R2600 / R2601
Electronic controller

Applications

The controller R2600 / R2601 is a digital single-channel controller with microprocessor, in a compact case with front dimensions of 48 × 96 / 96 x 48 mm according to DIN 43700 for installation in panels, front panels, etc.
It excels by easy operation, high standard functionality and few versions.
The main fields of application are found in temperature control in machines for plastics processing and packaging industry, food processing, oven construction.

The controller R2600/R2601 is available in the following versions:

- two-state controller
- three-state controller
- step controller
- continuous controller
- fixed-value controller
- differential controller
- slave controller

The controller R2600 is suited for controlled systems with the following characteristics:

Characteristics		
Tu	Delay time	1 s ... 10 min
Tg	Compensation time	1 min ... 10 h
Tg / Tu		> 5

Essential features

- Overshoot-free PDPI algorithm
- Second set point
- Ext. set point (slave controller)
- Set point ramp
- Self-optimization
- 2 alarm contacts with startup suppression
- Monitor for the heating circuit
- Heating current monitor (with external transformer)
- Step controller with and without position readback
- Continuous controller with split range
- Switching controller with actual value output
- Switching controller with set point output
- Differential controller
- Interface (RS 485, RS 232)
- Configuration and parameter adjustment by means of the PC software METRAwin

Description

Actual value and set point are simultaneously digitally displayed. Light-emitting diodes signal the switching state of the switching outputs, the alarm output, manual mode and "second set point active".

The control parameters and the configuration values are entered via film keyboard and rotary knob. The configuration and parameter level can be protected against unauthorized changes.

A heating current monitor is possible as standard feature (except for marking A4). The heating current is acquired with the current transformer GTZ 4121. Display and evaluation are made on the controller. Violation of the set point of the heating current and/or non-equivalence cause an error message.

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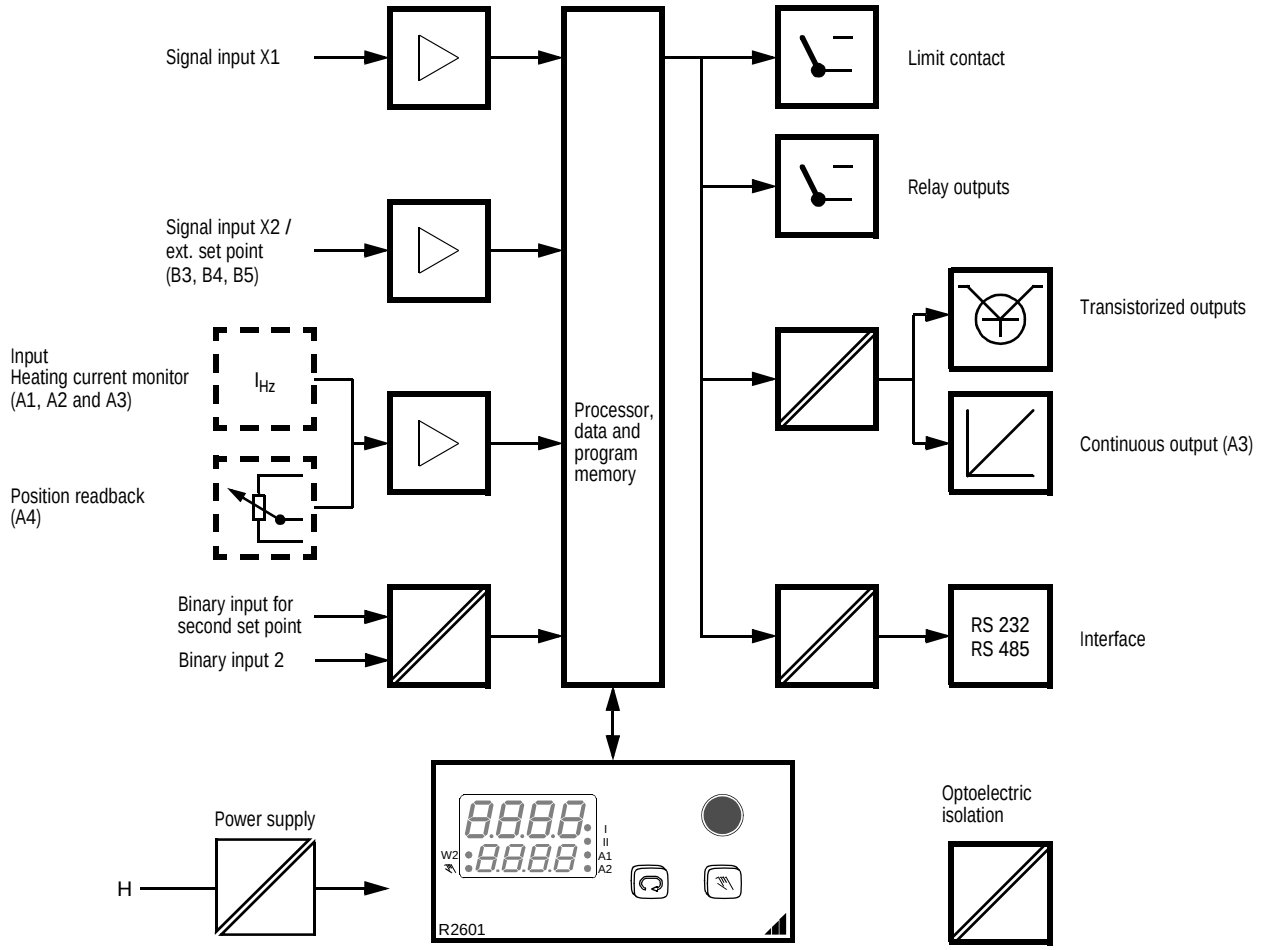

