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Test & Assessment Report No.: IN/CIMFR/TR21/ H320

Dated: 11 January, 2021

Equipment ID No.: 727/20

ULR No.: TC596221000000016F

CODE NO. FES/111(A)/20-21

To
M/s. SIGMA INDUSTRIES
SPECIAL SHED NO. 15/2/A, GIDC-I,
SHANKER TEKRI,
JAMNAGAR - 361 004

Subject: Type Examination Certificate along with test assessment report of FLP-WP (IP-66) Double Compression type Cable Gland, in Aluminium Alloy LM-6 construction as designated by Cat No.: CGF IIC 01SS A (M12) to CGF IIC01 6 (M110) as per IS/IEC 60079-1:2014 for use in Gas Group: IIC, EPL Gb atmosphere.

- (Test Report)

Your Ref. Appli. No.: SI/FLP/002/20-21

Dated: 26/05/2020

Dear Sir,

Please find the enclosed Type Examination Certificate along with test assessment report of the above sample submitted by you.

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

Charges of Rs. 2,68,415/- (Rupees Two Lakh Sixty Eight Thousand Four Hundred Fifteen Only) including applicable GST involved towards the testing 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 of the samples by public auction without any further NOTICE to you.

Kindly acknowledge the receipt.

Thanking you.

Yours faithfully,

Mondal
11/01/2021

(S. K. MONDAL)
HOS
TESTING CELL

Encl: As above.

1. Test assessment report in Triplicate
 2. Type Examination Certificate
- Copy to: 1. Head, Flameproof & equipment Safety
2. Bill section



सीएसआईआर केंद्रीय खनिज एवं ईंधन अनुसंधान संस्थान
CSIR - CENTRAL INSTITUTE OF MINING AND FUEL RESEARCH

(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद्)
(COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH)

बरवा रोड, धनबाद, झारखण्ड - 826015, भारत
BARWA ROAD, DHANBAD, JHARKHAND - 826015, INDIA



ज्वालासह एवं उपकरण सुरक्षा परीक्षण प्रमाण पत्र / TEST CERTIFICATE
FLAMEPROOF & EQUIPMENT SAFETY
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FORMAT NO.: (CIMFR: DQM: FLP02: F-01:REV-01)
(Flameproof & Equipment Safety)

Equipment ID No.: 727/20

ULR No.: TC59622100000016F

Code No.: FES/111(A)/20-21

Test & Assessment Report No.: IN/CIMFR/TR21/ H320

Dated: 11 January, 2021

Application Ref. No.: SI/FLP/002/20-21

Dated: 26/05/2020

1. Applicant : M/S. SIGMA INDUSTRIES,
SPECIAL SHED No. 416/1, G.I.D.C-1
SHANKER TEKRI, JAMNAGAR-361004
2. Manufacturer : Same as above.
3. Equipment : FLP-WP (IP-66) Double Compression type Cable Gland.
4. Designated by : Cat No.: CGF IIC 01SS A (M12) to CGF IIC01 6 (M110).
5. Type of Protection : Ex d for Gas Group IIC, EPL Gb.
6. Electrical ratings : NA.
7. Temperature Class : NA.
8. Degree of Ingress Protection : IP-66.
9. Material of Construction : Aluminium Alloy LM-6.
10. Description of the equipment: The FLP-WP (IP-66) Double Compression type Cable Gland, Cat No.: CGF IIC 01SS A (M12) to CGF IIC01 6 (M110) in Aluminium Alloy LM-6 construction mainly consists of Gland body nut, Neoprene seal for inner seath, skid nylon washer, Armour clamping ring, gland nipple, Armour clamping cone, etc. as given in relevant design drawings. The minimum uncompressed axial sealing height of neoprene rubber inner sealing ring provided in the cable gland. The cable gland is fitted with cable entry (hole) of a tested & certified FLP enclosure and maintaining 25mm axial length and min. 15 full thread of 1.5mm pitch engaged thread internal entry size.

11. Name plate and warning inscription: The name-cum-warning inscription plate and rating plate made of Brass/SS is permanently encaved on the body of enclosure.

