

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

Data Sheet
SS/C505_6

1/2 DIN Advanced Process Controller

C505

- **Multiple PID control capabilities**
  – single loop, feedforward, cascade, feedforward with cascade, ratio, auto/manual station, analog backup, heat/cool

- **Clear process display and color-coordinated switches**
  – process visibility, ease of operation

- **Comprehensive input/output capabilities**
  – up to three analog inputs, two analog outputs, four relays and four digital inputs

- **Process security and plant safety**
  – loop-break alarm, processor watchdog, password-protection and intelligent power recovery

- **Unique Control Efficiency Monitor (CEM)**
  – two Autotune algorithms plus manual fine-tuning using CEM

- **PC configuration for ease of setup**
  – easy access to advanced features and standard settings

- **IP66/NEMA4X front face**
  – reliability in the harshest environments

- **RS485 Modbus™ serial communication**
  – SCADA, PLC and open system integration



C505
– advanced single loop controller in a short-case, 6 x 3 format

C505

The C505 is an advanced multi-role controller with the capability of handling single loop and cascade applications.

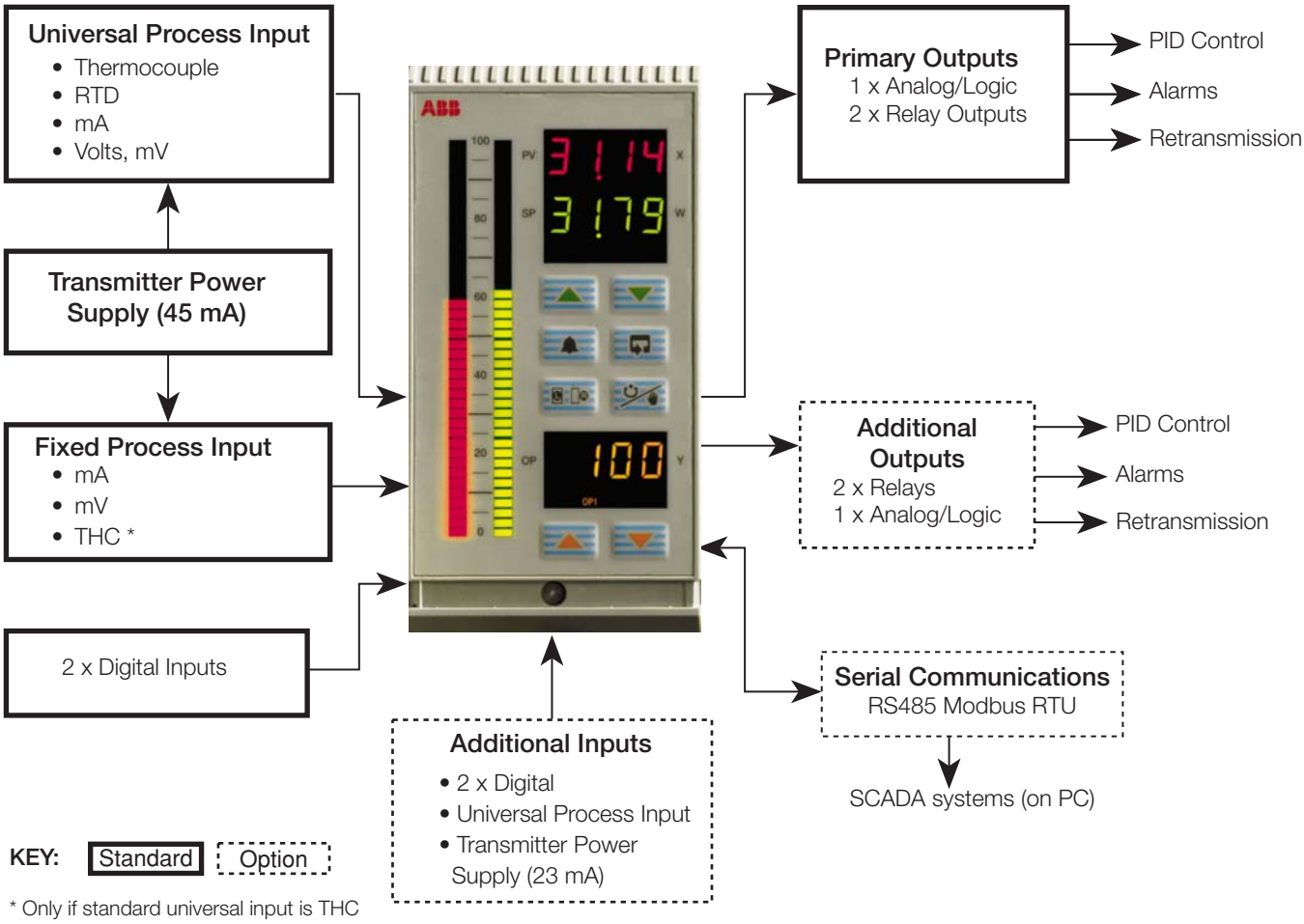
The instrument can be commissioned in minutes using a built-in library of application templates and advanced autotune facilities. Configurations can also be edited and stored off-line using our Windows™-based PC Configurator.

A wide range of process connections is included in the standard instrument; a choice of option cards provides additional input/output for complex applications. Modbus serial communications are available for integration with factory automation systems.

IP66 (NEMA 4X) front panel protection makes the C505 an extremely robust controller, suitable for use in a wide variety of industrial environments.



