INSTRUCTION MANUAL

DC-10 E.02 08.05

Dehumidifier
CONSORB DC-10

Seibu Giken DST AB
Avestagatan 33
S-163 53 SPÅNGA
Sweden

CE

Contents

Appendix

General Description

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 **ad**sorption principle provides great flexibility in solving humidity problems. It offers the user independent humidity control, down to dewpoints far lower than the effective operating range of refrigeration dehumidifiers.

Construction

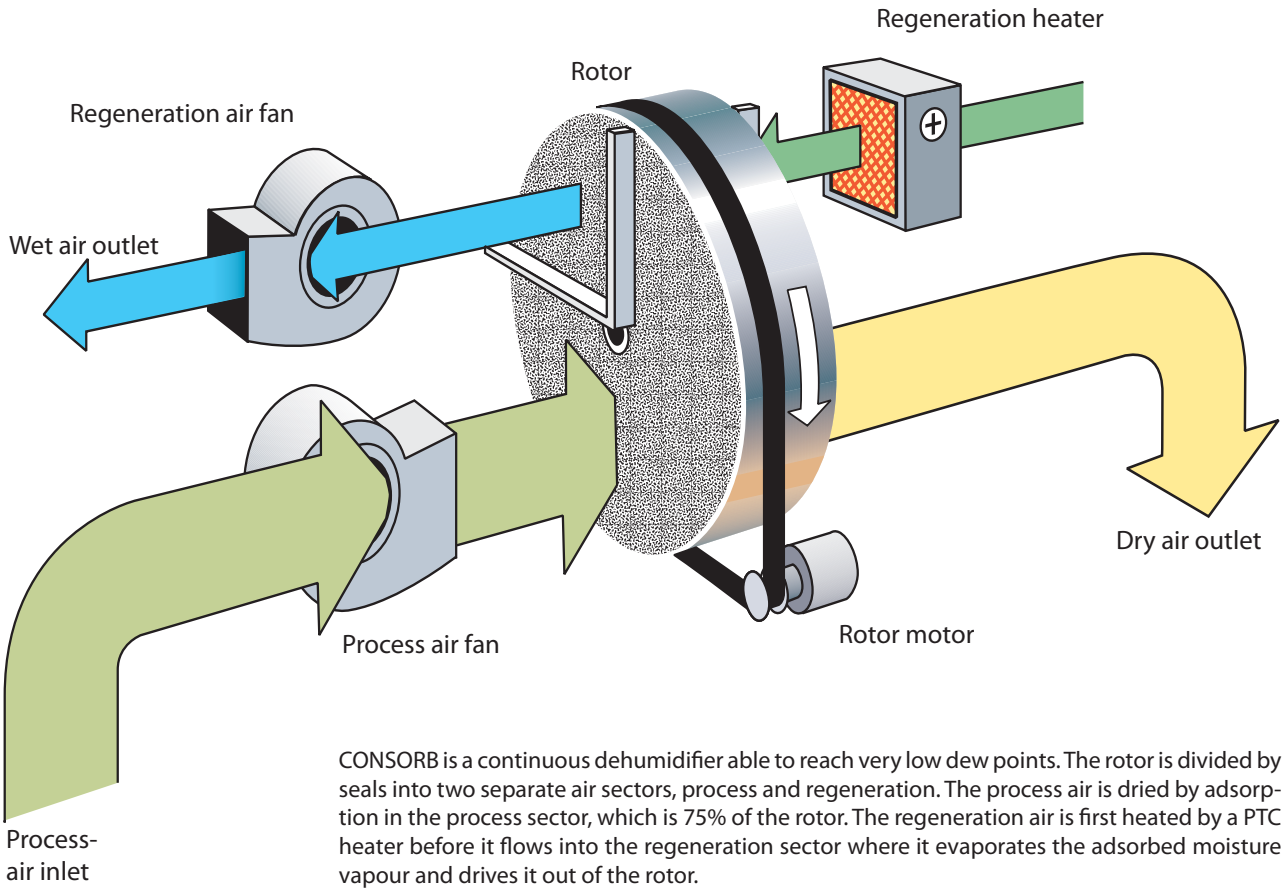
The dehumidifiers are made as complete units including rotor, fans, rotor motor and rotor drive transmission, heater for the regeneration, controls and electrical equipment.

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

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.

Principle of Operation



CONSORB is a continuous dehumidifier able to reach very low dew points. The rotor is divided by seals into two separate air sectors, process and regeneration. The process air is dried by adsorption in the process sector, which is 75% of the rotor. The regeneration air is first heated by a PTC heater before it flows into the regeneration sector where it evaporates the adsorbed moisture vapour and drives it out of the rotor.

Design

The dehumidifier CONSORB DC - 10 has a housing of 2333 stainless steel where all the different components are contained. The unit consists of rotor, filter, fans, heater for the regeneration, controls and electrical equipment.

