

केन्द्रीय खनन एवं ईंधन अनुसंधान संस्थान

(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)
बरवा रोड, धनबाद - 826 001, झारखण्ड, भारत



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Central Institute of Mining and Fuel Research

Formerly : Central Mining Research Institute
(Council of Scientific & Industrial Research)
BARWA ROAD, DHANBAD-826 001, JHARKHAND, INDIA

REGISTERED POST/COURIER SERVICE

No. CIMFR/TC/P/H/67
Equipment ID NO. 147/08

Dated: 18th June, 2008
Code No. FLP/34/08-9

To
M/s. Satguru Metal Industries,
137/5, Ashirwad Indl. Estate,
Ram Mandir Road,
Goregaon (W),
Mumbai 400 104

Sub: Flameproof Testing as per IS: 2148- 2004 (IEC 60079-1/2001) and weatherproof testing as per IS: 12063 - 1987 for IP-66 and surface temperature rise classification (T6) as per IS: 13346-2004 (IEC 60079-0/2000) of your **Flameproof cum Weatherproof (IP-66) Multi Purpose Thermocouple/RTD Head** in Cast Aluminium Alloy LM-6 Construction as designated by Catalog No. **SMI/TCH/G/137/08A** for use in Gas Group: IIC and Zone 1 & 2 atmosphere only.

- Report on (PROTOTYPE)

Your Ref. No.: SMI/FLP/001/08-09

Dated 02-05-2008

Dear Sir,

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

Charges of **Rs. 20,338/- (Rupees Twenty thousand Three hundred Thirty eight 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 CIMFR would dispose off the sample by public auction without any further NOTICE to you.

Kindly acknowledge receipt.

Thanking you.



Yours faithfully,

G.M. Prasad
(G.M. PRASAD)

HEAD OF THE DEPARTMENT
TESTING CELL

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

1 of 8

के० ख० एवं ई० अ० सं० परीक्षण प्रकोष्ठ-CIMFR TESTING CELL

केन्द्रीय खनन एवं ईंधन अनुसंधान संस्थान

(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)



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CENTRAL INSTITUTE OF MINING AND FUEL RESEARCH

Formerly Central Mining Research Institute
(Council of Scientific & Industrial Research)

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

परीक्षण प्रमाण पत्र - TEST CERTIFICATE

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

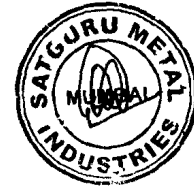
ID NO. 147/08

Code No. FLP/34/08-9

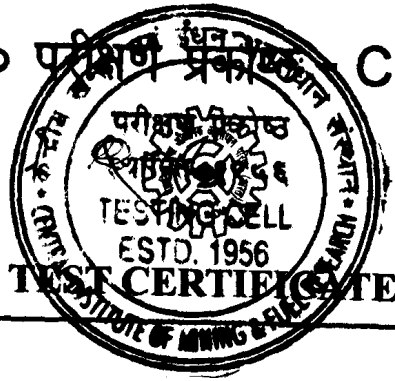
SCHEDULE: FIRST

[For association with the report of test sent (under cover of this office letter No. CIMFR/TC/P/H/167 Dated: 18 June, 2008) to M/s. Satguru Metal Industries, 137/5, Ashirwad Indl. Estate, Ram Mandir Road, Goregaon (W), Mumbai 400 104]

1. **Applicant:** M/s. Satguru Metal Industries,
137/5, Ashirwad Indl. Estate,
Ram Mandir Road,
Goregaon (W),
Mumbai 400 104
2. **Manufacturer:** Same as above.
3. **Title of Apparatus:** Flameproof cum Weatherproof (IP-66) Multi Purpose Thermocouple/RTD Heat in Cast Aluminium Alloy LM-6 Construction as designated by Catalog No. SMI/TCH/G/137/08A for use in Gas Group: IIC and Zone 1 & 2 atmosphere only.
4. **Type of Ex Protection:** Flameproof Ex 'd'.
5. **Type of Ingress Protection:** IP-66.
6. **Model No/Cat. No.:** Catalog No. SMI/TCH/G/137/08A.
7. **Rating of Apparatus:** Rating upto 20Amps 550V AC or 250V DC.
8. **Temperature Class:** T6 at 30°C ambient (20Amp/250VAC/50Hz).
9. **Zones and Gas Group:** Gas Group: IIC and Zone 1 & 2 only.
10. **Standard reference:**
 - (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-66: IS: 12063-1987.
11. **Material of construction and minimum thickness:** Cast Aluminum Alloy LM-6 and 3.5mm minimum wall thickness.



