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Manual for installation / operation / maintenance

Packo Ice Builder (PIB)

Ref. 168011 V 2.00

Eco Cool

Table of contents

About this manual

Introduction

We, at PACKO INOX N.V., thank you for choosing one of our products and hope we may also count you as one of our satisfied customers.

Therefore we strive to do everything possible to inform you and be of service as well as possible.

In this manual you will find …

This manual was drawn up to make you familiar with your Packo Ice Builder e.g. description of the equipment and instructions for the installation, operation and maintenance including a troubleshooting guide.

Please read everything carefully before you start to use the appliance. A minimum of effort beforehand by reading these instructions guarantees you a maximum return and a long life of your investment.

Use of the icons

A number of icons are used in this manual, to draw your attention to, for example, safety information. The table below provides an overview of the icons used and what they mean:

Icon	Meaning	Description
	Remark	A remark provides additional information about a certain topic. The information in a remark is not invaluable, but can be useful.
	Attention!	If you do not follow the directions precisely, then: • The system can be damaged (in this case, damage is not covered by the warranty) • The operation can be disturbed.
	Warning!	A warning draws your attention to a possible danger or risk of personal injury.

Procedures

The procedures in this manual are broken down into numbered actions . These actions have to be carried out in the described sequential order.

Changes

The company PACKO INOX N.V. reserves the right to make changes to the manual at any time and without prior notice.

Safety instructions

Introduction

Next to the safety instructions here below, always observe local regulations and prescriptions.

Stickers

The stickers below can be fixed on to your PIB to assure the safety of the use of the tank. They cannot be removed according to the CE regulations:

Sticker	Instructions
CE	The machine or part of it is built according to the CE regulations.
• Read instructions • Voir mode d'emploi • Siehe Gebrauchsanleitung • Véase instrucciones de empleo • Vedere istruzioni d'uso • Se brugsanvisning • Lees gebruiksaanwijzing	You are invited to read the instructions.
	Danger : Machinery / equipment connected to electrical network.
	Do not spray water on the motor.
	Do not spray water on the pump.

Training of operators

The operator need read this manual carefully before using the PIB.

Maintenance & fault finding

Service or maintenance works should **only** be carried out by **trained personnel**.

Electricity

Before doing the following, turn the main switch (located on the side of the electrical control cabinet) to 0 or OFF and lock it:

- Prior the opening the electrical cabinet of the PIB.
- Prior to any service work to the PIB or any of its components.
- In case of electrical or mechanical faults, inform the installer immediately.
- Prior to any work on the cooling system.

 Make sure that your hands are dry when you use the buttons.

 When you touch electronic equipment make sure you unload yourself of static electricity.

Cleaning

Never spray water under high pressure at the PIB.

 Wear protective gloves and safety goggles whilst cleaning the equipment.

General

- Only use the PIB for its intended use which means the creation of ice water.
- The PIB is not suitable to cool liquids other than ice water.
- Do not put anything on the PIB.

Area conditions

It is not recommended to install the cooling tank in a salty environment e.g. sea environment or salt flats.

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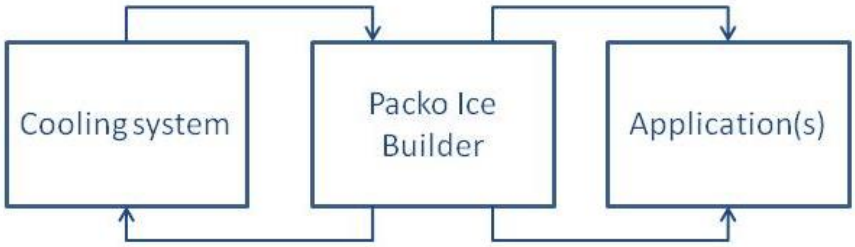
1. Introduction

1.1. Ice water systems

In various food and industrial processes, there is a demand to rapidly cool large amounts of product in a very short time.

Ice water systems are frequently used in those applications since they can provide this peak cooling capacity in an efficient and economical manner.

These systems act as a buffer which will build up the required cooling capacity in ice and ice water when its most economical and release this cooling rapidly to the application when needed.



Due to the large heat retention capacity of ice, this technology allows the construction of compact yet powerful units capable of producing large volumes of ice water at nearly zero degrees for a wide variety of cooling applications without any risk of freezing.

1.2. Ice water applications

The Packo Ice Builder can be used for a wide range of cooling applications. The following list will give a short overview of 3 of these application principles:

- *Closed loop cooling:*

  The PIB is connected to a heat exchanger in the application (for instance: double wall) and the ice water is circulated through this closed circuit.

- *Open loop cooling:*

  The PIB is connected to a heat exchanger in the application (for instance: double wall) and the ice water is fed to the heat exchanger, but afterwards not recuperated by the PIB (water level kept constant by new fresh water)

- *Plate heat exchanger:*

The PIB with integrated plate heat exchanger is used to cool a secondary (water) system which can be used in the food contact processes.

1.3. Product range

The "PIB-series" enable you to flexibly control your cooling requirements and comprises a comprehensive range of units and configurations.

1.3.1. Units

			PIB model									
			8	**13**	**25**	**40**	**60**	**80**	**120**	**160**	**230**	**370**
Capacity												
	Ice storage capacity	kcal	7600	11500	22200	35500	53200	70900	10600	142000	205000	322000
	Ice storage capacity	kWh	8	13	26	41	62	83	124	165	240	375

The ice builder type can be found on the identification plate, where you will also find the S/N.
This S/N should be mentioned in every communication towards your dealer of Packo Inox NV for services, spare-parts, ...

More detailed technical information and dimensions on the different models can be found in "annex A1 Technical data sheet".

