

AMR Sensor Application Note =Consumer & Industrial Use=



Sensor Products Division
Sensor Products Dept.2

AMR Sensor Overview

AMR sensor is a sensing device utilizing **Magneto Resistance** effect. **AMR** sensor comprised of four MR elements and a IC circuit forming a compact monolithic device.

Feature

- Various compact package offering
(Ultra-low height PKG size: 1.00 x 1.60 x 0.37mm)
- Narrower sensitivity spec for more accurate sensing performance.
- Omni polar (Operate with either North or South pole)
- Design flexibility (Horizontal magnetic field sensing advantage)

AMR= Anisotropic Magneto Resistance



Application Example (Consumer)

AMR sensor supports wide range of consumer applications including white goods.

Open-close Detection

Device/product with open-close structure

- Smartphone
- Note/Tablet PC
- DVC/DSC
- Handheld game console
- Refrigerator
- Dish washer
- Pressure cooker
- Water heater panel

etc...

Rotation Detection

Device/product with rotation structure

- Smartphone
- Note/Tablet PC
- DVC/DSC
- Jog dial
- Trackball

etc...

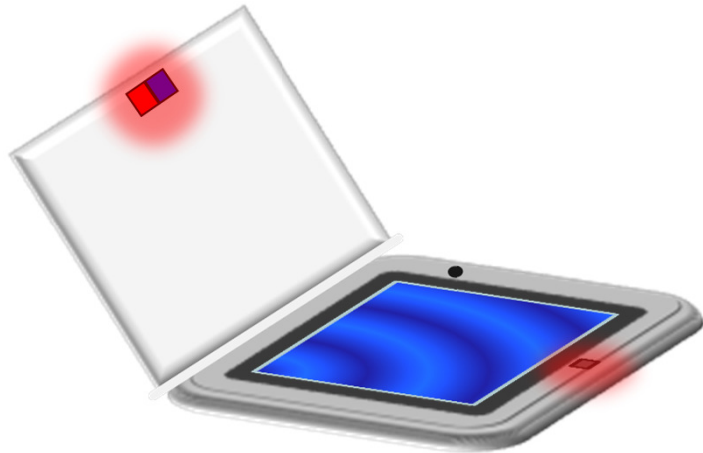
Position Detection

Device/product with slide structure

- Smartphone
- Handheld game console
- Level sensor
- Electric toothbrush
- Electric shaver
- Waterproof switch
- Slide door
- Security buzzer

etc...

Consumer-1 Position/ Tablet PC



Recommended P/N

- MRMS501A
- MRMS511H, MRMS511M, MRMS511L

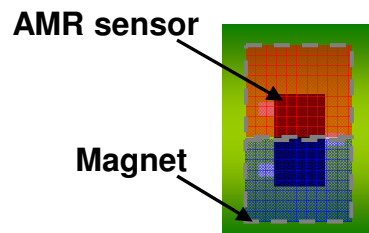
Why the application needs sensor?

- To activate sleep mode

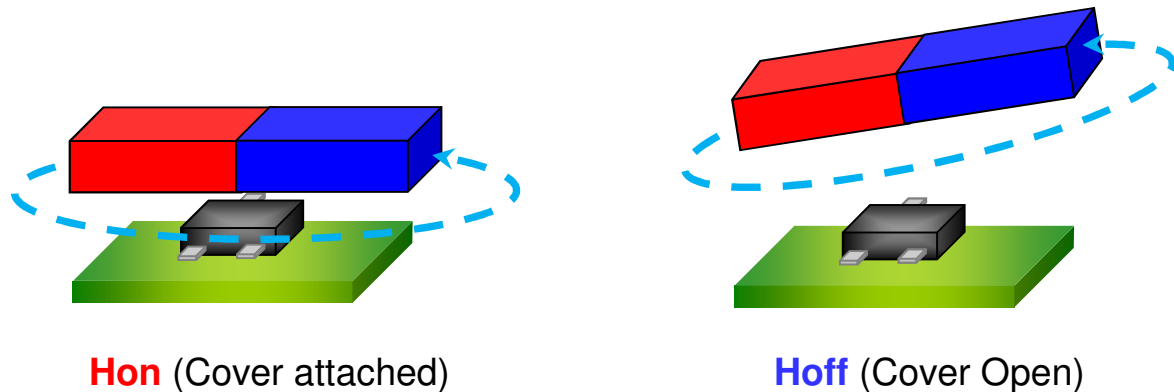
Similar Applications

- Consumer electronics with cover to deactivate the device or to change mode.

Top view

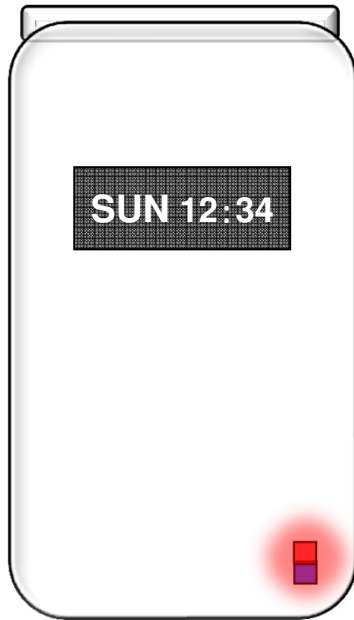


Side view



Consumer-2

Open-close/ Mobile Phone



Recommended P/N

- MRMS501A
- MRMS511H, MRMS511M, MRMS511L

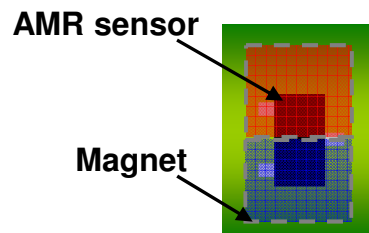
Why the application needs sensor?

- To switch off the display and save power

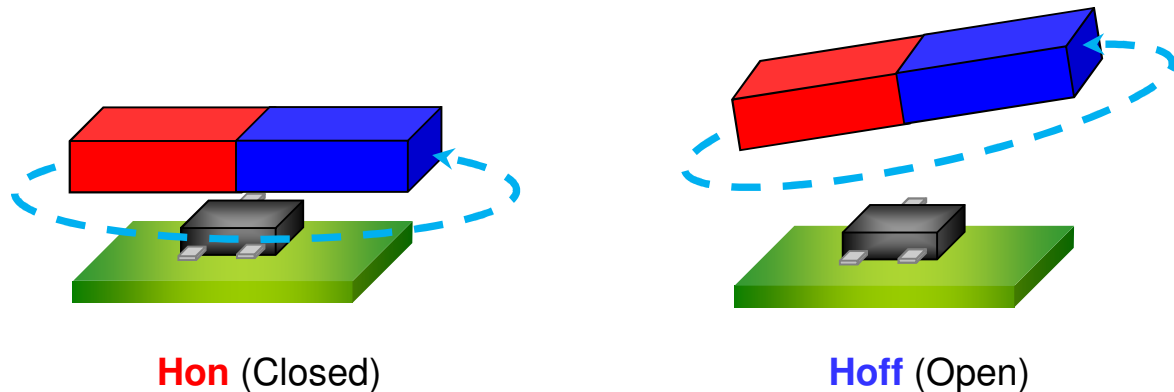
Similar Applications

- Note PC, Handheld game console, Electronic Dictionary etc.

