

Master User Guide

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Nofence AS

Table of Contents

1. Getting started with Nofence – Quick guide	4
2. Getting started with Nofence – Videos	6
3. Get to know the Nofence technology	7
3.1. Basics	8
3.2. The Nofence boundary	10
3.3. Mobile coverage	13
3.4. GPS / Positioning	14
3.5. Fitting collars	16
3.6. Training animals	20
3.7. Shelter Beacons	24
3.8. Good pasture design	26
4. The app	31
4.1. Symbols used in the app	32
4.2. Status	34
4.3. Pastures	39
4.4. Collars	43
4.5. Move	49
4.6. More	55
4.6.1. My user	56
4.6.2. My account	60
4.6.3. Search for Shelter Beacons nearby	62
4.6.4. Statistics and analysis	63
4.6.5. Point and line markers in map	68
4.6.6. Remove pasture via Bluetooth	70
4.6.7. Help and Info	73
5. Maintenance	74
5.1. Maintenance and storage for sheep / goat collars	75
5.2. Maintenance and storage for cattle collars	76
6. Other	77
6.1. Troubleshooting	78
6.2. The Nofence grazing map	80
6.3. The web portal my.nofence.no	81
6.4. Second Hand sale of collars?	85
7. Technical description	87
7.1. The cattle collar	88
7.2. The sheep and goat collar	90
7.3. Batteries	92
7.4. Chargers	94
7.5. The audio cue	97

7.6. The electrical pulse	99
7.7. The accelerometer	100
7.8. Firmware update	101
8. Downloads	102
8.1. Grazing Posters	103
8.2. Product data sheet	104
9. What is good animal welfare?.....	105
10. Contact us.....	107
11. FCC USA Compliance Statement.....	108
12. ISED Canada Compliance Statement.....	109

1. Getting started with Nofence – Quick guide



1. **Charging batteries:** Start with charging the batteries. It takes 8-10 hours to fully charge the sheep/goat batteries, and up to 14 hours to fully charge the cattle battery. It is therefore important to start the charging process well before you are planning to start the training. A constant green light on the charger indicates a fully charged battery.
2. **Insert battery in collar:** The collar will be switched on when you insert the battery and the [start up audio](#) is played. Make sure the battery is properly fitted in the collar – you should hear a click when the battery is inserted correctly.
3. **Leave collars with batteries inserted overnight:** This is to ensure that all collars are fully updated.
4. **Open the activation email from Nofence:** Click on the link in the email to activate your account.
5. **Download the Nofence app:** Log in to the app and follow the instructions.
6. **Assign the collars to your user:**
 - Make sure that you have switched on Bluetooth on your phone.
 - Go to Collars in the bottom menu.
 - Press + in the upper right corner.
 - All the collars in the nearby area will appear in the list.
 - Select the serial numbers on the list that match the serial numbers of your collars.
 - Press Confirm to add the collars.
7. **Create a new training pasture in the app:** Follow the guidelines for training under the section [Training animals](#). The training pasture should be in a physically fenced area.
8. **Assign the collars to the pasture:** Go to “move” in the bottom menu to set the collars to the

training pasture. Follow the instructions in the app.

9. **Fit the collars to the animals:** Make sure the collars are fitted properly around the animal's neck – it should be tight, but not uncomfortable for the animal. Be aware that some animals will grow during the grazing season. Please see a video of proper fitting [here](#).
10. **Move the animals into the new pasture:** When the position of the collar is registered inside the virtual pasture, the fence will be activated. You are now ready to start the training. Good luck!

To learn more about how the technology works, we recommend checking out the section [How the technology works](#).

Do you have any questions, or need any assistance? Feel free to contact us at support@nofence.no or at +44 1952 924012.

2. Getting started with Nofence – Videos

Please enjoy a few short videos showing how easy it is to get started with Nofence.



[Introduction](#)



[Turn the collar on and off](#)



[Fitting the collar](#)



[The Nofence-app](#)



[The Nofence boundary](#)



[Intuitive pastures](#)



[Training animals](#)



[Fencing in difficult terrain](#)



[Moving the animals](#)



[Locating the animals](#)

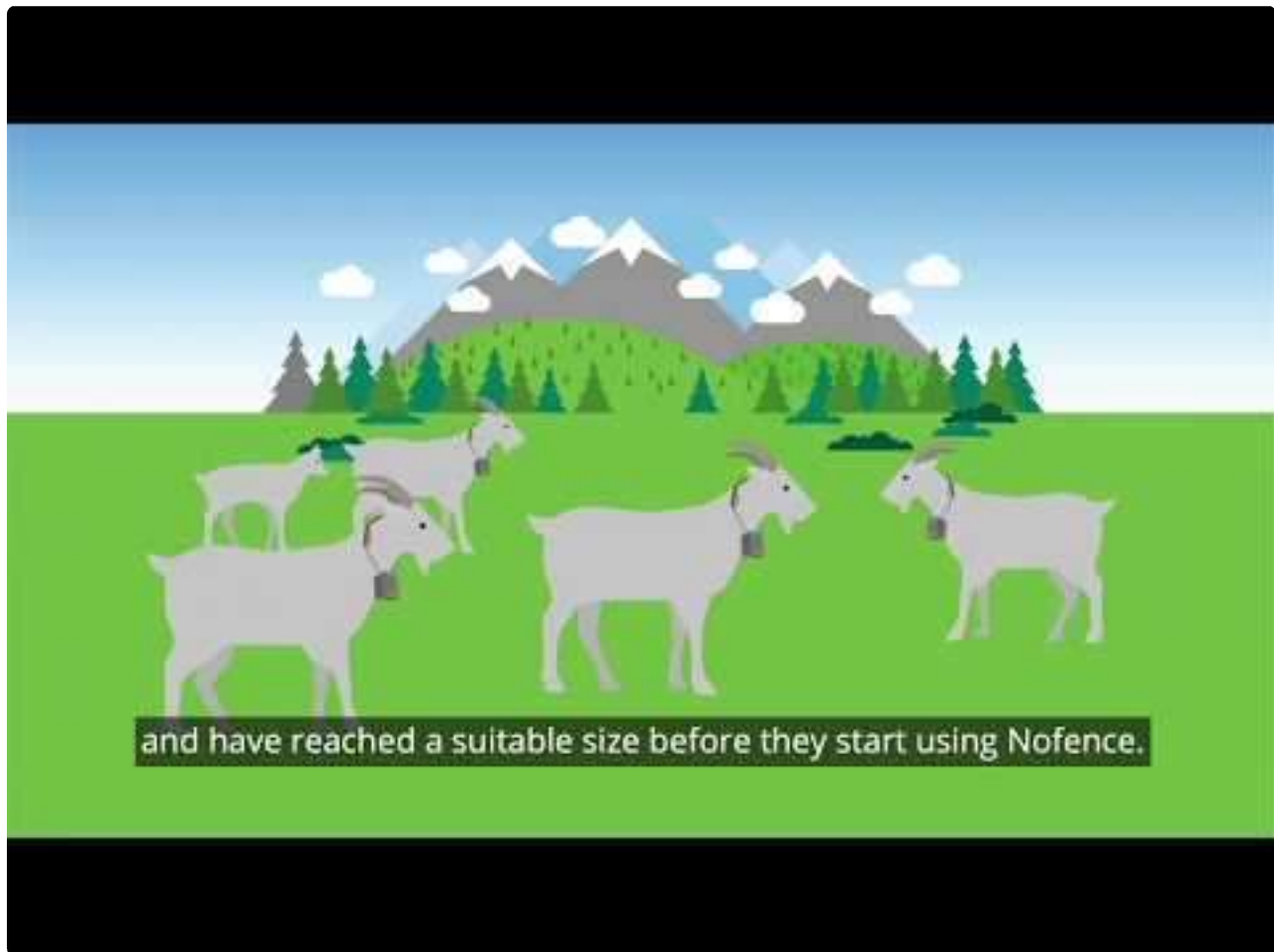
3. Get to know the Nofence technology

In this chapter we will explain how the Nofence technology works.

