
















### Joint Report Of Material Descrepancy Report of 220KV GIS (M/s Siemens Supply)

SI No	Item Code	Description of Material	Qty	Photo graph	Remarks
1	C1B45901917001	Contact blank (3150 A)	4		
2	FR2:GHV105188F0	SWITCHGEAR LABELS- Name slip	13		Replacement Done
3	C1B95043679000	Ch. head screw ISO 4762_M16x80_8.8-A2K	12		
4	C1B95049053000	Washer SWT 671_17.00x30.0x6.00_St A2K	56		Replacement done
5	C1B95028749000	Washer ISO 7092_16.0_200HV A2K	24		
6	C1B95025657000	Ch. head screw ISO 4762_M16x60_10.9-A2K	12		
7	C1B95025656000	Ch. head screw ISO 4762_M16x50_10.9-A2K	30		
8	C1B95050694000	Ch. head screw ISO 4762_M16x200_10.9-A2K	24		Replacement done
9	C1B44000500001	special screw	30		
10	C1B95048908000	SWT 671_13.00x25.0x5.00_St A2K	96		
11	C1B95025642000	Ch. head screw ISO 4762_M12x40_10.9-A2K	56		
12	C1B95028716000	Washer ISO 7089_16.0_200HV A2K	52		
13	107030699	dispensing Gun 300 ml.	1		
14	C1B95035634000	Screw DIN 931_M12.00x70_8.8-tZn_L49/22	40		

## 600493/2021/TBG-TB\_ENGG\_MSE

Sl No	Item Code	Description of Material	Qty	Photo graph	Remarks
15	C1B42702585002	Filter bag	20		
16	D08 DS Q1 Module	Disconnecter Module (Used from Spare)	1		Water drop found inside after opening. No N2 Filling. End cap not air sealed. Rupture disc joint found loose. Inner parts if rusted may be replaced as complete assembly is in good condition.
17	D04 BBM Q22 Module	Disconnecter Module	1		
18	C1B950-26692-000-M12X90	Hardware	96		

**Note :**

- 1 Item No. -17 - Cleaning done at site. M/s Siemens site representative advised that material to be checked in factory for internal checking.
- 2 BHEL observation is air sealed packing not provided and water/moisture entered during outdoor storage of material and no instruction over box for indoor storage.

M/s BHEL

*Shekhar*  
21/08/2021

M/s Siemens

*[Signature]*  
21/08/2021

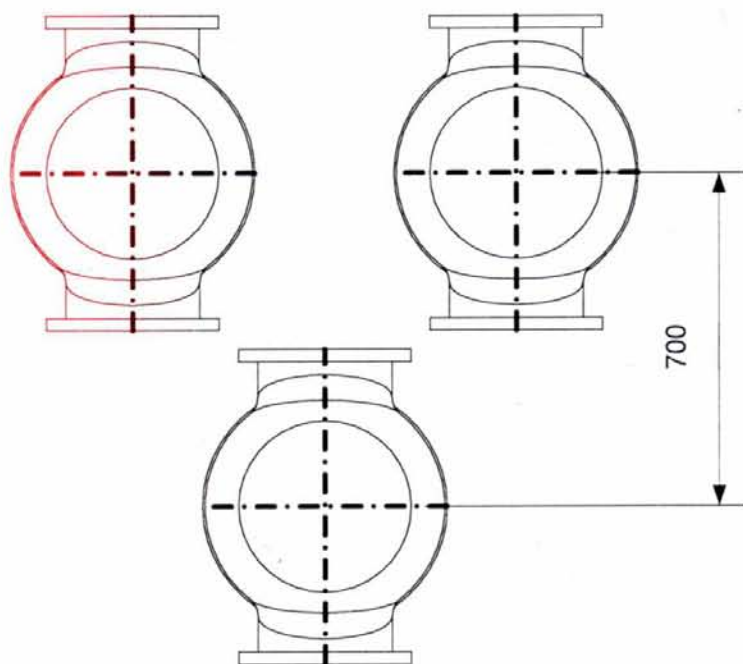
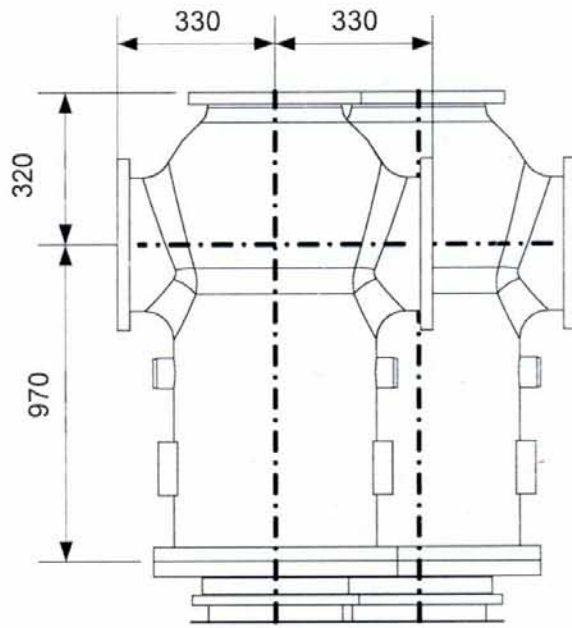
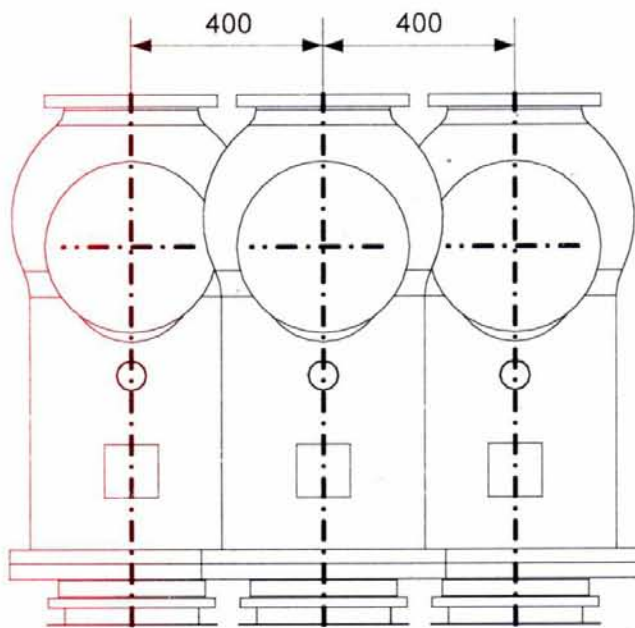


Customer: UPPTCL Ltd.

