
- MODBUS TCP/IP (ETHERNET CABLE)

EQUIPMENT LIST

REV.	DATE		PREP. BY	CHKD. BY	APPD. BY	AUTH. BY
00	13-AUG-22	FOR APPROVAL	H.K.	M.O.	A.M.	A.M.
REV.	DATE	POI				

EIED
Contract No. SMC-H-19/804

SCALE: N.T.S

DRAWING TITLE:

CONTROL SYSTEM BLOCK DIAGRAM

DRAWING NO.	Class	REV.	SHEET No.	SIZE
	1	00	1 OF 1	A3

Zanjan Refrigeration Package Preliminary Utility Consumption

Utility

Electricity	Service	Drive Power (kW)	Voltage (V)	Frequency (Hz)	Ph	Note
	Main Electric Motor Each	150	400	50	3	Rated Power of Each Compressor
	Oil Pump Motors	3	400	50	3	Qty 2 Oil Pumps(One for Each Compressor)
	Control Panel	3				24V DC
	Oil Heater	approx. 4.0 KW	400	50	3	Qty 2 Oil Heater

Cooling water	Temperature (deg.C.)	in 27	return 36	Flow Rate 80,000 Kg/hr			
		For Two Oil Coolers and Condenser					
	Pressure (BarG)	in	Allowable Press. (Bar)			Fouling Resistance (m² K/W)	
Steam	Pressure (BarG)	N/A	Temp. (deg.℃.)		Flow Rate (kg/hr)		
Instrument Air	Pressure (BarG)		Temp. (deg.℃.)		Flow Rate (kg/hr)		

Aug. 19th 2004

成績表番号 K7A40409

平成 16年 8月 19日

シャルピー衝撃試験成績表

Charpy Impact Test Certificate

シャルピー衝撃試験

株式会社 前川製作所 殿

For Mayekawa Mfg. Co., Ltd.

川重テクノサービス株式会社 材料技術部
By Kawajyu Techno Service Co., Ltd.
川崎重工業株式会社 神戸工場内
TEL (078)682-5475 FAX(078)682-5571

承認	確認	担当

材質 Material	試験片形状
FC300 Grey Cast Iron	2mm-Vノッチ(幅10mm)
試験機番号	72 OS 17
試験機容量	294.2J

Temperature

Absorbed Energy

材質 FC300

試験片番号 Test Piece No.	試験温度 (℃)	吸収エネルギー (kgf-m)	吸収エネルギー (J)
-1	RT(22)	0.37	4
3 -2	RT(22)	0.33	3
-3	RT(22)	0.37	4
-4	0	0.33	3
3 -5	0	0.37	4
-6	0	0.37	4
-7	-30	0.33	3
3 -8	-30	0.29	3
-9	-30	0.31	3
-1	-50	0.31	3
3 -2	-50	0.31	3
-1	-50	0.35	3
-1	-70	0.33	3
3 -1	-70	0.33	3
-1	-70	0.31	3
-1	-100	0.33	3
3 -1	-100	0.31	3
-1	-100	0.31	3
-1	-196	0.07	1
3 -2	-196	0.22	2
-2	-196	0.24	2

MYCOM reference list in Iran with Standard Material (Total=74):

All bare screw compressors were made in Japan according to JIS standard and Mayekawa design

YEAR	EPC	OWNER	MODEL	Qty	Type of gas
1990	TECNIMONT	ARAK PETROCHEMICAL	250L	1	AMMONIA
1989	UHDE	ARAK PETROCHEMICAL	320S	1	AMMONIA
1989	UHDE	ARAK PETROCHEMICAL	125L	1	AMMONIA
1996	KELLOG	PCC / RAZI PETROCHEMICAL	250L	2	AMMONIA
2000	LINDE	BANDAR IMAM	2016SS	1	HYDROCARBONS
2002	TEC	PARDIS PETROCHEMICAL	2520C	1	NH3
2003	LINDE	B.I.P.C.	320S	1	C2H6
2003	LINDE	B.I.P.C.	400S	1	C2H6
2003	LINDE	B.I.P.C.	4032ML	1	C3H8
2003	O.I.E.C./LG ENG.	FANAVARAN PETROCH. ACETIC ACID	320S	2	R134A
2004	DAELIM	NIOC/PETROPARS LTD. /SOUTH PARS 6,7,8	250M	4	PROPANE
2005	--	GHADIR UREA & AMMONIA PETROCHEMICAL COMPANY	2520LLC	1	AMMONIA
2005	KAWASAKI	KERMANSHAH PETROCHEMICAL INDUSTRIES	2520LLC	1	AMMONIA
2005	SIEMENS	LAVAN FIELD	2520LSC	1	NATURAL GAS
2006	LGE	KHARG PETROCHEMIICAL	250L	2	PROPANE
2006	LGE	KHARG PETROCHEMIICAL	320LL	2	PROPANE
2006	LGE	KHARG PETROCHEMIICAL	3225SSC	1	PROPANE
2006	LGE	KHARG PETROCHEMIICAL	3225SSC	2	PROPANE
2006	MITSUI	ILAM PETROCHEMICAL COMPANY	250S	2	PROPYLENE
2006	UHDE	ARAK PETROCHEMICAL	320LL	1	AMMONIA
2006	UHDE	ARAL PETROCHEMICAL	320LL	1	AMMONIA
2006	PROSERNAT	ENI IRAN, DARQUAIN OIL FIELD	320S	4	PROPANE
2006	DAELIM	NIOC / PETROPARS LTD. / SOUTH PARS 6,7,8	250L	4	PROPANE
2007	-	JAM PETROCHEMICAL	160LUD-LX	5	PROPYLENE
2007	MITSUI	MEHR PETROCHEMICAL COMPANY	320LL	1	R134A
2009	-	MEHR Petrochemical	320S	1	PROPANE
2010	DAELIM INDUSTRIAL CO., LTD.	South Pars Phase 12	250M	2	FREON
2012	-	ARAK PETROCHEMICAL	320LL	1	AMMONIA
2015	Jondishapour Co.	HENGAM GAS TREATMENT REFINERY	320L	2	PROPANE
2015	NDEC	PARDIS Petrochemical	320	2	AMMONIA
2017	Takhte Jamshid	TAKHTE Jamshid Petrochemical	250VLD	5	AMMONIA
2018	Jondishapour Co.	JAM PETROCHEMICAL	250L	5	AMMONIA
2019	SAZEH	Di Aria Polymer Co	320 VMD	2	AMMONIA
2020	JAM	JAM PETROCHEMICAL	160LUD	1	PROPYLENE
2021	PADJAM	JAM PETROCHEMICAL	160L	2	AMMONIA
2022	PETRO PALAYESH	ALA MAHESTAN	250L	2	PROPYLENE
2022	REGAL Petrochemical	REGAL Petrochemical	250L	1	PROPYLENE
2023	EIED	ALA MAHESTAN	400S	3	PROPYLENE
2024	PADJAM	JAM PETROCHEMICAL	160S	2	Propane

材料対比表（JIS⇔ASTM,AISI,SAE）

Material Comparison Table (JIS⇔ASTM,AISI,SAE)

MAYEKAWA MYCOM

No.	部品名	Parts Name	JIS	ASTM	AISI,SAE
1	ﾛｰﾀｹｰｼﾝｸﾞ	Main rotor casing	FC300	A48-93a	
	ﾛｰﾀｹｰｼﾝｸﾞ	Main rotor casing	SCW480	A216/A216 WCB	
	ﾛｰﾀｹｰｼﾝｸﾞ	Main rotor casing	SCPL1	A352/A352M	
2	六角穴付ﾎﾞﾙﾄ	Allen screw	SCM435		4137
3	平行ﾋﾟﾝ	Alignment pin	S45C		1045
4	ｱｲﾎﾞﾙﾄ	Hanger bolt	S17C		1017
5	ｻｸｼｮﾝｶﾊﾞｰ	Suction cover	FC300	A48-93a	
	ｻｸｼｮﾝｶﾊﾞｰ	Suction cover	SCW480	A216/A216 WCB	
	ｻｸｼｮﾝｶﾊﾞｰ	Suction cover	SCPL1	A352/A352M	
6	ｻｸｼｮﾝｶﾊﾞｰｶﾞｽｹｯﾄ	Gasket, suction cover	–	–	–
7	ｱｲﾎﾞﾙﾄ	Hanger bolt	S17C		1017
8	ｽﾌﾟﾘﾝｸﾞﾋﾟﾝ	Spring pin	SK5	W1-8	W1-8
9	Oﾘﾝｸﾞ	"O"ring	–	–	–
10	ﾌﾟﾗｸﾞ	Plug	S10C		1010
11	ﾍﾞｱﾘﾝｸﾞﾍｯﾄﾞ	Bearing head	FC300	A48-93a	
	ﾍﾞｱﾘﾝｸﾞﾍｯﾄﾞ	Bearing head	SCW480	A216WCB	
	ﾍﾞｱﾘﾝｸﾞﾍｯﾄﾞ	Bearing head	SCPL1	A352LCB	
12	ﾍﾞｱﾘﾝｸﾞﾍｯﾄﾞｶﾞｽｹｯﾄ	Gasket, bearing head	–	–	–
13	ｱｲﾎﾞﾙﾄ	Hanger bolt	S17C		1017
14	ｽﾌﾟﾘﾝｸﾞﾋﾟﾝ	Spring pin	SK5	W1-8	W1-8
15	ﾌﾟﾗｸﾞ	Plug	S10C		1010
16	ﾍﾞｱﾘﾝｸﾞｶﾊﾞｰ	Bearing cover	FC300	A48-45	
	ﾍﾞｱﾘﾝｸﾞｶﾊﾞｰ	Bearing cover	SCW480	A216WCB	
	ﾍﾞｱﾘﾝｸﾞｶﾊﾞｰ	Bearing cover	SCPL1	A352LCB	
17	ﾍﾞｱﾘﾝｸﾞｶﾊﾞｰｶﾞｽｹｯﾄ	Gasket, bearing cover	–	–	–
18	六角穴付ﾎﾞﾙﾄ	Allen screw	SCM435		4137
19	平行ﾋﾟﾝ	Alignment pin	S45C		1045
20	ｽﾌﾟﾘﾝｸﾞﾋﾟﾝ	Spring pin	SK5	W1-8	W1-8
21	ﾌﾟﾗｸﾞ	Plug	S10C		1010
22	ﾊﾞﾗﾝｽﾋﾟｽﾄﾝｶﾊﾞｰ	Blance piston cover	FC300	A48-45	
	ﾊﾞﾗﾝｽﾋﾟｽﾄﾝｶﾊﾞｰ	Blance piston cover	SCW480	A216WCB	
	ﾊﾞﾗﾝｽﾋﾟｽﾄﾝｶﾊﾞｰ	Blance piston cover	SCPL1	A352LCB	
23	ﾊﾞﾗﾝｽﾋﾟｽﾄﾝｶﾊﾞｰｶﾞｽｹｯﾄ	Gasket, blance piston cover	–	–	–
24	六角穴付ﾎﾞﾙﾄ	Hexagon socket head cap screw	SCM435		4137
25	Mﾛｰﾀ	Male rotor	FCD600	A536-84	
	Mﾛｰﾀ	Male rotor	SFCM930S	A668M/L	
26	Fﾛｰﾀ	Female rotor	FCD600	A536-84	
	Fﾛｰﾀ	Female rotor	SFCM930S	A668M/L	
27	ﾒｲﾝﾍﾞｱﾘﾝｸﾞ	Main bearing	STKM13A	A512-91	
			WJ2	B23-83	
28	ｻｲﾄﾞﾍﾞｱﾘﾝｸﾞ	Side bearing	STKM13A	A512-91	
			WJ2	B23-83	
29	ｽﾄｯﾌﾟﾘﾝｸﾞ	Stop ring	SWRH	A510	
30	ﾊﾞﾗﾝｽﾋﾟｽﾄﾝ	Blance piston	S45C		1045
31	ﾊﾞﾗﾝｽﾋﾟｽﾄﾝｷｰ	Key, blance piston	S45C		1045
32	ｽﾄｯﾌﾟﾘﾝｸﾞ	Stop ring	SWRH	A510	
33	ﾊﾞﾗﾝｽﾋﾟｽﾄﾝｽﾘｰﾌﾞ	Sleeve, blance piston	FC300	A48-93a	
34	ｽﾌﾟﾘﾝｸﾞﾋﾟﾝ	Spring pin	SK5	W1-8	W1-8
35	Oﾘﾝｸﾞ	"O"ring	–	–	–

材料対比表（JIS⇔ASTM,AISI,SAE）

Material Comparison Table (JIS⇔ASTM,AISI,SAE)

