DryGair Dehumidification Unit



Installation, Operation and Maintenance Manual 1-Phase

April 2021 Version 6

DryGair Energies Ltd. — www.drygair.com
8 Hamanofim St., Herzliya Pituach 46733
Tel.: 972-9-7730980, Fax: 972-9-7730989



: drygair.energies



Proprietary and Confidential

Copyright © 2019 by DryGair Energies Ltd.

All rights reserved. No part of this manual may be reproduced or copied in any form by any means- graphic, electronic, or mechanical, including photocopying, typing or information retrieval systems- without written permission of DryGair Ltd.

TABLE OF CONTENTS

1. INTRODUCTION 1
1.1 Before You Begin 1
1.2 Further Information 1
1.3 Conventions 2
2. SAFETY 3
2.1 Hazards 3
2.2 Operation Safety Notes 4
2.3 Maintenance Safety Notes 4
2.4 Unit Labels 5
3. UNIT OVERVIEW 7
3.1 Standard Features 7
3.2 Available Models 7
3.3 Options 8
3.4 Unit Description 9
4. UNIT PARTS AND COMPONENTS 10
4.1 Temperature and Humidity Sensor 10
4.2 Defrost Temperature Sensor 11
4.3 Electrical Compartment 12
4.4 Compressor 15
4.5 Pressure Protector and Switches 16
4.6 Heat Exchange Compartment 16
4.7 Blowing Fans 18
5. INSTALLATION 19
5.1 Site Preparation 19
5.1.1 Site Requirements 19
5.1.2 Unit Specifications (US) 21
5.2 Transporting the Unit 22
5.2.1 Safety Notes for Lifting and Transporting the Unit 22
5.2.2 Special Instruction for Tilting the Unit 24
5.2.3 Receiving the DryGair Unit 25
5.2.4 Initial Inspection 25
5.3 Unpacking the Unit 26
5.3.1 Unpacking 26
5.3.2 Parts List Received 27
5.4 Positioning the Unit 28

5.5 Connecting the Utilities 29
5.5.1 Connecting the Water Drain Pipe 29
5.5.2 Connecting the Unit to the Grid 30
5.5.3 Connecting the Climate Control Option 31
6. UNIT OPERATION 32
6.1 Operation Precautions 37
6.2 Preparing the Unit for Operation 38
6.2.1 Preliminary Checks 38
6.2.2 Powering On 39
6.2.3 Setting the Humidity Percentage 40
6.2.4 The Temperature Sensors 40
6.2.5 Selecting the Operation Mode 41
6.3 Operating the Unit 42
6.4 Operation Notes 43
7. MAINTAINING THE UNIT 44
7.1 Daily Maintenance 44
7.2 Monthly Maintenance 44
7.2.1 Notes for Cleaning 45
7.3 Quarterly Maintenance 45
7.4 Annual Maintenance 46
8. TROUBLESHOOTING AND REPAIRING THE UNIT 47
8.1 Preliminary Actions 47
8.2 Troubleshooting 47
8.3 Repairing the Unit 48
8.3.1 The Refrigerant Compressor 48
9. APPENDICES 49
Appendix A. Main Parts List 49
Appendix B. Unit Drawings 50
B.1. Extra Small Unit 50
B.2. Compact Unit 51
Appendix C. Air Distribution Modules (Canopy) 52
C.1. Four-Direction Canopy 52
C.2. One-Direction Canopy 54
C.3. Air Distribution Panel 55
10. COMMENTS AND NOTES 56

LIST OF FIGURES

Figure 2-1. High Voltage warning label 5
Figure 2-2. Hearing Protection required label 5
Figure 2-3. Hot Surface caution label 5
Figure 2-4. Lift from Here notice 5
Figure 2-5. DryGair Identification label 6
Figure 3-1. DryGair unit (front view) 9
Figure 3-2. DryGair unit (rear view) **Error! Bookmark not defined.**
Figure 4-1. Temperature and humidity sensor 10
Figure 4-2. Sensor unit 10
Figure 4-3. Defrost temperature sensor 11
Figure 4-4. Electrical compartment 12
Figure 4-5. Compressor (Front View) 15
Figure 4-6. Oil pressure protector and switches 16
Figure 4-7. Heat exchange compartment 16
Figure 4-8. Expansion valve 17
Figure 4-9. Sight glass 17
Figure 4-10. Blowing fans 18
Figure 5-1. Transferring the unit 26
Figure 5-2. Water drain outlet 29
Figure 5-3. Electric switchboard and grid terminal block 30
Figure 6-1. Humidistat controller 40
Figure 9-1. Extra small unit 50
Figure 9-2. Compact unit 51
Figure 9-3. Four-direction canopy 52
Figure 9-4. Air distributor module (4-way canopy) 53
Figure 9-5. One-direction canopy **Error! Bookmark not defined.**
Figure 9-6. Air distribution panel 55

LIST OF TABLES

Table 5-1. Parts and Accessories 27

1. INTRODUCTION

This manual provides instructions for operating the DryGair unit in a correct and safe way, 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 the following

- This manual: the DryGair dehumidification Installation, Operation, and Maintenance Manual provides information and procedures for operating the unit, as well as maintenance, troubleshooting and repair procedures.
  - Read the safety instructions.
  - Conventions: explains the symbols used in this manual.

Before beginning a procedure:

- Read the procedure through to the end. Thorough understanding of the entire procedure prevents unnecessary loss of time and error.

1.2 Further Information

For further information, contact DryGair at:

Email: info@drygair.com

Website: www.drygair.com

1.3 Conventions

The following conventions are used in this manual:



Warning

Information given in a “warning” message warns of 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 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 become 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 utilities, 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 that the unit has cooled down before touching them.



Danger: Bodily Injury Hazard. Be careful not to drop any of the unit parts. Dropping the canopy 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 is 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 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 Warning, Certification and Identification labels are adhered to the DryGair unit:

- **Attention High Voltage**



Figure 2-1. High Voltage warning label

- **Hearing Protection Required**



Figure 2-2. Hearing Protection required label

- **Caution hot surface**



Figure 2-3. Hot Surface caution label

- **Lift from here**



Figure 2-4. Lift from Here notice

- **Identification Label**

  This identification label is located on the right panel and contains the following information:

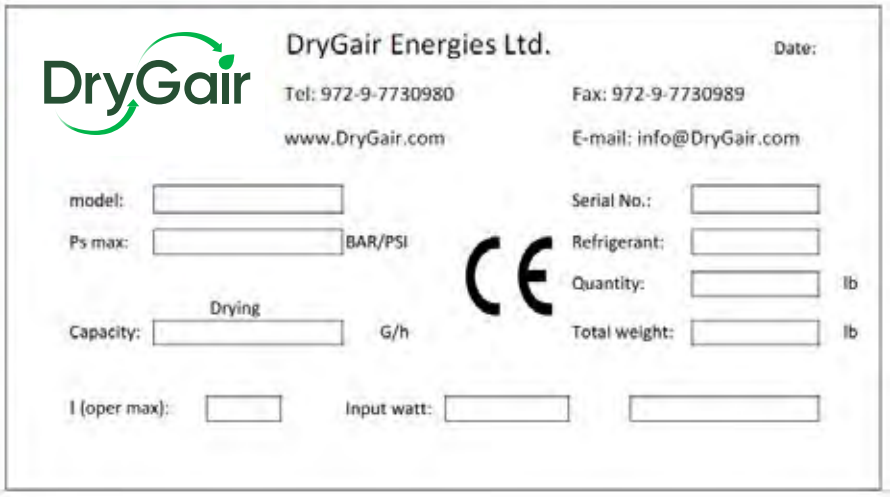


Figure 2-5. DryGair Identification label

- **Model**
  The model number provides information on the specific unit
- **Ps max**
  The maximum operating pressure
- **Capacity**
  The drying capacity of the unit (at designed conditions)
- **I (oper max) Amp**
  The maximum required current
- **Input watt**
  The power required by the unit (at 64°F and 80% RH)
- **Serial No.**
  The serial number of the specific unit
- **Refrigerant**
  The type of refrigerant used in the unit
- **Quantity**
  The amount of refrigerant required to fill in the unit
- **Total weight**
  The overall weight of the unit

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:

- **Humidity Set-Point** – ensures the humidity in the greenhouse is kept at this set-point.
- **Temperature Control** –stops the unit when the temperature drops to 50°F, and goes through a defrost cycle when reaching 43°F.

3.2 Available Models

The DryGair dehumidifying one phase unit includes the following main models:

- **DG5 – DryGair Small unit – One Phase**
- **DG3- DryGair Compact unit – One Phase**

Each of the above models can be configured as follows:

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

3.3 Options

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

- **Side Canopy** – a 1-direction air vent.
- **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.
- **Air Filter** – a net for preventing dust from entering the coils. Simple to clean and change.
- **Chemicals Resistance** – the unit parts are made of materials that improve their resistance to chemicals and soil disinfectants.
- **Casters** – set of casters for unit mobility.

For more details on the available options and configurations, see Appendix B and Appendix C.



Note

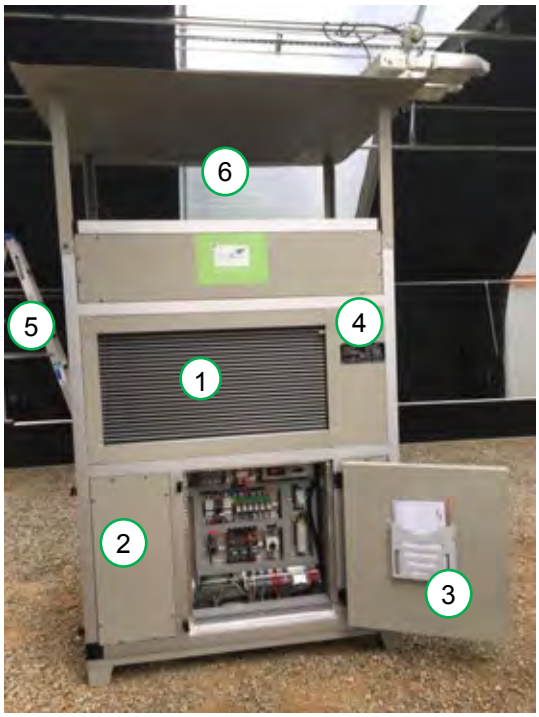
The unit configuration and options cannot be changed at the customer's site.

