

**BUREAU OF INDIAN STANDARDS  
(NORTHERN REGIONAL LABORATORY)**

Our Ref: NROL/Mech/Solar/SFPC-10

Date: 13-06-2007

**Subject: SUPPLY OF PYRANOMETERS**

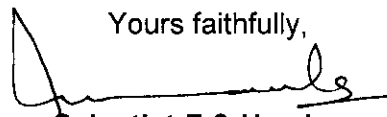
Dear Sirs,

Technical & Commercial Bids are invited for the supply of **PYRANOMETERS** from the nationally reputed & bonafide manufacturers/authorized dealers in separate SEALED covers, which should reach the undersigned latest by **1200 h, on 24 July 2007**, at the following address:

BUREAU OF INDIAN STANDARDS  
Northern Regional Laboratory,  
Plot No. B-69, Phase-VII,  
Industrial Focal Point, Mohali,  
Punjab – 160 051.

- A. Instructions, Terms and conditions of supply, etc are given in **Annex-I, II, III & IV**.
- B. The detailed Specification(s) of the above mentioned equipment(s)/item(s) are given in **Annex-IV**.
- C. The technical Bids shall be opened in the Conference Hall, at the address mentioned above at **16 00 h, on 25 July 2007** and in the presence of such tenderers or their duly authorized representatives, who may like to attend.
- D. Please note that the envelopes containing Technical & Commercial Bids are sealed properly i.e. either wax sealed or with adhesive cello tape on both ends. **Unsigned Bids, Unsealed /stapled envelopes** and bids **without EMD** shall be summarily rejected. **No exemption** whatsoever for payment of EMD shall be accorded.
- E. This office reserves the right to reject any /all bids without assigning any reasons whatsoever. Late tender will not be accepted by any means & this office will in no way be responsible for any reasons of late submission of bids.
- F. The specification and terms & conditions can also be downloaded from BIS Website – **www.bis.org.in**

Thanking you,

Yours faithfully,  
  
**Scientist-F & Head  
(NROL)**

Encls: as above

**BUREAU OF INDIAN STANDARDS  
(NORTHERN REGIONAL LABORATORY)  
MOHALI 160055.**

Ref: NROL/MECH/SOLAR/SFPC-10

**ANNEXURE-I**

**INSTRUCTIONS TO BIDDERS**

1. Sealed tenders are invited (under two bid system i.e. Technical Bid and Financial Bid, for details please see Annexure-II) separately from reputed manufacturers and their accredited/sole selling agents for the "Supply, Installation, Commissioning and Satisfactory Demonstration" of **PYRANOMETERS** (For detailed specifications, please see Annexure-IV).
2. **Security Bid (EMD)** – Rs 5000.00 (rupees five thousand only) may please be sent in the form of a Crossed/Account payee demand draft from a Nationalized Bank, payable at Chandigarh in favour of "BUREAU OF INDIAN STANDARDS". The Demand Draft of the EMD be placed inside a separate sealed envelope clearly marked 'EMD' on the right hand side corner of the envelope and be stapled along with the sealed envelope containing the Financial Bid.
3. **TENDER DOCUMENT** : Bidders may also download the Tender Notice, specifications, terms & conditions.
4. Tenders not accompanied with '**EMD**' shall be summarily rejected.

Last date for receipt of Bids is: **1200 h, on 24 July 2007**

Date of opening of Technical Bids is: **16 00 h, on 25 July 2007**

(N.B: In the event of any of above date(s) being declared a holiday, the last date of submission of completed bid(s) shall be on the next working day.)

5. The tenders should be addressed to:

**Head  
Northern Regional Laboratory (NROL),  
BUREAU OF INDIAN STANDARDS,  
Plot No. B-69, Phase-VII,  
Industrial Focal Point,  
Mohali 160051, Punjab.**

Phone No.0172-3246935, 2236722. FAX No.0172- 2237212, 2236722  
e.mail: [nrol@bis.org.in](mailto:nrol@bis.org.in)

**BUREAU OF INDIAN STANDARDS**  
**(NORTHERN REGIONAL LABORATORY)**  
**ANNEXURE-II**

**DETAILS OF TERMS AND CONDITIONS OF CONTRACT**

Ref: NROL/MECH/SOLAR/SFPC-10

**Instruction to bidders**

1. The BUREAU gives FIRST PREFERENCE in its purchase to goods bearing ISI CERTIFICATION MARK and second preference to those which conform to the relevant Specifications.
2. The Tenderers are requested to give detailed tender in their own forms in two bids i.e.

