

# **SNS COLLEGE OF ENGINEERING**

Kurumbapalayam (Po), Coimbatore – 641 107

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## **DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**COURSE NAME : 190E219 BUILDING AUTOMATION**

IV YEAR /VII SEMESTER

Unit 1- HVAC SYSTEM

Topic : Flow Sensor



# Introduction



- Flow meters are the devices used for measuring the flow rate of liquids or gases.
- Flow rate can be defined as the volume of fluid flowing through an area in unit time.
- In a pipe, the flow rate can be expressed in terms of speed of the fluid and the cross-sectional area of the pipe.



# Classification

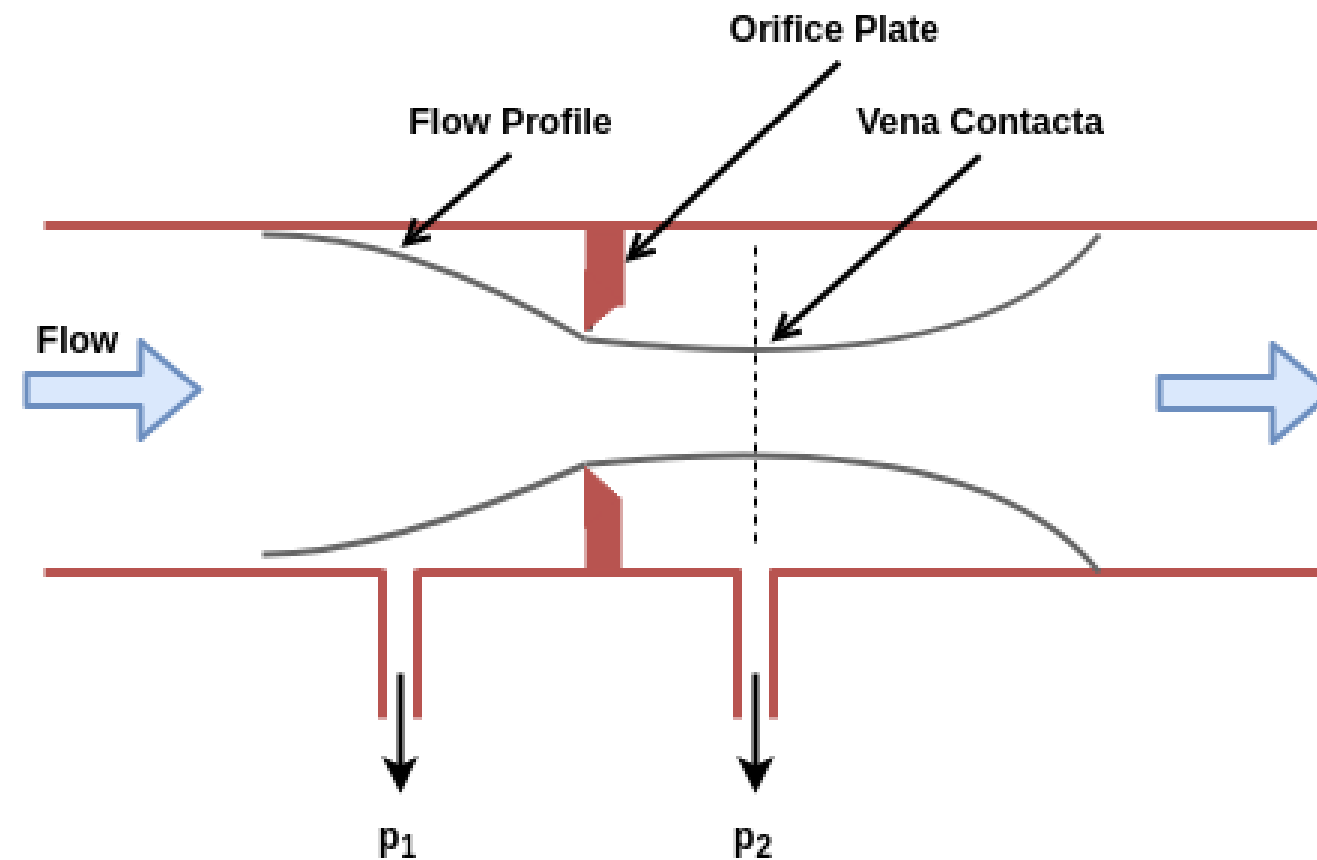


Different types of flow measuring techniques are used based on the requirements and depending upon the situation.

