

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
Current input	Type W5, W5Re/We26Re	ASTM E998	0 ... + 2315 °C	0 ... + 4200 °F	1 °C / 1 °F
Voltage 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)

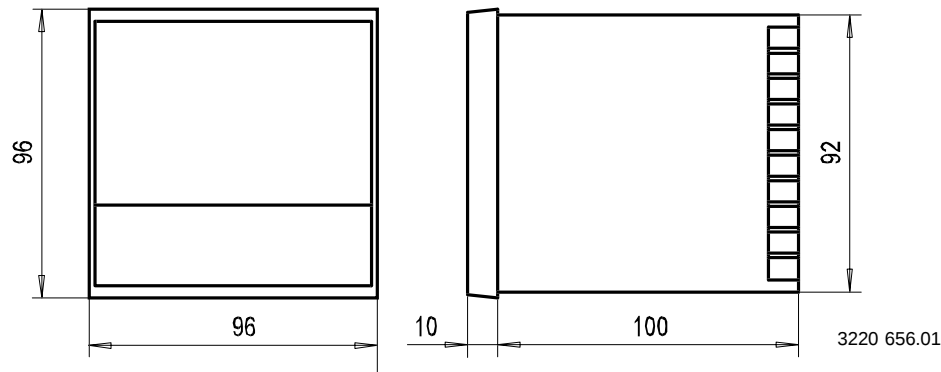
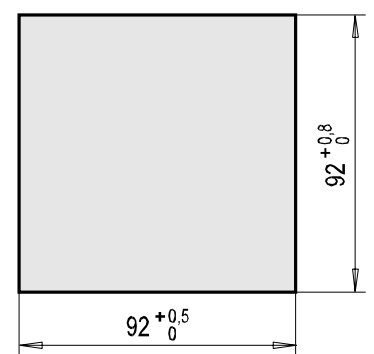
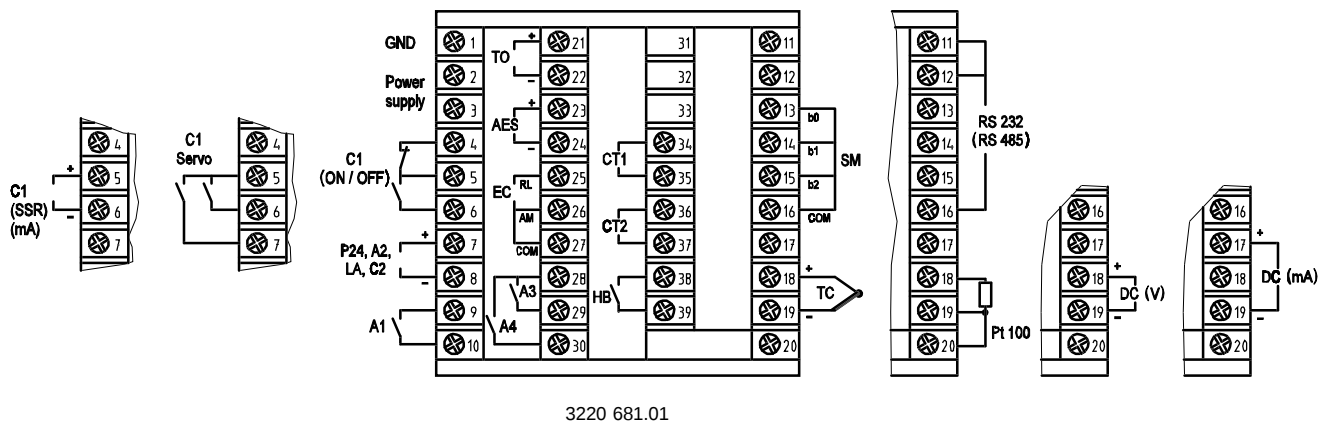
Control output	control output and the optional 2nd control output (heating/cooling) are available independent of each other in 3 different versions, alltimes relay contact (2 contacts, common contact root) with instrument feature three-step controller (Servo ON/OFF) • relay contact load: AC 250 V, 3 A (ohmic load) AC 250 V, 1 A (inductive load, $\cos \varphi = 0.4$) • logic level DC 0 / 12 V max. 40 mA (short circuit-proof) for solid state relay • analogue current signal 4 ... 20 mA (load max. 550 Ω)
Alarm output	one alarm output is part of the standard version, optionally available are up to four alarm outputs, alarm output 3 and 4 have a common contact root relay contact load: AC 250 V, 3 A (ohmic load) AC 250 V, 1 A (inductive load, $\cos \varphi = 0.4$) switching logic 5 different versions settable, to some extent also with stand-by function hysteresis settable: 0.1 ... 100.0 K
Loop alarm	available instead alarm output 2 relay contact load: AC 250 V, 3 A (ohmic load) AC 250 V, 1 A (inductive load, $\cos \varphi = 0.4$)
Heater burnout alarm	(not available with control output in analogue current signal 4 ... 20 mA), for 1 phase or 3 phase systems, max. 20 A or 50 A, current converter is supplied with controller relay contact load: AC 250 V, 3 A (ohmic load) AC 250 V, 1 A (inductive load, $\cos \varphi = 0.4$) hysteresis settable: 0.1 ... 100.0 K
Retransmission output	0 ... 20 mA (load max. 550 Ω) 4 ... 20 mA (load max. 550 Ω) 0 ... 1 V (load min. 100 kΩ) 1 ... 5 V (load min. 100 kΩ)
Transmitter supply	DC 24 V, max. 30 mA
Serial interface	RS 232-C RS 485
Remote setting	0 ... 20 mA (input impedance 50 Ω) 4 ... 20 mA (input impedance 50 Ω) 0 ... 1 V (input impedance 1 MΩ) 1 ... 5 V (input impedance 1 MΩ)
Parameter memory	7-fold, the control parameters as well as all other configuration data can be stored
Ambient conditions	ambient temperature: 0 ... +50 $^{\circ}\text{C}$ storage temperature: -20 ... +50 $^{\circ}\text{C}$ humidity: 35 ... 85 % relative humidity, noncondensing
Case	for switch panel mounting 96 mm x 96 mm dimensions: 96 mm x 96 mm x 110 mm (W x H x D) case material: polycarbonate, flame resistant operation: key pad colour: black ingress protection: panel front IP 50 (IEC 529 / EN 60 529) mounting: screw brackets, for switch panel thickness up to 15 mm weight: approx. 500 g

