DryGair Dehumidification Unit

Installation, Operation, and Maintenance Manual (50 Hz & EU Models)

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1. INTRODUCTION

This manual provides instructions for operating the DryGair unit correctly and safely, including installation instructions, maintenance procedures, and unit troubleshooting.

As DryGair continuously develops its machines to their maximum potential, this manual, though completely up to date when issued, is subject to changes without notice.

1.1 Before You Begin

Before you begin working with the DryGair dehumidification unit, read this manual. The DryGair dehumidification Operation and Maintenance Manual provides information and procedures for installing and operating the unit, as well as maintenance, troubleshooting, and repair procedures.

When reading, pay special attention to:

- The safety instructions.
- The conventions. They explain the symbols used in this manual.

Before beginning a procedure, read the procedure through to the end. A thorough understanding of the entire procedure will prevent unnecessary loss of time and error.

1.2 Further Information

For further information, contact DryGair at:

Email: info@drygair.com

Website: www.drygair.com

Online Technical Support Webpage: https://drygair.com/technical/

1.3 Conventions

The following conventions are used in this manual:

Warning

Information given in a “warning” message warns of a possible hazard to personnel and extreme hazard to the unit.

Caution

Information given in a “caution” message refers to the safe operation of the unit and provides a warning where the possibility for damage to the equipment exists.

Note

Information given in a note describes how the part/unit functions or provides a tip on how best to use it.

2. SAFETY

DryGair Energies Ltd. believes that the safety of personnel working with and around the unit is the most important consideration. The DryGair unit is equipped with all the safety devices necessary to ensure risk-free use under standard conditions.

Machine installation, maintenance, and adjustments must be performed only by a qualified technician with expert machine knowledge and that has read this manual.

Before operating the unit or performing maintenance operations, read and be familiarized with the safety information.

- Obey and follow all warnings and cautions given in this manual.
- Comply with all approved and established precautions for operating electrical and mechanical equipment.
- Only qualified and authorized personnel should perform maintenance or repair tasks.
- Verify the power, and any other connected facilities, are turned off and disconnected before beginning maintenance procedures, part replacements, or repairs.
- We advise strict observance of the work safety standard as defined by the authorities in each country.

DryGair cannot accept responsibility for injury to persons or damage to objects resulting from not observing safety standards.

2.1 Hazards

Danger: Electrical Shock Hazard. High voltage is present at points throughout the Unit. Contact with high voltage can result in injury or death. Before performing any operation related to electricity, open the electric compartment cover, switch off the Main Power switch and switch off the Circuit Breaker. Doing so ensures no voltage is present.

Danger: Hot Surface Hazard. The heat exchangers and their pipes, and the compressor may have a high temperature during unit operation. Do not touch the compressor and the heat exchanger pipes and coils while the unit is operating. Verify the unit has cooled down before touching them.

Danger: Bodily Injury Hazard. Be careful not to drop any of the unit parts. Dropping the Covers might cause bodily injury or damage to the parts.

2.2 Operation Safety Notes

The following safety practices must be complied with:

- **CAUTION** and **WARNING** notices posted on the machine and safety notes in this manual.
- Ensure that all control panels and electrical panels are covered.
- Do not start the unit if any of the safety covers are missing.
- **MOVING PARTS** – Do not touch the fans during unit operation.
- Do not permit smoking or food in the working area.
- Personnel operating the unit must not remove covers or panels.
- Although the electrical compartment is closed by a door, operator access to the compartment is strictly forbidden without explicit authorization.
- Ensure that all personnel operating the unit know where the main power switch is located and what to do in case of an electrical emergency.
- Locate approved types of fire extinguishers near the equipment.

2.3 Maintenance Safety Notes

Only authorized personnel are permitted to perform maintenance and repair tasks. Before performing such a task, read the instructions to ensure you understand them and that the required precautions and tools are available.

- For high mounted maintenance procedures, use a stable ladder to avoid high fall injuries.
- To avoid getting caught in moving parts, do not lubricate, repair or adjust the machine while in operation unless expressly written in the manual. Stop the machine according to the machine stopping procedure before lubricating or performing other maintenance tasks.
- Secure electrical wires and cables to prevent damage.
- The protecting doors and covers should not be opened during machine operation.
- Replace all safety shields after completing set-up, troubleshooting and maintenance procedures.

2.4 Unit Labels

The following Identification label is attached to the right-side panel.

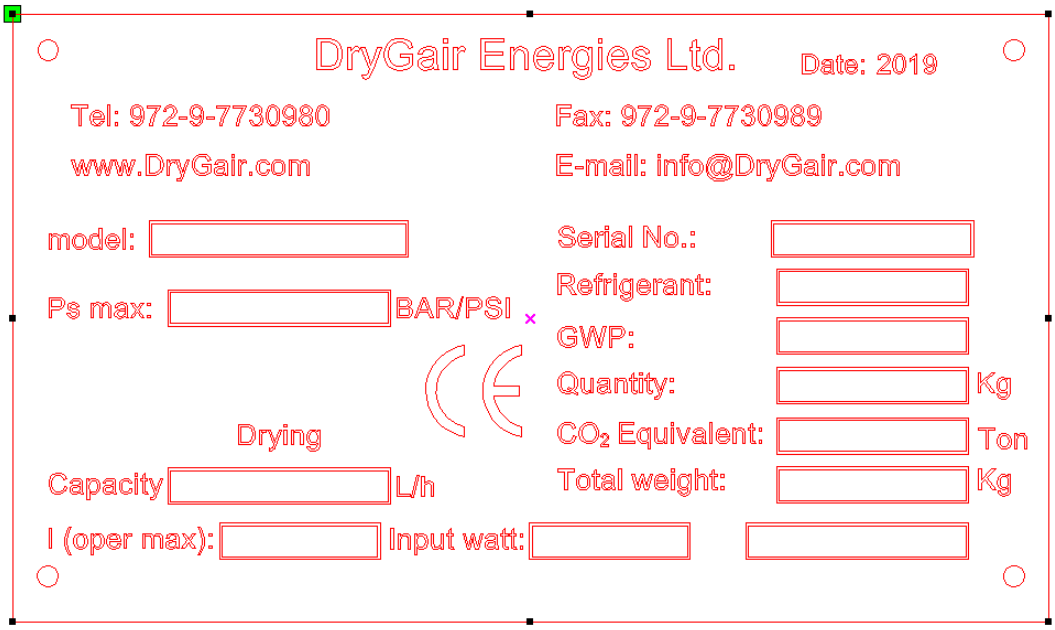


Figure 2-1. DryGair Identification label

- **Model** ---------- The model number provides information on the specific unit
- **Ps max** ---------- The maximum operating pressure
- **Capacity** ---------- The drying capacity of the unit (at 18°C and 80% RH)
- **I (oper max)** ------- The maximum operating current
- **Serial No.** ---------- The serial number of the specific unit
- **Refrigerant** -------- The type of refrigerant used in the unit
- **Quantity** ---------- The amount of refrigerant to fill in the unit
- **GWP** ---------- Global warming potential parameter
- **CO_2 Equivalent** --- Emissions comparison measurement between Refrigerant and CO_2
- **Input watt** ---------- The power required by the unit (at 18°C and 80% RH)
- **Total weight** ------- The overall weight of the unit

The following warning labels are attached to the panels of the DryGair unit.

Attention high voltage

Caution hot surface

Hearing protection required

Lift from here notice

3. UNIT OVERVIEW

The DryGair dehumidifying unit is designed and manufactured by DryGair Energies Ltd. The unit is designed for the dehumidification of greenhouses and can also be used in any other closed structure.

The unit reduces the humidity in the greenhouse according to a defined set-point by pulling the wet cold air from the bottom of the greenhouse, extracting the water, heating the air, and blowing the drier and warmer air back into the greenhouse through an air distribution module.
The unit can also be configured to heat or cool the dried air.

The water condensed during the dehumidification process is removed from the greenhouse through water drainage and can be reused for other purposes such as a hydroponic system.

3.1 Standard Features

The standard unit includes the following features:

- **Humidification Set-Point** – ensures the humidity in the greenhouse is kept at this set-point.
- **Temperature Control** – stops the unit when the temperature drops to 10°C to protect it from frost, and goes through a defrost cycle when the temperature reaches 6°C.

3.2 Available Models

The DryGair dehumidifying unit includes the following main models:

- **DG-12.** Available in EU models.
- **DG-6.** Available in EU models.
- **Warm Climate – DG-13**

Each of the above models can be configured as follows:

- **Split** configuration
- **With Heating & Cooling**
- **50 Hz** or **60 Hz**.

Note
EU models utilize refrigerant gas type R513a.

3.3 Options

The DryGair unit can include one or more of the following options:

- **Side/ One-direction Canopy** – a canopy that distributes the air in one or two specific directions.
- **Combined Heating and Cooling** – a water-based coil for heating or cooling the air exiting the unit.
- **Noise Reduction** – an option for adding noise insulation to receive a quieter unit.
- **Protecting Wire-Net** – a net for protecting the coil outer fins from mechanical damage.
- **Air Filter** – a fine mesh filter for protecting the coils dust and other small particles.
- **Chemical Protective Coating** – the unit parts are made of materials that improve their resistance to chemicals and soil disinfectants.
- **Wheels** – set of wheels for unit mobility.

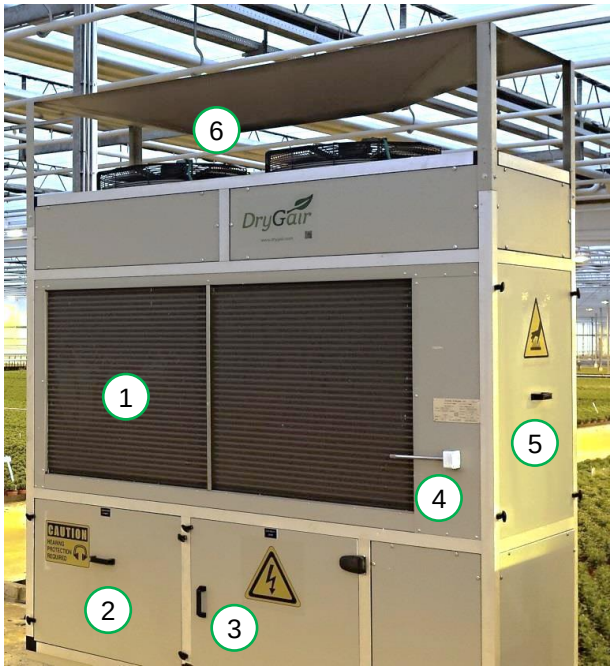
For more details on the available options, types, and configurations, see Chapter 9.

Note
The configuration cannot be changed at the customer's site.

3.4 Unit Description

The following figures show the various external parts of the DryGair unit.

> ***Note***
> The front and rear views are of different models and configurations.



1. Air inlet to coils
2. Removable cover to the compressor
3. Door to the electrical compartment
4. Temperature and humidity sensor
5. Removable cover to the service compartment:
   - Coils
   - Filter driers
   - Expansion valves
   - Temperature and humidity sensor
6. Fans and air distributor (4-way canopy)

Figure 3-1. DryGair unit (front view)

1. Air inlet to coils
2. Removable cover to the compressor and the drain outlet
3. Removable cover to the compressor pressure switches
4. Air distributor (side canopy)

Figure 3-2. DryGair unit (rear view)

4. INSTALLATION

The installation chapter includes site preparations, transporting and unpacking instructions, and installation instructions.

For a video showing parts of the installation procedure, go to https://www.youtube.com/watch?v=CPvgSqmch-0.

Note

The site should be prepared based on the unit configuration and location and should be done before unpacking and powering the unit on.

For units combined with Heating or Cooling, see details in Appendix D.1.

For split type units, see details in Appendix D.2

4.1 Site Preparations

4.1.1 Location Considerations

- The DryGair unit should be installed inside a greenhouse and located in an accessible location for operation and maintenance.
- The unit should preferably be positioned in the center of the greenhouse, blowing air towards the plants.
- If the unit is placed next to the greenhouse wall, ensure it is distanced at least 50 centimeters from the wall, and blowing air towards the plants.
- The unit in its final position should be positioned at a height the air distributor (canopy) is just below the thermal screen (if exists) and the unit's blowers are above the plants. The air should be distributed to the center of the greenhouse.
- If the plants growing method is high gutter, the unit should be elevated on stable designed tables to a height that enables the efficient and safe operation of the unit.

4.1.2 Required Utilities

Prepare the installation site before receiving the DryGair unit.

- Prepare a concrete leveled surface or tiles, built according to the unit dimensions and weight (see details in Appendix A and Appendix A).
- Prepare an electrical shut off switch in a protected location near the unit. Specifications for the shut-off switch are as follows:
  - **DG-12** – 3×40 Amp. **DG-12 EU** – 3×63 Amp.
  - **DG-6** – 3×24 Amp. **DG-6 EU** – 3×32 Amp.
  - **DG-13** – 3×63 Amp.
- Prepare drainage for removal of the water that is condensed by the unit. The unit is supplied with a metal 1½" BSP threaded bushing.

  The prepared drainage should include a siphon.

Warning
The unit condensation water is not for drinking!

Note
EU models utilize refrigerant gas type R513a.

- The site should be equipped with suitable climbing equipment to enable safe and comfortable access to the unit's top.
- The transit lanes inside the greenhouse where the unit is to be installed must be kept clear, and the floor must be clean and free from any obstacles that might cause the forklift, truck or crane to “jump”.

4.2 Transporting the Unit

4.2.1 Safety Notes for Lifting and Transporting the Unit

Warning

DryGair declines all responsibility for damage to objects or persons caused by not observing the safety standards concerning the lifting and moving of material within the user's facilities.

- Loading the truck and transporting the unit must be done with the appropriate equipment, considering the unit size and weight.

Warning

Only qualified and specialized personnel, which are trained for this type of maneuvering, should perform all the handling and lifting operations.

- When transferring the unit, be sure to have a supervising person.
- Personnel must keep a distance from suspended loads and work areas of the crane, forklift truck, or other lifting/handling equipment.
- Moving and lifting the unit should be done with suitable belts/chains.
- Always act with extreme caution to prevent personal injury and damage to the unit or its parts. When using a forklift, be sure not to damage the compressor.

Caution

The DryGair unit should be lifted only from its front or rear. A "LIFT" notice is attached to the front and rear panels of the unit. Ensure the forks are spread sufficiently apart to ensure the stability of the load.

- When lifting and transporting the unit, the load must always be secured and fixed to a load-bearing part of the lifting and transporting equipment. This will ensure no movement, swinging or damage to the unit or its surroundings.

Notes:

The unit and the air distribution module are shipped separately, wrapped in bubble wrap, and stretch wrap.

For model weight and dimensions, see details in Appendix A and Appendix B.

4.2.2 Special Instruction for Tilting the Unit

The unit can temporarily be carried in an angle inside the greenhouse under the following precautions:

Caution

Do not tilt the unit to more than 75 degrees from its vertical position.

Preparing the Unit:

1. Ensure the compressor connecting screws are tightly closed.
2. Secure the compressor:
   - With a belt to a firm part of the unit structure to avoid overweight on the compressor's screws.

   Or

   - Place a piece of wood in the gap between the compressor and the unit side post, to support the compressor's high end.
3. Verify the panels of the unit top fans are mounted well.
4. Protect the coils with polystyrene or plywood.

Caution

If the unit is tilted during its transportation, leave the unit in its vertical position for at list 3 hours before operating. This will ensure the oil drains back to the bottom of the compressor.

4.2.3 Receiving the DryGair Unit

Warning

Proceed with extreme care when performing the following unpacking procedure, as some machine parts may be fragile. Do not break, do not open the packing with sharp tools and do not perforate the cover.

When possible, the DryGair unit is shipped in a single package, which includes all unit parts and spare parts. When the unit cannot be packed as a complete unit, as in many configurations, it is packed in two parts (unit body and air distribution module) and reassembled on-site by an experienced technician during the installation procedure.

Before proceeding with the installation procedure, examine the shipping documents and packing crate labels against the purchase order. In case of discrepancy, contact your local DryGair representative.

4.2.4 Initial Inspection

Upon receipt, inspect the exterior of the packaged unit for any damage that might have occurred during transportation or delivery.

If there is any visible damage to the unit, do not proceed with the installation. Leave the packaged unit as it is and immediately contact your local DryGair representative.

Note

Failure to contact the DryGair representative immediately in these cases may result in the cancellation of the equipment warranty.

4.3 Unpacking the Unit

The DryGair unit should be transferred to its location in the greenhouse using a manual or driven forklift fitted to its weight and placed on the prepared flat surface.

Figure 4-1. Transferring the unit

4.3.1 Unpacking

The unit and its parts are delivered wrapped in bubble wrap and stretch wrap.

Caution

Do not open the packing with sharp tools.

To unpack the unit:

1. Remove the stretch wrap from around the unit.
2. Remove the bubble plastic sheet.
3. Open the right cover, remove it from the unit, and remove the polystyrene sheet from around the coils.
4. Return the cover and secure it.
5. Remove the bubble wrapping and the wrapping nylon from the Air Distribution Module (Canopy).
6. Remove the cardboard protection from the coils on both sides.

4.3.2 Received Parts List

The DryGair dehumidification unit is supplied with the following standard items and parts.

Table 4-1. Parts and Accessories

#	Part Description	Quantity
1.	Main Unit	1
2.	Air Distribution Module (Canopy)	1
3.	Accessories*:	N/A
4.	▪ Rubber pads (shock-absorbing and leveling)*	6
5.	▪ Screws and Washers**	N/A
6.	▪ Brackets for the Air Distribution Module***	4

* Located in the electrical compartment.
** The accessories are in a bag inside the service compartment (see Figure 3-1).
*** Located in the compressor compartment.

Note

Verify all parts and ordered items were received and that they are not damaged. Inform the carrier and your local DryGair representative immediately if any part is missing or damaged.

4.4 Positioning the Unit

The following section describes how to position the unit and remove the compressor's transportation locks.

To position the unit:

1. Place the supplied rubber pads at the locations of the unit legs (6 legs). These rubber pads act as shock absorbers and for leveling the unit.

> ***Note***
> For split units see specific details in Appendix D section D.2.

2. Lift the unit and position it on the rubber pads.
3. Level the unit and verify it is stable.

To remove the compressor locks:

> ***Note***
> Before removing the braces, check there are no oil leaks and verify the joins and pipes are in place.

1. Loosen the nuts securing the compressor just to the point the securing braces can be removed.
2. Remove the four (4) braces surrounding the compressor springs.

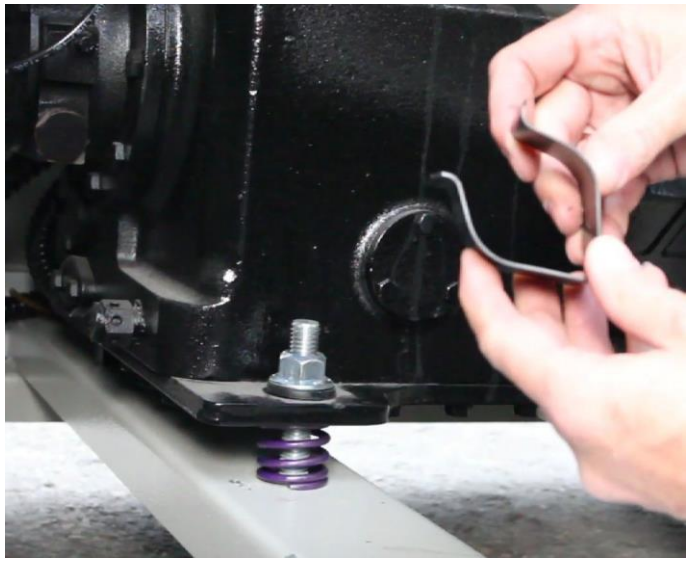


Figure 4-2. Compressor transport locks after removal

4.5 Connecting the Air Distribution Module (Canopy)

The DryGair unit accommodates various types of air distribution modules, which are recommended by DryGair according to the unique unit setup.

