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Process and Chemical Engineering

Process Trainers automated with Process Control System



Process Trainers automated with Process Control System

High-quality training systems help you teach complicated processes from the process sector in a way that is understandable and features thoughtful educational design. This is the standard to which the process trainers from Lucas-Nülle have been developed. The systems are based on plant designs used in the process industry and are automated by means of an industrial process control system.

Compact, functional training systems have been designed for four essential processes: rectification, extraction, reactions and adsorption. They demonstrate the process in a way that is clear and also manage to achieve this within a very small space.

Each of the systems is supplied with a fully pre-configured process control system. No programming knowledge is required. Advanced users, however, still have the option to modify the programming. It is your choice!

IPT 11 Rectification (Continuous Distillation)



IPT 11 Rectification (Continuous Distillation)

Multi-stage distillation by means of rectification is at the heart of many overall processes used in chemical and petrochemical facilities. Comprehensive understanding of such rectification is fundamental to optimize the operation of such a process unit.

Whether for plant operators, chemical technician, chemical engineers or process engineers, the process trainer ***IPT 11 Rectification*** provides the ideal prerequisites for learning the rectification process from its foundations.

The intelligent system design allows it to be constructed in a compact form. This benefits the teaching process since startup, practice and shutdown of the system is possible in the space of a day, thus enabling one-day practical sessions.

The use of high-quality, industrial borosilicate glass 3.3 makes it possible to see and follow the entire process. The interactive e-learning course also helps trainees gain a deeper understanding of what they have learned.

The process trainer ***IPT 11 Rectification*** is supplied with a complete, fully programmed industrial process control system. It is possible to connect multiple training systems with a single process control system. Lucas-Nülle will find a custom solution to your process engineering laboratory needs. Simply make contact with us about it.

Education objectives:

- First principles of continuous rectification
- Application McCabe-Thiele diagram
- Comparison practical to theoretical separation stage
- Mass and energy balance
- Alarm management
- Operation of a distillation column
 - starting up a unit
 - shutting down a unit
 - set control parameters
 - set alarm ranges
- Influence of efficiency of:
 - throughput
 - reflux ratio
 - preheating rate

Basic equipment set, consisting of:

Basic equipment set, consisting of:

Pos.	Product name	Bestell-Nr.	Anz.
1	IPT11 Rectification Unit, bubble cap column, automated with PCS	LM3110	1

Apparatus:

- Bubble cap column DN50/DN80
- Natural circulation evaporator 3.5 kW
- Overhead vessel 2 l
- Receiver and Feed vessel 13 l
- Overhead condenser 0.3 m²
- Product cooler 0.06 m²
- Feed preheater 0.03 m²
- Vacuum Header
- Peristaltic pump max. 33 l/h
- Piston metering pump max. 29 l/h
- 11x Temperature measurement Pt100
- Liquiphant for level monitoring in the bottom of the column
- Electrical level measurement in the overhead vessel
- Capacitive level measurement in the feed vessel
- Pressure measurement at vacuum header

Dimension:

height x width x depth: 2400 x 1400 x 950 mm



Additionally required:

Pos.	Product name	Bestell-Nr.	Anz.
2	Process Control System SIMATIC PCS 7 AS RTX Box	LM3910	1

Main components in the example package:

- 1 x SIMATIC PCS 7 Automated System
- 1 x Peripheral System
- 1 x Power supply

Detailed description:

- 1x SIMATIC PCS 7 AS - PROFIBUS automation system
- Several signal input-output-devices, depending on the LN-process-trainer configuration. For example:
 - SIMATIC DP, HART Analog Input SM 331
 - SIMATIC S7/PCS7, SM 322 Digital Output Module
 - SIMATIC S7-300, Digital Output SM 322
 - SIMATIC S7-300, Digital Input SM 321
 - SIMATIC S7-300, Analog Input SM 331
 - SIMATIC S7-300, Analog Output SM 332



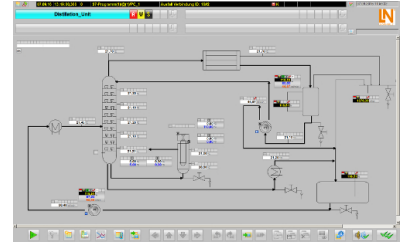
3 **Siemens Process Control System SIMATIC PCS 7 3-user license**

SO2806-1K

1

- 1 x DVD: PCS 7 Software
- 1 x Paper: Certificate of License
- 1 x Stick: License Key USB Stick with 3 * FLOATING LICENSES

Only available for schools, colleges, universities and for in-house vocational training departments.



Provided by customer:

Personnel Computer with fulfilled hardware and software requirements.

