



HUM-S series

Ultrasonic humidifiers

» Operation manual





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Intended use of the product

The product is designed for effective and controlled humidification of the air at atmospheric pressure in the temperature range from +5°C to +40°C. It can either be used as a stand-alone unit installed inside or outside of the premises to be humidified or together with an air treatment system.

Some examples of ultrasonic humidification:

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- Textile industry - electrostatic charging removal and dust reduction;
- Paper manufacturing - electrostatic charging removal and dust reduction;
- Server rooms - electrostatic charging removal;
- Electronic components production - electrostatic charging removal and humidity control;
- Automotive production - humidity control and dust reduction;
- Plastics industry - electrostatic charging removal and dust reduction;
- Warehouse premises - humidity control, dust reduction, shelf life increase;
- Different purposes laboratories – air humidity control;
- Tobacco industry - humidity control and dust reduction;
- Fruit and vegetables storage – humidity control;
- Green houses, growing rooms, hot houses – maintaining of required humidity level;
- Local misting - creation of scenes during filming for environmental simulation (fog, smoke of gunfire etc.)

Operating principle

Ultrasonic humidification principle is based on two effects superposition:

1. Capillary-wave theory

Ultrasonic generators generate surface Rayleigh waves of a regular shape in a water tank. Finest water mist originates from the waves crest and is injected into the atmosphere.

2. Cavitation bubbles collapse

Oscillator (transducer) amplitude variation causes strong hydraulic shocks which generate finest cavitation bubbles. Further collapse of these bubbles results in fine water mist in the air.

Superposition of the two mentioned effects in ultrasonic humidifiers ensures generation of uniform water mist with **minimum** power consumption!

An piezoelectric transducer located in the water layer transforms a high-frequency signal into high-frequency mechanical oscillations. Since the oscillation speed increases to the level when water particles are not able to follow the transducer oscillating surface anymore alternation of high-ratio instantaneous compression and vacuum occurs resulting in generation of air bubbles (cavitation). At cavitation standing capillary waves are generated, the finest droplets disrupt the water surface tension and rapidly spread in the atmosphere in the form of steam and then they are absorbed into the air flow.

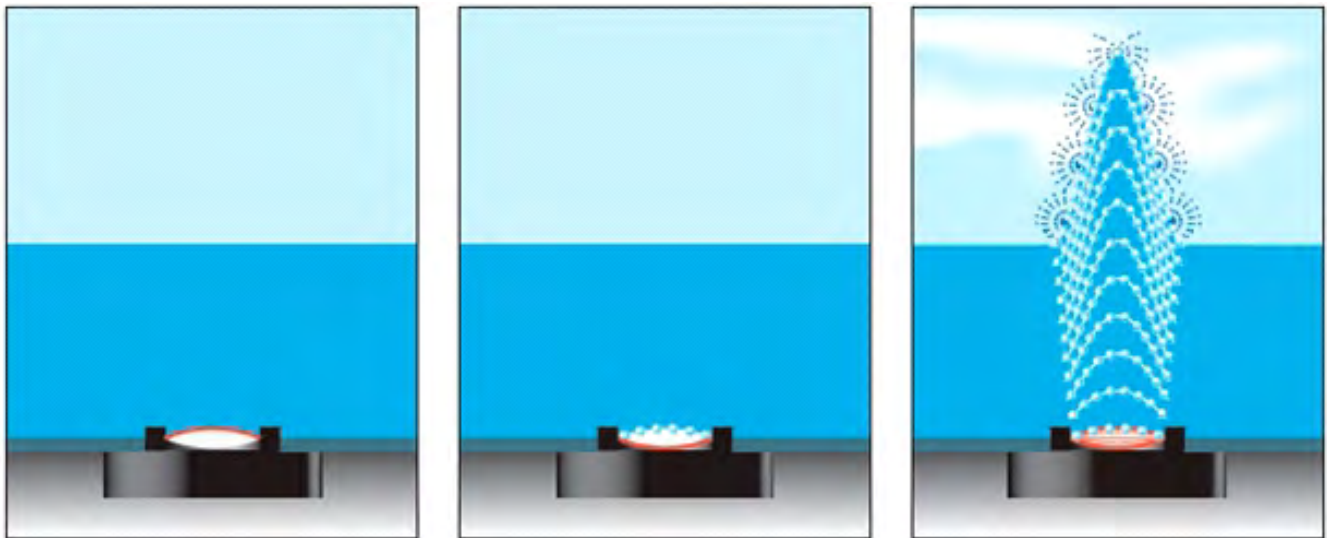
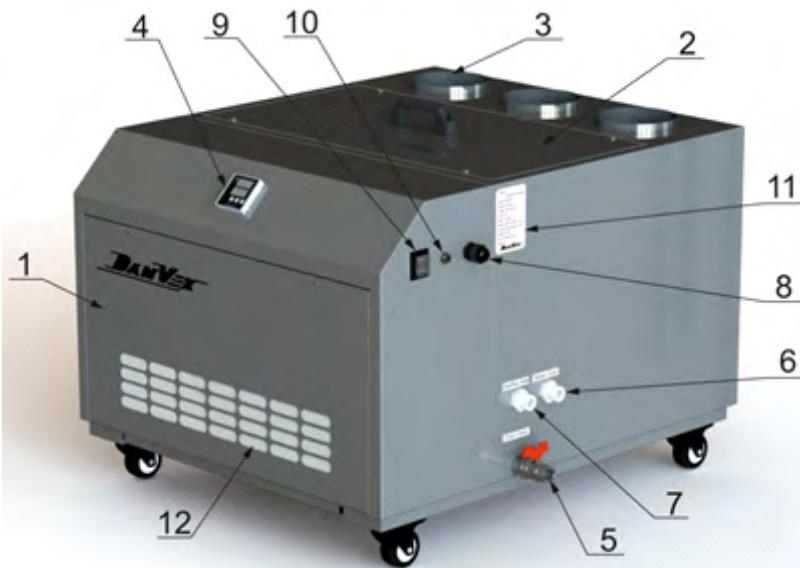


