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202101

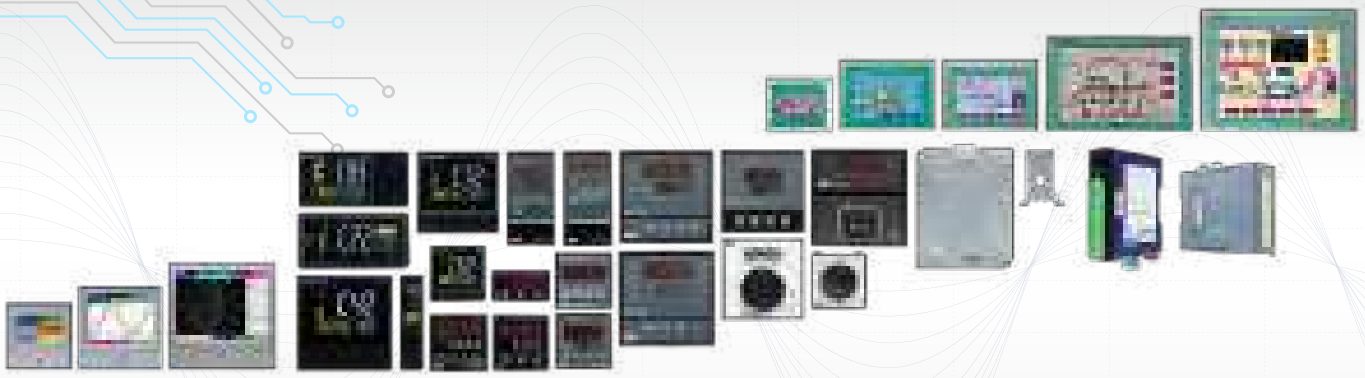


TABLE OF CONTENTS

C22

C62

C82

C83

High Performance Process & Temperature Controllers

C72

C42

R22

Features

01. Multi Color LCD Display	02. High Accuracy 18 Bit A-D Input and 15 Bit D-A Output
03. 200 msec Sampling Rate	04. Universal Inputs of Thermocouple, RTD, mA, VDC
05. Fuzzy+ PID Control and Auto-Tuning	06. Soft-Start Function
07. Possibility of both RS-485 and Analog Retransmission	08. Ramp & Soak Profiler
09. CT Inputs for Heater-Break Detection	10. Bumpless Transfer
11. Remote Setpoint and Up to 6 Event Inputs	12. Bidirectional Menu Navigation
13. Lockout Protection	14. Approvals: UL, cUL, CE, RoHS, WEEE

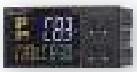
Specifications

Model


C22


C62


C82


C83


C72


C42

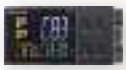

R22

Power Supply	90 to 250 VAC, 47–63 Hz ; 11 to 40 VDC / 20 to 28 VAC, 47–63 Hz
Power Consumption	C22/R22: 8VA, 4W maximum, C62: 10VA, 5W maximum, C72/C82/C83/C42: 12VA, 6W maximum

Signal Input				
Type	Thermocouple (J, K, T, E, B, R, S, N, L, U, P, C, D), RTD (PT100 (DIN), PT100 (JIS)), Current (mA), Voltage (V,mV)			
Resolution	18 Bits			
Sampling Rate	5 Times / Second (200 msec)			
Maximum Rating	-2 VDC minimum, 12 VDC maximum			
Input Characteristics	**Type**	**Range**	**Accuracy @ 25℃**	**Input Impedance**
	J	-120℃ to 1,000.0℃ (-184 ℉ to 1,832 ℉)	±2℃	2.2 MΩ
	K	-200℃ to 1,370.0℃ (-328 ℉ to 2,498 ℉)	±2℃	2.2 MΩ
	T	-250℃ to 400.0℃ (-418 ℉ to 752 ℉)	±2℃	2.2 MΩ
	E	-100℃ to 900.0℃ (-148 ℉ to 1,652 ℉)	±2℃	2.2 MΩ
	B	0℃ to 1,820.0℃ (32 ℉ to 3,308 ℉)	±2℃ (200℃ to 1,800℃)	2.2 MΩ
	R	0℃ to 1,767.8℃ (32 ℉ to 3,214 ℉)	±2℃	2.2 MΩ
	S	0℃ to 1,767.8℃ (32 ℉ to 3,214 ℉)	±2℃	2.2 MΩ
	N	-250℃ to 1,300.0℃ (-418 ℉ to 2,372 ℉)	±2℃	2.2 MΩ
	L	-200℃ to 900.0℃ (-328 ℉ to 1,652 ℉)	±2℃	2.2 MΩ
	U	-200℃ to 600.0℃ (-328 ℉ to 1,112 ℉)	±2℃	2.2 MΩ
	P	0℃ to 1,395.0℃ (32 ℉ to 2,543 ℉)	±2℃	2.2 MΩ
	C	0℃ to 2,300.0℃ (32 ℉ to 4,172 ℉)	±2℃	2.2 MΩ
	D	0℃ to 2,300.0℃ (32 ℉ to 4,172 ℉)	±2℃	2.2 MΩ
	PT100 (DIN)	-200℃ to 850.0℃ (-328 ℉ to 1,562 ℉)	±0.4℃	1.3 KΩ
	PT100 (JIS)	-200℃ to 600.0℃ (-328 ℉ to 1,112 ℉)	±0.4℃	1.3 KΩ
	mA	-3 mA to 27 mA	±0.05%	2.5 Ω
	VDC	-1.3 VDC to 11.5VDC	±0.05%	1.5 MΩ
	mV	0 to 50 mV	±0.05%	2.2 MΩ
Temperature Effect	1.5 μV/℃ for all inputs except mA input, 3.0 μV/℃ for mA			
Sensor Lead Resistance Effect	Thermocouple : 0.2 μV/Ω ; 3-wire RTD : 2.6℃/Ω of Difference of Resistance of two leads ; 2-wire RTD : 2.6℃/Ω of Sum of Resistance of two leads			
Burn-out Current	200 nA			
Common Mode Rejection Ratio (CMRR)	120 dB			
Normal Mode Rejection Ratio (NMRR)	55 dB			
Sensor Break Detection	Sensor open for Thermocouple and RTD inputs, sensor short for RTD input, below 1 mA for 4–20mA input, below 0.25 VDC for 1–5VDC input, not available for other inputs			
Sensor Break Responding Time	Within 4 seconds for Thermocouple and RTD inputs, 0.1 second for 4–20mA and 1–5VDC inputs			

Model




C22 C62 C82 C83 C72 C42 R22

Remote Set Point Input							
Type	Linear Current, Linear Voltage						
Range	-3 mA to 27 mA, -1.3 VDC to 11.5 VDC						
Accuracy	±0.05 %						
Remote Set Point Option	Not Available	Not Available	Available	Available	Available	Available	Not Available
Input Impedance	Current：2.5 Ω, Voltage：1.5 MΩ						
Resolution	18 Bits						
Sampling Rate	1.66 Times / Second						
Maximum Rating	280 mA maximum for Current Input, 12 VDC maximum for Voltage Input						
Temperature E□ect	±1.5 µV / ℃ for Voltage Input, ±3.0 µV / ℃ for Current Input						
Sensor Break Detection	Below 1 mA for 4 – 20mA input, below 0.25 VDC for 1 – 5VDC input, not available for other inputs						
Sensor Break Responding Time	0.1 Seconds						

Event Input							
Number of Event Input	1	2	6	6	2	6	2
Logic Low	-10 VDC minimum, 0.8VDC maximum						
Logic High	2 VDC minimum, 10VDC maximum						
Function	Refer to user manual						

CT Input	
CT Type	CT98-1
Accuracy	±5 % of Full Scale Reading, ±1 digit maximum
Input Impedance	294 Ω
Measurement Range	0 to 50 A VAC
Output of CT	0 to 5 VDC
CT Mounting	Screw Mounting
Sampling Rate	1 Time / Second

Output 1 / Output 2	
Type	Relay, Pulsed Voltage, Linear Voltage and Linear Current
Relay Rating	2 A, 240 VAC, 200,000 Life Cycles for Resistive Load
Pulsed Voltage	Source Voltage 5 VDC, Current Limiting Resistance 66Ω
Linear Output Resolution	15 Bits
Linear Output Regulation	0.02 % for full load change
Linear Output Settling Time	0.1 Second (Stable to 99.9 %)
Isolation Breakdown Voltage	1,000 VAC
Temperature E□ect	±0.01% of Span / ℃
Load Capacity of Linear Output	Linear Current：500 Ω maximum, Linear Voltage：10 KΩ minimum
Linear Output Ranges	0-22.2mA (0 - 20mA/4 - 20mA), 0-5.55VDC (0 - 5VDC, 1 - 5VDC), 0 - 11VDC (0 - 10VDC)

Alarm	
Relay Type	Form A
Maximum Rating	2 A, 240 VAC, 200,000 Life Cycles for Resistive Load
Alarm Function	Dwell Timer, Deviation Low, Deviation High, Deviation Band Low, Deviation Band High, Process High, Process Low, Range Low, Range High, Range High Low, Heater Break, Heater Short, Profile End, Profile Holdback
Alarm Mode	Latching, Holding, Normal, Latching / Holding, Set Point Holding
Dwell Timer	0.1 to 4,553.6 Minutes

Data Communication	
Interface	RS-485
Protocol	Modbus RTU (Slave Mode)
Address	1 to 247
Baud Rate	2.8 KBPS to 115.2 KBPS
Parity Bit	None, Even or Odd
Stop Bit	1 or 2 Bits
Data Length	7 or 8 Bits
Communication Bu□er	160 Bytes

Analog Retransmission	
Output Signal	4 – 20mA, 0 – 20mA, 0 – 10VDC
Resolution	15 Bits
Accuracy	±0.05 % of Span ±0.0025% / ℃
Load Resistance	0 to 500 Ω for Current Output, 10 KΩ minimum for Voltage Output
Output Regulation	0.01 % for full load change
Output Setting Time	0.1 Second (Stable to 99.9 %)
Isolation Breakdown	1,000 VAC minimum
Integral Linearity Error	±0.005 % of Span

Model


C22


C62


C82


C83


C72


C42


R22

Analog Retransmission	
Temperature E□ect	±0.0025 % of Span / °C
Saturation Low	0 mA or 0 VDC
Saturation High	22.2 mA or 5.55 VDC, 11.1 VDC minimum
Linear Output Range	0 – 22.2mA (0 – 20mA / 4 – 20mA), 0 – 5.55VDC (0 – 5VDC / 1 – 5VDC), 0 – 11.1VDC (0 – 10VDC)

User Interface							
Keypad	4 Keys						
Display Type	4 Digit LCD Display						
Number of Display	2	2	3	3	3	3	2
Upper Display Size	0.4" (10 mm)	0.58" (15 mm)	0.7" (17.7 mm)	0.7" (17.7 mm)	0.58" (15 mm)	0.98" (25 mm)	0.31" (8 mm)
Lower Display Size	0.19" (4.8 mm)	0.3" (7.8 mm)	0.4" (11.2 mm)	0.4" (11.2 mm)	0.32" (8.3 mm)	0.55" (14 mm)	0.25" (6.5 mm)

Programming Port	
Interface	Micro USB
PC Communication Function	Parameter Configuration and Firmware Upgrade

Control Mode	
Output 1	Reverse (Heating) or Direct (Cooling) Action
Output 2	PID cooling control, Cooling P band 50 ~ 300% of PB, Dead band -36.0 ~ 36.0% of PB
ON-OFF	0.1~50.0℃ (0.1~ 90.0 ℉) hysteresis control (P band = 0)
P or PD	0 – 100.0 % o□set adjustment
PID	Fuzzy logic modified Proportional band 0.1~500.0℃(0.1~900.0℉), Integral time 0 – 3,600 Seconds, Derivative time 0 – 360.0 Seconds
Cycle Time	0.1 to 90.0 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℃ (0~900.0℉) / Minute or 0~500.0℃ (0~900.0℉) / Hour Ramp Rate

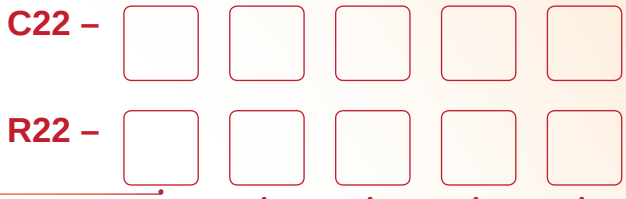
Digital Filter	
Function	First Order
Time Constant	0, 0.2, 0.5, 1, 2, 5, 10, 20, 30, 60 Seconds Programmable

Profiler							
Availability	No	No	Option	Option	Option	Option	No
No of Programs	N/A	N/A	4 / 2 / 1	4 / 2 / 1	4 / 2 / 1	4 / 2 / 1	N/A
Number of Segments / Program	N/A	N/A	4 / 8 / 16	4 / 8 / 16	4 / 8 / 16	4 / 8 / 16	N/A

Environmental and Physical Specifications							
Operating Temperature	-10 ℃ to 50 ℃						
Storage Temperature	-40 ℃ to 60 ℃						
Humidity	0 to 90 % RH (Non - Condensing)						
Altitude	2,000 Meters maximum						
Pollution	Degree II						
Insulation Resistance	20 MΩ minimum (@ 500 VDC)						
Dielectric Strength	2,000 VAC, 50 / 60 Hz for 1 Minute						
Vibration Resistance	10 to 55 Hz, 10 m / s^2 for 2 Hours						
Shock Resistance	200 m / s^2 (20 g)						
Molding	Flame Retardant Polycarbonate						
Mounting	Panel	Panel	Panel	Panel	Panel	Panel	DIN Rail
DIN Size	1/32	1/16	1/8	1/8	9/64	1/4	
Dimensions (W*H*D) (mm)	48*24*92	48*48*59	48*96*59	96*48*59	72*72*59	96*96*59	22.5*96*83
Depth Behind Panel (mm)	84	50	50	50	50	50	-
Cut Out Dimensions (mm)	45*22.2	45*45	45*92	92*45	68*68	92*92	-
Weight (grams)	120	160	220	220	190	290	160

Approval Standards	
Safety	UL61010-1, CSA 22.2 No.61010-1-12, EN61010-1(IEC1010-1), RoHS, REACH
Protective Class	IP50 for panel, IP20 for terminals and housing, all indoor use
EMC	EN61326

Ordering Code



Power Input

4： 90 to 250VAC, 47–63Hz

5： 11 to 40VDC / 20 to 28VAC, 47–63Hz

Output 1

1： Form A Relay

2： SSRD, 5VDC / 30mA

3： Isolated 4–20mA / 0–20mA (OM98-3)

5： Isolated 0–10VDC (OM98-5)

C： SSRD, 14VDC / 40mA (OM94-7)

Output 2/Alarm 1

0： None

1： Form A Relay

2： SSRD, 5VDC / 30mA

3： Isolated 4–20mA / 0–20mA (OM98-3)

5： Isolated 0–10VDC (OM98-5)

C： SSRD, 14VDC / 40mA (OM94-7)

Option 1

0： None

1： RS-485

2： 1 Event Input (EI1)

3： 1 CT Input (CT1)

Option 2

0： None

1： Retransmit 4–20mA / 0–20mA (OM98-3)

2： Retransmit 0–10VDC (OM98-5)

3： Alarm 2 (Form A relay)

4： 1 Event Input **(EI2 only for R22)**

5： 1 CT Input **(CT2 only for R22)**

Accessories for All Models

OM94-7 = 14VDC / 40mA SSR Drive Module

OM98-3 = Isolated 4–20mA / 0–20mA Analog Output Module

OM98-5 = Isolated 0–10VDC Analog Output Module

CM98-3 = Isolated 4–20mA / 0–20mA Retransmission Module for all models except C22 & R22

CM98-5 = Isolated 0–10VDC Retransmission Module for all models except C22 & R22

CT98-1 = Current Transformer 0-50A

PA98-1 = USB Programming Adaptor

CC98-1 = Programming Port Cable (1.5M)

BC-SET = Configuration Software

Related Products

SNA10A = Smart Network Adaptor for third party software, which converts 255 channels of RS-485 or RS-422 to RS-232 Network

Power Input

4： 90 to 250VAC, 47–63Hz

5： 11 to 40VDC / 20 to 28 VAC, 47–63Hz

Output 1

1： Form A Relay

2： SSRD, 5VDC / 30mA

3： Isolated 4–20mA / 0–20mA (OM98-3)

5： Isolated 0–10VDC (OM98-5)

C： SSRD, 14VDC / 40mA (OM94-7)

Output 2/Alarm 1

0： None

1： Form A Relay

2： SSRD, 5VDC / 30mA

3： Isolated 4–20mA / 0–20mA (OM98-3)

5： Isolated 0–10VDC (OM98-5)

C： SSRD, 14VDC / 40mA (OM94-7)

Alarm 2

0： None

1： Form A Relay

Option 1

0： None

1： RS-485

Option 2

0： None

1： 2 Event Inputs

2： 1 Event Input and 1 CT Input

3： 2 CT Inputs

Option 3

0： None

1： Retransmit 4–20mA / 0–20mA (CM98-3)

2： Retransmit 0–10VDC (CM98-5)

3： Alarm 3 (Form A Relay)

Option 4

0： None

1： Terminal Cover

C82 – ☐☐☐☐☐☐☐☐☐☐

C83 – ☐☐☐☐☐☐☐☐☐☐

C72 – ☐☐☐☐☐☐☐☐☐☐

C42 – ☐☐☐☐☐☐☐☐☐☐

Power Input

4： 90 to 250VAC, 47–63Hz

5： 11 to 40VDC / 20 to 28VAC, 47–63Hz

Output 1

1： Form A Relay

2： SSRD, 5VDC / 30mA

3： Isolated 4–20mA / 0–20mA (OM98-3)

5： Isolated 0–10VDC (OM98-5)

C： SSRD, 14VDC / 40mA (OM94-7)

Output 2/Alarm 1

0： None

1： Form A Relay

2： SSRD, 5VDC / 30mA

3： Isolated 4–20mA / 0–20mA (OM98-3)

5： Isolated 0–10VDC (OM98-5)

C： SSRD, 14VDC / 40mA (OM94-7)

Alarm 2 to 3

0： None

1： Form A Relay on Alarm 2

2： Form A Relay on Alarm 2 to 3

Event Inputs

0： None

1： 6 Event Inputs **(2 Event Inputs for C72)**

Option 1

0： None

1： RS-485 and Remote Setpoint

Option 2

0： None

1： 1CT Input and Remote Setpoint

2： 2CT Inputs and Remote Setpoint

Option 3

0： None

1： Retransmit 4–20mA / 0–20mA (CM98-3) and Remote Setpoint

2： Retransmit 0–10V (CM98-5) and Remote Setpoint

3： Alarm 4 (Form A Relay) and Remote Setpoint

4： Alarm 4 (Form A Relay), Retransmit 4-20 mA / 0-20mA (CM98-3) and Remote Setpoint **(Unavailable for C72)**

5： Alarm 4 (Form A Relay), Retransmit 0-10VDC (CM98-5) and Remote Setpoint **(Unavailable for C72)**

Option 4

0： None

1： Terminal Cover

2： Ramp & Soak Profiler

3： Terminal cover and Ramp & Soak Profiler

Fuzzy + PID
Process / Temperature Controller

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 retransmission
- Signal conditioner DC power supply
- A wide variety of output modules available
- Safety UL / CSA / IEC1010-1
- EMC / CE EN 61326

BTC-4300 BTC-8300 BTC-9300 BTC-2500

Overview

The Fuzzy Logic plus PID microprocessor-based controller series, incorporates a bright, easy to read 4-digit LED display, 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.

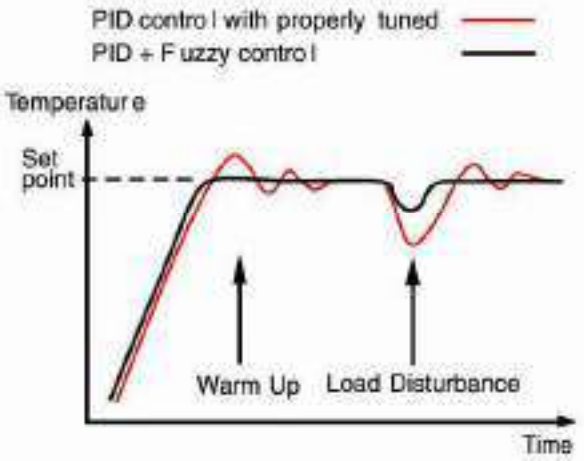
BTC-9300 is a 1/16 DIN size panel mount controller,
BTC-2500 is a 1/32 DIN size panel mount controller,
BTC-8300 is a 1/8 DIN size panel mount controller
and BTC-4300 is a 1/4 DIN size panel mount controller.

These units are powered by 11-26 VDC or 90-264 VAC supply, incorporating a 2 amp. control relay output as standard. Alternative output options include triac, 5V logic output, linear current and linear voltage. The units are fully programmable for PT100 and thermocouple types J, K, T, E, B, R, S, N, L with no need to modify the unit. The input signal is digitized by using a 16-bit A to D converter. Its fast sampling rate allows the unit to control fast processes.

Digital communications RS-485 or RS-232 are available as an additional option. These options allow the units to be integrated with supervisory control system and software.

A programming port is available for loading the configuration data with no need to use the keypads on front panel.

By using proprietary Fuzzy modified PID technology, the control loop will minimize the overshoot and undershoot in the shortest time. The following diagram is a comparison of results with and without Fuzzy technology.



High Accuracy

The series are manufactured with custom designed ASIC (Application Specific Integrated Circuit) technology which contains a 16-bit A to D converter for high resolution measurement (true 0.1°F resolution for thermocouple and PT100) and a 15-bit D to A converter for linear current or voltage control output. The ASIC technology provides improved operating performance, low cost, enhanced reliability and higher density.

Fast Sampling Rate

The sampling rate of the input A to D converter reaches 5 times/second. The fast sampling rate allow sthis series to control fast processes.

Fuzzy Control

The function of Fuzzy control is to adjust PID parameters from time to time in order to making manipulation output value more flexible and adaptive to various processes. The results is to enable a process to reach a predetermined set point in the shortest time, with the minimum of overshoot and undershoot during power-up or external load disturbance.

Digital Communication

The units are equipped with RS-485 or RS-232 interface card to provide digital communication. By using the twisted pair wires there are at most 247 units can be connected together via RS-485 interface to a host computer.

Programming Port

A programming port is used to connect the unit to a PC for quick configuration, also can be connected to an ATE system for automatic testing & calibration.

Auto-tune

The auto-tune function allows the user to simplify initial setup for a new system. A clever algorithm is provided to obtain an optimal set of control parameters for the process, and it can be applied either as the process is warming up (cold start) or as the process has been in steady state (warm start).

Lockout Protection

The parameters can be locked to prevent from being changed by using either Hardware lockout or Remote lockout or both.

Bumpless Transfer

Bumpless transfer allows the controller to continue to control by using its previous value as the sensor breaks. Hence, the process can be well controlled temporarily as if the sensor is normal.

Soft-start Ramp

The ramping function is performed during power up as well as any time the set point is changed. It can be ramping up or ramping down. The process value will reach the set point with a predetermined constant rate.

Digital Filter

A first order low pass filter with a programmable time constant is used to improve the stability of process value. This is particularly useful in certain application where the process value is too unstable to read.

SEL Function

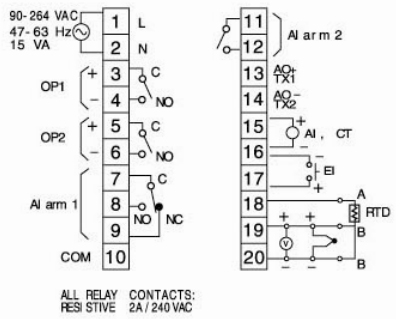
The units have the flexibility for user to select those parameters which is most significant to him and put these parameters in the front of display sequence. There are at most 5 parameters can be selected to allow the user to build his own display sequence.

Pump Control

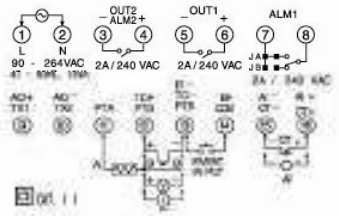
Only the superior noise rejection capability in addition to the fast sampling rate owned by this series of controllers can control the water pressure in a pump system which is driven by a variable speed motor.

