

Lely Juno

Feed Pusher



Operator Manual

EN-US – English Original

5.4303.8528.0 D





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Lely Industries N.V.

Cornelis van der Lelylaan 1

3147 PB Maassluis

the Netherlands

Phone: +31 (0)88 1228221

Fax: +31 (0)88 1228222

Website: www.lely.com



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List of included Amendments

Issue Date (yyyy/mm)	Revision	Chapter(s)	Remarks
2018/08	C		Initial issue.
2020/10	D		<ul style="list-style-type: none"> • Wheel calibration procedure added. • Create a robot log procedure added. • Switch the machine ON or OFF procedure changed. • Restore a backup procedure removed. • Test the barn door sensors procedure added. • Set the gyroscope target temperature procedure added. • Alarm handling: T4C InHerd notification added. • Settings changed. • Wifi configuration changed. • UI screens updated. • Questionnaire barn door supplier added.

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Preface

Manual Contents

This manual contains the information necessary to operate the Juno feed pusher.

The information in this manual is for operators.



Study and understand this information thoroughly before you operate the machine. Failure to do so could result in damage to equipment or personal injury (see Introduction on page 2-1). Please consult your local Lely service provider if you do not understand the information in this manual, or if you need additional information. Store this manual in a safe place for future reference.

All information in this manual has been compiled with care. Lely shall not be liable for errors or faults in this manual. The recommendations are meant to serve as guidelines. All instructions, pictures and specifications in this manual are based on the latest information that was available at the time of publication. Your machine may comprise improvements, features or options that are not covered in this manual.

Applicability

The table below shows the machine type numbers for which this manual is applicable.

Model designation

Model	Type number
Juno Feed Pusher with Flex Package	5.4303.0300.1
Juno Feed Pusher	5.4303.0000.1

Standard Torque Loading of Parts

All the nuts, bolts and screws used on the machine are torque tightened to standard torque loadings applicable to the construction materials used.

If a part has a non-standard torque loading, it is specified in the applicable part of the manual.

Registration

The type and serial number plate of the machine is attached to the mechanism underneath the cover. Always include the type and serial number of your machine when you contact your local Lely service provider or when you order spare parts.

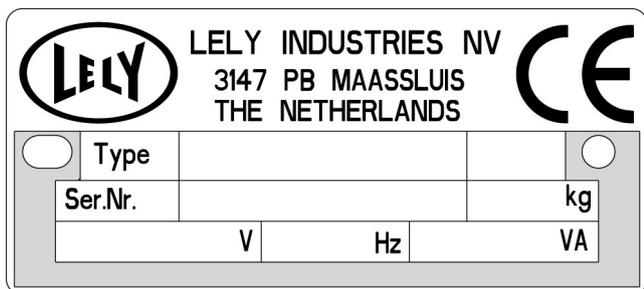
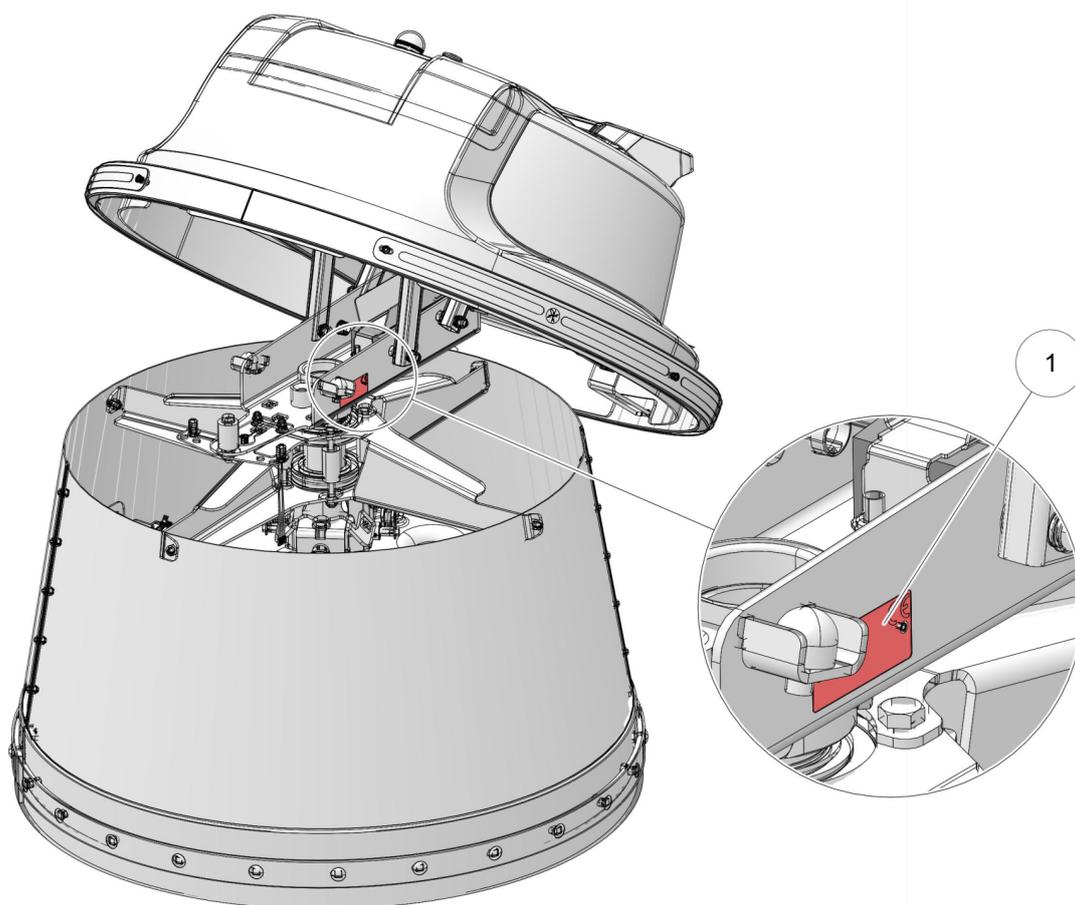


Figure 1. Type and serial number plate

We suggest that you complete the table below with the type and serial numbers of your machine. This makes sure that you can easily find the information.

Type number	
Serial number	



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Figure 2. Location of type and serial number plate

KEY: 1. Type and serial number plate

Personnel Requirements



Risk of accident from insufficiently qualified personnel. Unqualified personnel working on or in the danger zone of the machine can be the cause of serious injuries and considerable damage to material.

- ***All activities must only be carried out by qualified personnel.***
 - ***Keep unqualified personnel away from the danger zones.***
 - ***Only persons who can be expected to carry out their job reliably are authorized as personnel. Persons whose reactions are impaired, e.g. by drugs, alcohol medications are not authorized to work with the machine***
-

Maintenance Authorization



Risk of accident from uncertified technicians. Uncertified technicians doing maintenance on the machine can be the cause of serious injuries and considerable damage to material. Only technicians certified by Lely Industries are authorized to do maintenance on the machine, except for the maintenance done by the operator as indicated in the operator manual. If people who are not certified by Lely Industries do maintenance on the machine, the warranty on the machine becomes invalid.

Technician Training

All the technicians certified by Lely Industries have completed an approved training program, and passed written and practical examinations during and at the end of the training program. The training is given by Lely International or a specialist from the LSO and includes troubleshooting and corrective maintenance of the machine

During training, a trainee is permitted to work for up to a maximum of six months under close supervision of a certified technician. A trainee can do work on the machine only in the presence of a certified technician.

Contact Number Local Service Provider

We suggest you write the telephone number and email address of your local service provider contact in the table below. This makes sure you can easily find the information.



Telephone number	
email address	

Left, Right, Rear and Front

The positions left, right, rear and front in this manual refer to either:

- The machine, as seen in the driving direction.
- The particular component, as seen when standing in front of it.



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1 Lely Juno

1.1 The Lely Juno Feed Pusher

The Juno Feed Pusher is a battery-driven vehicle that pushes the forage towards the feed fence of the barn. This gives the cows better access to more fresh food through the day. The rotating lower part of the side of the feed pusher pushes the forage against the feed fence while the machine drives along the feed alley.

The information in this manual is for operators. The operator uses the information to operate the feed pusher. The operator also uses the information to do maintenance.

The operator must read the operating instructions for daily operation and for the setup of a day planning. He must also read the maintenance and troubleshooting sections for preventive and basic corrective maintenance instructions.

The operator should refer to the description and the operation section for background information. The operator must also read and understand the safety instructions in the section 'Safety'.

1.2 Intended Use

The Juno is designed as an autonomous driving machine to push cattle feed towards the feed fence in a barn.

The feed pusher has been built exclusively for pushing cattle feed lying on the ground of a barn with a level concrete floor (= proper use). Usage going beyond that does not constitute proper use. The manufacturer is not liable for damage resulting from improper use; the operator only bears the risk.

Intended use also implies that the instructions and rules prescribed by the manufacturer are observed.



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2 Safety

2.1 Introduction

The Juno Feed Pusher is an automated machine. Therefore it is of the utmost importance to obey all safety instructions.

2.2 Signal Icons

Note the use of the signal words DANGER, WARNING and CAUTION with the safety messages. The signal word for each message uses the following guidelines:



Danger
Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Warning
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Caution
Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Notice
Is used to address practices not related to physical injury e.g. property damage.



Tip
Indicates information that may help the reader, but not hazard related.

2.3 Safety Instructions

YOU are responsible for the SAFE operation and maintenance of your machine. YOU must make sure that you and anyone else who is going to operate, maintain or work in the vicinity of the machine knows all the related SAFETY information in this manual.

YOU are the key to safety. Good safety practices protect you and the people around you. Make these practices a working part of your safety program. Make sure that EVERYONE who operates, maintains or works near the machine obeys the safety precautions. Do not risk injury or death by ignoring good safety practices.

- Owners must train operators before they operate the machine. This training must be repeated at least annually.
- The operator must read, understand and obey all safety and operating instructions in the manual.
- A person who has not read and understood all safety and operating instructions is not permitted to operate the machine.
- Do not modify the equipment in any way. Unauthorized modification may impair the function and/or safety and could affect the life of the equipment and persons.
- Only use approved spare parts and make sure that they are only installed by authorized technicians.

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The hazards in the operating zone and working area pose a risk of fatal injury to unauthorized persons.

Unauthorized persons who do not satisfy the requirements described herein are not aware of the hazards in the work area. Unauthorized persons are therefore at risk of serious or fatal injury.

- ***Keep unauthorized persons away from the operating zone and work area.***
- ***If in doubt, approach unauthorized persons and ask them to leave the operating zone and work area.***
- ***Stop work as long as unauthorized persons are within the operating zone and work area.***

2.3.1 General Safety

- An authorized technician must install the machine and its optional components.
- Read and understand the manual and all safety signs before you connect power supplies to operate, maintain or adjust the machine.

- Only trained persons are permitted to operate the machine.
- A first-aid kit must be available near the machine. Store in a highly visible place.
- A carbon dioxide or foam fire extinguisher must be available near the machine. Store in a highly visible place.
- Install all protective covers before you operate the machine.
- Wear the correct protective clothing and equipment.
- When the buzzer is defect, make sure it is being repaired before putting the machine into operation again.
- When a part on the machine is broken or missing, take the machine out of operation. Make sure the part is repaired before you put the machine into operation again.
- Disconnect and isolate the electrical power supply, before you clean or do maintenance on the machine.
- Do not stand or sit on the machine (not when it is standing still and not when it is driving).
- Know the emergency medical center number for your area.
- Contact your nearest Lely service provider if you have any questions.
- Review safety related items with all operators frequently (annually).

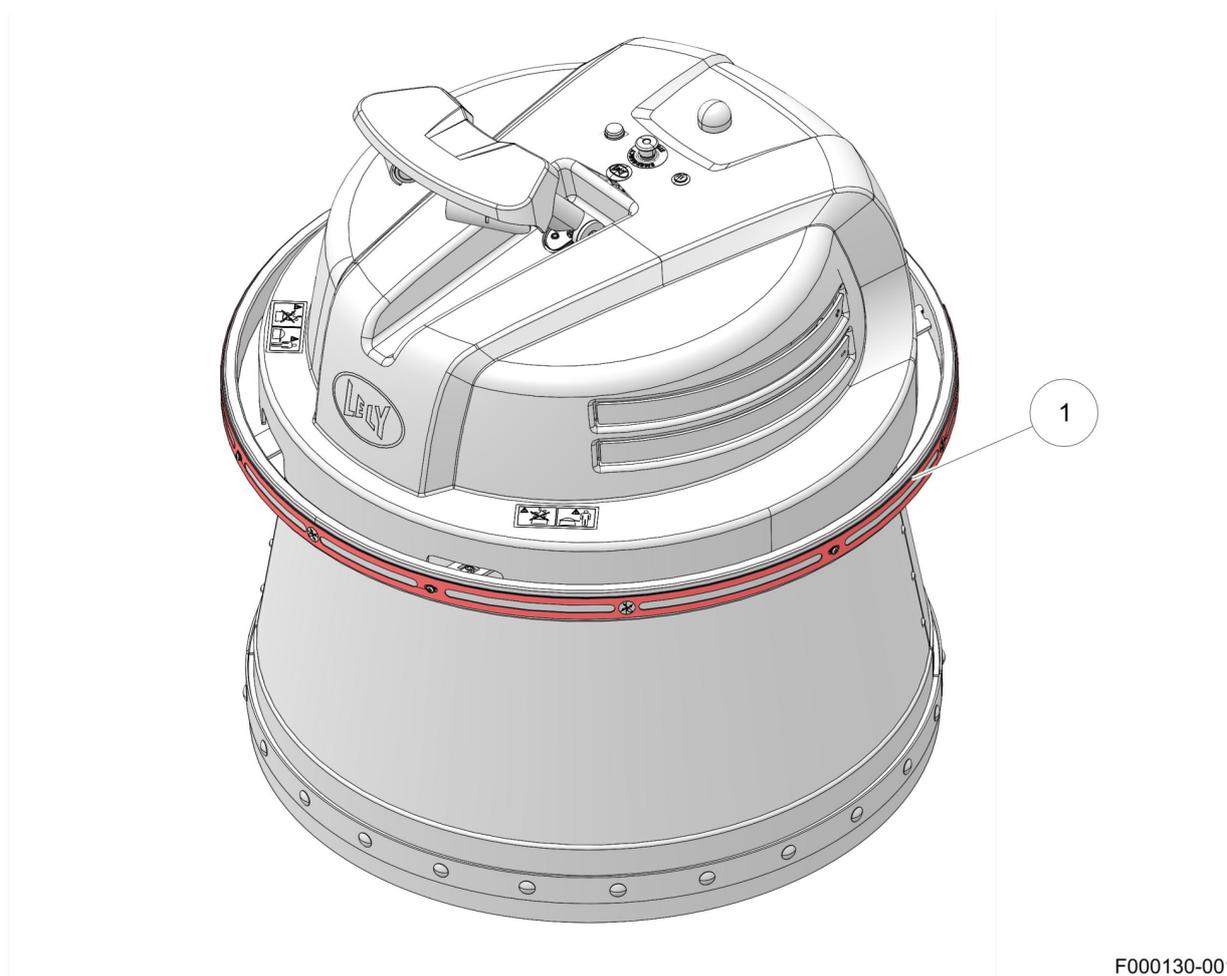
2.3.2 Electrical Safety

- Only an authorized electrician must install the electrical power supply for the charging station of the Juno.
- Make sure the electrical power supply and grounding meet local rules and regulations.
- Replace any damaged electrical lines, conduits, switches and components immediately .
- Switch the power OFF with the OFF button before you start to work on the system.
- Pull the plug from the socket before you start to work on the charging station.

2.3.3 Operating Safety

- Read and understand this manual and all safety signs before you connect power supplies to operate, maintain or adjust the machine.
- Only trained persons are permitted to operate the machine.
- Make sure all covers are installed before you operate the machine.
- Only operate the machine in a closed and marked feed alley.
- Remote operation of the smartphone or tablet by remote desktop software (such as, but not limited by, Teamviewer) is strictly forbidden to avoid dangerous situations. Make sure the machine is in your line of sight.
- The machine shall be operated under supervision only or in areas that are not accessible for unauthorized people, especially small children.
- Make sure you have a clear overview of the machine when you manually drive it.
- Keep hands, feet, hair and clothing away from all moving parts.

- Never touch the bumper when the machine is in operation to avoid an electric shock (see figure 3 on page 2-4).
- Review safety related items with all operators frequently (annually).
- Make sure the slope of the floor is no more than 8.5° (15 cm per 100 cm) (see figure 4 on page 2-5).
- Contact your nearest Lely service provider if you have any questions.
- The machine weighs approximately 620 kg (1367 lb). Always use the correct hoisting equipment when you hoist the machine. Refer to the manual that comes with the hoisting eye for correct hoisting of the machine.
- The manual of the hoisting eye must be stored with the hoisting eye. If the manual of the hoisting eye is lost contact your local Lely service provider.



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Figure 3. Area with electric pulse

KEY: 1. Bumper with electric pulse

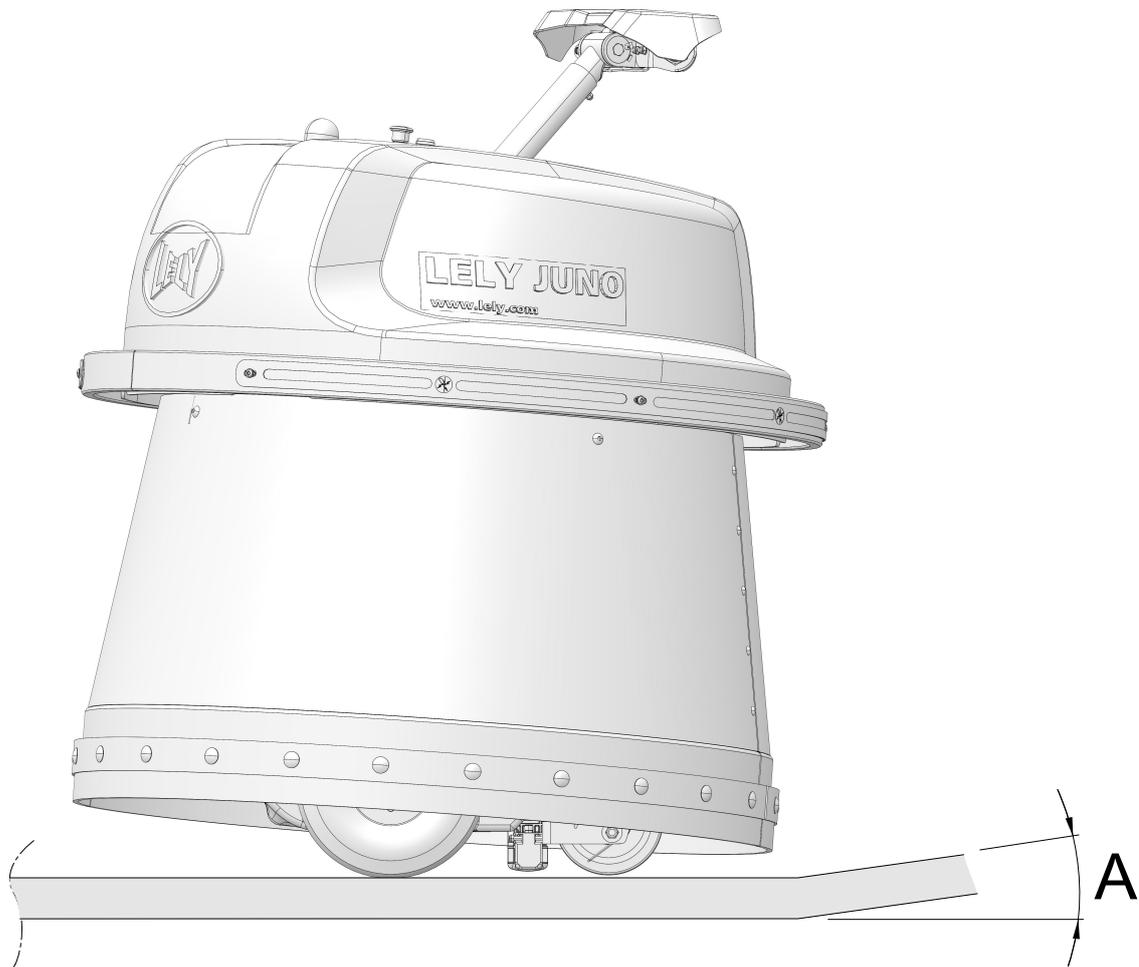


Figure 4. Maximum slope

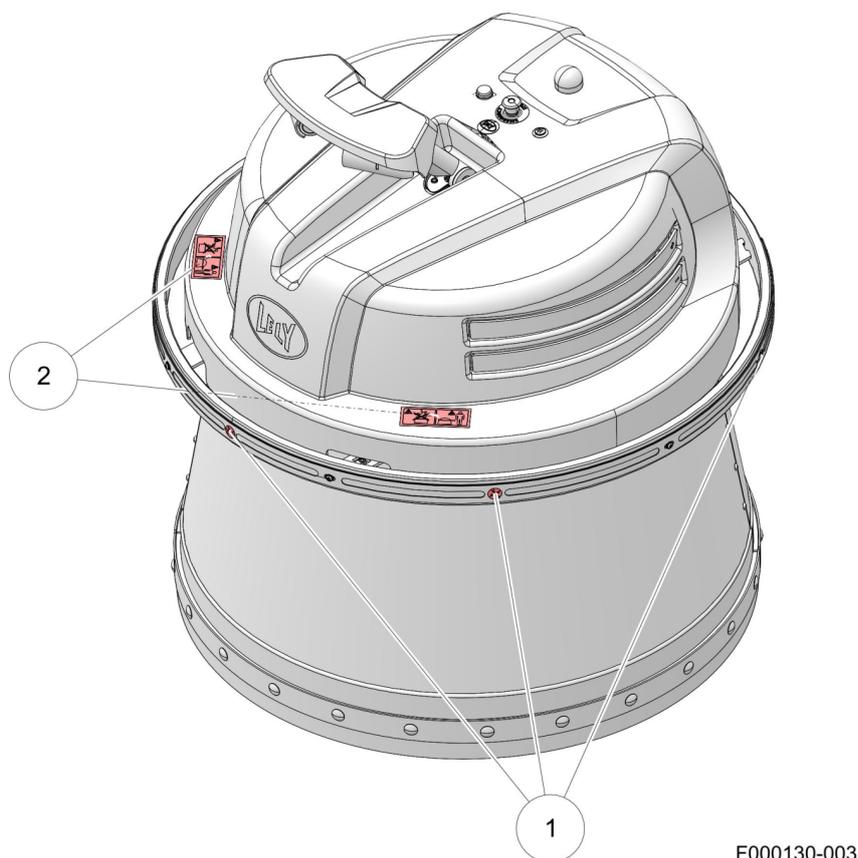
KEY:
A: 8.5°

2.3.4 Maintenance Safety

- Read and understand the applicable manual and all safety signs before you connect power supplies to operate, maintain or adjust the machine.
- Only trained persons are permitted to do corrective maintenance on the machine.
- Keep tools and metal parts away from the battery.
- Do NOT spout water on the body of the machine. Use a wet brush to clean the machine.
- Make sure all covers are installed when maintenance work is complete.

2.4 Safety Decals

2.4.1 Position of the Safety Decals



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KEY: 1. 'Electric shock - area with electric pulse' decal - 2. 'Do not sit on the vehicle' and 'keep safe distance' decal

2.4.2 Explanation of Safety Decals

General safety messages appear in this safety messages section. Specific safety messages are in applicable parts of this manual when potential hazards may occur if the instructions or procedures are not followed.

No.	Decal	Explanation
1		<p>Caution: Risk for electric shock</p> <p>Keep away from the bumper during operation of the machine.</p>

2		<p>Warning: Risk of falling or being crushed</p> <p>Unmanned moving vehicle. Do not sit on the machine. Keep safe distance.</p>
		<p>Warning: Restricted area</p> <p>Only persons who are authorized and have read and understood all applicable safety instructions are permitted to enter the area.</p> <p>Located at a narrow passage where the machine moves.</p>
		<p>Caution: Unmanned moving vehicles</p> <p>Only persons who are authorized and have read and understood all applicable safety instructions are permitted to enter the area.</p> <p>Located at the entrance of the farm where the machine moves.</p>

2.4.3 Installation of Safety Decals

1. Make sure that the installation surface is clean and dry.
2. Make sure that the temperature of the mounting surface is not less than 5 °C (41 °F).
3. Find the correct position for the decal before you remove the backing paper.
4. Remove a small part of the cover paper.
5. Put the decal in the correct position on the installation surface and carefully push the small part of exposed adhesive surface of the decal onto the installation surface.
6. Slowly remove the cover paper and attach the rest of the decal to the installation surface.
7. Puncture small air pockets in the decal with a pin and use the cover paper to smoothen the decal.

2.4.4 Maintenance of Safety Decals

Safety decals show important and useful information that will help you to safely operate and maintain the machine.

Obey the instructions below to make sure that all the decals stay in the correct position and condition.

- Keep the safety decals clean and legible at all times. Clean the safety decals with soap and water. Do not use mineral spirits, abrasive cleaners or other similar agents that may damage the safety decals.
- Replace safety decals that are missing or that are illegible.
- Safety decals can be purchased from your local Lely service provider.

2.5 Safety Devices

2.5.1 Emergency Stop Button

An emergency stop button is installed on top of the machine (see figure 5 on page 2-11). When the button is pushed, the machine immediately stops operation. To reset the emergency stop button, pull the button upwards. To resume operation the alarm must be cleared from the user interface and the pause button must be pushed.

2.5.2 Pause Button

A pause button is installed on the machine (see figure 5 on page 2-11). When the pause button is pushed while the machine is in operation, the machine goes into pause mode:

- The machine stops.
- The LED light in the pause button turns on.
- The operational sound of the machine is turned off.
- The user interface on the smartphone displays the status 'Paused'.