3.4 Unit Description

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

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





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

Figure 3-1. DryGair unit (front view)

4. UNIT PARTS AND COMPONENTS

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

4.1 Temperature and Humidity Sensor

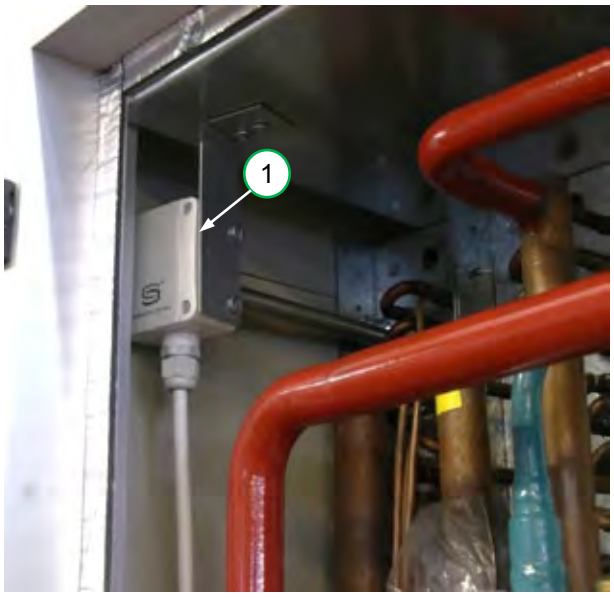
The Temperature and Humidity sensor is connected at the air entrance to the unit.



1. Temperature and humidity sensor

Figure 4-1. Temperature and humidity sensor

The sensor unit is located behind the left-side cover, at the upper left



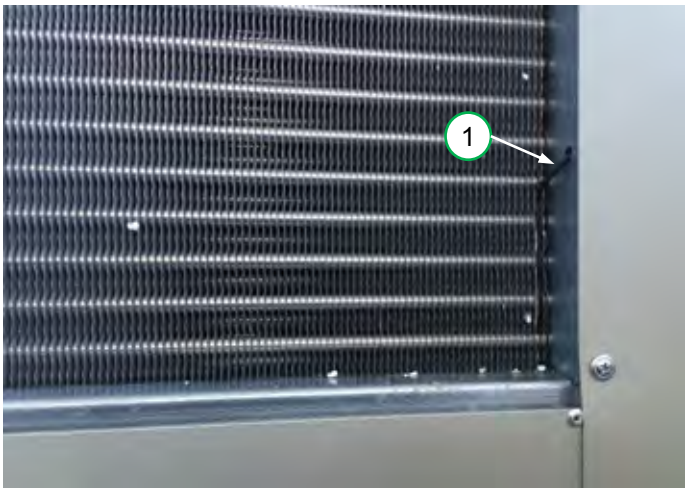
1. Temperature and humidity sensor unit

Figure 4-2. Unit Sensor

In this compartment you will find the screws and washers which are to be used for attaching the canopy to the unit.

4.2 Defrost Temperature Sensor

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



1. Defrost temperature sensor cable

Figure 4-3. Defrost temperature sensor

4.3 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.

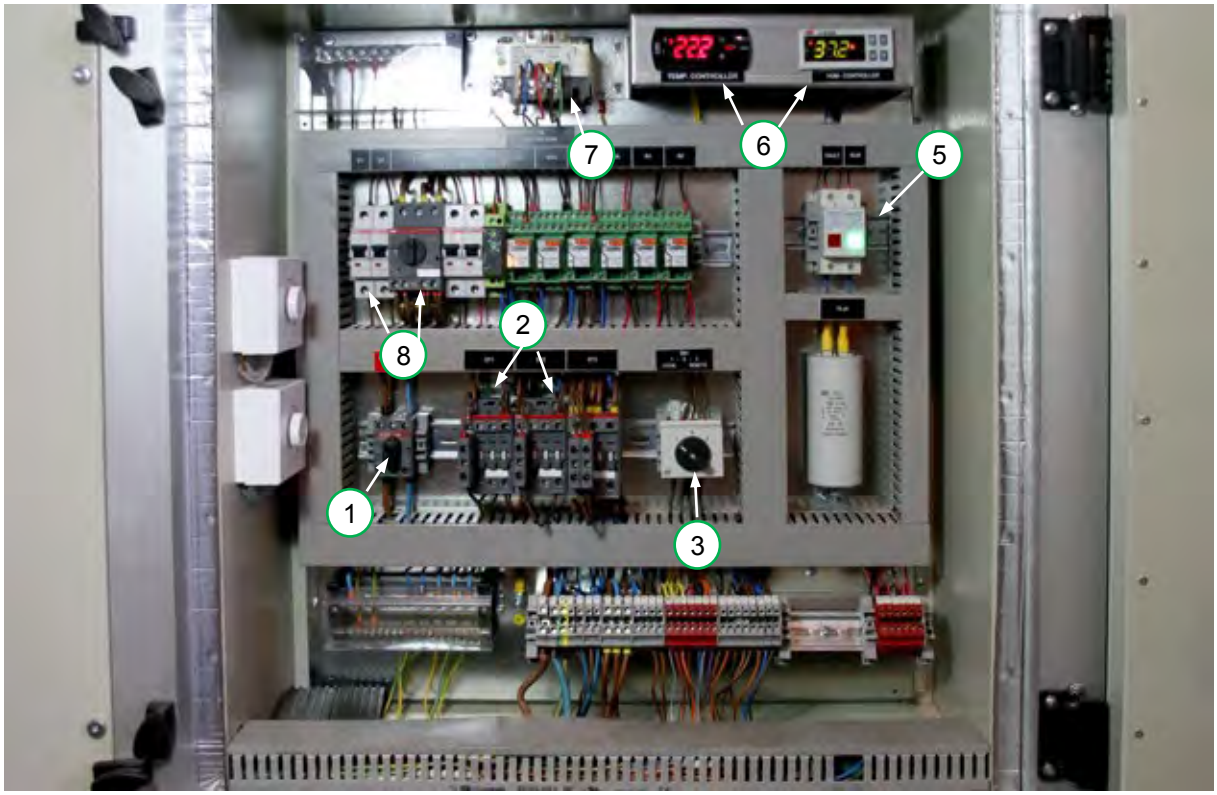


Figure 4-4. Electrical compartment

1. Main power switch
2. Fans and compressor contactors
3. Mode selection switch
4. TM3 Valve Controller (only on units with heating)
5. Fault signal lights
6. Temperature and humidity controllers
7. Transformer
8. Compressor and fans circuit breakers

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

Main power switch

Turns the unit On and Off.



Fans and compressor contactors

Provide power to the compressor and fans.



Mode selection switch (SW1)

Switches between Local and Remote control.



Green/Red signal lights

Provides indication on unit fault.



Temperature and humidity controllers

Display the temperature and the humidity. (Do not change the temperature controller).



Compressor and fans circuit breakers

Provide power to the compressor and fans



4.4 Compressor

The compressor chamber is located behind the removable panel on the opposite side from the electrical board.



Figure 4-5. Compressor (Front View)

4.5 Pressure Protector and Switches

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



1. High pressure switch
2. Low pressure switch

Figure 4-6. Pressure switches

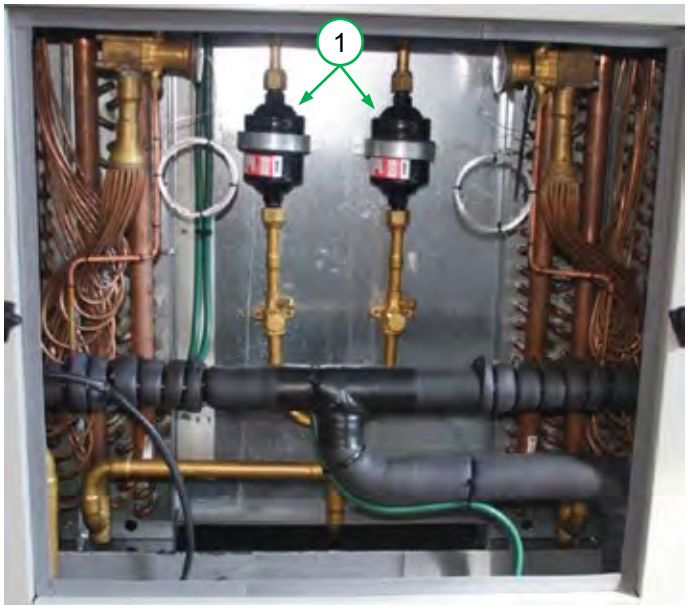


Caution

Do not change their settings; they come preset and tested from the manufacturer.

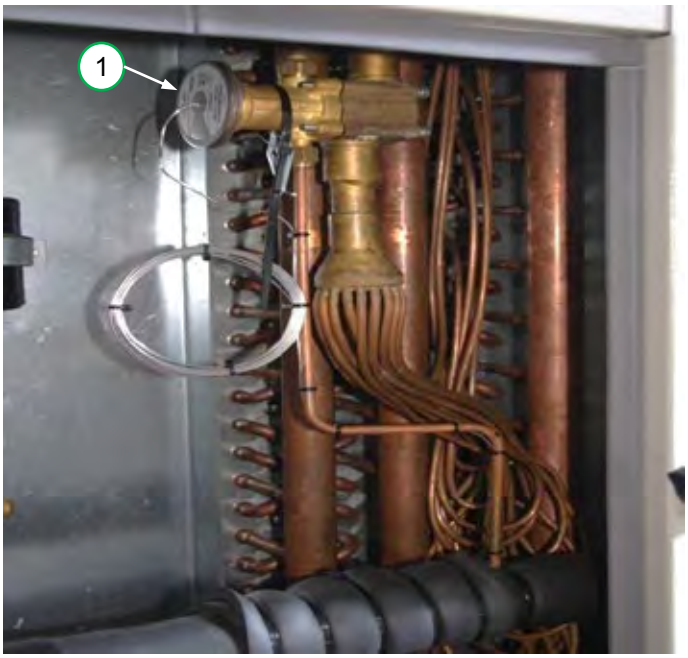
4.6 Service chamber –

The filter driers are behind the right side cover.



