White Paper

BALLUFF
sensors worldwide

# Increasing Sensor Life and Production Productivity

## *Sensor Solutions for Impact, Heat, and Slag Rich Environments*

**Today's new sensor designs are constantly improving. Advances in electronics, new sensor configurations, and increased sensor robustness are driving down the cost of sensors and increasing product quality and overall production efficiency. However, incorrect application of sensors – even of more advanced sensors – can often lead to increased sensor wastage, higher production costs, and lower productivity. In general, selecting a sensor that can do the job without the need for constant replacement, even if the sensor is of higher cost, is a far more efficient way to increase overall production productivity and profitability.**

***It's Not Just the Sensor***

**Think of a sensor as a mini system. There's the sensor itself. Then there's the means of holding it in position. Then there's the connector and cable. And then there is the equipment and application expertise often needed to choose the right sensor for the job and to keep the sensor and its components from incurring premature failure.**

**Impact and abrasion, plus heat and slag are usually the conditions that are most dangerous to the sensor and to your overall productivity. Impact and abrasion can be found in almost any sensor environment. In addition, weld cells add to the added dangers of heat and slag.**

# Impact

Impact causes more sensor wastage than all other factors combined. In fact, the vast majority of all premature sensor failures are caused by systemic or incidental impact. If a sensor is in danger of being hit, there are five basic remedies to the situation:

- Use a more robust sensor
- Use a smaller sensor with the same range
- Use a different type of longer range sensor
- Move the sensor out of the way
- Protect the sensor

## Use a more robust sensor

If the sensor is in danger of random impacts, using a one-piece stainless steel bodied sensor will greatly increase the life expectancy of the installation. These sensors will take repeated blows to their face and sides and still continue to function. Their housings are made from a gun drilled piece of solid stainless steel 316 or harder, creating an extremely rugged one piece body. These sensors can operate perfectly within the most physically abusive environments and continue to function – withstanding repeated blows from heavy objects during loading operations, or from general incidental impacts. Their ability to thrive in this difficult environment results in less downtime and lower maintenance costs. Some models are available in ferrous/non-ferrous versions, extended range versions, plus extended range PTFE coated versions for weld cell applications. **For more information go to: www.balluff.com/steelface.**

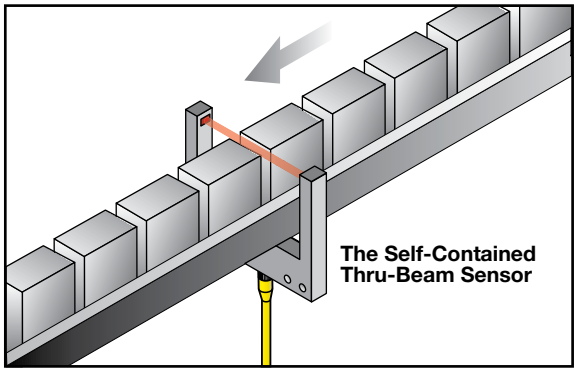
*These sensors have been destroyed by impact or abrasion. One-piece stainless steel sensors are the go-to sensors for harsh sensing environments. They can take brutal punishment and still keep functioning.*

### Use a smaller sensor

Sometimes a sensor is just too big for the task and gets in the way of the action too easily. Today's sensor technology is constantly reducing the ratio of size vs range. The remedy here is to switch to a smaller sensor with the same or greater range. Many inductive proximity models are available, down to 3mm in diameter.

### Switch to a different kind of sensor

Another answer is to switch to a different sensor style, such as from an inductive proximity type to a long range photoelectric analog or digital sensor. Often, depending on the application, these types can do the same or better job as the inductive prox, but from a distance that keeps them out of harm's way. Often this substitution will pay dividends in overall space utilization. Replacing the existing sensor with a similar sized extended sensing range model works especially well where sensor face abrasion is the problem as opposed to direct impact. Change the type of sensor being used, if allowable in the specific environment. Another solution is to use a self-contained thru-beam fork sensor, which uses a laser beam to sense the position of a solid object. These sensors come in various configurations and sensing modes for use in a multitude of applications.

