



**HIGH - TECH
IN AGRICULTURE**



M-HE.003.0605

**LELY INDUSTRIES N.V.
DAIRY EQUIPMENT**

SHUTTLE SAMPLING DEVICE

Operator's manual
(translation of the original instructions)



SHUTTLE

Operator's manual



Mhe003-c (amendment 2)

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List of included amendments

Amendment	Date (mm/yy)	Chapter(s)	Remarks
Basic	04/02	All	Changed construction
1	09/02		Amendment to drawing of NRS rack
2	06/05	Safety decals	Added decal "Spraying with water prohibited"
	06/05	1	Added chilled tray (optional)



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Safety

The symbol **ATTENTION; DANGER!** Means:

WARNING! TAKE CARE! OUR SAFETY IS AT RISK!

The safety symbol draws your attention to important safety warnings on your Shuttle milk sampling device and in the manual. Wherever you see this symbol, take special care to avoid the risk of (fatal) bodily injury. Heed the instructions on every safety decal.



SIGNAL WORDS

Note the use of the signal words **WARNING** and **CAUTION** in the safety notices. The signal words beside each notice have the following meanings:



- *Indicates a highly hazardous situation with the risk of serious injury or death, if the instructions are not followed.*



- **Indicates a potentially hazardous situation with the risk of serious injury or death, if the instructions are not followed, and includes hazards that may arise from removal of safety features.**



- *Indicates a situation with a risk of light bodily injury or damage to product or property, if the instructions are not followed.*

NOTE

- *This indicates helpful additional information.*

SAFETY INSTRUCTIONS

YOU are responsible for the **SAFE** operation and maintenance of your Shuttle milk sampling device. **YOU** must ensure that you and anyone else who will operate, maintain or in any way come in contact with the system, are all familiar with the operating and maintenance procedures and related **SAFETY** information in this manual. This manual will guide you step by step in the use of the Shuttle sampling device in your daily work, and make you aware of all the necessary measures for its safe operation.

Remember: **YOU** are the key to safety. Safety measures protect not only yourself, but also the people around you. Make these measures part of your daily routine. Make sure that **EVERYONE** operating this appliance is familiar with the recommended procedures and heeds all safety measures. Remember: most accidents can be prevented. Take no unnecessary risks; safety is a serious matter.

- The owner of the Shuttle milk sampling device must instruct his employees or any other person using the appliance on its use, before giving permission to use it for the first time; this knowledge should then be refreshed once a year.
- The most essential safety measure is the proper safety awareness of the person using the appliance. It is the operator's responsibility to read, understand and follow ALL safety and operating instructions in this manual. Most accidents can be avoided.
- A person who has not read and understood all operating and safety instructions is not qualified to operate this appliance. An untrained operator exposes himself and bystanders to the risk of serious injury or death.
- It is prohibited to modify the Shuttle milk sampling device in any way whatsoever. Unauthorized modifications may impair the operation and/or the safety and service life of the appliance, and may also endanger the operator and bystanders.
- Use only genuine parts, and have them installed by a qualified technician, if the necessary instructions are not available.
- Think SAFETY! Work SAFELY!

GENERAL SAFETY

- Before you supply power to the sampling device, or operate, maintain or adjust the unit, first carefully read the manual and become familiar with all safety notices.
- Only authorised and properly trained persons should be permitted to operate the Shuttle milk sampling device. An untrained operator is not qualified to operate this system.
- Have a first aid kit close at hand for use in accidents. Make sure it is visible and accessible without delay.
- Have a fire extinguisher close at hand. Make sure it is visible and accessible without delay.
- Before operating the machine, first install all supplied safety features and ensure that these are fitted and functioning as intended (mechanically and electrically).
- Wear appropriate protective clothing.
- SWITCH the appliance OFF, and completely shut off the air supply if present, before doing any servicing, maintenance, adjustment, repair, or cleaning.
- Always have the telephone number of the nearest medical centre close at hand.
- Contact your nearest Lely service provider if you have any questions.
- Hold a regular (annual) safety review with all persons who work with the Shuttle milk sampling device.

SAFE OPERATION

- Before you supply power to the sampling device, or operate, maintain or adjust the unit, first carefully read the manual and become familiar with all safety notices.
- Only authorised and properly trained persons should be permitted to operate the Shuttle milk sampling device. It is prohibited for untrained persons to operate this appliance.
- The Shuttle milk sampling device may be used solely for the purpose for which it was designed.
- SWITCH the appliance OFF, and completely shut off the air supply if present, before doing any servicing, maintenance, adjustment, repair, or cleaning.
- Before operating the machine, first install all supplied safety features and ensure that these are fitted and functioning as intended (mechanically and electrically).
- Keep hands, feet and hair away from moving parts.



- Contact your nearest Lely service provider if you have any questions.
- Hold a regular (annual) safety review with all persons who work with the Shuttle milk sampling device.

INSTALLATION SAFETY

- Read and observe the instructions in the manual. By choosing the correct place to install the appliance in your barn, and mounting it securely, you will reduce the risk of mechanical errors.
- When applicable, before connecting power to the appliance, take steps to ensure that the power supplied is adequate, and has the correct voltage, phase and frequency (see also the details on the rating plate).
- When applicable, have a qualified electrician verify that the power supply to your Shuttle sampling device is in order.
- Ensure that the grounding of the electrical system conforms to local regulations or standards that may be in force.

MAINTENANCE SAFETY

- Study all information in the manual covering operation, servicing and adjustment of the Shuttle sampling device; make sure you thoroughly understand it.
- If necessary, SWITCH the appliance OFF, and completely shut off the air supply if present, before doing any servicing, maintenance, adjustment, repair, or cleaning.
- Once you have completed your servicing, ensure that all safety features are in place, working, and properly secured.
- Make certain that the air supply is SHUT OFF (if present) before you work with any electrical parts of the appliance. Air circuits can cause bodily injury.

SAFETY AND ELECTRICITY (if applicable)

- Have a qualified (Lely) electrician verify that the compressed air supply to your Shuttle sampling device is in order.
- Ensure that the grounding of the electrical system conforms to local regulations or standards that may be in force.
- Make sure that all electrical switches are in the OFF position before you turn the electrical power back on.
- SWITCH the appliance OFF, and completely shut off the air supply if present, before doing any servicing, maintenance, adjustment, repair, or cleaning.
- Immediately replace any damaged electrical wiring, conduits, switches or other components.



Safety decals

Maintenance of safety decals

The safety decals applied to the Shuttle sampling device contain important and useful information to ensure that you can continue to use your machine/installation safely.

Please follow the instructions provided below to ensure that all decals remain in place and in good condition.

- Keep safety decals clean and legible at all times. Use soap and water; never use solvents, oils, abrasives etc. that could damage the decals.
- Replace safety decals that are missing or have become illegible.
- When replacing parts, always apply a new safety decal where there was previously a decal on the replaced part.
- Safety decals are obtainable from your local Lely service provider.

Applying safety decals:

- Make sure the surface is clean and dry.
- Ensure that the temperature of the surface is at least 5°C.
- Decide on the exact position before you remove the backing paper.
- First, remove only the smaller section of backing paper from the decal.
- Align the decal over the intended position and carefully press the exposed adhesive of the smaller section onto the surface.
- Slowly peel back the remaining paper and carefully smooth the rest of the decal in place.
- Small air pockets can be pierced with a pin and smoothed out using the piece of decal backing paper.

LOCATION AND CONTENT OF SAFETY DECALS

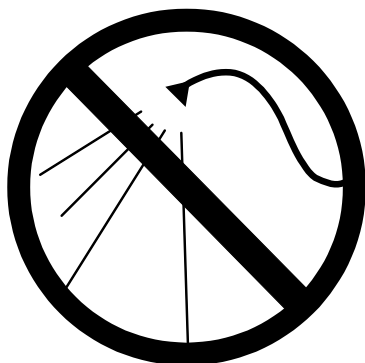
Safety decals of a general nature are covered in this section. Specific safety instructions are incorporated in various sections of the manual for those situations which are particularly hazardous if the instructions or procedures are not heeded.

