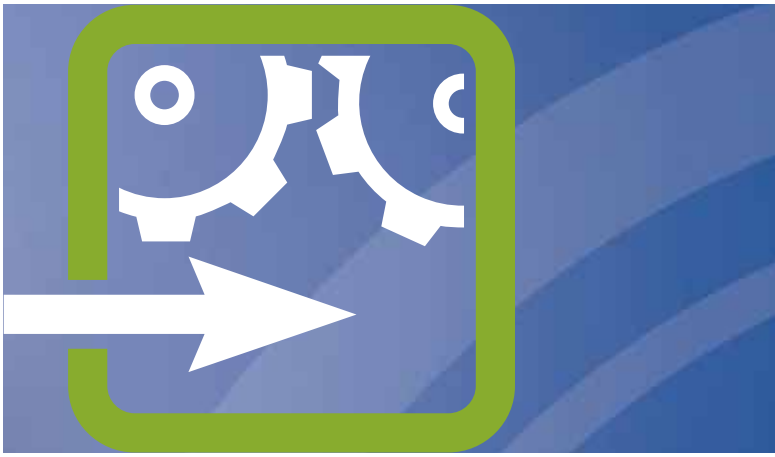
More than sensors + automation

Automation

Innovative solutions for the highest requirements



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Dear Reader,

The automation of machines and plants is the basis for planning and optimizing production processes. The aim is to lastingly increase product quality, productivity, and energy efficiency.

For decades now JUMO has been offering established solutions for a secure, reliable, and profitable plant operation and production process with its products from the field of automation.

How do we do it? Through long-standing experience and expertise: because for more than 60 years JUMO has been one of the leading manufacturers in the field of measurement and control technology and consequently it is also a competent partner for automation.

We place great value on regular new developments, constant improvement of existing products, and on increasingly economic production methods – because only this path allows us to achieve the highest degree of innovation for you.

This brochure provides an overview of JUMO's products and systems from the field of automation.

Further information concerning our products can be found using the given type/product group number at www.jumo.net.

Contents

Automation

For automation JUMO offers a cleverly combined product spectrum of temperature transmitters, digital indicators, SCR power controllers/power switches via a complete measurement, control, and automation system through to plant visualization software.

Thanks to a flexible configuration by a PC setup program, the individual device functions can be rapidly and conveniently adjusted for a wide range of applications. This enables you to achieve a self-financing configuration for a wide range of industry applications.

The most important branches

For every task the right solution: our wide range of different devices offers the right solution for classic plant construction and mechanical engineering as well as for the process industry or for the OEM-sector.

In addition to standard devices, JUMO's product range comprises individual customized versions for special purposes.

Transmitters

A secure, economical, and precise signal adjustment of temperature sensors, as well as other sensor elements, is achieved by electronic transmitters of the JUMO dTRANS Txx series. Depending on the type of transmitter, these can be supported by the universal measuring input of a wide range of sensor types. In terms of output, they provide a correspondingly linearized current/voltage and/or HART®signal for further processing to subsequent devices.

JUMO offers a well rounded range of transmitters that are available as head transmitters or as space-saving mounting rail transmitters. For cable-free and mobile use a wireless-head transmitter is available that enables a recording of temperature process values on movable or hard-to-access plants.

Head transmitters

The head transmitters of the JUMO dTRANS series are designed for installing in the terminal head form B or for terminal head form J. The big advantage in the head installation is the higher measuring accuracy due to the conversion of the sensitive sensor signal to a stable output signal (e.g. 4 to 20 mA or HART® signal) in the direct vicinity of the sensor.

The fully-sealed head electronics also offers increased protection against adverse environmental conditions. Combined with such a device as the JUMO PROCESStemp RTD temperature probe for process technology, the head transmitters provide the exact measurement of your process temperature.

	Designation	**dTRANS T01 Ex** **dTRANS T01 / HART® Ex** **dTRANS T01 Junior**	**dTRANS T03 J** **dTRANS T03 B** **dTRANS T03 BU**	**dTRANS T05 B**
	Data sheet	707010	707030	707050
Technical data	**Input** **RTD temperature probe**	Pt 100, Pt500, Pt 1000 (Junior only Pt 100 / Pt 1000), 2-/3-/4 wire circuit	Pt 100, 2-/3 wire circuit	Pt 100, Pt500, Pt 1000, resistance transmitter, 2-/3-/4 wire circuit
	Input **Thermocouple**	L, J, U, T, K, E, N, S, R, B, D, C (Junior only J, K, N, S, R)	–	R, S, B, J, T, E, K, N, L, U, A1, C, D, –100 to +1100 mV
	Output	4 to 20 mA	4 to 20 mA, 0 to 10 V	4 to 20 mA
	Calibration accuracy	± 0.05 %	± 0.2 %	± 0.05 %
	Galvanic isolation	3.75 kV, 2 kV, 1 kV	–	3.75 kV
	Special features	Customer-specific linearization	Analog signal path, Can be digitally adjusted/configured	USB interface, Customer-specific linearization, control LED (red/green), memory min/max sensor temperature via drag indicator function
	NAMUR-compliant	NE21		
	Approval	ATEX: EEx ia	–	–
	Configuration	Via PC interface, **HART® version via HART® modem**	Via PC interface	Via standard USB cable without auxiliary voltage
	Supply	DC 11.5 to 30 V	DC 7.5 to 30 V, DC 15 to 30 V (BU)	DC 11 to 35 V
	Ambient temperature	–40 °C to +85 °C	–40 °C to +85 °C	–40 °C to +85 °C
	Installation	In terminal head, form B	In terminal head, form B or form J	In terminal head, form B

