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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 41 Continuous Stirred Reactor



## IPT 41 Continuous Stirred Reactor

Continuously stirred reactors are basic reactor vessels which are as close as it gets to ideal stirred reactors. The process trainer ***IPT 41*** Continuously stirred reactor teaches the fundamentals of reaction techniques. Use of high-quality, industrial borosilicate glass 3.3 makes for a vivid visual experience. The interactive e-learning course also helps trainees to understand the theory.

Because the feed entering the reactor is mixed directly in the reactor itself, there is no development of gradients within the reaction vessel. The composition of the reaction products coincides with that of the reaction mass.

Continuously stirred reactors are versatile in application and can be used for a wide variety of disciplines for basic or advanced training.

Users also benefit from a fully pre-programmed process control system, such as those widely used in the process industry. It is possible to connect multiple trainers 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 continuously stirred Reactor
- Influence on conversion rate of:
  - Stirrer speed frequency
  - Temperature
  - Concentration
  - Throughput
- Determination of reaction parameter
- Comparison of real reactors with ideal model

Basic equipment set, consisting of:

**Basic equipment set, consisting of:**

Pos.	Product name	Bestell-Nr.	Anz.
1	<b>IPT41 Continuous stirred reactor 10l, automated with PCS</b>	LM3410	1

**Apparatus:**

- Stirred reactor 10l
- 2x Feed vessel 20l
- Condenser 0,3 m<sup>2</sup>
- 2x Centrifugal pump
- 2x Impeller flowmeter
- Conductivity cell incl. transducer with display
- Temperature measurement Pt1000
- Movable frame made of galvanized steel tube
- 5 Years Glass-Guarantee on all glass components according to the intended use

**Dimension:**

height x width x depth: 2200 x 1000 x 1400 mm

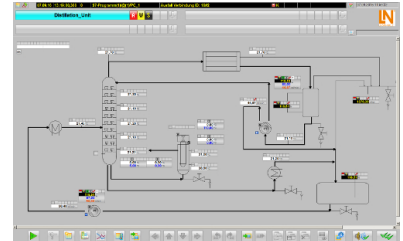


## Additionally required:

Pos.	Product name	Bestell-Nr.	Anz.
2	<b>Siemens Process Control System SIMATIC PCS 7 3-user license</b>	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

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3 **Process Control System SIMATIC PCS 7 AS RTX Box**

LM3910

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**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



Media:



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Pos.	Product name	Bestell-Nr.	Anz.
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4 **Interactive Lab Assistant: continuously stirred reactor**

SO2806-1F

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



Additionally recommended

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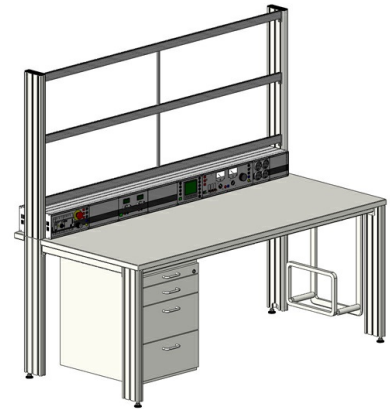
5 **Lab table SybaPro, 1600x800x760mm, Process and chemical engineering**

ST8031-1Q

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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

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## 6 FL1703 Recirculating Cooler

LM3920

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### 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  $+80^{\circ}\text{C}$



- 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