

The Modern Process Control system from Armfield, allows students to investigate the principles of industrial process control, using independent Temperature, Pressure, Flow, Level and Servo/Pendulum systems.

An advanced digital controller/logger with USB, Wifi, Bluetooth and LAN communications is built into each set of equipment.

Three sets of Windows PC software are supplied free of charge: Basic control, On/Off control and PID control. Software includes all settings and functions and on-screen graphing of Set point, Process value and Kp, Ki, and Kd terms in the Control Equation which is displayed dynamically. Data can be viewed on the internal graph or saved to a CSV file for later analysis.

PCT60 - Level Control / PCT61 - Flow Control / PCT62 - Temperature Control

PCT63 - Pressure Control / PCT64 - Servo Pendulum

Link to PCT



Key Features of the Essentials of Process Control Range

- ▶ Understanding drive and sensors
- ▶ On/Off control systems
- ▶ System time constant
- ▶ P, PI and PID control
- ▶ Zeigler Nichols algorithm
- ▶ Integral wind up
- ▶ Derivative filter
- ▶ Manual tuning
- ▶ Interfacing with MATLAB/LabVIEW
- ▶ Servo pendulum - angle control

Issue: 2

URL: <http://www.armfield.co.uk/pct60>

Applications

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**PCT
SERIES**

Level control is a fundamental aspect of process control in various industries, including chemical, petrochemical, food and beverage, water treatment, and more. Understanding level control is essential for students pursuing careers in engineering, process automation, or any field related to these industries.

The Armfield PCT60 level control system introduces students to fundamental control concepts, such as feedback control, proportional-integral-derivative (PID) controllers, and closed-loop control systems.

The Level system consists of a reservoir water tank, a variable speed pump, a pressure-based level sensor, and a clear process vessel with a scale. A proportional valve provides the process vessel drain.

An overflow pipe in the process vessel prevents it from being overfilled and the system allows students to adjust the pump speed and valve opening.

Features/Benefits

- ▶ USB, WiFi, Bluetooth & LAN communications supplied as standard
- ▶ Supplied software includes Basic control, On/Off control and PID control
- ▶ Software dynamically displays Set point, Process value and Kp, Ki, and Kd.
- ▶ MATLAB and Labview compatible
- ▶ Supplied with full set of manuals and teaching material

Experimental content

- ▶ Understanding how to control driving devices
- ▶ Understanding the sensors
- ▶ On/Off control systems
- ▶ System time constant
- ▶ P controller
- ▶ PI controller
- ▶ PID controller
- ▶ Zeigler Nichols algorithm
- ▶ Integral wind up
- ▶ Derivative filter
- ▶ Manual tuning
- ▶ Interfacing with MATLAB/LabVIEW

