

10. Add remarks if needed and finish installation by selecting **Finalize installation**.

Silo sensor images have been saved

Remarks

Silo is placed behind the shed.

Finalize installation

7. Maintenance

After installation, no special maintenance or cleaning is required.

The device does not contain any user serviceable parts.

A. Installation method M1

Prepare the surface

1. Clean the surface of the silo where the sensor will be mounted. The surface should be as clean as possible. The surface area must have a diameter of at least 15cm. Use the wire brush if the dirt on the surface is difficult to remove. End with the surface cleaner and make sure the surface is dry before proceeding to the next step.



Figure 6: Clean surface

Apply the glue

2. Temporarily place the sensor. Level the sensor. And mark the location of the sensor bracket.



Figure 7: Mark location

3. Apply a continuous bead of glue on the sensor bracket.



Figure 8: Bead of glue

Mount the sensor

4. Place the sensor according to the following steps. Make sure the sensor is in a suitable location and orientation (see section 5.4 and other parts of this manual).
 - a. Make sure that the sensor is correctly oriented, see Figure 9.
 - b. Make sure that the sensor is level in direction 2 (long edge of the sensor), see Figure 10: Level directions. Level 1 (short edge of the sensor) can be adjusted afterwards.
 - c. Make sure all of the mounting brackets are in good contact with the silo, or screen.

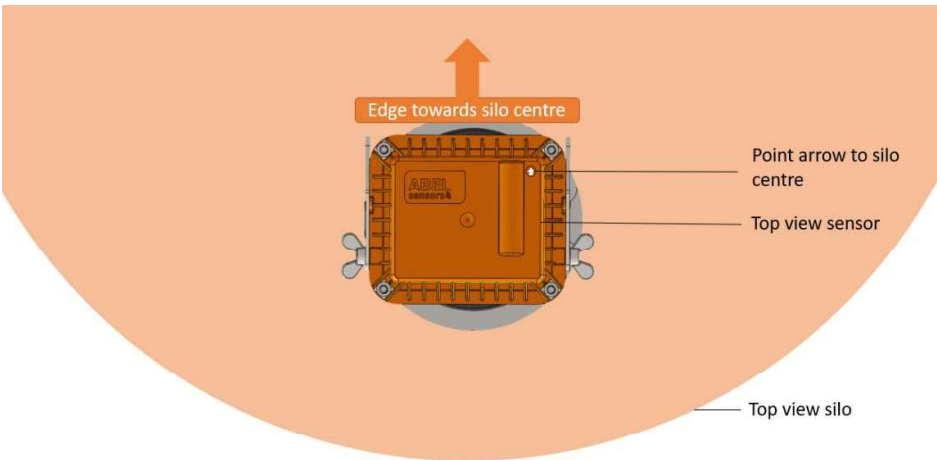


Figure 9: Sensor orientation

5. **Only when mounting directly on GRP without screen:** Fixate the bracket to the silo with the 3 self tapping screws and washers that are provided with the sensor.

Level the sensor

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6. Make sure the sensor is level in direction 1 (short edge of the sensor) and tighten the screws of the mounting brackets. See Figure 10: Level directions.

The product should be mounted level in both directions. Rotate sensor such that direction “1” is level. Afterwards adjust direction “2” until sensor top surface is level.

