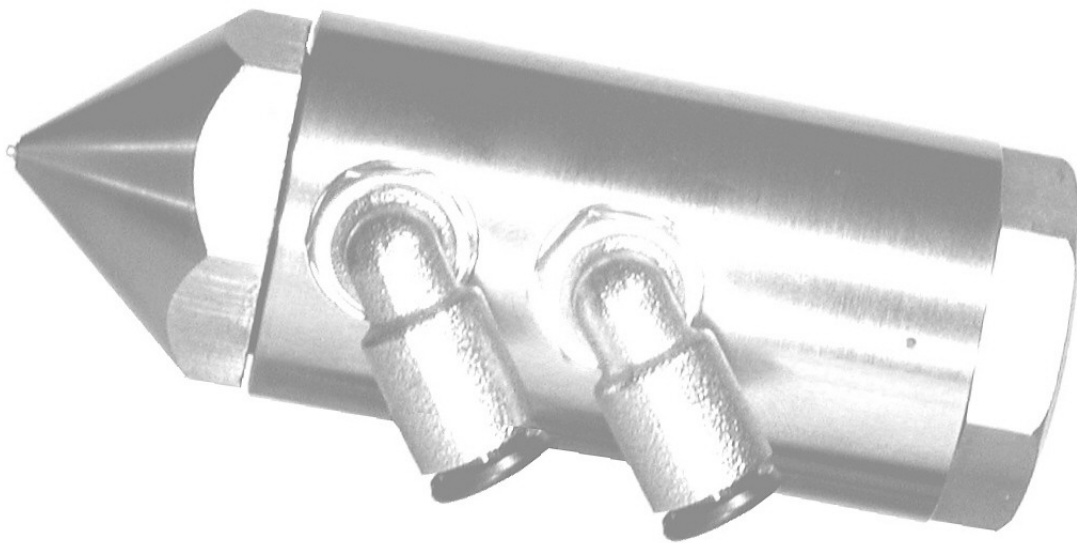


Operating Instructions

Vacuum Nozzle Type VN



Dodavatel:

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Preliminary Note: A Word about Water and Atomising Systems

All atomising humidifiers operate based on the principle that water in the form of very fine aerosol droplets may be atomised and subsequently evaporated.

Because tap water contains various components in addition to pure water (H₂O), solids remain behind after evaporation, such as calcium or other minerals. These form a fine dust in the area of evaporation. The build up of dust can be prevented by using fully demineralised water. Reverse osmosis systems, for example, are well-suited for this type of water treatment.

When drinking water is used, mineral deposits may form on the tip of the nozzle. These deposits must be removed during regular maintenance. Maintenance work can be reduced by using fully demineralised water.

Consult your HYGROMATIK specialists. We will answer any questions you may have concerning water and advise you on the installation and initial operation of your HYGROMATIK atomising system.

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VN e 0404

Information in this manual is subject to change or alteration without prior notice.



WARNING! All work to be performed by trained personnel only. All electrical installation and servicing of the electrical components of this unit to be performed by qualified electricians only. Disconnect power supply before installation and servicing!

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1. Introduction

Dear Customer,

HYGROMATIK vacuum nozzle systems represent the latest in humidification technology. They will impress you with their safety, ease of use and economical operation.

In order to operate your HYGROMATIK nozzle system safely, properly and efficiently, please read these operation instructions.

Employ your nozzle system only in sound condition and as directed. Consider potential hazards and safety issues and follow all the recommendations in these instructions.

If you have additional questions, please contact us:

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1.1 Directions for Use

The HYGROMATIK nozzle system with vacuum nozzles atomises water with compressed air using injector technology and is intended for direct room humidification.



Warning: Use compressed air of breathable air quality only! This meets Class 1 standards as specified in DIN ISO 85

Class 1 compressed air as specified by DIN ISO 8573-1	
residual oil content	≤ 0,01 mg/m ³
maximum dirt particle size	≥ 0,1 µm



Note: The air filter for the nozzle system has a pore size of 5 µm; it acts as protection for the nozzle system against impurities in the plumbing. To achieve breathable air quality, an extra filter is required.

Hygromatik vacuum nozzles operate with drinking water. Fully demineralised water must be used to prevent calcium and mineral dust. Usage of fully demineralised water also lengthens maintenance intervals.

For the nozzle system, the following connections are needed at the customer installation site:

Connections	
compressed air	5-10 bar, 10/8 mm hosing
water	2-4 bar, 10/8 mm hosing
electricity	230V/1Ph/50 Hz

Proper usage also entails following HYGROMATIK's instructions for installation, dismantling, reassembly, initial operation and operation and maintenance, as well as disposal procedures.

Only qualified, authorized personnel may operate or service the unit.

Workers who transport or service the unit must have read and understood the relevant sections of the operating instructions, especially the section "Safety Notes." In addition, staff must receive safety training about potential hazards from the operator.

Place a copy of the operating instructions at the location where the unit is operated.

1.2 Typographic Distinctions

- preceded by a bullet: general specifications
- » preceded by an arrow: Procedures for servicing or maintenance that should or must be performed in the indicated order.
- Installation step which must be checked off.

1.3 Documentation

Retention

Please retain these operating instructions in a secure, always accessible location. If the product is resold, turn the documentation over to the new operator. If the documentation is lost, please contact Hygromatik.

Versions in Other Languages

These operating instructions are available in several languages. If interested, please contact Hygromatik or your Hygromatik dealer.

2. Safety Notes

2.1 Overview

These safety notes are required by law. They promote workplace safety and accident prevention.

Warnings and Safety Symbols

The safety symbols below identify sections containing warnings about hazards or potential dangers. Please familiarize yourself with these symbols.



Warning: Failure to observe this warning may result in serious injury or death and/or damage to the unit.



Danger, Hazardous Voltage: Hazardous electrical current! Failure to observe this warning may result in injury or even serious injury or death.



Warning: Failure to follow these instructions may result in damage to the unit due to electrostatic discharge. The electronic components of the humidifier control are very sensitive to electrostatic discharges. In order to safeguard these components during installation and servicing, steps must be taken to protect against ESD.



Note: Materials and consumables must be handled and/or disposed of as required by law.



Note: Appears before explanations or cross-references which refer to other sections of the operating instructions.

2.2 Guidelines for Safe Operation

Overview

Observe all safety information and warnings which appear on the nozzle system.

In case of a malfunction, switch off the nozzle system immediately and prevent a restart. Repair malfunctions promptly.

After any repair work, have qualified personnel check the safe operation of the nozzle system.

Use original spare parts only.

Additional national safety regulations also fully apply to the operation of this nozzle system.

Accident Prevention Regulations

Comply with the accident prevention regulation

Accident Prevention Regulation Electrical Systems and Equipment (VBG 4/BGVA2) to prevent injury to yourself and others.

Operating the Nozzle System

Do not perform any work which compromises the safety of the nozzle system.

Regularly check that all safety and monitoring devices are functioning normally.

Do not remove or disable safety devices.

Installation, Dismantling, Maintenance and Repair of the Nozzle System

When performing maintenance or repair work on nozzle system components, switch off power, shut off pressure and close off water supply.

Attaching or installing **additional components** is permitted only with the **written consent** of the manufacturer.

Electrical

Work on the electrical system must be performed by qualified personnel.

If the electrical power supply malfunctions, switch off the control unit immediately.

Use only original fuses with the appropriate amperage rating.

Regularly check the control unit's electrical equipment. Promptly repair any faults, such as loose connections or damaged wiring.

After proper electrical installation or repair, test all safety mechanisms (such as grounding resistance).

2.3 Disposal after Dismantling



Note: The operator is responsible for the disposal of nozzle system components as required by law.

3. Transport

3.1 Overview



Note: Proceed carefully when transporting the nozzle system in order to prevent damage due to stress or careless loading and unloading.

3.2 Packing



Note: Notice the symbols affixed to the packing box.

3.3 Interim Storage

Store the nozzle system in a dry place and protect from frost.

3.4 Check for Complete and Correct Delivery of Goods

Upon receipt of the nozzle system, confirm that:

- the delivery is complete and that the items delivered match those listed in the order and delivery documents.
- all parts are in perfect condition.



Note: In case of damage during shipment or missing parts, immediately notify the carrier or supplier in writing.

Time limits for filing freight claims with shipping companies are*:

Shipping Companies	After Receipt of Goods*
Mail	no later than 24 hours
Rail	no later than 7 days
Truck and Rail Carriers	no later than 4 days
Parcel Service	immediately
Time limits for some services are subject to change.	

4. Operation and Installation

4.1 Basic Requirements

For basic operational requirements of the HYGROMATIK nozzle system, please read Section 1.1 Directions for Use.

4.2 Sequence of Operation

When the hygrostat calls for an increase in humidity, the control unit opens the pilot and vacuum valves by means of control air. The nozzles are supplied with air and atomisation water.

At regular intervals, the control unit briefly switches off humidification for self-cleaning. Inside the vacuum nozzle, elastic force causes a stainless steel needle to spring forward; this action detaches any calcium deposits that may be present in the atomiser tip. When humidification resumes, the cleaning needle retracts from the nozzle tip.

The HYGROMATIK vacuum nozzle atomising system consists of the following components:

- vacuum nozzle Type VN
- control unit Type CU-1
- pilot valve Type PV
- vacuum valve Type VV8
- air and water filter
- hygrostat
- fittings, T-pieces and plastic hoses

4.3 Vacuum Nozzle Type VN

All water-bearing parts of the vacuum nozzle Type VN are made of stainless steel.

The pilot valve supplies the nozzles with atomisation air. The vacuum valve feeds the nozzles with water. The control unit controls both valves via a control air line.

4.3.1 Vacuum Nozzle

The atomisation air (13) flows through the nozzle through a duct (5) and exits into the outlet (1) between the nozzle cap (2) and the atomiser tip (3). Following the injector principle, a low pressure differential is created in the nozzle tip (3); suction then draws water from the water installation (12) through the vacuum valve. This design ensures that the mixture of atomisation air and water first occurs outside of the outlet (1). When the flow of atomisation air is interrupted (pause in operation/cleaning cycle), the spring (9) drives forward the piston (8) holding the cleaning needle (11). This operation propels the cleaning needle (11) through the water outlet (1) and detaches any deposits that may be present.

