

Flow/Level with Variable Speed Pump (Model : TMS-PCT-FLE)



USB to IO
converter cable

Flow/Level with Pneumatic Control Valve (Model : TMS-PCT-FL)



SALIENT FEATURES

- ◆ Lightweight, yet sturdy, tabletop, Aluminium profile flat panel setup, with SS (304/316) piping for and wide angle view of every component in process. No hidden parts.
- ◆ Individual control loops as well as Advance control schemes like Ratio, Cascade, Feed forward, **coupled tank** made easy for student.
- ◆ Connection through polarized FRC connectors, sturdy 4mm Banana sockets & Patch cords enabling quick setting up of variety of process control experiments.
- ◆ Win7/8/10 Window Based PID Controller (**DDC**) software package with P, PI & PID control, Ratio & cascade control, three operating modes, Online graph drawing & data acquisition modes (**SCADA**). PC not in scope of supply
- ◆ Useful for Post Graduate projects and research purpose.
- ◆ Optionally SDK for Matlab & Labview provided.



Technical Specifications (Controller Section)

◆ Computer Interface panel (CIP)

- Connects to PC (Win7/8/10) USB port through USB to IO Module & type to mini B cable.
- 4 ADC channels I/P: 0 to 2.5V FS with 1no input simulation pot. 1 DAC channel O/P 2.5V FS.
- V to I function block: I/P 0 to 2.5V & O/P 0-20 or 4-20mA (100 ohm load) switch settable.
- I to V function block : I/P 4 to 20mA & O/P 0 - 2.5V
- USB IO module to interface 25 pin D connector on CI A panel to USB PC port enclosed in 25 Pin D shell using Type A to mini B cable.
- Optionally hardware module of square root extractor is provided so that PLC/Panel mount PID may be interfaced.

◆ Instrumentation Power supply cum Multichannel DPM panel (EMT 8)

- DC Multi Output power supply.
- Provides 1 Ph. AC supply through 3 MCB's, 4A each to power up other panels in the rack.
- Multi channel DPM for digital display of process parameters.
- 20 pin FRC power bus to supply power to neighbouring panels.

◆ Thyristor Actuator cum signal conditioning panel (TAP) / CE2 x 2No. (For only FLE)

- Optionals: Thyristor bridge based 0-200V/3A using cosine firing circuit, I/P 0 to 2.5Vdc.

- Supports signal conditioning for RTD, Pressure sensor with Instrumentation Amplifier & flow sensor (water / air) with F to V converter to generate 0-2.5Vdc (FS).
- 2 No. panels needed to cover signal conditioning needs of the selected process.
- ◆ **PC (WIN7/8/10) based digital PID controller (PC not in scope of supply but PC with USB port needed)**
- **Online monitoring / Data acquisition / PID Software** on Installable (CD) works under XP, WIN7. PC with parallel port / USB needed.
- **Operating modes**
 - Simulator Mode :** Tests data stored in files (*.txt) & Draw graph for all P, PI, PD & PID modes.
 - Process Monitoring Mode :** Draw graphs of analog data presented at CH 0 & CH 1 of CIP. Cursors for X & Y axis for measurement & online graphs saving for reproduction.
 - PID controller Mode**
 - PID controller with parameter like Integral Time T_i (0.01-64000), Sampling Time T_s (0.1-99.9), Derivative Time T_d (0-99.9), Proportional Band P_b (1-999), Derivative Gain K_d (1-999), Set Value R_n (0-99.9), PID output Upper Limit U_h (0-99.9), PID output Lower Limit U_l (0-99.9).
 - Facility to set units for output viz. (%) °C, RPM, V, mm, LPH, kg/cm², msi/cm, Degree optionally experiments with advance process control scheme viz; Ratio, Cascade, feedforward with Aux

PID, Ratio station & FF transfer function calculator, Alarm setting, ON/OFF control, square root extractor for Orifice.

