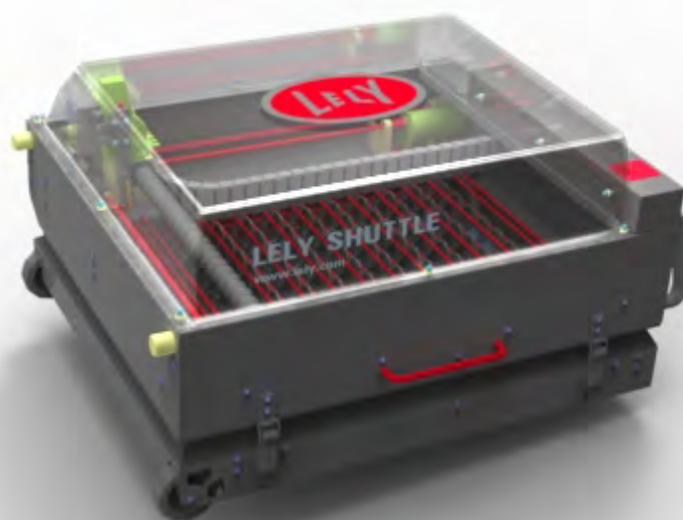


Lely SHUTTLE XY

Sampling Device



Operator Manual

D-H021.1011EN

English Original



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WARRANTY RESTRICTIONS

Excluded from this warranty are any cost or expenses due to:

- Abnormal use of the equipment which is not according to the specifications stated in the Operator Manual or handled during the Operators Service and Maintenance Certification program
- The result of any intervention by technicians other than Lely service technicians or technicians who have Lely's approval to perform certain duties.
- Incidents such as freezing, ice, fire, flood, inundation or any other form of excessive water, lightning.
- Defect of the electrical system or grounding.
- The use of chlorinated chemicals used for rinse, sanitation or washing of the robot may cause damage to the robot. All parts damaged as a result of the use of chlorinated chemicals will be excluded from warranty, nor will they be covered under the Super contract.
- Use of compressed air that does not meet the quality standards set by Lely Industries.
- Hacking activities, viruses or the like.
- Damage to the electrical system as a result of vermin or the like.
- For USERS that have followed the Operators Maintenance and Service Certification: Any damage resulting from abnormal use of the equipment which is not according to the specifications stated in the Operator Technical Training Manual and are also not covered by the warranty scheme.

Warranty does not apply to consequential damage which does not involve the machine itself.

All systems are tested. However in the event of a malfunction Lely cannot be held responsible for consequential damage.



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LIST OF INCLUDED AMENDMENTS

No:	Issue Date (yy/mm)	Chapter(s)	Remarks
2	10/11	All	Illustrations updated
		1 - 6, 8	Textual changes
		6	Cleaning procedure added
		7	Test and calibration procedures added
		8	Alarm code and attention codes added
		9	Diagram added
1	10/01		Initial Issue



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PREFACE

Manual Contents

This manual contains the information necessary to operate the SHUTTLE XY Sampling Device. It also includes maintenance and troubleshooting information that can be done by an operator.

Study and understand this information thoroughly before you operate the SHUTTLE. Failure to do so could result in personal injury or damage to equipment. Please consult your local Lely service provider if you do not understand the information in this manual, or if you need additional information.

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 milking robot may comprise improvements, features or options that are not covered in this manual.

Applicability

The first table below shows the type number of the SHUTTLE for which this manual is applicable. The second table below shows the type numbers of the Lely milking robots for which the SHUTTLE can be used.

Model designation

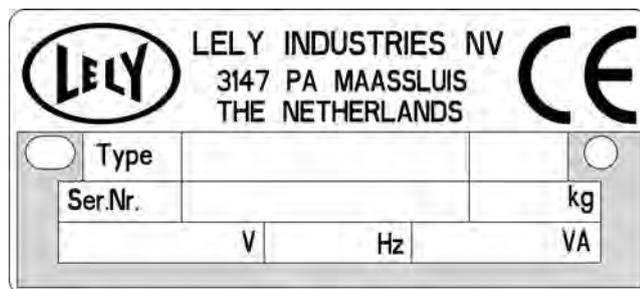
Model	Type number
SHUTTLE XY Sampling Device	5.1503.0001.0

Milking Robot Connectivity

Model	Type number
Lely Astronaut A2	5.1001.0000
	5.1002.0000
Lely Astronaut A3	5.1003.0000
	5.1103.0000
Lely Astronaut A3 Next	5.1003.0010
	5.1103.0010

Registration

The Type and Serial Number Plate is attached to the back of the base of the SHUTTLE. Always include the type and serial numbers of your SHUTTLE when you contact your local Lely service provider or order spare parts.



Type and Serial Number Plate

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

Type number	
Serial number	

Maintenance Authorization



Only technicians certified by Lely Industries are authorized to do maintenance on the SHUTTLE, 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 SHUTTLE, the warranty on the SHUTTLE becomes invalid.

Before a technician does maintenance on an SHUTTLE, the owner must examine the service pass of the technician and make sure the technician is currently certified to do maintenance on the SHUTTLE.

At the end of each visit, all work done on the SHUTTLE must be written in the logbook and the logbook must be signed by the certified technician. The logbook must always be kept near the SHUTTLE for the entire life of the product. The information in the logbook must include:

- The maintenance done
- The date of the maintenance
- The name of the technician
- The certification number of the technician.

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 a product specialist. The examinations are done under supervision of a master product specialist and include troubleshooting and corrective maintenance of the SHUTTLE.

There are five certification levels:

- Installation Technician (certification valid for two years)
- Service Engineer (certification valid for two years)
- Senior Service Engineer (certification valid for two years)
- Product Specialist (certification valid for one year)
- Master Product Specialist (certification valid for one year).

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 milking robot can only in the presence of a certified technician.

When the training program is completed successfully, Lely issue a certificate and a service pass to the technician. The service pass contains the following information:

- The name of the technician
- A photograph of the technician
- The certification number of the technician
- The date of expiry of the certification.

Local Maintenance Contact Number

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

Telephone number	
email address	



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1. INTRODUCTION

The SHUTTLE is a removable and external sampling device for the Lely Astronaut milking robots. Once connected, the SHUTTLE can automatically collect up to a 100 milk samples.

The SHUTTLE uses a sample box with bottles of CRV Nederland. The bottles are filled with approximately 30 ml of milk.

The SHUTTLE has the following parts:

- Base
- Sample box, with bottles
- Cover
- Fill unit
- Operator panel.

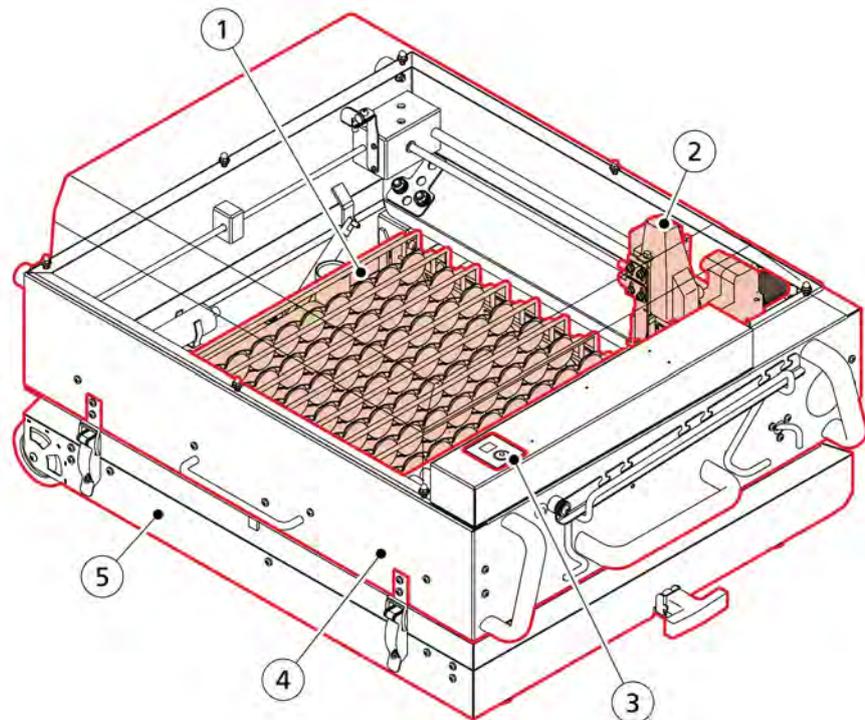


Figure 1. SHUTTLE overview

<p>KEY: 1. Sample box with bottles - 2. Fill unit - 3. Operator panel - 4. Cover - 5. Base</p>

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2. SAFETY

2.1 Safety Instructions

YOU are responsible for the SAFE operation and maintenance of your robotic milking system. YOU must make sure that you and anyone else who is going to operate, maintain or work in the vicinity of the milking robot 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 EVERYONE who operates, maintains or works near the milking robot obeys the safety precautions. Do not risk injury or death by ignoring good safety practices.

- SHUTTLE owners must train operators before they operate the SHUTTLE and the milking robot. 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 milking robot
- 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 they are only installed by authorized technicians.

2.1.1 General Safety

- Read and understand this manual, the operator manual of the milking robot and all safety signs before you connect the SHUTTLE to the milking robot
- Only trained persons are permitted to operate the SHUTTLE and the milking robot
- Wear the correct protective clothing and equipment
- Disconnect the CAN-bus cable before you clean or do maintenance on the SHUTTLE
- 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)

2.1.2 Transport Safety

- Only use the transport handle or the handle on the cover when you transport the SHUTTLE
- Close and lock the cover when you transport or store the SHUTTLE
- Do not transport the SHUTTLE with filled sample bottles installed.

2.1.3 Operating Safety

- Read and understand this manual, the operator manual of the milking robot and all safety signs before you connect the SHUTTLE to the milking robot
- Only trained persons are permitted to operate the SHUTTLE and the milking robot
- Disconnect the CAN-bus cable before you clean or do maintenance on the SHUTTLE
- Make sure the cover of the SHUTTLE is closed and secured before you start the sampling
- Make sure the transport handle is fully in
- Lock the cover with a lock when sampling bottles are in the SHUTTLE
- Keep the cover closed when the fill head moves or when the fill head is in fill position
- Keep the working area as clean and as dry as possible
- Make sure the transport handle is fully in when the SHUTTLE is in position
- Make sure the robot arm cannot hit you when you work on the SHUTTLE
- Make sure the robot arm cannot hit the SHUTTLE
- Make sure the SHUTTLE, the sampling bottles and milk tube are clean. Clean the SHUTTLE if it is not used for more than three days.
- Contact your nearest Lely service provider if you have any questions

2.1.4 Maintenance Safety

- Read and understand this manual, the operator manual of the milking robot and all safety signs before you connect the SHUTTLE to the milking robot
- Only trained persons are permitted to operate the SHUTTLE and the milking robot
- Disconnect the CAN-bus cable before you clean or do maintenance on the SHUTTLE
- Make sure all covers and guards are installed when maintenance work is complete

2.2 Safety Decals

2.2.1 Safety Decal Messages

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.

