Vitotherm

Instruction manual

CO_2 set

CO_2 dosing unit & control panel

EN (English) original instructions

Original instructions

The original manual is written in UK English. All other language versions are translations of the original manual.

Copyright

Disclaimer of liability

The manufacturer cannot be held responsible for personal injury, damage to the CO_2 set or property damage caused by incorrect use, foreseeable misuse or failure to follow the instructions in this manual. This also applies to unauthorised modifications of the CO_2 set and the use of non-approved spare parts, tools or accessories.

The manufacturer reserves the right to modify this manual without notification beforehand.

Customer service

Our customer service department is available 24 hours a day to provide any required technical information and support.

Please have the type plate information of the CO_2 set available when you contact our customer service department (see §**3.6**).

+31 (0) 15 369 47 57

Warranty

The equipment supplied by Vitotherm has a one-year warranty covering materials from date of commissioning against defective parts, limited to the delivery of parts only. Warranty is only valid when the installation has been realised in accordance with our instructions and commissioning is executed by a Vitotherm engineer or by Vitotherm authorised personnel.

During the period of the warranty any failures to Vitotherm equipment will be repaired within 10-14 days. Our local service expert for future regular maintenance will be at our daily rate.

Vitotherm

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1 Introduction

1.1 About this document

This manual contains instructions and safety information for operation, installation, commissioning and maintenance of the Vitotherm CO_2 set.

This manual is intended for:

- the owner of the CO_2 set;
- the worker that operates the CO_2 set;
- the qualified technician that performs the installation of the CO_2 set;
- the engineer that is authorized by Vitotherm to perform (re)commissioning, adjustments, troubleshooting,maintenance and repairs of the CO_2 set.

1.2 Symbols and labels

1.2.1 Safety warnings

This manual contains safety warnings that may result in injury when ignored. Each safety warning is indicated with a signal word. The signal word corresponds with the level of risk of the described hazardous situation:

Signal word	Level of risk	If not avoided
⚠ DANGER!	High	Will result in death or serious injury
⚠ WARNING!	Medium	Could result in death or serious injury
⚠ CAUTION!	Low	Could result in moderate or minor injury

Safety warnings given at the start of a section apply to the entire section.

Format example of a safety warning:

⚠ WARNING! Contact with live parts can cause electric shocks, burns or even death.

- ▶ Only perform work on electrical equipment if you are an authorised electrician.
- ▶ Before you start working on electrical equipment: Switch off and lock out the power supply isolator and verify that no voltage is present.

1.2.2 Notices

Messages that are not hazard-related are indicated with the signal word **NOTICE**. These messages do not have a safety alert symbol.

Format example of a message that is not hazard-related:

NOTICE Operating the engine at an oil level below the minimum limit value can damage the engine.

▶ Regularly check the oil level and refill when necessary.

1.2.3 Other symbols

 This symbol identifies a reference to an external document, such as an OEM manual.

1.3 Used terms and definitions

Term	Definition
CO_2 set	The combination of the CO2 dosing unit and control panel.
CO_2 dosing unit	The pre-assembled collection of components that transports the flue gases from the boiler to a greenhouse.
Greenhouse distribution system	The network that transports CO_2 gas to one or more greenhouses.
Boiler	The heating appliance to which the CO_2 dosing unit is connected. A water boiler is the most common type of heating appliance and will be used as the main example in this document.
Boiler house	The building in which the CO_2 set and boiler are installed.
OEM manual	User manual of the original equipment manufacturer.

1.4 Conformity

Vitotherm CO_2 sets carry the CE and EAC marks as a proof of compliance to the following directives:

1. MD 2006-42-EG
2. EMC 2014-30-EU
3. LVD 2014-35-EU

See Appendix D for the full declaration of conformity.

2 Safety

2.1 Introduction

Observe the instructions in this manual before you start working with the CO_2 set. If you fail to follow the instructions from this manual you can put persons, surroundings, the environment and the CO_2 set at risk. Store this manual in an accessible place near the CO_2 set for future reference.

- ▶ Always comply with the information, such as labels and the type plate, attached directly to the CO_2 set and keep the information in a legible condition.
- ▶ Always comply with applicable local laws and regulations.

A Vitotherm CO_2 set is used in combination with a Vitotherm Automatic forced draught burner system. Refer to the instruction manual of the burner system for more information.

The CO_2 set is equipped with several safety components that ensure safe interaction with the machine.

2.2 Intended use

The Vitotherm CO_2 set is intended to be used in the following ways:

- As an electrically powered fan to collect the flue gases from a boiler system.
- To mix the collected flue gases with clean air to create CO_2 gas with the desired temperature.
- To deliver the dosed flue gases to the distribution system of a greenhouse.
- OPTIONAL – To mix the collected flue gases with clean air to regulate the under pressure in the connected CO_2 collector.

The Vitotherm CO_2 set is intended to be used under the following conditions:

- The CO_2 set must only be installed, operated, commissioned and maintained according to the instructions in this manual.
- The CO_2 set must only be used for an application in compliance with the requirements in the order confirmation.
- The CO_2 set must only be used under ambient conditions in compliance with the requirements in the order confirmation.
- The CO_2 set must only be used in compliance with applicable local laws and regulations.

Safe use of the CO_2 set is only guaranteed if it is used as intended.

2.3 Reasonably foreseeable misuse

The following is considered foreseeable misuse:

- Use of the CO_2 set that deviates from the intended use as described in the previous section.
- Failure to comply with the instructions in this manual.
- Failure to eliminate faults, malfunctions or defects of the CO_2 set that impose safety risks.
- Failure to carry out the inspections and maintenance operations as described in this manual.
- Unauthorized removal or modification of parts or safety components of the CO_2 set.
- Use of spare parts or accessories that have not been approved by the manufacturer.
- Operation in a closed-off or poorly ventilated room.

2.4 Qualification of personnel

Only authorised personnel is allowed to operate and clean the CO_2 set. They must possess the following qualifications:

- are legal of age;
- are familiar with and abide by the safety instructions and sections of this manual related to operating the CO_2 set;
- are familiar with and abide by the applicable local, national and international laws and regulations;
- are officially trained and certified by Vitotherm B.V.
- have received adequate training to operate and clean the CO_2 set;
- have obtained authorisation to access the CO_2 set.

Only authorised technicians are allowed to perform installation and maintenance of the CO_2 set. They must possess the following qualifications:

- are legal of age;
- are familiar and abide by the safety instructions and sections of this manual related to installation and maintenance of the CO_2 set;
- are familiar with and abide by the applicable local, national and international laws and regulations;
- are able to recognize the possible dangers of the CO_2 set and take the necessary measures to protect persons and property;
- have received adequate training in the safe maintenance of the CO_2 set;
- have obtained authorisation to access the CO_2 set.

2.5 Protective measures

2.5.1 Personal protective equipment (PPE)

Personnel that operates the CO_2 set must equip themselves with the following:		Technicians that install or perform maintenance on the CO_2 set must equip themselves with the following:	
	Wear foot protection		Wear foot protection
	Wear eye protection		Wear eye protection
	Wear ear protection (above 80 dB)		Wear protective gloves
			Wear head protection (during lifting work)

2.5.2 Organizational measures

The owner is responsible for carrying out the necessary organizational measures to ensure safe use. Amongst other measures this is achieved by, but not limited to:

- Training and authorising personnel. Vitotherm is responsible for distributing passwords to authorised personnel only.
- Performing hazard assessments of the complete system that incorporates the CO_2 set and informing personnel of the possible dangers and protective measures.
- Performing good housekeeping in the facility that houses the CO_2 set.
- Running a preventive maintenance program.

2.6 Residual risks

Despite the safe design and construction of the CO_2 set and the prescribed protective measures, the CO_2 set poses residual risks. This manual provides safety messages to indicate these risks. The formatting and appearance of safety messages that are dedicated to a particular section or sentence are explained in chapter 1. Overall safety messages are grouped in the following sections.

2.6.1 Electricity

⚠ WARNING! Contact with live parts can cause electric shocks, burns or even death.

- Only perform work on electrical equipment if you are an authorised electrician.
- Perform the work on electrical equipment in accordance with the local safety standards.
- Do not make changes to the CO_2 set if you are not qualified to do so.
- Before you start working on electrical equipment: Switch off and lock out the power supply isolator and verify that no voltage is present.
- Use fuses that correspond with the installed power of the CO_2 set.
- Regularly check the electrical wiring for loose connections and damage and repair them without delay.

2.6.2 Mechanical

⚠ WARNING! The CO_2 set contains moving, pressurized and sharp parts that can crush, cut or hit.

- Do not operate the CO_2 set with covers or guards removed.
- Do not operate the CO_2 set with missing pipework or components.
- Never touch the air damper box during operation.
- Be aware of sharp edges.

2.6.3 Transport and storage

⚠ WARNING! The CO_2 dosing unit may drop or topple when transported incorrectly.

- Use suitable hoisting equipment.
- Make sure no personnel is below or near the object when lifting or hoisting.

⚠ CAUTION! The frame of the CO_2 set is made of steel and is sensitive to corrosion damage.

- Always store the CO_2 set in a dry, indoor location.
- Do not unpack the CO_2 set from the optional transport crate until you are ready to install it.

2.7 Warning labels

Always comply with warning labels and information signs on the CO_2 set. The warning labels and information signs must be kept legible and must be replaced if necessary. For this purpose, contact the manufacturer.

Symbol	Description	Location
	Do not insert your hands or limbs into the air inlet of the CO_2 dosing unit.	Next to the air inlet of the CO_2 dosing unit.

2.8 Safety precautions

A CO_2 set is equipped with several safety components that help prevent hazardous situations.

For more information about the integration of the safety components into the system, please refer to the electrical wiring diagram.

2.8.1 Maximum temperature safety switch

The maximum temperature safety switch shuts down the CO_2 set if the flue gas temperature exceeds the set limit of 65 °C.