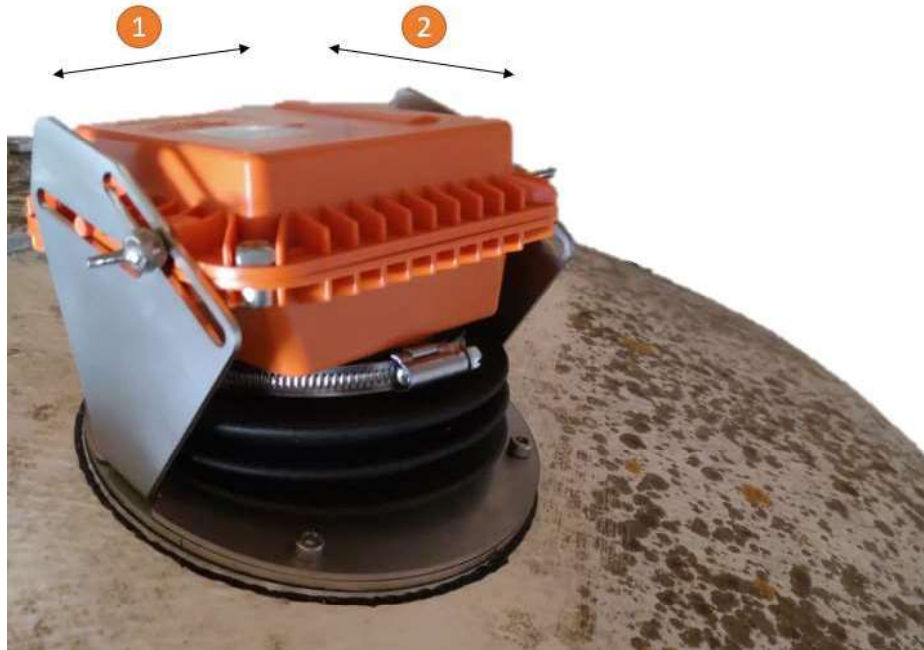


Figure 10: Level directions

B. Installation method M2 / M3

B.1 Roof angle up to 20 degrees

Preparation installation location

1. Find suitable spot on silo in accordance with chapter 5.4.

In case of a removeable hatch the following checklist can be used.

Hatch requirements	Checklist
The hatch is located in region A or B according to paragraph 0.	
The hatch has sufficient free area (diametrically 20cm) such that screen can be mounted.	
The hatch is angled less than 20 degrees from horizontal.	
The hatch surface is flat or slightly curved, not spherical.	

2. Clean an area with at least a diameter of 20cm.

Mounting the screen

3. Drill a hole using the 111mm holesaw.



4. Lay a bead of glue on the screen, covering all holes.



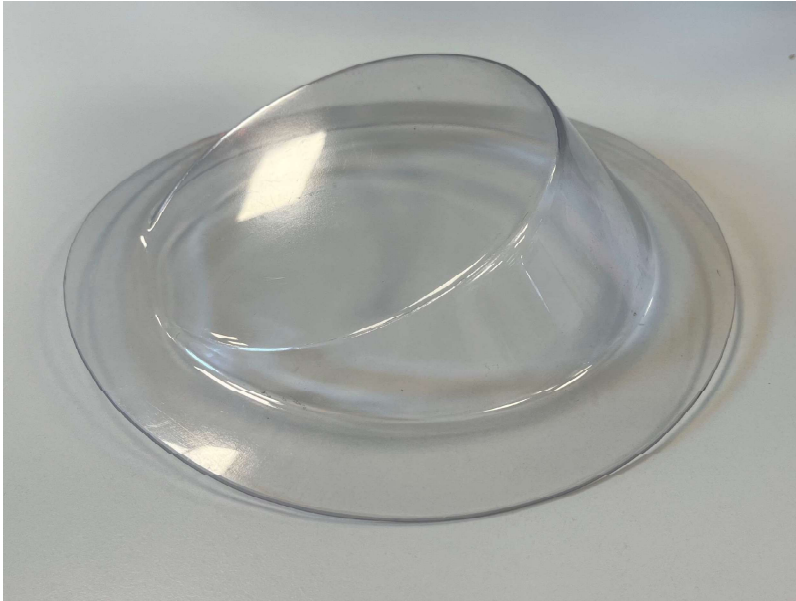
5. Place the screen on the glue and press it shut. Afterwards secure with 4 screws. For even spacing, screw in a screw in every ninth hole. Make sure the screen is placed concentric relative to the drilled hole.



