GOVERNMENT OF INDIA

BHABHA ATOMIC RESEARCH CENTRE
CONTROL INSTRUMENTATION DIVISION
Trombay, Mumbai - 400 085

Ref: CnID/E&IG/2021/ VS/132/P13050 08/11/2021

Sub: Design and fabrication of current sensors of two types (Type-A and Type-B) based on Rogowski technology as per the technical specifications given in Annexure-1

Dear Sir / Madam,

1. Quotations are invited for the minor fabrication job as given in para 16 below.

2. Bidder shall quote for fabrication and supply of parts along with material as per bill of quantity and technical specifications.

3. The bidder should have completed similar work with reasonable value (more than 3 lakh) in the last 5 years.

4. Taxes and excise duties shall be quoted separately. Form AF / H whichever is applicable shall be provided, if required.

5. The quotation must reach, **Head, Control Instrumentation Division by 22.11.2021, 18:00 hrs and must be sent in a sealed envelope super-scribed with the above reference number and due date given above.** The quotation should be sent by **speed post only.** Quotation should also indicate G**ST No., PAN No., Sale Tax Registration No. and Service Tax Registration No. of the party.**

6. The address on the envelope should read:
The Head, Control Instrumentation Division
Bhabha Atomic Research Centre
Trombay, Mumbai - 400 085
Attention: Shri Deoraj, Scientific Officer (contact deoraj@barc.gov.in for any clarification)

7. The bidder shall have to take an insurance policy against any material issued to him by the purchaser.

8. The fabrication work shall be subject to inspection by our engineer. The finished components shall not be despatched prior to approval by our engineer, at bidder's works. Necessary inspection facilities should be provided to our engineers during a fabrication at bidder's premises.

9. The bidder shall complete supply, installation and commissioning job within FOUR MONTHS from the date of the firm purchase order issued to the bidder. The finished components shall be delivered by the bidder at North Gate, BARC, TROMBAY, MUMBAI.

10. Head, Control Instrumentation Division, BARC, reserves the right to accept/reject any or all quotations without any reason.
11. Delivery charges if any must be clearly mentioned in the offer. Quotation must also indicate the validity of offer. **Quotation must also indicate the GST no. and PAN no. of the party.**
12. Drawings / Sketches must be returned along with the offer.
13. The quotation has to be signed by authorized person with company seal.
14. Payment will be made by cheque only after satisfactory completion of work on production of bill, delivery challan and advance stamped receipt. It may be noted that IT @ 2% and surcharge on tax will be deducted from your bills.
15. Job should be guaranteed against material and manufacturing defects & poor workmanship for one year from the date of supply.

16. Minor fabrication work:
Design and fabrication of current sensors of two types (Type-A and Type-B) based on Rogowski technology as per the technical specifications given in Annexure-1

Enclosures: 1. Technical Specifications as Annexure-1 (04 pages)
2. General Instructions as Annexure-2 (01 page)

A Mayya 8/11/21

(Anuradha Mayya)
OS & Head, Control Instrumentation Division
Bhabha Atomic Research Centre
For and on behalf of President of India

श्रीमती अनुराधा मैय्या / Smt. Anuradha Mayya
अध्यक्ष, नियंत्रण यंत्रीकरण प्रभाग
Head Control Instrumentation Division
भाभा परमाणु अनुसंधान केंद्र
Bhabha Atomic Research Centre
भारत सरकार/Government of India

Annexure-1

to Enquiry No. CnID/E&IG/2021/VS/132/P13050 dated 08.11.2021

Technical Specifications

Current sensors, based on Rogowski technology, are to be designed and fabricated for measurement of fast current transients.

Quantity: Current sensor of Type-A: 02 nos.
Current sensor of Type-B: 02 nos.

a) Current Sensor of Type-A

The coil of the sensor must be openable so that it can be looped around any component lead for in situ current measurement.

(a)	Sensitivity (mV/A)	: 1
(b)	Peak Current (kA)	: 6
(c)	Noise Max (mVp-p)	: 8
(d)	Droop (%/ms)	: 1.5, max.
(e)	LF (-3dB) bandwidth (Hz)	: 1.5 or better
(f)	Peak di/dt (A/ns)	: 100
(g)	HF (-3dB) bandwidth (MHz)	: 30, min.
(h)	Dimension	: 100 mm long coil x 4.5mm thick, 2.5 m cable
(i)	Output	:± 6V peak correspond to Peak Current
(j)	Accuracy	: ± 2% of reading or better
(k)	Linearity (with current magnitude)	: 0.05% of reading or better
(l)	Calibration	: calibrated to ±0.2% or better. **Calibration certificate must be provided**
(m)	DC offset	: ±3mV or less at 25°C
(n)	Temperature	: Coil and cable -40°C to +125°C
(o)	di/dt ratings (Abs. Max. Peak di/dt)	: 100kA/µs
(p)	Coil Length	: 100mm
(q)	Cable Length	: 2.5 m
(r)	Insulation	: 5kV peak
(s)	Delay	:< 25 ns
(t)	Rise Time	:20 ns or better
(u)	O/P cable	: 0.5m, BNC: BNC
(v)	Power	: Standard 4 x AA 1.5V alkaline batteries, external power adaptor disconnects batteries and power unit
(w)	External Power Adaptor	: Indian Standard
(x)	Carrying case	: Hard carry case
(y)	Standards and approvals	: CE marked or equivalent EN 61326-1:2013 EN 61010-1 Third Edition

b) Current Sensor of Type-B

The coil of the sensor must be openable so that it can be looped around any component lead for in situ current measurement.

