

# ASTA TYPE CERTIFICATE

## VERIFICATION OF TEST

**Project No:** G104913641LCS054 **Certificate No:** ASTA-TYPE-0001752

**Vendor:** MILLENNIUM SWITCHGEAR  
No. 3,45,46, 18<sup>th</sup> Cross, Vinayaka Layout, Near Chetan Circle,  
Andhrahalli Main Road, Peenya 2<sup>nd</sup> Stage,  
Bengaluru-560091, Karnataka, India.

**Apparatus:** 4000A, 415V/750V/6kV ( $U_e=U_n/U/U_{imp}$ ), 50Hz, IP43, extendable on both sides, power switchgear and controlgear (PSC) assembly incorporating a three-phase and neutral, vertical and horizontal busbar system, with one incoming ACB unit, two outgoing ACB units, three outgoing MCCB units, one DOL starter and a protective circuit.  
 $U_i=U_e=230V$  auxiliary circuit not connected to main circuit.

**Tested By:** ERDA, Electrical Research and Development Association, Vadodara-390010, India  
CPRI, Central Power Research Institute, Bengaluru-560080, India  
Intertek India Private Limited, Mumbai-400072, India

**Test Report No:** CPRIBLRSL21T0332, CPRIBLRSL21T0335, WO-2122-005450, G104557666-MUM-001, WO-2122-002077

**Designation:** PMCC panel

The apparatus which is representative of the designation, supplied drawings and photographs has been evaluated in accordance with:

**IEC 61439-1 and 2: Edition 3.0 2020-05 and 2020-07 and BS EN 61439-2: 2011**

Verifications with reference to the tests listed in Annex D of IEC 61439-1: Edition 3.0 2020-05

1: Strength of material and parts	6/7/8: No verification by testing required
2: Degree of protection of enclosures	9: Dielectric properties
3: Clearances	10: Temperature-rise limits
4: Creepage distances	11: Short-circuit withstand strength
5: Protection against electric shock and integrity of protective circuits	12: Electromagnetic compatibility (EMC)

The results are shown in the record of tests attached hereto. The values obtained and the general performance is considered to comply with the above Standard(s) and to justify the ratings assigned by the manufacturer as stated on the ratings page(s) of this Certificate. This Certificate applies only to the apparatus tested. Responsibility for conformity of any apparatus having the same or other designations rests with the Manufacturer.



010

*[Signature]*

Certification Engineer

*[Signature]*

Certification Officer

1st February 2022

Date



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**Project No:** G104913641LCS054 **Certificate No:** ASTA-TYPE-0001752

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**Authenticity:**

Authenticity of any ASTA document can be confirmed by contacting the Intertek ASTA Certification Office at the following address:

Intertek Testing & Certification Ltd., Centre Court, Meridian Business Park, Leicester, LE19 1WD,  
United Kingdom. Email: [asta@intertek.com](mailto:asta@intertek.com)

**Project No:** G104913641LCS054 **Certificate No:** ASTA-TYPE-0001752

Verification of a PSC-ASSEMBLY

No	Characteristic Verified	Clause/ Subclause	Verified Tests and Ratings
1	<b>Strength of material and parts</b>	<b>10.2</b>	
	Resistance to corrosion	10.2.2.2	Severity test A for metallic indoor enclosure: Verified
	Properties of insulating materials	10.2.3	Verified
	Thermal stability	10.2.3.1.1	Verified
	Resistance to abnormal heat and fire due to internal electric effects	10.2.3.2.1	Verified
	Resistance to ultra-violet (UV) radiation	10.2.4	Not applicable to enclosures of indoor assemblies
	Lifting	10.2.5.1	Verified: with following parts removed from panel: incoming 4000A ACB IP cover, rotary handles of 630A MCCB and rotary handles of 250A MCCB
	Mechanical impact	10.2.6	Verified: IK 10 for the metal enclosure
	Marking	10.2.7.1	Verified
Mechanical operation	10.2.8.1	Verified	
2	Degree of protection of enclosures	10.3	External enclosure: IP43 Form 4b Type 7 applying IP2X criteria Verified
3	Clearances	10.4	Verified $U_{imp} = 8kV$ for main horizontal busbars, distribution busbars, ACB's and MCCB's $U_{imp} = 6kV$ for DOL starter and complete assembly $U_{imp} = 6kV$ for auxiliary circuit (independent of main circuit)
4	Creepage distances	10.4	Verified Material group: IIIa Pollution degree: 3 $U_1 = 750V$ for main circuit $U_1 = 230V$ for auxiliary circuit (independent of main circuit)

