SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR ULTRA HIGH FREQUENCY (UHF) BASED PARTIAL DISCHARGE (PD) MONITORING/MEASUREMENT SYSTEM FOR GAS INSULATED SWITCHGEAR (GIS)

(Specification No. GIS/UHFPD/Portable/15-16/002)

Important Note:

1. Vendor must submit complete information against each clause/serial no of the specification.

2. The offer and all documents enclosed with offer should be in English language only.

3. BHEL reserves the right to verify the information submitted by the vendor. The offer with false/incorrect/incomplete information may be rejected.

4. Revised technical bid may be necessary should the specification need modification on technical scrutiny.

5. The Offer should be separately quoted for the two items as under:

Item 1: Supply of Portable UHF based PD Monitoring/Measurement System, with all accessories & Training cost.

Item 2: Supply of UHF based online PD monitoring system for installation at 420kV GIS Site with all accessories, E&C at site & site training cost. This is an optional Item.

6. **Vendor must quote for Item 1 as per specifications (page 2-4) and for Item 2 as per specifications (page 5-9). Technical compliance of both the Item 1 & Item 2 is a must, without which the offer will be rejected. Item 2 may be procured at a later date.**

Scope of Supply:

One set of "Portable UHF based PD monitoring/measurement system" for periodic online/offline testing of GIS at BHEL Corporate R&D, Hyderabad.

Item 1: SPECIFICATION OF SYSTEM (PORTABLE UHF BASED PD MONITORING/MEASUREMENT SYSTEM)

S.No.	DESCRIPTION OF REQUIREMENT	DESIRED SPECIFICATION	VENDOR'S OFFERED SYSTEM SPECIFICATION
1.	Equipment: Supply of UHF technology based hardware, software, UHF PD spacer sensors and other relevant modules for capturing Partial Discharges in GIS. Intended Use: This system will be used by BHEL R&D for establishing & evaluating the performance of UHF based PD measurement on 420kV (and higher voltage) GIS modules of BHEL design.	Vendor to note and confirm	
2.	Power Supply Voltage	200-240VAC, 50Hz, 1 Phase (with or without adaptor)	
3.	Input port/channels	a) 3 (minimum) for three UHF spacer sensors b) Extra port/channel for any additional noise sensor if required.	
4.	Display Type	LCD/LED/TFT in-build display or separate laptop as applicable. Vendor to confirm the display type and also include it in the offer.	
5.	Data Storage Memory	10 GB (minimum)	
6.	Communication Port	USB or Ethernet Type	
7.	Size & Weight	Vendor to specify the size & weight. Should be portable. Weight less than 30 kg.	
8.	PD monitoring & analysis software features	a) Pre-installed/In-build software for PD analysis and pattern recognition. b) Display PD in terms of either pC, dBm or mV. c) Ability to differentiate PD and noise and also identify major PD fault type e.g. free particle, floating electrode, corona, void etc. d) Time/phase synchronization e) Store the PD activity including PRPD (Phase Resolved Partial Discharges) over a period of time for future analysis. f) Trending features for PD amplitude and Discharge Rate g) Self-test functionality to check end to end electronics of the	

		system	
9.	No of Sensors	a) 3 UHF Spacer Sensors b) Additional noise gating sensors if required.	
10.	Sensor Type	External Sensor (Spacer Sensor), which can be fitted on the small opening/aperture (exposed epoxy surface) of the GIS barrier/cone insulator	
11.	Dimension of the opening/aperture on the LT metallic flange of the GIS barrier/cone insulator where sensor has to be fitted	Drawing representing the opening/aperture is enclosed at Annexure 1. The sensor should be designed to fit in this dimension properly.	
12.	Sensor mounting	To be mounted using suitable belt or bracket to hold it around the GIS spacer/cone insulator (metallic LT flange of the GIS spacer)	
13.	Outside dimension of the GIS barrier/cone insulator	Diameter: 680 mm Width: 46 mm	
14.	Frequency Range & Sensitivity	Frequency Range: 500MHz-1.5 GHz (or better) Sensitivity: -65 dBm (or better)	
15.	Cables, Connectors & Adaptors	Suitable cables, connectors, adaptors & accessories to connect the 3 UHF spacer sensors to the PD data acquisition main unit.	
16.	Synchronization	External synchronization (VT Signal $110/\sqrt{3}$ volt AC) or synchronization with the line frequency if VT signal is not available	
17.	Miscellaneous components	Any other hardware module/component required for the proper functioning of the system should also be quoted by the vendor	
18.	Immunity	The system offered should be type tested for EMI/EMC compatibility for undertaking PD measurements in harsh high voltage substation environment. The system should be tested to industrial generic immunity and emission standards.	
19.	Safety Aspect	The vendor must take care of all safety aspects regarding the equipment. The equipment should have adequate and reliable safety features to avoid system damage and ensure personnel safety.	
20.	General environmental conditions for all equipments and accessories	Operating Temperature: -10ºC to +50 ºC (or better) Humidity: 5-90 % (or better)	
21.	Training	Vendor to provide training for acquaintance on operation and	

