

Abbreviations:

RF: Radio Frequency

POM H: Polyacetal homopolymer

NABL: National Accreditation Board for Testing and Calibration Laboratories

PO: purchase order

1 Introduction:

Finger contact is a part of cavity and transmission line component. The use of this component is to make RF contact between sliding/moving plunger and wall of cavity. POM- H material is used to develop RF passive component as it has low tangent losses.

2 Scope of Supply and Scope of Work:

a) Supply of finger contact shall be done as per details mentioned in below table:

Table-I

Sr. No	ITEM	Details	Quantity (Nos)
1	Finger contact type-F1	Multilam, Drawing F1	35 nos.
2	Finger contact type-F2	Contact Strip Drawing No: F2/09 Drawing No: F2/10 Drawing No: F2/14 Drawing No: F2/15 Drawing No: F2/16	200 nos. (for each part nos.) Total 1000 nos. quantity
3	POM H (Polyacetal homopolymer) rods Note: No Teflon filler is allowed	Diameter: 50 mm, length of rod: 1 meter	8 nos.

*drawings provided as **Annexure-I**

The scope of work includes:

b) Initially Supplier will procure/manufacture five numbers of each type of finger contact (Prototype) within six months from the PO date. ITER-India representative will visit supplier's premises for factory acceptance test of prototype finger contact. Test will include 50 times functional check (compression-relaxation) for checking the appropriateness of spring action. Tools & components required for the functional check will be brought by I-I representative, while supplier shall manufacture appropriate fixture (refer to Annexure-II for reference). Only after successful acceptance of these prototypes, ITER-India will give clearance to supplier to start procurement/manufacturing of balance quantities.

c) Supplier need to first submit the material test certificate (chemical composition) of stamped coupon of POM-H rod from NABL approved lab. After acceptance of the POM H

material test certificate, ITER-India representative will give clearance to supplier for procurement of POM H rods.

d) ITER-India has provided fixture image in **Annexure-II** which is just for reference of supplier. Supplier need to prepare the fixtures similar to the 3D model provided by ITER India for mechanical compression testing of finger contacts. It shall be based on the step file of 3D model provided by ITER India. Supplier need to check the silver-plating thickness and submit the self-attested test report for the same.

e) Delivery of finger contact and POM H to ITER-India site with adequate packing to avoid damage during transportation. Delivery of fixture shall also be made to ITER India along with finger contacts.

f) All the dimensions mentioned in the drawings will follow tolerance ISO 2768 m-K standard. Final acceptance will be done based on visual inspection and dimensional check.

g) Supplier shall provide one-year warranty against manufacturing defects from the date of final acceptance for finger contacts as well as POM-H rods.

h) Material Procurement:

- The finger contact needs to be procured with the following grades of materials -Beryllium copper alloy brush 25, temper A (ASTM C17200) as per drawings mentioned in Annexure I. The material test certificate (type 3.1) for the same will furnish chemical composition details only.
- Supplier need to submit test certificate of POM H in EN 3.1 format. This should be checked against the datasheet given in Annexure III.
- The material test certificate shall be issued by NABL approved labs only.

i) Coating/ Plating:

5-6 micron of Silver plating on finger contact as per drawing. Silver plating is to be done as per reference document mentioned in Annexure IV.

j) Technical specification: The main technical specifications, especially the compression range for each finger contact, are mentioned below:

TABLE II:

Sr. No	ITEM	Technical Specifications	Material
1	Finger contact type-F1	Length – 950 mm approx., Width 8 mm, Compression-1 to 2 mm (tolerances as per drawing)	Beryllium copper alloy
2	Finger contact type-F2 a. Drawing No: F2/09 b. Drawing No: F2/10	a. Length – 500 mm approx., Width 6.5 mm, Compression- 2.5 to 3.5 mm	Beryllium copper alloy

	c. Drawing No: F2/14 d. Drawing No: F2/15 e. Drawing No: F2/16	b. Length – 500 mm approx., Width 6.5 mm, Compression- 2.5 to 4 mm c. Length – 500 mm approx., Width 5.5 mm, Compression- 0.5 to 1.8 mm d. Length – 500 mm approx., Width 5.5 mm, Compression- 0.5 to 1.6 mm e. Length – 500 mm approx., Width 5.5 mm, Compression- 1 to 2.7 mm	
3	POM H (acetal homopolymer) Note: No Teflon filler is allowed	Solid Rod of Diameter: 50 mm, length of rod: 1 meter	Delrin (POM H)

3 Acceptance tests:

I. Quality checks:

(a) The finger contacts and POM H shall be checked for their dimensions mentioned. The dimensions are mentioned in TABLE II and in reference drawings provided in Annexure I.

(b) The material used in the system will be checked for its required properties to confirm on the material grade, based on the test certificate submitted by the supplier.

II. Factory Acceptance Tests (FAT)/Pre-dispatch Inspection:

(a) Pre-dispatch inspection and testing at manufacturer's / fabricator's place shall be carried out in presence of ITER-India representative (s) for checks as per Table-III.

TABLE III

1	Dimensional Check
2	Submission of Silver-plating thickness test certificate
3	Functional check for spring action with II provided components for 100 times. The compression for each finger contact will be checked according to compression values mentioned in Table II.

III. Site Acceptance Test (SAT)

Following site acceptance test will be carried out at ITER-India site as per Table-IV: Supplier may participate in these tests.

Table-IV

1	Dimensional Check
2	Visual inspection of Silver plating

4 Document deliverables:

- Material Test certificates
- FAT reports signed between indenter and supplier as per section 3.
- Drawings and Models of fixture developed

5 Packing requirement:

All components are required to be packed with standard soft material to avoid damages to the machined surfaces. Wooden packing shall be sturdy and rigid enough to withstand shocks and vibrations during transportation of the system.

Any damage to the components during transportation or due to any other cause, will not be accepted and no compensation shall be paid by ITER-India for the same. Supplier shall take due care regarding packing and forwarding of the system. It is the liability of the supplier to deliver the system in perfect working condition to ITER-India. Damaged components will be repaired/ replaced by supplier at free of cost.

6 Input drawings / supporting documents:

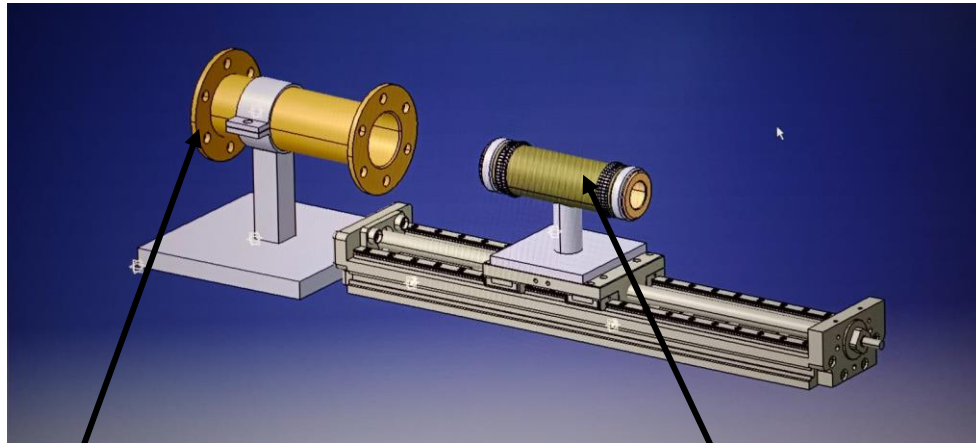
Refer to Annexure-I, Annexure-II, Annexure-III and Annexure-IV

ANNEXURE-I

1. Engineering reference drawings

ANNEXURE-II

Fixture 3 D model and step file for reference to supplier. Step file will be provided after placement of purchase order.



