

Installation and Operating Manual

Nozzle-based Humidifier System

DEFENSOR Airfog



Contents

1. Introduction

- 1.1 Let's start at the very beginning!
- 1.2 Notes on the technical document

2. For your safety

3. Product overview

- 3.1 System variants
 - 3.1.1 "Compact" system
 - 3.1.2 "Vario Easy" system
 - 3.1.3 "Vario" system
- 3.2 Description of operation
 - 3.2.1 Description of operation of the "Compact", "Vario Easy", and "Vario" systems with AF-1 nozzles

4. Basic planning

- 4.1 Notes on planning an AF humidifier system
- 4.2 Calculation of the maximum humidifier output
- 4.3 Determination of the number of atomizer nozzles
- 4.4 Determination of the number of control circuits
- 4.5 Selection of the system variants and notes on ordering
- 4.6 Notes on water and compressed air supplies

5. Installation

- 5.1 Installation safety notes
- 5.2 General notes on positioning
- 5.3 Installation instructions for "Compact" system
- 5.4 Installation instructions for "Vario Easy" system
- 5.5 Installation instructions for "Vario" system
- 5.6 Water and compressed air installation
- 5.7 Electrical installation

6. Commissioning the system

7. Operation

- 7.1 Start-up after a break in operation
- 7.2 Adjustments and inspections
- 7.3 Switching off the humidifier system

8. Maintenance and cleaning

- 8.1 Safety notes for maintenance and cleaning
- 8.2 Cleaning intervals
- 8.3 Cleaning operations

9. Faults and their elimination

- 9.1 What if ...?
- 9.2 Replacement of defective system components

10. Technical data/Declaration of Conformity

11. Appendix

- 11.1 h,x diagram
- 11.2 Accessories
- 11.3 Spares lists
- 11.4

1 Introduction

1.1 Let's start at the very beginning!

We would like to thank you for choosing the **Defensor Nozzle-based Humidifier System Airfog AF** (also called **AF humidifier system** in this manual).

The AF humidifier system was constructed using state-of-the-art technology and meets the recognized safety standards. Nevertheless, improper use of the AF humidifier system can endanger the safety of the user and/or other persons, and/or result in damage to property.

To ensure proper, safe and economical operation of your AF humidifier system, please read and adhere to all the information and safety instructions in this technical document.

If you have any questions that are not answered, or not adequately answered in this document, please contact Geveke on our servicehotline (+31 20-5822545). We will be happy to help you.

1.2 Notes on the technical document

Limitations of the document

The subject of this technical document is **the Defensor Nozzle-based Humidifier System Airfog AF** in the following versions: **“Compact”, “Vario Easy” and “Vario”**. The various accessories (humidistats, filters, etc.) are only described where this is necessary to ensure proper operation of the equipment. Further information on accessories can be obtained in the relevant manuals.

This technical document is restricted to:

- the **planning** of a humidifying system that is to be equipped with an AF humidifier system
- the **installation, commissioning, operation and servicing** of the AF humidifier system

This technical document is supplemented by various separate documents (brochures, order codes, etc.). Where necessary, appropriate cross-references are made to these publications in this technical document.

Conventions



This symbol highlights **safety instructions and danger warnings**. If unheeded, these could result in injury to persons and/or damage to property.

Safekeeping

Please keep this technical document in a safe place where it can be immediately accessed at all times. If the equipment changes hands, pass the document on to the new operator. If the document is mislaid, please contact Geveke (+31 20 / 5822545).

Language versions

This technical document is available in various languages. Please contact Geveke at this number: +31 20 / 5822545.

2. For your safety



Intended use

The AF humidifier system is **exclusively intended for controlled room air and process humidification** within the specified operating conditions in non-explosive areas. Any other use is considered non-intended and could prove dangerous.

Operation of the equipment in the intended manner requires **that all the information in this manual is observed** (in particular the safety instructions), that original spare parts are used exclusively and that the operating conditions are strictly adhered to.

General safety instructions

- The AF humidifier system must only be installed, operated, and repaired **by persons who are sufficiently qualified** to undertake such work and are well acquainted with the product. It is the responsibility of the customer to ensure that the technical document is supplemented by internal operating instructions relating to supervision and reporting responsibilities, work organization and the qualification of personnel, etc.
- **Before commencing work** on the components in the AF humidifier system, render the system **inoperative** as described in section 7.3 and secure it against being re-started inadvertently (switch off the control unit and isolate it from the electrical power supply, isolate water and compressed air supplies and depressurize the system).
- Observe all local **safety regulations**
 - relating to the operation of mains-operated **electrical and electronic equipment**
 - relating to the **provision of water and compressed air systems**



Poorly maintained humidification systems can endanger health. **The servicing intervals should therefore be strictly adhered to and the servicing work carried out correctly.**

- If it is suspected that **safe operation is no longer possible**, then the AF humidifier system should immediately **be shut down and secured against accidental power-up**. This can be the case under the following circumstances:
 - if system components are damaged
 - if the system is no longer operating correctly
 - if connections are not sealed or cables are leaking



The AF humidifier system must **only be operated under the specified operating conditions** (see section 10).

Caution! The AF humidifier system control unit must only be operated with a **24 VAC safety low voltage as described in EN-60 335 part 1** (see also section 5.7).

The AF humidifier system control unit is IP30 protected. Make sure the control units are installed in a drip-proof location



Caution! If the AF humidifier system is installed in an area without a water drain, water sensors must be fitted in the area so that the water supply will be shut off if the water system starts leaking.

In order to avoid damage due to water, **materials sensitive to water should not be stored directly below the atomizer nozzles.**



Caution! Danger of corrosion! In order to avoid damage, **no corrosion-sensitive components** should be located in the area of the aerosol streams of plant operated with **deionized water** (no rebounding surfaces for the aerosols).

Caution! Depending on the amount of minerals in the tap water, a relatively strong calcium deposit may accumulate in the area of the aerosol stream. Depending on the amount of materials in the pure water (generated by the water deionizer and reverse osmosis), a relatively strong deposit may accumulate in the area of the aerosol mist. Sensitive material or machines require adequate protection or must be removed from this area.

No work should be carried out on the AF humidifier system other than that described in this manual.

Use exclusively **original accessories and spare parts** available from your Geveke supplier.

No modifications must be undertaken on the AF humidifier system without the express written consent of Geveke, Amsterdam, Holland.

If modifications are made to the system, it must be inspected by the Geveke after-sales service or by Geveke-authorized persons before it is switched on for the first time again.

3. Product overview 3.1

System variants

The **AF humidifier system** is available in **three versions**:

- **“Compact”**
- **“Vario Easy”**
- **“Vario”**

3.1.1 “Compact” system

System description

In the “Compact” system, all the system components are integrated in a stable steel sheet housing. The atomizer nozzles are fixed on the top of the housing and are adjustable in all directions.

The “Compact” version is controlled by an **on/off humidistat** and is suitable for the **humidification of small rooms**. It is designed for **wall mounting** and is supplied complete with connections.

The “Compact” system is available in **two models**, with one or two AF-1 atomizer nozzles respectively:

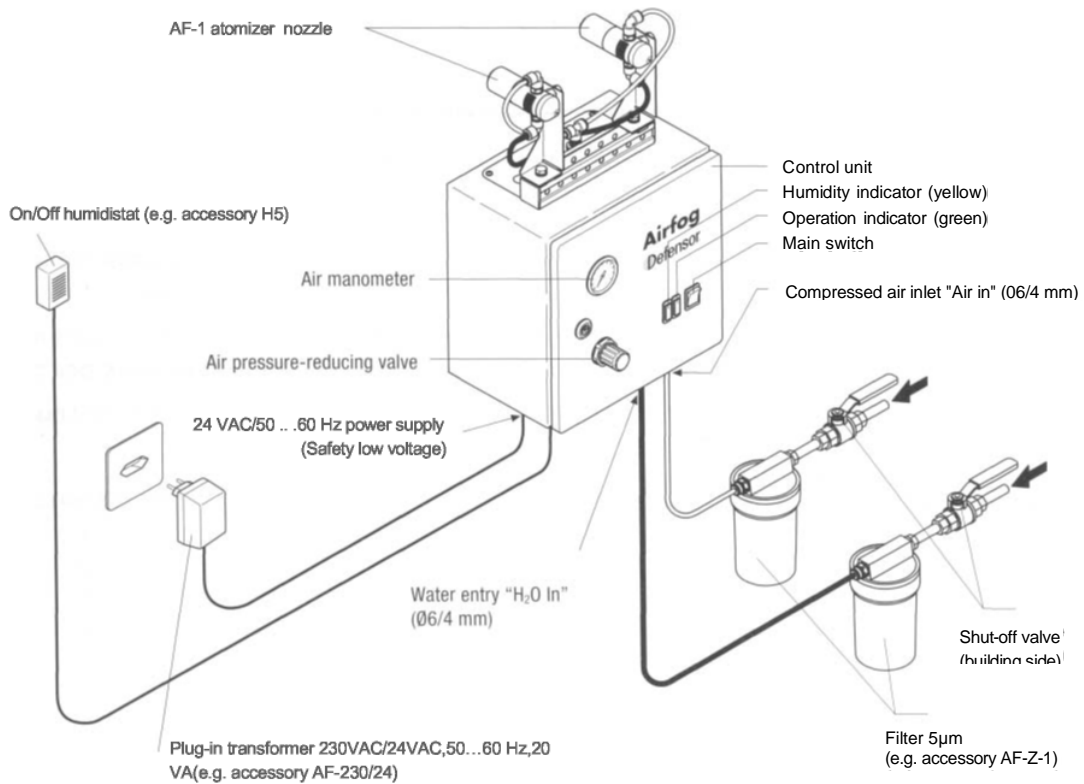
Product code	No. of nozzles	max. humidification output at 5 bar atomization air pressure ¹⁾
AF-C1	1	7 l/h
AF-C2	2	14 l/h

1) Important! See note on humidifier output in section 4 “Basic planning”.

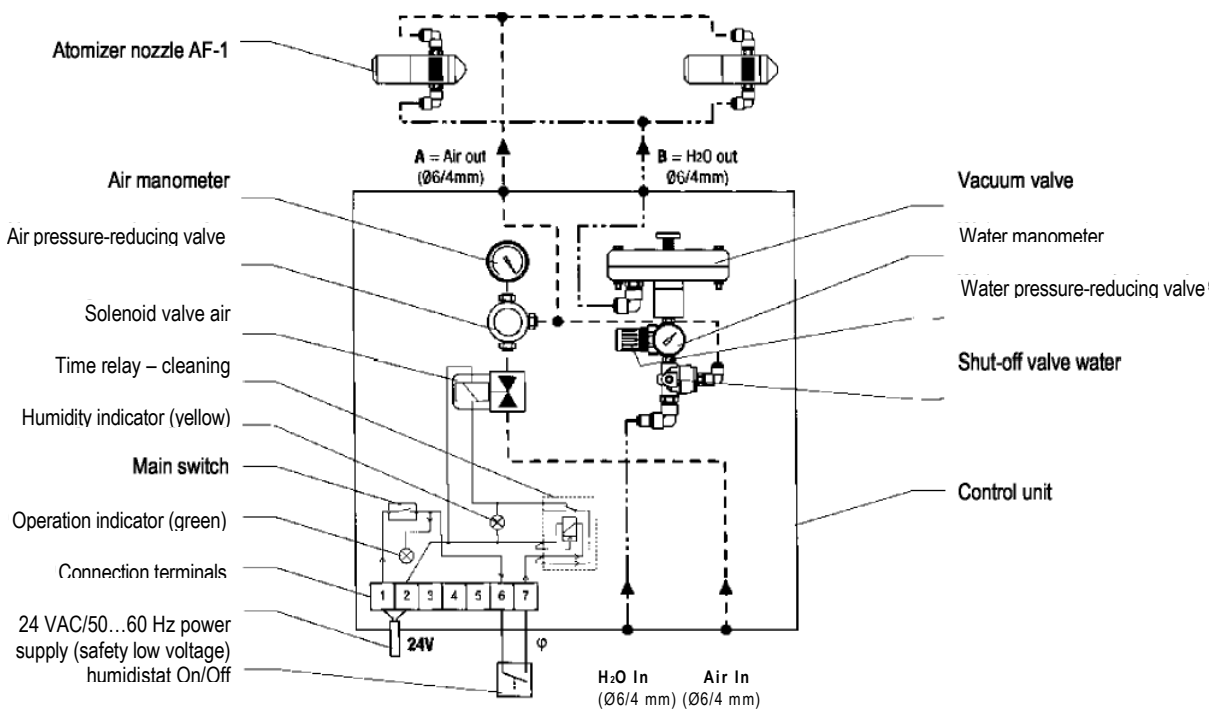
Accessories

Various accessories are available for the “Compact” system. These are identified as such in the following overview. The accessories required should be listed separately when placing an order. A list of accessories is provided in section 11.2.

