

SPECIFICATIONS
FOR STRAIN GAUGE BONDING
AND TESTING OF HOLD DOWN LEVER

SCOPE OF WORK

- Hold Down Lever should be collected from URSC and delivered to URSC after completion of Strain gauge bonding and testing.
- Vendor has to procure the strain gauges and bond them as per the procedure mentioned in this document.
- Vendor will carry out the testing and characterisation as per the document.

SL. No.	COMPONENT NAME	Qty (nos.)	MATERIAL	DRAWING NO.
1.	HOLD DOWN LEVER	10	Ti6Al4V	ISAC-SCMG-OCT3-O3-00034

- Vendor has to procure the strain gauges, adhesive, potting (as per annexure-3) and same has to be bonded on to the components as per the table below.

Hold Down Lever material (URSC supplied)	Strain Gauge Type (Vendor procured)	Brand	Adhesive (Vendor procured)	Potting (Vendor procured)
Ti6Al4V	FLA- 2-11	TML/Micro measurements	(M610) to be used for bonding of strain gauge	RTV (789)

- Free Issue of Materials (FIM) –
 - a) Components valued approximately Rs.25000.00 (Rupees Twenty Five Thousand Only) shall be issued to the Supplier against submission of equivalent value of Bank Guarantee (BG), issued by a Nationalized/Scheduled Bank on a non-judicial stamp paper of Rs. 200/- as per the URSC format, having validity up to completion of supply and its acceptance and BG shall be valid for a period of 60 days beyond the date of completion of the P.O. FIM shall be collected from our Premises (ISITE, Karthik Nagar, Marathahalli Post, Bangalore - 560037) through returnable gate pass, by the Supplier on submission of Authorization Letter & other relevant documents to our Purchase & Stores Officer (Stores), URSC/ISITE and the Gate Pass should be regularized by the Supplier on return of the ordered items. Utmost care should be taken while handling Government property. Damages caused, if any, should be suitably compensated.
 - b) The Supplier shall stock the free issue materials in safe custody and shall take all precautions during storage, handling and use against any loss, damage, etc.
 - c) As and when the Purchase Order is completely executed, Supplier shall provide details of FIM consumed in “Material Consumption Statement” (as per URSC format) and return balance FIM/Scrap, if any.

- Space qualified electrical wires should be wires of 28 AWG gauge with the following colour coding and identification and should withstand the temperature range of -40°C to +80°C.
 - Red colour wire : + P
 - Black colour wire : - P
 - Green colour wire : + S
 - White colour wire : - S

- Vendor has to prepare the preparation and bonding procedures, log sheets, non conformance reports, test data sheets if any and close outs.

- Each component to be packed separately in cleaned polythene bags with adequate protection for wiring and connectors.

➤ **APPLICABLE DOCUMENTS**

- Procedure for strain gauge bonding and testing of the component as given in Annexure-1.
- Drawings (supplied by URSC) (as given in this specification format)
- Specifications of strain gauges and strain indicator as given in Annexure- 3.

➤ **DELIVERABLES**

Delivery schedule: 16 weeks after FIM release date from URSC / ISITE by SMG

- Hold down levers with strain gauge bonded, tested and packed (as described in Annexures-1, 2 &3) along with 4 m long shielded cable (as per 2.1.8), duly approved and certified are to be delivered to URSC.
- Logbooks with test data and traceability data for all Hold Down Lever along with test data sheets/graphs, if any NCR (Non-Conformance Report) and associated close-outs appended to them.
- Check list to ensure that all the relevant documentation have been completed.
- Strain gauges and adhesive certificates (chemical composition and material properties from the source/OEM)

➤ **DOCUMENTATION**

• **LOG SHEETS**

The vendor shall maintain a separate log sheet for each Hold Down Lever, which documents the build and test effort, from strain gauges, adhesive details to delivery of tested unit. The log sheet shall be maintained throughout the

duration of this contract and submitted along with the test report for review and approval by SMG/URSC before the dispatch of the components from vendors end. The NCR raised and their closeouts shall also be appended to the log sheet and adequately referenced. Each log sheet shall include, but not limited to, unit identification data, inspection history, component remove and replace history, summary information relating to discrepancies, test results, failures and failure closure. Each log sheet shall be submitted to SMG/URSC for approval following unit testing. *No hardware shall be shipped to URSC prior to SMG's approval.*

- **OTHER DOCUMENTS**

The vendor shall prepare the following documents and submit the same for approval by SMG/URSC.