The locations of the different safety decals are indicated below.

ATTENTION - If a safety decal is damaged, missing or illegible, or if parts with a decal have been replaced without a decal, a new safety decal should always be applied. New safety decals are available from your nearest Lely service provider.



SPRAYING WITH WATER PROHIBITED



WARNING

- Carefully read the description of the chilled tray for the Shuttle milk sampling device (see chapter "Service and maintenance"). Observe all safety measures and instructions.

NOTE

- *The above safety decal is applicable only to Shuttle sampling devices equipped with a chilled tray.*



Introduction

Congratulations with your purchase of the Lely Shuttle sampling device. This advanced appliance has been developed and manufactured to meet the needs of the critical dairy farmer who recognises the advantages of automatic sampling.

In order to ensure safe, efficient and trouble-free operation of your sampling device, it is of vital importance that you and any other person who will be operating or maintaining the device **READS, UNDERSTANDS** and **CARRIES OUT** all instructions and recommendations given in this manual on safety, operation, maintenance and troubleshooting.

This manual is specifically intended for the sampling device that has been supplied by the relevant Lely organisation. It is possible that certain options required to adapt this device to specific local circumstances will not be covered in this manual. In that case, please contact your Lely organisation for information about such options. Please refer to the table of contents to find specific information.

NOTE

- *On receiving this manual, it is the responsibility of the owner and/or those operating the sampling device to study this manual and to follow the instructions it contains. Some components or systems have their own manual with detailed instructions. Study each manual before use. If the instructions are unclear, please contact your nearest Lely service provider.*



General view

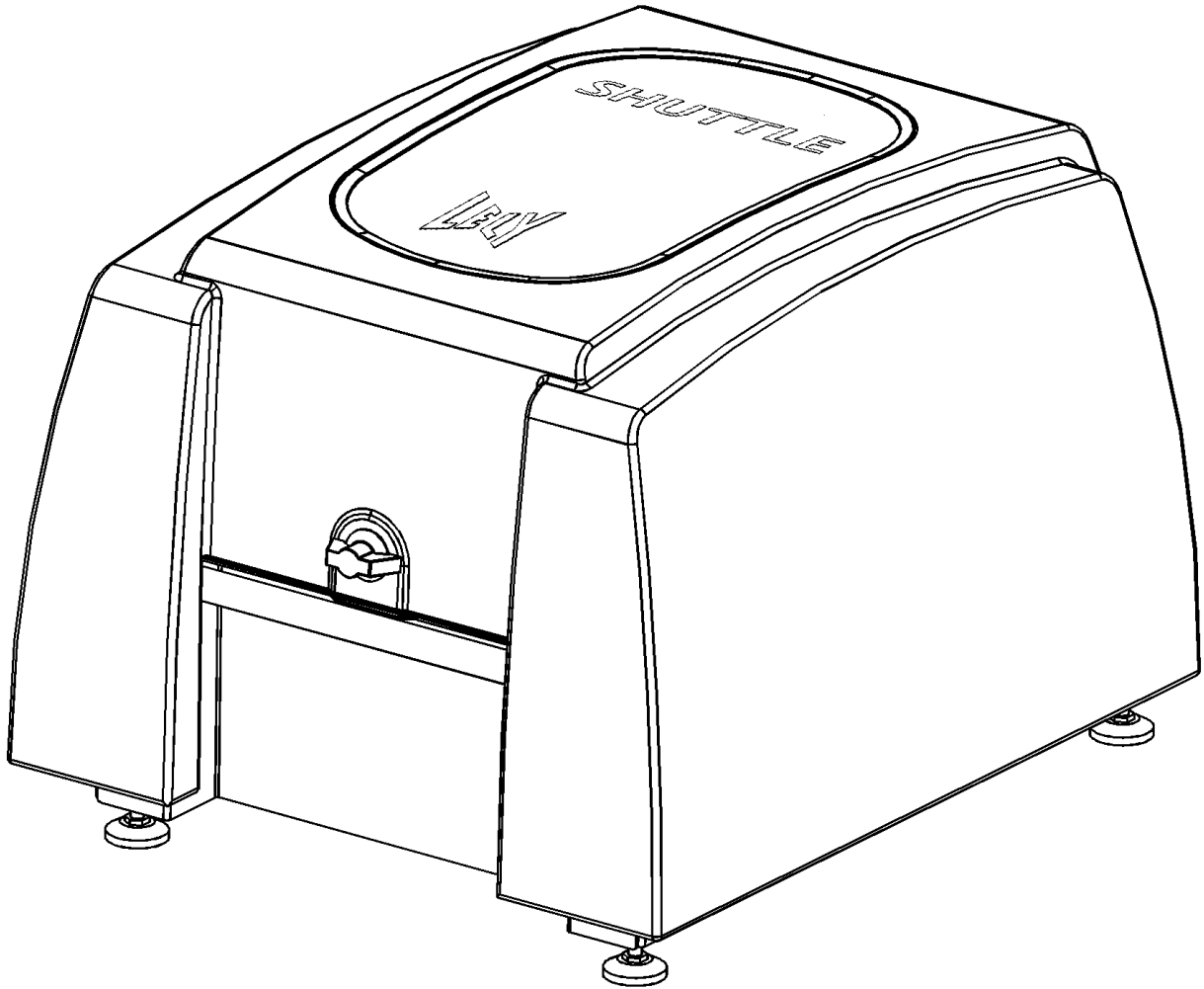


Figure 1 Shuttle sampling device

Registration

The type number/serial number identification plate is mounted at the right rear (below the cover) of the sampling device.

Please always state the article number and serial number of your sampling device in correspondence or when ordering spare parts. Take a moment now to fill the details in on this page:

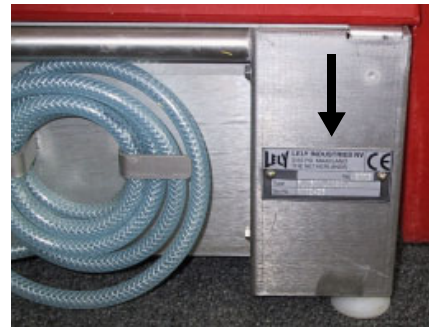

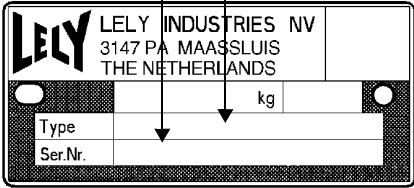


Table 1 Type and serial number identification plate

Type :	
Ser. No. :	



The below table shows the article number of the sampling device that this manual applies to.

Table 2 Article number of Shuttle sampling device

Description	Typenumber
Shuttle sampling device	5.1501.0020.1



1 Description of components

1.1 General

The Lely Shuttle sampling device (figure 1.1) is a device that automatically takes milk samples during milking with the Lely Astronaut milking robot. The sampling device comprises several different components, including:

- 1) Cover
- 2) Frame + serrated frame + spirit level (figure 1.2)
- 3) Spoon (options for float chamber volume: 10, 18, 30 and 50 cc) (figure 1.3)
- 4) Tray (standard) + sample rack (optional) (figure 1.3)
- 5) Chilled tray and insulation panels (optional) + sample rack (optional) (figure 1.3)
- 6) Air connection

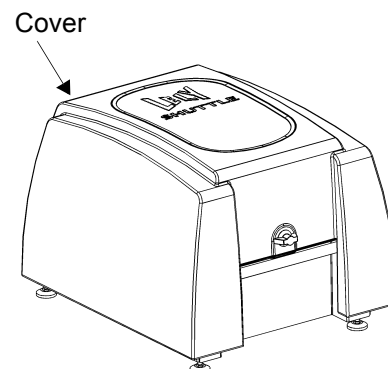


Figure 1.1 Shuttle sampling device

The Shuttle sampling device is easily connected to the milk delivery line and compressed air system of the Astronaut milking robot, enabling the milking robot to be set to automatically sample the milk from the cows.