12. Drawings: The unit is designed and constructed as flameproof and weatherproof in accordance with the following drawing conforming to the requirements of IS/IEC 60079-0:2011, IS/IEC 60079-1: 2014 and IS/IEC 60529-2001 (Reaffirmed 2014).

| Sl. No. | Drg. No. | Title | Rev. | Sheet | Date |
|---------|-------------------------|---|------|--------|------------|
| 1. | SI/CGFIIC/2012-13/REV-1 | CGS MAKE FLAMEPROOF (IP-66) DOUBLE COMPRESSION CABLE GLANDS FOR GROUP IIC | 0 | 1 of 1 | 06/11/2019 |

13. Any other relevant information:

- i) As per Clause 4.2 Note - 2 of IS/IEC 60079-0:2011 the equipment mark IIC is suitable for application requiring IIA/IIB equipment.

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(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद) / Council of Scientific & Industrial Research

बरवा रोड, धनबाद - 826015, झारखण्ड, भारत / Barwa Road, Dhanbad - 826015, Jharkhand, India

ज्वालासह एवं उपकरण सुरक्षा / FLAMEPROOF & EQUIPMENT SAFETY मूल प्रति

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- ii) The material of construction of the equipment may be CI/MS/SS/Brass instead of Aluminium Alloy LM-6 construction.
- iii) Equal and equivalent medium class fit NPT threads of medium class fit conforming to requirements of ANSI/ASME B1.20.1 may be used instead of metric threads conforming to ISO 965-1 & 965-3 as per Clause No. 5.3 & 13 of IS/IEC 60079-1:2014.
- iv) Cable Glands with following sizes and Cat. No. may be used:

| Gland Size (Cat. No.) | Dia "A" (mm.) | Nipple/Thread size (mm) | Length (max.) mm | "D" | Suitable cable overall dia |
|-----------------------|---------------|-------------------------|------------------|-----|----------------------------|
| CGF IIC 01 SS A | 8.00 | M 12 | 25.00 | | 10.00 |
| CGF IIC 01 SS B | 8.00 | M 16 | 25.00 | | 12.50 |
| CGF IIC 01 SS | 8.50 | M 20 | 25.00 | | 12.50 |
| CGF IIC 01 S | 16.00 | M 20 | 25.00 | | 16.00 |
| CGF IIC 01 | 12.00 | M 20 | 25.00 | | 17.50 |
| CGF IIC 01 A | 12.00 | M 25 | 25.00 | | 17.50 |
| CGF IIC 02 | 14.00 | M 25 | 25.00 | | 19.50 |
| CGF IIC 02 A | 14.00 | M 20 | 25.00 | | 19.50 |
| CGF IIC 03 | 17.00 | M 25 | 25.00 | | 22.00 |
| CGF IIC 04 | 20.00 | M 25 | 25.00 | | 25.00 |
| CGF IIC 04 A | 20.00 | M 32 | 25.00 | | 25.00 |
| CGF IIC 05 | 24.00 | M 32 | 25.00 | | 29.00 |
| CGF IIC 05 A | 24.00 | M 40 | 25.00 | | 29.00 |
| CGF IIC 06 | 27.00 | M 40 | 25.00 | | 32.00 |
| CGF IIC 06 A | 27.00 | M 32 | 25.00 | | 32.00 |
| CGF IIC 07 | 30.00 | M 40 | 25.00 | | 36.00 |
| CGF IIC 08 | 35.00 | M 50 | 25.00 | | 40.00 |
| CGF IIC 09 | 40.00 | M 50 | 25.00 | | 45.00 |
| CGF IIC 010 | 44.00 | M 50 | 25.00 | | 51.00 |
| CGF IIC 010 A | 44.00 | M 50 | 25.00 | | 51.00 |
| CGF IIC 011 A | 50.00 | M 63 | 25.00 | | 56.00 |
| CGF IIC 011 | 54.00 | M 63 | 25.00 | | 59.00 |
| CGF IIC 012 | 60.00 | M 63 | 25.00 | | 66.00 |
| CGF IIC 013 A | 66.00 | M 75 | 25.00 | | 71.00 |
| CGF IIC 013 | 72.00 | M 82 | 25.00 | | 77.00 |
| CGF IIC 014 | 78.00 | M 90 | 25.00 | | 83.00 |
| CGF IIC 015 | 88.00 | M 100 | 25.00 | | 93.00 |
| CGF IIC 016 | 98.00 | M 110 | 25.00 | | 104.00 |