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ID NO. 147/08

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12. Weight of the empty enclosure: 0.500gms.**13. Inspection window:** Not available.**14. Description of Apparatus:**

Sl No.	Name of Enclosure	Dimension mm	Volume in CC		Type of Cover/ Joint	No. and size of bolts (HTS)	Max No of Aperture on Cover
			Gross	Net			
1	T/C Head	Refer Drg.	350cc	250cc	Threaded Joint	Nil	3 Nos. (2nos. for cable entries & One no. for SS Tube of Thermocouple Head)

Flame paths and gaps:

No.	Description	Type of cover	Min. Flamepath Length in mm			Maximum Gap in mm or Pitch in mm		
			Req.	Specified	Meas.	Req.	Spec.	Meas.
1	T/C Head (Single Enclosure)	Threaded joint between cover and enclosure (body)	≥8.0	≥13	13	0.7 to 2	1.25 to 2	1.25 to 2

Max no. & size of cable entries:

Sl No.	Name of Enclosure	Max No of Entry
1	T/C Head	Maximum 2nos. of upto 3/4" NPT/BSC/ET/M19/BSP or 1/2" NPT or M20 or 1" ET/BSC/M25 or any equivalent thread with direct thread axial length 19mm (min.) with less than 1.25mm (min.) pitch and 2mm (max.)

15. Name and warning inscription: "DO NOT OPNE WHILE ENERGISED"

The Name/Rating/Warning inscription plate made of BRASS/SS is permanently fixed on the enclosure by hammer driven rivets leaving min. 3mm material thickness all around the rivets.

16. Drawing:

Sl. No.	Drg. No.	Sheet	Rev.	Date	Title
1.	SMI/TCH/G/137/08	1 of 1	0	23/11/07	Flameproof/Weatherproof (IP:66) Mult Purpose Thermocouple/RTD Head.

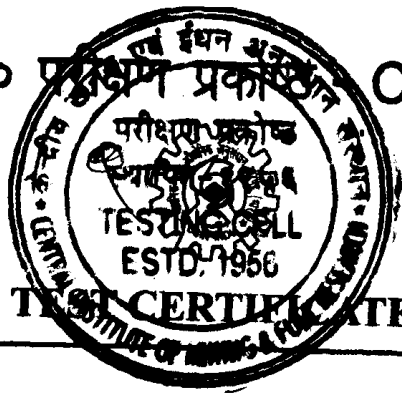
17. Any other relevant information: (i) As per the NOTE 2 of clause 4.2.1 of IS:13346-2004, the apparatus is suitable for applications requiring Group IIC apparatus.

(ii) Two Nos. M4 cheese head screws are provided for earthing by maintaining 3mm(min.) material thickness all around the screws.

18. Declaration by the applicant:

R





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Code No. FLP/34/08-9

(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-66: IS: 12063-1987

(B) Composition of the cast aluminum alloy LM-6 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. **SMI/TCH/G/137/08, Date: 23/11/2007.** However no sample of the alloy was drawn from the prototype enclosure for verifying its chemical composition declared by the manufacturer. 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	0.5 % (max.)	Zinc	0.1 % (max.)
Nickel	0.1 % (max.)	Manganese	0.5 % (max.)

Aluminium by difference

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. The chemical compositions are as given below in table.