- Function Generator : Sine / Triangular / Square wave generator

Technical Specifications :

Process Loops [Parameters]	Flow/Level with variable speed pump (Model : TMS:PCT/FLE)	Flow/Level with pneumatic control value (Model : TMS- PCT/FL)
Controlled Medium	Water	Water
Storage tank material/Capacity	1 No. 50 ltr, plastic/PVC.	1 No. 20 ltr, plastic/PVC
Process tank capacity / material	Vertically mounted tank 1 No. 18 liters, liters, plexiglass (130x130x1050mm)	Vertically mounted tank 1 No. 18 liters, liters, plexiglass (130x130x1050mm)
Electric sensor Type/output/ Range	- Flow: Turbine flow sensors 2 No. - Level WC pressure sensor 0 to 500 mm, level measurement by bubbler method, O/P= 0 to 2.5V. Pressure supplied through small compressor & AFR	- Flow: Turbine flow sensors 1+1 No. (Optionally 1 No. Orifice plate with DP sensor, (0.5 PSI) O/P - 0 to 2.5V, 0-200 LPH - Level WC pressure sensor 0 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V (optionally) capacitive sensor needs panel MIT-2
Control Valve	Fraction HP universal motor operated variable speed pump driven from TAP (EMT9) panel, I/P 0 to 2.5V O/P 0 to 195Vdc, Pump Speed : 0-3000RPM	Pneumatically operated air to close, liner type 1/2" Size Diaphragm operated, CV =0.4 with I to P. Converter I/P 4 to 20mA, O/P 3 to 15 psi.
Rotameter	2 Nos. Acrylic body 1/2" size 0 to 200LPH	2 Nos. Acrylic body 1/2" size 0 to 200LPH
Generation & Distribution Pump	1 No. 0.062KW, 1/12HP,2800RPM, 1/2"outlet, 500 LPH. Head 9 meters, with brass impeller + 1 no. AC motor pump (8 mtr head) for wild flow	1 No. 0.062KW, 1/12HP,2800RPM 1/2" outlet, 500LPH. Head 9 meters, with brass impeller
Bourden gauges	0 to 500mm of water column= 1 No.	4 Nos. (0 to 2 bars, 3 Nos. 0 to 500mm of water column=1 No.)
Manual SS valves Piping material/size	1/2" size =4 nos., 1/4" size = 3 nos. Stainless steel 1/2" for water, 1/4" for air	1/2" size =4 Nos., 1/4" size = 3 nos. Stainless steel 1/2" for water, 1/4" for air
Air filter & regulators OR accessories	1 No, 0 to 1 bars, size 1/4"	2 Nos, 0 to 10 bars, size 1/4", Oil catcher (1/4" size max. pressure= 10 bars) 1No.
Air compressor	-----	0 to 7 bars, 1/2 HP, 230VAC supply (optional) Tank capacity : 30-40 Liters.
Mech. Size/wt	1165(L) X 300(W) X 990(H)mm /38kg.	1165(L) X 300 (W) X 990(H)mm /38kg.
Advance control expt. Ratio Cascade Feedforward	Transfer function determination Ziegler Nicholas PID tuning Between 2 water flows Inner (fast) loop flow, outer(slow) loop level Water flow disturbance on level loop.	
List of Experiments	- Study of Level loop-open response & close loop response with P, PI, PID. - Study of Flow control loop - open loop response & close loop response with P, PI, PID. - Study of Flow control by Thyristorised control of pump - Study of Ratio control loop - Study of Cascade control loop - Study of Level ON-OFF control loop - Study of Feed - Forward control loop	- Study of Level loop-open response & close loop response with P, PI, PID. - Study of Flow control loop - open loop response & close loop response with P, PI, PID. - Study of control valve, equal % (Gain scheduler Hysteresis), Quick opening & linear, V to I converter, I to P converter. - Study of Ratio control loop - Study of Cascade control loop - Study of Level ON-OFF control loop - Study of Feed - Forward control loop - Study of Pressure loop
Optional	PLC interface will be provided	