

Physics

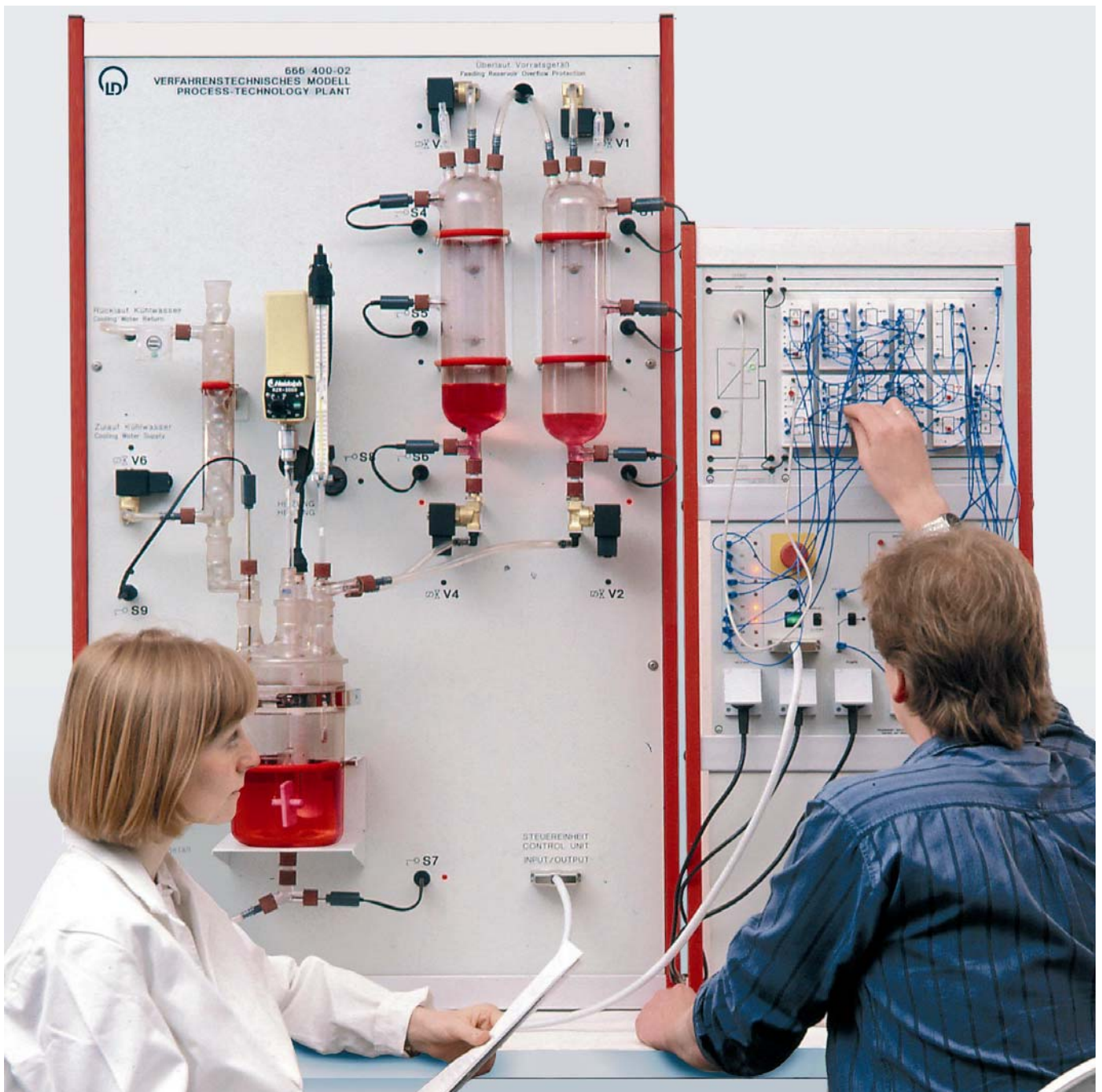
Chemistry · Biology

Technology



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Applied process control



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SIMULOG LS TTL
 Part 4: Digital Control Technology

D • 6 • 7
 Control technology

Sequence control system, complete with one reservoir

The process control model with one reservoir in section D.6.6, now also comprising control for cooler, heater and stirrer, is now to be tested once and to be supplemented with a further circuit for forced emptying (for mains switch-on). In the next section, the control for the second reservoir will be added.

