

# Important Safety Warning!



**TURCK** sensors and peripheral devices **DO NOT** include the self-checking redundant circuitry required to permit their use in personnel safety applications. A device failure or malfunction can result in either an energized or a de-energized output condition.

Never use these products as sensing devices for personnel protection. Their use as safety devices may create unsafe conditions that could lead to serious bodily injury or death.

## Selection Guide - Section A

### How does Proximity Sensing compare to conventional methods?

**TURCK** proximity sensors are entirely solid state electronic controls that contain no moving parts to wear out as do mechanical switches. They require no physical contact for actuation, no cams or linkages, have no contacts to bounce or arc and are completely encapsulated, making them impervious to most liquids, chemicals and corrosive agents. In addition, **TURCK** has a line of sensors that can be used in hazardous explosive environments without any special enclosures. See Hazardous Area Locations in Section A.

If any of the following conditions exists, a Proximity Sensor should be used:

- The object being detected is too small, too lightweight, or too soft to operate a mechanical switch.
- Rapid response and high switching rates are required, as in counting or ejection control applications.
- Object has to be sensed through non-metallic barriers such as glass, plastic, or paper carton.
- Hostile environments demand improved sealing properties, preventing proper operation of mechanical switches.
- Long life and reliable service are required.
- Fast electronic control system requires bounce-free input signal.

### Proximity Sensors are being used today in all industries:

- |  |   |
|--|---|
| Mining and Metallurgy                      | Sheet Metal Fabrication                       |
| Foundries                                  | Automotive and Appliance Plants               |
| Automatic Assembly and Robotics            | Electroplating Installations                  |
| Conveyor Systems in Airports and Factories | Can Plants, Food Processing and Breweries     |
| Chemical Plants and Oil Refineries         | Shipyards, Docks, and Off-shore Drilling Rigs |
| Semiconductor Equipment                    | PC-board Handling Machinery                   |

### Typical applications:

- |                                       |                      |                           |
|---------------------------------------|----------------------|---------------------------|
| Parts Detection                       | Void or Jam Control  | Valve Position Indication |
| Parts Counting                        | Feed Control         | Missing Parts Control     |
| Positioning                           | Indexing             | Parts Diverting           |
| Motion and Speed Control              | Inter-lock Control   | Coin Counting and Sorting |
| Bottle Cap or Can Lid Detection       | Liquid Level Control | Edge Guide Control        |
| Punch Press Feed and Ejection Control | Leak Detection       | Robotics and Conveyors    |
| Broken or Damaged Tool Detection      | Machine Programming  |                           |

### Axial Approach

The approach of the target with its center maintained on the sensor reference axis.

### Axially Polarized Ring Magnet

A ring magnet whose poles are the two flat sides of the disk. Mounted on pistons for *permaprox*<sup>®</sup> cylinder position sensing through nonmagnetic cylinder walls.

### Capacitive Proximity Sensor

A proximity sensor producing an electrostatic field that senses conductive targets and nonconductive materials having a dielectric constant of >1 within its sensing zone.

### Complementary Output

Two outputs, one N.O. and one N.C., that can be used simultaneously. ***The sum of both load currents cannot exceed the sensor's rated Continuous Load Current.***

### Continuous Load Current

The maximum current allowed to continuously flow through the sensor output in the ON state.

### Correction Factors

Percentage of the rated operating distance (Sn) that represents the operating distance for targets constructed from materials other than mild steel (mild steel's correction factor is 1.0).

### Differential Travel (Hysteresis)

The difference between the operating point as the target approaches the sensor face, and the release point as the target moves away. Given as a percentage of the operating distance (Sn).

### Dynamic Output

A sensor output that stays energized for a set duration of time, independent of the time the target is present (one-shot).

### Embeddable (Shielded) Proximity Sensor

A sensor that can be flush-mounted in any material without that material influencing the sensing characteristics.

### Free Zone

The space around a proximity sensor that must be kept free of any material capable of affecting the sensing characteristics.

### Inductive Proximity Sensor

A proximity sensor producing an electromagnetic field that senses only metal targets within its sensing zone.

### Inductive Magnet Operated Sensor (*Permaprox*<sup>®</sup>)

A solid-state sensor consisting of a sensing element susceptible to magnetic field strengths of 20-350 Gauss, and switching circuitry similar to that of an inductive proximity sensor.

