

Temperature Controller

PID controller, self optimizing,
with Fuzzy Logic

Electronic Temperature Measurement

96 mm x 96 mm • Model CF1L

Areas of application

for control tasks in

- Process and procedure technology
- Plant construction
- Plastic technology and processing
- Ventilation and air conditioning technology

Features

- **Control characteristic**
 - PID / PD controller, self optimizing
 - two-step controller (ON/OFF)
 - three-step controller (heating/cooling)
 - three-step controller (Servo ON/OFF)
- **Multi-function input**
 - thermocouples, resistance thermometers
 - current and voltage signals
- **Control output**
 - relay
 - logic level
 - continuous, 4 ... 20 mA
- **Displays**
 - each one display for process value and setting value
 - LED display, 4-digit
 - switchable for °C or °F
 - display for parameter memory
- **Alarm output**
 - max. four alarm contacts
 - setable switching logic, also with stand-by function

Options

- retransmission output
- heater burnout alarm
- loop monitoring
- serial communication
- remote setting
- parameter memory
- transmitter supply

Other features

- self optimizing
- self monitoring
- sensor monitoring
- sensor correction
- cold junction compensation



Description

Digital temperature controller with fuzzy logic for controlling, displaying and monitoring temperature signals.

All types of commonly used temperature sensors and standard signals can be connected to the multi-function input.

The control parameters can be set over wide ranges. Self optimizing parameter setting which can operate with fuzzy logic, as well, may also be brought in. This feature enables an optimal self setting of the controller.

Multiple options render this controller suitable for an extremely wide range of applications, e.g. monitoring control variables (heater burnout alarm), three-step control (heating/cooling), remote setting or connection to a computer by means of a serial interface.

At no extra cost the control output can be provided to choice as relay (for slow control operations), logic level (for fast control operations) or as continuous output 4 ... 20 mA. Optional alarm outputs for monitoring functions.

One alarm output is part of the standard version, optionally available are up to four alarm outputs.

Various monitoring functions can be realised with these outputs. These controllers have been designed for switch panel mounting.

Specification

Model CF1L

Input: setable (multi-function input), measuring span setable

			max. Measuring range ¹⁾		Resolution
RTDs	Pt 100	DIN IEC 751	-199.9 ... + 850.0 °C	-199.9 ... + 999.9 °F	0.1 °C / 0.1 °F
			-200 ... + 850 °C	-320 ... + 1560 °F	1 °C / 1 °F
	JPt 100	JIS C 1606	-199.9 ... + 500.0 °C	-199.9 ... + 900.0 °F	0.1 °C / 0.1 °F
Thermocouples	Type K, NiCr-Ni	DIN IEC 584	- 200 ... + 1370 °C	- 320 ... + 2500 °F	1 °C / 1 °F
	Type J, Fe-CuNi	DIN IEC 584	- 200 ... + 1000 °C	- 320 ... + 1800 °F	1 °C / 1 °F
	Type T, Cu-CuNi	DIN IEC 584	- 199.9 ... + 400.0 °C	-199.9 ... + 750.0 °F	0.1 °C / 0.1 °F
	Type E, NiCr-CuNi	DIN IEC 584	0 ... + 1000 °C	0 ... + 1800 °F	1 °C / 1 °F
	Type N, NiCrSi-NiSi	DIN IEC 584	0 ... + 1300 °C	0 ... + 2300 °F	1 °C / 1 °F
	Type R, PtRh-Pt	DIN IEC 584	0 ... + 1760 °C	0 ... + 3200 °F	1 °C / 1 °F
	Type S, PtRh-Pt	DIN IEC 584	0 ... + 1760 °C	0 ... + 3200 °F	1 °C / 1 °F
	Type B, PtRh-PtRh	DIN IEC 584	0 ... + 1820 °C	0 ... + 3300 °F	1 °C / 1 °F
	Type W5, W5Re/We26Re	ASTM E998	0 ... + 2315 °C	0 ... + 4200 °F	1 °C / 1 °F
Current input	0 ... 20 mA		- 1999 ... 9999 ²⁾	-	1 ²⁾
	4 ... 20 mA		- 1999 ... 9999 ²⁾	-	1 ²⁾
Voltage input	0 ... 1 V		- 1999 ... 9999 ²⁾	-	1 ²⁾

1) Switchable display unit °C or °F (DIP switch).
2) Scaling and decimal point freely setable.

