

# केन्द्रीय खनन अनुसंधान संस्थान

(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)

बरवा रोड, धनबाद - 826001, झारखण्ड, भारत



ADDITIONAL FIRST COPY



## Central Mining Research Institute

(Council of Scientific & Industrial Research)

BARWA ROAD, DHANBAD-826001, JHARKHAND, INDIA

### REGISTERED POST/COURIER SERVICE

No. CMRI/TC/PI/H189  
Equipment ID NO. 172/05

Dated: 24<sup>th</sup> June, 2005  
Code No. FLP/26/05

To  
M/S. SUDHIR SWITCHGEARS PVT. LTD.,  
305/6, Apeejay House,  
130, Bombay Samachar Marg,  
**MUMBAI - 400 023.**

**Sub:** Flameproof Testing as per IS: 2148- 2004 (IEC 60079-1/2001) and weatherproof testing as per IS: 12063-1987 (IEC 60529/1989) for IP-55 of your enclosure for **Flameproof -cum- Weatherproof Top Opening Type Light Fitting for Clean Room** suitable for upto 2X36W CFL Lamp with built in Control Gear at rated upto 250V/550 AC/DC, 50/60Hz (Max.), in Cast Aluminium Alloy LM-6 construction with /without Internal Reflector, designated by **Cat. No. CRF/SUDHIR/1273**, for use in Gas Group I, IIA & IIB and Zone 1 & 2 explosive atmospheres area only.

- Report on (PROTOTYPE)

Your Ref. No.: SSPL/RP/2005/13-1273

Dated: 16-04-2005

Dear Sir,

Please find enclosed the **Test Report (Prototype)** of the above sample submitted by you.

Charges of **Rs. 22,801/- (Rupees Twenty two thousand Eight hundred & one only)** including applicable service charges involved towards the testing /issuing the schedule have been adjusted against the advance deposit made by you.

Kindly arrange to collect the sample within 90 days from the date of receipt of this letter failing which CMRI would dispose off the sample by public auction without any further NOTICE to you.

Kindly acknowledge receipt.

Thanking you.

Yours faithfully,

(G.M. PRASAD)  
HEAD OF THE DEPARTMENT  
TESTING CELL

Encl: As above.  
Proto Test Report in Triplicates.  
Copy to: 1. Head, Flame & Explosion Lab.  
2. Bill Section.

फोन-निदेशक Director  
Ph.: 0091-326-2202326/2203043

पीओ ऑफिस PAX  
Ph.: 0091-326-2203010/2203070/2203090/2205045/2209041

फैक्स FAX  
0091-326-2202429/2204339/2201156

e-mail dcmrips@yahoo.co.in, dcmri@csir.res.in • Website : www.cmriindia.org

कार्यलय के दिन : सोमवार से शुक्रवार तक Working days : Monday to Friday

के० ख० अ० सं० परीक्षण प्रकोष्ठ - CMRI TESTING CELL

केन्द्रीय खनिक अनुसंधान संस्थान

(तैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)



## CENTRAL MINING RESEARCH INSTITUTE

(Council of Scientific & Industrial Research)

बरवा रोड, धनबाद - 826 001 (बिहार) BARWA ROAD, DHANBAD-826 001 (INDIA)

### परीक्षण प्रमाण पत्र - TEST CERTIFICATE

FORMAT NO.: (CMRI: DQM: FLP02: F-01)  
(Flame & Explosion Laboratory)

ID NO. 172/05

Code No. FLP/26/05

#### SCHEDULE: FIRST

[For association with the report of test sent (under cover of this office letter No. CMRI/TC/PI/1189  
Dated: 24<sup>th</sup> June 2005) to M/S. SUDHIR SWITCHGEARS PVT. LTD., 305/6, Apeejay House, 130,  
Bombay Samachar Marg, MUMBAI - 400 023]

- Applicant:** M/S. SUDHIR SWITCHGEARS PVT. LTD.,  
305/6, Apeejay House,  
130, Bombay Samachar Marg,  
MUMBAI - 400 023.
- Manufacturer:** M/S. SUDHIR SWITCHGEARS PVT. LTD.,  
"Sudhir House", Plot No. A-305.  
Road No. 32, Via Road No. 16,  
Wagle Industrial Estate, Thane-400 604

**3. Title of Apparatus: Flameproof -cum- Weatherproof Top Opening Type Light Fitting for Clean Room** suitable for upto 2X36W CFL Lamp with built in Control Gear at rated upto 250V/550 AC/DC, 50/60Hz (Max.), in Cast Aluminium Alloy LM-6 construction with /without Internal Reflector, designated by **Cat. No. CRF/SUDHIR/1273**, for use in Gas Group I, IIA & IIB and Zone 1 & 2 explosive atmospheres area only.

**4. Type of Ex Protection:** Flameproof Ex 'd'.

**5. Type of Ingress Protection:** IP-55.

**6. Cat No:** CRF/SUDHIR/1273.

**7. Rating of Apparatus:** upto 2X36W CFL at rated upto 250V/550 AC/ DC (Max.) & 50/60 Hz. (Max.).

**8. Temperature Class:** As given in the **TABLE # 3**.

**9. Zones and Gas Group:** Gas Group I, IIA & IIB & Zone 1 & 2 only.

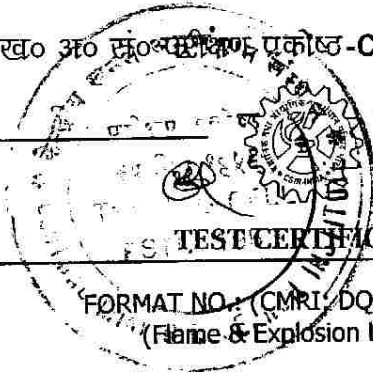
**10. Standard reference:**

- As to flameproof construction: IS: 2148-2004 (IEC 60079-1/2001)
- As to general design, rating, performance & T-class: IS: 13346-2004 (IEC 60079-0/2000)
- As to weatherproof construction IP-55: IS: 12063-1987 (IEC 60529/1989)

*CB*

के० ख० अ० सं० संशोधन प्रकोष्ठ - CMRI TESTING CELL

ADDITIONAL FIRST COPY



TEST CERTIFICATE  
 FORMAT NO. (CMRI/DQM: FLP02: F-01)  
 (Flame & Explosion Laboratory)

ID NO. 172/05

Code No. FLP/26/05

**11. Material of construction and minimum thickness:** Cast Aluminum Alloy LM-6 and thickness minimum 4.5 mm. The material of construction may also be of cast Iron/Stainless Steel/Mild Steel.

