

# BFF3302 SENSOR AND INSTRUMENTATION SYSTEM

## Proximity/distance sensor

By

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# Chapter Description

- Aims
  - Obtain basic knowledge about distance & proximity sensors.
- Expected Outcomes
  - Able to describe and use distance/proximity sensor and solve problems related to the sensors.
- References
  - Introduction to signal processing, instrumentation, and control : an integrative approach / Joseph Bentsman Hackensack, NJ : World Scientific Pub., 2016
  - Transducers for instrumentation / M. G. Joshi, New Delhi, India : Infinity, 2017
  - Instrumentation and measurement in electrical engineering / e Harinirina Randrianarisoa, New York : Arcler Press, 2017



# PROXIMITY SENSOR

- ❖ Inductive Proximity Sensor
- ❖ Capacitive Proximity Sensor
  
- ❖ For each sensor/transducer, find out the;
  1. Working principle
  2. Characteristics and construction of sensor
  3. Application
  4. Advantages
  5. Disadvantages

# INTRODUCTION TO PROXIMITY SENSOR

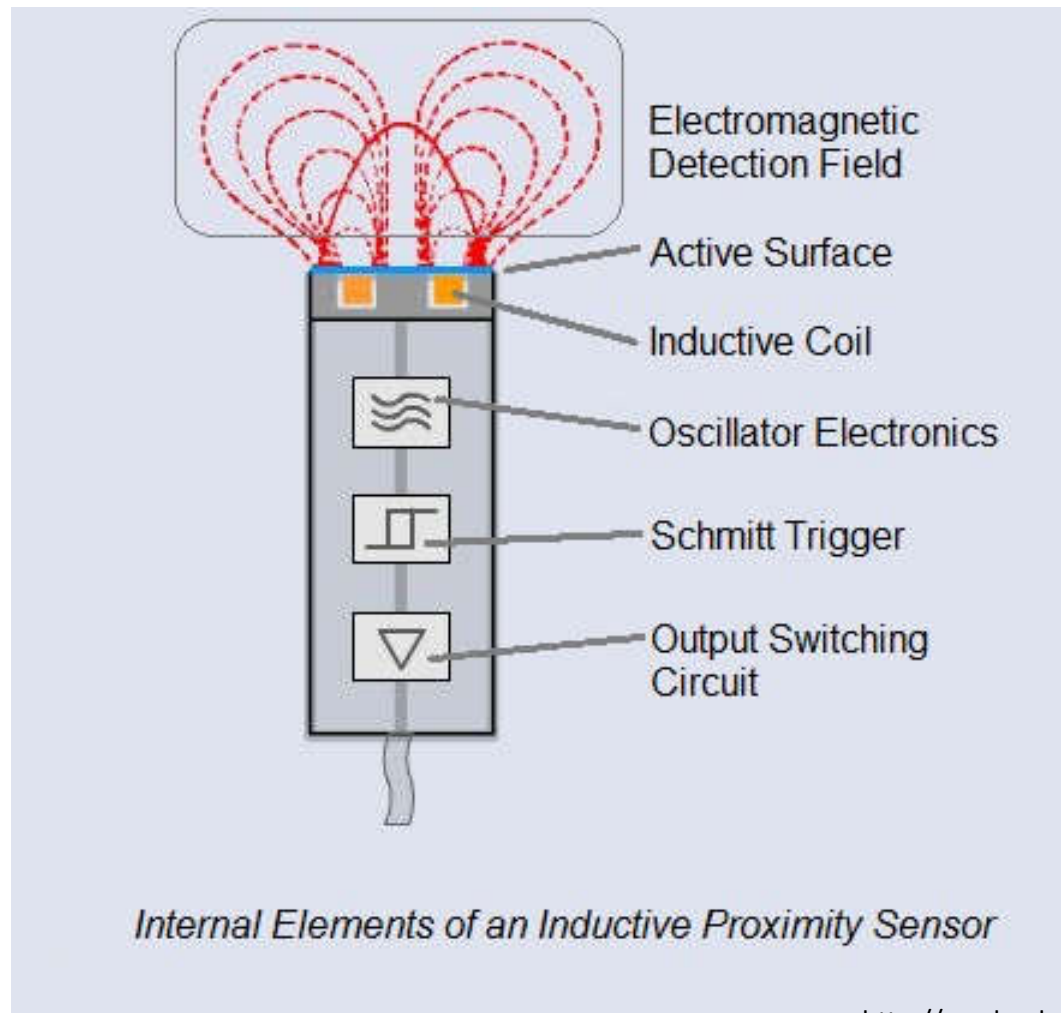
- There are many types of proximity sensors (PS) which are:-
  - Inductive PS,
  - Capacitive PS,
  - Magnetic PS,
  - Optical PS,
  - Ultrasonic PS and
  - Pneumatic PS.