After atomisation air returns, the piston (8) is driven backwards by atomisation air pressure. The cleaning needle (11) retracts from the nozzle tip (3).

Loc.	Designation
1	outlets
2	nozzle cap, front
3	nozzle tip
4	o-ring, front and back
5	atomisation air duct
6	seal ring
7	piston lining
8	piston
9	spring
10	nozzle cap, back
11	cleaning needle
12	water installation
13	atomisation air connection
14	vent hole

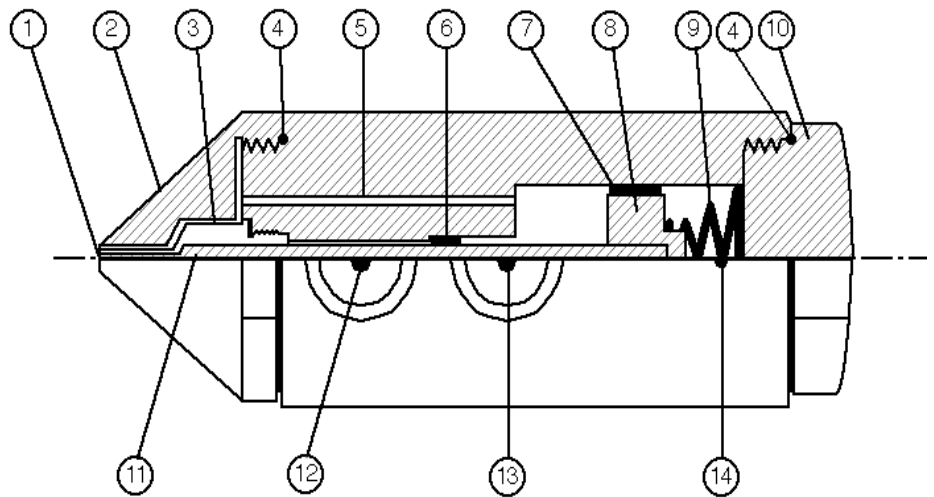
4.3.2 Vacuum Nozzle Technical Specifications

Vacuum Nozzle	VV	
Connections:		
outer / inner diameter		
water	[mm]	6/4
atomisation air	[mm]	6/4
dimensions HxWxD	[mm]	35x50x86
weight incl. mounting	[kg]	0,7
material		stainless steel 1.4305
atomisation output, max.*	[kg/h]	8,0
compressed air usage, max.*	[l/min]	50,0
sound level at a distance of 1m**	[dB(A)]	69,5

typical measurements

at 8 bar atomisation pressure and 0.1 bar at
the vacuum valve

** at 5 bar atomisation pressure



sectional drawing vacuum nozzle Type VN

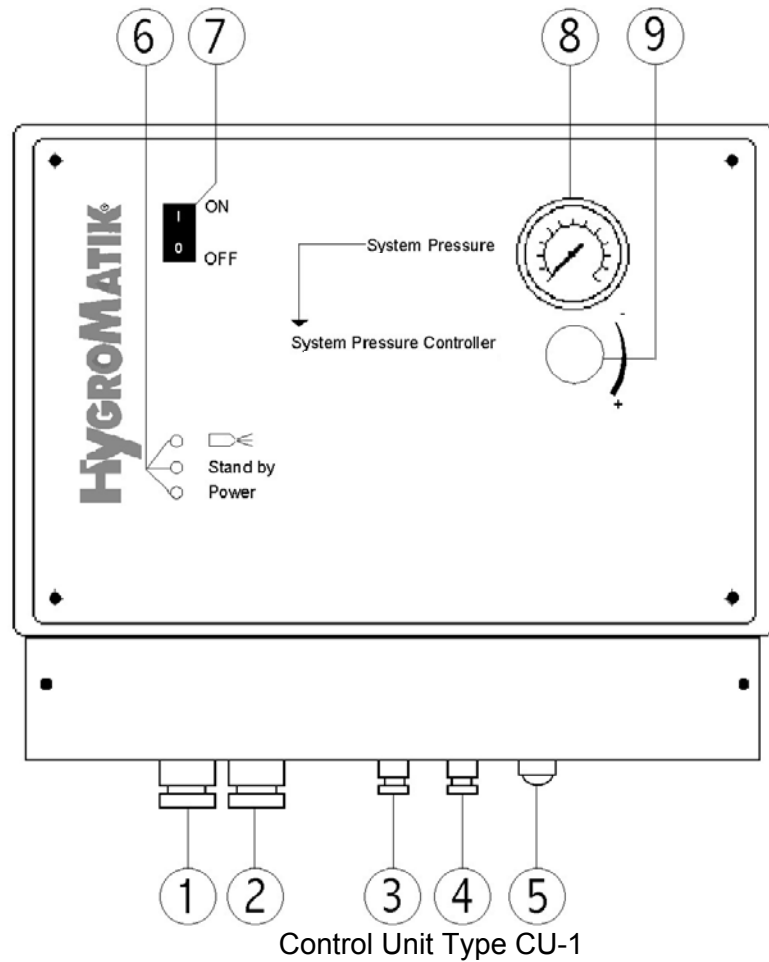
4.4 Control Unit Type CU-1

The CU-1 control unit switches the vacuum nozzles on and off according to humidification requirements. It also ensures that that VN nozzle cleaning cycles are performed at regular intervals.

The following control unit is available with the vacuum nozzles:

Control Unit	Type
ON/OFF control for max.16 nozzles	CU-1

4.4.1 Control Unit Mode of Operation



Loc.	Designation
1	power supply connection
2	hygrostat connection
3	control air connection
4	compressed air supply connection
5	venting
6	LED for power, stand by and humidify
7	ON/OFF switch
8	manometer for system pressure
9	pressure controller to adjust system pressure

4.4.2 Operation with hygrostat

If the actual humidity level lies below the hygrostat's set point, an electrical signal (2) is sent to the control unit. When humidification is needed, the control unit applies pressure through the control air line (3), opening the pilot valve and the water supply to the vacuum valve. Atomisation air from the pilot valve flows through the nozzles. Following the injector principle, a low pressure differential is created in the tip of the nozzle. This differential opens the water outlet inside the vacuum valve. Suction draws the water into the nozzles where it is atomised.

Once the set point is reached, the hygrostat sends an electrical signal to the control unit (2). The unit switches off the pressure in the control air line (3), causing the pilot and vacuum valves to interrupt the supply of atomisation air and water. The cleaning needles simultaneously close off the tips of the nozzles. The system remains in this position until the hygrostat signals the control unit for more humidification.

4.4.3 VN Nozzle Self-Cleaning

Self-cleaning takes place in regular cycles. The control unit briefly switches off the pressure to the control air line (3). The pilot and vacuum valves shut off the air and water supply to the nozzles. The springs in the nozzles relax and push back the pistons holding the cleaning needles. Shortly afterward, the control unit again pressurizes the air control line, causing the pilot and vacuum valves to reopen the air and water supply. The atomisation air presses the pistons holding the cleaning needles forward against the springs. The nozzle tips are cleaned and atomisation is resumed.

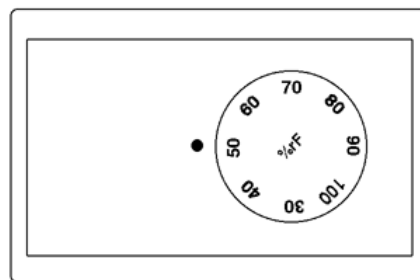
The factory settings for the cleaning interval and the duration of the cleaning cycle are:

Cleaning	
cleaning interval	ca. 20 min
duration of cleaning	5 sec.

4.4.4 Operation and Display

Control Unit Type CU-1

- » Turn on the control unit using switch (7). The green "power" LED lights up and the nozzle system is ready for operation.
- » On the hygrostat HG-Mini, set the desired relative humidity.
- » For example, for a set point of 50% RH, turn the knob until the number 50 is positioned directly at the black mark.



Room hygrostat HG-Mini

When humidification is needed, the green LEDs "stand by" and "humidify" light up on the control unit.

The system air pressure is adjusted on the valve (9) and is indicated by the manometer (8).



Note: Set the atomisation output level as specified in Section 4.8.1.

4.4.5 Control Unit Technical Specifications

Control Unit Type CU-1		
Connections: outer / inner diameter		
compressed air supply max. 10 bar	[mm]	6/4
control air for PV and VV	[mm]	6/4
installation area	[%RH]	30 - 90
dimensions HxWxD	[mm]	250x296x107
weight	[kg]	4
power supply connection		230V/1Ph/50Hz
power usage	[W]	25
cleaning interval	[min]	20
duration of cleaning	[sec]	5
external circuit protection	[A]	6
protection rating		IP55
size of external conduit	[mm ²]	0.5... 4mm
type of external conduit		for permanent installation only (e.g. NYM)
Rating as specified in DIN EN 60730-1 (German Association for Electrical, Electronic & Information Technologies (VDE) Standard 0631).		Type 1

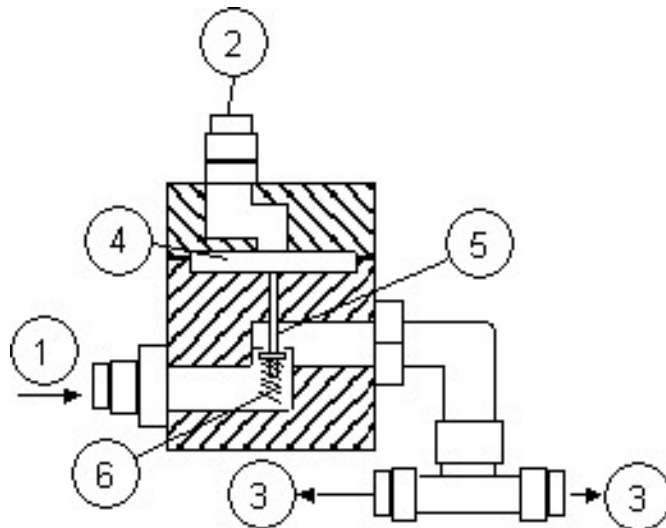
4.5 Pilot Valve Type PV

As soon as the control unit activates the pilot valve using the control air line (2), the pilot valve brings the atomisation air pressure for the nozzles to the control air pressure set by the control unit.

