

SENSOR TRAINER (XPO-MIT)



Salient Features

- Aesthetically designed injection moulded electronic desk. Master unit carrying useful experiment resources like Power supplies, DPMs, Computer Interface, Bar graph LED indicator Function Generator etc. while the central slot will carry replaceable experiment panel secured in an ABS molded plastic sturdy enclosure.
- Has colorful screw less overlay showing circuit & its connection tag numbers for easy connectivity.
- Hands on learning emphasized. Set of Users Guide provided with each Unit
- Virtual instrumentation (optional) through Computer interface provided for MIT3 & MIT 6 & Labview based instrumentation panel.

Master unit

- **Built in power supply**

DC supply +/- 12V, 500mA, Variable 7V to 14V @ 3Amp.
For torque measurement experiment.

- **Built in function generator**

O/p waveform- sine, triangle & square, TTL

O/p freq.- 1Hz to 200KHz in ranges with amplitude & freq. control pots, o/p voltage 10Vpp.

- **On board measurement :**

DC volt -2V/20V 1no. & LED BAR graph with 10 LED indicator to display 0-2.5V or 0-4V input.

- **Computer interface (Optional)**

Interfacing through 25 pin parallel port (LPT port). Software for virtual instrumentation with parallel port driver supplied.

4 ADC channels : 0 to 2.5V full scale

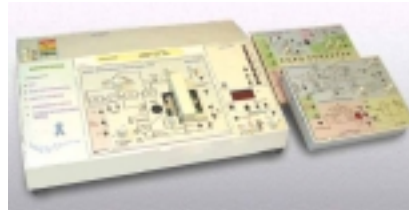
1 DAC channel : O/P 2.5 V full scale

V to I Function block : Input : 0-2.5Vdc

Output : 0-20 or 4-20mA, upto max. 2Vdc gnd compliance

- **Mechanical Dimensions :**
 - a) **Master Unit** : 400mm(W), 125mm (H), 270mm(D)
Net weight : 8Kg. Gross weight : 10Kg.
 - b) **Panel** : 215mm(W), 165mm(H), 40mm(D)
Net weight : 700gm approx.

- **Operating voltage :** 230V +/- 10%, 50Hz



Modular experiment panels - Following experiment panels normally work in conjunction with Master Unit. However they can be ordered as stand alone units with built in power supply at slightly extra cost optionally along with Digital 3.5 digit DMM.

1) Strain gauge Transducers (MIT1)

Piezo resistive transducer for strain measurement

Micrometer 0-20mm (Accuracy 0.01mm) for strain generation

Strain gauges in half & full **Wheatstone bridge** arrangement.

Zero & span adjustment for calibration with **instrumentation amplifier**.

Experiments on Gauge factor determination, Strain indicator, Displacement measurement using Strain gauges & cantilever.

Optional ADDONS : Provision to connect external strain gauge based application set ups as follows.

- a) Piezo resistive transducer for pressure measurement (0-15psi) (cannot share with Level setup)

Pressure sensor 0-15 psi, gage type, Pressure generating handpump connected using

T connector to the sensor & Bourden pressure gauge for measurement & calibration

- b) Piezo electric transducer for impact measurement with **attenuator & peak detector**.

- c) Force / Weight measurement using piezo transducer (0-20 kg weighing scale sensor).

- d) Level measurement by measuring water column height using pressure sensor by bubbler method in 400mm calibrated acrylic water tank, water pump, vibratory air pressure pump, manual bypass valve mounted on a compact (190mm x 1000mm) panel.

- e) Torque measurement setup consisting of trunnion mounted 1/4HP single phase 230Vac universal motor, piezo resistive force / torque sensor, loading pulley with 5kg spring balance (2Nos.).

2) Displacement Sensing Transducers (MIT2)

Micrometer 0-20mm/(Accuracy 0.01mm)

Precision phase sensitive rectifier

Measurement frequency of 1KHz sine wave @ 2Vpp.

Zero & span adjustment for calibration of following transducers

- i) Resistive linear transducer 0 - 20mm
- ii) Capacitive linear transducer 0 - 20mm
- iii) Capacitive angular transducer 0 - 90 degree
- iv) Inductive linear transducer 0 - 20mm
- v) LVDT transducer 0 - 20mm or (-10mm to + 10mm)

Optional ADD ON

- a) Level measurement by capacitance transducer using 600mm calibrated acrylic water tank, water pump, manual flow valve mounted on compact light weight (190x1000mm) panel.
- b) Level measurement by rotary pot transducer using 600mm calibrated acrylic water tank, water pump, manual flow valve mounted on compact light weight (190x1000mm) panel.
- c) Mounted resistive rotary transducer attachment 0 - 180°Span
- d) Humidity measurement demonstrator using polymer hybrid sensor.

3) Speed Sensing Transducers (MIT3)

12V **DC motor** with speed varying from 0-4000rpm & rotating slotted wheel having 8 slots,

Individual signal conditioning circuit with **programmable threshold comparator**.

F to V Converter with **span & zero amplifier**.

- Speed transducers :-
- i) Magnetic pickup
 - ii) Photo reflective
 - iii) Photo interruptive
 - iv) Inductive pickup with **envelop detector**.
 - v) Stroboscope
 - vi) Hall sensor

Optional ADD ON :

- a) **Flow measurement** - Compact, lightweight arrangement of size (190mm X 700mm) with small water pump, turbine flow sensor (200LPH) & rotameter (200LPH), 15Lt. plastic water tank.

4) Sound Sensing Transducers (MIT4)

40KHz gated oscillator to generate Ultrasonic sound waves.

V to I function block to convert voltage O/P into 4 to 20mA current loop.

Sound Sensors : i) Ultrasonic **Distance** Measurement.

- ii) Dynamic microphone as Sound / Audio sensor.

5) Light Sensing Transducers (MIT5)

Incandescent lamp with variable intensity

Light sensors : i) Photodiode with **I to V converter**

- ii) Phototransistor with **I to V converter**

- iii) Photo resistor/LDR with R to V converter using constant current source.

- iv) Photovoltaic cell / Solar cell

- v) Opto coupler, Laser diode, Infrared LED, Red LED

Optional ADD ON

- a) Elementary Fiber Optics : 3 nos of transmitter diodes (RED (660nm) / BLUE / IR (950nm), 1 no detector (photo transistor), 1m PMMA Cable Step Index Type (CRI= 1.492, NA=0.5) with SMA Connector I/P's- TTL&AC Coupled (0.4Vp-p), O/P's- AC, DC Coupled & TTL O/P, Band Width : Analog = 10Khz, Digital = 50Khz
Experiments performed: Setting up ANALOG LINK (Study DC Characteristics & frequency response of different transmitter diodes), Setting up DIGITAL LINK (observe effect of varying square wave frequency on receiver output). Needs external FG.
- b) Optical filters for Red, Green, Blue & Yellow colour to determine sensitivity transducers for colours.

6) Temperature Sensing Transducers (MIT6)

Instrumentation Amplifier to amplify thermocouple signals

Built in heat bar / mini oven driven by **Power amplifier** of sufficient wattage

Temp. selection upto 95 degree C in 5 ranges with ON / OFF closed loop control.

- Temp. sensors:-
- i) Thermocouple J with room temp. calibration pot.
 - ii) Thermocouple K with room temp. calibration pot.
 - iii) Thermister (100K)
 - iv) PT100
 - v) IC sensor (AD 590)
 - vi) Bimetallic switch

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