3.1. Basics

Our grazing technology consists of a collar and an app that communicate via the mobile network. The collar is equipped with an antenna for GPS positioning and solar panels for recharging the battery. Our technology enables farmers to remotely monitor animals in real time and, in the case of escapes, they will receive notifications in the app.





<https://www.youtube.com/embed/qC-FVhghSI?rel=0>

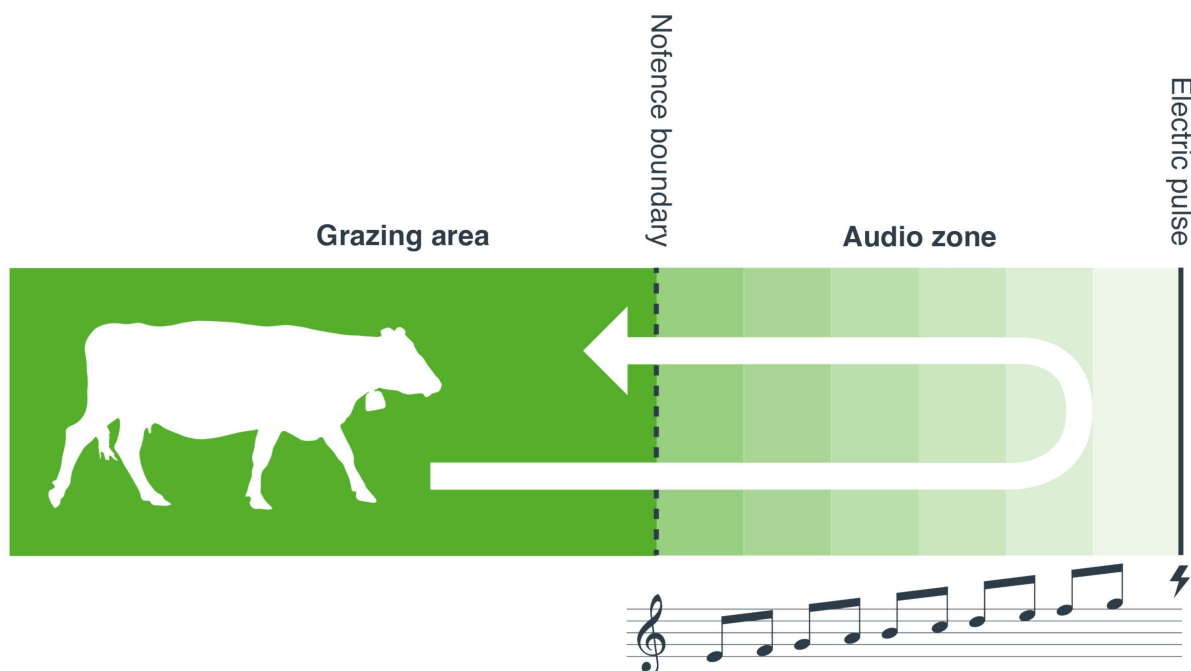
3.2. The Nofence boundary

How is it possible to fence animals with virtual grazing technology?

To keep animals within the virtual pasture boundary, Nofence uses two important elements: Their sense of hearing and their herd instinct. The animals use their hearing ability to identify where the boundary is, and the herd instinct makes them turn around and return to the pasture and the rest of the herd when they hear the audio cue.

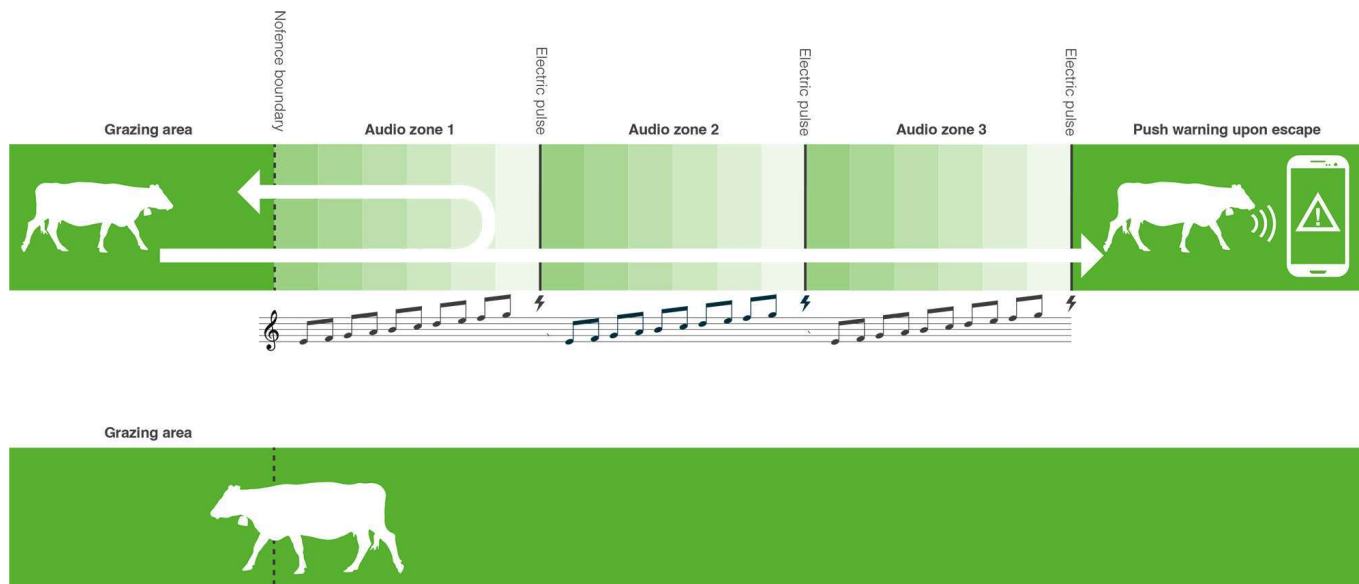
The pasture boundary

When the animal crosses the Nofence boundary, the collar emits an audio cue. The audio warning starts at a low cue, which gradually increases as long as the animal is outside the boundary. The animal recognizes this audio cue, turns around, and returns to the pasture to avoid the electric pulse.



The illustration shows the desired behavior. The animal leaves the pasture, responds to the audio cue, turns around and returns to the pasture.

If an animal escapes and keeps walking away from the pasture, it will receive a total of three audio zones. After the third, the fence function will switch off, and the audio cue and electric pulse will be deactivated. The farmer will be alerted with a push notification via the Nofence app. The collar will keep reporting its position even though the animal is outside the pasture, so you will know where the animal is at all times. When the animal returns to the pasture, the fence is reactivated and the farmer will be notified that the animal has returned.



The illustration above demonstrates what happens if the animal chooses to escape. A maximum of three electric pulses are emitted before the animal is registered as escaped and the fence function is switched off. The fence function is reactivated once the animal returns to the pasture.

- ✿ A significant difference between the Nofence boundary and a traditional, electric fence, is that the traditional fence is a fixed and absolute boundary, while the Nofence boundary marks the start of the audio cue. A potential electric pulse will come after the Nofence boundary. The audio cue has a certain extent both in time and distance, so that the animal has the time to perceive the fence function, turn around and walk back. The Nofence boundary should therefore be considered a zone, and this should be taken into account when designing the pasture.