The canopy connecting screws are supplied in a small bag placed in the service compartment.

For details on the available canopy types, see Appendix C.

> ***Note***
> The type of air distribution module must be pre-ordered. It cannot be added or retrofitted on-site.

4.5.1 Four-Direction Canopy

The four-direction canopy distributes the air coming from the unit to four directions. This canopy type is efficient when the DryGair unit is positioned in the center of the greenhouse, away from the greenhouse walls.

> ***Note***
> The four-direction canopy is not symmetric. Connect the canopy with its moderate slope towards the unit right side (when viewing from the front).

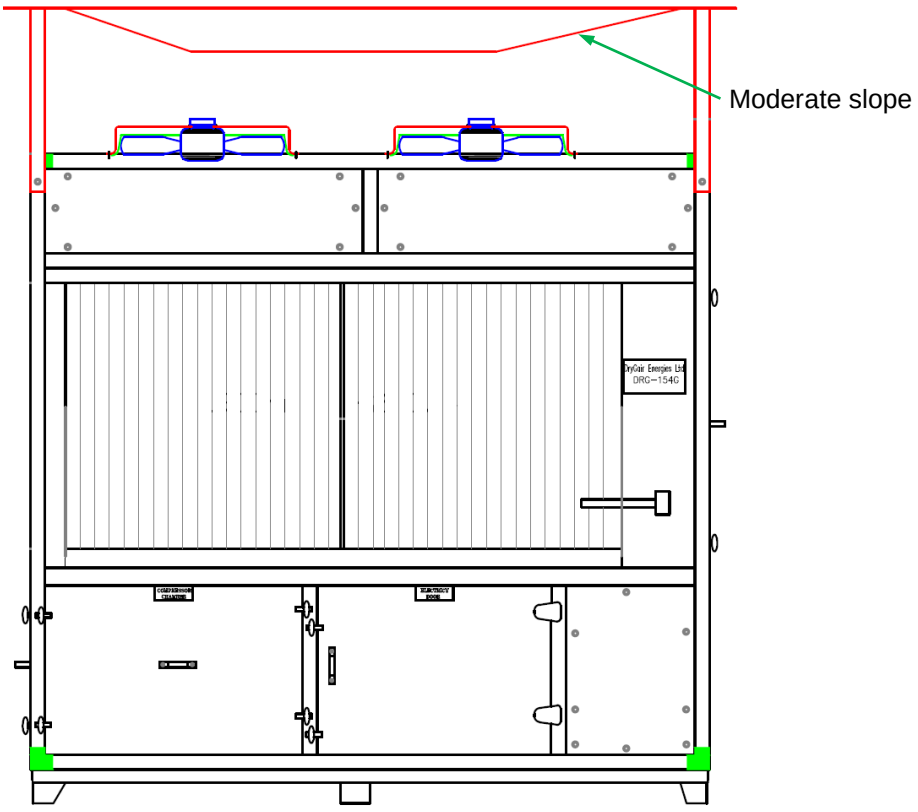


Figure 4-3. Air distributor module (4-way canopy)

The four-direction canopy has a sticker attached to its bottom, indicating "**This Side Facing Down**" and a notice indicating the canopy should be positioned according to the colored (red and yellow) stickers on its corners.

The canopy should be connected in an orientation that ensures the alignment red and yellow sticker on the bottom of the canopy match the red and yellow stickers on the corners of the unit's main body.

4.5.2 Side Canopy and One-Direction Canopy

For details on the side canopy and one-direction canopy, see Appendix C.

To connect the Air Distribution Module (Canopy):

Warning

Observe safety regulations when using a stepladder to connect the Air Distributor Module.

- Inspect the stepladder to makes sure it is in good condition.
- Choose a safe spot to anchor the stepladder.
- Work with a partner. One person should hold the stepladder steady.

1. Lift the module to the top of the unit.
2. Ensure the air distribution is directed towards the center of the greenhouse.
3. Connect it to the unit frame, using the supplied brackets and screws.
4. Ensure the module is tightly secured and that its height is just below the thermal screen (if it exists).

4.6 Connecting the Utilities

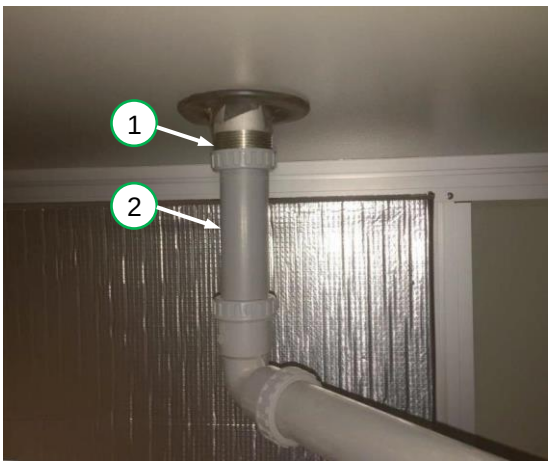
The following procedure describes how to connect the external utilities to the DryGair dehumidification unit.

4.6.1 Connecting the Water Drain-Pipe

During unit operation, water is condensed and needs to be removed from the unit. In some environments, depending on the air temperature and humidity, this may be a large quantity of water.

> ***Note***
>
> To prevent water accumulation, the water drain-pipe should be connected by a plumber to a drainage line leading outside the greenhouse or to any other place the water should be collected (such as a container).
>
> Make sure the unit is leveled.

1. Remove the rear cover from the unit.
2. Connect the prepared drain-pipe with a siphon to the threaded 1½" BSP bushing drain outlet.



1. Drain outlet (1½" BSP)
2. Drainage (not supplied)

Figure 4-4. Water drain outlet

3. Route the drainage tube through one of the three exits from the unit:

   Unit floor, Rear Cover or Side cover. There are pre-made circular cut-outs on the unit's side and rear covers, which can be easily punched out using a screwdriver and hammer, for threading the drainage pipe.
4. Reconnect the unit rear cover and secure it.
5. Route the drainage to the water collection location.

   The water can be used for other purposes, such as hydroponic systems.

After the unit is installed, call your electrician and the local DryGair technician to complete unit installation and to perform first unit activation. If the unit is to be connected to a climate control system, have your IT expert on-site for the first power-up. See details in D.2.3

4.6.2 Connecting the Unit to the Power Supply

Warning

Only a certified electrician is authorized to connect the unit to the power supply.

Warning

Verify the main power supply circuit breaker is turned OFF.

1. Open the electrical compartment door.

Important

The unit experiences motion during transportation.

Tighten all screws in the electrical switchboard, before connecting the electrical main supply cable.

2. Identify the grid connection terminal.

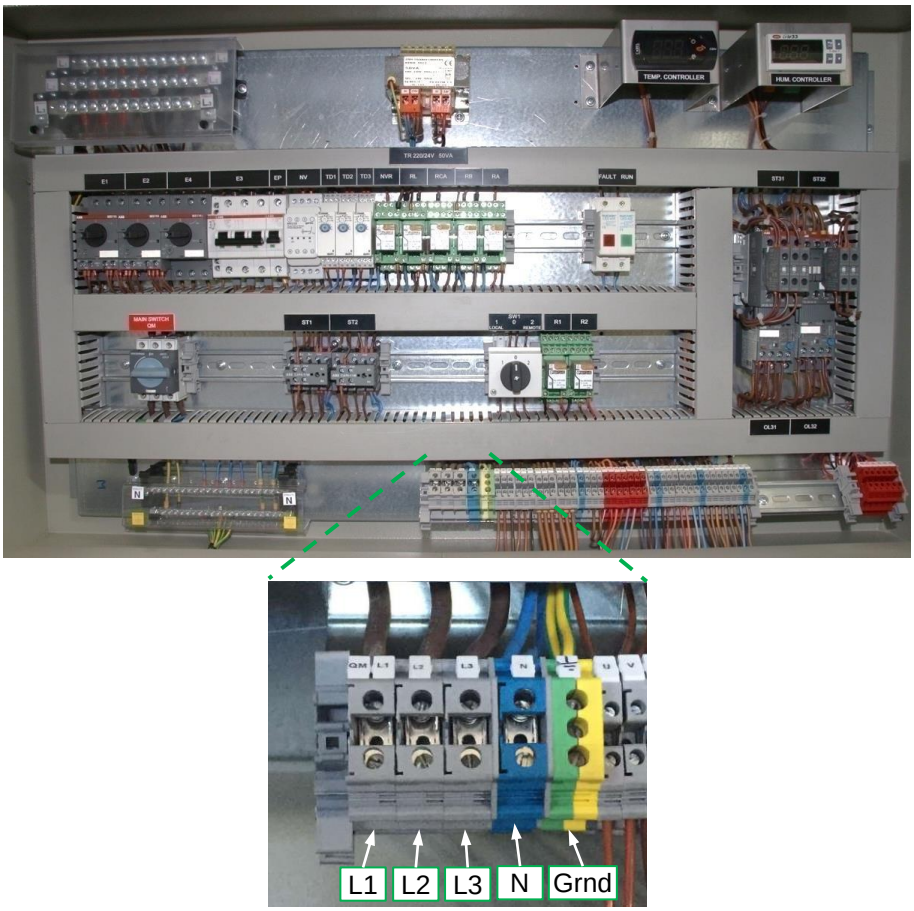


Figure 4-5. Electrical switchboard and electricity terminal block

3. Remove the wires routing channel cover (see Figure 4-7 for reference), and thread the main power cable through the hole in the left bottom corner of the electric compartment.

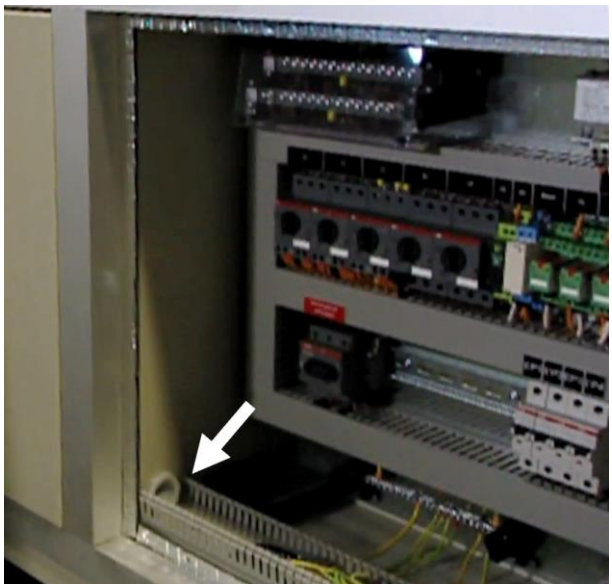


Figure 4-6. Hole for main power cable

4. Connect the main power cable to the grid terminal block (terminals **L1**, **L2**, **L3**, **N** and **Grnd.**).
5. Replace the wire routing channel cover.

Figure 4-7. Replacing wire channel cover

6. Close the electrical compartment door.
7. Connect the mains cable to the prepared external circuit breaker and power supply.

Note

See other specific hardware and utility connections, and other specific settings per unit configuration:

- Units combined with Heating or Cooling, see details in Appendix D.1.
- Split-type units, see details in Appendix D.2

5. UNIT PARTS AND COMPONENTS

The following figures show the various parts and components of the DryGair dehumidification unit.

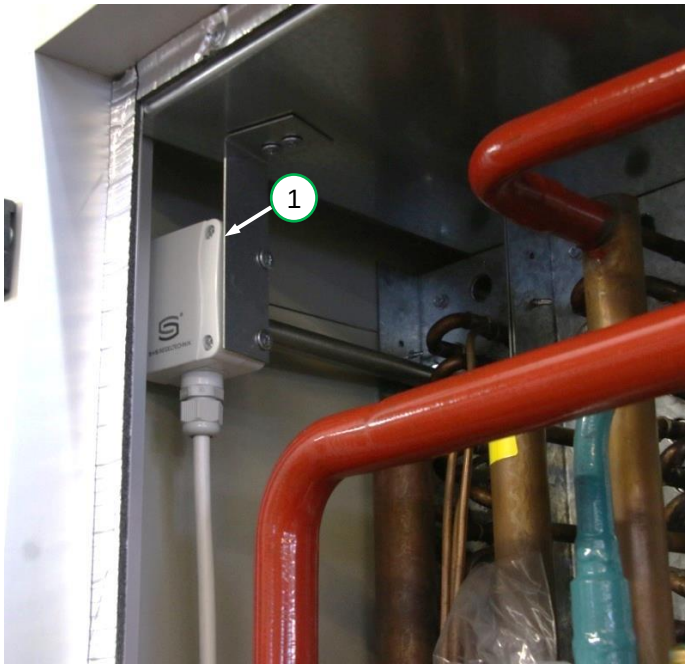
5.1 Temperature and Humidity Sensor

The Temperature and Humidity sensor is connected at the air entrance to the unit.

1. Temperature and humidity sensor

Figure 5-1. Temperature and humidity sensor

The sensor unit is connected inside the service compartment (upper left).

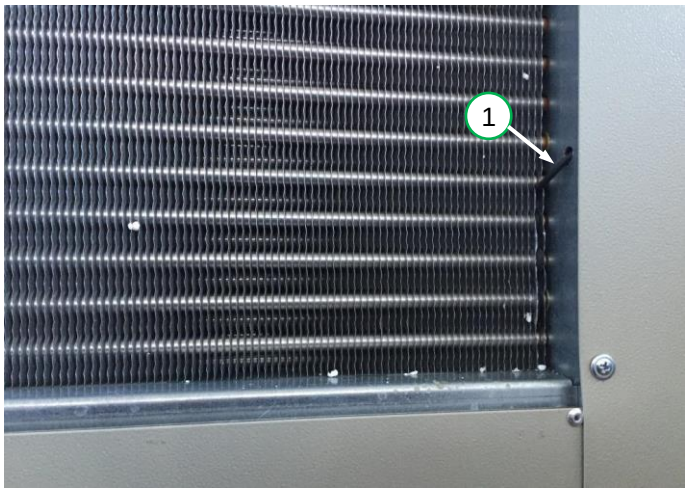


1. Temperature and humidity sensor unit

Figure 5-2. Sensor unit

5.2 Defrost Temperature Sensor

The defrost temperature sensor measures the temperature of the coil and its surroundings. It is positioned between the front heating coils and the air entrance fins. Only its connecting cable is visually seen.



1. Defrost temperature sensor cable

Figure 5-3. Defrost temperature sensor

5.3 Electrical Compartment

The door to the electrical compartment is at the lower right of the unit.

Warning

Danger: There is high voltage in the electrical compartment! Opening the electric compartment should only be done by authorized personnel or a certified electrician.

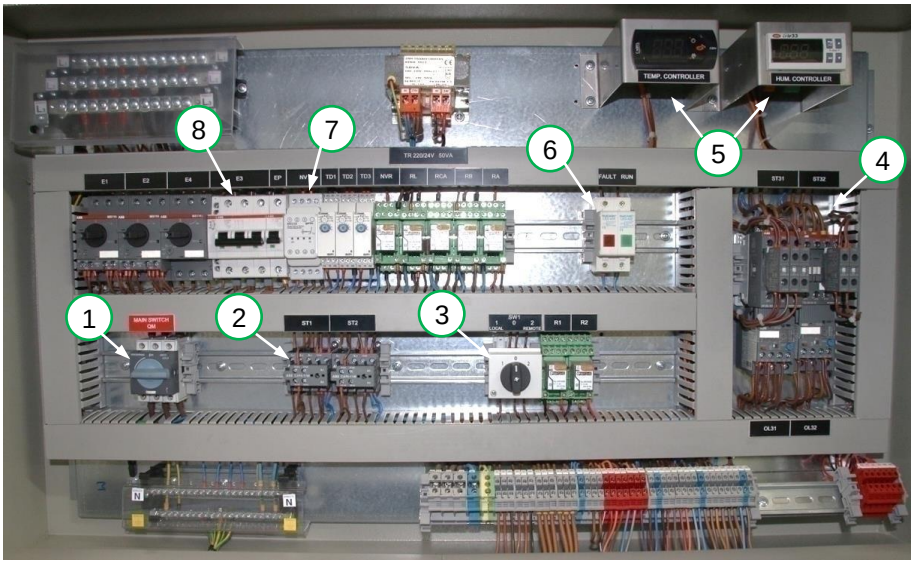


Figure 5-4. Electrical compartment

1. Main power switch
2. Fans contactors
3. Mode selection switch
4. Compressors contactors
5. Temperature and humidity controllers
6. Fault signal lights
7. Phase failure/sequence relay (NV relay)
8. Compressor circuit breaker (E3)

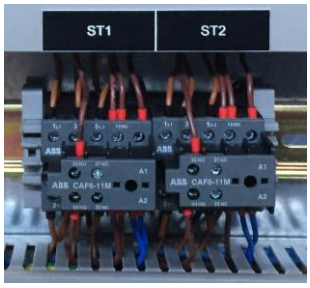
The following figures show the main components in the electrical compartment, marked in the above Figure 5-4.

Main power switch

Turns the unit On and Off.

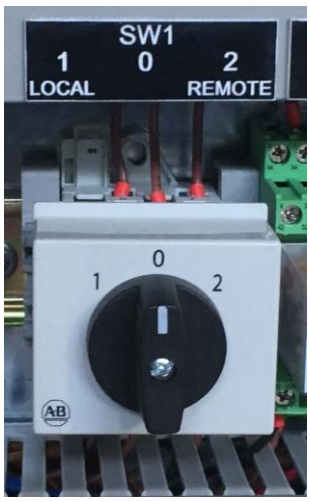
Fan contactors

Provide power to the fans.



Mode selection switch (SW1)

Switches between Local and Remote control.



Compressor contactors (ST31 and ST32)

Provide power to the compressor.

The two red pushbuttons are for resetting the contactors.

Temperature and humidity controllers

Display the temperature and the humidity.
The temperature controller comes preset from the factory and should not be adjusted.

Green/Red signal lights

Indicates unit fault.

Phase failure/sequence relay (NV relay)

A relay that operates when the voltage is lost.

Compressor circuit breaker (E3)

It provides power to the compressor.

5.4 Compressor

The compressor is located behind the removable front left cover.

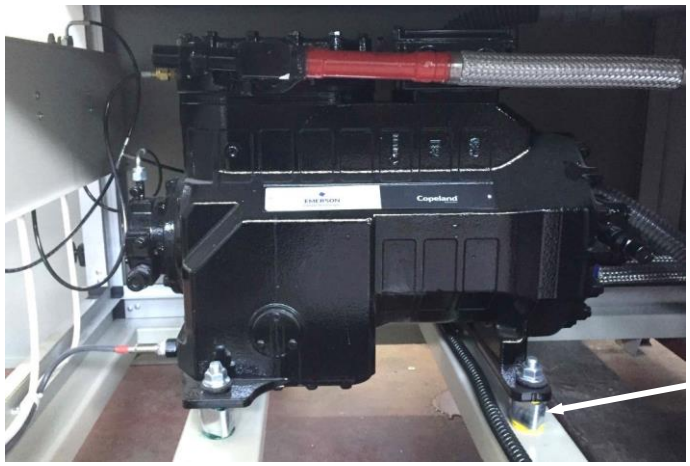


Figure 5-5. Compressor (front view)

The compressor is mounted on spring-type vibration eliminators, which are supplied by the compressor manufacturer.