**12. Weight of the enclosure:** 18 kgs.

**13. Inspection window/parts:**

Sl. No.	Size in mm	Shape	Type	Thickness	Cemented Path	Sealing Material
1	416x166mm	Rectangular	SUDHIR-Heat resistant Toughened Type - A Glass	8mm	>10mm (min.)	Litharge+Glycerine or Calcium Sulphate

**NOTE:** See the test results for impact test & thermal shock test in Table#1 & Table#4 respectively.

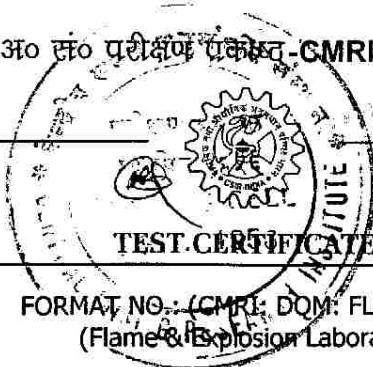
**14. Description of Apparatus:**

Sl No	Name of Enclosure	Dimension In mm	Volume in cc		Type of Cover/ Joint	No. and size of bolts (HTS)	Max No of Aperture on Cover
			Gross	Net			
1	Main Enclosure (Bottom opening)	455X195X 195mm	16860cc	10000cc	Flange	14 Nos. M6X25mm long	NIL
2	Terminal Enclosure (Spigot joint)	82ΦX40mm	210cc	180cc	Spigot	4Nos. M6X25mm long	Max. 2 nos. of upto 1" ET/BSC/BSP/NPT/METRIC/PG ORMETRI THREAD
3	Main Enclosure (Bottom opening) Alternatively	455X195X 195mm	16860cc	10000cc	Flange	14 Nos. M6X25mm long	NIL
4	Terminal Enclosure (Threaded joint) Alternatively	88ΦX56mm	340cc	310cc	Threaded	NIL	Max. 2 nos. of upto 1" ET/BSC/BSP/NPT/METRIC/PG ORMETRI THREAD
5	Main Enclosure (Top opening) Alternatively	455X195X 195mm	16860cc	10000cc	Flange	14 Nos. M6X25mm long	NIL
6	Terminal Enclosure (Spigot joint) Alternatively	82ΦX40mm	210cc	180cc	Spigot	4Nos. M6X25mm long	Max. 2 nos. of upto 3/4" ET/BSC/BSP/NPT/METRIC/PG ORMETRI THREAD

*B*



के० ख० अ० सं० परीक्षण प्रकल्प - CMRI TESTING CELL


 FORMAT NO.: (CMRI: DOM: FLP02: F-01)  
 (Flame & Explosion Laboratory)

ID NO. 172/05

Code No. FLP/26/05

**16. Drawing:**

Sl. No.	Drawing No.	Sheet No.	Rev.	Date	Title
1	CRF/1273	1 of 2	-	03/04/2005	FLAMEPROOF/WEATHERPROOF ENCLOSURE FOR CLEAN ROOM FITTING CAT NO. CRF/SUDHIR/1273
2	CRF/1273-A	2 of 2	-	03/04/2005	ALTERNATIVE VARIATION FOR FLP/WP ENCLOSURE FOR CLEANROOM FITTING CAT NO. CRF/SUDHIR/1273

**18. Declaration by the applicant: None****(A) Declaration by the Applicant/Manufacturer as to standards with which the apparatus complies in respect of:**

- (a) As to flameproof construction: IS: 2148-2004 (IEC 60079-1/2001)  
 (b) As to general design, rating, performance & T-class: IS: 13346-2004 (IEC 60079-0/2000)  
 (c) As to weatherproof construction IP-55: IS: 12063-1987 (IEC 60529/1989).

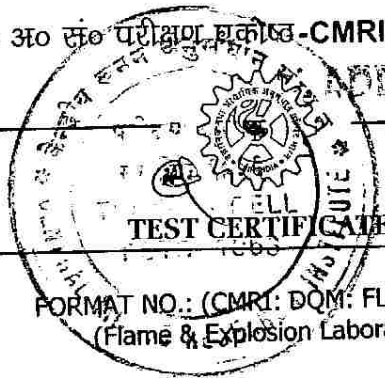
**(B) Composition of the cast aluminum alloy declared by the manufacturer:** Composition of cast aluminum alloy LM-6 purported to be forming the material of construction of the enclosure has been declared by the manufacturer in the drawing no. CRF/1273, Date: 03-04-2005, Sheet 1 of 2. However no sample of the alloy was drawn from the prototype enclosure for verifying its chemical composition declared by the manufacturer. The chemical compositions are as given below in table. The Report of test for Frictional Incendivity Test of the material of the enclosure is given in the **point C** of **Details of Test**.

**COMPOSITION OF ALUMINIUM ALLOY LM-6**

Copper	0.1 % (max.)	Silicon	10 to 13 % (max.)
Titanium	0.2 % (max.)	Lead	0.1 % (max.)
Tin	0.05 % (max.)	Magnesium	0.1 % (max.)
Iron	0.6 % (max.)	Zinc	0.1 % (max.)
Nickel	0.1 % (max.)	Manganese	0.5 % (max.)

Aluminium by difference

कै० ख० अ० सं० परीक्षण प्रकोष्ठ - CMRI TESTING CELL



ADDITIONAL FIRST COPY



FORMAT NO.: (CMRI: DQM: FLP02: F-01)  
(Flame & Explosion Laboratory)

ID NO. 172/05

Code No. FLP/26/05

**SCOPE OF CERTIFICATE**

Certificate issued by the certifying authority testify that the apparatus has been found to comply with the Definition of flameproof Enclosure contained in the relevant Standard specification. They do not vouch for the quality of the equipment in any other respect.