The boundary extent

The electric pulse is only to be emitted if the collar has played all the audio cues in the audio warning. The reason for this is that the system should be predictable and manageable for the animal. It takes at least 5 seconds, and a maximum of 20 seconds to play the audio cue, depending on the animal's speed away from the boundary. If the animal crosses the boundary at high speed, the audio cue will play at fast speed. On the other hand, it will play at a slower speed if the animal is crossing the boundary at a reduced speed. This should be considered when fencing the animals close to a road, especially if the pasture is on a hill so that the animal can move towards the road at a faster pace.

The audio zone is affected by the GPS signal. Poor position accuracy will make the boundary less accurate, and the audio cue can start sooner or later than where the actual boundary line is in the map. If the GPS signal is so poor that the accuracy is less than 3.5 meters, the collar will not emit any audio cues or pulse.

You may experience that the audio zone has a larger variation when the collar is in teach mode vs standard operating mode. Animals that know the system well, know that they can "stop" the audio cue more easily while the collar is in training mode. You can read more about the different operation modes in the chapter Training animals.

If you test the collar yourself while crossing the boundary, you can experience how the audio cue starts

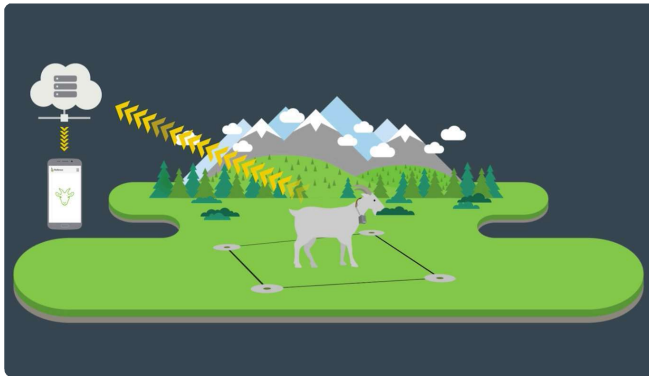
and stops at different speeds. While doing this, please remember to hold the collar correctly, to avoid receiving an electric pulse. Hold the collar by the neck strap, and make sure that you are not touching the chain.



People with heart diseases or a Pacemaker should avoid receiving a pulse from the collar.

3.3. Mobile coverage

The collar communicates with the app via the mobile network (2G). We therefore recommend having sufficient mobile coverage in the pasture, if not at least parts of the pasture, so that you can make changes to the Nofence boundary when needed, as well as receive data from the collars if anything happens. All collars will automatically pick the strongest signal, and communicate on this network. The fence function is not dependent on the mobile coverage, as it is not using the mobile network for this, but GPS and other GNSS satellites.



The collar reports to the app every 15 minutes. It reports its position, battery status, which operating mode it is in (teaching or operational) and if it has emitted any audio warnings or electric pulses. If the collar is outside mobile coverage, the status reports will not be sent to the app. If the collar misses a total of three of these reports, the collar symbol will turn yellow in the status map in the app.

As long as the collar is within mobile coverage, you can send information to the collar, for example if you want to adjust the pasture boundaries or give it a new pasture. You can also request real-time information from the collar via the status map. Electric pulses and escapes will be reported immediately to the app, as long as it's within mobile coverage.

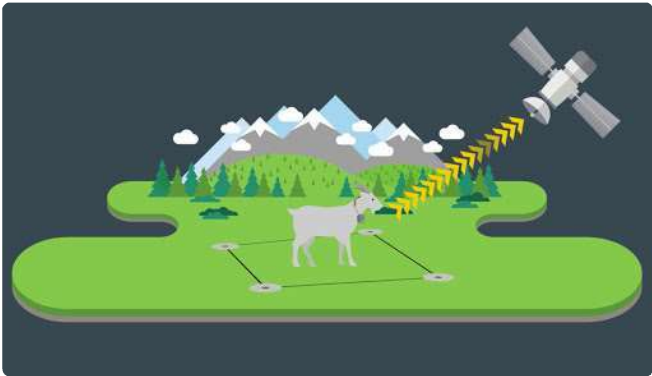
When the collar is outside mobile coverage, you will not receive status reports. Neither will you be able to send any information to the collar. If you are bringing the animals home from an area without coverage, you can [remove the pasture by Bluetooth](#).



It is worth noting that the information for each collar in the app is from the last report at all times. This means that if it has been a while since the collar last managed to send a report, the information in the app will be from its last report. The app informs you about when the last report was received.

3.4. GPS / Positioning

The Nofence collar will locate its position from the satellite based positioning systems GPS and GLONASS. These systems are not the same as the mobile network, but are used to decide the animal's location, as well as decide when the collar should emit the audio warning and electric pulse. Since it's the positioning systems that make sure the fence is functioning, this will function independently of the mobile coverage on site. This means that the animal will get the audio warning and the electric pulse when the animal crosses the boundary, even though there is no mobile coverage. A lack of mobile coverage will, however, lead to the collar not being able to send any information to the app. As soon as the collar is within mobile coverage again, it will report all the information from the period it was without coverage.

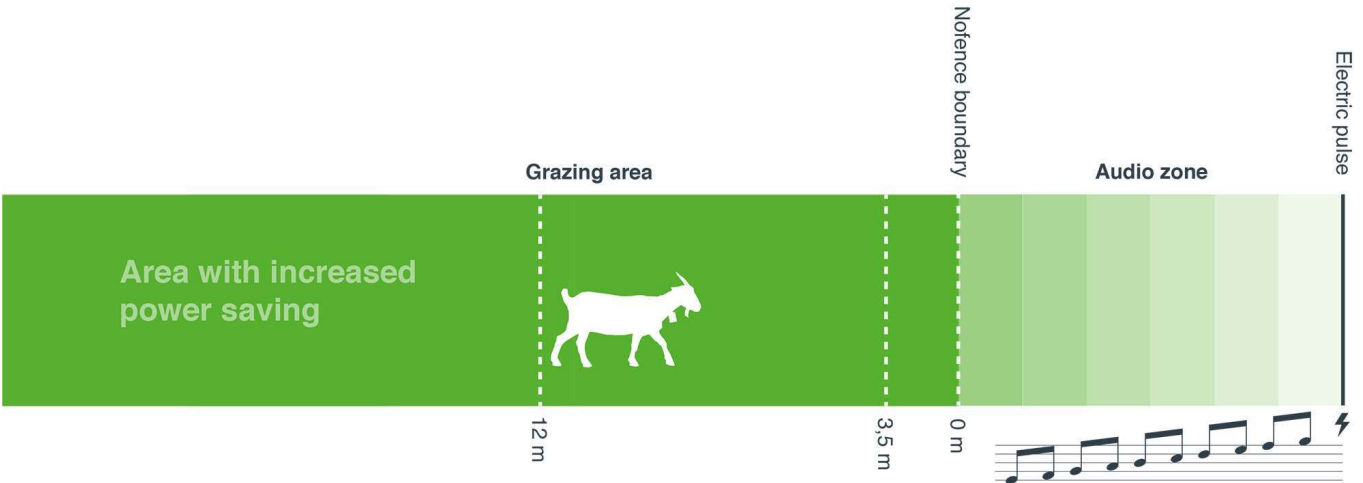


The Nofence collar is dependent on sufficient satellite coverage for the fence function to be active. Satellite coverage is pretty evenly distributed across the country, especially in open landscapes. Factors that may affect the accuracy of positioning are steep mountains, narrow valleys, walls and roofs. If the Nofence boundary is left close to an obstacle, it may cause the collar to not give any audio warnings or electric pulses where

the Nofence boundary is. Therefore, distance the boundary from such areas.

