

B.I.T. Sindri
P.O. - Sindri Institute, Sindri,
Dhanbad, Jharkhand -828123

Notice

Date- 28/08/19

Description : Supply and Installation of Chemical Vapour Deposition (CVD) system for nanotechnology laboratory

Package Code : TEQIP-III/JH/bits/18

Package Name : TEQIP-III/BITSindri/OTH/NANO-CVD

B.I.T. Sindri, Dhanbad wishes to establish a Nanotechnology lab as a central research facility. The Technical specifications of the equipments/goods are provided below.

Interested manufacturers / authorized supplier are requested to fill in the Information Form (Annexure - A) given below and send the filled, signed and stamped hard copy on or before **4:00 P.M. of 19/09/2019** at following address -

Director, B.I.T. Sindri,
P.O. - Sindri Institute, Sindri,
Dhanbad, Jharkhand -828123

Formal request for Financial and Technical proposal will be sent to the applied valid firms after 19/09/2019.

Technical Specification

Following are the specifications and details for Chemical Vapour Deposition (CVD) system for nanotechnology laboratory at B.I.T. Sindri, Dhanbad.

Chemical Vapour Deposition (CVD) should be fully automatically controlled by computer, it should consist of a fused quartz tube furnace, a precision mass flow gas control station, atmospheric as well as low pressure station, automatic sample loader, metal enclosure with exhaust port, gas leak detector and other safety interlocks, and other assembling parts for the controlled growth of low dimensional materials. Maximum temperature of this workstation should be 1100°C or higher. The mass flow gas control station should be able to mix two or more different gases together and input the mixed gas into a fused quartz tube inside the furnace. The individual gas flow rates should be precisely controllable. The system should offer wide range of material deposition. The system should have the following technical and general specifications.

SI. No.	Features	Detailed specifications of the features
1.	Tube Furnace	<ul style="list-style-type: none"> a) Maximum Temperature Resistance Furnace Temp. 1100°C or more Uniform working temperature of up to 1100°C in 150 mm mid zone must be ensured in the quartz tube reactor. b) Temperature Accuracy $\pm 1^\circ\text{C}$ in the entire temperature range during both heating and cooling. c) Heating Rate Temp Ramp Up rate (Programmable) d) Cooling Rate Temp Ramp Down rate(Programmable e. Number of Zones Three e) Heating Zone 300 mm or more (constant temp zone 150 mm) f) Temperature control Precision temperature controllers with PID function and 30 segments programmable. One extra temperature monitor should be built in to shut down power when temperature out of control by accident. g) Electrical Power Single Phase 220-240 V, 50 Hz
2.	Sample Holder	<ul style="list-style-type: none"> a) Reaction Chamber Quartz Reaction Tube of suitable size to enable laminar flow to achieve controlled CNT, Graphene, metal oxides, and two dimensional semiconductor/insulator/metals etc. growth on at least 1 inch X 1 inch specimen. Additional quartz tubes (up to three) may be quoted (optional). Provision for using different size (diameter) quartz tube. b) Sample/component size Variable, but the maximum size can be 100 L x 20 H x 30 W mm and minimum size can be 10 L x 10 H x 2 W mm. 1 Reduction of working zone size should be possible for carrying out coating deposition on small sized samples (Optional). c) Sample Mounting Automatic Cantilevered Sample loading/unloading (Optional).
3.	High Vacuum Station	<ul style="list-style-type: none"> a) Pump-1 Heavy duty rotary (oil free) pump. 2 stage exhaust with pressure of 10^{-3} torr. b) Pump-2 (Optional) Turbo Pump with pressure of maximum 10^{-6} torr, with needle valve and connecting accessories (Optional). c) Cleaning of Chamber (Purge Line) Pump should enable N_2 or Ar purging for cleaning Process tube (Reaction chamber) after deposition shall be flushed with Ar/N_2 for which separate line should be provided. d) Accessories Two Anti-corrosive, gas independent pressure gauge ($\sim 10^{-3}$-10^0 Torr, and 1-1000 torr measurement range), digital display, high accuracy, and reproducibility at atmosphere, easy to exchange plug & play sensor element.