***This Institute reserves the right to review, amend or withdraw this Test Report at any time if, considered necessary in the interest of safety.***

**SCHEDULE: SECOND**

The following are the permissible variations:

1. The alternate material of construction of the enclosure may be Cast Iron/S.S./M.S./Brass instead of Cast Aluminum Alloy LM-6.
2. Alternatively the Light Fitting enclosure can be used with only bottom opening arrangement as shown in Drawing no. CRF/1273-A DATED 03/04/2005 (Sheet 2 of 2).
3. Alternatively the Light fitting for Clean Room can be used as emergency Light fitting upto 2x36W CFL Lamp (Max.).
4. Alternatively the threaded type terminal enclosure may be used instead of spigotted type terminal enclosure.
5. Alternatively the Light fitting for Clean Room Enclosure may be used with IP-55 Degree of Protection without providing Neoprene rubber Gasket.

*AB*



के० ख० अ० ए० प्रीक्षण प्रकेंद्र - CMRI TESTING CELL



BEST COPY



FORMAT NO.: (CMRI: DQM: FLP02: F-01)  
(Flame & Explosion Laboratory)

ID NO. 172/05

Code No. FLP/26/05

[Accompanies this office letter No: CMRI/TC/PI/H/189 dated: 24<sup>th</sup> June, 2005 and pertains to the report of testing as regards Flameproof -cum- Weatherproof **Top Opening Type Light Fitting for Clean Room**, manufactured and submitted for test by M/S. SUDHIR SWITCHGEARS PVT. LTD., 305/6, Apeejay House, 130, Bombay Samachar Marg, MUMBAI - 400 023]

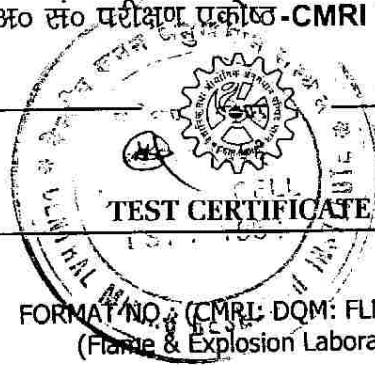
**REPORT OF TEST****Date of Test:** 17/05/2005 & 09/06/2005.**Details of Test:****A. Tests as per IS: 13346-2004:**

Sl. No	Cl. 23.4.3 Mechanical tests			Results (P, F, N) / Reference
1	Test for resistance to Impact	23.4.3.1	Ability to withstand impact	P / As per Table#1
2	Drop test	23.4.3.2	Ability to withstand impact	N
<b>Cl. 23.4.4 : Tests for the Degree of protection IP</b>				
3	IP of enclosure	23.4.4	Ability to prevent ingress of dust and water	P / As per Table#2
<b>Cl. 23.4.5 : Torque Test</b>				
4	Torque test for bushings	23.4.5	Ability of bushing to withstand torque	N
<b>23.4.6 : Thermal tests</b>				
5	Temperature measurement	23.4.6.1	To establish the maximum surface temperature	P / As per Table#3
6	Thermal shock test - for glass parts	23.4.6.2	Ability to withstand instant temperature gradient	P/As per Table#4
<b>23.4.7 : Tests for Non- Metallic enclosures or parts</b>				
7	Plastic parts and enclosures	23.4.7.2	Thermal Endurance: a. Heat b. Cold Mechanical Test Specific to Protection	N
8	Plastic Enclosures	23.4.7.5	Resistance to light For un-protected plastic & Group-1 Luminaries	N
9	Plastic Materials	23.4.7.8	Insulation resistance test	N
10	Non- Metallic enclosures	23.4.7.9	Earth continuity	N
11	Type of protection Ex 'd'	23.4.8	Withstand explosion	P / As per Table#5

**Legend:** P- Pass, F - Fail, N- Not applicable



कै० ख० अ० सं० परीक्षण एकीकृत - CMRI TESTING CELL



FORMAT NO. (CMRI-DM: FLP02: F-01)  
(Flame & Explosion Laboratory)

ID NO. 172/05

Code No. FLP/26/05

**Table#1:** 1kg mass of hardened steel fallen vertically on the surface of the enclosure and on the heat resistant toughened type-A to create impact energy for Gr. II apparatus.

**Table#2: ; IP-Protection:** Tests have been conducted as per IS: 12063 -1987(IEC-60529/1989) as tabulated below for Weatherproof IP-55 degree of protection .

Sl.No.	Type tests			Results
1	Dust Test (First Numeral 6)	Clause 7.5	No dust had entered inside the enclosure	Pass
2	Water Test (Second Numeral 6)	Clause 8.5	No water had entered inside the enclosure	Pass

**Table#3:** The surface temperature rise classifications of the above apparatus have been determined T6 with the 2X36 W CFL Lamp rated at 250VAC at an ambient temperature of 30°C. Hence temperature class T6 may be considered at 30°C ambient.

**Table#4:** The heat resistant toughened type-A flat glass having 8mm thickness was subjected to thermal shock test at max. operating temperature.

**Table#5:** The details are given below in the B. Tests as per IS: 2148-2004.

**B. Tests as per IS: 2148-2004:**

Sl.No.	Type tests			Results ( P, F, N) / Reference
1	Pressure Test	15.1.1	Test of ability of the enclosure to withstand pressure	P / As per Table # A & #B
2	Reference Pressure	15.1.2	Determination of Internal Explosion Pressure	P / As per Table #A
3.	Over Pressure Test	15.1.3	Determination as per Static / Dynamic	P / As per Table #B
4.	Non-transmission of Internal ignition	15.2	Without gaskets	P / As per Table #C
5	Sealing	15.3	Stopping Box with setting compound	N
6	Flame proof enclosure	15.4	Test for equipment with breathing and draining devices	N

Legend: P- Pass, F – Fail , N- Not applicable



कै० ख० अ० सं० परीक्षण एकोष्ठ - CMRI TESTING CELL



ADDITIONAL FIRST COPY


 FORMAT NO.: (CMRI: DOM: FEP02: F-01)  
 (Flame & Explosion Laboratory)

Code No. FLP/26/05

ID NO. 172/05

Table # A:

**Explosion pressure (Reference Pressure) test\***

Type of test	Gas group	Gas Mixture % in Air	No. of tests
Preliminary Test (reference pressure)	IIB	24% Hydrogen	Five