To ensure predictability for the animals, the collar is programmed to log positions more frequently when close to the Nofence boundary, so that the audio warnings and electric pulses come at the right time. When the animal is further away from the boundary, it is less important to have high accuracy, and the logging frequency of the animal's positions are minimized in favor of power saving.

The illustration and table below describe the different zones in the Nofence pasture.



Distance from the Nofence boundary	GPS accuracy
------------------------------------	--------------

> 12 metres	Zone with increased power saving
12 – 3.5 metres	The GPS receiver prepares. It prioritizes performance over power saving, but the position update is not more frequent than 1 per second
3.5 – 0 metres	Maximum performance with four position updates per second. The collar is preparing to play the audio warning
< 0 metres	The collar alerts the animal that it is outside the pasture by emitting the audio warning

Drifting

Roofs and walls can reduce the GPS signal, and incorrect positioning can happen – so-called “drifting”. If the incorrect position is outside the Nofence boundary and the system is unable to detect that the position is false, the collar will emit the audio warning at the wrong position. The animal may not understand what to do to stop the audio warning, and the collar would then emit an electric pulse. This is why it is important to use a Shelter Beacon if the animals have access to a barn, a shelter, or a small area with a roof.

A GPS receiver at rest may perceive a better accuracy than it actually has. This is a well-known phenomenon within GPS technology, and is defined as “drifting”. Drifting may cause the collar of an animal who is resting close to the boundary to log false positions. If the incorrect position is outside the Nofence boundary and the system is unable to detect that the position is false, the collar will emit the audio warning. The animal must then move further into the pasture to turn off the audio warning. The risk of this actually happening is small, but can occur if the collar goes into sleep mode when it is closer than 10 meters from the boundary. That is why we recommend leaving a safe margin in areas where you know the animals often are resting. A Shelter Beacon can also be considered in cases like this.

3.5. Fitting collars

To make sure the collar is comfortable for the animal, it is important to fit the collar properly.

For Cattle, we recommend that you can fit a fist vertically between the collar and the animal's neck.

For Sheep and Goats, we recommend a space of approximately 4 cm or two fingers vertically. Correct fitting is important – a collar too loose can bang against the animal's neck, and there can also be a danger of the animal getting a foot stuck between the collar and the neck, or that it gets stuck on something. On the other hand, a tight collar can be uncomfortable for the animal, and lead to chafing.

Observe how the collar is hanging when the animal is grazing and walking around, and adjust the collar if needed. If your animals are less tame, it can be easier to use two people when fitting the collars.

! Remember that young animals can grow quite a lot during a grazing season. Therefore, include checking the fitting as part of the routine when you are checking on the herd. Animals with a lot of wool should be checked closely, as the wool can make it difficult to actually determine how tight the collar is fitted.



https://www.youtube.com/embed/_yDjZq7reQ?rel=0

- ✿ Recommendations for sheep: Some individuals may get wounds on the underside of the jaw if the collar is too loose, as the collar will then hit the jaw on the wrong place when the animal is grazing. Therefore, ensure that the collar is properly fitted (see the video), and feel free to leave some of the wool under the jaw when you are cutting the wool off the sheep.



This collar is too loosely fitted.



This is perfect :).



The collar is well fitted if you can lift the neck strap like this (but not any further).

Fitting collars on smaller animals

Calves, lambs and goat kids have to be big enough before they start using Nofence. Two factors have to be taken into account:

- The animal is sufficiently mentally developed to understand and master the connection between the audio warning and its own behavior
- The animal has sufficient physique and size to carry the collar without it inhibiting the animal's behavior

There is great variation between each individual, breed and species. Nofence does not have a basis for giving an exact limit on when the animals are big and old enough. When young animals start using Nofence for the first time, it is important that the owner observes the animals.

It is also essential to check that the chain is in contact with the animal's neck. If the neck is too small in relation to the length of the neck strap, the contact points will come too far down, and the animal may not feel the electric pulse. Efficient delivery of the electric pulse ensures that the animals learn how the system works and to respect the Nofence boundary.



<https://www.youtube.com/embed/vHCEzgjFuQY?rel=0>

3.6. Training animals

- * For your animals' sake it is essential that the learning process is well-organised and thought-through. When the animal caretaker has prepared well for the training, the animals experience a more efficient learning process, with as few electric pulses as possible. Spend time observing your animals as they undergo the training.



<https://www.youtube.com/embed/yIQtoWld0vs?rel=0>

Before you start the learning process

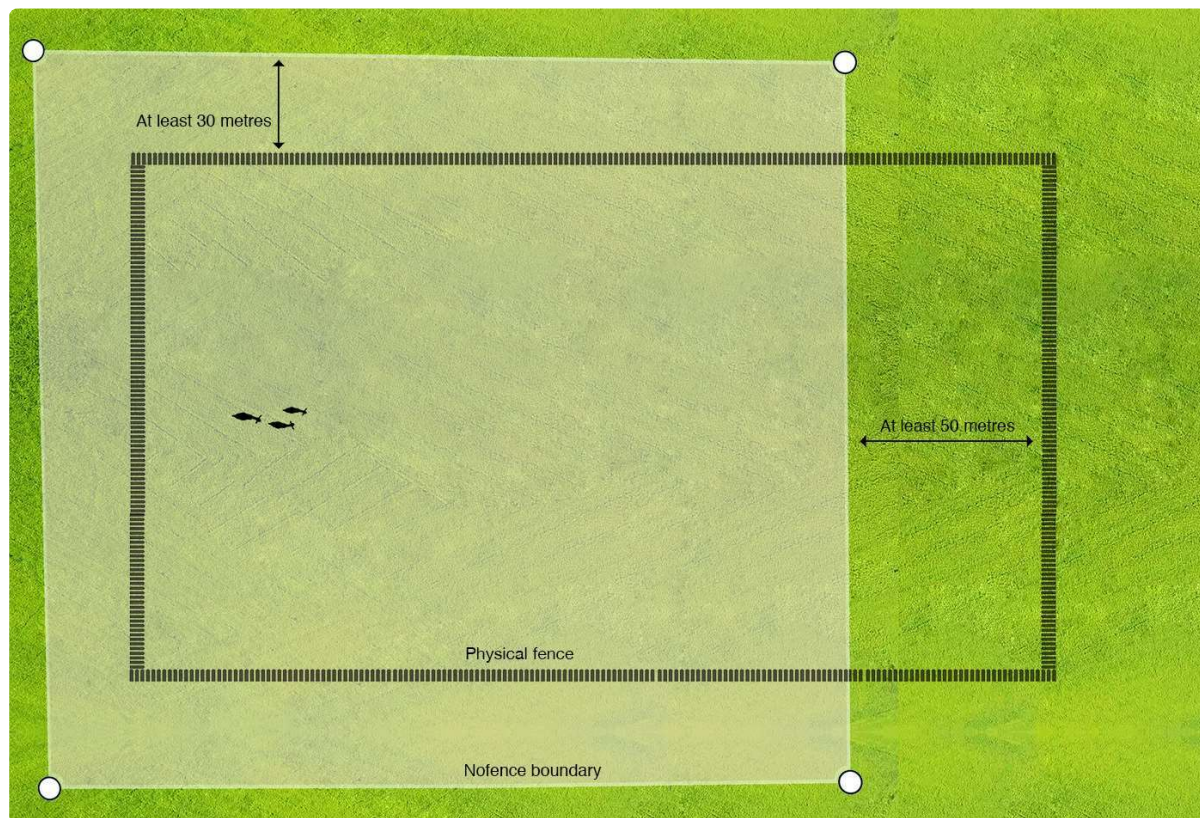
- Learning must take place in a location with satisfactory mobile and GPS coverage. If you have any doubts, you should conduct a test by walking around with a collar in your hand.
- The animals must have a sense of security in the area where the learning takes place. Let them spend time getting acquainted with the area before the training starts.
- We recommend creating the training pasture somewhere you can monitor the animals' progress. By observing the animals during the training period, you learn how they respond to the system.
- All adult animals must wear a collar to safeguard animal welfare. In herds where some animals wear collars and others do not, the animals wearing collars will ignore both audio warnings and electric pulses in order to follow the herd.