# INTRO TO PROXIMITY SENSOR

- Typical fields of application for proximity sensors are in the areas of:
  - Automotive industry
  - Mechanical engineering
  - Packaging industry
  - Timber industry
  - Printing and paper industry
  - Drinks and beverages industry
  - Ceramics and brick industry

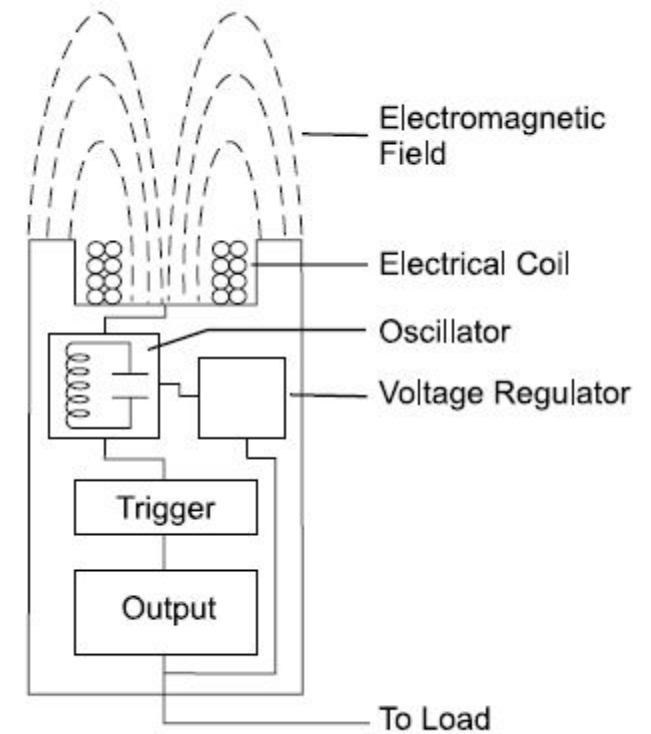
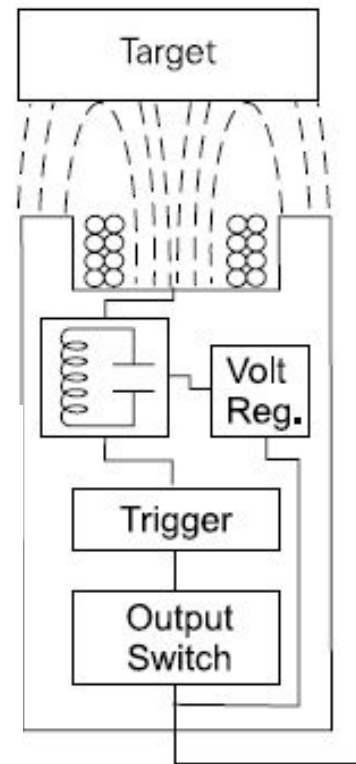
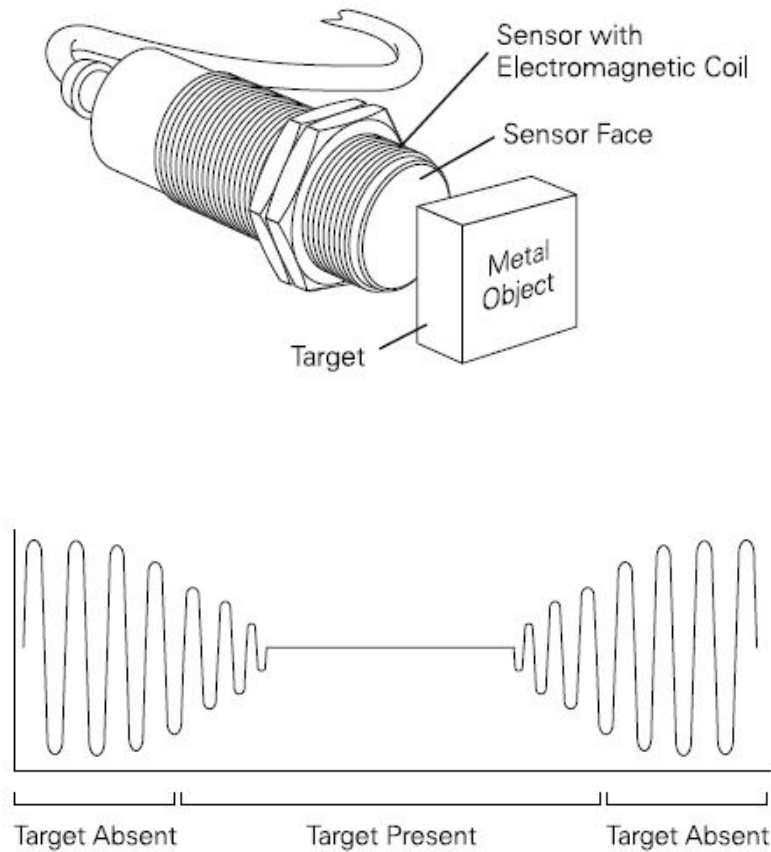
# Inductive Proximity Sensor

