JUMO TYA and JUMO IPC

Solid state relays, thyristor power controllers,
and electronic transformers

Solid state relay – JUMO TYA 432 series

	Description	❶ **709010/1-25-240** ❷ **709010/1-50-480**	❸ **709020/1-25-240** ❹ **709020/1-25-600**	**709020/1-40-600**	**709020/1-60-600**	**709020/3-20-600**
	Data sheet	709010	709020			
Technical data	**Load type**	1-phase				3-phase
	Dimensions	45 × 58.2 × 29 mm	17.8 × 110 × 98.5 mm	35.6 × 110 × 140.5 mm	70 × 110 × 140.5 mm	54 × 110 × 102.5 mm
	Load voltage	❶ 24 to 265 V AC ❷ 42 to 530 V AC	❸ 24 to 240 V AC ❹ 42 to 600 V AC	42 to 600 V AC		
	Load current (max.)	❶ 25 A_{eff} ❷ 50 A_{eff}	25 A_{eff} (at 40 °C)	40 A_{eff} (at 40 °C)	60 A_{eff} (at 40 °C)	20 A_{eff} (at 40 °C)
	Load current (min)	❶ 150 mA AC ❷ 250 mA AC	250 mA AC	400 mA AC		250 mA AC
	Control voltage	❶ 3 to 32 V DC ❷ 4 to 32 V DC	❸ 3 to 32 V DC ❹ 4 to 32 V DC	4 to 32 V DC		5 to 32 V DC
	Peak reverse voltage	❶ ≥ 650 Vp ❷ ≥ 1200 Vp	❸ ≥ 800 Vp ❹ ≥ 1200 Vp	1200 Vp/1600 Vp		1200 Vp
	Operating mode	Zero-voltage switching				
	Galvanic isolation	Between the control and power section through optocouplers; insulation voltage 4 kV				
	Ambient temperature	-20 to +70 °C	-40 to +80 °C			
	Electrical connection	Screw terminals				
	Protection type	IP20				
	Weight	60 g	260 g	515 g	972 g	680 g
	Approvals	cULus/CSA				
	Special features	Mounting on heat sinks	Devices with heat sinks; for mounting on DIN rail			
		Overvoltage protection by integrated varistor; LED display for control input				

JUMO TYA Series

Solid state relay Thyristor power controllers Electronic transformer

Brief description

The JUMO TYA 432 series of solid state relays is made up of devices for 1-phase or 3-phase operation. Solid state relays are required for contactless switching of alternating current loads. The control and power section is galvanically isolated by optocouplers. The control signal range is compatible with the logic outputs of JUMO controllers. The power section operates as a zero-voltage switch. As a result, switching always takes place at zero voltage, irrespective of the time when the control signal changes.

This way, interference voltage is avoided. A varistor is internally integrated on the output side to protect against voltage peaks from the mains voltage. The input status is displayed by an LED. A typical application for solid state relays is the switching of ohmic-inductive loads at a high switching frequency. This applies especially to the industrial sector in areas such as the plastic and packaging industry, air conditioning and heat technology, and industrial furnace construction.

Your benefits in a nutshell:

- Long operating life
- Low service and maintenance costs
- Noiseless and wear-free switching
- Excellent EMC properties
- High switching frequencies
- 100 kA_{eff} in short-circuit test (according to UL 508)
- Low space requirement due to compact design type as of 17.8 mm

Approvals and interfaces:

Thyristor power controller – JUMO TYA 200 series

	Product name	**JUMO TYA 201 – single-phase thyristor power controller**	**JUMO TYA 202 – three-phase thyristor power controller in economy circuit**	**JUMO TYA 203 – three-phase thyristor power controller**
	Type	709061	709062	709063
Technical data	**Load current**	20, 32, 50, 100, 150, 200, 250 A		
	Load voltage	24, 42, 115, 230, 400, 460, 500 V		
	Control voltage	Control voltage = load voltage		
	Configuration	Setup program (USB powered); plain text display on the device		
	Operating modes	Phase-angle control, burst-firing operation; dynamic cycle time; half-wave control; SSR logical operation; alpha start; soft start	Burst-firing operation; dynamic cycle time; SSR logical operation; alpha start; soft start	Phase-angle control, burst-firing operation; dynamic cycle time; half-wave control; SSR logical operation; alpha start; soft start
	Subordinate control loop	U, U^2 control (standard); I, I^2, P control (optional)		
	Load types	Resistive load; resistive inductive load; cold-warm ratio 1:16; transformer load; infrared emitter (short, medium, long-wave); carbon emitter; SiC, $MoSi_2$, and graphite heating elements	Resistive load; ohmic-inductive load; transformer load; infrared emitter (short, medium, long-wave)	Resistive load; resistive inductive load; cold-warm ratio 1:16; transformer load; infrared emitter (short, medium, long-wave); carbon emitter; SiC, $MoSi_2$, and graphite heating elements
	Load monitoring	Partial load failure, short circuit		
	Ambient temperature	0 to 45 °C		
	Interfaces	Modbus; PROFIBUS DP; JUMO mTRON T system bus; EtherCAT; PROFINET IO		
	Approval	UL 508		

