

INSTRUCTION MANUAL

TRANSLATION

ATMOSPHERIC ASCO CO₂
VAPORIZER V5
200 - 1000 kg/h
(440 – 2204 lb/h)

SN 55194-9.1, SN 55194-14.1, SN 55869-5.1

ascoco2.com



CONTACT

Head Office

ASCO CARBONDIOXIDE LTD.
Hofenstrasse 19, CH-9300 Wittenbach
T +41 71 466 80 80
info@ascoco2.com / ascoco2.com
VAT ID: CHE-107.889.692 MWST

Production Site

Asco Kohlensäure AG
Sprudelstrasse 3, DE-53557 Bad Honningen
T +49 2635 92 534-0
info@ascoco2.com / ascoco2.com
VAT ID: DE196946952

Subsidiary USA

ASCO CARBON DIOXIDE INC.
80-4 Industrial Loop North, Orange Park, FL 32073
T +1 904 374 9590 / Toll free +1 877 633 0996
usa@ascoco2.com / ascoco2.com/us

Sitz: Wittenbach | Handelsregister: Kanton St. Gallen | Firmen-Nr.: CHE107.889.692 | Präsident des Verwaltungsrates: Adolf Walth | Geschäftsleitung: Ralph Spring (MD)
Seat: Wittenbach | Commercial register of canton: St. Gallen | Company No.: CHE107.889.692 | Chairman of the Board: Adolf Walth | Management: Ralph Spring (MD)

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THANK YOU VERY MUCH!

Congratulations - You have acquired a quality product from
ASCO CARBONDIOXIDE LTD.



NOTE

Please read this instruction manual carefully before installing and commissioning this product, especially chapter "GENERAL SAFETY INSTRUCTIONS" and separate document "General Information and Safety Instructions – Working with CO₂".

In case of questions or for further information, please contact the manufacturer.

ASCO CARBONDIOXIDE LTD

PURPOSE OF DOCUMENT

This instruction manual contains important information and instructions on the safe use of the vaporizer, transport, installation, commissioning, adjustment, operation and disposal.

This instruction manual must be read and understood thoroughly by all persons who have contact with the vaporizer.

	NOTE
	This document has been drafted and edited with the greatest care and according to our best knowledge. The authors and publishers shall not be liable for damage arising from incorrect or incomplete information in this document.

WARRANTY

The warranty terms below apply in all countries. Please find the conditions for repairs to your machine within the warranty period in our General Terms and Conditions, which you received together with our order confirmation. Please contact the closest authorised ASCO distributor or the ASCO Customer Service Department in the event of a warranty claim. Please submit proof of purchase, the serial number of your device and the operating hours completed to date. For contact details, see footer.

Version of instruction manual

Version (year/month)	Note
V 1.0 (2026/02)	First publication

1 GENERAL SAFETY INSTRUCTIONS

1.1 ACCOMPANYING DOCUMENTS

The following separate documents are an integrated part of this instruction manual.

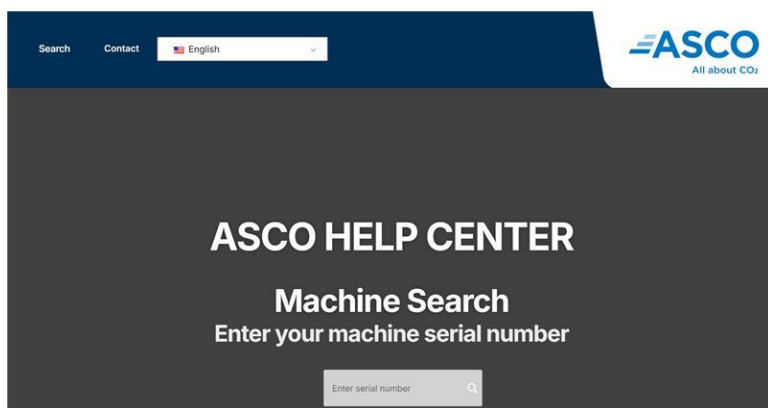
- Document "General Information and Safety Instructions – Working with CO₂"
- Spare parts list
- Electrical circuit diagram
- EU declaration of conformity / EU declaration of incorporation

1.1.1 DIGITAL ACCESS DOCUMENTS

The digital documents are available under the following QR code and link.



<https://help.ascoco2.com/>



After entering the serial number, digital access to documentation and other information is possible.

1.2 DRAWINGS AND SYMBOLS

Many accidents with devices are caused because operators ignore instructions, including safety instructions, of the manufacturer. In this document, internationally recognised symbols and signal words are used to highlight hazards and hazardous situations in the work environment.

Warnings are presented as follows:

	 DANGER Describes a hazard with a high degree of risk. If these instructions are not followed, this will result in death or serious injury (leading to disability).
	 WARNING Describes a hazard with a medium degree of risk. If these instructions are not followed, this may result in death or serious injury (leading to disability).
	 CAUTION Describes a hazard with a low degree of risk. If these instructions are not followed, this may result in slight or moderate injury.

Note, user tips, minor material damage at the most:

	NOTE Designates general instructions with subsequent action. User tips and recommendations for work are given, which have no effect on the health and safety of personnel, but do require certain behaviour or action. Highlights useful tips and recommendations plus information for efficient and fault-free operation.
	NOTE Describes general notes. Practical user tips and work recommendations are given which do not, however, have any effect on the safety and health of staff. ...highlights useful tips and recommendations plus information for efficient and fault-free operation.

Instructions designed to prevent serious damage to property:

	CAUTION Describes a potentially damaging situation. If these instructions are not followed, material damage will result. ... indicates a potentially damaging situation which may lead to material damage if these instructions are not followed.
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1.2.1 Pictograms used in this document

Safety instructions in this manual where non-compliance poses a danger to persons and property, are highlighted with a general warning symbol.

	General warning symbol
	Warning: electric voltage
	Warning: risk of suffocation
	Warning: low temperature
	Warning: high temperature
	Warning: automatic machine start-up
	Warning: slipping hazard
	Warning: low-floor movers
	Warning: suspended load
	Warning: automatic machine start-up
	Warning: pressure
	Wear eye protection
	Wear hearing protection
	Wear hand protection
	Wear foot protection

	Disconnect from the mains power supply
	Use head protection
	Follow instructions

1.2.2 Qualifications of the operating personnel

- The machine may only be operated by authorised and instructed staff.

The operators must be instructed in the following points by an authorised person (operator or ideally manufacturer):

- Safe handling of dry ice and/or liquid/gaseous CO₂
 - See also document "General Information and Safety Instructions – Working with CO₂"
 - Operation and maintenance of the ASCO system
 - Safety equipment and protective measures
 - Use of personal protection clothing
- Repair work must only be carried out by qualified skilled workers.
- Trained engineers or technicians for:
- Mechanical engineering
 - Electrical engineering
 - Hydraulic engineering
 - Refrigeration engineering
- The manufacturer offers staff training, including refresher sessions. For details, please contact our Customer Service Department.

1.3 IMPORTANT SAFETY INSTRUCTIONS

  	 DANGER Risk of damage or injury from high carbon dioxide concentration! Risk of suffocation and damage to health through carbon dioxide! Low concentration (3-5%) causes headaches and makes breathing difficult. High concentration (7-10%) causes headaches and nausea and leads to unconsciousness. Even higher concentration leads to unconsciousness and death. The highest non-hazardous CO₂ concentration is 5000 ppm. A higher concentration is very dangerous to humans (German MAK Scale IV). ▪ Operate the device only in well-ventilated spaces. ▪ The area in which the machine is installed must be equipped with CO₂ gas detectors alarms. ▪ Observe the instructions in the separate document “General Instructions and Safety Instructions – working with CO₂” Risk of damage or injury from electric power! Exposed electrical contacts, electrostatic discharge, physical impact on electrical systems, etc. pose a high safety risk. ▪ All work on electrical equipment must be performed by suitably qualified specialist technicians.
	 WARNING ▪ Do not operate the machine in a potentially explosive atmosphere.
	 WARNING Risk of damage or injury due to unexpected start-up of the vaporizer Before a cover of the vaporizer is removed or work is carried out on the vaporizer, it must be ensured that: ▪ The vaporizer is idle, the main switch is set to “OFF” and the unit is disconnected from the mains if necessary. ▪ The entire vaporizer is depressurised! ▪ All local safety provisions are observed and the requirements are met!

Personal protective equipment

	 WARNING Risk of eye injury! ▪ When operating the vaporizer, always wear suitable safety goggles. ▪ All persons standing close to the vaporizer must wear suitable safety goggles.
	 WARNING Risk of damage or injury from high sound level! ▪ When operating the vaporizer, always wear hearing protection. ▪ All persons standing close to the vaporizer must wear approved hearing protection.
	 WARNING Risk of head injury! ▪ During work in connection with the transport and commissioning of the vaporizer, always wear suitable head protection.
	 CAUTION Risk of hand injury, burns, frostbite! For example: Scratches, cuts, penetration wounds, burns and scalding due to hot or cold sources of energy and/or the environment. ▪ Always use suitable protective gloves when working on the vaporizer.
	 CAUTION Risk of injury to the feet! ▪ Always use suitable foot protection when doing any work on the vaporizer. ▪ All persons standing close to the vaporizer must wear suitable safety footwear.

Safety signs attached to the machine

Type plate

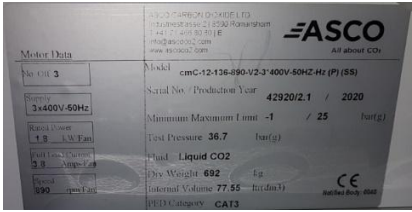


Fig. 1

Safety instructions



Fig. 2

Safety instructions



Fig. 3

Safety instructions



Fig. 4

Safety instructions



Fig. 5

Safety instructions



Fig. 6

Safe handling of dry ice

	 CAUTION Risk of frostbite from contact with dry ice! Solid carbon dioxide (dry ice) is at a temperature of about -79°C (-110.2 °F). If it comes into contact with your skin, it can cause frostbite. Dry ice can result when discharging liquid CO₂ or in the event of leaks. ▪ Do not touch the dry ice or any of the iced machine parts, unless you are wearing appropriate protective equipment. ▪ Prolonged contact with dry ice or iced components must be avoided, unless there is suitable insulation. ▪ Always read the supplier's safety data sheet and follow the instructions carefully. ▪ Observe the separate document "General Instructions and Safety Instructions".
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1.4 SAFETY COMPONENTS

	 DANGER Risk of damage or injury due to missing safety components! ▪ Only start the vaporizer after you have made sure that all safety components are properly installed and in working order. Risk of damage or injury from electric power! Exposed electrical contacts, electrostatic discharge, physical impact on electrical systems, etc. pose a high safety risk. ▪ All work on electrical equipment must be performed by suitably qualified specialist technicians.
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1.5 CONTROL-RELATED SAFETY FUNCTIONS:

The vaporizer is equipped with the following safety functions according to the provisions of EN ISO 13849-1.

