
HydraElectric

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TODAY'S GOAL:
Offer solutions to your toughest requirements

A PROVEN INNOVATOR

Pioneer in the aerospace industry since 1948

Overcoming common Issues

Survive pressure spikes, eliminate cycle wear, prevent pump ripple fatigue, eradicate burst diaphragms, remove failing wire bonds, survive 2000 V Lightning effects, address switch contact wear, and more

CONTINUALLY IMPROVING

Committed to on time delivery, lean initiatives and superior quality

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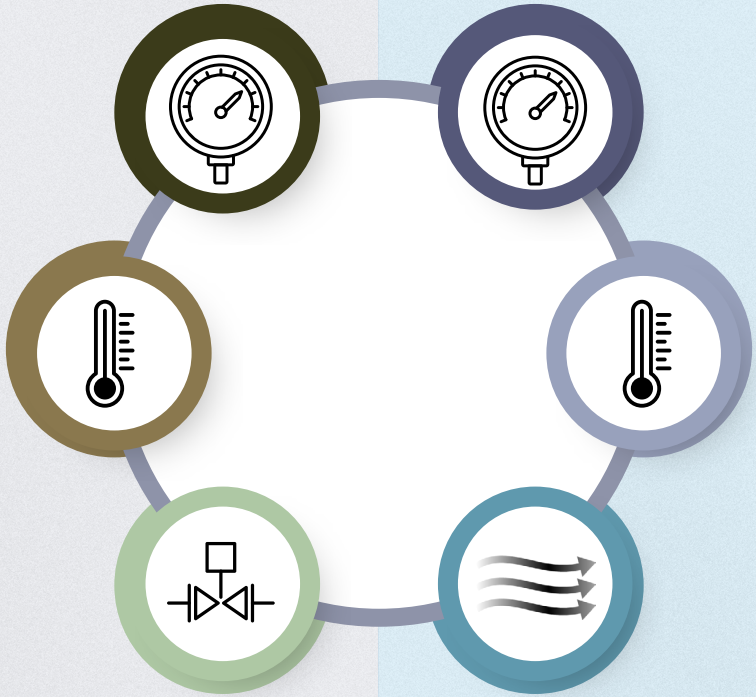
OUR CAPABILITIES

SWITCHES

- **Pressure Switches**
  - Gage
  - Absolute
  - Differential
- **Temperature Switches**
- **Other Switches**
  - Liquid Flow
  - Multi-Function
  - Flow switches and bypass valves
  - Hybrid electronic switches
  - Breather valves
  - Altitude switches



SENSORS

- **Pressure Sensors**
  - Gage
  - Absolute
  - Differential
  - High Line Pressure Differential
- **Temperature Sensors**
- **Other Sensors**
  - Liquid Flow
  - Air Flow
  - Multi-Function

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SWITCH
PRODUCT OFFERINGS

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SWITCH
PRODUCT OFFERINGS

Extensive Experience & Parts Catalog

Substantial library of RTCA DO-160 and Mil-STD qualifications, across a myriad of different applications.

R&D and Qualification

Full suite of lab-testing qualification capabilities, including endurance, temperature, shock, life cycle, vibration, and more.

Quality System

ISO9001 and AS9100

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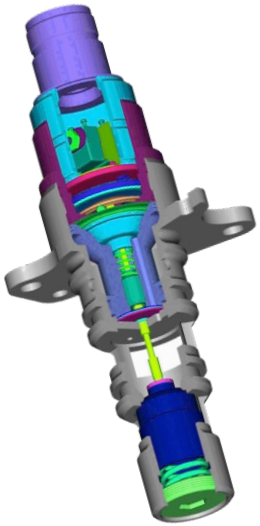
WHY CHOOSE HYDRA-ELECTRIC SWITCHES



- Premium quality products from the **industry pioneer**
- **Innovators** of the negative rate disc spring
- Highest level of **accuracy** for achieving the deadband
- **Manufacturability**
  We have perfected building the rough set
- **Design capabilities**
  Standard design, enhanced design and custom design.
- **Solving Common Industry Challenges**
  Hybrid Electronic Switch design – high contact resistance.

