NITech

National Infotech

A way to Power Electronics and Embedded Systems Solutions.

AUTOMATION AND INSTRUMENTATION TRAINERS

Industrial Automation has spread everywhere. The skill in this field has become pre-requisite for the students of Electrical /Electronics /Instrumentation discipline to fetch a good job.

NITECH offers varies types of Automation and Instrumentation Trainers for teaching Instrumentation, Automation, PLC, HMI, SCADA and VFD concepts to students.With following list of Trainers, it is possible to experiment basic to advance level concept of Instrumentation and Automation Process.

- Basic PLC Trainer
- Advance PLC Trainer
- SCADA Software
- Variable Frequency Drive (VFD) Trainer
- Servo Drive
- Level Control Trainer
- Flow Control Trainer
- Pressure Control Trainer
- Temperature Control Trainer
- Universal Control Trainer

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: Authorized Distributor :

NI-BPT-SI: Basic PLC Trainer with Siemens PLC

Siemens (SIMATIC S7-1200 based PLC trainer kit) has the following specifications.

Specifications:

- ❖ PLC: SIMATIC S7-1200, CPU 1215C, COMPACT CPU PLC
- ❖ Supply Voltage 24 VDC , permissible range 20.4 - 28.8 V DC,
- ❖ 14 Digital Inputs (24V DC sink/source type)
- ❖ 10 Digital Outputs (24V DC)
- ❖ 6 High Speed input(High Speed Counting)
- ❖ 4 High Speed Output (100 kHz Pulse Train Output)
- ❖ 2 Analog Inputs (0-10V DC)
- ❖ 2 Analog Outputs (0-20mA DC)
- ❖ Analog value creation :
  - Resolution with over range (bit including sign), max. 10 bit
  - Integration time, parameterizable
  - Conversion time (per channel) 625 µs
- ❖ 2 communication ports (PROFINET PORT)
  - Physics: Ethernet, 2-port switch, 2*RJ45
- ❖ Integrated Functions
  - 6 Number of counters
  - Counter frequency (counter) max. 100 kHz
  - Frequency meter
  - controlled positioning signals
  - PID controller
  - 4 Number of alarm inputs
  - 4 Number of pulse outputs
  - Limit frequency (pulse) 100 kHz
- ❖ Programming Cable
- ❖ Hard Copy of System manual with demo programs
- ❖ All Digital Inputs with on panel toggle switch with external/internal signal selection
- ❖ All Digital Outputs with on panel LED indicator and potential free relay contacts.
- ❖ All analog inputs with on panel potentiometer / external signal handling capability
- ❖ All analog outputs on panel connectors
- ❖ Standard instrumentation panel enclosure with SMPS, MCB, Power indicator and connectors.

Programming Software:
SIMATIC STEP 7 BASIC V13

- ❖ STEP 7 V13 is based on the central engineering framework Totally Integrated Automation Portal (TIA Portal), which offers the user a uniform, efficient and intuitive solution to all automation tasks.
- ❖ Supports the new SIMATIC Open controllers,
- ❖ Simulation for S7-1200 V4.0 and higher
- ❖ API engineering of STEP 7 and WinCC.

Suggested Experiments:
- ❖ Study of PLC and power wiring.
- ❖ Study of PLC instructions.
- ❖ Study of PLC ladder programming.
- ❖ Study of PLC structured language programming.
- ❖ Study of digital input interfacing using PLC.
- ❖ Study of digital output interfacing using PLC.
- ❖ Study of industrial standard analog input and programming for measurement.
- ❖ Study of industrial standard analog output and programming for measurement.
- ❖ Study of High speed input interfacing using PLC.
- ❖ Study of different communication protocol

NI-BPT-SC: Basic PLC Trainer with Schneider PLC

Specifications:

Schnieder (TM221C16tcontroller M221 16 Io Transistors PNP) Has Following Specifications:

- ❖ PLC: Modicon M221 24VDC
- ❖ 9 Digital Input including 4 high-speed inputs
- ❖ 7 Digital Outputs (24V DC transistor PNP including 2 high-speed output)
- ❖ 2 Analog Inputs (0– 10V DC)
  - Analogue input resolution 10 bits
  - Integration time, parameterizable
- ❖ Conversion time 1 ms per channel + 1 controller cycle time for analog input
- ❖ External 2 Analog Outputs Module
- ❖ 2 communication ports
  - 1 Ethernet port (Modbus TCP communication (client & server), Modbus TCP slave, Dynamic DHCP client Configuration, Programming,Downloading.)
- ❖ 1 serial link port (RJ 45 connector) RS232/485 Integrated Functions.
  - PID Process control
  - 4 high-speed counter inputs (HSC), 100 kHz frequency
  - Position control: pulse width modulation (PWM) ,pulse generator (PLS), 2 P/D pulse train outputs (PTO) with trapezoidal profile and S curve, 100 kHz frequency
- ❖ Programming Cable
- ❖ Hard Copy of System manual with demo programs
- ❖ All Digital Inputs with on panel toggle switch with external/internal signal selection
- ❖ All Digital Outputs with on panel LED indicator and potential free relay contacts.
- ❖ All analog inputs with on panel potentiometer / external signal handling capability
- ❖ All analog outputs on panel connectors

- ❖ Standard instrumentation panel enclosure with SMPS, MCB, Power indicator and connectors.

Programming Software:

SoMachine Basic
- ❖ Symbols, comments, animation tables are downloaded to the controller with the application.
- ❖ Instruction List and Ladder programming languages
- ❖ Ladder program animation
- ❖ Save / Restore backup data by SoMachine Basic, Backup firmware and backup user program with SD card.

Suggested Experiments:

- ❖ Study of PLC and power wiring.
- ❖ Study of PLC instructions.
- ❖ Study of PLC ladder programming.
- ❖ Study of PLC structured language programming.
- ❖ Study of digital input interfacing using PLC.
- ❖ Study of digital output interfacing using PLC.
- ❖ Study of industrial standard analog input and programming for measurement.
- ❖ Study of industrial standard analog output and programming for measurement.
- ❖ Study of High speed input interfacing using PLC.
- ❖ Study of different communication protocol

NI-BPT-DE: Basic PLC Trainer with Delta PLC

Specifications:

Delta EX2 Series (DVP20EX200R) has the following specifications.

