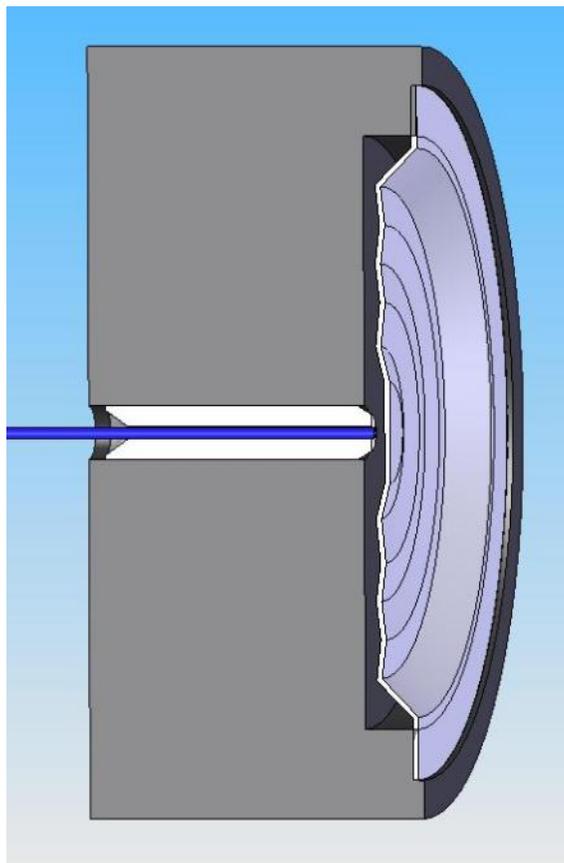


**DavidsonSensors™**

**Fiber Optic Sensing System Definitions**



**Davidson Fiber Optic Sensing System**

- DavidsonSensors™ Measure Temperature, Pressure, Vacuum, Flow, Level, and Vibration
- DavidsonSensors™ Transmit Intrinsically Safe Signals to Passive Fiber Optic Transducers
- DavidsonSensors™ are Immune to Lightning Damage and Grounding Problems
- DavidsonSensors™ are Immune to Electromagnetic and Radio Frequency Interference (EMI/RFI)
- DavidsonSensors™ Operate at 1000°F
- DavidsonSensors™ are Easy to Install and Require Very Low Maintenance

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# INSTRUMENTS

Definitions

**ABSOLUTE PRESSURE TRANSDUCER:**

A pressure transducer or pressure sensor that has an internal reference chamber sealed at or close to 0 psia (full vacuum) and normally provides increasing output voltage for increases in pressure.

**ABSOLUTE SIGNAL CONDITIONER:** A signal conditioner that has an internal reference that does not require periodic calibration.

**ACCURACY:** The standard deviation of measurement error between a measured value and the actual (true) value. The measurement includes combined error of the system for nonlinearity, repeatability, and hysteresis and is expressed as a percent of the full-scale output.

**ARMORED CABLE:** An optical or electrical cable that is protected by a metallic outer sheath. The sheath protects the cable from being cut or crushed.

**AXIAL LOAD:** A load applied along or parallel to and concentric with the primary axis.

**CALIBRATION:** The comparison of transducer voltage outputs against the outputs of a reference standard.

**DAMPING:** The reduction of response at the resonant frequency through the use of a damping media such as oil. Usually specified as the ratio of critical damping.

**DEAD VOLUME:** The volume inside the pressure port of a transducer at room temperature and barometric pressure.

**DEFLECTION:** The change in length along the primary axis or distance a diaphragm moves at the center between no-load and rated load conditions.

**DIAPHRAGM:** The sensing membrane which is deformed when pressure is applied.

**DISTRIBUTED TEMPERATURE SENSOR:** A sensor capable of making temperature measurements over an extended distance. This terminology usually refers to a signal processing method that determines temperature profile along the length of an optical fiber many kilometers long.

**DYNAMIC SIGNAL CONDITIONER:** A signal conditioner that measures environmental parameters that may change over short time periods much less than one second.

