

# GLOSSARY

## a

**Absolute Pressure** – the sum of gauge pressure plus atmospheric pressure. Absolute pressure can be zero only in a perfect vacuum.

**Accuracy** – the degree of conformity of an indicated value to a recognized accepted standard value or ideal value.

**Accutune** – continually adjusts the Gain or Proportional Band (P), Rate (I), and Reset Time (D) tuning constants in response to setpoint changes and/or Process Variable disturbances.

**Actuation Signal** – the setpoint minus the controlled variable at a given instant.

**Actuator** – a controlled motor, relay, or solenoid in which the electric energy is converted into a rotary, linear, or switching action. An actuator can effect a change in the controlled variable by operating the final control elements a number of times. Valves and dampers are examples of mechanisms which can be controlled by actuators. *Also see Proportional, Spring Return, and Two-Position Actuators.*

**Adaptive Tune** – changes control parameters according to current process conditions. It identifies process gains and time that can be used to improve the response of a control loop.

**Alarm** – an audible device or visible signal indicating a malfunction or off-normal condition.

**Alarm Circuit** – an electrical circuit that includes a bell, horn, or similar device to signal an unsafe condition.

**Algorithm** – a prescribed set of well defined rules or processes for the solution of a problem in a finite number of steps.

**Ambient Temperature** – the temperature of the air surrounding the equipment.

**Amplifier** – a device used to increase the magnitude of a small input signal to proportions sufficient to perform some desirable function.

**Amplitude Ratio** – the size-relationship between two quantities obtained by dividing one size by another; specifically, the ratio of peak height of an output signal to the peak height of a related signal.

**Analog Input** – a continuous variable input.

**Atmospheric Pressure Compensation** – the value of the atmospheric pressure of the process when using the Relative Humidity algorithm.

**Auto Bias** – is used for bumpless transfer when transferring from local setpoint to remote setpoint. Auto Bias calculates and adds a bias to remote Setpoint input each time a transfer is made.

**Automatic Control** – a system that reacts to a change or unbalance in one of its variables by adjusting the other variables to restore the system to the desired balance.

**Automatic Control Valve** – an electrically operated valve which combines a valve body and a valve actuator or motor. A signal from some remote point can energize the actuator or motor to open or close the valve, or to proportion the rate of flow through the valve.

**Automatic Mode** – the controller will operate from the local or remote setpoint and automatically adjust the output to maintain the setpoint at the desired value.

**Autotune** – automatically calculates Gain (PB), Rate (Derivative), and Reset (Integral) Time tuning constants on demand. These tuning constants are calculated at the end of the Autotune procedure based on the output step introduced onto the process.

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**Auxiliary Output** – generally a millivolt or voltage out that can be configured to represent a controller parameter (such as PV, an Input, setpoint, deviation or the control output). The range of the auxiliary output can be easily scaled by the operator.

## b

**Bargraph** – a vertical or horizontal display of discrete bars that represent the Setpoint, Output, or Deviation.

**Baud** – transmission speed in bits per second.

**Bias** – is used to compensate the input for drift of an input value due to deterioration of a sensor, or some other cause.

**Bumpless Transfer** – change from manual mode to automatic mode of control, or vice versa, without change in control signal to the process.

**Burnout (Sensor Break Protection)** – if the input fails, the indicated PV signal will increase (Upscale) or decrease (Downscale) with some indication on the operator interface.

## c

**Calibrate** – the procedure used to adjust the instrument for proper response (for example: Zero, Span, Alarm, and Range).

**Capacitance** – the change in energy or material required to make a unit change in a measured variable.

**Capacitive Load** – a leading load; a load that is predominantly capacitive, so that the alternating current leads the alternating voltage, i.e., the voltage does not change direction until after the corresponding current does.

**Cascade Control** – control action where the output of one controller is the setpoint of another controller. It can be used in a controller using two loops of control.

**Chassis** – a sheetmetal box, frame, or single plate on which the components of a device are mounted; the assembled frame and parts.

