केन्द्रीय खनन अनुसंधान संस्थान

(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)

बरवा रोड, धनबाद – 826001, झारखण्ड, भारत

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Central Mining Research Institute

(Council of Scientific & Industrial Research)

BARWA ROAD, DHANBAD-826001, JHARKHAND, INDIA

REGISTERED POST/COURIER SERVICE

No. CMRI/TC/P/H530
Equipment ID NO. 348/06

Dated: 13th October,2006
Code No. FLP/110/06

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 (IEC 60529/1989) for IP-66 of your **"Flameproof/Weatherproof enclosure for Thermocouple Head"**, in cast aluminium Alloy LM-6 construction, designated by **Cat No.: SMI/TCH/G/137/06A** for use in Gas Groups: IIA & IIB and Zone 1 & 2 atmospheres only.

- Report On (PROTOTYPE)

Your Ref. No.: NIL Dated: 22/09/2006

Dear Sir,

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

Charges of **Rs. 14,591/- (Rupees Fourteen thousand Five hundred Ninety 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 DEPATRMENT
TESTING CELL

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

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

पी० ए० एक्स PAX Ph.: 0091-326-2203010/2203070/2203090/2205045/2209041

फैक्स FAX 0091-326-2202429/2204339/2203156

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

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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.: (CMRI: DQM: FLP02: F-01)
(Flame & Explosion Laboratory)

ID NO. 348/06 Code No. FLP/110/06

FIRST SCHEDULE

[For association with the report of test sent (under cover of this office letter No. CMRI/TC/P/H530 Dated: 13th October,2006) to M/S. SATGURU METAL INDUSTRIES,137/5, ASHIRWAD INDL. ESTATE, RAM MANDIR ROAD, GOREGAON (W), MUMBAI – 400 104]

NAME & ADDRESS OF APPLICANT/MANUFACTURER:

1.Applicant	**2.Manufacturer**
M/S. SATGURU METAL INDUSTRIES, 137/5 ASHIRWAD INDL. ESTATE, RAM MANDIR ROAD, GOREGAON (W), MUMBAI – 400 104	M/S. SATGURU METAL INDUSTRIES,137/5 ASHIRWAD INDL. ESTATE, RAM MANDIR ROAD, GOREGAON (W), MUMBAI – 400 104

3. Title of Apparatus: "Flameproof/Weatherproof enclosure for Thermocouple Head".

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

5. Type of Ingress Protection: IP-66

6. Cat No / Model No: Cat. No. SMI/TCH/G/137/06A.

7. Rating of Apparatus: rating upto 20Amps. 440V AC or 230V DC

8. Temperature Class: as mentioned in **Table#3**

9. Zones and Gas Group: Zone 1 & 2 and Gas Groups I, IIA & IIB atmospheres only. (for group I application material of construction should be Cast iron or S.S.)

10. Standard reference:
(a) As to flameproof construction: IS: 2148-2004 (IEC 60079-1/2001)
(b) As to general design, rating, performance IS: 13346-2004 (IEC 60079-0/2000)
(c) As to weatherproof construction IS: 12063 –1987(IEC-60529/1989)

11. Material of construction and minimum wall thickness: Cast Aluminum Alloy LM-6 construction and 4mm (min) wall thickness.

13. Inspection window/parts:

Sl. No.	Size	Shape	Type	Thickness	Cemented Path	Sealing Material
...	.....	.....	.....	.....	.....	.....

FORMAT NO.: (QMS/TC DOM/REP02: F-01)
(Flame & Explosion Laboratory)

ID NO. 348/06 Code No. FLP/110/06

14. Description of Apparatus:

Sl. No.	Name of Enclosure	Dimensions (mm)	Volume in CC		No. and Size of bolts (HTS) Allen Cap screw	Max No of Aperture on Cover
			Gross Volume	Net Volume		
1	Thermocouple Head		350 cc	250 cc	Nil	Nil

14A. Flame paths and gaps (for IIB):

Flamepeths								
No.	Description	Type of Joint	Axial Length in mm			No. of threads engaged		
			Req.	Spec.	Meas.	Req.	Spec.	Meas.
1	Between enclosure Body & Cover	Threaded	>=8.0	>=13.0	13.0	>=5.0	>=6	7.0

Thermocouple: One no. threaded hole of size ¾"NPT is provided on the bottom side of the enclosure. A Thermocouple Assembly is fitted in the hole provided bottom side of the enclosure by threaded type of joint maintaining min. direct axial length 19mm with min. 6 full threads engaged. Wire/conductors passes through the thermocouple assembly is fully epoxy sealed.

Max no. & size of cable entries: All cable entries have threads (axial length 19mm with min. 6 full thread engaged) for attachment of appropriate and approved FLP/WP double compression type cable glands.