The Shuttle sampling device can be used with either a standard NRS sample rack (figure 1.3) for 96 samples or with a Lely sample rack for 40 or 60 sample bottles. (NRS = Nederlands Rundvee Syndicaat, the Dutch Cattle Syndicate) The NRS sample rack is suitable for taking samples of 9 to 9.5 cc (intermediate volumes can be set). The Lely is suitable for taking samples of 18, 30 and 50 cc (intermediate volumes can be set). This makes the Shuttle sampling device highly versatile.

If the cows are to be milked by multiple milking robots, then each milking robot must be equipped with an individual Shuttle sampling device.

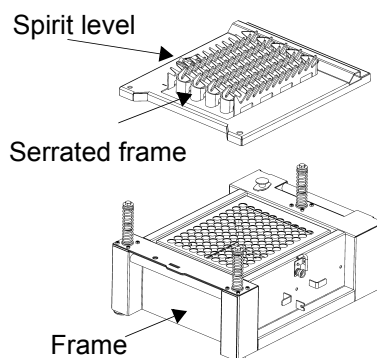


Figure 1.2 Frame and serrated frame

NOTE

- *To be sure of correct sampling, it is essential that the milking of all cows takes place smoothly, i.e. without interruptions either before or after the samples are taken.*

If an Astronaut milking robot is milking an individual group of cows, then the various groups may also be sampled one after the other.

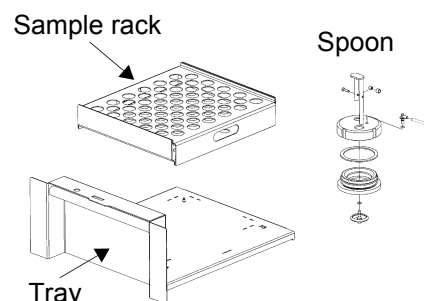


Figure 1.3 Sample rack and spoon



1.1.1 Chilled tray (optional)

Besides the standard tray, there is also an optional chilled tray available with insulation panels (figure 1.4), to ensure that the milk samples are kept cool and stay suitable for laboratory testing.

NOTE

- *The samples in the sample rack should be kept cool at all times, both before and after placing in the chilled tray of the Shuttle sample device (e.g. in a refrigerator).*
- *Be aware that when the ambient temperature is 15°C or less, there is a risk of freezing. In that case it is essential to disconnect the power to the thermo-electric chiller of the chilled tray (unplug the connector from the E-link connection).*

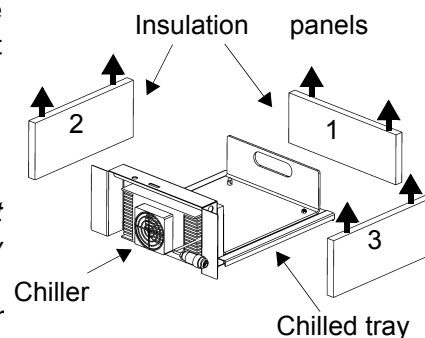


Figure 1.4 Chilled tray (optional)

A thermo-electric chiller mounted at the front of the chilled tray circulates refrigerated air through the tray. Once the chiller is running, the milk samples are maintained at a temperature of max. 20°C (when the ambient temperature is max. 50°C).

1.1.2 Installation of chilled tray insulation panels

Before you can use the chilled tray, you must first do the following:

- 1) Take the chilled tray from the Shuttle sampling device frame.
- 2) De-grease the rear wall and side walls on the inside of the frame.

NOTE

- *To optimise the effect of the chiller, and enable free insertion and withdrawal of the chilled tray, the insulation panels (see placement sequence below) must be placed as high as possible on each wall surface (see figure 1.4 and 1.5).*

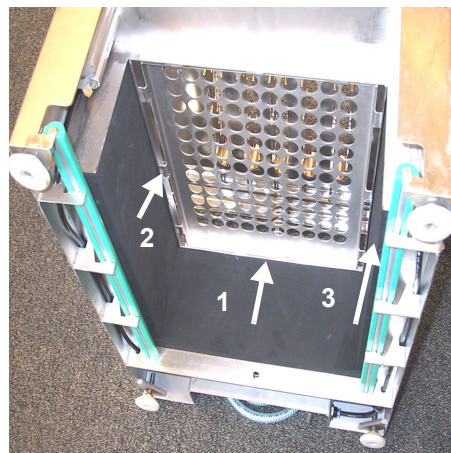


Figure 1.5 Placing insulation panels

- 3) Before placing each insulation panel, first remove the backing foil from the self-adhesive back of the panel.
- 4) Place insulation panel (1) first (on rear wall).
- 5) Then place insulation panels (2) and (3) (on side walls).



2 Connecting the Shuttle sampling device

2.1 Directions for connecting the Shuttle sampling device

The Shuttle sampling device may be connected to any automatic milking system, provided the system meets a number of preconditions. The following directions include the preconditions for correct sampling using the Shuttle milk sampling device.

2.1.1 Compressed air supply

- The Shuttle sampling device must be connected by means of an air hose to a compressed air valve (3/2 valve) controlled by the automatic milking system.
- This compressed air valve must deliver a pressure of between 600 and 800 kPa (6 to 8 bar).
- The speed of air supply and discharge must be adjustable.
- The compressed air valve will be operated at the start and end of a milking session. Depending on the type of sample rack, the compressed air valve will also be operated a number of times in between.

2.1.2 Milk sample delivery

- The Shuttle sampling device must be connected by tubing to the automatic milk system.
- The milk should be mixed (bubbling) before sampling each milking.
- This tube must deliver a reliable sample of the milk to be sampled, depending on the model of spoon in use, i.e. 10, 18, 30 or 50 cc¹.
- The excess milk delivered must be able to be extracted via the milk delivery tube by means of vacuum, and in particular, without leaving any residual milk in the tube.
- The lowest milk level in the system must be approximately 30 cm above the underside of the Shuttle sampling device.

NOTE

- *Ensure that the Shuttle sampling device is thoroughly cleaned before use. Give particular attention to the milk tubes.*
- *Screw each of the adjustable feet in, before you begin levelling the Shuttle sampling device.*
- *Take care to place the Shuttle sampling device outside the range of movement of the milk hoses and robot arm.*

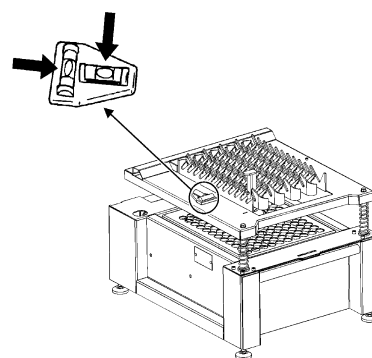


Figure 2.1 Spirit level

- 1) Position and level the Shuttle sampling device (figure 2.1) in the vicinity of the Astronaut milking robot.
- 2) Remove the caps from the sample bottles, and place the bottles in the rack.

1) 1 cc (cubic centimetre) = 0.001 litre



- 3) Loosen the coupling piece (B) from the silicone milk tube of the Shuttle sampling device. Feed this tube through the valve (C) of the built-in sampling unit, and reattach the coupling piece.
- 4) Remove the plug (D) from the elbow bend below the sight vessel of the milking robot and insert the coupling piece (B) of the Shuttle sampling device into this hole, up to its flange.

NOTE

- Place the rack in the tray, so that the pins on the bottom are located in the holes in the corners of the rack.
- The NRS rack must be placed between the indicated corner marking, and beside the corresponding bottle number on the tray.
- Loosen the tube (A, figure 2.2) of the built-in sampling unit (of the Astronaut milking robot) from the lid, and remove this tube from the built-in sampling unit. To open the valve in the sampling unit, see chapter 3 'Settings for sampling with Astronaut milking robot'.