2.8.2 Air inlet grid

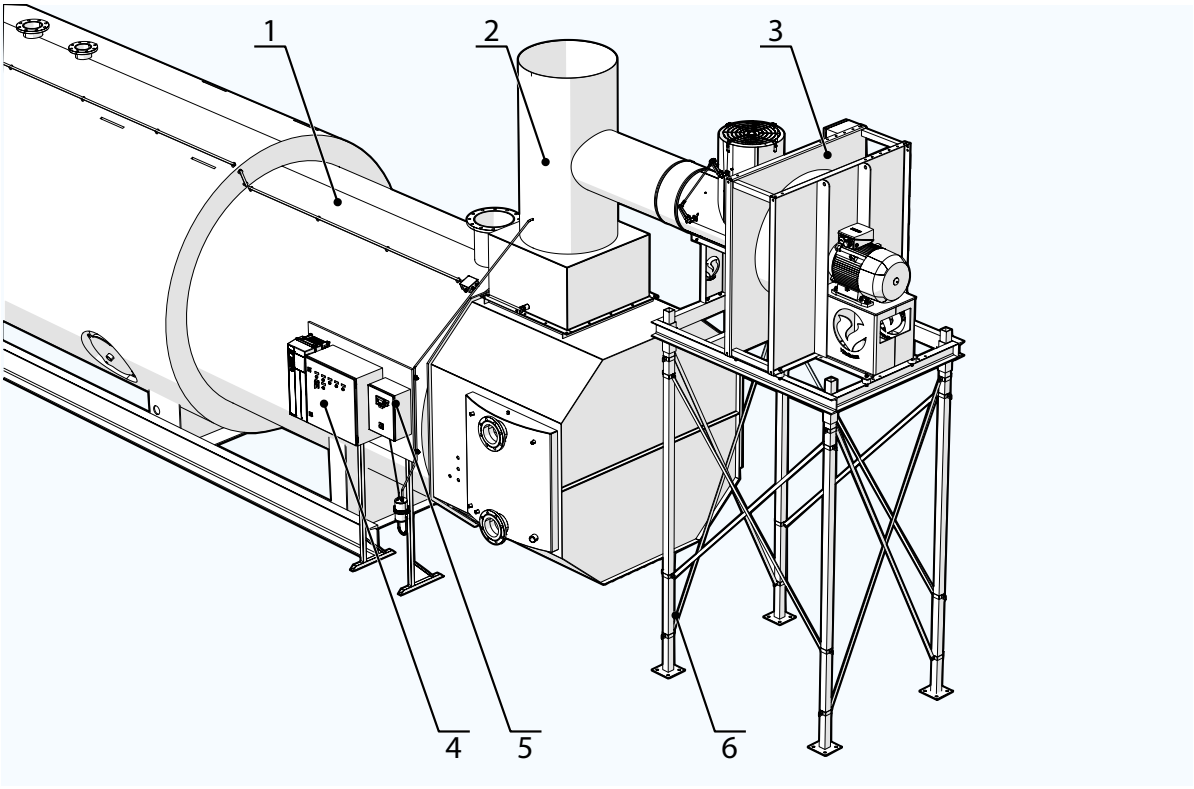
A protective grid is mounted on the air inlet of the CO_2 dosing unit. The grid prevents hands or limbs from entering the air inlet. Additionally, the grid prevents foreign objects or small animals from entering the air inlet and damaging the 2-way valve inside.

3 Design and function

The Vitotherm CO_2 set is designed to dose the flue gases from a boiler and transport the gas to a greenhouse, where it contributes to a healthy increase of crop growth.

3.1 System overview

The CO_2 set consists of the following components:

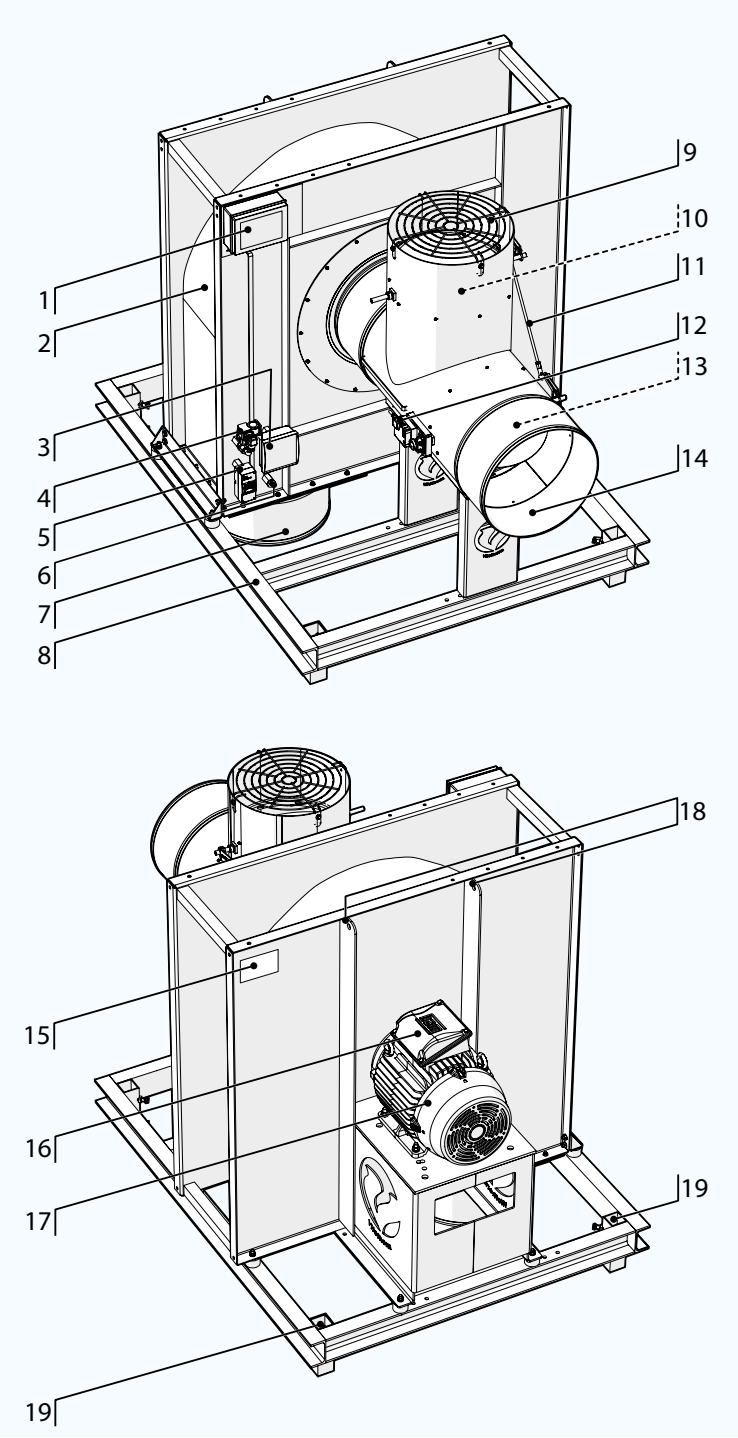


1 Boiler
2 Boiler chimney
3 CO_2 dosing unit
4 Control panel & frequency drive (optional)
5 Vitotherm CO detector (optional)
6 Elevation structure (optional)

The fan of the CO_2 set sucks in the flue gases from the boiler chimney as well as clean air from the boiler house. A 2-way valve is integrated in the T-piece and modulates the ratio of flue gas and clean air, to control the temperature of the CO_2 gas that is transported to the greenhouse.

The air mixture is transported to the greenhouse via the air outlet on the fan housing. The fan housing can be mounted in different configurations to better align with the inlet of the greenhouse distribution system (see §3.9 for more information).

3.2 CO_2 dosing unit



1 Junction box
2 Fan housing
3 Modulating temperature controller
4 Air pressure sensor (LD3) - Transport monitoring
5 Maximum thermostat
6 Pressure transmitter (only with optional frequency control)
7 Connection sleeve with hose clamps (fan outlet)
8 Mounting frame
9 Air inlet & filter grid
10 2-way valve (air inlet)
11 2-way valve transmission arm
12 2-way valve servomotor
13 2-way valve (flue gas inlet)
14 Connection sleeve with hose clamps (flue gas inlet)
15 Type plate
16 Junction box fan motor
17 Fan motor
18 Hoisting holes
19 Elevation structure connections

NOTICE The exact location of the electronic components may differ based on the configuration of the fan housing (see §3.9).

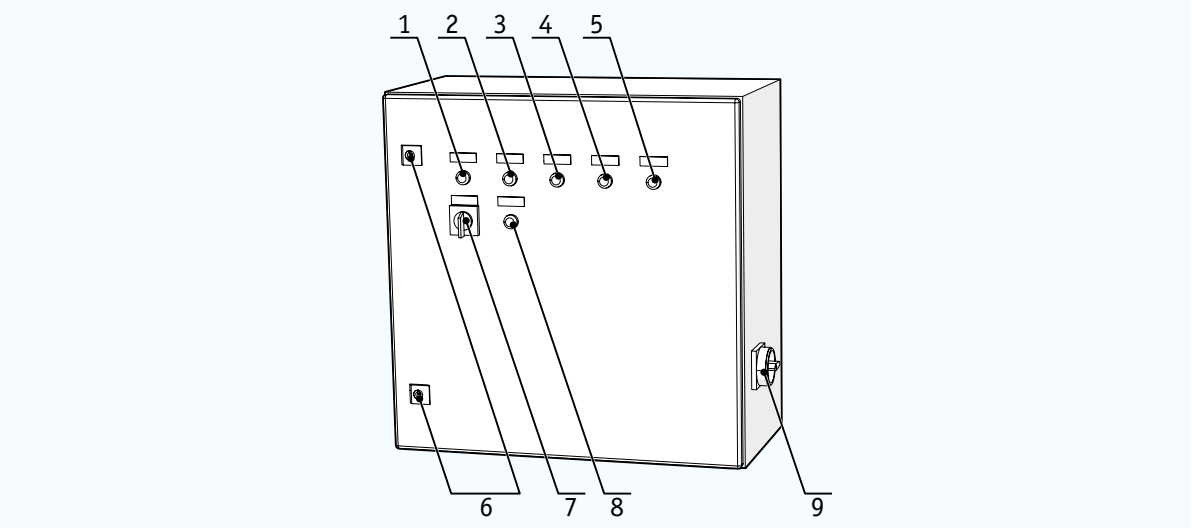
NOTICE

The variation of the CO_2 set that is connected to a CO_2 collector has a different dosing unit. The following components are not included in this variation:

- Air inlet
- 2-way valve & servomotor
- Modulating temperature controlller

3.3 Control panel

The CO_2 set is controlled with a separate control panel. It is recommended to install the control panel at an accessible height, close to the CO_2 set.



The following switches and lights are available on a standard control panel:

No.	Description		Function
1	Max. temperature failure light		Lights up red when the maximum flue gas temperature is exceeded.
2	Valve failure (ES6) light		Lights up red when a valve failure is detected. Only included together with the frequency control option (see §3.5.4).
3	Fan overload light		Lights up red when the load on the fan becomes too high.
4	Air pressure failure light		Lights up red when an air pressure failure is detected
5	CO_2 request indication light		Lights up green when CO2 dosing is requested.
6	Keyholes		Unlocks the control panel so that it can be opened.
7	Control switch	Computer	Switches the control to the external computer.
		Off	Switches the control off.
8	Reset button		Resets the CO_2 set.
9	Main power switch		Switches the CO_2 set on and off.

NOTICE

More information about the failures indicated by the lights on the control panel can be found in chapter 7 of this manual.

3.4 Frequency drive

For VCU 3000 - 4500

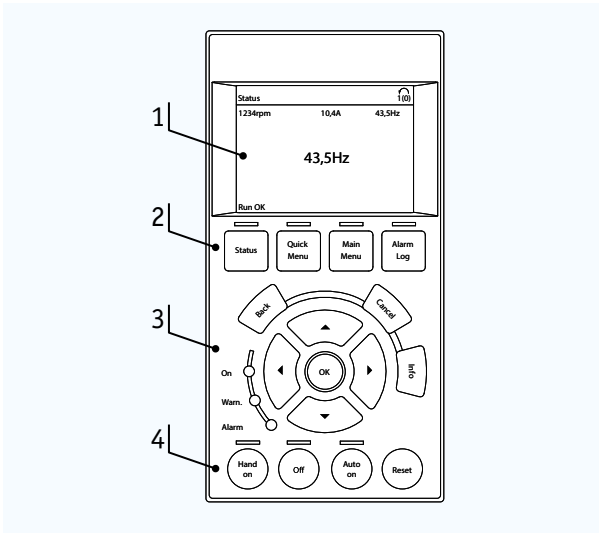
The frequency drive is located next to the control panel and is used to control the fan motor. The frequency drive is operated via the interface in the top left corner.

