kamstrup

Installation guide

Kamstrup Wireless M-Bus radio network

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Contents

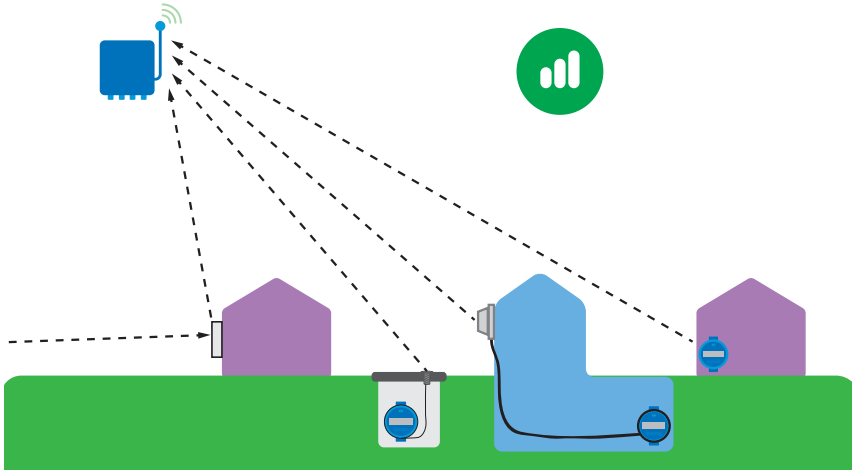
1 Introduction to this document

This installation guide provides an insight into the installation of radio network equipment in connection with READy, but can potentially also be used when installing other types of radio networks.

This guide focuses on "best practice" within installation of network equipment to obtain the best possible performance and to avoid repeated visits/trimming of the equipment.

Technical specifications of each component will not be emphasised, but the guide provides an overview of the total solution and of how components are connected in the best possible way.

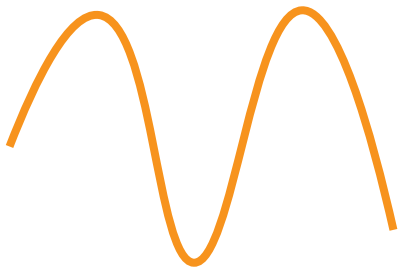
For technical specifications of each component, visit http://products.kamstrup.com/index.php.



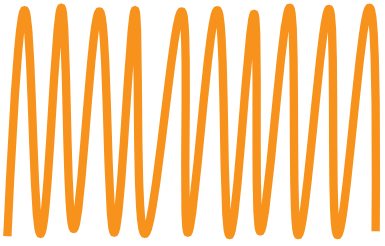
2 Radio theory in general

Radio signals are electromagnetic waves caused by vibrating electrons from a transmitting antenna.
Low-frequent radio signals below 3 MHz follow the curvature of the earth because of their diffraction with the atmospheric layer. This can potentially provide global reach if the signal is unobstructed and without interference. However, low-frequent signals are easily disturbed and affected by external factors and cannot contain very large amounts of data.

When we are working with frequencies above 3 MHz as is the case with wireless M-Bus, we operate with line-of-sight (LOS) communication. With this type of communication, the radio signals are moving in a straight line between the transmitter and the receiver because of the high frequency. If we zoom in on a high frequency, it will still be seen as fluctuations and not straight lines.



Low frequency



High frequency

This means that the transmitter and receiver ideally are directed towards and can see each other so that the radio waves can move between the two unobstructed. High frequencies are better reflected than low frequencies and can thus jump from and between surfaces. Radio signals with a high frequency can carry large amounts of data, but the range is reduced exponentially with the frequency increase.

2.1 Radio signal disturbances

2.1.1 Environmental and physical factors

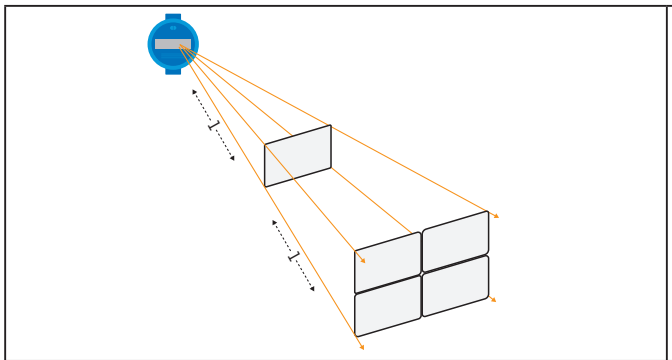
A number of environmental and physical factors affect the quality and strength of the radio signal. When we talk about network installations, it is important to consider the signal pathway from transmitter to receiver as obstacles such as buildings, trees and the topography all have an impact on the signal pathway. There are many concepts and theories about radio signals. Below, some of the main concepts and theories in connection with the installation of radio network equipment are described.

2.1.1.1 Spreading loss

You can think of radio signals as light. If we imagine the meter as a flashlight, you will see that the cone of light spreads and will be weaker, the farther you move away from the flashlight. In the same way, the radio signal's energy spreads over a greater area, the farther away it moves – resulting in a weaker signal.

As a basic rule, the signal is weakened by the square of the distance. This means that if we move 1 distance unit, the signal loss corresponds to a quarter of the starting point.

Note that the illustration is indicative. In practice, the signal loss will increase exponentially.



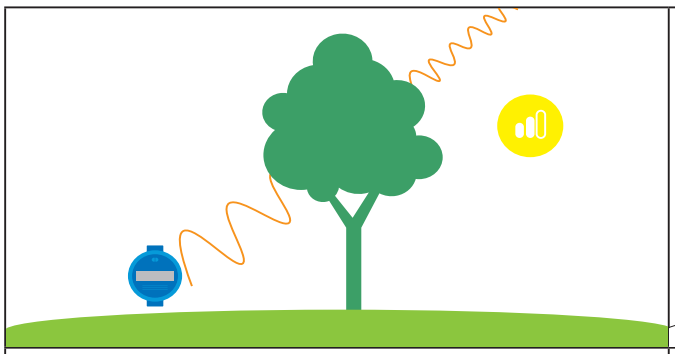
If we move 1 distance unit, the signal loss corresponds to a quarter of the starting point.

The signal loss increases exponentially with distance.

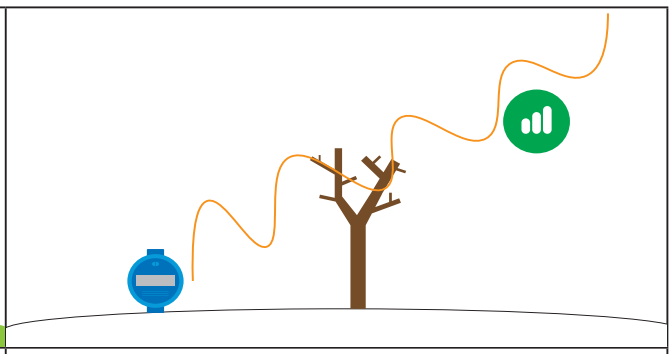
2.1.1.2 Absorption

Radio signals lose energy when they pass through obstacles such as buildings and trees. This is known as the absorption. When the signal on its way meets non-metallic surfaces such as concrete walls, some of the signal energy is absorbed and restricts the signal transmission power and thus its reach. Compact materials absorb much energy.

The season may also influence the absorption from the environment or the signal pathway. Through the summer months, more signal strength is absorbed by foliage on trees than in the winter months where trees are throwing leaves. In addition, parameters such as snow, rain, fog and air pollution are also important factors when talking about absorption of the signal.



Absorption during the summer. The signal is absorbed, and the signal strength is weakened.

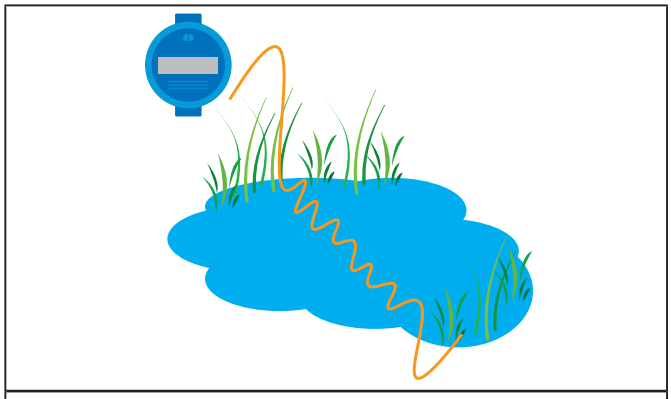


Almost no absorption in winter.

2.1.1.3 Reflection

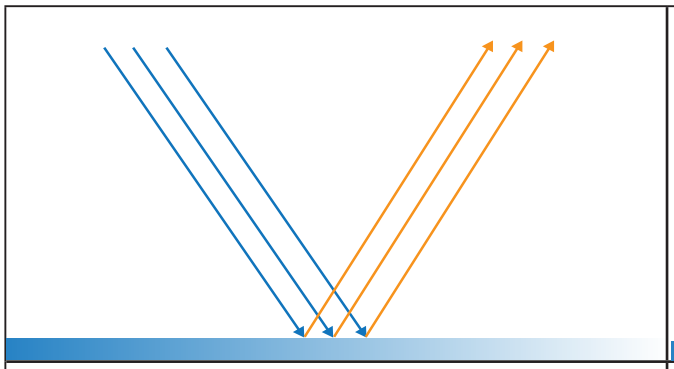
Many different surfaces reflect radio signals. This can be both a benefit and a disadvantage. If a vehicle parks on the signal path to the receiver, the signal is reflected away from the receiver, and you will experience a temporary deterioration or absence of the signal until the vehicle is removed.

Water or ice can act as a reflective surface, and therefore, by transmitters located far from the receiver with a pathway above water, a significant extension of the radio signal is often achieved without a particularly large signal loss.

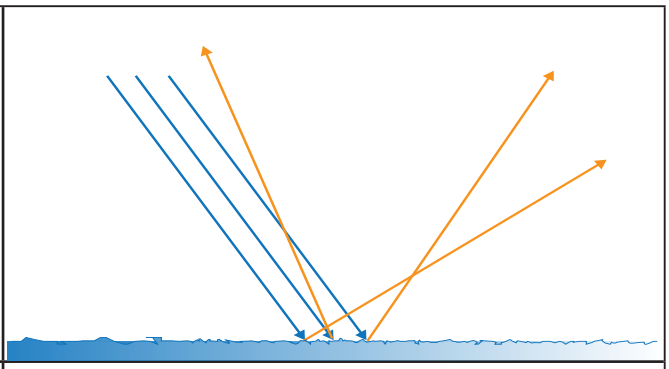


Example of the reflection on water.

In case of reflection, it is important to remember that the signal is scattered in different directions – once again we can make the comparison with the light from a flashlight. When the light hits a surface, it will be reflected and depending on the surface contour, the light is reflected in one or more directions. The same applies to radio signals, and as a result, the signals offset each other through collisions in the air.

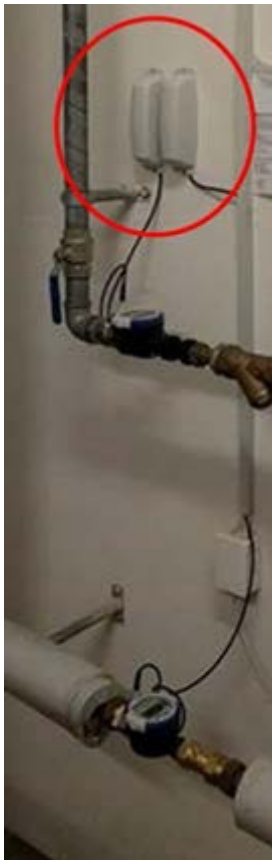


The reflection on a smooth surface.