## - Fundamental -



<http://mechplanet.org/proximity-sensors/>

# Inductive Proximity Sensor



[www.automationmedia.com/Port1050/SiemensFreeCourses](http://www.automationmedia.com/Port1050/SiemensFreeCourses)

<http://geniusdevils.com/2013/04/inductive-proximity-sensors/>

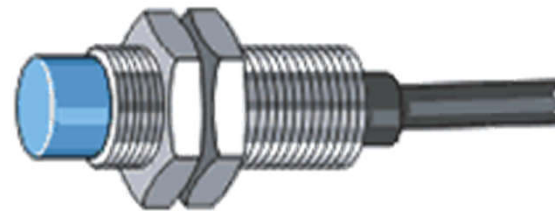
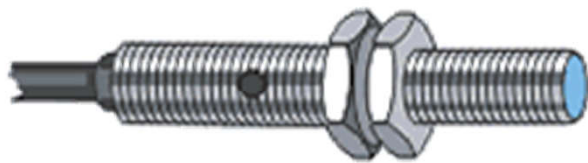




# Shielding

Proximity sensors contain coils that are wound on ferrite cores. They can be shielded or unshielded. Unshielded sensors usually have a greater sensing distance than shielded sensors.

[www.automationmedia.com/Port1050/SiemensFreeCourses](http://www.automationmedia.com/Port1050/SiemensFreeCourses)  
[http://www.omron-ap.com/service\\_support/FAQ/FAQ02657/index.asp](http://www.omron-ap.com/service_support/FAQ/FAQ02657/index.asp)



**Shielded Sensor**

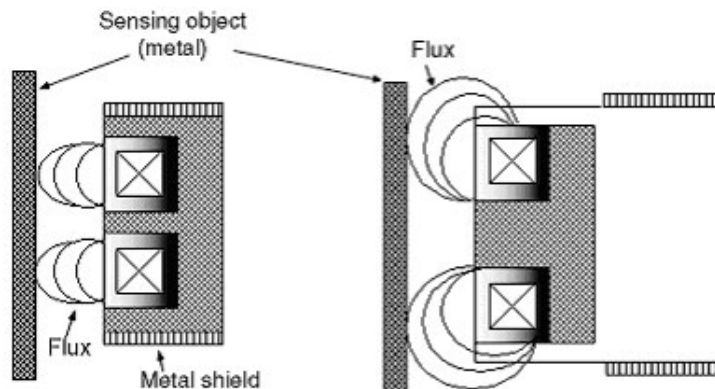


Figure 1  
Shielded Sensor (Cross Section)

**Unshielded Sensor**

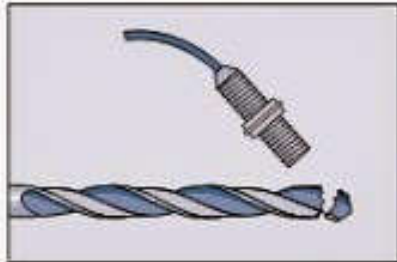


Figure 2  
Unshielded Sensor (Cross Section)

