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Operator's Manual

IC 030

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Your dry ice blasting machine

			
ICS ice cleaning systems, s.r.o., Robotnícka 2192, 017 01, Považská Bystrica, Slovakia			
Name:	Dry ice blasting machine	Type:	IC-030
Ser. number:		Manuf. date:	
AC volts:	100-240V 50/60Hz	Weight:	40 kg
Amps:	3 A	Pressure max:	10 bar
SSCR:	10 kA	MADE IN SLOVAKIA	

Your Contact at ICS:

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Introduction & Copyright

The purpose of these operating manual is to explain safe and trouble-free operation of the dry-ice blasting machine IC 030.

All personnel working with the machine are obliged to read the manual and familiarize themselves with the commissioning of the machine.

Please keep the operating instructions available at all times.

Failure to follow the procedures outlined in this manual can have serious consequences for persons and the machine itself. Operator is obliged to strictly follow the prescribed procedures.

Any change in use requires written consent of ICS ice cleaning systems s.r.o.

The machine manufacturer is not liable for damage caused by the machine due to:

- failure to comply with the operating instructions;
- improper use or handling with the IC 030;
- repair or maintenance carried out by unauthorized persons;
- installation and replacement of non-original ICS parts;
- non-compliance with requirements for compressed air.

Copyright of this manual belongs to ICS ice cleaning systems s.r.o. (ICS). This operating manual is intended for operating personnel. It contains instructions and images which may not be assigned to a third party without written permission.

We will be happy to receive your suggestions and comments on how to improve the system at ICS.

Depictions of dry-ice blasting equipment in the manual may contain details that are different from the current product line. Depicted is the optional equipment supplied for an extra charge.

Process description

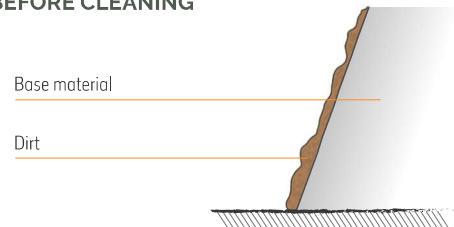
Dryice blasting equipment IC 030 works with dry ice pellets (Ø 3 mm), which is produced by pressing CO₂ snow.

The dry ice pellets contained in the hopper (Ø approx. 3.0 mm) are sucked in by a dosing system, transported by a hose, mixed in the blasting gun with a stream of compressed air and accelerated through a nozzle.

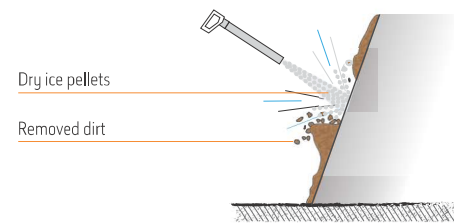
Dry ice pellets accelerated by compressed air hit the surface to be cleaned almost at the speed of sound.

The contamination on the surface is locally undercooled and brittle cracks are formed due to the different coefficients of expansion of the carrier material and the contamination. Secondary CO₂ granulate penetrates these fragile cracks and sublimates at the moment of impact. In this phase transition from solid to gas without a liquid phase (sublimation), the volume of CO₂ increases up to 700 times. The adhering dirt is peeled off.

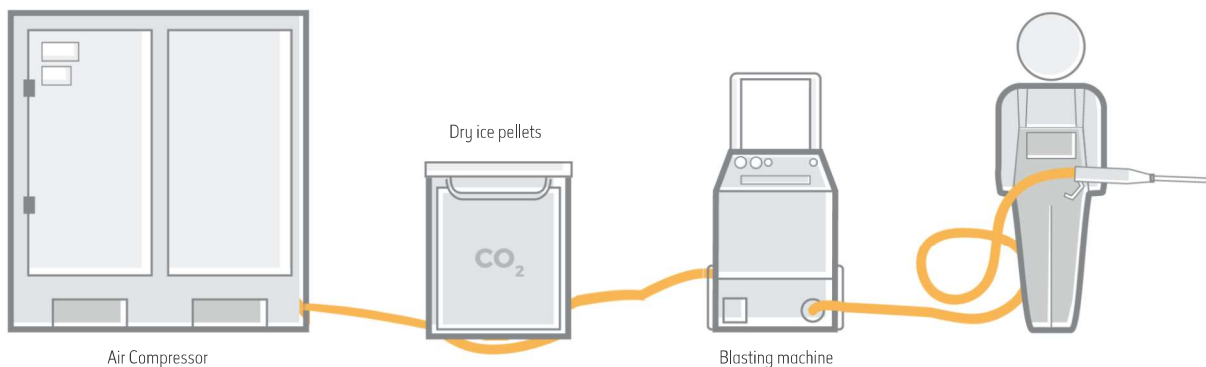
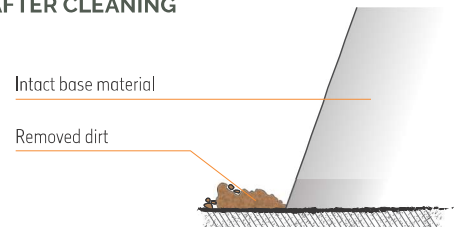
BEFORE CLEANING



