DeLaval milking automation MA200 (Test installation)

Instruction Book

2019-05-31, Version 1

Original instruction

Safety precautions

DeLaval milking automation
MA200 (Test installation)

1 Foreword

The safety and operational instructions must be observed by any person involved with the use or operation of this equipment. Under no circumstances must the equipment be used if it is damaged or if the operation of the equipment is not completely understood.

2 Disclaimer

The information, instructions and parts listed are applicable and current on the date when issued. DeLaval reserves the right to make changes without notice.

3 Definitions of admonishments

Admonishments are safety related warning messages.

Admonishments provide important information intended to prevent incorrect or hazardous use of equipment, machinery or software, and support risk assessment.

The following list defines the different types of admonishments used in DeLaval documentation:

Danger: *Refers to imminent and severe risk. Failure to comply with instruction will result in serious injury or death.*

Warning: *Refers to a potential but severe risk. Failure to comply with instruction could result in injury or death.*

Caution: *Refers to a limited risk. Failure to comply with instruction could result in minor injury.*

Mandatory: *Refers to an action or behaviour which is essential to safe and successful use of the equipment.*

Prohibited: *Refers to an action or behaviour which is incompatible to safe and successful use of the equipment.*

Note! *Is intended to draw attention to specific points of importance in the text and advice to prevent equipment damage.*

⚠ This symbol signals risk of injury.

⚠ This symbol signals risk of electric shock.

4 Safety regulations

4.1 Safety regulations - General

Danger!

Electric shock hazard

Disconnect the main power supply and use appropriate lockout-tagout procedures before any installation, inspection, adjustment, or maintenance on the equipment is performed.

Danger!

Electric shock hazard

The electrical installation or any other work on electrical equipment must be performed by skilled personnel. The work must be performed in accordance with provided wiring diagrams and must comply with national electrical safety and EMC regulations.

Warning!

If the equipment is not properly fastened, it can move and pull the electrical cables loose. This may cause personal injury and risk of fire.

Safety precautions

Warning!

Risk of injury!

The system must only be operated by trained personnel. Make sure that children and unauthorised people do not come into contact with the system.

Warning!

Keep safety signs legible!

Read all the safety signs on the machine and in this manual. Replace any lost or damaged signs. Keep safety signs clean and legible at all times.

Warning!

Intended use

Do not use the equipment for any other purposes than the intended use.

Mandatory!

Read the instructions carefully before using the equipment. Contact the local DeLaval dealer if there are parts of these instructions that are not understood. Compliance with the instructions ensures a correct and safe use of the equipment. Save the instructions for future reference.

Prohibited!

Do not use inadequate parts or consumables.

Using products which do not meet specified requirements, for example spare parts or consumables, or not appropriately trained personnel for the DeLaval product may lead to risks or damage. Consequently it may also void or limit the warranty.

4.2 Safety regulations - Operating the equipment

Danger!
Risk of electric shock
Do not spray water on electrical components even when they are switched off or disconnected. Water on electrical components can cause an electric shock, and could destroy the equipment.

Warning!
Risk of injury
Never start or operate the equipment unless all shields, covers and guards are in place.

Warning!
Risk of electric shock!
Ensure that any cables or wiring is out of animals' reach.

Mandatory!
Disconnect the electrical supply before removing shields, covers or guards.

Prohibited!
Never use solvents, detergents, solutions or alcohol on any part of the equipment. Failure to comply can destroy or harm the equipment.

Caution!

Risk of damage, injury or electric shock

Never clean the equipment with a high pressure cleaner or any other jet of water. The equipment is sensitive and can be destroyed by the high pressure cleaning.

Caution!

The DeLaval milking automation MA200 (Test installation) is intended to be used in the milking stall. Always allow for the unpredictable nature of the animals.

Always ask the dairy farmer about the behaviour of the animals and milking methods used.

4.3 Safety regulations - Specific equipment risks

5 Safety labels on the equipment

The safety labels must be placed visible on all locations where a safety hazard exists according to.

	Label	Explanation
A		
B		
C		

6 Safety devices

This system is designed to be safe to operate. The safety devices that are installed are there for personal safety and must not be modified, removed, or disconnected.

Any modification to the equipment's original design may compromise the personal safety. Consequently it may also void or limit the warranty.

Note! *All safety devices in the system must be checked by a DeLaval representative before the system is signed over to the customer.*

7 Safe and healthy work routines

- Ensure that the area is well lit.
- Keep the floor dry to avoid slipping.
- Wear protective clothing and appropriate shoes or boots.
- Keep a good milking hygiene.

8 Type plates

8.1 Type plate on infrastructure box

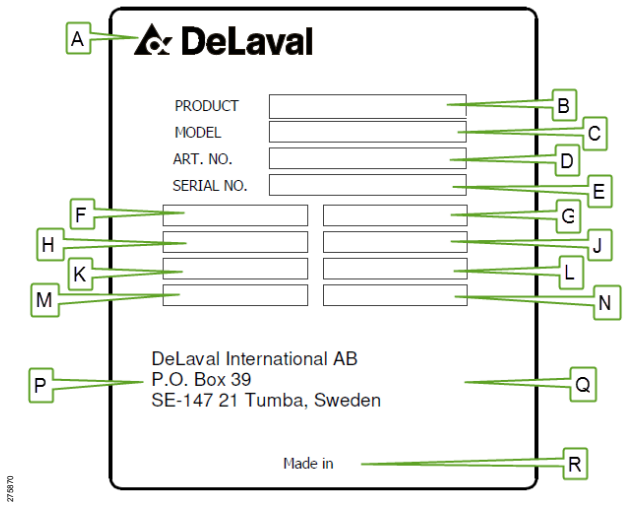


Fig. 1: Infrastructure box type plate.

A	DeLaval logotype
B	Product name
C	Product model
D	Article number
E	Serial number
F	Voltage rating
G	Supply voltage frequency
H	Power rating
J	Current rating
K	Fuse rating
L	Equipment class
M	Ingress Protection rating
N	Empty
P	DeLaval address
Q	CE and WEEE symbols
R	Country of origin

8.2 Type plate on milking automation modules

The type plates on the modules are located at the bottom of the module box and on the potting compund covering the PCB on the inside of the module, see . The type plates contains the information shown in and a field description is given in the table below.

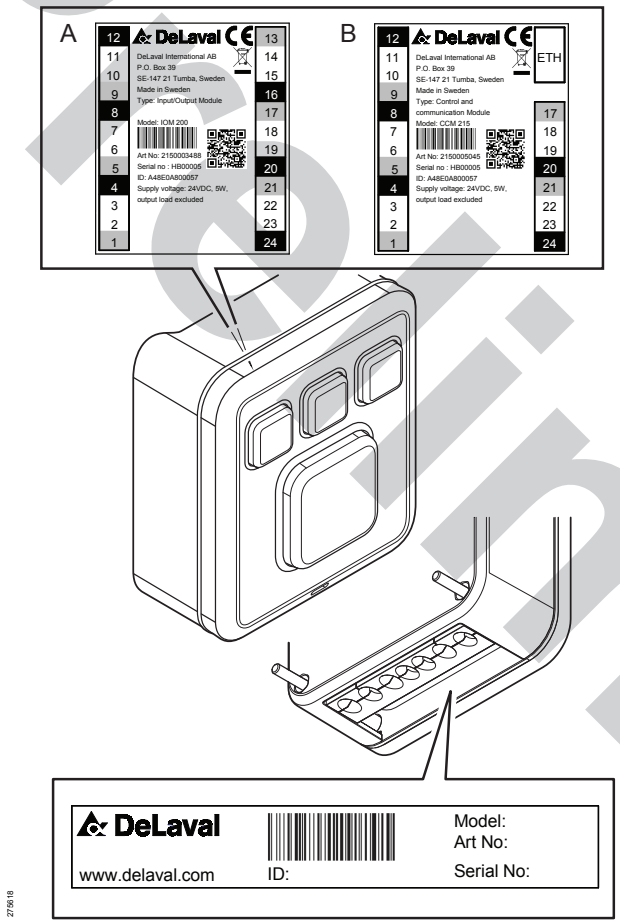
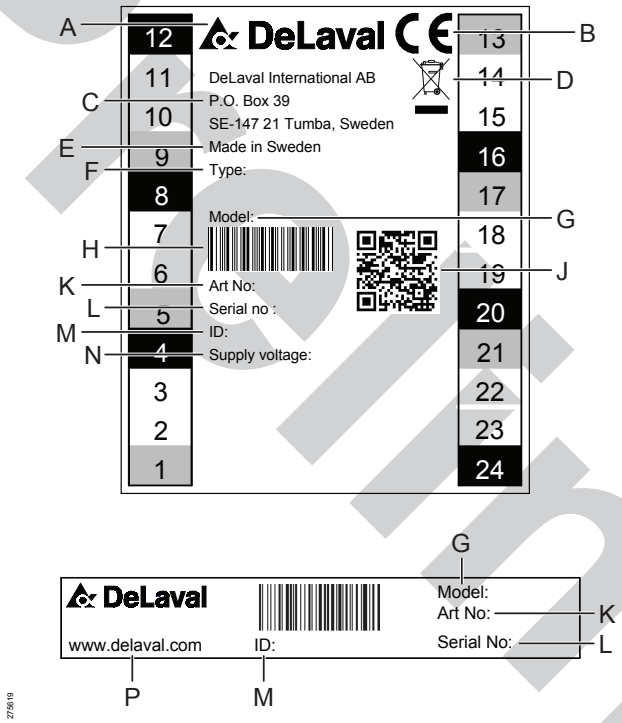


Fig. 2: Type plate locations on the modules. The Button Module is used as an example.

