WATLOW Basic Temperature and Limit Controllers

Basic Temperature and Limit Controllers Provide Economical Solution for a Wide Range of Applications



The basic and limit microprocessor-based controllers from Watlow[®] provide an economical solution for applications requiring simple on-off control. These controllers and limits are available in a broad range of packaging options, allowing users to select the best version for their individual application. The controllers and limits are available with or without an operator interface and can be ordered in a ¹/₈ DIN square panel mount, DIN-rail mount or open-board design configurations.

The basic and limit design provides significant improvements in the performance, repeatability and accuracy offered by analog basic temperature and limit controllers.

The variable options for the SERIES CV (controller) and SERIES LV (limit) include an operator interface for viewing and selecting the set point. A red, four-character, seven segment LED displays the set point to show the process option. The set point selection is made with a continuous turn rotary encoder, or with discrete up/down cursor keys. Operating range temperature values are customer definable in the product configuration part number.

The fixed options for the SERIES CF (controller) and SERIES LF (limit) offer fixed set points and are supplied without an operator interface. Operating set point temperature values are customer definable in the product configuration part number. The SERIES TM temperature indicator is available as an additional order option.

These basic and limit controllers are UL[®] recognized and include CE approvals. The limit controllers are FM approved with special UL[®] approval for the open-board potted versions. CV and LV panel mount controllers ordered with discrete up/down cursor keys include NEMA 4X/IP65 seal protection. Watlow's basic temperature and limit controllers include industry leading service and support and are backed by a three-year warranty.

Features and Benefits

Fixed or adjustable set points

- Provide tamper-proof operation
- Offer control flexibility

Four character LED display

Improves set point selection accuracy

Multiple mounting options

- Minimize installation time
- Heat or cool operation
- Provides application flexibility
- High or low limit with auto or manual reset
- Provides application flexibility

Fahrenheit or Celsius operation with indication

- Offers application flexibility
- Sensor break protection
- Provides positive system shutdown

Agency approvals

· Meet certification requirements/compliance

Microprocessor-based technology

Ensures accurate, repeatable control

Typical Applications

- Food preparation
- Industrial machinery
- Packaging
- Plastics processing







Specifications

On-Off Controller

- Microprocessor based, on-off control mode
- Nominal switching hysteresis, typically 3°F (1.7°C)
- Input filter time: 1 second

Limit Controller

- Microprocessor based, limit controller
- Nominal switching hysteresis, typically 3°F (1.7°C)
- High or low limit, factory selectable
- Latching output requires manual reset upon over or under temperature condition
- Manual or automatic reset on power loss, factory selectable
- Internal front panel or external customer supplied momentary reset switch
- Input filter time: 1 second

Operator Interface

- Four digit, seven segment LED displays, 0.28 in. (7 mm) high
- °F or °C indicator LED
- Load/Alarm indicator LED
- Continuous turn, velocity sensitive rotary encoder for set point adjustment
- Front panel key on push for set point or push for show process options (on-off controller only)
- Front panel SET/RESET key on variable set point models (limit controller only)
- · No operator interface on fixed set point models

Standard Conditions For Specifications

- Rated line voltage, 50 to 60Hz, 0 to 90% RH non-condensing, 15-minute warm-up
- Calibration ambient range: 77°F (25°C) ±3°C

Sensor Input

Thermocouple

- Grounded or ungrounded
- Type E, J, K, T thermocouple types
- >10 M Ω input impedance
- 250 nV input referenced error per 1Ω source resistance RTD
- 2-wire platinum, 100Ω
- DIN curve (0.00385 curve)
- 125 μA nominal RTD excitation current

Input Accuracy Span Range

Type E:	-328	to	1470°F	or	-200	to	800°C
Type J:	32	to	1382°F	or	0	to	750°C
Type K:	-328	to	2282°F	or	-200	to	1250°C
Type T:	-328	to	662°F	or	-200	to	350°C
RTD (DIN)	-328	to	1472°F	or	-200	to	800°C

Thermocouple Input

- Calibration accuracy: $\pm 1\%$ of input accuracy span, $\pm 1^{\circ}$ at standard conditions and actual calibration ambient Exception: Type T, $\pm 2.4\%$ of input accuracy span for -200 to 0°C (-328 to 32°F)
- Temperature stability: $\pm 0.3^\circ$ per degree change in ambient RTD Input
- Calibration accuracy $\pm 1\%$ of input accuracy span $\pm 1^\circ$ at standard conditions and actual calibration ambient
- Temperature stability: ±0.2° per degree change in ambient Allowable Operating Ranges

