PROCESS CONTROL TRAINER



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



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

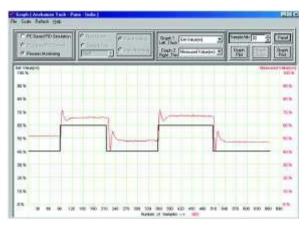


SALIENT FEATURES

- 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 CIA 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 (EMT8)
- DC Multi Output power supply.
- Provides 1 Ph. AC supply through 3 MCB's, 4Aeach 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
- a) Simulator Mode: Tests data stored in files (*.txt) & Draw graph for all P,PI,PD & PID modes.
- b) 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.

c) PID controller Mode

- PID controller with parameter like Integral Time Ti (0.01-64000), Sampling Time Ts(0.1-99.9), Derivative Time Td(0-99.9), Proportional Band Pb(1-999), Derivative Gain Kd(1-999), Set Value Rn(0-99.9), PID output Upper Limit Uh(0-99.9), PID output Lower Limit UI (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:

Control Valve Fraction HP universal motor operated variable speed jump driven from TAP (EMTs) pans, IP 0 to 2.5V, Persure supplied through small compressor & AFR Rotameter 2 Nos. Acrylic body 1/2" size 0 to 200LPH 2 Nos. Acrylic body 1/2" size 0 to 200LPH 3 No. 0.062KW, 1/12HP,2800RPM, 1/2" outlet, 500 LPH. Head 9 meters, with brass impeller + 1 no. AC motor pump (8 mit head) for wild flow Bourden gauges 3 1 No. 0 to 1 bars, size 1/4" (5 result of Experiment No.) 4 No. 0 (10 to 1 bars, size 1/4" (5 result of Experiment No.) 5 Stainless steel 1/2" for water, 1/4" for air 1 No. 0 to 1 bars, size 1/4" (5 size 0 to 200 LPH) 1 Study of Fear Flow and control top 1.5 Study of Personnect Organic Response with P. P.P. ID. 2 Study of Flow control top 2.5 Study of Personnect Organic Response with P. P.P. ID. 3 Study of Personnect Organic Response Across control top 2.5 Study of Personnect Organic Response with P. P.P. ID. 3 Study of Personnect Organic Response Across control top 2.5 Study of Personnect Organic Response with P. P.P. ID. 5 Study of Personnect Organic Response Across control top 2.5 Study of Personnect Organic Response with P. P.P. ID. 5 Study of Personnect Organic Response Across control top 2.5 Study of Personnect Organic Response with P. P.P. ID. 5 Study of Personnect Organic Response Across Control top 2.5 Study of Personnect Organic Response with P. P.P. ID. 5 Study of Personnect Organic Response Across Control top 2.5 Study of Personnect Organic Response with P. P.P. ID. 5 Study of Personnect Organic Response Across Control Cont	Process Loops [Parameters]	Flow/Level with variable speed pump (Model : TMS:PCT/FLE)	Flow/Level with pneumatic control value (Model : TMS- PCT/FL)
Process tank acapacity / Marieral Vertically mounted tank 1 No. 18 liters, plexigalss (130x130x1050mm) Vertically mounted tank 1 No. 18 liters, plexigalss (130x130x1050mm) Electric sensor Flow: Turbine flow sensors 2 No. Level WC pressure sensor 0 to 500 (Optionally 1 No. Orfice plate with DP sensor, (0.5 PSI) O/P - 0 to 2.5V. Pressure supplied through small compressor & AFR Level WC pressure sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. Pressure supplied through small compressor & AFR 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 Level WC pressure sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. (optionally) capacitive sensor needs panel MIT-2 Level WC pressure sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. (optionally) capacitive sensor needs panel MIT-2 Level WC pressure sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. (optionally) capacitive sensor needs panel MIT-2 Level WC pressure sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. (optionally) capacitive sensor needs panel MIT-2 Level WC pressure sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. (optionally) capacitive sensor needs panel MIT-2 Level WC pressure sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. (optionally) capacitive sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. (optionally) capacitive sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. (optionally) capacitive sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. (optionally) capacitive sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. (optionally) capacitive sensor 10 to 500 mm, level measurement by bubbler method, O/P - 0 to 2.5V. (optionally) capacitive sensor 10	Controlled Medium	Water	Water
Electric sensor Piow: Turbine flow sensors 2 No. Electric sensor Piow: Turbine flow sensors 2 No. Evel WC pressure sensor 0 to 500 mm, level measurement by bubbler method, O/P = 0 to 2.5 V. Pressure supplied through small compressor & AFR Piow: Turbine flow sensors 1+1 No. (Optionally 1 No. Orifice plate with DP sensor, (0.5 PSI) O/P - 0 to 2.5 V. Pressure supplied through small compressor & AFR Piow: Turbine flow sensors 1+1 No. (OP - 0 to 2.5 V. Dept.) OP - 0 to 2.5 V. Dept. OP - 0 to 2.5 V.		1 No. 50 ltr, plastic/PVC.	1 No. 20 ltr, plastic/PVC