A: Type plate layout for Button module and Input/ output module
B: Type plate layout for Communication and control module
C: Small type plate layout for all modules



A	DeLaval logotype
B	CE-marking
C	DeLaval address
D	Crossed household waste bin
E	Country of origin
F	Module type
G	Module model
H	Bar code
J	QR-code
K	Article number
L	Serial number
M	Bluetooth address
N	Supply voltage
P	DeLaval web page address

Fig. 3: Module type plate.

9 Warranty

Note! *DeLaval will not take any responsibility for damage resulting from faulty installation, operation, or for improper or inadequate care and maintenance.*

Note! *DeLaval will not take any responsibility for any damage resulting from frost. The owner/user must take the necessary measurements to prevent the ambient temperature around the equipment from dropping to or below freezing point.*

Note! *Modification may create risks not covered by the original construction. Do not make any modifications which has not been approved by DeLaval.*

Quick guide

DeLaval milking automation
MA200 (Test installation)

1 MA200 quick guide

1.1 Automatic milking

1.1.1 Automatic operations

Status	Indication	Description	Possible actions
Ready to operate	 The indicator is solid cyan.	The button module is ready to start milking a new animal.	**Press:** Cluster release (Vacuum and pulsation apply to the cluster). **Press and hold:** Drop clusters.
Normal take-off	 The indicator is solid green.	On take off, when the animal has finished milking and milking alarms have not been detected, see *Chapter 1.4 "Milking alarms" on page 16*. ***Note!*** The indication ends when either cluster releases or cow exits the rotary.	**Press:** Cluster release (reattach). **Press and hold:** Drop clusters.

1.1.2 Milk flow phases

Note! *The flow limits are set according to the farm settings.*

Status	Indication	Description	Possible actions
Pre milking phase	 The indicator is flashing white.	The cluster is attached to the udder, the milk flow is below low milk flow limit.	**Press:** Manual milking **Press and hold:** Cancel Milking
Main milking phase	 The indicator is solid white.	The milk flow has reached the low flow limit.	
Post milking phase	 The indicator is flashing rapidly white.	The flow rate is reaching the take-off limit.	

1.2 Manual milking

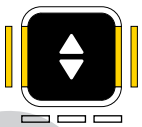
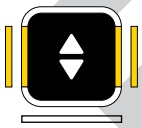
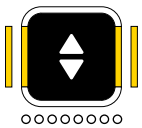
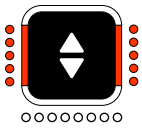
During manual milking, the milker takes control of the monitoring of the milking.

The automatic take-off is disabled.

Manual milking can be activated after the start of the automatic milking and while the button module is in any milk flow phase, refer to
↳ *Chapter 1.1.2 "Milk flow phases" on page 13.*

Press the large button to toggle between automatic and manual milking.

Manual milking indications

Status	Indication	Description	Possible actions
Pre milking phase	 The indicator is solid yellow on the left and right segments while the top and bottom are white slow flashing	The cluster is attached to the udder, the milk flow is below low milking flow limit.	**Press:** Automatic milking, refer to *Chapter 1.1.2 "Milk flow phases" on page 13*. **Press and hold:** Take-off, refer to *Chapter 4.3 "Taking off a cluster manually" on page 44*.
Main milking phase	 The indicator is solid yellow on the left and right segments while the top and bottom are white solid.	The milk flow has reached the low flow limit.	
Post milking phase	 The indicator is solid yellow on the left and right segments while the top and bottom are white rapid flashing.	The flow rate is reaching the take-off limit.	
Overmilking alarm	 The indicator is flashing rapidly red the left and right segments synchronised together with rapid flashing of the top and bottom segment.	The milk flow has reached the take-off limit.	**Press:** Automatic milking, refer to *Chapter 1.1.2 "Milk flow phases" on page 13*. **Press and hold:** Take-off, refer to *Chapter 4.3 "Taking off a cluster manually" on page 44*.

1.3 Herd management alarms

Herd Management alarms are pre-set according to special conditions of the animal.

Note! *To set a herd management alarm to an animal, see DelPro software.*

Note! *The indications of the herd management alarms are shown only by the large button indicator.*

Status	Indication	Description	Possible actions
Do not Milk (Large button is blocked)	 The large button indicator is solid red	This animal is not eligible to milk extraction.	**Press:** N/A **Press and hold:** Override, refer to *Chapter 1.5 "Override" on page 20.*
Dump milk (Large button is blocked)	 The large button indicator is rapid flashing red.	The milk of this animal is not eligible to be mixed with the milk for general collection. Note! Consider milking in a bucket, refer to linktarget doesn't exist but @y.link.required='true'.	

1.4 Milking alarms

Note! *On rotaries using retention bars, when a milking alarm is detected, the retention bar can be lowered immediately on detection or at the confirmed point according to farm settings. See Chapter 1.9.3 "Additional rotation" on page 25.*

Note! *Cluster take-off can be implemented immediately on detection of a milking alarm according to farm settings, unless if manual milking is active.*

1.4.1 Low milk yield and premature take-off alarm indication

Status	Indication	Description	Possible actions
Low milk yield detection	 The indicator is rapidly flashing yellow in all segments.	Occurs on take off, when the milk yield has not reached the expected yield limit. ***Note!*** The yield limit value is a seven days average, weighed with milking Interval.	**Press:** Cluster release (reattach), refer to *Chapter 4.4 "Reattaching a cluster" on page 45*. **Press and hold:** Cluster drop
Premature take-off	Occurs when, after take-off, the minimum milking time limit, according to farm settings, is not reached.	Consider reattach. ***Note!*** The alarm clears when, whichever occurs first, cluster release (reattachment) or cluster drop or on the IDD.	

1.4.2 General milking alarms

A number of milking alarms share the same indication, according to farm settings. When one or more general milking alarms is detected. Further information regarding the condition of the Milking alarm is available on the IDD.

Note! *Cluster attachment can be blocked after cluster take-off on detection of a General Milking alarm, according to farm settings. To override, see* *Chapter 1.5 "Override" on page 20.*

Status	Indication	Description	Alarm handling	Possible actions
Air leakage detection	 The large button indicator is flashing yellow slowly	Occurs due to liner slip or other leakage on teat cups.	Identify and fix the air leakage. ***Note!*** The alarm clears when, whichever occur first, the air leakage stops or on cluster take- off or on the IDD.	**Press:** Cluster release (reattach), refer to *Chapter 4.4 "Reattaching a cluster" on page 45*. **Press and hold:** Drop clusters ***Note!*** If cluster attachment is blocked, see *Chapter 1.5 "Override" on page 20*.
Kick-off detection		Occurs when the animal has physically kicked-off and detach the clusters while milking.	Consider reattachment. ***Note!*** The alarm clears when, whichever occur first, cluster release (reattachment) or cluster drop or on the IDD.	
Blocked air bleed detection		Occurs when blockage of the airbleed in the cluster is detected and the Milk is not evacuated from the cluster properly.	Clean the hole to unblock and consider reattaching. ***Note!*** The alarm clears when, whichever occur first, the hole unblocks and the air levels go back to normal or on cluster release (reattachment) or on the IDD.	
Blood detection		Occurs when the average blood concentration In the milk during this milking exceeds a threshold set by the user.	If the cluster is retracted due to a blood alarm it is not recommended to reattach the cluster as the blood detected is not always visible in the milk. Consider milking in a bugget. ***Note!*** The alarm clears when, whichever occur first, cluster release (reattachment) or cluster drop or on the IDD.	
Milk conductivity alarm		Occurs when the relative deviation between average conductivity during ongoing milking and the expected conductivity for the cow exceeds a set threshold (the expected Conductivity is based on a 7 days average conductivity).	Follow the farm's Conductivity management instructions. ***Note!*** The alarm clears when, whichever occur first, conductivity levels return to normal, cluster release (reattachment) or cluster drop or on the IDD.	

1.4.3 Optional milking alarm indication

The indicator turns to solid yellow.

It can be activated and used for one of the general milking alarms according to the farm settings.