- ❖ PLC: Delta DVP EX2 Series Analog MPU (100 -240VAC)
- ❖ 8 Digital Input 24VDC, 5mA
- ❖ 6 Digital Output(< 250VAC, 30VDC)
- ❖ 4 Analog Input(-10~+10V,-20~+20Ma)
- ❖ 2 Analog Output(-10 ~ + 10 V , -20 ~ + 20 Ma)
- ❖ Com Port:
- ❖ Built-in 1 RS-232 and 2 RS-485 ports; Compatible with Modbus ASCII/RTU protocol
- ❖ High speed input:
- ❖ 2 points of 100KHZ; 6 points of 10KHZ
- ❖ Programming Cable
- ❖ Hard Copy of System manual with demo programs
- ❖ All Digital Inputs with on panel toggle switch with external/internal signal selection
- ❖ All Digital Outputs with on panel LED indicator and potential free relay contacts.
- ❖ All analog inputs with on panel potentiometer / external signal handling capability
- ❖ All analog outputs on panel connectors
- ❖ Standard instrumentation panel enclosure with SMPS, MCB, Power indicator and connectors.

PLC Programming Software:
ISPSOFT/WPLSoft:

- ❖ ISPSoft is Delta's new generation software development tool for programmable logic controllers
- ❖ Supports five programming languages. They are ladder diagrams (LD), sequential function charts (SFC), function block diagrams (FBD), instruction lists (IL), and structured texts (ST).

Suggested Experiments:

- ❖ Study of PLC and power wiring.
- ❖ Study of PLC instructions.
- ❖ Study of PLC ladder programming.
- ❖ Study of PLC structured language programming.
- ❖ Study of digital input interfacing using PLC.
- ❖ Study of digital output interfacing using PLC.
- ❖ Study of industrial standard analog input and programming for measurement.
- ❖ Study of industrial standard analog output and programming for measurement.
- ❖ Study of High speed input interfacing using PLC.
- ❖ Study of different communication protocol

NI-APT-SI: Advance PLC Trainer with Siemens PLC

Siemens (SIMATIC S7-1200 based PLC trainer kit) has the following specifications.

Specifications:
- ❖ PLC: SIMATIC S7-1200, CPU 1215C, COMPACT CPU PLC
- ❖ DC 20.4 - 28.8 V DC,
- ❖ 14 Digital Inputs (24V DC sink/source type)
- ❖ 10 Digital Outputs (24V DC type)
- ❖ 6 High Speed input. (HSC 1 @20KHz and HSC 2 @ 2KHz)
- ❖ 2 Analog Inputs (0-10V DC)
- ❖ 2 Analog Outputs (0-20mA DC)
- ❖ Analog value creation :
  - Resolution with over range (bit including sign), max. 10 bit
  - Integration time, parameterizable
  - Conversion time (per channel) 625 µs
- ❖ 2 communication ports (PROFINET PORT)
  - Physics: Ethernet, 2-port switch, 2*RJ45
- ❖ Integrated Functions
  - 6 Number of counters
  - Counter frequency (counter) max. 100 kHz

- Frequency meter
- controlled positioning signals
- PID controller
- 4 Number of alarm inputs
- 4 Number of pulse outputs
- Limit frequency (pulse) 100 kHz
- ❖ Programming Cable
- ❖ Hard Copy of System manual with demo programs
- ❖ All Digital Inputs with on panel toggle switch with external/internal signal selection
- ❖ All Digital Outputs with on panel LED indicator and potential free relay contacts.
- ❖ All analog inputs with on panel potentiometer / external signal handling capability
- ❖ All analog outputs on panel connectors
- ❖ Standard instrumentation panel enclosure with SMPS, MCB, Power indicator and connectors.

HMI: Siemens Simatic,
KP300 Basic Mono PN
- ❖ Key Operation
- ❖ 3" FSTN LCL Display Monochrome
- ❖ Profinet Interface
- ❖ Supply voltage : 24 V DC
- ❖ 1 industrial Ethernet interfaces

Programming Software:
SIMATIC STEP 7 BASIC V13

- ❖ STEP 7 V13 is based on the central engineering framework Totally Integrated Automation Portal (TIA Portal), which offers the user a uniform, efficient and intuitive solution to all automation tasks.
- ❖ Supports the new SIMATIC Open controllers
- ❖ Simulation for S7-1200 V4.0 and higher
- ❖ API engineering of STEP 7 and WinCC

Suggested Experiments:
- ❖ Study of PLC and power wiring.
- ❖ Study of PLC INSTRUCTIONS.
- ❖ Study of PLC ladder programming.
- ❖ Study of PLC structured language programming.
- ❖ Study of digital input interfacing using PLC.
- ❖ Study of digital output interfacing using PLC.
- ❖ Study of industrial standard analog input and programming for measurement.
- ❖ Study of industrial standard analog output and programming for measurement.
- ❖ Study of High speed input interfacing using PLC.
- ❖ Study of different communication protocol.
- ❖ Study of HMI.
- ❖ Study of HMI programming.Study of HMI interfacing with PLC using standard protocol

NI-APT-SC: Advance PLC Trainer with Schneider PLC

Specifications:

SCHNIEDER (TM221CE16Tcontroller M221 16 IO transistor PNP) has following specifications.

- PLC: Modicon M221 24VDC
- 9 Digital Input including 4 high-speed inputs
- 7 Digital Outputs (24V DC transistor PNP including 2 high-speed output)
- 2 Analog Inputs (0- 10V DC)
  - Analogue input resolution 10 bits
  - Integration time, parameterizable: Yes
- Conversion time 1 ms per channel + 1 controller cycle time for analog input
- External 2 Analog Outputs Module
- 2 communication ports
  - 1 Ethernet port (Modbus TCP communication (client & server), Modbus TCP slave, Dynamic DHCP client Configuration, Programming,Downloading.
  - 1 serial link port (RJ 45 connector) RS232/485 Integrated Functions
  - PID Process control
  - 4 high-speed counter
  - inputs (HSC), 100 kHz frequency
  - Position control: pulse width
  - Modulation (PWM), pulse
  - generator (PLS), 2 P/D pulse
  - train outputs (PTO) with
  - trapezoidal profile and S
  - curve, 100 kHz frequency
- Programming Cable
- Hard Copy of System manual with demo programs
- All Digital Inputs with on panel toggle

- switch with external/internal signal selection
- All Digital Outputs with on panel LED indicator and potential free relay contacts.
- All analog inputs with on panel potentiometer / external signal handling capability
- All analog outputs on panel connectors
- Standard instrumentation panel enclosure with SMPS, MCB, Power indicator and connectors.

HMI: SCHNIEDER
XBT N 410:

Small panel with touch screen and keypad

- Display type Extra-bright matrix backlit LCD
- Display color Green
- Number of key 8
- Number of fixed keys 4
- Number of customizable keys 4
- Integrated connection type:
- Serial link- female SUB-D 25, asynchronous transmission mode (RS232C/RS485), multidrop topology

Programming Software (PLC):
SoMachine Basic

- Symbols, comments, animation tables are downloaded to the controller with the application.
- Instruction List and Ladder programming languages.
- Ladder program animation.
- Save / Restore backup data by SoMachine Basic, Backup firmware and backup user program with SD card.

