

Specification for Performance tests of 420 kV, 63 kA GCB

Item: 001:

Testing of 420 kV, 63kA, 4000 A Gas Insulated Circuit Breaker. Technical particular of the Circuit Breaker is given in **Table-1**. List of Tests to be conducted on Gas Insulated Circuit Breaker are given in **Table-2**. The Performance tests are to be conducted in accordance with **IEC 62271-100/110**. Vendor shall give confirmation against each technical requirement mentioned in **Table-3**. Weight & Size of Packing Case – Gas Insulated Circuit Breaker is given in **Table-4**. Vendor shall give separate charges against each item as per Price Schedule- 'A' given at **Table-5**.

Technical particular of the Gas Insulated Circuit Breaker

TABLE 1

General information circuit breaker		
Client	M/s Bharat Heavy Electricals limited Bhopal	
Manufacturer	M/s Bharat Heavy Electricals limited Bhopal	
Standard	IEC 62271-100/ 110	
Type of report	Test Report	
Client representative(s)	To be informed Later	
Description of the apparatus	One pole SF6 Gas-insulated metal-enclosed circuit breaker	
Ratings assigned by the manufacturer		
Designation / Type	GSM 420	
Serial number	To be informed Later	
Rated voltage	420	kV
Nominal current	4000	A
Number of poles	1	
Frequency	50	Hz
Operating sequence	O-0.3 sec-CO-3 min-CO	
Short-time withstand current	63	kA
Peak withstand current	157.5	kAp
Duration of short-circuit	3	s
Short-circuit making current	157.5	kAp
Short-circuit breaking current	63	kA
Time constant	45	ms
First pole to clear factor	1.3	
Pressure for interruption SF6 at 20°C	8.5	bar (absolute)
Pressure for insulation SF6 at 20°C	6.5	bar(abs)
Pressure for operation	8.5	bar(abs)
Supply voltage of closing and opening devices	220	Vd.c
Class	E2/M2/C2	
Minimum pressure for interruption at 20°C	8.5	bar (absolute)
Maximum pressure for interruption at 20°C	9	bar (absolute)
Mechanism for closing	Stored energy closing (springs, charged by motor)	
Mechanism for opening	Stored energy closing (springs, charged by motor)	
Type of mechanism	Spring-Hydro	
Supply voltage closing coil	220	V d.c.
Supply voltage opening coil	220	V d.c.
Supply voltage motor	230	V a.c.
Rated operating pressure	36.0	MPa
Minimum pressure for 'O' operation	31.0	MPa
Logistics		
Number of complete breakers ¹	2	
Number of incomplete breakers ²	4 (Spare Parts)	
Number of bushings	3	
Number of mechanisms	2	
Time needed to fill SF6 gas (including bushings, breaker etc.)	6	hours
Time needed to vacuum CB	2	hours
Time needed to assemble bushings	2	hours

¹ Please note here complete breakers. (including bushings and mechanism)

² Breaker without bushings and/or mechanism

List of Tests to be conducted on Gas Insulated Circuit Breaker

TABLE-2

Vendor shall give confirmation against each technical requirement

Test No.	DESCRIPTION	CONFIRMATION YES/NO	REMARKS
A.1	Single phase synthetic test comprising:		As per IEC 62271-100
	I. T100s(a) & T100s(b) at 63kA (On 1 st day on Prototype 1)		
	II. T100 a at 63 kA (After maintenance on Prototype 1) (On 5 th day on Prototype 2)		
	III. T60, T30, T10 at 63 kA (After maintenance on Prototype 1) (On 9 th day on Prototype 1)		
A.2	I. L90 at 63kA (minimum 2 months from the date of completion of A.1 or mutually agreed date) (On 1 st day on Prototype 1)		As per IEC 62271-100
	II. L75 at 63kA (After maintenance on Prototype 1) (On 5 th day on Prototype 2)		
	III. OP2 (a) + OP2 (b) 63 kA and voltage test (After maintenance on Prototype 1) (On 9 th day on Prototype 1)		
A.3	I. Capacitive current switching tests) in accordance with sub clause 6.11.9.1 of IEC 62271-100 (Class C1) (minimum 2 months from the date of completion of A.2 or mutually agreed date) (On 1 st day on Prototype 1)		As per IEC 62271-100
	II. Capacitive current switching tests in with sub clause 6.11.9.1 of IEC 62271-100 (Class C2) (After maintenance on Prototype 1) (On 5 th day on Prototype 2)		
	III. Shunt reactor current switching tests in accordance with IEC 62271-110. (After maintenance on Prototype 2) (On 9 th day on Prototype 1)		As per IEC 62271-110

- Maintenance time in between, min 3 working days' gap from previous test.

