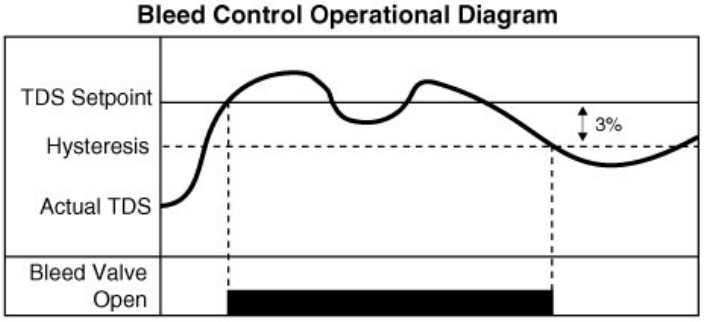
9 February 2021

APPLICATION NOTE: Hysteresis, Dose Timer Alarm, Timer Alarm Hysteresis v1.0

HYSTERESIS for BLEED

The Bleed Setpoint is the desired conductivity value of the process (displayed in TDS or µS/cm). When a solenoid valve is connected to the bleed output, the valve opens when the conductivity rises above the setpoint. When this occurs, the tower water is flushed to drain and fresh make-up water dilutes the system, thus lowering the conductivity of the tower water. The valve shuts when the conductivity drops to the Hysteresis value (i.e. a % below the setpoint). The cycle repeats.



Hysteresis is just another name for "Deadband", which is the band between the two conductivity points at which the solenoid valve opens and at which it closes. The solenoid valve opens when the conductivity rises above the programmed setpoint and shuts when it drops to a level below the setpoint. This level is called Hysteresis and is a % of the setpoint.

The main reason for Hysteresis is to prevent "relay chatter". This is the rapid switching on and off of the bleed relay when the reading hovers around the setpoint. The same technology is used in simple thermostats used in common household heaters, i.e. the heater turns off when it reaches the desired temperature, and only comes on when the temperature drops to the hysteresis value (which is usually 1 or 2 °C below the desired temperature)

NOTE: The maximum Hysteresis setting for the Conductivity, pH, and ORP is 20%. (Minimum is 1%)

HYSTERESIS for ORP CONTROL

(Only applicable in ON/OFF Control Mode. When set to PROPORTIONAL CONTROL, Hysteresis is not applicable – Refer Application note on Control Cycle and Proportional Band)

Cooling tower applications require dosing an Oxidant to increase the ORP.

The Chlorine pump will dose (or Brominator will dispense) when the ORP readout drops **below** the ORP SETPOINT . Dosing will stop once the readout rises **above** the ORP SETPOINT plus the Hysteresis percentage. (This percentage is the ORP Hysteresis value and is a percentage of the ORP SETPOINT).

This logic is the same as for Bleed control, except Bleed control is designed to lower the parameter, whilst ORP control is designed to raise the parameter.

Hysteresis prevents rapid switching of the pump (or Brominator solenoid valve) on and off when the system ORP hovers around the Setpoint. Hysteresis is the difference between the two mV points at which the pump starts and at which the pump stops.