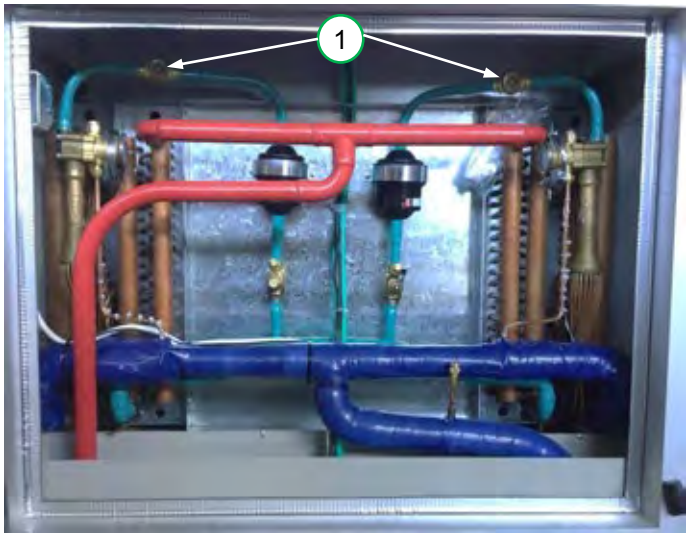
1. Filter driers (×2)

Figure 4-7. Heat exchange compartment



1. Expansion Valves (×2)

Figure 4-8. Expansion valve



1. Sight glass (×2)

Figure 4-9. Sight glass

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

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

Continuous presence of bubbles indicates loss in refrigerant.

4.7 Blowing Fans

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



1. Blowing fans (×2)

Figure 4-10. Blowing fans

These two fans circulate the air passing through the dehumidification unit.

5. INSTALLATION

For a video showing parts of the installation procedure, go to:
https://www.youtube.com/watch?v=GK_8t2r4c_Q

The installation chapter includes the site preparation, uncrating the unit and installation instructions of the DryGair dehumidification unit.



Note
The site should be prepared before unpacking and powering-on.

5.1 Site Preparation

Prepare the installation site before receiving the DryGair unit.

5.1.1 Site Requirements

- The DryGair unit should be installed inside a greenhouse/growing facility and placed in an accessible location for operation and maintenance. The unit should preferably be located in the center of the greenhouse, blowing air towards the plants.
- If the unit is a one-direction canopy (see Appendix C), and is placed next to the greenhouse wall, ensure it is distanced at least 20 inches from the wall, and blowing air towards the plants.
- The unit should be placed on a concrete leveled surface, or on tiles built according the unit dimensions and weight (see details in section 5.1.2 and Appendix B).
- The unit in its final position should be positioned at a height where the air distributor (canopy) is just below the thermal screen (if exists) and the unit's fans are above the plants. The air should be distributed to the center of the greenhouse. If the unit has wheels you should lock the wheels in order to prevent movement of the unit.
- If the plant growing method is high-gutter, the unit should be elevated on stable designed tables, or hung in a stable structure to a height that enables efficient and safe operation of the unit.
- 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”.
- An electrical shut off switch (1×25 / 2×25 Amp), unless stated otherwise, should be prepared and located in a protected location near the unit.
- Drainage should be prepared 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!

- The site should be equipped with suitable climbing equipment to enable safe and comfortable access to the unit top.

5.1.2 Unit Specifications (N. America)

The unit specifications are according to model type and options. Drawings with dimensions of the different models are attached in Appendix B.

- The units can be positioned on the ground - along the aisles, as part of the rows, on the side of the greenhouse/growing facility; or can be hung.
- There is an option to connect a 1-Phase unit – DG3 or DG5 - to two phases of 230 V instead of a 1- Phase and Neutral line (is this double checked?).

- Electricity connection possibilities:
- 1 phase 230V connection with Neutral line
- 2 Phase 230V
- Connection with r transformer

5.1.2.1 DG5- Small Unit –One Phase

Specification		Value
Depth **Width**	3'-2 1/4"	3'-0 1/4"
	7'-8 1/2"	6'-9 1/2"
Weight		~ 1,150 lbs.
Height*		7'-11 1/4" + 1'-7 3/4" Air distribution module
**Coverage Area ** **		Up to 17,000 ft^2
Temperature Operation Range		50°F – 80°F
Water Condensation (@64°F and 80% RH)		4.75 G/h
Electricity Requirements		1 phase, 230 V, 60 Hz I (oper max) = 35 Amp
Electricity Consumption (@64°F and 80% RH)		4.3 kWh
Air Flow		~ 6,500 CFM
Specification		Value

* Exact height can be specifically adjusted

** Depends on the crop

5.1.2.2 DG3- Compact Unit - One Phase

Specification		Value
Dimensions	**Depth**	3'-0 1/4"
	Width	4'- 6"
Weight		~ 850 lbs.
Height*		6'-3 1/4" + 1'-7 3/4" Air distribution module
**Coverage Area ** **		Up to 10,000 ft^2
Temperature Operation Range		50°F – 80°F
Water Condensation (@64°F and 80% RH)		3 G/h
Electricity Requirements		1 phase, 230 V, 60 Hz
Electricity Consumption (@64°F and 80% RH)		2.8 kWh
Air Flow		~ 4,500 CFM
Refrigerant Type		R410A

* Exact height can be specifically adjusted
** Depends on the crop

5.2 Transporting the Unit

5.2.1 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 appoint a supervising person.
- Always act with extreme caution to prevent personal injury and damage to the unit or its individual parts.
- Personnel must keep a distance from suspended loads and from work areas of the crane, forklift truck, or other lifting/handling equipment.
- Moving and lifting the unit to its position should be done with suitable belts/chains.

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 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 units and the air distribution modules are shipped separately, wrapped in bubble wrap and stretch wrap.

For the model weight, see the tables in section 5.1.2.

For the model dimensions, see the drawings in Appendix B.

5.2.2 Special Instructions for Tilting the Unit

The unit can temporarily be carried at an angle inside the greenhouse, while taking the following precautions:



Caution

Do not tilt the unit more than 15 degrees from its vertical position.

1.1. Make sure the screws are screwed tightly to the compressor.

1.2. Option 1: Tighten the compressor with a belt to part of the unit structure (not to tin parts) – to avoid overweight on the compressor's screws.

Option 2: Put a piece of wood in the gap between the compressor and side post of the unit to support the compressor.

1.3. Make sure that the upper fans' panels are mounted well.

1.4. Protect the coils with polystyrene or plywood.

1.5. In any way do not tilt the unit over 75 degrees from vertical position.

2. After placing the unit in vertical position:

2.1. Leave the unit vertically for at least 3 hours in order to ensure the oil drains back to the bottom of the compressor.

2.2. Make sure that there is no leakage or damage to solders and the pipes are in place.

5.2.3 Receiving the DryGair Unit



Warning

Proceed with extreme care when carrying out the unpacking procedure described below since 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 packaging, which includes all unit parts and spare parts. When it cannot be packed as a complete unit, it is packed in two parts 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 label against the purchase order. In case of discrepancy, contact your local DryGair representative.

5.2.4 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 cancellation of the equipment warranty.

5.3 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 5-1. Transferring the unit

5.3.1 Unpacking

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



Caution

Do not open the packaging 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 stretch wrap from the Air Distribution Module (Canopy).

5.3.2 Parts List Received

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

Table 5-1. Parts and Accessories

#	Part Description	Qty
1.	Main Unit	1
2.	Air Distribution Module (Canopy)	1
3.	Accessories:	N/A
	Rubber pads * (shock absorbing and leveling)	6
	Screws and Washers**	N/A

* The rubber pads are in the electrical compartment.

** The screws and washers are in the narrow side of the service door (Figure 4-2).



Note

Verify that 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.

5.4 Positioning the Unit

To position the unit:

1. Place the supplied rubber pads at the locations for the unit legs (6 legs for the DG5- DryGair Small Unit-1 phase, or 4 legs for the DG3- DryGair Compact unit). These rubber pads act as shock absorbers and for leveling the unit.
2. Lift the unit and position it on the rubber pads.
3. Ensure the Air Distribution Module is just below the black/thermal screen (if exists) and the unit's fans are above the plants.
4. Level the unit and verify that it is stable.
5. Connect the Air Distribution Module (Canopy).

   The Air Distribution Module type is ordered with the unit, as recommended by DryGair. The optional types are shown in Appendix B.



Notes

- The 4-direction Air Distribution Module (canopy) is not symmetric. When looking at the unit from the front, the canopy should be installed so that its moderate slope is connected to the right side of the unit, (see Appendix B section C.1).
- The 1-direction Air Distribution Module (canopy) should be connected with its opening facing the center of the greenhouse, blowing the air towards the plants, (see Appendix B section C.2).



Warning

Observe safety regulations when using 2 stepladders to connect the Air Distributor Module. You need at least 2 people to perform this task.

- Inspect the stepladder to makes sure it is in good condition.
- Choose a safe spot to anchor the stepladder.
- Work with partners. One should hold the stepladder steady and the other should pick up the module.

To connect the Air Distribution Module (Canopy):

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

After the unit is installed, call your electrician and the local DryGair technician to complete unit installation and to perform the first unit activation.

> ***Note***
> If the unit is to be connected to a climate control system, have your IT expert on-site for the first power up.

5.5 Connecting the Utilities

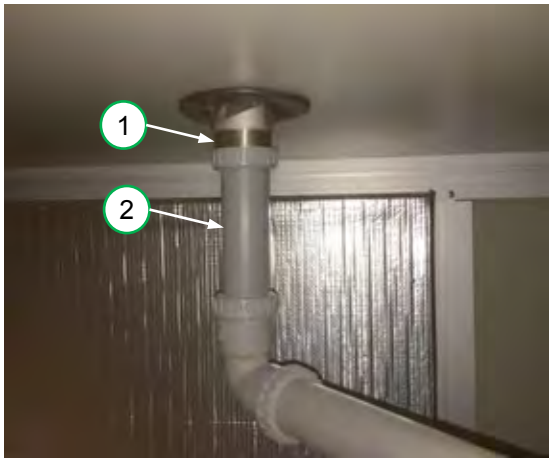
The following procedure describes how to connect the external utilities to the DryGair dehumidification unit.

5.5.1 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 will be collected (such as a container).

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 5-2. Water drain outlet

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

   Unit floor, Rear Cover, or Side cover.
4. Return and secure the unit rear cover.
5. Route the drainage to the water collection location.

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

5.5.2 Connecting the Unit to the Grid

> ***Warning***
> Only a certified electrician is authorized to connect the unit to the grid.

