GOSSEN METRAWATT

R2900
Compact Controller: 96 x 96 mm

3-349-202-03
3/7.02

- **Temperature controller**
  for the direct connection of thermocouples and resistance thermometer Pt100 as well as standard signals
- **Single-channel digital controller with microprocessor**
- **Available as 2-step, 3-step, continuous-action, step-action, fixed value, differential or slave controller**
- **Compact housing, front panel dimensions: 96 × 96 mm per DIN 43700**
  For installation to control panels etc.
- **Easy operation, extensive standard functions and few device variants**
- **Two keys each for function selection and value settings**

QUALITY MANAGEMENT SYSTEM

DQS- Certified per
DIN EN ISO 9001 Reg.-No. 1262

Applications

Primary applications include temperature control in plastics processing and packaging machines, oven manufacturing and food processing.

The R2900 controller is suitable for control systems with the following characteristic values:

Characteristic value		
Tu	delay	1 s ... 10 min.
Tg	balancing time	1 min. ... 10 h
Tg/Tu		> 5

Features

- Harmonic-free PDPI algorithm
- Proxy setpoint
- External setpoint (slave controller)
- Setpoint ramp
- Self-optimization
- 2 alarm contacts with actuation suppression
- Heating circuit monitoring
- Heating current monitoring (with external transformer)
- Step-action controller with or without repeater
- Continuous-action controller with split range
- Discontinuous-action controller with actual value output
- Discontinuous-action controller with setpoint output
- Differential controller
- Current settings can be saved as user-defined default settings
- Interface (RS 485, RS 232)
- Parameters configuration with METRAwin®10 PC software

Description

Actual and setpoint values are both displayed digitally at the same time. LEDs indicate the status of switching and alarm outputs, and whether or not manual operation and the proxy setpoint are active.

Control parameters and configuration values are entered with a membrane keypad. Current settings can be saved as user-defined default settings and recalled as required.

Heating current monitoring is provided as a standard feature (except with designations A5 and A6). Heating current is acquired by means of an external GTZ 4121 current transformer.
Acquired values are displayed and evaluated at the R2900 controller.
Error messages are generated if the heating current setpoint is fallen short of, or in the case of antivalence.