The frequency drive comes in two options:

- 380 - 480 V
- 500 - 600 V

Both options are equipped with a pressure sensor (0 – 100 mbar).

NOTICE The factory settings of the frequency drive have been set by Vitotherm.



1 Graphical display with status information
2 Menu buttons and indicator LEDs
3 Navigation buttons and indicator LEDs
4 Operation buttons and indicator LEDs

For more information, please refer to the OEM manual.

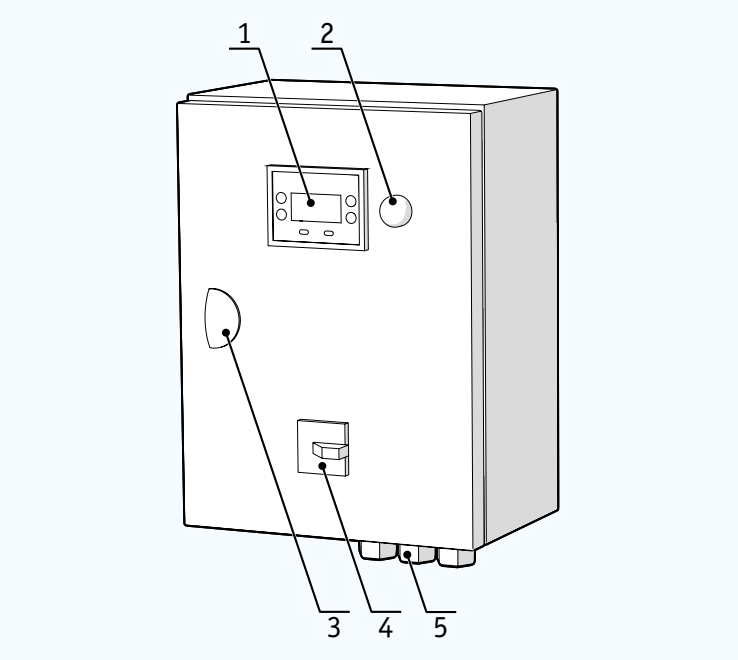
3.5 Optional components

The following options are available for a Vitotherm CO_2 set.

3.5.1 Vitotherm CO detector

type VCD2 with sampling pump

A Vitotherm CO detector checks the flue gas that is transported from the burner to external applications (e.g. greenhouses) for carbon monoxide. The CO detector is mounted near the flue gas exhaust.

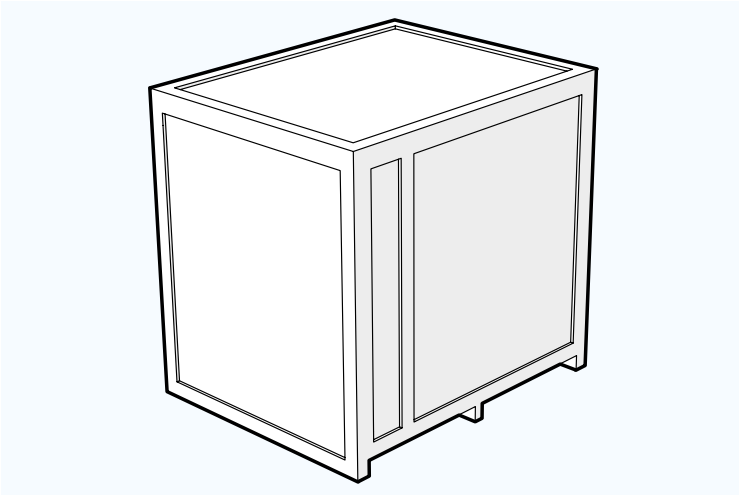


1 Interface & display
2 Failure feedback light
3 Key lock
4 Control switch
5 Cable connectors

For more information, please refer to the Vitotherm CO detector user manual.

3.5.2 Seaworthy packaging

If the CO_2 set needs to be well protected or shipped overseas, it can be packed in wooden crates treated according to ISPM 15.



3.5.3 Liquid CO_2 control

Built in the control panel

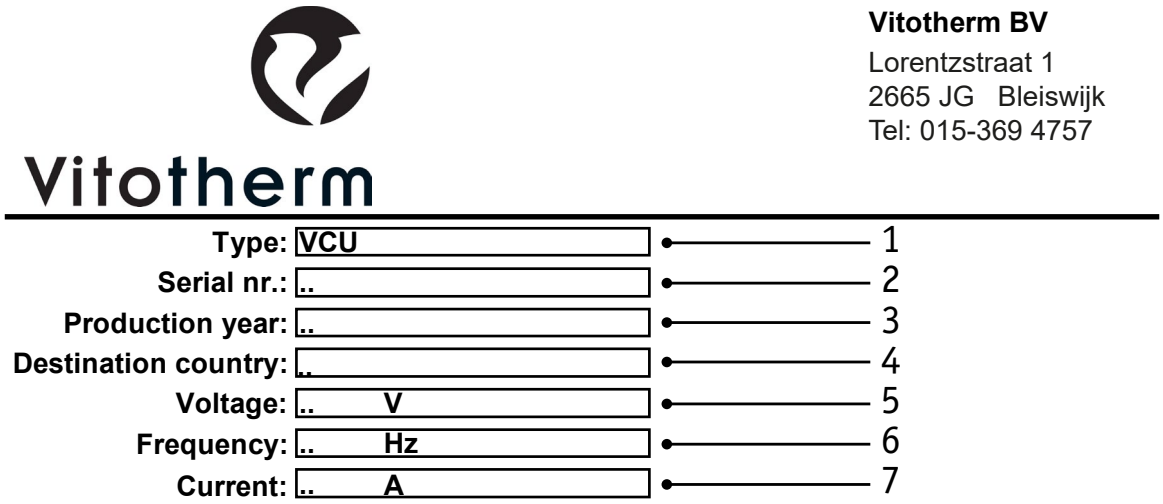
Control system which adds additional CO_2 in liquid form to the flue gases, in order to increase the CO_2 concentration of the gas supplied to the greenhouse.

3.5.4 Frequency control

A frequency control system can be added to the CO_2 set. This system uses a pressure transmitter to maintain a constant gas pressure inside the dosing unit.

3.6 Type plate

The CO_2 set is marked with a type plate in accordance with the applicable legislation requirements.



1. Type
2. Serial number
3. Year of manufacture
4. Country of destination
5. Voltage (V)
6. Frequency (Hz)
7. Current (A)

NOTICE The location of the type plate is indicated in §3.1

3.7 Technical data

For EU (50 Hz)

This section contains the standard dimensions, materials and performance data of a Vitotherm CO_2 set.

For technical data regarding your specific CO_2 set, please refer to the type plate (see §3.6) or the order confirmation. For performance data in imperial units, please refer to Appendix C of this manual.

Type	Fan motor power	* Motor voltage	3-way valve control	Inlet diameter (suction side)	Outlet diameter (pressure side)	Material fan housing, T-piece, fan.
	kW	VAC @ Hz	-	Ø mm	Ø mm	-
VCU220	2,2	400@50	Modulating	250	250	SS 304
VCU300	3,0	400@50	Modulating	250	250	SS 304
VCU400	4,0	400@50	Modulating	250	250	SS 304
VCU550	5,5	400@50	Modulating	300	315	SS 304
VCU750	7,5	400@50	Modulating	300	315	SS 304
VCU1100	11,0	400@50	Modulating	400	400	SS 304
VCU1500	15,0	400@50	Modulating	400	400	SS 304
VCU1850	18,5	400@50	Modulating	400	400	SS 304
VCU2200	22,0	400@50	Modulating	500	500	SS 304
VCU3000	30,0	400@50	Modulating	500	500	SS 304
VCU3700	37,0	400@50	Modulating	500	500	SS 304
VCU4500	45,0	400@50	Modulating	500	500	SS 304

*Motor voltage may vary per country (208, 400, 480 or 575 V @60 Hz).

3.8 Configurations

The fan housing can be mounted in 8 different orientations to better align with the inlet of the greenhouse distribution system. See appendix A for an overview of the different orientations.

NOTICE The standard configuration shown in this document is RD180 (4R).

4 Installation

This chapter provides instructions for the basic installation of a CO_2 set onto a boiler or other heating appliance. For information about a custom set-up, please contact Vitotherm.

⚠ CAUTION!	The CO_2 set may only be installed by qualified personnel. Handling the CO_2 set and supporting components without the required knowledge and experience may damage the CO_2 set or cause hazardous situations during installation and use.
⚠ WARNING!	The CO_2 set may only be installed in a sufficiently ventilated boiler house.
NOTICE	The CO_2 set must always be installed according to national and local laws and regulations.

4.1 Checking the delivery

Required tools:

- Forklift truck with adequate lifting capacity.

To check the delivery:

1. Transport the crate(s) to an accessible place near the boiler.
2. When delivered in an optional transport crate:
    a. Remove the lid of the crate(s).
    b. Remove the sides of the crate(s).
    c. Remove the lashing straps and packaging materials.
    d. Remove any screws that connect parts to the bottom of the crate(s).
3. Check if all parts have been delivered according to the agreed scope. If a part is missing, contact Vitotherm immediately.
4. Check all delivered parts for damage.

⚠ WARNING!	Damaged parts can affect the correct and safe functioning of the CO_2 set. ▶ Do not install damaged parts. ▶ If any parts are damaged upon delivery, please contact Vitotherm.

5. Check if the delivered CO_2 set will fit in the designated area of the room. For the dimensions of the CO_2 set, see §3.8.

4.2 Preparing the elevation structure

The CO_2 dosing unit can be installed on a supporting elevation structure. The mounting frame of the dosing unit can be expanded with legs to create this elevation structure.

The CO_2 dosing unit can also be installed on the floor. In this scenario, support feet can be attached to the mounting frame.

NOTICE	The elevation structure or support feet are not part of the standard delivery and may have to be created as part of the installation process.

Connection materials:

- Square steel tubing (50 x 50 mm)
- Connection brackets

To prepare the elevation structure:

1. Measure the required installation height and determine the required length of the frame legs. Use the dimensions in §3.8 as a reference.
2. Cut four pieces of square steel tubing with the required length.
3. Increase the stability of the structure:
    a. Weld footpads onto the bottom of the frame legs.
    b. Attach crosswise connector pieces between the frame legs.