Fixed transmission line

Sliding/ moving transmission
line with finger contacts

ANNEXURE-III

POM H datasheet given for supplier's reference:

Typical Properties of Acetron® POM-H Homopolymer Acetal

DETAIL

Description	Value
Material Type	Semi-Crystalline Thermoplastic
Chemical Name	POM Polyoxymethylene Acetal Homopolymer
Trade Name	POM-H
Additives	Unfilled
Color	Natural
Manufacturer	Mitsubishi Chemical Advanced Materials

PHYSICAL

Property	Test	Unit of Measure	Value
Density	ASTM D792	g/cm ³	1.41
	ASTM D792	lb/in ³	0.051
Water Absorption, 24 hrs, Immersion	ASTM D570	% by wt.	0.2
Water Absorption, Saturation, Immersion	ASTM D570	% by wt.	0.9

MECHANICAL

Property	Test	Unit of Measure	Value
Tensile Strength	ASTM D638	psi	11000
Tensile Modulus	ASTM D638	psi	450000
Tensile Elongation at Break	ASTM D638	%	30
Flexural Strength	ASTM D790	psi	13000
Flexural Modulus	ASTM D790	psi	450000

THERMAL

Property	Test	Unit of Measure	Value
Coefficient of Linear Thermal Expansion	ASTM D696	x 10 ⁻⁵ in./in./°F	4.7
Heat Deflection Temp	ASTM D648	*C at 264 psi	121
	ASTM D648	*F at 264 psi	250
Melting Point Temp	ASTM D3418	*C	175
	ASTM D3418	*F	347
Max Continuous Operating Temp		*C	82
		*F	180
Minimum Operating Temp		*C	-50
		*F	-58
Thermal Conductivity	ASTM C117	BTU-in/ft ² -hr-°F	2.5
Flammability Rating	UL94	NA	HB

ELECTRICAL

Property	Test	Unit of Measure	Value
----------	------	-----------------	-------

22/12/2023, 13:53

DETAIL

Dielectric Strength	ASTM D149	V/mil	450
Dielectric Constant at 1 MHz	ASTM D150	NA	3.7
Dissipation Factor at 1 MHz	ASTM D150	NA	0.005
Surface Resistivity	ASTM D257	ohm/square	>10 ¹³

ANNEXURE-IV

Silver plating procedure for supplier's reference:

1 SCOPE:

This procedure document covers the method to be adopted for silvering of various Finger contacts.

2 PRECAUTIONS:

- Handle all components carefully. Mishandling can cause dents or bends on the finished components as most of the components are thin walled and slender.
- Take proper care for the threads.
- Masking should be done properly.
- The atmosphere should be free from any sort of dust, smoke, fumes or chemical vapours.

3 PROCESS QUALIFICATION:

The Supplier has to do a pre-production trial to establish the process parameters for Silvering, and should generate a Silvering Process Qualification Record. This Process Qualification Record will be used for production jobs.

- 3.1 A test coupon of same material which is similar in geometrical configuration to the drawing has to be used for this process qualification.
- 3.2 Clean it using acid and wash it with DM water
- 3.3 Silvering to be done on this base of beryllium copper to a thickness of 4-5 microns.
- 3.4 All the process parameters have to be recorded. The coating thickness of Copper and Silver has to be measured using a DFT gauge or XRF meter. The process is qualified if the coatings are neat and uniform without any discontinuity.

4 PROCEDURE:

- Identify and note the drawing number of the component. Ensure that the component
- has to be silver coated as per approved drawing.
- Clean the component and dry.

- Identify the areas where silvering is required and Mask the remaining part properly, if needed.
- Silvering to be done on this base of beryllium copper to a thickness of 4-5microns.

5 ACCEPTANCE:

- The silvering has to be as per approved Silvering Process Qualification Record.
- Visual inspection: The coating should be uniform and neat. Any discontinuity is not acceptable. There should not be any coating on masked areas.