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SENSOR
PRODUCT OFFERINGS

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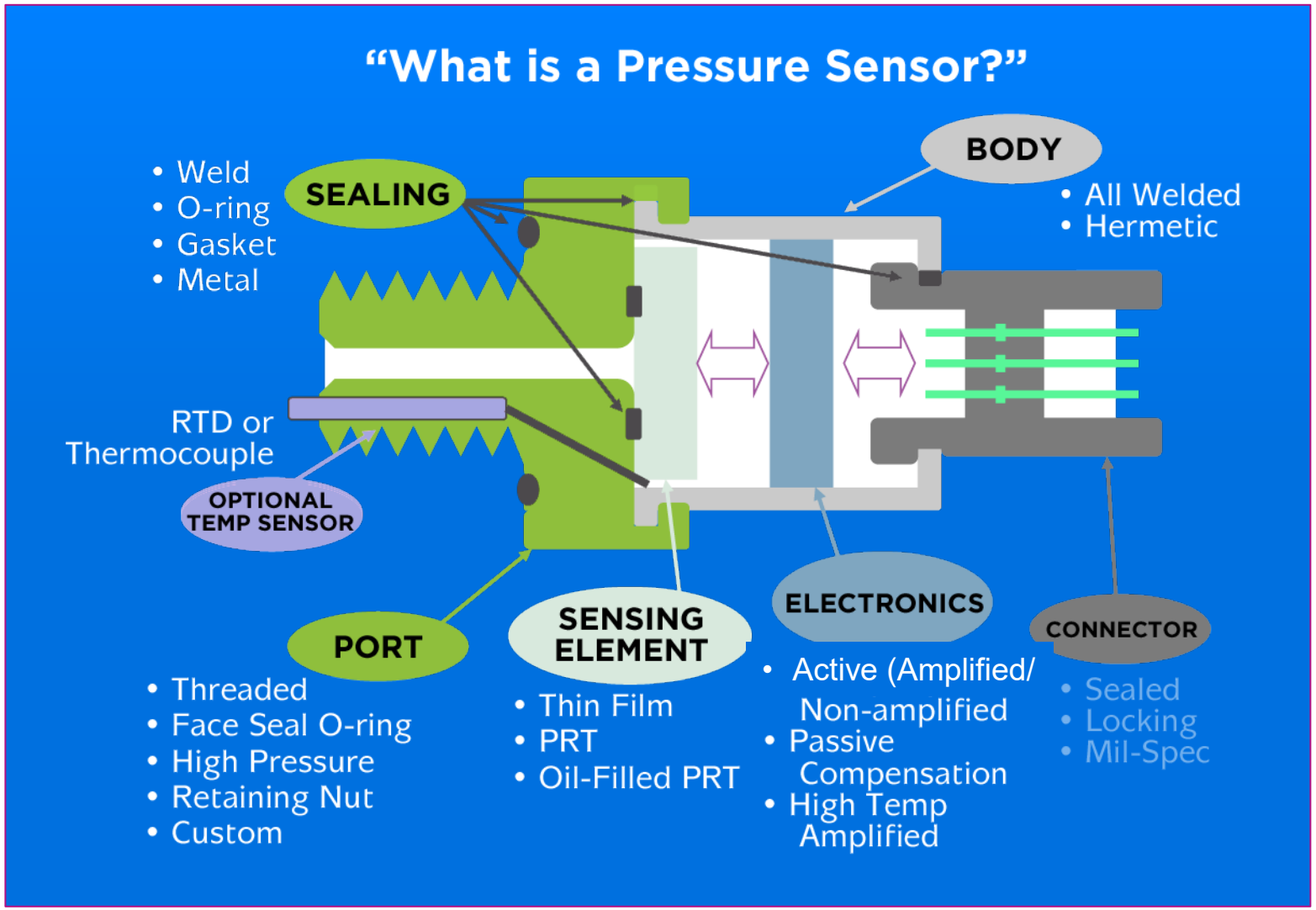
Pressure Sensor Technology



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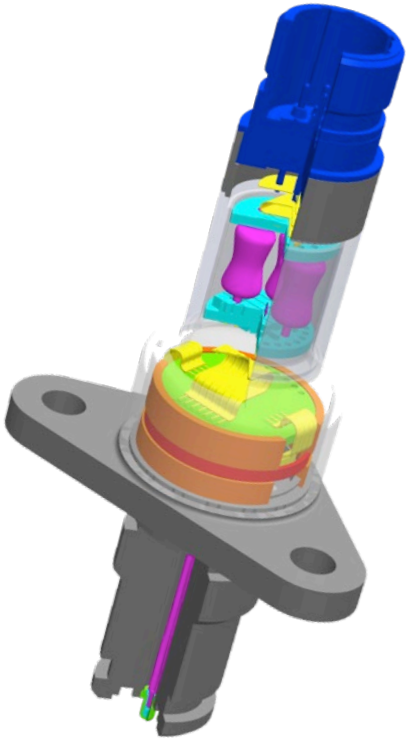
Breakthrough Sensor Technology