Technical Requirement for Type Tests

TABLE-3

Vendor shall give confirmation against each technical requirement

S.NO	DESCRIPTION	Confirmation by Test Lab YES/NO	REMARKS
1.	Performance Test as per details mentioned in TABLE-2. All tests covered in A.1, A.2 and A.3 of table-2 will be carried out by one test lab only. Follow up tests before & after above tests shall be conducted as per requirement of relevant IEC.		
2.	The successful test results shall be used for certification without repeating them. Further tests required for certification will be completed without modification of test specimen design.		
3.	Test dates shall be based on mutual agreed Tentative: Jan - March 2024		
4.	BHEL will have option to test alternate specimen to utilize shifts effectively for repeat test within agreed test schedule.		
5.	Test lab to allot Assembly Bay to assemble the Test Sample for complete duration of Test including Preparation of Assembly for First test and Packing of all samples after completion of all the tests. Facilities like crane, caterpillars to lift and transport the test sample etc. shall be provided. All work for preparing the test object shall be done by manufacturer. The assembly bay must have internet access.		
6.	The test and service charges are payable against production of documents indicating tests conducted with charges. These documents shall be jointly signed by BHEL representative and test lab.		
7.	The equipment will be exported in Sea worthy packing by BHEL. Unpacking of the Test equipment & its Repacking in the same packing case after the test shall be done by BHEL. For total weight & size of Packing Case Refer Table-4.		
8.	1 set of test report in English shall be dispatched to BHEL after completion of tests and soft copy or CD.		
9.	Testing assistance by lab shall be extended along with necessary equipment such as 5 KV Megger, contact resistance measurement kit etc. for checking by BHEL before the start of type test. Test lab shall specify the facility available.		
10.	Lab shall confirm travel recording facility during type test. Necessary travel recorder and mounting shall be organised by BHEL.		

11.	In case of doubts in specifications, the test agency shall contact BHEL for clarifications.		
12.	The duration of the test shift(s) shall be specified		
13.	The delivery time of certificates and reports shall be indicated. After confirmation for the final draft report and completion of final payment, the final report shall be delivered within 2 weeks.		

Weight & Size of Packing Case – Gas Insulated Circuit Breaker

TABLE-4

Sno.	Package no.	Length (Mts.)	Breadth (Mts)	Height (Mts)	Volume (M ³)	Approx. Net WT (Kg)	Approx. Gross WT (Kg)	Type of package	Description of package contents
1	2	3	4	5	6	7	8	9	10
1	1	2.40	2.30	2.30	12.70	1800	2000	BOX	Spare Insulators -10 Nos.
2	2	1.95	1.45	2.40	6.79	1200	1400	BOX	Mechanism 1 with base frame
3	3	1.95	1.45	2.40	6.79	1200	1400	BOX	Mechanism 2 with base frame
4	4	1.95	1.45	2.40	6.79	1200	1400	BOX	Mechanism 3 with base frame
5	5	2.80	1.05	1.80	5.29	850	1000	BOX	CB Chamber-1
6	6	2.80	1.05	1.80	5.29	850	1000	BOX	CB Chamber-2
7	7	2.80	0.90	1.05	2.65	400	500	BOX	2U assembly
8	8	4.75	1.05	1.10	5.49	780	900	BOX	Bushing-1
9	9	4.75	1.05	1.10	5.49	780	900	BOX	Bushing-2
10	10	4.75	1.05	1.10	5.49	780	900	BOX	Bushing-3
11	11	2.10	1.20	2.00	5.04	675	800	BOX	Pole Assemblies-3 Nos.
12	12	2.10	1.20	2.00	5.04	675	800	BOX	Pole Assemblies-3 Nos.
13	13	0.90	0.90	1.80	1.46	125	200	BOX	Gas Handling System
14	14	2.10	1.25	2.00	5.25	675	800	BOX	Insulators and HV parts
15	15	1.80	1.10	1.10	2.18	400	500	BOX	Spare parts 1
16	16	1.80	1.10	1.10	2.18	700	800	BOX	Spare parts 2
17	17	3.70	1.40	1.60	8.29	1250	1500	BOX	Structure Assembly with DS (2 Nos.) and structure for 2U (3 Nos.)
18	18	0.80	0.40	0.40	0.13	300	300	LOOSE	Tool box
						14340	16800		

Note: Insulators will be mounted on 2 U Disconnecter switch and CB Testing assembly which are required for testing.

