

**GOVERNMENT OF INDIA
DEPARTMENT OF SPACE
ISRO SATELLITE CENTRE (ISAC)
AIRPORT ROAD, VIMANAPURA POST
BANGALORE 560 017**

TENDER NOTICE NO.23 DATED 18.06.2003

On behalf of President of India, Head, Purchase & Stores, ISRO Satellite Centre (ISAC) Bangalore 560 017 invites sealed tenders for the supply of the following items:

SL NO	TENDER REFERENCE	BRIEF DESCRIPTION	QTY	TENDER FEE INCL OF S.TAX
01.	PAB 3GS 0973L	PRESSURE REGULATOR WITH STANDARD NITROGEN CYLINDER END ATTACHMENT	06 Nos.	Rs.109/-
02	PAC 3RE 0053F	AEROSPACE QUALITY HEXAGONAL NUTS	As per document	Rs.217/-
03.	PAS 3XA 117L	SQUIRREL CAGE INDUCTION MOTOR	01 No.	Rs.109/-
04.	PIK 3XA 0079F	PIEZO ELECTRIC ACCELEROMETERS (TWO PART TENDER)	60 Nos.	R.217/-
05.	PJS 3XA 0159L	VDBM INSTRUMENTATION	01 No.	Rs. 217/-

DUE DATE FOR RECEIPT OF TENDER : 31st JULY 2003 AT1600HRS.(IST)
TENDER OPENING DATE : 1st^h AUGUST 2003 AT 1000HRS.

NOTE:

1. Those who desirous of not utilizing the website shown at clause 16 can also buy the tender documents from Asst Purchase Officer, Purchase & Stores Division, ISRO Satellite centre, Airport Road, Vimanapura PO. Bangalore 560 017, India on payment of non-refundable tender fee as indicated above, on all working days between 1400Hrs to 1600Hrs.
2. Tender fee shall be payable only in the form of bank draft drawn in favour of Accounts Officer, ISRO Satellite Centre, payable at Bangalore. No other mode of payment for tender fee is acceptable.
3. Venders/firms name and tender no. shall be indicated on the reverse side of the Demand Draft.
4. While requesting for tender documents, please do not superscribe tender number and due date on the envelope.
5. Detailed specification, terms and conditions are furnished in the tender documents.
6. DD should not be dated prior to the date of advertisement / Intimation / website. Separate requests and demand drafts shall be sent for each tender document.
7. ISAC will not be responsible for non-receipt of tender documents/offers due to postal delay / loss in transit.
8. Quotations received without payment of tender fee will be treated as unsolicited.
9. Indian agents while quoting on behalf of their principals are requested to provide necessary authorisation letter from their principals
10. The offer should be valid for the period of ninety days from the date of opening.
11. Quotations received after the due date and time will not be considered.
12. While submitting your offer please super scribe tender no. and due date on the envelope.
13. If tender opening date happens to be a public holiday tender will be opened on the next working day.
14. No request for the extension of the due date will be considered.
15. Head, Purchase and Stores ISAC reserves the right to accept or reject any tenders in part or full without assigning any reasons thereof..
16. Tender documents are also available on ISRO Web site www.isro.org of Tender Notice No.23 dtd 18.06.2003. Interested tenderers may, at their option, download the tender documents from website and submit offers along with the prescribed tender cost (In terms of Bank Draft) as per details in the tender notification.

PIK 3XA 0079F

Detailed Specification for ACCELEROMETERS (Two Part Tender)