14. Declaration by the Applicant/Manufacturer:

(i) As to standards with which the equipment complies in respect of:

- Electrical equipment for Potentially Explosive atmosphere – General requirements: IS/IEC 60079-0: 2011.
- As to flameproof protection IS/IEC 60079-1: 2014
- Ingress protection as per IS/IEC 60529: 2001. (Reaffirmed 2014).

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(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद) (Council of Scientific & Industrial Research)

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ज्वालासह एवं उपकरण सुरक्षा / FLAMEPROOF & EQUIPMENT SAFETY

परीक्षण रिपोर्ट / TEST REPORT



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(B) Declaration by the manufacturer ate as follows:

- Tensile test and sealing test of cable glands are conducted at manufacturer site as per Annexure 'A' of IS/IEC 60079-0:2011 and complies.
- Ageing test of cable glands are conducted at manufacturer site as per Annexure 'A' of IS/IEC 60079-0:2011 and complies.
- Torque test (Mechanical Test) of cable glands are conducted at manufacturer site as per Annexure 'A' of IS/IEC 60079-0:2011 and complies.

However no sample of the alloy was drawn from the prototype enclosure for verifying its chemical composition declared by the manufacturer.

15. Documents/Samples Submitted : i) Application form ii) Drawings iii) Prototype sample

16. Condition of sample received: Good

17. Compliance of prototype or sample with documents: The test sample of cable glands submitted for the type tests complies with the manufacturers documents referred above.

Note: CIMFR has however not checked and tested the compliance of the equipment to any standard other than the above standards.

SCOPE OF THE TEST CERTIFICATE

The Test Certificate issued by CIMFR certifies that the equipment has been found to comply with the definition of Flameproof-Weatherproof equipment contained in the relevant Standard specifications. They do not vouch for the quality of the equipment in any other respect. The present test report pertains to the sample received only.

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

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CSIR-Central Institute of Mining and Fuel Research

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REPORT OF TEST

Date of Test: 14/12/2020

Result #A: Tests as per IS/IEC 60079-0: 2011:

| Type Tests | | | |
|------------|--|--|---|
| Clause | Tests | Remarks | Results (Complies, P- Pass, NA-Not Applicable, F-Fail) References |
| 1 | Scope | | Complies |
| 2 | Normative references | | Complies |
| 3 | Terms and definitions | | Complies |
| 4 | Equipment grouping | Gas Group: IIC , EPL Gb | Complies |
| 5 | Temperature | | |
| 5.1.1 | Ambient Temperatures | - 20 °C to +50 °C Amb. | Complies |
| 6 | Requirements for all electrical equipment | | Complies |
| 6.6 | Electromagnetic and ultrasonic energy radiating equipment. | | NA |
| 7 | Non-metallic enclosures and non-metallic parts of enclosures. | | Complies |
| 7.2 | Thermal Endurance | | Complies |
| 8 | Metallic Enclosure and metallic part of End | Aluminium Alloy LM-6 | Complies |
| 9 | Fasteners | | NA |
| 10 | Interlocking devices | | NA |
| 11 | Bushings | | NA |
| 12 | Materials used for cementing | | NA |
| 13 | Ex components | | Complies |
| 14 | Connection facilities and terminal compartments | | NA |
| 15 | Connection facilities for earthing and bonding conductors | | NA |
| 16 | Entries into enclosures | | Complies |
| 17 | Supplementary requirements for rotating machines | | NA |
| 18 | Supplementary requirements for switchgear | | NA |
| 19 | Supplementary requirements for fuses | | NA |
| 20 | Supplementary requirements for plugs and socket outlets and connectors | | NA |
| 21 | Supplementary requirements for luminaries | | NA |
| 22 | Supplementary requirements for cap lights and hand lights | | NA |
| 23 | Equipment incorporating cells and batteries | | NA |
| 24 | Documentation | | Complies |
| 25 | Compliance of prototype or sample with documents | | Complies |
| 26 | Type tests | | Complies |
| 26.3 | Tests in explosive test mixtures | | |
| 26.3 | Tests for Flameproof (Ex 'd') protection | Verification for Compliance to Ex 'd' requirements as per IS/IEC 60079-1: 2014 | Complies |
| 26.4 | Test of enclosures | | |

