



SILO TANKS
Installation and service manual
English | Version 2.0.1 | 2022

Wedholms

Table of Contents

Table of Contents	1
General description of Wedholms' silo tanks	3
Safety instructions.....	4
Preface.....	4
Disclaimer	4
Important information	4
Safety symbols and information signs.....	6
Type plate silo tank	7
Information sign cooling unit (refrigerant)	8
Agitator.....	9
Cleaning equipment	10
Cleaning head.....	10
Cleaning pump.....	10
Pipes and other connections on the silo tank	11
Dimensions and weights.....	12
Silo with diameter 2,300 mm	12
Silo with diameter 3,000 mm	13
Placement of the silo tank.....	14
Installation with alcove or pick-up room from Wedholms	15
Installation without alcove.....	16
Installation protocol – information	17
Cooling unit	18
Flow chart cooling system	18
Filling of refrigerant into the cooling system	19
Evacuation and filling of refrigerant.....	19
Double pressure switch.....	20
Setting of high-pressure switch.....	20
Setting of low-pressure switch.....	20
Speed regulator	21
Start-up of silo tank and cooling unit	22
Cleaning of the silo tank.....	23
Programming of the cleaning	23
Adjusting the water volume for cleaning.....	23
Checking the water volume for cleaning.....	23
Hot water supply for cleaning	24

Dosage of detergent.....	24
Service and maintenance	25
Annual service	25
General control performed by the user	25
Maintenance performed by a service technician.....	25
Maintenance of the cleaning head.....	26
Control of the cooling circuit.....	27
Actions in the event of a malfunction	28
Manual start of cooling and agitation	28
Extra equipment (options)	29
Interpac	29
Chilled outlet – glycol	32
Capacity regulator	33
Home consumption button	35
Heater.....	36
Instructions for recycling of silo tank and cooling unit	38
Installation protocol for silo tank	39
Customer copy – page 1 of 2	39
Customer copy – page 2 of 2	40
Installer copy – page 1 of 2	41
Installer copy – page 2 of 2	42

General description of Wedholms' silo tanks

Wedholms' silo tanks are of closed tank type with the shape of a vertical cylinder with a conical bottom to optimize the emptying of the tank. The silo tanks are available in sizes 5,000 to 24,000 liters with a diameter of 2,300 mm and 10,000 to 50,000 liters with a diameter of 3,000 mm. If necessary, it is possible to change to a tank with a larger diameter in the future, if the larger foundation has been chosen.

All metal parts are made of stainless steel according to EN 1 4301 - AISI 304. Inner jacket and outer jacket are made of 2.0 mm stainless steel.

The tanks are equipped with a manhole with an openable door.

A 4-inch ventilation pipe goes from the top of the tank into the milk chamber to ensure the venting function.

The milk is pumped into the silo tank through the outlet.

The tank outlet is equipped with a 3-inch throttle valve that can be fitted with different types of emptying connections with size and thread that fits the milk truck's connection. The outlet can also be equipped with various adapters (T-pipes) for connection to one or several milking robots.

If a long outlet pipe is required, it can be equipped with a double jacket containing glycol to ensure the cooling of the milk in the outlet. Outlet pipes with double jacket can be ordered in lengths up to 2,500 mm. The standard length is 1,500 mm.

Wedholms' silo tanks are insulated with 100 mm ozone-friendly polyurethane foam between the inner and outer jacket.

All internal connection pipes for refrigerant are made of stainless steel and are led out through the outer jacket on the preselected side of the silo.

The evaporator surface consists of two welded plates that are blown up to the correct channel height. The conical bottom forms a large cooling surface. There are additional evaporators on the sides in the lower part of the silo.

Safety instructions

Preface

The safety and operating instructions must be followed by all persons using this equipment. Under no circumstances may the equipment be used if it is damaged or if the operation of the equipment is not fully understood.

Disclaimer

The information and instructions given in this manual and the components described apply at the time of publication. Wedholms reserves the right to make changes without prior notice.

Read this before the silo tank is installed and put into operation!

Important information

- Operation, control, and maintenance may only be carried out by authorized persons.
- The silo and its equipment may only be used for what they are intended for.
- Gloves and protective goggles should always be worn when working with and handling chemicals for tank cleaning.
- Never mix the different detergents for tank cleaning.
- Do not touch the hot gas side of the cooling unit or hot cleaning pipes, as there is a risk of burns.
- Do not step on the base plate of the cooling unit.
- The manhole lid must be closed during tank cleaning. If the lid is opened during cleaning, hot water with or without detergent may splash out.
- Any additional drilling in the tank may only be carried out by a certified specialist. The heat from drilling can cause unhealthy gas evolution from the insulation between the inner and outer casing of the tank. The insulation contains isocyanates.
- The refrigeration installation must be carried out by a certified refrigeration technician from an approved company.
- Never enter the silo tank without interrupting the power supply and securing it against being switched on again, as there is a risk that the silo tank agitator will start up automatically.
- Never work alone in the silo tank.
- Do not step on the outlet pipe when entering or exiting the silo through the manhole.
- Use a low voltage lamp in the silo tank, max 48V.
- Electrical installation must be carried out by a qualified electrician at an authorized company.
- Work with electrical equipment may only be carried out by a qualified professional.
- Voltaged parts must not be opened.
- The power supply to the silo and the cooling unit must be installed by a qualified electrician from an authorized company.
- Check for adequate grounding for electrical installations.

- Exchange of fuses and resetting of tripped circuit breakers or motor protection may only be carried out in consultation with a qualified specialist and after the power supply to the silo tank has been switched off.
- Warranty does not apply to incorrectly mounted equipment and incorrect or careless operation.
- Responsibility is only taken for products and equipment delivered by Wedholms.

Safety symbols and information signs



WARNING - RISK OF SPLASHING

The manhole cover must be closed during cleaning. Never open the cover during cleaning. Hot water with or without detergent might splash out. Risk of burns and corrosion.



WARNING - AUTOMATIC STIRRING

The silo's agitator starts automatically. Always turn off the power when working inside the silo to avoid personal injury.



WARNING - DO NOT TOUCH

Do not touch the cooling unit or hot cleaning pipes. Risk of burns.



WARNING - VOLTAGE

Voltaged parts may only be opened by a qualified professional.

Type plate silo tank

The type plate only applies to the silo tank.

TYPE:	Tank type
MODEL:	Tank model
YEAR:	Manufacturing year
SERIAL NUMBER:	Serial number
COOLING CLASS:	Cooling class
CODE:	Type of equipment
MAXIMUM OPERATING PRESSURE LP-SIDE:	Max. operating pressure low pressure side
MAXIMUM OPERATING PRESSURE HP-SIDE:	Max. operating pressure high pressure side
VOLUME (L):	Tank volume (L)
VOLTAGE (V):	Operating voltage (V)
AMPERE (A):	Current (A)
EFFECT (kW):	Power (kW)
IP CLASS:	Enclosure class
MAXIMUM TEST PRESSURE LP-SIDE:	Maximum test pressure low pressure side
MAXIMUM TEST PRESSURE HP-SIDE:	Maximum test pressure high pressure side

Information sign cooling unit (refrigerant)

CE	Wedholms			
Serial number Ordningsnummer	<input type="text"/>	Code Code	<input type="text"/>	
Filling quantity kg Füllmenge kg	<input type="text"/>	Refrigerant Kältemittel	<input type="text"/>	
CO ₂ e in tonnes CO ₂ e in Tonnen	<input type="text"/>	GWP	<input type="text"/>	
Year of installation Jahr Installation	<input type="text"/>			
		HP side bar HD Seite bar	<input type="text"/>	
Maximum Operation Pressure Maximaler Betriebsdruck		LP side bar ND Seite bar	<input type="text"/>	
Contains fluorinated greenhouse gases by the Kyoto Protocol. Anlage enthält vom Kyoto-protokoll erfasste fluorierte Treibhausgase.	Yes Ja	<input type="checkbox"/>	No Nein	<input type="checkbox"/>

The silo tank's separate cooling unit has a sign that shows necessary GWP information regarding the tank cooling system. It is the cooling technician's responsibility to enter data on the plate when refrigerant is filled into the cooling system.



The location of the information plate on the cooling unit.

Agitator

The silo tank's agitator motor is mounted on top of the tank. The shaft goes through a stainless-steel tube all the way up to the gearbox. It ensures optimal sealing between tank and engine. The agitator shaft has a support at the bottom of the tank to ensure optimal stability.

Silo diameter 3,000 mm

Motor 3-phase

Type:	YE2-90S-4
Operating voltage:	3 x 400V – 50 Hz
Power:	1.1 kW
Speed N1:	1430 RPM
Speed N2:	25 RPM
Enclosure class:	IP 55
Shaft diameter:	35 mm
Material:	Cast iron



Note: The agitator must rotate clockwise.

Silo diameter 2,300 mm

Motor 1-phase

Type:	R 1C 245 NSBR
Operating voltage:	1 x 230V – 50 Hz
Power:	125 W
Speed N1:	2760 RPM
Speed N2:	25 RPM
Enclosure class:	IP 44
Shaft diameter:	35 mm
Material:	Aluminum



PERSONAL SAFETY:

Before any work inside the silo, the power supply must be interrupted and secured against being switched on again in order to prevent the agitator from starting up automatically!