- a) Strain gauges list and specifications
- b) Adhesive type and specifications
- c) Process list and specifications
- d) Calibration and test facilities/equipment
- e) Process log sheet and inspection reports
- f) Handling and packaging procedures

ANNEXURE – 1

PROCEDURE FOR STRAIN GAUGE MOUNTING AND TESTING OF HOLD DOWN LEVER

PROCEDURE FOR STRAIN GAUGE MOUNTING AND TESTING OF HOLD DOWN LEVER

The bonding of strain gauges, calibration and testing to be done on the Hold Down Lever according to the specifications and test procedures given below.

1. SPECIFICATIONS:

1. Load Details:
 - i. Refer table given in annexure-2
 - ii. Non-linearity in working range (0 to Proof Load (as per table page no:15):<3%
 - iii. Calibration load : Proof Load as per specification
Repeatability errors: <3%
2. Zero offset < 100 micro strain
3. Zero shift <20 micro-strains for full load
4. Insulation resistance > 100 M ohms @ 50 V DC
5. Operating temperature: - 100⁰ C to + 100⁰ C
6. Vacuum operation at < 1 x 10⁻⁶ torr or better
7. TML: <0.1% and <1% respectively (Total Mass Loss for wires and gauges)
8. Bridge: Full Bridge (4 stain gauge per component)

2. PROCEDURE FOR SURFACE PREPARATION:

- a. Ensure that the anodic layer, plating and rust is removed at the area of strain gauge bonding. Using a sand cloth (300 to 400 grit), polish the strain gauge bonding site over a wider area than the strain gauge size.
- b. Mark with pencil the exact position of the strain gauge on the components as per drawing.
- c. Using an Industrial tissue paper dipped in acetone, clean the strain gauge bonding site. Strongly wipe the surface in a single direction to collect dust and remove it by wiping in the same direction. (Reciprocal wiping does not ensure cleaning). After cleaning heat under a lamp (60 degree C, for 1 hour) to ensure that the surface is free of humidity.

3. PROCEDURE FOR STRAIN GAUGE BONDING

Operations to be done in a clean environment, preferably in laminar flow table.

- a. Gauge selected to be trimmed and cleaned with Isopropyl Alcohol.
- b. Adhesive (M610) to be used for bonding of gauges.
- c. Smear the adhesive on the "component" at the designated place and at the back of the strain gauge. Allow adhesive to semi dry for three minutes.

- d. Bond the gauge on the “component” ensuring as per the drawing. Care is to be taken to ensure lining up of centre mark on the gauge with that of the marking lines.
- e. Apply a clamping pressure through an Titanium fixture with Silicone Rubber pad and a Teflon sheet. Ensure Teflon sheet is placed between silicone rubber and the strain gauge. Fixture for clamping should ensure a uniform pressure of 3 to 4 kgf/cm² on the bonded gauges.
- f. The surface preparation and bonding of strain gauge to be done on the components.
- g. Connecting wires with a minimum of 350 mm length should be properly anchored using waxed lacing threads on the component.
- h. Suitable miniature **FEMALE** gold plated end-contacts to be provided at the end of the lead wires.
- i. Space qualified **RTV (789)** potting protection cover to be provided around the strain gauges and lead anchor location.

FORMAT FOR STRAIN GAUGE TEST DATA ON COMPONENT

TABLE 1: TEST REPORT BEFORE THERMAL CYCLING

Component Sl. No. = (Engraved number available on the component is to be written)
 Zero offset = (Record zero offset value in micro strain)
 Number of cycles done prior to test =
 Type and make of Strain Indicator used = (Record)
 Date of calibration= (Record)

Sl. No.	Load (Kgf)	Micro Strain Reading (µε)
1	0	
2	25	
3	50	
4	75	
5	100	
6	125	
7	150	
8	175	
9	200	
10	225	
11	250	
12	275	

Bridge configuration = Full bridge
 Gauge factor = (Record as mentioned on supplied gauge)