1.5 Override

Override unblocks the large button.

- **Press and hold** the large button to unblock it and enable cluster attachment until the indicator indicates the override remainder. For more information, see *Chapter 1.6 "Override reminders" on page 20*.

Note! *When herd management alarm overriden, override alarm appears, see Chapter 1.3 "Herd management alarms" on page 16.*

1.6 Override reminders

After overriding a herd management alarm, a reminder is indicated on the large button indicator and remains active until the animal exit the rotary. The reminder indication is a red top segment on the large button. The rest segments are indicating according to the function indications.

Note! *The override reminder disappears while manual milking is active.*

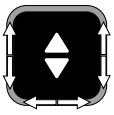
Indication	Description	Possible actions
 Red solid top Segment while the rest segments are solid cyan	Ready to operate	See *Chapter 1.1.1 "Automatic operations" on page 12*.
 Red solid top segment while the rest segments are flashing slowly white	Milking is in pre-milking phase	See *Chapter 1.1.2 "Milk flow phases" on page 13*.
 Red solid top segment while the rest segments are solid white	Milking is in main milking phase	See *Chapter 1.1.2 "Milk flow phases" on page 13*.
 Red solid top segment while the rest segments are flashing rapidly white.	Milking is in post milking phase	See *Chapter 1.1.2 "Milk flow phases" on page 13*.
 Red solid top segment while the rest segments are solid green.	Normal take-off	See *Chapter 4.3 "Taking off a cluster manually" on page 44*.

» Continue next page

Indication	Description	Possible actions
 Red solid top segment while the rest segments are flashing rapidly yellow.	Low yield alarm	See *Chapter 1.4 "Milking alarms" on page 16*.
 Red solid top segment while the rest segments are flashing slowly yellow.	General milking alarm	See *Chapter 1.4 "Milking alarms" on page 16*.
 Red solid top segment while the rest segments are flashing rapidly yellow.	Optional milking alarm indication	See *Chapter 1.4 "Milking alarms" on page 16*.

1.7 Cleaning mode

To enter cleaning mode, see cluster position in automatic mode and idle mode. For more information, see *Chapter 1.8 "Idle mode" on page 23*.

Status	Indication	Description	Possible actions
Cleaning mode	 The left, the bottom and the right segments are alternating sequentially white.	The button module is ready for the system cleaning.	**Press:** Idle mode **Press and hold:** Milking mode

1.8 Idle mode

Status	Indication	Description	Possible actions
Idle mode	 The indicator is inactive.	The button module is ridle.	**Press:** Cleaning mode **Press and hold:** Milking mode

1.9 Small button functions

1.9.1 Animal identification

Status	Indication	Description	Possible actions
No Animal ID	 Indicator is off	Animal has not been detected.	**Press:** N/A **Press and hold:** N/A
Unidentified or unkown ID	 Indicator is flashing rapidly cyan.	The animal ID cannot be identified due to one of the bellow reasons: ■ Animal ID is not registered in DelPro. ■ Animal doesn't carry a transponder.	**Press:** N/A **Press and hold:** No animal ID
Unverified animal ID	 Indicator is flashing slowly cyan.	The animal ID has not been verified.	**Press:** N/A **Press and hold:** N/A
Verified Animal ID	 Indicator is solid cyan.	The animal ID has been verified.	

Note! *For correcting id number of a wrongly identified or an unidentified animal, see (IDD reference).*

1.9.2 High forced vacuum

The forced low to high vacuum is available only with Duovac.

Status	Indication	Description	Possible actions
Forced High vacuum is inactive	 The indicator is off.	Indicates that the forced high vacuum function is inactive.	**Press:** Activate forced low to high vacuum **Press and hold:** N/A
High Force Vacuum is active	 The indicator is steady cyan.	Indicates that the high forced vacuum function is active. The activation can be triggered either manually or automatic.	**Press:** Deactivate forced low to high vacuum **Press and hold:** N/A

1.9.3 Additional rotation

Note! *The retention bar is used for keeping cows in the rotary platform for an additional rotation, automaticaly accorting to farm settings or manually. Press the additional rotation button to toggle the position of the retention between high and low position.*

Status	Indication	Description	Possible actions
No additional rotation (Retention bar is in High position)	 The indicator is off.	The animal will exit the platform.	**Press:** Retention bar is lowered. **Press and hold:** N/A
Second Rotation (Retention bar is in Low position)	 The indicator is steady cyan.	The retention bar has been automatically or manually lowered and the animal will continue an additional round on the platform.	**Press:** Retention bar is raised. **Press and hold:** N/A
Voluntary Additional rotation (Retention bar is in high position)	 The indicator is steady yellow.	The animal has voluntarily remained on the platform for an additional rotation.	**Press:** Retention bar toggles between high and low position. **Press and hold:** N/A

1.9.4 Separate animal

Note! *The separate animal function is used to separate an animal from the rest of its group and in the predefined sorting area after milking pass.*

Note! *Manually sorting an animal once to a predefined area can also be done from the IDD and rotary controller.*

Status	Indication	Description	Possible actions
Separate animal function is inactive	 The indicator is off.	The animal will exit the platform and the exit race without being seperated.	**Press:** Separate animal function activates. **Press and hold:** N/A
Separate animal function has been activated manually in real time during ther milking operation	 The indicator is steady cyan.	The animal will be separated to the predefined sorting area that has been set accorting to the farm settings.	**Press:** Separate animal function deactivates **Press and hold:** N/A
Saperate animal has been set from Delpro before milking session started.	 The indicator is steady green.	The animal will be separated to the predefined sorting area that has been set accorting to the farm settings.	**Press:** Separate animal function deactivates **Press and hold:** N/A

General description

DeLaval milking automation MA200 (Test installation)

1 Introduction

The milking automation MA200 (MA) is controlling the milking process at the milking points and communicate milking point data to the system controller (SC). The milking automation is also capable of controlling the milking equipment cleaning process and animal entrance and exit in the milking points.

2 Overview

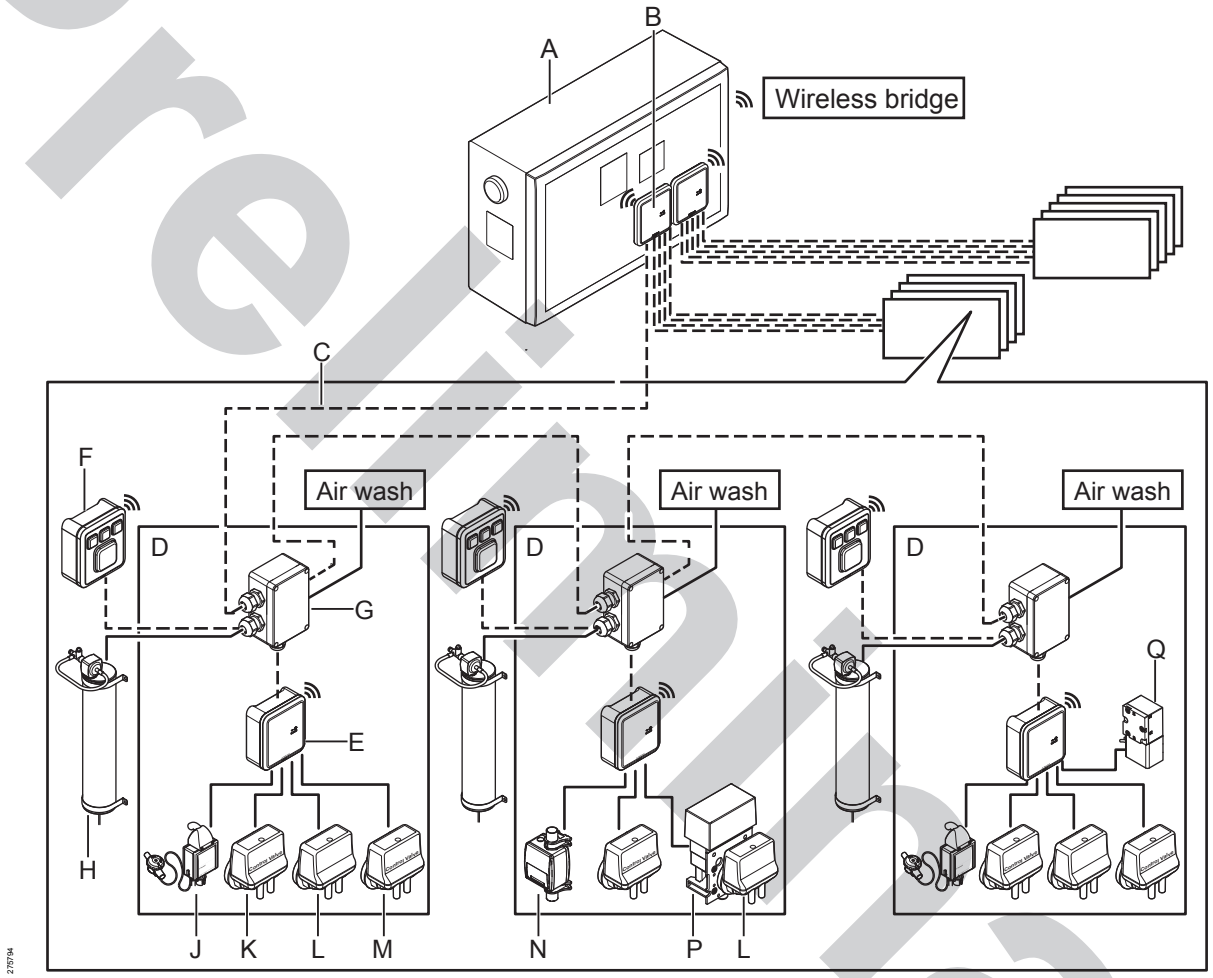


Fig. 4: Milking automation architecture.