Cleaning equipment

Cleaning head

All silo tanks are equipped with Wedholms' self-manufactured, rotating cleaning head with fixed nozzles for optimal cleaning.



Cleaning pump

The cleaning pump is of a different model, depending on whether the control system Argos and the cleaning pump are mounted on the silo body or separately.

Cleaning pump **not** mounted on the silo body:

A 900 W centrifugal pump is used to drive the rotating cleaning head.



Cleaning pump mounted on the silo body:

A centrifugal pump of 1,150 W is used to drive the rotating cleaning head.

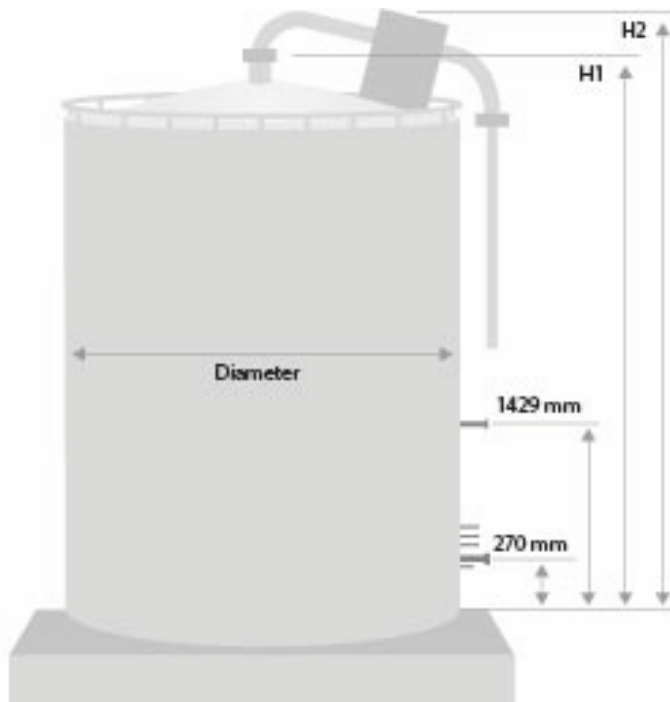


Pipes and other connections on the silo tank

An example of pipe connections and placement of manhole and outlet below. Note: Alternative locations may have been selected when the silo tank was ordered.



Dimensions and weights



Silo with diameter 2,300 mm

All weights apply to empty silo.

Volume	Diameter	H1	H2	Weight
5,000 L	2,300 mm	2,230 mm	2,250 mm	675 kg
6,000 L	2,300 mm	2,530 mm	2,850 mm	745 kg
7,000 L	2,300 mm	2,830 mm	3,150 mm	815 kg
8,000 L	2,300 mm	3,130 mm	3,450 mm	885 kg
9,000 L	2,300 mm	3,430 mm	3,750 mm	955 kg
10,000 L	2,300 mm	3,730 mm	4,050 mm	1,020 kg
12,000 L	2,300 mm	4,330 mm	4,650 mm	1,160 kg
14,000 L	2,300 mm	4,930 mm	5,250 mm	1,300 kg
15,000 L	2,300 mm	5,230 mm	5,550 mm	1,365 kg
16,000 L	2,300 mm	5,530 mm	5,850 mm	1,435 kg
18,000 L	2,300 mm	6,030 mm	6,350 mm	1,550 kg
20,000 L	2,300 mm	6,630 mm	6,950 mm	1,690 kg
22,000 L	2,300 mm	7,230 mm	7,550 mm	1,825 kg
24,000 L	2,300 mm	7,800 mm	8,150 mm	1,965 kg

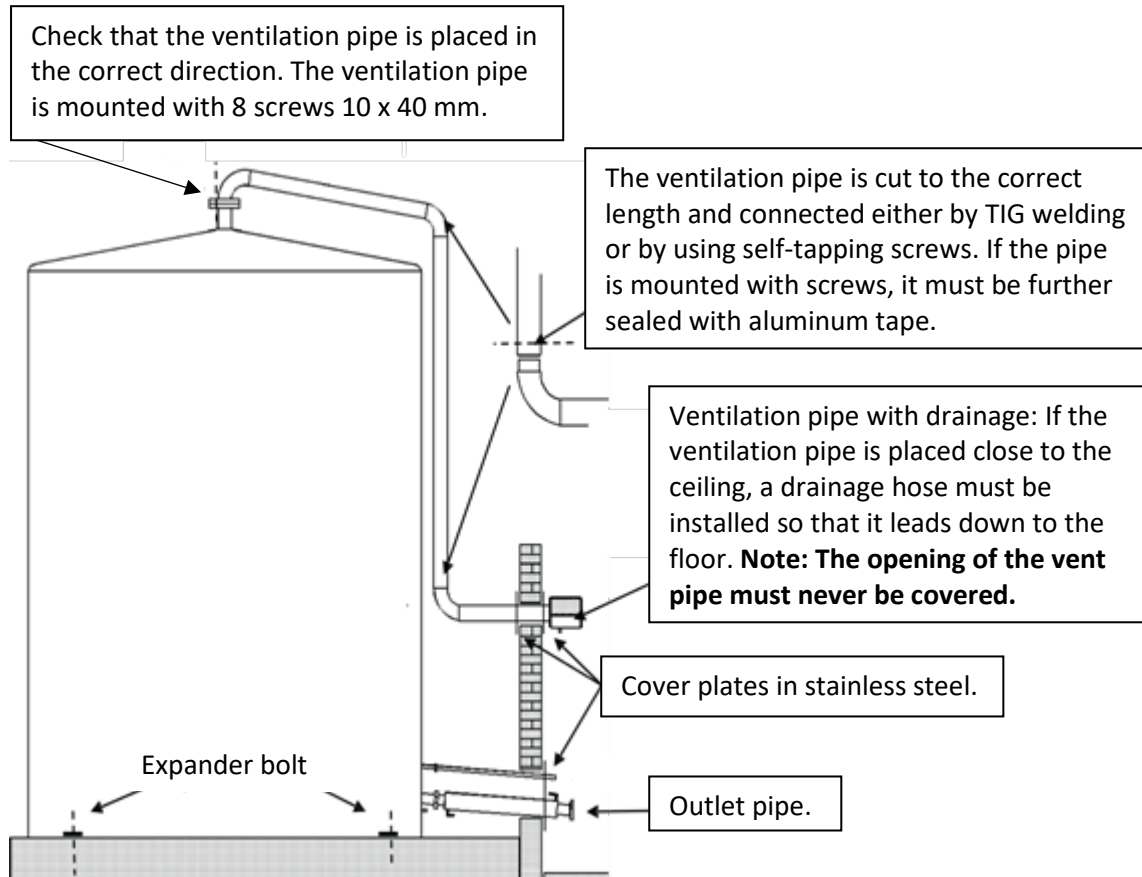
Silo with diameter 3,000 mm

All weights apply to empty silo.

Volume	Diameter	H1	H2	Weight
10,000 L	3,000 mm	2,600 mm	2,830 mm	1,272 kg
15,000 L	3,000 mm	3,450 mm	3,680 mm	1,496 kg
18,000 L	3,000 mm	3,900 mm	4,130 mm	1,649 kg
20,000 L	3,000 mm	4,260 mm	4,490 mm	1,770 kg
25,000 L	3,000 mm	5,072 mm	5,302 mm	2,023 kg
30,000 L	3,000 mm	5,900 mm	6,130 mm	2,319 kg
35,000 L	3,000 mm	6,700 mm	6,930 mm	2,807 kg
40,000 L	3,000 mm	7,409 mm	7,509 mm	3,247 kg
50,000 L	3,000 mm	8,918 mm	9,180 mm	4,175 kg

Placement of the silo tank

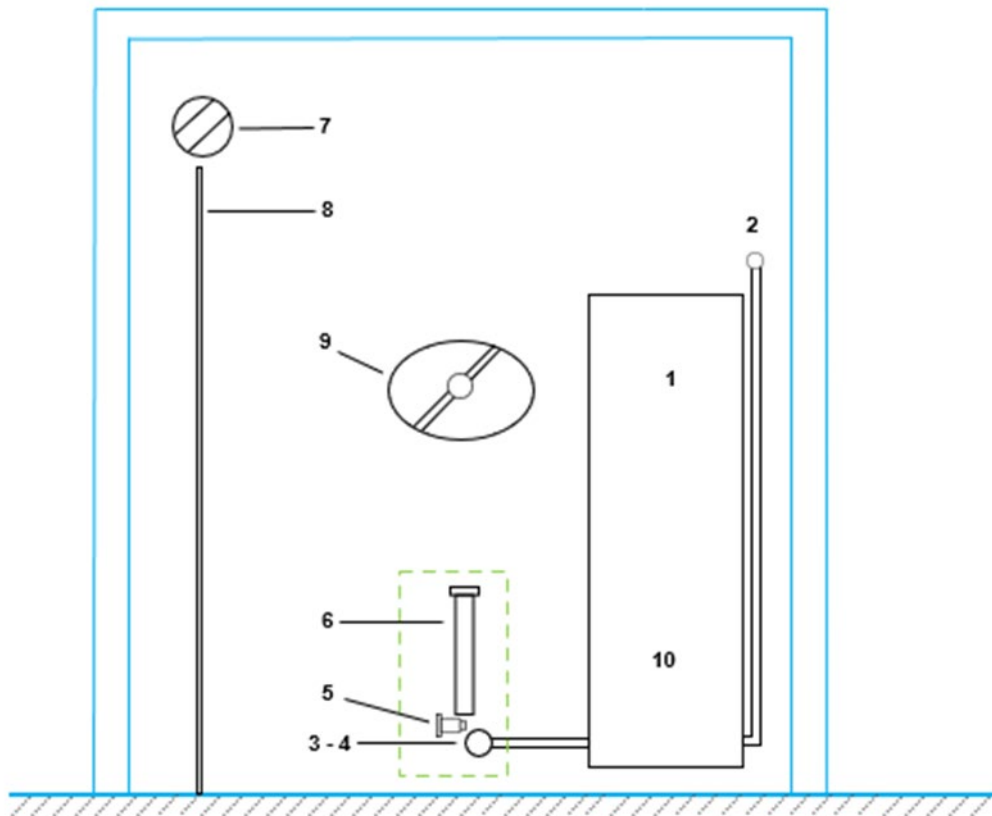
The silo is placed on the foundation. It is important that it is placed correctly regarding the outlet. Finally, the silo tank is fixed to the foundation with M20 expansion screws.



