

R2600 / R2601

Electronic Controller

3-348-797-03
6/8.04

- Digital single-channel controller with microprocessor
- Compact housing per DIN 43700 with front dimensions of 48 x 96 / 96 x 48 mm for installation in panels, front panels, etc.
- Easy operation, high standard functionality and few versions
- Two keys for function selection
- Retractable rotary knob for parameter configuration
- Available as two-step, three-step, continuous-action, step-action, fixed-setpoint, differential and slave controller



QUALITY MANAGEMENT SYSTEM



DQS certified per
DIN EN ISO 9001 Reg. No.1262

Application

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 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

Features

- Overshoot-free PDPI algorithm
- 2nd setpoint
- External setpoint (slave controller)
- setpoint 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-action controller with split range

- Switching controller with actual value output
- Switching controller with setpoint output
- Differential controller
- Current parameters can be stored as user-defined default setting
- Interface (RS-485, RS-232)

Description

Actual value and setpoint are simultaneously digitally displayed. Light-emitting diodes signal the switching state of the switching outputs, the alarm output, manual mode and "2nd setpoint active".

The control parameters and the configuration values are entered via film keyboard and rotary knob. Current parameters can be stored as user-defined default setting and retrieved when necessary. The configuration and parameter level can be protected against unauthorized changes.

A heating current monitor is possible as standard feature (except for code A4). The heating current is acquired with the external current transformer GTZ 4121.

The values are displayed and evaluated at the controller. Negative deviation from the setpoint of the heating current and/or non-equivalence trigger an error message.