4.	Gas Supply System	<p>a) Gas Supply Chamber Gas feed system shall be provided with Mass flow controller, Controls, Regulators, Valves, 316 steel corrosion resistance tubing and Flow monitoring devices and digital read out.</p> <p>b) Mass flow Controllers 4 Precision MFCs (Provision for 2 Extras) MFCs should be calibrated for, Ar, H₂, C₂H₄, CH₄. Optional Gases: C₂H₂, N₂ Control Range:1-1000 sccm Accuracy:≤ ± 0.02% of Full Scale Material: Stainless Steel (316L), Non Magnetic. Control Stability: ≤ ± 0.1% of Full Scale Control Valve: Closed Solenoid (Fast-Response) Solid source kit (Optional).</p>
5.	Control System	<p>a) Computer control system with Graphical User interface for complete process-related controls such as vacuum level, gas flow rates, gas pressure, process temperature, voltage and current.</p> <p>b) User interface: Fully computer controlled system with window based software for operating the microscope along with keyboard, mouse, control panel including multifunction for control.</p> <p>c) Software should have provision for Manual settings, automated experiment programming, Real time instrument read-out, Alarm display, administration management.</p> <p>d) Other displays/controls such as those for gas leak detectors, bubbler, status of safety valves, alarms, interlocks etc., process deviation etc. should also be provided on the control panel.</p> <p>e) Remote diagnostics/trouble shooting of the system/process by the supplier through internet /tele-maintenance shall be included.</p>
6.	Safety and other requirements	<p>a) The entire system should be thoroughly checked for leak (leak rate should be less than 10-6 cc/s). This should be shown at the time of inspection.</p> <p>b) Gas delivery system must shut off the supply in the event of leak rate exceeds the desired limits. The sensors should be interlocked with PLC/PID controllers. PLC system shall also be linked with air delivery system.</p> <p>c) Suitable audible and visual alarm should be provided in case of malfunction of CVD furnace like temperature shoot-up, high power drawing, vacuum loss and deviation from in water/gas flow rates.</p> <p>d) Sensors with audible/visible alarms for dangerous gas leakage (H₂, AlCl₃, Cl₂, HCl, SiCl₄ etc.) should be provided.</p> <p>e) Thermal insulation for minimum heat loss (Less than 5% of the reactor temperature) to the surrounding.</p> <p>f) Supplier should specify the maximum power rating and weight of the furnace.</p> <p>g) All the emergency procedures should be outlined.</p>

7.	Warranty and support	<p>a) 3 years comprehensive on-site warranty for all parts of the entire system including accessories supplied with the instruments from the date of successful installation and commissioning. Post warranty period will be for another 3 years for supply of all parts of the entire system, including accessories. If the system breakdown during warranty period, the warranty period will be extended for the full breakdown period after the expiry of initial warranty.</p> <p>b) Service response time must be 48 hours or less.</p> <p>c) On-site training must be provided by trained engineer at free of cost.</p>
8.	Maintenance	The supplier is required to confirm that the spares and accessories would be available for more than 6 years after expiry of warranty and post warranty.
9.	Upgradation	The supplier shall supply upgraded software for CVD operation whenever they are available.
10.	Application notes & Manuals	The supplier shall provide detailed application notes and manuals of CVD in hard and soft copy along with the detailed drawings and circuit diagrams (in English).
11.	Compliance statement	The supplier must submit a table indicating the compliance of the features of the model of the equipment being quoted with those given in indent.
12.	Pre-installation Requirement	Pre-installation requirement such as room size, tolerable limits of EM field and vibration (mechanical), required power rating, utility requirements are to be stated clearly, and to be verified/ surveyed by the supplier at the installation site. It is the supplier's responsibility to clearly provide details of the above mentioned requirements before delivery of the equipment.
13.	Delivery & Insurance Coverage	Vendor will be fully responsible in successful delivery (including unloading), installation and commissioning of the instrument at site of installation in B.I.T. Sindri with fully insurance coverage as per rule.