Top view

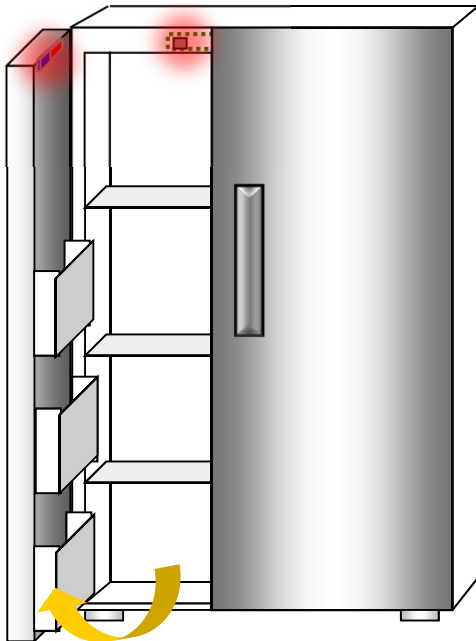


Side view



Consumer-3

Open-close/ Refrigerator Door



Recommended P/N

- MRMS205A
- MRMS215H, MRMS215M, MRMS215L

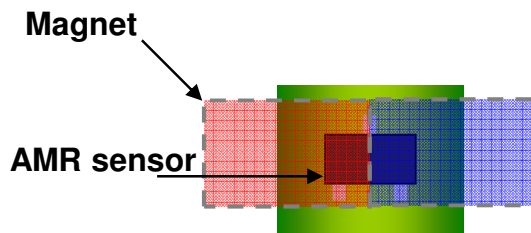
Why the application needs sensor?

- To switch on/off the light and save power
- To change the operating mode

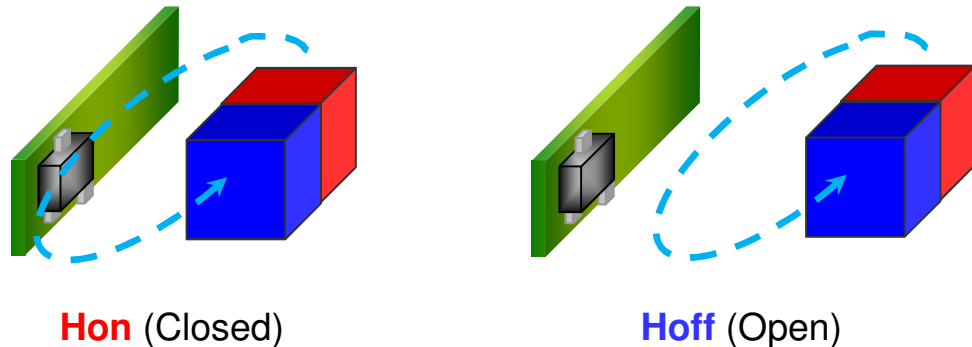
Similar Applications

- Security door and window sensor etc.

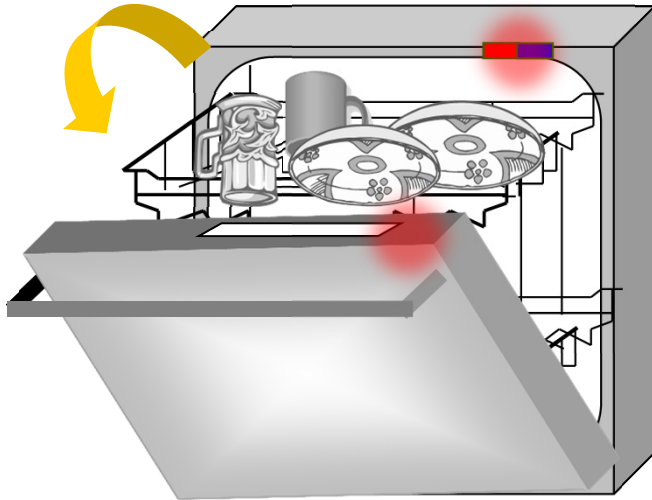
Front view



Side view



Consumer-4 Open-close/ Dishwasher Door



Recommended P/N

- MRMS205A
- MRMS215H, MRMS215M, MRMS215L

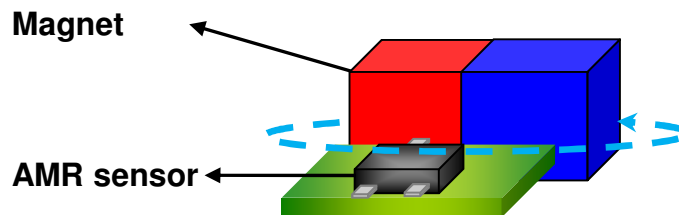
Why the application needs sensor?

- To avoid operational error when door is open

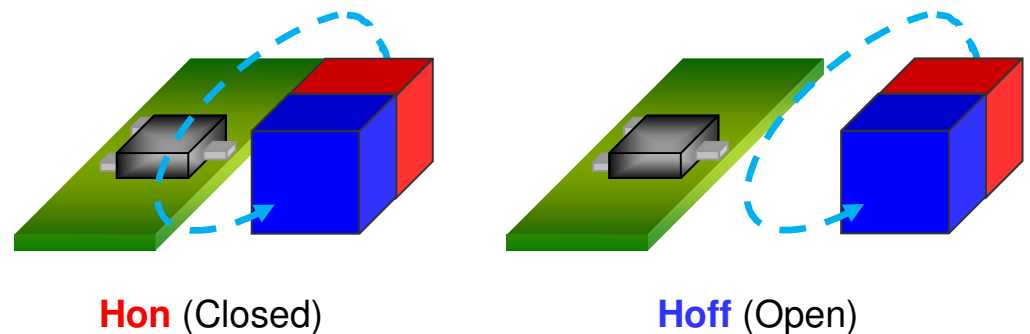
Similar Applications

- Oven door, Washer door etc.