MAYEKAWA MYCOM

No.	部品名	Parts Name	JIS	ASTM	AISI,SAE
36	Oﾘﾝｸﾞ座金	Spacer	SS400	A36-93a	
37	ｽﾄｯﾌﾟﾘﾝｸﾞ	Stop ring	SK5	W1-8	W1-8
38	ｽﾗｽﾄﾍﾞｱﾘﾝｸﾞ	Thrust bearing assembly	SUJ2		52100
			FCD450	A536-84	
	ﾃｨﾙﾃｨﾝｸﾞﾊﾟｯﾄｽﾗｽﾄﾍﾞｱﾘﾝｸﾞ	Tilting pad thrust bearing	-	-	-
39	ﾛｯｸﾅｯﾄ	Lock nut	SS400	A36-93a	
40	ﾛｯｸﾜｯｼｬ	Lock washer	SPCC	A109-91	
41	ｽﾗｽﾄﾍﾞｱﾘﾝｸﾞ受金		S45C		1045
42	ｽﾗｽﾄﾍﾞｱﾘﾝｸﾞ調整座金	Spacer, thrust bearing alignment	S45C		1045
43	ｽﾗｽﾄﾍﾞｱﾘﾝｸﾞ締付金具	Thrust bearing gland	SS400	A36-93a	
45	六角ﾎﾞﾙﾄ	Gland bolt	S45C		1045
46	六角ﾎﾞﾙﾄ廻り止め	Lock washer	SPCC	A109-91	
48	ｼｰﾙﾘﾃｰﾅ	Retainer, oil seal	S45C		1045
49	Oﾘﾝｸﾞ	"O"ring	-	-	-
50	ｵｲﾙｼｰﾙ	Oil seal	-	-	-
51	ｼｰﾙｶﾊﾞｰ	Seal cover	FC300	A48-45	
	ｼｰﾙｶﾊﾞｰ		SCW480	A216/A216	
	ｼｰﾙｶﾊﾞｰ		SCPL1	A352/A352M	
52	ｼｰﾙｶﾊﾞｰｶﾞｽｹｯﾄ	Seal cover gasket	-	-	-
53	六角穴付ﾎﾞﾙﾄ	Allen screw	SCM435		4137
54	ｱﾝﾛｰﾀﾞｽﾗｲﾄﾞ弁(1)	Unloader slide valve(1)	FC300	A48-45	
55	ｱﾝﾛｰﾀﾞｽﾗｲﾄﾞ弁(2)	Unloader slide valve(2)	FCD450	A536-84	
58	六角穴付ﾎﾞﾙﾄ	Hexagon socket head cap screw	SCM435		4137
59	Oﾘﾝｸﾞ	"O"ring	-	-	-
60	ｱﾝﾛｰﾀﾞｼﾘﾝﾀﾞ	Unloader cylinder	FC300	A48-45	
			SCW480	A216/A216	
			SCPL1	A352/A352M	
61	六角穴付ﾎﾞﾙﾄ	Hexagon socket head cap screw	SCM435		4137
62	六角穴付ﾎﾞﾙﾄ	Hexagon socket head cap screw	SCM435		4137
63	Oﾘﾝｸﾞ	"O"ring	-	-	-
64	ｱﾝﾛｰﾀﾞﾋﾟｽﾄﾝ	Unloader piston	S45C		1045
65	Oﾘﾝｸﾞ	"O"ring	-	-	-
66	ﾃﾌﾛﾝｷｬｯﾌﾟｼｰﾙ	Tefron cap seal	Tefron	-	-
67	ｱﾝﾛｰﾀﾞﾌﾟｯｼｭﾛｯﾄﾞ	Unloader push rod	S45C		1045
68	溝付ﾋﾟﾝ	Guide pin	SWRH	A510	
69	ﾛｯｸﾅｯﾄ	Lock nut	SS400	A36-93a	
70	ﾛｯｸﾜｯｼｬ	Lock washer	SPCC	A109-91	
73	Oﾘﾝｸﾞ	"O"ring	-	-	-
74	ｱﾝﾛｰﾀﾞｶﾊﾞｰ	Unloader cover	FC300	A48-45	
			SCW480	A216/A216	
			SCPL1	A352/A352M	
75	Oﾘﾝｸﾞ	"O"ring	-	-	-
76	六角穴付ﾎﾞﾙﾄ	Hexagon socket head cap screw	SCM435		4137
77	ｱﾝﾛｰﾀﾞ指示計円筒ｶﾑ	Indicator cam	S45C		1045
78	ﾎﾞｰﾙﾍﾞｱﾘﾝｸﾞ	Ball bearing	SUJ2		52100
79	ｽﾄｯﾌﾟﾘﾝｸﾞ	Stop ring	SWRH	A510	
80	ﾍﾞｱﾘﾝｸﾞ押さえ	Bearing gland	SS400	A36-93a	
81	六角穴付ﾎﾞﾙﾄ	Hexagon socket head cap screw	SCM435		4137
82	ﾃﾌﾛﾝVﾘﾝｸﾞ	Tefron "V"ring	Tefron		

材料対比表（JIS⇔ASTM,AISI,SAE）

Material Comparison Table (JIS⇔ASTM,AISI,SAE)

MAYEKAWA MYCOM

No.	部品名	Parts Name	JIS	ASTM	AISI,SAE
83	ｽﾌﾟﾘﾝｸﾞ	Spring	SWPB	BS5216-91	
84	ｽﾌﾟﾘﾝｸﾞ押さえ	Spring retainer	S25C		1025
85	ｵｲﾙｲﾝｼﾞｪｸｼｮﾝﾊﾟｲﾌﾟ	Oil injection pipe	STKM	A512-91	
87	ｶﾞｲﾄﾞﾌﾞﾛｯｸ	Guide block	S45C		1045
88	ｶﾞｲﾄﾞﾌﾞﾛｯｸｽﾃﾑ	Threaded guide block stem	S45C		1045
89	Oﾘﾝｸﾞ	"O"ring	–	–	
91	ｶｯﾌﾟﾘﾝｸﾞｷｰ	Shaft key	S45C S45C-H		1045 1045
92	吸入ﾌﾗﾝｼﾞ	Suction port flange	SF390	A668-93	
93	吸入ﾌﾗﾝｼﾞｶﾞｽｹｯﾄ	Gasket, suction port flange	–	–	–
94	六角ﾎﾞﾙﾄ	Hexagon head bolt	S25C		1025
95	吐出ﾌﾗﾝｼﾞ	Discharge port flange	SF390	A668-93	
96	吐出ﾌﾗﾝｼﾞｶﾞｽｹｯﾄ	Gasket, discharge port flange	–	–	–
97	六角ﾎﾞﾙﾄ	Hexagon head bolt	S25C		1025
98	ｽﾌﾟﾘﾝｸﾞﾋﾟﾝ	Spring pin	SK5	W1-8	W1-8
164	ｵｲﾙｲﾝｼﾞｪｸｼｮﾝﾊﾟｲﾌﾟ押さえ	Oil injection pipe gland	S45C		1045
166	六角穴付ﾎﾞﾙﾄ	Hexagon socket head cap screw	SCM435		4137
167	ﾌﾟﾗｸﾞ	Plug	S10C		1010
235	吐出ﾌﾗﾝｼﾞｽﾍﾟｰｻ	Spacer, discharge flange	SF390	A668-93	
236	吐出ﾌﾗﾝｼﾞｽﾍﾟｰｻｶﾞｽｹｯﾄ	Gasket, discharge flange spacer	–	–	–
237	はさみ板	Torsional slip washer	SK5	W1-8	W1-8
246	ｱﾝﾛｰﾀﾞｽﾗｲﾄﾞ弁ｶﾞｲﾄﾞ	Unloader slide valve guide	FC250	A48-93a	
247	六角穴付ﾎﾞﾙﾄ	Hexagon socket head cap screw	SCM435		4137
248	ｽﾌﾟﾘﾝｸﾞﾜｯｼｬ	Spring washer	SWRH	A510	
249	平行ﾋﾟﾝ	Alignment pin	S45C		1045
250	ｽﾗｽﾄ座金	Washer, thrust bearing	S45C		1045
251	ｴﾚｸﾄﾛﾏｲｻﾞ接続ﾌﾗﾝｼﾞ	Flange, economizer	SF390	A668-93	
252	ｴﾚｸﾄﾛﾏｲｻﾞ接続ﾌﾗﾝｼﾞｶﾞｽｹｯﾄ	Gasket, economizer flange	–	–	–
253	六角ﾎﾞﾙﾄ	Hexagon head bolt	SCM435		4137
254	ｱｸｱﾏｲｻﾞ接続ﾌﾗﾝｼﾞ	Flange, aquamizer	SF390	A668-93	
255	ｱｸｱﾏｲｻﾞ接続ﾌﾗﾝｼﾞｶﾞｽｹｯﾄ	Gasket, aquamizer flange	–	–	–
256	六角ﾎﾞﾙﾄ	Hexagon head bolt	SCM435		4137
267	六角ﾎﾞﾙﾄ用特殊ｽﾌﾟﾘﾝｸﾞﾜｯｼｬ	Special spring washer	SWRH	A510	

COMPOUND TWO STAGE SCREW	2016.ver1	MYCOMW 2016.ver1e							
DATE :		07-14-2024							
MODEL :		N1612LSC-MBL-63							
ROTOR & PORT 2ND :		125S L							
ROTOR & PORT 1ST :		160L MB							
REFRIGERANT :		AMMONIA							
RECOMMENDED PORT :		LBM	LBM	LBM	LBM	LBM	LBM	LBM	MBL
Vi 2ND :	[-]	5.69	5.15	4.72	4.38	4.1	3.84	3.56	2.82
Vi 1ST :	[-]	1.78	1.97	2.14	2.31	2.47	2.64	2.85	3.59
CAPACITY :	[Mcal/h]	59.8	70	79.8	89.5	98.9	108.7	121	167.2
CAPACITY :	[TR]	19.8	23.1	26.4	29.6	32.7	35.9	40	55.3
ABSORBED POWER :	[kW]	82.3	84.2	86.2	88.2	90.7	93.8	99.1	117.6
ABSORBED POWER 2ND :	[kW]	59.7	60	60.3	60.6	60.9	61.3	61.7	63.2
ABSORBED POWER 1ST :	[kW]	22.6	24.2	25.9	27.6	29.7	32.6	37.5	54.3
DRIVE SHAFT SPEED :	[min-1]	3566	3566	3566	3566	3566	3566	3566	3566
COMPRESSOR SPEED :	[min-1]	4350	4350	4350	4350	4350	4350	4350	4350
INDICATOR POSITION 2ND :	[%]	100	100	100	100	100	100	100	100
INDICATOR POSITION 1ST :	[%]	30	40	50	60	70	80	90	100
SWEPT VOLUME RATIO (2ND/1S	[-]	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17
CONDENSING TEMP. :	[degC]	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9
EVAPORATIVE TEMP. :	[degC]	-36.5	-36.5	-36.5	-36.5	-36.5	-36.5	-36.5	-36.5
SUCTION SUPERHEAT :	[degC]	0	0	0	0	0	0	0	0
INTERMED. SUPERHEAT :	[degC]	0	0	0	0	0	0	0	0
LIQUID APPROACH TEMP. :	[degC]	5	5	5	5	5	5	5	5
LIQUID SUBCOOLING :	[degC]	0	0	0	0	0	0	0	0
SUCTION TEMP. 1ST :	[degC]	-36.5	-36.5	-36.5	-36.5	-36.5	-36.5	-36.5	-36.5
OIL SUPPLY TEMP. :	[degC]	50	50	50	50	50	50	50	50
SUCTION PRESS. :	[kg/cm2A]	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
DISCHARGE PRESS. :	[kg/cm2A]	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
OIL SUPPLY PRESS. :	[kg/cm2A]	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
SUCTION PRES. DROP :	[kg/cm2]	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
DISCHARGE PRES. DROP :	[kg/cm2]	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SWEPT VOLUME 2ND :	[m3/h]	290	290	290	290	290	290	290	290
SWEPT VOLUME 1ST :	[m3/h]	918	918	918	918	918	918	918	918
LOAD(VOL. FLOW RATE) 2ND :	[%]	89.8	91.9	93.5	94.6	95.7	96.6	97.6	100
LOAD(VOL. FLOW RATE) 1ST :	[%]	32.9	38.9	44.8	50.6	56.4	62.5	70.2	100
INTERMED. TEMP. :	[degC]	-22.1	-19.1	-16.6	-14.4	-12.3	-10.1	-7.63	0.24
SUCTION TEMP. 2ND :	[degC]	54.8	54.6	54.5	54.4	54.6	55	56.1	59.5
DISCHARGE TEMP. 2ND :	[degC]	75.8	75.8	75.9	76	76.2	76.7	77.6	80.6
DISCHARGE TEMP. 1ST :	[degC]	56	55.9	55.8	55.8	56	56.5	57.6	61.1
INTERMED. PRESS. :	[kg/cm2A]	1.76	2.01	2.25	2.48	2.71	2.95	3.26	4.42
REFRIG. FLOW RATE 2ND :	[m3/h]	22	25.8	29.4	32.7	36.2	40	44.8	62.7
REFRIG. FLOW RATE INT. :	[m3/h]	47.6	46.7	45.7	45.1	43.8	42.5	41	35.5
REFRIG. FLOW RATE 1ST :	[m3/h]	269	319	367	414	461	511	574	818
REFRIG. FLOW RATE 2ND :	[kg/h]	246.1	287.6	327.9	364.2	403.7	444.7	496	684.9
REFRIG. FLOW RATE INT. :	[kg/h]	51.92	58.19	63.8	69.09	73.63	77.98	82.93	96.93
REFRIG. FLOW RATE 1ST :	[kg/h]	194	229.3	264	298.2	332.1	367.9	413.5	588.9
INJECT. OIL FLOW RATE 1ST :	[L/min]	34	34	34	34	34	34	34	34
LUB. OIL FLOW RATE 2ND :	[L/min]	25.5	25.4	25.3	25.2	25.1	25	24.9	24.4
LUB. OIL FLOW RATE 1ST :	[L/min]	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
TOTAL OIL FLOW RATE 2ND :	[L/min]	25.5	25.4	25.3	25.2	25.1	25	24.9	24.4
TOTAL OIL FLOW RATE 1ST :	[L/min]	71.5	71.5	71.5	71.5	71.5	71.5	71.5	71.5
TOTAL OIL FLOW RATE :	[L/min]	97	96.9	96.8	96.7	96.6	96.5	96.4	95.9
OIL HEAT REJECTION :	[Mcal/h]	60.8	60.8	60.9	61	61.5	62.5	64.7	71.4
OIL SPEC HT :	[kcal/kgC]	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
OIL DENSITY :	[kg/L]	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
COP :	[-]	0.845	0.966	1.08	1.18	1.27	1.35	1.42	1.65