Dismantling

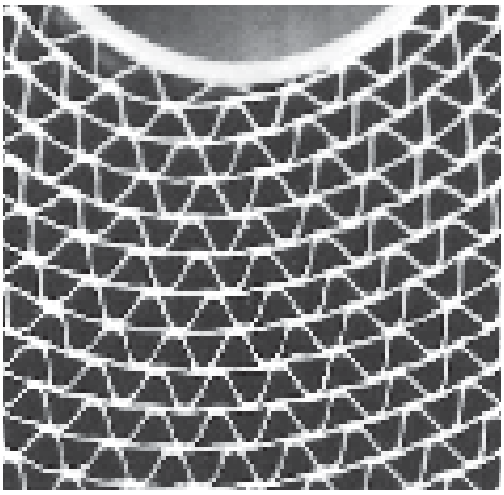
When dismantling, the unit must be electrically disconnected.

If the unit has been in operation it should be left to cool off, for at least 15 minutes.

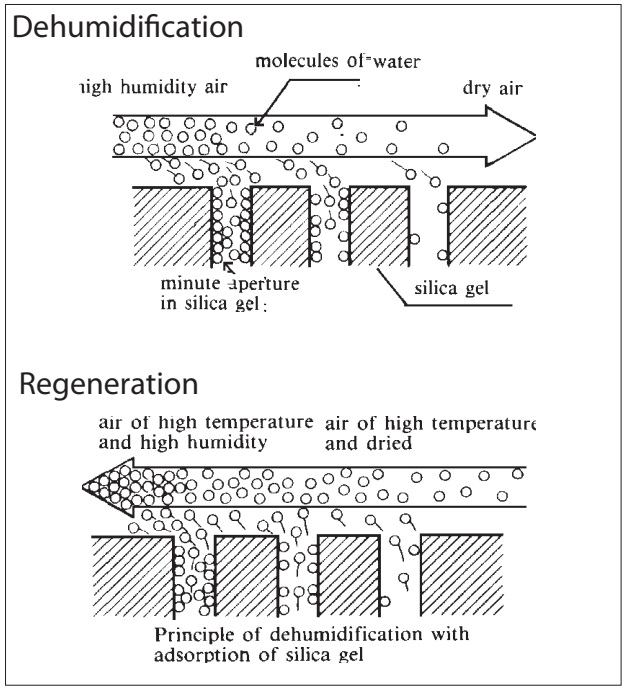
The upper part of the unit housing can easily be removed to enable service and inspection. The lid is fastened by four screws. By using the handle, the lid can be lifted off the unit in one piece.

Rotor

The heart of a DST dehumidifier is the very efficient patented Super SSCR silica gel rotor. This 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 of steel and two bronze bearings on which it rotates around a fixed steel shaft. The rotor is driven by rotor motor with a timing belt transmission.



Rotor matrix



Filter

The air filters are made as a rectangular flat sheet, cut from ordinary filter gauze.

The filter can easily be reached, without dismantling the unit, through the small panels. Process filter below the dry air outlet, and reg filter above the wet air outlet.

contin. Design.

Fans

Both fans are of medium pressure radial type, directly driven by a single-phase AC motor.

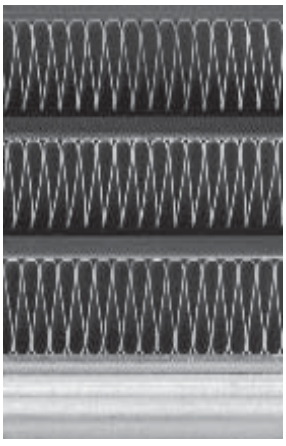
PTC Heater

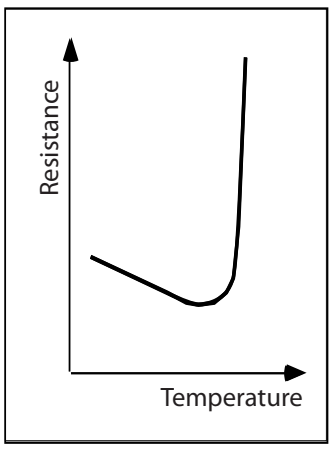
The heater is built around the PTC thermistor, which is a temperature dependent semiconductor resistor. Its resistance value rises sharply with increasing temperature after a defined temperature, the Curie point, has been exceeded. The very high positive temperature coefficient has given the PTC thermistor its name. From a practical standpoint, this resistance characteristic causes the thermistor temperature to remain essentially constant over a wide range of operational conditions. Variations in ambient temperature, applied voltage and air flow have but a small effect on thermistor temperature.

The automatic temperature limiting effect of the PTC heater prevents the formation of excessively high temperatures and thus also of fire hazard even in the event of an air flow failure.

The detrimental combustion of dust is definitely avoided. Even if the regeneration air flow is totally stopped the temperature of the heater will never exceed 230°C. The material near the heater is chosen to withstand such a temperature.

If the maximum drying capacity of the dehumidifier is not needed then simply reduce the regeneration air flow. The PTC heater will then immediately respond with a higher resistance to maintain the temperature of its surface. The reduction in current can be monitored on the ammeter (optional equipment). In other words; the less regeneration air flow the less heating output but with an almost constant temperature of the regeneration air.