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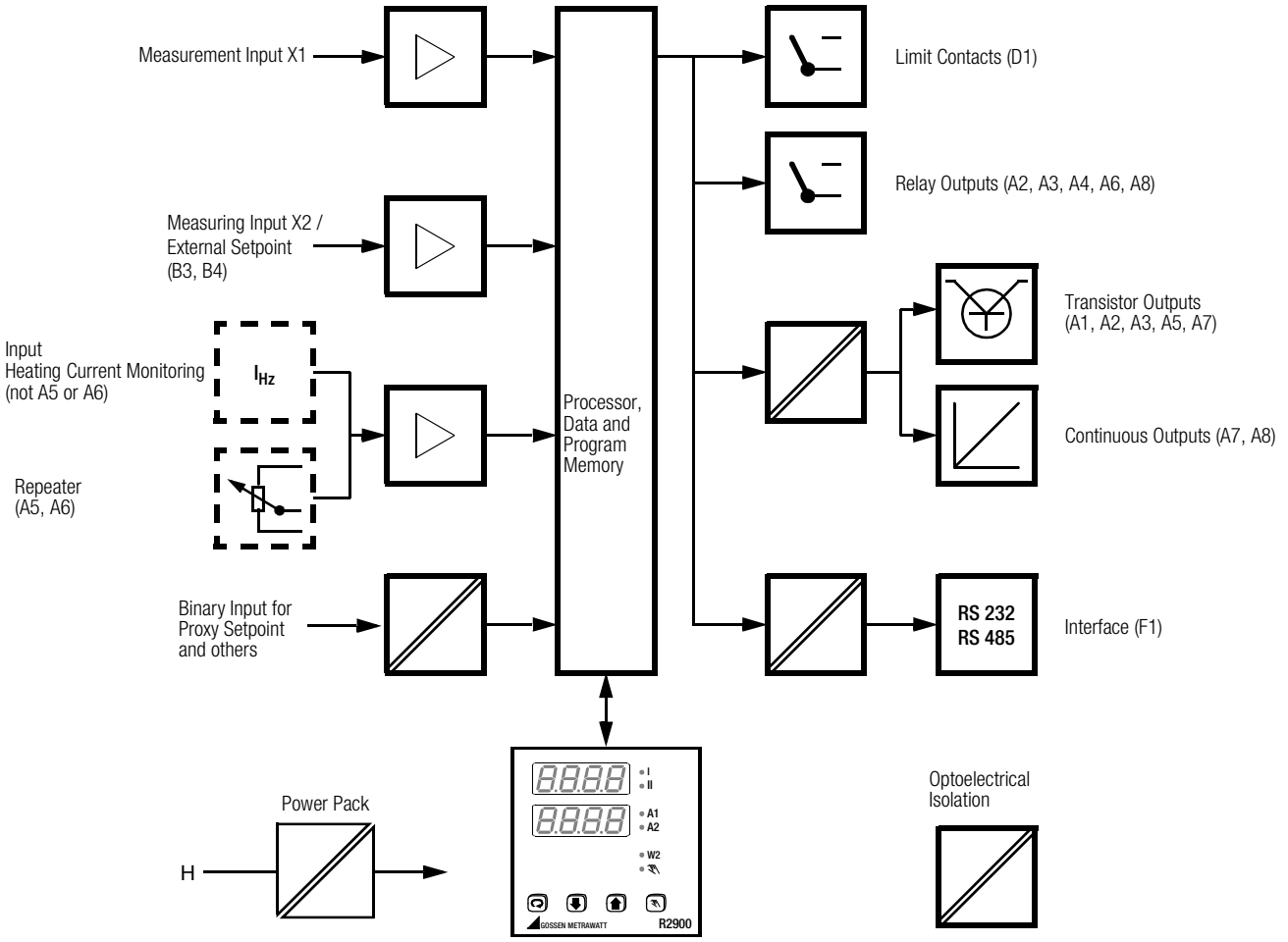

Figure 1: Schematic Diagram

Applicable Regulations and Standards

IEC 61 010-1 / DIN EN 61010-1/ VDE 0411 T1	Safety requirements for electrical equipment for measurement, control and laboratory use
IEC/EN 61 326	EMC requirements
DIN VDE 0106 T1	Protection against electric shock
EN 60529	Degrees of protection provided by enclosures (IP code)
DIN 3440	Temperature controllers and temperature limiting Devices for heat generating equipment
CSA	Approval applied for

Characteristic Values

Inputs

Measurement Input	14 bit transformer resolution
Measuring Range	See order information
Sampling Cycle	0.5 s
Offset Compensation	Possible by means of parameter entry

Sensor Input Configuration

Designation	Sensor Type	Selectable via Keypad	
B1, B3, B4	Thermocouple Pt100	°C /°F configurable	Measuring ranges and designations: See order information
B2	Direct voltage Direct current	0/4 ... 20 mA / 0/2 ... 10 V Scalable display range	

Thermocouple

Continuous overload	3 V / 50 Hz AC, sinusoidal 1 V DC
Input impedance	> 50 kΩ
Reference junction	Integrated equalizing circuit
Error messages	For broken sensor, polarity reversal, short-circuit (heating circuit monitoring) and temperature above or below measuring range

Pt100 Resistance Thermometer

	2-Wire Connection	3-Wire Connection
Cable resistance (both directions)	Balancing from 0 to 30 Ω (by means of keystroke with short-circuited sensor)	Compensated from 0 to 30 Ω
Continuous overload	3 V AC / 50 Hz sinusoidal 1 V DC	
Measuring current	approx. 0.2 mA	
Error messages	For broken sensor or short-circuit, or temperature above or below the measuring range	