1. Open the electrical compartment door and identify the grid connection terminal.

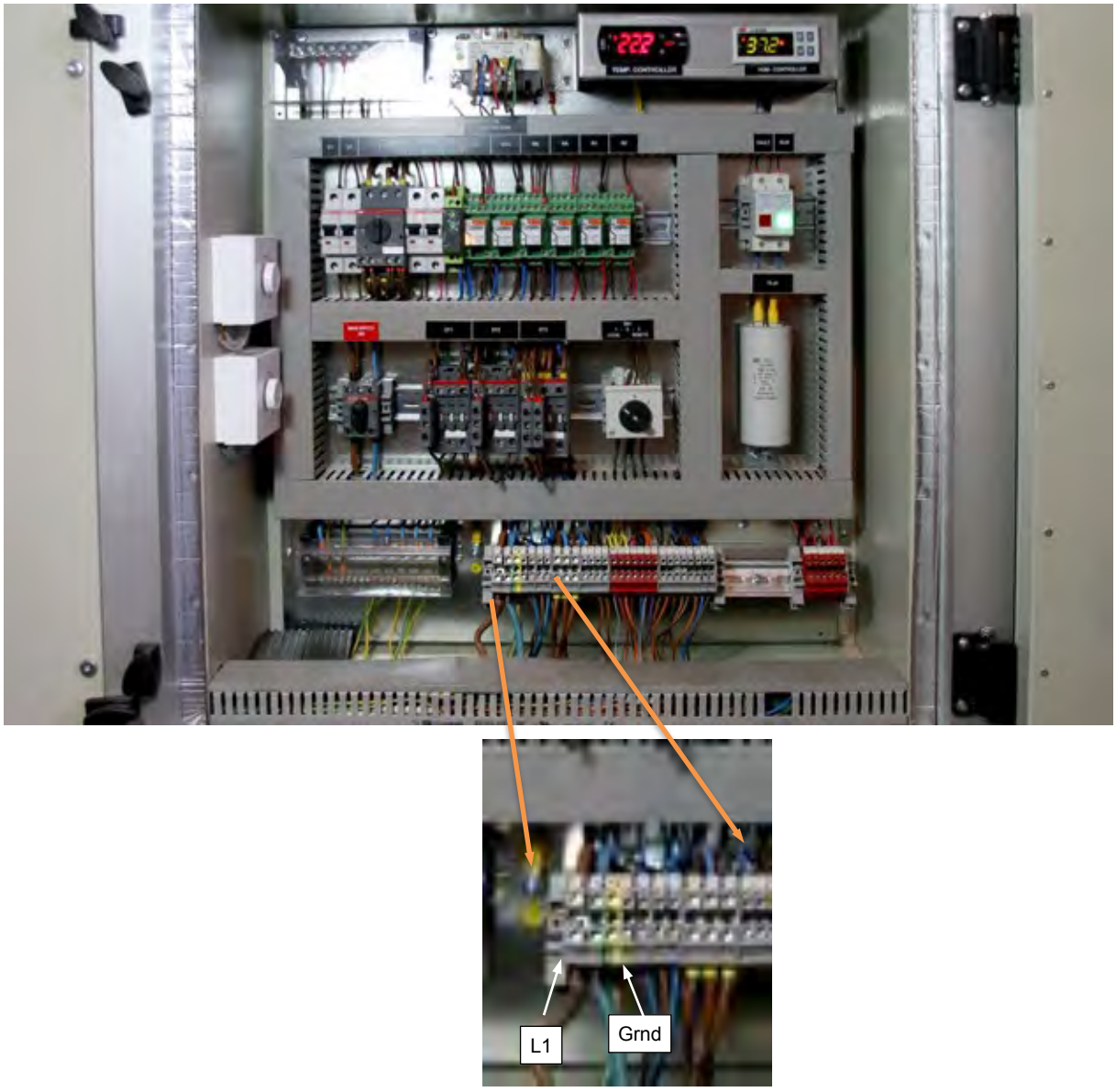
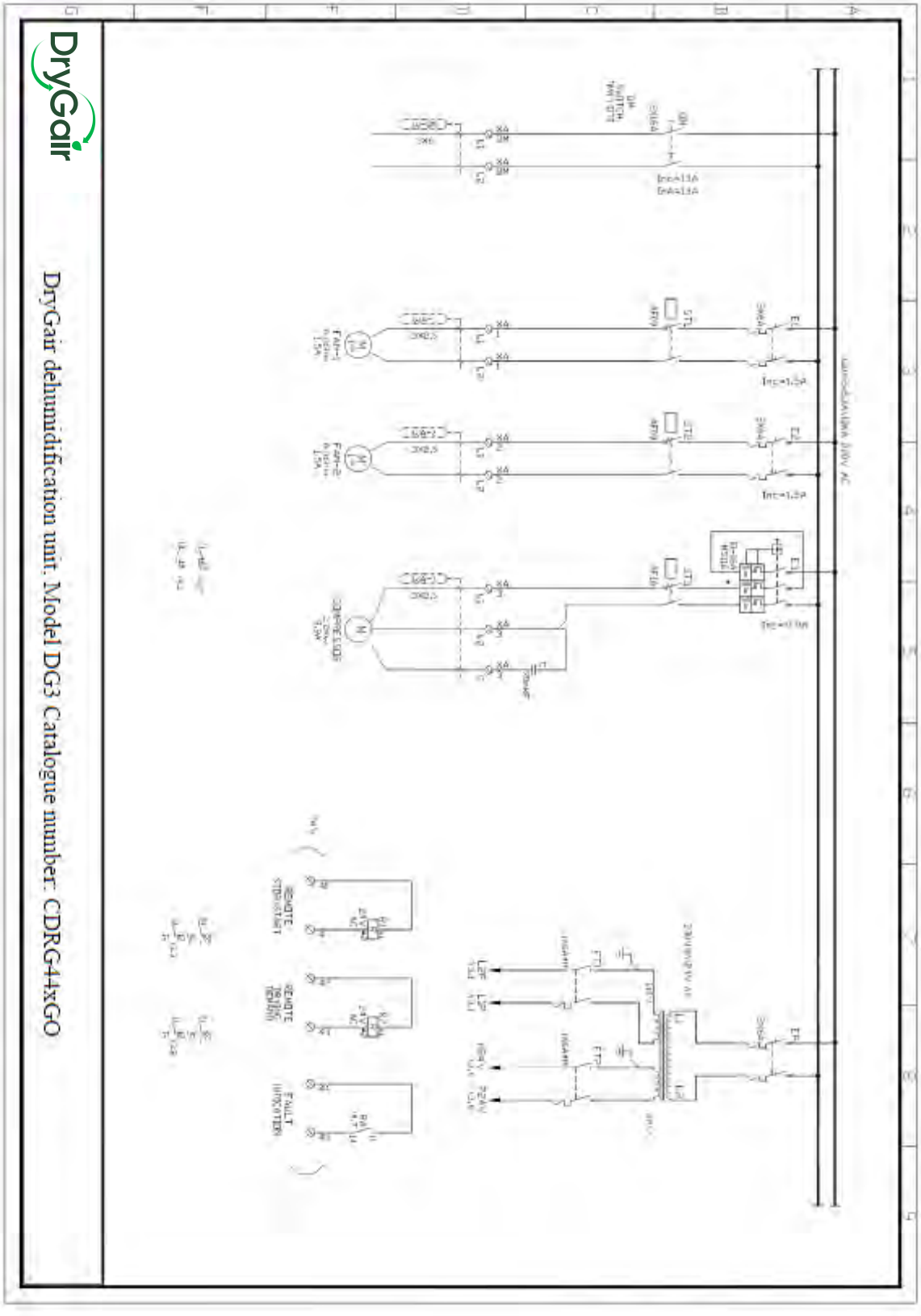


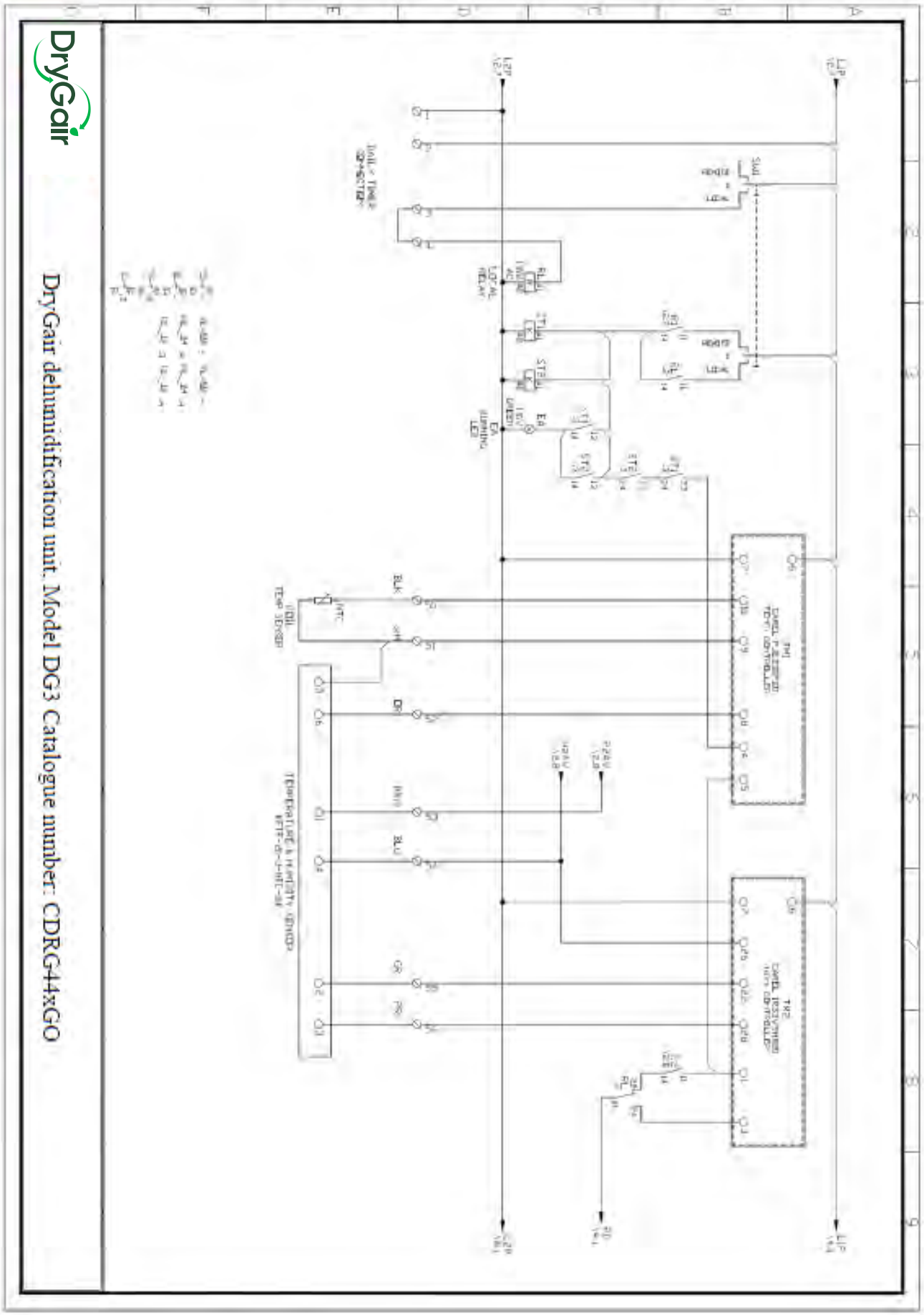
Figure 5-3. Electric switchboard and grid terminal block