--- SUPER HEAT is NOT counted in refrigeration capacity ---

--- WITH WATER COOLED OIL COOLER ---

--- WITH LIQUID SUBCOOLER ---

REFRIG. FLOW RATE :	[m3/h]	47.6	46.7	45.7	45.1	43.8	42.5	41	35.5
REFRIG. FLOW RATE :	[kg/h]	51.92	58.19	63.8	69.09	73.63	77.98	82.93	96.93
HEAT REJECTION :	[Mcal/h]	12.8	14.4	15.9	17.2	18.4	19.6	20.9	24.6

COMPOUND TWO STAGE SCREV 2016.ver1		MYCOMW 2016.ver1e							
DATE :		07-14-2024							
MODEL :		N1612LSC-MBL-63							
ROTOR & PORT 2ND :		125S L							
ROTOR & PORT 1ST :		160L MB							
REFRIGERANT :		AMMONIA							
RECOMMENDED PORT :		LBM	LBM	LBM	LBM	LBM	LBM	LBL	LBL
Vi 2ND :	[-]	5.21	4.71	4.31	4	3.73	3.5	3.24	2.56
Vi 1ST :	[-]	1.62	1.79	1.95	2.11	2.26	2.41	2.61	3.3
CAPACITY :	[Mcal/h]	68.5	80	91.2	102.1	112.8	123.8	137.8	189.7
CAPACITY :	[TR]	22.6	26.5	30.2	33.8	37.3	40.9	45.6	62.7
ABSORBED POWER :	[kW]	85.5	87.8	90	92.3	95.1	98.7	104.7	125.8
ABSORBED POWER 2ND :	[kW]	60	60.3	60.7	61	61.4	61.8	62.3	64.1
ABSORBED POWER 1ST :	[kW]	25.6	27.4	29.3	31.3	33.7	36.9	42.5	61.8
DRIVE SHAFT SPEED :	[min-1]	3566	3566	3566	3566	3566	3566	3566	3566
COMPRESSOR SPEED :	[min-1]	4350	4350	4350	4350	4350	4350	4350	4350
INDICATOR POSITION 2ND :	[%]	100	100	100	100	100	100	100	100
INDICATOR POSITION 1ST :	[%]	30	40	50	60	70	80	90	100
SWEPT VOLUME RATIO (2ND/1S	[-]	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17
CONDENSING TEMP. :	[degC]	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9
EVAPORATIVE TEMP. :	[degC]	-32	-32	-32	-32	-32	-32	-32	-32
SUCTION SUPERHEAT :	[degC]	23	23	23	23	23	23	23	23
INTERMED. SUPERHEAT :	[degC]	0	0	0	0	0	0	0	0
LIQUID APPROACH TEMP. :	[degC]	5	5	5	5	5	5	5	5
LIQUID SUBCOOLING :	[degC]	0	0	0	0	0	0	0	0
SUCTION TEMP. 1ST :	[degC]	-9	-9	-9	-9	-9	-9	-9	-9
OIL SUPPLY TEMP. :	[degC]	50	50	50	50	50	50	50	50
SUCTION PRESS. :	[kg/cm2A]	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
DISCHARGE PRESS. :	[kg/cm2A]	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
OIL SUPPLY PRESS. :	[kg/cm2A]	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
SUCTION PRES. DROP :	[kg/cm2]	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
DISCHARGE PRES. DROP :	[kg/cm2]	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SWEPT VOLUME 2ND :	[m3/h]	290	290	290	290	290	290	290	290
SWEPT VOLUME 1ST :	[m3/h]	918	918	918	918	918	918	918	918
LOAD(VOL. FLOW RATE) 2ND :	[%]	90.9	92.8	94.2	95.2	96.2	97	97.9	100
LOAD(VOL. FLOW RATE) 1ST :	[%]	33.1	39.1	45	50.8	56.6	62.6	70.3	100
INTERMED. TEMP. :	[degC]	-19.5	-16.4	-13.8	-11.5	-9.29	-7.09	-4.47	3.74
SUCTION TEMP. 2ND :	[degC]	57.1	57.2	57.3	57.5	57.9	58.7	60.2	65.3
DISCHARGE TEMP. 2ND :	[degC]	77.8	78.1	78.3	78.6	79.1	79.8	81.1	85.3
DISCHARGE TEMP. 1ST :	[degC]	58.4	58.5	58.7	59	59.5	60.3	61.9	67
INTERMED. PRESS. :	[kg/cm2A]	1.98	2.26	2.54	2.8	3.06	3.34	3.7	5.03
REFRIG. FLOW RATE 2ND :	[m3/h]	25.3	29.6	33.7	37.5	41.6	45.9	51.5	72.3
REFRIG. FLOW RATE INT. :	[m3/h]	46.8	45.6	44.4	43.6	42.2	40.7	38.9	32.8
REFRIG. FLOW RATE 1ST :	[m3/h]	273	323	372	420	467	517	581	826
REFRIG. FLOW RATE 2ND :	[kg/h]	280.1	327	372.5	413.3	457.8	503.8	561.3	772.5
REFRIG. FLOW RATE INT. :	[kg/h]	56.94	63.5	69.3	74.72	79.26	83.52	88.2	100.2
REFRIG. FLOW RATE 1ST :	[kg/h]	222.9	263.4	303.1	342.1	380.9	421.7	473.7	673.6
INJECT. OIL FLOW RATE 1ST :	[L/min]	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4
LUB. OIL FLOW RATE 2ND :	[L/min]	25.4	25.3	25.2	25.1	25	24.8	24.7	24.2
LUB. OIL FLOW RATE 1ST :	[L/min]	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1
TOTAL OIL FLOW RATE 2ND :	[L/min]	25.4	25.3	25.2	25.1	25	24.8	24.7	24.2
TOTAL OIL FLOW RATE 1ST :	[L/min]	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5
TOTAL OIL FLOW RATE :	[L/min]	95.9	95.8	95.7	95.6	95.4	95.3	95.2	94.6
OIL HEAT REJECTION :	[Mcal/h]	64.8	65.3	65.9	66.4	67.4	68.9	71.9	81.2
OIL SPEC HT :	[kcal/kgC]	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
OIL DENSITY :	[kg/L]	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
COP :	[-]	0.931	1.06	1.18	1.29	1.38	1.46	1.53	1.75

--- SUPER HEAT is NOT counted in refrigeration capacity ---

--- WITH WATER COOLED OIL COOLER ---

--- WITH LIQUID SUBCOOLER ---									
REFRIG. FLOW RATE :	[m3/h]	46.8	45.6	44.4	43.6	42.2	40.7	38.9	32.8
REFRIG. FLOW RATE :	[kg/h]	56.94	63.5	69.3	74.72	79.26	83.52	88.2	100.2
HEAT REJECTION :	[Mcal/h]	14.1	15.8	17.3	18.7	19.9	21	22.3	25.5

COMPOUND TWO STAGE SCREV 2016.ver1		MYCOMW 2016.ver1e							
DATE :		07-14-2024							
MODEL :		N1612LSC-MBL-63							
ROTOR & PORT 2ND :		125S L							
ROTOR & PORT 1ST :		160L MB							
REFRIGERANT :		AMMONIA							
RECOMMENDED PORT :		LBM	LBM	LBM	LBM	LBM	LBL	LBL	
Vi 2ND :	[-]	5.42	4.9	4.49	4.16	3.89	3.64	3.37	2.66
Vi 1ST :	[-]	1.56	1.72	1.88	2.03	2.17	2.32	2.5	3.17
CAPACITY :	[Mcal/h]	64.2	75	85.5	95.7	105.7	116	129.1	177.9
CAPACITY :	[TR]	21.2	24.8	28.3	31.6	34.9	38.4	42.7	58.8
ABSORBED POWER :	[kW]	84.9	87	89.2	91.4	94	97.5	103.3	123.7
ABSORBED POWER 2ND :	[kW]	59.8	60.2	60.5	60.8	61.2	61.6	62	63.7
ABSORBED POWER 1ST :	[kW]	25.1	26.9	28.7	30.5	32.8	35.9	41.3	60
DRIVE SHAFT SPEED :	[min-1]	3566	3566	3566	3566	3566	3566	3566	3566
COMPRESSOR SPEED :	[min-1]	4350	4350	4350	4350	4350	4350	4350	4350
INDICATOR POSITION 2ND :	[%]	100	100	100	100	100	100	100	100
INDICATOR POSITION 1ST :	[%]	30	40	50	60	70	80	90	100
SWEPT VOLUME RATIO (2ND/1S	[-]	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17
CONDENSING TEMP. :	[degC]	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9
EVAPORATIVE TEMP. :	[degC]	-32	-32	-32	-32	-32	-32	-32	-32
SUCTION SUPERHEAT :	[degC]	41	41	41	41	41	41	41	41
INTERMED. SUPERHEAT :	[degC]	0	0	0	0	0	0	0	0
LIQUID APPROACH TEMP. :	[degC]	5	5	5	5	5	5	5	5
LIQUID SUBCOOLING :	[degC]	0	0	0	0	0	0	0	0
SUCTION TEMP. 1ST :	[degC]	9	9	9	9	9	9	9	9
OIL SUPPLY TEMP. :	[degC]	50	50	50	50	50	50	50	50
SUCTION PRESS. :	[kg/cm2A]	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
DISCHARGE PRESS. :	[kg/cm2A]	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
OIL SUPPLY PRESS. :	[kg/cm2A]	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
SUCTION PRES. DROP :	[kg/cm2]	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
DISCHARGE PRES. DROP :	[kg/cm2]	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SWEPT VOLUME 2ND :	[m3/h]	290	290	290	290	290	290	290	290
SWEPT VOLUME 1ST :	[m3/h]	918	918	918	918	918	918	918	918
LOAD(VOL. FLOW RATE) 2ND :	[%]	90.4	92.4	93.9	94.9	95.9	96.8	97.7	100
LOAD(VOL. FLOW RATE) 1ST :	[%]	33.1	39.1	45	50.8	56.5	62.6	70.3	100
INTERMED. TEMP. :	[degC]	-20.7	-17.7	-15	-12.9	-10.6	-8.44	-5.84	2.37
SUCTION TEMP. 2ND :	[degC]	58.2	58.5	58.8	59.1	59.7	60.6	62.3	68
DISCHARGE TEMP. 2ND :	[degC]	78.6	79	79.4	79.7	80.3	81.1	82.6	87.3
DISCHARGE TEMP. 1ST :	[degC]	59.5	59.8	60.2	60.6	61.2	62.2	64	69.8
INTERMED. PRESS. :	[kg/cm2A]	1.88	2.15	2.41	2.66	2.91	3.17	3.51	4.78
REFRIG. FLOW RATE 2ND :	[m3/h]	23.8	27.9	31.8	35.2	39.1	43.2	48.5	68.4
REFRIG. FLOW RATE INT. :	[m3/h]	47.2	46.1	45	44.4	43	41.6	39.9	33.9
REFRIG. FLOW RATE 1ST :	[m3/h]	274	324	372	420	468	518	581	827
REFRIG. FLOW RATE 2ND :	[kg/h]	262.6	306.6	349.1	386.5	428.2	471.4	525.5	725
REFRIG. FLOW RATE INT. :	[kg/h]	54.29	60.64	66.27	71.63	76.08	80.28	84.97	97.34
REFRIG. FLOW RATE 1ST :	[kg/h]	208	245.8	282.7	319.1	355.2	393.2	441.6	628.2
INJECT. OIL FLOW RATE 1ST :	[L/min]	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4
LUB. OIL FLOW RATE 2ND :	[L/min]	25.4	25.3	25.2	25.1	25	24.9	24.8	24.3
LUB. OIL FLOW RATE 1ST :	[L/min]	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1
TOTAL OIL FLOW RATE 2ND :	[L/min]	25.4	25.3	25.2	25.1	25	24.9	24.8	24.3
TOTAL OIL FLOW RATE 1ST :	[L/min]	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5
TOTAL OIL FLOW RATE :	[L/min]	95.9	95.8	95.7	95.6	95.5	95.4	95.3	94.7
OIL HEAT REJECTION :	[Mcal/h]	66.6	67.4	68.3	69.1	70.3	72.1	75.4	85.9
OIL SPEC HT :	[kcal/kgC]	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
OIL DENSITY :	[kg/L]	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
COP :	[-]	0.879	1	1.11	1.22	1.31	1.38	1.45	1.67

