

INSTRUCTION MANUAL



Document version: EN.08 11.05

Product: RZ-104Rsp

Order: 110 231

Dehumidifier **RECUSORB RZ-104R**

SPECIAL:

Energy saving step 2; 0-10VDC signal from external regulator



The product picture may differ from the actual product



Contents

1. Safety	5	4.2.7 Energy saving.....	11
1.1 Aim of this Documentation.....	5	4.2.8 Linear & binary control	12
1.2 Accentuations in the text	5	4.2.9 Adjustable rotor speed	12
1.3 Inspection of goods	5	4.2.10 Frequency converter	12
1.4 Safety	5	5. Installation	13
1.4.1 General advice	5	5.1 Duct-work	13
1.4.2 Intended use.....	5	5.2 Electrical connection.....	13
1.4.3 Safety advice regarding transporta- tion	5	5.3 Humidistat connections	13
1.4.4 Safety advice - Mechanical	5	5.4 Remote connection.....	13
1.4.5 Safety advice - Electrical	6	5.5 Steam or hot water regeneration	13
1.4.6 Unit related safety advice	6	5.6 Positioning	14
1.4.7 Hazardous operating conditions.....	7	6. Operating	15
1.4.8 Responsibilities of the operator	7	6.1 Keys.....	15
1.4.9 Minimising hazards.....	7	6.2 Start	16
2. General Description	8	6.3 Stop	16
2.1 Applications	8	6.4 Run time - Heaters	16
2.2 Construction	8	6.5 Run time - Process fan	16
2.3 Principle of operation.....	8	6.6 Adjusting TH2 & TH3 setpoint	16
3. Design	9	6.7 Reset buttons & switches	17
3.1 Housing and dismantling	9	6.8 Reset the PLC & restart unit.....	17
3.2 Rotor.....	9	6.9 Configuration check.....	17
4. Components and features	10	6.10 Remote operation	18
4.1 Standard configuration	10	6.11 Start-up procedure.....	18
4.1.1 Rotor motor	10	6.12 Shut down procedure	18
4.1.2 Filters	10	6.13 PLC operation messages	18
4.1.3 Fans	10	7. Starting up	19
4.1.4 Heater and heater control.....	10	7.1 Pre-operation Checks.....	19
4.1.5 Electric box design	10	7.2 Start-up.....	19
4.1.6 Overheat protection and control ther- mostat	10	7.3 Responsibilities of the operator	19
4.1.7 Pressure nozzles.....	10	8. Troubleshooting	20
4.2 Special configurations ^(Options)	11	8.1 PLC-error codes	20
4.2.1 Filter guards	11	8.2 Capacity troubleshooting	21
4.2.2 Humidistat control.....	11	8.3 Capacity Test	21
4.2.3 Electronic controllers	11	9. Maintenance	22
4.2.4 Automatic restart	11		
4.2.5 Emergency stop	11		
4.2.6 Rotation guard.....	11		

See next page for appendix list and figure list

Appendix

1. Component list
2. Dimensions
3. Specification: TTC25X
4. Specification: Step controller SS-S4/D
5. Energy saving (option)
6. EC Declaration of conformity

Electric wiring diagram is located inside the electric box (The electric diagram has a drawing number. This number should correspond to the same drawing number found inside the electric cabinet).

Figures

FIGURE 1: Principle of Operation.....	8
FIGURE 2: Rotor matrix.....	9
FIGURE 3: Principle function of the rotor	9
FIGURE 4: Principle of design.....	9
FIGURE 6: Standard process and regeneration fan*	10
FIGURE 7: Electric regeneration *Heater*.....	10
FIGURE 5: Rotor motor*.....	10
FIGURE 8: Inside electric cabinet.....	10
FIGURE 10: Pressure nozzles.....	10
FIGURE 9: TH1	10
FIGURE 11: Differential U-tube manometers	11
FIGURE 12: Electronic filter guard	11
FIGURE 13: Humidistat 1 & 2 illustration.....	11
FIGURE 14: Binary and linearly control.....	12
FIGURE 15: Installation	13
FIGURE 16: Locating bracket.....	14
FIGURE 17: Dehumidifier leg	14
FIGURE 29: PLC alarm table and solution	20
FIGURE 30: Troubleshooting and solution table	21
FIGURE 31: Correction diagram.....	23

1 Safety

1.1 Aim of this Documentation

This document is included at delivery and is therefore an integral part of the equipment. It describes the machine's design and configuration at the time of delivery.

In the interest of safety, please study this documentation before installing or operating the equipment.

Instructions relating to safety, handling, operation and maintenance are to be followed.

Non-compliance can result in serious personal injury or damage to the machinery and may invalidate manufacturers' liabilities and warranties.

This documentation includes guidance for:

- Installers
- Operators
- Maintenance staff

Please retain this documentation throughout the lifetime of the equipment.

1.2 Accentuations in the text



Attention! This is advice on safety!

Identifies potential hazards that may cause injury to personnel.



Actions which must be taken to reduce risk of injury are marked like this.



Additional useful information is labelled like this.

1.3 Inspection of goods

The equipment was factory tested and inspected before delivery.



Attention! Check for transportation damage!



Continue the use of this product only if you assess it as being undamaged and faultless. Any damage must be recorded by the forwarder at time of delivery and reported to the supplier of the equipment at the earliest opportunity.

Please check condition of the equipment carefully for damage upon receipt and after removal of all packaging.

1.4 Safety

1.4.1 General advice

This equipment conforms to the appropriate European regulations and directives and is designed and manufactured to be safe and reliable in operation.

Continued safety and reliability is entirely dependent on correct handling, installation, operation and maintenance of the equipment supplied.

1.4.2 Intended use

This equipment is specifically designed for atmospheric air drying. It is unsuitable for any other use. For further advice please contact your DST representative.



Unless specifically stated in this manual, the following applications are prohibited:

- Conditioning of gases (other than air).
- Conditioning of air contaminated with chemicals or aggressive elements.
- Conditioning of air containing flammable or explosive elements.
- On rooms or air systems having a potentially explosive atmosphere (Ex-Zones).
- Conditioning of air at elevated pressures.
- Unfiltered air (minimum filter standards required are G4).

1.4.3 Safety advice regarding transportation



Attention! Heavy equipment being dropped!



Only use tested and certified lifting equipment to off-load and position the unit.



If a fork lift is used to move the unit, please ensure the load is evenly balanced.



If lifting the unit on a pallet, ensure the unit is firmly secured to the pallet.



Evacuate and secure the danger area during lifting and positioning of the unit.

1.4.4 Safety advice - Mechanical




Attention! Mechanical hazards!




Installation, testing, commissioning preventative and corrective maintenance must be carried out by a qualified person or under supervision of a qualified person. Wherever possible, all mechanical work must be carried out with the electric supply switched off.


A qualified person (mechanical) is defined in this manual as:

- A mechanical technician or engineer qualified to service and maintain air conditioning plant and associated systems.
- Has completed the appropriate health and safety training.
- Has read and is familiar with the contents of this manual.
- Is professionally competent to commission and service this type of equipment.

 For your own safety, wear the appropriate personal protective equipment (PPE).


1.4.5 Safety advice - Electrical


 **Attention!** This equipment will contain high voltage electrical components!


 Wherever possible, all electrical work must be carried out with the electric supply switched off. It is recommended that electrical isolators are locked in the off position. All electrical work must be carried out by a qualified person or under supervision of a qualified person.


A qualified person (electrical) is defined in this manual as:


- An electrical technician or engineer qualified to service and maintain air conditioning plant.
- Has completed the appropriate health and safety training.
- Has read and is familiar with the contents of this manual.


 For your own safety, wear the appropriate personal protective equipment (PPE).


 **Attention!** If the unit control panel isolation switch is off, the incoming cable terminals may still be live!


 If working on the unit's isolation switch, ensure that electrical power is isolated and locked to prevent accidental resetting.

 **Attention!** Permitted Voltage!

 Check incoming electrical voltage and operating frequency conform to the electrical wiring diagram and the manufacturer's type plate attached to the unit.

 Electrical connection to be made in accordance with local regulations.

 **Attention!** Loose terminal connections!


 Due to vibration during transportation it is advised that electrical terminals are checked for security and retightened where necessary


The following connecting terminals in the electrical control cabinet should be checked periodically and retightened if necessary:


- Connecting terminals in the main isolator switch.
- Connecting terminals in main components of the heater circuits.
- Connecting terminals in main components of the fans circuits.


Periodical as defined in this manual means:

- During installation.
- Two months after commissioning date.
- During annual maintenance.


 **Attention!** Electrical parameters!

 Parameters used in the electrical protection and alarm circuits must not be modified or adjusted. Factory (default) parameters are shown in the electrical wiring diagrams.