The reflection on an uneven surface.

2.1.1.4 Collisions, interference and near-field areas

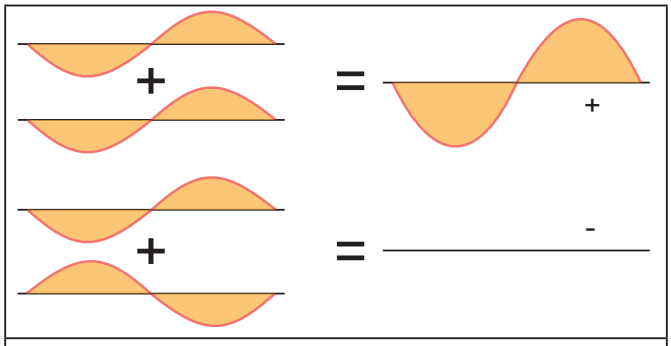


Interference/disturbance of radio signals occurs when multiple transmitters send signals away, which collide or hit each other mid-air. There are both constructive and destructive interference by which the radio signals either offset or reinforce one another. Meters or transmitting antennas that are mounted very close (in each other's near-field area) or in a large number within a small area will create more interference and increase the risk of collisions in the air than senders that are mounted in a good distance from each other.

In this example, there is a risk that the radio signals from the two meters with antennas expose each other to destructive interference.

To avoid this, the antennas of up to 2 m in size must be installed at a distance of minimum 75 cm. In this way, the antennas are not within each other's near-field areas in which the signals will interfere and the signal strength is reduced.

The examples in the illustration below only take place in extreme cases. It is rarely seen that the signal dies completely, but we must be aware that it can happen.

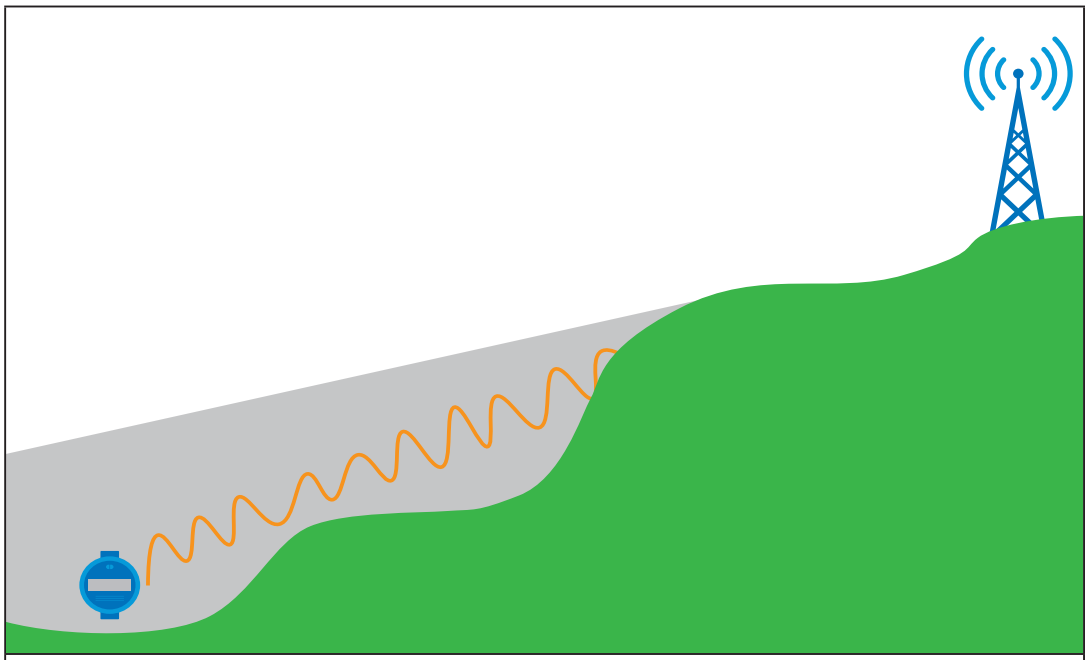


Interference models

2.1.1.5 Topography

The landscape contour or topography also has a major impact on the radio signal. For example, hills that are in the way of the signal path may absorb the entire signal.

The illustration below shows that the hill casts a shadow over the meter so that the receiver cannot receive the signal. The example is over-exaggerated, and in reality, the signal can probably reach the receiver due to reflection.



Meter and receiver may not "see" each other due to the topography.

3 Installation

In this section, we will review the meter installation in utility rooms, basements and pits. Each type of installation is described with focus on the radio signal. At the end of the section, a checklist of the most important elements is available.
An important element of the meter installation is check.kamstrup.com. Here, the meter's signal to the concentrator can be tested. See "7 check.kamstrup.com" on page 34 for a guide.

3.1 Meter installation

3.1.1 Guidelines for meter installation

At all installations, the following guidelines apply:

- Before installing the meter, orientate yourself on the receiver direction to achieve as short and direct a pathway as possible
- You must ensure free radiation so the signal is not quenched at installation
- The meter must not be covered, mounted in a metal cabinet, etc. If this is not possible, the range will be reduced
- If the network has been built, check that the meter can be read on check.kamstrup.com.

If these guidelines are complied with, the signal has the best possible conditions for reaching the receiver.
If it is not possible to see the meter, see "4.1 Trimming of the meter installation" on page 11.

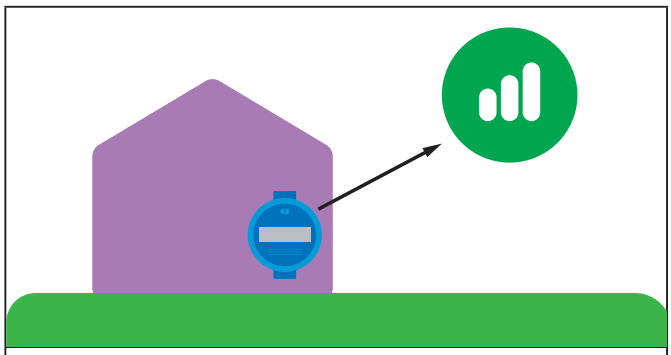
3.1.2 Utility room installation

In case of installation in a utility room or similar, the meter is typically located at or above street level. As a rule, this means that the meter's own antenna has sufficient transmission power to reach the receiver.

If reflective or absorbing materials such as a steel cabinet cover the meter, this can be the cause of a shorter/no range.

If this is the case, it is recommended to extend the signal range using one of the options described in "4.1 Trimming of the meter installation" on page 11.

Note: Always test whether the meter can be seen and received on check.kamstrup.com.



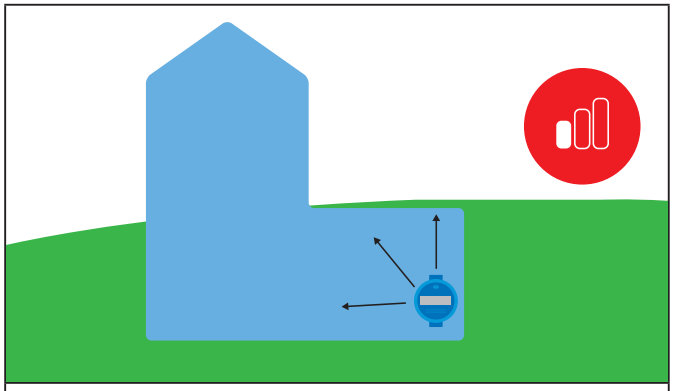
Meter mounted in utility room.

3.1.3 Basement installation

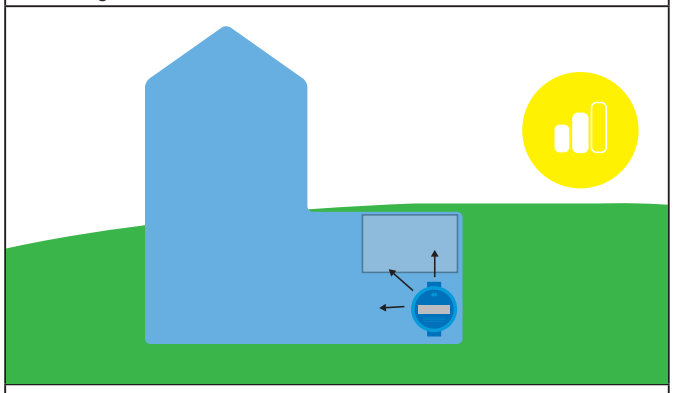
Here we take two different basement constructions as the starting point, which in their own ways affect the signal pathway:

1. A basement without a window or an opening to the outside
2. A basement with a window. **Note**:
   - In a closed basement without a window, it is difficult to get out the signal
   - If there is a window in the basement and if the meter can be placed high, the signal has good conditions

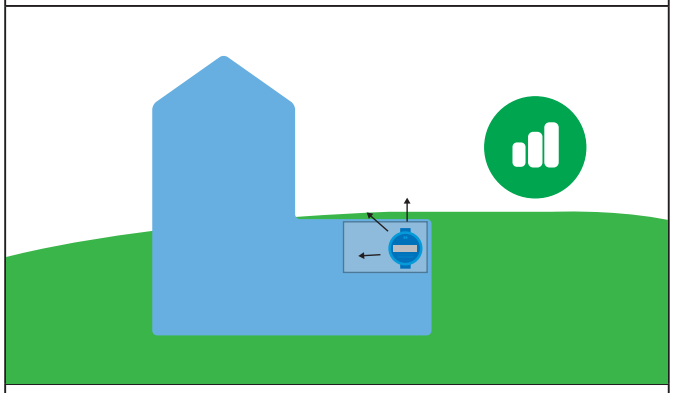
Check if the signal from the meter can be received on check.kamstrup.com.



Weak signal: Closed basement without a window.



Average signal: Basement with a window where the meter is not installed in the window.

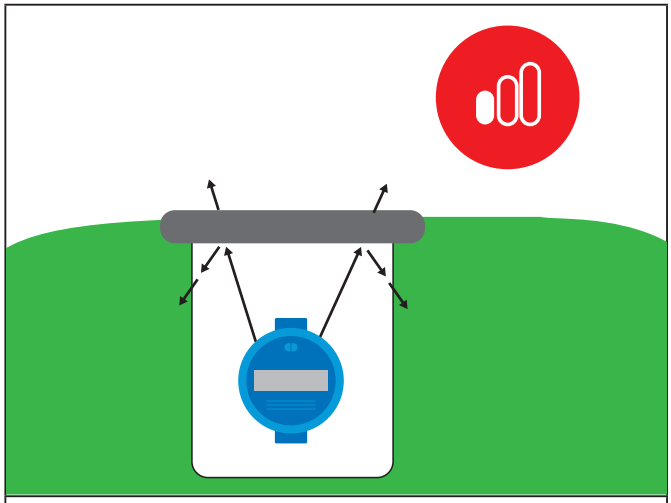


Good signal: Basement with a window, the meter can “see” a window.