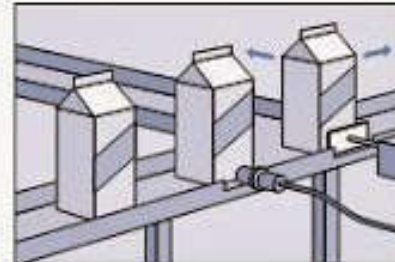




# Application of inductive sensors

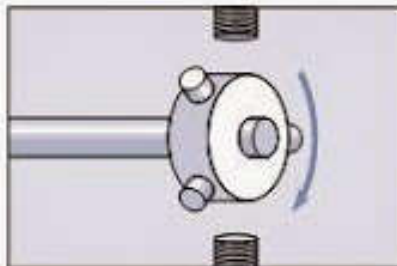


Application  
Detecting the  
Presence of a Broken  
Drill Bit

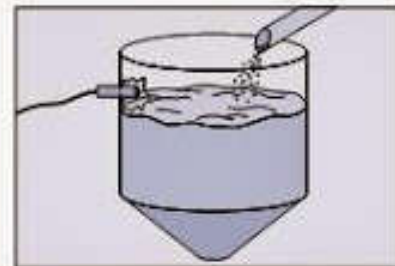


Application  
Detecting Milk in  
Cartons

Sensor  
Capacitive

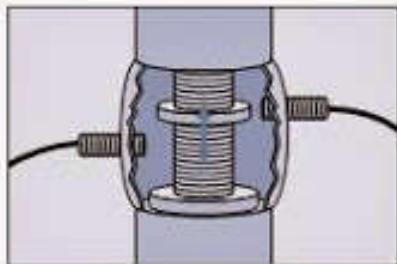


Application  
Detecting Presence of  
Set Screws on Hub for  
Speed or Direction  
Control

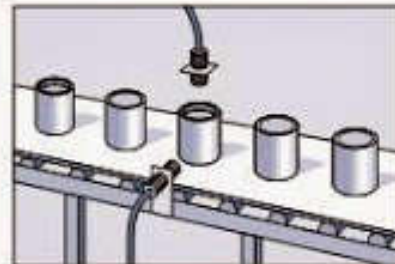


Application  
Controlling Fill level of  
solids in a bin

Sensor  
Capacitive



Application  
Detecting Full Open or  
Closed Valve Position



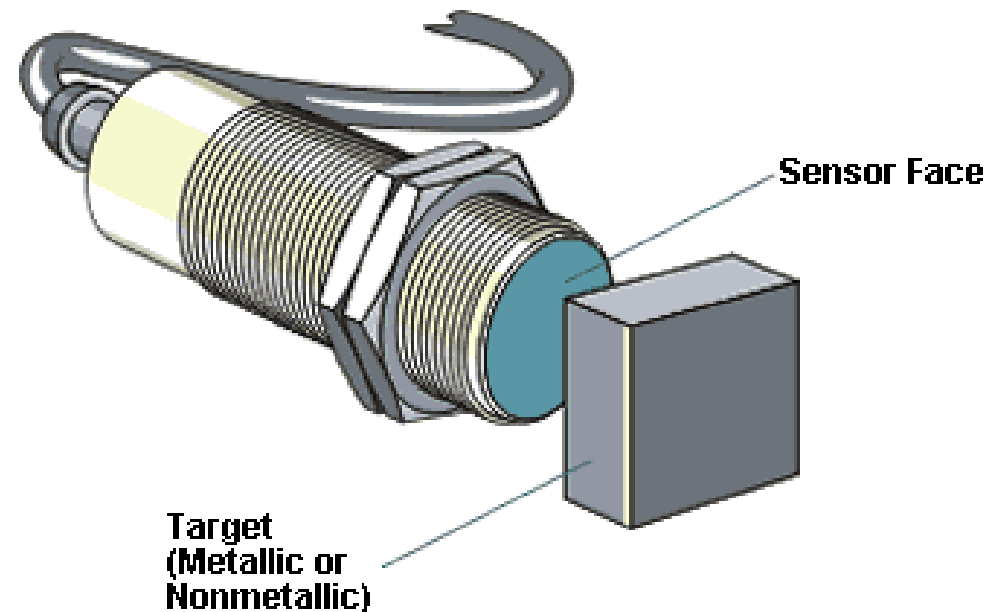
Application  
Detecting Presence of  
Can and Lid

<http://plc-scada-dcs.blogspot.my/2015/05/inductive-proximity-sensor-applications.html>

# CAPACITIVE PROXIMITY SENSOR

## Capacitive Proximity Sensors

Capacitive proximity sensors are similar to inductive proximity sensors. The main difference between the two types is that capacitive proximity sensors produce an electrostatic field instead of an electromagnetic field. Capacitive proximity switches will sense metal objects as well as nonmetallic materials such as paper, glass, liquids, and cloth.