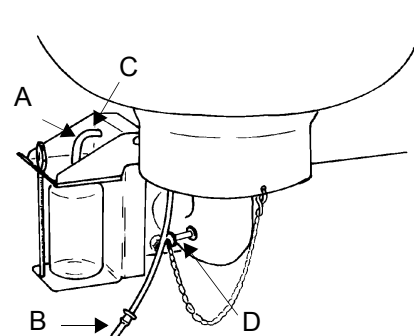


Figure 2.2 Built-in sampling unit

- 5) Place the spoon (figure 1.3) at position (A, figure 2.3) above the sample rack. The spoon will then be suspended above sample bottle (12) in an NRS rack or sample bottle (1) in a Lely rack (see chapter 2.2 'Filling sequence of sample bottles').
- 6) Connect the air hose to the valve on the cover below the auxiliary functions box of the milking robot.

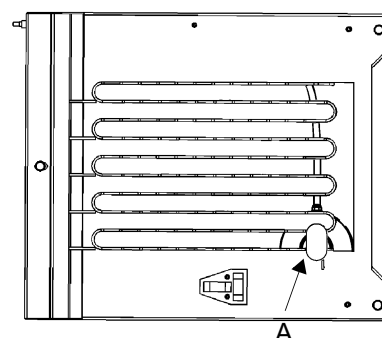


Figure 2.3 Spoon in sample rack



2.1.3 Connecting chilled tray

The thermo-electric chiller in the chilled tray is supplied with 24VDC power via the E-link connection on the multiple function control box (figure 2.4) of the Astronaut milking robot.

NOTE

- Carefully read the "Installation safety" instructions given in chapter 'Safety'.
- Verify with the service technician that the milking robot is capable of supplying sufficient power.

The chiller will start running as soon as the connector is plugged into the E-link connection and the milking robot is started.

2.1.4 Recording milk yield and sample details

- Details of the sampled milk must be recorded, otherwise the samples will be untraceable.
- The details to be recorded are: cow number, time of sampling, time of previous milking or the time the cow has needed to produce the measured quantity of milk, plus the location of the sample bottle.

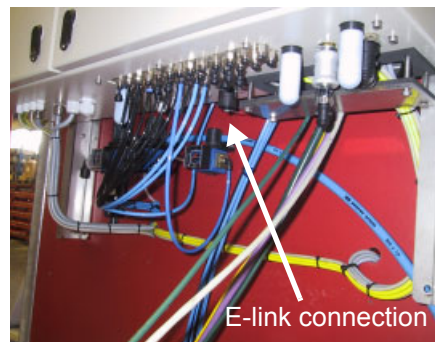


Figure 2.4 E-link connection on underside of multiple function control box

2.2 Filling sequence of sample bottles

2.2.1 Lely rack with 40 or 60 sample bottles (optional):

Start position: **below left**

Number of 1st bottle: 1

Number of steps/sample: 2

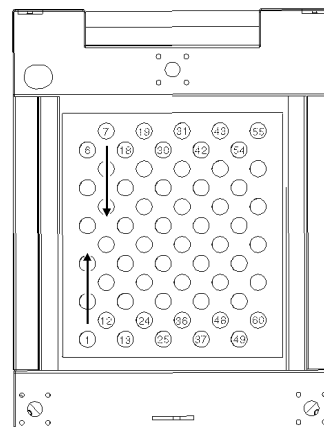


Figure 2.5 Lely rack

2.2.2 NRS rack with 96 sample bottles (optional):

Start position: **below left**

Number of 1st bottle: 12

Number of steps/sample: 1

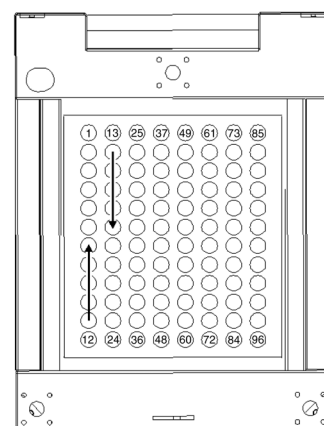


Figure 2.6 NRS rack



2.3 Print-out of sample details

Lely Industries N.V. (Dinsdag 30/03/1999 -- 7:55)

Lijstnaam : MILKTEST : Milk test

Overzicht-schema : MELKCONTROLE <<06/01/1999 0:00 -- 07/01/1999>>

Koe nr	Levens-nummer	Datum	Lst voor monst	Tijd	Melk gift	Tijd	Melk gift	Tijd	Melk gift	Tijd	Melk gift	Tijd	Melk gift
					Fles		Fles		Fles		Fles		Fles
101	2005981850	06/01	17:46	14:09	11.8	268	11:04	7.3	434	18#22	4.0	476	
122	2006645630	06/01	17:39	13#06	9.1	165	7:40	10.1	306	13:03	8.1	348	
216	2008638980	06/01	20:36	14:16	12.5	269	13:00	13.7	441				
253	2009739640	06/01	22:48	15:43	6.9	186							
258	2009784950	06/01	15:52	15:39	20.7	277	12:52	10.8	440				
261	2009804140	06/01	12:57	10:13	9.0	241	13:09	10.2	442				
294	2010247820	06/01	17:12	11:38	6.2	154	13:58	11.1	353				
300	2010298400	06/01	23:47	19:05	8.6	318							
306	2010342620	06/01	17:47	16:13	8.8	189	17:42	9.2	373				
336	7738233650	06/01	18:33	10:46	5.5	148	12:47	12.5	345				
339	7738233960	06/01	????	15:45	15.5	276	14:56	7.1	454				

Aantal dieren op lijst : 11

LEGENDA

- ????? : Koe is bij robot geweest, maar melkgift ontbreekt.
- # : Melking is niet juist afgesloten (status=mislukt).
- ! : Het getal achter het uitroepteken is het aantal uren tussen de eerste proefmelking van deze koe en de melking daarvoor.
Deze notatie wordt alleen gebruikt bij meer dan 24 uur tussentijd.
Bij minder dan 24 uur tussentijd wordt het tijdstip van de laatste niet-proefmelking afgedrukt.
- * : Melkgift is handmatig ingevoerd.
- & : Fictieve melkgift door systeem berekend.

Einde overzicht : MILKTEST

(C) 1999, Lely Industries N.V. (123456789)

Figure 2.7 Example of milk test list (X-pert)