3.1.4 Pit installations

Note the following:

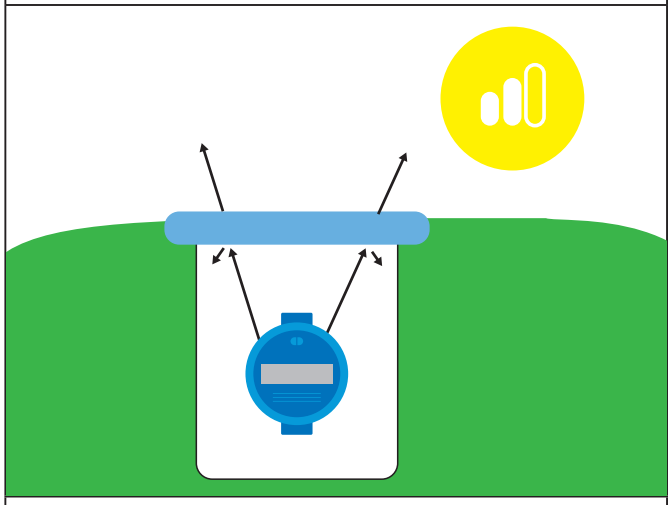
- The signal can be strictly limited since the signal must go through the pit cover
- It affects the signal differently whether the cover is made of plastic or metal



Metal cover: Weak signal

- Metal surfaces reflect the signal

The signal reaches outside of the pit, but with low transmission power. A large part of the signal is caught in the pit or absorbed by the ground.



Plastic cover: Average signal

Plastic does not absorb as strongly as metal, the signal therefore reaches outside of the pit, but with average transmission power.

Check that the signal from the meter can be received on check.kamstrup.com.

If the meter cannot be seen, perform a trimming of the installation.

See more in “4.3 Trimming of installation in pit” on page 15.

4 Trimming of installations

Kamstrup uses different methods for trimming the network.
Each installation is assessed individually to ensure the best solution.

- If a single meter cannot be read, it is recommended to install an external antenna
- If there are several meters that cannot be read within a short distance, it is recommended to use a repeater

4.1 Trimming of the meter installation

Before installing:

- Determine in which direction the receiver is placed
- In case of an external antenna: Measure the antenna cable's way from the meter to the possible antenna location to determine the proper cable length

Guidelines:

The cable:

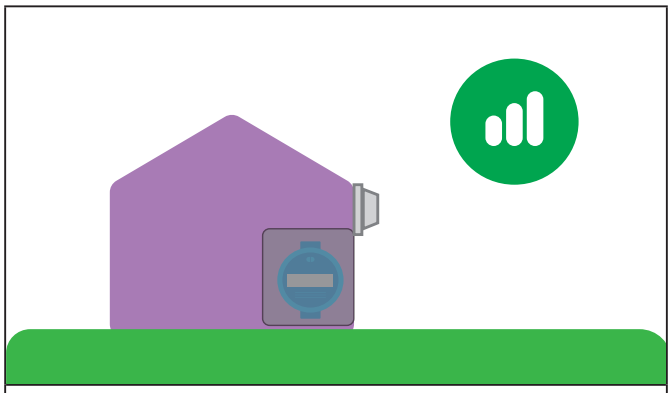
- Soft curves (bending radius 10 x diameter of cable)
- Properly measured length
- Properly mounted connector
- In own cable tray – if possible not together with power cables

The antenna:

- Installed towards the receiver
- Installed outside or inside with the following reservation:
  - No pipes, drain or boxes within 0.5 m of the antenna
    Note: Ensure free radiation around the antenna
- Make sure to install the antenna as high as possible

Check that the signal from the meter can be received on check.kamstrup.com.

Example of antenna installation:



The meter is installed in a steel cabinet.
The signal is extended with the external antenna.

4.2 Trimming of installation in basement

If the meter cannot be read on check.kamstrup.com, an external antenna must be mounted.

Important: It is recommended to use an external antenna with properly measured cable length.

Always follow the installation guide of the selected antenna, but with attention to the following guidelines:

Guidelines:

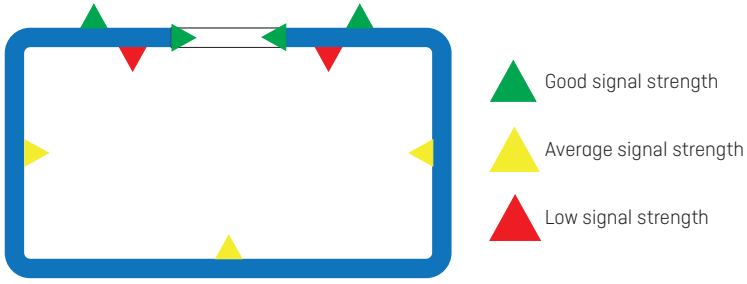
The cable:

- Soft curves (bending radius = 10 x diameter of cable)
- Properly measured length
- Properly mounted connector
- In own cable tray – as far as possible not together with conductive cables

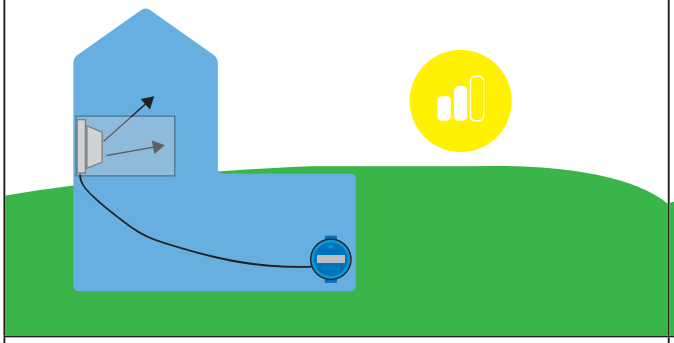
The antenna:

- Installed towards the receiver
- Installed outside or inside with the following reservation:
  - No pipes, drain or boxes within 0.5 m of the antenna
    Note: Ensure free radiation around the antenna
- Make sure to install the antenna as high as possible
- Free radiation

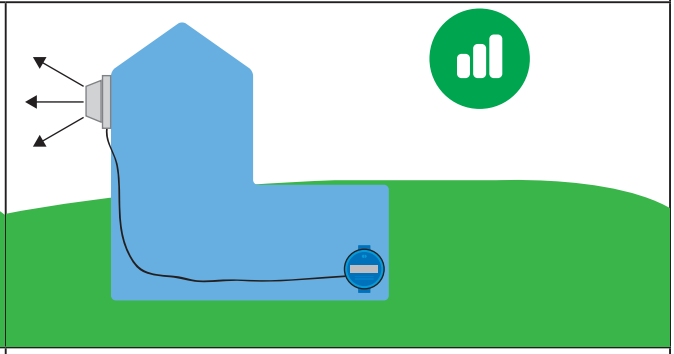
Check if the meter can be seen in the system on check.kamstrup.com.



Optimal placement of the antenna in basement. Seen from above.
Note that it is always most optimal to place the antenna outside, for example on the end wall of a house.



The external antenna is mounted in the basement in a window.



Outdoor mounting, as high and free as possible.

4.2.1 Installation scenarios – antenna in basement

	
The antenna is mounted in the window, see the drawing "Optimal placement of the antenna in the basement" in section 4.2.	The antenna is mounted outside the basement. However, it would be better to place it higher.
	
Antenna mounted in the window.	The antenna is mounted highly in the basement with good distance to ambient elements.
	
Pit antenna mounted in the mounting kit. Error: • The antenna is mounted in a corner • The distance to the pipes is too short	Pit antenna attached to the pipe. Error: • The antenna is attached to a pipe • The antenna is mounted in a corner

	
External antenna on water meter. Error: • The mounting ring mounted incorrectly • The cable is fastened with cable ties and the cable is squeezed	The mounting ring is mounted correctly. The IR diodes are visible in the notch in the ring.

4.3 Trimming of installation in pit

If the signal is not visible on check.kamstrup.com, an external antenna must be mounted on the meter.

Important: It is recommended to install an external antenna in the pit cover or outside the pit.

Always follow the installation guide of the selected antenna, but with attention to the following guidelines:

Guidelines:

The cable:

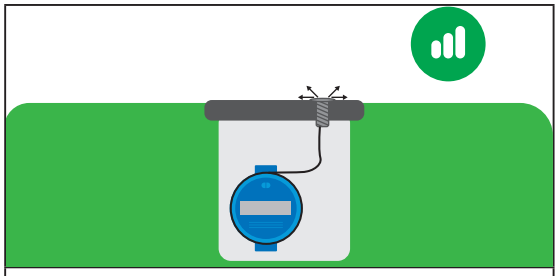
- Soft curves (bending radius = 10 x diameter of cable)
- Properly measured length
- Properly mounted connector
- Led through a PVC pipe

The antenna:

- Mounted vertically
- As short and direct a path as possible
- Orientate yourself on the location of the reciever
- Free radiation
- To be installed as high as possible

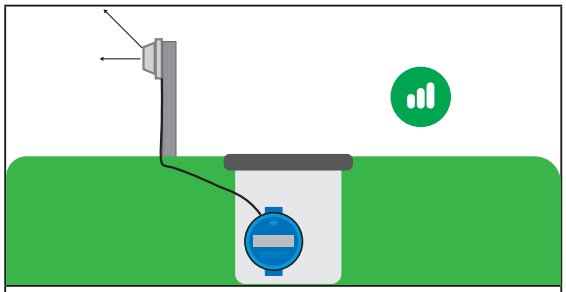
The pit antenna is designed for installation in pit cover, as can be seen in the illustration.

The pit antenna is primarily used where the signal has a short way to the receiver, otherwise a repeater is used.



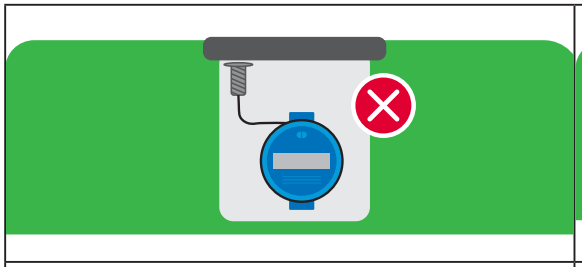
Meter installed in pit with antenna in the pit cover.

An external antenna can also be mounted to get the signal out of the pit. Here, the same principle applies as for the pit antenna.

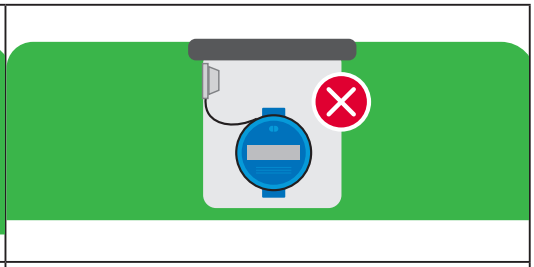


Meter installed in pit with external antenna.

The pit antenna or the external antenna mounted under the pit cover does not contribute to a better transmission power than what the meter's own antenna can deliver.



Meter with external pit antenna mounted under the pit cover.

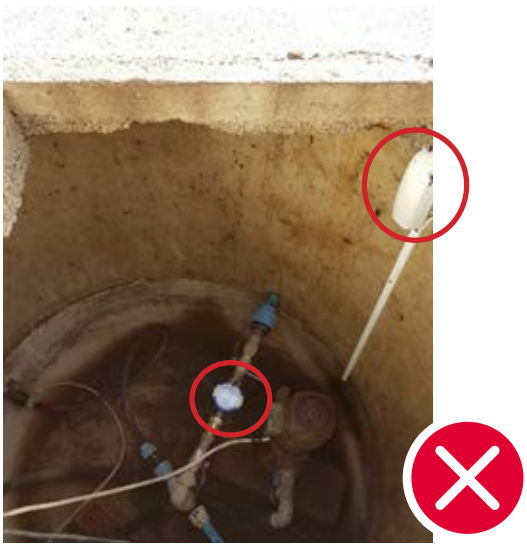


Meter with external antenna mounted under the pit cover.

4.3.1 Installation scenarios – pit installation

The external antenna mounted on the meter in pit. The cable has a proper length.

The antenna is mounted on the flagpole, higher than the cover. This can only be done with the consent of the owner of the property.



