AMENDMENT-01

E – Tender: NIT NO. CPRIBLR21NIT10
Short Circuit Generator Master Circuit Breakers and Make Switches for augmentation of Short circuit test facilities at High power laboratory, CPRI Bengaluru.

Annexure – I : Technical specification of Short Circuit Generator Master Circuit Breakers

Sl. No.	Page No.	Particulars	Existing	Amended to
1	Page 6 of 20	Clause no. 7 : MAIN TECHNICAL DATA	Rated making current: 360 kApeak Characteristic of electrical endurance (Minimum recommended value): $I_{\Sigma} \geq 10000$ kA	Rated making current: To be defined by the Bidder Characteristic of electrical endurance (Minimum required value): $I_{\Sigma} \geq 10000$ kA
2	Page 13 of 20	Clause no. 12.1 : MAINTENANCE REQUIREMENTS:	In addition, the master circuit breakers shall perform repeated breaking operations at any current up to the rated and fault short-circuit breaking current, before maintenance is required. Specific minimum values of the cumulative current broken without maintenance shall be specified by the Bidder (a recommended value is > 10000 kA).	In addition, the master circuit breakers shall perform repeated breaking operations at any current up to the rated and fault short-circuit breaking current, before maintenance is required. Specific minimum values of the cumulative current broken without maintenance shall be specified by the Bidder and this value shall be more than 10000 kA , which means a minimum of 100 current breaking operations at a current of not less than 100kA at system rated voltage.

<table>
<tr>
<td>3</td>
<td>Page 6 of 20</td>
<td>Clause no. 7 : MAIN TECHNICAL DATA</td>
<td>
<table>
<tr><td>Fault short-circuit breaking current (exceptional conditions)</td><td></td></tr>
<tr><td>RMS value
Peak value</td><td>180 kArms
450 kApeak</td></tr>
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<tr><td>Exceptional short-circuit breaking current</td><td></td></tr>
<tr><td>RMS value
Peak value</td><td>≥ 165 kArms
≥ 430 kApeak</td></tr>
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<td>4</td>
<td>Page 6 of 20</td>
<td>Clause no. 7 : MAIN TECHNICAL DATA</td>
<td>
<table>
<tr><td>Rated Transient Recovery Voltage for terminals faults</td><td></td></tr>
<tr><td>Frequency</td><td>≥30 kHz</td></tr>
<tr><td>Amplitude factor</td><td>1.9 p.u.</td></tr>
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<table>
<tr><td>Rated Transient Recovery Voltage for terminals faults</td><td></td></tr>
<tr><td>Frequency</td><td>≥60 kHz **</td></tr>
<tr><td>Amplitude factor</td><td>1.9 p.u.</td></tr>
</table>
** The circuit breakers shall be designed to match the test circuit inherent transient frequency of 60kHz and an amplitude factor of 1.9. However, if the maximum transient frequency for which the circuit breakers are designed is lower than 60kHz, the bidder shall provide for suitable capacitors to reduce the inherent transient frequency of. The inherent transient frequency shall not be lower than 30kHz.
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<tr>
<td>5</td>
<td>Page 14, 15 and 16 of 20</td>
<td>Clause no. 13 : INSPECTI-ON AND TESTS:</td>
<td>Clause No. 13.0 : INSPECTION AND TESTS:</td>
<td>Clause No. 13.0 : INSPECTION AND TESTS:
The Bidder shall plan the testing requirements of this specification as given below;
– The tests that are feasible at the Manufacturer works shall be conducted in the presence of CPRI representative/s or authorised CPRI representative. The tests that are not feasible at Manufacturer works shall be conducted at any of the STL member Laboratory and witnessed by CPRI</td>
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			Clause No. 13.1 : Inspection during manufacturing: The Bidder shall propose a comprehensive inspection program during manufacture of the generator master circuit breakers. CPRI representatives shall be allowed to inspect the production process in the factory. **Clause No. 13.2 : Type Tests** Generator master circuit breakers shall have been type tested according to a specific test program to be communicated to the CPRI for approval, based on the technical feasibility and standards where applicable, to verify the quality and performances of the product. In principle the following type of tests shall have been performed, for which reference to the corresponding clause of IEC 62271-100 is given hereinafter, as far as applicable. **No. / TESTS / IEC 62271-100 Clause** 1 — Dielectric tests — 6.2 3 — Measurement of the resistance of the main circuit — 6.4 4 — Temperature rise tests — 6.5	representative/s or authorised CPRI representative. – The test charges shall be borne by the Bidder and same shall be furnished separately in the price bid. **Clause No. 13.1 : Inspection during manufacturing:** The Bidder shall propose a comprehensive inspection program during manufacture of the generator master circuit breakers and obtain the approval from CPRI. CPRI representatives shall be allowed to inspect the production process in the factory. **Clause No. 13.2 : Type Tests** Short Circuit Generator master circuit breakers (MBs) shall have been type tested according to a specific test program to be communicated to the CPRI for approval, based on the technical feasibility and standards where applicable, to verify the quality and performances of the product. In principle the following type of tests shall have been performed, for which reference to the corresponding clause of latest IEC 62271-100 is given hereinafter, as far as applicable. **No. / TESTS** 1 — Dielectric tests 2 — Measurement of the resistance of the main circuit 3 — Short-time withstand current and peak withstand current tests