Test Ref. No.	Ignition	Gauge Position	Max. Pressure in Bar	Time of Pressure rise in millisecond	Remark
<b>Main Enclosure (Top Opening)</b>					
PPM/1679059	Body	Body	4.07	18.8	No evidence of distress
PPM/1679060	Body	Body	4.20	17.2	-do-
PPM/1679061	Body	Body	4.25	16.9	-do-
PPM/1679062	Body	Body	4.08	16.5	-do-
PPM/1679063	Body	Body	4.18	17.1	-do-
<b>Terminal Enclosure (Spigot)</b>					
PPM/1679064	Body	Body	5.42	11.8	No evidence of distress
PPM/1679065	Body	Body	5.27	11.9	-do-
PPM/1679066	Body	Body	5.95	12.2	-do-
PPM/1679067	Body	Body	5.18	11.7	-do-
PPM/1679068	Body	Body	5.213	11.6	-do-
<b>Main Enclosure (Alternatively bottom opening type)</b>					
PPM/1679069	Body	Body	5.52	74.5	No evidence of distress
PPM/1679070	Body	Body	5.12	77.7	-do-
PPM/1679071	Body	Body	4.42	97.8	-do-
PPM/1679072	Body	Body	5.08	66.7	-do-
PPM/1679073	Body	Body	5.10	76.6	-do-
<b>Terminal Enclosure (Spigot)</b>					
PPM/1679074	Body	Body	5.77	13.0	No evidence of distress
PPM/1679075	Body	Body	5.22	11.9	-do-
PPM/1679076	Body	Body	4.43	12.6	-do-
PPM/1679077	Body	Body	5.56	12.6	-do-
PPM/1679078	Body	Body	5.16	11.6	-do-
<b>Main Enclosure (Optional) Top opening type</b>					
PPM/1679079	Body	Body	2.39	73.8	No evidence of distress
PPM/1679080	Body	Body	2.14	23.8	-do-
PPM/1679081	Body	Body	2.41	31.7	-do-
PPM/1679082	Body	Body	2.5	31.5	-do-
PPM/1679083	Body	Body	2.35	18.7	-do-

केंद्र अ० सं० परीक्षण प्रकोष्ठ - CMRI TESTING CELL



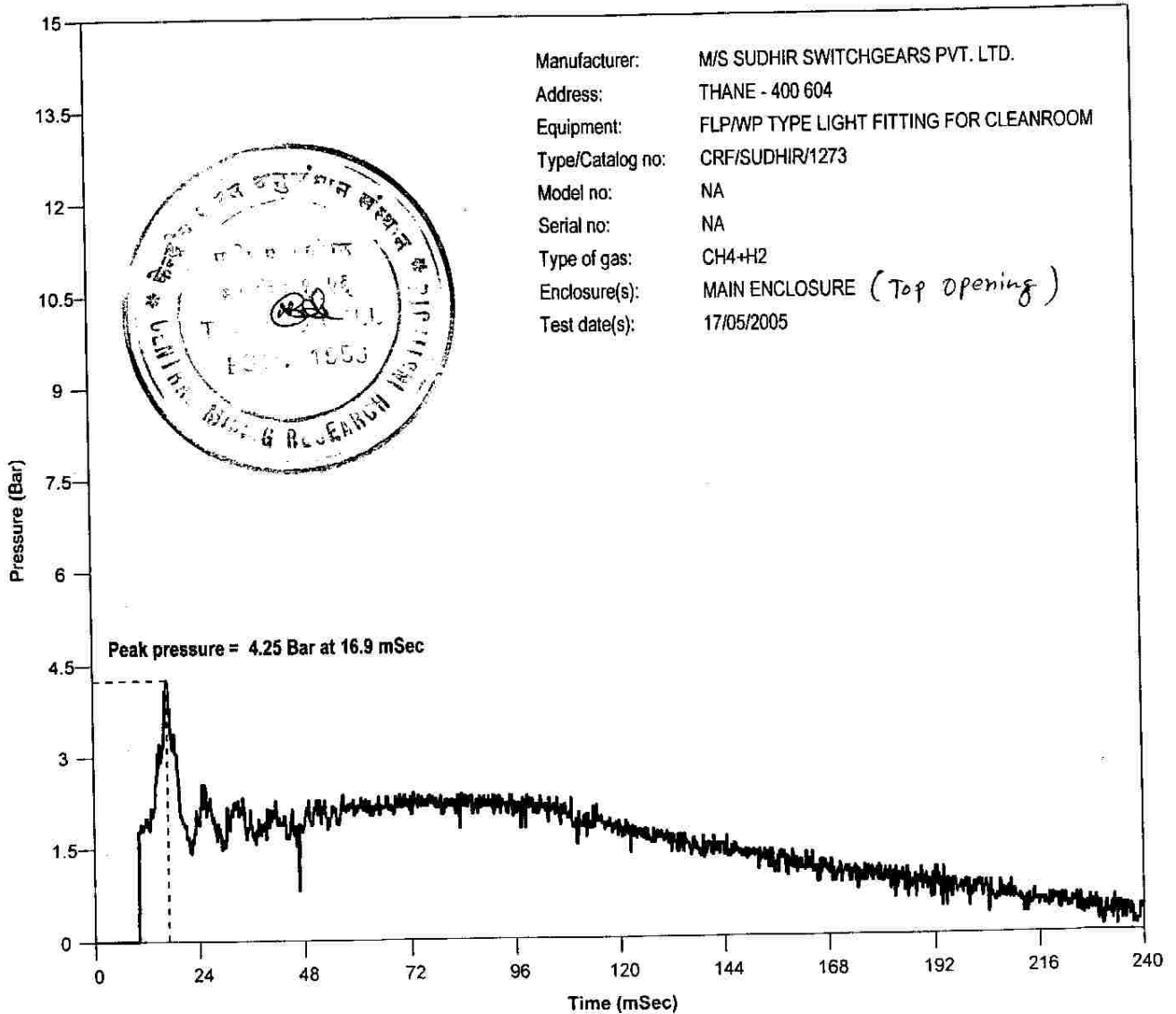
15/05/05

22/06/05



## TEST CERTIFICATE

## Explosion Pressure vs Time Graph



22/6/05  
 (Technical Officer)

22/06/05  
 (Discipline Head)