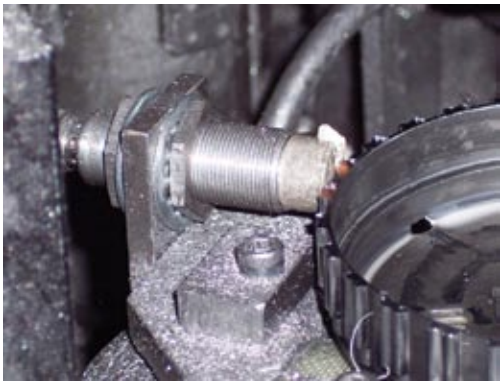



*Thru-beam fork sensors can solve a range of sensor application problems.*

**For more information go to: www.balluff.com/bgl**

### Move the sensor out of the impact zone

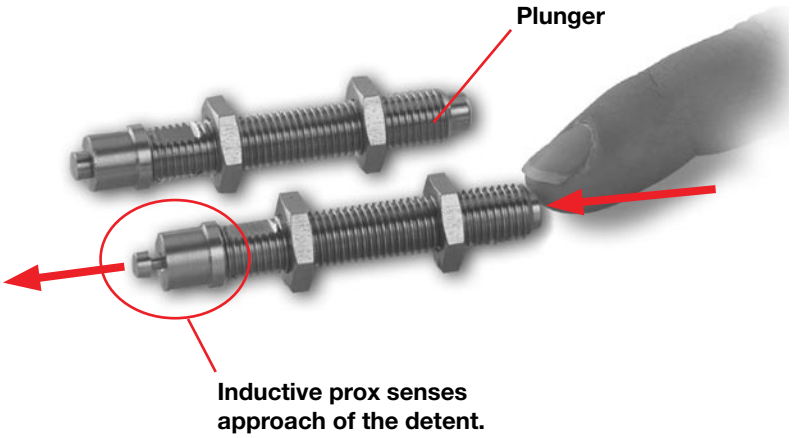
Sometimes this can be done by relocating the sensor slightly so that the trajectory of the object it is sensing will miss it automatically, or substituting one with greater range.



*The face of this inductive proximity sensor is being worn away because it is too close to its target.*

## Use a device such as an inductive proximity actuator

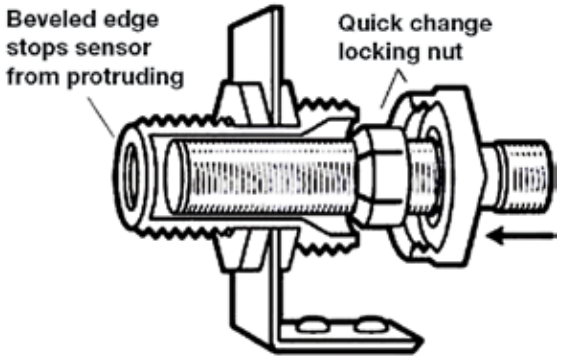
A prox actuator is a simple spring loaded device that is inserted between an inductive prox and its target such that the object being detected presses against the prox actuator, enabling the prox to read the actuator instead of the primary object. This avoids damage to the sensor in systemic contact situations and can also be used in certain applications to protect the sensor from high heat.




**For more information go to: www.balluff.com/accessories**

## Use a prox mount

Prox mounts offer additional protection from impact damage to a flush-style inductive proximity sensor by providing an external protection housing that encloses the entire sensor body up to the sensor face. Prox mounts also offer other productivity advantages such as the ability to provide fast removal and replacement of sensors without the need of physical readjustment.




**For more information go to: www.balluff.com/accessories**

### Bunker your sensors

Bunkering sensors provide a higher degree of positive performance when it comes to resistance to severe impacts. Bunker blocks are cubes of solid aluminum or steel, designed to incorporate a prox mount within them. They come in different shapes to handle installations where space constraints occur. Extremely heavy impact may destroy a sensor, even when mounted in a prox mount, but a bunker block will resist unusually hard hits such as, heavy parts being slung into a cell, or components inadvertently being dropped onto a weld cell. In addition, bunker blocks are constructed of heavy aluminum, which retards adherence of weld debris and also serves as thermal protection for the sensor.

**For more information go to: www.balluff.com/bunkerblock**

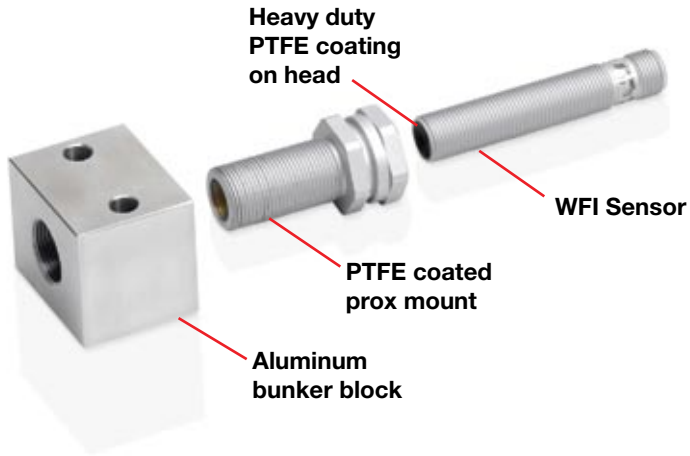
## Heat and Slag

Heat, especially heat found in weld cells, is a major problem, not just for sensors, but for their associated cables and connectors as well. Hot slag accumulation and elevated ambient temperatures created by welding operations can degrade sensor performance and destroy unprotected connectivity. Weld cells can consume large quantities of sensors when they are not applied correctly, or are not protected from the hostile weld environment. Balluff has developed a total solution for this issue.