6. Carry out sensor installation as described in installation method M1.

B.2 Roof angle above 20 degrees

For roof angles above 20 degrees, the adapter screen shown below should be used.

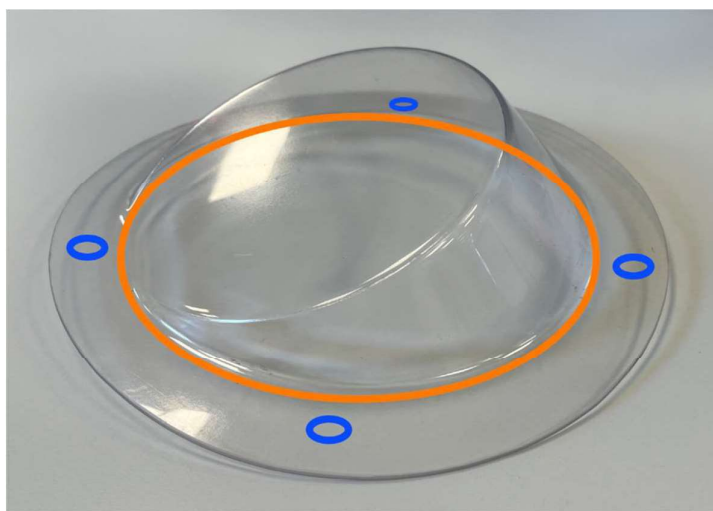


Preparation installation location

1. Find suitable spot on the silo in accordance with chapter 5.4.
2. Clean an area with at least a diameter of 26cm.

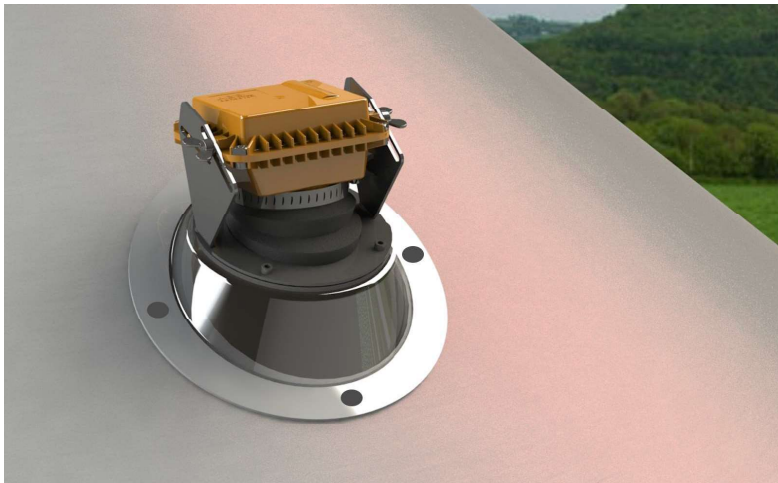
Mounting the adapter

3. A hole needs to be created in the silo that follows the inner circle as indicated in the picture below with the orange line. The shape is elliptical with dimensions of approximately 18cm x 19cm. Mark this shape on the silo and cut a hole with a jigsaw.



4. Drill four holes in the adapter, at the blue circles in the picture above, to accommodate the four mounting screws

5. Lay a thick bead of glue on the adapter over the flange of the adapter such that the entire flange is covered with glue.
6. Place the adapter over the hole and press is tightly such that the entire flange is sealed properly with glue. Afterwards secure with 4 screws.
7. Carry out sensor installation as described in installation method M1.



C. Measuring the dimensions

Cylindrical silos

- I. **(XS)** measure the distance from the edge of the sensor (long edge nearest to the silo wall) to the edge of the silo
- II. **(HS)** measure the distance from the bottom of the sensor box (excluding the lens) to the ground
- III. **(HD)** measure the distance from the highest point of the wall of the silo to the ground, where the inclination of the roof starts
- IV. **(HF)** measure the distance from the top of the cone to the ground
- V. **(HG)** measure the distance between the bottom of the cone to the ground
- VI. **(BG)** measure the width of the hole underneath the cone
- VII. **(D)** measure the diameter of the silo. The diameter of the silo is very crucial for the volume calculation.
- VIII. **(CA)** **Only for silos with an asymmetric cone!** Measure the angle of the side of the funnel at the point where the angle is the smallest. See the image below.