**Closed Loop** – the complete signal path in a control system; represented as a group of units connected to a process in such a manner that a signal started at any point follows a closed path and comes back to that point. The signal path includes a forward path, a feedback signal, and a summary point.

**Communications Address** – a number that is assigned to an instrument that will be its address in a communications message exchange.

**Configuration** – a dedicated operation where you use straightforward keystroke sequences to select and establish pertinent control data best suited for your application.

**Control Action** – the nature of the change of the output effected by the input. The output may be a signal or the value of a manipulated variable. The input may be an actuating error signal, the output of another controller, or the control loop feedback signal when the setpoint is constant.

**Control Element** – a component of a control system that reacts to manipulate a process attribute when stimulated by an actuating signal.

**Controlled Medium** – the substance (usually air, water, or steam) whose characteristics (such as temperature, pressure, flow rate, volume, level, or concentration) are being controlled.

**Controlled System** – the system made up of all equipment in which the controlled variable exists, but which does not include the automatic control equipment.

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**Controlled Variable** – that quantity or condition of a controlled medium which is measured and controlled. For example, temperature, pressure, flow rate, volume, level, or concentration.

**Controller** – a device which senses and measures changes in the controlled variable and *indirectly* acts to maintain the controlled variable within present limits.

**Control Mode** – designates the mode in which the controller will operate (such as Manual, Automatic with Local Setpoint, Automatic with Remote Setpoint, Manual-Cascade, Automatic-Cascade)

**Control Point** – the value of the controlled variable which the controller operates to maintain.  
*Also see Setpoint.*

**CSA Approval** – Canadian Standards Association approval.

**Current Duplex** – similar to current proportional but provides a second current output (split range) or a second current output via the auxiliary output for heat cool zones.

**Current Simplex** – supplies proportional direct current output for the final control element which require a 4 to 20 mA signal.

**Current/Time (Relay) Duplex** – a variation of duplex with current active for 50% output and relay active for 50% output.

**Cycle Time** – the length of one time proportional output relay cycle.

## d

**Damping** – the progressive reduction or suppression of oscillation in a device or system. It is built into electrical circuits and mechanical systems to prevent rapid or excessive corrections which may lead to instability or oscillatory conditions.

**Deadband** – is an adjustable gap between the operating ranges of output 1 and output 2 in which neither output operates (positive value) or both outputs operate (negative value).

**Derivative Action** – a type of control-system action in which a predetermined relation exists between the position of the final control element and the derivative of the controlled variable with respect to time.

**Deviation** – the difference between the setpoint and the value of the controlled variable at any instant.

**Differential** – the smallest range through which the controller variable must pass in order to move the final control element from one to the other of its two possible positions, such as from ON to OFF.

**Differential Gap** – the smallest increment of change in a controlled variable required to cause the final control element in a two-position control system to move from one position to its alternative position.

**Digital Control Programmer** – executes program control (setpoint programming) of process temperature, pressure, flow, rotation speed, and other variables.

**Digital Filter** – an algorithm which reduces undesirable frequencies in the signal.

**Digital Input** – information or data in digital form transferred or to be transferred from an external device into a computer or individual device.

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**Direct Acting Control** – in this control action, the controller's output increases as the process variable increases.

**Disturbance** – an undesired change in a variable applied to a system which tends to affect adversely the value of a controlled variable.

**DMCS Communications** – a communication link between Honeywell devices and a Honeywell supplied interface device capable of communicating via RS232 communications protocol with a host computer.

**Dropoff Value** – output value that below which the controller output will dropoff to the low output limit value that was configured.

**Duplex Control** – a control in which two independent control elements share a common input signal for the operation of separate final control elements both of which influence the value of the controlled condition.



**Eight Segment Characterizer** – provides an 8-segment piecewise linear function generator which can approximate almost any curve shape (i.e., linearizing a process variable, characterizing a remote setpoint, or changing the opening characteristics of an installed control valve).

**EMI (Electromagnetic Interference)** – any spurious effect produced in the circuits or element of a device by external electromagnetic fields.