HMI Configuration Software:
Vijeo-Designer Lite:

- Vijeo Designer Lite configuration software allows you to create operator dialogue applications for Magel is XBTN/R/RT Small

Panels for controlling simple automation Systems.

Suggested Experiments:
- Study of PLC and power wiring.
- Study of PLC INSTRUCTIONS.
- Study of PLC ladder programming.
- Study of PLC structured language programming.
- Study of digital input interfacing using PLC.
- Study of digital output interfacing using PLC.
- Study of industrial standard analog input and programming for measurement.
- Study of industrial standard analog output and programming for measurement.
- Study of High speed input interfacing using PLC.
- Study of different communication protocol.
- Study of HMI.
- Study of HMI programming.
- Study of HMI interfacing with PLC using standard protocol.

NI-APT-SC: Advanced PLC Trainer with Delta PLC

Specifications:

Delta EX2 Series (DVP20EX200R) has the following specifications.

- ❖ PLC: Delta DVP EX2 Series Analog MPU (100 -240VAC)
- ❖ 8 Digital Input 24VDC, 5mA
- ❖ 6 Digital Output(< 250VAC, 30VDC)
- ❖ 4 Analog Input (-10 ~ + 10 V , -20 ~ + 20 Ma)
- ❖ 2 Analog Output(-10 ~ + 10 V , -20 ~ + 20 Ma)
- ❖ Com Port:: Built-in 1 RS-232 and 2 RS-485 ports; Compatible with Modbus ASCII/RTU protocol
- ❖ High speed input: 2 points of 100KHZ; 6 points of 10KHZ
- ❖ Programming Cable
- ❖ Hard Copy of System manual with demo programs
- ❖ All Digital Inputs with on panel toggle switch with external/internal signal selection
- ❖ All Digital Outputs with on panel LED indicator and potential free relay contacts.
- ❖ All analog inputs with on panel potentiometer / external signal handling capability
- ❖ All analog outputs on panel connectors
- ❖ Standard instrumentation panel enclosure with SMPS, MCB, Power indicator and connectors.

HMI: DeltaTP02G-AS1

- ❖ Key Operation
- ❖ 24VDC input power
- ❖ Screen: STN-LCD
- ❖ Color: Monochromatic
- ❖ Resolution: 160X32 dots
- ❖ Communication Interface :
- ❖ Com1: RS-232 and Com2: RS-485

PLC Programming Software:
ISPSOFT:

- ❖ ISPSoft is Delta's new generation software development tool for programmable logic controllers
- ❖ Supports five programming languages. They are ladder diagrams (LD), sequential function charts (SFC), function block diagrams (FBD), instruction lists (IL), and structured texts (ST).
- ❖ It provides many convenient functions such as making comments, creating bookmarks, activating/inactivating networks, managing devices and symbols, simulation, and etc.

HMI Configuration Software:
TPEditor

- ❖ Editing software for TP series text panel.

Suggested Experiments:

- ❖ Study of PLC and power wiring.
- ❖ Study of PLC instructions.
- ❖ Study of PLC ladder programming.
- ❖ Study of PLC structured language programming.
- ❖ Study of digital input interfacing using PLC.
- ❖ Study of digital output interfacing using PLC.
- ❖ Study of industrial standard analog input and programming for measurement.
- ❖ Study of industrial standard analog output and programming for measurement.
- ❖ Study of High speed input interfacing using PLC.
- ❖ Study of different communication protocol.

NI-SC-WI SCADA Software – WonderWare

In Touch software is an open and extensible Supervisory HMI and SCADA solution that enables you to quickly create standardized, reusable visualization applications.

Key Benefits:

❖ Ease-of-use, enabling developers and operators to be more productive
❖ Unequaled device integration and connectivity to virtually every device and system
❖ Stunning graphic visual representation and interaction with your operation brings the right information to the right people at the right time

Key Capabilities:

❖ Resolution independent graphics and intelligent symbols that visually bring your facility to life right on your computer screen.
❖ Sophisticated scripting to extend and customize applications for your specific needs.
❖ Real-time distributed Alarming with historical views for analysis.
❖ Built-in, real-time and historical trending.
❖ Microsoft ActiveX controls and .NET controls integration.
❖ Extensible library of over 500 pre-designed intelligentand customizable graphic and object symbols.
❖ Support of Microsoft Remote Desktop Services, Smart Card authentication and Hyper-V virtualization allow highly economic, secure and available systems.

System Requirements for SCADA:

❖ Microsoft Windows 7 SP1 Professional, Enterprise, Ultimate (32/64-bit)
❖ Microsoft Windows 8 Professional and Enterprise (32/64-bit)

Description

❖ Processor Speed of 2 GHz
❖ Random Access Memory(RAM) of 2GB
Available Disk Space of 30GB

NI-SC-VC: SCADA Software – Citect

❖ Vijeo Citect is the operating and monitoring component with its powerful display capabilities and its operational features; it delivers actionable insight faster, enabling operators to respond quickly to process Disturbances, thereby increasing their efficiency. With its easy-to-use configuration tools and powerful features you can quickly develop and implement solutions for any size application.

❖ Capabilities of Vijeo Citect: Overview of configuration environment, Graphics (pages, animations), Communication to PLCs, Variable tags, Alarms, Trends, Reports.

❖ Drivers work on RS232, 422, 485, TCP/IP, Multiple protocols per I/O server, OPC Server DA2.0 support.

Industry Standard Protocols:
❖ ASCII
❖ BacNet*
❖ DNP 3.0
❖ EIB
❖ IEC870-5
❖ Modbus
❖ OPC
❖ Profibus
❖ SNMP