Sl. No.	Specification	TYPE 1	TYPE 2	TYPE 3
	Quantity Required	15 nos.	20 nos.	25 nos.
1.	Sensor	Shear type Piezoelectric sensor with integral electronics.	Shear type Piezoelectric sensor with integral electronics.	Shear type Piezoelectric sensor with integral electronics.
2.	Range	$\geq \pm 500$ g	$\geq \pm 500$ g	$\geq \pm 500$ g
3.	Shock limit	≥ 2000 g	≥ 5000 g	≥ 5000 g
4.	Weight	≤ 0.5 grams excluding connector and cable	≤ 12 grams.	≤ 12 grams.
5.	Size	Less than 7 mm (L) X 7 mm (W) X 5 mm (H)	Base dia < 16 mm Height < 20 mm including connector	Base dia < 16 mm Height < 10 mm
6.	Construction	Low profile, Anodized Aluminum or Stainless Steel case material, epoxy or hermitically sealed.	Stainless Steel case material, Hermetically sealed.	Low profile, Stainless Steel case material, Hermetically sealed.
7.	Electrical connection	Replaceable cable at the side of the sensor terminated at the other end with 10-32 UNF jack (for connecting to standard extension cable with 10-32 plug connector without using I-connector).	10-32 UNF female connector at the top of the sensor. (Top connector)	10-32 UNF female connector at the side of the sensor.
8.	Mounting arrangement	Adhesive.	Removable stud with 10-32 (or M5) thread.	Screw type mounting with a centrally located through hole permitting 360° orientation of output connector. (Metric size screw preferable.)
9.	Case isolation	Signal ground isolated <i>from case / mounting</i>	Isolated stud <i>to be provided</i>	Signal ground isolated <i>from case / mounting</i>

Sl. No.	Specification	TYPE 1	TYPE 2	TYPE 3
		from case / mounting surface.	to be supplied along with the sensor.	from case / mounting surface.
10.	Sensitivity (nominal)	10 mV/g	10 mV/g	10 mV/g.
11.	Frequency response	2 Hz to 15 KHz or better with ± 1 dB deviation in sensitivity.	2 Hz to 10KHz or better with ± 5 % deviation in sensitivity.	2 Hz to 10KHz or better with ± 5 % deviation in sensitivity.
12.	Amplitude linearity	Better than 1% of full scale.	Better than 1% of full scale.	Better than 1% of full scale.
13.	Cross axis response (Transverse sensitivity)	$\leq 5\%$	$\leq 5\%$	$\leq 5\%$
14.	Output Characteristics			
14.1	Output voltage	± 5 V Full scale	± 5 V Full scale	± 5 V Full scale
14.2	Output impedance	<120 Ohms	<120 Ohms	<120 Ohms
14.3	DC output bias voltage	8V to 11V typical	8V to 11V typical	8V to 11V typical
14.4	Residual noise	< 0.002 gRMS	< 0.002 gRMS	< 0.002 gRMS
15.	Input DC supply	18V to 24V @ 2-10Ma	18V to 24V @ 2-10mA	18V to 24V @ 2-10mA
16.	Operating temperature range	- 55 °C to + 125 °C	-55 °C to + 125 °C	- 55 °C to + 125 °C

NOTE:

1. Detailed catalog with drawings should be provided for each model quoted.
2. Optional accessories should be quoted separately.
3. **Quantity discounts** for ordering quantities of **1 to 10, 11 to 20, 21 to 30** numbers should be given in the quote.
4. Calibration certificates (calibration data) should be supplied along with each sensor.

SPECIAL INSTRUCTIONS FOR TWO PART TENDER

For preparing an offers in response to the two part tender called for:
We propose to receive offers in response to this tender in Two parts as follows:

PART ONE

This should consist of two sections viz., (a) Technical And part (b)
Commercial

(a) Technical : This section should consist of :

- All the technical specifications of the items options And accessories offered by you.
- Relevant leaflets and literature and any other technical matter Pertaining to the items offered.

(b) Commercial : All the commercial points to be indicated (other than prices) should come in this section for example:
Delivery terms and delivery period Payment terms (our standard terms i.e. 100% Payment within 30 days after receipt and Acceptance)

- Validity period of the offer (120 days required)
- Warranty / Guarantee applicable
- Installation details such as installation is done Free of cost or not
- If not indicate “ installation charges indicated in Price part ”.
- Whether training is required; if so, free of cost, if not if not indicate “ training charges indicated in price part”.
- “ Approximate weight of the consignment “.