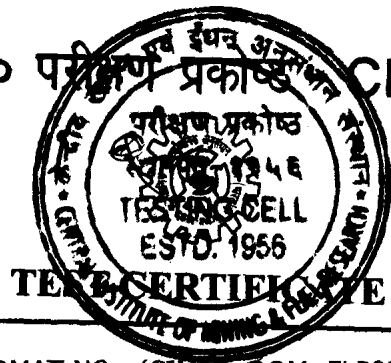
This Institute reserves the right to review, amend or withdraw this Test Report at any time if, considered necessary in the interest of safety.

SCHEDULE: SECOND

The following are alternative permissible variation to otherwise identical unit covered by this Test Report:

1. The alternate material of construction of thermocouple head may be Cast Iron/ SS instead of Cast Aluminium Alloy LM-6.





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

ID NO. 147/08

Code No. FLP/34/08-9

[Accompanies this office letter No: CIMFR/TC/P/H/67 dated: 18th June, 2008 and pertains to the report of testing as regards Flameproof /Weatherproof (IP-66) Multi Purpose Thermocouple/RTD Head, manufactured and submitted for test by M/s. Satguru Metal Industries, 137/5, Ashirwad Indl. Estate, Ram Mandir Road, Goregaon (W), Mumbai 400 104]

REPORT OF TEST

Date of Test: 15/05/2008 & 14/06/2008

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
Cl. 23.4.4 : Tests for the Degree of protection IP				
3	IP of enclosure	23.4.4	Ability to prevent ingress of dust and water	P / As per Table#2
Cl. 23.4.5 : Torque Test				
4	Torque test for bushings	23.4.5	Ability of bushing to withstand torque	N
23.4.6 : Thermal tests				
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	N
23.4.7 : Tests for Non- Metallic enclosures or parts				
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#4

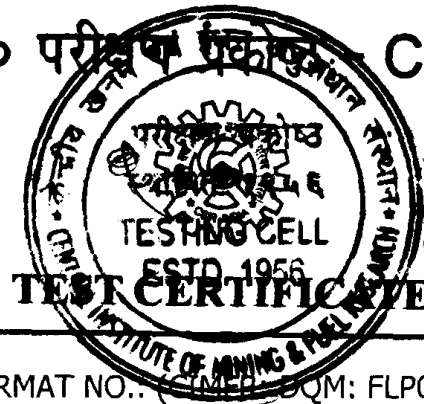
Legend: P- Pass, F – Fail, N- Not applicable



B

फे० ख० एवं ई० अ० सं० परीक्षण एकेडमी, दिल्ली

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(Flame & Explosion Laboratory)

ID NO. 147/08

Code No. FLP/34/08-9

Table#1: 1kg mass of hardened steel fallen vertically on the surface of the enclosure to create high level impact energy for Gr. II apparatus.

Table#2: ; IP-Protection: Neoprene Flat rubber gasket (3.0mm thick) is provided at the end of the each joint for Weatherproof IP-66 degree of protection. Tests have been conducted as per IS: 12063 – 1987(IEC-60529/1989) as tabulated below.

Sl.No.	Type tests		Results
1	Dust Test (First Numeral 6)	Clause 7.6	No dust had entered inside the enclosure Pass
2	Water Test (Second Numeral 6)	Clause 8.6	No water had entered inside the enclosure Pass

Table#3: The surface temperature rise measured on the surface of the enclosure when it reached equilibrium by injecting the 20Amp. current at 250VAC/50Hz. The measured temperature comes under T6 category. Hence a temperature class T6 at 30°C ambient may be acceptable.

Table#4: The details are given below in the B. Tests as per IS: 2148-2004.

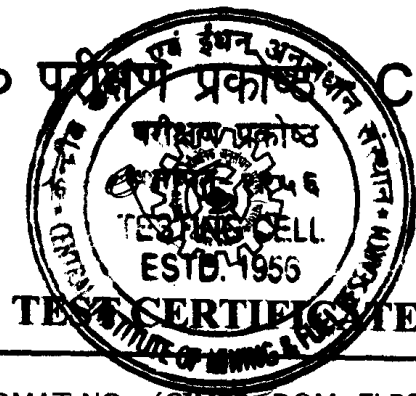
B. Tests as per IS: 2148-2004:

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



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 (Flame & Explosion Laboratory)

