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## Consulting and Engineering Services

Doc No. 0125B10SD02 –
Rev.01 www.LiutaioCES.com

# Process Control Glossary

1 2 3
A B C D E F G H I J K L M N O P Q R S T U V
W X Y Z

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| **1** | |
| 1st Order Filter | Same thing as a “LAG”, but the signal changes are generated by a control dynamic corresponding to just one(1) time constant. |
| **2** | |
| 2nd Order Filter | Control logic where the signal changes are generated by a control dynamic corresponding to two(2) pols, that can be real or imaginary numbers.<br>Real numbers produce a smooth dynamic response.<br>Imaginary numbers produce an oscillation response. |
| **A** | |
| Actual Operation conditions | Represent the value of the process variables, like temperature and pressure, at specific moment in time during the plant operation. |
| Actual Operation conditions, for flow compensation | Represent the value of the process variables, like temperature and pressure, at the same time when the related flow measured is achieved. |
| Advanced Process Control (APC) | APC refers to the functionality beyond the typical Proportional-Integral-Derivative controller (PID), to improve plant performance, product yield; reduce energy consumption; increase capacity; improve product quality and consistency; reduce product giveaway; and reduce environmental emissions. |
| Alive Spare | Associated condition to an instrument (transmitter, valve, etc.), or equipment (pump, fan, heater, etc.) that **IS NOT** selected in a group of several items of the same type to perform its duty during the plant operation, but it is all the time ready to substitute the “On Duty” selected item.<br>An “Alive Spare” is normally in the “Standby” condition. |
| Analogue signal | A signal type that can handle the measurement of a process variable. |

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| Analyser BIAS | For an analyser, and a sample point that are located in the same process stream (near each other as possible), the "Analyser BIAS" is the difference between the analyser measurement value and the laboratory result value from a sample that is taken at that sample point.<br>The analyser measurement shall be recorded at the same date and time when the sample is taken at the sample point.<br>When the recording process is automated in the control system, it is named as "Sample Submission Process" |
| Analyser Signal Validation Logic | Typically, an analyser signal exhibits several problems that affect continuous control and monitoring, and to solve such problem at the analyser level, it requires special measures per analyser. To implement an "Analyser Signal Validation Logic" (ASVL) in FCS is a simpler solution that can be applied to all analysers.<br>The analyser signal typical problems are signal disruptions due to unnoticed Calibration/Purge cycles, erratic signal value patterns, frozen signal value, drastic change to 0.0 or maximum measurement range value (negative or positive pick), the signal changes in steps (not gradually), etc.<br>The purpose of an ASVL is to pass the raw analyser signal through a smart filter which produces a smoother analyser signal that can be used for control and monitoring purposes with minimum upsets.<br>The ASVL shall include:<br>a) Constant signal value detection.<br>b) Spike signal rejection filter.<br>c) Realistic Operation range check.<br>d) Rate of change filter.<br>e) Last good value application and notification.<br>f) Analyser BIAS adjustment and Sample submission.<br>Filtered analyser signal alarms. |
| Astatic dynamic process response | See "Non-Self-Regulated dynamic process response". |
| AUTOMATIC mode | When a "Control Loop Component" is in AUTOMATIC mode:<br>• The Console Operator (or another user) **CANNOT** set the component output value,<br>• The component control algorithm is working and it is setting the component output value, and<br>• The component is **DISCONNECTED** from any upstream MASTER component.<br>Also see "Control Loop Operation Modes". |
| Automatic Pump-Cut-In | Refer to "Continuous Pumping Service" (CPS). |
| **B** | |
| Boolean signal | A type of signal that can have two(2) states only. These ones can be: One(1)/Zero(0), True/False, On/Off, Running/Stop, Safe/Normal, High/Low, etc. |
| Bumpless | A bumpless control loop is a control loop that transitions between MANUAL and AUTOMATIC or CASCADE modes without causing a large change in the PID controller output. This is important because large changes in the PID controller output can damage equipment, plant shutdown, or can cause disturbances in the process operation. |
| **C** | |

