Technical Note 108

CRONOS® and CRIUS®4.0 Control Options

Introduction

The full range of controllers from Process Instruments (CRONOS® and CRIUS®4.0) are capable of a wide variety of control options that have been specifically designed to make process control as easy as possible. The controllers offer excellent flexibility for inputs and outputs allowing them to be connected to the majority of external hardware. The controllers also come packed with a whole host of communication capabilities designed to offer connectivity to other systems. This technical note outlines the most popular control options.

AquaSense Controller

The AquaSense controller typically uses relays configured using PID control via pulse width modulated relays to control chlorine and pH in a swimming pool.

Outputs

Outputs are the means by which a signal is transmitted to an external device or system, for example, sending a signal to a SCADA system or a dosing pump. The CRONOS® and CRIUS®4.0 have two different types of output signal, these are Analogue and Relay Outputs.

Analogue Outputs

Analogue outputs are typically current or voltage outputs that vary between 4-20mA's or 0-10V, and these outputs are proportional to the input channel or to a PID output loop. Analogue outputs are regularly used to control pumps and other equipment that have 4-20mA or 0-10V inputs. Analogue outputs can be set up directly from the controller or via the internet using the Control InSite application, which is an optional feature on the CRIUS®4.0.

Relay Outputs

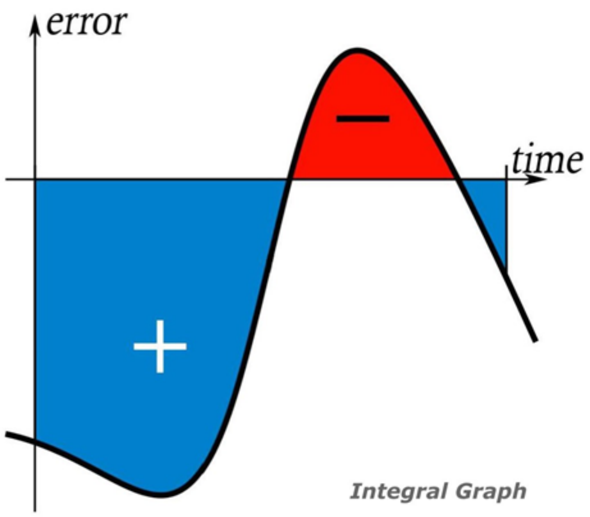
Relay outputs are mechanical reed relays. This range of controllers utilises standard mechanical reed relays, rated at 5Amp. Relay outputs can either be set up directly from the controller or via the internet using the Control InSite remote access application (optional feature on the CRIUS®4.0). Relays are used to control external equipment, for example, dosing pumps and solenoid valves. This range of controllers supports multiple control protocols including pulse frequency (number of contacts within a time period), pulse width (time between contacts within a time period) and contact (on/off).

Band Control

For applications where precise dosing control is not required it is possible to use band control. Band control is a simple on/off control mechanism that operates by triggering a relay when the measured signal moves outside a pre-determined range. The relay in the controller will then turn on a dosing pump which pumps chemical into the system, thereby returning the measured signal to within the desired band. Band control is built into all of Process Instruments controllers as standard.

PID Control

The CRONOS® and CRIUS®4.0 controllers offer full PID control (Proportional, Integral, Derivative) suitable for nearly all dosing requirements, from simple to very complex processes. PID control works by calculating the error value between a measured process variable and a desired setpoint. The calculated error is then used in three separate calculations to determine an output that is proportional to the error (the proportional term), an output proportional to the magnitude and duration of the error (the integral term) and an output proportional to the rate of change of the error (the derivative term). The PID control output is the sum of the three constituent terms. The result of the calculation is in the form of a decimal fraction that is converted into a percentage to be delivered to the relevant output. This PID feature is very flexible and can be configured as any permutation of P, I, and D, allowing P, I, PI or PID controls to be

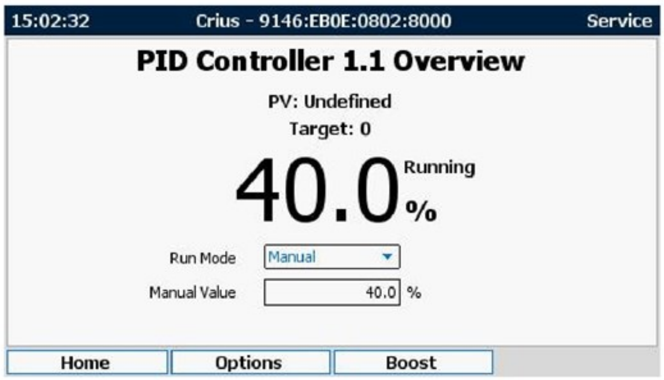


Integral Graph

implemented using a single interface. PID can be managed either directly from the controller or via the internet using the remote access application (available on the CRIUS®4.0). Please see Technical Note 13 PID for more information.

Inverter Control

The CRIUS®4.0 controller has the capability to control inverter drives. Inverters are commonly used, for example, on recirculation pumps for swimming pools to reduce the amount of electricity that is used circulating the water when the pool is not being used. There are two types of inverter control available from the controllers, manual



PID Screen

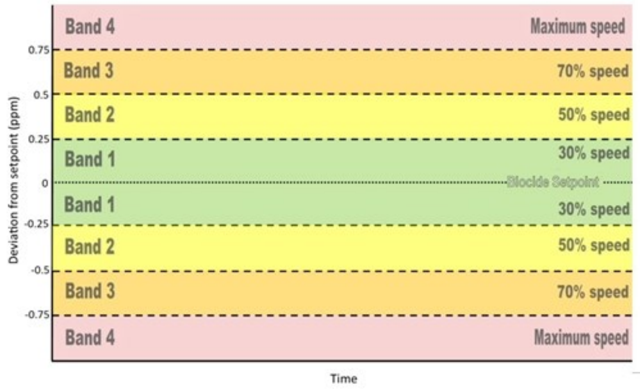
inverter control and automatic inverter control.

Manual Inverter Control allows for the motor speed to be set in the controller.

Automatic Inverter Control uses a measured signal (e.g. free chlorine level of a pool) to control the inverter drive. Auto inverter control has a day and night cycle which both function differently. The day cycle operates using four bands. Each band has its own set pump speed. When the chlorine residual is at its setpoint (within band 1), the pump is set to run at the minimum flow rate. When the residual drops into band 2 (indicating greater use of the pool), not only does this increase the chlorine dose but also the circulating pump rate. As the chlorine dips into band 3 (indicating even greater pool use) the pump is turned up again, and further still in band 4, to its maximum setting. Inverter control also allows for a night cycle which is a user defined time when the pump is set to minimum. If the controller goes into alarm (for any alarm condition), the night cycle is stopped and the day cycle takes over.

Flow Proportional Control

Flow proportional control is for use in applications where variations in flow are the primary control mechanism. This control allows modification of a secondary control loop, normally PID, to implement flow pacing with residual trim functionality. The flow proportional control output requires that a flow meter input and a secondary control loop are



VSD Bands

configured. Flow proportional control doses based on the flow rate, this level is then trimmed based on the measured value from the sensor (e.g. chlorine).

Real Time Clock Control

Real time clock control allows a relay output to be controlled based on the internal clock of the controller. An example of an application for real time clock control would be to activate a dump valve on a water recirculation system at a certain time. The controller could be setup to activate the relay every 6 hours for a predetermined time which would allow the water to be drained and then automatically made up to give the required dilution.