

Temperature Controller 309100 rev.D

For Use with Graco Therm–O–Flow[®] Controls

Part No. 195764 Syscon–RKC CB100 Part No. 233150 Syscon–RKC CB100 W/RS485 Communications (Therm–O–Flow Plus Units Only)



Read warnings and instructions.



9528A

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Table of Contents

Symbols .																-								3
Warnings	• •	• •	• •		 •	• •		•		• •	 •	• •	•	•	• •	-	•	•		•	•	•		3
Operation	••		• •	-	 •	• •	• •	•	 •	• •	 •		•	•	• •	•	•	•		•	•	•		6
Service	••	• •	• •	•	 •	• •	• •	•	 •	• •	 •	• •	-	•	• •	-	•	•	• •	•	•	•	•	16

Overview of the Temperature Settings	 19
Dimensions	 20
Technical Data	 21
Graco Standard Warranty	 22
Graco Information	 . 22

Symbols

Warning Symbol

WARNING

This symbol alerts you to the possibility of serious injury or death if you do not follow the corresponding instructions.

Caution Symbol

A CAUTION

This symbol alerts you to the possibility of damage to or destruction of equipment if you do not follow the corresponding instructions.



WARNING

HOT SURFACE AND FLUID HAZARD

Heated fluid can cause severe burns and can cause equipment surfaces to become very hot.

- Wear protective gloves and clothing when operating this equipment in a heated system.
- Do not touch the metal heat sink when the surface is hot.
- Allow the equipment to cool thoroughly before servicing.

Some heated systems are designed to dispense PUR heated materials. PUR systems are supplied with ventilation hoods, and require proper ventilation and specially designed system components.

INJECTION HAZARD

Fluid from the dispense gun, hose leaks, or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Splashing fluid in the eyes or on the skin can also cause serious injury.

- Fluid injected into the skin might look like just a cut, but it is a serious injury. **Get immediate** medical attention.
- Do not point the gun/valve at anyone or at any part of the body.
- Do not put your hand or fingers over the spray tip/nozzle.
- Do not stop or deflect fluid leaks with your hand, body, glove, or rag.
- If spraying, always have the trigger guard on the gun when dispensing.
- If the unit is equipped with a gun diffuser, check the gun diffuser operation weekly. Refer to the gun manual.
- Be sure the gun/valve trigger safety operates before dispensing.
- Lock the gun/valve trigger safety when you stop dispensing.
- Follow the **Pressure Relief Procedure** if the nozzle clogs, and before cleaning, checking or servicing the equipment.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Replace worn, damaged, or loose parts immediately. Do not repair high pressure couplings; you must replace the entire hose.

WARNING

Fach.	FIRE, EXPLOSION AND ELECTRIC SHOCK HAZARD
	Improper grounding, poor air ventilation, open flames, or sparks can cause a hazardous condition and result in fire, explosion, or electrostatic shock and other serious injury.
	• Ground the equipment, the object being dispensed, and all other electrically conductive objects in the dispense area. Proper grounding dissipates static electricity generated in the equipment.
N ih	 Do not use this equipment with flammable liquids.
Ç ZZ	 Keep the dispense area free of debris, including solvent, rags, and gasoline.
	• If there is any static sparking while using the equipment, stop dispensing immediately . Identi- fy and correct the problem.
	 Make sure all electrical work is performed by a qualified electrician only.
	 Make sure all electrical equipment is installed and operated in compliance with applicable codes.
	 Make sure power is disconnected when servicing and repairing equipment.
	• Have any checks, installation, or service to electrical equipment performed by a qualified electrician only.
	MOVING PARTS HAZARD
	Moving parts, such as the ram follower plate/pump inlet can pinch fingers.
	• Do not operate the equipment with the guard removed.
	 Keep clear of all moving parts when starting or operating the equipment.
	• Keep hands and fingers away from the priming piston during operation and whenever the pump is charged with air.
	 Keep clear of the follower plate, pump fluid inlet, and lip of the fluid container when raising or lowering the ram.
	• Before checking or servicing the ram or pump, follow the Pressure Relief Procedure .
	TOXIC FLUID HAZARD
	Hazardous fluid or toxic fumes can cause serious injury or death if splashed in the eyes or on the skin, inhaled, or swallowed.
	 Know the specific hazards of the fluid you are using.
	 Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.
	 Always wear protective eyewear, gloves, clothing and respirator as recommended by the fluid and solvent manufacturer.
	Avoid exposure to heated material fumes.
	Provide adequate ventilation.