The pilot valve is closed when control air pressure is absent (2).

4.5.1 Pilot Valve Mode of Operation

Pressure from the control air (2) pushes on the diaphragm and valve plate (4), depressing the valve cone (5) in the pilot valve. Compressed air (1) flows through the valve into the vacuum nozzles (3). In the absence of control air pressure, the valve cone (5) is closed by the spring (6), blocking the supply of atomisation air (3) to the nozzles.



Pilot Valve Type PV

Location	Designation
1	compressed air supply
2	control air from the control unit
3	atomisation air to the nozzles
4	diaphragm and valve plate
5	valve cone
6	spring

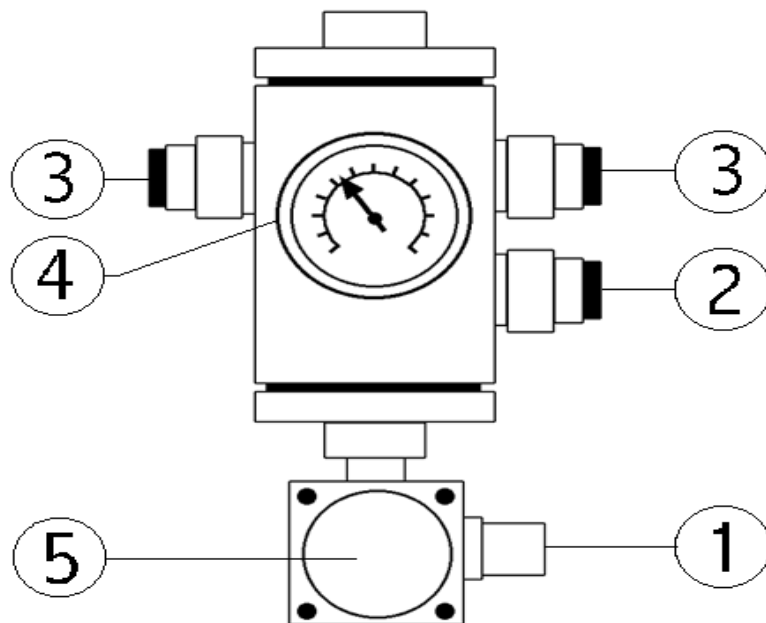
4.5.2 Pilot Valve Technical Specifications

pilot valve	PV
Connections: outer / inner diameter	
compressed air supply	10/8 mm
control line from the control unit	6/4 mm
atomisation air to the nozzles	2 x 10/8 mm
dimensions HxWxD	65 x 65 x 65 mm
approved for use with	max. 16 nozzles

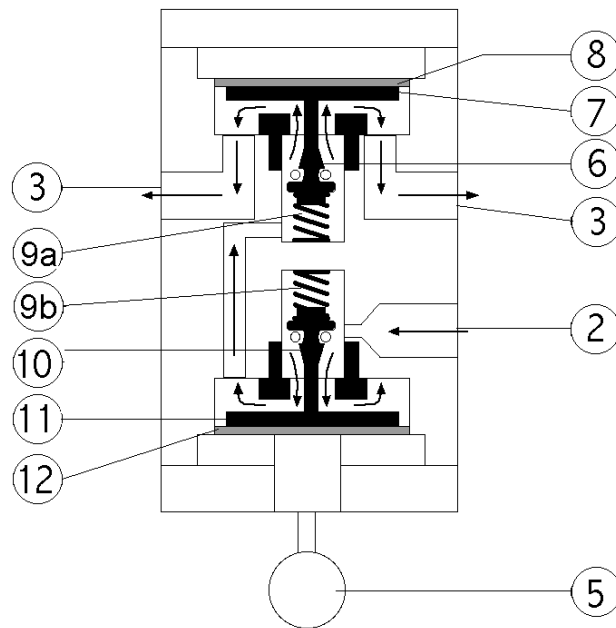
4.6 Vacuum Valve Type VV8

The vacuum valve supplies the nozzles with water.

It is controlled in parallel with the pilot valve by the control air from the control unit. Any interruption in the supply of compressed air thus automatically stops water supply to the nozzles.



Vacuum Valve Type VV8



Cross section: Vacuum Valve Type VV8

Location	Designation
1	control air connection
2	water inlet connection
3	connection, water outlet to the nozzles
4	manometer
5	pressure reduction valve
6	valve cone, water outlet
7	valve plate, water outlet
8	diaphragm, water outlet
9a	valve spring, water outlet
9b	valve spring, water inlet
10	valve cone, water inlet
11	valve plate, water inlet
12	diaphragm, water inlet

4.6.1 Vacuum Valve Mode of Operation

The water supply is connected to installation (2).

The control air (1) from the control unit is connected to the pressure reduction valve (5). The control air presses the ventill plate (11) and cone (10) upwards, opening the water supply (2)

Water now flows into the upper chamber. Water pressure (4) in the upper chamber is normally set by the pressure reduction valve (5) between 0.5 and 1.1 bar.

The low pressure produced inside the vacuum nozzles creates suction, pulling down the valve plate (7). The valve cone (6) then opens the water outlet and water flows to the nozzles.

Atomisation output depends not only on the atomisation pressure, but also on the water pressure set by the vacuum valve.



Note: Set the atomisation output level as specified in Section 4.8.1.



Warning: The vacuum valve will only function normally at water supply pressures of 2 to 4 bar.



Warning: To protect the nozzle system from impurities, install a water filter in the water supply line leading to the vacuum valve as specified in Section 8.5.1

4.6.2 Vacuum Valve Technical Specifications

Vacuum Valve	VV8
Connections: outer / inner diameter	
Water supply	6/4 mm
Water outlet line to the nozzles	2 x 10/8 mm
control line from the control unit	6/4 mm
dimensions HxWxD	124 x 87 x 85 mm
Intended for use with	<ul style="list-style-type: none"> • max. 8 nozzles • max. 10m hose length, 10/8 mm per water outlet line • an installation height equal to that of the VN nozzles

4.7 Adiabatic Humidification



Warning: Along with an increase in relative humidity, atomiser humidification also produces a temperature drop in the humidified air. This effect is called adiabatic humidification. It is necessary to warm the air to prevent unwanted temperature decrease due to humidification.

4.8 Atomisation Output

The atomisation output [kg/h] is dependent on the **atomisation air pressure** set by the control unit and the **water pressure** set by the vacuum valve.

4.8.1 Output Table

The output table below indicates the atomisation output of the VN nozzles. Atomisation output depends on the water pressure set by the vacuum valve and the atomisation air pressure set by the control unit. These settings simultaneously influence droplet size (see 4.8.2).

Finer droplets →

humidification output [kg/h]*		Atomization air pressure set by control unit [bar]					
		3	4	5	6	7	8
Setting	0,1	2,5	4,5	5,5	6,5	7,0	8,0
water pressure	0,3	2,5	4,0	4,5	6,0	6,5	7,5
in	0,5	2,0	3,5	4,5	5,5	6,0	7,0
vacuum valve	0,7	2	2,5	4,0	4,5	5,5	6,5
[bar]	0,9	<2,0	2,0	3,5	4,5	5,0	6,0
	1,1	<2,0	<2,0	2,5	4,0	4,5	5,5
compressed air usage	[l/min]	20	25	30	35	40	45

↓ Finer droplets

* Average value ± 20%

gray = recommended range



Note: When setting the atomisation output, please allow for prevailing environmental conditions such as temperature and clearances from other objects.



Note: Verify that the atomised water can be absorbed by the surrounding air.



Note: Note any overall pressure loss and air leakage related to the design and installation of the air compressor.



Warning: Maintain safe distances from all electrical machines, as well as sensitive units or devices, as described in Section 8.1 "General Installation Instructions".

4.8.2 Droplet Size

Droplet size depends on the atomisation air pressure and the water pressure set by the vacuum valve.

The higher the atomisation air pressure in the control unit, and the higher the water pressure in the vacuum valve, the finer the atomisation.

By adjusting water droplet size, the atomising system can be adapted to suit site conditions. For example, the nozzle system should be set for fine droplet size if the nozzles are simply placed the minimum required distance apart (see 8.1), or if the ambient temperature is below 20°C. This ensures that the atomised water can be absorbed by the air.

5. Initial Operation

5.1 Initial Start-Up



Warning: The nozzle system may only be started by qualified, authorized personnel.



Warning: During work on electrical components, disconnect the nozzle system from the power supply and protect against restart.



Warning: Before starting up the nozzle system, make sure you know how to switch it off. (See Section 5.3.)

- » Verify that installation work has been performed correctly and completely.
- » Thoroughly flush the water supply line to the nozzle system before connecting the system to the plumbing.
- » Set the hygostat (and max. hygostat) to maximum.
- » Switch on the power supply to the control unit.
- » Turn on the control unit using the ON/OFF switch. (The green LED "power," as well as the yellow LEDs "stand by" and "humidify", will light up.)
- » Open the shut-off valve for the compressed air supply. Check the compressed air system for leaks. (In case of leakage, switch off the nozzle system and repair any leaks!)
- » Using the system pressure controller on the control unit, set the desired system pressure for the desired maximum atomisation output as specified in the Output Table in Section 4.8.1. Hygromatik recommends a system pressure setting between 4 and 7 bar.
- » Open the shut-off valve for the water supply line. Check the water pipes for leakage. (In case of leakage, switch off the nozzle system and repair any leaks!)
- » Set the water pressure level for the vacuum valve between 0.5 and 1.1 bar, as indicated in the Output Table in Section 4.8.1
- » Check the spray pattern of all the nozzles. If the water cannot be fully absorbed into the air, take necessary corrective steps, such as:
 - » Remount the nozzles in conformance to minimum distances (see Section 8.1).
 - » Set the nozzle system to a finer droplet size as specified in Section 4.8.1.
- » Adjust for ambient temperature and preexisting humidity, because the absorption distance for the atomised water increases at low temperatures or higher preexisting humidity levels!