Empty reaction vessel (if necessary) by pressing ST.

Trigger start signal and check the entire sequence.

Switch off mains supply, then switch back on.

Reset flipflop even in the case of forced emptying.

RSFF2(A1) - RSFF1(E8), remove!
 RSFF2(A1) - 4OR2(E1), 4 cm
 4OR2(E4) - 4OR2(E2), 4 cm
 4OR2(A1) - RSFF1(E8), 15 cm

Switch off mains.
 Flip changeover switch ST up (prepare 1 signal).
 Switch on mains again.
 Flip changeover switch ST down again (0 signal) and, in this way, prepare control system for start.

Caution: If flipflop R is set after switch-on, then force emptying of the reaction vessel!

Flipflop V is normally set after switch-on and when the reaction vessel is empty. This can be reset by briefly enabling the reset input with a 1 signal.

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SIMULOG LS TTL
 Part 4: Digital Control Technology

D • 6 • 8
 Control technology

Sequence control system, complete with two reservoirs

The control system with one reservoir in section D.6.7 can easily be extended to include two reservoirs. No new steps (flipflops) are required for this; the filling step is carried out in parallel for both reservoirs and the depositing step is carried out in two halves.

Set flipflop V, when both reservoirs are filled (V2 × V5)

PCM(S2) - RSFF1(E8), remove!
 PCM(S2) - 4AND(E5), 2/4
 PCM(S5) - 4AND(E6), 2/4
 4AND(A5) - RSFF1(E8), 4 cm

RSFF1(A3) - PCM(V1), remove!
 RSFF1(A3) - 4OR1(E2), 4 cm
 4AND(E5) - 4OR1(E1), 15 cm
 4OR1(A1) - PCM(V1), 2/4

Open valve 3 in step F.

RSFF1(A3) - 4OR1(E3), 4 cm
 4AND(E6) - 4OR1(E4), 15 cm
 4OR1(A3) - PCM(V3), 2/4

Trigger start signal.

Do not set flipflop R until the left-hand reservoir is empty, $V \times S5 = 1$ instead of $V \times S3 = 1$.

4INV(A1) - 4AND(E8), remove!
 PCM(S6) - 4INV(E3), 2/4
 4INV(A3) - 4AND(E8), 8 cm

The contents of the left-hand reservoir are also deposited into the reaction vessel in step V, but, not until the right one is empty, $V \times S3 = 1$ instead of $V \times S5 = 1$.

RSFF1(A8) - 4OR1(E8), 4 cm
 4INV(E1) - 4OR1(E7), 15 cm
 4OR1(A7) - PCM(V4), 2/4

Trigger start signal and check the entire sequence.

Both the reservoirs are filled in step F. In step V, the contents are deposited into the reaction vessel, first the right one then the left. In step R, the stirrer, the heater, and the waste gas cooler are activated. After the desired temperature has been reached, the heater is switched off and 8 seconds later the reaction vessel emptied.