**Part - A: Technical Bid. 2 copies**

**Part - B: Financial Bid. 2 copies**

(1st copy – in original, 2nd copy – Photostat Copy)

The Technical & Financial Bids should be sealed and sent separately in sealed envelopes. Such Bids shall remain valid for a period of 180 days from the date of opening.

3. The Date and Time of opening for Part B (Financial Bid) will be intimated only to prequalified and technically acceptable tenderers for the item at a later date.
4. Quotations/Bids, qualified by indefinite expressions as "Subject to immediate acceptance, Subject to prior sale", etc. and incomplete quotations are liable to be summarily rejected.
5. Each tender document shall be accompanied with EMD of Rs 5000.00 (rupees five thousand only). The demand draft (from a Nationalized Bank) for the EMD amount shall be drawn in favour of BUREAU OF INDIAN STANDARDS payable at Chandigarh/Mohali. The sealed envelope containing EMD should be superscribed "EMD" and stapled separately with the envelope containing the commercial Bids. The Earnest Money of successful bidder will be returned only after installation, commissioning, satisfactory demonstration and acceptance of the equipment by the user Scientist/Head as per the terms of our purchase order. The Earnest Money of the unsuccessful bidder whose technical bid has not been found suitable will be returned. Earnest money deposit shall be liable to be forfeited, if the successful tenderer withdraws the tender after opening.
6. (A)Tenders not accompanied with Demand Draft/Bank Guarantee towards "Earnest Money Deposit" will summarily be rejected.

- (B) Tenders, which are submitted without following the Two-Bid Offer System, will summarily be rejected.
- (C) Unsigned Tenders will also be rejected.

7. Conditional Offers will not be considered.

8. TECHNOLOGY CERTIFICATES

The supplier should issue a certificate stating that :

- a) The equipment is of latest technology :
- b) The equipment may be upgraded as and when required by BIS.
- c) The equipments will be promptly and properly serviced by them whenever desired by BIS even after 10 years of its procurement/installation by BIS.

9. BIS shall pay 90% of the cost after satisfactory supply installation & commissioning and the Balance of 10% as contract performance security would be paid after expiry of warranty period. Supply means "Supply, Installation, Commissioning and satisfactory demonstration of the whole system and training".

10. BIS will not provide any accommodation/transportation for the Engineers/ Representatives for attending Installation, Commissioning and Demonstration Work. It is the absolute responsibility of the Principal Supplier/Indian Agent to make their own arrangements.

11. WARRANTY: The equipment is to be guaranteed for trouble free performance for a **minimum period of two years** after installation. The warranty period of the equipments may be stated clearly in the Technical Bids. In case the same is not found stated, it will be presumed that warranty period as mentioned in their respective specifications of the tender document (if specified), is applicable. The manufacturer shall also submit Annex-III along with the tender document duly signed and stamped.

12. The defects, if any, during the warranty period are to be rectified free of charge by arranging free replacement wherever necessary.

13. Indicate the name of firm, address, contact person, phone no. and fax no. etc of onsite warranty, agency that shall maintain during warranty and undertake Annual Maintenance Contract/Comprehensive Service Maintenance Contract beyond warranty shall be given in the technical bid. In case of foreign quote, the Indian Agent who shall maintain during warranty and AMC beyond warranty shall be given in the Technical Offer.

