

Neo-Dyn® Pressure/Temperature Switch Definitions & Terminology

Introduction

Neo-Dyn® uses the following definitions and terminology to describe the operating characteristics, specifications and other details relative to pressure and temperature switches. We

hope this data provides the answers to questions which may arise and helps you in selecting a switch.

Types of Switches

ABSOLUTE PRESSURE SWITCHES: The pressure sensing element in this type switch is ported to the pressure being monitored. The pressure sensing element is referenced to near perfect vacuum.

DIFFERENTIAL PRESSURE SWITCHES: There are two pressure ports (variable and reference) on this type unit. Actuation occurs when pressure to the variable port exceeds pressure to the reference port by a predetermined value.

GAUGE PRESSURE (AND VACUUM) SWITCHES: A switch that compares the pressure being sensed to that of atmospheric pressure. Positive pressure switches sense monitored pressure above atmospheric pressure while vacuum switches sense pressure below atmospheric.

TEMPERATURE SWITCHES: A Neo-Dyn® temperature switch is identical to a pressure switch with the addition of a fluid-vapor charged sensing probe. The fluid-vapor charge is exposed to the "basic sensor" and since probe pressure varies with temperature, discrete temperature settings can be accomplished.

FLOW SWITCHES: A Neo-Dyn® flow switch senses differential pressure generated by flow through a venturi to actuate an electrical switch at predetermined flow levels. Discrete flow settings are accomplished through a force balance interaction between the sensing diaphragm and a "Nega-Rate"® disc spring.

Definitions

Absolute Pressure - The difference between zero pressure (which exists only in a perfect vacuum) and some known pressure. Absolute pressure may be determined by adding gauge pressure to atmospheric pressure (14.7 psi at sea level).

0 PSIG equals 14.7 psia (29.92" HgA).

Actuation And Deactuation Point - The actuation point (also called the set point) is the exact point at which the electrical switching element is operated on increasing pressure/temperature. The deactuation point is the opposite, or the point at which the electrical switching element is operated on decreasing pressure/temperature.

Altitude Shift - The setting change that will occur due to the atmospheric pressure variance from sea level to a given altitude.

Ambient Pressure or Temperature - Adjacent (not necessarily atmospheric) pressure or temperature immediately surrounding the switch.

Atmospheric Pressure - The pressure caused by the weight of air. Atmospheric pressure at sea level is considered to be 14.7 psia (or 29.9 inches of mercury or 407 inches of water absolute.)

Burst Pressure - Burst pressure is the maximum pressure which may be applied to a switch without causing leakage. Permanent degradation may occur or the unit may become Inoperable if burst pressure is applied. Burst pressure is normally 2½ to 3 times maximum system pressure.

Charge Media - The fluid or gas with which the temperature

sensing probe is filled.

"Con-Rate"® - Is the Neo-Dyn® trade name for those switches which use a constant rate spring system, such as the conventional helical spring diaphragm or helical spring piston combination, (degrees per second), flow (feet per second) and media density. Lag is determined by multiplying the rise rate by the time constant. As an example: If a system with a constant flow, pressure and rise rate of 10° per second incorporated a switch with a response time of 3 seconds, the lag would be 30 degrees.

Critical Set Point - Is the most important set point of the unit and is held to the closest tolerance. It can be either the actuation (increasing) or deactuation (decreasing set point).

Deadband - Sometimes referred to as "differential" or "actuation value", is the difference between actuation and deactuation points, (also known as hysteresis). Example: Suppose a pressure switch is set to actuate at 50 psig increasing pressure. The electrical circuit is opened when pressure reaches 50 psig. As pressure decreases, the electrical circuit is closed at 40 psig. The deadband in this example would be 10 psi (50 psig minus 40 psig = 10 psi).

Differential Pressure - The difference between a variable pressure and a reference pressure.

Electrical Switching Element - Opens or closes an electrical circuit in response to movement by the pressure/temperature sensor. The most popular Neo-Dyn® electricals are SPST, SPDT and DPDT.

Enclosure - That portion of the unit which in varying degrees protects the mechanism from ambient conditions.