PTC heater

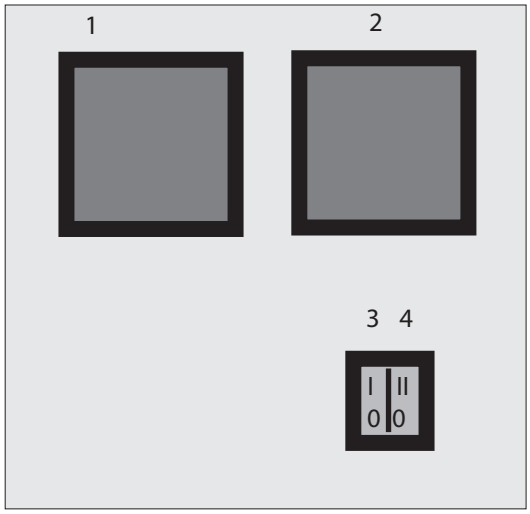
Control Panel

The switches for On(I)/Off(0) and Man(II)/Auto(0), plugged hole for elapsed time meter or ammeter, and electric supply cable are placed under the wet air outlet. The 0/1-button has lamps to indicate when the unit is switched on (0/1 button is lit).

A remote control, for example a humidistat, can be connected on the terminal block (see page 7, for installation).

Elapsed time meter and humidistat plug are available as optional equipment.

Control Panel



1. Ammeter
2. Plugged hole for extra equipment (i.e elapsed time meter)
3. ON/OFF-switch
4. MAN/AUTO-switch

Installation

DST dehumidifiers are prepared for easy connection to ductwork and electric supplies.

The dehumidifier should not be installed in an area where there is a danger of explosion, nor to treat air containing dangerous amounts of explosive substances!

Ductwork

In order to avoid recirculation, it is important in all installations to ensure that the wet air and dry air outlet ductwork is directed away from the process air inlet of the unit.

Ductwork dimensions are stated in dimension sketch on data sheet.

Ductwork pressure losses affects the capacity of the dehumidifier. The maximum capacity given in the data sheet, is valid for the back pressure stated in the data sheet. In order to receive the back pressure stated in the data sheet a damper should be installed on the dry air outlet.

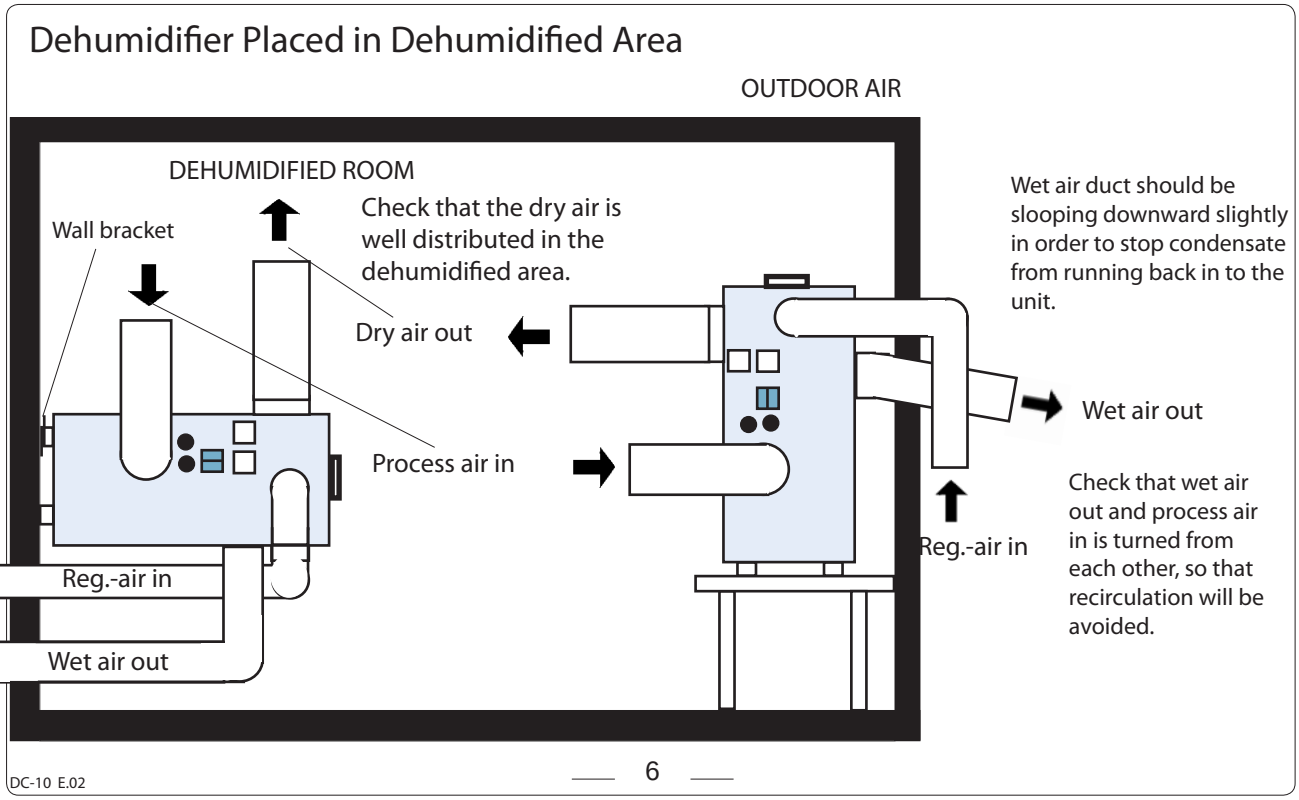
A wet air outlet damper should be installed if it is desired to have less than maximum capacity in order to save energy or when a damper is used on the dry air outlet.