2.2.1.1 Poisonous Substance - Chemical Hazard

A chemical hazard decal is affixed to the cover.



Figure 2. Example of the chemical hazard decal



The content of the sample box contains poisonous substances necessary to preserve the milk samples. There is a danger of damage to health when:

- large quantities of the preservative are inhaled
- the preservative comes in contact with the skin
- the preservative is swallowed.

Store the sample box locked and in a safe place out of the reach of children.

2.2.2 Maintenance of Safety Decals

Safety decals on the SHUTTLE XY Sampling Device display important and useful information that will help you safely operate and maintain the SHUTTLE.

Obey the instructions below to make sure 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 are illegible
- Safety decals can be purchased from your local Lely service provider.

2.2.3 Installation of Safety Decals

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

2.3 Emergency Stop Procedure

Method 1

1. Disconnect the CAN-bus cable from the E-Link connector on the bottom of the multiple function box.
2. Disconnect the milk tube from the SHUTTLE.
3. Pinch the milk tube to prevent unwanted drainage of milk.

Method 2

1. Push and hold button [Reset/Stop] for more than 5 s.

3. SPECIFICATIONS

Dimensions and weight

- Width: 73 cm (29 in)
- Height: 39 cm (15.4 in), 58 cm (22.9 in) with bleed tube strip up
- Depth: 59 cm (23.2 in)
- Weight: 23 kg (50 lb) (without sample box)

Power supply

- Voltage: 27 V, supplied via the CAN-bus

Operating capacity

- Tray/bottle type: CRV Nederland
- Nr. of trays: 10
- Nr. of bottles per tray: 10
- Bottle capacity: 30 ml (1 oz)

Operating conditions

- Ambient temperature: 0 - 40 °C (32 - 104 °F)
- Relative humidity: 30 - 100%
- Maximum slope of the floor where the SHUTTLE is installed: 5°
- Floor level where the SHUTTLE is installed: 36 cm (14.2 in) below the 5-kg level (1) of the milk jar.



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4. DESCRIPTION AND OPERATION

4.1 Description

The SHUTTLE has the following main parts:

- Stainless steel base
- Stainless steel cover with a transparent plastic top
- Sample box, with bottles
- Fill unit
- Operator panel.

The stainless steel base has two wheels and a transport handle (9, fig. 3, page 4-2). Holes in the bottom plate let water or milk drain. A hinged cover (1) is installed on the base with two dampers (15) to keep the cover open when it is opened. The cover is closed with two fasteners (11) that can be locked.

A lip (18) on the cover makes sure that the cover can not be closed if the sample box and racks are not installed correctly.

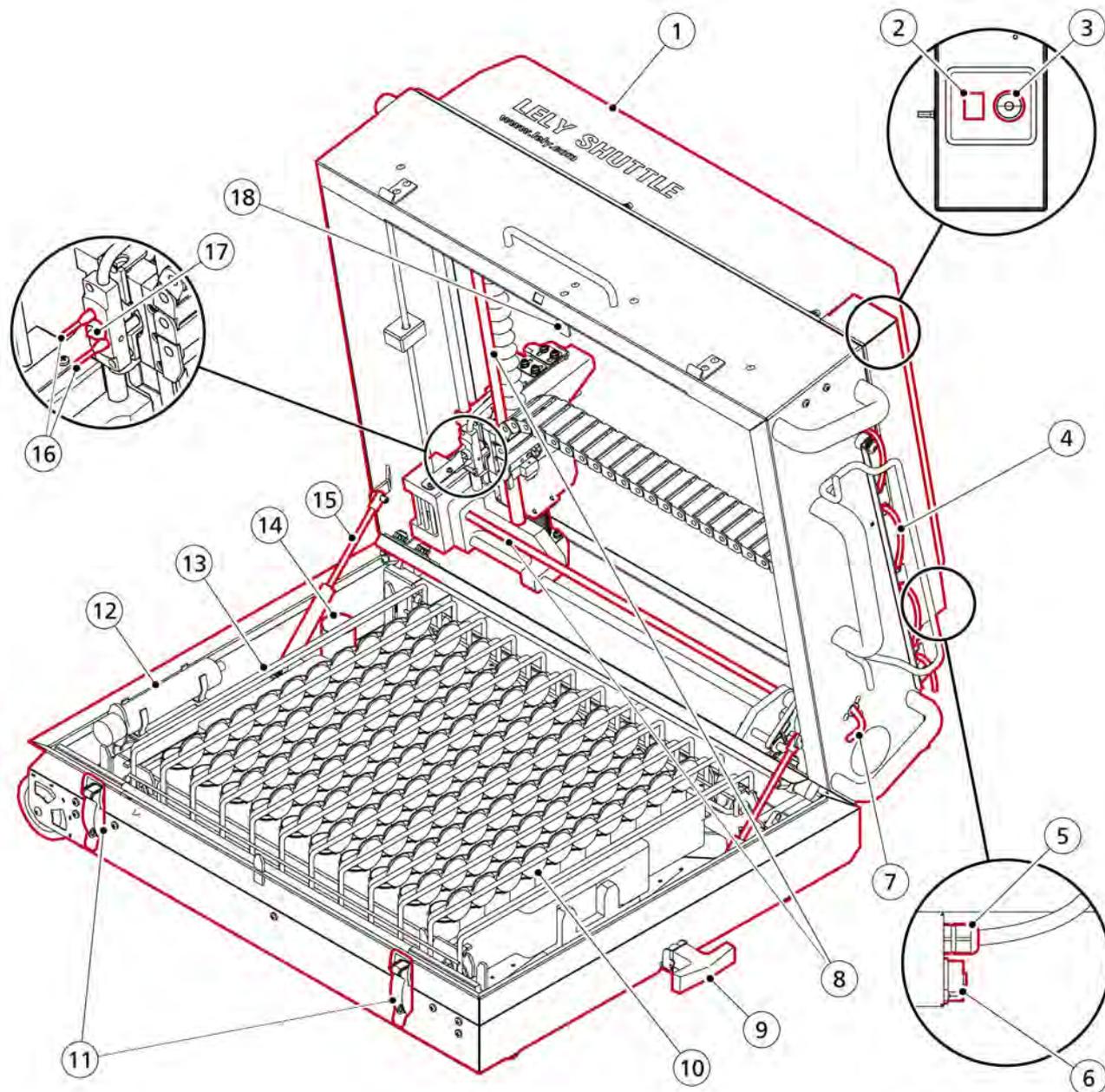
The sample box (10, fig. 3, page 4-2) is installed on the base on plastic supports. The sample box has room for ten trays with ten bottles each. An identification chip is installed on each tray. Two stainless steel racks keep the trays and the bottles in place and the lids in the correct position. The sample box can only be installed in one way in the SHUTTLE.

The milk tube connection (7) and the bleed tube strip (4) are installed on the right of the cover.

The fill unit is installed on a spindle that moves the fill head (17) from its home position on the drain (14) to the requested bottle (X and Y-axis). A spindle for the Z-axis moves the fill head up and down. The spindles are driven by an electro motor. The fill head has an electronic level sensor and a mechanical valve. The electronic level sensor has two level measure pins (16).

A syringe (12) for cleaning is installed on the base.

The operator panel is on the cover, with the CAN-bus cable (5) and the E-Link connector (6) (for service only). The operator panel has a 7-segment display (2) and a soft-button (3).



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Figure 3. Detailed overview of the SHUTTLE

KEY:

1. Cover - 2. 7-Segment display - 3. Soft button (Reset/Stop) - 4. Bleed tube, with strip - 5. CAN-bus cable - 6. E-Link connector (service only) - 7. Milk tube connection (from milking robot) - 8. Spindles - 9. Transport handle - 10. Sample box, with bottles - 11. Fasteners, with lock hole - 12. Syringe - 13. Bottle rack - 14. Drain - 15. Damper - 16. Level measure pins - 17. Fill head opening - 18. Lip

4.2 Operation

Operating conditions

The following operating conditions must be met to take milk samples:

- The SHUTTLE must be in a lower position than the milk jar
- The bleed tube strip must be in the up position and the tube end must be above the 5-kg level (11 lb) of the milk jar
- The bottle rack must be installed with sufficient empty and clean bottles
- Sampling must be enabled on the milking robot and in T4C
- The SHUTTLE must be connected to the milking robot (CAN-bus and milk hose).

Sampling

When the SHUTTLE is connected to the CAN-bus of the milking robot, it automatically switches on and a dot starts blinking on the display. The fill head moves to the home position, if necessary.

When milking of a cow starts and the milk flow is detected, the milking robot sends a signal to the SHUTTLE to move to stand-by on a specific bottle. The fill head moves to that bottle.

Halfway through the milking, and also when the milking is finished, the sampling cylinder opens and air is sucked in to mix the milk. The milk jar is emptied until there is 5 kg (11 lb) of milk in the milk jar. The sampling cylinder opens and the milk flows from the elbow through the milk hose to the fill head 5 seconds after opening, the fill head moves down into position and the milk will flow into the bottle. When the milk level has reached the level measure pins the fill head moves up and the mechanical valve in the fill head closes. The sampling cylinder closes after 20 s (this time is adjustable).

If no milk is detected (within 60 s), an attention is generated on the SHUTTLE. If no milk is detected after three attempts, an alarm is generated. The SHUTTLE continues to sample milk after an attention. The sampling stops after all alarms.

The sampling cylinder opens and vacuum is applied to the milk jar and sucks the remaining milk in the milk hose back into the milk jar. The sampling cylinder closes and the milk in the milk jar is pumped away.

Fill sequence

The fill head starts to fill the first bottle of the first tray at position 1, continues with the bottle at position 2, and so on, until the bottles of the first tray are filled. The fill head then moves to its home position to calibrate. It then continues with the first bottle of the second tray at position 11 and so on.

It is possible to let the SHUTTLE start at a different position than position 1. This is set during the setup of the sampling on the X-Link. The bottles must be installed in a row in the trays.

