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**BrainChild**

**BC-140.20E**

## PROCESS TEMPERATURE CONTROLLERS

### BTC 4300 (96x96mm) BTC8300 (96X48mm) BTC9300 (48X48mm)



#### SPECIFICATIONS

##### Power supply

90 - 264 VAC, 47 - 63 Hz, 15VA, 7W maximum  
11 - 26 VAC / VDC, SELV, Limited energy, 15VA, 7W maximum

##### Input 1

##### Characteristics

Type	Range	Accuracy @ 25 °C	Input Impedance
J	-120 ~ 1000 °C (-184 ~ 1832 °F)	±2 °C	2,2MΩ
K	-200 ~ 1370 °C (-328 ~ 2498 °F)	±2 °C	2,2MΩ
T	-250 ~ 400 °C (-418 ~ 752 °F)	±2 °C	2,2MΩ
E	-100 ~ 900 °C (-148 ~ 1652 °F)	±2 °C	2,2MΩ
B	-0 ~ 1820 °C (-32 ~ 3308 °F)	±2 °C (200 - 1820°C)	2,2MΩ
R	-0 ~ 1768 °C (-32 ~ 3214 °F)	±2 °C	2,2MΩ
S	-0 ~ 1768 °C (-32 ~ 3214 °F)	±2 °C	2,2MΩ
N	-250 ~ 1300 °C (-418 ~ 2372 °F)	±2 °C	2,2MΩ
L	-200 ~ 900 °C (-328 ~ 1652 °F)	±2 °C	2,2MΩ
PT100 (DIN)	-210 ~ 700 °C (-346 ~ 1292 °F)	±0,4°C	1,3 KΩ
PT100 (JIS)	-200 ~ 600 °C (-328 ~ 1112 °F)	±0,4°C	1,3KΩ
mV	-8 ~ 70mV	±0,05%	2,2MΩ
mA	-3 ~ 27mA	±0,05%	70,5Ω
V	-1,3 ~ 11,5V	±0,05%	302KΩ

Resolution : 18 bits

Sampling Rate : 5 times / second

Maximum Rating : -2 VDC minimum, 12 VDC maximum( 1 minute for mA input )

Temperature Effect : ±1.5 uV/ °C for all inputs except mA input ±3.0 uV/ °C for mA input

#### DESCRIPTION

The Fuzzy Logic plus PID microprocessor-based temperature controller, incorporate two bright, easy to read 4-digit LED displays, indicating process value and set point value. The Fuzzy Logic technology enables a process to reach a predetermined set point in the shortest time, with the minimum of overshoot during power-up or external load disturbance.

#### FEATURES

- High accuracy 18-bit input A-D
- High accuracy 15-bit output D-A
- Fast input sample rate (5 times / second)
- Basic & full function
- User menu configurable
- Pump control
- Fuzzy+PID microprocessor-based control
- Automatic programming
- Differential control
- Auto-tune function
- Self-tune function
- Sleep mode function
- "Soft-start " ramp and dwell timer
- Programmable inputs (thermocouple,RTD,mA,VDC)
- Analog input for remote set point and CT
- Event input for changing function & set point
- Programmable digital filter
- Hardware lockout + remote lockout protection
- Loop break alarm
- Heater break alarm
- Sensor break alarm+Bumpless transfer
- RS-485,RS-232 communication
- Analog retransmisión
- Signal conditioner DC power supply
- A wide variety of output modules available
- Safety UL / CSA / IEC1010-1
- EMC / CE 1326

#### Sensor Lead Resistance Effect :

T/C: 0.2uV/ohm

3-wire RTD: 2.6 °C/ohm of resistance difference of two leads

2-wire RTD: 2.6 °C/ohm of resistance sum of two leads 200nA

Common Mode Rejection Ratio ( CMRR ) : 120dB

Normal Mode Rejection Ratio ( NMRR ) : 55dB

#### Sensor Break Detection :

Sensor open for TC, RTD and mV inputs,

below 1 mA for 4-20 mA input,

below 0.25V for 1 - 5 V input, unavailable for other inputs.

#### Sensor Break Responding Time :

Within 4 seconds for TC, RTD and mV inputs,

0.1 second for 4-20 mA and 1 - 5 V inputs.