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ज्वालासह एवं उपकरण सुरक्षा परीक्षण रिपोर्ट / FLAMPROOF & EQUIPMENT SAFETY TEST REPORT



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| | | | |
|---------------|--|---|-----------------|
| 26.4.2 | Resistance to Impact | Refer Result#A1 | |
| 26.4.3/26.4.4 | Drop test | (not a handheld equipment or portable device) NA | |
| 26.4.5 | Degree of protection (IP) by Enclosures | | |
| 26.4.5 | Test of IP of equipment | IP 66 | Refer Result#A2 |
| 26.5 | Thermal tests | | |
| 26.5.1 | Temperature measurement | NA | |
| 26.5.2 | Thermal shock test | NA | |
| 26.6 | Torque test for bushings | NA | |
| 26.7 | Non- metallic enclosures or non-metallic parts of enclosures | | |
| 26.8 | Thermal endurance to heat | Refer Annexure I | Complies |
| 26.9 | Thermal endurance to cold | | |
| 26.10 | Resistance to light | NA | |
| 26.11 | Resistance to chemical agents for Group I Electrical Equipment | ----- | NA |
| 26.12 | Earth continuity test in non-metallic enclosure | NA | |
| 26.13 | Surface resistance test of parts of enclosures of Non metallic materials | ----- | NA |
| 26.14 | Measurement of capacitance | NA | |
| 26.15 | Verification of ratings of ventilating fans | NA | |
| 26.16 | Alternative qualification of elastomeric sealing O-rings | NA | |
| 27 | Routine tests | Manufacturer's responsibility: Compliance to prototype of the product and physical measurement of gap and flamepath and overpressure test at the pressure 30kg/cm ² given in earlier Test Report for every sample. | |
| 28 | Manufacturer's responsibility | Conformity of the equipment to the applicable standards | Complies |
| 29 | Marking | (Ex d IIC Gb) | |
| 30 | Instructions | Instruction related to use, installation, maintenance, adjustment to be provided by the manufacturer along with the equipment. | |

Result#A1: 1 kg mass of harden steel fallen vertically on the surface of the Ex'd' enclosure to create impact energy for Group II equipment.

Result#A2: Neoprene gasket (Ø3mm thick) is provided at the end of the each joint for weatherproof (IP-66) degree of protection. Tests have been conducted as per IS/IEC 60529:2001 (Reaffirmed 2014) as tabulated below for IP-66 degree of protection.

| Sl. No | Type tests | | | Results |
|--------|-------------------------------|--------------------|--|---------|
| 1. | Dust Test (First Numeral 6) | Clause 13.4 & 13.6 | No dust had accumulated inside the enclosure. | Pass |
| 2. | Water Test (Second Numeral 6) | Clause 14.2.6 | No water had accumulated inside the enclosure. | Pass |

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Result #B: Tests in explosive mixtures: Tests for type of protection Ex 'd' as per IS/IEC 60079-1:2014.