- The training pastures should be small enough for the animals to encounter the Nofence boundary during the training, but large enough for the animals to run about.
- Training pastures that are too big will result in few encounters with the audio warning and the training will take longer.
- If the training pasture is too small the animals can become restless, as they will meet a new boundary in the attempt to get away from another. Give them enough room to run about.

The animals should be well-acquainted with the system before left unattended in their Nofence pasture. Leaving the animals without supervision before they have learned the relationship between the audio warning and the electric pulse will lead to escapes.

The training pasture

The training pasture is fully fenced in with a physical fence. The physical fence is shown as black fence posts, while the Nofence boundary is illustrated by a white line between white corner posts.



The Nofence boundary cuts off a part of the existing pasture area. We recommend cutting off a part of the pasture that the animals will seek out for grazing as they have to cross the boundary to learn how the system works. There should be plenty of space outside the Nofence boundary (at least 164 ft / 50 meters) so that they have the ability to escape through all three warning fields and calm down before encountering the physical fence on the opposite side.

When you start training your animals, the first electric pulse will often result in an escape, and you should equip yourself with some grain to lure animals back into the Nofence pasture. It is important that

you are present during the learning process until you observe that the animals respect the audio warning and turn around when the scale starts playing.

The most important aspect of the learning process is that the animals learn they can turn the audio warning off by turning and going back into the Nofence pasture. Therefore, it is important that the boundaries are set in a manner that makes them logical to the animals. Create a simple pasture with simple boundaries.

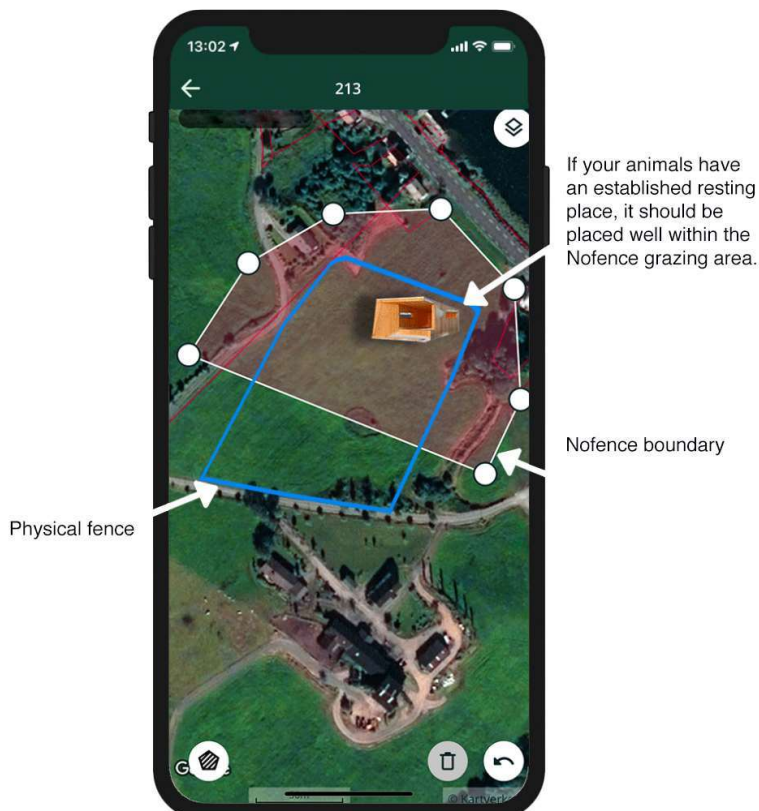
Most animals will understand the relationship between the audio warning and delivery of the electric pulse during the first three days of the training. When you see that the animals in the herd are well-acquainted with the system and turn around when they hear the audio warning, you can consider removing the physical fence from the training pasture. As a general rule, the animals should spend 1-2 weeks on the training pasture before they are given a fully virtual pasture.

It's important not to make frequent changes to the Nofence pasture in the beginning of the training process. A stable and logical boundary makes for a more efficient learning process.

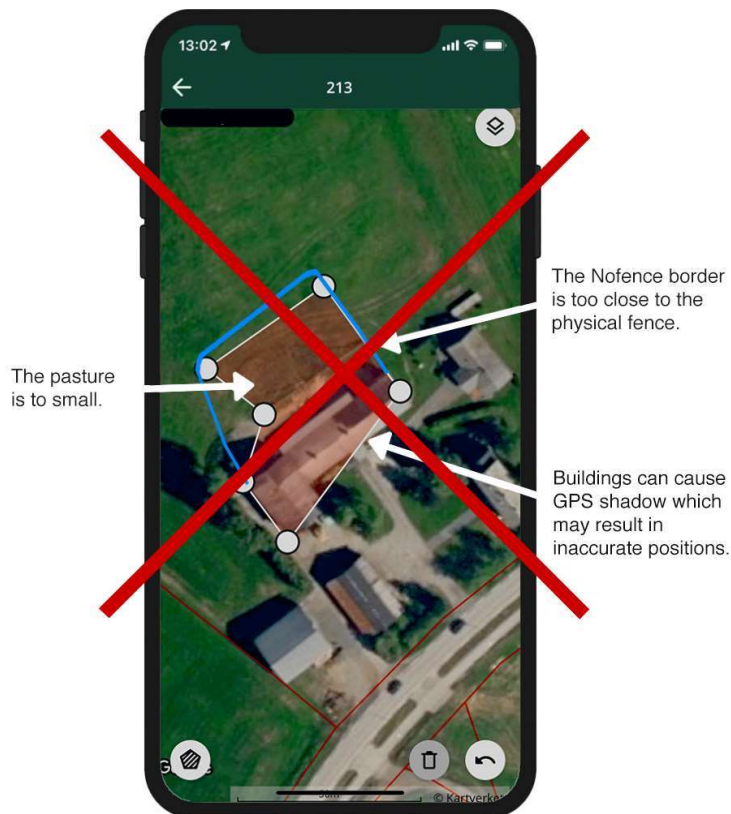
We recommend creating the training pasture in the vicinity of your home, so that you can monitor the animals' progress. By observing the animals during the training period, you learn how they respond to the system. Should you observe conditions that you need time to correct, gather the animals and disable the collars via the mobile app.

When the animals have learned to master the connection between their behaviour and the audio warning, they can be moved to new pastures without using physical fences.

Example of good pasture design



Example of poor pasture design



* The collar has two modes: operating mode and teach mode. The audio warning is more easily switched off in teach mode than in operating mode – which makes learning how to switch off the audio warning easier for the animal. You as a farmer, on the other hand, will probably feel that the pasture border is inaccurate when in teach mode.

! Are you new to keeping livestock? Make sure to allow your animals enough time to get to know their new grounds before embarking on the training. The animals should know and feel safe in the area where the training takes place. Experience shows that they establish a sense of security in a completely new location after approximately one week. However, this period will depend on several factors, such as the make-up of the herd and the individuals in it.

3.7. Shelter Beacons

- * The Nofence shelter beacon is a Bluetooth unit which disables the collar's GPS receiver. It should be used inside buildings to prevent animals from receiving wrongful audio cues and electric pulses due to signal deflection.