Description

❖ Processor Speed of 2 GHz
❖ Random Access Memory(RAM) of 2 GB
❖ Available Disk Space of 160GB
❖ Graphics Adapter of 64MB of VRAM
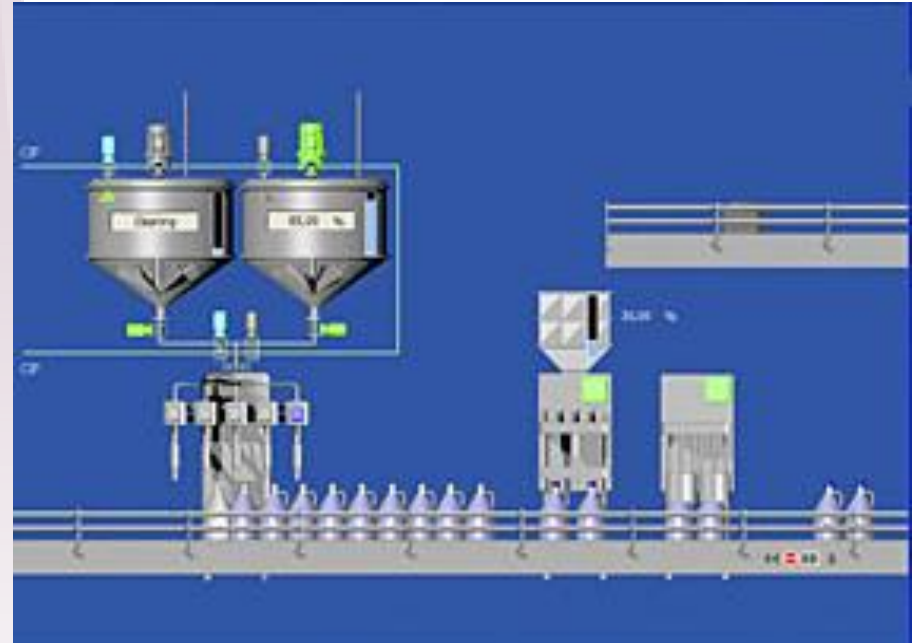
System Requirements for SCADA

❖ Microsoft Windows 7 SP1 Professional, Enterprise, Ultimate (32/64-bit)
❖ Microsoft Windows 8 Professional and Enterprise (32/64-bit)

NI-VT-SI: VFD Trainer with Siemens Drive

Features:
Siemens SINAMICS G1200.75 KW / 1 HP Variable Frequency Drivewith 1Ø, 230V, 50Hz supply.

Specifications:
- ❖ 9 Digital Inputs
- ❖ 2 Analog Inputs
- ❖ 3 Digital Outputs
- ❖ 2 Analog Outputs
- ❖ RS485 Communication port

Open-loop/closed-loop control techniques:
- ❖ V/f (linear, square law, free, FFC (flux current control)
- ❖ ECO (Encoder less torque control)
- ❖ Field-oriented control of speed and torque with encoder

Software Functions:
- ❖ Signal interconnection with BICO technology
- ❖ Automatic restart after line supply
- ❖ failure or operational fault
- ❖ Positioning down ramp
- ❖ Slip compensation
- ❖ Free function blocks (FFB) for logic and arithmetic operations
- ❖ Ramp smoothing
- ❖ 3 selectable drive data sets
- ❖ 3 selectable command data sets (CDS) (manual/auto)
- ❖ Flying restart
- ❖ JOG
- ❖ Technology controller (PID)
- ❖ Thermal motor protection
- ❖ Thermal inverter protection
- ❖ Set point input
- ❖ Motor identification

- ❖ Motor holding brake
- ❖ Vdcmax controller
- ❖ Kinetic buffering
- ❖ Braking functions for
    - DC braking
    - Compound braking
    - Dynamic braking

0.5HP 3Ø Induction Motor
- ❖ 440V AC
- ❖ 1440 RPM
- ❖ IP55
- ❖ 0.5HP DC Machine

Shaft Encoder
- ❖ 550 PPR / Proximity sensor
- ❖ Projected Shaft / Geared Teeth
- ❖ A, B, Z
- ❖ PNP Type, 24V

Mechanical Structure
- ❖ MS structure
- ❖ Aligned installation of AC motor and Shaft encoder
- ❖ Electrical terminal strip
- ❖ Electrical Panel
- ❖ VFD mounting
- ❖ Loading Arrangement
    - Motor-Generator Set

Suggested Experiments:
- ❖ Study of variable frequency drive and its control and power wiring.
- ❖ Study of AC drive parameters
- ❖ Interfacing AC drive with digital inputs
- ❖ Interfacing AC drive with analog inputs.
- ❖ Study of V/F control modes of operation of AC drive with load.
- ❖ Study of Encoder interfacing with VFD.

NI-VT-YA VFD Trainer with Yaskawa Drive

Features:
YASKAWA A10000.75 KW / 1 HP Variable FrequencyDrive with 3Ø, 400V, 50Hz supply.

Specifications:
- ❖ 8 Digital Inputs
- ❖ 3 Analog Inputs
- ❖ 1 Pulse Inputs
- ❖ 4 Digital Outputs
- ❖ 2 Analog Outputs
- ❖ 1 Pulse Outputs
- ❖ RS485 Modbus RTU Communication
- ❖ Control Methods:
- ❖ V/f Control/f Control with PG (encoder), Open Loop Vector Control, Closed Loop Vector Control, Open Loop Vector Control for PM, Advanced Open Loop Vector Control for PM, Closed Loop Vector Control for PM.
- ❖ Main Control Functions:
- ❖ Torque Control, Droop Control, Speed/torque Control Switching, Feed Forward Control, Zero Servo Function, Momentary Power Loss Ride-Thru, Speed Search, Over torque/Under torque Detection, Torque Limit, 17 Step Speed (max), Acceleration/deceleration Switch, S-curve Acceleration/deceleration, 3-wire Sequence, Auto-tuning (rotational, stationary tuning), Dwell, Cooling Fan on/off Switch, Slip Compensation, Torque Compensation, Frequency Jump, Upper/lower Limits for Frequency Reference, DC Injection Braking at Start and Stop, Over excitation Braking, High Slip Braking, PID Control (with sleep function), Energy Saving Control, Modbus Comm. (RS-422/485 max, 115.2 kbps), Fault Restart, Application Presets, DriveWorksEZ (customized function), Removable Terminal Block with Parameter Backup Function, Online Tuning, KEB, Over Excitation Deceleration, Inertia (ASR) Tuning, Overvoltage Suppression, High Frequency Injection.

0.5HP 3Ø Induction Motor
- ❖ 440V AC
- ❖ 1440 RPM
- ❖ IP55
- ❖ 0.5HP DC Machine

Shaft Encoder
- ❖ 550 PPR / Proximity sensor
- ❖ Projected Shaft / Geared Teeth
- ❖ A, B, Z
- ❖ PNP Type, 24V

Mechanical Structure
- ❖ MS structure
- ❖ Aligned installation of AC motor and Shaft encoder
- ❖ Electrical terminal strip
- ❖ Electrical Panel
- ❖ VFD mounting
- ❖ Loading Arrangement
  - • Motor-Generator Set

Suggested Experiments:
- ❖ Study of variable frequency drive and its control and power wiring.
- ❖ Study of AC drive parameters
- ❖ Interfacing AC drive with digital inputs
- ❖ Interfacing AC drive with analog inputs.
- ❖ Study of V/F control modes of operation of AC drive with load.
- ❖ Study of Encoder interfacing with VFD.