DURING THE CLEANING PROCESS



AFTER CLEANING



Technical data of the IC 030

Length:	723 mm
Width:	332 mm
Height:	966 mm
Weight:	45 kg (without blast hose)
Working pressure:	min. 1 bar - max. 10 bar
Hopper capacity:	6,2 kg standard
Consumption of dry ice:	2-53 kg/h
Compressed air consumption:	0,3 m ³ /min- 2,5 m ³ , depending on the combination of nozzle and pressure used
Compressed air requirements:	The air must be clean, dry, free of oil and foreign particles. Lowest permitted quality of press. air ISO 8573-1:2010 [1:4:1]
Connection to the press. air:	Cross coupling DIN 3489
Mains connection:	100-240V, 50/60 Hz, CEE 7/4 (typ F)
Noise level:	60-120 dB(A), depending on pressure, nozzle combination and surface of the object to be blasted



Safety equipment

BEI BETRIEB / DURING OPERATION / EN COURS DE FONCTIONNEMENT / 使用上の注意						
<p>WARNUNG / BEWARE ATTENTION / 注意</p> <p>VERLETZUNGSGEFAHR DURCH CO₂ DANGER OF INJURY THROUGH CO₂ RISQUE DE BLESSURE PAR LE CO₂ バレットによる怪我に注意</p>	<p>WARNUNG / BEWARE ATTENTION / 注意</p> <p>Sauerstoff / Oxygene / Oxygène / 酸素 CO₂ CO₂ ERSTICKUNGSGEFAHR DANGER OF SUFFOCATION RISQUE DE SUFFOCATION 酸欠・CO₂中毒の 恐れあり</p>	<p>WARNUNG / BEWARE ATTENTION / 注意</p> <p>ELEKTROSTATISCHE ENTLADUNG ELEKTROSTATIC DISCHARGE ÉLECTROSTATIQUE 静電気に注意</p>	<p>WARNUNG / BEWARE ATTENTION / 注意</p> <p>VERBRENNUNGSGEFAHR EISTEMPÉRATUR -79°C DANGER OF INJURY ICE TEMPERATURE -79°C RISQUE DE BRÛLURE TEMPÉ- RATURE DE LA GLACE -79°C ドライアイス (-79°C) 取扱注意</p>	<p>WARNUNG / BEWARE ATTENTION / 注意</p> <p>SICHT- UND GEHÖRSCHUTZ TRAGEN USE EYE AND EAR PROTECTION UTILISER IMPÉRATIVEMENS DES PROTECTIONS POUR LES OREILLES ET LES YEUX 保護メガネ、耳栓着用厳守</p>	<p>WARNUNG / BEWARE ATTENTION / 注意</p> <p>HANDSCHUHE TRAGEN WEAR GLOVES PORT DE GANTS OBLIGATOIRE 手袋着用厳守</p>	<p>WARNUNG / BEWARE ATTENTION / 注意</p> <p>ARBEITSKLEIDUNG MIT LANGEN ÄRMELN TRAGEN WEAR LONG SLEEVED INDUSTRIAL CLOTHING PORT OBLIGATOIRE D'UNE COMBINATION A MANCHES LONGUES 長袖の作業着を着用</p>
<p>BEACHTEN SIE ALLE HINWEISE IM BEDIENHANDBUCH / ADHERE TO ALL INSTRUCTIONS IN OPERATING MANUAL / TOUTES LES INSTRUCTIONS DANS LE MANUEL 取扱説明書を必ず一読して下さい。</p>						

Before starting work, care should be taken for the kind of dirt and object to be cleaned, so that you can optionally take further safety measures, e.g. full protection.

For a safe operation of a dry-ice blasting unit you always need the following protecting equipment:

1. Safety glasses
2. Ear protection
3. Long-sleeved working suit
4. Protective gloves
5. Dust mask
6. Safety shoes

Attention!

In poorly ventilated areas, the elevated concentration of CO₂ can lead to breathing difficulties and suffocation. Therefore, you should always care for sufficient fresh air in confined spaces (exhaust and fresh air).

When cleaning in silos, tanks or confined spaces, also ensure adequate air circulation or use, in addition, a breathing mask, which has an activated carbon filter interposed in the air supply line.



Caution!

When working with dry ice, the safety data sheet of the supplier has to be observed. Make sure that only dry ice can be found in the recipient. Always use gloves when handling dry ice, otherwise it may cause cryogenic burns.

The dry-ice temperature is -79°C .



You always have to make sure that there is enough fresh air in the room, because CO_2 in gaseous state replaces the oxygen from the room.

Failure to observe this indication may represent a danger to life!

The maximum allowable concentration (maximum allowable concentration in 8 hours of work) is of 5.000 ppm.

A CO_2 concentration of 8-10% (v/v) in the air is fatal!

Note: 1 kg dry ice pellets sublimates into about $0.5\text{m}^3 \text{CO}_2$ when blasting.

Attention!

Observing safety precautions when using the dry-ice blasting machine IC 030 is very important the operator and all persons involved.

It is necessary to ensure that the machine IC 030 is only plugged into the correct socket, in perfect condition, corresponding to the data on the nameplate. The supply cable must be secured to prevent damage to the machine during use.

Always pull the mains plug and depressurize the system before working on the IC 030.

The cables and the blast hose must be free of any damage. Once connected to the compressed air source, slowly open the inlet valve. From this point on, the device IC 030 is under pressure and must under no circumstances be left unattended.

The dry ice shall not be kept in the hopper for more than 15 minutes, in order to avoid the freezing of the IC 030 equipment.