		maintenance of supplied equipment to BHEL Engineers at BHEL Corporate R&D, Hyderabad	
22.	Warranty	12 months (minimum)	
23.	Documentation	Two set of following documents (Hard Copies) in English should be supplied along with the equipment: a) Operating Manual b) Detailed Maintenance Manual c) Test and Warranty certificates	
24.	Packaging	Air/Sea/Road worthy rigid packing for all items of complete equipment, all accessories and other supplied items to avoid any loss / damage in transit.	
25.	Qualification Requirements	The OEM should have earlier supplied similar systems. The OEM must have an office or an authorized agent in India to support the maintenance of equipment as and when required by BHEL. The quoted system must be a proven one and should have been deployed/used for a period of minimum two years, with trouble free operation. The OEM or its authorized agent must submit along with the offer a reference list of its customers of the "Portable UHF PD monitoring system". In this regard following documents to be provided by the bidder: i) Purchase Order/Installation & Commissioning report ii) Performance/Acceptance certificate by customer This is minimum qualifying criterion for a supplier to qualify for this bid.	
26.	Details of Supply Part	Vendor to provide the list of parts/modules/systems/components/accessories etc. which would be supplied for fulfilling the above mentioned specification. It is the responsibility of the vendor to ensure all the components and systems are offered for the proper functioning and total integration of the system.	
27.	Spares/Accessories	Vendor to separately quote for any spares/accessories like PD injection Unit/PD calibration unit etc.	

Item 2: SPECIFICATION OF OPTIONAL ITEM (To be quoted separately)

a) Offer for Supply of one set of UHF based online PD monitoring system for installation at a 420kV GIS Site:

S.No.	DESCRIPTION OF REQUIREMENT	DESIRED SPECIFICATION	VENDOR'S OFFERED SYSTEM SPECIFICATION
1.	Equipment: Supply of site deployable rugged UHF technology based hardware, software, UHF PD spacer sensors and other relevant modules for online capturing Partial Discharges in 420kV GIS bay. Intended Use: The supplied system will be installed at 420kV GIS site at 1 (one) bay with 3 phases.	Vendor to note and confirm.	
2.	Methodology/Philosophy of measurement: The PD equipment shall be able to detect/capture, measure and record partial discharge patterns/signals generated inside the 420kV GIS, using UHF technology. The detection method shall be compatible with the relevant IEC standards/CIGRE recommendations.	Vendor to note and confirm	
3.	Power Supply Voltage	200-240V, 50Hz, 1 Phase (with or without adaptor)	
4.	Input port/channels	The system to be configured for minimum 18 UHF spacer sensors and thus the system should be capable of taking PD inputs/data from minimum 18 UHF spacer sensors installed on the GIS modules in the substation bay. Also, it should take inputs from any external noise antenna/sensors (if available) for assisting in removal of external interfering signals (radar, radio, telecommunications, etc.), which are not associated with partial discharges in the GIS.	
5.	Display Type	LCD/LED/TFT	