Front view

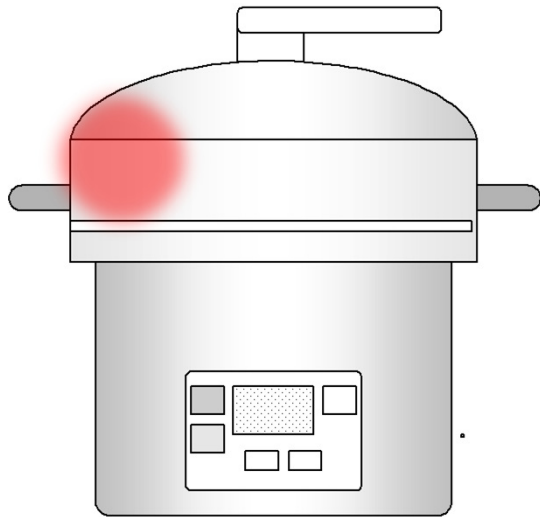


Side view

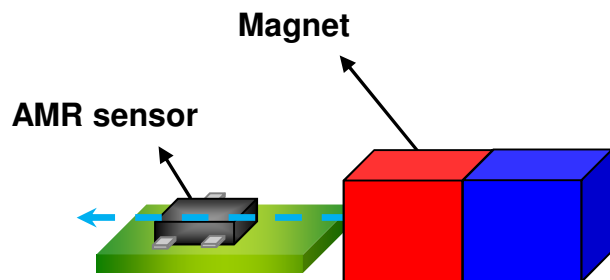


Consumer-5

Open-close/ Electric Rice Cooker



Front view



Recommended P/N

- MRMS205A
- MRMS215H, MRMS215M, MRMS215L

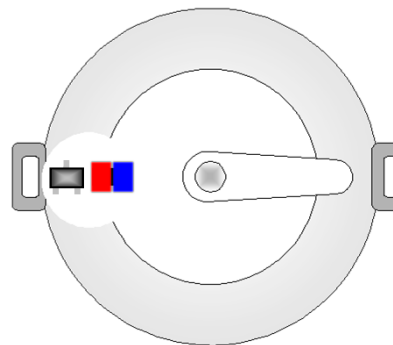
Why the application needs sensor?

- To assure the lid is closed tightly

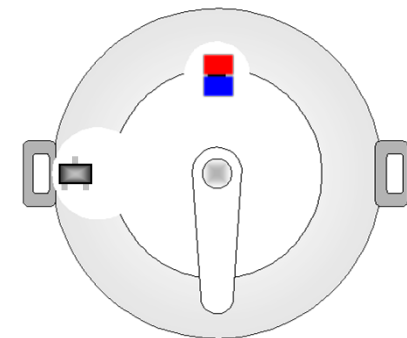
Similar Applications

- Pressure cooker, Blender, Mixer etc.

Top view

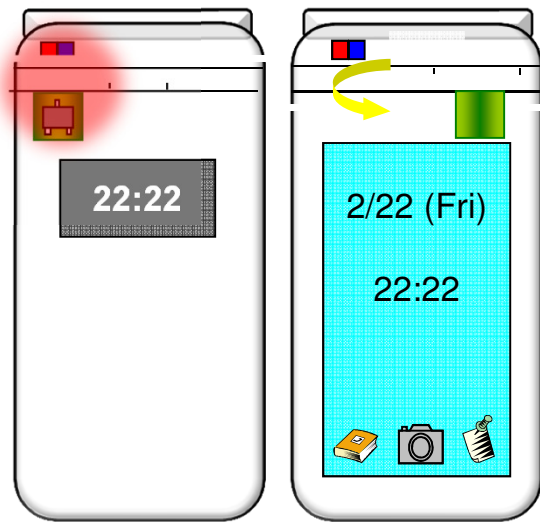


Hon (Locked)



Hoff (Unlocked)

Consumer-6 Rotation/ Mobile Phone



Recommended P/N

- MRMS501A
- MRMS511H, MRMS511M, MRMS511L

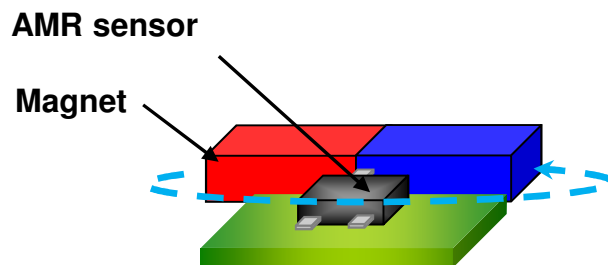
Why the application needs sensor?

- To adjust/rotate the display when LCD is flipped

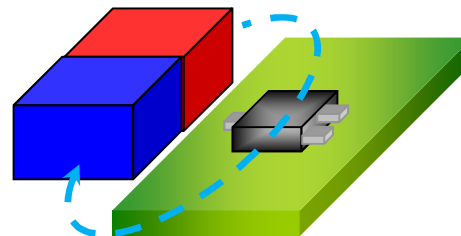
Similar Applications

- Note PC, DVC, DSC etc.

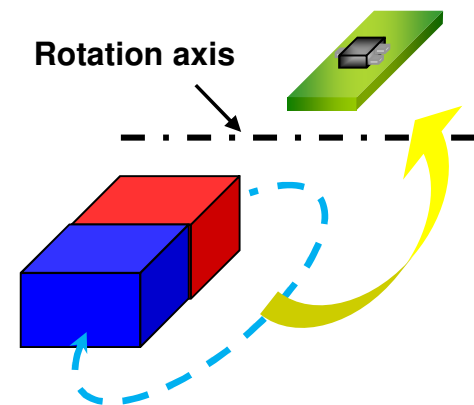
Front view



Side view

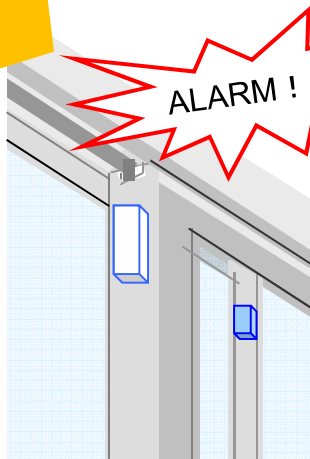
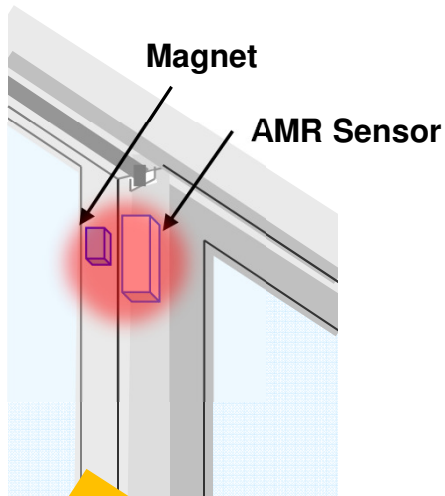


Hon (Closed)



Hoff (Flipped position)

Consumer-7 Position/ Window Security



Recommended P/N

- MRMS211H, MRMS211M, MRMS211L
- MRMS215H, MRMS215M, MRMS215L

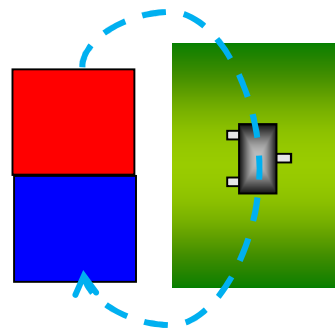
Why the application needs sensor?