Hardware Requirements

- **CPU:** Min. INTEL Core 2 Duo; > 2.4GHz, INTEL Core 2 Quad
- **RAM:** 4 GB (32-bit operating system) 6 GB (64-bit operating system)
- **HDD:** 200 GB HDD/SSD with 100 GB free on C:\
- **Network:** 2x RJ45 on-board gigabit Ethernet

Software Requirements

The following operating systems are supported in PCS 7

- Windows 7 Professional / Ultimate / Enterprise SP1 (64-Bit)
- Windows 10 Enterprise 2015 LTSC (64-Bit)

Additional software requirements

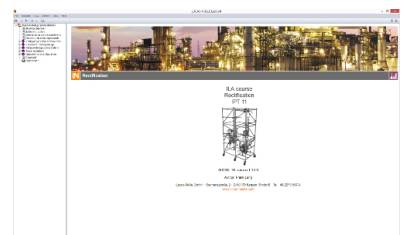
- Internet Explorer 11
- Microsoft .NET Framework

Media:



Pos.	Product name	Bestell-Nr.	Anz.
4	Interactive Lab Assistant: rectification unit	SO2806-1A	1

Multimedia experiment software with instructions and documentation for the process trainer "rectification".



Additionally recommended

Pos.	Product name	Bestell-Nr.	Anz.
5	Lab table SybaPro, 1600x800x760mm, Process and chemical engineering	ST8031-1Q	1

It is an exemplary equipment. We manufacture your laboratory according to your wishes and requirements!

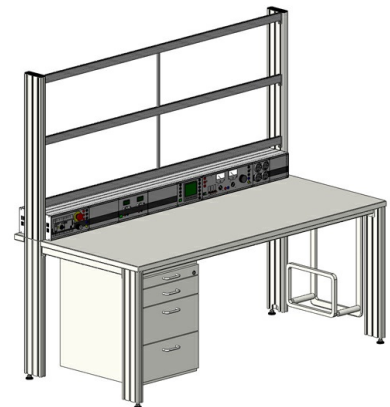
Laboratory bench

Highly-compressed 30mm-thick multi-layered fine chipboard conforming to German Industrial Standard (DIN) EN 438-1

- Colour grey RAL 7035, slightly textured 0.8mm-thick coating on both sides conforming to German Industrial Standard (DIN) 16926
- The border of the table top is a solid, impact-resistant protective trim made of 3mm-thick grey RAL 7047 coloured plastic
- The coating is resistant to a wide variety of chemicals and reagents such as dilute acid and alkaline solutions. Furthermore it is heat resistant even to liquid solder or the hot spots resulting from soldering irons and lit cigarettes, for example.
- Sturdy, continuous rectangular-tube frame with all necessary slots for fitting table legs and under-table cabinets, with approx. 0.8µm-thick acid-resistant epoxy resin coating
- 2 table legs, extruded aluminium profile, 705mm
- 2 table legs, extruded aluminium profile, 730mm
- 8 identical grooves in the extruded aluminium profile (3 grooves on each broad side and 1 on each narrow side)
- Grooves for mounting standard industrial brackets
- Two separate internal cable channels for wiring
- Integrated height-adjustable feet to compensate for uneven flooring
- Height of table top: 750mm
- Dimensions 1600 x 800 x 750mm (WxDxH)

Utensil drawer

- 3 drawers 2 HU
- 1 drawer 4 HU
- Usable width 330mm, Usable depth: 480mm
- Central locking
- Metal drawers with surrounding row of slots
- Body made of 19mm-thick, highly-compressed, multi-layered fine chipboard with grade E1 plastic coating on both sides



- Dimensions: 430 x 588 x 560mm (WxHxD)

Power ducting

for 1600-mm wide SybaPRO tables to accommodate 19", 3-HU inserts and panels

- To accommodate up to 25 x 12-PU (294 PU) 3-HU modules
- Can be fitted as console or as table-top ducts
- Pre-wired with power supply bus system for 3 HU inserts or panels
- Terminal strips for connection to existing power supply
- Base and lid made of anodised E6/EV1 extruded aluminium profiles
- Sides made of painted sheet steel (colour (RAL7047)
- High power quick-release IP20 safety plugs conforming to DIN EN 61984:2009
- External dimensions: 1530 x 133 x 230mm (WxHxD)

Exemplary equipment for the power ducting

- 230V/50Hz AC power supply insert for supply of power and fuse protection
- socket panel unit 5x230V
- socket unit 2x 230V/16A for supplying power to computer equipment
- RJ45 patch panel for networking PCs
- Multimedia terminal panel insert for PC

6 FL1703 Recirculating Cooler

LM3920

1

Recirculating Cooler/Chiller for environmentally friendly cooling

The FL series offers a new generation of chillers for routine cooling applications within the laboratory and industry. The temperature stability of the PID control is $\pm 0.5^{\circ}\text{C}$. All units can easily be cleaned and are provided with a splash water proof keypad with LED temperature indication. On the front of the units there is an RS232 interface as well as an alarm shutdown. The filling port is easily accessible placed on the top under a lift-up cover. Another hinged tray serves as a file for the operating manual or other documents concerning the installation. The removable venting grid allows an easy cleaning of the condenser, the drain tap is easily accessible behind the grid. All models include an easily visible level indication. Another advantage is the venting slots are on the front and rear and therefore the units can be placed directly one beside the other (space saving).