**ELECTRONIC:** A transducer that converts a measured environmental parameter (temperature, pressure, etc.) into a millivolt signal and then into a digital or analog signal that can be transmitted with minimal electrical interference, i.e. 4-20 mA two wire output or RS-485 Modbus.

**EXPLOSION-PROOF:** Incapable of explosion. This term usually refers to a burst-proof, heavy-walled enclosure that contains electronic equipment that may ignite an explosive gas.

**FABRY-PEROT:** An interferometric sensor that consists of two partially reflective plane parallel surfaces.

**FIBER BRAGG GRATING:** A periodic change in the refractive index of an optical fiber along a specified length.

**FIBER OPTIC SENSOR:** A sensor that uses optical fiber as the primary means of making a measurement.

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# INSTRUMENTS

Definitions

**FLUSH DIAPHRAGM:** Sensing element is located on the very tip of the transducer (NO pressure port).

**FREQUENCY RESPONSE:** The range of frequencies over which the transducer output signal follows changes in the measured environmental parameter.

**FULL SCALE:** The full range of the environmental parameter that can be measured with a device.

**FULL SCALE OUTPUT:** The difference between the minimum output (normally zero) and the maximum output.

**GAGE (GAUGE) PRESSURE :** The pressure above (or below) atmospheric pressure. Represents positive difference between measured pressure and existing atmospheric pressure. Can be converted to absolute by adding actual atmospheric pressure value.

**GAGE (GAUGE) PRESSURE TRANSDUCER:** A transducer that measures pressure relative to the atmospheric pressure.

**HYSTERESIS:** The maximum difference between output readings for the same measured point, one point obtained while increasing from zero and the other while decreasing from full scale. The points are taken on the same continuous cycle. The deviation is expressed as a percent of full scale.

**INTRINSICALLY-SAFE:** Equipment that never generates an ignition source and poses no explosion hazard.

**INCHES OF WATER:** A measure of pressure normally used for measurements of differential pressure.

**LINEARITY:** The maximum deviation of the calibration curve from a straight line between zero and full scale, expressed as a percent of full scale output.

**LINE PRESSURE:** The maximum pressure in the pressure vessel or pipe for differential pressure measurement.

**LOAD:** The weight, torque, or force applied to the transducer.

**MEASURAND:** Environmental parameter to be measured, e.g. temperature, pressure, strain, vibration.

**MOUNTED RESONANT FREQUENCY:** The frequency at which the internal spring/mass system of an accelerometer resonates, producing a 90° phase shift in output signal vs. applied acceleration.

**MULTIPOINT CONNECTOR:** Connector with more than one fiber optic connection point or termini.

**OPERATING PRESSURE RANGE:** The pressure range over which the unit provides a calibrated output.

**OPERATING TEMPERATURE RANGE:** The temperature range over which the unit provides a calibrated output.

**OPTICAL:** A transducer that converts a measured environmental parameter (temperature, pressure, etc.) into an optical signal which is transmitted through an optical fiber to an electronic converter that transforms the optical signal into a digital or analog signal, i.e. 4-20 mA two wire output or RS-485 Modbus.

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# INSTRUMENTS

Definitions

**OUTPUT:** The electrical signal measured at the output terminals of a fiber optic signal conditioner which is produced by an applied input to a transducer.

**OVERPRESSURE LIMITS:** The maximum pressure or load which may be applied to the transducer without causing a permanent change in the performance specifications.

**PRECISION:** The ability to repeat output readings when a system is brought to the same conditions. Precision is expressed as the standard deviation of output readings as a percent of full scale.

**PRIMARY AXIS:** The axis along which the transducer is designed to be loaded; normally its geometric centerline.

**PROOF PRESSURE LIMITS:** The pressure at which the unit no permanent damage occurs but recalibration is required.

**PSI:** A unit of pressure measured in pounds per square inch.

**PSIA:** Pounds per square inch absolute.

**PSID:** Pounds per square inch differential normally expressed in inches of water.

**PSIG:** Pounds per square inch gage (normally relative to atmospheric pressure).

**RANGE:** The measured values, over which a transducer is intended to measure, specified by their upper and lower limits.