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INFORMATION FORM

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Package Code : TEQIP-III/JH/bits/18

Package Name : TEQIP-III/BITSindri/OTH/NANO-CVD

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3) e-mail address :

4) Phone/Mobile Number :

5) PAN Number :

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8) Name of official Representative :

a) Post held :

b) Phone Number :

c) e-mail Address

We declare that we are interested to supply the above mentioned equipments/Goods

Date

Signature and official stamp

B.I.T. Sindri
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Notice

Date-28/8/2019

Description : Supply and installation of Low speed diamond cutting machine/saw for Nanotechnology lab

Package Code : TEQIP-III/JH/bits/16

Package Name : TEQIP-III/BITSindri/OTH/NANO-DIAMOND CUTTER

B.I.T. Sindri, Dhanbad wishes to establish a Nanotechnology lab as a central research facility. The Technical specifications of the equipments/goods are provided below.

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Technical Specification

Following are the specifications and details for Diamond Cutting Machine/Saw for nanotechnology laboratory at B.I.T. Sindri, Dhanbad.

The Low speed diamond cutting machine/saw must be capable of cutting hard ferrous and non-ferrous samples as well as substartes like ceramic pr glass. Arrngment must be provided for counter-balance to fine adjust cutting force on fragile/brittle samples. Further, arrngment must be provided with,

- 1) Cutting coolant assembly
- 2) Linear and rotary sample hold chucks/ vires.
- 3) Protective covers/shield for the machine.

SI. No.	Features	Detailed specifications of the features
1.	Blade diameter	3” - 6” supported
2.	Speed range	0-200 rpm with LCD digital display
3.	Microcontroller	Based stepper motor vice control
4.	Cutting wheels	Diamond sintered (5), SiC (10), Alumina (5)
5.	Speed Control	Manual
6.	Display	Motor RPM display
7.	Type	Table top - compact
8.	Cutting depth range	5 – 42 mm
9.	Minimum cut width	down to 0.2 mm
10.	Warranty and support	<ol style="list-style-type: none"> 1. 3 years comprehensive on-site warranty for all parts of the entire system including accessories supplied with the instruments from the date of successful installation and commissioning. Post warranty period will be for another 3 years for supply of all parts of the entire system, including accessories. If the system breakdown during warranty period, the warranty period will be extended for the full breakdown period after the expiry of initial warranty. 2. Service response time must be 48 hours or less. 3. On-site training must be provided by trained engineering at free of cost.
11.	Maintenance	The supplier is required to confirm that the spares and accessories would be available for more than 6 years after expiry of warranty and post warranty.
12.	Upgradation	The supplier shall supply upgraded software for cutting operation whenever they are available.
13.	Application notes & Manuals	The supplier shall provide detailed application notes and manuals of this instrument in hard and soft copy along with the detailed drawings and circuit diagrams (in English).
14.	Compliance statement	The supplier must submit a table indicating the compliance of the features of the model of the equipment being quoted with those given in indent.

15.	Pre-installation Requirement	Pre-installation requirement such as room size, vibration (mechanical), required power rating, utility requirements are to be stated clearly, and to be verified/ surveyed by the supplier at the installation site. It is the supplier's responsibility to clearly provide details of the above mentioned requirements before delivery of the equipment.
16.	Delivery & Insurance Coverage	Vendor will be fully responsible in successful delivery (including unloading), installation and commissioning of the instrument at site of installation in B.I.T. Sindri with fully insurance coverage as per rule.

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Description : Supply and installation of Low speed diamond cutting machine/saw for Nanotechnology lab

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Notice

Date 28/08/2019

Description : Supply and installation of Physical Quantities Measurement System (PQMS) for NANO technology laboratory

Package Code : TEQIP-III/JH/bits/19

Package Name : TEQIP-III/BITSindri/OTH/NANO-PQMS

B.I.T. Sindri, Dhanbad wishes to establish a Nanotechnology lab as a central research facility. The Technical specifications of the equipments/goods are provided below.

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Technical Specification

Following are the specifications and details for **Physical Quantities Measurement System (PQMS)** for nanotechnology laboratory at B.I.T. Sindri, Dhanbad.