1.3.2. Configurations

- *ICU (integrated cooling unit):*

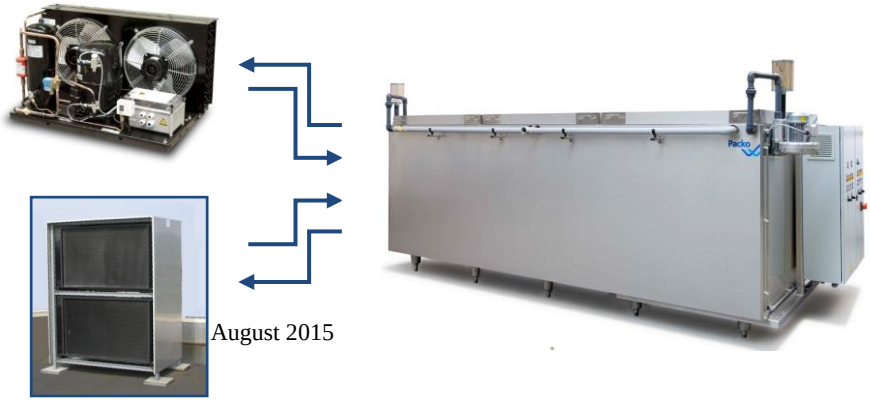
Cooling unit on top

PIB8 – PIB13

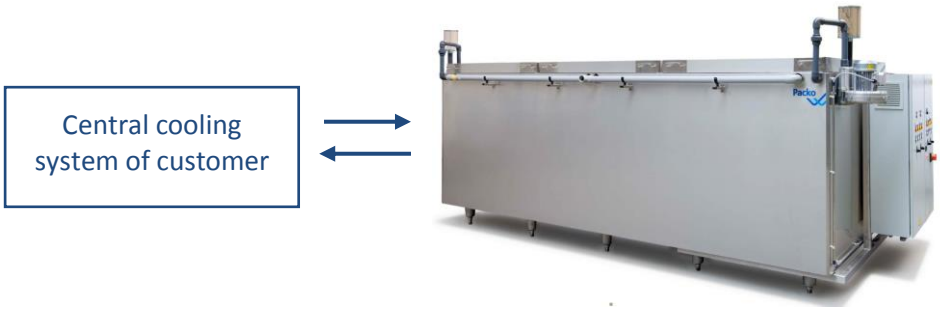
Cooling unit on side

PIB25 – PIB370

- *RCU (remote cooling unit):*



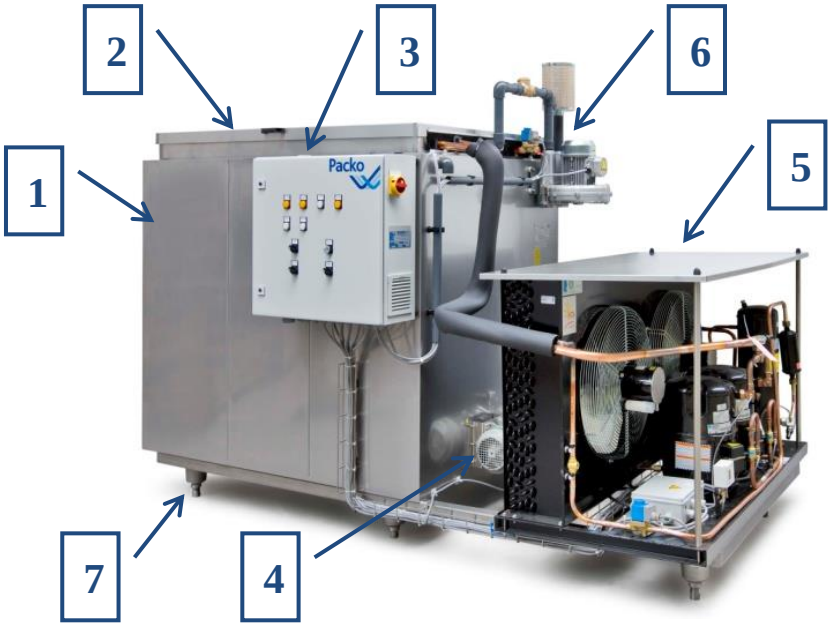
- *WCU (without cooling unit):*

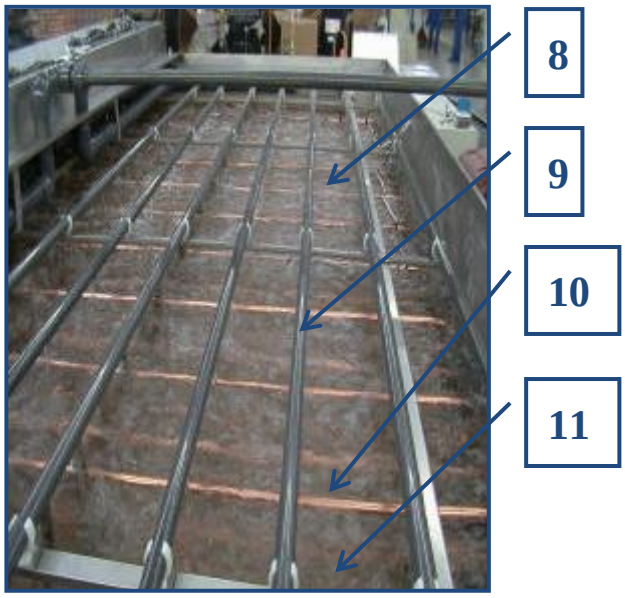


1.4. Equipment overview

1.4.1. Packo Ice Builder

The Packo Ice Builders (PIB) are compact and powerful units capable of storing cooling energy in ice form and afterwards releasing this energy by generating ice water for various cooling applications.





This table contains the main parts and functions:

Element	Description	Function
1	Ice water reservoir	Insulated vessel to hold the ice water.
2	Insulated cover	Insulated cover for the ice water reservoir.
3	Electrical enclosure	Control system PIB.
4	Ice water pump	Supply the ice water to the cooling application.
5	Cooling unit	Provide the required cooling capacity to the evaporator.
6	Ice water homogenisation (PIB 25 → 370)	Ensure an even ice meltdown by injecting air through the ice water reservoir. The air blower is automatically turned on when the ice water pump is running.
7	Leg	Adjustment/levelling of the PIB
8	Evaporator	Cool / freeze the water in the ice water reservoir.
9	Return header	Distribute the return (heated) water back into the PIB.
10	Electronic ice thickness sensors	Control the thickness of the ice layer between the pre-set minimum and maximum value.
11	Automatic ice water level control	Maintains the ice water up to the required level: – PIB8 -13: by floater valve – PIB 25-370: by electronic level control
12	Heat exchanger (optional)	The heat exchanger provides cooling to a secondary circuit and is available in the following sizes: – Type B28*46 (flow = 40l/min) – Type B28*80 (flow = 60 l/min) – Type B28*126 (flow = 100 l/min) Type B28*126 is not possible on PIB-8 and PIB-13

1.4.2. Cooling system

The cooling system generates the necessary cooling power to support the ice formation in the PIB.

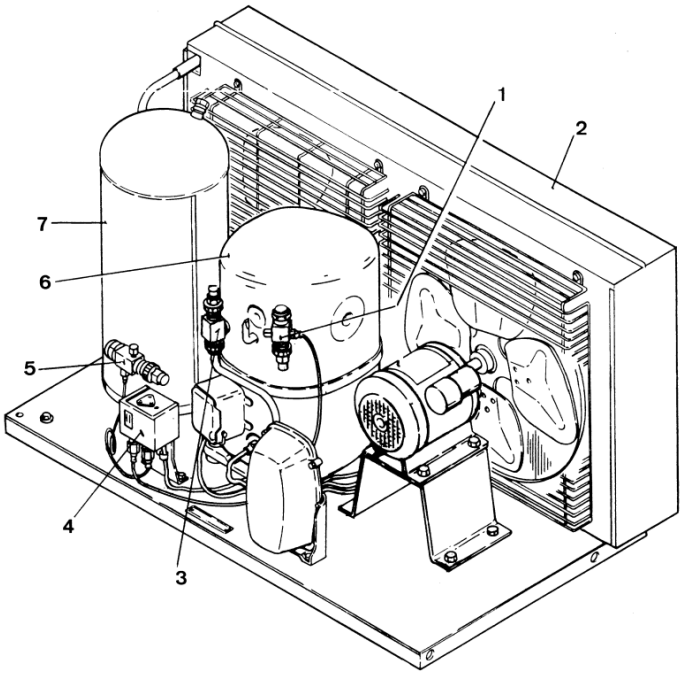
1.4.2.1. Packo ECO-COOL

IB cooling (=Ice Bank cooling) units are most commonly used for providing the cooling power to the PIB.

When the PIB is powered by other cooling units then the Packo ECO-COOL series, verify the compatibility with the PIB in Annex A1 (Qmin /Qmax @ evaporation temperature of -10°C and ambient temperature of 32°C).

These cooling units form an integral part in the PIB's operation and can be mounted onto the ice builder or remotely installed.

The mayor components of an ice bank cooling unit are indicated on the following sketch:



This table contains the main parts generally present in cooling units:

Element	Description	Element	Description
1	Valve (suction side)	**5**	Liquid valve
2	Condenser	**6**	Compressor
3	Valve (pressure side)	**7**	Liquid vessel
4	Pressure switch high and low pressure		

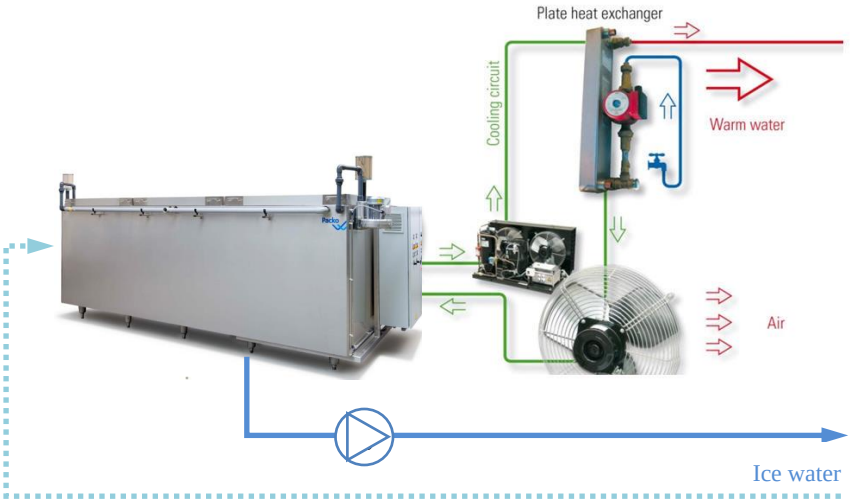
1.4.2.2. Packo ECO-COOL with heat recovery system

The cooling unit circuit is fitted with a heat exchanger, which is mounted between the compressor and the condenser.