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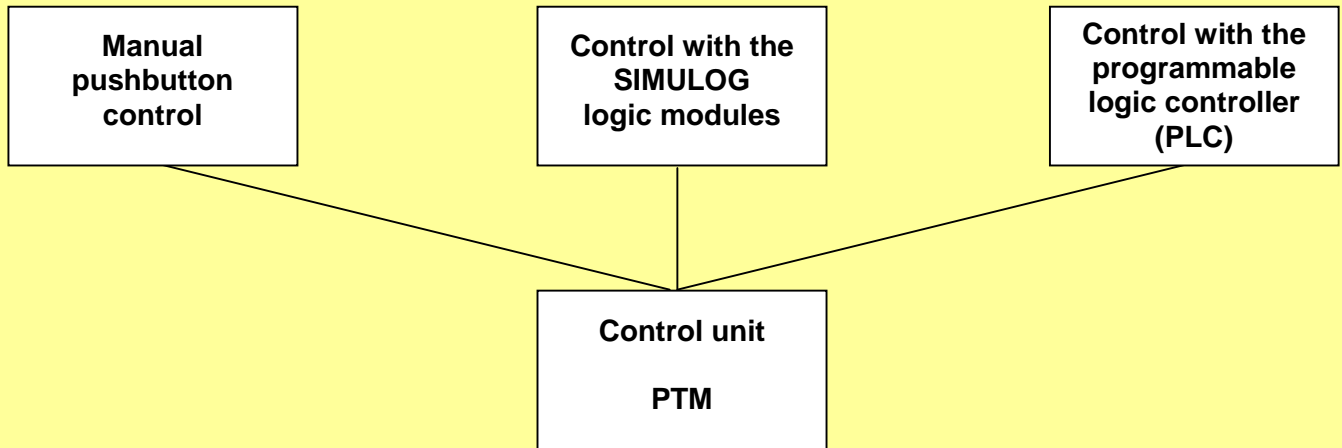
571 172
SIMULOG LS-TTL Part 1
Combinatorial and Sequential
Circuits
 69 experiments for group exercises by
 M. Hund 100 pages, DIN A4,
 150 illustrations
 Topics:
 Basic operations, combinatorial circuits,
 sequential circuits, serial and parallel
 arithmetic units, digital control. memory
 technology, DA and AD convertors.

571 202
SIMULOG LS-TTL Part 4
Digital Control Technology
 74 experiments for practical exercises by
 M. Hund College level, technical college,
 training institutions 106 pages, DIN A4,
 164 illustrations
 Topics:
 Basic units; measurement technology;
 control technology, alarm system,
 staircase lighting system, motor current
 conversion system, traffic lights, lift
 control, washing machine, punch
 machine, stepping motor, process
 control technology, memory technology,
 DA and AD convertors.

Applied computer science in natural science professions

Modern data processing technology has left an indelible imprint on production processes and analytic techniques. Changes in curricula for the natural sciences have taken this development into account; topics touching on applied computer science have been adopted in educational plans for professions in the natural sciences. Schools, colleges and businesses are being called upon to integrate these new subjects into teaching and training programs. Here there is a need for educational materials which are tailored to provide knowledge on computer science and its application in laboratory and production technology. The three systems offered here make for an ideal combination of digital and control technology for classroom use with the requirements of practical career training.

Process technology plant



Equipment list for the process technology model (PTM)

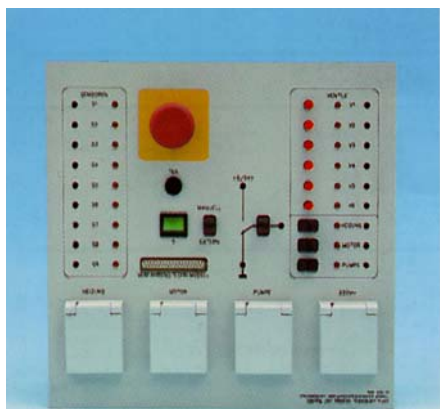
Designation	Cat. No.	Control		
		manual	SIMULOG	PCL
Process technology model (PTM)	666 400	x	x	x
Water supply*	666 402	(x)	(x)	(x)
Expansion kit	666 401	(x)	(x)	(x)
Special profile frame	666 403	x	x	x
Inverter for 666 400	666 404			x
SIMULOG LS-TTL, basic equipment for training in natural science professions	571 105		x (maximum)	
alternatively: SIMULOG LS-TTL, equipment for controlling the process technology model (included in 571 105)	571 106		X (minimum)	
Base panel SIM (297 x 300 mm)	726 55		x	
Base panel SIM (634 x 400 mm)	726 59		(x)	
Stabilized power supply, 5 V	726 88		x	
SIMATIC S7-312 IFM. 18DI. 14DO	730 8234			x
PC adapter	730 879			x
Software "Step 7" Lite	730 874			x
Manual S7-300	730 832			x
Manual 312 IFM, 314 IFM	730 842			x
Documentation Package "Step 2"	730 882			x
Reference manual "Step 7"	730 892			x
PC printer cable	728 069			x
Connection leads (set of 5)	571 21		4	
	571 22		3	
	571 23		3	
	571 24		3	
Set of 5 adapter cables	571 26		4	
Connection leads	501 26			20
	501 21			3
	501 31			1
Safety connection lead	500 602			10

* alternatively: tap water connection via pressure reducing valve (1 or 2 bar max.)