JUMO TYA Series

Solid state relay **Thyristor power controller** Electronic transformer

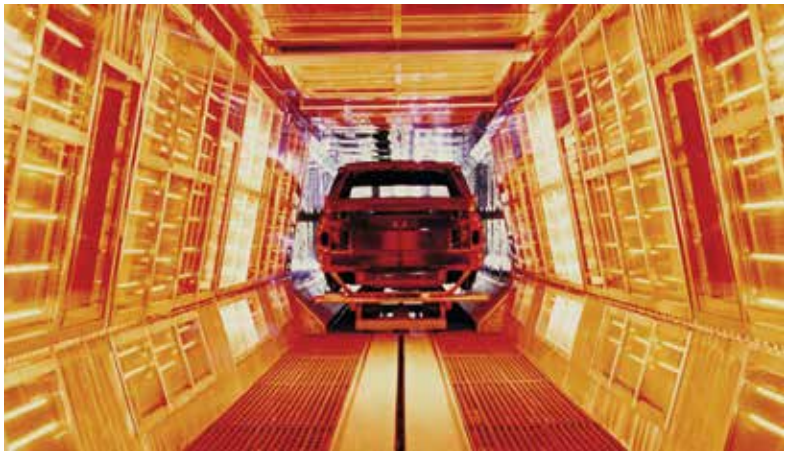
Brief description

The JUMO thyristor power controller series consists of the following device versions: type TYA 201 for 1-phase operation, TYA 202 for operation in a 3-phase economy circuit, and TYA 203 for a complete 3-phase operation. Parameterization can be carried out easily and quickly on the device thanks to the standard LCD display or by using the setup program on a PC. Here, the thyristor power controller is supplied via the interface so that an external voltage supply is not necessary. Additionally, the thyristor power controllers come with dual energy management to ensure the equal distribution of energy in the mains voltage, which helps to reduce energy costs. The recording of a partial-load break is also available through the "Teach-In" function as an option. With it the actual load current can be determined and stored as a reference value. Thanks to the optional control, current, voltage, or power can be controlled in proportion to the actuating variable, guaranteeing a constant output variable even when the mains voltage fluctuates. The devices are available in current ranges from 20 to 250 A. Process and device parameters can be easily transferred thanks to the optional interfaces.

Your benefits in a nutshell:

- Easy to operate thanks to a plain text display
- Enables setup data transfer on the device without voltage supply (USB powered)
- Cost reduction through dual energy management
- "Teach-In" function for the detection of partial load failure
- Phase-angle operation, burst-firing operation, and half-wave control
- Soft start function
- Current limiting (reduction/prevention of high inrush currents)
- RS422/485 interface, JUMO mTRON T system bus, Modbus RTU or PROFIBUS DP, EtherCAT, PROFINET

Approvals and interfaces:



Thyristor power controllers – JUMO TYA S200 series

	Product name	**JUMO TYA S201 – single-phase thyristor power controller for burst-firing operation**	**JUMO TYA S202 – three-phase thyristor power controller for burst-firing operation in economy circuit**
	Type	709065	709066
Technical data	**Load**	20, 32, 50, 100, 150, 200, 250 A	
	Load voltage	230, 400, 460, 500 V	400, 460, 500 V
	Configuration	Setup program (USB powered); plain text display on the device	
	Binary output	1 relay	
	Operating modes	Burst-firing operation; dynamic cycle time; SSR logical operation; alpha start; soft start	
	Load types	Resistive load	
	Load monitoring	Partial load failure; short circuit	
	Input	1 analog input	
	Ambient temperature	0 to 45 °C	
	Interfaces	RS485/422; PROFINET (optional)	
	Approval	UL 508	