A: Infrastructure box
B: Communication and control module
C: Local interconnection network bus
D: Automation panels
E: Input/output module
F: Button module
G: Junction box
H: Comfort start functionality
J: Milk meter
K: Control valve
L: Pulsator
M: Control valve
N: Flow indicator
P: Regulator block
Q: MAC-valve for air retraction

The milking automation system consists of modules with different functionalities interconnected in a milking automation network to each other through a local interconnetion network (LIN) bus. Up to three milking point input/output modules (IOM) are connected on the same local interconnetion network bus. The input/output module controls the milking process in one milking point. The button module (BM) is connected to the

input/output module through the local interconnetion network bus and the button module is used for milking point user interaction. For communication with the system controller and the rotary controller, each input/output module is connected through the local interconnetion network bus to a communication and control module (CCM). Each communication and control module handles up to five local interconnetion network buses with up to three milking points (input/output modules) in each bus.

2.1 Milking automation modules

2.1.1 Button module

The button module is the milking point user interface in the milking automation system. By pressing the buttons on the button module, user commands are sent through the local interconnection network bus to the input/output module. The milking application status is displayed on LED indicators around each button.

The large button controls all basic milking and cleaning operations. Four coloured light segments on each side of the large button communicates the status of the current operation. A coloured LED indicator to the right of the large button indicates communication issues with the system controller and the flow sensor.

The small buttons, if applicable, controls each one dedicated function. Each button has a coulored status light indicator that indicates the current function operation status.

One button module is needed for each milking point.

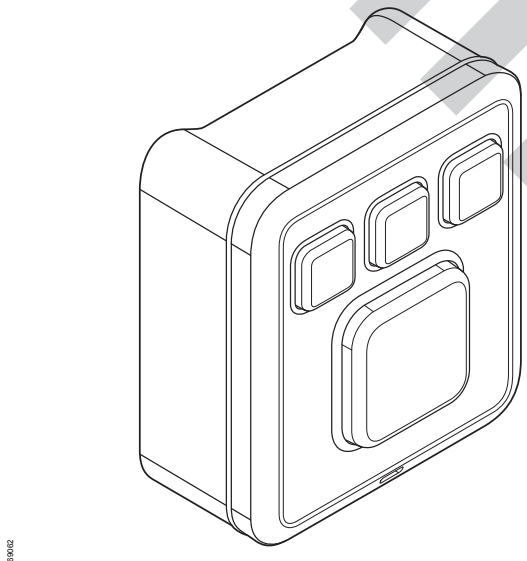


Fig. 5: Button module BM.

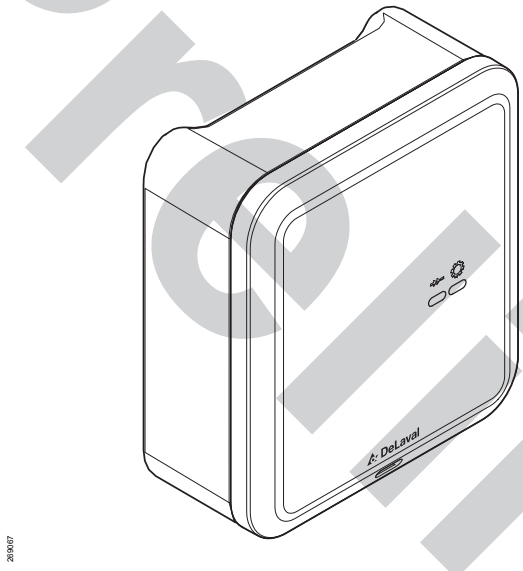


Fig. 6: Input/output module IOM.

2.1.2 Input/output module

The input/output module recieves user commands from the button module through the local interconnection network bus or the comfort start functionality. From these commands the input/output module controls the milking and cleaning processes. At the milking point and in the milking or cleaning process the input/output module interacts with a flow sensor and it controls the control valves and the regulator block. It interfaces with the system controller through a communication and control module. The input/output module is connected to a communication and control module through the local interconnection network. Two light indicators on the input/output module indicates the current status.

One input/output module is needed for each milking point.

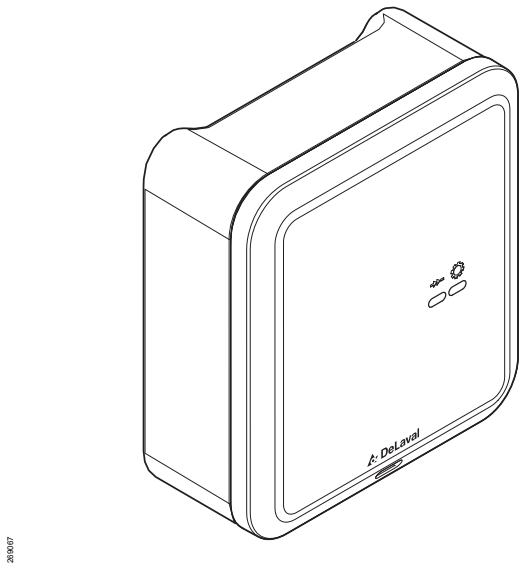


Fig. 7: Communication and control module CCM.

2.1.3 Communication and control module

The communication and control module routes data between the devices in the the local interconnection network (milking points) and the ethernet devices (system controller and rotary controller). The last communication and control module in the system stores the system installation configuration for the system interaction. Two light indicators on the communication and control module indicates the current status.

2.1.4 Technical data

Button module, input/output module and communication and control module

Main dimensions		
	Length	51 mm
	Width	107 mm
	Height	125,4
Power supply		24 VDC (from AC/DC Class 2 Power supply, 100-240 VAC, 50-60Hz)
Protection class		IP56
Bluetooth		
	Frequency range	2402-2480 MHz
	Channel bandwidth	1 MHz
	Maximum rated output power	4 dBm EIRP
Operation temperature		
	Operation temperature	-25°C to +55°C
	Ambient temperature in barn	+4°C to + 40°C
Weight		
	Net	
	Gross (packing included)	

2.2 Infrastructure box

The infrastructure box (IB) is acting as the power supply to the milking automation system and as the communication bridge to the system controller. The infrastructure box contains power supply, communication and control modules, network switch and connection terminals for data bus cables and power supply cables.

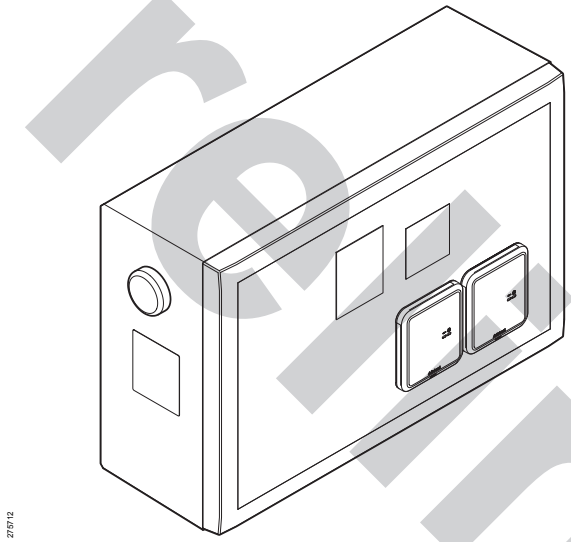


Fig. 8: Infrastructure box.

2.2.1 Technical data

Infrastructure box

Main dimensions		
	Length	X mm
	Width	Y mm
	Height	Z mm
Power supply		
Protection class		
Bluetooth		
	Frequency range	
	Channel bandwidth	
	Maximum rated output power	EIRP
Operation temperature		
	Operation temperature	
	Ambient temperature in barn	
Weight		
	Net	
	Bracket net weight	
	Gross (packing included)	

2.3 Junction box

On rotary milking point automation panels the junction box is a connection terminal between the input/output module and the button module, comfort start (CS) equipment and air wash (AW) equipment. In the milking automation network the junction boxes on the automation panels connects the input/output modules in the automation panel groups of three together. Every group of three automation panels are connected to one of the five bus connections in a communication and control module.