- » Check that the max. hygrostat's control mechanism functions properly by reducing the setting for the desired humidification level until the control unit turns off atomisation. After this, set the max. hygrostat to the maximum allowable humidification value.
- » To prevent excessive humidification due to hygrostat malfunction, a max. hygrostat must be installed.
- » Check that the hygrostat's control mechanism functions properly by reducing the optimal level setting until the control unit turns off atomisation. After this, set to the desired optimal value.



Note: Install the hygrostat in an appropriate location in the space. (For example, do not place too close to the spray cone of the nozzles; keep away from sources of cold or heat; and avoid areas with poor air circulation.)

5.2 Starting the Nozzle System in Everyday Operation



Warning: The nozzle system may only be operated by trained personnel.



Warning: Before starting up the nozzle system, make sure you know how to switch it off. (See Section 5.3.)



Warning: Check the nozzle system for damage before startup. Damaged nozzle systems may not be put into operation!

- » Open the shut-off valve for the water supply line. (water supply pressure 2-4 bar)
- » Open the shut-off valve for the compressed air supply. (air supply pressure max. 10 bar)
- » If the control unit is not connected to the power grid, turn on the power supply.
- » Turn the control unit on using the ON/OFF switch. The green LED "power" will light up.

- » If the actual humidity value is less than the hygrostat's set point, the system starts humidifying immediately (the yellow LEDs "stand by" and "humidify" light up).
- » As soon as the nozzle system begins humidification, check the system pressure at the control unit and the water pressure at the vacuum valve.



Note: After a lengthy interruption in operation (for example a holiday) follow the procedure for restarting the nozzle system as specified in Section 5.1 Initial Start-Up.

5.3 Turning off the Nozzle System

- » Set the hygrostat (and max. hygrostat) to maximum to make sure the system is humidifying.
- » Close the shut-off valve for the water supply and make sure it remains closed.
- » Let the nozzle system spray for approx. 1 minute, until no more water comes out of the nozzles.
- » In cases where the nozzle system will be switched off for a long period (for example a holiday): disconnect water supply from the nozzle system and connect to breathable quality compressed air (max. 4 bar) for 10 minutes.
- » Close the shut-off valve for the compressed air supply and make sure it remains closed.
- » As soon as you can no longer hear airflow through the nozzles, switch off the control unit using the ON/OFF switch.
- » Reset the hygrostat (and max. hygrostat) to the set point.
- » If work will be done on the control unit, disconnect power supply to the control unit and protect against restart.
- » In cases where the nozzle system will be switched off for a long period (for example a holiday): clean the water filter, wipe dry with a clean towel and insert a new, dry filter cartridge. After the period out of operation, start-up the nozzle system as per the initial start-up instructions.



Shut off the nozzle system immediately in case of malfunction. Malfunctions can only be corrected by qualified personnel in accordance with safety instructions.

6. Troubleshooting

Problem	Probable Cause	Resolution
no humidification	<ul style="list-style-type: none"> • no humidification required: set point is less than actual value. Yellow "stand by" light on the control unit does not light up. • no power supply Green "power" light does not light up. • fouled pilot valve • no compressed air supply • no water supply • Deposits have blocked up the nozzles. • Defective micro fuse on the pcb Green "power" light does not light up. • Solenoid valve for control air (in the control unit) is fouled or defective. 	<ul style="list-style-type: none"> • Check settings and increase set point if needed. • check power supply • clean pilot valve • check compressed air supply • check water supply check vacuum valve • clean nozzles. • Visually check pcb for damage, replace micro fuse or pcb if necessary • replace solenoid valve.
Only air comes out of the nozzle and no water	<ul style="list-style-type: none"> • Hose is not securely fitted into connection piece, for example T-piece or reducer (no low pressure differential produced). • Problem with the water supply • too little water pressure in the vacuum valve during operation • water filter is clogged • water and compressed air hoses are improperly or not securely attached to the nozzle • Deposits have blocked up the nozzles. 	<ul style="list-style-type: none"> • check all hose connection pieces between the nozzles and the vacuum valve • check water supply water supply pressure min. 2 bar • water pressure in the vacuum valve must be set by the pressure controller between 0.5 and 1.1 bar • clean water filter • check connections • clean nozzles.

Problem	Probable Cause	Resolution
Relative humidity is too low	<ul style="list-style-type: none"> • hygostat is improperly adjusted or must be calibrated • compressed air and water pressure are not compatible • humidification output is not sufficient 	<ul style="list-style-type: none"> • check hygostat • set air and water pressure according to Output Table (Section 4.8.1). • Collect data on output, air circulation and factors that interfere with operation, such as open windows and doors; if necessary, extend the system or minimize such factors.
When the unit is turned off, the nozzle drips	<ul style="list-style-type: none"> • Cleaning needle does not extend fully because of broken spring vacuum valve does not close properly due to fouling • Low pressure line between vacuum valve and nozzles leaks, and has been laid above the nozzles. 	<ul style="list-style-type: none"> • open rear nozzle cap and replace spring • open vacuum valve and clean valve cone, replace seal and valve spring if needed; at the same time check the unit's water filter and replace filter cartridge if needed. • Lay low pressure line up to 50 mm below the nozzles and repair leakage.
atomisation is too coarse	<ul style="list-style-type: none"> • compressed air and water pressure are not compatible • air filter is filled with condensate • water supply hoses have been installed above the nozzles • vacuum valve is placed above the nozzles 	<ul style="list-style-type: none"> • Set air and water pressure as specified in the Output Table in Section 4.8.1. • drain condensate from air filter • lay water supply hoses below the nozzles • reposition vacuum valve below the nozzles (max. distance 50 mm).
oil in the atomisation air	<ul style="list-style-type: none"> • the external air filter (for breathable air quality), has not been serviced, or none is available • compressor has not been serviced. 	<ul style="list-style-type: none"> • service or install external air filter • have maintenance performed on the compressor.
some nozzles persistently splutter during humidification	<ul style="list-style-type: none"> • pressure in the vacuum valve has been increasing slowly due to • fouling leaky hose line 	<ul style="list-style-type: none"> • clean vacuum valve check all the connections to the low pressure line between the vacuum valve and the nozzles.

7. Maintenance

7.1 Maintenance and Maintenance Checks

The HYGROMATIK nozzle system is easy to maintain. However, inadequate or improper maintenance can lead to operational malfunctions. Perform regular maintenance to give your nozzle system a long life span.



Warning: When performing maintenance work, please note:

- The nozzle system is only to be serviced by qualified, authorized personnel.
- Follow safety instructions.
- Switch off the nozzle system before maintenance and protect against restart.
- After maintenance work, check the nozzle system for correct and safe operation.

7.2 Maintenance Checks and Adjustments

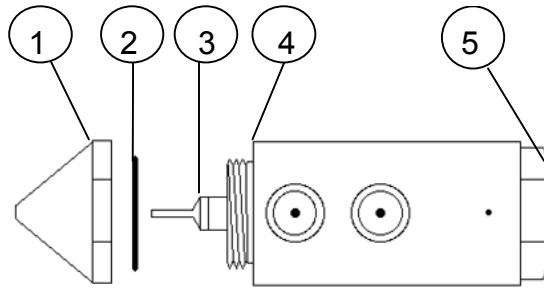
Cycle	Task
daily	<ul style="list-style-type: none"> • Check water and compressed air systems for leaks; if needed, immediately repair sites of leakage • check air filter, drain condensate if necessary
weekly	<ul style="list-style-type: none"> • Check system air pressure at the control unit, readjust to the desired value between 4 and 7 bar if needed (see Section 4.8.1). • Check water pressure at the vacuum valve, readjust to the desired value between 0.5 and 1.1 bar if needed (see Section 4.8.1). • Visually check the nozzle spray patterns, have the nozzles cleaned if needed.
semiannually	<ul style="list-style-type: none"> • check the hygostat and max. hygostat set point with a relative humidity gauge (see separate instructions for the respective product).

7.3 Cleaning and Maintenance

Cycle	Task
monthly*	<ul style="list-style-type: none"> • Clean the vacuum valve as specified in Section 7.4; check water filter, clean and replace filter cartridge if necessary
semiannually	<ul style="list-style-type: none"> • Visually check and test all electrical and pneumatic components

*The frequency of cleaning may have to be adjusted depending on the quality of the compressed air and water used for operation.

7.4 Cleaning the Vacuum Nozzle



Location	Designation
1	nozzle cap
2	o-ring
3	nozzle tip
4	nozzle body
5	nozzle cover



Warning: Do not use abrasive cleaners, solvents or concentrated acids!



Warning: Do not unscrew the nozzle tip (3) from the nozzle!

- » Shut off the atomisation system as specified in Section 5.3.
- » Unscrew nozzle cap (1).
- » With a soft, lint free cloth, rub clean the inside and outside of the nozzle cap. Clear deposits from the hole of the nozzle cap with a piece of wood (a toothpick for example).
- » Clean the nozzle tip (3) with a lint free cloth.
- » If necessary, replace the o-ring (2).
- » Screw the nozzle cap back on and tighten by hand.



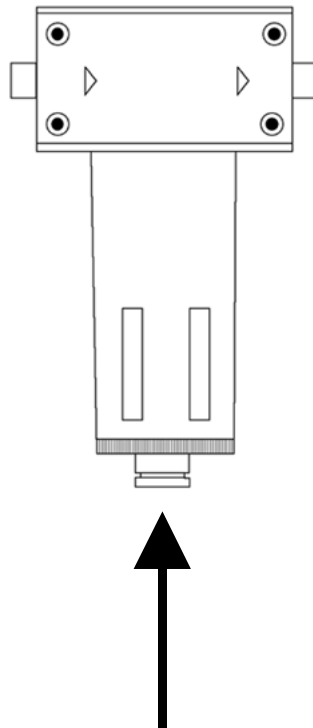
Note: For stubborn calcium deposits, you can soak the the nozzle cap (1) for an hour in a normal solution of household vinegar. After soaking, rinse the nozzle cap with clean water and clean as above.