Type E:	-328	to	1470°F	or	-200	to	800°C
Type J:	-346	to	1900°F	or	-210	to	1038°C
Type K:	-454	to	2500°F	or	-270	to	1370°C
Type T:	-454	to	750°F	or	-270	to	400°C
RTD (DIN)	-328	to	1472°F	or	-200	to	800°C

Output Types

Switched dc (non-isolated, on-off controller only)

- Supply voltage max.: 24VDC into an infinite load
- Supply voltage min.: 5VDC at 10mA
- Min. load impedance: 500Ω

Electromechanical Relay, Form C

- Min. load current: 100mA
- 8A @ 240VAC or 30VDC max., resistive
- 250VA pilot duty, 120/240VAC max., inductive
- Use RC suppression for inductive loads
- Electrical life 100,000 cycles at rated current

External Reset Switch (limit controller only)

• Momentary, dry contact closure

Agency Approvals

• CE⁽¹⁾, W.E.E.E., RoHS EU Directive (2002-95-EC)

Agency Approvals (on-off controller only)

- UL[®] 873 recognized temperature controller and indicator, File # E43684
- UL[®] 197 reviewed for use in foodservice appliances
- ANSI Z21.23 gas appliance thermostat approval
- Temperature control and indicator CSA 22.2 No. 24, File # 30586
- NEMA 4X/IP65 (SERIES CV and LV panel mount controllers with up/down cursor keys)

Agency Approvals (limit controller only) SERIES LF (potted version only)

 UL® 991 recognized temperature limit for foodservice industry

SERIES LV and SERIES LF (including potted version)

- UL[®] 873 recognized temperature regulator, File # E43684
- UL[®] 197 reviewed for use in foodservice appliances
- ANSI Z21.23 gas appliance thermostat approval
- CSA C22.2#24 approved temperature control, File # 30586
- FM Class 3545 temperature limit switches, File # 3017239 Terminals
- 0.25 in. (6.3 mm) quick connect, push on terminal or removable screw style terminal block

Power

- 24VAC +10%; -15%; 50/60Hz, ±5%
- 100 to 120VAC +10%; -15%; 50/60Hz, ±5%
- 200 to 240VAC +10%; -15%; 50/60Hz, ±5%
- 10VA max. power consumption
- Data retention upon power failure via nonvolatile memory

Operating Environment

- 32 to 158°F (0 to 70°C)
- 0 to 90% RH, non-condensing
- Storage temperature: -40 to 185°F (-40 to 85°C)

Dimensions

 DIN-rail model can be DIN-rail or chassis mount DIN-rail spec DIN 50022, 1.38 in. x 0.30 in. (35 mm x 7.5 mm)

Style	Width	Height	Depth
Open Board	2.43 in.	2.43 in.	1.78 in.
	(61.7 mm)	(61.7 mm)	(45.1 mm)
Potted	2.76 in.	4.05 in.	1.84 in.
	(70.1 mm)	(102.9 mm)	(46.6 mm)
DIN-rail	3.08 in.	4.42 in.	3.57 in.
	(78.1 mm)	(112.3 mm)	(90.7 mm)
Square ¹ /8 DIN Panel			Behind panel 2.04 in. (51.7 mm)

^①See declaration of comformity.



Ordering Information Part Number



3	Power Supply	5	Senso
B =	120VAC	H =	T/C Type J °F (-346 to 190
D =	230 to 240VAC	J =	T/C Type J °C (-210 to 103
F =	24VAC	K =	T/C Type K °F (-454 to 250
4	Package	L =	T/C Type K °C (-270 to 13
		M =	T/C Type T °F (-454 to 750
1 =	Panel mount, ¹ / ₈ DIN square - spade terminals	N =	T/C Type T °C (-270 to 400
2 =	DIN-rail mount - spade terminals		
5 =	Panel mount, 1/8 DIN square - screw terminals	P =	RTD °F (-328 to 1472°F)
		R =	RTD °C (-200 to 800°C)
6 =	DIN-rail mount - screw terminals	S =	T/C Type E °F (-328 to 147
A =	NEMA 4X panel mount, (spade terminals)		
C =	NEMA 4X panel mount, (screw terminals)	T =	T/C Type E °C (-200 to 800
<u> </u>	New A parter mount, (serew terrinidis)		
		(15)	Overlav