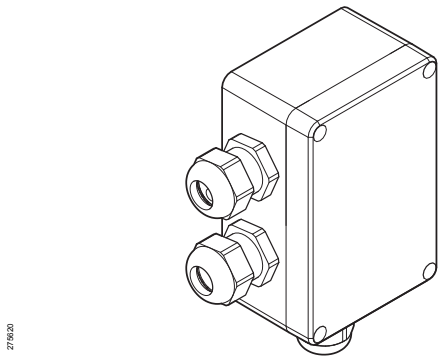


Fig. 9: Junction box.

Operation

DeLaval milking automation MA200 (Test installation)

1 Important notes

Prohibited!
It is prohibited to operate, service, inspect, or otherwise handle this equipment until the user has read the manual and has been properly trained in the intended use of the equipment.

Note! *This chapter only describes the use of the MA200. For a complete system operation, follow also the instructions for the milking parlour and other equipment installed in the parlour.*

2 Handling sick or treated animals

DeLaval recommends physically separating sick or treated cows and milking these cows in a separate group at the end of the milking session, directly before the system cleaning. This milk should not be mixed with the milk from healthy cows.

To prevent sick animal from accidentally being milked with healthy cows, a visual mark (a spray or a leg band) must be applied on animals (in addition to the herd management alarm). The marking helps recognizing animals that must not be milked or with milk to be diverted.

3 Operating the system during a milking session

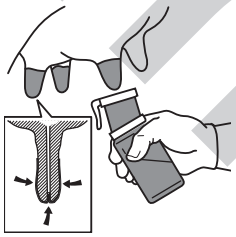
Note! *This chapter refers to functions on the small buttons (ID button, Second rotation button, High force vacuum button and Sort button). These are not always available depending on the button module type.*

3.1 Milking the animal

Ensure there is no problem with the identification of the animal and the cluster attachment is enabled. If the cluster attachment is disabled, perform override.

Note! *If the option "Allow to milk temporary cows" is activated in DelPro software, no herd management alarm is shown on the button module.*

Note! *If the option "Allow to milk temporary cows" is activated in DelPro software, all cows are allowed to be milked with or without transponder and no herd management alarm appears on the button module. However, as long as the cow is unidentified comfort start is deactivated and the large button on the button module must be pressed to release the cluster. If the cow is identified after cluster attach and the cow has a "Do not milk" or "Dump milk" flag set, the cluster is immediately retracted.*



1. If part of the routine, predip the teats.

2. Premilk (strip) 2-3 milk jets from each teat of all animals in the territory to check for flocculation (clots), colour changes, or other inconsistencies.

   Note! *Always keep abnormal milk separated. Examine the udder and if needed, take a sample for analysis, in for example the DeLaval cell counter DCC.*

3. Clean the teats of the animal and stimulate the udder.

   Note! *Make sure to remove all dirt and predip (if used). If wiping the teat ends, turn the towel to use the clean side of the towel on the teat end. Always use a clean towel for each animal, and wipe nothing but the animal with the towel.*

4. Verify that the animals are identified.

Note! *The animal ID can be manual adjusted using the IDD. If a temporary number is identified, it is possible to sort the animal to place the ear tags when needed and to adjust the animal number in DelPro software after the milking session.*

⇨ The cows are identified and verified when they enter the rotary parlour. The cow number is shown on the rotary controller and on the IDD. The ID may then be changed.

When the identification is verified the indicator of the animal identification button is solid cyan.

When there is an animal ID which is not not fully confirmed, not registered animal ID or when there is an unidentified animal, the indicator of the animal identification button is flashing rapidly cyan.

If the indicator of the animal identification button is off, no animal is detected.

5. Check if a herd management alarm active, see table below.

Herd management alarms

Indication	Description
	If the large button indicator is solid red, the *"Do not milk"* flag is set for the specific animal and the button module is blocked for start milking. If the animal is incorrectly flagged, see ↬ *Chapter 4.2 "Overriding a blocking" on page 42*.
	If the large button indicator is rapid flashing red, the *"Dump milk"* flag is set for the specific animal nd the button module is blocked for start milking. If the animal is incorrectly flagged, see ↬ *Chapter 4.2 "Overriding a blocking" on page 42*. See also, ↬ *Chapter 5 "Milking a sick or treated cow into a bucket" on page 49*.
	If the *"second rotation"* indicator light is solid yellow, the animal has voluntarily remained on the platform for an additional rotation. The large button indicator is solid red since *"second rotation"* indicator triggers a *"Do not milk"* flag. See the description for *"Do not milk"* alarm.

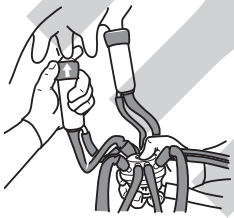
6. Visually inspect the teats.

   Note! *Do not milk infected teats.*

7. Press the large button to release the cluster.

   Note! *With comfort start there is no need to push the button, vacuum is applied to the cluster when it is lifted. However, this is not the case if the "Do not milk" or "Dump milk" flags are active.*

   Note! *If the animal is incorrectly blocked for milking, see* ↳ *Chapter 4.2 "Overriding a blocking" on page 42.*



8. Attach the cluster to the udder of the cow.

   Note! *Avoid that air enters the cluster before the actual attachment.*

   Note! *If needed, disable automatic retraction of the cluster by pressing the large button again to activate manual mode. For more information,* ↳ *Chapter 4.1 "Milking in manual mode" on page 41*

   ⇨ The large button indicator light flashes slowly in white until the milk flow is above the low flow limit.

   When the milk flow is above the low flow limit, the large button indicator light turns into a solid white.

   When the flow is below the take-off limit, the large button indicator light flashes slowly in white until the cluster is retracted.

   The large button indicator light turns to solid green at normal take-off.

If the large button indicator light is flashing rapidly yellow, the expected milk yield or the minimum milking time limit is not reached (by default 90 seconds after cluster release). Check if a reattach is needed, see *Chapter 4.4 "Reattaching a cluster" on page 45*.

9. If the animal has a high milk flow already at the start of the milking, press the [Force vacuum] button to activate a high vacuum level immediately if the system has two vacuum levels (Duovac).

   Note! *The activation can be triggered either manually or automatic.*

   ⇨ The indicator light turns into a steady cyan indicating that the high forced vacuum function is active. The activation can be triggered either manually or automatic.

10. Check for any alarms during milking. A number of milking alarms share the same indication on the button module, see table below.

    Note! *If the large button indicator is solid yellow, a general milking alarm is active. The general milking alarms are specific to the settings made on the farm. The general alarm can be a reminder for the specific animal, to check something, give a treatment, or do a manual attach, and so on.*

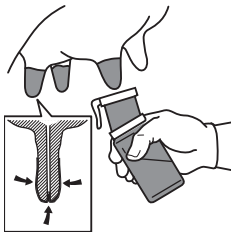
    Note! *Further information regarding the condition of the milking alarm is available on the IDD.*

    Note! *Cluster take-off can be implemented immediately on detection of a milking alarm according to farm settings, unless if manual milking is active.*

    Note! *Cluster attachment can be blocked after cluster take-off on detection of a general milking alarm, according to farm settings.*

    Note! *On rotaries using retention bars, when a milking alarm is detected, the retention bar will lower immediately on detection or at the confirmed point according to farm settings.*

General milking alarms
Air leakage detection. Occurs due to liner slip or other leakage on teat cups. Identify and fix the air leakage, see *Chapter 4.4 "Reattaching a cluster" on page 45* ***Note!*** The alarm clears when, whichever occur first, the air leakage stops or on cluster take- off or on the IDD.
Kick-off detection. Occurs when the animal has physically kicked-off and removed the clusters while milking. Consider reattachment, see *Chapter 4.4 "Reattaching a cluster" on page 45* ***Note!*** The alarm clears when, whichever occur first, cluster release (reattachment) or cluster drop or on the IDD.
Premature take-off. Occurs when, after take-off, the minimum milking time limit, according to farm settings, is not reached. Consider reattach, see *Chapter 4.4 "Reattaching a cluster" on page 45* ***Note!*** The alarm clears when, whichever occurs first, cluster release (reattachment) or cluster drop or on the IDD.
Blocked air bleed detection. Occurs when blockage of the airbleed in the cluster is detected and the milk is not evacuated from the cluster properly. Clean the hole to unblock and consider reattaching, see *Chapter 4.4 "Reattaching a cluster" on page 45* ***Note!*** The alarm clears when, whichever occur first, the hole unblocks and the air levels go back to normal or on cluster release (reattachment) or on the IDD.
Only in combination with milk meter MM27BC2: Blood detection. Occurs when the average blood concentration In the milk during this milking exceeds a threshold set by the user. If the cluster is retracted due to a blood alarm it is not recommended to reattach the cluster as the blood detected is not always visible in the milk. Consider milking in a bucket, see *Chapter 5 "Milking a sick or treated cow into a bucket" on page 49* ***Note!*** The alarm clears when, whichever occur first, cluster release (reattachment) or cluster drop or on the IDD.
Only in combination with milk meter MM27BC2: Milk conductivity alarm. Occurs when the relative deviation between average conductivity during ongoing milking and the expected conductivity for the cow exceeds a set threshold (the expected Conductivity is based on a 7 days average conductivity). Follow the farm's conductivity management instructions. ***Note!*** The alarm clears when, whichever occur first, conductivity levels return to normal, cluster release (reattachment) or cluster drop or on the IDD.



