PR120H Pelletizer

OPERATOR MANUAL

CONTENT


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INTRODUCTION

This manual should be kept with the owner and be readily accessible for operation and maintenance. This manual contains information for the safety, operation, and maintenance.
The graphics used in this manual may show machine details that may be different than the actual machine. Components of the machine may have been removed for illustrative purposes or the continuing improvement of the machine's design may cause changes that are not included in this publication.
The owner of this machine is responsible for verifying the operator of this machine is properly trained and understands the contents of this manual

About the PR120H
The Cold Jet PR120H presents a state-of-the-art dry ice pelletizer packed with features for easy operation, swift production shifts and high capacity.
The Cold Jet PR120H has a quick start-up that reduces downtime and loss of valuable CO2. This is secured by a start-up sequence purging the liquid line and using a special valve to fill the chamber.
The Cold Jet PR120H uses a heat exchanger for sub-cooling the liquid CO2, enabling a higher utilization of the liquid CO2 and a better liquid to solid CO_2 ratio.
The machine parts are protected by a moisture-free enclosure, which also reduces the noise level to a minimum - below 75 dB(a). The Cold Jet PR120H provides a non-stop supply of high-density dry ice pellets. The source of raw material to produce pellets is liquid carbon dioxide conserved at low temperatures in a storage tank.
The control system of the Cold Jet PR120H, based on Beckhoff Industrial PC and HMI system, offers maximum functionality and a user-friendly interface. Production is started by pressing one button. Just-In-Time production minimizes labour and waste during production.


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SYSTEM DESCRIPTION

This user's manual covers the Cold Jet PR120H. The main parts are described in the machine structure section. Operating instructions for add-ons can be found in separate instructions, and are not included in this manual.

Functional description

The main function of the Cold Jet PR120H is to produce dry ice pellets from liquid carbon dioxide.
This is performed by a sequence of operations executed by the Beckhoff Panel PC. The main steps in a normal production are as follows and refer to PI diagram P294-1-11991-B for Cold Jet PR120H CE and P294-1-16309-A for Cold Jet PR120H UL:

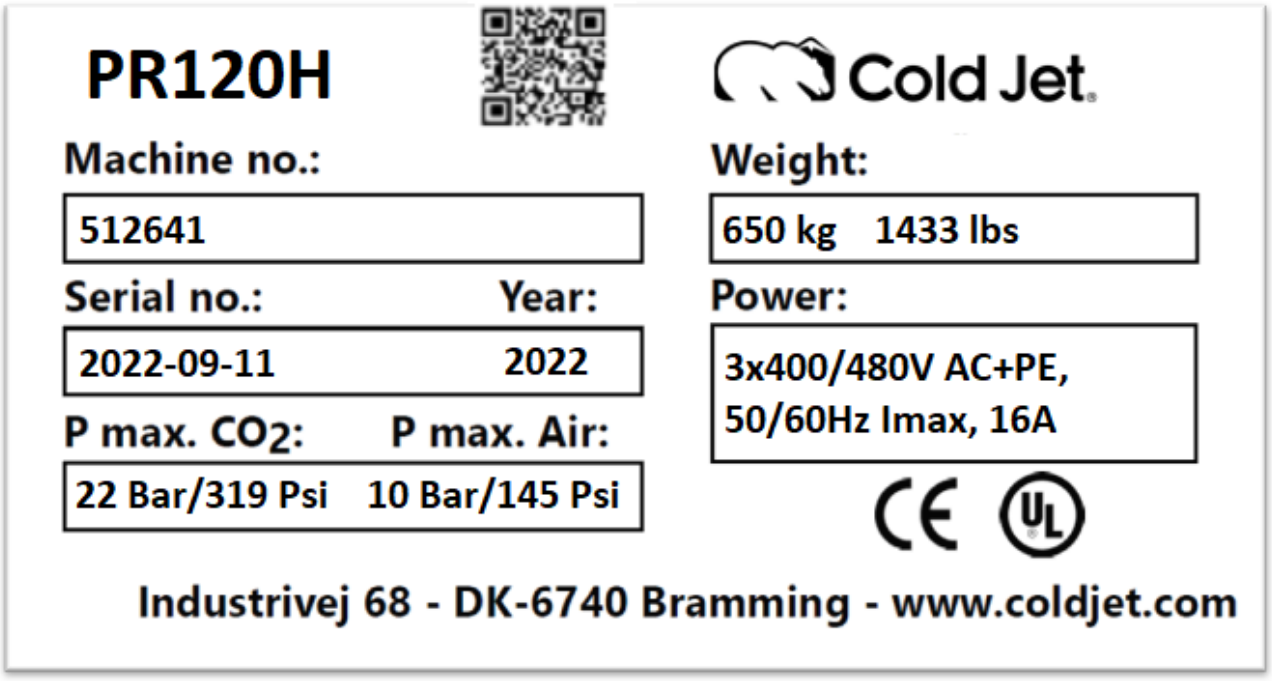
1. **Start up**
2. **Production**
3. **Standby**
4. **Shut down**