Connection Diagrams

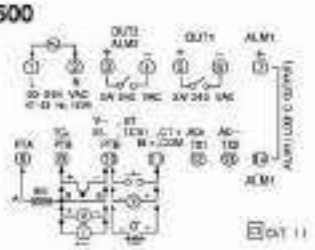
BTC-4300, BTC-8300



BTC-9300



BTC-2500



Specifications

Power

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

Input 1

Characteristics :

Type	Range	Accuracy @25°C	Input Impedance
J	-120°C -1000°C (-184°F -1832°F)	±2°C	2.2M
K	-200°C -1370°C (-328°F -2498°F)	±2°C	2.2M
T	-250°C -400°C (-418°F -752°F)	±2°C	2.2M
E	-100°C -600°C (-148°F -1652°F)	±2°C	2.2M
B	0°C -1820°C (32°F -3308°F)	±2°C (200°C - 1820°C)	2.2M
R	0°C -1767.8°C (32°F -3214°F)	±2°C	2.2M
S	0°C -1767.8°C (32°F -3214°F)	±2°C	2.2M
N	-250°C -1300°C (-418°F -2372°F)	±2°C	2.2M
L	-200°C -900°C (-328°F -1652°F)	±2°C	2.2M
PT100 (DIN)	-210°C -700°C (-346°F -1292°F)	±0.4°C	1.3K
PT100 (JIS)	-200°C -600°C (-328°F -1112°F)	±0.4°C	1.3K
mV	-8mV -70mV	±0.05%	2.2M
mA	-3mA -27mA	±0.05%	70.5
V	-1.3V -11.5V	±0.05%	302K

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
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 : 16 bits
Sampling Rate : 1.66 times / second
Maximum Rating : -2 VDC minimum, 12 VDC maximum
Emperature Effect : ±1.5uV/ °C for all inputs except mA input ±3.0uV/ °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 Impedence
CT94-1	0-50.0 A	±2% of Reading ±0.2 A	302 K
mA	-3mA-27mA	±0.05%	$70.5 + \frac{0.8V}{\text{input current}}$
V	-1.3V-11.5V	±0.05%	302 K

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	500 max.
0-20 mA	0 mA	20-21 mA	500 max.
0-5 V	0 V	5-5.25 V	10K min.
1-5 V	0.9-1 V	5-5.25 V	10K min.
0-10 V	0 V	10-10.5 V	10K min.

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 : ±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	±0.1 V	25 mA	0.2 Vp-p	500 VAC
12 V	±0.6 V	40 mA	0.1 Vp-p	500 VAC
5 V	±0.25 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. 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 : ±0.05 % of span ±0.0025 %/ °C
Load Resistance : 0 - 500 ohms (for current output), 10 K ohms 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 : ±0.005 % of span
Temperature Effect : ±0.0025 % of span/ LC
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)
BTC-2500	0.4"(10mm)

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^2 for 2 hours
Shock Resistance : 200 m/s^2 (20 g)
Moldings : Flame retardant polycarbonate
Dimensions :
BTC-4300 ---96mm(W) X 96mm(H) X 66 mm(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 86.5mm(D), 75mm depth behind panel
BTC-2500 ---50mm(W) X 26.5mm(H) X 110.5 mm(D), 98.0 mm 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)
BTC-2500 ---panel mount, cutout 45 X 22.2 (mm)
Weight :
BTC-4300 --- 255 grams
BTC-8300 --- 220 grams
BTC-9300 --- 150 grams
BTC-2500 --- 120 grams

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-2500- □ □ □ □ □ □

Power Input
4: 90 - 264 VAC, 50 / 60 HZ
5: 11 - 26 VAC or VDC
9: Special Order

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: 0 - 1V, 0 - 5V, 1 - 5V, 0 - 10V
Event Input (EI)
9: Special Order

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

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

Alarm 1
1: 5V Logic Output
9: Special order

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-9300- □ □ □ □ □ □

Power Input
4: 90 - 264 VAC, 50 / 60 HZ
5: 11 - 26 VAC or VDC
9: Special Order

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 - 20 mA, 0 - 20 mA
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

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

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-25mA DC Output Power Supply
8: Isolated 12V-40mA DC Output Power Supply
9: Isolated 5V-80mA DC Output Power Supply
C: Pulsed voltage to drive SSR, 14V / 40mA
A: Special order

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

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

BTC-8300 -
BTC-4300 - □ □ □ □ □ □ □

Power Input
4: 90-264 VAC, 50 / 60 HZ
5: 11-26 VAC or VDC
9: Special Order

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 -1 0V
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

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

Output 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 / 25mA DC Output Power Supply
8: Isolated 12V / 40mA DC Output Power Supply
9: Isolated 5V / 80mA DC Output Power Supply
C: Pulsed Voltage to drive SSR, 14V / 40mA
A: Special order

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

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

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

Accessories

CT94-1 = 0-50 Amp. AC Current Transformer
OM95-3 = Isolated 4-20mA / 0-20mA Analog Output Module
OM95-4 = Isolated 1 - 5V / 0-5V Analog Output Module
OM95-5 = Isolated 0 - 10V Analog Output Module
OM94-6 = Isolated 1A / 240VAC Triac Output Module (SSR)
OM94-7 = 14V / 40mA SSR Drive Module
DC94-1 = Isolated 20V / 25 mA DC Output Power Supply
DC94-2 = Isolated 12V / 40 mA DC Output Power Supply
DC94-3 = Isolated 5V / 80 mA DC Output Power Supply
CM94-1 = Isolated RS - 485 Interface Module
CM94-2 = Isolated RS - 232 Interface Module
CM94-3 = Isolated 4 - 20 mA / 0-20 mA Retransmission Module
CM94-4 = Isolated 1 - 5V / 0 - 5V Retransmission Module
CM94-5 = Isolated 0 - 10V Retransmission Module
CC94-1 = RS-232 Interface Cable (2M)
CC91-3 = Programming Port Cable

Related Products

SNA10A = Smart Network Adaptor for Third Party Software, converts 255 channels of RS-485 or RS-422 to RS-232 Network
SNA12A = Smart Network Adaptor for Programming Port to RS-232 interface
BC-Set = Configuration software

Auto-tune PID Temperature Controller

FEATURES

- Easy-to-use
- Fuzzy modified PID heat & cool control
- Fast A-D sampling rate (5 times/s)
- Universal input (PT100, thermocouple) with high accuracy 18-bit A-D
- Analog output (linear current or voltage) uses high accuracy 15-bit D-A
- RS-485 RS-232 interface
- Programming port provided on board
- Support manual control & auto-tune function
- Wide variety of alarm mode selection
- Lockout protection control
- Bumpless transfer during failure mode
- Soft-start ramp and dwell timer
- Bright display stabilized with digital filter
- SEL function allows to rearrange user menu
- UL/CSA/CE approval
- High performance with low cost

BTC-4100 BTC-7100 BTC-8100 BTC-9100

Overview

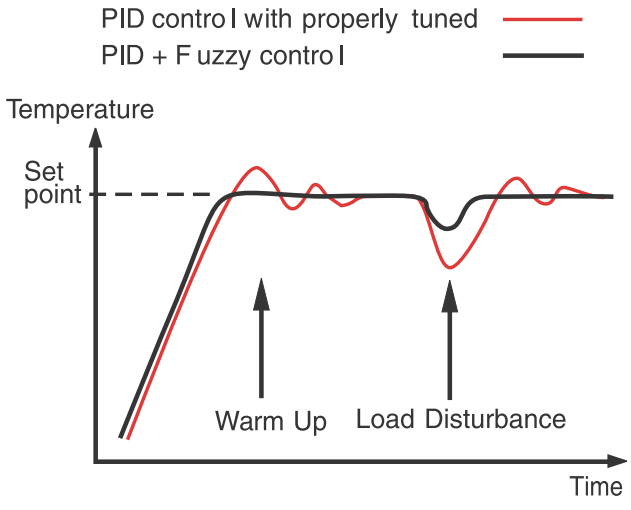
The Fuzzy Logic plus PID microprocessor-based controller series, incorporate two bright, easy to read 4-digit LED displays, indicating process value and set point value. The Fuzzy Logic technology enables a process to reach a predetermined set point in theshortest time, with the minimum of overshoot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

BTC-9100 is a 1/16 DIN size panel mount controller. BTC-7100 is a 72X72 DIN size panel mount controller. BTC-8100 is a 1/8 DIN size panel mount controller and BTC-4100 is a 1/4 DIN size panel mount controller. These units are powered by 11-26 or 90-250 VDC/VAC supply, incorporating a 2 amp. control relay output as standard. The second output can be used as cooling control, or an alarm. Both outputs can select triac, 5V logic output, linear current or linear voltage to drive external device. There are six types of alarm plus a dwell timer can be configured for the third output. The units are fully programmable for PT100 and thermocouple types J, K, T, E, B, R, S, N, L with no need to modify the unit. The input signal is digitized by using a 18-bit A to D converter. Its fast sampling rate allows the unit to control fast processes.

Digital communications RS-485 or RS-232 (for BTC-9100, BTC-08100, BTC-4100) are available as an additional option. These options allow the units to be integrated with supervisory control system and software.

Aprogramming port is available for automatic configuration, calibration and testing without the need to access the keys on front panel.

By using proprietary Fuzzy modified PID technology, the control loop will minimize the overshoot and undershoot in a shortest time. The following diagram is a comparison of results with and without Fuzzy technology.



High Accuracy

The series are manufactured with custom designed ASIC (Application Specific Integrated Circuit) technology which contains a 18-bit A to D converter for high resolution measurement (true 0.1°F resolution for thermocouple and PT100) and a 15-bit D to A converter for linear current or voltage control output. The ASIC technology provides improved operating performance, low cost, enhanced reliability and higher density.

Fast Sampling Rate

The sampling rate of the input A to D converter reaches 5 times/second. The fast sampling rate allows this series to control fast processes.

Fuzzy Control

The function of Fuzzy control is to adjust PID parameters from time to time in order to make manipulation output value more flexible and adaptive to various processes. The results is to enable a process to reach a predetermined set point in the shortest time, with the minimum of overshoot and undershoot during power-up or external load disturbance.

Digital Communication

The units are equipped with RS-485 or RS-232 interface card to provide digital communication. By using the twisted pair wires there are at most 247 units can be connected together via RS-485 interface to a host computer.

Programming Port

A programming port is used to connect the unit to a pc for quick configuration, also can be connected to an ATE system for automatic testing & calibration.

Auto-tune

The auto-tune function allows the user to simplify initial setup for a new system. A clever algorithm is provided to obtain an optimal set of control parameters for the process, and it can be applied either as the process is warming up (cold start) or as the process has been in steady state (warm start).

Lockout Protection

According to actual security requirement, one of four lockout levels can be selected to prevent the unit from being changed abnormally.

Bumpless Transfer

Bumpless transfer allows the controller to continue to control by using its previous value as the sensor breaks. Hence, the process can be well controlled temporarily as if the sensor is normal.

Soft-start Ramp

The ramping function is performed during power up as well as any time the set point is changed. It can be ramping up or ramping down. The process value will reach the set point with a predetermined constant rate.

Digital Filter

A first order low pass filter with a programmable time constant is used to improve the stability of process value. This is particularly useful in certain application where the process value is too unstable to be read.

SEL Function

The units have the flexibility for user to select those parameters which are most significant to him and put these parameters in the front of display sequence. There are at most 8 parameters can be selected to allow the user to build his own display sequence.

Specifications

Power

90-250 VAC, 47-63 Hz, 12VA, 5W maximum
11-26 VAC / VDC, 12VA, 5W maximum

Signal Input

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
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
Burn-out Current : 200nA
Common Mode Rejection Ratio (CMRR): 120dB
Normal Mode Rejection Ratio (NMRR): 55dB
Sensor Break Detection :
Sensor open for TC, RTD and mV inputs,
Sensor short for RTD input,
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.

Characteristics

Type	Range	Accuracy @25°C	Input Impedance
J	-120°C-1000°C (-184°F-1832°F)	±2°C	2.2MΩ
K	-200°C-1370°C (-328°F-2498°F)	±2°C	2.2MΩ
T	-250°C-400°C (-418°F-752°F)	±2°C	2.2MΩ
E	-100°C-900°C (-148°F-1652°F)	±2°C	2.2MΩ
B	0°C-1800°C (32°F-3272°F)	±2°C (200°C-1800°C)	2.2MΩ
R	0°C-1767.8°C (32°F-3214°F)	±2°C	2.2MΩ
S	0°C-1767.8°C (32°F-3214°F)	±2°C	2.2MΩ
N	-250°C-1300°C (-418°F-2372°F)	±2°C	2.2MΩ
L	-200°C-900°C (-328°F-1652°F)	±2°C	2.2MΩ
PT100 (DIN)	-210°C-700°C (-346°F-1292°F)	±0.4°C	1.3KΩ
PT100 (JIS)	-200°C-600°C (-328°F-1112°F)	±0.4°C	1.3KΩ
mV	-8mV - 70mV	±0.05%	2.2MΩ
mA	-3mA - 27mA	±0.05%	70.5Ω
V	-1.3V - 11.5V	±0.05%	650KΩ

Output 1 / Output 2

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

Type	Zero Tolerance	Span Tolerance	Load Capacity
4-20 mA	3.6-4 mA	20-21 mA	500Ωmax.
0-20 mA	0 mA	20-21 mA	500Ωmax.
0-5 V	0 V	5-5.25 V	10 KΩmin.
1-5 V	0.9-1 V	5-5.25 V	10 KΩmin.
0-10 V	0 V	10-10.5 V	10 KΩmin.

Linear Output

Resolution : 15 bits
Output Regulation : 0.02 % for full load change
Output Settling Time : 0.1 sec. (stable to 99.9 %)
Isolation Breakdown Voltage : 1000 VAC
Temperature Effect : ±0.01 % 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

Alarm

Alarm Relay : Form C, Max. rating 2A/240VAC, life cycles 200,000 for resistive load.
Alarm Functions : Dwell timer,
Deviation High / Low Alarm,
Deviation Band High / Low Alarm,
Process High / Low Alarm,
Alarm Mode : Normal, Latching, Hold, Latching / Hold.
Dwell Timer : 0.1 - 4553.6 minutes

Data Communication

Interface : RS-232 (1 unit), RS-485 (up to 247 units)
Protocol : Modbus Protocol RTU mode
Address : 1 - 247
Baud Rate : 2.4 ~ 38.4 Kbits/sec
Data Bits : 7 or 8 bits
Parity Bit : None, Even or Odd
Stop Bit : 1 or 2 bits
Communication Buffer : 160 bytes

Analog Retransmission

Output Signal : 4-20mA, 0-20mA, 0-5V, 1-5V, 0-10V
Resolution : 15 bits
Accuracy : ±0.05% of span ±0.0025%/°C
Load Resistance : 0-500 ohm (for current output)
10K ohm minimum (for voltage output)
Output Regulation : 0.01% for full load change

User Interface

Dual 4-digit LED Displays :
BTC-4100
Upper 0.55" (14mm)
Lower 0.4" (10 mm)

BTC-8100, BTC-7100, BTC-9100
Upper 0.4" (10 mm)
Lower 0.31" (8 mm)

Keypad : 4 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 50 ~ 300% of PB, dead band -36.0~36.0% of PB
ON-OFF : 0.1 - 90.0 (°F) hysteresis control (P band = 0)
P or PD : 0 - 100.0 % offset adjustment
PID : Fuzzy logic modified
Proportional band 0.1 ~ 900.0°F.
Integral time 0 - 1000 seconds
Derivative time 0 - 360.0 seconds
Cycle Time : 0.1 - 90.0 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 - 900.0°F/minute or 0 - 900.0°F/hour ramp rate

Digital Filter

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

Environmental & Physical

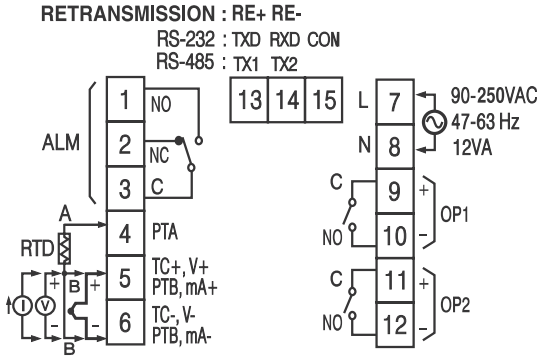
Operating Temperature : -10°C to 50°C
Storage Temperature : -40°C to 60°C
Humidity : 0 to 90 % RH (non-condensing)
Altitude : 2000m maximum
Pollution : Degree 2
Insulation Resistance : 20 Mohms min. (at 500 VDC)
Dielectric Strength : 2000 VAC, 50/60 Hz for 1 minute
Vibration Resistance : 10 - 55 Hz, 10 m/s² for 2 hours
Shock Resistance : 200 m/s² (20 g)
Moldings : Flame retardant polycarbonate
Dimensions :
BTC-4100 ---96mm(W) X 96mm(H) X 65 mm(D), 53 mm depth behind panel
BTC-7100 ---72mm(W) X 72mm(H) X 78.2 mm(D), 65 mm depth behind panel
BTC-8100 ---48mm(W) X 96mm(H) X 80mm(D), 65 mm depth behind panel
BTC-9100 ---48mm(W) X 48mm(H) X 116mm(D), 105 mm depth behind panel
Mounting:
BTC-4100 ---panel mount, cutout 92 X 92 (mm)
BTC-7100 ---panel mount, cutout 68 X 68 (mm)
BTC-8100 ---panel mount, cutout 45 X 92 (mm)
BTC-9100 ---panel mount, cutout 45 X 45 (mm)
Weight : BTC-4100 --- 250 grams
BTC-7100 --- 200 grams
BTC-8100 --- 210 grams
BTC-9100 --- 150 grams

Approval Standards

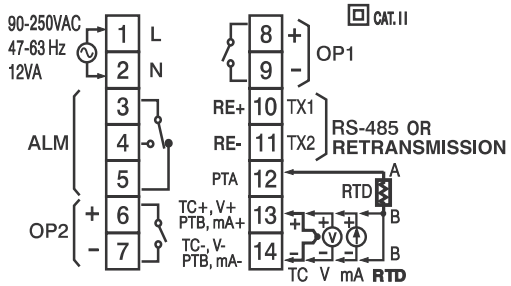
Safety : UL61010C-1
CSA C22.2 No. 24-93
EN61010-1 (IEC1010-1)
Protective Class :
IP65 front panel with additional option,
IP50 front panel without additional option,
all indoor use,
IP 20 housing and terminals with protective cover.
EMC: EN61326

Connection Diagrams

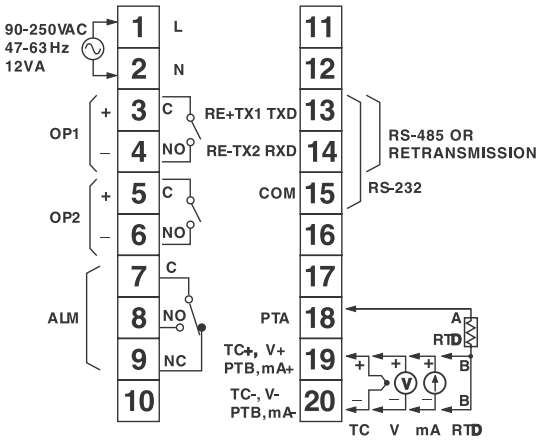
BTC-9100



BTC-7100



BTC-8100, BTC-4100



Ordering Code

BTC-9100 - □ □ □ □ □ □ □
BTC-8100 -
BTC-7100 -
BTC-4100 -

Power Input
4: 90 - 250 VAC, 50/60 HZ
5: 11 - 26 VAC or VDC
9: Special Order

Signal Input
1: Standard Input
Thermocouple: J, K, T, E, B, R, S, N, L
RTD: PT100 DIN, PT100 JIS
2: 0 - 60 mV
3: 0 - 1 V
4: 0 - 5 V
5: 1 - 5 V
6: 4 - 20 mA
7: 0 - 20 mA
8: 0 - 10V
9: Special Order

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

Options
0: Panel mount IP50 standard
1: Panel mount IP65 water resistant rubber installed
2: DIN Rail mount with IP50 (for BTC-9100 only)
3: DIN Rail mount with IP65 (for BTC-9100 only)

Communications
0: None
1: RS-485 interface
2: RS-232 interface(not available for BTC-7100)
3: Retransmit 4-20mA / 0-20mA
4: Retransmit 1-5V / 0-5V
5: Retransmit 0-10V
9: Special order

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

Output 2
0: None
1: From 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/25mA Transducer Power Supply
8: Isolated 12V/40mA Transducer Power Supply
9: Isolated 5V/80mA Transducer Power Supply
C: Pulsed voltage to drive SSR, 14V/40mA
A: Special order

Standard model without option
BTC-x100-4110000: power 90-250VAC, standard input thermocouple + PT100,
output 1 - relay, output 2 - none, alarm - none, communication - none, panel mount IP50 standard

Accessories

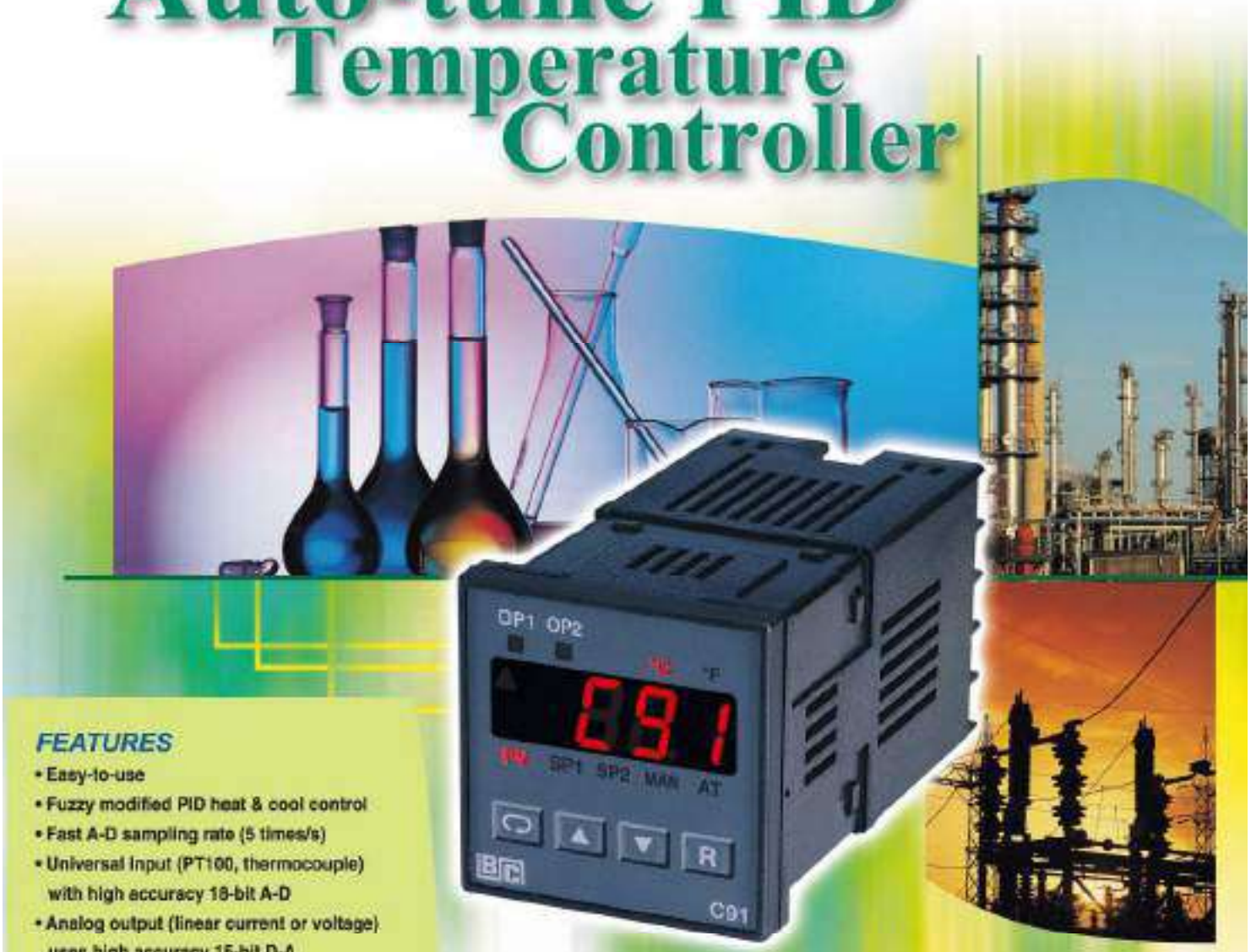
OM94-6 = Isolated 1A / 240VAC Triac Output Module (SSR)
OM94-7 = 14V / 40mA SSR Drive Module
OM96-3 = Isolated 4 - 20 mA / 0 - 20 mA Analog Output Module
OM96-4 = Isolated 1 - 5V / 0 - 5V Analog Output Module
OM96-5 = Isolated 0 - 10V Analog Output Module
CM94-1 = Isolated RS-485 Interface Module for BTC-7100 / 8100 / 4100
CM94-2 = Isolated RS-232 Interface Module for BTC-8100 / 4100
CM94-3 = Isolated 4-20mA / 0-20mA Retrans Module for BTC-8100 / 4100 / 7100
CM94-4 = Isolated 1-5V / 0-5V Retrans Module for BTC-8100 / 4100 / 7100
CM94-5 = Isolated 0-10V Retrans Module for BTC-8100 / 4100 / 7100
CM97-1 = Isolated RS-485 Interface Module for BTC-9100
CM97-2 = Isolated RS-232 Interface Module for BTC-9100
CM97-3 = Isolated 4-20mA / 0-20mA Retrans Module for BTC-9100
CM97-4 = Isolated 1-5V / 0-5V Retrans Module for BTC-9100
CM97-5 = Isolated 0-10V Retrans Module for BTC-9100
DC94-1 = Isolated 20V / 25mA DC Output Power Supply
DC94-2 = Isolated 12V / 40mA DC Output Power Supply
DC94-3 = Isolated 5V / 80mA DC Output Power Supply
CC94-1 = RS-232 Interface Cable (2M)
CC91-1 = Programming Port Cable
RK91-1 = Rail Mount kit for BTC-9100

Related Products

SNA10A = Smart Network Adaptor for third party software,
which converts 255 channels of RS-485 or RS-422
to RS-232 Network.
SNA12A = Smart Network Adaptor for programming port to
RS-232 interface.
BC-Set = Configuration Software

Low Cost

Auto-tune PID Temperature Controller



FEATURES

- Easy-to-use
- Fuzzy modified PID heat & cool control
- Fast A-D sampling rate (5 times/s)
- Universal input (PT100, thermocouple) with high accuracy 18-bit A-D
- Analog output (linear current or voltage) uses high accuracy 15-bit D-A
- RS-485 RS-232 interface
- Programming port provided on board
- Support manual control & auto-tune function
- Wide variety of alarm mode selection
- Lockout protection control
- Bumpless transfer during failure mode
- Soft-start ramp and dwell timer
- Bright display stabilized with digital filter
- Front panel sealed to NEMA 4X & IP65 (model C21)
- UL/CSA/CE approval
- High performance with low cost

C21

C91

Overview

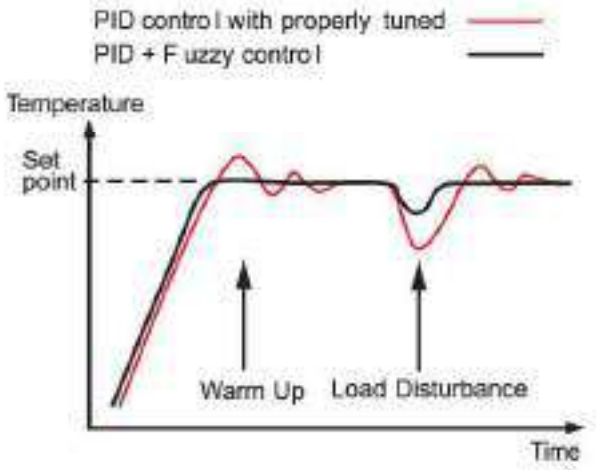
The Fuzzy Logic plus PID microprocessor-based controller series, incorporate a bright, easy to read 4-digit LED display, indicating process value or set point value. The Fuzzy Logic technology enables a process to reach a predetermined set point in the shortest time, with the minimum of overshoot during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

C21 is a 1/32 DIN size panel mount controller.C91 is a 1/16 DIN size panel mount controller. These units are powered by 11-26 or 90-250 VDC/VAC supply, incorporating a 2 amp. control relay output as standard. The second output can be used as cooling control, an alarm or dwell timer. Both outputs can select triac, 5V logic output, linear current or linear voltage to drive external device. There are six types of alarm plus a dwell timer can be configured for the second output. The units are fully programmable for PT100 and thermocouple types J, K, T, E, B, R, S, N, L with no need to modify the unit. The input signal is digitized by using a 18-bit A to D converter. Its fast sampling rate allows the unit to control fast processes.