Direct Voltage, Direct Current

	Direct Voltage	Direct Current
Measuring range	0/2 ... 10 V configurable	0/4 ... 20 mA configurable
Continuous overload	100 V	60 mA DC
Input impedance / load	> 150 kΩ	< 50 Ω
Error messages	For input quantities above or below the measuring range	For input quantities above or below the measuring range

Heating Current Monitoring Input (not with designations A5 and A6)

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

Repeater Input (with designations A 5 and A6)

Nominal potentiometer values	0.1 ... 1.0 kΩ
Measuring current	< 1.5 mA

Binary Input

Activation of the proxy setpoint by means of floating contact or isolated electronic switch (optocoupler etc.)

Configurable also for switch-over between manual and automatic operation or disturbance variable feed-forward.

Open circuit voltage approx. 15 V
Short-circuit current approx. 1.5 mA

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

Display

Display range	4-place, digital
Display height	13 mm

Status and Switching Outputs

	Symbol	Display Type
Status	W2, manual	LED
Switching outputs	I, II, A1, A2	LED

Controlled Variable

Designation	Measuring Range	Display Resolution
B1, B3, B4	All	1 °C or °F 0.1 °C or °F also with Pt100
B2	0/2 ... 10 V 0/4 ... 20 mA scalable from –1999 to +9999 digits	1 digit

Repeater

Measuring Range	Display Resolution
Scalable from 0 to 100%	1%

Heating Current

Measuring Range	Display Resolution
Scalable from 0 to 100.0 A	0.1 A

Setpoints

Setpoint limiting	Adjustable upper and lower setting limits
Proxy setpoint	Activation via external contact, value can be programmed at the device
Ramp function (separate for rise and fall)	Specification of a gradual temperature change in degrees per min. Activated by means of: – Turn on auxiliary voltage – Change current setpoint value – Activate proxy setpoint – Switch from manual to automatic operation
External setpoint	Configurable for designation B4

Control Performance

Configurable Control Modes

PDPI 2-step controller	For heating
PDPI 2-step controller	For cooling
PDPI 3-step controller	
PDPI 3-step controller	Water cooling
Continuous-action controller	
Continuous-action controller	With split range
Step-action controller	With or without repeater
Limit transducer	2 / 3-step controller without time response
Actuator	

In addition to fixed value control, each of these control modes also includes differential and slave controller functions.

Self-optimization — By means of keystroke from any mode. Control parameters can be changed manually.

Control Parameter Setting Ranges

Display	Meaning	Setting Range
PB I	Proportional band switching output I	0.1 ... 999.9%
PB II	Proportional band switching output II (with 3-step controller)	0.1 ... 999.9%
dbnd	Dead spot (for 3-step and step-action controllers)	0 ... MRS [1)]
tu	Path delay	0 ... 9999 s
tc	Read-out cycle time	0.5 ... 600 s

[1)] MRS = measuring range span

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Outputs

Control Outputs

Function: Switching output I (heating)
Switching output II (cooling)

Read-out cycle: Adjustable within a range of 0.5 ... 600 s

Output type: Relay or transistor output (can be set via DIP switch)

Relay output: Floating contact, normally open
- Switching capacity: 250 V AC / DC, 2 A, 500 VA / 50 W
- Service life: > 2 x 10^5 switching cycles at nominal load
- Interference suppression: Provide external RC element (100 Ω - 47 nF) at contactor
- CSA: 300 V CAT II

Transistor output: Suitable for commercially available semiconductor relays (SSR)

Switching Status	Open-Circuit Voltage	Output Current
Active (load ≤ 800 Ω)	< 17 V DC	10 ... 15 mA
Inactive	< 17 V DC	< 0.02 mA

Overload limit: Short-circuit, continuous interruption

Continuous Output

Function: Alternatively configurable manipulating factor, heating or cooling, controlled variable or setpoint

Output quantity: Alternatively
Current 0 / 4 ... 20 mA, at < 450 Ω load
Voltage 0 / 2 ... 10 V, at > 550 Ω load