## Input 2

Resolution : 18 bits  
 Sampling Rate : 1.66 times / second  
 Maximum Rating : -2 VDC minimum, 12 VDC maximum  
 Temperature Effect :  $\pm 1.5\mu\text{V}/^\circ\text{C}$  for all inputs except mA  
 input  $\pm 3.0\mu\text{V}/^\circ\text{C}$  for mA input  
 Common Mode Rejection Ratio ( CMRR ) : 120dB  
 Normal Mode Rejection Ratio ( NMRR ) : 55dB  
 Sensor Break Detection : Below 1 mA for 4-20 mA input,  
 below 0.25V for 1 - 5V input,  
 unavailable for other inputs.  
 Sensor Break Responding Time : 0.5 second

Characteristics :

Type	Range	Accuracy@ 25 °C	Input Impedance
CT94-1	0-50,0 A	$\pm 2\%$ of Reading $\pm 0,2\text{A}$	302K
mA	-3mA- 27mA	$\pm 0,05\%$	70,5 +0,8V / input current
V	-1,3V- 11,5V	$\pm 0,05\%$	302K

## Input 3 (event input)

Logic Low : -10V minimum, 0.8V maximum.  
 Logic High : 2V minimum, 10V maximum  
 External pull-down Resistance : 400 K maximum  
 External pull-up Resistance : 1.5 M minimum  
 Functions :  
 Select second set point and/or PID , reset alarm 1 and/or  
 alarm 2 , disable output 1 and/or output 2 , remote lockout..

## Output 1 / Output 2

Relay Rating : 2A/240 VAC, life cycles 200,000 for resistive  
 load  
 Pulsed Voltage : Source Voltage 5V, current limiting  
 resistance 66 .

Linear Output Characteristics:

Type	Zero Tolerance	Span Tolerance	Load Capacity
4-20 mA	3,8-4 mA	20-21 mA	500Ω máx.
0-20 mA	0 mA	20-21 mA	500Ω máx.
0-5 V	0 V	5-5,25 V	10KΩ mín.
1-5 V	0,95-1 V	5-5,25 V	10KΩ mín.
0-10 V	0 V	10-10,5 V	10KΩ mín.

Linear Output

Resolution : 15 bits  
 Output Regulation : 0.01 % for full load change  
 Output Settling Time : 0.1 sec. ( stable to 99.9 % )  
 Isolation Breakdown Voltage : 1000 VAC  
 Temperature Effect :  $\pm 0.0025\%$  of SPAN / °C  
 Triac ( SSR ) Output  
 Rating : 1A / 240 VAC  
 Inrush Current : 20A for 1 cycle  
 Min. Load Current : 50 mA rms  
 Max. Off-state Leakage : 3 mA rms  
 Max. On-state Voltage : 1.5 V rms  
 Insulation Resistance : 1000 Mohms min. at 500 VDC  
 Dielectric Strength : 2500 VAC for 1 minute

DC Voltage Supply Characteristics  
 (Installed at Output 2)

Type	Tolerance	Max. Output Current	Ripple Voltage	Isolation Barrier
20 V	$\pm 1,0\text{V}$	25 mA	0,2 Vp-p	500 VAC
12 V	$\pm 0,6\text{V}$	40 mA	0,1 Vp-p	500 VAC
5 V	$\pm 0,25\text{V}$	80 mA	0,05 Vp-p	500 VAC

## Alarm 1/ Alarm 2 (Output 2)

Alarm 1 Relay :  
 Form A or Form B for BTC-9300, Form C for BTC4300,  
 BTC-8300, 5V Logic output for BTC-2500 Max. Rating  
 2A/240VAC, life cycles 200,000 for resistive load.  
 Alarm 2 Relay :  
 Form A,Max. rating 2A/240VAC, life cycles 200,000 for  
 resistive load.  
 Alarm Functions :  
 Dwell timer,  
 Deviation High / Low Alarm,  
 Deviation Band High / Low Alarm,  
 PV1 High / Low Alarm,  
 PV2 High / Low Alarm,  
 PV1 or PV2 High /Low Alarm,  
 PV1-PV2 High /Low Alarm,  
 Loop Break Alarm,  
 Sensor Break Alarm.  
 Alarm Mode : Normal, Latching, Hold, Latching / Hold.  
 Dwell Timer : 0 - 6553.5 minutes

## Data communication

Interface : RS-232 ( 1 unit ), RS-485 ( up to 247 units )  
 Protocol : Modbus Protocol RTU mode  
 Address : 1 - 247  
 Baud Rate : 0.3 ~ 38.4 Kbits/sec  
 Data Bits : 7 or 8 bits  
 Parity Bit : None, Even or Odd  
 Stop Bit : 1 or 2 bits  
 Communication Buffer : 50 bytes