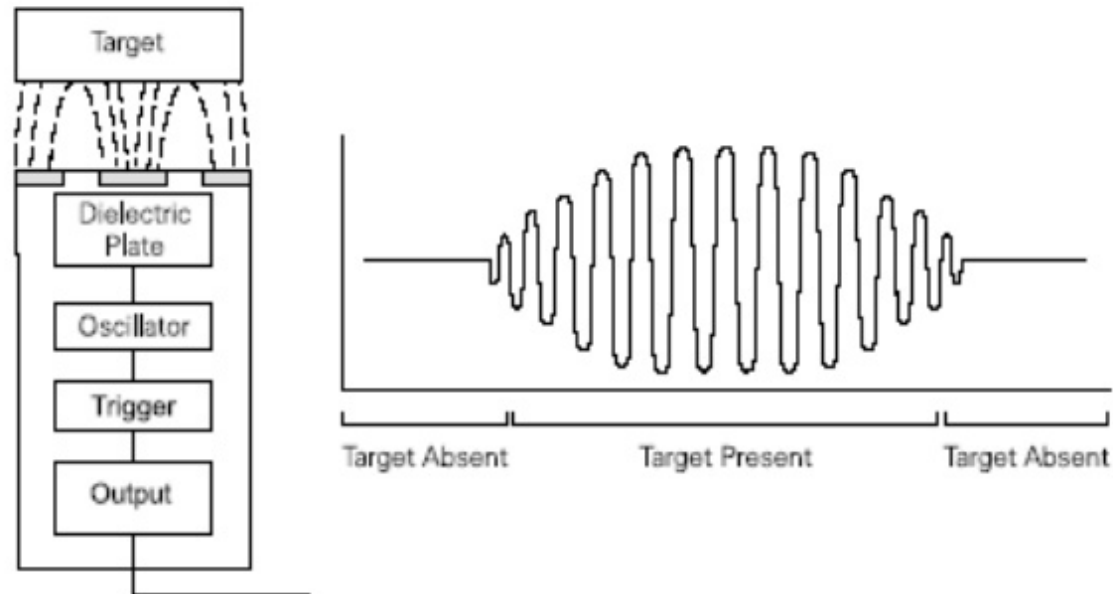


[www.automationmedia.com/Port1050/SiemensFreeCourses](http://www.automationmedia.com/Port1050/SiemensFreeCourses)