Project: 400/220/132kV GIS Substation at Rasra Ballia

Annexure-1

### Cable connection module 245 kV



Office of The Superintending Engineer  
 Electrical, 220kV Substation Design Circle  
 Uttar Pradesh Transmission Corporation Limited  
 700, Shakti Bhawan Extn. Lucknow

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For cable termination system according to

IEC 62271-209 Edition 1.0 (08-2007)  
Clause 7.2 Figure 5, Dry-type cable-terminations

**SIEMENS**

Customer: UPPTCL Ltd.

Project: 400/220/132kV GIS Substation at Rasra Ballia

Annexure-1

**Technical Data**

Rated voltage	245	kV
Rated power frequency withstand voltage	460	kV
BIL (1.2/50 $\mu$ s) Rated lightning impulse withstand voltage	1050	kV
SIL (250/2500 $\mu$ s) Rated switching impulse withstand voltage	---	kV
Rated normal current	2000	A
Rated short-time withstand current, 3 seconds	40	kA
Rated peak withstand current	100	kA
Rated frequency	50	Hz
SF <sub>6</sub> pressures <sup>2)</sup> :		
Filling pressure (at 20 °C)	610	kPa
-Min. service pressure range (Dielectric test pressure) at 20	550	kPa
-Design pressure of the adapter housing	850	kPa
-Test pressure of the adapter housing	1700	kPa
-Rupture diaphragm bursting pressure	1220 - 1340	kPa
-Bursting pressure of the adapter housing	≥4250	kPa
Volume of the adapter housing	≈140	l
Weight of the adapter housing	≈59	kg
Loss of gas	per year and compartment	<0.5 %
Temperature rise of enclosures at rated current over 50°C:		
-which have to be touched during normal operation	max. 20	K <sup>1)</sup>
-which need not be touched during normal operation	max. 30	K <sup>1)</sup>
-which are not accessible to the operator	max. 55	K <sup>1)</sup>
Ambient temperature range:		
-indoor <sup>3)</sup>	-5	to +50 °C
-outdoor <sup>3)</sup>	-5	to +50 °C
Mounting location of cable connection module		vertical

**Note:**

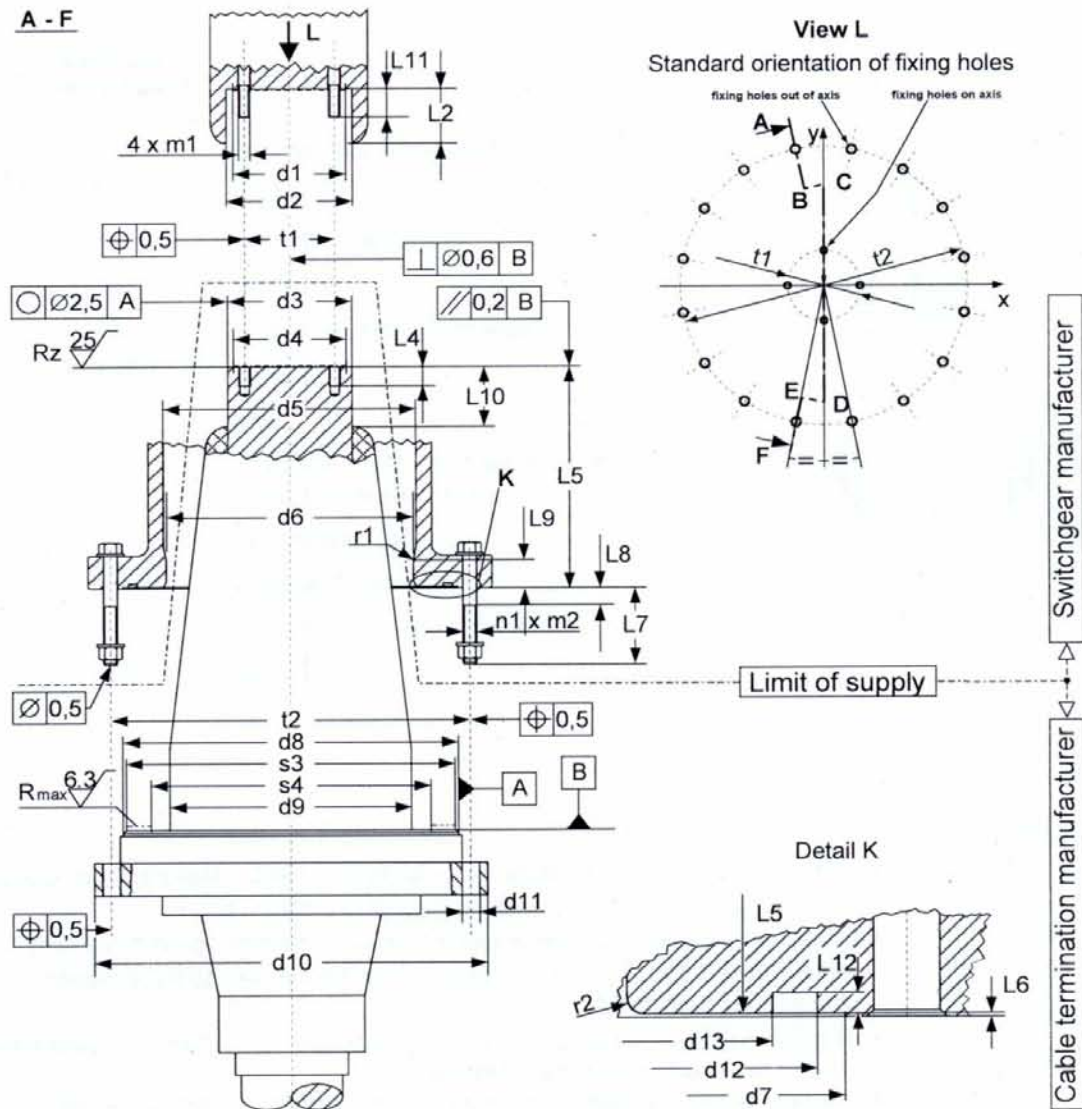
- Mechanical forces in lateral or axial direction caused by external forces, e.g. cable forces to the connecting flange of the cable connection enclosure shall not exceed 2kN. Forces in both directions can apply.
- Mechanical forces caused by internal forces to the cable termination are specified within IEC 62271-209, clause 6.2
- The overpressure relief device for the gas compartment including the cable connection enclosure is designed for covering possible internal faults within that compartment; it is not designed to cover internal faults within the cable termination as this component is not part of the GIS.
- According to IEC 62271-209, the insulation between the gas compartment of the gas-insulated cable connection enclosure and the cable termination serves as a barrier to prevent the flow of insulating gas between the components. Cable terminations which allow a flow of gas (e.g. SF<sub>6</sub>) between the components are not in conformity with the standard and are not appropriate for installation into the cable connection enclosure. Installation using a cable termination without an insulating barrier conforming to the requirements of IEC 62271-209 may lead to death, personal injury and/or property damage.
- Neither Siemens AG, nor any of its affiliates, subsidiaries, successors or assigns, shall be responsible or liable for any claims, losses, or damages, including, but not limited, to death, personal injury or property damage, resulting from or relating to an improper installation of the cable termination into the cable connection enclosure.