Installation with alcove or pick-up room from Wedholms

Control unit Argos and cleaning pump mounted on the silo tank body.

Principle sketch of assembly:

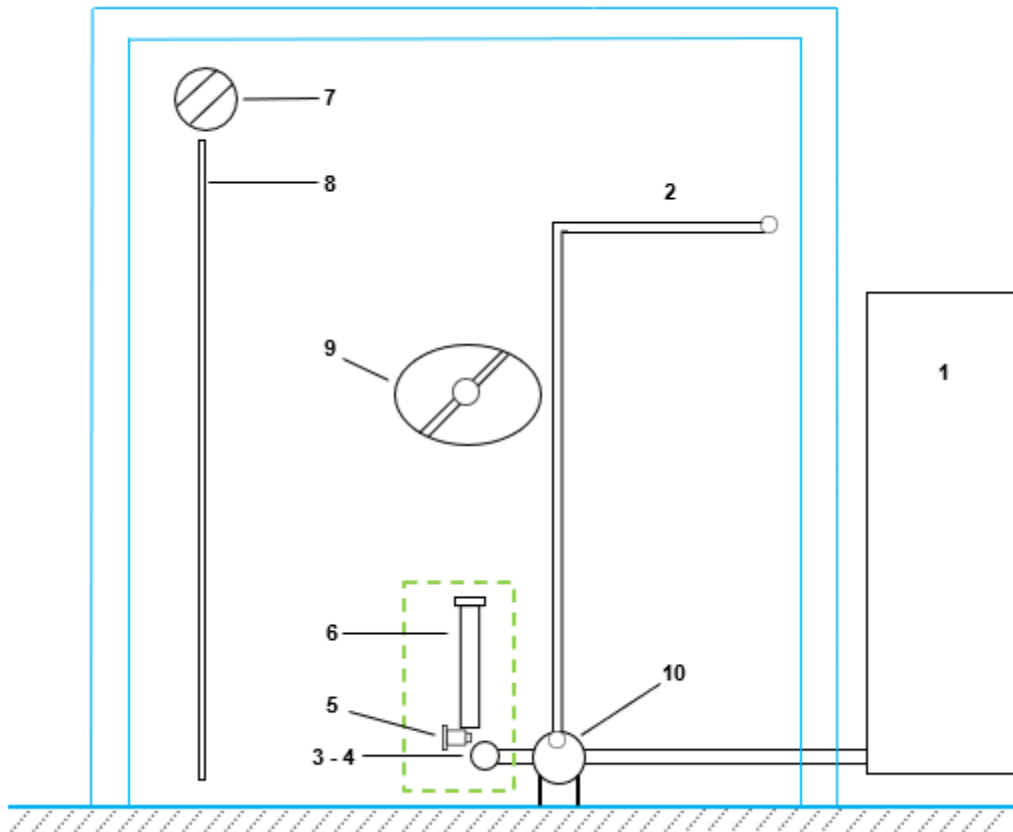


1. Cleaning unit Argos with water box
2. Cleaning pipe 25 mm stainless steel
3. 3-inch throttle valve
4. Outlet with cleaning cap
5. Glycol pump
6. Glycol container
7. Venting
8. PVC hose for drainage
9. Manhole
10. Cleaning pump mounted inside the Argos cleaning unit

Installation without alcove

Control unit Argos and cleaning pump not mounted on the silo tank body.

Principle sketch of assembly:



Note: To get the right amount of cleaning water in the silo tank, the bottom part of the water box must be mounted so that it is 74 mm above floor level.

1. Cleaning unit Argos with water box
2. Cleaning pipe 38 mm stainless steel
3. 3-inch throttle valve
4. Outlet with cleaning cap
5. Glycol pump
6. Glycol container
7. Venting
8. PVC hose for drainage
9. Manhole
10. Cleaning pump, separate

Installation protocol – information

At the time of installation, an installation protocol must be filled in. When installation is completed, the installation protocol must be sent via e-mail to info@wedholms.se.

1. For a silo tank with a cooling unit from Wedholms, both pages must be filled in.
2. For a silo tank without a cooling unit from Wedholms, only the first page must be filled in.

The installation protocol provides support for the installation to be performed correctly. The installation protocol is also proof that the installation has been carried out correctly and that the silo tank is correctly installed. A completed and submitted installation protocol is therefore a prerequisite for the warranty to apply.

The installation protocols are attached at the end of this manual.

When installation is completed, the installation protocol must be sent to info@wedholms.se. Without a submitted installation protocol, warranty does not apply!

Cooling unit

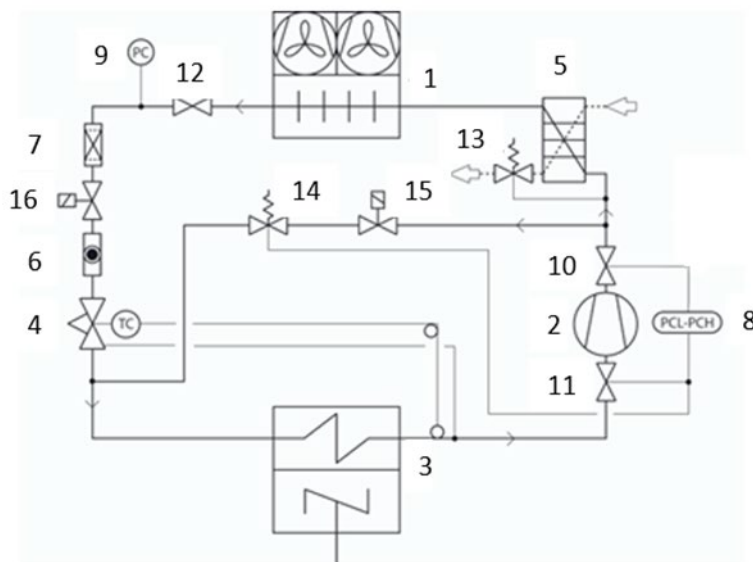
Silo tank and cooling unit are never connected upon delivery. The installation of the cooling unit must always be performed on farm by a certified cooling technician from an accredited company.

The cooling unit must be placed in a well-ventilated location and the condenser must have sufficient air circulation to ensure an efficient cooling of the milk. The unit can also be set up outdoors under a roof. The silo tank and the cooling unit are delivered with a protective gas filling (nitrogen gas). The cooling compressors are operated with ester oil.

Check that the shielding gas has a pressure of minimum 2 bar. If there is no pressure, check for leaks.

Connect the cooling unit to the suction and liquid pipes of the silo, use dimensions corresponding to the cooling unit and the length of the pipes. For level differences of more than 2.4 m, oil traps must be installed. Use clean pipes and shielding gas (nitrogen gas) when soldering. Oil traps should be placed under all vertical climbs. Ensure good oil return. Local regulations apply.

Flow chart cooling system



1. Condenser
2. Compressor (piston or scroll)
3. Evaporator
4. Expansion valve outer pressure equalization
5. Heat recovery Interpac (Option)
6. Sight glass (Option)
7. Drying filter
8. Dual pressure switch with automatic reset
9. Speed control fans
10. Service valve, pressure side of the compressor
11. Service valve, suction side of the compressor
12. Service valve
13. Water control valve (Option)
14. Capacity regulator (Option)
15. Solenoid valve capacity regulator (Option)
16. Solenoid valve (Option)

Filling of refrigerant into the cooling system

Fill the number of systems in the condenser according to the table below regarding piping and dimensions.

Type of condenser (BASE)	Basic filling per condenser (kg)	No. of systems in the condenser
K	2.0	1
L	3.0	1
M	4.0	2
N	6.0	2
P	8.0	2

Evacuation and filling of refrigerant

Evacuation and filling of refrigerant may only be carried out by a certified cooling technician at an accredited company.

- Check that the service valves of the cooling unit are fully open.
- Connect a vacuum pump to the suction and pressure lines of the compressor and evacuate to a pressure of less than 1 mm Hg (1.5 mbar) for 1 hour. Check that the pressure does not rise.
- Fill the system with refrigerant. Check that the suction and pressure values correspond to the operating data of the silo's cooling system.
- Any adjustment of the expansion valve is made when the temperature in the tank is below + 8°C.