R2600 / R2601

Electronic Controller

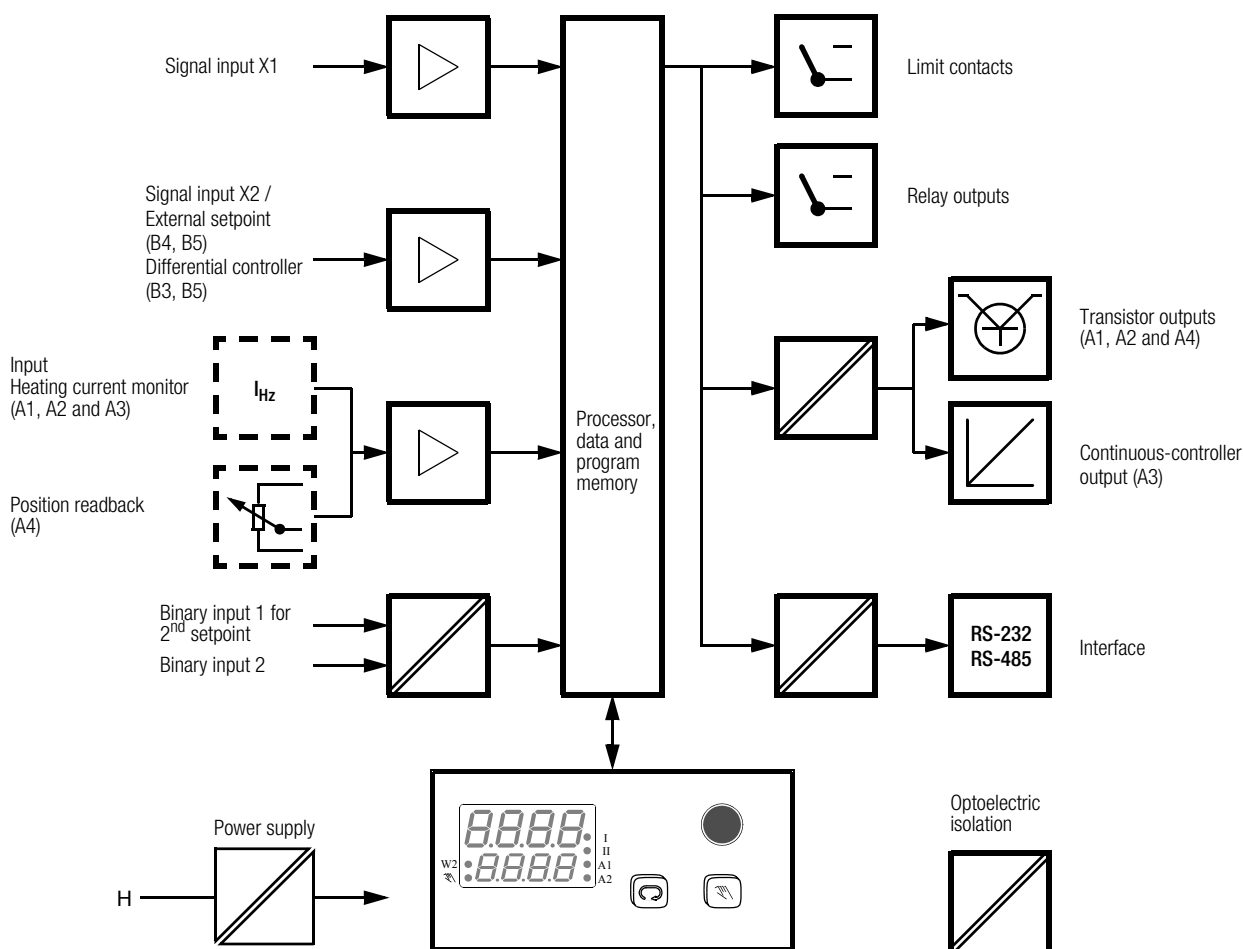


Figure 1, Block circuit diagram

Applicable Regulations and Standards

IEC 61010-1 / DIN EN 61010-1/ VDE 0411 Part 1	Safety requirements for electrical equipment for measurement, control and laboratory use
DIN EN 61326 VDE 0843 Part 20	Electrical equipment for measurement, control and laboratory use – EMC requirements
DIN VDE 0106 Part 1	Protection against electric shock
EN 60529	Degrees of protection provided by enclosures (IP Code)

Characteristic Values

Inputs

Signal input	Transformer resolution 14 bits
Measuring range	see order information
Scanning cycle	0.5 s
Offset compensation	possible by parameter entry

Configuration of sensor inputs

Code	Sensor	Selectable via keyboard	
B1, B3, B4	Thermocouple Pt100	°C / °F configurable	See order information for measuring ranges and codes
B2, B5	DC voltage Direct current	0 / 4 ... 20 mA / 0 / 2 ... 10 V Display range scalable	

Thermocouple

Overload continuous	AC sinusoidal 50 Hz / 3 V DC 1 V
Input resistance	> 50 kΩ
Cold junction	Built-in compensation circuit
Error message	In the event of broken sensor, polarity reversal, short circuit (heating circuit monitor) or temperature beyond measuring range

R2600 / R2601 Electronic Controller

Resistance thermometer Pt100

	Two-wire connection	Three-wire connection
Lead resistance (Forward/return wire)	0 ... 30 Ω can be balanced (with short-circuited 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 event of broken sensor or short circuit of the sensor or if temperature is beyond measuring range	

DC voltage, Direct current

	DC voltage	Direct 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	< 50 Ω
Error message	with input variable beyond measuring range	with input variable beyond measuring range

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

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

Position readback input (for code A 4)

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

Binary input for 2nd setpoint

The 2nd setpoint is activated via potential-free contact or potential-free electronic switch (optocoupler, etc.).

Open-circuit voltage approx. 15 V
Short circuit current approx. 1 mA

2 nd setpoint		
Active	Voltage drop via contact	< 2 V
Inactive	Residual current via contact	< 0.02 mA

Display

	Controlled variable	Master variable, heating current or manipulated variable
Display range	4-digit, digital	4-digit, digital
Display height	10 mm	7.5 mm

Status and switching outputs

	Symbol	Display type
Status	W2, hand	LED
Switching outputs	I, II, A1,A2	LED

Controlled variable

Code	Measuring range	Display resolution
B1, B3, B4	all	1 °C / °F for Pt100 also 0.1 °C / °F
B2, B5	0 / 2 ... 10 V 0 / 4 ... 20 mA scalable -1999 ... +9999 digits	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

Setpoint values

Setpoint limitation	Parameters for upper and lower setting limit configurable
2 nd setpoint	Activated via external contact, parameter value configurable at controller
Ramp function (separate for rise and fall)	Presetting of a gradual temperature change, in degrees per min. Activated when: <ul style="list-style-type: none"> – the auxiliary voltage is switched on – the momentary setpoint is changed – the second setpoint is activated – switchover between manual and automatic mode
External setpoint	Parameters configurable for code B4 and B5

Control action

Configurable controller types

Two-step PDPI controller	For heating
Two-step PDPI controller	For cooling
Three-step PDPI controller	
Three-step PDPI controller	Water cooling
Continuous-action controller	
Continuous-action controller	with split range
Step-action controller	with and without position readback
Limit monitor	Two-step / three-step 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. Intervention and manual change of control parameters is possible.