If the process air is cold and has a high relative humidity, condensation may occur inside the dehumidifier at the wet air outlet. The dehumidifier itself can withstand condensate thanks to the stainless steel, however material under the unit may be damaged and therefore the dry air outlet should be throttled in order to stop the condensation.

Due to the high moisture content at the wet air outlet, condensation may occur within the ductwork. It is therefore recommended that the wet air outlet ductwork is installed at an angle so that condensate cannot flow back into the dehumidifier. If the duct must be installed higher than the outlet, it should be insulated and a small drain hole is to be made for discharge of condensate at the lowest point in the ductwork.

Dehumidifier Unit Placed Inside Dehumidified Area

Wet air outlet ductwork is connected to ambient. The process air inlet has two spigots in order to keep a pressure balance between the dehumidified area and the ambient air. The right spigot (reg-air in) should have its ductwork connected to ambient. The left process inlet spigot can be left free if the dehumidified area is well sealed from the ambient. If there is a great leakage between the dehumidified area and the ambient air a damper is to be mounted to the reg-air inlet spigot. When restricting the process air inlet sucking from the room, the dehumidifier will create a small over pressure in the room, reducing ambient air from leaking into the dehumidified area. Ensure that the dry air is well distributed in the dehumidified area.



Dehumidifier Unit Placed Outside Dehumidified Area

The wet air outlet can be left freeblowing.
Dry air outlet ductwork is connected to the dehumidified area. If an extra low moisture content is needed the lower process inlet spigot should also be connected to the area.

If the dehumidified area is not properly sealed an over pressure should be created by restricting the process air inlet flow from the dehumidified area. No process air should be taken from the dehumidified area if there are great leakages to the ambient air.

Electrical Connection

The dehumidifier is to be connected simply by plugging the 3 -core electric cable into a single-phase net according to technical data. The electric supply shall be secured according to technical data.

For automatic control the unit is prepared for a humidistat to be connected on the terminal block. For quick connection of a humidistat, there is a hole made in the panel for an optional plug as auxiliary equipment.

When the dehumidifier is in the "AUTO" mode the humidistat will shut the dehumidifier off when the actual humidity reaches a value below the set-point.

Automatic ON/OFF-control must not be used if the OFF-cycles constantly is within the time period of 3-120 seconds.

Starting Up

Starting Up

1. Ensure that both air balance dampers, if any, are wide open and check that the air paths of the ductwork are not obstructed in any way.

2. Make sure that the filter is in its position.

3. Check that the fuse in the electric supply system is the size demanded in the data sheet.

4. Start the dehumidifier by turning the On/Off-switch (0/I) on the front to "I" and the Man/Auto-switch (0/II) to "II". The built in lamp the On/Off-switch (0/I), indicating operation, will now be lit.

5. Adjust the airflows by trimming of the dampers in the duct systems for dry air and wet air respectively.

Adjusting the Dampers

Thanks to the PTC-heater the DST-dehumidifier has the facility to vary the dehumidifying capacity and energy consumption. When freeblowing the heater output should be according tecnichal data, if inlet process air has a temperature of 20°C.
For every dry air flow, there is an optimum wet air flow for maximum dehumidifying capacity. If the wet air flow is above that limit the rotor will get too warm and the drying efficiency will be reduced.

Wet Air

The wet air flow should be regulated so that the wet air temperature never rises above 50°C. The smaller the wet air flow, the lower the wet air temperature. When the dry air is not freeblowing the wet air flow should be reduced with a damper on the wet air outlet.

The wet air flow should also be restricted if the maximum dehumidifying capacity is not required.
When adjusting the wet air flow, it should be kept in mind that a dirty filter reduces the wet air flow.

Dry Air

If a lower moisture content (g/kg) is needed, the dry air flow should be reduced. The smaller the dry air flow, the lower the dry air moisture content. With a smaller dry air flow the capacity (kg/h) will decrease somewhat.

Maintenance

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

When dismantling - Disconnect the unit by unplugging the electric supply cable!

When the unit has been in operation the PTC-heater is very hot:

The unit should be left to cool off, for at least 15 minutes, before dismantling!

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 filter installed!

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. Rotor motor and belt transmission.
2. Fans.
3. Electric equipment.
4. Regeneration heater battery.
5. Access panels and seals.

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

C. Washing the SSCR 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.

Ordinary dust and dirt can be washed out with water and a mild acid based detergent while rotors affected by oil and grease should be washed in industrial alcohol. In all normal applications however, it must be emphasised that washing of the rotor should be considered as a last resort, having alleviated all other possible defects first.
The washing procedure described below is not a normal maintenance requirement and it is recommended that a trained DST engineer is consulted before proceeding.