Fig. Water mist generation stages (from left to right):

1. The humidifier is switched on, the transducer (oscillator) membrane is in positive position; 2. Transducer membrane is in negative position, vacuum is generated due to inertia of the water; 3. After ten membrane oscillations the humidifier reaches its maximum capacity.

Product design



1. Front removable panel
2. Top removable panel
3. Steam pipe socket
4. Main controller
5. Drain valve
6. Water supply fitting
7. Water overflow fitting
8. Power cable entry
9. Mode selector switch
10. Humidity sensor connector
11. Marking
12. Replacement air filter

Front removable panel: used for air filter replacement; for inspection, maintenance and repair of the humidifier electrical components;

Top removable panel: used for maintenance of piezoelectric transducers and float valve system;

Steam pipe socket: used for connection of the output steam pipes (not included);

Main controller: used for display of the current humidity level and for setting of required humidity level;

Drain valve: used for water draining from the humidifier before maintenance works and during standstill;

Water supply fitting: used for the supplied demineralized water (pressure of 1-4 atm.);

Water overflow fitting: used for overflow prevention;

Power cable entry: used for the humidifier power supply;

Mode selector switch: used for selection of the humidifier operating mode (switched off – automatic mode – manual mode);

Humidity sensor connector: used for connection of remote humidity sensor;

Replacement air filter: used for incoming air treatment.

Dimensions and weight

Model	HUM - 3S	HUM - 6S	HUM - 9S	HUM - 12S	HUM - 15S	HUM - 18S	HUM - 24S
Overall dimensions	600×330×495mm		640×550×500mm		700×600×500mm		700×650×640mm
Dimensions of the package	700×440×620mm		700×660×620mm		790×710×610mm		790×760×750mm
Weight	25 kg	29 kg	35 kg	39 kg	42 kg	45 kg	52 kg

Technical specifications

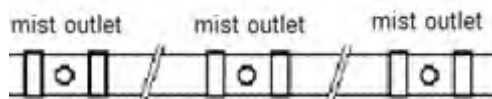
Model	HUM - 3S	HUM - 6S	HUM - 9S	HUM - 12S	HUM - 15S	HUM - 18S	HUM - 24S
Capacity	3 kg/hour	6 kg/hour	9 kg/hour	12 kg/hour	15 kg/hour	18 kg/hour	24 kg/hour
Voltage	220V/1/~50Hz						
Power demand	300 W	600 W	900 W	1200 W	1500 W	1800 W	2500 W
Head	20 Pa		40 Pa		50 Pa		
Steam pipe socket diameter	1 pc. (Ø110 mm)		2 pc. (Ø110 mm)		3 pc. (Ø110 mm)		
Air filter dimensions (EU3 class)	245x130x12		445x105x12		445x105x12		
Protection class	IPX0						
Connecting fittings	1/2 "						
Humidity sensor cable length	2 m						

Installation

Since the device is equipped with an ultrasonic transducer it is recommended to place the air humidifier as far as possible from electromagnetic sources. In case of electromagnetic disturbances from the electrical power network it is required to install an additional filter. Power wire section should not be less than 1,25 - 2,00 mm².