Name of Enclosure	Max no of entry
Single enclosure	Max. 2 nos. of size ¾"ET or ½"BSP/NPT or ¾"BSP/NPT or equivalent

15. Name and warning inscription: The nameplate cum warning plate in Brass/SS/MS is having the details of the apparatus with the warning permanently fixed to cover by rivets. The rivets for fixing the name cum warning plate should leave min. 3mm material thickness all around.

16. Drawing: Drg. No.: SMI/TCH/G137/06, Rev. 'O', Dated: 11/05/2006. Title "Flameproof /Weatherproof (IP-66) Thermocouple Head.

17. Any other relevant information: NA

18. Declaration by the applicant:

(A) Standard reference:

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

TEST CERTIFICATE

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

ID NO. 348/06 Code No. FLP/110/06

(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 above drawing.

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 - Remainder

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.**

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.

SECOND SHEDULE

The following are permissible variation without changing the flameproof properties.

1. Alternatively material of construction of the above apparatus may be cast iron/ Stainless Steel instead of Cast aluminium alloy LM-6 construction.

2. Alternatively the threaded cable entries may be NPT/BSP/ET/PG/METRIC/NPS threads.

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TEST CERTIFICATE

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

ID NO. 348/06 Code No. FLP/110/06

[Accompanies this office letter No: CMRI/TC/P/H530 dated: 13th October,2006 and pertains to the report of testing as regards **"Flameproof/Weatherproof enclosure for Thermocouple Head"**, in cast aluminium Alloy LM-6 construction, designated by **Cat No.: SMI/TCH/G/137/06A** 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: 05& 11/10/2006

Detail 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	**Pass/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

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

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

ID NO. 348/06 Code No. FLP/110/06

Table#2: IP-Protection: Neoprene flat rubber gasket (2.5mm thick) is provided at the end of the joint for Weatherproof IP-66 degree of protection for each enclosure.

Tests as per IS: 12063 –1987(IEC-60529/1989):

Sl. No.	Type Tests			Results
1	Dust Test (First Numeral 6)	Clause 7.6	No dust had accumulated inside the enclosure	**Pass**
2	Water Test (Second Numeral 6)	Clause 8.6	No water had accumulated inside the enclosure in harmful quantity.	**Pass**

Table#A3: The surface temperature rise classifications of the above apparatus have been determined at 110% of rated supply (20Amps, 240V AC) to the terminal placed inside the enclosure and is classified as T6 at an ambient temperature of 40°C.

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**

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

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% H2/CH4 (85/15)	Five

Test Ref. No	Ignition	Gauge Position	Max. Pressure in Bar	Time Of Pressure rise in millisecond	Remark
Single Enclosure					
PPM/1686681	Body	Body	3.69	12.2	No evidence of distress
PPM/1686682	Body	Body	3.58	11.9	-do-
PPM/1686683	Body	Body	3.68	11.7	-do-
PPM/1686684	Body	Body	3.62	11.5	-do-
PPM/1686685	Body	Body	3.58	15.7	-do-