Overview of "Compact" system (the figure shows system AF-C2)



Structure of "Compact" (the figure shows system AF-C2)



3.1.2 “Vario Easy” system

System description

The “Vario Easy” system (control circuit) consists of:

- **one AF-S1 control unit** (designed for wall mounting)
- **one AF-S2-E Vario Easy supply assembly** (comprising AF-VE-SH mounting, complete with AF-VV vacuum valve unit and AF-AV main air valve). The AF-S2-E Vario Easy supply assembly is always mounted, ex-works, roughly in the center of the console specified in the order.
- one or more **AF-VE- .. consoles**, with AF-1 atomizer nozzles mounted, complete with connections (**max. 20 atomizer nozzles per system**).

The consoles are available in two lengths and with different numbers of nozzles:

Console type	Length	Number of nozzles
AF-VE-1	1.5 m / 3.0 m	1
AF-VE-2	1.5 m / 3.0 m	2
AF-VE-3	1.5 m / 3.0 m	3
AF-VE-4	1.5 m / 3.0 m	4
AF-VE-5	1.5 m / 3.0 m	5
AF-VE-6	3.0 m	6
AF-VE-7	3.0 m	7
AF-VE-8	3.0 m	8
AF-VE-9	3.0 m	9
AF-VE-10	3.0 m	10

The AF-VE-.. consoles can be mounted **individually** (optimum room distribution), **combined as a unit** on the **wall** (with AF-VE-WH wall mounting support), or suspended from the **ceiling** (using ceiling mounting support AF-VE-CH). The stream directions of the atomizer nozzles can be individually adjusted. If the console is ceiling-mounted, the nozzles can be arranged so that the atomizer streams are emitted on both sides.

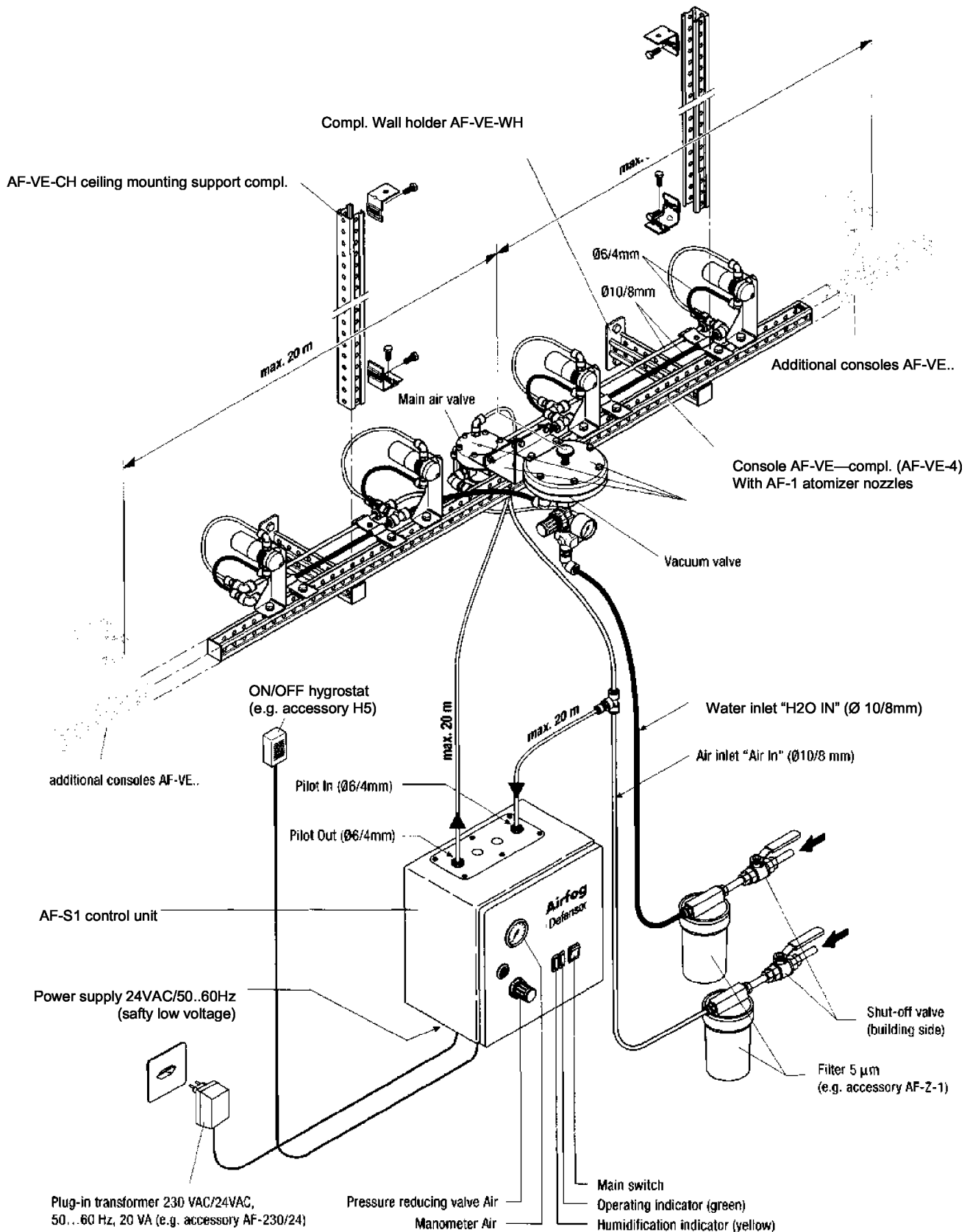
The “Vario Easy” systems are controlled by an **on/off humidistat** and are suitable for the **humidification of larger rooms**. A feature of these systems is their **ease of installation**.

The **maximum humidity output** of the “Vario Easy” depends on the number of atomizer nozzles fitted and ranges from **7 ... 140 l/h** (from 1 to a max. of 20 nozzles) at 5 bar atomization air pressure (**Important!** See note on humidifier output in section 4 “Basic planning”).

Accessories

Various accessories are available for the “Vario Easy” system. These are identified as such in the following overview. The accessories required should be listed separately when placing an order. A list of accessories is provided in section 11.2.

Overview of "Vario Easy" system



3.1.3 “Vario” system

System description

The “Vario” system (control circuit) consists of:

- one **AF-S1 control unit**
- one **AF-S2 supply unit** with AF-VV vacuum valve unit and AF-AV main air valve
- from **1 to max. 20 AF-1 atomizer nozzles**

The individual system components are designed for **wall mounting** and can be positioned anywhere in the room provided that certain maximum distances are satisfied (see overview). The “Vario” system is therefore particularly suitable for the **humidification of larger rooms and/or rooms with an angle in planform.**

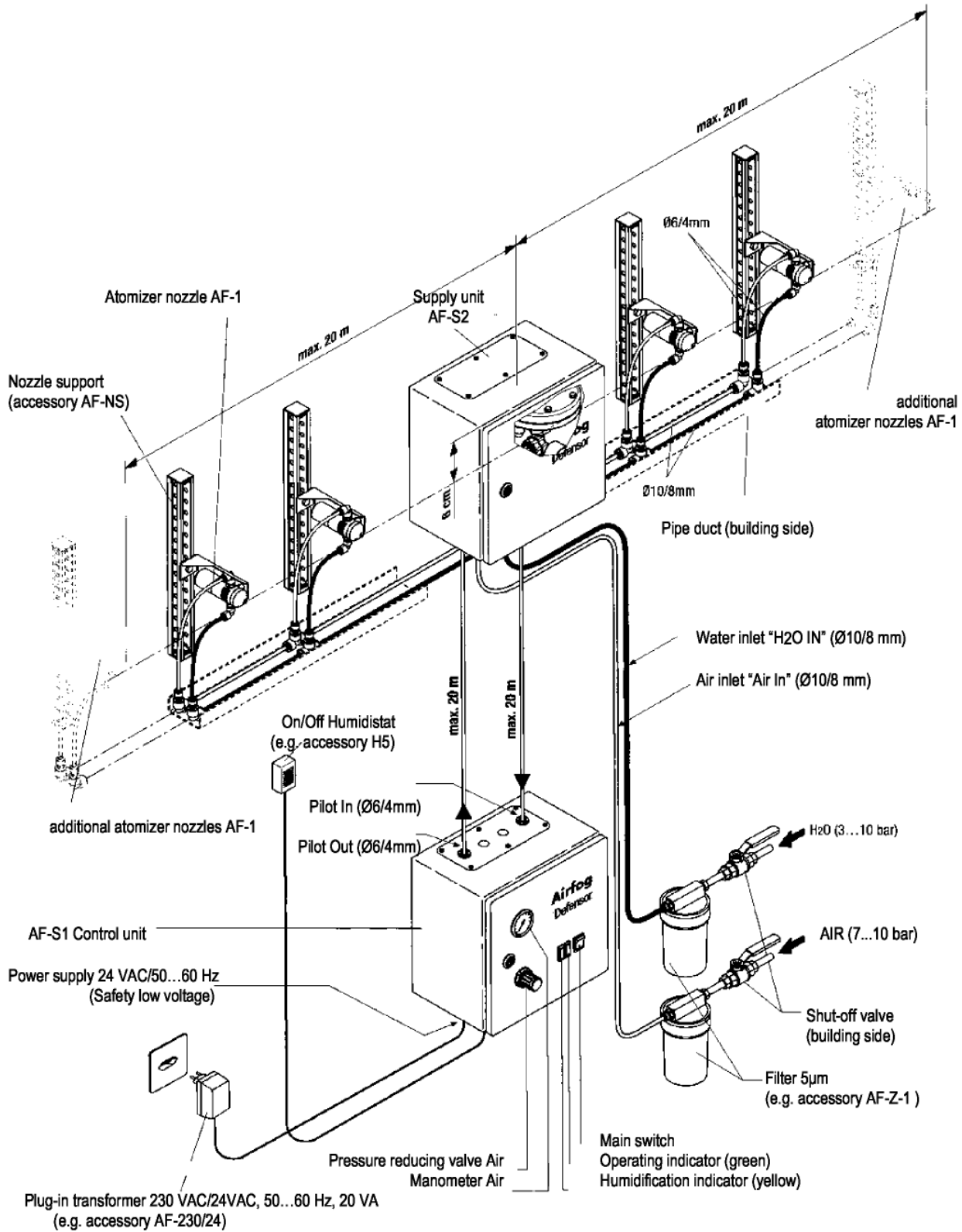
The “Vario” systems are controlled by an **on/off humidistat**. The **maximum humidifier output** depends on the number of atomizer nozzles employed and ranges from **7...140 l/h** (from 1 to a max. of 20 nozzles) at 5 bar atomization air pressure (**Important!** See notes on the humidifier output in section 4 “Basic planning”).

The stream directions of the atomizer nozzles can be individually adjusted.