Figure 1, Block circuit diagram

Applied rules and standards

VDE 0411-1 / DIN IEC 1010-1 / DIN EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use
DIN EN 50081-2	Electromagnetic compatibility; generic emission standard
DIN EN 50082-2	Electromagnetic compatibility; generic immunity standard
DIN VDE 0106-1	Electrical safety
VDI / VDE 3540 Sheet 2	Climatic classes for equipment and accessories
EN 60529	Degrees of protection provided by enclosures
DIN 3440	Temperature controller and temperature limiting installations for heat generating systems
CSA	Approval applied for
UL	Approval applied for

Signal inputs

Signal input	Transformer resolution 14 bits
Measuring ranges	See order code
Scanning cycle	0.5 s
Offset compensation	Possible by parameter entry

Configuration of sensor inputs

Marking	Sensor	Selectable via keyboard	
B1, B3, B4	Thermocouple Pt 100	°C / °F configurable	See order code for measuring ranges and markings
B2, B5	DC voltage DC current	dead / live zero, 10 V / 20 mA Display range scalable	

Thermocouple

Overload, continuous	AC sinusoidal 50 Hz / 3 V DC 1 V
Input resistance	> 50 kΩ
Cold junction	Compensation circuit built in
Error message	In the case of sensor breakage, wrong polarity (monitor for heating circuit) or temperature beyond measuring range

Resistance thermometer Pt 100

	Two-wire connection	Three-wire connection
Lead resistance	0 ... 30 Ω can be balanced (with shorted sensor "on key stroke“)	0 ... 30 Ω compensated
Overload, continuous	AC sinusoidal 50 Hz / 3 V DC 1 V	
Measuring current	approx. 0.2 mA	
Error message	In the case of breakage or short circuit of the sensor or temperature beyond measuring range	

DC voltage, DC current

	DC voltage	DC current
Measuring range	0/2 ... 10 V configurable	0/4 ... 20 mA configurable
Overload, continuous	100 V	60 mA DC
Input resistance / load	> 150 kΩ	55 Ω
Error message	With input variable beyond measuring range	With input variable beyond measuring range

Heating current monitor input (for version A1, A2 and A3)

Meas. range curr. transformer input GTZ 4121 000 R...	AC 0 ... 40 A
Measuring range heating current monitor input	DC 0 ... 10 V

Position readback input (for version A4)

Potentiometer nominal values	0.1 ... 1.0 kΩ
Measuring current	< 1.5 mA

Binary input for second set point

The second set point is activated via potential-free contact or potential-free electronic switch (optocoupler, etc.).