Safety function	Category, PL/SIL
Mains disconnection device with EMERGENCY STOP	Cat. 1, PL c/SIL 1
Temperature monitoring and switching off via solenoid valve	Cat. 1, PL c/SIL 1
Shutting off CO ₂ inflow and outflow by solenoid valve	Cat. 1, PL c/SIL 1
Pressure monitoring and limiting is done by an integrator.	Operator side, required PLr d/SIL2

The machine is equipped with the following safety components:

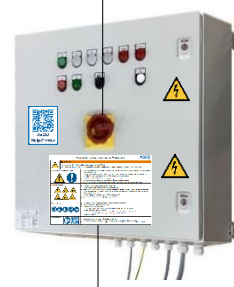
- Main switch (EMERGENCY-STOP)
- Warning information (fig. 2 to 6)
- Fan cover

Fan
cover



Fig. 7

Main switch
EMERGENCY-



Switchgear
cabinet

1.6 INTENDED USE

Liquid CO₂ from a tank is completely vaporised in the vaporizer and fed to the place of use. To ensure safe thawing, the vaporizer is equipped with two autonomous circuits that are controlled by one solenoid valve each. While one circuit is in use, the other is thawed. The air blowers are then only in use if a consumer draws CO₂ gas and the inlet temperature in the vaporizer is below 5 °C (41 °F). The vaporizer is only designed for the evaporation of liquid CO₂ with a max. pressure of 25 bar (362.6 psi). See machine description and technical data, chapter 2.

1.7 DECLARATION OF CONFORMITY

The EU Declaration of Conformity is included in the appendix to this instruction manual.

1.8 SPARE PARTS LIST / DRAWINGS / CIRCUIT DIAGRAMS

The spare parts list/drawings and circuit diagrams are enclosed as separate documents attached to this instruction manual.

	! WARNING Risk of damage or injury due to unsuitable spare parts! The use of unsuitable spare parts can lead to safety hazards. This applies in particular to safety components. ▪ Only use original spare parts.
---	---

2 MACHINE DESCRIPTION AND TECHNICAL DATA

2.1 FUNCTION OF THE VAPORIZER

- The vaporizer works fully automatically.
- During vaporizer operation, the system switches every 8 minutes from one circuit to the other.
- If the temperature at the CO₂ inlet exceeds 10 °C (50 °F), the fans are switched off with a 16-minute delay.
- When the inlet temperature drops again below 5° (41 °F), the fans automatically switch on again.
- To protect the downstream system against liquid CO₂, the solenoid valves of the vaporizer close automatically the moment the temperature at the CO₂ outlet drops below -10° C (14 °F). The fans continue to run in order to evaporate the liquid CO₂ in the vaporizer.

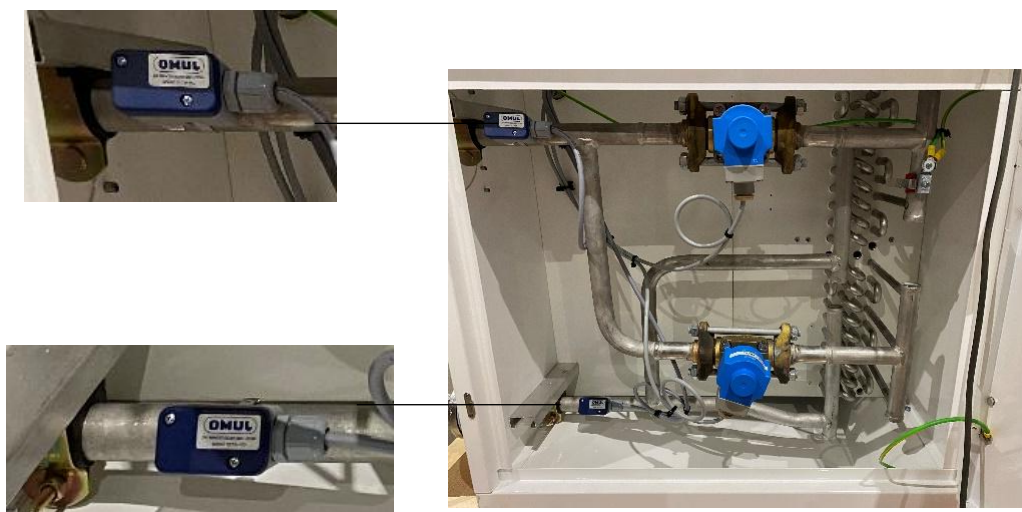


Fig. 8

2.1.1 Scope of delivery

- 1 Vaporizer
- 1 external control incl. cable
- 2 Pre-welded flanges
- 2 gaskets for flanged connections
- 8 bolts
- 8 nuts

2.1.2 Solenoid valves

The outlets of the two circuits are equipped with two solenoid valves. Each valve is controlled by a separate timer for switching over between the circuits. These are controlled via the central relay.

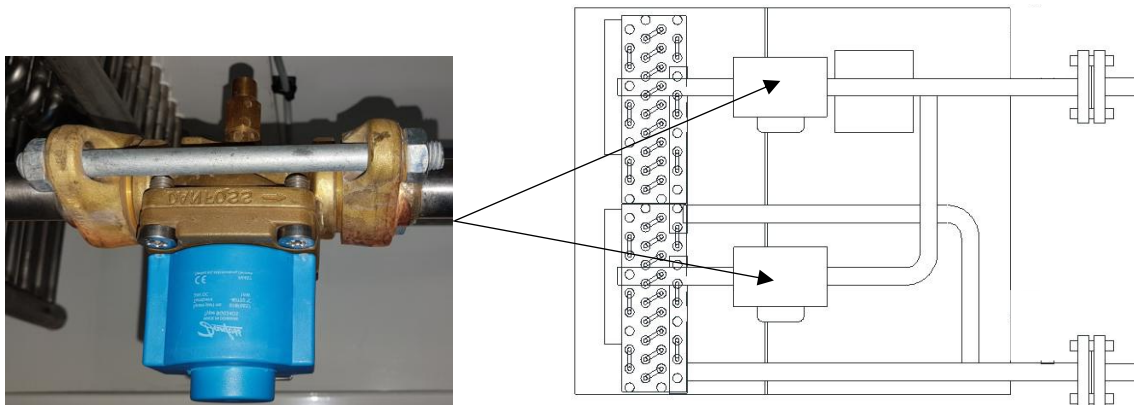


Fig. 9

2.1.3 Fans

If the inlet temperature is high, the fans switch off and the evaporation process continues to run.

2.1.4 Electric heater in switchgear cabinet

To prevent condensation, the switchgear cabinet is equipped with an electric heater.



Fig. 10

Option with process heating

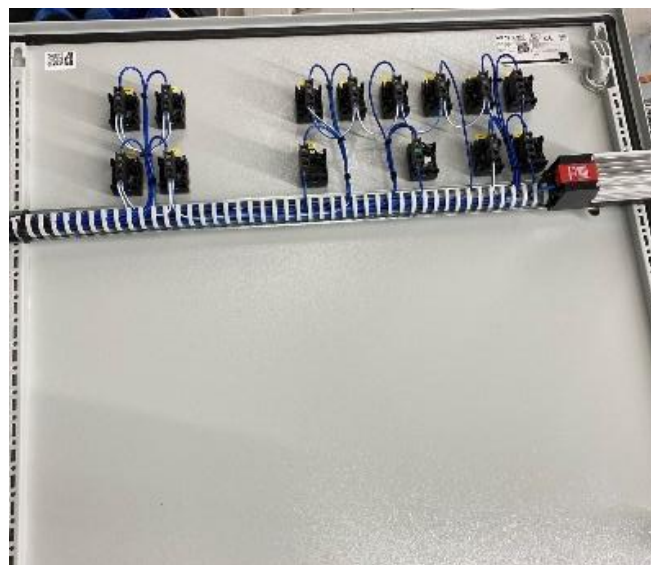


Fig. 11

2.2 PROCESS HEATING (OPTIONAL)

The optional process heater allows the vaporizer to be heated at low ambient temperatures. Should the ambient temperature drop below 10 °C (50 °F), one or two heaters switch on automatically in order to run the vaporizer at full capacity.

2.2.1 Operation with heater (optional)

The heating system is designed for fully automatic operation and is controlled via a thermostat. The operating status is indicated by the signal lights.

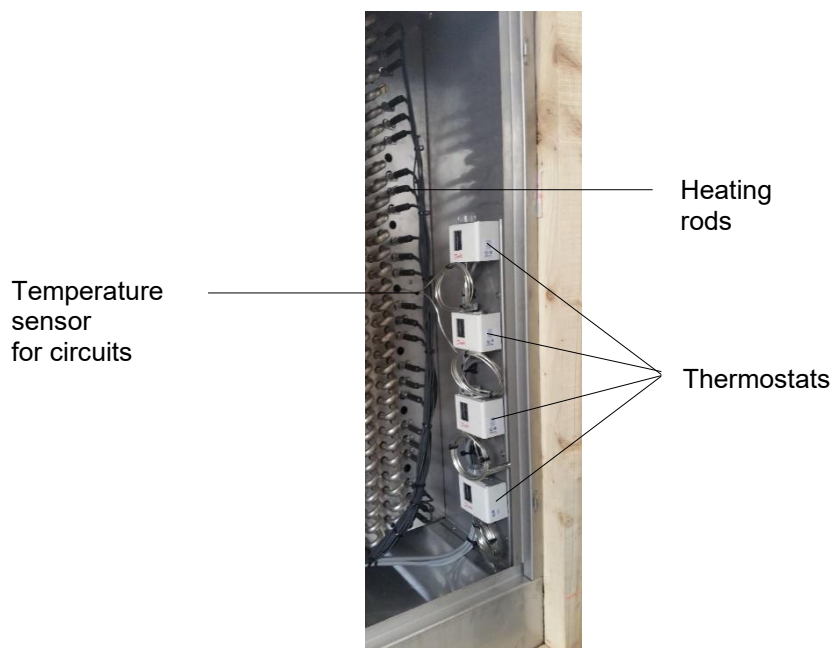


Fig. 12

Default settings for thermostats:

- Thermostat 1 10 °C(50 °F)
Heating stage 1 will be ON when the ambient temperature is below 10 °C (50 °F)
- Thermostat 2 5 °C(41 °F)
Heating stage 2 will be ON when the ambient temperature is below 5 °C (41 °F)
- Thermostat overtemperature right or middle air suction side OFF > 80 °C (176 °F)
- Thermostat overtemperature left air suction side OFF > 80 °C (176 °F)

2.3 CONTROL AND OPERATING ELEMENTS



Fig. 13

2.3.1 OVERVIEW PLUG CONNECTIONS

	VARIANTS	200 kg (440 lbs)	300 kg (661 lbs)	500 kg (1102 lbs)	1000 kg (2204 lbs)
Plug fan 1 Green 	Without heating Control cabinet/cable side 15X1 / 15W1	X	X	X	X
	With heating/control cabinet/cable side 15X1 / 15W1	X	X	X	X
Plug fan 2 Black 	Without heating Control cabinet/cable side 15X3 / 15W3	X	X	X	X
	With heating/control cabinet/cable side Black: 15X3 / 15W3	X	X	X	X
Plug fan 3 Orange 	Without heating Control cabinet/cable side 15X5 / 15W5		X	X	X
	With heating/control cabinet/cable side 15X5 / 15W5		X	X	X
Valve Green / Black 	Without heating Control cabinet/cable side 26X7 / 26W7	X	X	X	X
	With heating/control cabinet/cable side 26X7 / 26W7	X	X	X	X
Temperature gauge Green / Orange 	Without heating Control cabinet/cable side 40X2 / 40W1	X	X	X	X
	With heating/control cabinet/cable side 40X2 / 40W1	X	X	X	X
Heater 1	Control cabinet/cable side 60X1 / 60W1	X	X	X	X
Heater 2	Control cabinet/cable side 60X5 / 60W5	X	X	X	X

2.3.2 Relay control

Option with process heating



Fig. 14



Fig. 15

2.4 FUNCTION AND SETTINGS OF TIMER RELAYS

The switchover times of the solenoid valves and fans are controlled by a central relay.