Physical Quantities Measurement System with additional accessories and components which can be effectively used to measure the DC electrical conductivity and AC magnetic susceptibility of various materials in the temperature range 80-450K. This integrated transport properties measurement system should be able to identify changes in the transport properties of the sample from conducting, say, to insulating, semi-conducting or superconducting, and magnetic phase transitions in materials. The Physical Quantities Measurement System (PQMS) must have the following technical specification:

Sl. No.	Features	Detailed specifications of the features
1.	Hall effect set up for metals and semiconductors	<ol style="list-style-type: none"> 1. Constant current source with Current Display : 0-20 mA DC or better Voltage Display : 0+200mV@0.1mV or better Resolution : 10 micro ampere or better Current Adjust : 10-turns potential meter or better Power : 220V \pm 10%, 50 Hz AC or better Display : 3½ digit LED 2. Power Supply Voltage : 0-20V DC (or better)continuously variable & stabilized Voltage display : 3½ digit LED Ripple : Less than 25mV Overload : Current limiting protection Current : 5 A continuously variable, or better 10% to full rating Current display : 3½ digit LED Working voltage : 230V AC, 50 Hz single phase 3. Electromagnet arrangement Coils : 500 turns. Coil Current : 8.5Amp (Max.) Core material : Ferromagnetic. 4. DIGITAL MICROVOLTMETER Operating voltage : 230V, 50Hz Operating range : 0-20mV, 0-200mV, 0-2000mV, 0-2V Accuracy : \pm 0.01mV or better least count : 0.001mV or better 5. DIGITAL GAUSS METER Range : 200 Gauss & 2 k Gauss Resolution : 0.1Gauss at 0 - 200 Gauss Offset : By Potentiometer to set ZERO Display : 3½ Digit LED Input Voltage : 220 V, \pm 5 %, 50 Hz AC Axial Hall Probe 6. METALLIC SAMPLE: TUNGSTEN / SILVER Current : approx. 20 A DC Magnetic field : 1000 ... 6000 gauss Thickness : 5 x 10⁻⁵ m Dimensions : Appropriate for the apparatus quoted Stand rod : Appropriate for the apparatus quoted. Material : Silver, Tungsten 7. Semiconducting probe Sample: GE CRYSTAL PCB Crystal : Ge Wafer, P type

		<p>Crystal Size : 6x7 x 0.5mm³ (LxWxThickness) Resistivity : 1~ 10 ohm-cm Orientation : <100> VII) All other accessories for the operation of the equipments including but not limited to power cords, flexible plug leads, screw drivers etc should be included. To demonstrate dia-para-ferro magnetism in an inhomogeneous magnetic field.</p>
2.	Dia-, para-, ferro-magnetic materials in inhomogeneous field	<ol style="list-style-type: none"> 1. POWER SUPPLY Voltage : 0-30V (or better) DC continuously variable & stabilized Voltage display : 3½ digit LED Ripple : Less than 25mV Overload : Current limiting protection Current : 10 A continuously variable or better , 10% to full rating Current display : 3½ digit LED Working voltage : 230V AC, 50 Hz single phase 2. ELECTROMAGNET Coils : 500 turns. Coil Current : 8.5Amp (Max.) Connection : 4mm safety socket. U Core : 150x130mm²(LxH), 40x40mm² cross section. Pole piece : 40x40mm² cross section with pointed attachment pair Core material : Ferromagnetic. Bore piece : Iron with 5mm graduated scale Ventilation on three sides of coil to protect from overheating. 3. SAMPLES: Bi, Ni, Al 4. All other accessories for the operation of the equipments including but not limited to power cords, flexible plug leads, screw drivers, attachment assemblies, etc should be included.
3.	Electrical Transport Measurement Set-up (Physical Quantity Measurement System)	<ol style="list-style-type: none"> 1. Cryostate with (a) a complete set-up for evacuation; flushing (with an exchange gas) to access a temperature range 80-450K. (b) temperature control with a resolution of 0.01K and stability (in the isothermal mode) better than ±0.1 K. The system should be capable of bipolar ramp rates upto 10 K/min in steps of 0.1 K/min. 2. I-V source and measurement units for 2-/4-probe DC electrical transport property measurements in the range of 10 micro-ohm or lower to 100 Tera-ohm or better. The system should allow I-V measurements in different measurement configuration easily like two probe, 3 -probe, 4 probe local and 4-probe non-local measurement geometries. All I and V measurements should be at least 6½ digit. All set-point resolutions must be better than 0.05 % of full-scale. The following resistance measurement ranges should be supported.