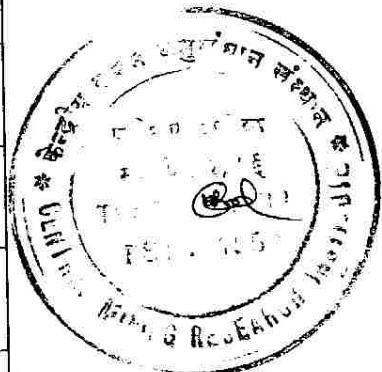
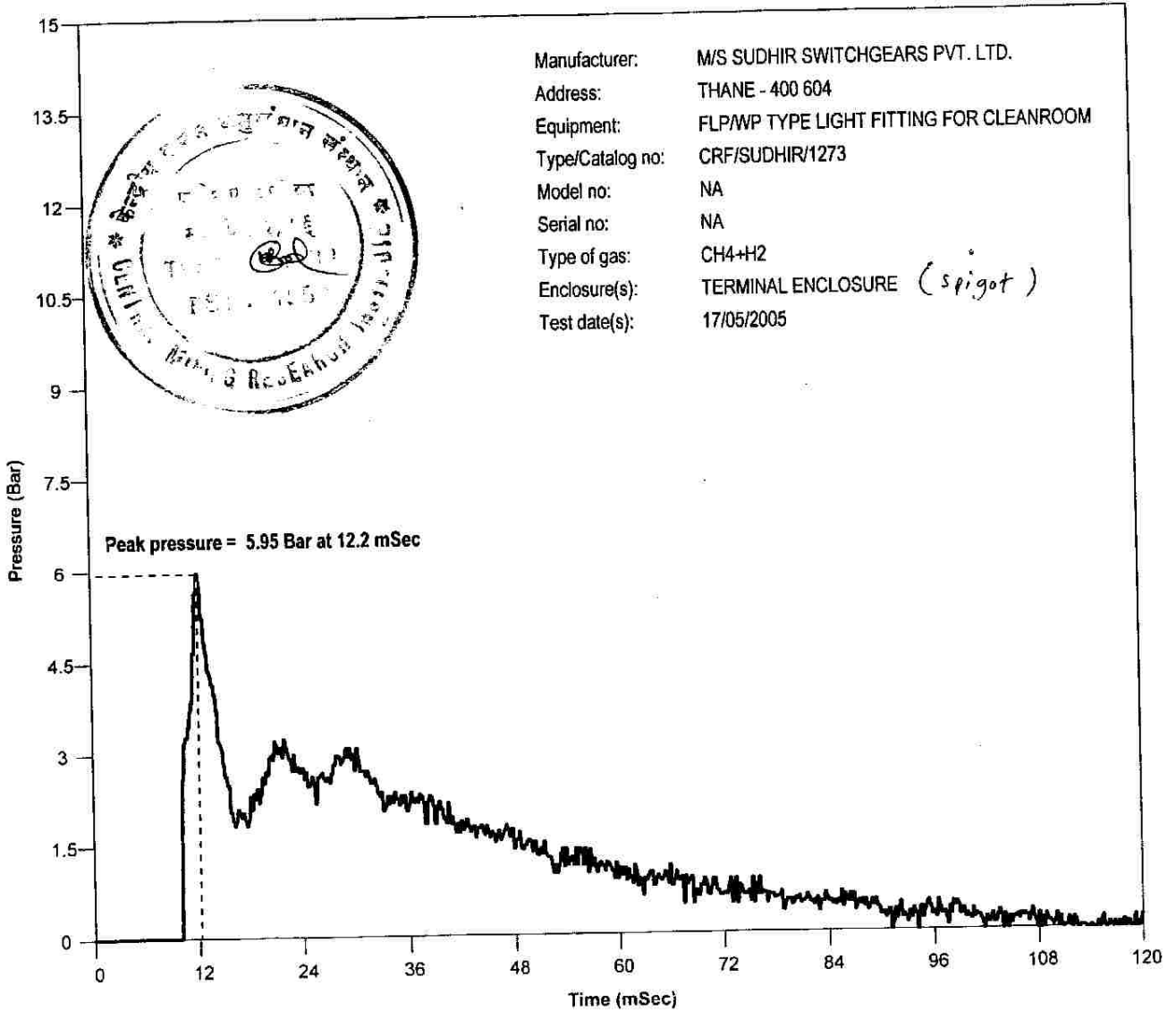
के० ख० अ० सं० परीक्षण प्रकोष्ठ - CMRI TESTING CELL

