

# Process Control Algorithm Software Package (T8019)

The Trusted system is capable of handling a variety of control and safety applications. The Trusted control algorithms may be used for a range of process control applications, but are primarily intended to support the limited process control capabilities required for Floating Production, Storage and Offloading (FPSO) installations.

These functions (once installed from the separate package T8019) are integrated into the toolset. The toolset environment is Commercial-Off-The-Shelf (COTS) and is designed to commercial standards. The integrity for the basic process control functions should not exceed SIL1 (AK3). These functions should therefore *not* be used within elements of application programs intended for SIL3 (AK6).

Control algorithms are divided into **functions** and **function blocks**:

- **Functions** have no internal state or time dependent operation (i.e., they have no storage element). The functions process the defined number of parameters and return a *single* resultant state or output value. Functions, therefore, have only a single operating mode, always performing the same operation.
- **Function blocks** include retentive information and may return *multiple* output values. Function blocks will have an initial state for each of their outputs. The initial value may be maintained for single or multiple application iterations.

The control functions and function blocks are available in the function block and quick ladder programming languages. Detailed information on each can be found in PD-8019 as well as the online technical notes (available by pressing F1). Most are designed to work with real (32-bit floating point) numbers. Some similar standard functions and function blocks exist for working with integer (32-bit long integer) numbers.

Functions include:

- Square root extraction (extracts a non-linear input)
- BCD (Binary Coded Decimal) translation (converts base 2 numbers to base 10)
- Analog select (selects one of two inputs)
- Multiple value averaging (calculates the average of between 1 and 10 values)
- Drum level control (provides pressure compensated drum level)
- Mass flow computation (provides mass flow corrected for current operating conditions)

Function blocks include:

- Analog scaling (linearly scales an input)
- Analog value clamping (limits the minimum and maximum range of a variable)
- Low value select (selects the lower of two variables)
- High value select (selects the higher of two variable)
- Mean value select (selects the middle of three variables)
- Proportional PID (superseded by Incremental PID)
- Incremental PID (Proportional, Integral, Derivative control)

- Deviation alarm (provides alarms when the process variable and set point differ by more than a specified amount)
- Manual tracking (used with a PID block when changing between manual and automatic mode)
- Time averaged value (calculates an average over a specified time)
- Rate of change detection (detects when the rate of change of the process variable exceeds a limit)
- Analog value slew (limits the rate of change of an output)

#### Other Functions:

- Lead/lag control (not a function or function block in its own right, but a combination of using both the high and low value select function blocks along with PID blocks)