DL ACCESS

Distance Learning Access

Real time remote control of our equipment and simultaneous recording of data.

Our standard solution allows the student at a remote location to view the Armfield software and images from multiple webcam feeds produced via the collaboration software, as they would if they were present in the laboratory.

Actual details are exercise specific, but typically the following features are available:

- All the temperatures and flow rates are displayed on a diagrammatic representation of the equipment
- Water flow / temperature is PID controlled, can be remote controlled
- Data from the sensors is logged into a spreadsheet format, under operator control
- Sophisticated graph plotting facilities are provided
- Comparisons between data taken on different runs can be displayed
- Student questions and answers, including a layered "Hint" facility
- Processing of measured values to obtain calculated results (this can be linked to the questions and answers to ensure student understanding)
- The data samples (measured and calculated) can be saved, or exported directly in Microsoft Excel format
- Data from the sensors can be displayed independently from the data logging
- This can be in bar graph format, or a recent history
- Graphical display (useful to check for temperature stability prior to taking a sample)
- Presentation screens are available, giving an overview of the software, the equipment, the procedure and the associated theory
- This is backed up by a detailed "Help" facility giving in-depth guidance and background information

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Applications
ChE CE IP

Introduction

To future proof engineering teaching and research remote self-based learning has become mandatory. Engaging students in their subject is paramount and providing access to a user-based system that not only allows you real time data logging but also to remotely control equipment is a necessity in teaching going forward.

There are countless solutions available to migrate to a remote learning environment, enabling online classrooms to bring together virtual face-to-face contact, assignments, files, and conversations via a single platform. The value add in the Armfield solution is to enable the student to truly conduct their studies and research remotely. We not only extend the classroom but also the laboratory environment by providing solutions that enable remote control of the equipment variables.

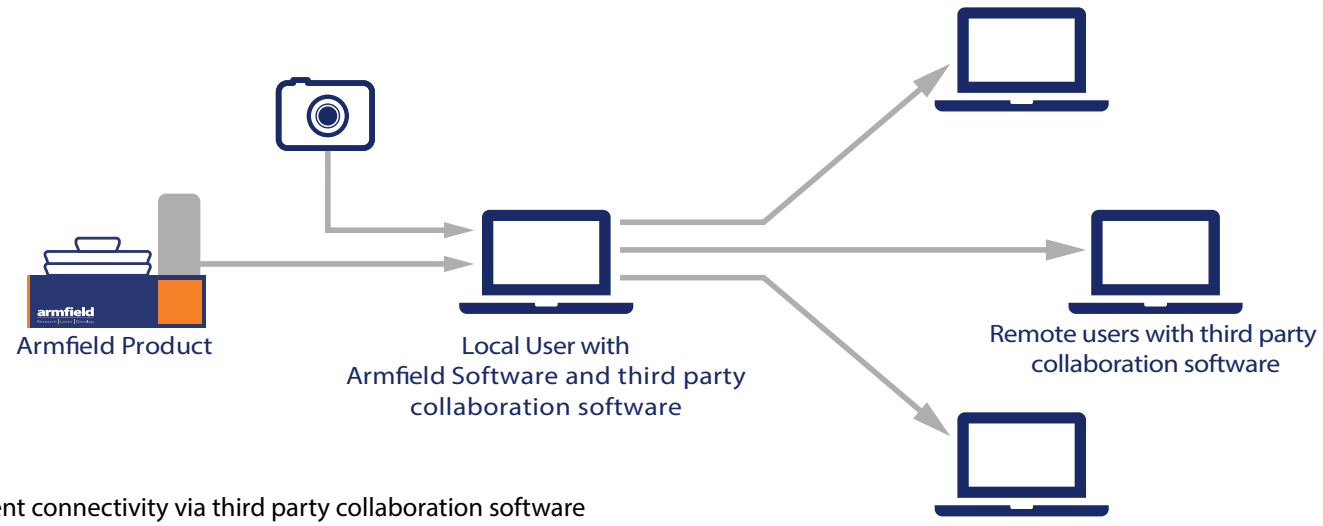
Armfield Software enabled products

Any Armfield product that is supplied with software are suitable to be used in a distance learning environment. In a selection of our portfolio we provide not only real time monitoring and data logging, but additional computer control of multiple variables used when undertaking experimentation. For example, in our heat exchanger range both the hot and cold-water flow rates can be controlled from the mimic diagram screen in the HT30XC software, which is supplied as standard.

