



FRAL

RIGHT HUMIDITY ON DEMAND



Adsorption Dehumidifiers FR3000 - 5000

BY FRAL SRL

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TECHNICAL DATA

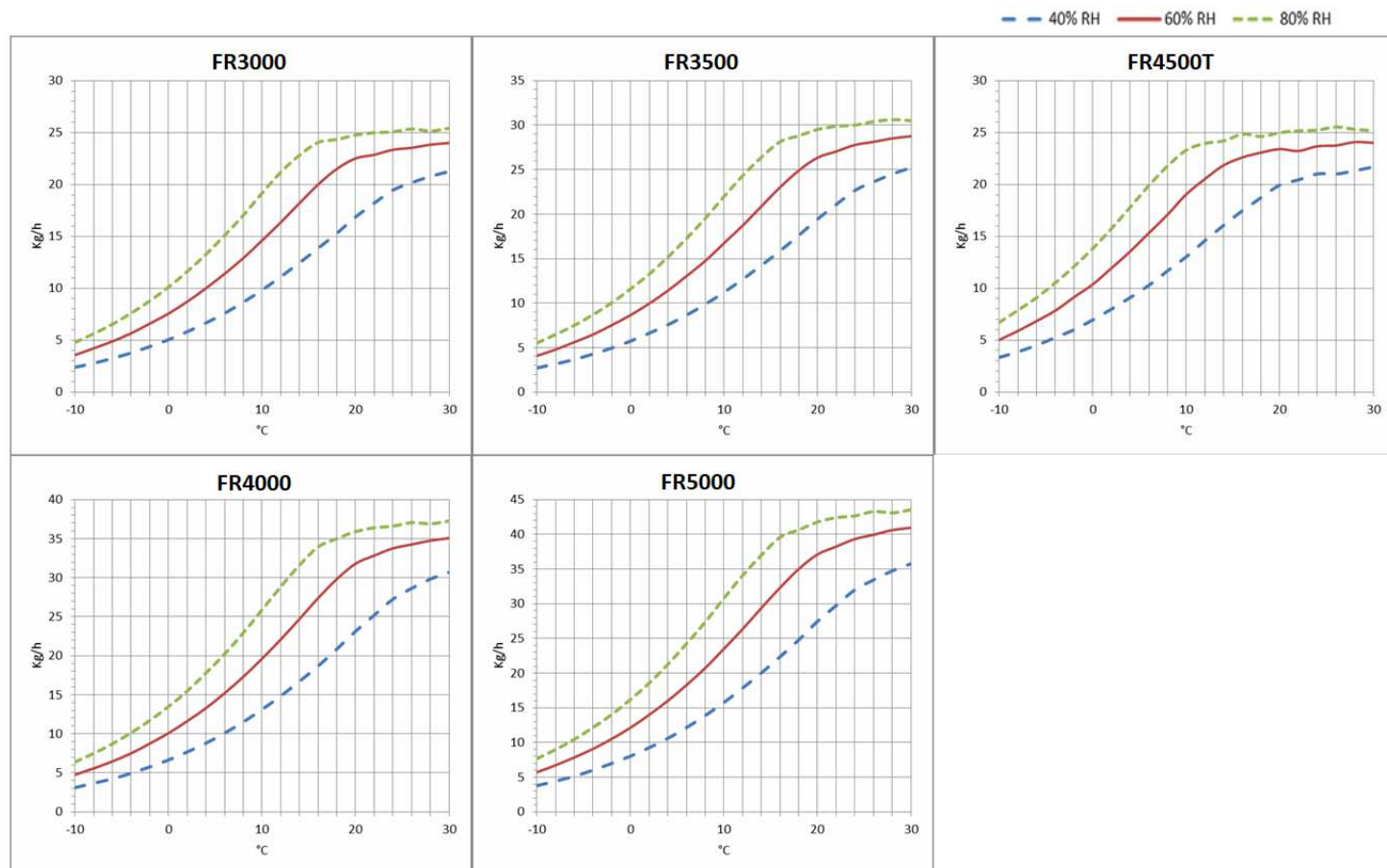
MODEL	FR	3000	3500	4500T	4000	5000
Performances						
Dehumidification Capacity *	Kg/h	23	27,3	21,1	31,7	37,2
Fans						
Process air flow	m ³ /h	3000	3500	4500	4000	5000
Static pressure	Pa	400	350	300	400	400
Fan nominal power	KW	1,65	1,65	2,4	2,2	2,2
Reactivation air flow	m ³ /h	900	1100	900	1350	1600
Static pressure	Pa	200	300	300	400	350
Fan nominal power	KW	0,49	0,72	0,72	0,75	1,1
Drive Motor						
Nominal power	W	10	10	10	10	10
Regeneration						
Regeneration type		Electric	Electric	Electric	Electric	Electric
Installed power	KW	30,0	36,0	27,0	45,0	54,0
Regeneration type		Steam	Steam	Steam	Steam	Steam
Power output heating	KW	31,1	37,9	31,1	46,6	55,2
Steam consumption at 6Bar(a)	Kg/h	54	65	54	80	95
Temperature rise in the heating coil	°C	100	100	100	100	100
Electrical characteristics						
Power supply	Volt/Ph/Hz	400/3/50 ±5%	400/3/50 ±5%	400/3/50 ±5%	400/3/50 ±5%	400/3/50 ±5%
Maximum power absorbed standard units	KW	32,3	38,5	30,3	48,1	57,5
Maximum current absorbed standard units	A	46,7	55,8	43,7	69,5	83,1
Noise level						
Sound pressure **	dB (A)	68	68	69	70	72
Sound power **	dB (A)	96	96	97	98	100