- To sound the alarm when window is opened and AMR sensor switches off.

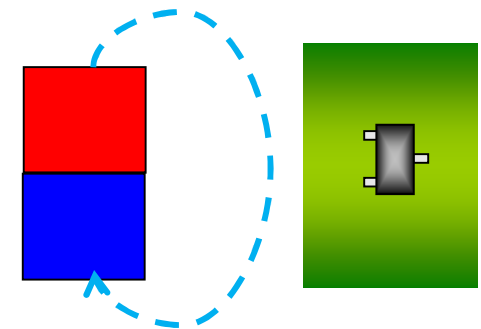
Similar Applications

- Security door sensor, Commercial door chime etc.

Front view

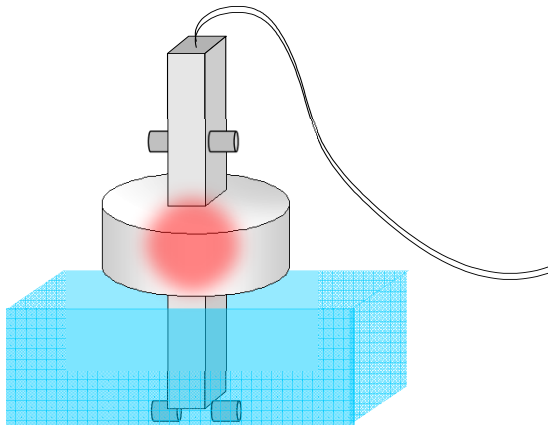


Hon (Closed)



Hoff (Open)

Consumer-8 Position/ Fluid Level



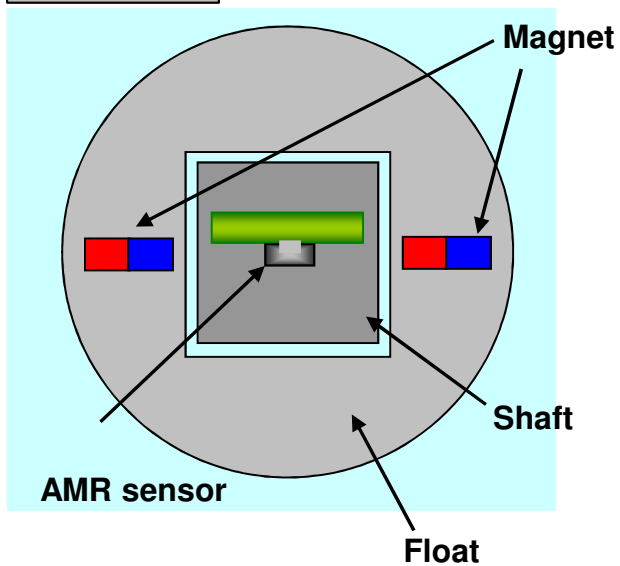
Recommended P/N

- MRMS201A
- MRMS211H, MRMS211M, MRMS211L

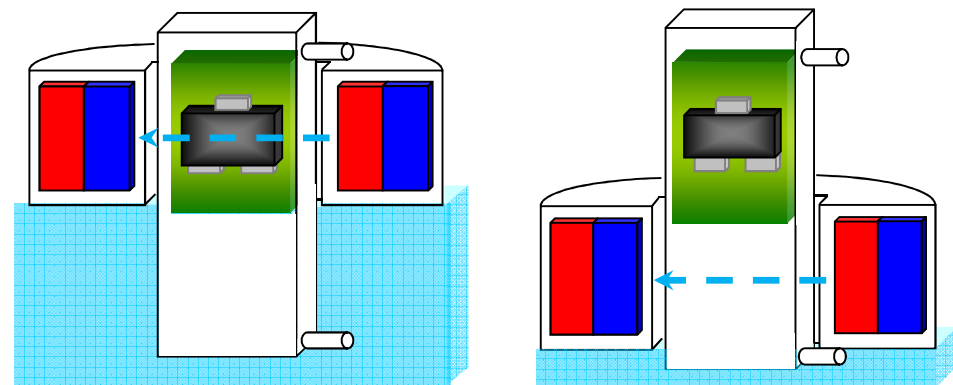
Why the application needs sensor?

- To check the fluid level.

Top view



Front view

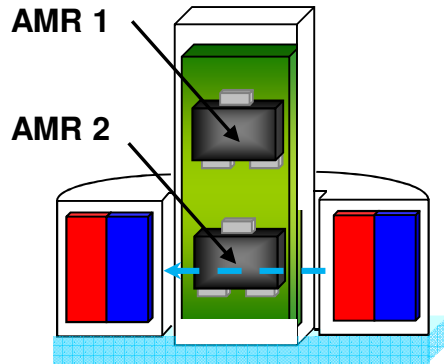


Hon (Full level)

Hoff (Empty level)

(Reference) Position/ Fluid Level Sensing

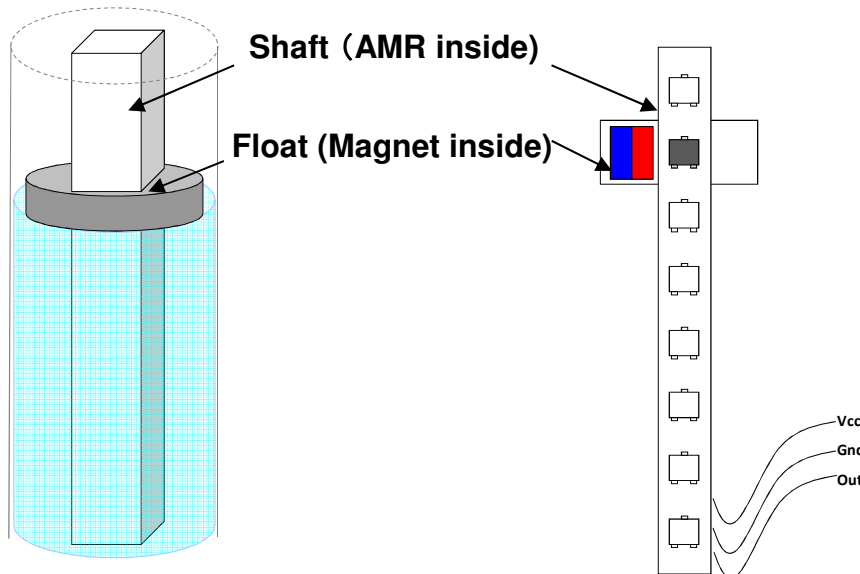
■ Example 1: 3 Level Sensing



By placing 2pcs AMR sensor in the shaft, three different fluid level sensing is possible.