At every start-up, the hydraulic cylinder =G01-G1-MO1 for extruder piston is extracted to its maximum position to extrude the CO2 snow in the chamber in case of emergency stop or machine error.
Liquid CO2 is fed from an external CO2 tank (not part of this description – see supplier information) through an insulated pipe to the Cold Jet PR120H. It is recommended to use a gas separator to eliminate gaseous CO2 from the liquid CO2.
When the hydraulic cylinder =G01-G1-MO1 for the extruder piston is retracted CO2 in valve =W01-Q1 and injection valve =G01-Q2 will open and purge gaseous CO2 through the chamber, degassing filters and via degassing pipes to CO2 out.
When temperature =W01-TT1 in the liquid CO2 is -14°C, first injection will begin using =G01-Q1 and proceed until the timer is reached. The degassing valve =G01-Q5 on the extruder chamber will open to reduce chamber pressure before the hydraulic cylinder =G01-G1-MO1 for the extruder piston will extract until pressure set point is reached and the hydraulic cylinder will again retract. This will continue until plug thickness set point is reached. When plug thickness is reached, production will commence.
In production mode CO2 In valve =W01-Q1 and the Injection valve =G01-Q1 will open until the timer is reached. The degassing valve =G01-Q5 on the extruder chamber will open to reduce chamber pressure before hydraulic cylinder =G01-G1-MO1 for the extruder piston will extract until plug set point is reached and the hydraulic cylinder will again retract. This cycle will continue until a different step is selected. During production, it is possible to set Cold Jet PR120H in standby. When maximum standby time is reached, the Cold Jet PR120H will run a shutdown sequence.
The shutdown sequence ensures that the Cold Jet PR120H is stopped in a proper position to empty extruder chamber from dry ice snow and avoid moisture in the extruder chamber. The hydraulic cylinder =G01-G1-MO1 for extruder piston will extract to maximum position and return to shutdown set point position.
The PR120H is supplied with a cap to be installed on the outlet sprout at production stop. This will hinder dew from condensating inside the extruder cylinder and filter. If the cap is not installed at production stops, it can cause damage to vital components inside the extruder unit. Before production start-up, the cap should be removed.

Color detection of the lighthouse

Green: Machine is ready and there are no alarms (error messages).
Yellow: Machine has been paused.
Red: Machine out of operation due to an alarm (error message).

System identification
The machine is double marked with EU and UL approval.



Example of a system identification, values and numbers may vary

Supplier responsible for the equipment

Cold Jet ApS
Industrivej 68
DK-6740 Bramming
Denmark
Phone: +45 75 56 15 00
Homepage: www.coldjet.com
Email: info@coldjet.com

TECHNICAL DATA - SAFETY REGULATIONS

Rated Output:
Kg/h: up to 120 / lbs/h: up to 265
Of high quality dry ice pellets, depending on the extruder plate applied

Pellet Size:
Diameter:
Mm: 3 - 10 or 16 / Inch: 1/8 – 3/8 or 5/8

Cylindrical - length varying from:
Mm: 50 to 100 / inch: 2 to 4

Inlet Liquid CO2 Pressure:
Bar: 16 – 22 / Psi: 232 – 319

Liquid CO2 Dryness Fraction:
The water content should not exceed 35 ppm and should not be less than 5 ppm – or equivalent to a dewpoint Temperature of -66°C to -51°C (-86.8°F to -59.8°F).
NOTE:
The liquid CO2 supply must be completely free of oil and must have a purity of minimum 99.9%.

Liquid CO2 Supply Pipe:
Internal dia. 20 mm (3/4 inch), very well insulated with a minimum number of bends and fittings.
NOTE: If over 20 m (65.6 feet) in length, always use an internal dia. of 25 mm (1 inch).