### Use PTFE protection

Problems created by ambient heat and localized heat from weld splatter can be dramatically reduced by using protective products made with medical grade silicone products which provide total protection, not only for the sensor, but for the connector and cable as well.

## Protecting sensors

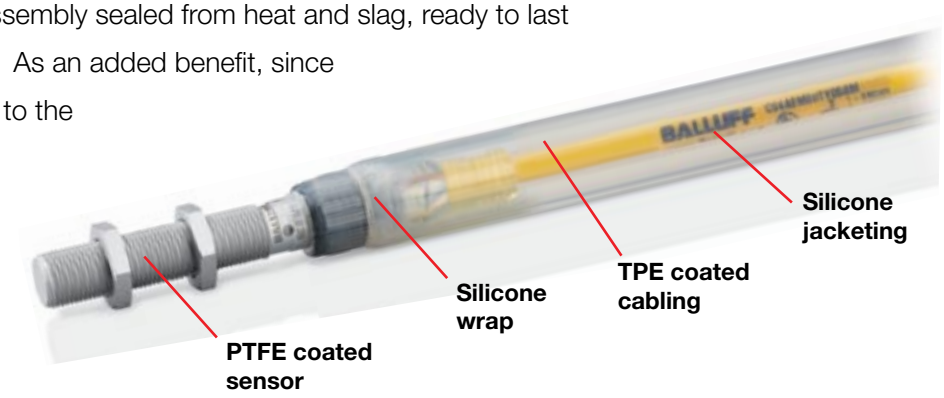



Steel bodied sensors with PTFE coating are an unbeatable combination in weld cells where sensor weld field immunity is not required. However, Weld Field-Immune (WFI) sensors equipped with slag shedding PTFE coating on their faces are usually the sensors of choice in weld cell applications. When WFI sensors need further protection, bunker blocks equipped with quick-change prox mounts can be added. Since bunker blocks are made of machined aluminum and prox mounts are PTFE coated, the entire system repels weld slag accumulation while simultaneously acting as a heat sink.

## Protect connectivity from heat and weld slag

It doesn't help protecting the sensor only to have its connectivity fail. The first step to prevent connectivity failure in weld cells is to specify TPE jacketed cabling. TPE jackets withstand weld slag far better than PVC or PUR coatings. For added protection, specify PTFE products to finish the job and dramatically reduce weld cell maintenance. Medical grade silicone-based wrap and jacketing protects sensors, cabling, and connectors not only from 500° ambient and localized slag heat, but from the accumulation of slag weight as well.

Medical grade silicone jacketing slips over cabling, connectors, and sensors to provide a heat barrier and prevent slag damage to the cable and connector. It is attached by medical grade silicone-based wrap, which is wrapped around the sensor and jacketing junction like tape around a hockey stick. This provides an entire assembly sealed from heat and slag, ready to last months rather than days. As an added benefit, since slag does not easily stick to the silicone jacketing, its weight doesn't build up to pull cabling from its connectors. These products provide the most significant increase in weld cell productivity in years.




**For a full discussion of weld cell issues go to www.balluff.com/welding.**

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### Object Detection
Inductive sensors BES, cylinder sensors BMF, magnetic field sensors BMF, capacitive sensors BCS for object detection, ultrasonic sensors BUS for object detection, photoelectric sensors BOS, fiber optic devices BFB, through-beam fork sensors BGL, optical window sensors BOW, light grids BLG, contrast sensors BKT, luminescence sensors BLT, color sensors BFS, mechanical and inductive single and multiple position switches BNS

### Linear Position Sensing
Micropulse transducers BTL, magnetic linear encoder system BML, incremental encoders BDG, absolute encoders BRG, inductive displacement system BIW, inductive distance sensors BAW, magnetoinductive distance sensors BIL, capacitive distance sensors BCW, photoelectric distance sensors BOD, ultrasonic sensors BUS for analog distance measurement

### Fluid Sensors
Pressure sensors BSP, capacitive sensors BCS for level detection

### Industrial RFID
Industrial RFID systems BIS, vision sensors BVS

### Industrial Networking and Connectivity
Connectors and connection cables BCC, valve connectors BCC, passive splitter boxes BPI, active splitter boxes BNI, IO-Link, inductive couplers BIC, bus systems (Profibus, Profinet, CC-Link, DeviceNet, EtherNet), wireless systems BWT, power supplies BAE, electrical devices BAE

### Mechanical Accessories
Brackets and mountings, mounting system BMS

**www.balluff.com**