



Government of India
Bhabha Atomic Research Centre
Electromagnetic Applications and Instrumentation Division



Ref: BARC/EMA&ID/VT/2021/12288

Date: 01-Nov-2021

Sub: Supply, development, testing and qualification of Indium based soldering alloy for cryogenic application

Dear Sir/Madam,

1. Quotations are invited for the execution of subject work.
2. Taxes and Excise Duties shall be quoted separately. Form AF / H whichever is applicable shall be provided, if required.

The quotations must reach the under mentioned address on or before 12 -Nov-2021 and must be sent in a sealed envelope super scribed with the reference number & the due date only through either registered post under India Post. Any other mode of transmission shall entitle the purchaser to reject the bids.

3. The address on the envelop should read:

The Head,
Electromagnetic application and Instrumentation division
RCnDBldg.,North Site
BARC, Trombay, Mumbai - 400 085
(Kind Attn: VIKAS TIWARI)

4. The bidder shall complete the job within **03 months** from the date of firm work order issued to the bidder.
5. Head, Electromagnetic application and instrumentation division reserves the rights to accept / reject any or all quotations without assigning any reason.
6. Quotation must also indicate the validity of offer. Quotation must also indicate the GST No and PAN number of the supplier.
7. The quotation has to be signed by authorized person with company seal.
8. Payment will be made by EFT only after satisfactory completion of work on production of bill, delivery challan and advance stamped receipt. Income tax as applicable will be collected at the time of payment.
9. In case of any technical clarifications, the supplier may kindly contact us vide email ID: vikast@barc.gov.in, Tel No: 26899/21492

Encl.: Technical Specification Sheet no: TSP/VT/2021/400

(VIKAS TIWARI)
TO/C, EmA&ID, B.A.R.C
For and on behalf of the President of India
(The Purchaser)

Technical specification

Tender Enquiry No BARC/EMA&ID/VT/2021/12288 dated: 01-Nov-2021

Document no.	Revision no.	Date of Issue	No of pages
TSP/VT/2021/400	0	01-Nov-2021	0

1.0 SCOPE

Supply, development, testing and qualification of Indium based soldering alloy for cryogenic application (Quantity: 1 Set).

The complete job shall be carried out strictly as per requirements, specifications and its compliance standards. In this specification, the supplier shall be referred to as the “supplier” and Bhabha Atomic research Centre shall be referred to as the “buyer”.

Supplier shall provide complete raw material to carry out the above jobs. The supplier shall be qualified as per Para 5.0 of this document. The brief description of contents of the tender specification document is as described below.

2.0 DETAILED JOB DESCRIPTION

2.1 Supply, development, testing and qualification of Indium based soldering alloy for cryogenic application.

3.0 DELIVERABLES

4.0 Supply, development, testing and qualification of Indium based soldering alloy for cryogenic application

Indium-base solders share the common characteristics of low melting point (Fig. 1) and extreme softness and ductility. Moreover, it remains ductile even at cryogenic temperatures.

The mechanical properties are mostly a reflection of the fact that at room temperature, indium solders operate at a very high homologous temperature. That is, 25°C (77°F, 298K) is close to the melting point when expressed in Kelvins. At high homologous temperatures, the rate of solid-state diffusion in metals with simple crystal structures is sufficiently fast that microstructural changes can occur in time scales that are comparable to changes in the service environment of joints in components. This is exemplified by the stress-strain curve of a thick indium soldered joint and the continuum between stress-strain and creep data given in Fig. 2 and 3, respectively. This means that recovery and recrystallization occur as fast as work hardening is induced, and mechanical failure of joints made of indium-base solders tends to be caused by stress overload or unidirectional creep.

Soldering Alloy Type-1:

In97-3Ag Indium-Silver Solder 6N purity

Categories: Metal; Nonferrous Metal; Indium Alloy; Solder/Braze Alloy

Characteristics:

Low melting temperature

Able to wet glass, quartz and many ceramics

Physical Properties Metric English Comments

Specific Gravity 7.41 g/cc 7.41 g/cc Calculated

Mechanical Properties Metric English Comments

Tensile Strength 5.50 MPa 798 psi

Electrical Properties Metric English Comments

Electrical Resistivity 0.00000750 ohm-cm 0.00000750 ohm-cm

Thermal Properties Metric English Comments

Thermal Conductivity 73.0 W/m-K

@Temperature 85.0 °C 507 BTU-in/hr-ft²-°F

@Temperature 185 °F

Melting Point 143 °C 289 °F

Solidus 143 °C 289 °F

Liquidus 143 °C 289 °F

Component Elements Properties Metric English Comments

Indium, In 97 %
Silver 3%

Soldering Alloy Type-II:

Bismuth (Bi) is being used more and more as a replacement for lead in solder alloys because it is non-toxic. Although the melting temperature of pure bismuth is 271°C, the addition of bismuth will lower the melting temperature of most metals it is alloyed with. Bismuth compounds are also widely used in medical and cosmetic applications.

Indium 66 Bismuth 34 alloy of 6N purity

Density 9.60 g/cc

Mechanical Properties Metric English Hardness, Brinell 15.5

Tensile Strength at Break 35.9 MPa

Elongation at Break 100 %

Electrical Properties Resistivity: 0.0000750 ohm-cm

Thermal Properties Heat of Fusion 34.7 J/g

Specific Heat Capacity 0.151 J/g-°C

Thermal Conductivity 13.0 W/m-K

@Temperature 85.0 °C 90.2 BTU-in/hr-ft²-°F

@Temperature 185 °F

Melting Point 96.0 °C 205 °F Eutectic

Solidus 96.0 °C 205 °F

Liquidus 96.0 °C 205 °F

Component Elements Properties

Bismuth, Bi 34 %

Indium 66%

RAW MATERIAL PROCUREMENT

The raw material, electrical components used by supplier for the manufacturing of these components shall be of brand new and shall not be used previously.

All the material shall strictly confirm to their corresponding IS standards and shall be purchased only after prior approval from the purchaser.

CONFIDENTIALITY CLAUSE

No party shall disclose any information to any third party concerning the matters under this Contract generally. In particular, any information identified as "Proprietary" in nature by disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party. This clause shall apply to sub-contractors, consultants, advisors or the employees engaged by a party with equal force.

"Restricted information" categories under section 18 of the Atomic Energy Act, 1962 and "Official secrets" under section 5 of the Official Secrets Act, 1923: Any contravention of the above-mentioned provisions by any contractor / sub-contractor, consultant, advisor or the employees of the contractor will invite penal consequences under the aforesaid legislation.

Prohibition against the use of BARC's name without permission for publicity purpose. The contractor or sub-contractors, consultants, advisors or the employees engaged by a party shall not use BARC's name for publicity purpose through any public media like: press, radio, TV or Internet without any prior approval of BARC (wide circular ref.: 2/Misc-9/Lgl/2001/92 date 30/04/2001).

(VIKAS TIWARI)
TO/C, EmA&ID, B.A.R.C
For and on behalf of the President of India
(The Purchaser)