Compressed air / CO2 gas pressure:
Bar: 8 – 10 / psi: 116 – 145
Air quality Class 3 – according to ISO 8573-1

Power Supply:
3 x 400 V AC + PE, 50Hz,
TN-S Earthing system
Imax. 16 A
480V AC Solidly Grounded Wye Source
3 Phase + GND wire, 60Hz
Imax. 16 A
Control Panel SCCR: 25kA rms symmetrical 480VAC Max.

Rated power:
8,3 kW / 10,7 Hp

Machine Dimensions:
Length: 1150 mm / 45,3 in
Width: 650 mm / 25,6 in
Height: 1738 mm / 68,4 in
Weight: 754 kg / 1662 lbs
Noise level: below 75 dB(a)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SAFETY REGULATIONS

General Measures
The Cold Jet PR120H manual contains instructions on starting up, operating and servicing the machine. The operator must follow the instructions in the manual. Moreover it is important that the owner makes sure that the operator understands the contents of this manual and follows its guidelines and safety regulations.

Personnel Qualifications
Employees, who are in charge of mounting, operation, service and maintenance must be adequately qualified to take care of such job functions.

If the employees do not possess sufficient knowledge, they must be instructed and trained properly. If necessary, this can be arranged in cooperation with the manufacturer of the machine.
The owner of the machine shall make sure that the operator, who is to work with the Cold Jet PR120H, fully understands the importance of studying the content of the manual and complying with the SAFETY REGULATIONS described on the following pages as well as those placed on the machine.

Security and Risk
The Cold Jet PR120H is designed so as to comply with the EC Declaration of Conformity for Machinery. Therefore, using the machine does not pose a risk to the operator when the instructions in this manual are followed carefully.
It is important that the operator carefully follows the safety signs on the machine and the safety regulations described later in this manual and that the operator reads and understands the content of this manual before starting up the machine. Installation must be carried out according to the instruction ”Unpacking and preparations before installation”.
The machine may only be installed by authorized personnel, that is electricians with knowledge of the Council Directives BT 2014/35/EU and EMC 2014/30/EU (or similar directives in other parts of the world).

Safety Labels

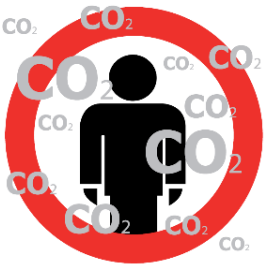
The symbols used on the machine were developed by the International Organization for Standardization (ISO) and are defined below. These symbols may include yellow warnings triangles, blue mandatory action circles, or red prohibited action circles.

Danger of Suffocation

Dry ice pellets are CO_2 in solid form. At ordinary atmospheric pressure, CO_2 can only exist in this solid form at temperatures of -79°C (-110°F) or lower. Therefore, during dry ice production, the CO_2 will immediately be heated and thus transform from solid form into gas form.

Please note:

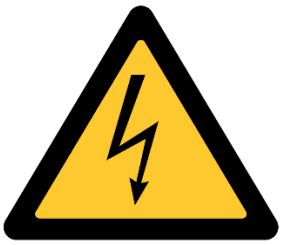
Since the specific gravity of CO_2 is higher than that of ordinary atmospheric air, the air with its contents of oxygen will be replaced by CO_2 if the dry ice production is taking place in small or insufficiently ventilated rooms.



Therefore, please note the following:

1. Low CO_2 concentrations (3-5%) may cause headaches and rapid breathing.
2. CO_2 concentrations of (7-10%) may cause headaches and nausea and may result in unconsciousness.
3. Higher CO_2 concentrations will result in unconsciousness and suffocation.

High CO_2 concentrations may result in unconsciousness due to the displacement of oxygen. Therefore, always provide sufficient ventilation of the working area, and avoid producing dry ice in small rooms.



Static Electricity

Dry ice can cause electrostatic discharges. However, the equipment is bonded to the ground to minimize electrostatic discharge, and the warning sign is meant to instruct the operator to avoid placing the equipment in rooms containing explosive gasses.

It is recommended to use a plastic shovel in the dry ice container.

Danger of Congelation

CO_2 in solid form has a temperature of -79°C

/-110°F or lower at atmospheric pressure and can therefore cause serious congelation injuries.

IMPORTANT!

The dry ice is extremely cold, therefore, do not touch parts of the machine, which are in direct contact with the dry ice without wearing appropriate protective clothing and gloves.