Note : (1) Part 1 prepared as above should be Enveloped and
Superscribed Technical & Commercial part 1

Reference no :.....
Due date :.....

Note : (2) Part 1 should not contain any price details

PART II (PRICE PART)

This part should consist of :

- Prices of the unit and total amount for the items offered (with break-up wherever required) :
Prices of option and accessories Installation charges & Training
(if not free)

Where the quotation is on Ex Works basis Packing forwarding and inland freight charges if any Price part (Part II) thus prepared should be Enveloped separately and superscripted as.

“ Price part part II “
“ Reference no:
“ Due Date:

Note: (3) Both the envelopes (Part 1 and part II)

Prepared as above should be placed in another envelope and superscribed as Follows:

Reference no:
Due date:

Part I & part II individually enveloped inside:

TO:

THE HEAD, PURCHASE AND STORES
ISRO SATELLITE CENTRE
GOVERNMENT OF INDIA
DEPARTMENT OF SPACE
AIRPORT ROAD
VIMANAPURA POST
BANGALORE: 56 00 17

NOTE: (4) THE ABOVE SHOULD REACH US ON OR BEFORE THE DUE DATE AND TIME

NOTE : (5) HEAD, PURCHASE AND STORES ISRO SATELLITE CENTRE, GOVT. OF INDIA, DEPARTMENT OF SPACE, AIRPORT ROAD, VIMANAPURA POST, BANGALORE:56 0 017, INDIA. RESERVES THE RIGHT OF ACCEPT OR REJECT ANY OF THE QUOTATION IN FULL / PART THEREOF WITHOUT ASSIGNING ANY REASONS.

PAB 3GS 0973L

Specification:

High pressure regulator with inlet and outlet pressure gauges.

Maximum inlet pressure : 200 bar

Inlet gauge range : 0 to 200 bar

Outlet gauge range : 0 to 12 bar

Operating temperature range : -65deg F to + 180deg F

Pressure regulator end attachment (as per IS 3224)

Materials of Construction:

Body : Stainless Steel
Seat : Stainless steel
Seals : Teflon and Stainless steel.
Diaphragm : Stainless steel.
Gauges : Stainless steel bourdon tubes and cases.

Note: Standard test certificate, technical literature and brochure has to be given along with item supplied.

PAC 3RE 053F

SPECIFICATION:

AEROSPACE QUALITY HEXAGONAL NUT

**ISO METRIC THREAD PROFILE SELF LOCKING WITH IN BUILD
WASHER SELF LOCKING BY UPPER THREAD FORMED OUT OF ROUND
THREAD CLASS 4H 5H**

MATERIAL : TITANIUM (Ti – 6AL – 4V)

**FINISH : ANODISED AND COATED WITH MOLYBDENUM – DI-SOLPHIDE
DRY LUBRICANT**

- 1. M4 X 0.7 mm PITCH – HEXAGONAL - 5000 Nos.**
- 2. M6 X 1.0 mm PITCH - HEXAGONAL - 2000 Nos.**

PAS 3XA 117L

SQUIRREL CAGE INDUCTION MOTOR

Squirrel Cage Induction Motor

Quantity : 01 No.

Specifications of the motor:

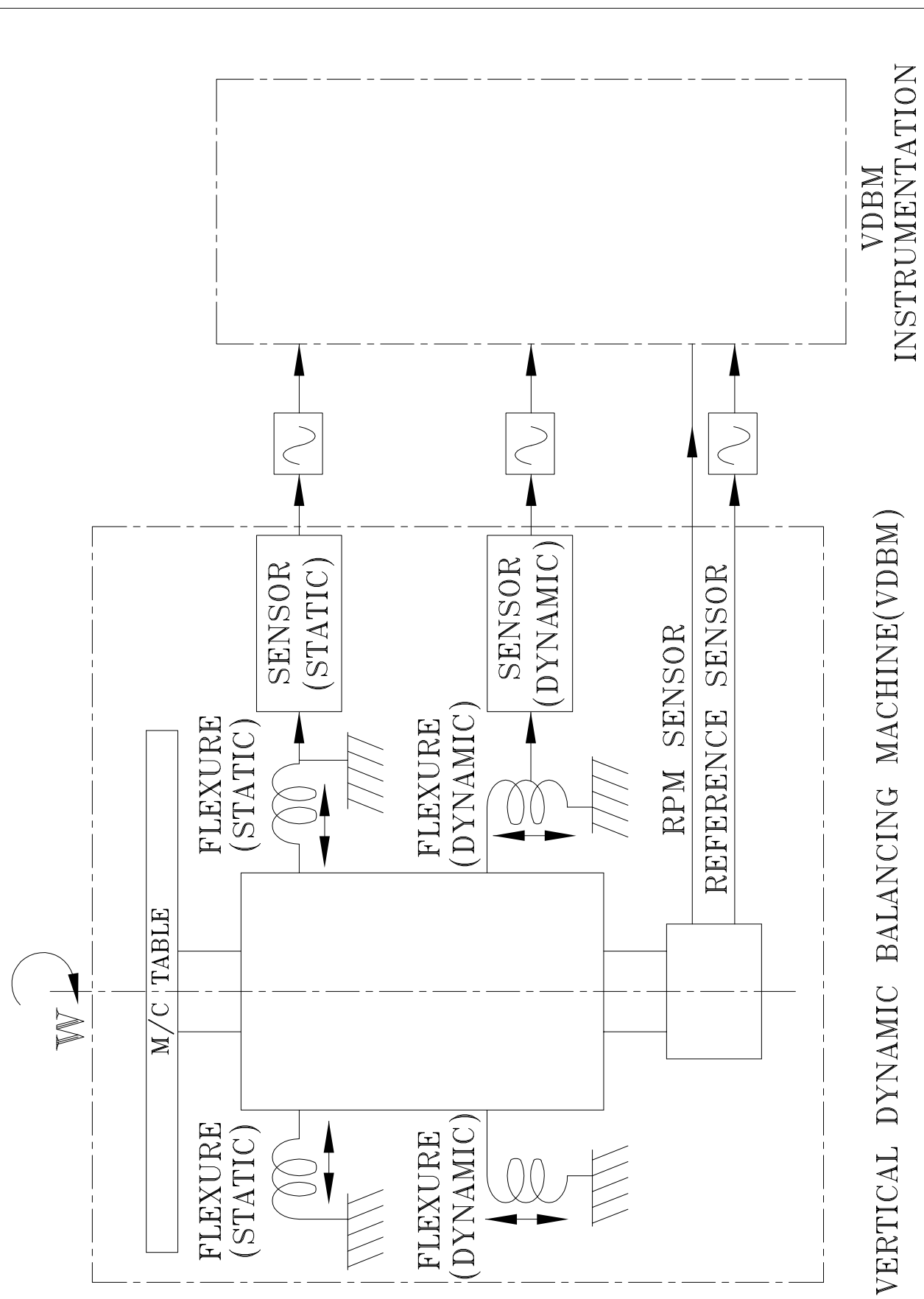
The motor must confirm to IS 325 or IEC 60 034-1 standards.

1) H P / kW	:	120/90
2) Type	:	Squirrel cage induction motor
3) Voltage	:	415 Volts
4) Phases	:	3
5) Frequency	:	50 Hz
6) Speed	:	1440 RPM (nominal)
7) Duty	:	S1 (Continuous)
8) Insulation	:	Class F
9) Protection	:	IP 55
10) Frame size	:	280M
11) Mounting	:	B3 Foot mounting

The quotation must be complete with detailed specifications, dimensions/drawings and applicable standards.

