

FUZZY LOGIC TRAINER (Model: TMS - FUZZY)

Trinity



Specification of Master Unit (MU)

SALIENT FEATURES

- ◆ PC (VWB) based Fuzzy Logic Controller.
 - ◆ Facility to monitor behavior of the controller output (Un) & process variable (MV) either on PC screen or on CRO. Settable time constants.
 - ◆ Graph printing facility for laboratory journal entries.
 - ◆ Can learn about different processes using simulated building blocks as well as real life processes using replaceable experiment panels/processes and built in sqr. / trig. / sin, Function Generator as disturbance.
 - ◆ Aesthetically designed injection molded electronic desk (master unit) carrying useful experiment resources like Power supplies, DPMs, Computer Interface, Analog PID controller with central slot to hold various replaceable experiment panels / processes.
 - ◆ Connection through sturdy 4mm Banana sockets & Patch cords.
 - ◆ Useful for Post Graduate projects and research purpose.
 - ◆ Students Workbook & Instructor's Guide provided with each unit.
- **Built in Power Supply :** DC supply +12V, 500mA. 1Phase sine reference for cosine firing 30Vpp. max., 17V DC, 500 mA unregulated for driving pulse X'mer, Variable DC power supply : 7 to 14V/3A.
 - **Display :** A) DPM-2Nos., for Temp upto 100°C/500°C
B) Analog Meter - 2Nos. i) Centre zero for display of process error (+9V) ii) For MV/SP (0-2.5V)
 - **Operating voltage :** Switch selectable 220-240Vac, +10%, 50Hz, 75VA.

◆ Mechanical Dimensions :

a) **M.U. :** 460mm (W), 160mm (H), 350mm (D),
Net Weight : 6.5 kg. **Gross weight :** 8.5 kg.

b) **PANEL :** 215mm (W), 165mm (H), 400mm (D),
Net Weight : 700 gm. approx.

◆ PC (WIN7/8/10) Software (VWB) based Fuzzy Controller (PC not in scope of supply) *Labview is trademark of NI.

A] ◆ **Fuzzy software Controller :** Elegantly designed GUI of realistic fuzzy controller with bar-chart, numeric display for controller output, set point & measurable variable in % with parameter like set value Rn (0-99.9), Sampling Time Ts (0.1-99.9), Error (0.1-99.9), Error dot (0.1-99.9), Fuzzy output Upper Limit Uh (0-99.9) & Lower Limit Ul (0-99.9), Facility to set units for output viz. Percentage (%), °C, RPM, Voltage (V), mm,

LPH, Kg/cm². • Facility to set inbuilt FG (Square/Triangle/Sine) as set Point.

- ◆ **Process Monitoring Mode :** Drawing graphs of analog data presented at CH 0 & CH1 of computer Interface. Cursors for X & Y axis for measurement & online graphs savings for reproduction.
 - ◆ **Fuzzification Mode :** Fuzzy controller based on linguistic rules & rule matrix (knowledge base), Calculation of N,Z,P, and membership function.
 - ◆ **Defuzzyfier :** Calculation of strength of LH, MH, HH & crisp output weighted average.
- B] Computer Interface Adaptor / CIA :** Optoisolated Adaptor to prevent damage to PC parallel port (25 pin LPT) due to wrong connections. Interfaces through 25 pin M to F cable 1 mtr Length, 4 ADC channels: 0 to 2.5V full scale, 1DAC channels: O/p 2.5 VFS.
- ◆ USB converter to interface 25 pin D connector on CIP panel to USB using microcontroller module enclosed in 25 pin D shell using Type A to mini B cable.

Modular experiment panels offered :

Select as per table below.

1] Servo Interface Panel (SIP) / CE3

(Provided with 36 banana tags.)

- ◆ Functional blocks for Lag (2 Nos.), Integrator (2 Nos.), Transport Lag (1 No.), Gain (1 No.), Buffer/error block (1 No.) for constructing simulated Type 0,1,2,3 & 1st, 2nd, 3rd Order processes to work under fuzzy control.
- ◆ Fast (10mS) & Slow (1sec) mode selection for all processes to observe response on either CRO or PC using CIA.
- ◆ Level shifters (2 Nos.) 0-2.5V to $\pm 9V$ to match voltage levels of PC (2.5V).
- ◆ Control Interface circuit for AC & DC servo motor, signal conditioning circuit for speed sensor to O/P 0-2.5VDC (2500RPM) with speed direction.

2] Thyristor Actuator cum sensor signal conditioner Panel (TAP) / EMT9 (CE2)

(Provided with 13 banana tags)

- ◆ Thyristor bridge based 0-200V/3A cosine firing circuits, I/P 0 to 2.5Vdc. Supports signal conditioning of RTD (PT100), Thermocouple K type & Photodiode output 0-2.5Vdc (FS).
- ◆ Facilitates closed loop control experiments based on temperature, light intensity, speed measurement using built in P/PI controller as well as external Analog /Digital PID/Fuzzy

Process setups offered : Select one or more options.

Process Parameters	Simulated Process	Temp/Light Process-I	DC Servo Position Control Process-III
Table Top assembly /accessories	Servo interfaced panel (SIP) simulating various types of process:- Type 0, 1, 2 & 1st, 2nd order	Process box containing 3 high wattage (60W) bulbs under aluminum plate heater. Builtin fan, lamp as disturbance generator.	PMDC Motor 12V DC, 40 Watt ND RPM 2000 RPM with gear box (Ratio 30:1) Loading : Using PMDC Motor @12V/3A max. servo Amplifier with built in 12V/3A power supply.
Panel	SIP(CE3)	TAP (CE2/EMT9)	SIP (CE3)
Sensor	Op-amp based process does not need any sensor	RTD for temp .control upto 100° C with built in CAL facility , Photodiode for light intensity control upto 2000lux.	Photo reflective speed sensor with direction detect using 2 pairs of photo emitter detector giving Quadrature o/p's, servo pot position feedback.
Mechanical Dimension (mm/wt.)	215 X 165 X 40mm / 700 gm.	280 (L) x 115 (W) x 160(H) / Power Coated /2 Kg.	365 (L) x 220 (W) x 95(H) / Powder coated with handle / 10Kg
List of Experiments	1) Lag with integrator using Fuzzy Logic Control. 2) Lag with transport lag using Fuzzy Logic Control. 3) Two first order lag using Fuzzy Logic Control. 4) Integrator using Fuzzy Logic Control.	1) Temperature control using Fuzzy Logic Control. 2) Light intensity control using fuzzy control.	1) DC motor position control using Fuzzy Logic Control. 2) DC motor speed control using Fuzzy Logic Control.