Highly robust Thin Film sensor

Patented automated compensation

Unique capability of scaling any electrical or pressure parameter

Highest levels of EMI and Lightning protection



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Performance and Versatility

SENSING AND SIGNALS

- 0.5 to 30,000 PSIA, PSIG, PSID ranges
- Output – 0-28 VDC, Millivolt balanced bridge, 4-20 mA, serial digital
- 10:1 common mode pressure to differential pressure
- Input voltage 5 to 60 VDC

FEATURES

- Active thermal compensation
- Protection from Lightning, Transients, ESD, EMI, reverse polarity
- Ratiometric or regulated power supply
- Pressure and temperature sensors, multiple pressure, and redundant channels
- Isolated and differential output
- Select any output impedance, Input impedance*, operating voltage, common mode and proof pressure

OPERATION

- Highest levels of EMI immunity - DO-160, MIL-STD-461
- Lightning protection (DO-160 Level 5 or higher)
- Impulse pressure spike protection
- 1 million to infinite pressure cycle life
- MTBF >300,000 hours to >1 million hours
- 2x proof and 5x full scale burst pressure with the ability to scale higher
- Shock >100 g's
- Vibration >60 g sine on random
- User adjustability (Where desired)

* Subject to operating voltage and current limit

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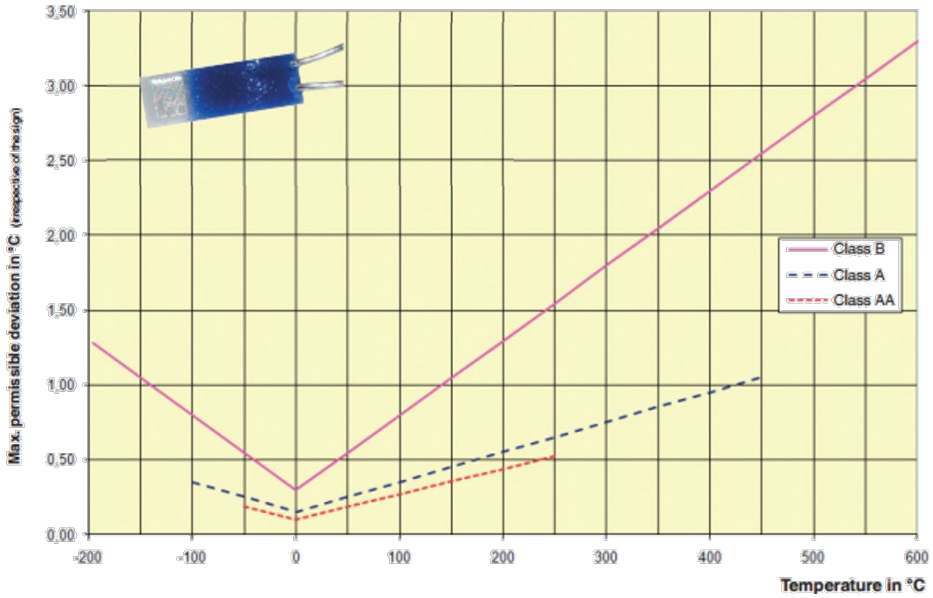
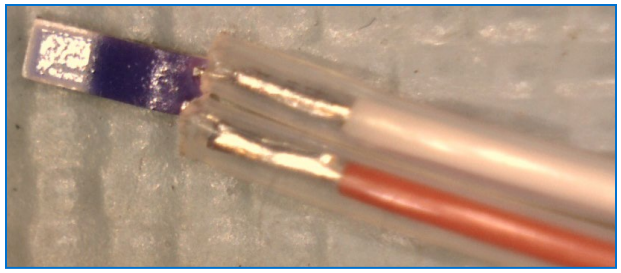
RTD Temperature Sensor