Setting Temperature Controllers

WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

To reduce the risk of fire, explosion, or electric shock:

- The power source conduit is not an adequate ground for the system. The unit must be bonded to either the building ground or a true earth ground.
- A qualified electrician must complete all grounding and wiring connections.
- Refer to your local code for the requirements for a "true earth ground" in your area.
- Also read and follow the warnings on page 5.

WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

To reduce the risk of fire, explosion, or electric shock the resistance between the supply unit components and true earth ground must be less than 0.25 ohms.

HOT MATERIAL AND EQUIPMENT HAZARD

Graco Hot Melt equipment is rated for operation at 206°C (400°F) maximum. Setting the temperature higher than 206°C (400°F) can result in personal injury or equipment damage. The temperature controller functions for the heated zones are preset at the factory.

For system operation, see your system manual.

For more information about using the temperature controllers, refer to the temperature controller instructions included in the electrical control panel documentation.

Controller Programming Notes

Fig. 1 shows an example of the CB100 temperature controller.

However, the critical controller settings must be checked before using the controllers for the first time and after replacing a defective controller. For removal and replacement procedures, see the **Service** section of this manual.

For the **Setting List**, which defines each function mode parameter name, see the **Overview of the Temperature Controller Settings** on page 19.

Before you begin to check the controller programs, make sure that the supply unit has been properly grounded, checked for resistance, and safely connected to a power source.

Controller Programming Notes

Fig. 1 shows an example of the CB100 temperature controller.

Table 1 describes the operation indicators for the CB100 temperature controller.

Table 1	. 0	peration	Indicators
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Indicator	Description
Display 1	Displays the process value or pa- rameter symbols.
Display 2	Displays the set point, variable, or parameter settings.
OUT1	Lit when control output 1 is on.
OUT2	Lit when control output 2 is on (not used).
ALM1	Lit when activated.
ALM2	(ALM2, Therm-O-Flow Plus only)
AT	Flashes during auto-tuning.

Table 2 describes the operation keys for the controller Use the keys when programming the controllers.

Table 2. Operation Keys

Кеу	Description
SET key	The SET key switches between auto and manual operation.
Shift/ R/S key	The Shift key shifts the digit when the setting is changed.
	The R/S key selects the RUN/STOP function.
Down arrow key	The down arrow key decrements or decreases numerals on display 2.
Up arrow key	The up arrow key increments or in- creases numerals on display 2.

Set Controllers from Run Mode to Stop Mode

The procedures in this manual are documented to run the temperature controllers with the heat zones switched to the **Run** mode. Run mode is the normal operating mode. The PV display should show the current zone temperature. The SV display indicates the desired set value. Press the R/S key on each temperature controller to switch the heated zone to the RUN mode if in the STOP mode (Pressing this key momentarily toggles between RUN and STOP modes). STOP mode is indicated by $5T \ DP$ in the PV (Display 1). See Fig. 1.

Temperature Control Operation

Place the temperature control in the RUN mode (see **Set Controllers from Run Mode to Stop Mode** above). Perform the following steps to adjust the set value (example shows how to set to 200).

-		
PV 6V	<u>3</u> 0 0000	Press the SET key to enter the SV Setting mode. The digit that lights brightly is set- table
27 87	3 0 0000	Press the <r brightly="" digit="" hundreds="" key="" lit="" place.<="" s="" shift="" th="" the="" to=""></r>
PV 84	<u>0 E</u> 0050	Press the UP key to set "2". Pressing the UP key increases the numeral and pressing the DOWN key decreases the numeral.
PV BV	<u>0 E</u> 005	After finishing the setting, press the SET key. All of the value digits light brightly, and, as a result, the instrument returns to the PV/SV display mode.