1) at 40 °C according to IEC 62271-1 Edition 1.0 (10-2007), Table 3

2) Note: 'bar' means bar gauge

3) Ambient temperatures higher than +40°C only possible with lower rated current

Diameters and Linear Sizes:



d1= 139 <sup>+0.3</sup> <sub>-0.3</sub> mm	d9≤ 375 mm	L5= 620 <sup>+2.0</sup> <sub>-2.0</sub> mm	r1≥ 10 mm
d2= 202 <sup>+0.5</sup> <sub>-0.5</sub> mm	d10≤ 500 mm	L6≤ 0 mm	r2≥ 2.5 mm
d3≤ 200 mm	d11≥ 14.5 mm	L7≥ 110 mm	s3≥ 451 mm
d4≥ 140 mm	d12= 428 mm	L8≤ 30 mm	s4≤ 391 mm
d5≥ 400 mm	d13= 417.3 mm	L9≤ 70 mm	t1= 110 <sup>+0.3</sup> <sub>-0.3</sub> mm
d6= 385 <sup>+0.5</sup> <sub>-0</sub> mm		L10≥ 105 mm	t2= 475 <sup>+0.5</sup> <sub>-0.5</sub> mm
d7= 455 <sup>+0.5</sup> <sub>-0</sub> mm	L2≤ 100 mm	L11≤ 20 mm	m1= M12
d8= 454 <sup>+0.3</sup> <sub>-0.3</sub> mm	L4≥ 21 mm	L12= 6.4 mm	n1 x m2= 16 x M12

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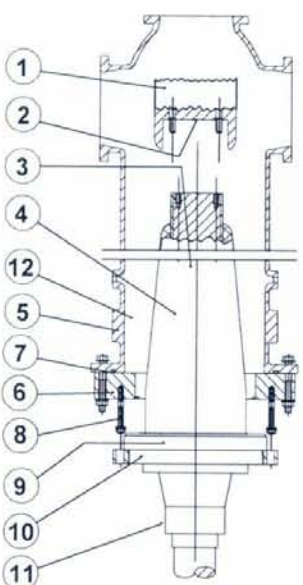
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Customer: UPPTCL Ltd.

Project: 400/220/132kV GIS Substation at Rasra Ballia

Annexure-1

## Limits of supply

	Switchgear Manufacturer	Cable Termination Manufacturer
		
Main circuit end terminal	①	
Connection interface	②	
Connection interface		③
Insulator		④
Cable connection enclosure	⑤	
Flange	⑥	
Seal	⑦	
terminal screw connection, washers, nuts (galvanized steel)	⑧	
cpl. sealing end		⑨
Flange (if needed)		⑩
remaining parts of sealing end		⑪
SF <sub>6</sub> -gas	⑫	

## Assembling

- Screws thread to be lubricated with –Centoplex 24DL- (Messrs. Dow. Corring, Munich) before assembling ①, tightening torque M12 = 70 ± 4 Nm
- Tightening torque for pressure vessel screw connection (galvanized bolt) M12 = 40 ± 4 Nm ③, terminal screw connection locked by liquid plastic 3 according to SN 46800 – Loctite 243
- Tightening torque for pressure vessel nuts M12 = 40 ± 4 Nm ③; (lower torque possible by the cable termination manufacturer)
- Flange surface exposed to air (outside the O-ring diameter) coated with –TECTYL 506-grease (Messrs. Valvoline, Hamburg). Sealing zone (groove and surface contacting O-ring) as well as flange surface exposed to SF<sub>6</sub> (inside of O-ring diameter) coated with –WD40 - (WD40 Company Ltd., Milton keynes, GB)
- Contact surface in the current path (main circuit-cable termination) to be copper-sprayed with 40 to 100 µm

Note: Consider mating material – terminal screw connection ↔ pressure ring

## Shipment

- Parts protected against mechanical damage and corrosion
- Contact surfaces in current path treated with easily removable anti-corrosion compound (e.g. Centoplex 24 DL, Messrs. Klüber, Munich)
- Cable connection housing with factory-assembled SF<sub>6</sub>-tight endplates

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Customer: UPPTCL Ltd.		<b>SIEMENS</b>
Project: 400/220/132kV GIS Substation at Rasra Ballia		
Title: Data Sheet for 220 kV SF6 Gas filled Bushing	Document No: Annexure-2	Date 31.07.2019