JUMO TYA Series

Solid state relay **Thyristor power controller** Electronic transformer

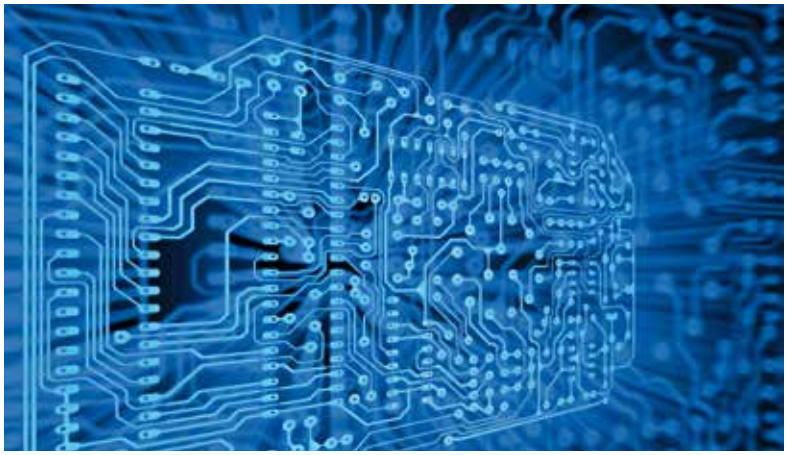
Brief description

The single-phase and three-phase thyristor power controller (in economy circuit) can be used in simple thermal processes for currents from 20 to 250 A (e.g. in industrial furnace construction and plastics processing). The device can be put into operation quickly and easily via the PROFINET interface. Since the thyristor power controllers can be mounted side by side, less space is required in the control cabinet. The display provides access to all process data so that it provides a quick overview of the machine status. Predictive maintenance is possible due to integrated diagnostic systems and comprehensive access to the device status. As a result, downtimes of the plant are reduced. Load monitoring also ensures higher plant availability. This is so because breakdowns can be avoided by detecting a partial load failure or a load short-circuit through the Teach-In function.

Your benefits in a nutshell:

- Tool-free and simple configuration via the keyboard directly on the device through plain text display
- Simple device configuration via the PROFINET interface – shortens startup times and reduces service requirements
- Setup program for configuration via USB interface
- Setup data transfer possible without voltage supply to the device (USB powered)

Approvals and interfaces:



Simple operation coupled with maximum power

1. Process parameters
2. Actuating variable signal
3. Subordinate control loop
4. Operating mode

Operating concept

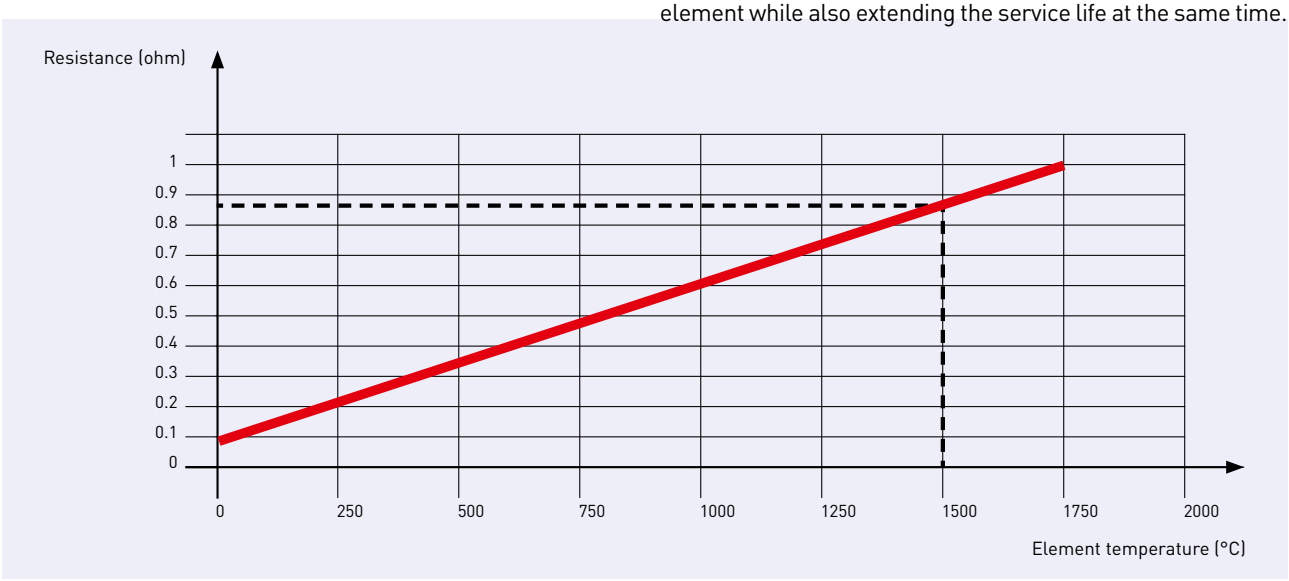
The power controllers have an illuminated display. This enables users to check all process parameters, operating modes, and setpoint values. Entry and modifications of the configuration can be implemented quickly via the control panel.