When in the RUN mode, the temperature control will activate the SSR that controls power to the zone. When the PV (present measured value, current temperature reading) is far from the SV (set value), the output power to the zone is full on. This is indicated by the small OUT1 LED on the control. When the PV value gets closer to the SV, the output, OUT1 will begin to pulse. The control is limiting the amount of power to the zone to keep the PV as close as possible to the SV.

Programming

Programming is only required if replacing a failed or damaged controller or when access and changes to the parameter settings have affected operation of the controller (see Fig. 15). **NOTE:** Thermo-O-Flow Plus systems that include the optional Enhanced Programming Pendant Kit 233098, have the ability to automatically set all parameter settings of all the temperature controllers. This is done by accessing the setup screens from within the pendant. (See Graco manual 309085.) (This is not available in the 2-zone control, 243698 and the 4-zone control, 243699).

First Steps – Programming Tip

Program each controller without the heating zone turned on. To do this, perform the following procedure:

NOTE: Refer to Figure 1, Table 1, and Table 2 on page 7 for user information about the CB100 controller.

Setting the Controller to the Stop Mode

To set the controller to the stop mode, immediately after applying power to the unit, press the <R/S key momentarily to toggle to the Stop mode (Fig. 2).

NOTE: In the Stop mode, configuration changes can be made to the controller without heating the zone powered-on.

Fig. 2_

The STOP mode removes the controller from all operations of the control box. The controller will not heat the zone and the alarms are inactive. Place the controller in STOP mode when not using the zone.

Checking Critical Controller Settings

The critical controller settings must be checked before using any of the controllers in normal operation.

To check the critical controller settings, complete the following procedures in the given order for **each** CB100 controller:

- Check the input type setting
- Check the temperature scale setting
- Check the temperature controller settings
- Check the communication settings (Therm–O–Flow Plus Units Only)

Checking the Input Type Setting

To check the input type setting, perform the following procedure:

Fig. 3 shows an example of a controller with the a PT100 RTD input type and range from 0 to 500.0°F.

*2. Input type table

Display	ď	J	r	5	Ь	E	Γ	п	ρ	Ū	IJ	L	JP	Ρſ	В
Input			The	ərn	noc	cou	iple	э (ТC)			RT	D	Veltage
Туре	к	J	R	s	в	E	т	N	PL II	W5Re/ W26Re	υ	L	JPt 100	Pt 100	(Current)

Fig. 3

1. Go to the next procedure to check the temperature scale setting.

Checking the Temperature Scale Setting

When the controls are first powered on, the SV display will show the current setting. The setting will be either FPT or CPT. The "PT" indicates that it is a 100 platinum RTD setting, the "F" indicates degrees Fahrenheit, the "C" indicates degrees Celsius. See Graco manual 309100 for a description of this and for instructions on moving through the screens.

- 1. At the RUN screen
 - Press and hold the SET key for approximately 4 seconds. The display changes to the parameter setting display mode
 - b. The display will show: AL 1 #### (alarm 1 settings)
 - c. Press the SET key until: LCK #### (lock settings)
 - change the SV display to: 1000 (this unlocks the configuration settings)
- **NOTE:** When unlocking the configuration settings, change only the setting described. Altering other settings will affect the operation of the controller. Be sure to relock the configuration settings as described in step 2 on page 10.
 - e. Press and hold the SET and <R/S keys simultaneously.
 - f. The display should change to the INITIAL SETTINGS mode
 - g. The display should now show: Cod 0000
 - h. Press the SET key twice until the screen shows:

SL 2 0001

the 1 in the far right position indicates $^\circ F$ as shown.

 Change the SV window to 0000 by using the down arrow. The display should now show:
 SL 2 0000
 All persons indicates %C

All zeroes indicates °C.

j. Press and hold the SET and <R/S keys simultaneously again. This will bring the display back to the RUN screen.