We additionally supply the ability for the pump speed to be controlled via a PID algorithm to achieve a stable flow of hot water through the heat exchanger on test. Changes to the flow that would be caused by effects, such as viscosity reduction due to increasing temperature, are eliminated by automatically adjusting the pump speed. Advanced users may change the P, I and D parameters to perform process control investigations.

Remotely enabling Armfield products

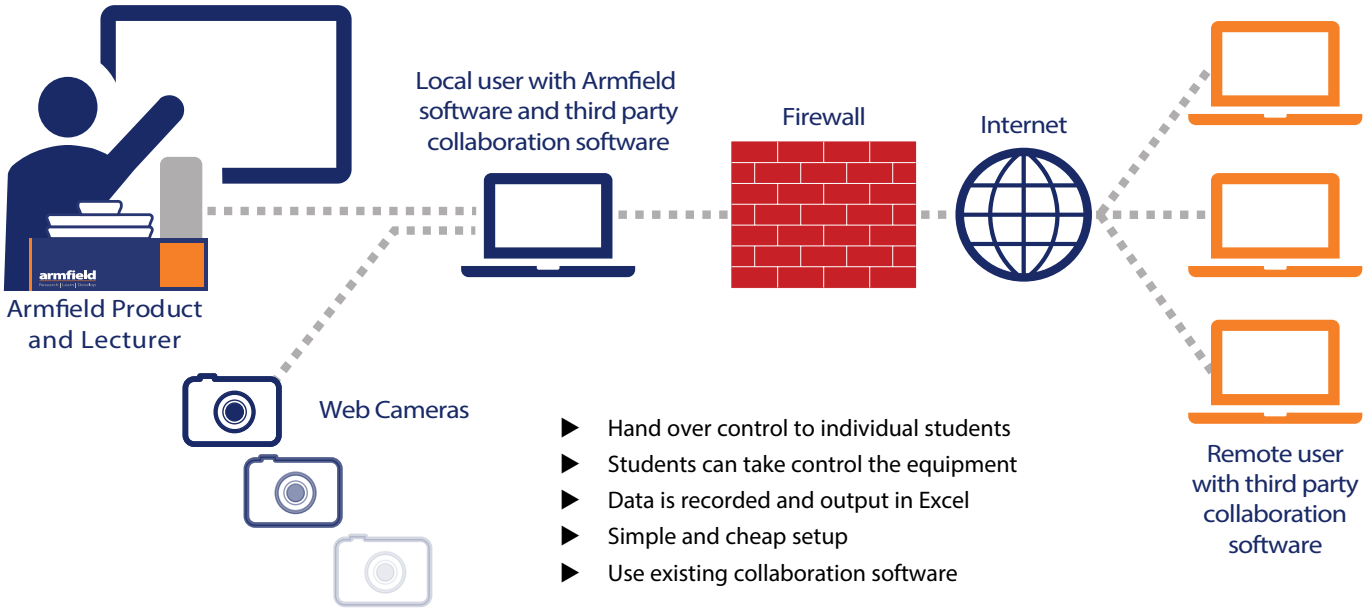
- Utilising standard IT equipment, such as a laptop or computer, registered on the educational establishment local domain it is relatively straight forward to extend the connectivity of the Armfield software to a remote location
- Distance learning is achieved by utilising TeamViewer, Microsoft teams or an alternative 3rd party collaboration software which allows the end user to take control of the local PC
- Using standard, IT hardware such as web camera's remote users and clearly see individual elements of the Armfield equipment, the only limitation to the number of cameras installed is the number of supported USB ports on the local PC/Laptop. Utilising standard USB Hubs can extend the number of USB devises if there is a hardware limitation on the local PC/Laptop
- The standard windows camera application is used to view the web camera feeds
- The collaboration software extends the capability of our existing software from a 1-to-1 local connection to 1-to-many network connections.
  - The key benefit here would be to allow enhanced social distancing in a local environment with multiple local users able to view the Armfield software
- The onus is on the end user to install and provide support for any 3rd party collaborative software. Although Armfield can offer this as a chargeable professional service



Multi client connectivity via third party collaboration software

Armfield Distance Learning Network Topology

Our standard solution allows the student at a remote location to view the Armfield software and images from multiple webcam feeds product via the collaboration software, as they would if they were present in the laboratory



- Hand over control to individual students
- Students can take control the equipment
- Data is recorded and output in Excel
- Simple and cheap setup
- Use existing collaboration software