Ordering specifications

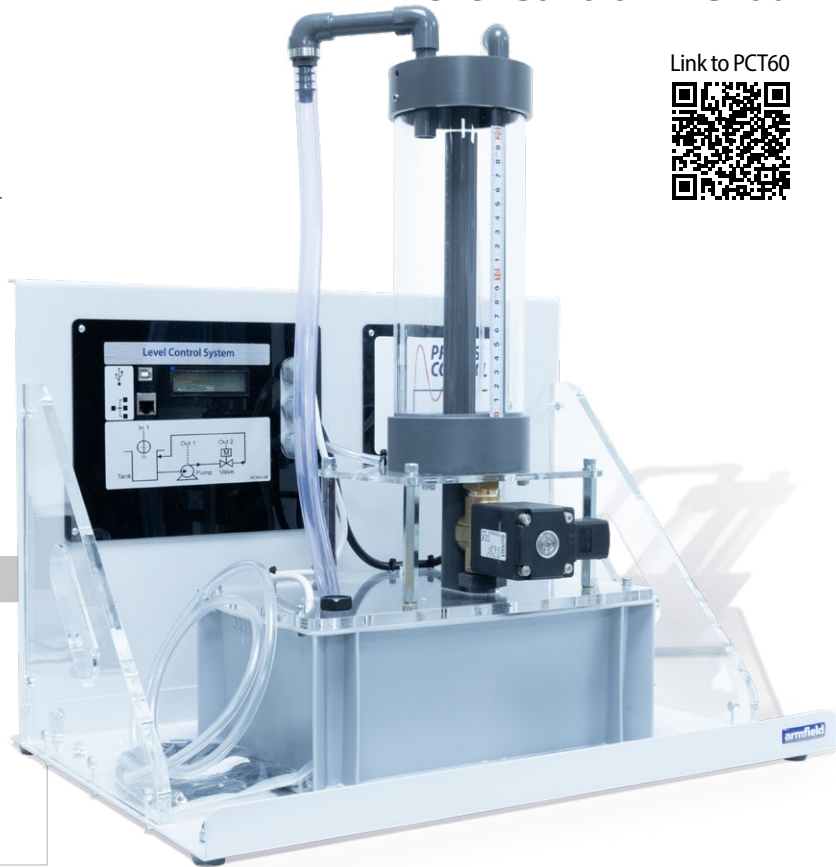
PCT60 Level Control Process

A level control process trainer, comprising:

- ▶ 4mm x 1.5mm wall clear PVC tube (300mm)
- ▶ 24V PSU 60w 2.5a
- ▶ Level process control system assembly
- ▶ Barley pot for process control
- ▶ USB lead
- ▶ Manual Control software allowing low level access to the Drive and Load in each system allowing calibration of sensors and drive systems
- ▶ On/Off Control software allowing control of each system with a simple On/Off algorithm, view software based oscillations and to explore the effects of hysteresis
- ▶ PID Control software allowing users to enter values for Kp, Ki, Kd and see how the system reacts to in-putted values

Level Control - PCT60

Link to PCT60



Requirements

Scale



Mains electrical supply:

110-230V, AC 50-60 Hz.

PC and Display meeting the following minimum specification:

- Processor: 1Ghz or faster
- RAM: 1Gb or more
- HDD Space: 1Gb
- OS: 32 or 64bit Windows 7, 8, 10 or 11
- Display: Recommended minimum (1920 by 1080) full HD

Overall dimensions

| | |
|--------|------|
| Length | 64cm |
| Width | 45cm |
| Height | 33cm |

Packed and crated shipping specifications

| | |
|--------------|---------------------|
| Volume | 0.095m ² |
| Gross weight | 12.1kg |

Ordering code

PCT60-UK: Level Process Control System

PCT60-EU: Level Process Control System

PCT60-USA: Level Process Control System

**PCT
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Flow Control - PCT61

Flow process control is a critical aspect of various industries, including chemical, petrochemical, manufacturing, and food production.

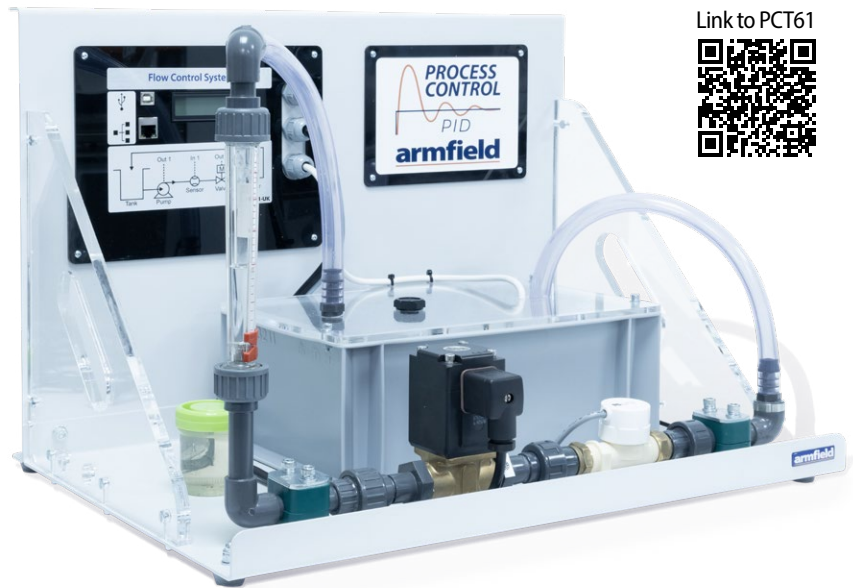
Students who understand flow control principles are better prepared for careers in these fields.