Mounting rail transmitter

	Designation	dTRANS T01 HART® T	dTRANS T02 J, PCP, LCD, Ex	dTRANS T03 T, TU dTRANS T03 TU	dTRANS T04	dTRANS T05 T
	Data sheet	707010	707020	707030	707040	707050
Technical data	Input RTD temperature probe	Pt 100, Pt 500, Pt 1000, 2-/3-/4 wire circuit	Pt 100, Pt 500, Pt 1000, Potentiometer / Resistance transmitter, 2-/3-/4 wire circuit	Pt 100, 2-/3 wire circuit	Pt 100, Pt 1000, Potentiometer	Pt 100, Pt 500, Pt 1000, 2-/3-/4 wire circuit
	Input Thermocouple	J, K (further ones upon request)	L, J, U, T, K, E, N, S, R, B, D, C, –10 to +10 V, –20 to +20 V	–	–	R, S, B, J, T, E, K, N, L, U, A1, C, D, –100 to +1100 mV
	Output	4 to 20 mA	0 (4) to 20 mA, 0 (2) to 10 V	4 to 20 mA, 0 to 10 V	0 (4) to 20 mA, 0 to 10 V	4 to 20 mA, 0 to 10 V
	Calibration accuracy	± 0.05 %	± 0.075 %	± 0.2 %	± 0.3 %	± 0.05 %
	Galvanic isolation	2 kV	50 V (triple isolation)	–	Up to 3.7 kV (against supply voltage)	1.875 kV
	Special features	Customer-specific linearization	Universal transmitter, customer-specific linearization, Open-collector output, alarm output	Analog signal path, can be digitally adjusted	Measuring ranges and current or voltage output can also be configured via the DIP switch, sensor-related hardware version	USB interface, customer-specific linearization, control LED (red/green), memory min/max sensor temperature via drag indicator function
	NAMUR-compliant	NE21				
	Approval	–	ATEX: EEx ia	–	–	–
	Configuration	Via HART® modem	Via PC interface or keys (LCD version)	Via PC interface	Via PC interface or DIP switch	Via standard USB cable without auxiliary voltage
	Supply	DC 11.5 to 30 V (2-wire transmitter)	DC 24 V, AC 110 to 230 V (4-wire transmitter)	DC 15 to 35 V (2-wire/3-wire transmitter)	AC 110 to 240 V, AC / DC 20 to 53 V (4-wire transmitter)	DC 11 to 35 V (2-wire/3-wire transmitter)
	Ambient temperature	–25 °C to +70 °C	–10 °C to +60 °C	–25 °C to +70 °C	–25 °C to +55 °C	–10 °C to +70 °C
	Installation	On mounting rail/DIN rail 35 mm x 7.5 mm				

Wireless head transmitter

	Designation	Wtrans B	Wtrans receiver T01
Technical data	Data sheet	707060	902931
	Input	Pt 100, Pt 500, Pt 1000, resistance transmitter, 2-/3-/4- wire circuit, R, S, B, J, T, E, K, N, L, U, A1, C, D, –100 to +1100 mV, 0(4) to 20 mA (via external shunt)	For up to 16 receivers per receiver (wireless frequency 868.4 MHz)
	Output	Wireless-based with open air range of max. 300 m (transmission frequency 868.4 MHz)	2 x 4 to 20 mA / 0 to 10 V, 2 x relay or 4 x 4 to 20 mA / 0 to 10 V
	Calibration accuracy	± 0.1 %	
	Galvanic isolation	> 10 kV	50 V
	Special features	Transmission interval 1 to 3600 s, customer-specific linearization	LCD display, RS485 interface (Modbus)
	NAMUR-compliant	NE21	
	Approval	–	
	Configuration	Via PC interface	Via PC interface or keys on the front
	Supply	3.6 V Li battery (battery size AA)	AC 110 to 240 V, AC / DC 20 to 30 V
	Ambient temperature	–30 °C to +85 °C	–20 °C to +50 °C
	Installation	In terminal head, form B	On mounting rail/DIN rail 35 mm x 7.5 mm

Isolation amplifier

	Designation	Ex-i power supply/input isolating amplifier
Technical data	Data sheet	707530
	Input	0(4) to 20 mA, Supply isolating amplifier operation or input isolating amplifier operation
	Output	0(4) to 20 mA, 0(1) to 5V
	Calibration accuracy	± 0.1 %
	Galvanic isolation	375 Vpeak
	Special features	HART®-compatible, active/passive current output, LED for power status, universal power supply
	Approval	ATEX: EEx ia, SIL2, UL
	Configuration	Via DIP switch
	Supply	AC / DC 24 to 230 V
	Ambient temperature	–20 °C to +60 °C
	Installation	On mounting rail/DIN rail 35 mm x 7.5 mm

Digital indicators

Digital indicators enable a precise on-site display of process values and monitor the values that are important for a smooth production process.

Limit value monitoring functions ensure an automatic monitoring of important process variables.

JUMO offers a complete indicator range of the "di" series from the 1-channel compact format to the 2-channel version with text display and moving script.