1) Hold Down Lever type: ----- 2) *Load range: 0 to ----- kgf

*Loading to be done as per Annexure-2

Note: Plot of load vs. micro strain to be provided

Date

Name and Signature of the person conducting the test

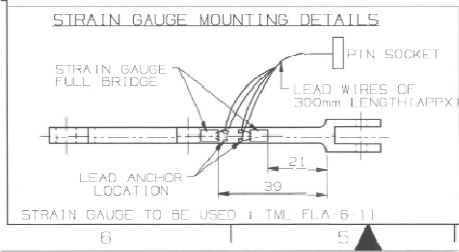
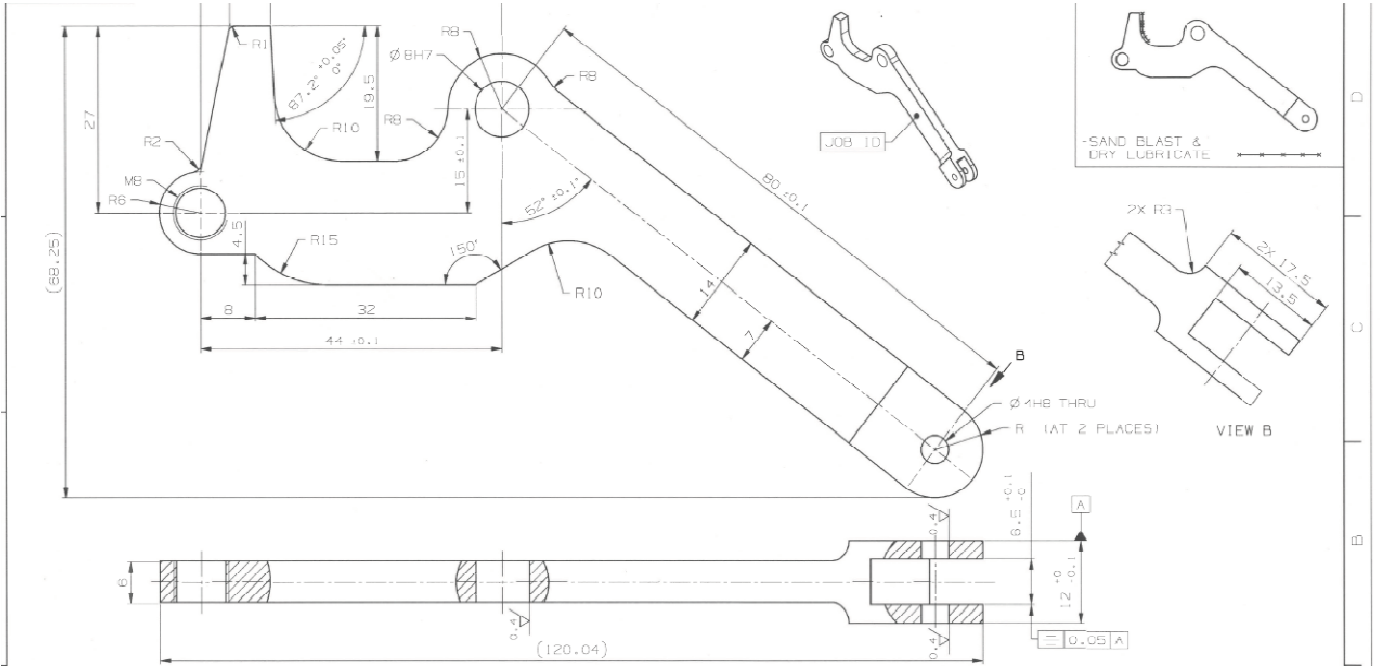
Name and Signature of the QA representative

ANNEXURE -2

HOLD DOWN LEVER

HOLD DOWN LEVER DRAWING NUMBERS AND DETAILS

SL. No.	COMPONENT NAME	TYPE	MATERIAL	DRAWING NO.	Total Quantity
1.	Hold Down Lever	New	Ti6Al4V	ISAC-SCMG-OCT3-O3-00034	10 nos.



QTY.	DESCRIPTION	QTY.	MATL.	MASS
1	CLAMP	1	Ti6AL4V	61.9 gm

ANNEXURE -3: SPECIFICATIONS OF STRAIN GAUGES AND STRAIN INDICATOR

STRAIN GAUGES

1. TML Strain gauges FLA-2-11type

Specifications:

1. Carrier matrix : Glass fibre reinforced epoxy phenolic resin
2. Foil alloy : Nickel-Chromium alloy/Cu-Ni alloy (K alloy)
3. Self temperature Compensation : For Ti6Al4V (Titanium Alloy)
4. Temperature Compensated Range : +10° C to +80 ° C
5. Active gauge dimensions : 2 X 1.5 mm (Length x width)
6. Grid and Tab geometry : Uni-axial grid with leads attached
7. Gauge Resistance : 120±0.3% ohms
8. Gauge factor : 2.1
9. Operating Temperature Range : -20° C to +80 ° C (Normal)
-196 ° C to +80° C (Short Term)
10. Pressure : The strain gauges must be compatible
to be Used in Vacuum (10^{-6} torr)

Fully encapsulated uni-axial foil type strain gauge with leads attached.

(Strain Indicator : P3 Indicator procured from Vishay Micro Measurements)

ADHESIVE

Strain gauge adhesive: M-Bond 610

1. Operating Temperature Range:
Short Term: -452° to +700°F [-269° to +370°C].
Long Term: -452° to +500°F [-269° to +260°C].
2. Shelf Life: Minimum 9 months at +75°F [+24°C]; or 15 months at +40°F [+5°C].
3. Pot Life: 6Weeks at +75°F [+24°C]; 12 weeks at +40°F [+5°C].
4. Clamping Pressure:
10 to 70psi [70 to 480kN/m²].
30 to 40psi optimum [200 to 275kN/m²].
5. Cure Requirements:

Recommended Post cure: 2 hours at 50° to 75°F [30° to 40°C] above maximum operating temperature or cure temperature, whichever is higher.

POTTING

RTV 789:

1. Room cure, RTV silicon rubber sealant.
2. No toxic,
3. Pollution and corrosion.
4. Excellent performance of electric insulation and resistance, aging resistance, damp and moisture proof.
5. Long working temperature (-60°C ~ 250°C)
6. Appearance: Transparent liquid

7. Usage
 - I. First, the surface should be clean and dry before application.
 - II. Squeeze out the glue to bond in the surface, it can get the working strength and put into use after 24 hour room curing time.

STRAIN INDICATOR

HARDWARE SPECIFICATIONS

All specifications nominal or typical at + 23⁰ C unless noted.

INPUTS:

Eccentric-lever-release terminal blocks accept up to four independent bridge inputs. Accommodates 16-28 AWG (1.3 to 0.35 mm dia)

BRIDGE CONFIGURATIONS:

Quarter-, half-, and full-bridge circuits, Internal bridge completion provided for 120Ω, 350 Ω and 1000 Ω quarter bridges, 60 to 2000 Ω half or full bridge.

DISPLAY:

Full dot matrix structure with 128 dots x 64 dots FSTN positive, gray transmissive LCD with backlight. Display update is twice a second.

DATA CONVERSION:

High-resolution sigma-delta converter. 60Hz or Hz noise rejection. User selectable.

BASIC RANGE:

± 31,000 microstrain (±1 microstrain resolution) at Gage Factor = 2.000.

ACCURACY:

± 0.1% of reading ± 3 counts. (Normal mode operation at Gage Factor – 2.000)

GAGE FACTOR SETTINGS:

Range 0.500 to 9.900.

BALANCE:

Single key operation to initiate automatic software balance.

BRIDGE EXCITATION:

1.5Vdc nominal. Readings are fully ratio metric, and not degraded by variation by variation in excitation voltage.

COMMUNICATION INTERFACE:

Universal Serial Bus with type B connector.

CALIBRATION:

Shunt calibration across each dummy resistor to simulate 5000 micro-strain ($\pm 0.1\%$). Remote calibration supported via assessable switch contacts at input terminal block.

ANALOG OUTPUT:

BNC Connector. 0 to 2.5 V maximum output. Device impedance of 2000Ω or greater. 480Hz output update rate.

POWER:

Internal battery pack using two “D” cells. Battery life up to 600 hours (single channel, normal mode.) Can also be powered from USB or by external battery or other power source of 6 to 15Vdc. AC adapter optional.

OPERATIONAL ENVIRONMENT:

Temperature 0 to $+ 50^{\circ}$ C. Humidity up to 90% RH. Non-condensing.

SIZE AND HANDLING:

To be compact in size and handling should be easy. (As indicated in figure)

FIGURE FOR REPRESENTATION ONLY