Proper flow control is essential for optimizing production processes. Students learn how to regulate the flow of materials or fluids in a way that minimizes waste, maximizes product quality, and improves overall process efficiency.

The PCT61 Flow control system introduces students to fundamental control concepts, such as feedback control, proportional-integral-derivative (PID) controllers, and closed-loop control systems.

The Flow system consists of a water tank, variable speed pump, a turbine type flow sensor, an electrically operated proportional valve and a variable area flow meter (rotameter).

This allows students to adjust the flow rate via the pump speed and the valve opening to develop a PID based control system.



Link to PCT61



Features/Benefits

- ▶ USB, WiFi, Bluetooth and LAN communications supplied as standard
- ▶ Supplied software includes Basic control, On/Off control and PID control.
- ▶ Software dynamically displays Set point, Process value and Kp, Ki, and Kd
- ▶ MATLAB and Labview compatible
- ▶ Supplied with full set of manuals and teaching material

Related products

- PCT60: Level Process Control System
- PCT62: Temperature Process Control System
- PCT63: Pressure Process Control System
- PCT64: Servo Pendulum Process Control System

Experimental content

- ▶ Understanding how to control driving devices
- ▶ Understanding the sensors
- ▶ On/Off control systems
- ▶ System time constant
- ▶ P controller
- ▶ PI controller
- ▶ PID controller
- ▶ Zeigler Nichols algorithm
- ▶ Integral wind up
- ▶ Derivative filter
- ▶ Manual tuning
- ▶ Interfacing with MATLAB LabVIEW

Ordering specifications

PCT61 Flow Control Process

A flow control process trainer, comprising:

- ▶ 4mm x 1.5mm Wall clear PVC tube (300mm)
- ▶ 24V PSU 60w 2.5a
- ▶ Flow process control assembly
- ▶ Barley pot for process control
- ▶ USB lead
- ▶ Manual Control software allowing low level access to the Drive and Load in each system allowing calibration of sensors and drive systems
- ▶ On / Off Control software allowing control of each system with a simple on off algorithm, view software based oscillations and to explore the effects of hysteresis
- ▶ PID Control software allowing users to enter values for Kp, Ki, Kd and see how the system reacts to in-putted values

Requirements

Scale



Mains electrical supply:

110-230V, AC 50-60 Hz.

PC and Display meeting the following minimum specification:

- Processor: 1Ghz or faster
- RAM: 1Gb or more
- HDD Space: 1Gb
- OS: 32 or 64bit Windows 7, 8, 10 or 11
- Display: Recommended minimum (1920 by 1080) full HD

Overall dimensions

| | |
|--------|------|
| Length | 64cm |
| Width | 45cm |
| Height | 33cm |

Packed and crated shipping specifications

| | |
|--------------|---------------------|
| Volume | 0.095m ³ |
| Gross weight | 12.1kg |

Ordering code

- PCT61-UK:** Flow Control System
- PCT61-EU:** Flow Control System
- PCT61-USA:** Flow Control System