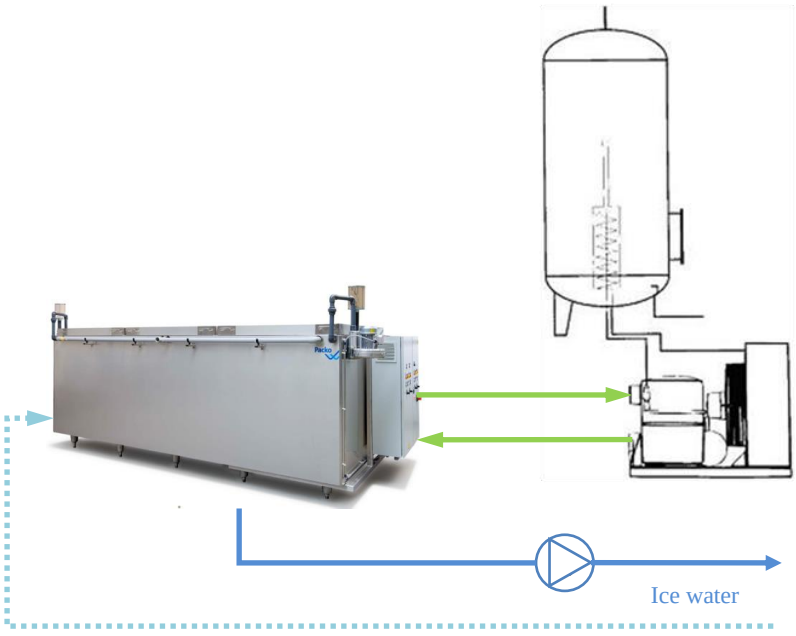
Hot refrigerant gas from the compressor is pre-cooled by the water-cooled heat exchanger before entering the condenser.

The heat exchanger therefore generates warm water and can be:

- *connected to a **water circuit**:*



- *mounted into a **boiler vessel**:*



1.4.2.3.

1.4.2.3. Central glycol system

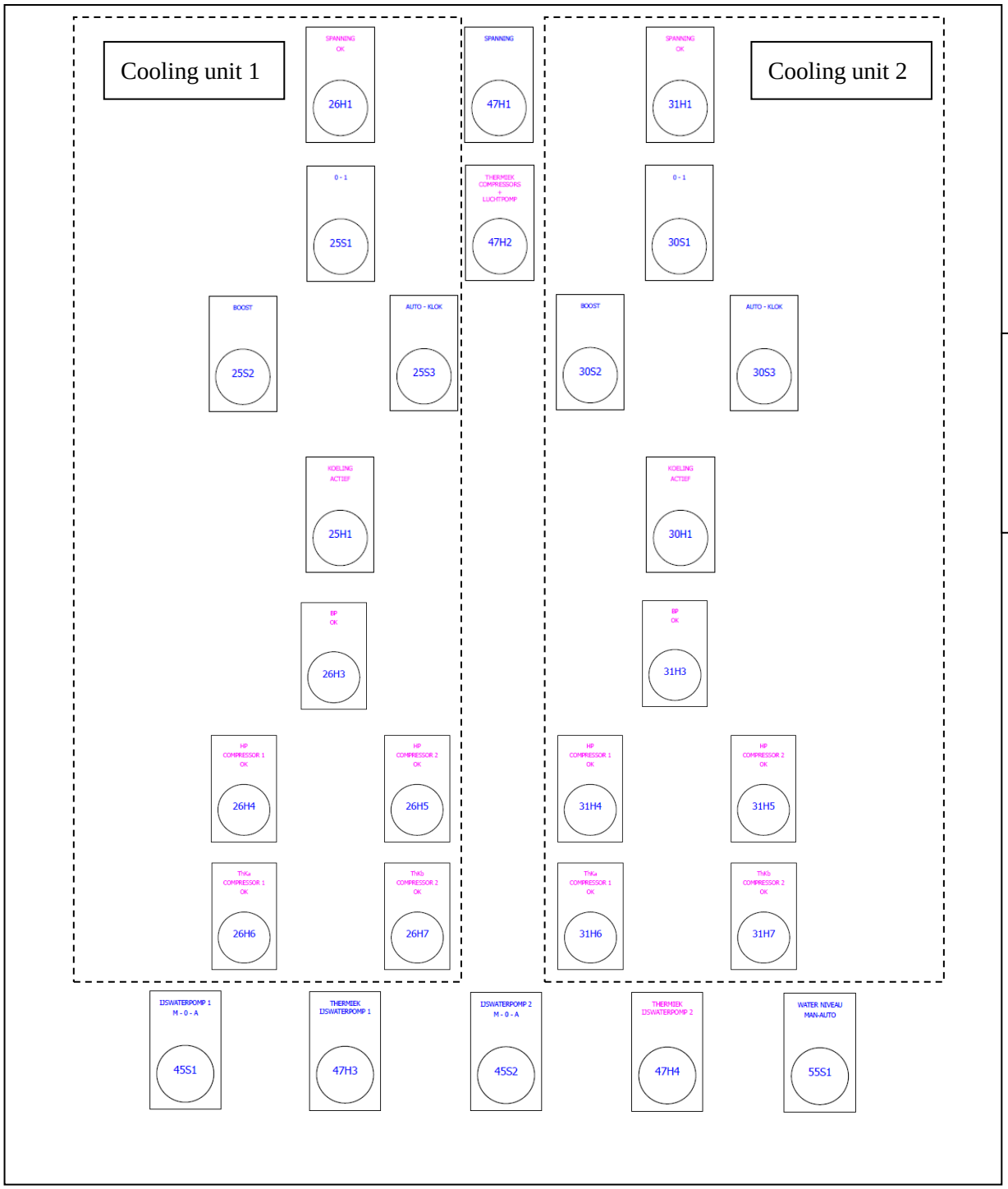
In centralized cooling systems, glycol may be used to cool the different applications.

This cooling agent is circulating in liquid form through the heat exchanger circuit (= evaporator) at -10°C in order to power the ice built up.

 The use of this cooling agent and cooling principle have to be specified at the time of order.

1.4.3. Electrical control system

1.4.3.1. Electrical control panel



#	Component	Tag	Function
Tension			
Main switch	Switch	Main Switch 0-1	Power equipment on / off
47H1	Lamp	Tension	Indicates when the PIB is on (tension present). Main Switch.
Alarm			
47H2	Lamp	Thermal Safety compressor(s) and air blower(s)	Indicates when the motor of compressor(s), air blower(s) is overloaded.
Cooling unit 1			
26H1	Lamp	Tension Ok	Main switch on Cooling unit 1 – 0: off – 1: on
25S1	Switch	0 - 1	Control circuit Cooling unit 1 – 0: off – 1: on
25S2	Knob	Boost function cooling unit 1	– Push: built op once to max. ice limits
25S3	Switch	Clock switch cooling unit 1	– Auto: no clock is used – Clock: Clock is used
25H1	Lamp	Cooling active	Liquid valve – 0: off – 1: on
26H3	Lamp	BP OK	On : when BP is closed and Cooling is active
26H4	Lamp	HP Compressor 1 OK	On : when HP is closed and BP is closed and cooling is active
26H6	Lamp	ThKa Compressor 1 OK	Indicates when compressor 1 (cooling unit 1) is running. On : when ThKa is closed and HP is closed and BP is closed and cooling is active
26H5	Lamp (Model dependant)	HP Compressor 2 OK	On : when HP is closed and BP is closed and cooling is active

26H7	Lamp (Model dependant)	ThKa Compressor 2 OK	Indicates when compressor 2 (cooling unit 1) is running. On : when ThKa is closed and HP is closed and BP is closed and cooling is active
Cooling unit 2-4 (Model dependant)			
31H1	Lamp	Tension Ok	Main switch on Cooling unit 2 – 0: off – 1: on
30S1	Switch	0 – 1	Control circuit Cooling unit 2 – 0: off – 1: on
30S2	Knob	Boost function cooling unit 1	– Push: built op once to max. ice limits
30S3	Switch	Clock switch cooling unit 1	– Auto: no clock is used – Clock: Clock is used
30H1	Lamp	Cooling active	Liquid valve – 0: off – 1: on
31H3	Lamp	BP OK	On : when BP is closed and Cooling is active
31H4	Lamp	HP Compressor 1 OK	On : when HP is closed and BP is closed and cooling is active
31H6	Lamp	ThKa Compressor 1 OK	Indicates when compressor 1 (cooling unit 2) is running. On : when ThKa is closed and HP is closed and BP is closed and cooling is active
31H5	Lamp (Model dependant)	HP Compressor 2 OK	On : when HP is closed and BP is closed and cooling is active
31H7	Lamp (Model dependant)	ThKa Compressor 2 OK	Indicates when compressor 2 (cooling unit 2) is running. On : when ThKa is closed and HP is closed and BP is closed and cooling is active
Ice water circuit			
45S1	Switch	Ice water pump 1 M-0-A	– M: Manual operation – 0: Pump off – A: Automatic operation

47H3	Lamp	Thermal Safety ice water pump 1	Indicates when ice water pump is overloaded.
45S2, …	Switch (model dependant)	Ice water pump 2-8 M-0-A	– M: Manual operation – 0: Pump off – A: Automatic operation
47H4, …	Lamp (Model dependant)	Thermal Safety ice water pump 2	Indicates when ice water pump 2 is overloaded.
Level control			
55S1	Switch	Level control M-A	– M: Manual operation – A: Automatic operation

1.4.3.2. Communication interface

1.4.3.2.1. Ice water pump

The supply of ice water to your application can be controlled by a remote operator panel or equipment.