Digital communications RS-485 or RS-232 (for C21) are available as an additional option. These options allow the units to be integrated with supervisory control system and software.

A programmable port is available for automatic configuration, calibration and testing without the need to access the keys on front panel.

By using proprietary Fuzzy modified PID technology, the control loop will minimize the overshoot and undershoot in a shortest time. The following diagram is a comparison of results with and without Fuzzy technology.



High Accuracy

The series are manufactured with custom designed ASIC (Application Specific Integrated Circuit) technology which contains a 18-bit A to D converter for high resolution measurement (true 0.1°F resolution for thermocouple and PT100) and a 15-bit D to A converter for linear current or voltage control output. The ASIC technology provides improved operating performance, low cost, enhanced reliability and higher density.

Fast Sampling Rate

The sampling rate of the input A to D converter reaches 5 times/second. The fast sampling rate allows this series to control fast processes.

Fuzzy Control

The function of Fuzzy control is to adjust PID parameters from time to time in order to make manipulation output value more flexible and adaptive to various processes. The results is to enable a process to reach a predetermined set point in the shortest time, with the minimum of overshoot and undershoot during power-up or external load disturbance.

Digital Communication

The units are equipped with RS-485 or RS-232 interface card to provide digital communication. By using the twisted pair wires there are at most 247 units can be connected together via RS-485 interface to a host computer.

Programming Port

A programming port is used to connect the unit to a pc for quick configuration, also can be connected to an ATE system for automatic testing & calibration.

Auto-tune

The auto-tune function allows the user to simplify initial setup for a new system. A clever algorithm is provided to obtain an optimal set of control parameters for the process, and it can be applied either as the process is warming up (cold start) or as the process has been in steady state (warm start).

Lockout Protection

According to actual security requirement, one of four lockout levels can be selected to prevent the unit from being changed abnormally.

Bumpless Transfer

Bumpless transfer allows the controller to continue to control by using its previous value as the sensor breaks. Hence, the process can be well controlled temporarily as if the sensor is normal.

Soft-start Ramp

The ramping function is performed during power up as well as any time the set point is changed. It can be ramping up or ramping down. The process value will reach the set point with a predetermined constant rate.

Digital Filter

A first order low pass filter with a programmable time constant is used to improve the stability of process value. This is particularly useful in certain application where the process value is too unstable to be read.

Specifications

Power

90-250 VAC, 47-63 Hz, 10VA, 5W maximum
11-26 VAC / VDC, 10VA, 5W maximum

Signal Input

Resolution : 16 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
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
Burn-out Current : 200nA
Common Mode Rejection Ratio (CMRR): 120dB
Normal Mode Rejection Ratio (NMRR): 55dB
Sensor Break Detection :
Sensor open for TC, RTD and mV inputs,
Sensor short for RTD input,
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.

Characteristics

Type	Range	Accuracy @25°C	Input Impedance
J	-120°C-1000°C (-184°F-1832°F)	±2°C	2.2MΩ
K	-200°C-1370°C (-328°F-2498°F)	±2°C	2.2MΩ
T	-250°C-400°C (-418°F-752°F)	±2°C	2.2MΩ
E	-100°C-900°C (-148°F-1652°F)	±2°C	2.2MΩ
B	0°C-1800°C (32°F-3272°F)	±2°C (200°C-1800°C)	2.2MΩ
R	0°C-1767.8°C (32°F-3214°F)	±2°C	2.2MΩ
S	0°C-1767.8°C (32°F-3214°F)	±2°C	2.2MΩ
N	-250°C-1300°C (-418°F-2372°F)	±2°C	2.2MΩ
L	-200°C-900°C (-328°F-1652°F)	±2°C	2.2MΩ
PT100 (DIN)	-210°C-700°C (-346°F-1292°F)	±0.4°C	1.3KΩ
PT100 (JIS)	-200°C-600°C (-328°F-1112°F)	±0.4°C	1.3KΩ
mV	-8mV - 70mV	±0.05%	2.2MΩ
mA	-3mA - 27mA	±0.05%	70.5Ω
V	-1.3V - 11.5V	±0.05%	650KΩ

Output 1 / Output 2

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

Type	Zero Tolerance	Span Tolerance	Load Capacity
4-20 mA	3.6-4 mA	20-21 mA	500Ωmax.
0-20 mA	0 mA	20-21 mA	500Ωmax.
0-5 V	0 V	5-5.25 V	10 KΩmin.
1-5 V	0.9-1 V	5-5.25 V	10 KΩmin.
0-10 V	0 V	10-10.5 V	10 KΩmin.

Linear Output

Resolution : 15 bits
Output Regulation : 0.02 % for full load change
Output Settling Time : 0.1 sec. (stable to 99.9 %)
Isolation Breakdown Voltage : 1000 VAC
Temperature Effect : ±0.01 % 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

Alarm (Output 2)

Alarm 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,
Process High / Low Alarm,
Alarm Mode : Normal, Latching, Hold, Latching / Hold.
Dwell Timer : 0.1-4553.6 minutes

Data Communication

Interface : RS-232 (1 unit), RS-485 (up to 247 units)
Protocol : Modbus Protocol RTU mode
Address : 1 - 247
Baud Rate : 2.4 ~ 38.4 Kbits/sec
Data Bits : 7 or 8 bits
Parity Bit : None, Even or Odd
Stop Bit : 1 or 2 bits
Communication Buffer : 160 bytes

Analog Retransmission

Output Signal : 4-20mA, 0-20mA, 0-5V, 1-5V, 0-10V
Resolution : 15 bits
Accuracy : ±0.05% of span ±0.0025%/°C
Load Resistance : 0-500 ohm (for current output)
10K ohm minimum (for voltage output)
Output Regulation : 0.01% for full load change

User Interface

Single 4-digit LED Displays : 10 mm (C21, C91)

Connection Diagrams

Keypad : 3 keys (C21), 4 keys (C91)
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 50 ~ 300% of PB, dead band -36.0 ~ 36.0% of PB
ON-OFF : 0.1 - 90.0 (°F) hysteresis control (P band = 0)
P or PD : 0 - 100.0 % offset adjustment
PID : Fuzzy logic modified
Proportional band 0.1 ~ 900.0°F.
Integral time 0 - 1000 seconds
Derivative time 0 - 360.0 seconds
Cycle Time : 0.1 - 90.0 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 - 900.0°F/minute or 0 - 900.0°F/hour ramp rate

Digital Filter

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

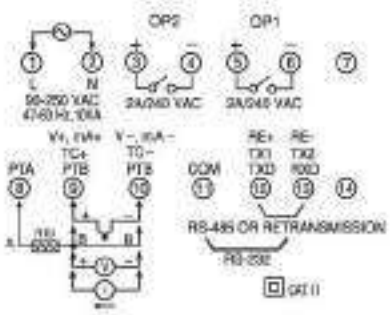
Environmental & Physical

Operating Temperature : -10°C to 50°C
Storage Temperature : -40°C to 60°C
Humidity : 0 to 90 % RH (non-condensing)
Altitude : 2000m maximum
Pollution : Degree 2
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/s² for 2 hours
Shock Resistance : 200 m/s² (20 g)
Moldings : Flame retardant polycarbonate
Dimensions :
C21 — 50mm(W) X 26.5mm(H) X 110.5mm(D), 98.0 mm depth behind panel
C91 — 48mm(W) X 48mm(H) X 94mm(D), 86 mm depth behind panel
Mounting: C21 — panel mount, cutout 22 X 45 (mm)
C91 — panel mount, cutout 45 X 45 (mm)
Weight : C21 — 120 grams
C91 — 140 grams

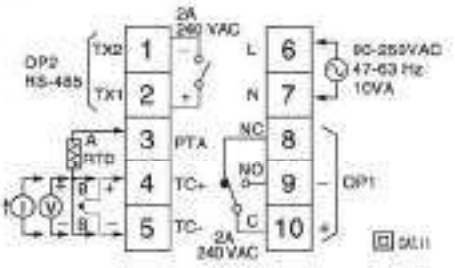
Approval Standards

Safety : UL61010C-1
CSA C22.2 No. 24-93
EN61010-1 (IEC1010-1)
Protective Class :
NEMA 4X (IP65) front panel for C21, IP30 front panel for C91, all indoor use, IP 20 housing and terminals
EMC: EN61326

C21



C91



Ordering Code

C21 - □ □ □ □ □ □
C91 - □ □ □ □ □ □

Power Input
4: 90 - 250 VAC, 50/60 HZ
5: 11 - 26 VAC or VDC
9: Special Order

Signal Input
1: Standard Input
Thermocouple: J, K, T, E, B, R, S, N, L
RTD: PT100 DIN, PT100 JIS
2: 0 - 60 mV
3: 0 - 1 V
4: 0 - 5 V
5: 1 - 5 V
6: 4 - 20 mA
7: 0 - 20 mA
8: 0 - 10V
9: Special Order

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

Output 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/25mA transducer power supply
8: Isolated 12V/40mA transducer power supply
9: Isolated 5V/80mA transducer power supply
A: RS-485 interface (for C91)
C: Pulsed voltage to drive SSR, 14V/40mA
D: Retransmit 4-20mA / 0-20mA (for C91)
E: Retransmit 1-5V / 0-5V (for C91)
F: Retransmit 0-10V (for C91)
B: Special order

Communication (for C21 only)
0: None
1: RS-485 interface (for C21)
2: RS-232 interface (for C21)
3: Retransmit 4-20mA / 0-20mA (for C21)
4: Retransmit 1-5V / 0-5V (for C21)
5: Retransmit 0-10V (for C21)
9: Special order

Display Color
0: Red color
1: Green color

Standard model without option
Cx1 - 411000: power 90-250VAC, standard input thermocouple + PT100, output 1 - relay, output 2 - none, communication - none, red display

Accessories

OM94-6 = Isolated 1A / 240VAC Triac Output Module (SSR)
OM94-7 = 14V / 40mA SSR Drive Module
OM96-3 = Isolated 4 - 20 mA / 0 - 20 mA Analog Output Module
OM96-4 = Isolated 1 - 5V / 0 - 5V Analog Output Module
OM96-5 = Isolated 0 - 10V Analog Output Module
CM94-1 = Isolated RS-485 Interface Module for C21
CM94-2 = Isolated RS-232 Interface Module for C21
CM94-3 = Isolated 4-20mA / 0-20mA Retrans Module for C21
CM94-4 = Isolated 1-5V / 0-5V Retrans Module for C21
OM94-5 = Isolated 0 - 10V Retrans Module for C21
CM96-1 = Isolated RS-485 Interface Module for C91
DC94-1 = Isolated 20V / 25mA DC Output Power Supply
DC94-2 = Isolated 12V / 40mA DC Output Power Supply
DC94-3 = Isolated 5V / 80mA DC Output Power Supply
CC94-1 = RS-232 Interface Cable (2M)
CC91-1 = Programming port for C21
CC91-2 = Programming port for C91

Related Products

SNA10A = Smart network adaptor for Brainchild software *Data Acquisition Studio* or third party software, which converts 255 channels of RS-485 or RS-422 to RS-232 network

SNA12A = Smart network adapter for programming port to RS-232 interface

BC-Set = Configuration software

Data Acquisition Studio software = PC software for data logging

PC-E = RS-232/485 to Ethernet converter

PC-W = RS-232/422/485 x 2 + Ethernet x 1 converted to Ethernet wireless

1/16 DIN Microprocessor Based PID Controller BTC-9090

The BTC-9090 is a new generation miniature controller using the latest SMD technology. Assembly is fully automatic and the units are checked and configured by computer. Software has been refined over several years and offers a very logical menu structure and high noise immunity. Using an unique command called SEL, the user has some flexibility in which parameters are accessible in level 2 of the menu. This is of great value for users as it is easy to limit access to suit the application specifically.

With 4 digit resolution and fully programmable decimal point, the 9090 can be configured for linear voltage and current inputs and with the addition of a single module, with 4-20mA
control output. This is one of the most versatile units available.

Manual control of the output is possible and Offset and Shift functions allow process values to be readily corrected for instinct offsets and in-site calibrations.

FEATURES

- Full 4 digit display.
- Autotune PID.
- Input user selectable.
- 90-240 VAC supply.
- Ramp rate function.
- Timer function.
- SEL function.
- Optional 4-20 mA input.
- 4-20 mA control output version.
- Three level software access.
- Safety: UL, CSA
- EMC, LVD: CE

KEYPAD OPERATION

TOUCHKEYS	FUNCTION	DESCRIPTION
	Scroll Key	Advance the index display to the desired position. indexes advanced continuously and cyclically by pressing this keypad.
	Up Key	Increased the parameter.
	Down Key	Decreased the parameter.
	Return Key	Resets the controller to its normal status. Also stops auto-tuning, output percentage monitoring and manual mode operation.
Press longer than 6 secs.	Long Scroll	Allows more parameters to be inspected or changed.
Press longer than 6 secs.	Auto-tuning	Executes auto-tuning function.
Press and	Output Percentage Monitoring	Allows the set point display to indicate the control output value.
Press and longer than 6 secs.	Manual Mode Execution	Allows the controller to enter the manual mode.

RANGE AND ACCURACY OF INPUTS

IN	Sensor	Input Type	Range (°F)	Accuracy (°F)	Range (°C)	Accuracy
0	J	Iron-Constantan	-58 to 1830°F	±3.6°F	-50 to 999°C	±2°C
1	K	Chromel-Alumel	-58 to 2500°F	±3.6°F	-50 to 1370°C	±2°C
2	T	Copper-Constantan	-454 to 752°F	±3.6°F	-270 to 400°C	±2°C
3	E	Chromel-Constantan	-58 to 1382°F	±3.6°F	-50 to 750°C	±2°C
4	B	Pt30%RH/Pt6%RH	572 to 3272°F	±5.4°F	300 to 1800°C	±3°C
5	R	Pt13%RH/Pt	32 to 3182°F	±3.6°F	0 to 1750°C	±2°C
6	S	Pt10%RH/Pt	32 to 3182°F	±3.6°F	0 to 1750°C	±2°C
7	N	Nicrosil-Nisil	-58 to 2372°F	±3.6°F	-50 to 1300°C	±2°C
8	RTD	PT100 ohms (DIN)	-328 to 752°F	±0.72°F	-200 to 450°C	±0.4°C
9	RTD	Pt100 ohms (JIS)	-328 to 752°F	±0.72°F	-200 to 450°C	±0.4°C
10	Linear	-10mV to 60mV	-1999 to 9999	±0.05%	-1999 to 9999	±0.05%

SPECIFICATIONS

INPUT

Thermocouple (T/C): type J, K, T, E, B, R, S, N.
RTD: PT100 ohm RTD (DIN 43760/BS1904 or JIS)
Linear: -10 to 60mV, configurable input attenuation.
Range: User configurable, refer to Table above.
Accuracy: Refer to Table above
Cold Junction Compensation: 0.1°C / °C ambient typical.
Sensor Break Protection: Protection mode configurable.
External Resistance: 100 ohms max.
Normal Mode Rejection: 60dB
Common Mode Rejection: 120dB
Sample Rate: 3 times / second

CONTROL

Proportion Band. 0-100% of SPAN
Reset (Integral): 0-3600 seconds
Rate (Derivative): 0-1000 seconds
Ramp Rate: 0-2000°C / Hour (0-3600°F / Hour)
Dwell: 0-3600 minutes
Anti-Reset Windup: Inhibit integral action outside P band
ON-OFF: With adjustable hysterisis (0-20% of SPAN)
Cycle Time: 0-120 seconds
Control Action: Direct (for cooling) and reverse (for heating)

INDICATION

Process Display: 0.4” red LED, 4 digits
Setpoint Display: 0.3” green LED, 4 digits
Status Indicator: Control-green LED, Alarm-red LED

POWER

Rating: 90-240VAC
50/60Hz
Consumption: Less than 5VA

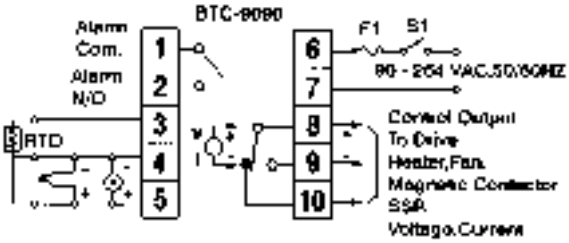
ENVIRONMENTAL & PHYSICAL

Operating Temperature: -10 to 50°C
Humidity: 0 to 90% RH (non-condensing)
Insulation: 20M ohms min. (500VDC)
Breakdown: AC2000V, 50/60Hz, 1 minute
Vibration: 10-55Hz, amplitude 1mm 200 m/
Shock: s^2 (20g)
Weight: 170 grams

DIMENSIONS

H 48mm (1.89”)
W 48mm (1.89")
D 94mm (3.7")
Depth behind panel 86mm (3.4")
Panel cutout 45 X 45mm (1.77" x 11.77")

CONNECTION DIAGRAM



ORDERING INFORMATION

Model No. □ □ □ □ □ □ □ □
(1) (2) (3) (4) (5) (6) (7) (8)

(1) Power Input

4	90-240VAC
5	20-32VAC-VDC
9	Other

(2) Signal Input

1	0 - 5V	3	PT100 DIN	5	TC	7	0 - 20mA
8	0 - 10V						

(3) Range Code

1	Configurable
9	Other

(4) Control Mode

3	PID / ON-OFF Control

(5) Output 1 Option

0	None
1	Relay rated 3A / 240VAC resistive
2	SSR Drive rated 20mA / 24V
3	4~20mA linear, max load 500 ohms (Module OM93-1)
4	0~20mA, linear, max. load 500 ohms (Module OM93 -2)
5	0-10V linear, min. impedance 500K ohms (Module OM93-3)
9	Other

(6) Output 2 Option

0	None

(7) Alarm Option

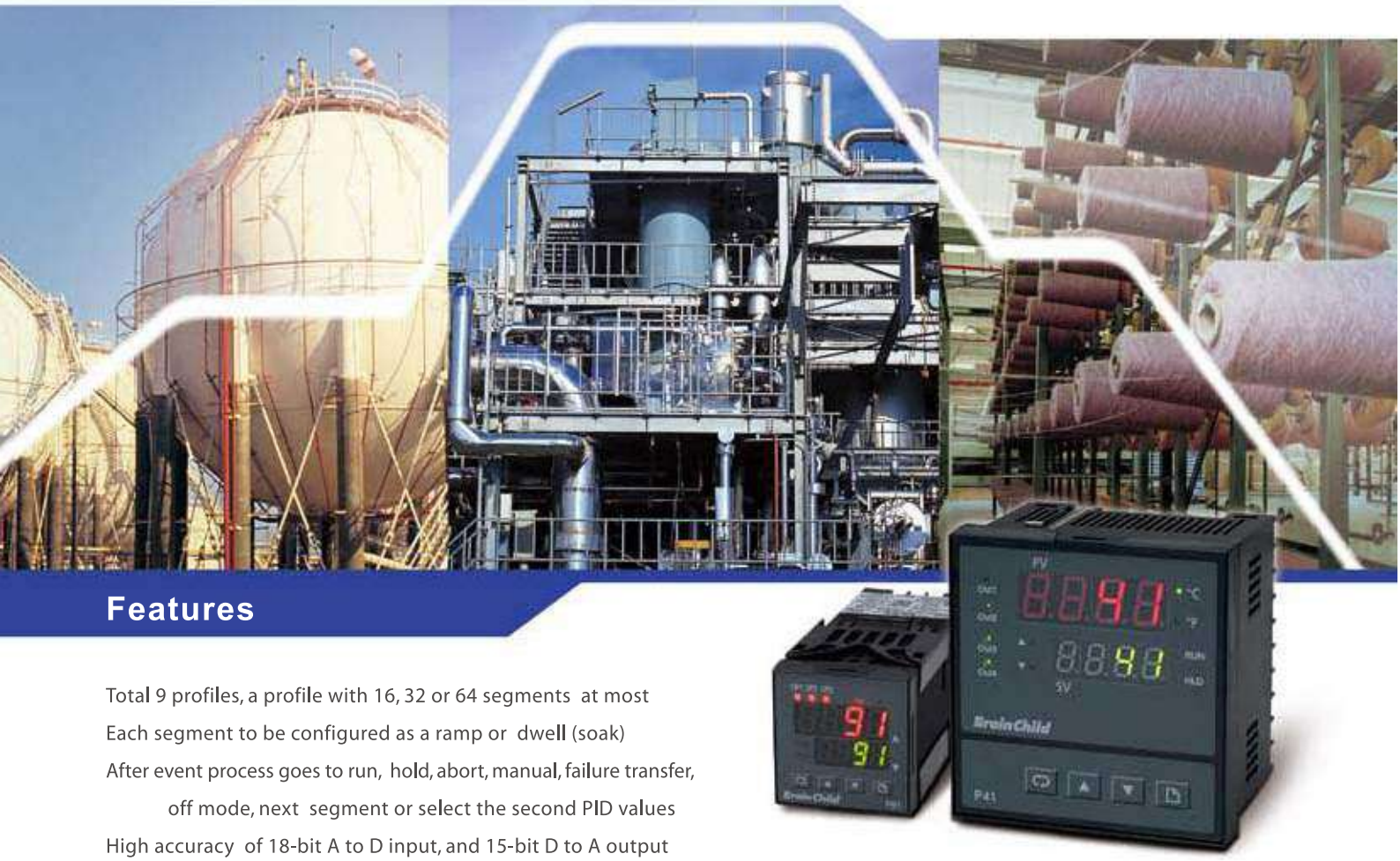
0	None
1	Relay rated 2A / 240VAC resistive
9	Other

(8) Communication

0	None

Temperature / Process Controllers & Programmers

PID with Time / Temperature Profiling Controllers



Features

Total 9 profiles, a profile with 16, 32 or 64 segments at most
Each segment to be configured as a ramp or dwell (soak)
After event process goes to run, hold, abort, manual, failure transfer, off mode, next segment or select the second PID values
High accuracy of 18-bit A to D input, and 15-bit D to A output
The fast sample rate of 200 msec
Fuzzy control to reach set point at the least overshooting & less time
Up to three relays are configurable for event output
Analog retransmission of process value & set point value
Optional RS-485 or 232 communications
Programmable port for easy configuration or calibration
Lockout protection for security requirement
Bumpless transfer of safely control while sensor breaks
Digital filter to improve the stability of process value
SEL function for easy operation

Overview

The Fuzzy Logic plus PID microprocessor-based profiling controller series, 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.