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| CASCADE mode | When a “Control Loop Component” is in CASCADE mode:<br>· The Console Operator (or another user) CANNOT set the component output value,<br>· The component control algorithm is working and it is setting the component output value, and<br>· The component is connected from any upstream MASTER component.<br>Also see “Control Loop Operation Modes”. |
| Closed control loop | Control loop condition in which the connection is established between the control algorithm and the final control element, or the next downstream element (SLAVE element) in the control loop. I.E. the control function is performing its control action. |
| Coexistence Safety actions | When a HAZARD occurs, and the related “Instrumented Protective Function” (IPF) trips, “Coexistence Safety actions” are the actions that a safety system MUST EXECUTE to avoid that a plant, unit, system, or equipment do not be unstable, or in condition to promote another HAZARD. |
| Compressor Load Control | Normally “Compressor Load Control” is referred to the compressor flow control. LOAD is referred to the compressor actual anti-surge parameter value, and the idea is to modulate the compressor operation through the “Compressor Load Controller” (CLC)), by commanding a compressor’s ASP controller as the MASTER of the compressor speed controller. |
| Confirmed Closed | A valve is in the “Confirmed Closed” state when the Close command is sent to the valve, and the valve feedback indicates that in fact the valve is in the Closed position.<br>Sometimes the “Confirmed Closed” state has a time requirement, in order to verify if the matching between the valve command and the valve position was reached in the required time frame. |
| Confirmed OPENED | A valve is in the “Confirmed OPENED” state when the OPEN command is sent to the valve, and the valve feedback indicates that in fact the valve is in the OPENED position.<br>Sometimes the “Confirmed OPENED” state has a time requirement, in order to verify if the matching between the valve command and the valve position was reached in the required time frame. |
| Confirmed Running condition | Typically, a pump is in the “Confirmed Running condition” if on start command request and within some delay time, the pump motor indication is RUNNING and the pump discharge pressure is above a pre-defined pressure setting.<br>And after the delay time spires, the pump remains in the RUNNING state, and the pump discharge pressure remains above a pre-defined pressure setting. |
| Console | See “Control Console” |
| Console | See “Control Console” |
| Console Operator | Operator that sits down in front of the “Control Console” to monitor and execute command through the Console to operate a plant. |
| Console Operator | Operator that sits down in front of the “Control Console” to monitor and execute command through the Console to operate a plant. |
| Constraint controller | Controller used as part of a control loop to avoid the operation of a plant, process unit or equipment, outside the operation limits, design limits, or both.<br><br>See “Protective Controller” |

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| Continuous Pumping Service | Sometimes it is required to continuously be pumping a fluid in a process plant.<br>In this case, a set of two(2) or more pumps is required to pump continuously the fluid. Typically, a pump set has “N+M” pumps, in order to have “N” running pumps, performing the “On Duty” role, and at least “M” pumps performing the “Standby” role, but ready to start.<br>In this case, a “Continuous Pumping Service” is provided when a pump control logic keeps at least one(1) pump running ALL the time in the pump set.<br>If the running pump stops, the pump control logic shall start any available “Standby” pump, in order to continue pumping the fluid. This functionality is named “Automatic Pump-Cut-In”.<br>Also, an opposite functionality has sense, in order to keep the pumps in the “Stopped” condition, and when some condition is satisfied, then start the “Continuous Pumping Service”. |
| Control block | See “Control Loop Component”. |
| Control Console | A collection of one or more workstations and associated equipment such as printers, communications devices and panel/mimic/push/switch buttons used by a “Console Operator” to interact with the plant control system and to perform plant operation functions. |
| Control loop | A control loop is a process management system, or computer-based algorithm, designed to maintain a process variable (PV) at, or as close as possible to, a desired setpoint (SPT) value, by manipulating the control loop output (OUT).<br>Each step in the loop works in conjunction with the others to manage the system. Once control loop has been enabled, this one operates using a four-step process: Sense (Measurement), Compare (error), Response (PID, control algorithm), and Effect (actuate a final element). |
| Control Loop Component | Any controller, switch, selector, input, output, characterization, calculation, etc. that is part of a control loop. |
| Control Loop Initialization | Refer to “Tracking functionality”. |
| Control Loop Operation Modes | The typical control loop operation modes are: Manual (MAN), Automatic (AUTO) and Cascade (CAS).<br>In these modes, a controller operates as follows:<br>a) In AUTO mode: to calculate the OUT value, in order to make the PV value to be equal or as near as possible to the “Controller Setpoint” value (SPT). The operator can enter or modify the value of the SPT parameter in this controller mode.<br>b) In CAS mode: the controller works as in the AUTO mode, but the controller uses a SPT value given by an upstream control loop component or “MASTER controller”. The operator cannot change the SPT in this controller mode.<br>c) In MAN mode: to allow operator to manually change the OUT value, while monitoring the changes in the PV value. The OUT parameter is connected normally to a valve in the field to set its position (0% closed, 100% opened). Sometimes the controller output is connected to a downstream component loop, to a SLAVE controller SPT, or it is an On/Off signal. |
| Control loop output (OUT) | See “Manipulated variable”. |
| Control Loop Tracking | See “Control Loop Initialization”. |
| Control tie-ins | See “Overall control scheme” |