14. The supply of spare parts is to be guaranteed at least for a period of 10 years after the supply of the equipment.

15. Please mention clearly in the Technical Bids regarding address of arrangements for service/repair of the equipments available. Suppliers having such arrangements near Chandigarh/Mohali would be preferred.
16. The Equipments are required to be installed at locations indicated in the Tender Notice and subsequently training is to be provided free of cost to the concerned scientists/testing personnel on site, wherever necessary.
17. Tenders complete in all respects for each item should be submitted separately for Technical as well as Financial bids as follows:
- One sealed envelope superscribed "Technical Bid" will contain only the Technical Specifications of the indented equipment as per details in Annexure-IV of this document.
  - A Second sealed envelope superscribed "Financial Bid" will contain only the financial bid in which price (alongwith warranty) and 3 year comprehensive warranty charges, Annual Maintenance Contract Charges [AMC] etc. and any other information, which has financial implications, shall only be given. The Demand Draft of the EMD be placed inside a separate sealed envelope clearly marked 'EMD' on the right hand side corner of the envelope and be stapled along with this sealed envelope containing the Financial Bid. However, the EMD of the successful Bidder may be adjusted against Performance Bank Guarantee.
  - Both the above sealed envelopes are to be kept in a sealed envelope, superscribed as Tender No \_\_\_\_\_ for \_\_\_\_\_ (Item/Name) due on \_\_\_\_\_ 2007 and duly sealed.
18. The **Technical Bid [Part A]** should accompany complete specification, Manufacturer's name, address and following details :
- Declaration regarding expected life span of equipment and accessories
  - List1: list of standard accessories being provided with equipment should be given separately.
  - List2: list of optional and any other essential items/accessories required for the maintenance of the equipment for the next three years.
  - List3: list of infrastructural facilities and consumables to be arranged by the Bureau for commissioning of equipment,
  - List4: list of the Users in India with complete postal address to whom the similar equipment has been supplied,
  - Near locations in India from where after sales services shall be provided along with the name of Servicing Agent,
  - Technical Literature of the equipment along with necessary photograph/ drawings, if any,
  - Signed copy of terms and conditions (all pages to bear signature of authorized signatory and duly stamped) denoting that the terms and conditions stipulated by the Bureau are acceptable. Deviations if

any to be detailed out in a deviation sheet, however the same will be accepted subject to the decision of the Competent Authority of the Bureau. In case there are no deviations it should be clearly indicated as 'Nil'. In case no deviation sheet is filled up it will be presumed all terms and conditions are acceptable and no query will be entertained at a later stage.

- i. Specification sheet duly filled in with all details.
- j. Special preferences/conditions, if any, should be indicated in Specification sheet for the equipment or in the Deviation sheet.

19. Cost of the items should be mentioned clearly in the **Financial Bid [Part-**

**B]**. The following details need to be included:

- a. Price break-up of main equipment and optional accessories (as per the specification) and consumables (for the accessories and consumables which are not part of the standard equipment) to be supplied by the party,
- b. The Comprehensive warranty charges for next three years after the expiry of warranty period,
- c. The **rates quoted shall be valid for a period of 180 days from the date of opening of the tender**. However wherever applicable the current value of the foreign currency would be applied at the time of placing the order.
- d. Packing, Forwarding, Freight & Insurance and Commissioning Charges, if any extra, may be quoted separately in Financial Bid.
- e. In case your quote is F.O.R./F.O.B. basis, estimated insurance coverage charges may be indicated.
- f. CIF (Carriage Inward & Freight), at site value both by Airfreight and Ocean freight, where applicable.
- g. The Bids should clearly give break-up of cost of each equipment. The rates quoted should separately indicate Basic Cost, Excise Duty, Sales Tax, P&F charges, Freight, Insurance, VAT etc. Rates quoted should specifically state Sales Tax, Excise Duty or any other taxes/charges. In absence of any such stipulation, it will be presumed that the prices include all such charges and no claim for the same shall be entertained. Form C/D shall not be provided by BIS.

20. In case of foreign quote, the Principal supplier should clearly indicate the address of the Indian Agent and percentage (%) of Agency Commission payable if any, to be paid to the Indian Agent in Indian Currency.

21. Indicate the names and addresses of the Indian reputed Organizations where you have supplied the similar equipment and may attach the satisfactory performance report of the equipment from user Organization.

22. **(A)** If you have supplied identical or similar equipment to Govt/CSIR Labs. /National Institutes, the details of contact person, phone numbers, fax, e.mail i.d., for such supplies for the preceding three years should be given

together with the prices eventually or finally paid. Preference will be given to those who have supplied to such Laboratories/Institutes

**(B)** Based on the above information BIS will have its option to obtain details of the equipment, their performance, after sales services etc. for evaluation of the tender, directly from the concerned Labs/Scientists etc.

