



## TECHNICAL SPECIFICATION FOR BOOSTER COMPRESSOR

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DOCUMENT No.: GGL/TS/2021/MAY/23



### SCOPE OF WORK FOR SUPPLY OF BOOSTER CNG COMPRESSOR

Approved



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### 1. SCOPE OF WORK

#### 1.1 SCOPE OF WORK UPTO SUPPLY AT SITE

1.1.1 This specification along with applicable codes as referred describe the minimum requirements for design, engineering, Preparation of documentation for design approval by GUJARAT GAS LTD, manufacturing, inspection, testing, supply, packing and forwarding 250 SM3/hr & 450 SM3/hr minimum capacity corresponding to suction pressure of 40 barg and Compressor shall be suitable for continuously variable suction pressure from 200 bar (g) to 30 bar, supplied through LCV mounted CNG storage cascade/static cascade. Electric motor driven hydraulic booster gas compressor packages" as required for dispensing CNG to vehicles at various locations in Gujarat. The Compressor Packages shall be new and identical in all technical respects. Various parts of this specification shall be read in conjunction with each other and in case where the different parts of this specification differs the more stringent requirement shall govern.

1.1.2 Any additional work / equipment or technical requirement not mentioned in the specification but required to make the offered system complete in accordance with the specification and for safe and proper operation, shall be deemed to be included in the scope of work by the bidder.

#### 1.2 SCOPE OF SERVICES AT SITE

1.2.1 Transportation, loading and unloading of equipment from store to site including loading and unloading.

1.2.2 Grouting of equipment (if required) including grouting material.

1.2.3 Installation of 3000 Ltr Cascade above the booster compressor package. The weight of the stationary cascade is 7.0 tons (Approx) & the dimensions of the cascade are 3700mm (length) x 2000mm (width) x 2000mm (height). The bidder shall also provide ladder for safe climbing on the top of the canopy along with hand railing on all sides on the top for ease of maintenance and operation. Ladder shall be fixed in one position. Location of the ladder will be finalized during detail engineering. The bidder shall ensure that adequate space is available around the cascade after keeping the cascade on the top of the canopy for carrying out routing checking/maintenance. Minimum space required for the movement on three side shall be 300 mm and 600 mm in front of the cascade cylinder valves.

1.2.4 Supply, installation, testing of electrical system required for booster compressor and air compressor. (Gujarat Gas Ltd will provide only power supply at one point just after the metering system of Power supply including cable till input of flame proof panel, Bidder's



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scope includes supply of Flame proof electrical panel, electrical FRLS cables, electrical cable for the compressor etc.)

- 1.2.5 Preparation of QAP, visual inspection of equipment.
- 1.2.6 Field trial run and performance test.
- 1.2.7 Erection, inspection, testing & commissioning.
- 1.2.8 Supply, installation, commissioning of SS tubing /piping/flexible hose required for connecting other utilities like, air, water etc. and instrument air supply tubing/ piping shall be of SS material.
- 1.2.9 Tubing/piping for CO2 cylinder with Flame detectors.
- 1.2.10 Scope of work includes the items/works which is not mentioned above but essential for the completion and commissioning of the project in totality.
- 1.2.11 Deployment of the required manpower for meeting GGL requirements.
- 1.2.12 Necessary data addresses and protocol will be submitted by the bidder along with Quality Assurance Plan (QAP) and drawing approval and also whenever sought by GGL without any additional cost.

## 2. CODES & STANDARD AND PRECEDENCE

### 2.1 CODES & STANDARD

The following codes and standards are referred to and made part of specification:

1. OISD 179
2. NFPA
3. ANSI
4. NEC
5. NEMA
6. Indian electricity rule
7. CCOE/PESO guideline/requirement.
8. API
9. PNGRB T4S

### 2.2 PRECEDENCE

In case of any conflict among the various documents, the most stringent norm shall govern:

1. Data sheets/drawings
2. This Technical Specification



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3. International standards/codes as applicable
4. Indian Standards / codes applicable
5. Compliance with this specification shall not relieve the bidder of the responsibility of furnishing equipment and accessories of proper design, material and workmanship to meet the specified operating conditions.
6. No deviations to the technical requirements and to the scope of supply specified in this enquiry document shall normally be accepted and offers not in compliance to the same shall be rejected summarily.
7. In case if the clause mentioned in the document is not clear then bidder need to raise the concern with GGL internal committee and GGL will give decision after detail review of the concern.

### 3. UTILITIES & BATTERY LIMITS

#### 3.1 UTILITIES

- 3.1.1 Bidder shall make his own provision for Instrument air with an electric motor driven hydraulic air compressor, receiver and air dryer system if required. Moreover, the compressed air compressor may be used for as utility for operations the CNG dispenser dispensers.
- 3.1.2 Instrument air compressor can be installed either inside or outside the canopy. However, bidder need to supply and install the power cables and tubing till the compressor. No additional cost shall be paid to the bidder for supply, installation of air compressor and its accessories (not limited to electric cable, tubing etc.).
- 3.1.3 Water is available as a make up water to expansion tank which can be used as cooling medium for closed circuit radiators. But the make up water tank and related piping, valves are to be provided by the Bidder. However cooling water for make up tank is available.
- 3.1.4 For running the compressor and illumination 415 Volt ( $\pm 10\%$ ) 3-phases 4 wire (TN-S), 50 Hz ( $\pm 5\%$ ) shall be provided by GGL at a single point before the compressor Electrical Panel. Bidder to make arrangement for conditioning of power supply beyond above limit.

#### 3.2 BATTERY LIMITS

- 3.2.1 Bidder shall make all necessary arrangement for hydraulic oil, compressor or any other oil removal from the CNG station. Bidder shall ensure the area clean and free from oil or any other unwanted material.



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- 3.2.2 As and where specified on the data sheets all vents shall be manifolded and terminated at skid edge outside the enclosure and vented to safe height at 3m above the highest working platform with Flame arrestor.
- 3.2.3 All drains from different process equipment and packing shall be manifolded and terminated as single point for customer interface duly flanged with isolation valve. Drain of Oil and Gas shall be separate.
- 3.2.4 Bidder shall connect the tubing upto the outlet of the priority panel.

### 4. EXCLUSIONS

The following are excluded from the scope of the bidder:

- 4.1 All civil works and foundation design. However the bidder shall furnish all the relevant data for design of pedestal/ foundation.
- 4.2 CNG storage cascade & CNG dispensers.
- 4.3 SS tubing for interconnection of CNG cascades (Mobile and Stationary) and CNG dispensers.
- 4.4 Electrical Cables connecting the Electrical Distribution Panel and compressor, Cable connecting the UPS and the compressor PLC.
- 4.5 Gujarat Gas Limited will provide cable till input of flame proof panel. Supply of flame proof panel with compressor is in bidder scope. However, all other's cable required for operation of booster compressor will be in the scope of bidder.

### 5. GENERAL CONDITION

#### 5.1 DESIGN DATA FOR REFERENCE

##### 5.1.1 SITE DATA

- |                                     |   |    |
|-------------------------------------|---|----|
| 1. Minimum ambient temperature, ° C | : | 00 |
| 2. Maximum ambient temperature. °C  | : | 50 |

##### 5.1.2 GAS COMPOSITION

Indicative gas composition and gas quality specifications are given below:



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Gas composition (% by volume)	
- Methane	91.9132 (May vary up to 97)
- Propane	1.18705
- I-butane	0.1993
- n-butane	0.28415
- I-pentane	0.0143
- n-pentane	0.00685
- Ethane	5.8181
- c6+	0.00745
- N2	0.54685
- CO2	0.02085
- Neo pentane	0.0019
Molecular weight of gas at	17.38 at NTP condition
Cp/Cv at suction	1.18 at NTP condition
Pressure	Maximum _*
Std. condition referred to	1.1013 bar(a) & 15.56 °C

## 6. AREA CLASSIFICATION

All electrical and electronic components shall be suitable for hazardous area CLASS I DIVISION I Group D as per NFPA 70 Article 500 or Zone -1 Group IIA/IIB as per IS/IEC

## 7. SAFETY

- 7.1 All controls shall operate in fail-safe mode i.e. failure of any control shall not lead to running of equipment in unsafe condition.
- 7.2 All electrical and electronic devices shall meet the requirement of specified area classification in which they are installed.
- 7.3 All exposed rotating parts shall be provided with adequate guards of non-sparking type.
- 7.4 Drive belt, if used, shall be anti-static type, fire resistant.
- 7.5 Piping shall be arranged in a manner so as to provide clear headroom.
- 7.6 The compressor system shall be designed to prevent air ingress in the system during startup, operation and shutdown. Necessary instrumentation shall be provided.
- 7.7 Two LEL detector, Two flame detector and one set of CO2 flooding system.