6.	Data Storage	10 GB (minimum) which could be expandable for higher data storage, if required. The system should have the facility to store the data in case of server failure.	
7.	Communication Port	USB or Ethernet	
8.	Enclosure/Cabinet	IP66 rated cabinet/enclosure suitable for installation in GIS hall.	
9.	PD monitoring & analysis software features	a) Software for PD analysis and pattern recognition. b) Display PD in terms of either pC, dBm or mV. c) Ability to differentiate PD and noise and also identify major PD fault type e.g. free particle, floating electrode, corona, void etc. d) Time/phase synchronization e) Store the PD activity including PRPD (Phase Resolved Partial Discharge) over a period of time for future analysis. f) Trending features for PD amplitude and Discharge Rate g) Support IEC61850 standard for communication. h) Facility to locate PD with ±0.5m or better accuracy.	
10.	No of Sensors	a) 18 UHF Spacer Sensors b) Additional noise sensors/antenna if required.	
11.	Sensor Type	External Sensor (Spacer Sensor), which can be fitted on the small opening/aperture (exposed epoxy surface) of the GIS barrier/cone insulator	
12.	Dimension of the opening/aperture on the LT metallic flange of the GIS barrier/cone insulator where sensor has to be fitted	Drawing representing the opening/aperture is enclosed at Annexure 1. The sensor should be designed to fit in this dimension properly.	
13.	Sensor mounting	To be mounted using suitable belt or bracket to hold it around the GIS spacer/cone insulator (metallic LT flange the GIS spacer)	
14.	Outside dimension of the GIS barrier/cone insulator	Diameter: 680 mm Width: 46 mm	
15.	Minimum Frequency Coverage	500MHz-1.5 GHz or better.	
16.	System Sensitivity	-65dBm or better	
17.	PD Acquisition Unit/Converter Unit:	Vendor to provide details of any intermediate unit/module between the sensors & the PD equipment cabinet in the	

		control/relay room. Suitable noise free communication (preferably optical) from GIS bay to the PD unit/cabinet in the control/relay room is required. Also, external noise antenna/sensors (if required) for assisting in removal of external interfering signals should be provided. Any, input voltage requirement of the PD Acquisition Unit/Converter Unit (in GIS bay) to be specified by the vendor.	
18.	Cables, Connectors & Adaptors	Suitable cables, connectors & adaptors to connect the 18 UHF spacer sensors (and any additional noise sensors/antenna) to the PD Unit/Cabinet in Control/Relay Room to be supplied. Vendor to supply suitable UHF/copper/optical/co-axial cables as required.	
19.	Synchronization	External synchronization (VT Signal 110/√3 volt AC) or synchronization with the line frequency if VT signal is not available.	
20.	Miscellaneous components	Any other hardware module/component required for the proper functioning and total integration of the system to 420kV GIS should also be quoted by the vendor	
21.	Immunity	The system offered should be type tested for EMI/EMC compatibility for undertaking PD measurements in harsh high voltage substation environment. The system should be tested to industrial generic immunity and emission standards.	
22.	Safety Aspect	The vendor must take care of all safety aspects regarding the equipment. The equipment should have adequate and reliable safety features to avoid system damage and ensure personnel safety.	
23.	General environmental conditions for all equipment's and accessories	Operating Temperature: -10ºC to +50 ºC (or better) Humidity: 5-90 % (or better)	
24.	Warranty	12 months (minimum). Post warranty, Annual Maintenance Contract (AMC) rate/cost of the system may be provided.	
25.	Documentation	Two set of following documents (Hard Copies) in English should be supplied along with the equipment: a) Operating Manual b) Detailed Maintenance Manual c) Test and Warranty certificates	