Meter with pit antenna.
The antenna is mounted under the pit cover which does not result in better signal conditions.

5 Data concentrator installation

Kamstrup has three network infrastructure components that are used for data collection:

1. READy Concentrator
2. READy Mini Concentrator
3. READy 4G Bridge

5.1 READy concentrator

A READy concentrator installation consists of a concentrator, antennas and cables.

Here, the composition of components to achieve the best possible performance of systems for the reception of signals from the meters is described. The antennas pick up radio signals sent from the meter.

Stand-alone

Plastic cabinet

Steel cabinet

Stand-alone

- Indoor installation
- With integrated cavity filters (signal filters)

Plastic cabinet

- Installed indoors or outdoors, IP 44
- 2 x cavity filters, noise filters
- Internal power switch

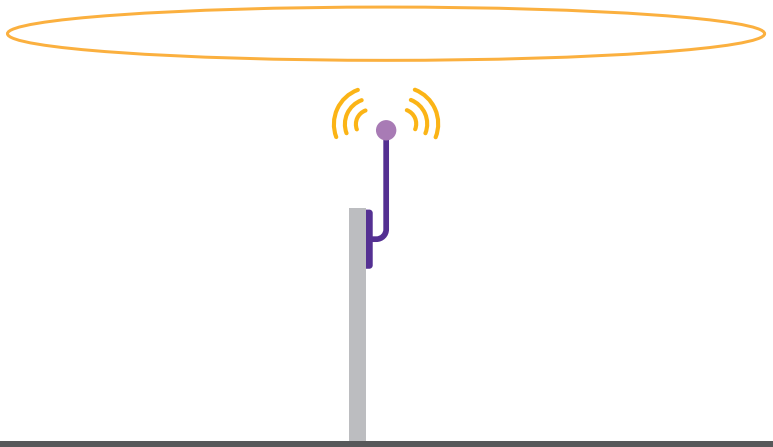
Steel cabinet

- Installed outdoors in hard environment
- 2 x cavity filters, noise filters
- Internal power switch
- Heater unit for freeze protection (optional)

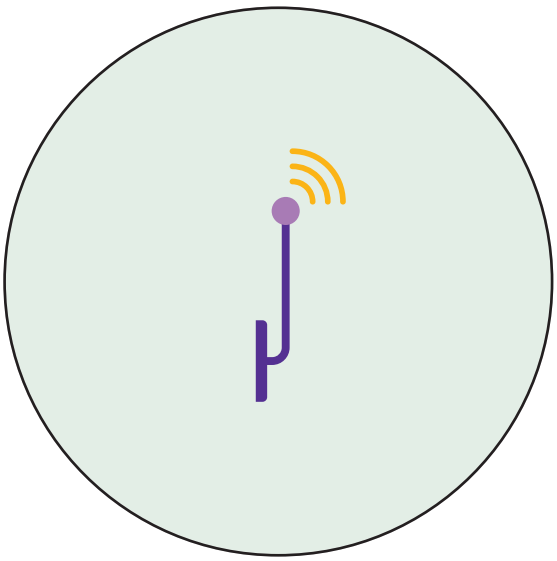
5.2 Omni antenna

This type of antenna is an omni-directional antenna.

The omni antenna is suitable for the reception of a large number of meters due to its 360° reception area and high amplification.



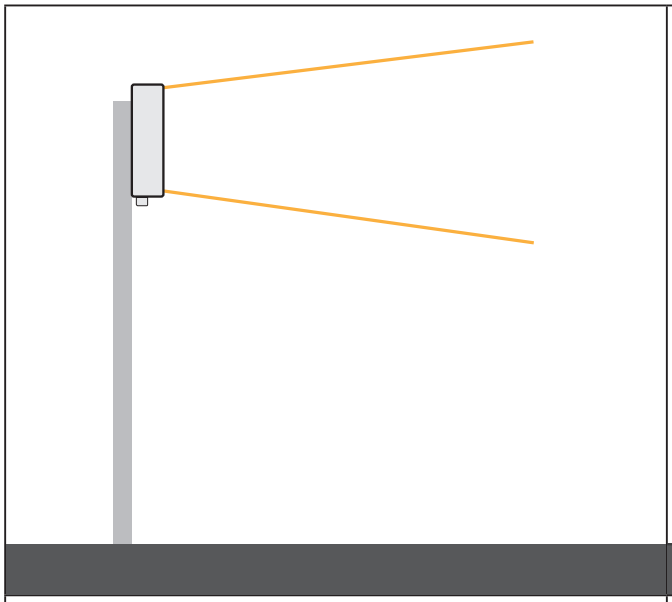
Omni antenna for 360° reception.



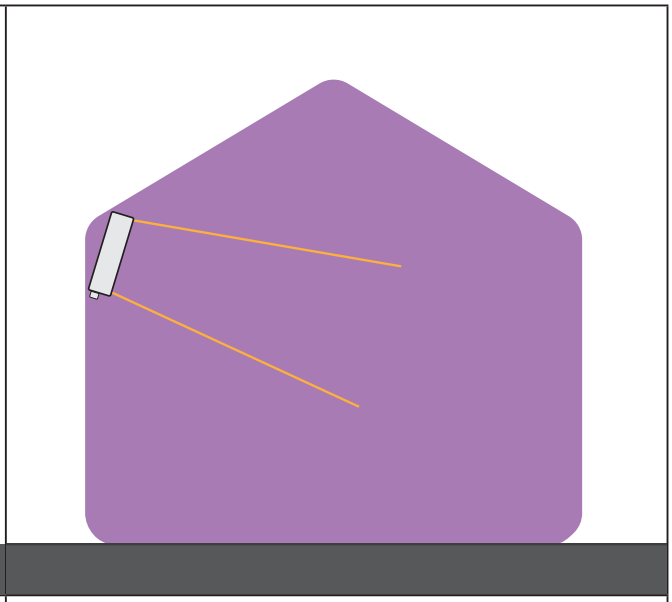
Omni antenna – 360° coverage.

5.3 Panel antennas

The panel antennas are recommended for reception in one specific direction. They must point directly in the direction of the meters.



Panel antenna for directional reception – outdoors.



Panel antenna for directional reception – indoors.

Outdoor panel antenna – coverage of a specific area or street.

In theory, the omni and wall antennas are omnidirectional, i.e. they are equally suitable for receiving signals in all 360 degrees. In practice, the reception conditions may be affected by the environment, buildings and vegetation. In other words, just because there is 200 m range in one direction, this does not mean that this range applies all the way around the antenna.

5.4 Cables

Follow the guidelines from the cable manufacturer for bending of the cable: For example, the bend must as a minimum amount to:

10 x diameter of a 10 mm thick coaxial cable

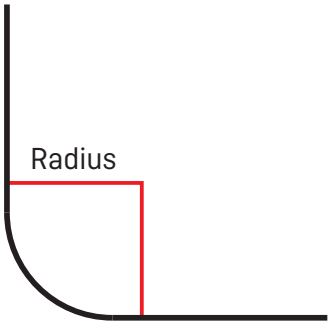
↓

Bending radius ≥ 100 mm

This also applies to the rolling up of a cable.

In general, the cable must not be forced into place. If force is used to pull the cable, the cable can be damaged.

Use measured cable lengths where possible. In this way, the signal loss is reduced as much as possible.

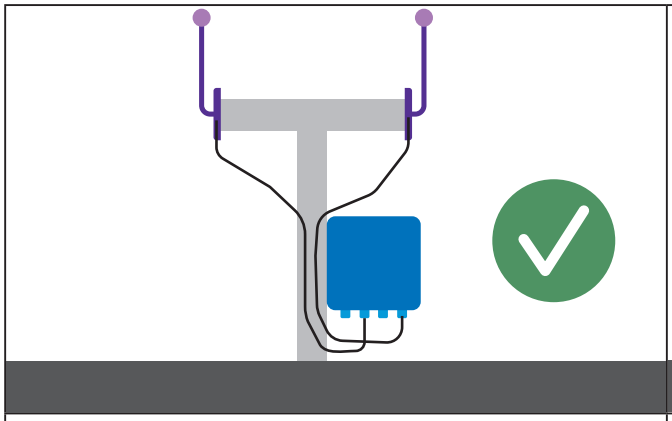


ø5 mm cable → radius ≥ 50 mm
ø10 mm cable → radius ≥ 100 mm

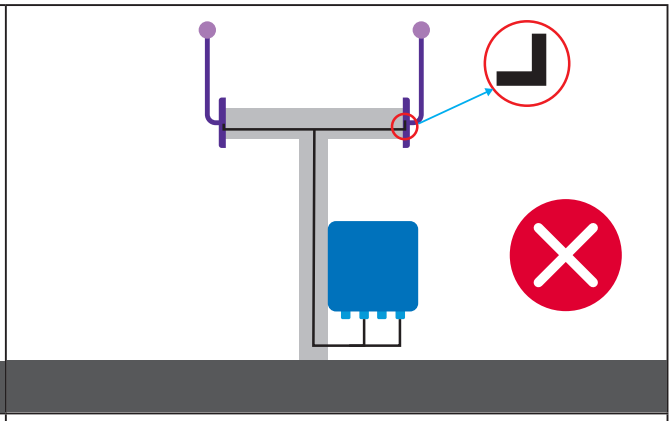
Here, the radius is respected. However, a shorter cable should have been selected for this installation.

Here, the radius is not respected. This may result in increased losses in the cable.

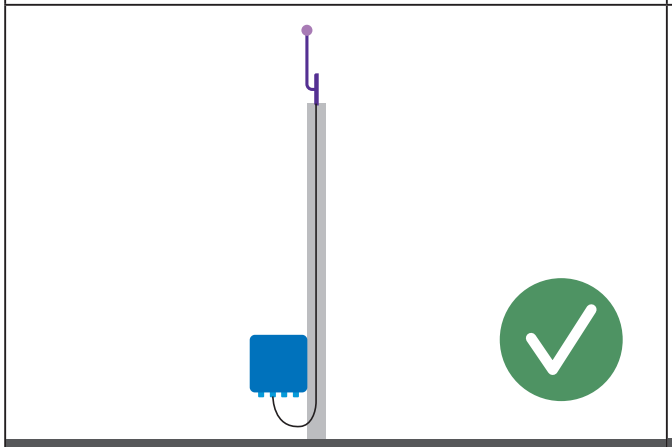
5.4.1 Cable installation



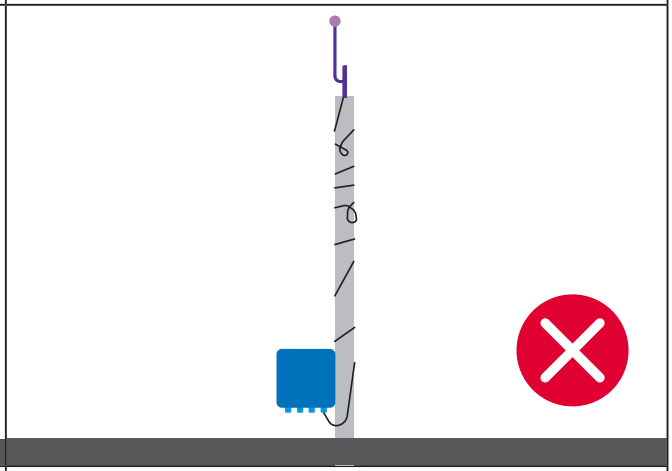
The cable is mounted with soft curves, but is still attached to the stand.