 **Attention!** Safety functions!


 The operation of all electric safety devices are to be checked at commissioning and during service/maintenance. Under no circumstances are these devices to be deactivated (e.g. adjustment or bridging).


 **Attention!** Defective electrical components!


 Defective electrical components and defective wiring must be replaced immediately. The equipment must not be operated until the defect has been repaired and the unit re-tested


1.4.6 Unit related safety advice


 **Attention!** Danger from incorrect installation!


 The air dryer is designed for internal installation. For external use it will require a weatherproof enclosure. Water hoses must not be used adjacent to this unit.


 Use of the air dryer in areas having a potentially explosive atmosphere (Ex-area) or treatment of air with potential explosive/flammable components is prohibited.


 The air dryer requires installing on a horizontal plane.


 The air ducts shall be connected load and vibration free.


 **Attention!** As standard, the air dryer is equipped with electrical resistive heater elements (regeneration air heater).

 For normal shut down, switch off the unit using the OFF-button. If switching the unit off in an EMERGENCY, the main isolator switch or emergency stop button may be used. However, residual heat from the heater elements will remain in the unit and this can result in damage to components close to the heater and release of the safety thermostat TH1.

 For maintenance purposes shut down the unit using the OFF button and allow the system to cool down before attempting to access internal components.

 **Attention!** Automatic restart after power failure! (Option)

 If the automatic restart function was selected (option), to prevent unintentional restart, ensure that the main isolator switch is off and power isolated before servicing internal components.

 Advise all operating & maintenance personnel regarding automatic restart function if applicable.



Do not remove the warning notice on the machine which alerts personnel to the dangers of an automatic restart function.



Attention! Condensate in wet air outlet duct.



Due to concentrated water content in the wet air outlet duct, incidental condensate may flow back into the machine and damage the equipment. To prevent this, install the wet air outlet duct at a slight gradient. If the duct needs to be installed at high level, fix a condensate drain at the lowest point of the duct.



In cold areas the wet air duct-work should also be insulated.



Ensure that the condensate drain does not create an ice hazard in winter.



Attention! Equipment fans can produce noise levels above 80 dB (A) depending on duct-work connection used.



Use ear protection, if remaining close to an operating machine for any length of time.



Pay attention to accessibility requirements for maintenance and service purposes.

- Use the machine as intended only.
- Only use the machine if it is fully functional.
- Check the condition of the machine before using.
- Check the machine on operational efficiency at regular intervals.
- Carry out maintenance and testing at the prescribed intervals.

1.4.7 Hazardous operating conditions

Operation of the system is deemed to be hazardous, if:

- Is not operated inside or is not protected within a weatherproof enclosure.
- Is not operated within the permitted operating parameters (see technical specifications).
- Is operated outside the scope of 'normal' use (see intended use).

1.4.8 Responsibilities of the operator

It is the responsibility of the operator of the system to ensure that all personnel engaged with installation, operation, maintenance and service of the equipment have read and understand the relevant sections of this manual.

1.4.9 Minimising hazards

To ensure risk to personnel is minimised:

- Ensure that all activities relating to this equipment are carried out by qualified and authorised staff only.
- Identify and prevent potential safety hazards in the environment.

Failure-free Operation

- To ensure a failure-free operation, please make the following arrangements:
- Keep this manual ready to hand with the unit.

2 General Description

2.1 Applications

DST desiccant type dehumidifiers are normally used where dry air is essential to the various manufacturing processes used in chemical, pharmaceutical, food or confectionery industries, or where a dry environment is required for storing and handling of moisture sensitive products and raw materials.

The well proven air drying technology using the adsorption principle provides great flexibility in solving humidity problems. It offers the user independent humidity control, down to dew points far lower than the effective operating range of refrigeration dehumidifiers.

2.2 Construction

The standard dehumidifiers are made as complete units including rotor, fans, rotor motor and rotor drive transmission, heater for the regeneration, controls and electrical equipment.

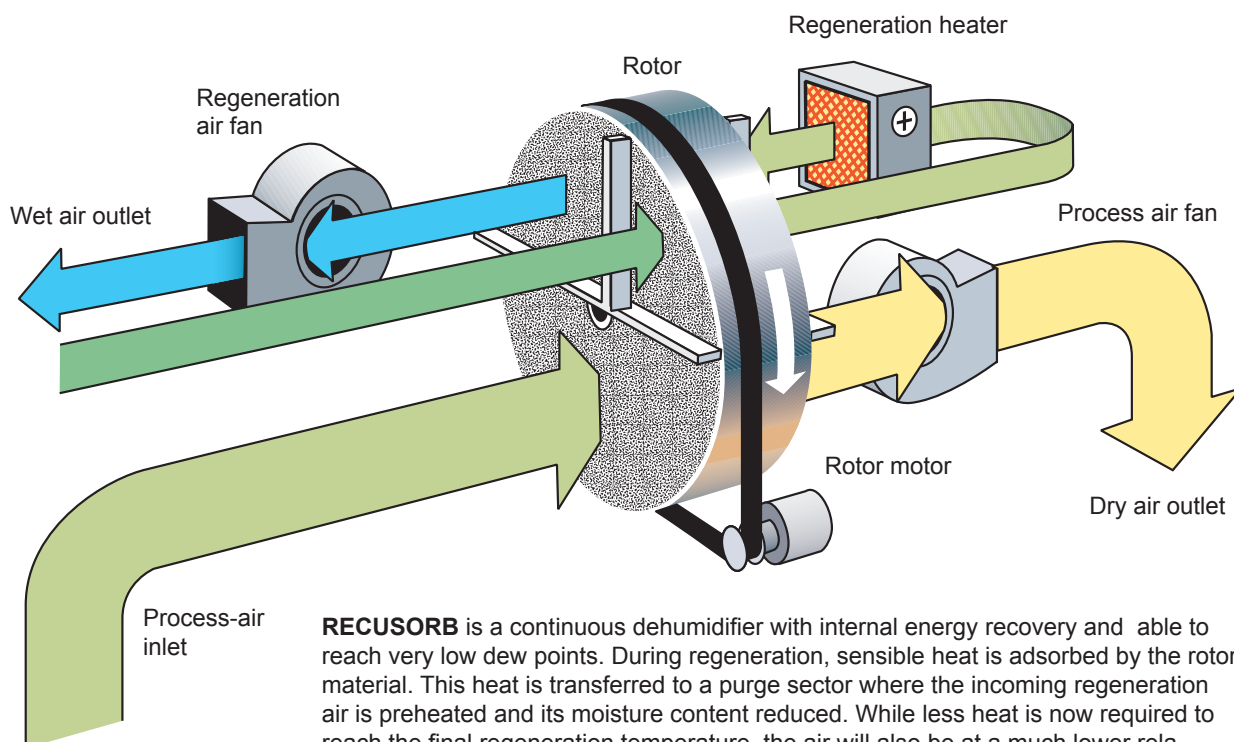
The regeneration heater is normally electric, but steam, hot water or gas-heater is available as option.

The water vapour is effectively adsorbed from the treated air in the SSCR silica gel rotor.

2.3 Principle of operation

It works on a continuous process with two air streams of different flow rates, normally having a flow ratio of approximately 3 to 1. The greater flow, *process air*, is dried as it passes through the dehumidifier, while the smaller flow, *regeneration air*, is used to heat the rotor material to drive the adsorbed moisture vapour from the desiccant. The moisture which is removed from the process air, is transferred over to the other as the SSCR rotor turns slowly.

FIGURE 1: Principle of Operation



RECUSORB is a continuous dehumidifier with internal energy recovery and able to reach very low dew points. During regeneration, sensible heat is adsorbed by the rotor material. This heat is transferred to a purge sector where the incoming regeneration air is preheated and its moisture content reduced. While less heat is now required to reach the final regeneration temperature, the air will also be at a much lower relative humidity. As a result of this, the dry air outlet is both cooler and drier than that achieved by other desiccant systems.

3 Design

3.1 Housing and dismantling

The RECUSORB RZ dehumidifier has a housing of galvanized sheet metal (AlZn). The unit housing contains rotor, rotor motor with belt transmission, regeneration heater and filters. The fans and the electrical control equipment are placed externally on the unit.



The unit should be electrically isolated before dismantling. The main switch should be in position "0", and can be locked in this position.



If the unit has been in operation, wait until the regeneration fan has stopped before disconnecting and dismantling the unit.

The regeneration fan removes residual heat from the regeneration heater for ten minutes after the unit has been switched off.

The access panel at the front of the unit can easily be opened, to enable service and inspection. The panels can be opened without any tools as they are fixed with hand wheels.