There is a potential-free, dry contact available per ice water pump to control its ON/OFF-operation.

 Check the electrical wiring diagram for more specific, technical information!

1.4.3.2.2. Default alarm

A default alarm, which includes the various motors, pressure switches,..., is centralized on 1 potential-free, dry contact.

This default, general alarm can be split up in the different specific alarms for use in a process monitoring system.

 Check the electrical wiring diagram for more specific, technical information!

1.4.3.3. External control system

In this version, the PIB is delivered without the standard control cabinet.

The ice water pump, air blower, level control are present without cabling nor wiring.

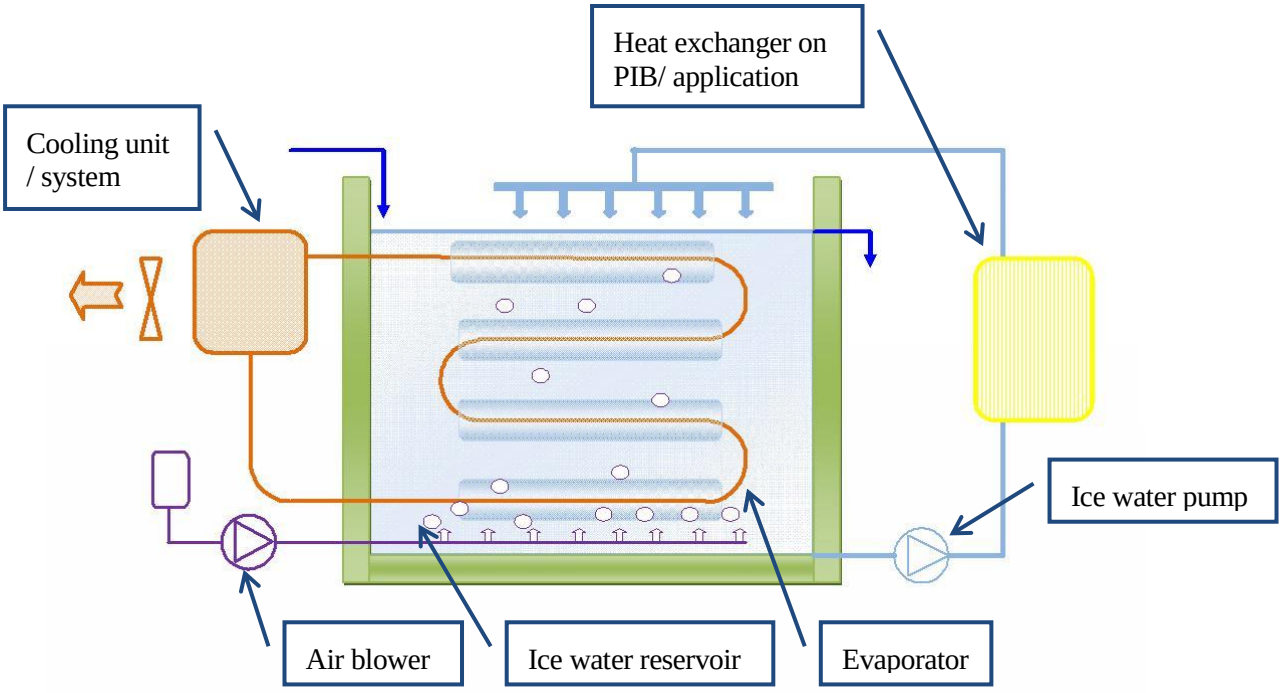
The ice thickness regulation module is pre-assembled in a small connection box on the side of the PIB. Ice thickness sensors are already pre-wired into this box.

 Check the electrical wiring diagram for more specific, technical information!

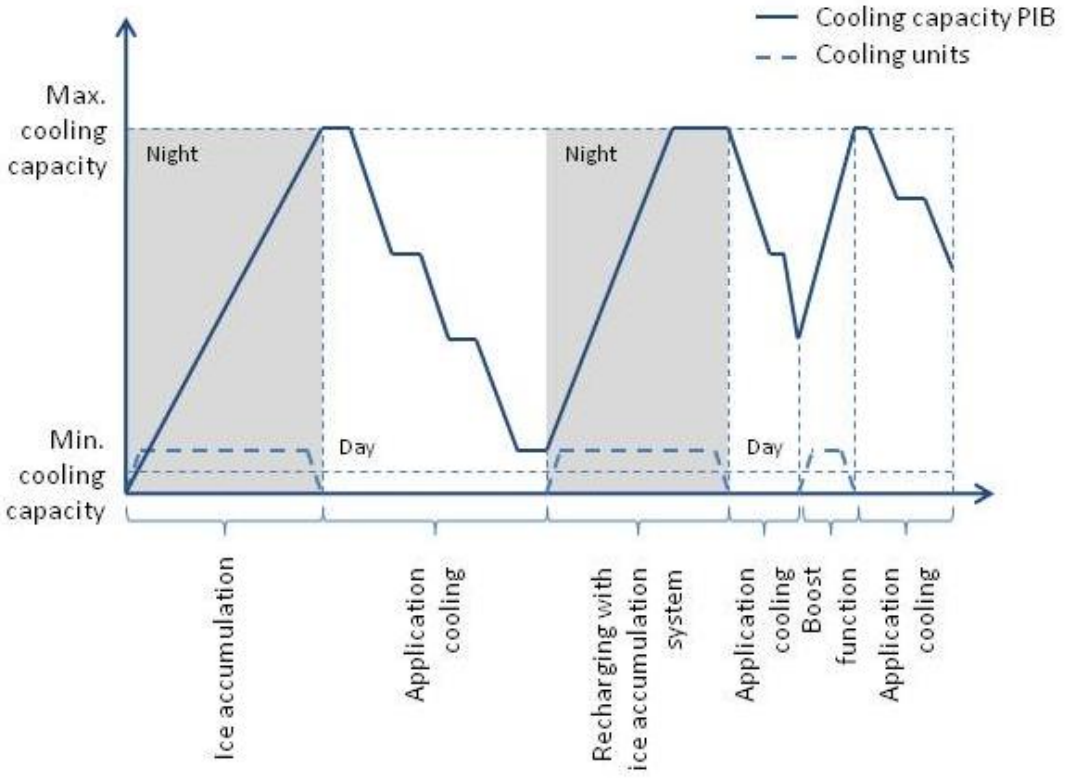
1.5. Process principle

1.5.1. Process principle Packo Ice Builder

The Packo Ice Builders (PIB) are used in a wide variety of cooling processes as they are the core of the complete ice water system.



The above mentioned cooling processes consist out of the following phases:



1.5.1.1. Ice accumulation

During the ice accumulation cycle, cooling energy is steadily built up in the PIB. A short description of this phase can be found in the table below:

Phase	Description
1	The ice water reservoir is filled with water.
2	The cooling system is connected to the PIB.
3	The cooling system is powered up.
4	During the cooling phase, heath is extracted from the water by the cooling system.
5	An ice layer is formed on the surface of the evaporator coil.
6	When the ice layer has reached the required thickness, the cooling system is switched off to avoid the formation of a solid block of ice.
7	The PIB is fully charged and ready to supply its cooling energy to your application.

1.5.1.2. Application cooling

A short description of this phase can be found in the table below:

Phase	Description
1	The ice water is transported to the heat exchanger on the PIB or on your application(s) by the ice water pump.
2	The ice water absorbs the heat of the heat exchanger.
3	The heated water returns to the PIB via the return header.
4	The ice layer around the evaporator cools the returned water and melts.
5	During the complete cooling process, air is being injected into the ice water reservoir to optimize the energy distribution.

1.5.1.3. Recharging

When the minimum ice level is reached, the cooling units are restarted in order to ensure sufficient ice volume and cooling capacity.

1.5.1.4. Recharging with ice accumulation control system

With the **optional** ice accumulation control system, the ice build up is primarily done at night. During the day only the minimum level is maintained.

At night, the PIB can be set to automatically build up to the maximum level or only start to build up when the minimum level has been reached.

1.5.1.5. Manual boost function

When an exceptional rise in ice water demand is foreseen, the boost button allows the operator to start the cooling units without reaching the minimum ice level and overruling the automatic ice layer control system to build up the ice level up to the maximum level.

Repetitive use of this function can lead to irregular ice formation. This can increase the need for defrosting the equipment.