4.3 Mounting the CO_2 dosing unit

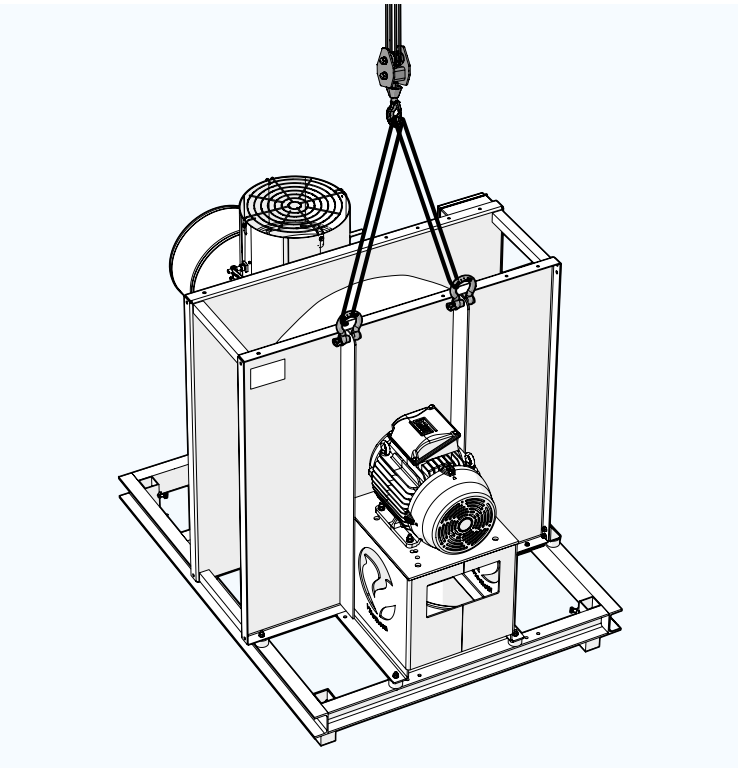
Required tools:

- Mobile crane with adequate lifting capacity.
- Suitable hoisting equipment:
    - D-shackles
    - Round sling
- Elevation structure
- Power drill with steel drill head (Ø12 mm)
- Ring wrenches or adjustable spanners

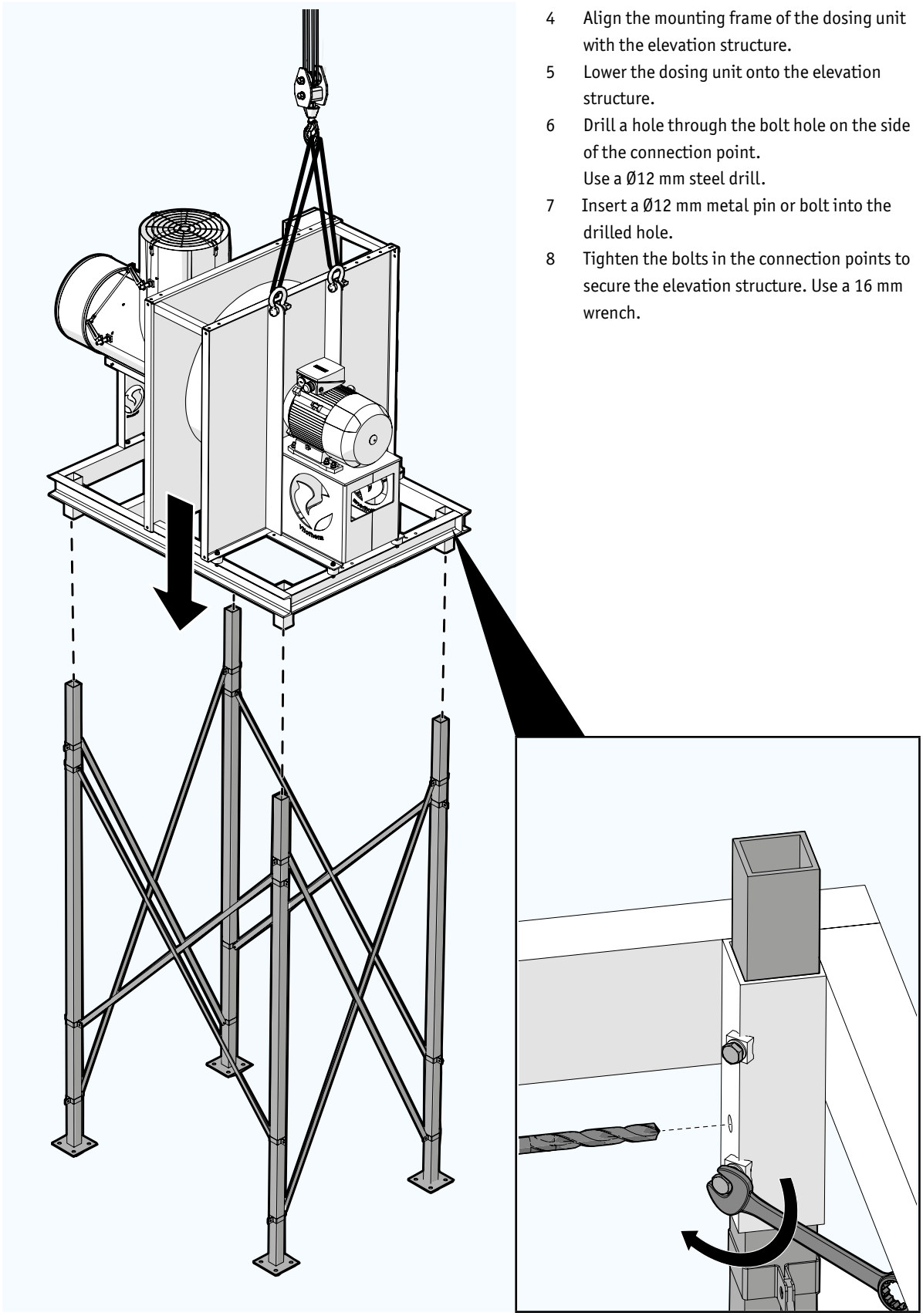
⚠ WARNING! The CO_2 dosing unit may drop or topple when transported incorrectly.

- ▶ Use suitable hoisting equipment.
- ▶ Make sure no personnel is below or near the object when lifting or hoisting.

To hoist the CO_2 dosing unit:



1 Connect your hoisting equipment to the hoisting eyes of the fan housing.
2 Carefully lift the dosing unit.
3 Place the elevation structure below the dosing unit.



4 Align the mounting frame of the dosing unit with the elevation structure.
5 Lower the dosing unit onto the elevation structure.
6 Drill a hole through the bolt hole on the side of the connection point.
Use a Ø12 mm steel drill.
7 Insert a Ø12 mm metal pin or bolt into the drilled hole.
8 Tighten the bolts in the connection points to secure the elevation structure. Use a 16 mm wrench.

4.4 Connecting the CO_2 dosing unit

The flue gas inlet of the dosing unit must be connected to the boiler chimney.

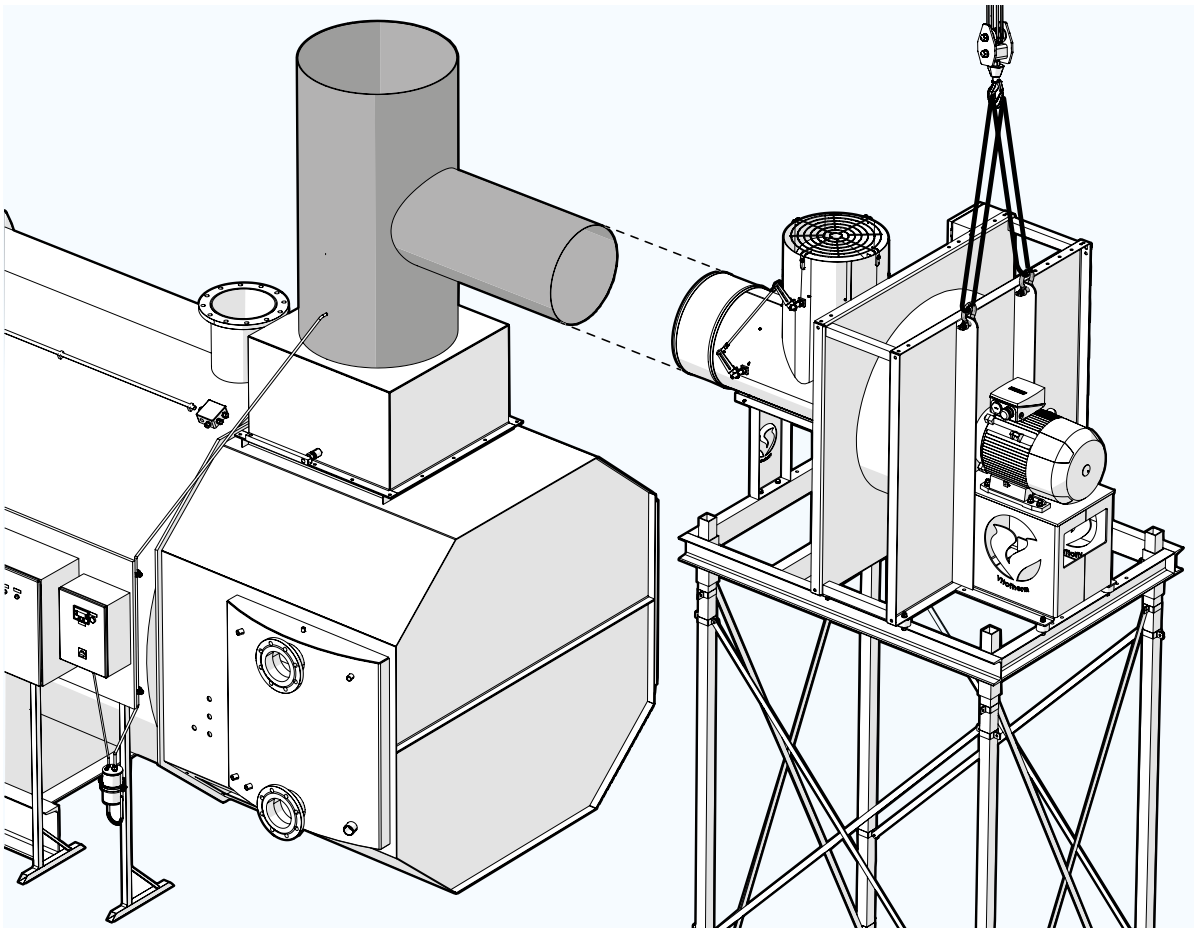
The fan outlet of the dosing unit must be connected to the greenhouse distribution system.

Required tools:

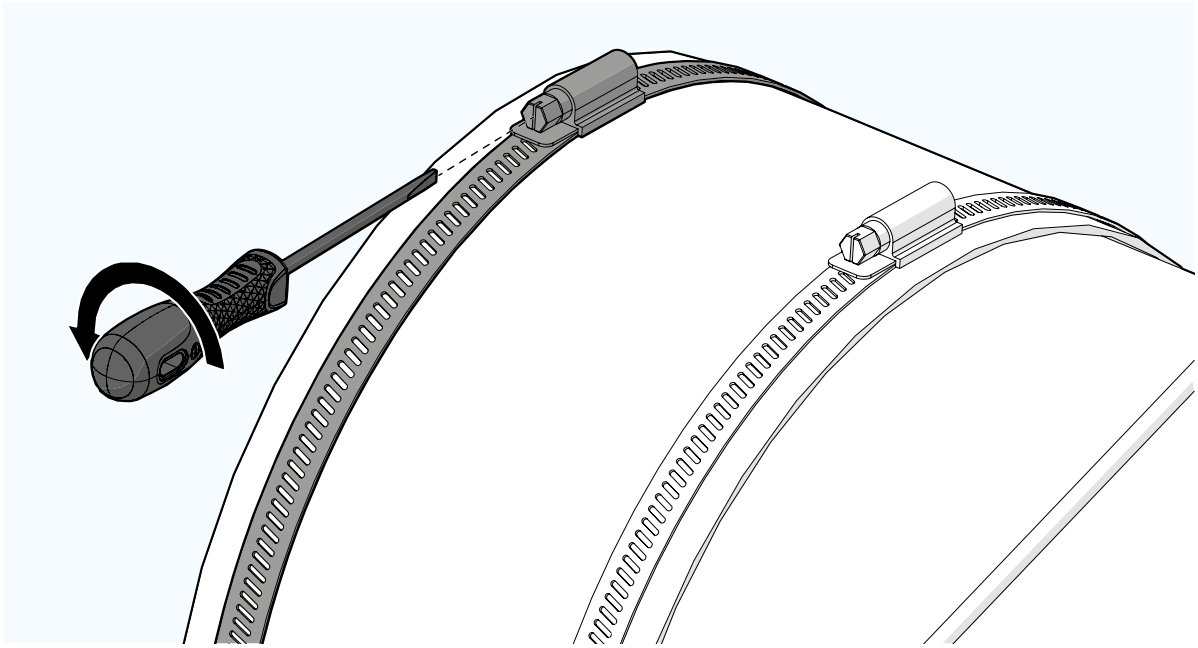
- Mobile crane with adequate lifting capacity.
- Suitable hoisting equipment:
  - D-shackles
  - Round sling
- Screwdriver