Digital indicators and handheld thermometers

	Designation	di 32 di 08	di eco	di 308
Technical data	Data sheet	701530	701540	701550
	Display	4-figure segment display (red, figure height 10/20 mm)	3-figure segment display (red, figure height 13 mm)	5-figure LCD display (two-line, figure height 18/7 mm), text display as moving script with color change
	Input	**Multifunction input:** RTD temperature probe, thermocouple, standard signal, 0 to 20mA/0 to 10 V	Pt 100 / Pt 1000 / KTY2X-6, Thermocouples J, L, K, 0 (4) to 20 mA, 0 to 10 V	Up to two channels with multifunction input: RTD temperature probe, thermocouple, standard signal, 0 to 20 mA / 0 to 10 V
	Output	1 or 2 relays (3A), Logic output	Relay (10A)	2 relays (can be expanded by optional board)
	Calibration accuracy	0.1 % / 0.4 %	0.1 % / 0.4 %	0.1 % / 0.25 %
	Galvanic isolation	500 V (measuring input for supply)	None	500 V (measuring input for supply)
	Special features	Minimum, maximum and hold function, switch-on delay and alarm suppression configurable	Switch-on delay and alarm suppression configurable, Sensor-related hardware version	Can be optionally expanded with analog output, RS485, Profibus, math-function, up to 4 limit values
	Configuration	Via PC interface or keys on the front	Via PC interface or keys on the front	Via PC interface or keys on the front
	Approval	–	cULus	cULus
	Protection type	IP 65 (front side), IP20 (rear side)	IP 65 (front side), IP20 (rear side)	IP 65 (front side), IP20 (rear side)
	Supply	AC / DC 20 to 53 V, AC 110 to 240 V	DC 24 V, AC 110 V / 230 V	AC / DC 20 to 30 V, AC 110 to 240 V
	Ambient temperature	0 °C to +55 °C	0 °C to +55 °C	0 to +55 °C
	Installation	In the front panel cut-out 48 mm x 24 mm, 96 mm x 48 mm	In the front panel cut-out 76 mm x 36 mm	In the front panel cut-out 96 mm x 48 mm

Designation	TDA-300 / TDA-3000
Data sheet	702540
Display	LCD display with date/time
Sensor input	Pt 100, thermocouple K, J
Calibration accuracy	0.1 %
Special features	Data logger, 99 / 9999 measured values, TDA-3000 with USB interface for reading, min / max value recording
Approval	–
Configuration	Menu navigation with keys
Protection class	IP67 (TDA-300), IP54 (TDA-3000)
Supply	1.5V alkaline battery (battery size AA)
Ambient temperature	–20 to +50 °C

SCR power switches, SCR power controllers

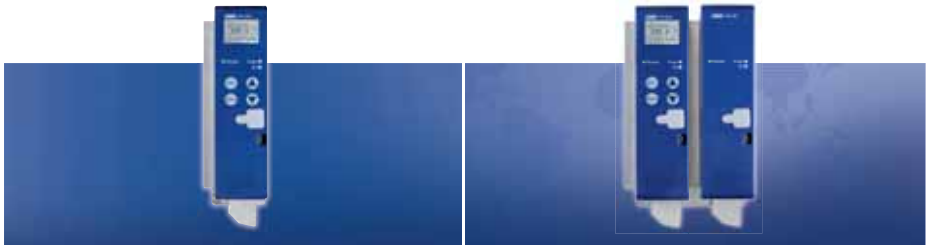
Wherever electrical energy is converted to heat and/or used for industrial heat generation, SCR power controllers are used. To develop practical products for this sector that have established themselves on the market, a close cooperation with the user is very important.

JUMO offers you products that provide you with an energy-efficient, sustainable, and cost-oriented production.

SCR power switches

	Designation	**❶ TYA 432-45/25, 265 ❷ TYA 432-45/50, 530**	**❸ TYA 432-100/30, 265 ❹ TYA 432-100/30, 660**	**❺ TYA 432-100/45, 660 ❻ TYA 432-100/3, 20, 660**
	Data sheet	709010	709020	709020
Technical data	**Dimensions**	45 mm x 58.2 mm x 29 mm	22.5 mm x 81.7 mm x 102.6 mm	45 mm x 81.7 mm x 102.6 mm
	Load voltage	❶ 24 to 265 V_{eff}, ❷ 48 to 530 V_{eff}	❸ 24 to 265 V_{eff}, ❹ 42 to 660 V_{eff}	42 to 660 V_{eff}
	Load current (max)	25 A_{eff}, 50 A_{eff}	30 A_{eff} (T_u = 25 °C), 30 A_{eff} (T_u = 25 °C)	45 A_{eff} (T_u = 25 °C), 20 A_{eff} (T_u = 25 °C)
	Load current (min)	150 A_{eff}		
	Control voltage	3 to 32 V DC	4 to 32 V DC	3 to 32 V DC
	Peak reverse voltage	650 Vpk	650 Vpk, 1200 Vpk	1200 Vpk
	Operating mode	SCR zero voltage switch		
	Galvanic isolation	Between the control and power section by means of optocouplers; insulation voltage 4kV		
	Ambient temperature	–20 °C to +70 °C (taking into account the reduction curve)		
	Electrical connection	Via screw terminals		
	Case	Noryl GFN1	PBT FR	
	Protection class	IP20		
	Weight	60 g	200 g	❺ 360 g, ❻ 380 g
	Approvals	cULus/CSA		
	Special features	Overvoltage protection by integrated varistor, LED display for control input	With integrated heat sink for mounting to DIN rail or screw mounting, 1-pole, suitable for three-phase use with three semiconductor relays	❺ With integrated heat sink for mounting to DIN rail or screw mounting, 1-pole, LED display for control input, three-phase version comes as standard