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- 7.8 Flame arrestor on common vent of the compressor shall be provided.
- 7.9 Following warning and caution signage shall be observed:
- "No Smoking" signs on the package.
  - Caution notice "This Machine may automatically start at any time".
  - "Stop Motor"
  - "Flammable Gas"

## 8. TECHNICAL SPECIFICATIONS OF BOOSTER COMPRESSOR

### 8.1 GENERAL

Following specification is intended to give the bidder the technical and operating conditions the compressor must fulfill.

- 8.1.1 The bidder shall meet all applicable statutory codes, national law and local regulation for safety and environment protection.
- 8.1.2 Offered package shall be complete with compressor, electric motor, hydraulic pump and piping, cooling system, suction filter, control panel safety and control devices and other accessories required for automatic and safe operation the system. The supply shall include all interconnecting piping/tubing/cables. Cooling system shall be of closed circuit type. Ultimate cooling shall be by air only.
- 8.1.3 The compressor package control system shall be designed for unattended safe operation in automatic mode and shall unload, start, load, stop safely. The compressor shall start in auto in case high bank pressure in dispenser falls below 200 bar(g) and stop once the pressure in all three banks reaches 250 bar(g).
- 8.1.4 Compressor shall be suitable for continuously variable suction pressure from 200 bar (g) to 30 bar, supplied through LCV mounted CNG storage cascade.
- 8.1.5 Compressor shall be suitable for discharge pressure of 250 bar (g).
- 8.1.6 Compressor shall be designed to ensure flow capacity as indicated in data sheet.
- 8.1.7 The Bidder shall provide Mass flow meters with local display at both end Suction and discharge to reconcile the CNG Qty.
- 8.1.8 Bidder need to design compressor in such a way that there is no by-pass line in between Suction and discharge mass flow meter of the booster compressor. Suction and discharge mass flow meter shall be provided with NRV in series.



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- 8.1.9 SRV/ PSV shall be provided on inlet, all stages and outlet to prevent pressure build.
- 8.1.10 SRV/ PSV shall be design and tested as per GGL technical specification. Also, PSV/ SRV design shall be as per API 520 and testing shall be performed as per API 527.
- 8.1.11 Suction and Discharge filter shall be provided in all compressor.
- 8.1.12 Subsequent suction and discharge filter, suitable for the higher pressure specified in the range of pressure, with oil drain. 2" or 63 mm or 4" size Differential Pressure Gauge (DPG) shall be provided across Suction and discharge gas filter.
- 8.1.13 Compressor shall be provided atleast the following clear and permanent markings readily accessible and easy to read in the installed position; namely: -
- a. Manufacturer's name;
  - b. Model;
  - c. Serial No. or month and year of manufacture
  - d. Certificate of approval no.
  - e. Rated capacity (cubic meter per hour)
  - f. Operating speed (RPM)
  - g. Required driving power (in kW)
  - h. Maximum and minimum supply pressures
  - i. Maximum outlet pressure
  - j. Certification for Natural Gas use.
- 8.1.14 All compliance certificate required by statutory authority will be provided by the bidder to GGL without any additional cost.

### 8.2 COOLING SYSTEM

- 8.2.1 Each compressor package shall be complete with its own cooling system. The cooler shall be air cooled heat exchanger. The gas temperature after after-cooler shall not exceed 52 Degree C. For calculating the surface area of the cooler the ambient air temperature of 50 °C and 90% RH shall be considered. Cooler design shall be on the basis of 20% extra load corresponding to max severe operating conditions based on the thermal duty.
- 8.2.2 Low cooling water flow switch shall be fitted into the cooling water return line to shut the compressor in the event of fault.

### 8.3 ELECTRICAL

#### 8.3.1 Electric motors

1	Type of drive	Totally enclosed fan ventilated (TEFV) high efficiency
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		as per IEEMA standard-19-2000
2	Protection	Explosion proof <b>IP.55</b>
3	Insulation	Class "F" with Class "B" temperature rise
4	Mounting	As per system requirements.
5	Specification	To be Specify by bidder
6	Supply Voltage	415 $\pm$ 10% volt, 3 phase, 50 $\pm$ 5%Hz
7	Synchronous Speed	To be Specify by bidder
8	Motor rating	To be Specify by bidder
9	Motor efficiency %	To be Specify by bidder
10	Power factor	To be Specify by bidder
11	Speed of motors	To be Specify by bidder
12	Nos. of hot starts of motors	4 per hours
13	Coupling direct/flexible	To be Specify by bidder

### 8.3.2 Electrical supply parameters :

All electrical shall be suitable for the following supply conditions.

1	Electrical operating voltage	AC, 3 phase, 415 V, 50 Hz
2	Electrical control voltage	230 VAC, 50 Hz (under supplier's scope)
3	Tolerance of voltage	$\pm$ 10%
4	Tolerance of frequency	$\pm$ 5%

### 8.3.3 Electric Specification

8.3.3.1 Gujarat Gas Ltd shall provide 415 V, 3 phase electrical connection at only one designated point for electric driven hydraulic booster compressor package. Bidder shall distribute electric power to all equipment and control systems by providing a suitable switch gear distribution panel within the compressor. Suitable flameproof double compression glands shall be provided for termination of main cable in main electrical panel. Exact size and specification of cable glands will be indicated to successful bidder within 2 weeks of order placement and receipt of electrical single line diagram from bidder.

8.3.3.2 All solenoid coils, power contactors etc. shall have operating voltage of 240VAC, and 50 Hz.



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- 8.3.3.3 Motor shall be TEFV squirrel cage type in standard frame size as per IS/IEC rated for continuous duty with high efficiency as per (EFF2) and designed for star/delta starting. Motors shall be suitable for starting under specified load conditions with 75% of rated voltage at the terminals. Motor torque shall be compatible with speed torque curve of compressor. Motor windings shall be class 'F' insulated with temperature rise limited to class 'B'. Minimum degree of protection of motor enclosure shall be IP55 as per IS. Motors for use in hazardous areas shall have protection Ex(d) as per area classification.
- 8.3.3.4 The motor name plate rating (exclusive of service factor) shall be minimum 110% of the greatest HP required under any of the specification operating conditions. All motors shall be tested in accordance with IS/IEC.
- 8.3.3.5 Each motor shall compulsorily be protected with thermal-magnetic over current relay.
- 8.3.3.6 The electrical power supply distributions panel shall be mounted in the flame proof covered area on the compressor enclosure and shall be as per IP 55 and flame proof design as per requirement of hazardous area classification. The switch gear shall have one incomer and adequate number of outgoing feeders. The incomers shall be provided with suitably rated switch fuse unit, ammeter, voltmeter with selector switch, energy meter, hour meter, PF meter, etc. Motor feeders shall be provided with heavy duty switch. HRC link type fuses, contactors (AC-3 duty), bi-metal relay, single phase preventor, ammeter, push buttons, earth leakage relays, indication lamps for Start/Stop/Trip, etc. Adequate number of MCB feeders for control and lighting shall be provided. Supplier shall furnish single line diagram of the panel with the bid.
- 8.3.3.7 Bidder to note that all control electronic / electrical / instrumentation, shall be capable of withstanding voltage fluctuation within +/- 10 % of rated voltage (24 V DC).
- 8.3.3.8 Earthing: Metallic part of all equipment not intended to be alive shall be connected to earth as per provisions of IS: 3043/IEC recommendation. Grounding of all electronics shall be separately connected to earth using insulated copper wire. Grounding of electronic equipment shall not be connected to earthing for electrics or equip-potential bonding.