Your advantages

- Ergonomic design and easy operation
- Splash-proof keypad with integrated mains switch
- Large, bright LED display

- Reliable Microprocessor PID temperature control
- Filling level indicator
- Powerful immersion pumps, suitable for continuous operation
- Permissible temperature in return line +80 °C
- Easy filling from the top with hinged protective lid
- Low liquid level protection with optical and audible alarm signal
- Integrated stainless steel bath tanks
- Removable venting grid for cleaning of the condenser
- Front drain
- No side vents
- RS232 interface for PC-connection
- IP class according to IEC 60529: 21
- Alarm output, potential-free change-over contact (max. 30 VA)
- Pressure Indicator
- By-pass valve to adjust pump pressure

Technical Data

- Working temperature range (°C): -20 ... +40
- Temperature stability (°C): ±0.5
- Setting / display resolution: 0.1 °C
- Temperature Display: LED
- Cooling capacity (Medium Ethanol) °C / kW :
20/1.7; 10/1.4; 10/1.4; 0/1; -10/0.75, -20/0.3
- Pump capacity flow rate (l/min): 40
- Pump capacity flow pressure (bar): 0.5-3.0
- Pump connections: G3/4"
- Barbed fittings diameter (inner dia. / mm): 3/4"
- Filling volume (liters): 12 ... 17
- Refrigerant: R404A
- Digital interfaces: RS232, Optional Profibus
- Ambient temperature: 5...40 °C
- Dimensions W x L x H (cm): 50 x 76 x 64
- Weight (kg): 91
- Suitable fluids: water, water-glycol mixture, JULABO Thermal bath fluids
- Included with each unit: 2 barbed fittings for tubing 3/4" inner dia. (pump connections G3/4" male)
- Cooling of compressor: Air

SE-6 Heating Circulator

Heating Circulator with stainless-steel bath tank for internal and external temperature applications

SE Heating Circulators with stainless steel bath tanks are mainly used for internal and external temperature tasks. The new range of these models now have increased capacities, allowing for temperature application of larger external systems, as well as open systems. Simultaneous temperature applications of smaller objects can also be carried out directly in the internal bath of the circulator. Models from the TopTech and HighTech Series' are available with different bath sizes and features. Accessories for these units include test tube racks, bath covers etc. An integrated cooling coil is provided for temperature applications at near ambient or just below.



Your advantages

- VFD COMFORT DISPLAY
- Keypad for setpoints, warning/safety values and menu functions
- ICC (Intelligent Cascade Control), self-optimizing temperature control
- ATC3 3-Point-Calibration
- Pt100 External sensor connection for measurement and control
- SMART PUMP, electronically adjustable pump stages
- Early warning system for low liquid level (DBGM 203 06 059.8)
- Adjustable high temperature cut-out, visible via display
- RS232 interface for online communication
- Integrated programmer for 10 program steps

Technical Data

- Working temperature range (°C): +20 ... +300
- Temperature stability (°C): ±0.01
- Setting / display resolution: 0.01 °C
- Integrated programmer: 1x10 steps
- Temperature Display: VFD
- Heating capacity (kW): 3
- Pump capacity flow rate (l/min): 22-26
- Pump capacity flow pressure (bar): 0.4-0.7
- Pump capacity flow suction (bar): 0.2-0.4
- Bath opening / bath depth (W x L / D cm): 13 x 15 / 20
- Pump connections: M16x1
- Barbed fittings diameter (inner dia. / mm): 8 / 12
- Filling volume (liters): 6
- External Pt100 sensor connection: integrated
- Digital interfaces: RS232
Optional Profibus
- Ambient temperature: 5...40 °C
- Dimensions W x L x H (cm): 21 x 43 x 44
- Weight (kg): 13.5
- Classification according to DIN12876-1: Classification III (FL)

Built-in cooling coil for tap water, connection for temperature, applications below or near ambient temperatures are integrated.
Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 female).

Cooling coil: integrated

Bath tank: Stainless steel

Thermal bath fluid

Thermal bath fluids are ideally suited for all of your temperature control applications and guarantee safe and reliable operation. Choosing the proper bath fluid is critical for best results in temperature control. Viscosity, oxidation characteristics and heat transfer of thermal fluids are specifically matched with each temperature control unit.



Benefits

- Low toxicity
- Low viscosity
- High stability
- Minimum odor
- Good heat conductivity
- Low corrosion tendency
- Wide temperature ranges
- Including drain tap

Technical Data

- Working temperature (°C) (-40) -20...+180
- Flash point (°C) >+170
- Fire point (°C) +220
- Viscosity (kinematic at 20 °C in mm²/s) 10.8
- Density (at 20 °C in g/cm³) 0.94
- Pour point (°C) <-60
- Boiling point (°C) +288
- Ignition temperature (°C) +370
- Color clear
- Thermal expansion coefficient K-1 0.00092
- Heat conductivity [W/m*K] 0.14
- Specific volume resistivity [Ohm*cm] 8x10¹⁴

Viton tubing

1 m Viton tubing (-35...+200°C) 12mm ID