Why use shelter beacon?

Environmental factors can cause degraded GPS signals. A roof can interfere with the collar's ability to receive accurate GPS signals, which may cause the position to drift. If the drifting position is logged outside of the Nofence boundary, the collar may emit audio warnings and electric pulses. This is why we recommend using a shelter beacon if your animals have access to a barn or a shed.

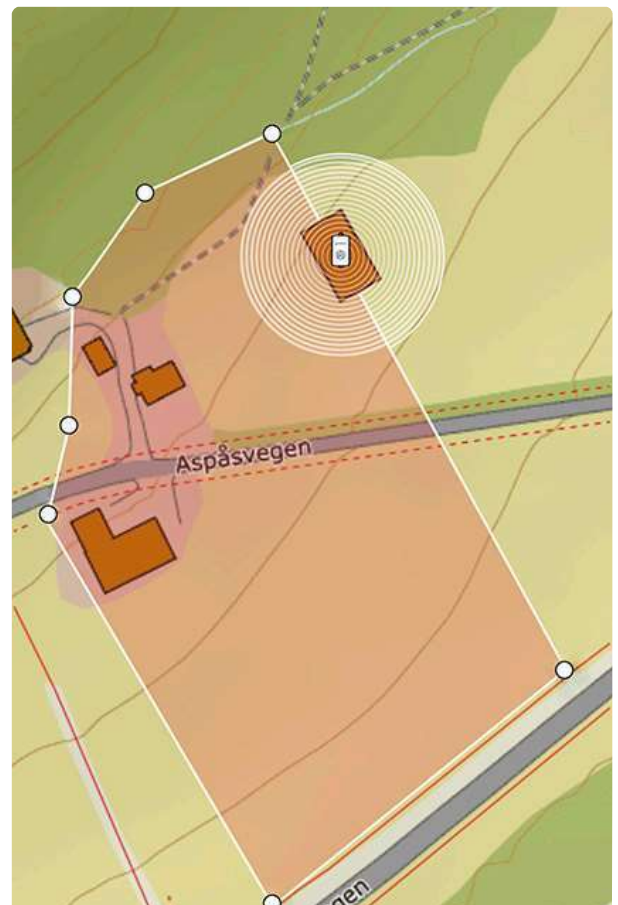
When the collar picks up the signal from the shelter beacon, the operating mode is disabled. Whenever the animal moves out of the shelter beacon's range, the operating mode comes back on.

The reach of a shelter beacon is approximately 10 metres, depending on physical obstructions. The Bluetooth symbol will appear in the app when the collar has contact with a shelter beacon.

To check the reach of a shelter beacon, you should take a collar in your hand and walk around with it to see when the beacon symbol appears in the app. Beware that the reach can vary depending on several factors, such as the animal's body facing towards or away from the shelter beacon, or any concrete walls obstructing the signal.

In larger rooms, we recommend using several shelter beacons. If the animals often lay down alongside the outside walls of the building, you should also consider placing shelter beacons here. Observe where the animals lay down to rest to estimate where the beacon should be installed.

The use of shelter beacons also reduces the collar's



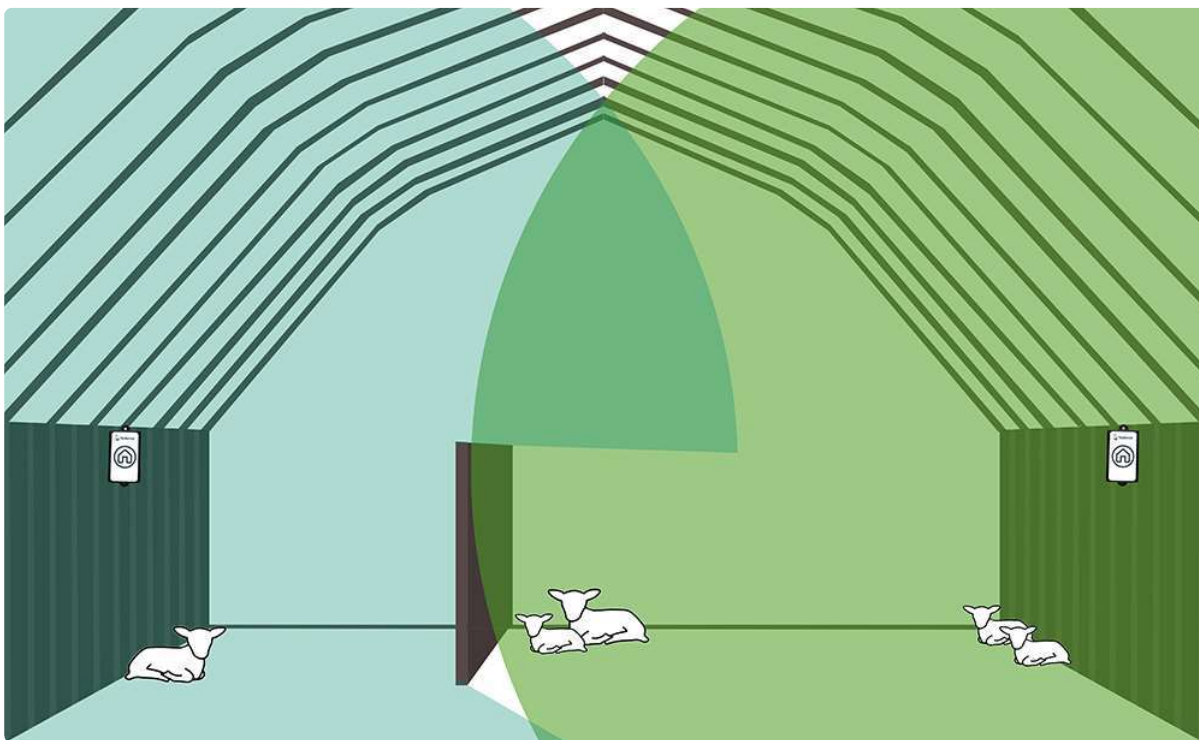
power consumption under such conditions, as it spends considerable energy trying to find good GPS positions under difficult conditions. As soon as the collar enters beacon mode, the energy consumption plummets.

The shelter beacon has an IP rating of 66.

Be aware that a shelter beacon could make a dent in the Nofence boundary if the reach tangents the boundary.