**Emissivity** – for radiamatic inputs. A radiamatic pyrometer converts radiant energy emitted by a target into electrical energy. Emissivity is a correction factor applied to the radiamatic input signal that is the ratio of the actual energy emitted from the target to the energy which would be emitted if the target were a perfect radiator.



**Failsafe Output** – the output value to which the device will go to protect against the effects of failure of the equipment, such as, fuel shut-off in the event of loss of flame in a furnace or a sensor break.

**Feedback Control** – an error driven control system in which the control signal to the actuators is proportional to the difference between a command signal and a feedback signal from the process variable being controlled. *Also see Control.*

**Feedforward Control** – a method of control that compensates for a disturbance before its effect is felt in the output. It is based on a model that relates the output to the input where the disturbance occurs. In distillation the disturbances are usually feed rate and feed compositions. Steady-state feedforward models are usually combined with dynamic compensation functions to set the manipulative variables and combined with feedback adjustment (trim) to correct for control model-accuracy constraints. *Also see Control.*

**Feedforward Multiplier** – a feedforward algorithm that calculates a new output signal by multiplying the computed PID output value the the feedforward signal (Input A) [i.e.,  $\text{Output Signal} = \text{PID Output} \times (\text{Input A} \times \text{Ratio A} + \text{Bias A})$ ]. It then sends the resultant value to the final control element.

**Feedforward Summer** – uses Input A, following a Ratio and Bias calculation as a value summed directly with the PID computed output value [i.e.,  $\text{Controller Output} = \text{PID Output} + (\text{Input A} \times \text{Ratio A} + \text{Bias A})$ ]. The result is sent as an output value to the final control element. Applies to Loop 1 only. This algorithm will only function in the automatic mode.

**Fieldbus** – a bus that interconnects process control sensors, actuators, and control devices.

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**Field Wiring** – wiring that must be done at the installation site (in addition to factory wiring) in order to complete an installation.

**Final Control Element** – the device that directly controls the manipulated variable of a control loop.

**First-Order Lag** – a term used to describe the signal-delaying and signal-size-changing effects of a part of the control loop. The name comes from the form of the equation which represents the relation between output and input. The effects are evaluated by a “Time Constant.”

**FM Approval** – Factory Mutual Association approval.

**Frequency** – the number of recurrences of a periodic phenomenon in a unit of time, usually expressed in hertz (Hz).

**Frequency Response** – the response of a component, instrument, or control system to input signals at varying frequencies.

## g

**Gain** – the ratio of the change in output to the change in input which caused the change. The reciprocal of Proportional Band.

**Gain Scheduling** – predefined separate GAIN tuning values automatically applied to predefined process variable regions.

**Guaranteed Soak** – guarantees that a setpoint programming segment’s process variable is within  $\pm$  deviation for the configured soak time. Whenever the  $\pm$  deviation is exceeded, soak timing is frozen.

## h

**Hertz (Hz)** – a unit of frequency equal to one cycle per second.

**High Limit** – a controller which shuts down the system if a condition exceeds its maximum value for safe operation. *See Limit.*

**High Output Limit** – the highest value of output beyond which you do not want the controller automatic output to exceed.

**High Reset Limit** – the highest value of output beyond which you want no reset to occur.

**Hysteresis** – an adjustable overlap of the ON/OFF states of each control output or alarm.

## i

**Inductive Load** – a lagging load; a load that is predominantly inductive, so that the alternating current lags behind the alternating voltage; i.e., the current does not change direction until after the voltage does.

**Input** – signals taken in by an input interface as indicators of the condition of the process being controlled.

**Input High Selector** – algorithm that specifies the PV or SP as the higher of two separate inputs.

**Input Low Selector** – algorithm that specifies the PV or SP as the lower of two separate inputs.

**Integral Action** – a type of controller function where the output (control) signal or action is a time integral of the input signal.

**Integrator** – a device whose output is proportional to the integral of the input variable with respect to time.

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**Interference, electromagnetic** – any spurious effect produced in the circuits or elements of a device by external electromagnetic fields. *Also see RFI.*

**Internal Cascade** – a control system composed of two loops where the SP of one loop (inner loop) is the output of the other loop (outer loop).