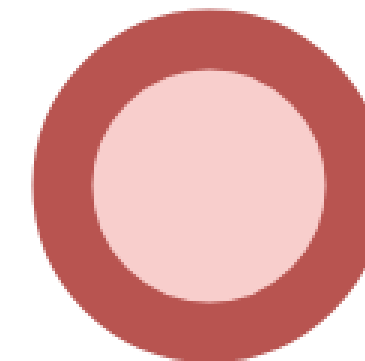
Common types of flow meters include

- Obstruction type.
  - Inferential.
  - Electromagnetic
  - Anemometer
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- In an **obstruction type flow meter**, an obstruction is created in the flow passage and the pressure drop across the obstruction is measured. This change in pressure is calibrated in terms of flow rate.
  - Depending upon the type of obstruction, different types of obstruction flow meters such as Orifice meter, Venturimeter, Flow nozzle, etc. are available.

- In an orifice type flow meter, an orifice plate is placed in the pipe.
- The pressure is dropped suddenly when the fluid passes the orifice and continues to drop until 'vena contracta' is reached.
- It is a result of the increase in velocity of the fluid passing through the reduced area.



(a) Orifice Meter



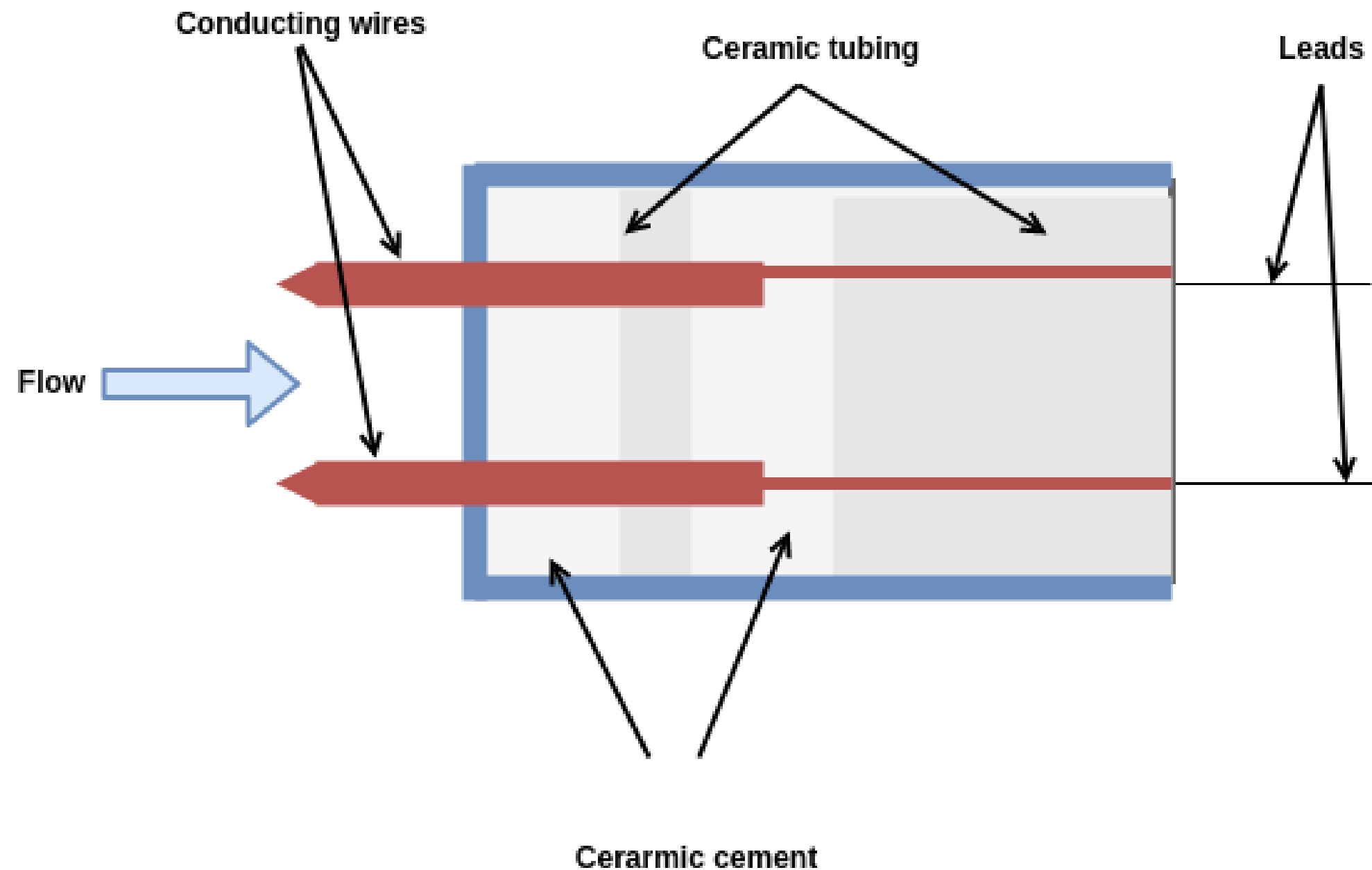
(b) Orifice Plate