**(C)** Clause by clause compliance with the technical specification in this tender is required. Deviation from the specification, if any, or better alternative offer by the supplier and suitability to substitute the specified conditions must be clearly brought out.

**(D)** Technical specification shall be as per the requirements laid down. However, any deviations offered may be considered by the Technical Committee subject to suitability and the needs of the Organisation.

**(E)** The specifications of equipments, have been specified at Annex-IV. However, bidder(s) may be required to arrange practical demonstration of equipment/model(s) quoted by them before finalization of order.

**(F)** The Bidder has to state in detail the Electrical Power/UPS requirements, floor space, head room, foundation needed and also to state whether Air-conditioned environment is needed to house the system and to run the tests. i.e. pre-installation facilities required for installation may please be intimated in the technical bid.

**(G)** Bidder shall be responsible for installation/demonstration wherever applicable and for after sales service during the warranty and thereafter.

23. Fax / E-mail / Telegraphic / Telex tenders shall not be considered.

24. All the Bank Charges inside and outside India, including opening of LC, communication, confirmation, amendments etc., will have to be borne by supplier only.

25. If applicable, with regards to terms of payment including period of warranty, we prefer to release the payment on BILL Basis (excluding Indian Agency Commission) after receipt of consignment in good condition and satisfactory installation, and commissioning thereof. Alternatively, depending upon the value and foreign exchange regulations the payment can also be considered through Sight Draft / Letter of Credit through the State Bank of India for the order value excluding the Indian Agency Commission. However, the detailed payment for Sight Draft / Letter Credit is mentioned above in this tender terms and conditions.


26. Details of after-sales services offered by you are to be made clear in the tender.

27. The delivery of the stores is required to be made within 30 days of receipt of order. If, it is not possible for you to effect delivery within the period, you are required to specify the date by which you can guarantee delivery of the stores. Delivery period mentioned in the Purchase Order should be strictly adhered to. Otherwise the tenderer will forfeit EMD, after maximum 10 days of the last date of delivery.

28. All goods received would be subjected to inspection, by BIS before or after receipt or commissioning (as applicable) and the decision of BIS shall be binding. Rejected items/goods/stores shall be removed by the supplier at his own cost and risk, within 30 days of receipt of notice for the removal of such goods, and no liability, whatsoever, on the Bureau shall be attached for the rejected/disapproved goods/items/stores.
29. The Bureau takes no responsibility for delay, loss or non-receipt of tenders after dispatch.
30. In case of non compliance with the Terms & Conditions of the contract, the Bureau reserves its right to:
- a. Cancel/rescind/revoke the order if supply is not made in time and is not conforming to the required specification.
  - b. Impose Penalty up to 1% of the total value of the order for a delay of every seven days after the schedule date subject to the ceiling of a maximum of 10% of the total value of the order.
31. Goods should not be dispatched until the Vendor receives a firm order.
32. Firms which have already supplied similar equipment to BIS shall indicate details of installation/commissioning.
- 33. Printed conditions of the quotation will not be binding on BIS.**
34. BIS will not be responsible:
- a. For delayed / late quotations submitted / sent by Post / Courier etc.
  - b. For submission / delivery of quotations at wrong places other than this office.
35. All question, disputes or differences arising under, out of or in connection with this Bid document shall be subject to the exclusive jurisdiction of Chandigarh /Mohali Court



36. The Bureau reserves the right to accept any tender in full or in part or to reject the lowest or any or all tenders without assigning any reason.

A handwritten signature in black ink, consisting of a large, stylized initial 'A' followed by a series of loops and a long horizontal stroke extending to the right.

**Scientist-F & Head**  
Northern Regional Laboratory  
Bureau of Indian Standards.

### Annexure-III

We warrant that everything to be supplied by us hereunder shall be brand new, free from all defects and faults in materials, workmanship and manufacture and shall be of the highest grade and quality and consistent with the established and generally accepted standards for material of the type ordered, shall be in full conformity with the specification, drawing, or samples, and operate properly. We shall be fully responsible for its efficient operation. This warranty shall survive inspection of and payment or, and acceptance of the goods, but shall expire (except in respect of complaints of which the contractor has been notified prior to such date) 24 months after their successful installation, commissioning and acceptance by BIS.