NI-VT-DE VFD Trainer with Delta Drive

Features:

DELTA VFD (VFD007V43-A2)0.75 KW / 1 HP Variable Frequency Drive with 3Ø, 380 to 480 Volts AC, 50Hz supply.

Specification:

- ❖ Analog input terminals (AVI, ACI, AUI, ACM)
- ❖ Digital inputs (FWD, REV, MI1~MI6, DCM)
- ❖ Digital outputs-photo coupler (MO1, MO2, MCM)
- ❖ Digital outputs-relayed (RA,RB,RC,MRA,MRB,MRC)
- ❖ Analog output meter (AFM)

Control Characteristics:

- ❖ Control System
  - • V/f curve
  - • V/f+ PG (Encoder)
  - • SVC(Sensor less vector control)
  - • FOC vector control+PG(Encoder)
  - • TQR(Torque control)+PG(Encoder)
- ❖ V/f Curve Adjustable V/f curve using 4 independent points and square curve
- ❖ Frequency Setting Signal±10V, 4~20mA, pulse input
- ❖ Braking Type: DC Injection; Dynamic Braking Motor Control-Max Level: Closed Loop Vector

0.5HP 3Ø Induction Motor

- ❖ 440V AC
- ❖ 1440 RPM
- ❖ IP55
- ❖ 0.5HP DC Machine

Shaft Encoder

- ❖ 550 PPR / Proximity sensor
- ❖ Projected Shaft / Geared Teeth
- ❖ A, B, Z
- ❖ PNP Type, 24

Mechanical Structure

- ❖ MS structure
- ❖ Aligned installation of AC motor and Shaft encoder
- ❖ Electrical terminal strip
- ❖ Electrical Panel
- ❖ VFD mounting
- ❖ Loading Arrangement
  - • Motor-Generator Set

Suggested Experiments:

- ❖ Study of variable frequency drive and its control and power wiring.
- ❖ Study of AC drive parameters
- ❖ Interfacing AC drive with digital inputs
- ❖ Interfacing AC drive with analog inputs.
- ❖ Study of V/F control modes of operation of AC drive with load.
- ❖ Study of Encoder interfacing with VFD.

NI-SD-YA: Servo Drive and Motor YASKAWA

Features:

Servo Drive and Motor YASKAWA (NI-SD-YA) have following features.

YASKAWA Servo Drive (SGDV-2R8-A-11-B):

Specification:

- ❖ Single-phase 200 to 230 VAC
- ❖ Servomotor Max. Capacity 400 Watt
- ❖ Feedback: Serial encoder 20-bit (incremental encoder)
- ❖ Sequence Input 7 Number of Channels
- ❖ Functions

  - Homing deceleration switch signal
  - External latch signals
  - Forward run prohibited , reverse run prohibited
  - Forward external torque limit, reverse external torque limit
  - Positive and negative logic can be changed.
- ❖ Sequence Output: Servo alarm ,3 Number of Channels
- ❖ Functions

  - Positioning completion
  - Speed limit detection
  - Speed coincidence detection
  - Brake
  - Rotation detection
  - Warning
  - Servo ready
  - Near
  - Torque limit detection
  - Positive and negative logic can be changed.

YASKAWA Servo Motor (SGMAV-04ADA61):

SSpecification:

- ❖ Single phase 200-230 VAC
- ❖ Rated Output : 400 watt
- ❖ Serial encoder : 20 bit Incremental encoder
- ❖ Shaft End with key and tap

Suggested Experiments:

- ❖ Study of Servo drive, Servo Motor and its control and power wiring.
- ❖ Study of Servo drive parameters
- ❖ Interfacing Servo drive with PLC.
- ❖ Study of Encoder interfacing.

NI-SD-DE: Servo Drive and Motor DELTA

Features:

Servo Drive and Motor DELTA (NI-SD-DE) has following features.

DELTA Servo Drive (ASD-B2-0421-B):

- ❖ Single-phase:200~255VAC,50/60Hz ±5%400W
- ❖ Encoder Resolution:17-bit (160000 p/rev)
- ❖ Main Circuit SVPWM Control
- ❖ Tuning Auto / Manual Modes
- ❖ Inputs:
  - Servo On, Reset, Gain switching, Pulse clear, Zero speed CLAMP, Command input reverse control, Speed/Torque limit enabled, Speed command selection, Position / Speed mode switching, Speed / Torque mode switching, Torque / Position mode switching, Emergency stop, Forward / Reverse inhibit limit, Forward / Reverse operation torque limit, Forward / Reverse JOG input, Electronic gear ratio (Numerator) selection and Pulse inhibit input
- ❖ Outputs :
  - Encoder signal output (A, B, Z Line Driver / Z Open collector) Servo ready, Servo On, At Zero speed, At Speed reached, At Positioningcompleted, At Torques limit, Servo alarm (Servo fault) activated, Electromagnetic brake control, Output overload warning, Servo warning activated.
- ❖ Communication interface: RS 232/RS 485

DELTA Servo Motor (ECMA-C20604ES):

- ❖ Single phase 230 VAC
- ❖ Rated output power 400 Watt
- ❖ Rated speed 3000 (r/min)

Suggested Experiments:

- ❖ Study of Servo drive, Servo Motor and its control and power wiring.
- ❖ Study of Servo drive parameters
- ❖ Interfacing Servo drive with PLC.
- ❖ Study of Encoder interfacing.

NI-SD-MI: Servo Drive and Motor Mitsubishi

Features:
Servo Drive and Motor Mitsubishi (NI-SD-MI) has the following features.

Mitsubishi Servo Drive (MR-JE-40A):
- 1-phase 200 V AC to 240 V AC,50 Hz/60 Hz
- Sine-wave PWM control/current control method
- Communication function USB: Connect a personalcomputer
- RS-422: Connect a controller
- Positioning feedback pulse Encoder resolution: 131072 pulses/rev
- Servo function: Advanced vibration suppression control II, adaptive filter II, robust filter, auto tuning, one-touch tuning,tough drive function, drive recorder function, machine diagnosis function, power monitoring function

Mitsubishi Servo Motor (HF-KN-43(B)J):
- Rated Power 400Watt
- Rated speed 3000 [r/min]
- Speed/position detector Incremental 17-bit encoder (resolution: 13107 Pulses/rev)

