

# TC33 and PC35 Series Controllers

## Overview

The TC33 and PC35 series are 1/16 DIN size PID auto-tune micro-processor-based controllers. A dual LED display offers optimum process information at a glance.

Individual LEDs identify the status of the controller and the tactile keyboard makes it easy to configure inputs, outputs and setup data, without internal dipswitch or jumper changes.

The universal inputs accept thermocouples and Pt100 RTDs. No dipswitches are required to make changes as the units are fully keypad programmable.

The units operate on a universal power supply from 90 to 260 VAC.

## TC33 Features

- Temperature multi-sensor selectable PV input without hardware change
- Multi-sensor input accepts seven types of thermocouples and two types Pt100 RTD
- Full PID and auto-tune temperature control - available algorithms: P, PI, PD, PID or ON/OFF with hysteresis
- RTD input with 0.1° or 1° resolution
- Selectable °F / °C temperature units
- Sensor break protection in any condition
- Output options include relay, 4-20 mA out, or isolated DC pulse output
- Ramp / Soak: one controlled ramp and one timed soak are standard

## PC35 Features

- Universal multi-sensor selectable PV input without hardware change
- Programmable Ramp / Soak: Seven 7-segment profiles can be linked to make longer programs up to 49 segments
- Square root function
- Sensor break protection in any condition
- Output options: relay, SSR, isolated linear 4-20 mA, 0-20 mA or isolated DC pulse output\*
- Up to three alarms, two programmable timer alarms
- Process variable or setpoint 0-20 mA, 4-20 mA isolated analog retransmission\*
- Auto/manual “bumpless” transfer
- One isolated digital input with programmable functions\*
- Linear remote setpoint input\*
- Programmable soft start (0 to 9999 sec)

**\*Refer to “Part Number Selection Guide” on the following pages for specific I/O availability information.**

Specifications				
Controller Series	TC33 Series	PC35 Series		
<b>Dimensions</b>	48x48x106 mm (1/16 DIN), weight 200g (approximate)	48x48x106 mm (1/16 DIN), weight 200g (approximate)		
<b>Panel Cutout</b>	45.5mmx45.5mm (+/- 0.3mm)	45.5mmx45.5mm (+/- 0.3mm)		
<b>Terminal Connection</b>	Screws accepting 16 to 24 AWG wires or 6.3 mm fork lugs	Screws accepting 16 to 24 AWG wires or 6.3 mm fork lugs		
<b>Power</b>	90 to 260VAC - 7VA maximum	90 to 260VAC - 7VA maximum		
<b>Operating Environment</b>	Temperature: 0 to 50°C (32 to 122°F), humidity: 10 to 85% RH, non-condensing	Temperature: 0 to 50°C (32 to 122°F), humidity: 10 to 85% RH, non-condensing		
<b>Instrument Case</b>	Flame-retardant ABS plastic case	Flame-retardant ABS plastic case		
<b>Warm-up Time</b>	15 minutes maximum	15 minutes maximum		
<b>Input</b>	<b>Display Resolution</b>	0.1°F/C or 1°F/C (Pt100 RTD)	0.1°F/C or 1°F/C (Pt100 RTD)	
	<b>Input Sample Rate</b>	10 per second (100 ms)	5 per second (200 ms)	
	<b>Accuracy</b>	Thermocouples J, K, N, E, and T: 0.2% of span ±1°C Thermocouples R and S: 0.25% of span ±3°C Pt100: 0.2% of span (+/-0.5°C)	Thermocouples J, K and T: 0.2% of span ±1°C Thermocouple S: 0.25% of span ±3°C Pt100: 0.2% of span (+/-0.5°C) Current (4-20mA) and voltage (50mV or 5V): 0.2% of span	
	<b>Impedance</b>	Thermocouple: >10 MΩ	Thermocouple: >10 MΩ	
	<b>Pt100 Measurement</b>	DIN 43760 standard (α=0.00385) 3-wire circuit, cable resistance compensation Excitation current: 170µA	DIN 43760 standard (α=0.00385) 3-wire circuit, cable resistance compensation Excitation current: 170µA	
<b>Output</b>	<b>Mechanical*</b>	<b>Resistive</b>	Single or dual SPST Relays 3A @ 250VAC/3A @ 30VDC	Dual SPST Relays 3A @ 250VAC/3A @ 30VDC
		<b>Inductive</b>	Single or dual SPST Relays 2A @ 250VAC/2A @ 30VDC	Dual SPST Relays 2A @ 250VAC/2A @ 30VDC
	<b>Solid State - Triac*</b>	none	1A @ 20 to 240VAC	
	<b>Solid State - DC Pulse*</b>	12VDC pulsed @ 15mA maximum	12VDC pulsed @ 15mA maximum	
<b>Analog*</b>	4-20mA sourcing @ 500Ω maximum load	0/4-20mA sourcing @ 500Ω maximum load		

\*Note: Model dependent. See specifications on following pages.