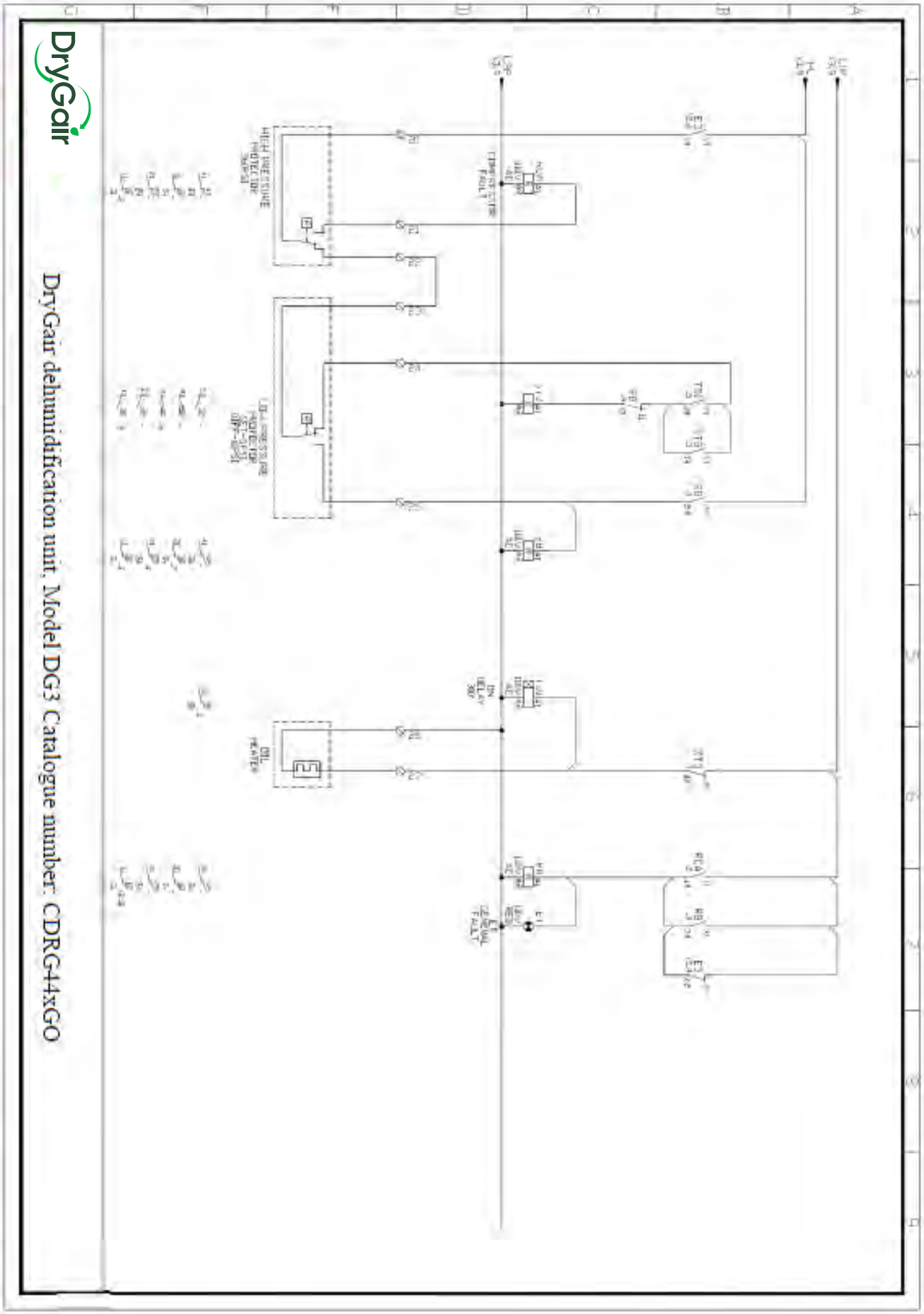
2. Connect the mains power cable to the grid terminal block:
   - For 1-Phase connect the wires to **L1** (~), **L2** (0) and **Grnd**.
   - For 2-Phases of 230 V, connect the wires to **L1** (~), **N** (~) and **Grnd**.
   - At locations with 110 V, a 110 to 230 V transformer can be used.
3. Close the electrical compartment door.
4. Connect the main cable to the prepared external circuit breaker.

5.5.3 Connecting the Climate Control Option

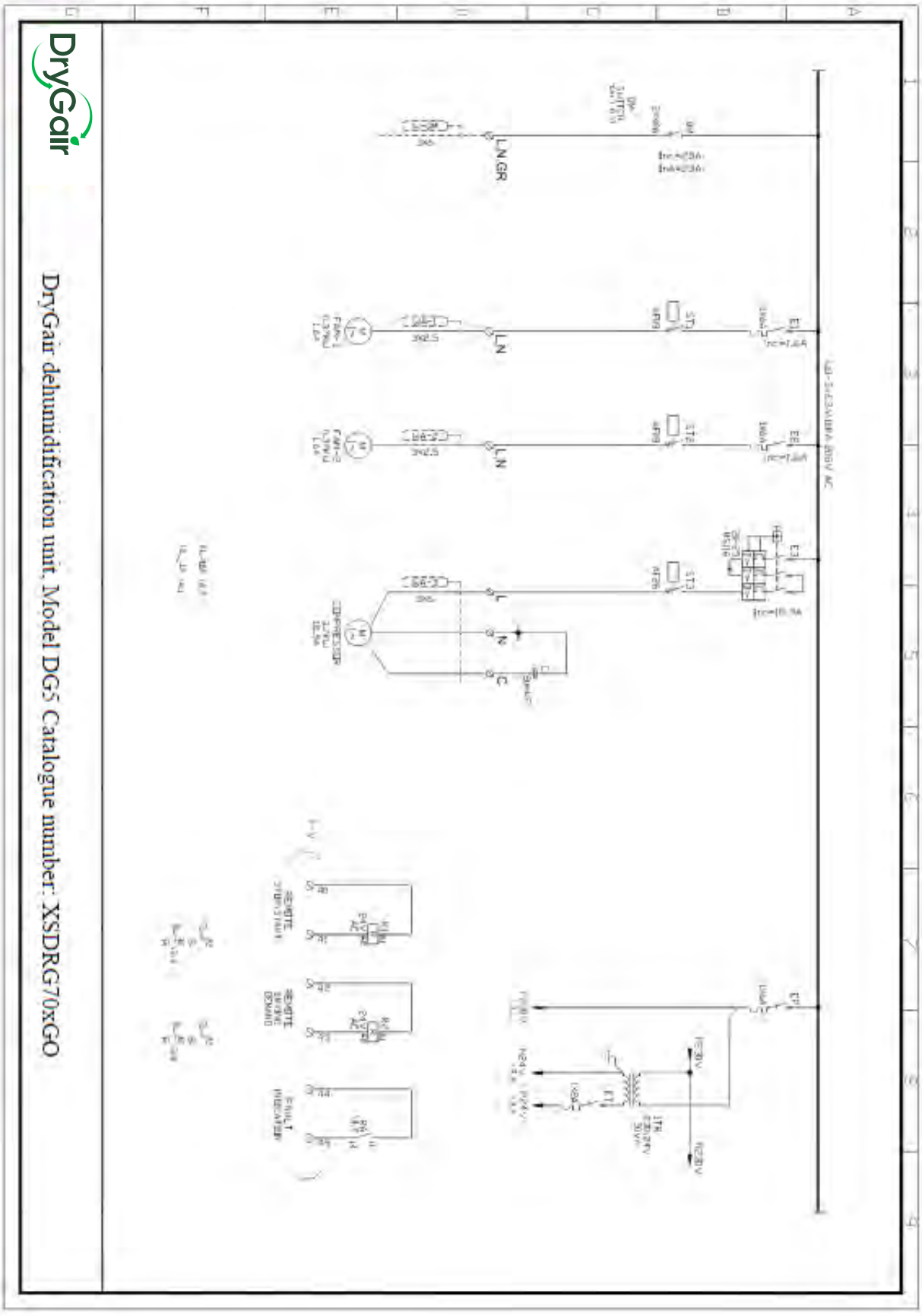
For systems that are connected to the climate control option, connect the climate control system according to the following electric scheme.

