

**TECHNICAL SPECIFICATION for**  
**Lock-in amplifier (1 mHz – 100 KHz or above ( Item 1)**

Lock-in amplifier (1 mHz – 100 KHz or above)				
S.No	Description	Comply / Not Comply	Reference Page No.	Remarks if any
1	INTERNAL OSCILLATOR			
	Operating frequency range	≤ 1 mHz to ≥ 100 kHz.		
	Frequency Accuracy	50 ppm or better		
	Frequency Resolution	<3 mHz		
	Output Impedance	50 Ω		
	Amplitude	Amplitude Accuracy 2% or better		
	Amplitude Stability	100 ppm/°C or better		
	Outputs	Working over the frequency of 1 mHz to at least 100 kHz with both sinusoidal and TTL outputs.		
2	DUAL INPUT			
	Voltage Inputs	≤ 10 mV to ≥ 1 V		
	Full Scale Sensitivity	≤ 10 nV to ≥ 1 V		
	Input Noise	6 nV/√Hz or better at 1 kHz.		
	Signal Filters	60 (50) Hz and 120(100) Hz notch filters (Q=4).		
	Dynamic Reserve	Greater than 100 dB (with no signal filters).		
	Voltage detection	Input impedance must be at least 10 mega Ohms		
3	REFERENCE CHANNEL			
	Frequency Range	≤ 1 Hz to ≥ 100 kHz		
	Reference Input	TTL (rising or falling edge) or Sine. Sine input is 1 MΩ, AC coupled (>1 Hz). 400 mV pk-pk minimum signal or better.		

	Phase Resolution	0.01° or better			
4	DISPLAYS	Chanel 1 and 2			
5	OUTPUTS				
	Phase of the output of the internal oscillator	Must be continuously tunable over the range of 0-180 degrees.			
	The voltage output of the internal oscillator	Should be tunable from at least 10 mV up to at least 1 V.			
	Output Voltage	±10 V full scale. 10 mA max output current.			
	Aux. Outputs	BNC Digital to Analog outputs. ±10.5 V full scale, 1 mV resolution or better. 10 mA max output current.			
	Aux. Inputs	BNC Analog to Digital inputs.  Differential inputs with 1 MΩ input impedance on both shield and center conductor. ±10.5 V full scale, 1 mV resolution.			
	Trigger Input	TTL trigger input triggers stored data samples.			
	The stability of the analog outputs	0.3 % or better			
6	DEMODULATOR				
	Zero Stability	Digital displays have no zero drift on all dynamic reserves. Analog outputs: <5 ppm/°C for all dynamic reserves.			
	Time constants	200 μs to 1 ks or better			
7	Ability to interface the system with a computer	GPIB or RS-232 or USB interfaces			
8	Working voltage	220V at 50Hz			
9	Warranty	Three years standard warranty on parts and labor on defects in materials and workmanship			

(Item 2)

Lock-in amplifier (1 Hz - 1 MHz or above)					
S.No	Description		Comply / Not Comply	Reference Page No.	Remarks If any
1	INTERNAL OSCILLATOR				
	Operating frequency range	$\leq 1 \text{ Hz}$ to $\geq 1 \text{ MHz}$			
	Frequency Accuracy	50 ppm or better			
	Frequency Resolution	$<3 \text{ mHz}$			
	Output Impedance	$50 \Omega$			
	Amplitude	Amplitude Accuracy 2% or better			
	Amplitude Stability	100 ppm/ $^{\circ}\text{C}$ or better			
	Outputs	Working over the frequency of 1 Hz to at least 1 MHz with both sinusoidal and TTL outputs.			
2	DUAL INPUT				
	Voltage Inputs	$\leq 10 \text{ mV}$ to $\geq 1 \text{ V}$			
	Full Scale Sensitivity	$\leq 10 \text{ nV}$ to $\geq 1 \text{ V}$			
	Input Noise	6 nV/ $\sqrt{\text{Hz}}$ or better at 1 kHz.			
	Signal Filters	60 (50) Hz and 120(100) Hz notch filters (Q=4).			
	Dynamic Reserve	Greater than 100 dB (with no signal filters).			
	Voltage detection	Input Impedance $10 \text{ M}\Omega + 25 \text{ pF}$ , ac ( $>1 \text{ Hz}$ ) or dc coupled			
	Input Noise	4.5 nV/ $\sqrt{\text{Hz}}$ or better, above 1 kHz, 10 mV input range			
3	REFERENCE CHANNEL				
	Frequency Range	$\leq 1 \text{ Hz}$ to $\geq 1 \text{ MHz}$			
	Reference Input	TTL (rising or falling edge) or Sine. Sine input is $1 \text{ M}\Omega$ , AC coupled ( $>1 \text{ Hz}$ ). 400			

		mV pk-pk minimum signal or better.			
	Phase Resolution	0.01° or better			
4	<b>OUTPUTS</b>				
	Phase of the output of the internal oscillator	Must be continuously tunable over the range of 0-180 degrees.			
	The voltage output of the internal oscillator	Should be tunable from at least 10 mV up to at least 1 V.			
	Output Voltage	±10 V full scale. 10 mA max output current.			
	Aux. Outputs	BNC Digital to Analog outputs. ±10.5 V full scale, 1 mV resolution or better. 10 mA max output current.			
	Aux. Inputs	BNC Analog to Digital inputs. Differential inputs with 1 M $\Omega$ input impedance on both shield and center conductor. ±10.5 V full scale, 1 mV resolution.			
	Trigger Input	TTL trigger input triggers stored data samples.			
	The stability of the analog outputs	5 ppm/°C stability			
5	<b>DEMODULATOR</b>				
	Zero Stability	Digital displays have no zero drift on all dynamic reserves. Analog outputs: <5 ppm/°C for all dynamic reserves.			
	dc Stability	Digital output values have no offset drift			
	Low Pass Filters	Typical RC type filters or Advanced Gaussian/Linear Phase filters			
	Time constants	200 $\mu$ s to 1 ks or better			
6	Ability to interface the system with a computer	GPIB or RS-232 or USB interfaces			

8	Working voltage	220V at 50Hz			
9	Warranty	Three years standard warranty on parts and labor on defects in materials and workmanship			

The bidder should have supplied the same or similar items to a minimum of three different companies in India /globally. copies of relevant documents proving the supply of products should be submitted along with the bid.

1. Bidders need to quote for both the Item 1 & Item 2. Partial quoting is not acceptable
2. IITM reserves right to purchase either Item 1 & Item 2 combined or separately after arriving the L1 value.

For Technical queries, kindly contact

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(Note: It is mandatory for the bidders to provide the compliance statement in tabular column format along with catalogue page number (comply/not comply) for the Above points with document proof as required. Failing which bidders will be technically disqualified)