Transformer resolution: 8 bit

Alarm Output

Number: 2 (optional)

Functions: Alternatively configurable:
min, max, min + max, relative / absolute, NO / NC contact
Actuation suppression off / on
Adjustable switching hysteresis

Contact type: Floating contact, normally open
- Switching capacity: 250 V AC / DC, 2 A, 500 VA / 50 W
- Service life: > 2 x 10^5 switching cycles at nominal load
- Interference suppression: Provide external RC element (100 Ω - 47 nF) at contactor
- CSA: 300 V CAT II

Heating Current Monitoring

Heating current monitoring: Permanently installed

Current acquisition: Via external current transformer GTZ 4121 000 R....*)
(via other external current transformer, scaling required)

*) See data sheet Z 4121 regarding mechanical installation and electrical connection.

Heating current nominal value transfer by means of keystroke

Error Messages for	
– Antivalence	Actuator signal OFF + heating current ON Actuator signal ON + heating current OFF
– Below current setpoint	Below heating current setpoint by more than 20% with actuator signal ON
Signaling	Error message read-out permanently wired to alarm output 1

Heating Circuit Monitoring

Without external transformer, without additional parameters

Configurable: Heating circuit monitoring active / inactive

Error Messages for: 100% heat without rising temperature, i.e.
- Short-circuited thermocouple
- Interrupted heating
- No sensor in heating circuit

Auxiliary Voltage

Nominal Value	Nominal Range of Use		CSA	Power Consumption
	Voltage	Frequency		
110 V / 230 V AC	95 ... 253 V AC	48 ... 62 Hz	300 V CAT II	Max. 10 VA typ. 6 W

Data Interface

Type (interchangeable)	RS 232	RS 485
Maximum number of devices	1	32, parallel connected
Number of strands	3	
Transmission speed	9600 baud	
Parity	Even	
Number of data bits	8	
Number of stop bits	1	
Operating mode	Half-duplex	
Protocol	Per DIN 19244 draft	

Accuracy

Controlled Variable Input	Error Limit relative to MRS 1)	Resolution relative to MRS 1)
Thermocouple		
– In general, except for types R, S and B	< 0.7%	< 0.02%
– Types R, S	< 1%	< 0.05%
– Tpye B > 600 °C	< 1.5 %	< 0.05%
Resistance thermometers	< 0.7%	< 0.02%
Direct voltage, direct current	< 0.7%	< 0.02%
	Error limit	
Reference junction	± 2 K	
	Error limit relative to measured value	Offset error
Heating current input	5%	± 0.1%
Repeater	5%	± 1 Ω
	Error limit relative to upper range value	Resolution
Continuous output	< 1.0%	0.4%

1) MRS = measuring range span

Reference Conditions

Reference Quantity	Reference Condition
Ambient temperature Tref	23 °C ± 2 K
Reference junction temperature Tver	23 °C ± 2 K
Auxiliary voltage	Nominal value ± 1% at 50 Hz AC ± 1%, sinusoidal Allowable common-mode voltage to electrically connected inputs: 0 V DC / AC
Warm-up time	10 min. (inputs within measuring range)

Influencing Quantities and Influence Error

Influencing Quantity	Nominal Range of Use	Maximum Influence Error
Ambient temperature Tu	0 °C ... +50 °C	0.1 K (Tu-Tref) / K
Reference junction temperature Tver	0 °C ... +50 °C	0.1 K (Tver – Tref) / K
Cable resistance		
– Thermocouple in general except for types R, S, B	RL = 0 ... 200 Ω	0.4 K / 10 Ω
Types R, S, B	RL = 0 ... 200 Ω	2 K / 10 Ω
– Pt100 2-wire	RL = 0 ... 30 Ω	3 K / Ω (adjustable)
– Pt100 3-wire	RL = 0 ... 30 Ω	0.5K / 10 Ω
Warm-up influence	≤ 5 minutes	± 1%