Teach-In for limit value alarms

When it comes to adjusting the limit values for the partial load failure alarm, all you need to do is press a button to log the actual current and save it as a limit. Alternatively, this can be performed automatically each time the power controller starts up. A special feature has been developed for SiC heating elements, allowing this function to be performed on a cyclical basis every second to detect any irregularities in the heating circuit.

Overload protection for $MoSi_2$ heating elements

$MoSi_2$ and Kanthal® Super elements are very difficult to keep under full control using simple U^2 control. The power tends to drop too much as the temperature rises. To remedy this problem the R-control function has been added, which uses the physical feature of the element. The element's resistance is proportional to the surface temperature. As a result, maximum performance is guaranteed from the heating element while also extending the service life at the same time.



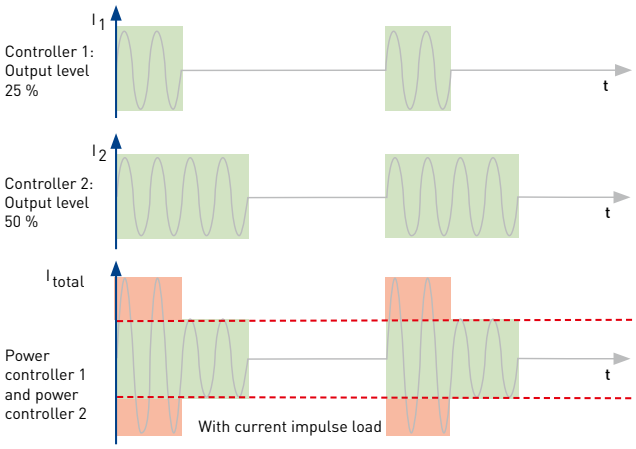
R-control function

Reduced energy costs for cost-effective operation

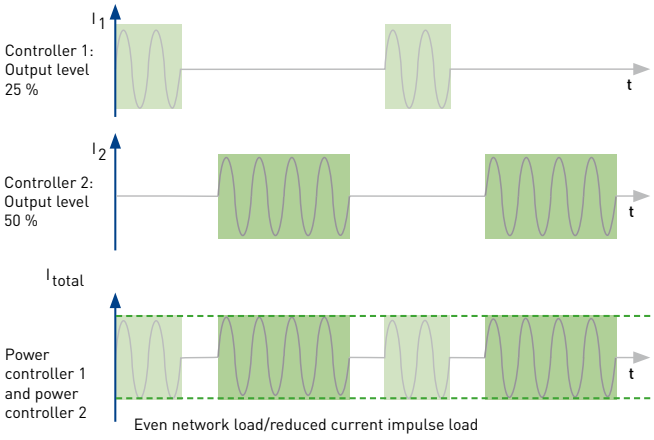
Dual energy management

The dual energy management of the JUMO thyristor power controller series coordinates the power output of several power controllers, which reduces the peak current load. For example, if several zones in a furnace or even several plants are kept at a certain temperature, then generally, the best course of action is to compensate with a low output level at approximately 50 %. The heating elements are controlled in burst-firing operation with complete sinusoidal cycles switched on or off depending on the assigned output level. With dual energy management, the pulse gaps that arise are detected and filled in so that a continuous load exists in the mains voltage. In addition to saving energy costs this procedure also significantly reduces connected loads and surge current loads. Setpoint values up to 50 % can be specified in each case without peak loads occurring in the mains voltage as a result of simultaneous activation. Even if the distribution of setpoint values is asymmetric (e.g. 30 % and 70 %) neither peak loads nor interference will occur in the mains voltage. If several plants are controlled by different setpoint values, even better distribution takes place in the mains voltage. The individual power controllers are synchronized by the mains voltage – a process that does not require any additional wiring. The devices simply need to be switched on at the same time. This can be done without any difficulty in a plant with several zones.