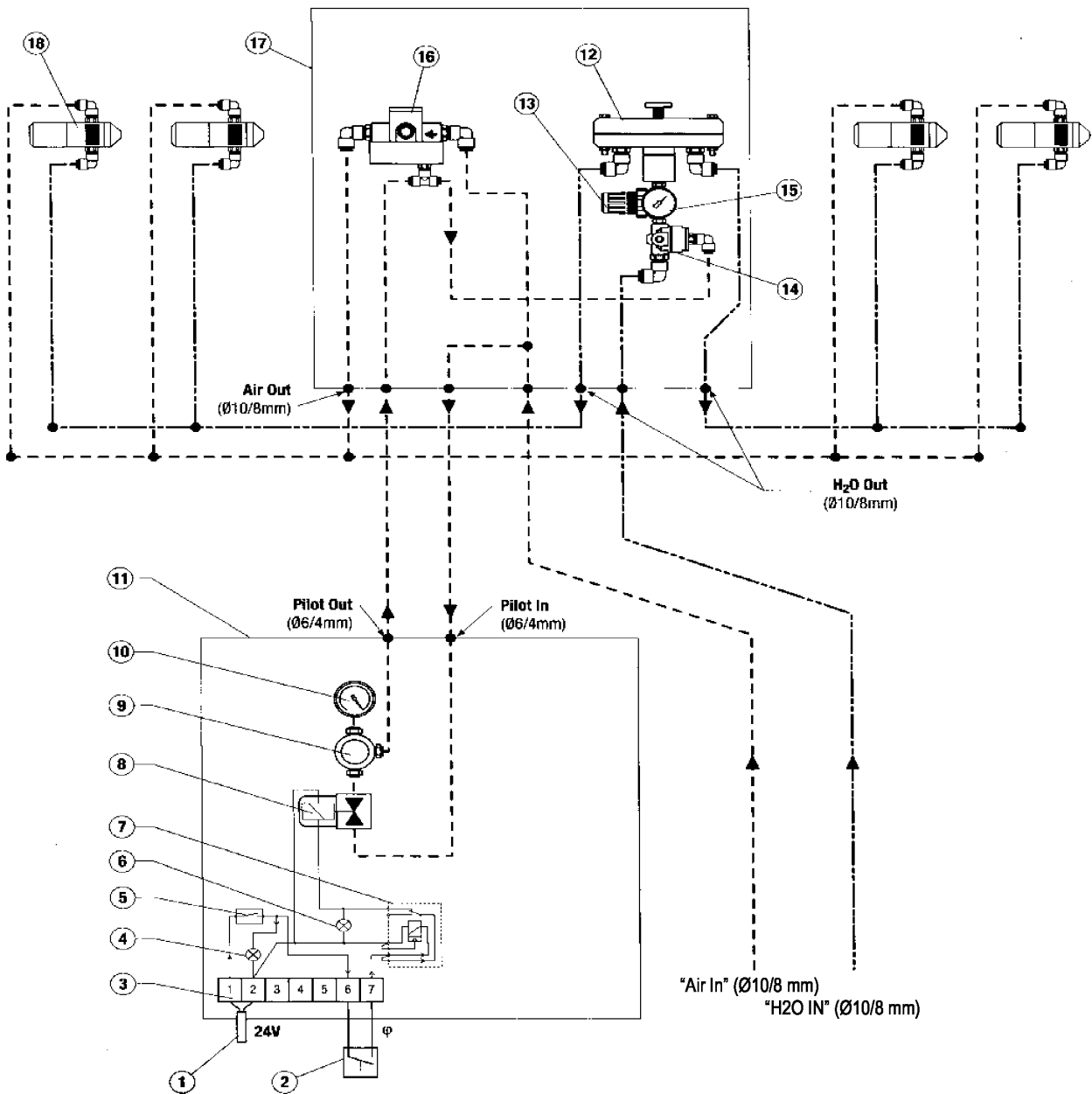
Accessories

Various accessories are available for the “Vario” system. These are identified as such in the following overview. The accessories required should be listed separately when placing an order. A list of accessories is provided in section 11.2.

Overview of "Vario" system



Structure of "Vario"



- 1 Power supply 24 VAC/50...60 Hz (safety low voltage)
- 2 ON/Off humidistat
- 3 Connection terminals
- 4 Operation indicator (green)
- 5 Main switch
- 6 Humidification indicator (yellow)
- 7 Cleaning time relay
- 8 Compressed air solenoid valve
- 9 Air pressure reducing valve

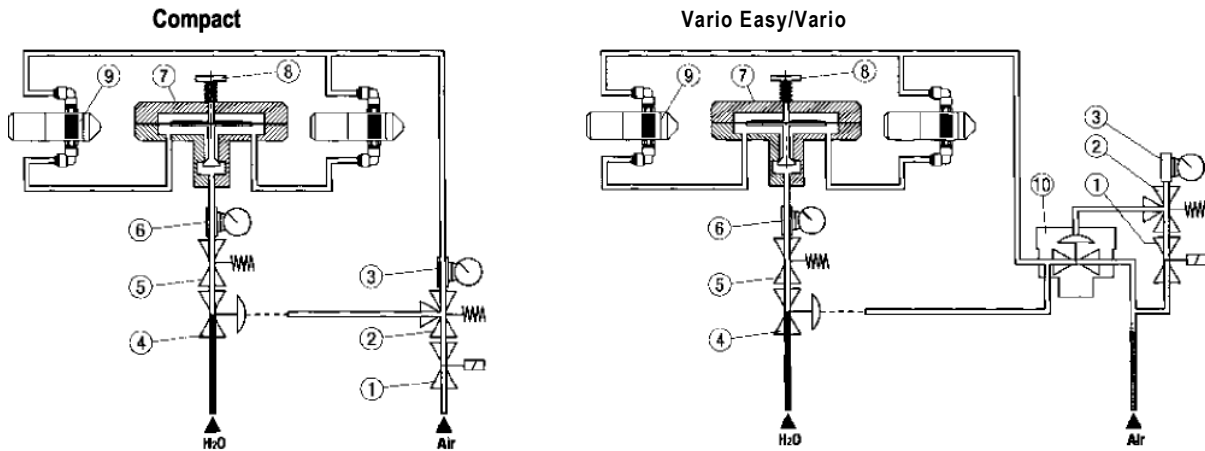
- 10 Air manometer
- 11 AF-S1 Control unit
- 12 Vacuum valve
- 13 Water pressure reducing valve
- 14 Water shut-off valve
- 15 Water manometer
- 16 Main air valve
- 17 AF-S2 supply unit
- 18 AF-1 atomizer nozzles

3.2 Description of operation

3.2.1 Functional description of the “Compact”, “Vario Easy”, and “Vario” systems with AF-1 nozzles

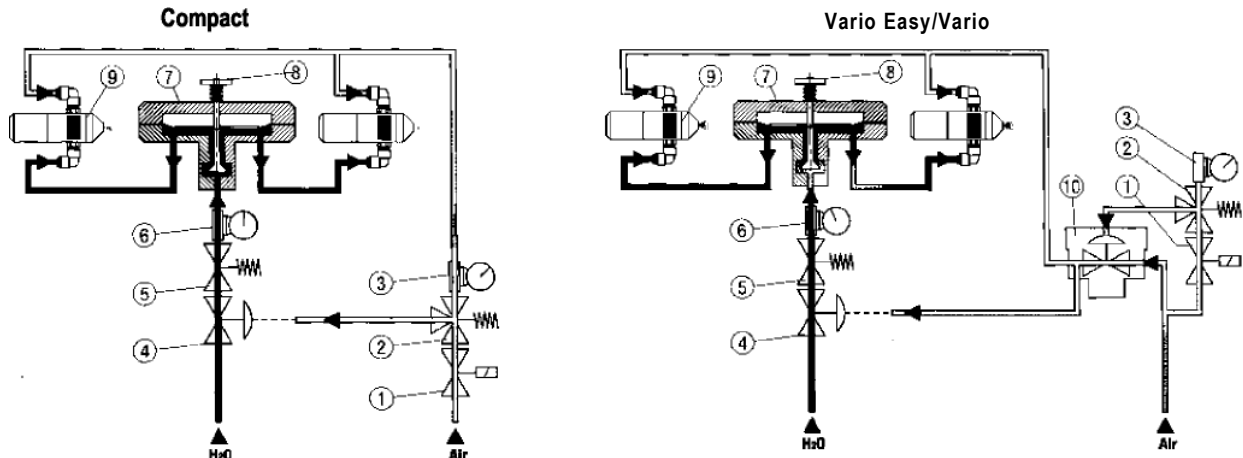
Standby mode

In standby mode (the control unit is switched on and humidifier operation is not currently required), the **green operation indicator** on the control unit is illuminated. The compressed air supply is isolated via the compressed air solenoid valve (1) and the water supply is isolated via the compressed air-operated water shut-off valve (4).



Humidifier operation

If the unit is switched on and current room humidity is below the set humidity value, the On/Off humidistat closes the circuit, the **green operation indicator** and the **yellow humidification indicator** on the control unit light up and the compressed air solenoid valve (1) opens.



In the “Compact” system, the compressed air passes through the pressure-reducing valve (2) directly into the atomizer nozzles, opening the compressed air operated water shut-off valve (4) at the same time.
In the “Vario” and “Vario Easy” systems, the compressed air passes through the pressure-reducing valve (2) to the main air valve (10). The main air valve opens and the compressed air flows into the atomizer nozzles, opening the compressed air operated water shut-off valve (4) at the same time.

The compressed air flowing into the atomizer nozzle (9) presses back the spring-loaded needle and the water escape outlet opens. The ejector effect of the air flowing out of the exit orifice causes a vacuum to occur in the water line between the atomizer nozzle (9) and the vacuum valve (7). This causes the membrane and the valve attached to it to be pulled downwards and the valve orifice is exposed. The water flows into the atomizer nozzle and the compressed air atomizes it into fine aerosols as it leaves the nozzle.

The humidifier system continues to operate at the set output level until the set humidity value has been attained.

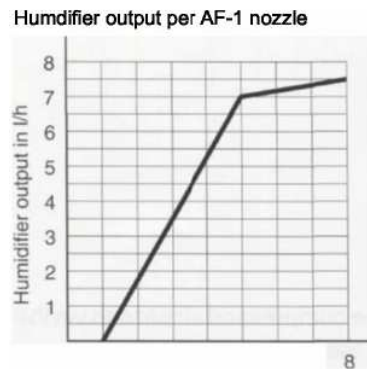
When the desired humidity level has been reached, the compressed air solenoid valve (1) and the compressed air-operated water shut-off valve (4) or main air valve (10) close simultaneously. The compressed air and water supplies are thus interrupted. The spring-loaded needle in the atomizer nozzle is pushed forward and the integrated O-ring closes the water outlet orifice. The vacuum in the water line between the atomizer nozzle (9) and the vacuum valve (7) is destroyed, and the vacuum valve closes.

Cleaning cycle

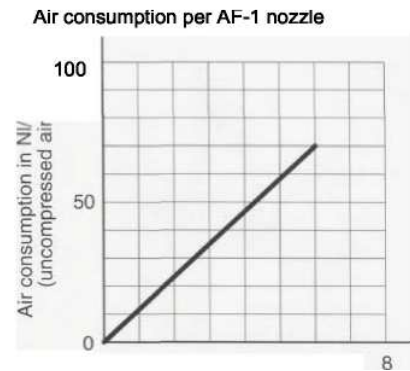
When the set cleaning interval has elapsed (ex-works: 1 hour of operation), the timer relay (in the control unit) interrupts the electrical circuit and the compressed air solenoid valve (1) closes for a few seconds. The air supply is interrupted. In the atomizer nozzle, the spring-loaded needle is pushed forward and is pushed through the outlet bore. This causes the bore to be cleaned and the water outlet orifice to be closed simultaneously by the integrated “O” ring to prevent residual dripping.

Specifying the maximum humidifier output (AF-1 nozzle)

The maximum humidifier output depends on the set atomization air pressure. It is specified using the compressed air-reducing valve (2) and the manometer (3) on the control unit, as described in the following diagram:



1 2 3 4 5 6 7 8
Atomization air pressure in bar



1 2 3 4 5 6 7 8
Atomization air pressure in bar

Note: In addition to the atomization air pressure, the water pressure (adjustable with the pressure reducing valve (5) and manometer (6) – factory setting 0.5 bar) and the setting of the adjuster nut (8) on the vacuum valve also affect the atomizer output. These settings are made in the factory and must not be changed by the customer.

4 Basic planning

4.1 Notes on planning an AF humidifier system

The following procedure is carried out to select/design an AF humidifier system:

- Calculation of the maximum humidifier output (see section 4.2)
- Determination of the number of nozzles required (see section 4.3)
- Selection of the number of control circuits (see section 4.4)
- Selection of the system version (see section 4.5)
- Calculation of the compressed air consumption (see section 4.6)
- Calculation of the water consumption (see section 4.6)

All the data necessary for these planning steps is provided in the following sections. A **sample calculation** is provided for each planning step, based on the following system data:

Example

An AF humidifier system is to be installed in the paper store of a large printing company to provide direct room air humidification. The following details are known:

<i>Room dimensions (LxBxH) in m:</i>	<i>130.0 x 30.0 x</i> <i>4.0</i>
<i>Number of air changes per hour:</i>	<i>2.2</i>
<i>Outside air conditions in winter:</i>	<i>-15°C/90%rh</i>
<i>Desired room temperature:</i>	<i>18°C</i>
<i>Desired relative air humidity:</i>	<i>45%rh</i>

4.2 Calculation of the maximum humidifier output

The maximum humidifier output is calculated using the following formula:

$$\text{mH}_2\text{O} = \frac{V \times 1.2 \times \text{LW/h} \times (x_2 - x_1)}{1000}$$

mH₂O: maximum humidifier output in kg / h

V: Air volume to be humidified in m³
(formula: L x B x H)

LW/h: No. of air changes per hour

The number of air changes per hour depends on the intended use of the room and must be calculated in advance by the system planner. The following values can be taken as a guide:

- Textile processing: 3-7 LW/h
- Printing rooms: 2-5 LW/h
- Store rooms: 1-3 LW/h
- Cool rooms: max. 1 LW/h

1.2: Fixed value for the specific air weight in kg / m³

x₂: Desired absolute humidity of the room air in g / kg

x₁: Minimum absolute humidity prior to humidification in g / kg

The values for **x₂** and **x₁** are given in the h,x diagram in the appendix (see the following example).