SCR power controller



	Designation	TYA-201 Single-phase power controller	TYA-202 Three-phase economy circuit power controller
	Data sheet	709061	709062
Technical data	Load currents	20, 32, 50, 100, 150, 200, 250 A	20, 32, 50, 100, 150, 200, 250 A
	Load voltage	24, 42, 115, 230, 400, 460, 500 V	24, 42, 115, 230, 400, 460, 500 V
	Control voltage	Control voltage = load voltage	Control voltage = load voltage
	Configuration	Setup / USB-powered Plain text display on the device	Setup / USB-powered Plain text display on the device
	Operating modes	Phase-angle control, burst firing mode, half-wave control, SSR logic operation, fast logic operation, Alpha start, soft start	Burst firing mode, SSR logic operation, fast logic operation, Alpha start, soft start
	Load types	Resistive load, resistive inductive load, cold-warm ratio 1 : 16, transformer load, infrared emitter (short, medium, long-wave)	Resistive load, resistive inductive load, transformer load, infrared emitter (short-, medium-, long-wave)
	Approval	cULus	cULus
	System interfaces	Modbus, PROFIBUS-DP	Modbus, PROFIBUS-DP
	Ambient temperature	–20 °C to +70 °C	–20 °C to +70 °C
	Subordinate control loop	U-, U^2-control loop (comes as standard), I-, I^2-, P-control loop (optional)	U-, U^2-control loop (comes as standard), I-, I^2-, P-control loop (optional)
	Special features	Current limiting	Economy circuit
		Mains load optimization, dual energy management, "Teach-in" function (partial load failure detection), "R-control" (resistance limitation), intelligent diagnosis system, rotary field detection, brilliant display, "True RMS" (Root Mean Square)	Mains load optimization, dual energy management, "Teach-in" function (partial load failure detection), "R-control" (resistance limitation), intelligent diagnosis system, rotary field detection, brilliant display, "True RMS" (Root Mean Square)

Application example

Infrared automobile tunnel

SCR power controllers are important function blocks of heat treatment plants. Special advantages of JUMO SCR power controllers are provided, among other things, by the integrated subordinate control loop. The devices are used to eliminate or compensate for external disturbances such as mains voltage fluctuations and changes in resistance that would negatively impact the control path. Varying mains voltages result in power changes in the process that can be noticed by changes in temperature. If the power controller has a subordinate control loop, the fluctuation in the energy supply is directly balanced out in the power controller, which results in the provision of a constant amount of power. This achieves high quality and continuity in the process. We distinguish between U^2-, I^2- and P control loops that also positively affect the control quality.

Fields of application for the U^2 control loops, for example, include: use in heating elements with a constant or positive Tk, such as NiCR, constantan or molybdenum heating elements or infrared emitters. For the I^2 control loop: application in the operation of heating elements with a negative Tk such as ceramic and graphite heating elements. For the P control loop: use in SIC heating elements, for example – depending on the temperature, these have a positive or negative Tk and are subject to an aging process.

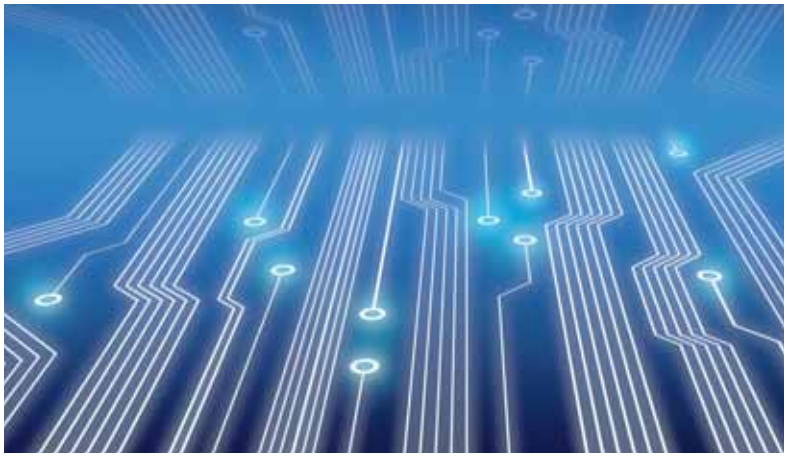
The SCR power controllers JUMO TYA-201/JUMO TYA-202 provide significant advantages due to a reliable and flexible technology and many user-friendly functions such as dual energy management, partial load failure detection, and resistance limitation.

Automation system JUMO mTRON T

Designed to be modular, JUMO mTRON T uses an Ethernet-based system bus and an integrated PLC – also for decentralized automation tasks. The measuring, control, and automation system can be used universally and combines JUMO's comprehensive process know-how with a simple, application-oriented, and user-friendly configuration concept.

