

Technical specifications of Differential Scanning Calorimetry (DSC)

Prospective vendors should quote for supply, delivery, installation, testing and commissioning with a list of other accessories required for complete and smooth installation and uninterrupted operation of the equipment. The technical offer should also include make and model number of parts/accessories. DSC should have following specifications.

S. No.	Parameters	Range
A. Furnace		
A 1	Furnace material	Good heating element with proper insulation
A 2	Thermocouple	Chemical resistant, corrosion resistant, exchangeable type heat flow measurement offering low signal time constant
B. Temperature		
B 1	Temperature range	RT-1600°C or better
B 2	Temperature accuracy	±1°C or better
B 3	Temperature precision	±0.01°C or better
B 4	Heating/cooling rate	0.01-100°C/min or better
B 5	Temperature repeatability	±0.1°C or better
C. DSC		
C 1	Measurement type	Heat flux
C 2	Heat flow digital resolution	±0.1 μW or better
C 3	Baseline Noise	0.5 μW or better
C 4	DSC resolution	0.4 μW or better
C 5	DSC sensitivity	1 μW or better
C 6	Cp sensitivity	1 μV/mW for Indium standard or better
C 7	Cp accuracy	2% or better
C 8	Baseline Repeatability (RT-1600°C)	<20 μW or better
C 9	Baseline Accuracy (RT-1600°C)	<30 μW or better
D. Samples		
D 1	Pan material with lid	Alumina (100 μL) - 20 Pcs Platinum (100 μL) - 10 Pcs
D 2	Crimpling tool	To be used to crimple samples
D 3	Pan arrangement	Vertical
D 4	Gas atmosphere	Inert, vacuum, oxidizing, reducing
D 5	Vacuum	10 ⁻³ mbar or better
D 6	Calibration standards	Low-temperature standards: (Sn, Pb, In, Zn, Al) High-temperature standards: (Ni, Ag, Au, Pd, sapphire, Al ₂ O ₃ , K ₂ Cr ₄)
D 7	Sample type	Powder/liquid/thin films/solid
E. Accessories		
E 1	Gas control	Software controlled gas flow through Mass Flow controller (MFC) for minimum of 3 gases (Ar, N ₂ , O ₂ , with Variable flow rate. Also, with an option of mixing of carrier gases with another auxiliary or reactive gaseous fluids. Mention lowest and highest flow rates.
E 2	Gas flow and controller	MFC (3 carrier gases-auxiliary and reactive gas)
E 3	Cylinders	Nitrogen Gas Cylinder 99.999% 01 Nos.

		Air Gas Cylinder 01 Nos. S.S double stage regulators 04 Nos. Filtration Unit 01 Nos. Oxygen trap To be included as option.
E 4	Computer and printer	One branded desk top computer processor Intel core i7 @ 3.40 GHz Ram 16 GB, Memory 1TB, Screen 23 inch or more, DVD write drive, key board and mouse with laser jet multi functional printer with high speed USB, wireless connect, up to 26 pages per minute and toner capacity 1200 pages or more for running the equipment and software. Vendor may also quote all in one desktop with the same specification. With original/latest operating software.
E 5	Principle of operation	Heat Flux. System should provide raw data without mathematical treatment/Deconvolution/smoothing/baseline correction. Heat flow measurements in Static as well as Dynamic Gas Atmospheres essential.
E 6	Data acquisition/processing system	Windows based software should enable automatic/manual online data acquisition and display of running measurement, Calibration. The multi-tasking software should facilitate storage of both raw DSC data as well as deconvoluted data in the form of standard DSC curves. There should be the facility of choosing different baselines e.g. line, tangential, horizontal, spline, Integral tangential, polygon line etc for correct evaluation/integration of peaks. Options for Baseline correction, data smoothing, plot expansion, Curve overlay unlimited, Font selection etc. should be provided. Storage of results in tabular form (ASCII format) should be facilitated.

