

SIXTH SENSE AI-200

LOW-COST 1/32 DIN TEMPERATURE CONTROLLER

The Sixth Sense AI-200 is the second generation in the AI series of fuzzy logic and PID microprocessor-based controllers. This 1/32-DIN panel-mount controller incorporates a bright, easy-to-read 4-digit LED display, high-accuracy analog-to-digital converter, and multiple-output options.

The AI-200 temperature controller is available with a temperature input (programmable for J, K, T, E, B, R, S, N, and L type thermocouples, and PT100 RTDs) as well as a voltage or milliamp linear input (0/1-5V, 0/4-20mA). The controller is available with up to 2 outputs. Each of the outputs on the Sixth Sense AI-200 can be ordered in one of three configurations: relay (2A / 240VAC), pulsed voltage (5V / 30mA), or a linear (0-20mA or 0/1-5V) analog output.

The fuzzy logic technology enables a process to reach a predetermined set point in the shortest time while minimizing overshoot during power up or external load disturbances. There is a wide variety of selectable alarm modes, soft-start ramp and dwell timer, and an on-board programming port for automatic configuration, calibration and testing without the need to access the keys on the front panel. Other features on the Sixth Sense AI-200 temperature controller include optional RS-485 or linear 0/4-20mA retransmission for a compact, high-performance, and easy-to-use controller.



- 1/32 DIN
- Power options
 - 90-250 VAC, 47-63 Hz, 10VA, 5W max
 - 11 - 26 VAC / VDC, 10VA, 5W max
- Signal Input
 - Sampling rate: 5 times/sec
 - Resolution: 18 bits
 - Max. Rating: -2 VDC min, 12 VDC max
- Output 1 / Output 2
 - Relay rating: 2A / 240VAC, life cycles 200,000 for resistive load
 - Pulsed voltage to drive SSR, 5V / 30mA
 - Isolated 4-20mA / 0-20mA
 - Isolated 1-5V / 0-5V
- Communications (optional)
 - RS-485
 - Retransmit 4-20mA / 0-20mA

AI-200 SPECIFICATIONS

POWER	90 to 250 VAC, 47 to 63 Hz, 10VA, 5W maximum 11 to 26 VAC / VDC, SELV, Limited Energy, 10VA, 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 μ V/ °C for all inputs except mA input ±3.0 μ V/ °C for mA input
SENSOR LEAD RESISTANCE EFFECT	
T/C	0.2 μ V/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

AI-200, CONTINUED

AI-200 SPECIFICATIONS, CONT.

SENSOR BREAK RESPONDING TIME	Within 4 seconds for TC, RTD and mV inputs, 0.1 second for 4 to 20 mA and 1 to 5 V inputs
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TYPE	RANGE	ACCURACY@ 25°C	INPUT IMPEDANCE
J	-184 to 1832°F (-120 to 1000°C)	±2°C	2.2MΩ
K	-328 to 2498°F (-200 to 1370°C)	±2°C	2.2MΩ
T	-418 to 752°F (-250 to 400°C)	±2°C	2.2MΩ
E	-148 to 1652°F (-100 to 900°C)	±2°C	2.2MΩ
B	32 to 3272°F (0 to 1800°C)	±2°C (200 to 1800°C)	2.2MΩ
R	32 to 3214°F (0 to 1767.8°C)	±2°C	2.2MΩ
S	32 to 3214 °F (0 to 1767.8°C)	±2°C	2.2MΩ
N	-418 to 2372°F (-250 to 1300°C)	±2°C	2.2MΩ
L	-328 to 1652°F (-200 to 900°C)	±2°C	2.2MΩ
PT100 (DIN)	-346 to 1292°F (-210 to 700°C)	±0.4°C	1.3KΩ
PT100 (JIS)	-328 to 1112°F (-200 to 600°C)	±0.4°C	1.3KΩ
mV	-8 to 70mV	±0.05%	2.2MΩ
mA	-3 to 27mA	±0.05%	70.5Ω
V	-1.3 to 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 TYPE	ZERO TOLERANCE	SPAN TOLERANCE	LOAD CAPACITY
4-20 mA	3.6 to 4 mA	20 to 21 mA	500Ω max
0-20 mA	0 mA	20 to 21 mA	500Ω max
0-5 V	0 V	5 to 5.25 V	10KΩ min
1-5 V	0.9 to 1 V	5 to 5.25 V	10KΩ min
0-10 V	0 V	10 to 10.5 V	10KΩ 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

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

AI-200 SPECIFICATIONS, CONT.