Open-circuit voltage approx. 5 V
Short circuit current approx. 1 mA

Second set point		
Active	Voltage drop across contact	< 2 V
Inactive	Residual current across contact	< 0.02 mA

Display

Controlled variable
Display range 4-digit, digital
Height of numerals 10 mm

Master variable, heating current or manipulated variable
Display range 4-digit, digital
Height of numerals 7.5 mm

Status and switching outputs
2+ 4 LED

Controlled variable

Marking	Measuring range	Display resolution
B1, B3, B4	All	1 °C / °F
B2, B5	0 / 2 ... 10 V 0 / 4 ... 20 mA Scalable –1999 ... +9999 digit	1 digit

Position readback

	Measuring range	Display resolution
	Scalable 0 ... 100 %	1 %

Heating current

	Measuring range	Display resolution
	Scalable 0 ... 100,0 A	0.1 A

Operation

- Two keys for function selection
- Sinkable rotary knob for setting of values

Set points

Set point limitation	Upper and lower setting limit parameterizable
Second set point	Activated via external contact, value parameterizable on controller
Ramp function (separate for rise and fall)	Presetting of a gradual temperature change, in degrees per min. Activated when: – the auxiliary voltage is switched on – the actual set point is changed – the second set point is activated – changing from manual to automatic mode
External set point	With marking B4 and B5 parametrizable

Control action

Configurable controller types

Two-state PDPI contr.	For heating
Two-state PDPI contr.	For cooling
Three-state PDPI contr.	
Three-state PDPI contr.	For water cooling
Continuous controller	
Continuous controller	With split range
Step controller	With and without position readback
Limit monitor	Two-state / three-state controller without time action
Positioner	
For each of these controller types, there is the function differential controller and slave controller in addition to the fixed-value controller	

Self-optimization "On key stroke" from any operating state. Action on and manual change of the control parameters is possible.

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Setting ranges of the control parameters

Display	Meaning	Setting range
Pb I	Proportional band switching output I	0.1 ... 999.9 %
Pb II	Proportional band switching output II (for three-state controller)	0.1 ... 999.9 %
dbnd	Deadband (for three-state controller and step controller)	0 ... MBU [1]
tu	Delay time of the controlled system	0 ... 9999 s
tc	Output cycle time	0.5 ... 600 s

[1] MBU = range span

Outputs

Control outputs

Functions	Switching output I (heat) Switching output II (cool)
Output cycle	Parameterizable on the range 0.5 ... 600 s
Output type	Relay or transistorized output (selectable via DIP switch)
Relay output	Potential-free normally-open contact (NOC)
Switching capacity	AC/DC 250 V, 2 A, 500 VA / 50 W
Lifespan	> $2 \cdot 10^5$ switching cycles under nom. load
Interf. protection	Ext. RC elem. (100 Ω -47 nF) has to be conncted to contactor
Transistorized output	Suitable for commercially available solid state relays (SSR)

Switching state	Open-circuit voltage	Output current
Active (load ≤ 800 Ω)	< DC 15 V	10 ... 15 mA
Inactive	< DC 15 V	< 0.1 mA

Overload limit	Short circuit, interruption continuous

Continuous controller

Functions	Alternatively configurable; regulation ratio Heat or Cool, controlled variable or set point
Output variale	Alternative Current 0/4 - 20 mA, at < 450 Ω burden Voltage 0/2 - 10 V, at > 550 Ω load
Transf. resolution	10 bits

Alarm output

Number	2 (A1, A2)
Functions	Alternatively configurable low, high, low + high relative / asolute NOC / NCC Startup suppression on/off
Contact type	Potential-free normally-open contact (NOC)
Switching capacity	AC/DC 250 V, 2 A, 500 VA / 50 W
Lifespan	> $2 \cdot 10^5$ switching cycles under nom. load
Interf. protection	Ext. RC elem. (100 Ω - 47 nF) has to be conected to contactor

Heating current monitor

Heating current monitor	Integrated
Acquisition of the heating current	Via ext. current transformer Z 4121 (Scaling required for other external current transformers)
Technical data	See data sheet Z4121

Entry of the nominal value of the heating current "on key stroke"