- After vena contracta, the pressure increases gradually until a maximum pressure point is reached that will be lower than the pressure  $P_1$ .
- The flow rate can be obtained by measuring the pressure difference ( $P_1 - P_2$ ).
- The major **advantages** of the orifice plate that it is simple in construction, low-cost device and easy to install.
- The **main disadvantage** of using the orifice plate is the permanent pressure drop occurred in the orifice plate. This problem can be overcome by using Venturimeter or Flow nozzles.

# Anemometer

A hot wire anemometer is a temperature transducer used for measuring flow rate.







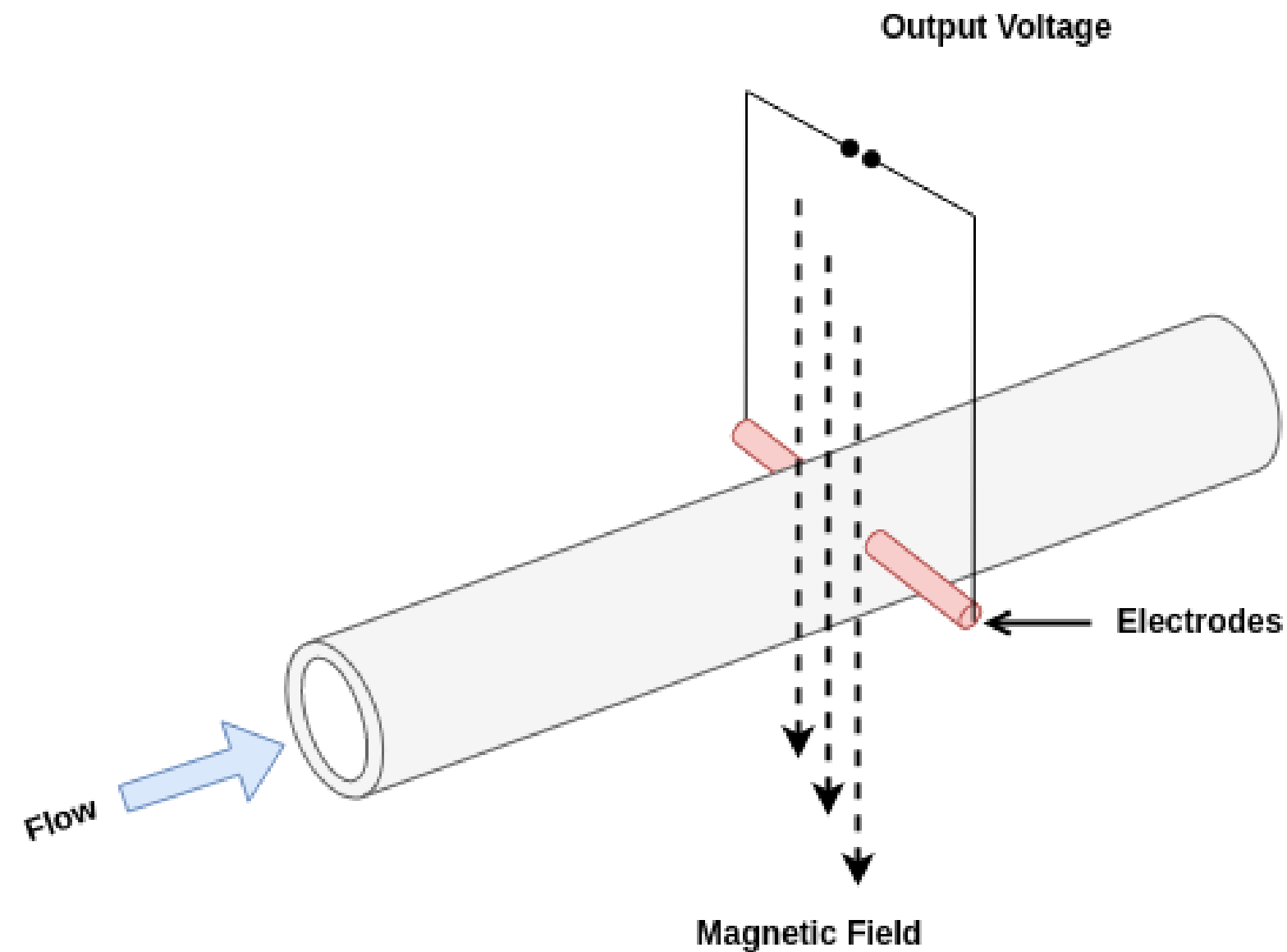
- When the electrically heated temperature sensor is placed in a flowing fluid, heat is transferred from the sensor to the fluid.
- Hence the temperature of the sensor reduces resulting in a change in resistance of the wire.
- The amount of cooling of the wire depends on the flow velocity and hence the resistance variation can be used to measure the flow rate of the fluid.