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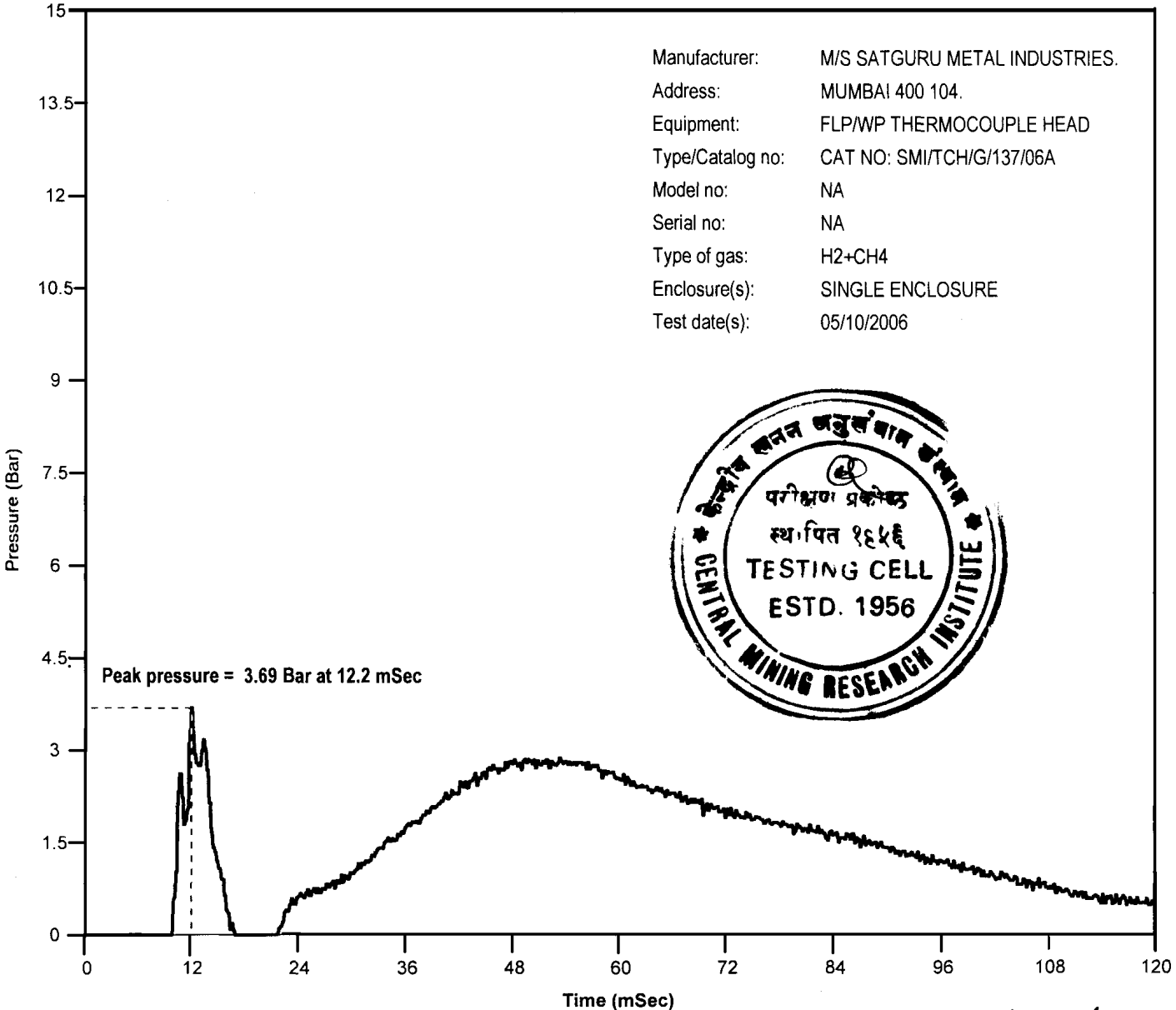
TEST CERTIFICATE

Explosion Pressure vs Time Graph



केन्द्रीय खनन अनुसंधान संस्थान
परीक्षण प्रकोष्ठ
स्थापित १९५६
TESTING CELL
ESTD. 1956
CENTRAL MINING RESEARCH INSTITUTE

13.10.06

(Technical Officer)

(Discipline Head)

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TEST CERTIFICATE

FORMAT NO: IMPL/QMS/FLP02: F-01)
(Flame & Explosion Laboratory)

ID NO. 348/06 Code No. FLP/110/06

Table #B:

Over Pressure Test:

A pressure of 10.0 Kg/cm^2 was applied hydraulically to the above enclosure and the pressure being maintained for one minute.

Test reference no. OPM/1686691

Table # C:

Non-transmission of internal ignition test:

Type of test	Test Ref. No.	Gas Group	Gas Mixture % in Air	No. of Tests	Result
Flame Transmission test (External ignition test)	EIT /1686686 to EIT/1686690	IIB	37% Hydrogen	Five test on each enclosure	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	Material of construction is non-incentives 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.

(iii) Impact Test & thermal Shock Test Set up

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

Environmental condition where Applicable: NA

Conclusion: **"Flameproof/Weatherproof enclosure for Thermocouple Head"**, in cast aluminium Alloy LM-6 construction, designated by **Cat No.: SMI/TCH/G/137/06A**, under reference meets the test requirements of IS: 2148-2004 in respect of flameproofness, IS: 12063-1987 (ICE 60529/1989) in respect of IP-66 degree of protection and IS: 13346-2004 (IEC 60079-0/2000) in respect of general requirements suitable for use in Zone 1&2 and Gas Groups: IIA & IIB atmospheres only.

Reported by

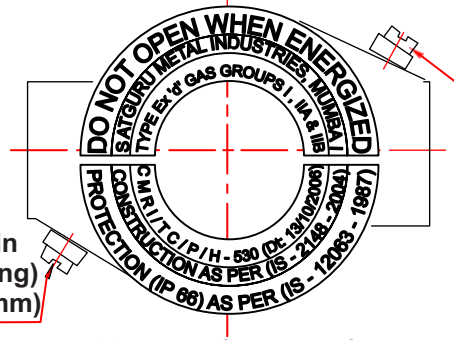
(A. KUMAR)
GROUP III (I)

Dated: 19th October, 2006
Flame & Explosion Laboratory
Central Mining Research Institute (CSIR)
Barwa Road, DHANBAD – 826 001,
(JHARKHAND) INDIA