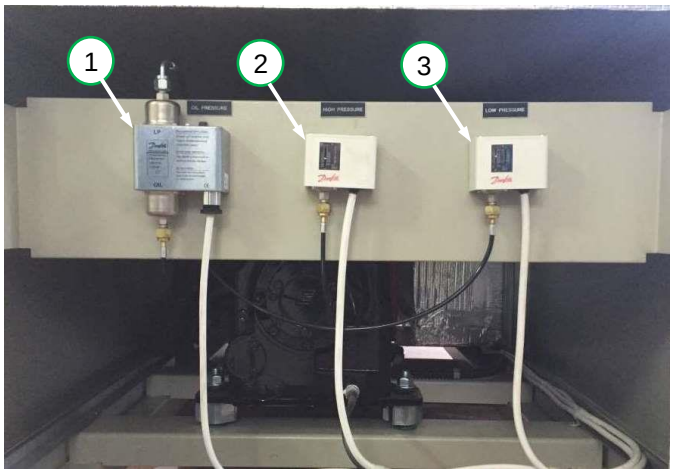
Caution

The compressor springs include locking braces for transportation. These transportation braces MUST be removed before operating the compressor.

Figure 5-6. Compressor (rear view)

5.5 Pressure Protector and Switches

Behind the left-side cover are the oil pressure protector and two pressure switches.



1. Compressor oil-compression safety switch.
2. High-pressure switch
3. Low-pressure switch

Figure 5-7. Oil pressure protector and switches

Caution

Do not change their settings; they were tested and adjusted at the factory.

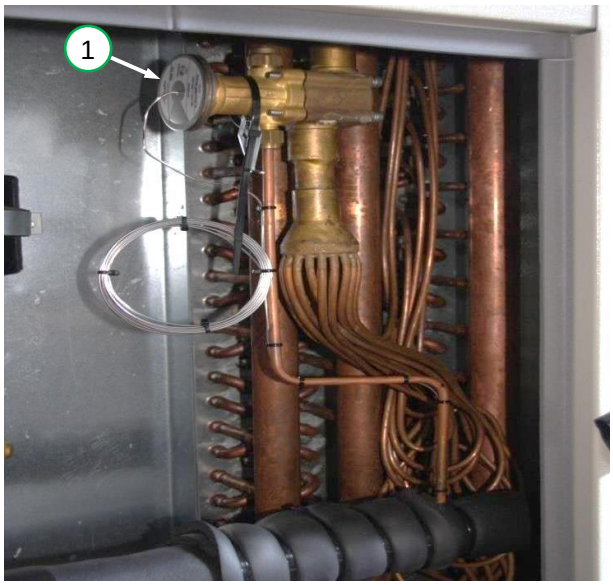
5.6 Service Compartment

The service compartment is located behind the right-side cover.

Figure 5-8. Service compartment (DG-12)

Note

The service compartment is different in units with the Heating and Cooling option (see Appendix D section D.1).

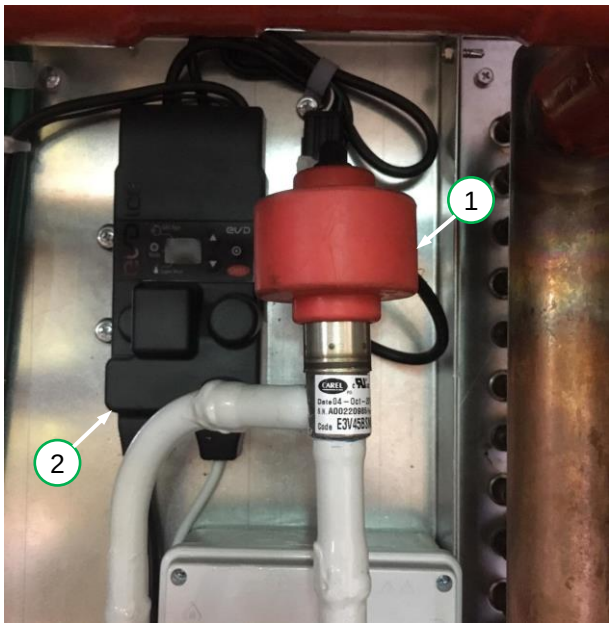


1. Expansion valves (×2)

Figure 5-9. Expansion valve

The EU models have different components in the service compartment.

Figure 5-10. Service compartment (DG-12 EU)



1. Expansion valve (×2)
2. Expansion valve controller

Figure 5-11. Electronic Expansion valve (DG-12 EU)

Note

The EU models utilize refrigerant gas type R513a.

1. Sight glass (×2)

Figure 5-12. Sight glass

The sight glass has a center indicator. Its color provides an indication to the refrigerant in the coils:

- Green (OK) if dry.
- Yellow (Fault) if wet.

The continuous presence of bubbles indicates a loss in the refrigerant.

5.7 Blowing Fans

There are two axial blowing fans on the top of the unit.

1. Blowing fans (×2)

Figure 5-13. Axial blowing fans

The two fans circulate the air that passes through the dehumidification unit.

6. UNIT OPERATION

The operation chapter explains how to use the DryGair unit.

Note
Operating the unit should be done only after receiving training from the representative of DryGair.

6.1 Operation Precautions

Before operating the unit, verify you are familiar with the following:

- The locations of the main shut off switches in case of emergency.
- The hazards areas and moving parts of the unit.

Warning
Opening the electric compartment should only be done by authorized personnel or a certified electrician.

- What is behind each cover, and risks related to that area.
- The electrical compartment: high voltage and low voltage areas.
- Operating the unit and stopping the unit.
- The climate control system (if applicable).

Caution
According to the kind of work being performed on the unit, wear personal protection devices such as helmet, eye protection glasses, protection shoes, ears noise protection, etc. All according to state law and regulation and/or according to management instructions.

Caution
Prevent unauthorized personnel from being near the unit without a qualified person.

Caution
If the unit was tilted during its transportation, leave the unit in its vertical position for at list 3 hours before operating. This will ensure the oil drains back to the bottom of the compressor.

6.2 Preparing the Unit for Operation

Preparing and setting the unit includes the following actions:

- Preliminary Checks (section 6.2.1)
- Powering On (section 6.2.2)
- Setting the Humidity Percentage (section 6.2.3)
- The Temperature Sensor (section 6.2.4)
- Selecting the Operation Mode (section 6.2.5)

Caution

The initial operation should be done by a professional person that is approved by DryGair Energies Ltd.

Note

For split units see and follow the instructions provided in Appendix D section D.2.

Caution

Before powering the unit on, visually check that all doors and covers of the unit are closed and that the unit inside and surroundings are clean from any parts, tools, etc.

6.2.1 Preliminary Checks

1. Make sure the main switch is OFF and that unauthorized persons are not near the machine.
2. Confirm the DryGair unit is stable and leveled.
3. Confirm the air distribution module (canopy) is installed and secured.
4. Confirm the drainage pipe installed and routed away from the unit.
5. Perform a visual check that everything is in place.

6.2.2 Powering On

1. Toggle the external circuit breaker of the main power supply to its ON position.

> ***Warning***
> High voltage is present at points throughout the unit. Contact can result in injury or death. Before opening the unit electrical compartment, ensure you are familiar with the location of the external circuit breaker to the unit.

2. Open the electrical compartment and toggle the compressor circuit breaker to its ON position.

3. Rotate the main switch to its ON position.

Powering OFF is performed when the unit is not in use, or before performing maintenance and service procedures.

To power OFF, rotate the main switch to its OFF position.

6.2.3 Setting the Humidity Percentage

The factory default value is around 75% RH.

To set the required Humidity percentage:

1. Press the **Set** button once. The screen displays "**ST 1**".

   When the **Set** button is released, the default humidity set point will flash on the display screen.

Figure 6-1. Humidistat controller

2. Set the required humidity percentage value using the **Up**/**Down** arrow buttons.
3. Press the **Set** button again to save the change.

   The current humidity level that the sensor reads is displayed on the screen. (Actual humidity level is displayed).

6.2.4 The Temperature Sensor

The main temperature sensor is factory set to 10°C. If the measured temperature drops to 10°C, the compressor stops working (fans continue).

The defrost temperature sensor is factory set to 6°C. If the measured temperature on the coils is below 6°C, the unit enters a 7-minute defrost cycle, in which the compressor stops but the fans continue operating.

The defrosting operation has a 1-hour cycle. If the measured temperature on the coils is above 6°C, the defrost cycle of that hour is not performed.

Caution

Do NOT change these values without consulting DryGair Ltd.

For details on how to change and set the Humidity and Temperature values, see the documentation of the Controllers on the manufacturer's website.

6.2.5 Selecting Operation Mode

The unit is turned on by a switch that has three operation modes:

- **Off mode (0)**: the unit is off.
- **Local mode (1)**: the unit operates according to the values set in the Humidity and Temperature controllers.
- **Remote mode (2)**: the unit is operated and controlled by computer software and 24 VAC that activate relays in the unit switchboard.

  See Appendix E for details on how to connect the DryGair unit to a climate control system and how to configure its parameters.

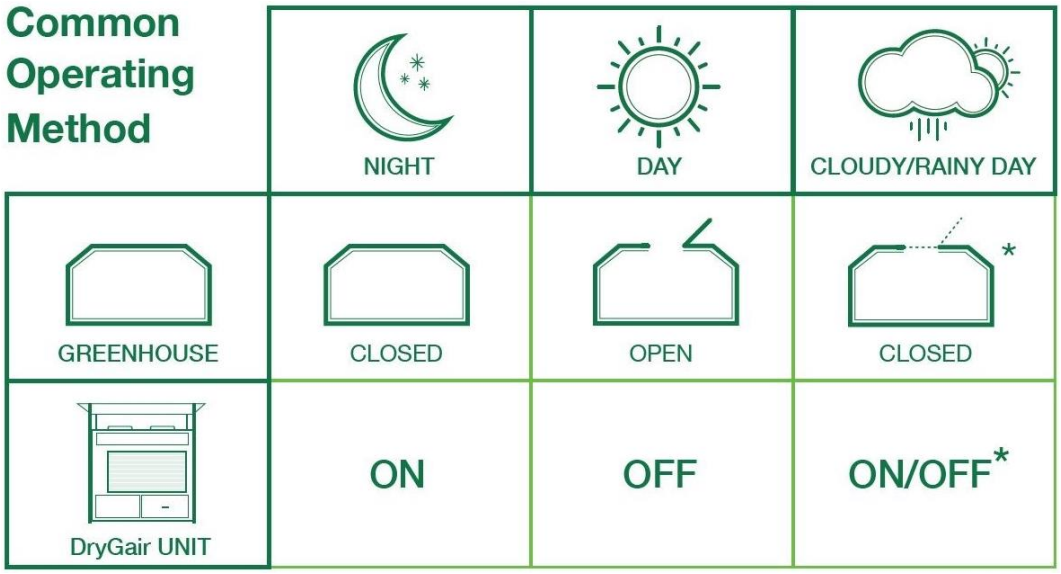
  It should be noted that even in the Remote mode, the unit stops working when the external temperature sensor measures 10°C and goes through a 7-minute defrost cycle when the internal sensor measures 6°C (according to the 1-hour defrost cycle).

Note
In all states, the unit should always be under power.

6.3 Basic Operation Guidelines

The following chapter provides basic operation guidelines for using the DryGair dehumidifying unit.

DryGair is designed to control humidity according to the night plant-transpiration rate, to allow maximum efficiency for the grower.



*** AS NEEDED**. On cloudy/rainy days the outside air is humid, which makes ventilation less effective; DryGair should be activated.
Due to the heightened levels of humidity caused by daytime plant transpiration, it is important to monitor humidity levels during the day and supplement DryGair's operation with ventilation–if needed.

Night

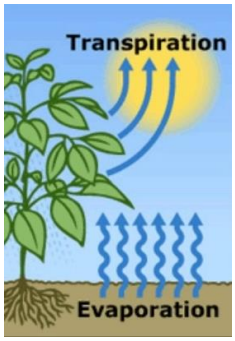
During the nighttime, plant transpiration releases water vapor into the air. Simultaneously, temperatures drop during the night.

At lower temperatures, the air cannot hold as much water in vapor form and below a certain temperature called the dew point, water will condense into liquid form. This happens on colder surfaces first, such as leaves and greenhouse structures, and this surface water is what triggers the development of plant disease.

To prevent reaching the dewpoint, **the greenhouse must be completely closed (vents and thermal screens, if applicable) and the DryGair system must be operated throughout the night**. At 18ºC and 80% RH, the DryGair DG-12 EU unit can extract 48L of water per hour from the greenhouse air and ensure uniform conditions throughout the growing space, which will prevent wet microclimates from forming. DryGair extracts more water than any other greenhouse dehumidifier on the market!

Day

In the morning, the sun rises, and its rays hit the surfaces of the plants. The presence of sunlight during the day generates photosynthetic activity which leads to daytime transpiration rates that are ten times higher than those occurring at night.



The greenhouse temperature increases, and additional water vapor is released into the air from the heat absorbed into the soil. Very high amounts of water-vapor are released into the greenhouse during the day.

Ventilation is often used to release heat which collects in the growing facility during the day, and given the appropriate outdoor humidity levels, also expels excess humidity from the growing facility in the process. **Because of this, ventilation is the most economical option for reducing humidity during the day**.

In the case of cloudy or rainy days, when the outside air is humid, it is possible to operate the DryGair around the clock and ventilate as little as necessary in order to reach optimum levels.

NOTE: During sunrise/sunset, if needed, DryGair's operation can be supplemented with ventilation.

- **Sunrise**: Once the plants receive any solar radiation, they begin to transpire at a very high rate. DryGair can remain operating in addition to ventilation to help treat the high quantities of water released into the air.
- **Sunset**: The sudden drop in outside temperature can cause spikes in the relative humidity. DryGair can be turned on before sunset to prevent the sudden spike.

The operation protocol depends on different elements in the greenhouse. If needed, we recommend consulting with the DryGair team.

6.4 Operating the Unit

> ***Note***
> Inspect the unit before performing a first unit operation. Verify the unit is complete and that all the covers and doors are closed.
>
> It is recommended that the first operation is performed by a qualified DryGair person or representative.

1. **Wait 2 hours after the machine is under voltage before operating**.
2. Check to ensure the temperature and the humidity set-points are set to the required values. The humidity can be set through the climate control system (if applicable). See details in D.2.3.
3. Verify that the **Run** (green) indication light is on and that the **Fault** (red) indication light is off.

> ***Warning***
> Before turning on the unit, make sure the inside of the unit is clear from any objects, and that there are no unauthorized people around the machine.

4. Rotate the Main Switch (**SW1**) to its ON position.

5. Check the following:
   - The two fans are operating and are rotating in a clockwise direction (blowing air out of the unit). If there is a problem, do the following:
     - If the fans are not rotating, check there is no failure with the NV relay component (see Figure 5-4 in section 5.3).
     - Go to the main power supply connections and reverse two of the cables (from R S T to R T S).
   - The air distributed by the unit blows over the top of the plants and does not disturb the plants.
   - The compressor is operating. It should start working about 5 minutes after the unit starts operating.
6. Wait 30 minutes from the unit operation and check to verify the coils are fully wet and water is flowing from the unit drain.

6.5 Operation Notes

Once the unit is operated, the unit continuously pulls the cold wet air, dehumidifies the air and blows out drier and warmer air to the greenhouse.

The desired humidity of the air is set on the humidity controller.

- When the mode selection switch is set to **Local** (**1**), the humidity setpoint is dictated by the unit's humidity controller.
- When the mode selection switch is set to **Remote** (**2**), the local humidity controller becomes inactive and the unit operation is controlled by the humidity setpoint and commands from the connected climate control unit (remote PC).

Regardless of the operation mode (local/remote), when the temperature drops to 10°C the unit goes through a 7-minute defrost cycle every hour if the measured coil temperature is below 6°C.
The sequence can be changed only by the DryGair technician.

The coil temperature sensor is set to around 6°C (dest. Temp.). When the temperature is above this value the unit does not go into the defrost mode.

The Oil Heater stops operating only when the compressor starts working.

Caution

Maintaining the unit is very important and essential. For details, refer to Chapter 7 –Maintaining the Unit.

7. MAINTAINING THE UNIT

The maintenance chapter provides instructions related to periodical maintenance and unit cleaning.

Periodic cleaning and maintenance of the unit will ensure efficient and long-term operation.

Warning

High voltage is present at points throughout the unit. Contact can result in injury or death. Before opening the unit electrical compartment, ensure you are familiar with the location of the external circuit breaker to the unit.

Caution

Avoid direct water contact with the unit sensors!

Do not immerse them in water and/or spray direct water at them.

7.1 Daily Maintenance

Perform the following every day:

- Visually inspect the unit, verifying the unit is operating properly and noticing if there is anything unusual.
- Clean the unit and its surroundings from any foreign material.

7.2 Monthly Maintenance

Warning

Before performing the following procedures, power down the unit and disconnect the power cord.

Perform the following monthly:

- The daily maintenance.
- Check to see if there are any oil stains/residues. If found, check to see the origin and contact your local DryGair representative.

Warning

Do not steam-clean the heat exchanger coils.

7.3 Quarterly Maintenance

Perform the following every quarter:

- The monthly maintenance.
- Clean the evaporator and condenser coils surfaces. For details on cleaning the coils, see section 7.5.
- Clean the filters and replace them if required.
- Clean the drainage basin. See details in section 7.5.
- Check the compressor oil level (see Figure 5-6) and change when needed.
- Check the refrigerant charge:
  a. Run the unit for about 15 minutes.
  b. Remove the side cover and check that there are no bubbles at the sight glass.
  c. Check that the evaporator coil is evenly wet across its surface. Partial wetness indicates a loss of refrigerant or low charge.

7.4 Annual Maintenance

Perform the following every year:

Note
It is recommended the yearly inspection and maintenance is performed by a qualified DryGair person or representative and having an HVAC person or electrician for assistance.

- The quarterly maintenance.
- Paint damaged or chipped body paint to preserve the unit body.
- Check that the fans are firmly secured to the motor shaft and that the fan rotates freely. The fan motor is sealed for life and therefore does not need to be lubricated.
- Check that the compressor isolators did not become free.
- Tighten the compressor taps and pressure switches to prevent refrigerant leaks.
- Check the electric currents of the compressor and fans.
- Check all wiring connections and tightened the screws if necessary (especially in the electricity panel).
- Check the defrost unit operation (for models with a defrost mode):
  - Switch the unit on, and leave it running for about 52 minutes.

    The unit enters the air defrost mode for approximately 8 minutes before returning to normal operation.
- Calibrate the humidity sensor. The humidity controller type is IR33, manufactured by "CAREL" (https://www.carel.com/product/ir33).

7.5 Cleaning Protocol

The following procedures should be performed by a qualified person that is familiar and trained in working with the DryGair dehumidification systems.

Warning

High voltage is present at points throughout the system. Contact can result in injury or death. Before opening the system's electrical compartment, ensure you are familiar with the location of the external circuit breaker to the system.

Note

The cleaning order is important. First, clean the evaporation/condensation batteries. Then, clean the drainage basin.

7.5.1 Professional HVAC Cleaning Companies

Companies that provide HVAC cleaning services, which are professionally trained on cleaning and handling coils and similar components as found in DryGair dehumidification systems, can be hired to clean the DryGair HVAC parts. If you choose to hire an external cleaning service, make sure they are qualified and certified and have reviewed this cleaning protocol and the operation manual.

7.5.2 Preliminary Procedures

1. Visually inspect the system, verifying the system is operating properly and noticing if there is anything unusual.
2. Clean the system and its surroundings from any foreign material.
3. Disconnect the unit from the power source.

Caution

Do not use gasoline or solvents, especially acidic detergents, as they might damage the paintwork, transparent parts, cable insulation, etc.

4. Check that the electrical compartment door is closed tightly. If not, tighten it.
5. It is recommended to seal the electrical compartment door, to ensure no debris or moisture enters the electrical compartment during the cleaning process.
6. Disconnect the drainage pipe from the drainage system.
7. Remove oil and sludge with a clean cloth. If necessary, use a paintbrush dipped in oil, or cleaning material.

7.5.3 Cleaning the Coils

Coil cleaning and disinfection should be performed along the entire coil area.

Note

Before you begin, check that the electrical compartment door is closed and sealed and that the unit is disconnected from the drainage system.

Caution

An adequate safe distance from the coils must be maintained during the cleaning process to ensure the coil fins will not be damaged.