Armfield Distance Learning Network Topology

Product ID	Product description	Remote Data Logging	Remote Computer Control
BE1	Batch Enzyme Reactor	Reactor temperature Heat Exchanger temperature Average Rotation Specific Rotation of Glucose Current Glucose Concentration Current Fructose Concentration	N/A
BE2	Chromatography Unit	Absorbance	N/A
BE3	Anaerobic Column Reactor	Process Temperature Water Temperature Recirculating Flow Rate Acidity Production Rate Total Gas Produced Feed Pump %	N/A
BE4	Anaerobic Tank Reactor	Process Temperature Water Temperature Acidity Production Rate Total Gas Produced Feed Pump % Recirculating Pump % Stirrer Speed %	N/A
C1-MkIII	Compressible Flow Unit	Pressure (Throat) (kPA) Pressure (Outlet) (kPA) Pressure (Inlet) (Kpa) Inlet Temperature °c Outlet Temperature °c Atmospheric Pressure Speed rpm Torque Nm	N/A
C3-MkII	Multi Pump Test Rig	Inlet Pressure (Kpa) Inlet Pressure (Kpa) Pump Speed Outlet Pressure (Kpa) Peak Pressure (Kpa) Pump Speed (rpm) Pump Torque (Nm) Flow Rate l/min Power (W) Total Head (m) Efficiency (%) C6-MKII	Pump Speed
C6-MKII	Fluid Friction Apparatus	Flow Meter l/s Calculated Flow rate l/s Head 1m Head 2 m Head Loss m Reynolds' No Predicted Loss m Pressure transducer P1 Bar G Pressure transducer P2 mmH^20	
C15	Wind Tunnel	Fan Speed (%) Static Pressure (mm) Velocity (m/s) Differential Pressure (mm) Total Head (mm) Lift (N) Drag (N) Rotation (N)	Fan Speed
CEXC	Chemical Reactor Service Unit		
CEB-MKIII Batch Reactor		Stirrer Speed Low Conductivity High Conductivity Reactor Temperature Hot Water temperature Optional temperature	Power On/Off Heater On/Off Hot Water Circulator On/Off Stirrer Speed (%) PID Controller

Product ID	Product description	Remote Data Logging	Remote Computer Control
CEM-MKII	Continuous Stirred Tank Reactor	Stirrer Speed (%) Low Conductivity High Conductivity Reactor Temperature Hot Water temperature Optional temperature Feed Pumps Flow Rate	Power On/Off Heater On/Off Hot Water Circulator On/Off Stirrer Speed (%) Control of Feed Pumps PID Controller Power On/Off
CET-MKII	Tubular Reactor	Low Conductivity High Conductivity Reactor Temperature Hot Water temperature Optional temperature Feed Pumps Flow Rate	Heater On/Off Hot Water Circulator On/Off Control of Feed Pumps PID Controller
CEY	Plug Flow Reactor	Power On/Off Water Flow Tracer Flow High Conductivity Low Conductivity Optional temperature T2 Optional Temperature T3	Power On/Off Water Flow Tracer Flow
CEZ	Laminar Flow Reactor	Power On/Off Water Flow Tracer Flow High Conductivity Low Conductivity Optional temperature T2 Optional Temperature T3	Power On/Off Water Flow Tracer Flow
CEP-MkII-A	Stirred Tank Reactors in Series	Pump 1 flow rate Pump 2 flow rate Stirrer speed % Tank 1 Concentration Tank 2 Concentration Tank 3 Concentration Final Concentration	N/A
CEU	Catalytic Reactor	Reactor Temperature Absorbance Flow feed rate	N/A
CEK-MkII	Fluid Mixing Studies	Set speed Actual speed Torque Calculated power	N/A
CEL-MkII	Fixed and Fluidised Bed Apparatus	Water flow rate Water pressure Air flow column 1 Air flow column 2 Air Pressure column 1 Air Pressure column 2	N/A
CM12	4 Cylinder Diesel Engine	Ignition On Brake On Knock warning Engine temperature warning Oil pressure warning Cooling water warning Torque Power Water In Temperature Water out Temperature Water Flow Exhaust Temperature Lambda Air mass flow Air Temperature Engine speed Fuel mass flow Fuel injected	Engine control ignition Engine control starter Engine control brake Brake drive Throttle

