Autoclave Engineers
Division of Snap-tite, Inc.

Autoclave Engineers
Providing Tools for Research and Industry

Instrumentation

Control Tower Series

At A Glance

Measure & Control:
- Process Temperature
- Heater Temperature
- Mixer Speed
- Process Pressure

General Specifications

Autoclave Engineers' Control Tower instruments provide high quality indication and control of parameters related to pressure vessels and reactors. Control Towers can be configured using option modules to accommodate one or many process variables, permitting technical and budget flexibility.

Option Module Specifications

The Control Tower series achieves it's flexibility through the use of process function modules. The following are specifications for the various function modules, and selections which may be used in configuration of an Autoclave Engineers' Control Tower.

Tower Controller Version

There are three versions for the Control Tower. The version determines the degree of data acquisition or automation that may be accessible through the instrument.

CT1000
is our basic system and provides for indication and control only.

CT2000
provides all the functionality of the CT1000 with the addition of analog retransmission (4-20 mA) of process variables, and multiple ramp-soak programming of the temperature control setpoint.

CT3000
provides all the functionality of the CT1000 with the addition of serial communications (RS-485) and multiple ramp-soak programming of the temperature control setpoint.

Temperature Control

The Temperature Control option modules provide closed loop, PID, control for vessel heating systems. This module is matched with the appropriate output device to interface with electric furnaces as well as circulation systems. The controller instrument includes an adjustable setpoint ramping function as well as a high temperature alarm signal which is used by the system. The CT1000 series includes single, ramp-to-setpoint, while the CT2000 and CT3000 series include 16 segment ramp/soak programming. The option modules are as follows.

Option Module Specifications Continued

0-15 Amp, Solid State Output
is used for electrically heated vessels. The power to the heater is controlled via a solid-state, zero-crossover, switching device which responds to demand from the temperature controller. Heater current of up to 15 Amps at 120 or 240 VAC can be handled with this option. A power shutdown circuit disconnects the heater in the event of: high temperature (alarm from controller), Front Panel "Heater On/Off" Switch, or external voltage-free contacts (for customer interlocks).

0-35 Amp, Solid State Output
provides the same features as the "0-15 Amp…" version at a higher, 35 Amp, heater current capacity. The power handling equipment is packaged in a separate enclosure which may be remotely located, thus limiting the need for long lengths of heavy gage cables.

Analog Control Output
is used where any external device is adjusting the heat applied to the vessel. This might be a modulating control valve, heating/cooling circulator, or other similar device or system. The output signal is 4-20 mA. The high temperature alarm signal, voltage-free contacts, is provided at rear panel mounted screw terminals.

Cooling Control
may be added to any of the previously described option modules. It is typically used to start and stop the flow of water or air through the cooling coil of a reactor in order to maintain setpoint. This is done by energizing and de-energizing a solenoid valve (sold separately) which is plumbed to the cooling coil. This option has the prerequisite of one of the Temperature Control options, as it is driven by a secondary output in the main temperature controller.
(Note: Cooling control is not available on the CT2000 instrument.)

Temperature Sensor / Units

This designates selection from three standard temperature sensors: Type "K" thermocouple, Type "J" thermocouple, or 100 ohm RTD. Fahrenheit or Centigrade temperature units of display may also be selected.

Overtemperature Controller

The Overtemperature Controller option module provides the ability to shutdown a vessel's electrical heater in the event a high temperature is sensed at the vessel skin (O.D.). The Overtemperature Controller includes a digital display of vessel skin temperature. The overtemperature alarm may be Latching or Non-Latching. The Non-Latching configuration will automatically re-energize the heater when temperature falls below the alarm setpoint. The Latching configuration requires that the operator reset the alarm before heater power can be restored.

Speed Control and Indication

This option module designates how agitator speed is indicated and varied.

DC Motor Drive Only
includes a DC motor drive which will provide power to energize a 90 VDC shunt wound or permanent magnet electric motor. Manual controls include a "Mixer On/Off Switch" and 0-100% control knob for speed adjustment.

DC Motor / Tach
includes all functions provided in the "DC Motor Drive Only" and digital indicator which displays rotational speed. The speed is sensed at the Magnedrive using a magnetically sensitive pick-up device.

DC Motor / Closed Loop Control
provides a PID controller to regulate the DC motor drive, resulting in a more constant agitation speed, despite changes in viscosity or load.

Tach Only
provides digital indication of rotational speed. The speed is sensed at the Magnedrive using a magnetically sensitive pick-up device. This is typically used with AC and air motors.

Closed Loop Only
provides a PID controller to regulate the AC or air motor drives located external to the Tower Controller. This results in a constant agitation speed, despite changes in viscosity or load. The output signal to the external drive is 4-20 mA.

Motor Size
This selection designates the motor size for appropriate tuning of the drive system.

Speed Indication Range
This selection designates the RPM range for the calibration of the tachometer instrument.