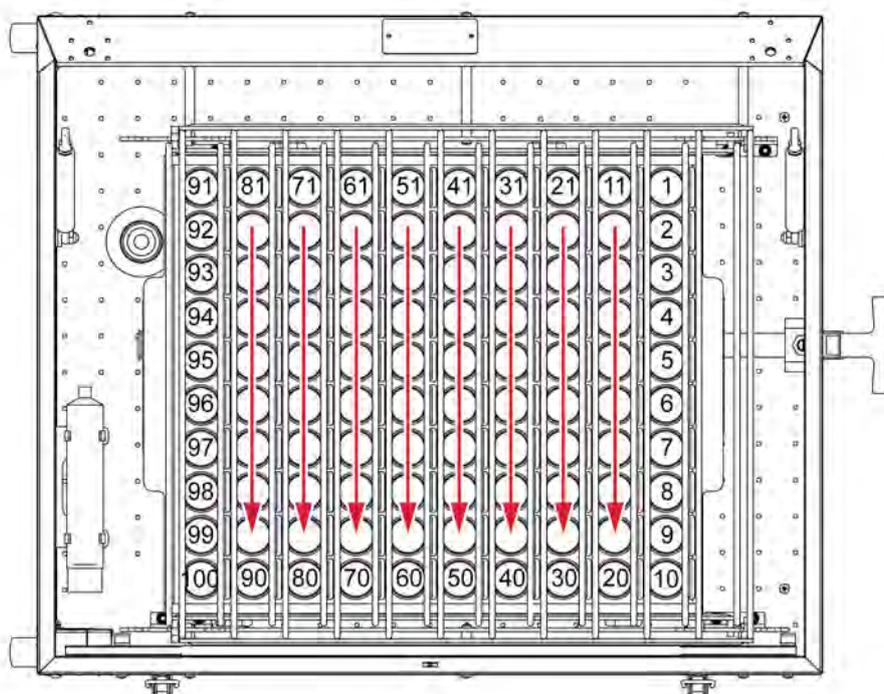


Figure 4. Fill sequence

4.3 Operator Panel

The operator panel of the SHUTTLE has the following parts:

- 7-Segment display
- Button
- Buzzer.

7-Segment display

The 7-segment display (1, fig. 5, page 4-5) indicates the status of the system.

Stop/reset button

The stop/reset button (2) stops or resets the system.

- Short push:
 - Interrupts the movement when the fill head moves
 - Resets the buzzer when it is ON.
- Long push (5 s):
 - Resets the SHUTTLE at start up and moves the fill head to the home position
 - Resets the system when the system is blocked after a malfunction.

Buzzer

The buzzer is on continuously if there is a malfunction of the system.

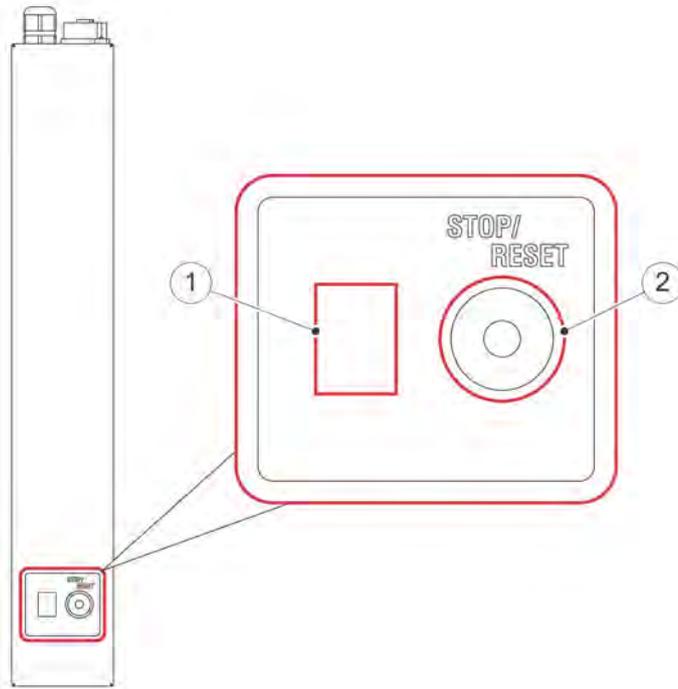


Figure 5. The user interface of the SHUTTLE

KEY:
1. 7-segment display - 2. Stop/reset button

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5. OPERATING INSTRUCTIONS

5.1 Transport the SHUTTLE

⚠ WARNING

Always lock the cover when sample bottles are in the SHUTTLE.

⚠ CAUTION

- Make sure the transport handle is fully in when you do not transport the SHUTTLE.

- Do not transport the SHUTTLE with filled sample bottles installed.

1. Make sure:
 - The milk tubes, fill head and level sensor are clean.
 - The CAN-bus cable is disconnected from the milking robot and wound on the cable bracket (2)
 - The bleed tube strip (3) is down
 - The milk tube is disconnected from the milk tube connection
 - The cover is closed.
2. Pull out the transport handle (1).
3. Use the transport handle to lift the SHUTTLE.

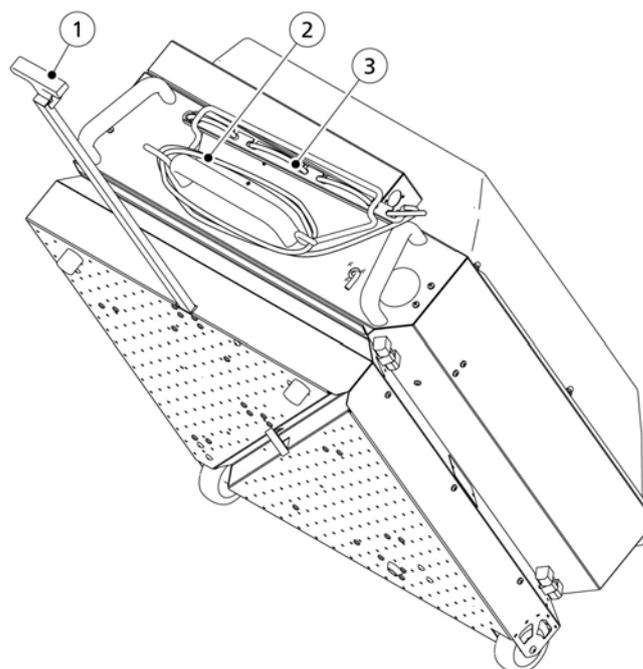


Figure 6. Transport the SHUTTLE

5.2 Connect the Sampling Device

Preparation

CAUTION

Make sure the SHUTTLE, the sampling bottles and milk tube are clean. Clean the SHUTTLE if it is not used for more than three days. See.

CAUTION

- Make sure the transport handle is fully in.
- Make sure the robot arm cannot hit you when you work on the SHUTTLE.
- Make sure the robot arm cannot hit the SHUTTLE.

CAUTION

- The maximum slope of the floor where the SHUTTLE is installed on must be not more than 5°.
- The SHUTTLE must be installed in a lower position than the milk jar.
- The bleed tube must be vertical and the top must be above the 5-kg level.

1. Position the SHUTTLE in the vicinity of the milking robot.
2. Make sure the 5 kg level (1) of the milk jar is 36 cm (14.2 in) above the floor level of the SHUTTLE (3).
3. Loosen the fasteners (11) and open the cover of the SHUTTLE.
4. Remove the cover from the sample box.

WARNING

The content of the sample box contains poisonous substances necessary to preserve the milk samples. There is a danger of damage to health when:

- ***large quantities of the preservative are inhaled***
- ***the preservative comes in contact with the skin***
- ***the preservative is swallowed.***

5. Open the lid of each bottle to 90°.

CAUTION

Do not use a not flat or bent sample box.

6. Install the sample box in the SHUTTLE base. The sample box can only be installed one way.
7. Install the first rack (1).
8. Install the second rack (2).
9. Make sure the lids are open and between the racks.

Note:

The cover can only be closed if the racks are correctly installed.

⚠ WARNING

Always lock the cover when sample bottles are in the SHUTTLE.

10. Close and lock the cover of the SHUTTLE.
If the cover can not be closed, make sure the racks are installed correctly and try again.
11. Connect the CAN-bus cable from the E-Link connector (3) on the bottom of the multiple function box.
12. Connect the milk tube to the pipe (2).
13. Put the bleed tube strip (1) in the up position.
14. Make sure the end of the bleed tube (5) is higher than the 5 kg level (1) of the milk jar.

X-Link adjustments

1. Take the milking robot out of operation. Refer to the Operator Manual of the milking robot for more information.
2. On the X-Link, select:
 - Tab [Settings]
 - [Milk procedure]
 - [Milk sampling].
3. In the field 'Rack type (max. nr. of bottles)', select button [Edit].
4. Select 'Shuttle XY'.
5. In the field 'Fill time sample bottle (Shuttle)', select button [Edit].
6. Make sure the value is '30'.



7. Select quick launch button [].
8. Tab [Sampling] is displayed.
9. In field 'Use shuttle', select button [Yes].
10. Select button [Next].
11. Select button [Open].
12. Connect the milk tube of the SHUTTLE, through the sampling cylinder, to the elbow.
For a Lely Astronaut A2 or A3 milking robot, do the following:
 1. If necessary, remove the tube from the hole in the elbow (5, fig. 11, page 5-8).
 2. Put the milk tube (2) from the SHUTTLE through the hole.
 3. Remove the stop (3).
 4. Install the connector piece (4) in the milk tube.
 5. Install the connector piece in the elbow.
13. For a Lely Astronaut A3 Next milking robot, do the following:
 1. Put the milk tube (1, fig. 12, page 5-8) through the hole (2).

2. Remove the stop (5).
 3. Install the connector piece (6) in the milk tube (4).
 4. Install the connector piece in the elbow (3).
14. Select button [Close] when the milk tube is in position.
 15. Make the applicable changes:
 1. 'Current rack number': enter the current rack number, this is usually rack 1.
 2. 'Start position': enter the position number of the first bottle.
 3. 'End position': enter the position number of the last bottle.
 16. Select button [Next].

T4C adjustments

Note:

Once activated, the sampling does not have to be deactivated in the T4C software again.

1. For a farm with T4C 1 software, do the following:
 1. Select survey tab [Farm].
 2. Select the applicable herd.
 3. Select module tab [Milking].
 4. Select button [Settings].
 5. Select worksheet tab [General].
 6. In the field 'All milkings', choose the correct option.
 7. Select worksheet tab [Post milking].
 8. In the field 'Sampling', choose the correct option.
 9. Select worksheet tab [Post milking].
 10. Select checkbox 'Sampling'.
 11. Select button [Submit].
2. For a farm with T4C 3 software, do the following:
 1. In the navigation bar, select 'Data Entry' and 'Settings'.
 2. Select tab 'Milking'.
 3. Select sub-tab 'General Milking'.
 4. Select the cell in the row for the herd or the applicable group in the column 'Sampling Method'.
 5. Select the sampling method.
 6. Select button [Save].
 7. Select sub-tab 'Post Milking'.
 8. Select the cell in the row for the herd or the applicable group in the column 'Sampling (Yes/No)'.
 9. Select 'Yes'.