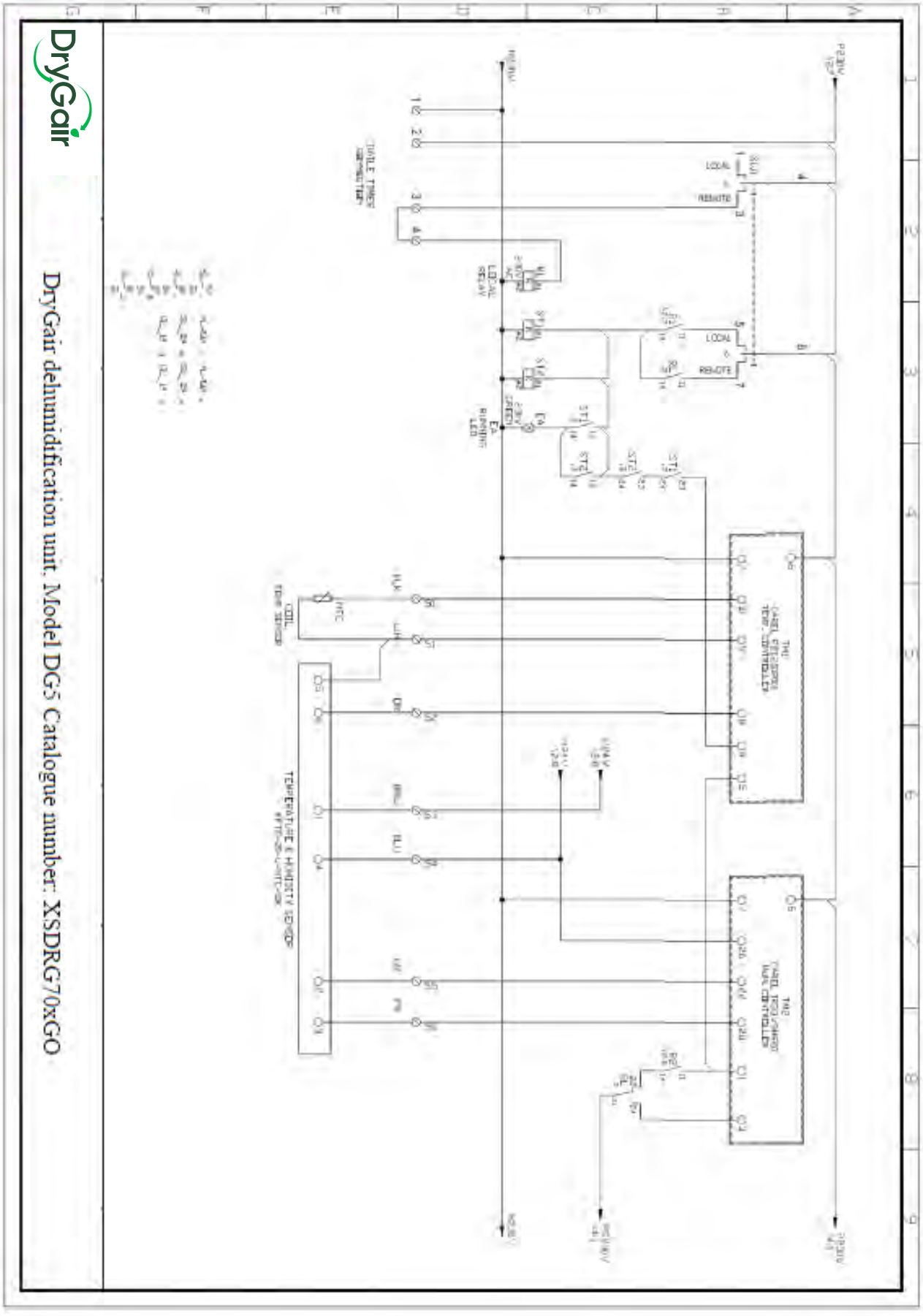


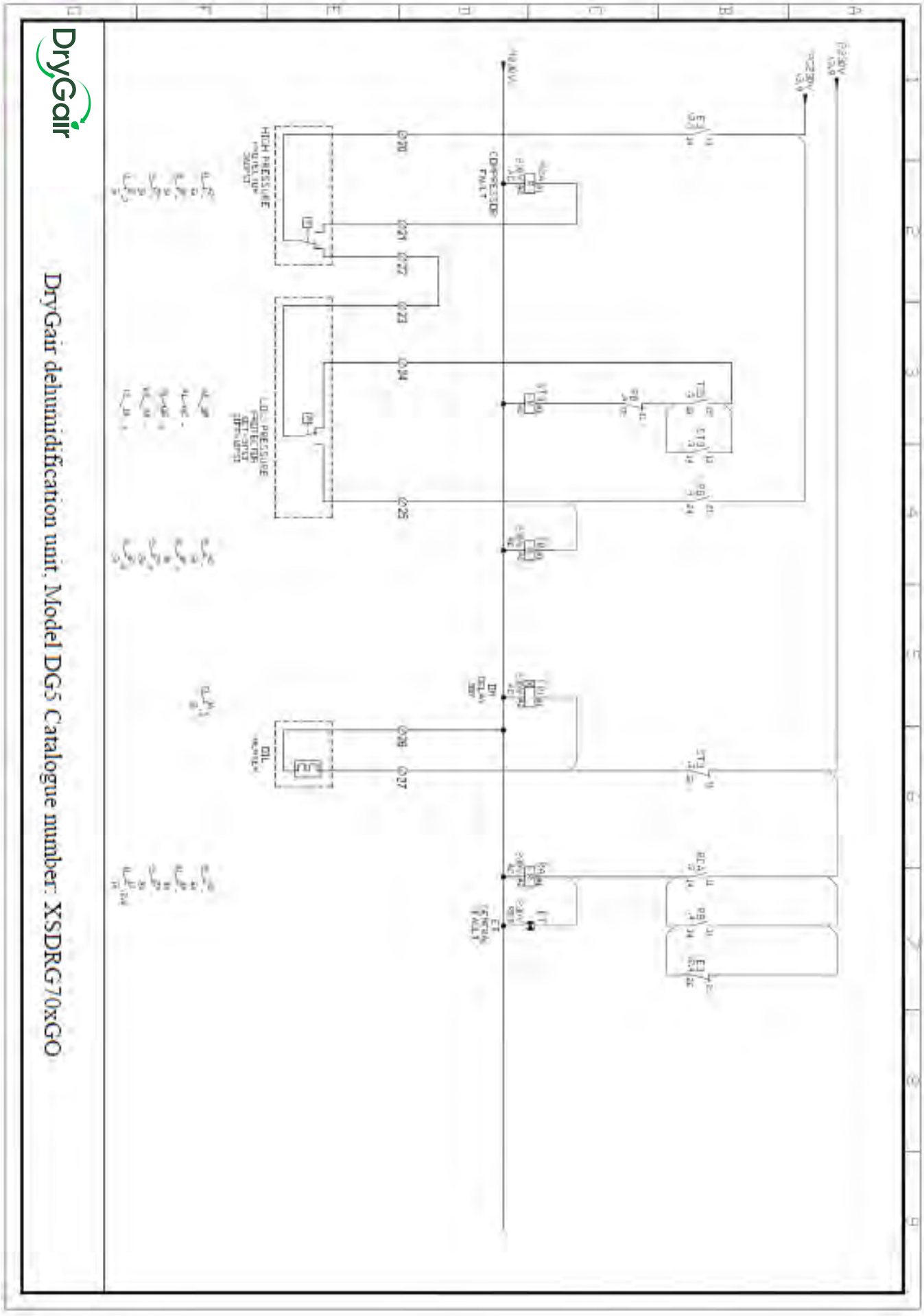

DryGair
DryGair dehumidification unit. Model DG3 Catalogue number: CDRG4xGO


DryGair
DryGair dehumidification unit, Model DG3 Catalogue number: CDRG44xGO

DG5 – EXTRA SMALL UNIT




DryGair
DryGair dehumidification unit, Model DG5 Catalogue number: XSDRG70xGO
LOCAL
REMOTE
LOCAL
REMOTE


DryGair
DryGair dehumidification unit, Model DG5 Catalogue number: XSDRG70xGO

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 hazardous areas and moving parts of the unit.



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

- The components that are behind each cover, and risks related to them.
- 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, ear 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.

6.2 Preparing the Unit for Operation

Preparing and setting the unit for operation includes the following actions:

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



Caution

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



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 unauthorized personnel are not near the machine.
2. Confirm that the DryGair unit is stable and leveled.
3. Confirm that the air distribution module (canopy) is installed and secured.
4. Confirm that 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 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 that you are familiar with the location of the external circuit breaker to the unit.

2. Open the electrical compartment and toggle the unit main switch ON.



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

To power OFF, toggle the unit 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**".



Figure 6-1. Humidistat controller

After releasing the button, the default humidity will flash on the screen display.

2. Using the **Up**/**Down** arrow buttons, set the value to the required humidity percentage.

   Press the **Set** button again to save the change. The current humidity level read by the sensor will be displayed.

6.2.4 The Temperature Sensors

The main temperature sensor measures the temperature of the evaporator coils and is factory set to 50°F. If the measured temperature drops to 50°F, the compressor stops working (fans continue).

The defrost temperature sensor is factory set to 43°F. If the measured temperature on the coils is below 43°F, the unit goes into 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 43°F, 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 the Operation Mode

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

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

  When working in the remote mode, the humidity set point is dictated by the climate control system. The humidity sensor will display the current humidity level that the unit's sensor reads.

  It should be noted that even in the remote mode, the unit stops working when the external temperature sensor measures 50°F and goes through a 7-minute defrost cycle when the internal sensor measures 43°F (according to the 1-hour defrost cycle).



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

Operating and controlling the unit by computer software requires the following (not necessarily all):

1. 24VAC to start the unit (digital output from the computer). The start parameter is set hours so that the unit receives a signal to operate between the required operating hours (usually from sunset to sunrise). This setting is performed by a climate control expert.
2. 24VAC to start dehumidification (digital output from the computer). This condition is different from the first signal. For situations in which drying is not required (e.g., low humidity), the circulating fans are operated (circulating air) while the compressor is off. This is also an option for using the fans during the day when the greenhouse is open.

   For the above two signals, 3 or 4 wires are required to be connected to the unit's switchboard.
3. Voltage free fault outlet terminals are in the switchboard; for general fault feedback to the software (digital input to the computer).
   Two additional wires will be required for this.

6.3 Operating the Unit

> ***Note***
> Inspect the unit before performing 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).
3. Verify that the **Run** (green) indication light is on and that the **Fault** (red) indication light is off. The green light should turn on after switching the Mode Selection Switch to 1 or 2 (1 – local 2 – remote)

> ***Warning***
> Before clicking the main switch button make sure that the inside of the machine 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 into the coils and out of the top of the unit). If there is a problem, do the following:
   - If the fans are not working, check that C1, C2, and the red fault light are not “on.”
   - The air distributed by the unit does not disturb the plants.
   - The compressor is operating. It should start working about 5 minutes after unit operation.
6. Wait 30 minutes after initiating unit operation and check to verify that the coils are fully wet, and that water is flowing from the unit drain.

6.4 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 temperature and humidity of the air are set on the temperature and humidity controllers.

- When the mode selection switch is set to **Local** (1), the sequence of operation is according to the unit control panel.
- When the mode selection switch is set to **Remote** (2), the local humidity controller becomes inactive, and the unit operation is controlled (start / stop) by commands from the connected climate control unit (remote PC).

Regardless of the operation mode (local/remote), when the temperature drops to 50°F the unit goes through a 7-minute defrost cycle every hour if the measured coil temperature is below 43°F.
The sequence can be changed only by the DryGair technician.

The coil temperature sensor is set to around 43°F (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 that 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 water directly at them.

7.1 Daily Maintenance

Perform the following daily:

- Visually inspect the unit, verifying that 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 refrigeration coils.

7.2.1 Notes for Cleaning

To avoid dust build-up, the unit can be covered by material with large ventilation holes and should not be completely closed at its base. This is to avoid humidity due to insufficient ventilation. Condensation will cause rusting or corrosion of the metal parts and damage to the electrical apparatus.

1. Clean carefully and dry with a clean cloth.



Caution
Do not clean the fins while the unit is operating.

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.



Caution
Do not use diesel or gasoline fuel.

4. When the machine is idle for a long period, disconnect it from the power supply:
   - If disconnected for around a week, just connect to the electricity and power on.
   - If disconnected for around a month, connect to the electricity for 5–6 hours or overnight prior to operating the unit.