--- SUPER HEAT is NOT counted in refrigeration capacity ---

--- WITH WATER COOLED OIL COOLER ---

--- WITH LIQUID SUBCOOLER ---

REFRIG. FLOW RATE :	[m3/h]	47.2	46.1	45	44.4	43	41.6	39.9	33.9
REFRIG. FLOW RATE :	[kg/h]	54.29	60.64	66.27	71.63	76.08	80.28	84.97	97.34
HEAT REJECTION :	[Mcal/h]	13.4	15.1	16.5	17.9	19.1	20.2	21.4	24.7

DATE : 01-15-2024

MYCOM SCREW COMPRESSOR PERFORMANCE COMPOUND TWO STAGE

Title :	
MODEL :	N2016MSC-LBM-*1
ROTOR & PORT 2ND :	160S M
ROTOR & PORT 1ST :	200M LB
REFRIGERANT :	AMMONIA

RECOMMENDED PORT :		LBL
Vi 2ND :	[-]	3.29
Vi 1ST :	[-]	3.03
CAPACITY :	[kW]	220.6
CAPACITY :	[TR]	62.7
ABSORBED POWER :	[kW]	137.5
ABSORBED POWER 2ND :	[kW]	83.6
ABSORBED POWER 1ST :	[kW]	53.9
DRIVE SHAFT SPEED :	[min-1]	2950
COMPRESSOR SPEED :	[min-1]	2950
INDICATOR POSITION 2ND :	[%]	100
INDICATOR POSITION 1ST :	[%]	100
SWEPT VOLUME RATIO (2ND/1ST) :	[-]	2.46
CONDENSING TEMP. :	[degC]	41.0
EVAPORATIVE TEMP. :	[degC]	-36.5
SUCTION SUPERHEAT :	[degC]	0.00
INTERMED. SUPERHEAT :	[degC]	0.00
LIQUID APPROACH TEMP. :	[degC]	5.00
LIQUID SUBCOOLING :	[degC]	0.00
SUCTION TEMP. 1ST :	[degC]	-36.5
OIL SUPPLY TEMP. :	[degC]	50.0
SUCTION PRESS. :	[MPaA]	0.081
DISCHARGE PRESS. :	[MPaA]	1.65
OIL SUPPLY PRESS. :	[MPaA]	1.84
SUCTION PRES. DROP :	[MPa]	0.005
DISCHARGE PRES. DROP :	[MPa]	0.050
SWEPT VOLUME 2ND :	[m3/h]	415
SWEPT VOLUME 1ST :	[m3/h]	1020
LOAD(SUCTION VOL. FLOW RATE) 2ND :	[%]	100
LOAD(SUCTION VOL. FLOW RATE) 1ST :	[%]	100
INTERMED. TEMP. :	[degC]	-5.57
SUCTION TEMP. 2ND :	[degC]	54.3
DISCHARGE TEMP. 2ND :	[degC]	71.9
DISCHARGE TEMP. 1ST :	[degC]	55.5
INTERMED. PRESS. :	[MPaA]	0.347
REFRIG. FLOW RATE 2ND :	[m3/h]	70.1
REFRIG. FLOW RATE INT. :	[m3/h]	55.0
REFRIG. FLOW RATE 1ST :	[m3/h]	908
REFRIG. FLOW RATE 2ND :	[kg/h]	774.7
REFRIG. FLOW RATE INT. :	[kg/h]	121.6
REFRIG. FLOW RATE 1ST :	[kg/h]	653.2
INJECT. OIL FLOW RATE 1ST :	[L/min]	63.9
LUB. OIL FLOW RATE 2ND :	[L/min]	36.8
LUB. OIL FLOW RATE 1ST :	[L/min]	66.4
TOTAL OIL FLOW RATE 2ND :	[L/min]	36.8
TOTAL OIL FLOW RATE 1ST :	[L/min]	130
TOTAL OIL FLOW RATE :	[L/min]	167
OIL HEAT REJECTION :	[kW]	103.4
OIL SPEC HT :	[J/kgK]	1930
OIL DENSITY :	[kg/m3]	880
COP :	[-]	1.60
Elevation :	[m]	NA
Atmospheric :	[MPa]	NA

--- SUPER HEAT is NOT counted in refrigeration capacity ---

--- WITH WATER COOLED OIL COOLER ---

--- WITH LIQUID SUBCOOLER ---

REFRIG. FLOW RATE :	[m3/h]	55.0
REFRIG. FLOW RATE :	[kg/h]	121.6
HEAT REJECTION :	[kW]	35.8

--- Refrigeration oil is not soluble with refrigerant (mineral oil) ---

--- When choosing the motor set a safety factor of more than 10% for the brake power. ---

--- Please check carefully the operating range. ---
--- Reference temperature : Dew Point ---

*** MYCOMW27 compressor performance table is valid until the end of Mar, 2024. ***

PACKAGE DATASHEET

Purchaser: **Zanjan Petrochemical Co.**

Owner: **Zanjan Petrochemical Co.**

Project: **UREA & AMMONIA**

Plant: **Zanjan City**

Location: **IRAN**

As per MYCOM STD Compressor Skid Option

Pidec 2nd reply: Noted. Also as mentioned before, note that electrical heat tracing will be in vendor scope of work and supply. Please confirm clearly.

Meeting conclusion: (02.10.2024)

Noted and confirm by vendor, will be applied during detail engineer stage.

Vendor Reply: Heat tracing will be added

Please specify whether there should be any electrical heat trace inside the package or not.
And be noted that if there should be any, it shall be provided by vendor.

Purchaser		**Zanjan Petrochemical Co.**
Owner		**Zanjan Petrochemical Co.**
Plant Name/Project		UREA
No.of Required units:		1 Refrigeration Package(2 Compressor Skids and Common Condensing Unit)
Item No. /Name		

Design Operating Condition

		Design Case
Refrigerant		Amm
Capacity	kg/hr	500.0 F
Evaporating temp	°C	-37.5
Condensing temp	°C	50

Pidec 2nd reply: So please replace it with mentioned rating (150KW) in new proposal.
Meeting conclusion: (02.10.2024)
Noted and confirm by vendor, will be applied during detail engineer stage.

Vendor Reply: Brakepower is 120 kW

Basic Specification

Please mention break power (shaft power) here not motor power.

Package Type	Refrigeration			Q'ty:1 Unit	
Ref. Compressor Type/Model		Screw Compressor		N2016	
No.of Compressors: Two compressor Per Unit					
Operating Condition (1 unit)		**Max capacity**		**Note**	
	Comp. Capacity	**207.0**		**Given capacities are ±5% per each compressor**	
	Break kW	**150.0**		**Given capacities are ±5% per each compressor**	
	Speed	**2950**			

Driver	☑	Electric motor	☐	Soft starter
Starting Method	☑	Direct on line	☐	VFD
Capacity Control	Control Source	☐	Inlet Pressure	
	Range of Control	☑	30 to 100 %	
	Control Method	☑	Slide valve	
Oil Separation	1 stage (Direction Change, Gravity and Coalescer element)			
Location	☑	Outdoor/underroof		
	☑	Ambient (-30 /+48)°		
Noise Limitation	☑	Specification (85 dBa @ 1 Meter from Skid Edge)		
Code & Standard	☑	JIS ☑ ASME VIII div 1 ☑ IEC, IECEX (No mechanical Atex)		

Altitude +1846m above sea level

Vendor Reply: OK

Pidec 2nd reply: Noted.

230Vac or 24 Vdc (as you mentioned in relevant doc. "Preliminary Utility Consumption")? Please correct this discrepancy.

Utility (Design capacity)

	Service	Drive Power (kW)	Voltage (V)	Frequency (Hz	Note
Electricity	Main Electric Moto	**150**	6000	50	
	Oil Pump Motors	5	400	50	
	Heater/ Heat tracing	2 (approx.)	400	50	
	Control Panel	2	230	50	IP55
	Air Cooler	N/A			
Cooling water	Temperature (°C.)	in 26C	return 36C	Flow Rate kg/hr 50,000	
	Pressure (bar G)	in	return		
Steam	Pressure (kg:cm²G)		Temp. (deg.°C.)		
Instrument Air	Pressure (bar G)	4 - 6	Temp. (deg.°C.)		

Vendor Reply: Noted.

Pidec 2nd reply: Noted about what? Which one is correct? 230Vac or 24V dc? Specify it clearly.

Screw Compressor Unit Components(per Compressor Unit)

As per PIDEC process data sheet, material of construction for internals shall be carbon steel.
Meeting conclusion: (02.10.2024)
Nodular cast iron material is agreed between vendor and owner and PIDEC requirement will not be followed.

☑ ***Compressor*** Make Mayekawa Mfr.

Type:	Oil Injected Screw Compressor	Model N2016	
Material :	Casing: Cast Iron FC300	Rotor: Nodular Cast Iron	
Shaft Seal:	Singel Mechanical Seal as per MYCOM STD		
		Code: JIS	

☑ ***Electric motor for compressor*** Q'TY: 1

Type:	Squirrel Cage Induction motor	Type of Explosion pr	Exec
Enclosure	TEFC	Ingress protection:	IP56
Rated Power:	**150**	Voltage:	~~400~~ V 6000 V
Poles:	2	Drive Speed:	2950 rpm
Frequency :	50		

Vendor Reply:
Rated power is 132 KW @site condition and based on client request voltage to be changed to MV Motor.

Pidec 2nd reply: Noted.

☑ ***Oil pump*** Make MYCOM/ Mayekawa Mfr.

Type:	Screw type Gear Pump		
Material :	Casing CI	Rotor:	CI

☑ ***Electric motor for oil pump***

Type:	Squirrel Cage Induction motor	Type of Explosi	
Enclosure:	TEFC	Ingress protectic	
Rated Power:	5	Voltage:	
Poles:	4	Drive Speed:	
Frequency :	50		

☑ ***Oil Separator*** Q'TY: 1

Type:	Horizontal drum type (Mycom design)	Code:	MYCOM STD
Material:	CS	Element	coalescers

☑ ***Oil cooler*** Q'TY: 1

Type: MYCOM STD
Water Cooled

☑ ***Oil Filter*** Q'TY: 1

Code: MYCOM STD

☑ ***Suction gas strainer*** Q'TY: 1

Type: Cone type

☐ ***Noise Enclosure(If required)*** Q'TY: 0

Unit Components (Common part)

☑ ***Refrigerant Condenser*** Q'TY: 1

Type: Water Cooled Code: ASME VIII without U-stamp

Material: Carbon Steel

☑ ***Receiver*** Q'TY: 1

Type: Pressure vessel Code: ASME VIII without U-stamp

☑ ***Economizer***

Q'TY: 1

Material: Shell Carbon Steel Code: MYCOM STD

☑ ***Suction K.O Drum*** Q'TY: 1

☑ ***Gas Purger*** Q'TY: 1

Code: MFR STD

☑ ***Piping for Skid and Interconnecting piping a*** Q'TY: 1

Pidec 2nd reply: About PLC is noted. But you mentioned control panel (not PLC) here. Modify it accordingly.

☑ ***Base Frame***

Type Carbon steel

☑ ***Local Push buttons and junction boxes***

Material : SS 304 or AL

Local c rea (Zone 2, IIC, T3). Modify it.

Vendor Reply: This is PLC and in safer Area

Control Panel and Instruments Q'ty: 1

☑ Control panel

Scope ☑ Vendor

Location ☑ Indoor ☑ Non-hazardous

Type ☑ Transmitters

☑PLC Siemens S7-400

Manufacturer ☑Siemens or Equivalent Allen Bradly

Instrumentation as per MYCOM STD PID.Number and Type of Instruments will be as per MYCOM design

Package Design and manufacturing will be Only as per PARDIS project with following changes:

1) Motors will be Exec instead of Safe Area
2) Instruments will be Exd Inside Package
3) Two Compressor is selected based on MR while Pardis has one compressor Skid
4) Documents for Compressor Skid will be PID, Compressor Package Data sheet, Compressor Skid drawing
5) No Specification can be applied on this offer except agreed specified items in this quote

Note that test and inspection of electrical equipments (motors, LCP,...) should be done as per our SOI attached to the requisition. Please confirm and consider it in your offer.