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| Control Valves Continuous Selector (CVCS) control scheme | Sometimes a control valve has a manual bypass globe valve; in order to:<br>• Apply maintenance online to the automatic control valve, without disturbing the process operation.<br>• Allow some degree of manual control on the “Controlled Variable” (PV), when maintenance is applied.<br>When the design requirement is to have the PV under precise control, even during maintenance, then two(2) control valves are installed in parallel. One(1) valve is always “On Duty” role, and the other one is in the “Standby” role, closed position. The controller manipulates the valve that is the “On Duty” state only.<br>When it is required to swap the valves’ role, the basic idea of the CVCS control scheme is simultaneously:<br>a) To close the valve “On Duty”, and<br>b) To open the valve in “Standby”,<br>in a short time, with minimum disruptions on the process (normally flow, downstream pressure or both). This operation is named the control valve SwitchOver.<br>The control scheme is designed based on the fact that the current flow capacity of the control valve arrangement will remain practically constant while the valve SwitchOver is in progress. This scheme is applicable for both liquid or gas flow control valves. |
| Controlled Variable (PV) | It is the “Process Variable” (PV) that must be controlled, in order to keep its value within the desired range, or as close as possible to the desired value. |
| Controller | See “Control Loop”. |
| Controller modes | See “Control Loop Operation Modes”. |
| Controller output (OUT) | See “Manipulated variable”. |
| Cricondentherm | The highest temperature at which liquid and vapor phases can exist at equilibrium in a multicomponent system, independent of the system pressure.<br>It is a typical practice of the gas transportation companies to control the maximum gas Dew-Point (Cricondentherm), in order to avoid the formation of condensate in the gas pipelines. |
| CV | By definition, the valve flow coefficient, CV, is the number of U.S. gallons per minute of water at 60°F that will pass through a given flow restriction with a pressure drop of one psi. For example, a control valve that has a maximum flow coefficient, CV, of 12 has an effective port area in the full open position such that it passes 12 gpm of water with one psi pressure drop. Basically, it is a capacity index upon which the engineer can rapidly and accurately estimate the required size of a restriction in any fluid system. |
| CV, max | See “CV, max flow” |
| CV, max flow | CV value of the control valve when it is opened fully (100%) and the maximum flow passes through it. |
| CV, rated | CV value of the control valve at Design operation condition. |
| **D** | |
| Dead Band (DB) | A dead band (sometimes called a neutral zone) is an interval of a signal domain or band where no action occurs (the system is dead). Dead band is used in voltage regulators and other controllers. Its common purpose is to prevent oscillation or repeated activation-deactivation cycles (called 'hunting' in proportional control systems).<br><br>Dead band is the range through which an input signal can be varied without initiating an observable response. |