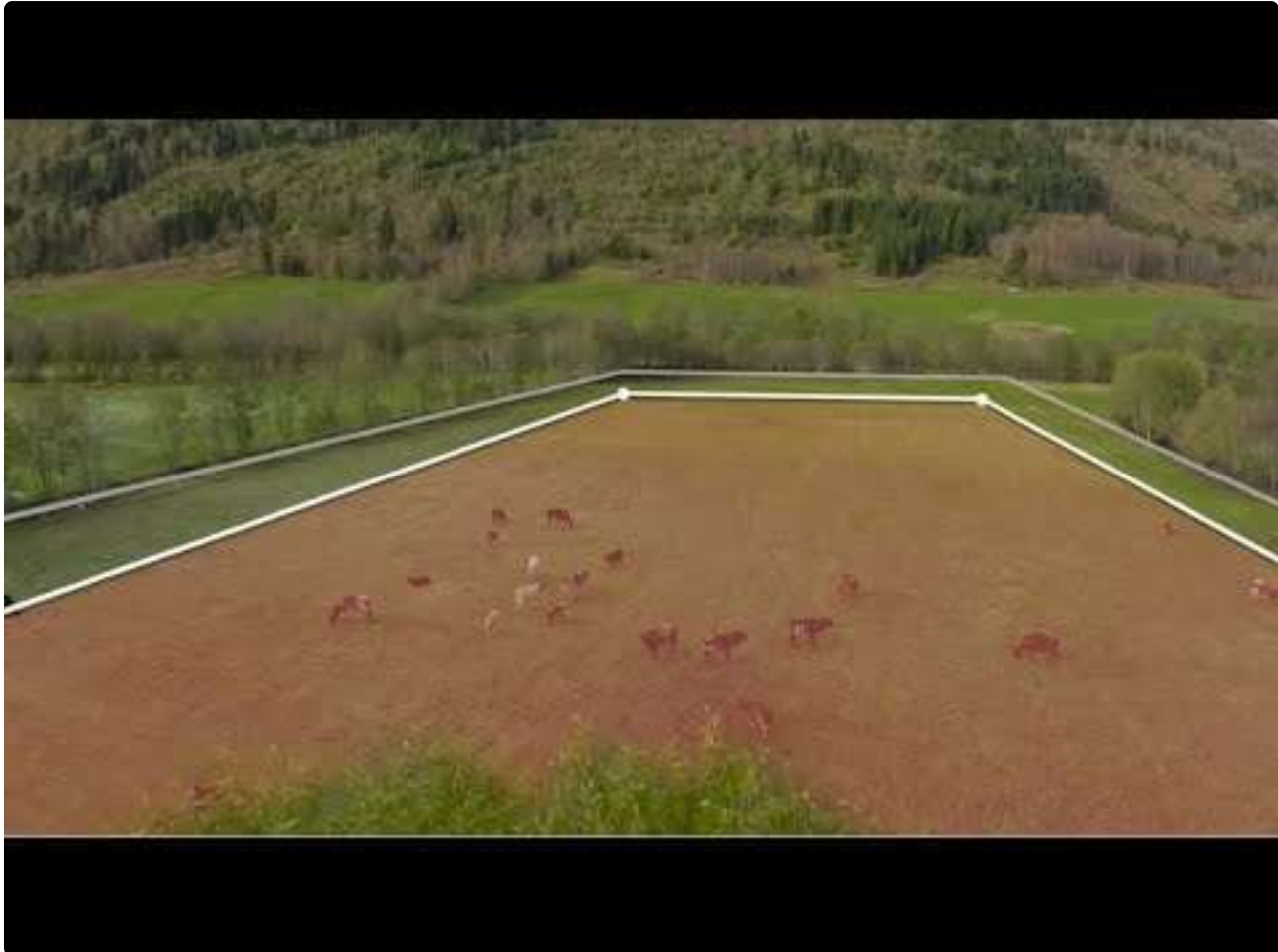
This is the symbol you will see in the app when the collar is in contact with the shelter beacon.



Please note that the connection will take some time. The animal can therefore move outside the pasture before regaining active fence function.

3.8. Good pasture design

Creating pastures with Nofence is easy. With just a tap on the screen you can place virtual fencing posts wherever you want in the terrain, regardless of slope and ground conditions. However, an easy pasture is not necessarily a good pasture for your animals. In this section, we have gathered our recommendations to help you optimize your pasture design.



<https://www.youtube.com/embed/xEDoLHyeoCY?rel=0>

A well-designed pasture should have:

- **Sufficient space.** The animals should have enough space. Four goats in a 50mx50m area is too small.
- **Access to food and water.** A lack of access to food and water may cause the animals to escape from the pasture.
- **Angles of 90 degrees or more.** Sharp corners or narrow corridors may confuse the animals.
- **A design that maintains the animal's natural instinct.**
- **A safe distance from dangerous areas in the environment.** The pasture boundary is where the audio warning starts, not where the animal stops to turn around.
- **Appropriate fencing in areas with buildings or barns.** Avoid GPS shadows or drifting by leaving a fair distance between the obstacles and the pasture boundary.

Below, we have outlined some of the points above on a deeper level. The illustrations demonstrate good and bad pasture design. Please be aware these illustrations are general. It is important to use your own

knowledge about your own pasture and animals to design good pastures that are suitable for your use.

Sufficient space

There can be great variations in topography, number of buildings in the pasture, access and quality of feed, number of animals in the pasture, etc. It is, therefore, difficult to have a standard recommendation on how large a pasture should be or the stocking density. However, the pasture should be big enough so that the animals can turn around after crossing the boundary, without interacting with the boundary again straight after turning around. The distance between the boundaries should therefore be more than 25 meters. Animals that are still learning the system should have more space than animals that have used the system for a longer period of time.

The animal's instinct

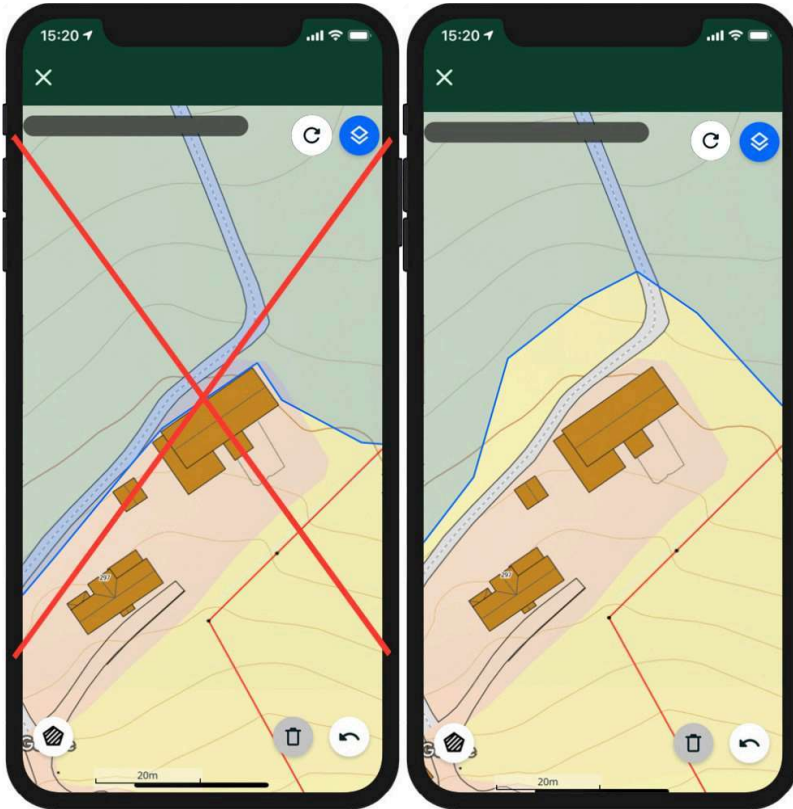
It is important to be aware that sometimes the animal's instinct can be stronger than the desire to avoid the electric pulse. If the pasture does not satisfy the animal's basic need for food and water, they may escape.

Nofence allows you to split herds into different pastures. You need to consider the animal's instinct if you wish to be successful in splitting herds. The herd instinct varies between animal type and breed. When the herd instinct is strong, keeping animals apart becomes increasingly difficult. The different pastures should have enough distance in between them so the animals in the different groups cannot see, hear or smell each other.