7.3 Quarterly Maintenance

On a quarterly basis perform the following:

- The monthly maintenance.



Caution
Do not clean the fins while the unit is operating.

- Clean the fins of the evaporator coils surface from dust and debris by gently blowing the dirt out from behind the fins. Clean with a gentle brush or dust brush from top to bottom, avoiding damage to the fins. Alternatively, vacuum clean the coils. If required, use a mild detergent.
- Visually check the refrigerant charge:

  Run the unit for about 15 minutes.

  Remove the side cover and visually check that there is no oil sludge and no bubbles at the sight glass. If there is, contact your distributor.

7.4 Annual Maintenance

On a yearly basis perform the following:



Note

It is recommended that the yearly inspection and maintenance is performed by a qualified DryGair person or representative, and to havean HVAC specialist or electrician for assistance.

- The quarterly maintenance.
- Repair body paint damaged or chipped to preserve the unit body.
- Check that the fans are firmly secured to the motor shaft and that the fans rotate freely. The fan motor is sealed for life and therefore does not need to be lubricated.
- Tighten the compressor taps and pressure switches to prevent refrigerant leaks.
- Have a qualified electrician check the electric currents of the compressor and fans.
- Have a qualified electrician check all wiring connections and tighten the screws if necessary (especially in the electricity panel).
- Check the defrost unit operation (to be performed by a technician on models with a defrost mode when the evaporator coil temperature is less than 43°F):
  - Switch the unit on, and leave it running for about 52 minutes. The unit should enter 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" (link to product: goo.gl/kn0A3N).

8. TROUBLESHOOTING AND REPAIRING THE UNIT

8.1 Preliminary Actions

1. Verify that the unit is connected to the electricity.
2. Check that the Main power switch is ON.
3. Change the Mode selection switch to Local.

8.2 Troubleshooting

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

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 two or three overloads
Little or no airflow	Fan motor is burnt compressor is not working	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 (only by a certified electrician)
	Circuit breaker tripped in the supply board (not in the unit)	Reset the circuit breaker
	Fuse is blown not in the unit	Replace the fuse
Little or no water extraction	Insufficient air flow	Check and perform the suggestions for the above "Little or no airflow" symptom
	Compressor fault (the red light will be on)	Contact the factory service center
	Loss of refrigerant	Contact the factory service center
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 High-Pressure switch button
	Circuit breaker tripped stage 1	Press circuit breaker stage 1
	Check humidistat set point. If it is higher than the current humidity the compressor will not work.	Change the set point if needed to a lower level than the current humidity,

8.3 Repairing the Unit

If any of the electrical components fails, 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

8.3.1 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 section 5.1.2).

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

1. Find the source of leak and fix it (verify it was found).



Note (for the technician)
For evacuating and recharging the unit, use the crimped and brazed charging stub attached to the side of the refrigerant compressor.

2. Evacuate the unit from the remaining refrigerant before recharging.
3. 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.

4. Crimp and re-braze the charging stub after servicing.

To check for failure of the compressor:

1. Check with a voltmeter that power is present at the compressor terminals.
2. With the power disconnected, check with a meter across the compressor terminals the continuity of the internal winding.
   An open circuit indicates the compressor should be replaced.
3. Check if there is a short circuit between the compressor terminals and the shell of the compressor to ensure the compressor is not grounded.

The compressor can be replaced by a professional refrigeration technician.

9. APPENDICES

Appendix A. Main Parts List

DG3 – Compact Unit

CDRG

#	Description	Manufacturer	Model
1.	Compressor	Copeland	ZP44K5E-PFV
1.	Axial Fan	Rosenberg	AKSE400-4-K-4FF-A4
2.	Humidity Controller	Carel	IR33V9HR20
3.	Temp Controller	Carel	PZD2S0P001
4.	Humidity Sensor	Carel	KFTF20UNTC10K
5.	Filter Dryer	Danfoss	DML 053S
6.	High pressure switch with reset	Danfoss	KP6B
7.	Low pressure switch	Danfoss	KP1
8.	Motor protector	ABB	MS116
9.	Timer	Crouzet	EMWS
10.	Relay 24V	Phoenix contact	REL-IR4/L-24VAC/4X21
11.	Rotary Switch 1-0-2 + Panel	AB	194L-A12-3252

DG5 – Extra Small

XSDRG

#	Description	Manufacturer	Model
12.	Compressor	Copeland	ZP70KWE-PFV
13.	Axial Fan	Rosenberg	AKSE500-6-K-5DF-A4
14.	Humidity Controller	Carel	IR33V9HR20
15.	Temp Controller	Carel	PZD2S0P001
16.	Humidity Sensor	Carel	KFTF20UNTC10K
17.	Filter Dryer	Danfoss	ADK 084S
18.	High pressure switch with reset	Danfoss	KP6B
19.	Low pressure switch	Danfoss	KP1
20.	Motor protector	ABB	MS116
21.	Timer	Crouzet	EMWS
22.	Relay 24V	Phoenix contact	REL-IR4/L-24VAC/4X21
23.	Rotary Switch 1-0-2 + Panel	AB	194L-A12-3252