Pinch Point Hazard

If the plexiglass covers in front of the extruder plates are removed, the operator will be exposed to pinch point hazards.

Wear Protective Gloves

While working with the conveyor system, the operator must wear protective gloves to avoid contact with the dry ice or with parts of the machine which are in direct contact with the dry ice.

How to Lift / Transport

1. The PR120H is supplied with thread holes for lifting eyes. Always use lifting eyes to lift the PR120H.
2. Always lift the Pelletizer according to the lifting Instruction in this manual.
3. Lifting over persons and animals is prohibited.
4. Always use a forklift truck to transport the Pelletizer.
5. Pick up the Pelletizer from the side as shown in the drawings.
6. Transport the Pelletizer upright.
7. Make sure that the forks are sufficiently long to fully engage the Pelletizer.
8. Always check that the forks are adjusted to maximum width.

SAFETY OPERATION

Emergency stop
All equipment is connected to the general emergency system for PR120H.
When an emergency-stop device is activated, all components located in the emergency zone will be disconnected from their power source.

Machine safety
There are machine safety measures in the following areas:

- Extruder unit
- Extruder plate changer

In these areas, protective covers are in place.
The covers are provided with locking screws to deter removal.

Required performance level PLr = c Implemented in category = Cat3.

There is a danger of congelation/frost bite by touching machine parts cooled down by dry ice.
To prevent congelation the entire machine enclosure is provided with locks that require special tools to open.

Liquid CO2 Leakage
If liquid CO_2 is leaking from any point of the CO_2 pipe system, the CO_2 supply must be stopped immediately. Localize the leakage and repair.

Stop Production

1. The machine is stopped by pressing the "Start / Stop" button.

NOTE: This will activate the shutdown procedure.

2. The CO_2 valve on the machine inlet will automatically close. It is recommended to close the manual valve on the mounting kit before leaving the machine unused for a longer period of time.
3. Cut off the main electric supply.

NOTE:
Do not shut off the main switch on the cabinet inside the machine before the inlet CO_2 pressure is ZERO. The CO_2 pressure can be checked on the "Process values" page.

Daily checkup before start-up

1. Check the oil level in the sight glass.
2. Check the pipe system for leaks.
3. Check the operation time since service intervals.
4. Open the drain and drain all water from the frame, then guide any remaining towards the open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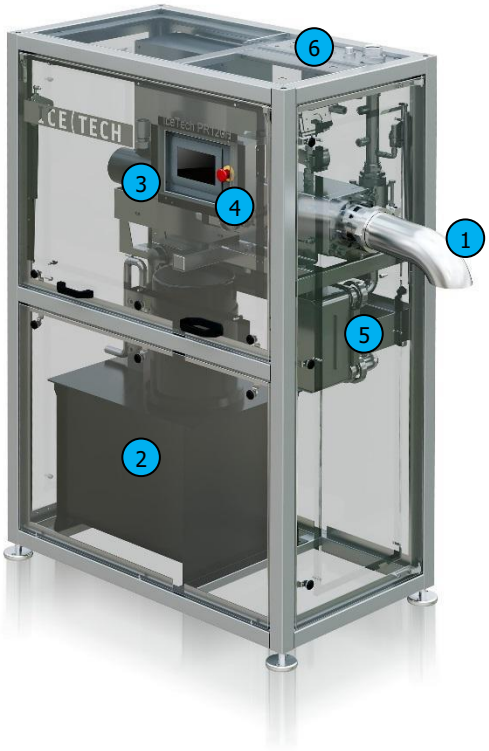
MACHINE STRUCTURE

PR120H



1 Pellets outlet sprout
2 Hydraulic station
3 Main hydraulic cylinder
4 Touch panel
5 Heat exchanger
6 Connection to external supply

PR120H

1 **Make sure that the CO_2, power supply and exhaust CO_2 pipe are connected. Open ball valves for liquid CO_2 supply and degassing.**

2 **Turn the MAIN SWITCH on.**

3 To start up the Cold Jet PR120H, select the "Automatic mode" and press the "Start" button.

MACHINE CONTROLS

PR120H

1 Start up page

This page can be activated from any page by pressing the "Home button" in the lower right hand corner.