Test & Inspection

Vendor reply: Refer to bid stage ITP agreed with Owner

Pidec 2nd reply: Note to originator:
Final decision about this matter should be made by the owner.

Items	Compressor	Pressure Vessel								Remarks
		a	b							
Performance Test	S	-	-							
Mechanical Running Tes	S	-	-							
Noise & Vibration Test	S	-	-							
Functional test	-	-	-	-	-	-		-	-	
Material Inspection	S	S	-	-	S	-		-	-	See note 3
Non-destructive Test (if applicable)	-	-	-	-	-	-		-	-	
Hydrostatic Test	S	S	-	S	-	-		-	-	See note 4
Pneumatic Leak Test	-		-		S	-		-	W	
Visual Inspection	-	W	-	S	S	-		W	W	
Dimensional Inspection	S	W	-	S	S	-		W	W	
Painting Inspection	-	-	-	-	-	-		-	W	
Shipping Inspection	-	-	-	-	-	-		-		
	-									

Abbreviations)

a ASME VIII Div.1 pressure vessel
b No code pressure vessel.
c Gas and lube oil piping
d Coolant, CW, IA piping and tubing
e Pre-fabricated piping

* Pneumatic leak test for piping will be performed as whole packaged unit after assembly, but before painting.
** SW is for tubing for gas and lube oil line.
W Witness Inspection by customer
S Report or certificate issue (see note 4)
V Manufacture's test/inspection (Report and certificate is not issued)

Notes)

1) Third party's inspection for local standard, regulation and code shall be provided by customer.
2) Compressor testrun will be done using air as compressed fluid with shop motor and lube oil system.
Tests will be performed at our workshop in Japan.
3) Hydrostatic Pressure Test might be replaced by Pneumatic Testing according to the Code.
4) Test reports shall be provided acc. To supplier format.

Code and Standard

General:	MYCOM Standard, IEC, JIS, ASME-Div.1
Compressor:	MYCOM Standard, JIS
Pressure Vessel / Heat Exchanger:	ASME VIII, DIV 1.
Piping:	MYCOM STD for Compressor Skid, ASME B16.5 & B31.3 for others
Valve:	MYCOM STD for Compressor Skid, Carbon steel
Flange:	MYCOM STD for Compressor Skid, ANSI, Carbon steel, JIS
Tubing :	Double ferrule compression type (SS 316) / SS 1/2"
Electric:	IEC, EX-proof
Cable	Armoured cable
Cable glands	
Material:	MYCOM STD for Compressor Skid, ANSI,JIS,ASTM,ASME, DIN
Painting :	Vendor offshort painting

Note :

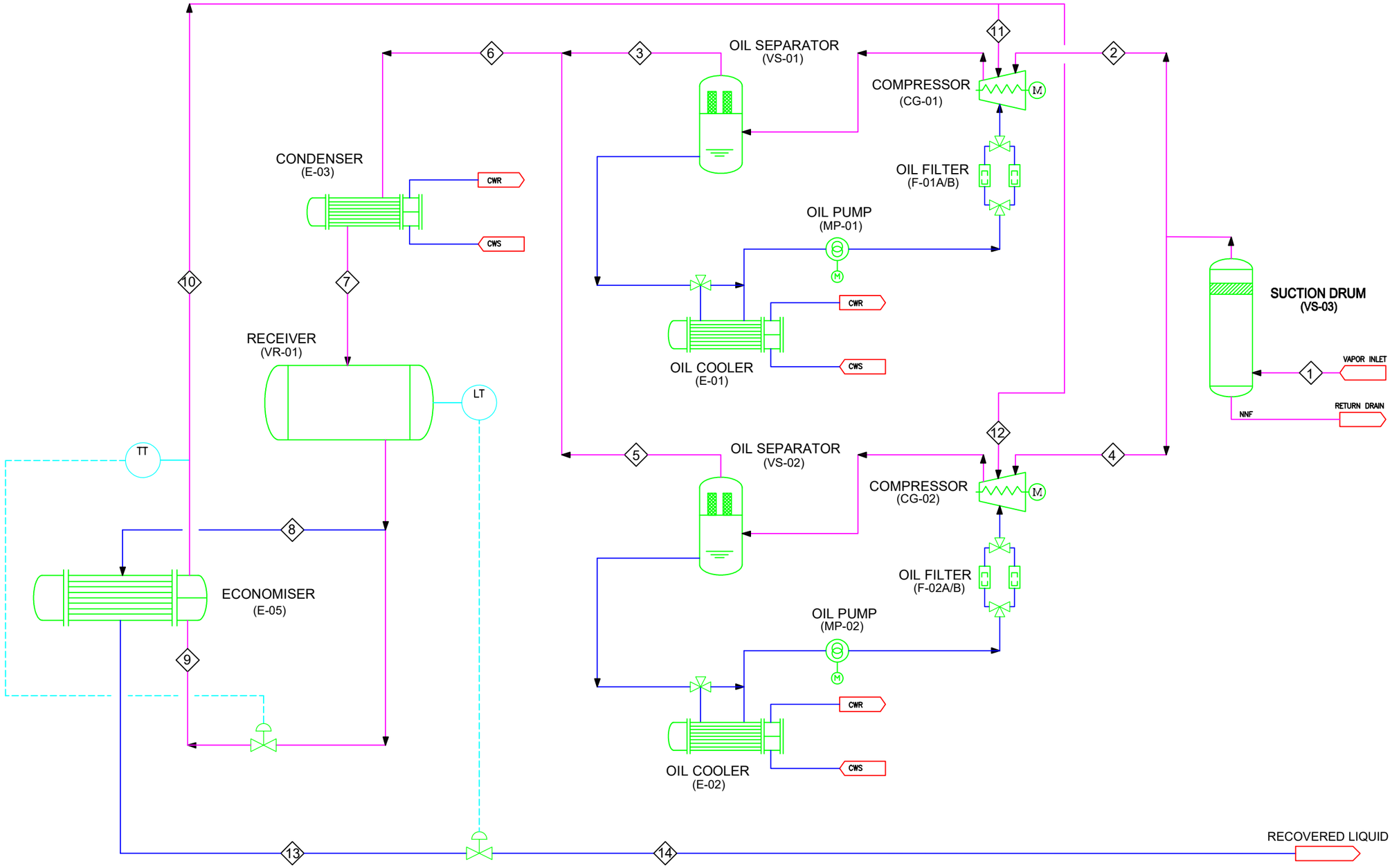
Scope of Supply

No.	Item	Scope	Remarks
1	Refrigeration Unit	Vendor	
2	Motors	Vendor	
3	PLC Control Panel for safe area	Vendor	
4	Motor starter (MCC)	N/A	Direct Feeder for Users
5	Foundation Work	Customer	
6	Installation Work, Assembly	Customer	
7	Piping Work		
	Piping within skid (Shop Work)	VENDOR	(Skids to be considered together)
	All piping till Reciever	VENDOR	
	Piping to others	Customer	
8	Electric Wiring Work (for power)	Customer	
	Instrun (Shop Work)	VENDOR	
	Wiring (Field Work)	Customer	
9	Instrumentation Work (Wiring/Tubing)		
	Wiring (Shop Work)	VENDOR	
	Wiring between skids	VENDOR	Connections between skids will be unplugged for transport
	Wiring (Field Work)	Customer	
10	Insulation within skid		Insulation by customer
	Design	Customer	
	Material & Work	Customer	
11	Heat Tracing		
	Material	Vendor	
	Work	Vendor	
12	Transportation	Vendor	Till Ex-Work Local Factory
13	Supervising		
	Installation, Re-assembly	Optional	
	Pre-commissioning	Optional	
	Start-up	Optional	
14	Schrinked Packing	VENDOR	

No.	Item	Scope	Remarks
15	Lube Oil for initial charge	Optional	
16	Refrigerant	Customer	
17	Ocean Freight	Vendor	
18	Capital/two years operational spare par	Optional	
	Commissioning spare parts	Vendor	a) As per commercial offer
19	Structures(Inside Skid)	VENDOR	Within the skid
20	Anchor bolts and nuts	VENDOR	
21	Lifting Lugs for unit	VENDOR STD	
22	Special tools	VENDOR	For compressor only
23	Main motor cable gland	Customer	
24	Molecular Sleeve, Fitler dryer	N/A	

Notes

1 Guarantee period.
Twelve (12) months after start-up or eighteen (18) months after notification of readiness for shipment, whichever occurs first.



NORMAL OPERATION, TS = -8.83C

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
TEMP.	°C	-8.83	-8.83	84.00	-8.83	84.00	84.00	41.28	41.28	-8.83	-8.98	-8.99	-8.99	-3.66	-36.65
PRESS.	barA	0.83	0.83	16.47	0.83	16.47	16.13	16.08	16.08	3.05	3.03	3.03	3.03	15.62	0.86
MASS FLOW	kg/h	1160.00	580.00	680.00	580.00	680.00	1360.00	1360.00	1160.00	200.00	200.00	100.00	100.00	1160.00	1160.00
DENSITY	kg/m3	0.82	0.82	10.26	0.82	10.26	10.05	576.23	576.23	2.43 / 649.6	2.43	2.43	2.43	642.6	0.908 / 680.5
V.F.	-	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.193	1.00	1.00	1.00	0.00	0.1366

NOTES

– PRESSURE CONTROLLER OUTPUT SIGNAL WILL BE SENT TO REFRIGERATION PACKAGE BY CLIENT TO CONTROL COMPRESSOR LOADING AS TO MAINTAIN PRESSURE OF AMMONIA STORAGE TANK CONSTANT.

LEGEND

REFERENCE DRAWINGS	DWG. No.
--	--

VENDOR:

VENDOR DOC. NO.:

Rev.	Date	Class	Purpose of Issue	Prepared by	Checked by	Approved by
02	7/12/2024	IFA	ISSUED FOR APPROVAL	A.K.	M.O.	A.M.
01	5/25/2024	IFA	ISSUED FOR APPROVAL	A.K.	M.O.	A.M.
00		IFA	ISSUED FOR APPROVAL	A.K.	M.O.	A.M.

OWNER:

PROJECT:

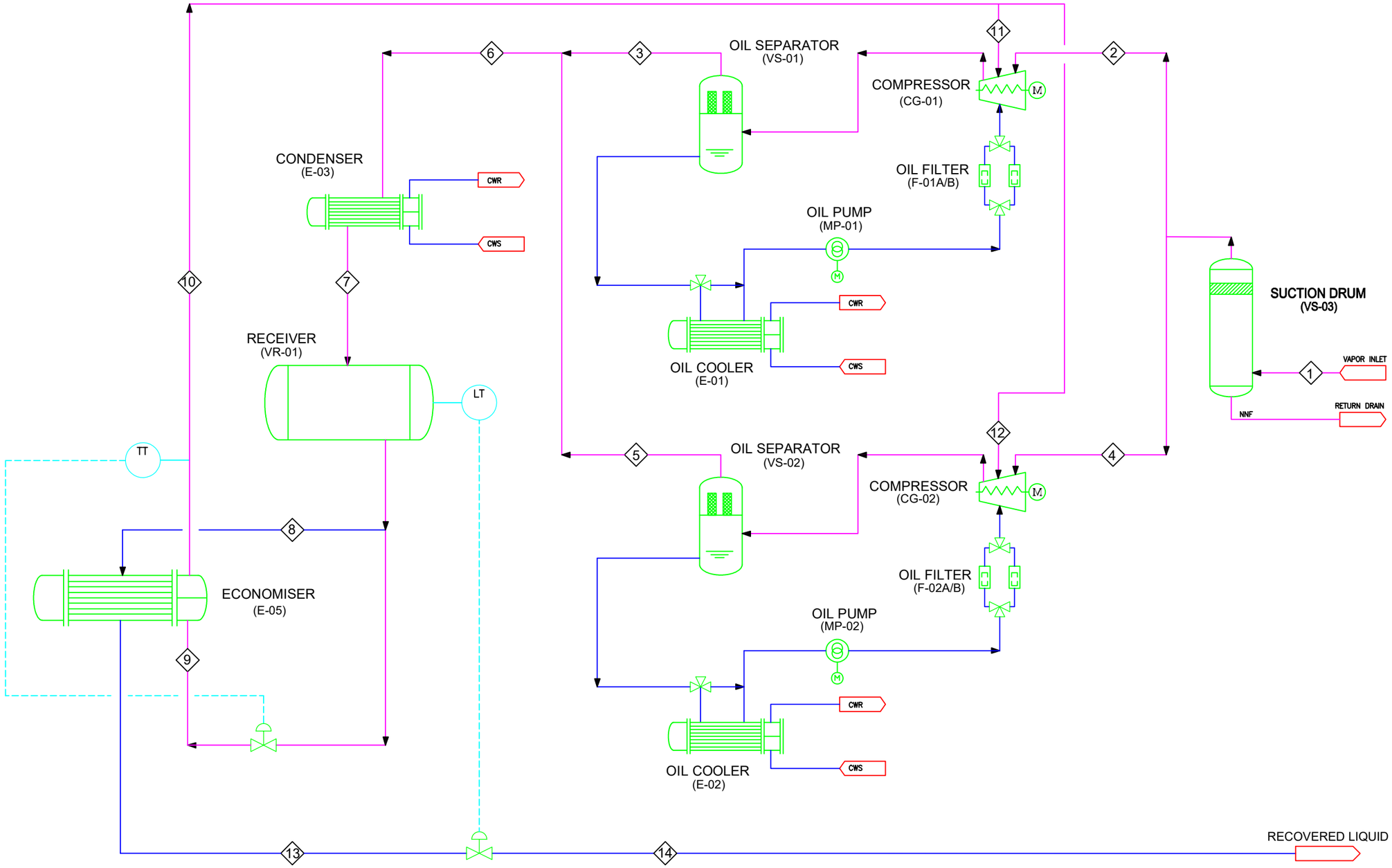
CONTRACTOR:

DRAWING TITLE:

PROCESS FLOW DIAGRAM

NORMAL OPERATION -Density 0.66 kg/m3

Rev.	Size.	Scale.	Sheet No.
02	A3	NTS	1 OF 1



NORMAL OPERATIG, TS = 9.5C

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
TEMP.	°C	9.50	9.50	84.00	9.50	84.00	84.00	41.28	41.28	-8.83	-8.98	-8.99	-8.99	-3.66	-36.65
PRESS.	barA	1.05	1.05	16.47	1.05	16.47	16.13	16.08	16.08	3.05	3.03	3.03	3.03	15.62	0.86
MASS FLOW	kg/h	1164.00	582.00	680.00	582.00	680.00	1360.00	1360.00	1164.00	196.00	196.00	98.00	98.00	1164.00	1164.00
DENSITY	kg/m3	0.76	0.76	10.16	0.76	10.16	10.05	576.26	576.26	2.43 / 649.6	2.43	2.43	2.43	642.6	0.908 / 680.5
V.F.	-	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.193	1.00	1.00	1.00	0.00	0.1403

NOTES

– PRESSURE CONTROLLER OUTPUT SIGNAL WILL BE SENT TO REFRIGERATION PACKAGE BY CLIENT TO CONTROL COMPRESSOR LOADING AS TO MAINTAIN PRESSURE OF AMMONIA STORAGE TANK CONSTANT.

LEGEND

REFERENCE DRAWINGS	DWG. No.
--	--

VENDOR:

VENDOR DOC. NO.:

Rev.	Date	Class	Purpose of Issue	Prepared by	Checked by	Approved by
02	7/13/2024	IFA	ISSUED FOR APPROVAL	A.K.	M.O.	A.M.
01	5/25/2024	IFA	ISSUED FOR APPROVAL	A.K.	M.O.	A.M.
00		IFA	ISSUED FOR APPROVAL	A.K.	M.O.	A.M.

OWNER:

PROJECT:

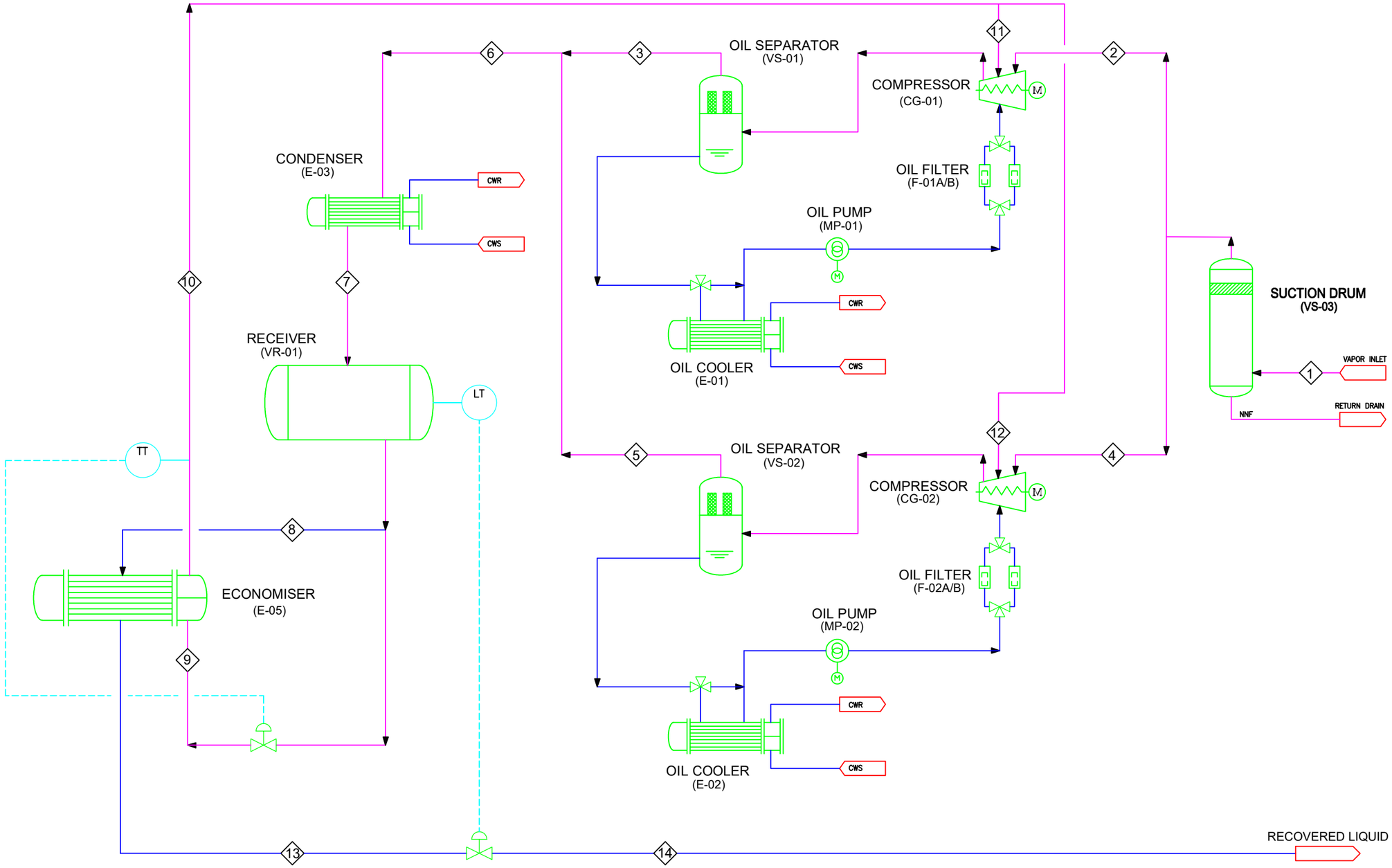
CONTRACTOR:

DRAWING TITLE:

PROCESS FLOW DIAGRAM

SATURATED STREAM

Rev.	Size.	Scale.	Sheet No.
02	A3	NTS	1 OF 1



NORMAL OPERATIG, TS = -36.5C

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
TEMP.	°C	-36.50	-36.50	84.00	-36.50	84.00	84.00	41.28	41.28	-8.83	-8.98	-8.99	-8.99	-3.66	-36.65
PRESS.	barA	1.05	1.05	16.47	1.05	16.47	16.13	16.08	16.08	3.05	3.03	3.03	3.03	15.62	0.86
MASS FLOW	kg/h	1164.00	582.00	679.00	582.00	679.00	1358.00	1358.00	1164.00	194.00	194.00	97.00	97.00	1164.00	1164.00
DENSITY	kg/m3	0.76	0.76	10.38	0.76	10.38	10.16	576.26	576.26	2.43 / 649.6	2.43	2.43	2.43	642.6	0.908 / 680.5
V.F.	-	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.193	1.00	1.00	1.00	0.00	0.1403

NOTES

– PRESSURE CONTROLLER OUTPUT SIGNAL WILL BE SENT TO REFRIGERATION PACKAGE BY CLIENT TO CONTROL COMPRESSOR LOADING AS TO MAINTAIN PRESSURE OF AMMONIA STORAGE TANK CONSTANT.

LEGEND

REFERENCE DRAWINGS	DWG. No.
--	--

VENDOR:

VENDOR DOC. NO.:

Rev.	Date	Class	Purpose of Issue	Prepared by	Checked by	Approved by
02	7/13/2024	IFA	ISSUED FOR APPROVAL	A.K.	M.O.	A.M.
01	5/25/2024	IFA	ISSUED FOR APPROVAL	A.K.	M.O.	A.M.
00		IFA	ISSUED FOR APPROVAL	A.K.	M.O.	A.M.

OWNER:

PROJECT:

CONTRACTOR:

DRAWING TITLE:

PROCESS FLOW DIAGRAM

SATURATED STREAM

Rev.	Size.	Scale.	Sheet No.
02	A3	NTS	1 OF 1

		Project: ZANJAN PC REFRIGERATION PACKAGE,	**Document Title: Inspection And Test (ITP)**		**CLIENT/OWNER:**								
		VENDOR NAME: HAM	**VENDOR DOC. NO.:**										
		vendor ITP will be followed for compressors skid, for other items, PIDEC scope of inspection will be followed by vendor.			**N & TEST PLAN (ITP) FOR REFRIGERATION UNIT**								
1	**SCOPE**	This Inspection and Test			.								DATE: 07.Apr.2024
2	**LEGEND OF THE TECHNICAL SURVEILLANCE**	1) (H)= INSPECTION NO inspection. Vendor must			nce of notified party. Next farbication stage is subject to acceptance of fteen (15) days in advance.								REV.: R2
		2) (SW)=10% OF TYPE/LOT WITNESSED. Action performed only on a certain number of pieces.											BY : AM
		3) (W)=WITNESSING. The Supplier shall inform the NOTIFIED PARTY of the date of the activity and the NOTIFIED PARTY reserves the right to witness the test. If the test is conducted at the notified date, the Supplier may proceed with the subsequent phase, even if the NOTIFIED did not witness the test.											
		4) (R/A)=REVIEW OF TECHNICAL DOCUMENTS BEFORE COMMENCEMENT OF CONSTRUCTION. The technical documents shall be reviewed and approved before the commencement of construction											
		5) (R)=REVIEW OF DOCUMENTS. Materials certificates, statement of compliance and reports of inspection and tests conducted by the Supplier shall be revised to assess their conformance with the requirements specified in the Code and Standards, Specifications and/or Purchase Order.											
		6) (D) = Vendor Inspection											
3	**Abbreviations**	O = Owner V = Vendor SV = Sub Vendor TPI = Third Party Inspection on behalf of owner											
Item No.	Inspection Description	References / Specifications / Codes	Verifying Document	Acceptance Criteria		INSPECTION ACTIVITY					REMARKS	R E V	
						SUB-VENDOR(SV)	VENDOR(V)	PE	Client/TPI				
A PROJECT PREPARATION (Before Manufacturing)													
A1	Submission of Project documents				TYPE	H	H	R	R				
					DATE								
					SIGN								
A2	PRE INSPECTION MEETING				TYPE	H	H	H	H	-			
					DATE								
					SIGN								
A3	BASIC DESIGN DRAFT DOCUMENT LIST P&ID , LAY-OUT				TYPE	H	H	R	R	-			
					DATE								
					SIGN								
A4	KICK-OFF MEETING CUSTOMER DETAILLED DESIGN				TYPE	H	H	R	R	-			
					DATE								
					SIGN								
B MATERIAL SELECTION / SUBCONTRACTOR ORDERING													
B0	GENERAL	ALL ITEMS SUITABLE FOR AMBIENT TEMPERATURE	MATERIAL SUPPLY FABRICATION SCHEDULE QA / QC		TYPE	H	H	R	R	-			
					DATE								
					SIGN								
B1	COMPRESSOR Block MAYEKAWA(MYCOM)	MYCOM STANDARD Procedures	TEST REPORT For Compressor: '- Noise test '- Vibration test '- Perfromance test '-Hydro test	MATERIAL CERTIFICATES	TYPE	H	R	R	R	-			
					DATE								
					SIGN								
B2	MAIN MOTOR - HELMKE/VEM GERMANY	As Per HELMKE GERMANY Test Procedures Hazardous Area Certificates	TEST REPORT (Manuf. Std) - Unwitenssed routine test report		TYPE	H	H	R	R	-			
					DATE								
					SIGN								
B3	Compressor Skids including Oil pump, Oil Filter, Piping, Oil Separator, etc	MYCOM MANUFACTURER STANDARD Test Procedure and Quality Control	Dimensional Check		TYPE	H	H	R	R	-			
					DATE								
					SIGN								
B4	PUMP MOTOR-HELMKE/VEM GERMANY	MANUFACTURER STANDARD with protection class as per Exec HAZARDOUS AREA CERTIFICATE Ex ec	TEST REPORT (Manuf. Std) - Unwitenssed routine test report		TYPE	H	H	R	R	-			
					DATE								
					SIGN								
NOTE :			CERTIFIED COMPLETE:			ENDORSEMENTS:							