Suggested Experiments:
- Study of Servo drive, Servo Motor and its control and power wiring.
- Study of Servo drive parameters
- Interfacing Servo drive with PLC.
- Study of Encoder interfacing.
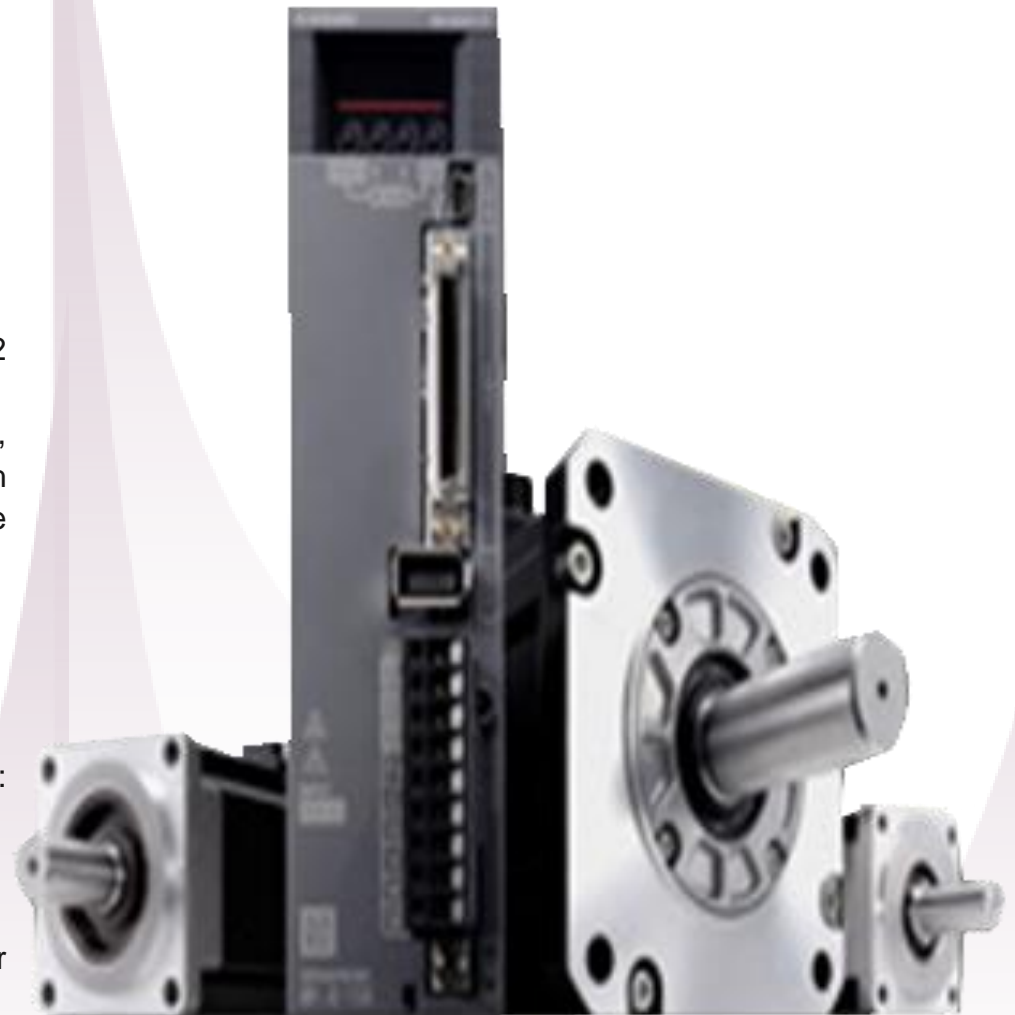
NI-SD-OM: Servo Drive and Motor OMRON

Features:

Servo Drive and Motor OMRON (NI-SD-OM) has the following features.

OMRON Servo Drive (R88D-GT04H):

❖ Single-phase 200 VAC
❖ Rated Power 400 Watt
❖ Control method All-digital servo
❖ Inverter method IGBT-driven PWM method
❖ Position Control, Speed Control, Torque Control
❖ Communications : RS-232, MECHATROLINKcommunications
❖ Feedback Serial encoder (incremental)
❖ Sequence input signal:
  • Forward/reverse run prohibit, deviation counter reset, alarm reset, control mode switch, pulse prohibited, speedselection, gain switch, zero speed designation, origin proximity
❖ Sequence output signal:
  • Brake release, servo ready and alarm output. It is possible also to output two types of configurable signals: currentlimit, rotation speeddetection, warning signal, speed coincidence, positioning completed

OMRON Servo Motor (R88M-G40030H-S2):

❖ Single phase 200 V
❖ Rated Power 400 W
❖ 3,000-r/min Servomotors
❖ With incremental encoder
❖ Straight shaft with key and tap
❖ Single phase 200 V
❖ Rated Power 400 W
❖ Without brake

Suggested Experiments:

❖ Study of Servo drive, Servo Motor and its control and power wiring.
❖ Studies of Servo drive parameters.
❖ Interfacing Servo drive with PLC.
❖ Study of Encoder interfacing.

NI-LCT: Level Control Trainer

❖ A level control trainer is designed for student's demonstration on level measurement as well as to provide them with hands on experience on how a level loop can be controlled using microprocessor based controller.

❖ The process setup consists of supply water tank fitted with pump for water circulation. The level transmitter used for level sensing is fitted on transparent process tank with graduated level scale. The level is controlled by microprocessor based digital indicating controller which manipulates pneumatic control valve through I/P converter. A pneumatic control valve adjusts the water flow in to the tank. These units along with necessary piping are fitted on support housing.
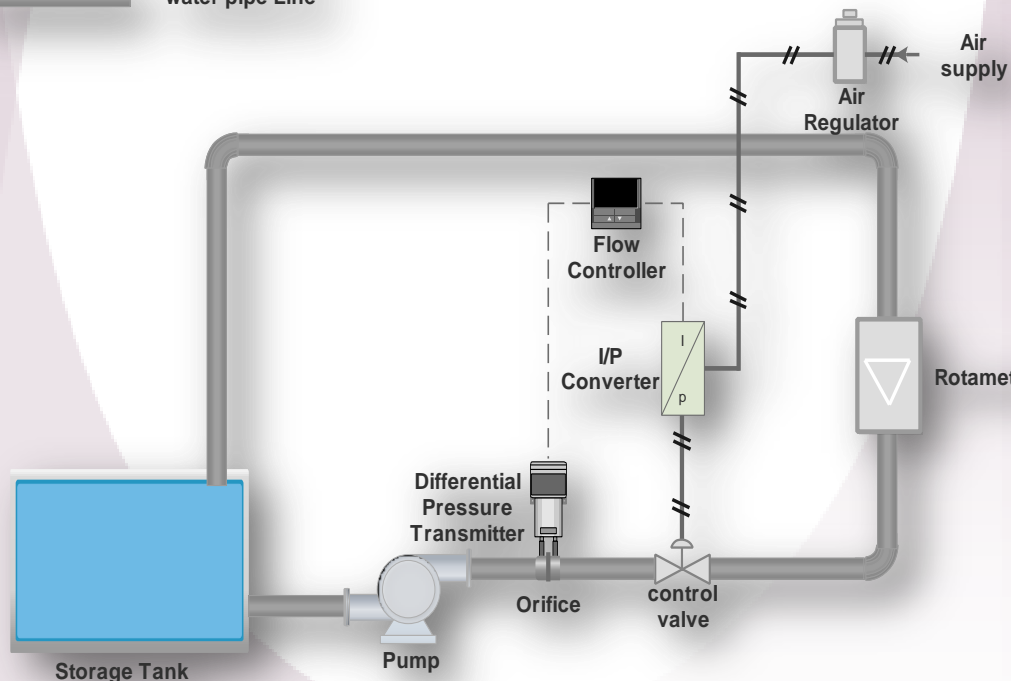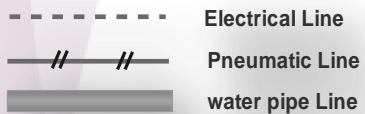
❖ The controller can be connected to computer through comport for monitoring the process in SCADA.