### 8.3.4 Emergency Shut Down devices

The Emergency Shut Down (ESD) system is also in scope of bidder. A fail safe system shall be designed and incorporated to isolate cascades storage from dispensers, stop compressor isolate the compressor suction and cut off power supply on activation of ESD switch. This ESD switch shall have to be manually reset to restart the compressor package again.



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### 8.4 INSTRUMENTATION & CONTROLS

- 8.4.1 All the instruments and control shall be suitable for area Class I, Group D, Division I.
- 8.4.2 All package mounted transmitters & temperature elements shall be intrinsic safe 'IB' as per IEC 79-11 and solenoid valves, switches and related junction boxes shall be flame proof 'd' as per IEC 79-1. Other special equipment / instrument, where intrinsic safety is not feasible or available, shall be flame proof/explosion proof as per IEC 79-1.
- 8.4.3 The compressor package instrumentation & control is to be configured for manual as well fully automatic control system including starting, shutdown as applicable for unattended operation.
- 8.4.4 All the instrumentation shall be capable or operating for full range of operation.
- 8.4.5 Separate junction boxes shall be provided for each type of signal i.e. e\analog digital, solenoids RTD, thermocouple, intrinsic safe and for power supply. No cable shall share power & signal.
- 8.4.6 Suitable bypass for interlocks shall be provided for startup.
- 8.4.7 Compressor package shall be provided with following indicators:
- i. Pressure indicator for suction and discharge.
  - ii. Temperature indicator for suction and discharge
  - iii. Oil level.
  - iv. Hour meter
  - v. Compressor jacket water (if applicable)
  - vi. Hydraulic oil pressure.

### 8.5 PRIORITY FILL SYSTEM

Five bank priority fill system including inlet and outlet valves, non-return valves and bypass valves with all interconnecting piping/tubing shall consist of following but not limited to:

- a. Free standing welded and powder coated (0.03 mm to 0.05mm thick epoxy) steel frame structure
- b. Interconnected SS tubing and manifold
- c. Isolation valves, Bleed valves, Non return valves and vent system
- d. Connections of all isolation valves with the emergency switch for closure of isolation valves in case of emergency
- e. Pressure gauges



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- f. Actuators for control of flow to dispensers / cascade / LCV point
- g. Solenoid Valves
- h. Clamps to fit the pipes & valve to the main frame
- i. Any accessories which Bidder feels necessary for better performance.

### 8.5.1 Specific requirements

- 8.5.1.1 The priority panel allocates gas from the compressor to the storage or dispenser in the optimum sequence. It may also have compressor "top off" facility so that gas may be pumped direct from the compressor to the dispenser.
- 8.5.1.2 The gas must flow from the storage cascade to dispenser through the priority panel. The direct flow from the cascade, by-passing, the priority panel shall not be allowed.
- 8.5.1.3 Priority Panel shall be located outside or inside the package. Priority panel shall have a separate access door from outside. If priority panel is inside the compressor the package, final design shall be as per GGL detail engineering.
- 8.5.1.4 Priority panel shall be provided with weather proof, IP-55, GI powder coated enclosure (0.03 mm to 0.05 mm thick epoxy) and the same shall be attached to the main enclosure of the compressor package.
- 8.5.1.5 When the compressor first starts and the storage system is empty, the priority fill system diverts the compressor discharge gas to the first on priority to the high bank of the dispenser. Once the pressure of the high bank of dispenser is ensured above 200 kg/cm<sup>2</sup>(g), the gas is diverted to the high bank of the cascade. As soon as the high bank of the cascade is filled to a pressure > 220 kg/cm<sup>2</sup>(g), the gas is diverted to the medium bank of the cascade ensuring that during this period the high bank of cascade and dispenser are always above 220 kg/cm<sup>2</sup>(g). Now, when the medium bank of cascade reaches to predetermined pressure of 220 kg/cm<sup>2</sup>(g), the low bank of the cascade starts receiving the gas till the discharge pressure reaches 250 kg/cm<sup>2</sup>(g). Once the pressure in the low bank reaches to 250 kg/cm<sup>2</sup> (g). As soon as the pressure in the mobile cascade reaches 250 kg/cm<sup>2</sup> (g) or auto shut down pressure of compressor, the compressor stops. With the directions of the NRV of priority panel, so configured that all banks of the cascades reaches 250 kg/cm<sup>2</sup> (g) or auto shut down, before the compressor goes to standby state.
- 8.5.1.6 In short, priority sequence would be 1st to high bank of dispenser, 2nd to Medium bank of dispenser, 3rd to low bank of dispenser, 4th to high bank of cascade, 5th to medium bank of cascade, 6th to low bank of cascade. Before the compressors goes to shut down state, it ensures that all the cascade banks are filled upto a pressure of 250 kg/cm<sup>2</sup>(g).
- 8.5.1.7 Actuator ball valves (Gas actuated) shall be provided between priority panel and dispenser as well as stationary and mobile cascade to control flow.
- 8.5.1.8 When a vehicle is connected to the dispenser for refueling, the dispenser auto sequencing system allocates gas from the cascade to the vehicle cylinder in the reverse



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sequence to which it is filled. The dispenser sequencing system is instigated by flow rate drop off which indicates equalization between each bank of the cascade and the vehicle cylinder. In this manner the gas from the largest storage volume, which may have already been drawn off to a pressure less than its initial fill pressure, fills the vehicle cylinder from its low pressure. Power is not wasted in compressing gas to high storage pressure and then reducing it again to match an empty or near empty vehicle cylinder, which is already at a low pressure.


- 8.5.1.9 Likewise the medium and high-pressure storage banks only top off the vehicle cylinder above certain pressures; the stored gas does not have to be unnecessarily reduced in pressure. This system is known as multi-refueling. To minimize the station power consumption, multi-line systems are nearly always used. In practice it has been preferred to go for 3 line dispenser system for high efficiency of 60%.

### 8.5.2 Basic datasheet

\*: Indicates data to be furnished/ confirmed by the supplier/ Bidder

Sr. No.	Description	Specification/ detail
1	Priority sequence for transfer / allocation of the gas shall be as under. (a) Fore-court high bank dispenser (b) Fore-court medium bank dispenser (c) Fore-court low bank dispenser (d) Stationary cascade high bank line (e) Stationary cascade medium bank line (f) Stationary cascade low bank line	
2	Control System	PLC/ SCADA Based
3	Location of priority panel	Outside and inside the enclosure of booster compressor
4	Set Pressure for Bank filling	250 kg/cm <sup>2</sup> (g) (must be settable)
5	Flow Rating Cv	*
6	Maximum Flow Rate	*
7	Priority Valve Type	Solenoid operated actuator ball valve
8	Inlet / Outlet Connection	½" (0.065" thk)OD SS 316 Tube
9	Size of inter connecting tubes/ valve/ fitting	Minimum ½" for all compressor
10	Mounting Type	Suitable for Wall mounting, Preferably with Outside enclosure body
11	Material of Construction	SS 316 seamless and annealed (tubing, fittings).
12	Actuator	One between priority panel & each dispenser, one between priority panel



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		and each bank of stationary cascade.
13	Enclosure	GI - Powder coated (0.03 mm to 0.05mm thick powder coated)

Note: Design of Priority panel shall be as per P&ID provided with the technical scope of work.

