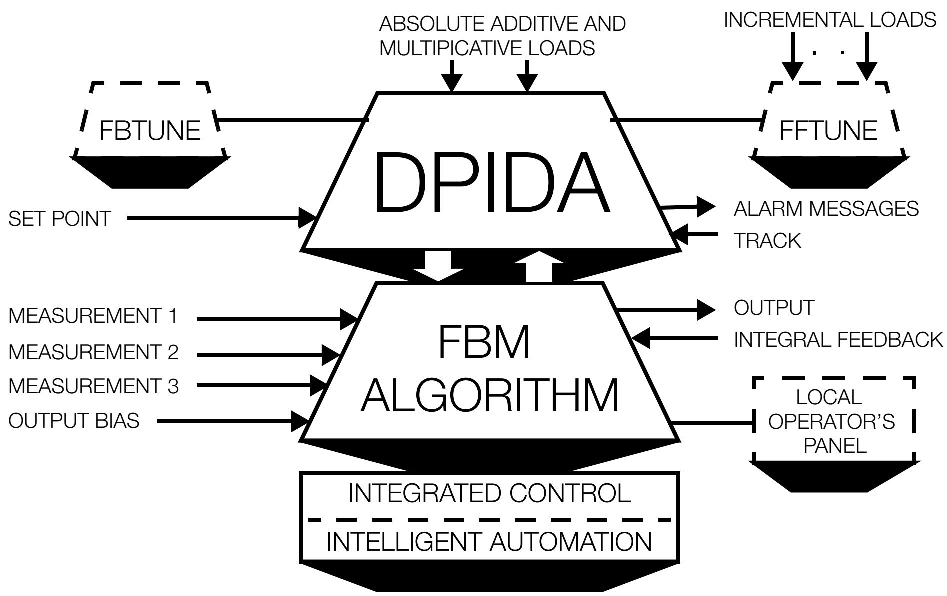
Foxboro Evo™ Process Automation System

Product Specifications

Foxboro by Schneider Electric

PSS 31S-3DPIDA

Distributed PIDA (DPIDA) Controller



An adaptive PID (PIDA) control algorithm in a Fieldbus Module (FBM) provides fast, real-time response for high speed control loops. It offers single-loop security, and connectivity for a manual backup station.

OVERVIEW

The control algorithm in the FBM offers ultra high performance and fast response appropriate for high speed control applications. The FBM synchronizes execution of the control algorithm to the analog-to-digital (A/D) conversion of the measurement input, thereby eliminating certain deadtime elements in the control loop. The following deadtimes found in classic sampled digital control using digital controllers and separate input/output (I/O) subsystems are eliminated:

- Deadtime between the end of the A/D conversion update and the time the control station retrieves the measurement values from the I/O
- Deadtime associated with the control station polling I/O cards

- Deadtime in the control station between polling the I/O and processing the given control block
- Deadtime associated with writing a value from the control station to the I/O device

The DPIDA controller consists of the control algorithm in the FBM paired with a companion DPIDA block in the Control Processor. The DPIDA block acts as the bridge between the operator workstation and the FBM algorithm by bidirectionally exchanging the parameters and data between the FBM and the operator.

The combination of the FBM algorithm, DPIDA block, plus FBTUNE and FFTUNE extenders provides adaptive control capabilities of the I/A Series patented EXACT MultiVariable control. The FBM algorithm is similar to the PIDA block algorithm (PSS 31S-3PIDA).

FBM based control achieves controller response with very low *integrated absolute error*, a key measure of controller performance to load and set point changes. Reducing deadtime variation also makes controller tuning more robust.

The FBTUNE extender block adaptively tunes the feedback controller parameters for all PID modes. The FFTUNE extender block provides dynamic compensation for an absolute multiplicative or additive feedforward input and both static and dynamic compensations for 3 or 4 incremental feedforward inputs and adapts the compensator parameters.

The FBM functions as a complete closed loop controller that executes the real-time portion of the algorithm every 10 ms to 50 ms (configurable), independent of the Control Processor (CP) execution period. It reads the measurement and changes the output using the set point and other information provided by the CP. The FBM also provides three redundant measurement inputs.

The DPIDA control algorithm is available for FBM204 and FBM227 with ECB software type 52.

The DPIDA block in the CP operates in conjunction with the control algorithm in the FBM to support tuning, scaling, and alarming functions.

DPIDA FEATURES

The DPIDA controller contains the following PIDA block features (refer to Figure 1, DPIDA Controller Structure, and PSS 31S-3PIDA):

- Local set point ramping and limiting
- Set point filtering
- Measurement filtering
- Absolute (multiplicative and additive) feedforwards
- Non-linear gain function.

Control Modes

DPIDA controller can be configured to operate in one of the following controller modes:

- Proportional (P)
- Integral (I)
- Proportional-plus-Derivative (PD)
- Proportional-plus-Integral (PI)
- Proportional-plus-Integral-plus-Derivative (PID)
- Non-Interactive PID (NIPID).

Standard DPIDA Features

- Manual/Auto control of the output, which can be initiated by either a host process or another block
- Local/Remote set point source selection
- Enhanced measurement filtering for improved controller response
- Adjustable measurement filter time constant in relation to derivative or deadtime
- External integral feedback and logic signals to prevent windup during closed-loop operation
- Assignable engineering range and units to measurement, bias, multiplicative input, and output
- Automatic scaling, based on assigned engineering ranges, so that the proportional band is expressed in percent
- Output biasing with scaling
- Output clamping between variable output limits
- Bad input detection and handling
- Bumpless transfer of the output signal when the controller returns to controlling operation in Auto, which is inherent in all controller modes
- Fast reaction to manual output change
- Automatic cascade handling as the secondary controller in a cascade loop. Explicit initialization provides proper coordination and fast initialization of cascade schemes.