The rotor unit is located between the two panel doors at the front. It contains rotor, rotor transmission and rotor motor. The short side of the rotor unit has a polycarbonate access panel, which is screwed to the rotor unit. The panel is removed to gain access to the rotor and the rotor transmission. The rotor motor can be reached when the left hand panel door is opened.

The electric box with control panel and all electric equipment is located on the top of the unit. The lids of the electric box can be opened when the lock are turned with a key that is attached with the unit.

The air connections are round galvanized spigots in standard dimensions.



The unit is designed so that it easily can be lifted by a fork lift. To allow securing of the unit to the floor or to a pedestal, square washers are delivered with the unit.

3.2 Rotor

The heart of a DST dehumidifier is the very efficient patented SSCR silica gel rotor. The rotor matrix is manufactured from alternate layers of flat and corrugated sheets of silica gel and metal silicates, chemically bonded into a tissue of inorganic fibres. It is made to form a vast number of axial air channels running parallel through the structure. The large internal surface area combined with the special micro structure of the SSCR silica gel material, ensures maximum contact area to give the rotor an extremely

high capacity for adsorbing water vapour. It has a galvanized sheet metal lining, spokes and a hub and two bearings on which it rotates around a fixed steel shaft.

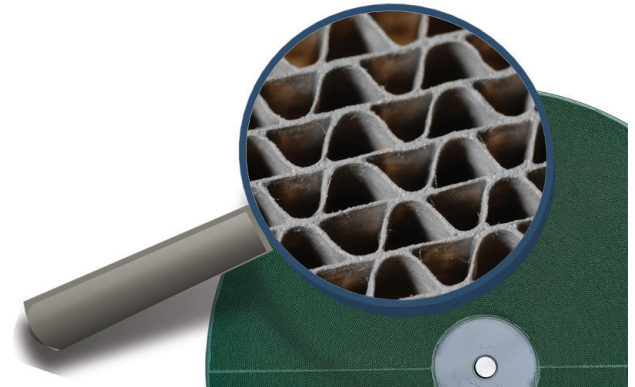


FIGURE 2: Rotor matrix

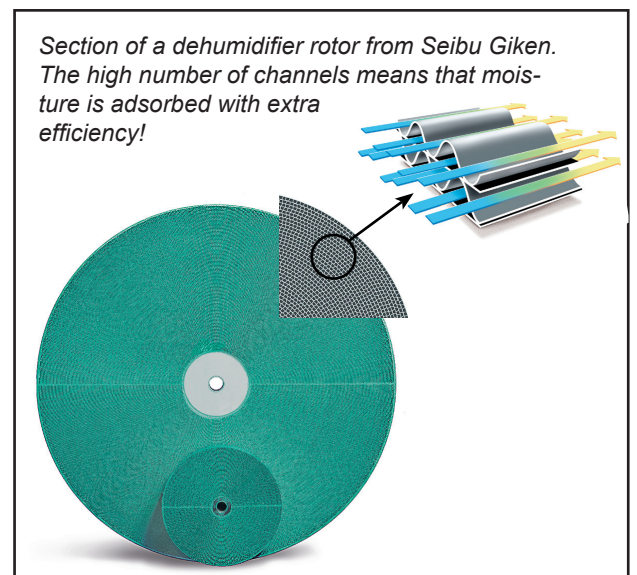


FIGURE 3: Principle function of the rotor

1. Electric equipment
2. Rotor
3. Rotor motor
4. Reg filter
5. Process filters
6. Process fan
7. Reg. fan, behind electric cabinet
8. Regen. heater
9. Process air in
10. Dry air out
11. Regen. air in
12. By-pass
13. Wet air out, behind electric cabinet

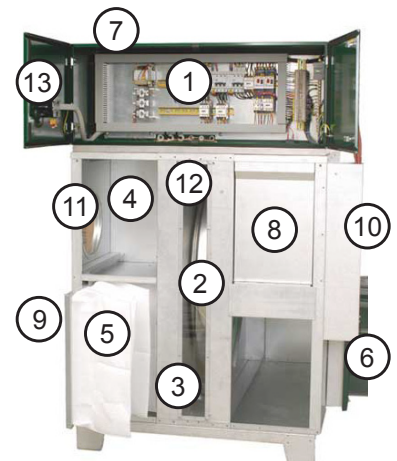


FIGURE 4: Principle of design

4 Components and features

4.1 Standard configuration

4.1.1 Rotor motor

The rotor is driven by a single phase rotor motor with a timing belt transmission. A belt tension device prevents belt slipping and overload of the rotor motor.

The rotor has both peripheral and radial seals.

The peripheral seals are mounted with hose clips. The radial seals are made of teflon and are held in place by steel rulers.



FIGURE 5: Rotor motor*

4.1.2 Filters

The air filters are synthetic fibre bag filters. Standard class G4 filter.

4.1.3 Fans

The regeneration air fan is a medium pressure, single inlet centrifugal fans, directly driven by three-phase motor.

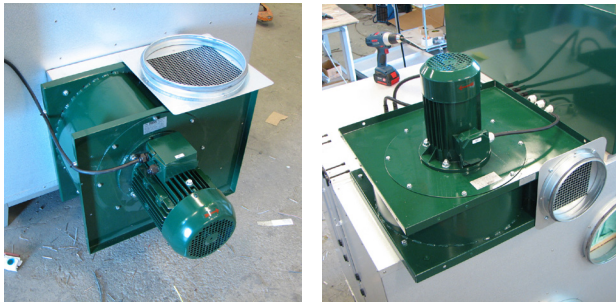


FIGURE 6: Standard process and regeneration fan*

4.1.4 Heater and heater control

The regeneration heater is normally an electric heater, but steam, hot water or gas heaters are also available.

For units with steam or hot water, only battery is included. At installation shall valve and steamtrap be installed externally, see steam coil installation.



FIGURE 7: Electric regeneration



The electric heater battery has a thermostat. The thermostat is found in the electric box.

* Components may slightly differ from delivered product

4.1.5 Electric box design

The PLC control panel is located at the front of the control box. Inside, the electric box houses multiples electronic devices and control units, such as contactors, fuses, motor protectors, relays, transformer. They are attached to the DIN-rails

Possible remote ON/OFF control (for example humidistat) and potential free alarm contacts are to be connected on this fixed terminal, see wiring diagram for installation.

4.1.6 Overheat protection and control thermostat

TH1 is a mechanical overheat protector. The reset button and adjustment are made on the thermostat.

TH2 (located inside heater chamber) and TH3 (located on wet air out) are electronic temperature transmitters, thermostat. The devices regulates the regeneration heater temperature.

Note: If TH1 is triggered, the unit will stop and start the cooling process for a pre-set time. The overheat protector automatically triggers the regeneration heater fuses as well. To restore operation, reset TH1 and Fuses F3 through F6.

See "10 Technical data" for default settings.

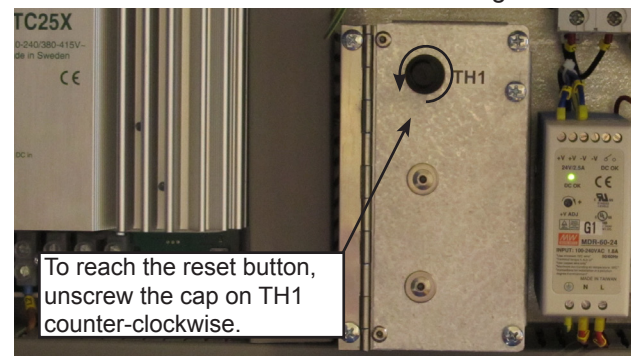


FIGURE 9: TH1

4.1.7 Pressure nozzles

Located on the rear side of the unit. Are to be used with gauges and other pressure sensitive devices.

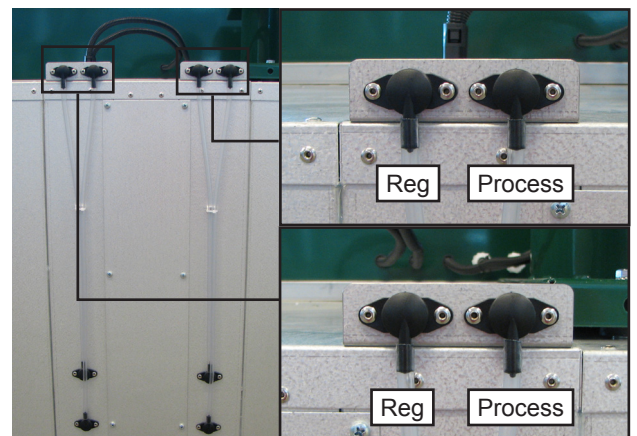


FIGURE 10: Pressure nozzles

4.2 Special configurations (Options)

4.2.1 Filter guards

Filter guards for process air and reg. air are available as an option.