Double pressure switch

High-pressure switch is used to prevent excessive pressure in the cooling system, for example due to a closed valve or poor ventilation of the condenser and if the pressure control of the condenser fan is incorrect.

Low-pressure switch is used to prevent too low pressure in the cooling system, for example due to a blockage in the liquid line or too small amount of refrigerant. It is also used when the compressor is stopped at pump down.

Setting of high-pressure switch

Set "Stop" and "Difference" according to the following table.

As protection:

	134a
Stop [bar (e)]	18.0
Difference [bar (e)]	3.0
Start [bar (e)]	15.0

(e) = overpressure

Setting of low-pressure switch

Set "Stop" and "Difference" according to the following table.

As protection:

	134a
Start [bar (e)]	0.7
Difference [bar (e)]	0.5
Stop [bar (e)]	0.2

(e) = overpressure

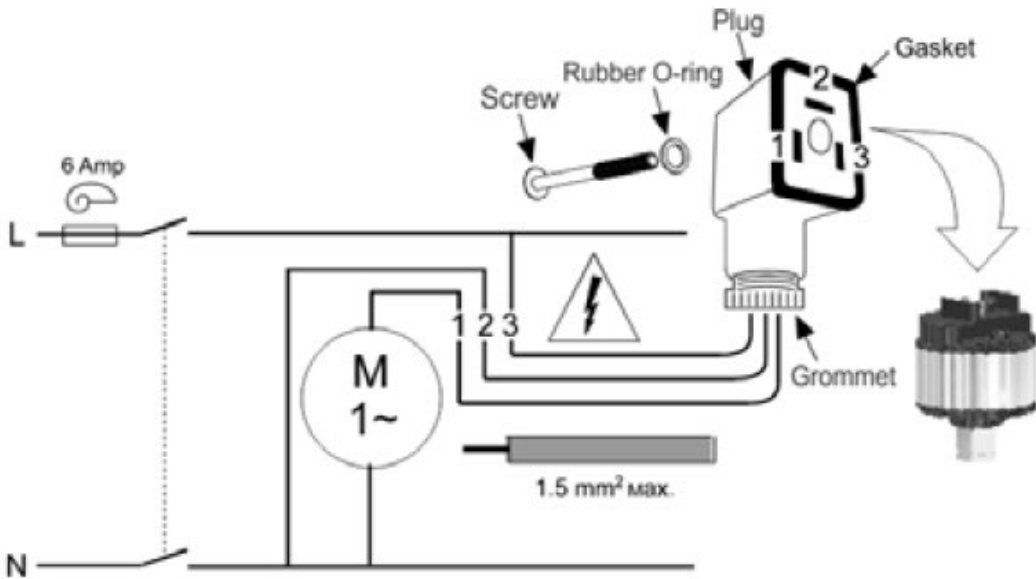
At pump down:

	134a
Start [bar (e)]	1.2
Difference [bar (e)]	1.0
Stop [bar (e)]	0.2

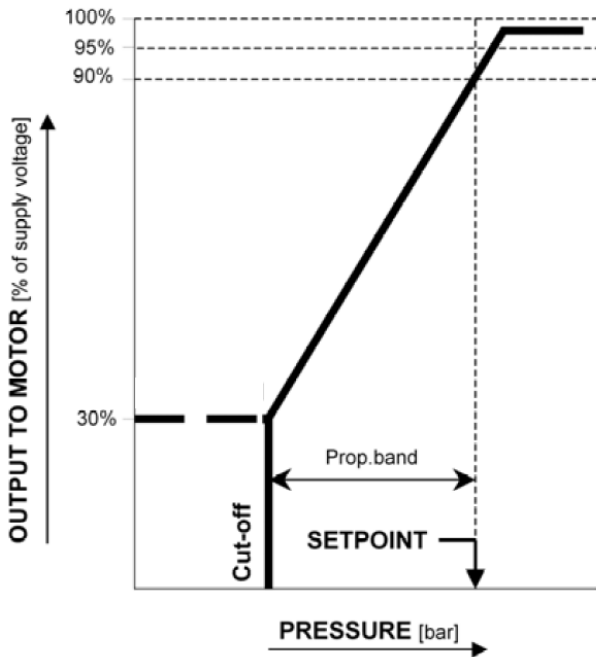
Speed regulator

The condenser fan is controlled by a pressure-controlled speed regulator which is mounted after the condenser. The regulator is controlled by the condensing pressure and regulates the fan speed between 30 - 90% of its maximum speed. At 30%, the speed regulator breaks, and the fan is switched off.

The speed regulator has a working range between 10 and 25 bar. The basic setting is 19 bar. The basic setting can be adjusted by turning the adjusting screw clockwise or counterclockwise. One turn corresponds to 2.5 bar.



CONTROLLER CHARACTERISTIC



Start-up of silo tank and cooling unit

Recommendations:

1. Switch on the power. Note: If the compressor has been stored at 0 °C or colder temperature, you need to wait with the start-up one hour after the electricity has been switched on. This protects the compressor and increases its service life.
2. Pressure switch settings, see chapter "Double pressure switch".
3. With a separate cooling unit, the capacity regulator cannot be set completely from factory. See "Setup" in the section "Capacity regulator" how to adjust it before it is put into operation.
4. Check that the direction of rotation of the fans sucks air out through the condenser.
5. Adjust the overheating and measure the pressure at the service valve on the compressor and the temperature out of the evaporator, minimum 8K.
6. After at least 2 hours, check that the oil level is in the range between 1/4 and 3/4 on the compressor sight glass.
7. Check the cooling circuits for leakage after the system has been put into operation.
8. Check that the silo has a sufficient supply of water by following the description in the chapter "Cleaning of the silo tank".
9. Settings for the silo tank's control unit are described in the Argos manual. Adjust and optimize the values regarding farm-specific conditions. The farm's water pressure, water temperature, water volume and water quality affect the recommended values.
10. Calibrate the silo tank's temperature sensor before running the complete cleaning according to point 11.
11. Check that the silo is empty and run a complete cleaning before using the silo for the first time. This is important for two reasons:
 - Verify that the silo cleaning works properly after installation.
 - Any need for setting adjustments can be detected and corrected.
12. Fill in both sides of the installation protocol at the back of this manual. Completed and submitted installation protocol is required for the warranty to apply.
13. Instruct relevant employees about maintenance and future service of the silo tank, regarding:
 - Start of cooling and cleaning.
 - Reading and acknowledgment of alarms.
 - Instructions for milk collection.

The capacity regulator of a robot silo must be adjusted during installation if the amount of milk in the silo is significantly less than what the silo is dimensioned for. Also adjust the control system settings according to the conditions on the farm, see the Argos manual.

Cleaning of the silo tank

Programming of the cleaning

Read in chapter 5 "Cleaning" in the Argos manual about which settings to make.

Adjusting the water volume for cleaning

The water volume that the silo tank takes in during cleaning is adjusted with a level screw on the side of the Argos post. The screw raises or lowers a level pipe inside the Argos post. In the level pipe there is a float that sends a signal to Argos when the water has reached the preset height. Note that the required amount of water for cleaning differs depending on whether the cleaning unit is mounted on the silo or separately. The following amounts of water are recommended for cleaning of the silo:

Tank volume (L)	5,000-9,000	10,000-14,000	15,000-18,000	20,000-25,000	30,000-35,000	40,000-50,000
Water volume (L) (Attached cleaning)	90	113	120	135	170	200
Water volume (L) (Separate cleaning)	65	80	80	100	100	120

Checking the water volume for cleaning

As it is difficult to assess how much a certain height of the level pipe means in water volume in the silo, here is an instruction on how to calculate this:

1. Measure 10 liters of water in a bucket and mark the level. Empty the bucket.
2. Remove the panel on the cleaning unit to access the water hoses.
3. Take out the water hoses that go down into the water box and put them in the bucket.
4. Go to menu 9 - "Test Relay" in Argos. Choose "H.water valve" and press "Change". When this is done, the hot water valve is opened, and the bucket is filled. Measure the time it takes for the water to fill up to the mark made in point 1. To close the hot water valve again, press "Change" again and then "Exit".
5. Put the hoses back in the water box.
6. Go to menu 5 in Argos, start the cleaning and measure the time the water valve is open. **Note: Only measure the time in phase 3 or 4.** In phase 1 and 8, the level guard is not used, in phase 3 and 4 hot water is used and in phase 2 and 5 both hot and cold water are used. Chapter 5 "Cleaning" in the Argos Manual shows how to go directly to the desired cleaning phase.
7. Using the measured times, you can calculate the water volume that the level screw corresponds to.

Example: In point 4, it was measured that 10 liters of water were filled in 24 seconds. In point 6, the time for filling the water was measured at 144 seconds. This gives a water volume of 60 liters ($10/24 * 144$). The measurement above can also be done with cold water. In point 4, the cold water valve must be opened, menu 9 – "Test Relay" - "C.water valve" in Argos and the timing must then take place in cleaning phase 6 or 7.