Fluid Level	Full	Middle	Empty
AMR 1	Hon	Hoff	Hoff
AMR 2	Hoff	Hoff	Hon

■ Example 2: Precise Level Sensing



More precise level sensing required?

We offer open-drain output type AMR sensor **MRMS571A** which meets the needs in precise level sensing applications.

Detailed application note is available upon request.

Application Example (Industrial)

AMR sensor supports wide range of industrial applications.

Open-close Detection

Product/ equipment with open-close structure

- Maintenance hatch
- Operation panel cover
- Machine cover

etc...

Rotation Detection

Product/ equipment with rotation structure

- Water heater
- Gas meter
- Water meter
- Tachometer
- Speed meter
- Wind flow meter
- Fluid flow meter

etc...

Position Detection

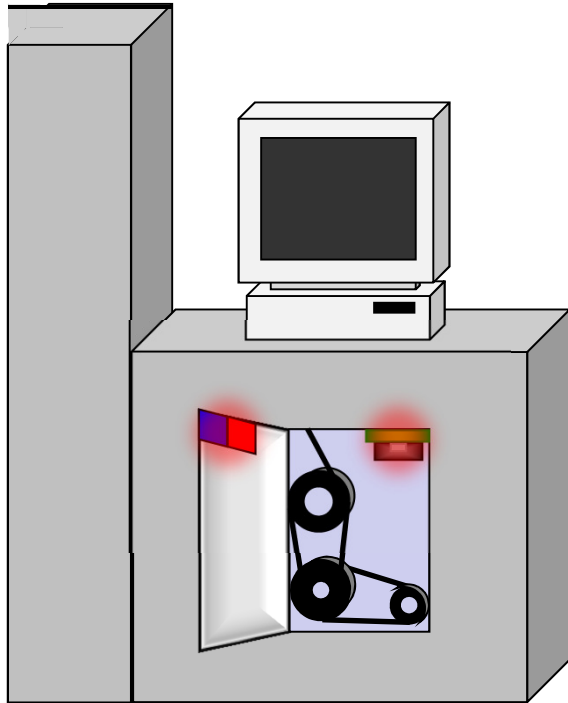
Product/ equipment with slide structure

- Cylinder switch
- Fluid level sensor
- Hidden switch in meters
- Shutter sensor

etc...

Industrial-1

Open-close/ Maintenance Hatch



Recommended P/N

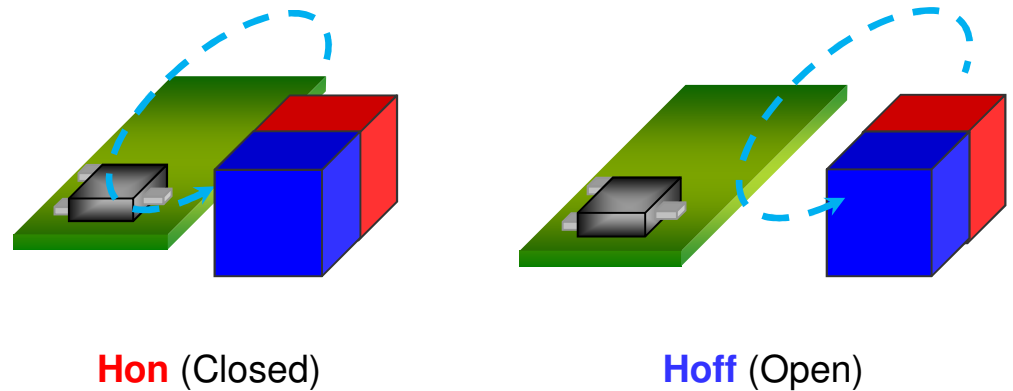
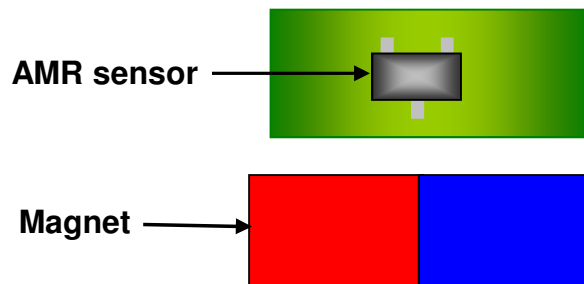
- MRMS201A, MRMS501A
- MRMS211H, MRMS211M, MRMS211L
- MRMS511H, MRMS511M, MRMS511L

Why the application needs sensor?

- To avoid operational error when hatch is open.

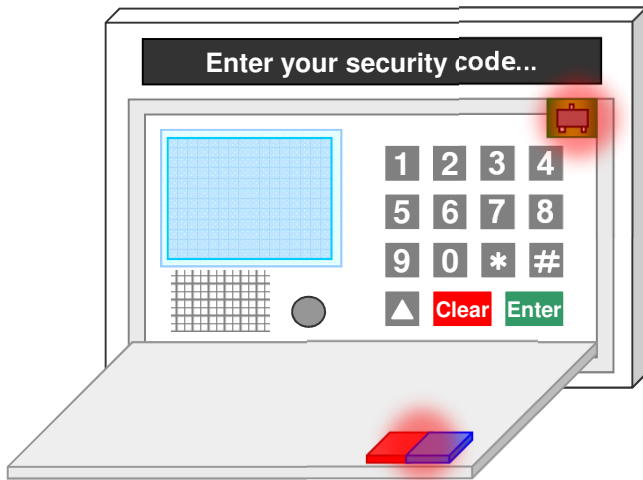
Side view

Top view



Industrial-2

Open-close/ Operating Panel Cover



Recommended P/N

- MRMS201A, MRMS501A
- MRMS211H, MRMS211M, MRMS211L
- MRMS511H, MRMS511M, MRMS511L

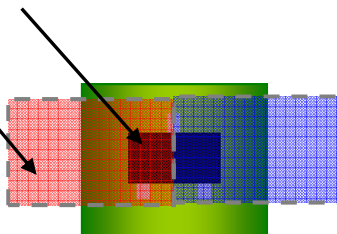
Why the application needs sensor?