* Conditions at 20°C 60% RH

** Sound pressure level calculated in free field, 10 meters from unit, direction factor Q = 2, according to ISO 961

DEHUMIDIFICATION CAPACITY

Approximate capacity in Kg/h with different relative humidity values of inlet process air (RH%).



PRINCIPLE OF OPERATION

The dehumidifier operates with 2 airflows. The main airflow, the PROCESS AIR is what is dehumidified and a second, smaller, airflow is used to regenerate the rotor material. Two high efficiency fan and motor assemblies inside the machine create these separate airflows in opposite directions through the rotor. The PROCESS AIR is taken through the dehumidification rotor and moisture is taken up by the desiccant material bonded to the rotor structure. Mainly Silica Gel is used, which is a hygroscopic material capable of holding many times its weight in moisture, but always as a vapour and with no free water. As it passes through the rotor, the moisture in the air is absorbed by the Silica Gel and sent from the machine as a dry air stream for onward processing, or direct to a conditioned room as required.

This dehumidification process is reliable between extremes of temperature, from as low as

-30°C and as high as +40°C.

During the process the rotor is turned very slowly by a small motor and reduction gearbox, driving a belt with friction contact direct to the rotor surface.

The separate REGENERATION AIR stream is taken through the dehumidifier in the opposite direction, through a heater bank where the temperature is raised typically by +100°C above ambient. This heating increases the capacity of the air to hold moisture and as a result of the vapour pressure differentials between this air stream and the rotor surface, moisture is given back to the regeneration air stream and passed out of the building as a vapour.

The rotor is then ready to absorb more moisture as it is turned and the whole process can continue.



STRUCTURE

The dehumidifier casework is made from painted galvanized steel insulated sandwich panels as standard, or in AISI304 stainless steel if required by the process. The top panel is removeable for maintenance and access to electrical components whilst access to internal components is through the front. Connections for the airflows to and from the dehumidifier would typically be in standard galvanised spiral ducting.

FANS

Fans are directly coupled to single-phase or three-phase motors rated at IP55, ISO F, class B. They are accessible for maintenance by removing a second internal panel so that in operation risk of injury is mitigated. The fans can be controlled by an optional frequency converter to control rotation speed and match performance with specific requirements. As standard, the process fan is set at fixed speed, but it can be configured to run at variable speeds from an external signal, or pressure sensor.

ROTOR

The desiccant rotor installed in the dehumidifier is the best currently available to the market, offering approximately 8% better moisture removal capacity and 25% less air pressure drop than the leading competitor. The rotor has a finely fluted structure manufactured from corrugated and heat resistant material and offering a huge contact surface area for the process air stream in a very small volume. The fluted and laminar nature of the structure affords a high contact area with the passing air flow to maximise moisture removal.

The rotor is not affected by saturated air and can therefore be used in conjunction with a pre-cooling coil. Additionally, the rotor will not be damaged if either of the airflows stop for any reason. The rotor does not shed particles and will not support the spread of flame (non-combustible).

TRANSMISSION SYSTEM

A belt drive system is used to turn the rotor. This movement is typically between 6 and 12 rph, and uses a powerful direct drive motor and reduction gearbox, operating on a belt with frictional contact with the outer rim of the rotor drum. A belt tensioning system is used to maintain correct belt tension and avoid slip. The rotation of the rotor is visible by removal of the front access panel so correct operation can be determined. The rotor is suspended on ball bearings around a central steel shaft.

REGENERATION AIR HEATING COIL

Electrical. The electric regeneration coil has steel elements, star connected, and divided into 2, 3 or more sequential control banks for power modulation. On demand, a continuous modulation with proportional power control can be used to increase the efficiency of the dehumidifier and save energy.

Steam. Steam regeneration coils are made of 304 grade stainless steel tubes with aluminium fins (options are available for other materials), and include a 2-port valve with modulating actuator to control the steam flow and thus the dehumidifier performance.