**PCT
SERIES**

Temperature Control - PCT62

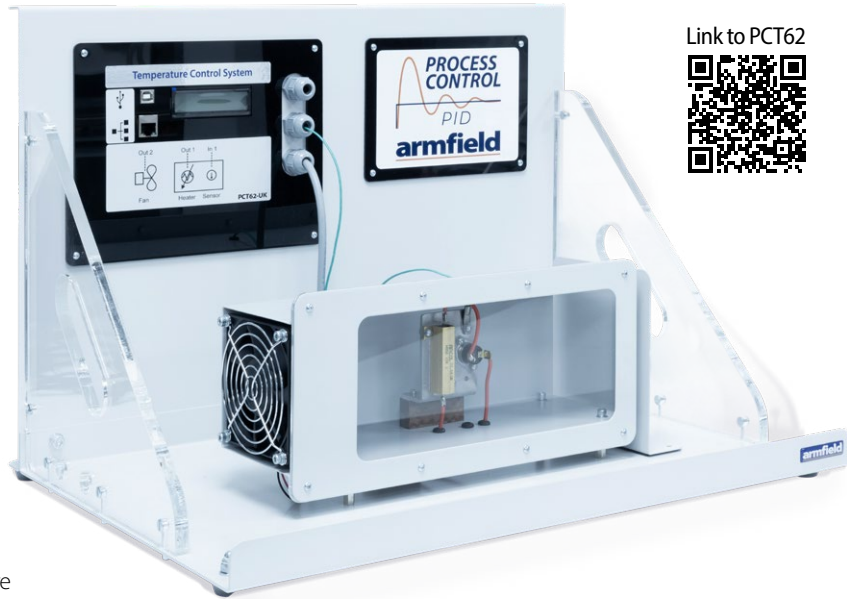
Temperature control is a critical aspect of many industries, including chemical, pharmaceutical, food and beverage, manufacturing, and HVAC (heating, ventilation, and air conditioning). Understanding temperature control is crucial for students pursuing careers in these industries.

Proper temperature control can help industries reduce energy consumption and operating costs. Students learn how to optimize temperature control systems to minimize energy waste and environmental impact.

The Armfield PCT62 temperature control system introduces students to fundamental control concepts, such as feedback control, proportional-integral-derivative (PID) controllers, and closed-loop control systems.

The temperature process control system includes a heated plate within a duct and a thermocouple. A fan at one end of the duct blows ambient air over the block, to change the control conditions and provide a disturbance to the system.

The system allows users to adjust the heater power and the air flow rate to develop a PID based control system then adjust these parameters to achieve the required time/temperature change profile for the system in response to step changes in system requirements.



Link to PCT62



Features/Benefits

- ▶ USB, WiFi, Bluetooth and LAN communications supplied as standard
- ▶ Supplied software includes Basic control, On/Off control and PID control
- ▶ Software dynamically displays Set point, Process value and Kp, Ki, and Kd
- ▶ MATLAB and Labview compatible
- ▶ Supplied with full set of manuals and teaching material

Experimental content

| | |
|--|------------------------------------|
| ▶ Understanding how to control driving devices | ▶ PID controller |
| ▶ Understanding the sensors | ▶ Zeigler Nichols algorithm |
| ▶ On/Off control systems | ▶ Integral wind up |
| ▶ System time constant | ▶ Derivative filter |
| ▶ P controller | ▶ Manual tuning |
| ▶ PI controller | ▶ Interfacing with MATLAB/ LabVIEW |

Ordering specifications

PCT62 Temperature Control Process
A temperature control process trainer, comprising:

- ▶ 24V PSU 60w 2.5a
- ▶ Pressure process control assembly
- ▶ USB lead
- ▶ Manual Control software allowing low level access to the Drive and Load in each system allowing calibration of sensors and drive systems
- ▶ On/Off Control software allowing control of each system with a simple On/Off algorithm, view software based oscillations and to explore the effects of hysteresis
- ▶ PID Control software allowing users to enter values for Kp, Ki, Kd and see how the system reacts to in-putted values