Input circuiting

Resistance thermometer 3 wire symmetric, max. permissible connection resistance: 10 Ω each wire
Thermocouple max. permissible connection resistance: 100 Ω
Current input input impedance: 50 Ω
Voltage input input impedance: 1 MΩ

Display

process value: 4-digit, 7-segment LED, red, 14.3 mm high
setting value: 4-digit, 7-segment LED, green, 10 mm high
memory: 1-digit, 7-segment LED, yellow, 8 mm high (parameter memory)
measuring time: 125 ms (8 conversions in a second)
divers status indicators

Control characteristic

PD algorithm
PID algorithm
two-step controller (ON / OFF)
optional: three-step controller (heating / cooling)
three-step controller (Servo ON/ OFF)

Control parameters

control parameter setting ranges, self optimizing setting (Fuzzy Logic) can be brought in,
a 7-fold parameter memory is available optionally
proportional band: 0.1 ... 99.9 % of end of measuring range
integral time: 0 ... 3600 s
differential time: 0 ... 3600 s
proportional cycle: 0 ... 120 s
hysteresis: 0.1 ... 100.0 K

Accuracy

± 0.2 % of set measuring span ± 1 digit (restrictions with thermocouples)
Type K, Type J, Type T with values < 0 °C : ± 0.4 % of measuring range ± 1 digit
Type R and Type S with values < 200 °C : ± 4 K ± 1 digit

Electrical data

power supply: AC 100 ... 240 V 50 ... 60 Hz, optional: AC/DC 24 V
power consumption: approx. 8 VA
isolation resistance: ≥ 10 MΩ with DC 500 V
isolation voltage: AC 1500 V, 60 s (function groups against each other)

Electromagnetic compatibility (EMC)

interference emission per EN 55 011 (1991) Group 1 Class A
interference immunity per EN 50 082-2 (1993)

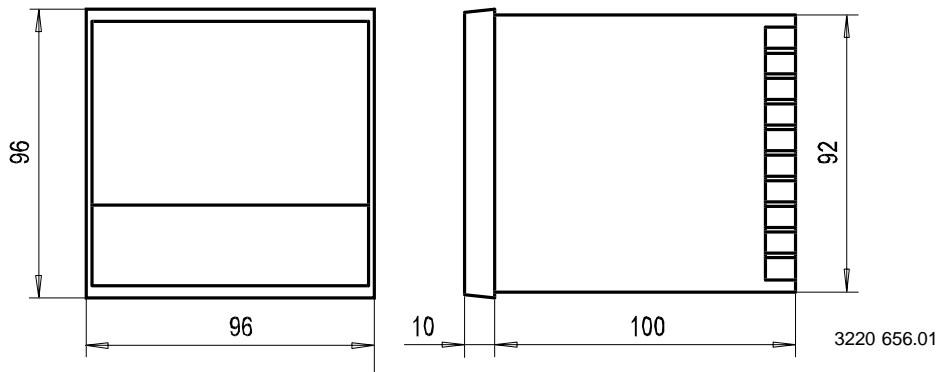
Other features

Self monitoring	automatic execution of initial test after connection to power supply, thereafter monitoring due to internal malfunction
Sensor monitoring	optical signalling of sensor burnout and sensor short circuiting
Sensor correction	setable
Cold junction compensation	± 1 K in ambient temperature range 0 ... 50 °C

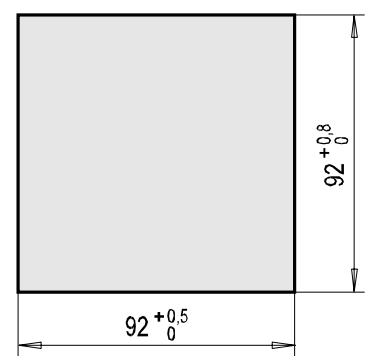
Further options

- ingress protection of panel front IP 54 (additional seal)
- terminal cover for additional protection

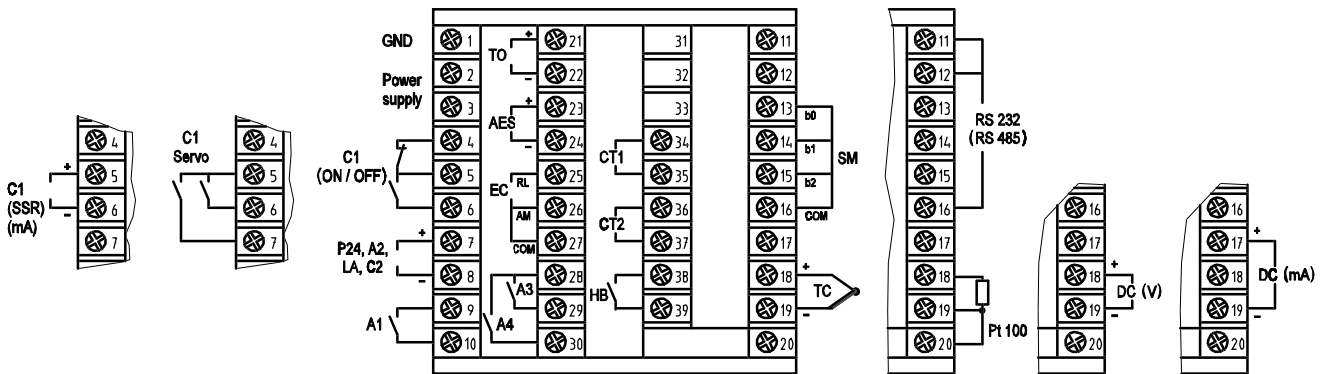
Dimensions in mm



Panel cutout in mm



Designation of terminal connectors



3220 681.01

Legend:

Power supply	power supply	optional:	
GND	ground	C1 Servo	control output for Servo ON / OFF
C1	control output	A2 up to A4	alarm output 2 up to 4
	(ON / OFF) relay	LA	loop alarm
	(SSR) logic level	TO	retransmission output
	(mA) analogue current signal	C2	control output for heating / cooling
TC	input thermocouple	HB	heater burnout alarm
Pt 100	input resistance thermometer	RS 232	serial interface RS 232-C
DC (V)	voltage input	RS 485	serial interface RS 485
DC (mA)	current input	CT 1, CT 2	connection of current converter
A1	alarm output 1	SM	parameter memory
		AES	remote setting
		P24	transmitter supply
		EC	selection setting value (internal / external)

Order code for temperature controller Model CF1L 96 mm x 96 mm

Field No.	Code	Features
		Control characteristic
1	3	PID (setable control parameter)
	5	PID ON/OFF Servo (setable control parameter)
		Control output
2	R	relay
	S	logic level DC 0/12 V for solid state relay 1)
	A	analogue current signal (4 ... 20 mA) 1)
		Input configuration
3	K1	thermocouple type K (NiCr-Ni), range -200 ... +1370 °C 2)
	J1	thermocouple type J (Fe-CuNi), range -200 ... +1000 °C 2)
	S1	thermocouple type S (PtRh-Pt), range 0 ... +1760 °C 2)
	T1	thermocouple type T (Cu-CuNi), range -199.9 ... +400.0 °C 2)
	N1	thermocouple type N (NiCrSi-NiSi), range 0 ... +1300 °C 2)
	R1	thermocouple type R (PtRh-Pt), range 0 ... +1760 °C 2)
	E1	thermocouple type E (NiCr-CuNi), range 0 ... +1000 °C 2)
	B1	thermocouple type B (PtRh-PtRh), range 0 ... +1820 °C 2)
	C1	thermocouple type W5 (W5Re/W26Re), range 0 ... +2315 °C 2)
	11	Pt 100, range -199.9 ... +850.0 °C 2)
	74	current input (4 ... 20 mA) 2)
	70	current input (0 ... 20 mA) 2)
	91	voltage input (0 ... 1 V) 2)
		Power supply
4	H	AC 100 ... 240 V 50 ... 60 Hz
	L	AC/DC 24 V

1) Not with control characteristic PID SERVO ON/OFF (Field No. "1" code "5")

2) Setable input.

Field No.	Code	Features
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Options:

		Alarm output 2
5	<input type="checkbox"/>	AS setable switching logic 1)
	<input type="checkbox"/>	AR loop monitoring 1)
		Control output for heating/cooling (three-step)
	<input type="checkbox"/>	DR relay 1) 3)
5	<input type="checkbox"/>	DS logic level DC 0/12 V for solid state relay 1) 3)
	<input type="checkbox"/>	DA analogue current signal (4 ... 20 mA) 1) 3)
		Retransmission output
5	<input type="checkbox"/>	TA 4 ... 20 mA
	<input type="checkbox"/>	TV 0 ... 1 V
		Heater burnout alarm
	<input type="checkbox"/>	W12 for 1 phase (max. 20 A) 1) 4)
	<input type="checkbox"/>	W15 for 1 phase (max. 50 A) 1) 4)
5	<input type="checkbox"/>	W32 for 3 phase (max. 20 A) 1) 4)
	<input type="checkbox"/>	W35 for 3 phase (max. 50 A) 1) 4)
		Serial communication
5	<input type="checkbox"/>	C2 RS 232-C
	<input type="checkbox"/>	C5 RS 485
		Remote setting
	<input type="checkbox"/>	EA0 0 ... 20 mA
	<input type="checkbox"/>	EA4 4 ... 20 mA
5	<input type="checkbox"/>	EV0 0 ... 1 V
	<input type="checkbox"/>	EV1 1 ... 5 V
		Additional alarm outputs
5	<input type="checkbox"/>	4SA Alarm 3 and 4
		Parameter memory
5	<input type="checkbox"/>	SM 7-fold
		Terminal connections
5	<input type="checkbox"/>	KA with additional terminal cover <i>Without terminal cover as standard</i>
		Ingress protection
5	<input type="checkbox"/>	IP IP 54 <i>In front IP 50 as standard</i>
		Transmitter supply
5	<input type="checkbox"/>	P24 DC 24 V max. 30 mA 3)
		Instrument configuration
5	<input type="checkbox"/>	V? to customer's specifications <i>Please state as additional text</i>

Order code:

1	2	3	4	Options (Field No. 5):	5)
CF1L - <input type="checkbox"/>	A - <input type="checkbox"/>	/ M - <input type="checkbox"/>	<input type="checkbox"/>		-

Additional text: _____

- 1) Not with control characteristic PID SERVO ON/OFF (Field No. "1" code "5")
- 2) Setable input.
- 3) Not with alarm output 2 (options AS/AR)
- 4) Not with analogue control output (4 ... 20 mA)
- 5) Please separate the codes for several options by a hyphen if you wish to combine options.
Example: CF1L-3 A - R / M - 11 H - AS - W32 - 4SA

Specifications and dimensions given in this leaflet are correct at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.



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