10. Select button [Save].
3. Connect the CAN-bus cable from the E-Link connector (3) on the bottom of the multiple function box. A dot starts blinking on the display of the SHUTTLE.

Close-up

1. Put the milking robot in operation with the X-Link. Refer to the Operator Manual of the milking robot for more information.

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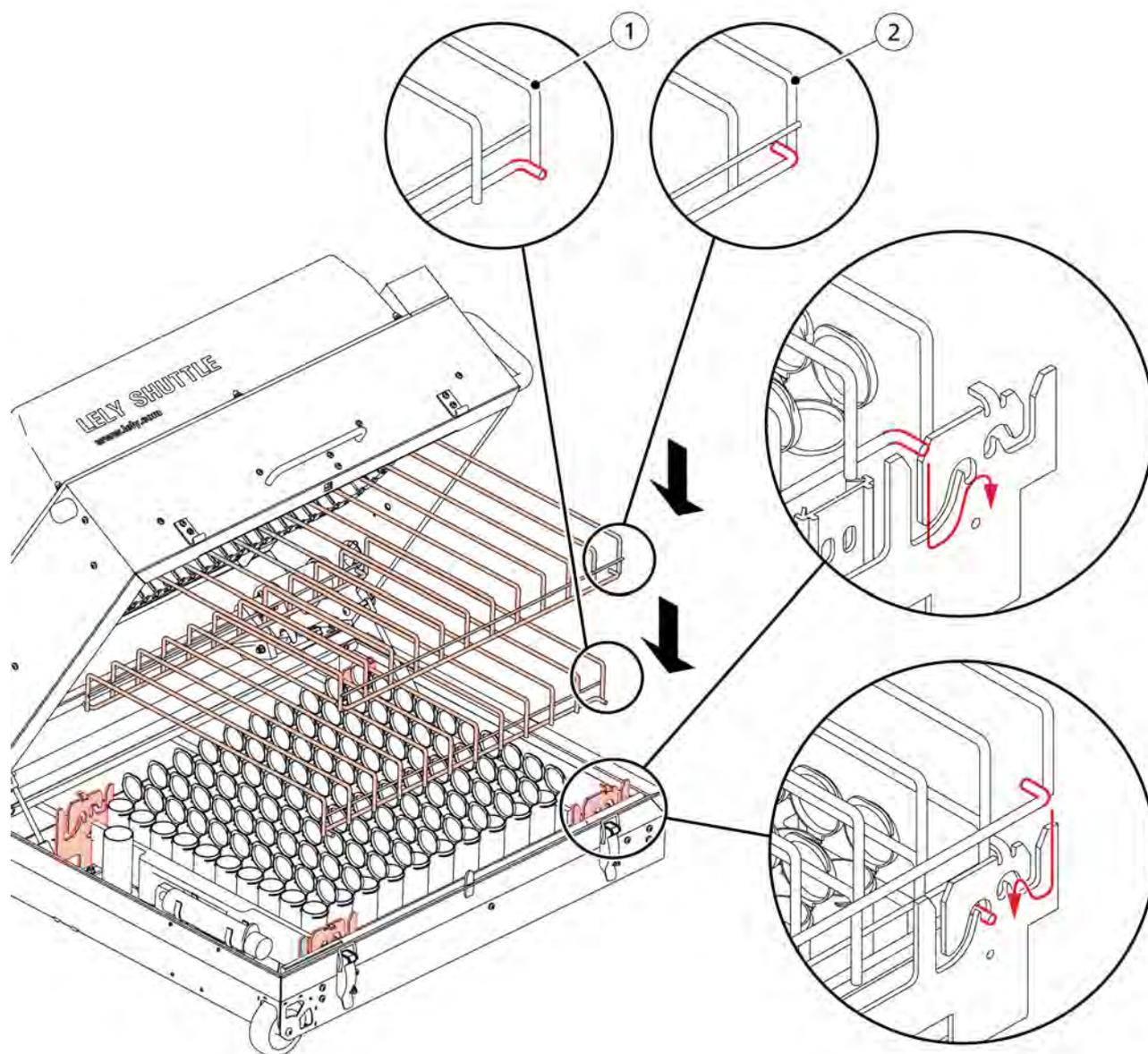


Figure 7. Install the racks and secure the lids

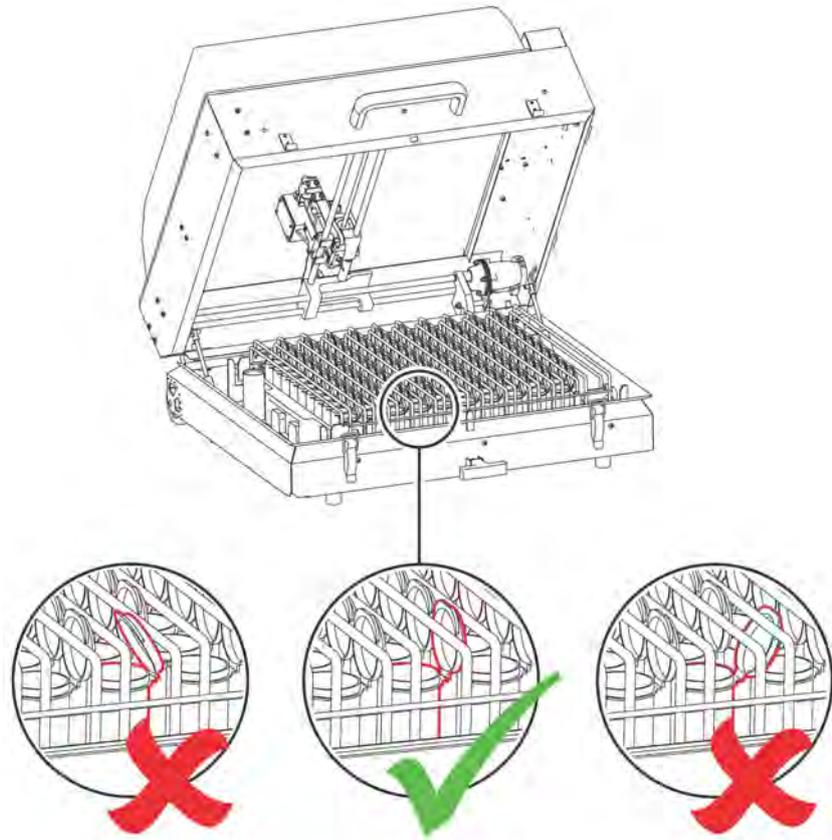


Figure 8. Opened bottle lid

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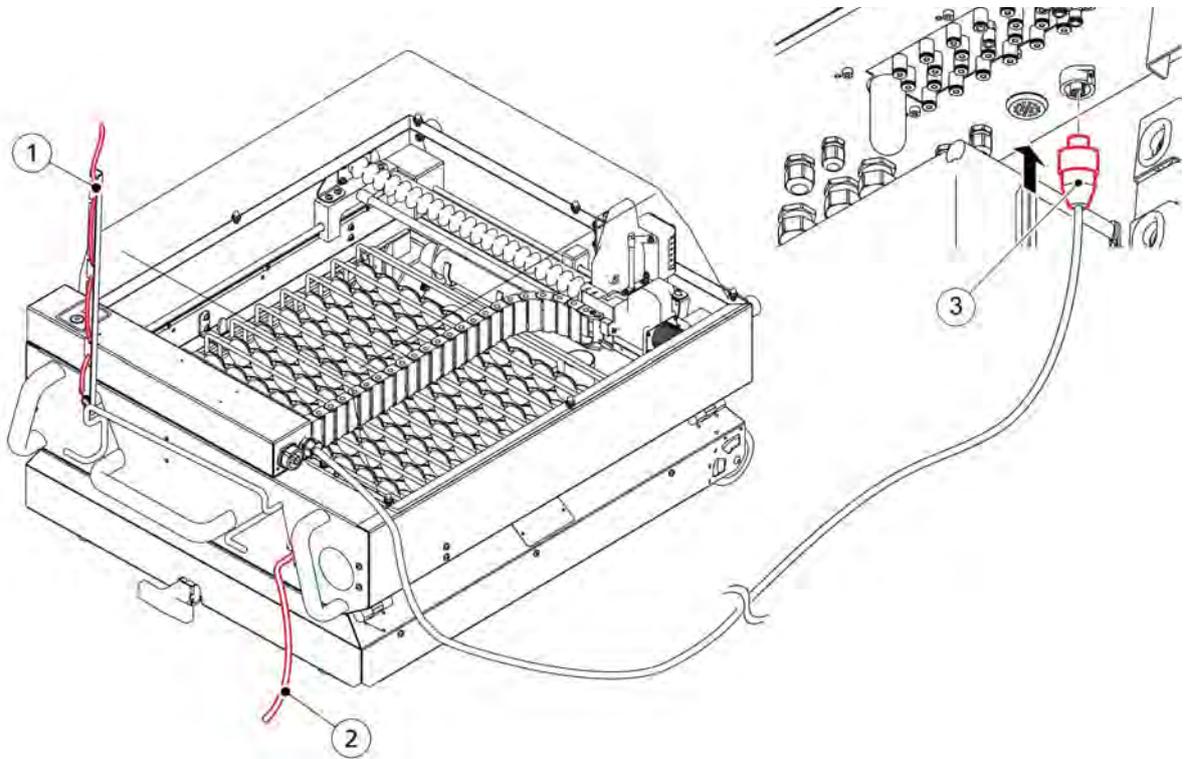