11. If part of the routine, post-dip or spray the teats of the animals with a suitable solution after take-off.

Note! *The post-dip or spray should fully cover the teat and the teat end.*

Note! *If the on-deck teat spray is used, the post spray is performed after a normal take-off.*

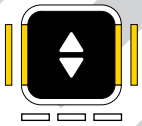
4 Handling specific MA200 functions

4.1 Milking in manual mode

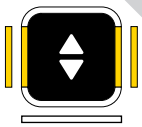
Sometimes it is better to milk in manual mode. For example, if an animal has a very low milk flow at start and there is a risk that the pre-milking time-out will occur before the milk flow is above the low flow limit which results in a premature take-off. The mode can be shifted back to automatic when the milk flow has increased, to activate automatic retraction after milking.

Note! *Manual milking requires extra attention since the cluster is not retracted automatically. Retract the cluster in due time to avoid over-milking the animal.*

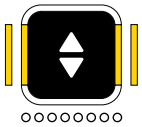
1. Press the large button to shift to manual mode from automatic mode.



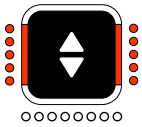
⇨ The indicator is solid yellow on the left and right segments while the top and bottom are white slow flashing until the milk flow is above the low flow limit.



The indicator is solid yellow on the left and right segments while the top and bottom are white solid when the milk flow is above the low flow limit.



The indicator is solid yellow on the left and right segments while the top and bottom are white rapid flashing when the milk flow has reached the low flow limit.



The indicator is flashing rapidly red the left and right segments synchronised together with rapid flashing of the top and bottom segment indicating that the milk flow has reached the take-off limit and there is a risk of over-milking.

2. When the milk flow has increased above the low flow limit, press the large button again to shift back to automatic mode to activate automatic retraction after milking.

4.2 Overriding a blocking

Fig. 10: The "Do not milk" flag.

If the large button indicator is solid red, the *"Do not milk"* flag is set for the specific animal and the button module is blocked for start milking. This flag is usually used on animals during the post calving and dry-off period or when antibiotic treatment is applied.

Fig. 11: The "Dump milk " flag.

If the large button indicator is rapid flashing red, the *"Dump milk "* flag is set for the specific animal nd the button module is blocked for start milking. This flag is usually set on animals with colostrum milk or animals under treatment.

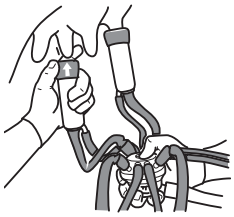
If the animal is incorrectly flagged, it is possible to override a blocking if the setting to allow an override is activated in DelPro software.

See also, *Chapter 5 "Milking a sick or treated cow into a bucket" on page 49*.

1. If the animal is incorrectly blocked for milking, press and hold the large button until the blocking is released.

   Note! *Do not override an animal which is correctly blocked for milking.*

   ⇨ When an override is released, the top segment turns to solid red while the rest segments are solid cyan.



2. Attach the cluster to the udder of the cow.

   Note! *With Duovac milking mode the vacuum level can be forced to a high level immediately by pressing high forced vacuum button after attaching the cluster.*

   Note! *If needed, disable automatic retraction of the cluster by pressing the large button again to activate manual mode. For more information, Chapter 4.1 "Milking in manual mode" on page 41*

   Note! *After overriding a herd management alarm, a reminder is indicated on the large button indicator and remains active until the animal exit the rotary. However, the override reminder disappears while manual milking is active.*

⇨ The large button indicator light has a the top segment is solid red and the other segments flash slowly in white until the milk flow is above the low flow limit.

When the milk flow is above the low flow limit, the large button indicator light turns into a solid white and the top segment is solid red.

When the flow is below the take-off limit, the large button indicator light is flashing rapidly white and the top segment is solid red until the cluster is retracted.

The large button indicator light turns to solid green at normal take-off. The top segment is solid red still indicating the override.

If the large button indicator light is flashing rapidly yellow, the milk yield is below the expected level. The top segment is solid red still indicating the override. Check if a reattach is needed, see *Chapter 4.4 "Reattaching a cluster" on page 45*.

If the large button indicator light, despite flashing rate, turns to yellow, it means that a milking alarm has been detected. The top segment is solid red still indicating the override. Check if a reattach is needed, see *Chapter 4.4 "Reattaching a cluster" on page 45*.

4.3 Taking off a cluster manually

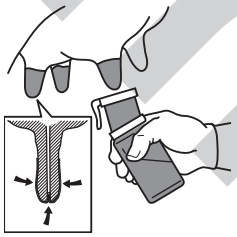
If a cluster is attached to the udder of an animal and needs to be manually detached, do the following:

1. Press and hold the large button to take off the cluster manually.

   ⇨ The milking ends (vacuum and pulsation stops) and the cluster is retracted.

   If there is no active milking alarm, the indicator turns to solid green.

If the large button indicator light, despite flashing rate, turns to yellow, it means that a milking alarm has been detected.



2. If part of the routine, post-dip or spray the teats of the animals with a suitable solution after take-off.

   Note! *The post-dip or spray should fully cover the teat and the teat end.*

   Note! *If the on-deck teat spray is used, the post spray is performed after a normal take-off.*

4.4 Reattaching a cluster

Note! *Always check the udder to see if the animal is milked out or if a reattach is necessary.*

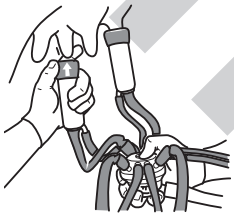
Note! *When reattaching a cluster to an animal; according to farm settings, different parameters will be applied.*

Note! *If a cluster must be reattached near the exit of a rotary parlour without retention bar it is necessary to stop the platform rotation, reattach the cluster, and manually position a chain behind the animal for a second rotation.*

1. Press the large button to release the cluster.

   Note! *With comfort start there is no need to push the button, vacuum is applied to the cluster when it is lifted.*

   Note! *If the animal is incorrectly blocked for milking, see Chapter 4.2 "Overriding a blocking" on page 42.*

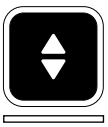


2. Attach the cluster to the udder of the cow.

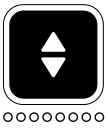
   Note! *Avoid that air enters the cluster before the actual attachment.*

   Note! *The 2nd pre-milking time, which is active at a reattach, is shorter than the 1st pre-milking time.*

⇨ The large button indicator light flashes slowly in white until the milk flow is above the low flow limit.



When the milk flow is above the low flow limit, the large button indicator light turns into a solid white.



When the flow is below the take-off limit, the large button indicator light flashes slowly in white until the cluster is retracted.

The large button indicator light turns to solid green at normal take-off.

If the large button indicator light is flashing rapidly yellow, the milk yield the minimum milking time limit is not reached (by default 90 seconds after cluster release). Check if a reattach is needed, see *Chapter 4.4 "Reattaching a cluster" on page 45*.

If the large button indicator light, despite flashing rate, turns to yellow, it means that a milking alarm has been detected. Check if a reattach is needed, see *Chapter 4.4 "Reattaching a cluster" on page 45*.

3. If the animal has a high milk flow already at the start of the milking, press the [Force vacuum] button to activate a high vacuum level immediately if the system has two vacuum levels (Duovac).

   ⇨ The indicator light turns into a steady cyan indicating that the high forced vacuum function is active.

Second rotation (with retention bar)

4. If a cluster must be reattached near the exit of a rotary parlour, press the [second rotation] button to lower the retention bar.

Second rotation (without retention bar)

5. Stop the platform rotation.
6. Reattach the cluster.
7. Manually position a chain behind the animal for a second rotation.

4.5 Manually sorting a cow once to a predefined sorting area

This section describes how to manually sort an animal to a predefined area when exiting the parlour after a milking session.

Note! *Manually sorting an animal once to a predefined area can also be done from the IDD or rotary controller.*

- Press the [Sort] button to activate the separate animal.

  Note! *Pressing* [Sort] *again cancels the sorting of the animals.*

  ⇨ The indicator light is steady cyan indicating that the animal will be separated, from the rest of its group, to the predefined sorting area that has been set according to the farm settings.