When the pause button or the button in the app on the smartphone is pushed shortly while the machine is in pause mode, the machine goes back into work mode:

- The machine goes back into operation.
- The LED light in the pause button turns off.
- The operational sound of the machine is turned on.

When the button in the app on the smartphone is pushed for 5 seconds while the machine is in pause mode, a popup appears on the screen **Are you sure to go out of operation?** confirm this and the machine goes out of operation.

The pause button can be operated remotely with the app on the smartphone, except when an emergency stop occurred.

If an alarm occurs, the LED in the pause button blinks. The alarm must be confirmed with the app on the smartphone.

Status of the machine	LED status of the pause button
Start up	Blink
Out of operation	On
Paused	On
In operation	Off
Alarms	Blink

2.5.3 Bumper

The machine has a bumper (see figure 5 on page 2-11) that stops the vehicle immediately when it hits an object that is at least 60 cm above floor level.

If the machine hits a solid object the bumper sensors (see figure 8 on page 4-3) are activated and the machine stops driving. After 30 seconds the machine tries to continue its route. If the bumper is still activated the machine waits again 30 seconds. The machine repeats this cycle maximum 5 times. If the bumper is still activated after 5 cycles an alarm is generated and the machine goes out of operation. To resume operation the cause of the alarm must be resolved and the pause button must be pushed. If the bumper is not activated anymore, the machine resumes operation automatically.

When the machine is in operation the bumper has an electric pulse on it (optional) to make sure cows do not block the vehicle.

2.5.4 Bumper Sensors



*Electrical hazard.
Risk for electric shock.
Keep away from the bumper during operation of the machine.*

When the cover is opened the bumper sensors (see figure 8 on page 4-3) are activated and the machine stops driving. After 30 seconds the machine tries to continue its route. If the cover is still open the machine waits again 30 seconds. The machine repeats this cycle maximum 5 times. If the cover is still open after 5 cycles an alarm is generated and the machine goes out of operation. To resume operation the cause of the alarm must be resolved and the pause button must be pushed.

When the cover is closed again, the alarm is cleared on the smartphone and the pause button is pushed for a longer while, the machine resumes operation.

2.5.5 Buzzer

A buzzer is installed on the machine (see figure 5 on page 2-11). The buzzer alerts persons and cows when the vehicle starts to move, moves or when an alarm occurs.

The beep lengths and beep frequencies of the buzzer are:

Operational state of the Juno	Beep frequency buzzer
Normal operation	Once per 2 seconds (default)
An alarm occurred	3 short beeps every minute

2.5.6 Software Controlled Charging System

The operational software of the machine controls the charging system. This allows to keep the machine connected to the charging station when it is not moving, even if the battery is fully charged. The software prevents overcharging the battery and keeps it fully charged until the next operation.

2.5.7 Overload Protection

The drive motors are protected against overload. If the current is high for a long time the overload protection operates and stops the Juno to prevent overheating. An alarm message is also generated.

2.5.8 Barn Door Control (optional)

When the machine drives from one barn to another, it communicates with the barn door control unit to open/close the barn door(s).

Lely is not responsible for the barn door. The customer needs to arrange permission for the barn door manufacturer to connect the barn door to the Lely barn door control system via the 'CE questionnaire barn door supplier' (see CE Questionnaire Barn Door Supplier on page 10-1).

2.5.9 Shock System (optional)



*Electrical hazard.
Risk for electric shock.
Keep away from the bumper during operation of the machine.*



The maximum amount of energy the electric pulse on the bumper transfers is 15mJ (at 500R). This does not harm cows or humans.



The shock system meets the standard EN 60335-2-76 for electric fence energizers.

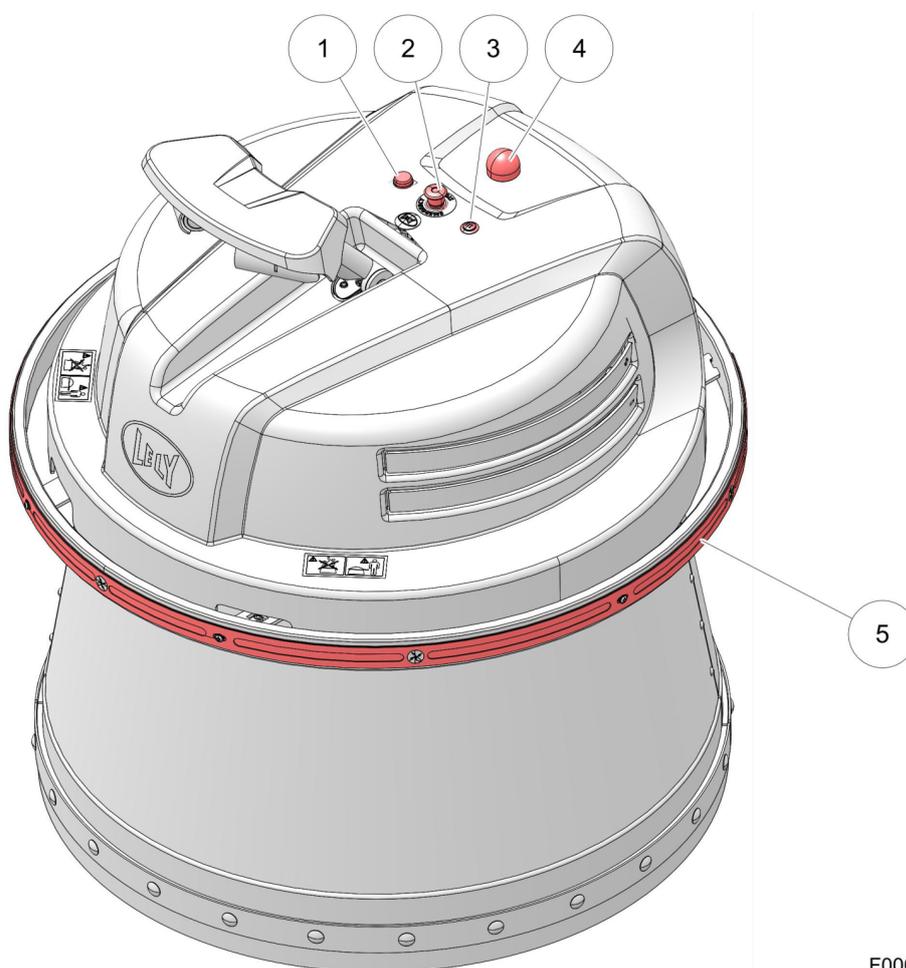
The shock system (see figure 12 on page 4-9) makes sure the cows do not block the machine. Cows are deterred from touching the machine by an electric pulse on the bumper. The power energizer generates the electric pulse on the bumper. The shock system is on when the machine is in operation. When the machine is out of operation the shock system is off.

Machine status	Shock system status
In operation + machine is driving	On
In operation + an alarm is active	On
In operation + machine is charging	Off
In operation + pause button is pushed	Off

Machine status	Shock system status
Out of operation	Off
In operation, charging + safety bumper is activated	On

2.5.10 LED Beacon (optional)

The machine is optionally fitted with a LED beacon (see figure 5 on page 2-11) that makes the machine visible when it drives in the dark from one barn to another. When the machine is at the charging station the LED beacon is switched off.



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Figure 5. Position of the safety devices

KEY: 1. Buzzer - 2. Emergency stop button - 3. Pause button - 4. LED beacon (optional) - 5. Bumper with electric pulse (optional)



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3 Specifications

3.1 Feed Pusher

3.1.1 Dimensions and Weight

- Diameter: 110 cm (43.3 in).
- Height: 115 cm (45.3 in).
- Weight: 620 kg (1367 lb).
- Rotating part height: 630 – 670 mm (24.8 in – 26.4 in) depending on skirt setting.
- Maximum width of feed: 630 – 670 mm (24.8 in – 26.4 in) depending on skirt setting.
- Maximum height of feed: 630 – 670 mm (24.8 in – 26.4 in) depending on skirt setting.

3.1.2 Battery

- Number of batteries: 1.
- Weight: 19.9 kg (43.9 lb).
- Nominal voltage 12 V.
- Capacity: 55 Ah.
- Charging time: 6 hours maximum.
- Spare capacity: 120 min.
- Length: 254 mm (10.0 in).
- Width: 174 mm (6.9 in).
- Height: including battery terminals: 194 mm (7.6 in).
- Height excluding battery terminals: 173 mm (6.8 in).

3.1.3 Operation

- Maximum driving speed: 200 mm/s.
- Maximum driving time without charging: 1 hr (0.6 mi).
- Maximum driving distance: 1 km.
- Route programming: with app on smartphone.
- Routing outside barn: Strip following.
- Routing inside barn: Ultrasound follow, straight drive, feed fence follow, strip follow, strip reset.
- Routing on ramp: Strip follow.
- Charger docking: Strip follow.
- Maximum slope: 8.5° (15 cm per 100 cm).
- Ultrasound maximum height: 1.77 m (69.7 in).

- Ultrasound minimum height: 1.10 m (43.3 in).
- Ultrasound maximum distance to feed fence or wall: 3 m (9.8 ft).
- Ultrasound minimum distance to feed fence or wall: 0.54 m (21.3 in).
- Minimum distance between machine and wall (without warning light): 0.5 m (19.7 in).
- Minimum distance between machine and wall (with warning light): 0.2 m (7.9 in).
- Maximum width of feed mass: 75 cm (29.5 in).
- Maximum height of feed mass: 60 cm (23.6 in).
- Minimum time charging at charger: 50%.
- Minimum night charge time: 4 hr.
- Maximum recommended straight drive distance: 2 m (6.6 ft).
- Allowed working temperature: -20 to + 50 °C (-4 to + 122 °F).

3.1.4 Miscellaneous

- Drive: 2x electric motor.
- Number of wheels: 3
- Average power consumption: 0.3 to 0.4 W per meter depending on farm conditions and route details.
- Determination of direction of motion: using gyroscope.
- Determination of distance to feed fence: using ultrasonic sensor.
- Determination of distance travelled: field-oriented control (FOC).
- Calibration points: End of straight metal strips with at least 1 m of length.

3.2 Charging Station

3.2.1 Dimensions and Weight

Charging station

- Width: 37.5 cm (14.7 in).
- Depth: 25 cm (9.8 in).
- Height: 66 cm (25.9 in).
- Weight excluding floor column: 17 kg (37.5 lb).
- Weight including floor column: 59 kg (130.1 lb).

Floor column

- Width: 45 cm (17.7 in).
- Depth: 30 cm (11.8 in).
- Height: 170 cm (66.9 in).
- Weight: 42 kg (92.6 lb).

3.2.2 Battery Charger

- Type: Exendis (9-1188-0027-0).
- Input voltage: 180 - 240 VAC / 50 Hz or 115 / 60 Hz.
- Output voltage: 17 VDC.
- Max. charge current: 20 A.
- Safety features: reversed connections, short circuit.
- Weight: 2 kg (4.4 lbs).
- Length excluding battery terminals: 200 mm (7.9 in).
- Width: 150 mm (5.9 in).
- Height: 70 mm (2.8 in).

3.3 Smartphone Requirements

- 100 MB available storage space.

iPhone® model names

- iPhone X
- iPhone 8
- iPhone 8 Plus
- iPhone 7
- iPhone 7 Plus
- iPhone SE
- iPhone 6s
- iPhone 6s Plus
- iPhone 6
- iPhone 6 Plus
- iPhone 5s
- iPhone 5c
- iPhone 5

Android phone

- Android 4.4 or higher.



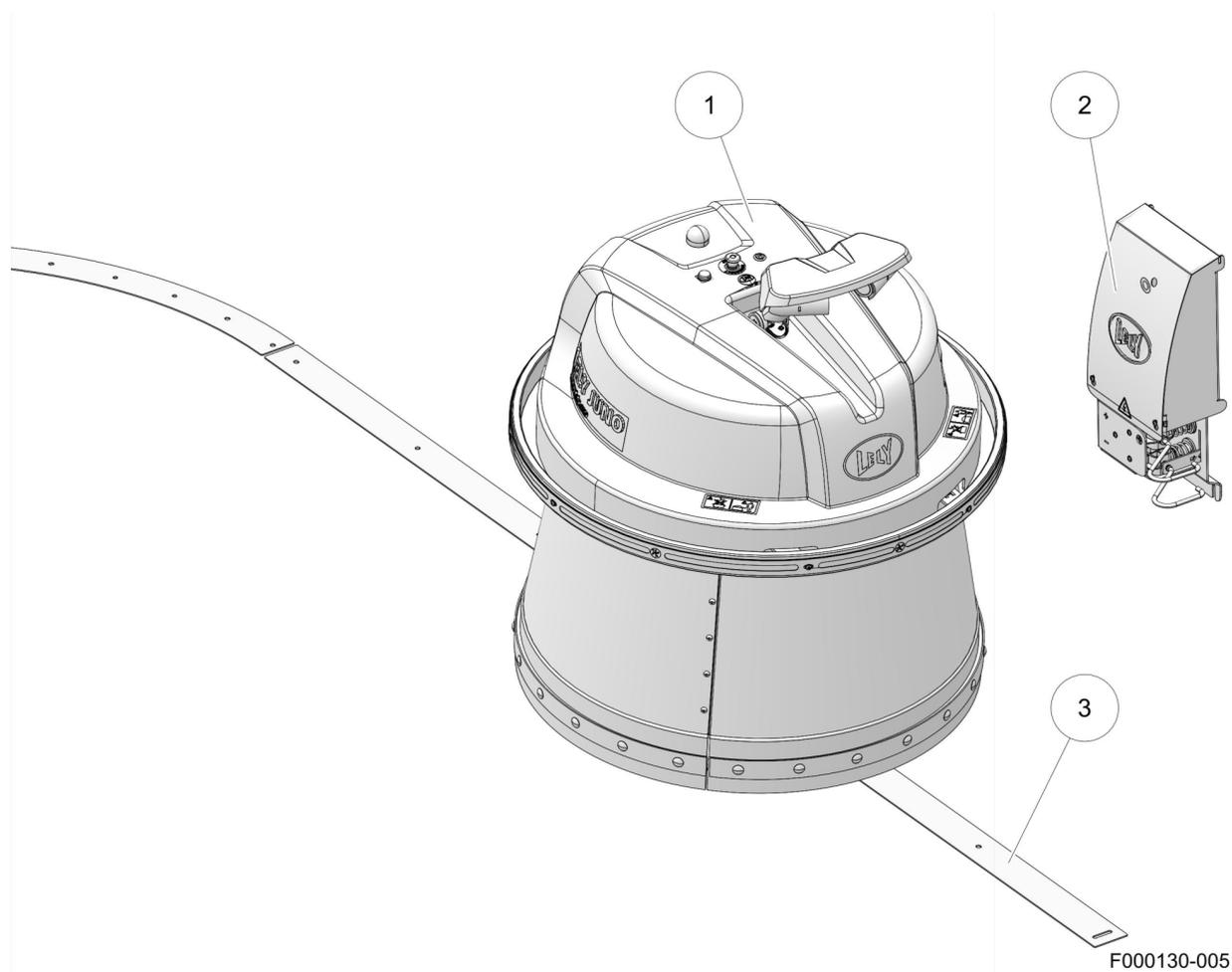
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4 Description and Operation

4.1 Introduction

This chapter describes the parts of the feed pusher. It also explains how the parts work together to push the feed towards the feed fence.



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Figure 6. Main components

KEY: 1. Feed pusher - 2. Charging station - 3. Metal guiding strip

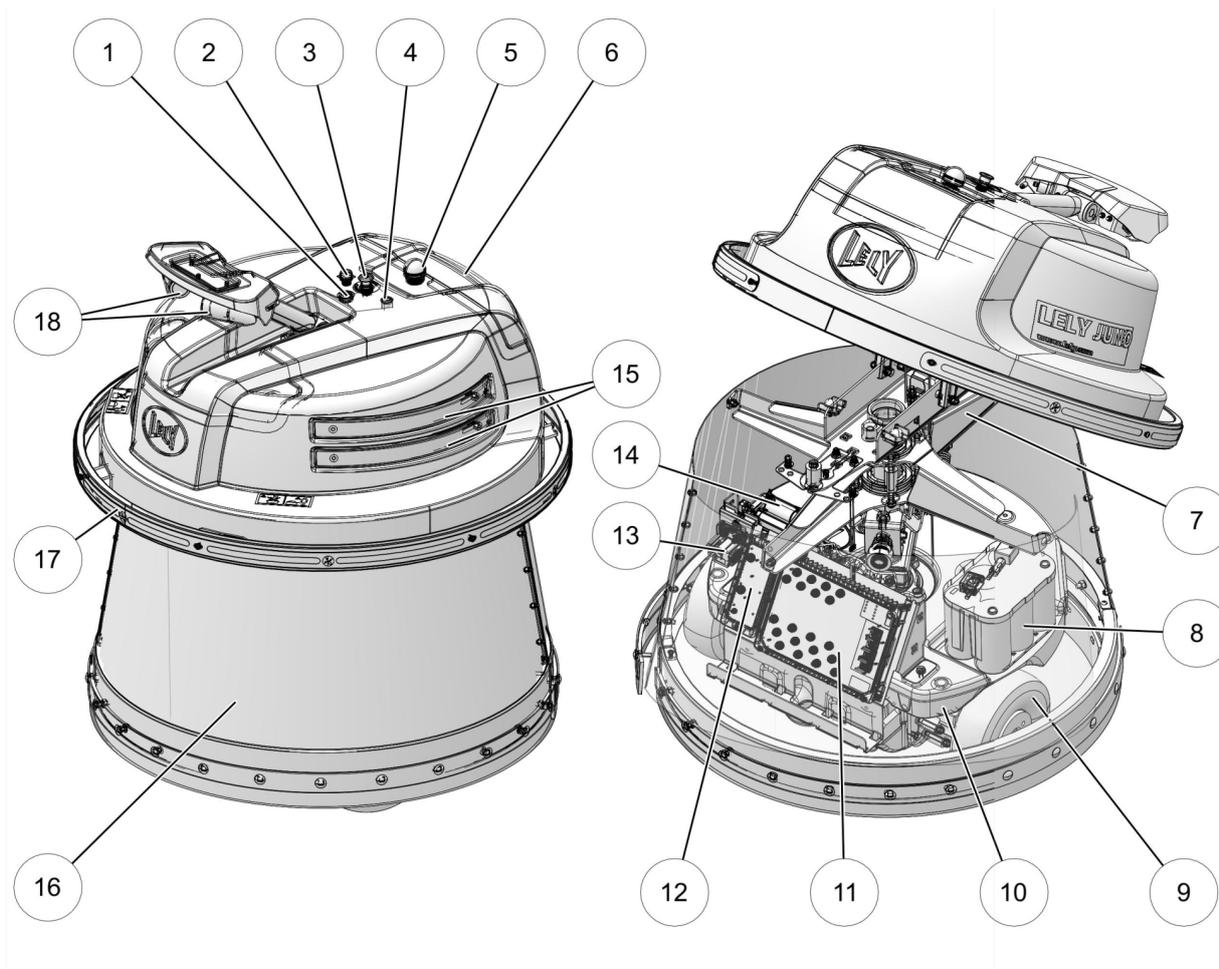
4.2 Component Description

4.2.1 Feed Pusher Vehicle

The machine has the following main components:

- Cover.
- Skirt.

- Steel weight block.
- Driving mechanism.
- Power system.
- Control system.
- Shock system (optional).



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Figure 7. Component overview

KEY: 1. Hoisting eye point cover - 2. Buzzer - 3. Emergency stop button - 4. Pause button - 5. LED beacon - 6. Cover - 7. Frame - 8. Battery - 9. Right drive wheel - 10. Steel weight block - 11. VIOB - 12. VCB - 13. Gyroscope - 14. Actuator - 15. Charging strips - 16. Skirt - 17. Bumper with shock strip (optional) - 18. Ultrasonic sensors

4.2.1.1 Covers

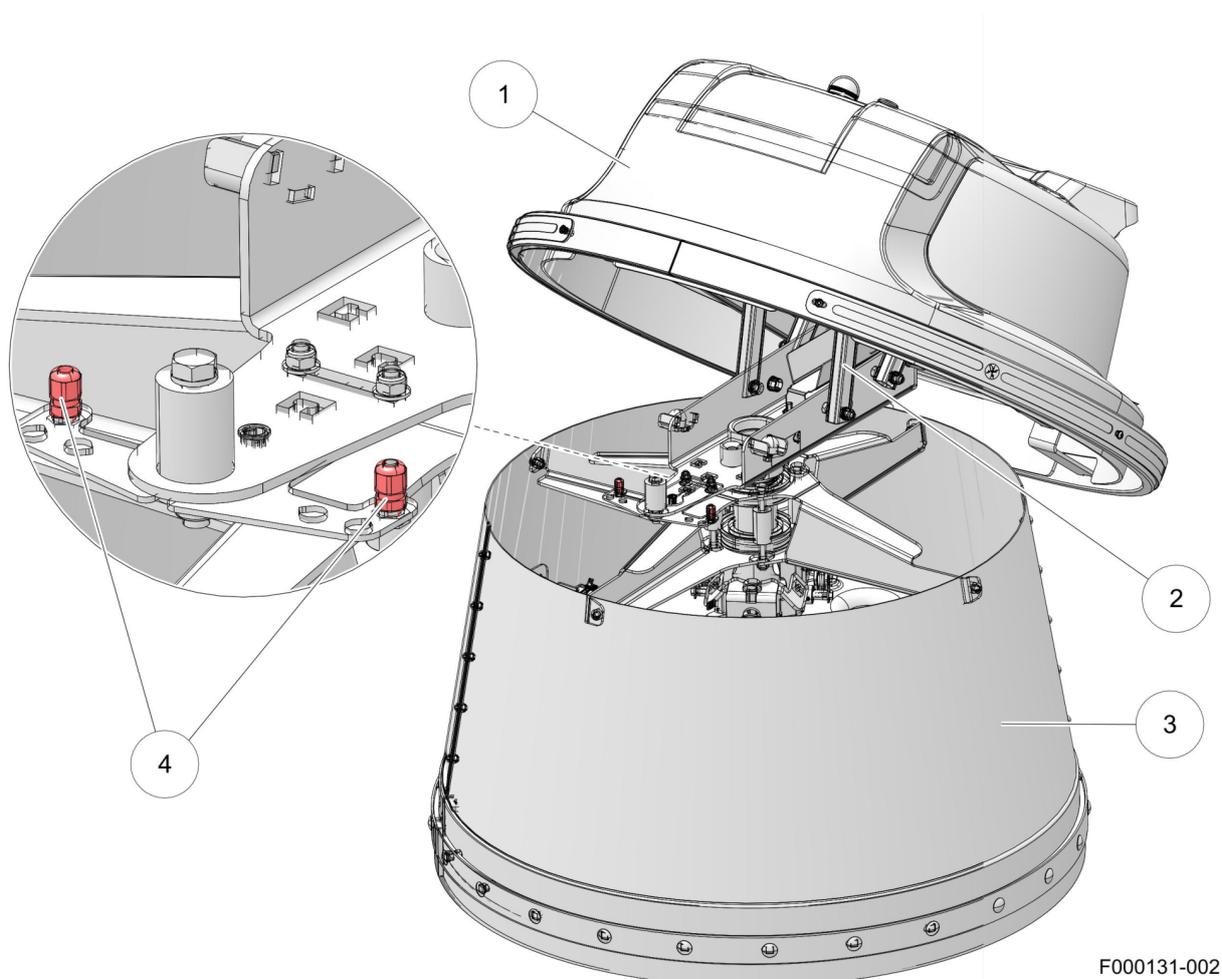
The machine has:

- Cover.
- Cover opening mechanism.
- Bumper sensors.

- Skirt.

The cover is installed on the opening mechanism that is attached to the frame of the machine. The cover has bumper sensors that stop operation of the machine immediately when the bumper is activated.

The skirt is the rotating surface on the lower section of the machine. The skirt rotates and pushes the forage towards the feed fence while the machine drives along the feed alley.



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Figure 8. Covering and bumper sensors

KEY: 1. Cover - 2. Cover opening mechanism - 3. Skirt - 4. Bumper sensors

4.2.1.2 Carriage

The carriage has:

- Frame.
- Steel weight block.

The frame is attached to a steel weight block. The frame is adjustable for feed pushing at the left or right side of the machine. The steel block weighs 405 kg (893 lbs) which makes sure the machine has sufficient mass to push the forage.

4.2.1.3 Driving Mechanism

The drive motors, that are attached to the steel weight block, drive the two wheels on the side. The vehicle has no steering wheel. The front swivel wheel is a support wheel. Its direction is controlled by letting one of the drive motors run faster than the other.

The driving mechanism has the following parts:

- Drive motors with gear box (left and right).
- Drive wheels (left and right).
- Front swivel wheel.

The drive motors get input from the VIOB.