7.5 Cleaning the Air Filter

Drain condensate from the air filter as needed. Atomisation can become too coarse due to damp compressed air.

Air Filter, Type Skillair:

- » Turn the bleeder valve button to open, and if air pressure is present, press upwards to drain condensate from the air filter.
- » After draining, turn the bleeder valve button to close.
- » You will find additional information in the separate operating instructions for this component.



cleaning the air filter

7.5.1 Cleaning the Water Filter

Replace the water filter cartridge in the water filter at least twice a year. Replace the water filter cartridge sooner if there is a high level of impurities.

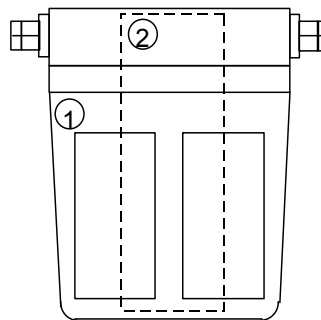


Note: A fouled water filter leads to increased pressure loss. This can cause a fall in the nozzles' atomisation output.



Note: The pressure loss can be determined by placing a manometer in front of and behind the water filter. If pressure loss is increasing, clean the water filter and replace the filter cartridge.

- » Shut off the nozzle system as specified in Section 5.3.
- » Unscrew the lower part (1) of the water filter. Turn counterclockwise.
- » Remove water filter cartridge (2).
- » Clean the inner surface of the water filter housing with a clean cloth.
- » Thoroughly rinse out the lower part (1) of the filter with drinking water.
- » Insert new water filter cartridge.
- » Screw the lower part of the filter back on.
- » Start up nozzle system as specified in Section 5.2.



water filter

7.5.2 Cleaning the Vacuum Valve

As a general rule, it is not necessary to clean the vacuum valve. However, if there is dirt in the water line (i.e. due to improper maintenance of the water filter), this can lead to leakage from the water valves inside the vacuum valve. In this case, HYGROMATIK service personnel must clean and check your vacuum valve.

8. Installation

In order to install your HYGROMATIK nozzle system safely and properly, please first read these operating instructions.



Warning: Installation of this nozzle system to be attempted only by qualified personnel (plumber, electrician). We accept no liability for damage due to faulty installation.

Please consult and obey all local regulations and guidelines concerning electrical, compressed air and plumbing installation.

The instructions and regulations in this section regarding placement of system components and installation must be noted and followed under any circumstances!

Attaching or installing additional components with the nozzle system is permitted only with the written consent of the manufacturer. Without this consent the warranty is void.

8.1 General Installation Instructions

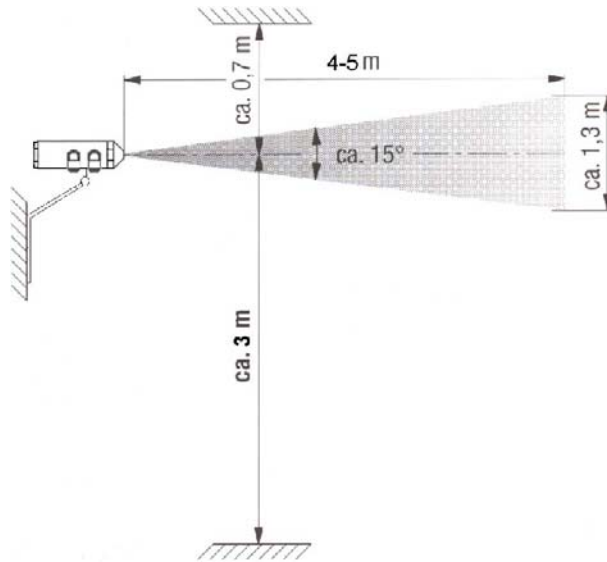
During planning of nozzle system installation, a rough layout for placement of system components is typically prepared. Before installation, check this for compliance with the following installation instructions.



Note: In all cases, the following general instructions for placement must be noted and followed:

- The construction (wall, pillar, ceiling, etc.) on which system components will be mounted **must support loads satisfactorily and be appropriate for mounting.**
- The atomisation nozzles must be placed and mounted to allow free dispersion of the mist. Obstructions in the spray cone area can lead to condensation of the mist.

- At temperatures of 20°C ($\pm 5^\circ\text{C}$), observe the following required minimum installation distances for unobstructed spread of the spray cone at maximum atomisation output.



minimum installation distances at 20°C

- At temperatures over 20°C, the above minimum distances decrease; at temperatures below 20°C, the above minimum distances increase.
- In storage areas, bear in mind that the height of stocked goods can vary, altering distances to the nozzles.
- If you select a higher water pressure for the vacuum valve (up to 1.1 bar; see Section 4.8.1 Output Table), this will yield finer atomisation along with reduced atomisation output. This step allows you to reduce minimum installation distances because air absorbs finer mist more quickly. In this case, you must perform a specific check to verify that the mist spreads freely at maximum system air pressure and lowest possible room temperature!
- When choosing the installation site, make sure that nozzles and system components are easily accessible, e.g. for maintenance. In general, hallways and driveways are particularly good locations.
- It is advantageous to install the nozzles close to preheated intake air or a heater.
- Distribute the vacuum nozzles as evenly as possible throughout the space to achieve efficient dispersion of atomisation.

- All vacuum nozzles, as well as the vacuum valve, must be placed at the same height to ensure sufficient, consistent atomisation output.
- One vacuum valve is intended for use with max. 8 vacuum nozzles and 2x10 hose lengths between the vacuum valve and the furthest nozzle.



Warning: Do **not** install nozzles in the following situations:

- Nozzles are not to be mounted above machines or objects susceptible to water damage.
- Avoid installation right beside an offtake or a dormer window (or skylight), since the humidity produced will be immediately removed from the room.
- Do not install nozzles near a cold air intake.
- Do not position nozzles directly above regular work areas, because workers may find the adiabatic cooling effect uncomfortable.
- The nozzle spray cones cannot overlap. Nozzles placed opposite each other must have a minimum separation distance of 10 m to prevent overlapping spray cones.
- The spray cone is not to be directed at cold parts of the building, such as outer walls and windows (danger of condensation).
- **When the nozzle system is operated using fully demineralised water,** only objects made of plastic or stainless steel (min. DIN 1.4301) are allowed in the atomisation area.



Note: During operation with drinking water, minerals precipitate during evaporation in the form of dust. To prevent mineral dust, usage of fully demineralised water is recommended.

8.2 Installation of System Components

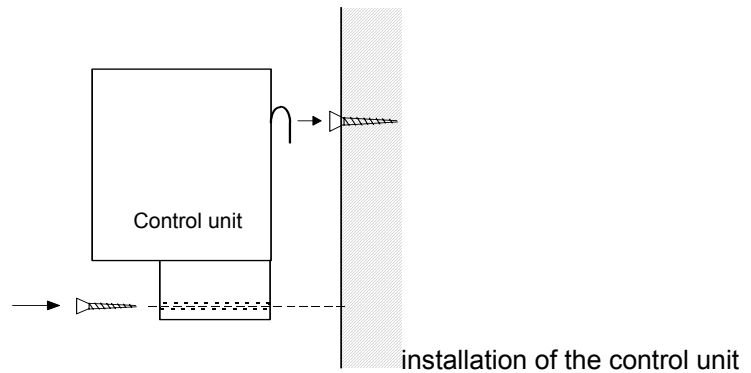


Warning: Before installing system components, check that the general installation instructions in Section 8.1 have been followed.

Secure system components at the intended locations.

8.2.1 Installation of the Control Unit

Mount the control unit at a comfortable height (ca. 1.6 m). The distance between the control unit and the vacuum valve or pilot valve must not exceed 30 m.



- » Securely screw the mounting screws intended for the control unit into the wall.
- » Position the control unit and secure to the wall by screwing two appropriate screws through the holes in the lower panel.



Note: See Section 8.7 Electrical Work for electrical wiring of the control unit.

8.2.2 Hygrostat

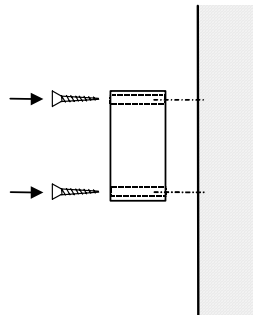


Warning: Do not install the hygrostat or sensor near an intake (door, window), on an outer wall, over a heater, or above another heat source. Avoid direct exposure to sunlight.



Warning: To prevent excessive humidification due to hygrostat malfunction, install a max hygrostat.

- Install the hygrostat where desired humidity levels must be reached (e.g. at a height of 2m).
- Do not place the hygrostat where it is exposed to aggressive air.
- In addition, follow the guidelines in the separate hygrostat operating instructions.



Room hygrostat for control unit type CU1

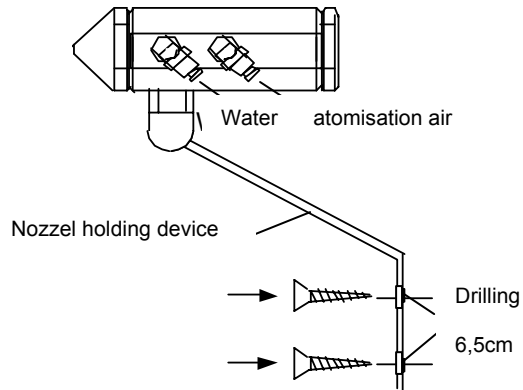
- » Secure the hygrostat to the wall using the two appropriate screws.



Note: See Section 8.7 Electrical Work for electrical wiring of the control unit and hygrostat.