Related products

- PCT60: Level Process Control System
- PCT61: Flow Process Control System
- PCT63: Pressure Process Control System
- PCT64: Servo Pendulum Process Control System

| Requirements | Scale |
|--|-------|
| <div style="display: flex; gap: 10px;"> <div style="border: 1px solid white; padding: 2px 5px;">PC</div> <div style="border: 1px solid white; padding: 2px 5px;">USB</div> <div style="border: 1px solid white; padding: 2px 5px;"></div> </div> | |
| <p>Mains electrical supply: 110-230V, AC 50-60 Hz.</p> <p>PC and Display meeting the following minimum specification:</p> <ul style="list-style-type: none"> - Processor: 1Ghz or faster - RAM: 1Gb or more - HDD Space: 1Gb - OS: 32 or 64bit Windows 7, 8, 10 or 11 - Display: Recommended minimum (1920 by 1080) full HD | |

Overall dimensions

| | |
|--------|------|
| Length | 64cm |
| Width | 45cm |
| Height | 33cm |

Packed and crated shipping specifications

| | |
|--------------|---------------------|
| Volume | 0.095m ² |
| Gross weight | 12.1kg |

Ordering code

- PCT62-UK:** Temperature Control System
- PCT62-EU:** Temperature Control System
- PCT62-USA:** Temperature Control System



Teaching pressure process control to students equips them with the knowledge and skills necessary for success in industries where pressure regulation is critical.

It provides a strong foundation in engineering, automation, safety, and problem-solving, making students valuable assets in the workforce while contributing to the efficiency, safety, and quality of industrial processes.

Improper pressure levels can lead to equipment failure, leaks, or even explosions and emphasizes the importance of maintaining safe operating conditions.

The Armfield PCT63 system introduces students to fundamental control concepts, as in feedback control, proportional-integral-derivative (PID) controllers, and closed-loop control systems. It consists of a variable-speed reciprocating air pump (compressor), the speed of which can be adjusted by the user, a pressure vessel, and an outflow system.

The outflow system allows the air to escape via either a manually operated needle valve - providing an ongoing outflow, or via a solenoid valve and second needle valve - providing a step change in the outflow.

The vessel pressure is measured by a Bourdon-type mechanical gauge along with a pressure sensor. Providing a visual indication of the pressure in the vessel and a means for the user to check and calibrate the controller input from the pressure sensor.

Features/Benefits

- ▶ USB, WiFi, Bluetooth and LAN communications supplied as standard
- ▶ Supplied software includes Basic control, On/Off control and PID control
- ▶ Software dynamically displays Set point, Process value and K_p , K_i , and K_d
- ▶ MATLAB and Labview compatible
- ▶ Supplied with full set of manuals and teaching material

Experimental content

- ▶ Understanding how to control driving devices
- ▶ Understanding the sensors
- ▶ On/Off control systems
- ▶ System time constant
- ▶ P controller
- ▶ PI controller
- ▶ PID controller
- ▶ Zeigler Nichols algorithm
- ▶ Integral wind up
- ▶ Derivative filter
- ▶ Manual tuning
- ▶ Interfacing with MATLAB/ LabVIEW

Ordering specifications

PCT63 Pressure Control Process
 A Pressure control process trainer, comprising:

- ▶ 24V PSU 60w 2.5a
- ▶ Pressure process control assembly
- ▶ USB lead
- ▶ Manual Control software allowing low level access to the Drive and Load in each system allowing calibration of sensors and drive systems
- ▶ On/Off Control software allowing control of each system with a simple On/Off algorithm, view software based oscillations and to explore the effects of hysteresis
- ▶ PID Control software allowing users to enter values for K_p , K_i , K_d and see how the system reacts to in-putted values