Product ID	Product description	Remote Data Logging	Remote Computer Control
CM14	Axial Flow Gas Turbine Engine (bench mounting)	Thrust Calculated Thrust Speed Fuel Flow Air Flow Inlet static pressure Compressor static pressure Compressor total pressure Combustor total pressure Turbine total pressure Inlet total temperature Compressor total temperature Turbine total temperature Exhaust total pressure	Power On/Off Enable On/Off Start / Stop Throttle %
CM20	Single Cylinder Test Stand	Brake % Lambda AFR Speed rpm Torque Nm Power KW Exhaust Temp °c Air Temp °c Air Mas Flow kg/s Fuel Flow ml/s	Engine On/Off Starter P.I.D. control of the brake Throttle %
FM40	Centrifugal Fan Demonstration Unit	Torque Nm Speed rpm Discharge l/s Inlet Temperature °c Fan Pressure kPa Orifice Pressure kPa	Fan On Fan setting %
FM41	Axial Fan Demonstration Unit	Fan Speed rpm Discharge l/s Motor power W Fan Pressure Pa Orifice Pressure Pa Temperature °c	Fan On Fan setting %
FM42	Centrifugal Compressor Demonstration Unit	Torque Nm Speed rpm Discharge l/s Orifice Pressure kPa Compressor Pressure kPa Inlet Temperature °c	Fan On Motor setting %
FM50	Centrifugal Pump Demonstration Unit	Motor Torque Nm Speed rpm Total Head m Efficiency % Temperature °c Flow Rate l/s Outlet Pressure Kpa Inlet Pressure kPa	Fan On Pump setting %
FM51	Series/Parallel Pump Demonstration Unit	Motor Torque Nm Pump 1 Speed rpm Total Head m Efficiency % Temperature °c Pump 1 Pressure kPA Pump 2 Pressure kPA Inlet Pressure kPa	Pump 1 On Pump 2 On Pump 1 Setting % Mode
FM52	Gear Pump Demonstration Unit	Motor Torque Nm Speed rpm Total Head m Efficiency % Temperature °c Flow Rate l/s Outlet Pressure Kpa	Pump On Pump setting %

Product ID	Product description	Remote Data Logging	Remote Computer Control
FM53	Plunger Pump Demonstration Unit	Cylinder Pressure kPa Maximum Cylinder Pressure kPa Outlet Pressure kPa Maximum Outlet Pressure kPa Displacement mm Motor Toque Nm Stroke Rate spm	Pump On Motor Speed %
FM60	Axial Flow Impulse Turbine (requires FM6X)	Torque Nm Brake Power W Speed rpm Force N Flow l/min Motor Torque Nm	Pump speed % Brake Control % PID Control Pump On/Off
FM61	Radial Flow Reaction Turbine (requires FM6X)	Torque Nm Brake Power W Speed rpm Force N Flow l/min Motor Torque Nm	Pump speed % Brake Control % PID Control Pump On/Off
FM62	Pelton Turbine (requires FM6X)	Torque Nm Brake Power W Speed rpm Force N Flow l/min Motor Torque Nm	Pump speed % Brake Control % PID Control Pump On/Off
FM63	Propeller Turbine Demonstration Unit	Torque Nm Brake Power W Speed rpm Force N Flow l/min Differential Pressure kPa	Pump speed % Brake Control %
HT10XC	Computer Controlled Heat Transfer Teaching Equipment		
HT11	Linear Heat Conduction	Heater Voltage Heater Current Cold Water Flow l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c	Heater Control % Power On/Off
HT11C	Computer Controlled Linear Heat Conduction	Heater Voltage Heater Current Cold Water Flow l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c	Heater Control % Power On/Off Cold Water Flow Control %
HT12	Radial Heat Conduction	Heater Voltage Heater Current Cold Water Flow l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c	Heater Control % Power On/Off
HT12C	Computer Controlled Radial Heat Conduction	Heater Voltage Heater Current Cold Water Flow l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c	Heater Control % Power On/Off Cold Water Flow Control %