# TC33 Series Controllers Specifications

Part Number Selection Guide							
Part Number	Input Power	PV Multi-Sensor Input	Digital Input	Discrete Outputs	Analog Outputs	Pulsed Output	Price
<b>TC33-1100-AC</b>	90-260VAC	Table 2	None	1 Mechanical relay	None	12VDC	<--->
<b>TC33-2010-AC</b>	90-260VAC	Table 2	None	2 Mechanical relays	4-20mA	none	<--->
Accessories							
Part Number	Description						Price
<b>PANEL-16</b>	Mounting clip for 1/16th DIN timers and temperature/process controllers. Package of 5 clips. (One clip included with each controller)						<--->

Table 2 - Selectable Input types	
Input Type	Range
Thermocouple J (1°C resolution)	-58 to 1400 °F (-50 to 760°C)
Thermocouple K (1°C resolution)	-130 to 2498°F (-90 to 1370°C)
Thermocouple S (1°C resolution)	32 to 3200°F (0 to 1760°C)
Thermocouple T (1°C resolution)	-148 to 752°F (-100 to 400°C)
Thermocouple E (1°C resolution)	-22 to 1328°F (-30 to 720°C)
Thermocouple N(1°C resolution)	-130 to 2372°F (-90 to 1300°C)
Thermocouple R (1°C resolution)	32 to 3200° F (0 to 1760°C)
RTD Pt100 (0.1°C resolution)	-199.9 to 986.0°F (-199.9 to 530.0 °C)
RTD Pt100 (1°C resolution)	-328 to 986°F (-200 to 530°C)

## Main dimensions and panel cutout



# PC35 Series Controllers Specifications

Part Number Selection Guide								
Part Number	Input Power	PV Universal Sensor Input	Remote SP Analog Input	Digital Input	Discrete Outputs	Analog Output	Pulsed Output	Price
PC35-2000-AC	90-260VAC	See Table 3	None	None	2 Mechanical relays	None	None	<--->
PC35-2010-AC	90-260VAC	See Table 3	Voltage <sup>1</sup>	Dry Contact <sup>2</sup>	2 Mechanical relays	Current <sup>3</sup>	None	<--->
PC35-0210-AC	90-260VAC	See Table 3	Voltage <sup>1</sup>	Dry Contact <sup>2</sup>	2 Solid State relays	Current <sup>3</sup>	None	<--->
PC35-2110-AC	90-260VAC	See Table 3	Voltage <sup>1</sup>	Dry Contact <sup>2</sup>	2 Mechanical relays	Current <sup>3</sup>	12VDC	<--->
Accessories								
Part Number	Description							Price
PANEL-16	Mounting clip for 1/16th DIN timers and temperature/process controllers. Package of 5 clips. (One clip included with each controller)							<--->

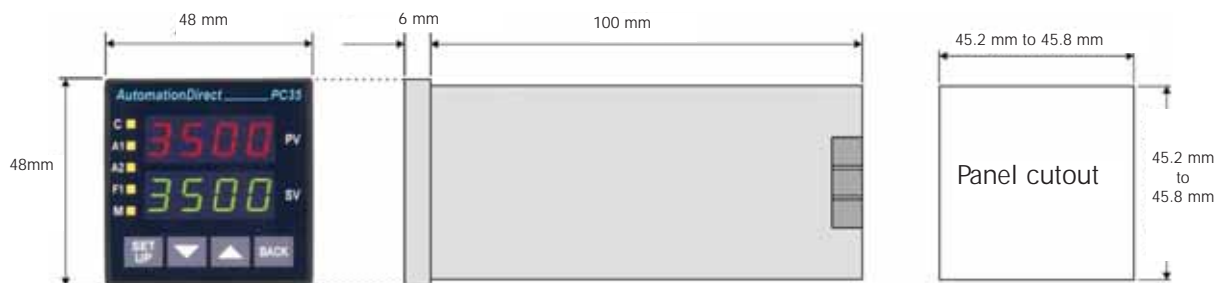
**Note 1: Remote set point analog input: 0.4 to 2.0 VDC (for 4-20 mA input, add external 100Ω/0.1% shunt resistor). RSP function not available if Analog Output is used.**

**Note 2: Digital Input function not available if Analog Output is used.**

**Note 3: Analog Output: 0-20 mA or 4-20 mA; 500Ω maximum load (for 0/1-5V output, add external 250Ω/0.1% shunt resistor). Analog Output function not available if Digital Input is used.**

Table 3 - Selectable Input types	
Input Type	Range
Thermocouple J (1°C resolution)	-166 to 1400 °F (-110 to 760 °C)
Thermocouple K (1°C resolution)	-238 to 2498°F (-150 to 1370°C)
Thermocouple S (1°C resolution)	32 to 3200°F (0 to 1760°C)
Thermocouple T (1°C resolution)	-256 to 752°F (-160 to 400 °C)
RTD Pt100 (0.1°C resolution)	-199.9 to 986°F (-199.9 to 530°C)
RTD Pt100 (1°C resolution)	-328 to 986°F (-200 to 530°C)
4 to 20 mA	Tc. J linearization. programmable range: -166 to 1400°F (-110 to 760°C)
4 to 20 mA	Tc. K linearization. programmable range: -238 to 2498°F (-150 to 1370°C)
4 to 20 mA	Tc. T linearization. programmable range: -256 to 752°F (-160 to 400°C)
4 to 20 mA	Tc. S linearization. programmable range: 32 to 3200°F (0 to 1760°C)
4 to 20 mA	RTD Pt100 (0.1°C Resolution) Linearization programmable range: -328.0 to 986.0°F (-199.9 to 530.0°C)
4 to 20 mA	RTD Pt100 (1.0°C Resolution) Linearization programmable range: -328 to 986°F (-200 to 530°C)
0 to 50mV	Linearization programmable indication - 1999 to 9999
4 to 20 mA	Linearization programmable indication - 1999 to 9999
0 to 5 Volts	Linearization programmable indication - 1999 to 9999
4 to 20 mA	Square root extraction