Different types of filter guards and pressure gauges are available for installation. Such as, standard mechanical differential U-tube manometers.

Other option is a electronic filter guard with a warning light. The warning light will turn on if the pressure has dropped below the pre-set value.

The recommended pressure will decide when to change filter (See technical data)



FIGURE 11: Differential U-tube manometers

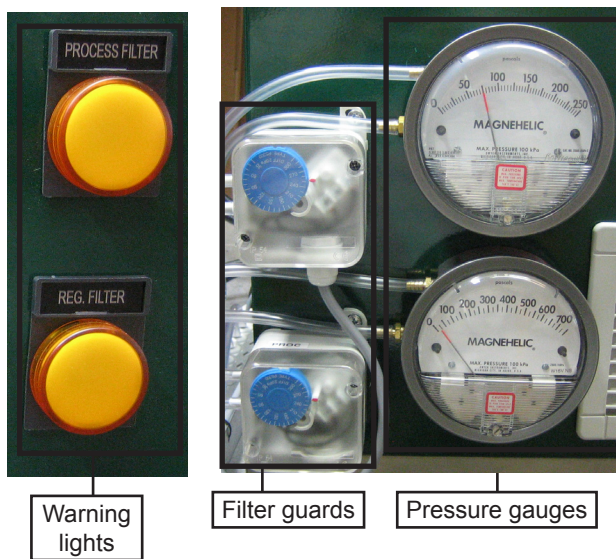


FIGURE 12: Electronic filter guard

4.2.2 Humidistat control

The heater can be controlled by two Humidistat inputs (see wiring diagram). When both of the Humidistat inputs are closed, the heater operates at maximum output. The 2-step humidistat operates accordingly.

1) When Humidistat 2 opens...

The heater output reduces the kW* effect.

*RZ-081: 10.2kW, RZ-101: 17.1kW, RZ-102: 27kW

2) When Humidistat 1 opens...

a) In **AUTO-OFF** mode - Turns off the heater completely and initiate shutdown procedure.

b) In **AUTO-VENT** mode - The heaters and reg. fan are turned off completely. Rotor motor and process fan will continue to run.

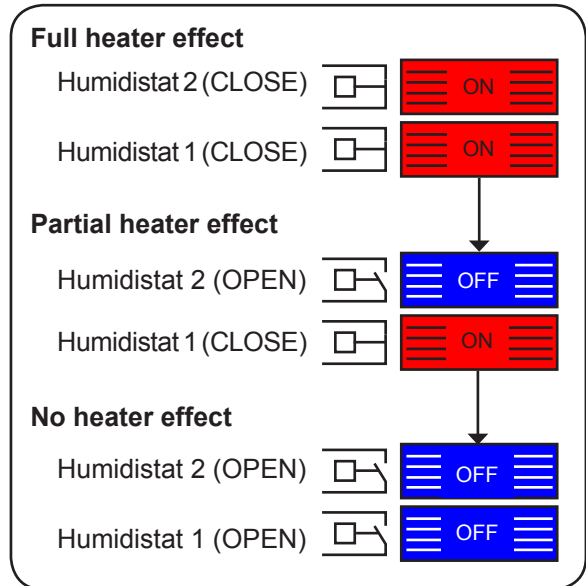


FIGURE 13: Humidistat 1 & 2 illustration

4.2.3 Electronic controllers

Electronic controller such as EH4 and EH3 are available as an option.

4.2.4 Automatic restart

Automatic restart after power failure. Also equipped with a emergency stop button and labelled with warning signs.

4.2.5 Emergency stop

When the unit is equipped with automatic restart.

4.2.6 Rotation guard

Display an alarm on the PLC and stop the unit if the rotor have stopped.

4.2.7 Energy saving

The RZ units can be controlled in 3 different "Energy saving versions.

Energy saving 1: The dehumidifier is controlled by 1- or 2-step humidistats. In example an electric-mechanical HMH, or the controllers EH3 or EH4

Energy saving 2: Controls the heater for units with electric or gas heater. Can be linear, via a triac, or binary. The dehumidifier is controlled by a regulator signal 0-10VDC, for example controllers EH3 or EH4.

Energy saving 3: Controls the regeneration airflow and thereby the steam consumption for units with steam heater. The dehumidification capacity is controlled from around 15% up to full capacity. The dehumidifier is controlled by a regulator signal 0-10VDC, for example controllers EH3 or EH4.

See appendix on energy saving

4.2.8 Linear & binary control

The heating is a combination of binary and linearly control run by a 0-10VDC external signal. This allows the unit the micro manage and adjust the heating output instantly which will dehumify with accuracy and improve the energy efficiency.

The linear is heating is controlled by a TRIAC and is coupled to the first contactor, R1. The rest of the contactors (R2-R4) are managed binary by the step controller.

The heating system will always run R1 as linear from 0-8kW. To increase the output, >8kW, the step controller will activate the contactors (R2-R4), statically, in different sequences, thus creating a greater output than 8kW. The process is reversed when the power is decreased.

"E.g. the first step of linear heating stretches from 0-8kW (R1). If the need of more heating output is required, >8kW. The step controller will activate R2 (8kW) with full effect, and at the same time the program will deactivate the R1 and restart the linear heating from zero and thus create a linear control that stretches from 8-16kW ($8kW^{R1} + (0-8kW^{R2})$), not 0-16kW. The third and fourth step is based on same process, i.e. $16^{R3} + (0-8^{R1})$, $24^{R1+R3} + (0-8^{R1})$.

See illustration.

See more details and description in the appendix.

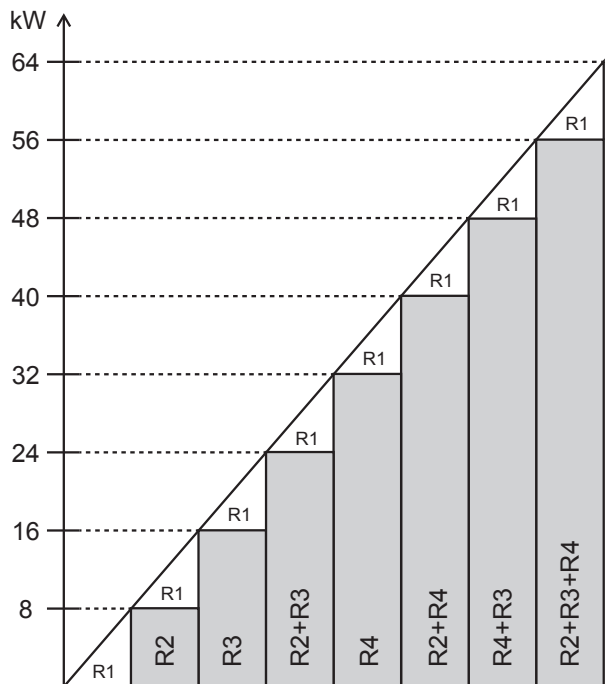


FIGURE 14: Binary and linearly control

$R1 = 8kW$ (linear heating)

$R2 = 8kW$

$R3 = 16kW$

$R4 = 32kW$

4.2.9 Adjustable rotor speed

Stepless variation of the rotor speed. Can be equipped with a manual control unit (potentiometer).

4.2.10 Frequency converter

Electronic speed regulator for electric fans.

5 Installation

DST dehumidifiers are prepared for easy connection to duct-work and electric supplies.



The dehumidifier unit must not be used in an area where there is a danger of explosion nor to treat air with dangerous amounts of explosive substances.

5.1 Duct-work

If the unit is installed inside the dehumidified area, regeneration air inlet and wet air outlet duct-work is connected to ambient. See example installation figure.



In all installations it is important to ensure that the wet air outlet is directed away from the regeneration air inlet of the unit.

If the unit is installed in a plant room, dry air supply and process air return duct-work is connected to the dehumidified area and, unless the plant room is adequately ventilated, regeneration air inlet and wet air outlet to ambient.



If a lower moisture content is required, then a damper should be installed on the dry air outlet.

The same care should be taken for the process air inlet and the dry air outlet.

Due to the high moisture content at the wet air outlet, condensation may occur within the duct-work. It is therefore recommended that the wet air outlet duct-

work is well insulated and installed at an angle so that condensate cannot flow back into the dehumidifier. If the duct must be installed higher than the outlet, a small drain hole is to be made for discharge of condensate at the lowest point in the duct-work.

5.2 Electrical connection

The terminal for connection of the supply cable is easily accessible in the left part of the electric box. The electrical supply to the unit should be three phase, voltage according to electrical diagram, and earth. No neutral is required. The connection L1, L2, L3 should be fused with slow fuses, rated according to data sheet in appendix .