For correct operation the humidifier should be located on a flat surface. The minimum length of a straight steam pipe should not be less than 1,5 meter over the humidifier housing to prevent water mist entering the humidifier air intake channels. In case a guiding square elbow is mounted on the steam pipe the connection area should be sealed and the distance from the steam pipe end and the humidifier housing should be at least 100 mm to protect the housing from water since it can cause damages. Resistance of the ducts must be not more than 20 Pa for models HUM-3S, HUM-6S and not more than 40 Pa for other models.

For better water mist distribution inside a room it is necessary to use a steam pipe with diffusers. In this case the steam pipe should not have height differences and its internal surface should be smooth to prevent water accumulation.



Water quality requirements:

Dimensions of the solid particles should not exceed 100 micron and Demineralized water (demineralization no more than 5 mg on liter). If the water quality does not meet the mentioned requirements the humidifier must be equipped with a water demineralization device.

Attention! Never refill water through steam pipes! It will cause the humidifier failure.

It is not allowed to use the device without grounding. Grounding cable section should be 20% larger than the section of power wires.

Commissioning

Prior to commissioning it is necessary to make oneself aware of operating conditions and to observe them during operation:

Operation temperature	+5..+40°C	Water pressure	1 - 4 bar
Range of humidification	10 - 98%	Water temperature	+1..+30°C
Water quality requirements	Clean main water (with softener)	Environment	Do not place near IR heaters; Do not place near strong magnetic field sources; Use in premises with low dust content

Prior to the first start-up it is necessary to open service panels and to make sure that there are no foreign objects. It is also necessary to make sure that filters are installed, power and water supply lines are properly connected to the humidifier. After inspection the service panels should be closed. It is prohibited to operate the humidifier with open panels.

The humidifier is started by selection of an operating mode with a 3-position switch located on the right side panel. Before the operating mode selection it is necessary to open the water supply and to wait till the humidifier tank is filled with water.

The humidifier has two operating modes: manual (MAN) and automatic (AUTO). In manual mode (MAN) humidification is continuous. In automatic mode (AUTO) humidification is performed until a humidity set-point is reached. Humidity level is controlled by means of a remote humidity sensor. The humidity sensor connector is near mode selector switch. Humidifier automatic operation is impossible without the humidity sensor.

Humidity parameters are monitored and controlled by a controller located on the humidifier front panel.








Humidity controller indicators:

- **RUN** indicates that the humidifier is running;
- upper **PV** figures display current humidity values;
- lower **SV** figures display the set humidity.

Buttons of the humidity controller:

- used for entering the parameters menu;
- used for humidity level increase;
- used for humidity level decrease.

To set the desired humidity level press , then use  and  to choose the humidity value. Press  and set the operating threshold (SHC) at humidity change. To apply the settings and to leave the menu press  again.

For example. The operating threshold (SHC) is set at 2%. If PV parameter value is 2% above SV parameter value the device will stop automatically till PV parameter value is 2% lower than SV parameter value. As soon as this condition is fulfilled the device will switch on again.

The humidifier default setting is 80%. The desired humidity can be set from 0% to 100%.

Attention! It is not allowed to place the remote humidity sensor in the area directly exposed to water mist!

Maintenance

To assure the humidifier long-time and trouble-free operation its timely cleaning and maintenance is required.

Prior to any operations on the humidifier it is necessary to disconnect it from the electric network and to drain water from the tank using a cock located on the humidifier housing.

Before a long shut-down period it is necessary to drain water from the tank, remove the tank top panel, wipe with a dry cloth and let the device to dry out.

