

S&S POWER SWITCHGEAR



Founded by N S Sethuramon and A R
Shanthanakrishnan way back in 1978



S&S POWER SWITCHGEAR

40 Years of Experience

20,000 Units Installed in Field

SF6 Circuit Breakers

Vacuum Circuit Breakers

Vacuum Contactor Panel

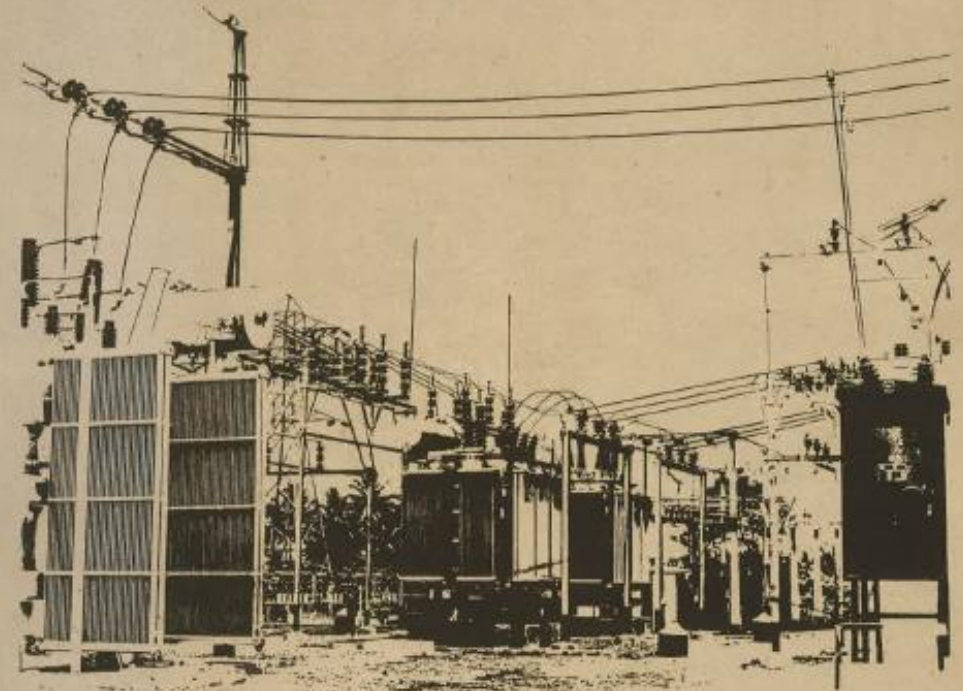
Indoor Circuit Breakers

Outdoor Circuit Breakers

Draw out

Fixed Type

VACUUM SWITCHGEAR



from
S&S

FIXED TYPE VACUUM SWITCHGEAR PANEL

Technical Data :

Type	FV6/12	FV12/12	FV12/25	FV20/31.5	FV20/40
Rated Voltage, kV	12	12	12	12	12
Rated continuous current (amps)	400/630	1250	1250	2000	2000
Short-circuit rating					
Symm. breaking capacity (kA)	12.5	12.5	26.3	31.5	40
Asym. breaking capacity (kA)	15.3	15.3	33	39	50
Making capacity (peak) (kAp)	31.3	31.3	67	79	100
Power frequency withstand (kV)	28	28	28	28	28
Impulse withstand (kVp)	75	75	75	75	75

TYPE FV VACUUM SWITCHGEAR

Low-Maintenance Costs

The principle of current interruption in a high vacuum ensures long contact life without inspection or replacement.

Long Life and Reliability of Performance

The Vacuum interrupters are capable of many load and fault operations and the operating mechanism has been designed to ensure a life comparable with the life of the interrupters with the minimum of maintenance.

Minimum Fire Risk

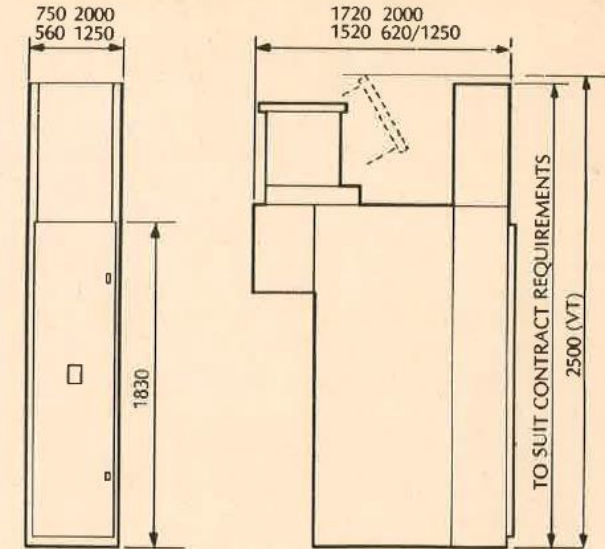
The absence of oil and inflammable gases ensures minimum fire risk.

Application

The type FV equipment is suitable for systems up to 13.8kV for all duties; i.e. distribution switchgear, arc furnace control, capacitor switching and motor starting. It is also suitable for high speed fault clearance and auto-reclose duties.

Bottom Busbars

Each unit is equipped with a 3-phase set of busbars located in the lower chamber of the unit and supported on cast resin insulators.



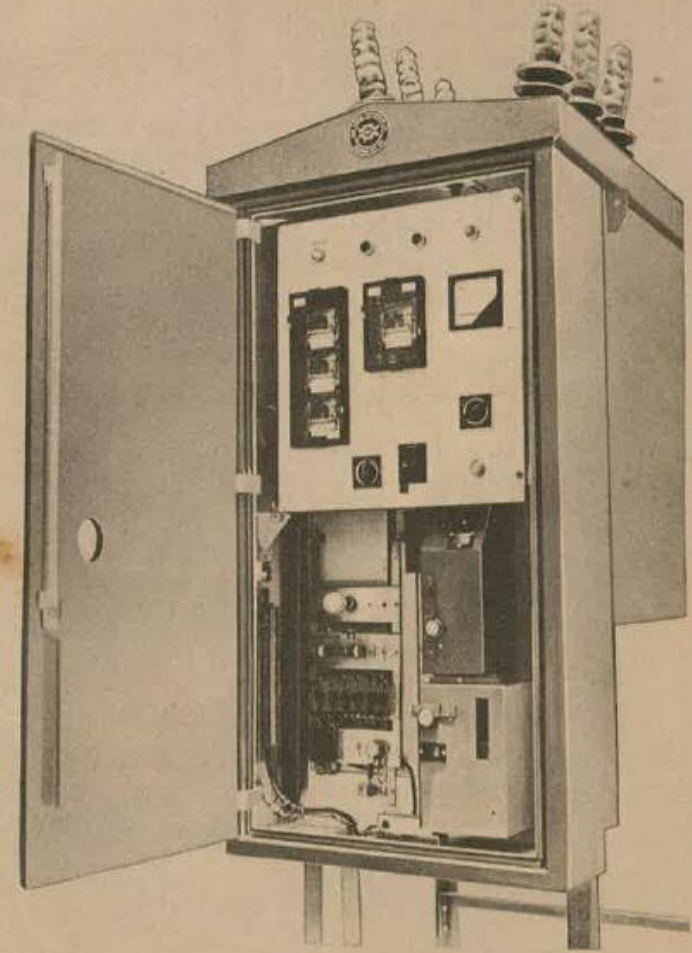
DISTRIBUTION

are of the spring-charged and solenoid types. Included in the Vacuum range is the Contactor for motor starting duties on systems upto 7.2KV.