Process Connections



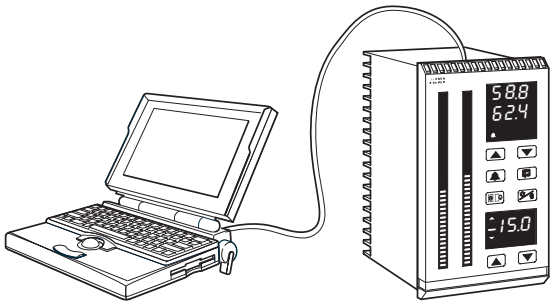
Process Visibility and Operation

Three high-visibility, colored digital displays show Process Variable, Set Point and Controller Output simultaneously. Dual, 40-segment bargraphs give an instant indication of process status. For clarity, function keys are color-coded to match their corresponding displays.

Eight individual tactile front panel keys make the controller very operator-friendly, with one-touch access to local/remote set point adjustment, alarm acknowledgment, auto/manual and output adjustment.

Secret-til-lit LED indicators display controller modes and alarm status, and provide extensive controller and plant diagnostics.

All of these features ensure that the controller is operator-friendly and no specific training is required for operational use.



Process Security and Self-diagnostics

To keep your process stable and secure, the C505 has intelligent diagnostics and responses, which can be used for process safety to initiate an action or to indicate a fault. A processor watchdog monitors the processor continuously; a unique loop-break alarm detects analog output failure; and there is an open circuit detector on the input. Using these signals, safety shutdown strategies can be initiated.

For configuration data security, there are three levels of password protection plus front panel function key lockouts, ensuring total process security.

Custom Linearizer

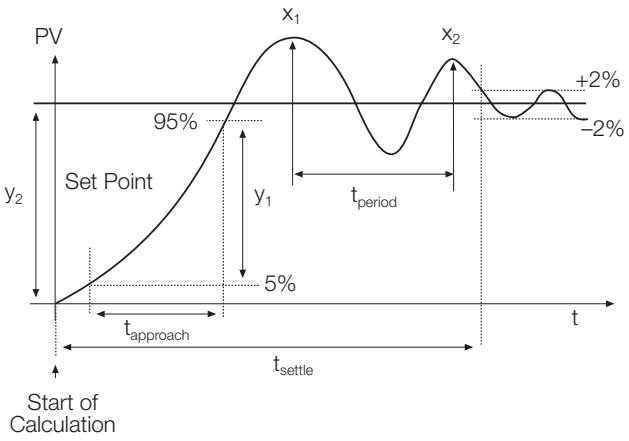
The C505 has two separate 15-breakpoint linearizers which can be programmed via the PC configurator and applied to either inputs or outputs. These can be used for non-standard thermocouples, non-linear tank levels or any non-linear input. The output linearizer accommodates any non-linear control elements.

Maths and Soft-Wiring

Four individual math blocks, each having up to 7 operators and operands, provide functions such as average, maximum and minimum calculations. Square root, relative humidity and arithmetic functions are also included as standard. Inputs can be selected or switched in and out of calculations by digital signals. This allows both simple and advanced calculations to be processed and these can be soft-wired to control functions.

Control Efficiency Monitor (CEM)

CEM measurements are designed to help you fine-tune your process manually. Six key-performance parameters are measured and displayed, allowing you to vary your PID settings to match the process needs and measure the results of your investment.



Out-of-the-Box and Installed-in-Minutes

The C505 has been designed to minimize your configuration and commissioning time, as you need only enter values that relate to your process. Application templates, offering preconfigured customized control strategies, allow rapid setup of the controller. Templates are selected via the PC configurator or the front panel keys. Alternatively the unit may be supplied preconfigured. Once a template is selected only three key settings are required and the controller is ready-to-run.

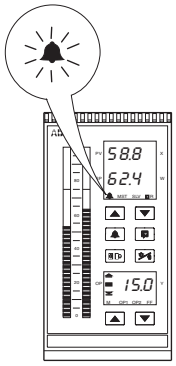
Complete configurations can be created, edited and stored off-line, using the PC configuration editor. A dedicated cable connects the PC to a jack socket on the top of the controller for rapid upload, or download, of configurations. Copies of the configurations can be saved and produced as hard copy.

A dual mode, intelligent autotune requires no prior knowledge of PID settings and offers a choice of fast response or minimum overshoot strategies.

Process Alarms

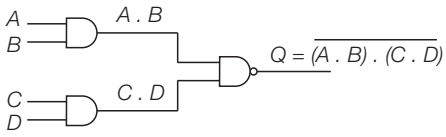
The C505 has eight internal process alarms. These can be soft-wired to control strategies, logic equations and output relays.

Each alarm can have a separate hysteresis for values programmable in engineering units and time. Alarms can also be enabled or disabled via digital inputs and can be configured as annunciators, so the alarm may be disabled once acknowledged.



Sequencing and Logic Control

The C505 offers comprehensive sequencing, to complement its advanced analog control features, and six logic equations, with up to fifteen elements per equation. These six logic equations, when combined with delay timers, real-time alarms and extensive I/O, make the C505 a powerful interlocking controller.



Intelligent Adjustable Power Recovery

Two forms of plant power failure recovery are available programmable between 0 and 9999s for recovery time:

'HOT' restart – if the power is restored within the recovery time the C505 defaults to Auto mode, allowing the process to be up-and-running without delay.