Setting ranges of the control parameters

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

¹⁾ MRS = Measuring range span

R2600 / R2601

Electronic Controller

Outputs

Control outputs

Functions	Switching output I (heating) Switching output II (cooling)
Output cycle	Parameters configurable in the range of 0.5 ... 600 s
Output type	Relay or transistor 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 x 10 ⁵ switching cycles under nominal load
Interference protection	ext. RC elem. (100 Ω - 47 nF) to be connected to contactor
Transistor output	Suitable for commercially available solid state relays (SSR)

Switching state	Open-circuit voltage	Output current
Active (load ≤ 800 Ω)	< DC 17 V	10 ... 15 mA
Inactive	< DC 17 V	< 0.1 mA

Overload limit Short circuit, interruption continuous

Continuous controller output

Functions	Alternatively configurable Regulation ratio heat or cool, controlled variable or setpoint
Output variable	alternative Current 0 / 4 ... 20 mA, at < 450 Ω load Voltage 0 / 2 ... 10 V, at > 550 Ω load
Transformer resolution	10 bits

Alarm output

Quantity	2 (A1, A2)
Functions	Alternatively configurable min, max, min + max relative / absolute NOC / NCC Startup suppression on/off Switching hysteresis configurable
Contact type	potential-free normally-open contact (NOC)
Switching capacity	AC / DC 250 V, 2 A, 500 VA / 50 W
Lifespan	> 2 x 10 ⁵ switching cycles under nom. load
Interference protection	ext. RC elem. (100 Ω - 47 nF) to be connected to contactor

Heating current monitor

Heating current monitor	integrated
Acquisition of heating current	via external current transformer GTZ 4121 000 R.... ^{*)} (scaling required for other external current transformers)

^{*)} see data sheet Z 4121 for mechanical
installation and electrical connection

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

Error message in the event of	
- Non-equivalence	Positioning signal 'off' + heating current 'on' Positioning signal 'on' + heating current 'off'
- Negative deviation from current setpoint	Negative deviation from the setpoint 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	Heating at full throttle without temperature rise, i.e. with short-circuited thermocouple heater interrupted no sensor in heating circuit

Auxiliary voltage

Nominal value	Nominal range of use		Power consumption
	Voltage	Frequency	
AC 110 V	AC 95 V ... 121 V	48 Hz ... 62 Hz	maximum 10 VA typically 6 W
AC 230 V	AC 196 V ... 253 V		
AC 24 V	AC 21 V ... 26 V		
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	per DIN Draft 19244	

Accuracy

Input controlled variable	Error limit in relation to MRS ¹⁾	Resolution in relation to MRS ¹⁾
Thermocouple		
- general, except for type B	< 0.7 %	< 0.02 %
- Type B > 600 °C	< 0.7 %	< 0.05 %
Resistance thermometer	< 0.7 %	< 0.02 %
DC voltage, direct current	< 0.5 %	< 0.02 %
	Error limit	
Cold junction	± 2 K	
	Error limit in relation to measured value	Offset error
Heating current input	5 %	± 0.1 %
Position readback	5 %	± 0.1 Ω
	Error limit in relation to final value	Resolution
Continuous-controller output	< 1.5 %	< 0.1 %

¹⁾ MRS = Measuring range span

R2600 / R2601 Electronic Controller

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 in the measuring range)

Influence variables and influence errors

Influence variable	Nominal range of use	Maximum influence error
Ambient temperature Tu	0 °C ... + 50 °C	± 0,05 % MRS ¹⁾ / K
Cold junction temperature Tver	0 °C ... + 50 °C	0.1 K (Tver – Tref) / K
Lead resistance		
– Thermocouple	RL = 0 ... 200 Ω	0.1 % MRS ¹⁾ / 10 Ω
– Pt100 two-wire	RL = 0 ... 30 Ω	3 K / Ω (can be balanced)
– Pt100 three-wire	RL = 0 ... 30 Ω	0.1 % MRS ¹⁾ / 10 Ω
Warm-up effect	≤ 5 min	± 1 %