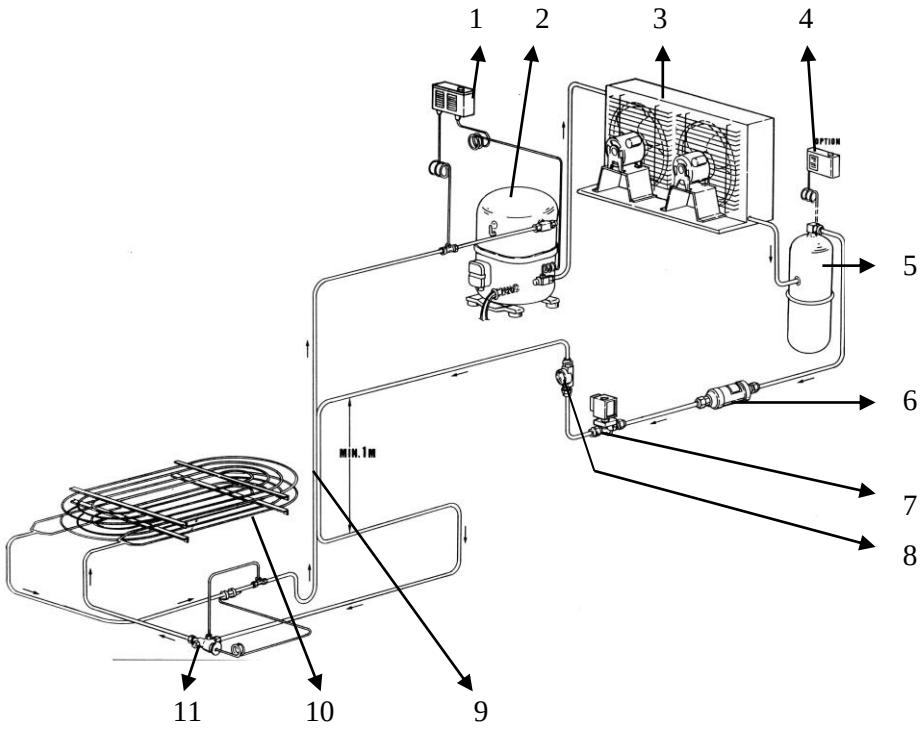
1.5.1.6. Water level control

During the complete operation of the PIB, the water level in the reservoir is kept at a pre-set level by means of the automatic filling system.

1.5.2. Process principle Packo ECO-COOL

1.5.2.1. Illustration cooling system

The following sketch indicates the major components of the IB cooling system:



Element	Description	Element	Description
1	Pressure switch high and low pressure	**7**	Solenoid valve
2	Compressor	**8**	Sight glass
3	Air-cooled fan condenser	**9**	Heat exchanger (option)
4	High pressure switch	**10**	Evaporator coil
5	Liquid receiver	**11**	Thermostatic expansion valve
6	Filter / Dryer		

1.5.2.2. Principle of operation of cooling system

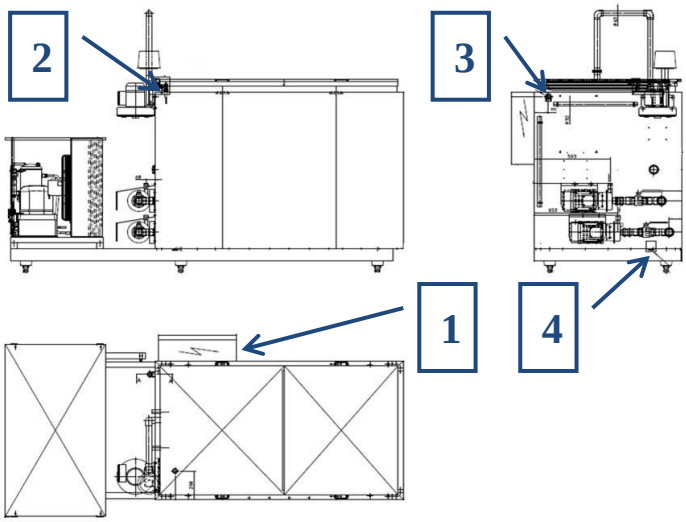
The IB cooling system (Packo ECO-COOL) which can provide the cooling power to the PIB-series operates as follows:

Phase	Description
1	The compressor sucks the refrigerant under low pressure from the evaporator coil and compresses it to high pressure and temperature towards the condenser.
2	Cold air, which is generated by the fans, flows over the cooling fins and the refrigerant condensates inside the condenser.
3	The newly formed liquid leaves the condenser at high pressure.
4	The thermostatic expansion valve injects the refrigerant into the evaporator.
5	The refrigerant absorbs the heath of the water and evaporates.
6	The compressor sucks the newly formed gas and the cycle restarts.

2. Installation

2.1. Installation area requirements

The area, where the PIB will be installed, has to comply with certain specific requirements in order to ensure ease of installation and optimum operation.

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>1</td><td>The following utilities have to be present:
 

1. Electricity (standard: 3x400V / 50Hz)
When 4 cooling units are foreseen to power the PIB 3x400V + neutral has to be available. Otherwise an optional transformer has to be installed.
2. A cold water connection providing filtered water free of calcium (limestone):
<table>
<tr><td>Model</td><td>Connection type PIB-side</td></tr>
<tr><td>PIB 8-370</td><td>½” female</td></tr>
</table>
3. An overflow connection:
<table>
<tr><td>Model</td><td>Connection type PIB-side</td></tr>
<tr><td>PIB 8-13</td><td>None</td></tr>
<tr><td>PIB 25-160</td><td>1” male / dia 40 glued</td></tr>
<tr><td>PIB 230-370</td><td>1” female</td></tr>
</table>
4. A water drain point:
<table>
<tr><td>Model</td><td>Connection type PIB-side</td></tr>
<tr><td>PIB 8-160</td><td>½” female</td></tr>
<tr><td>PIB 230-370</td><td>1” female</td></tr>
</table>
</td></tr>
</table>

	In order to avoid possible corrosion issues be sure that: −there are no drains or drain gutters underneath the PIB −the floor is sloped so that no water can stay underneath the PIB
2	The ambient temperature has to be above 0°C at the Packo Ice Builder. The PIB has to be installed in a frost-free area.
3	The ambient temperature in the cooling unit area may not exceed 43°C.
4	Provide proper ventilation area around the equipment.
5	Provide at least 0.6m of free space on at least 2 sides (3 sides is preferred) of the PIB in order to being able to access the different components.

2.2. Delivery & handling

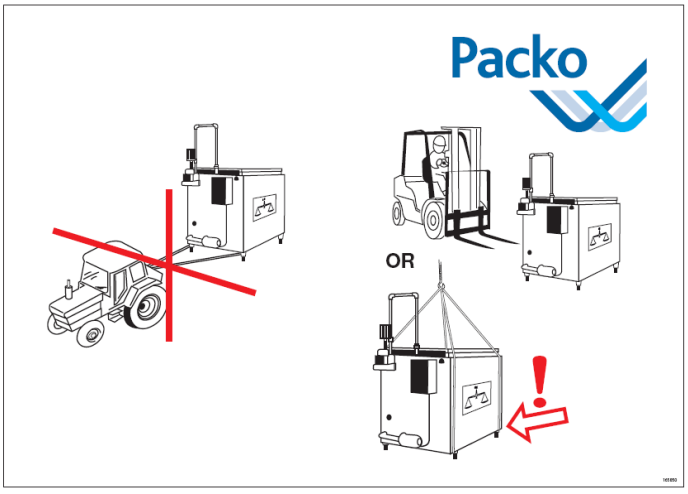
2.2.1. Upon delivery

Check whether the delivery is complete, in other words whether it completely meets the order.

Check what has been delivered against what is written on the delivery note. Write any shortcomings on the delivery note before signing it.
If there is something missing you should immediately inform your supplier.

2.2.2. Handling the Packo Ice Builder

The complete PIB unit, including remote components, has to be handled with care and the following instructions have to be followed in order to avoid any damage:



These instructions are also clearly indicated on the unit, including the centre of gravity.

2.3. Installation activities

In this chapter you will find detailed directions for installing your PIB:


The installation has to be carried out in the order described below and by trained personnel.

During the installation, please the following general guidelines in mind:

- Be careful when placing the tank and do not scratch the outside or inside of the PIB. If the PIB is scratched, follow the procedure to treat young damage (see 4. Maintenance).
- When grinding or cutting, keep sparks away from the PIB. If the PIB was in contact with sparks, follow the procedure to treat young damage .

2.3.1. Installing the Packo Ice Builder

Step	Action
1	Enter the unit into the installation area according to the transport instructions.
2	Remove all packaging material.  Check for possible damage which the PIB may have incurred during transport. In case of damage, please inform your supplier immediately.
3	Position the PIB on a stable & solid surface.
4	Check that the unit is positioned in a horizontal position. Adjust as necessary using the adjusting legs.
5	Ensure a free passage of 0.6m on at least 2 sides (3 sides is preferred).
6	Ensure proper ventilation in the installation area.
7	Verify if the internal tank of the PIB is clean.