4.4.1 Connecting the boiler chimney

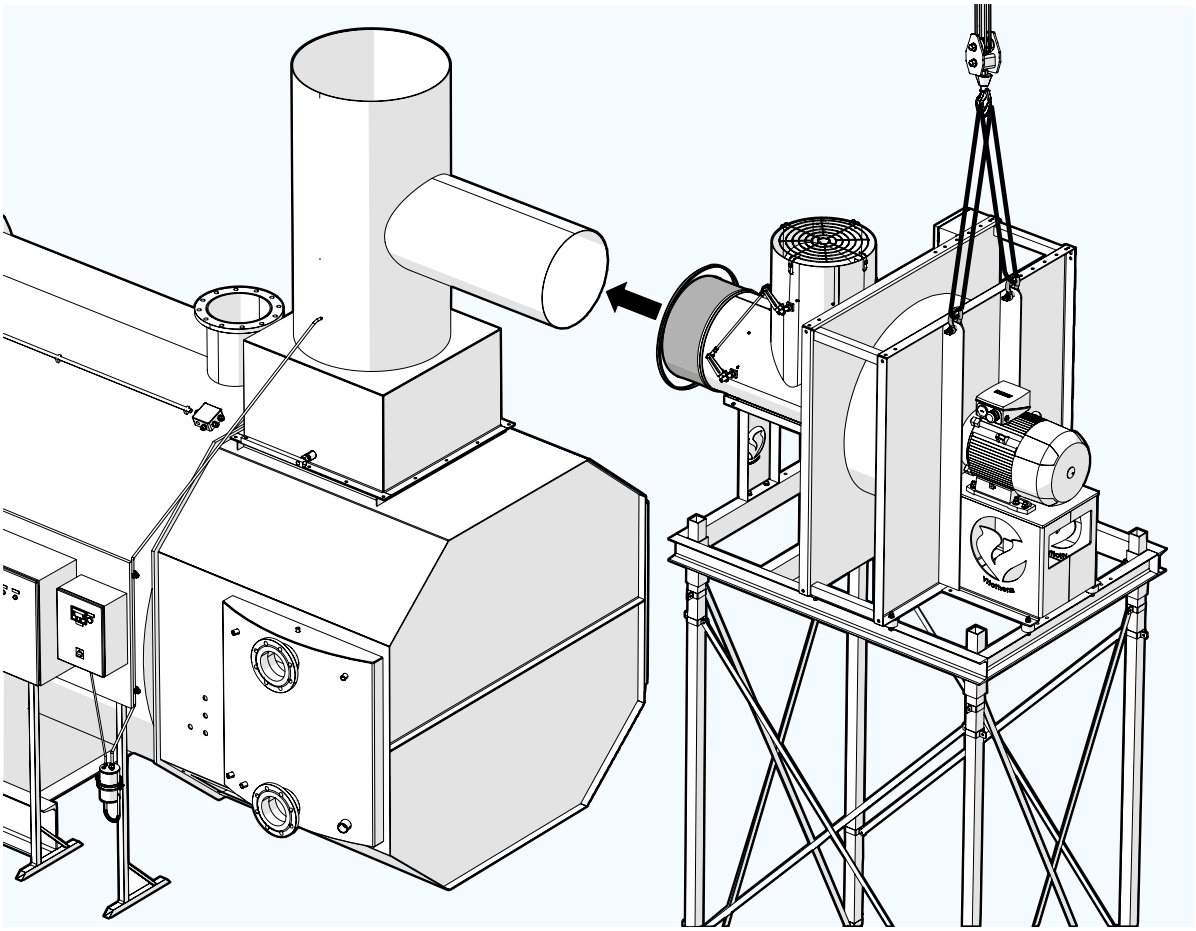
To connect the dosing unit to the boiler chimney:



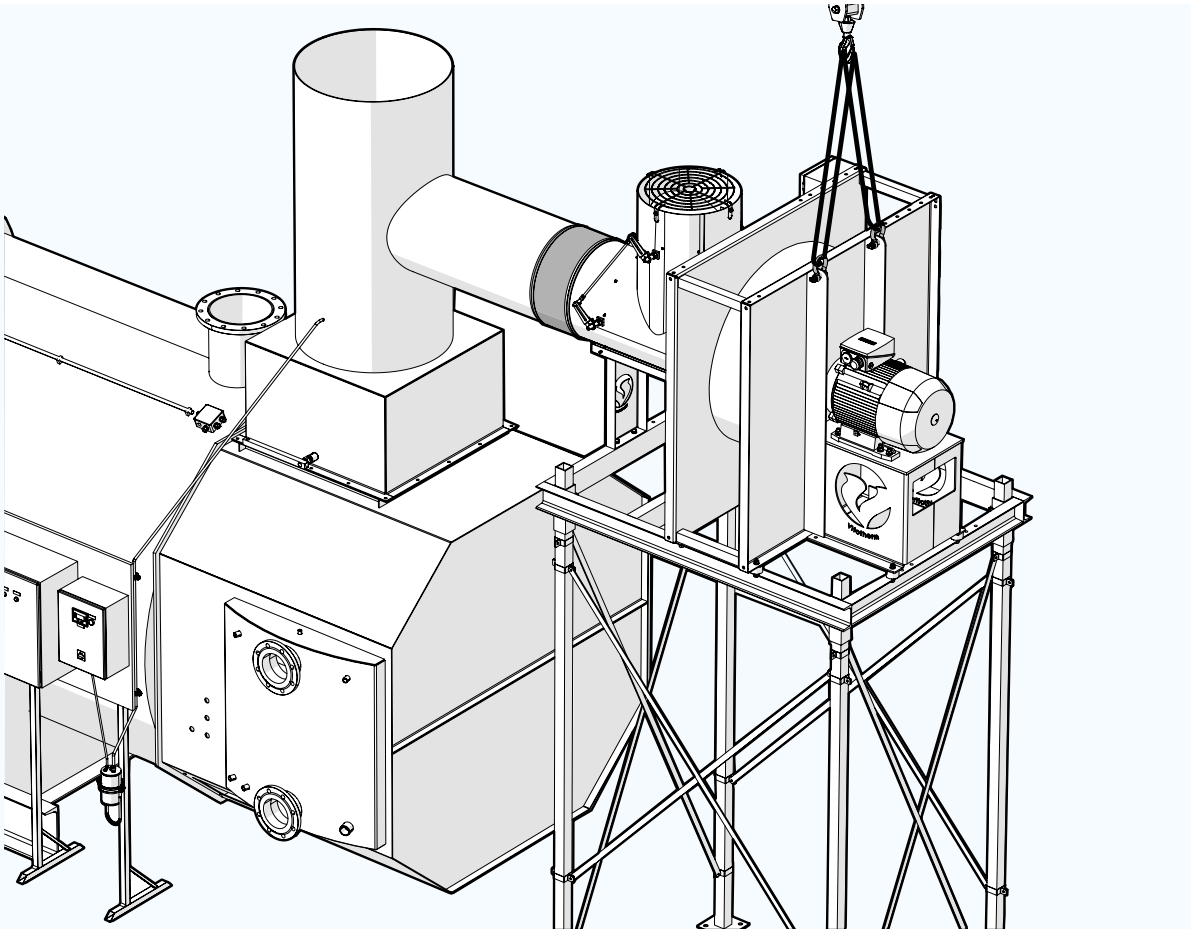
1. Align the T-piece of the dosing unit with the outlet of the boiler chimney.



2. Loosen the outer hose clamp. Use a screwdriver.

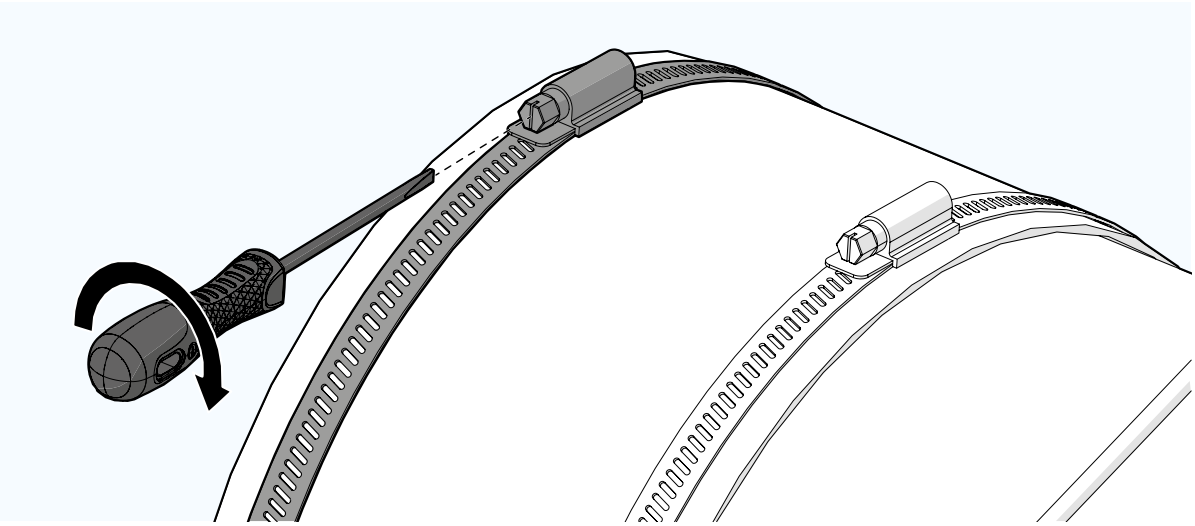


3. Wrap the plastic sleeve around the outlet of the boiler chimney.



NOTICE The boiler chimney outlet and the T-piece of the dosing unit may not touch each other to allow for movement. Leave a space of at least 10 cm between these two components.