8.2.3 Vacuum Nozzle

- » Secure the nozzle bracket using the two appropriate screws.
- » Position the nozzle to avoid any obstructions within the nozzle spray cone.



installation of a vacuum nozzle



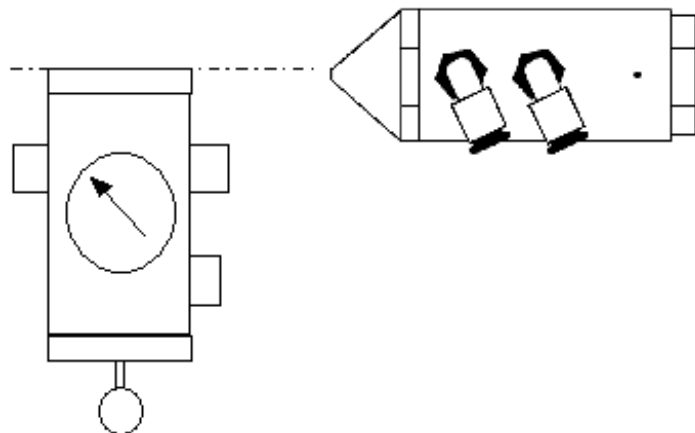
Note: The hoses must be directly and securely attached to the nozzle to make a tight connection.

8.2.4 Vacuum Valve Type VV8



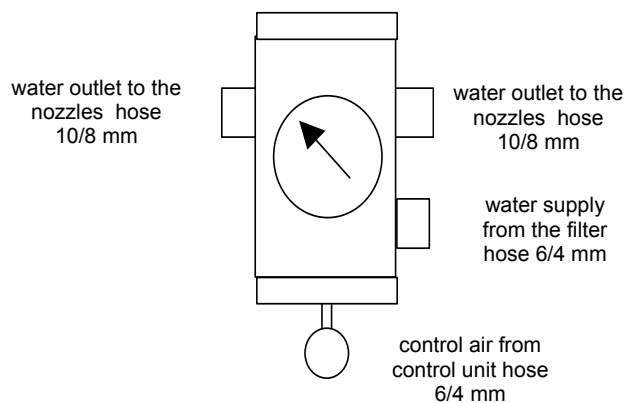
Note: Note the following when installing the vacuum valve:

- Install the vacuum valve at the center of a nozzle row.
- Install the vacuum valve at the same height as the nozzles.



vacuum valve and nozzles at the same height

- One vacuum valve is intended to supply max. 8 vacuum nozzles with water.
 - Hose lengths may not exceed 10m on either side.
 - Lay the hose from the vacuum valve to the nozzles 50 mm below the nozzles. Laying the hose further away leads to reduced output.
 - Never lay the hose from the vacuum valve to the nozzles *above the nozzles* because the atomisation will be too coarse.
 - Use only opaque (black) hosing for water hoses.
- » Secure the vacuum valve with the two appropriate screws. When connecting the hoses, note the water installation diagram below.



Note: When the distance between the water installation and the vacuum valve is greater than 15 m, 10/8 mm plastic hosing should be used.

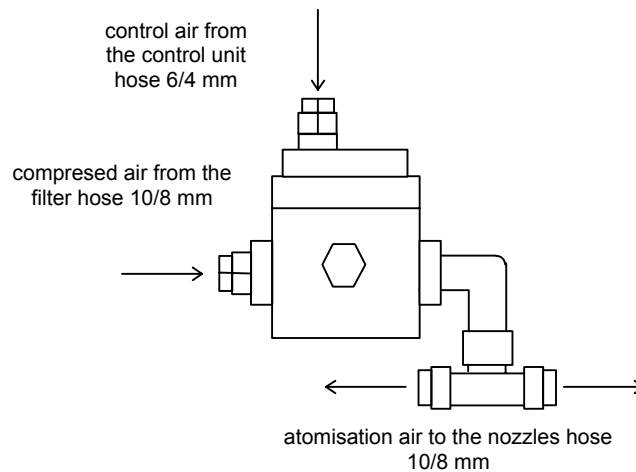
8.2.5 Pilot Valve Type PV



Note: Note the following when installing the pilot valve:

- Install the pilot valve at the center of a nozzle row.
- One pilot valve can supply up to 16 vacuum nozzles with compressed air.

- Hose lengths may not exceed 20 m on either side.
- We recommend white hosing for the compressed air hoses.
- Secure the pilot valve with the two appropriate screws.
- When connecting the hoses, note the connection diagram below.



pilot valve connection diagram

8.2.6 Plastic Hosing

For laying plastic hosing, usage of installation pipes, installation tubes or cross braces is recommended.



Note: Note the following when installing the hoses:

- Use only opaque (black) hosing for water hoses.
- Do not lay plastic hoses taut since they may later contract. Allow for 50 mm extra length per 1 meter of plastic hosing.
- Shorten hoses with a suitable hose cutter to ensure a clean, straight edge.
- Always insert the hoses straight into the connector to achieve a tight seal.



Note: Before installation, flush the hoses with compressed air to prevent possible impurities in the hoses from entering the nozzle system.

Colors are specified below:

Plastic Hose	Color
water	black
atomisation air control air	white

8.3 Checklists



Warning: The nozzle system is only to be started by qualified, authorized personnel.

- Have the nozzle clearances (minimum distances and heights) been observed?
- Is the vacuum valve mounted at the same height as all the nozzles it supplies? Are all these nozzles mounted at the same height?
- Are the vacuum and pilot valves installed in the middle of a nozzle row?
- Is the vacuum valve at the same height as the nozzles?
- Are the hoses from the water outlet line to the vacuum valve no longer than 10 m?
- Are no more than 8 nozzles connected to one vacuum valve?
- Are the hoses from the atomisation air supply to the pilot valve no longer than 20 m?
- Are all hoses secure and straight in the connectors?
- Have the hose lines been laid with at least 50 mm spare length per meter?
- Have the electrical connections been made according to the wiring diagram?
- Are water and air filters correctly inserted and secure?

After Nozzle System Startup:

- Are the nozzles switched on and off correctly by the hygostat (and max. hygostat)?
- Do the nozzles close properly when humidification is not required?
- Are no objects or obstacles being sprayed?