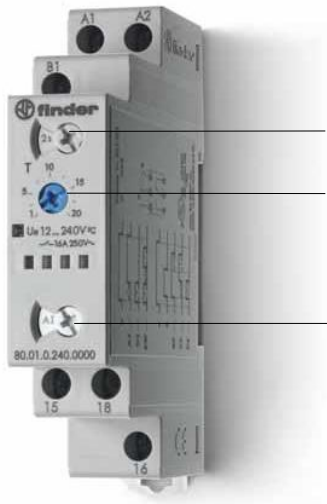
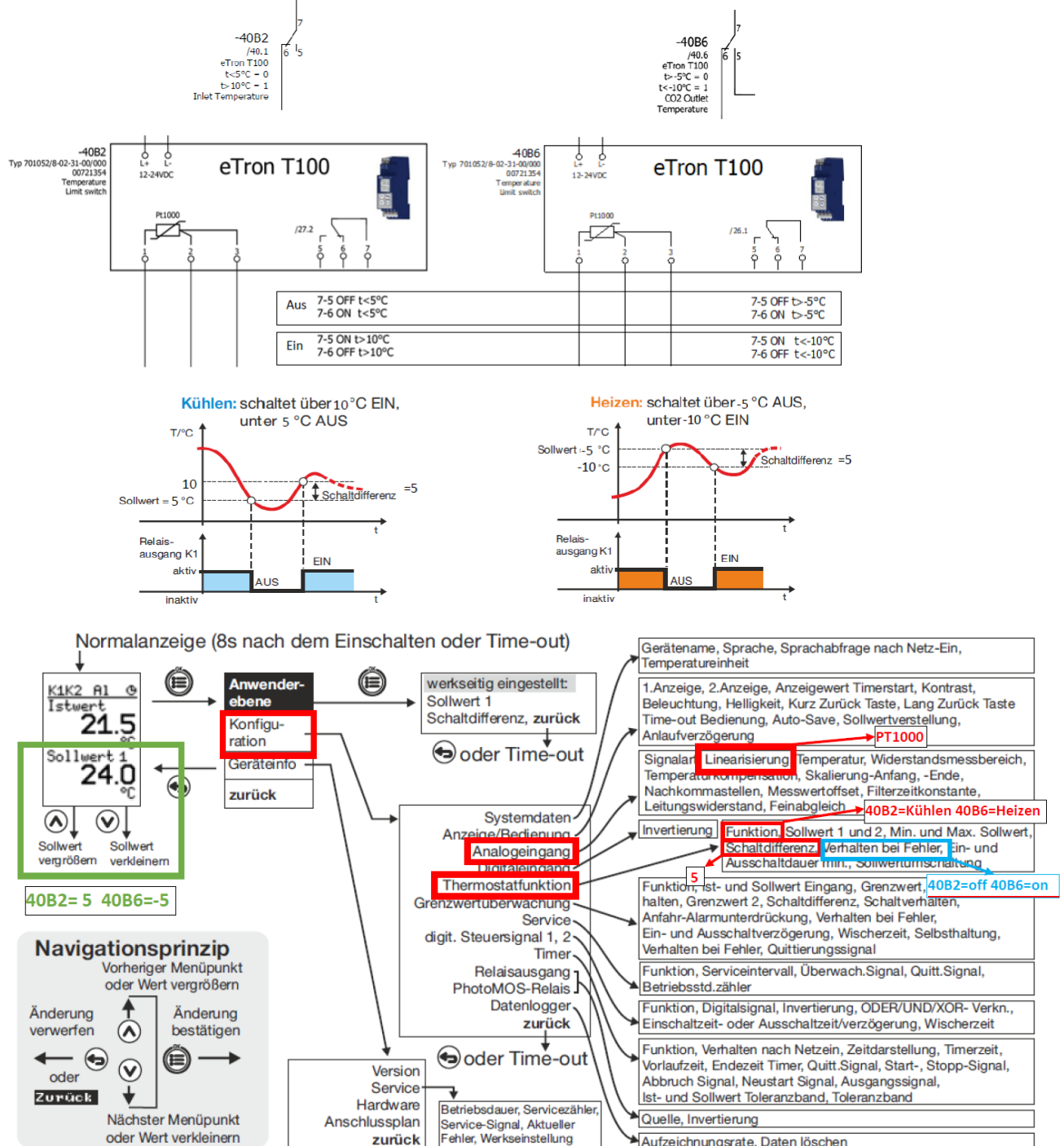


Fig. 16

Time scale
Time settings
Function

27K5	vaporizer start pulse	time scale	0.1 - 2 sec
		Time settings	10 (factory settings: 1 sec)
		Function	DI (interval)
27K2	fan shutdown delay	time scale:	1 - 20 min
		Time settings	16 (factory settings: 16 min)
		Function	BE (off-delay)
26K3	vaporizer circuit switchover	time scale	1 - 20 min
		Time settings	8 (factory settings: 8 min)
		Function	SW (symmetrical flasher)

2.5 FUNCTION AND SETTINGS OF THE LIMIT SWITCH



2.5.1 Settings/function

Configuration 40B2

1. Setpoint = **5 °C(41 °F)**
2. Configuration ► analog input ► Pt1000
3. Configuration ► thermostat function ► **Cooling**
4. Configuration ► thermostat function ► Switching difference = 5 °C(41 °F)
5. Configuration ► thermostat function ► Action on error = **OFF**

Limit switch 40B2

Monitoring of CO₂ inlet temperature:

If the vaporizer is in operation while no more CO₂ is drawn off, the temperature in line increases. If the limit value is reached, the fans are switched off. The vaporizer is set to standby mode. As CO₂ flows through the line, it cools down, and the fans are switched on again.

- Temperature > 10 °C (50 °F) fans OFF
- Temperature < 5 °C (41 °F) fans ON

Configuration 40B6

1. Setpoint = **-5 °C (23 °F)**
2. Configuration ► analog input ► Pt1000
3. Configuration ► thermostat function ► **Heating**
4. Configuration ► Thermostat function ► Switching difference = 5 °C (41 °F)
5. Configuration ► thermostat function ► Action on error = **ON**

Limit switch 40B6

Monitoring of CO₂ gas outlet temperature:

If the CO₂ gas outlet temperature drops below the limit value, the two outlet valves are closed and a temperature alarm is triggered. This prevents liquid CO₂ from entering the downstream system. The fans remain in operation.

- Temperature < -10 °C(14 °F) valves closed and alarm signal
- Temperature > -5 °C (23 °F) valve open

2.5.2 Standard ASCO CO₂ vaporizer

1	Start
2	24VDC circuit ON
3	Local control mode
4	Vaporizer remote control
5	Motor fault
6	Temperature fault
7	Stop
8	Vaporizer in operation
9	Changeover switch - local/remote control
10	Error message acknowledgement
11	Main switch serving as EMERGENCY-STOP switch

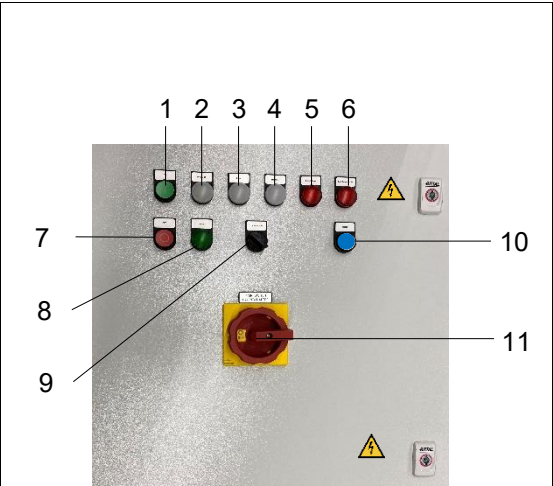


Fig. 17

Side view CO₂ connection lines interior without side cover

1	Input
2	Output
3	Solenoid valve



Fig. 18

2.5.3 ASCO CO₂ vaporizer with process heating (optional)

1	Start
2	24VDC circuit ON
3	Local control mode
4	Vaporizer remote control
5	Motor fault
6	Temperature fault
7	Stop
8	Vaporizer in operation
9	Changeover switch - local/remote control
10	Error message acknowledgement
11	Main switch serving as EMERGENCY-STOP switch
12	Heating group 1
13	Heating group 2
14	Fault circuit breaker heating
15	Excessive temperature heating

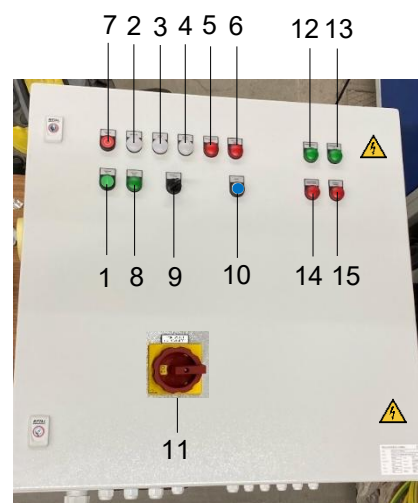


Fig. 19

2.6 TECHNICAL DATA

Performance data with liquid CO₂ at about -17 °C(1.4 °F), and an ambient temperature of +10 °C (50 °F).

Vaporizer	200 kg/h (440 lb/h)	300 kg/h (661 lb/h)	500 kg/h (1102 lb/h)	1000 kg/h (2204 lb/h)
Environmental conditions	+10°C to +40°C (50 °F to 104 °F)	+10°C to +40°C (50 °F to 104 °F)	+10°C to +40°C (50 °F to 104 °F)	+10°C to +40°C (50 °F to 104 °F)
Sound level	≤ 85 dB	≤ 85 dB	≤ 85 dB	≤ 85 dB
Air flow rate m ³ /s	3.4	5.1	5.1	9.9
Electrical power connected in kW/h	1.9	2.7	2.7	5.6
Maximal operating pressure in bar	25	25	25	25
Minimum permissible temperature (TS min.)	-50 °C (- 58 °F)	-50 °C (- 58 °F)	-50 °C (- 58 °F)	-50 °C (- 58 °F)
Maximum permissible temperature (TS max.)	+120° C (248 °F)	+120° C (248 °F)	+120° C (248 °F)	+120° C (248 °F)
Supply voltage/conductor	3x400/230VAC 50Hz/3Ph+PE+N	3x400/230VAC 50Hz/3Ph+PE+N	3x400/230VAC 50Hz/3Ph+PE+N	3x400/230VAC 50Hz/3Ph+PE+N
Control voltage	24VDC	24VDC	24VDC	24VDC
Pre-fuse	16 A	16 A	16 A	20 A
Drainage connection	1½" BSP male	1½" BSP male	1½" BSP male	1½" BSP male
Connection size	1" / DN25 / 33.7	1" / DN25 / 33.7	1" / DN25 / 33.7	1" / DN25 / 33.7
Flange connection	DN25/PN40	DN25/PN40	DN25/PN40	DN25/PN40
Internal volume dm ³	SS 15.76 CU 16.55	SS 22.24 CU 24.40	SS 43.58 CU 45.75	SS 77.55 CU 81.41
Expected service life	15 years	15 years	15 years	15 years
Vaporizer with process heating (optional)				
Environmental conditions	≥+5°C (≥ 41 °F)	≥+5°C (≥ 41 °F)	≥+5°C (≥ 41 °F)	≥+5°C (≥ 41 °F)
Sound level	≤ 85 dB	≤ 85 dB	≤ 85 dB	≤ 85 dB
Air flow rate m ³ /s	3.4	5.1	5.1	9.9
Electrical power connected in kW/h	7.5	10.5	12.5	27.8
Maximal operating pressure in bar	25	25	25	25
Minimum permissible temperature (TS min.)	-50 °C (- 58 °F)	-50 °C (- 58 °F)	-50 °C (- 58 °F)	-50 °C (- 58 °F)
Maximum permissible temperature (TS max.)	+120 °C (248 °F)	+120 °C (248 °F)	+120 °C (248 °F)	+120 °C (248 °F)
Supply voltage/conductor	3x400/230VAC 50Hz/3Ph+PE+N	3x400/230VAC 50Hz/3Ph+PE+N	3x400/230VAC 50Hz/3Ph+PE+N	3x400/230VAC 50Hz/3Ph+PE+N
Control voltage	24VDC	24VDC	24VDC	24VDC
Pre-fuse	16 A	20 A	25 A	63 A

Drainage connection	1½" BSP male	1½" BSP male	1½" BSP male	1½" BSP male
Connection size	1" / DN25 / 33.7	1" / DN25 / 33.7	1" / DN25 / 33.7	1" / DN25 / 33.7
Flange connection	DN25/PN40	DN25/PN40	DN25/PN40	DN25/PN40
Internal volume dm ³	SS 15.76 CU 16.55	SS 22.24 CU 24.40	SS 43.58 CU 45.75	SS 77.55 CU 81.41

2.7 DIMENSIONS / MEASUREMENTS

Dimensions / measurements applicable to the following versions:

- SS vaporizer without process heater
- SS vaporizer with process heater
- CU vaporizer without process heater
- CU vaporizer with process heater

Vaporizer capacity kg/h	LxWxH mm	CO ₂ connections Input/ Output	External switchgear cabinet without process heating mm	External switchgear cabinet with process heating mm	Drainage point for dripping water
200 (440 lb/h)	2200 (86.6 in) 900 (35.4 in) 1000 (39.3 in)	1", DN25/33.7	600x600x250 (23.6x23.6x9.8 in)	760x760x300 (29.7x29.7x11.8 in)	1½" BSP male
300 (661 lb/h)	3000 (118.1 in) 900 (35.4 in) 1000 (39.3 in)	1", DN25/33.7	600x600x250 (23.6x23.6x9.8 in)	760x760x300 (23.6x23.6x9.8 in)	1½" BSP male
500 (1102 lb/h)	3000 (118.1 in) 900 (35.4 in) 1200 (47.2 in)	1", DN25/33.7	600x600x250 (23.6x23.6x9.8 in)	760x760x300 (23.6x23.6x9.8 in)	1½" BSP male
1000 (2204 lb/h)	4200 (165.3 in) 1000 (39.3 in) 1450 (57 in)	1", DN25/33.7	600x600x250 (23.6x23.6x9.8 in)	760x760x300 (23.6x23.6x9.8 in)	1½" BSP male

2.8 WEIGHT

SS vaporizer without process heater

Vaporizer Capacity kg/h	LxWxH mm	Net dry weight without control without CO ₂ without condensate (ice) approx. kg	Additional Weight in production CO ₂ approx. kg	Additional Weight Condensate (ice)*	Additional Weight Control approx. kg
200 (440 lb/h)	2200 (86.6 in) 900 (35.4 in) 1000 (39.3 in)	295 (650 lbs)	26 (55 lbs)	*	55 (121 lbs)
300 (661 lb/h)	3000 (118.1 in) 900 (35.4 in) 1000 (39.3 in)	348 (767 lbs)	36 (79 lbs)	*	55 (121 lbs)
500 (1102 lb/h)	3000 (118.1 in) 900 (35.4 in) 1200 (47.2 in)	404 (890 lbs)	70 (154 lbs)	*	55 (121 lbs)
1000 (2204 lb/h)	4200 (165.3 in) 1000 (39.3 in) 1450 (57 in)	692 (1525 lbs)	124 (273 lbs)	*	55 (121 lbs)

*Dependent on environmental conditions

SS vaporizer with process heater

Vaporizer Capacity kg/h	LxWxH mm	Net dry weight without control without CO ₂ without condensate (ice) approx. kg	Additional Weight in production CO ₂ approx. kg	Additional Weight Condensate (ice)*	Additional Weight Control approx. kg
200 (440 lb/h)	2200 (86.6 in) 900 (35.4 in) 1000 (39.3 in)	315 (694 lbs)	26 (55 lbs)	*	80 (176 lbs)
300 (661 lb/h)	3000 (118.1 in) 900 (35.4 in) 1000 (39.3 in)	378 (833 lbs)	36 (79 lbs)	*	80 (176 lbs)
500 (1102 lb/h)	3000 (118.1 in) 900 (35.4 in) 1200 (47.2 in)	454 (1000 lbs)	70 (154 lbs)	*	80 (176 lbs)
1000 (2204 lb/h)	4200 (165.3 in) 1000 (39.3 in) 1450 (57 in)	762 (1679 lbs)	124 (273 lbs)	*	80 (176 lbs)

*Dependent on environmental conditions

CU vaporizer without process heater

Vaporizer Capacity kg/h	LxWxH mm	Net dry weight without control without CO ₂ without condensate (ice) approx. kg	Additional Weight in production CO ₂ approx. kg	Additional Weight Condensate (ice)*	Additional Weight Control approx. kg
200 (440 lb/h)	2200 (86.6 in) 900 (35.4 in) 1000 (39.3 in)	287 (632 lbs)	26 (55 lbs)	*	55 (121 lbs)
300 (661 lb/h)	3000 (118.1 in) 900 (35.4 in) 1000 (39.3 in)	338 (745 lbs)	36 (79 lbs)	*	55 (121 lbs)
500 (1102 lb/h)	3000 (118.1 in) 900 (35.4 in) 1200 (47.2 in)	387 (853 lbs)	70 (154 lbs)	*	55 (121 lbs)
1000 (2204 lb/h)	4200 (165.3 in) 1000 (39.3 in) 1450 (57 in)	664 (1463 lbs)	124 (273 lbs)	*	55 (121 lbs)

*Dependent on environmental conditions

CU vaporizer with process heater

Vaporizer Capacity kg/h	LxWxH mm	Net dry weight without control without CO ₂ without condensate (ice) approx. kg	Additional Weight in production CO ₂ approx. kg	Additional Weight Condensate (ice)*	Additional Weight Control approx. kg
200 (440 lb/h)	2200 (86.6 in) 900 (35.4 in) 1000 (39.3 in)	307 (676 lbs)	26 (55 lbs)	*	80 (176 lbs)
300 (661 lb/h)	3000 (118.1 in) 900 (35.4 in) 1000 (39.3 in)	368 (811 lbs)	36 (79 lbs)	*	80 (176 lbs)
500 (1102 lb/h)	3000 (118.1 in) 900 (35.4 in) 1200 (47.2 in)	437 (963 lbs)	70 (154 lbs)	*	80 (176 lbs)
1000 (2204 lb/h)	4200 (165.3 in) 1000 (39.3 in) 1450 (57 in)	734 (1618 lbs)	124 (273 lbs)	*	80 (176 lbs)

*Dependent on environmental conditions

3 TRANSPORT

3.1 TRANSPORT

All products to be packaged are protected with packaging suitable for the stresses they will be subjected to. This means that they will endure the normal stresses in the transport chain, i.e. the conditions occurring during sea, land and air transport as well as during proper handling and storage. High quality packaging does not relieve those involved in the logistic chain from their duty of care when handling the products. This applies to the time from the manufacture of the packaging and the packing of goods to be sent until the delivery of the shipment.

After delivery of the vaporizer, the machine must be inspected for damage in transit. If there is damage, the commissioned shipping company must be contacted in order to record the damage. Check whether the delivery is complete.

	 WARNING Risk of injury due to improper transport work! ▪ The vaporizer is transported in an upright position on wood profiles (without legs). ▪ Never transport the machine tipped forward or to the side! ▪ When transporting on a vehicle, the vaporizer must be secured to the platform and protected against slipping.
	 WARNING Risk of injury or damage due to unqualified personnel! Transportation must only be done by qualified and suitably trained specialist personnel.
	 WARNING Risk of head injury! ▪ During work in connection with the transport, installation and commissioning of the vaporizer, always wear suitable head protection.
	 DANGER Risk of injury due to improper transport! ▪ It is the responsibility of the transport and logistics company to carry out all transport procedures professionally, and according to best practice. ▪ Loading and unloading, wrapping and storage for transport must be carried out by a specialist company. ▪ The transport company must ensure that the country-specific requirements of safety and laws are complied with, and that staff have the necessary qualifications and training.
	 WARNING Risk of injury or damage during on-site transport and installation work! ▪ The regulations for the transportation and installation of the machine must be observed. ▪ The following work may only be carried out by qualified personnel and on machines disconnected from the mains supply.

3.2 UNPACKING THE VAPORIZER

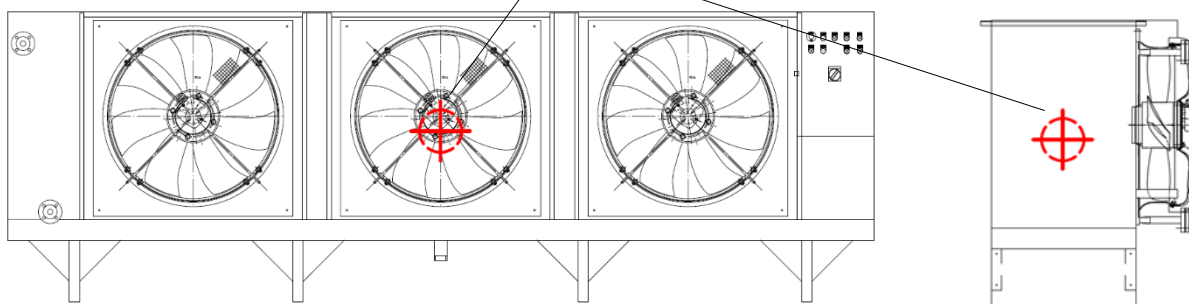
 	! WARNING
Risk of injury due to transport! ▪ Only lift using a forklift from beneath. ▪ Transportation by crane or hoist is not allowed.	

Carry out work as follows:

- Lift with forklift
 - Assemble foot frame
 - Assemble leg assembly kit
- Position vaporizer correctly on the floor



Centre of gravity



3.3 STORAGE

	CAUTION
	Damage due to insufficient protection of the vaporizer! ▪ Opening the packaging is only permitted if it is properly closed again. ▪ If it is not sealed to the same standard, any complaint will be rejected and the warranty claim will expire.

- Store vaporizer in a dry place.
- Storage temperature between 10 °C (50 °F) and 30 °C (86 °F).
- Air humidity between 30% and 60%.
- Store vaporizer protected from the weather (e.g. in a closed warehouse).
- Protect vaporizer from external environmental effects.
- The packaging is designed for one year of storage. In the event of a longer duration of storage, the packaging must be replaced with VCI foil. The foil must be protected from sunlight. "Volatile corrosion inhibitors (VCIs, sometimes referred to as vapour corrosion inhibitors)" and the "BRANOROST Chip U".

4 INSTALLATION

4.1 ASSEMBLY AND CONNECTION OF THE ASCO CO₂ VAPORIZER

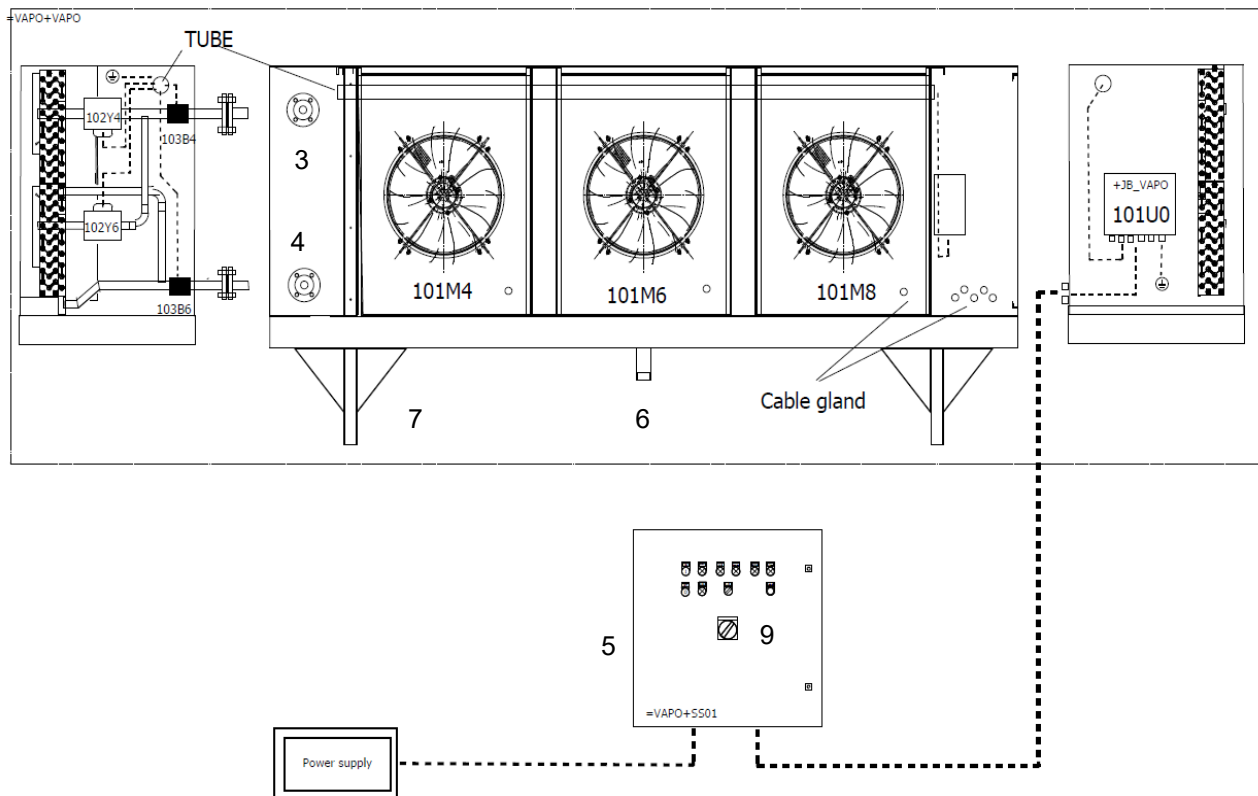


Fig. 20

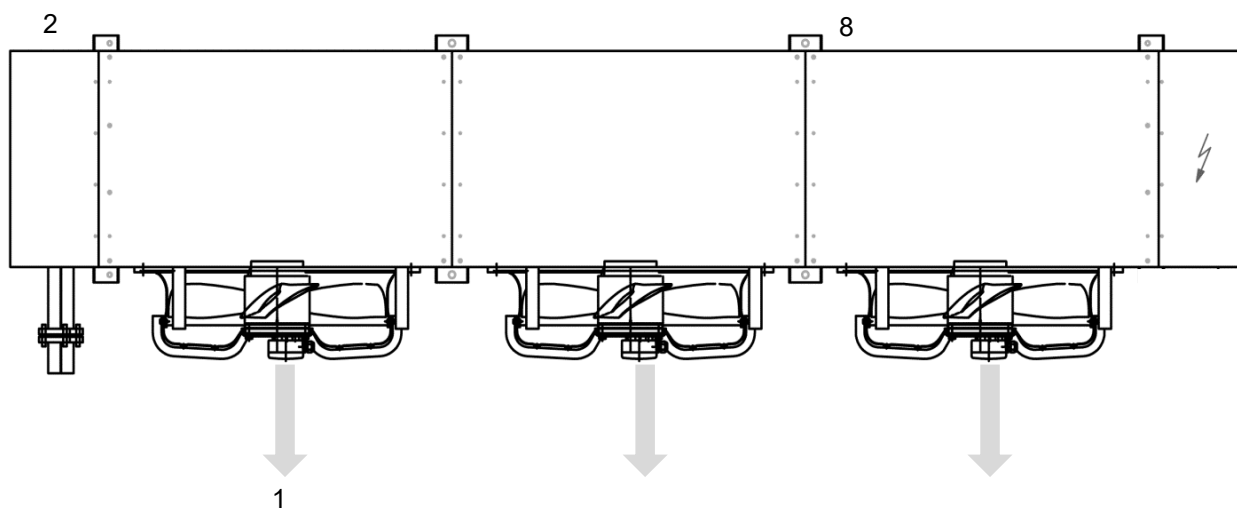


Fig. 21

1	Direction of air flow Minimum clearance 2.3 m (200 kg, 300 kg, 500 kg) or 3.5 m (1000 kg) (7.54 ft (440 lbs, 661 lbs, 1102 lbs) or 11.48 ft (2204 lbs))
2	Placement at least 1.5 m (4.92 in) free all around
3	CO ₂ connection outlet gas
4	CO ₂ connection outlet liquid
5	Electrical connection / switchgear cabinet
6	Condensate drain / 1½" BSP male
7	Vaporizer feet
8	Suspension for ceiling mounting
9	Main switch



NOTE

All work covered in this section must be carried out by a qualified and trained technician. ASCO CARBONDIOXIDE Ltd. shall not be liable for damage caused by non-compliance with the instructions and recommendations in this chapter.



WARNING

Hazards in the area of the vaporizer due to neighbouring manufacturing processes, environmental influences and the placement location must be excluded!

- Water on the floor
- Oxygen deficiency
- Dust, impurities, pollution and mist
- Electromagnetic interference
- Humidity (air humidity >80%)
- The vaporizer must only be placed in internal spaces. Not in the open air.
- Minimum air temperature in buildings for the vaporizer without heating in operation +10 °C (50 °F).
- Minimum air temperature in buildings for the vaporizer with heating in operation +5 °C (41 °F).
- The operator is responsible for the safe and professional installation of the machine (suspension/securing).
- The work must be performed by qualified specialists.



WARNING

Risk of head injury!

- During work in connection with the transport, installation and commissioning of the vaporizer, always wear suitable head protection.

Assembly process:

- Unpack the vaporizer and inspect the machine for transport damage.
- Mounting the feet (7) under the vaporizer.
- When placing the vaporizer, pay attention to the direction of air flow and ensure that the minimum clearance is 2.3 m (200 kg, 300 kg, 500 kg) or 3.5 m (1000 kg) ((7.54 ft (440 lbs, 661 lbs, 1102 lbs) or 11.48 ft (2204 lbs)), and otherwise a minimum clearance of 1.5 m (4.92 in) is maintained to walls, to ensure good air circulation (1) (2).
- Position the vaporizer correctly on the floor and secure. Recommended concrete anchor M10 x 80. Use vibration damper.
- Route and connect the CO₂ liquid pipe to the liquid CO₂ fitting (4) of the vaporizer.
- Route and connect the gas pipe to the CO₂ gas outlet (3) of the vaporizer.
- Pipes must be laid so that no stresses and vibrations can occur on the flange connections of the vaporizer.
- CO₂ pipework and components must be laid and secured to be collision-proof.
- Insulate all liquid CO₂ lines properly to prevent warming. In addition, protect insulation against mechanical exposure and UV radiation.
- Laying and connecting the condensate line to the vaporizer condensate drain (6).
- Depending on the purpose of the vaporizer, a pressure reducing valve on the vaporizer outlet is necessary once the vaporizer has been connected to the tank.

	 DANGER
	Risk of damage or injury due to CO₂! ▪ The operating company must define the operational safety measures and precautions by means of a local risk analysis (HAZOP) such as venting points for safety valves, drain cocks, degassers, etc. ▪ CO₂ gas collects at the lowest point. ▪ The CO₂ escapes at high velocity and at a very high noise level. ▪ Loose parts or dirt particles are blown about by the escaping gas. ▪ Install the prescribed CO₂ warning equipment. ▪ All persons standing in the vicinity of CO₂ pipework or devices, must be equipped with personal CO₂ warning devices. ▪ They must wear personal protective equipment such as safety goggles, safety footwear, hearing protection, protective gloves. ▪ Processes upstream and downstream of the machine must be designed so that they work properly at all times, even in the event of power loss.

 	 DANGER
	Risk due to pressure! Risk of damage or injury due to improper piping and welding! ▪ Welding work on pipelines must be carried out by a qualified specialist. The local legal permissions are required for this. ▪ The welding technique must be performed according to best practices. All statutory welding regulations and rules must be adhered to. ▪ After welding, the pipelines must be professionally and completely cleaned and flushed. Failure to observe this can lead to contamination or to damage to fittings, valves, instruments and other components. This can result in serious damage to the unit. ▪ Insulate all liquid CO₂ lines properly to prevent warming. In addition, protect insulation against mechanical exposure and UV radiation. ▪ The pipeline must be inspected by a specialist and released for operation.

	! WARNING
	Risk of damage or injury from pressurised machine! ▪ Prior to carrying out work on the machine, shut off the CO₂ supply. ▪ All installation must be carried out when the machine is depressurised. Depressurise the system as described in chapter 5.9.

	! CAUTION
	Hazard and material damage due to insufficient flushing Before the commissioning of the vaporizer, it must be flushed with CO ₂ gas twice for at least 5 minutes, in order to remove possible contamination or moisture from the unit. Before flushing, remove membrane from solenoid valve and reinsert after flushing.

ESTABLISHMENT OF CO₂ CONNECTION

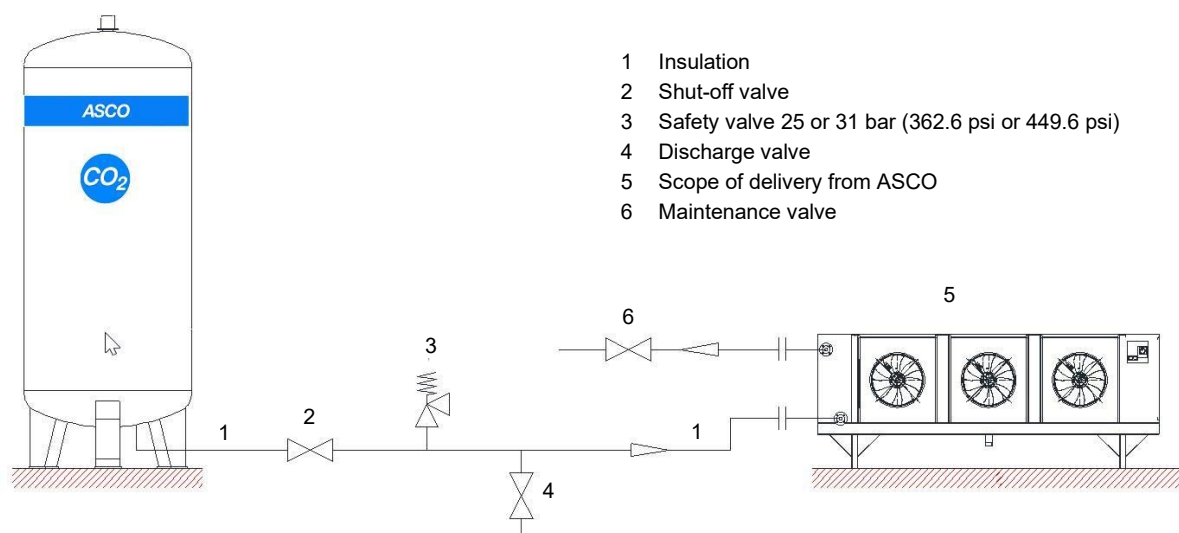


Fig. 22

	NOTE
	Assembly of shut-off valves: A manually operated shut-off valve before or after the outlet is recommended when using several vaporizers.

	! CAUTION
	Risk of injury from pressurised machine! The above task must be performed by qualified personnel and while the machine is disconnected from the mains power supply and de-pressurised. See also chapter 5.9 "Depressurising the machine" and 5.10 "De-energising the machine".

	 DANGER Danger due to pressure and missing safety valves, shut-off valves and drain cocks! ▪ All pipeline sections where liquid CO₂ might become trapped must be equipped with a safety valve and relief tap. ▪ The operator must install a shut-off valve and a drain cock in front of the machine. ▪ Drain lines for safety valves and drain cocks may be filled with condensate/water and therefore cannot be drained or cannot be drained sufficiently due to back pressure and/or icing. Danger due to incorrect design of the pressurized components! ▪ Maintain correct design of the safety valve (maximum 25 bar / maximum 362.6 psi) ▪ Proper design of drain lines, piping, safety valves and drain valves, etc. must be determined by a qualified specialist. Design according to national/international standards and defined measures in the operator's risk analysis (HAZOP). Danger due to inadequate maintenance! ▪ The operating company must have the safety valves inspected and tested at the intervals prescribed by the manufacturer (see maintenance matrix) and according to the applicable statutory regulations. All performed tests must be documented. ▪ Recommendation: Test or replace the safety valves every 2 years. Depending on the ambient conditions (e.g. foundries), shorten the inspection and replacement intervals for the safety valves.
	 WARNING Risk of damage or injury due to unexpected start-up of the vaporizer Before a cover of the vaporizer is removed or work is carried out on the vaporizer, it must be ensured that: ▪ The vaporizer is idle, the main switch is set to "OFF" and the unit is disconnected from the mains if necessary. ▪ The entire vaporizer is depressurised! ▪ All local safety provisions are observed and the requirements are met!
	 WARNING Risk of suffocation! Working in small, enclosed and unventilated spaces presents a suffocation hazard due to high CO₂ concentration! ▪ When working in enclosed spaces, ensure that there is adequate ventilation to keep the CO₂ concentration in the ambient air below a dangerous level. ▪ Use CO₂ sensors with warning devices. ▪ See separate document "General Information and Safety Instructions – Working with CO₂".

4.2 ELECTRICAL CONNECTION

	 DANGER Risk of damage or injury from electric power! Exposed electrical contacts, electrostatic discharge, physical impact on electrical systems, etc. pose a high safety risk. ▪ Use of approved high-power cable. ▪ The cable must be inspected before each use, and damage must be professionally repaired. In the event of damage to the cable, operating the machine is forbidden. ▪ All work on electrical equipment must be performed by suitably qualified specialist technicians. Risk of injury due to electrical energy and loose screws! Before connection to the mains, the following points must be checked: ▪ Only start the vaporizer after you have made sure that all safety components are correctly installed and in working and safe order. ▪ All cable connections are correctly tightened. ▪ All earthing connections and terminals are in place and securely connected. ▪ All screws are tightened.
	 WARNING Risk of damage or injury due to unexpected start-up of the vaporizer by remote control or master control! When using the remote operation or a master control (higher-level control), the operator must take the following points into account: ▪ After power failure, the higher-level control cannot send a starting signal to the vaporizer. ▪ The higher-level control must start the vaporizer manually. ▪ Check that the vaporizer is ready for operation before starting. ▪ Only start the vaporizer when it is ready for operation.
	 WARNING Risk of injury due to overheating/fire! Check the safety thermostats. Switch-off point 80 °C (176 °F).
▪ At item (5), there is an external switchgear cabinet with a 10 m cable for the electrical connection of the vaporizer. ▪ The main switch is item (9). ▪ The switchgear cabinet must be installed and connected to the power mains by an electrician. (Fig. 11)	
 	 WARNING Risk of damage or injury due to access to machine by third parties! ▪ The vaporizer must be secured against access by unauthorised persons and third parties. ▪ Access to the vaporizer must be secured (e.g. by a lockable gate). ▪ The vaporizer must be secured against unintentional switching on (e.g. by a padlock on the main switch).

For connection details, please refer to the chapter “Technical data and circuit diagram”.

4.3 COMMISSIONING AND INITIAL TESTING

Before commissioning, the following inspections must be conducted:

4.3.1 Inspection of the placement location

- Inspection of the placement location before commissioning

	! WARNING Further hazards at the placement location of the vaporizer must be excluded. E.g. due to neighbouring work processes, environmental influences, etc.! ▪ Water on the floor ▪ Oxygen deficiency, ventilation ▪ Dust, pollution and mist ▪ Electromagnetic interference ▪ Humidity (air humidity >80%) ▪ Contaminants ▪ The vaporizer must only be placed in internal spaces. Not outside of the building in the open air. ▪ Minimum air temperature in buildings for the vaporizer without heating in operation +10 °C (50 °F). ▪ Minimum air temperature in buildings for the vaporizer with heating in operation +5 °C (41 °F). ▪ The operator is responsible for the safe and professional installation of the machine (suspension/securing). ▪ The work must be performed by qualified specialists.
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4.3.2 Inspection of the CO₂ pipeline system and the warning devices

	! DANGER Risk of injury or damage due to missing risk analysis and implementation of additional safety measures! ▪ Additional safety measures must be defined and implemented by the operating company by means of a risk analysis (HAZOP) such as venting points for safety valves, drain cocks, degassers, etc. ▪ During commissioning, it must be checked whether all safety-related measures have been carried out correctly. ▪ The CO₂ collects at the deepest point. ▪ Do not operate in closed spaces. Risk of suffocation. ▪ The CO₂ escapes at high velocity and at a very high noise level. ▪ Loose parts or dirt particles are blown about by the escaping gas. ▪ CO₂ warning equipment is mandatory. ▪ All persons standing in the vicinity of CO₂ pipework or devices, must be equipped with personal CO₂ warning devices. ▪ Use prescribed personal protection equipment such as safety shoes, hearing protection, gloves and CO₂ warning devices. ▪ Processes upstream and downstream of the vaporizer must be designed so that a safe operating state is maintained at all times, even in the event of power failure.
---	---

	 DANGER
	Risk of injury or damage due to pressure! ▪ Install a safety valve wherever liquid CO₂ can be trapped. ▪ Ensure that the safety valve has the suitable specifications, 25 or 31 bar (362.6 or 449.6 psi), see type plate. ▪ The correct layout of the drainage line of the safety valve must be calculated by a qualified specialist. ▪ The relief tap/ball valve must be installed by the operating company. ▪ The operating company must have the safety valves inspected and tested at the intervals prescribed by the manufacturer and according to the applicable statutory regulations. ▪ It is recommended to inspect or replace the safety valves every 2 years.

4.3.3 Inspection of the weld joints

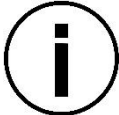
 	 DANGER
	Risk due to pressure! Risk of damage or injury due to improper piping and welding! ▪ Welding work on pipelines must be carried out by a qualified specialist. The local legal permissions are required for this. ▪ The welding technique must be performed according to best practices. All statutory welding regulations and rules must be adhered to. ▪ After welding, the pipelines must be professionally and completely cleaned and flushed. Failure to observe this can lead to contamination or to damage to fittings, valves, instruments and other components. This can result in serious damage to the unit. ▪ Insulate all liquid CO₂ lines properly to prevent warming. In addition, protect insulation against mechanical exposure and UV radiation. ▪ The pipeline must be inspected by a specialist and released for operation.

4.3.4 Inspection of the electrical installation

	 DANGER
	Risk of injury due to electric power and loose screws! Work on the electrical equipment must only be performed by qualified specialist technicians. Before connection to the mains, the following points must be checked: ▪ Test protocols for the electrical installation in accordance with EN 60204-1, chapter 18 or the local regulations for the commissioning of electrical installations have been drawn up. ▪ All safety components are correctly installed and in a safe operating state. ▪ All cable connections are correctly tightened. ▪ All earthing terminals and connections are in place and securely connected. ▪ All screws are tightened. ▪ No unprotected electrical contacts. ▪ Protection from external electrostatic phenomena. ▪ Sufficient protection from external influences on the electrical equipment. ▪ Use of suitable and approved high-power cable. ▪ Correct dimensioning of the connection cable. ▪ The cable must be inspected for damage before each use. If damage is discovered, it must be professionally repaired. If there is damage to the cables, it is forbidden to operate the machine.

4.3.5 Inspection of the direction of rotation of the fan motor

The fan must draw air through the heat exchanger.

	NOTE If the motor turns in the opposite direction, the two phases at the connection terminals must be exchanged. Tighten the connection terminals securely. WARNING! Disconnect the vaporizer from the mains power supply!
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4.3.6 Inspection of the surroundings of the ASCO vaporizer

	NOTE ▪ Before each start-up of the machine, all safety doors must be closed and all other safety equipment must be inspected for presence and function. ▪ Check whether the reference and ambient temperature and the required CO₂ quantity correspond to the specifications of the instruction manual. ▪ The added quantity of CO₂ may be higher than the capacity of the vaporizer at the corresponding ambient temperature. ▪ Regular cleaning of the vaporizer fins with compressed air.
---	---

	CAUTION Risk of slipping! ▪ Connect the drip tray to a drainage system. ▪ Check draining water regularly to ensure it drains away freely. ▪ Risk of slipping due to condensate on the floor. ▪ Wear safety shoes with anti-slip soles!
--	---

	WARNING Risk of injury due to high temperature! ▪ Are protective distancing guards and warning signs (pictograms) in place ▪ (heating rods, electrical motors)?
---	--

	WARNING Risk of damage or injury due to access to machine by third parties! ▪ The vaporizer must be secured against access by unauthorised persons and third parties. ▪ Access to the vaporizer must be secured (e.g. by a lockable gate). ▪ The vaporizer must be secured against unintentional switching on (e.g. by a padlock on the main switch).
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4.4 PROCESS HEATING OPTIONAL

The heating system consists of:

- Heating rods, bundled into two separate heater groups that are integrated into the vaporizer circuits.
- A heating controller, integrated into the switchgear cabinet. The heating rods and the thermostats are installed inside the vaporizer.
- One terminal box for intermediate wiring.
- Two thermostats for the independent control of the two heating circuits.
- Two overtemperature sensors to protect the system against overheating.

	! DANGER Risk of damage or injury from electric power! Exposed electrical contacts, electrostatic discharge, physical impact on electrical systems, etc. pose a high safety risk. ▪ All work on electrical equipment must be performed by suitably qualified specialist technicians.
	! WARNING Risk of injury due to high temperature! ▪ Heating rods ▪ Electric motor
 	! WARNING Risk of injury or damage from CO₂ under pressure! Shut off CO₂ supply. ▪ Close the shut-off valve before the vaporizer (CO₂ liquid line) and the shut-off valve after the vaporizer (CO₂ exhaust line). ▪ Release the pressure upstream, in and downstream of the vaporizer by opening the discharge valve. ▪ Secure shut-off valves against accidental opening and label them.
	! WARNING De-energise the machine! ▪ Turn the main switch to "OFF". ▪ Disconnect the vaporizer from the mains power supply.

To complete the electrical installation, connect the power supply line:

- The connection specification and the recommended pre-fuse can be seen on the table in the chapter “Technical Data”.
- Connect the wires to the terminals in the terminal box.

View thermostats

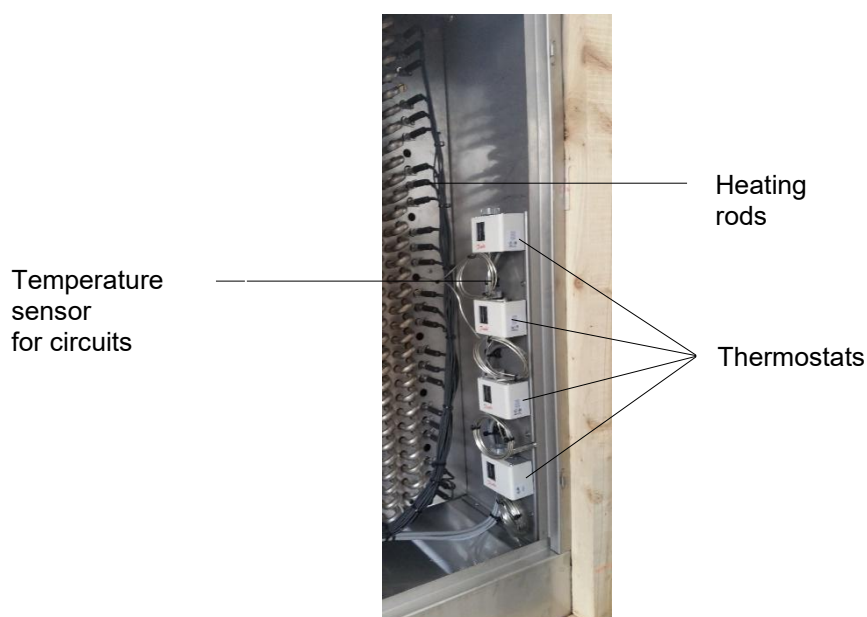


Fig. 23



NOTE

- Further information is available in the electrical schematic.
- The electrical schematic is located in the switchgear cabinet.

4.5 DEPRESSURISE AND DE-ENERGISE THE MACHINE

If the vaporizer is taken out of operation, it must normally be de-pressurised and de-energised.
If only the production was interrupted, the machine is under pressure when idle.

 	 WARNING Risk of injury or damage from CO₂ under pressure! De-pressurise the machine as described in chapter 5.9
	 WARNING Danger from electrical current! De-energise the machine as described in chapter 5.10

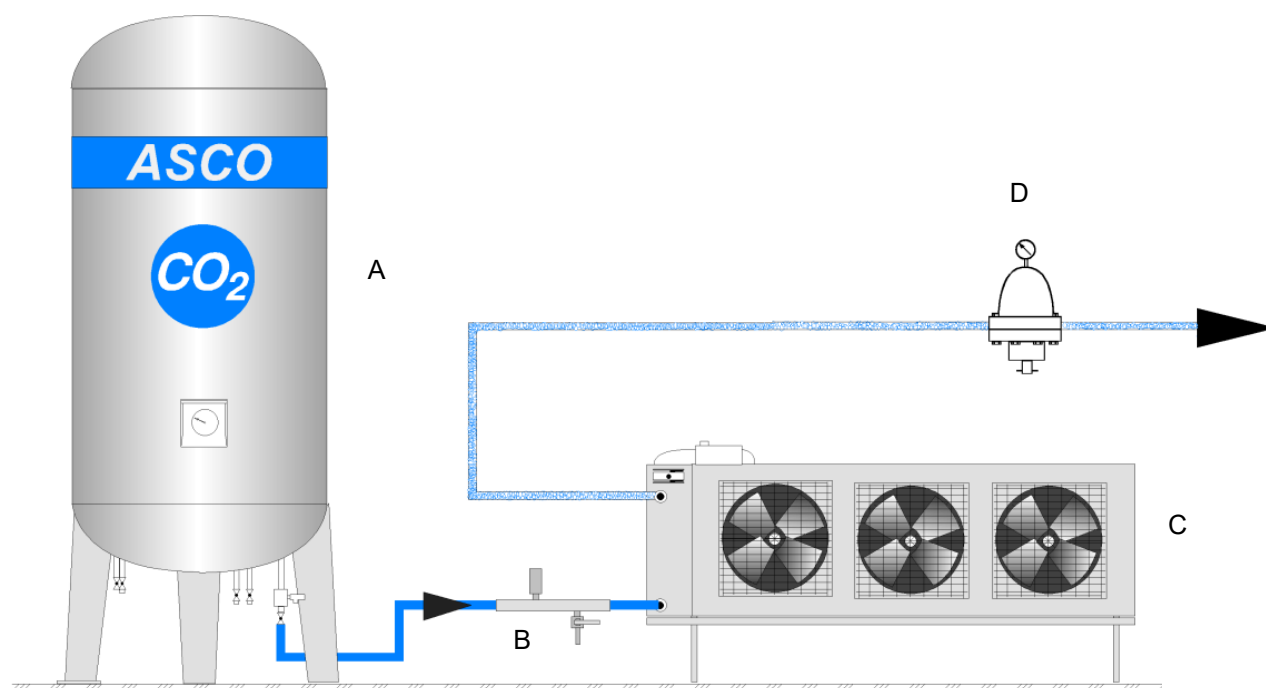
5 MACHINE OPERATION

	! WARNING Risk of suffocation! Working in enclosed, unventilated spaces presents a suffocation hazard due to high carbon dioxide concentration! ▪ When working in enclosed spaces, ensure that there is adequate ventilation to keep the carbon dioxide concentration in the ambient air below a dangerous level. ▪ Use CO₂ warning devices. ▪ See separate document "General Information and Safety Instructions – Working with CO₂".
 	! WARNING Precondition for operation: ▪ All safety instructions have been read and understood. ▪ The machine has been correctly installed.
	! WARNING Risk of damage or injury due to unexpected start-up of the vaporizer Before a cover of the vaporizer is removed or work is carried out on the vaporizer, it must be ensured that: ▪ The vaporizer is idle, the main switch is set to "OFF" and the unit is disconnected from the mains if necessary. ▪ The entire vaporizer is depressurised! ▪ All local safety provisions are observed and the requirements are met!
	! WARNING Risk of injury due to high temperature ▪ Heating rods ▪ Electric motor

Tests to be carried out before switching on:

- Fan inlets and outlets must be free
- Liquid CO₂ lines must be open
- Vaporizer pressure must be on
- Process at CO₂ outlet must be ready
- Check whether there is sufficient air supply

5.1 INTENDED USE (EXAMPLE)



A	CO₂ storage tank (liquid)	Liquid CO ₂ is filled in a vertical, vacuum-insulated stainless steel CO ₂ storage tank from a CO ₂ production plant, a CO ₂ recovery system or a transportable CO ₂ tank.
B	Line protection unit	Line protection unit for a simple connection between the tank and vaporizer. It consists of a stainless steel pipe, a connection for the vaporizer, a safety valve set to 25 or 30 bar (depending on the max. permissible operating pressure) and a relief tap if necessary.
C	Atmospheric CO₂ vaporizer	Atmospheric CO ₂ vaporizer that converts the liquid CO ₂ to gaseous CO ₂ using the ambient air as a heat source. Electrical energy is only needed for the fans and the solenoid valve.
D	CO₂ pressure reducer valve	CO ₂ dome pressure reducer with large CO ₂ flow capacity for the monitoring and maintenance of the necessary CO ₂ pressure.

5.2 PRINCIPLE OF FUNCTION

The ASCO CO₂ vaporizer is equipped with 2 separate circuits that are operated alternately. The circuits are positioned one on top of the other. While one circuit is in operation, the other is being defrosted.

5.3 GENERAL

When the unit is switched on with the main switch, the following components are switched on:

- Switchgear cabinet heating, to prevent condensation (self-regulating PTC technology)
- Control voltage ON indicator [24V OK] ► white indicator lit

5.4 LOCAL CONTROL MODE

The vaporizer can be controlled locally.

5.4.1 Start-up in local control mode:

- Switch on the main switch
- Control voltage ON indicator [24V OK] ► white indicator lit
- Set selector switch [LOCAL/REMOTE] to LOCAL ► [Local] indicator lit
- Start vaporizer with **ON button [I]** ► [RUN] indicator lit
- The vaporizer fans start, provided there are no faults (all motor protection switches OK, no faults).
- One CO₂ outlet valve is opened, provided that there is no CO₂ outlet temperature error (CO₂ outlet temperature limit too low).

5.4.2 STOPPING THE CO₂ VAPORIZER IN LOCAL CONTROL MODE

- Switch off vaporizer with button [O] ► vaporizer OFF

5.4.3 Stop machine for end of production, normal shutdown in local control mode

- Switch off vaporizer with button [O] ► vaporizer OFF
- Turn the main switch with EMERGENCY STOP function (vaporizer OFF).

5.5 REMOTE CONTROL MODE

The vaporizer can be controlled remotely.

5.5.1 Start-up in remote control mode:

- Switch on the main switch
- Control voltage ON indicator [24V OK] ► white indicator lit
- Set selector switch [LOCAL/REMOTE] to LOCAL ► [Local] indicator lit
- Start vaporizer **remotely with ON button = 1**] ► [RUN] indicator lit
- The vaporizer fans start, provided there are no faults (all motor protection switches OK, no faults).
- One CO₂ outlet valve is opened, provided that there is no CO₂ outlet temperature error (CO₂ outlet temperature limit too low).

5.5.2 STOPPING THE CO₂ VAPORIZER IN REMOTE CONTROL MODE

- **Remote ON signal = 0** ► vaporizer OFF

5.5.3 Stop machine for end of production, normal shutdown in remote control mode

- **Remote ON signal = 0** ► vaporizer OFF
- Turn the main switch with EMERGENCY STOP function (vaporizer OFF).

5.6 LOCAL / REMOTE / STANDBY MODE

- The vaporizer fans start. They are controlled on the basis of the CO₂ inlet temperature.
- > 10°C (50 °F) ► fans OFF with 16 min delay
- The vaporizer is in standby mode
- < 5°C (41 °F) ► fans ON
- Output signal "all fans" is activate, if all fans are running.
- If one of the fans is faulty (motor protection switch tripped) the other fans continue to run. Note: In this case, the vaporizer performance is reduced.
- CO₂ outlet temperature > -5 °C (23 °F) ► CO₂ valves ON
- The CO₂ valves of the two circuits switch over every 8 min.
- CO₂ outlet temperature < -10 °C (14 °F) ► CO₂ valves OFF

5.7 EMERGENCY SHUTDOWN

- Turn the main switch with EMERGENCY STOP function (vaporizer OFF).

5.8 RESTARTING AND TESTS AFTER EMERGENCY STOP

- Disconnect the vaporizer from the power supply and de-pressurise it.
- Identify the cause of the EMERGENCY STOP.
- Search for the error and correct it.
- Acknowledge the error message.
- Before restarting the vaporizer, it should be fully defrosted (no ice on ventilation slots).
- Connect the vaporizer to the power supply and slowly open the CO₂ supply valve.
- The machine is now again ready for operation.
- Switch on the main switch.
- Press the (green) start button.

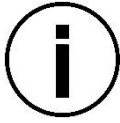
5.9 DEPRESSURISING THE MACHINE

 	 WARNING Risk of injury or damage from CO₂ under pressure! Shut off CO₂ supply. ▪ Close the shut-off valve before the vaporizer (CO₂ liquid line) and the shut-off valve after the vaporizer (CO₂ exhaust line). ▪ Release the pressure upstream, in and downstream of the vaporizer by opening the discharge valve. ▪ Secure shut-off valves against accidental opening and label them.
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5.10 DE-ENERGISING THE MACHINE

	 WARNING Danger from electrical current! Switch off the machine after end of production: ▪ Empty the machine's CO₂ lines ▪ Turn the main switch to "OFF". ▪ Disconnect the vaporizer from the mains power supply.
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6 MAINTENANCE, SERVICING, CLEANING

	NOTE The electrical system must be inspected before commissioning and at least every 100 operating hours. Before every operation, visual inspection by the operator for damage to cables, visible external electrical components and mechanical parts.
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As the vaporizer has been designed according to best engineering practice for user-friendliness, it requires only minimum maintenance.