Warning

Steam cleaning must only be performed by a qualified person to prevent damage to the coil cooling fins.

To clean the external coils:

1. Clean the evaporator and condenser coils surface by gently blowing the dirt out from behind the fins with low-pressure compressed air.

   To prevent any damage to the fins, it is best not to aim the air nozzles directly at the coils. Alternatively, gently vacuum clean the coils.

2. Gently wipe the coils with a semi-wet cloth.
3. Further cleaning can be done by steam or by using a cleaning substance meant for cleaning air conditioning systems. For example, ACE® Foam N' Clean® Coil Cleaner
4. After cleaning, leave all unit doors open to let all internal parts dry.
5. Check the electrical compartment to ensure nothing got wet and that there is no moisture.

To clean the internal coils:

Accessing the internal coils requires dismantling and removing the fans on the roof of the unit. Access to the coils is from the top of the unit. Otherwise, only the external half of the unit can be accessed.

Follow the above procedure for cleaning the internal coils.

7.5.4 Cleaning the Drainage Basin

Note

Before you begin the cleaning procedure, disconnect the drainage pipe from the drainage basin.

1. Disconnect the drainage pipe from the drainage basin.
2. Remove the unit's coil access covers and doors, located on the right and left sides of the unit beside the coils.
3. Prepare the cleaning substances as detailed in the instructions by their manufacturer.
4. Apply or spray the material along the drainage basin, at a slow flow.
5. After completing the basin cleaning, leave the unit covers and doors open to ensure all internal parts are dry.
6. Check the electrical compartment to ensure nothing got wet and that there is no moisture.

7.5.5 Antibacterial and Antifungal Treatment

It is possible to apply antibacterial and antifungal materials approved for air conditioning systems to disinfect the coils and drainage basin. For Example, ACE® Evap-Guard or ACE® Evap-Gard Plus. Make sure to follow the manufacturer's instructions to guarantee the integrity of the unit.

7.6 Notes for Storage

To avoid dust build-up during storage, the unit can be covered by material with large ventilation holes.

The cover should not be completely closed at its base, to avoid humidity due to insufficient ventilation. Condensation will cause rusting or corrosion of the metal parts and damage to the electrical apparatus.

1. Carefully clean the unit and dry it with a clean cloth.
2. Use a vacuum cleaner to clean difficult-to-reach areas.

Caution

Do not use gasoline or solvents, which might damage the paintwork, transparent parts, cable insulation, etc.

3. Remove oil and sludge with a clean cloth. If necessary, use a paintbrush dipped in oil, or cleaning material.

Caution

Do not use diesel or gasoline fuel.

4. When the unit will be idle for a long period disconnect it from the power supply.

8. TROUBLESHOOTING AND REPAIRING THE UNIT

8.1 Troubleshooting

The troubleshooting section provides malfunction symptoms, the possible cause, and what may be done to overcome.

Symptom	Possible Cause	Remedy
Unit is not operating	No power to the unit	Check the power from the power supply panel
	Overload tripped	Reset the overloads
Little or no airflow	Fan motor is burnt	Replace the fan
	Refrigeration coils are dirty	See section 7—Maintaining the unit
	Loose electrical wiring connections	Check the wiring diagram to find the fault and repair
	Circuit breaker tripped	Reset the circuit breaker
Little or no water extraction	Insufficient airflow	Check and perform the suggestions for the above "Little or no airflow" symptom
	Compressor fault	Contact the factory service center
	Loss of refrigerant	Contact the factory service center
Unit vibrates excessively	Loose compressor	Tighten the nuts of the compressor mounts
	Damaged fan	Replace the fan
	Spring spacers not removed	Remove spring spacers
Water flooding inside the machine	Drain-pipe is blocked/frozen	Clear the obstruction
	Drain-pipe is too high	Ensure that no section of the drain hose is above the level of the water outlet
	Crimped or blocked tubing	Straighten, clear, or replace the tubing
Compressor is not working while the fans are working	High-pressure switch fault	Press the HP switch button
	Oil pressure switch fault	Press the oil pressure switch button
	Circuit breaker tripped stage 1	Press circuit breaker stage 1
	Circuit breaker tripped stage 2	Press circuit breaker stage 2
	Compressor overload tripped	Reset the overload
Fans are not rotating	Possible failure of the no-volt relay component	Check that there is no failure of the no-volt relay component
Fans are rotating counterclockwise (blowing air into the unit)	The power supply cable is not connected correctly	Go to the main power supply connections and reverse two of the cables (from R S T to R T S)

8.2 Repairing the Unit

If any of the electrical components fail, contact the factory Service Center to obtain the proper replacement part.

For further information, contact DryGair at:

Email: info@drygair.com

Website: www.drygair.com

8.2.1 The Refrigerant Compressor

The refrigerant compressor fitted to the dehumidifier is a durable unit that should give many years of service. However, loss of refrigerant may result in compressor failure.

If the level of the refrigerant is low, contact the factory Service Center to report the issue. Then, contact a local refrigeration technician to fill the unit with the appropriate refrigerant (see tables in Appendix A).

Any professional refrigeration technician will be able to service the equipment. The following procedure must be used:

1. Turn the unit off.
2. Find the source of the leak.

Note

For evacuating and recharging the unit, use the crimped and brazed charging stub attached to the side of the refrigerant compressor.

3. Evacuate the unit from the remaining refrigerant before recharging.
4. Fix the leak.
5. Vacuum the unit pipes using a vacuum pump.
6. Recharge the unit with accurately measured by weight refrigerant.

Note

NEVER allow permanent service valves to be fitted to any part of the refrigerating circuit. Service valves may leak, causing further loss of refrigerant.

To check for failure of the compressor:

This check should only be performed by a certified refrigeration technician.

In the case of a compressor failure, the compressor can be replaced by a certified refrigeration technician.

9. APPENDICES

Appendix A. Standard Units Specifications (R507 Refrigerant)

Unit Specifications are also available online: https://drygair.com/dehumidifiers/

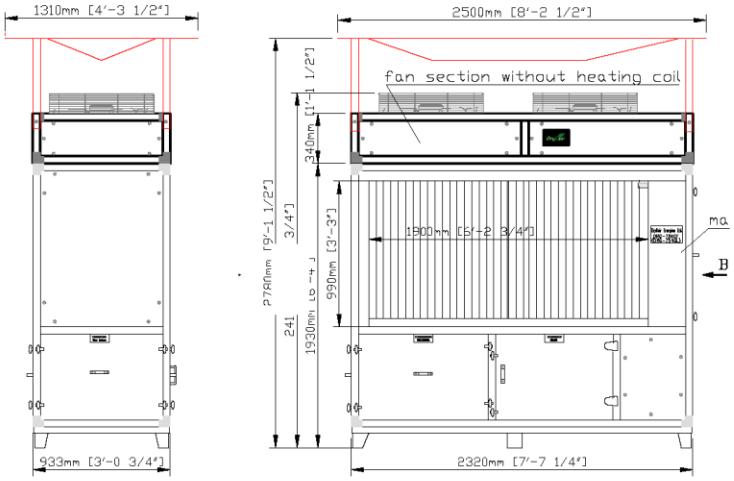
A.1. DG-12 Standard Unit

Standard Unit - DG12

Dimensions	Depth	930 mm
	Width	2,320 mm
Weight	~775 kg	
Height*	2,410 mm. 2,780 mm With air distribution module	
Optimal temperatures' range	10°c - 25°c	
Water condensation ***@ 18°C, 80%RH***	45 L/h	
Electricity consumption	10 kw	
Electricity requirements	***60Hz***	3 Phase, 460V, 60 Hz | (Oper. max) = 21 Amp or 3 Phase, 208V, 60 Hz | (Oper. max) = 46 Amp
	50Hz	3 Phase, 400V, 50 Hz | (Oper. max) = 31 Amp
Air flow	~22,000 m³/h	
Type of refrigerant	R507	

* Exact height can be specifically adjusted.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



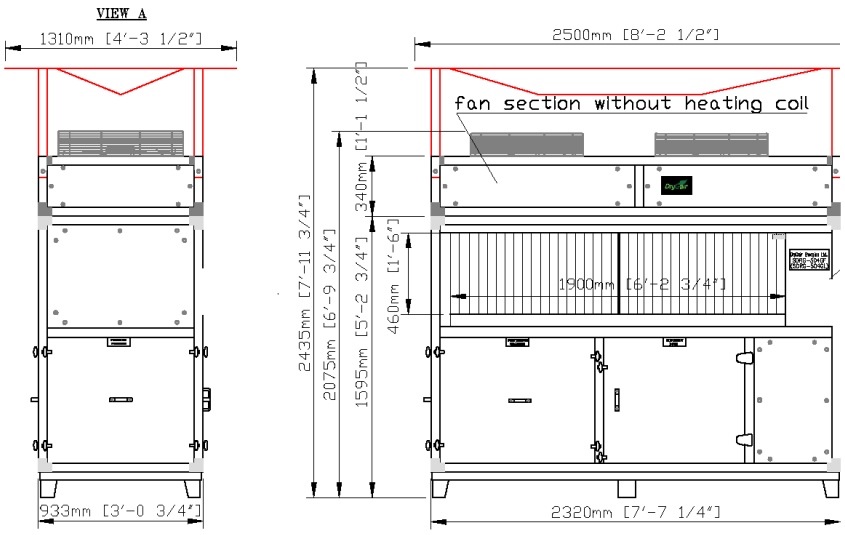
A.2. DG-6 Standard Unit

Small Unit - DG6

Dimensions	Depth	930 mm
	Width	2,320 mm
Weight	~550 kg	
Height*	2,075 mm. 2,435 mm With air distribution module	
Optimal temperatures' range	10°c - 25°c	
Water condensation ***@ 18°C, 80%RH***	24 L/h	
Electricity consumption	6 kw	
Electricity requirements	***60Hz***	3 Phase, 208V, 60 Hz | (Oper. max) = 30 Amp or 3 Phase, 460V, 60 Hz | (Oper. max) = 16 Amp
	50Hz	3 Phase, 400V, 50 Hz | (Oper. max) = 18 Amp
Air flow	~12,000 m³/h	
Type of refrigerant	R507	

* Exact height can be specifically adjusted.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



A.3. DG-12 Split Unit

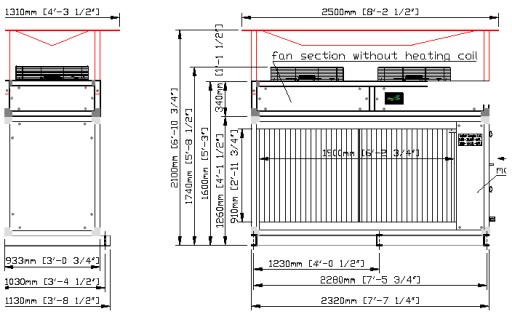
DG12 (Standard Unit) Split

		Upper part	*Lower part*
Dimensions	***Depth***	1130 mm	820 mm
	Width	2,320 mm	1,900 mm**
Weight		~550 kg	~330 kg
Height*		1,740 mm. 2,100 mm With air distribution module (adjustable)	940 mm
Optimal temperatures' range		10°c - 25°c	
Water condensation ***@ 18°C, 80%RH***		45 L/h	
Electricity consumption		10 kw	
Electricity requirements		***60Hz*** 3 Phase, 460V, 60 Hz | (Oper. max) = 21 Amp or 3 Phase, 208V, 60 Hz | (Oper. max) = 46 Amp	
		50Hz 3 Phase, 400V, 50 Hz | (Oper. max) = 31 Amp	
Air flow		~22,000 m³/h	
Type of refrigerant		R507	
Note		Max. distance between the unit's parts - 4 meters	

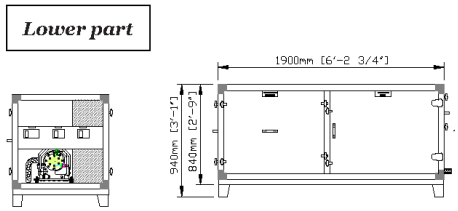
* Exact height can be specifically adjusted.
** Can be shorter - depends on the requirements.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.

Upper part



Lower part



A.4. DG-6 Split Unit

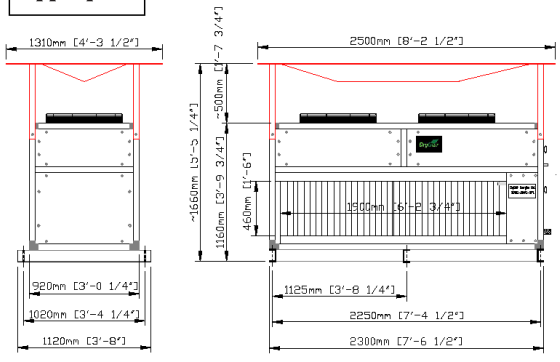
DG6 (Small Unit) Split

		Upper part	*Lower part*
Dimensions	***Depth***	1120 mm	820 mm
	Width	2,300 mm	1,655 mm**
Weight		~330 kg	~325 kg
Height*		1,160 mm +~500 mm Air distribution module (adjustable)	950 mm
Optimal temperatures' range		10°c - 25°c	
Water condensation *@ 18°C, 80%RH*		24 L/h	
Electricity consumption		6 kw	
Electricity requirements	***60Hz***	3 Phase, 208V, 60 Hz | (Oper. max) = 30 Amp or 3 Phase, 460V, 60 Hz | (Oper. max) = 16 Amp	
	50Hz	3 Phase, 400V, 50 Hz I (Oper. max) = 18 Amp	
Air flow		~12,000 m³/h	
Type of refrigerant		R507	
Note		Max. distance between the unit's parts - 4 meters	

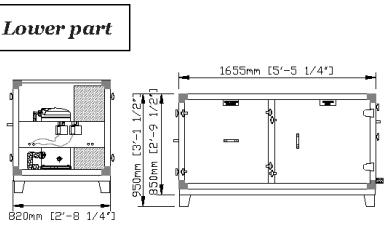
* Exact height can be specifically adjusted.
** Can be shorter - depends on the requirements.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.

Upper part



Lower part



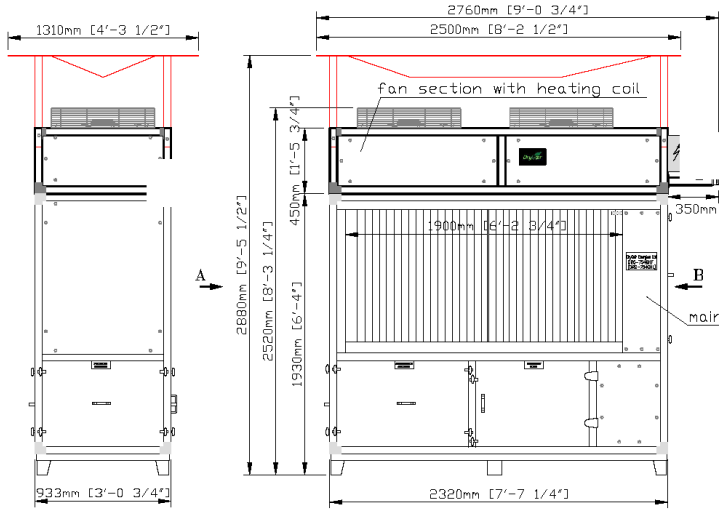
A.5. DG-12 Unit with Heating & Cooling

DG12 (Standard Unit) with Heating & Cooling

Dimensions	Depth	930 mm
	Width	2,320 mm
Weight	~825 kg	
Height*	2,520 mm. 2,880 mm With air distribution module	
Hot water pipe connection	300 mm	
Optimal temperatures' range	10°c - 25°c	
Water condensation *@ 18°C, 80%RH*	45 L/h	
Electricity consumption	10 kw	
Electricity requirements	***60Hz***	3 Phase, 460V, 60 Hz | (Oper. max) = 21 Amp or 3 Phase, 208V, 60 Hz | (Oper. max) = 46 Amp
	50Hz	3 Phase, 400V, 50 Hz | (Oper. max) = 31 Amp
Air flow	~22,000 m³/h	
Type of refrigerant	R507	

* Exact height can be specifically adjusted.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



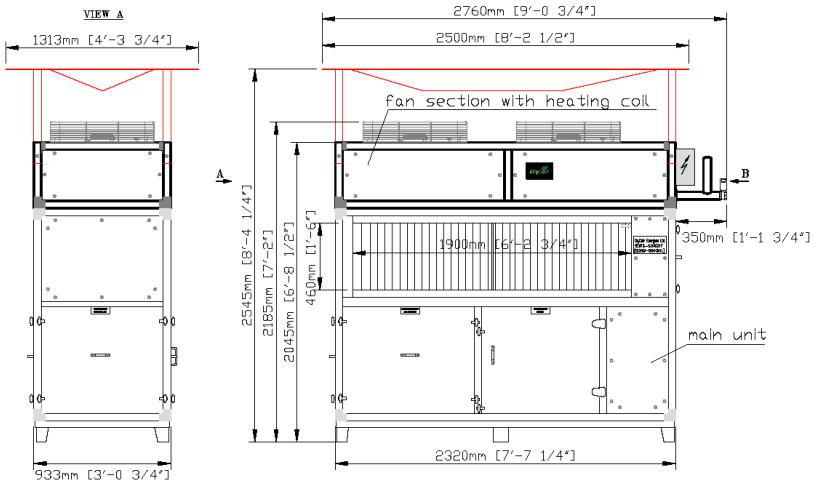
A.6. DG-6 Unit with Heating & Cooling

DG6 (Small Unit) with Heating & Cooling

Dimensions	Depth	930 mm
	Width	2,320 mm
Weight	~600 kg	
Height*	2,185 mm. 2,545 mm With air distribution module	
Hot water pipe connection	300 mm	
Optimal temperatures' range	10°c - 25°c	
Water condensation ***@ 18°C, 80%RH***	24 L/h	
Electricity consumption	6 kw	
Electricity requirements	***60Hz***	3 Phase, 208V, 60 Hz | (Oper. max) = 30 Amp or 3 Phase, 460V, 60 Hz | (Oper. max) = 16 Amp
	50Hz	3 Phase, 400V, 50 Hz I (Oper. max) = 18 Amp
Air flow	~12,000 m³/h	
Type of refrigerant	R507	

* Exact height can be specifically adjusted.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



A.7. DG-12 Split Unit with Heating & Cooling

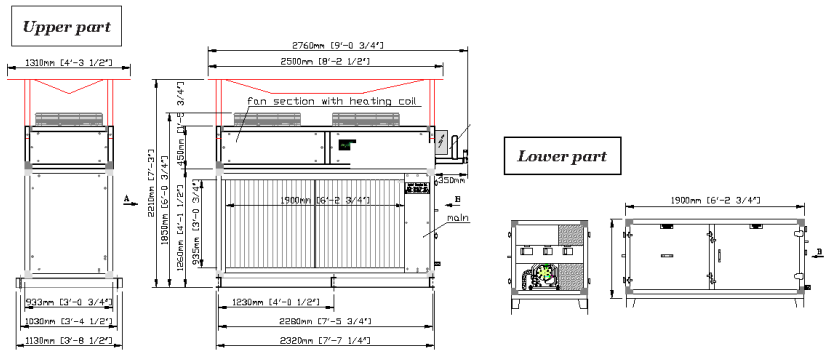
DG12 (Standard Unit) Split with Heating & Cooling

		Upper part	*Lower part*
Dimensions	***Depth***	1130 mm	820 mm
	Width	2,320 mm	1,900 mm**
Weight		~600 kg	~330 kg
Height*		1,850 mm. 2,210 mm with air distribution module (adjustable)	940 mm
Hot water pipe connection		300 mm	
Optimal temperatures' range		10°c - 25°c	
Water condensation ***@ 18°C, 80%RH***		45 L/h	
Electricity consumption		10 kw	
Electricity requirements		***60Hz*** 3 Phase, 460V, 60 Hz | (Oper. max) = 21 Amp or 3 Phase, 208V, 60 Hz | (Oper. max) = 46 Amp	
		50Hz 3 Phase, 400V, 50 Hz I (Oper. max) = 31 Amp	
Air flow		~22,000 m³/h	
Type of refrigerant		R507	
Note		Max. distance between the unit's parts - 4 meters	

* Exact height can be specifically adjusted.