Fencing close to buildings

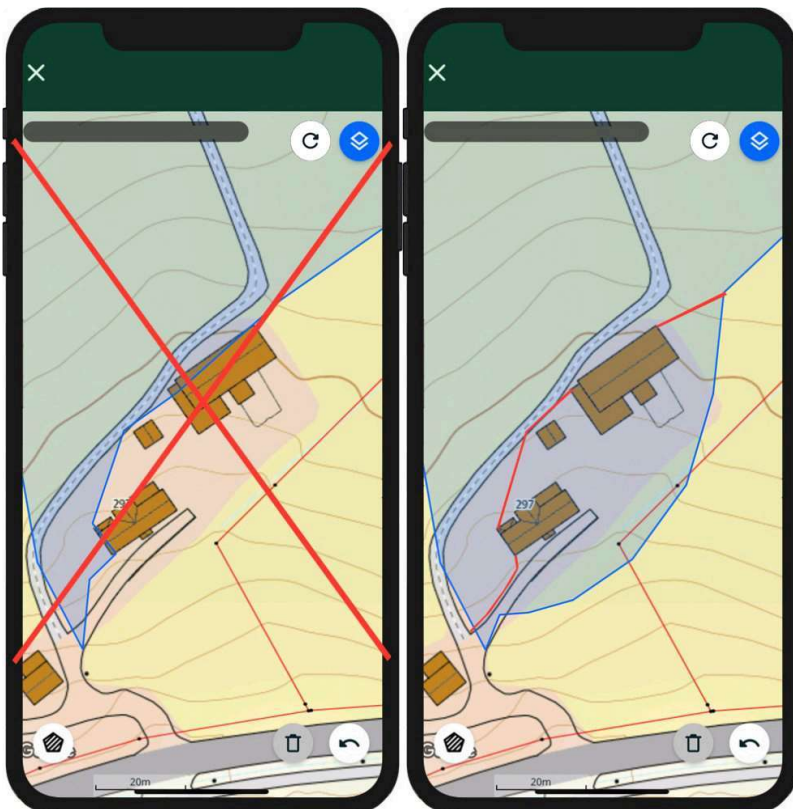
As described in "GPS/Positioning", walls can affect the GPS signal and cause it to be less accurate. The first illustration below shows the Nofence boundary placed at the same line as the house wall. In this case, you will experience that the animal can cross the pasture boundary without receiving any warnings. This is because the building affects the GPS signal, and with an inaccurate GPS position, the collar will not give any audio warnings or pulses. However, when the animal gets out in a more open area, the GPS accuracy will increase and the warnings will start.

In the second illustration below, the Nofence boundary is left with more space from the building, and there is no risk of the GPS signal being affected.



Pastures close to the farm yard

If you want the animals close to the barn, but not in the farm yard, it may be an option to combine the Nofence boundary with a physical fence. In the illustration below, we have left the virtual boundary far from the farm yard, and marked in red where it would be appropriate to leave the physical fence.



Inappropriate use of Exclusion zones

Make sure that the different exclusion zones have enough distance between them. If the distance is too

short, you may risk that the animals become trapped between two boundaries, and have trouble maneuvering their way out. Since the GPS positions always have a certain inaccuracy, we recommend at least 25 meters between the boundaries. In the illustration to the left, a line of trees has been excluded by leaving an exclusion zone for each tree. A better solution here is to create one large exclusion zone for all the trees. This makes it easier for the animals to understand.



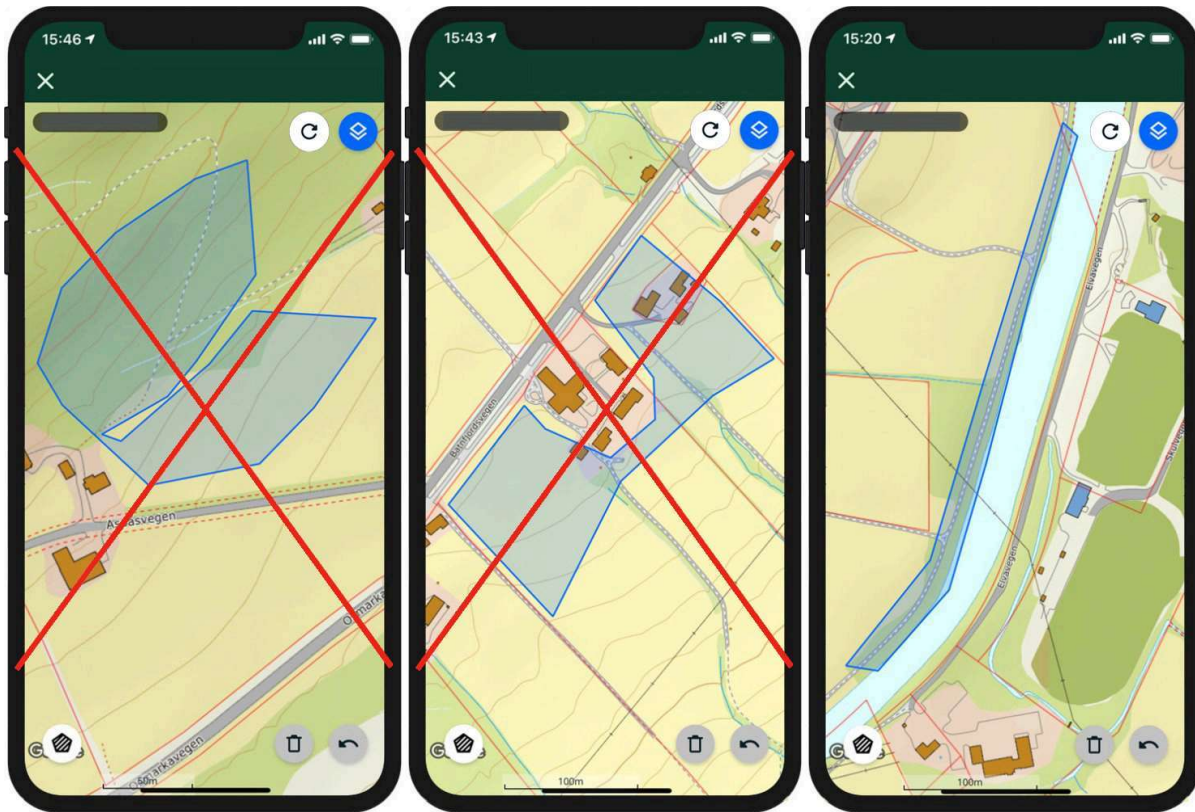
Fencing close to dangerous areas

If the pasture is located close to a dangerous area that you do not want your animals to access, like a busy road, it is important to leave the Nofence boundary with enough distance from it, so that the animals turn around before they reach the dangerous area. A good idea can be to take a single collar and test where the audio warning starts. If a dangerous area is at the bottom of a hill, we recommend placing the Nofence boundary further up the hill. The animals will often be traveling faster as they move downhill and therefore may move towards the boundary more quickly, which can increase the distance of the Nofence boundary zone.

Narrow pastures

Below, you can find three different examples of narrow pastures. In the illustration to the left, the pasture has a narrow corridor in between it. If some animals are on one side of the corridor, and other animals on the other side, they may cross the corridor just to get to the rest of their herd.

Pastures with a narrow design may confuse the animals as they will meet the pasture boundaries wherever they move. After the training period, the animals have learned to turn around on the audio warning. Therefore, they should not meet a new audio warning after doing as they have learned. Narrow pastures can also lead to GPS inaccuracy when the animal is laying still and resting, something that may lead to audio warnings and electric pulses inside the pasture. Remember that experienced animals can handle narrow pastures better than animals that recently have been introduced to Nofence.

**Tip:**

Avoid corridors or pastures narrower than 25 meters. Rather combine Nofence with physical fences on one side of the pasture. If the pasture goes along a sea, you can leave the pasture boundary out in the water. This way, you can save battery life-time.

Knowledge-based adjustment of the pasture boundary

In the app or in the web portal my.nofence.no, you can find an overview of the animals movement patterns. You can also view where the animals have received audio warnings and electric pulses. We recommend using this information to identify areas where the pasture boundary should be adjusted. Also when an animal escapes, it is important to investigate the cause of it. This way, it can be prevented from happening again.