Suggested Experiments:
❖ Study of open loop (Manual control)
❖ Study of on/off controller
❖ Study of proportional controller
❖ Study of proportional Integral controller
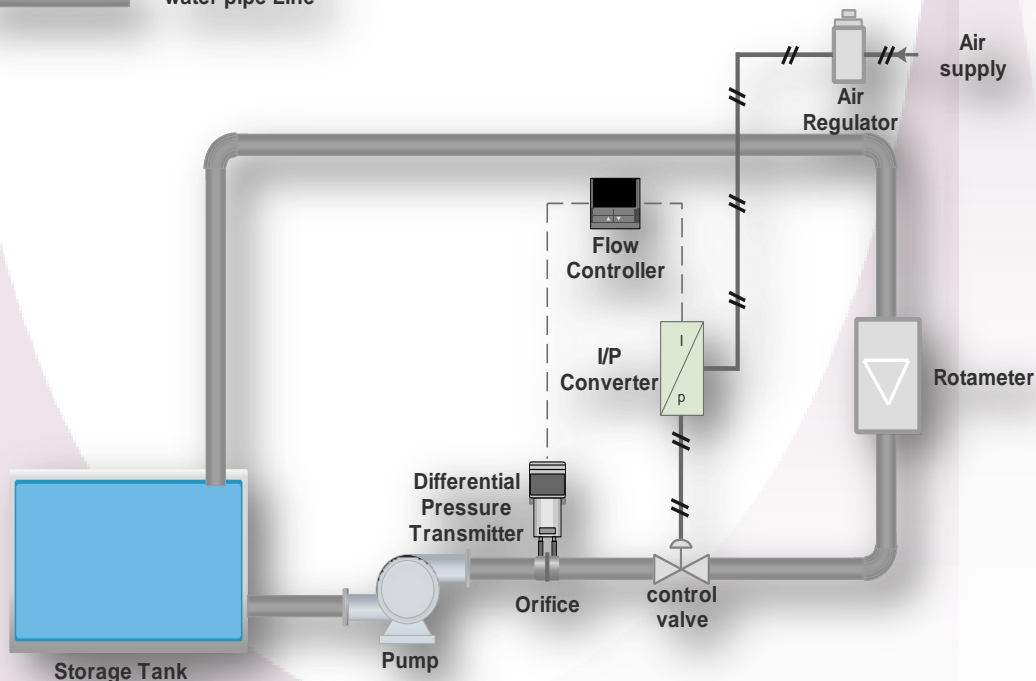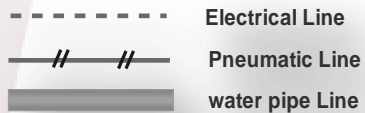❖ Study of proportional derivative controller
❖ Study of PID controller

Diagram:

Specification:

Description

❖	Process Tank	Transparent With Graduated Level Scale, Capacity 2 Lit
❖	Pump	Vertical, Fractional Horsepower
❖	Supply Tank	SS304
❖	Rotameter	Range 10-100 LPH
❖	Control Valve	Size1/2", Pneumatic, input:3-15 psig
❖	I/P Converter	Input 4-20 mA DC, Output 3-15 psig
❖	Air Regulator	Size 1/4" BSP, Range 0-2 Kg/Cm2
❖	Panel and Support	MS
❖	Piping and Fittings	1/4" Size
❖	Interfacing Unit	For Input-Output Communication With Auto/Manual Facility
❖	Controller	Make: West UK; PID Controller with display, Modbus Supported
❖	Software	PID Control, Data Logging, Trend Plots, Off-Line Analysis.

NI-FCT: Flow Control Trainer

- ❖ A flow control trainer is designed for student's demonstration on flow measurement as well as to provide them with hands on experience on how a level loop can be controlled using microprocessor based controller.
- ❖ The process setup consists of supply water tank fitted with pump for water circulation. The Differential pressure transmitter used for flow sensing with orifice plate is fitted on pipe to create differential pressure. The flow is controlled by microprocessor based digital indicating controller which manipulates pneumatic control valve through I/P converter. A pneumatic control valve adjusts the water flow. These units along with necessary piping are fitted on support housing.
- ❖ The controller can be connected to computer through comport for monitoring the process in SCADA.

Suggested Experiments:

- ❖ Study of open loop (Manual control)
- ❖ Study of on/off controller
- ❖ Study of proportional controller
- ❖ Study of proportional Integral controller
- ❖ Study of proportional derivative controller
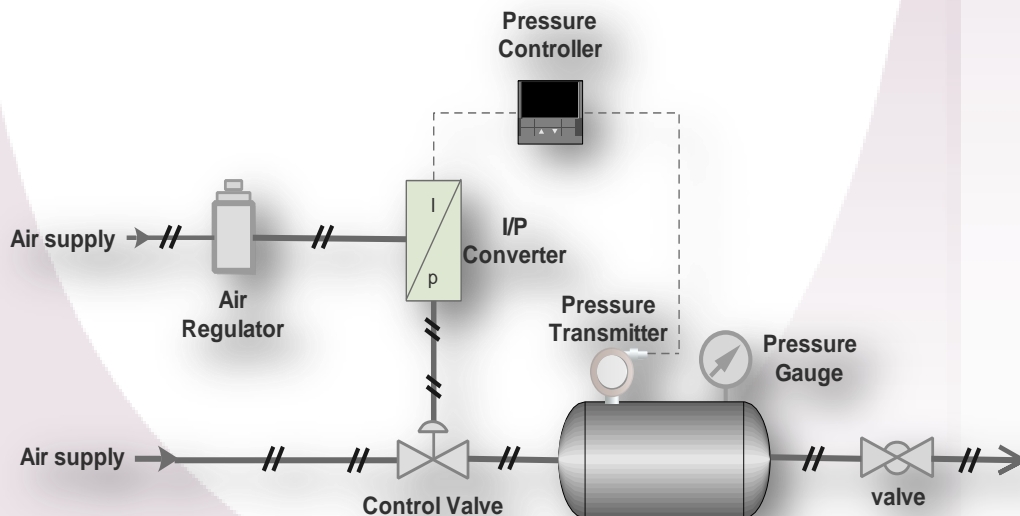- ❖ Study of PID controller