TABLE-5
(PRICE SCHEDULE -A)

Vendor shall give separate charges against each item

SL. NO.	DESCRIPTION	QTY.	CHARGES	TOTAL CHARGES
1	A.1 Test Charges for Sl. No A.1 of Table-2 (As per IEC 62271-100)			
	I. T100s(a) +T 100S (b) at 63kA	1 shift		
	II. T100 a - at 63kA	1 Shift		
	III. T60 at 63kA	1 Shift		
	IV. T30 at 63kA			
	V. T10 at 63kA			
2	A.2 Test Charges for Sl. No A.2 of Table-2			
	I. L90 at 63 kA	1 Shift		
	II. L75 at 63 kA	1 Shift		
	III. OP2 (a) + OP2 (b) 63 kA	1 Shift		
3	A.3 Test Charges for Sl. No A.3 of Table-2			
	I. Capacitive current switching tests (Class C1) (As per IEC 62271-100) - TEST DUTY 1	2 to 3 Shifts		
	II. Capacitive current switching tests (Class C1) (As per IEC 62271-100) - TEST DUTY 2			
	III. Capacitive current switching tests (Class C2) (As per IEC 62271-100) - TEST DUTY 1	2 to 3 Shifts		
	IV. Capacitive current switching tests (Class C2) (As per IEC 62271-100) - TEST DUTY 2			
	V. Shunt reactor current switching test (As per IEC 62271-110) – Duty 1	1 to 2 Shifts		
	VI. Shunt reactor current switching test (As per IEC 62271-110) –Duty 2,3 and 4			
	All below mentioned additional services will be charged based on an actual cost price basis (Subject to maximum of Quoted Price)			
4	Charges for filling and evacuation of SF6 gas during testing along with SF6 gas. Charges for fresh SF6 gas. (To be charged as per actuals).	900 Kgs		
	SF6 Gas Charges for A.1			
	SF6 Gas Charges for A.2	900 Kgs		
	SF6 Gas Charges for A.3	600 kgs		
5	Charges for suitable Assembly Bay to assemble / dismantle the Test Sample. Height of assembly bay must be more than 8 meter or high. The assembly bay will be utilised for 48 days (Testing duration). (To be charged as per actuals). Note: Test object to be stored outside in lab premises on arrival. Assy. bay will be used when BHEL team reaches test lab.			

	Assembly bay Charges for A.1	16 days		
	Assembly bay Charges for A.2	16 days		
	Assembly bay Charges for A.3	16 days		
6	Charges for Testing assistance by lab and for providing necessary equipment such as 5 KV Megger, contact resistance measurement kit, etc. for checking by BHEL before the start of type test.	1 Set		
7	Charges for Type test report. This Report of Performance shall consist of the title page, information sheet, table of contents, identification of the apparatus tested, test arrangements, general information, circuits applied, oscillograms and photographs in line with respective IEC and STL Guidelines. Total 9 reports. Necessary Set will be informed at the time of testing. a. For A.1 Tests- 3 Reports b. For A.2 Tests- 3 Reports c. For A.3 Tests- 3 Reports	1 Report for each test		
8	Auxiliary CB for all tests (To be charged as per actuals).If Any	1 Set		
9	Drawing verification & specimen identification Charges. (If Any) 1 set of drawings consists tentative 15 sheets. (To be charged as per actuals). a. For A.1 Tests- 3 Sets b. For A.2 Tests- 3 Sets c. For A.3 Tests- 3 Sets	1 Set for each test		
10	Test Lab Shall provide: 1. A CD/DVD/Pen Drive/Hard Disk with all raw data and a visualization program, within one week after the shift and test results within a day after each test. 2. A preliminary report within one week after the test shift.	1 Set for each test		
11	Other charges, if any, in detail.			
	a.			
	b.			
	c.			
	d.			
	Total			
	Net charges (will be considered to decide L1)			

Notes:

- 1) In case of discrepancy, the prices mentioned in words will be treated as final.
- 2) Over-writing in price bid is not acceptable.
- 3) Qty. mentioned at 4 to 11 are tentative and for calculation. However, lab to charge for actual consumption based on unit rate quoted.

(Dr. M. Mohana Rao)