Error message at – Non-equivalence – Negative deviation from the current set point	 Positioning signal `off' + heating curr. `on' Positioning signal `on' + heating curr. `off' Negative deviation from the set point of the heating current by more than 20 % with positioning signal `on'
Signalling	Error message hard-wired to alarm output 1

Heating circuit monitor

Without external transformer, without additional parameters

Configurable	Heating circuit monitor active / inactive
Error message at	100 % switched-on heater without rising temperature that is, with shorted thermocouple heater stopped sensor not in the heating circuit

Auxiliary voltage

Nom. value	Nominal range of use		Power consumption
	Voltage	Frequency	
AC 110 V AC 230 V AC 24 V	AC 95 V ... 121 V AC 196 V ... 253 V AC 20 V ... 26 V	48 Hz ... 62 Hz	Maximum 10 VA Typically 6 W
DC 24 V	DC 20 V ... 30 V	–	

Data interface

Type (pluggable)	RS 232	RS 485
Max. number of devices	1	32 parallel on bus
Number of leads	3	
Transmission speed	9600 bauds	
Number of data bits	8	
Number of stop bits	1	
Operating mode	half duplex	
Protocol	according to DIN 19244	

Accuracy

Input controlled variable	Typical error limit referred to MBU [1]	Resolution referred to MBU
Thermocouple		
General except type B	< 0.7 %	< 0.02 %
Type B > 600 °C	< 0.7 %	< 0.05 %
Resistance thermometer	< 0.7 %	< 0.02 %
DC voltage, DC current	< 0.5 %	< 0.02 %

[1] MBU = Range span

	Error limit	
Cold junction	± 2 K	

	Error limit referred to measured value	Offset error
Input heating current	5 %	± 0.1 %
Position reedback	5 %	± 1 Ω

	Error limit referred to final value	Resolution
Continuous output	< 1.5 %	0.1 %

Reference conditions

Reference variable	Reference condition
Ambient temperature Tref	23 °C ± 2 K
Cold junction temperature Tver	23 °C ± 2 K
Auxiliary voltage	Nom. value ± 1 %, for AC 50 Hz ± 1 % sinusoidal permissible common mode voltage to the electrically connected inputs 0 V DC / AC
Warm-up time	10 min (inputs within the meas. range)

Influence variables and variations

Influence variable	Nominal range of use	Maximum variation
Ambient temperature Tu	0 °C ... +50 °C	± 0,05 % MBU / K
Cold junction temperature Tver	0 °C ... +50 °C	0.1 K (Tver – Tref) / K
Lead resistance		
Thermocouple	RL = 0 ... 200 Ω	0.1 % MBU / 10 Ω
Pt 100 two-wire	RL = 0 ... 30 Ω	3 K / Ω (can be balanced)
Pt 100 three-wire	RL = 0 ... 30 Ω	0,1 % MBU / 10 Ω
Warm-up effect	≤ 5 min	± 1 %

Electrical safety

Protection class	II, panel meter in the sense of DIN EN 61010-1 subclause 6.5.4
Degree of pollution	1, acc. to DIN EN 61010-1 subcl. 3.7.3.1 and/or IEC 664
Overvoltage category	II, according to DIN EN 61010 appendix J and/or IEC 664
Operating voltage	300 V according to DIN EN 61010

Radio interference suppression acc. to DIN EN 50081-2

Measuring procedures
EN 50011 Limit class B

Immunity to interference acc. to DIN EN 50082-2

Type of test	Specifications	Test severity level	Criterium
ESD	EN 61000-4-2	4 kV Contact discharge 8 kV Air path	B B
E-field	ENV 50140	10 V/m 80-1000 MHz	A
Burst	IEC 801-4	2 kV On all connection leads	B
HF	ENV 50141	10 V 0.15-80 MHz all connectors	A

Climatic suitability

Climatic suitability with ref. to VDI/VDE 3540		3z / 0 / 50
Relative humidity, annual average, no dewing		75 %
Ambient temperature	Nominal range of use	0 °C ... + 50 °C
	Function range	0 °C ... + 50 °C
	Storage range	–25 °C ... + 70 °C