(x): These components are not mandatory.



Process technology model (666 400) and expansion set (666 401)



Control unit for 666 400

Control unit:

- Outputs: 9 for sensors, 1 for start
- 6 valve inputs: manually via pushbutton or externally
- 3 relay inputs: for heating, pump and motor
- 3 x 230 V sockets: switchable via relay
- 1 x 230 V socket: Fixed voltage
- Emergency fuse: 6 A
- Output to PTM: 37-pin sub-D jack strip
- LEDs: 18
- Power supply: 230 V, 50 Hz
- Dimensions: 30 cm x 29.7 cm x 15 cm
- Weight: 3 kg



Water supply (666 402)

666 402 Water supply for 666 400

Required where the model is set up in rooms without a supply of running water. The especially quiet and controllable recirculating pump makes this unit suitable for continuous operation. With integrated connections for feed, return, overflow and cooling circuit.

- Type of pump: Submersible circulation pump, 230 V, 75 W
- Hydraulic head: 2.5 m
- Volume: 5 l
- Connectable cable: 10 m
- Housing: PVC
- Dimensions: 40 cm x 30 cm x 21,5 cm
- Weight: 6 kg

666 400 Process technology model

With all components and the control unit permanently attached to a panel mounted in a metal profile frame. With integrated electronics for connection of control units running on operating voltages between 5 and 24 V, such as the SIMULOG system or the programmable control.

Basic unit:

- Reaction vessel: Duran glass, 2 l
- Ground cover: 15 cmØ 4 ST 29
- Supply container: Duran glass, 1.5 l with connections for 3 fill level sensors, feed, return and vent
- Agitator motor: 230 V, variable betw. 60 to 700 Rpm.
Chuck: 0.5 to 8 mmØ
Agitator: 8 mmØ, 54 cm, guide with ST 29 grind, agitator shaft with PTFE paddle
- Contact thermometer: 0-240 °C, 46 cm
- Quartz heating rod: 1000 W, 30 cm
- 4 fill level sensors: LF electrodes (Pt), 10 cm, 8 mmØ
- 1 fill level sensor: LF electrode (Pt), 25 cm, 8 mmØ
- 4 solenoid valves: 24 V, (may be increased to with expansion set 666 401)
- Input/output to control unit: 37-pin sub-D jack strip
- Cable for connection to control unit: 2 m, 37 conductors
- LEDs: 16
- Dimensions: 85 cm x 140 cm x 54 cm
- Weight: 30 kg

666 401 Expansion set, 2nd reservoir for 666 400

For process technology plant training model.

Scope of delivery:

- 1 Supply container
- 3 Filling level sensors
- 2 Solenoid valves

666 403 Special frame for 666 400

Two-level frame for experiment panels, for accommodating the control unit of the process technology plant, the SIMULOG work panel and the programmable control unit.