Product ID	Product description	Remote Data Logging	Remote Computer Control
FM53	Plunger Pump Demonstration Unit	Cylinder Pressure kPa Maximum Cylinder Pressure kPa Outlet Pressure kPa Maximum Outlet Pressure kPa Displacement mm Motor Toque Nm Stroke Rate spm	Pump On Motor Speed %
FM60	Axial Flow Impulse Turbine (requires FM6X)	Torque Nm Brake Power W Speed rpm Force N Flow l/min Motor Torque Nm	Pump speed % Brake Control % PID Control Pump On/Off
FM61	Radial Flow Reaction Turbine (requires FM6X)	Torque Nm Brake Power W Speed rpm Force N Flow l/min Motor Torque Nm	Pump speed % Brake Control % PID Control Pump On/Off
FM62	Pelton Turbine (requires FM6X)	Torque Nm Brake Power W Speed rpm Force N Flow l/min Motor Torque Nm	Pump speed % Brake Control % PID Control Pump On/Off
FM63	Propeller Turbine Demonstration Unit	Torque Nm Brake Power W Speed rpm Force N Flow l/min Differential Pressure kPa	Pump speed % Brake Control %
HT10XC	Computer Controlled Heat Transfer Teaching Equipment		
HT11	Linear Heat Conduction	Heater Voltage Heater Current Cold Water Flow l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c	Heater Control % Power On/Off
HT11C	Computer Controlled Linear Heat Conduction	Heater Voltage Heater Current Cold Water Flow l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c	Heater Control % Power On/Off Cold Water Flow Control %
HT12	Radial Heat Conduction	Heater Voltage Heater Current Cold Water Flow l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c	Heater Control % Power On/Off
HT12C	Computer Controlled Radial Heat Conduction	Heater Voltage Heater Current Cold Water Flow l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c	Heater Control % Power On/Off Cold Water Flow Control %

Product ID	Product description	Remote Data Logging	Remote Computer Control
HT13	Laws of Radiant Heat Transfer and Radiant Heat Exchange	Heater Voltage V Heater Current A Ambient Temperature °c Plate Temperature °c Radiometer Reading W/m^2	Heater Control % Power On/Off
HT14	Combined Convection and Radiation	Heater Voltage V Heater Current A Heater Temp °c Air Velocity m/s Duct Temp °c	Heater Control % Power On/Off
HT14C	Computer Controlled Combined Convection and Radiation	Heater Voltage V Heater Current A Heater Temp °c Air Velocity m/s Duct Temp °c	Heater Control % Power On/Off Flow Control %
HT15	Extended Surface Heat Transfer	Heater Voltage V Heater Current A Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c Thermocouple T7 °c Thermocouple T8 °c Thermocouple T9 °c	Heater Control % Power On/Off
HT16	Radiation Errors in Temperature Measurement	Heater Voltage V Heater Current A Small Polished Bead Temp °c Small Black Bead Temp°c Large Black bead °c Wall Temp °c Air Velocity m/s Upstream Temperature °c	Heater Control % Power On/Off
HT16C	Computer Controlled Radiation Errors in Temperature Measurement	Heater Voltage V Heater Current A Small Polished Bead Temp °c Small Black Bead Temp°c Large Black bead °c Wall Temp °c Air Velocity m/s Upstream Temperature °c	Heater Control % Power On/Off Fan Speed % Shield On/Off
HT17	Unsteady State Heat Transfer	Voltage V Shape Surface Temperature°c Bath Temperature°c Shape Core Temperature°c	Power On/Off Pump Control %
HT18C	Thermo-Electric Heat Pump	Peltier Voltage V Peltier Current A Peltier Power W Heater Voltage V Heater Current A Heater Power W Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Flow Rate ml/m	Power On/Off Load On/Off Source/ Sink Toggle Flow Control Heater Control Peltier Control PID Control
HT19	Free and Forced Convection	Heater Voltage V Heater Current A Heater Power W Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c Air Velocity m/s	Power On/Off Configuration Used Heater Control %