ID NO. 147/08

Table # A:

Explosion pressure (Reference Pressure) test*

Code No. FLP/34/08-9

Type of test	Gas group	Gas Mixture % in Air	No. of tests
Preliminary Test (reference pressure)	IIC	31% Hydrogen in air, 14% Acetylene in air	Three for each gas

Test Ref. No.	Ignition	Gauge Position	Max. Pressure in Bar	Time of Pressure rise in millisecond	Remark
Single Enclosure (Hydrogen)					
PPM/1470801	Body	Body	3.99	16.98	No evidence of distress
PPM/1470802	Body	Body	4.38	14.88	-do-
PPM/1470803	Body	Body	4.93	16.02	-do-
Single Enclosure (Acetylene)					
PPM/1470804	Body	Body	5.16	18.12	No evidence of distress
PPM/1470805	Body	Body	5.84	13.26	-do-
PPM/1470806	Body	Body	5.53	17.21	-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/cm² was applied hydraulically to the above enclosure and the pressure being maintained for one minute. Test reference no. is for above test OPM/1470817.

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) for Hydrogen	EIT / 1470807 to EIT/ 1470811	IIC	28% Hydrogen in air	Five	Pass
Flame Transmission test (External ignition test) for Acetylene	EIT /1470812 to EIT/ 1470816	IIC	8% Acetylene in air	Five	Pass