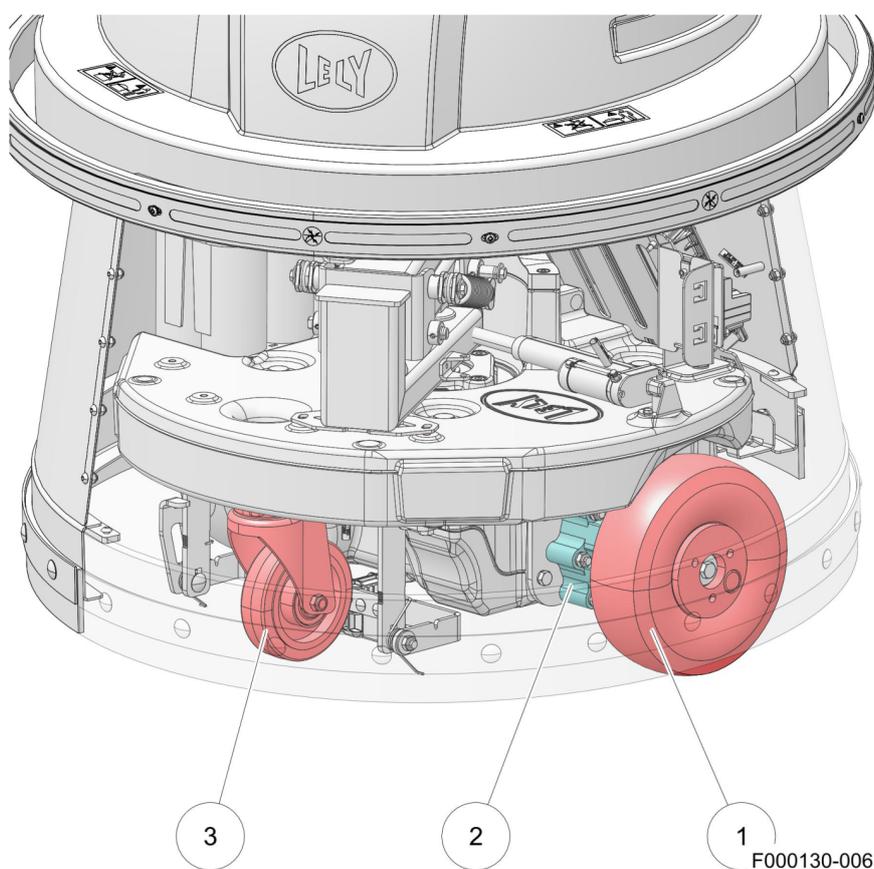


Figure 9. Driving mechanism

KEY: 1. Left drive wheel - 2. Left drive motor with gear box - 3. Front swivel wheel

4.2.1.4 Power System

NOTICE

Do not cover the vent ports of the battery.

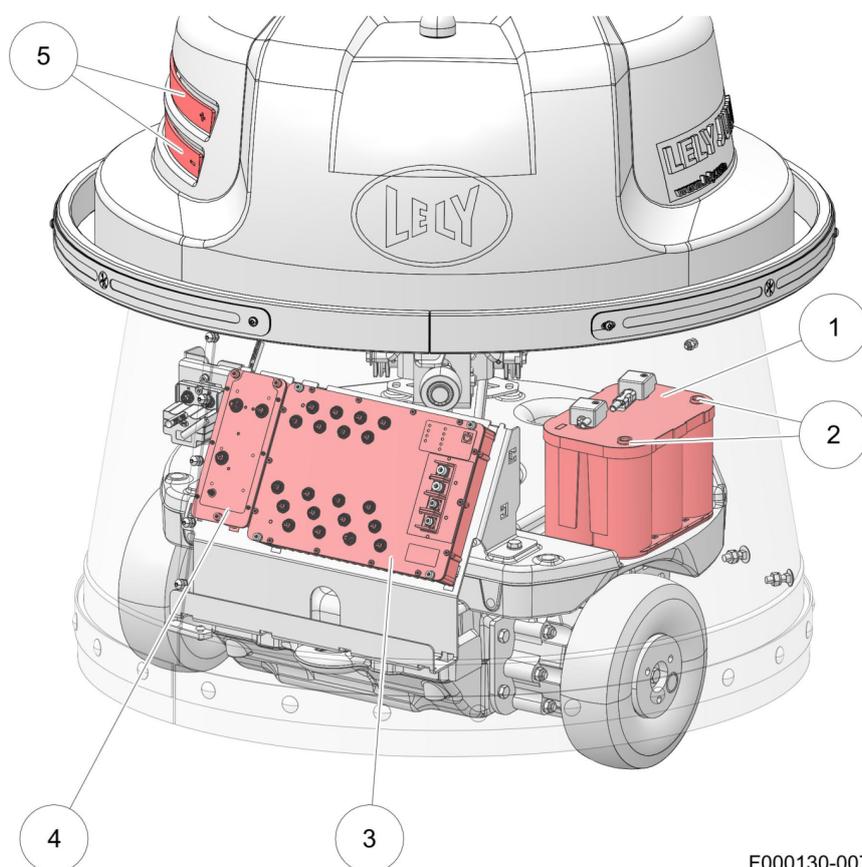
The power system stores and distributes the electrical power for the driving mechanism and the control system. The power supply is a single 12 V battery.

Charging takes place at the charging station. The charging process is controlled by the VIOB. The VCB can start or stop the charging process.

The power system has the following primary parts:

- Battery.
- Charging strips.
- VIOB.
- VCB.

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Figure 10. Power system

KEY: 1. Battery - 2. Battery vent ports - 3. VIOB - 4. VCB - 5. Charging strips

4.2.1.5 Safety System

The machine has a safety system to (see Emergency Stop Button on page 2-8):

- Protect people and animals against mechanical hazards by a set of safety devices that stop the machine immediately when hit or opened:
 - Emergency stop button.
 - Pause button.
 - Bumper.
 - Bumper switch.
- Warn people and animals by a buzzer.
- Warn people and animals by a LED beacon (optional).
- Ensure that a fault in the hardware or software does not lead to hazardous situations:
 - Software controlled charging station.
 - Overload protection of the drive motors.
 - Fuse.
- Protect people during maintenance:
 - Maintenance-free battery.

4.2.1.6 Control System

The control system has the following parts:

- Vehicle control box (VCB).
- Vehicle input/output box (VIOB).
- Ultrasonic sensor(s).
- Gyroscope.
- Inductive sensor (2x).
- Lely Control Plus app.

All the parts work together to keep the machine on the correct route.

VCB

The VCB hosts the management software and communicates with the VIOB.

VIOB

The VIOB is the interface between the VCB and the sensors and actuator on the machine.

Ultrasonic Sensor(s)

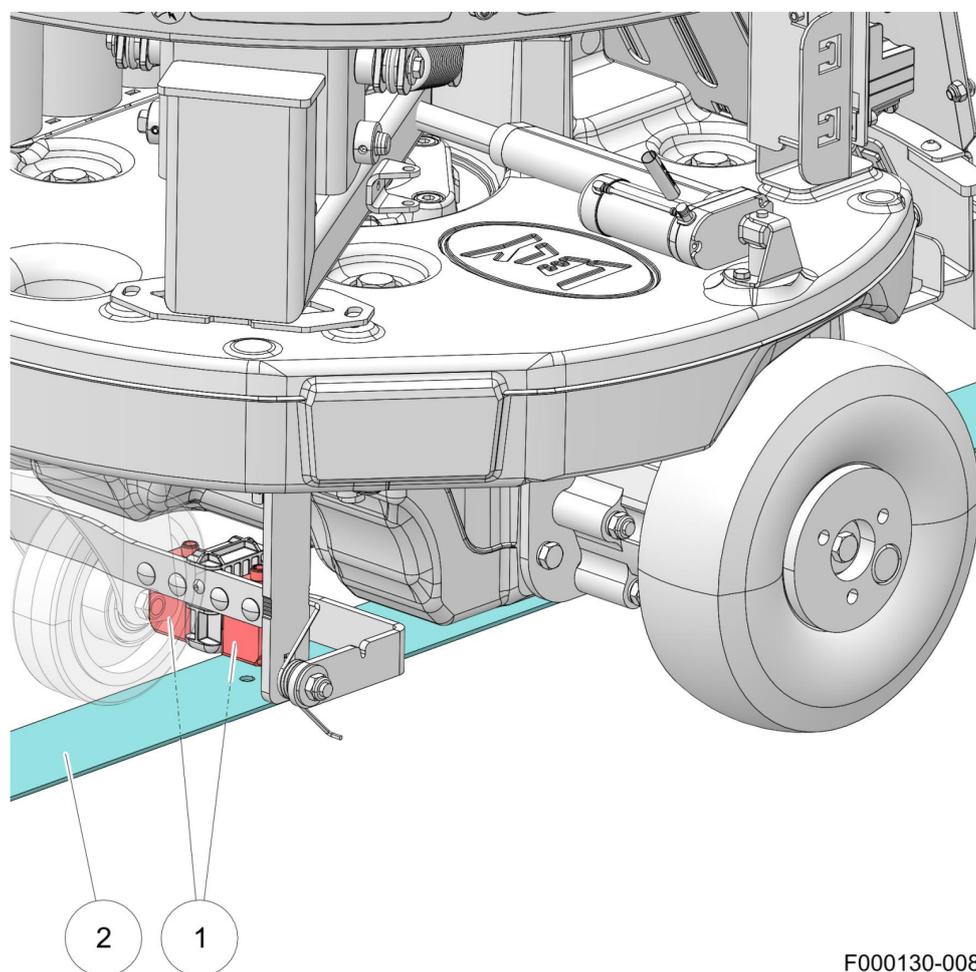
The ultrasonic sensor(s) make sure the machine follows the wall or fence at a pre-determined distance. The sensors get input from and send outputs to the VIOB.

Gyroscope

The gyroscope measures the turning angle. This information is used to find the correct direction.

Inductive sensors

The inductive sensors can detect and follow pre-installed metal strips on the floor. This makes it possible to drive from one barn to another and ensures accuracy of the programmed routes.



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Figure 11. Inductive sensors

KEY: 1. Inductive sensors - 2. Metal strip

Lely Control Plus app

Lely control Plus is the application for mobile devices to operate the machine via a bluetooth connection.

4.2.1.7 Shock System (optional)



*Electrical hazard.
Risk for electric shock.
Keep away from the bumper during operation of the machine.*

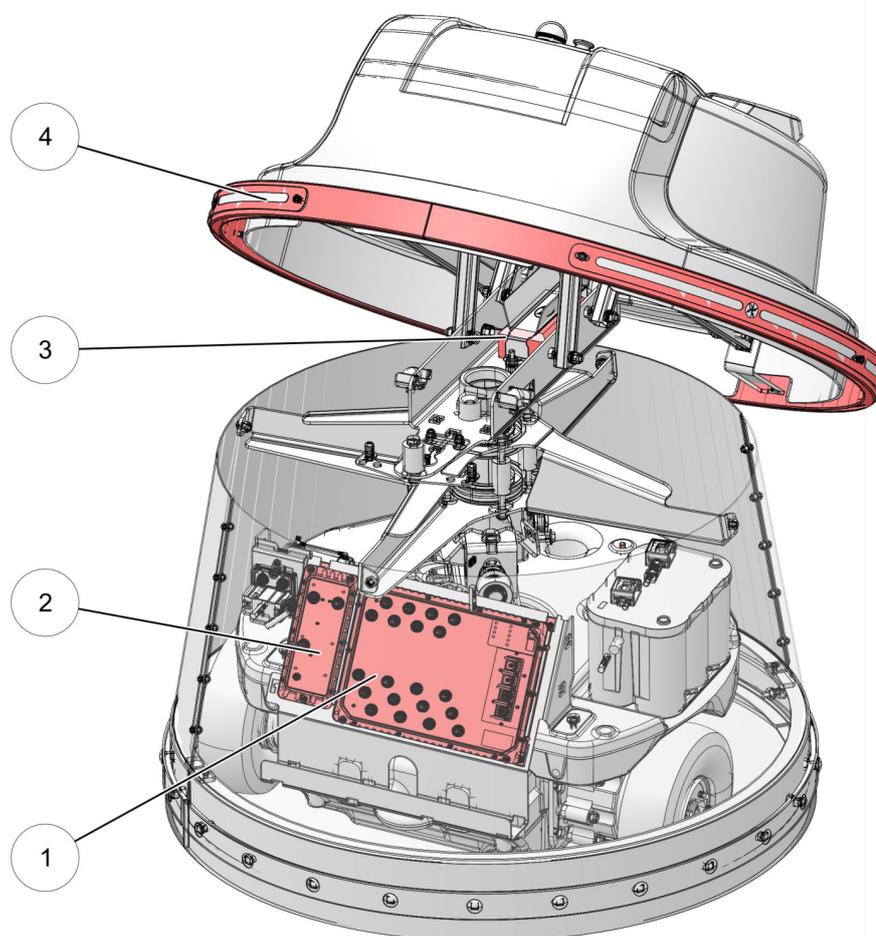


The maximum amount of energy the electric pulse of the bumper transfers is 15mJ (at 500R). This does not harm cows or humans.



The shock system meets the standard EN 60335-2-76 for electric fence energizers.

The shock system makes sure the cows do not block the machine. Cows are deterred from touching the machine by an electric pulse on the bumper. The power energizer generates the pulse on the bumper. The pulse is on when the machine is in operation. When the machine is out of operation the shock system is off. The power energizer is connected to the VIOB, gets its input from the VCB and sends output to the bumper.



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Figure 12. Shock system

KEY: 1. VIOP - 2. VCB - 3. Power energizer - 4. Bumper with electric pulse

4.2.1.8 Skirt Lift and Rotation System (optional)

The skirt lift and rotation system has:

- Electric actuator (optional).
- Skirt lift and rotation mechanism.

The skirt lift and rotation system rotates the skirt to the lifted middle position or to the left or right feed push position. In order to push feed at the left and right side of the machine, the machine must be equipped with a second ultrasonic sensor (optional). In the middle position the skirt is lifted from the ground. This is useful for instance to avoid contamination of the skirt when the machine drives from one barn to another. An electric actuator (optional) adjusts the rotation mechanism of the machine to the preferred position.

Requirements for driving the machine with lifted skirt

- The surface where the machine drives on in skirt lift mode must be even.

- The skirt lift mode must only be used in areas where it is necessary.

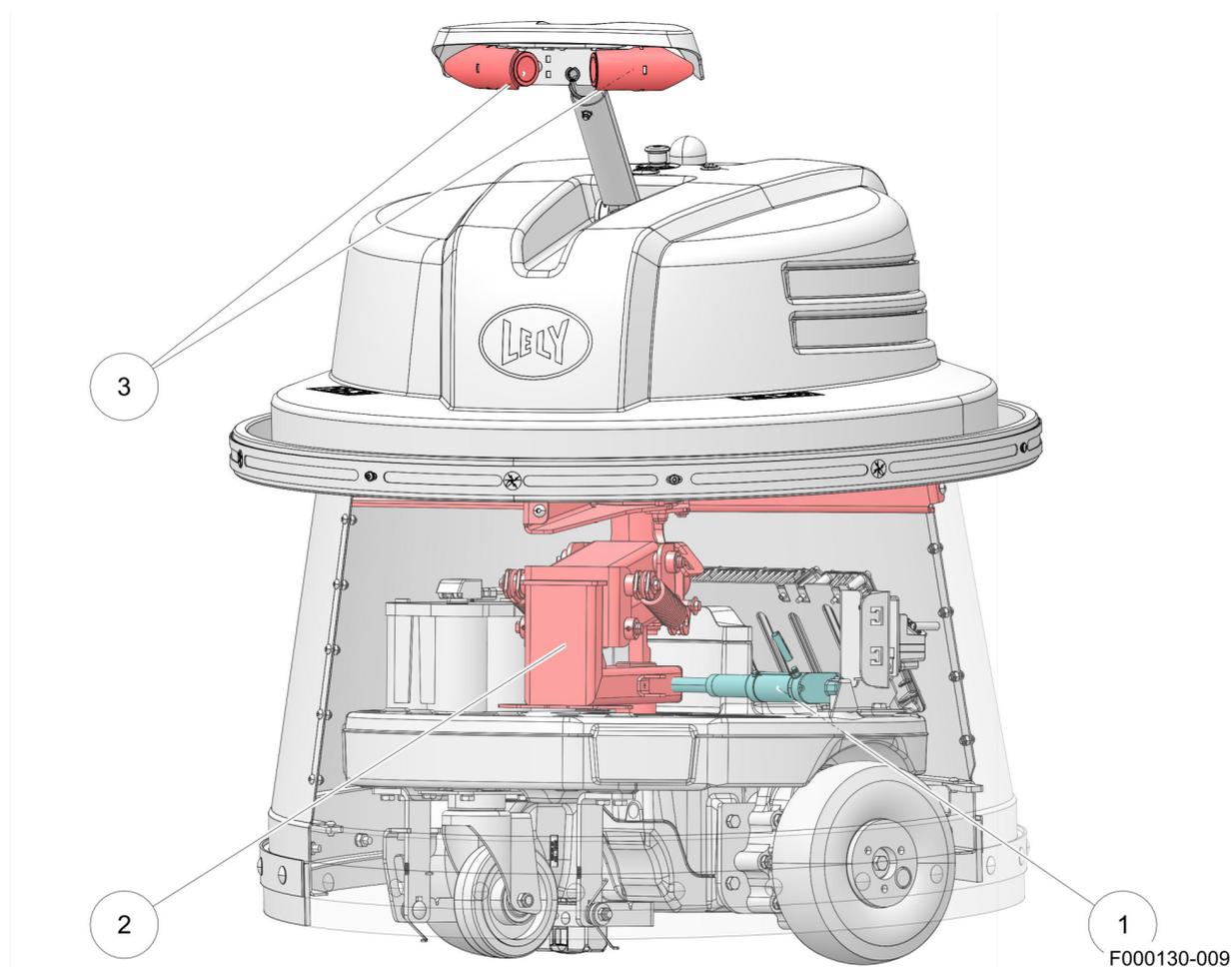


Figure 13. Skirt lift and rotation mechanism

KEY: 1. Electric actuator - 2. Skirt lift and rotation mechanism - 3. Ultrasonic sensors

4.2.2 Charging Station

The charging station is the start and end point for all routes in the day planning. The machine can be left permanently connected to the charging station. This keeps the battery in good condition. The VCB continuously examines the voltage of the battery. It is not possible to overcharge the battery

The charging station has a 20 A electronic battery charger. The battery charger electrodes are at the front near the bottom of the charging station.

The charging station can be installed in the barn in two ways:

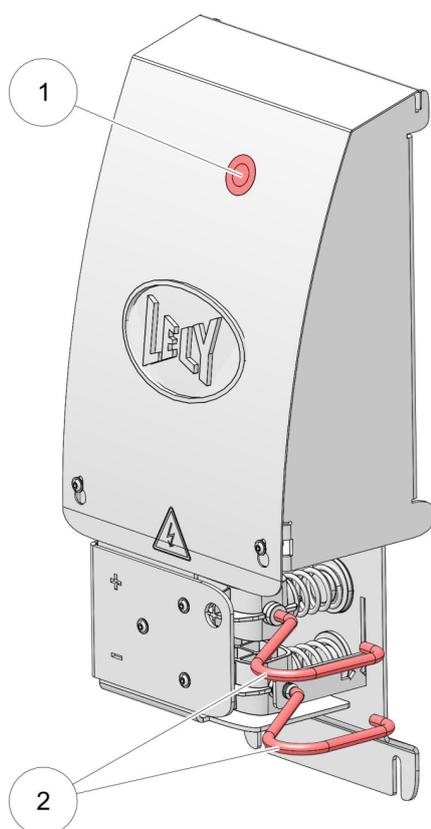
- Wall-mounted.
- Floor-mounted (requires pole).

If it is not possible to install the charging station to the wall, an optional floor column can be supplied.

Battery charger

The 20 A electronic battery charger has two indicator LEDs on the upper right side. The meaning of the LEDs are:

Status	Charging LED (orange)	Power LED (green)
Mains connected	OFF	ON
Charging (>1A)	ON	ON
Error	blinking	blinking



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Figure 14. Charging station

KEY: 1. Indicator LEDs - 2. Charging electrodes

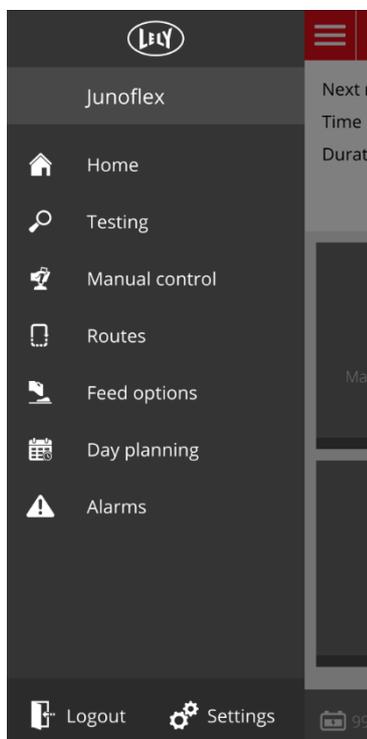
4.3 User Interface



The main menu can be accessed from the dashboard with button



The machine is operated with a smartphone. The smartphone communicates with the software via bluetooth.

Display	Description
	<p>The main menu on the smartphone has the following items:</p> <ul style="list-style-type: none"> • Home. • Testing. • Manual control. • Routes. • Feed options. • Day planning. • Alarms. • Logout. • Settings.

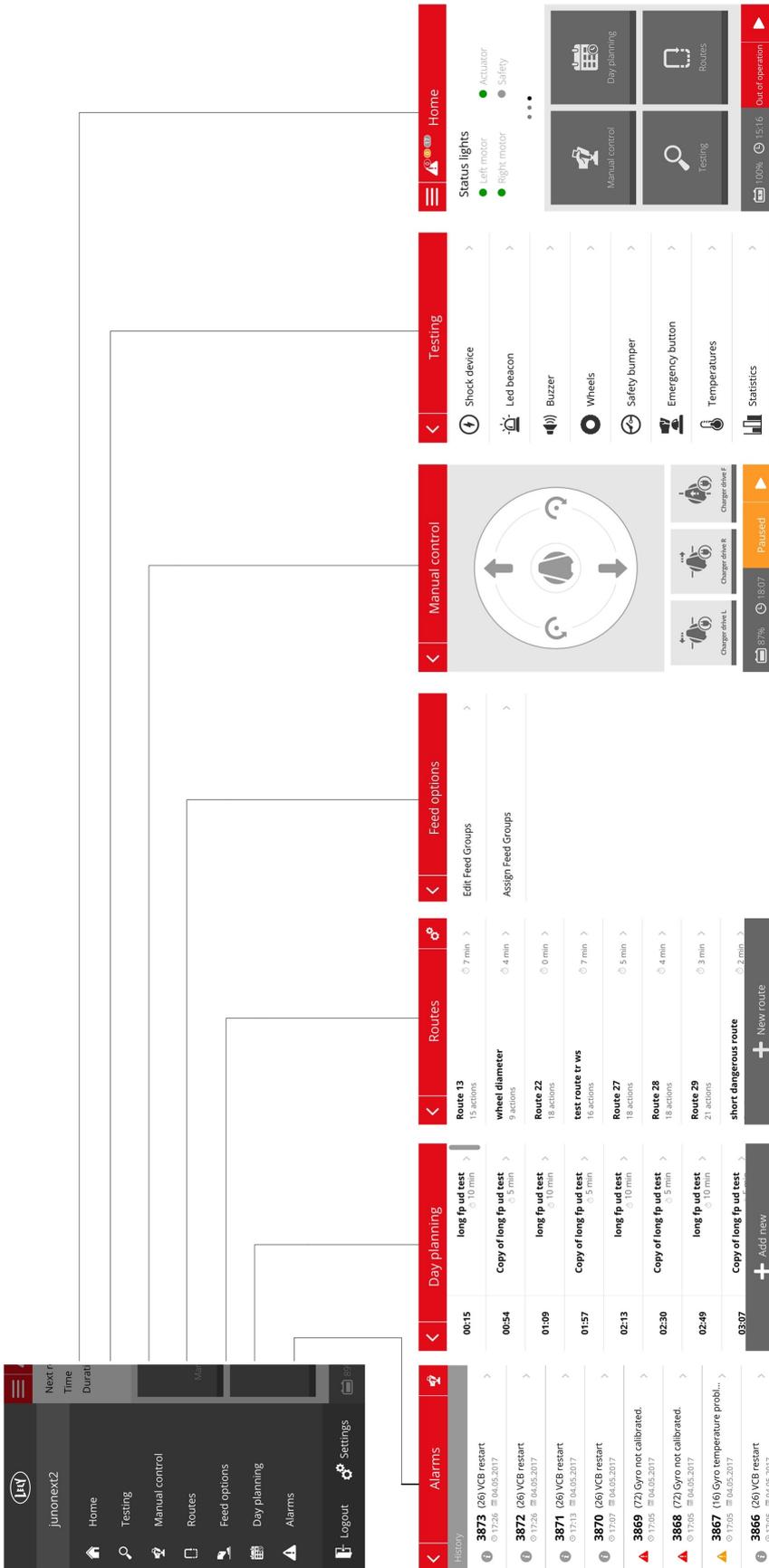
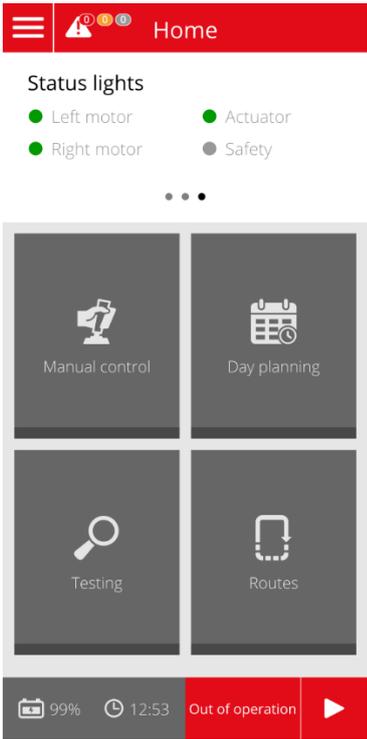


Figure 15. Main menu items of the user interface
Description and Operation

4.3.1 Home

The home screen is used for daily operation of the machine. You can operate the machine in automatic mode using a day planning and in manual mode. Button  must be used to put the machine into operation. Button  must be used to pause the machine. When the pause button is pushed for 5 seconds the machine goes out of operation.