FIG:1.0

VERTICAL DYNAMIC BALANCING MACHINE(VDBM)



VDBM INSTRUMENTATION TO BE SUPPLIED BY VENDOR

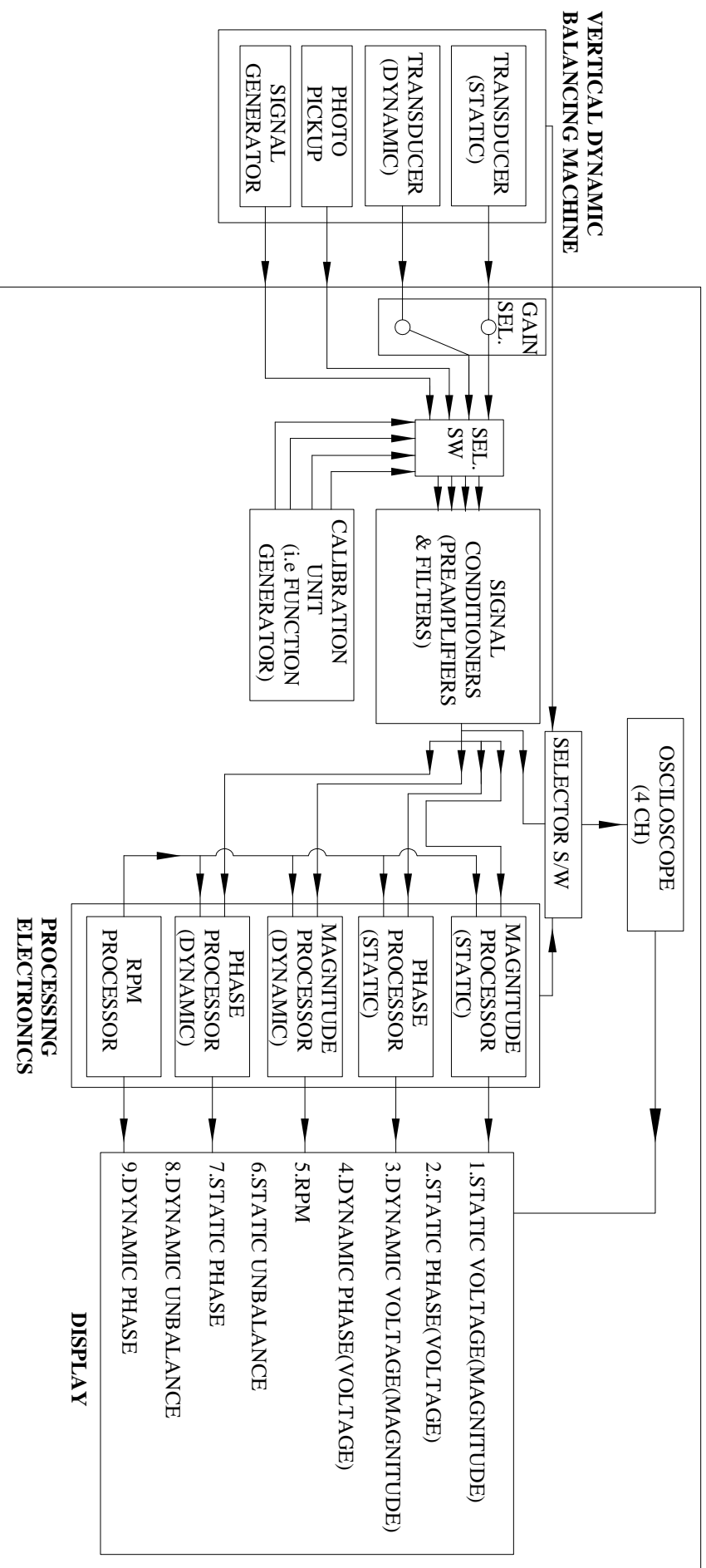


Fig. 1.1: VDBM INSTRUMENTATION

VDBM INSTRUMENTATION

1.0.INTRODUCTION:

Vertical Dynamic Balancing Machine (VDBM) is used for dynamic balancing of spacecrafts, rockets & other payloads. Refer figure 1.0 which schematically shows the block diagram of Vertical Dynamic Balancing Machine (VDBM). It consists of a machine Table, drive assembly, bearings, Flexures, Transducers, etc., Machine table is precisely machined having an interface to receive the payload for balancing. Drive assembly with DC motor & chain of pulleys enables to rotate the payload to be balanced at required speed. Unbalance (static & dynamic) in the payload induces vibratory motion of the flexures. This vibratory motion is simple harmonic motion (SHM) in nature but mixed with lot of harmonics (noise) due to AC power supply, drive assembly, etc., This vibratory motion signal is fed to the transducers (static & dynamic) through mechanical amplifiers. A reference pulse generator is mounted below the machine pulley which generates the pulse frequency equal to running speed of the machine. By comparing reference pulse with the unbalance (static & dynamic) signal phase is measured. A disc (with 180 holes) is also mounted below the machine spindle which generates 180 pulses for every revolution of the VDBM using photo pick up unit for RPM processing.

The vendor is expected to design the instrumentation, assemble the standard instrumentation components consisting of signal conditioners, signal processors , PC etc., as shown in figure 1.1.& to display the following values on PC

- 1) Static voltage (V_s)
- 2) Static angle (θ_s)
- 3) Dynamic voltage (V_d)
- 4) Dynamic angle (θ_d)
- 5) RPM

These values are to be used as input(either automatic or manual) for mathematical computations using standard programming languages & the result of the computed values are to be displayed on the PC monitor.

The whole system supply to be executed on a turnkey basis.

2.0.INSTRUMENTATION SYSTEM FOR VDBM:

The instrumentation system consists of the following
(Refer figure 1.1):

- 1) Transducers & pickups
- 2) Signal conditioners
- 3) Signal processors.
- 4) Data Processing system.
- 5) Safety circuit.
- 6) Calibration circuit.

The vendor has to design, assemble, test & supply all the above instrumentation system (except sl.No:1) housed in a standard 19" rack.

2.1.Transducers & pickups:

Unbalance forces produce oscillatory motion of the flexure elements. This oscillatory motion is Simple Harmonic(SH) in nature but mixed with noise. Magnitude & direction of unbalance is calculated by measuring the amplitude & phase of these motions after conditioning & processing the signals. The following transducers are incorporated with the VDBM. Vendor may note that the electrical output from the transducers are available from the VDBM for conditioning, processing & displaying on the PC.

- a)Two transducers which gives SH output (mixed with noise).
- b)Signal generator which generates a sine signal of constant amplitude (approximately 10 V(PP) and the frequency is equal to the machine spindle speed (varies from 0.1 Hz to 5 Hz).
- c)Photo pick-up which generates 180 pulses/revolution.

2.1.1. Transducers: This unit is part of VDBM. The vendor is expected to use this output for conditioning & processing to display unbalance voltages & their phase.

Following are specifications of these transducers:

- i)Output : 1 mV to 10 V (Sinusoidal wave)
- ii)Operating frequency : 0.1 Hz to 5 Hz

2.1.2. Signal generator: This generates a standard sine/cosine signal of amplitude of about 10V (P-P) which is used as a reference. The frequency of this signal is equal to the running frequency of the machine spindle. The peak of this pulse is compared with the peak of unbalance signals to determine the phase difference between the two signals.

2.1.3.Photo pick-up: Photo pickup assembly is used to generate 180 pulses per revolution of the spindle. The pulses can be processed to get RPM of the machine.

2.2.Signal conditioners: The electrical output from velocity transducers contain noise of in band: 0.2 Hz to 5 Hz (due to pulleys, belt.etc.,) & Out band : 6 Hz – 50 Hz (due to rotating parts of the machine, AC signal, etc.,) of the desired signal. This noise need to be eliminated using low pass filter & high pass filter to make a sharp band pass. We insist the vendor to use standard units containing Low pass/high pass switchable unit to make a sharp band pass filter. The selected filters should have minimum attenuation characteristics of 80 db/ decade & can be fitted to standard 19" rack.