**Intrinsic Safety** – a method to provide safe operation of electric process control instrumentation where hazardous atmospheres exist.

**ISA** – Instrument Society of America

**Isolated Circuit** – a circuit in which the current, with the equipment at reference-test conditions, to any other circuit or conductive part does not exceed the limit for leakage current.

## j

**Jumper** – a short length of wire used to compete a circuit temporarily or to bypass part of a circuit. Also, the action of using a jumper.

## k

**Knockout** – a removable portion in the side of a box or cabinet. During installation, it can be readily taken out with a hammer, screwdriver, or pliers so wires, cables, or fittings can be attached.

## l

**Lag** – a relative measure of time delay between two events, states, or mechanisms.

**Latching Relay** – real device or program element that retains a changed state without power.

**Limit** – a controller which continuously monitors a condition (such as temperature, pressure, or liquid level) in a controlled medium and responds immediately to shut down the system if a dangerous, predetermined condition occurs. It is normally set beyond the operating range of the controlled equipment.

**Limit Control** – a sensing device that shuts down an operation or terminates a process step when a prescribed limiting condition is reached.

**Linearity** – closeness of a calibration curve to a specified straight line. Linearity is expressed as the maximum deviation of any calibration point on a specified straight line, during any one calibration cycle. It is expressed as "within  $\pm$  \_\_\_ percent of full scale output."

**Local Automatic Mode** – in this mode, the controller operates from the local setpoint and automatically adjusts the output to maintain the setpoint at the desired value.

**Local Setpoint** – setpoint determined by the controller or recorder.

**Lockout** – any condition which prevents any unauthorized configuration or calibration changes.

**Logic Gate** – used in solving math problems through a repeated use of simple functions which define basic concepts (i.e., AND, OR, NOR, etc.).

**Loopback** – tests communications hardware.

**Loop Rate** – loop sampling rate for any input selectable from 3 to 12 conversions per second.

**Low Limit** – a controller which shuts down the system if a condition drops below its minimum value for safe operation. *See Limit.*

**Low Output Limit** – the lowest value of output below which you do not want the controller automatic output to exceed.

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**Low Reset Limit** – the lowest value of output beyond which you want no reset to occur.

## m

**Manual Mode** – controller does not adjust the output for changes in SP or PV; output can be changed manually.

**Minutes Per Repeat** – the time between each repeat of the proportional action by reset.

## n

**NEMA Rating** – consensus standards for electrical equipment approved by the majority of the members of the National Electrical Manufacturers Association.

**Noise** – an unwanted component of a signal or variable which obscures the information content.  
*Also see Interference, electromagnetic.*

**Nonlinearity** – signifies that the relationship between the output and input is not representable by a single straight line.

## o

**Offset** – a sustained deviation between the actual control point and the setpoint under stable operating conditions.

**On/Off Control** – is the simplest control type. the output can be either ON(100%) or OFF(0%)

**Open Collector** – type of relay output.

**Open Loop** – a control system in which there is no self-correcting action for misses of the desired operational condition, as there is in a closed-loop system

## p

**Parity** – a binary digit added to a group of bits to make the sum of all the bits always odd (odd parity) or even (even parity) to verify data storage and transmission.

**PD with Manual Reset** – is used whenever integral action is not wanted for automatic control. The equation is computed with no integral contribution. The manual reset, which is operator adjustable, is then added to the present output to form the controller output.

**PID A Algorithm** – control algorithm normally used for three mode control. The output can be adjusted somewhere between 100% and 0%. It applies all three control actions - Proportional, Integral, and derivative -- to the error signal

**PID B Algorithm** – control algorithm normally used for three mode control. The controller gives only an integral response to setpoint change, with no effect on, and it gives full response to PV changes. n the output due to the gain or rate action

**Position Proportioning Control** – type of control that uses two SPDT relays and a motor which has a 100 to 1000 ohm feedback slidewire.