5	Short-time withstand current and peak withstand current tests	6.6
6	Verification of the degree of protection	6.7
7	Tightness tests	6.8
8	Electromagnetic compatibility (EMC) tests	6.9
9	Additional tests on auxiliary and control circuits	6.10
10	Mechanical and environmental tests (M2 Class)	6.101
11	Short-circuit current making and breaking tests (at rated and fault short circuit currents as given in clause 7)	from 6.102 to 6.106
12	Out-of-phase making and breaking tests	6.110
13	Capacitive current switching tests	6.111
14	Electrical endurance tests	6.112

It is understood that, for those tests for which no specific

4	Verification of the degree of protection, where ever applicable
5	Tightness tests, if applicable
6	Additional tests on auxiliary and control circuits
7	Mechanical tests
8	Short-circuit and Out-of-phase breaking current tests

It is understood that, for those tests for which no specific requirements have been defined in clauses 7 and 9, the Bidder shall define and prove the relevant rated characteristics generally in accordance with IEC 62271-100 prescriptions, where ever applicable.

Type test repetition is not required provided that the Bidder can submit valid type test certificates, not older than 10 years. Otherwise type test will be performed at Bidder exclusive cost.

The requirements for conducting above type tests as given below;

13.2.1 : Dielectric tests

The dielectric test shall be carried out as per procedure defined in IEC 62271-100. The test voltage shall be in accordance with those specified in Clause no. 7.0 of the technical specifications of MBs.

13.2.2 : Measurement of the resistance of the main circuit

The Measurement of the resistance of the main circuit shall be carried out as per procedure defined in IEC 62271-100.

			requirements have been defined in clauses 7 and 9, the Bidder shall define and prove the relevant rated characteristics according to IEC 62271-100 prescriptions, where applicable. Type test repetition it's not required provided that the Bidder can submit valid type test certificates. Otherwise type test will be performed at Bidder exclusive cost.	**13.2.3 : Short-time withstand current and peak withstand current tests** The short time withstand current and peak withstand current test shall be performed as per the procedure defined in IEC 62271-100, taking in to account the special requirement of this specification. The test circuit shall be such that the return conductor will be at a distance corresponding to the value provided between two phases of the station (i.e. between 4-6m). The following tests shall be performed: – 1 fully asymmetrical current test with r.m.s test current value of 165kA, the peak current being not less than 430kA for duration of 0.5 second. – 1 test with an r.m.s test current value of 120kA, the peak current being not less than 300kA; the short circuit duration shall be 1.0 second. After the test, circuit breaker shall not show any mechanical and di-electric deterioration and shall be capable of operating normally and particularly, any breaking tests as stated in clause no. 7.0 of the technical specifications of MBs could be performed. The resistance of the main circuit of MB after the tests, shall not exceed 20% of the before test value. The MB shall withstand rated power frequency high voltage test for 1 minute duration as per the values given in clause no. 7.0 of the technical specifications of MBs, across open contacts and live parts to ground with MB closed. **13.2.4 : Verification of the degree of protection** Verification of the degree of protection shall be carried out as per procedure defined in IEC 62271-100 where ever applicable for IP XX rating as declared by Bidder.