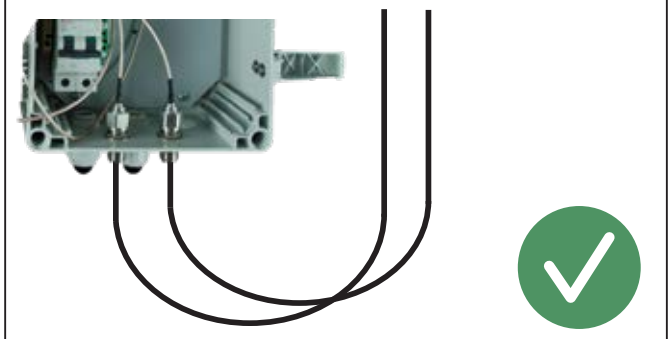
The cable is mounted with hard bends and fixed tightly to the stand.



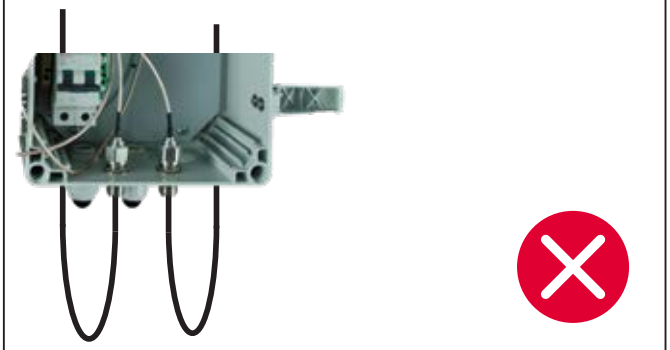
The cable mounted along the pipes in a straight line with a soft curve to the concentrator.



The cable wrapped around the pipe.



Soft curves – correct radius.



Too small radius of cables.

5.4.1.6 Installation scenarios – cables

	
Concentrator 1 – in plastic cabinet Error: • GSM cable caught in box cover • The cable breaks and there is no GSM signal	Concentrator 1 – in plastic cabinet Error: • Cable severed when closing the cabinet
	
Concentrator 2 – in plastic cabinet Error: • GSM Mini Triangle antenna mounted on wM-Bus connector	Concentrator 2 – in plastic cabinet Error corrected: • GSM Mini Triangle antenna mounted on 2G/3G modem in concentrator
	
Antenna cable. Error: • Bending radius too small • Unnecessary load • Cable breaks in the connector • Water can penetrate	Antenna cable. Error: • The cable is led in narrow steel profile, resulting in too small a bending radius

5.5 READy Mini Concentrator

READy Mini Concentrator is a standalone data concentrator with built-in antennas. It receives wM-Bus signals from meters or sensors and forwards the data to READy Manager either by WiFi, Ethernet or the optional GSM connection.

It is not possible to attach external antennas to READy Mini Concentrator.

5.5.1 READy Mini Concentrator reception

READy Mini Concentrator has a reception range of approximately 60 m, depending on potential obstacles on the radio signals way from meter to READy Mini Concentrator.

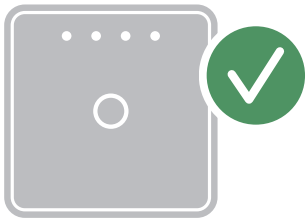
5.5.2 READy Mini Concentrator installation

Install READy Mini Concentrator as close as possible, but at least 50 cm from to the meters you intend to read.

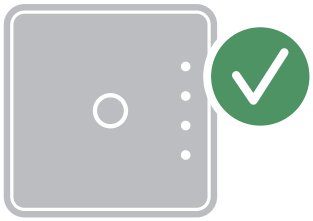
Consider aspects as reflection and absorption of radio signals when installing READy Mini Concentrator. Typically, it is best to install READy Mini Concentrator up high to allow free radiation around the built-in antenna.

Guidelines:

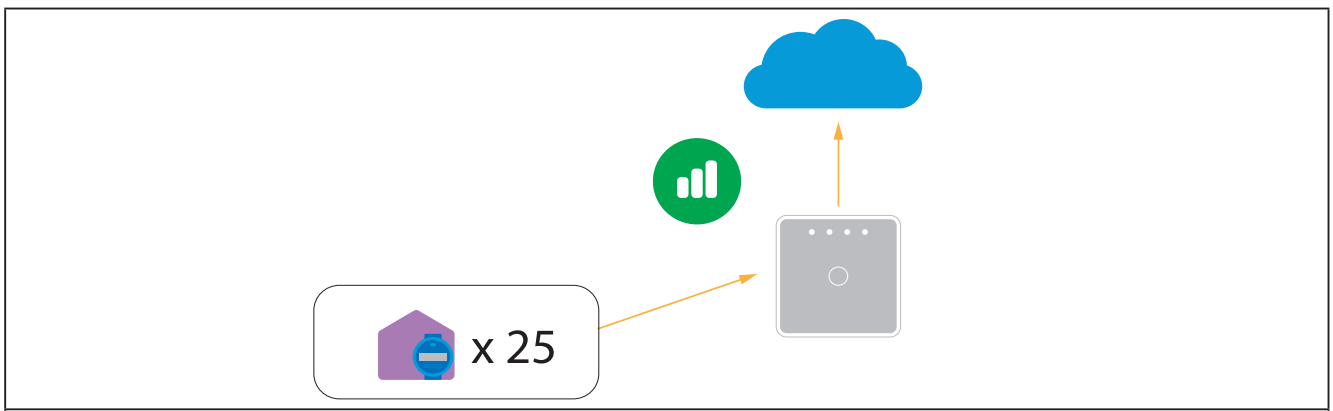
- Free radiation
- Installation as high as possible, preferably in a height of 4 – 6 meters
- Test the signal strength between READy Mini Concentrator and the meter on the final installation site
- Follow the quick guide for installation and configuration
- Verify that the meters can be seen on check.kamstrup.com



Vertical orientation



Horizontal orientation



READy Mini Concentrator receiving data from 25 meters.

5.6 READy 4G Bridge

READy 4G Bridge is a 4G cellular connected wM-Bus data collected with built-in antennas.

5.6.1 READy 4G Bridge reception

READy 4G Bridge has a reception range of approximately 200-300 m, depending on potential obstacles of the radio signals.

5.6.2 READy 4G Bridge installation

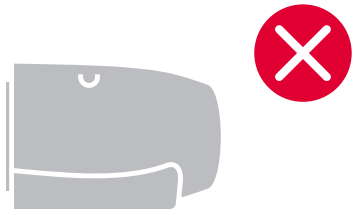
Install READy 4G Bridge as close as possible, but at least 50 cm from to the meters you intend to read.

Consider aspects as reflection and absorption of radio signals when installing READy 4G Bridge. Typically, it is best to install READy 4G Bridge up high to allow free radiation around the built-in antenna.

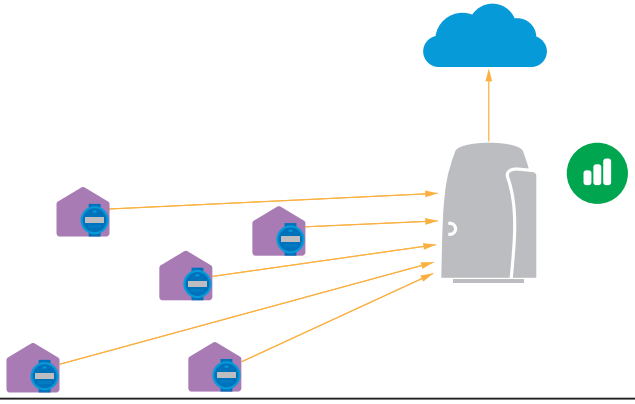
Guidelines:

- Vertical mounting
- Free radiation
- Installation as high as possible, preferably in a height of 4 – 6 meters
- Test the signal strength between READy 4G Bridge and the meter on the final installation site
- Follow the quick guide for installation and configuration
- Verify that the meters can be seen on check.kamstrup.com

Vertical orientation

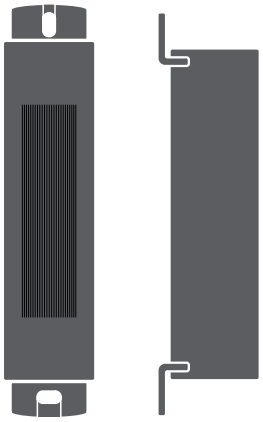


Horizontal orientation



READy 4G Bridge connected to 5 meters.

6 Installation of Kamstrup Repeater 5

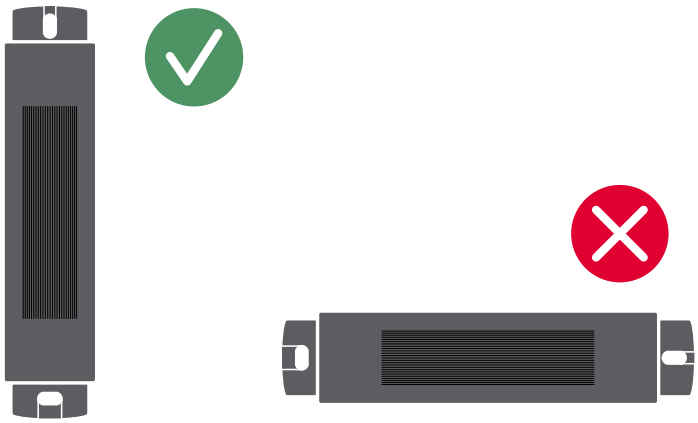


This section describes the installation of Kamstrup Repeater 5.
The repeater can forward the signal of up to 5 meters.

Guidelines

- Vertical mounting, see the arrow on the back.
- Free radiation
- Installed as high as possible, preferably in a height of 4-6 m
- Front towards the meter and the receiver. Therefore, orientate yourself on the location of the receiver.
- Test the signal strength between the repeater and the meter on the final location of the repeater
- Minimum -90 dBm between repeater and meter.

After the installation of the repeater, check the signal strength via READy App.
See “6.2 Pairing of meter and repeater” on page 27.
Verify that the paired meters can be seen on check.kamstrup.com with a signal strength of minimum 1 bar.

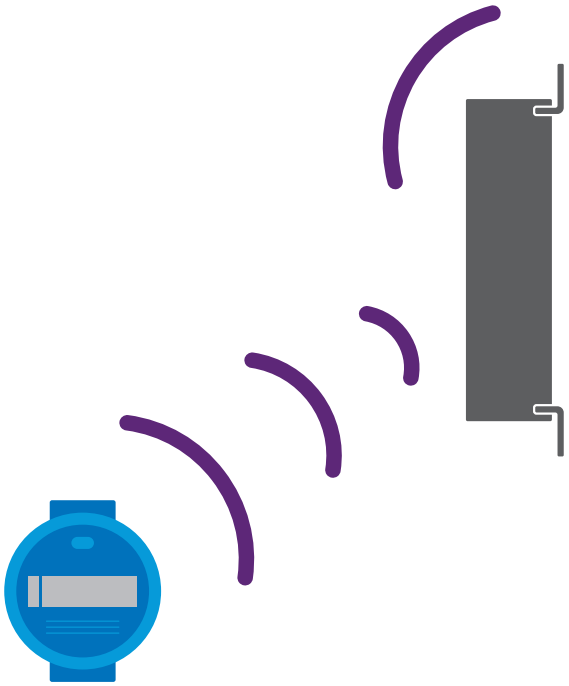


Vertical mounting Horizontal mounting

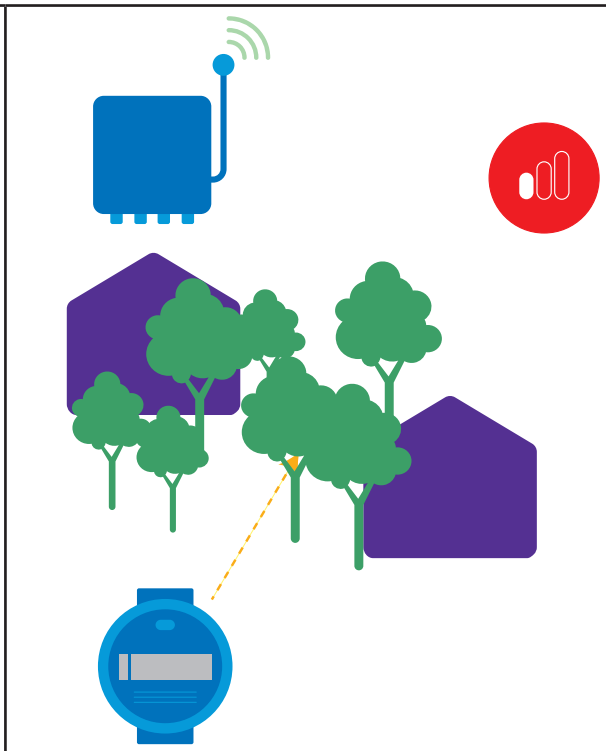
The horizontal mounting is due to the antenna’s location in the repeater.
The signal is strongest at the front, and therefore, vertical installation is recommended to achieve the best spread of the radio signal.