P91 is a 1/16 DIN size panel mount profiling controller. It can also be used for rail mount by adding a rail mount kit. P41 is a 1/4 DIN size panel mount profiling controller. These units are powered by 11-26 or 90-250 VDC/VAC supply, incorporating a 2 amp. control relay output as standard. The second output can be used as cooling control, an event output or an alarm. Both outputs can select triac, logic output, linear current or linear voltage to drive external device. The units are fully programmable for PT100 and thermocouple types J, K, T, E, B, R, S, N, L, C, P with no need to modify the unit. The input signal is digitized by using a 18-bit A to D converter. Its fast sampling rate allows the unit to control fast processes.

There are more functions than the heating and cooling control could be configured for the controller outputs, these include: up tp three alarm outputs, up to three event outputs and up to two analog retransmission outputs.

Digital communications RS-485 or RS-232 are available as an additional option. These options allow the units to be integrated with supervisory control system and software.

A programming port is available for automatic configuration, calibration and testing without the need to access the keys on front panel.

By using proprietary Fuzzy modified PID technology, the control loop will minimize the overshoot and undershoot in a shortest time. The following diagram is a comparison of results with and without Fuzzy technology.

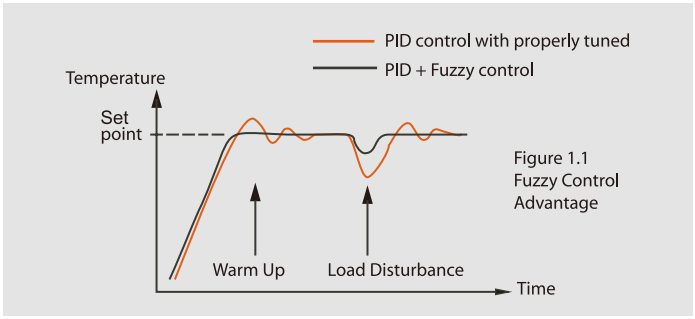


Figure 1.1
Fuzzy Control Advantage

The series can be configured as a single set point controller (static mode) or a ramp and dwell profiling controller (profile mode). The profile mode feature allows the user to program up to 9 profiles of up to 64 free-format (ramp, dwell, jump or end) segments each. The total segments available for the product is 288 segments
The profiling controllers contain the following features:

Flexible Configuration of Program

There are up to 64 segments can be defined for a profile. Each segment can be configured as a ramp or a dwell (soak) segment or defining a repeat number of cycles at arbitray location within the profile and finally terminated by an end segment. The user can edit a currently running profile.

Maximum Capacity of Program

There are at most 9 profiles can be defined and 288 segments totally available for all profiles. The profiles are divided into three kinds of length.. The short length profile contains 16 segments, the medium length profile contains 32 segments while the long length profile contains 64 segments at most.

Event Input

The event input feature allows the user to select one of eight functions:
enter profile run mode, enter profile hold mode, abort profile mode, enter manual mode, perform failure transfer, enter off mode, advance to the next segment and select second set of PID values.

Programmable Event Outputs

Up to three relays are configurable for event outputs and the state of each output can be defined for each segment and end of profile.

Analog Retransmission

The output 4 and output 5 (P41 only) of the products can be equipped with anolog output module. The output can be configured for transmitting the process value as well as set point value.

High Accuracy

The series are manufactured with custom designed ASIC(Application Specific Integrated Circuit) technology which contains a 18-bit A to D converter for high resolution measurement (true 0.1°F resolution for thermocouple and PT100) and a 15-bit D to A converter for linear current or voltage control output. The ASIC technology provides improved operating performance, low cost, enhanced reliability and higher density.

Fast Sampling Rate

The sampling rate of the input A to D converter reaches 5 times/second. The fast sampling rate allows this series to control fast processes.

Fuzzy Control

The function of Fuzzy control is to adjust PID parameters from time to time in order to make manipulation output value more flexible and adaptive to various processes. The results is to enable a process to reach a predetermined set point in the shortest time, with the minimum of overshoot and undershoot during power-up or external load disturbance.

Digital Communication

The units are equipped with RS-485 or RS-232 interface card to provide digital communication. By using the twisted pair wires there are at most 247 units can be connected together via RS-485 interface to a host computer.

Programming Port

A programming port is used to connect the unit to a hand-held programmer or a PC for quick configuration, also can be connected to an ATE system for automatic testing & calibration.

Auto-tune

The auto-tune function allows the user to simplify initial setup for a new system. A clever algorithm is provided to obtain an optimal set of control parameters for the process, and it can be applied either as the process is warming up (cold start) or as the process has been in steady state (warm start).

Lockout Protection

According to actual security requirement, a password is provided to prevent the unit from being changed abnormally.

Bumpless Transfer

Bumpless transfer allows the controller to continue to control by using its previous value as the sensor breaks. Hence, the process can be well controlled temporarily as if the sensor is normal.

Digital Filter

A first order low pass filter with a programmable time constant is used to improve the stability of process value. This is particularly useful in certain application where the process value is too unstable to be read.

SEL Function

The units have the flexibility for user to select those parameters which are most significant to him and put these parameters in the home page. There are at most 8 parameters can be selected to allow the user to build his own display sequence.

Connection Diagrams

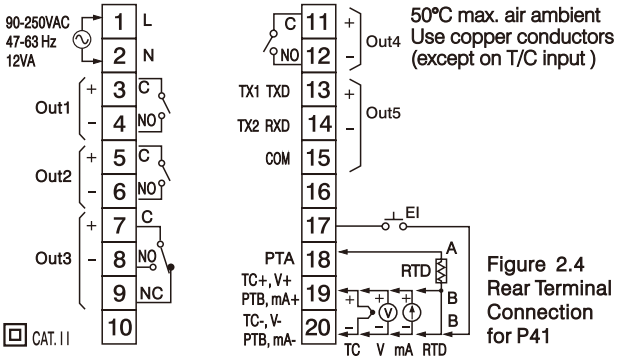


Figure 2.4
Rear Terminal
Connection
for P41

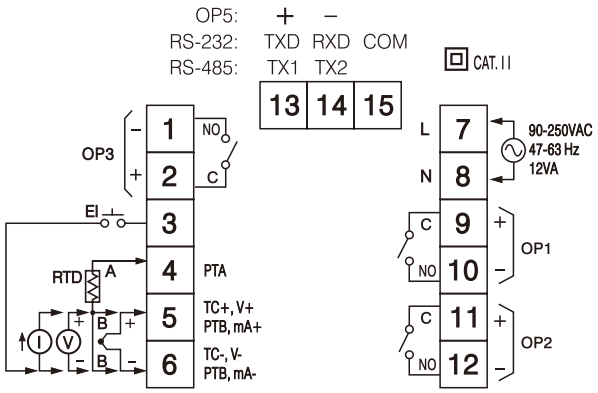


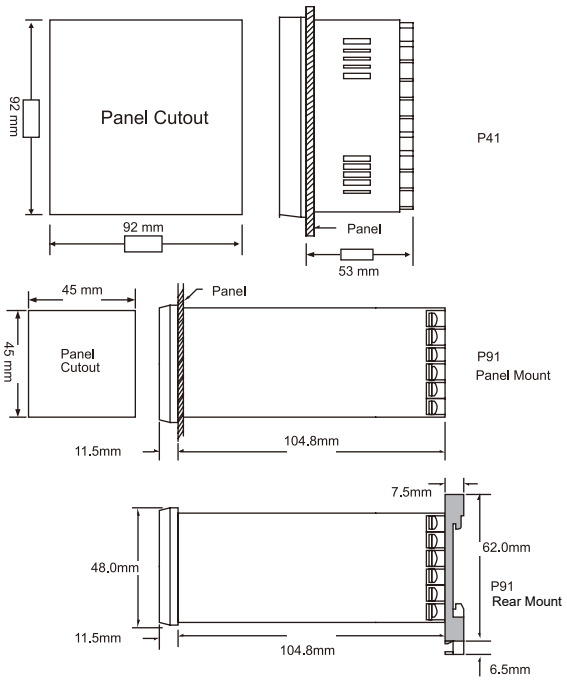
Figure 2.5
Rear Terminal
Connection
for P91

Figure 1.2
Programming Port
Overview

A special connector can be used to touch the programming port which is connected to a PC for automatic configuration, also can be connected to an ATE system for automatic calibration and testing.

The programming port is used for off-line automatic setup and testing procedures only. Don't attempt to make any connection to these pins when the unit is used for a normal control purpose.

Mounting Dimensions



Specifications

Power

90 ~ 250 VAC, 47 63 Hz, 12VA, 5W maximum
11 ~ 26 VAC / VDC, 12VA, 5W maximum

Input

Resolution : 18 bits
Sampling Rate : 5 times / second
Maximum Rating : -2 VDC minimum, 12 VDC maximum
(1 minute for mA input)
Temperature Effect : A1.5uV/ ℃ for all inputs except mA input
A3.0uV/ ℃ for mA input
Sensor Lead Resistance Effect :
T/C: 0.2uV/ohm
3-wire RTD: 2.6 ℃/ohm of resistance difference of two leads
2-wire RTD: 2.6 ℃/ohm of resistance sum of two leads
Burn-out Current: 200 nA
Common Mode Rejection Ratio (CMRR): 120dB
Normal Mode Rejection Ratio (NMRR): 55dB
Sensor Break Detection :
Sensor open for TC, RTD and mV inputs,
Sensor short for RTD input
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.

Characteristics:

Type	Range	Accuracy @ 25°C	Input Impedance
J	-120°C~1000°C (-184°F~1832°F)	±2°C	2.2 MΩ
K	-200°C~1370°C (-328°F~2498°F)	±2°C	2.2 MΩ
T	-250°C~ 400°C (-418°F~752°F)	±2°C	2.2 MΩ
E	-100°C~ 900°C (-148°F~1652°F)	±2°C	2.2 MΩ
B	0°C~ 1800°C (32°F~3272°F)	±2°C (200°C~1800°C)	2.2 MΩ
R	0°C~ 1767.8°C (32°F~3214°F)	±2°C	2.2 MΩ
S	0°C~ 1767.8°C (32°F~3214°F)	±2°C	2.2 MΩ
N	-250°C~ 1300°C (-418°F~2372°F)	±2°C	2.2 MΩ
L	-200°C~ 900°C (-328°F~ 1652°F)	±2°C	2.2 MΩ
C	0°C~ 2315°C (32°F~ 4199°F)	±2°C	2.2 MΩ
P	0°C~ 1395°C (32°F~ 2543°F)	±2°C	2.2 MΩ
PT100 (DIN)	-210°C~ 700°C (-346°F~ 1292°F)	±0.4°C	1.3 MΩ
PT100 (JIS)	-200°C~ 600°C (-328°F~ 1112°F)	±0.4°C	1.3 MΩ
mV	-8mV~70mV	±0.05 %	2.2 MΩ
mA	-3mA~27mA	±0.05 %	70.5 MΩ
V	-1.3V~11.5V	±0.05 %	650 KΩ

Output 1 / Output 2

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

Type	Zero Tolerance	Span Tolerance	Span Tolerance
4~20 mA	3.6~4 mA	20~21 mA	500Ω max.
0~20 mA	0 mA	20~21 mA	500Ω max.
0~5 V	0 V	5~5.25 V	10 KΩ min.
1~5 V	0.9~1 V	5~5.25 V	10 KΩ min.
0~10 V	0 V	10~10.5 V	10 KΩ min.

Linear Output

Resolution : 15 bits
Output Regulation : 0.02 % for full load change
Output Settling Time : 0.1 sec. (stable to 99.9 %)
Isolation Breakdown Voltage : 1000 VAC
Temperature Effect : ±0.01 % 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	±1 V	25 mA	0.2 Vp-p	500 VAC
12 V	±0.6 V	40 mA	0.1 Vp-p	500 VAC
5 V	±0.25 V	80 mA	0.05 Vp-p	500 VAC

Alarm

Alarm Relay : Form C Rating
2A/240VAC, life cycles 200,000 for resistive load.
Alarm Functions : Dwell timer, Deviation High / Low Alarm,
Deviation Band High / Low Alarm,
PV High / Low Alarm,
Alarm Mode : Normal, Latching, Hold, Latching / Hold.
Dwell Timer : 0.1-4553.6 minutes

Data Communication

Interface : RS-232 (1 unit), RS-485 (up to 247 units)
Protocol : Modbus Protocol RTU mode
Address : 1-247
Baud Rate : 2.4~38.4 Kbits/sec
Parity Bit : None, Even or Odd
Stop Bit : 1 or 2 bits
Communication Buffer : 64 bytes

Analog Retransmission

Output Signal : 4-20 mA, 0-20 mA, 0-5V, 1-5V, 0-10V
Resolution : 15 bits
Accuracy : ±0.05 % of span ±0.0025 %/°C
Load Resistance : 0 - 500 ohms (for current output)
10 K ohms 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 : ±0.005 % of span
Temperature Effect : ±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
Keypad : 4 keys
Programming Port : For automatic setup, calibration and testing
Communication Port : RS-232 and RS-485

Control Mode

Output 1 : Reverse (heating) or direct (cooling) action
Output 2 : PID cooling control, cooling P band 50~300%
of PB, dead band -36.0 ~ 36.0 % of PB
ON-OFF : 0.1 - 90.0 (°F) hysteresis control (P band = 0)
P or PD : 0-100.0 % offset adjustment
PID : Fuzzy logic modified
Proportional band 0.1~900.0 °F. Integral time 0-1000 seconds
Derivative time 0-360.0 seconds
Cycle Time : 0.1-90.0 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 : 0-900.0 °F /minute or 0-900.0 °F /hour ramp rate

Digital Filter

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

Profiler

Number of profiles : 9
Number of Segment per profile
Profile 1, 2, 3, 4 : 16
Profile 5, 6, 7: 32
Profile 8, 9: 64
Event Outputs : 3

Environmental & Physical

Operating Temperature : -10°C to 50°C
Storage Temperature : -40°C to 60°C
Humidity : 0 to 90 % RH (non-condensing)
Altitude: 2000m maximum
Pollution: Degree 2
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^2 for 2 hours
Shock Resistance : 200 m/s^2 (20 g)
Moldings : Flame retardant polycarbonate
Dimensions : P41 - 96mm(W) X 96mm(H) X 65mm(D),
53 mm depth behind panel
P91 - 48mm(W) X 48mm(H) X 116mm(D),
105 mm depth behind panel
Weight : P41 - 250 grams
P91 - 150 grams
Approval Standards
Safety : UL61010C-1
CSA C22.2 No.24-93
EN61010-1 (IEC1010-1)

Protective Class :

IP65 for panel with additional option
IP50 for panel without additional option
IP20 for terminals and housing with protective cover.
All indoor use.

EMC: EN61326

Ordering Code

P41- □ □ □ □ □ □ □ □
P91- □ □ □ □ □ 0 □ □

Power Input
4: 90 - 250 VAC, 47-63 Hz
5: 11 - 26 VAC or VDC, SELV, Limited Energy

Signal Input
1: Standard Input
Thermocouple:
J, K, T, E, B, R, S, N, L, C, P
RTD: PT100 DIN, PT100 JIS
Voltage: 0-60mV
5: 0-10V, 0-1V, 0-5V, 1-5V
6: 0-20/4-20 mA
9: Special Order

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/0 - 10V
6: Triac output 1A / 240VAC,SSR
C: Pulsed voltage to drive SSR, 14V/40mA
9: Special order

Output 2
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/0 - 10V
6: Triac output 1A / 240VAC,SSR
7: Isolated 20V/25mA transducer power supply
8: Isolated 12V/40mA transducer power supply
A: Isolated 5V/80mA transducer power supply
C: Pulsed voltage to drive SSR, 14V/40mA
9: Special order

Output 3
0: None
1: Relay rated 2A/240VAC
2: Pulsed voltage to drive SSR, 5V/30mA
6: Triac output 1A / 240VAC,SSR
7: Isolated 20V/25mA transducer power supply
8: Isolated 12V/40mA transducer power supply
A: Isolated 5V/80mA transducer power supply
C: Pulsed voltage to drive SSR, 14V/40mA
9: Special order

Output 4
0: None
1: Relay rated 2A/240VAC
2: Pulsed voltage to drive SSR, 5V/30mA
3: Retransmit 4 - 20mA / 0 - 20mA
4: Retransmit 1 - 5V / 0 - 5V/0 - 10V
6: Triac output 1A / 240VAC,SSR
7: Isolated 20V/25mA transducer power supply
8: Isolated 12V/40mA transducer power supply
A: Isolated 5V/80mA transducer power supply
C: Pulsed voltage to drive SSR, 14V/40mA
9: Special order

Output 5
0: None
3: Retransmit 4 - 20mA / 0 - 20mA
4: Retransmit 1 - 5V / 0 - 5V/0 - 10V
7: Isolated 20V/25mA transducer power supply
8: Isolated 12V/40mA transducer power supply
A: Isolated 5V/80mA transducer power supply
D: Isolated RS-485 interface
E: Isolated RS-232 interface

Options
0: Panel mount IP50 standard
1: Panel mount IP65 water resistant rubber installed
2: DIN rail mount with IP50 (for P91 only)
3: DIN rail mount with IP65 (for P91 only)




Accessories

OM94-6 – Isolated 1A / 240VAC Triac Output Module (SSR)
OM94-7 = 14V / 40mA SSR Drive Module
OM98-3 = Isolated 4 - 20 mA / 0 - 20 mA Analog Output Module
OM98-5 = Isolated 0 -10V Analog Output Module
CM94-1 = Isolated RS-485 Interface Module for P41 Output 5
CM94-2 = Isolated RS-232 Interface Module for P41 Output 5
CM94-3 = Isolated 4-20mA/0-20mA Retrans Module for P41 Output 5
CM94-5 = Isolated 0-10V Retrans Module for P41 Output 5
CM97-1 = Isolated RS-485 Interface Module for P91 Output 5
CM97-2 = Isolated RS-232 Interface Module for P91 Output 5
CM97-3 = Isolated 4-20mA/0-20mA Retrans Module for P91 Output 5
CM97-5 = Isolated 0-10V Retrans Module for P91 Output 5
DC94-1 = Isolated 20V/25mA DC Output Power Supply
DC94-2 = Isolated 12V/40mA DC Output Power Supply
DC94-3 = Isolated 5V/80mA DC Output Power Supply
DC97-1 = Isolated 20V/25mA DC Output Power Supply for P91 Output 5
DC97-2 = Isolated 12V/40mA DC Output Power Supply for P91 Output 5
DC97-3 = Isolated 5V/80mA DC Output Power Supply for P91 Output 5
CC94-1 = RS-232 Interface Cable (2M)
CC91-1 = Programming Port Cable
RK91-1 = Rail Mount kit for BTC-9100 / P91
DC21-1 = Isolated 20V/25mA DC Output Power Supply for P41 Output 5
DC21-2 = Isolated 12V/40mA DC Output Power Supply for P41 Output 5
DC21-3 = Isolated 5V/80mA DC Output Power Supply for P41 Output 5

Related Products

SNA10A = Smart network adaptor for Brainchild software *DAQ Studio* or third party software, which converts 255 channels of RS-485 or RS-422 to RS-232 network.
SNA12A = Smart network adapter for programming port to RS-232 interface
BC-Set = Configuration software
DAQ Studio software = PC software for data logging
PC-E = RS-232/485 to Ethernet converter
PC-W = RS-232/422/485 x 2 + Ethernet x 1 converted to Ethernet wireless

L41 / L91 Temperature Limit Controller

L41

L91

CE SA FM APPROVED UL LISTED RoHS

The L41 / L91 is a microprocessor based specially designed limit controller to protect the equipment from high temperature and low temperature. A latched relay cuts power to the process if safe values are exceeded. These units must be reset before the process continues. The temperature controller takes an input from the universal input which is fully programmable for PT100, thermocouple types J, K, T, E, B, R, S, N, L, C, P and 0~60mV. The controller equipped with 2 Amp form C relay as limit control output and equipped with the optional RS-232 or RS-485 communication, retransmission output and transmitter power supply.

Features

- » Fastest Sampling Rate of 200 msec
- » Universal Input
- » High or Low or High / Low Limit
- » Normal / Latching Alarm Output
- » Limit Annunciator
- » Remote Reset / Remote Lock via Event Input
- » PV /SP Retransmission
- » Connect with HMI for Alarm Monitoring
- » Network up to 247 Controllers on RS-485 (Modbus Protocol)
- » FM, UL, CSA, CE, RoHS, REACH Approval
- » Available in ¼ DIN and 1/16 DIN Size

Specifications

Specification	L41	L91
Power Supply	90-250 VAC, 47-63 Hz, 11-26 VAC/VDC, SELV, Limited Energy	
Power Consumption	10VA, 5W Maximum	
Over Voltage Category	II	
Signal Input		
Type	Thermocouple: J, K, T, E, B, R, S, N, L, P(L41 only), C(L41 only); RTD: PT100 DIN, PT100 JIS; mV: 0~60 mV; Current: 0~20mA; Voltage: 0~1 V, 0~10V	
Resolution	18 Bits	
Sampling Rate	5 Times / Second (200 msec)	

Input Characteristics	Type	Range	Accuracy @ 25° C	Input Impedance
	J	-120° C to 1000° C (-184° F to 1832° F)	± 2° C	2.2 MΩ
	K	-200° C to 1370° C (-328° F to 2498° F)	± 2° C	2.2 MΩ
	T	-250° C to 400° C (-418° F to 752° F)	± 2° C	2.2 MΩ
	E	-100° C to 900° C (-148° F to 1652° F)	± 2° C	2.2 MΩ
	B	0° C to 1820° C (- 32° F to 3308° F)	± 2° C (200° C to 1800° C)	2.2 MΩ
	R	0° C to 1767.8° C (- 32° F to 3214° F)	± 2° C	2.2 MΩ
	S	0° C to 1767.8° C (- 32° F to 3214° F)	± 2° C	2.2 MΩ
	N	-250° C to 1300° C (-418° F to 2372° F)	± 2° C	2.2 MΩ
	L	-200° C to 900° C (-328° F to 1652° F)	± 2° C	2.2 MΩ
	P (L41 only)	0° C to 1395° C (32° F to 2543° F)	± 2° C	2.2 MΩ
	C (L41 only)	0° C to 2315° C (32° F to 4199° F)	± 2° C	2.2 MΩ
	PT100(DIN)	-210° C to 700° C (-346° F to 1292° F)	± 0.4° C	1.3 KΩ
	PT100(JIS)	-200° C to 600° C (-328° F to 1112° F)	± 0.4° C	1.3 KΩ
	mV	-8mV to 70mV	± 0.05%	2.2 MΩ
	mA	-3mA to 27mA	± 0.05%	L41: 70.5 Ω, L91: 100Ω
	VDC	-1.3VDC to 11.5VDC	± 0.05%	L41: 302 KΩ, L91: 510 KΩ

Temperature Effect	1.5μV /° C
Sensor Lead Resistance Effect	**Thermocouple:** 0.2 μV /° Ω **3-wire RTD:** 2.6° C /Ω of Difference of Resistance of two leads **2-wire RTD:** 2.6° C /Ω of Sum of Resistance of two leads
Burn-out Current	200nA
CMRR	120 dB
NMRR	55dB
Sensor Break Detection	Sensor open for Thermocouple, RTD, mV inputs, Below 1mA for 4 to 20mA, Below 0.25V for 1 to 5V
Sensor Break Response Time	Within 4 seconds for TC, RTD and mA inputs, 0.1 second for 4-20 mA and 1-5V inputs