Display	Description
 <p>The screenshot shows the Home screen interface. At the top, there's a red header with a menu icon, status icons, and the word 'Home'. Below this, 'Status lights' are shown with indicators for Left motor, Right motor, Actuator, and Safety. A central area contains four large buttons: 'Manual control', 'Day planning', 'Testing', and 'Routes'. At the bottom, a status bar displays '99%' battery, '12:53' time, 'Out of operation' text, and a red play button icon.</p>	<p>The home screen displays when the machine drives the next route, the time and the battery status.</p> <p>On the home screen you can access the following menus:</p> <ul style="list-style-type: none"> • Manual control: to manually control the machine. • Day planning: to access the day planning. • Testing: to access the test menu. • Routes: to choose which route must be followed. <p>Buttons</p> <ul style="list-style-type: none"> •  to put the machine into operation. •  to pause the machine (take the machine temporary out of operation). • When the machine is in paused state and button  is pushed for 1 second the machine will go into operation again. • When the machine is in paused state and button  is pushed for 5 seconds the machine will go out of operation. • Button  to go to the main menu (see on page 4-12).

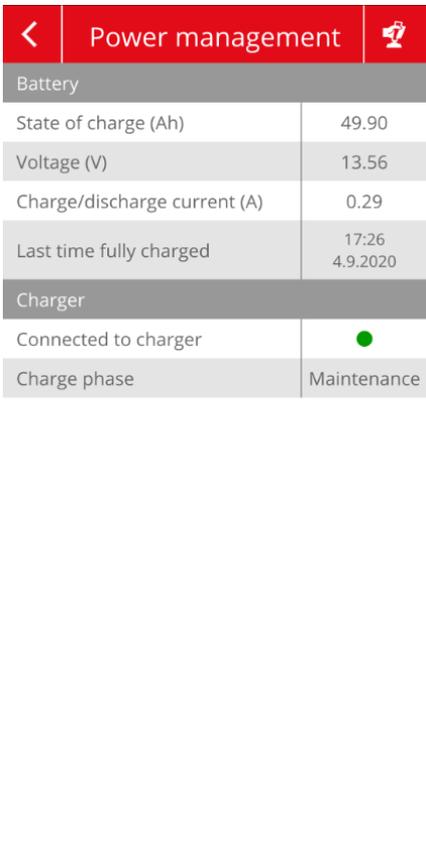
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4.3.2 Testing

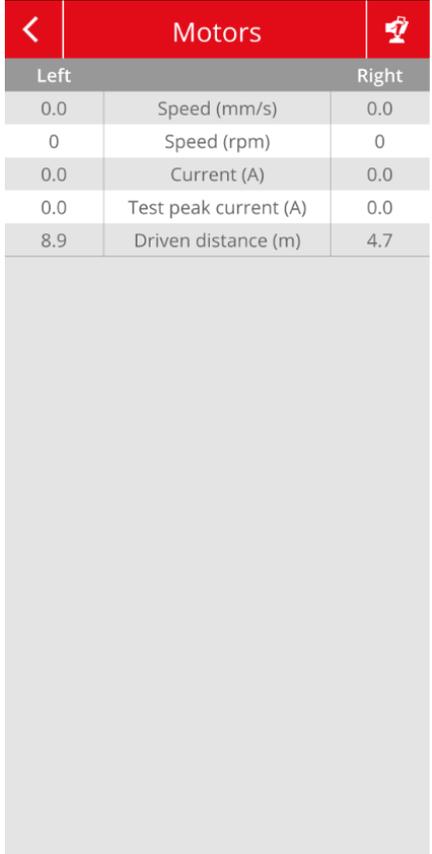
The menu **Testing** gives the possibility to test parts of the machine and to read out values that give information about the performance of the machine. Sensors that require calibration can be calibrated in this menu.

Display	Description
	<p>The menu Testing has read out and test possibilities for the following machine items:</p> <ul style="list-style-type: none"> • Power management. • Motors. • Ultrasound sensors. • Induction sensors. • Gyroscope. • Pause button. • Electric actuator. • Led beacon. • Buzzer. • Wheels. • Safety bumper. • Emergency button. • Temperatures. • Statistics. • Barn door. • Machine info
	<p>Buttons</p> <ul style="list-style-type: none"> • Button  to return to the home screen.

4.3.2.1 Power Management

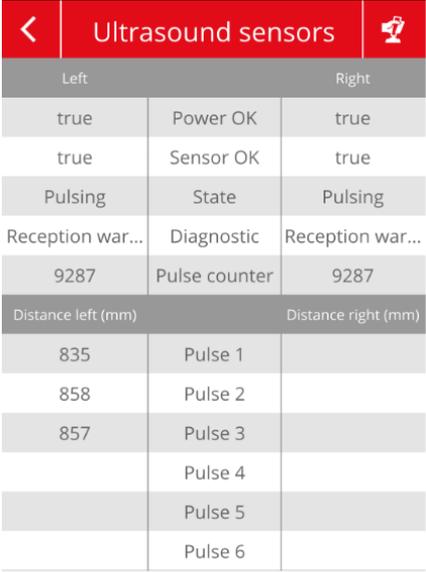
Display	Description
	<p>The menu Power management gives status information about the battery and the charger.</p> <p>Battery</p> <ul style="list-style-type: none"> • State of charge (Ah): the amount of amperes the battery is currently charged with. Maximum 55 Ah. • Voltage (V): The current voltage of the battery. • Charge/discharge current (A): the amount of amperes the battery supplies when it discharges or absorbs when it is charging. Maximum 50 Ah. • Last time fully charged: Date and time of the moment the battery was charged 100% for the last time. <p>Charger</p> <ul style="list-style-type: none"> • Connected to charger: when the battery is connected to the charger correctly a green indicator (●) is displayed. • Charge phase. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.

4.3.2.2 Motors

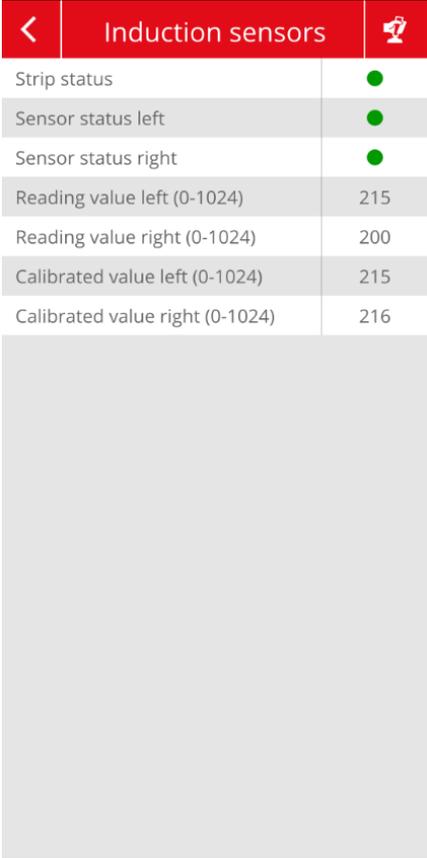
Display	Description																		
 <table border="1" data-bbox="161 409 593 667"> <thead> <tr> <th>Left</th> <th></th> <th>Right</th> </tr> </thead> <tbody> <tr> <td>0.0</td> <td>Speed (mm/s)</td> <td>0.0</td> </tr> <tr> <td>0</td> <td>Speed (rpm)</td> <td>0</td> </tr> <tr> <td>0.0</td> <td>Current (A)</td> <td>0.0</td> </tr> <tr> <td>0.0</td> <td>Test peak current (A)</td> <td>0.0</td> </tr> <tr> <td>8.9</td> <td>Driven distance (m)</td> <td>4.7</td> </tr> </tbody> </table>	Left		Right	0.0	Speed (mm/s)	0.0	0	Speed (rpm)	0	0.0	Current (A)	0.0	0.0	Test peak current (A)	0.0	8.9	Driven distance (m)	4.7	<p>The menu Motors gives actual status information about the left and right drive motor.</p> <ul style="list-style-type: none"> • Speed (mm/s): the actual drive speed of the left and right motor in millimeters per second. • Speed (rpm): the actual drive speed of the left and right motor in revolutions per minute. • Current (A): the actual electric motor current for the left and right motor in amperes. • Test peak current (A): peak current for the test run. Each time test restarted previous values are cleared. • Driven distance (m): the driven total distance for the left and right motor in meters. <p>Buttons</p> <ul style="list-style-type: none"> •  : to return to the menu Testing. •  : to enter the menu Manual control.
Left		Right																	
0.0	Speed (mm/s)	0.0																	
0	Speed (rpm)	0																	
0.0	Current (A)	0.0																	
0.0	Test peak current (A)	0.0																	
8.9	Driven distance (m)	4.7																	

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4.3.2.3 Ultrasound Sensors

Display	Description																																							
 <table border="1" data-bbox="164 409 590 981"> <thead> <tr> <th colspan="2">Left</th> <th>Right</th> </tr> </thead> <tbody> <tr> <td>true</td> <td>Power OK</td> <td>true</td> </tr> <tr> <td>true</td> <td>Sensor OK</td> <td>true</td> </tr> <tr> <td>Pulsing</td> <td>State</td> <td>Pulsing</td> </tr> <tr> <td>Reception war...</td> <td>Diagnostic</td> <td>Reception war...</td> </tr> <tr> <td>9287</td> <td>Pulse counter</td> <td>9287</td> </tr> <tr> <th colspan="2">Distance left (mm)</th> <th>Distance right (mm)</th> </tr> <tr> <td>835</td> <td>Pulse 1</td> <td></td> </tr> <tr> <td>858</td> <td>Pulse 2</td> <td></td> </tr> <tr> <td>857</td> <td>Pulse 3</td> <td></td> </tr> <tr> <td></td> <td>Pulse 4</td> <td></td> </tr> <tr> <td></td> <td>Pulse 5</td> <td></td> </tr> <tr> <td></td> <td>Pulse 6</td> <td></td> </tr> </tbody> </table>	Left		Right	true	Power OK	true	true	Sensor OK	true	Pulsing	State	Pulsing	Reception war...	Diagnostic	Reception war...	9287	Pulse counter	9287	Distance left (mm)		Distance right (mm)	835	Pulse 1		858	Pulse 2		857	Pulse 3			Pulse 4			Pulse 5			Pulse 6		<p>The menu Ultrasound sensors gives actual status information about the left and right ultrasound sensor.</p> <ul style="list-style-type: none"> • Power OK: Power check on both sides of the machine. • Sensor OK: Correct working of sensors checked on both sides of the machine. • State: Indicates if the sensors are pulsing or not. • Diagnostic: Checks if the pulses are received in a correct way. • Pulse counter: The total amount of pulses which are received are shown for both sides of the machine. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.
Left		Right																																						
true	Power OK	true																																						
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	Pulse 5																																							
	Pulse 6																																							

4.3.2.4 Induction Sensors

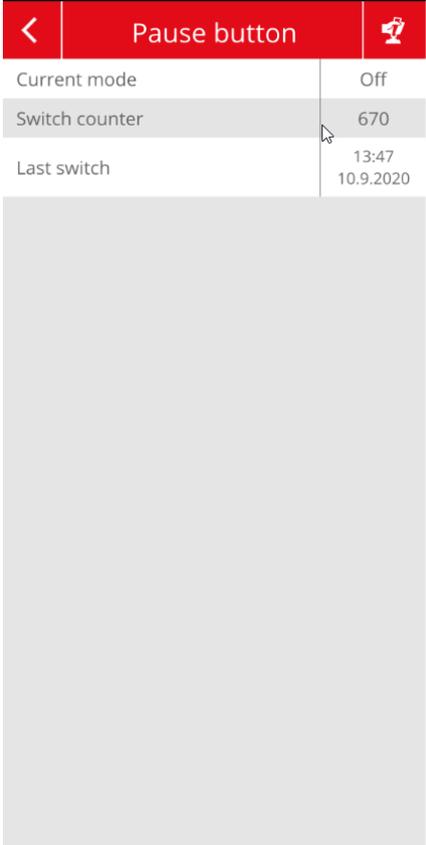
Display	Description
	<p>The menu Induction sensors gives actual status information about the left and right induction sensor.</p> <ul style="list-style-type: none"> • Strip status: the status indicator turns to green when the induction sensors detect a strip on the floor. This happens if both induction sensors read a value less than 700. • Sensor status left: the status indicator turns to green when the left induction sensor detects a strip on the floor. This happens if the left sensor reads a value less than 700. • Sensor status right: the status indicator turns to green when the right induction sensor detects a strip on the floor. This happens if the right sensor reads a value less than 700. • Reading value left (0 - 1024): <ul style="list-style-type: none"> • 1024: No strip detection. • 0: Maximum strip detection. • Reading value right (0 - 1024): <ul style="list-style-type: none"> • 1024: No strip detection. • 0: Maximum strip detection. • Calibrated value left. • Calibrated value right. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.

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4.3.2.5 Gyroscope

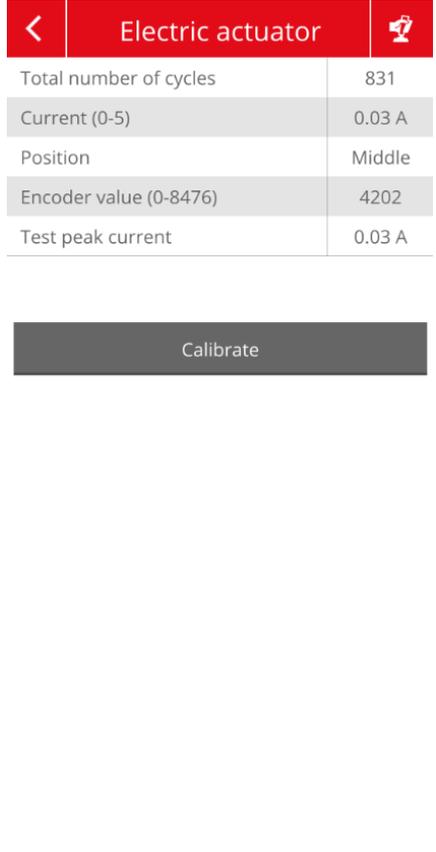
Display	Description																																																
 <table border="1" data-bbox="164 409 590 1267"> <tr> <td colspan="4" style="background-color: #e91e63; color: white; text-align: center;">Gyroscope</td> </tr> <tr> <td>Gyroscope temperature (°C)</td> <td colspan="3">44.90</td> </tr> <tr> <td>Target gyroscope temperature (°C)</td> <td colspan="3">45.00</td> </tr> <tr> <td>Outside oven temperature (°C)</td> <td colspan="3">31.50</td> </tr> <tr> <td></td> <td style="text-align: center;">x</td> <td style="text-align: center;">y</td> <td style="text-align: center;">z</td> </tr> <tr> <td>Absolute angle (°)</td> <td>354.53</td> <td>357.23</td> <td>180.21</td> </tr> <tr> <td>Angular speed (°/s)</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> </tr> <tr> <td>Gyro bias (°/s)</td> <td>359.97</td> <td>0.04</td> <td>0.03</td> </tr> <tr> <td>Accelerations (m/s²)</td> <td>0.13</td> <td>0.02</td> <td>0.01</td> </tr> <tr> <td>Accelerations bias (m/s²)</td> <td>0.37</td> <td>0.03</td> <td>10.35</td> </tr> <tr> <td></td> <td style="text-align: center;">roll</td> <td style="text-align: center;">pitch</td> <td style="text-align: center;">yaw</td> </tr> <tr> <td>Gravitational Based Orientation (°)</td> <td>-0.31</td> <td>2.76</td> <td>-0.01</td> </tr> </table>	Gyroscope				Gyroscope temperature (°C)	44.90			Target gyroscope temperature (°C)	45.00			Outside oven temperature (°C)	31.50				x	y	z	Absolute angle (°)	354.53	357.23	180.21	Angular speed (°/s)	0.00	0.00	0.00	Gyro bias (°/s)	359.97	0.04	0.03	Accelerations (m/s ²)	0.13	0.02	0.01	Accelerations bias (m/s ²)	0.37	0.03	10.35		roll	pitch	yaw	Gravitational Based Orientation (°)	-0.31	2.76	-0.01	<p>The menu Gyroscope gives actual status information about the gyroscope.</p> <ul style="list-style-type: none"> • Gyroscope temperature: The actual temperature of the gyroscope in degrees Celsius. • Target gyroscope temperature: The set target temperature of the gyroscope in degrees Celsius. • Outside oven temperature: The temperature outside the oven of the gyroscope in degrees Celsius. When this temperature exceeds the gyroscope target temperature, the gyroscope switches off. • Absolute angle. • Angular speed: The turning speed of the machine in degrees per second. • Gyro bias. • Accelerations: the acceleration of the machine in meters per second squared. • Accelerations bias. • Gravitational Based Orientation: The position of the machine relative to its normal (vertical) axis (Yaw), transverse axis (Pitch) and longitudinal axis (Roll). In general to determine the machine position relative to the level surface. This is used to determine if the brake of the machine must be activated on slopes. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.
Gyroscope																																																	
Gyroscope temperature (°C)	44.90																																																
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4.3.2.6 Pause Button

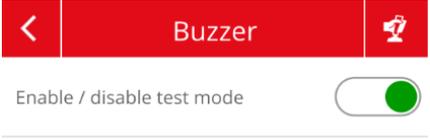
Display	Description
	<p>The menu Pause button gives status information about the pause button.</p> <ul style="list-style-type: none"> • Current mode: the actual status of the pause button: <ul style="list-style-type: none"> • On: pause button active. • Off: pause button not active. • Switch counter: the total amount of times the pause button was pushed. • Last switch: the date and time of the last moment that the pause button was pushed. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.

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4.3.2.7 Electric Actuator

Display	Description
	<p>The menu Electric actuator gives actual status information about the actuator. Also you can adjust the feed push position of the skirt or lift the skirt to the middle position in this menu.</p> <ul style="list-style-type: none"> • Total number of cycles: the total amount of times the actuator has adjusted the position of the skirt. • Current: actual current on the actuator in amperes. • Position (Left-Middle-Right): the actual position of the skirt / actuator. • Encoder value (0 - 400): <ul style="list-style-type: none"> • 0: fully closed (0 mm). • 400: fully open (150 mm). • Test peak current: peak current from the moment the actuator was started from the test menu in amperes. <p>Buttons</p> <ul style="list-style-type: none"> • Button Calibrate to calibrate the actuator. •  to return to the menu Testing. •  to enter the menu Manual control.

4.3.2.8 Buzzer

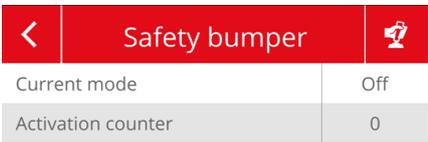
Display	Description
	<p>In the menu Buzzer you can switch the buzzer on or off for test purposes.</p> <ul style="list-style-type: none"> • Enable / disable test mode: <ul style="list-style-type: none"> •  Buzzer currently on. •  Buzzer currently off. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.

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4.3.2.9 Wheels

Display	Description
	<p>The menu Wheels gives actual status information on the drive wheels:</p> <ul style="list-style-type: none"> • Driven distance left (km): the total amount of kilometers driven by the left wheel. • Driven distance right (km): the total amount of kilometers driven by the right wheel. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.

4.3.2.10 Safety Bumper

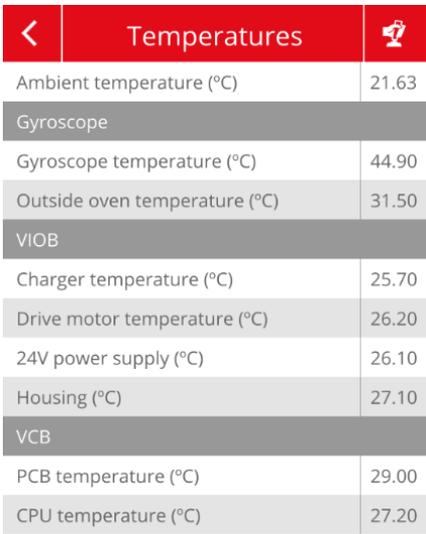
Display	Description
	<p>The menu Safety bumper displays the status of the safety bumper and the amount of times it was activated.</p> <ul style="list-style-type: none"> • Current mode: <ul style="list-style-type: none"> • On: safety bumper is currently on. The bumper is pushed towards the machine. • Off: safety bumper is currently off. The bumper is released. • Activation counter: the amount of times the safety bumper is activated during its lifetime. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.

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4.3.2.11 Emergency Button

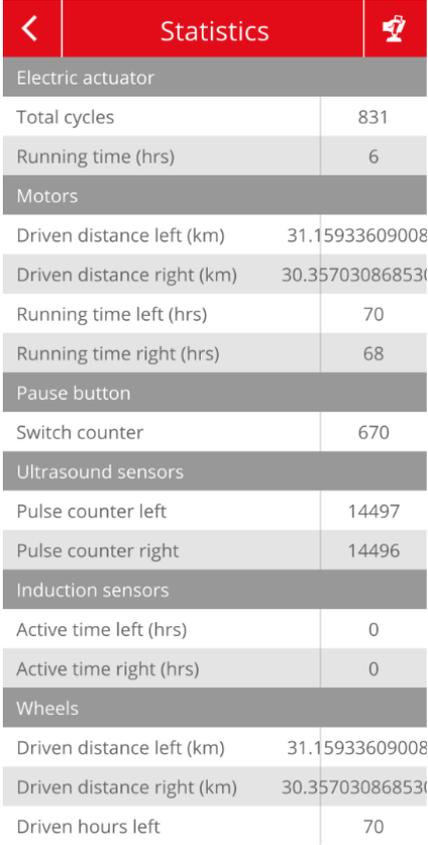
Display	Description
	<p>The menu Emergency button displays the status of the emergency stop button and the amount of times it was activated.</p> <ul style="list-style-type: none"> • Current mode: <ul style="list-style-type: none"> • On: Emergency stop button is on. The button is currently activated. • Off: Emergency stop button is off. The button is currently not activated. • Activation counter: the amount of times the emergency stop button is activated during its lifetime. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.

4.3.2.12 Temperatures

Display	Description
 <p>The screenshot shows a menu titled "Temperatures" with a back arrow on the left and a manual control icon on the right. The menu lists the following items and their values:</p> <ul style="list-style-type: none"> Ambient temperature (°C): 21.63 Gyroscope Gyroscope temperature (°C): 44.90 Outside oven temperature (°C): 31.50 VIOB Charger temperature (°C): 25.70 Drive motor temperature (°C): 26.20 24V power supply (°C): 26.10 Housing (°C): 27.10 VCB PCB temperature (°C): 29.00 CPU temperature (°C): 27.20 	<p>The menu Temperatures gives actual status information on the ambient temperature and the temperatures of:</p> <ul style="list-style-type: none"> • The gyroscope. • The VIOB. • The VCB. • Ambient temperature: the temperature in the direct environment of the machine. <p>Gyroscope</p> <ul style="list-style-type: none"> • Gyroscope temperature (°C): the actual gyroscope temperature in degrees Celcius. • Outside oven temperature (°C). <p>VIOB</p> <ul style="list-style-type: none"> • Charger temperature. • Drive motor temperature. • 24V power supply (°C). • Housing (°C). <p>VCB</p> <ul style="list-style-type: none"> • PCB temperature (°C). • CPU temperature (°C). <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.

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4.3.2.13 Statistics

Display	Description																																								
 <p>The screenshot shows the 'Statistics' menu with a red header and a back arrow. The menu is organized into sections: Electric actuator, Motors, Pause button, Ultrasound sensors, Induction sensors, and Wheels. Each section contains a list of metrics and their values.</p> <table border="1"> <thead> <tr> <th colspan="2">Electric actuator</th> </tr> </thead> <tbody> <tr> <td>Total cycles</td> <td>831</td> </tr> <tr> <td>Running time (hrs)</td> <td>6</td> </tr> </tbody> <thead> <tr> <th colspan="2">Motors</th> </tr> </thead> <tbody> <tr> <td>Driven distance left (km)</td> <td>31.15933609008</td> </tr> <tr> <td>Driven distance right (km)</td> <td>30.357030868531</td> </tr> <tr> <td>Running time left (hrs)</td> <td>70</td> </tr> <tr> <td>Running time right (hrs)</td> <td>68</td> </tr> </tbody> <thead> <tr> <th colspan="2">Pause button</th> </tr> </thead> <tbody> <tr> <td>Switch counter</td> <td>670</td> </tr> </tbody> <thead> <tr> <th colspan="2">Ultrasound sensors</th> </tr> </thead> <tbody> <tr> <td>Pulse counter left</td> <td>14497</td> </tr> <tr> <td>Pulse counter right</td> <td>14496</td> </tr> </tbody> <thead> <tr> <th colspan="2">Induction sensors</th> </tr> </thead> <tbody> <tr> <td>Active time left (hrs)</td> <td>0</td> </tr> <tr> <td>Active time right (hrs)</td> <td>0</td> </tr> </tbody> <thead> <tr> <th colspan="2">Wheels</th> </tr> </thead> <tbody> <tr> <td>Driven distance left (km)</td> <td>31.15933609008</td> </tr> <tr> <td>Driven distance right (km)</td> <td>30.357030868531</td> </tr> <tr> <td>Driven hours left</td> <td>70</td> </tr> </tbody> </table>	Electric actuator		Total cycles	831	Running time (hrs)	6	Motors		Driven distance left (km)	31.15933609008	Driven distance right (km)	30.357030868531	Running time left (hrs)	70	Running time right (hrs)	68	Pause button		Switch counter	670	Ultrasound sensors		Pulse counter left	14497	Pulse counter right	14496	Induction sensors		Active time left (hrs)	0	Active time right (hrs)	0	Wheels		Driven distance left (km)	31.15933609008	Driven distance right (km)	30.357030868531	Driven hours left	70	<p>The menu Statistics counts values for the following machine items:</p> <ul style="list-style-type: none"> • Electric actuator. • Motors. • Pause button. • Ultrasound sensors. • Induction sensors. • Wheels. • Skirt rubber. <p>Electric actuator</p> <ul style="list-style-type: none"> • Total cycles: the total amount of cycles the actuator has adjusted the feed push direction or lifted the skirt since the last reset action. • Running time (hrs): the total time the actuator was moving in hours. <p>Motors</p> <ul style="list-style-type: none"> • Driven distance left (km): the total amount of kilometers the left drive motor has travelled since the last reset action. • Driven distance right (km): the total amount of kilometers the right drive motor has travelled since the last reset action. • Running time left (hrs): the total amount of time the left motor has run since the last reset action. • Running time right (hrs): The total amount of time the right motor has run since the last reset action. <p>Pause button</p> <ul style="list-style-type: none"> • Switch counter: the total amount of times the pause button was pushed since the last reset action. <p>Ultrasound sensors</p> <ul style="list-style-type: none"> • Pulse counter left: when activated, 10 times in 1 second the ultrasound sensor sends out 6 ultrasound pulses. The reflected pulses are counted. • Pulse counter right: when activated, 10 times in 1 second the ultrasound sensor sends out 6 ultrasound pulses. The reflected pulses are counted. <p>Induction sensors</p> <ul style="list-style-type: none"> • Active time left (hrs): the total time the left induction sensor was in operation in hours since the last reset action. • Active time right (hrs): the total time the right induction sensor was in operation in hours since the last reset action.
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Driven hours left	70																																								

Display	Description
	<p>Wheels</p> <ul style="list-style-type: none"> • Driven distance left (km): the total distance the left drive wheel has travelled in kilometers since the last reset action. • Driven distance right (km): the total distance the right drive wheel has travelled in kilometers since the last reset action. • Driven hours left: the amount of time the left drive wheel has travelled since the last reset action. • Driven hours right: the amount of time the right drive wheel has travelled since the last reset action. <p>Skirt rubber</p> <ul style="list-style-type: none"> • Driven distance: the distance the skirt rubber has travelled since the last reset action. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.

