EcoStruxure™

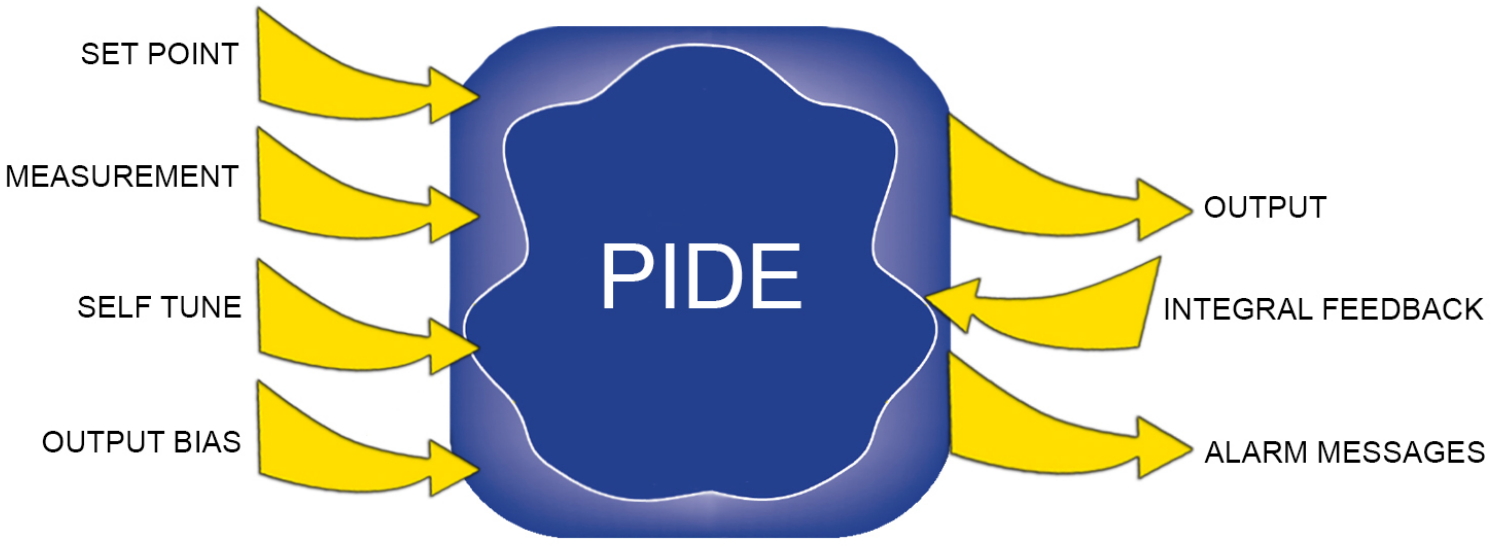
Foxboro™ DCS

EXACT Proportional-Integral-Derivative (PIDE) Controller

PSS 41S-3PIDE

Product Specification

May 2019



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Legal Information

Overview

The EXACT (EXpert Adaptive Controller Tuning) Proportional-Integral-Derivative (PIDE) block provides "Expert System" adjustment of PID control tuning parameters for tuning a continuous process where process characteristics, such as gain and dead time, are time-variant.

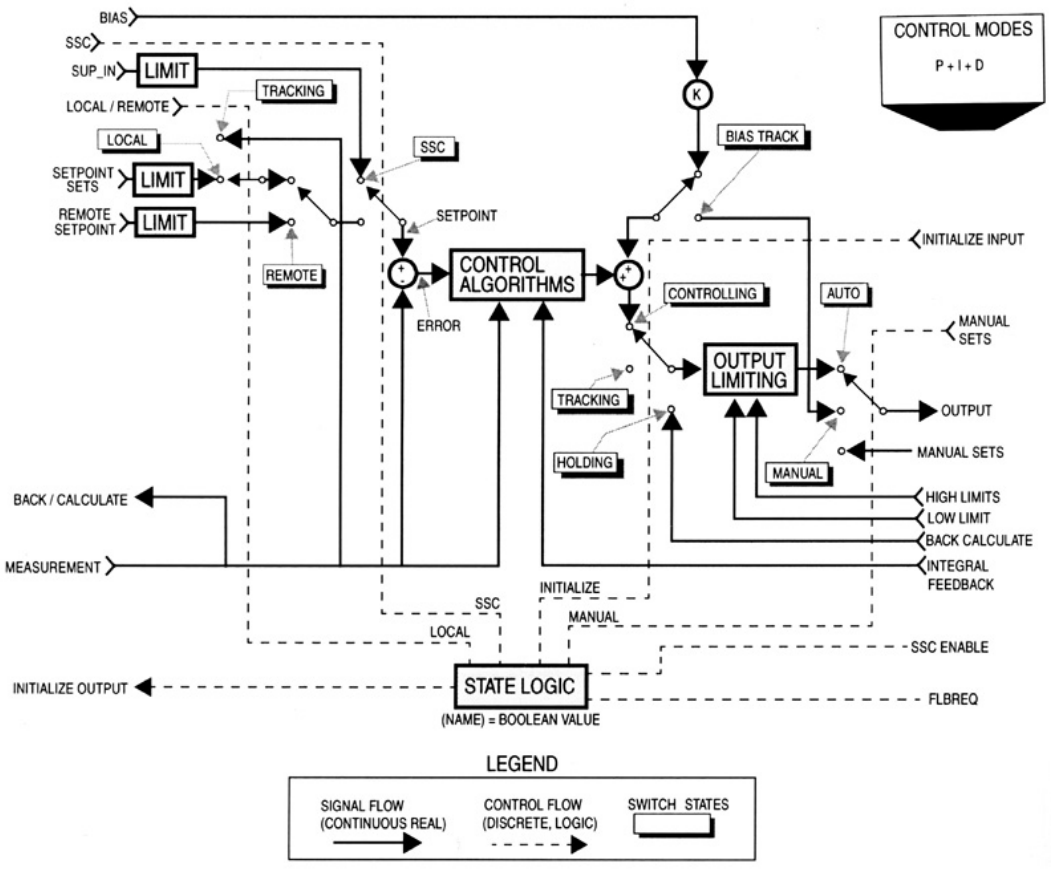
The PIDE block (Figure 1) is a self-tuning PID controller designed to be used in continuous control loops. (See *Extended EXACT Proportional-Integral-Derivative (PIDXE) Controller Product Specification* (PSS 41S-3PIDXE) for a self-tuning controller which is suitable for discontinuous applications.) The EXACT self-tuning algorithm monitors the closed loop recovery following a disturbance to the set point or load. EXACT compares the observed process response to a user desired response.