Volt-free contacts are provided for wiring to remote alarm indication (normally closed, will open at alarm). The connections for these facilities are prepared on the control terminal block. Refer to wiring diagram.



All electric cables to the unit are to be drawn through the cable inlet on the right hand side of the electric box.

5.3 Humidistat connections

The step with the lowest set-point is connected to humidistat 1, see enclosed wiring diagram.

This will switch off the whole heater, regen. fan and, if auto-off is chosen, process fan and rotor motor. In auto-vent mode the process fan and rotor motor will continue to run.

The step with the highest set-point is connected to humidistat 2, see enclosed wiring diagram.

If it is a one-step humidistat it should be connected to humidistat 1. Humidistat 2 should then be bridged.

5.4 Remote connection

Beside the humidistat connections there are a remote connection that will switch off the whole unit when opened regardless of operation mode.

5.5 Steam or hot water regeneration

For units with steam or hot water, only battery is included.



At installation shall valve and steamtrap be installed externally.

- A)** Wet air duct should be slooping downward slightly in order to stop condensate from running back in to the unit.
- B)** Check that wet air out and process air in is turned from each other, so that re-circulation will be avoided.
- C)** Check that the dry air is well distributed in the dehumidified area.

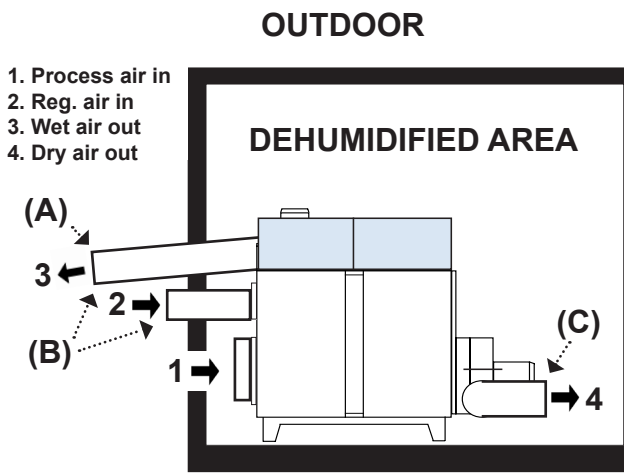


FIGURE 15: Installation

5.6 Positioning

The unit can be lifted with a fork-truck between the units feet or. The weight of the unit is shown in the data sheet in appendix.

To enable inspection and service of the unit, adequate working space must be left clear in front of the unit to allow access doors to be opened and the rotor to be removed. The free floor area in front of the inspection doors should be as wide as the unit itself. For more detailed information on working space and foot bolt-hole dimensions, see appendix.

The standard unit is designed for indoor installation. Weatherproof units can be supplied as an optional extra.



To allow securing of the dehumidifier to the floor or to a pedestal, four brackets with pre-drilled boltholes are delivered with the unit.

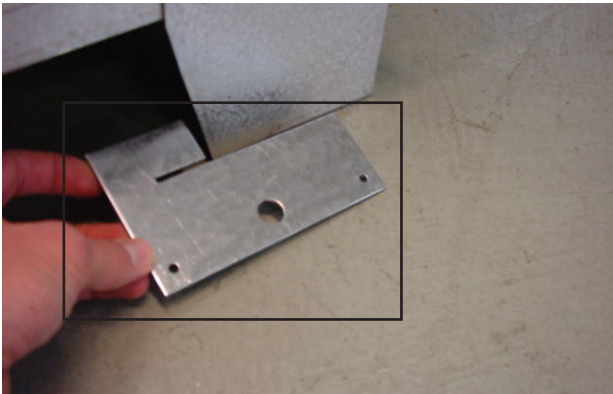


FIGURE 16: Locating bracket

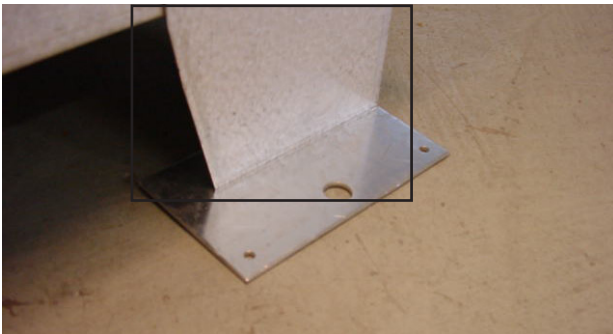


FIGURE 17: Dehumidifier leg

6 Operating

6.1 Keys

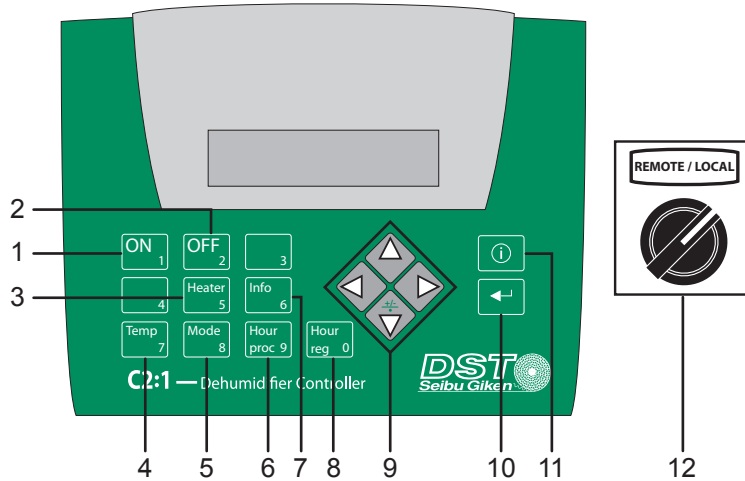


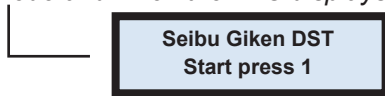
FIGURE 18: PLC-keys

1.	[ON / 1] - Start	9.	Navigation keys [▲] - Present value, software version and browse up [▼] - Set points and browse down [▶] - Browse right [◀] - Browse left	
2.	[OFF / 2] - Stop	10.		[↵] - Select choice, confirm choice
3.	[Heater / 5] - Selecting the active heater steps for electric heater.	11.		[(i)] - Display firmware information
4.	[Temp / 7] - Temperature setting for TH2 and TH3	12.		[Local / Remote] - Enable or disable the humidistat/external regulator control
5.	[Mode / 8] - Select different mode (AUTO-OFF or AUTO VENT)			
6.	[Hour-proc / 9] - Run time for process fan			
7.	[Info / 6] - Function description/Back			
8.	[Hour-reg / 0] - Total run time for regeneration heaters			

6.2 Start

The unit will initiate starting sequence by activating the process fan, rotor motor, reg. fan and heaters.

- The start-up will last for appx. 15 seconds.
- The ventilation mode can only be set when the unit is in standby-mode and when the PLC displays:



OPERATING INSTRUCTION

1. Press **[Mode / 8]** to enter venting mode*: Select "AUTO-VENT" or "AUTO-OFF" by entering "1" or "0", respectively. Confirm and exit by pressing **[↵]** twice.
2. Select mode*: "LOCAL" or "REMOTE" on **[Local / Remote]** switch (Use "REMOTE" if a humidistat/external regulator is connected, use "LOCAL" if else).
3. Press **[ON / 1]**. Display shows "Start up" and the unit will initiate starting procedure.

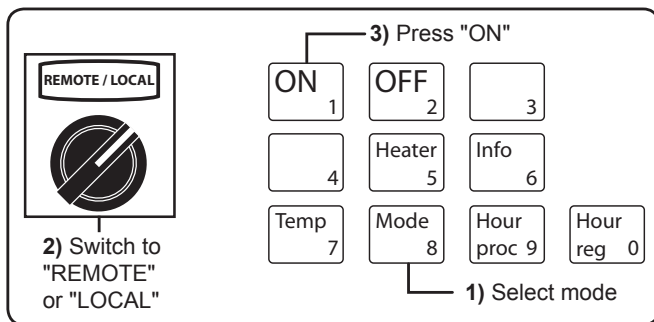


FIGURE 19: Starting the dehumidifier in AUTO/OFF or AUTO/VENT

6.3 Stop

The unit will start to shut down and come to a complete stop.

- During shut down, the regeneration fan and rotor motor will continue to run for a pre-set time as a part of a cooling stage.