**Pot** – short for potentiometer.

**Potentiometer** – an electromechanical device consisting of a resistive element with a terminal at each end, and a third terminal connected to the wiper contact. As the wiper moves along the element, it changes the resistance in each leg (portion of the element between each end terminal and the wiper). Thus, the electrical input or output can be changed mechanically.

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**Power Up Mode Recall** – determines which mode and setpoint the controller will use when the controller restarts after a power loss.

**Pressure Controller** – a controller which monitors the pressure of steam, air, gases, or liquids, and operates to keep the pressure within predetermined limits. It may operate as a pressure switch (ON-OFF), or it may be a proportioning controller.

**Process** – the manufacturing operations which use energy measurable by some quality such as temperature, pressure, or flow, to produce changes in quality or quantity of some material or energy.

**Process Variable** – any characteristic or measurable attribute whose value changes with changes in prevailing conditions.

**Proportional Band** – is the percent of the range of the measured variable for which a proportional controller will produce a 100% change in its output. The reciprocal of Gain.

**Proportional Control** – a control mode in which there is a continual linear relationship the deviation in the controller, the signal of the controller, and the position of the final control element.



**Ramp Segment** – the time it takes to change the setpoint to the next setpoint value in the program.

**Ramp Time** – the time it takes for a setpoint ramp to reach the next or final setpoint.

**Range** – the region between the limits within which a quantity is measured, received, or transmitted, expressed by stating the lower and upper range values.

**Rate Action (Derivative Control)** – produces a corrective signal proportional to the rate at which the controlled variable is changing. It produces a corrective action faster than proportional action alone.

**Rate Time** – in the action of a proportional-plus rate or proportional-plus reset-plus-rate controller, the time by which the rate action advances the proportional action on the controlled device.

**Reference Junction** – a thermocouple junction which is at a known or reference temperature.

**Relative Humidity** – the ratio of the amount of water vapor contained in the air at a given temperature and pressure to the maximum amount it could contain at the same temperature and pressure under saturated conditions.

**Relay** – an electromechanical device with contacts that open and/or close when its coil is energized or de-energized in response to a change in the conditions of the electrical circuit. The operation of the contacts affect the operation of other devices in the same circuit or in other circuits.

**Relay Chatter** – noise due to the rapid opening and closing of relay contacts.

**Remote Automatic Mode** – the controller will operate from a remote setpoint, usually other than input 1.

**Remote Setpoint** – a setpoint generated externally from the controller or recorder.

**Remote Switching (Digital Input)** – detects the state of external contacts but responds according to how the switching input is configured.

**Repeatability** – the ability of a controller or interlock to maintain a constant setpoint characteristic.

**Repeats Per Minute** – unit of Reset Rate.

# GLOSSARY

**Reset Action** – adjusts the controller's output in accordance with both the size of the deviation (SP-PV) and the time it lasts.

**Reset Rate (Integral Action Rate)** – the number of repeats per minute or minutes per repeat that the proportional response of a two or three mode controller to a step input is repeated by the initial integral response.

**Resistance** – the opposition to the flow of electricity in an electric circuit measured in ohms.

**Resolution** – the minimum detectable change of some variable in a measurement system.

**Response** – the change in output in relation to the change of input.

**Reverse Acting Control** – control in which the value of the output signal decreases as the value of the input (measured variable or controlled variable) increases.

**RFI (Radio Frequency Interference)** – a type of electrical noise that can affect electronic circuits adversely.

**RS422/485 Communication** – a standard for serial data transmission.

**Run Period** – the period of time after ignition trials and before the operating setpoint is reached during which the main burner is firing. (In a flame safeguard programming control, the timer stops.)



**Sensor Break Protection (Burnout)** – will make the indicated PV signal increase (upscale) or decrease (downscale) when a sensor fails.

**Setpoint Program** – individual Ramps and Soak Segments needed to generate the required setpoint versus time profile.

**Setpoint Ramp** – a ramp that can be configured to occur between the current local setpoint and a final local setpoint over a time interval.

**Setpoint Rate** – a specific rate of change for any local setpoint change.

**Setpoint Tracking** – the local setpoint will track either the PV or the remote setpoint and will use that value when transfer is made.