*Taking the **example** as a basis and using the following values:*

$$V = 15,600 \text{ m}^3$$

$$\square = 1.2 \text{ kg/m}^3$$

$$\text{LW/h} = 2.2$$

$$x_2 = 5.80 \text{ g/kg}$$

$$x_1 = 1.00 \text{ g/kg}$$

*the result is a humidifier output of **198 kg/h**.*

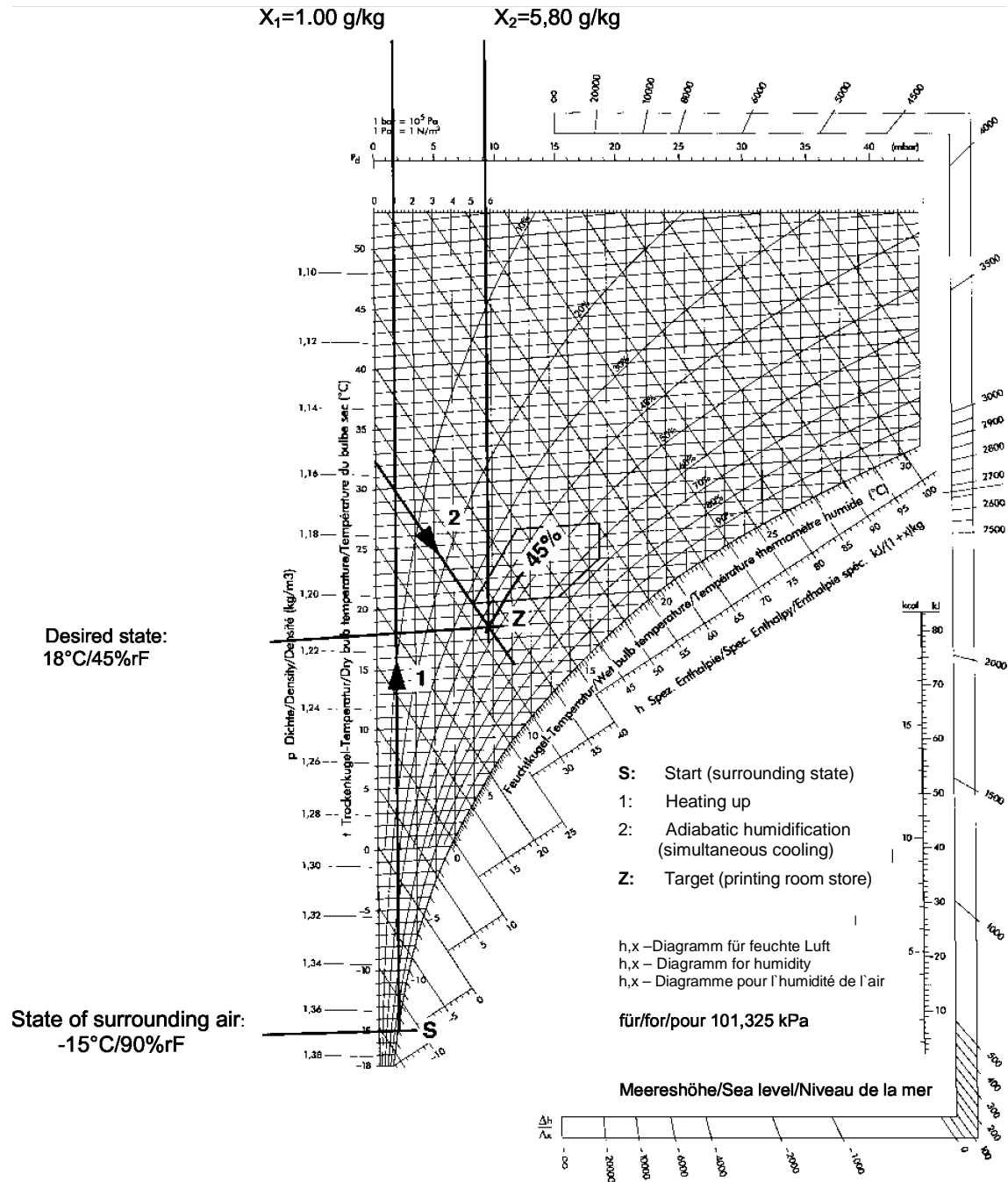
Important notes:

- The above formula does not allow for humidity gain or loss from materials in the room.
- While the atomized water is evaporating, heat is removed from the surrounding air. In order to maintain the desired room temperature, the room air must be heated. The heat generated by machinery/equipment in the room normally achieves this.

If you have further questions concerning the calculation of the humidifier output, please contact Geveke Amsterdam.

Example

Graphic calculation of the necessary values using the hx diagram (for the example).



4.3 Calculating the number of atomizer nozzles

The number of atomizer nozzles is calculated using the following formula:

$$n_D = \frac{m_{H_2O}}{L_D \cdot f_R}$$

- n_D:** Number of nozzles (rounded up to the nearest whole number)
m_{H₂O}: Max. humidifier output in **kg/h**
L_D: Max. output of one atomizer nozzle (atomizer nozzle AF-1, room air humidification), **max. 7 kg/h**
f_R: Reduction factor

Note: The given maximum outputs of the atomizer nozzles are theoretical values and are only achieved under optimum conditions (very warm and dry). Depending on the system, they must therefore be reduced to prevent the aerosol stream from condensing out. General data on the reduction factor cannot be given since it depends on various factors (safety for the humidifier output upwards, reduction of noise emissions, better humidification by spreading the maximum humidifier output over a number of additional nozzles, etc.). Information on the reduction factor for your particular application can be obtained from Geveke Amsterdam.

Taking the **example** as a basis and using the following values:

$$m_{H_2O} = 198 \text{ kg/h}$$

$$L_D = 7 \text{ kg/h } f_R = 0.63$$

the result is **45** atomizer nozzles.

4.4 Calculating the number of control circuits

In the "Vario" and "Vario Easy" system versions (see section 4.5 for system versions), it has to be established over how many **individual systems (control circuits)** the calculated number of nozzles is to be distributed. Each **control circuit can have a maximum of 20 AF-1 nozzles or 8 AF-US nozzles** respectively. The number of control circuits is calculated using the following formula.

$$n_R = \frac{n_D}{20 \text{ (8)}}$$

- n_R:** No. of control circuits (rounded up to the nearest whole number)
n_D: No. of nozzles (as calculated in section 4.3)
20 (8): Max. number of nozzles per control circuit (prescribed value)

Taking the **example** as a basis and using the following values:

$$n_D = 45$$

the result is **3** control circuits.

Important notes

- The maximum distance between the outermost nozzles in a control circuit is limited to **40 m** (20 m on either side of the vacuum valve). For greater distances, the system should be divided into additional control circuits.
- The maximum distance between the AF-S1 control unit and the AF-S2-E Vario Easy supply assembly / the AF-S2 supply unit is **20 m**.
- If a larger room area cannot be optimally humidified with the calculated number of control circuits, additional control circuits should be provided and the number of nozzles divided up between these.

4.5 Selection of the system variants and notes on ordering

The **AF humidifier system** is available in various versions. The correct version is selected depending on the type of humidification (room or process humidification), the number of atomizer nozzles and the options for their placement.

- No. of nozzles ~ 2: "Compact" system (see section 3.1.1)
- No. of nozzles >2: "Vario Easy" system (see sect. 3.1.2) or "Vario" system (see section 3.1.3)

Notes on ordering






The following information is required when placing orders:

- Calculated maximum humidifier output in kg/h
- Room dimensions, including sketch of the room plan
- Additional data for the "Compact" system:
 - Number of units
 - Accessories required (filters, humidistats, plug-in transformers, tubing material, etc., as specified in section 11.2)
- Additional data for "Vario Easy" system
 - No. of individual systems (control circuits)
 - Type and number of consoles per individual system, including mounting type (wall or ceiling mounting)
 - Accessories required (filters, humidistat, plug-in transformer, console profiles, tubing material, etc., as specified in section 11.2).
- Additional data for "Vario" system:
 - Number of individual systems (control circuits)
 - Number of atomizer nozzles per individual system
- Accessories required (filters, humidistat, plug-in transformer, tubing material, etc., as specified in section 11.2).

Example

For the store in the large printing works, it was decided that the “Vario Easy” system should be used. In order to achieve optimum humidification, the 45 nozzles are evenly distributed over the **three individual systems** (control circuits), i. e., **15 nozzles per system**. In order to distribute the nozzles as optimally as possible over the entire length of the building, consoles AF-VE-3 are used (for console types, see section 3.1.2). These are distributed along the length of the building. Two **AF-VE-SP3** (3 m) console profiles and one AFVE-SP1 (1.5 m) console profile are inserted in each interval between the consoles to carry the required ducting. The consoles and support sections are linked together with AF-VE-PC connectors. The following system layout results (ground plan):

Ground plan

-  Console AF-VE-3 (1.5 m)
-  Console AF-VE-3 (1.5 m) with supply assembly Vario Easy AF-S2-E
-  Console profile AF-VE-SP3 (3 m)
-  Console profile AF-VE-SP1 (1.5 m)
-  Control unit AF-S1

This results in the following order:

Total	Total per individual system	Type	Name
3	1	AF-S1	Control unit compl. incl. fixing brackets
15	5	AF-VE-3	1.5 m console with 3 nozzles, incl. 1 connector and 2 end caps
3	1	AF-S2-E	Vario Easy supply assembly (mounted and connected in the center of one of the consoles).
30	10	AF-VE-WH	Wall mounting support (2 per AF-VE-3 console)
24	8	AF-VE-SP3	Accessories Console profile, empty (3 m)
12	4	AF-VE-SP1	Console profile, empty (1.5 m)
33	11 *	AF-VE-PS	Console connector * total quantity needed:16 pcs (5 of which are supplied with the consoles).
72	24	AF-VE-WH	Wall mounting support (2 per console profile AF-VE-SP1 and AF-VE-SP3)
3	1	AF-230/24	Plug-in transformer 230VAC/24VAC, 50...60Hz
3	1	H5	
6	2	AF-Z-1	Room humidistat
3	1	AF-Z-10	10" filter for air and water (5 µm)
3	1	AF-Z-11	PE tubing, black Ø10/8mm (roll with 50 m)
1	-	AF-Z-12	PE tubing, transparent Ø10/8mm (roll with 50 m)
1	-	AF-Z-13	PE tubing, black Ø6/4mm (roll with 50 m) PE tubing, transparent Ø6/4mm (roll with 50 m)

4.6 Calculating the water and compressed air consumption

Compressed air supply

The compressed air consumption of a system depends on the number of nozzles and is calculated using the following formula:

$$Q_L = n_D \cdot Q_{LD}$$

Q_L: Required air quantity in l/min at 5 bar operating pressure

n_D: Number of nozzles (as calculated in section 4.3)

Q_{LD}: Air consumption of 1 nozzle in l/min at 5 bar operating pressure
(Nozzle AF-1 : 11.5 l/min)

*Taking the **example** as a basis and using the following values:*

Operating pressure of the nozzles 5 bar.

$$\begin{aligned} n_D &= 45 \cdot Q_{LD} \\ &= 11.5 \end{aligned}$$

Important notes

- In order to ensure problem-free operation, the compressed air system should provide 1.2 times the calculated air flow rate.
- The permissible air pressure is 7...10 bar
- The compressed air must be clean and free of oil and water (breathing air quality). The installation of a 5 mm filter in the compressed air line is essential. - Any queries on the layout of the compressed air system should be addressed to the supplier of your system.
- **Caution!** The suppliers mostly assume standard liter quantities at 1 bar.

Water supply

A system's water consumption depends on the number of nozzles and is calculated using the following formula.

$$Q_W = n_D \cdot Q_{WD}$$

Q_w: Required water quantity in l/h

n_D: Number of nozzles (from to the calculation in section 4.3)

Q_{WD}: Maximum water consumption of 1 nozzle in l/h (Nozzle AF-1: max. 7 l/h)

*Taking the **example** as a basis and using the following values:*

$$\begin{aligned} n_D &= 45 \\ Q_{WD} &= 7 \end{aligned}$$

the result is a water quantity of **315 l/h**.

Important notes:

- In order to ensure problem-free operation, the water system should provide 1.2 times the calculated maximum water flow rate.
- The permissible water temperature/pressure is 1...40°C / 3...10 bar.
- The **standard** model of the three variants must only be supplied with **natural water** (drinking water). If partially or fully deionized water is to be used, changes must be made to the standard model. In this case, the manufacturer must be contacted before an order is placed or installation starts.