Electrical Safety

Safety class	II, panel-mount device per DIN EN 61010-1 section 6.5.4
Fouling factor	1, per DIN EN 61010-1 section 3.7.3.1 and IEC 664
Overvoltage category	II, per DIN EN 61010 appendix J and IEC 664
Operating voltage	300 V per DIN EN 61010

Electromagnetic Compatibility

Interference emission		EN 61326 measuring method EN 55011, class B limit value		
Interference immunity		EN 61326		
Test type	Standard	Test severity		Criterion
ESD	EN 61000-4-2	4 kV 8 kV	contact discharge atmospheric discharge	B B
E field	EN 61000-4-3	10 V / m	80 ... 1000 MHz	B
Burst	EN 61000-4-4	2 kV	at power supply 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 dip	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
– Functional range	0 °C ... +50 °C
– Storage range	–25 °C ... +70 °C

Mechanical Design

Design	Panel-mount device per DIN 43700 Housing made from plastic per UL VO Side-by-side mounting with separator ≥10 mm
Panel cutout	$92^{+0.8}$ mm x $92^{+0.8}$ mm
Mounting position	Front panel vertical or tilted back up to 45°
Protection	front panel IP 65 housing IP 20 terminals IP 20
Weight	approx. 0.5 kg

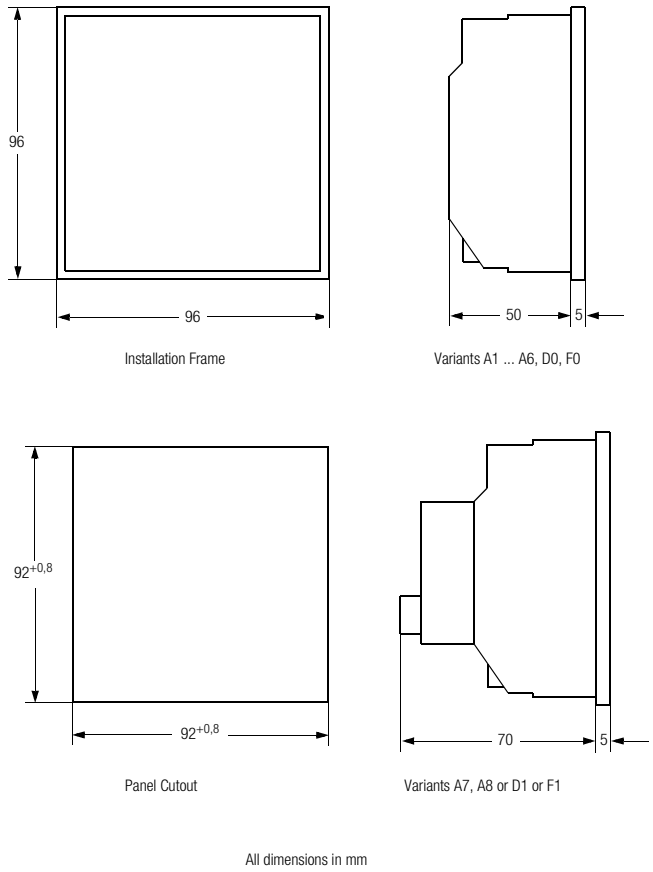

Figure 2: Housing Dimensions and Panel Cutout

Standard Equipment

- Controller
- 2 mounting components
- Multilingual operating instructions
- Multilingual operating instructions for data interface (with designation F1 only)