Mechanical configuration

Design type	Panel case of UL-VO listed plastic according to DIN 43700, side-by-side mounting possible without intermediate bars, except when using the accessory seal for bezel/panel (intermediate bar ≥10 mm)
Instrument module	Can be withdrawn without tools
Mounting position	Front vertical to maximum 45° declined to the rear
Protection type	IP 54 for the front (with gasket and pressed rotary knob) IP 20 for the case IP 20 for the connectors
Weight	approx. 0.5 kg

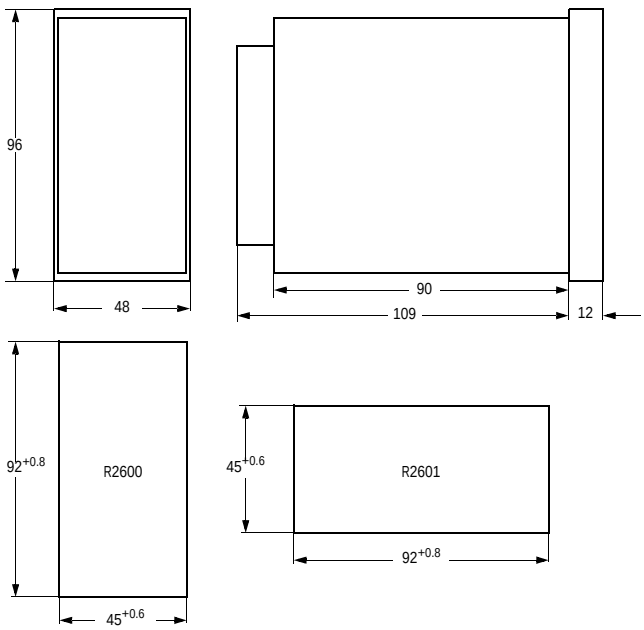

Figure 2, Case dimensions and panel cutout

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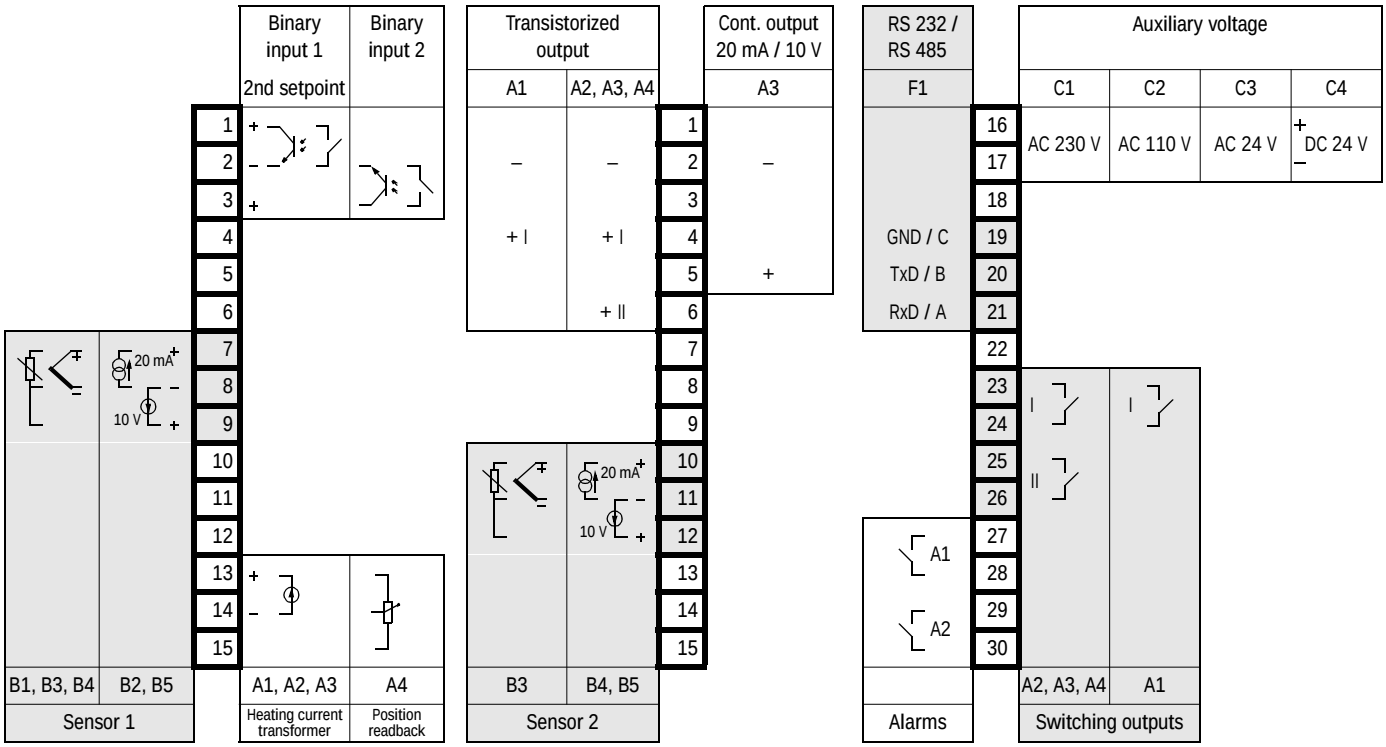
Electrical connection