5 Installation

5.1 Installation safety notes



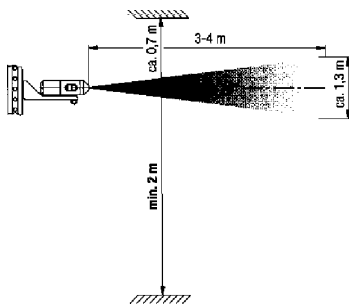
- The assembly and installation work must be carried out by **appropriately qualified personnel only** (plumbing installer, electrical installer). It is the responsibility of the customer to check the qualifications of such personnel.
- All local safety regulations and directives relating to the execution of electrical, compressed-air and water installations must be followed.
- **The information and specifications in this section relating to the positioning of system components, assembly and electrical installation must be observed and followed unconditionally.**

5.2 General notes on positioning

The positioning of a system is always established during the planning procedure and is specified in the system document. However, the following general positioning requirements must be observed and followed in all cases:

- Ensure that the construction (wall, pillar, ceiling, etc.) on which the system components are to be mounted is an **adequate load-carrying structure and is suitable for the installation.**
- Position the atomizer nozzles in such a way that the aerosol mist can propagate freely. If the aerosol stream is obstructed (e.g. by ceilings, beams, etc.), areas of stagnant flow and vorticity can occur, which can lead to condensation.
The following diagram shows the **dimensions of the aerosol stream and the minimum clearance distances required.** The dimensional data are based on a maximum humidifier output of the atomizer nozzles, a room temperature of 15°C to 24°C and an ambient humidity of 45 %rh. The dimensions of the aerosol stream reduce at higher temperatures and increase at lower temperatures.

AF-1 nozzle



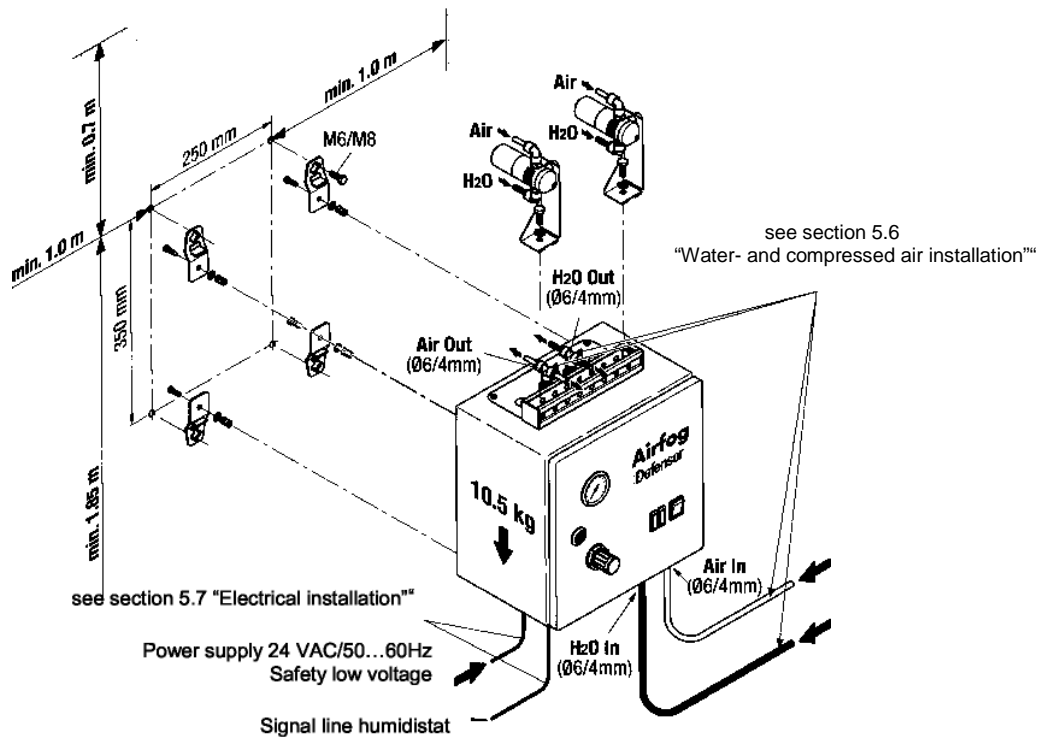
- If the atomizer nozzles are positioned **opposite each other**, ensure that there is a **minimum distance of 10 m** between the nozzles (AF-1 nozzles) and **8 m** (AF-US nozzles), so that the nozzles are not prone to mutual influence leading to condensation.
- Take account of the airflow in the room: do not mount atomizer nozzles in the direct vicinity of an air extraction system or a cold air inlet.
- Do not place atomizer nozzles against cold parts of the building such as outer walls, windows, etc. (danger of condensation). Insulate cold water pipes in the vicinity of the aerosol stream (danger of condensation).

- Due to the evaporation process, heat is extracted from the surrounding air. Therefore, ensure that the aerosol stream is not directed towards persons.
- In order to ensure optimum humidification, make sure that the atomizer nozzles are sensibly distributed in the room.
- The system components should be mounted in such a way that sufficient space is available for maintenance purposes.
- All control and supply units are 30 cm high, 30 cm wide and 20 cm deep. The knob on the pressure reducing valve projects by another 5 cm.

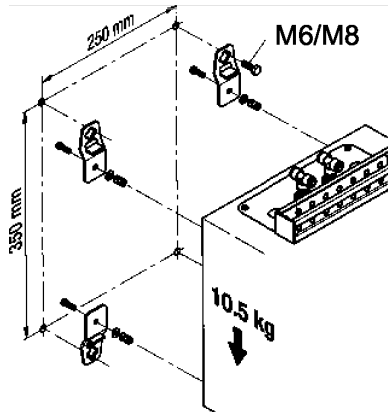
Please address questions regarding the positioning of systems to your Geveke.

5.3 Installation instructions for “Compact” system

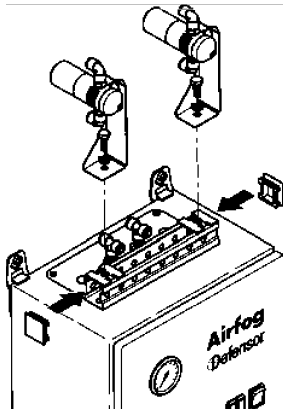
Installation overview (figure shows AF-C2)



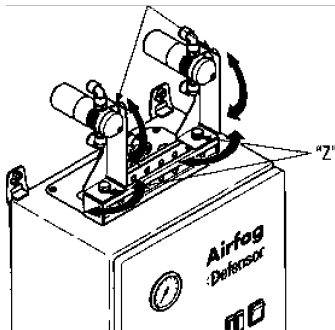
Installation instructions



- Secure the AF-C1 or AF-C2 control unit to the wall in the specified location, using the support brackets provided.



- Secure the atomizer nozzles on the support sections.



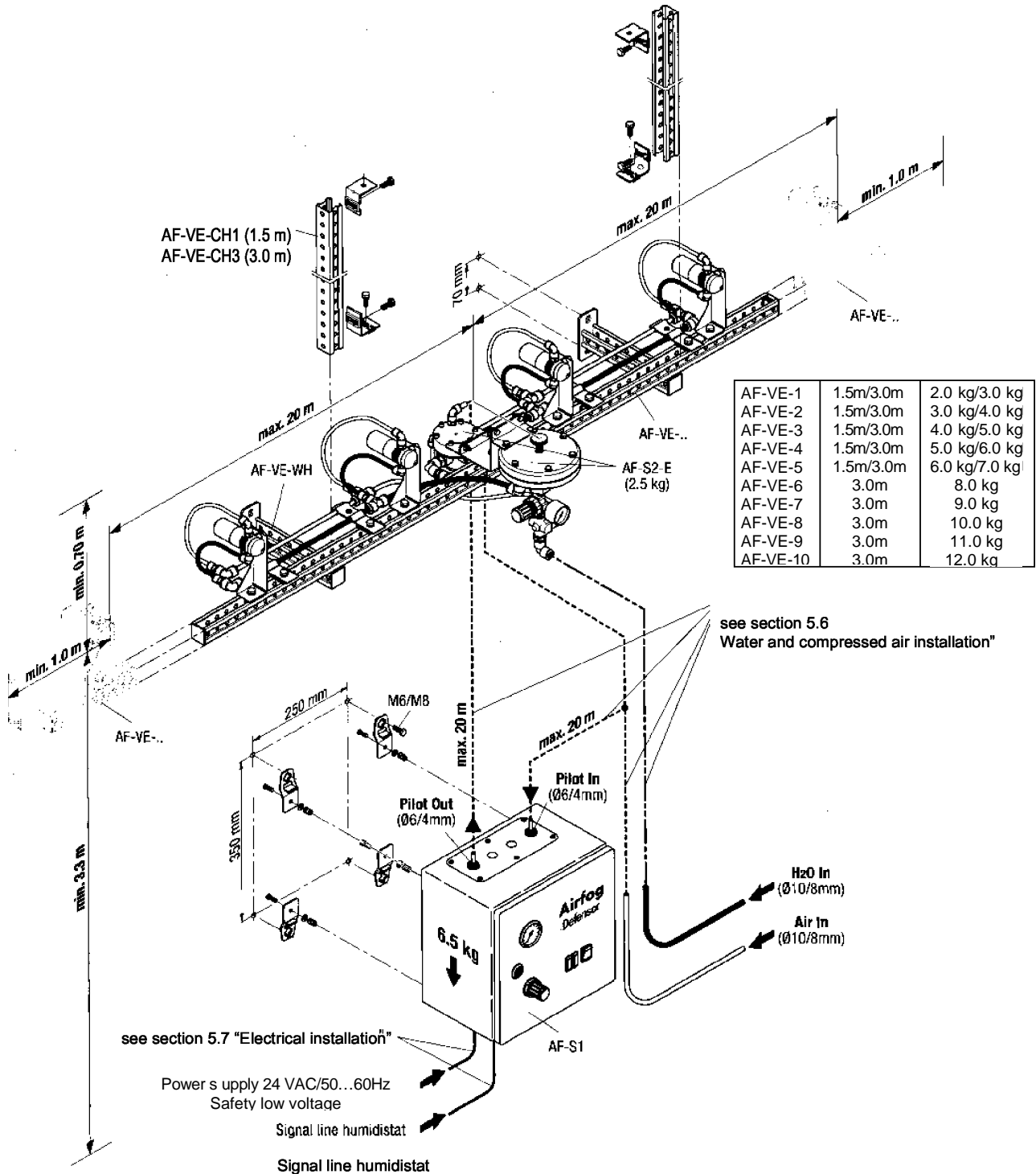
- If necessary, adjust the spray direction of the atomizer nozzle(s).
 - **Vertical** rotation: Loosen nut "M". Rotate the nozzle and re-tighten the nut.
 - **Horizontal** rotation: Loosen screw "Z". Rotate the nozzle and re-tighten the screw.

- Carry out the water and compressed air installations as described in section 5.6.
- Carry out the electrical installation as described in section 5.8.

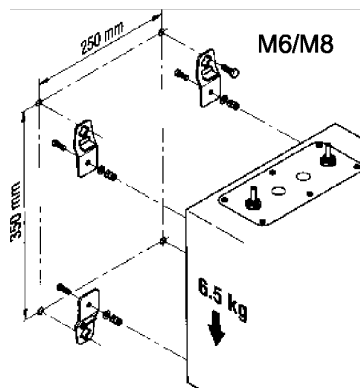
5.4 Installation instructions for "Vario Easy" system

Installation overview for "Vario Easy" system

The following illustration shows one possible installation variant for the "Vario Easy" system. It may differ from your installation. In order to ensure the correct functioning of your system, the planning notes in section 5.2 should be followed in every case and the minimum and maximum distances given in the following illustration should be adhered to.

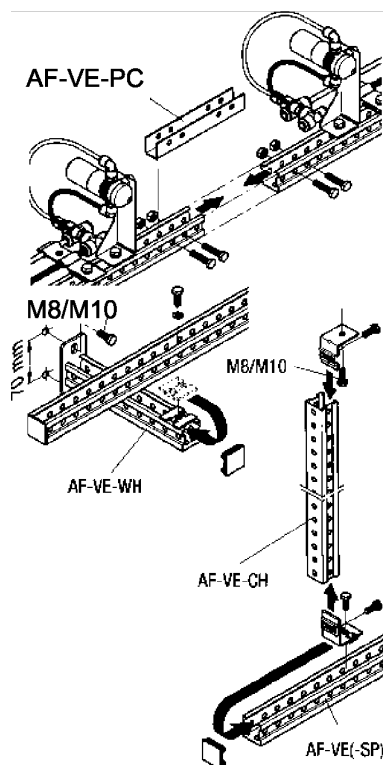


Installation instructions



- Secure the AF-S1 control unit to the wall in the specified location using the support brackets supplied.

Note: In order to keep the tube connections as short as possible (**max. 20 m**), we recommend that you install the AF-S1 control unit immediately beneath the AF-S2-E Vario Easy supply assembly.

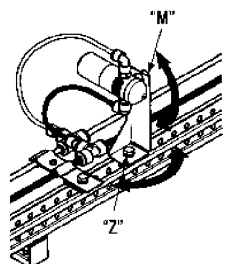


- If your system consists of a number of AF-VE... consoles (and empty AF-VE-SP1/AF-VE-SP3 console profiles) and these are to be mounted as a unit, connect them using the AF-VE-PC console connectors supplied.