'COLD' restart – if the power is not restored within the preset recovery time, the controller defaults to Manual mode, or a predetermined control output. This ensures that after power failure the controller does not start to control the process without operator acknowledgment.

Customized Application Templates

A 'template' is a preconfigured control strategy to match a particular application requirement. This presets the display and inputs of the controller and only the control action strategy needs to be entered. Templates can be varied from the standard configuration, if required, using our Windows-based PC Configurator software.

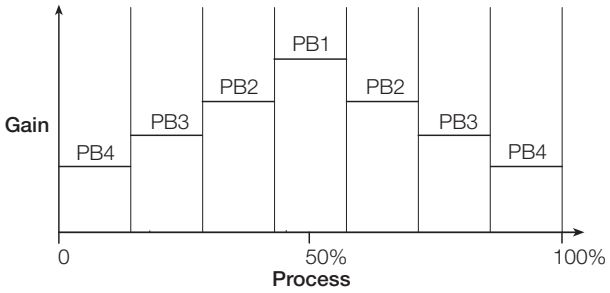
Configuration time is greatly reduced as 90% of the choices you would normally need to make in similar products are already preconfigured.

The C505 offers the following templates:

1 Single loop controller with local set point
2 Single loop controller with remote set point
3 Auto Manual station (low signal detection)
4 Auto Manual station (digital signal selection)
5 Analog Backup station (low signal detection)
6 Analog Backup station (digital signal selection)
7 Single Indicator/manual loader station
8 Dual Indicator/manual loader station
9 Single loop with feedforward
10 Single loop with feedforward and remote set point
11 Cascade
12 Cascade with remote set point
13 Cascade with feedforward
14 Ratio controller
15 Ratio controller with external ratio
16 Ratio station
17 Ratio station with external ratio

Gain Scheduling

To optimize your process control, and the response of the C505, four independent PI terms are available. This eliminates the need to manipulate variables as a result of process conditions and loads. These are selectable via internal process alarms or digital inputs. This ensures tighter control and more response action at a specific set point.



Process Protection

Advanced control features, including ramping set point, process start-up and output slew-rate, are all designed to provide you with a flexible controller that has built-in process protection as standard.

Industrial Robust Design

The front face has been designed to meet IP66/NEMA4X rating with a unique moulded case and panel seal. A chemical resistant polyester front panel makes a secure investment for any environment.

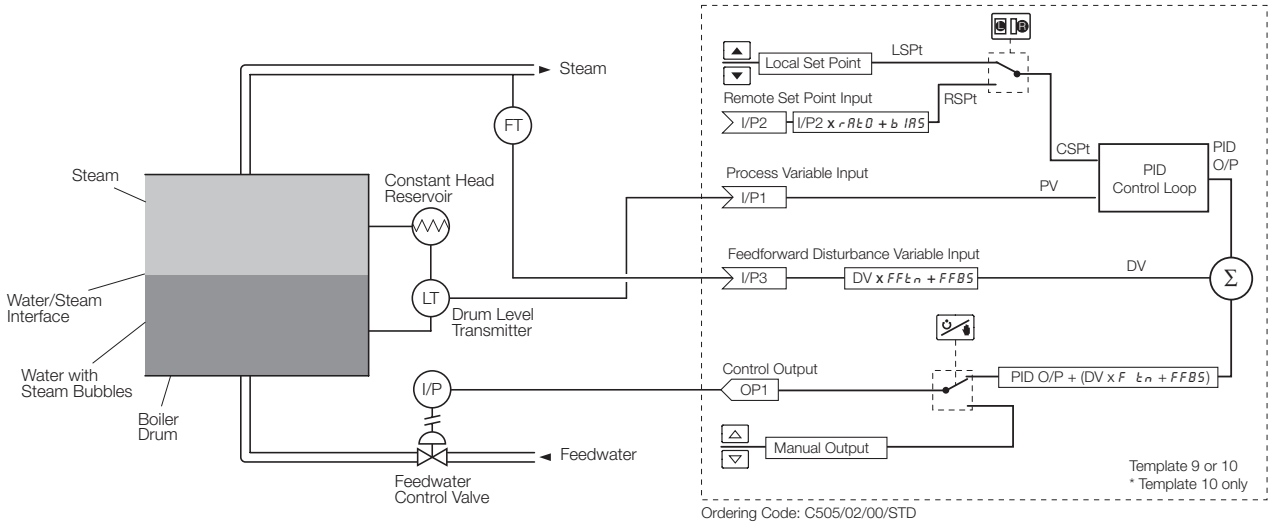


Template Examples

Boiler drum level control is a good example of the power and flexibility of the C505 Controller. Single element control may be adequate for slow changing steam demand or small boilers where, in steady state conditions, the feedwater flow always equals steam flow. However, because of the low time constants and varying dynamic response in high demand boilers, other control strategies may need to be considered for regulation of the feed water to the drum. The C505 offers you these alternative control strategies and many more in preconfigured templates.

