

PSGSG420	<b>Specifications of Gas-to-Cable Termination for 420kV GIS</b>	Drg.No	
		Date	15.04.2016
		Product	GSM-420
1.0	<p><b>Application:</b> Gas-to-Cable Termination is a part of high voltage gas insulated indoor switchgear equipment. The component is intended for a high voltage system of 400 kV (AC), 50 Hz. The scope of supply shall include 2SETs of Gas-to-Cable Terminations back to back ( Refer. Fig4 )in which each assembly consists of Plug-In Socket (<b>EPOXY BUSHING</b>) for GIS (2NO),Cable Connector (<b>CABLE TERMINATION</b>)(2NO),XLPE Cable (4-5 Meter) and accessories.The scope of supply shall also include Termination kit and standard cable accessories, if applicable and its installation by trained and certified staff at BHEL R&amp;D,Hyderabad.</p>		
2.0	<p><b>Specification:</b> The terminations for gas insulated switchgear will be installed with an epoxy resin insulator including an integrated insulating clearance for potential isolation between the switchgear housing and the cable screen / sheath. Gas-to-cable termination shall be designed with following features:</p> <ol style="list-style-type: none"> <li>1.Termination suitable for SF6 gas insulated switchgear equipment.</li> <li>2. Metal-clad plug-in cable termination.</li> <li>3. Adopt pre-moulded stress cone and epoxy bushing.</li> <li>4. Pre-mould stress cone shall be of feasible rubber material.</li> <li>5. The cable clamp shall be short circuit proof and shall provide soft support for cable.</li> <li>6. Maintenance free.</li> <li>7. Termination insulation level, current capacity, operating temperature shall match to cable specifications of IEC 62271-209, IEC 62271-203, IEC 62067 (245-420 kV) and IEEE 48/IEC 60071 (Insulation Co-ordination) and revisions there of.</li> <li>8. The design of termination shall be such that no mechanical forces are transferred to GIS by cable.</li> </ol>		
2.1	<p><b>Epoxy Insulator/Bushing :</b> High grade non-tracking epoxy insulators shall provide excellent mechanical and electrical characteristics. The insulators to be compatible with SF6 gas by-products ensuring long life of the termination. The insulator shall be capable of operating at a normal pressure difference of 4.5 bar (g). The insulator shall withstand for more than three times normal pressure under transient/abnormal conditions.</p>		
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2.2