** Can be shorter - depends on the requirements.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



A.8. DG-6 Split Unit with Heating & Cooling

DG6 (Small Unit) Split with Heating & Cooling

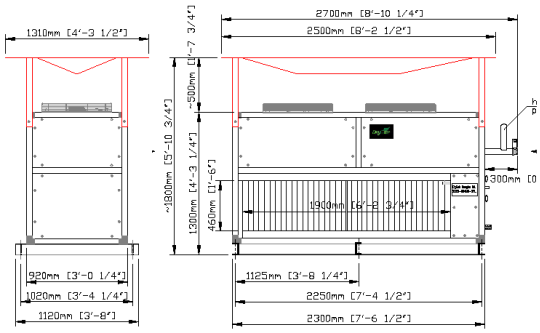
		Upper part	*Lower part*
Dimensions	***Depth***	1120 mm	820 mm
	Width	2,300 mm	1,655 mm**
Weight		~550 kg	~325 kg
Height*		1,300 mm + ~500 mm Air distribution module	950 mm
Hot water pipe connection		300 mm	
Optimal temperatures' range		10°c - 25°c	
Water condensation *@ 18°C, 80%RH*		24 L/h	
Electricity consumption		6 kw	
Electricity requirements		***60Hz*** 3 Phase, 208V, 60 Hz | (Oper. max) = 30 Amp or 3 Phase, 460V, 60 Hz | (Oper. max) = 16 Amp	
		50Hz 3 Phase, 400V, 50 Hz I (Oper. max) = 18 Amp	
Air flow		~12,000 m³/h	
Type of refrigerant		R507	
Note		Max. distance between the unit's parts - 4 meters	

* Exact height can be specifically adjusted.

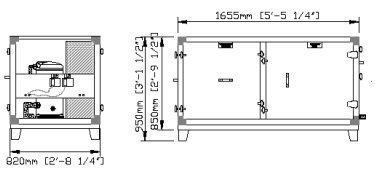
** Can be shorter - depends on the requirements.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.

Upper part



Lower part



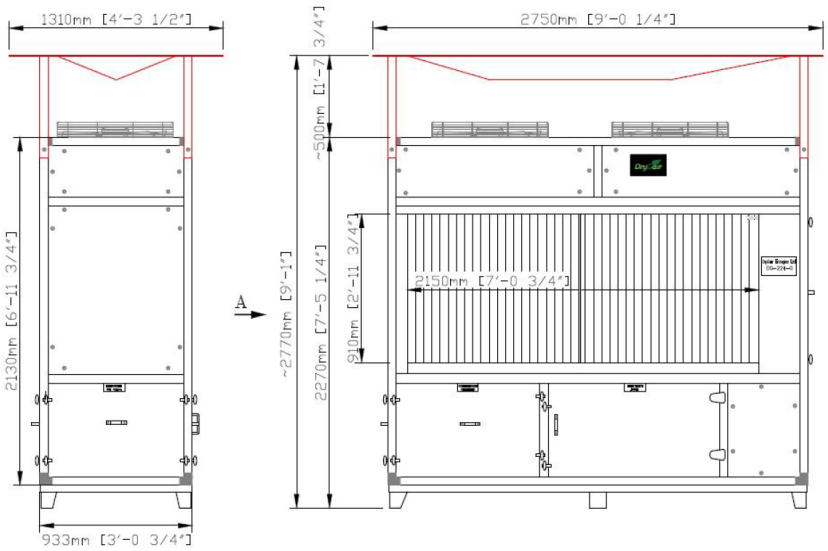
A.9. DG-13 Warm Climate Unit

Warm Climate Unit - DG13

Dimensions	Depth 933 mm
	Width 2,570 mm
Weight	~920 kg
Height*	2,270 mm. 2,770 mm with air distribution module.
Optimal temperatures' range	10°c - 40°c
Water condensation *@ 18°C, 80%RH*	48 L/h
Electricity consumption	12 kw
Electricity requirements	***50Hz*** 3 Phase, 400V, 50 Hz I (Oper. max) = 44 Amp
Air flow	~22,500 m³/h
Type of refrigerant	R134A

* Exact height can be specifically adjusted.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



Appendix B. EU Models Specifications (R513a Refrigerant)

Unit Specifications are also available online: https://drygair.com/dehumidifiers/

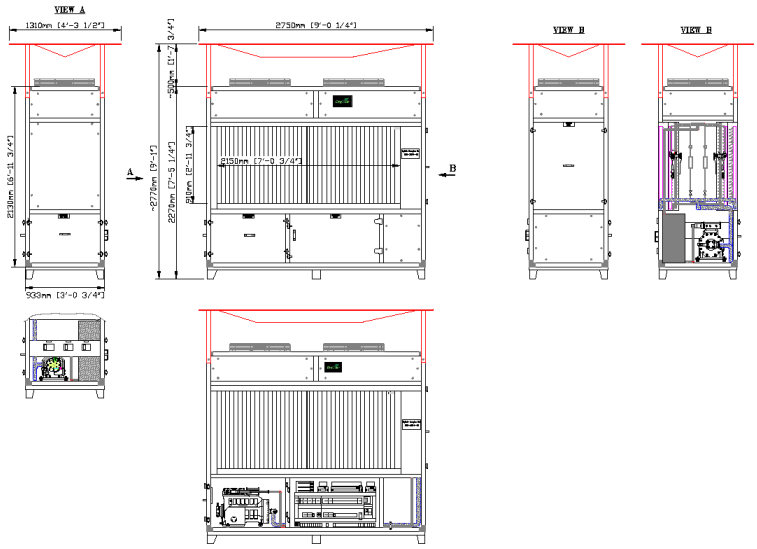
B.1. DG-12 EU Standard Unit

Standard Unit - DG12 EU

Dimensions	***Depth***	933 mm
	Width	2,570 mm
Weight	920 kg	
Height*	2,270 mm	2,770 with air distribution module
Optimal temperatures' range	10°c - 40°c	50°F - 80°F
Water condensation @ 18°C, 80%RH	48 L/H	
Electricity consumption	12 kw	
Electricity requirements (50Hz)	3 Phase, 400 V, 44 Amp	
Air flow	22,500 m^3/h	
Type of refrigerant	R513a	

* Exact height can be specifically adjusted.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



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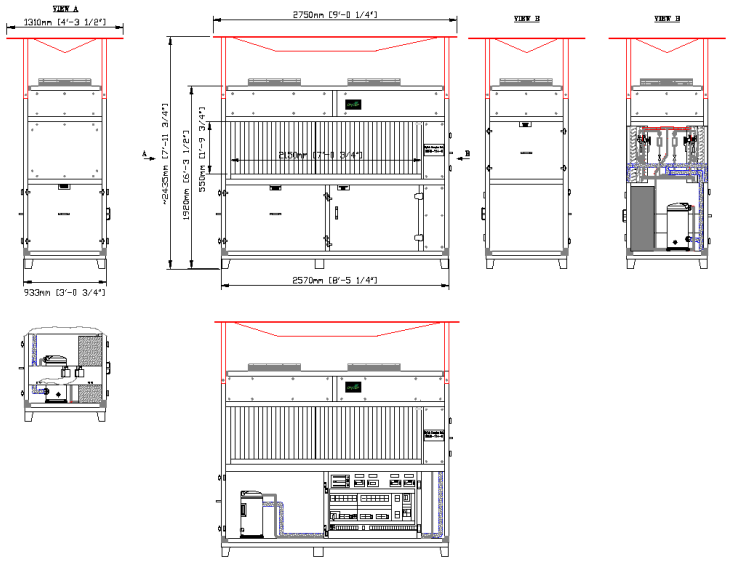
B.2. DG-6 EU Standard Unit

Small Unit - DG6 EU

Dimensions	***Depth***	933 mm
	Width	2,570 mm
Weight	850 kg	
Height*	1,920 mm	2,435 with air distribution module
Optimal temperatures' range	10°c - 40°c	50°F - 80°F
Water condensation *@ 18°C, 80%RH*	25 L/h	
Electricity consumption	6.5 kw	
Electricity requirements (50Hz)	3 Phase, 400 V I (oper max) = 35 Amp	
Air flow	13,500 m^3/h	
Type of refrigerant	R513a	

* Exact height can be specifically adjusted.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



B.3. DG-12 EU Split Unit

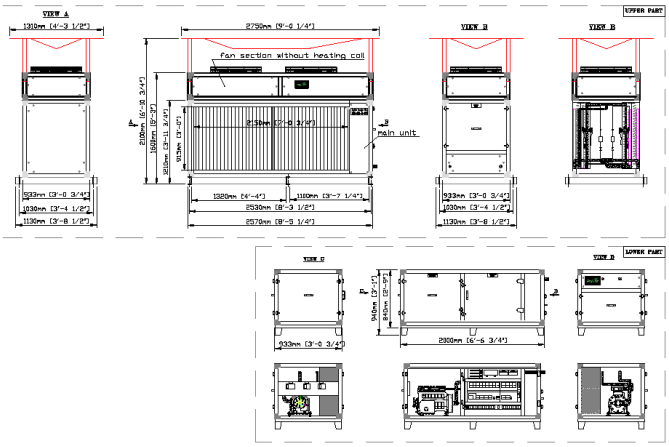
DG12 EU (Standard Unit) Split

		Upper part	*Lower part*
Dimensions	***Depth***	933 mm	933 mm
	Width	2,570 mm	2,000 mm**
Weight		595 kg	395 kg
Height*		1,600 mm 2,100 with air distribution module	940 mm
Optimal temperatures' range		10°c - 40°c (50°F - 80°F)	
Water condensation *@ 18°C, 80%RH*		48 L/h	
Electricity consumption		12 kw	
Electricity requirements (50Hz)		3 Phase, 400 v, 44 Amp	
Air flow		21,000 m^3/h	
Type of refrigerant		R513a	
Max. distance between the unit's parts		4 Meters (13.5 ft)	

* Exact height can be specifically adjusted.

** Can be shorter - depends on the

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



Upper part

Lower part

B.4. DG-6 EU Split Unit

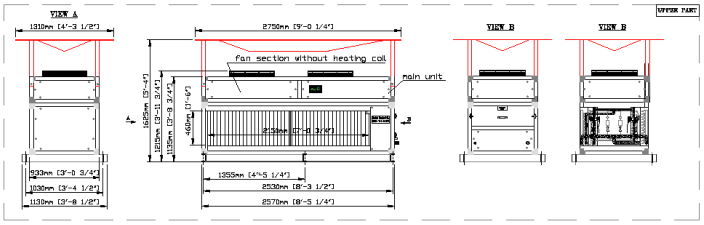
DG6 EU (Small Unit) Split

		Upper part	*Lower part*
Dimensions	***Depth***	933 mm	820 mm
	Width	2,570 mm	1,900 mm**
Weight		540 kg	360 kg
Height*		1,215 mm 1,625 mm with air distribution module	950 mm
Optimal temperatures' range		10°c - 40°c (50°F - 80°F)	
Water condensation ***@ 18°C, 80%RH***		25 L/h	
Electricity consumption		6.5 kw	
Electricity requirements (50Hz)		3 Phase, 400 V I (oper max) = 35 Amp	
Air flow		13,500 m^3/h	
Type of refrigerant		R513a	
Max. distance between the unit's parts		4 Meters (13.5 ft)	

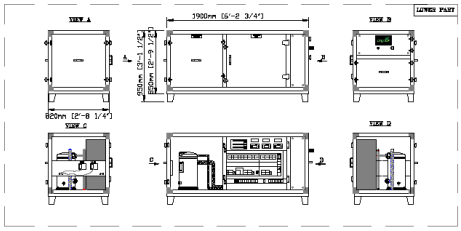
* Exact height can be specifically adjusted.

** Can be shorter - depends on the

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



Upper part



Lower part

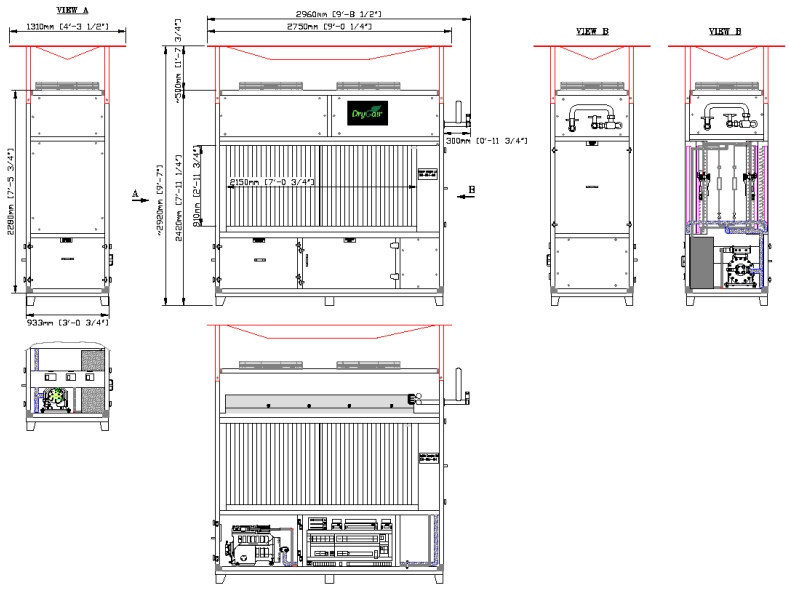
B.5. DG-12 EU with Heating & Cooling

DG12 EU (Standard Unit) with Heating & Cooling

Dimensions	***Depth***	933 mm
	Width	2,570 mm
Weight	960 kg	
Height*	2,420 mm	2,920 with air distribution module
Optimal temperatures' range	10°c - 40°c	50°F - 80°F
Water condensation *@ 18°C, 80%RH*	48 L/h	
Electricity consumption	12 kw	
Electricity requirements (50Hz)	3 Phase, 400 V, 44 Amp	
Air flow	21,000 m^3/h	
Type of refrigerant	R513a	

* Exact height can be specifically adjusted.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



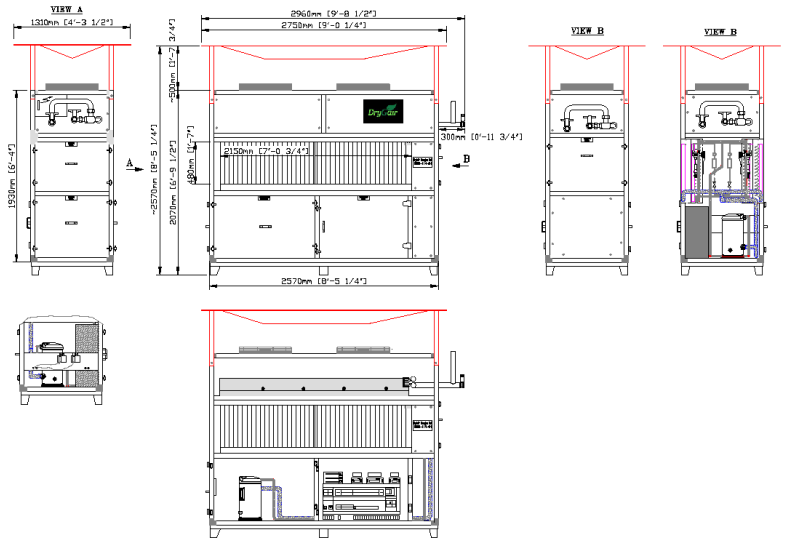
B.6. DG-6 EU with Heating & Cooling

DG6 EU (Small Unit) with Heating & Cooling

Dimensions	***Depth***	933 mm
	Width	2,570 mm
Weight	890 kg	
Height*	2,070 mm	2,570 with air distribution module
Optimal temperatures' range	10°c - 40°c	50°F - 80°F
Water condensation *@ 18°C, 80%RH*	25 L/h	
Electricity consumption	6.5 kw	
Electricity requirements (50Hz)	3 Phase, 400 V, 35 Amp	
Air flow	13,000 m^3/h	
Type of refrigerant	R513a	

* Exact height can be specifically adjusted.

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



B.7. DG-12 EU Split Unit with Heating & Cooling

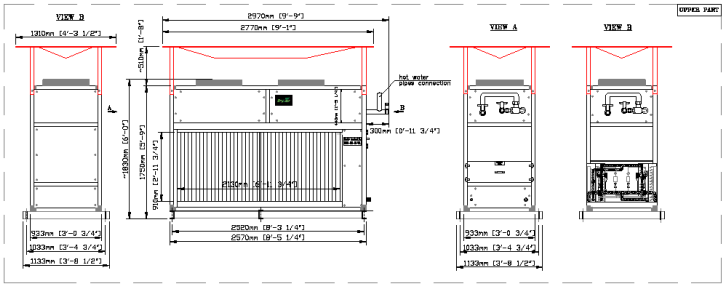
DG12 EU (Standard Unit) Split with Heating & Cooling

		Upper part	*Lower part*
Dimensions	***Depth***	933 mm	933 mm
	Width	2,570 mm	2,000 mm
Weight		610 kg	410 kg
Height*		1,830 mm 2,260 mm with air distribution module	940 mm
Optimal temperatures' range		10°c - 40°c (50°F - 80°F)	
Water condensation ***@ 18°C, 80%RH***		48 L/h	
Electricity consumption		12 kw	
Electricity requirements (50Hz)		3 Phase, 400 V I (oper max) = 44 Amp	
Air flow		13,500 m^3/h	
Type of refrigerant		R513a	
Max. distance between the unit's parts		4 Meters (13.5 ft)	

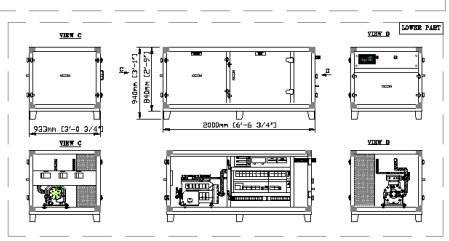
* Exact height can be specifically adjusted.

** Can be shorter - depends on the

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



Upper part



Lower part

B.8. DG-6 EU Split Unit with Heating & Cooling

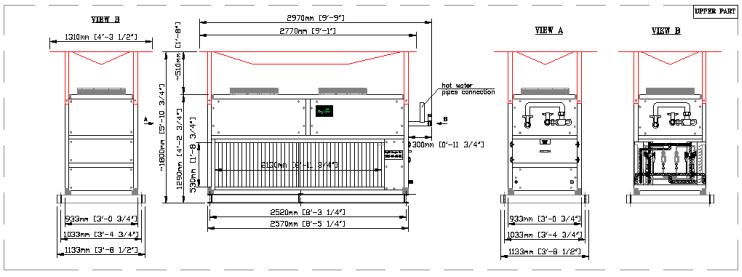
DG6 EU (Small Unit) Split with Heating & Cooling

		Upper part	*Lower part*
Dimensions	***Depth***	933 mm	820 mm
	Width	2,570 mm	1,900 mm**
Weight		565 kg	375 kg
Height*		1,290 mm 1,800 mm with air distribution module	950 mm
Optimal temperatures' range		10°c - 40°c (50°F - 80°F)	
Water condensation ***@ 18°C, 80%RH***		25 L/h	
Electricity consumption		6.5 kw	
Electricity requirements (50Hz)		3 Phase, 400 V I (oper max) = 35 Amp	
Air flow		13,000 m^3/h	
Type of refrigerant		R513a	
Note		Max.distance between the unit's parts - 4 meters	

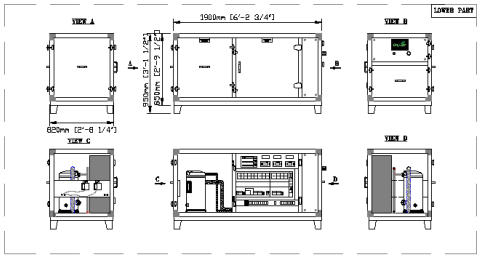
* Exact height can be specifically adjusted.