Single Loop with Feedforward – Two-element Boiler Drum

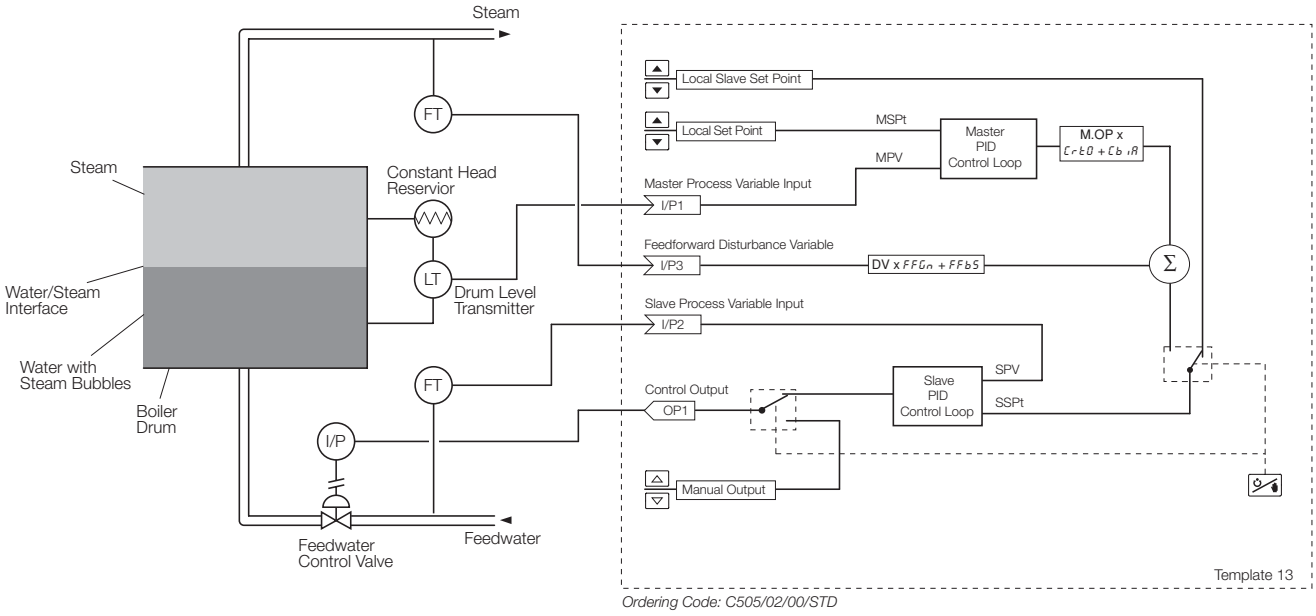
Two variables (steam flow and drum level) influence the feedwater valve position, giving tight control on steady state conditions and manipulation of the feedwater to equal any changes in steam demand.



Ordering Code: C505/02/00/STD

Cascade with Feedforward – Three-element Boiler Drum

All three variables (steam flow, feedwater flow and drum level) influence the feedwater valve position, giving tight control on steady state conditions and providing control on both variations in steam demand and feedwater supply flow rates.
Sequencing and Logic Control