2 Start /Stop

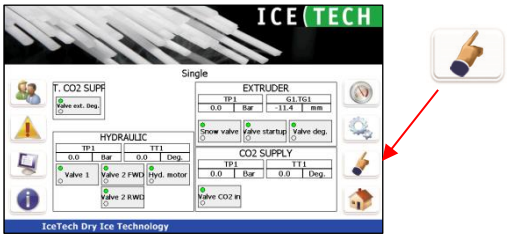
By activating the "Start / Stop" button, the machine starts or stops when in group mode.

3 Mode select

By activating the "mode select" button, it is possible to choose between automatic mode and single mode. The default selection is automatic mode, which must be selected for production. In single mode, the components can be operated individually.

4 Single mode controls

By activating the "Single mode" button, the manual operation page will appear. On this page, it is possible to access the function in single mode, i.e. operating the components one by one.

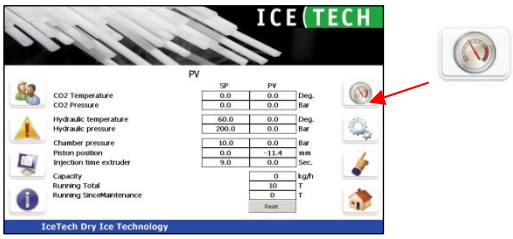


This page should only be operated by well-trained staff and with reference to P&I diagram.

The components will be activated by pressing the buttons. When the component is activated and working properly, the button will turn green showing "Component OK".
Most components have real names like "purge valve" and moving the hydraulic cylinders can be done by starting the hydraulic motor and pressing the arrow buttons.
The hydraulic valves have numbers corresponding to the P&I diagram.

5 Set point

By pressing the "toothed wheel" button, the "Setpoint" (SV) page is activated.
The "set point" section contains 3 pages display of set values for the current dry ice production. Fixed set points are password protected and have hardcoded limits to avoid unsafe production.



6 Process values

By pressing the "gauge" button, the "process values" page is activated. The page contains a 2-column display of real time process values (PV). The corresponding "Set Values" (SV) are displayed next to the PV for comparison. During production, the PV will vary inside the given SV window.
The operating hours, time to service calculated capacity is also displayed on this page.

7 Alarm

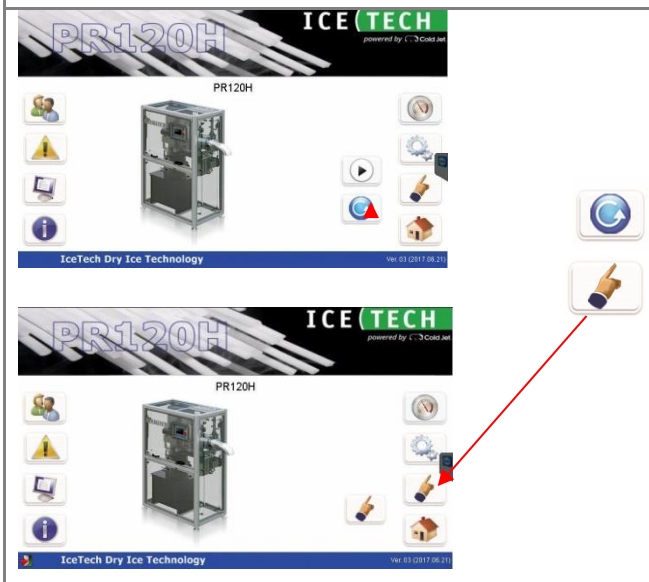
The Alarm page displays alarms for PR120H. By pushing the "Alarm" button, the active alarms are shown on the screen. The alarm text will be written in red.

Alarms must be reset before the production can continue.

To reset an alarm, press the reset button. If the error is corrected, the alarm text will be removed.

8 Password protection

Some functions are password protected, ie. setpoints.
To change these values, the operator must login.
By activating the "User" button, a login window and a keyboard appears on the screen.
Select the user level and enter the corresponding password.
Press OK to proceed and cancel to exit.



9 Shutdown before turning power off.

When machine have finished production and there is a need for shutting down machine and turn power off it is needed to follow this procedure.

Press mode select icon once and it changes into single mode.

In the bottom left on the screen there is now an active icon (exit door), press this icon once.

Now the HMI program will shut down and after this the Windows program will shut down. The screen will turn black with the text – It is now safe to turn off.
The power can now be turned off on the main switch on the electrical cabinet.

Note

In general, it is recommended leaving the machine with the main power on and avoiding turning the power off direct on the main power switch.
This is for protecting the PLC computer not wearing out, due to sudden power cut off.