Still, if the hopper freezes, it has to be emptied manually. It is not allowed to press it with an object in order to loosen the ice pellets, because the dosing plate can become damaged.

The very high speed of the pellets can cause injuries. Therefore, blasting towards people or animals is prohibited. Never stretch your hand towards the blast, high risk of injury! Make sure that in the working area no unauthorised personnel is allowed.

The IC 030 has to be operated only by qualified personnel and after a detailed training, in order to avoid as much as possible the hazard potential and to ensure a smooth workflow.

The operator undertakes to use the IC 030 equipment only when it is in perfect condition and to immediately remedy any kind of damages.

When using the IC 030 the local standards relating to security and accident prevention shall always apply.



Caution!

The blasting procedure shall not be carried out in areas with explosive air mixtures.



High electrostatic charges can develop. Always pay attention that the object which has to be cleaned should have earthing and this earthing should not be removed during the cleaning process. The IC 030 is provided with earthing from the gun, to the hose package up to the power plug.



The user should always wear safety footwear class S2 or higher in order to protect himself from the static charge.

Persons having a pacemaker are not allowed to work with the IC 030.



Operation of the IC 030



Attention!

Even after emergency stop switch is pressed, the machine remains energized and pressurized with compressed air!



When the main switch (1) is switched on, the IC 030 is activated and fully ready for dry-ice blasting. The emergency switch (2) immediately switches off all machine functions.

The pressure regulator (3) can be used to regulate the working pressure in the range of 1-10 bar.

The pellet and ground fraction controller (6) can be used to continuously regulate the pellet usage in the extent of 2-53 kg/h.

Connecting the IC 030

Connections and components on the back of the machine

The **blast hose connection** (13) is sealed on the cone and the hose can be fitted or removed with a fork wrench 24.

Insert the **electrical connector** (12) into the socket and turn it clockwise to lock the connector. To pull the connector out push the silver latch, turn the connector counterclockwise and pull out.

In case of static electricity problems, ground the device with **the grounding terminal** (11).

Connect the compressed air hose to the **cross coupling** (14) by turning clockwise until it clicks twice. To disconnect the compressed air hose, press the hose coupling without pressure towards the machine by turning to the left until the coupling disconnects.

Insert the **light power** connector (10) into the socket and turn clockwise to lock the connector. To pull the connector out, push the latch, turn the connector counterclockwise and pull out.

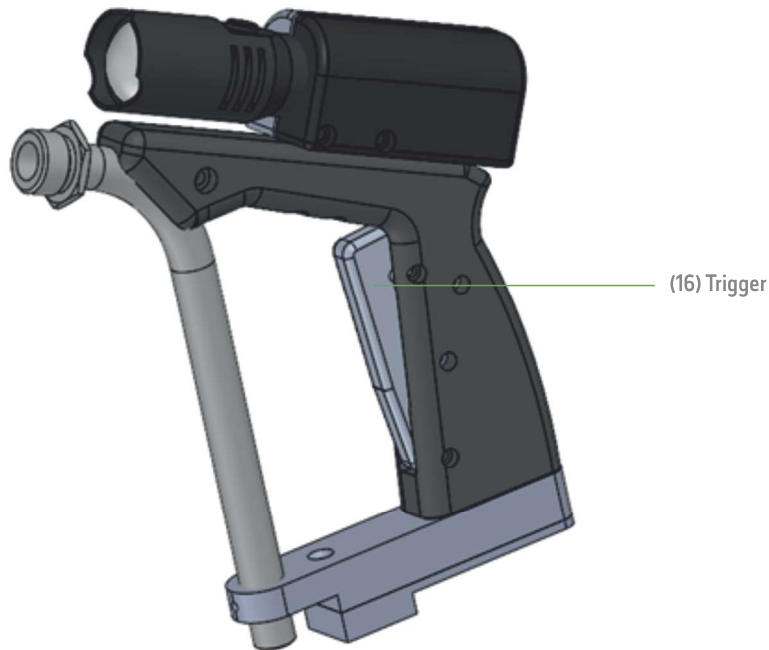
Slide the **blasting gun control connection** (14) into the socket and secure with the hex nut.

Attention!

The device is energized even after the main switch has been switched off!



Blasting gun control



To start blasting, push the trigger (16) towards the handle. When blasting is complete, simply release the trigger (16), the trigger will return itself to the starting position.

Attention!

Always make sure you hold the gun securely and firmly in your hand so that you do not endanger yourself or others.



Commissioning

To start up the dry-ice blasting machine IC 030:

1. Connect the air hose to the cross coupling (15) on the rear of the machine and then to the compressed air source.
2. Plug the power cord into the power socket (12) on the back of the machine and then into the appropriate socket.
3. Connect the blast hose - position (13). Connect the power supply to the light (10) and the blast hose control connection (14).
4. Press the Main Switch (1) on the control board.
5. Open the compressed air valve slowly!
6. Set the pressure regulator (3) to the desired value.
7. Set the pellet and ground fraction consumption or ground fraction consumption with the pellet and ground fraction controller(6).
8. Point the blasting gun into the floor and blast for approximately 10 seconds to remove residual moisture from the system. Fill the hopper (9) with dry ice and close the cover to prevent foreign bodies from entering the hopper.
9. The IC 030 is now ready for operation.