## 8.6 CO<sub>2</sub> FLOODING SYSTEM:

The package shall be protected against fire with automatically operated CO<sub>2</sub> flooding system designed as per NFPA-12 and consisting of two cylinders, piping, valves and control systems etc. The minimum requirements of the system shall be as under.

- 8.6.1. Gas by installation of hydrocarbon gas detector (IR type) with self check function and transmitter with adjustable alarm levels (0-100%) with preset of 10%, 20% and 50%. Each enclosure should have at least 2 nos. gas detectors.
- 8.6.2. Installation of flame detector (UV-IR type) with self check function and transmitter, alarm on detection of flame. Each enclosure shall have minimum 2 nos. of flame detectors.
- 8.6.3. CO<sub>2</sub> flooding system will consist of 2 nos. of adequately sized CO<sub>2</sub> cylinders. One cylinder will act as main cylinder & other as stand by, which shall have identical arrangement and connected to the system. The cylinders shall be placed outside the package enclosure and in a shed to protect from weather and direct sunrays as per Gas Cylinder Rules, 2004. Cylinders shall be fitted with automatic actuated Valves, Solenoid valves etc.
- 8.6.4. The System shall be designed to operate on 24 V DC supply.
- 8.6.5. FRLS (Fire resistant low smoke) cables shall be used for the wiring of the system.
- 8.6.6. Interlock of CO<sub>2</sub> Flooding system with respect to compressor shall as per following sequence:
  - a. Compressor shall trip on detection of gas at preset level.
  - b. Compressor shall trip on detection of flame at preset level and automatic discharge of CO<sub>2</sub> gas shall take place from the main cylinder simultaneously.
  - c. Compressor shall not start if the CO<sub>2</sub> Flooding System is faulty, not working, Switched OFF etc. The compressor shall be able to start only when the CO<sub>2</sub> Flooding System is in healthy working condition.
  - d. Maintenance Override Switch shall be provided to keep the system off during maintenance. This feature shall be in compliance to the point no. ( c ).
  - e. Selector switch shall be provided to put Main/Stand by Cylinder in line at the turn of a switch as per requirement.





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- 8.6.7. Alarm panel for CO<sub>2</sub> Flooding System shall be integral with the main compressor panel. Necessary displays as system ON, OFF, FAULT, RESET, Gas/ Flame indication, Remote actuation of solenoid valve, distinguished hooter etc., shall be provided for CO<sub>2</sub> flooding system.
- 8.6.8. CO<sub>2</sub> cylinders shall be provided outside the package at a safe place, minimum 4.5 meters away (aerial distance), where it is not exposed to fire in case of fire in the compressor. Facility shall be made to operate the system both manually from remote with the help of a switch/ call point and with help of pull down lever on cylinders.
- 8.6.9. The Bidder shall provide suitable weighing arrangement to facilitate weighing of the cylinders without requiring the cylinders to be detached from the installation. For this lever operated lifting arrangements shall be made.
- 8.6.10. All installation shall be compatible for hazardous area, Temperature T6, Zone 1, Division 1, Group-D for Methane Gas.
- 8.6.11. The system designed by the Bidder shall be duly approved by GUJARAT GAS LTD.
- 8.6.12. Technical specifications, Operation and Maintenance Manual, CCOE Certificate, Approval/ Manufacturing certificates for cylinders and cylinder valves, gas detectors, flame detectors, solenoid valves etc. shall be furnished by the Bidder along with system. Software and hardware, calibration procedure shall be provided by the Bidder along with the supply sufficient enough to handle the system independently. Necessary tools (1 set per package) shall be provided with the system.
- 8.6.13. System shall be offered for testing to GUJARAT GAS LTD by the Bidder after commissioning at site by creating actual Gas leak and Gas fire situations and actual discharge of CO<sub>2</sub> Gas from the Cylinders. This shall form a part of performance test and thereby acceptance of the package. The cylinders have to be refilled by the Bidder at no extra cost to GUJARAT GAS LTD after performance test. If the system fails during testing, subsequent testing and refilling would be at Bidder's cost.
- CO<sub>2</sub> flooding system piping of the compressor shall be Hydro tested after installation at site.

### 8.7 ENCLOSURE OF CNG COMPRESSOR PACKAGE

- 8.7.1 Each compressor module shall be housed within a purpose built aluminium / cold rolled carbon steel (CRCS) acoustic compressor enclosure. The units shall incorporate a rigid frame work with a combination of fixed and removable panels.
- 8.7.2 Enclosure should be designed for Installation of 3000 Ltr Cascade above the booster compressor package. The weight of the stationary cascade is 7.0 tons (Approx) & the dimensions of the cascade are 3700mm (length) x 2000mm (width) x 2000mm (height). The bidder shall also provide ladder for safe climbing on the top of the canopy along with hand railing on the top for ease of maintenance and operation. The bidder shall ensure

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that adequate space is available around the cascade after keeping the cascade on the top of the canopy for carrying out routing checking/maintenance. Minimum space required for the movement on three side shall be 300 mm and 600 mm in front of the cascade cylinder valves.

- 8.7.3 The enclosure shall be assembled onto the package base plate along with water cooler, electric panel and air compressor at the suppliers works to give a fully transportable unit. Air compressor can be installed either inside canopy or outside the canopy. However, manufacturer shall supply and lay the power cables and tubing till the compressor.
- 8.7.4 Enclosure shall be provided a degree of protection equivalent to IP 44 as defined AS1939.
- 8.7.5 The maximum rise in temperature within the enclosure shall be limited to 2.5 - 3 Deg. C. above ambient temperature.
- 8.7.6 Enclosure shall provide a degree of protection equivalent to IP 44 as defined in AS 1939.
- 8.7.7 Enclosures shall be engineered to give a noise level of maximum 75 dBA measured at 1 meter as standard, utilizing aluminum or steel with mineral wool infill and perforated steel inner face. Materials shall be non-combustible to deter spread of flame requirements. Any compressor auxiliary motors installed externally to the enclosure shall be considered as part of the compressor package for meeting the noise level requirement.
- 8.7.8 The enclosure shall be designed for ease of access to the equipment within and has suitable entry doors.
- 8.7.9 To prevent the discharge of gas into the enclosure, all safety relief valves within to be connected to a manifold. From this connection a single pipe passes through the enclosure roof to a vent stack to allow satisfactory dispersion of gas at a safe height above ground level.
- 8.7.10 A viewing window at operating level to be fitted to allow monitoring of gauges, etc. without entering the enclosure.
- 8.7.11 The enclosure shall be finished in a weatherproof paint finish, external colour supplied to customer requirements i.e white, blue and green. The external surfaces of the enclosure shall be painted. The paint shall be chosen, primed and applied as to have a service life of ten years. The exterior of the equipments piping, enclosure, hinges, locks, handles etc. is required to be corrosion free from ten years and to have fade free lift without oxidation of paint surface for five years in an environment of bright sun light with an intense UV content and tropical climatic conditions. The interconnecting radiator piping shall also be painted as per above specification. Bidder to give details of painting in unpriced bid.