Figure 9. Make the connections

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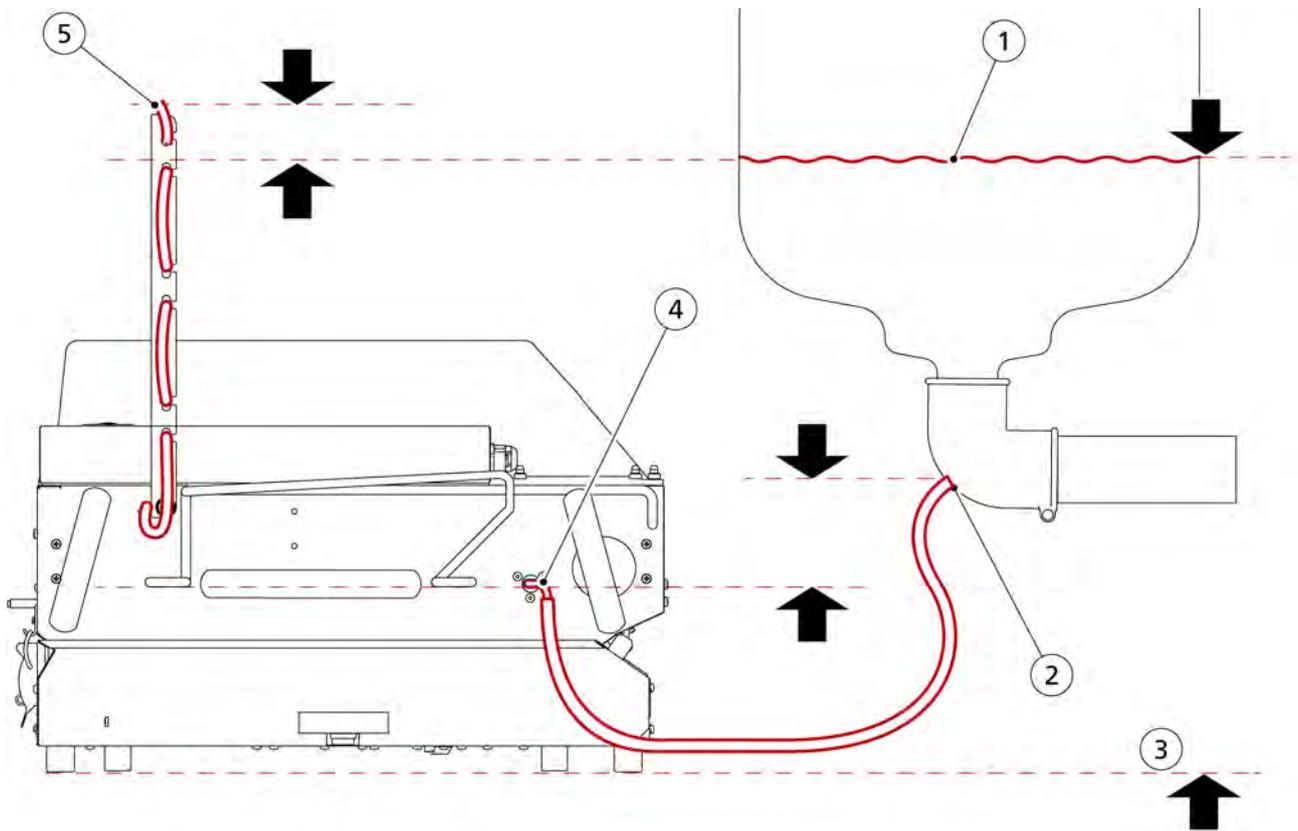


Figure 10. The milk level

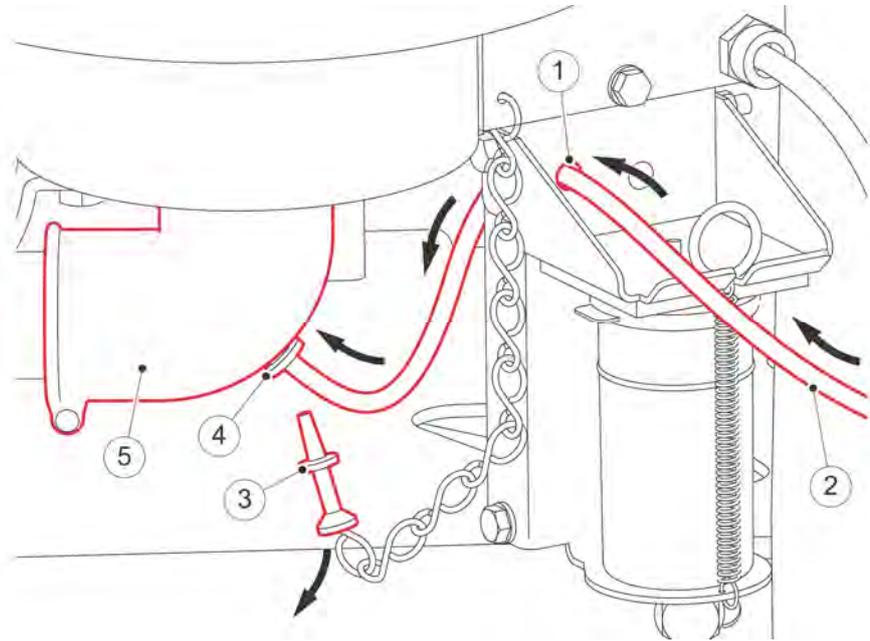


Figure 11. Connect the milk tube to an Astronaut A2 or A3 milking robot

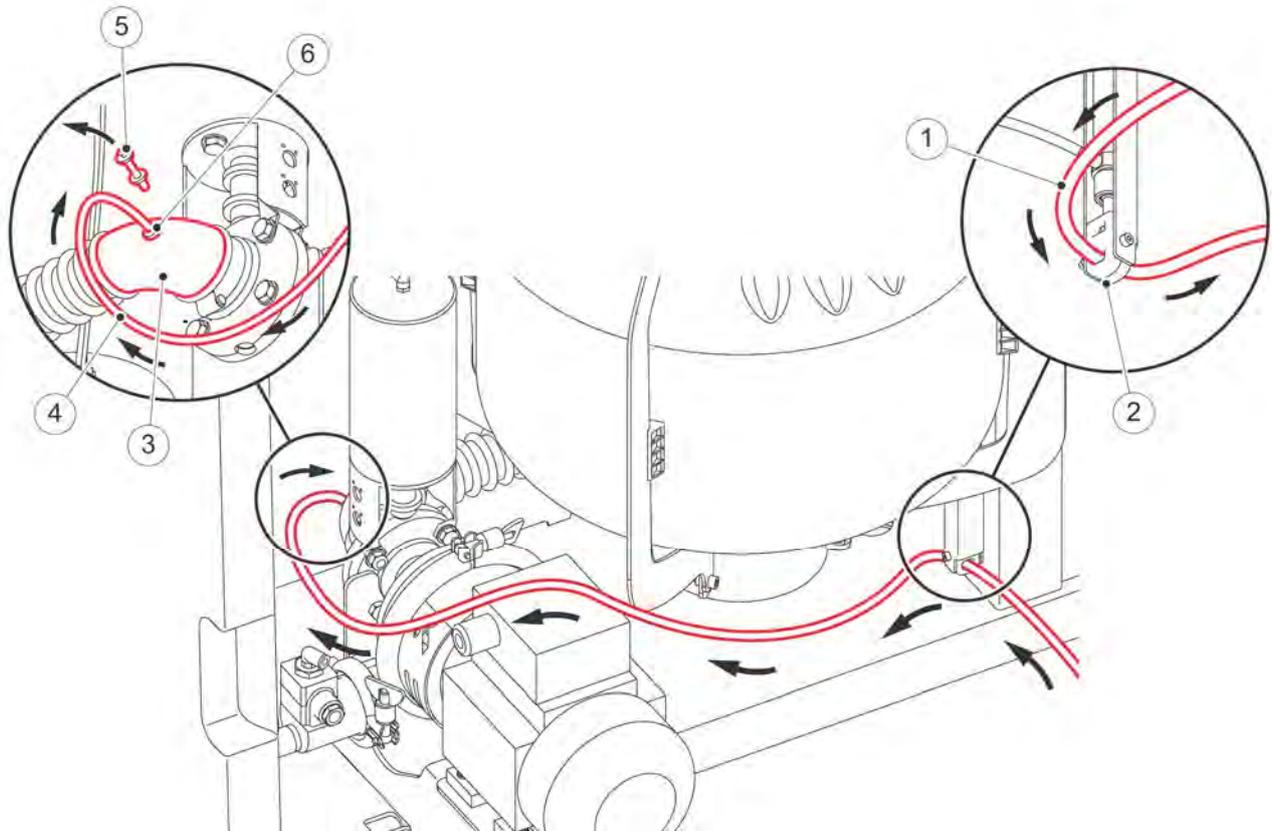


Figure 12. Connect the milk tube to an Astronaut A3 Next milking robot

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5.3 Replace the filled Bottles and Trays

Note:

The sample box, with trays and disposable bottles, is provided by CRV Nederland.

Preparation

1. Take the milking robot out of operation with the X-Link. Refer to the Operator Manual of the milking robot for more information.
2. Select tab [Sampling].
3. Select button [Change rack].

Removal

1. Loosen the fasteners (11) and open the cover of the SHUTTLE.
2. Remove the second rack (2).
3. Remove the first rack (1).
4. Close the bottles.
5. Remove the sample box from the SHUTTLE.

Installation

1. Remove the cover from the sample box.

 **WARNING**

The content of the sample box contains poisonous substances necessary to preserve the milk samples. There is a danger of damage to health when:

- large quantities of the preservative are inhaled
- the preservative comes in contact with the skin
- the preservative is swallowed.

2. Open the lid of each bottle to 90°.

 **CAUTION**

Do not use a not flat or bent sample box.

3. Install the sample box in the SHUTTLE base. The sample box can only be installed one way.
4. Install the first rack (1).
5. Install the second rack (2).
6. Make sure the lids are open and between the racks.

Note:

The cover can only be closed if the racks are correctly installed.

 **WARNING**

Always lock the cover when sample bottles are in the SHUTTLE.

7. Close and lock the cover of the SHUTTLE.
If the cover can not be closed, make sure the racks are installed correctly and try again.

Close-up

1. Put the milking robot in operation with the X-Link. Refer to the Operator Manual of the milking robot for more information.

5.4 Disconnect the Sampling Device

Preparation

1. Take the milking robot out of operation. Refer to the Operator Manual of the milking robot for more information.

X-Link adjustments

1. Select tab [Sampling].
2. Select button [Turn sampling off].
3. Select button [Stop].
4. The sampling is stopped.
5. Select button [Open].
6. Remove the milk tube from the elbow.
7. Put the stop in the elbow.
8. Remove the milk tube from the sampling cylinder.
9. Select button [Close].
10. Disconnect the CAN-bus cable from the E-Link connector on the multiple function box.

T4C adjustments

Note:

It is not necessary to disable milk sampling in T4C if more sample runs must be done in the future.

1. For a farm with T4C 1 software, do the following:
 1. Select survey tab [Farm].
 2. Select the applicable herd.
 3. Select module tab [Milking].
 4. Select button [Settings].
 5. Select worksheet tab [General].
 6. Deselect checkbox 'Sampling'.
 7. Select button [Submit].
2. For a farm with T4C 3 software, do the following:
 1. In the navigation bar, select 'Data Entry' and 'Settings'.
 2. Select tab 'Milking'.

3. Select sub-tab 'Post Milking'.
4. Select the cell in the row for the herd or the applicable group in the column 'Sampling (Yes/No)'.
5. Select 'No'.
6. Select button [Save].