Important! Ensure that the console with the AF-S2-E Vario Easy supply assembly is as close as possible to the center of the row of nozzles.

- Secure the AF-VE-... consoles and (if applicable) the empty AF-VE-SP console profiles to the wall or ceiling in the specified location so they are at **the same height**. Use the AF-VE-WH wall mounting supports/AF-VE-CH ceiling mounting supports and suitable fixing materials for this purpose (2 supports per console or empty console profile).

Important! If the individual consoles are not mounted as a unit, make sure that the consoles are positioned in such a way that the distances between the extreme outer nozzles, left and right and the Vario Easy supply assembly are equal, and that the **maximum distance to the supply assembly of 20 m is not exceeded**.



- If necessary, adjust the spray direction of the atomizer nozzles.
 - **Vertical** rotation:
Loosen nut "M". Rotate the nozzle and re-tighten the nut.
 - **Horizontal** rotation:
Loosen screw "Z". Rotate the nozzle and re-tighten the screw.

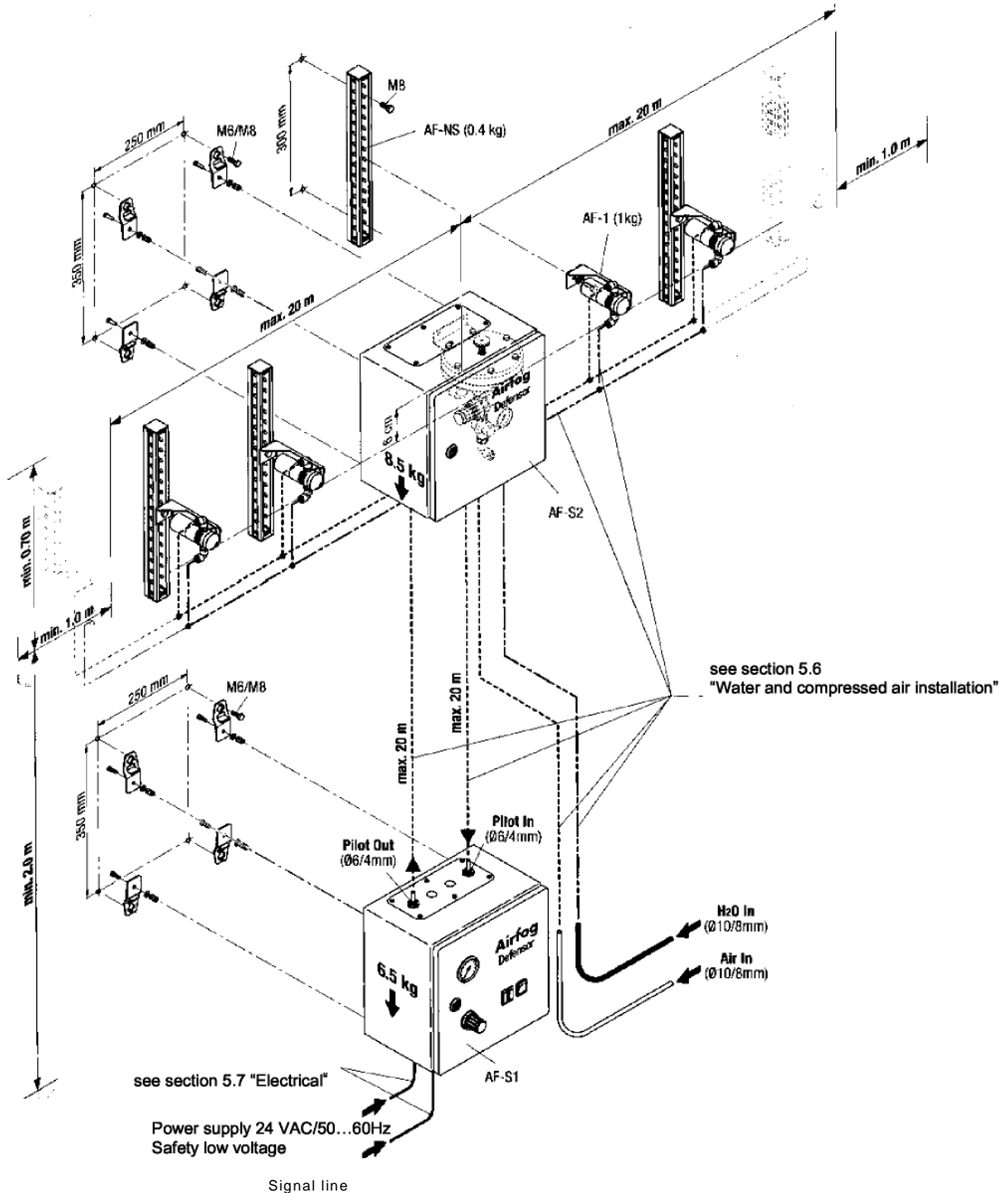
Note: if the console is ceiling-mounted, the streams can be emitted from both sides by arranging the nozzles alternately to point one side or the other.

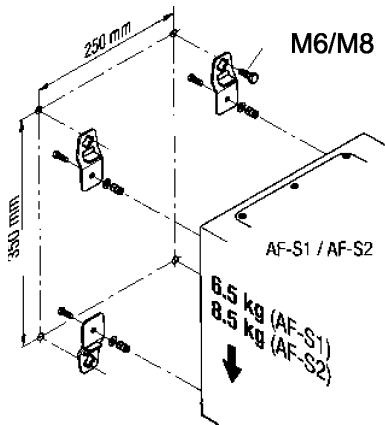
- Carry out the water and compressed air installations as described in section 5.6
- Carry out the electrical installation as described in section 5.7.

5.5 Installation instructions for "Vario" system

Installation overview of "Vario" system

The following illustration shows one possible installation variant for the "Vario" system. It may differ from your installation. In order to ensure the correct functioning of your system, the planning notes in section 5.2 should be followed in every case and the minimum and maximum distances given in the following illustration should be adhered to.





Installation instructions

- Secure the AF-S1 control unit to the wall in the specified location using the support brackets supplied.

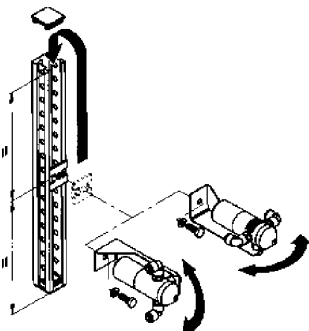
Important! In order to keep the tube connections as short as possible (**max. 20 m**), we recommend that you install the AF-S1 control unit immediately beneath the AF-S2 supply unit.

- Secure the AF-S2 supply unit to the wall in the specified location, using the support brackets provided

Important! In order to ensure correct operation, the AF-S2 supply unit must be mounted **as close as possible to the center of the row of nozzles**. In addition, it must be positioned in such a way that the vacuum valve membrane inside the AF-S2 supply unit is at **the same height as the nozzle outlets or above them**.

- Secure the AF-NS nozzle supports (accessory) to the wall in the specified locations using suitable fixing materials.

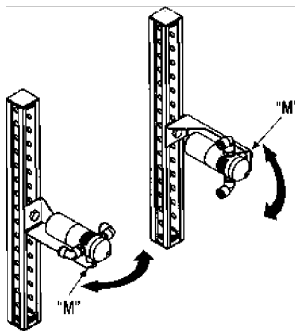
AF-NS Important! Mount the nozzle supports in such a way that all the atomizer nozzles can be installed at the **same height as the vacuum valve membrane, or below it**.



- Secure the nozzle holder with nozzle AF-1 to the AF-NS nozzle support, noting the following instructions:

- **Important!** All nozzles must be mounted at the same height in such a way that the nozzle outlets are at the **same height as the vacuum valve membrane, or beneath it**.

- **Important!** Mount the nozzle holders (horizontal or vertical alignment) in such a way that the desired spray direction can be set.



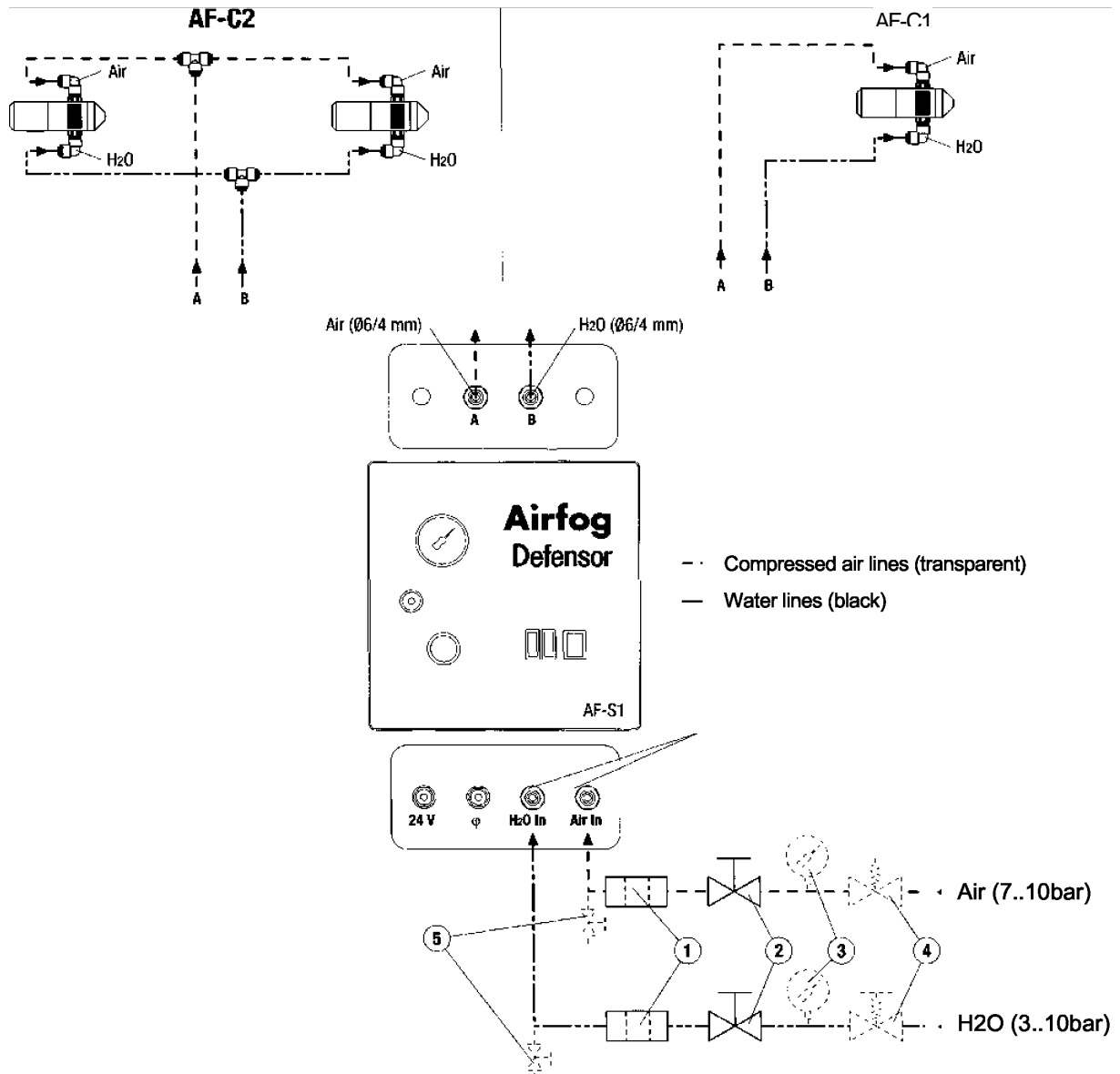
- If necessary, loosen nut "M" and adjust the spray direction of the atomizer nozzle(s). Then, tighten nut "M" again.

- Carry out the water and compressed air installation as described in section 5.6.
- Carry out the electrical installation as described in section 5.7.