The moving parts of the machine are protected by a non-removable barrier located in the hopper neck.

Attention!

Do not insert objects or limbs into the hopper before or during work, there are moving parts in the hopper!

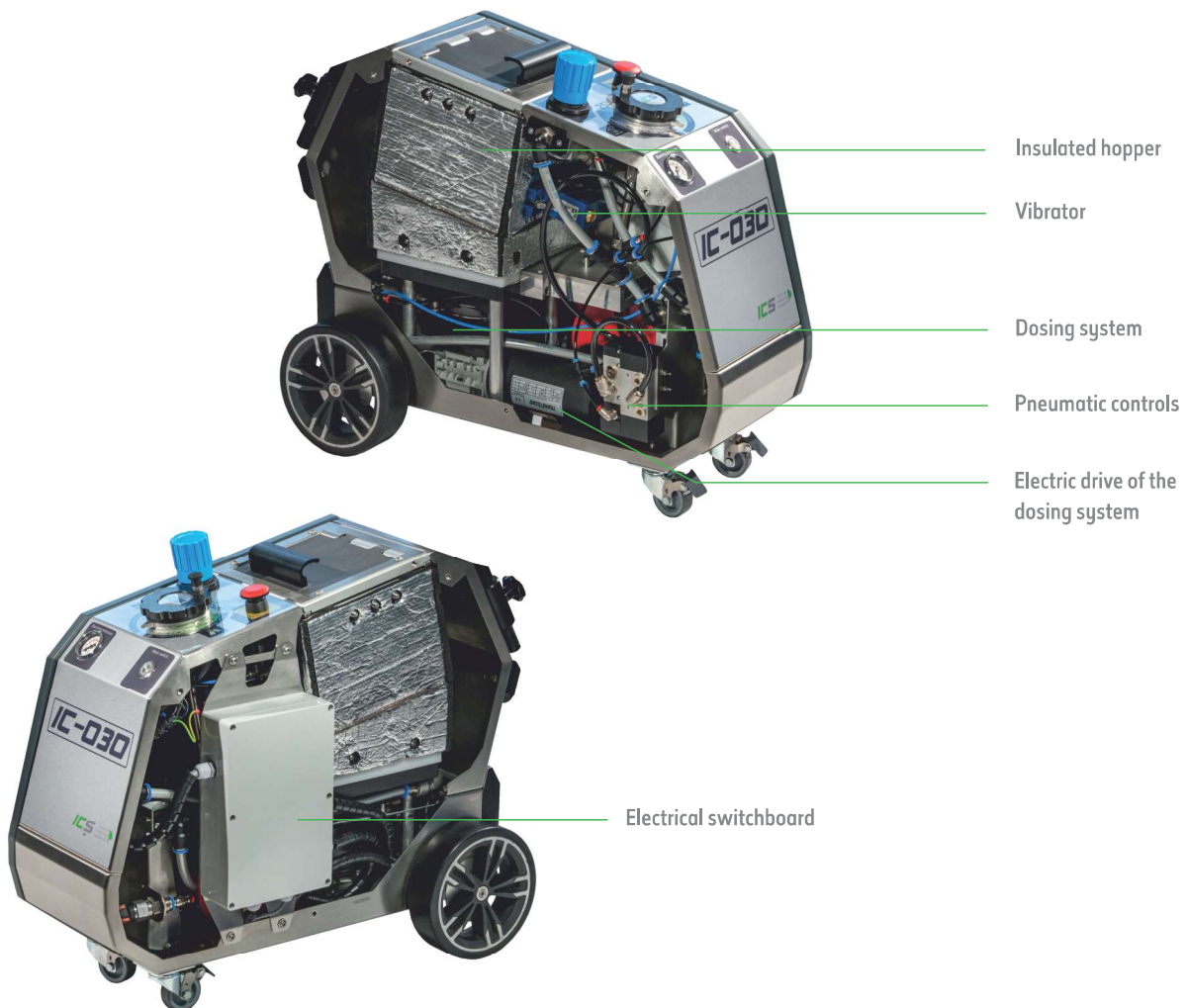


Finishing the work

When the blasting is complete, proceed as follows:

1. Blast until the hopper (4) is empty.
2. Close the compressed air valve.
3. Press the trigger (16) of the blasting gun to empty the compressed air from the system.
4. Press the main switch (1).
5. Pull the mains plug (12) and disconnect the compressed air hose (15) from the machine.
6. Disconnect the blast hose (13/14/10) and roll it.

Internal machine components



Transport

To simplify the transport of the machine from one workplace to another within the same company, the machine is equipped with a handle (7 / see page 10). When transporting between facilities, transport the IC 030 with the rolled up blast hose on a pallet secured with straps.

After removing the fixing screw (8 / see page 10) and the handle (7), the device is ready for transport.

Repair & Warranty

All work, including inspection and repair, special work on safety parts of the equipment may only be carried out by ICS technicians, or a person who has received special training in the maintenance of dry-ice blasting machines and accessories from the company ICS.

Any repairs during the warranty period are provided by ICS preferably after mutual coordination. Spare parts that are subject to warranty will be delivered to the customer either at our company or sent to his address. Transport costs, travel costs, accommodation costs, dismantling and reassembly costs are charged to the customer.

To qualify for warranty, the equipment or replacement part must be sent to ICS.