Remove the bottles

1. Remove the second rack (2).
2. Remove the first rack (1).
3. Close the bottles.
4. Remove the sample box from the SHUTTLE.

Close-up

1. Put the milking robot in operation with the X-Link. Refer to the Operator Manual of the milking robot for more information.
2. Clean the SHUTTLE.
3. Remove the milk tube from the milk tube connection.

5.5 Print the List of Sample Details

5.5.1 Print the List in T4C 1

1. Select survey tab [Reports].
2. Select module tab [Milking].
3. From the tree, select 'Default reports' and 'Lely Milk Sampling'.
4. Enter the start date and time and the end date.
5. Choose the output format.
6. Select button [Make Report].
7. Depending on the output format, you must choose a location to store the file.

5.5.2 Print the List in T4C 3.0

1. In the navigation bar, select 'Analysis/Reports' and 'Reports'.
2. Select report 'Milking - Milk Sampling'.
3. Print the list.
 1. Select button [Print All] to print all cows on the list, or
 2. Select the cows to be printed and select button [Print selected] to print the selection.
4. Choose a printer from the list.
5. Select button [Print].

5.6 Calculate the 24 h Milk Yield

The total milk yield in 24 h is calculated with the formula:

- Total milk yield \times 1440 : time
 - Total milk yield: total yield of all milkings during the sampling run, denoted in kg or lb
 - 1440: 24 h in minutes, this is a fixed number
 - Time: time period from last milking prior to the sampling run to the last milking in the sampling run, denoted in minutes

To make a correct calculation, make sure:

- The last milking of the cow is successful prior to the sampling run
- The last milking of the cow is successful during the sampling run.

Milking(s) in between this period do not have to be successful.

Example

The last milking prior to the sampling run is done at 18:33 h. During the sampling run, the cow is milked at 0:46 h with a yield of 5.5 kg (12.1 lb) and at 12:47 h with a yield of 12.5 kg (27.5 lb).

The total milk yield during this sampling run is 18 kg (39.7 lb). The time period from the last milking prior to the sampling run to the last milking in the sampling run is 1094 minutes.

The formula gives a 24 h milk yield of: $18 \text{ kg} \times 1440 : 1094 = 23.7 \text{ kg}$ ($39.7 \text{ lb} \times 1440 : 1094 = 52.3 \text{ lb}$).

Incorrect calculations

An unsuccessful last milking prior to and during the sampling run gives an incorrect 24h milk yield calculation. Two examples:

An unsuccessful milking prior to the sampling run: the cow was not fully milked at the 18:33 h milking. She returns to the milking robot again at 18:48 h where she gave 7 kg (15.4 lb) of milk. The other milkings are the same. The total milk yield for the period is 25 kg.

The formula gives a 24 h milk yield of: $25 \text{ kg} \times 1440 : 1094 = 32.9 \text{ kg}$ ($55 \text{ lb} \times 1440 : 1094 = 72.5 \text{ lb}$).

This is 9.2 kg (20.2 lb) too high.

An unsuccessful milking at the last milking of the sampling run: the cow only gave 2 kg (4.4 lb) of milk at the 12:47 h milking. The total milk yield for the period is 7.5 kg (16.5 lb).

The formula gives a 24 h milk yield of: $7.5 \text{ kg} \times 1440 : 1094 = 9.9 \text{ kg}$ ($16.5 \text{ kg} \times 1440 : 1094 = 21.8 \text{ lb}$).

This is 16.2 kg (35.7 lb) too low.

6. MAINTENANCE

6.1 Clean the SHUTTLE

Special Tools

- Bucket with cold water
- Bucket with warm water
- Teeth brush (or comparable brush)
- Sponge
- Alkaline cleaning agent, for example soap

Preparation

Note:

The SHUTTLE must be cleaned after each sampling to avoid pollution and to ensure uncomplicated operation.

1. Make sure the fill head is not in a bottle (the 'up' position).
2. If the fill head is in a bottle, disconnect the CAN-bus cable from the E-Link connector on the bottom of the multiple function box and connect it again.
The fill head goes to the 'up' position.
3. Disconnect the CAN-bus cable from the E-Link connector on the bottom of the multiple function box.
4. Loosen the fasteners (11) and open the cover of the SHUTTLE.
5. Remove the second rack (2).
6. Remove the first rack (1).
7. Close the bottles.
8. Remove the sample box from the SHUTTLE.
9. Find the syringe (12) that is attached to the lower side of the SHUTTLE.
10. Disconnect the milk tube from the elbow.

Flush and clean the tubes and the fill head

1. Use the syringe to flush the internal parts of the SHUTTLE with cold water:
 1. Install the syringe (3) in the milk tube (2).
 2. Flush the milk tube and the fill head (4), while you push up and release the bottom side of the fill head to close and open the valve.
 3. Flush the milk tube and the fill head again.
 4. Remove the syringe from the milk tube and install it in the bleed tube (1).
 5. Flush the bleed tube.

6. Clean the fill head (4), the valve on the fill head (inside and outside) and the level sensors (5) with the brush (6).
2. Repeat flushing and cleaning procedure with warm water and the alkaline cleaning agent.
3. Repeat flushing and cleaning procedure with clean, cold water.
4. Repeat flushing and cleaning procedure with clean, cold water to make sure all of the cleaning agent is removed.

Clean the case



Make sure you do not wet the spindles and electrical parts.

1. Carefully clean the outside and the inside of the SHUTTLE with a sponge and cold or luke warm water.

Close-up

1. Install the syringe on its bracket in the SHUTTLE.
2. Install the sample box in the SHUTTLE.
3. Install the racks.
4. Close the cover and fasteners.

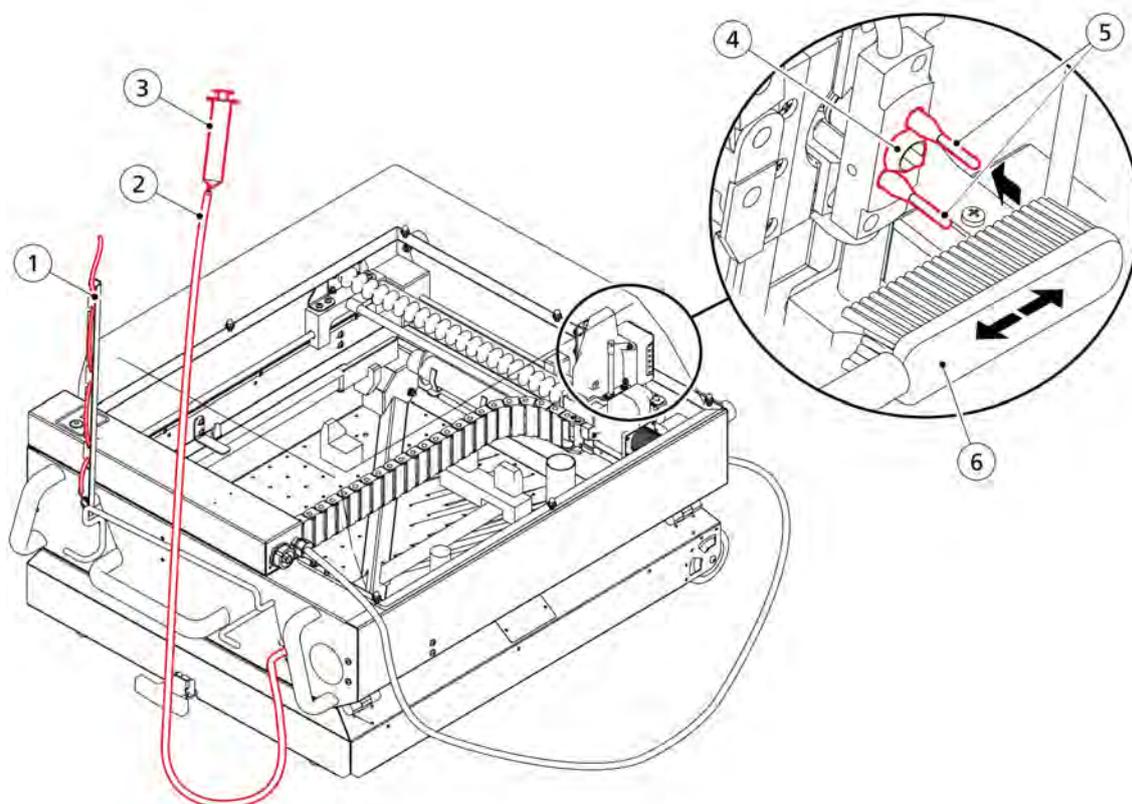


Figure 13. Clean the milk tube, bleed tube, inner parts and fill head

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7. TEST AND ADJUSTMENT

The SHUTTLE must be tested each year to make sure the fill head moves down to each bottle in the correct position with the level measure pins in the bottle. If not all bottles are filled correctly, the SHUTTLE must be calibrated.

Note:

This information is for Service Technicians.

7.1 Preparation

Special Tools

- E-Link Manual Controller

Preparation

1. Remove the cover from the sample box.

⚠ WARNING

The content of the sample box contains poisonous substances necessary to preserve the milk samples. There is a danger of damage to health when:

- large quantities of the preservative are inhaled
- the preservative comes in contact with the skin
- the preservative is swallowed.

2. Open the lid of each bottle to 90°.

⚠ CAUTION

Do not use a not flat or bent sample box.

3. Install the sample box in the SHUTTLE base. The sample box can only be installed one way.
4. Install the first rack (1).
5. Install the second rack (2).
6. Make sure the lids are open and between the racks.

Note:

The cover can only be closed if the racks are correctly installed.

⚠ WARNING

Always lock the cover when sample bottles are in the SHUTTLE.

7. Close and lock the cover of the SHUTTLE.
If the cover can not be closed, make sure the racks are installed correctly and try again.