5.6 “Water and compressed air installation”

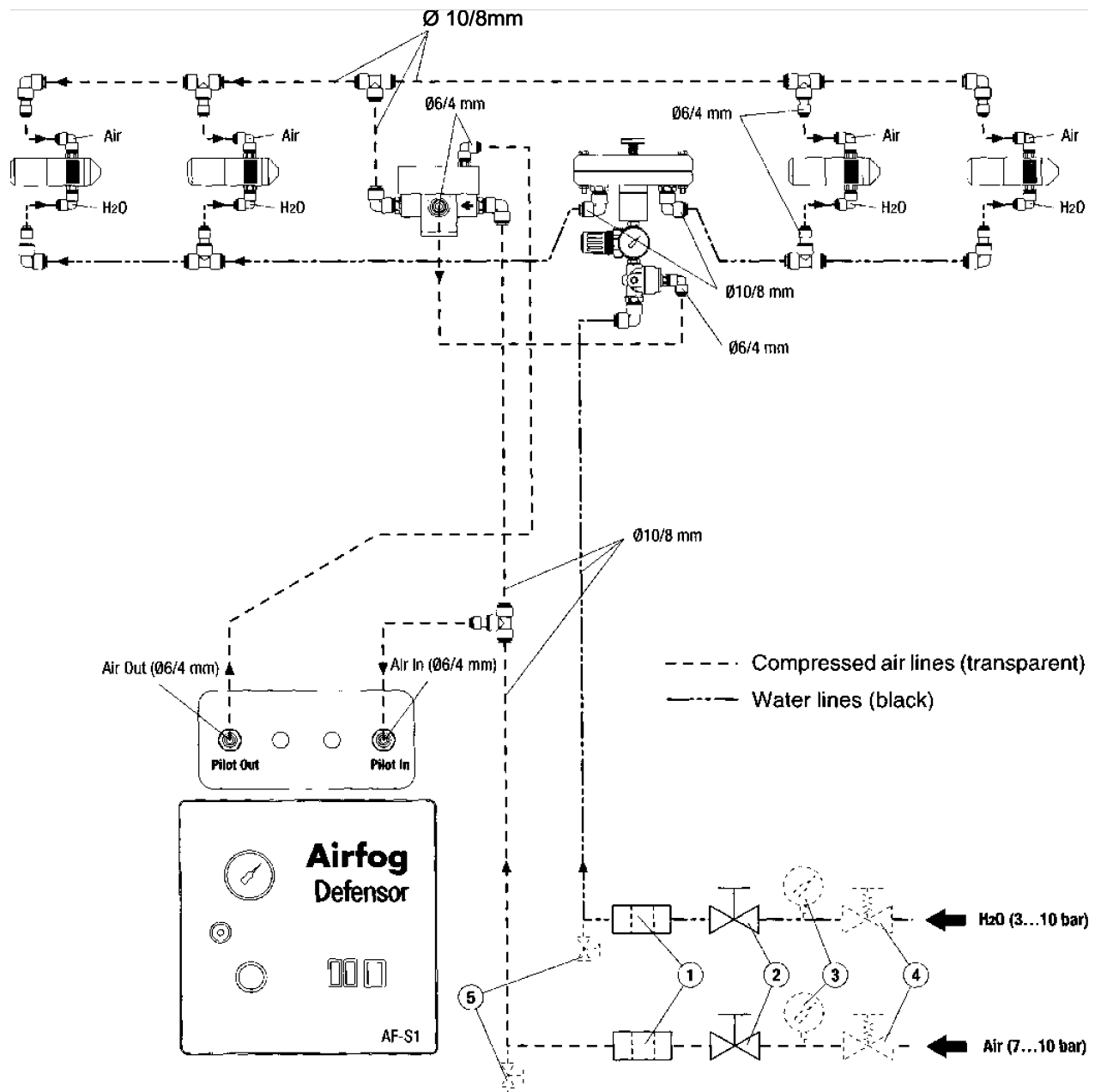
Carry out the water and compressed air installation as described in the installation overview for the system in question. The **details** in the overview diagrams and the **installation instructions** at the end of this section **must be observed and adhered to without exception**.

Overview of water and compressed air installation in the “Compact” system



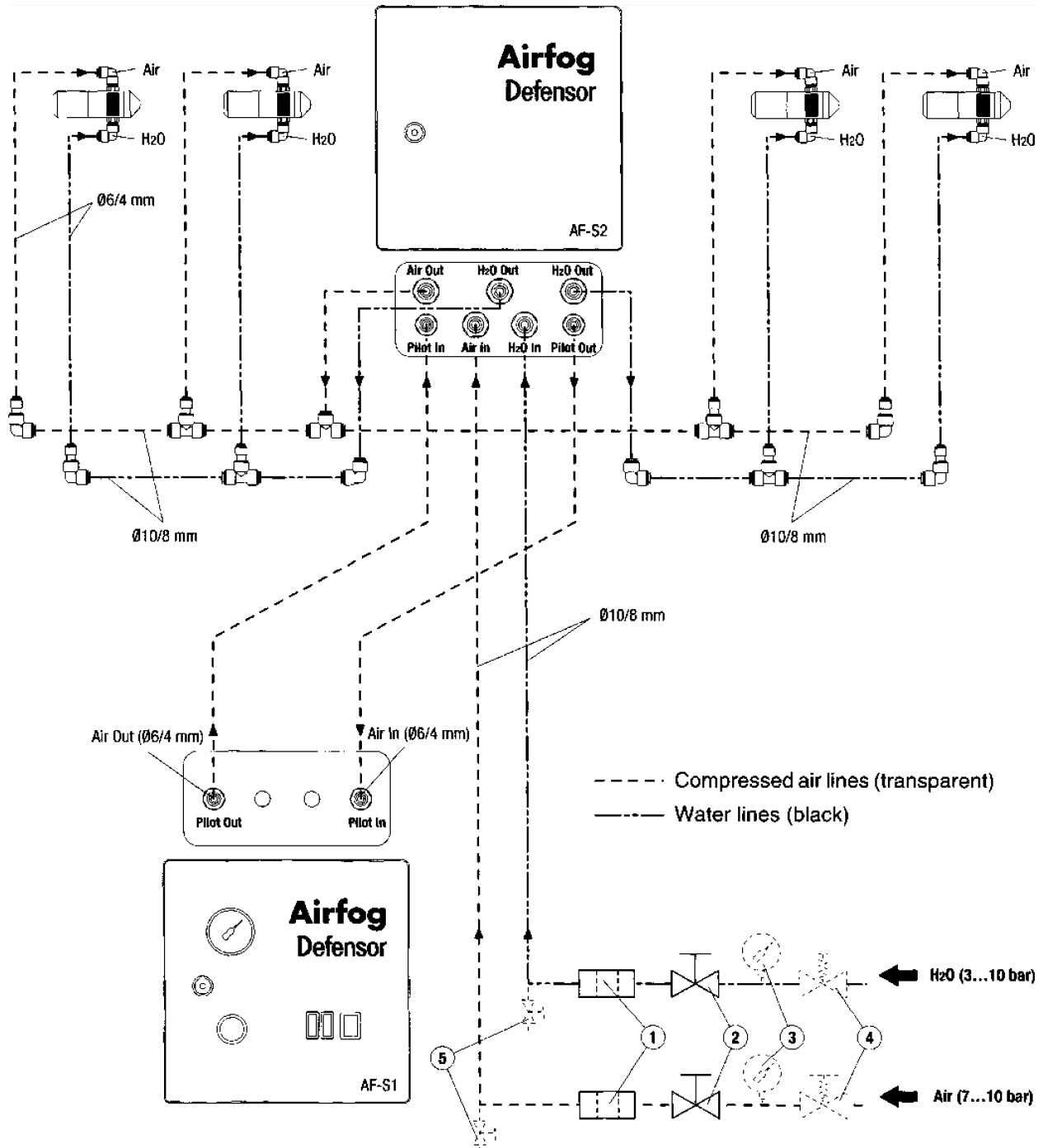
- 1 Filter 5 μm (accessory AF-Z-1, must be fitted)
- 2 Shut-off valve (must be fitted by customer)
- 3 Manometer (installation recommended, to be performed by customer)
- 4 Pressure reducing valve (compulsory for supply pressures >10 bar, to be installed by customer)
- 5 Pressure relief/emptying valve (installation recommended, to be performed by customer)

Overview of water and compressed air installation in the "Vario Easy" system



- 1 Filter 5 µm (accessory AF-Z-1, must be fitted)
- 2 Shut-off valve (must be fitted by customer)
- 3 Manometer (installation recommended, to be performed by customer)
- 4 Pressure reducing valve (compulsory for supply pressures >10 bar, to be installed by customer)
- 5 Pressure relief/emptying valve (installation recommended, to be performed by customer)

Overview of water and compressed air installation of the „Vario“ system



- 1 Filter 5 µm (accessory AF-Z-1, must be fitted by customer)
- 2 Shut-off valve (must be fitted on building side)
- 3 Manometer (installation recommended, to be performed by customer)
- 4 Pressure reducing valve (compulsory for supply pressures >10 bar, to be installed by customer)
- 5 Pressure relief/emptying valve (installation recommended, to be performed by customer)

Notes on water installation

- **Water softened** with a base exchanger **must not be used**.

- The **standard** model of the three variants must only be supplied with **natural water** (drinking water). This must be free from organic (max. 1000 germs) and chemicals such as chlorine, disinfectant, ozone etc. If partially or fully deionized water is to be used, changes must be made to the standard model. In this case, the manufacturer must be contacted before an order is placed or installation starts.

Caution! Deionized water is aggressive. The connections for a deionized water system should be made exclusively from **stainless steel (min. DIN 1.4301) or plastic**.

- The permissible connection pressure is 3...10 bar (without pressure fluctuations or "water hammer"). For connection pressures >10 bar, a feed line pressure-reducing valve should be fitted (set to 10 bar).

- **The permissible water feed temperature is 3...35 °C.**

- The installation of a **5mm water filter (e.g. accessory AF-Z-1)** and a shut-off valve in the water line is compulsory. They should be installed as close as possible to the system control unit.

- It is recommended that a manometer and a drain valve be fitted in the water feed line.

- **Important!** Before connecting the water line, **the line must be thoroughly well flushed out**.

Notes on compressed air installation

- The compressed air must be of **breathing air quality** and **free from impurities** (oil, dust, water, etc.)

- The installation of a **5µm air filter (e.g. accessory AF-Z-1)** and a **shut-off valve** is compulsory. They should be installed as close as possible to the system control unit.

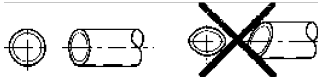
- **The permissible connection pressure is 3...10 bar (without pressure fluctuations or "hammer")**

- For connection pressures >10 bar, a feed line pressure-reducing valve should be fitted (set to 10 bar).

- It is recommended that a manometer and a pressure relief valve be fitted in the compressed air line.

- **Important!** Before connecting the **compressed air line, the line should be "blown out"**.

Notes on tubing installation



- All tube connections should be made using the **transparent (air) and black (water) plastic tubing, Ø10/8 mm and Ø6/4 mm respectively**. These are available as accessories. For reasons of hygiene, other tubing must not be used.
- The tubing should be cut with a **suitable cutting tool (e.g. accessory AF-Z-90) that provides a straight and nick-free cut**.
- The tubing must not have nicks or longitudinal cracks in it.
- Always fit the tubing with an extra allowance in length (**min. 5 mm**) so that it can be correctly inserted into the quick-action couplings as far as it can go.
- Make sure that the tubing is **not kinked** and that the **minimum bend radius is never less than 40 mm**.
- Do not lay the tubing close to hot components (**max. permissible ambient temperature for the supplied PE tubes is 80°C**).
- To protect the tube from damage and to prevent sagging, the tubing should be supported between the individual system components wherever possible (e.g. using the AF-VE-SP console profiles).
- Following the installation, check the following:
 - All tubing must be firmly seated. Correctly mounted tubing can only be pulled out by pressing on the clamping rings.
 - The water and compressed air systems are sealed.

