dry ice cleaning systems®

The coolest way to clean...

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Slovakia

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www.ics-dryice.com
version:2601

Operator's Manual

IC 310 / IC 310 S

CONTENT

Your Dry ice Blasting Unit

Typ Modell Modéle	
Nr. No. No.	
Gewicht Weight Poids	
Druck max. Pressure max. Pression max.	
Baujahr Year of manufacture année de fabrication	
CE	

Your contact to ICS:

ICS ice cleaning systems s.r.o.
Robotnícka 2192
Považska Bystrica 01701, SLOVAKIA

Tel.:+421 42 4261 135
Fax:+421 42 4330 248
E-Mail: support@ics-dryice.com

www.ics-dryice.com

Introduction & Copyright

These operating instructions serve as explanation for a safe and undisturbed operation of the IC 310 / IC310S dry ice blasting unit.

All individuals who are operating the blasting unit have to read and understand completely the operator`s manual, before using it.

Please keep these operating instructions always close at hand.

Failure to observe the procedures specified herein may lead to serious consequences both on the equipment and on its operators. The operator has to strictly observe the working procedures described herein. Any changes made to these work procedures have to be approved in writing by ICS Ice Cleaning Systems s.r.o.

The manufacturer of the equipment is not held responsible for damages caused to the system or generated by the system in the following cases:

- Non-observance of these working instructions
- Improper use or handling of the IC 310/IC 310S
- Repair and maintenance works performed by unauthorized persons
- Installation and replacement with ICS non-original parts
- Noncompliance with the requirements regarding compressed air.

Recommendations regarding the improvement of the machine or of the operating manual can be transmitted to ICS Ice Cleaning Systems s.r.o.

The graphic representation of the blasting equipment can differ from the current delivery program, in certain individual details. Special accessories are partially represented at additional costs.

Process description

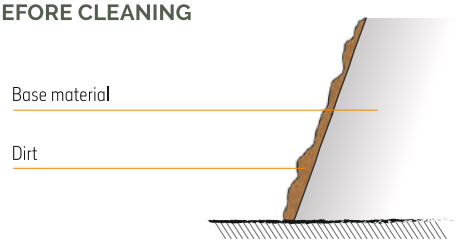
The dry ice blasting equipment IC 310/ IC 310S operates with granules of dry ice pellets (up to ø3mm), produced through the pressing of the CO_2 snow.

The pellets are blasted on the surface to be cleaned. The dirt from the surface is frozen through thermal shock and it breaks because of the different expansion coefficients.

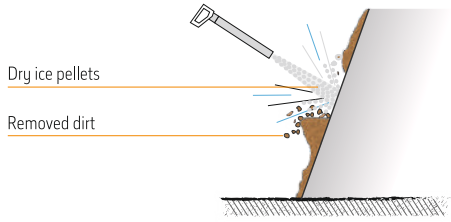
The CO_2 granulate sublimes in the moment of impact from solid to gaseous state. Only the initial dirt remains behind.

The dry ice pellets in the hopper (up to ø3mm) will be mixed using a compressed air operated dosing system, transported through the blasting hose and accelerated through blasting nozzle, the pellets can reach the speed of sound (depending on compressed air pressure and blasting nozzle).

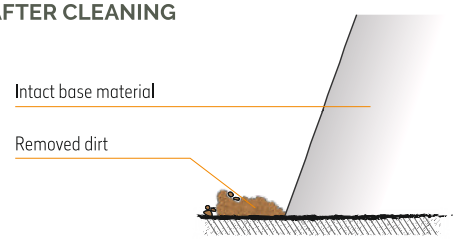
BEFORE CLEANING

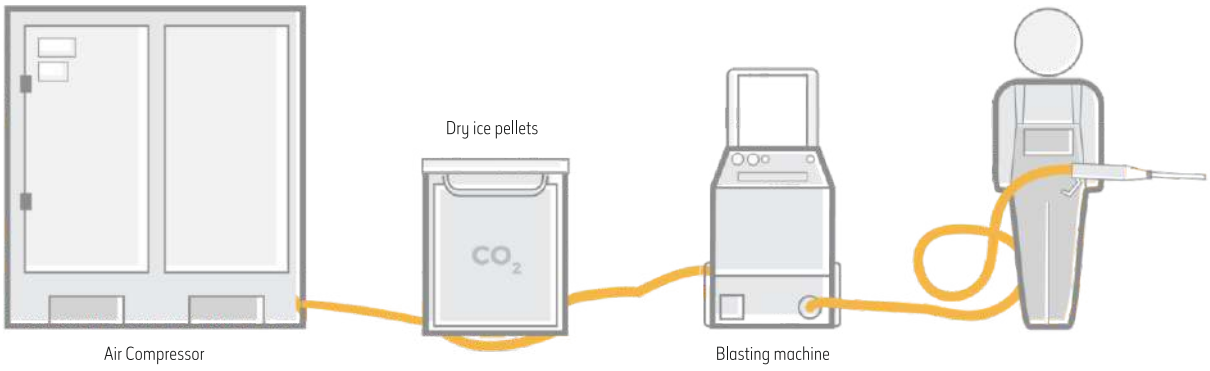


DURING THE CLEANING PROCESS



AFTER CLEANING

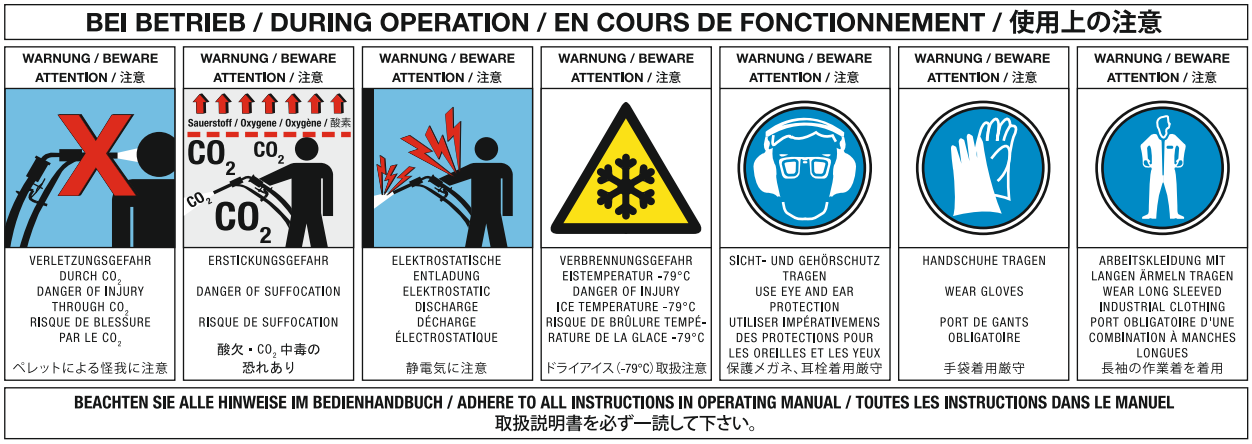




Technical Data of the IC 310 / IC 310 S

Depth	565 mm
Width:	387 mm
Height:	1007 mm
Weight:	IC 310: 70 kg / IC 310 S: 73 kg (without hose package)
Hopper capacity:	13 kg standard, 10 kg with dry ice grinder
Dry ice consumption:	max. 100 kg/h
Operation pressure:	max. 16 bar
Air consumption:	1.0 m^3/min – 12.0 m^3/min, according to the nozzle combination used and the working pressure
Requirements for the compressed air:	The compressed air should be clean, dry and oil-free, meaning without foreign matter. Min. requirements reg. compressed air quality according to ISO 8573-1:2010 [1:4:1]
Compressed air supply:	Claw coupling DIN 3489
Power connection:	Electrical : 200W, 110-240 V , 50-60 Hz, (IC 310), 210W, 110-240 V , 50-60 Hz (IC 310S) CEE 7/4 (type F)
Noise emission:	60-120 dB(A), according to the blast pressure, nozzle combination and the surface of the object to be cleaned

Safety equipment



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.

In order to use the dry ice blasting equipment in safe conditions, you should always wear the following protection equipment:

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

Caution!

In poorly ventilated areas, the elevated concentration of CO_2 can lead to breathing difficulties and suffocation. Therefore, you should always ensure that enclosed spaces are properly ventilated (exhaust air and fresh air supply).

When cleaning in silos, tanks or other similar spaces, ensure adequate air circulation or use additionally a breathing mask, which contains in the air supply line an activated carbon filter.

Operating the IC 310 / IC 310 S

The Emergency shutdown (4) push-button immediately stops all functions of the equipment.

Caution!
Despite the emergency shutdown push-button has been actuated, the equipment is supplied with compressed air and electricity!

After turning on the main switch (1), the reset push-button (2) will be actuated in order to activate the control. By actuating the equipment on/off switch (3), the IC 310/IC 310S is ready for use. By using the pressure regulator (5), the blast pressure can be adjusted progressively between 1-16 bar. The ice consumption is progressively adjustable between 10 – 100 kg/h by using the pellet quantity adjustment (6). The on/off button (19) allows you to turn on and off the dry ice mill.

Connecting the IC 310 / IC 310 S

Connections and components on the front side

(8) Blast hose attachment

(9) Quick coupling (optional)

(7) Control line

The blast hose connection (8) seals conically and can be connected or disconnected with a SW32 wrench.

If your equipment is provided with a quick coupling (9) (optional), push the outer ring towards the housing and insert the fitting of the blast hose until the ring snaps by itself in position. The closing is done in reverse order.

Please do not use this quick coupling as carrying aid during transportation!

The control lines (7) are simply inserted according to the diameter, up to the stop. To unlock, pull the silver bracket and turn the plug to the right, and after that take it out.

Connections and components on the back side

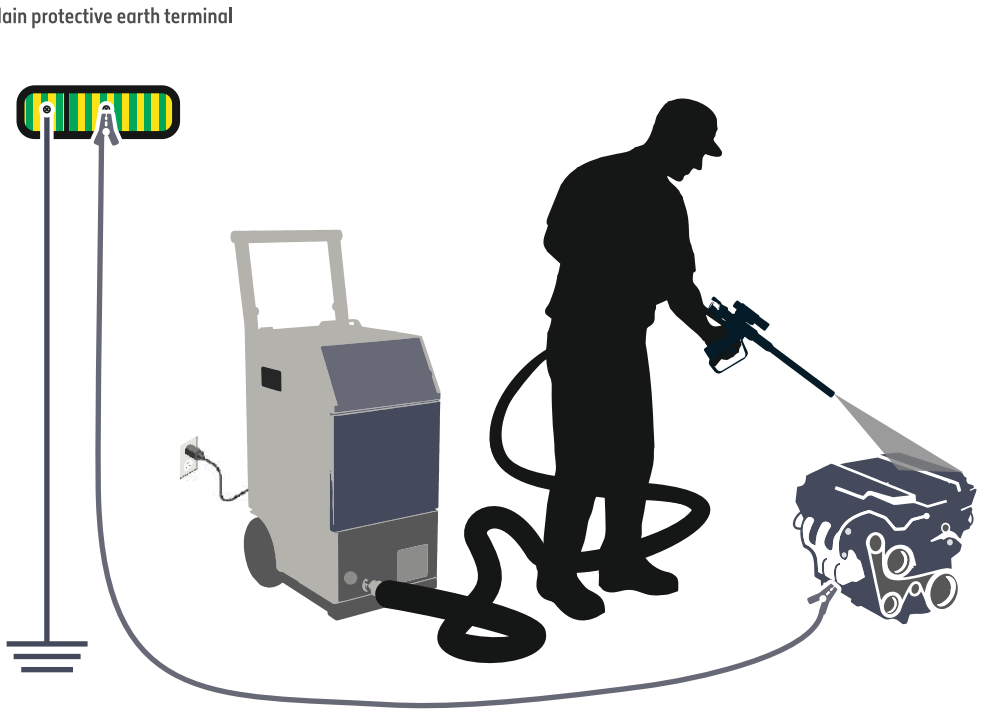
Connect the compressed air hose using the claw coupling (11) by rotating the hose coupling in a clockwise direction until it snaps into place two times. In order to remove it, press the coupling of the unpressurised compressed air hose towards the machine and then turn to left.

Insert the plug of the power cord (12) and turn it to the right until it locks by itself. To unlock, pull the silver bracket and turn the plug to the left, and after that take it out. Insert the grounded plug (type F) in a suitable socket.

Attention!

Even when the main switch is off, the power cord is alive!

Proper grounding:



Connect the blasted object with the included grounding kit to the main grounding terminal.

Operating the Blast gun

In order to trigger the blast gun, push the locking lever (13) upwards and pull the actuating lever (14) towards the handle.
In order to stop the blast, release the actuating lever (14), it goes by itself back into the starting position.

Caution!

Always make sure you hold the gun safely and securely in your hand, so as not to endanger yourself or other persons.

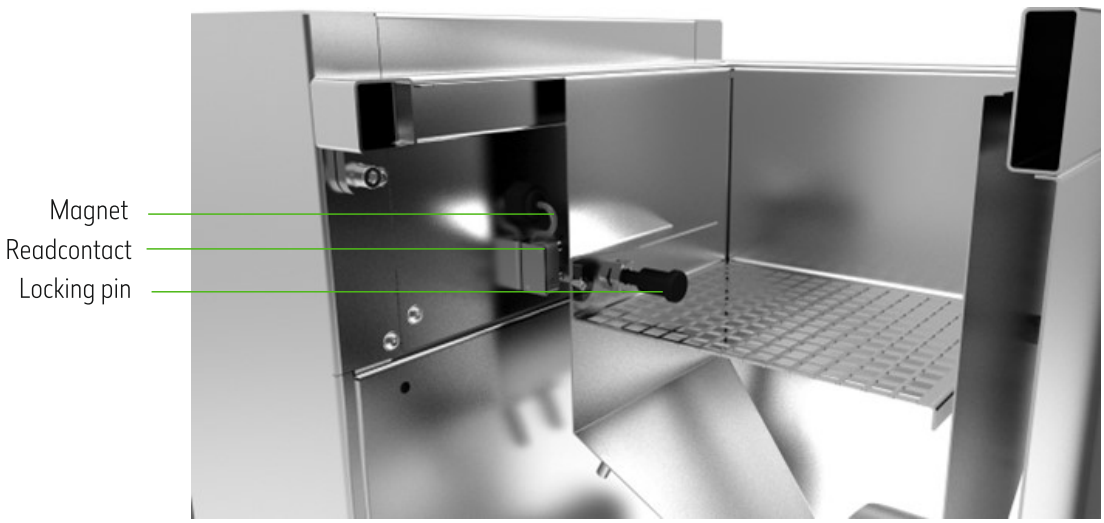
Putting into operation

In order to put the IC 310/IC 310-S into operation proceed as follows:

1. Connect the compressed air hose first with the claw coupling (11) at the back of the blasting equipment and then to the compressed air source.
2. First, plug the power cable in the power connection (12) on the back of the blasting equipment and then into the power source.
3. Connect the blast hose of the hose package to position (8/9). Check the position of the quick coupling (9). Connect the control lines of the hose package to position (7). Do not fasten with a tool, only by hand!
4. On the control panel, push the main switch (1).
5. Push the reset button (blue) (2).
6. Actuate the On button (green) (3).
7. Open slowly the compressed air source!
8. Adjust the blast pressure from the pressure regulator (5).
9. Adjust the ice consumption from the pellet quantity adjustment (6).
10. Now actuate the gun for about 10 seconds towards the floor in order to blast the residual humidity out of the system.
11. Now fill the hopper with dry ice and close the lid to prevent any foreign objects getting inside the hopper.
12. Now, the IC 310/IC 310S is ready for use.

Safety contact for hopper top

To avoid the risk of injury the top of the blaster is secured by an electrical contact. By opening the top the ice braking axle is not working , axle is working only if top is closed.



Attetntion!

Make sure that during operation no one holds his hand into the hopper, because there are moving parts of the ice loosening system!

Decommissioning

After completion of the blasting operations, proceed as follows:

1. Empty the dry ice from the hopper.
2. Close the compressed air source.
3. Actuate the gun to release the residual compressed air.
4. Actuate the Off button (green) (3).
5. Turn off the main switch (1).
6. Detach the power plug (12) and the air hose (11) from the equipment.
7. Disconnect the hose package (7/8/9) and roll it up.

Internal components of the equipment

Internal components of the equipment

Safety measures

The safety measures are important both to you and to the operating personnel involved, and also for the use in optimal conditions of the IC 310/IC 310S.

Ensure that the sockets are used according to the CEE 7/4 system, and if this is not possible, a separate earth conductor should be connected to the IC 310/IC 310S. Ensure that the existing voltage corresponds with that mentioned on the name plate. The power cords should be fitted to as to be protected against damages, e.g. if people walk over them. Before making any works at the IC 310/IC 310S, the power plug has to be always taken out and the equipment has to be depressurised. Wait for 5 minutes so that any residual voltage dissipates.

Only free of damage compressed air hoses have to be used. The compressed air source is slowly opened after the successful connection to the equipment. From this point on, the IC 310/IC 310S is pressurised and it cannot be left under any circumstances unsupervised.

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, other- wise 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 0.5m^3 CO_2 when blasting.

The dry ice shall not be kept in the hopper for more than 15 minutes, in order to avoid the freezing of the IC 310/IC 310S 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 310/IC 310S 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 work flow.

The operator undertakes to use the IC 310/IC 310S equipment only when it is in perfect condition and to immediately remedy any kind of damages. (see page 20)

When using the IC 310/IC 310S, 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 310/IC 310S 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 310/IC 310S.

Transportation

For the simple transportation from one working place to another within your company, you are advised to use the transport handle (16 / see page 11).

For the transportation with a shipping company, the IC 310/IC 310S equipment shall be fastened on a pallet using a strap and with the hoses rolled up. After removing the fastening screws (17 / see page 9) and the transport handle (16), the blasting equipment becomes easier to handle during transport.

Repairs and warranty

Please bear in mind that the works, including the inspection and maintenance works, especially at the safety devices , can be carried out only by an ICS technician or by a person who received special training for equipment and accessories of ICS Ice Cleaning Systems s.r.o. and who can present evidence in this respect.

The potential repairs necessary during the warranty period have to be agreed upon beforehand with ICS Ice Cleaning Systems s.r.o.

The spare parts which fall in the warranty period are replaced either at our location or are sent to you. The transportation costs, travel costs and costs related to the stay, as well as those for the disassembly and reassembly fall on the client.

For the evaluation of the warranty, the component or the equipment shall be sent to ICS Ice Cleaning Systems s.r.o.

Warranty conditions

The warranty becomes void in the following cases:
- incorrect handling of the IC 310/IC 310S equipment.
- using non-original spare parts.
- works at the IC 310/IC 310Sequipment carried out by unauthorised persons.
- using materials different than dry ice.
- noncompliance with the requirements regarding compressed air quality.

Carrying out unauthorised changed to the IC 310/IC 310S equipment is prohibited! The warranty period is 12 months after the delivery date. Excluded are rubber parts, wear parts and maintenance parts.

Requirements for compressed air

For an efficient blasting result, the compressed air to be used is of outermost importance. The compressed air should be dry, clean, oil-free and free of foreign bodies. We recommend that the minimum requirements for the quality of the compressed air comply with ISO 8573-1: 12010 [1:4:1].

Particle = class 1 = 0,1 mg/m³
Water = class 4 = DTP 3°C
Oil = class 1 = 0,01 mg/m³

The pressure range of the IC 310/IC 310S equipment is between 1 - 16 bar and the air volume between 1 – 12 m³/min.

Maintenance

Thanks to its practical structure, the IC 310/IC 310S equipment only requires a very low maintenance.
For the IC 310/IC 310S, maintenance works should be performed on a regular basis at every 1,000 operating hours, and at least once a year. See the yearly control sticker (see page 9). We recommend concluding a maintenance contract with ICS Ice Cleaning Systems GmbH or with an ICS authorised partner.

Maintenance plan for IC 310/IC 310S after 1,000 operating hours:

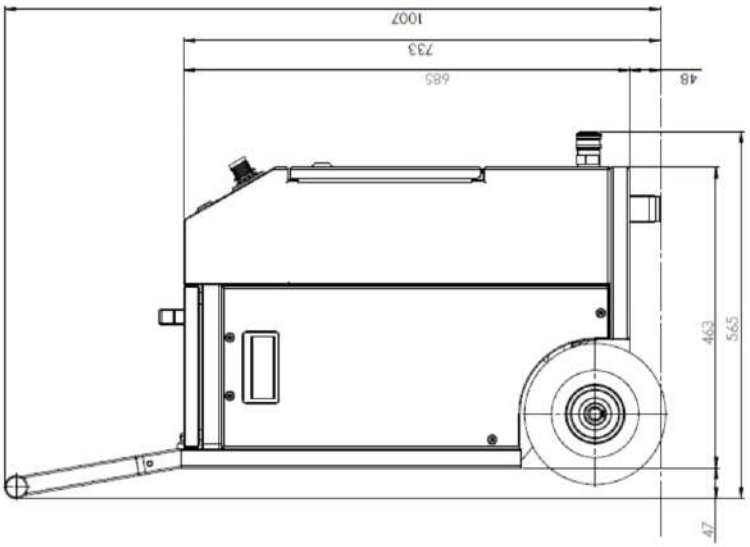
1. General visual inspection of body, weld joints, chassis, tires, screw seat
2. If necessary, complete exterior and interior cleaning
3. Checking the functioning of the inlet pressure regulator and pilot pressure regulator
4. Cleaning control air filter, replacing filter
5. Checking the pneumatic control elements, checking for leaks and replacing the shock absorber
6. Complete electrical inspection, including contactors, voltage converter, frequency inverter, electric motor, firm seating of elements and terminals
7. Checking the entire ice dosing system for signs of wear, if it is functional and leak-proof
8. Checking the functioning and firm seating of the vibrator
9. Checking the ice loosening system, including the electro-pneumatic control, for signs of wear, if it is functional and safe for use
10. Checking the hose package for signs of wear, if it is functional and leak-proof (pressing)
11. Checking the connecting elements, connectors, pneumatic couplings for signs of damage, if they are functional and safe for use
12. Checking the blast gun if it is functional and safe for use
13. Checking the existing blasting nozzles for signs of wear and cracks
14. Pressure and safety test
15. Functional test
16. Blasting test

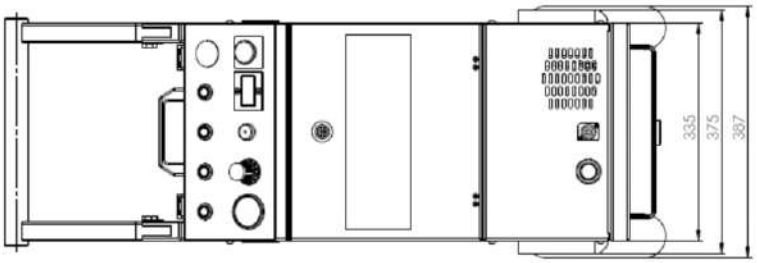
Troubleshooting

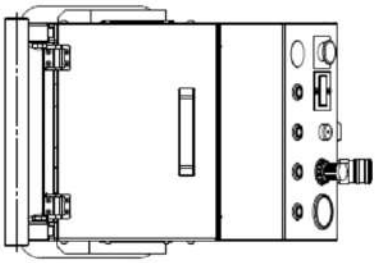
Problem	Description	Corrective action
The equipment cannot be started	The Reset button is lit despite actuation.	Unlock the Emergency Stop button by pulling it. Check the hopper grid for firm seating. See page 25.
The equipment does not start	Nothing happens after the gun has been actuated.	Check whether the control line is blocked.
No air comes out from the gun	The equipment is running, but it does not blow out air.	Check the compressed air supply and the connection of the equipment and adjust the desired blast pressure at the equipment.
No ice comes out	After actuating the gun, only air and no ice comes out.	Place ice in the hopper. Set a minimum quantity of 10 kg/h.
The equipment is running, but no ice comes out	Ice is falling down on the lower part of the equipment	Blast pressure, amount of ice & the blasting tube are not optimally combined with one another and adjusted to each other.

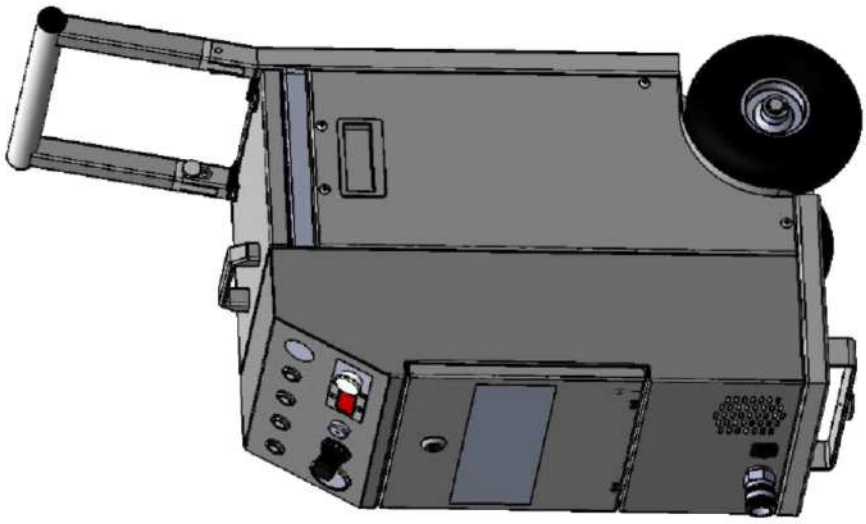
Electrical components

310-00-000

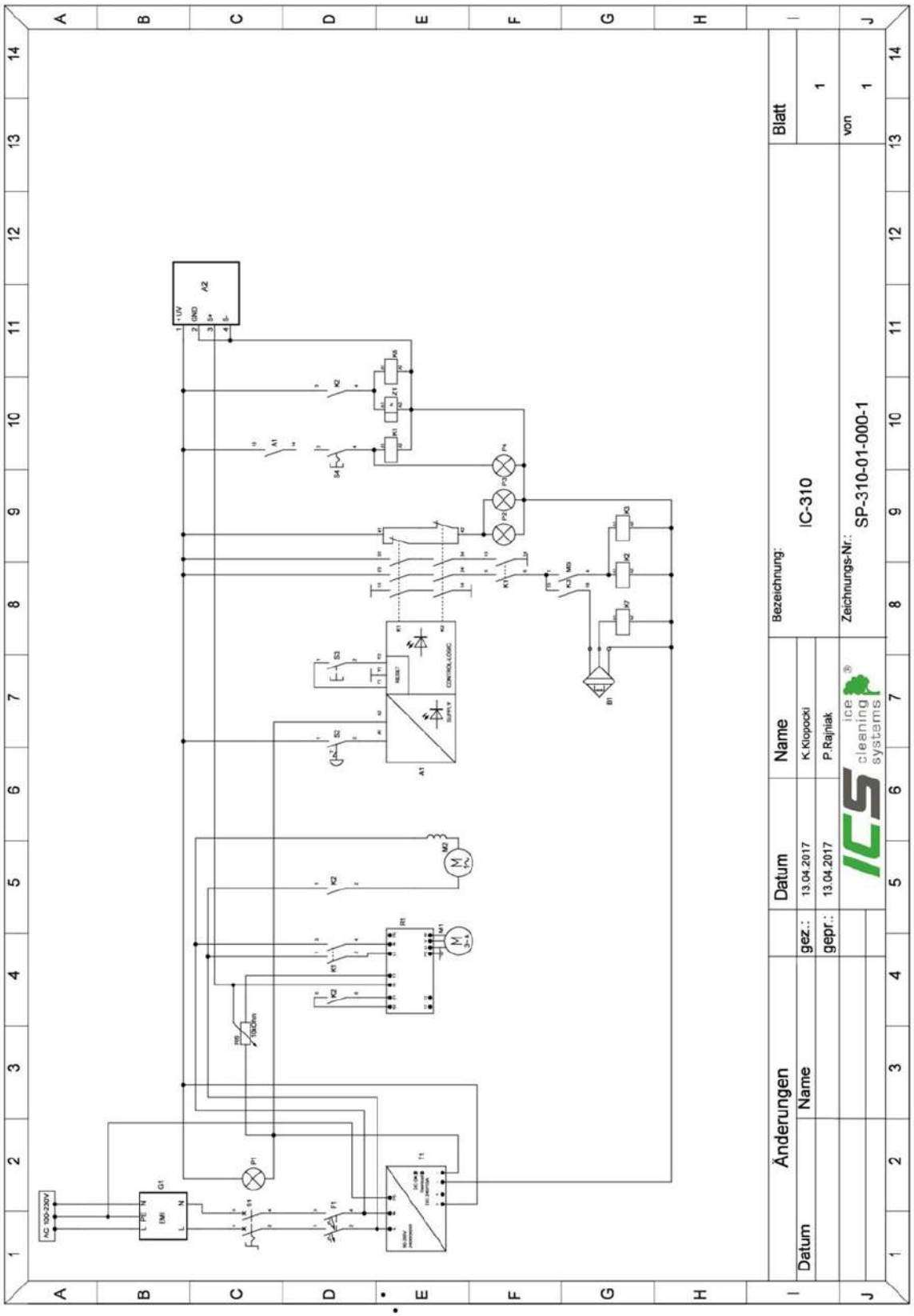








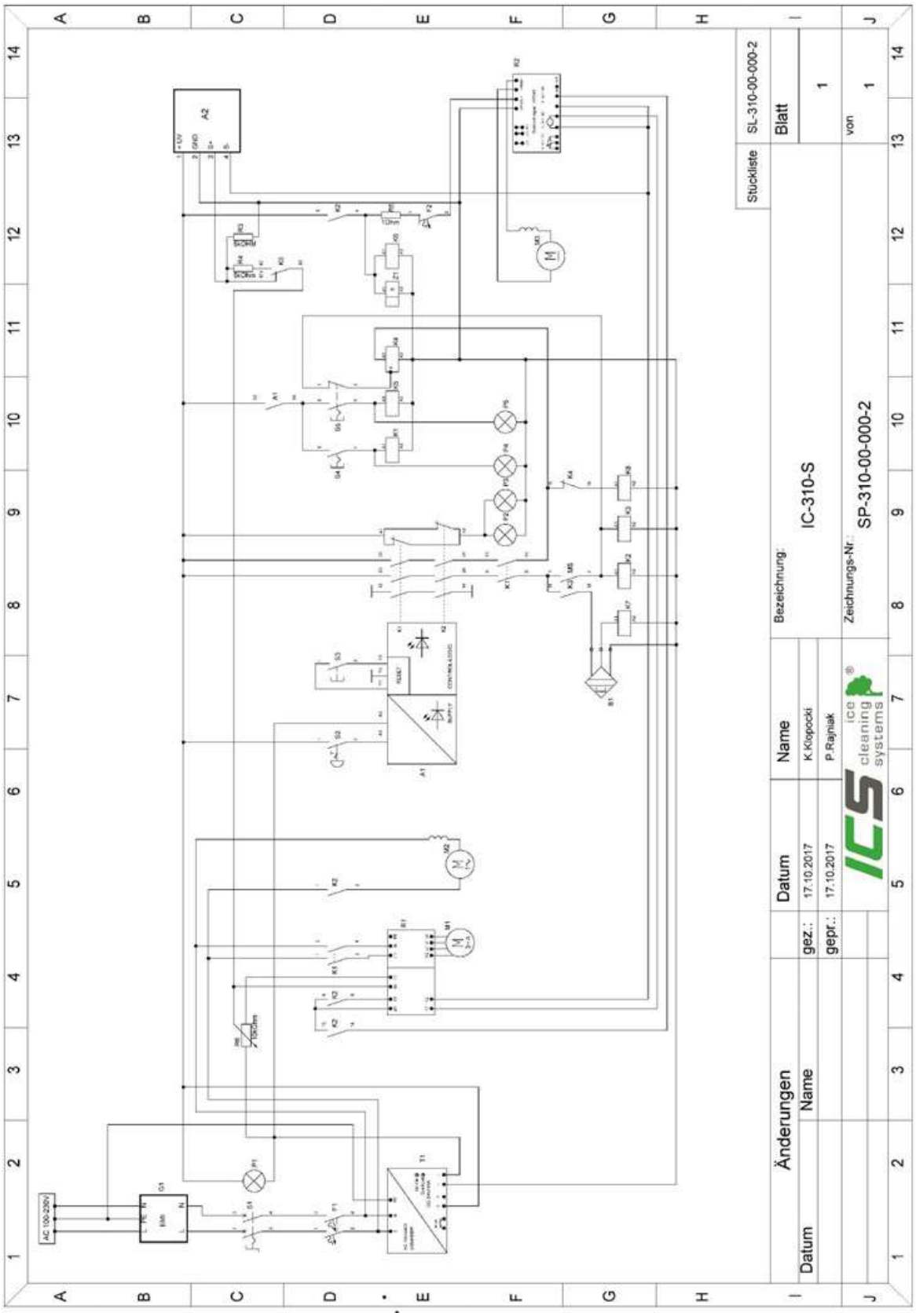
Electrical wiring diagram IC 310



Spare parts list control cabinet IC 310

ID	Description		Article No.
A1	Safety relay	Manual reset	52054
A2	Digital display	0-10V	52000
B1	Contact cover	Read Contact	52014
F1	Automatic circuit breaker	10A Typ B	52020
G1	EMI Filter	230V AC	52030
K1	Contactor	24V DC	52048
K2	Contactor	24V DC	52048
K3	Time relay	CRM 91-H	52065
K6	Air valve	Norgren	52019
K7	3/2 Way valve	Flow system	51025
M1	Dosage	230V AC	52017
M2	Vibrator	230V AC	52106
MS	Micro switch	5 A	52021
P1	LED Green	Main switch	52061
P2	LED Red	Emergency stop	52056
P3	LED Blue	Reset	52062
P4	LED Grün	On/Off	52063
R1	Frequency converter	230V AC	52016
R6	Potentiometer	10k Ohm	52010
S1	Main switch	230V AC	52061
S2	Emergency stop	Opener	52057
S3	Reset	Closing	52062
S4	Safety switch	On/Off	52063
T1	Switch power supply	100-240V AC/ 20-28V DC/1	52080
Z1	Operating hours counter	24V DC	52003

Electrical wiring diagram IC 310 S



Spare parts list control cabinet IC 310 S

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A2	Digital display	0-10V	52000
B1	Contact cover	Read Contact	52014
F1	Automatic circuit breaker	10A Typ B	52020
F2	Thermocouple	70°C	52034
G1	EMI Filter	230V AC	52030
K1	Contactor	24V DC	52048
K2	Contactor	24V DC	52048
K3	Time relays	CRM 91-H	52065
K4	Time relays	CRM 91-H	52065
K5	Change relays	80A	52009
K6	Air valve	Norgren	52019
K7	3/2 Way valve	Flow system	51025
K8	3/2 Way valve	Scrambler	51025
M1	Dosage	230V AC	52017
M2	Vibrator	230V AC	52106
M3	Scrambler engine	24V DC	52078
MS	Micro switch	5A	52021
P1	LED Green	Main switch	52061
P2	LED Red	Emergency stop	52056
P3	LED Blue	Reset	52062
P4	LED Green	On/Off	52063
P5	LED Yellow	Scrambler	52064
R1	Frequency converter	230V AC	52016
R2	Speed adjuster	24V DC	52112
R3	Resistor	5k Ohm	52011
R4	Resistor	5k Ohm	52011
R5	Resistor	1 Ohm	52022
R6	Potentiometer	10k Ohm	52010
S1	Main switch	230V AC	52061
S2	Emergency stop	Opener	52057
S3	Reset	Closing	52062
S4	Safety switch	On/Off	52063
S5	Safety switch	Open/Closed	52064
T1	Switch power supply	100-240V AC/ 20-28V DC/10A	52080
Z1	Operating hours counter	24V DC	52003

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

Identification of hazardous substance Dry Ice

Other designation: Carbon dioxide – in frozen state
CAS no.: 124-38-9EU 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

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. Ľudovít Bakala, PhD.
Konstrukteur

ISO Certificate

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

SNAS
Reg. No. 153/Q-011

TÜV SÜD
Slovakia

CERTIFICATE

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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
Jašíkova 6, 821 03 Bratislava

F-Q-019/2/5

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