		<ul style="list-style-type: none"> a. 10 micro ohms or lower to 10 Mega Ohms (conductors) : Using a programmable current source (1uA to 10mA or better) and nano-voltmeter (10nV to 10V or better). b. 1 milli-ohms to 1 Giga (generic) : Using selectable current/voltage source (1uA to 10mA or better, 1mV to 10V or better) and meter (1nA to 10mA or better, 1uV to 10V or better). c. 1 Mega to 100 Tera (insulators) Using programmable voltage source (1mV to 100V or better) and pico-ammeter (0.1pA to 1uA or better). <ul style="list-style-type: none"> 3. AC-susceptibility (χ-T) measurement : Lock-in amplifier with operating frequency range 10Hz – 10 KHz, an integration time of at least 1 sec, pre- and post-amp gain(s) of 1, 10, 100 and capable of measuring both phase and amplitude, and includes a built in reference source. Sample positioner for cancellation of thermal drift, with provision for stall detection. 4. Data acquisition and control software, which automates recording of time domain voltage,current and resistance data along with I-V, R-T and χ-T measurements under linear and stepped temperature profile mode, allows easy control of all experimental parameters, supports real time recording and plotting of physical quantities and runs on Linux or Windows. 5. Magneto-resistance; Hall Coefficient Measurement Unit for the temperature range of 80- 450K with a bipolar H-field in the range of 0 - 1000 gauss or better using an air-core electro-magnet, with a set-point resolution better than 0.05 % of full-scale, with a compatible Gaussmeter with resolution better than 1 Gauss and inclusive of a 6 Amp power supply 6. All accessories required to run the system such as rotary pump, Pirani gauge, branded computer (i3 processor or better, 4GB RAM, 500GB hard disk), helium cylinder and regulator,liquid nitrogen dewar (min capacity 3 litres)
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4.	Warranty and support	<ol style="list-style-type: none"> 1. 3 years comprehensive on-site warranty for all parts of the entire system including accessories supplied with the instruments from the date of successful installation and commissioning post warranty period will be for another 3 years for supply of all parts of the entire system, including accessories. If the system breakdown during warranty period, the warranty period will be extended for the full breakdown period after the expiry of initial warranty. 2. Service response time must be 48 hours or less. 3. On-site training must be provided by trained engineering at free of cost.
5.	Maintenance	The supplier is required to confirm that the spares and accessories would be available for more than 6 years after expiry of warranty and post warranty.
6.	Upgradation	The supplier shall supply upgraded software for PQMS operation whenever they are available.
7.	Application notes & Manuals	The supplier shall provide detailed application notes and manuals of PQMS in hard and soft copy along with the detailed drawings and circuit diagrams (in English).
8.	Compliance statement	The supplier must submit a table indicating the compliance of the features of the model of the equipment being quoted with those given in indent.
9.	Pre-installation Requirement	Pre-installation requirement such as room size, tolerable limits of EM field and vibration (mechanical), required power rating, utility requirements are to be stated clearly, and to be verified/ surveyed by the supplier at the installation site. It is the supplier's responsibility to clearly provide details of the above mentioned requirements before delivery of the equipment.
10.	Delivery & Insurance Coverage	Vendor will be fully responsible in successful delivery (including unloading), installation and commissioning of the instrument at site of installation in B.I.T. Sindri with fully insurance coverage as per rule.

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Date

Signature and official stamp

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Notice

Date - 28/8/2019

Description : Supply and installation of Scanning Tunneling Microscope Physical (STM) for nanotechnology

Package Code : TEQIP-III/JH/bits/17

Package Name : TEQIP-III/BITSindri/OTH/NANO-STM

B.I.T. Sindri, Dhanbad wishes to establish a Nanotechnology lab as a central research facility. The Technical specifications of the equipments/goods are provided below.