Hot water supply for cleaning

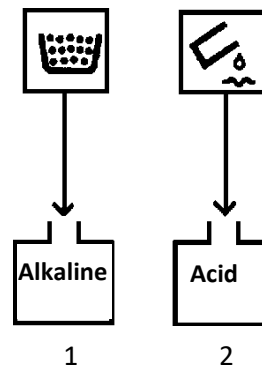
Having a sufficiently high cleaning temperature is very important to get a good cleaning result and prevent bacterial growth. The temperature of the incoming water should be at least 60°C to secure a minimum of 43°C in the main cleaning phase. If the incoming water temperature is lower, the amount of water must be increased for the tank to be heated up to 43°C. If the temperature is higher than 60°C, the amount of water can be reduced, or cleaning phases omitted. **Note: With too low a water volume, there is a risk that air will enter the pump, which leads to poorer performance. Check that the hot water supply on the farm is sufficient in relation to the size of the silo for all cleaning phases where hot water is used.**

Also remember to check the temperature of the hot water right at the silo tank as any long pipes from the boiler can significantly lower the water temperature.

Incoming hot water must not exceed 80°C in order not to damage valves and rubber parts.

Dosage of detergent

The dosing pump in Argos delivers 4 dl of detergent per minute. Water volume and dosing time need to be adjusted so that the concentration of the cleaning solution is in accordance with the supplier's instructions. Use only products intended for this purpose.



The Argos control system offers automatic dosing of detergent. The left level electrode is for alkaline detergent (1) and the right for acid detergent (2).

Handling of strong detergents must be done with great care! Wear protective gloves. High concentrations of detergent increase the wear on hoses and parts of plastic or rubber, which shortens the life of the products. Never mix alkaline and acidic detergents as this leads to dangerous gas evolution and the risk of explosion.

Service and maintenance

Annual service

An annual service is recommended to maintain efficient and good milk cooling. To ensure the function and service life and to avoid unnecessary downtime of the silo tank, it is important that preventive maintenance of the tank and the cooling unit is carried out in accordance with Wedholms' recommendations.

Some maintenance can be done by the milk producer and others by common service technicians. However, some tasks must be performed by a certified cooling technician at an accredited company.

As the owner of a cooling system containing between 5 and 49.9 tons of CO₂ equivalents, you are legally responsible for the system to be leak-tested at least once a year by a certified cooling technician at an accredited company.

General control performed by the user

- Make sure that the cooling unit and the condenser are kept clean and that they are not used as a drying rack as this has a negative effect on the condenser's ability to get rid of the heat.
- Once a month, the condenser should be checked and possibly cleaned by rinsing with hot water or blowing with compressed air. A dirty condenser causes increased energy consumption and can adversely affect the life of the condenser. Also check that the supply air and exhaust air are satisfactory if the cooling unit and the condenser are located indoors.
- Check the boiler's output temperature (recommended temperature 85 - 90°C when no heater is installed).
- Check the function of the dosing pumps at least once a month, replace the dosing pump hoses if necessary. Check that the tank is clean on the inside to prevent bacterial growth.
- Check hoses for detergent level sensors (alkaline/acid) once a month, replace if necessary.
- Check all water intake filters and clean if necessary.
- Pay attention to alarms from the control system, contact service technicians if necessary.
- Check that installed extra equipment is set correctly, see chapter "Extra equipment (options)".

Maintenance performed by a service technician

Cooling

- Check pressure and temperature, test high pressure and low pressure.
- Listen for noise. Check for any liquid leakage or corrosion. Check suspension of cooling pipes.
- Check the temperature of the milk and calibrate the temperature sensor if necessary.
- Suggest measures for optimizing cooling times, ventilation, speed control fans and Interpac heat recovery.

Cleaning

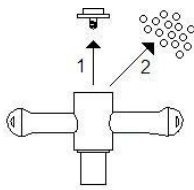
- Check for any dry cracks in rubber parts, replace if necessary.
- Function test components.
- Check that the correct amount of detergent is used against the specified amount of water in the tank and that the correct frequency of acid detergent is used based on the quality of the water (water hardness).

Components covered during service visits:

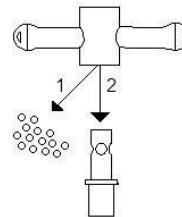
- Gaskets and dosing hoses.
- Drain valves - function.
- Level sensor detergent "level rod" alkaline / acid - function.
- Fans - function.
- Agitator motor - function.
- Air motor - function.
- Heater (option) - function.
- Cleaning head - function (that it rotates friction free).

Maintenance of the cleaning head

Disassembly of the cleaning head

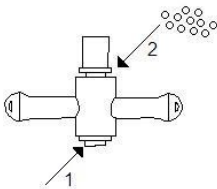


1. Unscrew the end bearing with a wrench.
2. Empty the 16 plastic balls.
3. Clean.

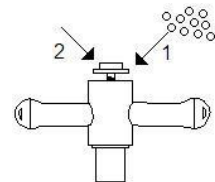


4. Disassemble the cleaning head.
5. Empty the 16 plastic balls.
6. Clean.

Assembly of the cleaning head



1. Attach the end bearing a few turns in the threads.
2. Put in the 16 plastic balls.



3. Turn around the cleaning head and put in the 16 plastic balls.
4. Tighten the end bearing with a wrench.

Control of the cooling circuit

Control of the cooling circuit must be performed by a certified cooling technician.

When checking for possible leaks, include:

- Leak detection of the refrigerant system: Compressors, condensers, evaporators, heat exchangers, safety valves, expansion valves, shut-off valves, fittings, flange strips and fixed connections.
- Oil leakage: Control of compressors, screw connections, fixed connections, condensers, evaporators, heat exchangers, containers, fittings and pipes.
- Corrosion on components, equipment, joints, containers and pipes.
- Refrigerant volume control: Sight glass and liquid level sensor.
- Vibrations on compressors, fans and pumps.
- Operating data for the equipment: Pressure, temperature and current.
- Documentation required by authorities.

A milk cooling tank containing between 5 and 49.9 tons of CO₂ equivalents must by law be leak tested at least once a year.

Actions in the event of a malfunction

In the event of a malfunction, first perform the following checks:

- Check that the condenser is clean.
- Check that the room temperature does not fall below + 5°C or exceed the maximum performance temperature specified for the tank.
- Check that the agitator rotates freely.
- Check that fuses in the farm's group center have not tripped so that the correct power supply reaches the tank. Check that the motor protection and group fuses for the tank functions have not tripped.
- Check the troubleshooting chart in the Argos Manual.

If the tank does not work normally after these actions, call a cooling or service technician.

Manual start of cooling and agitation

Cooling can be started and stopped manually if it does not work automatically in the event of, for example, electronic faults. This is done by using the timer, located on the contactor box. The maximum time that the timer can be set is 60 minutes. The timer ignores the automatics, see the tank's electric wiring diagram for details.



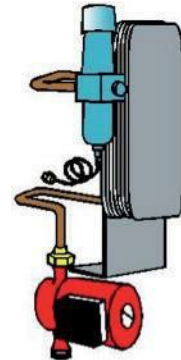
Timer on the contactor box

Manual start of cooling creates an alarm to the Argos control unit. Cooling and agitation stop when the timer has reached the 0 position.

Extra equipment (options)

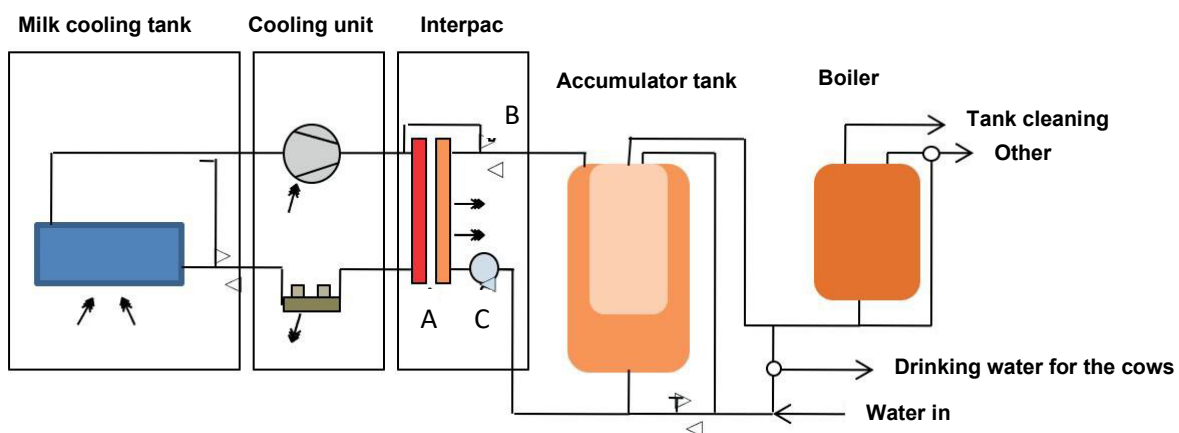
Interpac

Interpac is a compact heat recovery unit for water heating. Interpac is connected to a cooling circuit on the cooling unit. Produced hot water is collected in one or more accumulator tanks. From each liter of milk cooled from 35°C to 4°C, approximately 0.7 - 1.0 liters of well water can be heated up to 40 - 45°C. Note that there is a limit to how much recovered heat can be extracted without affecting the cooling unit's performance and thus the tank's cooling capacity. Note that Interpac cannot withstand ambient temperatures below 0°C, as the water freezes. When installing Interpac, the amount of refrigerant in the cooling system may need to be increased.