**Technical Data:**

1.	Rated Voltage	220 kV
1.a	Highest System Voltage	245 kV
2.	One minute Power Frequency Voltage @ 50Hz	460 kV
3.	Impulse Voltage (1.2/ 50 micro sec)	1050 kVp
4.	Rated Current	2000
5.	Maximum Service Current @ ambient of 40°C	3150 A
6.	Rated Short Circuit Current	40 kA 3 sec
7.	Partial Discharge Extinction Voltage	> 245 kV
8.	Partial discharge level	< 10 pC
9.	Filling Pressure at 20 deg C	6.1 Bar (relative)
10.	Minimum Service Pressure at 20 deg C	5.5 Bar (relative)
11.	Max. Service Pressure at 20 deg C	8.5 Bar (relative)
12.	Test pressure at 20 deg C	15 Bar (relative) for 5 min
13.	Maximum Allow leak rate per annum	< 0.2 %
14.	Arcing Distance	2340 mm
15.	Creepage Distance (Minimum)	7595 mm
15.a	Specific Creepage Distance	31mm/kV
16.	Mechanical Load	
16a	Maximum Mechanical Load	8 kN
16b	Maximum Earthquake acceleration (Horizontal and Vertical)	0.5 g
16c	Allowable Inclination	0 to 90 deg from vertical axis
17	Total Weight	170 kg
18	Applicable Standard	IEC 60137
19	Insulating Medium	SF6 Gas
20	Insulator	Silicon Composite

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 Electrical, UPPTCL, Ballia  
 UP Power Transmission Corporation Limited  
 11th Floor, Sheela Park, Kanpur

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Customer: UPPTCL Ltd.	<b>SIEMENS</b>	
Project: 400/220/132kV GIS Substation at Rasra Ballia		
Title: Data Sheet for 220 kV SF6 Gas filled Bushing	Document No: Annexure-2	Date 31.07.2019

**Rating Plate:**

SIEMENS		SF6 GAS FILLED BUSHING [Made in India]			RATING PLATE								
Type	DFS 245-3150	Insulation Level	460kV/1050kVp	Standard	IEC 60137	Rated Primary Current Ir	2000 A	Frequency	50 Hz	Sr No		Year	2019
Highest System Voltage Um	245 kV	Max. Angle to Vertical	90°	Insulation class	B	Total Weight (Approx.)	170Kg	SF6 Gas detail at 20 deg C	Filling Pressure : 6.1 bar (rel) Min. Service : 5.5 bar (rel) Pressure				
Caution: The terminal connector should be in line with the maximum current requirement & duly type tested as per relevant IEC.													

**General Description:****SF6/Outdoor bushing type DFS 245-3150A**

1. The composite insulator consists of glass-reinforced epoxy-resin-pipe with silicone sheds and aluminium flanges
2. Hue of silicone sheds: ANSI 70 (pale grey)
3. Sealings in form of O-rings made of EPDM resp. FVMQ
4. The rating plate is made up of Aluminium alloy of size 150X40X1mm (max) with black colour font painted over Aluminium natural background.
5. Provision for lifting through eye-bolt has been provided on bushing.

**Transport:**

1. Filter material for absorbing prospective moisture is placed within the bushing
2. Packing and shipping in wooden box, secured with nylon ratchet, for fixing the bushing
3. Transport flange will be bolted at lower flange with the help of transport 'o' ring & mounting hardware (for details, refer point no.6)
4. Transport pressure: 0.2 to 0.5 bar @ 20 deg C (rel.)
5. Gas filling arrangement (DN20) will be accommodated in the transport flange
6. Mounting hardware (SR-6KY 931-A2-70:M12X50 & plain washer 125-A2:M12) will be provided.

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Electricity 760/100kV Substation Design Circle-1  
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Siemens Ltd. India

CUSTOMER: UPPTCL LTD.			
PROJECT: 220KV GIS SUBSTATION AT RASRA BALLIA (U.P.)			
SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR 220KV GIS			
SL. NO.	DESCRIPTION	UNIT	PARTICULARS
<b>A. Complete GIS Module</b>			
1	Type of GIS Enclosure (Isolated / Encapsulated)	-	Busbar - 3 ph encapsulated Switchgear - 1 ph encapsulated
2	Material of enclosure	-	Aluminium alloy
3	Minimum thickness of enclosure	mm	11
4	Nominal voltage of system	kV	220
5	Rated voltage of system	kV	245
6	Rated voltage for equipment (U <sub>r</sub> )	kV	245
7	Rated insulation levels phase-to-earth and between phases	kV peak	1050
	Rated short-duration power-frequency withstand voltage (U <sub>d</sub> )	kV rms	460
8	Rated switching impulse withstand voltage (Us)	-	-
	Phase-to-earth	kV peak	Not applicable for 220KV system
	Between phases	kV peak	Not applicable for 220KV system
9	Rated lightning impulse withstand voltage (U <sub>p</sub> )	kV peak	1050
10	Rated frequency (fr)	Hz	50
11	Rated normal current (I <sub>r</sub> )	A	3000
12	Rated short-time withstand current (I <sub>k</sub> )	kA rms	40
13	Rated peak withstand current (I <sub>p</sub> ), kA	kA peak	100
14	Rated duration of short-circuit (t <sub>k</sub> )	sec	3
15	Rated supply voltage of closing and opening devices and of auxiliary and control circuits (U <sub>a</sub> )	V	220
16	Rated supply frequency of closing and opening devices and of auxiliary circuits (Hz DC or 50 or 60)	-	DC Voltage
17	Neutral earthing Solidly or not solidly	-	Solidly Earthed
18	Number of phases	-	3
19	Single- or three-phase design	-	Busbar - 3 ph encapsulated Switchgear - 1 ph encapsulated
20	Maximum SF <sub>6</sub> leakage rate	% / year	< 0.5 %
21	Rated filling pressure	-	-
	Circuit-breaker	bar	6.9
	Other compartments	bar	6.1
22	Alarm pressure	-	-
	Circuit-breaker	bar	6.4
	Other compartments	bar	5.7
23	Minimum functional pressure	-	-
	Circuit-breaker	bar	6.2
	Other compartments	bar	5.5
24	Design pressure of enclosures	-	-
	Circuit-breaker	bar	9.0
	Other compartments	bar	8.5
25	Type test pressure of enclosures	-	-
	Circuit-breaker	bar	45.0
	Other compartments	bar	42.5
26	Routine test pressure of enclosures	-	-
	Circuit-breaker	bar	18.0
	Other compartments	bar	17.0
27	Operating pressure of pressure relief device	-	-
	Circuit-breaker	bar	12.2 - 13.4
	Other compartments	bar	12.2 - 13.4
28	Internal fault	-	-
	Short-circuit current	kA	40
29	Quantity of SF <sub>6</sub> gas of complete GIS at filling pressure	kg	Will be furnished after finalisation of GIS layout
30	Quantity of SF <sub>6</sub> gas of the largest compartment at filling pressure	kg	Will be furnished after finalisation of GIS layout
31	Maximum permissible gas dew point	°C	-5
32	Number of gas compartments	-	Refer SLD [(1)-G71770-AD309-S005]
33	Length of longest section for transportation	mtr	Will be furnished after finalisation of GIS layout
34	Weight of the heaviest piece of equipment to be handled during installation on-site	kg	<= 5000
35	Seismic acceleration	g	Will be furnished in foundation load report
<b>B. Busducts</b>			
1	Inductance	μH/m	0.2 ± 0.04
2	Capacitance	pF/m	50 ± 10
3	Resistance of enclosure at fr	μΩ/m	<= 9
4	Resistance of conductor at fr	μΩ/m	<= 8
5	Surge impedance	Ω	60 ± 12
<b>C. Bushing (Outdoor-immersed bushing)</b>			
1	Type of internal insulation	-	SF <sub>6</sub>
2	Type of external insulation	-	Air
3	Nominal specific creepage distance	mm/kV	31 mm
4	Shed profile 4. Normal or alternating	-	Alternating
5	Rated short-duration, power-frequency withstand voltage (U <sub>d</sub> )	kV rms	460
7	Rated switching impulse withstand voltage (Us)	kV	Not applicable for 220KV system
8	Rated lightning impulse withstand voltage (U <sub>p</sub> )	kV peak	1050
9	Cantilever test load	kN	8
10	Cantilever operation load	kN	8
11	Type of line termination	-	SF <sub>6</sub> to Air Termination
<b>D. ENCLOSURES BUSBARS</b>			
1	Type of busbar and standard	-	3 ph encapsulated
2	Rated working voltage	kV rms	245
3	Maximum voltage at which busbar can operate continuously	kV rms	245
4	Shape of busbar	-	Cylindrical
5	Material and cross sectional area of busbar	sq.mm	Aluminium, 5024