Warranty conditions

The warranty shall be extinguished in the following cases:

- The IC 030 is used in a manner other than that specified in the operating instructions.
- Spare parts other than the original have been installed in the machine.
- Work on the IC 030 was carried out by unqualified persons.
- A medium other than dry ice pellets was used in the work.
- Requirements for compressed air had not been met during operation.
- For rubber parts and normal wear and tear, e.g. wear and tear on the blast hose, metering plate, etc.

Any unauthorized changes to the IC 030 are grounds for immediate cancellation of the warranty claim! The warranty period is 12 months from the date of sale.

Compressed air requirements

Compressed air is crucial for effective dry ice blasting results. The compressed air must be dry, clean, oil-free and free of foreign particles. The min. quality requirements for compressed air shall comply with ISO 8573-1: 12010 0

Parts = Class 1= 0,1 mg/m³

Water= Class 4= DTP 3°C

Oil = Class 1= 0,01 mg/m³

Pressure range of the IC 030 ranges from 1 - 10 bar and the compressed air quantity from 0,3 – 2,5 m³/min.

Maintenance

Thanks to the simple design, the IC 030 maintenance costs are minimal. The IC 030 must be serviced regularly after 1,000 hours of operation. We recommend concluding a service contract with ICS Ice Cleaning Systems s.r.o., or with another authorized person.

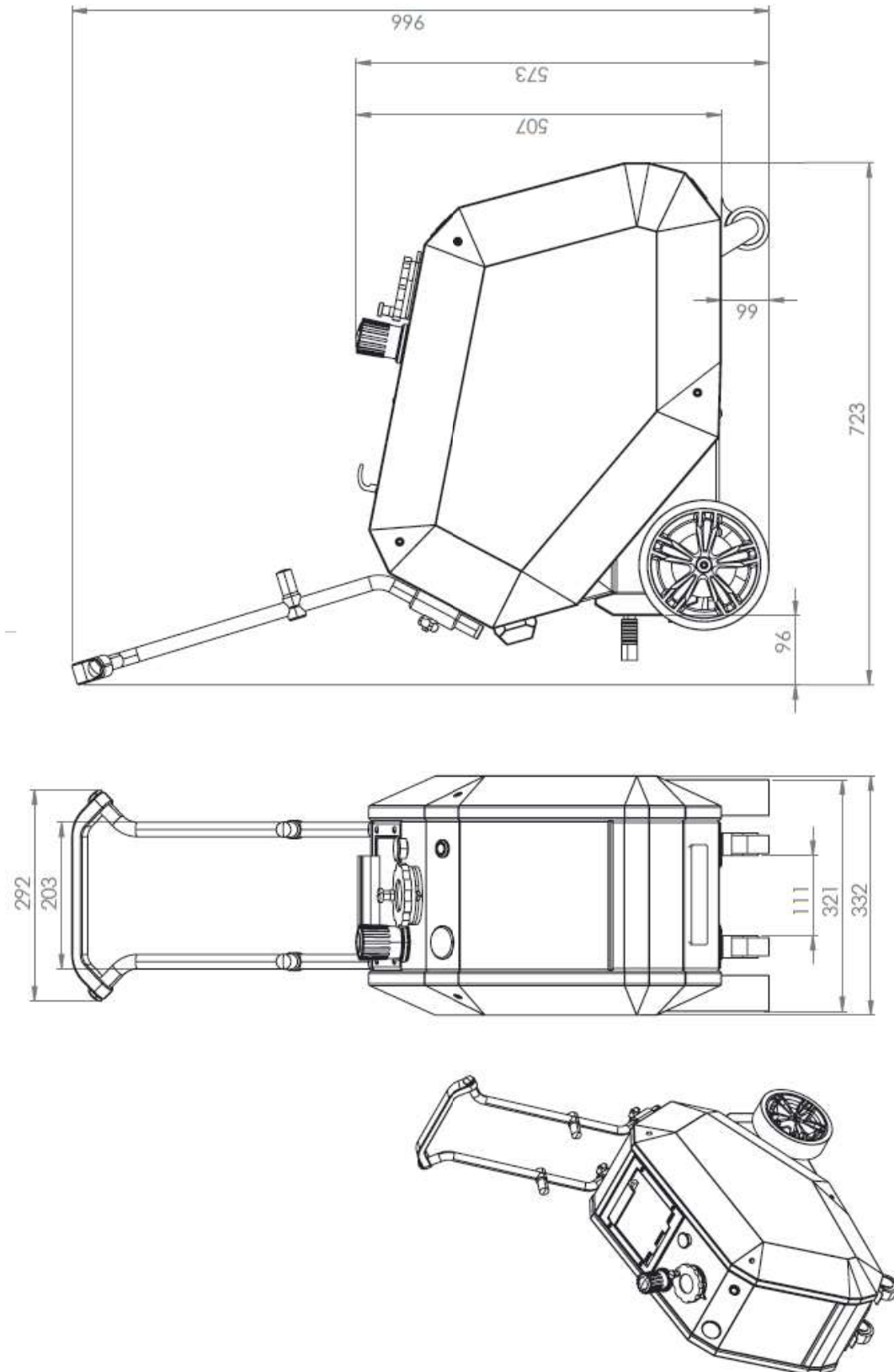
Maintenance plan of the IC 030 every 1,000 operating hours.