OPERATING INSTRUCTION

1. Press **[OFF / 2]**

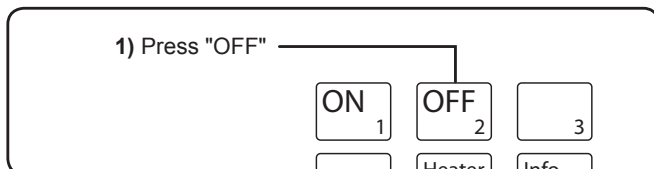


FIGURE 20: Stopping the dehumidifier



Always stop the unit according to above procedure. Use the "main switch" to shut down the unit in EMERGENCY-case only(!) If doing so, will deactivate the post-cooling procedure and may damage the rotor and the surrounding equipment due to heat build-up. See "1 Unit related safety chapter".

6.4 Run time - Heaters

Monitors the total running time for heaters.

- Can only be used during operation (Feature not available if the unit is equipped with hot water or steam heater).

OPERATING INSTRUCTION

1. Press **[Hour-reg / 0]** once to view run time for heater group 1 , press the same key again to view the rest of the heater groups and to exit the menu.

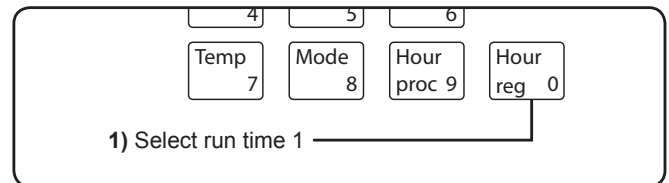


FIGURE 21: Run time for heaters

6.5 Run time - Process fan

Monitors the running time for process fan.

- Can only be used during operation.

OPERATING INSTRUCTION

1. Press **[Hour-proc / 9]** to display run time for process fan. Press **[Hour-proc / 9]** again to exit.

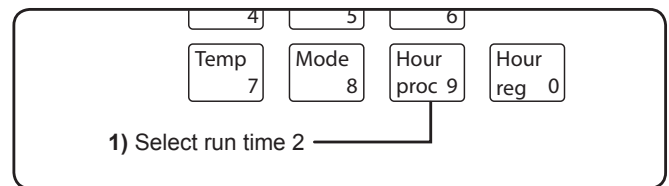
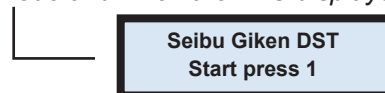


FIGURE 22: Run time for process fan in operation

6.6 Adjusting TH2 & TH3 setpoint

Adjusting the TH2 and TH3 through the PLC.

- The adjustment can only be performed during standby-mode.
- Unit with steam or hot water coil is not equipped with TH1, the menu will only display TH2 and TH3.
- TH1 is a mechanical overheat protector and is located inside the electrical cabinet.
- The setpoint mode can only be set when the unit is in standby-mode and when the PLC displays:



OPERATING INSTRUCTION

1. Press and hold **[Temp / 7]** until the menu shows up.
2. Enter the password (1919) with the numerical keys and press **[↵]**.
3. Enter TH2 temperature setting by pressing the numerical keys. Press **[↵]** to confirm and **[↵]** again to continue.
4. Enter TH2 temperature setting by pressing the numerical keys. Press **[↵]** to confirm and **[↵]** again to exit.

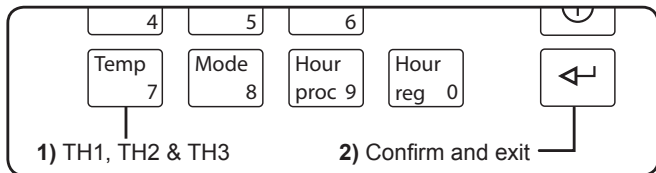


FIGURE 23: TH1, TH2 and TH3

! Do not set TH1, TH2 and TH3 temperature setting above the recommended value stated in the technical data. Consult DST-representative before changing the setpoints.

6.7 Reset buttons & switches

Fuses, overheat protections or motor protectors are found inside the electrical cabinet. The position and denotation of the devices may vary depending on the unit and configuration.

Reset the devices when asked by the PLC. See troubleshooting for more information.

See the electrical diagram for correct layout and information of the reset devices.

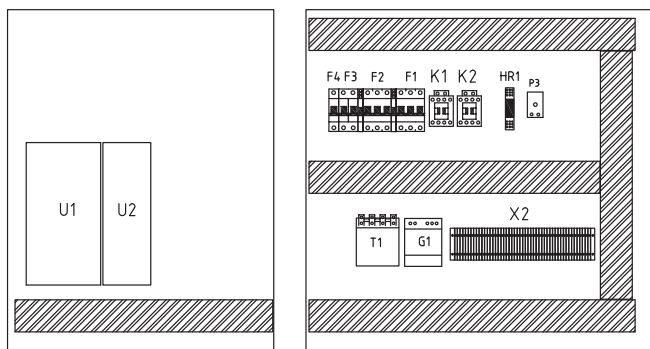


FIGURE 24: Example of a component layout inside an electrical cabinet.

! See the electrical diagram for correct layout and information of the reset devices.

6.8 Reset the PLC & restart unit

Once the error has been corrected, use the PLC to reset itself and restart the unit. If the unit does not start up, check the display for errors and correct it.

- The unit can only start when the PLC displays:



OPERATING INSTRUCTION

1. Press [OFF / 2] to remove the errors on the display.
2. Press [Mode / 8] to enter dehumidification mode*: Select "AUTO/VENT" or "AUTO/OFF" by entering "1" or "0", respectively. Confirm and exit by pressing [↵] twice.

3. Select "REMOTE" or "LOCAL" on [Local / Remote] switch.
4. Press [ON / 1]. Display shows "Start up" and the unit will initiate starting procedure.

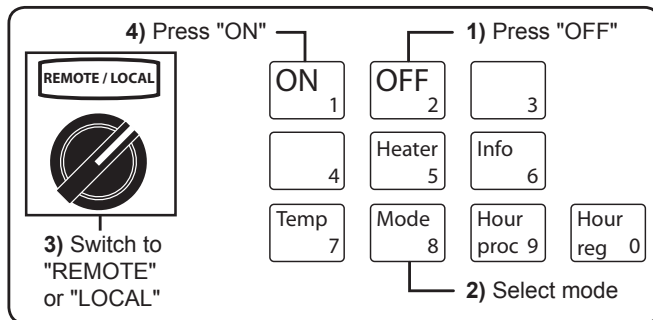


FIGURE 25: Reset PLC and restart the unit

6.9 Configuration check

During pre-operation, check the configuration according to the specification.

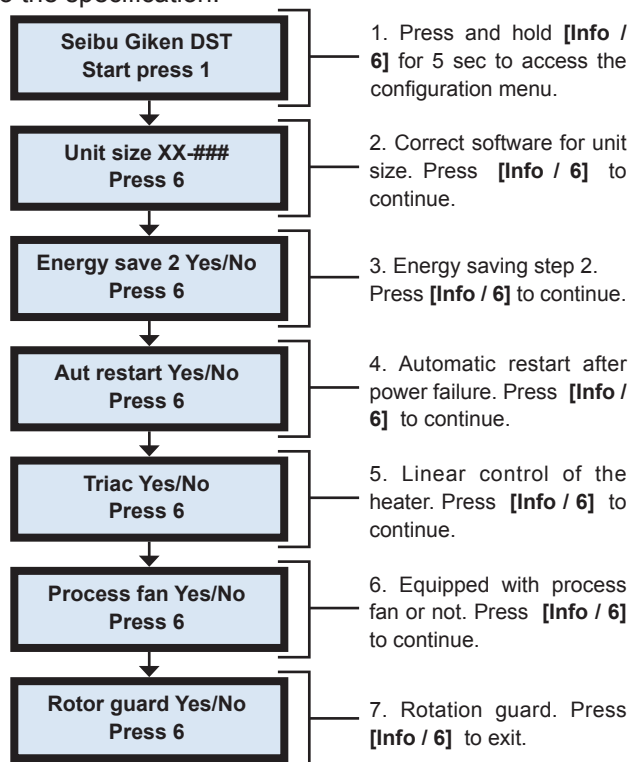


FIGURE 26: Unit configuration check

! When "Aut. Rest" is selected. The unit starts automatically after electric failure. It is up to DST's representatives to inform any parties that are involved with installation, operation,

6.10 Remote operation

A connected remote switch will act as a master switch and will shut down the unit (shutting down from remote will be the same as pressing [OFF / 2]). The dehumidifier cannot start-up on-site using the PLC or the control panel before the remote switch has been restored.

6.11 Start-up procedure

During start-up, the unit will go through a series of activation. See illustration.