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4.3.2.14 Barn Door

Display	Description
	<p>The menu Barn door gives actual information about the barn door.</p> <ul style="list-style-type: none"> • Door ID: <ul style="list-style-type: none"> • Identification number of the barn door. • Current state: <ul style="list-style-type: none"> • Open: the barn door is currently opened. • Closed: the barn door is currently closed. • Manual: the door is set to manual operation. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.

4.3.2.15 Machine Info

Display	Description
	<p>The menu Version info gives all kind of information about software and hardware versions of the VCB, VIOB and the gyroscope.</p> <p>VCB</p> <ul style="list-style-type: none"> • Application version: version of the machine specific software. • Application version date: release date of the machine specific software. • Application installation date: Installation date of the machine specific software. • VCB version; VCB software version. • Uboot version: Uboot software version. <p>VIOB</p> <ul style="list-style-type: none"> • VIOB LPC software version name. • VIOB DSP software version name: version of the Digital Processing Software. <p>Gyroscope</p> <ul style="list-style-type: none"> • Application version: the version number of the gyroscope software. <p>VCB hardware</p> <ul style="list-style-type: none"> • Serial number: the serial number of the VCB. <p>Lely Control Plus App</p> <ul style="list-style-type: none"> • Application version: version number of the application. • Application version date: release date of the application version. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the menu Testing. •  to enter the menu Manual control.

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4.3.3 Manual Control

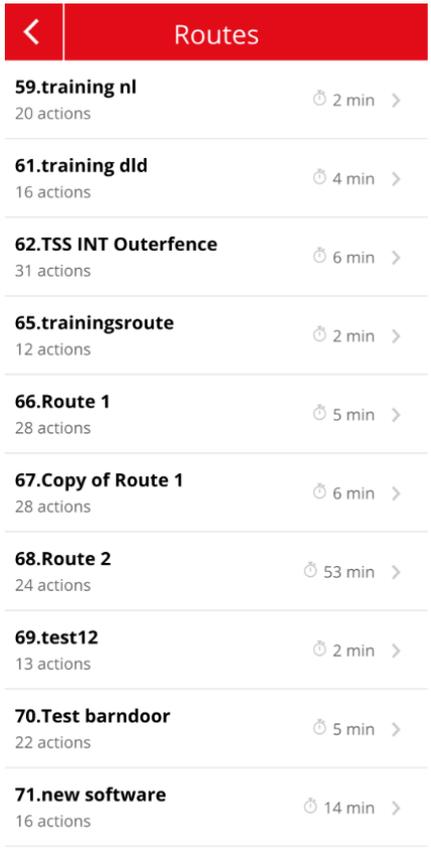


You can only control the machine manually when it is out of operation.

Display	Description
	<ul style="list-style-type: none"> Manually move the machine (see Manually control the Machine on page 6-6). <p>Buttons</p> <ul style="list-style-type: none"> to move the machine in all directions. Ribbon buttons: <ul style="list-style-type: none"> Charger drive L To detect the strip at the charger and to follow it in the left direction towards the charger. Approach the strip at a 45 - 90° angle. Charger drive R To detect the strip at the charger and to follow it in the right direction towards the charger. Approach the strip at a 45 - 90° angle. Charger drive F To detect the strip at the charger and to follow it towards the charger. Approach the strip in the direction of the strip. Straight drive To drive the machine straight on. Skirt left To move the skirt of the machine to the left feed push position. Skirt lift To lift the skirt from the ground. E.g to drive from one barn to another. Skirt right To move the skirt of the machine to the right feed push position. Ultrasound follow L To follow a wall or fence at the left side of the machine at a distance of 1 meter from the wall or fence using ultrasound. Ultrasound follow R To follow a wall or fence at the right side of the machine at a distance of 1 meter from the wall or fence using ultrasound.

Display	Description
	<ul style="list-style-type: none">  Strip follow L To detect a strip and follow it into the left direction. Approach the strip at a 45 - 90° angle.  Strip follow R To detect a strip and follow it into the right direction. Approach the strip at a 45 - 90° angle.  Strip follow F To detect a strip and to follow it. Approach the strip in the direction of the strip.

4.3.4 Routes

Display	Description
	<p>The menu Routes displays a list with the available routes for the machine.</p>

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4.3.5 Feed Options

The menu **Feed options** is used to create feed groups and to set the feed push power for a feed group. You can link a feed push action to a feed group. A feed group can only be assigned to feed push actions. A push power is set for each feed group.

Display	Description
	<ul style="list-style-type: none"> • Edit Feed Groups: push power to assign to a feed group. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the main menu. •  to enter the menu Edit Feed Groups.

Display	Description
	<p>This menu is used to create feed groups and to set the feed push power for each feed group. There are five levels of push power:</p> <ul style="list-style-type: none"> • Extra low. • Low. • Medium. • High. • Extra high. <p>Buttons</p> <ul style="list-style-type: none"> • to return to the menu Feed options. • to add a new group and to set the power for this group.

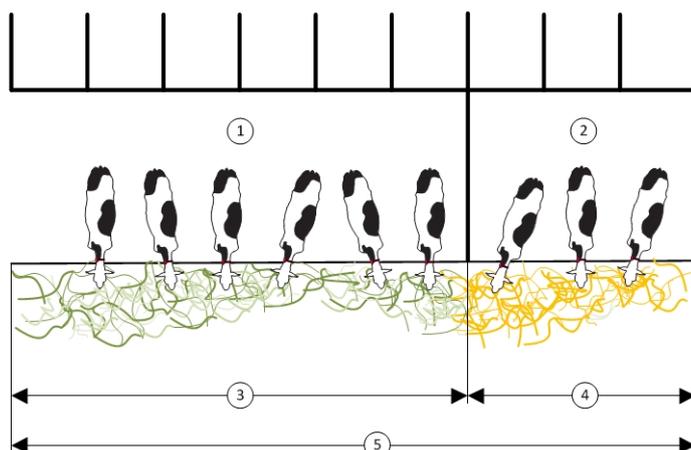


Figure 16. Feed groups and feed push power

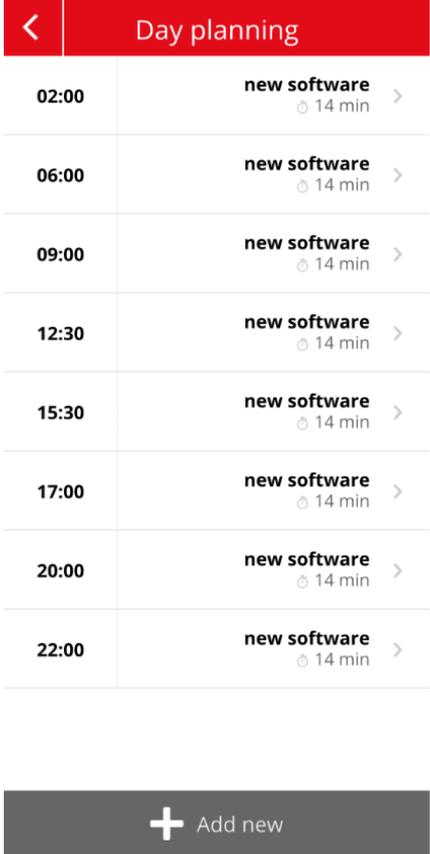
KEY: 1. Young stock - 2. Dairy cows - 3. Feed group for young stock - 4. Feed group for dairy cows - 5. Feed push action

4.3.6 Day Planning

For daily operation the routes must be set in a day planning. If the machine is put into operation the day planning is switched on and the machine drives the set routes automatically at the set times each day (see

Create a Day Planning on page 6-12). The machine drives routes in a day planning maximum 40% of the time. The other 60% of the time the machine charges at the charging station.

The display shows the following information:

Display	Description
	<ul style="list-style-type: none"> • Day planning: start times of set routes. • Names of the set routes. <p>Buttons</p> <ul style="list-style-type: none"> •  to add a route to the day planning. •  to return to the Home screen or main menu. •  to access the route planned at a certain time in the day planning.

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4.3.7 Alarms

The machine monitors itself continuously and informs you about the situation.

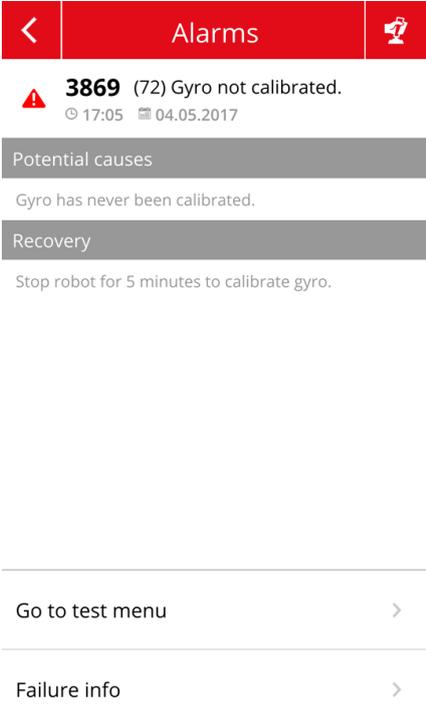
Alarm List

The alarm list gives a summary of the history of the alarms received.

Display	Description
<p>The screenshot shows the 'Alarms' menu with a red header. Below the header is a 'History' section containing a list of alarm events. Each event is represented by a row with an icon (warning triangle or information 'i'), an ID number, a description, and a timestamp. The events listed are:</p> <ul style="list-style-type: none"> 1362 Safety mode activated (13:47, 10.09.2020) 1361 Safety mode activated (13:44, 10.09.2020) 1360 VCB restarted (13:44, 10.09.2020) 1359 Safety mode activated (00:00, 01.01.1970) 1358 VCB restarted (00:00, 01.01.1970) 1357 Safety mode activated (00:00, 01.01.1970) 1356 VCB restarted (00:00, 01.01.1970) 1355 Safety mode activated (00:00, 01.01.1970) 1354 VCB restarted (00:00, 01.01.1970) 1353 Drive motor cannot initialize 	<p>The alarm list displays three kinds of alarms:</p> <ul style="list-style-type: none"> • Grey: Information alarms. • Yellow: Non critical alarms. • Red: Critical alarms. <p>Buttons</p> <ul style="list-style-type: none"> • to return to the main menu. • to go to the selected alarm. • to enter the manual control menu.

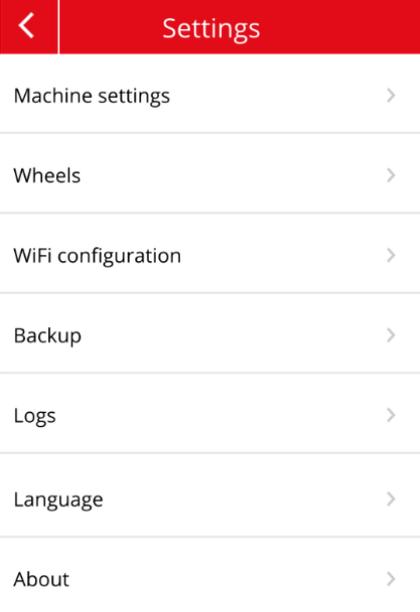
Alarms

The menu **Alarms** explains the alarms received.

Display	Description
	<p>The alarms display three kinds of information:</p> <ul style="list-style-type: none"> • Kind of alarm. • Potential causes: what causes the alarm. • Recovery: solution for how to handle the alarm. <p>Buttons</p> <ul style="list-style-type: none"> •  to return to the alarm list. •  to enter the menu Manual control. • Go to test menu. • Failure info.

4.3.8 Settings

The menu **Settings** is used to make basic machine settings and backups.

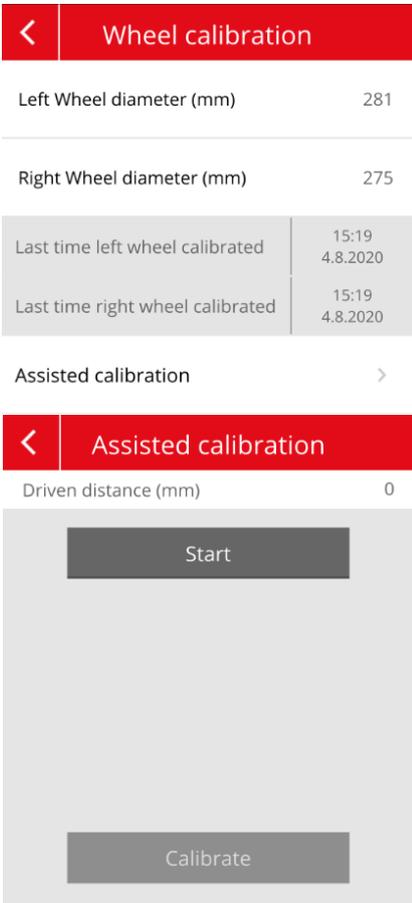
Display	Description
 <p>The screenshot shows a settings menu with a red header containing a back arrow and the word "Settings". Below the header are several menu items, each with a right-pointing chevron: "Machine settings", "Wheels", "WiFi configuration", "Backup", "Logs", "Language", and "About".</p>	<p>Machine settings to set:</p> <ul style="list-style-type: none"> • Shock device working mode. • Led beacon working mode. • Buzzer working mode. • Buzzer beep length (ms). • Gyro target temperature (°C). <p>Wheels: to set the wheel diameter and to calibrate the wheels:</p> <ul style="list-style-type: none"> • Left Wheel diameter. • Right Wheel diameter. • Last time left wheel calibrated. • Last time right wheel calibrated. • Assisted calibration. <p>WiFi configuration</p> <ul style="list-style-type: none"> • SSID. • Password. <p>IP configuration</p> <ul style="list-style-type: none"> • IP address. • Subnet mask. • Router. • Signal Strength. <p>DNS configuration</p> <ul style="list-style-type: none"> • DNS server 1. • DNS server 2. <p>Backup to:</p> <ul style="list-style-type: none"> • Create backup. • Restore backup. <p>Logs</p> <ul style="list-style-type: none"> • Create log. <p>Language to set:</p> <ul style="list-style-type: none"> • User language. <p>Buttons</p> <ul style="list-style-type: none"> •  to go back to the main menu.

Display	Description
	<ul style="list-style-type: none">  to enter the specific setting.

4.3.8.1 Machine Settings

Display	Description
 <p>The screenshot shows a settings menu titled "Machine settings" with a red header bar containing "Cancel" and "Machine settings". Below the header are five settings:</p> <ul style="list-style-type: none"> Shock device working mode: <input checked="" type="checkbox"/> Led beacon working mode: <input checked="" type="checkbox"/> Buzzer working mode: <input type="checkbox"/> Buzzer beep length (ms): 200 Gyro target temperature (°C): 45.00 	<p>Machine settings:</p> <ul style="list-style-type: none"> Shock device working mode: to switch the shock device on or off. Led beacon working mode: to switch the lead beacon on or off. Buzzer working mode: to switch the buzzer on or off. Buzzer beep length: to set the beep length of the buzzer. Gyro target temperature: to set the target temperature of the gyroscope. <p>Buttons</p> <ul style="list-style-type: none">  to go back to the previous menu. <input checked="" type="checkbox"/>: to switch an item on. <input type="checkbox"/>: to switch an item off.

4.3.8.2 Wheels

Display	Description
	<p>Wheels:</p> <ul style="list-style-type: none"> • Left Wheel diameter: the set diameter for the left wheel in mm. • Right Wheel diameter: the set diameter for the right wheel in mm. • Last time left wheel calibrated. • Last time right wheel calibrated. • Assisted calibration: menu to calibrate the wheels. <p>Buttons</p> <ul style="list-style-type: none"> • Button  to return to the previous menu. • Start: to start driving to calibrate the wheels. • Stop: to stop driving to calibrate the wheels. • Calibrate: to calibrate the wheels based on the distance driven.

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4.3.8.3 Wifi Configuration

The **WiFi configuration** screen displays the wifi settings and statuses.

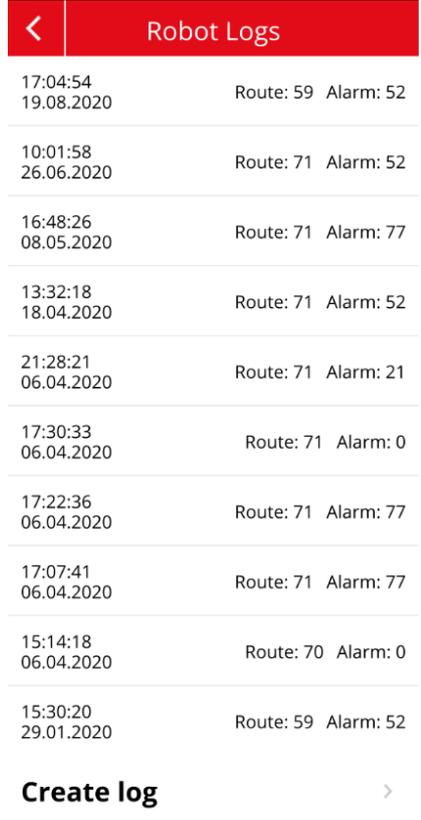
Display	Description
	<ul style="list-style-type: none"> • The row of LED indicators at the top of the screen display: <ul style="list-style-type: none"> • Router: the status of communication between the robot and the router (green: communication is active). • Internet: the status of the internet connection (green: the connection is established). • Cloud: the status for connection to the cloud (green: the connection is established). • Notif Read: the read status of a notification in the Signals app (green: the notification is read). • SSID. • Password. • Farm license: licence key for cloud connection. • IP configuration. • DNS configuration.

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4.3.8.4 Backup

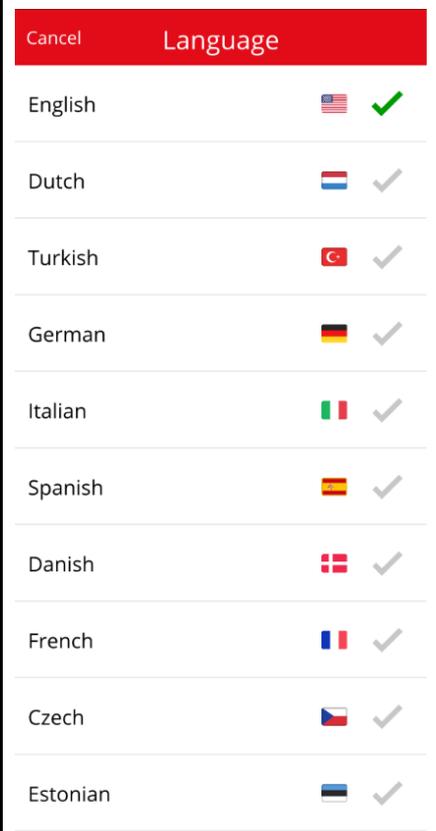
Display	Description
	<p>Backup: menu to create a backup of the routes and settings of the machine.</p> <p>Buttons</p> <ul style="list-style-type: none"> • to go back to the previous menu. • Create backup: to start creating a backup of the routes and settings of the machine.

4.3.8.5 Logs

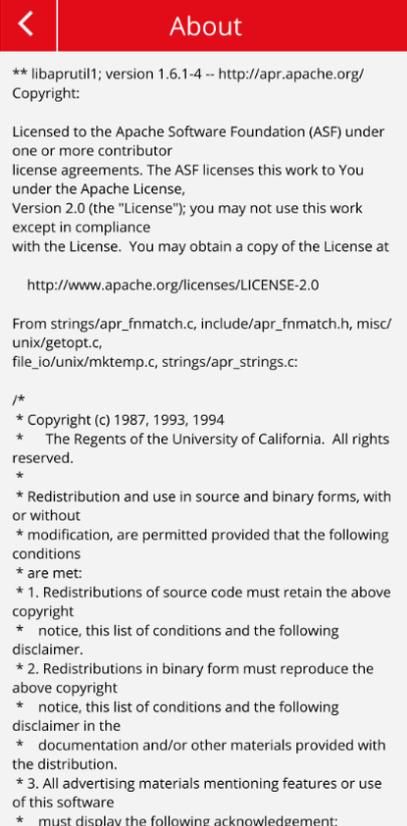
Display	Description																																												
 <p>The screenshot shows a mobile application interface for 'Robot Logs'. At the top, there is a red header with a back arrow and the text 'Robot Logs'. Below this is a list of log entries, each consisting of a timestamp and date on the left, and 'Route' and 'Alarm' counts on the right. The entries are as follows:</p> <table border="1"> <thead> <tr> <th>Timestamp</th> <th>Date</th> <th>Route</th> <th>Alarm</th> </tr> </thead> <tbody> <tr> <td>17:04:54</td> <td>19.08.2020</td> <td>59</td> <td>52</td> </tr> <tr> <td>10:01:58</td> <td>26.06.2020</td> <td>71</td> <td>52</td> </tr> <tr> <td>16:48:26</td> <td>08.05.2020</td> <td>71</td> <td>77</td> </tr> <tr> <td>13:32:18</td> <td>18.04.2020</td> <td>71</td> <td>52</td> </tr> <tr> <td>21:28:21</td> <td>06.04.2020</td> <td>71</td> <td>21</td> </tr> <tr> <td>17:30:33</td> <td>06.04.2020</td> <td>71</td> <td>0</td> </tr> <tr> <td>17:22:36</td> <td>06.04.2020</td> <td>71</td> <td>77</td> </tr> <tr> <td>17:07:41</td> <td>06.04.2020</td> <td>71</td> <td>77</td> </tr> <tr> <td>15:14:18</td> <td>06.04.2020</td> <td>70</td> <td>0</td> </tr> <tr> <td>15:30:20</td> <td>29.01.2020</td> <td>59</td> <td>52</td> </tr> </tbody> </table> <p>At the bottom of the list is a button labeled 'Create log' with a right-pointing arrow.</p>	Timestamp	Date	Route	Alarm	17:04:54	19.08.2020	59	52	10:01:58	26.06.2020	71	52	16:48:26	08.05.2020	71	77	13:32:18	18.04.2020	71	52	21:28:21	06.04.2020	71	21	17:30:33	06.04.2020	71	0	17:22:36	06.04.2020	71	77	17:07:41	06.04.2020	71	77	15:14:18	06.04.2020	70	0	15:30:20	29.01.2020	59	52	<p>Robot Logs: menu to view and create logs of the routes and alarm data of the machine.</p> <p>Buttons:</p> <ul style="list-style-type: none">  to go back to the previous menu. Create log: to create a log file.
Timestamp	Date	Route	Alarm																																										
17:04:54	19.08.2020	59	52																																										
10:01:58	26.06.2020	71	52																																										
16:48:26	08.05.2020	71	77																																										
13:32:18	18.04.2020	71	52																																										
21:28:21	06.04.2020	71	21																																										
17:30:33	06.04.2020	71	0																																										
17:22:36	06.04.2020	71	77																																										
17:07:41	06.04.2020	71	77																																										
15:14:18	06.04.2020	70	0																																										
15:30:20	29.01.2020	59	52																																										

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4.3.8.6 Language

Display	Description
 <p>The screenshot shows a 'Language' menu with a red header bar containing 'Cancel' and 'Language'. Below the header, there is a list of languages with their respective flags and a checkmark indicating the selected language. The languages listed are: English (USA flag, checked), Dutch (Netherlands flag), Turkish (Turkey flag), German (Germany flag), Italian (Italy flag), Spanish (Spain flag), Danish (Denmark flag), French (France flag), Czech (Czech Republic flag), and Estonian (Estonia flag).</p>	<p>Language: menu to set the language of the user interface of the machine.</p> <p>Buttons</p> <ul style="list-style-type: none">  : to go back to the previous menu.  : to set the preferred language.

4.3.8.7 About

Display	Description
	<p>About: displays detailed information about the software version.</p> <p>Buttons</p> <ul style="list-style-type: none">  to go back to the previous menu.

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4.3.9 Logout

The menu **Logout** is used to logout from the user interface and to disconnect the smartphone from the machine.

4.4 Operation

4.4.1 Actions, Routes, Day Planning and Manual Control

Actions make a Route

The machine drives through the barn(s) along a programmed route. A route is built up of actions like **Strip follow** or **Turn left**. Refer to the example (see figure 17 on page 4-46). A route always starts with the action **Strip follow**, **Straight drive** or **Wait**.

Automatic Feed Pushing with a Day Planning

The machine pushes the feed each day automatically at the same times if a day planning is set. Routes in a day planning always start and end at the charging station.

Manual Feed Pushing with Manual Control

When **Manual control** is enabled the machine can be driven manually through the barn or the machine can follow a route independent from the day planning. For instance to test a route.