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- 8.7.12 External emergency stop push button shall be fitted on the enclosure. Also the emergency shut off push buttons, 2 nos., one to be provided at dispensing area or where it easy to access at the time of emergency. Bidder to assume that the sales / control room and dispensing area, each will be 100 mtrs. away from the compressor. Bidders to include the cables along with cable trays / flexible PVC ducts for emergency stop push buttons and have to install the same at the site. Cables shall be PVC insulated and of 1.1 KV grade copper armoured. Any utilized cables shall be returned to Gujarat Gas Ltd with no extra cost.
- 8.7.13 Enclosure gas detection system consisting of 2 no. infrared type LEL detectors and 2 no. flame detector (UV type) shall be provided. The detectors shall be recalibrated at site during commissioning. Also the performance of the detectors shall be demonstrated at the time of commissioning.
- 8.7.14 Adequate fixed flameproof lighting (minimum at 1 locations) shall be provided inside the enclosure.
- 8.7.15 Suitable gradient shall be provided on the enclosure roof for rain drainage and to avoid water pockets. Enclosures shall be designed with proper rain protection in the ducting or any other cut out to protect the inside equipment from rain water.
- 8.7.16 For handling of all heavy parts for maintenance purpose suitable lifting arrangement shall be provided i.e beam fitted with chain hoist arrangement. The chain hoist arrangement i.e chain pulley block shall be removable type, which can be disassembled and shifted onto the other machines. 1 No. shall be provided for tendered quantity of compressors or safe lifting mechanism shall be provided to handle heavy parts installed inside the compressor
- 8.7.17 The enclosures shall have doors for normal access and removable wall panels for ease of maintenance.

### 8.8 PIPING

- 8.8.1 All gas piping shall be designed, fabricated & tested in accordance with ANSI B 31.3.
- 8.8.2 Gas piping shall be seamless carbon steel.
- 8.8.3 All rigid piping, tubing & other components of compressor package shall be designed for full range of pressure & temp and loading to which they may be subjected with a factor of safety of at least 4 based on minimum specified tensile strength at specified ambient temperature.



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8.8.4 All high-pressure double ferrule fitting and 2/3 way valves shall be S.S. material only. Material of tube shall also be SS316 as per ASTM A269.

8.8.5 Mercapton/ THT dosing is envisaged hence all materials coming in contact with gas shall be compatible to such gas with Mercapton/ THT dosing and be of compressor manufacture's standard. The use of SA 515 material is prohibited.

8.8.6 All piping after coalescent filter at compressor discharge shall be of SS 316.

## 9. INSPECTION AND TESTING

### 9.1 General


- a) Inspection and Test Requirements shall be as per approved QAP
- b) Bidder shall confirm compliance to all inspection and testing requirements stipulated therein.
- c) Calibration and material test certificates complying with the statutory requirement are to be furnished for future reference.
- d) Bidder shall appoint Third Party Inspection agency for witness of tests as per data sheet, QAP and this specification. The bidder shall notify the timing of such inspection and testing at least 15 days in advance to Gujarat Gas Ltd. Gujarat Gas Ltd may depute their representative for witnessing the tests.

### 9.2 Mechanical running test (MRT)

9.2.1 The MRT for the each compressors with job or shop driver including complete job driving system for 4 hours continuously at shop of compressor manufacturer/packager/bidder shall be carried out in presence of any of the Third Party Inspection Agencies. Gujarat Gas Ltd/consultant or their representatives may also witness the test. The compressor need to be on full pressure loaded (i.e. 200 bar) for MRT test. During this test following shall be recorded at agreed intervals.

- Vibration levels measured on cylinders and frame
- Bearing temperature
- Oil cooler inlet and outlet temp
- Sound level of enclosure (required 75 dBA)

**Bidder shall submit test procedure for approval.**


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### 9.2.2 Package Performance Test

- 9.1.2.1 Bidder shall assemble the complete package including auxiliary systems, instrumentation, safety devices within the enclosure at site, The machine shall be accepted after the performance test at site.
- 9.1.2.2 Complete package shall be performance tested as a module along with electric motor & compressor performance bidder shall demonstrate all controls, shutdown, trips / alarms etc.
- 9.1.2.3 The test shall be the basis of acceptance / rejection of the package thereon. Bidder shall submit the detail test procedure for the same, which shall be approved by Gujarat Gas Ltd. The test for the package shall be witnessed by Gujarat Gas Ltd or their representatives. All guaranteed and other critical parameters shall be demonstrated by the supplier.
- 9.1.2.4 Gas loss of the package (difference between in & out at final of Booster compressor) shall not exceed 1%.

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## **10. BIDDERS SCOPE OF WORK – General Terms & Conditions**

- 10.1 The Bidder shall make his own arrangement for the accommodation of his personnel at respective locations and subsequent transportation for them from their work place of residence to work place or any other place as required. GUJARAT GAS LTD shall have no obligation in this respect. GUJARAT GAS LTD shall not be responsible for providing any medical assistance to the employees of Bidder.
- 10.2 Training module with the details of the training that will be imparted, schedule for refresher training and continuous updation of the credential of the personnel engaged should be under the scope of the Bidder.
- 10.3 OEM should notify any change in manpower to concerned EIC of GUJARAT GAS Ltd with details like Name, address, photograph and details of training imparted. The change in manpower shall be allowed only after the approval of EIC-GGL
- 10.4 The Bidder shall be responsible for the discipline, good behaviour of all his personnel & ensure that all his personnel deployed in services are well-dressed in uniform. In case any complaint is received against any of his employee, he shall arrange to replace such person(s) within 24 hrs of notice issued by GGL Engineer in charge. The decision of the “GGL Authorised representative” shall be final & binding on the Bidder.
- 10.5 The Bidder shall arrange to supply & renew identity cards to his workforce at his own cost if so required by the PURCHASER/OWNER (GUJARAT GAS LTD) for security or any other reasons. Those Vendor’s persons shall carry their I. D. cards while on duty & shall produce the same on demand.
- 10.6 Sub-letting of the contract shall not be allowed without prior permission of GUJARAT GAS LTD (GGL) in writing. If the services are not provided as per required time (the services called for 365 days including Sundays, which is defined by GUJARAT GAS LTD), nothing contained herein shall restrict PURCHASER/OWNER to terminate the contract and get services carried out through other agency.
- 10.7 It may be noted that the technicians and supervisor can be kept in consultation with GUJARAT GAS LTD as per distance/time between the allotted refuelling stations.
- 10.8 However acceptance by GGL on the number of technicians/supervisor to be mobilised shall not leave Bidder from his responsibility to ensure machinery BDT loss not to exceed defined limits and GUJARAT GAS LTD shall recover the loss of sales (if so happened on account of shortage of manpower of any type including technician & other manpower engaged for the works).
- 10.9 Only sound & experienced persons shall be deployed for the works. The supervisor shall report daily to representative of GUJARAT GAS LTD for day to day working. The Gujarat Gas Ltd shall also review and approve preventive schedule (generally as per OEM recommendation) prepared for the package application.



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- 10.10 The supervisor shall ensure the safety of all machines & men during the entire course of operations & onsite repairs as well as offsite repairs & maintenance works.
- 10.11 All deployed persons of the Bidder, shall arrange snacks/lunch/dinner for themselves. GUJARAT GAS LTD shall not have any obligation to provide the same. All the persons deployed, shall have minimum acceptable proficiency in written and speaking skills in Hindi and Gujarati, except for helper who can have required proficiency in Gujarati speaking.
- 10.12 If any of the persons found not competent for his work after deployment, it shall be in the interest of contractor to replace him immediately on the instructions of EIC-GGL.
- 10.13 The Bidder shall observe the compliance of different labour laws act 1970, for PF/FP/minimum wage/ESIC/Insurance/weekly leave (rest)/daily working hours etc & shall maintain proper attendance & payment records. Wages consider should be either Central or State whichever is higher.
- 10.14 Employees employed by the Bidder will not enjoy any legal rights of the Employee of Gujarat Gas Ltd & will not be considered as an Employee of Gujarat Gas Ltd at any point of time during/after the contract.

### 11. SPARE PARTS, SPECIAL TOOLS AND TACKLES

- 11.1 All spare parts, special tools & tackles for erection and commissioning and period specified in Schedule of rates for Comprehensive operation and maintenance of compressor package shall be supplied by the bidder and shall form his scope of supply.
- 11.2 A brand new separate set of special tools and tackles as required for Normal maintenance in the contract period shall be supplied by the Bidder, which shall form the property of Gujarat Gas Ltd.