2. Relock the configuration settings

- a. Press and hold the SET key for approximately 4 seconds.
- b. The display will change to the parameter setting display mode.
- c. The display should show:
 AL 1
 #### (alarm 1 settings)
- d. Press the SET key until: LCK #### (lock settings)
- e. Change the SV display back to: 0011 (this relocks the manufacture settings)
- f. Press and hold the SET key for approximately 4 seconds.
- g. The display will change back to the RUN mode.
- 3. The RTD connected to the display will now be indicating in °C in the PV window. The SV must now be changed for °C operation.
- 4. Cycle power to the unit and the screen will show CPT in the SV window on power-up.

Checking the Temperature Control Settings

To check each setting, perform the following procedure:

- 1. Press and hold the SET key for more than 5 seconds.
- 2. To check each setting, perform the following steps:
- NOTE: The alarms are a deviation of the SV. Alarm 1 is the high temperature, safety alarm to avoid over-heating the material and the system. This alarm is set as a 40°F (22°C) deviation above the set point. If the temperature exceeds the setpoint by 40°F (22°C) the red light will turn on and all the zones of the system will turn off.

Alarm 2 activates the Autopressurization (AP) solenoid and the green ready light when the temperature is within the operating parameters of the alarm setting. The alarm setting is a deviation of the setpoint of $35^{\circ}F$ ($19^{\circ}C$) below the setpoint.

- a. Press the SET key to move through the parameter settings (See **Overview of the Temperature Controller Settings** on page 19).
- Verify that each controller setting corresponds to the "Initial value prior to shipment" as shown in Fig 15.
- c. Press and hold the SET key for more than 5 seconds to return to the exit parameter settings.

Check Communication Parameters

Parameters in communication setting mode are selected in the order of device address "Add", communication speed "bPS", data construction "bIT" and interval time set value "InT". (Fig. 4). Each parameter is selected by pressing the SET key.

Auto tuning and self tuning the controllers are not recommended if Graco PID values can be applied. However, auto tune and self tune can be used if no Graco PID values are available.

Graco Factory P, I, and d Settings

The P, I, and d settings are preset at the factory when installed on a Graco Therm–O–Flow control. These values are optimized values and should not need to be altered by an auto tune process or a self tune process.

These P, I, and d values allow the heat zones to reach their maximum temperature as fast as possible without significantly exceeding the desired temperature.

Table 3 lists the P, I, and d settings for standard control panels. These settings are preset at the factory.

Category	Р	I	d	Unit Voltage
Ram Plate	41	118	29	ALL
Pump	50	1186	296	ALL
Hose	9.9	51	12	ALL
Gun	75	49	12	ALL
Manifold	24.1	144	36	ALL
Compensator	40.9	87	21	ALL
Header	1.7	109	16	ALL
Regulator	58.5	330	82	ALL

Table 3. Graco P, I, and d Settings

Auto Tuning the Controllers

The auto tune process adjusts the P, I, and D settings to the optimal level at each controller automatically.

After the critical controller settings have been checked, complete the following procedures:

- Changing the Set Point
- Auto Tune Process

Changing the Set Point (SV)

During the auto tune process, the temperature can rise as much as 40° higher than the set point. If the material reacts adversely to higher temperatures, the set point should be lowered approximately 40° to avoid the adverse reaction. After the auto tune process is completed, the set point can be raised back to the desired temperature.

To change the set point, press the SET key momentarily. The first digit will be highlighted in the SV display. See Fig. 5. Perform the following procedure:

- **NOTE:** See step 1 or 2 depending on your situation in the auto tune process.
- Use the <R/S key to select the digit to change and the arrows to increase or decrease the value (see Fig. 5).
- 2. If starting the auto tune process, lower the set point setting approximately 40° to avoid an adverse material reaction (see Fig. 5).
- 3. If finishing the auto tune process, reset the set point, raising the setting to the desired material temperature (see Fig. 5).