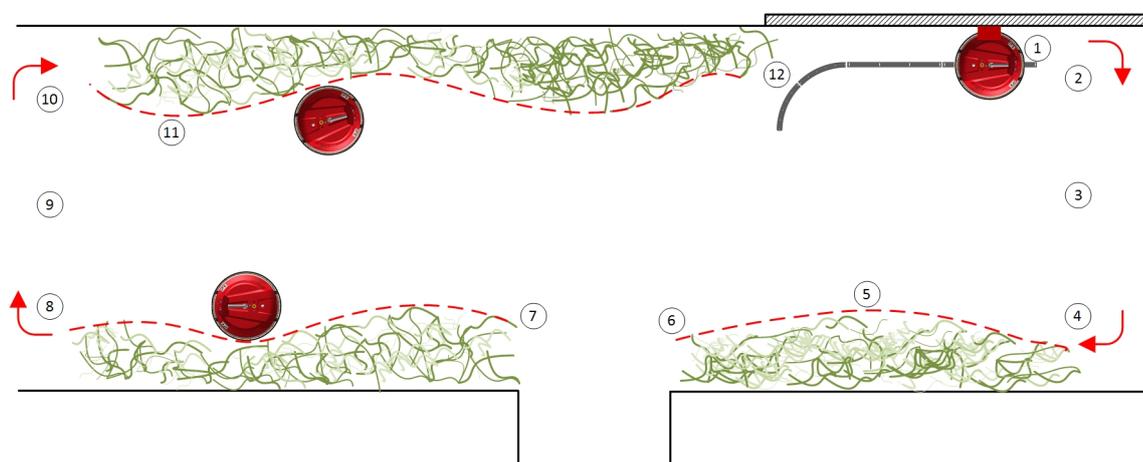


Figure 17. Actions make a route

KEY:
 1. Strip follow 2. Turn right 90° 3. Straight drive 4. Turn right 90° 5. Feed push left 6. Straight drive 7. Feed push left 8. Turn right 90° 9. Straight drive 10. Turn right 90° 11. Feed push left 12. Charger drive L

4.4.2 Control System

The control system keeps the vehicle on the correct route. Two sensors on the bottom detect the metal strips on the floor. The built-in ultrasonic sensors makes sure that the machine follows a wall or feed fence at a predetermined distance. An electronic gyroscope guides the machine into the correct direction when a turn is programmed.

Driving distance

The machine measures the number of revolutions of the motors. The measured value is used to calculate the travelled distance. If, due to slip, the actual driving distance is less than calculated it will be corrected the next time. It can only be corrected if the action ends at a reset point (a strip on the floor of the feed alley).

Speed

The number of revolutions is also used to calculate the speed.

Distance to a wall or fence

The ultrasonic sensor sends a pulsed ultrasound wave at the object and then measures the time for the sound echo to return. Knowing the speed of sound, the sensor determines the distance of the machine to a wall, fence or other object. The control software in the VCB uses the ultrasound data along with data coming from other sensors to determine the motor speeds that the VIOB must set.

Direction

The machine has a gyroscope that is used to make the machine turn and to determine the direction the machine must follow. The gyroscope is reset if the machine determines drift during operation.

Obstacles

The machine has a bumper that stops the vehicle immediately when it hits an object that is at least 60 cm above floor level.

If the machine hits a solid object the bumper sensors (see figure 8 on page 4-3) are activated and the machine stops driving. After 30 seconds the machine tries to continue its route. If the bumper is still activated the machine waits again 30 seconds. The machine repeats this cycle maximum 5 times. If the bumper is still activated after 5 cycles an alarm is generated and the machine goes out of operation. To resume operation the cause of the alarm must be resolved and the pause button must be pushed. If the bumper is not activated anymore, the machine resumes operation.

When the machine is in operation the bumper has an electric pulse on it (optional) to make sure cows do not block the vehicle.

Barn door control

When the machine drives from one barn to another, it communicates with the barn door control unit to open/close the barn door(s).



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5 First use

If you use the machine for the first time make sure:

- You have read and understood all operating and safety instructions (see Introduction on page 2-1).
- You know how to handle alarms.
- All components are installed:
 - Charging station.
 - Metal strips.
 - Barn door control system (optional).
 - The sign 'area with unmanned autonomous vehicle'.
 - The sign 'no admittance for unauthorized persons'.
 - The machine itself.
- The Lely Control Plus app is installed on the smartphone (see Install the Lely Control Plus App on the Smartphone on page 6-2).
- The machine is switched ON (see Switch the Machine ON or OFF on page 6-3).
- The machine is paired with the smartphone (see Pair the Machine with the Smartphone on page 6-5).
- Routes are programmed for the machine.
- A day planning is created (see Create a Day Planning on page 6-12).
- You know how to put the machine into operation and take out of operation (see Put the Machine into Operation on page 6-13).



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6 Operating Instructions



**Unmanned moving vehicle.
Risk of falling or being crushed.
Do not sit on the vehicle. Keep safe distance.**



**Failure to follow operator instructions could result in death or serious injury.
Only persons who have read and understood the instructions are permitted to enter the working area of the machine.**



**Electrical hazard.
Risk for electric shock.
Keep away from the bumper during operation of the machine.**



The maximum amount of energy the electric pulse of the bumper transfers is 15mJ (at 500R). This does not harm cows or humans.



The shock system meets the standard EN 60335-2-76 for electric fence energizers.

This chapter describes how to prepare the machine for operation and how to operate it. To prepare the machine for operation the following actions must be done:

1. Install the Lely Control Plus app on the smartphone (see Install the Lely Control Plus App on the Smartphone on page 6-2).
2. Pair the machine with the smartphone (see Pair the Machine with the Smartphone on page 6-5).
3. Connect the machine and the user interface (see Start the Lely Control Plus App on the Smartphone on page 6-5).

4. Create a day planning (see Create a Day Planning on page 6-12).

6.1 Install the Lely Control Plus App on the Smartphone

1. On the smartphone go to the App Store® or Play Store.
2. Search for **Lely Control Plus**.
3. Download the Lely Control Plus app.
4. Install the app.

6.2 Rename the Machine on the Smartphone



The name of the machine that is displayed on the smartphone can only be modified by a certified Lely technician.

6.3 Set the Farmer Password



The farmer password must be set by a certified Lely technician.

6.4 Open or Close the Cover



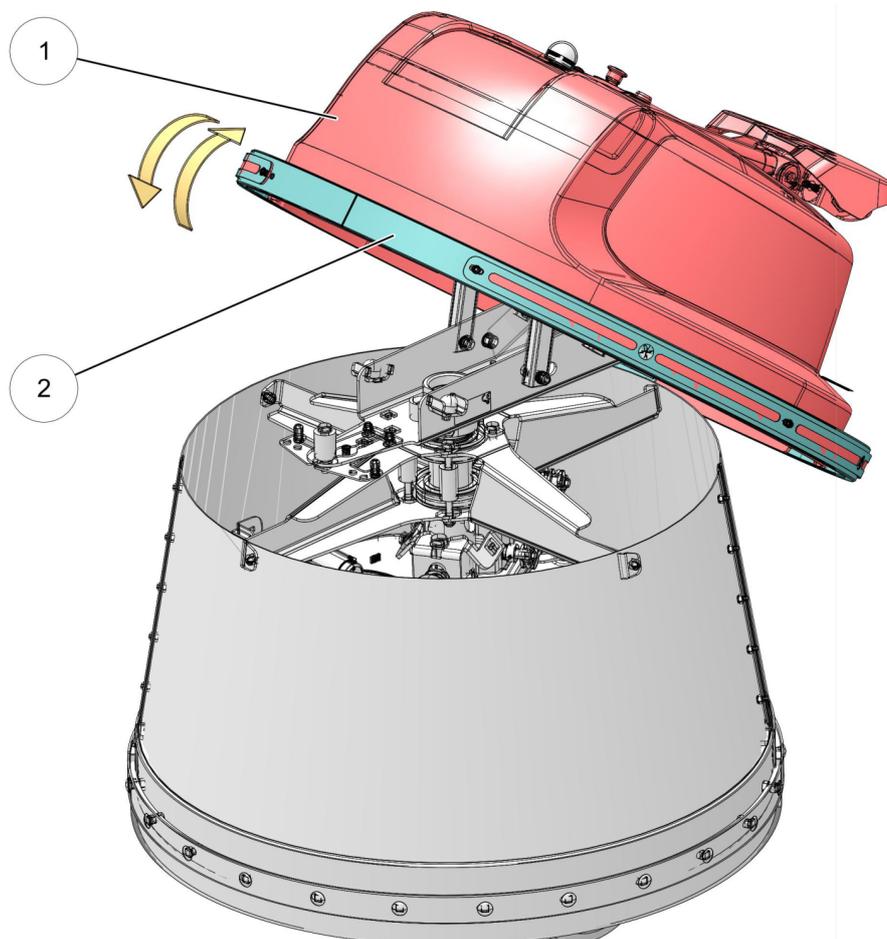
Take the machine out of operation (see Take the Machine out of Operation on page 6-14) before you open the cover to make sure the machine and its shock system (optional) are deactivated.

Open

1. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
2. At the rear side of the machine, lift the bumper and push it away from you until it locks.

Close

1. At the rear side of the machine, pull the bumper towards you and lower it.



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Figure 18. Open or close the cover

KEY: 1. Cover - 2. Bumper

6.5 Switch the Machine ON or OFF



If the machine must be switched OFF for a longer period of time, disconnect one of the battery terminals from the battery.

Switch ON

1. Open the cover (see Open or Close the Cover on page 6-2).
2. At the right top corner of the VIOB, push the power button to switch the machine ON. The machine starts up. This takes approximately one minute.
3. Close the cover.

4. Open the Lely Control Plus app on the smartphone.

5. On the home screen tap the **Manual control** button .

6. The message **Press pause button on Juno** is displayed. Press the pause button.

7. **Please wait for motor initialization** is displayed.

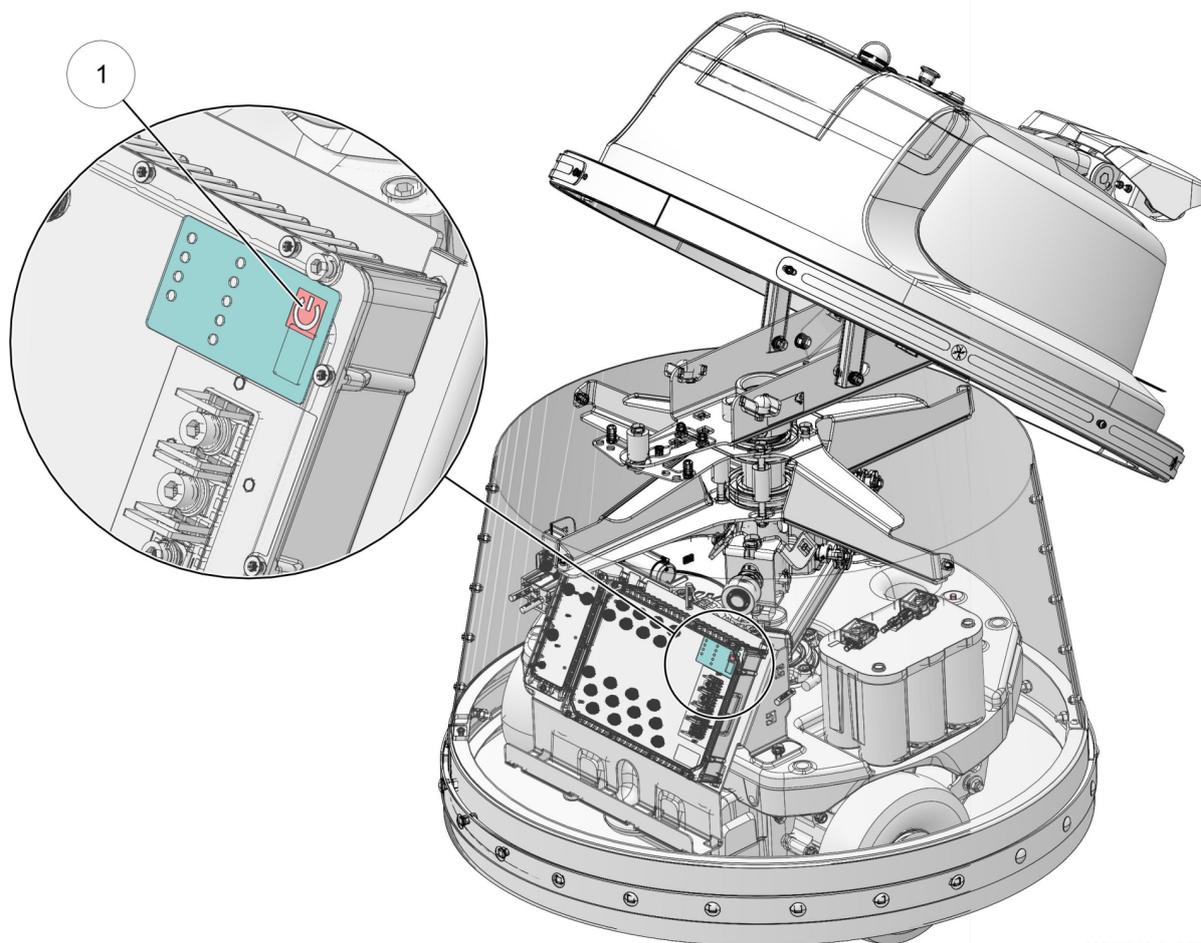
8. When you select the next action you want to do in the Lely Control Plus app, the message **Please wait for calibration to finish** is displayed. The gyroscope is calibrated.

Switch OFF

1. Open the cover (see Open or Close the Cover on page 6-2).

2. At the right top corner of the VIOB, push and hold the power button for 2 seconds to switch the machine OFF.

3. Close the cover.



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Figure 19. Switch the machine ON or OFF

KEY: 1. Power button

6.6 Pair the Machine with the Smartphone



Make sure the smartphone has bluetooth switched on.



The farmer password must be set by a certified Lely technician.

1. Open the Lely Control Plus app on the smartphone.
2. Tap to search for devices.
3. Tap the machine name in the list of available devices.
4. A message appears on the smartphone display if you want to pair the smartphone with the machine. Confirm.
5. The smartphone connects to the machine. If the smartphone connects to the machine for the first time software is downloaded.
6. Unless the password is remembered, the smartphone asks for the farmer password.

6.7 Start the Lely Control Plus App on the Smartphone



***Unexpected movement of vehicle.
Risk of personal injury.
Make sure the machine is in your line of sight. Remote operation of the smartphone or tablet by remote desktop software (such as, but not limited by, Teamviewer) is strictly forbidden to avoid dangerous situations.***



The first time the machine and the user interface are connected, the Lely service technician must set the farmer password before you can continue.



Make sure you are in the vicinity of the machine when you connect the smartphone to the machine. If the distance is too big, the machine name will not appear in the list on the smartphone display.



Make sure the machine and the smartphone are paired before doing the procedure below.



The machine can not be connected to more than 1 smartphone simultaneously.

1. Start the Lely Control Plus app.

If:

- No machine is connected, the **Find machine** screen is displayed.
- A machine is already connected the home screen is displayed. Tap the back button of the smartphone to enter the **Find machine** screen.

2. In the **Find machine** screen tap  to scan for available machines.

3. Tap the line of the applicable machine to connect to it. When the machine is connected, the home screen is displayed.

6.8 Manually control the Machine



***Unexpected movement of vehicle.
Risk of personal injury.
Make sure you have a clear overview of the machine when you manually drive it.***



The motors of the machine must be active to manually drive the machine. A beep sounds when the motors are activated.



If it is the first time the machine is switched on, push the pause button on the machine before you manually drive the machine. As soon as the indicators for the motors at **Status lights** in the home screen are green it is possible to manually control the machine.



To detect a strip it is recommended to approach it at a 45 - 90° angle.

1. Open the Lely Control Plus app on the smartphone.
2. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
3. On the home screen tap . The screen **Manual control** is displayed.

4. Manually drive the machine with the joystick and the actions displayed on the ribbon:

Joystick

-  to drive forward.
-  to drive backwards.
-  to rotate counter clockwise.
-  to rotate clockwise.

Actions on the ribbon

-  **Charger drive L:** To detect the strip at the charger and to follow it in the left direction towards the charger. Approach the strip at a 45 - 90° angle.
-  **Charger drive R:** To detect the strip at the charger and to follow it in the right direction towards the charger. Approach the strip at a 45 - 90° angle.
-  **Charger drive F:** To detect the strip at the charger and to follow it towards the charger. Approach the strip in the direction of the strip.
-  **Straight drive:** To drive the machine straight on.
-  **Skirt left:** To move the skirt of the machine to the left push position.
-  **Skirt lift:** To lift the skirt from the ground. E.g. to drive from one barn to another.
-  **Skirt right:** To move the skirt of the machine to the right push position.
-  **Ultrasound follow L:** To follow a wall or fence at the left side of the machine at a distance of 1 meter from the wall or fence using ultrasound.
-  **Ultrasound follow R:** To follow a wall or fence at the right side of the machine at a distance of 1 meter from the wall or fence using ultrasound.
-  **Strip follow L:** To detect a strip and follow it into the left direction. Approach the strip at a 45 - 90° angle.



- **Strip follow R:** To detect a strip and follow it into the right direction. Approach the strip at a 45 - 90° angle.



- **Strip follow F:** To detect a strip and to follow it in the forward direction. Approach the strip in the direction of the strip.

6.9 Drive the Machine to the Charging Station

NOTICE

Do not drive backwards to the charger. Approach the charger in the forward direction.

1. Open the Lely Control Plus app on the smartphone.
2. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
3. Manually drive (see Manually control the Machine on page 6-6) the machine to 0.5 - 2 m (2 - 7 ft) from the strip at the charger station.
4. If the machine:

- must follow the strip to the right direction to reach the charger, tap  **Charger drive R.**

- must follow the strip to the left direction to reach the charger, tap  **Charger drive L.**

- must follow the strip in the direction of the strip to reach the charger, tap  **Charger drive F.**

The machine approaches the charging station and stops by itself.

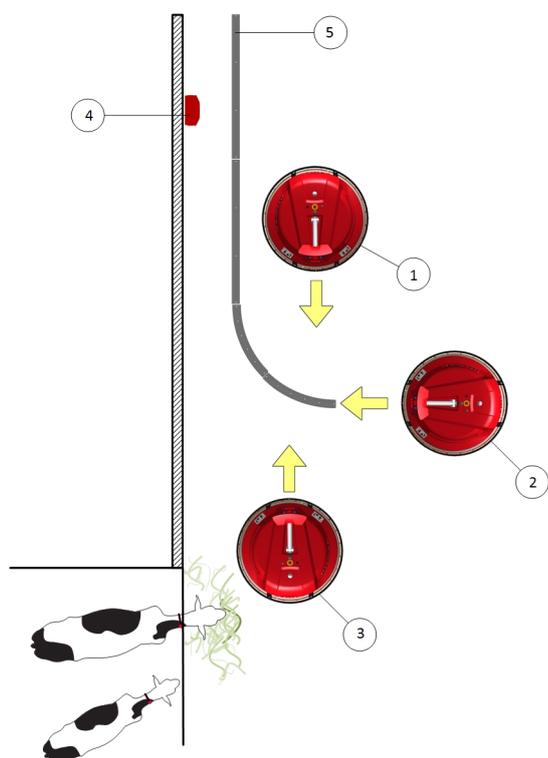


Figure 20. Approach the charger

KEY:

1. **Charger drive R** to approach the charger - 2. **Charger drive F** to approach the charger - 3. **Charger drive L** to approach the charger – 4. Charger – 5. Strip

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6.10 Set Feed Options

6.10.1 Edit Feed Groups and set Feed Push Power

1. Open the Lely Control Plus app on the smartphone.

2. On the home screen tap .

3. Tap **Feed options**.

4. Tap **Edit Feed Groups**.

5. Tap  **Add group** to add a new feed group.

6. Tap the name of the feed group.

7. Tap the group you want to set the feed push power for and select the feed push power:



Default the feed push power is set to **Medium**. For wet and compact feed set the feed push power to **High** or **Extra high**. When the feed is dry and has a lot of air set the feed push power to **Low** or **Extra low**.

- **Extra low.**
- **Low.**
- **Medium.**
- **High.**
- **Extra high.**

8. Tap **Save**.

6.11 Modify Actions of an existing Route

1. Open the Lely Control Plus app on the smartphone (see Start the Lely Control Plus App on the Smartphone on page 6-5).

2. On the home screen, tap .

3. Tap **Routes**.

4. Tap the applicable route.

5. Tap the action you want to modify.

6. Tap the parameter that you want to modify.

7. Modify the parameter.

8. Tap **Save**.

6.12 Make a Backup

1. Open the Lely Control Plus app on the smartphone.

2. On the home screen tap .

3. Tap **Settings**.

4. Tap **Backup**.

5. Tap **Create backup**. A backup file (.bkp) of the routes and settings is created and is stored in location /sdcard/LelyControl/JunoNext/backup.

6.13 Copy a Backup File from the Smartphone to a PC

1. Connect the smartphone to a usb port of the PC. Use the data cable of the smartphone to connect.
2. Use the PC to browse to the Lely backup folder on the smartphone: /sdcard/LelyControl/JunoNext/backup
3. Select the applicable backup file (.bkp).
4. Copy the backup file from the smartphone.
5. Paste the backup file to the PC.

6.14 Copy a Backup File from a PC to the Smartphone

1. Connect the smartphone to a usb port of the PC. Use the data cable of the smartphone to connect.
2. Use the PC to browse to the location of the backup file (.bkp).
3. Copy the backup file from the PC.
4. Paste the backup file to the Lely backup folder on the smartphone: /sdcard/LelyControl/JunoNext/backup

6.15 Create a Day Planning

NOTICE

The machine must not drive more than 40% of the total time routes from the day planning. It must spend minimum 60% of the total time charging at the charging station.

Create a day planning to plan when the machine drives which route through the barn(s). The machine pushes the feed each day automatically at the set times.

Add routes to the day planning

1. Open the Lely Control Plus app on the smartphone.
2. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
3. On the home screen tap  **Day planning**.
4. Tap  **Add new**.
5. Select the hour and minute on which you want to add a route to the day planning.
6. Tap **Done**.
7. Tap the added route at the set moment in the day planning. The list with available routes is displayed.
8. Tap the route you want the machine to drive at the set time.
9. Tap **Save**. The route is added to the day planning at the set time. If you add multiple routes to the day planning you only need to save once after the last route was added.

Remove routes from the day planning

1. Open the Lely Control Plus app on the smartphone.
2. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
3. On the home screen tap  **Day planning**.
4. Tap and hold the line of the route that you want to remove from the day planning. The line turns to green and the buttons  and  are displayed.
5. Tap . **Day planning entry will be deleted. Are you sure to continue?** appears on the smartphone display.
6. Tap **Yes** to confirm.

6.16 Put the Machine into Operation



**Unexpected movement of vehicle.
Risk of personal injury.**
Make sure the machine is in your line of sight. Remote operation of the smartphone or tablet by remote desktop software (such as, but not limited by, Teamviewer) is strictly forbidden to avoid dangerous situations.

1. Open the Lely Control Plus app on the smartphone.

2. On the home screen tap .

On the smartphone display **In operation** is displayed and the operational status color changes from red to green. The machine drives the routes according to the day planning.

6.17 Pause the Machine

1. Open the Lely Control Plus app on the smartphone.

2. On the home screen tap . Or:
 - Push the pause button on the machine.

On the smartphone display **Paused** is displayed and the operational color changes from green to orange. The machine stops.

3. Tap  on the smartphone or the pause button on the machine to continue operation.

6.18 Take the Machine out of Operation

1. Open the Lely Control Plus app on the smartphone.

2. On the home screen tap button . Or:

- Push the pause button on the machine.

The machine stops.

3. On the smartphone push button  for 5 seconds.

On the smartphone display **Out of operation** is displayed and the operational status color changes from orange to red.

6.19 Disconnect the Smartphone from the Machine

1. Open the Lely Control Plus app on the smartphone.

2. On the home screen tap .

3. Tap  **Logout**. The smartphone disconnects from the machine.

6.20 Manually start a Route



Start a route manually for example when you want to test a route.

1. Open the Lely Control Plus app on the smartphone.

2. On the home screen tap  **Routes**.

3. Tap the route that you want to start manually.

4. The message **Are you sure to play route?** appears on the smartphone display.

5. Tap **Yes** to confirm. The message **Do you want to go in operation after route finished playing?** appears on the smartphone display.

6. Tap **Yes** to confirm or **No** to cancel. The machine drives the manually started route 1 time.

6.21 Reset the Emergency Stop Button

1. Pull the button out until it unlocks (see figure 5 on page 2-11).

- To resume operation, press the pause button on the machine.

6.22 Hoist the Machine

⚠ DANGER

**Falling object.
Risk of being crushed.
Use correct and well maintained hoisting equipment.
Never stand under the lifted machine.**



The manual of the hoisting eye must be stored with the hoisting eye. The hoisting eye and its manual are typically stored in the charging station. If the manual of the hoisting eye is lost, contact your local Lely service provider.

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Install the hoisting eye

- Remove the black cap from the cover of the machine.
- Before every use of the hoisting eye, do the necessary safety checks as described in the manual of the hoisting eye. If there are any abnormalities, do not use the hoisting eye and contact your local Lely service provider.
- Turn the hoisting eye into the machine until the red mark on the hoisting eye is not visible anymore. Only the green marking may still be visible.