# CAPACITIVE PROXIMITY SENSOR: Theory of Operation

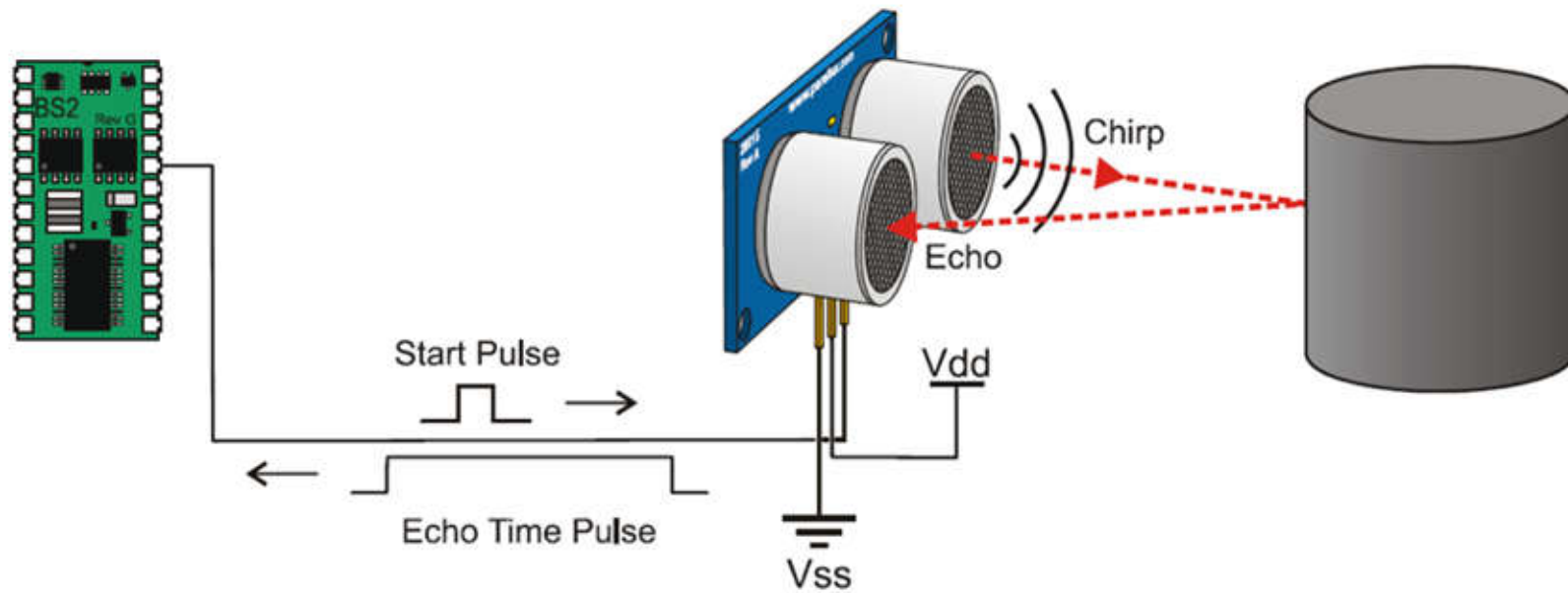
## Capacitive proximity sensors



<https://www.slideshare.net/satyanaveenvyas/proximity-sensors>

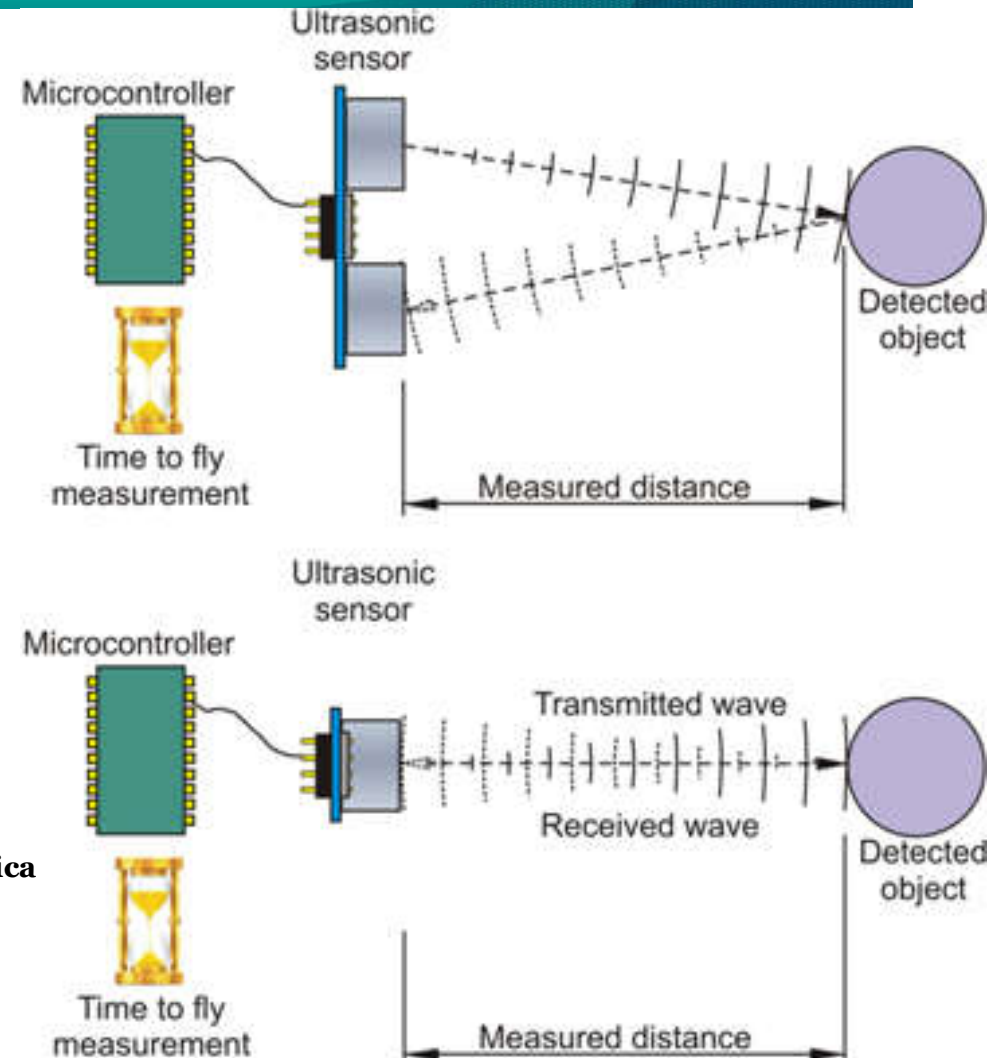
By: Satyabodha Vyasasamudra

# Ultrasonic Sensor



<http://arduinosenors.com/index.php/arduino-ultrasonic-distance-sensor/>

# Principle of operation

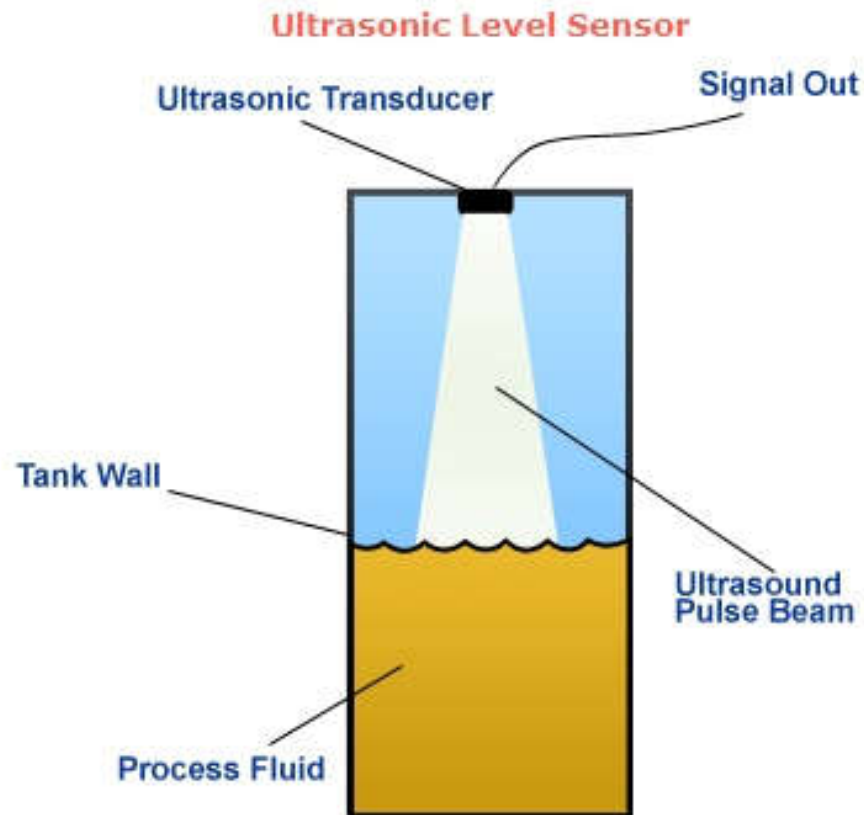


<http://pubs.sciepub.com/automation/3/3/6/>

**Michal Kelemen, Ivan Virgala, Tatiana Kelemenová, Ľubica Miková, Peter Frankovský, Tomáš Lipták, Milan Lörinc**  
*Journal of Automation and Control.* **2015**, 3(3), 71-74  
doi:10.12691/automation-3-3-6



# Liquid Level System using Ultrasonic Sensor



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By: Lizzie:

[http://automationwiki.com/index.php?title=Ultrasonic\\_Level\\_Measurement](http://automationwiki.com/index.php?title=Ultrasonic_Level_Measurement)



# Infrared Sensor

1. Working principle
2. Characteristics and construction of sensor
3. Application
4. Advantages
5. Disadvantages