Connect the E-Link and Start-up

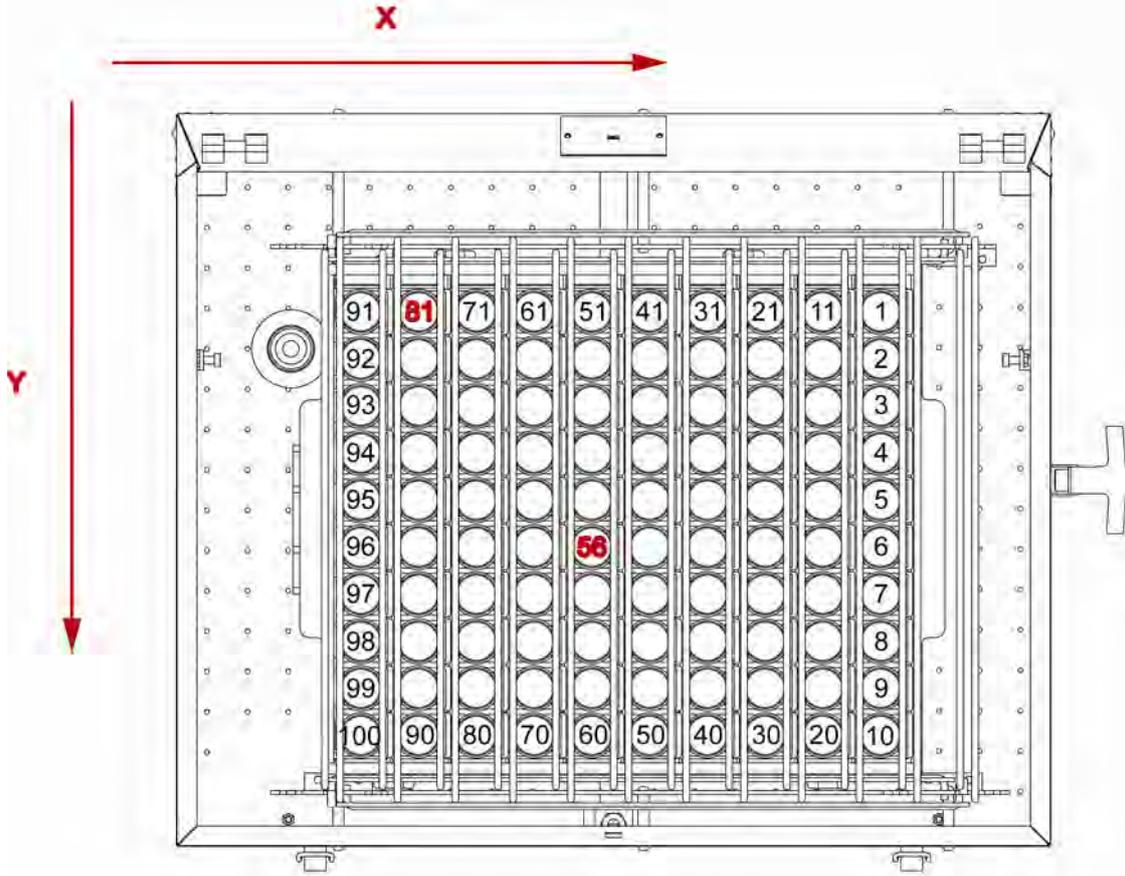
1. Connect the E-Link manual controller to the E-Link connector on the SHUTTLE.
2. Push the middle soft button and hold it.
3. Connect the CAN-bus cable from the E-Link connector (3) on the bottom of the multiple function box.
A dot starts blinking on the display of the SHUTTLE.
4. Release the middle soft button on the E-Link.
5. Select the menu 'Application' and push [].
6. Remove the CAN-bus cable to the E-Link connector at the bottom of the multiple function box and connect it again.
The E-Link displays the application menu.

7.2 Test the SHUTTLE

1. On the E-Link, select the menu '###Test menu', 'Go to position'.
2. Use buttons [] and [] to select position 81 and push [].
3. Make sure the level measure pins are in the bottle.
4. If the measure pins are not in the bottle:
 1. Remove the CAN-bus cable to the E-Link connector on the multiple function box and connect it again.
 2. Do the calibration procedure (page 7-2).
 3. Repeat the test procedure.
5. Remove the E-Link.

7.3 Calibrate the SHUTTLE

1. On the E-Link, select the menu 'Settings menu', 'Set the offset'.
The fill head moves to the calibration position (position 56).
2. Move the fill head to a position exactly above the bottle 56 with the soft buttons [x] and [y].
3. Move the fill head into the bottle 56 with the soft button [z].
4. Make sure both level measure pins are in the bottle.
5. Push [] two times.
The fill head moves to the home position.
6. Move the fill head into the bottle 0 with the soft button [z].
7. Make sure both level measure pins are in the bottle.
8. Push [] two times.



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Figure 14. Calibration positions



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8. TROUBLESHOOTING

8.1 Attention Codes

The table shows the attention codes. The attention codes are only visible for a few seconds. The attention codes, plus the time when they appeared, are stored in the SHUTTLE and can be read with the E-Link controller for service.

Code	Description	Result	Reason	Action
A	The bottle could not be filled within 60 s after the fill command	A time-out is generated. The sampling process will continue as normal	The milk tube is not connected (correctly)	Examine the milk tube and the milk tube connections
			The sampling cylinder does not work correctly	Examine the sampling cylinder
			The SHUTTLE is not positioned correctly	Make sure the position and the height of the SHUTTLE is correct. See.
b	The fill head could not move down (Z-axis) or could not reach the lowest position	The sampling process will continue as normal	The lid of the bottle to be filled is not fully open	The lid must be between the casings. See .
			The bottle to be filled is not installed correctly	Make sure the bottle is correctly installed
			The rack is not straight or bent	Replace the rack with a straight one
			The cover of the SHUTTLE is not closed correctly	Make sure the cover is correctly closed.
d	The fill head did not reach the requested bottle before the fill command was given	The sampling process will continue as normal	The spindle is dirty	Clean the spindle with a clean, soft towel If the attention remains, call your local service provider
			The movement of the fill head is obstructed	Make sure the fill head can move freely
			The milk time of the milked cow is too short	No milk sample is taken during this milking. The next time the cow is milked a new attempt is made

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Code	Description	Result	Reason	Action
2	Three times three bottles could not be filled within 60 s after the fill command	A time-out is generated. The sampling process will continue as normal	The milk tube is not connected (correctly)	No action to be taken
			The sampling cylinder does not work correctly	No action to be taken
			The SHUTTLE is not positioned correctly	No action to be taken
8	No communication signal from the milking robot to the SHUTTLE	The sampling process stops	The SHUTTLE is not activated on the X-Link. See .	No action to be taken
			The CAN-bus cable has defective contacts or wires	No action to be taken
			The CAN-bus connector on the milking robot has defective contacts	No action to be taken

8.2 Alarm Codes

The table shows the alarm codes displayed on the 7-segment display.

Code	Description	Result	Reason	Action
1	The fill head cannot move up (Z-axis) (after a bottle has been filled)	The sampling process stops	The fill head is obstructed	Push the button [STOP/RESET] for a short time.
2	Three times three bottles could not be filled within 60 s after the fill command	A time-out is generated. The sampling process will continue as normal	The milk tube is not connected (correctly)	Examine the milk tube and the milk tube connections
			The sampling cylinder does not work correctly	No action to be taken
			The SHUTTLE is not positioned correctly	No action to be taken
3	Calibration of the X-axis failed	The sampling process stops	The spindle of the X-axis is obstructed	Push the button [STOP/RESET] for a short time. Remove the obstruction
4	Calibration of the Y-axis failed	The sampling process stops	The spindle of the Y-axis is obstructed	Push the button [STOP/RESET] for a short time. Remove the obstruction

Code	Description	Result	Reason	Action
5	The fill head could not move down (Z-axis) or could not reach the lowest position three times	The sampling process stops	The lid of the bottle to be filled is not fully open	<ol style="list-style-type: none"> 1. Push the button [STOP/RESET] for a short time. 2. Make sure the lid is between the racks 3. Push and hold button [STOP/RESET] for more than 5 s.
			The bottle to be filled is not installed correctly	<ol style="list-style-type: none"> 1. Push the button [STOP/RESET] for a short time. 2. Make sure all bottles are installed correctly 3. Push and hold button [STOP/RESET] for more than 5 s.
			The rack is not straight or bent	<ol style="list-style-type: none"> 1. Push the button [STOP/RESET] for a short time. 2. Make sure the rack is undamaged. 3. Push and hold button [STOP/RESET] for more than 5 s.
			The cover of the SHUTTLE is not closed correctly	<ol style="list-style-type: none"> 1. Push the button [STOP/RESET] for a short time. 2. Close the cover of the SHUTTLE 3. Push and hold button [STOP/RESET] for more than 5 s.
			The racks are not positioned correctly	Make sure the racks are positioned correctly
6	The controller does not get feedback from the X-axis motor	The sampling process stops	The rotation sensor (encoder) is broken	<ol style="list-style-type: none"> 1. Push the button [STOP/RESET] for a short time. 2. Turn the spindle manually, very slowly (approx. 1 revolution in 2 s) 3. Push and hold button [STOP/RESET] for more than 5 s. 4. Make sure the fill head moves to the home position.
			The fill unit is stuck	<ol style="list-style-type: none"> 1. Push the button [STOP/RESET] for a short time. 2. Turn the spindle manually, very slowly

Code	Description	Result	Reason	Action
				<p>(approx. 1 revolution in 2 s)</p> <ol style="list-style-type: none"> 3. Push and hold button [STOP/RESET] for more than 5 s. 4. Make sure the fill head moves to the home position. 5. If the alarm remains, call your local service provider
7	The controller does not get feedback from the Y-axis motor	The sampling process stops	The rotation sensor (encoder) is broken	<ol style="list-style-type: none"> 1. Push the button [STOP/RESET] for a short time. 2. Turn the spindle manually, very slowly (approx. 1 revolution in 2 s) 3. Push and hold button [STOP/RESET] for more than 5 s. 4. Make sure the fill head moves to the home position. 5. If the alarm remains, call your local service provider
			The fill unit is stuck	<ol style="list-style-type: none"> 1. Push the button [STOP/RESET] for a short time. 2. Turn the spindle manually, very slowly (approx. 1 revolution in 2 s) 3. Push and hold button [STOP/RESET] for more than 5 s. 4. Make sure the fill head moves to the home position.
8	No communication signal from the milking robot to the SHUTTLE	The sampling process stops	The SHUTTLE is not activated on the X-Link. See .	Push the button [STOP/RESET] for a short time.
			The CAN-bus cable has defective contacts or wires	Push the button [STOP/RESET] for a short time.
			The CAN-bus connector on the milking robot has defective contacts	Push the button [STOP/RESET] for a short time.

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Code	Description	Result	Reason	Action
C	Electrical current required by the X-axis and/or Y-axis motor is too high	The sampling process will continue as normal	The spindle is dirty	Clean the spindle with a clean, soft towel If the alarm remains, call your local service provider
			The movement of the fill head is obstructed	Make sure the fill head can move freely
			The milk time of the milked cow is too short	No milk sample is taken during this milking. The next time the cow is milked a new attempt is made

8.3 Reset an Alarm

1. Push the button [STOP/RESET] for a short time..
2. Make sure the alarm code disappears and the dot starts blinking.
3. Make sure the buzzer stops.

8.4 Reset the SHUTTLE



All actions are stopped when you do this procedure.

1. Push and hold button [STOP/RESET] for more than 5 s.
2. Make sure the SHUTTLE resets and the fill head moves to the home position.