Other requirements

Other requirements:

- (i) Manuals (both electronic and hard copy)
- (ii) Installation: The satisfactory free installation to the full specifications of the machine with all accessories at TIET within one month of receipt of goods at TIET. Any additional equipment/accessory for the installation of the system should be quoted invariably. Institute will provide only space and electrical connection.
- (iii) Training: Free training to operators and students/staffs to the satisfaction.
- (iv) Consumables and other items required to handle the system while operating all measurement options, must be quoted for enough quantity for uninterrupted operation of the machine for at least ONE year.
- (v) Quote separately for all optional items/accessories, optical components and consumables which are not explicitly specified above however required for smooth functioning of the machines.
- (vi) A list of institutes with complete contact details in India where the same equipment in this document has been sold or is under operation should be provided. Prospective vendor should clearly mention the type of measurement options (along with the main system) supplied to these institutes.

Warranty/AMC:

- (a) Minimum one (01) year on-site Warranty/ Guarantee commencing from the date of complete and satisfactory installation of the equipment against the defect of any manufacturing, workmanship and poor quality of the components. The bidder also must agree and issue a certificate stating that technical query will be responded within 2 working days and the on-site support will be provided within 07 working days from the date of reporting of the technical failure for down time free operation of the instrument.
- (b) Warranty on lasers must be one year OR more from the date of installation.

Extension of warranty (OPTIONAL):

- (a) Quote for extension of warranty for (i) 12 months and (ii) 24 months with terms and conditions as stated above (standard one -year warranty).
- (b) AMC (annualized) for 60 months after completion of one year - standard warranty

NECESSARY NOTE:

1. Just complying above specifications will not warrant qualifying for the price bid stage. Short listing of valid technical quotes will be done before the price bid opening. Short listing of the quotations will be done on the basis of technical quality/level of quoted components of system, experimental flexibility, Installations in India, indenter's hands-on experience on various systems, user feedbacks, etc.
2. Shortlisted vendors will be provided an opportunity to present the technical aspect of their product before a competent technical evaluation panel at TIET. The panel may ask the selected vendors to arrange demonstration/measurement on their machine at user facility.

TERMS AND CONDITIONS:

1. The printed manufacturer documents supporting above mentioned technical specifications/points must be provided. Each point given in the specification sheet must be clearly visible and highlighted in COLOR.
2. Omission of any technical point given in specification sheet OR failing to provide clear documentary support of any of technical points may lead to the rejection of the quotation without any clarification from the vendor.
3. Validity of quote should be at least **120 days** from the date of submission.
4. **Price** must be quoted component wise. Failing will disqualify the quote.
5. Supply list of part numbers with the quote.
6. Vendors should submit **LIST** of previously (2016 - onwards) installed DSC systems with the quote bearing complete address and contact details of the user (phone no and email ID).
7. In case the vendor is not OEM, original authorization certificate with validity from the OEM is required for consideration of the quote.
8. A certificate from OEM explicitly mentioning that the spare parts/accessories will be made available for 10 years from the date of discontinuation of the model by the manufacturer.

Sr. No.	Required Indent Specifications	Please mention your remarks, details or mention the value of specifications (Yes/No, better or specify)
1	Is the bidder original equipment manufacturer (OEM)/authorized dealer?	
2	If authorized dealer, recent dated certificate to this effect from OEM, attached or not?	
3	Undertaking from OEM regarding technical support & extended warranty.	
4	Offer validity of 120 days or not?	
5	Undertaking from bidder regarding acceptance of terms & conditions	
6	List of reputed users for the past three years (2016 - onwards) specific to the instrument model quoted	
7	Whether special educational discount for TIET given	
8	Whether one week of training of operator and research students without any charge offered?	
TECHNICAL SPECIFICATIONS		
1	Furnace: (i) Furnace material: Good heating element with proper insulation (ii) Thermocouple: Chemical resistant, corrosion resistant, exchangeable type heat flow measurement offering low signal time constant	
2	Temperature: (i) Temperature range: RT-1600°C or better (ii) Temperature accuracy: $\pm 1^\circ\text{C}$ or better (iii) Temperature precision: $\pm 0.01^\circ\text{C}$ or better (iv) Heating/cooling rate: $0.01-100^\circ\text{C}/\text{min}$ or better (v) Temperature repeatability: $\pm 0.1^\circ\text{C}$ or better	
3	DSC: (i) Measurement type: Heat flux (ii) Heat flow digital resolution: $\pm 0.1\mu\text{W}$ or better (iii) Baseline Noise: $0.5\mu\text{W}$ or better (iv) DSC resolution: $0.4\mu\text{W}$ or better (v) DSC sensitivity: $1\mu\text{W}$ or better (vi) Cp sensitivity: $1\mu\text{V}/\text{mW}$ for Indium standard or better (vii) Cp accuracy: 2% or better (viii) Baseline Repeatability (RT-1600°C): $<20\mu\text{W}$ or	