Pressure Indication and Control
This option module provides for monitoring and control of vessel pressure. These modules operate from a 4-20 mA signal generated by a pressure transducer (transducer not included in module).

Pressure Indication
provides a digital indicator which displays vessel pressure. This module includes a high pressure alarm with Form A or B relay contact outputs available for external functions.

Indication & On / Off Control
This module includes digital indication of pressure as well as closed loop control using digital (On/Off) outputs. Two voltage-free contact outputs are provided in this module: one output to drive pressure increase (for pumps, gas inlet), and one output to drive pressure decrease (for vent valves).
(Note: Pressure control is not available on the CT2000 instrument.)

Indication & Analog Control
This module includes digital indication of pressure as well as closed loop control using analog (4-20 mA) outputs. Two analog outputs are provided in this module: one output to drive pressure increase (for pumps, gas inlet), and one output to drive pressure decrease (for vent valves).
(Note: Pressure control is not available on the CT2000 instrument.)

Pressure Indication Range / Units
These selections designate the range of the pressure transducer and units of measure for display.

Cables, Interconnect
Ten foot (3 meter) cables are provided for interconnect of the Control Tower and the Vessel (Reactor).

Power Plug Style
This designates type of power plug to be sent with the Control Tower.

Approval
Optionally provides for all filters and components required to meet CE Mark inclusive of EMC Directive.

General Specifications

Electrical Power:	100-120 VAC, 50/60 Hz or 200-240 VAC, 50/60 Hz
Dimensions:	
Tower:	19" High x 6" Wide x 11" Deep (483 mm High x 152 mm Wide x 279 mm Deep)
35 Amp Remote:	12" High x 10" Wide x 8" Deep (305 mm High x 254 mm Wide x 203 mm Deep)
Temperature Control Output:	15 Amp, 35 Amp Solid-State or 4-20 mA
Cooling Control Output:	2 Amp, Relay
Temperature Sensor:	Type "K", "J" Thermocouple, or 100 ohm RTD
Internal Motor Drive:	90 VDC, permanent magnet or shunt wound 1/8 through 1/2 Horsepower
Voltage Free Contacts:	2 Amp, Relay

Control Tower Ordering Guide

C A B C D E F G H I J K L M N

A Tower Version
1 = Basic
2 = 4-20 mA Retransmit
3 = Serial Comm.

B Voltage
1 = 100-120 VAC
2 = 200-240 VAC

C Temperature Control
0 = None
1 = 15 Amp Solid State
2 = 35 Amp Solid State
3 = Analog Output
4 = 15 Amp SS w/Cool*
5 = 35 Amp SS w/Cool*
6 = Analog Out. w/Cool*

D Temperature Sensor / Units
0 = None
1 = "K" T/C, °C
2 = "K" T/C, °F
3 = "J" T/C, °C
4 = "J" T/C, °F
5 = RTD, °C
6 = RTD, °F

E Overtemperature Control
0 = None
1 = Latching
2 = Non-Latching

F Speed Control & Indication
0 = None
1 = DC Motor Drive Only
2 = DC Drive/Tach
3 = DC Drive/Closed Loop
4 = Tach Only
5 = Closed Loop Only

G Motor Size
0 = None
1 = 1/8 HP
2 = 1/4 HP
3 = 1/3 HP
4 = 1/2 HP

H Speed Indication Range
0 = None
1 = 0-500 RPM
2 = 0-1,500 RPM
3 = 0-3,000 RPM
4 = 0-6,000 RPM

I Pressure Indication & Control
0 = None
1 = Pressure Indication
2 = Ind. & On/Off Control*
3 = Ind. & Analog Control*

J Pressure Indication Range
0 = None
1 = 500 PSIG (34 Bar)
2 = 1,000 PSIG (69 Bar)
3 = 3,000 PSIG (207 Bar)
4 = 5,000 PSIG (345 Bar)
5 = 10,000 PSIG (689 Bar)

K Pressure Units
0 = None
P = PSIG
B = Bar
M = MPa
K = KPa
G = Kg/cm^2

L Cables
1 = 10 ft.

M Power Plug
0 = None
1 = US / Canada

N Approval
0 = None
C = CE Mark

*** Indicates not available on CT2000 instrument.**

Supporting Information

The sensors and control devices (T/Cs, transducers, solenoid valves, etc.) which interface with the Control Tower are available as options on our pressure vessel and reactor products. If you are using a Control Tower with existing equipment, each of these accessories is available separately. For information on other Autoclave Engineers Instrumentation, Software, and Accessory products refer to our Instrumentation Selection Guide. (Bulletin "IN-SG")

For information on Autoclave Engineers Pressure Vessel and Reactor products refer to:

Pressure Vessels:	Pressure Vessel Selection Guide (Bulletin "PV-SG")
Stirred Reactors:	Stirred Reactor Selection Guide (Bulletin "SR-SG")
Catalytic Reactors:	Catalytic Reactor Selection Guide (Bulletin "CR-SG")

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