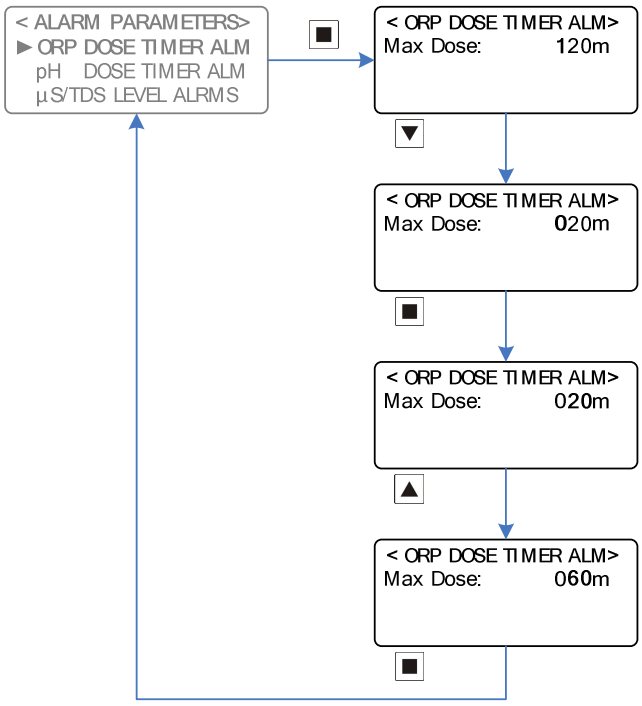
ORP Hysteresis is programmed as a percentage of the ORP Setpoint, is only applicable to ON/OFF control, and is usually only required to be greater than 1% if no dose cycle is programmed.

For example, if the ORP SETPOINT is 500 mV and the ORP Hysteresis value is 5%, then the calculated Hysteresis value is 25 mV.

In this example, the pump will be activated when the ORP drops below 500 mV and will stop when the ORP rises above 525 mV (i.e. 500 mV plus 25 mV).

ORP DOSER TIMER ALARM and TIMER ALARM HYSTERESIS for ORP CONTROL

Main Menu > *ALARM PARAMETERS > ORP DOSE TIMER ALM*



Example: Setting a Maximum Continuous ORP Dose Time of 60 minutes

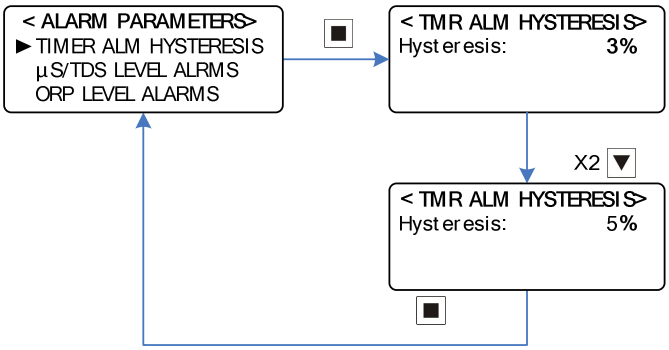
The **ORP Dose Timer Alarm** is the maximum acceptable Dose time for the system to reach the ORP Setpoint (or 97% of the ORP Setpoint (as the Default setting for ORP Timer Alarm Hysteresis is 3%). i.e. **ORP Timer Alarm Hysteresis of** 100–97= 3%).

This alarm is designed to protect the system from excessive dosing in the event of a false reading from a faulty ORP probe stuck on a particular mV value, or if the controller itself is faulty.

If the measured mV reaches the ORP Setpoint within the programmed time, (or 97% of the ORP Setpoint), the timer resets. However, if the timer times out before the mV reaches this level, the ORP Dose Timer Alarm is raised and the pump switches off and remains disabled until the controller is manually reset by holding down the Reset pushbutton, Reset via www.digichemplus.com interface or a setting is changed in the controller (i.e. locally or remotely).

(TIP: To disable the ORP Dose Timer Alarm, program the timer setting to 000m).

Main Menu > *ALARM PARAMETERS > TMR ALM HYSTERESIS*



Example: Setting the Timer Alarm Hysteresis to 5%

The Timer Alarm Hysteresis is a percentage value programmable from 1 to 20%. For instance, if you are happy if the ORP reaches 90% of setpoint (eg. 450mV, if setpoint is 500mV), then set the Timer Alarm Hysteresis to (100–90= **10%**), so that the ORP Timer Alarm cancels if the ORP is above 450mV.

Another way of describing "Timer Alarm Hysteresis" is basically a **Programmable Tolerance**. This tolerance is a mV level below the setpoint that you are happy maintaining without actually achieving the desired setpoint. This "Tolerance" is set as a % of the setpoint.