Without dual energy management



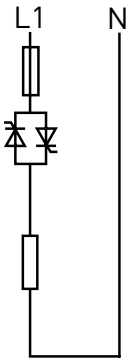
With dual energy management



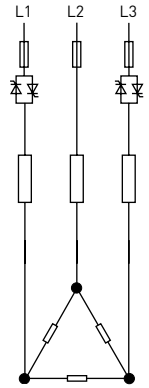
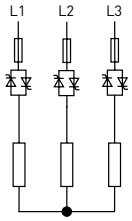
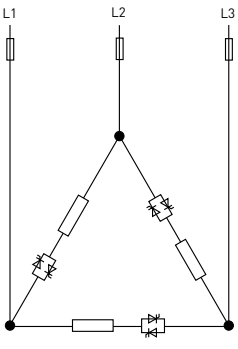
Your benefits in a nutshell:

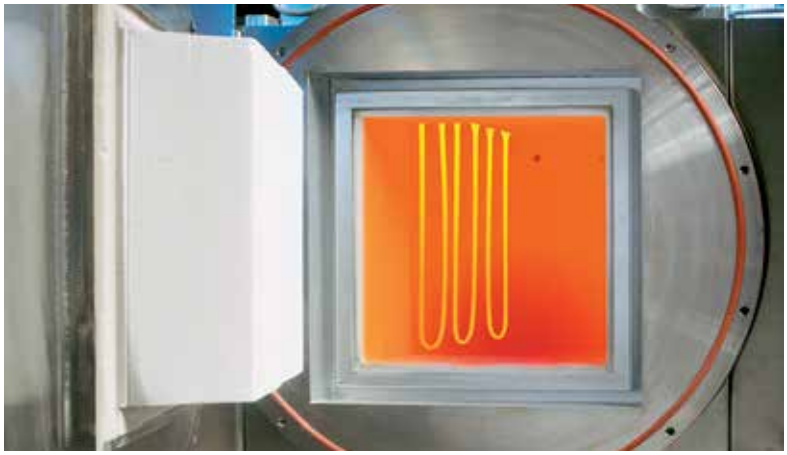
- Deliberately lowering the peak current load with dual energy management
- Up to 50 % reduction in energy costs for your processes
- Reduction in plant costs and operating costs
- Low connected loads
- Improved transparency
- More efficient processes
- Reduction in environmental impact

Selection guides

APPLICATION	LOAD TYPE	OPERATING MODE	CONTROL TYPE	NOTE
	1-phase – TYA 201			
	Medium and long wave IR emitters	BF	U or U^2	A dynamic cycle time is recommended for high speed thermal processes. For parallel switching of several loads, the I^2 version is suitable for detecting partial load failures.
	Shortwave IR emitters	PA/BF	U or U^2	If you want to reduce inrush currents, we recommend launching the device with the soft start. For burst-firing operation, opt for a dynamic cycle time to minimize flickering in the emitter. For phase-angle control, the emitters are activated without any flickering, even though harmonic waves and reactive power occur as a result. These have to be balanced out with additional restrictors and a mains filter.
	$MoSi_2$ heating elements	PA	U^2 or P	Current limiting is not necessary because the heating element has high impedance when in a cold state. The R-control function restricts the maximum heat output as the resistance is proportional to the power.
	SiC heating elements	PA	P	Start up using gradient or soft start. The maximum heat output must be adapted to the heating element's surface temperature.
	Resistive load	BF + DT	U^2	The triggering delay causes ignition of the first half sine wave to be delayed, reducing the inrush current in the transformer.
	Graphite	PA	P	Positive or negative temperature coefficient depending on the material composition. The heat output must be adapted to the heating element's surface temperature.
	1-phase – TYA S201			
	Resistive load	BF	–	Only available with burst-firing operation.