2.3.2. Installing the cooling system

2.3.2.1. Installing the Packo ECO-COOL unit(s)

Step	Action
1	Enter the cooling units into the properly ventilated installation area according to the handling instructions.
2	Remove all packaging material.  Check for possible damage which the cooling unit(s) may have incurred during transport. In case of damage, please inform your supplier immediately.
3	Position the cooling units on a stable & solid surface.

 The connection of the cooling unit(s) can only be performed by authorised personnel trained in mechanical cooling systems.

 The distance between the cooling unit(s) and the PIB should not exceed 10m.

2.3.2.2. Air circulation

The cooling unit(s) may be placed both inside and outside. In any case, sufficient air circulation must be provided:

- If it is placed outside, appropriate shielding / covering has to be foreseen.
- If the cooling unit is placed inside in front of an opening in the wall, the following measures have to be taken:
  - Keep a free area of at least 25 cm between the wall and the condenser.
  - Make an opening in the wall to which the condenser is standing against. This opening should be at least as large as the condenser.
  - In the wall opposite to the condenser, make an opening with the size of the condenser for the evacuation of hot air.
- If the cooling unit is placed inside and in front of a closed wall, the following measures have to be taken:
  - Keep a free area between the wall and the condenser equal to the following formula:

$$\frac{L \times H}{2 \times H + L}$$

    L = length, H = height of the condensing unit
- Make sure there is enough ventilation.

- If the condenser is installed in an area where the temperature is always below 5°C, a high-pressure switch should be placed to control the fan motor(s).
- It has to be prevented that the cooling unit sucks in the exhaust gases of other equipment.

2.3.2.3. Piping for remote cooling unit(s) (RCU)

Step	Action
1	A separate cooling unit is always delivered filled with nitrogen (N_2). Check whether the unit is still under pressure. If not, check for leaks and repair.
2	Place the suction pipe and then the liquid pipe. The diameter of the pipes depends on the type of cooling unit. Take the following into account: - Always use sealed and dehydrated copper pipes especially for refrigeration engineering. - The distance between the compressor and the PIB should not exceed 10 metres. - The horizontal suction pipe should slope slightly down towards the compressor. - If the cooling unit is placed higher than the tank, an oil trap (as small as possible) **has** to be made in the suction pipe before the vertically placed pipe.
3	Carry out a pressure test as follows: - Connect a low and high-pressure manometer to the compressor. - Place the compressor under pressure (maximum 2500 kPa) with nitrogen (N_2) - Check for leaks. If necessary, repair the leaks and do the pressure test again.
4	Put the cooling system fully under vacuum for at least 1 hour, using a 2-step vacuum pump
5	Put the system under pressure with the right type of refrigerant.


Blow dry (moisture content < 7ppm) N_2 through the pipe (5 litres/minute) to prevent oxidation during welding. Use a copper solder to weld the pipes together.


Use a silver solder to weld the pipes to the different elements (evaporators, liquid receivers,…)

Avoid getting moisture and dirt in the pipes!

If refrigerant or oil is accidentally spilt on the PIB, it must be thoroughly cleaned immediately. If not, the stainless steel surface can be affected.

All hot parts/pipes must be properly insulated (e.g. Armaflex)

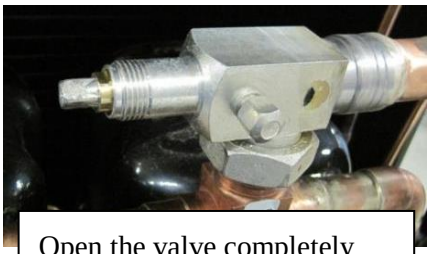
Refrigerant when burnt spreads very poisonous gases. Ensure that welding work is carried out away from any refrigerant.

2.3.2.4. Setting up cooling unit(s)

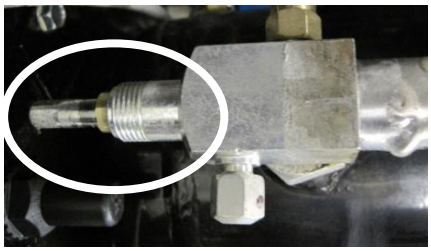
Step	Action
1	Set the pressure control units (see below).
2	Verify that the oil level is between ¼ and ¾ at the sight glass.
3	Connect the various components (compressor, fans, pressure switches, carter,...) according to the electrical diagram.
4	Verify the rotation sense of the fans.
5	Verify the refrigerant.
6	Verify the oil level again after 2 running hours.
7	Set the expansion valve as follows: – The overheating is minimal between 5 and 10°C – Ice is being formed over the complete surface of the evaporator (up to the end).

2.3.2.4.1. Integrated cooling unit (ICU)

When your PIB has an ICU-configuration, you have to open the suction valve on the cooling unit:



Open the valve completely by turning counter clockwise.



See also instruction label attached to the valve!

2.3.2.4.2. Pressure control switches

For safety reasons, **never** exceed the specified maximum pressure of the cooling unit(s). The setting of the pressure control unit for high pressure has to be **lower** than the maximum pressure indicated on the identification plate.

The pressure control units have to be set as follows:

- Low pressure (kg/cm³):

	R404A	**R22**
Set value low pressure	2	2
Set value high pressure	1	1

- High pressure (kg/cm³):

	R404A	**R22**
Open	23	23
Semi-hermetic	24	24
Hermetic	26	26

2.3.2.4.3. Fan control

The pressure control units of the fans have to be set as follows:

- Fan 1:

	Set value low	**Set value high**
R404A	17.5	16.0
R22	11.5	10.0

- Fan 2:

	Set value low	**Set value high**
R404A	18.0	16.5
R22	12.5	11.0

Refrigerant R22 is since 2010 no longer allowed in new installations in the EU.

2.3.3. Ice water pump

Depending on the PIB-model the ice water pump is mounted differently:

- *PIB8-13: on top of the lid:*
  Because the ice-water pump is mounted higher than the water surface, it is necessary to fill the suction tube, fitted with a non-return valve, with water when starting up unit for the first time.

- *PIB 25-370: on the side of the ice-builder:*
  The pump is mounted lower then water surface, so it is not necessary to fill the suction tube with water.

2.3.4. Ice water circuit

The ice water circuit connects the PIB to the cooling application. The ice water will be supplied by means of one or more ice water pump(s).

Model	Ice water outlet diameter	Ice water return diameter
PIB 8-13	1" Male	25
PIB 25-160		32
PIB 230-370		50

Only use PVC-A, copper or stainless steel piping which is appropriate for your specific temperature conditions.

The minimum diameter should be 40mm.

Short bends or fine grid filters may not be used and also avoid additional valves, since these items will decrease the water flow and prolong the application cooling time.

In order to reduce the energy losses, it is recommended to insulate the ice water circuit with for instance Armaflex.

2.3.5. Overflow circuit

The water overflow of the Packo Ice Builder can be connected directly on the drainage system of the building. The water will start to flow out as soon as the first ice built up occurs.

Only use PVC-A, copper or stainless steel piping which is appropriate for your specific temperature conditions.

2.3.6. Air pump

The air pump and piping are factory-mounted onto the PIB.

 Do not change the configuration of the air pump or its piping without prior approval from your dealer or Packo Inox nv.

2.3.7. Communication interface

 All electrical activities have to be performed by trained electricians! In case of doubt, contact your dealer or Packo Inox NV

2.3.7.1. Ice water pump

The following general steps have to be followed to allow the ice water pump operation by your remote control panel or equipment:

Step	Description
1	Switch off the main switch and lock prior to start any work on the PIB.
2	Verify the electrical wiring diagram to identify the potential-free, dry contact of the ice water pump.
3	Connect the wires as indicated on the electrical diagram.
4	Repeat steps 2 & 3 as required per ice water pump.
5	Verify the installation.
6	Remove the padlock and switch on the main switch
7	Put the switch of the ice water pump in position A (automatic operation) to enable the ice water pump control from your control panel or equipment.