** Can be shorter - depends on the

- The unit can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse; or it can be hung.
- Electricity consumption @ conditions 18°C/80%RH.



Upper part



Lower part

Appendix C. Air Distribution Modules (Canopy)

> ***Note***
> The type of air distribution module must be pre-ordered. It cannot be added or retrofitted on-site.

C.1. Four-Direction Canopy

The four-direction canopy option distributes the air coming from the unit to four directions.

This type of canopy is efficient when the DryGair unit is positioned in the center of the greenhouse, away from the greenhouse walls.

Figure 9-1. Four-direction canopy

The 4-way canopy is not symmetric. Connect the canopy with its moderate slope towards the unit right side (when viewing from the front), using the provided brackets and screws (in a small bag in the service compartment).

The following Figure 9-2 shows the direction for connecting the 4-way air distribution module (canopy).

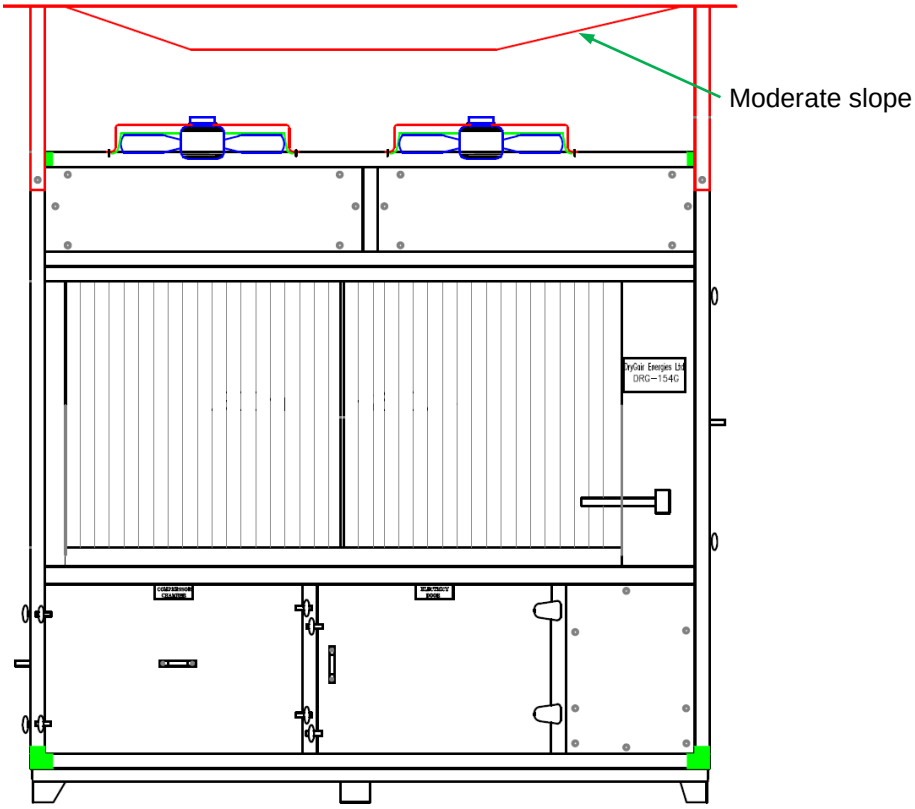


Figure 9-2. Air distributor module (4-way canopy)

C.2. Side Canopy

The side canopy option distributes the air coming out of the unit in chosen directions. This configuration is efficient when the DryGair unit is positioned at the sides of the greenhouse, near the greenhouse walls.

> ***Note***
> Make sure to place the unit with a minimum distance of 50 cm from the greenhouse wall, to allow airflow into the rear coils.

The side canopy is composed of two parts, where each part is placed above one of the unit's fans and facing in the desired direction.

Install the canopy by placing each half facing the desired direction and secure them with the screws provided in a bag in the heat exchange compartment.

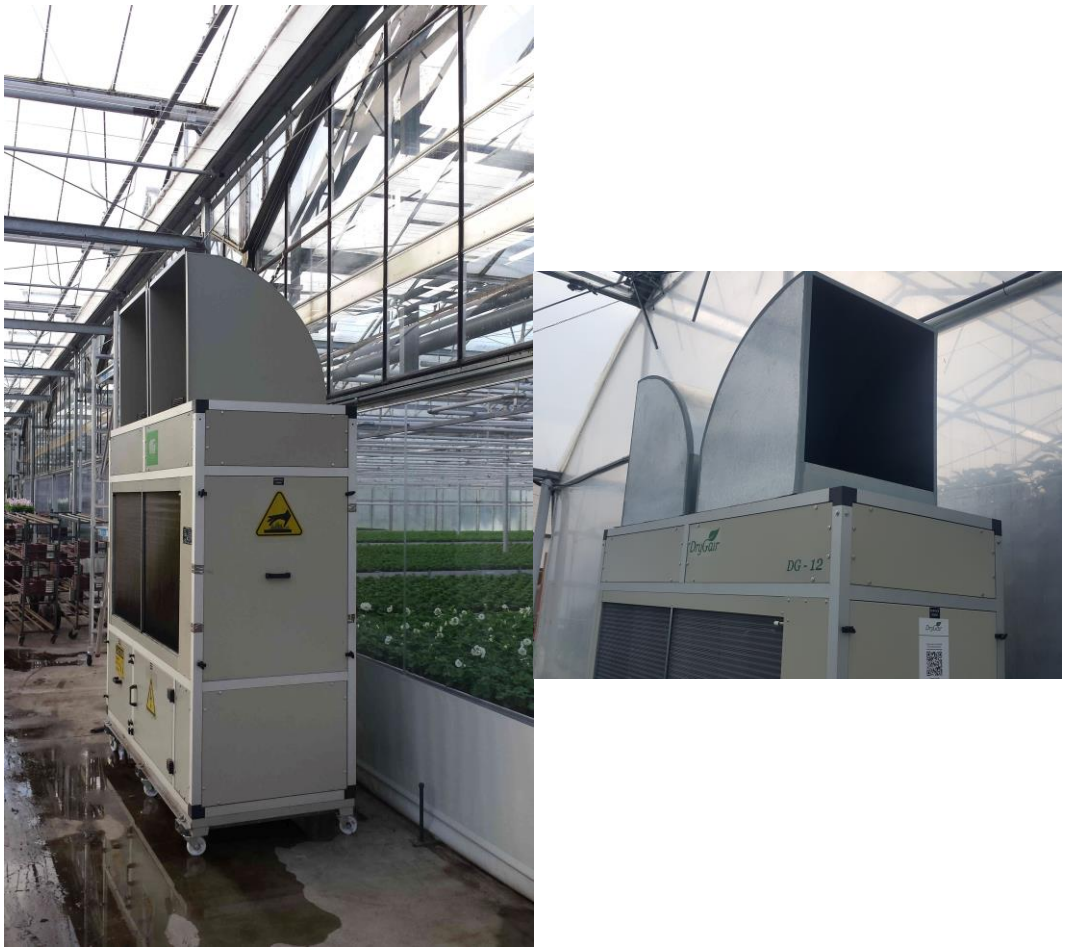


Figure 9-3. Side canopies (different orientations)

C.3. One-Direction Canopy

This small one-direction canopy option is separately connected above each fan, blowing the air in one direction.

This type of canopy is efficient when the DryGair unit is positioned in a narrow or long-narrow location.

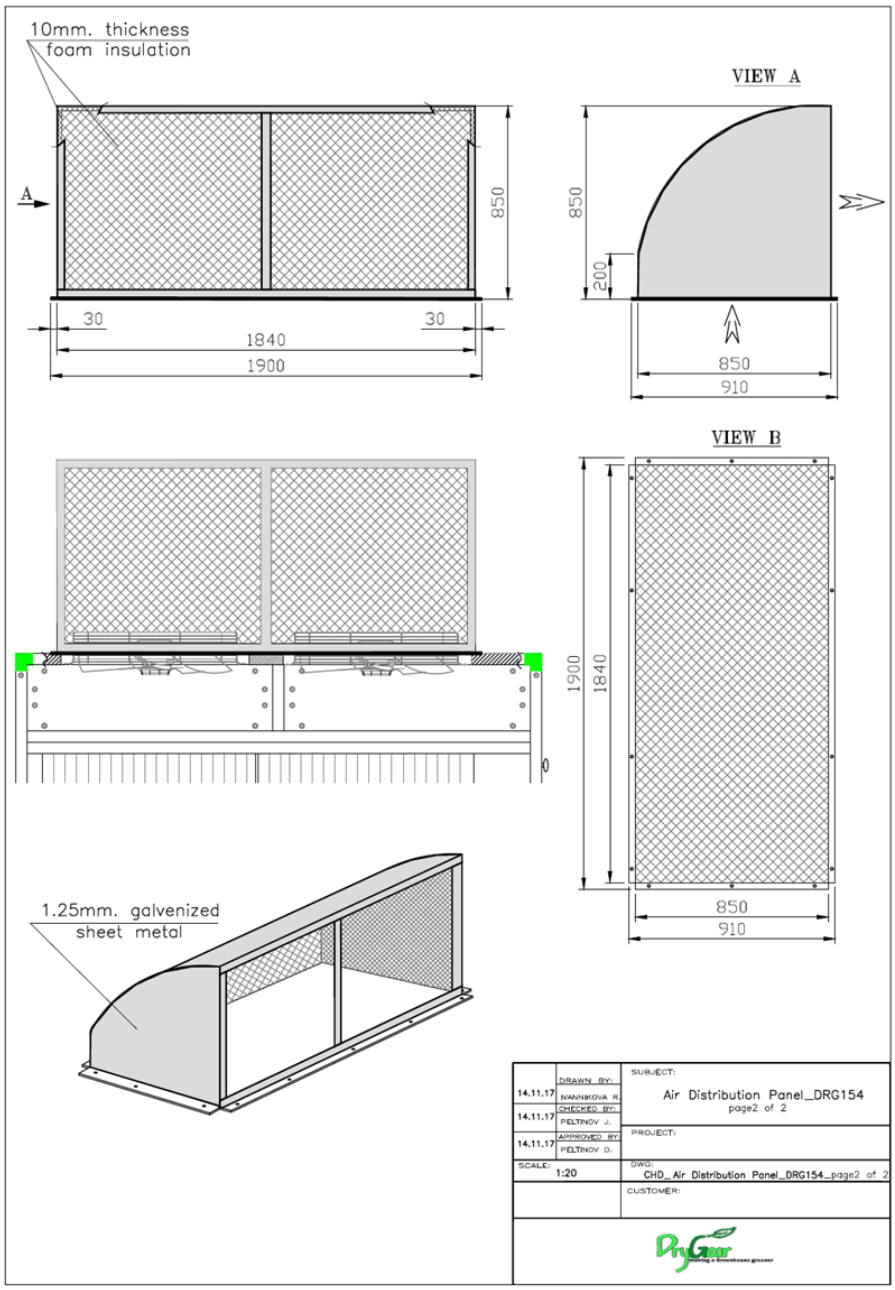


Figure 9-4. Air distribution panel

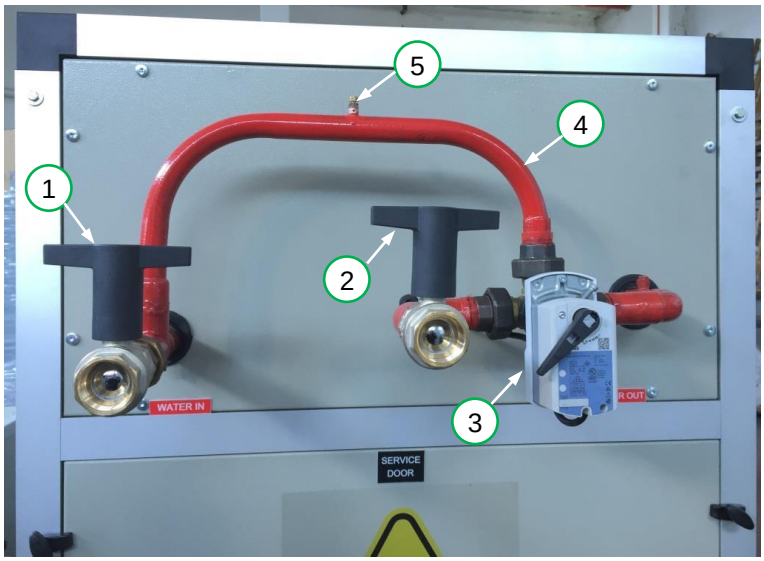
Appendix D. Unit Types and Configurations

D.1. Units Combined with Heating or Cooling

The air heating/cooling option is most often used in cold or hot areas, where additional warming/cooling of the air is required.

Warming/cooling the air is performed by adding a heat exchange element at the air exit path, replacing a heating/cooling unit. This provides additional heating or cooling to the air blown out of the unit and into the greenhouse.

> ***Note***
> This option may be used to replace the greenhouse heater or cooler.



1. Water-in valve
2. Water-out valve
3. Rotary actuator (proportional)
4. Water bypass
5. Air release valve

Figure 9-5. Air heating option

The Heat/Cool option uses hot or cold water, supplied from an external source, which flows through a horizontal heat exchanger located between the unit's heat exchangers and the unit fans.

The temperature is controlled by the amount of water flowing through the heat exchanger, which is modulated by a proportional rotary actuator ("temperature valve"). When there is a demand for heating/cooling, the valve gradually closes the opening to the by-pass pipe.

The demand for heating/cooling is received from the thermostat and the temperature controller located inside the electrical compartment. It can also be controlled remotely by a climate control system with proper connection (see details in Appendix E.2).

Details on setting the temperature of the controller can be found on the controller's manufacturer website (https://www.carel.com/product/ir33-din).

Video instructions on the heating and cooling unit can be found in https://www.youtube.com/watch?v=c71uSnCSsHE&list=PL4DgRhaYl-hBTk8vjpa_QAQzeNZJyRyIL&index=1

D.1.1. Connecting the Hot and Cold Water-Source to the Unit

1. Make sure the external water supply you are connecting to the unit provides water under the conditions specified by the DryGair team.
2. Connect the external hot/cold water supply, using 1.25" BSP male connections.
3. The first time you run water through the system do the following:
   a. Slightly loosen the air release valve and open the inlet and outlet pipe valves.
   b. Turn on the external water pump and wait for all the air to exit the pipe system.
   c. When you see water starting to come out of the air release valve, gently close the air release valve.

D.1.2. Manually Adjusting the Temperature Settings

The temperature valve controller determines the temperature produced by the unit and is located inside the electrical compartment on the bottom right. The operating mode (heating or cooling) and the desired temperature set point need to be defined.

Figure 9-6. Temperature valve controller

The following instructions explain how to manually adjust the temperature on the controller located inside the unit. For instructions on how to connect the temperature function to a climate control system, see E.2.

To select between cooling or heating mode:

1. Press the "**Prg**" and "**Set**" buttons together for 5 seconds until the display shows the number "**0**".
2. Press the up or down arrows until you reach "**77**". Press "**Set**".
3. The display will read "**c0**". Press "**Set**".
4. Select the mode (scroll up/down with the arrow buttons):
   - For Cooling, set the value to "**1**".
   - For Heating, set the value to "**2**".
5. Press "**Set**".
6. To permanently save the changes press the "**Prg**" button for 5 seconds.

To select the units of temperature measurements (Celsius/Fahrenheit):

1. Press the **Prg** and **Set** button together for more than 5 seconds; the display shows the number **0**.
2. Press the **up-arrow** button until the password (**77**) is displayed.
3. Press the **Set** button.

   The first modifiable parameter, **c0**, will be displayed.
4. Press the **up-arrow** button until the parameter **c18** is reached.
5. Press the **Set** button and use the arrow buttons to define the temperature units of measurement:
   - For **Celsius**, set the value to **0**.
   - For **Fahrenheit**, set the value to **1**.
6. Press **Set** to temporarily save the value. The parameter **c18** is displayed
7. Press the **Prg** button for 5 seconds to permanently save the set value and exit the parameter setting mode.

To define the Temperature Set Point:

(the temperature to achieve in the growing facility)

1. Press "**Set**". The display will read "**ST1**", and then show the current setpoint in the thermostat.
2. Press the up or down arrows until you reach the desired value.
3. Press "**Set**" to permanently save the new set point.
4. The display will return to showing the current temperature.

For instructions on how to control the heating or cooling function remotely through a climate control system, see Appendix E.2.

D.2. Split Units

For locations with operative or location special requirements, the DryGair unit can be separated into two parts.

> ***Note***
> The two sections must be placed no farther than 4 meters apart.

The DryGair split unit includes two sections:

- Lower section – includes the compressor and the electrical switchboard.
- Upper section – includes the parts for treating the air.

Figure 9-7. DryGair split unit

The unit sections can be placed one next to each other, or one above the other (air treatment section above the compressor and electrical switchboard section). In both cases, the upper section must be placed at a height of at least 50–60 cm from the floor.

Both the upper and lower sections have a pair of copper tubes that connect the compressor to the air treatment section of the unit.

The following figure shows the lower section connecting tubes.

Figure 9-8. Connecting copper tubes (lower section)

- **Discharge tube** (red): 1⅛" dia. tube. In EU models: 1⅝" dia.
- **Suction tube** (blue and usually isolated): 1⅝" dia. tube. In EU models: 2⅛" dia.

The tubes include a Schrader valve that is used for the connecting procedure.

D.2.1. Connecting the Unit Sections

On the upper and lower sections of each tube is a valve inside the unit. Its purpose is to prevent refrigerant leakage from the unit sections during transportation and before connecting the two sections at the customer's site.

> ***Note***
> These valves are closed during transportation and are only opened after completing the tubes soldering process (see section D.2.1.1).

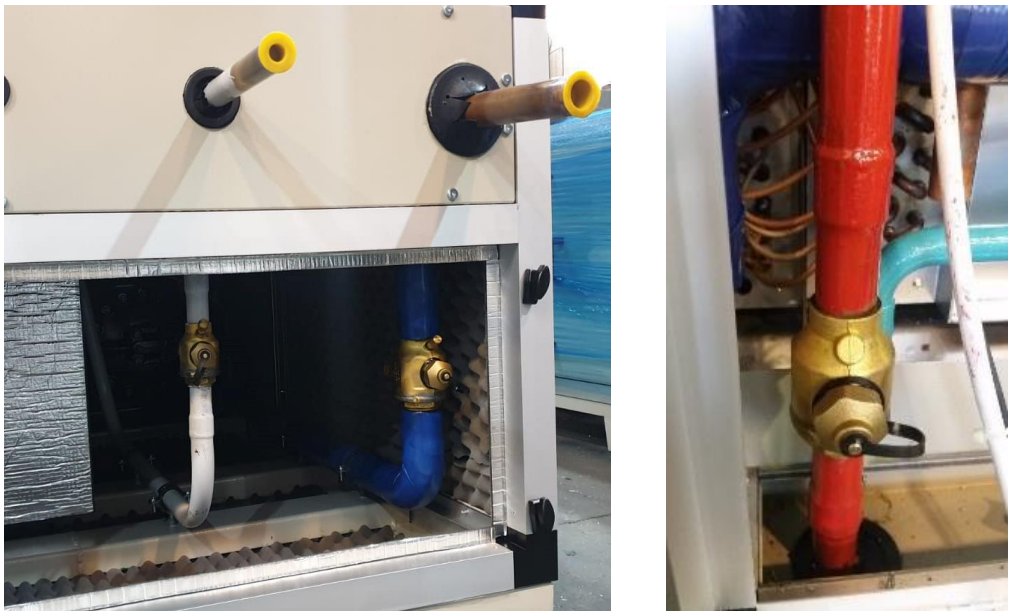


Figure 9-9. Tube stop valves – lower section (left) & upper section (right)

D.2.1.1. Soldering the Tubes

Required Parts:

- Tubes compatible in size with the tubes to be connected.
- Isolating material, 19 mm thick, for isolating the copper suction tube.
- Copper soldering materials.