	better	
4	(ix) Baseline Accuracy (RT-1600°C): <30 μW or better	
	Sample:	
	(i) Pan material with lid: Alumina (100μL) - 20 Pcs Platinum (100μL) - 10 Pcs	
	(ii) Crimping tool: To be used to crimple samples	
	(iii) Pan arrangement: Vertical	
	(iv) Gas atmosphere: Inert, vacuum, oxidizing, reducing	
	(v) Vacuum: 10 ⁻³ mbar or better	
	(vi) Calibration standards: Low-temperature standards: (Sn, Pb, In, Zn, Al) High-temperature standards: (Ni, Ag, Au, Pd, sapphire, Al ₂ O ₃ , K ₂ Cr ₄)	
(vii) Sample type: Powder/liquid/thin films/solid		
5	Accessories:	
	(i) Gas control: Software controlled gas flow through Mass Flow controller (MFC) for minimum of 3 gases (Ar, N ₂ , O ₂ , with variable flow rate. Also, with an option of mixing of carrier gases with another auxiliary or reactive gaseous fluids. Mention lowest and highest flow rates.	
	(ii) Gas flow and controller: MFC (3 carrier gases- auxiliary and reactive gas) Nitrogen Gas Cylinder 99.999% 01 Nos. Air Gas Cylinder 01 Nos. S.S double stage regulators 04 Nos. Filtration Unit 01 Nos. Oxygen trap To be included as option	
	(iii) Computer and printer (Provide key specification/model and make details)	
	(iv) Principle of operation: Heat Flux. System should provide raw data without mathematical treatment/ Deconvolution/ smoothening/ baseline correction. Heat flow measurements in Static as well as Dynamic Gas Atmospheres essential.	
(v) Data acquisition/procession system: Windows based software should enable automatic/ manual online data acquisition and display of running measurement, Calibration. The multi-tasking software should facilitate storage of both raw DSC data as well as deconvoluted data in the form of standard DSC curves. There should be the facility of choosing different baselines e.g line, tangential, horizontal, spline, Integral tangential, polygon line etc for correct evaluation/integration of peaks. Options for Baseline correction, data smoothening, plot expansion, Curve overlay		

	unlimited, Font selection etc. should be provided. Storage of results in tabular form (ASCII format) should be facilitated.	
6	Other Requirements (YES/NO and mention specific details)	
	(i) Manual - technical aspects with service details (electronic and hard copy)	
	(ii) Installation - Details of the space, power provided	
	(iii) Training - Free training to TIET operators and students.	
	(iv) Warranty (give details including scope, no. of visits, etc.).	
	(v) Power supply: 220-230 VAC, single phase or specify the power requirements for all the components in the technical quotation.	
	(vi) Standard sample for calibration provided	
	(vii) Tool kit and consumables for one year uninterrupted operation.	
7	The bidder must agree and issue a certificate stating that technical query will be responded within 02 working days and the support will be provided within 07 working days from the date of reporting of the technical failure for down time free operation of instrument.	
8	A list of institutes (with details) in India where same equipment (with all options in this document) has been sold or is under operation should be provided. Prospective vendor should clearly mention the type of measurement options (along with the main system) supplied to these institutes.	
9	Installation: The satisfactory free installation to the full specifications of the machine with all accessories at TIET within one month of receipt of goods at TIET. Any additional equipment/accessory for the installation of the system should be quoted invariably.	