



Heating, Ventilation, and Air Conditioning Training WorkBench

Nvis 438HVAC



Nvis 438HVAC is a comprehensive Heating, Ventilation, and Air Conditioning Training WorkBench designed for hands-on learning of different scenarios like Heating, Ventilation and Air Conditioning systems, temperature and humidity monitoring, AHU operation, and HVAC control strategies.

The workBench provides a practical representation of a multi-floor HVAC distribution system, integrating an Air Handling Unit (AHU), cooling unit, temperature & humidity monitoring, HMI-based supervision, PID controllers and electrical protection/control devices.

It enables students, trainees and engineers to understand the complete HVAC control cycle—from sensing environmental parameters to controlling HVAC equipment and monitoring the system through an HMI.

Applications

Nvis 438HVAC is suitable for:

- Engineering Colleges & Universities
- Polytechnic Institutes
- ITI & Skill Development Centres
- HVAC Training Centres
- Industrial Training Centres
- R&D and Demonstration Laboratories
- Faculty Development & Trainer Development Programs
- Industrial Automation and HVAC Training Labs



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Features

- **Comprehensive HVAC Training Platform:** Integrates essential HVAC components, electrical systems, instrumentation, control, and automation technologies into a single practical training platform.
- **Individual Floor Zones:** Each floor is configured as a separate HVAC zone to demonstrate independent temperature, humidity and Air Quality.
- **Real-Time Temperature & Humidity Monitoring:** Provides live measurement of temperature and humidity across multiple zones/floors for effective process monitoring and analysis.
- **Comprehensive HVAC Component Demonstration:** Includes a visible compressor, electromagnetic clutch, condenser, evaporator, filter-drier, and expansion valve for hands-on understanding of component functions and system operation.
- **Air Handling Unit (AHU):** Demonstrates fundamental concepts of air handling, air conditioning, ventilation, and air distribution.
- **Three-Floor HVAC Distribution Model:** Simulates air distribution across multiple floors/zones, enabling practical study of zoning, air distribution, and system balancing.
- **Condenser Fan Speed Control:** Allows variable control of condenser fan speed to study its effect on HVAC system performance and operating conditions.
- **Industrial HMI-Based Control:** Integrated Delta HMI enables real-time system monitoring, parameter setting, alarm indication, and control of HVAC processes.
- **PID-Based Temperature Control:** Facilitates hands-on learning of closed-loop process control, PID parameters, tuning, and temperature regulation.
- **Energy Monitoring:** Integrated digital energy meter enables monitoring of electrical parameters and energy consumption for energy-efficiency analysis.
- **Clear Piping & Wiring Representation:** Diagrammatic representation of HVAC piping, electrical wiring, and control circuits provides easy identification of connections and component interactions.
- **Interactive Hands-On Training:** Supports real-time operation, experimentation, troubleshooting, parameter adjustment, and performance analysis of HVAC systems.
- **Integrated Multidisciplinary Learning:** Combines HVAC, electrical, instrumentation, process control, and industrial automation concepts to provide comprehensive practical training.
- **Industrial-Grade Construction:** Built on a heavy-duty M.S. frame with epoxy coating, ensuring durability, reliability, and suitability for demanding laboratory and industrial training environments.
- **Mobile Workbench Design:** Equipped with heavy-duty castor wheels with locking mechanisms, allowing easy movement and secure positioning during training sessions.
- **Electrical Safety:** Integrated MCB with AC power supply provides electrical protection and enhances operational safety during practical experiments and training.



Scope of Learning

HVAC Fundamentals

- Understand the basic principles of HVAC systems.
- Identify major HVAC components and their functions.
- Understand the operation of an Air Handling Unit.

Temperature & Humidity Measure

- Measure and monitor temperature and humidity.
- Understand temperature control requirements for different HVAC zones.

PID Control

- Understand the fundamentals of closed-loop control.
- Configure and operate PID controllers.
- Set process parameters and observe controller response.
- Understand the relationship between set point, process value and controller output.
- Study basic temperature/process control applications.