### Inrush Current

The maximum short-term load current that the output of a sensor can tolerate.

### IP Rating

Ingress Protection rating per IEC 529.

### Lateral Approach

The approach of a target perpendicular to the sensor reference axis.

### Load

A device or circuit that is operated by the energy output of another device such as a proximity sensor.

### M Threading

ISO 68 Metric straight threading, designated as "Nominal Size" X "Pitch", in mm. (Ex. M5X0.5)

### Minimum Load Current

The minimum amount of current that is required by the sensor for reliable operation.

### NAMUR

The acronym for a European standards organization.

### NAMUR Sensor

A 2-wire variable-resistance DC sensor whose operating characteristics conform to DIN 19 234. Requires a remote amplifier for operation. Typically used for intrinsically safe applications.

### NEMA Rating

An enclosure rating per NEMA Standard 250.

### No-Load Current

The current drawn by a DC proximity sensor from the power supply when the outputs are not connected to a load.

### Nonembeddable (Nonshielded) Proximity Sensor

A sensor is nonembeddable when a specified free zone must be maintained around its sensing face in order not to influence the sensing characteristics.

### Normally Closed (N.C.)

The output is OFF when the target is detected by the sensor.

### Normally Open (N.O.)

The output is ON when the target is detected by the sensor.

### NPN Output (Current Sinking)

A transistor output that switches the common or negative voltage to the load. Load is between sensor and positive supply voltage.

## NPSM Threading

American National Standard Straight Pipe Thread for Free-Fitting Mechanical Parts.

## NPT Threading

American National Standard Taper Pipe Thread.

## Off-State (Leakage) Current

The current that flows through the load circuit when the sensor is in the OFF-state. Also known as leakage or residual current.

## Operating Distance

A distance at which the target approaching the sensing face along the reference axis causes the output signal to change.

## Overload Protection

The ability of a sensor to withstand load currents between continuous load rating and short-circuit condition with no damage.

## PG Threading

Steel conduit threading per German standard DIN 40 430.

## PNP Output (Current Sourcing)

Transistor output that switches the positive voltage to the load. Load is between sensor and common.

## Programmable Output

Sensor output whose N.O. or N.C. function can be selected by means of a jumper or specific terminal connection.

## Radially Polarized Ring Magnet

A ring magnet whose poles are the inner and outer diameter rings.

## Rated Operating Distance (Sn)

A conventional quantity used to designate the operating distance. It does not take into account either manufacturing tolerances or variations due to external conditions such as voltage and temperature.

## Reference Axis

An axis perpendicular to the sensing face and passing through its center.

## Repeatability

The difference between actual operating distances measured at a constant temperature and voltage over an 8-hour period. It is expressed as a percentage (%) of rated operating distance (Sn).

## Response frequency

The maximum rate that the output can change in response to the input and still maintain linearity.

## Response Time

The time required for the device switching element to respond after the target enters or exits the sensing zone.

## Reverse Polarity Protection

Internal components that keep the sensor from being damaged by incorrect polarity connection to the power supply.

## Ripple

The alternating component remaining on a DC signal after rectifying, expressed in percentage of rated voltage.

## Sensing Face

The surface of the proximity sensor through which the electromagnetic (or electrostatic) field emerges.

## Short-Circuit Protection

The ability of a sensor to withstand a shorted condition (no current-limiting load connected) without damage.

## Slew Rate

The rate of change of the output voltage with respect to a step change in input. A change in output of 0 to 10 volts at a slew rate of 1.25 V/ms would take 8 ms to slew to the new value.

## Solid State

Pertains to devices using semiconductors instead of mechanical parts.

## Static Output

A sensor output that stays energized as long as the target is present.

## Switching Frequency

The maximum number of times per second that the sensor can change state (ON and OFF) under ideal conditions, usually expressed in Hertz (Hz).

## Time-Delay Before Availability

The length of time after power is applied to the sensor before it is ready to operate correctly, expressed in milliseconds (ms).

## Uprox Sensor®

An inductive proximity sensor that detects all metals at the same range. Uprox sensors are inherently weld-field immune, operate over a wider temperature range and have a higher switching frequency than standard inductive sensors.

## Weld-Field Immunity (WFI)

The ability of a sensor not to false-trigger in the presence of strong magnetic fields typically produced by resistance welders.

## Wire-Break Protection

Results in the output being OFF on a DC sensor if either supply wire is broken.