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**Project No:** G104913641LCS054 **Certificate No:** ASTA-TYPE-0001752

No	Characteristic Verified	Clause/ Subclause	Verified Tests and Ratings
5	Protection against electric shock and integrity of protective circuits:	10.5	Verified
	Effective continuity between the exposed-conductive-parts of the class I assembly and the protective circuit	10.5.2	Verified
	Short-circuit withstand strength of the protective circuit Effectiveness of the assembly for external faults using B phase of incoming 4000A ACB and protective conductor (size: 2 x 40mm x 10mm) bare aluminium conductor	10.5.3.5	Verified $I_{cc} = 39\text{kA rms at } 240\text{V and pf } 0.25$
9	<b>Dielectric Properties</b>	<b>10.9</b>	Rated Voltages: $U_e = U_n = 415\text{V}$ $U_{imp} = 8\text{kV}$ for main horizontal busbars, distribution busbars, ACB's and MCCB's $U_{imp} = 6\text{kV}$ for DOL starter and complete assembly $U_{imp} = 6\text{kV}$ for auxiliary circuit (independent of main circuit) $U_i = 750\text{V}$ for main circuit $U_i = 230\text{V}$ for auxiliary circuit (independent of main circuit)
	Power-frequency withstand voltage	10.9.2	Verified
	Impulse withstand voltage	10.9.3.2	Verified
	Enclosures of insulating material	10.9.4	Verified
	Handles of insulating materials	10.9.5	Verified
	Testing of conductors and hazardous live parts covered by insulating material to provide protection against electric shock	10.9.6	Verified

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**Project No:** G104913641LCS054 **Certificate No:** ASTA-TYPE-0001752

No	Characteristic Verified	Clause/ Subclause	Verified Tests and Ratings
10	Temperature-rise	10.10	
	The rated current of the assembly is based upon a mean/maximum ambient temperature of:	10.10.2.3.5	35/40°C
	Rated current of the assembly	10.10.2.3.5	$I_{ra} = 4000A$
	Rated current of incoming 4000A ACB.		$I_{rg} = 4000A$
	Rated current of outgoing-1 1250A ACB.		$I_{rg} = 1250A$
	Rated current of outgoing-2 800A ACB		$I_{rg} = 800A$
	Rated current of outgoing-3 630A MCCB.		$I_{rg} = 504A$
	Rated current of outgoing-4 250A MCCB.		$I_{rg} = 250A$
	Rated current of outgoing-5 160A MCCB.		$I_{rg} = 160A$
	Rated current of outgoing-6 5.5kW DOL starter (MPCB and contactor)		$I_{rg} = 10A$
	Main horizontal busbars 2 x 2 x 150mm x 10mm bare aluminium per phase	10.10.2.3.7 a)	$I_{rg} = 4000A$