¹⁾ MRS = Measuring range span

Electrical safety

Safety class	II, built-in device in accordance with DIN EN 61010-1 Item 6.5.4
Contamination degree	1, per DIN EN 61010-1 Item 3.7.3.1 and/or IEC 664
Overvoltage category	II, per DIN EN 61010 Appendix J and/or IEC 664
Operating voltage	300 V per DIN EN 61010

Electromagnetic Compatibility

Interference emission	EN 61326 Measuring method EN 55011 limit value class B		
Interference immunity	EN 61326		
Test type	Standard	Test severity	Criterion
ESD	EN 61000-4-2	4 kV Contact discharge	B
		8 kV atmosph. discharge	B
E-field	EN 61000-4-3	10 V / m 80 ... 1000 MHz	A
Burst	EN 61000-4-4	2 kV at all connector cables	B
HF	EN 61000-4-6	10 V 0,15 ... 80 MHz all terminals	A
Surge voltage	EN 61000-4-5	2 kV at all connector cables	A
Voltage drop	EN 61000-4-11	½ period	A

Ambient conditions

Annual mean relative humidity, no condensation	75 %
Ambient temperature	
– Nominal range of use	0 °C ... + 50 °C
– Operating range	0 °C ... + 50 °C
– Storage range	– 25 °C ... + 70 °C

Mechanical Design

Design type	Device for panel mounting per DIN 43700. Panel housing of UL-VO listed plastic. Side-by-side mounting possible without intermediate bars, except when using the accessory seal for bezel/panel (intermediate bar ≥ 10 mm)
Panel cut-out (width x height)	R2600: 45 ^{+0,6} x 92 ^{+0,8} mm R2601: 92 ^{+0,8} x 45 ^{+0,6} mm
Module	Retractable without the use of tools
Mounting position	Front vertical up to maximum 45° declination to the rear
Protection type	IP 54 Front (with seal and rotary knob pressed down) IP 20 Housing IP 20 Terminals
Weight	Approx. 0.5 kg