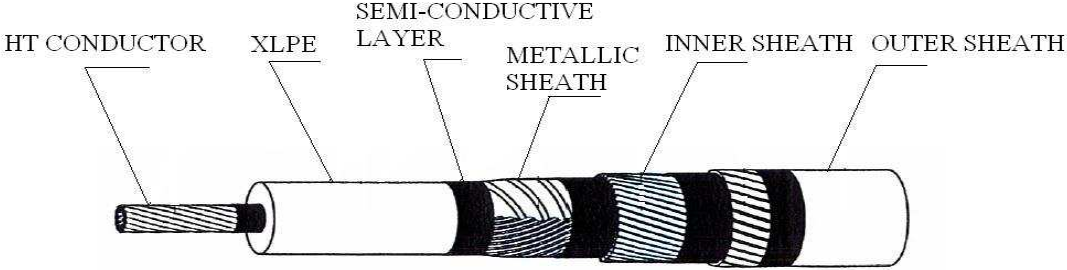


Fig1.A Sectional View of XLPE Cable

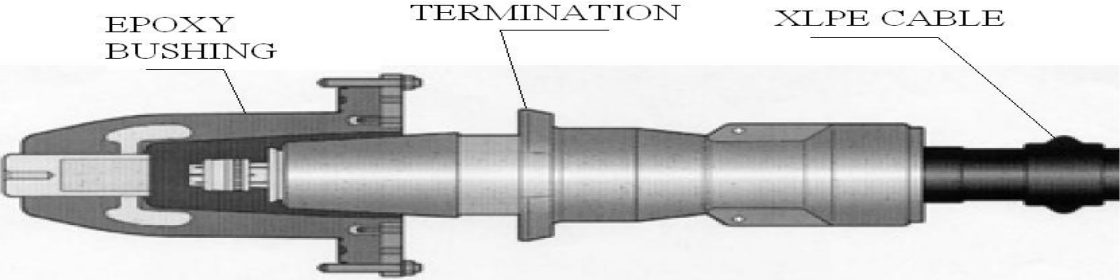


Fig2.A Sectional View of Gas-to-Cable Termination

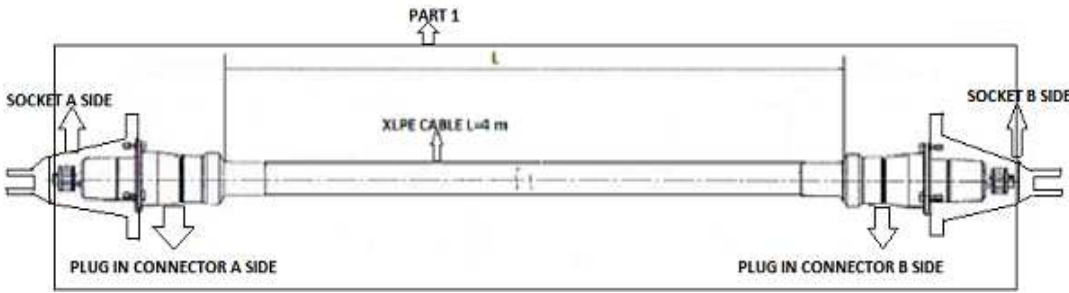
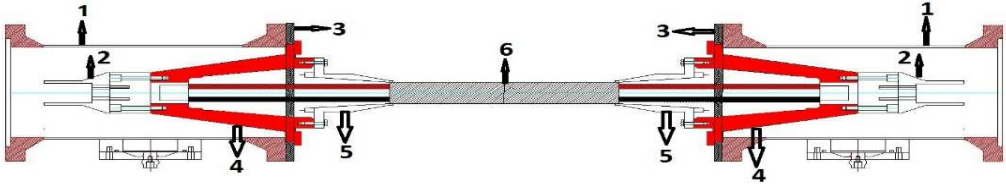