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Technical Specification

Following are the specifications and details for Scanning Tunneling Microscope Physical (STM) for nanotechnology laboratory at B.I.T. Sindri, Dhanbad.

Scanning Tunneling Microscope Physical (STM) is predominately used for surface topography and spectroscopy of thin film and nano structures of carbon based materials (i.e., CNT, carbon fiber ect.) and inorganic compounds.

SI. No.	Features & detailed specifications of the features
1.	<ul style="list-style-type: none"> • Suitable for pedagogy • The controller and Data-Acquisition electronics • A toolkit (with tools for tip and sample changing, spare sample mounting discs, conducting silver paste, tip wire cutters) • Two pre-mounted calibration samples, one for large area scans and one for calibration at the 0.1 nm level. • Pt/Ir and Tungsten tips (10 each) with 1 m extra of tungsten wire. • The STM should work under ambient conditions.
2.	Scan area: Min. 500nm × 500nm or smaller and Max. 2.0 μm × 2.0 μm or higher Atomic resolution with X-Y resolution 8 pm or better
3.	Imaging mode: Topographic imaging with sub atomic resolution in -Constant Current Mode - Constant Height Mode - Dynamical Conductance Imaging
4.	Z-resolution: Analog Mode : 8 – 10 pm or better Digital : 15pm or better
5.	Spectroscopy modes: 1. I-V Spectroscopy in point mode, line mode and grid modes (i) Numerical dI/ dV & Normalized dI/dV plots (ii) dI/dV with Lock-in Amplifier 2. I- Z Spectroscopy
6.	Bias settings: -10V to+ 10V in Steps of 0.5m V or better -100V to + 100V in Steps of 5mV or better
7.	Tunneling current range: + 5nA to -5nA in steps of 0.1n A or better
8.	Lock-in amplifier: Dynamical Conductance/Local Density of States Imaging through the fully integrated lock-in amplifier simultaneously with topography Local barrier height imaging through the same Lock-in amplifier.
9.	Image display: Dual Imaging Window for Scan and Retrace Image Display
10.	Data export: Export to standard image file formats like jpg, png, ASCII, postscript formats.
11.	Analysis functions: Line (Single line profile) Extraction, Localized Zooming, Roughness Display, Measure length & angles on the images, 2D Fast Fourier, Transformation etc.
12.	Sample size: 1×1 cm ² or higher
13.	Power supply: 220-240 V/ 50 Hz
14.	The STM should have suitable vibration isolation platform, an acoustic isolation shield, essential tool-kit, instruction manual, a few calibration samples.
15.	Computer: A third-party branded computer with essential specifications.
16.	List of optional items - Reference Sample Kit (with 10 pre-mounted samples having HOPG, Bismuth Telluride,

	and DVD samples)
17.	<p>Warranty and support :</p> <ol style="list-style-type: none"> 1. 3 years comprehensive on-site warranty for all parts of the entire system including accessories supplied with the instruments from the date of successful installation and commissioning post warranty period will be for another 3 years for supply of all parts of the entire system, including accessories. If the system breakdown during warranty period, the warranty period will be extended for the full breakdown period after the expiry of initial warranty. 2. Service response time must be 48 hours or less. 3. On-site training must be provided by trained engineering at free of cost.
18.	<p>Maintenance :</p> <p>The supplier is required to confirm that the spares and accessories would be available for more than 6 years after expiry of warranty and post warranty.</p>
19.	<p>Upgradation :</p> <p>The supplier shall supply upgraded software for STM operation whenever they are available.</p>
20.	<p>Application notes & Manuals :</p> <p>The supplier shall provide detailed application notes and manuals of STM in hard and soft copy along with the detailed drawings and circuit diagrams (in English).</p>
21.	<p>Compliance statement :</p> <p>The supplier must submit a table indicating the compliance of the features of the model of the equipment being quoted with those given in indent.</p>
22.	<p>Pre-installation Requirement :</p> <p>Pre-installation requirement such as room size, tolerable limits of EM field and vibration (mechanical), required power rating, utility requirements are to be stated clearly, and to be verified/ surveyed by the supplier at the installation site. It is the supplier's responsibility to clearly provide details of the above mentioned requirements before delivery of the equipment.</p>
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