BF = Burst-Firing operation, PA = Phase-Angle control, DT = Delay Triggering

APPLICATION	LOAD TYPE	OPERATING MODE	CONTROL TYPE	NOTE
	2-phase – TYA 202 and TYA S202			
	Resistive load	BF	U^2 (only with TYA 202)	In economy circuit only burst-firing operation is possible.
	3-phase – TYA 203			
	• Resistive load • IR emitters • $MoSi_2$ heating elements • SiC heating elements	PA	U^2 or P	Current limiting is not necessary because the heating element has high impedance when in a cold state. The R-control function restricts the maximum heat output as the resistance is proportional to the power.
	• Resistive load • IR emitters • $MoSi_2$ heating elements • SiC heating elements	PA	P	Start up using gradient or soft start. For SiC elements, the maximum heat output must be adapted to the heating element's surface temperature.
	• Resistive load • IR emitters • $MoSi_2$ heating elements • SiC heating elements • Graphite	PA	U^2 or P	Current limiting is not necessary because the heating element has high impedance when in a cold state. The R-control function restricts the maximum heat output as the resistance is proportional to the power.
	• Resistive load • IR emitters • $MoSi_2$ heating elements • SiC heating elements	PA/BF	U or U^2	If you want to reduce inrush currents, we recommend launching the device with the soft start. For burst-firing operation, opt for a dynamic cycle time to minimize flickering in the emitter. For phase-angle control, the emitters are activated without any flickering, even though harmonic waves and reactive power occur as a result. These have to be balanced out with additional restrictors and a mains filter.



Electronic transformer – JUMO IPC 300

	Product name	**JUMO IPC 300**
	Type	709051
Technical data	**Service**	Up to 40 kW
	Operating mode	Amplitude control
	Dimensions	348.6 × 300 × 217 mm or 403.5 × 300 × 257.5 mm
	Subordinate control	Select between U^2, I^2, and P
	Analog output	0(4) to 20 mA; 0(2) to 10 V or 0(1) to 5 V
	Display	LCD with plain text display
	Operation	Keypad on the device
	Configuration	Setup program with transfer of parameters via USB interface without voltage supply (USB powered); configuration via fieldbus possible
	Protective functions	Short-circuit control during activation procedure; r-control; integrated semiconductor fuses for protection in case of ground fault
	Interface	PROFINET
	Special features	• Gentle mains operation with high power resistive loads (flicker), minimum harmonics in the plant power supply • Ageing process compensation for SiC heating rods with display, when the voltage reserve is no longer sufficient for compensation • Control is independent of the heating elements' resistive characteristics • Protection of molybdenum disilicide heating elements against overheating in the upper temperature range

JUMO IPC

Solid state relay Twwhyristor power controller **Electronic transformer**

Brief description

The JUMO IPC 300 is an electronic transformer for controlling heating loads that previously required an additional transformer for power control. Due to the amplitude control, the mains current is proportional to the required performance. This reduces energy costs and malfunctions (flicker, harmonics) while increasing the durability of molybdenum disilicide heating elements, which in turn reduces operating costs.

Your benefits in a nutshell:

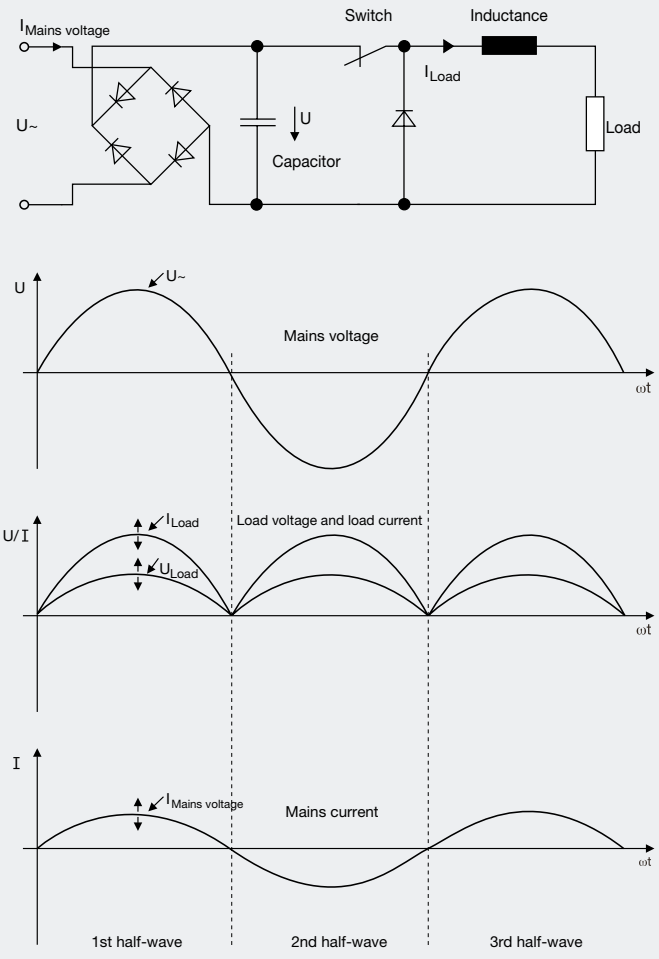
- Consistent power output to the heating elements due to amplitude control
- Smaller connected loads due to consistent power consumption
- Less EMC interference than in phase-angle operation
- Current consumption synchronous with mains voltage
  - No flickering
  - Prevents harmonics
  - No significant reactive power component