JUMO automation system

	Modules	JUMO mTRON T, Multichannel Controller Module	JUMO mTRON T, relay module 4-channel	Analog input module 4-channel	Analog input module 8-channel	Digital input/output module
	Data sheet	705010	705015	705020	705021	705030
Technical data	Measuring inputs/ outputs	2 digital outputs (N/O contact) or logic output, 2 universal analog inputs, 2 digital inputs, 3 expansion slots for further inputs and outputs	4 relay outputs (changeover contact)	4 universal analog inputs, 1 digital input, Universal analog inputs for RTD temperature probe, thermocouple and standard signals	8 analog inputs for RTD temperature probes in 2-wire circuit, 1 digital input	12 channels that can be configured individually as DC 24 V digital inputs or DC 24 V digital outputs/max. 500 mA
	Interfaces	A USB device interface (setup), a LAN connection (Ethernet), and two system bus connections are available as standard (in CPU and HMI). As an option, (in CPU and HMI) up to two interfaces can be used for fieldbus applications. Furthermore, USB host interfaces (e.g. for a USB stick) are available in HMI.				
	Special features	Universal analog inputs for RTD temperature probe, thermocouple and standard signals, all analog inputs are galvanically isolated from each other, up to 4 PID controller channels, including self-optimization function, math/logic functions	–	HMI with pre-defined screen templates for display and operation of the multichannel controllers and program generators. The individual visualization can be provided by process screens. HMI with recording function for max. 9 groups with 6 analog and 6 digital inputs. Integrated web server, math-function, PLC CODESYS for the individual automation solution.		



JUMO mTRON T – Your System

The scalable measuring, control, and automation system

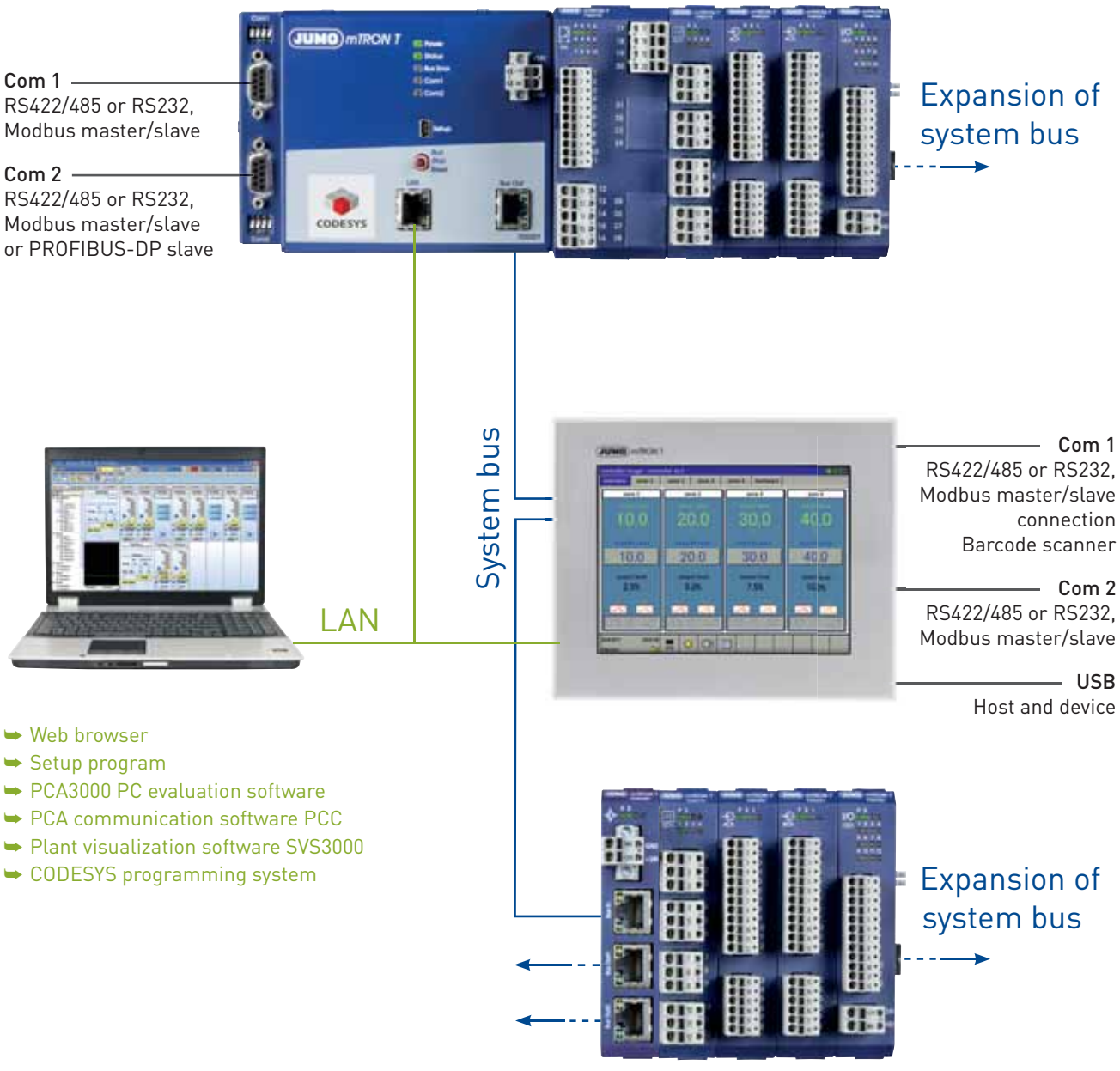
System layout

The core element of JUMO mTRON T is the **central processing unit** with a process image for up to 30 input/output modules. The CPU has higher-level communication interfaces including web server. The system has a PLC (CODESYS V3) for individual control applications, program generator, and limit value monitoring functions as well as math and logic modules.