Connection elements

Screw terminals suitable for stranded wire 2.5 mm^2 and/or twin-wire multi-core cable ends for 2 × 1.0 mm^2



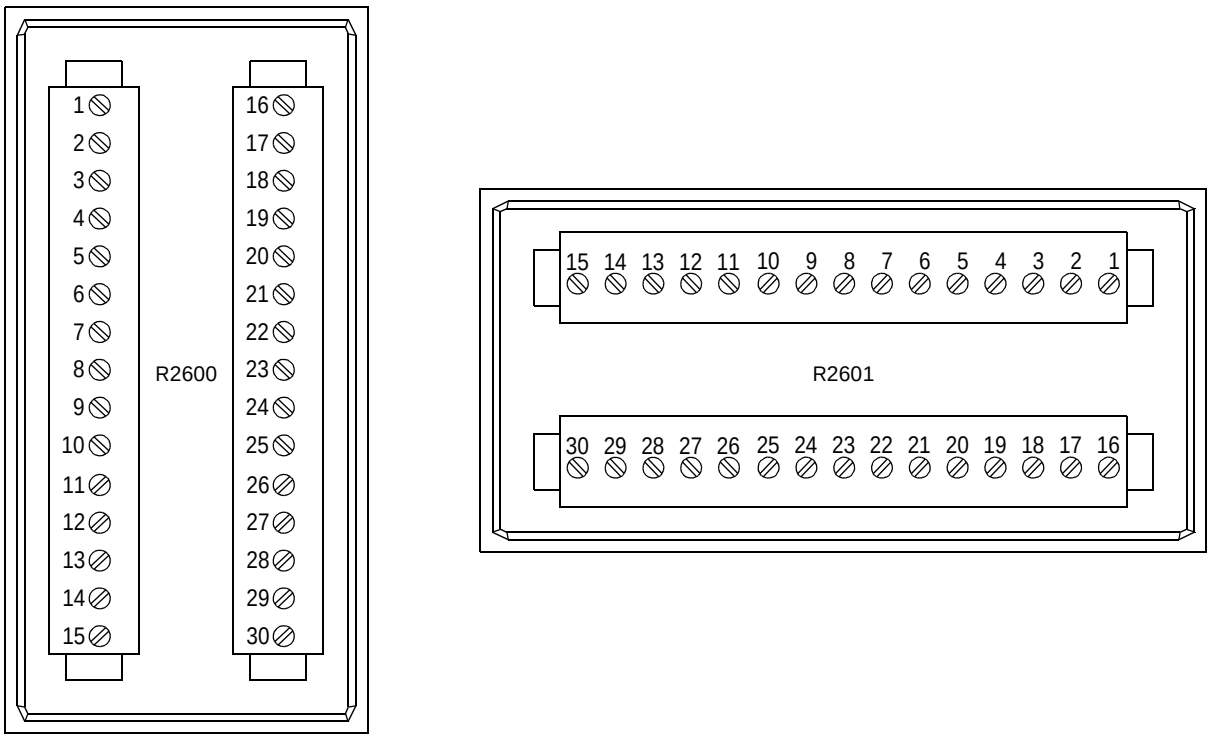


Figure 3, Location of the connection contacts

Order code

The following applies to determination of the order code:
Only one marking of like capital letters may be chosen.
If the capital letter of the marking is followed by zero numerals only, this marking may be omitted in the order code.