| Type Tests | | | |
|------------|--|---|---|
| Clause No. | Description and relevant tests | Remarks | Results (Complies-P- Pass, NA-Not Applicable, F-Fail) References |
| 1 | Scope | | Complies |
| 2 | Normative references | | Complies |
| 3 | Terms and definitions | | Complies |
| 4 | Level of protection (Equipment Protection Level, EPL) | Gas Group IIC, EPL Gb | Complies |
| 5 | Flameproof joints | Threaded joint | Complies |
| 6 | Sealed joints | | |
| 6.1 | Cemented joints | | NA |
| 6.1.2 | Mechanical strength | | NA |
| 7 | Operating rods | | NA |
| 8 | Supplementary requirements for shafts and bearings | | NA |
| 9 | Light transmitting parts | | NA |
| 10 | Breathing and draining devices which form part of a flameproof enclosure | | NA |
| 11 | Fasteners and openings | | NA |
| 12 | Materials | Aluminium Alloy LM-6 | Complies |
| 13 | Entries for flameproof enclosures | | Complies |
| 14 | Verification and tests | | Complies |
| 15 | Type Tests | | |
| 15.1 | General | | NA |
| 15.2 | Tests of ability of the enclosure to withstand pressure | | |
| 15.2.1 | General | | Complies |
| 15.2.2 | Determination of Explosion Pressure (Reference Pressure) | | NA |
| 15.2.3 | Overpressure Test | | Complies |
| 15.3 | Test for non-transmission of an internal ignition | | |
| 15.3.1 | General | | Complies |
| 15.3.2 | Electrical equipment of Groups I: IIA & IIB | | NA |
| 15.3.3 | Electrical equipment of Group IIC | (Refer Result #B1) | Complies |
| 15.4 | Tests of flameproof enclosures with breathing and draining devices | | |
| 15.4.1 | General | | NA |
| 16 | Routine tests | To be conducted by the manufacturer overpressure test at the pressure 30kg/cm ² given in every sample. | |
| 17 | Switchgear for Group I | | NA |
| 18 | Lamp holders and lamp caps | | NA |
| 19 | Non-metallic enclosures and non-metallic parts of enclosures | | |
| 19.1 | General | | NA |
| 19.2 | Resistance to tracking and creepage distances on mineral surfaces of the enclosure walls | | NA |
| 19.3 | Requirements for type test | | NA |
| 19.4 | Test of erosion by flame | | NA |
| 20 | Marking | | (Ex d IIC Gb) |
| 20.2 | Caution and warning markings | | NA |
| 21 | Instruction | The manufacturer shall supply instruction manual of the equipment complying IS/IEC 60079-0:2011. | |

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Result #B1: Test for Non transmission of internal ignition:

Gas Mixture: Test with 28% Hydrogen and 7.5% Acetylene in air for Gas Gr. IIC

No. of Tests: 5 nos. tests with single enclosure for each gas

Test Condition, as per clause 15.3.3.2, Table 9 (No pre compression required)

| Cable Gland | Test Ref. Nos. | Gas Group | Gas Mixture % in Air | No. of Test | Result |
|---------------|----------------------------|-----------|----------------------|-------------|--------|
| CGF IIC01SS A | EIT/7272001 to EIT/7272005 | IIC | 28 % Hydrogen | Five | Pass |
| | EIT/7272006 to EIT/7272010 | | 7.5 % Acetylene | | |
| CGF IIC 04 | EIT/7272011 to EIT/7272015 | IIC | 28 % Hydrogen | Five | Pass |
| | EIT/7272016 to EIT/7272020 | | 7.5 % Acetylene | | |
| CGF IIC 09 | EIT/7272021 to EIT/7272025 | IIC | 28 % Hydrogen | Five | Pass |
| | EIT/7272026 to EIT/7272030 | | 7.5 % Acetylene | | |
| CGF IIC 012 | EIT/7272031 to EIT/7272035 | IIC | 28 % Hydrogen | Five | Pass |
| | EIT/7272036 to EIT/7272040 | | 7.5 % Acetylene | | |
| CGF IIC 016 | EIT/7272041 to EIT/7272045 | IIC | 28 % Hydrogen | Five | Pass |
| | EIT/7272046 to EIT/7272050 | | 7.5 % Acetylene | | |

CONCLUSION: The FLP-WP (IP-66) Double Compression type Cable Gland, in Aluminium Alloy LM-6 construction as designated by Cat No.: CGF IIC 01SS A (M12) to CGF IIC01 6 (M110) requirements for flameproofness as per IS/IEC 60079-1:2014 and general requirements as per IS/IEC 60079-0:2011 is deemed to be suitable for use in Gas Group: IIC, EPL Gb.