- Dimensions: 80 cm x 73 cm x 15 cm

Controlling the process technology model using the SIMULOG logic modules

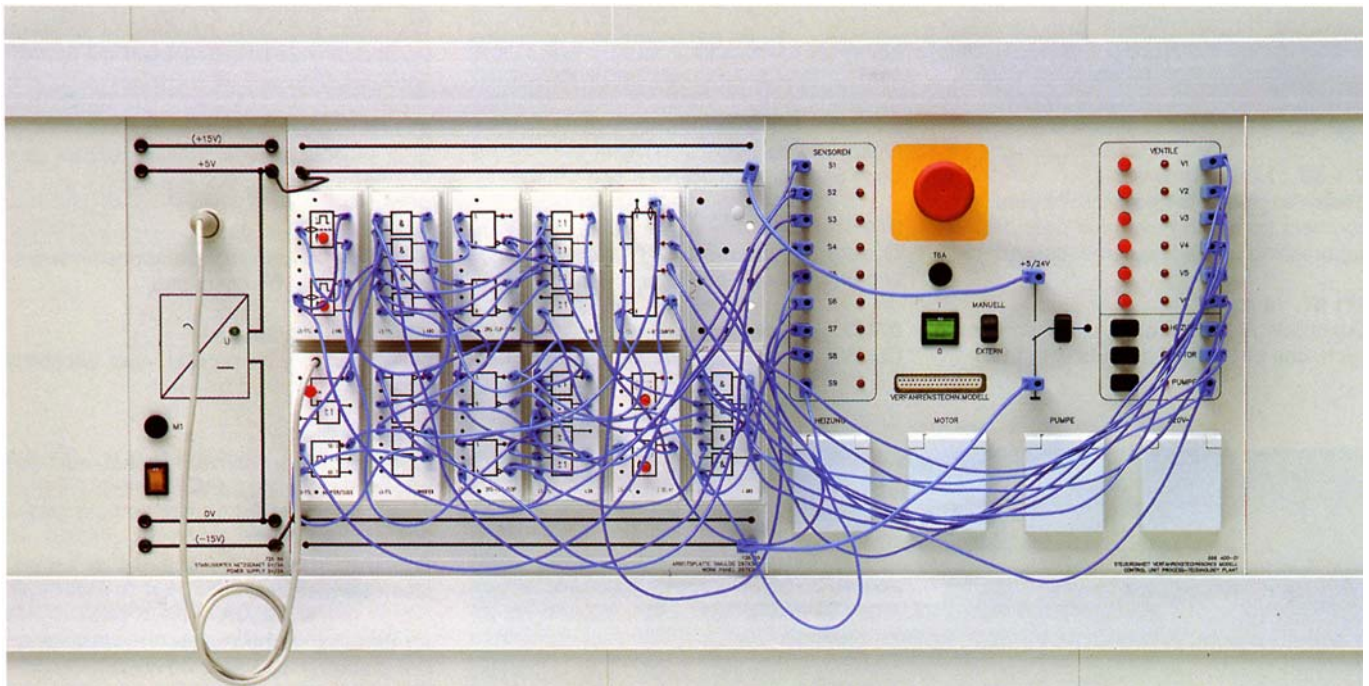
Logic modules offer excellent educational options for simple and sensible integration of applied computer science into natural science courses. Even with just a few modules it is possible to control automatically fairly complex process technology models.

The use of the modules allows the instructor to

- present the required data processing theory in an easily grasped fashion,
- set up the signal flow and follow it optically,
- check immediately to determine whether the student's own approach to solving the problem is correct.

The integrated circuits in the SIMULOG elements utilize LS-TTL technology and are characterized by low power requirements. Additional protective circuits at the inputs and outputs are not necessary. The IC inputs and outputs can be accessed directly where assignments in measurement technology must be carried out.

High-flex signal lines with hard gold-plated plugs for multiple plug connections. Adapter cables with 2/4 mm dia. plug connectors are available for interfacing.



571 105 SIMULOG LS-TTL, basic equipment

Basic equipment for training in natural science professions.

Scope of delivery:

1	Tray for SIMULOG LS-TTL	571 31
1	Adapter/Clock	531 34
1	4-Bit Inputs	571 36
2	4-Bit Outputs	571 37
1	LED-Display	571 38
2	4 AND	571 51
1	4 NAND	571 52
2	4 OR	571 54
1	4 NOR	571 55
1	4 XOR	571 57
1	4 Inverter	571 58
4	2 JK-Flipflops	571 59
1	2 Delay	571 615
3	2 RS-Flipflops	571 63
2	4-Bit Registers	571 64
1	4-Bit Adder	571 76
3	4-Bit Counters	571 77
2	2 Relays	571 80
1	Speaker	571 81

571 106 SIMULOG LS-TTL, PTM

Equipment for controlling the process technology model (included in 571 105).

Scope of delivery:

1	Tray for SIMULOG LS-TTL	571 31
1	Adapter/Clock	571 34
1	4-Bit Input	571 36
1	4 AND	571 51
2	4 OR	571 54
1	4 Inverter	571 58
1	2 Delay	571 615
2	2 RS Flipflop	571 63
1	4-Bit Counter	571 77

571 172 SIMULOG LS-TTL Part 1 Combinatorial and Sequential Circuits

69 experiments for group exercises by M. Hund 100 pages, DIN A4, 150 illustrations

Topics:

Basic operations, combinatorial circuits, sequential circuits, serial and parallel arithmetic units, digital control, memory technology, DA and AD convertors.