Lely Monstername



19-07-2005 07:30

Koe nr.	Levensnr.	Ltste Melk datum	Tijd	Gift	Tijd	Gift	Tijd	Gift	Tijd	Gift	24H gift
			Tijd	Fles nr		Fles nr		Fles nr		Fles nr	
1	NL 233606860	18/07	14:55	22:51	8.9	235					26.9
3	NL 264908007	18/07	15:48	22:38	12.1	224					42.4
4	FR 3912260279	18/07	8:04	21:29	10.8	215					19.3
5	FR 3931041706	18/07	10:10	21:54	12.7	218					28.0
6	FR 3912290341	18/07	6:57	23:40	7.0	230					10.1
7	FR 3912290342	18/07	7:05	19:41	7.8	207					14.9
9	FR 3922780546	18/07	10:28	22:26	10.8	222					21.7
10	FR 3922780534	18/07	17:39	1:51	5.0	247					14.6
11	FR 3922780544	18/07	11:15	19:00	10.6	212					32.9
12	FR 3922780540	17/07	20:51	20:04	12.7	205					13.1
17	FR 3912920408	18/07	6:27	19:22	5.6	209					10.4
18	FR 3912920396	18/07	17:05	23:18	8.9	232	7:22	11.0	261		33.4
20	FR 3930320329	18/07	11:35	22:32	7.9	223	7:00	5.9	251		17.1
21	FR 3931210223	18/07	11:48	21:21	7.7	214	7:14	2.9	249		13.1
23	FR 3926481363	18/07	16:13	0:04	7.8	227	7:08	7.1	250		24.0
24	FR 3929606259	18/07	9:06	23:02	11.9	234					20.5
26	FR 3926481421	18/07	10:21	22:01	10.9	219					22.4
28	FR 3926481396	18/07	6:39	18:47	9.6	212					19.0
29	FR 3926481444	18/07	17:14	0:18	8.4	225					28.5
30	FR 3926481443	18/07	18:25	1:33	9.3	245					31.3
31	FR 3926481377	18/07	15:55	0:45	9.1	238					24.7
32	FR 3926481429	18/07	16:22	0:51	5.2	239					14.7
33	FR 3936541933	18/07	11:43	20:51	9.0	201					23.6
34	FR 3936541975	18/07	12:20	20:26	10.6	204	6:09	11.7	257		30.0
35	FR 3926481435	18/07	10:38	19:52	9.2	206	3:02	8.3	258		25.6
36	FR 3935790309	18/07	17:59	0:12	8.9	226					34.4
37	FR 3930110198	18/07	10:15	20:15	4.0	205					9.6
38	FR 3919242115	18/07	17:45	23:49	8.8	229					34.8
39	FR 3935440206	18/07	13:25	23:30	9.7	231					23.1
40	FR 3919419635	18/07	17:52	0:59	9.2	240					31.1
42	FR 3915900268	18/07	14:51	22:46	10.5	236					31.9
44	FR 3933570908	18/07	15:32	1:11	5.0	242					12.4
46	FR 3924450323	18/07	16:29	1:41	6.8	246					17.7
47	FR 3922796339	18/07	16:06	22:11	7.3	220	6:23	7.9	256		25.5
49	FR 3916775899	18/07	9:27	21:04	11.8	213					24.4
579	NL 182521823	18/07	18:47	6:32	8.0	159					16.3
594	NL 220914976	18/07	10:52	20:04	14.0	104	4:44	12.9	141		36.1
608	NL 245042449										
665	NL 232423888	18/07	11:20	19:50	3.5	106					9.9
674	NL 232423989	18/07	6:39	7:01	8.4	156					8.3
682	NL 232424076	18/07	8:12	1:18	13.5	130					19.0
692	NL 260924845	18/07	10:45	19:16	13.5	210	2:04	10.6	260		37.8
702	NL 275921231	18/07	15:03	6:46	7.2	253					11.0
707	NL 277096500										

Figure 2.8 Example of milk test list (T4C)



A legend (figure 2.7) is printed below each print-out.

The bottle number is composed of the rack number and the bottle position (last 2 digits). In order to differentiate between the various racks, there must be a different rack number assigned to each robot.

For proper calculation of a 24-hour milk yield, for every cow being sampled, it is essential that the last milkings both prior to the sampling run, and during the sampling run, are completed without interruption. The milk production registered between these two moments in time can then be taken as correct.

One can be sure that the last milking prior to the sampling run, and the last milking during the sampling run have been completed problem-free, by checking the attention list: if there are no cows listed, then the milkings were good.

If there are still cows listed at these two moments, then take these cows through the robot and ensure that the milking is completed trouble-free. Only then can the sampling run be started or finished.

The following example calculation shows what the effect can be when the milking is interrupted:

Properly completed sampling run:

We will use cow 336 (figure 2.7) as example.

The last milking prior to the sampling run was on 06-01 at 18:33.

During the sampling run, the cow was milked twice by the robot: on 07-01 at 00:46 and 12:47, with respective milk yields measured of 5.5 and 12.5 kg. The total is 18.0 kg.

The 24-hour yield is then calculated as follows:

The 18.0 kg of milk was produced in 1094 minutes (between 18:33, and 12:47 the next day); there are 1440 minutes in 24 hours.

The 24-hour milk yield calculation therefore becomes:

$$18.0 \times 1440 / 1094 = 23.7 \text{ kg.}$$

Interrupted last milking prior to sampling run:

Once again, we will use cow 336 (figure 2.7) as our example.

Suppose that under "Lstt" (last), the time read 18#33 instead of 18:33. This means that the milking was not completed trouble-free.

The following milk yields were measured during the sampling run: 7.0 kg at 18:48, 5.5 kg at 00:46 and 12.5 kg at 12:47. The cow has turned up at the robot for a second time at 18:48, because she wasn't completely milked at the 18:33 milking.

Now the 24-hour milk yield calculation is:

$$(7.0 + 5.5 + 12.5) \times 1440 / 1094 = 32.9 \text{ kg.}$$

The difference $(32.9 - 23.7) = 9.2$ kg is caused by the cow not being fully milked prior to the sampling run due to an interruption, so that a false production of 7 kg of milk is registered for the intervening 15 minutes.

So before you start sampling, it is clearly essential to ensure that every cow has yielded all her milk at the last milking prior to the sampling run.

Interrupted last milking during sampling run:

We will use cow 336 (figure 2.7) as our example one more time.

Suppose that the last milking was recorded as 12#47 instead of 12:47.

The following milk yields were measured during the sampling run: 5.5 kg at 00:46 and 12.5 kg at 12:47. The cow was not full milked during the last milking.



Now the 24-hour milk yield calculation is:

$$(5.5 + 1.2) \times 1440/1094 = 8.8 \text{ kg.}$$

The difference $(23.7 - 8.8) = 14.9 \text{ kg}$ is caused by not all milk being milked from the udder during the last milking of the milking run.

Apart from the last milking from the sampling run, any other incomplete milkings during the sampling run will not affect the 24-hour milk yield calculation.



3 Settings for sampling with Astronaut milking robot

3.1 Description of sampling menus

- **Fill time sample bottle** (figure 3.1):
The preset filling time determines how long the valve remains open (to fill the spoon).
- **Maximum position sample bottle**:
The maximum position of the sample bottle depends on the type of rack in use. As soon as this position is reached, the robot generates a warning to exchange the rack.