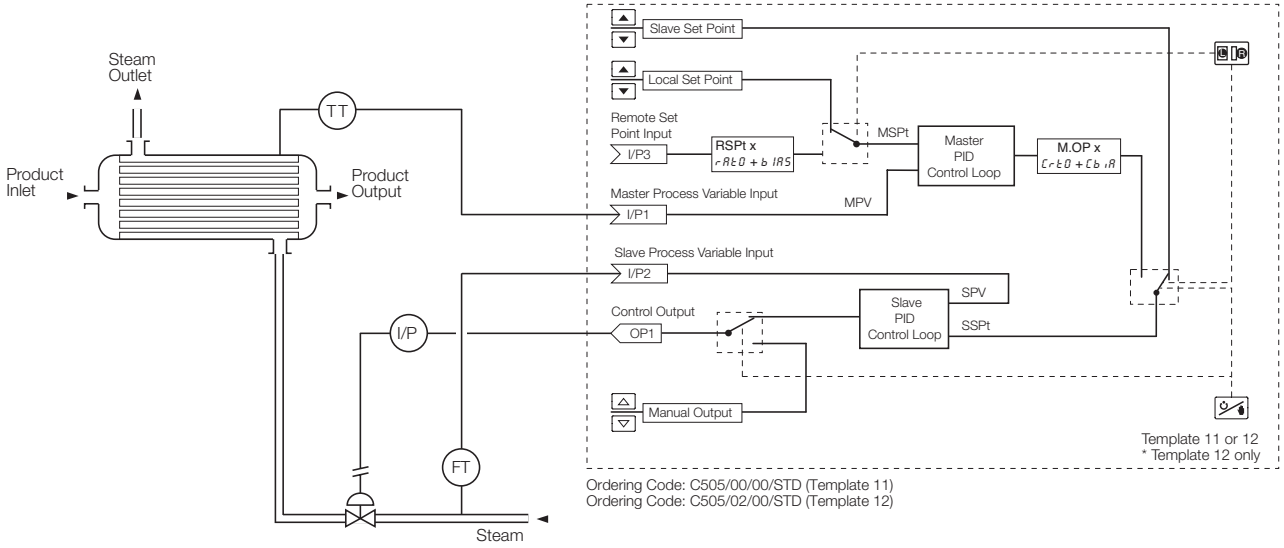


Ordering Code: C505/02/00/STD

...Template Examples

Cascade Control – Heat Exchangers

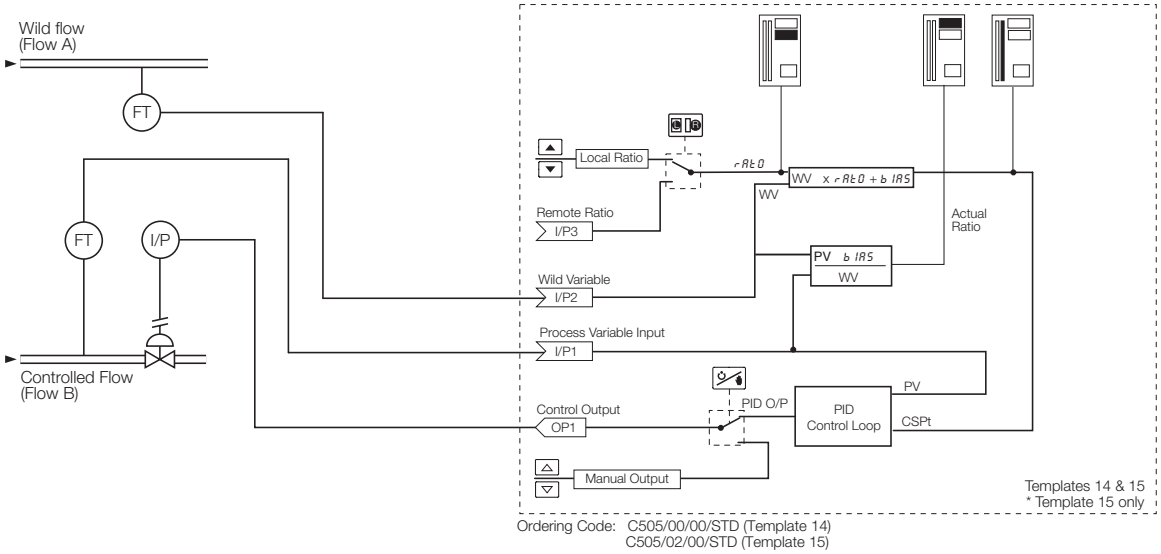
A heat exchanger is used to heat, or cool, a process fluid to a desired temperature by another stream. In this cascade example the output of the master loop (temperature) manipulates the set point of the slave loop (flow). The purpose of cascade control is to eliminate the effects of feed or product disturbances and improve dynamic performance of the control loop. Ideally the slave loop should be a considerably faster response loop than the master.



Ordering Code: C505/00/00/STD (Template 11)
Ordering Code: C505/02/00/STD (Template 12)

Ratio Controller – Mixers

Ratio Control is a technique in which the ratio between two process variables is constantly controlled. It is often applied to control of flow in blending systems, where as displayed below, a controllable flow is maintained in constant proportion to the wild flow or uncontrolled stream.

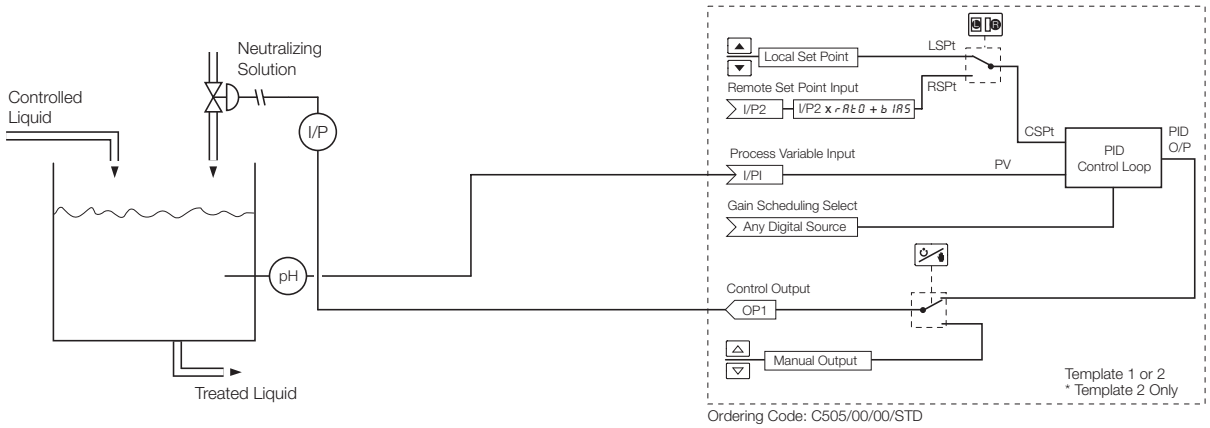


Ordering Code: C505/00/00/STD (Template 14)
C505/02/00/STD (Template 15)

pH Neutralization – Gain Scheduling

pH control is an example of a difficult process to control. This is because of pH's logarithmic characteristics, i.e. the ratio of acid reagent required to neutralize is not linear compared to the pH range. A switchable gain is a solution to this application and is provided as standard with the C505 controller.

The process gain, which is the pH per unit acid reagent required to neutralize, drops by a factor of 10 per each pH unit of neutrality. Therefore, a high gain is required near a pH value of 7 and low gain at a higher or lower pH value.