### 12. DOCUMENTS/DATA REQUIRED DURING DETAIL ENGINEERING

- 12.1 Bidder shall necessarily furnish the following along with the bid without which the offer shall be considered incomplete:
- Completely filled in Data Sheets of compressor, Electric motors
  - Utilities requirements
  - Electrical Load summary
  - Flow v/s suction pressure and power v/s suction pressure graph or full range suction pressure i.e. 250 bar to 30 bars.

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- e. Safety code for CNG application.
- f. P&ID of Compressor.
- g. Interlock Table.
- h. GAD of Compressor,

12.2 Any other document required over and above aforesaid documents during engineering stage after placement of order shall be supplied by bidder. Bidder shall also supply above data in editable soft copy.

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## 13. GUARANTEED PARAMETERS ELECTRIC MOTOR DRIVEN HYDRAULIC BOOSTER COMPRESSOR

Sr No	Description	Bidder to indicate
A	For 250 SCMh Compressor	
1	Average flow capacity (overfull range of suction pressure from 200 bar to 30 bar varying on continuous basis)	
2	Minimum flow capacity corresponding to suction Pressure of 200 bar	
3	Minimum flow capacity corresponding to suction Pressure of 40 kg/cm <sup>2</sup> <b>Required 250 Sm<sup>3</sup>/h</b>	
4	Sound level of enclosure (required 75), dBA	
B	For 450 SCMh Compressor	
1	Average flow capacity (overfull range of suction pressure from 200 bar to 30 bar varying on continuous basis)	
2	Minimum flow capacity corresponding to suction Pressure of 200 bar	
3	Minimum flow capacity corresponding to suction Pressure of 40 kg/cm <sup>2</sup> <b>Required 450 Sm<sup>3</sup>/h</b>	
4	Sound level of enclosure (required 75), dBA	



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## 14. EQUIPMENT DATA SHEETS

### 14.1 DATA SHEETS OF COMPRESSOR

Bidder shall furnish the Data sheet of Hydraulic booster in their standard format considering the basic specification indicated in Tender Documents.

1	GENERAL		
2	PROJECT:		
3	OWNER: M/S Gujarat Gas Ltd		
4	SERVICE:		
5	SITE:		
6	NO. REQD :		
7	COMPRESSOR CAPACITY : 250 SCMH at suction pressure 30 bar	DRIVER: ELECTRIC MOTOR	
8	NOTE: ■ SCOPE OPTION / INFORMATION SPECIFIED BY GUJARAT GAS LTD □ INFORMATION REQUIRED FROM VENDOR.		
9	□ MANUFACTURER:	□ MODEL NO.:	
10	□ PLACE OF MANUFACTURE:		
11	□ NO. OF STAGES: bidder	□ CYLINDER ARRANGEMENT:	
12	CYLINDER LUBRICATION: □ LUBRICATED □ MINIMUM LUBRICATED □ NON LUBRICATED		
13	■ DRIVER TYPE: ELECTRIC MOTOR		
14	□ DRIVE:	□ V – BELTS (ANTI-STATIC TYPE) □ DIRECT WITH COUPLING	
15	□ DIRECTION OF ROTATION (FACING DRIVEN END): □ CLOCKWISE □ COUNTER CLOCKWISE		
16	EARTH QUAKE ZONE V WIND VELOCITY (M/SEC): 39 MAX. RH : 82% (MAX.), ALTITUDE : 55 M FROM MSL SITE DATA : TEMP : 110 °F (Max.), 50 °F (Min.)		
17	INSTALLATION: ■ OUTDOOR		
18	■ MOUNTED ON A COMMON SKID ALONGWITH DRIVER, ENCLOSED INSIDE A ACOUSTIC ENCLOSURE		
19	□ Total Utility Consumption		
20	□ Cooling Water (Make UP) (m3 /hr)		
21	□ Power (Auxiliaries) (kW)		
22	□ Power (Heaters) (kW)		
23	REMARKS:		



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24	Vendor/Bidder should estimate the requirement for all the Utilities and indicate the same in tabular form.				
25	□ CONSTRUCTION / DESIGN FEATURES				
26	Nomenclature	Unit	Stage#1	Stage#2	Stage#3
27	Cylinders				
28	No of Cylinders -				
29	Single Acting (SA) / Double Acting (DA)				
30	Cylinder Bore / Stroke	Mm / mm			
31	Rotational Speed of motor	RPM			
32	Linear Average Piston Speed	M/sec			
33	Piston Displacement	M3/ hr			
34	Cylinder Liner (Yes / No)				
35	Type of Cylinder Liner : Dry/Wet -				
36	Max. Allow. Working Pressure, Cylinder	kg/cm <sup>2</sup> a			
37	Max./Min Allow. Working Temp., Cylinder	OC			
38	M.A.W.P, Cylinder @ Amb. Temp.	kg/cm <sup>2</sup> a			
39	Safety Valve Set Pressure, Cylinder	kg/cm <sup>2</sup> a			
40	G Helium Test Pressure, Cylinder	kg/cm <sup>2</sup> a			
41	Hydrostatic Test Pressure, Cylinder	kg/cm <sup>2</sup> a			
42	Type of Suction valve -				
43	Type of Discharge valve -				
44	Suction Valve Unloaders Yes / No				
45	Max. Allow. Rod Load Comp.	Kg			



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46	Tension	Kg			
47	Rod Load Comp.	Kg			
48	Tension	Kg			
49	Rod Load at R.V Set Comp.	Kg			
50	<input type="checkbox"/> Lubrication/Hydraulic oil System				
51	Type of lube system	Piping material			
52		Carbon Steel			
53	Main Oil Pump Driven By :	Stainless Steel (all piping & valves Trims)			
54	Standby Oil Pump, Driven By :	Oil tank capacity			
55	Suction Strainer	Lube Oil Consumption			
56	Pressure Control Valve	Main Pump	Make :	Model :	
57	Level Sight Glass on the Crankcase		Type :	Material :	
58	Type of Oil Cooler :	Standby Pump	Make :	Model :	
59	Size of Filter:		Type :	Material :	
60	Oil Heater (if required).				
61	Electric Heater with thermostat (Kw) (if required).				
62	Thermostatic Valve				
63	■ MATERIALS				
64	Cylinder Materials				
65	Stage	1 Stage	2 Stage	3 Stage	
66	Cylinder				
67	<input type="checkbox"/> Liner				
68	<input type="checkbox"/> Piston				
69	Piston Rings	PTFE	PTFE	PTFE	
70	Piston Rod				
71	<input type="checkbox"/> Valve Seats				
72	<input type="checkbox"/> Valve Stops				
73	Valve Rings / Plates				
74	Valve Springs				
75	<input type="checkbox"/> Cylinder Head				
76	INSPECTION AND TESTS				
77	Material Composition and Physical Properties Certificates Required For:				
78	■ Cylinder and Liner	■ Piston			
79	■ Pressure Vessels	■ Heat Exchangers			



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80	■ X-Ray Examination for components: Pressure Vessels (certificates to be furnished).			
81		Required	Observed	Witnessed
82	■ Mech. Running Test with shop Driver (4 Hours min.)	■	<input type="checkbox"/>	■
83	■ Performance Test at Site	■	<input type="checkbox"/>	■
84	■ Functional/Continuity Tests - Control Panel.	■	<input type="checkbox"/>	<input type="checkbox"/>
85	■ Field Trial Run 20 Hrs. under Vendor's Supervision (Package)	■	<input type="checkbox"/>	■
86	■ Valve Leak Test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
87	■ Lube Oil Console Run test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
88	■ Closed Circuit C.W. System test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
89	<input type="checkbox"/> During package performance test			
90	<input type="checkbox"/> Test Certificates Required For:			
91	■ Auxiliary Motor & Pumps		■ Safety Relief Valves ( * )	
92	■ Safety Switches		■ Solenoid Valves	
93	<input type="checkbox"/> WEIGHTS			
94	Overall supply (excluding driver and gear box, if any) Kg. approx.			
95	Maximum erection weight Kg. approx.			
96	Maximum maintenance weight Kg. approx.			
97	Gear Box Kg. Approx.			
98	Driver Kg. approx.			
99	SCOPE OF SUPPLY			
100	■ Compressor Assembly complete with frame, cylinders, cross head etc.			
101	■ Motion work lubrication system			
102	■ Cylinder and packing lubrication system			
103	■ Cooling system			
104	■ Process Gas system			
105	■ Local instrumentation			
106	■ Local Gauge Board			
107	■ Local Control Panel			
108	■ Main driver electric Motor			
109	■ Barring Device:		<input type="checkbox"/> Manual	<input type="checkbox"/> Electric. Pneumatic
110	■ Flywheel			
111	<input type="checkbox"/> V-Belts with Pulley			
112	<input type="checkbox"/> Couplings			