The following are the specifications of the signal from transducers.

- i)Voltage range : 5 mv to 10 volts (0 to peak)
- ii)Frequency : 0.1 to 5 Hz.

The filter units should be from reputed make such as KEMO/Spectral Dynamics /NEC /AGILENT/MEASUREMENTS GROUP & complete specification including make & model number must be specified in the offer. Gain & phase characteristics of the selected filters from 6 RPM to 300 RPM (1Hz=60 RPM) in steps of 1

RPM should be supplied for the selected low pass & high pass when the unit is delivered to us.

2.3.Signal processors: Signal processors have to process the signals from Signal conditioners i.e filters. After processing, the outputs should be stored as variables for feeding them into a software programme. Following Signal processor units should be contained in the instrumentation to process the filtered output from Signal conditioners.

- a)Static magnitude processor.
- b)Static Phase processor.
- c)Dynamic magnitude processor.
- d)Dynamic Phase processor.
- e)RPM processor.

2.3.1. Static magnitude processor: Following are the inputs from the signal conditioners (filters).

- i)Voltage range : 5mv to 10 volt (0 to peak)
- ii)Polarity : Bipole

The processor has to process the output from the filters and display the magnitude of static voltage in volts (i.e. digital out put). The maximum error should be with in $\pm 2\%$ (total) on magnitude.

2.3.2. Static Phase processor : The processor has to process the phase of the conditioned output with reference to standard pulse

generated by signal generator. The specifications of the phase processor outputs are given below.

- i) Range : 0 to 360 degrees
- ii) Max. input frequency : 5 Hz
- iii) Resolution : 0.5 degree
- iv) Input amplitude : 5 mv to 10volts
- v) Accuracy : +/- 1 degree

2.3.3. Dynamic magnitude processor: Following are the inputs from the signal conditioners (filters).

- i) Voltage range : 5mv to 10 volt (0 to peak)
- ii) Polarity : Bipole

The processor has to process the output from the filters and display the magnitude of dynamic voltage in volts (i.e. digital out put). The maximum error should be within $\pm 2\%$ (total) on magnitude.

2.3.4. Dynamic Phase processor : The processor has to process the phase of the conditioned output with reference to standard pulse generated by signal generator. The specification of phase processor outputs are given below.

- i) Range : 0 to 360 degrees
- ii) Max. input frequency : 5 Hz
- iii) Resolution : 0.5 degree
- iv) Input amplitude : 5 mv to 10volt (0 to peak)
- v) Accuracy : +/- 1 degree

2.3.5. RPM processor: For this, 180 pulses generated by photo pickup is the reference or the signal generator output. Suitable multipliers can be added to get the RPM of the machine to achieve

the specified resolution & accuracy. The following are the specifications of the RPM processor output.

- i) Speed range : 0.1 to 5 Hz (6 RPM to 300 RPM)
- ii) Resolution : 0.1 RPM
- iii) Accuracy : Better than $\pm 0.5\%$

2.4. Data Processing system :

Based on their design, Vendor has to select the suitable Data Processing system. However it should have following minimum Pc configuration & all the hardware elements should be of 19" rack mountable.

- 1) Industrial pc, industrial computer chassis with back plane of 10-ISA & 06 PCI slots.
- 2) All in one Pentium IV add on CPU Board 2 GHz
- 3) Accessories:
 - INTEL Pentium IV CPU 2.4 GHz & 512 KB cache RAM
 - AGP : with 128 MB RAM
 - RAM : 1 GB DDR
 - FDD : 1.44MB & 3.5" (sony)
 - HDD : 80 GB(Seagate)
 - CD writer : Sony/LG writer R48X W48X RW24X
 - Mouse : Logitech Scroll mouse (3 button)
 - SVGA PCI Bus compatible card with 4 MB RAM.
 - Cabinet with SMPS 250W
- 4) Monitor : 19" SVGA Color monitor(SAMSUNG)
- 5) Keyboard : Multimedia keyboard with drawer & telescopic slides.
- 6) UPS(1KVA & 30 minute Backup time.