के० ख० एवं ई० अ० सं० परीक्षण प्रकोष्ठ - CIMFR TESTING CELL

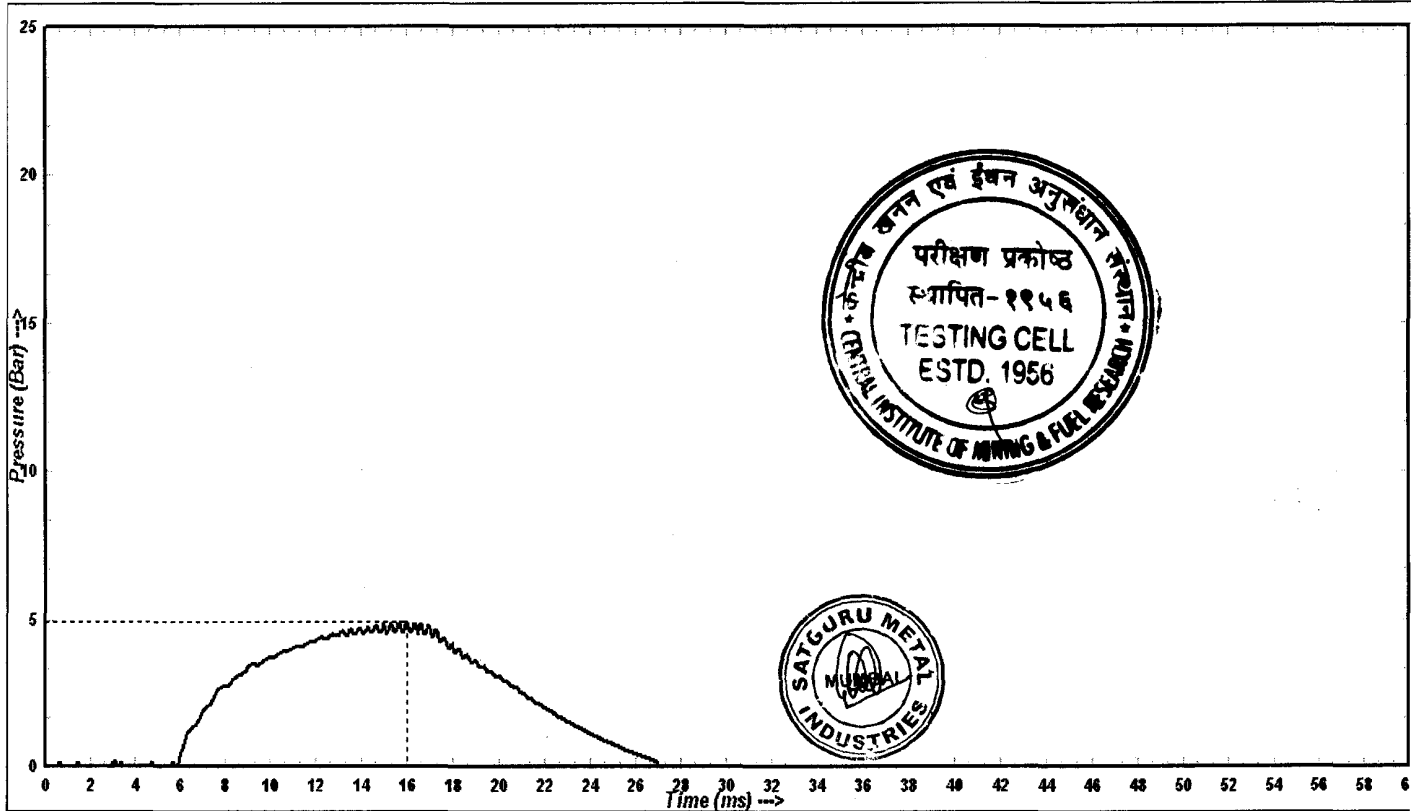


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TEST CERTIFICATE

ID Number: 147/08 Code Number: FLP/34/08
 Test Date : 15/05/2008
 Manufacturer Details : M/S SATGURU METAL INDUSTRIES .
 Manufacturer Address : MUMBAI 400 104 .
 Model / Type : NA
 Category No. : SMI/TCH/G/137/08A
 Gas : HYDROGEN
 Gas Group : IIC
 Equipment Details : FLP/WP THERMOCOUPLE / RTD HEAD
 Enclosure Details : SINGLE ENCLOSURE
 Serial / Badge No. : NA
 Peak Pressure : 4.93 Bar at 16.02 ms

Explosion Pressure vs Time Graph



Handwritten signature and date: 16/6/2008

Handwritten signature and date: 16/6/2008

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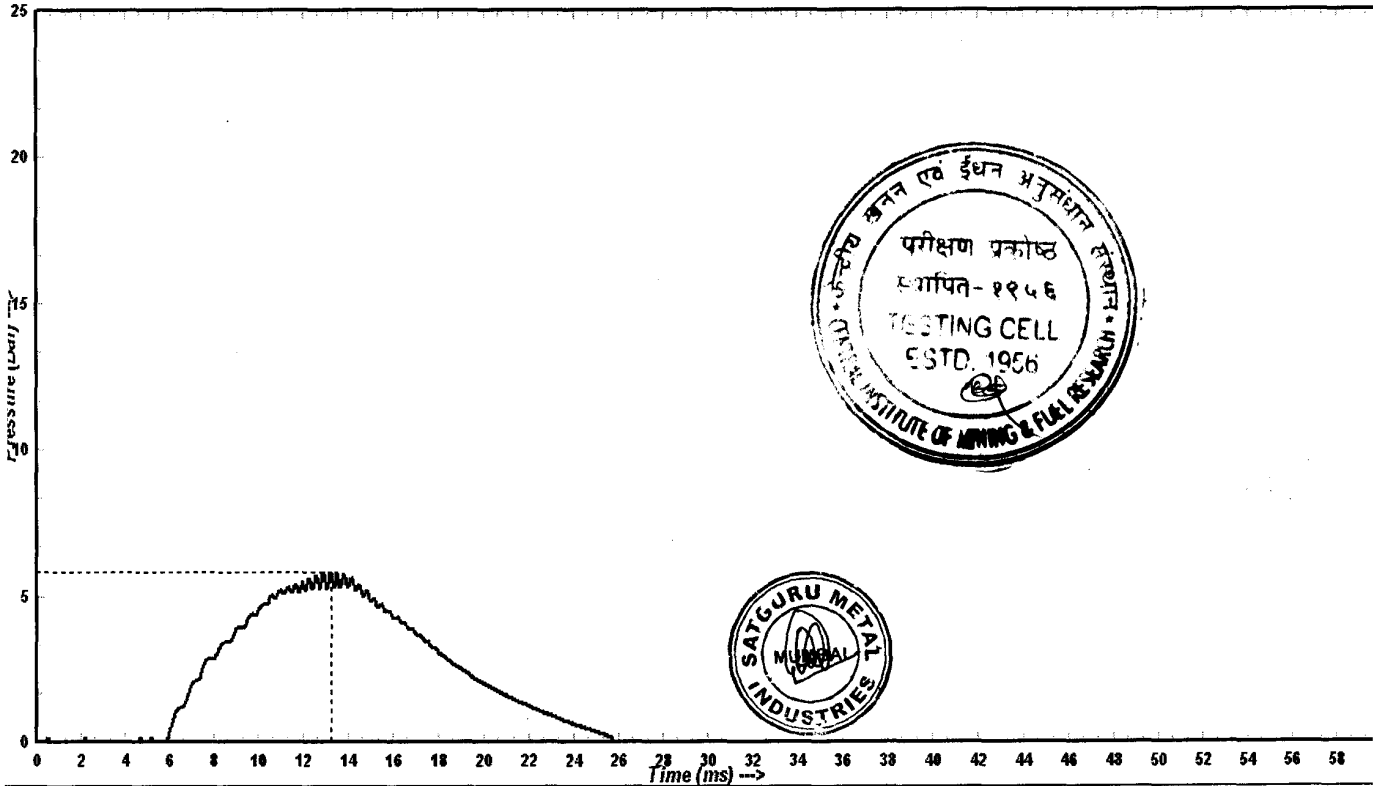