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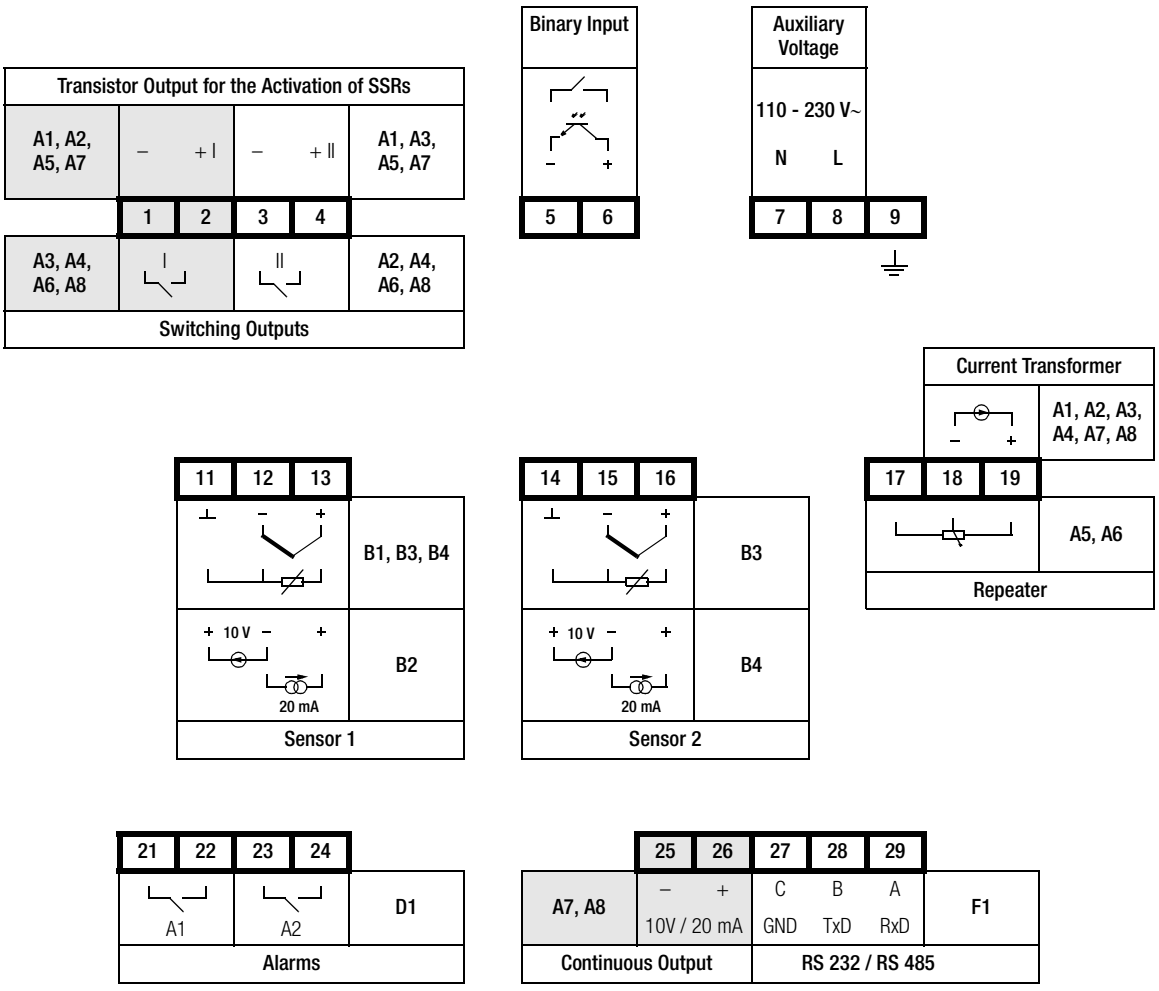
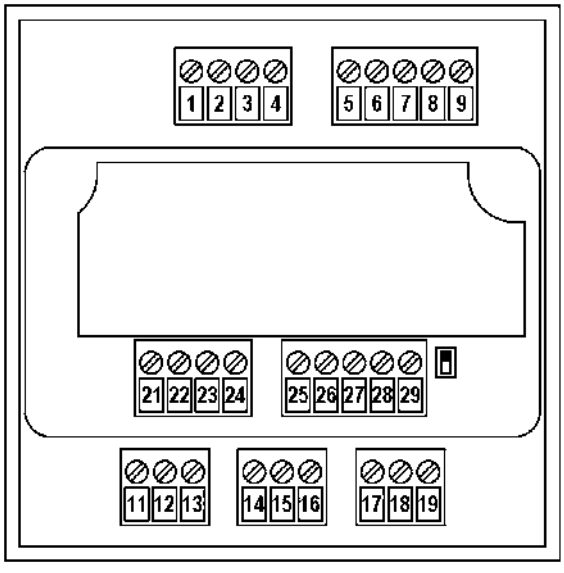
Electrical Connection