- To change mode when panel is open

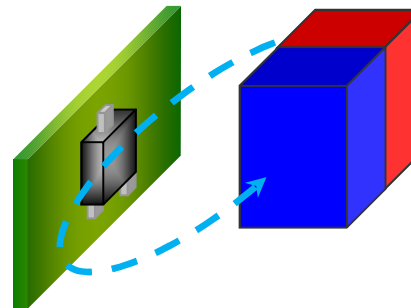
Front view

AMR sensor

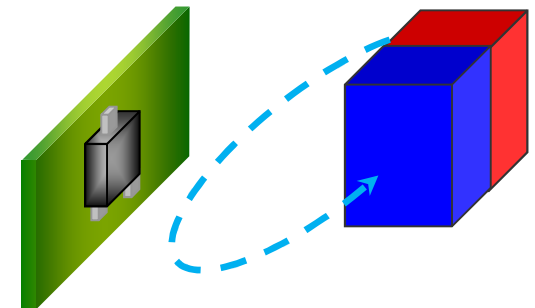
Magnet



Side view

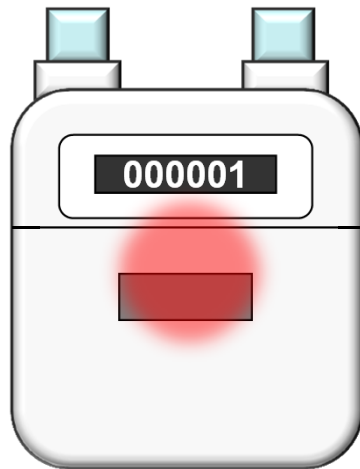


Hon (Closed)



Hoff (Open)

Industrial-3 Rotation/ Gas Meter



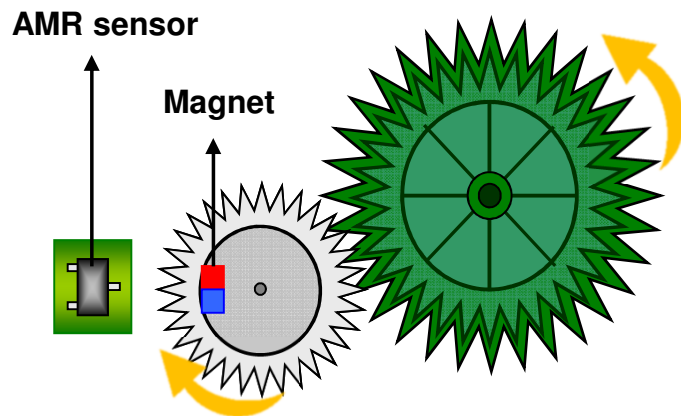
Recommended P/N

- MRUS52F
- MRUS72S, MRUS74S
- MRUS72X, MRUS74X
- MRSS29DR *For high voltage operation

Why the application needs sensor?

- To count the rotation and converts the data into gas usage.
- To check meter is normally operating.

Top view



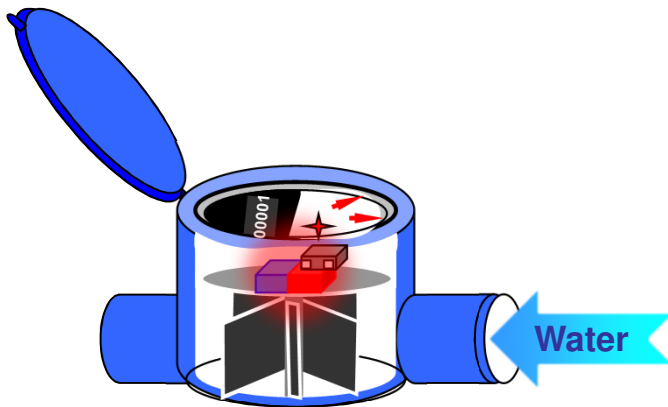
Front view



Hon

Hoff

Industrial-4 Rotation/ Water Meter



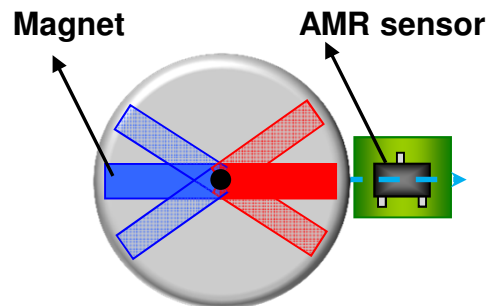
Recommended P/N

- MRUS52F
- MRUS72S, MRUS74S
- MRUS72X, MRUS74X

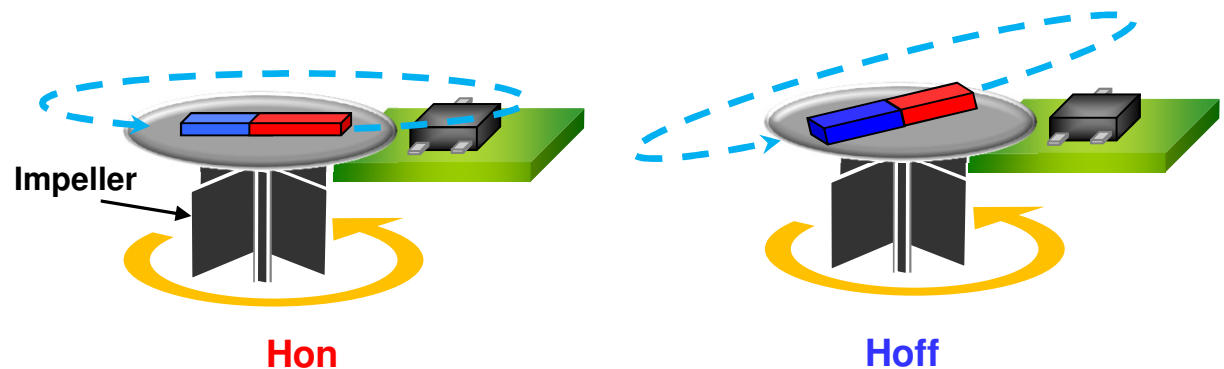
Why the application needs sensor?

- To count the rotation and converts the data into water usage.
- To check meter is normally operating.