> ***Caution***
> Soldering the copper tubes must be performed by a qualified refrigeration technician or by a copper soldering expert, who knows how to solder copper tubes. If the tube soldering is not performed properly, gas may be released/discharged, and the unit will not work.

To solder the tubes of both sections:

1. Place both sections of the unit in their final location.
2. Solder both pairs of the copper tubes.
3. Perform pressure and leakage tests:
   a. Insert Nitrogen at a pressure of up to 400 psi (28 bars) into the connected tube (see Figure 9-8).
   b. Check for leaks with a leak detection device, or even better, with soapy water (bubbles at the leak point).
   c. If a leak is found- fix it.
4. Evacuate the Nitrogen from the tested section and remove the remaining air with a vacuum pump; until it is completely empty.
5. Open the stop valves of both sections of the unit.

D.2.1.2. Connecting the Electrical Cables

> ***Caution***
> All electrical connections must be performed by a certified electrician.

To connect the electrical cables:

1. Open the service compartment door on the right side of the upper unit and release the electrical cables:
   - Two green cables that are connected to the axial fans.
   - A white cable that connects to the temperature and humidity sensors.
   - A thin black cable that connects to the defrost sensor.

Figure 9-10. Electrical cables

The cables should be connected to the electrical switchboard **according to the electrical diagram attached inside the electrical compartment**.

> ***Important***
> Do not shorten the wires. They are about 5 meters long and are outfitted with cable end connectors.
> Place excess wiring in the lower section electric compartment.

2. Connect the brown wires of the green cables (fans power supply) to the electrical switchboard terminal block, marked U, V, and W.

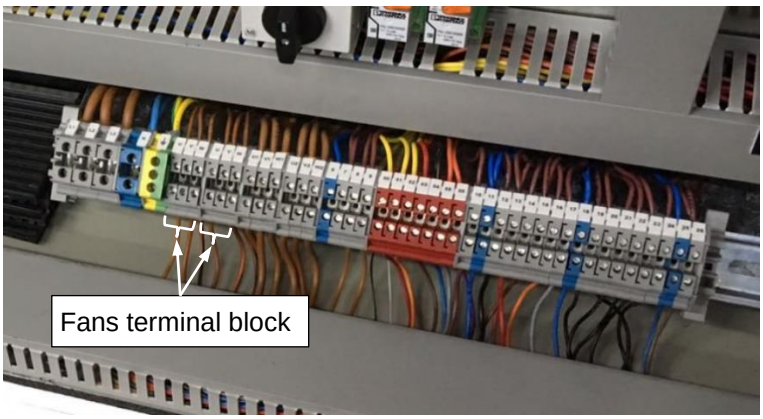


Figure 9-11. Fan connections

3. Connect the ground wires (yellow/green) to the switchboard ground terminal.
4. Connect the white and black cables to the electrical board terminals according to the electrical diagram. These wires connect the temperature, humidity, and defrost sensors:
   d. Connect white and black wires of the thin black cable to terminal blocks 50 and 51 (the connection order has no significance). This connects to the defrost sensor.
   e. Connect the six colored wires of the white cable to terminal blocks 51–56, according to the color scheme shown on the electrical diagram. These connect to the temperature and humidity sensors.

   See wire connections by color code in the following Figure 9-12.

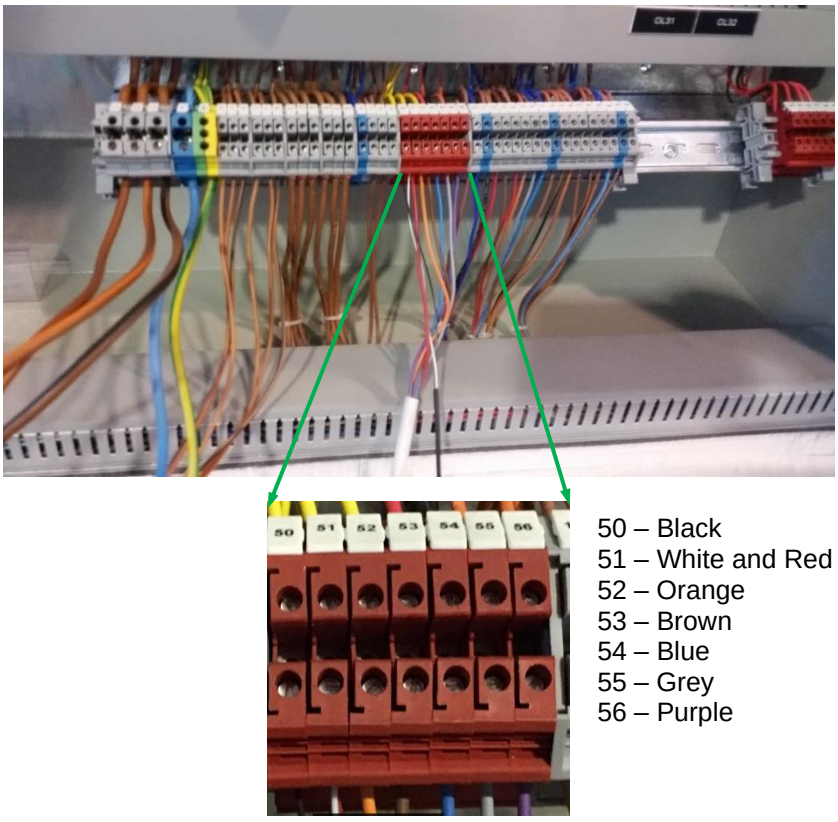


Figure 9-12. Brown terminal block (50–56)

D.2.2. Connecting the Drainage

Water is condensed during unit operation and needs to be removed from the unit. In some environments, depending on the air temperature and humidity, this could be a large quantity of water.

Warning

The unit condensation water is not for drinking!

Connecting the unit to a water drain shall be performed by the customer.

Figure 9-13. Water drainage

Note

To prevent water accumulation, the water drain tube should be connected by a plumber to a drainage line leading outside the greenhouse or to any other place the water should be collected (such as a container).

The water can be further used for various purposes, as a hydroponic system.

Note

The drain water is distilled water. To use the water for irrigation, add minerals and fertilizers.

D.2.3. Split Units with Heating or Cooling

Units with the heating or cooling option use hot or cold water, supplied from an external source, which flows through a horizontal heat exchanger located between the unit's heat exchangers and the unit fans.

D.2.3.1. Electrical Connections

Units with the heating/cooling option include an additional thermostat on the electrical switchboard, which controls the proportional rotary actuator.

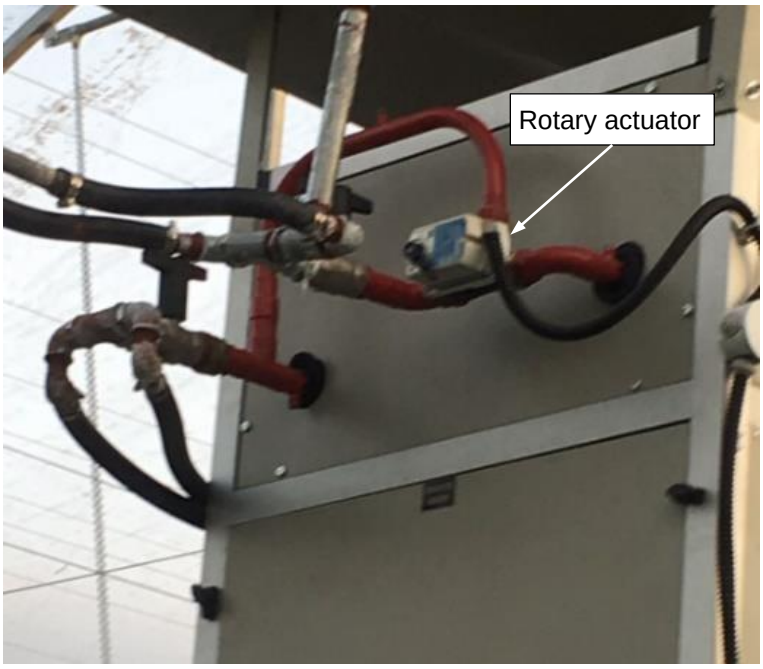


Figure 9-14. Unit with heating/cooling

Split units with the heating/cooling option come with an additional black three-wires cable, usually blue, brown and green/yellow. These wires should be connected to the electrical switchboard terminal blocks according to the electrical diagram.

D.2.3.2. Water Connections

The water connections to the hot/ cold water supply shall be performed by the customer. The pipes will be supplied by the customer and there is no specific requirement for the type of material from which the pipes are made of.

Note

The water connections should be done by a certified plumber or by a qualified piping person.

Connect the hot/cold water inlet and outlet supply pipes to the unit valves. They have an internal pipe threading of 1¼" BSP.

Appendix E. Climate Control System

This section describes how to connect the DryGair dehumidifier to a climate control system, for operating and controlling the unit by computer software.

> ***Note***
> All settings in the climate control system should be performed by a climate control expert, with an understanding of communication.

E.1. DryGair Systems for Dehumidification (only)

This configuration requires connecting 24 VAC cables to the relays, located at the bottom right corner of the electrical compartment.

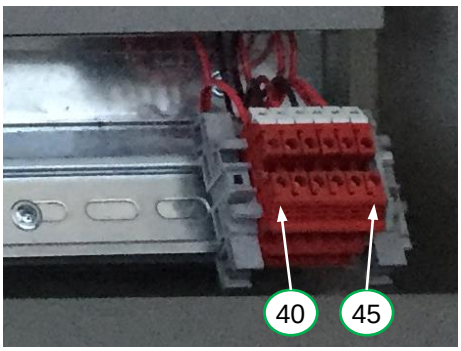


Figure 9-15. Climate control relays

- **Terminals 40 and 41**: Remote start and stop command to the unit (digital output from the computer).

  Turning the unit on turns the unit's fans on.

  The start parameter is generally set by a defined operating hour. The unit receives a signal to operate between the required operating hours (usually from sunset to sunrise).

- **Terminals 42 and 43**: Remote drying command to start and stop dehumidification (digital output from the computer).

  This signal turns the dehumidification on/off, based on the humidity sensor data and the humidity setpoint in the climate control system.

  - **Drying on**: When dehumidification is required (e.g., high humidity), the unit will receive a signal to turn on dehumidification. This turns the unit's compressor on, and moisture is removed from the air.

    Note: To operate the dehumidification, the signals must be sent to both the compressor and the fans.

  - **Drying off**: When drying is not required (e.g., low humidity), the dehumidification will turn off and the circulating fans will continue operating (circulating air) while the compressor is off. This is also the option for using the fans during the day when the greenhouse is open.

- **Terminals 44 and 45**: Output fault indications feedback to the software (digital input to the computer).

E.2. DryGair Systems with Heating or Cooling

Controlling DryGair units combined with heating or cooling by a climate control system involves controlling both the humidity and temperature.

DryGair units with the combined Heating and Cooling function come equipped with a temperature valve controller (CAREL ir33 DIN (DN 33)), located in the bottom right corner of the electrical compartment.

The temperature valve controller controls the air temperature produced by the unit by regulating the flow of hot or cold water being delivered to the system from an external source.

E.2.1. Humidity Control

Connect the DryGair unit to the climate control system as described in section E.1 above.

E.2.2. Temperature Control

The temperature control is based on the DryGair unit's temperature sensor.

It should be noted that due to the location and calibration of the temperature sensor there may be small differences in the readings when compared to the climate control system. We recommend calculating the difference between the sensors (DryGair temperature reading – Climate control temperature reading), to allow corrections as needed and for uniform temperature control.

Controlling the DryGair temperature from the climate control system requires integrating a serial communication card into the temperature valve controller (CAREL ir33) and connecting it to the climate control system with a two-pair shielded RS485 communication cable.

Communication is done with the Modbus communication protocol.

Note

To use the temperature control feature, the unit's fans must be operating.

E.2.2.1. Preparing the Temperature Valve Controller

The temperature valve controller (CAREL ir33 DIN (DN33)) is connected to a DIN rail at the lower right part of the electrical compartment.

Figure 9-16. Temperature valve controller

Controlling the DryGair unit with a heating/cooling configuration by a climate control system requires connecting a serial communication card (IROPZSER30) to the temperature valve controller.

Note: the serial communication card is not included in the unit.

Temperature Valve Controller – ir33 DIN (DN33) **Serial Communication Card - IROPZSER30**

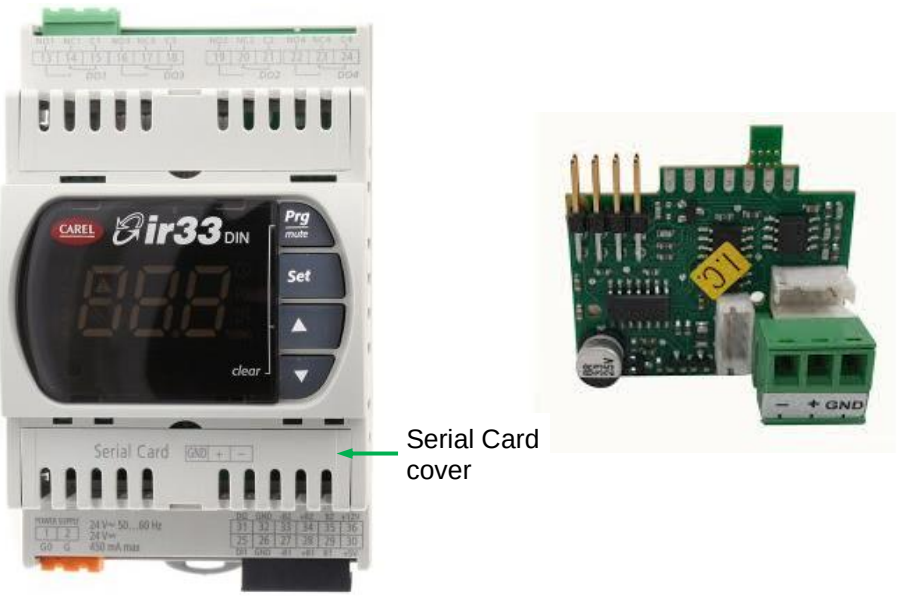


Figure 9-17. Temperature valve controller and serial communication card

To connect the Serial Communication Card to the Temperature Valve Controller

1. Power off the DryGair unit.
2. Remove the Serial Card cover from the temperature valve controller.

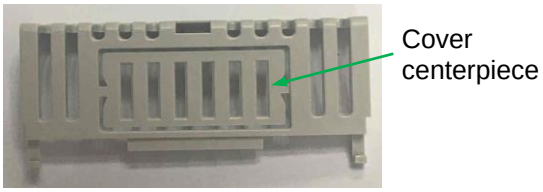


Figure 9-18. Controller cover centerpiece

3. Break off the cover centerpiece.
4. Connect the serial communication card to the temperature valve controller.

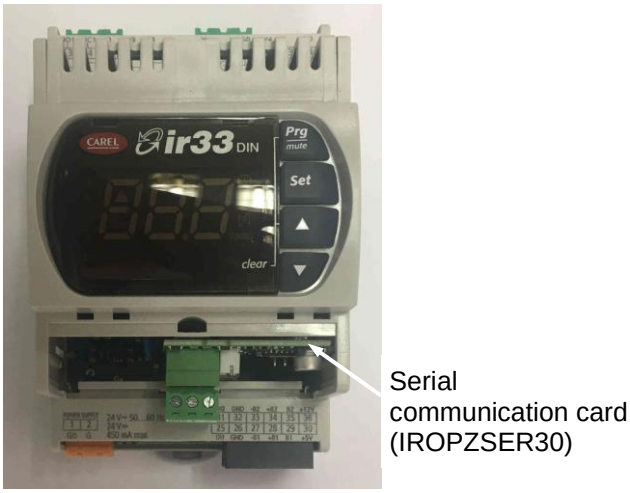


Figure 9-19. Communication card in the controller

5. Reassemble the Serial Card cover to the controller.

E.2.2.2. Connecting to the Serial Communication Card

Connect the RS485 cable from the climate control system to the serial communication card (green) connector ("**-**", "**+**", "**GND**").

E.2.2.3. Setting the Temperature Valve Controller Serial Address

Connecting the temperature valve controller to a climate control system requires setting an address for the controller and assigning it in the climate control system to communicate with the temperature valve controller.

The Serial connection parameter of the controller is C32.

Par.	Description	Def	Min	Max	UoM
c32	Serial connection address	1	0	207	-

(The address can be between 1 and 207)

To set the controller address:

1. Press the **Prg** and **Set** button together for more than 5 seconds; the display shows the number **0**.
2. Press the **up-arrow** button until the password (**77**) is displayed.
3. Press the **Set** button.
4. The first modifiable parameter, C0, will be displayed.
5. Press the **up-arrow** button until the parameter **C32** is reached.
6. Press the **Set** button. The associated value is displayed. In most cases, it will be the default value 1.

   If required, press the **up/down arrow** keys to increase/decrease the value until the desired value is reached. This will be the address to be set in the climate control system.
7. Press **Set** to temporarily save the new value and return to the display of the parameter code (C32).
8. Press the **Prg** button for 5 seconds to permanently save the new value and exit the parameter setting mode.

E.2.2.4. **Modbus Parameters**

Transmitting information between the DryGair temperature valve controller and the climate control system is done by Modbus (communication protocol).

Following are the controller parameters and their corresponding Modbus parameters for the climate control system:

- **Temperature units of measurement** – Definition of temperature unit of measurement – Celsius or Fahrenheit (reading and writing).

c18	Temperature unit of measure 0=°C, 1=°F		0	0	1	-	D	26	26	R/W	

- **Set point 1** – Temperature set point definition (reading and writing).

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7. TABLE OF PARAMETERS

In the parameter tables, repeated parameters highlight different settings on the models with universal inputs compared to the models with temperature inputs only.

Par.	Description	Note	Def	Min	Max	UoM	Type	CAREL SPV	ModBus®	R/W	Icon
St1	Set point 1		20 (68)	c21	c22	°C (°F)	A	4	4	R/W	
St2	Set point 2		40 (104)	c23	c24	°C (°F)	A	5	5	R/W	

- **Heating** and **Cooling** modes (reading and writing) – The preferred mode of operation. It must be set to generate the proper temperature.

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7. TABLE OF PARAMETERS

In the parameter tables, repeated parameters highlight different settings on the models with universal inputs compared to the models with temperature inputs only.

Par.	Description	Note	Def	Min	Max	UoM	Type	CAREL SPV	ModBus®	R/W	Icon
St1	Set point 1		20 (68)	c21	c22	°C (°F)	A	4	4	R/W	
St2	Set point 2		40 (104)	c23	c24	°C (°F)	A	5	5	R/W	
c0	Operating mode 1= direct 2= reverse 3= dead zone 4= PWM 5= alarm 6= direct/reverse from digital input 1 7= direct: set point and differential from digital input 1 8= reverse: set point and differential from digital input 1 9= direct and reverse with distinct set points.		2	1	9	-	I	12	112	R/W	
P1	Set point 1 differential		2 (3,6)	0.1 (0,2)	50 (90)	°C (°F)	A	6	6	R/W	

Cooling

Heating

- **Probe 1 reading:** Temperature reading from the DryGair controller.

7.1 Variables only accessible via serial connection

Description	Def	Min	Max	UOM	Type	CAREL SPV	Modbus®	R/W
Probe 1 reading	0	0	0	°C/°F	A	2	2	R
Probe 2 reading	0	0	0	°C/°F	A	3	3	R

E.2.2.5. List of Carel ir33 Parameters

The following is a list of parameters from the CAREL ir33 User Manual.

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7. TABLE OF PARAMETERS

In the parameter tables, repeated parameters highlight different settings on the models with universal inputs compared to the models with temperature inputs only.