**RATED CAPACITY:** The maximum value that a device is designed to measure within its specification.

**REPEATABILITY:** The ability to repeat output readings when a system is brought to the same conditions from the same direction and measured at different times. Repeatability is expressed as the standard deviation of output readings as a percent of full scale.

**RESOLUTION:** The smallest change in the input which produces a measurable change in the output signal.

**SAMPLE RATE:** The number of measurements reported per measurement interval, e.g. 10Hz is a sample rate of ten measurements per second.

**SENSOR:** A device that converts changes in a physical parameter into a signal which may be optical, electrical, chemical, mechanical, etc.

**SENSITIVITY:** The ratio of change in transducer output to a change in the value of the measured parameter.

**SIGNAL CONDITIONER:** A device that converts one signal type to another, e.g. optical to electrical, digital to analog. A signal conditioner usually includes signal processing. The term is synonymous with the terms signal processor, instrument, interrogator, and surface unit.

**SPAN:** The algebraic difference between the limits of the range from zero to full scale.

**SPECIFICATIONS:** The group of error limits within which each device will operate.

**STABILITY:** The ability to repeat output readings when a system is maintained at the same conditions and measured at different times. Stability is expressed as the standard deviation of output readings as a percent of full scale.

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# INSTRUMENTS

Definitions

**STATIC SIGNAL CONDITIONER:** A signal conditioner that measures environmental parameters that do not change over time periods less than one second.

**STRAIN SENSOR OR STRAIN GAGE:** A measuring element for converting force, pressure, tension, etc., into an signal.

**TEMPERATURE COMPENSATION:** The utilization of supplementary devices, materials, or components within the bridge to minimize sources of error caused by changing temperature.

**TEMPERATURE CORRECTION:** The correction of a measured output based on algebraic correction factors applied that are based on a known temperature.

**TEMPERATURE, OPERATING:** The range of temperature over which a transducer may be safely operated up to full scale without causing failure, but specifications may not be met.

**TEMPERATURE EFFECT ON SPAN:** The change in rated output due to a change in ambient temperature. Usually expressed as  $\pm$  a percentage change in rated output per degree F change in ambient temperature, over the compensated temperature range.

**TEMPERATURE EFFECT ON ZERO:** The change in zero balance due to a change in ambient temperature. Usually expressed as  $\pm$  a percentage change in rated output per degree F change in ambient temperature over the compensated temperature range.

**TOOL:** A term used in the oil and gas industry for devices that are used downhole. For measurement applications, a "tool" typically is a device that is packaged for use downhole that includes one or more transducers.

**TORR:** A measure of vacuum equal to one millimeter of mercury.

**TRANSDUCER:** A device (or medium) that converts energy from one form to another. The term is generally applied to devices that take physical phenomenon (environmental parameters such as pressure, temperature, humidity, flow, etc.) and converts it to an electrical or optical signal. The transducer typically includes one or more sensors in a package that isolates the optical or electronic device from the environment. This term is synonymous with the terms gauge and probe.

**TRANSVERSE SENSITIVITY:** Signal output as a result of acceleration perpendicular to the sensitive axis. Specified as a percentage of sensitive axis output for equivalent right angle acceleration or as a decimal fraction.

**UPDATE RATE:** The time interval between measurements, e.g. 0.1 second when the sample rate is 10Hz.

**VIBRATION ERROR:** The maximum change in output of a transducer when a specific amplitude and range of frequencies are applied to a specific axis at room temperature.

**WETTED PARTS:** The diaphragm and pressure port material that comes in direct contact with the medium (gas, liquid).

**ZERO ADJUSTMENTS:** Used when 'setting up' a transducer to adjust the output signal to zero when zero load/pressure is applied.

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# INSTRUMENTS

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Definitions

**ZERO BALANCE:** The output signal of the transducer with rated excitation and with no-load or pressure applied, usually expressed as a percent of rated output.

**ZERO RETURN:** The difference in zero balance measured immediately before application of rated load or pressure for specified duration and measured after removal of the load, and when the output has stabilized.

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