

Going Custom Sensor

How to identify and work with a custom sensor supplier to get the ideal solution for your application's requirements



First Things First: Do you really need a custom sensor?

If you are designing a product or system that requires some type of pressure, load or torque sensor, then the very first choice to consider is a catalog product. If a good catalog sensor meets your specs without any special adaptations, it may cost less and have a shorter delivery cycle.

If a standard sensor does not meet your specification, it may also be possible to purchase a “customized” version of the catalog product so that it does. Customization can include adapting the standard design to make it more resistant to environmental conditions, adding different connectors or adapting the geometry of the device to fit specific mounting conditions. Catalog sensor manufacturers frequently offer modular adaptations of their products that cost more and generally have longer lead-times.

The other alternative for meeting unique sensor requirements is to purchase a custom sensor that is designed “from scratch” to meet all of your application requirements. The lead-time for the custom sensor will be longer than for the catalog product. However, because custom sensor manufacturers do nothing but make unique sensing devices, the lead-times don’t necessarily vary greatly from a customized catalog sensor.

The custom sensor may or may not cost more than the catalog product. Custom sensor manufacturers can, in some cases, deliver sensors that cost less because they can give their customers a product that includes nothing more than exactly what they need.

If you will work effectively with your custom sensor manufacturer, your partner will likely meet all of your application requirements and it is possible that they will also exceed expectations by delivering a sensor that adds value to your original design. Here are some thoughts on how to choose an appropriate sensing technology partner and maintain a productive working relationship with them.

Define The Critical Issues

Once you have decided on using a custom sensor in your application, you will need to find a supplier who you can work with comfortably and with whom you have confidence. However, before you initiate discussions with potential sensing solution partners, it is important to ask yourself a few questions about what sensor attributes will be most important to your application. These may include:

Performance Requirements:

What are the technical requirements of my application? These could include such considerations as accuracy, stability, thermal effects and resistance to other environmental factors such as shock, vibration or moisture.

Space Considerations:

An unavoidable need to “shoe-horn” a sensor into a confined space is one of the most common incentives for choosing a custom sensor solution. Space conserving sensor designs may be used in new products having unique geometries that make sensors difficult to locate or existing products requiring re-engineering to incorporate a sensor feedback for improved performance.

Cosmetics:

Often the pressure sensing solution is hidden away where no one but the technicians who service the equipment will see it. There are also cases in which high-end devices used in medical, laboratory and other applications are visible to service customers who would find anything but the cleanest possible device packaging as disconcerting. These applications will call for higher levels of cosmetic engineering to preserve high levels of confidence in those who are being served by the equipment.

Delivery Expectations:

Custom sensors are designed from the ground up and the delivery process is well established. As a result, custom sensors usually have a longer delivery cycle but it does not have to be inordinately long. In fact, once the design is approved, custom sensors have very reasonable lead-times for repeat orders.

Cost:

If a custom sensor is needed, then a well-conceived design will meet design requirements at the lowest total cost compared to the marginally acceptable adaptation of catalog sensors to the application. As mentioned previously, the custom solution can even cost less because it will have no unneeded extras in the design. That being said, it is also understood, that cost is always an issue. Having a good working relationship with your partner will ensure that they will do everything they can to limit costs without sacrificing the desired performance of your custom sensor.

Choose A Worthy Partner

Once you have arrived at a basic understanding of your application's sensing requirements you can begin to identify a resource to be your partner in developing and manufacturing your custom sensing solution. Here are some of the things you will need to consider.

Proven Sensing Technology.

There are several different sensing technologies that can be adapted to a broad range of applications and you should be wary of "one size fits all" solutions. A reputable partner will help you identify the right sensing technology for your application and guide you in that direction.

There is one technology that, over the last 50 years, has proven to be the most robust and readily adaptable to the widest range of pressure, load and torque sensing applications. That is the bonded foil strain gage sensor. It is therefore prudent to test the cost and benefits of other solutions against the bonded foil strain gage as a meaningful point of reference for making your final choice. For more information on the bonded foil strain gage ask for our white paper, "Why Bonded Foil."

Anticipating Unspecified Needs.

You are the expert in your product or device but you can't be expected to know all of the subtleties of how such things as the design, configuration and placement of your sensor can make or break your application. You need to have a partner who can anticipate these unspecified requirements and ask a broad range of questions that will allow for the identification of unique problems or

opportunities that could impact your product's cost and performance.

Clear Development Process Methodology.

Custom sensors call for their own development process in parallel with the design and development of your own product. Ask your sensor solution partner to share their development process and especially the critical points where you will need to become involved to ensure the custom sensor will meet specifications and be delivered on time.

Custom Manufacturing Focus.