HMI & Automation

- Understand HMI-based HVAC monitoring.
- Monitor HVAC parameters through an operator interface.
- Understand basic alarm and parameter-monitoring concepts.
- Develop an understanding of industrial HVAC automation.

Electrical & Energy Monitoring

- Understand three-phase electrical supply and phase indication.
- Identify electrical protection devices used in HVAC systems.
- Monitor electrical parameters using an energy meter.
- Understand the importance of electrical safety in HVAC installations.
- Understand the role of an emergency stop in an automated system.



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Technical Specifications

PLC: 1 no.

- Digital Inputs: 16 nos.
- Digital Outputs: 12 nos.
- Analog Inputs: 4 nos.
- RTD Module: 1 no.
- Programming Software: ISPSoft

HMI: 1 no.

- Display Size: 7-inch
- Display Type: TFT LCD
- Resolution: 800 × 480 pixels
- Display Colors: 65,536 colors
- Touch Screen: High-precision 4-wire resistive type
- CPU: 32-bit, 400 MHz RISC
- Communication Interfaces: Ethernet, RS485
- Supply Voltage: +24 V DC
- Flash Memory: 128 MB
- DDRAM: 64 MB

Three-Phase Induction Motor: 1 no.

- Motor Type: 3-Phase Squirrel Cage Induction Motor
- Rated Power: 2 HP (1.5 kW)
- Rated Voltage: 415 V AC
- Frequency: 50 Hz
- No. of Poles: 4
- Rated Speed: Approx. 1440 RPM
- Rated Current: Approx. 3.2–3.5 A

Variable Frequency Drive (VFD): 1 no.

- Rated Power: 2 HP (1.5 kW)
- Input Voltage: 3-Phase, 380–480 V AC
- Input Frequency: 50/60 Hz
- Output Current: 4.6 A (Normal Duty)
- Output Frequency: 0–599 Hz
- Enclosure Protection: IP20

RTD Temperature Sensors – 2 nos.

- Sensor type: RTD
- Application: Temperature measurement and monitoring in HVAC processes

Air Quality Sensor – 1 no.

- Application: Monitoring of air-quality parameters for HVAC demonstration and environmental monitoring





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Digital Energy Meter – 1 no.

- Display: Backlit LCD
- Display Configuration: 3 rows of 4 digits + 1 row of 7½ digits
- Electrical Connection: 3-Phase, 4-wire
- Output: Pulse Output
- Communication: RS485 with Modbus RTU
- Rated Input Current: 5 A AC nominal
- Input Current Range: 11 mA to 6 A
- Supply Voltage: 85–270 V AC
- Frequency: 45–65 Hz
- Mounting: Panel Mount

Temperature & Humidity Sensors – 3 nos.

- Supply Voltage: 5–30 V DC
- Signal Output: RS485
- Communication Protocol: Modbus RTU
- Operating Temperature: –40°C to +60°C
- Application: Zone-wise temperature and humidity monitoring

HVAC Refrigeration System

- Compressor: 1 no.
- Condenser: Air-cooled condenser with 12 V DC fan – 1 no.
- Evaporator: Evaporator with speed-regulated 12 V DC fan – 1 no.
- Cooling System: Blower-based air distribution
- Application: Demonstration of refrigeration cycle and HVAC cooling operation

Three-Floor Air Distribution Model

- Air Distribution: Multi-zone, three-floor representation
- Floor-wise Monitoring: Temperature and humidity measurement
- Air Distribution: Blower-based conditioned-air distribution
- Application: Demonstration of HVAC zoning, airflow distribution, and temperature control

Electrical Protection & Safety

- MCB: 4-Pole, 3-Phase, 10 A
- Phase Indication: R, Y & B phase indicators
- Emergency Stop: Provided for safe operation
- Key Switch: 1 no. for controlled system operation

Mechanical Construction & Mobility

- Caster Wheels: 4 nos.
- Wheel Configuration: 2 locking + 2 non-locking
- Caster Wheel Size: 75 mm