Based on the difference between the observed and desired response, EXACT estimates new values for P, I, and D to minimize process recovery time without exceeding error signal trajectories acceptable to the user.

The controller operates in one of the three tuning modes:

- *Pre-Tune* permits the user to perform open-loop response test of the control loop. At completion of the open-loop test, EXACT estimates the starting value of P, I, and D and other key loop characteristics before proceeding to self-tuning.
- *Self-Tune* allows the EXACT algorithm to monitor and compare observed versus desired loop response to local and set point disturbance and to adjust tuning constants as required for a continuous process.
- *Manual Tune* functions as a conventional PID controller (that is, it allows manual modification of the PID parameters).

Figure 1. PIDE Block, Simplified Diagram



Supervisory Control

Supervisory Control (SSC) allows a user's application program to perform supervisory control over the PIDE block's set point. SSC can be enabled/disabled by an operator, or enabled by the supervisory application program at a control block group or control block level. If SSC is enabled in the control block, the back calculated value status requests the application program initialization. The application program must send the supervisory set point to the block periodically. While SSC is enabled, the control block parameters associated with local set point are not settable by the operator. If the operator asserts fallback or if a supervisory application program failure is detected, the control block falls back to a configured fallback mode (Manual, Auto, Remote, or Local).

Standard Features

- Tuning modes
  - Self-Tune with override
  - Pre-Tune
  - Manual Tune
- Manual/Auto control of the outputs, which can be initiated by either a host process or another block
- Local/Remote set point source selection
- Enhanced derivative filtering for improved controller performance
- Adjustable derivative gain
- External integral feedback to help prevent windup during open-loop operation
- Assignable engineering range and units to measurement, bias, and output
- Automatic scaling, based on assigned engineering ranges, so that the controller gain is normalized in proportional band
- Output biasing with scaling
- Output clamping between variable output limits
- Bad inputs detection and handling
- Bumpless transfer of the output signal when the block returns to controlling operation in Auto, which is inherent in all controller modes
- Automatic cascade handling that includes:
  - Explicit initialization input/output parameters that provide proper coordination and initialization of cascade schemes
  - Back calculation of the reference or set point input for the upstream block to provide bumpless cascade operation
- Set point clamp limit in Remote, Local, or Supervisory mode

Options

- Set point tracking of the measurement signal allows bumpless return to automatic control when the block or any downstream block returns to normal operation.
- Manual override forces the block to manual if either the measurement or feedback inputs are off scan, disconnected, or bad. Return to automatic control requires external intervention.
- Absolute alarming of the measurement.
- Deviation alarming of the set point – measurement error signal.
- Absolute alarming of the output.
- Manual alarming allows all configured alarm options to be operational in manual.
- Reverse action: measurement increases cause controller output to increase.
- Output clamping when block is in manual.
- Local set point ramping and limiting – the local set point can be ramped to a new target value at a user set rate by toggling a switch. Ramping stops when the set pointset point reaches the target or when the controller is placed in manual.
- Workstation lock access allows write access to the HMI that owns the lock.
- Loop identifier allows the user to identify the loop or process unit that contains the block.
- Supervisory Control (SSC) of the block’s set point.

Additional Features

- Delayed alarming. A configurable timer delays alarm detection or return-to-normal messages for a specific alarm to reduce the number of alarm messages generated when a block parameter crosses back and forth over an alarm limit.
- Quality Status output parameter provides a single source for the block's value record status, block status, and alarm status.

WARNING: This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.p65warnings.ca.gov/.

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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