Specifications

Specification	L41		L91	
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 Ω			
Triac Output	Rating: 1A / 240 VAC, Inrush current: 20A for 1 cycle, Minimum Load Current: 50 mA rms, Max. Off-state Leakage: 3 mA rms, Max. On-state Voltage: 1.5 V rms, Insulation Resistance: 1000 MΩ min. at 500 VDC, Dielectric Strength: 2500 VAC for 1 minute			
Limit Control Function	High Limit, Low limit and High / Low Limit programmable			
Alarm Function	Process Value High, Process Value Low			
Alarm Mode	Normal, Latching			
Transmitter Power Supply (Output 2)				
Transmitter Power Supply Output Characteristics	Type	Tolerance	Maximum Output Current	Ripple Voltage	Isolation Barrier
	20V	± 1V	25mA	0.2Vp-p	500 VAC
	12V	± 0.6V	40mA	0.1Vp-p	500 VAC
	5V	± 0.25V	80mA	0.05Vp-p	500 VAC
Digital Filter				
Function	First Order			
Time Constant	0, 0.2, 0.5, 1, 2, 5, 10, 20, 30, 60 Seconds, Programmable			
Event Input				
Logic Low	-10V minimum, 0.8V maximum			
Logic High	2V minimum, 10V maximum			
Event Input Functions	Remote reset, remote lockout			
Data Communication				
Interface	RS-485 or RS-232			
Protocol	Modbus RTU (Slave Mode)			
Address	1 to 247			
Baud Rate	2.8KBPS to 115.2KBPS			
Parity Bit	None, Even or Odd			
Stop Bit	1 or 2 Bits			
Data Length	7 or 8 Bits			
Communication Buffer	50 Bytes			
Analog Retransmission				
Output Signal	4 - 20mA, 0 - 20 mA, 0 - 10VDC, 0 - 5VDC, 1 - 5VDC			
Resolution	15 Bits			
Accuracy	± 0.05% of Span ± 0.0025% / ° C			
Load Resistance	0 to 500Ω for current output, 10KΩ minimum for Voltage Output			
Output Regulation	0.01% for full load change			
Output Setting Time	0.1 second (stable to 99.9%)			
Isolation Breakdown	1000VAC min			

Specifications

Specification	L41	L91
Analog Retransmission		
Integral Linearity Error	± 0.005% of span	
Temperature Effect	± 0.0025% of span / ° C	
Saturation Low	0mA or 0VDC	
Saturation High	22.2mA or 5.55V, 11.1V min	
Linear Output Ranges	0 - 22.2mA (0 - 20mA / 4 - 20mA), 0 - 5.55VDC (0 - 5VDC / 1 - 5VDC), 0 - 11.1VDC (0 - 10VDC)	
User Interface		
Keypad	4 Keys	
Display Type	4 Digit LCD Display	
No of Display	2	1
Upper Display Size	0.55”（14mm)	0.4”（10mm)
Lower Display Size	0.55”（14mm)	N.A.
Environmental and Physical Specifications		
Operating Temperature	-10° C to 50° C	
Storage Temperature	-40° C to 60° C	
Humidity	0 to 90 % RH (Non - Condensing)	
Altitude	2000 Meters Maximum	
Pollution	Degree II	
Insulation Resistance	20MΩ Minimum (@500V DC)	
Dielectric Strength	2000VAC, 50/60 Hz for 1 Minute	
Vibration Resistance	10 to 55 Hz, 10m/s2 for 2 Hours	
Shock Resistance	200 m/s2(20g)	
Housing	Flame Retardant Polycarbonate	
Mounting	Panel Mounting	
DIN Size	1 / 4	1/16
Dimensions (W*H*D) (mm)	96*96*65 mm	48*48*94 mm
Mounting (W*H) (mm)	92*92 mm	45*45 mm
Depth behind Panel	53 mm	86 mm
Weight (grams)	250 grams	150 grams
Approval Standards		
Safety	FM Class 3545 (Oct. 1998), UL61010C-1, CSA C22.2 No. 24-93, EN61010-1 (IEC1010-1), RoHS, REACH	
Protective Class	IP65 for panel with additional option, IP50 for panel without additional option, IP20 for terminals and housing with protective cover. All indoor use	IP30 front panel, indoor use, IP20 housing and terminals (with protective cover)
EMC	EN61326	

L41 Ordering Code

L41 – □ □ □ □ □ □

Power Input

4: 90-250 VAC, 47-63 HZ
5: 11-26 VAC or VDC,
SELV, Limited Energy

Signal Input

1: Standard Input
Thermocouple: J, K, T, E, B, R, S, N, L, C, P
RTD: PT100 DIN, PT100 JIS
mV: 0~60 mV
2: Voltage: 0-1 V
3: Voltage: 0-10 V
4: Current: 0-20mA
5: Voltage: 0-5 V
9: Special Order

Output 1

0: None
1: Form C relay rated 2A / 240VAC
2: Pulsed voltage to drive SSR, 5V / 30mA
6: Triac Output 1A / 240VAC, SSR
C: Pulsed voltage to drive SSR, 14V / 40mA
9: Special Order

Output 2

0: None
1: Form C Relay 2A / 240VAC
2: Pulsed voltage to drive SSR, 5V / 30mA
6: Triac Output, 1A / 240VAC, SSR
7: Isolated 20V / 25mA DC Output Power Supply
8: Isolated 12V / 40mA DC Output Power Supply
9: Isolated 5V / 80mA DC Output Power Supply
C: Pulsed voltage to drive SSR, 14V / 40mA
H: Special Order

Communication

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

Options

0: IP50 Standard
1: IP65 Water Resistant Rubber Installed

L91 Ordering Code

L91 – □ □ □ □

Power Input

4: 90-250 VAC, 47-63 HZ
5: 11 - 26 VAC or VDC,
SELV, Limited Energy

Signal Input

1: Standard Input
Thermocouple: J, K, T, E, B, R, S, N, L, C, P
RTD: PT100 DIN, PT100 JIS
mV: 0~60 mV
2: Voltage: 0-1 V
3: Voltage: 0-10 V
4: Current: 0-20mA
5: Voltage: 0-5 V
9: Special Order

Output 1

0: None
1: Form C relay rated 2A/240VAC
2: Pulsed voltage to drive SSR, 5V/30mA
6: Triac Output 1A / 240VAC, SSR
C: Pulsed voltage to drive SSR, 14V/40mA
9: Special Order

Output 2

0: None
1: Form C Relay 2A/240VAC
2: Pulsed voltage to drive SSR, 5V / 30mA
6: Triac Output, 1A / 240VAC, SSR
7: Isolated 20V / 25mA DC Output Power Supply
8: Isolated 12V / 40 mA DC Output Power Supply
9: Isolated 5V / 80mA DC Output Power Supply
A: RS-485
B: Event Input
H: Special Order
C: Pulsed voltage to drive SSR, 14V/40mA
D: Retransmit 4-20mA / 0-20mA
E: Retransmit 1-5V / 0-5V
F: Retransmit 0-10V

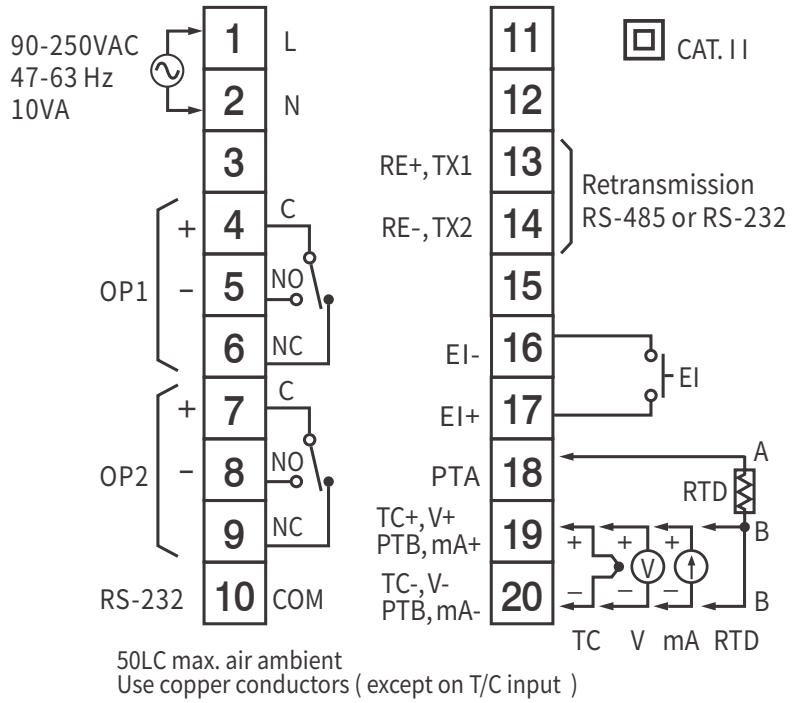
Accessories

OM94-6 = Isolated 1A/240VAC Triac Output Module (SSR)
OM94-7 = 14V/40mA SSR Drive Module
DC94-1 = Isolated 20V / 25mA DC Output Power Supply
DC94-2 = Isolated 12V / 40mA DC Output Power Supply
DC94-3 = Isolated 5V / 80mA DC Output Power Supply
CM94-1 = Isolated RS-485 Interface Module for L41
CM94-2 = Isolated RS-232 Interface Module for L41
CM94-3 = Isolated 4-20mA / 0-20mA Retransmission Module for L41
CM94-4 = Isolated 1-5V / 0-5V Retransmission Module for L41
CM94-5 = Isolated 0-10V Retransmission Module for L41
CC91-3 = Programming Port Cable for L41
CM96-1 = Isolated RS-485 Interface Module for L91
CM96-3 = Isolated 4-20mA / 0-20mA Retransmission Module for L91
CM96-4 = Isolated 1-5V / 0-5V Retransmission Module for L91
CM96-5 = Isolated 0-10V Retransmission Module for L91
EI96-1 = Event Input Module for L91
CC91-2 = Programming Port Cable for L91

Related Products

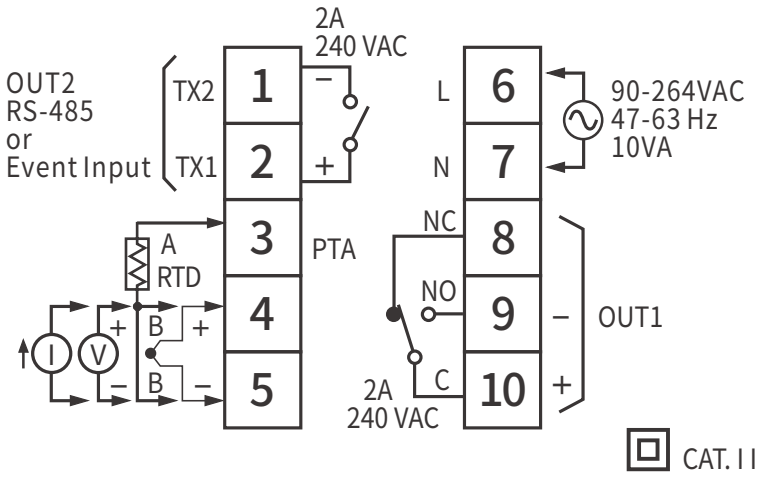
» SNA-10A = Smart Network Adaptor for Third Party Software, Converts 255 channels of RS-485 or RS-422 to RS-232 Network
» SNA-12A = Smart Network Adaptor for programming port to RS-232 Interface
» BC-SET= Configuration Software

L41



50LC max. air ambient
Use copper conductors (except on T/C input)

L91



PR Series
Paperless Recorders

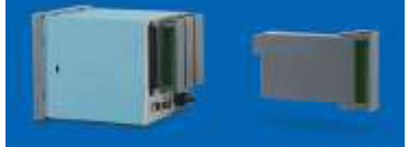
Outstanding Specifications & Features

			
	PR10	PR20	PR30
Product position	low-cost one, good for replacing 6-dotting chart recorders, and 1, 2, 3 pen recorders	medium size and powerful one, input numbers up to the highest 24 channels	big size and high-end one, good for sophisticated applications, for example power industry
Input numbers	3, 6 channels	3, 6, 12, 18, 24 channels	6, 12, 18, 24, 30, 36, 42, 48 channels
Input Signals	Thermocouples: J, K, T, E, B, R, S, N, L, U, P, W5 or C, W3, LR, A1, A2, A3, M RTD: Pt50, Pt100, Pt200, Pt500, Pt1000 (α=0.00385), Pt50, Pt100 (α=0.00391) JPt50, JPt100, JPt200, JPt500, JPt1000 (α=0.003916) Cu10 (α=0.00427), Cu50, Cu100(α=0.00426, 0.00428), Ni100, Ni200, Ni500, Ni1000 (α=0.00617) mA, V, mV		
The fastest sampling rate	to reach 100 msec / dot, default setting at 1 sec / dot		
Digital inputs / Relay outputs	Maximum 24 channels		
Analog outputs	Maximum 6 channels	Maximum 6 channels	Maximum 12 channels
Math channels (in standard firmware)	15	40	60
External channels (in plus 1/3 firmware)	24	48	96
Batch & FDA 21 CFR part 11	available in plus 1/3 firmware		
Custom display	available in plus 2/3 firmware		
Display	4.3" TFT wide touch screen	5.6" TFT touch screen	12.1" TFT touch screen
Resolution	480 x 272	640 x 480	1024 x 768
MTFB backlight at 25°C	30,000 hrs	30,000 hrs	60,000 hrs
Backlight	LED		
Screen saver, Email	Yes		
CPU	ARM Cortex-A8, 1Ghz with 256 MB RAM		
Internal Flash memory	256 MB		
Ethernet	Modbus TCP/IP		
RS-232/422/485	optional RS-232 or RS-422/485 Modbus RTU		
SD card Slot, USB host x 2	standard, one USB in the front, another USB in the back		
Pulse input	optional DI card supports pulse input up to 100 Hz		
PID Process control	Maximum 4 cards	Maximum 4 cards	Maximum 8 cards
START / STOP key	to start / stop record and to turn off the display only, not the power so that a quick restart possible later		
Calibration correction	on-site calibration possible, or using handy features of Offset and Gain for correction		
Multilingual	convenient for local users by offering languages in Brazil Portuguese, Chinese (simplified, traditional), Czech, Danish, Dutch, English, French, German, Greek, Italian, Japanese, Korean, Polish, Portuguese, Russian, Spanish, Swedish, Thai, Turkish, other languages negotiable		
PC software	standard: Historical Viewer+Configuration, optional Data Acquisition Studio for real-time monitoring & logging		
Power supply	90-250VAC or 11-36VDC		
Outer dimensions (W x H x L mm)	144 x 144 x189	144 x 144 x189	288 x 288 x 189
Shorter mounting depth (mm)	171	171	171
DIN Panel cutout (W x H mm)	137 x 137	137 x 137	281 x 281
Protection	IP65 front, IP20 rear		
Operating temperature	0°C to 50°C		
Storage temperature	-30°C to 70°C		
Safety standards	CE, UL, cUL, RoHS, WEEE (UL & cUL available only for 90-250VAC on PR10 & PR20)		

Features

* 100 milliseconds data logging
* FDA 21 CFR part11 compliance
* Batch control, log data in batches
* Timer, Counter, Totalizer & Math channels
* Custom display pages
* PID control with profile function
* Alarms by email
* On field calibration
* Web server
* Clock synchronization via internet
* Handwriting function in historical data
* Multiple Languages
* Circular chart in PR30
* Direct printer connectivity or PDF printer
* USB barcode reader connectivity for data entry
* Dynamic data exchange (DDE) via PC software

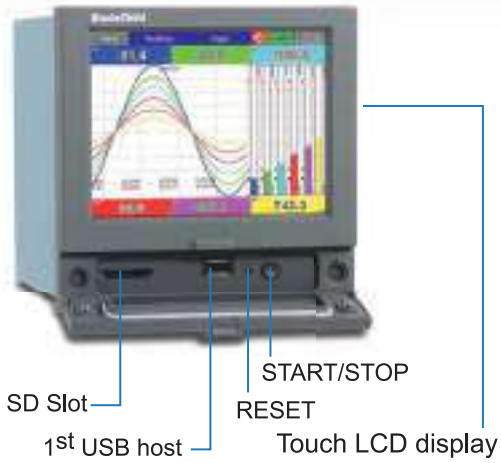
IO modules easy for expansion



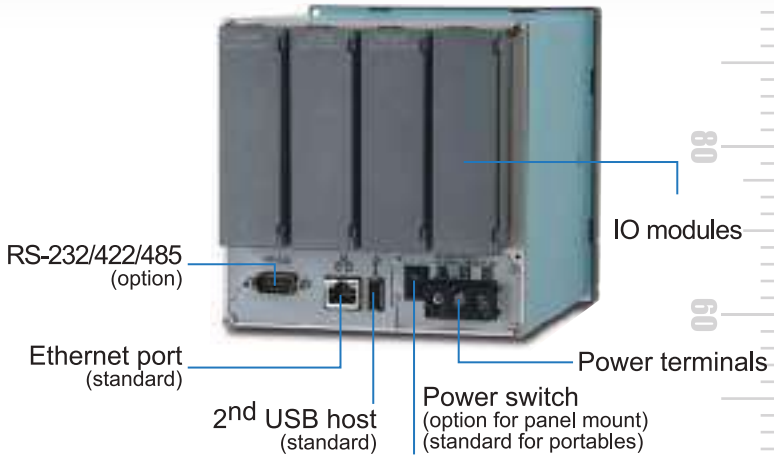
Smart Mechanism

Front view, Back view

PR20 Front view



PR20 Back view



Expandable modules of inputs & outputs

AI206
6 AI (6 analog inputs)

AI203
3 AI (3 analog inputs)

RO206
6 relay outputs

DI206
6 DI (6 digital inputs)

PC201
single loop process control

AO206
6 AO (6 analog outputs)

RD233
3 relays + 3DI

PR10
(4 Slots, up to 6 AI)

PR20
(4 Slots, up to 24 AI)

PR30
(16 Slots, up to 48 AI)

Portable recorders, Security key

Portable recorders

PR10 PR20 PR30

Security key

PC201: Single Loop PID Process Control Card

Input 1

Characteristics :

Type	Range	Accuracy @25°C	Input Impedance
J	-120°C -1000°C (-184°F -1832°F)	±2°C	2.2MΩ
K	-200°C -1370°C (-328°F -2498°F)	±2°C	2.2MΩ
T	-250°C -400°C (-418°F -752°F)	±2°C	2.2MΩ
E	-100°C -900°C (-148°F -1652°F)	±2°C	2.2MΩ
B	0°C -1820°C (32°F -3308°F)	±2°C (200°C - 1820°C)	2.2MΩ
R	0°C -1767.8°C (32°F -3214°F)	±2°C	2.2MΩ
S	0°C -1767.8°C (32°F -3214°F)	±2°C	2.2MΩ
N	-250°C -1300°C (-418°F -2372°F)	±2°C	2.2MΩ
L	-200°C -900°C (-328°F -1652°F)	±2°C	2.2MΩ
PT100 (DIN)	-210°C -700°C (-346°F -1292°F)	±0.4°C	1.3KΩ
PT100 (JIS)	-200°C -600°C (-328°F -1112°F)	±0.4°C	1.3KΩ
mV	-8mV -70mV	±0.05%	2.2MΩ
mA	-3mA -27mA	±0.05%	70.5Ω
V	-1.3V -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
Sensor Lead Resistance Effect :
T/C: 0.2uV/ohm
3-wire RTD: 2.6 ˚C/Ω of resistance difference of two leads
2-wire RTD: 2.6 ˚C/Ω 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 : ±1.5uV/˚C for all inputs except mA input ±3.0uV/˚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	±2% of Reading ±0.2 A	302 KΩ
mA	-3mA-27mA	±0.05%	$70.5\Omega + \frac{0.8V}{\text{input current}}$
V	-1.3V-11.5V	±0.05%	302 KΩ

Input 3 (Event Input)

Logic Low : -10V minimum, 0.8V maximum.
Logic High : 2V minimum, 10V maximum
External pull-down Resistance : 400 KΩ maximum
External pull-up Resistance : 1.5 MΩ minimum

Output 1 / Output 2

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

Type	Zero Tolerance	Span Tolerance	Load Capacity
4-20 mA	3.6-4 mA	20-21 mA	500 Ω max.
0-20 mA	0 mA	20-21 mA	500 Ω max.
0-5 V	0 V	5-5.25 V	10 KΩ min.
1-5 V	0.9-1 V	5-5.25 V	10 KΩ min.
0-10 V	0 V	10-10.5 V	10 KΩ min.

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 : ±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 MΩ 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	±0.1 V	25 mA	0.2 Vp-p	500 VAC
12 V	±0.6 V	40 mA	0.1 Vp-p	500 VAC
5 V	±0.25 V	80 mA	0.05 Vp-p	500 VAC

Alarm 1/ Alarm 2 (Output 2)

Alarm 1 Relay :
Form C, life cycles 200,000 for resistive load
Alarm 2 Relay :
Form A, Max. rating 2A / 240VAC, life cycles 200,000 for resistive load
Dwell Timer : 0 - 6553.5 minutes

Control Mode

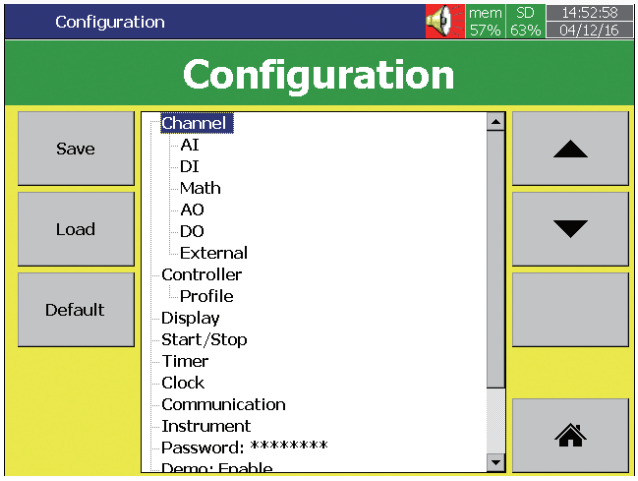
Output 1 : Reverse (heating) or direct (cooling) action
Output 2 : PID cooling control, cooling P band 1 ~ 255% of PB
ON-OFF : 0.1-100.0˚C (0.1-100.0˚F) hysteresis control (P band = 0)
P or PD : 0 - 100.0 % offset adjustment
PID : Fuzzy logic modified , Proportional band 0 ~ 500.0 ˚C , Integral time 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
Self-tuning : Select None and YES
Failure Mode : Auto-transfer to manual mode while sensor break or A-D converter damage
Ramping Control : 0-500.0˚C (0 - 900.0˚F) / minute or 0-500.0˚C (0 - 900.0˚F) / hour ramp rate
Sleep Mode : Enable or Disable
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

Profiler

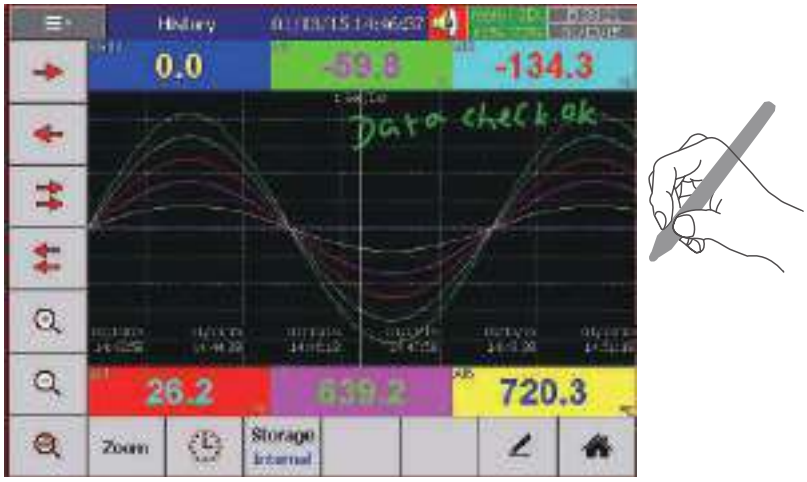
Number of Profiles : 50 per recorder
Number of Segments per Profile : 32
Note : Total Segments are limited to 1000 Segments

User friendly functions in recorders

Configuration in Tree Layout is easy for operation



Handwriting messages are handy for users



Circular display (PR30 only)

For some industries preferred circular display, PR30 can offer this unique feature and set the display speed for each page/circle in 30 minutes, 1, 2, 4, 8, 12 hours,1, 2 days, or 1, 2, 4 weeks.

Standard version of Firmware

AI: Analog input is offered various log speed in 100ms, 1, 2, 5, 10, 20, 30 Sec, 1, 2 Min/Dot.

DI: Digital input is offered either normal Logic or high frequency Pulse.

AO: In analog output, mA or V and its Expression can be defined.

DO: Digital output/relay output can be enabled. Each DO card has 6 relays.

Display: Various display speeds are available in 100ms, 1, 2, 5, 10, 20, 30 Sec/Dot, or 1, 2, 10, 30 Min/Page, 1, 2, 4, 8, 12 Hour/Page, or 1 Day/Page.

Timer: Timer in Countdown, Repeat Countdown, Daily, Weekly or Monthly base, and various jobs can be defined.

Clock: Date Style of MM/dd/yy or dd/MM/yy, Time Synchronize via Internet, and Summer Saving Time can be defined.

Communication: Web Server and Email functions are available in Communication in Standard firmware.

Instrument: Brightness adjustment and Screen Saver are available in Instrument.