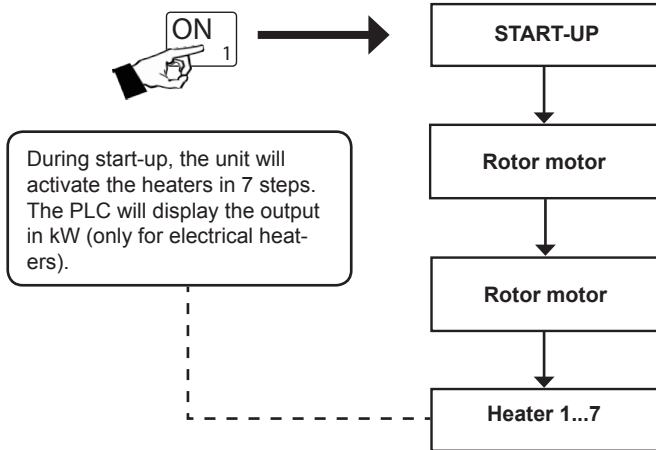


FIGURE 27: Start-up sequence

6.12 Shut down procedure

During shut down, the unit will incrementally deactivate each moving component. The post-cooling procedure will continue for a pre-set time.

The procedure applies when [OFF / 2] is pressed, remotely deactivated or when the mode is set to AUTO/OFF (controlled by a humidistat/external regulator).

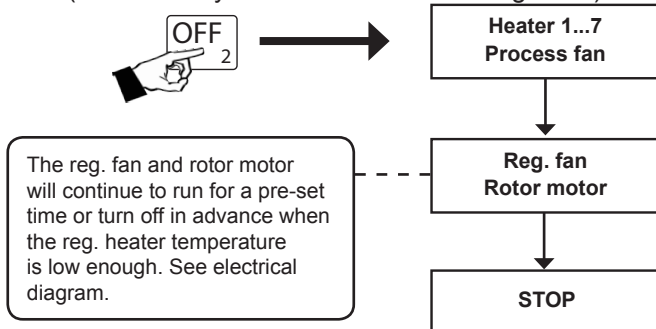


FIGURE 28: Shut down sequence

6.13 PLC operation messages

During operation the following messages may appear on the PLC. These messages are not to be confused with ALARMS codes.

LOW HUMID

When the attached external regulator is giving off a signal 0.5V or lower in a period 5 mins or more.

OPERATION HUMIDISTAT

The unit is either running on Auto-On or Auto-Off, with both Humidistats 1 & 2 opened.

OPERATION EH3

When the attached electric controller EH3 is giving off a signal of 0.5V or lower in a period 5 mins or more.

REGFAN OFF DELAY

C #### s

During shut down or standby (if an external regulator is connected or humidistat 1 & 2 is opened). The display will also show the current heater temperature and countdown until the reg. fan stops.

HUMIDISTAT1 OPEN

If the %RH has dropped below setpoint 1 (Appears only if a humidistat is connected)

STARTING UP

SYSTEM OK

Initiating the start-up sequence. All system are fully operational.

STARTING UP

DIRTY PROCFILTER / DIRTY REGFILTER

Initiating the start-up sequence. Change process or reg. filter (Units with electronic filter guard).

STARTING UP

FILTERS OK

Initiating the start-up sequence and no filter changes is needed (Units with electronic filter guards)

OPERATION ##kW

During normal operation The output will vary depending on the size of the unit.

OPERATION

During normal operation. No output is displayed if the unit is installed with hot water or steam heaters.

OPERATION TH2

Reg temp ##°C

When the maximum temperature of TH2 has been reached. The PLC deactivates the heater step by step to reduce the temperature.

OPERATION REMOTE

The connected remote has shut down the dehumidifier.

7 Starting up

7.1 Pre-operation Checks

1. Inspect and clean the inside of the unit from foreign objects such as rags, tools, particles of metal, and the like.
2. Ensure that both air balance dampers, if any, are wide open and check that the air paths of the duct-work are not obstructed in any way.
3. Check that the filters are securely in place.
4. Inspect the wiring of incoming cable.
5. Check that the rating of the electrical supply fuses is correct, see wiring diagram.

7.2 Start-up

1. Close and secure all access doors and then switch the main switch to "1"
2. Briefly switch the unit ON and then switch it OFF watching, as the fans slows down, the direction of fan rotation. If incorrect, check troubleshooting.
3. Balance the airflows, using the dampers in the duct-work. For maximum dehumidifying both dampers should be wide open. If a greater reduction in moisture content is needed the process air damper should be throttled. If the wet air outlet gets very hot (more than 70°C) or if the maximum capacity is not needed the regeneration damper should be throttled or/and a heater step can be switched off.
4. Measure the voltage on both fans and compare the numbers labelled on fan. If the voltage is too high, adjust and decrease the airflow.
5. Check performance in accordance with the capacity diagram of the dehumidifier.

7.3 Responsibilities of the operator

The safety at the machine can take place in practice, if all required arrangements are taken.



The operator of the system has to assure, that all people, which are engaged with installation, operation and maintenance or reparation of the machine, read the parts of the manual from beginning until end..

8 Troubleshooting

8.1 PLC-error codes

If an error occurs, the dehumidifier will shut down, but the reg. fan continues to operate in order to cool down the regeneration heater for a preset time. See technical data for time setting.

During shutdown, the PLC will promptly display a code, where the error is located. The table below displays the frequent error codes for the CZ-series.

CODE	EXPLANATION	CAUSE	SOLUTION
Motorst. Q1 or Q2.	Process fan overload (Q1).	Too high airflow. Motor failure.	Readjust the airflow. Reset Q1. Set point.
	Reg. fan overload (Q2).	Too high airflow. Motor failure.	Readjust the airflow. Reset Q2. Set point.
Fuse F3-6 or TH1.	Overheat protection on reg heater tripped (TH1).	Heater failure.	Reset TH1 and F3 through F5. Note that TH1 will also switch off heater fuses. For TH1 adjustment see technical data.
	Heater overload (F3 through F6).	Regeneration fan failure. Regeneration airflow blocked in some way, for example dirty filters. Very high temperature on reg. inlet.	Reset TH1 and F3 through F5. Note that TH1 will also switch off heater fuses. For adjustment see technical data.
Frost guard GT81	Freezing protection device stops the unit.	Temperature on the hot water outlet / condensate outlet is below 7°C.	Check supply and insulation for potential thermal loss. Restart the unit.
Thermostat TH3.	Wet air thermostat tripped (TH3).	Rotor has stopped. Process fan has stopped. Very low moisture load in the process air. Wet air temperature too high. Low react. air flow.	Readjust the airflow. Reset TH3.
Rotor stopped.	Rotor stopped (E2).	Rotor motor failure. Rotor motor gear. Belt transmission. Slipping belt. Distance too great between sensor and contact screw. Sensor failure.	Press [OFF/1] and restart the unit.
Fr.converter U1/U2.	Frequency converter alarm (U1 or U2).	Frequency converter failure.	Read message on the converter display, check the list/check the frequency converter manual for troubleshooting. Press [OFF / 2] and restart the unit.
Emergency stop.	Emergency stop.	The emergency button is still active.	Pull the emergency button to restore. Press [OFF / 1] and restart the unit.

FIGURE 29: PLC alarm table and solution

8.2 Capacity troubleshooting

The dehumidifier performance can be checked very simply by feeling the temperature of the uninsulated duct-work near the unit.

Normally with the unit working at nominal conditions (with process air at room temperature), the dry air duct should be warm (25-40°C) and the wet air duct should be warm or hot (30-60°C).

If the unit does not maintain the required humidity look for the following causes:

PROBLEM	CAUSE	SOLUTION
The unit does not maintain the desired %RH humidity despite operating at full capacity.	Dehumidification capacity is insufficient although both dry and wet air ducts are warm	Check the real moisture load and compare to design data. The unit may be too small. Check the airflow volumes, filter and adjustment of dampers. Check the rotor for correct position and alignment to its panel, and ensure that there are no leakages.
	Both air ducts are cold	Is the unit switched on? Is any of the motor protections alerted? Check that the wet air damper is not closed. Check the regeneration filter. Check operation of the regeneration fan.
	Dry air duct is cold and wet air duct is very hot	Check rotation of the rotor. Check process air fan. Check that the dry air damper is not closed. Check the process air filter.
The process fan and/or reg. fan is spinning in the opposite direction	The incoming phase supply wiring is incorrect	Switch the main switch to "0" and switch off incoming voltage. Change over two of the three incoming phase supply wires.

FIGURE 30: Troubleshooting and solution table

8.3 Capacity Test

If no fault can be found after checking as troubleshooting table, a performance test should be carried out on the dehumidifier, proceeding as follows.

1. The different moisture contents x (g/kg), in the four airflows, can be determined by using wet and dry thermometers. To receive the moisture contents the measured temperatures shall be plotted in a psychometric chart.