**Shed Mode** – determines the mode of local control that the units will go to when there is shed from communication.

**Shed Time** – this number represents the number of sample periods there will be before the instrument sheds from communications.

**Short** – a short circuit. Also, to intentionally bypass part of a circuit with a jumper.

**Short Circuit** – an abnormal connection of relatively low resistance between two points of a circuit, resulting in a flow of excess (often damaging) current between these two points.

**Signal** – a physical variable, one or more of which carry information about another variable (which the signal represents).

**Single Setpoint Ramp** – occurs between the current local setpoint and a final setpoint over a time interval.

**Soak Segment** – a combination of a soak setpoint (value) and a soak duration (time) in Setpoint programming.

**Specific Gravity** – the ratio of the weight or mass of a given volume of a substance to that of the same volume of a standard (water for liquids and solids; air or hydrogen for gases) at the same temperature; abbreviated sp. gr., s.g., or G.

**Split Range Control** – action in which two or more signals are generated or two or more final control elements are actuated by an input signal.

# GLOSSARY

**Stability** – the ability of an electronic device or circuit to maintain specified operating characteristics over extended periods of service.

**Static Pressure** – the steady state pressure applied to a device, in the case of a differential pressure device, the process pressure applied equally to both connections.

**Step Change** – the change from one value to another in a single increment in negligible time.

**Switch** – a mechanical or electrical device that makes or breaks contacts to either complete or open an electrical circuit; may be automatic or manual.

**System** – a set or arrangement of things so related or connected as to form a unity or organized whole; a collection of consecutive operations and procedures required to accomplish a specific objective.



**Temperature Units** – medium of temperature indication or display (usually °F or °C).

**Thermocouple** – a device for measuring temperature consisting of two electrical conductors of dissimilar metals joined at a point, called the "hot" junction. When heat is applied to the "hot" junction, a voltage directly proportional to the temperature is developed across the output.

**Three Position Step Control** – an algorithm which is an extension of the ON/OFF Duplex control and includes internal feedback of the state of the relays. The effect of the control action is that the ON and OFF time of the output relay change in proportion to the error signal and the Gain and reset time settings.

**Time Constant** – time required for the output of a "First Order Lag" device to reach a percentage of its final value for a step change in input.

**Time/Current Duplex** – a variation of duplex with Current active for 50 to 100% output and Time active for 0 to 50% output.

**Time Proportioning Duplex** – an Output algorithm that uses two SPDT relays for Time Duplex Proportional Control. Its normally open (NO) or normally closed (NC) contacts are selected by positioning an internal jumper.

**Time Proportioning Simplex** – an Output algorithm that uses one SPDT relay for Time Proportional Control. Its normally open (NO) or normally closed (NC) contacts are selected by positioning an internal jumper.

**Totalizer** – calculates and displays the total flow volume as measured by the input or derived by an input algorithm.

**Transducer** – any device or component that converts an input signal of one form to an output signal of another form.

**Transmitter Characterization** – instructs the controller or recorder to characterize a linear input to represent a non-linear one.

**Tuning** – The adjustment of control constants in algorithms or analog controllers to produce the desired control effect.

**Two Loop Control** – two independent loops of control or internal cascade control.



**UL Approval** – approved by Underwriters Laboratories, an independent testing and certifying organization.

**Upload/Download** – Data or program transfer, usually from a computer to a controller or recorder and vice-versa.

# GLOSSARY

## V

**Valve Positioner** – A position controller, which is mechanically connected to a moving part of a valve or its actuator, and automatically adjusts its output pressure to the actuator in order to maintain a desired position that bears a predetermined relationship to the input signal.

**Variable, Measured** – The process condition (such as temperature or pressure) selected to represent the state of material which is being made or processed.

## W

**Weighted Average** – the controller combines two inputs and computes a PV for the control algorithm.

## Z

**Zero Shift** – A shift in the instrument calibrated span evidenced by a change in the zero value. Usually caused by temperature changes, overrange, or vibration of the instrument.