Fig3.Desired Final Product of Gas-to-Cable Termination after Assembly

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3.0	Standards	IEC 62271-203, IEC 62067 (245-420 kV)/ IEEE 48 and IEC 60071 (Insulation Co-ordination)		
	Standard Dimensions	As per IEC 62271-209		
	Working Conditions	Indoor or Outdoor		
	Highest Voltage for Equipment, Um kV ( 3Ph )	420		
	Rated Voltage, kV	400		
	Frequency (Hz)	50		
	Max. Short circuit current of termination, kA	>40kA/3sec		
	Rated LI Withstand Voltage, kV	1425		
	AC Withstand Voltage, kV	440		
	Partial Discharge Test < 5 pC at, kV	330		
	DC Voltage Test	As per IEC		
	Heat Cycles Voltagec Test, kV	440		
	Rated SF6 gas pressure (min) @ 20°C of BHEL system	4.5 bar (g)		
	Separable connectors shall be of water proof	Yes		
4.A	<b>SYSTEM PARAMETERS:</b>			
1	Rated Phase to Phase Voltage, kV (rms)	380-400		
2	Frequency, Hz	50		
4.B	<b>CABLE DESIGN:</b>			
4.C	<b>HT CONDUCTOR DETAILS:</b>			
1	Cross-Section of Conductor (Cu), Sq.mm	~630		
4.D	<b>INSULATION DETAILS:</b>			
1	Material	XLPE		
2	Semi conducting layer	Fully bonded		
3	Metallic sheath / screen	Yes		
4	Inner sheath with metallic screen	Yes		
5	Outer sheath with metallic screen	Yes		
6	Outdoor vertical Installation	Yes		
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5.0	 <p><b>NOTE:</b>  <b>BHEL SCOPE -1 &amp;2</b>  <b>SUPPLIER SCOPE - 3,4,5&amp;6</b></p> <p><b>Fig4. An Assembly Arrangement of Gas-to-Cable Termination plugged in GIS</b>  <b>Scope of Supply:</b>  1. Gas-to-cable terminations along with epoxy insulator/bushing for connecting the BHEL's Gas Insulated System.  2. Necessary seals/gaskets for the assembly of gas-to-cable termination.  3. Necessary grounding links / screen connection for connecting cable sheath to the termination. These links shall be capable of withstanding short circuit currents under fault conditions.</p>		
6.0	<p><b>TECHNICAL INPUTS:</b></p> <ol style="list-style-type: none"> <li>1. Dimensional drawing of gas insulated bus section (<b>Item No.1 in Fig 4</b>) in which epoxy bushing is to be installed shall be provided by BHEL.</li> <li>2. Detailed Dimensional drawing of end flange of gas insulated bus section (<b>Item No.3 in Fig 4</b>) for necessary sealing arrangements shall be provided by vendor.</li> <li>3. Detailed dimensional drawing of epoxy insulator / bushing by vendor</li> <li>4. Type of connections / shields required for insulator / bushing by BHEL (<b>Item No.2 in Fig 4</b>)</li> <li>5. Detailed Dimensional drawing of Connector arrangement offered by vendor along with bushing.</li> <li>6. Dimensional drawing of fixing arrangement used for bushing.</li> </ol>		
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7.0	<p><b>SPARES AND SERVICES:</b></p> <p>1.The vendor shall specify cost of additional bushings as optional.</p> <p>2.The vendor shall specify the services charges for installation and pre-commissioning tests as part of offer. The offer shall cover details about installation period, man hours requirement (Engineers, supervisors and helpers) etc.</p> <p>3.Insulators along with a set of seals or any other spares suggested by supplier for instillation / maintenance of terminations shall be specified as optional.</p> <p>4.Offer shall be made for termination with and without voltage tap arrangement.</p>		
8.0	<p><b>PERFORMANCE GUARANTEE:</b></p> <p>Supplier shall provide Guarantee certificate for the equipment to ensure reliability of the equipment for a period of 12 months from the date of installation and commissioning.</p>		
9.0	<p><b>DRAWING APPPROVAL:</b></p> <p>Outline General Arrangement (OGA) and component drawings as per Bill of Materials shall be submitted on order acceptance for approval prior to commencement of supply.Detailed drawing of the critical components like plug-in insulator / bushing, termination etc shall be submitted for approval by BHEL.</p>		
10.0	<p><b>FACTORY TESTS:</b></p> <p>All routine tests shall be carried out on the equipment supplied and test reports shall be submitted along with the supply. A sample of test report shall be submitted along with the technical offer containing details of electrical and mechanical tests for which the gas-to-cable termination has been evaluated by the vendor.</p>		
11.0	<p><b>TYPE TEST REPORTS:</b></p> <p>All type test reports pertaining to gas-to-cable termination including Power frequency, Lightning impulse, DC, Power frequency with heat cycles,Short time current test,etc. specified by IEC 62271-209 and revisions there of. Copy of reports shall be submitted along with technical offer.</p>		
12.0	<p><b>SITE TESTING:</b></p> <p>After installation of cable termination the vendor shall perform pre-commission tests as per IEC 62271-209 and revisions there of for ensuing the reliability of terminations during service. <u>Necessary test equipment required for commissioning of terminations shall be provided by BHEL.</u></p>		
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13.0	<p><b>INSTALLATION &amp; COMMISSIONING:</b>  Installation and commissioning by trained and certified staff at BHEL R&amp;D,Hyderabad.</p> <p>The vendor shall confirm the list of items to be supplied by BHEL prior to installation. The vendor shall also provide details about storage instructions, installation period, pre-commissioning tests after installing termination, condition monitoring details etc. along with the technical bid.</p> <p>The cable termination manufacturer should ensure that during manufacture, handling, storage and installation of the cable termination, provisions shall be made to ensure that the requirements given in IEC 60694, clause 10.</p>		
14.0	<p><b>SAFETY ASPECTS:</b>  The design must take care of all safety aspects related to equipment and operating personnel. The termination should have adequate and reliable gas pressure withstandability to avoid any system damage and ensure personnel safety.</p>		
15.0	<p><b>OPERATION AND MAINTENANCE MANUALS:</b>  Supplier shall provide operation and maintenance manual covering instructions for safe handling and transport of the cable termination. The user manuals shall have detailed information about dimensions of parts of cable termination, maintenance of the equipment, trouble shooting, spare parts and methods. Contact addresses and the person for future service requirements shall be ensured.</p>		
16.0	<p><b>PACKING:</b>  The termination shall be supplied in sealed condition. The insulator shall be protected and covered with moisture proof packing with requisite quantity of absorbents.</p> <p>The supplier is advised to pack the equipment in air/sea worthy packing with suitable markings and vibration sensors (recording handling abuse). For marking on packing follow the marking instructions given with the purchase order.</p> <p>Necessary precautions shall be taken by vendor for safe storage of material during transportation and storage at BHEL till installation and commissioning are completed even if date of installation is delayed due to unforeseen circumstances.</p>		
17.0	<p><b>QUALIFYING REQUIREMENTS:</b>  The supplier shall be of International repute with proven record and should have supplied similar or higher rated plug-in gas-to-cable terminations for gas insulated substations, at least, for last three years. The supplier must submit along with the technical bid the references of supplies made so far and certificates of operating experience.</p>		
18.0	<p><b>ANY OTHER INFORMATION:</b>  In case of doubts please contact BHEL for clarifications. Vendor can furnish any other/additional information, considering overall requirements.</p>		
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