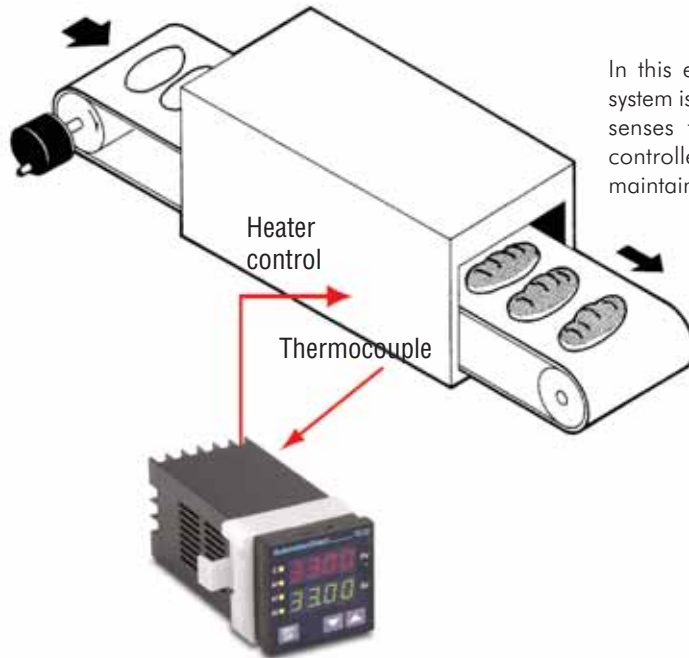
## Main dimensions and panel cutout



# Temperature / Process Controllers

Temperature/Process Controllers Selection Guide			
<b>Description</b>	<b>On/Off Controller PM Series</b> On/Off controller with two mechanical relays. Universal inputs include T/C, RTD, mA, mV, V. Fully scalable display	<b>Temperature Controller TC Series</b> Temperature controller with two mechanical relays and one 4-20mA output. Inputs include T/C and RTD. Autotune PID control with ramp and soak profile	<b>Process Controller PC35 Series</b> Process controller with two mechanical relays and one 4-20mA output. Inputs include T/C, RTD, mA, mV, V. Autotune PID control with 49 segment ramp/soak profile
<b>Input (Universal PV)</b>	T/C, RTD, mA, mV, V	T/C, RTD	T/C, RTD, mA, mV, V
<b>Input (Digital)</b>	N/A	N/A	Optional: One
<b>Outputs (Control, Alarm)</b>	Two mechanical relays	Two mechanical relays or one mechanical relay Optional: One 4-20mA output Optional: DC pulse output	Two mechanical or two solid state relays Optional: One 4-20mA output Optional: DC pulse output
<b>Output Relay Ratings</b>	Mechanical 3A @ 250VAC	Mechanical 3A @ 250VAC	Mechanical 3A @ 250VAC Solid state 1A @ 240VAC
<b>4-20 mA Load Rating</b>	N/A	500Ω @ 12VDC	500Ω @ 24VDC
<b>Input Power</b>	90-260VAC	90-260VAC	90-260VAC
<b>Control Routines</b>	On/off control	PID, autotune, on/off control, Time proportioned	PID, autotune, time proportioned, ON, OFF
<b>Security</b>	Three level function protection via keypad	N/A	Seven level function protection via keypad
<b>Enclosure Rating</b>	NEMA 1 - faceplate	NEMA 1 - faceplate	Nema 1 - faceplate
<b>Prices starting at</b>	<--->	<--->	<--->
<i>Note: The manual for these products is available online. Please visit our Web site at <a href="http://www.automationdirect.com">www.automationdirect.com</a>.</i>			

## Application example: oven temperature control



In this example, an oven control system is shown. The thermocouple senses the temperature and the controller adjusts the heater to maintain a constant temperature.

- PLC Overview
- DL05/06 PLC
- DL105 PLC
- DL205 PLC
- DL305 PLC
- DL405 PLC
- Field I/O
- Software
- C-more HMIs
- Other HMI
- AC Drives
- Motors
- Steppers/Servos
- Motor Controls
- Proximity Sensors
- Photo Sensors
- Limit Switches
- Encoders
- Current Sensors
- Pushbuttons/Lights
- Process
- Relays/Timers
- Comm.
- TB's & Wiring
- Power
- Circuit Protection
- Enclosures
- Appendix
- Part Index