(a)	Sensitivity (mV/A)	: 2
(b)	Peak Current (kA)	: 3
(c)	Noise Max (mVp-p)	: 12
(d)	Droop (%/ms)	: 3.0, max.
(e)	LF (-3dB) bandwidth (Hz)	: 3 or better
(f)	Peak di/dt (A/ns)	: 80
(g)	HF (-3dB) bandwidth (MHz)	: 50
(h)	Dimension	: 100 mm Circumference coil x 3.5mm thick, 1mtr cable
(i)	Output	:± 6V peak correspond to Peak Current
(j)	Accuracy	: ± 2% of reading or better
(k)	Linearity (with current magnitude)	: 0.05% of reading or better
(l)	Calibration	: calibrated to ±0.2% or better. **Calibration certificate must be provided**
(m)	DC offset	: ±3mV or less at 25°C
(n)	Temperature	: Coil and cable -40°C to +125°C
(o)	di/dt ratings (Abs. Max. Peak di/dt)	: 80kA/µs
(p)	Coil Length	: 100mm
(q)	Cable Length	: 1 mtr
(r)	Insulation	: 2kV, peak
(s)	Delay	:<13ns
(t)	Rise Time	:12.5 ns or better
(u)	O/P cable	: 0.5m, BNC: BNC
(v)	Power	: Standard 4 x AA 1.5V alkaline batteries, life time 25 hrs, external adaptor disconnects batteries and power unit
(w)	External Power Adaptor	: Indian Standard
(x)	Carrying case	: Hard carry case
(y)	Standards and approvals	: CE marked or equivalent EN 61326-1:2013 EN 61010-1 Third Edition

c. Important Note to the bidders:

Bidders must have previous experience of designing and fabrication of such current sensors using Rogowski technology.

d. Scope of the work:

1. Design and fabrication the current sensors based on Rogowski Technology as per the specification.
2. The sensor will have two parts, a) Rogowski coil b) Integrator and associated electronics. The fabricator will design and fabricate both the parts. The output of the sensor will be compatible to all standard measuring devices (like oscilloscope, DVM etc.) having an input impedance of more than 100 kOhm. The sensor must also be capable of driving the 50 Ohm input impedance of an oscilloscope.

3. Calibration of the sensor and providing calibration certificates. Calibration must be traceble.
4. Design and testing must conform to EN 61326-1:2013 and EN 61010-1 Third Edition

e. Deliverables:

1. Current sensor (based on Rogowski technology) of Type-A: 02 nos. The sensor will include Rogowski coil, integrator electronics, o/p cable, batteries etc.
2. Current sensor (based on Rogowski technology) of Type-B: 02 nos. The sensor will include Rogowski coil, integrator electronics, o/p cable, batteries etc.
3. Hard carry case for each sensor
4. Calibration certificates for each sensor. Calibration must be traceable.
5. External power adaptor: 02 nos. (one for each type of sensor).

f. **Acceptance criteria:**

The following parameters will be tested in BARC and their compliance with the specifications are required for acceptance

1. Peak current
2. Sensitivity
3. HF bandwidth
4. Delay and rise time
5. Coil length and cable length
6. Insulation
7. Peak di/dt (upto 90%)
8. Accuracy and linearity

g. **Sub-Contract:**

The fabricator shall not sub-contract any or all the work without written consent from the purchaser. The fabricator shall be responsible to the purchaser for all work, done by the sub-contractor of the fabricator, if allowed by the purchaser.

h. Quality surveillance, Inspection:

Used or recycled materials will not be accepted. The work covered by the specifications shall be subject to surveillance/ inspection by the authorized representative of the purchaser. The Supplier shall intimate the purchaser for inspection of the completed fabrication job.

i. Confidentiality:

1. 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.

2. "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.

3. 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 (vide circular ref.: 2/Misc-9/Lgl/2001/92 date 30/04/2001)

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Ok

Annexure- 2

(Inquiry No:CnID/E&IG/2021/VS/132/P13050 dated 08.11.2021

General Instructions

Mandatory requirements

1. Quotation should contain item wise price for all items of our enquiry.
2. Quotation to be submitted considering completion of the work within four months from the date of release of work order.
3. For installation & commissioning, I&C charges and service tax to be quoted separately.
4. All the electronic components, hardware, cables & other items shall be brand new from reputed manufacturers procured from their authorized agents.

General requirements

5. Bidder can suggest equivalent or better make and model number against each suggested Instruments/components and same to be approved by the customer.
6. Total time to execute the job given above is from the date of work order placed which includes design, procurements of components, fabrication, assembly and testing.
7. No Free Issue Material will be provided to the supplier. Materials, tools, manpower etc required for the above work will not be supplied by the user. Supplier has to arrange the above on his own.
8. The supplier must incorporate minor changes (20% of the overall design work) in the design as required at the time of execution of work at no extra cost.
9. Supplier shall submit the list of their clients, and catalogues or literature to support their quotation with the list of similar jobs carried out.
10. During work execution, the supplier shall follow standard practices & procedures for quality assurance.
11. **Sub contract**: The supplier shall not sub-contract any or all the work without written consent from the indenter. The supplier shall be responsible to the indenter for all work, the sub-contractor of the supplier, if allowed by the indenter.
12. **Quality surveillance, Inspection**: The fabricator will use standard quality new material for fabrication. He will conduct BBT/FPT of all the PCBs used in the system. The fabricator will procure components (as per BOM) from the manufacturers or from their authorized distributors. Used or recycled materials will not be accepted.
13. **Acceptance Criterion**: Items meeting the Technical specifications only will be accepted. Any Item not meeting the Technical Specifications are liable for rejection.
14. For the items with detailed specification as given in Annexure-1 shall be subject to surveillance/ inspection by the indenter or his authorized representative.
15. **Without above detailed information offer will be considered incomplete and may be rejected.**