Approved by

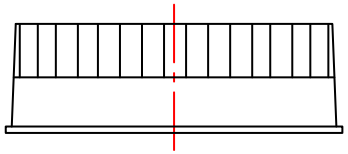
(A. K. SINGH)
HEAD OF THE DEPARTMENT

H.O.D
Testing Cell

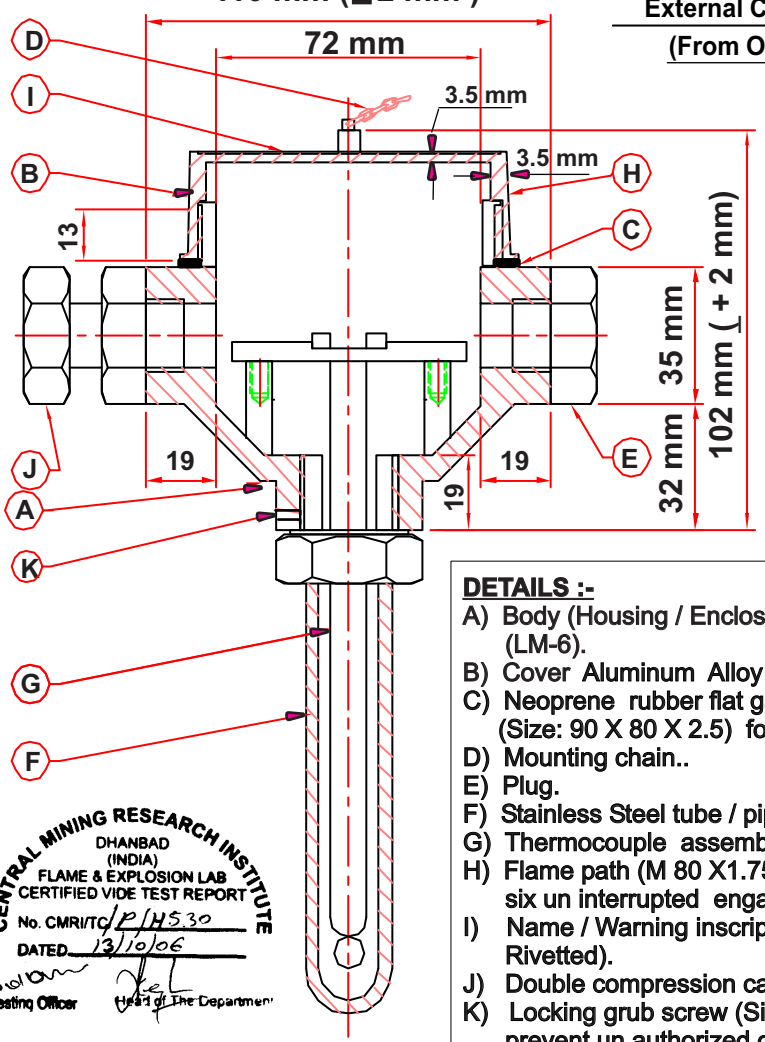


External Earthing Screw (Size M 4 X 6mm)

Screw for Chain Fixing (Mounting) (Size: M 4 X 8mm)



External Cover View
(From Outside)



DETAILS :-

A) Body (Housing / Enclosure) Aluminum Alloy (LM-6).
B) Cover Aluminum Alloy (LM-6).
C) Neoprene rubber flat gasket (Size: 90 X 80 X 2.5) for (IP) protection.
D) Mounting chain..
E) Plug.
F) Stainless Steel tube / pipe.
G) Thermocouple assembly
H) Flame path (M 80 X1.75 Pitch) 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 MINING RESEARCH INSTITUTE
DHANBAD (INDIA)
FLAME & EXPLOSION LAB
CERTIFIED VIDE TEST REPORT
No. CMRI/TC/P/H530
DATED 13/10/06
Testing Officer
Head of The Department

NOTES :-

1) This design confirms to IS:2148-2004 for gas groups I - IIA & IIB and IS:12063-1987 for (IP : 66) degree of protection and 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 - ½" BSP / NPT - 3/4" BSP / NPT- metric threads - PG threads (OR) equivalent.
5) Size of bottom entries are : ½" 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 is provided for (IP) protection. (Gasket size: 90mm O/D X 80mm I/D X 2.5mm thickness)
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) 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			

CMRI/TC/P/H530 Date: 13/10/2006

Satguru Metal Industries

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

TITLE :- FLAME PROOF / WEATHER PROOF (IP 66) THERMOCOUPLE HEAD.

DRAWN BY	CHKD BY	DATE	SCALE	MATL	CAT NO :-
		11/05/06	N.T.S	—	SMI/TCH/G/137/06A.

DO NOT SCALE THIS DRAWING

DRAWING NO :- SMI/TCH/G/137/06. REV. 0
DATE :- 11/05/2006.

FILE NAME :- WPFPTCPHD