1. Let the dehumidifier cool for at least an hour.

2. Carefully remove the rotor 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 to hold the air nozzle too close to the rotor surface.

6. Carefully refit the rotor and its transmission belt into the unit.

7. 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!

Troubleshooting

The dehumidifier performance can be checked very simply by feeling the temperature of the uninsulated ductwork 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).

…the wet air duct should be warm or hot (30-50°C).

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

A. If both dry and wet air ducts are warm

A1. Check the real moisture load and compare to design data. The unit may be too small.

A2. Check the airflow volumes, filter and adjustment of dampers.

A3. Check that the rotor is in its right position so that there is no leakages.

B. If both air ducts are cold

B1. Is the unit switched on?

B2. Check that the wet air damper is not closed.

B3. Check the filter.

B4. Check operation of the fan.

C. If dry air duct feels cold and wet air duct is very hot

C1. Check rotation of the rotor.

C2. Check that the dry air damper is not closed.

Capacity Test

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

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

   Process air in: x_{PI} (g/kg)

   Process air out: x_{PO}

   Wet air out: x_{RO}

2. Calculate from the actual temperatures the density of the two outlet airflows D_{PO} (kg/m^3) 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 static pressure in the dry air duct and the wet air duct.

   Measurements should be done in a straight part of the ductwork. To avoid faulty measurements caused by turbulent flows, measurements should not be done close to a bend or a fan.

   The flow rate in each duct can be calculated as:

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

   Where D is the densities according to item 2.

   Calculate the volume air flows, V_{PO} (m^3/h) for the dry air and V_{RO} for the wet air:

   $$V = w * A \qquad (m^3/h)$$

   Where A is the cross section area of each duct.

4. Now determine the dehumidification capacity, Q (kg/h), by the following equation.

   $$Q = (Q_P + Q_R) / 2 \quad (kg/h)$$

   where

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

   and

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

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

Technical Data

Unit Data

Dehumidifier Model DC-	**10**
Capacity [kg/h] [1]	0.6
Nominal dry air flow [m³/h] [2]	190
External static pressure [Pa] [3]	0
Nominal wet air flow [m³/h] [4]	60
Total power [kW]	1.3
Heater current [A] [5]	4.5
Supply fuse 230V/ 50Hz [A]	10
Weight [kg]	15
Speed of rotor rotation [rph]	36

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) Free blowing airflow.
5) Thanks to the PTC thermistor heater the power can be steplessly variated, by control of the wet air flow.

Data for all Single Phase DC-Units

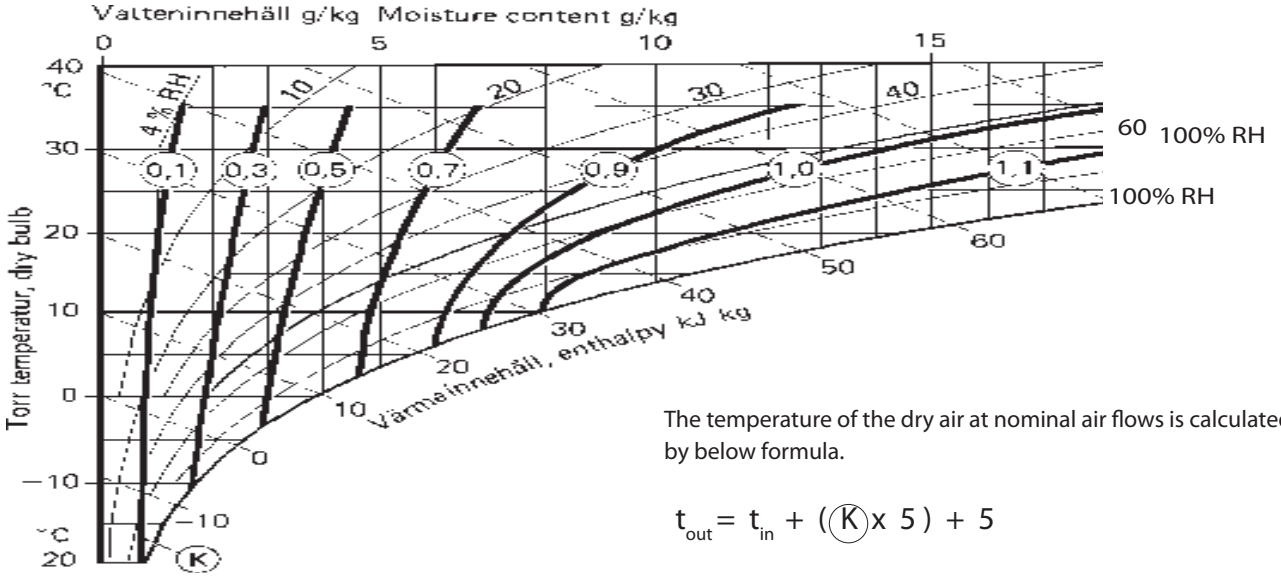
Air filter class: G4

Electric compartment protection class: IP54

Humidistat connection: 230 V, 10 A

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 flows is calculated by below formula.