Related products

- PCT60: Level Process Control System
- PCT61: Flow Process Control System
- PCT62: Pressure Process Control System
- PCT64: Servo Pendulum Process Control System

| Requirements | Scale |
|--|-------|
| <div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 2px;">PC</div> <div style="border: 1px solid black; padding: 2px;">USB</div> <div style="border: 1px solid black; padding: 2px;"></div> </div> | |
| <p>Mains electrical supply: 110-230V, AC 50-60 Hz.</p> <p>PC and Display meeting the following minimum specification:</p> <ul style="list-style-type: none"> - Processor: 1Ghz or faster - RAM: 1Gb or more - HDD Space: 1Gb - OS: 32 or 64bit Windows 7, 8, 10 or 11 - Display: Recommended minimum (1920 by 1080) full HD | |

Overall dimensions

| | |
|--------|------|
| Length | 64cm |
| Width | 45cm |
| Height | 33cm |

Packed and crated shipping specifications

| | |
|--------------|---------------------|
| Volume | 0.095m ² |
| Gross weight | 12.1kg |

Ordering code

- PCT63-UK:** Pressure Process Control System
- PCT63-EU:** Pressure Process Control System
- PCT63-USA:** Pressure Process Control System



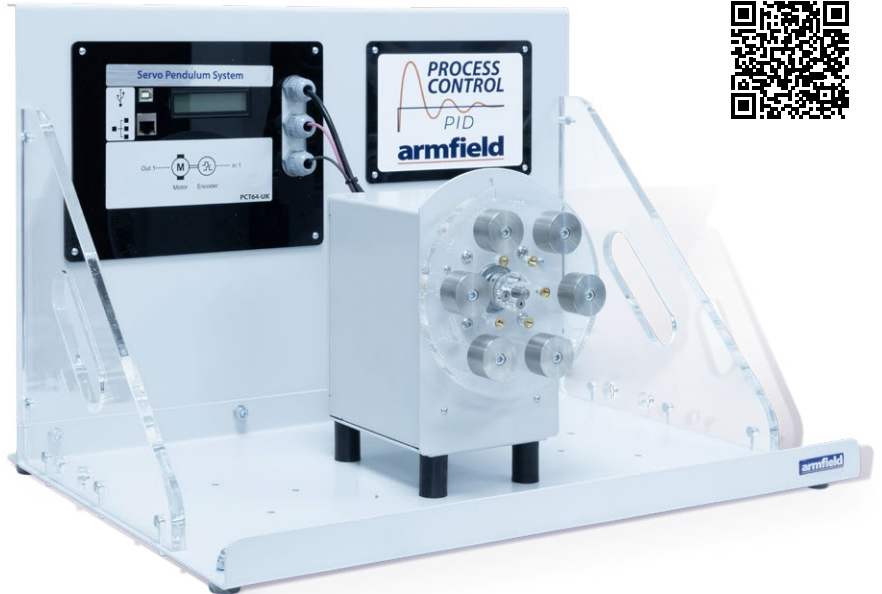
A servo pendulum is a specific type of control system used for applications like pendulum control and inverted pendulum control.

Learning about servo pendulum control systems allows students to see real-world applications of control theory. These systems are used in areas like robotics, aviation, and mechatronics, and understanding them can help students relate theory to practice.

The Armfield PCT64 servo pendulum control system introduces students to fundamental control concepts, such as feedback control, proportional-integral-derivative (PID) controllers, and closed-loop control systems.

The system consists of a powerful DC motor mounted on a rugged frame. A disc with captive nuts is attached to the DC motor and students are able to screw in 100-gram weights to different parts of the disc to alter the characteristics of the system.

A single weight at 0 degrees forms an inverting pendulum.