5	Sensor Type and Scale
H =	T/C Type J °F (-346 to 1900°F)
J =	T/C Type J °C (-210 to 1038°C)
K =	T/C Type K °F (-454 to 2500°F)
L =	T/C Type K °C (-270 to 1370°C)
M =	T/C Type T °F (-454 to 750°F)
N =	T/C Type T °C (-270 to 400°C)
P =	RTD °F (-328 to 1472°F)
R =	RTD °C (-200 to 800°C)
S =	T/C Type E °F (-328 to 1470°F)
T =	T/C Type E °C (-200 to 800°C)
(15)	Overlay/Customs Ontions
U	Overlay/Customs Options
A =	Standard with Watlow logo
1 =	Standard without Watlow logo

Ordering Information Part Number

Limit control with 8A relay output. Fixed set point, no user interface

12	3 Power Supply	④ Package	5 Sensor Type and Scale	6 Limit Type	 7 8 9 10 Fixed Set Point Temp. Value 	11 12 13 14	(15) Overlay/ Custom Options				
LF						AAAA					
3		P	ower Sup	ply		6	Limit Type				
C = 1	20VAC					U = High	limit manual reset				
E = 2	30 to 240V/	AC				W = High limit auto reset					
G = 2	4VAC					Y = Low limit manual reset					
4			Package	2		Z = Low limit auto reset					
1 = Pa	anel mount	t, ¹/ଃ DIN sq	uare - spad	e terminal	s	78910 Fixed Set Point Temperature Value					
2 = D	IN-rail mou	unt - spade	terminals			Note: An A (-) used in the left most digit of the fixed set point					
3 = 0	pen, non p	otted - spa	de terminal	S		indicates a negative temperature value.					
4 = P	otted case	- spade terr	minals			Overlay/Customs Options					
5 = Pa	anel mount	t, 1/8 DIN sq	uare - screv	v terminals	5	Image: Constraint of the second sec					
6 = D	IN-rail mou	unt - screw 1	terminals			1 = Standard with wattow logo					
7 = 0	pen, non p	otted - scre	ew terminal	S							
5		Sens	or Type an	d Scale							
	C Tupo 1ºE	(216 to 10									

5	Sensor Type and Scale
H =	T/C Type J °F (-346 to 1900°F)
J =	T/C Type J °C (-210 to 1038°C)
K =	T/C Type K °F (-454 to 2500°F)
L =	T/C Type K °C (-270 to 1370°C)
M =	T/C Type T °F (-454 to 750°F)
N =	T/C Type T °C (-270 to 400°C)
P =	RTD °F (-328 to 1472°F)
R =	RTD °C (-200 to 800°C)
S =	T/C Type E °F (-328 to 1470°F)
T =	T/C Type E °C (-200 to 800°C)



Ordering Information Part Number Limit control with 8A relay output. Rotary set point adjustment, 4 character, 7 segment display, reset switch

		<u> </u>		<u> </u>		. 5	isplay, leset switch			
12	Power Supply	④ Package	5 Sensor Type and Scale	6 Limit Type	7 8 9 10 Low Set Point Operating Range Value	(1) (2) (3) (4) High Set Point Operating Range Value	(15 Overlay/ Custom Options			
LV										
3		F	ower Supp	oly		6	Limit Type			
C =	120VAC					U = High l	imit manual reset			
E =	230 to 240V	AC				W = High I	limit auto reset			
G =	24VAC						mit manual reset			
4			Package			Z = Low li	mit auto reset			
1 =	Panel mount	t, 1/8 DIN sq	uare - spade	e terminals		78910	Low Limit Set Point Operating Range Value			
2 =	DIN-rail mou	int - spade	terminals			Note: An A (-) used in the left most digit of the fixed set point				
5 =	Panel mount	t, 1/8 DIN sq	uare - screw	r terminals		indicates a negative temperature value.				
6 =	DIN-rail mou	int - screw 1	terminals			(1) (1) (1) (1) High Set Operating Range Value				
A =	NEMA 4X pa			<u> </u>	minals)	Note: An A (-) used in the left most digit of the fixed set point				
B =	DIN-rail mou					indicates a negative temperature value.				
C =	NEMA 4X pa				minals)	(15) Overlay/Customs Options				
D =	DIN-rail mou	int, tactile k	keys (screw	terminals)		A = Standard with Watlow logo				
5		Sens	or Type an	d Scale		1 = Standard without Watlow logo				
H =	T/C Type J °F	(-346 to 19	900°F)							
J =	T/C Type J °C	(-210 to 10	038°C)							
K =	T/C Type K °F		,							
L =	T/C Type K °C									
M =	T/C Type T °F									
<u>N =</u>	T/C Type T °C		00°C)							
P =	RTD °F (-328	,								
<u>R =</u>	RTD °C (-200		470%5)							
S =	T/C Type E °F	- (-328 to 14	470°F)							

Ordering Information Part Number

T = T/C Type E °C (-200 to 800°C)