CUSTOMER: UPPTCL LTD.			
PROJECT: 220KV GIS SUBSTATION AT RASRA BALLIA (U.P.)			
SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR 220KV GIS			
SL. NO.	DESCRIPTION	UNIT	PARTICULARS
6	Continuous current rating of busbar	A	3000
7	Temperature rise over at specified ambient Temp		
	a) Busbars	°C	55
	b) Enclosure	°C	20
8	Short time current withstand	kA - sec	40 kA for 3 sec
9	Type of encapsulation	-	3 phase encapsulated
10	Material and shape of enclosure	-	Aluminium Alloy, Cylindrical
11	Thickness of enclosure material	mm	13
12	Standard length of each unit	mm	1500
13	Losses in the busbars	Watt	Will be furnished along with Civil drawing
14	Losses in the enclosure	Watt	Will be furnished along with Civil drawing
15	One minute power frequency test withstand Voltage	kV rms	460
16	1.2/50 microsec. Lighting impulse test withstand voltage	kV peak	1050
17	Arrangement of earthing and size of Earthing conductors	-	Will be furnished along with Earthing dwg
20	Details of cable termination	-	Dry type as per IEC 62271-209
21	Type and material of connector between adjacent joints	-	Aluminium
22	DC resistance/phase	μΩ/m	6
23	Inductance/phase	μH/m	0.2 ± 0.04
24	Capacitance to earth/phase	pF/m	50 ± 10
25	Phase to phase spacing	mm	Manufacturer's Internal design data
26	Enclosure burn through time at rated short circuit current	Sec	0.3
27	Enclosure design pressure	bar	8.5
28	Enclosure rupturing pressure	bar	12.2 - 13.4
29	Gas losses per gas compartment per year	% / year	< 0.5
30	Minimum creepage distance over insulator	mm	NA
31	a) Type/material of insulators	-	Solid Cast Resin
	b) P.C. level of insulators	pC	< 5
	c) Whether insulators are suitable for SF6 arcing contact	-	Yes
32	Circulating and eddy current of enclosure during normal operation	-	Manufacturer's Internal design data
33	Maximum potential rise of enclosure		
	a) Under short circuit condition	V	< 65
	b) Under normal operating condition	V	< 65
35	Whether temperature compensated density Monitor, pressure relief devices provided with each compartment	-	Yes
36	Dielectric strength of compartment if SF6 Gas pressure falls to atmospheric pressure (For information purpose)	kV rms	142
37	i) Lighting impulse withstand level		
	a) Circuit breaker compartment	kV peak	1050
	b) Others	kV peak	1050
	ii) Continuous AC operating voltage		
	a) Circuit breaker compartment	kV rms	245
	b) Others	kV rms	245
38	Pressure relief device		
	a) Rupturing pressure and time of rupture	bar	12.2 - 13.4
<b>E.</b>	<b>LOCAL CONTROL CUBICLES</b>		
1	Manufacturer's name	-	Siemens Ltd.
2	Degree of protection	-	IP43
3	Thickness of sheet steel		
	a) Front	mm	2.5
	b) Back	mm	2.5
	c) Sides	mm	2.5
4	Paint treatment and color shades	-	Powder coating & RAL 1013
5	Weight of each panel	kG	approx. 500
6	Dimensions (width x depth x height)	mm x mm x mm	950 x 400 x 1800
7	Mimic bus material and colors	-	Black Paint
8	Cable glands included	-	Yes
9	Auxiliary relays		
	a) Make	-	Siemens
	b) Type designation	-	3RH21 Series
10	Control switches		
	a) Make	-	Salzar
	b) Type designation	-	CH10A215-600FT2
11	Push buttons		
	a) Make	-	NA
	b) Actuator type	-	NA
12	Indicating lamps		
	a) Type	-	LED
	b) Rating		
	i) Voltage	V	220V DC
	ii) Wattage	Watt	2.42
<b>F.</b>	<b>SF6 GAS</b>		
1	Normal operating pressure	kg/cm <sup>2</sup>	6.9 / 6.1
2	Normal operating density	gms/cc	-
3	Maximum permissible pressure	kg/cm <sup>2</sup>	9.0 / 8.5
4	Maximum gas density	gms/cc	-
5	Minimum pressure to maintain dielectric insulation	kg/cm <sup>2</sup>	6.2 / 5.5
6	Maximum leakage rate	% / year	< 0.5
7	Maximum permissible moisture content by weight	ppm	As per IEC 60376
8	Permissible variation in ambient temperature	°C	As per IEC 60376