- 4. Repeat step 1 or 2 to change the set point for the other controllers.
- 5. Go to the next procedure to perform the auto tune process.

Auto Tune Process

With the unit at ambient temperature and all heated devices filled with the media to be heated, auto tune each temperature controller by performing the following procedure:

- **NOTE:** The auto-tuning process can take 5 minutes to 2 hours to complete. The controllers can be auto-tuned at the same time.
- 1. Enter the parameter setting mode (see Fig. 5).
- 2. Use the Set key to select $\Pi \Gamma U$ and change setting to 0001 and press the set key again.
- 3. Hold the set key for approximately five seconds to return to the run mode.
- **NOTE:** In the run mode, the zones are heated while the configuration changes are programmed into the controller. Auto tuning cannot be executed when the controller is in the stop mode.
- **NOTE:** The auto tune process can take from 5 minutes to 2 hours to complete.
- 4. Wait 2 to 3 seconds for the AT light to start flashing. This indicates the start of the auto tune process. When the AT light stops flashing, the auto tune process is complete
- 5. Repeat steps 1 through 5 to auto tune the other five controllers.
- **NOTE:** The auto tune setting will automatically be set back to 0000 once the auto tune process is complete or interrupted.
- 6. Go to the procedure: **Recording the Site P, I, and d Settings** on page 14.

Self Tuning the Controllers

The self tune process is a continuous process that automatically calculates P, I, d parameters and monitors the response. It automatically changes the P, I, d parameters for a more favorable response.

After the critical controller settings have been checked, complete the following procedures:

- Changing the Set Point
- Self Tune Process

Changing the Set Point (SV)

During the self tune process, the temperature can rise as much as 40° higher than the set point. If the material reacts adversely to higher temperatures, the set point should be lowered approximately 40° to avoid the adverse reaction. After the self tune process is completed, the set point can be raised back to the desired temperature.

Self Tune Process

With the unit at ambient temperature and all heated devices filled with media to be heated, self tune each temperature controller by performing the following procedure:

- **NOTE:** Self tune requires approximately correct values. Load Graco PID values prior to self tuning or run Auto tune if no PID values are available.
- 1. In the **stop mode**, press and hold the set button for approximately 5 seconds until the AL1 screen appears.
- 2. Press the set key to toggle through until STU appears on the screen. The STU value must be set to 0001 and the set key must be pressed.
- 3. Press and hold the set key for approximately 5 seconds to return to the run mode.
- After all the zones are set to self tune, turn all zone controllers to run mode by pressing the <R/S key.
 Immediately start the system heat.
- **NOTE:** The controller remains in self tune until the STU value is set to 0000. Refer to steps 1 through 3, but use 0000 instead of 0001 in step 2.
- 5. Go to the procedure: **Recording the Site P, I, and d Settings** on page 14.

Recording the Site P, I, and d Settings After Performing an Auto Tune or Self Tune Process

Programmed controllers sometimes fail. To avoid doing a lengthy auto tune or self tune process after replacing a controller, record the P, I, and d settings for your site by performing the following procedure:

- **NOTE:** P denotes proportional band. I denotes integral time, and d denotes derivative time.
- 1. Press and hold, for more than 5 seconds, the SET key to change to the parameter setting mode.
- 2. Press the SET key to change to the P setting, as shown in Fig. 6.

3. Record the P setting for the controller in Table 4.

Table 4. Sile F, I, and u Sellings	Table 4.	Site F	P. I. and	d	Settings
------------------------------------	----------	--------	-----------	---	----------

Category	Р	I	d
Follower			
Hose			
Gun			
Pump			

Compare the P, I, and d settings that you recorded for your site with the Graco factory P, I, and d settings for standard control panels.

4. Using the SET key, change display 1 to show the integral time (I) setting , as shown in Fig. 7.

- 5. Record the I setting for the controller in Table 4.
- 6. Using the SET key, change display 2 to show the derivative time (D) setting as shown in Fig. 8.