1. General visual inspection of covering, welds, chassis, wheels, bolts.
2. If a complete cleaning is needed both internal and external.
3. Check the functionality of the inlet pressure regulator.
4. Cleaning of the separating filter.
5. Inspection of pneumatic components, checking the tightness of the pneumatic assembly
6. Complete inspection of electrical components, including voltage transformer, electric motor, checking for proper fitting and fixing of electrical components
7. Dosing system inspection - wear, functionality, tightness
8. Vibrator check - functionality, fit
9. Inspection of the release system - electro-pneumatic control, wear, functionality, safety
10. Checking the blast hose - wear, functionality, tightness
11. Connecting components such as electrical connectors, pneumatic couplings - damage, functionality, safety.
12. Blasting gun - functionality and safety check
13. Blast nozzle - check for wear, presence of cracks
14. Pressure and safety test
15. Functionality test

Troubleshooting

Problem	Description	Remedy
The machine cannot be turned on	The main switch light is on, the device does not respond when the trigger is pulled	Release the emergency switch by turning
The machine does not start	After pressing the trigger of the gun, the machine does not respond	Check that the control cable is connected
No air goes into the gun	The device works, but no compressed air goes into the gun	Check the connection to the compressed air supply and set the desired pressure value
No ice coming out of the nozzle	When the trigger of the gun is pulled, only compressed air comes out of the nozzle and no ice	Pour dry ice into the hopper, set the quantity to min. 1. grade of pellets or ground fraction

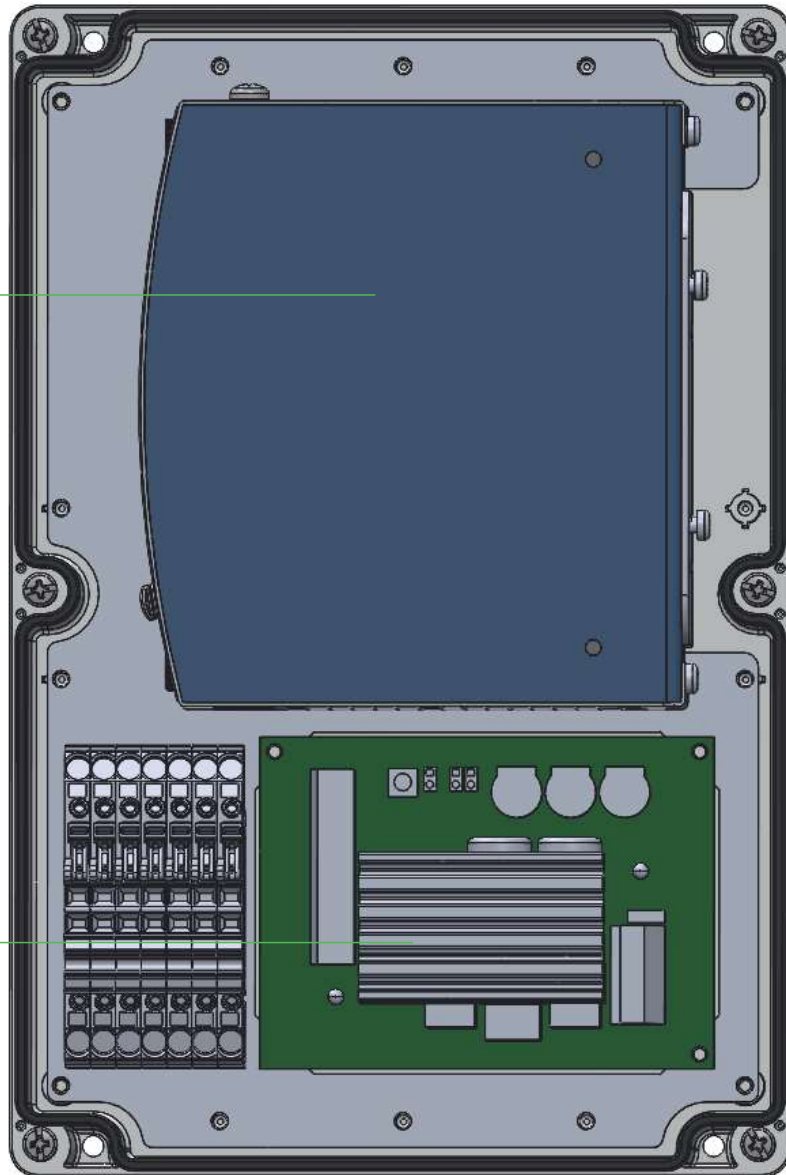
Technical drawing

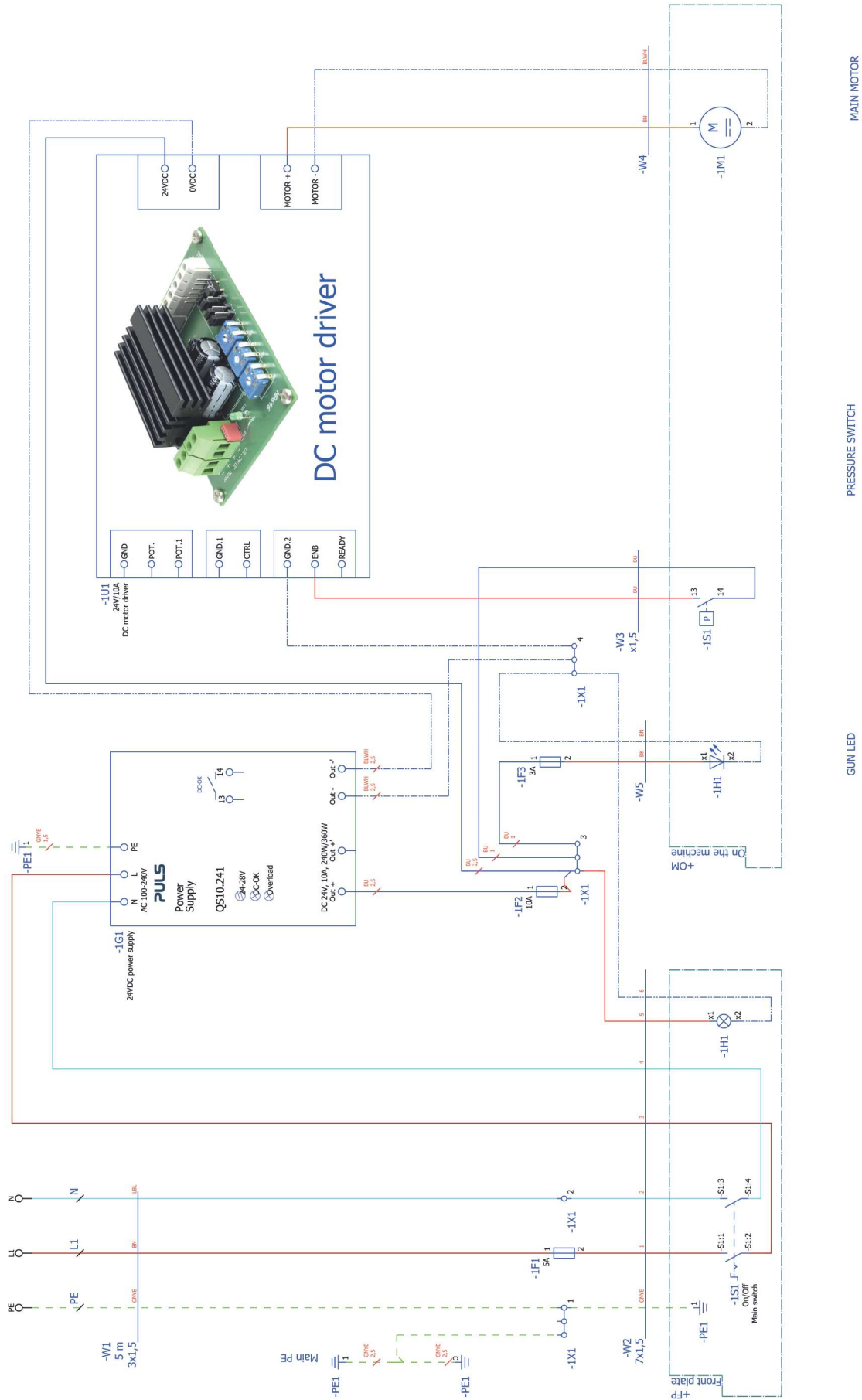


Electrical Components

-1G1
24 VDC
POWER
SUPPLY

-1U1
24 V/10A
DC MOTOR
DRIVER

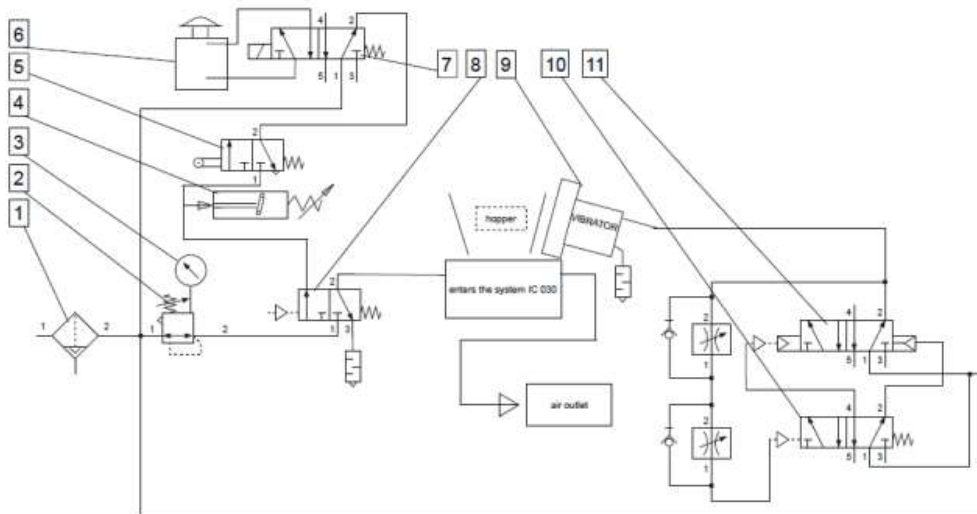




Electrical components list

Designation	Component name	Component No.	pcs.
-1S1	ON/Off switch	520761	1
-1G1	24VDC power supply	52178	1
-1H1	Flashlight	52177	1
-1F1	5A Fuse	-	1
-1F2	10A Fuse	-	1
-1F3	3A Fuse	-	1
-1S1	Electropneumatic Sensor	51116	1
-1U1	DCmotor driver	52112	2
-1M1	Transtecno motor	52159	1