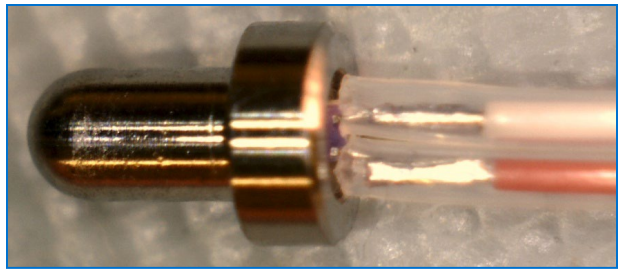
Highly accurate and repeatable RTD per DIN EN 60751 Class A

Or other curves if desired



Encapsulated into themowell (temperature probe cover) with thermally conductive epoxy – for environmental protection





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DESIGN CONSIDERATIONS

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WHAT WE NEED
TO KNOW

When designing a Sensor/Switch

For All

- Operating Pressure Range
- Proof & Burst Pressure
- Temperature Range (Fluid & Ambient)
- Electrical Receptacle
- Pressure Fitting Style
- Envelope/Dimensional Reqs.
- Qualification Requirements
  - Particularly Lightening/Dielectric
- Fluid Media
- Type: Gauge/Absolute/Differential

For Switches

- Actuation/Deactuation Pressure
  - Deadband

For Sensors

- Accuracy Range

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UPFRONT DESIGN **CONDIDERATIONS**

Switches

Common challenges that can mitigated during the design phase of the switch.

Pressure Spikes

Pressure spikes can often occur during startup or during the opening of a valve in the system. These can cause an in-rush of pressure, which if not properly prepared for, can cause multiple component damage on the switch.

Solution: We can add a damping device to alleviate pressure spikes.

Pump Ripple

Pressure pulsation caused by a nearby pump. Causes excessive operation and wear of the unit, and potentially signal chatter as well.

Solution: Can be mitigated by a pressure dampening device.

Negative Pressure

Often occurs during shut down on a closed system, for example, like a fuel system. Negative pressure can cause diaphragm damage.

Solution: We can install a diaphragm support which can prevent damage from negative pressure scenarios.

Low Over High Condition

Certain differential pressure switches can be damaged if the system, even if not operating, experiences a condition where the low side port pressure exceeds that of the high side port. **Solution:** This condition should be presented up front, so the severity of the low over high condition can be evaluated.

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UPFRONT DESIGN **CONDIDERATIONS**

Sensors Part 1

Common challenges that can mitigated during the design phase of the sensor.

What Sense Band is Most Important?

We can optimize our sensors or switches to operate with increased accuracy within very specific band of pressure & temperature. If you know within the operating range, which temp/pressure band is most critical for your application, we can design our switch or sensor to have optimal performance within this range.

Solution: We can optimize our design to operate with improved accuracy in this band.

Pressure Exceeds Initial Design

Very commonly we find that peak pressures can exceed initial estimates. However, if this is not taken into account, the signal range of sensors can be exceeded, resulting in lack of useful data at this range.

Solution: Alert us early if there is the potential for peak pressure to exceed current limit.

Lightening Level/Dielectric Strength

DO-160 Level 3 is Hydra's standard Lightening level.
500 VACrms with >2mA leakage is Dielectric standard.

Solution: We can accommodate higher levels (up to DO-160 Level 5) and 750VACrms, but this needs to be known upfront. Changing this down the road typically requires a redesign which can add significant delays.

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UPFRONT DESIGN **CONDIDERATIONS**

Sensors Part 2

Common challenges that can mitigated during the design phase of the sensor.

Temperature Range

135°C (275°F) and 150°C (302°F) are standard maximum ambient temperatures for Hydra.

Solution: Potentially higher fluid temperatures can be tolerated, especially for short durations. However, higher ambient temperatures cannot.

Accuracy on Differential Pressure

±1% of full scale output is generally standard, but depends a lot of other requirements. On Differential Pressure, full scale can refer to either the operating range, or the differential pressure band.

Solution: On Differential Pressure Sensors, please specify the accuracy for the differential pressure band.

Pressure Media

Air, fuel, hydraulic fluid, oil, etc. This is especially important for us to know for differential sensors.

Solution: Please specify the type of fluid media upfront.

Austin Reed
Director of Sales & Engineering
818-843-6211 x334
areed@hydraelectric.com

Chris Chavez
Manager-Engineering
818-843-6211 x214
cchavez@hydraelectric.com

David Sedlik
Aerospace Sales Engineer
818-843-6211 x224
dsedlik@hydraelectric.com

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THANK YOU

https://hydraelectric.com/

info@hydraelectric.com

+1 (818) 843-6211

3151 N Kenwood St, Burbank,
CA 91505