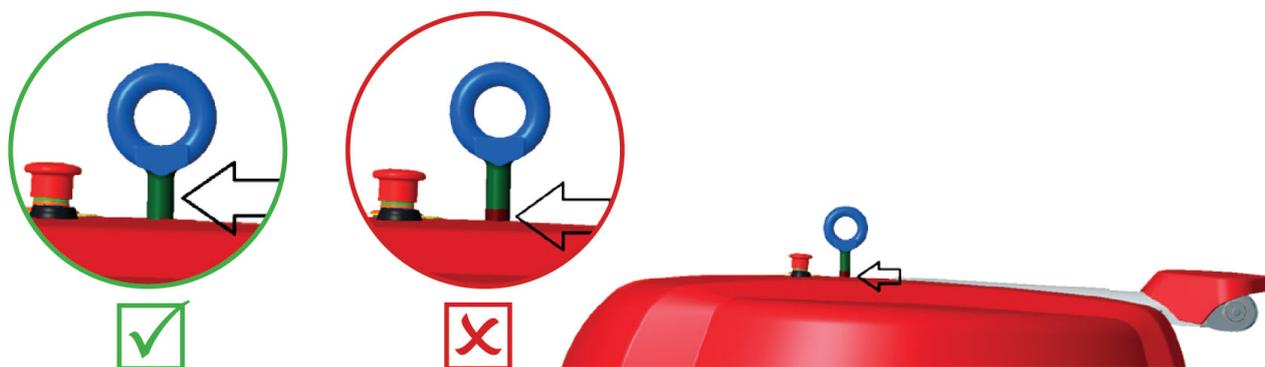


Figure 21. Hoisting eye installation



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7 Maintenance

7.1 Introduction

This chapter contains the preventive maintenance schedule and the applicable preventive maintenance procedures for the machine.

7.2 Preventive Maintenance Schedule

Maintenance Tasks	Frequencies	
	Operating Months	Note
Examine the charger (see Examine the Charging Station on page 7-2).	3	
Clean the charging strips and the charging electrodes (see Clean the Charging Strips and the Charging Electrodes on page 7-3).	3	
Examine and clean the ultrasonic sensor(s) (see Examine and Clean the Ultrasonic Sensor(s) on page 7-5).	3	
Clean the machine (see Clean the Machine on page 7-5).	3	
Examine the skirt (see Examine the Skirt on page 7-6).	3	
Adjust the ultrasound sensor height (see Adjust the Ultrasonic Sensor Height on page 7-6).	3	
Examine the drive wheels (see Examine the Drive Wheels on page 7-7).	6	
Test the emergency stop button (see Test the Emergency Stop Button on page 7-8).	3	
Examine and replace the metal strips (see Examine and replace the metal Strips on page 7-8).	3	
Test the induction sensors (see Test the Inductive Sensors on page 7-11).	3	

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7.3 Maintenance Procedures

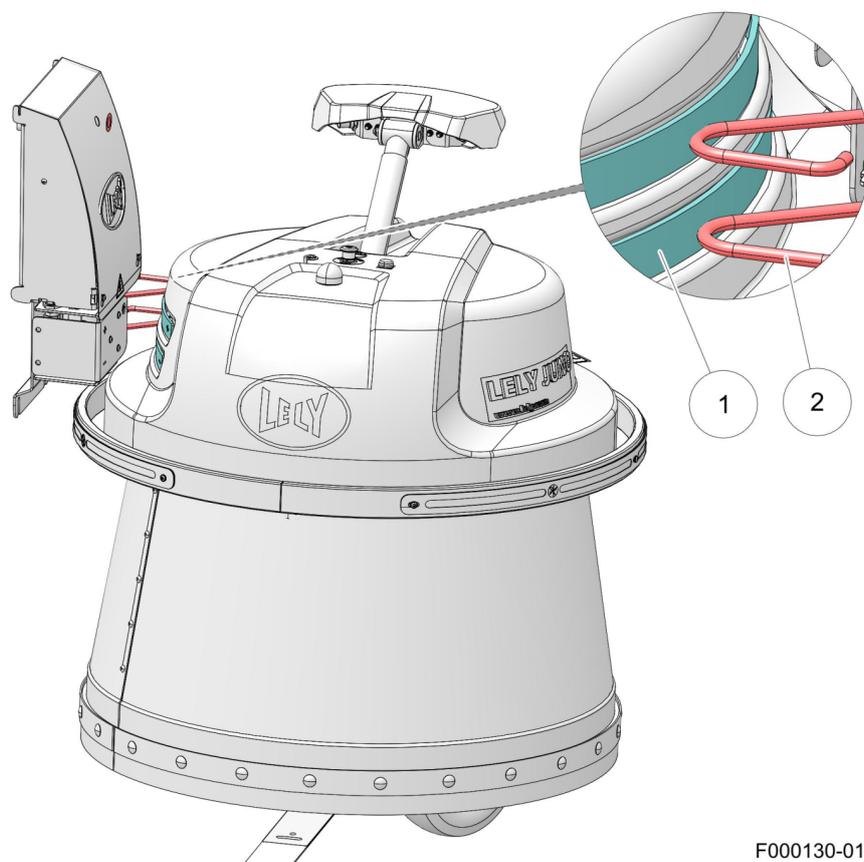
7.3.1 Examine the Charging Station

Preparation

1. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
2. Manually drive the machine to a clean and quiet location (see Manually control the Machine on page 6-6).

Examine

1. Examine the charging station for dirt and damage. If necessary clean with a moist cloth.
2. Examine the indicator LEDs on the upper right side of the charger (1) (see figure 14 on page 4-11). Make sure the LEDs do not blink.
3. Manually drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9).
4. Examine the charging electrodes (1) (see figure 22 on page 7-3) slide over the middle of the charging strips (2) when the machine connects to the charger. If the electrodes do not slide over the middle of the strips, call your local Lely service provider.



F000130-011

Figure 22. Position charging electrodes

KEY: 1. Charging strip - 2. Charging electrode

Close-up

1. Manually drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9).
2. Put the machine into operation (see Put the Machine into Operation on page 6-13).

7.3.2 Clean the Charging Strips and the Charging Electrodes

NOTICE

Make sure that after cleaning the charging electrodes slide over the middle of the charging strips when the machine connects itself to the charging electrodes.

Preparation

1. Disconnect the main power supply to the charging station.

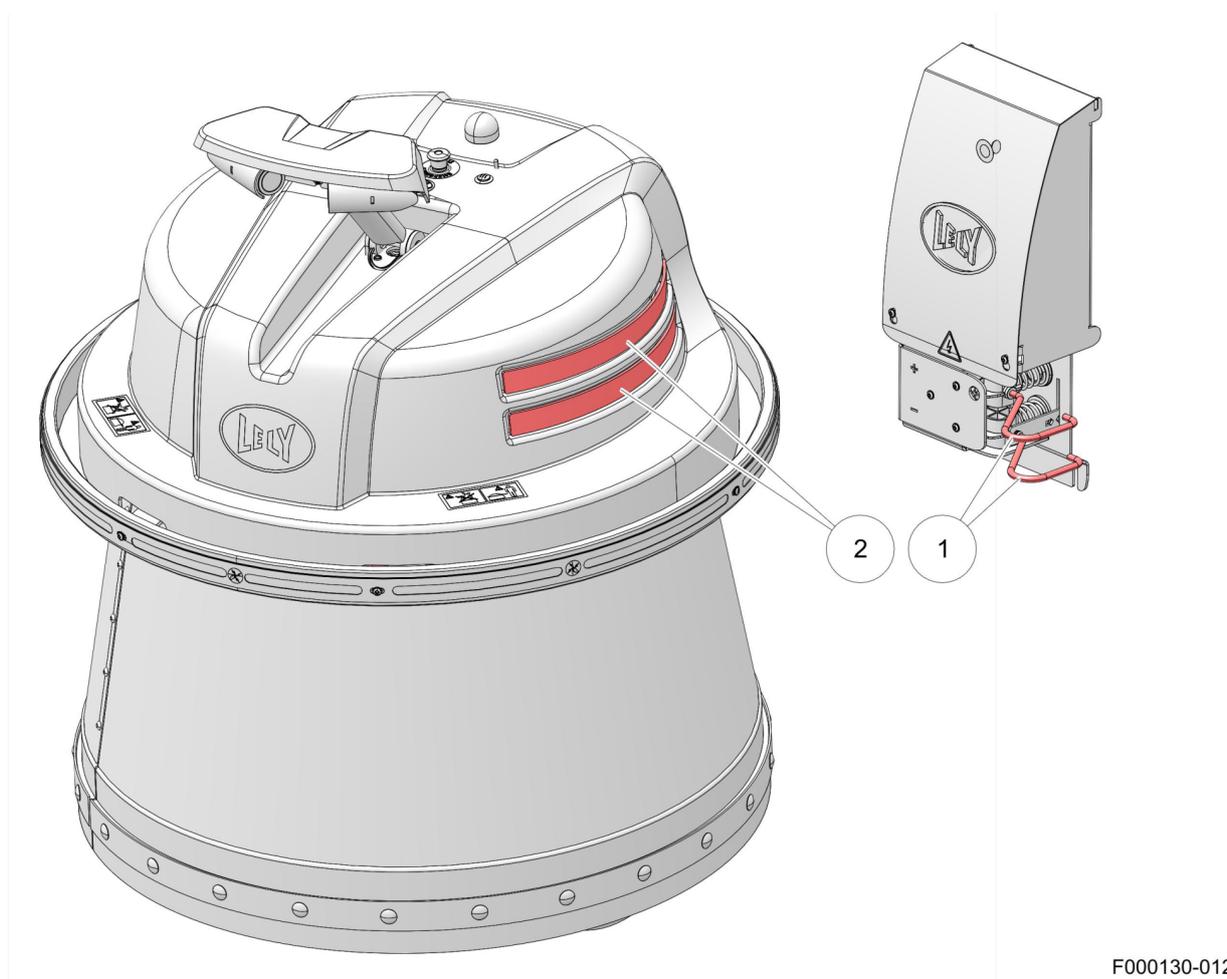
2. Manually drive the machine to a clean and quiet location (see Manually control the Machine on page 6-6).

Clean

1. Thoroughly clean the charging strips (see figure 23 on page 7-4) of the machine with sand paper.
2. Thoroughly clean both electrodes of the charging station with a brush or sand paper.

Close up

1. Connect the charging station to the main power supply.
2. Manually drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9).
3. Examine the charging electrodes slide over the middle of the charging strips when the machine connects to the charging station (see Position charging electrodes on page 7-3).
4. Put the machine into operation (see Put the Machine into Operation on page 6-13).



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Figure 23. Clean the charging strips and the charging electrodes

KEY: 1. Charging electrodes - 2. Charging strips

7.3.3 Examine and Clean the Ultrasonic Sensor(s)

NOTICE

Do not use sharp objects to clean the ultrasonic sensor.

Preparation

1. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
2. Manually drive the machine to a clean and quiet location (see Manually control the Machine on page 6-6).

Examine and Clean

1. Clean the ultrasonic sensor(s) with a tissue.
2. Examine the angle of the ultrasonic sensor(s). If the angle deviates and the brackets of the ultrasonic sensor(s) are bend or cracked, call your local Lely service provider.

Close-up

1. Manually drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9).
2. Put the machine into operation (see Put the Machine into Operation on page 6-13).

7.3.4 Clean the Machine

NOTICE

Do not spout water on the body of the machine.

Preparation

1. Manually drive the machine to a clean and quiet location (see Manually control the Machine on page 6-6).
2. Make sure the cover is closed (see Open or Close the Cover on page 6-2).

Clean

1. Clean the cover and the skirt with water and a brush.

Close-up

1. Manually drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9).
2. Put the machine into operation (see Put the Machine into Operation on page 6-13).

7.3.5 Examine the Skirt

Preparation

1. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
2. Manually drive the machine to a clean and quiet location (see Manually control the Machine on page 6-6).

Examine

1. Examine the skirt for dirt and damage. If necessary clean the machine (see Clean the Machine on page 7-5).
2. If the skirt is damaged, call your local Lely service provider.

Close-up

1. Manually drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9).
2. Put the machine into operation (see Put the Machine into Operation on page 6-13).

7.3.6 Adjust the Ultrasonic Sensor Height

NOTICE

The ultrasonic sensor must be at the same height as the centre of the top tube of the feed fence.

Preparation

1. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
2. Manually drive the machine to a location parallel to the feeding fence (see Manually control the Machine on page 6-6).

Adjust the angle of the ultrasound sensor

1. Support the ultrasonic sensor manually.
2. Loosen nut (1) (see figure 24 on page 7-7).
3. Put the ultrasonic sensor in the correct angle.
4. Tighten the nut (1).

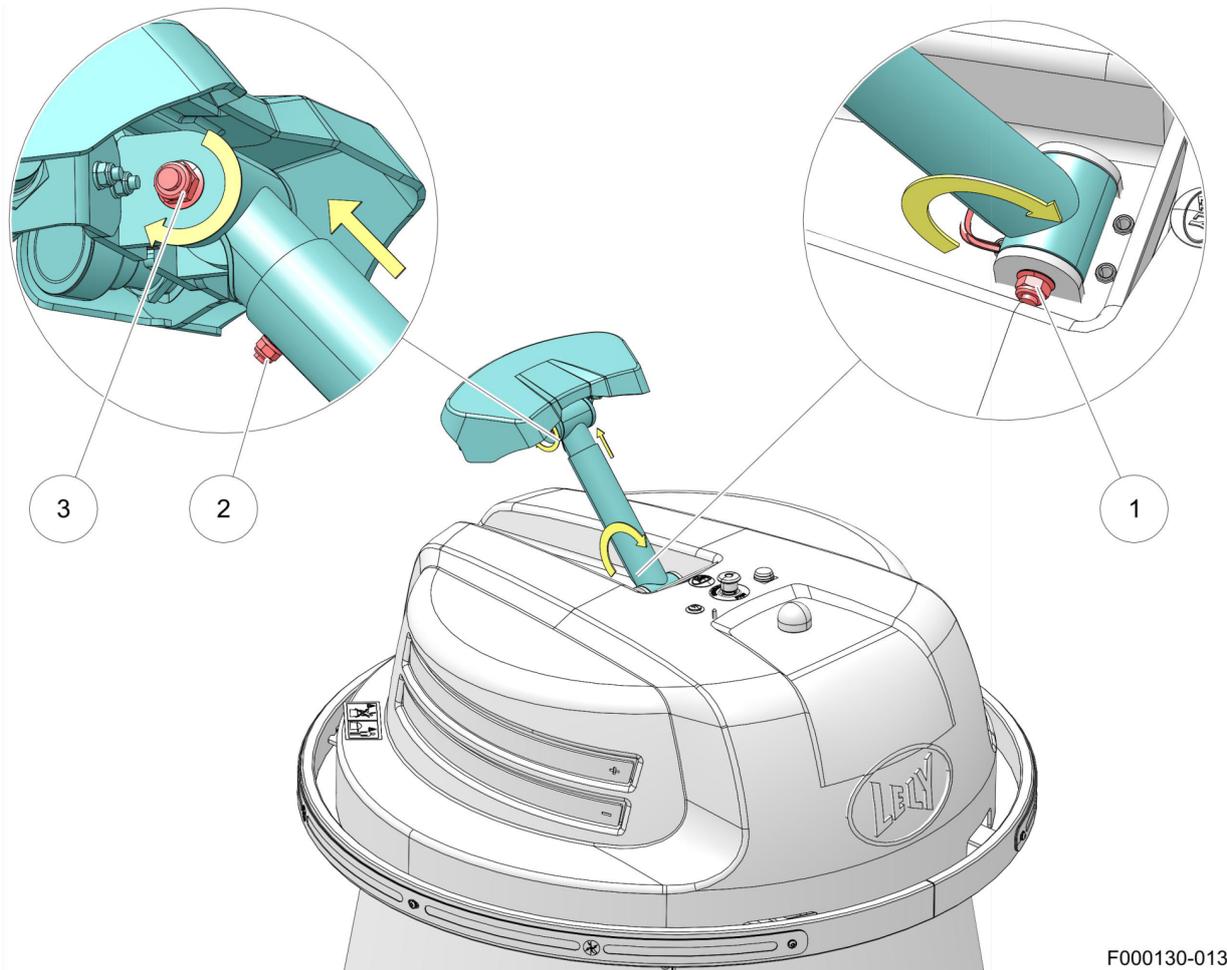
Adjust the tube length of the ultrasound sensor

1. Support the ultrasonic sensor manually.
2. Loosen nut (2) (see figure 24 on page 7-7).
3. Put the ultrasonic sensor on the correct length.
4. Tighten the nut (2).

Adjust the angle of the ultrasound sensor head

1. Support the ultrasonic sensor manually.

2. Loosen nut (3) (see figure 24 on page 7-7).
3. Put the ultrasonic sensor in the correct angle.
4. Tighten the nut (3).



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Figure 24. Ultrasound sensor adjustment

Close-up

1. Manually drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9).
2. Put the machine into operation (see Put the Machine into Operation on page 6-13).

7.3.7 Examine the Drive Wheels

Preparation

1. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
2. Manually drive the machine to a clean and quiet location (see Manually control the Machine on page 6-6).

Examine

1. Open the cover of the machine (see Open or Close the Cover on page 6-2).
2. Examine the profile of the drive wheels. If the profile is less than 2 mm, call your local Lely service provider for replacement of the tyres.

Close-up

1. Manually drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9).
2. Put the machine into operation (see Put the Machine into Operation on page 6-13).

7.3.8 Test the Emergency Stop Button

While the machine is in operation and drives a route:

1. Push the emergency stop button (2) (see figure 5 on page 2-11). The machine must stop immediately.
2. Pull the emergency stop button upwards.
3. On the smartphone display tap **Mark as solved**. The alarm list is displayed.

4. Tap  to go to the home screen.

5. Make sure the status lights of the motors are green.

6. Tap  on the smartphone or the pause button on the machine. The machine continues operation.

7.3.9 Examine and replace the metal Strips

NOTICE

A metal strip that is not properly attached to the floor and points upwards on one side can severely damage the inductive sensors of the machine.

NOTICE

The metal strip must be installed in its original place. If the machine does not find the metal strip on the same location it can get lost on the route and generate an alarm.

1. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
2. Manually drive the machine to a clean and quiet location (see Manually control the Machine on page 6-6).

Examine

1. Examine if all metal strips in the route are installed correctly to the floor.
2. Determine if you must:
 1. Replace screws.
 2. Replace a metal strip.

Replace Screws

NOTICE

Do not use an impact wrench.



Only the hole (A) (see figure 25 on page 7-10) in the center is round. The holes B and C are slots to allow the metal strip to shrink and expand a bit with temperature changes. The metal strips are not symmetrical. If (after some time) a hole in the concrete can not be used anymore, you can turn the strip over the long side and drill new holes in the concrete.

If one or more screws must be replaced:

1. Remove all screws of the strip.
2. Turn the strip around over the long side so the holes in the strip do not match the old holes in the floor.
3. Mark the position of the holes. Start to mark the hole in the center (A) of the strip. Mark the slotted holes (B) and (C) in the center of the holes.
4. Drill new holes in the floor with a 10 mm drill and >65 mm deep.
5. Clean the holes.
6. Insert S10 plugs.
7. Use a bit T30 to tighten the metal strip with the screws (BT 6x65). Tighten only with a torque of 20 Nm. It must still be possible that the metal strip can shrink and expand a bit when temperature changes occur.

Replace a metal Strip

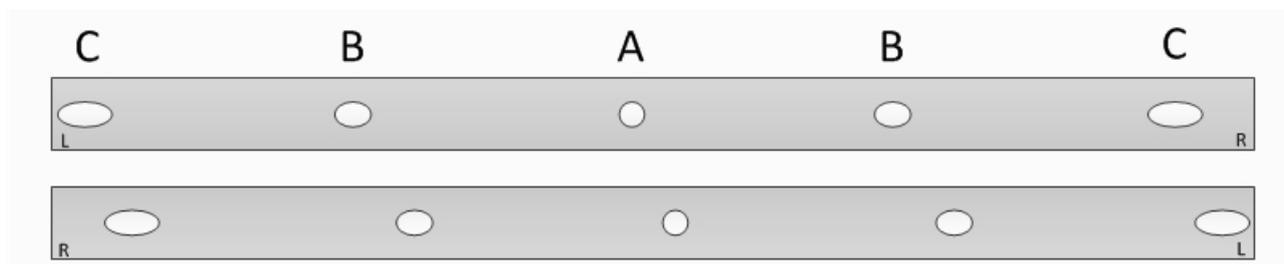


Figure 25. Metal strip holes

KEY:

A: Round hole

B: Slotted hole

C: Slotted hole

NOTICE

If a metal strip sticks out over the edge of a concrete plate (2x2 m) the swivel wheel of the machine will deform the metal strip and the screws will brake due to the tension.

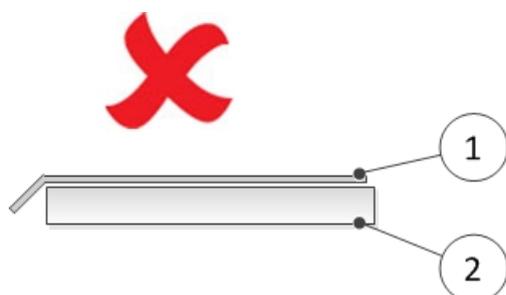


Figure 26. Metal strip positioning (1)

KEY: 1. Metal strip - 2. Concrete plate

1. Remove all screws of the strip.

2. Put the new strip on the floor. If necessary cut the strip with a grinder. Make sure:
 - The machine will find the metal strip on the exact same position as the old one.
 - The strip does not stick out over the edge of the concrete plate or on other surfaces than concrete plates: leave at least 10 mm of space between two metal strips.

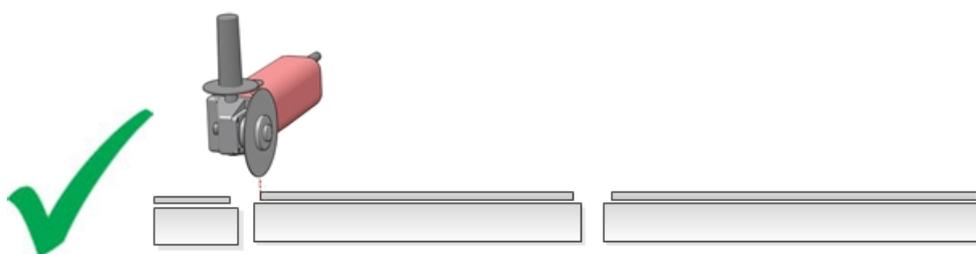


Figure 27. Metal strip positioning (2)

3. Mark the position of the holes. Start to mark the hole in the center (A) of the strip. Mark the slotted holes (B) and (C) in the center of the holes.
4. Drill new holes in the floor with a 10 mm drill and >65 mm deep.
5. Clean the holes.
6. Insert S10 plugs.
7. Use a bit T30 to tighten the metal strip with the screws (BT 6x65). Tighten only with a torque of 20 Nm. It must still be possible that the metal strip can shrink and expand a bit when temperature changes occur.

Close-up

1. Manually drive the machine to the charger (see Drive the Machine to the Charging Station on page 6-9).
2. Put the machine into operation (see Put the Machine into Operation on page 6-13).

7.3.10 Test the Inductive Sensors

Preparation

1. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
2. Drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9).

Test

1. Tap .
2. Tap **Testing**.
3. Tap **Induction sensors**.
4. Examine **Strip status**, **Sensor status left** and **Sensor status right**. The status indicators must be green.
5. If one of the indicators is not green, call your local Lely service provider.

Close-up

1. Put the machine into operation (see Put the Machine into Operation on page 6-13).

7.3.11 Calibrate the Wheels

Preparation

1. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).
2. Manually drive the machine to a clean and quiet location with a flat floor (see Manually control the Machine on page 6-6).
3. Make sure you have a least 5 m (16 ft) of free driving distance.

Calibrate

1. Tap .
2. Tap **Settings**.
3. Tap **Wheels**.
4. Tap **Assisted calibration**.
5. Tap button **Start**. The machine drives forward.
6. After driving at least 5 m (16 ft), tap button **Stop**. The message **Measure Driven Distance, enter the distance and press calibrate** is displayed.
7. Measure the exact distance the machine has driven (in mm).
8. Tap **Ok**.
9. Tap **Driven distance**.
10. Fill out the driven distance in mm.
11. Tap button **Calibrate**.
12. **Calibration of wheel diameter was successfull** is displayed.
13. Tap **Ok**.
14. Examine the wheel calibration values and the date of calibration. If necessary, repeat the calibration procedure.

Close-up

1. Drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9).

- Put the machine into operation (see Put the Machine into Operation on page 6-13).

7.3.12 Test the Barn Door Control Sensors

Connect to the barn door control unit

- Open the Lely Control Plus app. on the smartphone.
- In the **Find machine** screen tap  to scan for available devices.
- Tap the line of the applicable barn door to connect to it. When the machine is connected, the automatic door screen is displayed.

Test the sensors

- In the Lely Control Plus app go to **Testing**. Four test items are displayed:
 - Manual mode.**
 - Induction sensor.**
 - Relay 1.**
 - Relay 2.**
- Open and close the door with the Lely Control Plus app. Examine in the **Testing** menu if at:
 - Relay 1** the status indicator turns to green when the door opens.
 - Relay 2** the status indicator turns to green when the door closes.
 - Induction sensor** the status indicator turns to green when the door is open.
- Turn the Manual mode switch on the barn door control unit to the manual mode position. Examine in the **Testing** menu if the status indicator at **Manual mode** turns to green.
- Turn the Manual mode switch on the barn door to the automatic mode position.

7.3.13 Set the Gyroscope Target Temperature

NOTICE

Only change this setting if the gyroscope does not calibrate properly.

On the smartphone:

- Connect your smartphone to the machine.
- In the main menu tap **Settings**.
- Tap **Machine settings**.



4. Tap **Gyro target temperature**.

NOTICE

The applicable target temperature of the gyroscope is about 15 degrees higher than the average maximum outside temperature for that period.

5. Select the applicable temperature.
6. Tap **Save**.

8 Troubleshooting

8.1 Alarm Handling

Critical Alarms

When the machine is in operation and a critical alarm occurs:

- An alarm message is displayed on the smartphone.
- The led in the pause button on the machine blinks.
- An alarm signal sounds.
- On the home screen the alarm is indicated with a red mark.