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113	■ Driver Compressor
114	■ Guards for moving parts ■
115	■ Base plate Common for Compressor and Driver
116	■ Fabricated Steel skid Common for compressor, driver and accessories
117	■ Ladders and platforms
118	■ Special Tools - One Set for each package
119	■ Anchor Bolts for Complete Package
120	■ Piping supports and brackets : ■ prefabricated for piping in Vendor's Scope
121	■ Supports For Cylinders & Auxiliaries, Prefabricated & fitted in the Package
122	■ Commissioning Spares, erection and commissioning spares
123	■ Spares as specified in the Job Specification
124	■ Vendor Data as specified
125	NOTE : Refer checklist for scope of supply

NOTE : \* Calculation for sizing of Safety relief valves to be submitted by Bidder.



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## 14.2 DATA SHEET OF COMPRESSOR MOTOR

1	Project name:	
2	Driven equipment	Compressor / <b>Hydraulic Oil Pump</b>
3	Tag No. / Equipment No.	
4	Duty	
5	Manufacturer	
6	Type	THREE PHASE, SQUIRREL CAGE INDUCTION MOTOR, EFF2 rated
7	Frame designation	
8	Output _____ KW	
9	Voltage _____ VOLT	415 V+/- 10%
10	Full load current _____ AMP	
11	Full load speed _____ RPM	
12	Enclosure	TEFC/FLAMEPROOF/IP55 AS PER IS:4691-1985
13	Mounting	
14	Insulation Class	F' - Temp. rise limited to Class - 'B'
15	Ambient temperature _____ °C	
16	Temp. Rise by resistance _____ °C	
17	Applicable Code	
18	Full load torque _____ Kg-m	
19	Starting torque _____ FLT	
20	Efficiency at _____ 100% Load	
	_____ 75% Load	
	_____ 50% Load	
21	Rotation viewed from DE	
22	Bearing type No.	
23	Type of Lubrication	
24	Coupling / pulley	DIRECT / FLEXIBLE
25	Net weight (approximate) _____ kg	
26	Cable size / type _____ mm sq.	
27	Phase / connection / No. of terminal	
28	Frequency _____ Hz.	50 Hz +/- 5%
29	No. of poles _____	
30	Locked rotor current _____ %FLC	
31	LR withstand time (HOT) _____ Sec	
	(COLD) _____ Sec	
32	Startor / rotor time constant _____ Min	



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33	Power factor at – 100% Load	
	- 75% Load	
	- 50% Load	
34	Break down or pull out torque ____ %FLT	
35	Space heaters _____ WATT / VOLT	
36	GD Sq. of load _____ Kg-m <sup>2</sup>	
37	GD Sq. of motor _____ Kg-m <sup>2</sup>	
38	Starting time at 100% / 80% V-Sec	
39	No. of starts – Hot / Cold	4
40	Vibration Level / Noise Level	As per IS12065 / IS12075
41	Area classification	CLASS - I, ZONE (DIV)-1, GAS GROUP IIA / II B

Approved





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## 14.3 DATA SHEET GAS DETECTION SYSTEM

1	<b>TECHNICAL GENERAL</b>				
2	<b>PROJECT: .</b>				
3	<b>OWNER: M/S</b>		<b>SITE:</b>		
4	<b>EQUIPMENT: GAS DETECTION FOR CNG STATIONS</b>				
5	<b>NO.</b>		<b>GAS DETECTION TYPE:</b>		
6	NOTE: <input checked="" type="checkbox"/> SCOPE OPTION / INFORMATION SPECIFIED BY GUJARAT GAS LTD <input type="checkbox"/> INFORMATION REQUIRED FROM VENDOR.				
7	<input type="checkbox"/> MANUFACTURER:		<input type="checkbox"/> MODEL NO.:		
	<b>SIGNAL TRANSMISSION</b>				
8	<input type="checkbox"/> ANALOG: TRANSMISSION BY 3CORE SHEILDED CABLE				
9	<input type="checkbox"/> MEASUREMENT CONTROL: 4mA to 20mA				
10	<input type="checkbox"/> SENSOR DRIFTS BELOW ZERO:				
11	<input type="checkbox"/> MEASURING RANGE EXCEEDED:				
12	<input type="checkbox"/> TRANSMITTER FAULT:				
13	<input type="checkbox"/> MAINTENACE SIGNAL:				
14	<input type="checkbox"/> HART COMPATIBLE:				
	<b>■ SITE / ENVIRONMENTAL DATA</b>				
15	<b>SITE DATA:</b>				
16	AMBIENT TEMP. (0 F):	MAX	110		
17		MIN:	51		
18	RELATIVE HUMIDITY (%):	MAX	82		
	ALTITUDE (M):		55 M ABOVE MSL		
19	<b>INSTALLATION: ■ INDOOR</b>				
20	<b>■ ELECTRICAL AREA HAZARD:</b>				
21	CLASS/ZONE: CLASS I ZONE I DIVISION: I GAS GROUP: D, GROUP IIA, IIB				
	<b>■ APPLICABLE CODES AND STANDARDS</b>				
22	<b>■ GAS DETECTION APPROVALS:</b>		<b>■ UL, CSA: Class 1, Div 1, Groups B,C,D</b>		
	CENELEC :Exd IIC 6				
	<b>VOLTAGE OF SUPPLY</b>				
23	<input type="checkbox"/> OPERATING VOLTAGE:		A.C/D.C	V	Ph
24	<input type="checkbox"/> IN-RUSH CURRENT: A.C/D.C				
25	<input type="checkbox"/> POWER INPUT		A.C/D.C		
	<b>■ PHYSICAL SPECIFICATIONS</b>				




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26	<input type="checkbox"/> ENCLOSURE: NEMA 4+7 (IP55)
27	<input type="checkbox"/> SIZE
28	<input type="checkbox"/> WEIGHT
	<input checked="" type="checkbox"/> INSPECTION AND TESTS
29	<input type="checkbox"/> Physical Tests on site:
	REMARKS

Approved

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**14.4 DATA SHEET- UV FIRE DETECTION SYSTEM**