CUSTOMER: UPPTCL LTD.			
PROJECT: 220KV GIS SUBSTATION AT RASRA BALLIA (U.P.)			
SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR 220KV GIS			
SL. NO.	DESCRIPTION	UNIT	PARTICULARS
9	Details of gas filters	-	MOS 13X
10	Effective life of gas filters	years	Untill opening of compartment
11	Test pressure for gas system	kg/cm <sup>2</sup>	18 / 17
12	Constituents of gas in percent of weight and volume (SF6, air, CF4, H2O)	-	As per IEC 60376
13	Size and weight of gas cylinder with/without gas	kG	Dia 200mmx 1500mm, Approx. 50 KG
14	Weight of gas for each different module	kG	Manufacturer's internal design data
<b>G. GENERAL</b>			
1	Weights and dimensions		
	a) Shipping weight of heaviest section	kg	≤ 5000
	b) Dimensions of largest package	mm	Will be furnished after finalisation of GIS layout
	c) Shipping weight of SF6 gas treatment unit	kG	
	d) Weight of each type of switchgear bay module	kG	
	e) Untanking height	mm	
	f) Shipping dimensions and weight of SF6 gas cylinders required for first fillings and testing	-	
	g) Overall dimensions of the switchgear	mm x mm x mm	
<b>H. CABLE INTERFACE MODULE</b>			
1	Refer Annexure-1		
<b>I. CIRCUIT BREAKER</b>			
1	Name of Manufacturer & Address	-	Siemens Ltd., Aurangabad, India
2	a) Type of circuit breaker	-	SF6
	b) Type of Tank	Live / Dead	Dead tank
3	Manufacturer's type designation	-	P1-245KV
4	Standards Applicable	-	IEC 62271-203 & IEC 62271-100
5	Rated Voltage	kV rms	245
6	Rated Insulation Level	kV peak	1050
7	Rated frequency (fr)	Hz	50
8	Class	-	C2 - M2
9	Number of pole	-	3
10	Whether 3 pole or 1 pole unit	-	3
11	Number of breaks per pole	-	1
12	Normal current rating		
	a) Under standard condition	A	3000
	b) Under site condition	A	3000
	c) De-rating factor if any for site condition	-	--
	d) Temperature rise at 150% rating for 3 hours	-	--
13	Short time current rating	kA - Sec	40KA for 3 sec
14	Maximum temperature rise over ambient @ due to rated current in main contacts, measured after breakng test	°C	≤ 55 °C
15	Rated short circuit breaking current		
	a) Symmetrical component at highest system voltage	kA rms	40
	b) DC components (%)	%	47%
	c) Asymmetrical component at highest system voltage	kA rms	46
16	Rated making capacity		
	a) At higher rated voltage	kA peak	100
	b) At lower rated voltage	kA peak	100
17	Total break time		55
	a) For interruption of 10% of the rated capacity	milli sec	46.1
	b) For interruption of 30% of the rated capacity	milli sec	45.8
	c) For interruption of 60% of the rated capacity	milli sec	48.4
	d) For interruption of the full rated capacity	milli sec	45.7
18	Arcing time	milli sec	22
19	Opening time & breaking time	milli sec	33±3 / 55
20	Closing time	milli sec	56 ± 6
21	Rated operating sequence	-	0-0.3sec-CO-3min-CO
22	Minimum re-closing time at rated interrupted capacity from the instance of the trip coil energisation	milli sec	355
23	Minimum dead time		
	a) 3 phase re-closing	milli sec	300
	b) Limit of adjustment of dead time for 3 phase re-closing	-	NA
	c) 1 phase re-closing	milli sec	300
24	Data on re-striking voltage for 100%, 50% or 30% rated capacity		
	a) Amplitude Fator	-	1.4
	b) Phase Factor	-	NA
	c) Natural Frequency (Hz)	Hz	2754
	d) Rate of rise of re-striking voltage	V/ μ Sec	7 for 10% Isc, 5 for 30% Isc, 3 for 60% Isc, 2 for 100% Isc
25	Rated out of phase breaking current	kA	10
26	Rated line charging breaking current	A	125
27	Maximum line charging current breaking capacity & corresponding over voltage recorded in test		
	a) On supply side	A	125
	b) On line side	A	125
28	Maximum cable charging current breaking capacity & corresponding over voltage recorded in test		
	a) On supply side	A	250
	b) On line side	A	250
29	Rated single capacitor bank		
	a) Capacitive in rush current handling capacity	A	0.5 to 20
	b) Capacitive breaking current capacity	A	0.5 to 20