4.6 Manually raising / lowering the retention bar

The retention bar is used for keeping cows in the rotary parlour for a second rotation. The retention bar can be raised or lowered manually as described in below.

If the indicator light is solid yellow, the animal has voluntarily remained on the platform for an additional rotation.

269169

Fig. 12: Voluntary second rotation.

- Press [second rotation] to lower the retention bar.

  Note! *Pressing the* [second rotation] *again, raises the retention bar and the indicator light turns off indicating that the retention bar is raised.*

  ⇨ The indicator light is steady cyan to indicate that the retention bar is lowered to keep the animal for a second rotation.

4.7 Milking in fail-safe mode

If the communication with the herd management system is lost, it is still possible to perform milking but with limited functionality, see below.

In fail-safe mode:

- Each button module must manually be set in milking mode
- The animals are not identified and therefore no animals are blocked for milking
- No herd management alarms are visible on the button modules
- Low yield alarm is not available
- Animals cannot be sorted
- Automatic and manual milking can still be performed
- Forced vacuum, second rotation (retention bar), reattach, milking a sick or treated cow into a bucket, and manual take-off can still be performed

Note! *The "Do not milk" or "Dump milk" indications are not present on the button module if the communication with the herd management is lost. Unless the animals have a physical indication (leg band or similar) indicating that they need special treatment, there is a risk of mixing milk from these animals with the milk from healthy animals. For more information, see*
Chapter 2 "Handling sick or treated animals" on page 34.

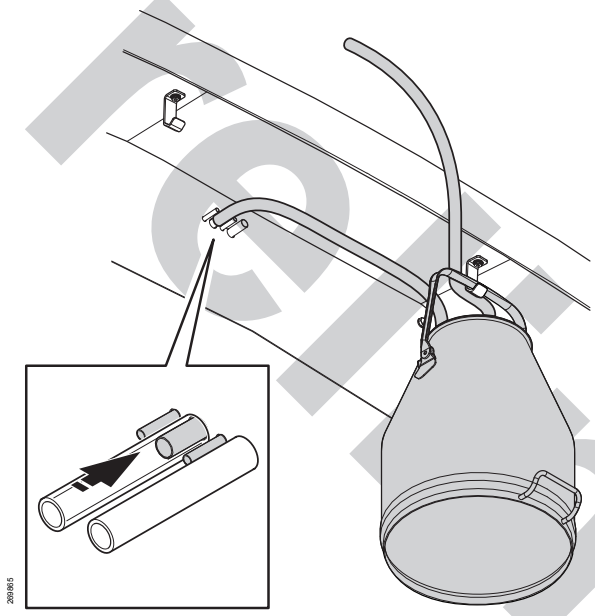


Fig. 13: Milking into a bucket.

5 Milking a sick or treated cow into a bucket

When an animal in the parlour is not supposed to be milked into the regular milk line because it has colostrum milk, is sick, or is treated with penicillin and so on, it can be milked into a milk bucket using a separate cluster.

When the cluster is retracted, proceed as follows:

1. Disconnect the cluster milk tube from the dropper pipe below the platform and connect it to the lid of the milk bucket.
2. Connect a tube from the lid of the milk bucket to the dropper pipe, see Fig. 13.
3. Milk the cow manually according to *Chapter 4.1 "Milking in manual mode" on page 41*.

   Note! *Take off the cluster in due time to avoid over-milking the animal.*

   Note! *Avoid over-flowing the bucket, to prevent milk entering the vacuum line.*
4. Report to the system the appropriated flag *"Do not milk"* or *"Dump milk"* from IDD or directly into the DelPro herd management system.

   Note! *The herd management alarm is activated for the period set into the system for future milkings.*

Operator's maintenance

DeLaval milking automation
MA200 (Test installation)

1 Introduction

2 Preparing for maintenance

- Switch off the power supply.

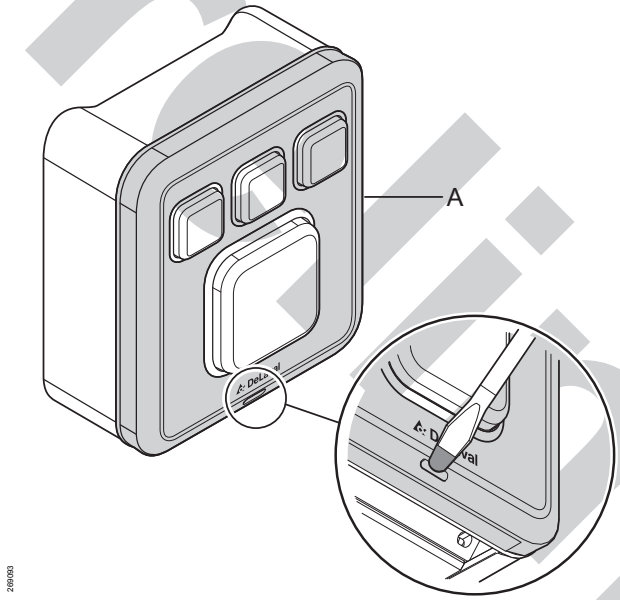
3 Maintenance schedule

3.1 Every six months

No	Operator's maintenance task	Frequency	Max. interval	Replacement parts or kits
1	Cleaning the button module	-	Every six months	

Frequency	-
Max. interval	Every six months
Estimated time:	-
Service type:	

No 1 Cleaning the button module



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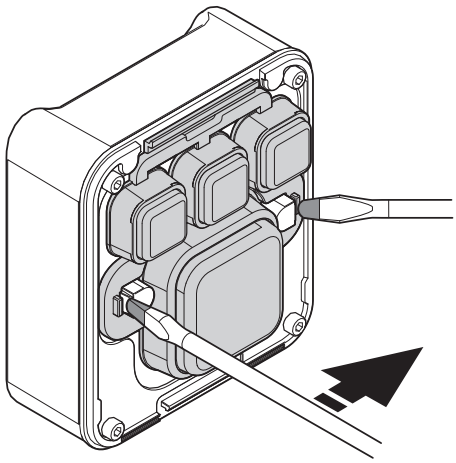
The front cover and button frame is secured to the button module unit with click-locks. Use a flat rubber head tool to carefully click off the parts.

Removing the front cover, button frame and buttons

1. Remove the front cover (A).



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2. Remove the button frame (B).
3. Remove the buttons from the button frame.

Cleaning

Danger!
Risk of electric shock
Do not spray or flush water on electrical components even when they are switched off or disconnected. Water on electrical components can cause an electric shock, and could destroy the equipment.

4. Clean the surfaces of the button module using a sponge and soapy water.
5. Clean the front cover using a sponge and soapy water. Rinse with water.

   Note! *Directing the water jet towards the connections may short circuit the system.*
6. Clean the button frame in a dishwasher or by hand. Rinse with water.

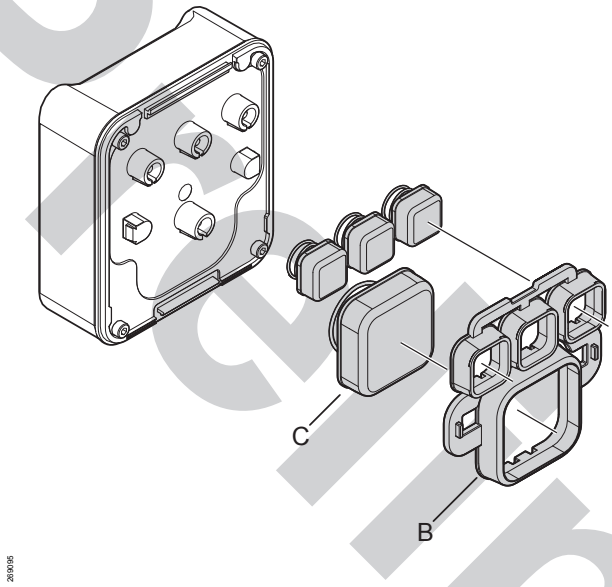
Checking the parts

7. Check that all dirt, dust and residues are removed.
8. Check that the four screws on the button module unit are correctly fastened and that there are no gaps in the frame sealing.

Reassembling the front cover and button frame

Warning!
If the equipment is not properly fastened, it can move and pull the electrical cables loose. This may cause personal injury and risk of fire.

9. Reinstall the buttons onto the button frame.



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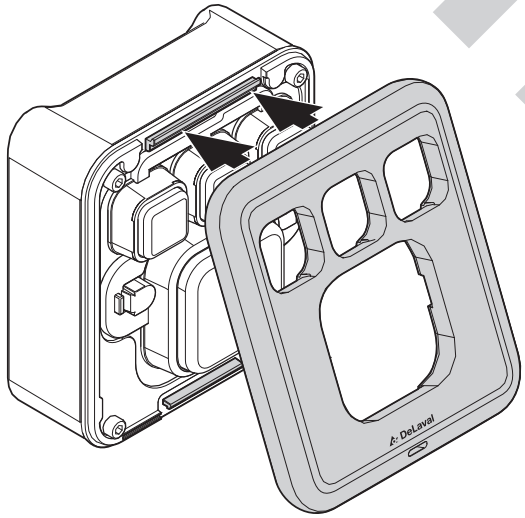
10. Reinstall the buttons (C) and button frame (B) onto the button module unit. Ensure that the frame clicks correctly in place.