Approvals and interfaces:

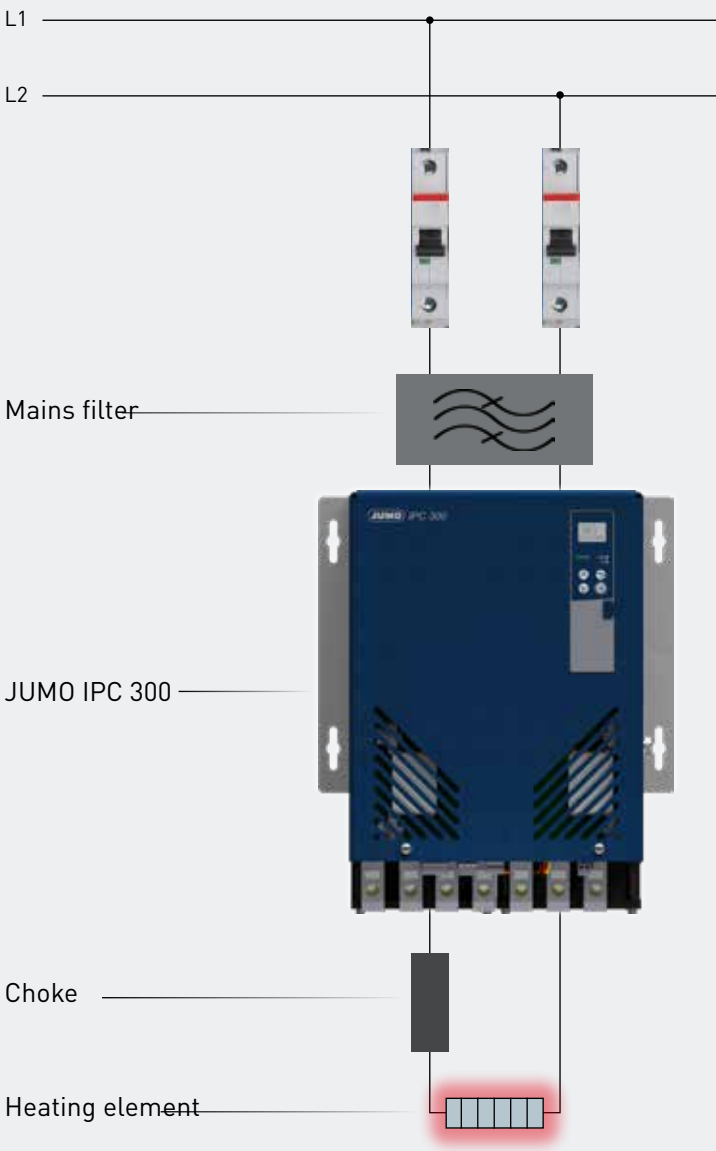
The ideal control for $MoSi_2$ and SiC heating elements

The JUMO IPC 300 operates on the principle of a buck converter. The output voltage will vary, but always remains lower than the voltage supply – which is comparable to an autotransformer without galvanic isolation between input and output voltage. The supplied alternating voltage is rectified into intermediate circuit voltage.

The following IGBT switch determines the output voltage by varying the pulse-pause ratio. The choke that is connected in series for the load ensures an almost constant current flow during a switching period. By varying the duty cycle, a sinusoidal current is imposed on the load that has the same phase position as the mains voltage.



How to use the JUMO IPC 300 correctly:



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