DESCRIPTION			MARKING		
Electronic controller with self-optimization, second set point, 2 limit relays, front dimensions 48 x 96 mm			R2600		
Electronic controller with self-optimization, second set point, 2 limit relays, front dimensions 96 x 48 mm				R2601	
Controller version					
Two-state controller with heating current monitor		Relay output and transistorized output	A1		
Three-state controller with heating current monitor / step controller		2 relay outputs and 2 transistorized outputs	A2		
Contin. controller / three-state controller with heating curr. monitor / step controller		Contin. output and 2 transist. and 2 relay outputs	A3		
Step controller with position readback / three-state controller		2 relay outputs and 2 transistorized outputs	A4		
Measuring ranges					
Signal input	Thermocouple, configurable Type J, L –18 ... 850 °C / 0 ... 1562 °F Type K –18 ... 1200 °C / 0 ... 2192 °F Type S, R –18 ... 1770 °C / 0 ... 3218 °F Type B 0 ... 1820 °C / 32 ... 3308 °F Type N –18 ... 1300 °C / 0 ... 2372 °F	(precision specified from 600 °C)	B1		
Signal input	Resistance thermometer Pt 100 – 100 ... 500 °C / –148 ... 932 °F – 100.0 ... 500.0 °C / –148.0 ... 932.0 °F				
Signal input	Standard signal, configurable 0 / 2 ... 10 V or 0 / 4 ... 20 mA		B2		
Common configuration of both signal inputs is possible; same as B1 for **differential controller**			B3		
First signal input configurable as B1 and second signal input configurable as B2 for **slave controller**			B4		
Both signal inputs configurable as B2 for **differential controller / slave controller**			B5		
Auxiliary voltage					
AC 230 V AC 110 V	C1 → C2, and/or C2 → C1 internal plug-change possible		C1 C2		
AC 24 V			C3		
DC 24 V			C4		
Data interface					
Without			F0		
RS 232 / RS 485 internal plug change possible			F1		
Configuration					
Standard setting			K0		
Setting according to customer's specifications			K9		
Customer-specific front film					
On request					

Note: A copy of multi-lingual operating instructions with information on startup and operation is part of the supply

See last page for accessories and ordering example.

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Example for ordering

DESCRIPTION (clear text)		MARKING	
Electronic controller	Front dimensions 48 x 96 mm	R2600	
Controller version	Three-state controller with heating current monitor, 2 limit relays, 2 relay outputs and 2 transistorized outputs	A2	
Measuring range	Thermocouple	B1	
Auxiliary voltage	AC 230 V	C1	
Data interface	RS 232 / RS 485 internal plug-change possible	F1	
Presetting	Standard setting	K0	

Accessories

DESCRIPTION		IDENT NUMBER		
Current transformer for mounting to top-hat rail for acquisition of the heating current				
With 3 inputs	(1 three-phase consumer or 3 AC consumers)	GTZ 4121 000 R0001		
With 4 inputs	(1 three-phase consumer + 1 AC consumer or 4 AC consumers)	GTZ 4121 000 R0002		
Solid state load relays for mounting to top-hat rail, for connection to transistorized outputs				
	280 V, 10 A	GTZ 4102 001 R0001		
	280 V, 25 A	GTZ 4102 001 R0002		
	280 V, 45 A	GTZ 4102 001 R0003		
	480 V, 10 A	GTZ 4102 002 R0001		
	480 V, 25 A	GTZ 4102 002 R0002		
	480 V, 40 A	GTZ 4102 002 R0003		
Heat sink for mounting to top-hat rail	Length 80 mm	GTZ 4102 003 R0001		
	160 mm	GTZ 4102 003 R0002		
	160 mm	GTZ 4102 003 R0003		
Protecting cover (contact protection)		GTZ 4102 004 R0001		

Scope of delivery

- Controller
- 2 fasteners
- 1 seal for front panel
- Multi-lingual operating instructions
- Multi-lingual operating instructions for data interface (only with F1)

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