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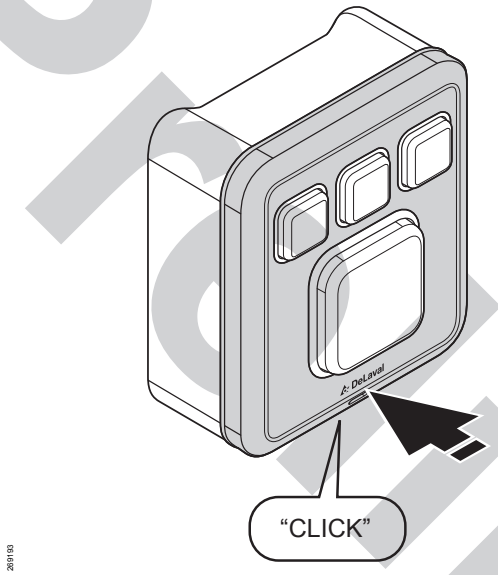
11. Reinstall the front cover onto the button module unit (B).



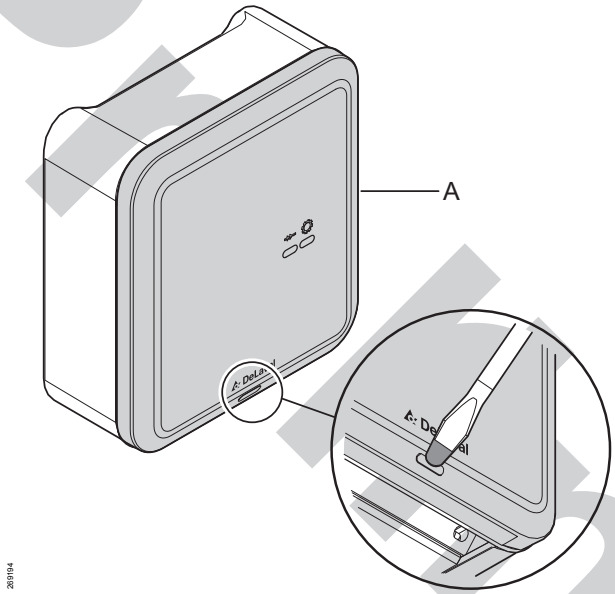
12. Ensure that the cover clicks correctly in place.

3.2 Every second year

No	Operator's maintenance task	Frequency	Max. interval	Replacement parts or kits
1	Cleaning the input/output module and the communications and control module	-	Every second year	

Frequency	-
Max. interval	Every second year
Estimated time:	-
Service type:	

No 1 Cleaning the input/output module and the communications and control module



Removing the front cover

1. Remove the front cover.

Cleaning

2. Clean the surfaces of the units using a sponge and soapy water.
3. Clean the front cover using a sponge and soapy water. Rinse with water.

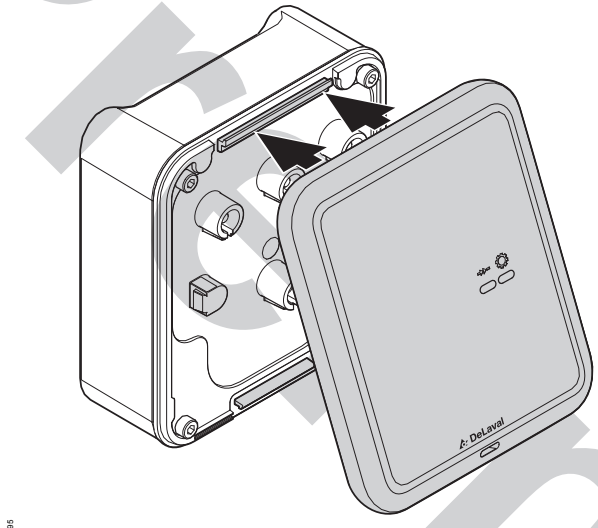
   Note! *Directing the water jet towards the connections may short circuit the system.*

Checking the parts

4. Check that all dirt, dust and residues are removed.
5. Check that the four screws on each unit are correctly fastened and that there are no gaps in the frame sealing.

Reassembling the front covers

6. Reinstall the front covers.



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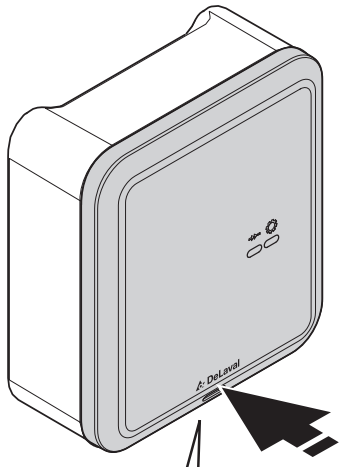
7.



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Warning!
If the equipment is not properly fastened, it can move and pull the electrical cables loose. This may cause personal injury and risk of fire.

Make sure that the covers click correctly in place.

Troubleshooting

DeLaval milking automation MA200 (Test installation)

1 Procedure when a problem occurs

1. Make a note in an error log file on the desktop of the DelPro computer describing the error.

   Note the following:

   - Date (YYYY-MM-DD) and time (HH:MM) when the problem occurred
   - What happened (the actual symptoms of the problem)?
   - Is the problem reoccurring at a milking point?
   - Is the problem with one button module or with several / all?

   Example; 2019-05-26 at 08:36 AM: Cow no 126 premature take-off at milking point 3.

   Note! *This is very important for support personnel who are not present first hand when the problem occurred.*

2. If no alarm code is present, look through the *"Possible problems"* section, see .
3. If it is necessary to contact a service technician, make sure as much detailed information as possible is available on the installation, such as:

   - Software version (and possibly serial number) of the button module
   - Flow sensor type
   - Number of button modules connected to each smart connection box
   - Serial number of the smart control box

2 Possible problems

The tables below describe possible problems with the system, what might cause the problem, and suggestions on how the problem might be solved.

Try to isolate the error by studying smaller parts of the system. Find the suitable table below to find out what is causing the problem.

Some manual operations are related to the possible problems below, these are described in the following section .

No.	Symptom	Cause	Action
1	The fuses or thermal protection are broken repeatedly in the power supply.	The cable type used between the power supply to the communication and control module is incorrect.	Contact an authorised service technician.
		The cable type between the communication and control module and the input/output module is incorrect	Contact an authorised service technician.
		The wiring between the power supply and the communication and control module and input/output module is incorrect.	Contact an authorised service technician.
		The wiring between the communication and control module and the input/output module is incorrect	Contact an authorised service technician.
		The wiring between the button module and the interface box / smart control box is incorrect.	Contact an authorised service technician.
		The installer did not follow the power consumption guidelines and connected too many input/output modules or/and button modules to one 5 A circuit.	Contact an authorised service technician.
2	The clusters are removed too early during milking in one or several milking points.	There is a communication problem between the input/output module and the milk meter / flow sensor.	Contact an authorised service technician.
3	The clusters are removed too late during milking in one or several milking points.	Incorrectly programmed parameters.	Contact an authorised service technician.
4	The clusters are retracted during cleaning in one or several milking points in cleaning mode.	There is a problem with timing of the milking / cleaning signals.	Contact an authorised service technician.
5	Communication interruption with flow sensor in external rotary.	A DeLaval teat spray robot TSR is installed which might disturb the button module.	Contact an authorised service technician.
6	The button module behaves erratic.	The button module is exposed to high temperatures or significant temperature difference repetitively.	Contact an authorised service technician.

» Continue next page

No.	Symptom	Cause	Action
		The button module enclosure is cracked.	Contact an authorised service technician.
		Dirt is lodged between the button magnet and the chamber of the push button.	■ Clean the button and chamber, see *Chapter 3 "Maintenance schedule" on page 50*.
		The magnet is not properly assembled, or magnetic switch in the button module is not level.	■ Take the push button apart and reassemble it correctly.
		A button is broken.	Replace broken parts in the button.
		An electrical storm or extreme power surge took place, possibly rearranging the program values in the button module.	Contact an authorised service technician.
		A Variable Speed Drive (VSD) has been installed incorrectly on the facility, causing excess harmonic current to ground.	Contact an authorised service technician.
		External high or low voltage equipment on the facility have defective wiring or grounds. Voltage is leaking to ground.	Contact an authorised service technician.

3 Manual operations during troubleshooting

4 Alarms

	Explanation	Solution

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