ADDRESS	1 to 247
BAUD RATE	2.4 to 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	4-20 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 to 500 ohms (for current output), 10 K ohm minimum (for voltage output)
OUTPUT REGULATION	0.01 % for full load change
USER INTERFACE	
SINGLE 4-DIGIT LED DISPLAYS	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 50 to 300% of PB, dead band -36 to 36% of PB
ON-OFF	0.1 to 90.0 (°F) hysteresis control (P band = 0)
P OR PD	0 to 100.0% offset adjustment
PID	Fuzzy logic modified, Proportional band 0.1 to 900.0°F
INTEGRAL TIME	0 to 3600 seconds, Derivative time 0 to 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 to 900.0°F/minute or 0 to 900.0 °F/hour ramp rate
SLEEP MODE	Enable or Disable
RAMPING CONTROL	0 to 500.0°C/minute or 0 to 500.0°C/hour ramp rate
DIGITAL FILTER	
FUNCTION	First order
TIME CONSTANT	0, 0.2, 0.5, 1, 2, 5, 10, 20, 30, 60 seconds programmable
OPERATING TEMPERATURE	-10 to 50°C
STORAGE TEMPERATURE	-40 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 to 55 Hz, 10 m/s ² for 2 hours
SHOCK RESISTANCE	200 m/s ² (20 g)
MOLDINGS	Flame retardant polycarbonate
DIMENSIONS	50mm (W) X 26.5mm (H) X 110.5mm (D), 98.0 mm depth behind panel
MOUNTING	Panel mount, cutout 22 X 45(mm)
WEIGHT	120 grams
APPROVAL STANDARDS	
SAFETY	UL 61010C-1 , CSA C22.2 No. 24-93 , EN61010-1 (IEC1010-1)
PROTECTIVE CLASS	NEMA 4X (IP65) front panel IP20 housing and terminals
EMC	EN61326

AI-200, CONTINUED

AI-200 ORDERING INFORMATION

A	I	-	2	0	0	-	A	-	B	-	C	-	D	-	E	-	0
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To create a part number fill in the boxes above with the appropriate number and/or letter from the corresponding list below.

Box A: Power Input

- 4 = 90 - 250 VAC, 50/60 Hz \$ 129
- 5 = 11 - 26 VAC or VDC 139

Box B: Signal Input

- 1 = Standard thermocouple / RTD input N/C
- 4 = 0 - 5 V N/C
- 5 = 1 - 5 V N/C
- 6 = 4 - 20 mA N/C
- 7 = 0 - 20 mA N/C

Box C: Output 1

- 0 = None N/C
- 1 = Relay rated 2A / 240 VAC N/C
- 2 = Pulsed voltage to drive SSR, 5V/30mA N/C
- 3 = Isolated: 4 - 20 mA / 0 - 20 mA 20
- 4 = Isolated: 1 - 5V / 0 - 5V 20

Box D: Output 2

- 0 = None N/C
- 1 = Form A relay 2A / 240 VAC \$ 10
- 2 = Pulsed voltage to drive SSR, 5V / 30 mA 10
- 3 = Isolated 4 - 20 mA / 0 - 20 mA 20
- 4 = Isolated 1 - 5V / 0 - 5V 20

Box E: Communication

- 0 = None N/C
- 1 = RS-485 interface 45
- 3 = Retransmit: 4 - 20mA / 0 - 20mA 45

AI-200 WIRING DIAGRAM