Product ID	Product description	Remote Data Logging	Remote Computer Control
HT20	Conductivity of Liquids & Gases	Heater voltage V Heater Current A Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c Cold Water Flow l/m	Power On/Off Heater Control %
HT20C	Computer Controlled Conductivity of Liquids & Gases	Heater voltage V Heater Current A Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c Cold Water Flow l/m	Power On/Off Heater Control % Flow Control %
HT30XC	Computer Controlled Heat Exchanger Service Unit		
HT31	Tubular Heat Exchanger	Hot Water Flow Rate l/min Cold Water Flow Rate l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c	Hot Water PID Control Cold Water Flow Rate Heater On Power On Heater PID Control
HT32	Plate Heat Exchanger	Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Hot Water Flow l/min Cold Water Flow l/min	Hot Water PID Control Cold Water Flow Rate Heater On Power On
HT33	Shell & Tube Heat Exchanger	Hot Water Flow l/min Cold Water Flow l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c	Hot Water PID Control Cold Water Flow Rate Heater On Power On Heater PID Control
HT34	Jacketed Vessel with Coil and Stirrer	Hot Water Flow l/min Cold Water Flow l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c	Hot Water PID Control Cold Water Flow Rate Heater On Power On Heater PID Control
HT35	Single-Pass Crossflow Heat Exchanger	Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Air Velocity m/s Air Flow m3/s	Hot Water PID Control Heater PID Control
HT36	Extended Tubular Heat Exchanger	Hot Water Flow l/min Cold Water Flow l/min Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c Thermocouple T7 °c Thermocouple T8 °c Thermocouple T9 °c Thermocouple T10 °c	Hot Water PID Control Cold Water Flow Rate Heater On Power On Number of Tubes selector Heater PID Control
HT37	Extended Reconfigurable Plate Heat Exchanger	Hot Water Flow l/min Cold Water Flow l/min Hot Water Temperature°c Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c	Heater PID Control Hot Water PID Control Cold Water Flow Rate Heater On Power On Number of Heating Sections selector

Product ID	Product description	Remote Data Logging	Remote Computer Control
PCT23-MkII	Process Plant Trainer	Tank A Level mm Feed Flow ml/min Heater Power kw Holding Temperature °c Hot Water Temperature °c Product Exit Temperature °c Product Conductivity mS	Heating Pump Speed % Feed Pump Speed % Heater Power Setting % PID Loop 1 PID Loop 2
PCT40	Multifunction Process Control Teaching System	Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Pressure P1 mm Pressure P2 mm Pressure P3 mm Level L1 mm User Input V Conductivity mS Acidity pH Hot Water Pump rpm	Hot Water Pump % Pneumatic Valve % Pump A % Pump B % PSV Position % Stirrer on/off SOL1 On/ Off SOL2 On/Off SOL 3 On/Off SSR Heater On/Off PID A PID B Power On / Off
PCT50	Level Control Apparatus	Level L1 mm Solenoid Valve Position Pump Speed %	Power On / Off Solenoid Valve On/Off Pump Control % PID Control
PCT51	Flow Control Apparatus	Flow l/min Solenoid Valve position Pump Speed %	Power On / Off Solenoid Valve On/Off Pump Control % PID Control
PCT52	Temperature Control Apparatus	Temperature T1 °c Temperature T2 °c Heater Output % Fan Speed % Thermocouple T1 °c Thermocouple T2 °c	Power On / Off Heater Control % Fan Control % PID Control
PCT53	Pressure Control Apparatus	Pressure P1 bar Solenoid Valve Position Pump Speed %	Power On / Off Solenoid Valve On/Off Pump Control % PID Control
RA1-MkII	Vapour Compression Refrigeration Unit	Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c Thermocouple T7 °c Thermocouple T8 °c Thermocouple T9 °c Refrigerant Flow l/hr Pressure P1 bar Pressure P2 bar Water Flow F1 l/min Water Flow F2 l/min Compressor Speed rpm Qout W Qin W Motor Current A Work In W Evaporator Saturation temperature °c Condenser Saturation Temperature °c Evaporator Super Heat °c Condenser Subcooling °c Saturated Temperature °c	Compressor on/off Pump 1 % Pump 2 % Compressor %