Pneumatic diagram / Pneumatic components list



Pos.	Component No.
1	51115
2	51118
3	51079
4	51116
5	51026
6	51009
7	51000
8	51107
9	52106
10	51073
11	51074

<p>ICS Ice Cleaning Systems GmbH</p>	<p>Operating manual according to art. 14 of the Ordinance on Hazardous Substances Operating area: Working place:</p>	<p>Status: May 2012 (based on SDB 4/ 2005)</p>
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Identification of hazardous substance Dry Ice

Other designation: Carbon dioxide – in frozen state

CAS no.: 124-38-9 EU index no.: 204-696-9

Aggregate state: solid

Colour: white

Odour: inodorous

Flash point:

Boiling point: -78.5°C

Melting point: -56.6 °C

Dangers for people and environment



Risk of frostbite development (-78°C) at skin contact

Risk of suffocation because of the sublimated vapours (from 1 litre of dry ice result 460 litres of gas)



Loss of mobility and consciousness

The gas released through evaporation is heavier than air and can accumulate in lower spaces

First aid measure and rules of conduct



Protective measures:

- Avoid contact of the product with skin and eyes;
- During usage, ensure proper ventilation in the room;
- During the shredding operation, avoid dispersion of the chips;
- Do not transport with elevator if the elevator is being used by people;
- Avoid protrusion of the gas released by evaporation in the sewerage or in lower areas.



Eye protection:

Wear goggles with tight-closing system.

Hand protection:

Wear protective gloves made of leather or low temperature resistant gloves

Suitable extinguishing agents:

According to the conditions; carbon dioxide does not burn

Storage:

- not to be stored in basements and unventilated spaces;
- not to be stored in gas-tight containers (risk of bursting because of high pressure).

First aid measure

Injured persons have to be transported out of the danger area, using protection means, proper ventilation has to be ensured, in case of high concentration levels, a self-contained breathing apparatus has to be used.

Administering first aid



General information

After inhalation Ensure proper ventilation, in case a person becomes unconscious, the victim should be positioned in a stable side position, in case of respiratory arrest administer artificial respiration, seek medical assistance.

In case of skin contact In case of frostbites, rinse for 15 minutes with lukewarm water. **In case of eye contact** Rinse eyes for at least 15 minutes, afterwards see an ophthalmologist.

After swallowing: Drink plenty of water, seek medical assistance.

Appropriate disposal

The dry ice residues can be stored outdoors and left to evaporate, but only under strict supervision. For additional information, contact the Labour Protection Department.

EC DECLARATION OF CONFORMITY

in compliance with the Machine Directive 2006/42/EC dated 17 May 2006, Annex II A

We hereby declare that the machine specified below complies in its design and construction and in the version marketed by us with the basic safety and health requirements of the EC Directive 2006/42/EC. Any changes to the machine unauthorized by us shall invalidate this declaration.

Product: dry ice blasting unit

Type: IC 022 / IC 110 / IC 110E / IC 310 / IC 310S / IC 030

Manufacturer:

ICS ice cleaning systems s.r.o.

Robotnícka 2192, Považská Bystrica, Slovak Republic

Phone: +421 42 4261 135

Email: info@ics-dryice.de

Web: www.ics-dryice.de

It is declared the compliance with other directives/regulations applicable to the product:

- 2006/42/EC - Machine Directive
- 2006/95/EC - Low Voltage Directive
- EMC Directive (2004/108/EC) dated 15 December 2004

Applied harmonized standards in particular:

- DIN EN 12100 Safety of machinery - Basic concepts, general principles for design - basic terminology, methodology, risk assessment
- DIN EN 60204-1 Safety of machinery - Electrical equipment of machines, Part 1: General requirements
- DIN EN ISO 13849-1: Safety of machinery - Safety-related Parts of Control Systems

Representative for the technical documentation: Eng. L'udovit Bakala, PhD.

Place/Date: Považská Bystrica, Slovak Republic, 01.10.2015



Peter Gabriš
Geschäftsführer



Ing. Ludovít Bakala, PhD.
Konstrukteur

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IČO: 45570370 • **DIČ:** 2023046278 • **IČ DPH:** SK2023046278

ZERTIFIKAT ◆ CERTIFICATE ◆ CERTIFICADO ◆ CERTIFICAT ◆
 認証証書 ◆

ISO Certificate



CERTIFICATE

TÜV SÜD Slovakia s.r.o.
Certification Body for Management Systems

Accredited by SNAS
 Certificate on accreditation No. Q-011

certifies that



ICS ice cleaning systems s. r. o.
Robotnícka 2192
SK – 017 01 Považská Bystrica
IČO: 45 570 370

has established and applies
 a Quality Management System for

Development, manufacture, sale and service of machines for dry ice blasting. Development, manufacture, sale and service of machines for the production of dry ice. Production of dry ice. Industrial cleaning with dry ice.

An audit was performed, Report No. **1587/30/22/Q/AS/R2**
 Proof has been furnished that the requirements
 according to

STN EN ISO 9001:2016

are fulfilled. The certificate is valid from **2022-07-28** until **2025-05-18**

Certificate Registration No. **Q 1587-3**

Date of recertification audit: **13.06.2022**

Bratislava, 2022-07-28



TÜV SÜD Slovakia s.r.o.
 Certification Body for Management Systems
 Member of Group TÜV SÜD
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F-Q-019/2/5



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