				13.2.5 : Tightness tests Tightness tests shall be carried out as per procedure defined in IEC 62271-100 where ever applicable. **13.2.6 : Additional tests on auxiliary and control circuits** Additional tests on auxiliary and control circuits shall be carried out as per procedure defined in IEC 62271-100. **13.2.7 : Mechanical Tests** The mechanical test shall be consists of 2000 operating cycles without voltage on or current in the main circuit. The tests shall be carried out as per the procedure defined in IEC 62271-100 without any maintenance. However, the closing time and opening time shall be measured each 200 CO operations when the technical tests are performed. Ten CO operations shall be carried out on each of the other five units in order to check the accuracy and the reliability of the opening time and closing time of each unit of the other five units in order to check the accuracy and reliability of the opening time and closing time of each unit. The maintenance schedule and list of renewable parts shall be defined by the Bidder for confirming the MBs to comply M2class (10,000 operations). **13.2.8 : Short-circuit and Out-of-phase breaking current tests** One Mater Circuit Breaker (on which Mechanical Tests are completed) shall be submitted to test to prove its breaking capacity, taking in to account the special requirement of this specification.

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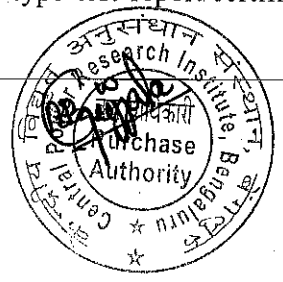
				The test circuit shall be such that the return conductor will be at a distance corresponding to the provided between two phases of the station (i.e. between 4-6m). Taking into account the particular use and special in nature of these circuit-breakers, the conventional Circuit Breakers test procedure as per IEC cannot be strictly applied. The general arrangements of the station will be such that the current limitation devices will always be connected downstream of the circuit-breakers which will be directly connected to the short-circuit generator terminals. Consequently, the test conditions shall match as far as possible the actual operating conditions on site, particularly with regards to the transient recovery voltage. Breaking test required by the present specifications shall be performed using the synchronized breaking procedure, and the contacts shall not be changed until the test sequence is completed. According to the requirements of this specification the following tests shall be carries out: – 03 no. of breaking tests at 10% of the rated short circuit breaking current (12kArms) – 03 no. of breaking tests at 30% of the rated short circuit breaking current (36kArms) – 03 no. of breaking tests at 60% of the rated short circuit breaking current (72kArms) – 10 no. of breaking tests at 100% of the rated short circuit breaking current (120kArms) – 03 no. of Asymmetrical breaking tests with the DC component (as declared by the manufacturer based on the opening time and protection tripping time according to IEC 62271-100) shall be performed (120kArms).

				– 03 no. of out of phase breaking current tests (at 30kArms) as per the procedure defined in IEC 62271-100 shall be performed at voltage factor of 2.5. In addition, one breaking test at 100% of the exceptional short circuit breaking current (165kArms) and one more exceptional short circuit breaking current (165kArms) test with a maximum arcing time (>10ms) shall be carried out to check the behaviour of the circuit breaker in case of failure of synchronized breaking system. The parameters of the transient recovery voltage being in accordance with those stated in sub-clause no. 7.0. The exact test conditions shall be discussed with and agreed by CPRI. No negative tolerance on the above said a test current is allowed. However, there is no limit on positive tolerance. After this test sequence, to meet the requirement of electrical endurance characteristic of $I\sum \geq 10000$ kA and particularly the main contacts shall not show any excessive arcing. The condition of MB after the above tests shall be as per IEC 62271-100. MBs shall be tested for Breaking of the laboratory transformers magnetizing current and Breaking of low inductive current tests according to clause no. 9.1 and 9.2 respectively of this technical specification. The no. of tests for each current value given in clause no. 13.4.2 shall be 10. A tolerance of ±10% is allowed on the test currents given in 13.4.2. MBs shall be designed for capacitive current switching tests according to clause no. 9.3 and 13.4.2 of this technical specification. No type test report/certificate is required for these tests.