After a long period of operation various hard deposits can form on the tank surface and on the piezoelectric radiators panel which have a negative effect on spraying. To assure nominal humidification it is necessary to keep the panel with radiators free of any deposits. It is prohibited to use household detergents for tank and radiator panel cleaning. Do not touch the nozzles. Cleaning should be carried out at least 1 time per month. Proceed as follows :

- open the top panel;
- wipe the tank and the upper part of the piezoelectric radiators panel with a soft cloth or brush;
- wash the tank and the panel with flowing water. Avoid water contact with electronic components. It can cause a short circuit;
- wipe the surfaces with a dry cloth and replace the top panel.

If the humidifier is used with interruptions it is required to change the water in the tank on a regular basis.

Water filter cleaning should be carried out at least once a month. For this purpose proceed as follows:

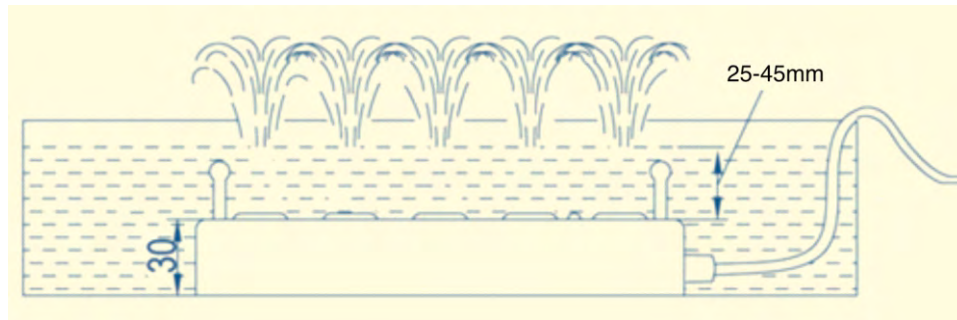
- open the water filter housing;
- wash the filter element;
- assemble the filter.

Attention! The supplied water quality strongly influences the device durability. To improve the water quality it is recommended to use additional filters for dematerialized water treatment.

The air filter located behind the front removable panel is to be maintained as well. The filter condition should be checked at least once a month. If the filter condition is unsatisfactory it must be replaced.

The piezoelectric radiators panel is subject to replacement after 5000 operating hours. For the nozzle panel replacement contact an authorized service center.

After the radiators panel or the float valve replacement it is necessary to check the panel depth relative to the tank water surface and if necessary adjust the depth. The depth is adjusted with a screw located on the float valve.



Pic. The location of the panel with emitters relative to the surface of the water

Possible malfunctions and their correction

The device is equipped with fuses. The fuse blows in case of an internal failure and for fire prevention. After detection of the malfunction cause it is necessary to replace the fuse. Never replace a fuse with a bigger one.

Malfunction	Cause	Solution
No information on the display	Controller is improperly connected or not connected to power line	Check wiring with wiring diagram
	High or low electric line voltage	Connect the device to a power source with required parameters
The display is blinking	Power cable is damaged	Replace the cable
Power indicator is off	A. No voltage in the electric line B. Fuse is blown C. Power cable is not connected	A. Check the electric line voltage B. Replace the fuse C. Connect the power cable
The device is switched on but there is no mist	Voltage is more than 5% lower/higher than required	Check the voltage, install a stabilizer if necessary
Water tank overflow	A. Float valve is incorrectly adjusted B. Float valve is blocked or damaged	A. Adjust the float valve B. Clean or replace the float valve
Water mist is thin or no mist at all	A. Float valve incorrect level B. Badly contaminated radiator panel C. Voltage is more than 5% lower than required	A. Adjust the float valve level in accordance with instructions B. Clean or replace the panel C. Install a stabilizer
Device misoperation	Humidity sensor is broken	Replace the humidity sensor
	Humidity sensor wires are damaged	Check the wires for discontinuity ok for insulation damage
	Humidity sensor installation depth is not sufficient	After checking of the sensor check whether it is installed in a right way
	Humidity sensor is installed in a wrong place	Install the sensor in accordance with instructions
	There is a source of strong disturbances near the device	Find and remove the source of disturbances
Device misoperation	Controller wires are is improperly connected	Check wiring with wiring diagram
	Incorrect operating parameters	Set correct parameters
	Humidity controller is broken	Replace the humidity controller

The device repair and diagnostics must be performed in an authorized service center.

Attachment



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