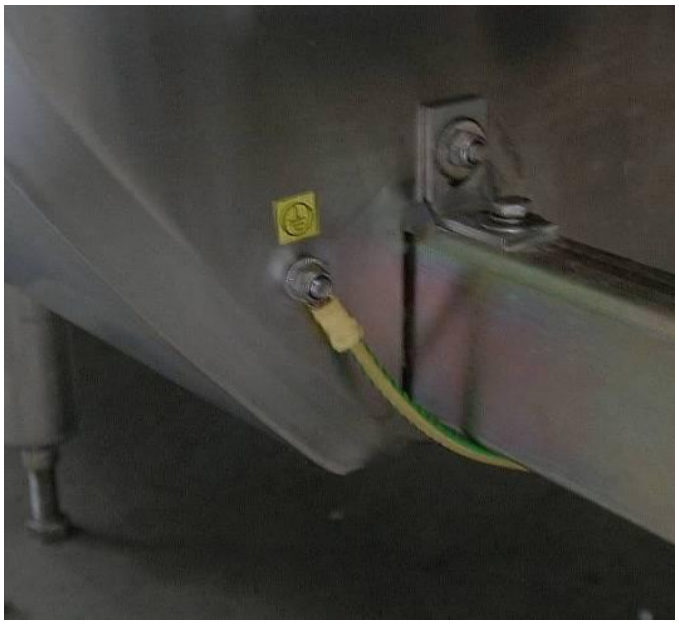
2.3.7.2. Default alarm

The following general steps have to be followed to:

Step	Description
1	Switch off the main switch and lock prior to start any work on the PIB.
2	Verify the electrical wiring diagram or electrical components (e.g. ice water pump, blower, …)
3	Connect the wires as indicated on the electrical diagram either for the general, default alarm or the individual alarms.
5	Verify the installation.
6	Remove the lock and switch on the main switch and padlock prior to start any work on the PIB.

2.3.8. Verification of the installation

When the previous steps of the installation have been done, the complete installation has to be verified and the following items have to be checked:

Step	Action
1	Verify if the specifications of the electrical utilities comply with the local requirements.
2	Verify if the unit is properly grounded and bonded. The bonding has to be installed by means of a yellow/green wire with 6 mm², near the connection clamp, foreseen on the PIB, the cooling unit and the main earth connection of the building and must be continuous.   Do not connect the bonding to the earth terminal strip in the electrical panel!
3	Verify the setting of the thermal securities (fusing).
4	Verify if the electrical connection is compliant to the specifications on the motor identification plate.
5	Ensure that all electrical connections are properly fastened.
6	Verify the rotation sense of the motors of the ice water pump(s) and the air pump.

7	Clean the external surfaces of the PIB: – Clean the stainless steel on the outside of the tank with good quality water to remove all impurities, mud, dust, … Make sure the surface is degreased. – Wipe the surface with a damp cloth. Be sure to use a cloth with distilled-water [Article#: 168434] .  Distilled-water is necessary because tap water contains minerals which can cause corrosion.  Additional distilled-water to refill the spray can is available: [Article#: 100306]. – Let the surface dry to the air. – Put SS Polish [Article#: 90925] on the clean, dry surface. Polish the product until an equal thin film has settled on the surface. After this step the stainless steel has extra protection from environmental influences that cause corrosion.  Instead of SS Polish, Protection spray [Article#: 168435] can also be used

3. Start-up and normal use

3.1. Filling PIB

The Packo Ice Builder has to be filled with pure, clear water (drinking quality) up to 1cm above the top copper tube of the evaporator.

 The ice water reservoir may only be filled with water after the cooling circuit has been made vacuum and put under pressure.

 To protect the system an inhibitor (1,2,3 Benzotriazol) must be added to the water before the start-up.

The PIB can be filled automatically by following these steps:

Step	Action
1	Place the switch “Level control” in position A, which will open the water supply valve.
2	The filling cycle will automatically stop when the required level has been reached.
3	Remove the cover.
4	Add the amount of 1, 2, 3 Benzotriazol needed to the ice water reservoir.  For the required dosage, check chapter “4. Maintenance”.
5	Put the cover plate back in place.

 An additional, temporary water supply system may be used to speed up the filling of the PIB at the start-up.

In this case, the level in the PIB has to be monitored by the operator, since this additional water supply system is not monitored by the PIB’s control system.

3.1.1. Water requirements

The water quality has to comply with the following requirements:

Water resistance (Water conductivity)	Max. 40kOhm (200 – 1000 µS/cm)
pH-value	+/- 7

Chlorine / Chloramines / Chlorine dioxide / Sodium hypochlorite / Calcium hypochlorite	Max. 0.25ppm
Copper sulphate	Max. 1mg/L Cu
Aluminium sulphate	Max. 0.1ppm Al
Sodium aluminate / Potassium permanganate / Iron chloride	Max. 0.3mg/L Mn
Iron sulphate / Sodium silicate	Max. 10ppm SiO2

 Add 1,2,3-Benzotriazol to the water (bag included in the delivery package). For the required dosage please check chapter “4. Maintenance”.

 Do never add NaCl (salt) to the water, since this could cause stainless steel corrosion.

 The conductivity of the water can be improved by adding Sodium sulphate (+/- 1.4g/100L water).

When ice water is consumed by the cooling application and has to be replaced by fresh water, the water supply system has to be controlled to ensure the water remains compliant to the above mentioned requirements.

3.2. PIB operation

When starting up the PIB, proceed as follows:

Step	Action	
1	Turn on the power supply (main switch).	
2	Turn on the cooling unit(s) (switches cooling units).  Leave a delay of +/-20sec between powering up the different cooling units, this to prevent a high peak current.	
3	When the controls are ...	Then...
	Manually (the ice water pump is controlled by the PIB)	Put the control switch in position “M”.
	Automatically (the ice water pump is controlled by an external source)	Put the control switch in position “A”.
4	When the ice formation has reached the required level, the valve controlling the flow of cooling agent is closed and the cooling units are stopped. During a prolonged period without ice building (cooling units are not running), the cooling units can switch on /off for a short period.	

5	Always leave the ice accumulator under tension to ensure proper control of the ice capacity.

3.3. Fine-tuning

While starting-up the PIB, the operation of the cooling units should be fine-tuned as follows:

- Check the ice growth towards the end of the evaporator.
- When there is no ice at the end of the evaporator coil you have to open the expansion valve a little bit more.
- When you see ice on the suction line towards the compressor, close the expansion valve a little bit more.

The result of this fine-tuning should be an evaporator coil “completely” covered with a layer of ice and no ice formation further on at the compressor.

 All work on the cooling system has to be performed by authorised, trained personnel.

4. Maintenance

Regularly performed preventive maintenance will:

- Ensure a long life expectancy of the equipment.
- Ensure the cooling units operate at optimal efficiency.
- Avoid defects and unnecessary repairs.

4.1. Refreshing the ice water

When refreshing the water in the ice water reservoir, follow these steps:

Step	Action
1	Place the switch “Level control” in position 0 which will close the water supply valve.
2	Empty the PIB via the drain on the bottom.
3	Rinse the internal surfaces with clear water.  Never spray water under high pressure at the PIB.
2	Close the drain.
3	Place the switch “Level control” in position A which will open the water supply valve.
4	The filling cycle will automatically stop when the required level has been reached.
5	Add the amount of 1, 2, 3 Benzotriazol needed to the water in the ice water reservoir.  For the required dosage check chapter “4. Maintenance”.
6	Put the cover plate back in place.

4.2. Maintenance of stainless steel

 The items regarding the maintenance of stainless steel as mentioned in this paragraph are **only applicable to the <u>external</u> stainless steel surfaces of the PIB**!

A common idea about stainless steel is that it cannot corrode. Unfortunately this is not correct. Stainless steel has a protective layer of chromium oxide, which makes it more corrosion resistant. This protective layer has self repairing properties, but when the damage is too severe the protection wears off and stainless steel corrodes.

Causes of corrosion can be contact with chlorides, mild steel, other foreign particles or mixing cleaning chemicals.

4.2.1. Preventive maintenance of stainless steel

- *Frequent cleaning:*

  When the outside surfaces of the PIB are regularly (every 3 days) cleaned, it will stay spotless and clean.

  The cleaning should be done with water and a right amount of cleaning agent (for instance: a standard cream cleaner from the kitchen or bathroom). In this case contamination would have no time to affect the surface.

- *Extra protection film:*

  In real life it is not common to clean the outside of the PIB as frequently, as described above.

  Allowing the user to maintain the outside of the stainless steel PIB correctly Packo offers a specific product line.

  Included in this line is a product that gives next to your chromium oxide layer an additional protection.

  Always read all the information on the product package and any additional included information before using the products.

Step	Action
1	Always start with cleaning the outside stainless steel surfaces of the PIB with good quality water to remove all impurities, mud, dust, …
2	Apply *SS cleaner* [Article#: 90942] on the stainless steel surfaces and wipe it evenly with a cloth. Always apply and wipe the product aligned with the brush lines on the stainless steel surfaces. Otherwise scratches will be made from the abrasive that is included in the SS treatment. This product maintains the chromium oxide layer that protects your installation. It can remove light corrosion as well.
3	Let the product work for 5 - 10 minutes (depending on the degree of contamination). Do not let the product dry up otherwise a slight color change will be noticed on the treated surface.
4	Rinse the tank surface with lukewarm distilled-*water* [Article#: 168434]. If no warm distilled-water is available you can use warm, good quality water and hose the product away.