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	$\pm 1\text{ K}$ in ambient temperature range $0 \dots 50\text{ }^{\circ}\text{C}$

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****Legend:**

Power supply	power supply
GND	ground
C1	control output (ON / OFF) relay
	(SSR) logic level
	(mA) analogue current signal
TC	input thermocouple
Pt 100	input resistance thermometer
DC (V)	voltage input
DC (mA)	current input
A1	alarm output 1

optional:

C1 Servo	control output for Servo ON / OFF
A2 up to A4	alarm output 2 up to 4
LA	loop alarm
TO	retransmission output
C2	control output for heating / cooling
HB	heater burnout alarm
RS 232	serial interface RS 232-C
RS 485	serial interface RS 485
CT 1, CT 2	connection of current converter
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
1		Control characteristic
		3 PID (setable control parameter)
		5 PID ON/OFF Servo (setable control parameter)
2		Control output
		R relay
		S logic level DC 0/12 V for solid state relay 1)
3		A analogue current signal (4 ... 20 mA) 1)
		Input configuration
		K1 thermocouple type K (NiCr-Ni), range -200 ... +1370 °C 2)
4		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)
5		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)
6		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)
7		74 current input (4 ... 20 mA) 2)
		70 current input (0 ... 20 mA) 2)
		91 voltage input (0 ... 1 V) 2)
8		Power supply
		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
Options:		
Alarm output 2		
5	AS	setable switching logic 1)
	AR	loop monitoring 1)
Control output for heating/cooling (three-step)		
5	DR	relay 1) 3)
	DS	logic level DC 0/12 V for solid state relay 1) 3)
	DA	analogue current signal (4 ... 20 mA) 1) 3)
Retransmission output		
5	TA	4 ... 20 mA
	TV	0 ... 1 V
Heater burnout alarm		
5	W12	for 1 phase (max. 20 A) 1) 4)
	W15	for 1 phase (max. 50 A) 1) 4)
	W32	for 3 phase (max. 20 A) 1) 4)
	W35	for 3 phase (max. 50 A) 1) 4)
Serial communication		
5	C2	RS 232-C
	C5	RS 485
Remote setting		
5	EA0	0 ... 20 mA
	EA4	4 ... 20 mA
	EV0	0 ... 1 V
	EV1	1 ... 5 V
Additional alarm outputs		
5	4SA	Alarm 3 and 4
Parameter memory		
5	SM	7-fold
Terminal connections		
5	KA	with additional terminal cover <i>Without terminal cover as standard</i>
Ingress protection		
5	IP	IP 54 <i>In front IP 50 as standard</i>
Transmitter supply		
5	P24	DC 24 V max. 30 mA 3)
Instrument configuration		
5	V?	to customer's specifications <i>Please state as additional text</i>

Order code:

1	2	3	4	Options (Field No. 5):	5)
CF1L	-	A	-	/	M

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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