Example of cooling circuit with Interpac

The milk that enters the cooling tank is 35°C and it is then cooled down to 4°C. The heat energy from the milk can be utilized with the help of the heat recovery unit Interpac which is mounted in the cooling circuit, between the compressor and condenser. Hot gas from the compressor is passed through the heat exchanger (A). Water from the accumulator tank is pumped with the pump (C) through the heat exchanger and is heated by the hot gas to the temperature set by the control valve (B).



Interpac must be mounted in series with the condenser, directly after the compressor, where it recovers energy from the system. The refrigerant partially condenses in the heat exchanger. Therefore, the heat exchanger must be mounted vertically so that the condensed refrigerant can drain out of the exchanger. The water flow should be in the opposite direction (from the bottom up). Interpac is not damaged by running with refrigerant only, in cases where the water circulation circuit is not fully assembled or switched off.

The water flow through Interpac is regulated by the control valve which is controlled by the condensing pressure. When the water is cold, the water flow is reduced so that the desired condensing pressure is maintained. As the water heats up, the valve opens more and more.

The tap water circuit

Important: For water hardness > 8.4 ° dH, Interpac should be operated by a separate heat exchanger in the accumulator tank or water heater.

Circulation circuit for water hardness < 8.4° dH

The circulation pump is placed horizontally so that the water flow is vertical (from the bottom up). The suction side of the pump is connected to the bottom of the accumulator tank where also the cold-water filling of the system is located (T-tube). From the pressure-controlled valve, the hot water is led to the top of the accumulator tank.

Circulation circuit for water hardness > 8.4° dH

The circulation pump is placed horizontally so that the water flow is vertical (from the bottom up). The suction side of the pump is connected to the outlet of the heat exchanger connected to the accumulator tank. From the pressure-controlled valve, the hot water is led to the top of the accumulator tank. Contact a plumber if problems with limescale deposits occur.

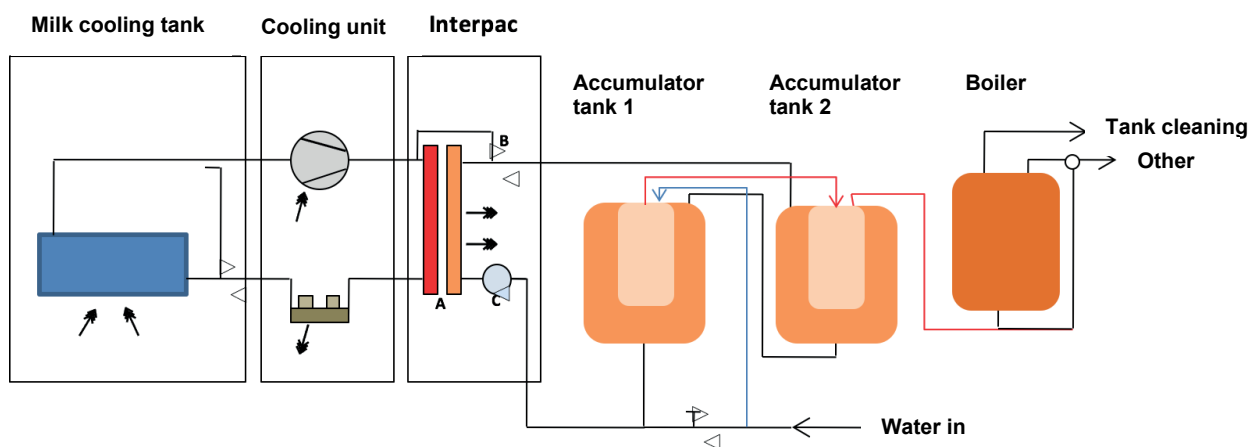
Interpac and robotic milking

As the heat recovery in robotic milking is more continuous and with smaller batches of milk at a time than in conventional milking, a smaller accumulator tank can be used.

No. of robots	Accumulator tank (Liter)
1	200-300
2	300-600
3	600-900

Two or more accumulator tanks

When several accumulator tanks are used, these must be connected in series. See example below.



Dimensions Interpac

- H = 400 mm.
- B = 190mm.
- D (14 plates) = 170 mm.
- D (20 plates) = 184 mm.
- D (40 plates) = 225 mm.

Electrical connection

Electrical connection pump 1x230V, 50 Hz.

The pump must be in operation when the compressor in the cooling circuit is in operation. See the silo tank's wiring diagram for connection.

Settings

The pressure-controlled control valve's adjusting screw is marked from 1 to 5.

3 on the scale of the adjusting screw corresponds to 40°C with the refrigerant R134a.

During installation, check and note the set value of the Interpac flow adjustment in the installation protocol.

Note: Complete condensation must not take place in the heat exchanger without refrigerant receiver.

Chilled outlet – glycol

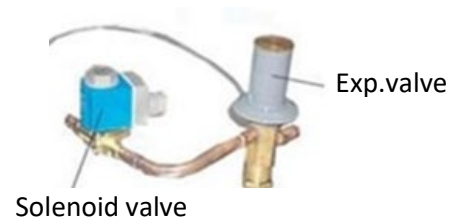
Inlet and outlet are connected with pipes adapted to the glycol container.

Inlet and outlet on the tank are connected with 25mm hose or pipe.



Capacity regulator

When the amount of milk is small relative to the size of the tank, for a longer period, there is a risk of ice formation in the tank as large parts of the evaporator surfaces are not covered by milk. The capacity regulator is used in these cases to adapt the cooling capacity to the current evaporator load.



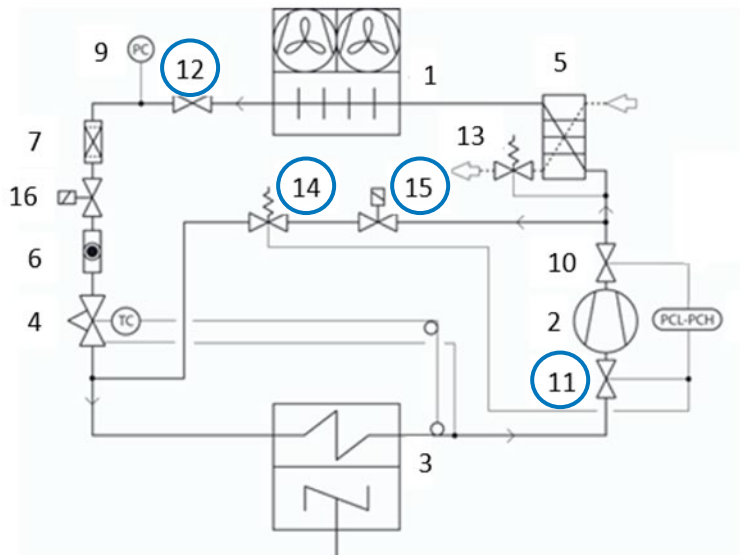
The regulator senses the evaporation pressure via a pressure switch. When the evaporation pressure falls below the value set on the regulator, the valve opens and leads hot gas (from the high-pressure side) into the evaporator.

The hot gas is injected via a liquid gas mixer that is soldered in between the thermostatic expansion valve and the evaporator (or any distributor). This results in the evaporator working with an "artificial" load and a higher evaporator pressure.

A solenoid valve can be connected to the capacity regulator. This is controlled from Argos so that the capacity regulator is only in operation for a certain period. Note: When soldering close to the capacity regulator, it must be protected by wrapping a wet cloth around the valve.

The capacity regulator of a robot silo must be adjusted during installation. Adjust the settings according to the conditions, see the Argos manual.

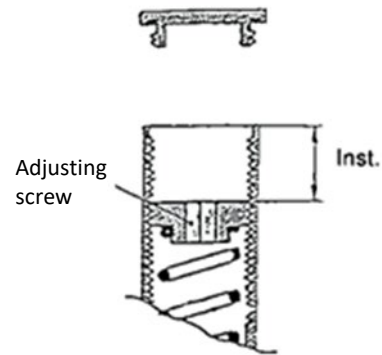
Flow chart cooling system with capacity regulator



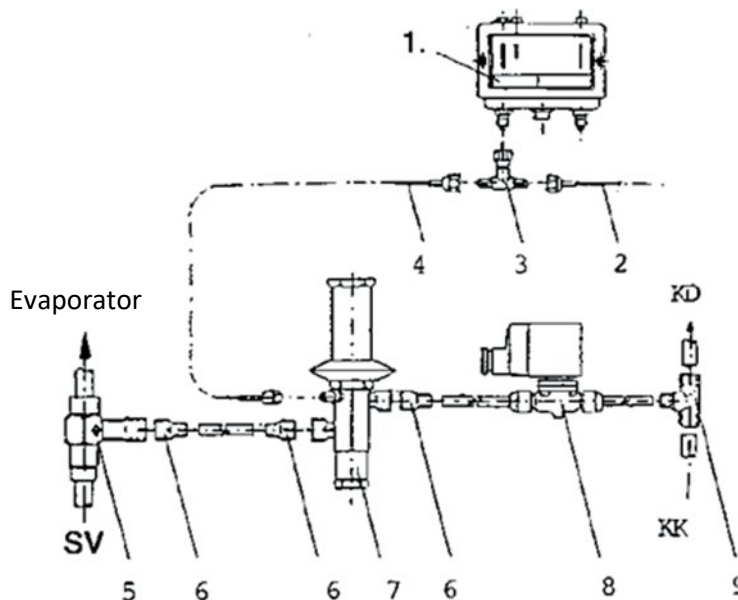
- 11. Service valve, suction side of the compressor
- 12. Service valve
- ~~13. Water control valve (Option)~~
- 14. Capacity regulator (Option)
- 15. Solenoid valve capacity regulator (Option)
- ~~16. Solenoid valve (Option)~~

Settings

1. The setting of the capacity controller can be performed at any time during cooling when the solenoid valve (15) is activated.
2. Remove the cap on the capacity regulator (14) and insert an 8 mm Allen key into the adjusting screw.
3. Mount a manometer on the compressor service valve (11) on the suction side. Open the valve so that the suction pressure can be read.
4. Close the condenser outlet valve (12) completely so that the liquid flow to the expansion valve stops. The pressure displayed on the manometer will drop but stabilize for a few seconds before continuing to fall. Open the outlet valve (12) again.
5. The temperature corresponding to the temporary stabilized pressure must be between -3°C and -5°C .
6. If the temperature was higher, adjust the screw on the capacity regulator (14) upwards and repeat step 3. If the temperature was lower, turn down and repeat step 3.
7. Close the service valve (11) and then open the condenser service valve (12) completely and remove the manometer.



Connection



Position

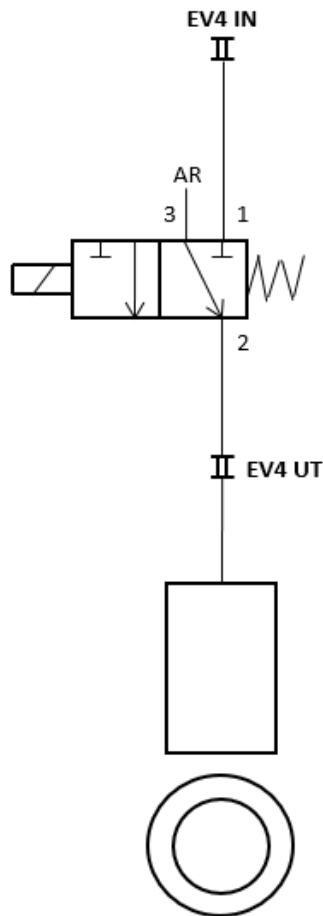
1. LP pressure switch
2. Capillary tubes
3. T-tube
4. Capillary tubes
5. Liquid/gas mixer
6. Reduction $1/2'' - 3/8''$
7. Capacity regulator
8. Solenoid valve EVRG $3/8''$
9. T-tube $1/2 \times 1/2'' \times 3/8''$

Home consumption button

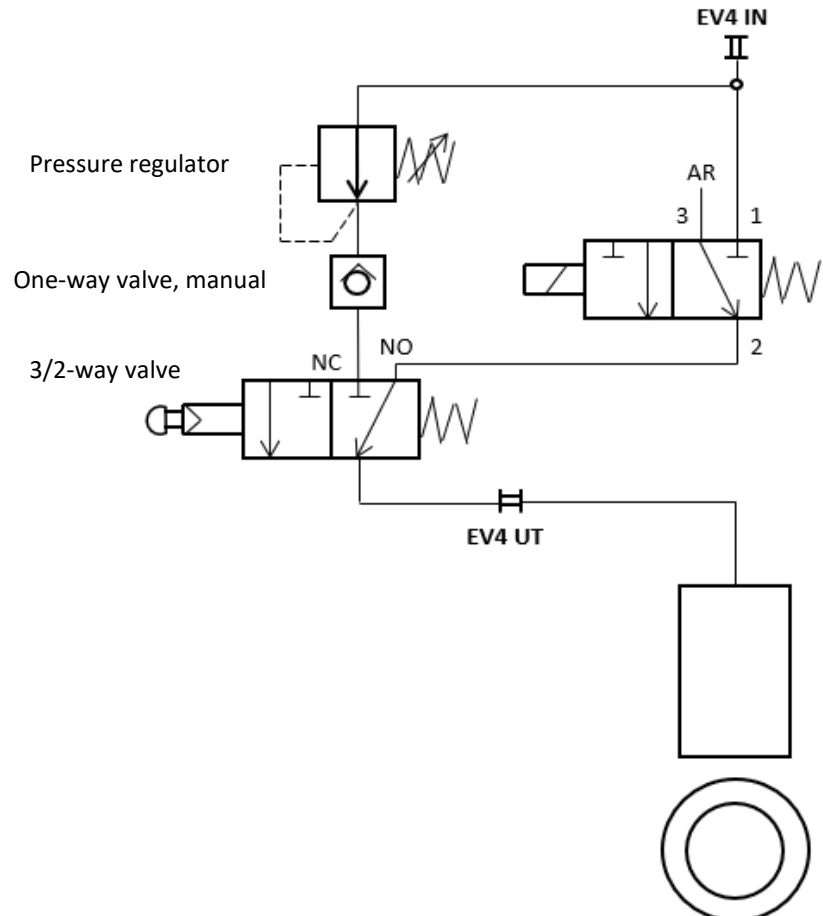
In robotic milking, a home consumption button can be installed to regulate the outlet valve and make it possible to dispense a small amount of milk for household needs. The home consumption button is an option that can either be ordered together with the silo from factory or purchased as an accessory and fitted afterwards.

Wiring diagram

Without home consumption button:



With home consumption button:



Heater

To ensure the availability of hot water throughout the cleaning of the silo, an electric heater can be installed as an option. The heater is connected to the cleaning line and when the water flows through the heater during cleaning, the water heats up. One heater is sufficient to ensure the water temperature in the cleaning process.

The heater is only active in cleaning phase 4. The phase lasts until the desired temperature is reached. Note: The desired cleaning temperature is set in Argos, not with the heater knob. The knob on the heater should be set in the range 60 to 70 degrees.

The heater is mounted in a stainless-steel case which is mounted on the cleaning pump's pressure line. The heater comes with a built-in thermostat and overheating protection. The heater is an option that can either be ordered when buying a silo or purchased as an accessory and installed afterwards. The heater is delivered pre-mounted if the Argos control system is mounted on the silo tank.



Technical data

Voltage:	400V, 3-phase 50 Hz	230V, 3-phase 50 Hz
Effect:	10 kW	10 kW
Current:	14.5 A	25 A
Fuse:	16 A	32 A
Maximum temperature:	85°C	85°C
Enclosure class:	IP44	IP44

Water quality

Below guideline is to be seen as a general guideline for water quality when a heater is installed. A water analysis is strongly recommended if there is any doubt about water quality, especially for private owned wells.

Guidelines for water quality:

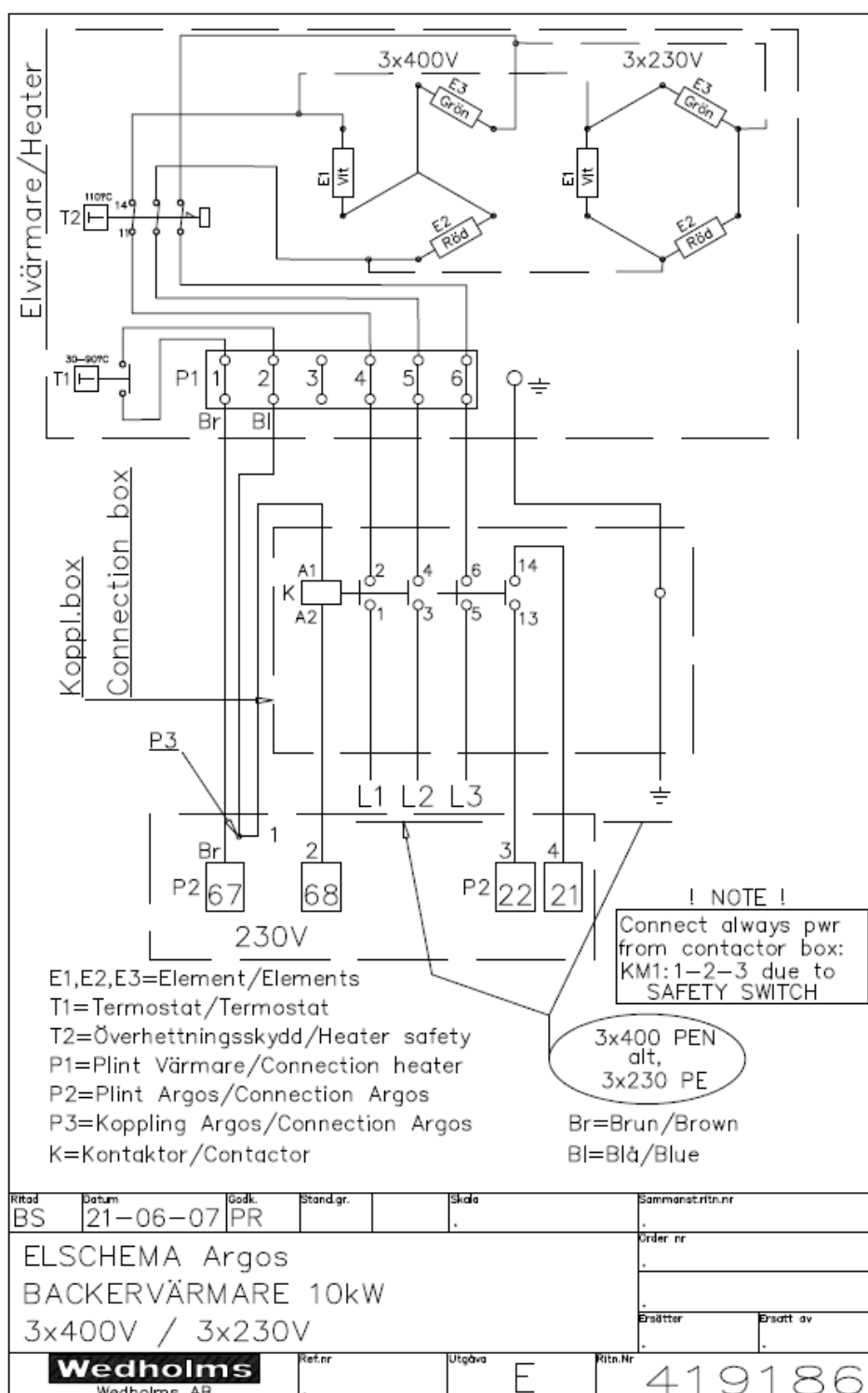
- pH: 7.5-9.5
- Chloride: Max. 50 mg/l
- Conductivity: 150-350 μ S/cm
- Hydrogen carbonate: 80-100 mg/l (HCO_3)
- Water hardness: 2-4 dH

In case an anti-freeze agent is needed, a ready to use premix is recommended. Note that water quality is only one parameter effecting the heater. Other factors like oxygen in the system, mix of different types of metal quality (risk of galvanic corrosion), etc. can cause potential corrosion problems. Quality issues due to water quality or other external circumstances are not covered by warranty.

Installation

The electric heater may only be switched on during the filled liquid phase and with a functioning cleaning pump. For connection of the heater to Argos, see wiring diagram on the next page. For programming of parameters for the heater, see the Argos manual. Electrical installation must be carried out by a qualified electrician at an authorized company.

Wiring diagram heater



Instructions for recycling of silo tank and cooling unit

When disposing of the silo tank and the cooling unit, the following should be considered:

Cooling system

Empty the refrigerant from the cooling system. The refrigerant can be reused or left for destruction according to current local regulations. Collect the cooling system's compressor oil (ester oil) for recycling in accordance with current local regulations.

All work related to refrigerant must by law be carried out by a certified refrigeration technician from an accredited company.

Electrical system

Electrical cables and electrical connections with PVC insulation and copper are recycled as electrical waste in accordance with current local regulations.

Silo tank body

The silo tank body is made of stainless steel according to EN 1.4301 (SS2333). The tank is insulated with polyurethane foam between the inner and outer jacket. When the insulation is heated, isocyanates are formed. At high heat during drilling and cutting, unhealthy gas can therefore occur. Provide good ventilation and use personal protective equipment when working. Recycle the silo according to current local regulations.

Installation protocol for silo tank

Customer copy – page 1 of 2

Both pages must always be filled in by the cooling technician during installation and sent via e-mail to info@wedholms.se when the installation is completed. **Please note that a submitted installation protocol is a prerequisite for the warranty to apply!**

Customer:		
Tank type: <i>Silo</i>	Volume:	Serial no:

FUNCTION TEST OK COMMENTS

Compressors:		
Piping:		
Cleaning pump:		
Heater (<i>option</i>):		
Dosing pumps:		
Capacity regulator (<i>option</i>):		
Rotating cleaning spray head:		

CLEANING

Water volume in phase 2:		liter
Detergent dosage per cleaning:		dl
Hot water temperature to silo:		°C

FUNCTION TEST CLEANING OK COMMENTS

Calibrate the temp sensor and run a test cleaning.		
--	--	--

ELECTRICITY OK COMMENTS

Correctly adjusted motor protection:		
Correct fuse:		

ARGOS OK COMMENTS

Control of settings:		
----------------------	--	--

HEAT RECOVERY (*option*)

Setting of regulating screw:		
Function test:		

DOCUMENTATION OK COMMENTS

Instruction Argos:		
Installation manual:		
Electrical diagram:		
Instruction sheets driver/farmer:		

INFORMATION TO CUSTOMER OK COMMENTS

General information:		
Safety:		
Maintenance:		

Customer copy – page 2 of 2

COMPRESSOR 1

Model:		Serial no:	
Refrigerant:	R:		kg
HP cut-off:			bar
LP cut-off:			bar

COMPRESSOR 3

Model:		Serial no:	
Refrigerant:	R:		kg
HP cut-off:			bar
LP cut-off:			bar

COMPRESSOR 2

Model:		Serial no:	
Refrigerant:	R:		kg
HP cut-off:			bar
LP cut-off:			bar

COMPRESSOR 4

Model:		Serial no:	
Refrigerant:	R:		kg
HP cut-off:			bar
LP cut-off:			bar

Fill the silo with water to half the agitator blade. Then start cooling and fill in the data for evaporators and condensers when the temperature of the water is below 7 °C. Note the temperature.

TEMPERATURE

	°C
--	----

EVAPORATOR 1

Evaporation temperature:		°C
Superheating:		K

EVAPORATOR 3

Evaporation temperature:		°C
Superheating:		K

EVAPORATOR 2

Evaporation temperature:		°C
Superheating:		K

EVAPORATOR 4

Evaporation temperature:		°C
Superheating:		K

CONDENSER 1

Temp. in:		°C
Condensation temp.:		°C
Subcooling:		K

CONDENSER 3

Temp. in:		°C
Condensation temp.:		°C
Subcooling:		K

CONDENSER 2

Temp. in:		°C
Condensation temp.:		°C
Subcooling:		K

CONDENSER 4

Temp. in:		°C
Condensation temp.:		°C
Subcooling:		K

COOLING

Setting of expansion valves:	
Vacuum test and leak detection:	
Setting of capacity regulator:	

OK COMMENTS

ELECTRICITY

Silo connected according to enclosed wiring diagram:	
--	--

OK COMMENTS

Place:	Date:
Cooling tech. name:	Signature:
Cooling tech certification no:	
Customer name:	Signature:

Installer copy – page 1 of 2

Both pages must always be filled in by the cooling technician during installation and sent via e-mail to info@wedholms.se when the installation is completed. **Please note that a submitted installation protocol is a prerequisite for the warranty to apply!**

Customer:		
Tank type: <i>Silo</i>	Volume:	Serial no:

FUNCTION TEST OK COMMENTS

Compressors:		
Piping:		
Cleaning pump:		
Heater (<i>option</i>):		
Dosing pumps:		
Capacity regulator (<i>option</i>):		
Rotating cleaning spray head:		

CLEANING

Water volume in phase 2:		liter
Detergent dosage per cleaning:		dl
Hot water temperature to silo:		°C

FUNCTION TEST CLEANING OK COMMENTS

Calibrate the temp sensor and run a test cleaning.		
--	--	--

ELECTRICITY OK COMMENTS

Correctly adjusted motor protection:		
Correct fuse:		

ARGOS OK COMMENTS

Control of settings:		
----------------------	--	--

HEAT RECOVERY (*option*)

Setting of regulating screw:		
Function test:		

DOCUMENTATION OK COMMENTS

Instruction Argos:		
Installation manual:		
Electrical diagram:		
Instruction sheets driver/farmer:		

INFORMATION TO CUSTOMER OK COMMENTS

General information:		
Safety:		
Maintenance:		

Installer copy – page 2 of 2

COMPRESSOR 1

Model:		Serial no:		Model:		Serial no:	
Refrigerant:	R:		kg	Refrigerant:	R:		kg
HP cut-off:			bar	HP cut-off:			bar
LP cut-off:			bar	LP cut-off:			bar

COMPRESSOR 3

COMPRESSOR 2

Model:		Serial no:		Model:		Serial no:	
Refrigerant:	R:		kg	Refrigerant:	R:		kg
HP cut-off:			bar	HP cut-off:			bar
LP cut-off:			bar	LP cut-off:			bar

COMPRESSOR 4

Fill the silo with water to half the agitator blade. Then start cooling and fill in the data for evaporators and condensers when the temperature of the water is below 7 °C. Note the temperature.

TEMPERATURE

	°C
--	----

EVAPORATOR 1

Evaporation temperature:		°C	Evaporation temperature:		°C
Superheating:		K	Superheating:		K

EVAPORATOR 3

EVAPORATOR 2

Evaporation temperature:		°C	Evaporation temperature:		°C
Superheating:		K	Superheating:		K

EVAPORATOR 4

CONDENSER 1

Temp. in:		°C	Temp. in:		°C
Condensation temp.:		°C	Condensation temp.:		°C
Subcooling:		K	Subcooling:		K

CONDENSER 3

CONDENSER 2

Temp. in:		°C	Temp. in:		°C
Condensation temp.:		°C	Condensation temp.:		°C
Subcooling:		K	Subcooling:		K

CONDENSER 4

COOLING

Setting of expansion valves:		
Vacuum test and leak detection:		
Setting of capacity regulator:		

OK COMMENTS

ELECTRICITY

Silo connected according to enclosed wiring diagram:		
--	--	--

OK COMMENTS

Place:	Date:
Cooling tech. name:	Signature:
Cooling tech certification no:	
Customer name:	Signature:

Contact information Wedholms AB

Order:	order@wedholms.se
Support:	support@wedholms.se
Spare parts:	spareparts@wedholms.se
Warranty:	warranty@wedholms.se

Support line: +46-155-28 03 80