Toase-ehe Park Sanati Gohar Ofogh
Petrochemical Co.
CONCEPTUAL, BASIC and DETAIL DESIGN ENGINEERING OF STYRENE PARK OFFSITE

Document Title: Inspection And Test (ITP)

VENDOR DOC. NO.:

QUALITY CONTROL / INSPECTION & TEST PLAN (ITP) FOR REFRIGERATION UNIT

DATE: 07.Apr.2024

REV.:R2

BY : AM

1	**SCOPE**	This Inspection and Test plan covers all activtiies that will be carrived out in design and farbrication of equipment.
2	**LEGEND OF THE TECHNICAL SURVEILLANCE**	1) (H)= INSPECTION NOTIFICATION will be issued by manufacturer and inspection shall be performed at presence of notified party. Next farbication stage is subject to acceptance of inspection. Vendor must notify parties (see inspection activtiy) of the defidcated inspection activity at least fifteen (15) days in advance.
		2) (SW)=10% OF TYPE/LOT WITNESSED. Action performed only on a certain number of pieces.
		3) (W)=WITNESSING. The Supplier shall inform the NOTIFIED PARTY of the date of the activity and the NOTIFIED PARTY reserves the right to witness the test. If the test is conducted at the notified date, the Supplier may proceed with the subsequent phase, even if the NOTIFIED did not witness the test.
		4) (R/A)=REVIEW OF TECHNICAL DOCUMENTS BEFORE COMMENCEMENT OF CONSTRUCTION. The technical documents shall be reviewed and approved before the commencement of construction
		5) (R)=REVIEW OF DOCUMENTS. Materials certificates, statement of compliance and reports of inspection and tests conducted by the Supplier shall be revised to assess their conformance with the requirements specified in the Code and Standards, Specifications and/or Purchase Order.
		6) (D) = Vendor Inspection
3	**Abbreviations**	O = Owner V = Vendor SV = Sub Vendor TPI = Third Party Inspection on behalf of owner

Item No.	Inspection Description	References / Specifications / Codes	Verifying Document	Acceptance Criteria		ATTENDED BY: SUB-VENDOR(SV)	VENDOR(V)	PE	Client/TPI		REMARKS
B MATERIAL SELECTION / SUBCONTRACTOR ORDERING (CONTINUE)											
B5	CONDENSOR / CHILLER	ASME Sec. VIII Div. 1 and TEMA	WPS/PQR – WELDER QUALIFICATIONS WELD - WELDING CHECK NDE REPORTS CLEANLINESS TREATMENT HYDRAULIC & PRESSURE STATIC TEST DIMENSIONAL INSPECTION RT/UT REQUIREMENT Spot (on pressure retaining parts) PAINTING INSPECTION	MANUFACTURING STANDARD & Approved Drawing	TYPE	H	W	R	R		
					DATE						
					SIGN						
B6	BASE FRAME For CHILLER Skid		PT -10 % OF MAJOR STRUCTURAL CONNECTIONS 100 % PT LIFTING LUG WELDS 100 % UT BUTT WELDS IN MAJOR SUPPORTING BEAMS	ACC. Vendor DATASHEET/DRAWING SKID CONNECTION POINTS – ANCHOR BOLT POSITIONS INSPECTION	TYPE	H	H	R	R	-	
					DATE						
					SIGN						
B7	VALVES For Chiller Skid	ASME for Chiller Skid / MYCOM STD	-MANUFACTURER INSPECTION AND TEST RECORD -Manual Valves on Compressor skid is part of MYCOM STD Skid and as per MYCOM quality control System	ACC. Vendor DATASHEET/DRAWING INSPECTION /CERTIFICATE	TYPE	H	W	R	R		Inspection will be at Vendor workshop
					DATE						
					SIGN						
B8	PIPING For Chiller Skid	ASME/MYCOM STD For Compressor skid	1) Carbon oil and refrigerant piping 10% . 2) Instrument air header 10% . Amount will be based on total amount of welded inches.	Material certificates	TYPE	H	W	R	R	-	
					DATE						
					SIGN						
B9	SAFETY VALVES	ASME/MYCOM STD For Compressor skid	MATERIAL CERTIFICATES	INSPECTION REPORT	TYPE	H	W	R	R		
					DATE						
					SIGN						
B10	Smaller components within instrumenetation routing, such asTUBING and GASKETS and bolting For chiller Skid		MATERIAL CERTIFICATES 3.1 For Compressor Skid, as per MYCOM STD quality Control System	INSPECTION CERTIFICATE	TYPE	H	R	R	R		
					DATE						
					SIGN						
B11	INSTRUMENTATION	Pressure and temperature guages are provided with 3.1 material certificates	MATERIAL CERTIFICATES 3.1 DIMENSIONAL AND CONSTRUCTION DWG HAZARDOUS AREA CERTIFICATE CALIBRATION REPORT (3.1 material certificates)		TYPE	H	R	R	R		
					DATE						
					SIGN						

NOTE : CERTIFIED COMPLETE: ENDORSEMENTS:

			Document Title: Inspection And Test (ITP)									
			VENDOR DOC. NO.:									
		QUALITY CONTROL / INSPECTION & TEST PLAN (ITP) FOR REFRIGERATION UNIT										
1	**SCOPE**	This Inspection and Test plan covers all activtiies that will be carrived out in design and farbrication of equipment.										DATE: 07.Apr.2024
2	**LEGEND OF THE TECHNICAL SURVEILLANCE**	1) (H)= INSPECTION NOTIFICATION will be issued by manufacturer and inspection shall be performed at presence of notified party. Next farbication stage is subject to acceptance of inspection. Vendor must notify parties (see inspection activtiy) of the defidcated inspection activity at least fifteen (15) days in advance.										REV.: R2
		2) (SW)=10% OF TYPE/LOT WITNESSED. Action performed only on a certain number of pieces.										BY : AM
		3) (W)=WITNESSING. The Supplier shall inform the NOTIFIED PARTY of the date of the activity and the NOTIFIED PARTY reserves the right to witness the test. If the test is conducted at the notified date, the Supplier may proceed with the subsequent phase, even if the NOTIFIED did not witness the test.										
		4) (R/A)=REVIEW OF TECHNICAL DOCUMENTS BEFORE COMMENCEMENT OF CONSTRUCTION. The technical documents shall be reviewed and approved before the commencement of construction										
		5) (R)=REVIEW OF DOCUMENTS. Materials certificates, statement of compliance and reports of inspection and tests conducted by the Supplier shall be revised to assess their conformance with the requirements specified in the Code and Standards, Specifications and/or Purchase Order.										
		6) (D) = Vendor Inspection										
3	**Abbreviations**	O = Owner V = Vendor SV = Sub Vendor TPI = Third Party Inspection on behalf of owner										

Item No.	Inspection Description	References / Specifications / Codes	Verifying Document	Acceptance Criteria		ATTENDED BY					REMARKS
						SUB-VENDOR(SV)	VENDOR(V)	PE	Client/TPI		
C INSPECTION											
C1	DIMENSIONAL INSPECTION OF SKID CONNECTION POINTS				TYPE	H	SW	R	W		Timer period of PMI will be informed.No specific dates are consider to be informed in advance by Vendor
					DATE						
					SIGN						
C2	PAINTING	Vendor STANDARD / SUPPLIER_(Painting_Standard)	THICKNESS VISUAL INSPECTION and measurement via instrument. PAINT INSPECTION REPORT		TYPE	H	W	R	R		
					DATE		-	-	-		
					SIGN						
C3	ELECTRICAL WIRING	WIRING CHECK			TYPE	H	W	R	R		
					DATE						
					SIGN						
C4	INSPECTION OF JUCTION BOX, LOCAL PANEL AND PLC	FACTORY ACCEPTANCE TEST FOR PLC 1) VISUAL INSPECTION JUNCTION BOX, LOCAL PANEL AND PLC 2) FUNCTION TEST	TEST REPORT PLC FAT TEST PROCEDURE	CONTROL NARRATIVE DRAWINGS, DATA SHEETS	TYPE	H	W	W	W		
					DATE						
					SIGN						
C5	FINAL INSPECTION		NAME PLATES CONFIRMATION	RELEASE NOTE	TYPE	H	H	W	W		
					DATE						
					SIGN						
C6	APPROVAL OF CONCESSION REQUEST AND NON-CONFORMANCE REPORTS				TYPE	H	R	R / A	R / A		
					DATE						
					SIGN						
D SHIPMENT AND LOADING											
D1	PACKING AND MARKING PREPARATION FOR SHIPMENT DETAILED PACKING LIST	Shrinked Packed	PACKING INSPECTION: VISUAL INSPECTION COMPLETENESS CHECK PACKING LIST		TYPE	H	R	R	R		
					DATE						
					SIGN						
D2	DOCUMENTATION	As per Agreed document List Incl. Final data book, ITP, etc.	A COMPLETE PACKAGE OF INSPECTION AND TEST RECORD/CERTIFICATE MANUFACTURED RECORD		TYPE	H	R/A	R/A	R/A		
					DATE						
					SIGN						

NOTE : CERTIFIED COMPLETE: ENDORSEMENTS:

Vendor Reply: To be agreed with Owner

Pidec 2nd reply: Noted.

Zanjan Refrigeration Package Preliminary Utility Consumption

Utility

Electricity	Service	Drive Power (kW)	Voltage (V)	Frequency (Hz)	Ph	Note
	Main Electric Motor Each	150	~~400~~ 6000	50	3	Rated Power of Each Compressor
	Oil Pump Motors	3	400	50	3	Qty 2 Oil Pumps(One for Each Compressor)
	Control Panel	3				24V DC
	Oil Heater	approx. 4.0 KW	400	50	3	Qty 2 Oil Heater

Cooling water	Temperature	(deg.C.)	in 27	return 36	Flow Rate	80,000 Kg/hr	
			For Two Oil Coolers and Condenser				
	Pressure	(BarG)	in	Allowable Press.	(Bar)	Fouling Resistance	(m² K/W)
Steam	Pressure	(BarG)	N/A	Temp.	(deg.℃.)	Flow Rate	(kg/hr)
Instrument Air	Pressure	(BarG)		Temp.	(deg.℃.)	Flow Rate	(kg/hr)

24 Vdc or 230Vac (as you mentioned in file "PACKAGE DATASHEET Based on MYCOM STD Compressor Skid-16 June-2024"? Please correct this discrepancy.

Vendor Reply: noted, discrepancy will be removed

Pidec 2nd reply: Noted.

ZAFIC PRC Comment
Jan. 24, 2024

1. Some specified items shall be omitted from revised SVL.
Vendor reply: refer to below reply for item 2
2. Project's AVL is NPC AVL Rev. 8 and shall be considered for local/foreign additional Sub Vendors in revised SVL.
Vendor reply: Instead of MOP AVL mentioned, NPC AVL will be used or client approval will be granted for other Sub-vendors and for MOP items mentioned in below NPC to be considered as basis. Please note for MYCOM STD Skid, subvendors are as per MYCOM AVL and cannot be modified.
3. For each items, the SVL shall be defined clearly and such definition as: "other MOP or NPC AVL" is not acceptable at all.
Vendor reply: This is not possible as this is PO stage and during project execution and considering availability of material we will select and mention exact subvendors. We can agree on origin as per Item 4 and also NPC/MYCOM AVL at this stage as main criteria for project execution.
4. Chinese/Indian Origin of material or Equipment, are not acceptable at all, **BIDDER TO CONFIRM**.
Vendor reply: Noted.
5. The original Material Test Certificates or Test Sheets for Raw Material & Equipment, shall be submitted to 3rd party inspector in Raw Material Inspection Stage, and any additional cost to verify the untraceable/Unreliable MTCs shall be borne by selected Vendor. **BIDDER TO CONFIRM**
Vendor reply: For Local Portion confirmed, for MYCOM STD Skid only ITP provided is governing and MYCOM Material Handling/ certification is governing.