The obligations under the Warranty expressed above shall include all cost relating to labour, spares, maintenance (preventive and unscheduled) and transport charges from site to the manufacturer's works and back and free repair/adjustment or replacement at site or any parts of the equipment which under normal and proper use and maintenance proves defective in design, material or workmanship or fails to conform to the specification previously given by BIS to the contractor.

Signature of the Vendor

Date: \_\_\_\_\_

Place: \_\_\_\_\_

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## DEVIATION SHEET

1. Column 1, 2 and 3 to be filled up, Column 4 is for BIS use
2. More than one may be used for filling up deviations from the specified terms and conditions

Sl no	Clause no and ref of BIS document (annexure no)	Type of deviation	Acceptable/Not acceptable (FOR BIS USE)
(1)	(2)	(3)	(4)

Signature of the Vendor

Date: \_\_\_\_\_

Name \_\_\_\_\_

Place: \_\_\_\_\_

Seal of Firm

**ANNEXURE-IV**

PYRANOMETERS		
Ref No: NROL/MECH/SOLAR/SFPC-10		
Equipment Name: PYRANOMETER		
Quantity: One Each		
Sl. No.	<b>NROL SPECIFICATION</b>  PYRANOMETER- WMO STANDARD, SECONDARY - Equipment Specification Codes SFPC 010—Page 13,14 PRECISION PYRANOMETER - Equipment Specification Codes SFPC 024 —Page 15,16 SHADOW RING FOR PYRANOMETER- - Equipment Specification Codes SFPC 025—Page 17	<b>BIDDER'S RESPONSE</b>  (Bidder shall indicate "Complied" or "Non Complied" as applicable in each row. In case of "Non Complied", detail shall be mentioned)

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**BUREAU OF INDIAN STANDARDS**  
(BANGALORE BRANCH OFFICE LABORATORY)  
**EQUIPMENT SPECIFICATION**

EQUIPMENT SPEC. CODE	:	SFPC 010
NAME OF THE EQUIPMENT	:	PYRANOMETER, WMO Standard, Secondary
PROPOSED FOR BIS LABS	:	<b>NR02</b>
TOTAL QUANTITY REQUIRED	:	One No.
<b>1.0</b>	<b>Scope</b>	<p>Prescribes the requirements for a thermoelectric pyranometer for measuring the irradiance on a plane surface which results from direct solar radiation and from the diffuse radiation from the hemisphere.</p> <p>This instrument is required for carrying out the following tests:</p> <ul style="list-style-type: none"> <li>➤ Outdoor No-flow exposure test as per Cl. 5.2 of IS 12933 (Pt.5).</li> <li>➤ External thermal shock test as per Cl. 5.4 of IS 12933 (Pt.5).</li> <li>➤ Internal thermal shock test as per Cl. 5.5 of IS 12933 (Pt.5).</li> <li>➤ Thermal performance test as per Cl. 6.4 of IS 12933 (Pt.5).</li> </ul>
<b>2.0</b>	<b>Material and Detailed Requirements</b>	<p>2.1 The entire instrument shall be made of brass and shall be resistant to the corrosive dampness.</p> <p>2.2 The sensitive element shall be made of constantan copper thermocouple combined in a star shape and temperature balanced.</p> <p>2.3 The protection domes shall be made of special optical clear flint glass of exceptional clarity, uniform optical transmission characteristics and refractive index.</p> <p>2.4 The sensitive element shall be of copper constantan junctions formed on an insulating disc, approximately 20 mm in diameter and 8 mm thick. The thermopile should be made from 0.19 mm thick constantan wire.</p> <p>2.5 The active junctions of the thermopile shall lie in an even horizontal plane and painted black with special optical black lacquer.</p> <p>2.6 The absorptivity of the black lacquer shall not less than 98 percent and uniform over a wide range of wave lengths.</p> <p>2.7 The entire instrument except for the two glass domes shall be protected from dust radiation by mounting it in the centre of a circular guard plate painted white.</p> <p>2.8 The top surface of the guard plate shall be exactly level with the blackened surface of the thermopile for a distance of 25 mm from the inner edge and shall slope down from there at an angle of about 10°.</p> <p>2.9 The electrical leads from the thermopile shall be mounted in an air tight inside the tubes through which they emerge and screw cap closing the bottom lid of the cylindrical chamber shall be threaded over a rubber ring washer.</p> <p>2.10 The interior of the cylindrical chamber shall be made air tight and dry all times.</p> <p>2.11 The entire instrument shall be mounted on a mounting plate for facilitating ease of installation and correct alignment.</p>