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9. DIAGRAM

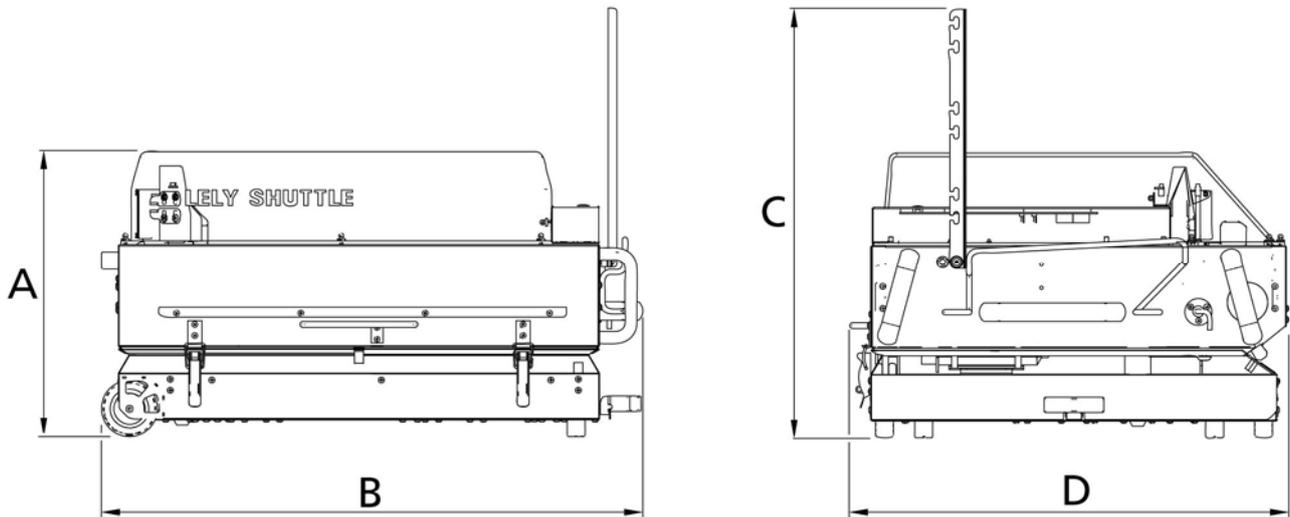


Figure 15. Dimensions

- A: 38.5 cm (15.2 in)
- B: 72.6 cm (28.6 in)
- C: 57.8 cm (22.8 in)
- D: 58.5 cm (23.0 in)

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GLOSSARY OF TERMS

approx: approximately

Astronaut: Lely Astronaut milking robot

cm: centimeter

EU: European Union

gal: gallon

h: hour

in: inch

kg: kilogram

lb: pound

LED: Light Emitting Diode

m: metre

s

s: second(s)

T4C: Lely Time For Cows Farm Management Software

V: Volt



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Technical update

Title	ICAR approval
Subject	Technical update ICAR approved Shuttle XY
Date	21-Jul-14
Auteur	A.Breevaart

1 Introduction

The milk recording device Shuttle XY is tested for a period of time resulting in ICAR approval. The approval is applicable for the Shuttle XY on all Astronaut milking robots. Some modifications are required to comply to the ICAR standard. Resulting in better mixing of the milk in the milk jar, reducing cleaning water remaining and ensuring minimal carry-over during sampling.

This document will describe required modifications to comply to ICAR and will be a guideline for correct sampling.

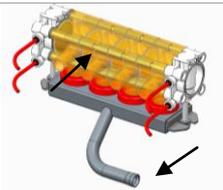
2 ICAR update matrix

Required modifications can be found in the update matrix and will be explained below.

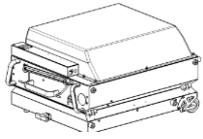
Modifications are required to comply to ICAR

Y= needs update

N/A = Not applicable, no update is required.

#	Img.	Part / Process / Setting	Description	Robot A2-A3	Robot A3N	Robot A4
1		9.1065.0074.2 (100m) Silicone tube	Inner diameter to 4mm Max. length of sample tube 1meter.	Y	Y	Y: SN <3170637 (4/10/'13) N/A: for newer models
2		5.1004.1615.0 Connection nipple	Inner diameter to 4mm	Y	Y	Y: SN <3170637 (4/10/'13) N/A: for newer models
3		5.1004.0226.0 Milk manifold / Pre-milk manifold	bigger drain holes, 10.5mm (inside) bigger drain pipe inside to 12mm	N/A	N/A	Y: SN <3157694 (5/3/'13) N/A: For newer models
4		222158 Six-fold tube	bigger inner diameter of PRE drain 6-folded tube 14mm	N/A	N/A	Y: SN <3161129 (19/4/'13) N/A: For newer models
5		5.1001.6659.0 Nipple (2x)	Bigger connector pipe of drain tube. Inner diameter increased, 13mm	N/A	N/A	Y: SN <3161129 (19/4/'13) N/A: For newer models
6		9.1185.0013.3 (30m) Tube (2x)	Bigger inner diameter (14mm) drain tube at separator	N/A	N/A	Y: SN <3161129 (19/4/'13) N/A: For newer models
7		Robot Software 4.1 or newer	Version with improved sampling process A3N and A4 and longer addition pumping time A2 for data communication with Shuttle XY	Y Latest A2 Version	Y	Y



-		Shuttle XY	Shuttles will be updated with improved fill head and pins. Exchanged in the factory organized by CRV. List of updated Shuttles is available on request.	-	-	-
---	---	------------	---	---	---	---

So the A2, A3 and A3N only need a sample nipple, tube and software update to comply to ICAR. The 'older' types of A4 need to be updated with multiple modifications.

3 Modifications

3.1 Sample tube improvement #1,2

The inner diameter of the sample tube and nipple is changed to 4 mm. The bigger inner diameter will result in more effective mixing end of milking and slightly improve fill time of the bottle. See #1 and 2 in the ICAR update matrix.

3.2 Water remaining improvements #3-7

A little amount of water remains during cleaning cycles. Water will remain in edges, tubes and parts. The amount of water will influence the freezing point and is found critical on the A4 robot due to new milk pump system. Additional water collected in the stainless steel tube under the milk jar before the milk pump will influence the mixing of the total.

The milk manifold, pre-milk, 6-fold tube, nipples and tubes are changed. Also the drain cycle during the Lely wash is improved in Robot software version 3.0 SR2. See #3-7 in the ICAR update matrix

[How to replace the parts can be found in the A4 service manual.](#)

3.3 Software update #7

The software is changed in different versions, each version is explained below.

Version 3.0 SR2 (09-2013): A3N and A4

Together with the hardware changes, the water remaining during the Lely Wash is negligible.

The software will use an optimized drain cycle during the Lely wash, timing and vacuum level are improved.

Version 3.0 SR4 (01-2014): A3N and A4

End mixing in milk jar is improved. Longer more effective mixing end of milking.

Version 4.1 (05-2014) : A3N and A4

To ensure the milk jar doesn't consist milk from the previous cow, the software is changed:

1. Longer pumping time during sampling process. Will ensure empty jar after milking
2. When sample process is activated on the Robot, one pump stroke will be executed.
3. When sample process is activated on the robot during milking, pump time is added to ensure empty milk jar. But sample will be taken next milking.

The A2 Robots requires an extra 7 pins connector and the latest software version to communication with Shuttle XY.



4 Guideline for correct sampling

Handling of the Shuttle

- Maximum slope of the floor where the SHUTTLE is installed: 3° If not the level is to high detection full sample bottle.
- Floor level where the SHUTTLE is installed: 36 cm-150 cm below the 5-kg level of the milk jar.
- Do not move the Shuttle during sampling. Close all caps of the vials before moving. A small drop spilled on the edge of the vial can have big influence on the fat percentage.

Operating of Shuttle / Robot

- Use operator manual [the operator manual](#) chapter
- Clean the measuring pins of the fill head before sampling with a decriaser, like Astri-TDS.
- Check correct function of fill head Shuttle XY. Milk of previous cow is flushed passing the fill head passing the loop to the antenna and must not flow back into the sample bottle. Little backflow is allowed, approx. 2 cm backflow during filling of the vial.
- Vials must not be filled until the top, about 0.5 cm of air is required for good mixing preservative and fat content in labrotory
- Always check sharp bend in sample tubing. This can block the flow.
- During end mixing (bubbling) the vacuum level should be reaching 48 kPa for at least 10 sec.
- Check water leakage on top of the milkjar during 1 milking, some drops are allowed
- End of sampling the milk must complely pumped away. No milk remainings are allowed, this will influence next sample. The influence of milk foam is allowed.

Correct Settings

- Type of Rack = Shuttle XY, Fill time = 30 seconds
- Air pressure Shutt-off sleeves Air pressure setting at 2.0 bar. Should not leak (to be tested)
- Check CU settings for optimal performance during cleaning (lely wash):
 - o Air pressure setting = min. 6.2bar
 - o Air pressure Blow empty = 4 bar
 - o Water pressure reducer setting = installation manual A3 A4 2 – 4 bar

Trouble shooting can be found in [the operator manual](#) chapter 8 and make use of the trouble shooting card

Code	Omschrijving	Waar	Oplossing	Andere toelichting	Andere instructies
1	Volgt een fout bericht van de Shuttle XY op de computer of het veld van de Shuttle XY.	De Shuttle XY	De Shuttle XY is niet correct geïnstalleerd. De Shuttle XY is niet correct geïnstalleerd.	Controleer de installatie van de Shuttle XY. Controleer de installatie van de Shuttle XY.	Controleer of de Shuttle XY is geïnstalleerd op de juiste plaats. Controleer of de Shuttle XY is geïnstalleerd op de juiste plaats. Controleer of de Shuttle XY is geïnstalleerd op de juiste plaats. Controleer of de Shuttle XY is geïnstalleerd op de juiste plaats. Controleer of de Shuttle XY is geïnstalleerd op de juiste plaats.
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4	De Shuttle XY is niet correct geïnstalleerd op de computer of het veld van de Shuttle XY.	De Shuttle XY	De Shuttle XY is niet correct geïnstalleerd. De Shuttle XY is niet correct geïnstalleerd.	Controleer de installatie van de Shuttle XY. Controleer de installatie van de Shuttle XY.	Controleer of de Shuttle XY is geïnstalleerd op de juiste plaats. Controleer of de Shuttle XY is geïnstalleerd op de juiste plaats. Controleer of de Shuttle XY is geïnstalleerd op de juiste plaats. Controleer of de Shuttle XY is geïnstalleerd op de juiste plaats. Controleer of de Shuttle XY is geïnstalleerd op de juiste plaats.