Hamian

Code4	comments/ reasons for rejection. All corrected documents shall be resubmitted before starting the Manufacturing Process. In this case, VENDOR shall not proceed with subsequent work until receiving Code 1 or Code 2 or No Code from CONTRACTOR/OWNER. VENDOR shall re-submit the documents with the same revision within (10) ten working days (including transmission/mailing time) after receiving the commented documents from CONTRACTOR/OWNER.
NO Code	☐ **NO Code (Only for "FOR INFORMATION" Documents and "As Built DWGs")** Document has been submitted for CONTRACTOR's Information (FI). Consistency, completeness and correctness of document content is Vendor's responsibility.
Above checking results by PPC shall in no way relieve Vendor of any liability, obligation and responsibility out of the purchase order and the mutual agreement in writing.	
	Date: **Dept:** **Signature:**

Only for internal review

CV	**PC**	**PI**	**EL**	**IN**	**ME**	**MA**
ST	**DC**	**AR**	**PR**	**SA**	**HV**	**TL**

00	30.05.2023	F	IFA	N.M.	M.A.	F.T.	A.M.
Rev.	**Date**	**Status**	**Purpose of Issue**	**PRE'D**	**CHC'D**	**APP'D**	**AUT'D**

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POS	DECSRIPTION	LIST OF SUPPLIERS	ORIGIN
1	OIL FLOODED SCREW COMPRESSOR	MYCOM	JAPAN
2	Manual Valves	METTALLUM, VIMEC, ~~MOP Approved Manufacturers~~	BELGIUM/ITALY/Iran
3	Medium Voltage MOTOR	HELMKE/Schorch/VEM/WEG	GERMANY/BRAZIL
4	Low Voltage Motor	HELMKE/Schorch/VEM/WEG	GERMANY/BRAZIL
5	LUBE OIL PUMPS	MYCOM	JAPAN
6	MAIN COUPLING	FLENDER/REXNORD	GERMANY/USA
7	VESSELS	MYCOM ~~Approved vendors for compressor skid~~, Hamoon Rah, ~~other MOP AVL~~	BELGIUM/ITALY/ UAE/ Iran
8	HEAT EXCHANGER SHELL AND TUBE	MYCOM ~~Approved vendors for compressor skid~~, Hamoon Rah, other MOP AVL	BELGIUM/ITALY/ UAE/ Iran
9	SAFETY VALVE	TECHNICAL, AST, LESSER,HAZAVE, ~~other MOP AVL~~	ITALY/GERMANY/ IRAN
10	FILTER	TM FILTERS, MYCOM	NETHERLANDS
11	OIL HEATER	FATI, ELMESS	ITALY, Germany
12	FINE FILTER ELEMENT	TM FILTER,MYCOM	NETHERLANDS, Japan
14	CONTROL & ON/OFF VALVE	AKO, PETROLVALVES, SESTO VALVES, KG, RMT ~~AND other MOP AVL~~	GERMANY/ITALY/ITALY/ITALY/IRAN
15	Oil Pump COUPLING	FLENDER, REXNORD	GERMANY/USA
16	LEVEL GAUGES	WIKA, ABB, ENDRES, YOKOGAWA, ~~other MOP AVL~~	GERMANY
19	SOLENOID VALVE	ASCO, BIFOLD	USA/UK
21	Pressure Gauge	WIKA, ABB, ENDRES, YOKOGAWA, ~~other MOP AVL~~	GERMANY
22	LEVEL INDICATOR, LEVEL TRANSMITTER	WIKA, ABB, ENDRES, YOKOGAWA, ~~other MOP AVL~~	GERMANY

23	PRESSURE DIFF. TRANSMITTER	WIKA, ABB, ENDRES, YOKOGAWA, ~~other MOP AVL~~	GERMANY
24	PRESSURE TRANSMITTER	WIKA, ABB, ENDRES, YOKOGAWA, ~~other MOP AVL~~	GERMANY
26	SENSOR THERMOWELL ASSY	WIKA, ABB, ENDRES, YOKOGAWA, ~~other MOP AVL~~	GERMANY
27	TEMPERATURE TRANSMITTER	WIKA, ABB, ENDRES, YOKOGAWA, ~~other MOP AVL~~	GERMANY
28	TEMPERATURE INDICATOR	WIKA, ABB, ENDRES, YOKOGAWA, ~~other MOP AVL~~	GERMANY
29	THERMOWELL	WIKA, MOORE, MINCO	GERMANY/USA/USA
30	PLC	SIEMENSE	GERMANY
31	Coupling Guard	NASH, BERG	UAE/UAE
32	JUNCTION BOX	CORTEM, Mashin Sazi Shomal	ITALY, Iran
33	CABLE GLAND	CMP/Hawke, ~~other Local MOP Manufactueres~~	USA/UK/Iran
34	CABLE	Policabos, Batt Cable, Leoni Kerpen, Draka, Cavacel, ~~other Local MOP Manufactueres~~	POTUGAL/UK/GERMANY/GERMANY/ ITALY/Iran
35	LCP	Mashin SAZI Shomal, CORTEM,STAHL	IRAN/ITALY/GERMANY
36	Strainer and Cone Element	METTALLUM, Hammon Rah, ~~other Local MOP Manufactueres~~	BELGIUM/Iran
37	REFIGERANT OIL	BVA, CPI	USA
38	Instrument Cable	DUCAB / NEXAN / DRAKA, ~~other Local MOP Manufactueres~~	UAE/FRANCE/GERMANY/Iran
39	Earthing Cable	DUCAB / NEXAN / DRAKA, ~~other Local MOP Manufactueres~~	UAE/FRANCE/GERMANY/ Iran
40	Tubing	FITOK, DK LOK, CENTRAVIS, SANDVIK	GERMANY/KOREA/UKRAINE/CZECH

**** Note: This list is subjected to modification considering Local Manufacturing requirement of SAMT ministry, however, client approval will be granted accordingly.**

Sub-Vendor List for Refrigerator Package

Code1	☐ **Code 1: Approved** No comment and the document is released for Manufacturing.
Code2	☐ **Code 2: Approved with Minor Comments** VENDOR shall correct, revise and resubmit the document. The document can be released for Manufacturing if changes incorporated.
Code3	☐ **Code 3: Commented** VENDOR shall correct, revise and resubmit the document by the date specified. The document shall be revised under the Status of "R: Revised Issue". All corrected documents shall be resubmitted before starting the Manufacturing Process.
Code4	☐ **Code 4: Not Accepted (Rejected)** VENDOR shall re-work/re-design/re-specify the contents of the documents according to the comments/ reasons for rejection. All corrected documents shall be resubmitted before starting the Manufacturing Process. In this case, VENDOR shall not proceed with subsequent work until receiving Code 1 or Code 2 or No Code from CONTRACTOR/OWNER. VENDOR shall re-submit the documents with the same revision within (10) ten working days (including transmission/mailing time) after receiving the commented documents from CONTRACTOR/OWNER.
NO Code	☐ **NO Code (Only for "FOR INFORMATION" Documents and "As Built DWGs")** Document has been submitted for CONTRACTOR's Information (FI). Consistency, completeness and correctness of document content is Vendor's responsibility.
Above checking results by PPC shall in no way relieve Vendor of any liability, obligation and responsibility out of the purchase order and the mutual agreement in writing.	
	Date: **Dept:** **Signature:**

Only for internal review

CV	**PC**	**PI**	**EL**	**IN**	**ME**	**MA**
ST	**DC**	**AR**	**PR**	**SA**	**HV**	**TL**

01	15.06.2024	F	IFA	N.M.	M.A.	F.T.	A.M.
00	30.05.2023	F	IFA	N.M.	M.A.	F.T.	A.M.
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19	SOLENOID VALVE	ASCO, BIFOLD	USA/UK
21	Pressure Gauge	WIKA, ABB, ENDRES, SCHEMIERER, YOKOGAWA, other MOP AVL	GERMANY
22	LEVEL INDICATOR, LEVEL TRANSMITTER	WIKA, ABB, ENDRES, YOKOGAWA, EMKOMETER, other NPC AVL	GERMANY
23	PRESSURE DIFF. TRANSMITTER	WIKA, ABB, ENDRES, YOKOGAWA, other NPC AVL	GERMANY

24	PRESSURE TRANSMITTER	WIKA, ABB, ENDRES, YOKOGAWA, other NPC AVL	GERMANY
26	SENSOR THERMOWELL ASSY	WIKA, ABB, ENDRES, YOKOGAWA, other NPC AVL	GERMANY
27	TEMPERATURE TRANSMITTER	WIKA, ABB, ENDRES, YOKOGAWA, other NPC AVL	GERMANY
28	TEMPERATURE INDICATOR	WIKA, ABB, ENDRES, YOKOGAWA, other MNPC AVL	GERMANY
29	THERMOWELL	WIKA, MOORE, MINCO	GERMANY/USA/USA
30	PLC	SIEMENSE	GERMANY
31	Coupling Guard	NASH, BERG,MYCOM STD SVL	UAE/UAE
32	JUNCTION BOX	CORTEM, Mashin Sazi Shomal, STAHL	ITALY, Iran
33	CABLE GLAND	CMP/Hawke, other Local NPC Manufactueres	USA/UK/Iran
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36	Strainer and Cone Element	METTALLUM, Hammon Rah, other Local NPC Manufactueres	BELGIUM/Iran
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39	Earthing Cable	DUCAB / NEXAN / DRAKA, other Local MOP Manufactueres	UAE/FRANCE/GERMANY/ Iran
40	Tubing	FITOK, DK LOK, CENTRAVIS, SANDVIK	GERMANY/KOREA/UKRAINE/CZECH

**** Note: This list is subjected to modification considering Local Manufacturing requirement of SAMT ministry, however, client approval will be granted accordingly.**

TEMA Sheet

Heat Exchanger Specification Sheet

1	Company: DELTA					
2	Location: Zanjan					
3	Service of Unit: CONDENSER					
4	Item No.: E-004	Your Reference:				
5	Date:	Rev No.: 0	Job No.:			
6	Size: 325 - 4800 mm	Type: BEM Horizontal		Connected in: 1 parallel	1 series	
7	Surf/unit(eff.) 35.6 m²	Shells/unit 1		Surf/shell(eff.)	35.6 m²	
8	**PERFORMANCE OF ONE UNIT**					
9	Fluid allocation	Shell Side		Tube Side		
10	Fluid name	AMMONIA		COOLING WATER		
11	Fluid quantity, Total kg/h	1266		40000		
12	Vapor (In/Out) kg/s	0.3516	0	0	0	
13	Liquid kg/s	0	0.3516	11.1111	11.1111	
14	Noncondensable kg/s	0	0	0	0	
15						
16	Temperature (In/Out) °C	71.8	41.52	27	36.1	
17	Bubble / Dew point °C	41.65 / 41.65	41.64 / 41.64	/	/	
18	Density Vapor/Liquid kg/m³	10.43 /	/ 579.89	/ 997.94	/ 995.78	
19	Viscosity mPa-s	0.0118 /	/ 0.0869	/ 0.8561	/ 0.7041	
20	Molecular wt, Vap	17.03				
21	Molecular wt, NC					
22	Specific heat kJ/(kg-K)	2.524 /	/ 4.952	/ 4.191	/ 4.189	
23	Thermal conductivity W/(m-K)	0.0351 /	/ 0.4445	/ 0.6031	/ 0.6149	
24	Latent heat kJ/kg	1097.9	1097.9			
25	Pressure (abs) bar	16.1283	16.1216	6	5.89827	
26	Velocity (Mean/Max) m/s	0.29 / 1.77		0.82 / 0.83		
27	Pressure drop, allow./calc. bar	0.05	0.0067	0.5	0.10173	
28	Fouling resistance (min) m²-K/W	0.0001		0.00017	0.0002 Ao based	
29	Heat exchanged 418.5 kW			MTD (corrected) 9.77 °C		
30	Transfer rate, Service 1202.8	Dirty 1343.2		Clean 2227.4 W/(m²-K)		
31	**CONSTRUCTION OF ONE SHELL**			**Sketch**		
32		Shell Side		Tube Side		
33	Design/Vacuum/test pressure bar	20 / 1 / 26		12 / / 18		
34	Design temperature °C	120		85		
35	Number passes per shell	1		2		
36	Corrosion allowance mm	3		3		
37	Connections In mm	1 76.2 / 300 ANSI		1 76.2 / 150 ANSI		
38	Size/Rating Out	1 31.75 / 300 ANSI		1 76.2 / 150 ANSI		
39	Nominal Intermediate	1 / 300 ANSI		1 / 150 ANSI		
40	Tube #: 126 OD: 19.05 Tks. Average 1.24 mm Length: 4800 mm Pitch: 23.81 mm Tube pattern:30					
41	Tube type: Plain Insert:None Fin#: #/m Material:SA-334 6					
42	Shell SA-516 70 K02700 ID 325 OD 345 mm			Shell cover -		
43	Channel or bonnet SA-516 70 K02700			Channel cover -		
44	Tubesheet-stationary SA-350 LF2 K03011 1 -			Tubesheet-floating -		
45	Floating head cover -			Impingement protection None		
46	Baffle-cross SA-516 70 K02700 Type Single segmental Cut(%d) 37.31 Verti Spacing: c/c 650 mm					
47	Baffle-long - Seal Type			Inlet 736.48 mm		
48	Supports-tube U-bend 0 Type					
49	Bypass seal Tube-tubesheet joint Expanded only (2 grooves)(App.A 'i')					
50	Expansion joint - Type None					
51	RhoV2-Inlet nozzle 521 Bundle entrance 7 Bundle exit 0 kg/(m-s²)					
52	Gaskets - Shell side Flat Metal Jacket Fibe Tube side Spiral-Wound Metal Fib					
53	Floating head -					
54	Code requirements ASME Code Sec VIII Div 1 TEMA class R - refinery service					
55	Weight/Shell 997.2 Filled with water 1379 Bundle 417 kg					
56	Remarks					
57						
58