Standard DPIDA Options

- Supervisory set point control by user application software. For cascade loops, the DPIDA controller can only be at the bottom of the cascade
- Set point tracking of the measurement signal allows bumpless return to automatic control when the controller returns to normal operation
- Non-linear gain compensation
- Output tracking
- Manual override to force the controller to Manual if the measurement is bad. Return to automatic control is by operator action
- 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 increase causes controller output to increase
- Output clamping when the controller is in Manual
- Workstation lock allows write access to the block parameters only by the Display Manager that owns the lock
- Loop identifier allows the user to identify the loop or process unit that contains the block.

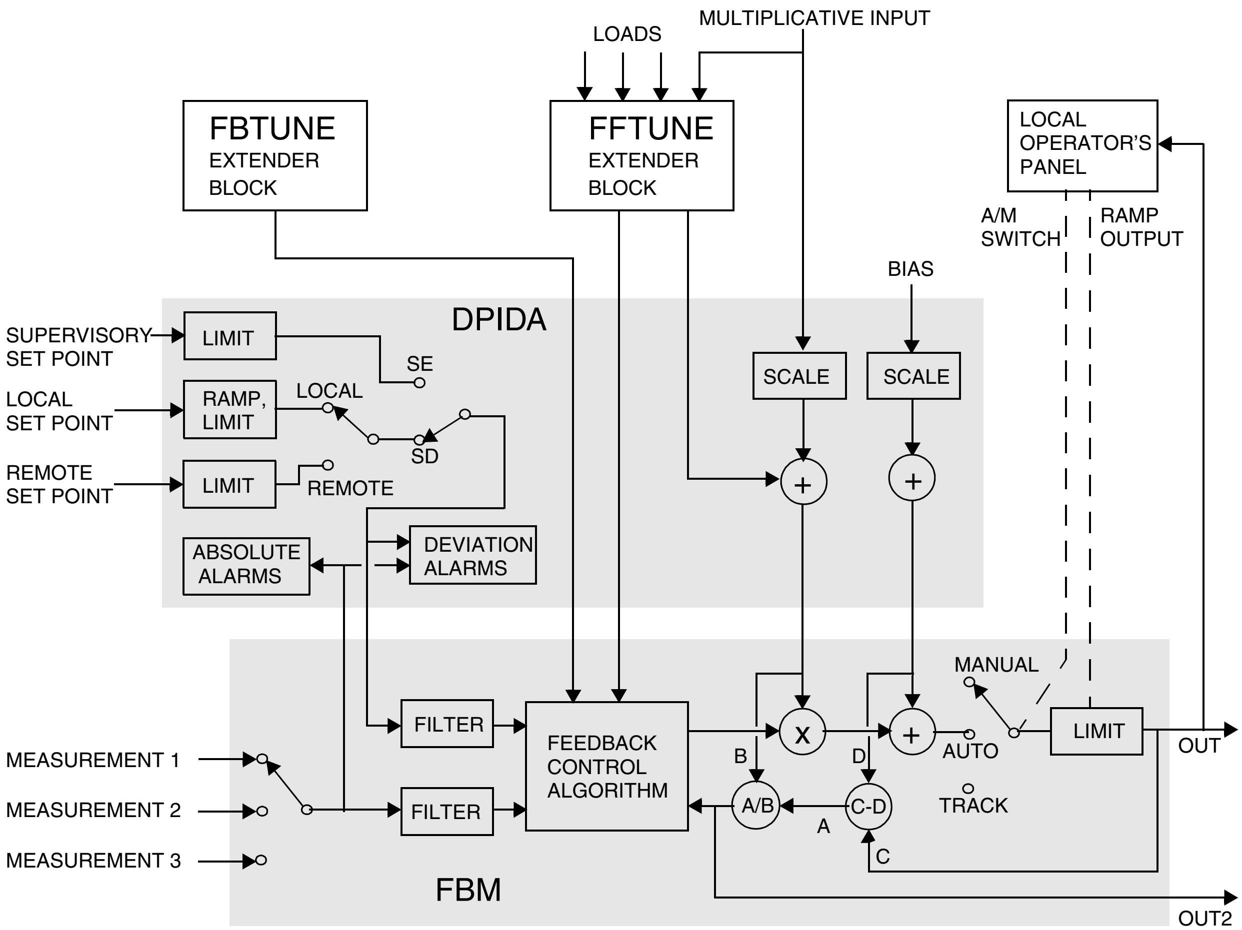


Figure 1. DPIDA Controller Structure

Extended PDIDA Options

- Three redundant measurement inputs, each one available for selection as the measurement input to the algorithm. Options are:
  - Non-redundant measurement
  - Dual-redundant measurements (FBM204 and FBM227 only)
  - Triple-redundant measurements (FBM204 and FBM227 only)
- The FBM uses either the median signal or the signal selected by the operator. If one or more signals are bad, the FBM uses the good signal nearest to the set point.
- Measurement processing with an 8-segment characterizer or a linearizer (square root) function
- Failsafe control options while the controller is in Auto or Hold
- Control algorithm cycle time configurable from 10 ms to 50 ms, in 5 ms increments
- Bad I/O alarming

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.

Invensys Systems, Inc
10900 Equity Drive
Houston, TX 77041
United States of America
http://www.invensys.com

Global Customer Support
Inside U.S.: 1-866-746-6477
Outside U.S.: 1-508-549-2424
Website: https://support.ips.invensys.com

MB 031 0914