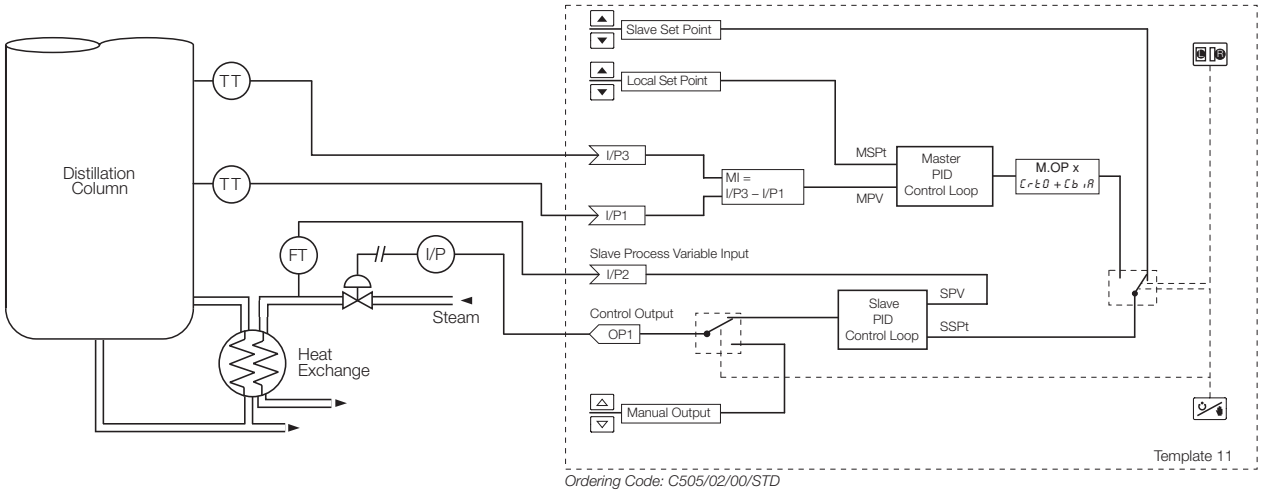


Ordering Code: C505/00/00/STD

Temperature Control by Differential

In some industrial processes, such as distillation columns, when controlling the separation of two products, measurement of one product temperature may be inadequate. Controlling by two temperatures, or temperature difference, can be a better solution. The C505 offers a math block that allows you to either average these two inputs or calculate the differential and have the result become the Process Variable Input into the controller.

This example shows a differential temperature being used as the Process Variable Input to a master controller in a cascade template.



Ordering Code: C505/02/00/STD

Specification

Summary

17 application templates: Single loop, Cascade, Feedforward, Ratio, Auto/Manual

Two Autotune options

Control Efficiency Monitor

PC configuration

IP66/NEMA4X front face

Operation

Display

2 x 100 mm 40-segment LED bargraphs

2 x 10 mm 4-digit LED indicators

1 x 10 mm 3-digit LED indicators

Display range –1999 to +9999

Configuration

Basic configuration via front panel keys

Advanced feature configuration by PC only

Security

Internal security switch and password-protected menus

Standard Functions

Control Strategies

Single-loop, Auto/Manual Station, Analog Backup, Indicator/ Manual Loader, Cascade*, Feedforward, Ratio

Output Types

Current proportioning, Time proportioning, On/off, Motorized Valve* (with and without feedback), Heat/cool.

Control Parameters

Four sets of PID settings, selectable via digital signals

Set Points

Local, remote and four local set points, selectable via digital signals

Configured Outputs

Three preset output values, selectable via digital signals

Autotune

On demand for 1/4 wave or minimal overshoot

Process Alarms

Number	8
Types	High/low process, High/low output, High/low deviation
Hysteresis	Level and time**
Alarm enable/disable	Enable/disable of alarms via digital signal

Real Time Alarms**

Number	2
Programmable	On time/day and duration

* Motorized valve without feedback output is not available with the Cascade template

** Accessed via PC Configurator

Analog Inputs

Universal Process Inputs

Number

1 standard

1 optional

Type

Universally configurable to provide

Thermocouple (THC)

Resistance thermometer (RTD)

mV

Volts

mA

Resistance

Input Impedance

mA	100 Ω
mV, V	10 MΩ

Linearizer Functions

THC types B, E, J, K, L, N, R, S, T, PT100, √, 3/2, 5/2

Broken Sensor Protection

Programmable for upscale or downscale drive

Sample Interval

125 ms (1 input)

Digital filter

Programmable

Cold Junction Compensation

Automatic CJC incorporated as standard

Stability 0.05 °C/°C change in ambient temperature

Input Protection

Common mode rejection	>120 dB at 50/60 Hz with 300 Ω imbalance resistance
Series mode rejection	>60 dB at 50/60 Hz

Transmitter Power Supply

Number	1 standard, 1 optional
Voltage	24 V DC nominal
Drive	Up to 45 mA as standard, up to 23 mA on option board

Non-universal Process Input

Number

1 standard

Input types	mA, mV only (THC only if IP1 is a THC)
Linearization	B, E, J, K, L, N, R, S, T, PT100, √, 3/2, 5/2

Standard Analog Input Ranges

Thermocouple	Maximum Range °C	Maximum Range °F	Accuracy (% of reading)
B	–18 to 1800	0 to 3270	0.1 % or ±1 °C (1.8 °F) [above 200 °C (392 °F)] *
E	–100 to 900	–140 to 1650	0.1 % or ±0.5 °C (0.9 °F)
J	–100 to 900	–140 to 1650	0.1 % or ±0.5 °C (0.9 °F)
K	–100 to 1300	–140 to 2350	0.1 % or ±0.5 °C (0.9 °F)
L	–100 to 900	–140 to 1650	0.1 % or ±1.5 °C (2.7 °F)
N	–200 to 1300	–325 to 2350	0.1 % or ±0.5 °C (0.9 °F)
R	–18 to 1700	0 to 3000	0.1 % or ±0.5 °C (0.9 °F) [above 300 °C (540 °F)] *
S	–18 to 1700	0 to 3000	0.1 % or ±0.5 °C (0.9 °F) [above 200 °C (392 °F)] *
T	–250 to 300	–400 to 550	0.1 % or ±0.5 °C (0.9 °F)