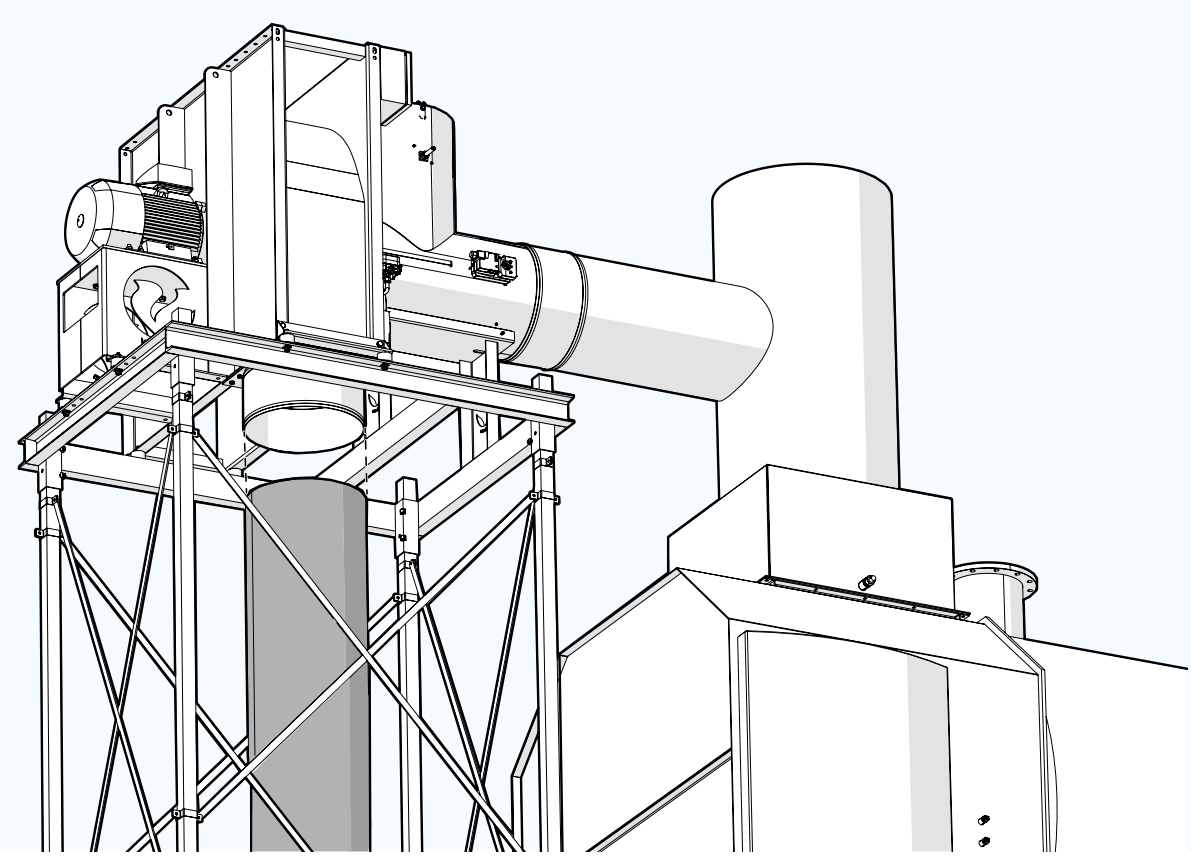
4. Place the loosened hose clamp around the sleeve on the boiler chimney.



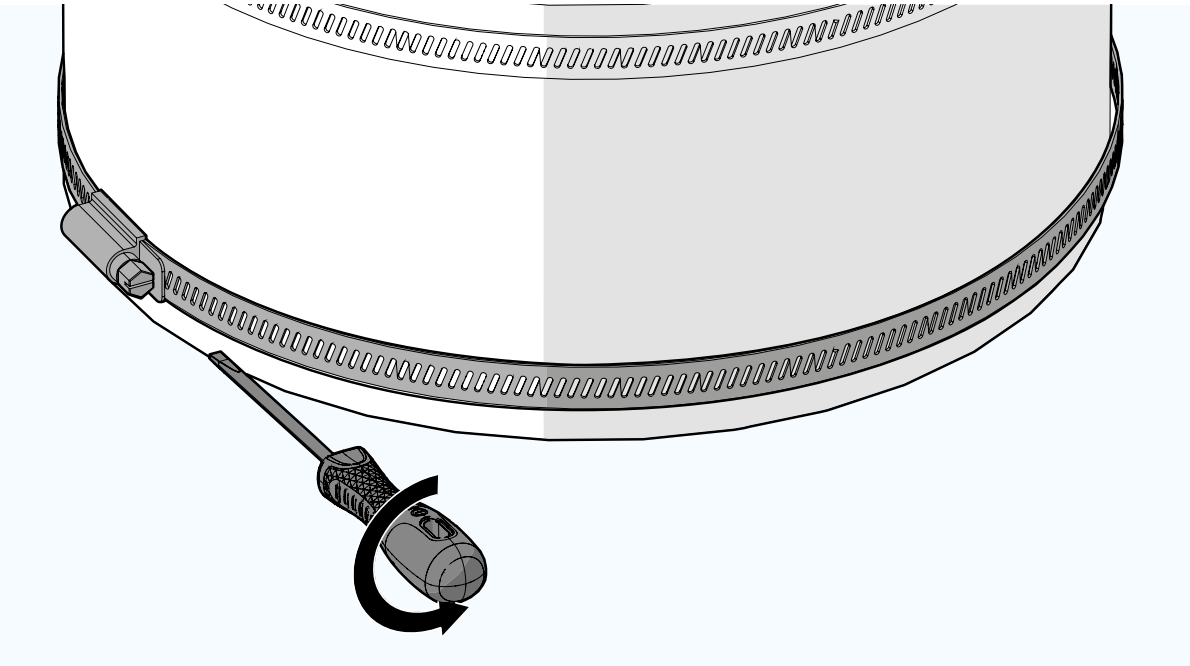
5. Tighten the clamp:
   a. Use a screwdriver.
   b. Make sure the connection is air tight.

4.4.2 Connecting the greenhouse distribution system

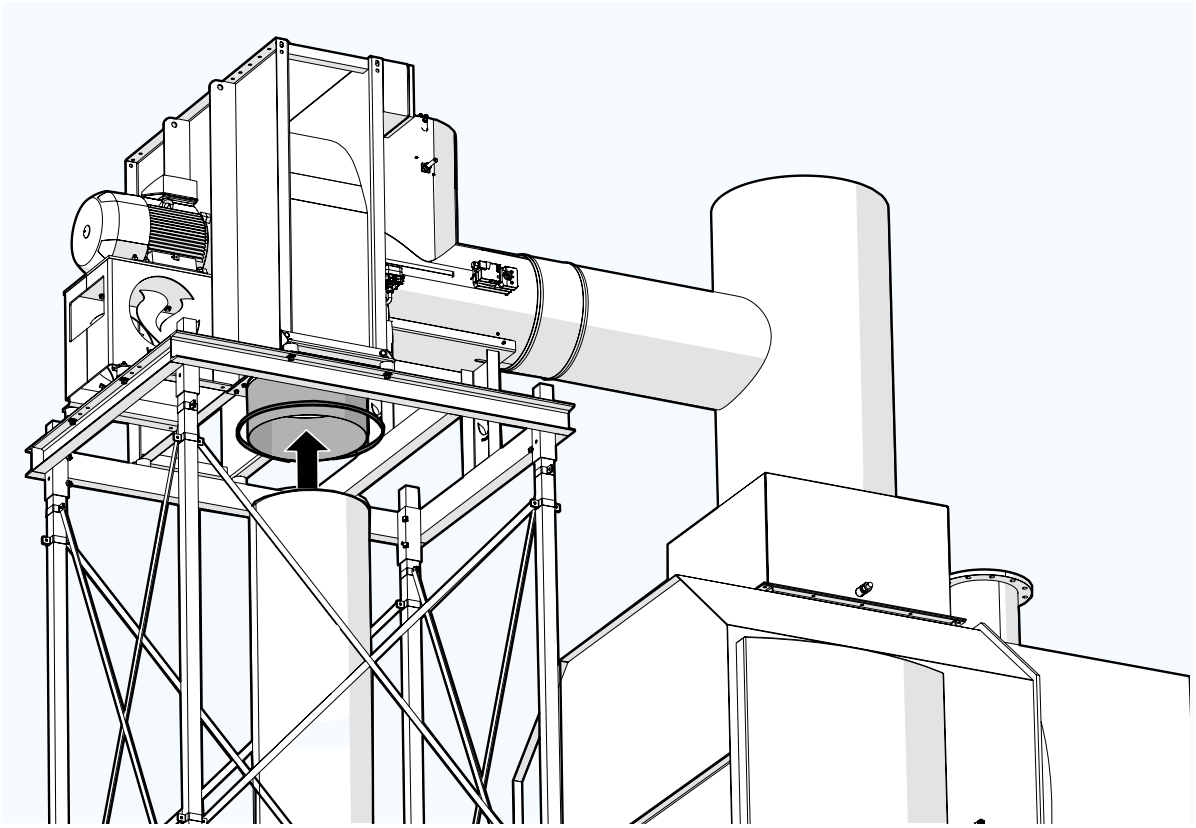
To connect the dosing unit to the greenhouse distribution system:



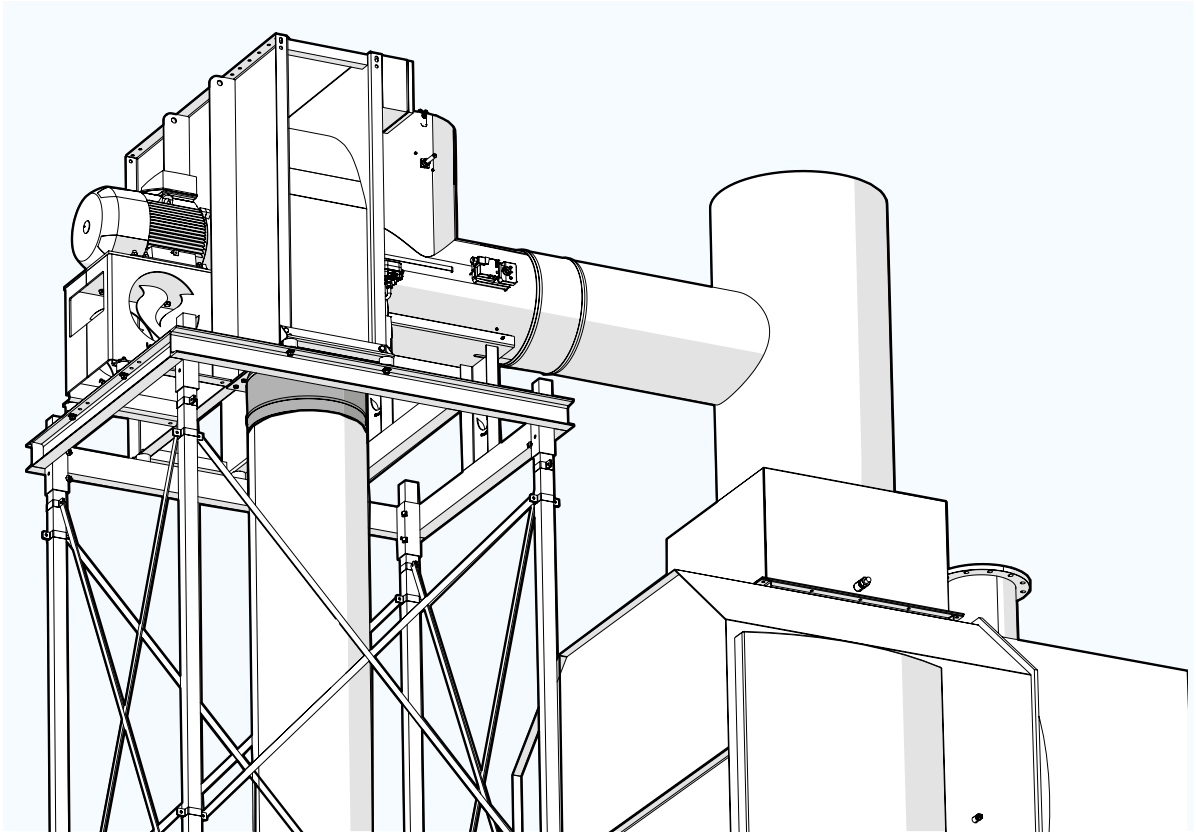
1. Align the outlet of the fan housing with the inlet of the greenhouse distribution system.