571 202 SIMULOG LS-TTL Part 4 Digital Control Technology

74 experiments for practical exercises by M. Hund College level, technical college, training institutions 106 pages, DIN A4, 164 illustrations

Topics:

Basic units; measurement technology; control technology, alarm system, staircase lighting system, motor current conversion system, traffic lights, lift control, washing machine, punch machine, stepping motor, process control technology, memory technology, DA and AD convertors.

Information on **further logic modules** and kits covering the following topics

Basic logic operations

Combinatorial and sequential circuits

Serial and parallel processors

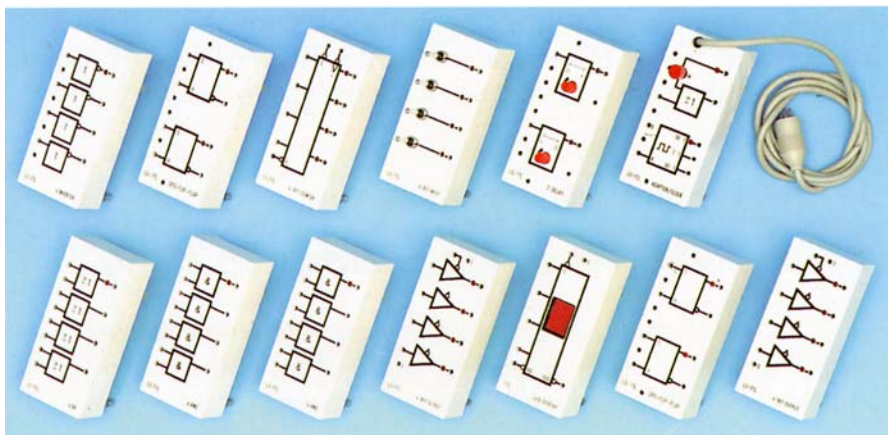
Microprocessor circuits

Digital measurement and control technology

Memory technology

is provided in our prospectus "Digital technology with the SIMULOG LS-TTL SIM 5.1".

This prospectus is free of charge and available upon request.



SIMULOG basic equipment (571 105)

571 34 Adapter/Clock

For connections of correct polarity between the base panel and power supply unit, generation of square wave pulse trains of half the mains frequency and 1 Hz (50 : 1 or 60 : 1), with LED indicator. Automatic stop when applying a 1-signal. With push button for generation of single pulses, LED indicator.

571 38 LED-Display

7-segment display for hexadecimal figures from 0 to F with the possibility of suppressing preceding zeros, cascable.

571 51 4 AND

Quad AND gates with two inputs each, one of the four outputs with LED.

571 52 4 NAND

Quad AND gate with two inputs each and negated outputs, 1 LED.

571 54 4 OR

Quad OR gates with two inputs each, one of the four outputs with LED.

571 55 4 NOR

Quad OR gates with two inputs each and negated outputs, 1 LED.

571 57 4 XOR

Quad exclusive OR gates with two inputs each, one output with LED.

571 58 4 Inverter

Quad negation, one output with LED.

57159 2 JK Flipflop

With inputs for static and dynamic setting, with negated and unnegated outputs and two LEDs for indication of both stored values. Single edge triggered master-slave flipflop.

571 36 4-Bit Input

With changeover switches and 4 LEDs for presetting 4 variables, debounced, without negation.

571 37 4-Bit Output

Four commonly-controlled drivers (tristate buffer), with 4 LEDs for indication of output values, can also be used as a bus driver.

571 615 2 Delay

Two delay elements with adjustable delay times of 0.1 s-5 s, one element delays the 0-signals, the other element delays the 1-signals.

571 63 2 RS Flipflop

With inputs for static setting, with negated and unnegated outputs and two LEDs for indication of both stored values.

571 64 4-Bit Register

Shift register with series and also parallel data input/output, four LEDs.

571 76 4-Bit Adder

Full adder for parallel operation between two 4-bit words, cascable.

571 77 4-Bit Counter

Dual counter with parallel input capability and four LEDs.

571 80 Relay

With input driver, changeover and NO contact, max. 24 V, 1 A.