8.4 Example of Installation

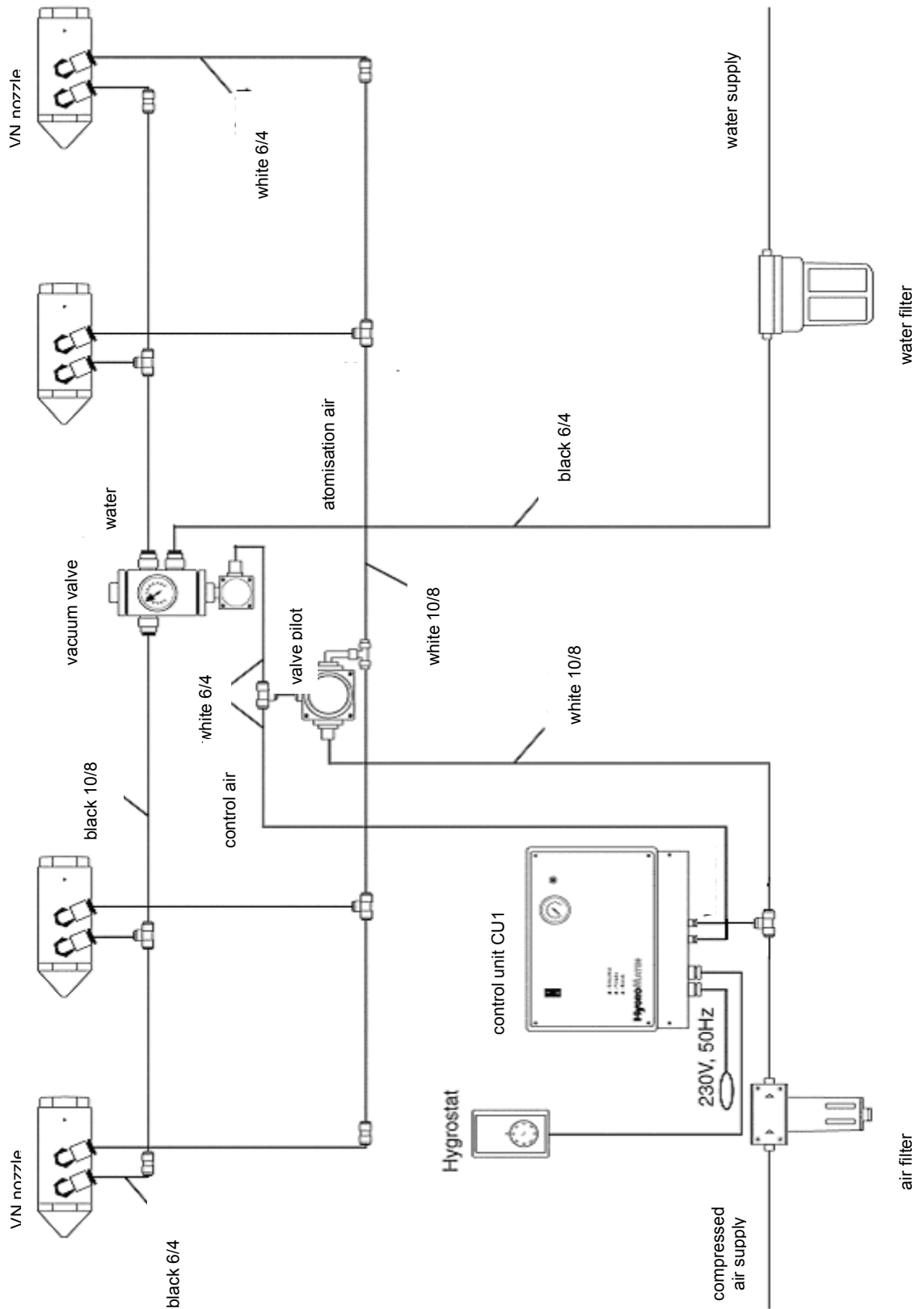


Fig.: Example of installation, a VN Unit with 4 nozzles

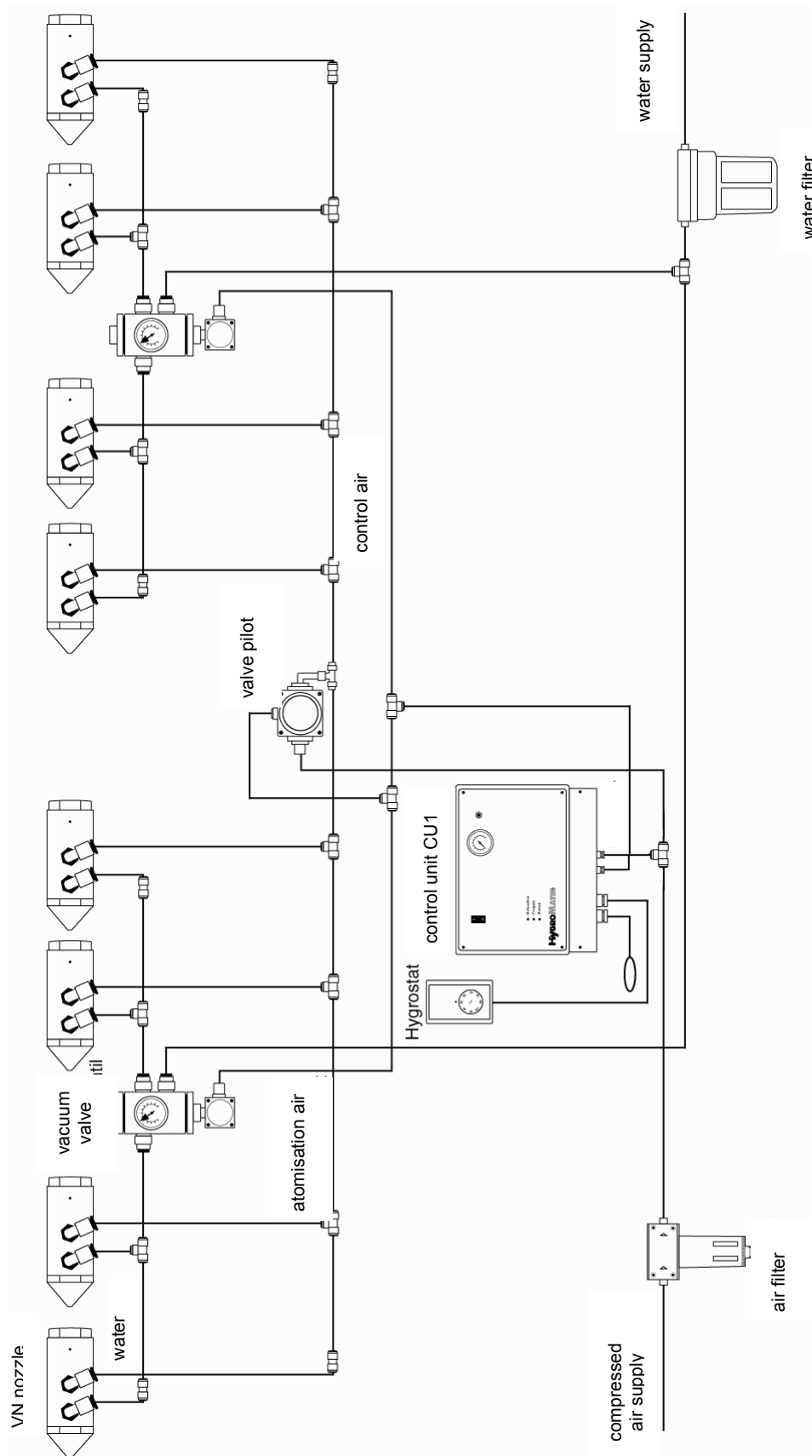


Fig.: Example of installation, a VN Unit with 8 VN nozzles and 2 vacuum valves

8.5 Water Installation



Warning: Note the following when installing:

- Have all work performed by a professional.
- Obey local regulations enforced by water and other public utilities.
- Use potable drinking water or fully demineralised water only.
- The water supply temperature may not exceed 30° C.
- Water installation pressure: 2-4 bar
- Water supply: minimum DN 8



Note: Type VN vacuum nozzles are to be operated with tap water or fully demineralised water. Fully demineralised water must be used to prevent calcium and mineral dust and to reduce maintenance intervals.

8.5.1 Installing the Water Installation

Install a shut-off valve (SV) in front of the water filter

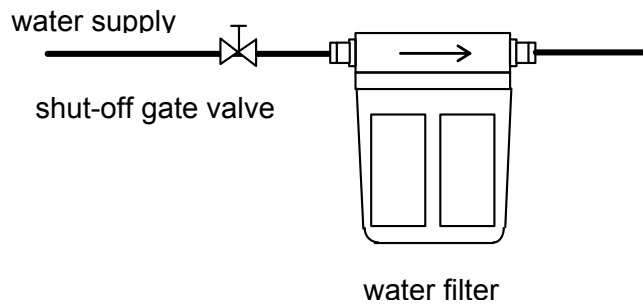
- » in the water supply line.
- » Install water filter (5µm)

water filter	connection
inlet	10/8 mm
outlet	6/4 mm

Typically, a black plastic hose 6/4 mm is laid from the water filter outlet to the vacuum valve.



Note: When the distance between the water installation and the vacuum valve exceeds 15 m, use a plastic hose 10/8 mm to prevent pressure loss. In this case, use water filter part no. and a reducer 10/8-6/4 (part no.E-7600104) for the connection to the vacuum valve.



8.6 Compressed Air Connection



Warning: For installation, note the following:
Have all work performed by a professional.



Warning: Use compressed air of breathable air quality only! This meets Class 1 standards as specified in DIN ISO 8573-1.

Class 1 compressed air as specified by DIN ISO 8573-1	
residual oil content	$\leq 0,01 \text{ mg/m}^3$
maximum dirt particle size	$\geq 0,1 \text{ }\mu\text{m}$



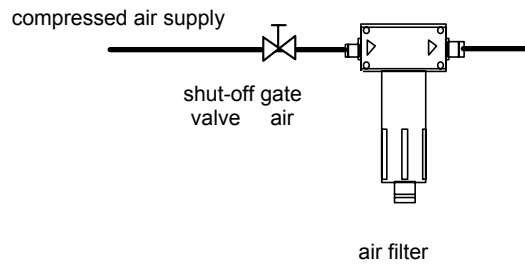
Note: The air filter for the nozzle system has a pore size of $5 \text{ }\mu\text{m}$; it acts as protection for the nozzle system against impurities in the plumbing. For breathable air quality, a separate filter - usually in the compressor - is required!

- The compressed air supply temperature may not exceed 40°C .
- Compressed Air Connection: 5 - 10 bar
- compressed air supply line: minimum DN 8

8.6.1 Installing the Compressed Air Connection

Install a shut-off valve (SV) in front of the air filter

- » in the supply line.
- » Install air filter (5µm).



Air Filter	Skillair
intake	10/8 mm
outlet	10/8 mm

8.7 Electrical Work



Warning: For installation, note the following:

- Electrical installation of the control unit is only to be attempted by qualified personnel.
- Disconnect from power supply before performing any work.
- Professionally lay electrical connector cable.
- Install the electrical connections according to the wiring diagram.

8.7.1 Electrical Installation

- » Only connections with a permanent installation wire (e.g. NYM) are permitted for electrical wiring. Flexible wires may not be used.
- » For external fuses, choose between quick and medium blow ratings:

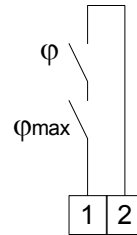
External Circuit Protection
6 A (min. 1 mm ² size)

Room Hygrostat

When the hygrostat is open, a voltage of 230V~ is applied to terminals 1 and 2.

Control Unit Type CU-1:

- » connect hygrostat (φ) and max. hygrostat (φ_{\max}) to terminals 1 and 2 in the control unit CU1 as specified in the schematic:



terminals in control unit



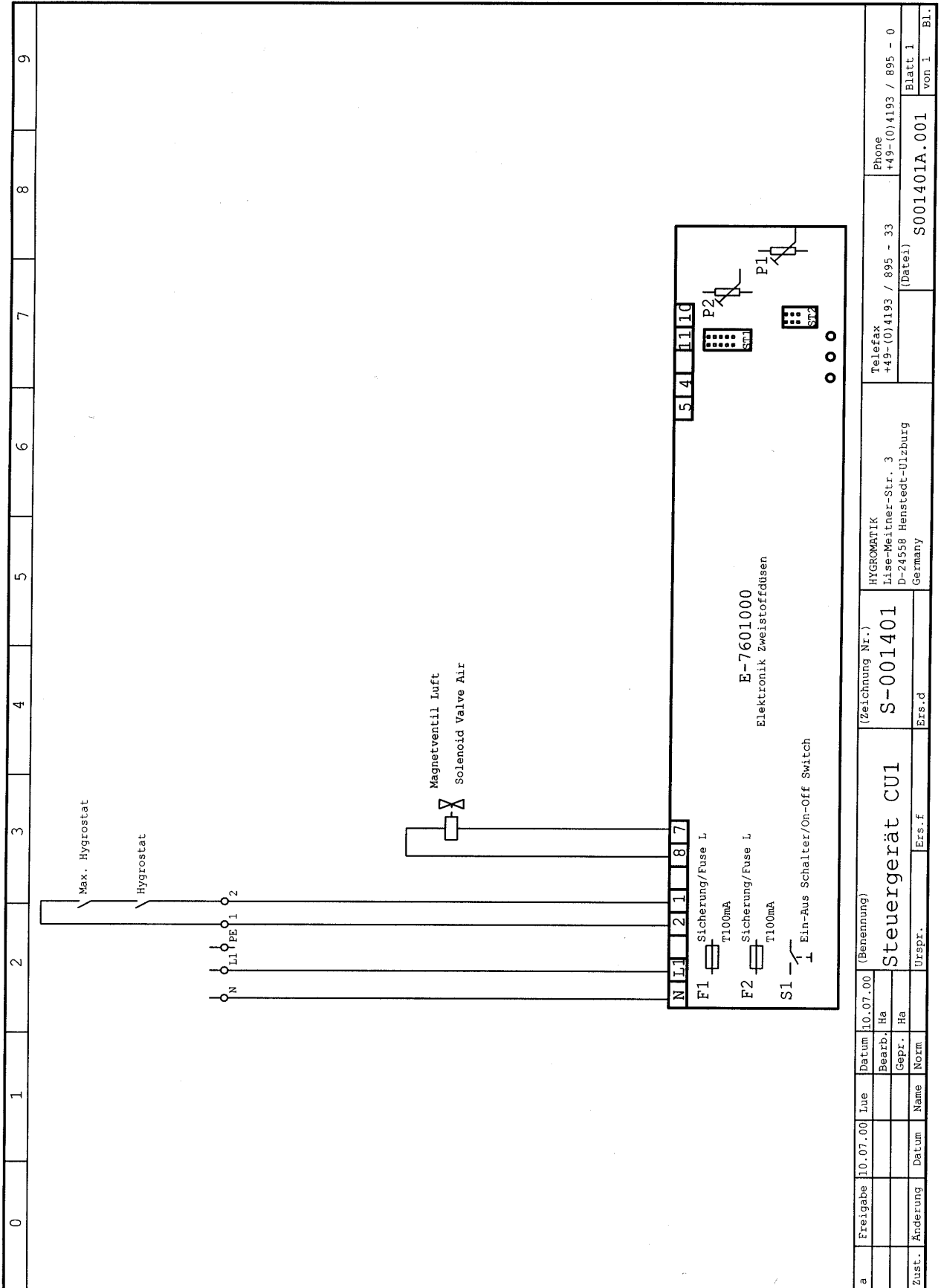
Warning: To prevent excessive humidification due to malfunction of hygrostat (φ) control, a max. hygrostat (φ_{\max}) must be installed.