Type/output/ Range - 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 - 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 Rotameter - 2 Nos. Acrylic body 1/2* size 0 to 200LPH - 195Vdc, Pump Speed: 0-3000RPM Rotameter - 2 Nos. Acrylic body 1/2* size 0 to 200LPH - 1 No. 0.062KW, 1/12HP.2800RPM, 1/2*outet, 500LPH. Head 9 meters, with brass impeller + 1 no. A C motor pump (8 mtr head) for wild flow - 1/2* size = 4 nos., 1/4* size = 3 nos. Stainless steel 1/2* for water, 1/4* for air - 3/4 if filter & regulators OR accessaries - 1 No. 0 to 1 bars, size 1/4* - 1 No. 0.052KW, 1/12HP.2800RPM - 1/2* size = 4 nos., 1/4* size = 3 nos. Stainless steel 1/2* for water, 1/4* for air - 3/4 if filter & regulators OR accessaries - 1 No. 0 to 1 bars, size 1/4* - 1 No. 0 to 1 bars, size 1/4* - 2 Nos, 0 to 10 bars, size 1/4* (oi catcher (1/4* size max, pressure= 10 bars) 1 No. - 1 No. 0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2 bars, 3 Nos. 0 to - 500mm of water column= 1 No. - 1 Nos. (0 to 2		· ·	·
variable speed pump driven from TAP (EMT9) panel, I/P 0 to 2.5V 0/P 0 to 195Vdc, Pump Speed: 0-3000RPM Converter I/P 4 to 20mA, O/P 3 to 15 psi.	Type/output/	 Level WC pressure sensor 0 to 500 mm, level measurement by bubbler method, O/P= 0 to 2.5V. Pressure supplied through small compressor 	(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)
Generation & 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 Bourden gauges 0 to 500mm of water column= 1 No.	Control Valve	variable speed pump driven from TAP (EMT9) panel, I/P 0 to 2.5V O/P 0 to	liner type ½" Size Diaphragm operated, CV =0.4 with I to P. Converter I/P 4 to 20mA, O/P 3 to
Distribution Pump 1/2"outlet, 500 LPH. Head 9 meters, with brass impeller + 1 no. AC motor pump (8 mtr head) for wild flow 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 1/2" size = 4 nos., 1/4" size = 3 nos. Piping material/size Stainless steel 1/2" for water, 1/4" for air Air filter & regulators OR accessaries 1 No, 0 to 1 bars, size 1/4" 2 Nos, 0 to 10 bars, size 1/4" for air 2 Nos, 0 to 10 bars, size 1/4" for air 2 Nos, 0 to 10 bars, size 1/4" for air 1 No, 0 to 1 bars, size 1/4" of bars, 1/2 Ph., 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. 1165(L) X 300 (W) X 990(H)mm /38kg. Transfer function determination Ziglor Nicholas PID tunning Between 2 water flows Inner (fast) loop flow, outer(slow) loop level Water flow disturbance on level loop. List of Experiments 1. Study of Level loop-open response & close loop response with P, PI, PID. 3. Study of Flow control loop - open loop response & close loop response with P, PI, PID. 3. Study of Flow control loop - open loop response & close loop response with P, PI, PID. 3. Study of Flow control loop 5. Study of Gascade control loop 6. Study of Feed - Forward control loop 7. Study of Feed - Forward control loop 8. Study of Pressure loop	Rotameter	2 Nos. Acrylic body 1/2" size 0 to 200LPH	2 Nos. Acrylic body 1/2"size 0 to 200LPH
Somm of water column=1 No.		1/2"outlet, 500 LPH. Head 9 meters, with brass impeller + 1 no. AC motor	1/2" outlet, 500LPH. Head 9 meters,
Piping material/size Stainless steel 1/2" for water, 1/4" for air Air filter & regulators OR accessaries 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 Between 2 water flows Inner (fast) loop flow, outer(slow) loop level Water flow disturbance on level loop. List of Experiments 1. Study of Level loop-open response & close loop response with P, PI, PID. 2. Study of Flow control by Thyristorised control of pump 4. Study of Ratio control loop 5. Study of Cascade control loop 6. Study of Level ON-OFF control loop 7. Study of Feed - Forward control loop 7. Study of Feed - Forward control loop 8. Study of Feed - Forward control loop 9. Study of Peed - Forward control loop	Bourden gauges	0 to 500mm of water column= 1 No.	· · · · · · · · · · · · · · · · · · ·
OR accessaries Air compressor Mech. Size/wt 1165(L) X 300(W) X 990(H)mm /38kg. Advance control expt. Ratio Cascade Feedforward List of Experiments 1. Study of Level loop-open response & close loop response with P, PI, PID. 2. Study of Flow control by Thyristorised control of pump 4. Study of Ratio control loop 5. Study of Cascade control loop 6. Study of Level ON-OFF control loop 7. Study of Feed - Forward control loop 8. Study of Pressure loop			Stainless steel 1/2" for water, 1/4"
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response with P, PI, PID. 2. Study of Flow control loop - open loop response & close loop response with P, PI, PID. 3. Study of Flow control by Thyristorised control of pump 4. Study of Ratio control loop 5. Study of Cascade control loop 6. Study of Level ON-OFF control loop 7. Study of Feed - Forward control loop 8. Study of Pressure loop 7. Study of Pressure loop 7. Study of Pressure loop	Ratio Cascade	Between 2 water flows Inner (fast) loop flow, outer(slow) loop level	
Optional PLC interface will be provided	List of Experiments	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	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
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