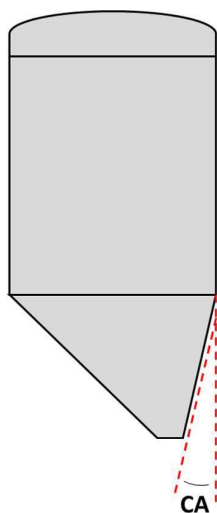


Figure 11: Dimension CA

Rectangular silos

- I. **(XS)** measure the distance from the edge of the sensor (long edge nearest to the silo wall) to the edge of the silo
- II. **(HS)** measure the distance from the bottom of the sensor box (excluding the lens) to the ground
- III. **(HD)** measure the distance from the highest point of the wall of the silo to the ground, where the inclination of the roof starts
- IV. **(HF)** measure the distance from the top of the cone to the ground
- V. **(HG)** measure the distance between the bottom of the cone to the ground
- VI. **(ED)** measure the depth of the hole underneath the cone
- VII. **(EW)** measure the width of the hole underneath the cone
- VIII. **(DS)** measure the depth of the silo
- IX. **(WS)** measure the width of the silo

Tapered silos

- I. **(XS)** measure the distance from the edge of the sensor (long edge nearest to the silo wall) to the edge of the silo
- II. **(HS)** measure the distance from the bottom of the sensor box (excluding the lens) to the ground
- III. **(HD)** measure the distance from the highest point of the wall of the silo to the ground, where the inclination of the roof starts
- IV. **(HF)** measure the distance from the top of the cone to the ground
- V. **(HG)** measure the distance between the bottom of the cone to the ground
- VI. **(ED)** measure the diameter of the hole underneath the cone
- VII. **(DB)** measure the diameter at the bottom of the silo, right above the cone
- VIII. **(DT)** measure the diameter at the top of the silo, at the highest point before the inclination of the roof starts.

D. Silo Dimension Sheets

E. RAD-SEN-04aX-XX Specifications

General:	
Dimensions (L x W x H):	17cm x 15cm x 10cm
Weight:	1.16kg
Power supply:	3.6V/17Ah D-size Li-SoCl ₂ (not replaceable by the user)
Environmental:	
Location:	Outdoor use
Temperature range:	-20°C - +50°C
Max. relative humidity:	95%
Max. Altitude:	2000 meter
Ingress protection	IP65
Pollution degree	4 (Electrical equipment for outdoor use)
RADAR:	
Frequency range:	76GHz - 81GHz
Type of modulation:	FMCW
Output power:	27.1dBm/50MHz
LoRa radio communication:	
Center frequency:	869.525MHz
Bandwidth:	125Khz
Maximum transmitted power:	20dBm
PCB antenna gain (dBi):	-2.14

F. RAD-SEN-05aX-XX Specifications

General:	
Dimensions (L x W x H):	17cm x 15cm x 10cm
Weight:	1.16kg
Power supply:	3.6V/17Ah D-size Li-SoCl ₂ (not replaceable by the user)
Environmental:	
Location:	Outdoor use
Temperature range:	-20°C - +50°C
Max. relative humidity:	95%
Max. Altitude:	2000 meter
Ingress protection	IP65
Pollution degree	4 (Electrical equipment for outdoor use)
RADAR:	
Frequency range:	60Ghz - 64GHz
Type of modulation:	FMCW
LoRa radio communication:	
Center frequency:	921.228MHz
Bandwidth:	500Khz
Maximum transmitted power:	20dBm
PCB antenna gain (dBi):	-2.34