Features/Benefits

- ▶ USB, WiFi, Bluetooth and LAN communications supplied as standard
- ▶ Supplied software includes Basic control, On/Off control and PID control
- ▶ Software dynamically displays set point, Process value and Kp, Ki, and Kd
- ▶ MATLAB and Labview compatible
- ▶ Supplied with full set of manuals and teaching material

Experimental content

- ▶ Understanding how to control driving devices
- ▶ Understanding the sensors
- ▶ On/Off control systems
- ▶ System time constant
- ▶ P controller
- ▶ PI controller
- ▶ PID controller
- ▶ Zeigler Nichols algorithm
- ▶ Integral wind up
- ▶ Derivative filter
- ▶ Manual tuning
- ▶ Interfacing with MATLAB/ LabVIEW

Ordering specifications

PCT64 Servo Process Control System Process
 A Servo Pendulum Process Control trainer, comprising:

- ▶ 24V PSU 60w 2.5a
- ▶ Servo Pendulum control assembly
- ▶ USB lead
- ▶ Manual Control software allowing low level access to the Drive and Load in each system allowing calibration of sensors and drive systems.
- ▶ On/Off Control software allowing control of each system with a simple On/Off algorithm, view software based oscillations and to explore the effects of hysteresis
- ▶ PID Control software allowing users to enter values for Kp, Ki, Kd and see how the system reacts to in-putted values

Related products

- PCT60: Level Process Control System
- PCT61: Flow Process Control System
- PCT62: Temperature Process Control System
- PCT63: Pressure Process Control System

| Requirements | Scale |
|--|-------|
| <div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 2px;">PC</div> <div style="border: 1px solid black; padding: 2px;">USB</div> <div style="border: 1px solid black; padding: 2px;"></div> </div> | |
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Overall dimensions

| | |
|--------|------|
| Length | 64cm |
| Width | 45cm |
| Height | 33cm |

Packed and crated shipping specifications

| | |
|--------------|---------------------|
| Volume | 0.095m ³ |
| Gross weight | 12.1kg |

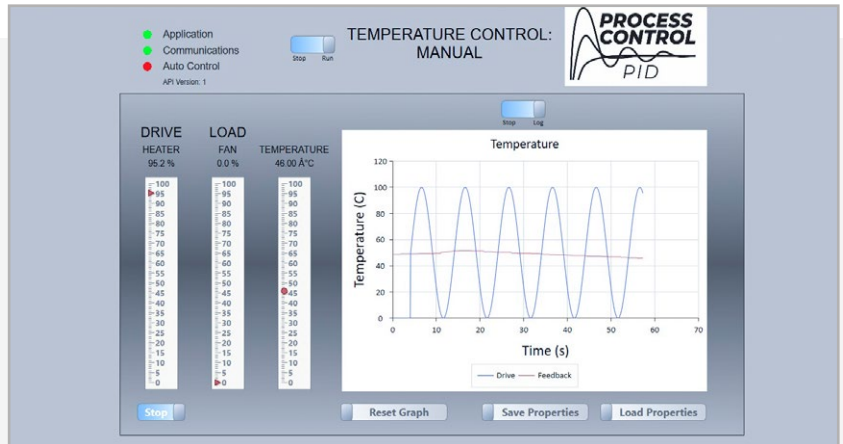
Ordering code

- PCT64-UK:** Servo Pendulum Control System
- PCT64-EU:** Servo Pendulum Control System
- PCT64-USA:** Servo Pendulum Control System

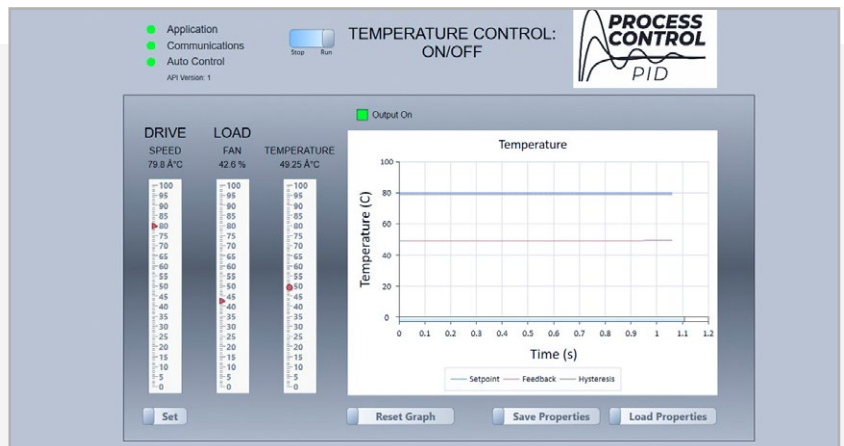
SOFTWARE AND INTERFACING FOR THE ESSENTIALS OF PROCESS CONTROL UNITS

Each process is supplied complete with software that allows it to be controlled using a Windows PC via a USB connection. There are currently 3 software applications available with the unit.