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TEST CERTIFICATE

ID Number: 147/08 Code Number: FLP/34/08
 Test Date : 15/05/2008
 Manufacturer Details : M/S SATGURU METAL INDUSTRIES .
 Manufacturer Address : MUMBAI 400 104 .
 Model / Type : NA
 Category No. : SMI/TCH/G/137/08A
 Gas : ACETYLENE
 Gas Group : IIC
 Equipment Details : FLP/WP THERMOCOUPLE / RTD HEAD
 Enclosure Details : SINGLE ENCLOSURE
 Serial / Badge No. : NA
 Peak Pressure : 5.84 Bar at 13.26 ms

Explosion Pressure vs Time Graph



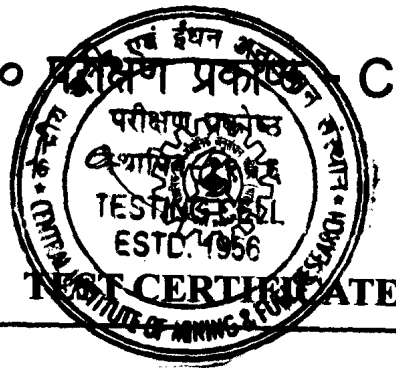
[Signature]
16/6/2008

(Testina Officer)

[Signature]
(Discipline Head)

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Code No. FLP/34/08-9

C. Tests as per IS: 4013-1967

Type of test	Clause	Gas Mixture % in Air	Result
Test For Frictional Incendivity	9.7	28% Hydrogen	Cast Aluminium Alloy (Material of construction) is non-incendive with respect to Gas Group - IIC

TEST EQUIPMENT USED:

- (i) Computer, Kistler Piezo Electric Transducer & Charge Amplifier for conducting Explosion Pressure Tests.
- (ii) Fabricated set up for Dust Protection & Water Protection Testing.
- (iii) Impact test setup.
- (v) Temperature measurement set up.

ENVIRONMENTAL CONDITION WHERE APPLICABLE: NA

CONCLUSION: The **Flameproof cum Weatherproof (IP-66) Multi Purpose Thermocouple/RTD Head** in Cast Aluminium Alloy LM-6 Construction as designated by Catalog No. **SMI/TCH/G/137/08A** under reference meets the test requirements of IS: 2148-2004 in respect of flameproofness, IS: 12063-1987 in respect of IP-66 degree of protection and IS:13346-2004 in respect of general requirements for suitable in gas groups: IIC and Zone 1 & 2 area only.