Password: If Normal Security is chosen, then only one password is offered. If high Security of CFR-21 is chosen, then 9 levels of password can be defined.

Demo: Enable or disable the demonstration.

Auto-output: Automatic output can be set to specify the printer, to print Historical data & Report data in specified period of time.

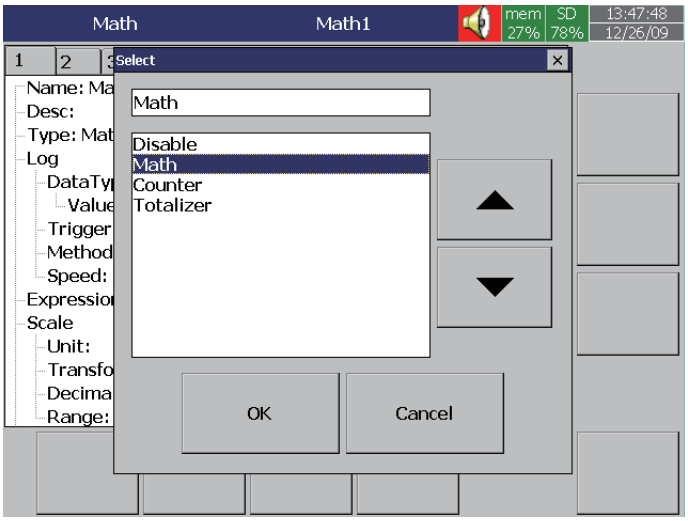
System information: It gives Firmware version number, Internal & External memory status, IP address, and IO card status of each Slot.

Calibrate: Sometimes the field calibration is required for high accuracy. In this case, a qualified engineer can do the necessary calibration.

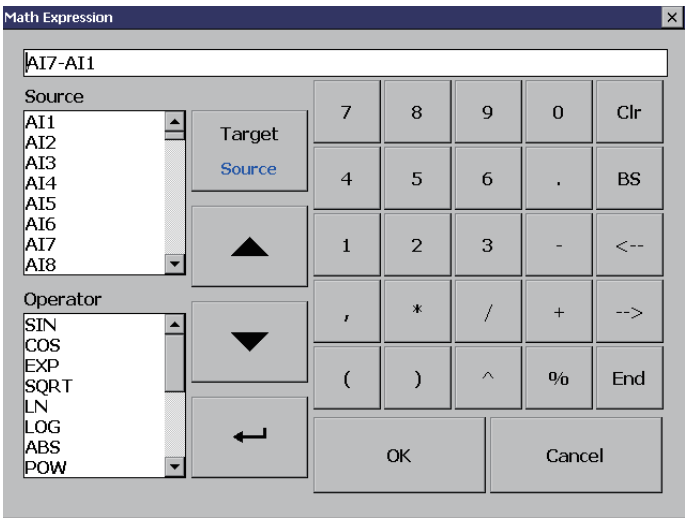
User friendly functions in recorders

Math: Standard version includes mathematics

Math: It includes Math, Counter & Totalizer.



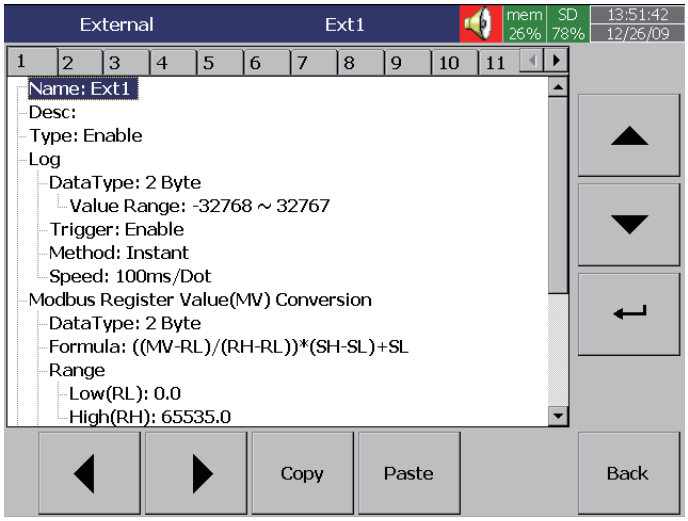
Math Expression is keyed in an easy way.



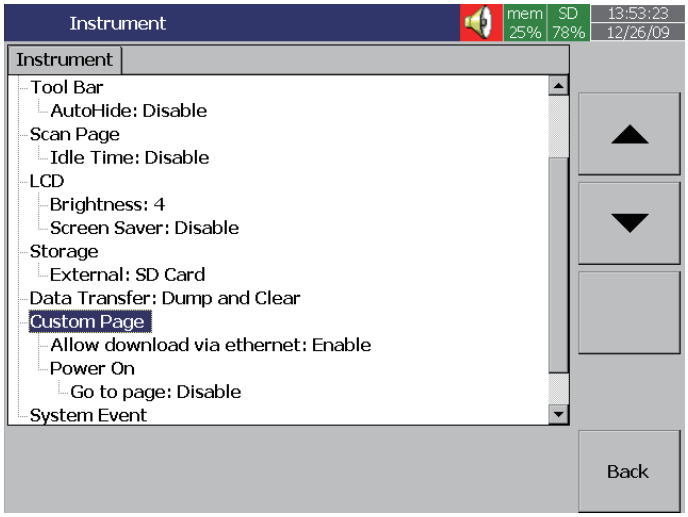
Plus version of Firmware

Plus versions offer more features of External Channels, Custom Display, Batch, FDA 21 CFR part 11.

External Channels: Besides AI & DI inputs, PR recorders accept inputs through communication called External Channels. PR10, PR20 & PR30 can work External Channels maximum up to 24, 48 & 96 respectively.



Custom Edited Display: In Plus versions, PC software Panel Studio allows users to edit the specific display instead of standard one, and then download it onto PR recorders.



Batch: Batch production record is constantly required for more strict production, for example food and drugs.

FDA 21 CFR part 11: This feature is complied with U.S. Food and Drug Administration with human health concern. All data should be avoided from manipulating after recording.

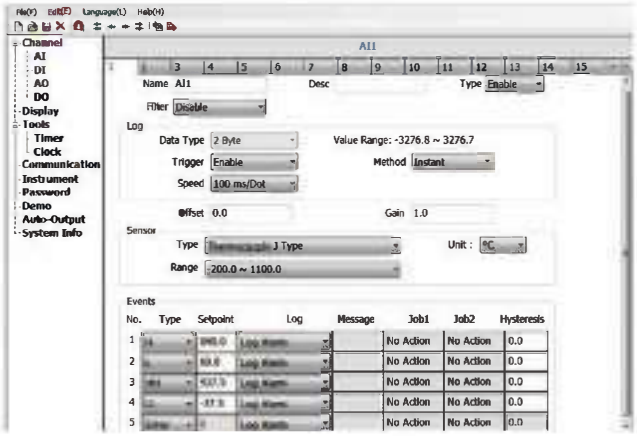
Powerful functions in PC Software

Free basic software

It consists of two parts, which are Configuration and Historical Viewer.

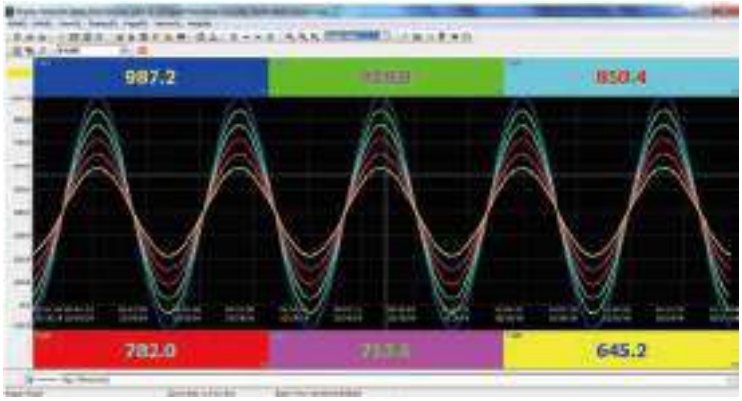
I. Configuration

It is easy to do recorder configuration on PC.
Then, send the configuration files from PC to recorder.



II. Historical Viewer

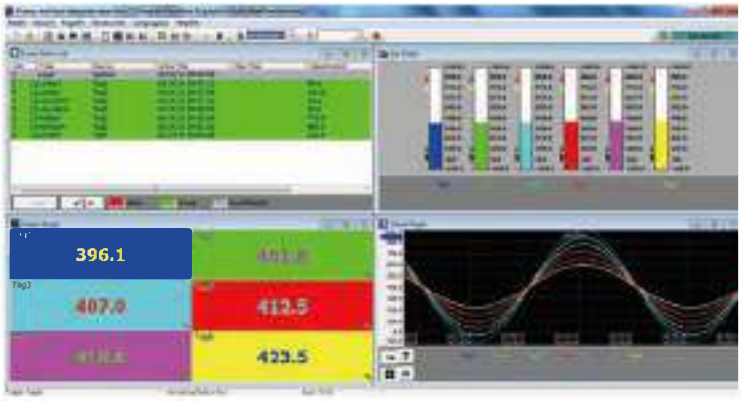
It can display historical trends, historical alarms, events, and then print it. It can search data by time, time period, tag, alarm, events and remarks. It also can export data in CSV format.



Extensive software Data Acquisition Studio

III. RealTime Viewer

Besides Configuration & Historical Viewer, it offers additional software RealTime Viewer for real-time monitoring.

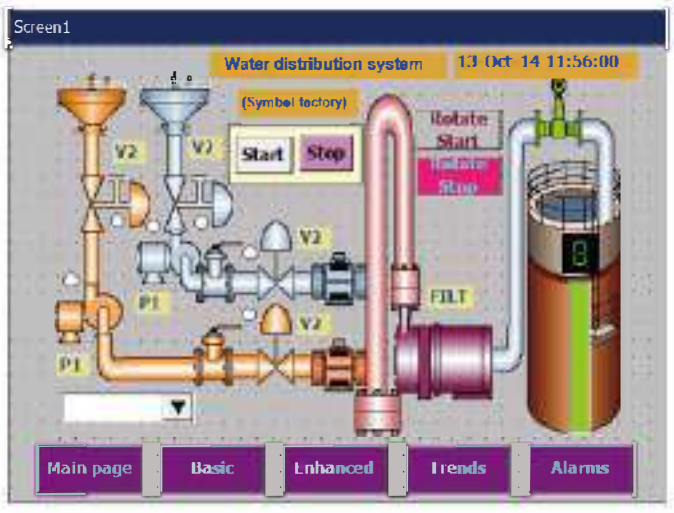


IV. Panel Studio

If Plus version 2 or 3 of Firmware is purchased, additional software Panel Studio is offered for editing custom display. The users can use it to edit specific displays on PC first, and then download it onto recorders. The custom edited displays will be additional pages to standard ones.

Edit it on PC

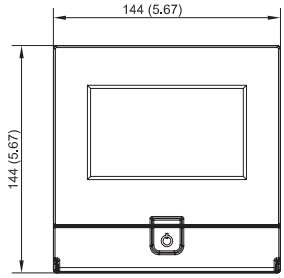
Download it onto recorders

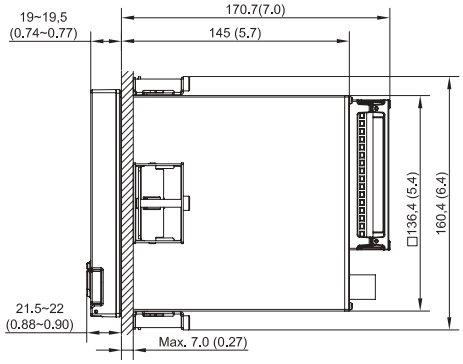


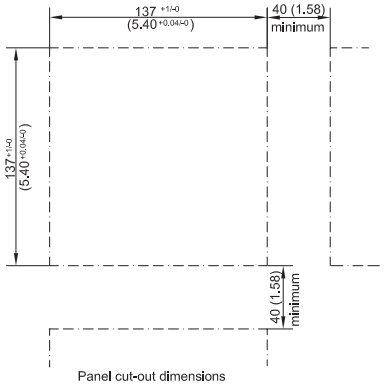
Installation

Dimensions in mm (in.)

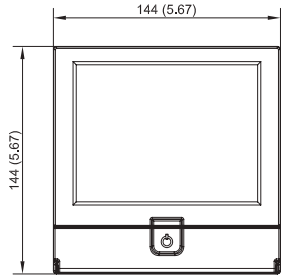
PR10

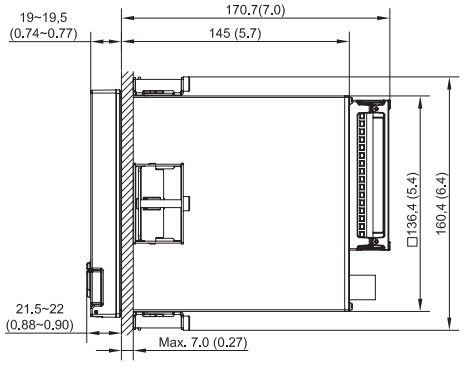


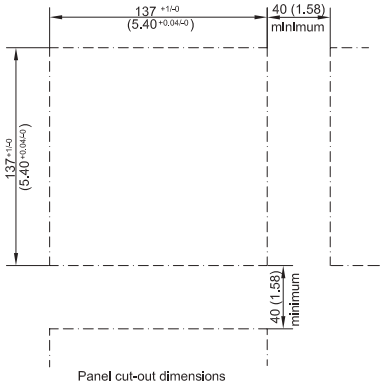




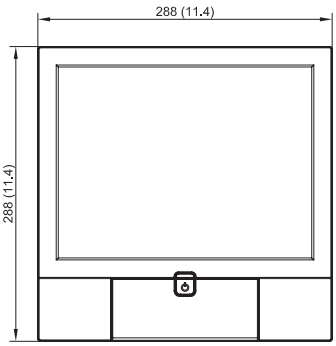
PR20

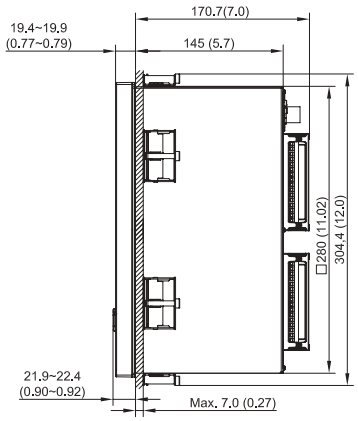


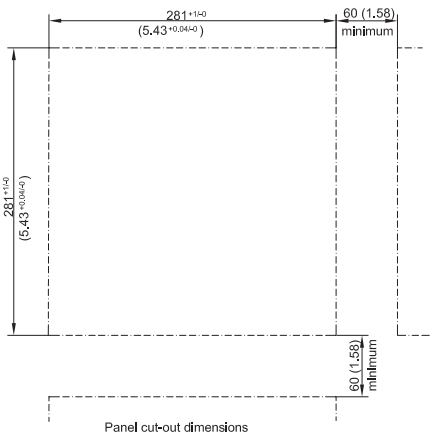




PR30







Ordering Code

PR10 Ordering Code

PR1003
(3 analog inputs)

Other inputs & outputs*
0: none
6: 3 relays + 3 DI

PR1006
(6 analog inputs)

Other inputs & outputs*
0: none
1: 6 relays
3: 6 DI
6: 3 relays + 3 DI
7: 6 relays + 6 DI

Power
A: 90-250 VAC, 50/60 Hz
D: 11-36 VDC

Communication
0: standard Ethernet
1: Ethernet + RS232
2: Ethernet + RS-422/485

Firmware
0: standard version with mathematics
1: Plus version 1 with external channels, batch & FDA 21 CFR part 11
2: Plus version 2 with custom edited display, an editing software Panel Studio to be supplied
3: Plus version 3 including Plus version 1+2 above

PC software
1: free basic software of Historical Viewer & Configuration
2: extensive software Data Acquisition Studio (RealTime Viewer + Historical Viewer + Configuration)

Mounting types, power cord & switch
0: panel mount, no power cord, no power switch
1: panel mount, no power cord, power switch
2: portable, UL & CSA power cord, power switch
3: portable, VDE power cord, power switch
4: portable, SAA power cord, power switch
5: portable, BS power cord, power switch
6: portable, no power cord, power switch
7: panel mount, UL & CSA power cord, power switch
8: panel mount, VDE power cord, power switch
9: panel mount, SAA power cord, power switch
A: panel mount, BS power cord, power switch

Special options
00: none
S1: 16G SD card
S2: 32G SD card

*Note: DI - digital inputs
PID Process control card can be purchased separately

Process Control card Ordering Code

PC201 –

Output 1
0: None
1: Relay 2A/240VAC
2: Pulse voltage to drive SSR, 5V/30mA
3: Isolated 4-20mA/0-20mA (OM95-3)
4: Isolated 1-5V/0-5V (OM95-4)
5: Isolated 0-10V (OM95-5)
6: Triac output 1A/240VAC,SSR
C: Pulse voltage to drive SSR, 14V/40mA (OM94-7)

Output 2
0: None
1: Relay 2A/240VAC
2: Pulse voltage to drive SSR, 5V/30mA
3: Isolated 4-20mA/0-20mA (OM95-3)
4: Isolated 1-5V/0-5V (OM95-4)
5: Isolated 0-10V (OM95-5)
6: Triac output 1A/240VAC,SSR
7: Isolated 20VDC/25mA power supply (DC94-1)
8: Isolated 12VDC/40mA power supply (DC94-2)
9: Isolated 5VDC/80mA power supply (DC94-3)
C: Pulse voltage to drive SSR, 14V/40mA (OM94-7)

Alarm 1
0: None
1: Form C relay 2A/240VAC

Alarm 2
0: None
1: Form A relay 2A/240VAC

PR20 Ordering Code

PR2003
(3 analog inputs)

Other inputs & outputs*
0: none
6: 3 relays + 3 DI
C: 3 relays + 3 DI + 6 AO

PR2006
(6 analog inputs)

Other inputs & outputs*
0: none
1: 6 relays
3: 6 DI
5: 6 AO
6: 3 relays + 3 DI
7: 6 relays + 6 DI
A: 6 relays + 6 AO
B: 6 DI + 6 AO
C: 3 relays + 3 DI + 6 AO
D: 6 relays + 6 DI + 6 AO

PR2009/12
(9/12 analog inputs)

Other inputs & outputs*
0: none
1: 6 relays
2: 12 relays
3: 6 DI
4: 12 DI
5: 6 AO
6: 3 relays + 3 DI
7: 6 relays + 6 DI
8: 9 relays + 3 DI
9: 3 relays + 9 DI
A: 6 relays + 6 AO
B: 6 DI + 6 AO
C: 3 relays + 3 DI + 6 AO

PR2015/18
(15/18 analog inputs)

Other inputs & outputs*
0: none
1: 6 relays
3: 6 DI
5: 6 AO
6: 3 relays + 3 DI

PR2021/24
(21/24 analog inputs)

Other inputs & outputs*
0: none

Power

A: 90-250 VAC, 50/60 Hz
D: 11-36 VDC

Communication

0: standard Ethernet
1: Ethernet + RS232
2: Ethernet + RS-422/485

Firmware

0: standard version with mathematics
1: Plus version 1 with external channels batch & FDA 21 CFR part 11
2: Plus version 2 with custom edited display, an editing software Panel Studio to be supplied
3: Plus version 3 including Plus version 1+2 above

PC software

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2: extensive software Data Acquisition Studio (RealTime Viewer + Historical Viewer + Configuration)

Mounting types, power cord & switch

0: panel mount, no power cord, no power switch
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4: portable, SAA power cord, power switch
5: portable, BS power cord, power switch
6: portable, no power cord, power switch
7: panel mount, UL & CSA power cord, power switch
8: panel mount, VDE power cord, power switch
9: panel mount, SAA power cord, power switch
A: panel mount, BS power cord, power switch

Special options

00: none
S1: 16G SD card
S2: 32G SD card

**Note: DI - digital inputs*
AO - analog retransmission output
PID Process control card can be purchased separately
Process control card cannot be chosen together with PR2003, PR2006, PR2012, PR2018 order codes 5, A, B, C, D nor with PR2024 (24 analog inputs)

PR30 Ordering Code

PR3006 (6 analog inputs)
PR3012 (12 analog inputs)
PR3018 (18 analog inputs)
PR3024 (24 analog inputs)
PR3030 (30 analog inputs)
PR3036 (36 analog inputs)
PR3042 (42 analog inputs)
PR3048 (48 analog inputs)

Relay outputs

0: none
1: 6 relays
2: 12 relays
3: 18 relays
4: 24 relays

Digital inputs

0: none
1: 6 channels
2: 12 channels
3: 18 channels

Analog outputs

0: none
1: 6 channels
2: 12 channels

Power

A: 90-250 VAC, 50/60 Hz
D: 11-36 VDC

Communication

0: standard Ethernet
1: Ethernet + RS232
2: Ethernet + RS-422/485

Firmware

0: standard version with mathematics
1: Plus version 1 with external channels, batch & FDA 21 CFR part 11
2: Plus version 2 with custom edited display, an editing software Panel Studio to be supplied
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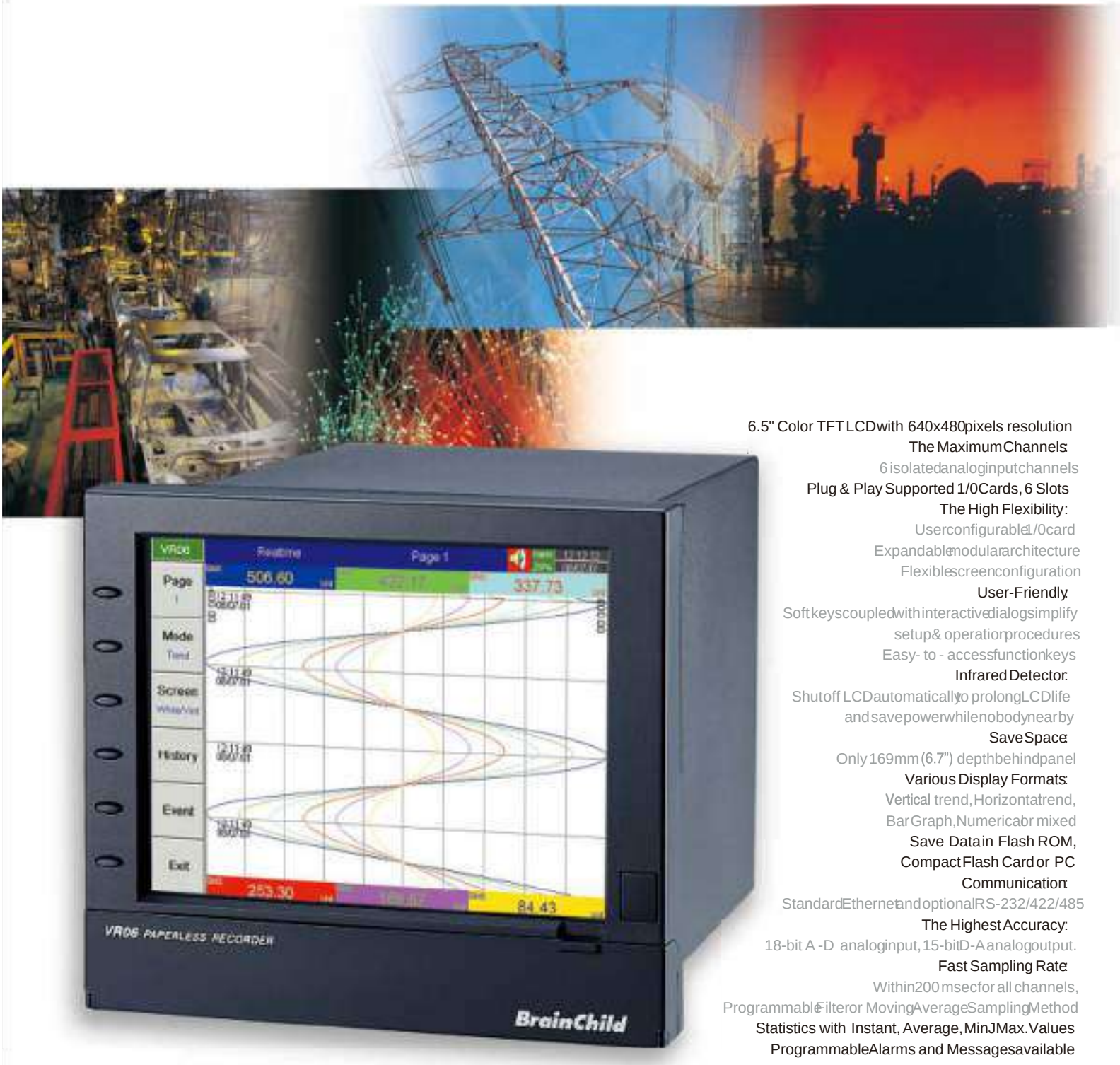
6: portable, no power cord, power switch
7: panel mount, UL & CSA power cord, power switch
8: panel mount, VDE power cord, power switch
9: panel mount, SAA power cord, power switch
A: panel mount, BS power cord, power switch

Special options

00: none
S1: 16G SD card
S2: 32G SD card

**Note: PID Process control card can be purchased separately*

VR06 Paperless Recorder



6.5" Color TFT LCD with 640x480 pixels resolution

The Maximum Channels:
6 isolated analog input channels

Plug & Play Supported 1/0 Cards, 6 Slots

The High Flexibility:
User configurable 1/0 card
Expandable modular architecture
Flexible screen configuration

User-Friendly:
Soft keys coupled with interactive dialogs simplify setup & operation procedures
Easy- to - access function keys

Infrared Detector:
Shut off LCD automatically to prolong LCD life and save power while nobody near by

Save Space:
Only 169mm (6.7") depth behind panel

Various Display Formats:
Vertical trend, Horizontal trend, Bar Graph, Numerical or mixed

Save Data in Flash ROM, Compact Flash Card or PC

Communication:
Standard Ethernet and optional RS-232/422/485

The Highest Accuracy:
18-bit A -D analog input, 15-bit D-A analog output.