571 81 Speaker

For acoustic indication of external or internal alarm signals.

All SIMULOG components:

- Dimensions: 42 mm x 92 mm x 40 mm
- Weight: 42 g

Signal leads

Highly flexible 0.5 mm² connecting leads with 2 mm^Ø hard-gold plated cage-spring plugs.

Adapter cable with 2/4 mm^Ø plugs for adaption to the plug-in system for electricity and electronics and the TPS system.

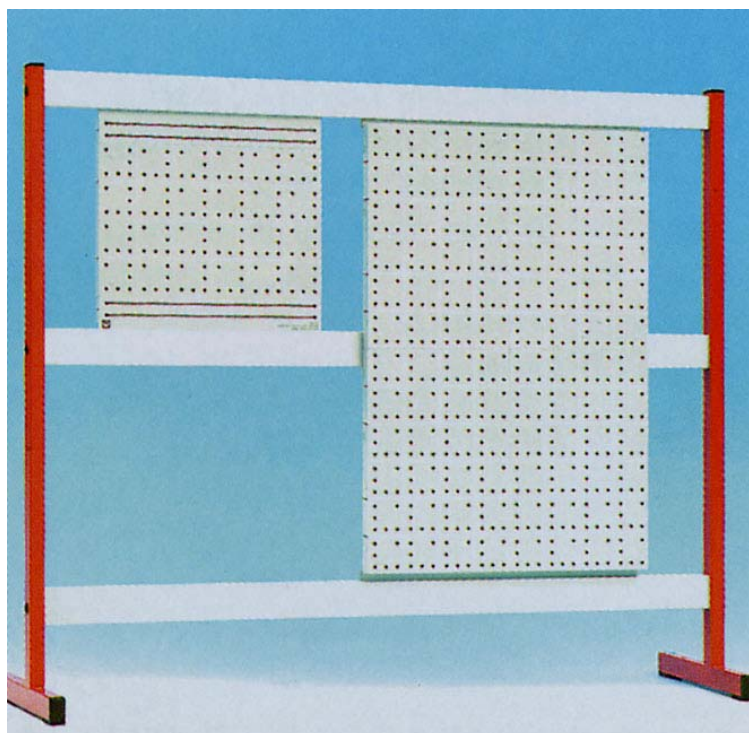
Cat. No. Designation

571 21	Connecting leads,	4 cm, set of 5
571 22	Connecting leads	8 cm, set of 5
571 23	Connecting leads	15 cm, set of 5
571 24	Connecting leads	30 cm, set of 5
571 25	Connecting leads	50 cm, set of 5
571 26	Adapter cables,	30 cm, set of 5

726 55/59 SIM Base panels

For profile frames, this panel ensures the connection with correct polarity of a circuit with logic IC's (LBS) of the Simulog-LS-TTL for laboratory exercises, with 24 socket fields (for maximum 12 plug-in elements) and 2x2 traversing current rails.

- Dimensions/Weight:
726 55: 297 mm x 300 mm / 1.2 kg
726 59: 634 mm x 400 mm / 3.5 kg



SIM base panels 726 55 and 726 59 in panel frame


726 88 AC/DC Stabilizer

Lab power supply unit with DC and AC voltage outputs, equipped with illuminated mains switch.

- **DC Outputs:**
 - fixed voltage: 5 V / 1 A floating ground residual ripple: 1 mV RMS
 - tracking stabilizer: $\pm 0...15$ V / 1 A floating ground
- **AC Outputs:**
 - AC voltage: 6/12/24 V / 1 A floating ground
- Output: 4 mm sockets/6pin DIN-socket
- Mains cable with schuko plug


666 425 CPS-Panel frame C 50

Panel frame, two-level, for PLC control unit SIMATIC S7-312 (730 8234) or SIMULOG base panel (726 55 and 726 59).

- Dimensions: 84 cm x 56 cm x 30 cm
- Weight: 2 kg

666 428 CPS-Panel frame C 100

Panel frame, two-level, for PLC control unit SIMATIC S7-312 (730 8234) or SIMULOG base panel (726 55 and 726 59).