## Analog retransmission

Functions : PV1, PV2, PV1-PV2, PV2-PV1, Set Point,  
 MV1, MV2, PV-SV deviation value  
 Output Signal : 4-20 mA, 0-20 mA, 0-1V, 0-5V, 1-5V, 0-10V  
 Resolution : 15 bits  
 Accuracy :  $\pm 0.05\%$  of span  $\pm 0.0025\%$  / °C  
 Load Resistance : 0 - 500 ohms ( for current output ), 10 K  
 ohm minimum ( for voltage output )  
 Output Regulation : 0.01 % for full load change  
 Output Settling Time : 0.1 sec. (stable to 99.9 % )  
 Isolation Breakdown Voltage : 1000 VAC min.  
 Integral Linearity Error :  $\pm 0.005\%$  of span  
 Temperature Effect :  $\pm 0.0025\%$  of span/ °C  
 Saturation Low : 0 mA ( or 0V )  
 Saturation High : 22.2 mA ( or 5.55V, 11.1V min. )  
 Linear Output Range : 0 - 22.2mA(0-20mA or 4-20mA),  
 0 - 5.55V ( 0 - 5V, 1 - 5V ),  
 0 - 11.1 V ( 0 - 10V )

## User interface

Dual 4-digit LED Displays :

BTC-4300 Upper 0.55" ( 14mm )

Lower 0.4" ( 10 mm )

BTC-8300, BTC-9300 Upper 0.4" ( 10 mm )

Lower 0.31" ( 8 mm )

Keypad : 3 keys

Programming Port : For automatic setup, calibration and testing

Communication Port : Connection to PC for supervisory control

## Control mode

Output 1 : Reverse ( heating ) or direct ( cooling ) action

Output 2 : PID cooling control, cooling P band 1 ~ 255% of PB

ON-OFF : 0.1 - 55.6 ( °C ) hysteresis control ( P band = 0 )

P or PD : 0 - 100.0 % offset adjustment

PID : Fuzzy logic modified , Proportional band 0 ~ 500.0 °C

Integral time 0 - 1000 seconds , Derivative time 0 - 360.0 seconds

Cycle Time : 0.1 - 100.0 seconds

Manual Control : Heat (MV1) and Cool (MV2)

Auto-tuning : Cold start and warm start

Failure Mode : Auto-transfer to manual mode while sensor break or A-D converter damage

Ramping Control : 0 ~ 500.0 °C/minute or 0 ~ 500.0 °C/hour ramp rate

Sleep Mode : Enable or Disable

Ramping Control : 0 ~ 500.0 °C/minute or 0 ~ 500.0 °C/hour ramp rate

Power Limit : 0 - 100 % output 1 and output 2

Pump / Pressure Control : Sophisticated functions provided

Remote Set Point : Programmable range for voltage or current input

Differential Control : Control PV1 - PV2 at set point

Digital Filter

Function : First order

Time Constant : 0, 0.2, 0.5, 1, 2, 5, 10, 20, 30, 60 seconds programmable

## Environmental & Physical

Operating Temperature : -10°C to 50°C

Storage Temperature : -40°C to 60°C

Humidity : 0 to 90 % RH ( non-condensing )

Insulation Resistance : 20 Mohms min. ( at 500 VDC )

Dielectric Strength : 2000 VAC, 50/60 Hz for 1 minute

Vibration Resistance : 10 - 55 Hz, 10 m/s<sup>2</sup> for 2 hours

Shock Resistance : 200 m/s<sup>2</sup> ( 20 g )

Moldings : Flame retardant polycarbonate

Dimensions :

BTC-4300 ---96mm(W) X 96mm(H) X 66mm(D), 53 mm depth behind panel

BTC-8300 ---48mm(W) X 96mm(H) X 80mm(D), 65 mm depth behind panel

BTC-9300 ---50.7mm(W) X 50.7mm(H) X 88.5mm(D), 75mm depth behind panel

Mounting:

BTC-4300 ---panel mount, cutout 92 X 92 ( mm )

BTC-8300 ---panel mount, cutout 45 X 92 ( mm )

BTC-9300 ---panel mount, cutout 45 X 45 ( mm )

Weight :

BTC-4300 --- 255 grams

BTC-8300 --- 220 grams

BTC-9300 --- 150 gram

## Approval Standards

Safety : UL 61010C-1 , CSA C22.2 No. 24-93 , EN61010-1 (IEC1010-1)

Protective Class :

BTC-8300, BTC-4300:

IP 20 housing and terminals with protective covers.