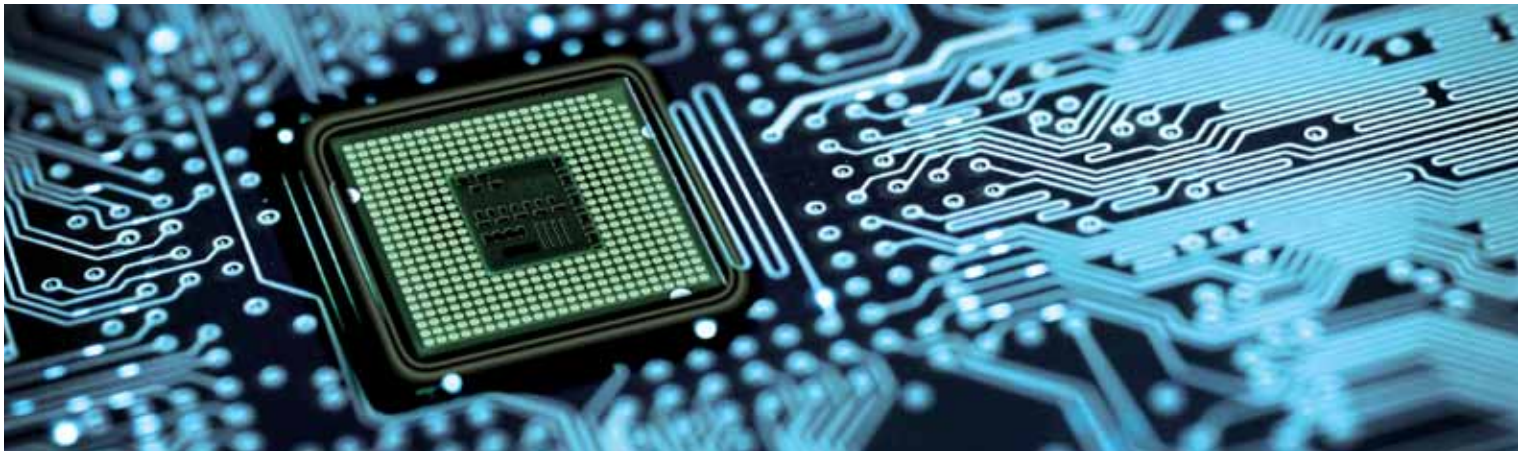
The following components are available as **input/output modules**: the four-channel analog input module with four electrically isolated universal analog inputs for thermocouples, resistance thermometers, and standard signals. These modules enable precise recording and digitizing of process variables with the same hardware which simplifies planning, resource management, and stockkeeping. Multichannel controller modules support up to four independent PID control loops with a fast cycle time and proven control algorithm without placing any load on the central unit. The system allows for simultaneous operation of up to 120 control loops and meets the needs of demanding control processes.

Optional slots can be used to extend and adapt the inputs and outputs of each controller module individually. The **multifunction panel** provides visualization of data as well as convenient operation of the controller and program generators. User-dependent access to parameter and configuration data of the overall system is also possible. Recording functions of a high-quality paperless recorder, including web server, are implemented as a special feature. Proven PC programs with standard predefined screen templates are available for reading and evaluating historical data.

A setup program is used for **hardware and software configuration** as well as project design for control tasks and recording measurement values. Users can create their own highly efficient automation solutions with CODESYS editors in accordance with IEC 61131-3. The entire application is recorded in a single project file.

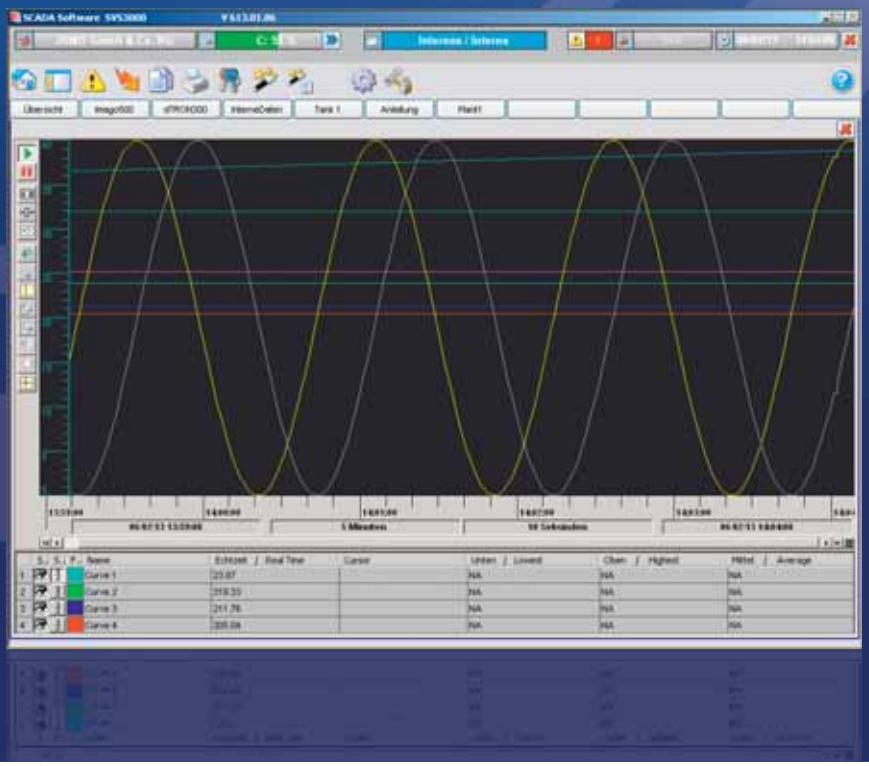


- Web browser
- Setup program
- PCA3000 PC evaluation software
- PCA communication software PCC
- Plant visualization software SVS3000
- CODESYS programming system