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Explosion Proof - An enclosure which is capable of containing an explosion which may occur within, and/or capable of (not igniting) an explosive atmosphere which may surround it.

Final Bath Temperature - The temperature above the set point to which a temperature switch is rapidly subjected when testing response time.

Gauge Pressure - Gauge pressure is the difference between atmospheric pressure and a variable pressure.

Hermetically Sealed - An enclosure completely sealed from the environment. Neo-Dyn[®] hermetically sealed electrical assemblies are all metal with a glass header. All joints are soldered or welded to insure sealing integrity. All Neo-Dyn[®] hermetically sealed enclosures are per MIL-HDBK-5400 Para. 3.8.

Initial Soak Temperature - The temperature at which a temperature switch is stabilized before being subjected to a higher temperature such as final bath.

Mass Rate of Flow - An expression of flow by weight in a given time, such as pounds per hour (PPH).

Media Velocity - The speed at which a media is flowing. This is normally expressed in feet per second.

"Nega-Rate"[®] - Is the Neo-Dyn trade name for those switches which use a negative rate spring system. A Belleville disc spring is the heart of the sensing device with various sealing methods used to form a pressure area.

Non-Critical Set Point - The non-critical set point is the least important setting, and the tolerances are not held as close as the critical set point. It can be either the actuation or deactuation point.

Pressure - The force per unit of area.

Pressure Sensing Element - The pressure sensing element is the mechanism which moves as pressure increases or decreases, and, in the process, actuates or deactuates an electrical switching element at a predetermined point. Most common types of pressure sensing elements are a Bourdon tube, piston, diaphragm and bellows. Neo-Dyn's "Nega-Rate"[®] pressure switches utilize a diaphragm or piston as a media seal with a Belleville negative-rate disc spring system. Neo-Dyn's "Con-Rate"[®] pressure switches utilized a helical spring and diaphragm or piston pressure sensing element which are constant-rate spring systems.

Pressure Switch - A pressure switch is basically an instrument designed to convert a change in pressure into motion to operate an electrical switching element—thereby making or breaking an electrical circuit.

Proof Pressure - Proof pressure, normally 1½ to 2 times system pressure, is the maximum momentary pressure, including surges,

which may be applied to any switch without causing degradation.

Proof Temperature - The maximum temperature within a specified time to which the sensing portion of the switch can be subjected without causing degradation.

Reference Pressure - The pressure to which the measured or controlled pressure is being compared. In a gauge or vacuum pressure switch, the reference pressure is ambient pressure. In a differential pressure switch it is the "low" pressure side. In an absolute pressure switch it is a near perfect vacuum.

Repeatability (Accuracy) - Repeatability is the maximum set point deviation of a single switch under one given set of environmental and operational conditions.

Step Temperature - The difference in temperature between the final bath temperature and the stabilized temperature. Example: A temperature switch with an increasing setting of $260 \pm 5^\circ\text{F}$ is stabilized at a temperature (initial soak of 80°F). The sensing probe of the switch is rapidly immersed in hot moving oil (final bath of 325°F). The step temperature is 245°F ($325 - 80$).

System (Working) Pressure or Temperature - Is the maximum operating pressure or temperature of the system.

Temperature Log - The number of degrees above the actuation point that the media will be when the switch operates. Lag is expressed for a designated rise rate.

Temperature Rise Rate or Ramp Rate - The number of degrees (Fahrenheit or Centigrade) that the media will increase in temperature in a unit of time (minute or second).

Time Constant (Response Time) - The amount of time (in seconds) that it takes a temperature switch to operate after being subjected to a step temperature where the difference between the initial soak temperature and actuation temperature. Response time must take into account designated flow and properties of the media.

Tolerance - Is the maximum allowable setting deviation between two or more production units under all specified environmental and operational conditions. Tolerance represents the sum total of setting deviations due to calibration and manufacturing variations, temperature changes, etc.

Variable Pressure - Changing pressure, generally the pressure which is being measured or controlled.

Volume Rate of Flow - An expression of flow by volume in a given time, such as gallons per minute (GPM).

Wetted Materials - That portion of the unit which comes in contact with the media.