Product ID	Product description	Remote Data Logging	Remote Computer Control
RA2	Air Conditioning Unit	Atmospheric Pressure kPa Relative Humidity RH1 % Relative Humidity RH2 % Relative Humidity RH3 % Relative Humidity RH4 % Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Reheat % Simmer % Preheat % Mains Voltage V Velocity m/s	Power On/Off Cooling On/Off Reheat PID Control Simmer PID Control Preheat PID Control Fan Setting Control Preheat Control Boiler Control Reheat
RA3	Recirculating Air Conditioning Unit	Inlet RH % Inlet Temp °c Mains Voltage V Atmospheric Pressure kPa Relative Humidity RH1 % Relative Humidity RH2 % Relative Humidity RH3 % Relative Humidity RH4 % Relative Humidity RH5 % Relative Humidity RH6 % Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c Inlet RH % Inlet Temp °c Velocity m/s	Power On/Off Cooling On/Off Simmer PID Control Preheat PID Control Fan Setting Control Preheat Control Boiler Control Reheat Full Power On/Off
TH1	Temperature Measurement & Calibration	PT100 REF °c PT100 IND (Lo) Ohms PT100 IND (Hi) Ohms Thermocouple 1 µV Thermocouple 2 µV Thermistor Ohms	N/A
TH2	Pressure Measurement & Calibration	Sensor Output mV	
TH3	Saturation Pressure & Throttling Calorimeter	Corrected Resistance Ohms	
TH4	Recycle Loops	Temperature T1 °c Pressure P1 kN/m^2 Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Water Flow F1 l/min Water Flow F2 l/min	
TH5	Expansion Processes of a Perfect Gas	Thermistor 1 Output Ohms Thermistor 2 Output Ohms Thermocouple T1 °c Pressure Sensor 1 kN/m^2 Pressure Sensor 2 kN/m^2	
TH6	Dropwise & Film Condensation Demonstration Unit	Cooling Water Inlet °c Condenser Outlet Temperature °c Mean Surface Temperature condenser 1 °c Mean Surface Temperature condenser 2°c Pressure / Vacuum mbar Flow Rate l/min Power set point Water set point Delta T condenser outlet and inlet for each condenser Delta T Steam Temperature and mean Condenser Surface Temperature Heat Flus Density Heat Transfer coefficient Celta Steam Temperature and Cooling Water Temperature.	Heat Toggle On/OFF Power Set Point % Water Set Point %

Product ID	Product description	Remote Data Logging	Remote Computer Control
UOP3CC	Computer Interfaced Distillation Column	Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c Thermocouple T7 °c Thermocouple T8 °c Thermocouple T9 °c Thermocouple T10 °c Thermocouple T11°c Thermocouple T12°c Thermocouple T13°c Thermocouple T14°c Feed Pump Speed rpm Heater Power kW Cooling Water Flow Rate l/min Reboiler PWR	Feed Pump Speed % Heater Power % PID 1 PID 2
UOP4-MkII	Solid/Liquid Extraction Unit (complete)	Conductivity C1 µS/cm Conductivity C2 µS/cm Thermocouple T1 °c Thermocouple T2 °c Organic Flow ml/min Water Flow ml/min Concentration in % Concentration out %	N/A
UOP5-MkII	Liquid/Liquid Extraction Unit	Conductivity C1 µS/cm Conductivity C2 µS/cm Thermocouple T1 °c Thermocouple T2 °c Organic Flow ml/min Water Flow ml/min Concentration in % Concentration out %	N/A
UOP6-MkII	Computer Controlled Water-Cooling Tower	Water Inlet Temperature °c Water Outlet Temperature °c Air Outlet Temperature °c Air Inlet Temperature °c Thermocouple T5 °c Thermocouple T6 °c Thermocouple T7 °c Thermocouple T8 °c Thermocouple T9 °c Thermocouple T10 °c Relative Humidity RH1 % Relative Humidity RH2 % Relative Humidity RH3 % Relative Humidity RH4 % Relative Humidity RH5 % Orifice Pressure Drop mbar Water Level mm Mains Voltage V Water Flow Rate l/m Column Press Drop mbar Heater Power kW Air Flow g/s	Power On/Off Fan Setting % Pump Setting % Fan Setting PID Pump Setting PID
UOP7-MkII	Gas Absorption Column	Pressure Sensor 1 mbar Pressure Sensor 2 mbar Water Flow l/min Air Flow l/min CO2Flow l/min Thermocouple T1 °c Thermocouple T2 °c Inlet Concentration % Outlet Concentration %	Sensor Position toggle