Top view

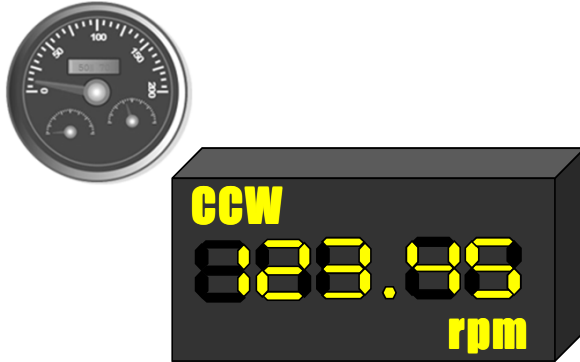


Front view



***Use of 2pcs of AMR enables flow direction sensing in addition to flow rate sensing.**

Industrial-5 Rotation/ Speed Meter



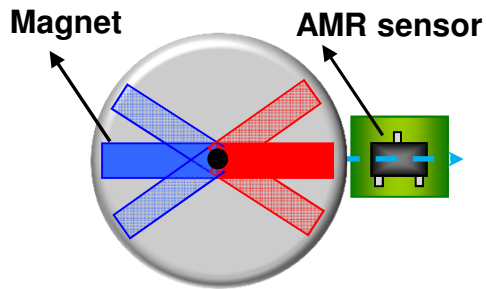
Recommended P/N

- MRUS52F
- MRMS201A
- MRMS211H, MRMS211M, MRMS211L

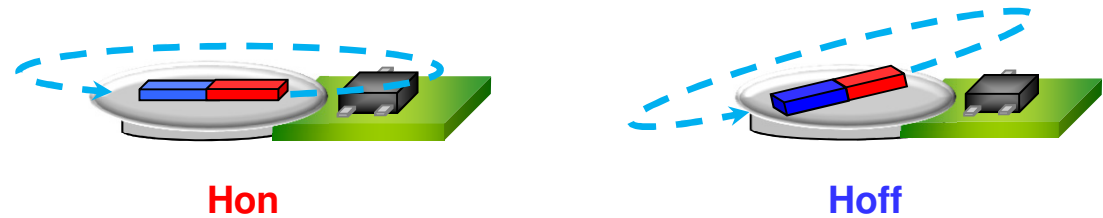
Similar Applications

- Tachometer, Air flow meter etc.

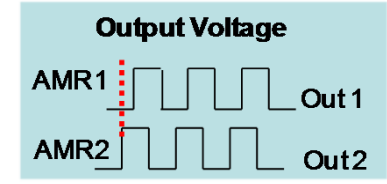
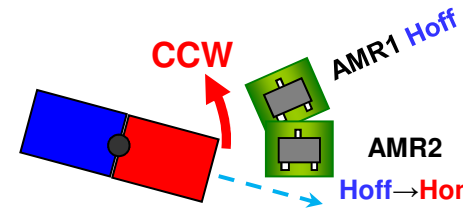
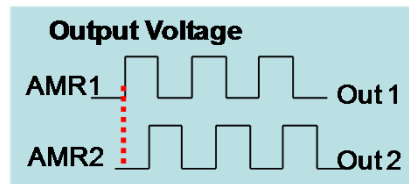
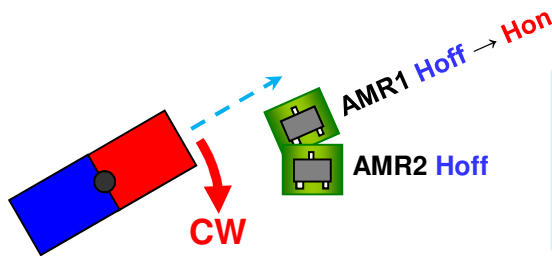
Top view



Front view

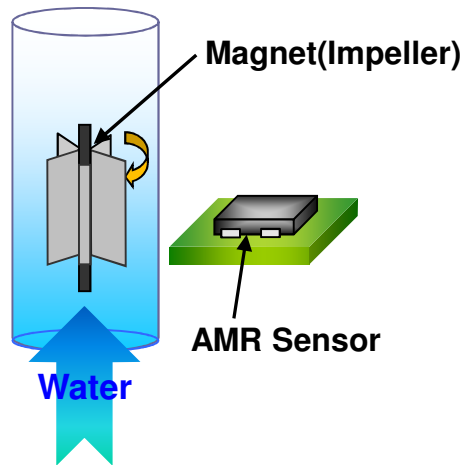


***Use of 2pcs of AMR enables rotation direction sensing.**



Industrial-6 Rotation(Flow Rate)/ Water Heater

Front view



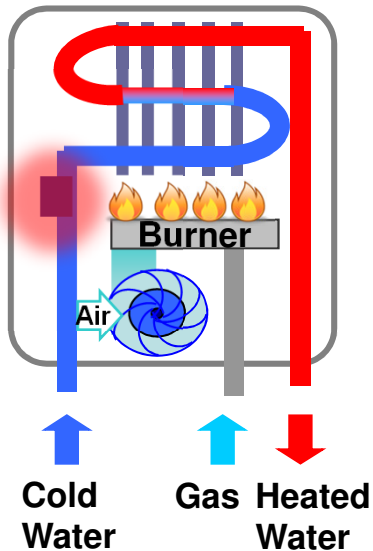
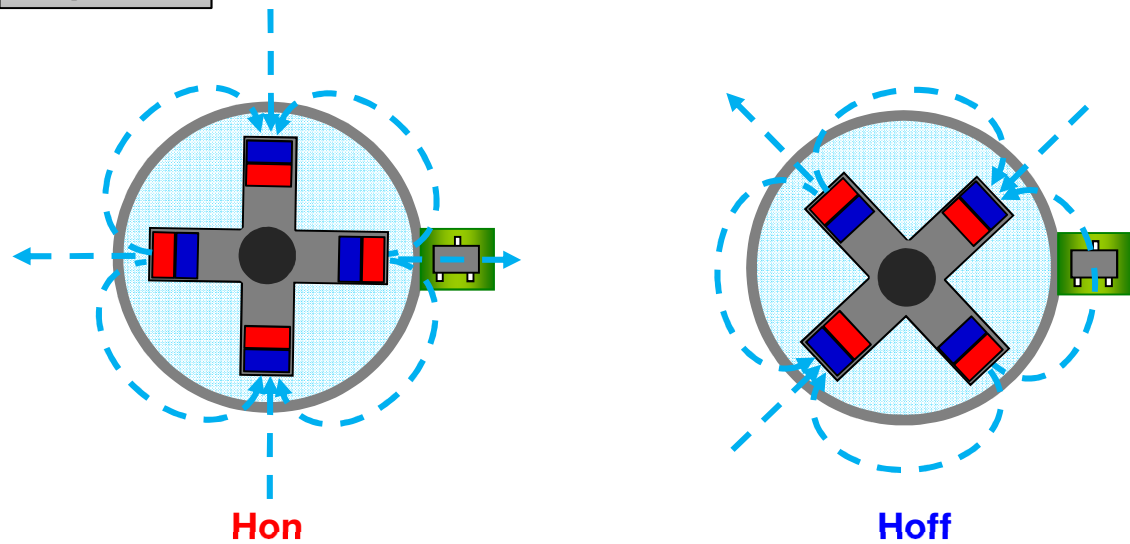
Recommended P/N

- MRSS29DR

Similar Applications

- Oil flow measurement etc.