* For B, R and S thermocouples, accuracy is not guaranteed below value stated

Min. span below zero Type T 70 °C (126 °F)
Type N 105 °C (189 °F)

THC standards DIN 43710
IEC 584

RTD	Maximum Range °C	Maximum Range °F	Accuracy (% of reading)**
Pt100	–200 to 600	–325 to 1100	0.1 % or ±0.5 °C (0.9 °F)

** RTD, 3-wire platinum, 100 Ω per DIN 43760 standard (IEC 751), with range of 0 to 400 Ω

Linear Inputs	Range	Accuracy (% of reading)
Millivolts	0 to 500 mV	0.1 % or ±10 µA
Milliamps	0 to 50 mA	0.2 % or ±2 µA
Volts	0 to 5 V	0.2 % or ±2 mV
Resistance	0 to 5000 Ω	0.2 % or ±0.08 Ω

...Specification

Outputs

Control/Retransmission Outputs

Number	1 standard, 1 optional
Type	Programmable as analog or logic (digital) output
Dielectric	Galvanically isolated from the rest of the circuitry
Analog range	0 and 20 mA (programmable), accuracy: 0.25 %
Digital voltage	17 V @ 20 mA

Relay Outputs

Number	2 standard, 2 optional
Type	SPST, rated 5 A at 115/230 V AC

Digital Inputs

Number	2 standard, 2 optional
Type	Volt-free
Minimum pulse	200 ms

Advanced Features

Maths Blocks *

Number	4
Operators	+, –, x, ÷, Average, Maximum, Minimum, High select, Low select, √, Median select, Relative Humidity Input multiplexer (digitally selected)

Delay Timers *

Number	2
Programmable	Delay and Duration in seconds

Logic Equations *

Number	6
Elements	15 per equation
Operators	OR, AND, NOR, NAND, NOT, EXOR

Custom Linearizers *

Number	2
Breakpoints	15 per linearizer

* Accessed via PC Configurator

Options

Analog Inputs

Number	1
Isolation	Galvanically isolated from the rest of the circuitry
Type	Universal (see **Universal Process Inputs** on page 11)

Analog/Digital Output

Number	1
Isolation	Galvanically isolated from the rest of the circuitry
Type	Programmable 0 to 20 mA analog or 17 V @ 20 mA digital

Relay Outputs

Number	2
Type	SPST, rated 5 A at 115/230 V AC

Digital Inputs

Number	2
Type	Volt-free
Minimum pulse	200 ms

Serial Communications

Connections	RS485, 2- or 4-wire
Protocol	Modbus RTU
Isolation	Galvanically isolated from the rest of the circuitry

Physical

Size

76 mm x 148 mm x 149.5 mm

(2.99 in. x 5.83 in. x 5.87 in.)

Weight

750 g (1.6 lb)

EMC

Emissions and Immunity

Meets requirements of IEC 61326 for an Industrial Environment

Electrical

Voltage

85 min. to 265 V max. AC 50/60 Hz

24 V DC

Power consumption

15 VA max.

Power interruption protection

Up to 60 ms

Safety

General safety EN 61010-1

Dielectric Strength

500 V DC to earth:

Analog/digital output 1 to rest of the circuitry

(500 V DC for 1 minute)

Analog/digital output 2 to rest of the circuitry

(500 V DC for 1 minute)

Analog input 3 (IP3) to rest of the circuitry

(500 V DC for 1 minute)

Serial communications to rest of the circuitry

(500 V DC for 1 minute)

Environmental

Operating Limits

0 ° to 55 °C (32 ° to 130 °F)

5 to 95 %RH (non-condensing)

Temperature stability

<0.02 %/°C or 2 µV/°C (<0.011 %/°F or 1.11 µV/°F)

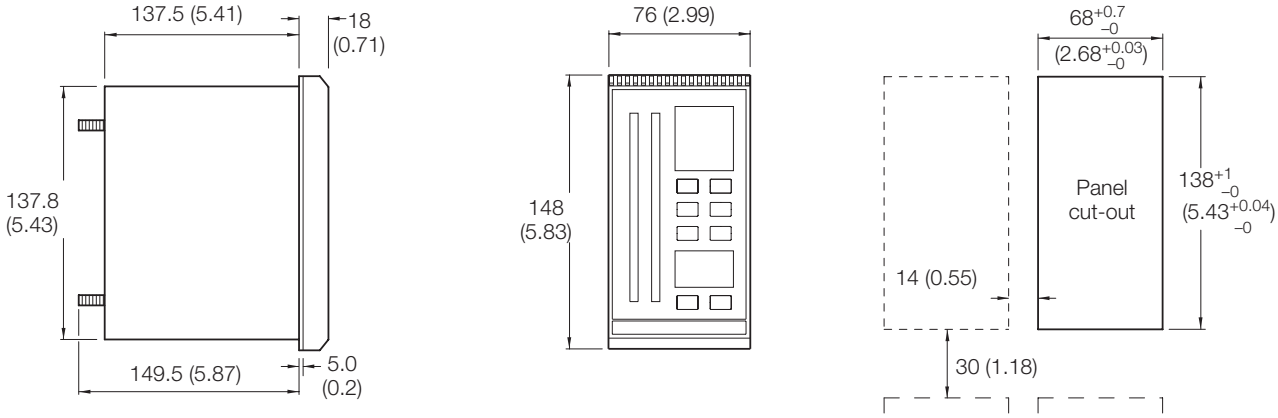
Long term drift <0.02 % of reading or 20 µV annually

