

## ICAR-CIAE Bhopal, MP

### **K4b<sup>2</sup> MOBILE BREATH by BREATH METABOLIC SYSTEM**

#### **Instrument Details:**

The instrument is used for recording the oxygen consumption rate during the physiological studies in laboratory and field conditions on the agricultural tools and equipment with farm workers. The instrument can record oxygen consumption rate, heart rate, energy expenditure, pressure, temperature etc. This facility can be availed at ICAR-CIAE for measuring the physiological parameters of farm workers.

**Make:** Cosmed

**Model:** K4b<sup>2</sup>

**Specifications:**

Telemetry Distance: 1000m

O<sub>2</sub> Analyzer

Range : 7-24 %,

Response time: < 150 msec.,

Accuracy: 0.02% O<sub>2</sub>.

CO<sub>2</sub> Analyzer Range: 0-8 %,

Memory of portable unit: 5 hours of Test Data

**Parameters:**

Time, VO<sub>2</sub>, VCO<sub>2</sub>, VO<sub>2</sub>/kg, VT, R, HR, VO<sub>2</sub>/HR,

Energy Expenditure (Kcal/day),

Energy Expenditure (Kcal/min),

Energy Expenditure (Kcal/h).



#### **Charges per Subject**

Price per day: Rs 3000/- +18%GST

The facility can be availed by Universities, R&D institutions, Industry

#### **Contact**

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## VIBRATION MEASURING ANALYSER

### Instrument Details:

The instrument is used for recording the vibrations on agricultural tractors, combine harvesters, self-propelled vehicles, agricultural machines and structures in laboratory and field conditions. The instrument can be used for recording both types of vibrations namely: segmental (hand-arm) and whole-body. This facility can be availed at ICAR-CIAE for measuring vibrations on vehicles, machines and structure.

**Make:** OROS

**Model:** OR36

**Specification:**

Input channels: 8

Output channels: 2 to 6

Auxiliary BNC channels: 4

On board Hard disk: 40 GB

Battery: Integrated, 30min.

OR36 can be powered directly from vehicle battery.

**Parameters:**

Acceleration, displacement, velocity, Max, Min, RMS, Skew, Kurtosis, User selectable band pass filter, User selectable average time, Octave analysis



### Charges per sample:

Price per day: Rs 3000/- + 18% GST

The facility can be availed by Universities, R&D institutions, Industry

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## DROPLET SIZE ANALYSER

### Instrument Details:

The Spraytec droplet size analyser (Malvern Instrument) used to measure spray droplet and particle size distributions using the technique of laser diffraction. This facility can be availed at ICAR-CIAE for measuring the droplet size and particle size distribution of spray droplets coming out of the nozzles.

**Make:** Malvern Instruments

**Model:** STP5621

**Serial No:** MAL1031149

**Specification:**

**Measurement principle:** Laser diffraction

**Size range:** 0.1  $\mu\text{m}$  - 2000  $\mu\text{m}$

**Working range:** 150 mm at 0.5  $\mu\text{m}$   
extending to >1 m above 5  $\mu\text{m}$

**Accuracy:** Better than  $\pm 1\%$  on the  $D_{v50}$

**Precision / Repeatability:** Better than  $\pm 1\%$   
COV on the  $D_{v50}$

**Parameters:**  $D_{v10}$ ,  $D_{v50}$  and  $D_{v90}$ ,  
uniformity coefficient, and Droplet  
spectrum.



### Charges per Sample

Price per sample: Rs 3000+GST@18%

Number of replications: Three

Sample required: Nozzle

The facility can be availed by Universities, R&D institutions, Industry

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## Spectro-Radiometer

### Instrument Details

Hyper spectral reflectance data can be collected using the ASD FieldSpec3<sup>®</sup> spectro-radiometer (Analytical Spectral Devices Inc., Boulder, Co., USA) having spectral range of 350–2500 nm. The spectro-radiometer is equipped with three sensors; VNIR (750–1000 nm), SWIR1 (1,000–1830 nm) and SWIR2 (1830–2500 nm) with spectral sampling of 3 to 10 nm. White reference panel made of polytetrafluoroethylene is used to take reference spectrum. This facility can be availed at ICAR-CIAE for measuring hyper reflectance data of different plant surfaces.

Make: Analytical Spectral Devices Inc., Boulder, Co., USA

Model: FieldSpec3

#### Specification

FOV : 5 and 25°

Spectral range : 350-2500 nm

Spectral Resolution: 3 nm @ 700 nm ,10 nm @ 1400/ 2100 nm

Sampling Interval: 1.4 nm @ 350 - 1050 nm ,2 nm @ 1000 - 2500 nm

Scanning Time: 100 milliseconds

Connectivity: Wireless for remote data collection of up to 150' feet

White reference : Polytetrafluoroethylene

Parameters : Spectral signature in field and laboratory conditions



### Charges per Sample

Price per sample: Rs 1000/- + 18% GST

Number of replications: Five

Sample required:

The facility can be availed by Universities, R&D institutions, Industry

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## Soil Dynamics Laboratory

The soil dynamics research laboratory at Central Institute of Agricultural Engineering, Bhopal has a full scale soil bin having length: width: height(16:2.5:1,m) which is fully equipped with state-of-the art instrumentation which is one of the best soil dynamics testing laboratory in India. Here the required soil and operating condition is maintained under controlled conditions.

**Utility of soil bin system:** A variety of soil machine interactions can be studied with soil bin system in relation to soil disturbance. Soil-machine interface mechanics, soil stress, tillage energy, soil deformation characteristics, soil failure pattern etc. Soil dynamics research laboratory is very much useful for studying and research for improved understanding of soil machine interactions which is very much necessary for proper soil management and to operate machines effectively and efficiently under controlled field conditions.

### Instrument Details

Equipment/instruments available in the CIAE soil bin setup		
Sensors	Type and Range	Functions
Double 'S' load cells	3000,5000,10000N Calibrated for tension and compression	Measurement of Horizontal, vertical and side forces
Linear distance sensor Make: Sick, Germany	Laser guided, DT - 500,0-30 m range	Measurement of operational speed of tools
Angular speed sensor Make: Sick, Germany	Incremental Encoder; Accuracy:720 lines /rev	Measurement of angular speed of tools
Torque sensor Make: HBM, Germany	1000 Nm, overload:150% of maximum over load Torque: 300%, Accuracy: 0.2%	Measurement of torque of rotating tools
Data acquisition system Make: HBM, Germany Model: QuantumX840A	16 channel universal data acquisition system; Sampling rate: 19200 samples/s/channel	Acquisition of data from all the sensors
Hydraulic operated instrumented cone penetrometer	Max. penetration force:5000N, Force resolution: infinite Depth registration: 400 mm depth resolution: Infinite	Measurement of cone index of soil profile
Others	Laboratory equipment for bulk density, shear stress and moisture content	Measurement of soil physical properties

### Charges per Day

Price per day: Rs 10000/- + 18% GST

The facility can be availed by Universities, R&D institutions, Industry

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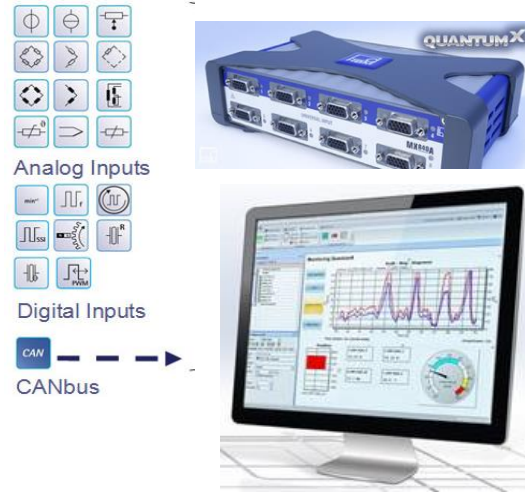
## Instrumented Tractor

In order to be able to advice on the improvement of productivity and efficiency of mechanization, it is important to measure the exact status of the current performance. With this data as basis, the engineer / technician can make proposals for improvement. Hence, to measure the soil parameters as well as on the go performance of tractor implement combination, a 60hp air conditioned cab tractor from HMT is being equipped with state-of-the art instrumentation.

### Instrument Details

Equipment/instruments available in instrumented tractor		
Sensors	Type and Range	Functions
Double ended and single ended load pins Make: BCM Sensors, Belgium	20 kN Calibrated for bending	Measurement of draft forces
Linear displacement/ position sensor Make: Micro-Epsilon	Wire draw type linear position encoder	Measurement of depth operation of tools
Angular displacement/ position sensor Make: Autonics, Korea	Absolute rotary encoder Number of lines (Z) per revolution: 1024	Measurement of angular position of links
Linear velocity sensor Make: Dickey john, USA	RVS III Radar Sensor, Range: 0.53 - 107.8 km/h, Accuracy: $< \pm 1\%$	It delivers the truest velocity measurement available
Proximity sensors	Magnetic type; Range: 5000Hz; Inductive type; Range: 5000Hz	Engine and ground wheel rotation measurement
Fuel flow sensors With display board computer Make: Aquametro, Switzerland	Oval gear type Range: 0-135 lph; Accuracy: $> 1\%$ FSD	For total and current fuel consumption measurement
Hydraulic operated instrumented cone penetrometer	Max. penetration force: 5000N, Force resolution: infinite Depth registration: 500 mm; depth resolution: Infinite	Measurement of cone index of soil profile
Universal three point linkage dynamometer	15 kN Calibrated for tension and compression	Measurement of draft forces
Data acquisition system Make: HBM, Germany; Model: QuantumX840A	16 channel universal data acquisition system; Sampling rate: 19200 samples/s/channel	Acquisition of data from all the sensors





The image shows the QuantumX data acquisition system. On the left, there are icons for various input types: Analog Inputs (voltage, current, frequency, etc.) and Digital Inputs (CAN, CANbus). On the right, there is a photograph of the QuantumX hardware unit and a screenshot of the software interface displaying a graph of data over time.

### Charges per Day

Price per day: Rs 10000/- + 18% GST

The facility can be availed by Universities, R&D institutions and Industry

### Contact

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## MINI FLASH AND FIRE POINT APPARATUS

### Instrument Details

The instrument is required to determine the flash and fire point of liquid fuels under control condition. The apparatus is a closed cup type and flash point is determined under controlled temperature conditions as per ASTM D6450.

Make: Grabner Instruments

Model: Mini Flash FLPH

Specification:

Range: 10 to 400 °C

Accuracy:  $\pm 0.2$  °C

Parameters : Flash and fire points of liquid fuels



### Charges per Sample

Price per sample: Rs 500/-

Number of replications: Five

Sample required: 100 ml

The facility can be availed by Universities, R&D institutions, Industry

### Contact

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## EDDY CURRENT DYNAMOMETER

The setup is used to determine the engine performance parameters by using liquid fuels such as diesel, biodiesel, blends of diesel and biodiesel, blends of ethanol and diesel, any renewable combustible fuels for diesel engine. The performance test of the engine will be carried out as per IS: 10000 (Part VIII):1980.

Make: SAJ-Froude  
Model: AG 20  
Specification:  
Maximum Capacity: 20 kW at 2450 rpm  
Maximum RPM: 10000  
Capacity of engine coupled: 3.73 kW at 1500 rpm



### Parameters to be measured/determined

Torque	Nm
Power	kW
RPM	Engine Speed
Engine Break Power	kW
Break Specific Fuel Consumption	g/kWh
Thermal Efficiency	%

### Engine testing charges

Price per sample: Rs 1000/-

The facility can be availed by Universities, R&D institutions, Industry

### Contact

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## ONLINE GAS ANALYZER

The online analyzer is used to measure composition of producer gas (CO, CO<sub>2</sub>, CH<sub>4</sub>, H<sub>2</sub> and O<sub>2</sub>) produced from biomass. This facility can be availed at ICAR-CIAE for measuring the gas compositions. Gas sample for analysis should be brought to the institute by using a gas collection balloon.

Make: Electronic System Tech.

Model: PGA 13

Specification:

Gas Type	Measuring Range
CO	100% Vol.
CO <sub>2</sub>	30% Vol.
CH <sub>4</sub>	20% Vol.
H <sub>2</sub>	50% Vol.
O <sub>2</sub>	25% Vol.



### Charges per Sample

Price per sample: Rs 500/-

The facility can be availed by Universities, R&D institutions, Industry

### Contact

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## Texture Analyzer

### Instrument Details

**Make of Texture Analyzer:** Stable Micro Systems, UK

**Model** : TA-XT 2i/TA-XT Plus

**Specification** : Software: Exponent Lite

Capacity: 5/25/50 Kg Load Cell



**Texture analysis has the capability of measuring virtually any physical product characteristic such as hardness, brittleness, bloom strength, fracturability, adhesiveness, gel strength, extensibility etc. of biological material matrixes.**

### Type of analysis possible

Sr. No.	Type of analysis	Report	Cost of analysis (Rs.)
1	Texture analysis of snacks and Confectionary Item	TPA (Springiness, Cohesiveness, Hardness or firmness, Chewiness, Adhesiveness, Resilience, consistency)	1500/ sample (5 replication each)
2	Texture analysis of fruits and vegetables	TPA (Springiness, Cohesiveness, Hardness or firmness, Chewiness, Adhesiveness, Resilience)	1500/ sample (5 replication each)
3.	Texture analysis of paste, smoothies and gel	Cohesiveness, Gumminess, Adhesiveness, Resilience	1500/ sample (5 replication each)
4.	Texture analysis of Dairy Products	TPA (Springiness, Cohesiveness, Hardness or firmness, Chewiness, Adhesiveness, Resilience)	1500/ sample (5 replication each)
5	Some specialized texture tests according to the test product	Specified individual test	1500/ sample (5 replication each)

### Contact Details

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## Hunter Lab Color Measurement System

### Instrument Details

**Make of Hunter LAB** : Hunter Corporation, USA  
**Model** : Labscan XE  
**Specification** : HunterLab Universal software

Capacity: Color Range L value 0-100, 'a' value -50 to +50, 'b' value -50 to +50



**Hunter color Lab is a color management system for the color analysis of food and other biological materials. Hunter Lab instrument offers accurate and reliable solutions for color quality control of the products in the form of its L\*, a\* and b\* values.**

### Type of analysis Possible

Sr. No.	Type of analysis	Report	Cost of analysis (Rs.)
1	Color analysis of processed food products	L*,a*,b* values in spreadsheet and in hard copy	200/sample (5 replications)
2	Color analysis of biological material	L*,a*,b* values in spreadsheet and in hard copy	200/sample (5 replications)

### Contact Details

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## Rheometer

### Instrument Details

**Make of Rheometer** : Anton Paar,

**Model** : MCR 51, Physica Smartpave

**Specification** : Software: Rheoplus V2.81  
Minimum torque 0.1  $\mu$ Nm  
Maximum Torque 125 mNm  
Frequency range  $10^{-4}$ Hz -100Hz



**A rheometer is a laboratory device used to measure the way in which a liquid, suspension or slurry flows in response to applied forces. It pertains to study of deformation and flow of liquid, semi-solid as well as some solid food materials. It measures the rheology of the fluid.**

### Type of analysis Possible

Sr. No.	Type of analysis	Report	Cost of analysis
1	Shear rate test, Shear stress test, Creep test, Normal force test	Values of various measured and analyzed variables in spreadsheets and graphical representations	1500/sample
2	Amplitude sweep, Frequency sweep	Values of various measured and analyzed variables in spreadsheets and graphical representations	1500/sample

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