Make:APC/WIPRO/POWER ONE/TVS

7) Data storage, retrieval & documentation system: suitable hp Color Laser jet printer (A3 paper size) for Data storage, retrieval & documentation system to be supplied.

8) Operating system: Windows 95/98/2000 to be pre loaded

2.5. Safety circuits:

Some of the safety circuits need to be added finally. The details & requirements will be supplied by this office after reviewing the overall designed system.

2.6. Calibration circuit:

The supplied system should have built in function generator so that the performance of the supplied system can be checked with out running the machine (i.e this circuit should simulate the machine signals with out running the machine). The instrumentation system can be either connected to the transducer outputs of the machine or to the calibration unit by means of a selector switch on the console as shown in figure 1.1.

The specifications of the function generator are given below:

Frequency range: It should cover a minimum range of
0.1 Hz to 10 Hz

Wave form : Sine, Square and Triangle

Amplitude : 0.01 mv to 20 v p-p (50 ohm)
with maximum peak current of 100 mA

Accuracy : $\pm 5\%$ of the selected frequency

Aberration : < 10%

Impedance : 50 ohm \pm 10 %

Make : HP / Tektronix / wavetek

3.0. Oscilloscope:

The supplied instrumentation system should have a digital storage Oscilloscope with selector s/w as shown in figure 1.1, So that the signal conditioners inputs & outputs can be to captured , stored & measured using cursors. The details of the Oscilloscope (rack mountable) to be supplied by the vendor are given below:

- a) Digital storage with real-time oscilloscope.
- b) Maximum sampling rate of 100 M samples (4 Channels, simultaneous), 12 bit resolution and 32 K words/ ch.
- c) DC – 100 MHz, 4 channels, 5 wave forms, 10 traces, fastest sweep time of 1 ns/div.
- d) Independent 32 – k word memory for each channel to enable automatic measurement and printer output.
- e) Auto setup function.
- f) Functions for flexible measurement such as an event trigger, automatic calibration, save/recall, comment,original wave form acquisition/processing,non stop motion wave form indication and quick auto setup function.
- g) GP IB interface.
- h) Other specifications of DSO are enclosed in annexure – 3a.
- i) Make : IWATSU / TEKTRONIX/ HP

4.0. Instrumentation Rack (19'')

All the instruments (PC, Signal conditioners, Processing electronics, Oscilloscope & other accessories) should be assembled in 19" rack. The standard 19" cabinet should be provided with following:

- AC power supply(with spike suppression) with fuse, indication, etc.,
- Power supply for all equipments & earthing provision.
- Front ventilated glass door, rear ventilated steel door, top fully ventilated steel cover & side panels. Front, rear & side doors should have hinges & lock.
- Cooling fans fitted on standard fan tray at the top of the cabinet to enable circulation of fresh air.
- Sliding tray for key board & mouse.
- Shelves & slides for equipment that need frequent operations.
- Provision for mounting all equipments & SWs
- Adjustable screw legs.

Make: VERO PRESIDENT Systems Ltd / Equivalent
Model NO: Rack 19" S12, SNC, LVD 42U.

5.0. Design of Instrumentation system:

After the design of Instrumentation system it has to be submitted for our approval. This office will study the same & suggest any corrections /safety circuits if necessary. Accordingly, vendor should implement the suggested corrections & design will be finalized .

Based on this finalized & approved design the vendor has to purchase the necessary instruments & items, Assemble, Test & Deliver the instrumentation system to our office.

6.0. Service manuals & Spares:

Service manuals of all instruments should be supplied to our office along with instrumentation system. In addition vendor should prepare the service manual of instrumentation system supplied containing design of the instrumentation system, operating& service instructions, etc.,

The vendor should supply following spares:

- Filter units (both for static & Dynamic)
- Processors (for static & Dynamic magnitude & phase)
- RPM Processor.