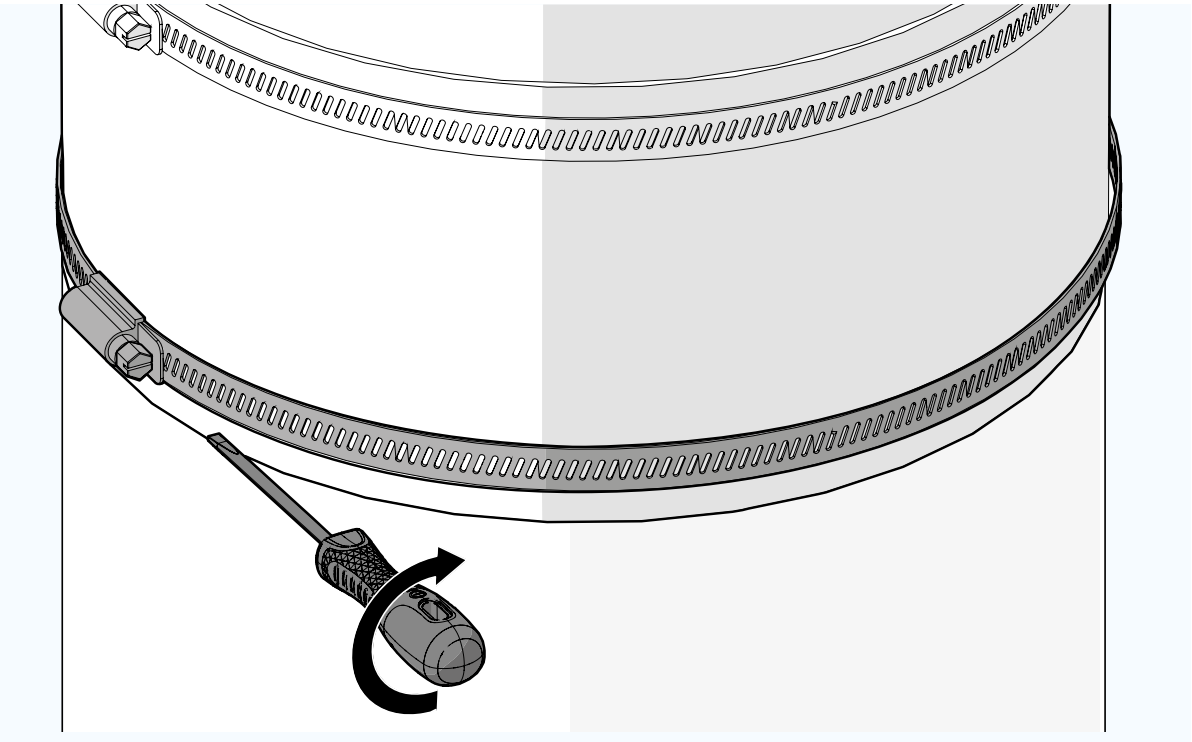
2. Loosen the outer hose clamp. Use a screwdriver.



3. Wrap the plastic sleeve around the inlet of the distribution system.



4. Place the loosened clamp around the sleeve on the distribution system.



5. Tighten the clamp:
    a. Use a screwdriver.
    b. Make sure the connection is air tight.

4.5 Electrical connections

All electric cabling is pre-wired to a junction box in the control panel. During installation, this cabling must be connected to the junction boxes on the CO_2 dosing unit (see §3.1).

NOTICE	For all electrical connections, the applicable local standards and the connection requirements must be taken into account.
	For more information about the electrical connections and integrated circuits, please refer to the electrical wiring diagram.

5 Commissioning

Before commissioning the CO_2 set, make sure it meets the requirements below.

⚠ WARNING!	All mechanical screw connections (e.g. gas/oil line, flange connections, oil valves, electrical terminals) must be retightened prior to commissioning.
⚠ WARNING!	All components must be sealed with an appropriate sealant prior to commissioning.
⚠ WARNING!	The supporting burner system must be installed and commissioned according to the instruction in the corresponding instruction manual.
NOTICE	Commissioning of a Vitotherm installation may only be performed by certified personnel.
NOTICE	A commissioning report is created after the CO_2 set has been successfully commissioned. Keep this report near the CO_2 set for future reference.

- ☐ The CO_2 set is completely installed according to the instructions in this manual, including:
  - ☐ CO_2 dosing unit
  - ☐ Control panel & frequency drive (optional)

- ☐ Electrical wiring is completed according to the provided electrical wiring diagram, free of errors, so that the electrical pre-start condition circuit (safety chain) is closed. Completion of electrical field wiring to the control panel.
- ☐ Electrical power is available on the CO_2 set.
- ☐ Safety components are functioning correctly and ready for operation (see §2.8).
- ☐ Equipment supplied by third parties that is present in the control panel must be adjusted and programmed.
- ☐ Sufficient fresh air is available.
- ☐ The necessary local work permits are available.
- ☐ Qualified personnel is available for instructions, system transfer and site acceptance test.
- ☐ A safe workspace is available, according to health and safety regulations and realistic common sense.

6 Operation

This chapter describes the main operational procedures of the CO_2 set.

6.1 Control panel

The CO_2 set is controlled via the control panel. This panel has a control switches and several feedback LEDs. See §3.3 for an overview of the standard components of the control panel.

6.1.1 Main power switch

The control panel is activated by using the main power switch on the right side of the panel.

6.1.2 Internal components

The control panel can be opened with a key to gain access to:

- Relays and fuses
- A power outlet and modbus connection for a service laptop
- The USB drive with the technical file of the CO_2 set
- This instruction manual

⚠ WARNING! Contact with live parts can cause electric shocks, burns or even death.

- ▶ Only perform work on electrical equipment if you are an authorised electrician.
- ▶ Before you start working on electrical equipment, switch off and lock out the power supply isolator and verify that no voltage is present.

6.2 Switching the CO_2 set on or off

The CO_2 set is switched on or off with the main switch. This switch has two options:

- 1 = ON
- 0 = Off.

6.3 Performing a system reset

A system reset must be performed after a failure in the CO_2 set has been resolved. This procedure allows the CO_2 set to be put back into operation.

To reset the CO_2 set:

- Press the reset button on the control panel.

7 Troubleshooting

System failures are displayed on the interface of the control panel or frequency drive. The table below can be used to identify and solve the failure.

For more detailed information about these system failures, please refer to the OEM manual of the Lamtec operating system.

Description	Cause(s)	Solution(s)
Failure indication LED: Max. thermostat	Flue gas after CO_2 temperature is too high.	1 Perform a system reset (see §6.3). 2 Check the modulating temperature control. Adjust if necessary.
Failure indication LED: Valve failure (ES6)	Valve servomotor has stopped working: jammed valve shaft	1 Dismount, clean and remount the 2-way valve servomotor. 2 Replace the servomotor if necessary.
	Valve servomotor has stopped working: jammed ball joint	1 Close the valve by hand. 2 Perform a system reset (see §6.3).
	Limit switch of the 2-way valve servomotor is set incorrectly.	Adjust the settings of the limit switch. Refer to the OEM manual for instructions.
The fan motor overrides the maximum current.	Fan or air inlet is obstructed.	Check the fan and air inlet and remove any obstructions.
	The motor runs on 2 phases.	Check the electrical wiring and fuses.
	The motor is defective.	Repair or replace the motor.
Minimum CO_2 pressure failure (LD3)	Insufficient air is being transported through the dosing unit.	Check the fan housing outlet for obstructions. Check if the sleeve connections are airtight.

8 Maintenance

8.1 Pre-emptive parts replacement schedule

Certain parts of the CO_2 set should be replaced every X years to prevent failure of vital components. The table below gives an overview of these maintenance activities and the frequency with which they should be performed.

Task	Interval (years)							To be carried out by
	1	2	5	8	10	15	20	
CO_2 set								
2-way valve servomotor					●			
Temperature controller					●			
Pressure transmitter					●			
Pressure sensor (LD3)					●			
Maximum thermostat					●			
Connection sleeves			●					
Silicon gaskets (air outlet)			●					
Silicon seal strips (air inlet)			●					
VCD								
Pump		●						
CO sensor			●					
3-way valve			●					

8.2 Annual Periodic Maintenance

⚠ CAUTION! To guarantee the quality and safety of the CO_2 set, Vitotherm advises annual Periodic Maintenance (PM) to be performed by their own certified service engineers.

This section contains maintenance instructions for the standard components of a CO_2 set. For maintenance instructions for any other (optional) components, please refer to the corresponding OEM manual.

8.2.1 Control panel

The following aspects of the control panel should be inspected:

- All electrical connections;
- The cables, for any sign of overload or burns;
- The circuit breaker fuses, for a correct rating;
- All switches and lights, for correct functioning;
- The cam timers, for correct functioning;

8.2.2 The CO_2 dosing unit

⚠ WARNING! Make sure the burner system and CO_2 set are completely shut down before performing maintenance on the CO_2 dosing unit:

- ▶ Use the control switch on the control panel to close the fuel supply to the burner.
- ▶ Interrupt the mains power supply to the burner system and CO_2 set.
- ▶ Shut down the CO_2 set with the main switch on the control panel.

⚠ WARNING! All mechanical screw connections must be retightened prior to every Periodic Maintenance.

Required tools:

- Ring wrenches or adjustable spanners
- Allen wrenches
- Screwdriver (slotted)

To perform Periodic Maintenance on the dosing unit of the CO_2 set, do the following:

1. Perform a visual check of all components for correct functioning.
2. Check the following parts for dirt or defects. Clean or repair if necessary:
   a. The fan.
   b. The fan motor.
   c. The air inlet cover.
   d. The 2-way valve.
3. Check if the 2-way valve opens smoothly.
   a. Clean if necessary.
4. Check the welds on the mounting frame for any defects.
   a. Repair if necessary.
5. Check the sleeve connections on the flue gas inlet and fan housing outlet for tears.
   a. Replace if necessary.
6. Check if the safety precautions are in place and function correctly (see §2.8).

9 Transport and storage

This section contains instructions and information on how to properly transport and store the CO_2 set.