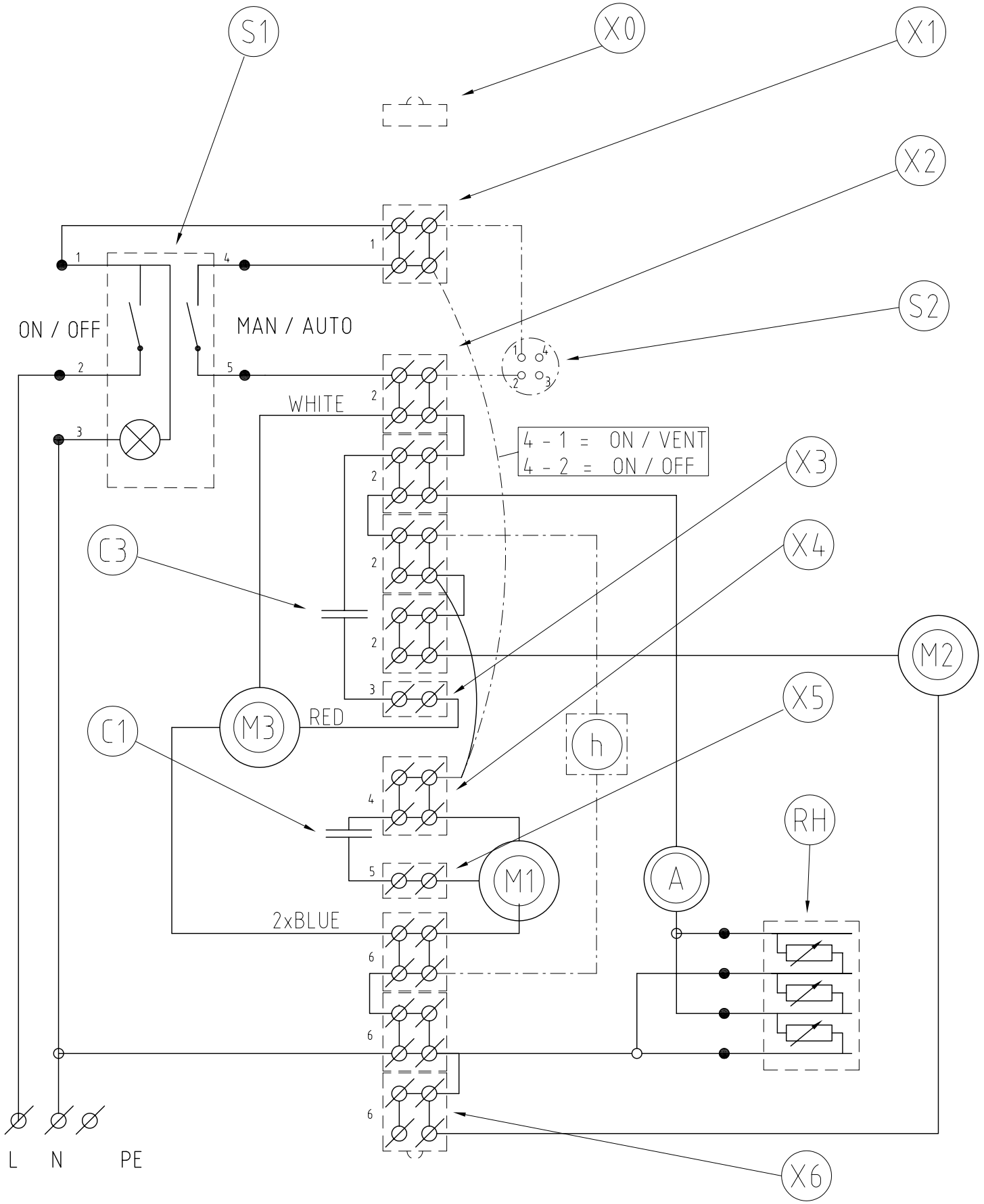
$$t_{out} = t_{in} + (K \times 5) + 5$$

Komponentlista / Component list DC-10

Pos	AntalQty	Benämning	Description	Typ, ritn nr o dyl Type, Drwg No etc	Art. Nr Art No	Tillverkare / Leverantör Manufact. / Supplier	Anmärkningar Notes
	Huvudkomponenter / Main components						
1	1	Aggregathus	Housing		104212		
2	1	Rotor	Rotor	SSCR-U 180 H 050	105411	Seibu Giken /	
3	1	Rotormotor	Rotor motor	82529435 230V 50-60Hz; 5W; 3,75rpm incl. Capacitor 0,12uF	102837		
4	1	Drivrem	Drive belt	250 XL 037	100572		
5	1	Remskiva	Belt pulley	18 XL 037 6F d=6mm	100731		
6	1	Process Fläkt	Proc Fan	G2E 140, 130W, 0,57A	101998		
7	1	Kondensator	Capacitor	3µF (incl. in fan)			
8	1	Reg Fläkt	Reg Fan	Torin DSA326-115	104211		
9	1	Värmeelement	Reg. heater	HRKK05 18/24 230V	103941		
10	0,05 m^2	Filtermatta	Filter media (Proc)	CM 360, 165x250x15 mm	100356		
11	0,03 m^2	Filtermatta	Filter media (Reg)	CM 360, 200x115x15 mm	100356		
12	0,05 m^2	Isolering, 6 mm	Insulation, 6 mm		100303		
13	2	Stos	Dry air spigot	100 mm	100029		
14	2	Stos	Inlet air spigot	80 mm	100028		
15	1	Handtag-bygel	Handle	WN 130 120 M6	100037		
16	4	Gummifot	Feet	55 mm grey M10	100983		
17	1	Typskylt DC-10	Mfgr label		101777		
18	1	Instruktion	Instructions manual		100637		
19	1	Sladdställ	Flexible cord		100022		
20	1	Remspännare	Belt tensioner		104585S		
21	1	Teflonbricka, distans	Spacer, teflon	010 2 8183.01			
22	1	Brytare, dubbel	Switch ON / OFF & MAN / AUTO	Orange / Black	101257		
23	1	Amperemeter	Ammeter	RQ48E 0-10A	100215		
24	0	(Drifttidsmätare)	Elapsed time meter	Gruner BZW 48 / 2			extra / optional
25	2	Gummipackning	Rubber seal				