BTC-2500, BTC-9300:

NEMA 4X(IP65) front panel , IP 20 housing and terminals

EMC : EN61326

### ORDERING CODE BTC 9300 (48x48mm)

1 2 3 4 5 6

#### 1 Power supply

4: 90 - 264 VAC, 47-63 HZ

5: 11 - 26 VAC or VDC, SELV, Limited Energy

#### 2 Signal input

1: Standard Input

Input 1-Universal Input

Thermocouple: J, K, T, E, B, R, S, N, L

RTD: PT100 DIN, PT100 JIS

Current: 4 - 20mA, 0 - 20mA

Voltage: 0 - 1V, 0 - 5V, 1 - 5V, 0-10V

Input 2-CT: 0 - 50 Amp.AC

Current Transformer

Analog Input: 4-20mA, 0-20mA,

0 - 1V, 0 - 5V, 1 - 5V, 0 - 10V

Input 3-Event Input (EI)

9: Special Order

### ORDERING CODE BTC 8300 (48x96mm) BTC 4300 (96x96mm)

1 2 3 4 5 6 7

#### 1 Power supply

4: 90 - 264 VAC, 47-63 HZ

5: 11 - 26 VAC or VDC, SELV, Limited Energy

#### 2 Signal input

1: Standard Input

Input 1-Universal Input

Thermocouple: J, K, T, E, B, R, S, N, L

RTD: PT100 DIN, PT100 JIS

Current: 4 - 20mA, 0 - 20mA

Voltage: 0 - 1V, 0 - 5V, 1 - 5V, 0-10V

Input 2-CT: 0 - 50 Amp.AC

Current Transformer

Analog Input: 4-20mA, 0-20mA,

0 - 1V, 0 - 5V, 1 - 5V, 0 - 10V

Input 3-Event Input (EI)

9: Special Order

## BTC 9300

### 3 Output 1

- 0: None
- 1: Relay rated 2A / 240VAC
- 2: Pulsed voltage to drive SSR, 5V / 30mA
- 3: Isolated 4 - 20mA / 0 - 20mA
- 4: Isolated 1 - 5V / 0 - 5V
- 5: Isolated 0 - 10V
- 6: Triac output 1A / 240VAC, SSR
- C: Pulsed Voltage to drive SSR, 14V/40mA
- 9: Special order

### 4 Output 2 / Alarm 2

- 0: None
- 1: Form A relay 2A / 240VAC
- 2: Pulsed voltage to drive SSR, 5V / 30mA
- 3: Isolated 4 - 20mA / 0 - 20mA
- 4: Isolated 1 - 5V / 0 - 5V
- 5: Isolated 0 - 10V
- 6: Triac output, 1A / 240VAC, SSR
- 7: Isolated 20V / 25 mA DC Output Power Supply
- 8: Isolated 12V / 40 mA DC Output Power Supply
- 9: Isolated 5V / 80 mA DC Output Power Supply
- C: Pulsed Voltage to drive SSR, 14V/40mA
- A: Special order

### 5 Alarm 1

- 0: None
- 1: Form A relay 2A / 240VAC
- 2: Relé forma B 2A / 240VAC
- 9: Pedido especial

### 6 Communications

- 0: None
- 1: RS-485 interface
- 2: RS-232 interface
- 3: Retransmit 4 - 20 mA / 0 - 20 mA
- 4: Retransmit 1 - 5V / 0 - 5V
- 5: Retransmit 0 - 10V
- 9: Special order

## BTC 8300

## BTC 4300

### 3 Output 1

- 0: None
- 1: Relay rated 2A / 240VAC
- 2: Pulsed voltage to drive SSR, 5V / 30mA
- 3: Isolated 4 - 20mA / 0 - 20mA
- 4: Isolated 1 - 5V / 0 - 5V
- 5: Isolated 0 - 10V
- 6: Triac output 1A / 240VAC, SSR
- C: Pulsed Voltage to drive SSR, 14V/40mA
- 9: Special order

### 4 Output 2 / Alarm 2

- 0: None
- 1: Form A relay 2A / 240VAC
- 2: Pulsed voltage to drive SSR, 5V / 30mA
- 3: Isolated 4 - 20mA / 0 - 20mA
- 4: Isolated 1 - 5V / 0 - 5V
- 5: Isolated 0 - 10V
- 6: Triac output, 1A / 240VAC, SSR
- 7: Isolated 20V / 25 mA DC Output Power Supply
- 8: Isolated 12V / 40 mA DC Output Power Supply
- 9: Isolated 5V / 80 mA DC Output Power Supply
- C: Pulsed Voltage to drive SSR, 14V/40mA
- A: Special order

### 5 Alarm 1

- 0: None
- 1: Form A relay 2A / 240VAC
- 9: Special order

### 6 Alarm 2

- 0: None
- 1: Form A relay 2A / 240VAC
- 9: Special order

### 7 Communications

- 0: None
- 1: RS-485 interface
- 2: RS-232 interface
- 3: Retransmit 4 - 20 mA / 0 - 20 mA
- 4: Retransmit 1 - 5V / 0 - 5V
- 5: Retransmit 0 - 10V
- 9: Special order