Appendix B. Unit Drawings

B.1. DG5 - Extra Small Unit

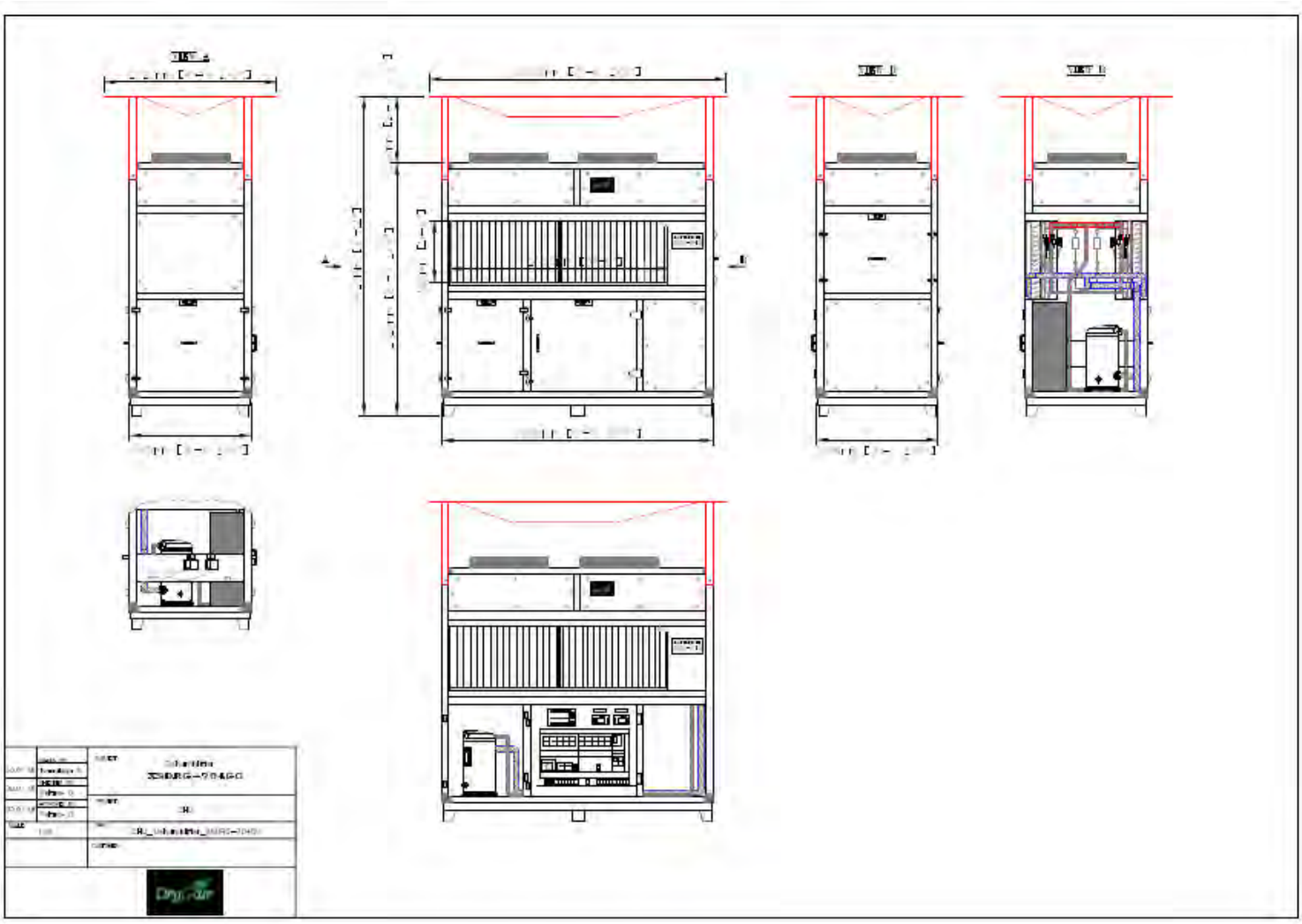


Figure 9-1. DG5 -small unit

B.2. DG3 - Compact Unit

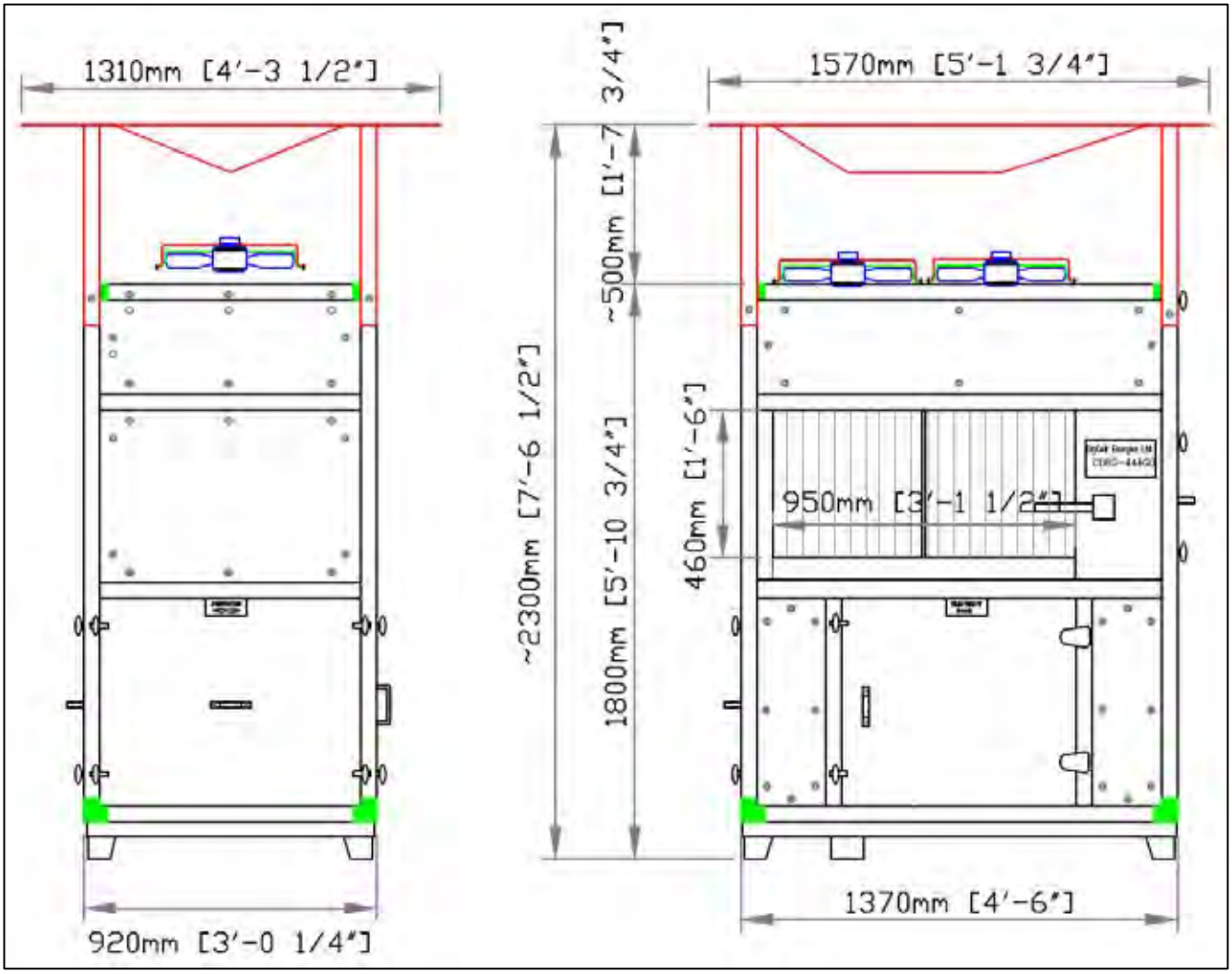


Figure 9-2. DG3 - Compact unit

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

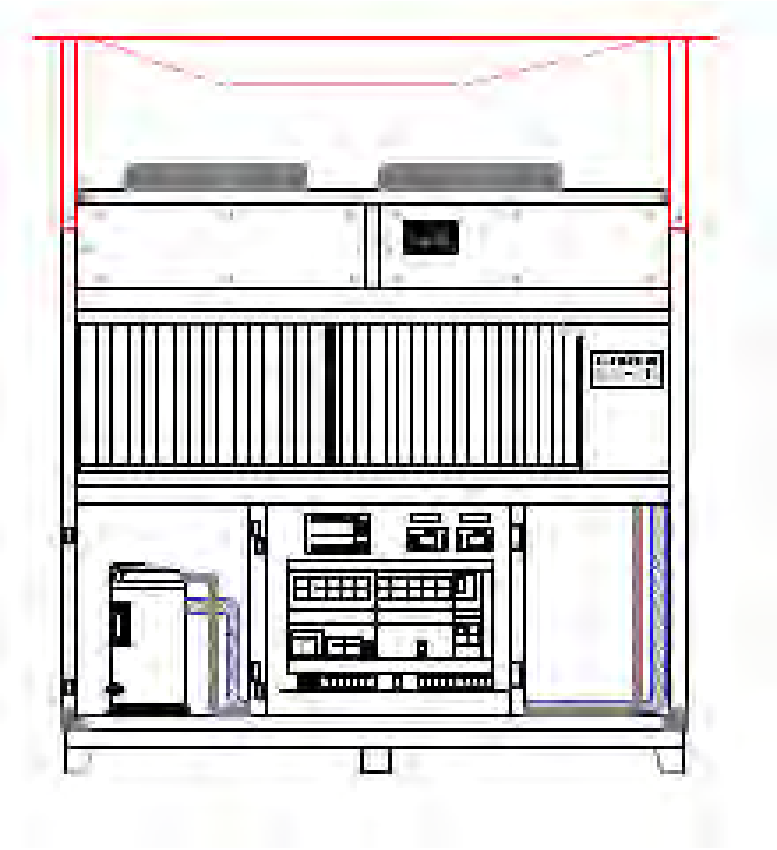
The four-direction canopy option distributes the air coming from the unit to four directions.

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



Figure 9-3. 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).



The following

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

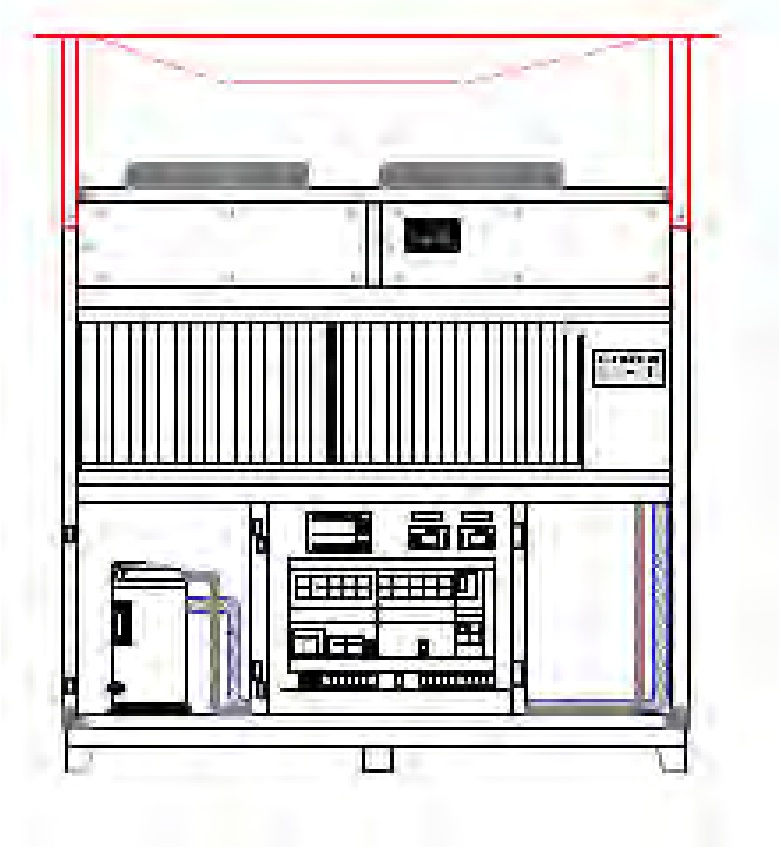


Figure 9-4. Air distributor module (4-way canopy)

C.2. One-Direction Canopy

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

This type of canopy is efficient when the DryGair unit is positioned at the sides of the greenhouse, near the greenhouse walls.

C.3. Air Distribution Panel

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.

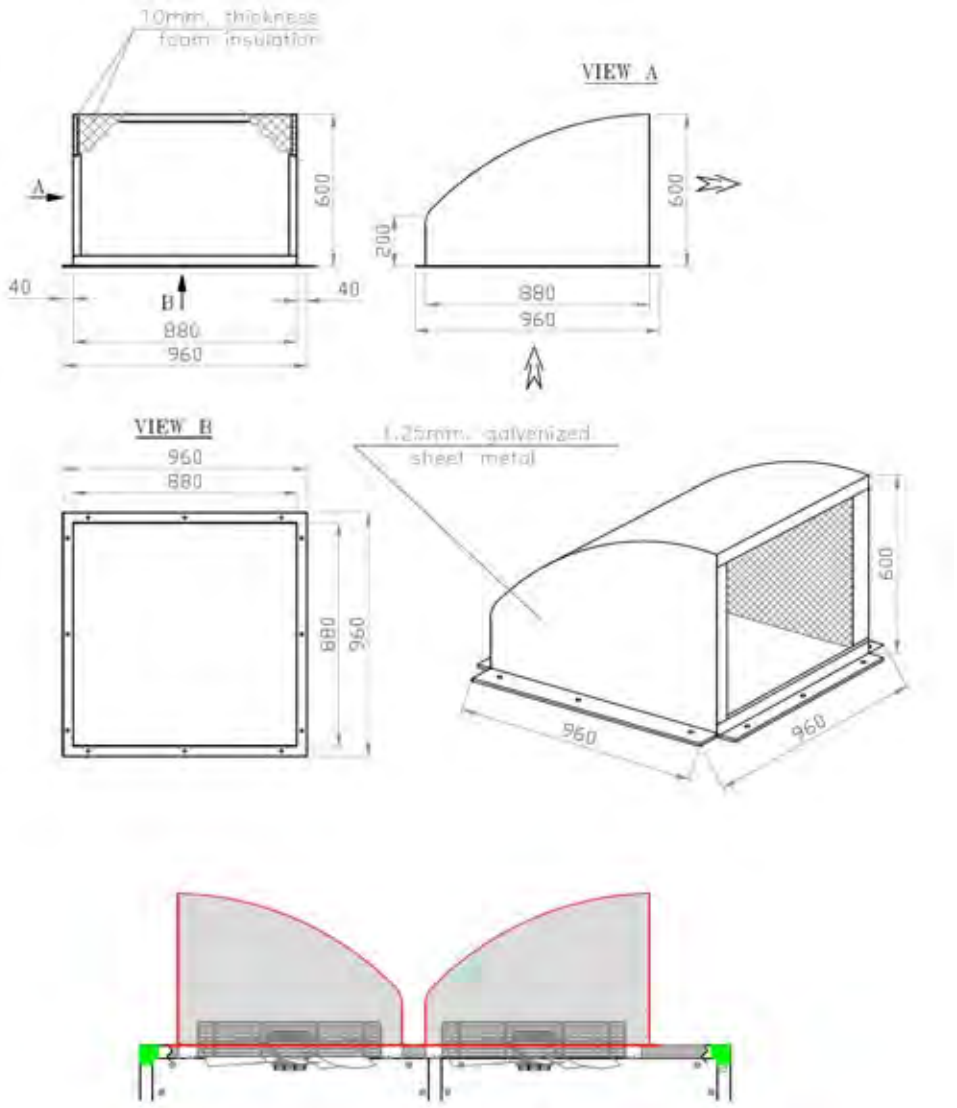


Figure 9-5. Air distribution panel

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.