26	0	(Chassikontakt)	Chassi contact for remote control	Amphenol			extra / optional
27	4	Ansl.list	Terminal block	AWG 26-14 261-334			
28	1	Ansl.list	Terminal block	AWG 26-14 261-304			
29	1	Ansl.list	Terminal block	AWG 26-14 261-306			
30	2	Ansl.list	Terminal block	AWG 26-14 261-331			
31	1	Ändplatta	End plate	AWG 26-14 261-361			
32	1	Kabelsats	Set of cables	Dr-010 B	100593		
33	1	Emballge	Cardboard box		101780		
34	1	Täckbricka, 45x45mm	Cover 45x45mm	Amp- / Elapsed time meter	100025		
35	1	Täckplugg, d=22mm	Cover plug	P208/4 DR-020	100023		

Cooke Industries - Phone: +64 9 579 2185 Email: sales@cookeindustries.co.nz Web: www.cookeindustries.co.nz

Nr	Modification	Date	Sign.
01	M1, M2 and M3	03-09-05	AL
02	Varistor borttagen	06-04-20	SO



Pos. nr.	Qty.	Description	Material/Type	Dimension	Supplier/Note
M2	1	Reg Fan	art 104211		Torin DSA326-115
X6	3	Terminal block, blue 4		261-334	Wago AWG 26-14
X5	1	Terminal block, grey 2		261-301	Wago AWG 26-14
X4	1	Terminal block, blue 4		261-334	Wago AWG 26-14
X3	1	Terminal block, grey 2		261-301	Wago AWG 26-14
X2	4	Terminal block, blue 4		261-334	Wago AWG 26-14
X1	1	Terminal block, grey 4		261-331	Wago AWG 26-14
X0	1	Terminal end plate		261-361	Wago AWG 26-14
h	(1)	Elapsed time meter		230V 50Hz	Tälje M/Gruner BZW48/2
C3	1	Capacitor		0,12 uF	ELFA
C1	1	Capacitor		3 uF	Ziehl - EBM
RH	1	Reg heater	art 100 031	230 V	DBK / OEM HR 05
A	1	Amp meter	art 100 215	0 - 10 A	Tälje Mät. IME RQ48E
M3	1	Rotor motor	art 100 017	4 rpm	Cruozet 82.305.5
M1	1	Fan motor	art 101 998	130W 230V	Ziehl-EBM G2E140
S2	(1)	Chassie contact			Amphenol/Remote, humid.
S1	1	Switch	art 101 257		Orbitus