6.1 Repeater

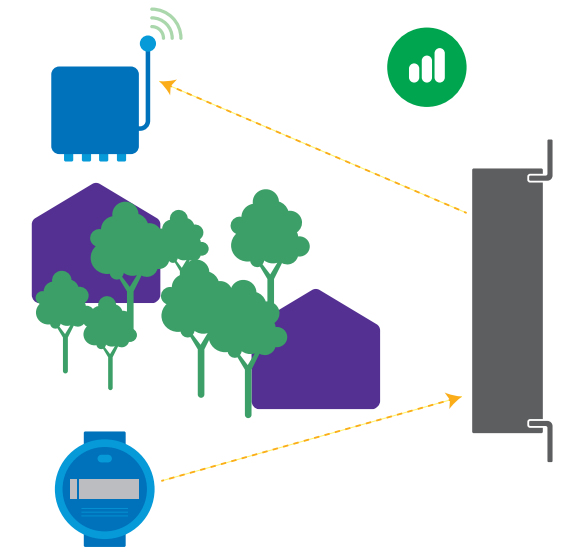
The repeater receives the signal from the meter and forwards it to the concentrator. When the signal is received by the repeater, it is forwarded once more at full transmission power. In this way, the repeater functions as a signal extension for meters that are placed on the outskirts of the concentrator antenna's reception area or for meters that are placed on locations where the signal has bad conditions.



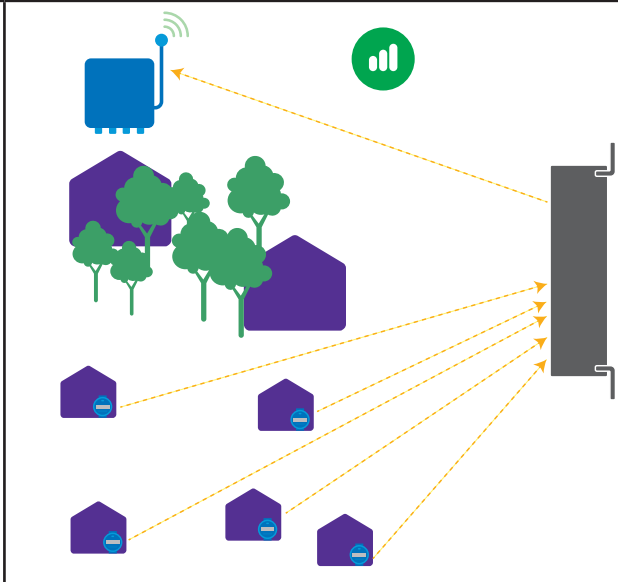
The signal from the meter is received by the repeater and forwarded from this new starting point at full power.



The meter signal is not picked up by the concentrator.



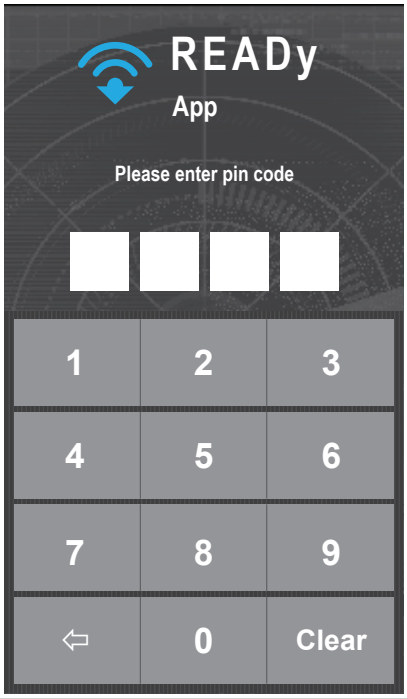
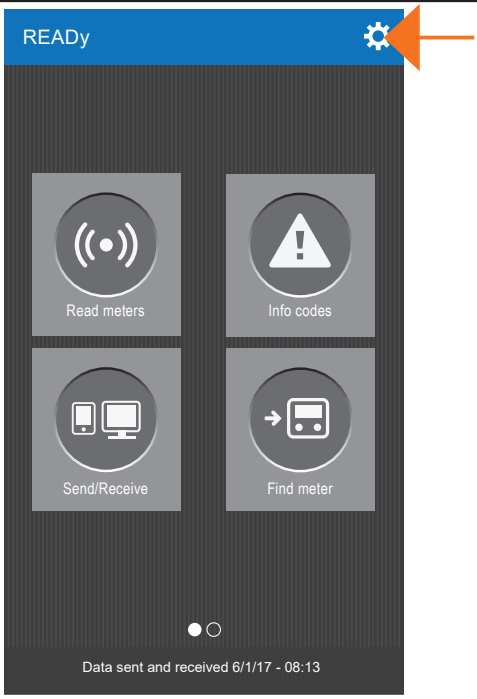
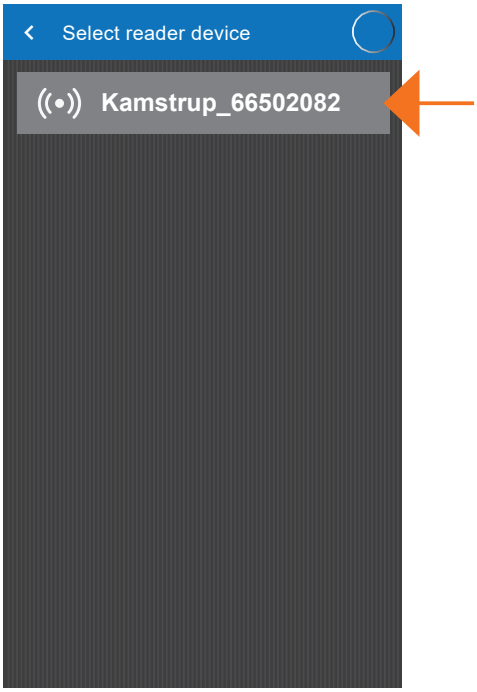
The signal pathway from the meter, through a repeater, to the concentrator's receiver antennas.
The problem with the obstacle is resolved.



Repeater paired with 5 meters.

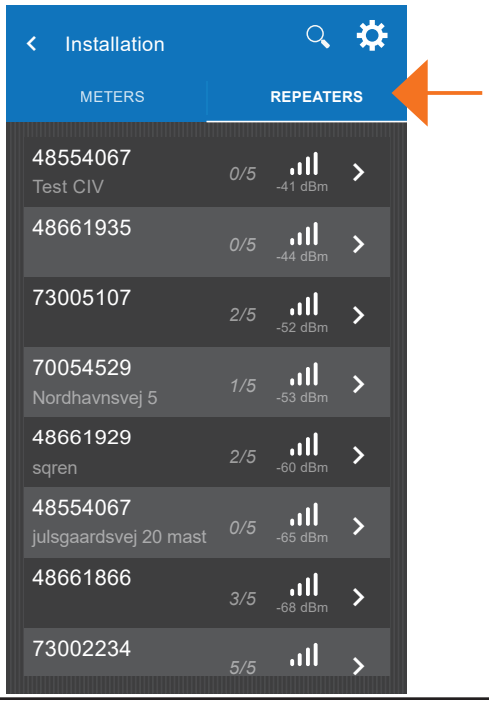
6.2 Pairing of meter and repeater

Follow the procedure below to pair a meter with a repeater in READy App.

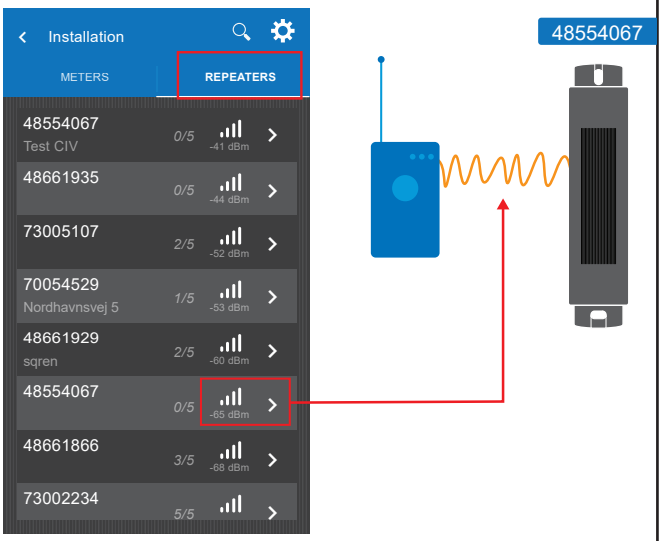
1. Log in to READy App:	2. Click the icon in the upper right corner to select settings:
	
3. Select **Pair with reader device**:	4. Select the converter based on serial number:
	

5. Select **Installation**:

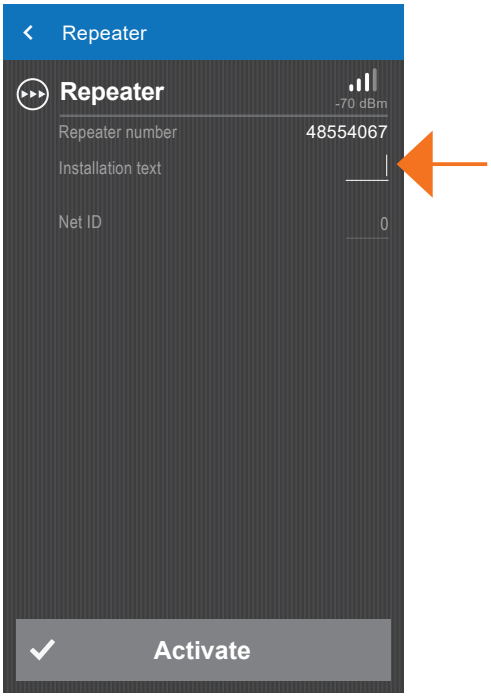
6. Select **Repeaters**:



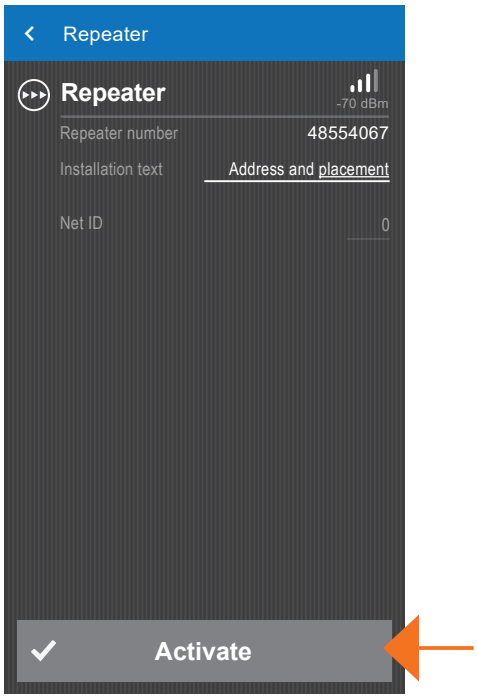
7. Select the repeater that is to be configured.
Here, the signal strength between a converter and the repeater is displayed:



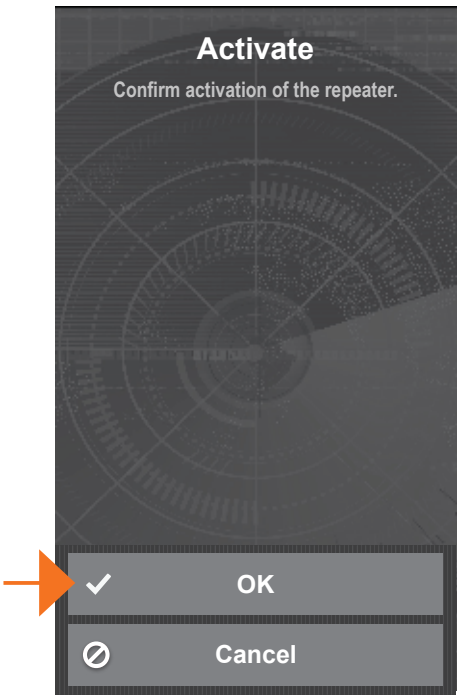
8. Enter the repeater's location in Installation text.



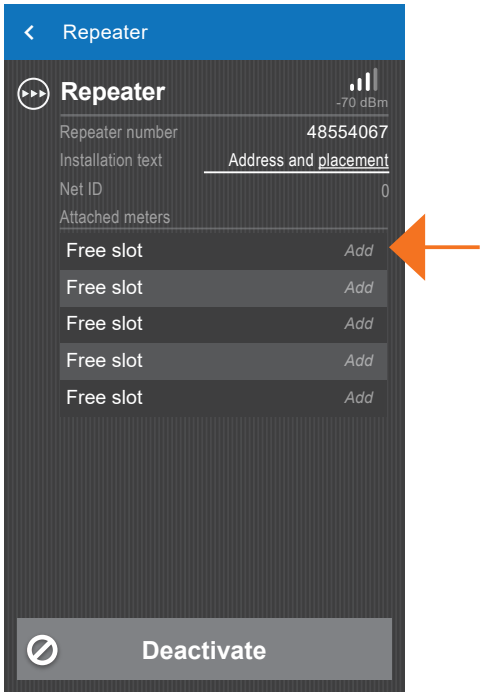
9. Press **Activate** to activate and start using the repeater.



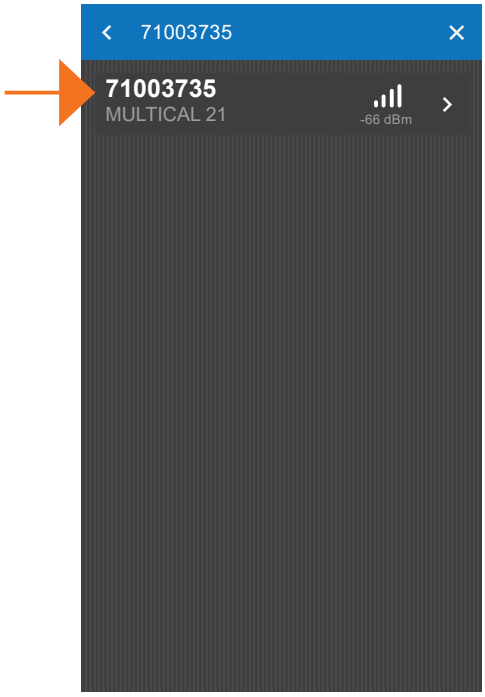
10. Select **OK**.



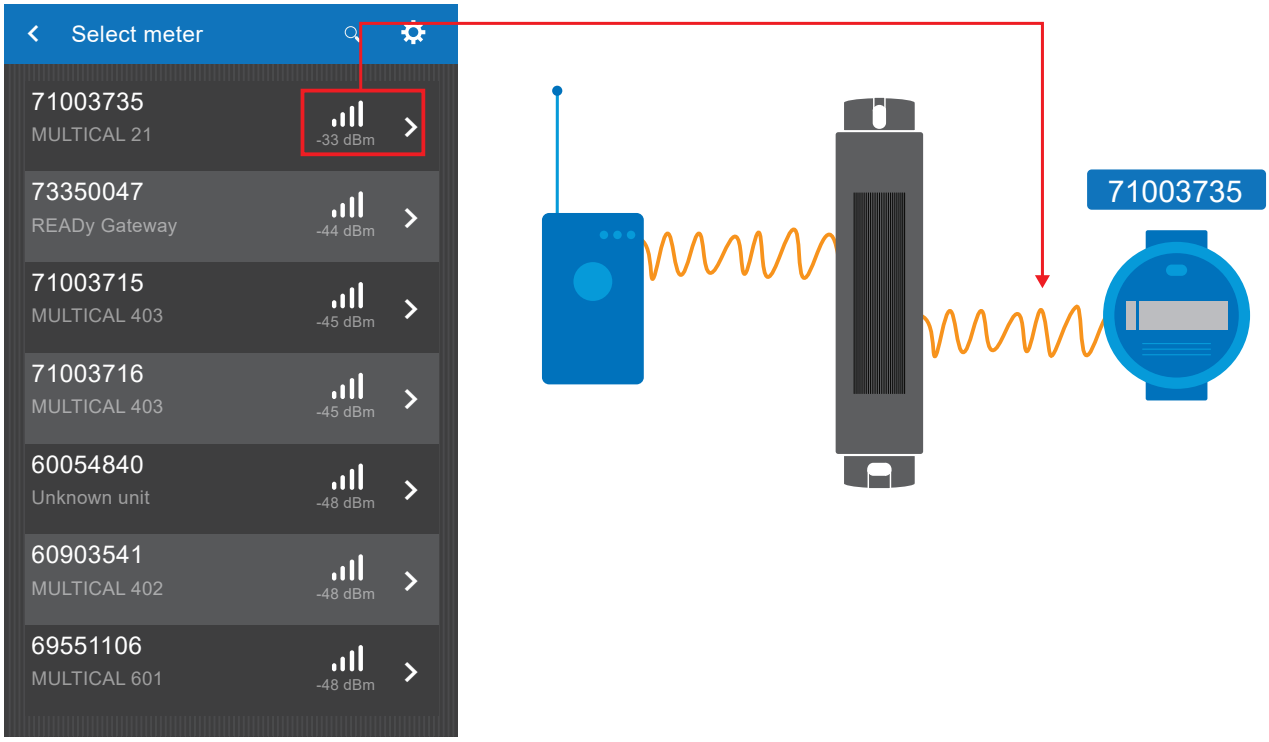
11. Add meters to the repeater's free spaces by selecting **Add**.



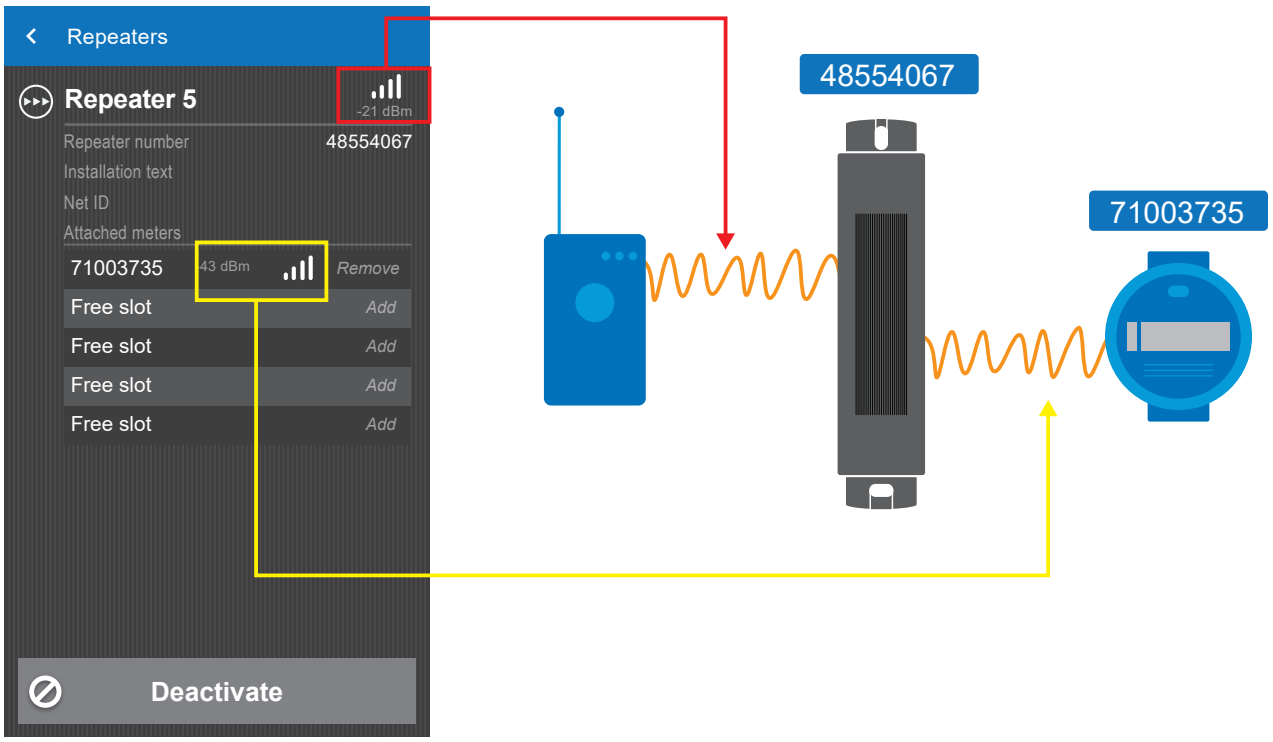
12. Select the meter with the correct serial number.



The signal strength between the repeater and the meter is now displayed.
Note: Minimum -90 dBm.
If the value is, for example, -95 dBm, the signal may not be strong enough to be read each time.



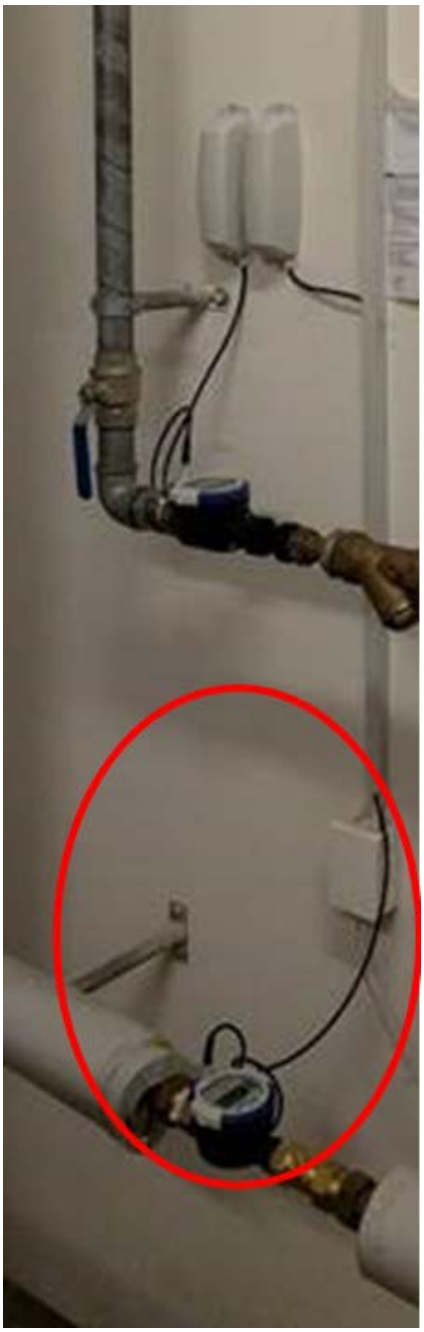
Here, the final configuration with the signal strength from converter to repeater and from repeater to meter is shown:



Installation scenarios – the repeater

	
The repeater mounted on a bicycle shed. Error: • The repeater is mounted horizontally	Repeater mounted vertically on a shed.