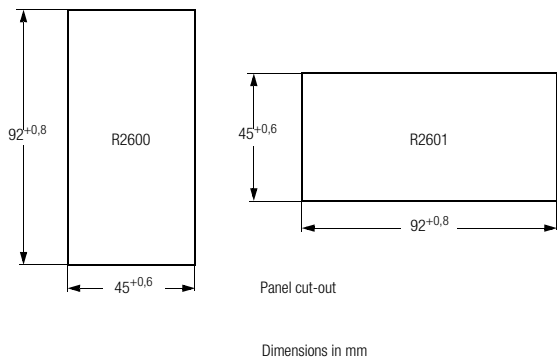
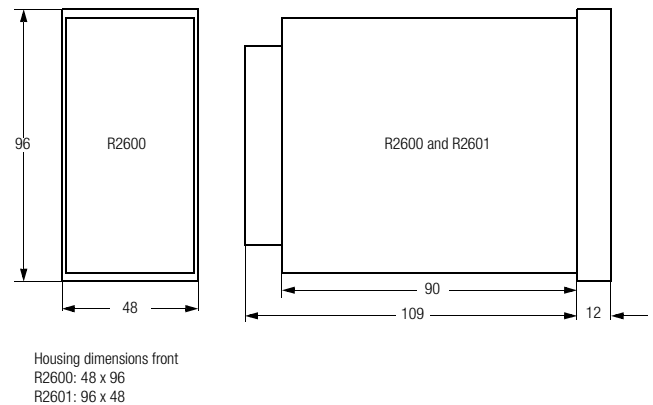
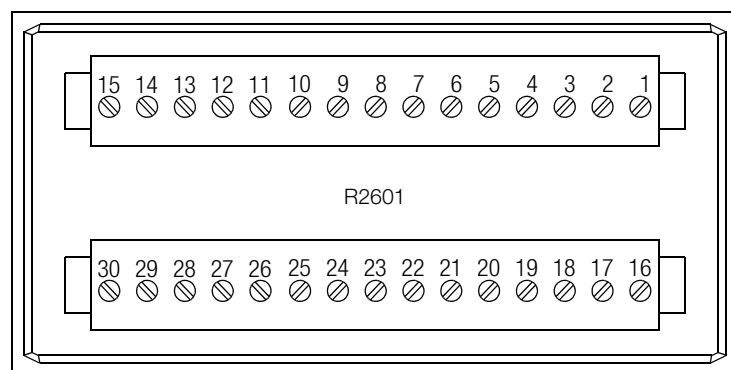
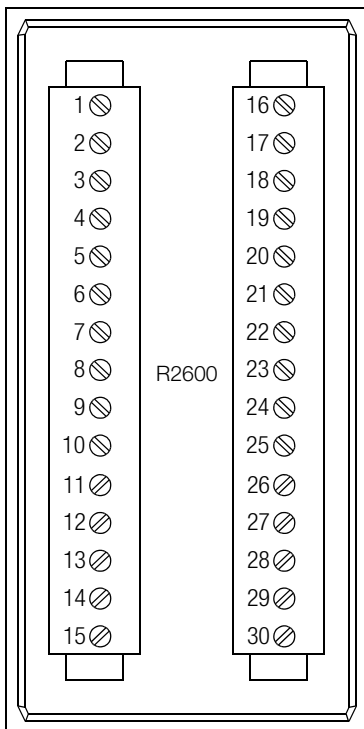
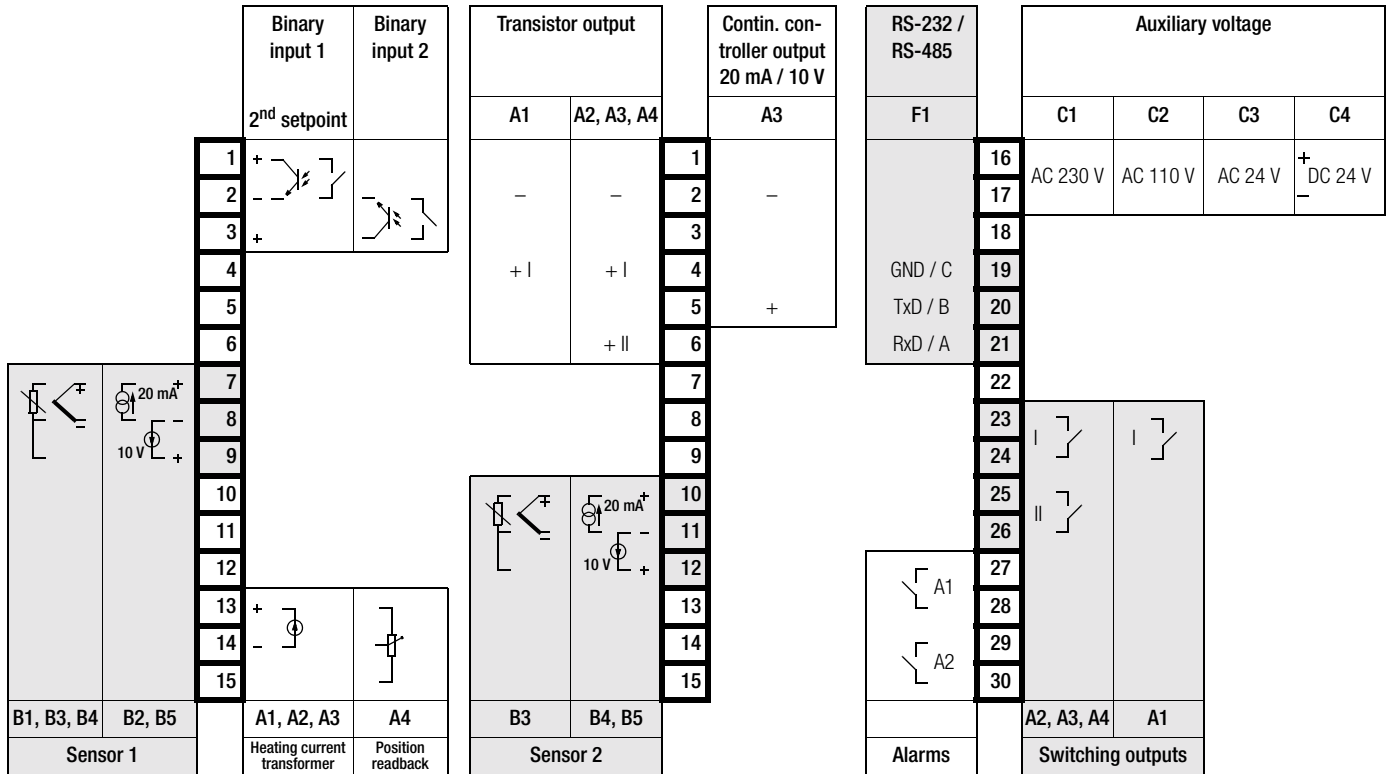