Par.	Description	Note	Def	Min	Max	UoM	Type	CAREL SPV	ModBus®	R/W	Icon
St1	Set point 1		20 (68)	c21	c22	°C (°F)	A	4	4	R/W	
St2	Set point 2		40 (104)	c23	c24	°C (°F)	A	5	5	R/W	
c0	Operating mode 1= direct ← 2= reverse ← 3= dead zone 4= PWM 5= alarm 6= direct/reverse from digital input 1 7= direct: set point and differential from digital input 1 8= reverse: set point and differential from digital input 1 9= direct and reverse with distinct set points.		2	1	9	-	I	12	112	R/W	
P1	Set point 1 differential		2 (3,6)	0.1 (0,2)	50 (90)	°C (°F)	A	6	6	R/W	
P2	Set point 2 differential		2 (3,6)	0.1 (0,2)	50 (90)	°C (°F)	A	7	7	R/W	
P3	Dead zone differential		2 (3,6)	0 (0)	20 (36)	°C (°F)	A	8	8	R/W	
P1	Set point 1 differential		2 (3,6)	0.1 (0,2)	99,9 (179)	°C (°F)	A	6	6	R/W	
P2	Set point 2 differential		2 (3,6)	0.1 (0,2)	99,9 (179)	°C (°F)	A	7	7	R/W	
P3	Dead zone differential		2 (3,6)	0 (0)	99,9 (179)	°C (°F)	A	8	8	R/W	
c4	Authority. Validity: mode 1 or 2		0.5	-2	2	-	A	9	9	R/W	
c5	Type of control 0=ON/OFF (Proportional) 1=Proportional+Integral+Derivative (PID)		0	0	1	-	D	25	25	R/W	
c6	Delay between activation of 2 different relay outputs Validity: c0≠ 4		5	0	255	s	I	13	113	R/W	
c7	Minimum time between activation of the same relay output Validity: c0 ≠ 4		0	0	15	min	I	14	114	R/W	
d1	Minimum time between deactivation of 2 different relay outputs Validity: c0 ≠ 4		0	0	255	s	I	15	115	R/W	
c8	Minimum relay output off time Validity: c0 ≠ 4		0	0	15	min	I	16	116	R/W	
c9	Minimum relay output on time Validity: c0 ≠ 4		0	0	15	min	I	17	117	R/W	
c10	Status of control outputs on circuit 1 in the event of probe 1 alarm 0=All outputs OFF 1=All outputs ON 2="Direct" outputs on, "reverse" outputs off 3="Direct" outputs off, "reverse" outputs on"		0	0	3	-	I	18	118	R/W	
d10	Status of control outputs on circuit 2 in the event of probe 2 alarm see c10		0	0	3	-	I	112	212	R/W	
c11	Output rotation 0=Rotation not active 1=Standard rotation (on 2 or 4 relays) 2=2+2 rotation 3=2+2 rotation (COPELAND) 4=Rotate outputs 3 and 4, do not rotate 1 and 2 5=Rotate outputs 1 and 2, do not rotate 3 and 4 6=Rotate separately pairs 1,2 (between each other) and 3,4 (between each other) 7=Rotate outputs 2,3,4, do not rotate output 1 Validity: c0=1,2,3,6,7,8,9 and on/off outputs 8=Rotate outputs 1 and 3, do not rotate 2 and 4		0	0	8	-	I	19	119	R/W	
c12	PWM cycle time		20	0,2	999	s	A	10	10	R/W	
c13	Probe type 0=Standard NTC range (-50T+90°C) 1=NTC-HT enhanced range (-40T+150°C) 2=Standard PTC range (-50T+150°C) 3=Standard PT1000 range (-50T+150°C)		0	0	3	-	I	20	120	R/W	

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Par.	Description	Note	Def	Min	Max	UoM	Type	CAREL SPV	ModBus®	R/W	Icon
c13	Probe type 0= Standard NTC range (-50T+110°C) 1= NTC-HT enhanced range (-10T+150°C) 2= Standard PTC range (-50T+150°C) 3= Standard PT1000 range (-50T+200°C) 4= PT1000 enhanced range (-199T+800°C) 5= Pt100 standard range (-50T+200°C) 6= Pt100 enhanced range (-199T+800°C) 7= Standard J thermocouple range (-50T+200°C) 8= Enhanced J thermocouple range (-100T+800°C) 9= Standard K thermocouple range (-50T+200°C) 10= Enhanced K thermocouple range (-100T+800°C) 11= 0 to 1 Vdc input 12= 0.5 to 1.3 Vdc input 13= 0 to 10 Vdc input 14= 0 to 5 Vdc ratiometric 15= 0 to 20 mA input 16= 4 to 20 mA input		0	0	16	-	I	20	120	R/W	
P14	Probe 1 calibration		0 (0)	-20 (-36)	20 (36)	°C (°F)	A	11	11	R/W	
P15	Probe 2 calibration		0 (0)	-20 (-36)	20 (36)	°C (°F)	A	12	12	R/W	
P14	Probe 1 calibration		0 (0)	-99 (-179)	99,9 (179)	°C (°F)	A	11	11	R/W	
P15	Probe 2 calibration		0 (0)	-99 (-179)	99,9 (179)	°C (°F)	A	12	12	R/W	
c15	Minimum value for probe 1 with current/voltage signal		0	-199	c16	-	A	13	13	R/W	
c16	Maximum value for probe 1 with current/voltage signal		100	c15	800	-	A	14	14	R/W	
d15	Minimum value for probe 2 with current/voltage signal		0	-199	d16	-	A	29	29	R/W	
d16	Maximum value for probe 2 with current/voltage signal		100	d15	800	-	A	30	30	R/W	
c17	Probe disturbance filter		4	1	15	-	I	21	121	R/W	
c18	Temperature unit of measure 0=°C, 1=°F		0	0	1	-	D	26	26	R/W	
c19	Function of probe 2 0= not enabled 1= differential operation 2= compensation in cooling 3= compensation in heating 4= compensation always active 5= enable logic on absolute set point 6= enable logic on differential set point 7= independent operation (circuit 1+circuit 2) 8= control on higher probe value 9= control on lower probe value 10= control set point set by B2 11= automatic heating/cooling changeover from B2 12= Differential operation with pre-alarm Validity c0= 1, 2, 3, 4		0	0	12	-	I	22	122	R/W	
c21	Minimum value of set point 1		-50 (-58)	-50 (-58)	c22	°C (°F)	A	15	15	R/W	
c22	Maximum value of set point 1		60 (140)	c21	150 (302)	°C (°F)	A	16	16	R/W	
c21	Minimum value of set point 1		-50 (-58)	-199 (-199)	c22	°C (°F)	A	15	15	R/W	
c22	Maximum value of set point 1		110 (230)	c21	800 (800)	°C (°F)	A	16	16	R/W	
c23	Minimum value of set point 2		-50 (-58)	-50 (-58)	c24	°C (°F)	A	17	17	R/W	
c24	Maximum value of set point 2		60 (140)	c23	150 (302)	°C (°F)	A	18	18	R/W	
c23	Minimum value of set point 2		-50 (-58)	-199 (-199)	c24	°C (°F)	A	17	17	R/W	
c24	Maximum value of set point 2		110 (230)	c23	800 (800)	°C (°F)	A	18	18	R/W	
P25	Low temperature alarm threshold on probe 1 if P29=0, P25=0: threshold disabled if P29=1, P25=-50: threshold disabled		-50 (-58)	-50 (-58)	P26	°C (°F)	A	19	19	R/W	
P26	High temperature alarm threshold on probe 1 if P29=0, P26=0: threshold disabled if P29=1, P26=150: threshold disabled		150 (302)	P25	150 (302)	°C (°F)	A	20	20	R/W	
P27	Alarm differential on probe 1		2 (3,6)	0 (0)	50 (90)	°C (°F)	A	21	21	R/W	
P25	Low temperature alarm threshold on probe 1 if P29=0, P25=0: threshold disabled if P29=1, P25=-199: threshold disabled		-50 (-58)	-199 (-199)	P26	°C (°F)	A	19	19	R/W	
P26	High temperature alarm threshold on probe 1 if P29=0, P26=0: threshold disabled if P29=1, P26=800: threshold disabled		150 (302)	P25	800 (800)	°C (°F)	A	20	20	R/W	
P27	Alarm differential on probe 1		2 (3,6)	0 (0)	99,9 (179)	°C (°F)	A	21	21	R/W	
P28	Alarm delay time on probe 1(**)		120	0	250	min (s)	I	23	123	R/W	
P29	Type of alarm threshold on probe 1 0=relative; 1=absolute		1	0	1	-	D	27	27	R/W	
P30	Low temperature alarm threshold on probe 2 if P34=0, P30=0: threshold disabled if P34=1, P30=-50: threshold disabled		-50 (-58)	-50 (-58)	P31	°C (°F)	A	31	31	R/W	
P31	High temperature alarm threshold on probe 2 if P34=0, P31=0: threshold disabled if P34=1, P31=150: threshold disabled		150 (302)	P30	150 (302)	°C (°F)	A	32	32	R/W	
P32	Alarm differential on probe 2		2 (3,6)	0 (0)	50 (90)	°C (°F)	A	33	33	R/W	
P30	Low temperature alarm threshold on probe 2 if P34=0, P30=0: threshold disabled if P34=1, P30=-199: threshold disabled		-50 (-58)	-199 (-199)	P31	°C (°F)	A	31	31	R/W	

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P31	High temperature alarm threshold on probe 2 if P34=0, P31=0: threshold disabled if P34=1, P31=800: threshold disabled		150 (302)	P30	800 (800)	°C (°F)	A	32	32	R/W	⚠
P32	Alarm differential on probe 2		2 (3,6)	0(0)	99,9 (179)	°C (°F)	A	33	33	R/W	⚠
P33	Alarm delay time on probe 2(**)		120	0	250	min (s)	I	113	213	R/W	⚠
P34	Type of alarm threshold on probe 2 0=relative; 1=absolute		1	0	1	-	D	37	37	R/W	⚠
c29	Digital input 1 0= Input not active 1= Immediate external alarm, Automatic reset (circuit 1) 2= Immediate external alarm, Manual reset (circuit 1) 3= Delayed external alarm (P28), Manual reset (circuit 1) 4= ON/OFF control in relation to status of digital input 5= Activation/deactivation working cycle from button 6= Override outputs (circuit 1) 7= Signal only alarm E17, delayed (P33) 8= Signal only alarm E17, immediate 9= Immediate external alarm, Automatic reset (circuit 2) 10= Immediate external alarm, Manual reset (circuit 2) 11= Delayed external alarm (P33), Manual reset (circuit 2) 12= Override outputs (circuit 2) 13 = Immediate external alarm with automatic reset (circuit 1) 14 = Immediate external alarm with manual reset (circuit 1) 15 = Delayed external alarm (P28) with manual reset (circuit 1) Validity: c0 other than 6,7, and if c33= 1 with "dependence"=16 and 17. In the event of alarms, the status of the relay depends on c31 or d31		0	0	15	-	I	24	124	R/W	⚠
c30	Digital input 2 See c29		0	0	15	-	I	25	125	R/W	🔧
c31	Status of control outputs in circuit 1 in the event of an alarm from digital input 0= All outputs OFF 1= All outputs ON 2= "Reverse" outputs OFF, others unchanged 3= "Direct" outputs OFF, others unchanged		0	0	3	-	I	26	126	R/W	🔧
d31	Status of control outputs in circuit 2 in the event of an alarm from digital input See c31		0	0	3	-	I	114	214	R/W	🔧
c32	Serial connection address		1	0	207	-	I	27	127	R/W	🔧
c33	Special operation 0=Disabled 1= Enabled (Before modifying make sure the required start mode has been selected and programmed (c0))		0	0	1	-	D	28	28	R/W	🔧
c34	Output 1 dependence 0= Output not enabled 1= Control output (St1,P1) 2= Control output (St2,P2) 3= Generic alarm, circuit 1 (relay OFF) 4= Generic alarm, circuit 1 (relay ON) 5= Serious alarm, circuit 1 and E04 (relay OFF) 6= Serious alarm, circuit 1 and E04 (relay ON) 7= Serious alarm, circuit 1 and E05 (relay OFF) 8= Serious alarm, circuit 1 and E05 (relay ON) 9= Alarm E05 (relay OFF) 10= Alarm E05 (relay ON) 11= Alarm E04 (relay OFF) 12= Alarm E04 (relay ON) 13= Serious alarm, circuit 1+2 (relay OFF) 14= Serious alarm, circuit 1+2 (relay ON) 15= Timer 16= Control output with change set point and reverse operating logic from digital input 1 17= Control output with change set point and maintain operating logic from digital input 1 18= ON/OFF status signal 19= Generic alarm, circuit 2 (relay OFF) 20= Generic alarm, circuit 2 (relay ON) 21= Serious alarm, circuit 2 and E15 (relay OFF) 22= Serious alarm, circuit 2 and E15 (relay ON) 23= Serious alarm, circuit 2 and E16 (relay OFF) 24= Serious alarm, circuit 2 and E16 (relay ON) 25= Alarm E16 (relay OFF) 26= Alarm E16 (relay ON) 27= Alarm E15 (relay OFF) 28= Alarm E15 (relay ON) 29= Alarm E17 (relay OFF)		1	0	29	-	I	28	128	R/W	1
c35	Type of output 1		0 (■)	0	1	-	D	29	29	R/W	1

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Par.	Description	Note	Def	Min	Max	UoM	Type	CAREL SPV	ModBus®	R/W	Icon
y	Date: year		0	0	99	year	I	1	101	R/W	
M	Date: month		1	1	12	month	I	2	102	R/W	
d	Date: day		1	1	31	day	I	3	103	R/W	
u	Date: day of the week (Monday,-)		1	1	7	day	I	4	104	R/W	
h	Hours		0	0	23	hour	I	5	105	R/W	
n	Minutes		0	0	59	minutes	I	6	106	R/W	

Tab. 7.a

The default, minimum and maximum values of the alarm set points refer to temperature values. With universal inputs (voltage, current), these values must be entered manually based on the range of measurement set.

(**) for alarms from digital input, the second unit of measure is used.

(▪) DEFAULT PARAMETER TABLE

	Model				
Parameter	V	W	Z/A	B	E
c35	0	0	0	0	0
c36	-100	-50	-25	-50	-25
C37	+100	+50	+25	+50	+25
c39	-	0	0	1	1
c40	-	-100	-50	-100	-50
c41	-	+50	+25	+50	+25
c43	-	-	0	-	0
c44	-	-	-75	-	-75
c45	-	-	+25	-	+25
c47	-	-	0	-	1
c48	-	-	-100	-	-100
c49	-	-	+25	-	+25

Tab. 7.b

7.1 Variables only accessible via serial connection

Description	Def	Min	Max	UOM	Type	CAREL SPV	Modbus®	R/W
Probe 1 reading	0	0	0	°C/°F	A	2	2	R
Probe 2 reading	0	0	0	°C/°F	A	3	3	R
Output 1 percentage	0	0	100	%	I	127	227	R
Output 2 percentage	0	0	100	%	I	128	228	R
Output 3 percentage	0	0	100	%	I	129	229	R
Output 4 percentage	0	0	100	%	I	130	230	R
Password	77	0	200	-	I	11	111	R/W
Output 1 status	0	0	1	-	D	1	1	R
Output 2 status	0	0	1	-	D	2	2	R
Output 3 status	0	0	1	-	D	3	3	R
Output 4 status	0	0	1	-	D	4	4	R
Digital input 1 status	0	0	1	-	D	6	6	R
Digital input 2 status	0	0	1	-	D	7	7	R
Probe 1 fault alarm	0	0	1	-	D	9	9	R
Probe 2 fault alarm	0	0	1	-	D	10	10	R
Immediate external alarm (circuit 1)	0	0	1	-	D	11	11	R
High temperature alarm, probe 1	0	0	1	-	D	12	12	R
Low temperature alarm, probe 1	0	0	1	-	D	13	13	R
Delayed external alarm (circuit 1)	0	0	1	-	D	14	14	R
Immediate external alarm with manual reset (circuit 1)	0	0	1	-	D	15	15	R
RTC fault alarm	0	0	1	-	D	16	16	R
EEPROM unit parameters alarm	0	0	1	-	D	17	17	R
EEPROM operating parameters alarm	0	0	1	-	D	18	18	R
Maximum time in calculation of PID parameters	0	0	1	-	D	19	19	R
PID gain null	0	0	1	-	D	20	20	R
PID gain negative	0	0	1	-	D	21	21	R
Integral & derivative time negative	0	0	1	-	D	22	22	R
Maximum time in calculation of continuous gain	0	0	1	-	D	23	23	R
Starting situation not suitable	0	0	1	-	D	24	24	R
Immediate alarm from digital 1 (circuit 1)	0	0	1	-	D	42	42	R
Immediate alarm from digital 1 with manual reset (circuit 1)	0	0	1	-	D	43	43	R
Delayed alarm from digital 1 (circuit 1)	0	0	1	-	D	44	44	R
Immediate alarm from digital 2 (circuit 1)	0	0	1	-	D	45	45	R
Immediate alarm from digital 2 with manual reset (circuit 1)	0	0	1	-	D	46	46	R
Delayed alarm from digital 2 (circuit 1)	0	0	1	-	D	47	47	R
High temperature alarm, probe 2	0	0	1	-	D	49	49	R
Low temperature alarm, probe 2	0	0	1	-	D	50	50	R
Delayed signal only alarm	0	0	1	-	D	51	51	R
Immediate signal only alarm	0	0	1	-	D	52	52	R
Immediate external alarm (circuit 2)	0	0	1	-	D	53	53	R
Delayed external alarm (circuit 2)	0	0	1	-	D	54	54	R
Immediate external alarm with manual reset (circuit 2)	0	0	1	-	D	55	55	R
Probe reading alarm	0	0	1	-	D	56	56	R
Switch controller On/Off	0	0	1	-	D	36	36	R/W
Reset alarm	0	0	1	-	D	57	57	R/W

Tab. 7.c

Type of variable: A= analogue, D= digital, I= integer

SVP= variable address with CAREL protocol on 485 serial card, registers and coils with Modbus ® protocol on 485 serial card.

The selection between CAREL and ModBus® protocol is automatic. For both of them the speed is fixed to 19200 bit/s.

The devices connected to the same network must have the following serial parameter settings: 8 data bits; 1 start bit; 2 stop bits; parity disabled; baud rate19200. For CAREL and Modbus® the analogue variables are expressed in tenths (e.g.: 20.3 °C= 203)

Appendix F. Main Parts List

Table 9-1. Main Parts List

#	Description	Manufacturer	Model
1.	Compressor	Copeland	For DG-12: 3DS5-150X-AWMD For DG-12 EU: 4MT1-22X-AWM/D For DG-6: ZB58KCE For DG-6 EU: ZB114KCE
2.	Axial Fan	Rosenberg	AKFD 710-6-6-K 6H A4
3.	Humidity Controller	Carel	IR33V9HR20
4.	Temp Controller	Carel	PZD2S0P001
5.	Humidity Sensor	Carel	KFTF20UNTC10K
6.	Filter Dryer	Danfoss	DML 165S
7.	High-pressure switch with reset	Danfoss	KP5
8.	Low-pressure switch	Danfoss	KP1
9.	Oil pressure switch	Danfoss	KP55
10.	Motor protector	ABB	MS116
11.	Phase failure device	ENTES	MKC-03
12.	Timer	TELE	E1Z1
13.	Relay 24V	Phoenix Contact	REL-IR4/L-24VAC/4X21
14.	Rotary Switch 1-0-2 + Panel	AB	194L-A12-3252
15.	Overload	ABB	AKFD 710-6-6-K 6H A4

10. COMMENTS AND NOTES

The following pages are intentionally left blank and can be used for adding personal comments and notes related to the DryGair unit.