Fast Sampling Rate:
Within 200 msec for all channels, Programmable Filter or Moving Average Sampling Method

Statistics with Instant, Average, Min J Max. Values

Programmable Alarms and Messages available

VR06 is the Low-Cost paperless recorder in bigger size 6.5" with the highest resolution (true VGA , 640x480 pixels), infrared detector, 6 channels, plug & play I/O card, high flexibility, the most user - friendly and the shortest depth. In chemical plant, food & beverage plant, petrochemical plant, semiconductor plant, metal alloy, automotive plant, environmental monitoring or laboratory, VR06 can be used to monitor, record, evaluate the processes in the plants.

The user can access data on the screen as well as on site from a remote place via RS-232, RS-485, RS-422 serial interface or Ethernet networking. The historical data can be stored in flash ROM, Compact Flash Card, or collected in a remote host PC for data evaluation and print-out.

Panel Mounted Style

6.5" color TFT LCD 640x480 pixels resolution

Infrared detector protect LCD & save power

Power switch

Compact Flash Card

12 SOFT KEYS FOR EASY OPERATION

Rear Terminals

standard Ethernet and optional RS-232/422/485

Power supply

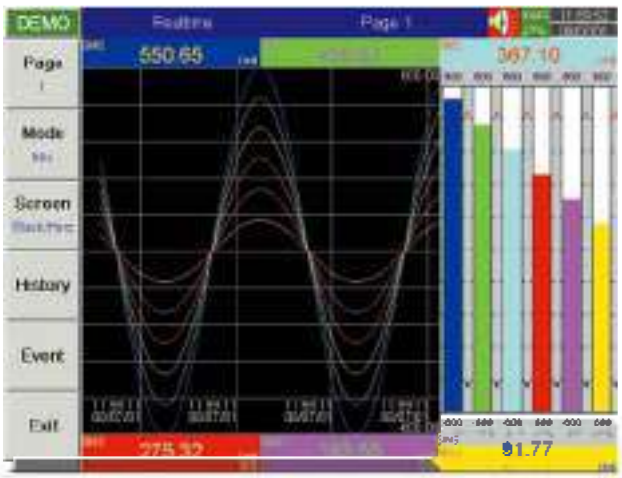
6 SLOTs for Plug & play I/O cards, maximum 6 analog input or mixed with analog & digital I/O cards

Input & Output Cards

Digital input Digital output (6 alarms) Analog input

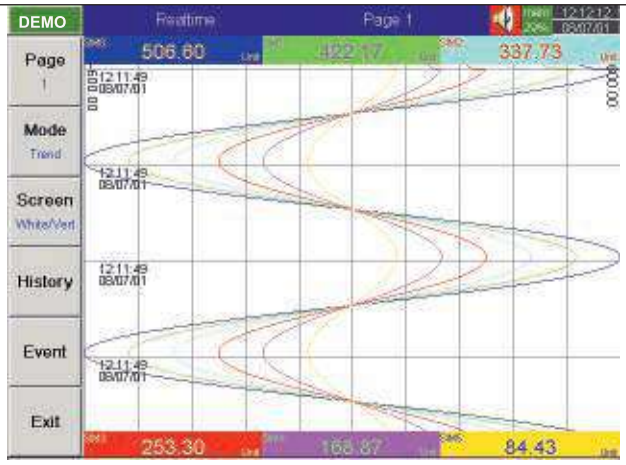
Configure input by DIP switches

Mixed Mode



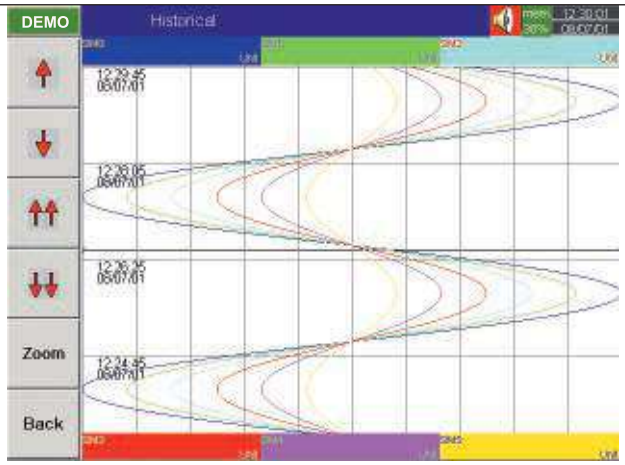
- View max. 6 mixed real time data trends horizontally.
- Display data in "Bars" and "Digits" together with mixed "Trends".
- Recognize data trends easily by different colors and tag names.
- Switch to other configured pages easily by "Page" function key.
- Display current "Time/Date" information.
- Remind the user of "Alarm" or "Memory Full".

Trend Mode



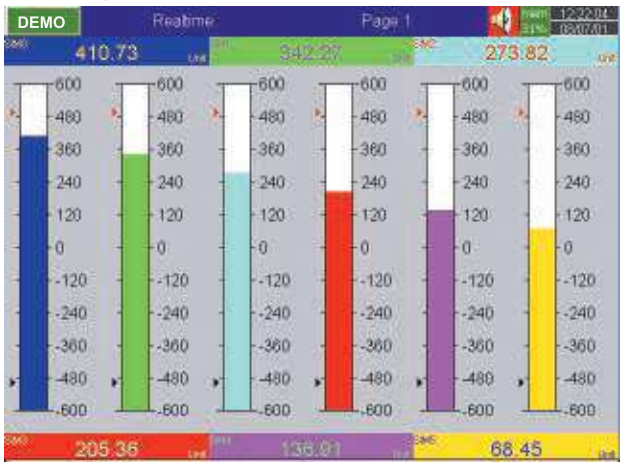
- View max. 6 real time data trends vertically.
- Recognize data trends easily by different colors and tag names.
- Switch to other configured pages easily by “Page” function key.
- Display current “Time/Date”information.
- Remind the user of “Alarm” or ”Memory Full”

Historical Mode



- Display max. 6 sets of historical data simultaneously.
- View desired data section by " ↑ "&" ↓ " function keys.
- Access precise data value at a point selected by moving the "ruler".
- "Zoom" to expand/contract the display time span.
- View historical data trends and their respective data values.
- Recognize trends easily by different colors and individual tag names.

Bar Graph Mode



- View max. 6 real time data in bar graphs.
- Scale individually by user in “configuration”.
- Display data value and tag name in different colors together with each bar graph.
- Mark “Hi/Lo” alarm limits.
- Display current “Time/Date” information.
- Remind the user of the “Alarm” or “Memory Full”.

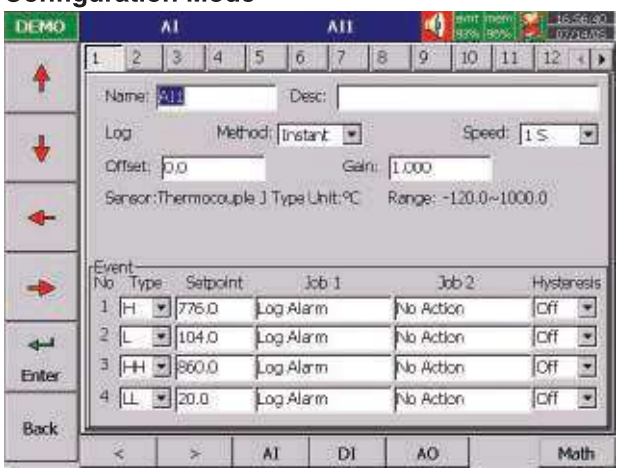
Alarm List

- List all the alarm records clearly with useful information.
- Browse through the alarm list or "acknowledge" alarm easily by function keys on the vertical bar.
- Remind the user of the alarm status in different colors.

Numerical Mode

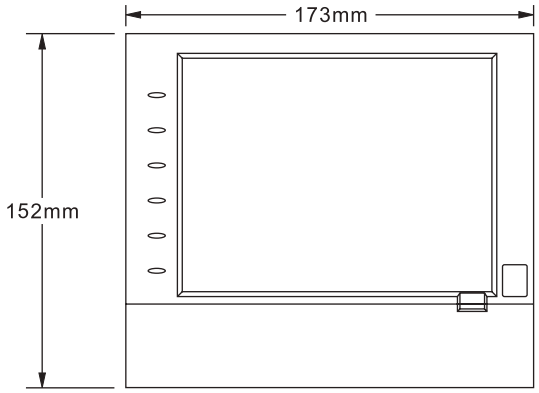
- View max. 6 real time data in numbers.
- Display data value and tag name in different color.
- Mark “Hi/Lo” alarm limits.
- Display current “Time/Date” information.
- Remind the user of the “Alarm” or “Memory Full”.

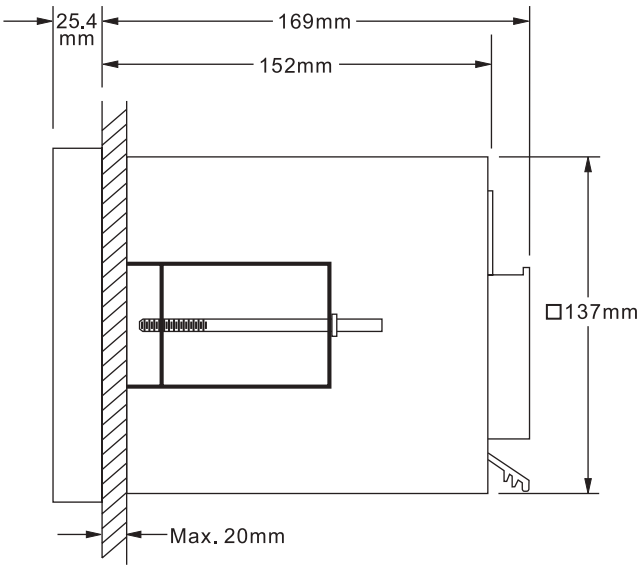
Configuration Mode



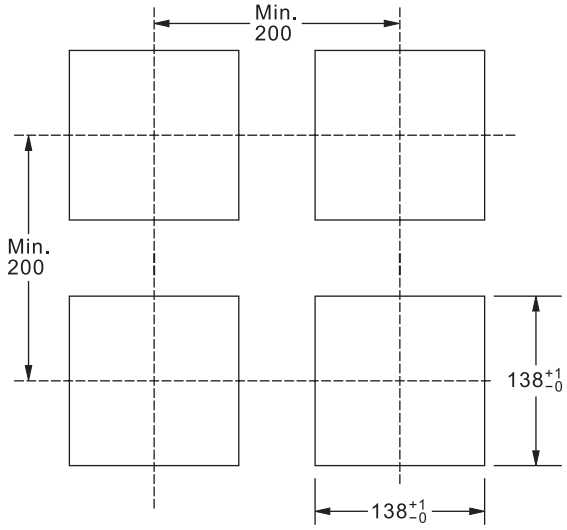
- Configure pen (input/output, pen name, event, job.....)
- Configure page (color, pen, decimal, pen width.....)
- Configure timer.
- Configure instrument (storage media, display, communication, time/date....)

Mechanical Data

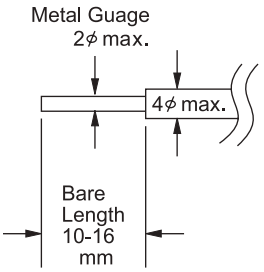




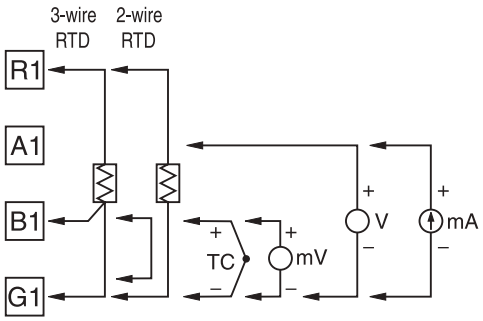
Panel Cutout



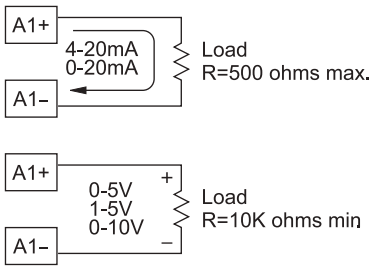
Wiring Cable



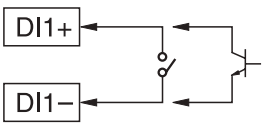
Analog Input Card (AI181, AI182, AI183)



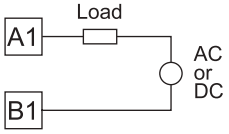
Analog Output Card (AO183I, AO183V)



Digital Input Card (DI181)



Digital Output Card (DO181)



SPECIFICATIONS

Power
90-250VAC or 20-28VAC，47-63Hz, 60VA, 30W maximum
11-18, 18-36 or 36-72 VDC 60VA, 30W maximum

Display
6.5"TFT LCD, 640X480 pixel resolution, 256 colors

Memory
Storage Memory on board:16MB
CF Card: 2GB standard

Analog Input Card (AI181, AI182, AI183)
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 μV/°C for all inputs except mA input
±3.0 μV/°C for mA input
Sensor Lead Resistance Effect:
T/C: 0.2 μV/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
Burn-out Current: 200nA
Common Mode Rejection Ratio (CMRR): 120dB
Normal Mode Rejection Ratio (NMRR): 55dB
Isolation Breakdown Voltage among channels: 430VAC min.
Sensor Break Detection:
Sensor open for TC,RTD and mV inputs,
below 1 mA for 4-20mA input,
below 0.25V for 1-5V inputs,
unavailable for other inputs.
Sensor Break Responding Time:
Within 10 seconds for TC, RTD and mV inputs,
0.1 second for 4-20 mA and 1-5V inputs.

Characteristics:

Type	Range	Accuracy @25°C	Input Impedance
J	-120°C - 1000°C (-184°F - 1832°F)	±1°C	2.2MΩ
K	-200°C - 1370°C (-328°F - 2498°F)	±1°C	2.2MΩ
T	-250°C - 400°C (-418°F - 752°F)	±1°C	2.2MΩ
E	-100°C - 900°C (-148°F - 1652°F)	±1°C	2.2MΩ
B	0°C - 1820°C (32°F - 3308°F)	±2°C (200°C - 1820°C)	2.2MΩ
R	0°C - 1767.8°C (32°F - 3214°F)	±2°C	2.2MΩ
S	0°C - 1767.8°C (32°F - 3214°F)	±2°C	2.2MΩ
N	-250°C - 1300°C (-418°F - 2372°F)	±1°C	2.2MΩ
L	-200°C - 900°C (-328°F - 1652°F)	±1°C	2.2MΩ
PT100 (DIN)	-210°C - 700°C (-346°F - 1292°F)	±0.4°C	1.3KΩ
PT100 (JIS)	-200°C - 600°C (-328°F - 1112°F)	±0.4°C	1.3KΩ
mV	-8mV - 70mV	±0.05%	2.2MΩ
mA	-3mA - 27mA	±0.05%	70.5Ω
0~1V	-0.12 - 1.15V	±0.05%	32KΩ
0~5V	-1.3V - 11.5V	±0.05%	332KΩ
1~5V	-1.3V - 11.5V	±0.05%	332KΩ
0~10V	-1.3V - 11.5V	±0.05%	332KΩ

Analog Input Card (AI183V)

Type	Range	Accuracy @25°C	Input Impedance
-60~60mV	-62~62mV	±0.1%	2.2MΩ
-2~2V	-2.2~2.2V	±0.3%	340KΩ
-20~20V	-22~22V	±0.1%	3.64MΩ
-20~20mA	-22~22mA	±0.1%	70.5Ω

Digital Input Card (DI181)
Channels: 6 per card
Logic Low: -5V minimum, 0.8V maximum
Logic High: 2V minimum, 5V maximum
External Pull-down Resistance: 1KΩ maximum
External pull-up Resistance: 1.5MΩ minimum

Digital Output Card (DO181)
Channels: 6 per card
Contact Form: N.O. (form A)
Relay Rating: 5A/240 VAC, life cycles 200,000 for resistive load

Analog Output Card (AO183I, AO183V)
Output Signal : 4-20mA, 0-20mA (AO183I)
0-5V, 1-5V, 0-10V (AO183V)
Resolution : 15 bits
Accuracy: ±0.05% of Span ±0.0025% / °C
Load Resistance: 0-500 ohms (for current output)
10K ohms minimun (for voltage output)
Output Regulation: 0.01% for full load change
Output Setting Time: 0.1 sec (stable to 99.9 %)
Isolation Breakdown Voltage: 1000VAC min.
Integral Linearity Error: ±0.005% of Span
Temperature Effect: ±0.0025% of Span / °C

COMM Module (CM181)
Interface: RS-232 (1 unit), RS-485 or RS-422 (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

Standard Ethernet Communication
Protocol: Mod Bus TCP / IP, 10 BaseT
Auto polarity correction for 10 BaseT
Ports: RJ-45

Infrared Detector
Distance: Detect moving human body within 2 meters

Environmental & Physical
Operating Temperature: 5°C to 50°C
Storage Temperature: -25°C to 60°C
Humidity: 20 to 80% RH (non-condensing)
Insulation Resistance: 20 Mohms min. (at 500 VDC)
Dielectric Strength: 1350VAC 50/60 Hz for 1 minute
Vibration Resistance: 10-55 Hz, 10m/S^2 for 2 hours
Shock Resistance: 30 m/S^2 (3g) for operation, 100g for transportation
Dimensions: 173mm(W) x 152mm(H) x 169mm(D)

Approval Standards
Safety: UL61010 C-1
CSA C22.2 No. 24-93
CE: EN61010-1 (IEC1010-1)
Overvoltage category II, Pollution degree 2
Protective Class:
IP 30 front panel, indoor use,
IP 20 housing and terminals
EMC
Emission: EN50081-1, EN61326
(EN55011 class A,
EN61000-3-2, EN61000-3-3)
Immunity: EN50082-2, EN61326
(EN61000-4-2, EN61000-4-3,
EN61000-4-4, EN61000-4-5,
EN61000-4-6, EN61000-4-8,
EN61000-4-11)

ACCESSORIES LIST

Part No.	Description
AI181	1-channel analog input card (Universal except -mA, -V)
AI182	2-channel analog input card
AI183	3-channel analog input card
AI183V	3-channel analog input card (±mA, ±V only)
DI181	6-channel digital input card
DO181	6-channel relay output card
AP181	24VDC auxiliary power supply
CM181	RS-232/422/485 & Ethernet Comm module
CM182	Ethernet Comm module
PM181	90~250 VAC power supply
PM182	11-18 VDC power supply
PM183	18-36 VDC power supply
PM184	90~250 VAC power supply with power plug
PM185	36-72 VDC power supply
PM186	20-28 VAC power supply
MK181	Panel mount assembly kit
CF204	2GB compact flash card
AS181	Basic PC software Observer I
AS182	Extensive PC software Observer II
SC181	Slot cover for empty slot
AO183I	3-channel analog output card with current output
AO183V	3-channel analog output card with voltage output
BT182	Boot ROM w/ Math, Counter, Totalizer & FDA 21 CFR part 11
SNA-10A	RS-485 to RS-232 converter
UMVR061	User Manual

Ordering Code:

VR06 – □ □ □ □ - □ □ □ - □ □ □

Power
- 4: 90-250 VAC, 47-63Hz
- 5: 20-28VAC, 47-63Hz
- 6: 11-18VDC
- 7: 18-36VDC
- 8: 36-72VDC

Analog input card
- 0: none
- 1: 1 channel with AI181
- 2: 2 channels with AI182
- 3: 3 channels with AI183
- 4: 4 channels with AI181 & AI183
- 5: 5 channels with AI182 & AI183
- 6: 6 channels with AI183
- 7: 6 channels with AI183 & AI183V
- G: 3 channels with AI183V
- H: 6 channels with AI183V

*See AI181/2/3 (V) to the left.

Digital input card
- 0: none
- 1: 6 channels

Digital output card
- 0: none
- 1: 6 relays
- 2: 12 relays

Communication
- 0: standard Ethernet interface
- 1: RS-232/422/485 (three in one)+Ethernet interface

PC software
- 1: free basic software Observer I for non-communication application
- 2: extensive software Observer II for RS-232/422/485 or Ethernet

Firmware
- 1: with Mathematics, Counter , Totalizer & FDA 21 CFR part 11 compliance

Storage media
- 6: 2GB compact flash card

Case / Mounting
- 4: standard panel mounting in black case

Special option
- 0: none
- 1: 24VDC auxiliary power supply (for transmitter, 6 channels)
- 2: 3-channel current output
- 3: 6-channel current output
- 4: 9-channel current output
- D: 3-channel voltage output
- E: 6-channel voltage output
- F: 9-channel voltage output
- G: panel mounting with rear power plug & Europe power cable
- 5: panel mounting with rear power plug & USA power cable
- 6: panel mounting with front power switch
- 7: 7=1+5, 24VDC auxiliary power supply with rear power plug
- 8: 8=1+6, 24VDC auxiliary power supply with front power switch
- 9: 9=1+5+6, 24VDC auxiliary power supply with rear power plug and front power switch
- X: other options

Note: * Standard model without option VR06-4X00-011-140
* The rear slots of the recorder will only accept up to 6 optional cards in any combination.

VR18 Paperless Recorder

6.5" Color TFT LCD with 640x480 pixels resolution

The Maximum Channels :
18 isolated analog input channels

Plug & Play Supported I/O Cards, 6 Slots

The High Flexibility :
User configurable I/O card
Expandable modular architecture
Flexible screen configuration

User-Friendly :
Soft keys coupled with interactive dialog simplify setup & operation procedures
Easy - to - access function keys

Infrared Detector :
Shut off LCD automatically to prolong LCD life and save power while nobody near by

Save Space :
Only 169 mm (6.7") depth behind panel

Various Display Formats :
Vertical trend, Horizontal trend,
Bar Graph, Numerical or mixed

Save Data in Flash ROM, Compact Flash Card or PC

Communication :
Standard Ethernet and optional RS-232/422/485

The Highest Accuracy :
18-bit A -D analog input, 15-bit D-A analog output.

Fast Sampling Rate :
Within 200 msec for all channels,
Programmable Filter or Moving Average Sampling Method

Statistics with Instant, Average, Min./Max. Values

Programmable Alarms and Messages available

VR18 is the World First paperless recorder of the same size with the highest resolution (true VGA , 640x480 pixels), infrared detector, 18 channels, plug & play I/O card, high flexibility, the most user - friendly and the shortest depth. In chemical plant, food & beverage plant, petrochemical plant, semiconductor plant, metal alloy, automotive plant, environmental monitoring or laboratory, VR18 can be used to monitor, record, evaluate the processes in the plants.

The user can access data on the screen as well as on site from a remote place via RS-232, RS-485, RS-422 serial interface or Ethernet networking. The historical data can be stored in flash ROM, Compact Flash Card, or collected in a remote host PC for data evaluation and print-out.