Front face

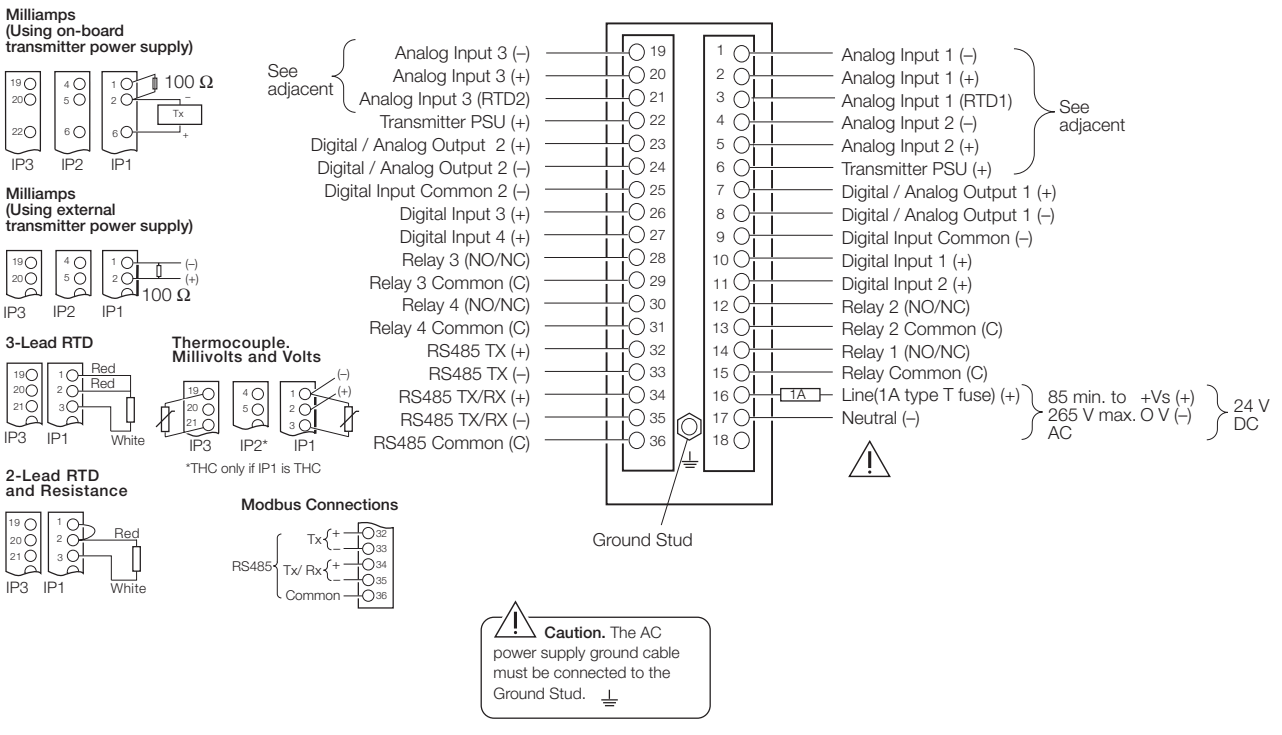
NEMA4X (IP66)

Overall Dimensions

Dimensions in mm (in.)



Electrical Connections



Ordering Information

C505 1/2 DIN Advanced Process Controller	C505	/ X	X	X	X	/	X	X	X	X
Option Board										
None		0	0							
2 x Digital Input 2 x Relay		0	1							
1 x Analog Input 1 x Analog Output 2 x Digital Inputs 2 x Relay		0	2*							
RS485 Modbus		0	3							
1 x Analog Input 1 x Analog Output 2 x Digital Inputs 2 x Relays RS485 Modbus		0	4*							
Power Supply										
85 V min. to 265 V max. AC				0						
24 V DC				1						
Build										
ABB Standard					0					
CSA approval (pending)					1					
UL approval (pending)					2					
Programming/Special Features										
Configured to factory standard							S	T	D	
Configured to customer requirements							C	U	S	
Special features							S	P	X	X

* If configuring the controller for templates 10, 12, 13, 15 and 17, motorized valve with feedback, dual analog output or heat/cool – either option 02 or 04 must be fitted.

Accessories

PC Configurator Kit (part no. C100/0700)

Licensing, Trademarks and Copyrights

Modbus™ is a trademark of Modicon, Inc.

Windows™ is a trademark of the Microsoft Corp.

ABB has Sales & Customer Support expertise in over 100 countries worldwide

www.abb.com

The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.

Printed in UK (06.07)

© ABB 2007

SS/C505 Issue 6

ABB Limited
Howard Road, St Neots
Cambridgeshire
PE19 8EU
UK
Tel: +44 (0)1480 475321
Fax: +44 (0)1480 217948

ABB Inc.
125 E. County Line Road
Warminster
PA 18974
USA
Tel: +1 215 674 6000
Fax: +1 215 674 7183

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP