Soren srl
Via Pacinotti 29
20094 Corsico, MI / Italia
tel +39 02 45177.1 r.a. fax +39 02 45177.340
Email: soren@soren.it

ISTRUCTION MANUAL

FOR

FREEZER

Model : **W 700 - R507**

Serial number : **FW001-09**

- ORDER: **2009095**

. CUSTOMER : **MACHINERY WORLD Ltd**
Wolvey Lodge Business Centre
Cloudsley Bush Lane
Wolvey
LE10 3 HB LEICESTERSHIRE
GREAT BRITAIN

. FACTORY : **Same**

. Order : **5530 of Jan-28-09**

. DELIVERY : **May 2009**

- **When requesting information about your machine always state: model of the machine, serial n°, order n°.**
- **Keep this manual in a safe place for future reference..**

REA/CCIAA: 856472/MI
Cap. soc. € 832.000 i.v.
C.f./Iva 01720330156

INDEX

INTRODUCTION

The purpose of this manual is to provide instructions for the safe installation, operation and maintenance of your SOREN equipment.
SOREN is committed to provide quality equipment and customer satisfaction**.**

Specialized personnel has to read and understand the entire manual before removing from the create and installing the equipment.

Should you have any questions concerning any information contained in this manual, contact SOREN s.r.l.

SOREN reserves the right to improve, change or modify the construction of its equipment or any parts thereof without incurring any obligation to provide like changes to equipment previously sold.

Keep this manual in a safe place for future reference.

*Some paragraphs appearing in the index of this manual, are relevant to features not present on this machine/plant. The note **"N.A."** beside the titles of these paragraphs informs that the text of the same has not been reported in the manual.*

1. STANDARD WARRANTY

- **Obligations of Seller (SOREN)**: during the warranty period, Seller shall repair or, at Seller's option, replace parts determined by Seller to be defective in material or workmanship. The warranty period is one (1) year from the date of delivery to Buyer F.O.B. point of manufacture. The foregoing shall be the sole obligation of Seller under this warranty with respect to the supply of this machine and/or other equipment.

- **Warranty Exclusion**: Repair or replacement of parts required because of misuse, improper care or storage, negligence, alteration, accident, or lack of specified maintenance are excluded from Seller's warranty obligations.
  - Normal wear parts are also excluded from this warranty.

- **Limitation of liability and remedies**: The liability of Seller for breach of any warranty obligation hereunder is limited to:
  - the repair or replacement of the equipment on which the liability is based; or at Seller's option
  - the refund to Buyer of the amount paid by Buyer to Seller for said equipment.

- **Seller shall not be liable for incidental or consequential damages of any kind whatsoever. The remedies set forth herein are exclusive.**

- **Infringement**: Seller will not be liable for the infringement of any patent by the Buyer's use of any equipment or materials delivered.

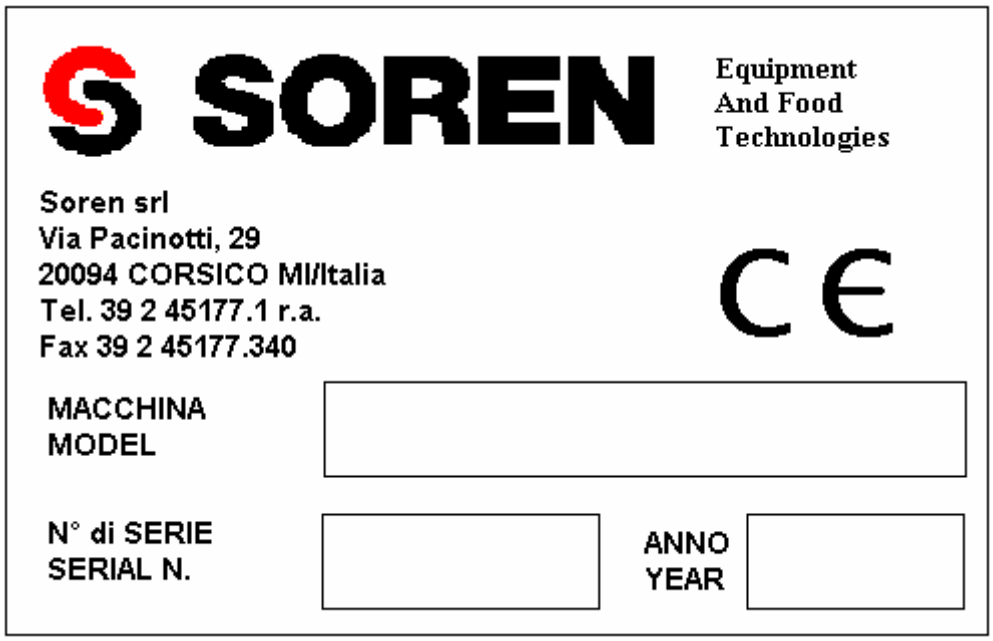
- **Construction materials:** Soren guarantees that the machines and installations of his supply have **all parts in contact with product made of stainless steel AISI 316 or AISI 316L, therefore they are resistant to chemical products and solutions not corroding these materials.**
  Soren is not responsible for corrosions consequent to misuse of chemical products, due to improper formulation or wrong concentration and temperature of solutions.
  The buyer is then responsible for the choice and use of products for the preparation of cleaning solutions and shall ask the supplier of chemicals to give specifications about the suitable substances, there concentration, usage temperatures and contact times.
  The only parts manufactured with materials other than the mentioned st. steels, are the cylinders of ice cream freezers and of scraped surface heat exchangers (SSHE), which can be made of chrome plated nickel, WBC 50 (nickel based alloy): when cleaning these machines or the plants where these machines are installed, the use of acids is not recommended. Before starting the cleaning operations, read the chapter: "Cleaning and sanitizing" and carefully follow the instructions therein.

2. DESCRIPTION OF THE MACHINE AND INDEX OF ANNEXES

2.1 IDENTIFICATION OF THE MACHINE

The Soren's freezer are identified by means of a plate (as shown below) indicating:

- The name and address of the manufacturer
- The model, in the case: **Model**
- The serial number, in the case: **Serial nr.**
- The year of construction, in the case: **Year**

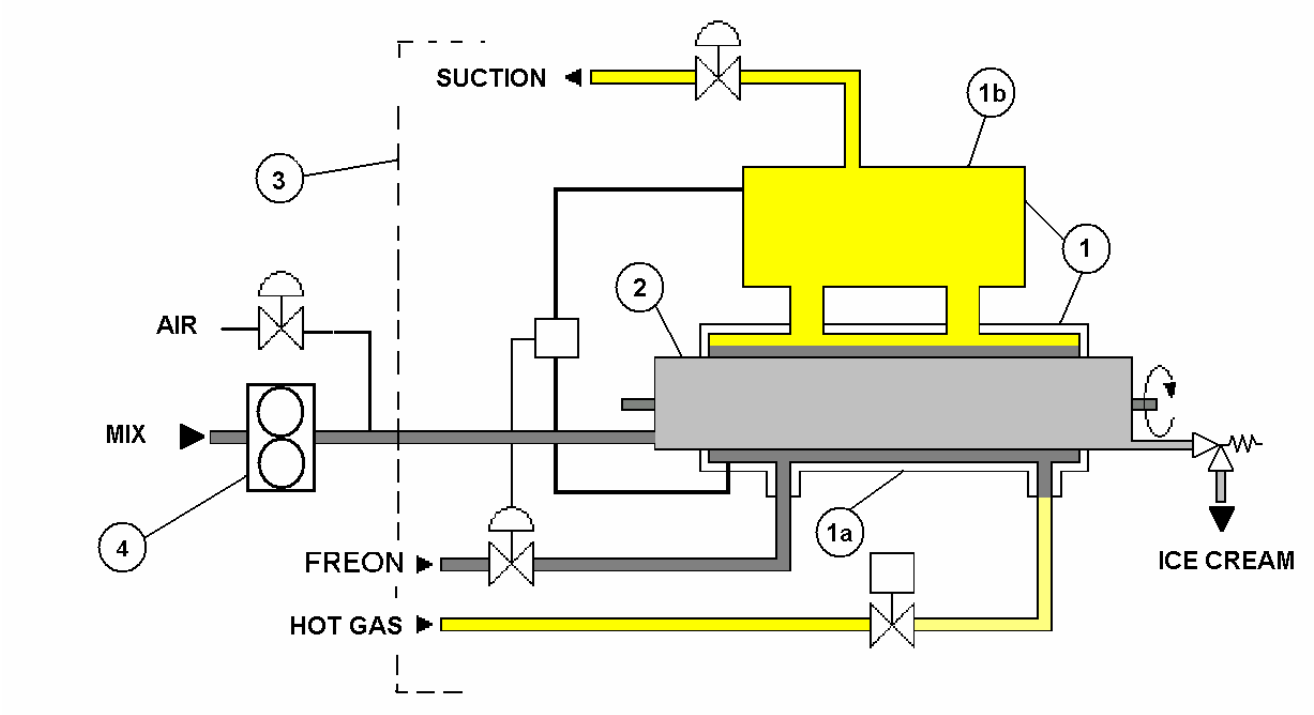


2.2. PURPOSE OF THE MACHINE AND PRINCIPLE OF OPERATION

W series freezers are appliances for freezing specially formulated liquid mixtures to make ice cream.
They are designed to work with the flooding refrigeration system, using Freon as refrigerant fluids.
The process of freezing ice cream mixtures takes place in a horizontal cylinder with a coaxial-mounted blade shaft: the liquid mixture freezes on the sides of the cylinder and is scraped by the blades that also vigorously beat the product mass inside the cylinder, essential for incorporating air into the product.

WORKING SPECIFICATIONS

The essential working elements of the W series freezers are given in the diagram below.



1 – Refrigeration unit consisting of two cylindrical parts one on top of the other.

1a Evaporator

1b Separator

2 – Cylinder to freeze product containing rotary shaft and scraping blades

3 – Freon refrigeration system

4 –Rotary pump

The refrigerant fluid evaporates outside the cylinder freezing the product, with consequent partial crystallisation and incorporation of air.
Evaporation temperature is controlled by a barostatic valve, which can be worked either manually or automatically with a special instrument.
A rotary positive-displacement pump fills the refrigeration cylinder with the mixture to be frozen.
Air, metered by a mass measurer, is injected upon pouring the mixture into the cylinder.
Another positive-displacement pump is often installed to extract the ice cream.
Where necessary, hot gas will be injected into the evaporator by a system controlling the drive motor load.

2.3 MACHINE ANALYSIS BY HACCP 43/93/CEE METHOD

2.3.1 ANALYSIS OF ALIMENTARY HAZARDS

Freezer are machines that permit the continual production of ice-cream by means of a previously pasteurised mix; as it freezes, the mass absorbs air, injected into the mix on entry into the freezer cylinder.
In a machine processing a previously pasteurised, refrigerated mix that is cooled to safe temperatures from a microbial point of view, the alimentary hazards are mainly associated with:

- The possibility of external contamination
- Problems associated with the cleanliness of machine parts in contact with the product.

2.3.2 INDENTIFICATION OF POINTS AT WHICH ALIMENTARY HAZARDS MAY DEVELOP

Problems related to external contamination are exclusively associated with the injection of air or nitrogen into the product. Cleanliness related problems are on the other hand linked with the efficiency of washing and sanitation; the areas most under risk are the dasher (agitator shaft), the air injection valve and the front inspection port.

2.3.3 PROVISIONS TAKEN WITH REGARD TO THE IDENTIFIED POINTS

Injection air

- The compressed air used by the client to feed the injection valve mounted on the freezer must be filtered to ensure an adequate level of hygiene and must be free of oil.

Cleaning and sanitizing

- The machine is designed and constructed to be closed circuit washer with cleaning in place system (CIP wash).
- During the CIP washing cycle, the dasher must be periodically activated to ensure complete cleaning of the same. The CIP cleaning cycle (sequence and length of the various cleaning phases, type of detergents, concentrations and temperatures) is described in the machine instruction manual in the chapter *"Cleaning and sanitizing"* and must be carefully followed.
- The effectiveness of the cycle must always be checked and, if necessary, suitably corrected.
- It is recommended to carefully clean the machine manually before first time operation, and on routine basis whenever processing food products (see par. 6.3).
- Before starting production of each batch, always sanitize the machine (see par. 6.4).

2.3.4 CONTROL OPERATION WITH REGARD TO THE IDENTIFIED POINTS

Injection air

- The quality of the injected air must be periodically checked by microbiological and physical analysis.

Washing and sanitizing

- At the end of a washing cycle it is necessary to periodically (at least once a week), check the state of cleanliness of the machine surfaces in contact with the product, by visual, olfactory and microbial inspection.

2.4. 97/23/CE DIRECTIVE REGARDING EQUIPMENT UNDER PRESSURE APPLICATION

The pressure unit called W model Freezer is an integrated working unit designed to be used for specific authorized purposes. See relative description in the following diagram “Description of W 700 (Freon) freezer pressure unit”.

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DESCRIPTION OF W 700 (FREON) FREEZER PRESSURE UNIT

IDENTIFICATION / DESCRIPTION FREEZER CONTAINER UNIT: W 700 – Serial number N. FW001-09 PS MAX: Product 14.5 /Fluid BP 17 /Fluid AP 28

REFERENCE DRAWING: W 700 – R507 TS Min: -10/-50 ; TS Max : +42 / +120

FLUID: R507A CATEGORY / MODULE: III – B + C1

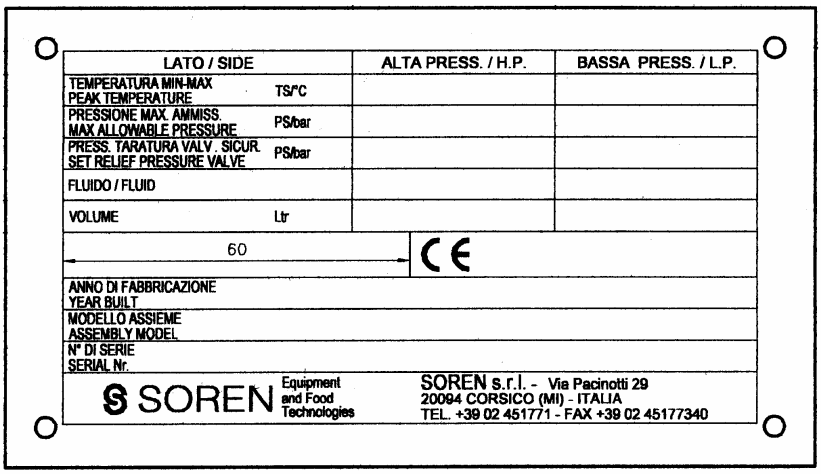
LIST OF CONTAINERS /PIPES /PRESSURE ACCESSORIES MAKING UP THE UNIT

Drawing Pos.	Description	Model	Project Temp. °C		Project Pressure bar		Hydraulic Test Bar		Volume Litres		DN -	Categ.	Module	Certific. N°	Issued by	Manufacture	Factory/ serial nr.
			min TS	max TS	PS		PT										
04M0510	Refrigerant container	W 700	-50	+42	18,5	14,5	26,.5	20,7	61,5	21,5	-	III	B+C1	-	-	SOREN	EP-0098
W 700 – R507	Oil separator	5540/11	-10	+130	32		43		3,52		-	I	A	-	-	CASTEL	0708
W 700 – R507	Condenser (CR 100)	L228941	-10	+120	30	10	43	14,3	12,1	7,8	-	III	H1	1615/05/CE	0100 ISPESL	ONDA	P0903144-01
W 700 – R507	Liquid Separator	S-7721-CE	-40	+130	31	27,5	-		16		-	II	D1	US.HTI.120.00	H.S. 0871	HENRY	-
W 700 – R507	Stainless steel pipes	W 700	-50	+120	PS x DN < 3500		43		-		60	I	A	-	-	SOREN	-
W 700 – R507	CU pipes + access.	W 700	-50	+120	PS x DN <1000		43		-		<32	Art. 3.3	-	-	-	SORITRONIC	-
W 700 – R507	Body valve	ICS 40	-60	+120	52 bar (754 psi)		-		-		40	II	D1	07 202 0511 Z0009/1/H-0002	TUV 0045	Danfoss	-
W 700 – R507	Freon level switch	FTL 70	-60	+230	100 bar		-		-		25	I	A	-	TUV 0045	E+H	-
W 700 – R507	Valve	PS40 DN20	-	-	-		-		-		-	Art. 3.3	-	-	-	Danfoss	-
W 700 – R507	L.P. pressure gauge	ϕ 100	-	-	F.s. 15 bar		-		-		-	Art. 3.3	-	-	-	Fantinelli	-
W 700 – R507	H.P. pressure gauge	ϕ 100	-	-	F.s. 32 bar		-		-		-	Art. 3.3	-	-	-	Fantinelli	-

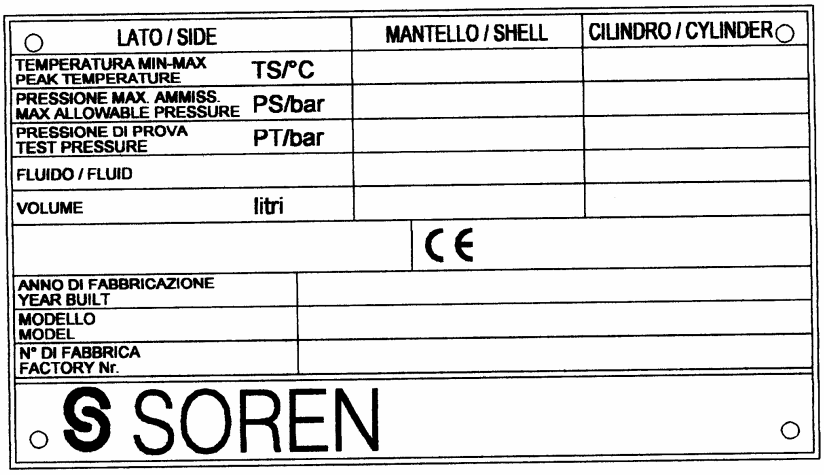
LIST OF UNIT SAFETY ACCESSORIES

Drawing Pos.	Description / Function	Model	Project Temp. °C		Project Pressure bar	DN	Relief capacity	Setting	Categ	Module	Certif. N°	Issued by	Manufacturer	Factory / Serial nr.
			min TS	max TS	PS			Bar						
00896002	L.P. safety valve	3030/44	-50	+150	42	15	120	17	IV	B + D	CE-PED-B-CAS001-01-ITA	BUREAU VERITAS	CASTEL	747132
00896002	H.P. safety valve	3030/44	-50	+150	42	15	909	28	IV	B + D	CE-PED-B-CAS001-01-ITA	BUREAU VERITAS	CASTEL	XW00249

See the unit rating plate illustrated here below, giving details required by the Directive; it is fixed onto the left-hand side of the machine body.



The machine pressure equipment conforms to the Directive and is identified by the rating plate giving details required by such Directive, accompanied by relevant Certificate of Conformity.
The rating plate for the freezer container produced by Soren is shown here below; it is fixed to a special support on the evaporator.



Appropriate pressure relief valves, identified by serial numbers given in the machine Certificate of Conformity, have been used to prevent the equipment and refrigerating circuit from exceeding max. tolerated PS pressure.

WARNING !
Keep strictly to instructions given in paragraph 2.6.2. to prevent pressure in the product cylinder from exceeding max. tolerated PS pressure.

2.5. FORESEEN AND NOT FORESEEN USES OF THE MACHINE

DANGER !
This machine is designed to produce ice cream to be packed in different ways (cups, cones, bulk, etc.). The Soren freezer can also be used to cool liquid food products containing at least 1-2% of fat. *Any other use is improper and so is prohibited by Soren.* *In particular the machine must not be used for production and processing of:* • *Grated-ice drink* • *Toxic and not toxic chemical products and chemical products mixes* • *Alcohol based products and explosive products*

2.6 MACHINE SPECIFICATIONS - UTILITIES

2.6.1 SPECIFICATIONS OF W SERIES ICE CREAM FREEZERS

The technical and functional features of W freezers are shown in the following tables 1 and 2.

2.6.1.1 Capacity

The maximum capacities listed are based on the following conditions:

- **Mix composition**
  - 10% fat
  - 15% sugar (of which 85% is sucrose)
  - 0,3% stabilizer
  - 38% total solids
- **Temperature of entering mix: 4°C**
- **Ice cream drawn at -5°C**
- **Refrigerant evaporating temperature in the jacket: - 33°C**

2.6.1.2 Main freezer components

- Stainless steel 304 frame
- Freezing cylinder made of plated chrome stainless steel
- Freezing vessel-evaporator made of 304 stainless steel
- Dasher and machine parts in contact with product made of 316 st. steel with scraper blade of special sanitary alloy
- Rotary pumps, made of 316 st. steel, with rotors of resilient sanitary material
- Dasher drive and pump drive, powered by electrical motors.
- Control and power panel and electrical system according to the directive 72/23/CEE

- Self containing freon refrigerant unit, including semi-hermetic compressor and condenser with pressure controlled water valve
- Air compressor and compressed air system

2.6.2 POWER SOURCES AND UTILITIES REQUIRED

- **Freezing mixture:** 4°C; feed the freezer rotary pump by gravity or by using a centrifugal pump with head at 1-2 bar.
  Do not use positive-displacement pumps to feed the freezer pump. Max. tolerated PS pressure on product side is 14.5 bar.

WARNING
Make sure the product flowing out of the freezer cylinder is not obstructed by any parts blocking it.

- **Electrical power:** 380 V, 3 phases, 50 Hz
- **Sanitary compressed air:** 7 bars
- **Cooling water :** 20°C (max.), 2 - 4 bars.
- **Refrigerant type:** R507

DANGER !
The safety valve/s vent (see annex refrigeration plant) must be conveyed outside the building when installing the machine, in a point where eventual refrigerant gas leaking out may not cause any harm.

2.7. MACHINE NOISE EMISSION

Noise sources of the machine are :

- dasher motor
- pump motor
- refrigerating compressor

Measurements made on freezer W have given the following results:

Machine with built in refrigerating compressor

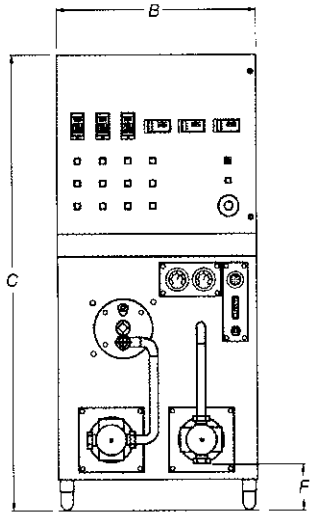
- equivalent continuous A-weighted sound pressure level at workstation is from 76 to 83 dB (A).
- Peak C-weighted instantaneous sound pressure value at value at workstations is lower than 130 dB.

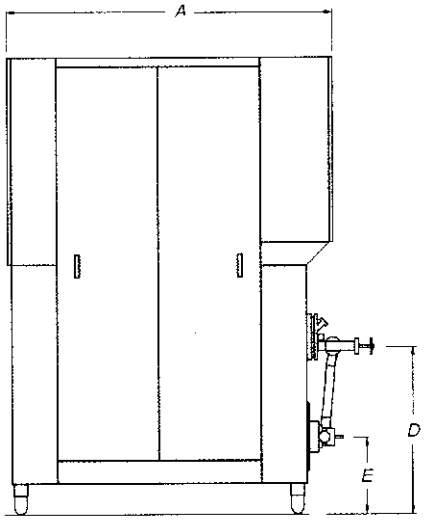
Machine connected to refrigeration unit centralized

- Continuous sound pressure level equivalent “A”, at workstation, is from 74 to 76 dB (A).

ICE CREAM FREEZER W SERIES

TABLE 1 - Technical specifications





TYPE	W 700
REFRIGERANT	R507
A (mm)	2.020
B (mm)	900
C (mm)	2.040
D (mm)	800
E (mm)	310
F (mm)	230
INSTALLED BLADES (ON 3 ROWS)	15
ELECTRIC POWER Kw	32
COOLING WATER AT 20°C l/h	9.500
NET WEIGHT:UNIT TO BE CONNECTED TO CENTRAL REFRIGERATION PLANT Kg	1.050
NET WEIGHT: UNIT WITH SELF CONTAINED REFRIGERATION PLANT Kg	1.330
SHIPPING VOLUME m^3	7,0

NOTE :
. R507 : MACHINES USING R507 ARE COMPLETE WITH BUILT IN REFRIGERATION UNIT

ICE CREAM FREEZER W SERIES

TABLE 2 - Technical specifications

FEATURES		W 700
OUT PUT ICE CREAM (PRODUCTION GLACE (MIN./MAX.))	l/h	140-780
REFRIGERATING POWER (CAPACITE FRIGORIFIQUE)	w	27.270
CONDENSING/EVAP. TEMPERATURE (TEMPERATURE CONDENS./ ÉVAPOR.)	°C	+30/-32.5
REFRIGERANT TYPE (REFRIGERANT)		R507
CYLINDER SURFACE (SURFACE DU CYLINDRE)	m^2	0,59
CYLINDER INNER DIAM. (DIAMETRE INT. DU CYLINDRE)	mm	155
BLADES- three raws mounting (LAMES – sur trois rangees)	N°	3x5
COMPRESSOR MOTOR (MOTEUR COMPRESSEUR)	KW	18,5
DASHER MOTOR (MOTEUR “DASHER”)	KW	11
DASHER SPEED (VITESSE DASHER)	RPM	300
PUMP MOTOR (MOTEUR POMPE)	KW	1,1
MIX PUMP (POMPE MELANGE)		#1 ROTARY
ICE CREAM PUMP – (optional) (POMPE GLACE)		#1 ROTARY
MAX AIR CONSUMPTION (CONSOMMATION D’AIR)	Nl/h	400
REQUIRED AIR PRESSURE (PRESSION DE L’AIR DEMANDÉE)	bar	7
CONDENSER INLET / OUTLET (EAU DE REFROIDISSEMENT-ENTREE/SORTIE)		1 ¼ " / 1 ½ "
CONDENSING WATER AT 20°C (CONSOMMATION D'EAU A 20°C)	l/h	9.500
REQUIRED WATER PRESSURE (PRESSION DE L’EAU DEMANDÉE)	bar	2 - 4

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2.8 MACHINE COMPONENTS AND INDEX OF ANNEXES

3. SAFETY

3.1. GENERAL SAFETY INFORMATION

The following information provides specific warnings on hazardous conditions which are inherent in the use and service of machines/plants supplied by SOREN.
Safe operation requires the application of sound and prudent operating, maintenance and servicing procedures under the direction of properly trained supervisors.
Our objective in providing instructions and warnings is to identify each area of potential hazards and its level of severity and to guide each worker for safe operation, service and maintenance procedures.
SOREN equipment is designed to provide minimum operator access to hazardous areas while providing adequate access for service by trained personnel. Hazardous areas are provided with guards. Various types of fasteners may be used for the guards depending on how frequently routine access is required. Regardless of the type of fastener used, **the mere existence of a guard should alert the worker to the presence of a hazard.**
Never operate or test run the equipment with a guard removed, unless under the supervision of properly trained and authorized personnel. Then use extreme caution to avoid the hazard.

DEFINITIONS:

DANGER !
An immediate hazard with a possibility of severe personal injury or death if instructions, including recommented precautions, are not followed

WARNING !
Hazard or unsafe practices which could result in severe personal injury or death if instructions, including recommented precautions, are not followed.

CAUTION !
Possible hazard or unsafe practices which could result in minor injury or damage to product or property if instructions including recommended precautions, are not followed.

3.2. SAFETY FIRST

SOREN equipment is designed and manufactured with due consideration and care for generally accepted safety standards. However, like any mechanical device, the proper and safe performance of this equipment depends upon using sound and prudent operating, maintenance and servicing procedures under properly trained supervision.
For your protection, and the protection of others, learn and always follow the safety rules outlined in this booklet.

3.3. OPERATING ZONE

An operating zone should be established around all machines. A brightly painted guard rail or warning stripe should define the zone. Only the operator or other authorized personnel should be within the operating zone when machine control circuits are energized or the machine is running. No tools or other equipment should be kept within the operating zone.

3.4. INSTALLATION

WARNING !
Power sources, such as electric and air, should be installed by trained and authorized personnel only.

3.5. SAFETY INSPECTION

Before starting a machine:

- Be absolutely positive all guards and safety devices are installed and operative.
- Be sure all personnel are clear of the machine/plant.
- Remove from the operating zone any materials, tools or other foreign objects that could cause injury to personnel or damage the machine/machines.
- Make certain the machine/plant is in operating condition.
- Make certain all indicating lights, horns, pressure gauges or other safety devices or indicators are in working order.

After shutdown:

- Make certain all air and electrical power is turned off.

3.6. GENERAL OPERATING SAFETY

- Do not operate this machine/plant until you read and understand the operating instructions and become thoroughly familiar with the machine/plant and its controls.
- Never operate a machine/plant while a safety device or guard is removed or disconnected.
- Do not start the machine/plant until all other personnel in the area have been warned and have moved outside the operating zone.
- Remove any tools or other foreign objects from the operating zone before starting.
- Absolutely do not have loose clothing, neckties, necklaces or unrestrained long hair near an operating machine.
- Do not wear gloves, rings, watches, bracelets or other jewelry near an operating machine.
- Keep the operating zone free of obstacles that could cause a person to trip or fall towards an operating machine.
- Never sit or stand on anything that might cause you to fall.
- Know the **EMERGENCY STOP** procedure for the machine/plant.
- Air and electrical power must be off when the machine/plant is not in use.
- Never manually operate limit switches with power on.
- Keep alert and observe indicator lights and warnings that are displayed on the machine/plant.
- Never leave the machine/plant unattended while in operation.
- Do not operate faulty or damaged equipment. Make certain proper service and maintenance procedures have been performed.
- Avoid placing fingers, hands, or any part of your body into a machine or near moving parts when control circuits are energized.

3.7. SERVICE AND MAINTENANCE SAFETY

- Do not service a machine/plant until you are throughly qualified and familiar with the tasks to be performed.
- Never operate any controls while other persons are performing maintenance on the machine/plant.
- Do not bypass a safety device.
- Always use the proper tool for the job.
- Never open covers that house electrical components when power is on.

- Only perform maintenance on a machine in motion when properly trained and required to do so. When directed to make adjustments on machines in motion, extreme care must be taken.
- Service fluids pressure must be relieved before performing maintenance or loosening connection on any pressurized system.
- Service fluids and electrical power are to be turned off unless they are absolutely required for the specific servicing being performed.
- **Do not enter a confined space without first checking for toxic fumes and providing standby personnel on the site.**

3.8. ELECTRICAL HAZARD

DANGER !
The machine/plant is normally powered by electric motor(s) and has many other electic and electronic controls and devices. This creates a hazard of electrical shock which could cause severe injury or even loss of life.

To minimize the risk from this inherent hazard:

- All electrical/electronic maintenance should be performed by trained and authorized electricians only.
- Always assume that power is on and treat all conditions as live. This practice assures a cautious approach which may prevent an accident or injury.
- To remove the load from circuit or equipment, open disconnector or breaker and lock in open position.
- Make certain that the circuit is open by using the proper test equipment.
- Capacitors must be given time to discharge, otherwise it should be done manually with care.
- There may be circumstances where “trouble-shooting” on live equipment may be required. Under such conditions, special precaution must be taken as follows:
  - Make certain your tools and body are clear of the ground
  - Extra safety measures should be taken in damp areas
  - Be alert and avoid any outside distractions.
- Before applying power to any equipment, make certain that all personnel are clear of the machine.
- Control panel doors should be open only when checking out the electrical equipment or wiring. After closing the panel door, make certain that (on those panels where applicable) the disconnect handle mechanism is operating properly.

- All covers on junction panels should be closed before leaving any job.
- All electrical apparatus must be properly grounded and overload protected.
- All electrical connections should be protected by confining them within a sealed junction box.

3.9. MECHANICAL HAZARD

3.9.1 HAZARD INHERENT MOVING PARTS

DANGER !
Machines/plant have moving parts guarded and/or enclosed. *However, it is necessary to remove the guards/enclosures to perform routine maintenance, cleaning or services procedures.* *As moving parts are powered by electric motors which may start unexpectedly during these procedures, severe injury or even loss of life could result.*

To minimize the risk:

- All maintenance and service operations must be perfomed anly by trained and authorized personnel.
- Always turn off the electrical power supply and lock it out, before doing any of the following operations:
  - Removing the guards from moving parts
  - Performing any maintenance on the electric motors
  - Performing any manual cleaning
  - Performing any service of the machine/plant components

3.9.2 HAZARD INHERENT SPECIFIC COMPONENTS

DASHER AND COUPLING OF FREEZER AND SSHE (scraped surface heat exchanger)

- In order to assure maximum sanitary operating conditions or for certain maintenance and servincing procedures it is necessary to disassemble and assemble the dasher

DANGER !
Should the dasher start rotating unexpectedly during servicing and maintenance procedures severe injury or loss of life could result. ALWAYS turn off the electrical power supply and LOCK OUT using a locking device for which only the person doing the work has the key before performing service or maintenance.

***Rotating Coupling**: NEVER remove the coupling guard(s) or service the coupling assembly without locking out the drive power source such that only the person involved has the key.*
Reaching in or around the coupling while the freezer is running could cause severe injury or loss of life.

***Dasher**: The dasher assembly is heavy. This creates a hazard of severe injury for anyone handling it incorrectly. Provide enough workers or mechanical lifting assistance to enable removing, installing and servicing the dasher safely.*

To minimize the risk from these inherent hazards:

- Only trained and authorized mechanics should perform maintenance or service work on the freezer
- INSTALL an emergency shut-off switch within easy reach of the operator.
- ALWAYS turn off the electrical power supply and LOCK OUT using a locking device for which only the person doing the work has the key, BEFORE performing any of the following:
  - Removing the guards from the motor coupling or from the front bearing.
  - Performing any maintenance or service on the motor(s).
  - Removing the front door.
  - Disassembling the pump cover or rotors
  - Assembling or disassembling the dasher

SCRAPER BLADES

DANGER !
All dasher have removable scraper blades. These blades can be very sharp and cause severe injury if not handled properly.

The scraper blades assembled on the dasher must be sharp to work correctly. This creates a hazard of severe cuts for anyone handling the dasher assembly or scraper blades incorrectly. Wear protective clothing for the hands and arms when handling the dasher assembly or the scraper blades. Avoid contacting the cutting edge of the scraper blades.

To minimize the risk of cuts from these blades when removing and installing the dasher:

- When removing the dasher by hand, always use heavy protective gloves (such as welders gloves) that reach to the elbows.
- Always work with at least one other trained person when removing or installing the dasher.

- Remove each blade from the dasher as soon as possible to remove the danger from others in the immediate area.
- Always store the blades together in a labeled container when not in use.

3.9.3 DANGERS DERIVING FROM EQUIPMENT UNDER PRESSURE

Refrigerant fluid side

Equipment under pressure in the refrigeration system is potentially dangerous.

ATTENTION !
Servicing and maintenance works on equipment under pressure and relevant connecting circuit must be done by specially trained and qualified refrigerator engineers only.

DANGER !
Never mishandle the safety valves installed on equipment under pressure. They have been calibrated and sealed to protect the equipment and circuit against overpressure.

Product side

Never feed the product circuit at a higher pressure than the one shown in point 2.6.2..

WARNING
Do not use positive-displacement pumps to feed the freezer pump. *Make sure that the product flowing out of the freezer cylinder is not obstructed by any parts blocking it.*

3.10. HIGH TEMPERATUR HAZARD

DANGER !
During production, cleaning and sanitizing some surfaces of the machine/plant can reach high temperatures (above 65°C) and cause severe burns if touched.

The design of machines/installation has been carried out in order to reduce the hazard inherent the high temperature; when possible the hazard has been eliminated by insulating or shielding the surfaces.

To minimize the risk from this inherent hazard:

- All installation, maintenance, and service of piping, valves and controls must be performed by trained and authorized personnel.
- Written notice of residual high temperature hazard shall be given to personnel working in the area; protection cloths and gloves shall be used by same personnel.

3.11. COMPRESSED AIR HAZARD

The W Freezer uses compressed air for the following functions:

- Added to the product to produce “overrun”
- Operate the bypass covers on the product pump

Compressed air creates certain unavoidable hazards. Compressed air may retain the power to move objects even after the supply is turned off. Air operated mechanical devices may operate unexpectedly from a remote control signal. If the air supply pressure exceeds design limits, plastic line connections could come apart and move around uncontrolled. These create a hazard of severe injury to personnel working in the area.

To minimize the risk from these inherent hazards:

- All installation of compressed air must be performed by trained and authorized pipefitters only.
- All compressed air installation must comply with all applicable codes and standards.
- Install a hand operated shut-off valve in the supply line to allow isolation of components before service or maintenance
- DO NOT perform any maintenance or service on the compressed air system components unless the supply valve to the system has been closed and locked or tagged.
- Train operating and maintenance personnel to always fully reconnect the removable air lines used to operate the pump bypass feature.

3.12. CLEANING HAZARD

DANGER !
The use of water around electronic equipment enclosures creates a hazard of electric shock which could cause severe injury or loss of life. Turn off the electric power supply and lock out before using any water for cleaning or rinsing around the electrical enclosures. Be certain the doors on all electric enclosures are closed and fasteners tightned. Never spray water directly into any electric controls or enclosures.

DANGER !
To properly clean and sanitize the machines/plants for use with food products it may be necessary to use chemical solutions. Many of the commonly used chemical solutions could cause severe injury to personnel if contacted. The hazard is especially severe for eyes, skin or inhalation.

To minimize the risk from these inherent hazards:

- Throughly train all personnel working with cleaning or sanitizing chemicals in their safe handling and disposal following use.

Manual Cleaning Procedure:

- Do not use toxic and/or flammable solvents to clean a machine/plant.
- Turn off air and electrical power prior to cleaning a machine/plant.
- Equip all personnel using cleaning/sanitizing solutions with protective clothing, including eye protection.
- Keep electrical panel covers closed and power off when washing a machine.
- Always clean up spills around machine as soon as possible.
- Never attempt to clean a machine while it is operating.

Cleaning In place procedure:

- Make certain that all connections in the cleaning circuit are tight to avoid contact with hot water or cleaning solutions.
- When the cleaning cycle is controlled from a remote or automated control center, establish fail-safe procedures to avoid automatic start-up while servicing equipment in the circuit.
- On equipment which includes manways, make certain covers are closed and latched prior to starting the cleaning cycle.

3.13. HALOCARBON HAZARD

If the Continuous Ice Cream Freezer uses halocarbon as a refrigerant for freezing the product, the following precautions are important. Halocarbon (R22 or R507) is colorless and clear in appearance with only a slight ethereal odor. It is heavier than air and thus displaces much needed oxygen for breathing. Thus it has the potential hazard of producing unconsciousness and even loss of life.
Do not open any connection into the refrigeration system until all refrigerant is evacuated and the freezer is isolated by closing the hand valves in the liquid and suction lines.

DANGER !
A sudden release of refrigerant liquid sprayed on the skin can cause serious damage to skin tissue. Keep eyes and exposed skin areas away from any potential refrigerant discharge. If such a refrigerant burn occurs, flush immediately with cold water, apply ice packs if severe and see a physician at once.

Refrigerant R22 and R507 are generally considered to be chemically nontoxic and nonflammable; however, any gas under pressure can be hazardous because of the energy latent in the pressure alone. Never fill any refrigerant gas cylinder completely with liquid. Always limit to approximately 80% liquid full. This will allow for normal expansion.

To minimize the risk from this inherent hazard:

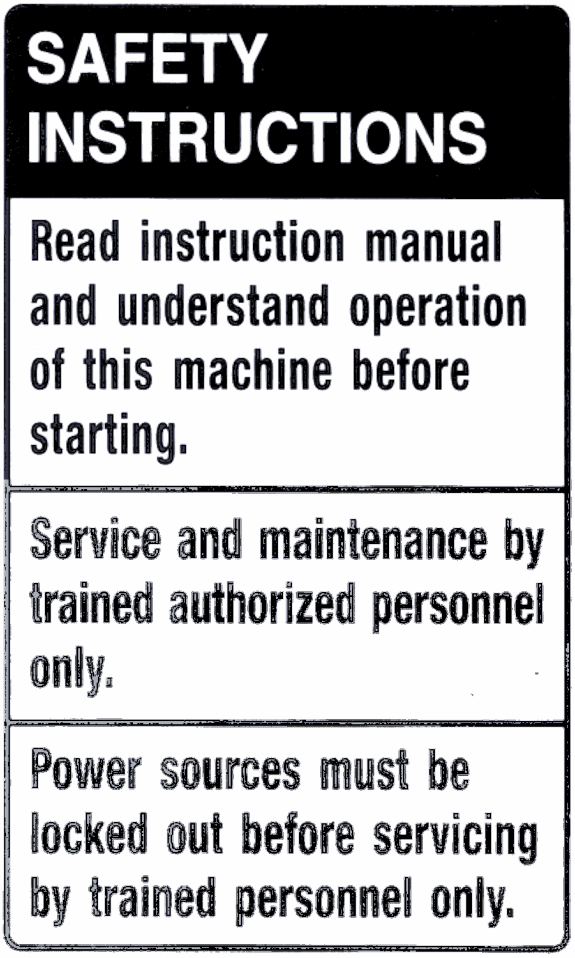
- The refrigeration installation must comply with all applicable codes and standards
- The refrigeration installation must be performed only by pipefitters trained and authorized for halocarbon refrigeration systems.
- Maintenance and service of the refrigeration system must be performed only by trained and authorized service personnel.
- Install a hand operated shut-off valve in the line to each service connection to allow isolation of components during service or maintenance.
- Throughly train all operating and maintenance personnel in the areas of:
  - use and care of personal protective equipment;
  - the hazardous effects of halocarbons;
  - first aid procedures.

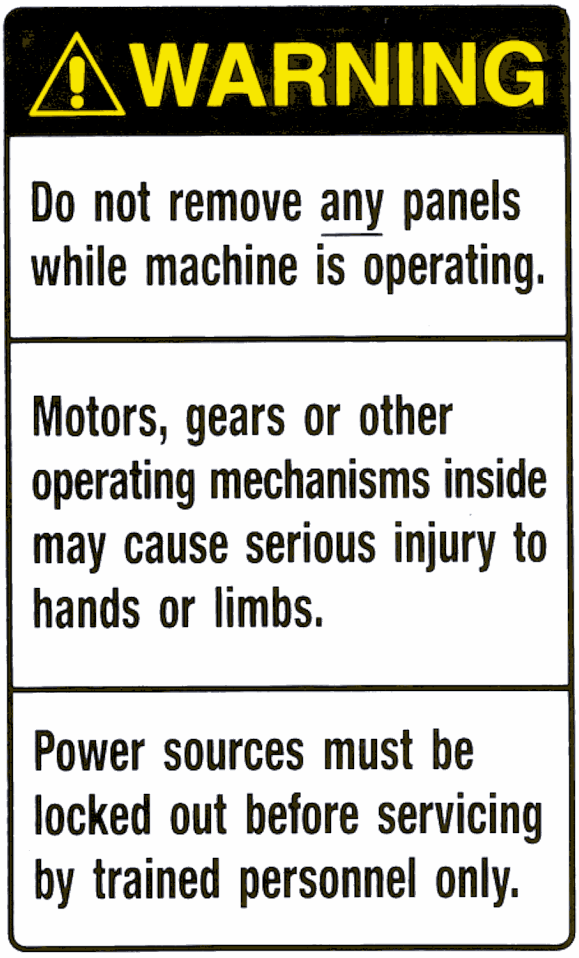
WARNING !
When evacuating or purging any sistem containing R22 or R507, always ventilate the area immediately. Concentrations in the presence of open flames such as gas range or gas water heater pilot lights may break down and form small amount of harmful phosgene gas.

- Develop and use a plant-wide program for the safe operation and maintenance of the halocarbon refrigeration system and all associated equipment.
- Provide personal protective equipment including protective clothing and respiratory protection.
- Provide adeguate ventilation for the processing area.
- Provide first aid supplies.

3.14. SAFETY LABELS

Following are the standard safety labels located by Soren on machine and plants. It is important that all personnel working on each machine/plant read and understand the instructions of those labels and follow them for their protection and safety.





3. SAFETY

3.1. GENERAL SAFETY INFORMATION

The following information provides specific warnings on hazardous conditions which are inherent in the use and service of machines/plants supplied by SOREN.
Safe operation requires the application of sound and prudent operating, maintenance and servicing procedures under the direction of properly trained supervisors.
Our objective in providing instructions and warnings is to identify each area of potential hazards and its level of severity and to guide each worker for safe operation, service and maintenance procedures.
SOREN equipment is designed to provide minimum operator access to hazardous areas while providing adequate access for service by trained personnel. Hazardous areas are provided with guards. Various types of fasteners may be used for the guards depending on how frequently routine access is required. Regardless of the type of fastener used, **the mere existence of a guard should alert the worker to the presence of a hazard.**
Never operate or test run the equipment with a guard removed, unless under the supervision of properly trained and authorized personnel. Then use extreme caution to avoid the hazard.

DEFINITIONS:

DANGER !
An immediate hazard with a possibility of severe personal injury or death if instructions, including recommented precautions, are not followed

WARNING !
Hazard or unsafe practices which could result in severe personal injury or death if instructions, including recommented precautions, are not followed.

CAUTION !
Possible hazard or unsafe practices which could result in minor injury or damage to product or property if instructions including recommended precautions, are not followed.

3.2. SAFETY FIRST

SOREN equipment is designed and manufactured with due consideration and care for generally accepted safety standards. However, like any mechanical device, the proper and safe performance of this equipment depends upon using sound and prudent operating, maintenance and servicing procedures under properly trained supervision.
For your protection, and the protection of others, learn and always follow the safety rules outlined in this booklet.

3.3. OPERATING ZONE

An operating zone should be established around all machines. A brightly painted guard rail or warning stripe should define the zone. Only the operator or other authorized personnel should be within the operating zone when machine control circuits are energized or the machine is running. No tools or other equipment should be kept within the operating zone.

3.4. INSTALLATION

WARNING !
Power sources, such as electric and air, should be installed by trained and authorized personnel only.

3.5. SAFETY INSPECTION

Before starting a machine:

- Be absolutely positive all guards and safety devices are installed and operative.
- Be sure all personnel are clear of the machine/plant.
- Remove from the operating zone any materials, tools or other foreign objects that could cause injury to personnel or damage the machine/machines.
- Make certain the machine/plant is in operating condition.
- Make certain all indicating lights, horns, pressure gauges or other safety devices or indicators are in working order.

After shutdown:

- Make certain all air and electrical power is turned off.

3.6. GENERAL OPERATING SAFETY

- Do not operate this machine/plant until you read and understand the operating instructions and become thoroughly familiar with the machine/plant and its controls.
- Never operate a machine/plant while a safety device or guard is removed or disconnected.
- Do not start the machine/plant until all other personnel in the area have been warned and have moved outside the operating zone.
- Remove any tools or other foreign objects from the operating zone before starting.
- Absolutely do not have loose clothing, neckties, necklaces or unrestrained long hair near an operating machine.
- Do not wear gloves, rings, watches, bracelets or other jewelry near an operating machine.
- Keep the operating zone free of obstacles that could cause a person to trip or fall towards an operating machine.
- Never sit or stand on anything that might cause you to fall.
- Know the **EMERGENCY STOP** procedure for the machine/plant.
- Air and electrical power must be off when the machine/plant is not in use.
- Never manually operate limit switches with power on.
- Keep alert and observe indicator lights and warnings that are displayed on the machine/plant.
- Never leave the machine/plant unattended while in operation.
- Do not operate faulty or damaged equipment. Make certain proper service and maintenance procedures have been performed.
- Avoid placing fingers, hands, or any part of your body into a machine or near moving parts when control circuits are energized.

3.7. SERVICE AND MAINTENANCE SAFETY

- Do not service a machine/plant until you are throughly qualified and familiar with the tasks to be performed.
- Never operate any controls while other persons are performing maintenance on the machine/plant.
- Do not bypass a safety device.
- Always use the proper tool for the job.
- Never open covers that house electrical components when power is on.

- Only perform maintenance on a machine in motion when properly trained and required to do so. When directed to make adjustments on machines in motion, extreme care must be taken.
- Service fluids pressure must be relieved before performing maintenance or loosening connection on any pressurized system.
- Service fluids and electrical power are to be turned off unless they are absolutely required for the specific servicing being performed.
- **Do not enter a confined space without first checking for toxic fumes and providing standby personnel on the site.**

3.8. ELECTRICAL HAZARD

DANGER !
The machine/plant is normally powered by electric motor(s) and has many other electic and electronic controls and devices. This creates a hazard of electrical shock which could cause severe injury or even loss of life.

To minimize the risk from this inherent hazard:

- All electrical/electronic maintenance should be performed by trained and authorized electricians only.
- Always assume that power is on and treat all conditions as live. This practice assures a cautious approach which may prevent an accident or injury.
- To remove the load from circuit or equipment, open disconnector or breaker and lock in open position.
- Make certain that the circuit is open by using the proper test equipment.
- Capacitors must be given time to discharge, otherwise it should be done manually with care.
- There may be circumstances where “trouble-shooting” on live equipment may be required. Under such conditions, special precaution must be taken as follows:
  - Make certain your tools and body are clear of the ground
  - Extra safety measures should be taken in damp areas
  - Be alert and avoid any outside distractions.
- Before applying power to any equipment, make certain that all personnel are clear of the machine.
- Control panel doors should be open only when checking out the electrical equipment or wiring. After closing the panel door, make certain that (on those panels where applicable) the disconnect handle mechanism is operating properly.

- All covers on junction panels should be closed before leaving any job.
- All electrical apparatus must be properly grounded and overload protected.
- All electrical connections should be protected by confining them within a sealed junction box.

3.9. MECHANICAL HAZARD

3.9.1 HAZARD INHERENT MOVING PARTS

DANGER !
Machines/plant have moving parts guarded and/or enclosed. *However, it is necessary to remove the guards/enclosures to perform routine maintenance, cleaning or services procedures.* *As moving parts are powered by electric motors which may start unexpectedly during these procedures, severe injury or even loss of life could result.*

To minimize the risk:

- All maintenance and service operations must be perfomed anly by trained and authorized personnel.
- Always turn off the electrical power supply and lock it out, before doing any of the following operations:
  - Removing the guards from moving parts
  - Performing any maintenance on the electric motors
  - Performing any manual cleaning
  - Performing any service of the machine/plant components

3.9.2 HAZARD INHERENT SPECIFIC COMPONENTS

DASHER AND COUPLING OF FREEZER AND SSHE (scraped surface heat exchanger)

- In order to assure maximum sanitary operating conditions or for certain maintenance and servincing procedures it is necessary to disassemble and assemble the dasher

DANGER !
Should the dasher start rotating unexpectedly during servicing and maintenance procedures severe injury or loss of life could result. ALWAYS turn off the electrical power supply and LOCK OUT using a locking device for which only the person doing the work has the key before performing service or maintenance.

***Rotating Coupling**: NEVER remove the coupling guard(s) or service the coupling assembly without locking out the drive power source such that only the person involved has the key.*
Reaching in or around the coupling while the freezer is running could cause severe injury or loss of life.

***Dasher**: The dasher assembly is heavy. This creates a hazard of severe injury for anyone handling it incorrectly. Provide enough workers or mechanical lifting assistance to enable removing, installing and servicing the dasher safely.*

To minimize the risk from these inherent hazards:

- Only trained and authorized mechanics should perform maintenance or service work on the freezer
- INSTALL an emergency shut-off switch within easy reach of the operator.
- ALWAYS turn off the electrical power supply and LOCK OUT using a locking device for which only the person doing the work has the key, BEFORE performing any of the following:
  - Removing the guards from the motor coupling or from the front bearing.
  - Performing any maintenance or service on the motor(s).
  - Removing the front door.
  - Disassembling the pump cover or rotors
  - Assembling or disassembling the dasher

SCRAPER BLADES

DANGER !
All dasher have removable scraper blades. These blades can be very sharp and cause severe injury if not handled properly.

The scraper blades assembled on the dasher must be sharp to work correctly. This creates a hazard of severe cuts for anyone handling the dasher assembly or scraper blades incorrectly. Wear protective clothing for the hands and arms when handling the dasher assembly or the scraper blades. Avoid contacting the cutting edge of the scraper blades.

To minimize the risk of cuts from these blades when removing and installing the dasher:

- When removing the dasher by hand, always use heavy protective gloves (such as welders gloves) that reach to the elbows.
- Always work with at least one other trained person when removing or installing the dasher.

- Remove each blade from the dasher as soon as possible to remove the danger from others in the immediate area.
- Always store the blades together in a labeled container when not in use.

3.9.3 DANGERS DERIVING FROM EQUIPMENT UNDER PRESSURE

Refrigerant fluid side

Equipment under pressure in the refrigeration system is potentially dangerous.

ATTENTION !
Servicing and maintenance works on equipment under pressure and relevant connecting circuit must be done by specially trained and qualified refrigerator engineers only.

DANGER !
Never mishandle the safety valves installed on equipment under pressure. They have been calibrated and sealed to protect the equipment and circuit against overpressure.

Product side

Never feed the product circuit at a higher pressure than the one shown in point 2.6.2..

WARNING
Do not use positive-displacement pumps to feed the freezer pump. *Make sure that the product flowing out of the freezer cylinder is not obstructed by any parts blocking it.*

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DANGER !
During production, cleaning and sanitizing some surfaces of the machine/plant can reach high temperatures (above 65°C) and cause severe burns if touched.

The design of machines/installation has been carried out in order to reduce the hazard inherent the high temperature; when possible the hazard has been eliminated by insulating or shielding the surfaces.

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- All installation, maintenance, and service of piping, valves and controls must be performed by trained and authorized personnel.
- Written notice of residual high temperature hazard shall be given to personnel working in the area; protection cloths and gloves shall be used by same personnel.

3.11. COMPRESSED AIR HAZARD

The W Freezer uses compressed air for the following functions:

- Added to the product to produce “overrun”
- Operate the bypass covers on the product pump

Compressed air creates certain unavoidable hazards. Compressed air may retain the power to move objects even after the supply is turned off. Air operated mechanical devices may operate unexpectedly from a remote control signal. If the air supply pressure exceeds design limits, plastic line connections could come apart and move around uncontrolled. These create a hazard of severe injury to personnel working in the area.

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- Train operating and maintenance personnel to always fully reconnect the removable air lines used to operate the pump bypass feature.

3.12. CLEANING HAZARD

DANGER !
The use of water around electronic equipment enclosures creates a hazard of electric shock which could cause severe injury or loss of life. Turn off the electric power supply and lock out before using any water for cleaning or rinsing around the electrical enclosures. Be certain the doors on all electric enclosures are closed and fasteners tightned. Never spray water directly into any electric controls or enclosures.

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- Do not use toxic and/or flammable solvents to clean a machine/plant.
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- Keep electrical panel covers closed and power off when washing a machine.
- Always clean up spills around machine as soon as possible.
- Never attempt to clean a machine while it is operating.

Cleaning In place procedure:

- Make certain that all connections in the cleaning circuit are tight to avoid contact with hot water or cleaning solutions.
- When the cleaning cycle is controlled from a remote or automated control center, establish fail-safe procedures to avoid automatic start-up while servicing equipment in the circuit.
- On equipment which includes manways, make certain covers are closed and latched prior to starting the cleaning cycle.

3.13. HALOCARBON HAZARD

If the Continuous Ice Cream Freezer uses halocarbon as a refrigerant for freezing the product, the following precautions are important. Halocarbon (R22 or R507) is colorless and clear in appearance with only a slight ethereal odor. It is heavier than air and thus displaces much needed oxygen for breathing. Thus it has the potential hazard of producing unconsciousness and even loss of life.
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To minimize the risk from this inherent hazard:

- The refrigeration installation must comply with all applicable codes and standards
- The refrigeration installation must be performed only by pipefitters trained and authorized for halocarbon refrigeration systems.
- Maintenance and service of the refrigeration system must be performed only by trained and authorized service personnel.
- Install a hand operated shut-off valve in the line to each service connection to allow isolation of components during service or maintenance.
- Throughly train all operating and maintenance personnel in the areas of:
  - use and care of personal protective equipment;
  - the hazardous effects of halocarbons;
  - first aid procedures.

WARNING !
When evacuating or purging any sistem containing R22 or R507, always ventilate the area immediately. Concentrations in the presence of open flames such as gas range or gas water heater pilot lights may break down and form small amount of harmful phosgene gas.

- Develop and use a plant-wide program for the safe operation and maintenance of the halocarbon refrigeration system and all associated equipment.
- Provide personal protective equipment including protective clothing and respiratory protection.
- Provide adeguate ventilation for the processing area.
- Provide first aid supplies.

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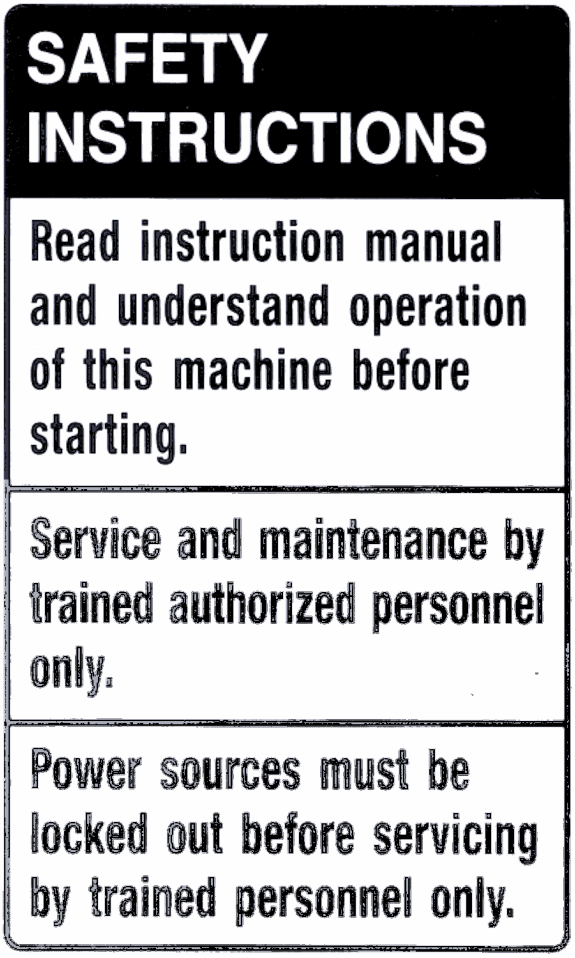
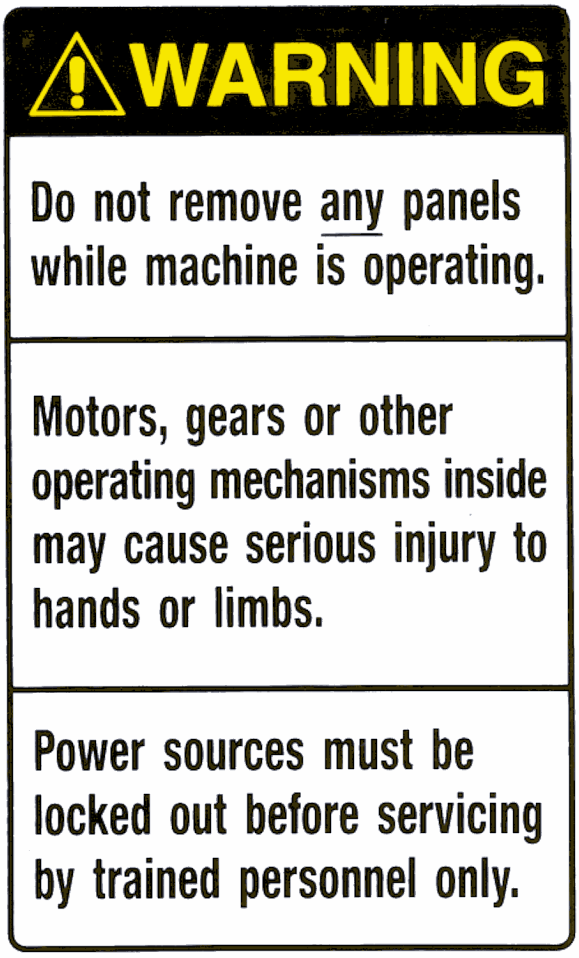




4. INSTALLATION AND ASSEMBLY

4.1. RECEIVING AND INSPECTION

SOREN equipment is run tested and inspected prior to shipment. When leaving the factory, it is well crated for normal transportation procedures. SOREN cannot, however, guarantee safe arrival. Therefore, upon receipt of this equipment, check the received items against the packing list for damage or missing parts. Check the packing material thoroughly for small parts.
Damage or loss should be reported immediately to the delivery carrier while present. Following the immediate notification of the lost or damage parts, a detailed description of losses or damages, and a cash value should be claimed against the carrier.

4.2. INSTALLATION PLACE

WARNING !
Install the machine in an area with good ventilation. The possibility of leaking refrigerant liquid or gas creates a hazard of severe injury or loss of life when installed in areas with poor ventilation.

Install the machine in a location with good lighting and allow around it for maintenance and operation the following space:

SPACE AROUND THE MACHINE

- **FRONT** (for dasher removal):
  FREEZER model : W 700 2000 mm
- **REAR** (for maintenance) : 1000 mm
- **BOTH SIDES** (for maintenance) : 1000 mm

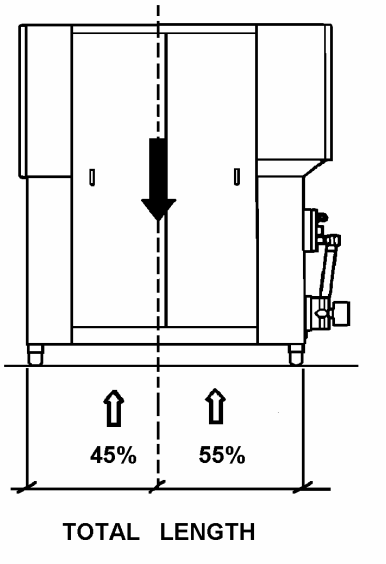
4.3. INSTALLATION AND LEVELLING

Locate with consideration for required service connections. Keep service supply lines as short and direct as possible for optimum operating efficiency.
Locate close to associated process equipment to minimize piping between equipment and minimize pressure build up through lines.
Locate near floor drains with a hose station nearby.

WARNING !
If the lifting equipment slips or breaks, severe injury may result. Make sure lifting equipment is rated for the weight of the unit. Only trained personnel should operate the lifting equipment.

- Remove the crating, but leave the machine on the skid.
- Raise the machine with a lift truck, positioning the forks as illustrated in the figure below.

- Be certain that the lift truck capacity is higher than the machine weight.
- Move to plant installation site and place in position.



- Remove skid from under the machine.
- Gently lower the machine until the adjustable legs support the weight
- Level the machine by turning the adjustable feet in or out. When correctly positioned, the machine should be level from side and have a slight pitch end to end so that water drains out the front of the cylinder: this is an approximate 5 mm per meter slope.
- Check each adjustable leg. Be certain legs are all firmly against the floor when levelling is finished.

4.4. ELECTRIC POWER CONNECTIONS

- See paragraph 2.6 “Machine specifications-utilities”.
- **Wiring must be done by qualified and authorized electricians only.**
  - Wiring must be done according to standards in force and in conformity to specifications on the motor rating plate.
  - Make sure the dasher rotates in the same direction as the arrows.

4.5. FLUID CONNECTIONS

- See paragraph 2.6 “Machine specifications-utilities”.
- Refrigerant fluids must be connected up by qualified and authorized personnel only.

DANGER !
The safety valve/s vent (see annex refrigeration plant) must be conveyed outside the building when installing the machine, in a point where eventual refrigerant gas leaking out may not cause any harm.

5. OPERATION

5.1 IMPORTANT CAUTIONS

The following important cautions describe ways to avoid incorrect operating procedures which will cause serious damage to the machine.

5.1.1 PROTECT CYLINDER

WARNING !
Machine cylinder is made of chrome plated nickel. Incorrect operating procedures may cause severe damage or rapid wear of the surface and require an expensive cylinder replacement.

To prevent serious damage :

- Do not operate dasher without product or water in the cylinder
- Do not wash or rinse with acid solution of any kind
- Avoid thermal shocks
- Do not operate dasher with worn scraper blade at less than the recommended width dimension of 31,7 mm.

5.1.2 AVOID FREEZE-UP

WARNING !
Incorrect operating procedures may cause a "freeze-up". A freeze-up occurs when the product becomes too cold and too stiff. The resulting load on the dasher motor and drive components may cause severe damage to the dasher, belts, motor, and other drive components. If the dasher stops, the product inside the cylinder will freeze further, requiring a time consuming defrosting procedure before production can resume.

To prevent freeze up:

- Do not turn on the refrigeration without the dasher running
- Do not allow the supply of product to the machine to stop during freezing operations.
- Do not operate with product stiffness at greater than 100% motor load.
- Do not obstruct the machine outlet.
- Do not turn on the refrigeration when flushing out with water.

5.1.3 BEWARE OF SANITIZING SOLUTIONS

WARNING !
Sanitizing solutions are extremely corrosive, especially those which contain halogen compounds (chlorine, bromine, iodine). Solutions of these chemicals will attack the surface of the cylinder and the special hard alloy stainless steel scraper blades.

To prevent serious damage:

- Do not sanitize the machine sooner than 15 minutes immediately prior to starting production.
- Do not leave sanitizing solutions in prolonged contact with any surface - product contact or exterior. As droplets dry out they become more concentrated and will cause corrosion pitting
- Do not use any type of sanitizer containing halogen compounds.

5.1.4 PREVENT PUMP DAMAGE

WARNING !
Incorrect operating procedures may cause damage or rapid wear to pump parts, especially the rotors and shafts.

To obtain maximum service life of pump parts:

- **Do not** operate the pumps "dry" (without water or product present).
- **Do not** use screwdriver or other prying type tools when removing rotors. Use the rotor removal tool provided.
- **Do not** operate product pump against excessive discharge pressure.
  - Keep discharge lines short as possible.
  - Use large as possible discharge lines.
  - Use few as possible elbows, tees, and/or valves in discharge line
  - Use wide sweep elbows wherever possible in the discharge line.

WARNING
Make sure that the product flowing out of the freezer cylinder is not obstructed by any parts blocking it.

5.1.5 PREVENT DASHER DAMAGE

WARNING !
Incorrect operating and/or maintenance procedures may cause severe damage to the dasher and expensive replacement.

To obtain maximum service life of the dasher:

- Do not allow the product inside the cylinder “freeze-up”.
- Series 30 dasher:
  - **Do not** continue to operate the freezer when the bearings in the front dasher head or the beater support are excessively worn.

5.2 PRE-START-UP PROCEDURES

Prior to putting the machine in operation, proceed as follows:

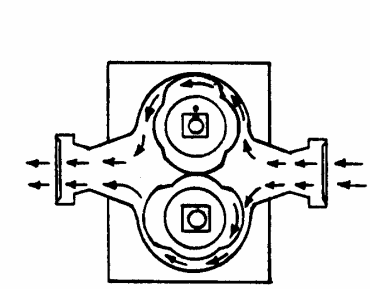
5.2.1. DASHER AND DASHER DRIVE

- Remove stainless steel panels to access the dasher drive area
- Check V-belt tension.
- Check dasher rotation by jogging the starter. Correct rotation is counter clockwise facing the front of the freezer

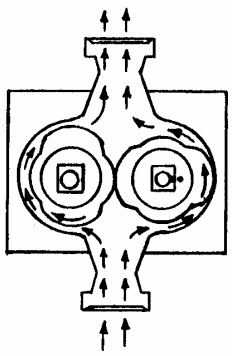
5.2.2. PUMP(S) AND PUMP(S) DRIVE

- Disassemble the rotary pump(s) on the front of the unit (see 7.1.2 “PUMP MAINTENACE”) disconnect piping and remove the cover, rotor and body.
- Check oil level in the pump gear-case(s). If necessary, add oil (see “7.1.2 “PUMP MAINTENACE”)
- Check pump(s) rotation by jogging the starter
- Reassemble pumps and piping

The correct rotation of the rotary pumps is:



Correct ice cream pump rotation



Correct mix pump rotation

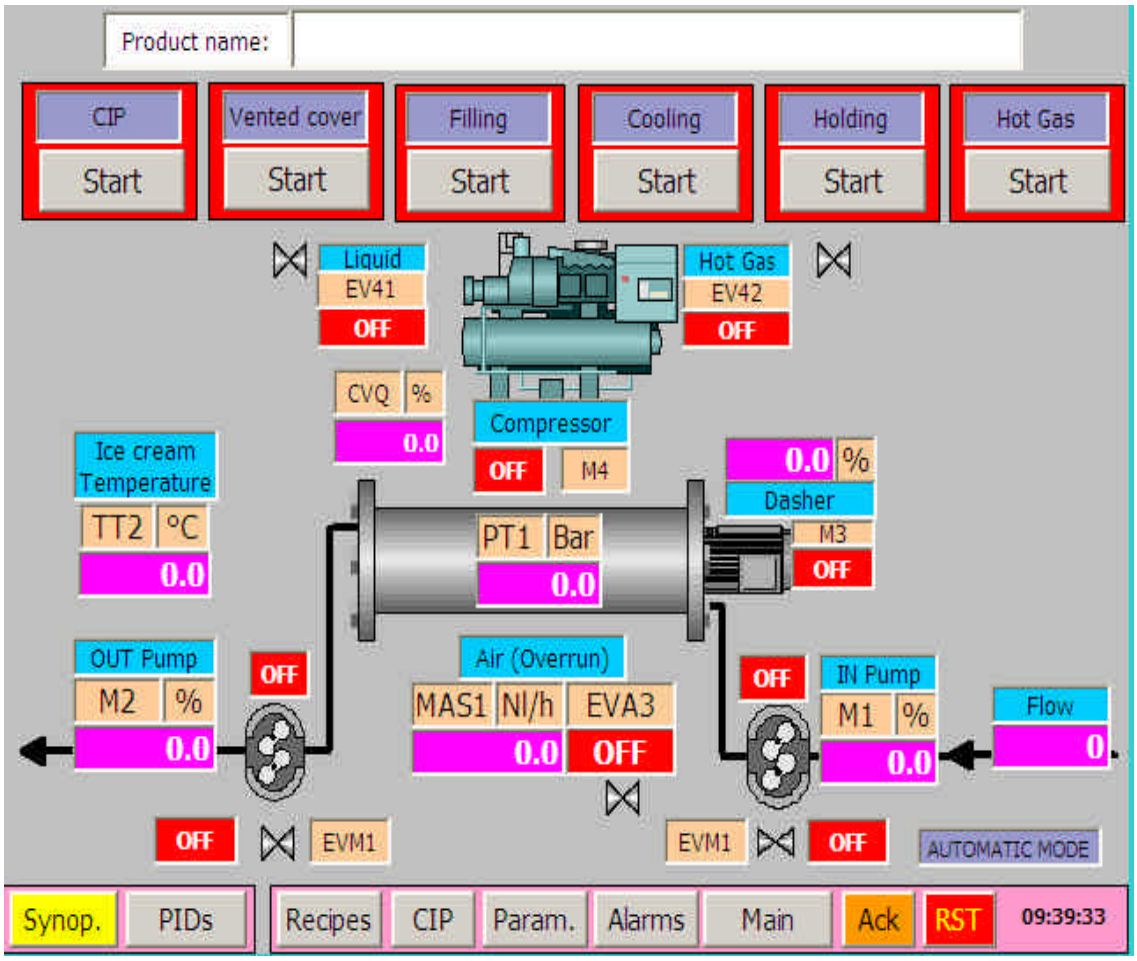
Clean and sanitize the machine (see chapter 6).

5.3 PLANT AUTOMATION

The machine is totally managed by a PLC and an HMI operator panel

SIEMENS MP277 10” HMI DESCRIPTION

The Siemens MP277 10” operator touch panel runs on the Windows CE operating system.
All automatic and manual machine functions can be controlled from this panel.

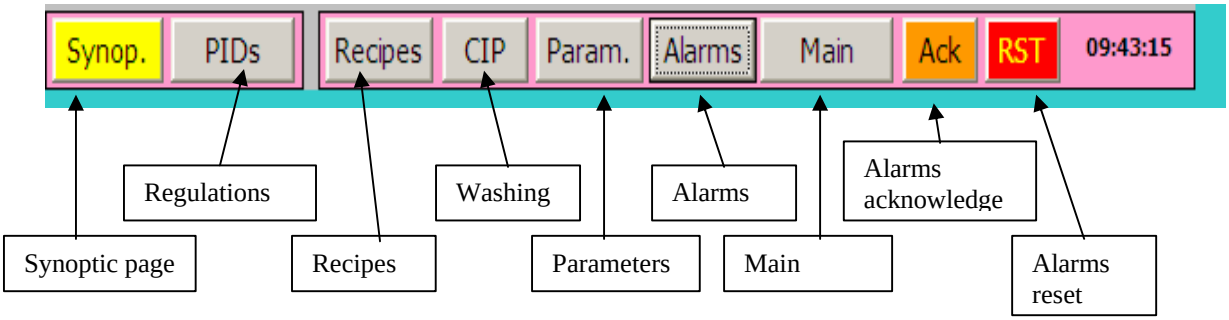


GRAPHIC PAGES

Each window shows a diagram of part of the plant and all the required operating information. For large plants, diagrams can be spread over several windows.

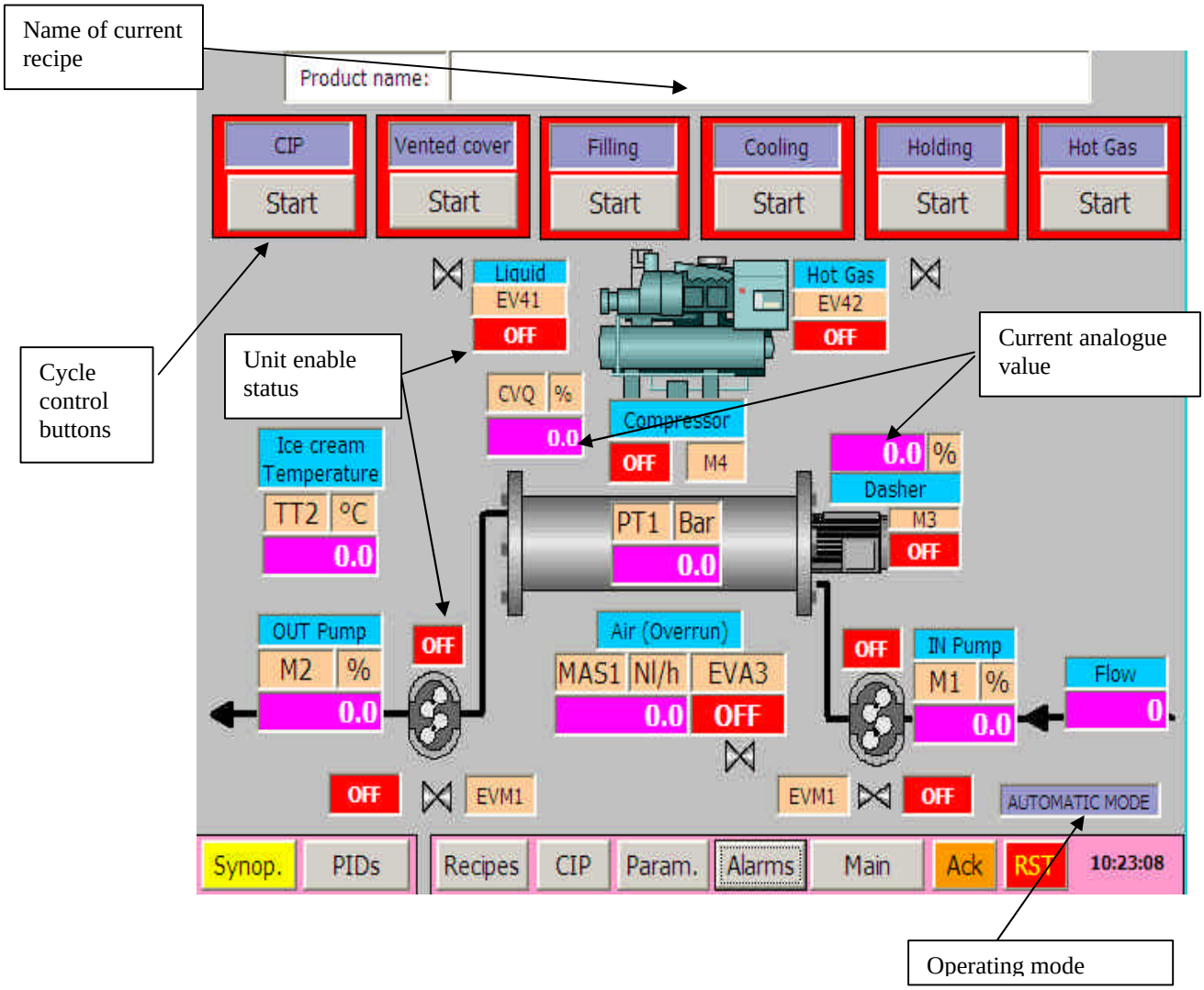
5.3.1 NAVIGATION MENU

The lower part of the screen contains a button bar allowing the operator to navigate between the various panel pages.



5.3.2 SYNOPTIC PAGE

This page shows the flow diagram of the machine, the enable status of the electrical users and the current values of the analogue variables.



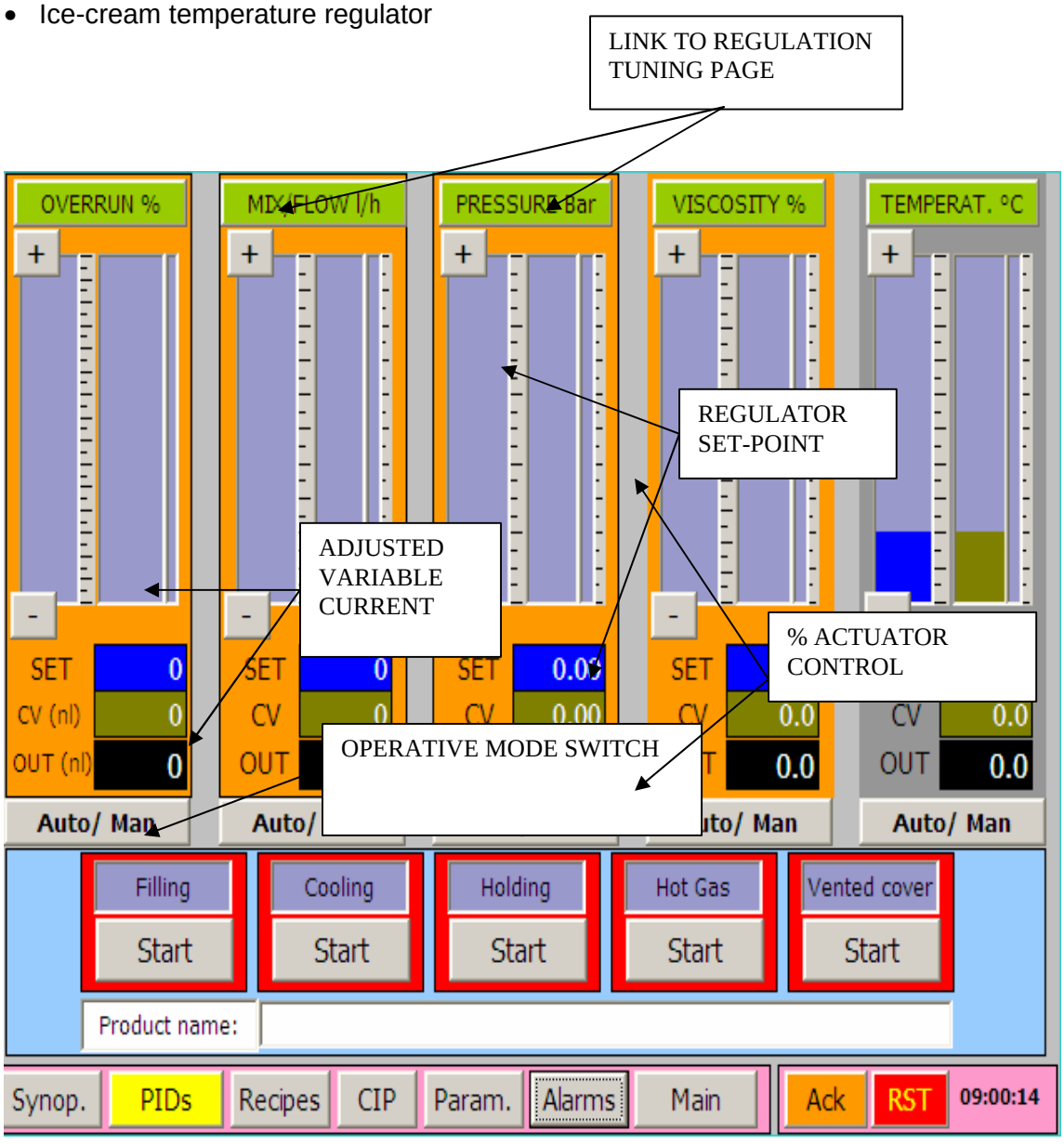
The synoptic page is split into three areas:

- **The upper part** indicates the name of the current recipe and the control buttons of the automatic production and cleaning functions.
- **The central area** contains the synoptic diagram.
  The automatic machine cycles can be enabled on this page
- **The lower part** contains the navigation menu and the alarms reset and acknowledge buttons (visible on all pages)

5.3.3 REGULATIONS

This page indicates the machine regulators :

- Overrun regulator
- Cylinder pressure regulator
- Mix flow regulator
- Ice-cream viscosity regulator
- Ice-cream temperature regulator

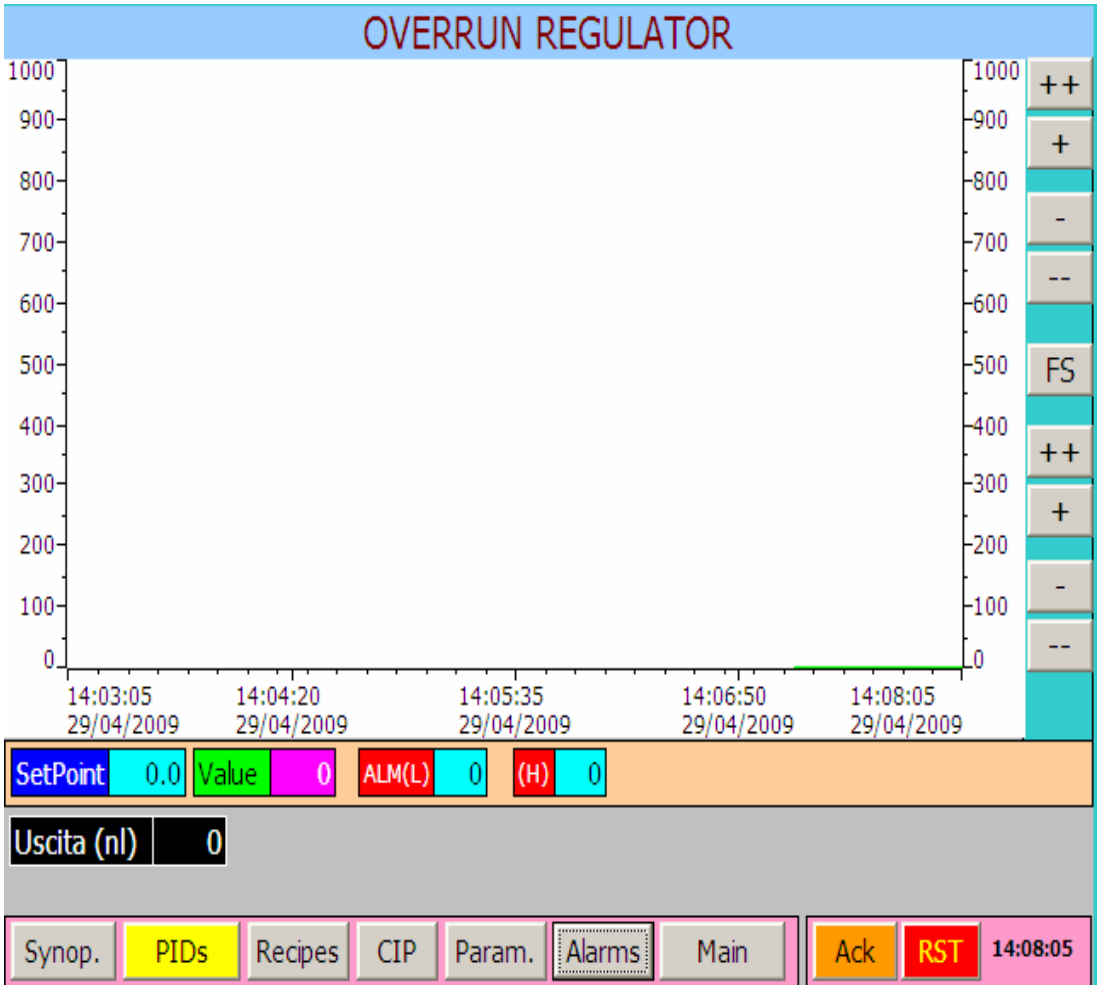


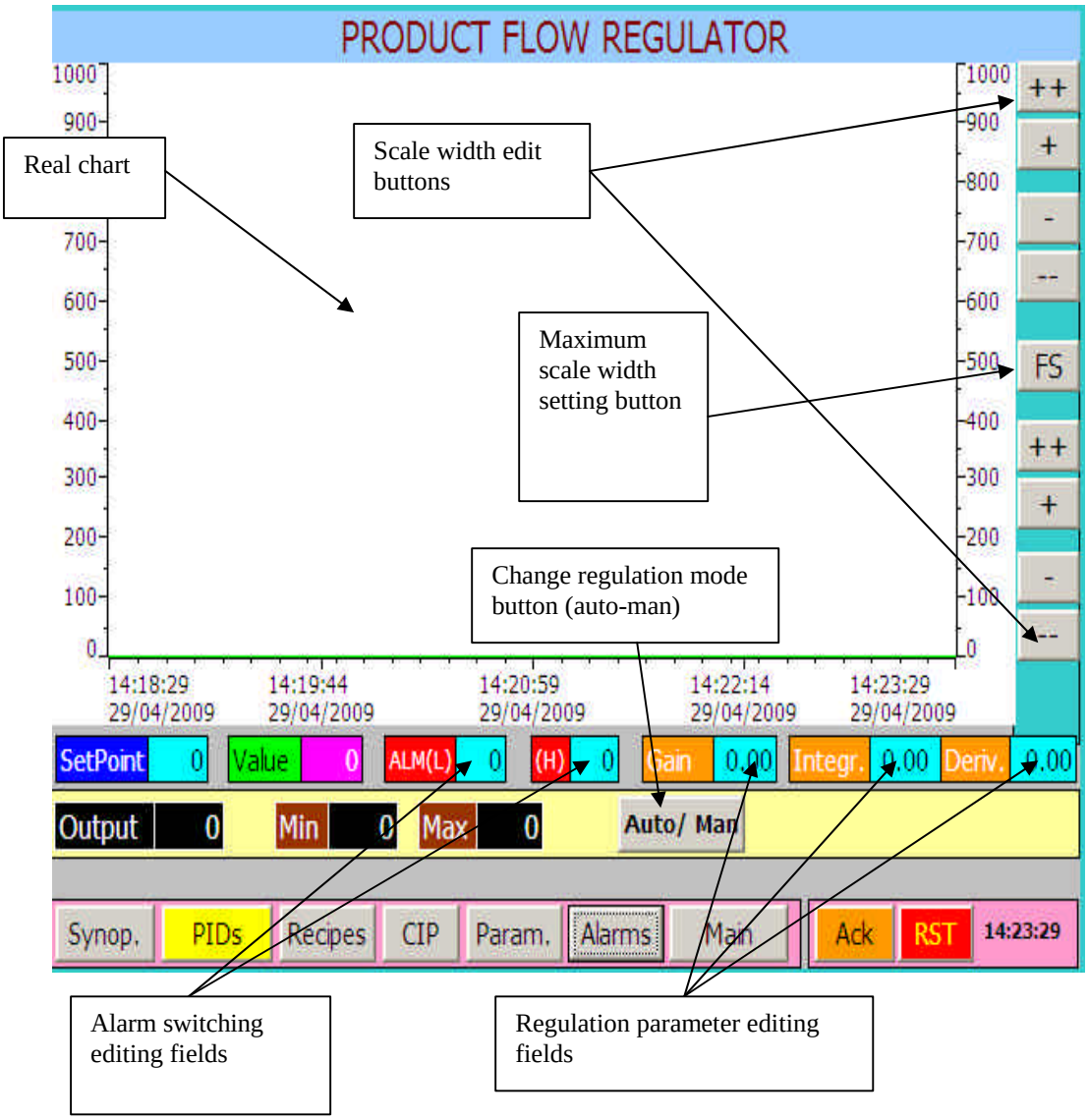
This page can be used to check the status of the automatic machine regulations. The set-points and operating mode (automatic-manual) of the regulations can also be changed

The regulation tuning pages comprise an upper part with a real chart showing the curves of the regulation variables (set-point, regulator output and analogue input). The right-hand part of the chart contains buttons for modifying the scale in order to more fully control the behaviour of the variables.
The lower part of the page shows the settings fields where the following parameters can be edited:

- set-point
- minimum alarm switching
- maximum alarm switching
- gain
- integral time (sec.)
- derivative time (sec.)
- the change mode button (auto-man)

The parameters must be edited (available at supervisor level) by qualified staff
To edit a value, press the number to change, enter the account and password, if requested, and enter the new value.

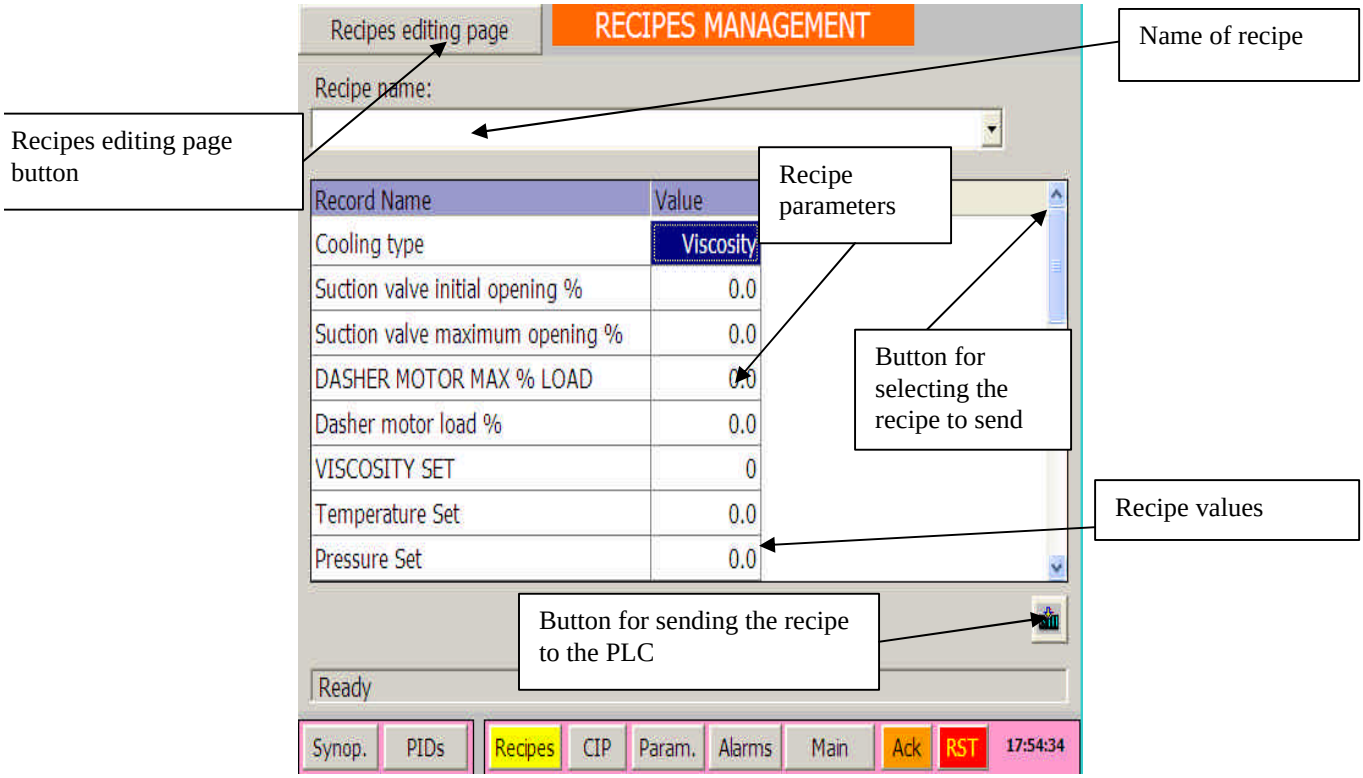




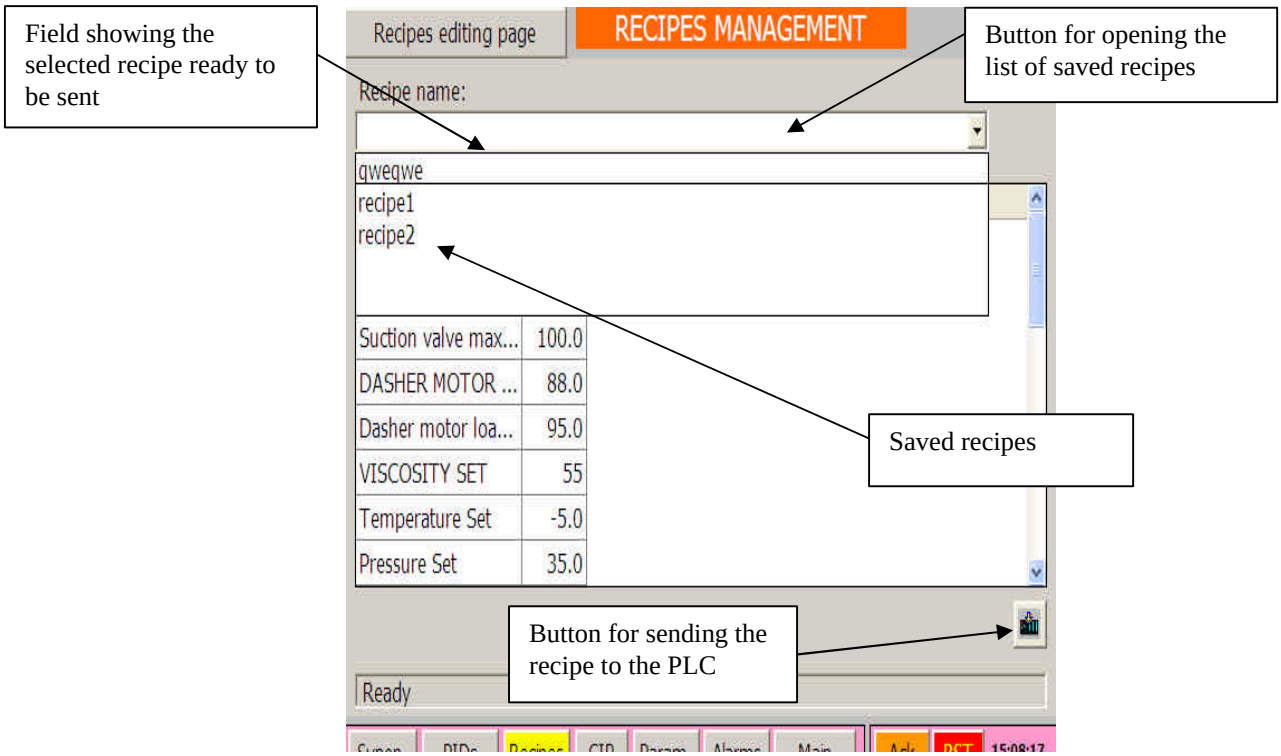
All the regulation parameters are rewritten whenever a recipe is sent.
With regulation in the manual mode, the actuator control % can be edited using the + and – buttons appearing on the screen.
The switching values cause the regulation alarms to trip during the production cycle.

5.3.4 RECIPES

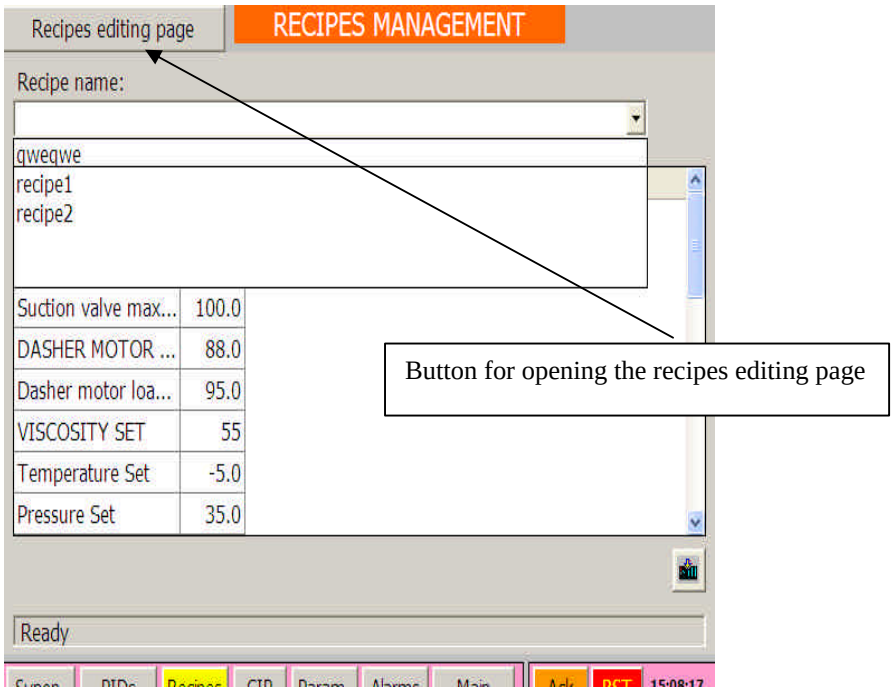
This page is used to manage the recipes:
recipes can be created, edited, saved, reloaded and sent to the PLC.
To edit the recipes (create, edit, delete and save, enter the “supervisor” password; the “operator” password is sufficient to load them from the database and send them to the PLC.
There are 3 password levels: administrator, supervisor and operator.
The “administrator” level is the highest and can be used to perform all machine operations, including switching off the operator panel.
The “supervisor” level can be used to fully manage recipes and change the auto/man operating mode for the manual control of individual users.
The operator level provides access to the recipe page and allows a recipe to be sent to the PLC.

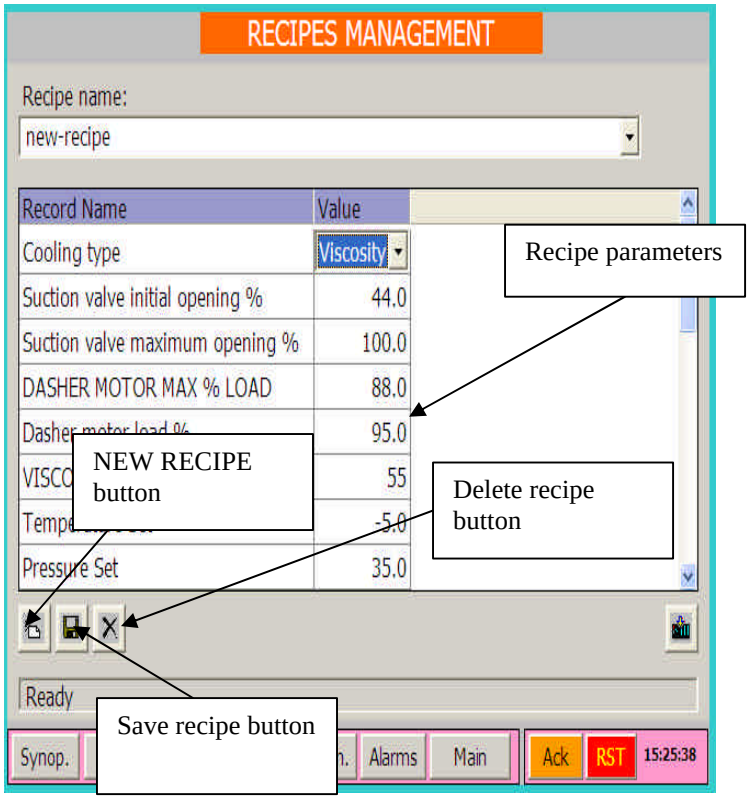


To send a recipe:
Press the relative button to open the list of saved recipes
Touch the name of the required recipe
The name of the selected recipe appears in the “Recipe Name” field
Press the send button to send the recipe to the PLC
Check the recipe has been sent (the name of the sent recipe appears in the “product name“ field in the synoptic page at the top).



To create a recipe:
Select the recipes editing page (supervisor level required)
Press the “new recipe” button at the bottom
Edit the recipe parameters
Assign a name to the recipe and enter it in the “Recipe name” field
Press the SAVE RECIPE button to save it
Check that the new recipe has been saved (recipe present in the list of saved recipes)





To edit a recipe
Select the recipes editing page (supervisor level required)
Press the relative button to open the list of saved recipes
Select a recipe
The name of the selected recipe appears in the “Recipe Name” field
Edit the recipe parameters
Press the SAVE RECIPE button to save it

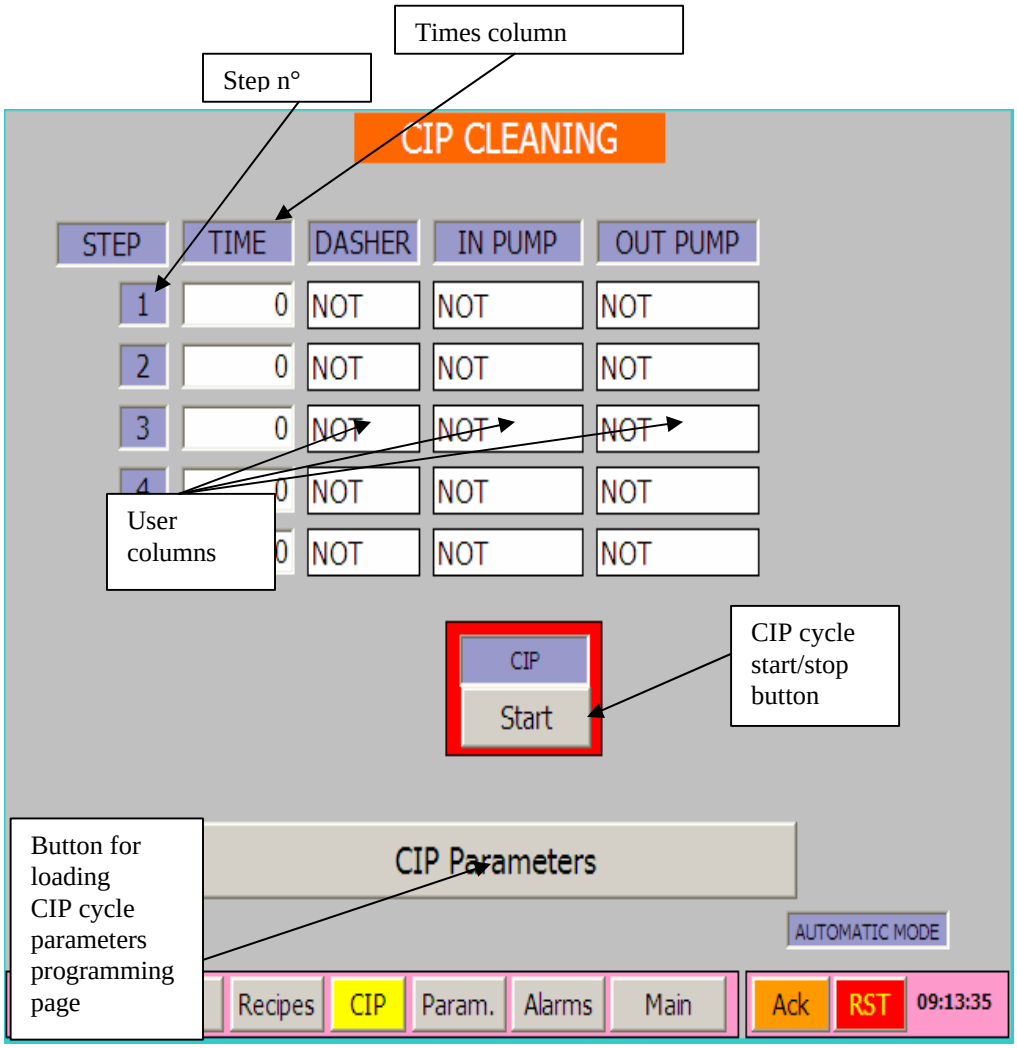
To delete a recipe
Select the recipes editing page (supervisor level required)
Press the relative button to open the list of saved recipes
Select a recipe
The name of the selected recipe appears in the “Recipe Name” field
Press the DELETE RECIPE button to delete it

Recipe parameters:

- Cooling type: touch the required type of cooling regulation (temperature or viscosity)
- Suction valve initial opening: fixed freon suction valve opening percentage during the initial cooling phase, this percentage remains fixed until the rotary pumps start
- Suction valve maximum opening: maximum opening percentage of the freon suction valve
- Dasher max % motor load alarm: maximum dasher motor load (compressor stopped)
- Warning dasher % motor load alarm: 1st dasher motor load alarm (hot gas activation)
- Viscosity set: viscosity set point of ice-cream at outlet
- Temperature set: temperature set point of ice-cream at outlet
- Pressure set: cylinder pressure set point
- Overrun set : ice-cream overrun set point
- Flow set: mix flow rate set point (l/h)
- Dasher speed set: dasher speed set point (optional)
- PID1_viscosity gain: loop 1 gain (viscosity regulation)
- PID1_viscosity derivative: loop 1 derivative time (viscosity regulation)
- PID1_viscosity integral: loop 1 integral time (viscosity regulation)
- PID2_temperature gain: loop 1 gain (temperature regulation)
- PID2_temperature derivative: loop 1 derivative time (temperature regulation)
- PID2_temperature integral: loop 1 integral time (temperature regulation)
- PID3_pressure gain: loop 1 gain (pressure regulation)
- PID3_pressure derivative: loop 1 derivative time (pressure regulation)
- PID3_pressure integral: loop 1 integral time (pressure regulation)
- PID5_flow gain: loop 1 gain (mix flow rate regulation)
- PID5_flow derivative: loop 1 derivative time (mix flow rate regulation)
- PID5_flow integral: loop 1 integral time (mix flow rate regulation)

5.3.5 CIP

This page is used to activate the CIP cleaning cycle with the relative button Execution of the cleaning cycle sequence can also be controlled.



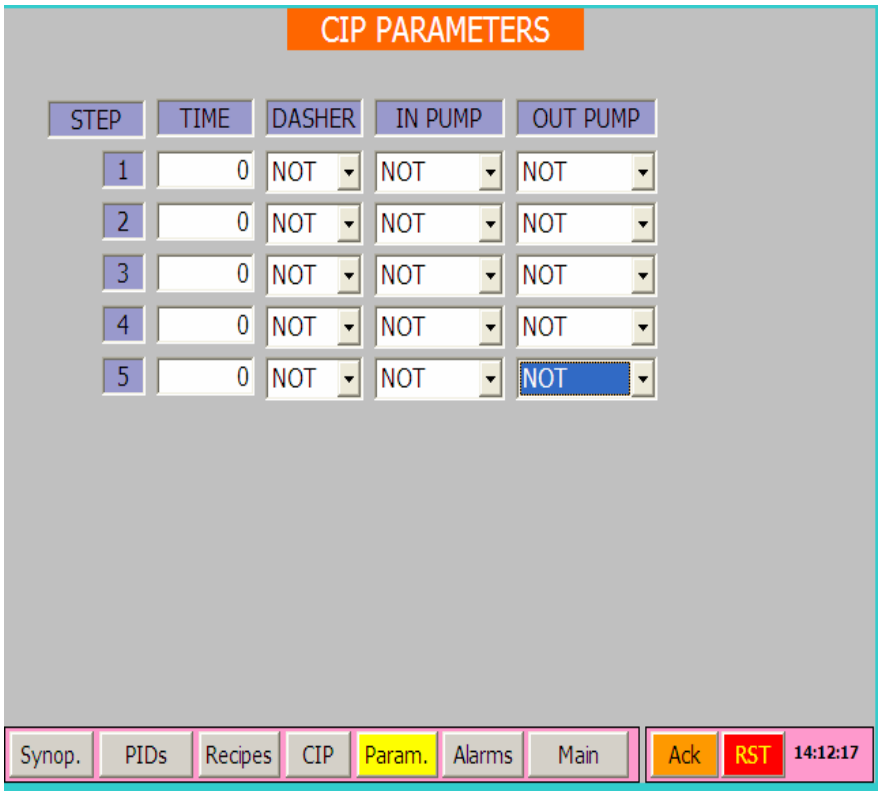
Prior to start CIP see chapter 6 “Cleaning and Sanitizing”

To perform CIP:

- Connect the machine to the cleaning system
- Close the external cleaning ack contact
- Make sure there are no active cycles.
- Press the Start CIP button
  The cycle starts (the button turns green) and the vented covers open. When the pressure in the cylinder exceeds that set in the system page, the pumps and the dasher motor start according to the displayed programme.
- To terminate the cycle, press the STOP CIP button (the button turns red)

To compile the CIP sequence

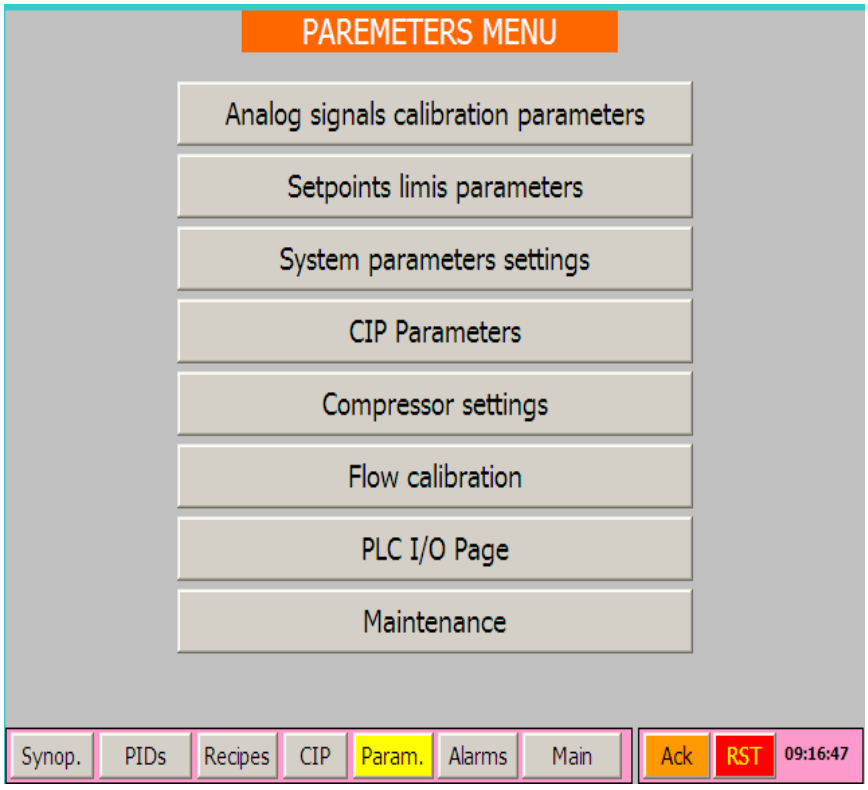
- Load the CIP PARAMETERS page from the CIP page or the menu on the Parameters page (supervisor level required)
- Compile the sequence by entering the times and users in the table
- The sequence need not be saved as it is unique
  The CIP cycle comprises the cyclical execution of the 5 steps in the table (after the 5th step the programme returns to the 1st step)
  The duration of each step is indicated in the times column.



5.3.6 PARAMETERS

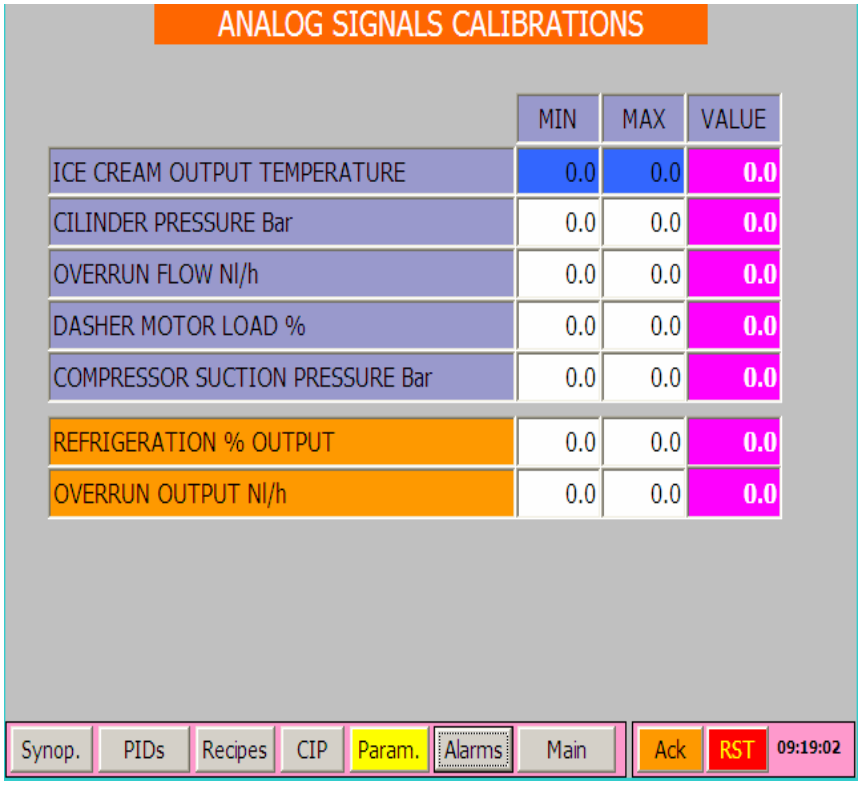
This page is used to access the general machine parameter pages:

- Analog signals calibration parameters: min. and max. analog input and output limits
- Minimum and maximum set point limits
- System parameter settings
- CIP parameters
- Compressor settings (future)
- Flow calibration
- PLC I/O page
- Programmed maintenance



Analog signal calibrations page

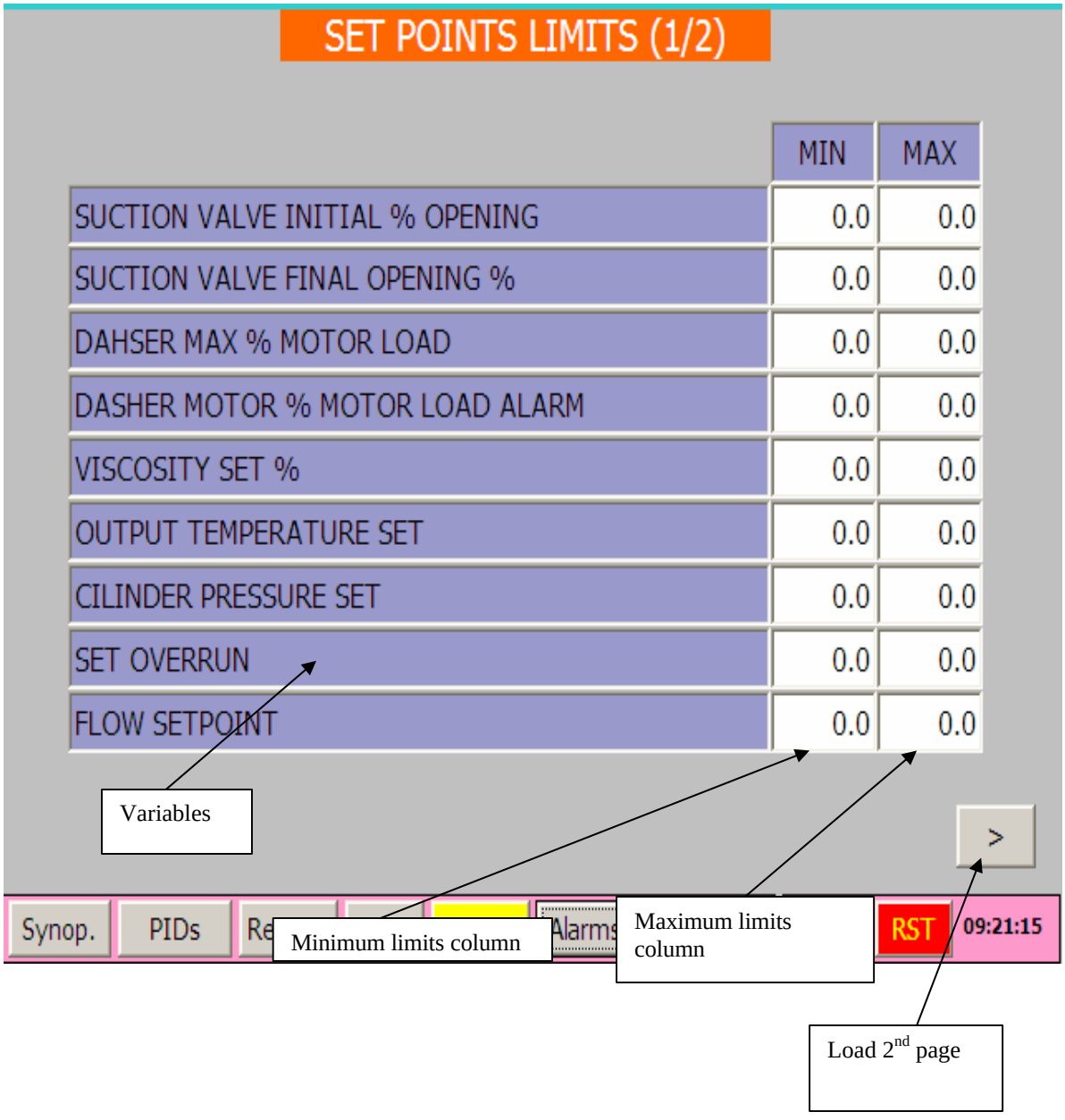
This page can be accessed at “administrator” password level
In the Min and Max columns enter the minimum and maximum values of the input and output analog signals. These values must only be changed if an analog transducer is replaced with another having a different scale.
This operation is very delicate and must be performed by qualified staff



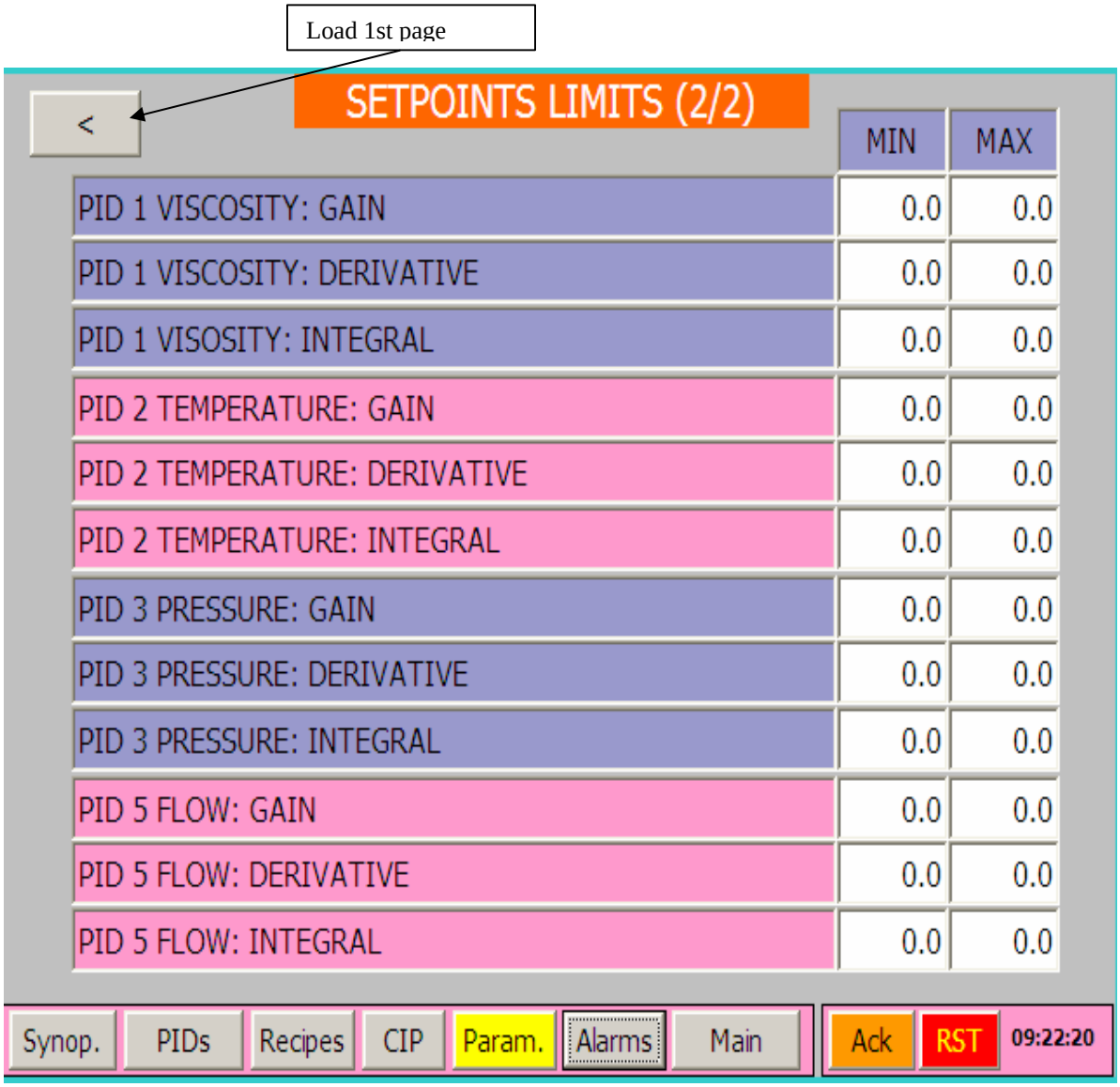
Set point limit parameters

This two-page section can be accessed at “administrator” password level
This page is used to enter the minimum and maximum limits of the variables used in the automatic regulations and in the recipe.

1st page



2nd page



System parameter settings

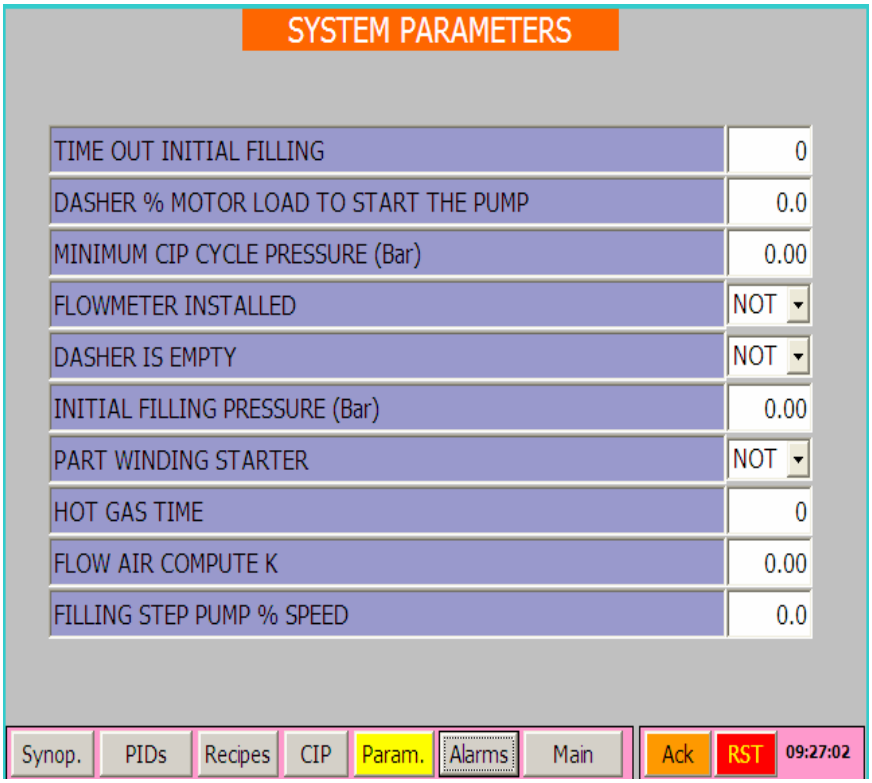
This two-page section can be accessed at “administrator” password level
Enter the general system parameters (values used by the PLC for automatic machine operation) in this page

- **Time out initial filling:** time in seconds, used during the automatic filling cycle and acquires the filling phase performed unless one of the other two conditions (pressure or acceptance button) intervenes
- **Dasher % motor load to start the pump**: if the dasher is empty during the cooling phase, the pump starts after the load exceeds this limit.
- **Minimum CIP cycle pressure**: When the cleaning system is started, the sequence will only be activated after the inlet pressure exceeds this limit
- **Flow meter installed**: confirm the presence or not of a flow meter on the ice-cream mix inlet

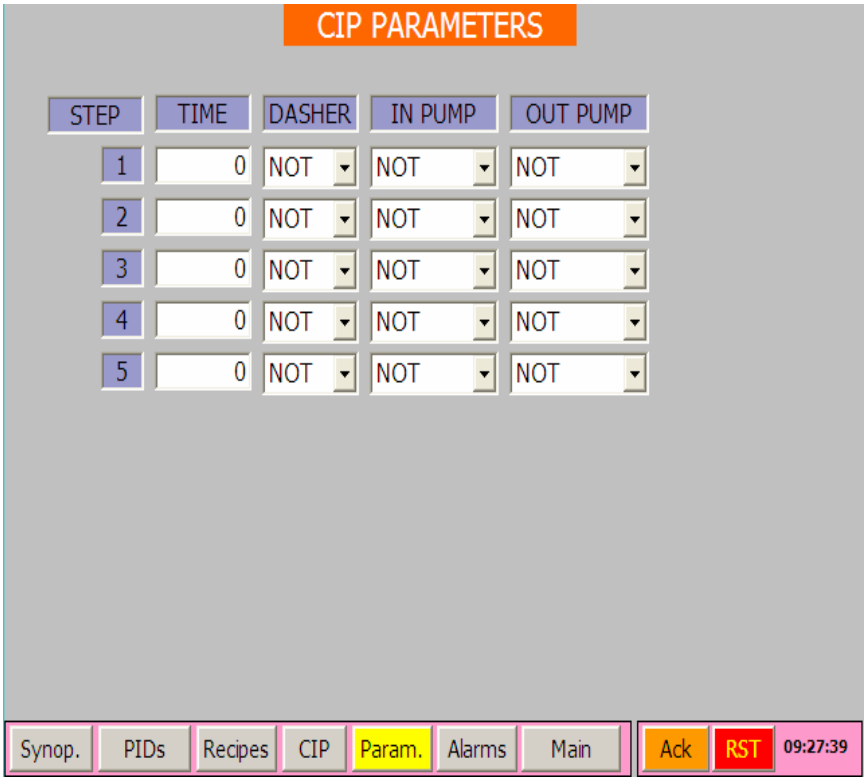
- **Dasher is empty**: confirm the presence or not of the empty dasher
- **Initial filling pressure:** used during the automatic filling cycle and acquires the filling phase performed unless one of the other two conditions (maximum time or acceptance button) intervenes
- **Part Winding starter**: device present (reduced starting current)
- **Hot gas time**: time (in seconds) of hot gas distribution when the hot gas function is activated either in the manual or automatic modes
- **Flow air compute "K"**: constant used to multiply the flow of the mix in litres to calculate the overrun air flow (referring to 100% overrun)

  E.g.: with K =1.16
  overrun set = 110%
  Mix flow rate = 350 l/h
  Air flow overrun set point = $\frac{350 \times 1{,}16 \times 110}{100}$ = 446 nl/h

- **Filling step pump % speed**: sets the mixing pump speed % during the filling phase



CIP parameters (see 5.3.5)



Flow calibration parameters

This page can be accessed at “supervisor” password level
Flow calibration must be performed in machines without flow meters.
Flow can be calibrated in two ways:

- Calibration with two points (recommended when starting from zero)
- Calibration with just one point

Calibration with two points:

Set the initial pump speed in %.
Set the pressure on the pressure regulator (loop page).
Note the value of the calibration constant.
Load the mix into the machine:
- Press start pump at low speed
- Wait for the pressure in the machine to stabilise, then calculate the flow in litres/hour (example A), enter the value in the “measured flow” field and press the stop button. (consider the specific weight of the mix in the calculation)

Example A:
weigh the ice-cream leaving the machine in 36” (e.g.: 2 kg)
multiply this value by 100
measured flow = 200 Kg / h (2kg in 36”)
specific weight of mix = 1.10 Kg/l
calculation of flow rate in l/h = 200 / 1.10 = **181.8 (value to enter in the inlet field)**

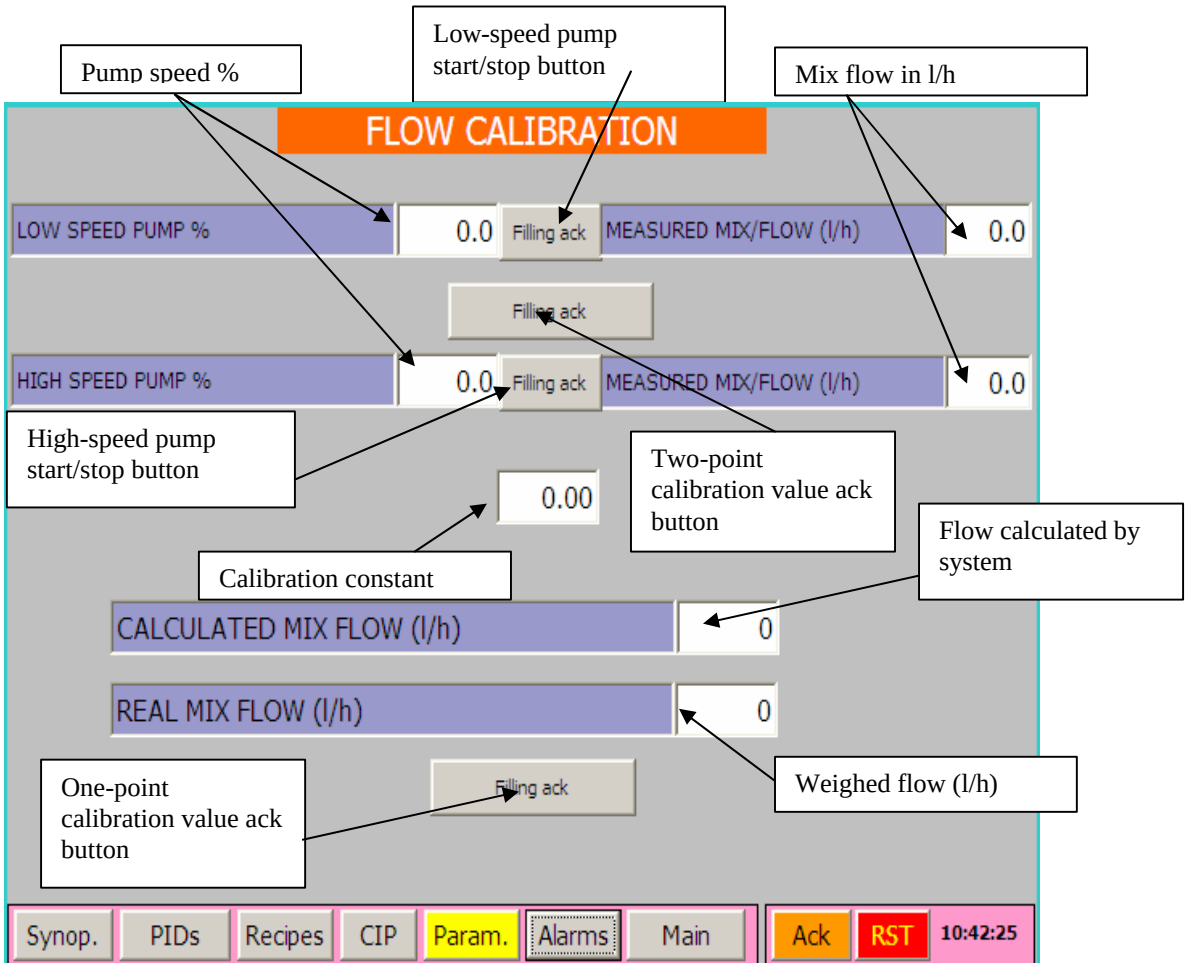
Press start pump at high speed

Wait for the pressure in the machine to stabilise, then calculate the flow in litres/hour (example A), enter the new value in the “measured flow” field and press the stop button. (consider the specific weight of the mix in the calculation)

Press the accept values button to acquire the data.

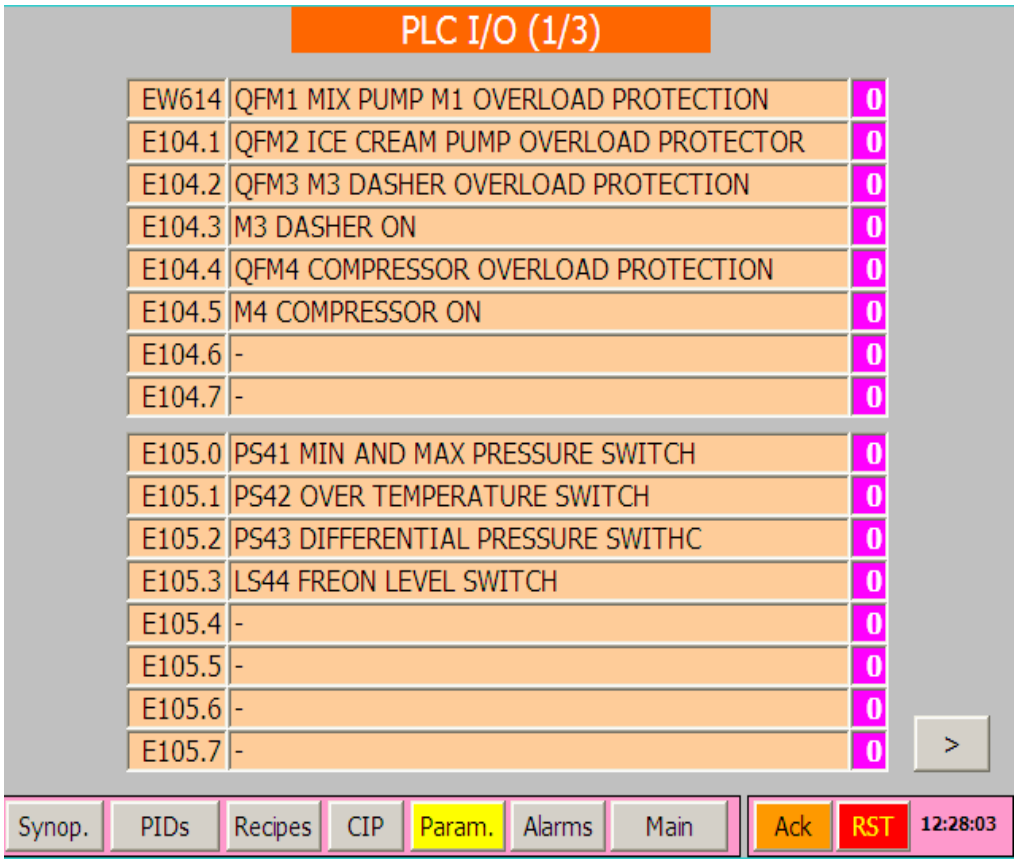
Calibration with just one point:

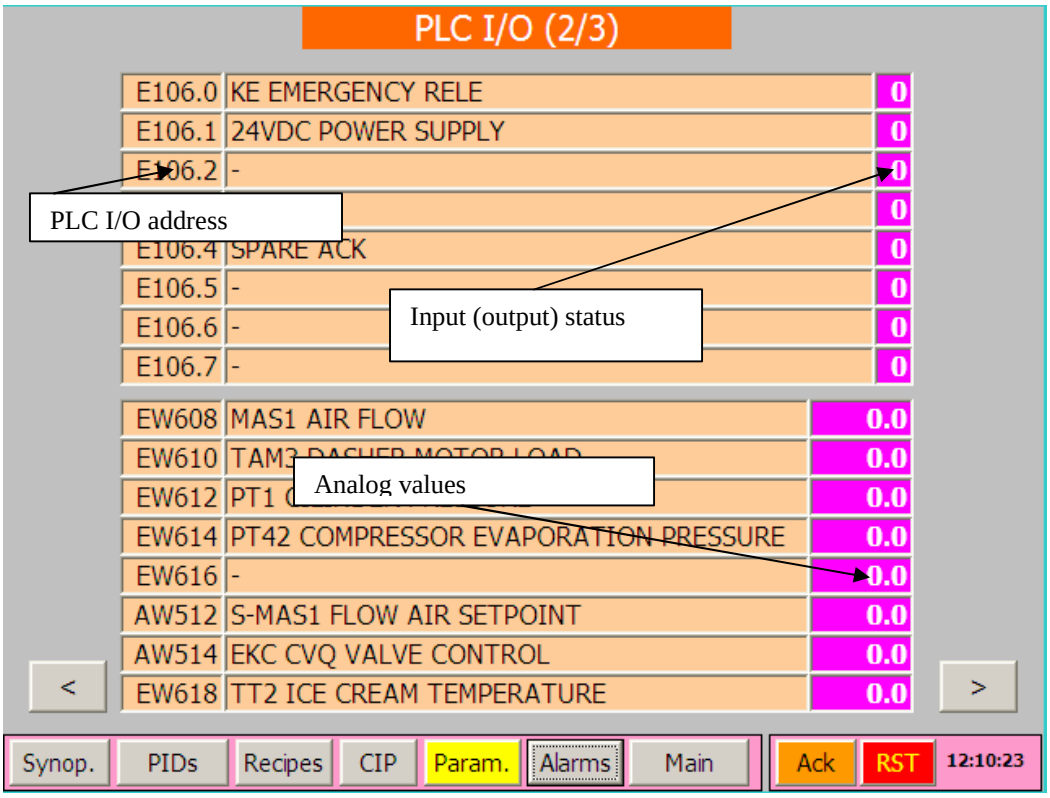
To be performed during normal production:
Measure the effective flow rate of the machine by weighing the ice-cream leaving the machine in 36“ and dividing this weight by the specific weight of the mix. Multiply the result by 100 to obtain the flow rate in l/h.
Enter this value in the “**real mix flow**” field at the bottom.
Note the calibration constant and press the filling ack button at the bottom **just once**.
Check the real flow after a few minutes of production and repeat the operation if necessary.

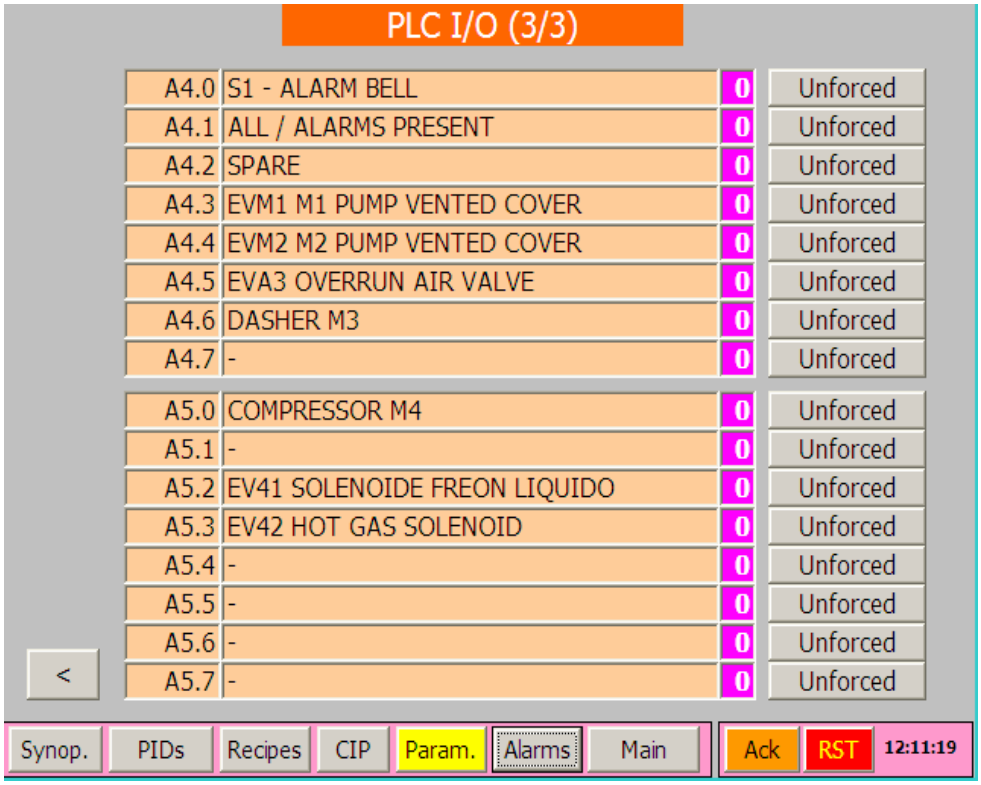


PLC input/output parameters

This page can be accessed at “supervisor” password level
This section comprises three pages: the first two display the status of the digital inputs and the analog values of the PLC, while the third page displays the PLC outputs.
All the outputs can be overridden for test purposes (the **machine must be in the manual mode**)

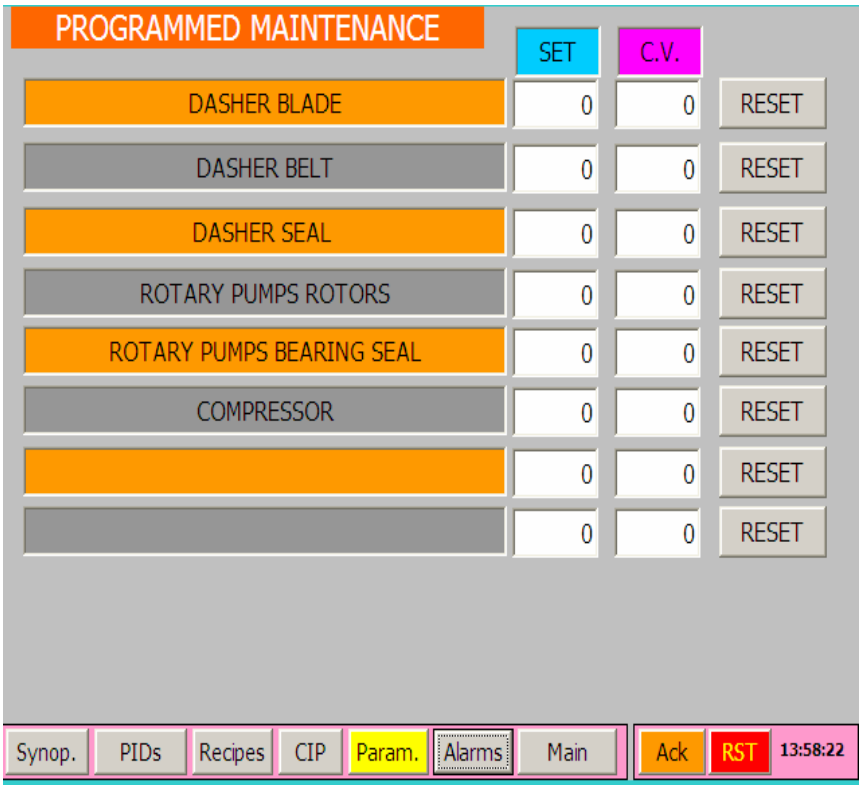

PLC I/O (1/3)
EW614 QFM1 MIX PUMP M1 OVERLOAD PROTECTION 0
E104.1 QFM2 ICE CREAM PUMP OVERLOAD PROTECTOR 0
E104.2 QFM3 M3 DASHER OVERLOAD PROTECTION 0
E104.3 M3 DASHER ON 0
E104.4 QFM4 COMPRESSOR OVERLOAD PROTECTION 0
E104.5 M4 COMPRESSOR ON 0
E104.6 - 0
E104.7 - 0
E105.0 PS41 MIN AND MAX PRESSURE SWITCH 0
E105.1 PS42 OVER TEMPERATURE SWITCH 0
E105.2 PS43 DIFFERENTIAL PRESSURE SWITHC 0
E105.3 LS44 FREON LEVEL SWITCH 0
E105.4 - 0
E105.5 - 0
E105.6 - 0
E105.7 - 0
>
Synop. PIDs Recipes CIP Param. Alarms Main
Ack RST 12:28:03


PLC I/O (2/3)
E106.0 KE EMERGENCY RELE 0
E106.1 24VDC POWER SUPPLY 0
E106.2 - 0
E106.4 SPARE ACK 0
E106.5 - 0
E106.6 - 0
E106.7 - 0
PLC I/O address
Input (output) status
EW608 MAS1 AIR FLOW 0.0
EW610 TAM3 DASHER MOTOR LOAD 0.0
EW612 PT1 0.0
EW614 PT42 COMPRESSOR EVAPORATION PRESSURE 0.0
EW616 - 0.0
AW512 S-MAS1 FLOW AIR SETPOINT 0.0
AW514 EKC CVQ VALVE CONTROL 0.0
EW618 TT2 ICE CREAM TEMPERATURE 0.0
Analog values
<
>
Synop. PIDs Recipes CIP Param. Alarms Main
Ack RST 12:10:23



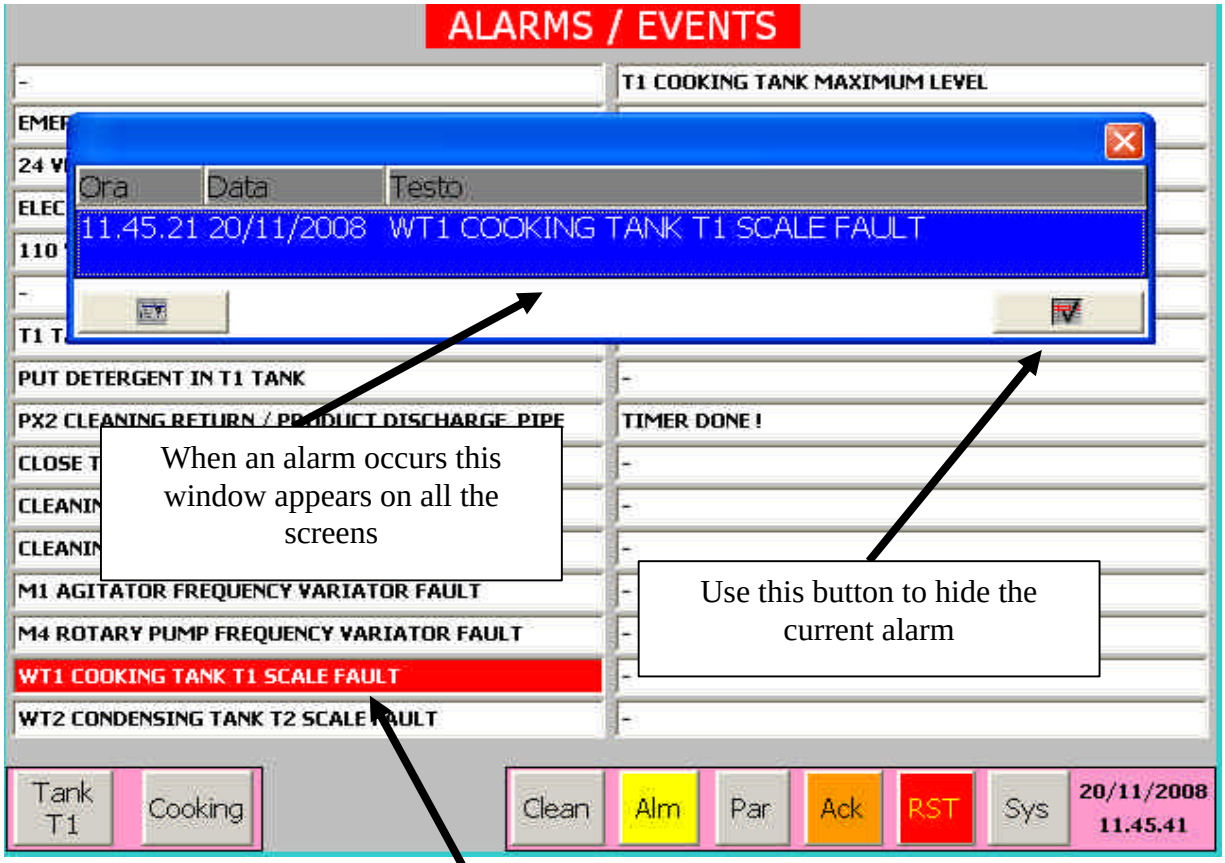
Programmed maintenance page

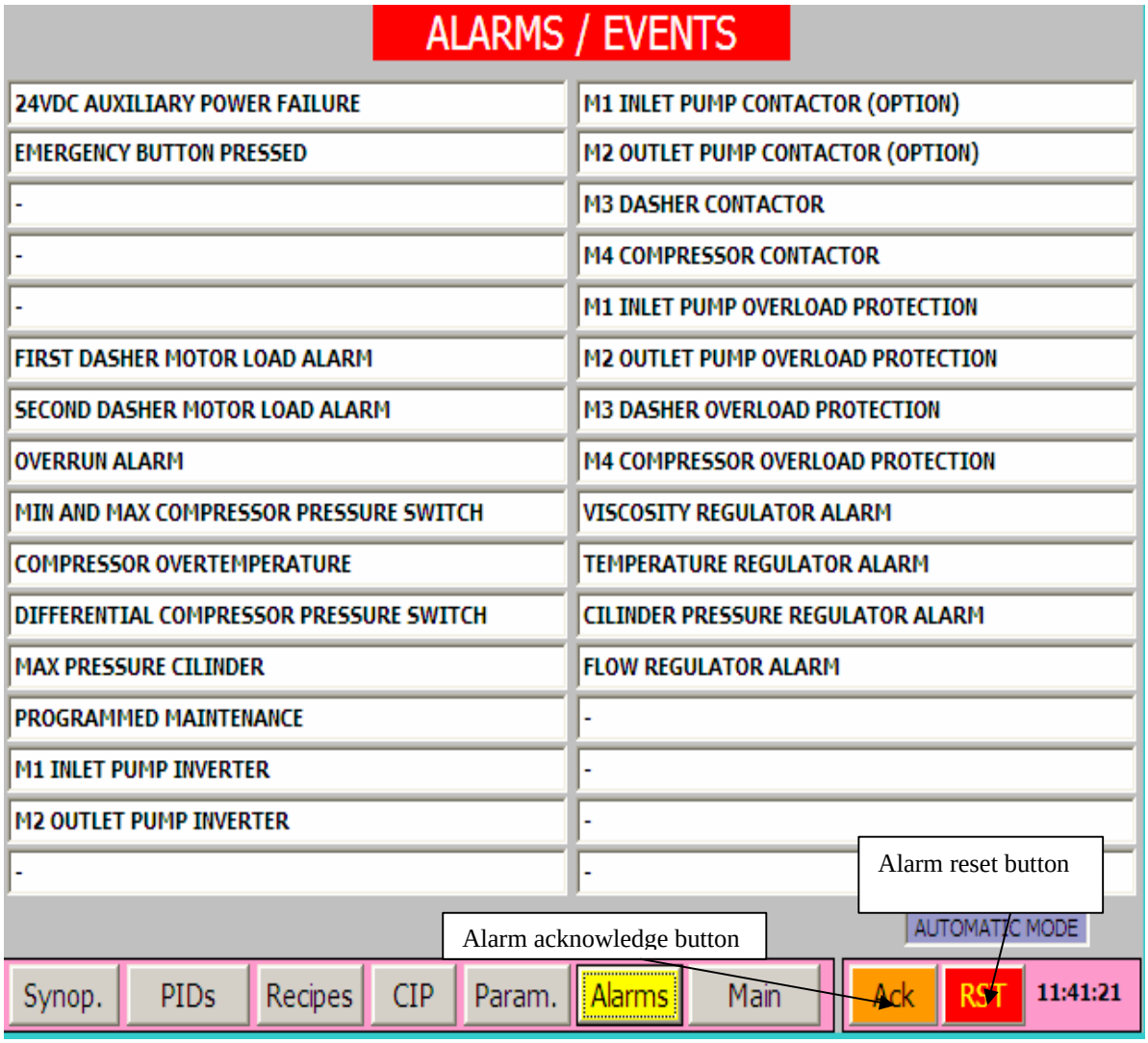
This page can be accessed at “supervisor” password level
This page counts the machine operating hours and displays an alarm when the number of operating hours reaches the set point. Press the reset button to zero-set the counter.



5.3.7 ALARMS

This page shows all the possible alarms on this machine.
When an alarm trips, the siren sounds and a message appears signalling the fault. Tripped alarms are shown in red on this page.





List of alarms :

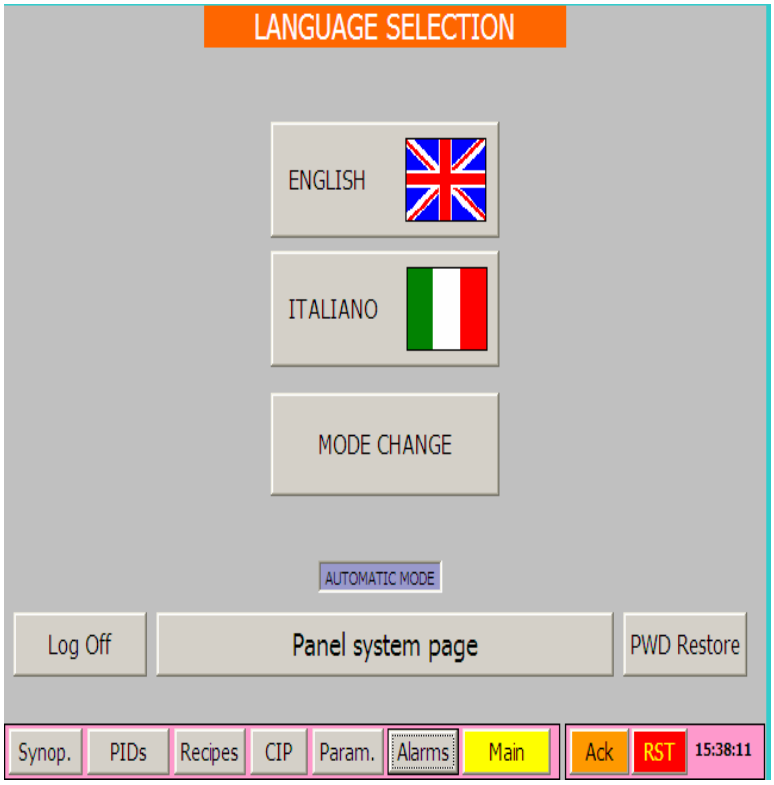
- **24 VDC auxiliary power failure**: no auxiliary 24 voltage, check the electrical panel
- **Emergency button pressed**: the emergency circuit must be reset. Check the mushroom button and press the RESET EMERGENCY button
- **First dasher motor load alarm**: the dasher motor load has reached the first alarm limit (hot gas distribution). Check the flow of the mix
- **Second dasher motor load alarm**: the dasher motor load has reached the second alarm limit (general machine shutdown).
- **Overrun alarm**: the air to inject in the mix is out of tolerance. Check the compressed air circuit and the air inlet pressure
- **MIN & MAX compressor pressure switch**: the minimum and maximum pressure switch has tripped. Check the condenser cooling water and the cooling circuit, and reset the pressure switch using the button mounted on board.

- **Compressor over-temperature**: the compressor motor thermal protection has tripped
- **Differential compressor pressure switch**: the oil differential relay has tripped. Check the cooling system and reset the differential relay by pressing the button on the device.
- **Max cylinder pressure:** machine pressure has reached 10 bar for more than 2 seconds. With this alarm the inlet pump is stopped
- **Programmed maintenance**: signals that a programmed maintenance limit has been exceeded, carry out the relative check and reset the alarm.
- **M1 inlet pump inverter**: a fault has developed in the M1 pump inverter. Check and reset the alarm.
- **M2 inlet pump inverter**: a fault has developed in the M2 pump inverter. Check and reset the alarm.
- **M1 inlet pump contactor**: motor M1 relay alarm
- **M2 outlet pump contactor**: motor M2 relay alarm
- **M3 dasher contactor**: motor M3 relay alarm
- **M4 compressor contactor**: motor M4 relay alarm
- **M1 inlet pump overload protection**: motor M1 thermal protection
- **M2 outlet pump overload protection**: motor M2 thermal protection
- **M3 dasher overload protection**: motor M3 thermal protection
- **M4 compressor overload protection**: motor M4 thermal protection
- **Viscosity regulator alarm**: product viscosity is out of tolerance
- **Temperature regulator alarm**: product temperature is out of tolerance
- **Cylinder pressure regulator alarm**: cylinder pressure is out of tolerance
- **Flow regulator alarm**: product flow is out of tolerance

5.3.8 MAIN

This page is used to select the language used on the panel
Press “change mode” to change the machine operating mode (automatic / manual). This button is enabled at “supervisor” password level.
Buttons at the bottom:

- **Log off**: cancels the password level
- **Panel system page**: loads the panel system page (this button is enabled at “supervisor” password level.
- **PWD restore**: (always enabled) this button is used to restore saved passwords (must be used when the security system has blocked the machine due to three unsuccessful logon attempts

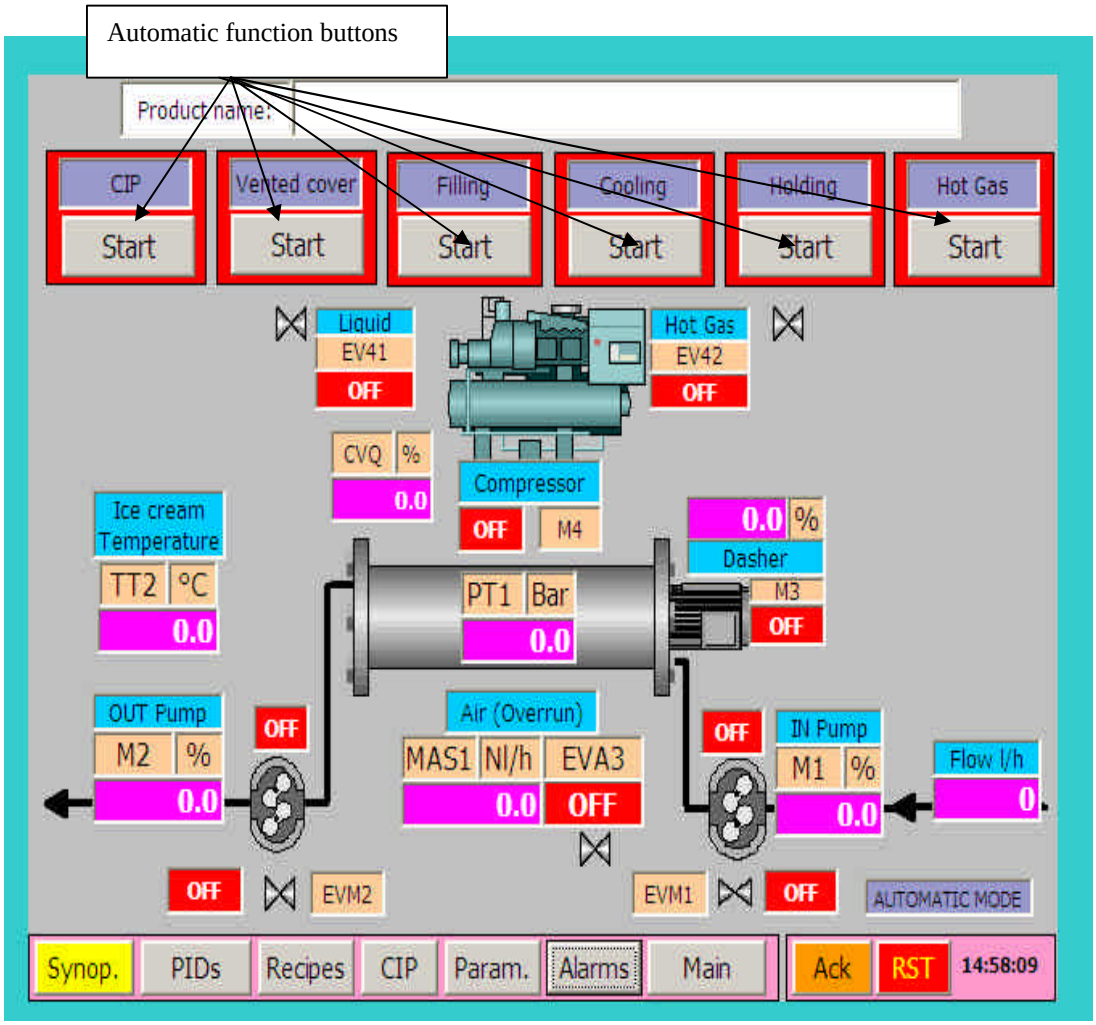


5.3.9 SYSTEM PAGE

The system page can be accessed at “supervisor” password level
This page is used to associate passwords with access levels:
To associate an account to administrator level, assign group 9
To associate an account to supervisor level, assign group 2
To associate an account to operator level, assign group 9

The screen cleaning button disables the touch screen for 20 seconds to allow the screen to be cleaned without activating unwanted commands.
The touch calibration button is used to calibrate the touch screen according to the instructions that are given when the function is activated.
The output button closes the supervision programme.
The TX mode button sets the system to load a new programme
The pwd export button saves the passwords to a backup file. This function should be performed whenever an account is added, edited or deleted

5.3.10 PRODUCTION



Production is performed from the synoptic page:

- Check the loaded recipe
- Make sure the machine is in the automatic mode
- Check the set points in the PID page
- Connect the machine to the mix feeder and the packing machine
- Make sure the compressed air and condensate water supplies are open
- Before commencing production, fill the machine with mix.
- Press the Filling button to begin the filling phase
  While this phase is in progress, “filling in progress” appears together with a filling ack button. A table also appears showing the completed filling time.

There are three ways of finishing filling:

1) The time set in the previous system page has elapsed

2) The pressure in the cylinder has exceeded the limit set in the system page

3) Press the filling ack button for 2 seconds
Press the Filling button again to repeat the filling phase.
When filling has terminated, “filling done” appears on the screen
The machine remains in the “full” condition until production stops or a cleaning cycle is performed.
Press the “vented cover” button to open the vented covers: the air supply is interrupted while this button is pressed down. This operation can be performed to fill the machine again.

- Press the Start production button to start the freezing cycle.
If the machine has not been filled yet, before activating the compressor the system will automatically activate the filling cycle after which freezing will be enabled.
When freezing is enabled, the cycle checks the type of dasher motor present:
Dasher full: the mix pump starts together with the compressor
Dasher empty: the mix pump only starts after the dasher load exceeds the limit set in the recipe.
All the automatic regulations activate the relative actuators.
The PID page can be used to check the performance of the automatic regulations and edit the relative set points.
Edit the various set points gradually in order to reduce regulation leaps.
Press the STOP production button to stop the production cycle. The pumps and the compressor stop while the dasher motor continues to turn for a few minutes to prevent the cylinder from freezing. Filling is zero-set with this type of stopping.
Press the pause button to stop the cycle as above apart from the fact that filling is not zero-set.
The hot gas function can be activated with the dedicated button or automatically by the cycle when the dasher motor load exceeds the 1st alarm limit and when the freezing cycle stops.
This function activates the hot gas electrovalve and keeps it activated for the time set in the system parameters page (normally 30 seconds). The function is then disabled.

5.3.11 DETERMING THE OVERRUN FACTOR

To determine the overrun factor in a product, use the following formula:

$$\frac{\textbf{(wt. starting product) - (wt.same volume finished product)}}{\textbf{(wt.same volume finished product)}} \textbf{ x 100 = \% overrun}$$

For example: weight per liter of starting product is 1.08 Kg and the yield weight in the finished product is 0.6 Kg per liter :

$$\frac{\textbf{(1.08 Kg/l starting product) - (0.6 Kg/l finished product)}}{\textbf{(0.6 Kg/l finished product)}} \textbf{ x 100 = 80\% overrun}$$

OVERRUN TABLE - Metric

Weight in grams of finished product in various sized container			Overrun percent for various densities (grams/litres) of mix (product) input			
1/4 litre	1/2 litre	1 litre	% overrun at 1080 g/l	% overrun at 1092 g/l	% overrun at 1104 g/l	% overrun at 1116g/l
108	216	432	150	153	156	158
110	219	438	147	149	152	155
111	222	444	143	146	149	151
113	225	450	140	143	145	148
114	228	456	137	139	142	145
116	231	462	134	136	139	142
117	234	468	131	133	136	138
119	237	474	128	130	133	135
120	240	480	125	127	130	133
122	243	486	122	125	127	130
123	246	492	120	122	124	127
124	249	498	117	119	121	124
126	252	504	114	117	119	121
128	255	510	112	114	116	119
129	258	516	110	112	114	116
130	261	522	107	109	111	114
132	264	528	105	106	109	111
134	267	534	102	104	106	109
135	270	540	100	102	104	107
136	273	546	97	100	102	104
138	276	552	96	98	100	102
139	279	558	94	96	97	100
141	282	564	91	94	95	98
143	285	570	89	92	93	96
144	288	576	88	90	91	94
146	291	582	86	88	89	92
147	294	588	84	86	87	90
148	297	574	82	84	85	88
150	300	600	80	82	84	86
151	303	606	78	80	82	84
153	306	612	76	78	80	82
154	309	618	75	77	78	80
156	312	624	73	75	76	79
157	315	730	71	73	75	77
159	318	636	70	72	73	75
160	321	642	68	70	71	74
162	324	648	67	68	70	72
164	327	654	65	67	68	70
165	330	660	64	65	67	69
166	333	666	63	64	66	67
168	336	672	61	63	64	66
170	339	678	59	61	63	65
171	342	684	58	60	61	63
173	345	690	57	58	60	62
174	348	696	55	57	59	60
176	351	702	54	56	57	59
177	354	708	53	54	56	58
179	357	714	51	53	55	56
180	360	720	50	52	53	55

5.3.12 REFRIGERATION PLANT OPERATION

CAUTION !
Make sure that at least four hours before starting the refrigeration, the electric board has been energized. *If not there will be oil entrainment at compressor start up, and consequent failure of the machine.*

Evaporating pressure / temperature

The evaporating pressure of refrigerant in the jacket surrounding the freezing cylinder, normally is –32,5°C; the correspondent absolute pressure value is:

R507 1,9 bar

R22 1,47 bar

During operation constantly watch this value, that is shown on the evaporating pressure gauge.
The evaporating pressure control is made by means of the thermostatic valve PM, which is manually or automatically adjusted according to the freezer specifications.

Condensing pressure / temperature

The refrigerating plant has been designed for optimum operation at the condensation temperature of 30±3°C; the correspondent absolute pressure is:

R507 13,2÷ 15,4 bar

R22 11,3÷13,3 bar

During operation constantly watch the condensing pressure gauge in order to keep the condensing pressure within said range. The temperature / pressure control is obtained by varying the flow or the temperature of cooling water. In some units a pressure control valve is fitted on cooling water line : when necessary the valve shall by adjusted in order to keep condensation pressure within the suggested range.

Oil bleeding

The lubrication oil is lighter than liquid freon, it accumulates on the freon surface in the separator and hinders the correct operation of the refrigeration system.
In order to avoid this inconvenient, an oil bleeder has been fitted in the separator, by which the oil, mixed to refrigerant, is directly sucked back in the compressor, leaving the evaporation surface free.
The operators shall check, through the sight glass fitted on the bleeder piping, if bleeding is carried out correctly : a regular flow of an oil / freon mix shall be visible.
The bleeder position is fixed at Soren's premises; if a flow adjustment is necessary, this is normally obtained by means of the throttling valve fitted between the bleeder and the sight glass.
In case this is not enough, the bleeder height can be changed, by loosing the bleeder fixing nut.

5.3.13 OPERATION PROBLEM SOLVING

Product too soft

- Liquid refrigerant filter clogged.
- Liquid refrigerant pressure too low
- No liquid refrigerant available.
- Scraped blades need reconditioning.
- Mix flow rate too high.
- Mix supply too warm
- Mix formulation incorrect

Overrun too low

- Leaking air connections.
- Air supply pressure too low.
- Freezing cylinder pressure too high.
- Mass flow meter or controller not working correctly.
- Mix formulation incorrect.
- Product too soft or too stiff.

Overrun too high

- .Air supply pressure too high.
- Rerun added to mix supply.
- Mix pump worn.
- Air in mix supply.

Air pockets in product

- Rerun added to mix supply.
- Freezing cylinder not full.
- Mix formulation incorrect.
- Product too cold or too warm.

5.4 SANITIZING

After each production cycle, the machine must bee cleaned and sanitized, see the following chapter.

6. CLEANING AND SANITIZING

DANGER !
*The use of water around electric and electronic equipment enclosures creates a hazard of electric shock which could cause **severe injury** or **loss of life**. Turn off the electric power supply and lock out before using any water for cleaning or rinsing around the electrical enclosures. Be certain the doors on all electric enclosures are closed and fasteners tightened. Never spray water directly into any electric controls or enclosures.*

CAUTION !
The presence of any water inside electrical control enclosures, may ruin the controls. Be certain the doors on all electric enclosures are closed and fasteners tightened. Never spray water directly onto any electric controls or enclosures.

DANGER !
Direct contact with cleaning/sanitizing solutions may cause chemical burns. Equip all personnel performing cleaning/sanitizing operation with protective clothing (including eye protection).

CAUTION !
Do not use any acid type cleaner to clean the inner cylinder: acid attacks the chrome inner cylinder lining.

Buyer is liable for the chemical solutions used for cleaning/sanitizing.
In particular these chemical products must be compatible with the inner cylinder lining.
Chemical cleaning supplier should give directions about the right products, their recommended concentrations, temperature and exposure times.

6.1. FIRST CLEANING

Carefully clean all product contact surfaces prior to use, to eliminate all possible foreign material which may have accumulated during manufacture, shipment and installation.
In addition this gives plant personnel an opportunity to become familiar with the freezer.

- Use a detergent solution.
- Disassemble all of the product contact areas of the freezer, including:
  - freezer cylinder front door;

- dasher assembly;
- freezing cylinder rear door;
- rotary pumps, covers, rotors, bodies.

- Scrub the interior surfaces of the cylinder and all the removed product contact parts, using a brush and detergent until completely clean.
- Thoroughly rinse away all traces of detergent solution with clean water and allow cylinder to drain.
- Reassemble all of the product contact parts.
- Clean the exterior surfaces of the freezer by wiping methods only.

6.2. RECOMMANDATIONS ABOUT CLEANING

The freezer is designed to be cleaned using C.I.P. method and circulation cleaning methods may be used for daily cleaning. See specific recommendations following:

- Periodically the unit should be disassembled. All product contact surfaces, except the cylinder, should be hand washed to remove product deposits. Check for any worn or deteriorating parts at this time.
- Once a week inspection is recommended
- If the machine will not be used for a month or more, the following procedure is recommended:
  - Remove all blades and seals from dasher and store
  - The freezer cylinder is chrome plated nickel: coat the surface with vegetable or other food grade oil

6.3. CIRCULATION CLEANING - C.I.P.

Circulation cleaning methods provide a convenient way to clean the product contact area of the equipment without disassembly. These methods require a separate system of tanks, pump. valves, and controls specifically designed for that purpose. A sequence of cleaning steps including rinses, chemical cleaning, and chemical sanitizing, known as a CIP program, may be used to effectively clean and sanitize the equipment. Raccomended flow rate for effective C.I.P. cleaning is 5.000 l/h per cylinder.

6.3.1. SEQUENCE OF CLEANING STEPS – C.I.P

C.I.P is a combination of following steps:

- **Pre-rinse**: Preliminary remove of excess residual product
- **Wash**: Use of detergent solution to remove residual product
- **Rinse**: Removal of residual detergent solution

WARNING !
In case the machine or part of product circuit, have been disassembled, before starting CIP operations, make sure that all parts have been correctly tightened.

DANGER !
During cleaning and sanitizing front door and pumps surfaces can reach high temperatures (over 65°C) and cause severe burns if contacted. *To avoid the risk, during these operations, personnel must keep away from these parts of the machine (no manual intervention is necessary during cleaning and sanitizing).*

WARNING !
The cleaning and sanitizing solution must never exceed 82°C to prevent serious damage to freezer pumps.

6.3.2. PRE-RINSE

The purpose of this step is to flush out as much of the soil (residual product) as possible and minimize the soil which must be chemically removed in the following steps.
If the product contains fats, the temperature should be above the fat melting point. If the product contains protein, too high temperature can "set" the proteins making them more difficult to remove.
Generally, temperatures between 50-60°C are best.
Continue to rinse, discharging to drain, until the rinse water becomes clear.

6.3.3. SOLUTION WASH

The purpose of this step is to chemically and mechanically remove the soil in the system. Caustic cleaning chemicals are best for most types of soil (residual product) .
Concentration of caustic cleaning solutions is typically 2% causticity.
Circulate the cleaning chemical solution for 30 minutes maximum at the temperature of ~ 75°C.

6.3.4. RINSE

The purpose of this step is to rinse the system clear of the chemical solution and removed soil.
Use water at 50 -60°C:
At the start of this step, route the return into the cleaning solution tank to recover the solution remaining in the system. After an appropriate time, divert to drain.
Continue to rinse until returning water is clear of chemical and removed soil.

6.3.5. ACID WASH

WARNING !
The inner cylinder of freezer is chrome plated: do not use acid wash step as chrome has no resistance to acid attack!

6.4 SANITIZING

Sanitizing is used to kill bacteria on product contact surfaces of the unit. When using chemical solutions, sanitizing should be performed no earlier than 15 minutes prior to processing product. The chemicals commonly used for sanitizing are corrosive.

Solution strength and exposure time must be closely regulated.

Do not use any type of sanitizer containing halogen compounds

Solutions of these chemicals will attack the surface of the cylinder and the special hard alloy stainless steel scraper blades.

Hot water may be used for sanitizing to avoid the corrosive effect of chemical solutions.

7. MAINTENANCE AND RECOMMENDED SPARE PARTS LIST

7.1. MAINTENANCE

7.1.1. SCRAPER BLADE MAINTENANCE

DASHER DISASSEMBLY

DANGER !
All dashers have removable scraper blades. These blades can be very sharp and cause severe injury if not properly handled. *When installing or removing dasher ALWAYS USE HEAVY PROTECTIVE GLOVES that reach to the elbows.*

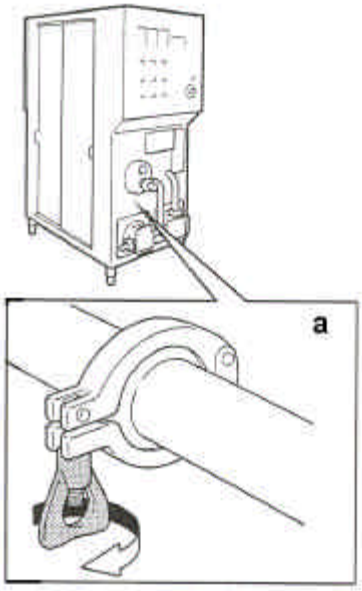
DANGER !
Should the dasher start rotating unexpectedly during servicing and maintenance procedures severe injury or loss of life could result. ALWAYS turn off the electrical power supply and LOCK OUT using a locking device for which only the person doing the work has the key before performing service or maintenance.

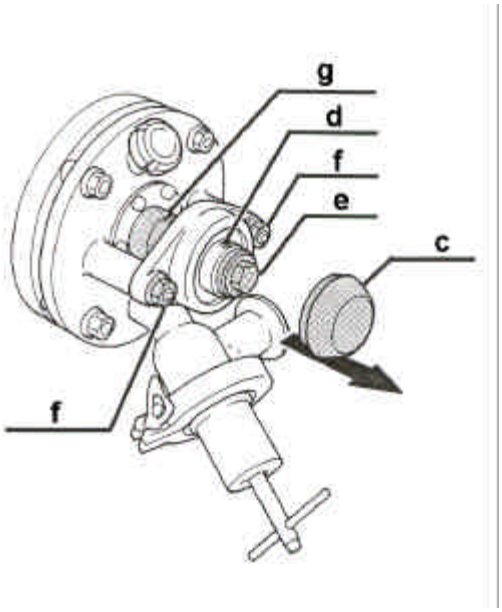
DANGER !
Rotating coupling: *NEVER remove the coupling guard(s) or service the coupling assembly without locking out the drive power source such that only the person involved has the key.* *Reaching in or around the coupling while the freezer is running could cause severe injury or loss of life.* **Dasher:** *The dasher assembly is heavy. This creates a hazard of severe injury for anyone handling it incorrectly. Provide enough workers or mechanical lifting assistance to enable removing, installing and servicing the dasher safely.*

Dasher must be removed from freezer to assemble or disassemble scraper blades.

For dasher disassembly proceed as follows:

- **Lock out power supply.**





a Remove the product pipe connected with the front door.

b In case the machine is equipped with solid dasher (type 80 dasher) proceed as described in **c** and following paragraphs, otherwise go to paragraph **h**.

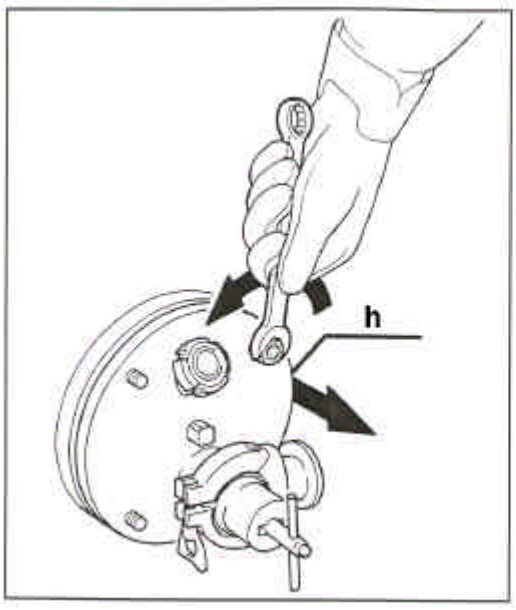
c Remove the front door bearing guard.

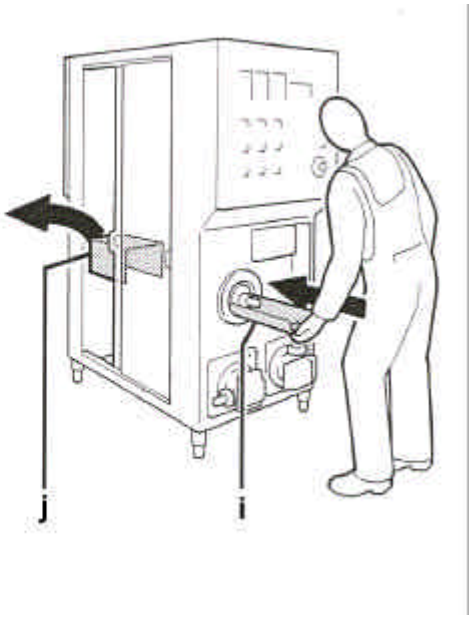
d Loose the security dowels of oscillating bearing.

e Remove the front door bearing stud.

f Remove the bearing nuts.

g Remove the rotating seal.

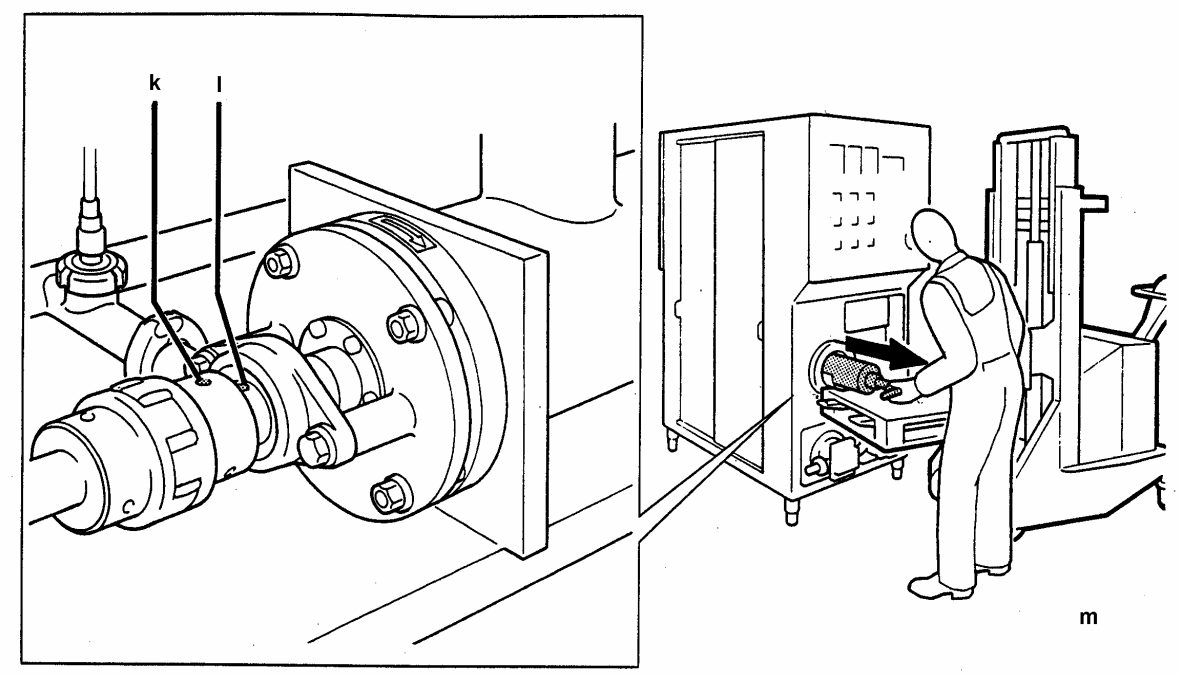




h Remove the front door stud nuts and pull the door out.

i Insert the cylinder protector in the upper side of the cylinder and then turn 180° the dasher with the cylinder protector in order to have the cylinder protector on the bottom under the dasher.

j Open the sliding door and remove the rotating coupling protection.



k Loose the security dowels of coupling.

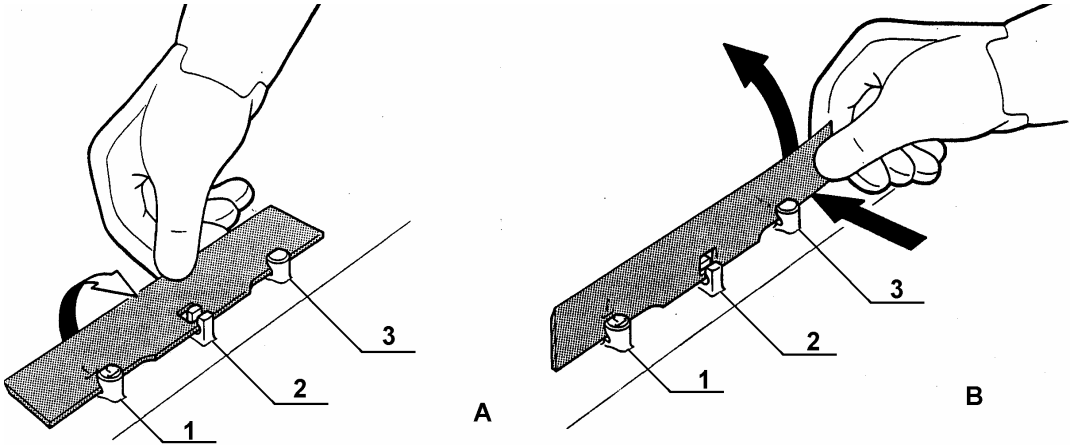
l Loose the security dowels of rear bearing.

m Using the cylinder protector straight out the cylinder protector and the dasher.

The dasher removal is now completed; for dasher mounting follow the opposit procedure.

REMOVAL OF SCRAPER BLADES

DANGER !
Scraper blades can be very sharp and cause severe injury if not properly handled: when removing scraper blades, use protective gloves.

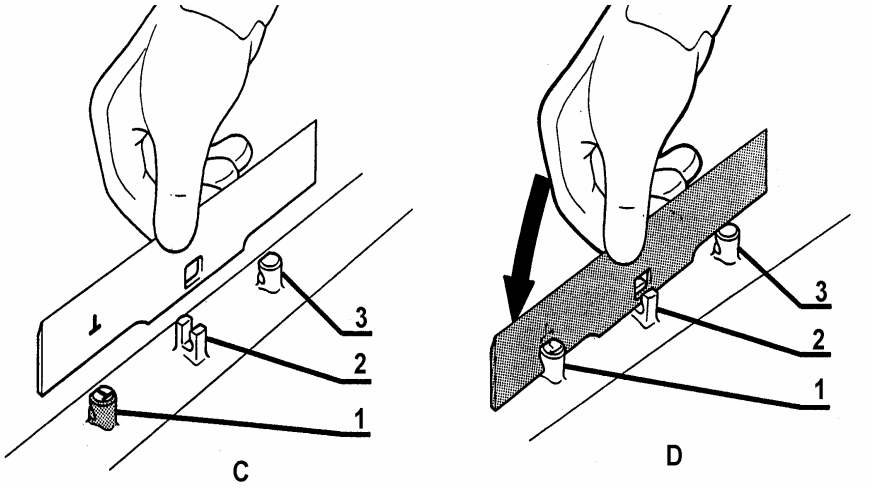


A Tip the blade up so that it is positioned as illustrated in step **B**.

B Press forward with the right thumb while lifting the right end of the blade up and away from the dasher.

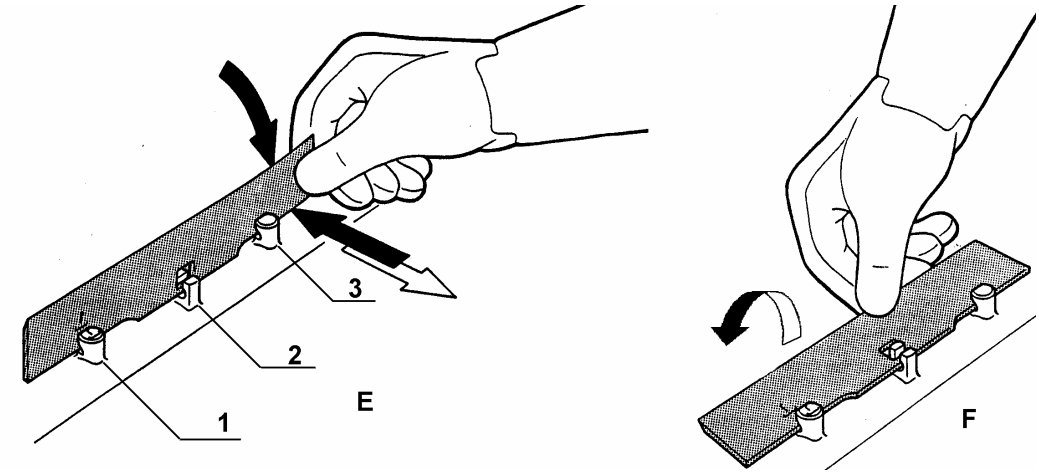
ASSEMBLY OF SCRAPER BLADES ONTO DASHER

DASHER !
Scraper blades can be very sharp and cause severe injury if not properly handled: when installing scraper blades use protective gloves.



C Position the blade so that the beveled edge is facing away from you, and the letter **T** on both the blades and dasher coincide.

D Vertically position the blade between pins **1** and **3**, making sure that the square hole in the blade is directly in the center of pin **2**.



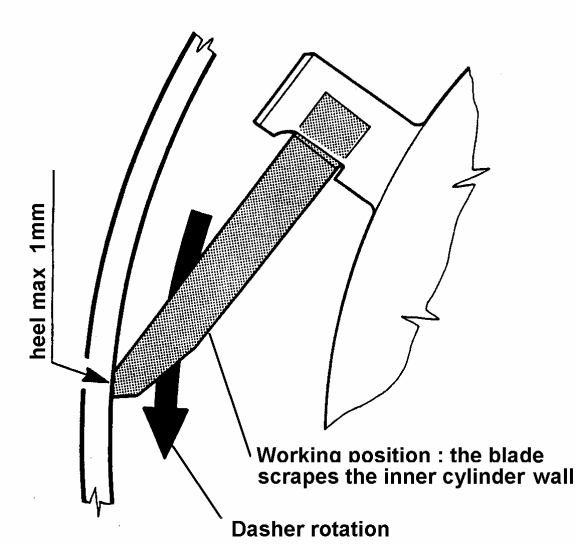
E Push the right side of the blade forward with the thumb of your right hand, bending the blade enough so that you are able to push the blade down behind pin **3**.

F Push the blade forward again and, if it has been correctly positioned in pin **2**, it will snap into the correct articulate position.

GENERAL INFORMATION ABOUT BLADES

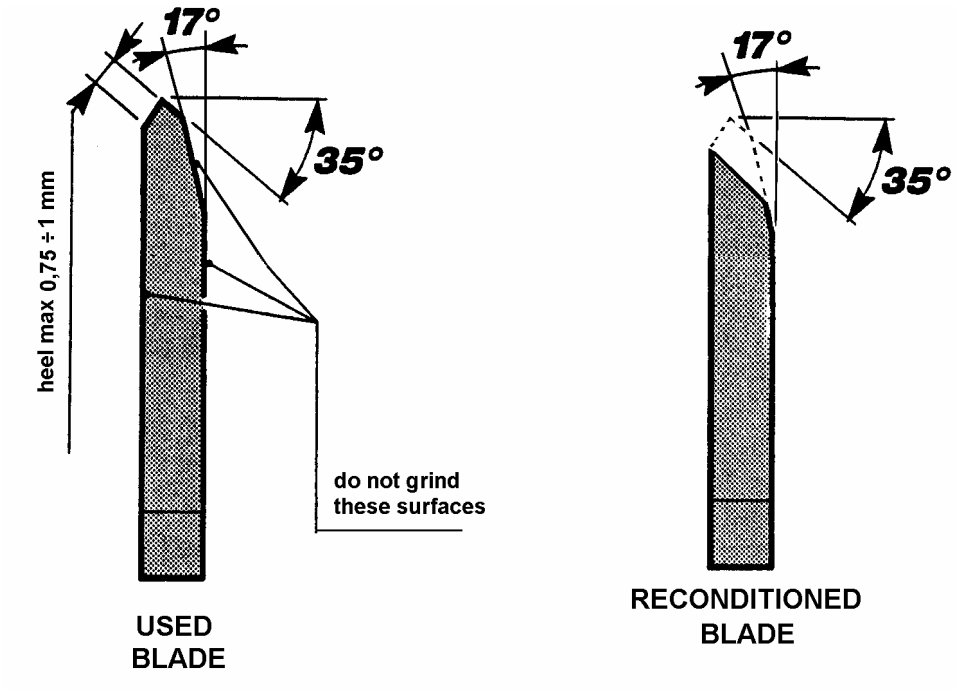
- Scraper blade are extremely hard and therefore subject to nicks when mishandled.
- Blades are designed to give maximum service. Wear depends on operating conditions.
- Products with a high percentage of water and products that contain certain fruits or grit accelerate wear.
- Running dasher too long during the cleaning operation or running dasher dry is not recommended..
- Avoid bending blades when removing the dasher from the inner cylinder. Follow the instruction for dasher removal. Bent blades should not be used. The will not scrape the cylinder wall properly, greatly lowering the efficiency of heat exchange.
- Scraper blades need reconditioning when the scraping edge becomes “knife-sharp”, rounded, or nicked. Remove the blades for reconditioning monthly, and replace with a reconditioned set of blades.
- The lenght of time which blades remain in good condition will depend largely on the type of product being processed. Experience will determine frequency of reconditioning.

SCRAPER BLADE OPERATION



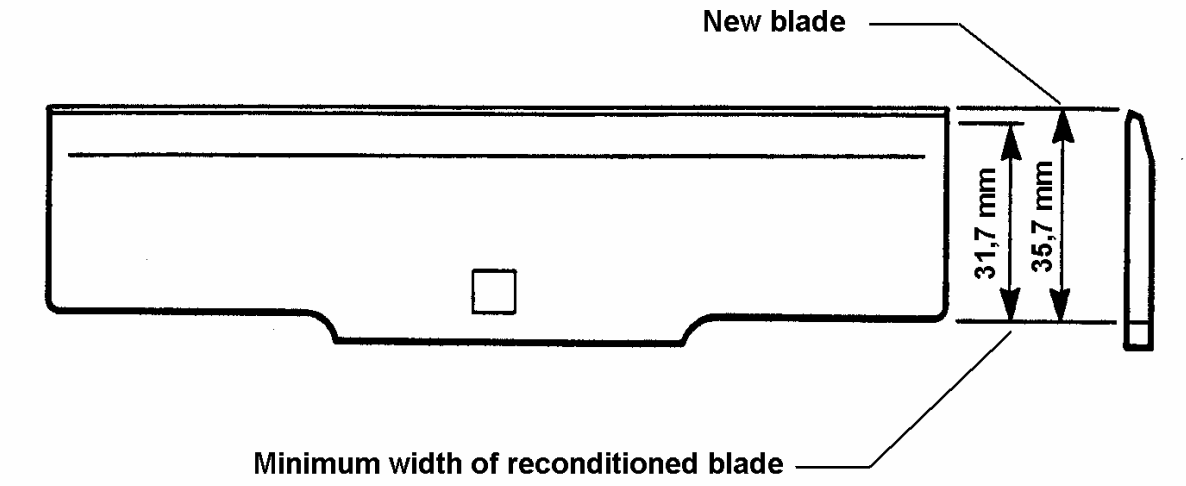
BLADES RECONDITIONING

Blades that have a heel over 0.75 mm (1/32 inch) should be reconditioned. To permit sufficient time for good reconditioning, a spare set of blades should always be kept available.



SCRAPER BLADE WIDTH

After the blade has been repeatedly filed or reconditioned down to 31,7 mm width, it must be replaced with a new blade.



SPECIAL CLEANING INSTRUCTIONS

DANGER !
Scraper blades can be very sharp and cause severe injury if not handled properly: use protective gloves.

- The scraper blades are made from high quality hardened stainless steel Certain condition may cause small spots to develop. If unchecked, these spots enlarge, resulting in serious corrosion and pitting.
- At the first indication of these spots, treat the blades as follows: remove blades from the dasher and immerse them in a solution of 20% nitric acid, 2% potassium or sodium dichromate and 78% water.

DANGER !
The special cleaning solution could cause severe injury to personnel if contacted. The hazard is especially severe for eyes and skin: use protective clothing including eye protection.

- An immersion time of 30 minutes at 43°C is recommended
- Rinse blades thoroughly in clear water and dry
- .If necessary, clean daily after a day's run until all colored spots have disappeared (it is important to remove all colored spots).

CAUTION !
Never allow the cleaning solution to come in contact with the nickel inner cylinder.

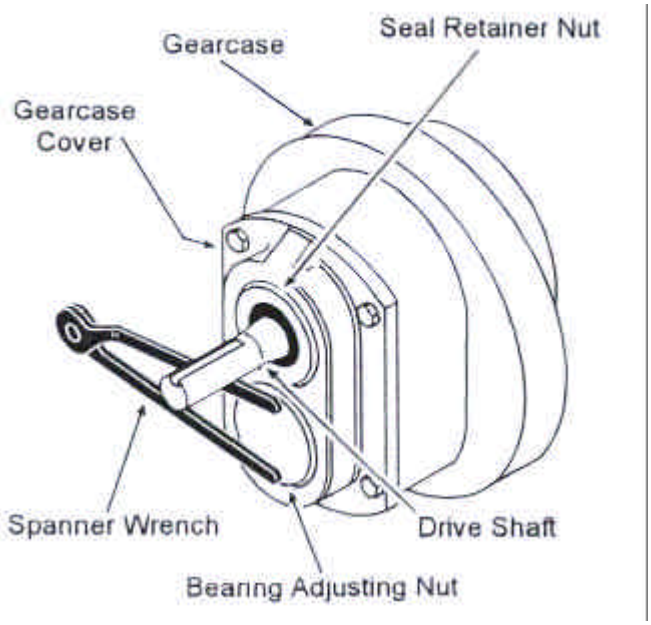
7.1.2. ROTARY PUMPS MAINTENANCE

ROLLER BEARING ADJUSTMENT

Test for loose shaft roller bearings by gripping the rotor shafts firmly and attempting to move in various directions while the pump is disassembled. If the bearing show looseness by a "chucking" sound or there is a feel of movement, tighten by the following procedure:

- Remove the lock screw in each of the bearing adjustment nuts.
- Using a spanner wrench, tighten one bearing adjustment nut at a time.
- Rotate the rotor shafts back and forth 180° during adjustment.
- Tighten one adjustment nut until a slight resistance to shaft rotation is felt. Mark its position and back the adjustment nut off one-half turn.
- Tighten the other adjustment nut the same way, but leave it in its tightened position (do not back off).
- Replace lock screw and secure.
- Move the first adjustment nut back to its mark. Replace lock screw and secure

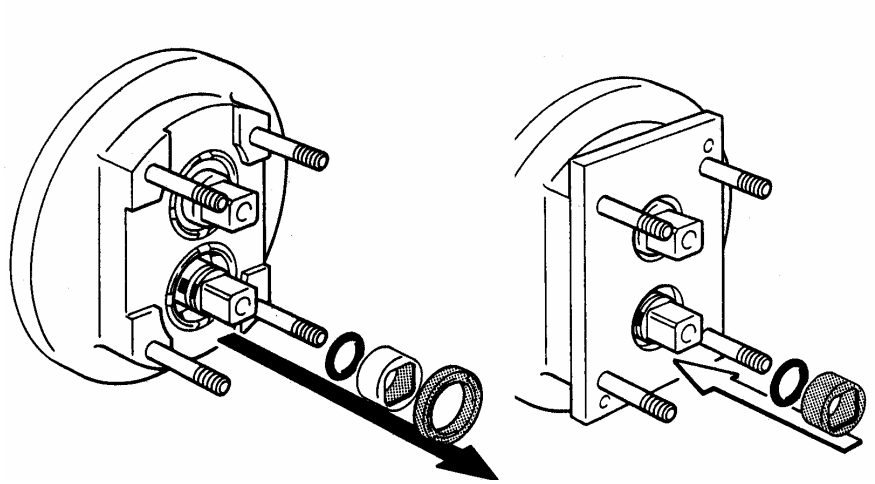
Excessive shaft looseness requires bearing replacement.



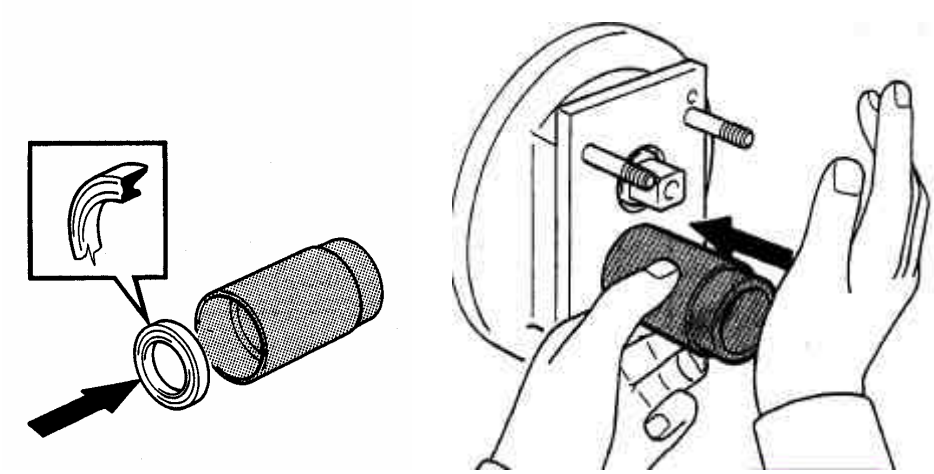
SHAFT SEALS REPLACEMENT

Shaft seals should be replaced monthly or when leaking occurs.

- Remove worn shaft seal.
- Check seal bearing and "O" rings for wear; replace if necessary.



- Use seal inserter to replace shaft seals.
- Lubricate new shaft seal with sanitary lubricant.
- Slide back inside cylinder of seal inserter until recessed 12 mm.

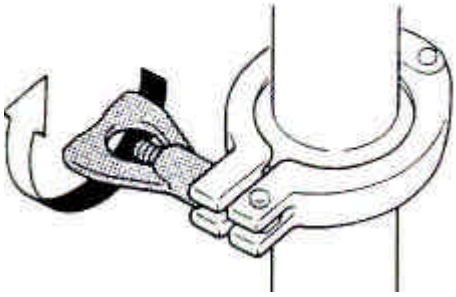


- Insert new shaft seal into recessed area of inserter with the color coded dot facing outwards.
- Slide forward the inner cylinder, bringing seal even with the front rim of the inserter
- Slide inserter over pump rotor shaft and pump body.
- Push inside cylinder slowly forward against pump body, inserting seal into its cavity. Remove seal inserter.
- Check the newly assembled seal making sure the lips of seal are not twisted and the lip of seal is even with periphery of the cavity.

ROTORS

Removal

- Remove all product and mix piping from the rotary pump (1).
- Remove the front cover from the pump chamber.
- Remove the pump chamber (2) and the rotor (3).
- Remove the pump back plate (4).



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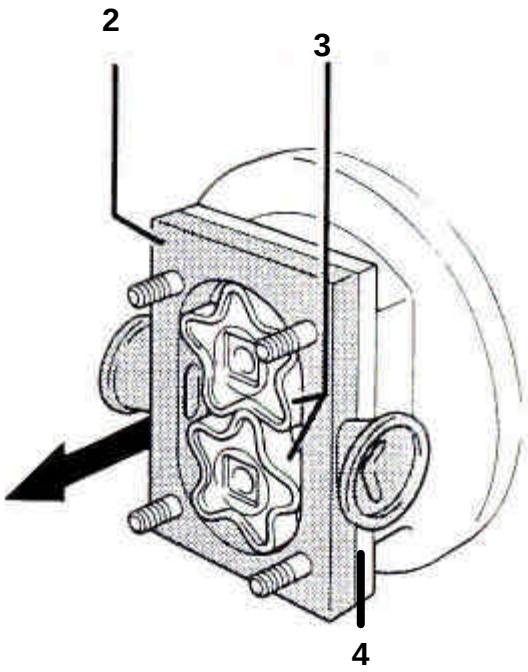
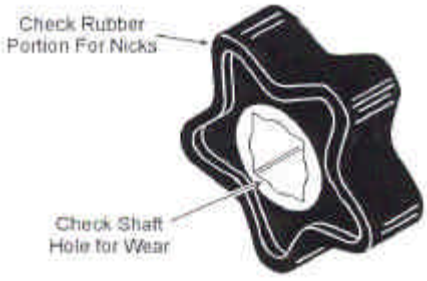


Inspection

Inspect the rotors for the following:

- Nicks in the rubber.
- Worn shaft hole.
- Worn rotor faces.
- Rubber deterioration.

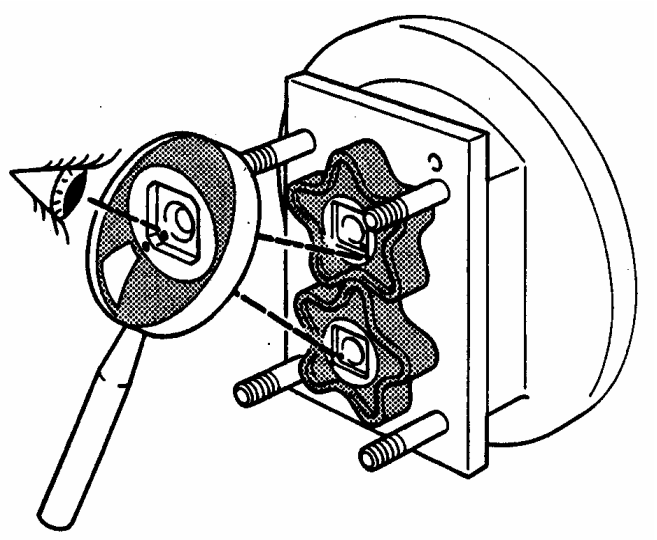
If the rotors are worn, replace them with new ones. Always replace the rotors in pairs.



With the rotors removed, inspect the shafts for visible signs of wear.

Installation

CAUTION !
Install or assemble rotor onto shaft by hand, using caution to assemble so that dimple (match mark) on rotor corresponds with dimple (match mark) on shaft. See illustration.



- Install back plate and pump chamber.
- Install shafts seals using the seal inserter.
- Apply sanitary lubricant to rotors and shafts.

WARNING !
If these instructions are not strictly followed, severe or complete damage to the pumps could result.

ROTOR CARE

- Before starting the freezer, and after cleaning, lubricate pump body Interior with sanitary, food grade lubricant. **Do not use silicon compounds.**
- Since the amount and location of wear will differ with each pump, do not interchange rotors and other pump parts (interchanging parts may result in erratic operations).
- **Never permit pumps to run dry.** The most common cause of rotor damage and wear is lack of lubrication or lack of fluids being pumped. Running pumps dry or without lubrication may cause rotor surface temperatures to rise to a damaging point within a few minutes after starting.

LUBRICATION

PUMP GEAR CASE

Lubricant to be used:

- Oil NUTO 100 – ESSO or equivalent

Gear case capacity

Pump model	Mounting : vertical in-out Cap.ty liters	Mounting : horizontal in-out Cap.ty liters
N. 0	0,18	0,22
N. 0,5	0,33	0,50
N. 1	0,33	0,50
N. 2	0,33	0,50
N. 2,5	0,75	1,20

Lubrication schedule

Component	Lubricant	Interval
Gear case	Oil	Check weekly and drain every 500 hours
Rotors and inner sanitary body	Food grade lubricant	At assembly

ROTARY PUMP PROBLEMS

Product leak

- Shaft seal excessively worn.
- Seal bearing excessively worn.
- Seal parts improperly cleaned and lubricated.
- Nicks and burrs in seal cavity and/or seal bearing.
- Loose bearings.
- Abrasive product.
- Seals improperly installed.

Excessive bearing wear

- Oil contamination.
- Operating at excessive pressure and at excessive speeds.
- Improper bearing adjustment

Oil contamination

- Prolonged product leakage.
- Failure to change oil.
- Breather positioned wrong.
- Oil seals improperly installed.
- Failure to clean gear case front regularly.

Short life for shaft seal

- Running pump dry.
- Nicks or burrs in seal bearings or in seal cavity.
- Improper seal installation.
- Loose bearings.

Excessive rotor wear

- Running pump dry.
- Pumping abrasive product.
- Circulating cleaning solution with rotors in.
- Nicks in body and cover.
- Excessive speeds and pressures.
- Extreme and sudden product temperature changes.

Rotor damage

- Running pump dry.
- Hard substances passing through pump.
- Loose bearings.
- Nicks and burrs in cover and body.

Oil leak

- Breather plugged.
- Oil seal excessively worn.
- Loose bearings.
- Excessive wear on shaft at contact with oil seal.
- Improper oil seal installation.

Excessive shaft wear at contact with oil seal

- Excessive exposure of oil seal to external abrasive.
- Oil contamination.
- Failure to clean gear case front regularly.

Excessive Cover Wear

- Running pump dry.
- Excessive pressure and speed.
- Abrasive product run through the pump.

7.1.3. CYLINDER SERVICING

WARNING !
The cylinder is part of the refrigeration unit, which is subject to the 97/23/EEC Directive regarding equipment under pressure. *Please contact Soren for eventual repairs or replacements.* *Eventual repairs must anyhow be reported to the competent health care service.*

7.2. RECOMMENDED SPARE PARTS LIST

SPARE PARTS RECOMMENDED FOR 1 YEAR OR 2000 HOURS OF OPERATION

Adjustable take off oil bleed

Q.ty	P/N	Description
10	A4335-10	O RING
10	A4335-07	O RING

Air sanitary check valve

Q.ty	P/N	Description
2	A149122	RUBBER VALVE
2	B52892	SPRING
10	A131311	O RING
2	01R0032	GASKET

Dasher

Q.ty	P/N	Description
10	01Z0046	O RING
1	01M0470	BUSH
1	01M0469	BUSH

Doors

Q.ty	P/N	Description
10	AG150-66	O RING
10	AG150-69	O RING
10	01Z0017	O RING
4	01R0031	GASKET
10	01Z0041	O RING
15	A470028	BLADE INOX
10	A001505	GASKET
5	A250800	SEAL U
10	01Z0172	O RING
1	01M3006	SLEEVE

 # 1 FAR ROTARY PUMP (quantities listed are per pump)

Q.ty	P/N	Description
5	AP189	SEAL REAR OIL
10	AP190	SEAL FRONT OIL
10	A1314-03	O RING
2	A133525	GASKET
10	A137708	RING SEAL
10	A137709	BEARING SEAL
10	A203252	GASKET
10	A1313-16	O RING
4	A151267	ROTOR N 2 SS TO 57°C
10	A133526	GASKET

Vented cover (quantities listed are per vented cover)

Q.ty	P/N	Description
10	A1313-07	O RING
10	A325721	GASKET
10	A1314-18	O RING
10	AK361-AP	SEAL U x 86,7