Note: This enclosure is only Flameproof when all cable entries have either correctly fitted certified FLP Blanking Plug or certified FLP Cable Gland, completely with proper cable termination in the proper manner. Cable Glands and Blanking Plugs fitted must be of a type approved for use with this unit.

Reported by

(B. AHIRWAL)
SCIENTIST

**Approved by**

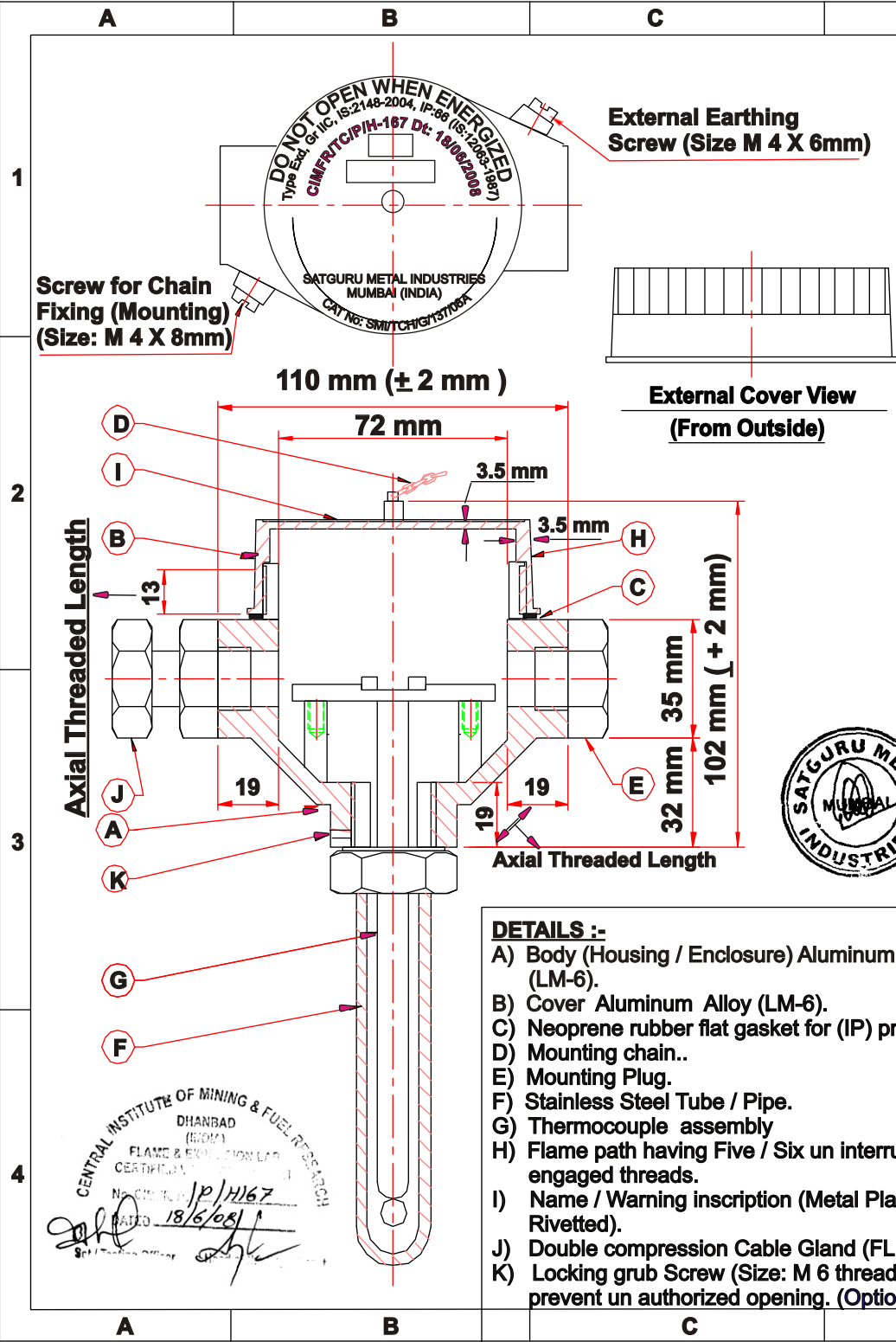
(A. K. SINGH)
HEAD OF THE DEPARTMENT

Dated: 16th June, 2008

Flame & Explosion Laboratory,
Central Institute of Mining & Fuel Research, (CSIR-INDIA)
(Erstwhile: Central Mining Research Institute)
Barwa Road, Dhanbad -826015, Jharkhand, INDIA