Process air in: x_{PI}

Process air out: x_{PO}

Regeneration air in: x_{RI}

Wet air out: x_{RO}

2. Calculate from the actual temperatures the density of the two outlet airflows D_{PO} (kg/m³) and D_{RO} .
3. Measure the dynamic pressure Δp (Pa) in the air ducts, by using a Prandtl tube. The dynamic pressure is measured by the difference between the total pressure and static pressure in the duct.

Measurements shall be done in a straight part of the duct-work. In order to avoid faulty measurements caused by turbulent flows, measurements should not be done close after a bend or a fan.

The flow rate in each duct can be calculated as:

$$w = (2 * \Delta p / D)^{1/2} \text{ (m/s)}$$

Where D is the densities according to item 2.

Then calculate the volume air flows, V_{PO} (m³/h) for the dry air and V_{RO} for the wet air:

$$V = w * A * 3600 \text{ (m}^3\text{/h)}$$

Where A is the cross section area of each duct.

Now determine the de-humidification capacity, Q (kg/h), by the following equation.

$$Q = (Q_P + Q_R) / 2 \text{ (kg/h)}$$

where

$$Q_P = V_{PO} * D_{PO} * (x_{PI} - x_{PO}) / 1000$$

and

$$Q_R = V_{RO} * D_{RO} * (x_{RO} - x_{RI}) / 1000$$

Compare this measured capacity to the capacity which can be calculated from the data sheet.

9 Maintenance

Before dismantling the unit, for inspection or service, the following precautions should be noted:



When dismantling the main switch shall be turned to "0".

If the unit has been in operation it should be left to cool off, for at least 30 minutes, before dismantling.

The wet air duct can be very hot if it is not insulated.

DST dehumidifiers are designed to run for long periods with little maintenance requirements. The items listed below shall however be noted;

9.1 A. Exchanging Filters

The filters should be inspected at regular intervals, the frequency of which can best be judged by experience. In storage applications where clean air conditions normally exist, the filter will typically require changing only every six months. In process work and dusty environments, the filter may need to be changed more often.

A dirty filter will in time affect the drying performance of the dehumidifier.



On no account should the unit be operated without the correct air filters installed!

9.2 B. General Maintenance

Every two years an inspection of all internal components of the dehumidifier should be carried out, the following items being blown with compressed air and cleaned with a vacuum cleaner.

1. Gear motor and belt transmission.
2. Fans.
3. Electric equipment.
4. Regeneration heater battery.
5. Access doors, hinges, locks and seals.

Depending on how dirty the dehumidifier was at the first general maintenance, the interval of inspection may be increased or decreased.

9.3 C. Washing the Rotor

The SSCR rotor contained in DST dehumidifiers has a distinct advantage over other types of desiccant rotors in that dust and grease can be washed out of the material without any need for reimpregnation after the treatment.

Before dismantling the unit, for inspection or service, the following precautions should be noted:

DST dehumidifiers are designed to run for long periods with little maintenance requirements. The items listed below shall however be noted;

1. Let the dehumidifier be shut-off for at least an hour.
2. Carefully remove the rotor from the unit. The rotor is removed in the following way:
 - a. Open the lower doors and remove the transparent polycarbonate access panel, fixed with screws, from the stainless steel rotor unit.
 - b. Remove the rotor motor and the belt tension device.
 - c. Loosen the two brackets that are holding the rotor shaft.
 - d. Support the rotor with a wooden plank or similar and push the rotor shaft from the rotor hub.
 - e. Carefully roll the rotor out from the unit, taking great care not to damage the delicate matrix.
3. Wet the rotor with water and a mild acid based detergent or with industrial alcohol and allow to soak for 30 minutes.
4. Rinse carefully with fresh water, pumped at low pressure through an ordinary hose.
5. Allow the liquid to drain from the rotor structure and blow the channels free with air. Do not hold the air nozzle too close to the rotor surface.
6. Carefully refit the rotor and its transmission belt into the unit.
7. Ensure that all peripheral and radial seals are placed correctly.
8. Start the dehumidifier again and let it operate for one hour without heater before the capacity is checked. Repeat the washing with a stronger detergent if the performance has not recovered satisfactorily.



Never use a strong alkaline based detergent, as this may destroy the rotor!

10 Technical data

Dehumidifier model RZ-

104R

Capacity [kg/h] ¹⁾	50
Nom dry air flow [m ³ /h] ²⁾	7000
External static pressure [Pa] ³⁾	400
Nom wet air flow [m ³ /h] ²⁾	2500
External static pressure [Pa] ³⁾	200
Nom heater power [kW]	64
Electric heater steps [kW]	36+18+9
Supply pressure steam battery [bar]	-
Humidistat setpoint [%RH] Step 1	-
Humidistat setpoint [%RH] Step 2	-
Motor power [kW]	3
Supply fuse 3x230/400V/50Hz [A]	250/125
Weight (appx.) [kg]	553
Speed of rotor rotation [rph]	10
Noice level [dB(A)] ⁴⁾	-
Air filter class	G4
Filter change at pressure [Pa] ⁵⁾	250
Electric compartment protection class	IP54
Humidistat connection	24Vdc
Setting thermostat TH1 [°C]	190
Setting thermostat TH2 [°C]	140
Setting thermostat TH3 [°C]	80
Regfan time delay after stop, (PLC) [min]:	15

¹⁾ Valid for inlet conditions 20°C/ 60%RH. For other inlet conditions the capacity can be calculated by the correction factor from below diagram.

²⁾ Volume flow for density 1,20 kg/m³.

³⁾ If no data is stated here the volume flow above is given at free blowing airflow.

⁴⁾ Unit connected to uninsulated ducts, nominal air flows.

⁵⁾ Units with mechanical and electronic filter guards

Correction diagram

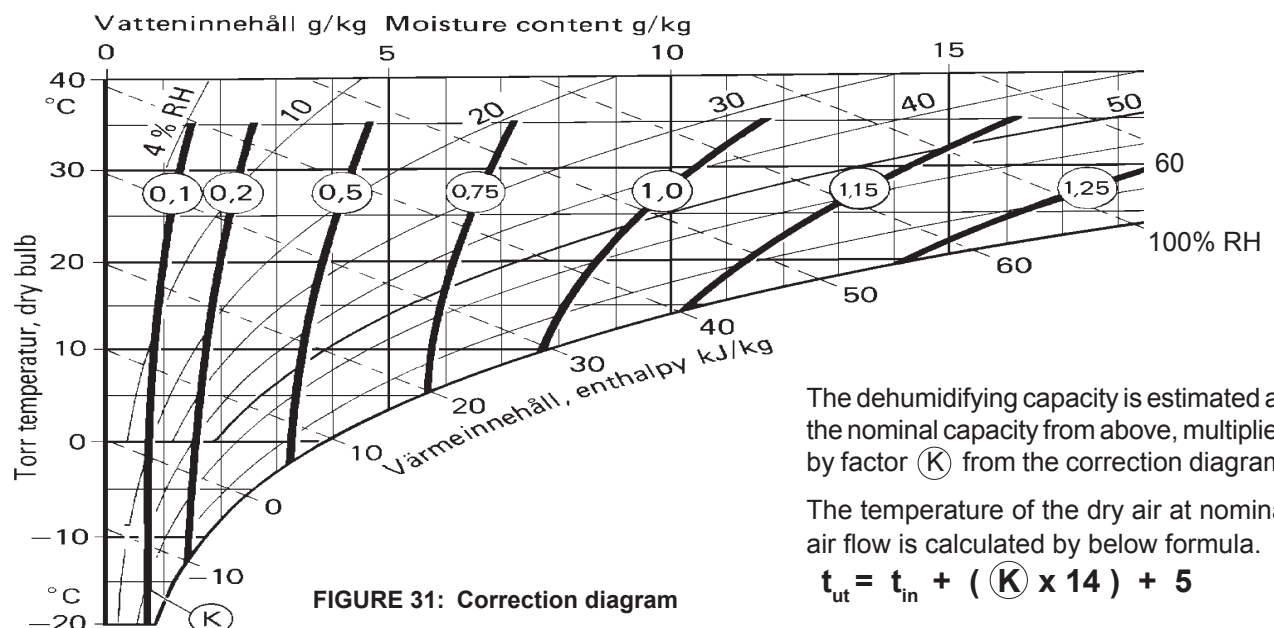


FIGURE 31: Correction diagram

The dehumidifying capacity is estimated as the nominal capacity from above, multiplied by factor (K) from the correction diagram.

The temperature of the dry air at nominal air flow is calculated by below formula.

$$t_{ut} = t_{in} + (K \times 14) + 5$$