1027/04-17/05/05



TEST CERTIFICATE

Explosion Pressure vs Time Graph



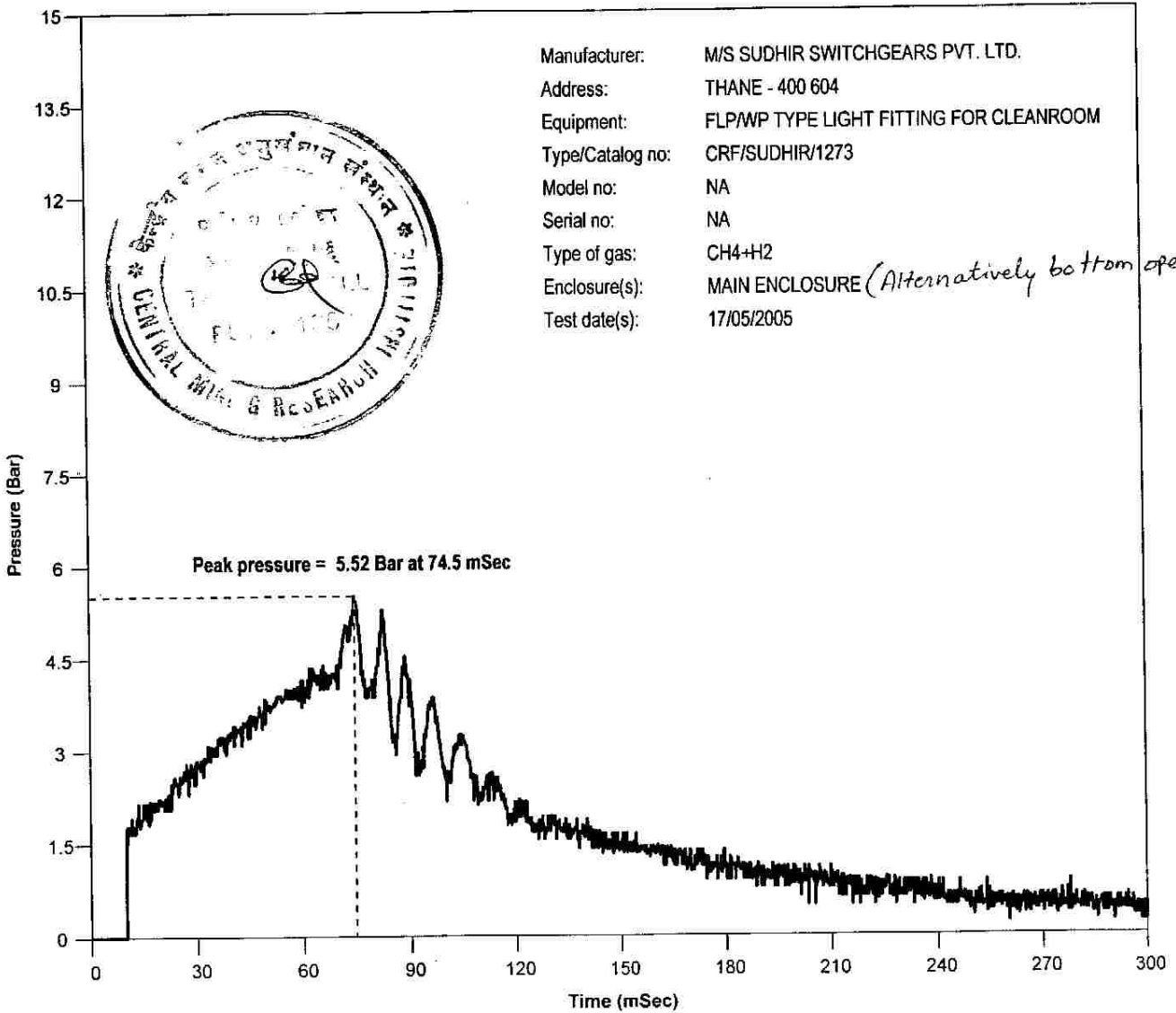
*[Signature]*  
22/6/05  
(Technical Officer)

*[Signature]*  
22/06/05  
(Discipline Head)



TEST CERTIFICATE

Explosion Pressure vs Time Graph



*[Signature]*  
22/6/05  
(Technical Officer)

*[Signature]*  
22/06/05  
(Discipline Head)

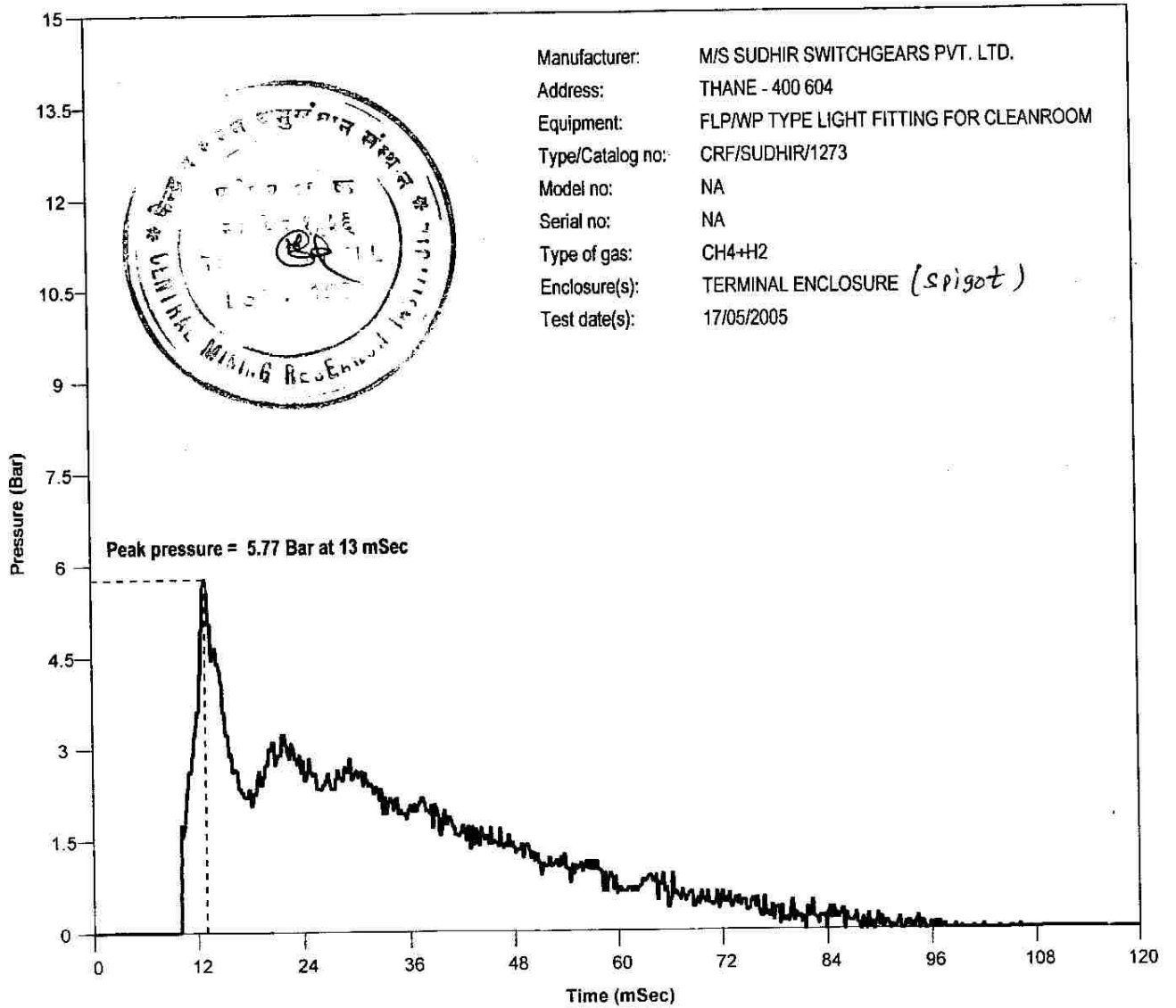
के० ख० अ० सं० परीक्षण प्रकोष्ठ - CMRI TESTING CELL