- 7. Record the D setting for the controller in Table 4.
- 8. Repeat the procedure to record the P, I, and d settings for each heated zone and CB100 controller used at your site.
- 9. Keep the recorded settings in a safe place for later reference, in case a programmed controller fails.

Configuring Temperature Controllers for Unused Heated Zones

If you are not using all the temperature controllers for your current application, you **must** turn to the STOP mode in the unused controllers. If any heat zone is not being used and its temperature controller is not turned to the STOP mode, the supply unit will experience a high temperature fault when power is applied to the supply unit.

To turn off the unused controllers, perform the following procedure:

 Press the <R/S key until display 1 shows STOP (Fig. 9). Pressing the <R/S key again will set the controller back into RUN mode.

STOP MODE	
Fig. 9	

Service

Removing the CB100 Controller

To remove the CB100 controller, perform the following procedure:

WARNING

ELECTRIC SHOCK HAZARD

Do not open the electrical control panel, unless you are a trained professional.

Before opening the control panel, make sure that all power has been removed from the control panel.

- 1. Turn OFF the main electrical disconnect.
- 2. Turn the system CONTROL ON switch to OFF.
- **NOTE:** Before disconnecting the wires from the CB100 controller, make sure that each wire is labeled to facilitate replacement of the new CB100 controller.
- Disconnect the wires from the CB100 controller terminals. Label each wire to match the controller terminal numbers. Fig. 10 shows the rear view of the CB100 controller.

- 4. At the front of the control panel, squeeze the flexible retainers on the sides of the controller. Pull the controller from the control panel as shown in Figure 11.
- **NOTE:** If replacing a defective E5CS or E5CK temperature controller, perform the **Installing the CB100m Controller** procedure on page 17 using a CB100 temperature controller.

Service

1. If replacing an old E5CK controller, remove the snap pin that secures the terminal cover on the controller. Remove the terminal cover (Fig. 12).

- 2. Remove the mounting screws from the adapter on the controller.
- Disconnect the wires from the controller terminals. Label each wire to match the controller terminal numbers.
- 4. At the front of the control panel, squeeze the flexible retainers on the sides of the controller. Pull the controller from the control panel.

Installing the CB100 Controller

To install the CB100 controller, which replaces the E5CS or E5CK controller, perform the following procedure:

The CB100 controller is part of the Temperature Controller Kit, P/N 195764.

- **NOTE:** Before inserting the replacement CB100 controller into the panel, make sure the gasket is in place.
- 1. Insert the CB100 controller into the mounting hole on the control panel (Fig. 13). Make sure the controller is firmly fixed in place.

- 2. At the back of the control panel, install the adapter on the CB100 controller (Fig. 13).
- 3. Tighten the two mounting screws on adapter. To avoid damaging the CB100 controller, tighten the screws alternately. Do not over tighten the screws.
- Connect the wires to the CB100 controller terminals (Fig. 14). Do not over tighten the screws.
 If replacing a CB100 controller, use the terminal conversion chart listed in Table 5 to make the correct wiring connections.
- 5. After replacing the CB100 controller, you must complete the series of procedures that are listed under **Temperature Controller Settings** on page 19 to program the controller settings.

Service

4

5

6

OUT 1

NO

NC

1

2

100 to 240V

Ν

Table 5.

Controller Model Terminals				
E5CS	E5CK	CB100		
1	8	10		
2	7	11		
3	6	12		
4	3	9		
5	2	8		
7	11	5		
8	12	6		
9	4	1		
10	5	2		

Overview of the Temperature Controller Parameter Settings

The basic program settings for each temperature controller satisfy most application needs. These settings are preset at the factory, but can be changed. The input type, temperature scale, and over temperature alarm point are the critical controller settings that you must check before doing an auto-tune or using any controller in normal operation. Figure 15 provides an illustration of the basic program settings.