CUSTOMER: UPPTCL LTD.			
PROJECT: 220KV GIS SUBSTATION AT RASRA BALLIA (U.P.)			
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Sl. NO.	DESCRIPTION	UNIT	PARTICULARS
30	Rated small inductive breaking current & the corresponding over voltage	A	0.5 to 20
31	First pole to clear factor	-	1.3
32	Rated transient recovery voltage for terminal faults	kV	As per IEC62271-100
33	Rated characteristic for short line faults i.e. rate of rise	-	As per IEC62271-100
34	Dry 1-minute power frequency test withstand voltage for complete circuit breaker		
	a) Between line terminal & grounded parts	kV rms	460
	b) between terminals with breakers contacts open	kV rms	460
	c) Between poles	kV rms	NA
35	Wet 1-minute power frequency test withstand voltage		
	a) Between line terminal & grounded parts	kV rms	NA
	b) between terminals with breakers contacts open	kV rms	NA
36	1.2/50 microsecond wave impulse with stand test voltage for complete circuit breaker		
	a) Between line terminal & ground	kV peak	1050
	b) between terminals with breakers contacts	kV peak	1050
	c) Between poles	kV peak	NA
37	Minimum clearance		
	a) Between phases	mm	Manufacturer's Internal design data
	b) Live parts & earth	mm	Manufacturer's Internal design data
	c) Live parts to ground level	mm	Manufacturer's Internal design data
38	Number of operation possible without maintenance		
	a) At full rated interrupting capacity	nos	15
	b) At 150% of rated current	nos	4000
	c) At 100% of rated current	nos	6000
	d) At 50% of rated current	nos	6000
39	SUPPORTING INSULATORS		
	a) Make & Type	-	Solid Cast Resin
	b) Weight	kG	Manufacturer's Internal design data
	c) Transport Dimension	mm	Part of bay
	d) Insulation Class	-	Manufacturer's Internal design data
	e) Visible corona discharge voltage	kV	NA
	f) Dry-1 minute power frequency flash over voltage	kV	NA
	g) Wet-1 minute power frequency flash over voltage	kV	NA
	h) 1.2/50 microsecond impulse flash over withstand voltage	kV	NA
	i) Creepage distance to ground for heavily polluted atmosphere	mm	NA
	a) Total	mm	NA
	b) Protected	mm	NA
40	No. of poles per circuit breaker	-	3
41	No. of breakes per pole	-	1
42	Total length of breaks per phase	-	Manufacturer's Internal design data
43	Type of main contacts	-	Maultilam & Fingers
44	Material of main contacts	-	Cu with Ag plating
45	Whether main contacts are silver plated	Yes/No	Yes
46	Thickness of silver coating on main contacts	mm	Manufacturer's Internal design data
47	Contact pressure on arcing contacts	kg/m2	Manufacturer's Internal design data
48	Type of arcing contacts	-	Pin & Tulip Contacts
49	Contact pressure on main contacts	kg/m2	Manufacturer's Internal design data
50	Type of auxiliariy switches	-	NA
51	Wheather contacts of auxiliariy switches silver plated	Yes/No	NA
52	No. of auxiliariy switch contacts operating with all three poles of breaker		
	a) Which are closed when breaker is closed	nos	8
	b) Which are open when breaker is closed	nos	8
	c) Those adjustable with respect to the position of main contacts	-	Yes
53	No. of spare auxiliariy switch contacts operation with all three poles of breaker		
	a) Which are closed when breaker is closed	nos	4
	b) Which are open when breaker is closed	nos	4
	c) Those adjustable with respect to the position of main contacts	-	Yes
54	Number of spare terminal block	-	20%
55	Tripping & closing circuit voltage	V	220V DC
56	Power required for Trip coil	Watt	225
57	Power required for Closing coil	Watt	225
58	Contingencies for which alarm provided	-	SF6 low, Zone trip, breaker block
59	Design data for supporting structure	-	Will be furnished along with Civil drawing
60	Weight of supporting steel structure for breaker	kG	No special support structure needed
61	Wheather descriptive leaflets enclosed	Yes/No	No
J	FOR SF6 GAS CIRCUIT BREAKER		
62	Rated pressure of SF6 gas in the gas cylinder	kg/cm2	21
63	Quantity of SF6 gas required per single pole unit	kG	19.4
64	a) Quantity of SF6 gas per cylinder	kG	50
	b) Guaranteed maximum leakage rate per year	% / year	< 0.5
65	Weight of emty cylinder	kG	45
66	Quantity of absorbent required per pole	kG	0.45
67	Recommended interval for renewable of absorbent in case of outdoor circuit breaker operating in tropical condition	-	Not applicable as all CBs are indoor
68	Chemical composition of absorbent		MOS 13X
69	Quantity of absorbent covered in the scope of supply (including spare quantity)	kG	For complete GIS
70	Limit of gas pressure for proper operation of circuit breaker	bar	6.9
71	Pressure at which the temperature compensated gas pressure switch will,		
	a) Give alarm	bar	6.4
	b) Cut off	bar	6.2
72	Name of SF6 supplier & country of origin	-	Solvay - Belgium / Chengdu - China

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SL. NO.	DESCRIPTION	UNIT	PARTICULARS
73	Quantity of SF6 gas supplied for		
	a) Actual use in breakers	kG	58.2
	b) As spares	kG	As per Approved Spare list
74	Chemical composition of gas		
	a) Quantity of air by weight	ppm	As per IEC 60376
	b) Quantity of H <sub>2</sub> O by weight	ppm	
	c) Quantity of CF <sub>4</sub> by weight	ppm	
75	Type of operating mechanism offered	-	Spring operated
76	Dimensions of the control cabinet	mm x mm x mm	1480mm x 500mm x 1100mm
78	Weight of control cabinet	kG	Approx 500KG
79	Seismic level for which breaker is designed	g	As per project parameters
80	Compliance to technical specification w.r.t. parameters specified for,		
	a) Control cabinet	Yes/No	Yes
	b) Bushing/Support Insulator	Yes/No	Yes
	c) Terminal Connector	Yes/No	NA
	d) SF6 gas	Yes/No	Yes
81	Detailed literature,		
	a) Whether similar equipment are type tested as per IEC/IS and are in successful operation for atleast 2 years (if yes, furnish type test report)	-	Yes, Refer Type Test Report
	b) Furnish data on capabilities of circuit breaker in terms of time & number of operations at duties ranging from 100% fault currents to load currents of the lowest possible value without requiring any maintenance or checks	-	Refer type test report
	c) Furnish details of effect of non simultaneity between contacts within a pole or between poles & also show how it is covered in the guaranteed rated break time	-	Refer type test report
	d) Overall general arrangement drawing of circuit breaker is to be enclosed	-	Refer Layout [(1)-G71770-AD309-V021]
<b>K</b>	<b>WEIGHT &amp; SPACE REQUIREMENT</b>		
82	Weight of 3-phase breaker complete with operating mechanism, insulating supports frame work etc.	kG	1750
83	Impact loading for foundation design to include dead load plus impact value on opening at maximum interrupting rating in terms of equipment of static load	-	Will be furnished in foundation load report
84	Weight of heaviest package	kG	≤ 5000
<b>L</b>	<b>ISOLATORS/GROUNDING SWITCHES</b>		
1	Name & address of the manufacturer	-	Siemens Ltd., Aurangabad, India
2	Manufacturer's type designation	-	Siemens Ltd., Aurangabad, India
3	Standard applicable	-	IEC 62271-102
4	Rated voltage, Ur	kV	245
5	Rated current under site conditions at 50°C ambient	A	3000
6	Rated frequency (fr)	Hz	50
7	Number of poles	-	3
8	Whether all 3 poles are ganged / mechanically coupled	Yes/No	Yes
9	Pole to pole spacing	mm	NA
10	Rated short time current of isolator & earth switch & dynamic current	kA-Sec & kA	40KA for 3 sec / 100 KA
11	Opening time of Isolator & earth switch	Sec	DS / WIP ES : < 4 sec HSES : < 6 sec including spring charging time HSES : < 60 milli Sec excluding spring charging time
12	Closing time of Isolator & earth switch	Sec	DS / WIP ES : < 4 sec HSES : < 6 sec including spring charging time HSES : < 60 milli Sec excluding spring charging time
13	Rated mechanical terminal load	kN	NA
14	Dielectric withstand capacity of completely assembled isolator/earth switch	kN	NA
15	One minute dry power frequency withstand test voltage		
	a) Against ground	kV rms	460
	b) across isolating distance	kV rms	530
16	1.2/50 micro second impulse withstand test voltage		
	a) Against ground	kV peak	1050
	b) across isolating distance	kV peak	1200
17	Total no. of auxiliary switch contacts		
	a) Normally Open	nos	7
	b) Normally Closed	nos	7
18	No. of spare auxiliary switch contacts		
	a) Normally Open	nos	3
	b) Normally Closed	nos	3
<b>M</b>	<b>CURRENT TRANSFORMER</b>		
1	Name & address of the manufacturer	-	Siemens Ltd., Aurangabad, India
2	Standards Applicable	-	IEC 61869-1 & 2
3	Type of CT (Live or dead tank type)	Live / Dead	Dead tank
4	Rated frequency (fr)	Hz	50
5	Rated Voltage Ur	kV	245
6	Rated current		
	a) Rated continuous current	A	3000
	b) Rated extended primary current	A	4500 for metering CTs
7	Short time thermal current withstand	kA - Sec	40KA for 3 sec
8	Dynamic current withstand	kA peak	100
9	1.2/50 micro second impulse withstand test voltage	kV peak	1050
10	250/2500 micro second switching surge withstand voltage (dry & wet)	kV peak	Not applicable for 220KV system
11	One minute dry & wet power frequency withstand voltage	kV rms	460
12	No. of primary winding	nos	
13	No. of cores per CT	nos	
14	Current Ratio (For all cores)	A / A	