ADDITIONAL FIRST COPY



TEST CERTIFICATE

Explosion Pressure vs Time Graph



*[Signature]*  
22/6/05  
(Technical Officer)

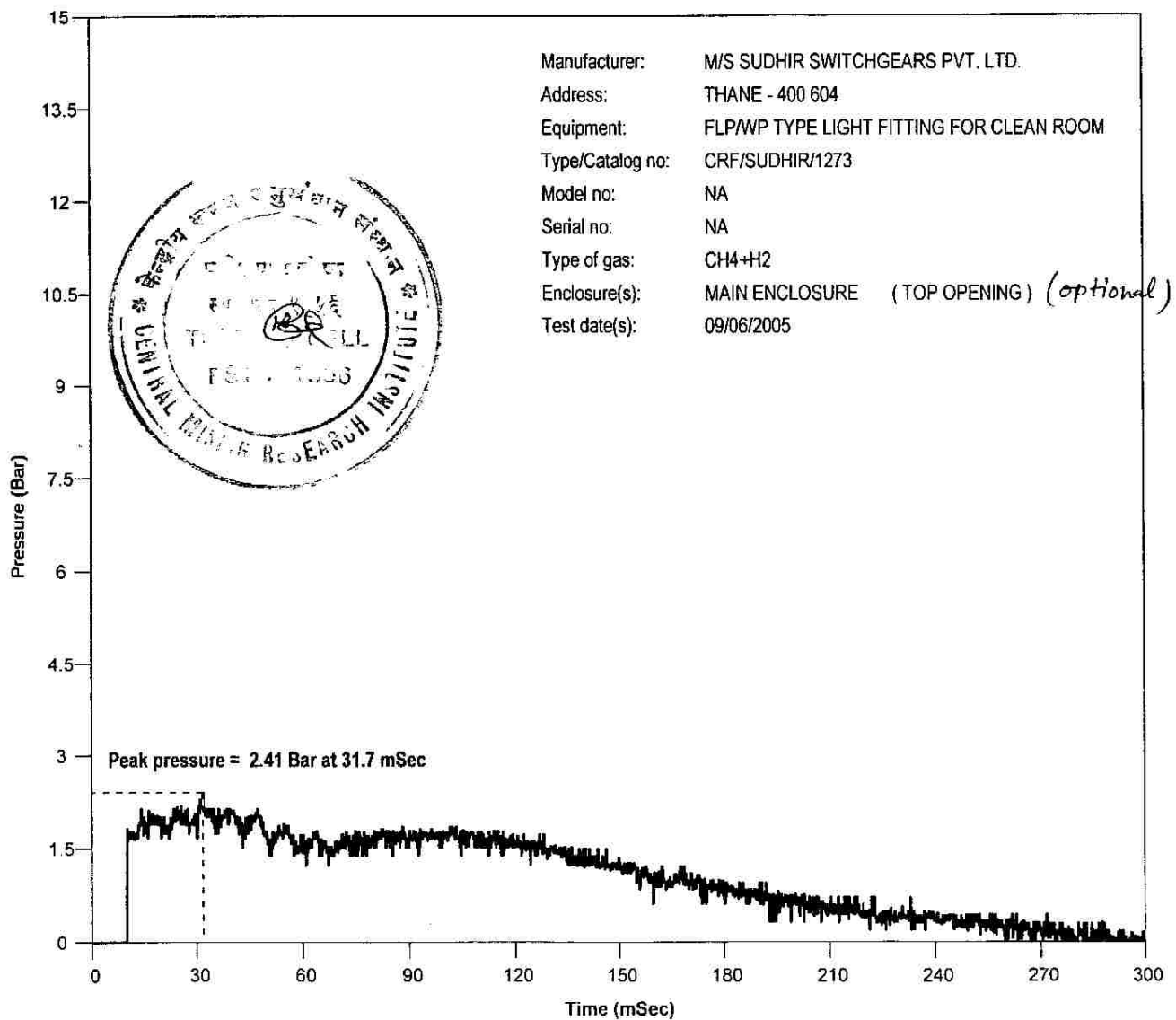
*[Signature]*  
22/06/05  
(Discipline Head)

के० ख० अ० सं० परीक्षण प्रकोष्ठ - CMRI TESTING CELL



## TEST CERTIFICATE

## Explosion Pressure vs Time Graph



*[Signature]*  
22/6/05  
(Technical Officer)

*[Signature]*  
22/06/05  
(Discipline Head)