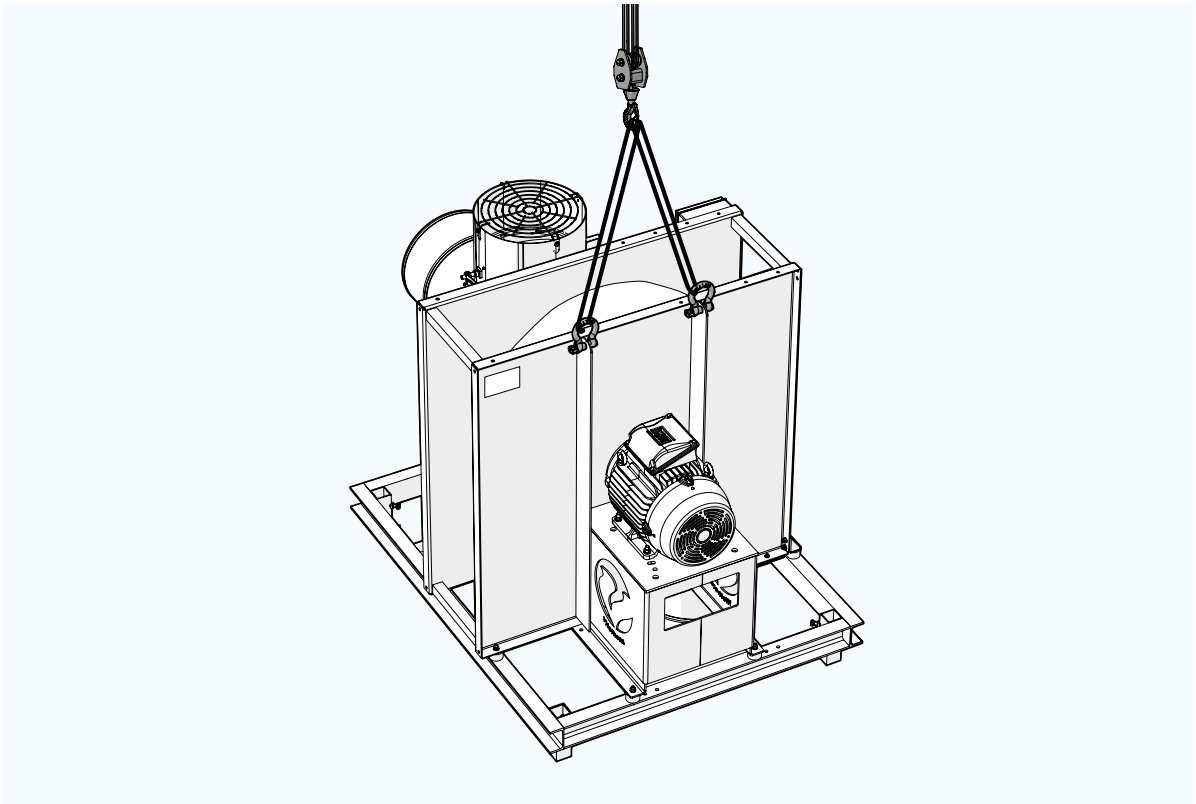
9.1 Transport

When transporting the components of the CO_2 set separately, use suitable hoisting or lifting equipment.

⚠ WARNING! The CO_2 dosing unit may drop or topple when transported incorrectly.

- ▶ Use suitable lifting or hoisting equipment.
- ▶ Make sure no personnel is below or near the object when lifting or hoisting.

The CO_2 set is equipped with two hoisting eyes at the top of the fan housing. Hoisting equipment can be attached to these eyes as follows:



9.2 Storage

⚠ CAUTION! The frame of the CO_2 set is made of steel and is sensitive to corrosion damage.

- ▶ Always store the CO_2 set in a dry, indoor location.
- ▶ Do not unpack the CO_2 set from the optional transport crate until you are ready to install it.

10 Decommissioning and disposal

This section contains instructions and information on how to properly decommission and dispose of the CO_2 set.

⚠ CAUTION! The CO_2 set may only be installed by qualified personnel. Handling the CO_2 dosing unit and supporting components without the required knowledge and experience may damage the CO_2 set or cause hazardous situations during installation and use.

10.1 Decommissioning

To decommission the CO_2 set:

1. Use the control switch on the control panel to put the CO_2 set out of operation.
2. Shut down the CO_2 set with the main switch on the control panel.
3. Cut off the power source to the control panel.

10.2 Dismantling the CO_2 dosing unit

Required tools:

- Ring wrenches or adjustable spanners
- Allen wrenches
- Screwdriver (slotted)
- Mobile crane with adequate lifting capacity.
- Suitable hoisting equipment:
  - D-shackles
  - Round sling

To dismantle the CO_2 dosing unit:

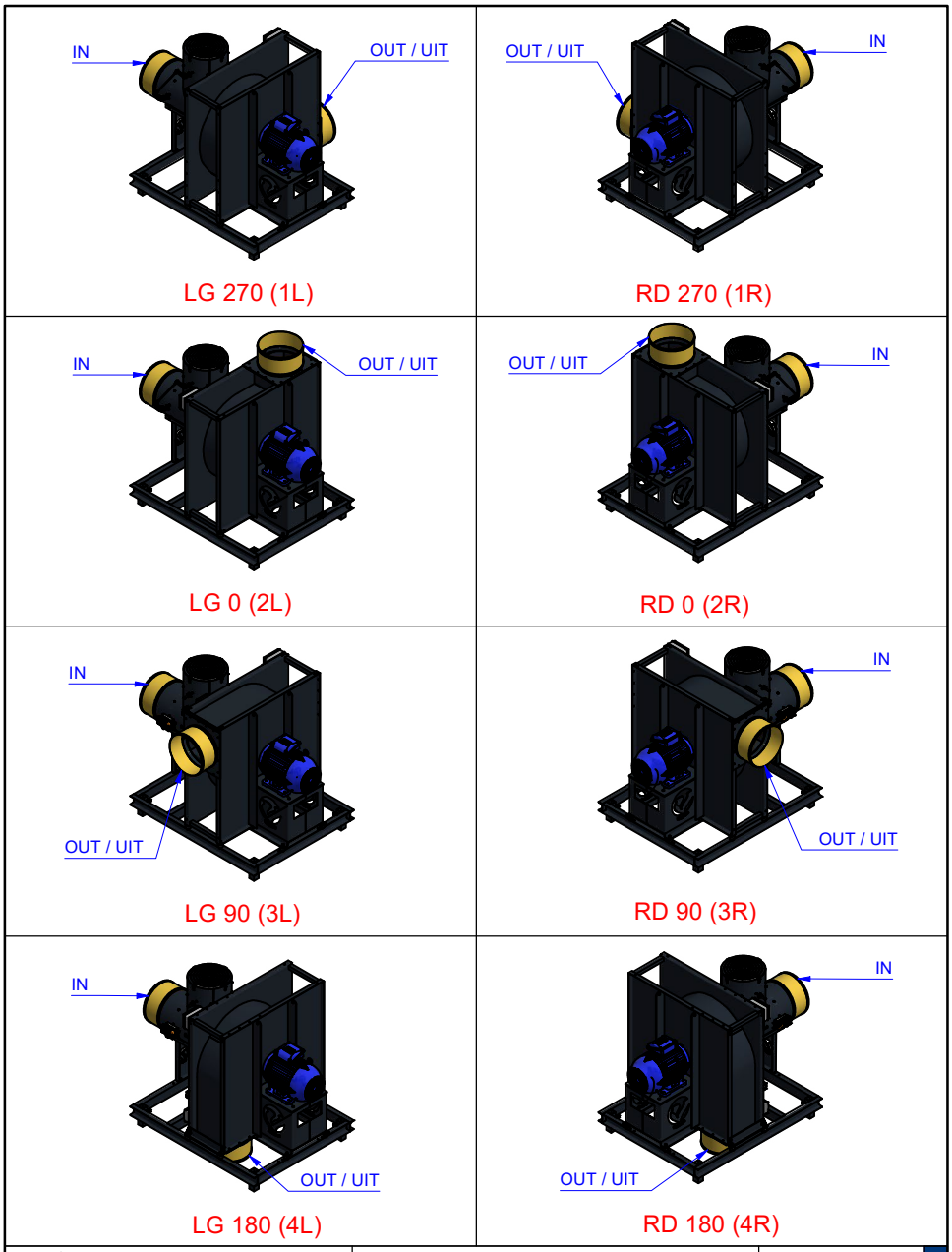
1. Disconnect all electrical connections.
2. Disconnect the dosing unit from the boiler chimney.
3. Disconnect the dosing unit from the inlet of the greenhouse distribution system.
4. Attach hoisting equipment to the dosing unit.
5. Loosen the bolts in the connection points of the elevation structure.
6. Hoist the dosing unit and remove the elevation structure from underneath.
7. Remove the electric components from the dosing unit (see §3.1):
   a. Fan motor
   b. Junction boxes
   c. Servomotors
   d. Air pressure sensor (LD3) -
   e. Pressure transmitter (optional)
   f. Modulating temperature controller
   g. Maximum thermostat
8. Remove the plastic connection sleeves.

10.3 Disposal

⚠ CAUTION!	Separate and dispose the components of the CO_2 set into the applicable waste streams based on their material, in accordance with local regulations.
NOTICE	All structural components of a Vitotherm CO_2 set are made of powder-coated steel and should be disposed of accordingly.
	For more information on how to properly dispose of supplier parts, please refer to the OEM manual.

Appendices

A CO_2 dosing unit orientations



B Technical data

For NA (60 Hz)

Type	Fan motor power	* Motor voltage	3-way valve control	Inlet diameter (suction side)	Outlet diameter (pressure side)	Material fan housing, T-piece, fan.
	HP	VAC @ Hz	-	Ø inch	Ø inch	-
VCU220	3.0	400@50	Modulating	9 27/32	9 27/32	SS 304
VCU300	4.0	400@50	Modulating	9 27/32	9 27/32	SS 304
VCU400	5.4	400@50	Modulating	9 27/32	9 27/32	SS 304
VCU550	7.4	400@50	Modulating	11 13/16	12 13/32	SS 304
VCU750	10.1	400@50	Modulating	11 13/16	12 13/32	SS 304
VCU1100	14.8	400@50	Modulating	15 3/4	15 3/4	SS 304
VCU1500	20.1	400@50	Modulating	15 3/4	15 3/4	SS 304
VCU1850	24.8	400@50	Modulating	15 3/4	15 3/4	SS 304
VCU2200	29.5	400@50	Modulating	19 11/16	19 11/16	SS 304
VCU3000	40.2	400@50	Modulating	19 11/16	19 11/16	SS 304
VCU3700	49.6	400@50	Modulating	19 11/16	19 11/16	SS 304
VCU4500	60.3	400@50	Modulating	19 11/16	19 11/16	SS 304

*Motor voltage may vary per country (208, 400, 480 or 575 V @60 Hz).

C Declaration of conformity

Declaration of conformity

Manufacturer:	VITOTHERM B.V.
Adress:	Lorentzstraat 1 2665 JG Bleiswijk Netherlands
Products:	CO2 dosing unit & control panel

Type: **VITOTHERM B.V. CO2 dosing unit types:**

VCU 220	VCU 1500
VCU 300	VCU 1850
VCU 400	VCU 2200
VCU 550	VCU 3000
VCU 750	VCU 3700
VCU 1100	VCU 4500

Applications: **VITOTHERM CO2 dosing units for greenhouses**

CO2 transportation fan

Standards: **Mentioned products are in compliance with the following technical standards:**

NEN EN-ISO 14120
ISSO 86

Directives: **Mentioned products are according the following European directives:**

EMC 2014-30-EU
MD 2006-42-EG
LVD 2014-35-EU

Protection class IP: **Degree of protection**

IP54 IP - EN 60529

Marking of type plate: **The CO2 dosing units are labelled with:**

CE mark
CE Pin nr
Indentification No. of Notified Body
EAC

v1-2022

Vitotherm BV

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