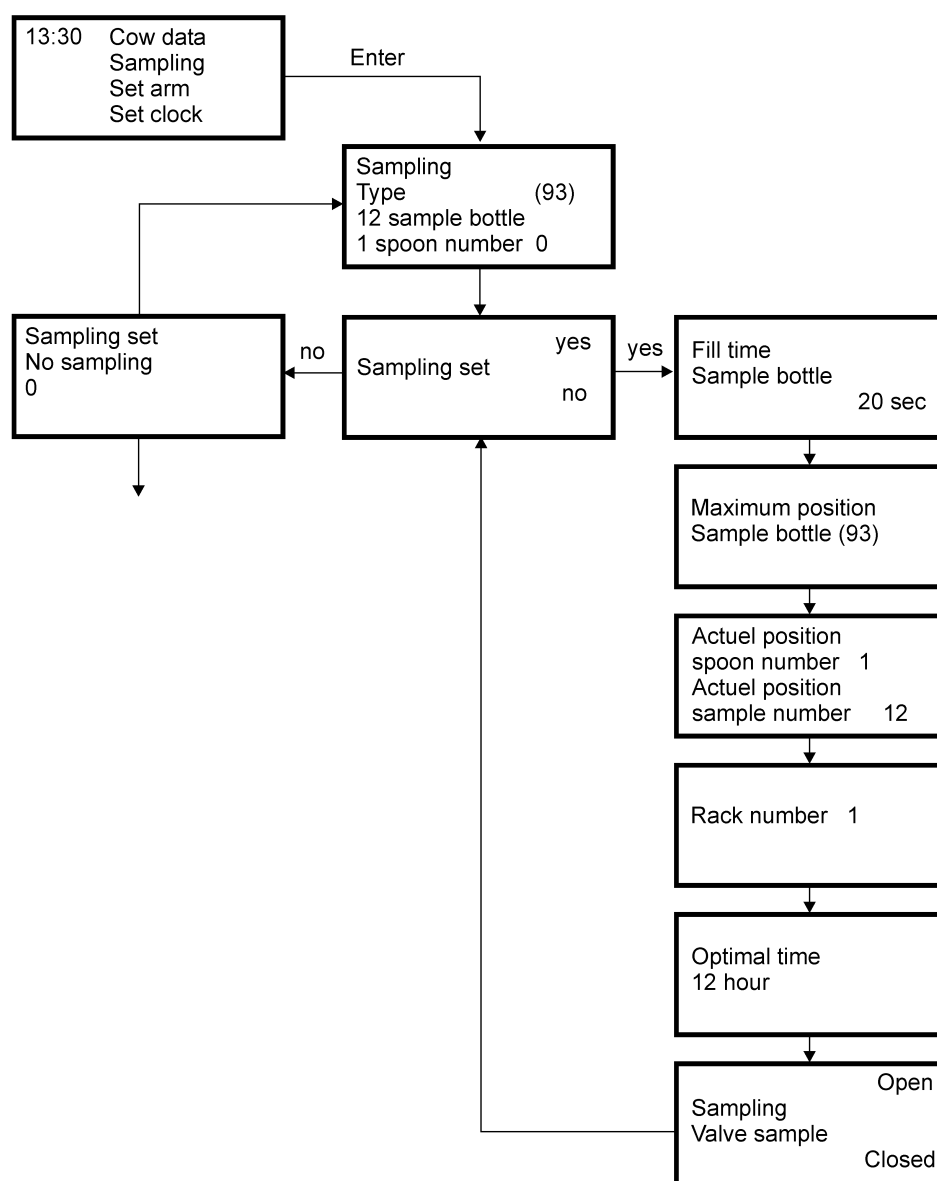


Figure 3.1 Sampling procedure flowchart



- **Actual position spoon number (1):**
Actual position sample bottle (12):
 Enter the number of the bottle below the spoon (= filling point of the Shuttle sampling device).
 This enables the position of the sample bottles to be registered. If the value is set to "1", the serrated frame is lifted again to ease the correct positioning of the spoon.
- **Rack number (1):**
 Enter the sequence number of the sample bottle rack. Enter the value "1", unless a different rack has been filled in the previous 48 hours. If this is the case, enter the next rack number in the sequence. If multiple milking robots are in use, then you must enter a different rack number each time.
- **Optimal time (12 hours):**
 Period within which samples are taken (default 12). One sample is always taken. If a cow visits the robot within the "Optimal time" after the first sampling, then a second sample will be taken.
- **Sampling:**
Sampling valve open/closed:
 The valve of the built-in sampling device must be open to enable the milk tube to be fed through, so that the Shuttle sampling device can be connected to the Astronaut milking robot for sampling purposes.

Sampling definitions:

No sampling (0):

NOTE

- *This option should be used to halt all sampling procedures.*
- **0 - No sampling**
 Sampling disabled.
- **1 - All cows**
 A sample is taken from every cow visiting the milking robot.
- **2 - Individual**
 When you select this option, you must enter a cow number. The milking robot takes a single sample from the cow whose number is entered.
- **3 - 1 sample**
 A single sample is taken from every cow. Once this sampling procedure has been completed (i.e. one sample from every cow), then disable the procedure via option "0 - No sampling".
- **4 - 1 sample local**
 One milk sample per cow, based on the robot's local database. This option is not yet in use.
- **5 - 2 samples**
 Two milk samples are taken from every cow. Once this sampling procedure has been completed (i.e. two samples from every cow), then disable the procedure via option "0 - No sampling".
- **6 - Optimal**
 A single sample is taken from every cow. If a cow revisits the robot within the "optimal time" after the first sampling, then a second sample can be taken.
 Once this sampling procedure has been completed (i.e. one or two samples from every cow), then disable the procedure via option "0 - No sampling".
- **7 - Separation**
 A sample is taken from every cow registered for manual milk separation. A sample is also taken from the next cow to enter the robot, i.e. the cow that follows the cow with milk separation.



- **8 - Correct rack**

In the event that an error of some kind takes place during the sampling procedures, i.e. 1 sample, 2 samples or optimal, an option is present to resample all cows from whom a milk sample had already been taken via the "Error rack".

This means that a new milk sample will be taken from all cows sampled via a certain rack, once "Rack correction" has been activated for that rack.

Procedure for sampling:

After selecting a certain procedure for sampling (figure 3.1), i.e. 1 sample, 2 sample or optimal, the milking robot must communicate with the VCPC (Cattle Code Process Controller) based on the preset settings.

Patience!	yes
Sampling type	
0 nr. Check	
in Xpert system	no

If something should go wrong when entering settings, then the system message shown here will be displayed. Keep repeating the settings until the message disappears.

You can see in the printed report whether or not the procedure for sampling has been enabled.

Entry failed
Sampling type

3.2 Ending sampling

Sampling can be completed when sufficient samples have been taken. This depends on the selected option (see chapter 3.1 'Description of sampling menus'). When the samples are only being taken for cell count tests, then sampling can be completed as soon as a sample has been taken from every cow. A single sample is often sufficient when using individual sampling.

3.2.1 Disconnecting the Shuttle milk sampling device

- 1) Turn off the robot.
- 2) Disconnect the air hose between the Astronaut milking robot and the Shuttle sampling device.
- 3) Disconnect the milk delivery tube between the milking robot and the Shuttle sampling device, and remove the coupling piece, so that the tube can also be withdrawn through the valve of the built-in sampling device. To open the valve in the built-in sampling device, see chapter 3.1 'Description of sampling menus' > Sample valve (open/closed).
- 4) Use the plug to seal the hole in the elbow bend below the sight vessel of the Astronaut milking robot (A, figure 3.2). Clean the plug before inserting it.
- 5) Reconnect the tube (B) of the built-in sampling unit.
- 6) If applicable: Disconnect the power to the chilled tray by removing the connector from the E-link connection.
- 7) Remove the rack with filled sample bottles from the Shuttle sampling device, and cap the bottles.

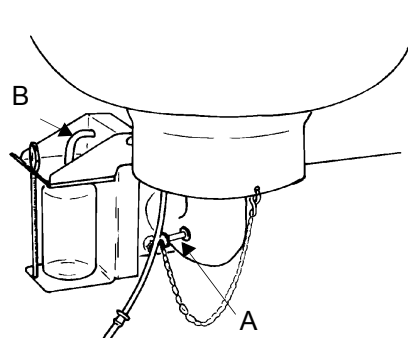


Figure 3.2 Existing sampling unit



NOTE

- *This option should be used to halt all sampling procedures.*

- 8) On the milking robot control panel, select the option "Sampling all cows" and respond to the next screen with "no".

Remove the Shuttle sampling device from the vicinity of the Astronaut milking robot, and service the sampling device as described in chapter 4.1 'Service after use'.

Sampling all cows:	yes
	no

3.3 Printing the sample data

Once the sampling period has ended, a list must be printed out from the X-pert/T4C program for the appropriate authorities.

From X-pert:

Using Shift-F6 from the main menu, start an extra communication session. Next, select menu "Daily > reviewlists". Start the list "MILKSMPL". Enter the requested starting date and time, and end date.

This list shows data for the cow, the milking times, and the yields.

If the list is not yet defined, this can be done so in the X-pert program as follows.

Go to menu "Daily > reviewlists" and select the option "Compose a reviewlist". Next, go to "Milktestdata" and press "Enter". Using the spacebar, select the items "Lifenumbr" and "Milktestmeasur." and press "Enter". Press "Enter" again to select the selection sequence "Cownr". Now use the spacebar to highlight the selection criterion "In milk" and press Enter. Name the list "MILKSMPL" and add the subtitle "Sampling data". Press F2 to save this list.

An example of the sample data is given in chapter 2.3 'Print-out of sample details'.



From T4C:

There are three folder types under the tab sheet "Reports" (figure 3.3): "My reports" and "Default reports". Under the folder "Default reports", the subfolder "Lely milk sampling" can be found. This folder gives an overview of all milk-yielding animals with the samples that have been taken. The "Milk sampling start & end date" and "Milksampling starttime" must be entered if you wish to restrict the data to a selected period.