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SL. NO.	DESCRIPTION	UNIT	PARTICULARS
15	Output burden (For all cores)	VA	Refer SLD [(1)-G71770-AD309-S005]
16	Accuracy class (For all cores)	-	
17	Knee point voltage at different taps (for all cores)	VA	
18	Maximum exciting current at knee point voltage at different ratios (For all cores)	mA	
19	Secondary winding resistance for all ratios & cores	$\Omega$	
20	Instrument security factor at different ratios for metering cores	-	
21	Radio interference voltage at 1.1 Ur/V3 at 1.0 MHz	micro volt	NA
22	Corona extinction voltage	kV rms	NA
23	Partial discharge level	pC	< 5
24	Standard to which oil conforms generally	-	IEC 61869-1 & 2
25	Total weight	kg	Will be furnished in rating plates
26	Confirm whether similar equipment are type tested & in successful operation for atleast 2 years ratios (For all cores) (Furnish type test report)	-	Yes
27	Overall general arrangement drawing of CT is to be enclosed	-	Will be furnished in rating plates
<b>N</b>	<b>VOLTAGE TRANSFORMER</b>		
1	Name & address of the manufacturer	-	Siemens Ltd., Aurangabad, India
2	Standard applicable	-	IEC 61869-1 & 3
3	Type	-	GIS VT
4	Manufacturer's type	-	Siemens Ltd., Aurangabad, India
5	Designation	-	GIS VT-245KV
6	Rated voltage	kV	245
7	Rated primary voltage	kV	220
8	Rated secondary voltage	V	110
9	Number of cores	core-1 core-2 core-3	nos
	a) Rated output	VA	Refer SLD [(1)-G71770-AD309-S005]
	b) Class	-	
	c) Ratio error	%	
	d) Phase angle error	min.	
10	One minute power frequency dry withstand test voltage	kV rms	
11	One minute power frequency wet withstand test voltage	kV rms	NA
12	1.2/50 micro second impulse withstand test voltage	kV peak	1050
13	One minute power frequency withstand voltage on secondary	kV rms	3
14	Temperature rise of winding at rated voltage factor		
	a) at 1.2 voltage factor for continuous rating	$^{\circ}$ C	As per IEC 61869-1 & 3
	b) at 1.5 voltage factor for 30 seconds rating	$^{\circ}$ C	As per IEC 61869-1 & 3
15	Whether suitable for handling capacitive discharge current of cable	Yes/No	No
16	Class of winding insulation	-	E
17	Rated SF6 gas pressure/density & minimum SF6 gas pressure/density	bar	6.1
18	Creepage distance of bushing	mm	NA
19	Protected creepage distance	mm	NA
20	Weight of oil	kg	NA
21	Weight of core	kg	Will be furnished along with rating plates
22	Total weight	kg	Will be furnished along with rating plates
23	Mounting details	-	Plug-in type
24	Overall dimensions	-	Refer Layout [(1)-G71770-AD309-V021]
<b>O</b>	<b>SURGE ARRESTERS</b>		
1	Name & address of the manufacturer	-	Not applicable for UPPTCL Rasra Ballia project
2	Manufacturer's type designation	-	
3	Applicable standards	-	
4	Arrester type & class	-	
5	Rated voltage	kV	
6	Rated system voltage	kV	
7	Maximum continuous operating voltage (COV) at 50 $^{\circ}$ C ambient temperature	kV	
8	Nominal discharge current (8/20 micro sec. wave)	kA	
9	Minimum discharge capability	kJ/kV	
10	a) Maximum residual voltage at nominal discharge current	kV peak	
	b) Minimum residual voltage at nominal discharge current	kV peak	
11	a) Maximum residual voltage at 50% nominal discharge current	kV peak	
	a) Maximum residual voltage at 200% nominal discharge current	kV peak	
12	Steep fronted wave residual voltage at 1kA	kV peak	
13	Long duration discharge class	-	
14	Impulse current withstand		
	a) High current short duration (4/10 micro sec. wave)	kV peak	
	b) Low current long duration (2000 micro sec.)	kV peak	
15	Current for pressure relief test (as per IEC99)	kA	
<b>P.</b>	<b>SF6 Air Bushing drawing &amp; GTP</b>		
1	Refer Annexeure-2		

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