FILTERS

The dehumidifier has two separate G4 filters: one on the process air inlet and the other on the high temperature regeneration air inlet. On request, higher grade filters can be supplied.

PLC CONTROL WITH TOUCH-SCREEN TERMINAL

All standard units are provided with PLC control. The PLC controls the following functions: regeneration temperature regulation, thermal protection, regeneration cool down timing, component start sequence, alarm resets, RH or dewpoint control (dependant on control required) and control of pre and post-cooling or heating. The user interface display can be positioned remotely. The PLC is set for heater control from an external humidistat. On request, it can be adapted for connection to remote BMS systems. Operation with various MODBUS protocols can be discussed with the technical department if this is what is required by the process.



ELECTRICAL PANEL

The electric panel is made in compliance with European regulations 73/23 and 89/336. Access to the electrical panel is from the top after the panel is removed. All units include the following components as standard: mains

switch, magneto thermal switches (for fan and electric resistance protection), fan relays, gearmotor relays and electric resistance relays (if any). The panel is also equipped with a terminal block with clean contacts for remote ON-OFF control and clean contact for general alarm.

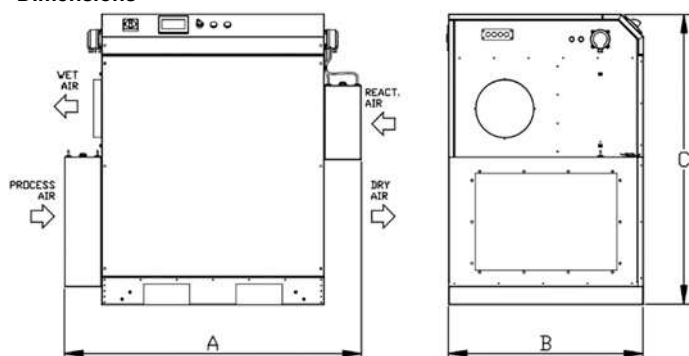
VERSIONS

FR...	Standard
FR.../TX	Version with external satin stainless steel frame 304
FR.../TTX	Version with steel frame completely inox304 interior and exterior satin
FR.../STC	Construction version, with pivoting wheels
FR.../M	Handed version (Process and Regeneration airflows are reversed)

FR Model	Code	3000	3500	4500T	4000	5000
Painted steel frame		●	●	●	●	●
Satin stainless steel frame 304	TX	○	○	○	○	○
Frame totally stainless steel304 and satin finish outside	TTX	○	○	○	○	○
Construction site version with pivoting wheels	STC	○	○	○	○	○
Frame Handed version	M	○	○	○	○	○
Filters G4 process and reactivation		●	●	●	●	●
Filters F5, F7, F9		○	○	○	○	○
Recovery regeneration heat	RCFX	○	○	○	○	○
Purge area for low Dew Point	LDP	-	-	-	-	-
Pre-cooling water coil	W	○	○	○	○	○
Post-cooling water coil	PW	○	○	○	○	○
Post-heating water coil	PHW	○	○	○	○	○
Proportional 3way-valve for pre/post-treatments (supply only)	3WSF	○	○	○	○	○
Proportional 3way-val. for pre/post-treatments (with assembly)	3WCM	○	○	○	○	○
PLC electronic control and touch-screen display		●	●	●	●	●
Remote terminal	TR	○	○	○	○	○
Different power supply voltage		○	○	○	○	○
Proportional control PWM regenerationheaters	PWM	○	○	○	○	○
Proportional 2way-valve for steam regeneration	2VS	○	○	○	○	○
Process fan inverter (VFD)	VFP	○	○	○	○	○
Regeneration fan inverter (VFD)	VFR	○	○	○	○	○
Process filter alarm	ALFP	○	○	○	○	○
Regeneration filter alarm	ALFR	○	○	○	○	○
Circular spigot connections for processes/regeneration	CP	○	○	○	○	○
Temperature sensor / RH%, Absolute Humidity, DewPoint	ST / H	○	○	○	○	○
Serial RS485 ModBus Interface		●	●	●	●	●
TCP-IP ModBus Interface		●	●	●	●	●
Other protocols and other accessories on request		○	○	○	○	○

● standard, ○ optional, – not available.

Dimensions



Model	FR	3000	3500	4500T	4000	5000
A	mm	1500	1500	1500	1895	1895
B	mm	1020	1020	1020	1115	1115
C	mm	1395	1395	1395	1500	1500
Empty weight	Kg	350	360	360	490	530
Connections						
Process air inlet	mm	825 x 500	825 x 500	825 x 500	800 x 520	800 x 520
Dry air outlet	mm	825 x 500	825 x 500	825 x 500	800 x 520	800 x 520
Reactivation air inlet	mm	355 x 290	355 x 290	355 x 290	415 x 350	415 x 350
Wet air outlet	mm	Ø 280	Ø 280	Ø 280	Ø 315	Ø 315