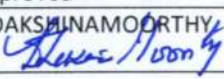


BHARAT HEAVY ELECTRICALS LIMITED
TIRUCHIRAPPALLI

CONTROLS AND INSTRUMENTATION / FB
QUALITY ASSURANCE

STANDARD PACKING PROCEDURE
FOR
ELECTRONIC MODULES

Rev	Date	Prepared	Checked	Approved	Revision History
00	09/10/2014	V.AVINASH 	RM.VAIRAVAN 	S.DAKSHINAMOORTHY 	Initial Release

1.0 SCOPE

- 1.1 This procedure gives minimum guidelines to be complied for packing of Electronic modules. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage for periods more than one year.

2.0 MATERIAL SPECIFICATION FOR PACKING

- 2.1 The material shall be packed in carton box and / or seasoned wood or plywood as per international standard.

3.0 PACKING

- 3.1 For Inland packing, suitable carton boxes shall be used. For export packing suitable box made of seasoned wood and / or plywood sheets of required thickness shall be used.
- 3.2 The individual electronic card shall be kept inside a bubble sheet cover and sealed appropriately
- 3.3 ESD sensitive components/assemblies shall be packed using ESD protective bags and sealed appropriately.
- 3.4 The electronic modules packed as above shall be kept inside a suitably sized carton box.
- 3.5 The gap between modules and the box shall be filled with suitable shock absorbing material like thermocol, etc.
- 3.6 Individual carton boxes with modules shall be stacked inside a carton box or wooden box according to inland or export packing.
- 3.7 Each case must have sufficient quantity of silica gel, packed in cotton cloth bags, and shall be kept at different places as required.
- 3.8 Wooden boxes shall be steel strapped and straps shall be secured with crimped steel seals.
- 3.9 Carton boxes shall be strapped with Non-metallic straps.
- 3.10 Carton boxes should be wrapped around with water proof tape to prevent water ingress.
- 3.11 Wooden boxes should be provided with foot in case of size of box side exceeds 600 mm

4.0 MARKING

- 4.1 After completing the packing, Stencil marking, as per dispatch instructions and symbol marking as per Annexure – I shall be made. Please ensure the box is stenciled with “FRAGILE ITEM”, “HANDLE WITH CARE”

5.0 **PACKING SLIP**

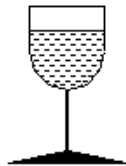
- 5.1 A copy of the packing slip, kept in a polythene cover shall be kept inside the box. Another copy of the packing slip, kept in a polythene cover shall be kept outside the box and covered with a metallic plate for wooden box and polythene cover for carton box.

6.0 **CAUTION**

- 6.1 Do not pack any other Mechanical items with this case.

7.0 **GENERAL**

- 7.1 These packing procedures are the minimum requirements in addition to the standard instructions mentioned in the Purchase Order and Specification.
- 7.2 Deviation to meet the packing procedure requirements / non-clarity in packing approach in any quotation will be liable for rejection of offer.

ANNEXURE – 1TOPROCEDURE NO:CI:QAC:PR:02/00 ; PR:03/00 ; PR:04/00

FRAGILE, HANDLE WITH CARE



PROTECT FROM HEAT AND RADIOACTIVE SOURCES



USE NO HOOKS

NOTE: The design of heavy goods packages cannot always resist top lifting by grabhooks.



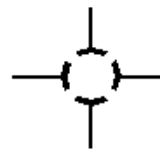
KEEP DRY

NOTE: Not all cases have waterproof internal liners: plywood used in the construction may not have a waterproof glue-line.



THIS WAY UP

NOTE: Certain designs of small cases make it difficult to distinguish top from bottom.



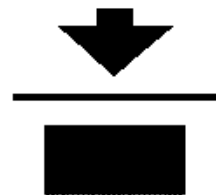
CENTRE OF GRAVITY

NOTE: This should be stencilled as a minimum on the two longest case sides (this information will normally be supplied by the manufacturer of the item(s) packed).



KEEP AWAY FROM HEAT

... kg max



STACKING LIMITATION



INTERNATIONAL "SLING HERE" SYMBOL

NOTE: The maximum load in kilograms should be marked above the arrow.

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PROCEDURE FOR PERFORMANCE TESTING
OF
WEIGHING MODULE
(LOAD CELL)

REV	DATE	PREPARED		REVIEWED	APPROVED	Revision History
02	12/11/2020	[KV] K. V. [Signature]	[BA] B. Anbumalai	[AKP] [Signature]	[BMK] [Signature]	Type test criteria modified
01	19/03/2018	[KV] SD/-	[VA] SD/-	[TK] SD/-	[RMV] SD/-	Revised to Correct Quantum of Inspection
00	11/12/2016	[KV] SD/-	[VA] SD/-	[RMV] SD/-	[SDM] SD/-	Initial Release

Load Cell Performance Testing Procedure

1. Tests

1.1 Test Methods and parameters specified in this procedure are in accordance with IS: 9281.

1.2 Tests

I. Routine Test (Inspection - 10% of offered lot shall be performed)

1. Calibration (Following parameters are inferred from Calibration curve): -

- a) Non-Linearity
- b) Hysteresis
- c) Repeatability

2. Zero balance

II. Type Test

1. Temperature effect (During inspection vendor shall furnish the type test certificate dated not earlier than 5 years from the date of purchase enquiry).

2. Creep test (Inspection - 1 No. per PO shall be performed)

NOTE:

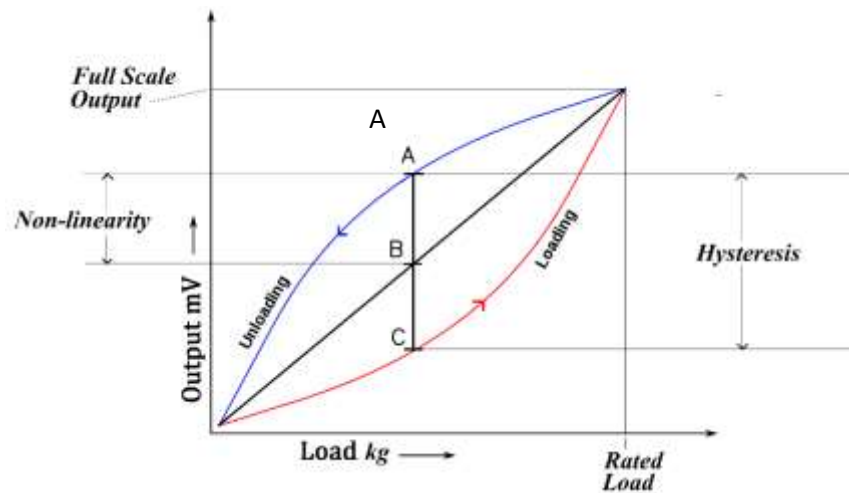
- If there is no test load equivalent to rated load, employ a test load which is as close to rated load. The output shall have extrapolated to the maximum load in the curve.
- Application of load shall be done using force calibrator/Universal Testing Machine (UTM)/ standard weights (Calibrated in any national accredited labs).
- Inspection shall be in presence of BHEL inspectors at vendor works or any NABL accredited labs.
- The excitation voltage for the load cell is 10V DC.
- The measurement of output signal from load cell (mV) shall be done using digital multimeter having error $\pm 0.01\%$ of accuracy.

2. Calibration

- a) Apply the maximum load (68 kg) then remove the load. (0 kg). Repeat this step for three times (warming up process).
- b) Wait for the output to stabilize.
- c) Measure the initial output without load.
- d) Apply loads in ascending order to maximum load as per table 1.1. Take readings after a stabilization period for each load increment.
- e) Remove the same test loads in a descending order as per Table 1.1. Take readings after a stabilization period for each load decrement.
- f) Upon removal of the last test load, record the output at minimum load (0 kg).
- g) Repeat (a) through (f) two more times.
- h) Corresponding readings (average readings from 3 runs) of the output at the various loads are taken (refer table 1.1). Plot a graph showing output versus load as shown in Figure 1.1.
- i) Note: Number of load points can be increased to obtain smooth graph.

Table 1.1

SL. NO.	Load (kg)	Output (mV) (Ascending)				Output (mV) (Descending)			
		a ₁	a ₂	a ₃	a _{avg}	d ₁	d ₂	d ₃	d _{avg}
1.	0								
2.	15								
3.	30								
4.	45								
5.	68								

Figure 1.1
Typical Graph for illustration

3. Calculations

a. Non-linearity

The calibration data (refer table 1.1) is used to determine non-linearity. The curve joining the various points is drawn (refer Figure 1.1). The maximum deviation of the curve from the straight-line joining the end points (Terminal linearity) is then interpreted as the nonlinearity factor.

$$\% \text{ NonLinearity} = \frac{A - B}{S} * 100$$

S = Full scale (FS) output at rated load

Acceptable Limits: $\pm 0.05 \% \text{FS}$

b. Hysteresis

The calibration data (refer table 1.1) is used to determine hysteresis. The curve joining the various points is drawn (refer Figure 1.1). The maximum deviation (nominally occurring at 50% load) from the line joining the end points shall give the hysteresis value.

$$\% \text{ Hysteresis} = \frac{A - C}{S} * 100$$

S = Full scale output at rated load

Acceptable Limits: $\pm 0.03\%$ FS

C. Repeatability

The calibration data (refer table 1.1) is used to determine non-repeatability. For each set of the three data points (refer table 1.2), taken at the same temperature, non-repeatability is the maximum deviation between any two readings expressed as percentage of rated output.

Table 1.2

SL. NO.	Load (kgs)	Output (mV) (Ascending)			Max.Difference Δ	Repeatability $= \frac{\Delta}{E} * 100\%$
		a ₁	a ₂	a ₃	$\Delta (a_1, a_2, a_3)$	
1.	0					
2.	15					
3.	30					
4.	45					
5.	68					
Average =						

Data for Table 1.2 is taken from Table 1.1 (Calibration data).

E = Rated output RO in mV

Acceptable Limits: $\pm 0.02\%$ RO

d. Zero Balance

Zero balance is the load cell's zero load output which will likely read some value slightly off true zero.

$$\text{Zero Balance} = \frac{e0}{E} * 100\%$$

e0 = mV output at No Load

E = Rated output RO in mV

Acceptable Limits: $\pm 1\%$ RO

e. Temperature Effect

$$\text{Temperature effect on No Load Output} = \frac{Z2 - Z1}{(T2 - T1) * E} * 100 \frac{\%}{C}$$

$$\text{Temperature effect on Rated Output} = \frac{S2 - S1}{(T2 - T1) * S} * 100 \frac{\%}{C}$$

Z1= mV output at T1 (T1= -15°C) at No load.

Z2= mV output at T2 (T2= 65°C) at No load.

E = Rated output

S = Full scale output (Output at rated load)

S1= mV output at T1 (T1= -15°C) at 68kgs.

S2= mV output at T2 (T2= 65°C) at 68kgs.

Acceptable Limits:-Effect on Zero: $\pm 0.0015\% \text{ RO}/^{\circ}\text{C}$ Effect on Rated Output: $\pm 0.0015\% / ^{\circ}\text{C}$ **f. Creep**

The change in LOAD CELL SIGNAL occurring with time under constant load and with all environmental conditions and other variables also remaining constant.

Apply the full rated load and read the output immediately after the load has been applied after a short stabilization period (t1) and after at 20 minutes (t2).

t2-t1 = creep measurement period (20 min)

$$\text{Creep \% of Rated output} = \frac{e2 - e1}{E} * 100$$

e1 = mV output at t1

e2 = mV output at t2

E = Rated output RO in mV

Acceptable Limits: $\pm 0.03\% \text{ RO}$

4. Test Results:

Test results shall fall within acceptable limits shown below: -

Sl.No	Tests	Acceptable Limit	Results
a.	Non-linearity	$\pm 0.05\% \text{ FS}$ (FS-Full Scale)	
b.	Hysteresis	$\pm 0.03\% \text{ FS}$	
c.	Repeatability	$\pm 0.02\% \text{ RO}$ (RO-Rated Output)	
d.	Zero Balance	$\pm 1\% \text{ RO}$	
e.	Temperature Effect	Effect on Zero: $\pm 0.0015\% \text{ RO}/^{\circ}\text{C}$ Effect on Rated Output: $\pm 0.0015\% / ^{\circ}\text{C}$	
f.	Creep	$\pm 0.03\% \text{ RO}$	