Custom sensors can be produced cost-effectively in lean manufacturing facilities specifically equipped for custom manufacturing. A true custom sensor manufacturer's products are never "specials" – making application specific sensors is routine for them. As a result, you can be confident that your sensors will not become lost in some side stream of a high volume manufacturing operation – waiting for specialized testing, special tooling, availability of equipment tied up in volume production, etc. You need to be sure that your project won't get log-jammed.



Custom 30lb. load cell used in the medical equipment industry.

Rigorous Testing.

A good partner will be committed to rigorously testing your custom sensor until it faithfully simulates the conditions of your application. Often this calls for not only engineering a custom sensor but also a very sophisticated customized testing apparatus as well. Does the sensor produce the right amount of output? Will it pass simulated stress tests for thousands and thousands of cycles? What are the cost benefit implications of using different sensor materials? These questions need to be addressed systematically but expeditiously to assure you get the sensor you thought you were specifying.

Work Toward Your Solution

Once you have selected your custom sensor partner, it's time to get to work.

Keep the Process Moving:

A good partner already has a proven methodology in place, your goal should be to help move the process along by giving them what they need at each of the development stages, which include:

- In-depth requirements analysis
- Review of business and technical constraints
- Prototype development
- Rigorous testing and simulations
- Prototype approval
- Custom sensor production

Be Accessible:

Custom sensor manufacturers frequently work within the confines of NDA, which protects their customers as well as their own organization from revelations of proprietary information that might compromise a competitive advantage. So there is no reason not to be forthcoming with detailed information that will allow your partner to do his job effectively.

Have High Expectations

Whether you need wireless torque sensing, low profile load cells or a uniquely configured pressure sensor, you should identify a supplier who brings to bear unmatched domain knowledge and experience to customize the sensor and transducer that are an exact fit for your requirements.

Expect a lot from the partner you have chosen. Challenge them to help you introduce the best possible product, perhaps even one with a sensing-based competitive advantage into your market space.

Getting Started: 12 Critical Questions

Whether you meet for the first time in person or via a teleconference, you should be prepared to provide answers to 12 critical questions that will allow your chosen partner to begin designing a sensing solution ideally suited to meeting all of your requirements. Having these answers in hand will enable them to get back quickly with initial recommendations and your relationship will be off to great start.

1. What do you want to measure?

- Pressure
- Load
- Torque

2. Over what range will the measurements be taken?

3. How much overload should the device be capable of withstanding without failing?

4. What are your accuracy requirements?

5. What output signal will the device generate?

- Millivolts
- Volts
- Milliamps

6. Are there environmental factors that will impact sensor life or performance?

- Extreme Temperatures (hot or cold)
- Aggressive chemicals (acids, abrasives, etc)
- Shock
- Vibration
- Moisture

7. How will the sensor be mounted?

- Pressure port?
- Bolted Assembly

8. What is the size and shape of the area where the sensor will be located?

9. What are your connectivity requirements?

- Connector
- Cable
- Wireless

10. What power supply is available?

- Battery 3V
- Precision 5V
- Regulated 9 to 26V
- Other _____

11. How many sensors will be needed over what time frame?

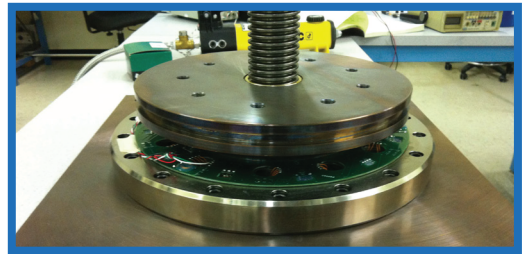
12. What are your “total cost of ownership” objectives for the sensor’s life cycle?

Creating the Best Fit for Your Needs

Answers to these questions will be the starting point for addressing the many technical considerations that go into an optimal sensing solution design. For example what material should be chosen for mounting the strain gage pressure transducer in sensor? The most commonly used materials are aluminum, stainless steel and Titanium. Aluminum is relatively inexpensive and

produces a high level of output per unit of strain. Aluminum, however is more vulnerable to aggressive chemicals and abrasives. Titanium is very strong and has high chemical resistance. There are also two grades of stainless steel that are used frequently, each with its own advantages and disadvantages.

The material recommended for your application will depend on your answers to questions 2, 4, 6, and 12. The initial approach to many other sensor design issues will be analyzed in a similar fashion. This is why your partner needs to know as much as possible about the nature of your application and where sensing fits in.



Custom 100,000 lb. load cell used in the transportation industry.



Viatran

38 Forge Parkway
Franklin, MA 02038
Phone: +1-716-629-3800
Toll Free: +1-800-688-0030
Fax: 716-693-9162
Email: VTcustomerservice@viatran.com
Web: www.viatran.com