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| Dead time (DT) | See “Delay” |
| Delay | Pure dead time, also known as transportation lag or delay time, which occurs when a signal (typically PV, or OUT) is transported from one point in time to another one, hence the term transportation lag. At any point in time, the signal value downstream is what the signal upstream was one dead time before, hence the term time delay. When the signal first starts changing at the upstream point, it takes one dead time before the downstream variable starts changing, hence the term dead time. |
| Delay time (DT) | See “Delay” |
| Design conditions | Represent the value of extreme process variables, like temperature and pressure, far from “Design Operation conditions”, that are used to size industrial assets, like instruments, equipment, vessels, pipes, etc., in order to guarantee that asset will not break after considering all possible variations in the plant operation conditions. |
| Design Operation conditions | Represent the value of the process variables, like temperature and pressure, at the operation situation that correspond with the plant normal production scenario. |
| **F** | |
| Feedforward control | This is a control strategy that looks for eliminating the effect of measured disturbances in the controlled variable, by applying additional adjustments from the measured disturbance within the control loop manipulated variable (OUT). These adjustments require tuning of a Gain/Delay/Lead/Lag algorithm. |
| Field Operator | Operator that is normally at the plant field to monitor and to execute action directly over the plant equipment or instruments. |
| **G** | |
| Gain | Parameter value that determines the degree of amplification, or attenuation, of an analogue control signal. |
| Gain-Delay-Lead-Lag (GDLL) algorithm | Control element or algorithm that is applied to an input signal to generate an output signal, which combines the actions of a single “GAIN’, “Delay”, Lead” and “LAG”. These kinds of control elements are used for dynamic control compensation in a control loop. |
| GAP controller | Controller which control action is not applied, nor has a low proportional gain, all the time the process variable (PV) falls inside a defined range. If the PV strays outside the range, the PID controller action with a higher proportional gain is applied to drive the PV back within the range.<br><u>In other words:</u><br>The difference between regular PID controller and a GAP controller is that for the GAP option there is no control action when the deviation between the setpoint (SPT) and the process variable (PV) is within a certain band (GAP), i.e. a kind of dead band. |
| Gradient | Progressive decrement (increment) of a variable from a high (low) value to a low (high) value across a line, network, surface, or volume. |
| **H** | |
| Harm | Physical injury or damage to the health of people, or damage to property, or to the environment. |
| HART | “Highway Addressable Remote Transducer” is a hybrid analogue+digital industrial automation protocol. Its most notable advantage is that it can communicate over legacy 4–20 mA analogue instrumentation current loops, sharing the pair of wires used by the analog only host systems. |
| HAZARD | Potential source of harm. |

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| Human Machine Interface (HMI) | Also known as an HMI. An HMI is a software application that presents information to an operator or user about the state of a process, and to accept and implement the operators control instructions. Typically, information is displayed in a graphic format (Graphical User Interface or GUI). An HMI is often a part of a SCADA (Supervisory Control and Data Acquisition) system, or a DCS (Distributed Control system. |
| **I** | |
| Initialization | Refer to “Tracking functionality”. |
| In Service | Opposite to “OUT OF SERVICE” (OOS).<br>“In Service” state means that the related analyser, equipment or system is lined-up ready to receive and deliver process fluid. So, it is capable to handle process fluid. |
| **L** | |
| LAG | Control element or algorithm that is applied to an input signal to generate an output signal, which converts any change in the input signal, in a similar change in the output signal, but smoother and slower. |
| Lead | Control element or algorithm that is applied to an input signal to generate an output signal, which creates a kick, or drastic signal change, in the output signal, when there is a change in the input signal. The kick change in the output signal can be in the same direction or reverse to the change in the input signal. |
| Local Control Panel (LCP) | The LCP is a panel that is used to control and monitor equipment, like a pump, a compressor, a heater, etc.<br>The LCP is the HMI which allows any user to monitor and control equipment. The LCP can include additional means to allow remote Monitor/Control. It can be installed indoors or outdoors in industrial areas.<br>As a difference with an UCP, the LCP does not contain logic programmable equipment. |
| Lock-In-Last Position (LILP) | Valve assembly feature that is able to keep a control valve in the position it was prior to a specific control system failure. This functionality can keep the valve in the last operation position in case of:<br>a) Loss of instrument air supply only,<br>b) Loss of loop power supply only, or<br>c) Loss of both instrument air and loop power supply. |
| **M** | |
| (MAN) MANUAL mode | When a “Control Loop Component” is in MANUAL mode:<br>• The Console Operator (or another user) can set the component output value,<br>• The component control algorithm is **NOT WORKING**, and<br>• The component is **disconnected** from any upstream MASTER component.<br>Also see “Control Loop Operation Modes”. |
| Manipulated variable (OUT) | Plant variable associated to physical equipment, like: control valve, damper position, heating power, etc., which value will have a high impact in determining the value of a controlled variable. |
| MASTER controller | As part of a cascade control loop, this one is a controller whose OUT parameter is connected to the SPT of a SLAVE controller. The MASTER controller can manipulate the SLAVE controller’s SPT, only if the SLAVE controller in cascade mode. |
| Material Diagram (MD) | A Material Diagram (MD) is a diagram similar to a “Process Flow Diagram” (PFD), where all equipment and process pipes are show, but instead of showing process information, it describes the limit process conditions and material used to build the process plant. |