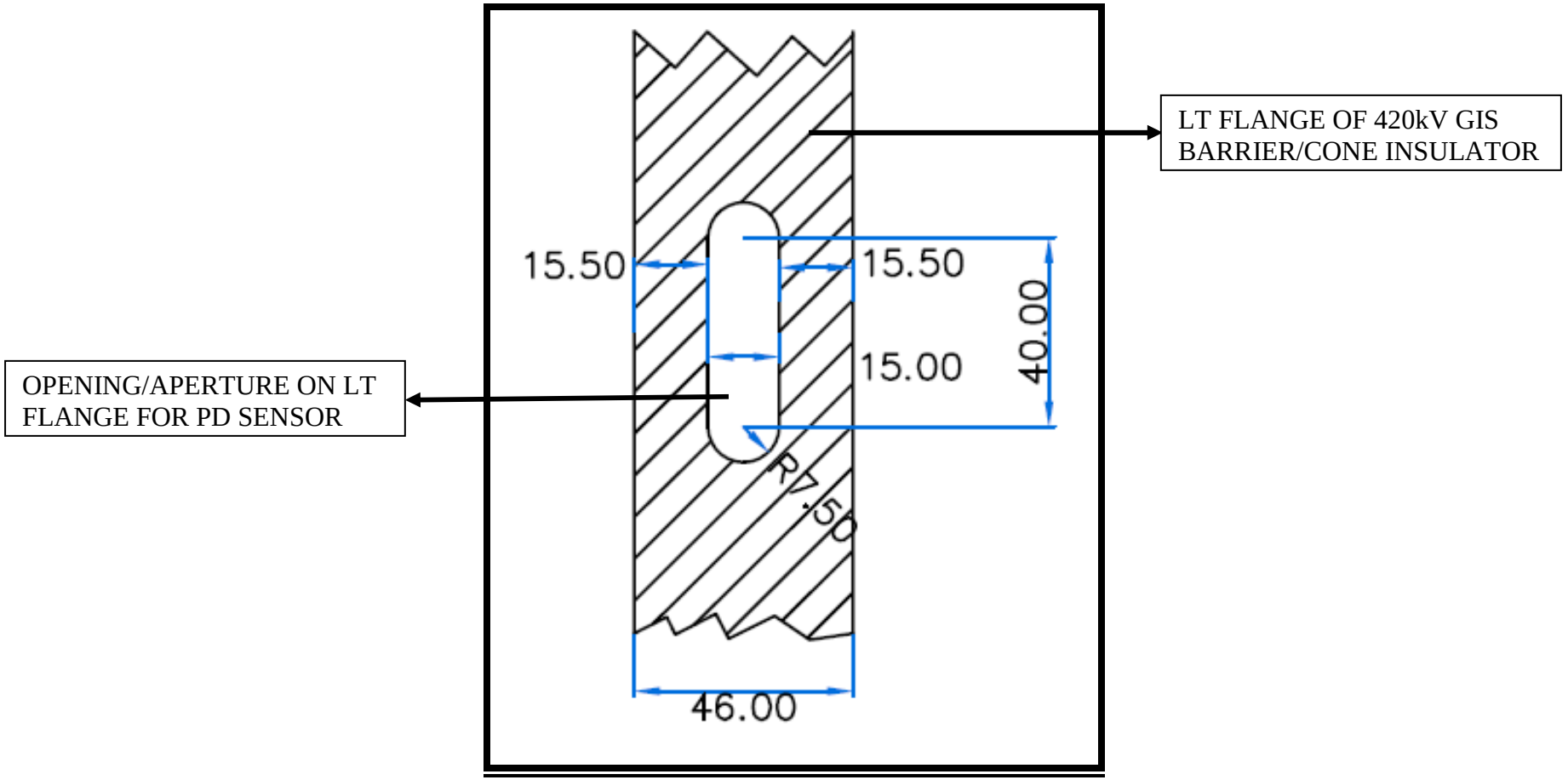
26.	Packaging	Air/Sea/Road worthy rigid packing for all items of complete equipment, all accessories and other supplied items to avoid any loss / damage in transit.	
27.	Qualification Requirements	The OEM should have earlier supplied similar systems. The OEM must have an office or an authorized agent in India to support the maintenance of equipment as and when required by BHEL. The quoted system must be a proven one and should have been deployed/used for a period of minimum two years, with trouble free operation. The OEM or its authorized agent must submit along with the offer a reference list of its customers of the "Online UHF PD monitoring system". In this regard following documents to be provided by the bidder: i) Purchase Order/Installation & Commissioning report ii) Performance/Acceptance certificate by customer This is minimum qualifying criterion for a supplier to qualify for this bid.	
28.	Details of Supply Part	Vendor to provide the list of parts/modules/systems/components/accessories etc. which would be supplied for fulfilling the above mentioned specification. It is the responsibility of the vendor to ensure all the components and systems are offered for the proper functioning and total integration of the system at 420kV GIS site	

(b) Offer for Erection, Commissioning & On-site training of the above system:

S.No.	DESCRIPTION OF REQUIREMENT	DESIRED SPECIFICATION	VENDOR'S REMARK
1.	Installation, onsite training, onsite testing and commissioning of the UHF based online PD monitoring system	Vendor to undertake erection and commissioning of the supplied system at site (420kV Site at Himachal Pradesh, India). Vendor to depute service engineer for commissioning, supervision & onsite training of the system. SLD diagram of the bay (1 phase) enclosed at Annexure 2.	
2.	System Integration	It is the responsibility of the vendor to ensure the integration of the entire system at site. BHEL will offer support in terms of labor, cable laying and other logistic requirements as required by the vendor.	
3.	After Sales & Service	Vendor shall ensure the availability of spares for the supplied equipment and after sales service at 420kV GIS Site, Himachal Pradesh, India for minimum 3 years.	