- Dimensions: 86 cm x 93 cm x 30 cm
- Weight: 4 kg

666 404 Inverter for 666 400

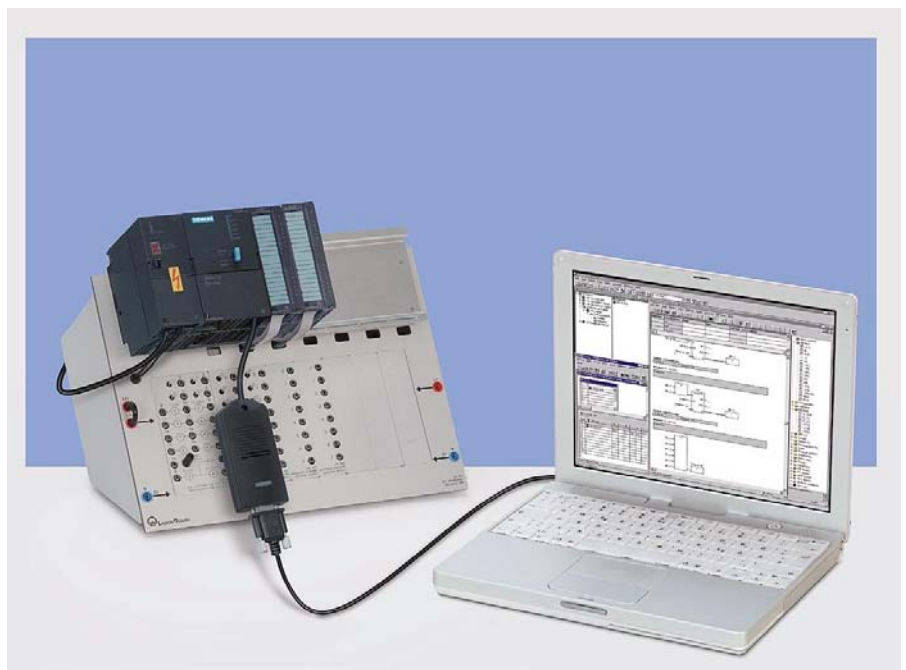
For switching the valves on the process technology model (PTM) via the control unit with "High" signals.

- Panel: 100 x 297 mm

730 8234 SIMATIC S7-312 IFM, 18DI, 14DO

Complete unit consisting of the PLC basic unit (730 800), DIN rail, power supply, input simulation for 18 digital inputs, 14 digital outputs and 5 blank panels. All of the inputs and outputs are connected to 4-mm safety sockets.

- RAM: 6 Kbytes
- Flags: 1024
- Counters: 32
- Timers: 64
- Integrated interface: MPI
- Programming software: Step 7 or Step 7 Mini
- Integrated inputs/outputs:
 - Digital inputs: 18 (24 V DC)
 - Digital outputs: 14 (24 V DC)
- Power supply:
 - Primary: 120/230 V, 50/60 Hz
 - Secondary: 24 V DC, 2 A with mains connection line and grounded plug


730 874 Software "Step 7" Lite

The software solution used to re and-alone applications. Step 7 Lite provides the user with essentially the same tools as Step 7.

STEP 7 Lite contains user-friendly functions for all phases of an automation project, for:

- Configuring and parameterizing the hardware
- Programming
- Testing, commissioning and service
- Documentation
- Operation/diagnostics functions

730 832 Manual S7-300

Design, CPU data, module specifications and operation list. In english.

730 842 Manual 312 IFM, 314 IFM

Integrated functions of the 312 IFM and 314 IFM CPU's. In english

730 892 Reference manual "Step 7"

Consisting of manuals for statement lists (AWL), ladder diagrams (LAD) and function block diagrams (FBD) as well as the reference manual of the standard and system functions for the Simatic S7-300. In english.

730 882 Documentation Package "Step 7"

Consisting of manuals for statement lists (AWL), ladder diagrams (LAD) and function block diagrams (FBD) as well as the reference manual of the standard and system functions for the Simatic S7-300. In english

730 879 PC adapter

A PC adapter is used for PCs without a vacant slot. This is connected to the RS232 interface and includes the RS232 cable.

728 069 PC printer cable

With 25 pin sub-D-plug for the connection of a printer with parallel (Centronics) interface to the PC



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