8.7.2 Checklist Prior to Initial Operation

Electrical installation must be performed in compliance with German Association for Electrical, Electronic & Information Technologies (VDE) standards, customer site requirements and public power utility regulations.

- All electrical connections must be made according to the wiring diagram.
- Cable connections must be secure.

8.7.3 Wiring Diagram



a	Freigabe	10.07.00	Datum	10.07.00	(Benennung)	HYGROMATIK Lise-Meitner-Str. 3 D-24558 Henstedt-Ulzburg Germany	Telefax +49-(0)4193 / 895 - 33 (Datei)	Phone +49-(0)4193 / 895 - 0
			Bearb.	Ha	S-001401	Ers.d	S001401A.001	Blatt 1 von 1
			Gepr.	Ha				
Zust.	Änderung	Datum	Name	Norm	Urspr.	Ers.f		

8.8 Dismantling

After you stop using the nozzle system, dismantle (demolish or scrap) it by following the installation procedures in reverse order.

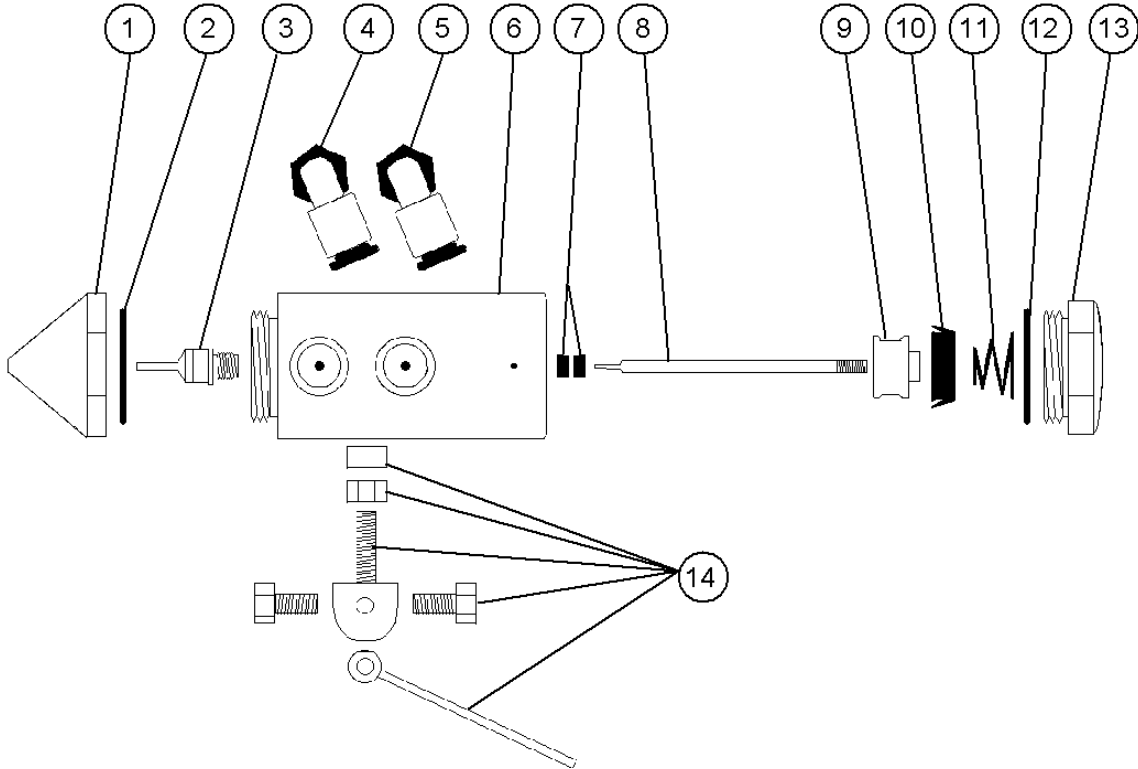


Warning: Dismantling of the unit is only to be attempted by qualified personnel. Electrical dismantling is only to be attempted by trained professionals.

Note the information provided in Section 2 "Safety Notes," especially the guidelines for disposal.

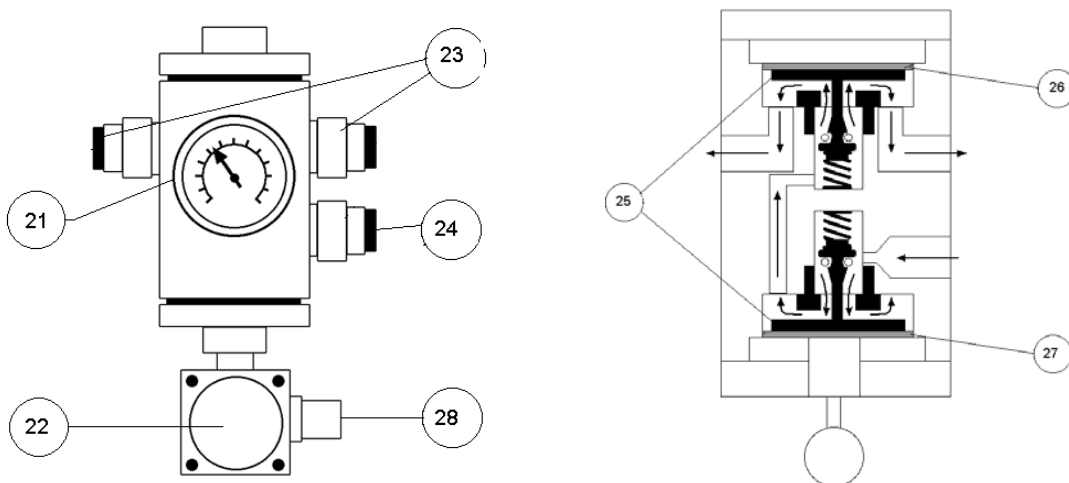
9. Spare Parts

9.1 Exploded View of Vacuum Nozzle



Vacuum Nozzle Type VN

9.2 Sectional Drawing Vacuum Valve Type VV8



Vacuum Valve Type VV8

Spare parts without location numbers are available from the Hygromatik factory.

9.3 Spare Parts List

Loc.	Article No.	Designation
	B-7601501	Vacuum Nozzle HYGROMATIK Type VN, complete
1	E-7601504	nozzle cap
2, 12	E-7601522	o-ring
3	E-7601508	nozzle tip; WARNING! OBTAIN ONLY FROM HYGROMATIK!
4, 5	E-7601516	swivel connector, bracket, 6x4-1/8"
6	E-7601502	nozzle body
7 (2x)	E-7601518	seal for cleaning needle
8	E-7601510	cleaning needle, Hy-vacuum nozzle
9	E-7601512	piston for cleaning needle
10	E-7601520	piston lining
11	E-7601500	spring, compression spring for vacuum nozzle Type VN
13	E-7601506	end cap
14	E-7601514	nozzle bracket for wall mounting,
	B-7600101	Vacuum Valve Type VV8
21	E-7601584	manometer, 0 - 1.6 bar,
22	E-7601582	pressure controller 0-2.5 bar for control air
23	E-7601574	screw connector, straight, G1/4"
24	E-7601576	screw connector, straight, 6x4-G1/4"
25		valve plate - replacement part only available from the Hygromatik factory
26	E-7600114	diaphragm, black, water outlet
27	E-7600112	diaphragm, brown, water inlet
		Additional replacement parts are available from the Hygromatik factory.
	B-7600047	Pilot Valve for max.16 vacuum nozzles
	B-7601503	Control Unit Type CU-1
	E-7601000	control for two substance nozzles 230V, 50-60 Hz
	E-7601618	manometer, 0 - 10 bar
	E-7601622	solenoid valve, 3/2 way, 230V 50 Hz
	E-7601640	pressure controller for atomisation pressure 0-8 bar
	B-7600039	Air Filter incl. Connection 3/8" 10x8 mm
	B-7600041	Water Filter incl. Connections 3/8", 10x8-6x4 mm
	E-7600190	filter cartridge (5µm) for water filter 5 inch
	E-0611001	Room Hygrostat HG-Mini (RH1), 1 stage, 35 - 95% RH
	E-0611100	duct hygrostat HG80 (KF1), 1 stage, 35-95% RH
	E-0610152	wall bracket for HG80
		Plastic Hosing
	E-7600182	for water, black, 6/4mm
	E-7600210	for compressed air, white, 6/4mm
	E-7600184	for water, black, 10/8mm
	E-7600214	for compressed air, white, 10/8mm
		Connector, T-piece
	E-7600060	T-piece connector, 6/4 mm
	E-7600062	T-piece connector, 10/8 mm
	E-7600064	T-piece connector, 10/8 mm - 6x4 mm
		Connector, straight
	E-7600100	Connector, straight, 6/4 mm
	E-7600102	Connector, straight, 10/8 mm
	E-7600104	connector, Type 158M,10/8-6/4