On-off controller, fixed set point, no user interface

12	3 Power Supply	④ Package	5 Sensor Type and Scale	6 Control Type	7 8 9 10 Fixed Set Point Temp. Value	11 12 (3 14	15 Overlay/ Custom Options			
CF						AAA	A				
3		P	ower Supp	oly		5			Sensor Type and Scale		
B = 1	20VAC, swi	tched dc οι	utput			H =	T/C Ty	/pe J °F (-34	6 to 1900°F)		
C = 1	20VAC, 8A	relay outpu	t			J =	T/C Ty	vpe J °C (-21	0 to 1038°C)		
D = 2	30 to 240V	AC, switche	d dc output	t		K =	T/C Ty	vpe K °F (-45	54 to 2500°F)		
<u> </u>	30 to 240V/	AC, 8A relay	/ output			L = T/C Type K °C (-270 to 1370°C)					
F = 2	4VAC, swite	ched dc out	put			M = T/C Type T °F (-454 to 750°F)					
G = 2	4VAC, 8A re	elay output				N = T/C Type T °C (-270 to 400°C)					
4			Package			P = RTD °F (-328 to 1472°F)					
	anel mount	t, ¹ /8 DIN sa	uare - spade			R = RTD °C (-200 to 800°C)					
	DIN-rail mou					S = T/C Type E °F (-328 to 1470°F)					
			d - spade te	rminals		T = T/C Type E °C (-200 to 800°C)					
	otted case					6 Control Type					
5 = P	anel mount	t, ¹ /8 DIN sq	uare - screv	/ terminals		H = Heat					
6 = D	DIN-rail mou	int - screw	terminals			C = Cool					
7 = 0	Open board, non potted - screw terminals Open board, non potted - screw terminals Open board, non potted - screw terminals										
									he left most digit of the set point		

Note: An A (-) is used in the left most digit of the set point operating ranges to indicate a negative temperature value.

15	Overlay/Customs Options
A =	Standard with Watlow logo
1 =	Standard without Watlow logo



Ordering Information

Part Number

S =

On-off controller, rotary set point adjustment, 4 character, 7 segment display

		ary set poir	nt adjustme	nt, 4 charao	cter, / segment o	lispiay					
12	3 Power Supply	④ Package	5 Sensor Type and Scale	6 Control Type	78910 Low Set Point Operating Range Value	1) 12 13 (High Set Poi Operating Range Valu	int Overlay, Custom				
CV											
3		F	ower Sup	ply		6		Control Type			
B =	120VAC, swi	tched dc oເ	utput				leat				
C =	120VAC, 8A	relay outpu	It			C = C	ool				
D =	230 to 240V	-		t		(7)(8)(9)	0 Low 9	Set Point Operating Range Value			
E =	230 to 240V					000		the left most digit of the set point operating			
F =	24VAC, swite							gative temperature value.			
G =	24VAC, 8A re	elay output				11 12 13		gh Set Operating Range Value			
4			Package	e				the left most digit of the set point operating			
1 =	Panel moun	t, ¹/ଃ DIN sq	uare - spad	e terminals		ranges to indicate a negative temperature value.					
2 =	DIN-rail mou	unt - spade	terminals			(15)		Overlay/Customs Options			
5 =	Panel moun	t, 1/8 DIN sq	uare - screv	v terminals		A = Standard with Watlow logo					
6 =	DIN-rail mou	unt - screw	terminals			B = Push to show process with Watlow logo					
A =	NEMA 4X pa	inel mount,	tactile keys	s (spade ter	minals)	C = Push to adjust set point with Watlow logo					
B =	DIN-rail mou	unt, tactile l	keys (spade	terminals)		D = Show process push to adjust set point with Watlow logo					
C =	NEMA 4X pa	inel mount,	tactile keys	s (screw ter	minals)	1 = Standard without Watlow logo					
D =	DIN-rail mou	unt, tactile l	keys (screw	terminals)				process without Watlow logo			
	-			1.0.1				set point without Watlow logo			
5			or Type an	d Scale			,	bush to adjust set point without Watlow logo			
<u>H =</u>	T/C Type J °F										
J =	T/C Type J °C										
K =	T/C Type K °F										
<u>L =</u>	T/C Type K °(
<u>M =</u> N =	T/C Type T °F										
<u>N =</u> P =	T/C Type T °C RTD °F (-328		00 C)								
<u>P =</u> R =	RTD °C (-328	-									
<u> </u>	TID C (-200	10 800 C)									

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To be automatically connected to the nearest North American Technical Sales Office:

T/C Type E °F (-328 to 1470°F) T/C Type E °C (-200 to 800°C)

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