The report "Lely milk sampling" contains the cow and lifelong number, last milking date and time, a corrected daily yield and the time, yield and bottle number of every sampling.

In addition to this report, there is also the possibility of providing the data digitally in the form of an "EDI-MLP" file. This digital data can be created in T4C under the tab sheets "Farm" > "Milking" (figure 3.4), followed by clicking on "Data export > settings". After first selecting the country in question (which causes a file to be created that complies with the requirements of the milk inspection authority) and the "Nr. of days" (milk yield), the file can be saved on the PC and sent to the milk inspection authority.

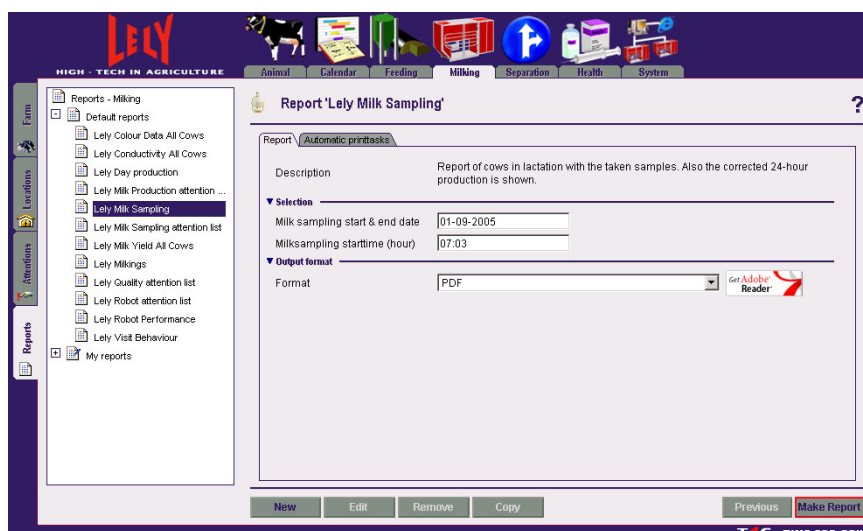


Figure 3.3 T4C Sampling

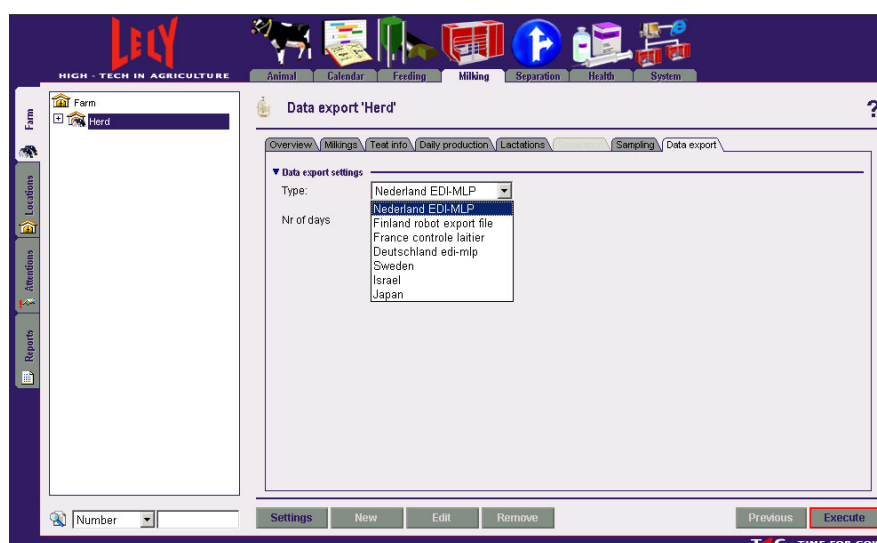


Figure 3.4 T4C Data export



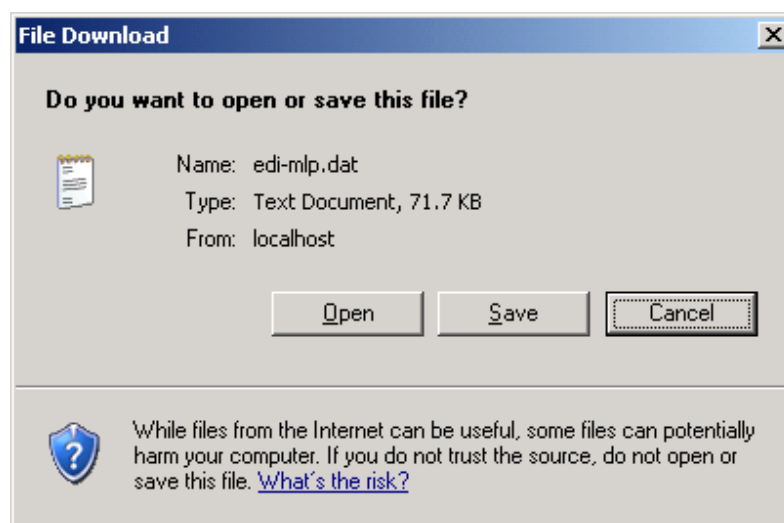


Figure 3.5 Save data on PC



4 Service and maintenance

NOTE

- *Regular maintenance of the Shuttle sampling device is essential in order for it to be completely safe and reliable in use.*

If the Shuttle sampling device is used by multiple users, it is strongly recommended to agree with one another as to how and when maintenance will be performed.

As a hygienic measure, we recommend that each user keeps an individual set of milk delivery tubes, for which they are solely responsible.

4.1 Service after use

NOTE

- *Whenever dismantling multiple spoon assemblies, take care to keep the parts for each assembly completely separate from one another.*

Remove the spoon from the Shuttle sampling device frame and completely dismantle the spoon assembly.

Thoroughly clean each individual component of the spoon assembly with hot water and an alkaline cleaning agent.

Thoroughly flush the coupling piece and the tube connection (A, figure 4.1) with the aid of a syringe (D). Replace the tube if it is not clean enough after flushing with the syringe.

The holes in the valve (B) must also be thoroughly flushed with the aid of the syringe (D).

Detach the tube (A) from the elbow pipe on the ring-nut (E) and check the condition of each part.

Reassemble the spoon.

Only screw the parts together hand-tight. Check that the numbers on the underside of the float chamber (C) correspond with those on the coupling piece. These two components must be kept together in connection with the calibrated volume of the float chamber.

- Attach the tube with cleaning stainless steel milk tube holder at the correct point on the side of the Shuttle sampling device (figure 4.2).

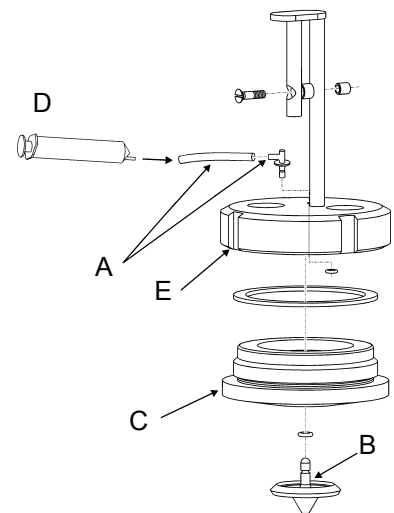


Figure 4.1 Spoon assembly

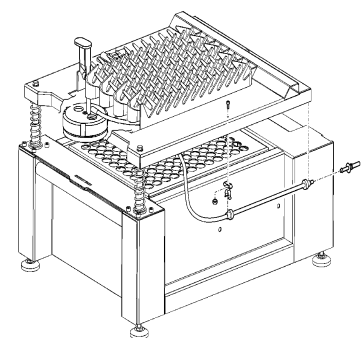


Figure 4.2 Delivery tube

CAUTION

- *When a chilled tray is in use, take care that the thermo-electric chiller does not come into contact with water or any other liquid, due to the risk of a short circuit. For more information see chapter 'Safety'.*



- Spray the frame and scrub it thoroughly clean with water and alkaline cleaning agent.
- Allow the entire unit to dry thoroughly. This is especially important if there is risk of frost. If the Shuttle sampling device freezes while being transported, this can cause damage to the unit.