5	Rinse abundantly with distilled-water. Additional distilled-water to refill the spray can is available [Article#: 100306].
6	Wipe the surface with a damp cloth. Be sure to use a cloth with distilled-water. Distilled-water is necessary because tap water contains minerals which can cause corrosion. So when cleaning a treated surface, always end the cleaning with distilled-water.
7	Let the surface dry to the air.
8	Put *SS Polish* [Article#: 90925] on the clean, dry surface. Polish the product until an equal thin film has settled on the surface. Instead of SS Polish, Protection spray [Article#: 168435] can also be used

After this step the stainless steel is protected from environmental influences that cause corrosion.

Repeat this process at least every **3 months** to have a good result.

4.2.2. Corrective maintenance of stainless steel

- *Young damage:*

It is always possible that by accident there is surface damage to the PIB. When this occurs, the damaged area must be treated immediately so the formation of corrosion can be prevented.

The procedure to threat 'Young damage' is the same as the procedure 'Surface corrosion, pitting corrosion' (see next paragraph).

The only difference is that in this case it is not necessary to treat the whole PIB but only the surface where the damage occurred.

Always treat the whole side where the damage occurred because the used product gives a slight color difference.

- *Surface corrosion, pitting corrosion:*

Always read all information on the product packaging and additional included information before using any of the products.

Always use protective gloves, safety goggles and protective clothing when using one of the products.

For the following procedure the *surface corrosion kit* [Article#: 168432] is needed.

Step	Action
1	Clean the stainless steel on the outside of the PIB with water to remove all impurities, mud, dust, … Make sure the surface is degreased.
2	Clean the outside of the PIB with SS cleaner [Article#: 90942], as described in chapter "Preventive maintenance of stainless steel" to remove most of the surface corrosion. Do not put SS polish or Protect spray on the surface as described in that chapter but continue the procedure as described below.
3	Dry the surface with a cloth.
4	Spray *Corrosion remover* [Article#: 168433] on the stainless steel surface and let the cleaner work for 10 - 20 minutes (depending on the degree of contamination).
5	For the best result, rinse the PIB surface with lukewarm distilled-*water* [Article#: 168434]. If no warm distilled-water is available you can use warm good quality water and hose the product away.
6	Afterwards, rinse abundantly with distilled-water. Additional distilled-water to refill the spray can is available : [Article#: 100306].
7	Wipe the surface with a damp cloth. Be sure to use a cloth with distilled-water. Distilled-water is necessary because tap water contains minerals which can cause corrosion. So when cleaning a treated surface, always end the cleaning with distilled-water.
8	Let the surface dry to the air.
9	Spray the Protect Spray [Article#: 168435] on the clean, dry surface. Polish the "Protect Spray" until an equal thin film has settled on the surface. Instead of Protect spray, SS Polish [Article#: 90925] can also be used

After this step the stainless steel is protected from environmental influences that cause corrosion.

When the corrosion is removed, check the surface if there are really no black spots left (= pitting corrosion).

If there are some black spots left repeat the "surface corrosion"-procedure several times. Repeat the procedure with an interval of a week. The black spots will be removed after several procedures.

- *Non removable pitting corrosion or heavy corrosion:*

  In some cases the pitting corrosion has already changed into heavier corrosion and cannot be removed.

  To remove this kind of corrosion please contact Packo Inox NV to insure the correct procedure and products are chosen.

4.3. Ice water systems

In a wet environment as at the PIB, corrosion can occur on the wetted surfaces.

In order to avoid this phenomenon, proceed as follows:

- Make sure the copper evaporator remains covered with ice as much as possible.
- When renewing the ice water, always add 1,2,3-Benzotriazol

Dosage table:

PIB-type	**8**	**13**	**25**	**40**	**60**	**80**	**120**	**160**	**230**	**370**
1,2,3-Benzotriazol (grams)	3	3	5	5	5	8	10	16	16.5	24

4.4. Cooling units

Verify regularly the condition of the variuos components of the cooling unit(s) and specifically the condenser.

The maintenance work on the cooling units have to be performed by trained personnel.

4.5. Air pumps

The air filter of the air pump has to be replaced anually.

4.6. Corrective maintenance

Many issues can be resolved by the operator himself by following the descriptions, recommendations,.. included in this chapter.

 Other corrective maintenance work can only be performed by specifically trained personnel.

In this case or when you were unable to resolve the problem, do not hesitate to contact your after-sales service team or dealer.

4.6.1. After-sales service

When contacting the after-sales service or dealer, please provide the following information:

- The fabrication number (see identification plate)
- The type and capacity of the system (see identification plate)
- The installed options (for instance: automatic level control)
- A clear description of the problem
- When the problem first occurred
- How many times the problem occurred

4.6.2. Safety fuses

There is a spare for every type of safety fuse in the switch box. If you have used a safety fuse, get a replacement spare as quickly as possible from the after-sales service or dealer.

 Always replace a safety fuse with a new safety fuse of exactly the same type. Never bridge a safety fuse.

4.6.3. Rotation sense

 Always check the rotation sense of every electric motor (indicated by arrow) when maintenance work on the electric installation has been performed.

When rotation sense of the motor does not match the arrow, contact your after-sales service team or dealer.

4.6.4. Trouble shouting guide

Problem	Cause	Remedy
Cooling doesn't start	The fusing has blown.	Replace the fusing.  Always replace a fusing by an identical type. Place the main switch in the off position and secure with a padlock.
	Thermal security is on, indicated by an illuminated orange lamp on control panel.	Wait until the thermal mechanism has cooled down. The orange lamp will go out and the cooling unit will automatically restart. If this problem reoccurs repeatedly, please contact your after-sales service or dealer.
	The main switch is off or defect.	Put the main switch in the on-position or replace when defect.
The application cooling doesn't work appropriately.	Cooling not activated.	Put the switch of the cooling unit(s) in position 1.
	 Leave a delay of +/-20sec between powering up the different cooling units, this to prevent a high peak current.	
	Valve closed.	Open the shut-off valve on the ice water circuit.
	The ice water pump doesn't work or fails to supply enough flow.	Verify the pump operation and check for possible blockages.
	Ice thickness controller is broken.	Check the controllers operation and replace if necessary.
Indication lamp of the thermal security lights up repeatedly.	Short circuit	Eliminate the short circuit or contact your after-sales team or dealer.

	Thermal security is broken (fusing).	Replace thermal security (fusing).  Always replace a fusing by an identical type. Place the main switch in the off position and secure with a padlock.
Cooling unit turns on /off repeatedly.	Not enough cooling agent present in the system.	Add cooling agent until the sight glass is clear.
	The low pressure set value of the pressure control unit is too high.	Set the value to 1kg/cm³.
	The solenoid valve doesn't open.	Verify the operation and replace when necessary.
	Obstruction of the condenser.	Remove the obstruction.
	Fan(s) are not running.	Check the set value (see paragraph 2.3.2.4.3)
Flow of the ice water pump is insufficient.	The ice water pump doesn't operate properly.	Check the ice water circuit for possible blockages and remove when necessary.

4.6.5. Spare part list

- *General spare parts:*

Article #	Description
70145	1,2,3-Benzotriazol – 5 grams
70146	1,2,3-Benzotriazol – 8 grams
70147	1,2,3-Benzotriazol – 12 grams
109890	Expansion valve TES2
23473	Ice thickness / Level controller 220/240V – 50/60Hz
23474	Ice thickness sensor
23175	Ice water pump PS15-137 0,88 kW
185721	Ice water pump NP63-32 0-115 (60 Hz)
185713	Ice water pump NP63-32 0-132 (50 Hz)
27528	Blower + filter
29734	Air Filter

- *Cleaning products*

Article #	Description	Volume
136755 90064	Protective gloves Size – M Size – L	100 pc.
90950	Cloth	280 pc.
90068	Protective goggles	1 pc.
90942	SS cleaner	650 ml
90925	SS polish	500 ml
168432	Surface corrosion kit: – 168433 – 168434 – 168435 – Protective gloves – Cloth	
100306	Distilled-water	25 liters
Surface corrosion kit for stainless steel contains the following products which can be ordered separately:		
168433	Corrosion remover (from the surface corrosion kit)	500 ml
168434	Distilled-water (from the surface corrosion kit)	500 ml
168435	Protect spray (from the surface corrosion kit)	400 ml