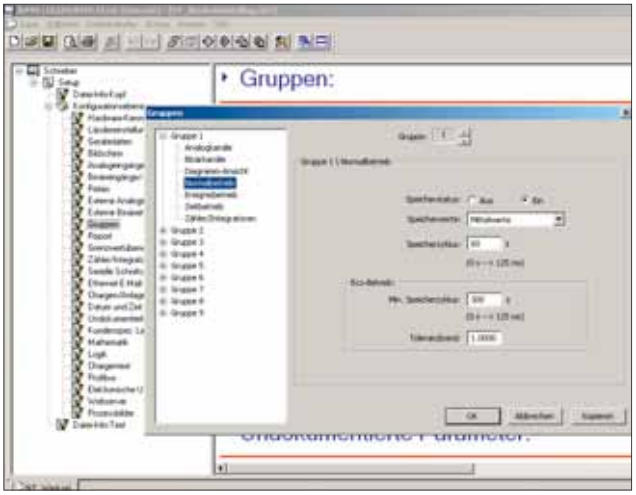


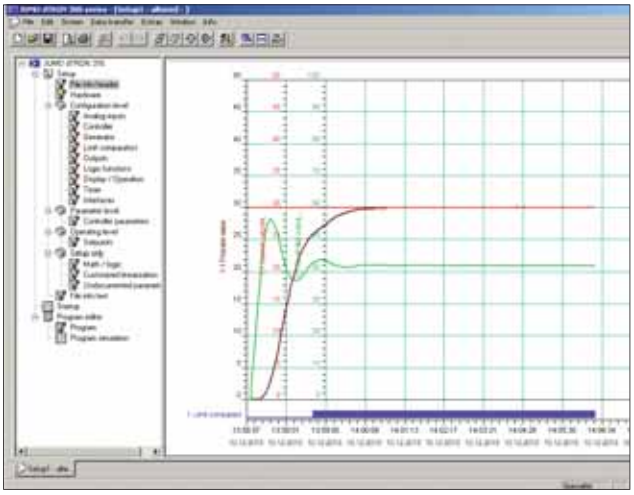
Software

JUMO offers intuitive PC-based setup software for all digital compact controllers, supporting the user during device configuration and parameterization. It also simplifies the optimization of the control of plants or processes so that you can implement good control in terms of energy efficiency. The startup tool contained in the setup software is particularly helpful during startup.
The professional PC evaluation software PCA3000 can be used for administration, archiving, visualization, and evaluation of the historical process data recorded by a paperless recorder integrated into a digital controller or by the JUMO mTRON T automation system. The plant visualization software SVS3000, which is also PC-based, enables online-visualization and reporting of important process values; this can also be performed in a batch-related manner if required. Pre-programmed graphic elements make it easier to create a customized process screen.
In addition, the JUMO mTRON T automation system is equipped with the PLC programming system CODESYS, which is easy to program via the development environment embedded in the setup program.



PC software components





Setup program

You can use the setup program to conveniently carry out project design and configuration of the respective digital compact controller on your PC. Integrated auxiliary functions assist you in adjusting the controller to your process or your application.

- User-friendly configuration and parameterization
- Diagnosis function (process data display)*)
- Input of math and/or logic formulae*)
- Program editor*)
- Process screen editor*)
- Easy printout of the configuration for documentation purposes**)

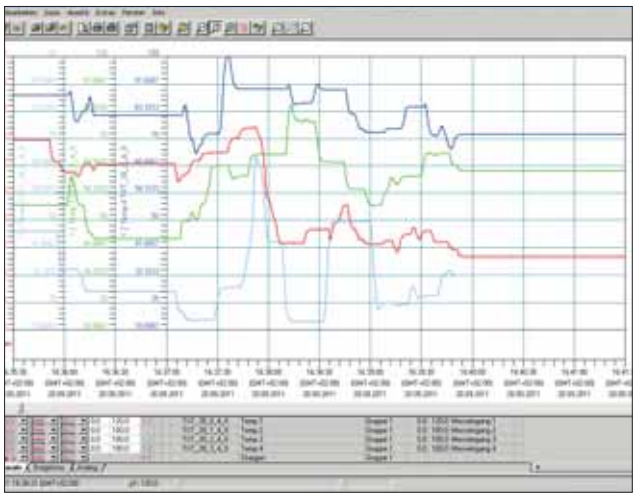
Startup software**)

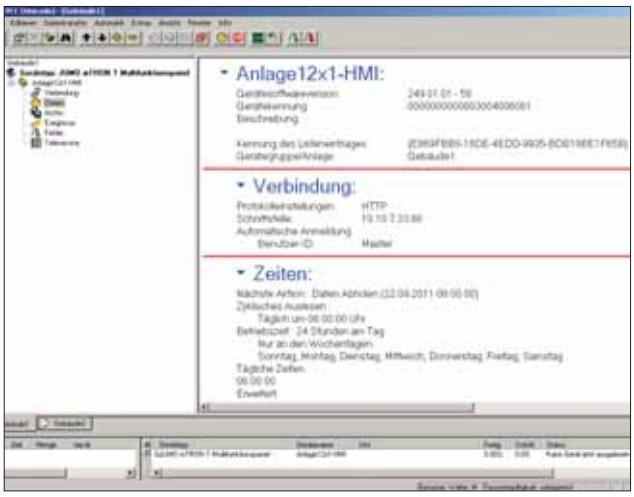
This software tool* included in the setup program enables real-time visualization and storage of analog and binary signals during a startup or optimization phase after a tool change for example. A visual display of the key process data in real-time is particularly useful when carrying out demanding processes.