EQUIPMENT SPEC. CODE		:	SFPC 010
NAME OF THE EQUIPMENT		:	PYRANOMETER WMO Standard, Secondary
PROPOSED FOR BIS LABS		:	NR 01
TOTAL QUANTITY REQUIRED		:	One No.
3.0	<b>Requirements</b> 3.1 Variation in spectral response within $\pm 2\%$ over the spectral range from 0.3 to 2.5 microns. 3.2 Sensitivity: $\sim 9$ micro-volt/ $\text{w/m}^2$ 3.3 Time Response : less than 5 s to achieve a reading of 63.2 percent {that is $1-1/e$ } of its final reading after a step change in solar radiance. 3.4 Zero offset temperature change : $\pm 2\text{w/m}^2$ 3.5 Zero offset thermal radiation : $\pm 7\text{w/m}^2$ 3.6 Change of response due to variation in ambient temperature shall be less than $\pm 1\%$ . 3.7 Non linearity of response shall be within $\pm 1\%$ 3.8 Temperature Range - 40 to + 80° C 3.9 Temperature Dependence $< 1\% / ^\circ\text{C}$ 3.10 Temperature compensation curve to be provided 3.11 Expected Accuracy $\pm 2\%$ 3.12 Cosine: $\pm 1\%$ from normalization 0-70° zenith angle. $\pm 3\%$ 70 -80° zenith angle. 3.13 Signal Out Put 0-15 mV 3.14 Tilt Response $\pm 0.2\%$		
4.0	<b>Calibration :</b> Calibration certificate with calibration traceability to World Radiation Reference (WRR) shall be furnished along with the equipment.		
5.0	<b>Guarantee</b> The equipment shall be guaranteed for a minimum period of one year of satisfactory operation		
6.0	<b>Specification</b> IS 8336		
7.0	<b>Accessories</b> Signal cable length 20 m.		

**BUREAU OF INDIAN STANDARDS**  
(BANGALORE BRANCH OFFICE LABORATORY)  
**EQUIPMENT SPECIFICATION**

EQUIPMENT SPEC. CODE	:	SFPC 024
NAME OF THE EQUIPMENT	:	PRECISION PYRANOMETER
PROPOSED FOR BIS LABS	:	NROL
TOTAL QUANTITY REQUIRED	:	One No.

- 1.0 Scope**  
Prescribes the requirements for a precision thermoelectric pyranometer for measuring the irradiance on a plane surface which results from direct solar radiation and from the diffuse radiation from the hemisphere.  
This instrument is required for carrying out the following tests:
- Outdoor No-flow exposure test as per Cl. 5.2 of IS 12933 (Pt.5).
  - External thermal shock test as per Cl. 5.4 of IS 12933 (Pt.5).
  - Internal thermal shock test as per Cl. 5.5 of IS 12933 (Pt.5).
  - Thermal performance test as per Cl. 6.4 of IS 12933 (Pt.5).

- 2.0 Material**
- 2.1 The entire instrument shall be made of brass and shall be resistant to the corrosive dampness.
  - 2.2 The sensitive element shall be made of constantan copper thermocouple combined in a star shape and temperature balanced.
  - 2.3 The protection domes shall be made of special optical clear flint glass of exceptional clarity, uniform optical transmission characteristics and refractive index.
  - 2.4 The entire instrument except for the two glass domes shall be protected from dust radiation by mounting it in the centre of a circular guard plate painted white.
  - 2.5 The top surface of the guard plate shall be exactly level with the blackened surface of the thermopile for a distance of 25 mm from the inner edge and shall slope down from there at an angle of about 10°.
  - 2.6 The electrical leads from the thermopile shall be mounted in an air tight inside the tubes through which they emerge and screw cap closing the bottom lid of the cylindrical chamber shall be threaded over a rubber ring washer.
  - 2.7 The interior of the cylindrical chamber shall be made air tight and dry all times.
  - 2.8 The entire instrument shall be mounted on a mounting plate for facilitating ease of installation and correct alignment.