## **Advantages**

- Can be used for fluids with rapidly fluctuating velocity.
- Relatively low cost.

# Electromagnetic Flow Meter

- Electromagnetic flow meters are suitable for measuring the flow of electrically conducting liquid.

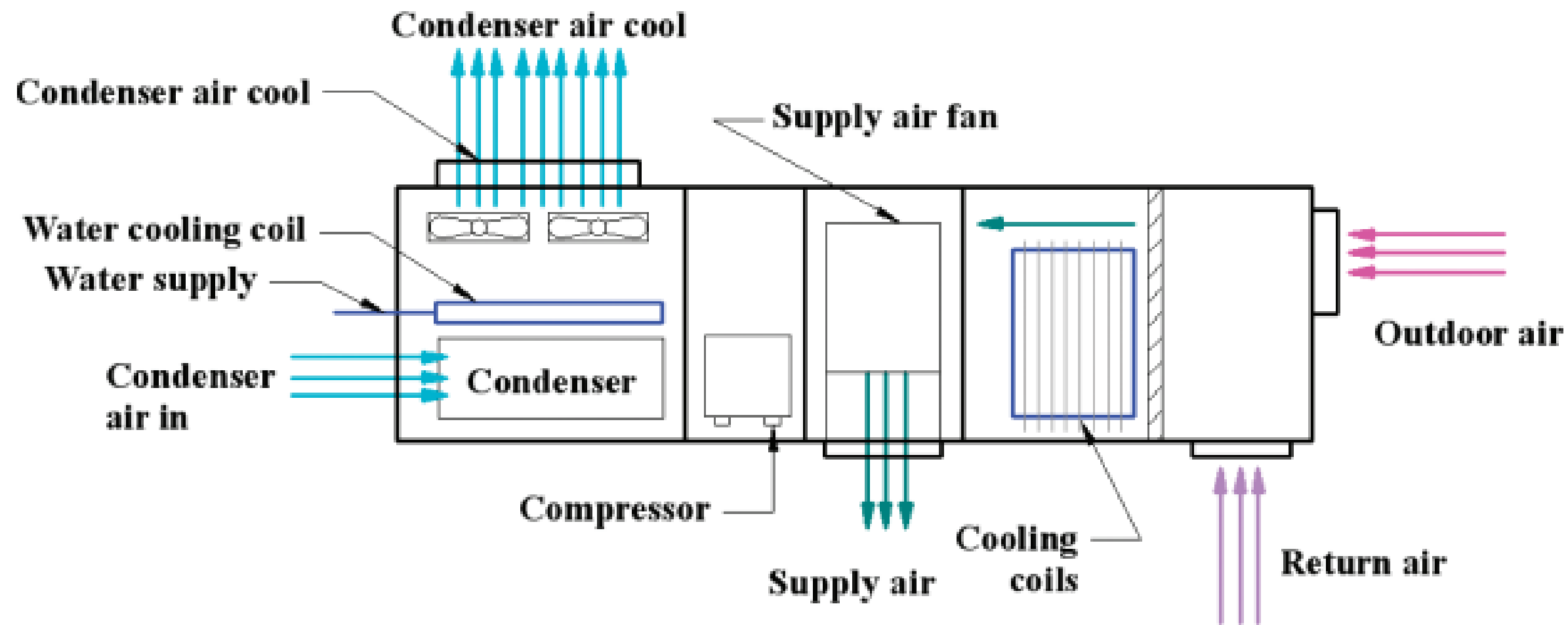






- It consists of a pair of electrodes fixed in the opposite sides of a pipe carrying the fluid whose flow is to be measured.
- A pipe with non-conducting and non-magnetic property is used.
- The pipe is surrounded by some material to produce a magnetic field.

1. Can you say this shown in fig. is the example of which method of HVAC?





# References



1. Shengwei Wang, “ Intelligent Buildings and Building Automation”, Routledge 2010.
2. Reinhold A, Carlson Robert A, Di Giandomenico, “Understanding Building Automation Systems: Direct Digital Control, Energy Management, Life Safety, Security Access Control, Lightning, Building”, R. S Means company limited, 1<sup>st</sup> edition, 1991.

**Thank You**