Figure 2, Housing dimensions and panel cut-outs

R2600 / R2601

Electronic Controller

Electrical Connection



Terminal elements

Screw terminals adapted to 2.5 mm² flexible cord and/or two-core wire-end ferrules for 2 x 1 mm²

Figure 3, Position of terminal contacts

R2600 / R2601 Electronic Controller

Scope of supply

- Controller
- 2 fasteners
- 1 front panel seal
- Multilingual operating instructions
- Multilingual operating instructions for data interface (only for code F1)

Order information

The following applies for determining the order code:

Only *one* code of identical capital letters may be chosen. If the capital letter of the code is followed by zero numerals only, this code may be omitted in the order code.

Feature	Code	
Electronic controller	R2600	
with self-optimization, 2 nd setpoint, 2 limit relays, front dimensions 48 x 96 mm (width x height)		
Electronic controller	R2601	
with self-optimization, 2 nd setpoint, 2 limit relays, front dimensions 96 x 48 mm (width x height)		
Controller version		
Two-step controller with heating current monitor	1 relay output and 1 transistor output	A1
Three-step controller with heating current monitor / step-action controller	2 relay outputs and 2 transistor outputs	A2
Continuous-action controller / three-step controller with heating current monitor / step-action controller	1 continuous-controller output, 2 transistor outputs and 2 relay outputs	A3
Step-action controller with position readback / three-step controller	2 relay outputs and 2 transistor outputs	A4
Measuring ranges		
Measuring input Thermocouple, configurable		B1
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 (accuracy specified as from 600 °C)	
Measuring input Resistance thermometer Pt100		B2
	-100 ... 500 °C / -148 ... 932 °F -100.0 ... 500.0 °C / -148.0 ... 932.0 °F	
Measuring input Standard signal, configurable	0 / 2 ... 10 V or 0 / 4 ... 20 mA	B3
Common configuration of both signal inputs is possible; same as code B1 for differential controller		B4
First signal input configurable as code B1 and second signal input configurable as code B2 for slave controller		B5
Both signal inputs configurable as code B2 for differential controller / slave controller		
Auxiliary voltage		
AC 230 V	} C1 → C2, bzw. C2 → C1 internal plug change possible	C1
AC 110 V		C2
AC 24 V		C3
DC 24 V		C4
Plug		
Lateral connection		D0
Rear connection		D1
Operating instructions		
German / English		L0
French / Italian		L1
none		L2
Data interface		
none		F0
RS-232 / RS-485 internal plug change possible		F1

R2600 / R2601

Electronic Controller

Feature	Code
Configuration	
Default setting	K0
Configuration according to customer's specifications	K9
Customized front film	upon request

Order example

Feature (plain text)		Code
Electronic controller	Self-optimization, 2 nd setpoint, 2 limit value relays, front dimensions 48 x 96 mm (width x height)	R2600
Controller type	Three-step controller with heating current monitor, 2 relay outputs and 2 transistor outputs	A2
Measuring range	Thermocouple	B1
Auxiliary voltage	AC 230 V	C1
Plug	Rear connection	D1
Operating instructions	German / English	L0
Data interface	RS-232 / RS-485 internal plug change possible	F1
Configuration	Default setting	K0

Accessories

Feature		Article number / Feature
Current transformer for top-hat rail mounting for the acquisition of 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
Blanking cover		
	48 x 96 mm	GTZ 0501 000 E0001
Profibus interface		
	including function modules for SIMATIC S5 / S7, GSD and type files, xxx.200 for connecting a maximum number of 31 controllers	R101A
Interbus-S Gateway		
	for the connection of a maximum number of 31 controllers	R101C

Edited in Germany • Subject to change without notice • A pdf version is available on the internet