4.2 Monthly maintenance

4.2.1 Inspection of serrated frame

Check that the serrated frame is still perfectly flat. This means that the fingers should all lie at the same height on the line A-A (figure 4.3).

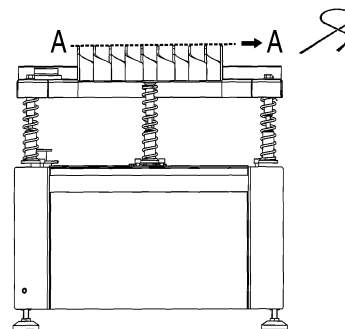


Figure 4.3 Flat serrated frame

A distorted serrated frame (figure 4.4) can lead to the spoon valve opening too early, with insufficient milk being dispensed into the sample bottle, or the spoon becoming jammed.

- Check that the O-rings (7, figure 4.5) in the spoon are in a good condition (i.e. they shown no signs of leakage). Replace worn or damaged O-rings.
- Check that the pneumatic cylinders in the unit still work properly, by actuating them with compressed air ≥ 600 kPa (≥ 6 bar).
- Check that the small roller (6) in the spoon turret can turn freely. Replace it if necessary.

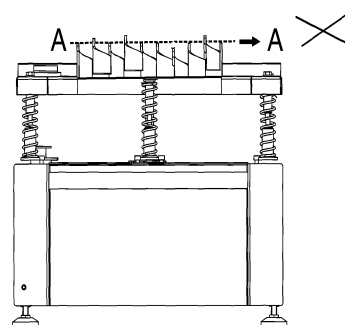


Figure 4.4 Distorted serrated frame



4.2.2 Inspection of float chamber

Check that the float chamber (4, figure 4.5) contains the correct volume. Proceed as follows:

- Remove the spoon assembly from the Shuttle sampling device and hang it on a hook. Ensure that the spoon assembly [ring nut (3) + float chamber (4)] are screwed together only hand-tight.
- Fill the float chamber (4) with water.
- Suck the excess water from the float chamber (4) via the elbow pipe (1) using your mouth or a syringe. The spoon now contains water equivalent to 1 sample volume.
- Using a bottle or measuring flask, lift the float chamber (4) valve straight upwards. The float chamber should now fully drain out without any help.
- The volume collected must now lie within the requirements set by the milk inspection authority.
- If the collected volume is too low, this can be modified by carefully shortening the elbow pipe (1) from the bottom using a file. Check the volume again after making the modification.
- If the collected volume is too high, a new elbow pipe (1) must be fitted. This may need to be modified to deliver the correct volume. Check the volume again after making the modification.

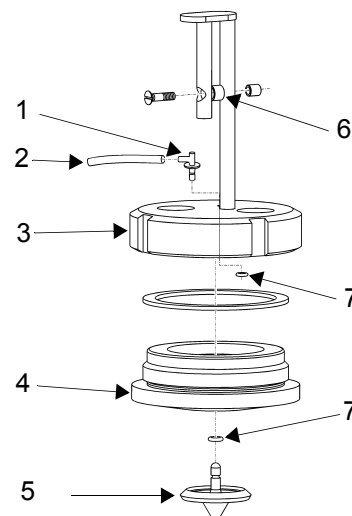


Figure 4.5 Float chamber

4.3 Robot control panel

Next screen/Enter (1)

This key (figure 4.6) is used to open a selected menu, after which the next screen of the menu is selected. Data input or changes are entered via the currently displayed screen.

Previous screen (2)

Use this key to select the previous screen of the current menu.

Display (3)

UP key (4)

Depending on the currently displayed screen, this key is used to select an option, modify a value or confirm a command.

DOWN key (5)

Similar to UP key.

Stop key (6)

In a limited number of situations, this key can be used to interrupt a procedure. Use the Stop key also to return to the start of the menu currently displayed.

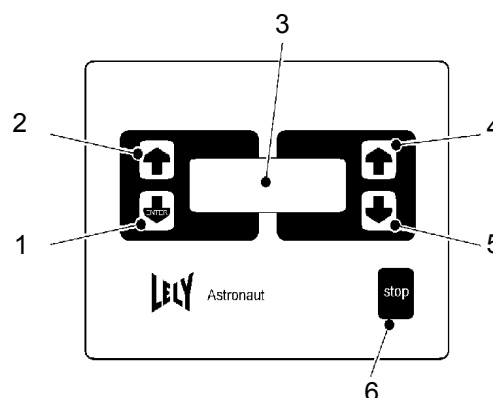


Figure 4.6 Robot control panel



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5 Troubleshooting

Table 5.1 Shuttle sampling device errors

Problem	Possible cause
One sample bottle not filled	<ol style="list-style-type: none"> 1) Milk yield too low. Examine the related milk yield 2) Milk delivery tube kinked/blocked. Clean the tube. 3) Milk frozen. Keep the control room frost-free.
Sample volume too low.	<ol style="list-style-type: none"> 1) Filling time too short. Follow the instructions in chapter 3 to change the filling time. 2) Shuttle sampling device installed too high. Place the Shuttle sampling device on the control room floor. 3) Filler pipe too long. Follow the instructions in chapter 4.2.2 'Inspection of float chamber' to modify the volume of sample taken. 4) The milk delivery tube is not fully open, because the tube has been pinched too long in the built-in sampling device valve. Replace the tube.
One sample bottle too full.	<ol style="list-style-type: none"> 1) The milk deliver tube has not been led through the valve of the built-in sampling unit of the robot. Feed the tube through the valve. 2) Serious contamination of spoon. Thoroughly clean the spoon. 3) The spoon has become jammed. The milk has been dispensed beside the sample bottle. <ul style="list-style-type: none"> - Check that the tube runs freely. - Check that the small roller in the hook of the spoon can spin freely. - Check that the serrated frame is still straight. 4) The spoon is overfilled; milk is overflowing the spoon. Check the period of milk delivery during sampling.
Sample volume is too large.	<ol style="list-style-type: none"> 1) Filler elbow pipe is too short. Follow the instructions in chapter 4.2.2 'Inspection of float chamber' to modify the volume of sample taken.
The valve in the spoon is spilling.	<ol style="list-style-type: none"> 1) The O-ring of the valve is worn. Replace the O-ring. 2) The serrated frame is no longer in a level position, causing the valve in the spoon to hit the position plate and to open up. Put the serrated frame in a level position (see chapter 4.2.1 'Inspection of serrated frame').



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6 Technical specifications

Table 6.1 Technical specifications

SHUTTLE SAMPLING DEVICE	
Length (cm)	60
Width (cm)	48
Height (cm)	40
Weight (kg)	22
CHILLED TRAY, SHUTTLE SAMPLING DEVICE (OPTIONAL)	
Weight of chilled tray (kg)	7.2
Power consumption max. (A)	4.5 (start-up) 3.7 (nominal)
	<p>NOTE</p> <ul style="list-style-type: none"> Check the power supply and nominal power consumption of the milking robot including peripheral equipment (replace power supply if not adequate). Power must be directly supplied by the Nevpow PCB connection (not via VC4 bridge).
Electrical connection	Via E-link connection on Astronaut milking robot (see figure 2.4).
Connector pin description	Pin 0 = GND (earth) Pin 6 = POWER (24 VDC)
Capacity of thermo-electric chiller (W)	71 (at $\Delta T = 0^{\circ}\text{C}$)
Ambient temperature max. ($^{\circ}\text{C}$)	50
Ambient temperature min. ($^{\circ}\text{C}$)	15 (switch off at lower ambient temperatures).
Temperature reduction max. ($^{\circ}\text{C}$)	20



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