Product ID	Product description	Remote Data Logging	Remote Computer Control
UOP8-MkII	Computer Controlled Tray Drier	Temperature Pre-Trays °c Temperature Post-Trays °c Ambient Air Temperature °c Relative Humidity sensor 1 % Relative Humidity sensor 2 % Inlet Air Velocity m/s Air Velocity Over Trays m/s Heater Setting Fan Setting Total Mass g Load Cell 1 g Load Cell 2 g Load Cell 3 g	Power On/Off Fan Setting % Temperature Control PID Heater Setting %
UOP12	Filtration Unit with Plate & Frame Filter	Flow Rate L/h Back Pressure bar Change in Pressure bar Absorbance Abs Inlet pressure Bar Transcartridge Pressure Drop bar Thermocouple T1 °c	
UOP14-MkII	Crystallisation Unit	Vessel Contents Temperature °c Hot Water Temperature °c Cold Water Temperature °c Feed Temperature °c Feed Flow l/hr Conductivity mS/cm Stirrer Speed Upper Temperature °c Lower Temperature °c Vessel Set point °c	Power On/Off Heating / Cooling Selection Stirrer Speed % PID Control
UOP15-A	Fixed Bed Adsorption Unit	Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c Thermocouple T7 °c Carbon Dioxide Flow SLPM Helium Flow SLPM Feed Flow SLPM Carbon Dioxide Concentration %	
UOP20X-PHW	Evaporator Service Unit - Electric Heating	Feed Pump ml/min Circulation Pump 1 ml/min Circulation Pump 2 ml/min Pressure PT 1 mbar Hot Water Flow Rate ml/min Cold Water Flow Rate ml/min Rotameter Flowrate 1 ml/min Rotameter Flowrate 2 ml/min Conductivity C1 ms Conductivity C2 ms Conductivity C3 ms Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c Thermocouple T7 °c Thermocouple T8 °c Thermocouple T9 °c Thermocouple T10 °c Thermocouple T11 °c Thermocouple T12 °c	Conductivity ms/ % weight Film Type Feed Type Feed Pump % Circulation Pump 1 % Circulation Pump 2 % PID Control

Product ID	Product description	Remote Data Logging	Remote Computer Control
UOP20X-STM	Evaporator Service Unit - Steam Heating	Feed Pump ml/min Circulation Pump 1 ml/min Circulation Pump 2 ml/min Pressure PT 1 mbar Steam Rate ml/min Cold Water Flow Rate ml/min Rotameter Flowrate 1 ml/min Rotameter Flowrate 2 ml/min Conductivity C1 ms Conductivity C2 ms Conductivity C3 ms Thermocouple T1 °c Thermocouple T2 °c Thermocouple T3 °c Thermocouple T4 °c Thermocouple T5 °c Thermocouple T6 °c Thermocouple T7 °c Thermocouple T8 °c Thermocouple T9 °c Thermocouple T10 °c Thermocouple T11 °c Thermocouple T12 °c	Conductivity ms/ % weight Film Type Feed Type Feed Pump % Circulation Pump 1 % Circulation Pump 2 % PID Control
UOP30	3-Phase Horizontal Separator	Air Pump l/min Water Pump Flow l/min Separator Vessel °c Oil Feed °c Oil Flowrate l/min Water Feed °c Water Flowrate l/min	Air Pump % Water Pump Flow % Power On/Off
W3-MkII	Permeability/Fluidisation Studies	Water Pump Flow ml/min Pressure sensor 1 mbar Pressure sensor 2 mbar	Power On/Off Pump Speed %
W4-MkII	Filterability Index Unit	Pressure sensor mbar Water Pump Flow ml/min	Power On/Off Pump Speed %
W5-MkII	Deep Bed Filter Column	Pressure sensor 1 mbar Pressure sensor 2 mbar Pressure sensor 3 mbar Pressure sensor 4 mbar Pressure sensor 5 mbar Pressure sensor 6 mbar Pressure sensor 7 mbar Pressure sensor 8 mbar Pressure sensor 9 mbar Pressure sensor 10 mbar Pressure sensor 11 mbar Pressure sensor 12 mbar Pressure sensor 13 mbar Pressure sensor 14 mbar Pressure sensor 15 mbar Pressure sensor 16 mbar Pressure sensor 17 mbar Pressure sensor 18 mbar Pressure sensor 19 mbar Pressure sensor 20 mbar Pressure sensor 14 mbar Pressure sensor 14 mbar Pressure sensor 14 mbar Pressure sensor 14 mbar Pressure sensor 14 mbar Pressure sensor 14 mbar Pressure sensor 14 mbar Thermocouple T1 °c Water Pump Flow ml/min	Power On/Off Pump Speed %

Product ID	Product description	Remote Data Logging	Remote Computer Control
W9-MkII	Ion Exchange Unit	Thermocouples °c Pump Flow ml/min Conductivity mS/cm pH sensors	Power On/Off Pump Speed %
W10-MkII	Aeration Unit	Stirrer Speed rpm Stirrer Torque Ncm Oxygen mg/l Temperature °c Flow Rate L/min	Power On/Off

Collaboration Software List		
Product	**Remote Presentations**	**Remote Control**
TeamViewer	Yes	Yes
Microsoft Teams	Yes	Yes
RemotePC	Yes	Yes
Zoom	Yes	No
Cisco Webex	Yes	No

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