Connector components

Screw terminals, suitable for wire with 1.5 square mm cross-section or two-core wire-end ferrules with 2 x 0.75 square mm cross-section

Figure 3: Connector Terminal Positions

Order Information

The following applies for the selection of order features: Only *one* designation beginning with any given capital letter may be selected. If the capital letter is followed by zeros only, the designation need not be entered.

Feature					Designation
Electronic controller					R2900
With self-optimization and proxy setpoint, front panel dimensions: 96 x 96 mm (W x H)					
Controller type					
2 / 3-step controller with heating current monitoring / step-action controller				2 transistor outputs	A1
2 / 3-step controller with heating current monitoring				1st switching point: transistor output 2nd switching point: relay output	A2
2 / 3-step controller with heating current monitoring				1st switching point: relay output 2nd switching point: transistor output	A3
2 / 3-step controller with heating current monitoring / step-action controller				2 relay outputs	A4
Step-action controller with repeater / 3-step controller				2 transistor outputs	A5
Step-action controller with repeater / 3-step controller				2 relay outputs	A6
Continuous-action controller / step-action controller / 3-step controller with heating current monitoring				1 continuous output and 2 transistor outputs	A7 [1]
Continuous-action controller / step-action controller / 3-step controller with heating current monitoring				1 continuous output and 2 relay outputs	A8 [1]
Measuring ranges					
Measurement input:	configurable thermocouple				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 of 600 °C)	
	Type N	–18 ... 1300 °C /	0 ... 2372 °F		
Measurement input:	Pt100 resistance thermometer				
		– 100 ... 500 °C / – 100.0 ... 500.0 °C /	-148 ... 932 °F –148.0 ... 932.0 °F		
Measurement input:	configurable standard signal				B2
	0 / 2 ... 10 V or 0 / 4 ... 20 mA				
Both measurement inputs can be mutually configured as with designation B1 for differential controller.					B3
First measurement input can be configured as with designation B1, and second as with designation B2 for slave controller.					B4
Auxiliary voltage					
AC 110 ... 230 V					C1
Limit contacts					
None					D0
Two				2 relay outputs	D1 [2]
Data interface					
None					F0
RS 232 / RS 485, internally selectable					F1 [3]
Operating instructions					
English / German					L0
French / Italian					L1
None					L2
Configuration					
Default settings					K0
Configure per customer requirements					K9
Customer-specific front panel					upon request

[1] Cannot be ordered with D1 or F1
[2] Cannot be ordered with A7 and F1, or A8 and F1
[3] Cannot be ordered with A7 and D1, or A8 and D1

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Sample Order

Feature (plain language)		Designation
Electronic controller	With self-optimization and proxy setpoint, front panel dimensions: 96 x 96 mm (W x H)	R2900
Controller type	2 / 3-step controller with heating current monitoring 1st switching point: transistor output 2nd switching point: relay output	A2
Measuring range	Thermocouple	B1
Auxiliary voltage	AC 110 ... 230 V	C1
Limit contacts	Two 2 relay outputs	D1
Operating instructions	English / German	L0
Data interface	RS 232 / RS 485, internally selectable	F1
Configuration	Default settings	K0

Accessories

Feature			Article Number / Feature
Current transformer, top-hat rail mounting, for acquiring heating current			
	With 3 inputs	(one 3-phase consumer or three single-phase AC consumers)	GTZ 4121 000 R0001
	With 4 inputs (one 3-phase consumer + one single-phase AC consumer, or four single-phase AC consumers)		GTZ 4121 000 R0002

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