Symbol	Name	Setting Range	Description	Initial value prior to shipment
AL I	First alarm (ALM1)	For temperature input Deviation alarm, Process Alarm: -1999 to +1999 C(F) or -199.9 to +999.9 C(F) SV alarm:	Set the first alarm set value and second alarm set value.	40
AL2	Second alarm (ALM2)	Same as setting range of SV For voltage/current Inputs Deviation alarm: –span to +span (Within 9999) Process alarm: Same as Input range SV alarm: Same as setting range of SV	Alarm differential gap Temperature input: 2 or 2.0 C(F) Voltage/current inputs: 0.2%	35
ALN	Autotuning (AT)	0: AT end or AT suspension1: AT start	Turns the autotuning ON/OFF.	0
SFU	Self-tuning (ST)	0: ST end or ST suspension 1: ST start	Turns the self-tuning ON/OFF.	0
Р	Proportional band (P)	Temperature Input: 1(0.1) to span or 9999(999.9) C(F) Voltage/current inputs 0.1 to 100.0% of span	Set when PI, PD or PID control is performed, For heat/cool PID action Proportional band setting on the heat-side. *ON/OFF action control when set to "0"(0.0)*. Differential gap 2 C(F)	See Table 3
1	Integral time (I)	1 to 3600 sec. *PD control when set to 0 sec.	Set the time of integral action which eliminates the offset occurring in proportional control.	See Table 3
d	Derivative time (D)	1 to 3600 sec. *PI control when set to 0 sec.	Set the time of derivative action which prevents ripples by predicting output changes & thus improves control stability.	See Table 3
Ar	Anti-reset windup (ARW)	1 to 100% of heat-side proportional band. *"0" setting: integral action OFF	Overshooting and undershooting are restricted by the integral effect.	100
ſ	Heat-side proportioning cycle (T)	1 to 100 sec (0 cannot be set.) *Not displayed if the control output is current output.	Set control output cycle. For heat/cool PID action: Heat-side proportioning cycle.	2
Pc	Cool-side proportioning band (Pc)	1 to 1000% of heat-side proportional band. (0 cannot be set.)	Set cool-side proportional band when heat/cool PID action.	100
db	Deadband (db)	Temperature input: -10 to +10 C(F) or -10.0 to +10.0 C(F) Voltage/current inputs: -10.0 to +10.0% of span	Set control action deadband between heat-side and cool-side proportional bands. Minus (–) setting results in overlap.	0 or 0.0
E	Cool-side proportioning cycle (Pc)	1 to 100 sec (0 cannot be set.) *Not displayed if the control output is current output.	Set control cool-side output cycle for heat/cool PID action.	2
РЬ	PV bias∖P(Pb)	Temperature input: -1999 to +1999 C(F) or -199.9 to +999.9 C(F) Voltage/current inputs: -span to +span	Sensor correction is made by adding bias value to measured value (PV).	0 or 0.0
LCY	Set data lock function (LCK)	See *5.	Performs set data change\Penable/disable.	0000

NOTE: Some parameter symbols may not be displayed depending on the control part number specification.

Dimensions

Controller Mounting and Clearance Dimensions

Technical Data

90 to 264 VAC

50 / 60 Hz

7 VA max. (at 100 VAC) 10 VA max. (at 240 VAC)

250 VAC, 1 A (resistive load)

0 / 12 VDC (load resistance 600Ω or more)

Input Voltage Input Frequency

Power Consumption

Alarm Output rated Relay Contact

Control Output rated Relay Contact

Graco Standard Warranty

Graco warrants all equipment manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale by an authorized Graco distributor to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non–Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

Graco makes no warranty, and disclaims all implied warranties of merchantability and fitness for a particular purpose in connection with accessories, equipment, materials or components sold but not manufactured by Graco. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

FOR GRACO CANADA CUSTOMERS

The parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présente document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés à la suite de ou en rapport, directement ou indirectement, avec les procedures concernées.

Graco Information

TO PLACE AN ORDER, contact your Graco distributor, or call one of the following numbers to identify the distributor closest to you: 1–800–367–4023 Toll Free 612–623–6921 612–378–3505 Fax

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> Sales Offices: Minneapolis, Detroit International Offices: Belgium, Korea, Hong Kong, Japan

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