

Section 1 – copy from CuW MS / tender

2. Scope of supply

HGCAL uses hexagonal planar silicon sensors assembled into modules, with the sensor being sandwiched between a PCB housing the front-end Electronics and a “laminated baseplate”. In the electromagnetic calorimeter section the laminated baseplates consist of a hexagonal Cu-W (25% copper, 75% tungsten) absorber plate onto which a top layer that is made of KaptonTM-clad copper sheet is glued, for the purpose of electrically isolating the sensors (that are operated at up to 800V) and shielding them from sources of external noise that could be otherwise be picked up through the CuW baseplate.

The purpose of this Market Survey is to identify potential bidders for the supply of approximately 12,888 kapton-based flexible circuit boards meeting the specific requirements of the HGCAL as defined in this Technical Description, including its annexes, and in accordance with the criteria defined in the Qualification Questionnaire.

2.1 Technical Deliverables and Activities

The Supply shall include the following deliverables and activities:

- The fabrication of 12,888 kapton-based flexible circuit boards, from the Gerber files attached;
- Application of 3M 9460 VHB on each sheet;
- Technical documentation, as specified by CERN;
- Packaging;
- Shipping to a CERN contractor.

2.2 Production Quantities

Table 1 shows the geometries required, including the estimated total quantity of each type (including spares). Drawings in Gerber format are included in the documentation package.

Baseplate type	#
CEE LD semi-right	228
CEE LD semi-left	132
CEE LD half-bottom	384
CEE LD half-top	420
CEE LD five	660
CEE HD left	312
HD chopTwo (bottom)	312

CEH LD full	7872
CEH LD half-bottom	420
CEH LD half-top	372
CEH LD five	588
CEH HD full	924
CEH HD top	84
CEH LD semi-right	108
CEH LD semi-left	72
Total	12,888

3. Requirements

3.1 Normative references

overall IPC Class 2

ISO 9001, ISO 14001, UL, IPC2/IPC3, IATF 16949, EMPB, VDA2, PPAP, cuts, measurements, declarations of conformity, data sheets, ESD packaging (from <https://www.leiton.de/flex-printed-circuit-boards.html>) ????

3.2 Technical requirements

Table 2: Dimensions

Typical external sizes [mm]	See drawings
Tolerance [mm]	+/- 0.20
Copper thickness [um]	18
Position tolerance, 3M top [mm]	1
<i>Smallest structure, outer layer [mm]</i>	<i>>=0.25 (from LeitOn specs)</i>
<i>Smallest via [mm]</i>	<i>>= 0.25</i>
<i>Via pad [mm]</i>	<i>>= 0.6</i>

Table 3: Materials

Copper	18 um electro-deposited or rolled
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Plastic?	50 um adhesive-free, halogen-free polyimide IPC-4024/25 (Shengyi base material) ITEQ has CAS numbers listed
Glue Tape	3M 9460 VHB. No alternative material is acceptable.

5. Performance of the contract

6. Contact persons

References:

current PCB market survey <https://cds.cern.ch/record/2919982?ln=en>
<https://www.leiton.de/flex-printed-circuit-boards.html>

From TDR-019:

“A 105 mm thick Kapton foil coated with a thin layer of gold is epoxied to the baseplate, very nearly covering it completely. The thin layer of gold, on the exposed side of the Kapton, is used to provide the HV bias connection to the sensor back-plane through a conducting epoxy bond. The Kapton itself provides electrical insulation of the sensor back-plane from the baseplate, which is held at ground.”

“The baseplate, Kapton, silicon sensor, and hexaboard are bonded together with epoxy to form a single physical unit. Sets of multiple wirebonds are made between an Au bonding pad on the hexaboard and each sensor pad, the Au-Kapton layer that provides backplane biasing, and the sensor guard rings. The wirebonds are protected by encapsulating them with a clear, radiation tolerant silicon elastomer. An example of the wirebonds in the prototype modules for beam tests is shown in Fig. 2.9. An automated assembly process has been developed with high-rate production in mind; it is fully described in Section 7.2.”

[HGCAL Baseplates](#)