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| Measured variable | The process variable that is measured by an instrument. |
| Minimum Miscible pressure | Minimum pressure at which an injected gas becomes miscible (soluble) with the reservoir fluid. If NGL is not the injected gas, other gases such as carbon dioxide, flue gas or nitrogen can be used. All of these gases become miscible only when their density is high, generally greater than 0.5 g/cc. Thus, they work best at high pressure. |
| Model Predictive Control | Model predictive control (MPC) is an optimal control technique in which the calculated control actions minimize a cost function for a constrained dynamical system over a finite, receding, horizon.<br>At each time step, an MPC controller receives or estimates the current state of the plant. It then calculates the sequence of control actions that minimizes the cost over the horizon by solving a constrained optimization problem that relies on an internal plant model and depends on the current system state. The controller then applies to the plant only the first computed control action, disregarding the following ones. In the following time step the process repeats. |
| Multivariable Predictive Control (MPC) | MPC is a type of Model Predictive Control (MPC) that simultaneously manages and optimizes multiple input and output variables within a system, allowing for coordinated control of complex processes where several variables interact with each other, while considering constraints on all involved variables and ensuring they stay within specified limits; essentially, it uses a predictive model to make informed control decisions across multiple aspects of a system at once. |
| **N** | |
| NAMUR | User Association of Automation Technology in Process Industries (NAMUR) (German: Interessengemeinschaft Automatisierungstechnik der Prozessindustrie), established in 1949, is an international association for users of automation technology in the process industries with its headquarters in Leverkusen, Germany. The association represents the interests of, and supports the experience exchange among over, 140 member companies and with other associations and organizations. Work results are published in the form of NAMUR recommendations and worksheets and submitted to national and international standardization bodies as proposed standards.<br><br>www.namur.de |
| NAMUR NE 43 (For Analogue signals) | The Namur NE 43 is a recommendation which gives a guideline (for Analogue signals) how a sensor fault can be indicated to a DCS or SIS by means of the 4-20mA signal.<br><br>A sensor fault is signaled by extending the range of the 4-20mA signal. When the current is below 3,6 mA or above 21 mA this is interpreted as a sensor fault. In order to avoid false alarms. |
| NAMUR Sensor (For Boolean, Digital or Discrete signals) | (EN-60947-5-6:2000 and IEC-60947-5-6:1999) NAMUR format that is used for switching devices (Sensors or Sensors' interfaces) to communicate the two switch states via two different current levels.<br>Typically, 2.1 mA for one State and 1.2 mA for the other State. Signal current value above 2.1 mA or below 1.2 mA indicates that a "Detected Failure" occurred. |
| (NGL) Natural Gas and Liquids | NGL stands for natural gas liquids, which are hydrocarbons that are a by-product of natural gas processing. NGLs are made up of carbon and hydrogen, and include ethane, propane, butane, isobutane, and pentane. |
| Non-Integrative dynamic process response | See "Self-Regulating dynamic process response". |

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| Non-Self-Regulated dynamic process response | To explain this definition, let's assume a process that initially is in a stable and equilibrium condition, with a process variable value (PV) with a stable value, and a controller in MAN mode (open loop) to control such PV.<br>This process has a "Non-Self-Regulated" dynamic response, if when a change is done in the controller output (OUT), then the process reacts, making the process variable value (PV) to change up to the maximum or minimum measurement range, without reaching a stable or equilibrium value.<br>This kind of processes reaches unstable condition with the controller in MAN mode (open loop). Such processes shall be operated with the controller in AUTO/CAS mode to reach a stable condition.<br>Example: A level controller that is commanding a tank outlet level control valve is keeping the level constant. If the controller is set in MAN mode, and the level control valve is opened (closed) a little, the tank level will underflow (overflow). The process PV does not reach a stable condition when the process exhibits a "Non-Self-Regulated" dynamic process response. |
| Normal conditions | Similar to "Actual Operation conditions", but referred to the temperature and pressure that are used to standardize flow in gas operations. |
| Normal Operation conditions | See "Design operation conditions". |
| NORMAL state | It is the value, position, mode or condition of a signal or safety equipment while the plant is in NORMAL operation mode. |
| **O** | |
| On Duty | Associated role or condition to an instrument (transmitter, valve, etc.), or equipment (pump, fan, heater, etc.) that is selected in a group of several items of the same type to perform its duty during the plant operation. |
| Open control loop | Control loop condition in which the connection is broken between the control algorithm and the final control element, or the next downstream element (SLAVE element) in the control loop. I.E. the control function is "IDLE"; it is doing nothing, and no control actions are performed.<br>Typically, this condition occurs when the PID industrial controller is in MAN mode. |
| Operator | Personnel in charge of operating a process plant. |
| Operator Console | See "Control Console".<br>A console used by an operator to perform the functions required to monitor and command his/her assigned process units. |
| OUT OF SERVICE (OOS) | "OUT OF SERVICE" state means that the related analyser, equipment or system is NOT lined up to receive and deliver process fluid, or it is not capable to handle process fluid.<br>In Fact, No process fluid is passing through, or there is no process fluid within. Also, if the component is capable to provide information, then it is disabled to do so.<br>This is a typical condition prior to apply, of after applying, maintenance.<br>The opposite state is "In Service". |
| Overall control scheme | Block diagram that shows the main equipment and units in a plant section or system, the process interconnections, and the control loops that execute actions (control tie-ins) between equipment/units. |
| **P** | |
| Pressure drop gradient | Pressure profile where the system inlet pressure drops gradually up to a lower value at the system outlet pressure. A pressure drop gradient is always established in pipeline or pipeline networks when a fluid flows throughout the system.<br>The pressure drop gradient is flat, or it does not exist (fix pressure) when the fluid does not flow throughout the system. |