- Visualization, monitoring, and recording of relevant analog and binary signals
- Triggering of a setpoint value change for determining control-related characteristic values on the basis of the plant behavior
- Straightforward comparison of control results for various controller parameters
- Random monitoring of control quality
- No additional devices required to assist with startup

*) Included with the JUMO mTRON T automation system and with certain JUMO compact controllers
**) Included with certain JUMO compact controllers; in preparation for the JUMO mTRON T automation system

PC software components





Evaluation software PCA3000

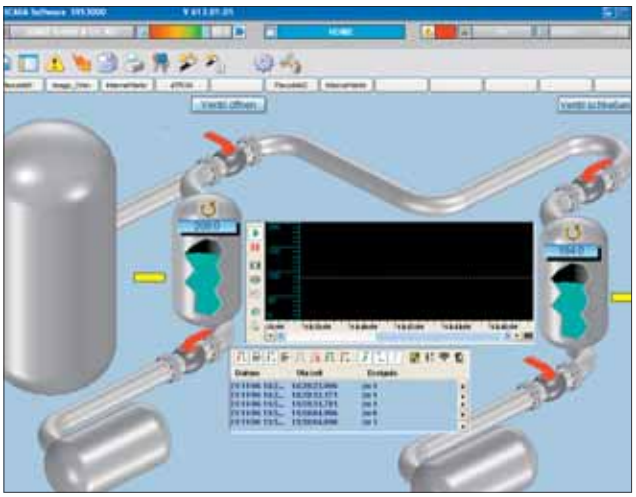
The PC-based professional evaluation software PCA3000 can be used for administration, archiving, visualization, and evaluation of the historical process data (measured data, batch data, messages, etc.). The data can be imported via a USB memory stick or made available for central data processing using the PCC communication software.

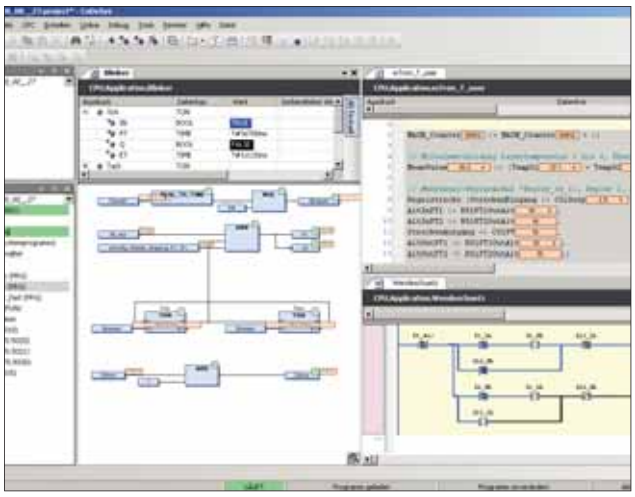
- Backup and archiving of all process data in an easily understandable data file
- Archived data can be directly read and visualized from the CD-ROM/DVD
- Graphic presentation of measured values:
  Evaluation of measurement data with min./max. search and zoom function (magnifying glass icon)
- Data export with PCA3000 form issued in a wide range of formats (CSV, HTML, PDF)

PCA communication software PCC

The communication software PCC that is ideally geared towards PCA3000 enables convenient data extraction via Ethernet, serial interface (USB, RS485), or modem.

- Time-controlled, automated data extraction via interface or modem
- Backup and archiving of all process data to a hard disk drive or a network server (in the form of an easily understandable data file)
- Diagnosis function (display of current process data via modem or Ethernet for example)
- Can be launched as a Windows® service
- Email notification in the event of communication failure





Plant visualization software SVS3000

The visualization software SVS3000 enables you to visualize process data in real-time or as a historical trend on your PC. The diverse reporting functions with batch-related protocol creation facilitate the evaluation of archived production data. Thanks to pre-programmed graphic objects, it is easy to visualize plant-specific components and processes in the form of module screens and process screens. You have the option of processing 75, 250, 1,000, or 5,000 process variables.

- Extensive library with graphic elements for customized process screens
- Pre-programmed graphic objects for JUMO products
- Quick and easy creation of customized groups and trend screens
- Plant operation via groups and/or process screens
- Extensive documentation function with continuous and batch-related evaluation
- Search function for date/time, plant criteria, and freely defined batch criteria
- Automatic printout and data export

PLC programming system CODESYS V3

The CODESYS development environment implemented in the JUMO mTRON T is a comprehensive software tool for industrial automation. This widely used PLC programming system according to IEC 61131-3 enables the implement of almost all automation tasks.

All editors defined in the standard are available for the purpose of programming your control applications:

- Editor for structured text (ST)
- Sequential function chart editor (SFC)
- Continuous function chart editor (CFC)
- Function block diagram (FBD)
- Ladder diagram (LD)
- Instruction list editor (IL)

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