कै० ख० अ० सं० परीक्षण प्रकोष्ठ-CMRI TESTING CELL

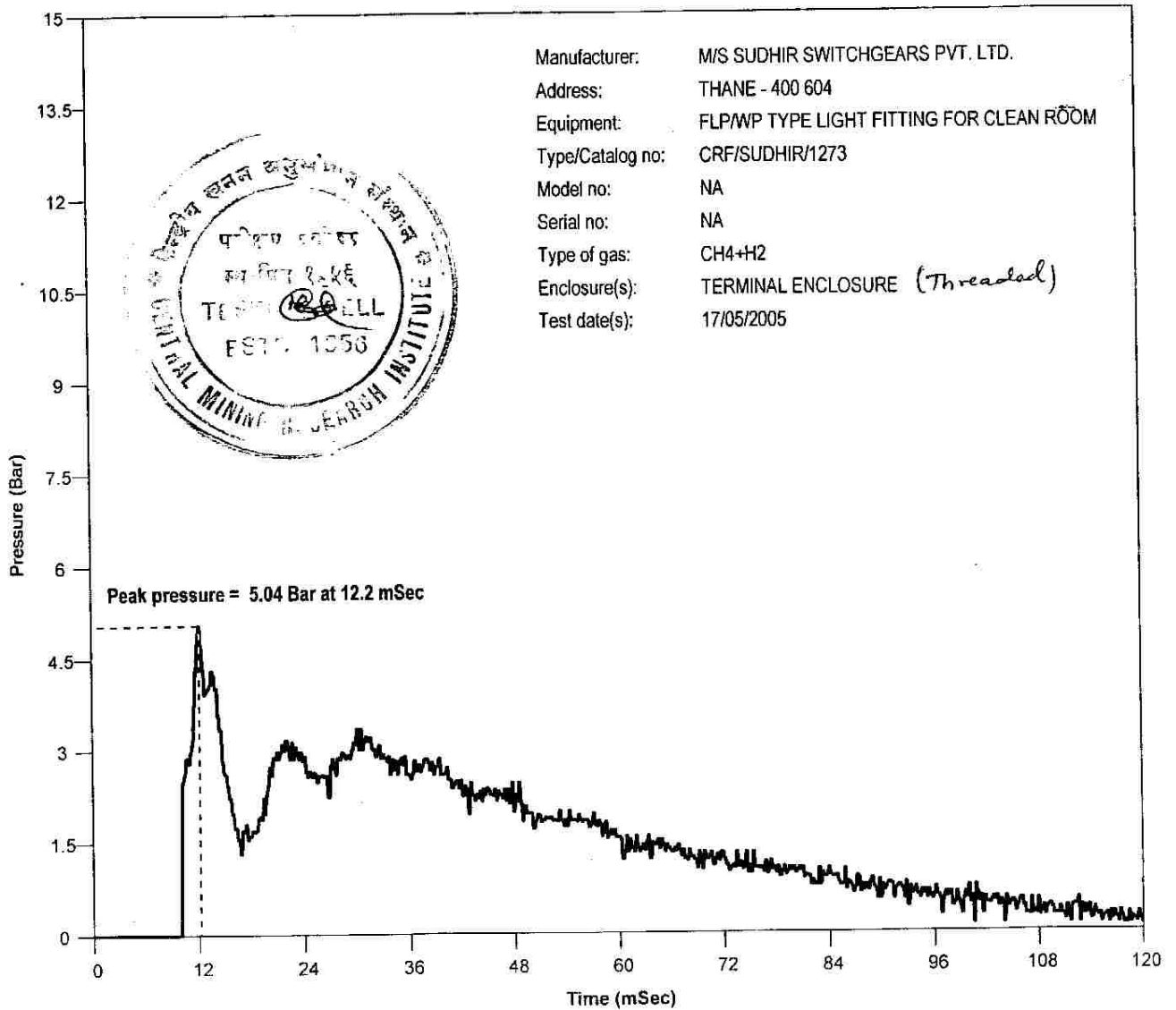


ADDITIONAL TEST COPY



TEST CERTIFICATE

Explosion Pressure vs Time Graph

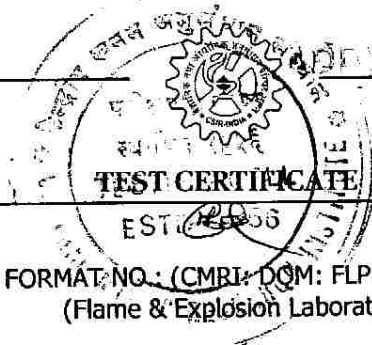


  
 22/6/05  
 (Technical Officer)

  
 22/06/05  
 (Discipline Head)



के० ख० अ० सं० परीक्षण प्रकोष्ठ - CMRI TESTING CELL



FORMAT NO.: (CMRI/COM: FLP02: F-01)  
(Flame & Explosion Laboratory)

ID NO. 172/05

Code No. FLP/26/05

Terminal Enclosure (Threaded)					
PPM/1679084	Body	Body	4.59	11.6	No evidence of distress
PPM/1679085	Body	Body	4.72	11.7	-do-
PPM/1679086	Body	Body	5.04	12.2	-do-
PPM/1679087	Body	Body	4.4	11.4	-do-
PPM/1679088	Body	Body	4.36	11.7	-do-

\*Results shown for the pressure time curve (enclosed) are the highest recorded value obtained in the test.

**Table # B:**

A pressure of 10.0 Kg/cm<sup>2</sup> were applied hydraulically to the above enclosures and the pressure being maintained for one minute for each enclosure. Test reference no. is for above test OPM/1679119 to OPM/1679124.

**Table # C:****Non transmission of internal ignition test**

Type of test	Test Ref. No.	Gas group	Gas Mixture % in Air	No. of Test	Result
Flame Transmission test (External ignition test)	EIT /1679089 to EIT/ 1679118	IIB	37% H <sub>2</sub>	Five	Pass

**C. Tests as per IS: 4013-1967**

Type of test	Clause	Gas Mixture % in Air	Result
Test For Frictional Incendivity	9.7	21% Hydrogen	Light Aluminium Alloy (Material of construction) is non-incendive with respect to Gas Group - IIB

**TEST EQUIPMENT USED AND THEIR CALIBRATION STATUS:**

- (i) Computer, Kistler Piezo Electric Transducer & Charge Amplifier for conducting Explosion Pressure Tests.
- (ii) Fabricated set up for Dust Protection & Water Protection Testing.

**Calibration:** Calibration was performed as per in house procedure and are within the permissible range.

के० ख० अ० सं० परीक्षण प्रकोष्ठ-CMRI TESTING CELL



TEST CERTIFICATE



FORMAT NO.: (CMRI: DQM: FLP02: F-01)  
(Flame & Explosion Laboratory)

ID NO. 172/05

Code No. FLP/26/05

**ENVIRONMENTAL CONDITION WHERE APPLICABLE: NA**

**CONCLUSION:** Flameproof cum Weatherproof Enclosure for Top opening type light fitting for clean room suitable for upto 2x36W CFL Lamp with built in control gear at rated upto 250V/500V AC/DC Volts, 50/60Hz (max.). designated by Cat. No. **CRF/SUDHIR/1273**, in Cast Aluminum LM-6 construction under reference meets the test requirements of IS: 2148-2004 (IEC 60079-1/2001) in respect of flameproofness, IS: 12063-1987 (IEC 60529/1989) in respect of IP-55 degree of protection and IS:13346-2004 (IEC 60079-0/2000) in respect of general requirements.

Reported By

(B. AHIRWAL)  
SCIENTIST

Approved By

(A. K. SINGH)  
HEAD OF THE DEPARTMENT

Dated: 22<sup>nd</sup> June 2005  
Flame & Explosion Laboratory  
Central Mining Research Institute (CSIR)  
Barwa Road, DHANBAD – 826 001, (JHARKHAND) INDIA

विभागाध्यक्ष  
 परीक्षण प्रकोष्ठ  
 H.O.D.  
 Testing Cell