No	Characteristic Verified	Clause/ Subclause	Verified Tests and Ratings
11	Short-circuit withstand strength	10.11	
	Outgoing-1 1250A ACB	10.11.3.5.2	$I_{cc} = 65\text{kA rms at } 415\text{V, pf} = 0.2$
	Outgoing-2 800A ACB	10.11.3.5.2	$I_{cc} = 65\text{kA rms at } 415\text{V, pf} = 0.2$
	Outgoing-3 630A MCCB	10.11.3.5.2	$I_{cc} = 65\text{kA rms at } 415\text{V, pf} = 0.2$
	Outgoing-4 250A MCCB	10.11.3.5.2	$I_{cc} = 65\text{kA rms at } 415\text{V, pf} = 0.2$
	Outgoing-5 160A MCCB	10.11.3.5.2	$I_{cc} = 65\text{kA rms at } 415\text{V, pf} = 0.2$
	Outgoing-6 5.5kW DOL starter (MPCB and contactor)	10.11.2 b	Conditions for no testing: Verified
	Incoming 4000A ACB	10.11.5.3.3	$I_{cw} = 65\text{kA rms for } 1\text{s}$ $I_{pk} = 143\text{kA peak}$ $I_{cc} = 65\text{kA rms at } 415\text{V, pf} = 0.2$
	Main horizontal busbars: 2 x 2 x 150mm x 10mm bare aluminium per phase	10.11.5.3.3	$I_{cw} = 80\text{kA rms for } 1\text{s}$ $I_{pk} = 176\text{kA peak}$
	Vertical distribution busbars: 2 x 80mm x 10mm bare aluminium per phase	10.11.5.3.3	$I_{cw} = 80\text{kA rms for } 1\text{s}$ $I_{pk} = 176\text{kA peak}$
	Connections to the supply side of outgoing units	10.11.5.3.4	Conditions for no testing: Verified
	Neutral conductor: Incoming 4000A ACB	10.11.5.3.5	$I_{cw} = 39\text{kA rms for } 1\text{s}$ $I_{pk} = 81.9\text{kA peak}$ $I_{cc} = 39\text{kA rms at } 240\text{V, pf} = 0.25$
	Neutral conductor: Main horizontal busbars 2 x 150mm x 10mm bare aluminium per phase	10.11.5.3.5.1	$I_{cw} = 39\text{kA rms for } 1\text{s}$ $I_{pk} = 81.9\text{kA peak}$
	Neutral conductor: Vertical distribution busbars: 1 x 80mm x 10mm bare aluminium per phase	10.11.5.3.5.1	$I_{cw} = 39\text{kA rms for } 1\text{s}$ $I_{pk} = 81.9\text{kA peak}$
	Neutral conductor: Outgoing-1 1250A ACB	10.11.5.3.5.1	$I_{cc} = 39\text{kA rms at } 240\text{V, pf} = 0.25$
	Neutral conductor: Outgoing-2 800A ACB	10.11.5.3.5.1	$I_{cc} = 39\text{kA rms at } 240\text{V, pf} = 0.25$

**Project No:** G104913641LCS054 **Certificate No:** ASTA-TYPE-0001752

No	Characteristic Verified	Clause/ Subclause	Verified Tests and Ratings
11	<b>Short-circuit withstand strength</b>	<b>10.11</b>	
	Neutral conductor: Outgoing-3 630A MCCB	10.11.5.3.5.1	$I_{cc} = 39\text{kA rms at } 240\text{V, pf} = 0.25$
	Neutral conductor: Outgoing-4 250A MCCB	10.11.5.3.5.1	$I_{cc} = 39\text{kA rms at } 240\text{V, pf} = 0.25$
	Neutral conductor: Outgoing-5 160A MCCB	10.11.5.3.5.1	$I_{cc} = 39\text{kA rms at } 240\text{V, pf} = 0.25$
	Neutral conductor: Outgoing-6 5.5kW DOL starter (MPCB and contactor)	10.11.2 b	Conditions for no testing: Verified
12	<b>Electromagnetic compatibility (EMC)</b>	<b>10.12</b>	Conditions for no testing (J.9.4.2): Verified

Note: The apparatus tested was manufactured by Modutec Ready Panels Private Limited, No:4, K Ashwath Industrial Layout, Uttari Road, off Kanakapura Road, Kaggalipura, Bengaluru – 560116, Karnataka, India, for which ASTA Type Certificate No. ASTA-TYPE-000889 dated 15<sup>th</sup> December 2021 was issued.

**Project No:** G104913641LCS054 **Certificate No:** ASTA-TYPE-0001752

**Certificate Contents:**

The following documents are attached to and form part of this certificate:

Documents:	Number of pages
Test report: CPRIBLR5CL21T0332, CPRIBLR5CL21T0335, WO-2122-005450, G104557666-MUM-001, WO-2122-002077 dated 1 <sup>st</sup> December 2021	174
Drawings	25

**Certificate Revision Amendment Table**

Certificate Number	Issue Date	Amendment
ASTA-TYPE-0001752	See page 1	Initial issue

# ASTA

## RECORD OF PROVING TESTS

Laboratory Ref. No: CPRIBLRSL21T0332, CPRIBLRSL21T0335, WO-2122-005450,  
G104557666-MUM-001, WO-2122-002077

### APPARATUS TESTED:

4000A, 415V/750V/6kV ( $U_e=U_r/U/U_{imp}$ ), 50Hz, IP43, extendable on both sides, power switchgear and controlgear (PSC) assembly incorporating a three-phase and neutral, vertical and horizontal busbar system, with one incoming ACB unit, two outgoing ACB units, three outgoing MCCB units, one DOL starter and a protective circuit and a  $U_l=U_e=230V$  auxiliary circuit not connected to main circuit.

### STANDARD:

IEC 61439-1 and 2: Edition 3.0 2020-05 and 2020-07  
BS EN 61439-2:2011

### MANUFACTURER:

Modutec Ready Panels Private Limited,  
No:4, K Ashwath Industrial Layout, Uttari Road, Off  
Kanakapura Road, Kaggalipura, Bengaluru – 560116,  
Karnataka, India.

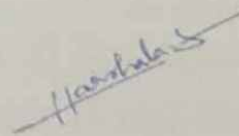
### TESTING LABORATORY:

ERDA, Electrical Research and Development Association  
ERDA Road, Makarpura Industrial Estate, Vadodara-390010,  
Gujarat, India.

and  
ERDA, Electrical Research and Development Association  
120kA Short-circuit Laboratory, Plot No. K-V/2, Manjusar GIDC,  
Savli, Gujarat, India

and  
CPRI, Central Power Research Institute, P.B.No.8066, Prof. Sir  
C.V. Raman road, Sadashivnagar SUB P.O. Bengaluru-  
560080.

and  
Intertek India Private Limited  
'F' Wing, TEX Centre, Chandivali Farm Road,  
Andheri (E), Mumbai - 400 072, India



### APPROVED BY:

Harshala Shivalingappa

### DATE:

1<sup>st</sup> December 2021

date of tests: 7<sup>th</sup> January 2021 to 24<sup>th</sup> October 2021.

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## RECORD OF PROVING TESTS

Laboratory Ref. No: CPRI/BLR/SCL/21/T0332, CPRI/BLR/SCL/21/T0335, WO-2122-005450,  
G104557666-MUM-001, WO-2122-002077

### CONTENTS

Record of proving tests:	Pages 1 to 174
Diagram numbers:	Pages 64 to 66 OLSC/SWG/47, OLSC/SWG/49, OLSC/SWG/49A.
Oscillogram numbers:	Pages 67 to 128  CPRI/BLR/SCL/21/T0384/S0003, 05, 07, 09, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 67, 69, 71, 73, 75, 77 108/4000/101 to 107, 108/4000/109 to 117, 108/4000/124 to 126, 108/4000/130 to 136
Photographs:	Pages 129 to 174
Drawings:	25

**Photographs:** The following photographs are included in this document.

Photograph No:	Description
ERDA-00417440/4000/01 a,b	Resistance to corrosion (Severity test A)
ERDA-00417440/4000/02	Verification of thermal stability test
ERDA-00417440/4000/03	Glow wire test: after test
ERDA-00417439/4000/04	Marking test
INTK/01	Needle flame
CPRI/01 a, b	Lifting test (section-1 and section-2)
CPRI/02 a, b	Mechanical impact test
ERDA-00417439/4000/05- 15	IP43 test
CPRI/03	Power-frequency withstand voltage
CPRI/04	Dielectric test on insulation sleeves
CPRI/05	Power-frequency withstand voltage on enclosures made of insulating material
CPRI/06	Power-frequency withstand voltage on external operating handles of insulating material
CPRI/352 a, b	Temperature-rise test on complete assembly thermocouple positions
CPRI/353	Temperature-rise test on main horizontal busbar thermocouple positions
108/4000/51 a, b and 108/4000/52 a, b	Test at rated short-time and peak withstand current, three-phase, 65kA rms for 1s, 143kA peak on main horizontal busbars and vertical distribution busbars (on extreme left side of the panel) with incoming 4000A ACB (before and after test)
108/4000/53 a, b and 108/4000/54 a, b	Test at rated short-time and peak withstand current, single-phase, 39kA rms for 1s, 81.9kA peak on main horizontal busbars and vertical distribution busbars (on extreme left side of the panel) with incoming 4000A ACB between R phase and neutral (before and after test)
108/4000/55 a, b and 108/4000/56 a, b	Test at rated conditional short-circuit current, three-phase, 65kA rms at 415V on incoming 4000A ACB (before and after test)

Date of tests: 7<sup>th</sup> January 2021 to 24<sup>th</sup> October 2021.

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## RECORD OF PROVING TESTS

Laboratory Ref. No: CPRI BLRSCL21T0332, CPRI BLRSCL21T0335, WO-2122-005450,  
G104557666-MUM-001, WO-2122-002077

### CONTENTS (Continued)

Photograph No:	Description
108/4000/57 a, b and 108/4000/58 a, b	Test at rated conditional short-circuit current, three-phase, 65kA rms at 415V on outgoing 1250A ACB with incoming 4000A ACB in circuit (before and after test)
108/4000/61 a, b and 108/4000/62 a, b	Test at rated conditional short-circuit current, three-phase, 65kA rms at 415V on outgoing 630A MCCB with incoming 4000A ACB in circuit (before and after test)
108/4000/63 a, b and 108/4000/64 a, b	Test at rated conditional short-circuit current, three-phase, 65kA rms at 415V on outgoing 250A MCCB with incoming 4000A ACB in circuit (before and after test)
108/4000/65 a, b and 108/4000/66 a, b	Test at rated conditional short-circuit current, three-phase, 65kA rms at 415V on outgoing 160A MCCB with incoming 4000A ACB in circuit (before and after test)
108/4000/67 a, b and 108/4000/68 a, b	Test at rated conditional short-circuit current, single-phase, 39kA rms at 240V on outgoing 160A MCCB with incoming 2500 ACB between R phase and neutral (before and after test)
108/4000/69 a, b and 108/4000/70 a, b	Test at rated conditional short-circuit current, single-phase, 39kA rms at 240V on outgoing 250A MCCB with incoming 2500 ACB between R phase and neutral (before and after test)
108/4000/71 a, b and 108/4000/72 a, b	Test at rated conditional short-circuit current, single phase, 39kA rms at 240V on outgoing 630A MCCB with incoming 2500 ACB between R phase and neutral (before and after test)
108/4000/73 a, b and 108/4000/74 a, b	Test at rated conditional short-circuit current, single-phase, 39kA rms at 240V on incoming 4000A ACB between R phase and neutral (before and after test)
108/4000/83 a, b and 108/4000/84 a, b	Test at rated conditional short-circuit current, single-phase, 39kA rms at 240V on outgoing 1250A ACB with incoming 4000A ACB in circuit between R phase and neutral (before and after test)
108/4000/85 a, b and 108/4000/86 a, b	Test at rated conditional short-circuit current, single-phase, 39kA rms at 240V on outgoing 800A ACB with incoming 4000A ACB in circuit between R phase and neutral (before and after test)
108/4000/79 a, b and 108/4000/80 a, b	Test at rated conditional short-circuit current, single-phase, 39 kA rms at 240V on protective circuit conductor and nearest B phase with incoming 4000A ACB (before and after test)
108/4000/87 a, b and 108/4000/88 a, b	Test at rated conditional short-circuit current, three-phase, 65kA rms at 415V on outgoing 800A ACB with incoming 4000A ACB in circuit (before and after test)

Date of tests: 7<sup>th</sup> January 2021 to 24<sup>th</sup> October 2021.

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