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| Pressure drop profile | See “Pressure drop gradient”. |
| Process Variable (PV) | The plant variable (pressure, temperature, level, flow, concentration, etc.) that is important to monitor (or to control), in order to determine if the process plant is in the desired operation condition.<br>Or, to control to make the process plant to be in the desired operation condition. |
| Profile | See “Gradient”. |
| Protective controller | Controller used as part of a safeguarding function (typically, Non-SIL rated) to avoid a Hazard in a plant, process unit or equipment.<br>In normal operation conditions, the protective controller shall not execute any control actions. It shall execute a control action only when a process variable operation reaches the protective limits that the controller is taking care. |
| Pump running condition | It is the same as the “Confirmed Running Condition”, but this one is monitored continuously by DCS. |
| PV tracking | Feature of a “Control Loop” that can be enabled or disabled.<br>When it is enabled, and the control loop is working in MANUAL operation mode (other than CASCADE or AUTOMATIC), the PV value is copied into the SPT value. |
| **R** | |
| Remote-Manual station | This is a block that allows to enter manual value in the middle of a connection between a source and a destination blocks. It shall include:<br>a) Two(2) operation modes, one to enter the manual value that goes to the destination block (normally MANUAL mode), and another mode to connect the source block to the destination block (normally AUTO or CAS mode).<br>b) Tracking functionality.<br>It could be used to command control valves, Start/Stop pumps, Pump manual speed regulation, On/Off Heater, On/Off Fans, etc. |
| Reset Function | The purpose of a “Reset Function” is to keep a machine, equipment or process plant in the SAFE condition, after it was performed a transition from the NORMAL to the SAFE state. After such transition, the “Reset Function” is activated.<br>In other words, the “Reset Function” is activated after an IPF (SIF) demand.<br>Once the machine, equipment or process plant comes back to the NORMAL state, a “RESET command” must be executed to make the “Reset Function” to abandon the “Activated” condition, and to allow the “Safety Logic” output to determine the NORMAL or SAFE state.<br>The “Reset Function” can be implemented as a “Reset Logic” in the “Logic Solver”, or as a mechanical device in the field, located at the “Trip device”/“Final Safety Element”, or both.<br>Refer to “Reset Logic” or “Mechanical Reset” for further details. |
| Reset Logic | The “Reset Logic” is implemented in a “Logic Solver, and it applies to a “TARGET signal(s)”.<br>The “Reset Logic” starts to work after a transition of the “Safety Logic” output from the NORMAL to the SAFE state. At this time, the purpose of the “Reset Logic” is to keep the related “TARGET signal” in the SAFE state, superseding the “Safety Logic” output. I.E., the “TARGET signal” remains in the SAFE state, regardless the “Safety Logic” output state value.<br>Once the “Safety Logic” output changes back to NORMAL state, and it remains in that state, keeping the final safety element also in the SAFE state. In this condition a “Reset Command” action is required on the “Reset Logic” to disable it, in order to allow the “Safety Logic” output to change back to the NORMAL state, and to set the final safety elements in NORMAL state as well.<br>The Reset Logic implementation can be “Automatic Reset” or “Manual Reset”. |