ANNEXURE 1

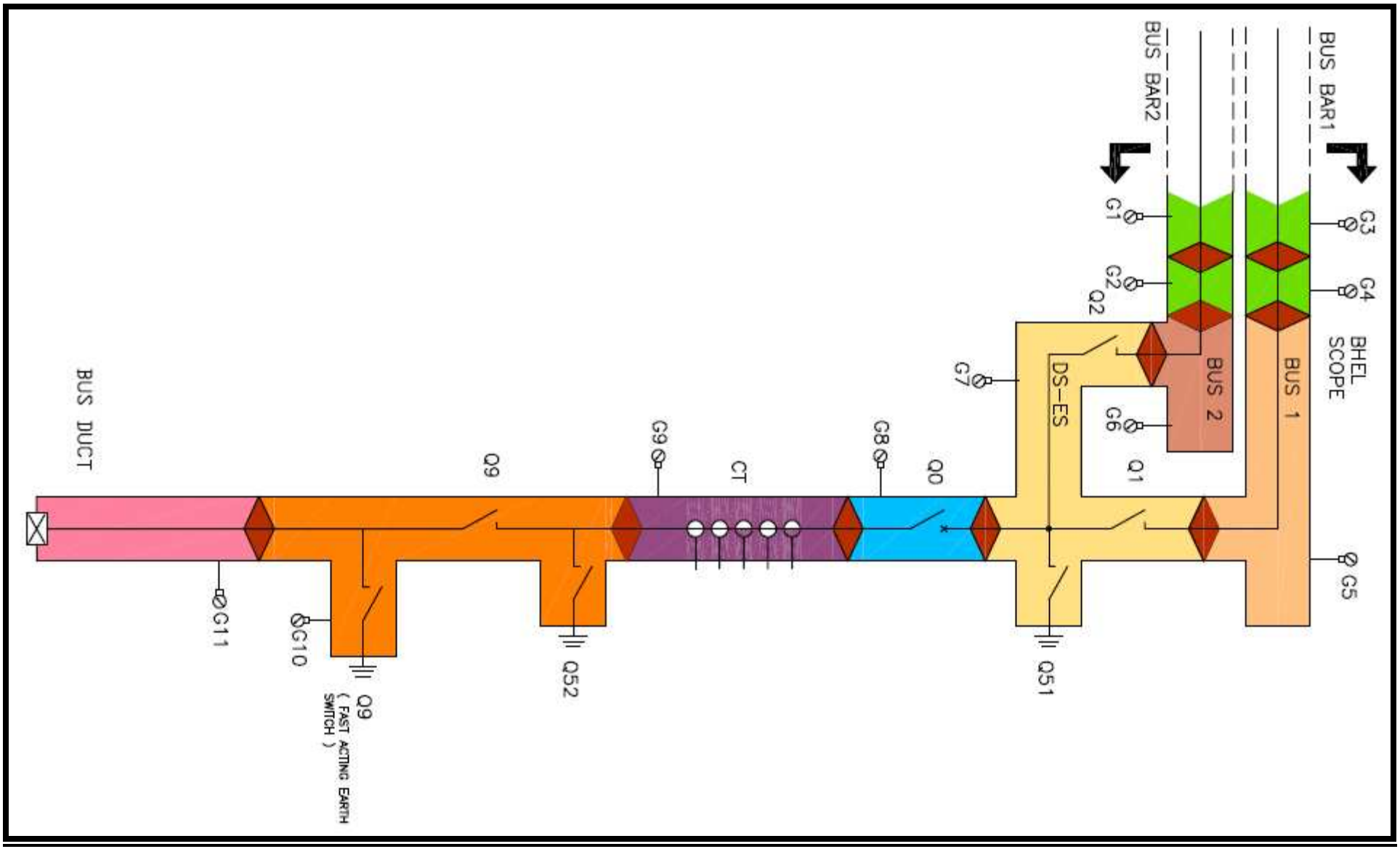
INDICATIVE DRAWING OF THE OPENING/APERTURE ON 420kV GIS BARRIER/CONE INSULATOR



Note: Drawing is representative only (All dimensions in mm)

ANNEXURE 2

SLD DIAGRAM OF THE 420kV GIS BAY (1 PHASE) FOR THE OPTIONAL ITEM



Note: Diagram is representative only