Clause no.: 13.3 Routine Tests

No.	TESTS	IEC 62271-100 Clause
1	Dielectric test on the main circuit	7.1
2	Dielectric test on the auxiliary and control circuits	7.2
3	Measurement of the resistance of the main circuit	7.3
4	Tightness Test	7.4
5	Design and visual checks	7.5
6	Mechanical operation tests	7.101

Clause no.: 13.3 Routine Tests

No.	TESTS
1	Dielectric test on the main circuit
2	Dielectric test on the auxiliary and control circuits
3	Measurement of the resistance of the main circuit
4	Tightness Test, if applicable
5	Design and visual checks
6	Mechanical operation tests

Annexure – II : Technical specification of Making switches

Sl. No.	Page No.	Particulars	Existing	Amended to
1	Page 8 of 16	Clause no. 8 : MAIN TECHNICAL DATA	Number of making operations before inspection/maintenance: to be defined by the Bidder	Number of making operations before inspection/maintenance: Minimum values of the cumulative current making without maintenance shall be specified by the Bidder and this value shall be more than 10000 kA, which means a minimum of 100 current making operations at a current of not less than 100kArms at system rated voltage with a peak current not less than 410kA peak.
2	Page 11 and 12 of 16	Clause no. 10 : INSPECTION AND TESTS:	**CLAUSE NO 10: INSPECTIONS AND TESTS:**	**CLAUSE NO 10: INSPECTIONS AND TESTS:** The Bidder shall plan the testing requirements of this specification as given below; a. The tests that are feasible at the Manufacturer works shall be conducted in the presence of CPRI representative/s or authorised CPRI representative. The tests that are not feasible at Manufacturer works shall be conducted at any of the STL member Laboratory and witnessed by CPRI representative/s or authorised CPRI representative. b. The test charges shall be borne by the Bidder and same shall be furnished separately in the price bid.

10.1 : Inspection during manufacturing

The Bidder shall propose a comprehensive inspection program during manufacture of the making switches.

CPRI representatives shall be allowed to inspect the production process in the factory.

10.2 : Type Tests

Making switches shall have been type tested according to a specific test program to be communicated to the CPRI, based on the technical feasibility and following IEC Standards [1] and [2] where applicable.

In principle the following type of tests shall have been performed, for which reference to the corresponding clause of IEC 62271-100 is given hereinafter, as far as applicable.

No.	TESTS	IEC 62271-100 Clause
1	General	6.1
2	Dielectric tests	6.2
3	Measurement of the resistance of circuit	6.4
4	Temperature-rise tests	6.5
5	Short-time withstand current and peak withstand current tests	6.6

10.1 : Inspection during manufacturing

The Bidder shall propose a comprehensive inspection program during manufacture of the making switches and obtain the approval from CPRI.

CPRI representative/s shall be allowed to inspect the production process in the factory.

10.2: Type Tests

Making switches shall have been type tested according to a specific test program to be communicated to the CPRI, based on the technical feasibility and following IEC Standards [1] and [2] where applicable.

In principle the following type of tests shall have been performed, for which reference to the corresponding clause of IEC 62271-100 is given hereinafter, as far as applicable.

No.	TESTS
1	Dielectric tests
2	Measurement of the resistance of the main circuit
3	Short-time withstand current and peak withstand current tests
4	Mechanical tests
5	Short circuit making tests

Type test repetition is not required provided that the Bidder can submit valid type test certificates, not older than 10 years. Otherwise type test will be performed at Bidder exclusive cost.