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| Reset, Automatic | A Reset Logic is implemented with “Automatic Reset” when the related final safety elements change to the NORMAL state as soon as the related initiator(s) is (are) back in the NORMAL state, without Console Operator intervention. |
| Reset, Manual | A Reset Logic is implemented with “Manual Reset” when the related final safety elements remain in the SAFE state, even though the related initiator(s) is (are) back in the NORMAL state<br>In this case, it is required the Console Operator intervention to set the final safety elements back in NORMAL state. The Console Operator shall press the safety logic related “Reset Push Button”, in order to command the safety logic to pass the NORMAL state from the initiator(s) to the final safety element(s). |
| Reset, Mechanical | The “Reset Function” can be implemented as a mechanical device in the field, located at the “Trip device”, “Final Safety Element”, or both.<br>The Mechanical “Reset Function” starts to work, after a transition of the related “Trip device”/“Final Safety Element” from the NORMAL to the SAFE state.<br>At this time, the purpose of a Mechanical Reset is to keep the “Trip device”/ “Final Safety Element” in the SAFE state, regardless the related “SIF Output Signal” state changes that will occur later.<br>Once the state of all the related “SIF Output Signals” change back to NORMAL state, and such NORMA state remains, it is required that the Field Operator executes a Manual “Reset Command” at the “Trip device”/“Final Safety Element”. This command disables the Mechanical Reset action, in order to allow the “Trip device”/“Final Safety Element” to change to the NORMAL state, and to let the “SIF Output Signal” to determine the “Trip device”/“Final Safety Element” state. |
| Robust PID controller | A PID controller is considered relatively robust against moderate model changes, meaning it can still maintain stability and control a system even when the system dynamics deviate slightly from the initial model used for tuning, thanks to its inherent design and ability to adapt to errors through its proportional, integral, and derivative components. |
| **S** | |
| SAFE condition | Plant condition next to a shutdown request, in which the possibility of any harm occurrence is eliminated, after applying safety actions to set all equipment (Final Safety Elements) in the SAFE state. |
| SAFE state | It is the value, position, mode or condition of a signal or safety equipment while the plant is in the safe shutdown mode after execution of safety actions. |
| Sample Point | Device arrangement at a process stream that allows a laboratory or operator to collect into a container a small volume of the fluid that is flowing within the process stream. |
| Sample submission process | Procedure where a laboratory sample is taken at a sample point, and the date and time when the sample is taken is recorded in the control system, as well as all the analysers’ measurements related to the same sample point.<br>This is a normal procedure to online determine the analyser BIAS value.<br>Sometimes, also process data is included in the record. |
| Self-Regulated dynamic process response | Having a process initially is in a stable and equilibrium condition, with a process variable value (PV) with a stable value, and a controller in MAN mode (open loop) to control such PV.<br>This process has a “Self-Regulated” dynamic response, if when a change is done in the controller output (OUT), then the process reacts, making the process variable value (PV) to change up to a new stable and in equilibrium value. |

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| Semi Dump Control | The purpose of the well testing operation is to measure for a selected well the average production flows of hydrocarbon, gas and water.<br>For Gas wells, the amount of hydrocarbon and/or water flow can be below the minimum flow range of the respective flow meter low range. Normally this is the situation at the beginning of the well life, but at some time of the well life the water flow shall increase, the condensate flow shall decrease, the gas flow can increase or decrease, and some of these flows will be for sure below the respective flow meter low range.<br><br>The Semi Dump Control loop is active only during the Well Testing time period. Within this time frame the loop works as a typical continuous level control loop on flow, or on level, manipulating the control valve located in the bottom liquid outlet of a vessel or vessel boot. But, when the outlet flow measurement in lesser than the respective flow meter low range, the continuous level control loop is converted online into an On-Off level control loop, by accumulating and dumping the vessel (vessel boot) content in batches.<br>The average flow of the respective outlet stream is measured continuously, or it is measured in batches, when the flow is within the flow range given by the flow transmitter turndown ratio (transmitter rangeability), and according to the transmitter calibration.<br><br>The Semi Dump Control loop can be implemented:<br>a) With a control valve only, or<br>b) With a control valve in series with a block valve.<br>Above option “b” operates with less leakage than option “a”. |
| Semi-AUTOMATIC mode | See “MANUAL mode” and “AUTOMATIC mode”.<br>This operation mode is mainly associated to sequence control logics.<br>When the sequence works fully in AUTOMATIC mode, the sequence itself execute each sequence step, one after the other.<br>When the sequence works in Semi-AUTOMATIC mode, the sequence awaits for Console Operator confirmation to execute each sequence step, and sometimes some action shall be executed by the Console Operator, instead of by the sequence. |
| Sensor | Device used for measurement, monitoring, or fetching a process variable value continuously. There are many different technologies to measure a process variable, and for measuring each process variable type. |
| Setpoint (SPT) | It is the desired value for the “Controlled Variable” (PV) during the plant operation |
| Signal | It is an indication, such as a gesture, coloured light, electric current or electromagnetic field, which serves as a means of communication from one place to another one. |
| SLAVE controller | As part of a cascade control loop, this one is the controller that receives its SPT value from a MASTER controller OUT. The MASTER controller is disconnected from the SLAVE controller when this one is in a mode other than cascade. |
| Soft Reset | Manual RESET command signal (see “Command signal, Manual RESET”) that is implemented in the IPS HMI. |
| Stable dynamic process response | See “Self-Regulating dynamic process response”. |
| Standard Operation conditions | Similar to “Actual Operation conditions”, but referred to the temperature and pressure as described in “Standard conditions” in section **Error! Reference source not found.**. |