However, the vaporizer must be inspected for damage regularly and each time before it is started. This enhances the vaporizer's operational safety and extends its service life.

	! WARNING Risk of injury or damage from improper maintenance and servicing! All service and maintenance work must be carried out by trained and qualified personnel with the approved tools and devices. Heavy loads must be handled with suitable equipment.
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	! WARNING Before removing a cover of the machine, ensure that: ▪ The mains switch is set to "OFF". ▪ All applicable safety regulations have been complied with! ▪ De-pressurise the machine as described in chapter 5.9, disconnect the mains plug.
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	! WARNING Risk of damage or injury due to unexpected start-up of the vaporizer by remote control or master control! When using the remote operation or a master control (higher-level control), the operator must take the following points into account: ▪ After power failure, the higher-level control cannot send a starting signal to the vaporizer. ▪ The higher-level control must start the vaporizer manually. ▪ Check that the vaporizer is ready for operation before starting. ▪ Only start the vaporizer when it is ready for operation.
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	! CAUTION ▪ Damaged and leaking valves, pipework and seals must be replaced immediately. ▪ Never operate the machine with damaged or leaking lines. ▪ CO₂ escaping under high pressure can result in serious injury and damage to property and the environment!
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	! CAUTION Never clean pipelines, valves and any associated parts with a solvent or detergent.
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	 CAUTION When handling cold parts, wear protective gloves.
	 WARNING Risk of damage or injury due to unsuitable spare parts! The use of unsuitable spare parts can lead to safety hazards. This applies in particular to safety components. ▪ Only use original spare parts.
 	 WARNING De-pressurise the machine! Shut off CO₂ supply. ▪ Close the shut-off valve before the vaporizer (CO₂ liquid line) and the shut-off valve after the vaporizer (CO₂ exhaust line). ▪ Release the pressure upstream, in and downstream of the vaporizer by opening the discharge valve. ▪ Secure shut-off valves against accidental opening and label them.
	 WARNING De-energise the machine! ▪ Turn the main switch to "OFF". ▪ Disconnect the vaporizer from the mains power supply.

6.1 INSPECTIONS OF OPERATING EQUIPMENT AND WEAR PARTS

In case of questions, contact the ASCO customer service.

 	⚠ WARNING Risk of injury due to improper maintenance! Observe the following when carrying out maintenance work on the vaporizer: ▪ Depressurise and de-energise the machine as described in chapter 5.9 “Depressurising the machine” and 5.10 “De-energising the machine” ▪ Set the main switch to “0/OFF”. Disconnect the unit from the mains power supply. ▪ All local safety provisions have been observed and complied with! ▪ All work on the electrical and mechanical equipment must be carried out by qualified specialists.
	⚠ DANGER Risk of injury or damage due to pressure, incorrect design or missing equipment! ▪ Ensure that the safety valve has the suitable specifications, 25 or 31 bar (362.6 or 449.6 psi), see type plate. ▪ The relief tap/ball valve must be installed by the operating company. ▪ The operating company must have the safety valves inspected and tested at the intervals prescribed by the manufacturer (see maintenance matrix) and according to the applicable statutory regulations. All performed tests must be documented. ▪ Recommendation: Test or replace the safety valves every 2 years. ▪ Depending on the ambient conditions (e.g. foundries), shorten the inspection and replacement intervals for the safety valves.

Component	Task	once		repeated			
		During commissioning	1000 h or 1 year*	weekly	monthly	1000 h or 1 year*	2000 h or 2 years*
Safety devices	Visual inspection of all safety devices. Replace missing or defective safety devices (guards/signs).	X			X	X	X
EMERGENCY STOP / LED lamps	Indicator check by specialist	X		X			
Check all screw connections	for damage. If necessary, re-tighten screw connections carefully.	X				X	X
CO ₂ liquid and exhaust lines	Check for damage and leaks, seal, re-tighten or replace connections. Have connections sealed by specialist in case of leaks.	X				X	X
Condensate tray and line	Check for damage, leaks and impurities, whether condensate can flow out. If necessary, seal and re-tighten connections.	X				X	X
Power cable and plug	Check for damage, have replaced by specialists if necessary.	X				X	X
Solenoid valves	Perform a function test. Replace if necessary.	X				X	X
Heat exchanger or fins	Check for damage and leaks.	X				X	X
Heat exchanger	Regularly blow out with compressed air			X			
Motor and fan	Check for damage and function.	X				X	X
Fans	Visual inspection: all fans work			X			
Electrical components	All electrical installations inspected by a qualified electrician of the operator.		According to national regulations, but at least every 1000 hours				
Electrical components and also contact resistance thermometer with transmitter and limit switch (2x) for CO ₂ inlet temperature and CO ₂ gas outlet temperature	Check for damage and for the respective adjustment range. Replace if necessary.	X				X	X

Component	Task	once		repeated			
		During commissioning	1000 h or 1 year*	weekly	monthly	1000 h or 1 year*	2000 h or 2 years*
Process heating (optional)	Check heating rods for damage, replace if necessary.	X				X	X
Control thermostat (6x) (option) process heating	Check for damage and for the respective adjustment range. Replace if necessary.	X				X	X
External visual inspection	All fans work The heating must not run when ambient temperature > 10 °C (50 °F (LED control cabinet)			X			

* whichever comes first

6.2 CLEANING

	! WARNING Risk of injury due to cleaning work on a machine in operation! Note the following: ▪ The vaporizer is de-energised and de-pressurised! ▪ The main switch is set to "0/OFF". ▪ All applicable safety regulations have been complied with! ▪ The unit is disconnected from the mains power supply. Only then can covers be removed and the cleaning work be carried out.
	! CAUTION Risk of injury or damage from use of unsuitable cleaning agent! ▪ No solvents or cleaning agents may be used for cleaning the fins and all associated parts.
	! CAUTION Risk of injury due to failure to use personal protective equipment! ▪ Wear safety glasses, hearing protection and suitable gloves for cleaning work.

Clean the inside and outside of the machine, using a conventional industrial detergent.

Carefully blow clean the vaporizer fins and heating rods with compressed air.

7 MAINTENANCE, TROUBLESHOOTING

	! WARNING Risk of injury or damage due to unqualified personnel! All tasks described in this chapter must be performed by suitably trained and qualified skilled workers. Ensure that all safety instructions are understood and adhered to.
 	! WARNING Risk of injury or damage from CO₂ under pressure! Shut off CO₂ supply. ▪ Close the shut-off valve before the vaporizer (CO₂ liquid line) and the shut-off valve after the vaporizer (gas CO₂ line). ▪ Release pressure before, in and after the vaporizer with the relief tap. ▪ Secure the shut-off valves against unintentional opening and label them, if necessary.
	! WARNING Risk of damage or injury due to unexpected start-up of the vaporizer by remote control or master control! When using the remote operation or a master control (higher-level control), the operator must take the following points into account: ▪ After power failure, the higher-level control cannot send a starting signal to the vaporizer. ▪ The higher-level control must start the vaporizer manually. ▪ Check that the vaporizer is ready for operation before starting. ▪ Only start the vaporizer when it is ready for operation.
	! WARNING Before removing a cover of the machine, ensure that: ▪ The mains switch is set to "OFF". ▪ All applicable safety regulations have been complied with! ▪ De-pressurise the machine see chapter 5.9, disconnect the mains plug.
 	! WARNING Risk of injury due to unexpected start-up! ▪ Set the main switch to "OFF". ▪ Disconnect the vaporizer from the mains power supply.
	! WARNING Risk of injury due to use of unsuitable spare parts! ▪ Only use original spare parts.

7.1 FAULT LIST WITH CAUSES AND CORRECTIVE ACTIONS

FAULT	CAUSE	REMEDY
Solenoid valve does not switch	Control relay or solenoid coil faulty	Check relay or solenoid coil and replace if necessary.
Excessive water ice build-up in heat exchanger	Solenoid valve always open	Check solenoid valve, relay or membrane and replace if necessary.
	Excessive CO ₂ usage	Reduce usage.
	Ambient temperature too low	Reduce usage or place vaporizer in a location with an ambient temperature of at least +10° (50 °F).
	Fan does not work	- Check motor protection relay. - Check motor for loose connections.
	Air flow insufficient or blocked	An unhindered air flow must be ensured.
Solenoid valves remain open	Dust or dirt in valve	Clean valve.
	Moisture in system, rust or water ice in valve	Use dry CO₂ gas to flush.
Vaporizer does not start	Main switch is turned off	Switch on the main switch.
	Motor circuit breaker has tripped	- Remedy cause and switch on motor circuit breaker again. - Press reset button.
Fan does not run	Dirt on heat exchanger fins	- Clean heat exchanger fins with compressed air. - Remedy cause and switch on motor circuit breaker again.
	Motor circuit breaker has tripped	- Switch on motor circuit breaker again. - Press reset button. - Inlet temperature >+10 °C (50 °F), - Cause: no CO₂ demand, fans turn off.

FAULT	CAUSE	REMEDY
24V OK indicator not lit	Main switch off	Switch on the main switch
	Electronic fuse tripped (red LED on)	- Reset fuse - If necessary, check current
	No 24VDC supply	- Check mains circuit breaker 24VDC circuit defective; replace
CO ₂ GAS alarm indicator	CO ₂ GAS outlet temperature below limit value (< -10 °C / 14 °F)	- Risk that liquid CO₂ has entered the vaporizer. - Check the vaporizer to ensure that it works properly
Motor protection switch alarm indicator	One or more motor protection switches tripped	- Check motor current settings. - Check current consumption of motor(s). - Reset motor protection switch(es).
Option with process heating:		
Indicator group 1 off	Air temperature >10 °C (50 °F). or Air temperature <10 °C (50 °F). Thermostat does not switch or One of the fans is not in operation	- Inspect thermostat (Function, settings) - Check function of the vaporizer
Indicator group 2 off	Air temperature >7 °C (44.6 °F). or Air temperature <7 °C (44.6 °F) Thermostat does not switch or One of the fans is not in operation	- Inspect thermostat (Function settings) - Check function of the vaporizer
Indicator alarm circuit breaker heating	Circuit breaker of heating group 1 or 2 has tripped	Search for cause and switch on
Indicator alarm overtemperature heating	One of the two overtemperature thermostats has tripped (>80 °C, >176 °F)	Heater

8 DECOMMISSIONING, DISMANTLING, DISPOSAL

	 WARNING Risk of injury due to improper disassembly work! ▪ All of the work involved in decommissioning, dismantling, and disposal must only be carried out by trained and qualified specialists. ▪ Only use suitable tools and devices. ▪ Heavy loads must only be handled with suitable equipment.
	NOTE Environmental hazard due to improper and unlawful disposal! ASCO machines are designed based on the key principles of ecological design and contain high-quality materials (metals, plastics, electrical components, electrical cables, etc.), which can be recycled at the end of their service life. Ensure that all materials are recycled and, if necessary, disposed of in accordance with the current environmental directives and local regulations for safe waste disposal.

9 ATTACHMENTS (DOCUMENTS)

9.1 DOCUMENT "GENERAL INFORMATION AND SAFETY INSTRUCTIONS – WORKING WITH CO₂"

9.2 SPARE PARTS LIST

9.3 ELECTRICAL CIRCUIT DIAGRAM

9.4 EU DECLARATION OF CONFORMITY