Temperature Control Quick Reference Guide

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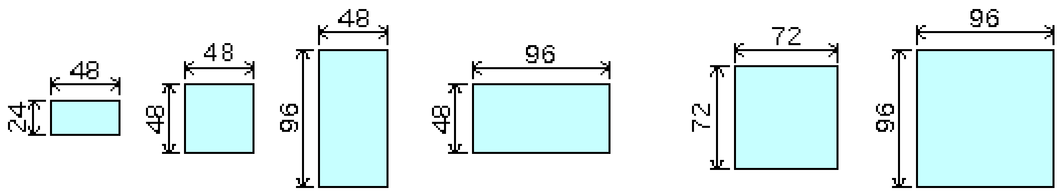
Front Panel Size



Unit: MM

Accuracy

Extra	± 0.05°C	Temperature Controller	
0.1	± (0.1% of reading + 1digit)	Process / Temperature Controller	**HA400/900** (TC, RTD) **FB400/900** (TC, RTD)
		Ramp/Soak Temperature Controller	
		Modular multi-loop Process / Temperature Controller	**SRX**
	± (0.1% of span + 1digit)	Process / Temperature Controller	**HA400/900** (mV, V, mA) **FB400/900** (mV, V, mA)
		Modular multi-loop Process / Temperature Controller	**SR Mini HG** (High accuracy type)
0.3	± (0.3% of reading + 1digit) or ± 2°C (4°F) (TC) or ± 0.8°C (1.6°F) (RTD)	Temperature Controller	**CB100/400/500/700/900** **CB103/403/903** **SA100** (RTD, mV, V, mA) **SA200**
		Multi-loop Temperature Controller	**MA900** (4 ch) **MA901** (8 ch)
		Ramp / Soak Temperature Controller	
		Modular multi-loop Temperature Controller	**SRV**
	± (0.3% of span + 1digit)	Temperature Controller	**REX-D100/400/900**
		Ramp / Soak Temperature Controller	**REX-P24** **REX-P48/96**
		Modular multi-loop Process / Temperature Controller	**SR Mini HG** (Standard type)

Temperature control action is classified into three types ;
ON/OFF temperature control, Proportional temperature control and PID temperature control actions. Each action has its own advantages and disadvantages, and it cannot be said which

action is the best. Your temperature control requirements will dictate the best control action for your application.

ON/OFF temperature control

ON/OFF temperature control is the simplest and least expensive form of control available. The output signal from a controller is either FULL ON or FULL OFF depending on the direction of the deviation from a set point.

Figure 1 shows the characteristics of ON/OFF temperature control action.

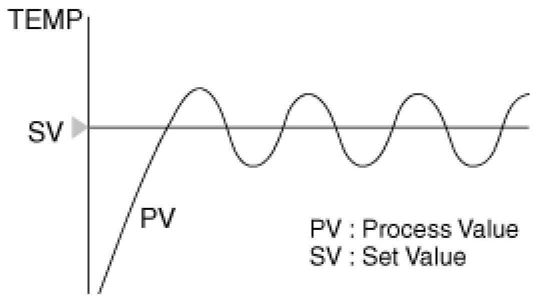


Figure 1

ON/OFF temperature control action takes place if any deviation occurs from set point. This action responds quickly but is sensitive to input noise which causes chattering (ON/OFF switching at short intervals).

Therefore, in actual use, ON/OFF temperature control action has some hysteresis which is named dead band or control sensitivity.

Proportional action temperature control

Proportional action temperature control is referred to as P or gain. With proportional action, the controlled object no longer switches as a direct result of the set value (SV). The RKC instrument compares the difference between the set value and the process variable, then controls the output proportional to the deviation.

This proportional action temperature control is active within user-definable zone around the set point called the proportional band (Pb). When the temperature (PV) enters the proportional band, the output becomes gradually smaller and the temperature stabilizes somewhere within the proportional band.

Proper adjustment of the proportional band will result in smooth control. However, it is seldom that the actual temperature stabilizes exactly on the set point, and it usually becomes stable with some deviation called offset. RKC instruments have an adjustable proportional band to meet your process requirements.

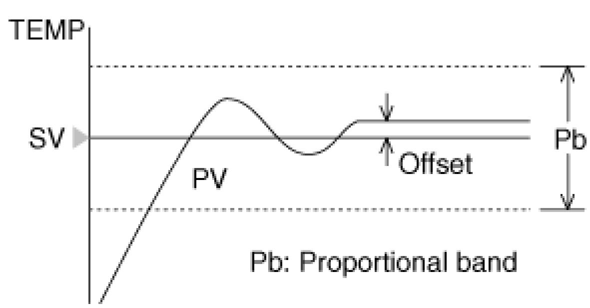


Figure 2

Integral action temperature control

Integral action temperature control is referred to as I or reset. The degree of integral action is expressed as integral time in seconds. The purpose of the integral action is to automatically compensate for any steady state offset inherent with a proportional controller.
The integral action moves or resets the proportional band up or down depending on the offset. The integral time on RKC instruments is adjustable and determines how fast the proportional band is moved.

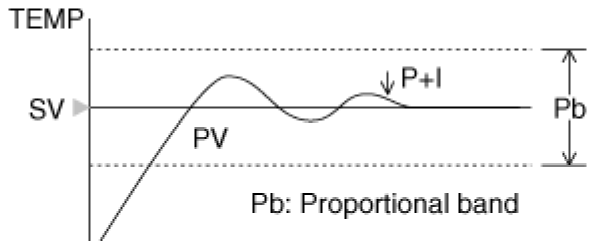


Figure 3

Derivative action temperature control

Derivative action temperature control is referred to as D or rate. The degree of derivative action is expressed by derivative time. This action on RKC controllers is adjustable in seconds.
The controller measures the rate of the temperature increase and moves the proportional band to minimize overshoot. The output change is directly proportional to the rate of change in the process value (PV).

Anti-reset windup

The anti-reset windup (ARW) inhibits the integral action until the PV is within the proportional band thus reducing overshoot on start-up. ARW inhibits the integral action by preventing the controller from moving the proportional band during start-up.
This action is measured in a percentage of proportional band and can be set from 0 - 100%.