Manufacture of Vacuum Switchgear demands stringent quality-control and production techniques. The critical areas in this respect, are the mechanism, the drive system and the method of mounting. A lot of expertise and experience obtained over the past years, in these areas, has led to the manufacture of the best maintenance-free Switchgear.

OUTDOOR SWITCHGEAR





S & S POWER SWITCHGEAR LIMITED
Regd. Office & Factory: Porur, Madras 602 104
Tel: 433664 -6 Grams: CURRNTFLOW
TLX: WSI 41-281.

 **COLLABORATORS**
HAWKER SIDDELEY
BRUSH SWITCHGEAR LIMITED
ENGLAND

GENERATION

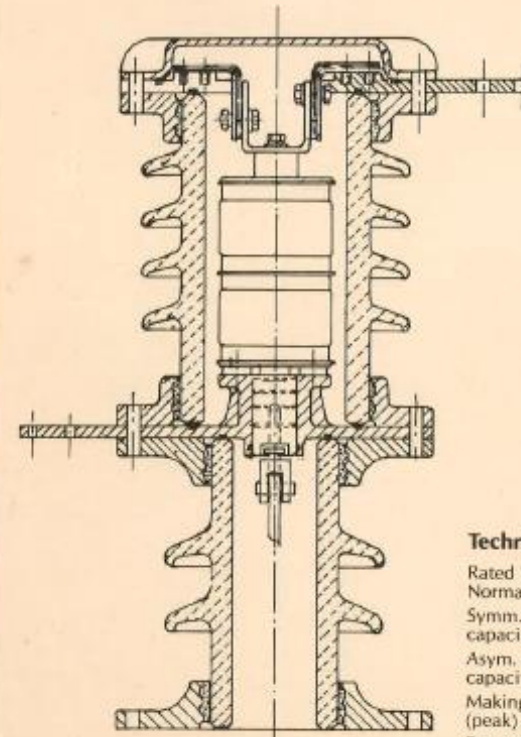
Maintaining the 100 year-old tradition of quality and reliability of Brush Switchgear Ltd., S&S have gone in for the manufacture of Vacuum Switchgear, which has several advantages over conventional Switchgear.

The latest technology has been incorporated in the actual production of Switchgear. The continuing technical development of the use of Vacuum Interrupters for all applications has resulted in an effective, proven range of different types of breakers for use in Switchgear for generation, distribution, traction and industry. Standard operating mechanisms

INDOOR SWITCHGEAR



TYPE OFVp VACUUM SWITCHGEAR



**Pole Unit Construction
(Closed Condition)**

Technical Data:

Rated Voltage	12kV		
Normal Current Rating	630A, 800A, 1250A, 1600A, 2000A, 2500A		
Symm. breaking capacity (kA)	12.5	20	25
Asym. breaking capacity (kA)	16.6	26.8	33
Making capacity (peak) (kAp)	31.3	50	62.5
Power frequency withstand (kV)	28	28	28
Impulse withstand (1.2/50μs) (kVp)	75	75	75

Rated System Voltage (kV) 12/12

Rated Continuous Current amps 1250/2000

Short Circuit Rating

System Breaking Capacity (kA) 20/25

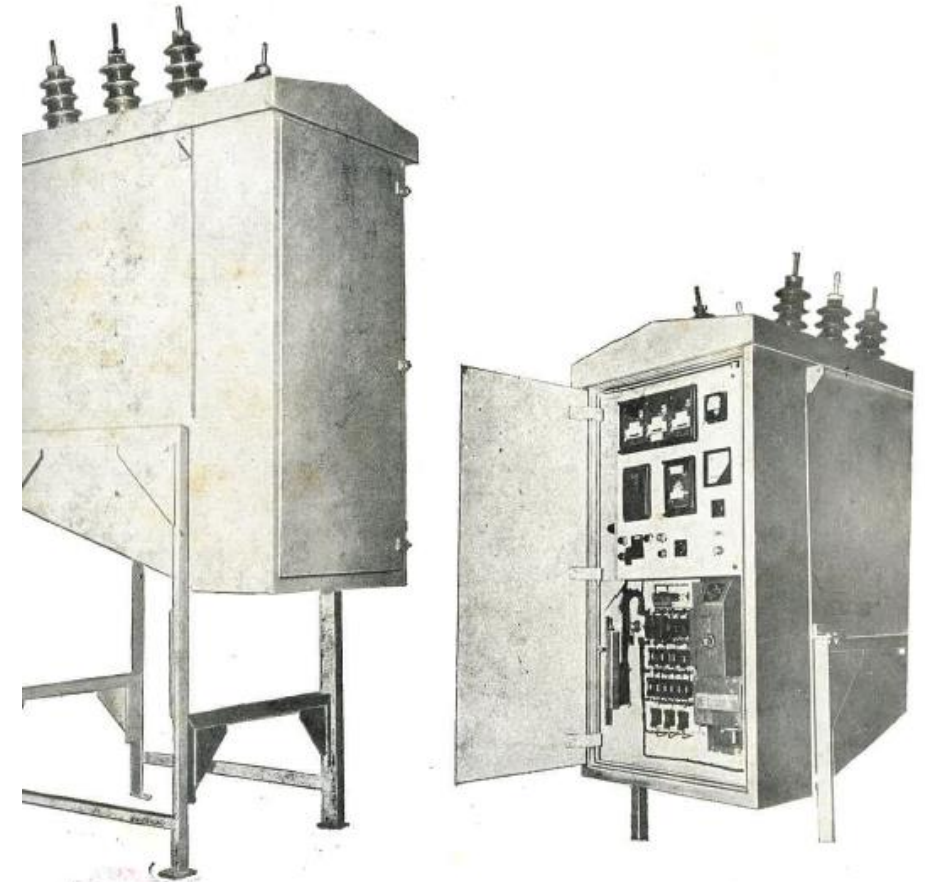
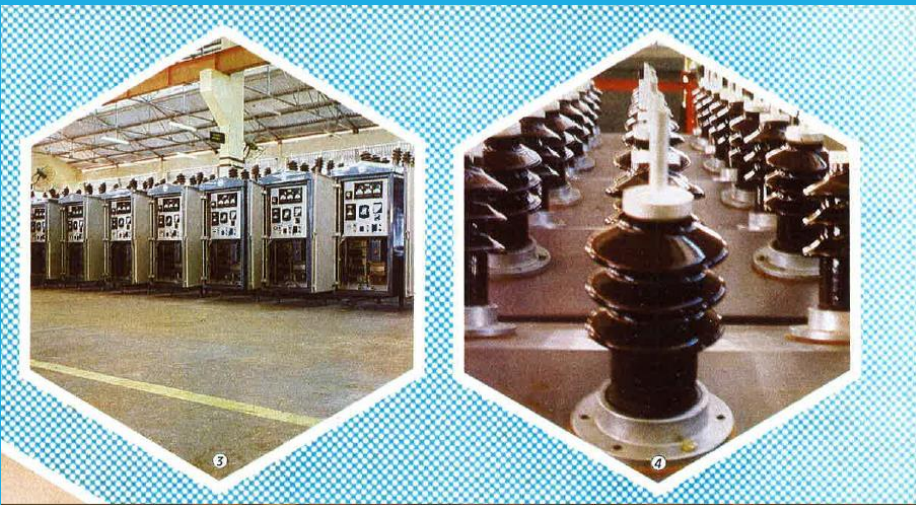
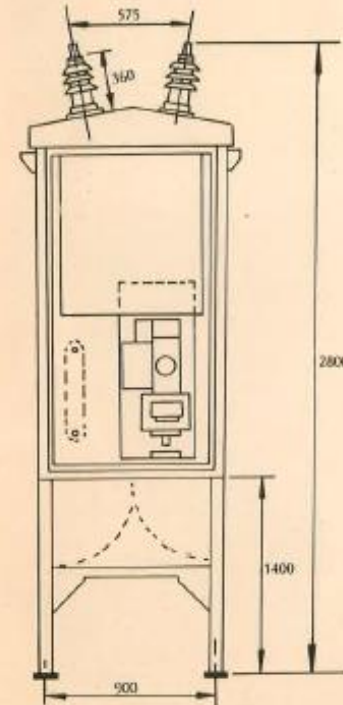


Fig. 9.

TYPE OFV OUTDOOR VACUUM CIRCUIT BREAKER KIOSK.



TYPE OFV VACUUM SWITCHGEAR



Technical Data:

Rated system voltage, kV	12		
Rated continuous current (amps)	630/800/1250/1600		
Short-circuit rating			
symm. breaking capacity (kA)	12.5	20	25
Asym. breaking capacity (kA)	16.6	26.8	33
Making capacity (peak) (kAp)	31.3	50	62.5
Power frequency withstand (kV)	28	28	28
Impulse withstand (1.2/50μs) (kVp)	75	75	75

HAWKVAC 6

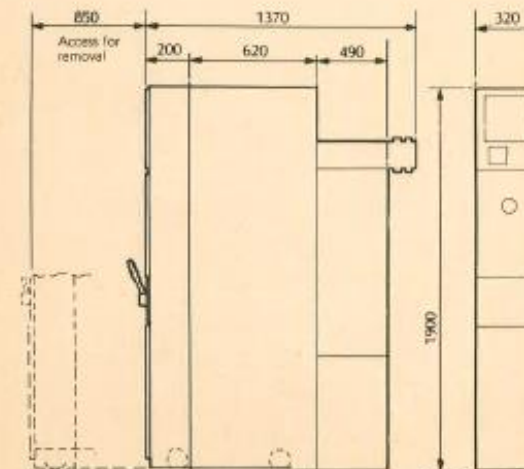
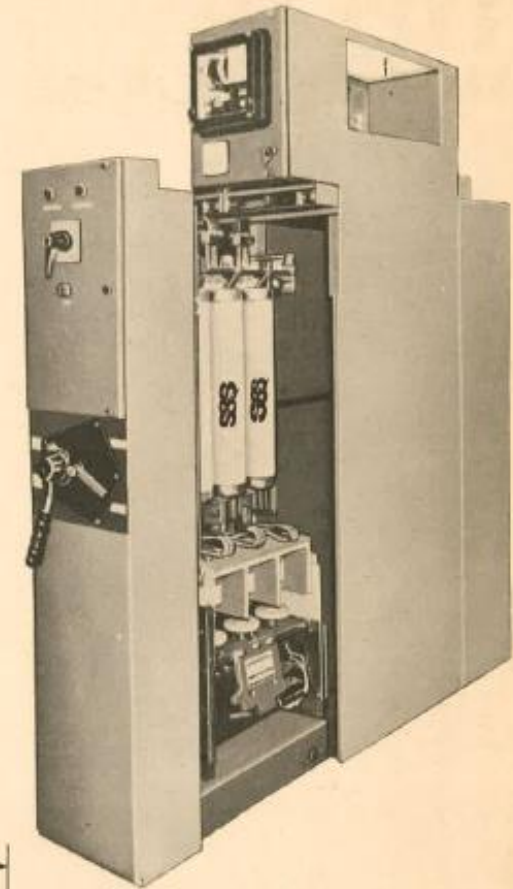
VACUUM SWITCHGEAR

The S & S range of HAWKVAC 6 vacuum contactor equipment is suitable for use on systems upto and including 6.6 kV with short circuit fault levels up to and including 40kA.

Basic philosophy is a fixed housing accommodating busbars, protection relays, earth switch, C.T's and cable area and a removable carriage accommodating HRC fuses, vacuum contactor, and control equipment.

Units can be supplied as single free standing starters or individual units can be connected together to form complete control boards.

The unit has been designed for direct-on-line starting of squirrel cage induction motors but other units will become available for assisted start requirements.



Technical Data:

Rated Voltage	3.6kV	7.2kV
Normal Current Rating	250A	
Busbar current		
continuous	800A, 1250A, 1600A, 2000A, 2500A	
Busbar short time rating	upto 40kA for 3secs	
Busbar peak withstand current	100kA	100kA
Impulse level	40kV	40kV
Power frequency withstand		
for one minute	10kV	20kV
Motor switching	1150kW	2150kW
Transformer switching	1400kVA	2750kVA
Capacitor switching	1400kVAr	2750kVAr
Maximum fuse rating	350A	315A
Contactor	400A	400A
Maximum interrupting capacity	5.0kA	5.0kA
Contactor power consumption	80Watts	80Watts

Applicable standard	IEC 62271-100
Type designation	HHV – 12
Rated Voltage	12kV
Frequency	50/60Hz
Rated Current	Upto 2000A
S.C Breaking capacity	25 / 31.5 kA
Impulse withstand voltage	75kVp
Internal Arc	0.1 sec
Power frequency withstand voltage	28kV







S&S POWER SWITCHGEAR LIMITED

Marai Malai Nagar, Chennai

Retrofitting of MOCB to VCB 12kV,630A ,25kA / 3Sec Indoor



NGEF – MOCB (GR Model)



S&S – VCB (HHV12)

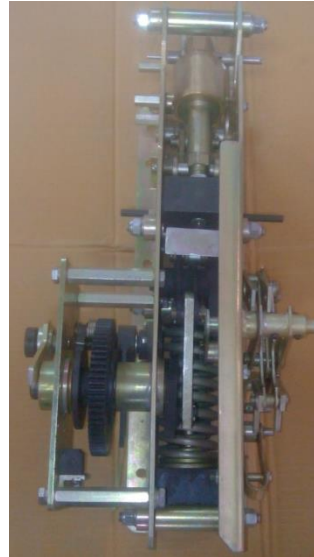




S&S POWER SWITCHGEAR LIMITED

Marai Malai Nagar, Chennai

SUPPLY OF HHV12 TRUCK WITH M37 MECHANISM – ONGC - AHMEDABAD





S&S POWER SWITCHGEAR LIMITED

Marai Malai Nagar, Chennai

**SUPPLY OF IDAM MECHANISM - 3 NOS
AND SERVICE OF HHV12 TRUCK – ONGC -
ASSAM**





S&S POWER SWITCHGEAR LIMITED

Marai Malai Nagar, Chennai

SUPPLY OF OFVP 36 KV - 1 NO

1. Work Order No & Date	15/05/CB/S/3001 DT 08.05.2015
2.Customer Name & Brief Address	Shree Ganesh EPC Pvt Ltd A/cGuru Krishna Textiles , Theni Project
3. Equipment Details & Qty	22kV 1250A 25kA Outdoor PCVCB - 1 No
4.Total Value of the Order	INR 199K



S&S POWER SWITCHGEAR LIMITED

Marai Malai Nagar, Chennai

S&S AS OEM - ORDER BOOK & REVENUE GENERATION

Description	Opening Order in Lakhs	Completed in Lakhs	Work in Progress in Lakhs	Completion Target
Retrofit of IGCAR Breaker	25.97	4.92	21.05	05-06-2015 – 16.75 L 12-06-2015 – 4.30 L
Retrofit & Supply of Spares (ONGC-Ahmedabad)	2.80	-	2.80	20-06-2015 – 2.80 L
On site overhaul /repair /HHV12 with spares (ONGC - Assam)	4.88	-	4.88	25-06-2015 – 4.88 L
Supply of OFVP 36KV – Shree Ganesh EPC	1.99	-	1.99	20-06-2015 – 1.99 L
TOTAL	35.64	4.92	30.72	



S&S POWER SWITCHGEAR LIMITED

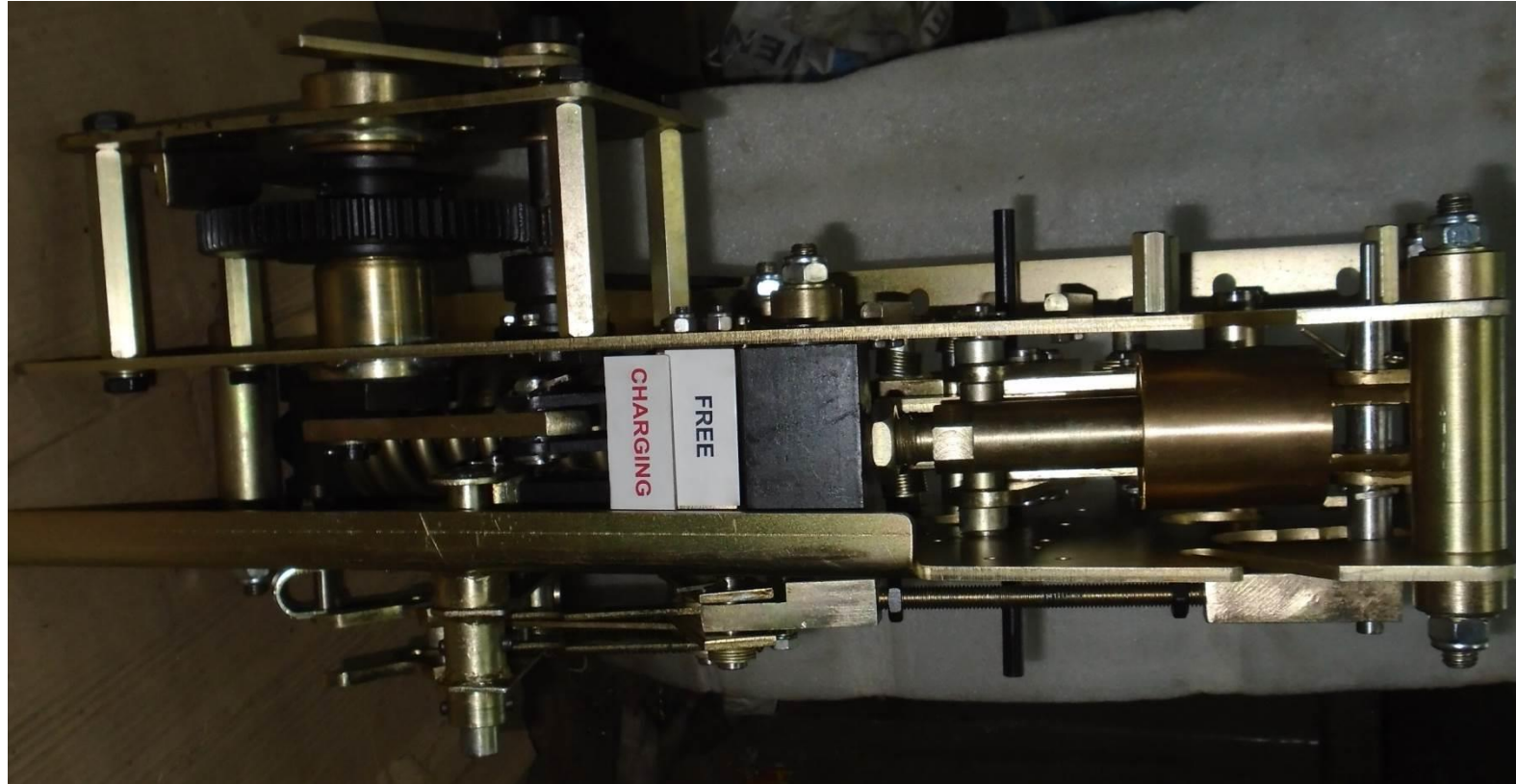
Marai Malai Nagar, Chennai

S&S AS SERVICE PROVIDER

S&S PSL IS PROVIDING SERVICE

- 1. TO APIL WITH MANUFACTURE & SUPPLY OF ALL ALUMINIUM WIRING PLATES AND ALUMINIUM CUBICLES USING TURRET PUNCH PRESS**
- 2. TO SSPSE, PONDY MANUFACTURE & SUPPLY OF ALUMINIUM DRIVE BOXES**
- 3. CAPACITY ADDED TO UTILISE TPP MACHINE FOR 2 SHIFTS WITH RECRUITMENT OF TPP OPERATOR**
- 4. CAN CATER TO ACRASTYLE FOR ALSTOM ORDER OF MS MECHANISM CABIN PRODUCTION WITH MINIMUM INVESTMENT ON TOOLS (DIES & PUNCHES)**
- 5. ADDING A BENDING MACHINE AT LOW COST CAN HELP TO AVOID & REDUCE LOGISTICS AND DEPENDENCY ON EXTERNAL AGENCY FOR BENDING WITH IMPROVED DELIVERY PERFORMANCE AND PRODUCTIVITY.**

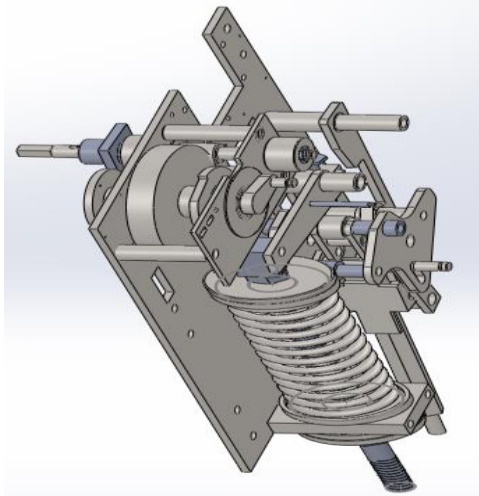
COMPLETE MECHANISM M37/M41



Success Story

3D Modelling of IDAM

Mechanism



B.Rajamanikandan – SSPSL, M.M Nagar

A. What were the Challenges?

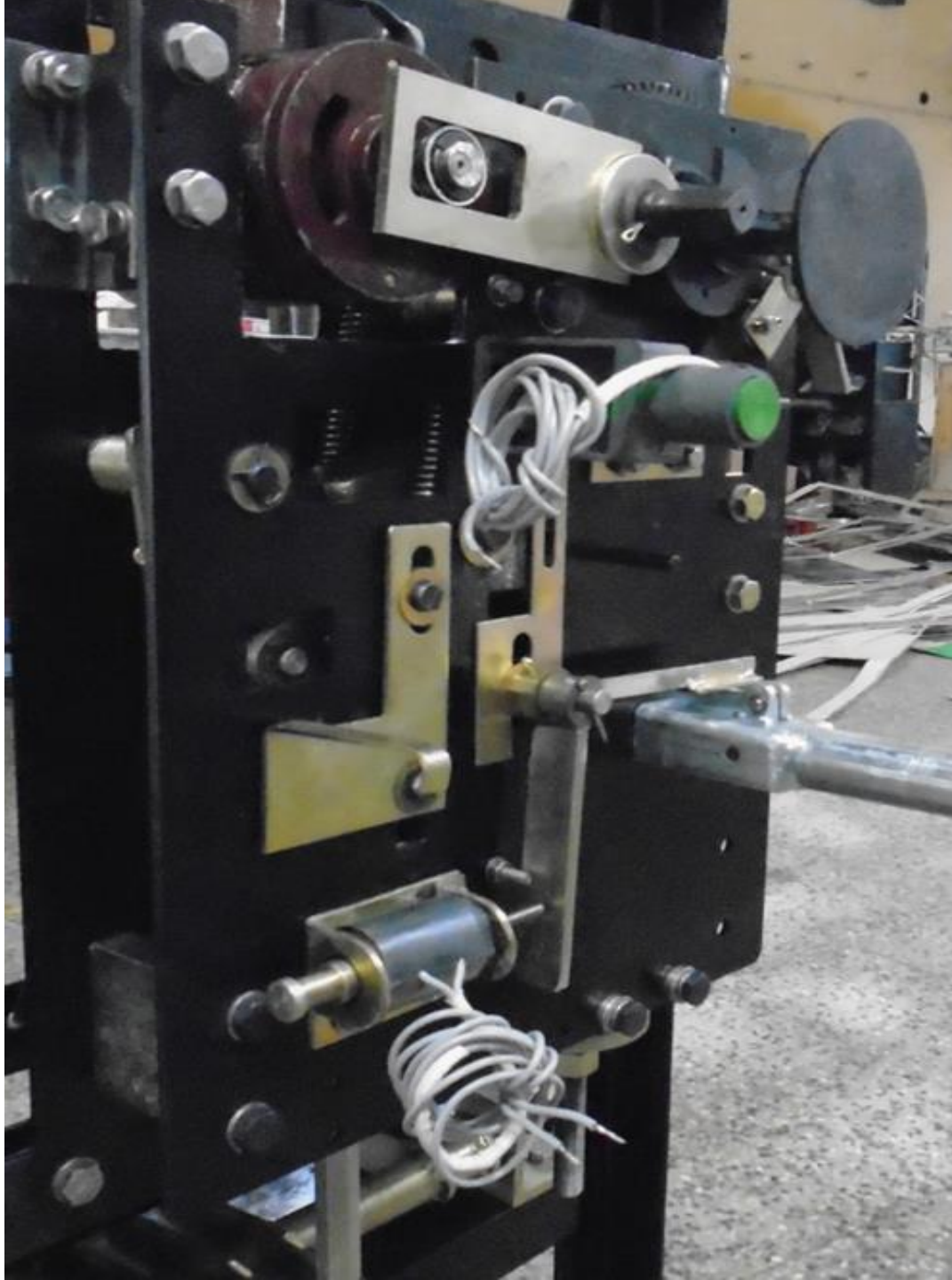
1. Non-availability of complete 2D drawings
2. Non-availability of site failure reports and data on improvements made in the past.
3. Technical guidance on IDAM improvements
4. Meeting M2 class of IEC requirement

B. How did we overcome the Challenges?

1. Reverse Engineering from components for 2D drawings
2. 3D drawings prepared thro' Solid Works for part drawing and assembly validation.
3. Engagement of technical consultant involved in historical IDAM development and product improvement.

C. What did we Learn?

1. Mapping of problems faced in earlier versions and improvements identification.
2. Engaging in 3D modeling for error free design
3. IDAM could have features of unique S&S design and minimal component parts
4. Feasibility of adopting the mechanism in BMC Breaker

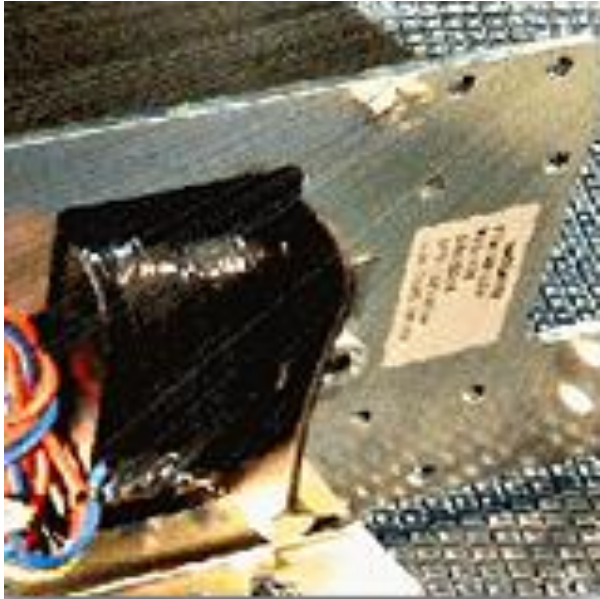


**10,000
Cycles
Mechanical
Endurance**

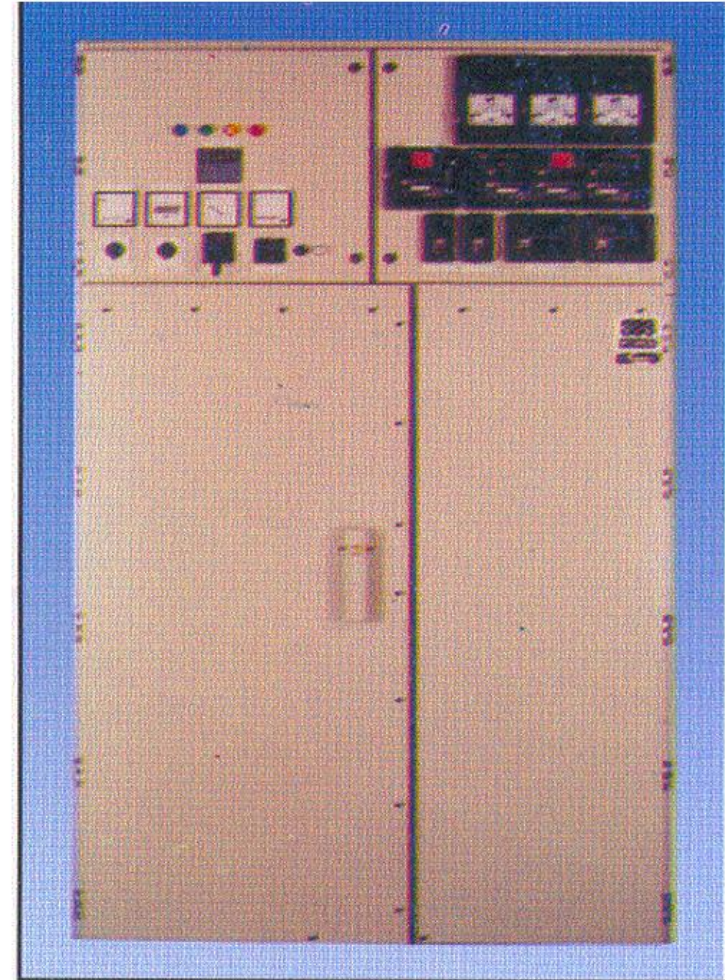
**Upto 36 KV
Indoor/
Outdoor
Upto 2000 A
Upto 40 KA**

**TECHNICAL
PRESENTATION
ON
IDAM MARK II
MECHANISM
DEVELOPED
USING
Integrated
Design And
Manufacturing
technique
By lucas .UK**

MAGLATCH TECHNOLOGY



Applicable standard	IEC 62271-100
Type designation	HHV – 36
Rated Voltage	36kV
Frequency	50/60Hz
Rated Current	Upto 2000A
S.C Breaking capacity	25kA
Impulse withstand voltage	170kVp
Power frequency withstand voltage	70kV



REPLACEMENT OF EXISTING SF6 WITH NEW OFVp36

OLD SF6



S&S OFVp36



Specification – 12kV (Outdoor)

Applicable standard	IEC 62271-100
Type designation	OFVp – 12
Rated Voltage	12kV
Frequency	50/60Hz
Rated Current	Upto 1600A
S.C Breaking capacity	25kA
Impulse withstand voltage	75kVp
Power frequency withstand voltage	28kV



OFVp-12 with CT and Structure Mounted Control & Relay Panel.

Applicable standard	IEC 62271-100
Type designation	OFVp – 36
Rated Voltage	24 / 36kV
Frequency	50/60Hz
Rated Current	Upto 1600A
S.C Breaking capacity	25kA
Impulse withstand voltage	125 / 170kVp
Power frequency withstand voltage	50 / 70kV



OFVp-36 with CT, PT and Control Panel.

Retrofit Case Study

IGCAR

ONGC

MPL

Retrofitting of MOCB to VCB
12kV,630A ,25kA / 3Sec Indoor



NGEF – MOCB (GR Model)

S&S – VCB (HHV12)




The Process flow

- ▶ Input : Purchase Order From EC Enterprises (for IGCAR Supply).
- ▶ Concept Design: Proven Design Already Supplied by S&S To IGCAR.
- ▶ Review: Mr.RJR & Mr.J.Sundarrajan Visited IGCAR plant & Township for Technical & Commercial Discussion with Mr.Jothishkumar, Mr.N.Djearadjane& Mr.Rajendiran
- ▶ Design area focus: Matching of the Truck to the Panel, Panel Interlocks (mech. & Elec.), Rear door Electrical interlock arrangement, In Existing panel separate panel door was not available. We designed swing type panel door arrangement with view glass & Emergency trip.
- ▶ Verify: In house- Mechanical endurance, Contact resistance, Time Interval,H.V, Megger, Shunt Coil, Charging Motor Resistance Value & Mechanical overall check.
- ▶ Validate: Type testing at IIT Chennai. (Impulse Test).
- ▶ Output : Execution of W.O.No. – SS RET - 001

Retrofitting process for Truck


- ▶ Dismantled the existing MOCB Carriage from truck frame.
- ▶ Truck frame alone taken for Retrofitting Job.
- **Fabrication work:-**
 - Cutting of the frame to match with the panel
 - Welding of the channels on the frame for mounting of the mech. fixing plate.
- **Painting Work:-**
 - Cleaning & Removing of the welding spatters & burrs on the truck frame.
 - One coat of primer coating done.(spray painting)
 - One coat of 631 shade spray painting done.
- ▶ Mechanism Assy.
- ▶ Mechanism fitted on the truck & started all other assy. work related to the truck.
- ▶ After completion of all the mech. assy.work truck wiring was carried out.
- ▶ VCB travel settings checked and ensured.

Retrofitting process for Panel

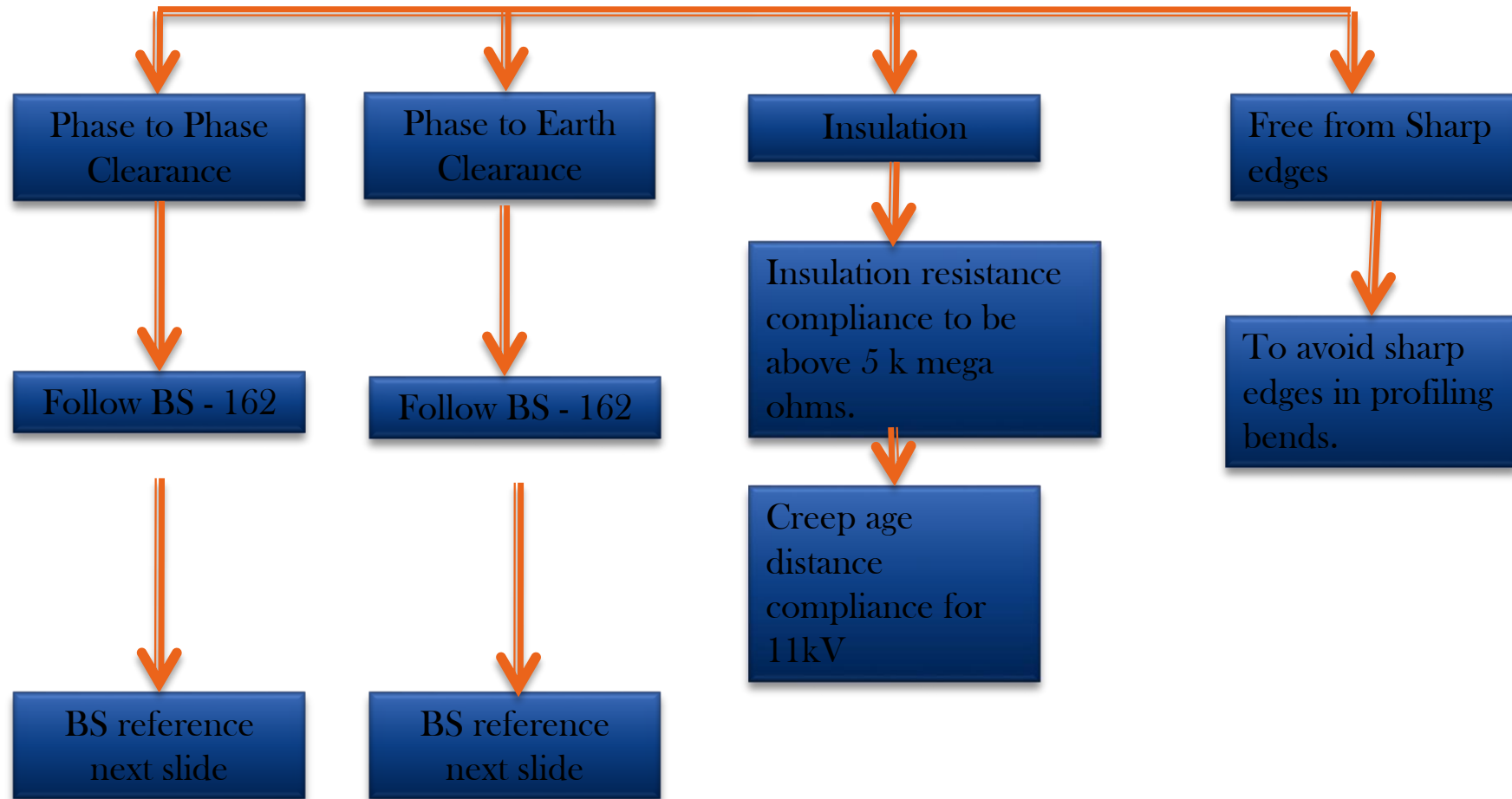
- ▶ Rear Door Electrical inter lock done.
 - ▶ Service / Test Electrical Interlock done.
 - ▶ Panel wiring for VCB.
 - ▶ Swing door arrangement done.
- 

- ▶ Verification and Validation carried out as per IS/IEC – 62270-100,62271 -1

Verification for following as per IEC 62271 -1

- ▶ Mechanical endurance test.
 - ▶ Power Frequency Voltage with stand test.
 - ▶ Lightning impulse Voltage withstand test
 - ▶ Contact resistance test.
 - ▶ Insulation resistance test.
 - ▶ Time interval test.
 - ▶ Shunt Coil, Charging Motor Resistance Value.
 - ▶ Mechanical overall check.
- 

Check points for a Power Frequency with stand & Lightning Impulse voltage withstand test.



Test voltage for the
following dielectric tests:-
Ref: IEC 62271-1

1. Power Frequency voltage
withstand test-1 min.
duration.

2. Lightning impulse
voltage withstand test.

Table 1a – Rated insulation levels for rated voltages of range I, series I

Rated voltage U_r kV (r.m.s. value)	Rated short-duration power-frequency withstand voltage U_d kV (r.m.s. value)		Rated lightning impulse withstand voltage U_p kV (peak value)	
	Common value	Across the isolating distance	Common value	Across the isolating distance
(1)	(2)	(3)	(4)	(5)
3,6	10	12	20	23
			40	46
7,2	20	23	40	46
			60	70
12	28	32	60	70
			75	85
17,5	38	45	75	85
			95	110
24	50	60	95	110
			125	145
36	70	80	145	165
			170	195
52	95	110	250	290
72,5	140	160	325	375
100	150	175	380	440
	185	210	450	520
123	185	210	450	520
	230	265	550	630
145	230	265	550	630
	275	315	650	750
170	275	315	650	750
	325	375	750	860
245	360	415	850	950
	395	460	950	1 050
	460	530	1 050	1 200

**Minimum Electrical Clearance As
Per BS:162.**

Voltage in KV	Phase to earth in mm	Phase to phase in mm
0.415	15.8	19.05
0.600	19.05	19.05
3.3	50.8	50.8
6.6	63.5	88.9
11	76.2	127.0
15	101.6	165.1
22	139.7	241.3
33	222.25	355.6

Creepage Distance Selection- BS 162.

Table 2. Creepage distances to earth in air for open and enclosed busbars of indoor-type switchgear	
Rated voltage	Minimum creepage distance in air
kV	mm
3.6	50
7.2	90.0
12	125.0
17.5	150.0
24	200.0
36	300.0

Minimum Phase to Earth clearance Maintained Area



→ Minimum Clearance
maintained - 130mm

IN House Test



Jayam Engineering Services

AN ISO 9001 : 2008 Certified Company



REPORT NO: 280115-1

DATE: 28.01.15

CONTACT RESISTANCE MEASUREMENT TEST:

Testing Equipment: Contact resistance meter
Model: CRM 100B
Calibration due date: 11.01.2016

Make: Scope
Sl. No: 2301.02AA552

PHASE	ACROSS POLE TO POLE (Micro.Ohms)
R	60.9
Y	63.1
B	64.5

TIME INTERVAL TEST:

Using Equipment: Time Interval Meter
Model: SCOT MXP
Calibration due date: 11.01.2016

Make: Scope
Sl. no: 2101.05AA553

PHASE	OPERATION 1(110%)			OPERATION 2(100%)			OPERATION 3(85%)	OPERATION 4(70%)	
	CLOSE (ms)	TRIP (ms)	C-O (ms)	CLOSE (ms)	TRIP (ms)	C-O (ms)	CLOSE (ms)	TRIP (ms)	C-O (ms)
R	039	032	014	040	034	015	042	042	014
Y	037	032	014	038	034	015	040	042	016
B	039	032	014	039	034	015	041	042	016

HIGH VOLTAGE TEST:

Using Equipment: High Voltage Test Set
Type: B.D.T

Make: Automatic Electric
Sl. no: HVA 730

PHASE	High Voltage AC r.m.s(1 MIN)	
	Close 28KV AC r.m.s	Open 30KV AC r.m.s
R	28	30
Y	28	30
B	28	30

- Withstood in all values.



Jayam Engineering Services

AN ISO 9001 : 2008 Certified Company



REPORT NO: 280115-1

DATE: 28.01.15

BREAKER TEST REPORT

CLIENT: S & S POWER SWITCHGEAR LTD
SITE: MARAIMALAI NAGAR
MAKE: S & S
RATED VOLTAGE: 12KV
AMPS: 630A
TYPE: INDOOR VCB TRUCK
SI.NO: 001

INSULATION RESISTANCE VALUE TEST:

Using Equipment: Insulation Tester
Model: CIE/444
Calibration due date: 16.07.2015

Make: CIE
Testing Voltage: 5000V DC

BEFORE HIGH VOLTAGE TEST:

VCB Position : Close

R ph to Y ph	: >5000 M.ohm
Y ph to B ph	: >5000 M.ohm
B ph to R ph	: >5000 M.ohm
R ph to Earth	: >5000 M.ohm
Y ph to Earth	: >5000 M.ohm
B ph to Earth	: >5000 M.ohm

AFTER HIGH VOLTAGE TEST:

VCB Position : Close

R ph to Y ph	: 5000 M.ohm
Y ph to B ph	: >5000 M.ohm
B ph to R ph	: >5000 M.ohm
R ph to Earth	: >5000 M.ohm
Y ph to Earth	: >5000 M.ohm
B ph to Earth	: >5000 M.ohm



Jayam Engineering Services

AN ISO 9001 : 2008 Certified Company



REPORT NO: 280115-1

DATE: 28.01.15

REMARKS:

NIL

NOTE:

Values are satisfactory and Breaker fit for service.

TEST WITNESSED BY

DAE / GSO - Electrical

M/s. S&S Power Switchgear Ltd.

1.Mr.S.Saravanan, TO/C

1.Mr.R.Chandramouli, Engineer - Technical

2.Mr.P.N.Shanmugam, SA/E

2.Mr.B.Rajamanikandan, Senior Engineer

3.Mr.J.Sundarrajan, Senior Technician



JES SERVICE ENGINEER

V. Venkadeswaran

V.VENKADESWARAN

VALIDATION

- ▶ Lightning impulse voltage test.



LIGHTNING IMPULSE TEST



Department of Electrical Engineering
High Voltage Laboratory
Indian Institute of Technology Madras, Chennai- 600 036

TR / 07 / 14-15

Date: 05.02.2015

DRY POWER FREQUENCY AND IMPULSE VOLTAGE WITHSTAND TEST ON 12 kV, 630 A, THREE PHASE VACUUM CIRCUIT BREAKER

1.0 General Data :

Name of the manufacturer : M/s S & S POWER SWITCHGEAR Ltd.
Maraimalai Nagar – 603209.
Present during the test
On behalf of customer : Mr.N.Djeardjane / R.Nagarajan / P.N.Shanmugan, GSO
On behalf of manufacturer : Mr.R.Jayaraman / R.Chandramouli / B.Rajamanikandan

2.0 Technical Data:

Type of specimen : One no. Vacuum Circuit Breaker HHV12 ,three phase
as per drawing Nos.4BH910000 Rev A ,IGSK060 Rev 00
& 150-35260
Nominal ratings as per nameplate or
as submitted by the manufacturer. : Voltage Rating : 12 kV
Current Rating : 630A
Rated breaking current : 25kA
No. of phases : 3
Vacuum Interrupter type : WL-35260
Serial no. : 001

Test Conducted : Dry Power Frequency and Impulse Voltage withstand test
As per : IEC – 62271-100 & IEC-62271-1
Tested on : 13.01.2015

Phone: 044-2257 5424

Fax: 044 – 2257 4402

3.0 Test data:

3.1 Test Voltage

Lightning Impulse : 75 kV_{max} - Breaker Closed & Open position
Power Frequency Voltage : 28 kV(rms)

3.2 Test Conditions

: Test was conducted as per testing arrangement
shown in the attached drawing No.TR/07/14-15

Wave shape

: 1.2 / 50 μ s (within permissible tolerance)

Sl.No	Breaker Test Condition	Voltage applied to	Earth connected to
1	Closed	Aa	BCbcF
2	Open	A	BCabcF

3.3 Atmospheric conditions

Average room temperature : 27 °C
Average barometric pressure : 758 mm Hg
Average relative humidity : 70 %

3.4 Test procedure

After connecting the VCB in closed position , the 50 Hz A.C voltage was gradually raised from 0 to 28 kV_{max}, maintained for 1 min. duration and reduced to zero. The test was repeated by keeping VCB in open position.

After adjusting the impulse generator to deliver a standard impulse (1.2 /50 μ s) of 75 kV_{peak}, fifteen full waves of both positive and negative polarities have been applied in sequence. The wave shapes of the applied voltages during the first and fifteenth applications have been recorded in all three phases as stated in 3.2 Test Conditions. Typical oscillographic recordings are appended.

4.0 Comments / Results:

Under the conditions detailed in section 3.0, the 12 kV, 630 A three phase Vacuum Circuit Breaker is considered to have withstood both the dry power frequency and impulse voltage withstand test .

Encl: Drawing No. TR/07/14-15
Typical oscillograms



R. Sarathi
(R.SARATHI)

Phone: 044-2257 5424

Fax: 044 – 2257 4402

Successfully Validated at IIT, Chennai, TAMILNADU

Conclusion and action

- ▶ First W.O effected with eleven 3Nos. Despached to IGCAR.
(Kalpakkam)

Site Assessment Observations

- Total No. of panel: 8 Nos.
- Make : Jyoti
 - 2 Nos. 11kV, 1250A, 25kA/3s Indoor MOCB panel
 - 6 Nos. 11kV, 800A, 25kA/3s Indoor MOCB panel
- Retrofitting required: 8 Nos.



To be continued...

Site Assessment Observations

- Dimension of Existing
Jyoti make Truck
- 1400Hx730Wx720D



Jyothi MOCB by S&S VCB (HHV12 Based)