6	Mechanical and environmental tests	6.101
7	Basic short-circuit test-duty TD 100 S, restricted to making operations	6.106.4.4

Type test repetition it's not required provided that the Bidder can submit valid type test certificates. Otherwise type test will be performed at Bidder exclusive cost.

The requirements for conducting above type tests as given below;

10.2.1: Dielectric tests
The dielectric tests shall be carried out as per procedure given in IEC 62271-100. The test voltage shall be in accordance with those specified in sub-clause no. 8.0 of this technical specification of MSs.

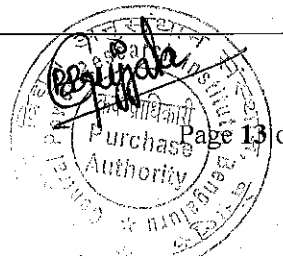
10.2.2 : Measurement of the resistance of the main circuit
The Measurement of the resistance of the main circuit shall be carried out as per the procedure defined in IEC 62271-100.

10.2.3 : Short-time withstand current and peak withstand current tests
The Short-time withstand current and peak withstand current tests shall be carried out as per procedure defined in IEC 62271-100.

The rated short time current with stand current of the make switch shall be:
180kArms/430kApeak for 0.5 second and
120kArms/360kApeak for one second

10.2.4 : Mechanical tests
The mechanical test shall consist of 2000 operating cycles without voltage on or current in the main circuit. They shall be carried out on one unit only as per the procedure out line in latest version of IEC 62271-100.
Before and after the test the routine test shall be proven as per standard to meet the timings given in the technical specifications.
Moreover, the closing time shall be measured each 100 CO operations when the technical tests are performed.
Ten CO operations shall be carried out on each of the other five

				units in order to check the accuracy and the reliability of the closing time of each unit of the other five units in order to check the accuracy and reliability of the closing time of each unit. The maintenance schedule and list of renewable parts shall be defined by the Bidder for confirming the MSs to comply M2class (10,000 operations). **10.2.5 : Short circuit Making tests** One making switch (on which Mechanical Tests are completed) shall be submitted to test to prove its making capacity, taking in to account the special requirement of this specification. The test circuit shall be such that the return conductor will be at a distance corresponding to the provided between two phases of the station (i.e. between 4-6m). According to the requirements of this specification, the following tests shall be carried out; – 10 making tests, the peak making current shall not be less than 360kApeak with asymmetrical current. – One making test, the peak making current shall not be less than 410kApeak with asymmetrical current. For these test the short-circuit duration shall not be less than 0.25 seconds No negative tolerance on the above said a test current is allowed. However, there is no limit on positive tolerance. After this test sequence, according to the requirement of this specification, the Make switch (MS) and particularly the main contacts shall not show any excessive aging or deterioration. The condition of MB after the above tests shall be as per IEC 62271-100.



Clause 10.3: Routine Tests

No.	TESTS	IEC 62271-100 Clause
1	Dielectric test on the main circuit	7.1
2	Dielectric test on the auxiliary and control circuits	7.2
3	Measurement of the resistance of the main circuit	7.3
4	Tightness Test	7.4
5	Mechanical operation tests (including resistance and current measurements of closing coils and checking anti-pumping function)	7.101
6	Design and visual checks	7.5
7	Timing test of making switch (including measurement of operating time, stroke, speed, current consumption of closing coil and also auxiliary contacts of close coil). The uncertainty of closing times shall be evaluated.	--

Clause 10.3: Routine Tests

No	TESTS
1	Dielectric test on the main circuit
2	Dielectric test on the auxiliary and control circuits
3	Measurement of the resistance of the main circuit
4	Tightness Test, if applicable
5	Mechanical operation tests (including resistance and current measurements of closing coils and checking anti-pumping function)
6	Design and visual checks
7	Timing test of making switch (including measurement of operating time, stroke, speed, current consumption of closing coil and also auxiliary contacts of close coil). The uncertainty of closing times shall be evaluated.