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| Standby | Associated role or condition to an instrument (transmitter, valve, etc.), or equipment (pump, fan, heater, etc.) that **IS NOT** selected in a group of several items of the same type to perform its duty during the plant operation.<br>A "Standby" item can be an "Alive Spare" item or not. |
| Static dynamic process response | See "Self-Regulating dynamic process response". |
| Strapping table | A tabular record of tank volume versus height so that taped (strapped) measurements of liquid depth can be converted into liquid volumes. Also known as gauging table. |
| **T** | |
| Tracking functionality,<br>Tracking state | State in which any control loop component is set when it is disconnected from the downstream component(s), making the component to track the condition of those downstream component(s), in order to be ready to reconnect to, with no bump (bumpless transfer). Example: in a cascade control loop with a MASTER and a SLAVE controller, when the SLAVE controller is set in AUTOMATIC or MANUAL mode, the MASTER controller enters in initialization mode.<br>One of the most common problems in a control loop start-up is to connect a "MASTER" to a "SLAVE" without creating a process plant upset (Bumpless connection).<br>It is defined as "Tracking" state the "MASTER" condition in which it is following the changes in the "SLAVE", in order to when they are connected, the "MASTER" starts to execute its control action at the last condition the "SLAVE" was. |
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| Transmitter | Device that read the process variable value from the Sensor, next amplify/normalize/convert the process variable value to a standard communication protocol and sends that value (or SIF Input Signal) to the "Trip criterion". Nowadays some communication protocols also send "Sensor/Transmitter" configuration and statuses information.<br>Sometimes the "Sensor" and the "Transmitter" are contained in the same device. Example of this is a nowadays pressure transmitter. |
| Transportation LAG | See "Delay" |
| TRIP Criterion | Logic to apply to one[1] (or more) "IPF input signal(s)" to determine if such value (or group of values) is (are) in the NORMAL or in the TRIP state (SAFE state).<br>The simpler "TRIP criterion" consists in comparing an analogue IPF input signal value against its fix "Trip value" or "Trip setting", to check if one value is greater or lesser than the other one. |
| Trip setting | Value in which an analogue signal value, input of an IPF, shall be above or below to change such signal from the NORMAL state to the TRIP state. |
| TRIP state | See "SAFE State". |

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| Trip value | See “Trip setting”. |
| **U** | |
| Unstable dynamic process response | See “Non-Self-Regulated dynamic process response”. |
| Unit Control Panel (UCP) | Similar to an LCP, but with more two-way communication with the PSD and ESD. |
| **V** | |
| Valve | Device that is used to allow, block or regulate the flow of a fluid in a process stream. |
| Valve, block | A “Block valve” is a valve that:<br>• Can be remotely monitored (Closed/OPENED positions) from FCS, and<br>• Can be remotely commanded by the Console Operator, or by a logic in FCS. |
| Valve, control | A “Control valve” is a valve that can be remotely operated by the Console Operator, or by a logic in FCS. |
| Valve, isolation | An “Isolation valve” is a manually operated valve that cannot be remotely operated by the Console Operator, or by a logic in FCS, or IPS. Only the Field Operator can Open/Closed such valve. |
| Valve, safety | A “Safety valve” is a valve that can be remotely operated by a safety logic in IPS. |
| Valve, monitored isolation | A “Monitored isolation valve” is the same thing as an “Isolation valve”, but the valve Closed/OPENED positions are remote monitored from FCS. See also “Isolation valve”. |