विभागाध्यक्ष
परीक्षण प्रकोष्ठ
H.O.D.
Testing Cell

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NOTES :-

- 1) This design confirms to IS:2148-2004 for gas group IIC & IS:12063-1987 for (IP : 66) degree of protection & IS:13346 - 2004 (General requirements for electrical ratings).
- 2) The maximum Cable entries are 2 (Two) nos.
- 3) The cable entries shall be applied thru certified Flame Proof Double Compression Cable Glands.
- 4) Size of cable entries are : 3/4" B.S.Conduit - 1/2" BSP / NPT - 3/4" BSP / NPT- Metric Threads - PGTthreads (OR) Equivalent.
- 5) Size of Bottom Entries are : 1/2" BSP / NPT - 3/4" BSP / NPT - 1" BSP / NPT- Metric Threads - (OR) equivalent.
- 6) The enclosure is designed to withstand max. pressure of 10 KG / Cm2 (duration 1 minute).
- 7) Gross volume of enclosure : 350 CC.
- 8) Nett volume of enclosure : 250 CC.
- 9) The Flame Path / Threaded Path shall be left un painted.
- 10) Name / Warning inscription made of Brass / Stainless Steel is permanently fixed to cover by rivets.
- 11) Alternatively the Name / Warning inscription may be provided by raised letters cast integrally on the cover.
- 12) Neoprene Rubber Flat Gasket / "O" ring is provided for (IP) protection.
- 13) Construction materials for FLP / W P enclosure shall be Aluminum Alloy (LM-6).
- 14) Alternatively construction materials for FLP / WP enclosure may be Cast Iron / Stainless Steel instead of Aluminum Alloy (LM-6).
- 15) Unless otherwise specified all dimensions are in MM .
- 16) General Tolerances on over all dimensions (±2mm).
- 17) Chemical composition of Aluminum 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. 5 % Max.	Zinc	0.1% Max.
Nickel	0. 1 % Max.	Manganese	0.5% Max.
Aluminum by Difference		Remainder	

CIMFR / TC / P / H : 167 Dt : 18 / 06 / 2008

Satguru Metal Industries

137/5 ASHIRWAD INDUSTRIAL ESTATE, RAM MANDIR ROAD
GOREGAON (WEST) MUMBAI 400 104.

TITLE :- FLAME PROOF / WEATHER PROOF (IP : 66)
MULTI PURPOSE THERMOCOUPLE / RTD HEAD

DRAWN BY	CHKD BY	DATE	SCALE	MATL	CAT NO :-
Keshav	Rupa	23/11/07	N.T.S	—	SMI/TCH/G/137/08A.

DO NOT SCALE THIS DRAWING		DRAWING NO :- SMI/TCH/G/137/08	REV. DATE :- 23/11/2007.
		0	

DETAILS :-

- A) Body (Housing / Enclosure) Aluminum Alloy (LM-6).
- B) Cover Aluminum Alloy (LM-6).
- C) Neoprene rubber flat gasket for (IP) protection.
- D) Mounting chain..
- E) Mounting Plug.
- F) Stainless Steel Tube / Pipe.
- G) Thermocouple assembly
- H) Flame path having Five / Six un interrupted engaged threads.
- I) Name / Warning inscription (Metal Plate Rivetted).
- J) Double compression Cable Gland (FLP grade)
- K) Locking grub Screw (Size: M 6 threaded) to prevent un authorized opening. (Optional).

CENTRAL INSTITUTE OF MINING & FUEL RESEARCH
DHANBAD (BOM)
FLAME & EXPLOSION LAB
CERTIFIED
No. 18/1167
DATED 18/6/08