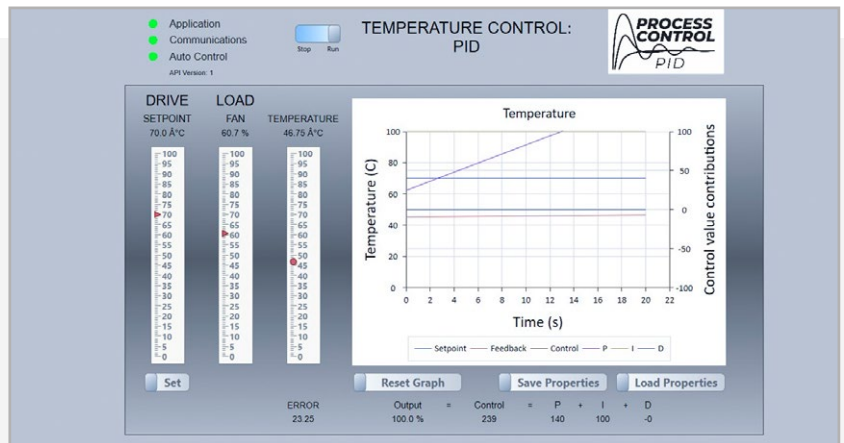
- ▶ Manual Control gives low level access to the Drive and Load in each system and allows students to calibrate the sensors and drive systems.



- ▶ On/Off Control allows students to explore controlling each system with a simple on off algorithm, to see the oscillations this produces and to explore the effects of hysteresis.



- ▶ PID Control allows students to enter values for Kp, Ki, Kd and see how the system reacts to those values.



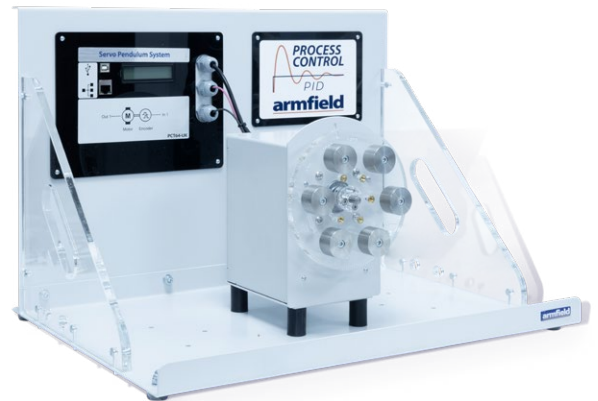
The MATLAB software is supplied with the unit. The Control functionality is controlled via a USB COM port or Networked connection to the computer. We have provided a library of functions to allow the various aspects of the Control Hardware to be investigated and controlled.

An Application Programming Interface is provided which makes the equipment compatible with MATLAB, Labview or other software.

Our Commitment to you

Armfield recognises that it is not enough to just supply quality engineering equipment, but that it must also ensure a complete range of services both pre and post-sale:

- ▶ Supplied equipment meets global curriculum requirements
- ▶ Expert consultation in laboratory design and layout
- ▶ Professional installation and commissioning service
- ▶ Comprehensive training for all products in house or on site
- ▶ In house trials (industrial and research)
- ▶ Two year warranty on all products
- ▶ Dedicated aftersales service
- ▶ Detailed learning outcomes and experiments supplied with all equipment



armfield worldwide

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- > 50 years' providing engaging engineering teaching equipment

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