	<b>TECHNICAL GENERAL</b>	
1	<b>PROJECT:</b>	
2	OWNER:	SITE:
3	EQUIPMENT: <b>UV FIRE DETECTION FOR CNG STATIONS</b>	
4	NO.	FIRE DETECTION TYPE:
5	NOTE: ■ SCOPE OPTION / INFORMATION SPECIFIED BY GUJARAT GAS LTD □ INFORMATION REQUIRED FROM VENDOR.	
6	□ MANUFACTURER:	□ MODEL NO.:
7	□ WAVE LENGTHS:	■ TYPICAL RESPONSE TIME: < 3 SEC @ 50FT
8	□ FIELD OF VIEW:	□ MINIMUM SENSOR RESPONSE TIME:
9	□ SENSITIVITY	□ MAINTENACE SIGNAL:
10	■ CLASSIFICATION: CLASS I, DIV 1, GROUPS B, C & D: Eexd IIC, T5, IP66	■ CLASS II, GROUP E,F & G CLASS III, TYPE 4X
11	■ APPROVALS: CSA, FM, ATEX, CENELEC, CE MARKING	
12	■ ENVIRONMENTAL SPECIFICATIONS	
13	■ OPERATING TEMPERATURE RANGE: -40 (°C) to 85 (°C)	
14	■ STORAGE TEMPERATURE RANGE: -50 (°C) to 85 (°C)	
15	■ OPERATING HUMIDITY RANGE: 0% TO 100% RH NON-CON-DENSING	
16	■ ALTITUDE (M): 55 M FROM MSL	AMBIENT TEMP: 110 OF (MAX.), 51 OF (MIN.)
17	■ EARTH QUAKE ZONE V	
18	■ INSTALLATION: ■ INDOOR	
	■ ELECTRICAL SPECIFICATION:	
19	■ INPUT POWER: 20 – 36 VDC, 24 VDC @ 150Ma max.	□ COPM FAULT
20	■ ANALOG SIGNAL: 4-20mA (600 Ohms Max.)	□ READY SIGNAL
21	□ FAULT SIGNAL: 0Ma	□ UV SIGNAL:
22	□ IR SIGNAL:	□ WARN SIGNAL:
23	□ ALARM SIGNAL:	□ BAUD RATE:
24	■ RELAY CONTACT RATING: 8A, 250VAC, 8A @ 24VDC	□ RS-485 OUTPUT:
25	■ RFI/EMI PROTECTION: COMPLIES WITH EN50081-2	□ STATUS INDICATOR:
26	□ FAULT MONITORING:	
	■ MECHANICAL SPECIFICATION:	
28	■ HOUSING:	■ LENGTH:
29	■ DIAMETER:	■ MOUNTING:
30	■ CABLE ENTRY:	■ WEIGHT:



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SCOPE OF SUPPLY	
31	■ UV FIRE DETECTION SENSORS COMPLETE:
32	■ Mass Flow Meter ( make Micromotion/E&H)
33	■ DATA SHEET COMPLETED
	REMARKS:

Approved

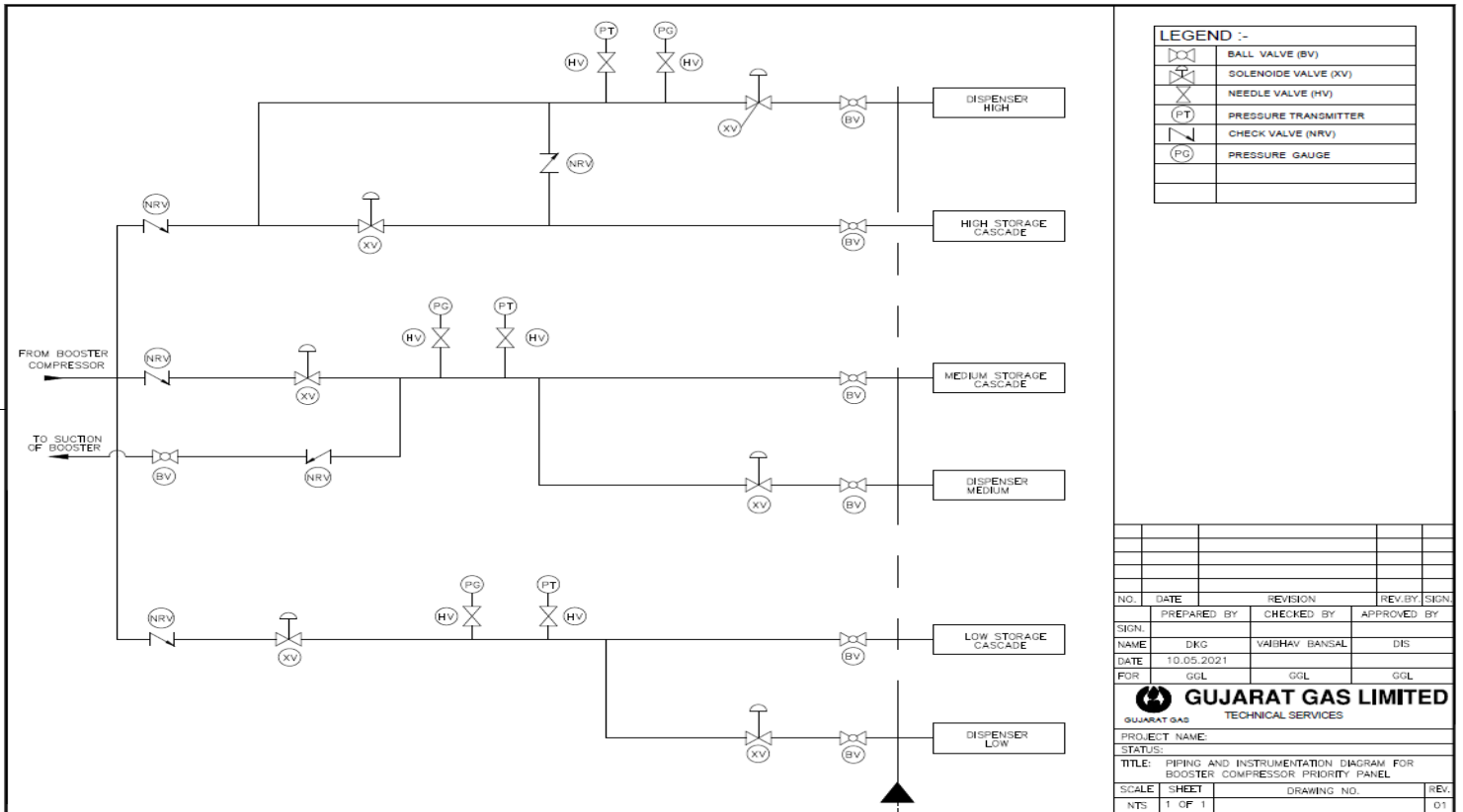



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## 14.5 TYPICAL P&ID OF PRIORITY PANEL OF BOOSTER COMPRESSOR



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**14.6 Automation:**

1. The operations services required to be carried out by vendor remotely from their control room by 24x7 through automation however, one operator in 1 shift of 8 hours needs to be deployed at station, the shift timing shall be defined by the EIC of GGL. in case the operations period exceeds for more than 1 shift then payment shall be made on proportionate basis as per prices quoted by the bidder.
2. The compressor package shall be equipped for automation to operate remotely and locally with instrumentation & control is to be configured for including starting, shutdown as applicable for unmanned operations.
3. PLC shall be suitable for recording of compressor parameters as indicated in instrumentation and all other parameters that are recommended by the compressor manufacturer for recording on hourly basis for the last 24 hours.
4. PLC shall be configured as a remote terminal unit of supervisory control and data acquisition system (SCADA) complete with Ethernet Port shall be readily configurable for communication over MODBUS TCP protocol through Leased Line/MPLS/VSAT/RF.
5. There shall be three independent ports (one for HMI, 2nd for Vendor remote connectivity and 3rd port for GGL SCADA connectivity) available in the PLC with all the parameters available on each individual port.
6. Panel shall be complete with start and stop push buttons, hours run meter, power on and fault indication lamps, fault reset button. All necessary timers and intrinsically safe relays to control the system on an automatic starting and stopping basis shall be provided. The compressor package control system shall be designed for unattended operation in automatic mode and in case of any fault it will go in a safe mode.
7. Bidder shall send daily report, weekly report, fortnightly report and monthly report to GGL. In addition to these reports, vendor shall submit the reports required by GGL EIC.
8. Bidder shall provide provision to keep SIM card in hardware for connectivity with Gujarat Gas control room/SCADA etc.
9. Bidder shall provide provision to connect 2 CNG car dispensers in compressor PLC through RS485 and the same shall be display in HMI