Top view



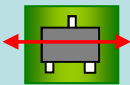
More detail provided on next page.

(Reference) Rotation/ Flow Rate Measurement



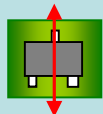
Recommended Sensor: **2-axis field sensing type**

What is 2-axis field sensing?



Direction A

When magnetic field is applied to direction A, AMR sensor state is **Hon**.

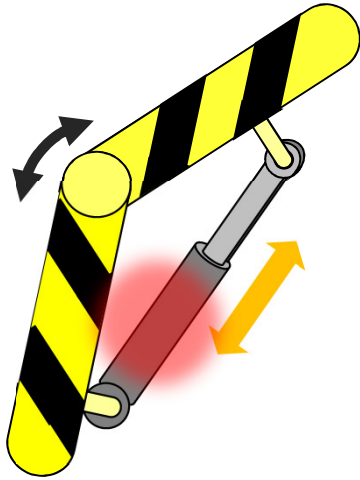


Direction B

If magnet rotates and magnetic field is applied to direction B, AMR sensor state changes from Hon to **Hoff**.

***Depending on the design or required preciseness for performance, different sensor can be adopted for flow rate measurement. Please ask for consultation.**

Industrial-7 Position/ Cylinder Switch



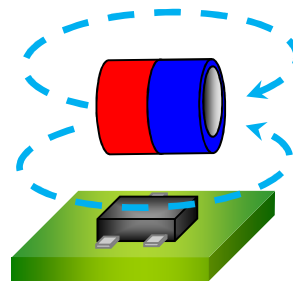
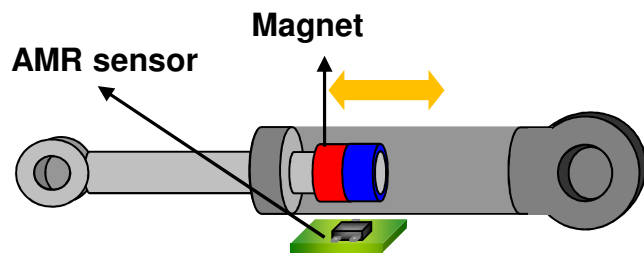
Recommended P/N

- MRSS27H
- MRMS541D
- MRUS73C

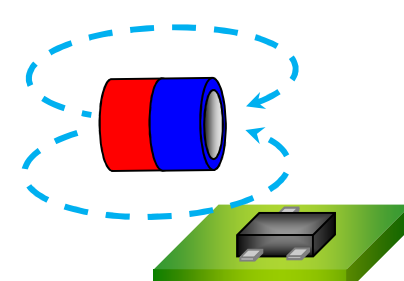
Why the application needs sensor?

- To detect the end point(s) of cylinders.
- To avoid piston operation accident.

Front view



Hon



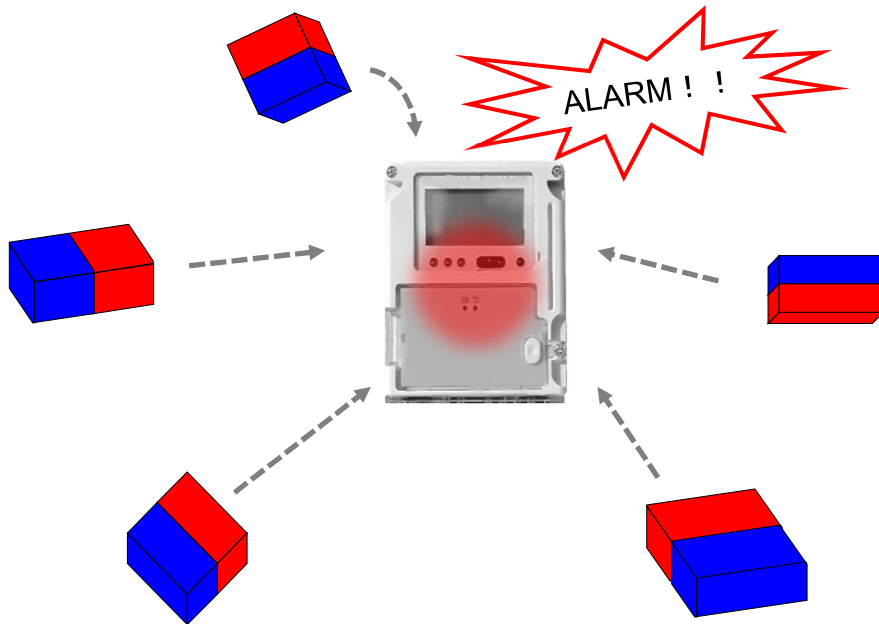
Hoff

***Use of 2pcs AMR enables two end points detection .**

Industrial-8 Position/ Anti-tampering

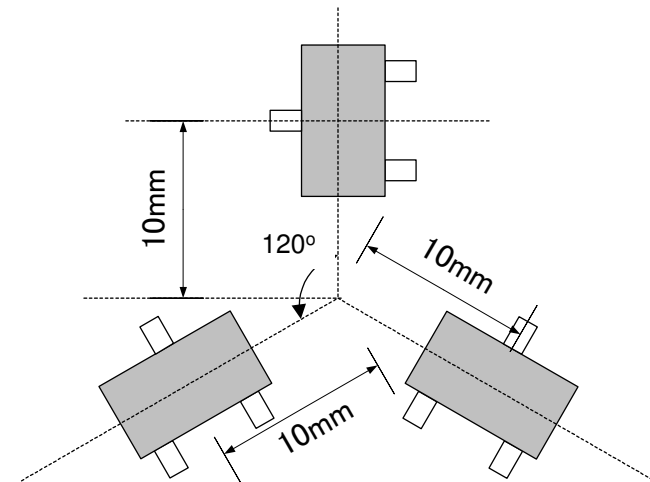
Recommended P/N

- MRMS571A *Open drain output type



To steal electricity, strong magnet will be placed on meter housing and the direction the magnet approach is unpredictable. AMR sensor must detects magnetic field approaching from all direction!

Sensor Arrangement Example



MRMS571A x 3 pcs

*** 3D sensor that covers similar or better sensing range with 3pcs MRMS571A is under development.**



FIN