- 3.0 Requirements**
- 3.1 Response time : less than 5 s
  - 3.2 Zero offset temperature change :  $\pm 2 \text{ W/m}^2$
  - 3.3 Zero offset thermal radiation :  $\pm 7 \text{ W/m}^2$
  - 3.4 Non stability (change/year):  $\pm 0.5 \%$
  - 3.5 Non linearity of response :  $\pm 0.6 \%$
  - 3.6 Directional error(at  $1000 \text{ W/m}^2$ ) :  $\pm 10 \text{ W/m}^2$
  - 3.7 Temperature dependence of sensitivity :  $\pm 1 \%$  (-10 to +40° C)

EQUIPMENT SPEC. CODE		:	SFPC 024
NAME OF THE EQUIPMENT		:	PRECISION PYRANOMETER
PROPOSED FOR BIS LABS		:	NROL
TOTAL QUANTITY REQUIRED		:	One No.
3.0	<b>Requirements (Contd)</b> 3.8 Tilt response ( at $1000 \text{ W/m}^2$ ): $\pm 0.2 \%$ . 3.9 Sensitivity: 4-6 micro-volt/ $\text{W/m}^2$ 3.10 Impedance: 700-1500 Ohms. 3.11 Level accuracy : $0.1^\circ$ 3.12 Operating temperature – $40$ to $+80^\circ \text{C}$ 3.13 Spectral range (50% points) $305 - 2800 \text{ nm}$ 3.14 Maximum irradiance $4000 \text{ W/m}^2$		
4.0	<b>Calibration :</b> Calibration certificate shall be furnished along with the equipment with traceability to National standards. .		
5.0	<b>Guarantee</b> The equipment shall be guaranteed for a minimum period of one year of satisfactory operation.		
6.0	<b>Specification</b> -		
7.0	<b>Accessories</b> Signal cable 10 m Integrator with provision for two channels		



**BUREAU OF INDIAN STANDARDS  
(BANGALORE BRANCH OFFICE LABORATORY)  
EQUIPMENT SPECIFICATION**

<b>EQUIPMENT SPEC.CODE</b>	<b>:</b>	<b>SFPC 025</b>
<b>NAME OF THE EQUIPMENT</b>	<b>:</b>	<b>SHADOW RING FOR USE PYRANOMETER</b>
<b>PROPOSED FOR BIS LABS</b>	<b>:</b>	<b>NROL</b>
<b>TOTAL QUANTITY REQUIRED</b>	<b>:</b>	<b>One No.</b>
<b>1.0 Scope</b>	<p>Prescribes the requirements for a shadow ring use with pyranometer This instrument is required for carrying out the following tests:</p> <ul style="list-style-type: none"> <li>➤ Outdoor No-floe exposure test as per Cl. 5.2 of IS 12933 (Pt.5).</li> <li>➤ External thermal shock test as per Cl. 5.4 of IS 12933 (Pt.5).</li> <li>➤ Internal thermal shock test as per Cl. 5.5 of IS 12933 (Pt.5).</li> <li>➤ Thermal performance test as per Cl. 6.4 of IS 12933 (Pt.5).</li> </ul>	
<b>2.0 Principles</b>	<p>The objective of the shadow ring is to intercept the direct radiation from coming to the pyranometer from the sun during the whole day without readjustment. The shadow ring must satisfy the following requirements:</p> <ul style="list-style-type: none"> <li>➤ The axis of the shadow ring must always be parallel to the polar axis. In consequence the angle between shadow ring axis and horizontal should be equal to the latitude of the observation site.</li> <li>➤ The shadow ring must able to shift along the shadow ring axix relative to the pyranometer and in this way be adjusted to the suns changes in declination during the year.</li> <li>➤ Within the shadow ring construction the pyranometer must be positioned with its sensor on shadow ring axis.</li> </ul>	
<b>3.0 Specification</b>	<p>Material : Anodized aluminium of sea water proof quality/ stainless steel Outer Ring Diameter : 620 mm Ring width : 55 mm Ring width/ring radius ratio: 0.185 View angle (The apparent width of the ring as seen from the pyranometer) 10.6°</p>	