Reported By

Amit Kumar

(Amit Kumar)

Technical Officer

Dated: 07/01/2021

Flameproof & Equipment Safety

CSIR - Central Institute of Mining & Fuel Research

Barwa Road, DHANBAD - 826 015,

(JHARKHAND), INDIA

Checked & Approved By

A. K. Singh

(A. K. SINGH)

Chief Scientist & HORG

Flameproof & Equipment Safety

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ANNEXURE - I

(Id No -727/20)

Double Compression Cable Gland: Armour clamping rubber, Neoprene seal (outer & inner), washer, cone, ring.,
Colour- Black.

Thermal Endurance to Heat test as per Clause No. 26.8 of IS/IEC 60079-0:2011.

| Date & Time of test: 21/11/2020 10.00 Hrs. to 20/12/2020 10.00 Hrs. | | | | | |
|---|-----------------------------|--------------------------|---------------|--------------|--|
| Duration | Specified Temp. | Tested Temp. | Specified RH% | Observed RH% | Remarks |
| 4 weeks | $T_s \leq 70^\circ\text{C}$ | $82 \pm 2^\circ\text{C}$ | $90 \pm 5\%$ | 85% | The maximum service temperature (T_s) is considered to be less than 70°C . |

Thermal Endurance to Cold test as per Clause No. 26.9 IS/IEC 60079-0:2011.

| Start Date & Time of test: 21/12/2020 11.00Hrs. to 22/12/2020 11.00 Hrs. | | |
|--|---------------------|---|
| Duration | Tested Temp. | Remark |
| 24 Hrs | -25°C | The test is conducted at lower temperature, minimum service temperature reduced to -25°C as per 26.7.2. |

Visual observations after Endurance to heat and Cold Tests: No change and development of cracks and no damage or deformation after overpressure test (static method). No change in colour is observed.

सीएसआईआर- केन्द्रीय खनन एवं ईंधन अनुसंधान संस्थान

(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)
बरवा रोड, धनबाद - 826015, झारखण्ड, भारत



CSIR-Central Institute of Mining & Fuel Research

(Council of Scientific & Industrial Research)
Barwa Road, Dhanbad - 826015, Jharkhand, India

मूल प्रति
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SPEED POST/COURIER SERVICE

No. CIMFR/FES/Amend//20-21/ 76

Dated: 02/02/2021

To
M/S. SIGMA INDUSTRIES,
SPECIAL SHED No. 416/1, G.I.D.C-1
SHANKER TEKRI, JAMNAGAR-361004

Subject: Amendment to FLP-WP (IP-66) Double Compression Type Cable Gland, in Aluminium Alloy LM-6 construction designated by Cat. No. CGF IIC 01SS A (M12) to CGF IIC 016 (M110) as per IS/IEC 60079-1:2014 suitable for use in Gas Group: IIC, EPL Gb atmosphere.

- AMMENDMENT

Dated: Nil

Your Ref. No.: E-mail


Dear Sir,

There is a typographical error in the CIMFR Test & Assessment Report No.: IN/CIMFR/TR21/H320 dated: 11/01/2021 and Test Certificate No. No.: CMF 21 INEx0016 dated: 07/01/2021 in applicant address should be read as:

- 1) In Covering letter and Test certificate applicant address should read as M/S. SIGMA INDUSTRIES, SPECIAL SHED No. 416/1, G.I.D.C-1 SHANKER TEKRI, JAMNAGAR-361004 instead of M/S. SIGMA INDUSTRIES, SPECIAL SHED No. 15/2/A, G.I.D.C-I, SHANKER TEKRI, JAMNAGAR-361004.
- 2) Test certificate, in page no. 1 of 2, Cat. No. should be read as CGF IIC 01SS A (M12) to CGF IIC 016 (M110) instead of CGF 01SS A (M12) to CGF 016 (M110).

This Amendment should be read in conjunction with CIMFR Test & Assessment Report No.: IN/CIMFR/TR21/H320 dated: 11/01/2021 and Test Certificate No. No.: CMF 21 INEx0016 dated: 07/01/2021.

Yours faithfully,


(A. K. SINGH)
Chief Scientist & HORG
Flameproof & Equipment Safety

CC: Head, Testing Cell

EPABX : 0091-326-229-6027/6028/6029

Fax : 0091-326-229-6025

Working Days : Monday to Friday - Website : www.cimfr.nic.in