6.3 Typical error scenarios

		
Cable jammed in the assembly.	The antennas interfere with each other. Note that this installation does not provide a better signal than the meters can provide.	Cable pulled together with 230V.
Solution: The cable is rolled up in a soft curve. See “5.4 Cables” on page 20.	**Solution:** The antennas are moved to a distance of at least 50 cm between them and installed higher than the meters.	**Solution:** The cable is placed in own cable tray.

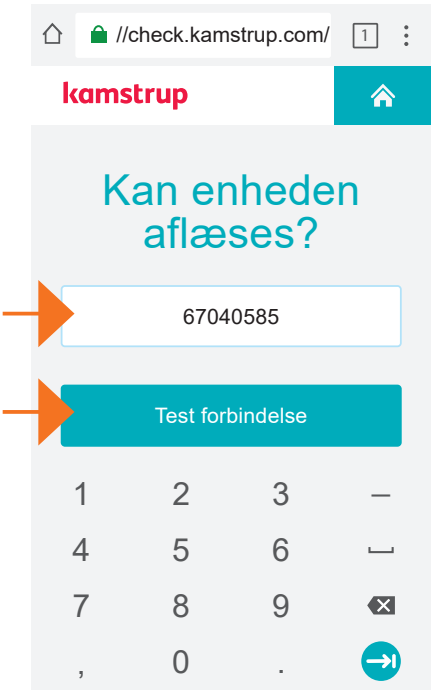
6.4 Examples of good installation

	
Antenna mounted in the window, here in a basement installation.	Concentrator mounted outside, no tangling.
	
Repeater mounted vertically + highly.	The antenna is mounted as high and free as possible.

7 check.kamstrup.com

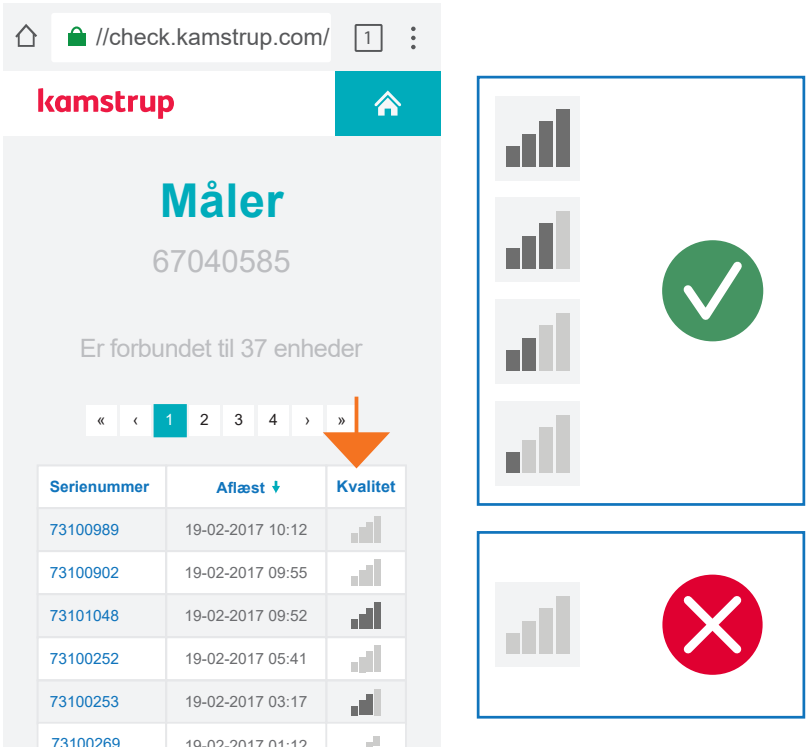
Follow the procedure below to check that there is a connection to a specific device:

1. Go to check.kamstrup.com
2. Enter the number of the unit to be read
3. Press **Test connection**



4. Press **See related devices** for more details on the quality and the time of the reading

The meter should at least be able to be read by the concentrator with 1 bar. This appears from the column **Quality**.



Note: Be aware of the date and time.

8 Checklist for meter installation

The meter is installed as described in the installation guide for the meter concerned.
Before mounting the meter, check the following:

❑ Is the flow direction correct?

❑ Are the connections performed correctly?

When the meter registers a flow for the first time, the radio module is automatically activated and the meter will become visible in the radio network.
When the meter is active, check whether the signal is received by the concentrator on check.kamstrup.com.

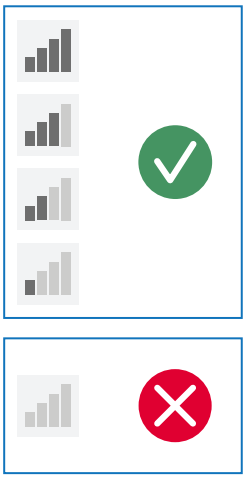
❑ Can the meter be seen with at least 1 signal bar?

❑ Is the reading time correct?

Consider whether the signal quality is affected by the installation's location.

Location

The meter's location has a huge impact on the signal strength.
When the meter is mounted in a cabinet, in a corner or covered, the range is reduced.



9 Checklist for meter antenna installation

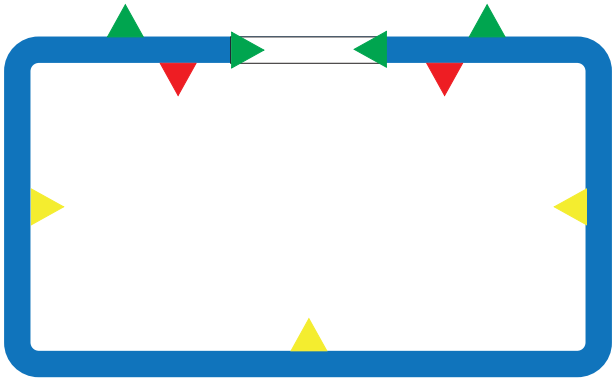
If it becomes necessary to install an antenna, you must be aware of the concentrator's location as the antenna must be installed towards the concentrator.

The antenna should be installed with the correct conditions:
The antenna must be mounted with at least 1 m. to:
❑ Other antennas
❑ Corners
❑ Powerful magnetic fields

In addition, the antenna must:
❑ Be mounted high
❑ Have a clear view of the window
❑ Be mounted in vertical position with the cable pointing downwards

In case of installation in basement:
❑ Optimally, the antenna must be mounted outside

If this is not possible:
❑ Place the antenna in the basement window, or in such a way that the antenna can "see" the window, see the figure below
❑ In a basement without windows, the antenna is moved outside and above basement level



Green is the most optimal position

Yellow is an acceptable position

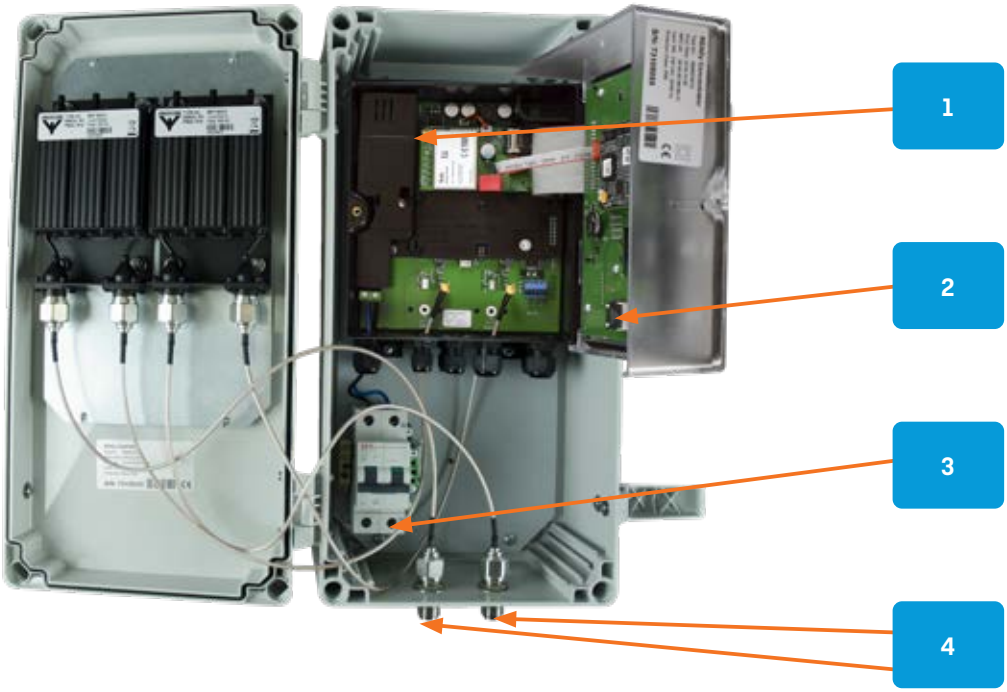
Red may reduce the range

Before the installation is completed, you must check that the meter can be read by the system.

Use check.kamstrup.com for this purpose.

10 Checklist for concentrator installation

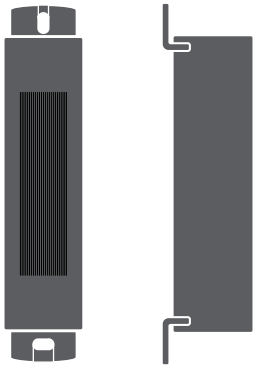
Check if the antennas are connected correctly to the READy Concentrator.
Overview of the connections:



1	GSM
2	Ethernet
3	Current
4	wM-Bus

❑ Are the cables connected to the correct terminals?
❑ Antennas through the filters?
❑ Power for the switch?
❑ The GSM antenna to the modem?
or
❑ The network cable to the Ethernet port?
❑ Are power and GSM antenna cables led out through the holes in the bottom of the cabinet?
❑ Are all cables neatly placed, without any hard bends?
❑ Have the connections been tightened?
❑ Does all diodes flash green/light up?
❑ Is the concentrator visible on check.kamstrup.com?

11 Checklist for repeater installation



- ❑ Is the Repeater mounted vertically?
- ❑ Is there free radiation towards meter and receiver?
- ❑ Is the Repeater visible on check.kamstrup.com?
- ❑ Can the repeater see the meters?
  This is checked in READy App.
  See "6.2 Pairing of meter and repeater" on page 27 and "6.1 Repeater" on page 26.
- ❑ Has the signal test been performed after the installation of the repeater?
  The signal strength should be tested with the repeater mounted on the final location.

Note: There must be at least -90 dBm between Repeater and meter.
If the signal is -95 dBm, the signal may be too weak to ensure that it can be read.

Kamstrup A/S • FILE100002702_B_EN_06.2023

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