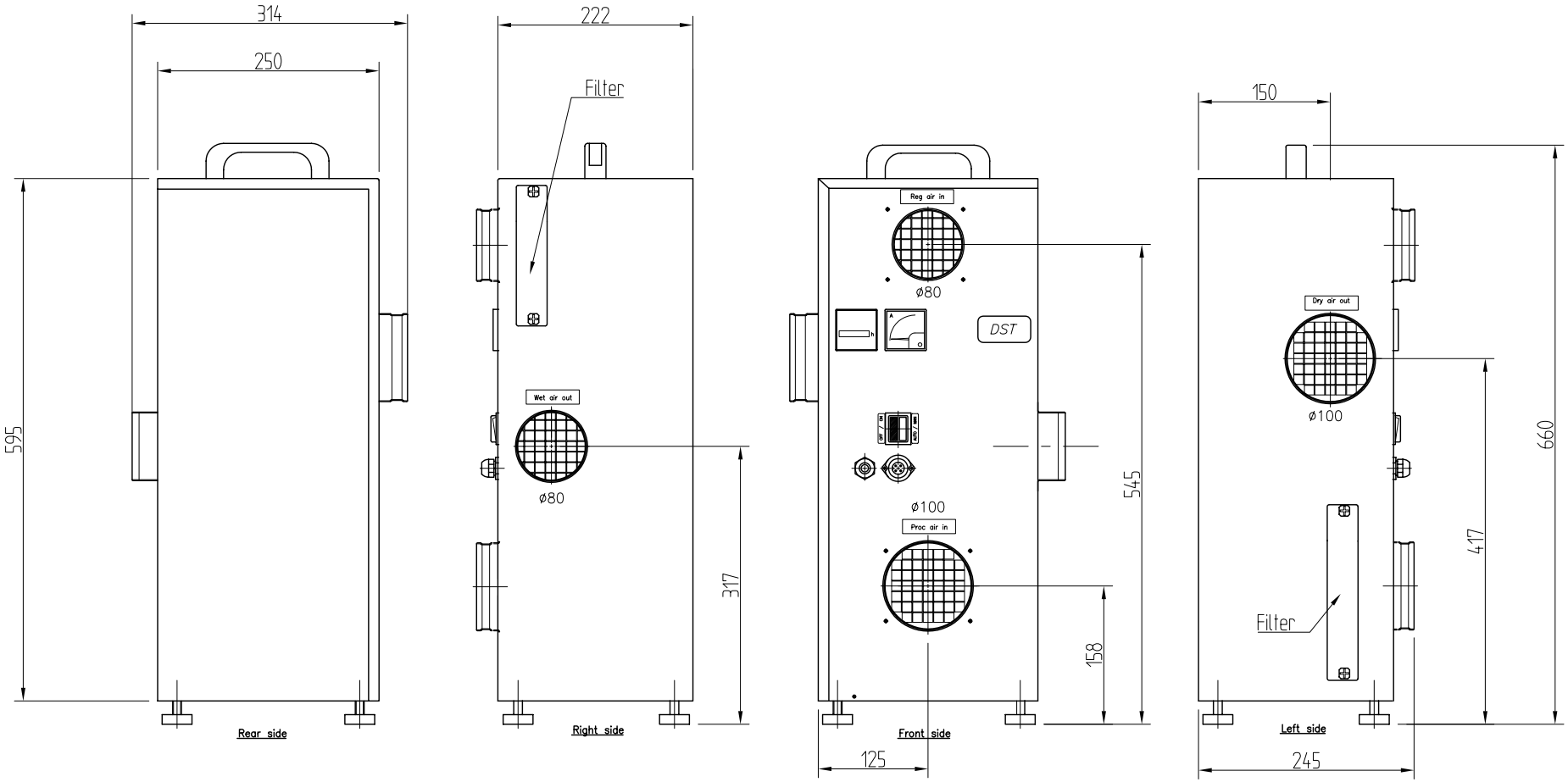
DST Seibu Giken

DC-10
Electric diagram

General tolerance SS-ISO 2768-1
General Roughness Ra

Scale 1:1 | Drawn AL | Date 03-08-25
File name 010 3 8039 | Rev. 02

Nr	Ant	ndring	Datum	Inf.	Godk.



		Dimension drwg	SS 2333		
Det.nr	Ant.	Benämning	Material	Mod.nr ämne Dimension	Anm.
Konstr.	Ritad AL	Kop. / Kontr. / Stand. / Godk.	Skala 1:5	Ersätter	Ersatt av
DST Seibu Giken		Consorb DC-10		Filnamn	Dat. 03-05-26
				Ritn.nr Dimension dwg	

EC declaration of conformity

Manufacturer:

Seibu Giken DST AB
Avestagatan 33
S-163 53 SPÅNGA
Sweden
Tel: ...46 8 445 77 20 Fax: ...46 8 445 77 39

Hereby confirms that:

Machinery type DC-10 with serial number from.0300001

a) is manufactured in compliance with COUNCIL DIRECTIVE of 14 June 1989 on the approximation of laws of the Members States relating to machinery, 89/392/EEC, with special concern to Annex I in the directive concerning essential health and safety requirements relating to the design and construction of machinery, supplemented with:

1. COUNCIL DIRECTIVE, 91/368/EEC, of 20 June 1991 ammending Directive 89/392/EEC on the approximation of the laws of the Members States relating to machinery.

2. COUNCIL DIRECTIVE, 93/44/EEC, of 14 June 1993 ammending Directive 89/392/EEC on the approximation of the laws of the Members States relating to machinery.

3. COUNCIL DIRECTIVE, 93/68/EEC, of 22 July 1993 ammending Directive 89/392/EEC on the approximation of the laws of the Members States relating to machinery.

b) is manufactured in compliance with COUNCIL DIRECTIVE of 3 May 1989 on the approximation of laws of the Members States relating to electromagnetic compability, 89/336/EEC, supplemented with:

COUNCIL DIRECTIVE, 93/68/EEC, of 22 July 1993

c) is manufactured in compliance with European Standards EN 60204-1, EN 292-2, EN 294, EN 50 081-1 and EN 50 082-1.

Spånga 22/05/03

Anders Kristoferson, Managing Director

DST Seibu Giken

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