To recover the critical alarm:

1. Tap the alarm indication at the top of the home screen to go to the alarm list.
2. Tap the critical alarm.
3. Do the recovery action that is displayed on the smartphone at **Recovery**.
4. Tap button **Mark as solved**. The alarm list is displayed.

5. Tap button  to go to the home screen.
6. At the top of the screen, swipe two times to the left to display the status lights.
7. Make sure the status lights of the motors are green.
8. Tap  on the smartphone or the pause button on the machine. The machine continues operation.

Non-critical Alarms and Notifications

When a non-critical alarm or a notification occurs:

- An alarm signal sounds.
- The alarm or notification is added to the alarm list. The machine tries to continue its route.
- On the home screen the alarm or notification is indicated with a mark:
 - Non-critical alarm: orange
 - Notification: grey

To read out the non-critical alarm or notification:

1. In the main menu tap .
2. Tap **Alarms**. The alarm list is displayed.
3. Tap the alarm or notification.
4. Do the recovery action that is displayed on the smartphone at **Recovery**.
5. Tap button **Mark as solved**. The alarm list is displayed.

T4C InHerd — Signals App (optional)

When an alarm occurs a push notification is sent to the T4C InHerd Signals app too.

To access the alarm notification in the Signals app:

1. Open the Signals app.
2. The alarm is displayed in the signals app at the top of the list.
3. Tap the line of the alarm to read the alarm. In the Lely Control Plus app you can mark the alarm as solved. In the **WiFi configuration** screen is displayed if the alarm notification is read in Signals (see on page 4-42).

8.2 Create a Robot Log

Preparation

1. Take the machine out of operation (see Take the Machine out of Operation on page 6-14).

Create Log

1. Tap .
2. Tap **Settings**.
3. Tap **Logs**.
4. Tap **Create log**.
5. **Waiting for log to be created** is displayed.
6. The created log is displayed in a green line at the top of the page **Robot Logs**.
7. Tap the line of the log file.
8. Tap  to download the log file to the smartphone.
9. Find the log file in the lelycontrolplus folder on the smartphone and send it to your local lely service provider.

Close-up

1. Drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9).
2. Put the machine into operation (see Put the Machine into Operation on page 6-13).

8.3 Troubleshooting Tables

8.3.1 Troubleshooting Table Juno Vehicle

Symptom	Possible cause	Action
The smartphone does not connect to the machine / connection lost.	The farmer password is not set on the smartphone.	<ol style="list-style-type: none"> 1. Ask the Lely service provider for the password.

Symptom	Possible cause	Action
	The smartphone is not paired with the machine.	<ol style="list-style-type: none"> 1. Make sure bluetooth of the smartphone is switched on. 2. Examine in the bluetooth settings of the smartphone if the machine is paired. <p>Refer to the user manual of the smartphone.</p>
	The machine is switched OFF.	<ol style="list-style-type: none"> 1. Switch ON the machine (see Switch the Machine ON or OFF on page 6-3).
	The distance between the smartphone and the machine is too big.	<ol style="list-style-type: none"> 1. Move the smartphone towards the machine and try to connect.
The vehicle does not move.	The machine is switched OFF.	<ol style="list-style-type: none"> 1. Switch ON the machine (see Switch the Machine ON or OFF on page 6-3). 2. Put the machine into operation (see Put the Machine into Operation on page 6-13).
	The route is blocked.	<ol style="list-style-type: none"> 1. Remove the blockage.
	The battery is low.	<ol style="list-style-type: none"> 1. Drive the machine to the charging station (see Drive the Machine to the Charging Station on page 6-9). 2. Charge for one hour.
	The fuse is blown.	<ol style="list-style-type: none"> 1. Call your local Lely service provider.
	The power supply is not connected.	<ol style="list-style-type: none"> 1. Connect the power supply.
	The emergency stop button is pushed.	<ol style="list-style-type: none"> 1. Reset the emergency stop button (see Reset the Emergency Stop Button on page 6-14). 2. Put the machine into operation (see Put the Machine into Operation on page 6-13).

Symptom	Possible cause	Action
The vehicle does not start a route	The emergency stop button is pushed.	<ol style="list-style-type: none"> 1. Reset the emergency stop button (see Reset the Emergency Stop Button on page 6-14). 2. Put the machine into operation (see Put the Machine into Operation on page 6-13).
	The bumper is activated.	<ol style="list-style-type: none"> 1. Make sure the bumper has no contact with any object.
	The route is blocked.	<ol style="list-style-type: none"> 1. Remove the blockage.
	No route is programmed.	<ol style="list-style-type: none"> 1. Call your local Lely service provider.
	Day planning is not set.	<ol style="list-style-type: none"> 1. Create a day planning (see Create a Day Planning on page 6-12).
The machine swings.	The gyroscope is drifting.	<ol style="list-style-type: none"> 1. Test the gyroscope.
	The ultrasonic sensor does not function correctly.	<ol style="list-style-type: none"> 1. Clean the ultrasonic sensor. 2. Test the ultrasonic sensor.
The machine does not stop at the charging station.	The charging strips or electrodes do not make contact.	<ol style="list-style-type: none"> 1. Clean the charging strips and the charging electrodes.
	No power supply.	<ol style="list-style-type: none"> 1. Make sure the charging station is connected to the power supply.
	Springs that hold the electrodes are loose.	<ol style="list-style-type: none"> 1. Call your local Lely service provider.
The machine does not follow the guide strip.		<ol style="list-style-type: none"> 1. Call your local Lely service provider.
The machine is 'searching' the fence when driving Ultrasound drive left .		<ol style="list-style-type: none"> 1. Call your local Lely service provider.
The skirt does not rotate smoothly.	The rubber skirt is worn out.	<ol style="list-style-type: none"> 1. Call your local Lely service provider.
The machine has problems with pushing feed to the fence.	The action Ultrasound drive left is programmed instead of Feed push left to push the feed.	<ol style="list-style-type: none"> 1. Call your local Lely service provider.

Symptom	Possible cause	Action
	Pushing intervals between the programmed routes are too large.	1. Program new routes with smaller intervals (not more than 25 cm or 9.8 in).
	There was too much feed in front of the feed fence during programming of the routes.	1. Remove the feed and program a new route.
	The skirt of the machine does not rotate smoothly.	1. Call your local Lely service provider.
While pushing feed, feed is coming under the skirt or the feed alley is not clean.	The skirt is too high.	1. Call your local Lely service provider.
	The skirt is worn.	1. Call your local Lely service provider.
The backup process of the routes does not function.	The software version of the smartphone is not correct.	Make sure the software version on the smartphone is correct. If the version is not correct update the smartphone software.

8.3.2 Troubleshooting Table Juno Charging Station

Symptom	Possible cause	Action
Green and Yellow LED together blink 2 times, followed by a few seconds rest.	Battery loader defect.	1. Call your local Lely service provider.
Green and Yellow LED together blink 4 times, followed by a few seconds rest.	Temperature lower than -15° C (5° F).	1. Warm the barn and try again.
	Battery loader defect.	1. Call your local Lely service provider.
Green and Yellow LED together blink 5 times, followed by a few seconds rest.	Internal temperature is higher than 85° C (185° F).	1. Remove plug from the mains. Connect plug and retry after one hour.
Green and Yellow LED together blink 7 times, followed by a few seconds rest.	Current too high (>20 A).	1. Remove short-circuit, else: 2. Call your local Lely service provider.



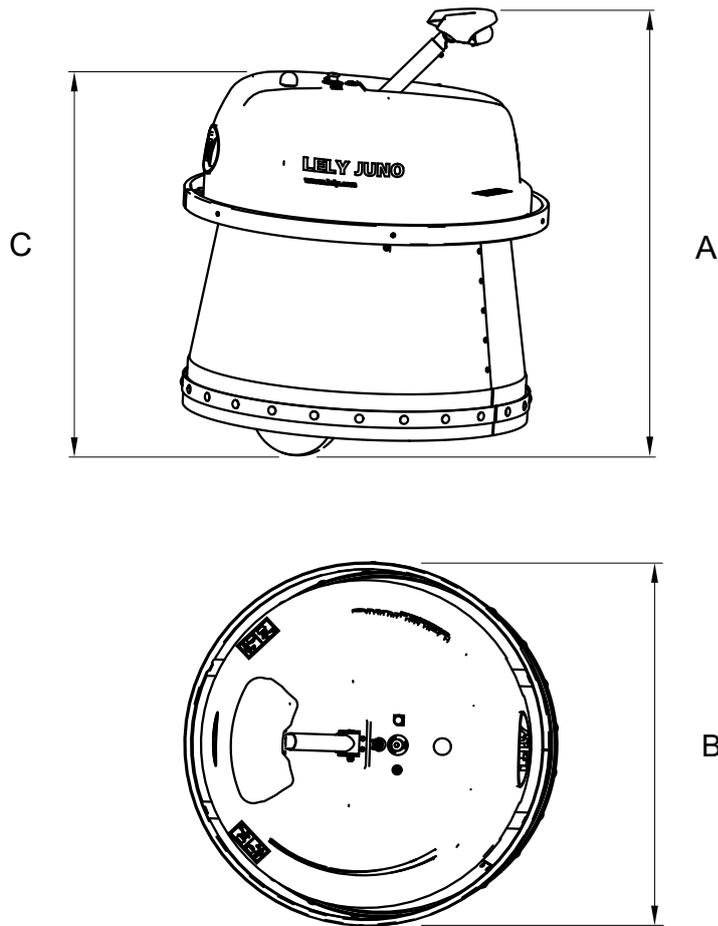
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9 Diagrams

9.1 Dimensions

Juno dimensions

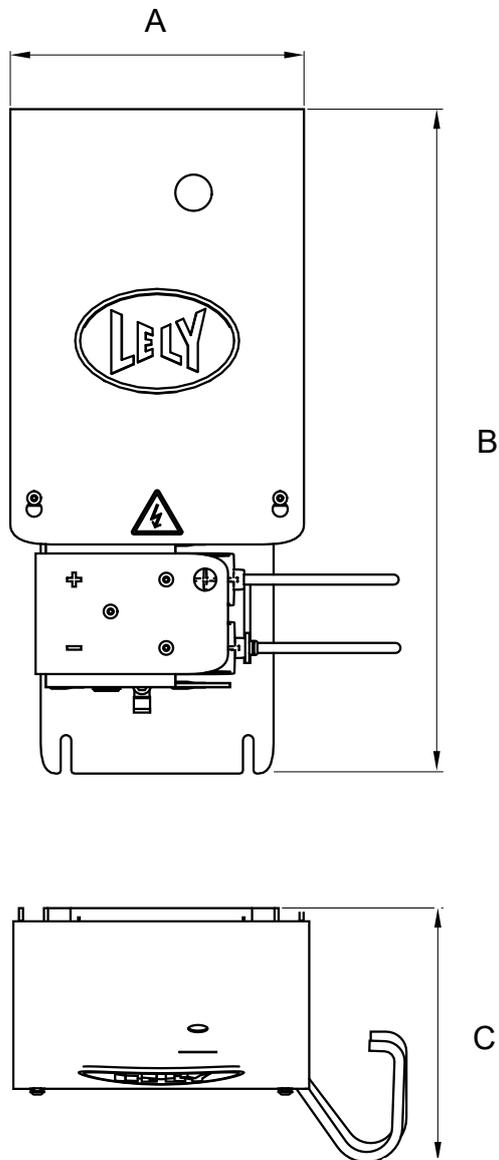


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Figure 28. Dimensions Juno

KEY:
 A: 1770 mm (69.68 in)
 B: 1100 mm (43.30 in)
 C: 1100 mm (43.30 in)

Charger dimensions

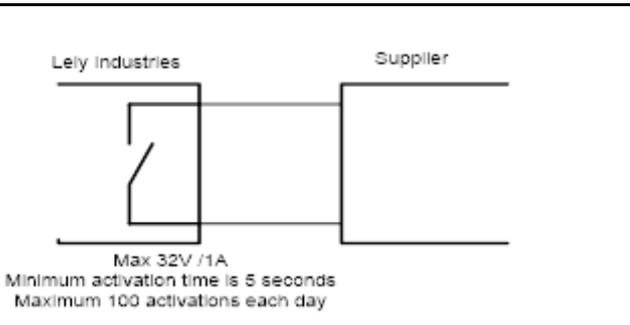
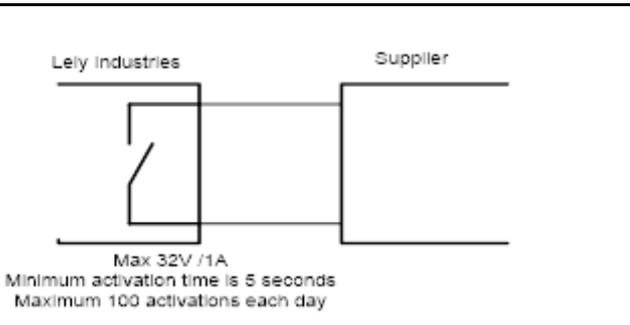
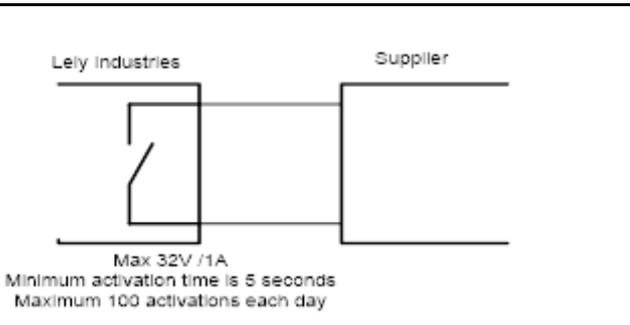


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Figure 29. Dimensions charger

KEY:
A: 200 mm (7.87 in)
B: 150 mm (5.90 in)
C: 70 mm (2.75 in)

10 CE Questionnaire Barn Door Supplier

Dear potential supplier, The following product has been selected by Lely :									
Product name	Barn door								
Supplier code/reference									
Lely code/reference									
<p>It is our intention to cooperate this barn door with a mobile agricultural robot from Lely Industries N.V. The mobile agricultural robot is covered by the Machine directive 2006/42/EC. Lely Industries N.V. will act as the legal manufacturer for the mobile agricultural robot. As legal manufacturer, safety for all users of the total system is our utmost concern.</p> <p>We will and cannot be the legal manufacturer for the Barn door. Therefore we ask your permission and cooperation to safely integrate this Barn door with our mobile agricultural robot. Thank you for your cooperation.</p> <p>Jan Willem Rodenburg, Product Safety & Compliance Lely Industries N.V.</p>									
1	Please provide us with a CE declaration on the selected product.								
2	<p>A connection with the system will be made in the following methods:</p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%; text-align: center;">  </td> <td style="width: 40%; vertical-align: top;"> <p>Allowed? YES/NO*</p> </td> </tr> </table>		<p>Allowed? YES/NO*</p>						
	<p>Allowed? YES/NO*</p>								
3	<p>In order to be able to safely connect to a mobile agricultural robot we require the following mandatory provisions.</p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Emergency stop device on the product.</td> <td style="width: 40%;">YES/NO*</td> </tr> <tr> <td>Lockout / Tagout procedure possible?</td> <td>YES/NO*</td> </tr> <tr> <td>Identified Power switch on control box of the product?</td> <td>YES/NO*</td> </tr> <tr> <td>Barn door in compliance with EN 12453 and EN 60335-1</td> <td>YES/NO*</td> </tr> </table> <p style="text-align: right;">* = Delete as applicable. If no explain in remarks</p>	Emergency stop device on the product.	YES/NO*	Lockout / Tagout procedure possible?	YES/NO*	Identified Power switch on control box of the product?	YES/NO*	Barn door in compliance with EN 12453 and EN 60335-1	YES/NO*
Emergency stop device on the product.	YES/NO*								
Lockout / Tagout procedure possible?	YES/NO*								
Identified Power switch on control box of the product?	YES/NO*								
Barn door in compliance with EN 12453 and EN 60335-1	YES/NO*								
4	<p>Do you foresee additional safety issues not covered by your CE declaration which we must address? Please inform us on risk reducing measures.</p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Danger:</td> <td style="width: 50%;">Risk reducing measure:</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> </table>	Danger:	Risk reducing measure:						
Danger:	Risk reducing measure:								
5	In case of additional questions, please provide us with a contact:								

5.4303.8528.0 D



Additional remarks:	
Supplier:	Name:
Date:	Sign:

5.4303.8528.0 D



11 Disposal

Disposing this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

Decommissioning and disassembly of the product can be dangerous and must be done only by qualified recycling organizations. All components must be disposed in compliance with the local rules and regulations.

Lubricants and fluids must be disposed correctly to prevent pollution of the environment. Read the safety data sheets of the used lubricants and fluids for correct disposal. All lubricants and fluids must be disposed in compliance with the local rules and regulations.

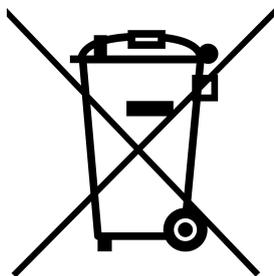
Contact your local authority or local Lely service provider for further details.



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5.4303.8528.0 D

12 WEEE



This symbol [crossed-out wheel bin WEEE Annex IV] indicates separate collection of electrical waste and electronic equipment in the European countries. We are committed to being a good corporate citizen. As part of that commitment, we strive to maintain an environmentally conscious manufacturing operation

In accordance with the European Union WEEE (Waste Electrical and Electronic Equipment) Directive 2012/19/EC, we would like to notify you that this product might contain regulated materials, which upon disposal, according to the WEEE directive, require special reuse and recycling processing.

For this reason, Lely Industries N.V. has arranged that this product can be recycled at the local recycling/disposal companies to collect and recycle this product at no cost to you.

Additional local legislation may apply.

NOTICE

Please note, only this product itself falls under the WEEE Directive. When disposing of packaging and other related shipping materials we encourage you to recycle these items through the normal channels.



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5.4303.8528.0 D

13 EC Declaration of Conformity

EC DECLARATION OF CONFORMITY
EG-KONFORMITÄTSEKTLÄRUNG
DÉCLARATION DE CONFORMITÉ AUX NORMES DE LA CE
DICHIARAZIONE CE DI CONFORMITÀ
CERTIFICADO DE CONFORMIDAD CEE
DECLARAÇÃO DE CONFORMIDADE CE
DEKLARASJON EU MASKINDIREKTIV
VAATIMUSTENMUKAISUUSVAKUUTUS
EU-KONFORMITETSERKLÆRING
EG-FÖRSÄKRAN OM ÖVERENSSTÄMMELSE
CB - SAMRÆMISYFJRLÝSING



ΔΗΛΩΣΗ ΣΥΜΜΟΡΦΩΣΗΣ Ε.Ε.
DECLARATIE DE CONFORMITE CE
EU MEGFELELŐSÉGI NYILATKOZAT
ES-PROHLÁŠENÍ O SHODĚ
DEKLARACJA ZGODNOŚCI WE
ES - PREHLÁSENIE O ZHODE
VASTAVUS EU DIREKTIVIDELE
ES ATITIKTIES DEKLARACIJA
ЗАЯВЛЕНИЕ О СООТВЕТСТВИИ НОРМАМ ЕС
EG - POTVRDA O SUKLADNOSTI
ES IZJAVA O SKLADNOSTI

Wij fabrikant

We manufacturer
Der Hersteller
Nous, soussignés, le fabricant
fabbricante
fabricante
producent
valmistaja
produsenten
tillverkare
framleiðandi

Lely Industries N.V.
Cornelis van der Lelylaan 1 • 3147 PB Maassluis • The Netherlands
tel. +31 (0)88 - 12 28 221 • fax +31 (0)88 - 12 28 222
www.lely.com

Εμείς, ο κατασκευαστής
fabricant
gyártó
výrobce
producent
výrobca
tootja
gamintojas
производитель
proizvođač
naziv proizvajalca

verklaren geheel onder eigen verantwoordelijkheid dat de machine:
herewith declare, on our own responsibility, that the machinery:
erklärt hiermit eigenverantwortlich, dass die Maschine:
déclarons que les machines désignées ci-après :

productbeschrijving

description of product
Produktbezeichnung
description du produit
descrizione del prodotto
nombre del producto
designação de produto
produktnavn
tuotenimi
produktnavn
produktname
vörulýsing

Lely Juno

περιγραφή του προϊόντος
descrierea produsului
termék megnevezése
označení produktu
opis produktu
označenie výrobku
toote kirjeldus
gaminio aprašymas
наименование изделия
naziv proizvoda

typenummer

model number
Typnummer
numéro de modèle
numero di modello
modelo
número do modelo
modellnummer
mallinnumero
modellnummer
gerðarnúmer

5.4303.0000.X
5.4303.0300.X

αριθμός μοντέλου
numărul modelului
típus száma
numer modelu
typové číslo
tüübi number
modello numeris
номер модели
broj modela
številka artikla

waarop deze verklaring betrekking heeft, in overeenstemming is met de bepalingen van de volgende Richtlijn(en):
which this declaration refers to, is in accordance with the conditions of the following Directive(s):
worauf sich diese Erklärung bezieht, hergestellt ist gemäß den Bestimmungen der Richtlinie(n):
auxquelles la présente déclaration se rapporte, sont conformes aux dispositions de la ou des directives suivantes :

è conforme alle direttive
de acuerdo con las directivas
de acordo com a directiva
opfylder følgende direktiver
täyttää seuraavien direktivien vaatimukset
oppyllyr følgende direktiver
uppfyller följande direktiv
uppfyllir eftirlitandi tilskipanir

Machinery directive 2006/42/EC

conform cu directivele
rendelkezeseknek megfelelelen
podle směrnice
zgodny z dyrektywą
vzhode so smernicami
direktivide jargi
pagal direktyvas
соответствует требованиям директив
po smjernicama
v skladu z direktivo

en in overeenstemming is met de volgende normen of andere normatieve documenten :
and is in conformity with the following standard(s) or other such specifications :
und den folgenden Normen oder vergleichbaren Spezifikationen entspricht:
et aux normes et autres spécifications suivantes :

è conforme alle norme
de acuerdo con las normas
de acordo com as normas
opfylder følgende standarder
täyttää seuraavien standardien vaatimukset
oppyllyr følgende standarder
uppfyllir eftirlitandi staðla
ηλποοι τις η ποδιαιοραφες

EN-ISO 12100:2010
EN 60204-1:2006/AC:2010

în conformitate cu standardele
megfelel a szabványoknak
odpovídá normám
zgodny z normą
zodpovedá normám
normidele vastavus
atitinka standartus
соответствует стандартам нормам
u skladu sa standardima
v skladu s standardi

handtekening en datum

signature and date
Unterschrift und Datum
signature et date
firma e data
firma y fecha
assinatura e data
underskrift og dato
allekirjoitus ja päiväys
signatur og dato
underskrift och datum
undirskrift og dagsetning

S. Loosveld
Director Product Development
Lely Industries N.V.

J.W. Rodenburg
Manager Product Safety & Compliance
Lely Industries N.V.

υπογραφή και ημερομηνία
semnătura și data
aláírás és dátum
podpis a datum
podpis i data
podpis a dátum
allkirj ja kuupäev
parašas ir data
подпись и дата
potpis i datum
podpis in datum

27-6-2018

5.4303.8507.9

EC DECLARATION OF CONFORMITY
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designação de produto
produktnavn
tuotenimi
produktnavn
produktnamn
vörulýsing

Lely Door Control Box

περιγραφή του προϊόντος
descrierea produsului
termék megnevezése
označení produktu
opis produktu
označenie výrobku
toote kirjeldus
gaminio aprašymas
наименование изделия
naziv proizvoda

typenummer

model number
Typnummer
número de modelo
numero di modello
modelo
número do modelo
modellnummer
mallnumero
modellnummer
gerðarnúmer

5.4303.0562.x

Is intended to be used in
combination with Lely Juno.

αριθμός μοντέλου
numărul modelului
típus száma
numer modelu
typové číslo
lütübi number
modello numeris
номер модели
broj modela
številka artikla

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opfylder følgende direktiver
täyttää seuraavien direktiivien vaatimukset
opfylder følgende direktiver
uppfyller följande direktiv
uppfyllir eftirfarandi tilskipanir

Low voltage directive 2014/35/EU
Electromagnetic compatibility 2014/30/EU
Radio Equipment Directive 2014/53/EU

conform cu directivele
rendelkezeléseknél megfelelően
podle směrnice
zgodny z dyrektywą
v zohode so smernicami
direktiviude järgi
pagal direktyvas
sootvetstvuet trebovaniyam direktiv
po smjernicama
v skladu z direktivo

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täyttää seuraavien standardien vaatimukset
opfylder følgende standard
uppfyller följande standarder
uppfyllir eftirfarandi staðla
πληροί τις προδιαγραφές

EN 300 328 V2.1.1
EN 60204-1:2006/A1:2009
EN 61000-6-3:2007/A1:2011
EN-IEC 61000-6-2+C11:2005

în conformitate cu standardele
megfelel a szabványoknak
odpovídá normám
zgodny z normą
zodpovedá normám
normidele vastavus
atitinka standartus
sootvetstvuet standartam normam
u skladu sa standardima
v skladu s standardi

handtekening en datum

signature and date
Unterschrift und Datum
signature et date
firma e data
firma y fecha
assinatura e data
underskrift og dato
allekirjoitus ja päiväs
signatur og dato
underskrift och datum
underskrift og dagsetning

S. Loosveld
Director Product Development
Lely Industries N.V.

J.W. Rodenburg
Manager Product Safety & Compliance
Lely Industries N.V.

20-11-2019

5.4303.8509.9

5.4303.8528.0 D

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Lely Industries N.V.

Cornelis van der Lelylaan 1

NL-3147 PB Maassluis

Tel +31 (0)88 - 12 28 221

Fax +31 (0)88 - 12 28 222