Panel Mounted Style

6.5"color TFT LCD 640x480 pixels resolution

Infrared detector protect LCD & save power

Power switch

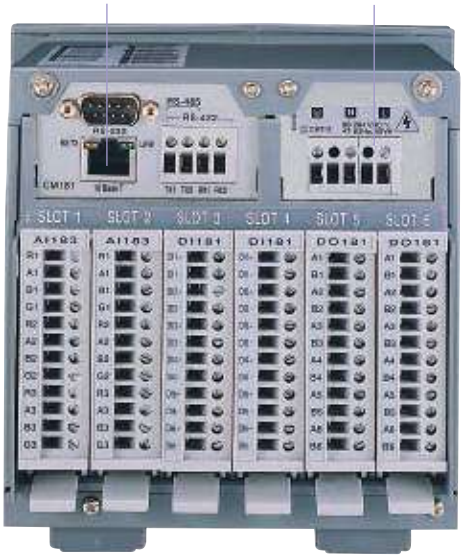
Compact Flash Card

12 SOFT KEYS FOR EASY OPERATION

Rear Terminals

standard Ethernet and optional RS-232/422/485

Power supply



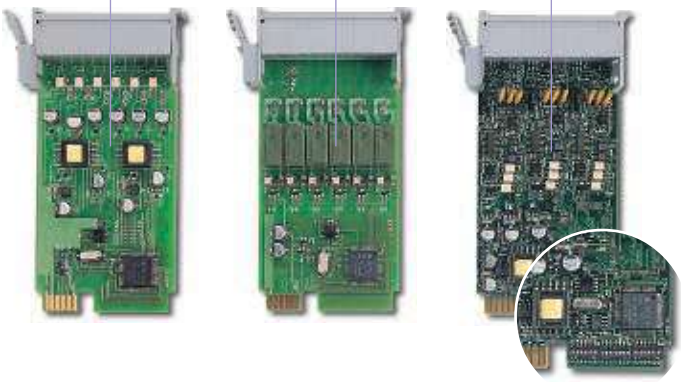
6 SLOTs for Plug & play I/O cards, maximum 18 analog input or mixed with analog & digital I/O cards

Input & Output Cards

Digital input

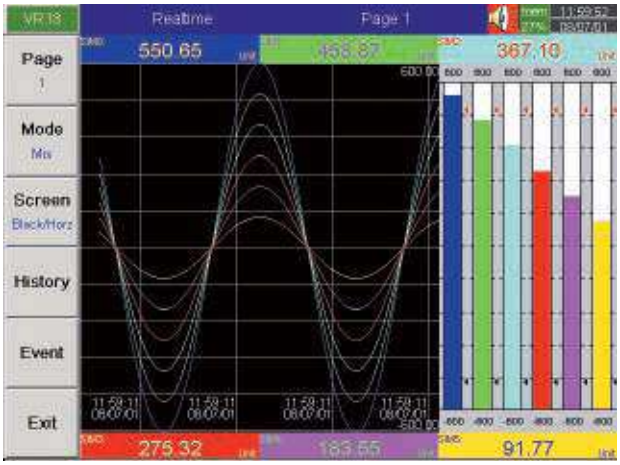
Digital output (6 alarms)

Analog input



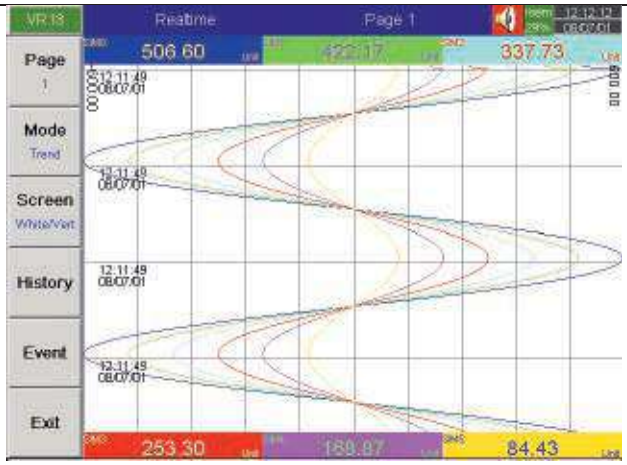
Configure input by DIP switches

Mixed Mode



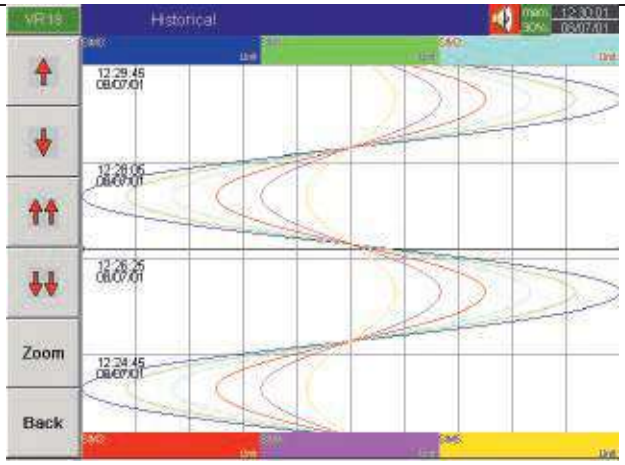
- View max. 6 mixed real time data trends horizontally.
- Display data in "Bars" and "Digits" together with mixed "Trends".
- Recognize data trends easily by different colors and tag names.
- Switch to other configured pages easily by "Page" function key.
- Display current "Time/Date" information.
- Remind the user of "Alarm" or "Memory Full".

Trend Mode



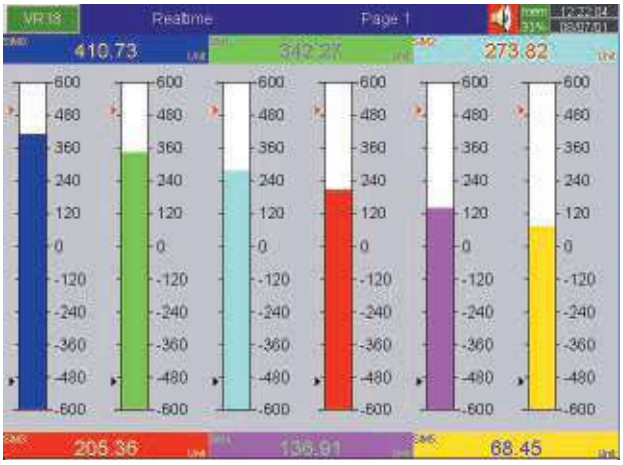
- View max. 6 real time data trends vertically.
- Recognize data trends easily by different colors and tag names.
- Switch to other configured pages easily by “Page” function key.
- Display current “Time/Date”information.
- Remind the user of “Alarm” or ”Memory Full”

Historical Mode



- Display max. 6 sets of historical data simultaneously.
- View desired data section by "↑"&"↓" function keys.
- Access precise data value at a point selected by moving the "ruler".
- "Zoom" to expand/contract the display time span.
- View historical data trends and their respective data values.
- Recognize trends easily by different colors and individual tag names.

Bar Graph Mode



- View max. 6 real time data in bar graphs.
- Scale individually by user in “configuration”.
- Display data value and tag name in different colors together with each bar graph.
- Mark “Hi/Lo” alarm limits.
- Display current “Time/Date” information.
- Remind the user of the “Alarm” or “Memory Full”.

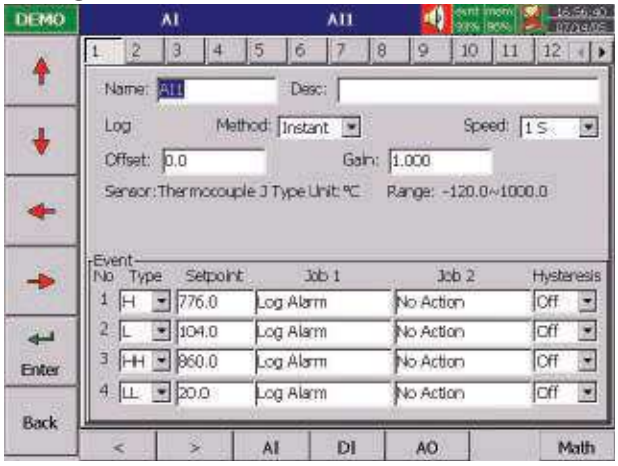
Alarm List

- List all the alarm records clearly with useful information.
- Browse through the alarm list or "acknowledge" alarm easily by function keys on the vertical bar.
- Remind the user of the alarm status in different colors.

Numerical Mode

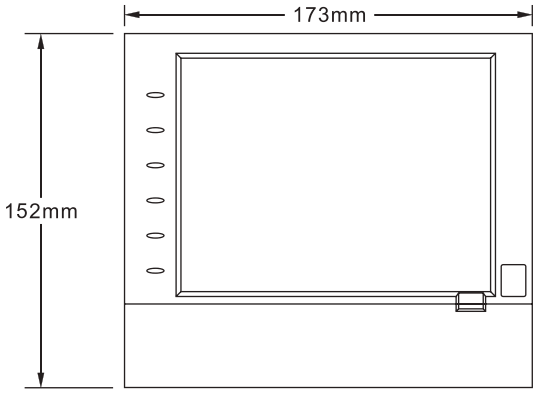
- View max. 6 real time data in numbers.
- Display data value and tag name in different color.
- Mark “Hi/Lo” alarm limits.
- Display current “Time/Date” information.
- Remind the user of the “Alarm” or “Memory Full”.

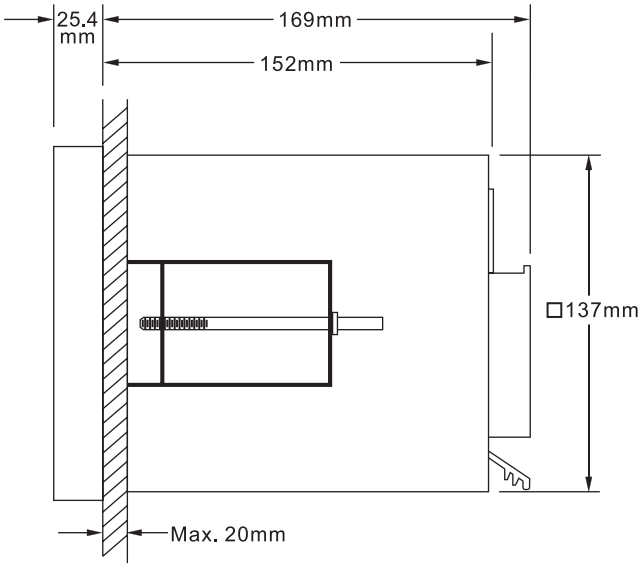
Configuration Mode



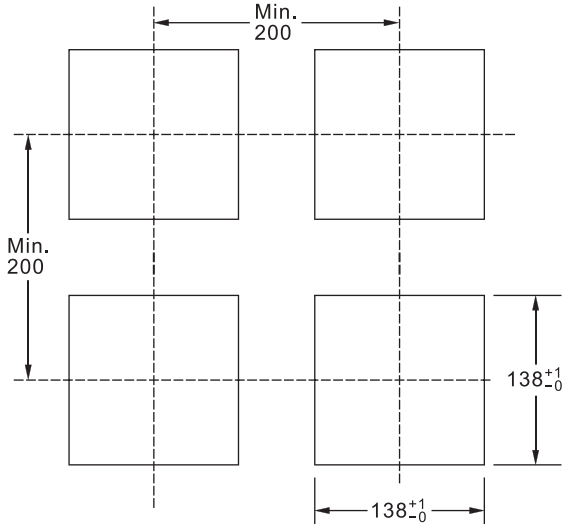
- Configure pen (input/output, pen name, event, job.....)
- Configure page (color, pen, decimal, pen width.....)
- Configure timer.
- Configure instrument (storage media, display, communication, time/date....)

Mechanical Data

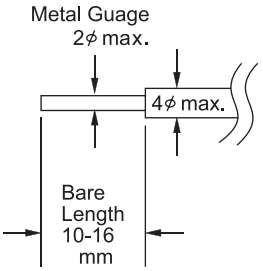




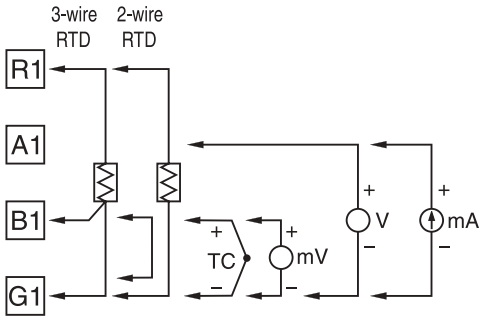
Panel Cutout



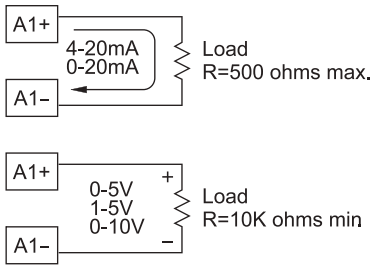
Wiring Cable



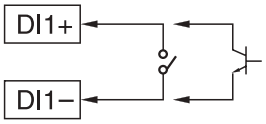
Analog Input Card (AI181, AI182, AI183)



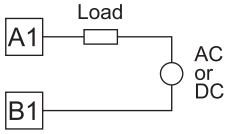
Analog Output Card (AO183I, AO183V)



Digital Input Card (DI181)



Digital Output Card (DO181)



SPECIFICATIONS

Power
90-250VAC or 20-28VAC，47-63Hz, 60VA, 30W maximum
11-18, 18-36 or 36-72 VDC 60VA, 30W maximum

Display
6.5" TFT LCD, 640X480 pixel resolution, 256 colors

Memory
Storage Memory on board: 16MB
CF Card: 2GB standard

Analog Input Card (AI181, AI182, AI183)
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 μV/°C for all inputs except mA input
±3.0 μV/°C for mA input
Sensor Lead Resistance Effect:
T/C: 0.2 μV/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
Burn-out Current: 200nA
Common Mode Rejection Ratio (CMRR): 120dB
Normal Mode Rejection Ratio (NMRR): 55dB
Isolation Breakdown Voltage among channels: 430VAC min.
Sensor Break Detection:
Sensor open for TC,RTD and mV inputs,
below 1 mA for 4-20mA input,
below 0.25V for 1-5V inputs,
unavailable for other inputs.
Sensor Break Responding Time:
Within 10 seconds for TC, RTD and mV inputs,
0.1 second for 4-20 mA and 1-5V inputs.

Characteristics:

Type	Range	Accuracy @25°C	Input Impedance
J	-120°C - 1000°C (-184°F - 1832°F)	±1°C	2.2MΩ
K	-200°C - 1370°C (-328°F - 2498°F)	±1°C	2.2MΩ
T	-250°C - 400°C (-418°F - 752°F)	±1°C	2.2MΩ
E	-100°C - 900°C (-148°F - 1652°F)	±1°C	2.2MΩ
B	0°C - 1820°C (32°F - 3308°F)	±2°C (200°C - 1820°C)	2.2MΩ
R	0°C - 1767.8°C (32°F - 3214°F)	±2°C	2.2MΩ
S	0°C - 1767.8°C (32°F - 3214°F)	±2°C	2.2MΩ
N	-250°C - 1300°C (-418°F - 2372°F)	±1°C	2.2MΩ
L	-200°C - 900°C (-328°F - 1652°F)	±1°C	2.2MΩ
PT100 (DIN)	-210°C - 700°C (-346°F - 1292°F)	±0.4°C	1.3KΩ
PT100 (JIS)	-200°C - 600°C (-328°F - 1112°F)	±0.4°C	1.3KΩ
mV	-8mV - 70mV	±0.05%	2.2MΩ
mA	-3mA - 27mA	±0.05%	70.5Ω
0~1V	-0.12 - 1.15V	±0.05%	32KΩ
0~5V	-1.3V - 11.5V	±0.05%	332KΩ
1~5V	-1.3V - 11.5V	±0.05%	332KΩ
0~10V	-1.3V - 11.5V	±0.05%	332KΩ

Analog Input Card (AI183V)

Type	Range	Accuracy @25°C	Input Impedance
-60~60mV	-62~62mV	±0.1%	2.2MΩ
-2~2V	-2.2~2.2V	±0.3%	332KΩ
-20~20V	-22~22V	±0.1%	332KΩ
-20~20mA	-22~22mA	±0.1%	70.5Ω

Digital Input Card (DI181)
Channels: 6 per card
Logic Low: -5V minimum, 0.8V maximum
Logic High: 2V minimum, 5V maximum
External Pull-down Resistance: 1KΩ maximum
External pull-up Resistance: 1.5MΩ minimum

Digital Output Card (DO181)
Channels: 6 per card
Contact Form: N.O. (form A)
Relay Rating: 5A/240 VAC, life cycles 200,000 for resistive load

Analog Output Card (AO183I, AO183V)
Output Signal : 4-20mA, 0-20mA (AO183I)
0-5V, 1-5V, 0-10V (AO183V)
Resolution : 15 bits
Accuracy: ±0.05% of Span ±0.0025% / °C
Load Resistance: 0-500 ohms (for current output)
10K ohms minimun (for voltage output)
Output Regulation: 0.01% for full load change
Output Setting Time: 0.1 sec (stable to 99.9 %)
Isolation Breakdown Voltage: 1000VAC min.
Integral Linearity Error: ±0.005% of Span
Temperature Effect: ±0.0025% of Span / °C

COMM Module (CM181)
Interface: RS-232 (1 unit), RS-485 or RS-422 (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

Standard Ethernet Communication
Protocol: Mod Bus TCP / IP, 10 BaseT
Auto polarity correction for 10 BaseT
Ports: RJ-45

Infrared Detector
Distance: Detect moving human body within 2 meters

Environmental & Physical
Operating Temperature: 5°C to 50°C
Storage Temperature: -25°C to 60°C
Humidity: 20 to 80% RH (non-condensing)
Insulation Resistance: 20 Mohms min. (at 500 VDC)
Dielectric Strength: 1350VAC 50/60 Hz for 1 minute
Vibration Resistance: 10-55 Hz, 10m/S² for 2 hours
Shock Resistance: 30 m/S² (3g) for operation, 100g for transportation
Dimensions: 173mm(W) x 152mm(H) x 169mm(D)

Approval Standards
Safety: UL61010 C-1
CSA C22.2 No. 24-93
CE: EN61010-1 (IEC1010-1)
Overvoltage category II, Pollution degree 2
Protective Class:
IP 30 front panel, indoor use,
IP 20 housing and terminals
EMC
Emission: EN50081-1, EN61326
(EN55011 class A,
EN61000-3-2, EN61000-3-3)
Immunity: EN50082-2, EN61326
(EN61000-4-2, EN61000-4-3,
EN61000-4-4, EN61000-4-5,
EN61000-4-6, EN61000-4-8,
EN61000-4-11)

ACCESSORIES LIST

Part No.	Description
AI181	1-channel analog input card (Universal except -mA, -V)
AI182	2-channel analog input card
AI183	3-channel analog input card
AI183V	3-channel analog input card (±mA, ±V only)
DI181	6-channel digital input card
DO181	6-channel relay output card
AP181	24VDC auxiliary power supply
CM181	RS-232/422/485 & Ethernet Comm module
CM182	Ethernet Comm module
PM181	90~250 VAC power supply
PM182	11-18 VDC power supply
PM183	18-36 VDC power supply
PM184	90~250 VAC power supply with power plug
PM185	36-72 VDC power supply
PM186	20-28 VAC power supply
MK181	Panel mount assembly kit
CF204	2GB compact flash card
AS181	Basic PC software Observer I
AS182	Extensive PC software Observer II
SC181	Slot cover for empty slot
AO183I	3-channel analog output card with current output
AO183V	3-channel analog output card with voltage output
BT182	Boot ROM w/ Math, Counter, Totalizer & FDA 21 CFR part 11
SNA-10A	RS-485 to RS-232 converter
UMVR181	User Manual

Ordering Code:

VR18 – □ □ □ □ - □ □ □ - □ □ □

Power
- 4: 90-250 VAC, 47-63Hz
- 5: 20-28VAC, 47-63Hz
- 6: 11-18VDC
- 7: 18-36VDC
- 8: 36-72VDC

Analog input card
- 0: none
- 1: 1 channel with AI181
- 2: 2 channels with AI182
- 3: 3 channels with AI183
- 4: 4 channels with AI181 & AI183
- 5: 5 channels with AI182 & AI183
- 6: 6 channels with AI183
- A: 9 channels with AI183
- B: 12 channels with AI183
- C: 15 channels with AI183
- D: 18 channels with AI183
- G: 3 channels with AI183V
- H: 6 channels with AI183V
- J: 9 channels with AI183V
- K: 12 channels with AI183V
- L: 15 channels with AI183V
- M: 18 channels with AI183V

*See AI181/2/3 (V) to the left.

Digital input card
- 0: none
- 1: 6 channels
- 2: 12 channels
- 3: 18 channels
- 4: 24 channels
- 5: 30 channels
- 6: 36 channels

Digital output card
- 0: none
- 1: 6 relays
- 2: 12 relays
- 3: 18 relays
- 4: 24 relays

Communication
- 0: standard Ethernet interface
- 1: RS-232/422/485 (three in one) + Ethernet interface

PC software
- 1: free basic software Observer I for non-communication application
- 2: extensive software Observer II for RS-232/422/485 or Ethernet

Firmware
- 1: with Mathematics, Counter , Totalizer & FDA 21 CFR part 11 compliance

Storage media
- 6: 2GB compact flash card

Case / Mounting
- 1: standard panel mounting in grey case

Special option
- 0: none
- 1: 24VDC auxiliary power supply (for transmitter, 6 channels)
- 2: 3-channel current output
- 3: 6-channel current output
- 4: 9-channel current output
- D: 3-channel voltage output
- E: 6-channel voltage output
- F: 9-channel voltage output
- G: panel mounting with rear power plug & Europe power cable
- 5: panel mounting with rear power plug & USA power cable
- 6: panel mounting with front power switch
- 7: 7=1+5, 24VDC auxiliary power supply with rear power plug
- 8: 8=1+6, 24VDC auxiliary power supply with front power switch
- 9: 9=1+5+6, 24VDC auxiliary power supply with rear power plug and front power switch
- X: other options

Note: * Standard model without option VR18-4X00-011-610
* The rear slots of the recorder will only accept up to 6 optional cards in any combination

CR06

HYBRID RECORDER

Low price, short case, light weight

NEW

Large LEDs
with 18mm-height display

Easy Operation Keys

Analog Recording
of 6 Point

Short Depth
150mm

Dust-proof,
IP65 Water-resistance

FEATURES

- 6-channel dotting
- Short depth in 150mm
- Weights 1.5kg only
- Dust-proof.IP-65 Water- resistance
- Standard RS-232 Communication interface
- Universal input and range
- UL, CSA, CE approved

CR06

HYBRID RECORDER

SPECIFICATIONS

Input

Nos. of input: 6
Input sampling: 10s/6ch, max
Type of input: Direct voltage: ±10mV, 0-20mV, 0-50mV, ±1V, 1-5V
Direct Current: 4-20mA
Thermocouple: K, T, J, E,B,S,R,G,C,N,PR40-20, PLII, L, Au-Fe
RTD: Pt100, Pt50, JPt100

Performance

Accuracy: ±0.2%±1 digit max. for Digital indicator/printing
Noise reduction : NMRR: 60dB min.
CMRR: 140dB min.
Isolation resistance: Each terminals/ground: 500VDC, 20MΩ min.
Dielectric strength: Power input terminal/ground: 1.5kVAC, 1 minute
Input terminal/ground: 0.5kVAC, 1 minute

Alarm

Nos. of relay outputs: 6 outs (Form a contacts; Built-in option)
Capacity: 30VDC 3A Max. Loaded

Communication

Interface: RS-232C (Standard), RS-485

Power Supply

Rated power voltage: 100-240VAC (50/60Hz)
Power consumption: 25VA max.

Structure

Mounting/housing: Panel mounting/Front panel: Dust-proof, Water-proof (IP-65)
Dimension: 144(W) x 144(H) x 150(D) mm
Weight: 1.5kg max.

Operation Condition

allowable conditions: Temperature: 0-50°C, Humidity: 20-80%RH

Recording / Printing Performance

Recording: Raster-scan printing
Printing: Dotting with 6 color ribbon
Dot print interval: 10.0s/6ch max.
Chart paper: Length: 16m, Dotting width: 100mm
Chart speed: User-selective from 28 speeds
In range: 10-1500mm/hr
Printing color: Purple, Red, Green, Blue, Brown, Black

ORDERING CODE

CR06 - □ □ □

Communication
0 = stardard RS - 232C
1 = RS -485

DI/DO (digital input / output)
0 = none
1 = 6 relay output
2 = 3 DI
3 = 3 DI + 6 relay output

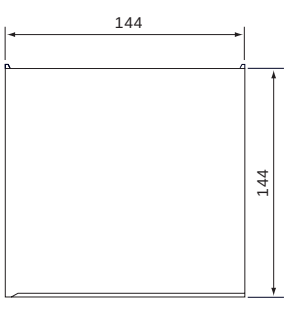
Out-of-paper sensor
0 = none
1 = yes

ACCESSORIES

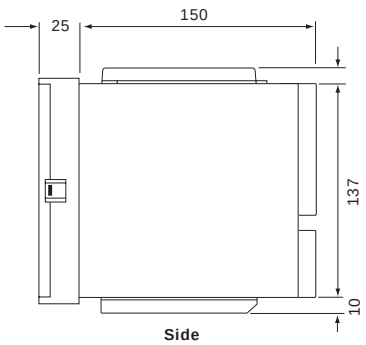
Item	Part number
Chart paper	HZCGA0105EL001
Ribbon cassette	WPSR188A000001A

DIMENSIONS & CUTOUT (mm)

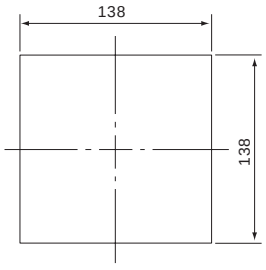
Unit: mm



Front



Side



Panel Cutout