Specification:

Description

❖	D/P Transmitter	Range 0-200 mm water, Output 4-20 mA DC
❖	Orifice Meter	SS304
❖	Pump	Vertical, Fractional Horsepower
❖	Supply Tank	SS304
❖	Rotameter	Range 10-100 LPH
❖	Control Valve	Size1/2", Pneumatic, input:3-15 psig
❖	I/P Converter	Input 4-20 mA DC, Output 3-15 psig
❖	Air Regulator	Size 1/4" BSP, Range 0-2 Kg/Cm2
❖	Panel and Support	MS
❖	Piping and Fittings	1/4" Size
❖	Interfacing Unit	For Input-Output Communication With Auto/Manual Facility
❖	Controller	PID Controller withdisplay, Modbus Supported
❖	Software	PID Control, Data Logging, Trend Plots, Off-Line Analysis.

Diagram:

Electrical Line
Pneumatic Line
water pipe Line

Air supply
Air Regulator
Flow Controller
I/P Converter
Rotameter
Differential Pressure Transmitter
Orifice
control valve
Pump
Storage Tank

NI-PCT: Pressure Control Trainer

- ❖ A Pressure control trainer is designed for student's demonstration on pressure measurement as well as to provide them with hands on experience on how a pressure loop can be controlled using microprocessor based controller.
- ❖ The process set up consists of pressure vessel fitted with pneumatic control valve. Pressure transmitter is used for pressure sensing. The process parameter (Pressure) is controlled by microprocessor based digital indicating controller which manipulates pneumatic control valve fitted at inlet of pressure tank by I/P converter. These units along with necessary piping are fitted on support housing designed.
- ❖ The controller can be connected to computer through comport for monitoring the process in SCADA.

Diagram:

Suggested Experiments:

- ❖ Study of open loop (Manual control)
- ❖ Study of on/off controller
- ❖ Study of proportional controller
- ❖ Study of proportional Integral controller
- ❖ Study of proportional derivative controller
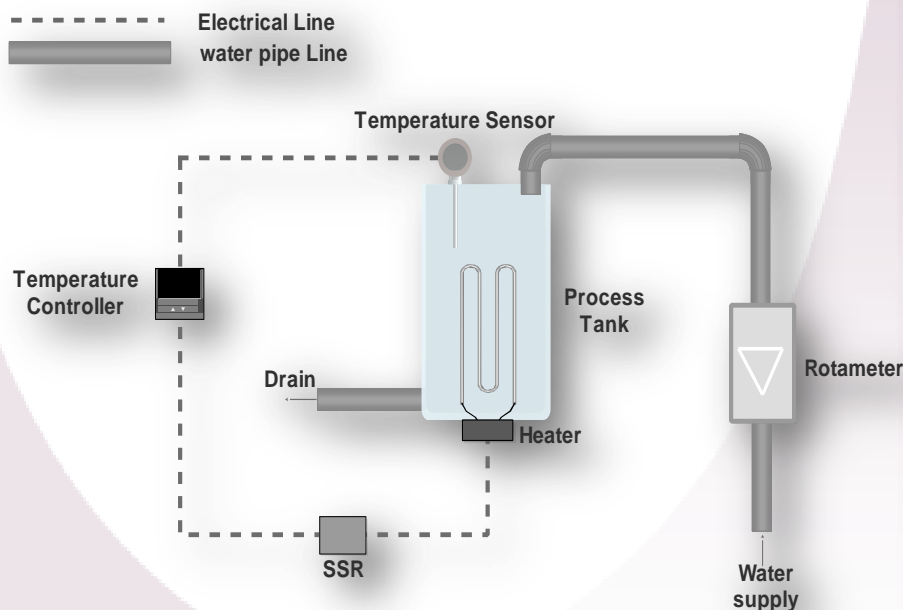- ❖ Study of PID controller

Specification:

Description

❖ Pressure Transmitter	Range 0-6 Bar, Output 4-20 mA
❖ Process Tank	Capacity 1.5 Liter
❖ Control Valve	Size1/2", Pneumatic, input:3-15 psig
❖ I/P Converter	Input 4-20 mA DC, Output 3-15 psig
❖ Air Regulator	Size 1/4" BSP, Range 0-2 Kg/Cm2
❖ Panel and Support	MS
❖ Piping and Fittings	1/4" Size
❖ Interfacing Unit	For Input-Output Communication With Auto/Manual Facility
❖ Controller	PID Controller with display, Modbus Supported
❖ Software	PID Control, Data Logging, Trend Plots, Off-Line Analysis.

NI-TCT: Temperature Control Trainer

❖ A Temperature control trainer is designed for student's demonstration on Temperature measurement as well as to provide them with hands on experience on how a temperature loop can be controlled using microprocessor based controller.

❖ The process setup consists of heating tank fitted with SSR controlled heater for on-line heating of the water. The flow of water can be manipulated and measured by Rotameter. Temperature sensor is used for temperature sensing. Temperature is controlled by microprocessor based digital indicating controller which manipulates heat input to the process. These units along with necessary piping and fitting are mounted on support frame designed for tabletop mounting.

❖ The controller can be connected to computer through comport for monitoring the process in SCADA mode.

Diagram:

Suggested Experiments:

❖ Study of open loop (Manual control)
❖ Study of on/off controller
❖ Study of proportional controller
❖ Study of proportional Integral controller
❖ Study of proportional derivative controller
❖ Study of PID controller

Specification:

Description

❖ Temperature sensor	RTD ,PT100 / Thermocouple J type
❖ Heater	230 V AC
❖ Solid State Relay	Analog 0 – 10 V
❖ Process Tank	SS304
❖ Rotameter	Range 10-100 LPH
❖ Panel and Support	MS
❖ Piping and Fittings	1/4" Size
❖ Interfacing Unit	For Input-Output Communication With Auto/Manual Facility
❖ Controller	PID Controller with display, Modbus Supported.
❖ Software	❖ PID Control, Data Logging, Trend Plots, Off-Line Analysis.