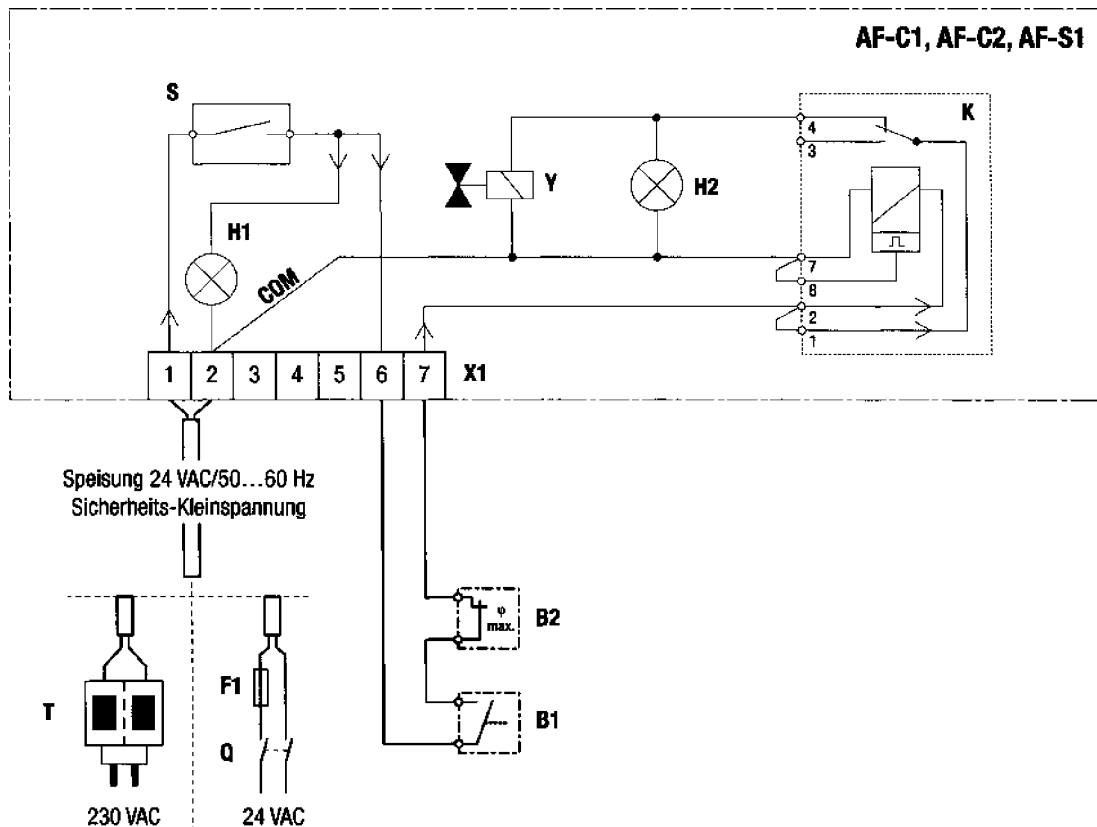
5.7 Electrical installation

Electrical installation of systems with AF-1 nozzles

The electrical installation of these systems comprises:

- Installation of the **voltage supply**
- Connection of the **On/Off humidistat** (and a **maximum humidistat** as well)

The electrical installation is to be carried out as described in the following scheme.
Caution! Read the installation notes at the end of this section.



- B1 Humidistat (e.g. accessory "H5")
- B2 Maximum humidistat **in series** with the humidistat (optional)
- F1 1 A external fuse (if the supply is from an existing 24 V supply)
- H1 Operating signal lamp (green)
- H2 Humidification signal lamp (yellow)
- K Timer controlled relay
- S Main switch
- T 24 VAC/50...60 Hz/20 VA transformer (Plug-in transformer accessory AF-230/24)
- Q External service switch (if supply is from an existing 24 V supply)
- Y Compressed air solenoid valve
- X1 Connection terminal (on the appropriate control unit: AF-C1, AF-C2 or AF-S1)

Notes on the electrical installation



- It is absolutely essential to feed the connecting cable through the cable glands provided for this purpose.
- **Caution! The control unit must only be supplied with 24 VAC/50...60 Hz safety low voltage in accordance with “EN-60 335 part 1”.**
- To ensure the safety low voltage, observe the following points when making the wiring connections:
 - If the low voltage cable is laid next to a cable carrying mains voltage, one of the cables is to be provided with double insulation.
 - Connect the safety low voltage cable to the connection terminals in such a way that no loose cable braiding can contact any singly insulated cables or terminals carrying low voltage.

The AF-230/24 plug-in transformer, available as an accessory, satisfies the **safety low voltage regulations in “EN-60 335 part 1”.**

If the control unit is to be connected to an existing 24 VAC safety low voltage supply, ensure that this supply satisfies “EN-60 335 part 1”. The service switch “Q” and the fuse “F1” are absolutely essential in this case.



- **Caution! Danger of electric shock! The control unit must not be supplied via an auto or compensator transformer** since life-threatening voltages can occur when live components contact each other.
- The humidistat (or sensor) should be mounted at a suitable position in the room (not too close to the humidifiers and not close to sources of heat or cold).
- When connecting the humidistat and controller, read the separate installation instructions for these components.
- To prevent excess humidification if a humidistat or control unit fails, we recommend the installation of a maximum humidistat.

Please address any questions on the electrical installation to Geveke Amsterdam.

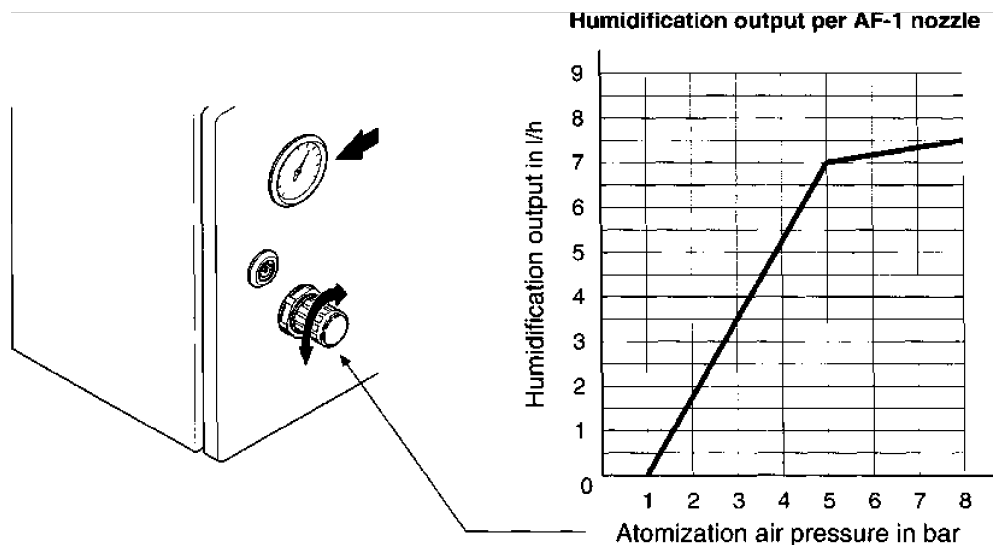
6 Commissioning the system



Caution! Several of the following commissioning steps and adjustment procedures must be undertaken on the open **live control unit**. Do not, under any circumstances, contact any live components such as connection terminals, contacts, etc.

Commissioning: “Compact”, “Vario Easy” and “Vario” systems with AF-1 nozzles

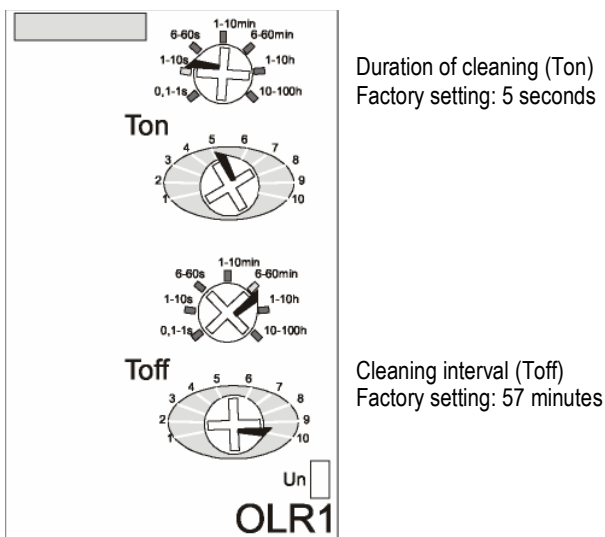
- Ensure that **all installation work has been correctly carried out and completed**.
- Set the humidistat to the highest value.
- Plug the AF-230/24 plug-in transformer into the mains socket (230 VAC) or switch on the service switch in the 24 VAC supply line.
- Switch on the main switch on the control unit (the green operating indicator lights up).
- Open the shut-off valve in the compressed air line, check the supply air pressure (7...10 bar) and check that the compressed air system is sealed (e.g. with soapy water).
- Unlock (pull forward) the rotary knob on the compressed air pressure-reducing valve and set the atomization air pressure for the desired maximum humidification output (see the following diagram). Re-lock (push in) the knob.



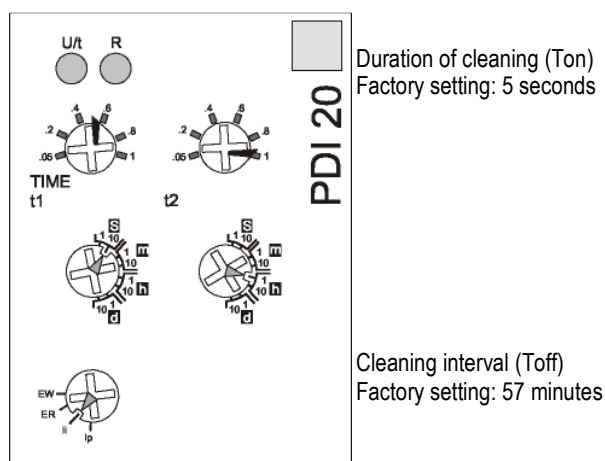
- Open the shut-off valve in the water line. Check the supply pressure (3...10 bar) and check that the water line is correctly sealed.
- Check the water pressure on the manometer on the vacuum valve unit. It is set, ex-works, to **0.5 bar**. If the indicated value differs from this value, unlock (pull forward) the rotary knob on the water pressure-reducing valve on the vacuum valve unit and set the water pressure to 0.5 bar. Re-lock (push-in) the knob.
- The knurled adjuster nut on top of the vacuum valve is set, ex-works, to the appropriate system. It must only be changed following consultation with your Defensor supplier (optimization of the humidifier output).

- Check the cleaning interval set on the time relay inside the unit (factory setting is 1 hour) and the duration of cleaning (factory setting 5 seconds).

Factory setting for cleaning time relay Typ1



Factory setting for cleaning time relay Typ2



Important! The factory settings should not be changed except in consultation with Geveke.

- Check the aerosol stream on the atomizer nozzles. If the aerosol stream is visible on all the atomizer nozzles, switch the control unit off again. Check that all the atomizer nozzles are closed, without drops. In the event of problems, refer to section 9.
- Switch the control unit on again.
- Set the humidistat to the desired interior humidity value.

The system is now ready for operation and will start humidifying as soon as the interior humidity value falls below the set value.

7 Operation

7.1 Start-up after a break in operation

When the AF humidifier system is to be started up after a short break in operation (e.g. compressed air filter replacement), proceed as follows:



- Check the humidifier system for damage. **Caution!** A damaged humidifier system must not be operated.
- Open the water shut-off valve (supply pressure min. 3...10 bar).
- Open the compressed air shut-off valve (supply pressure min. 7...10 bar).
- If the control unit has been disconnected from the power supply, re-connect the control unit. To do so, either plug-in the transformer AF-230/24 or switch on the service switch in the 24 VAC supply line.
- Switch on the control unit main switch (the green operating indicator lights up). If the current humidity value is lower than the set value on the control humidistat or the controller, the system starts humidifying immediately (the yellow humidification indicator lights up).
- As soon as the system is humidifying, check the following in the "Comparct", "Vario Easy" and "Vario" systems: the **atomization air pressure** on the air pressure-reducing valve manometer (set value: **5 bar** or value set during commissioning), and the **water pressure** on the water pressure-reducing valve manometer (set value: **0.5 bar**).

Note: When commencing operation after a longer break (holidays, etc.), proceed as for commissioning (see section 6).

7.2 Adjustments and inspections

During operation, the following adjustments and inspections should be carried out:

- **Daily**
 - o Check water and compressed air systems for leaks. Re-seal if necessary.
- **Weekly**
 - o Check supply air pressure (7...10 bar) and atomization pressure on the control unit and adjust if necessary (see output diagram in section 6).
 - o Check water supply pressure (3...10 bar) and set water pressure (0.5 bar) on the water pressure-reducing valve and adjust if necessary.
 - o Check the atomizer nozzle outlets for soiling **with the unit switched off**. If necessary, reset the cleaning interval on the time relay (see section 6).
- **Twice yearly**
 - o Check the switch points for the control humidistat or for the controller/humidity sensor and for the maximum humidistat using a precision instrument (see separate instructions for the product employed).

7.3 Switching off the humidifier system

If you need to switch your humidifier system off, proceed as follows:

- Set the humidistat to the highest value so that the system is operational.
- Close the shut-off valve in the water line and secure it in this position.
- Wait approx. 1 minute, then close the shut-off valve in the compressed air line and secure it in this position.
- As soon as no air flow is audible anymore, the lines have been discharged. Now set the mains switch on the control unit to the off position.
- Set the humidistat back to the desired humidity value.
- If work has to be carried out on the control unit, disconnect the control unit from the electrical supply (unplug plug-in transformer / switch off service switch).
- If the humidifier system is to be taken out of service for a longer period, remove the water feed line to the unit and "blow out" the entire water system with compressed air.

8 Maintenance and cleaning

8.1 Safety notes for maintenance and cleaning



- Before commencing maintenance and cleaning work, the humidifier system is to be taken out of operation as described in section 7.3. Place warning signs indicating which section of the system is being worked on.
- Maintenance and cleaning work must only be undertaken by suitably trained personnel. It is the responsibility of the customer to monitor such qualifications.

8.2 Cleaning intervals

In order to ensure fault-free operation, we recommend that the AF humidifier system be cleaned once a month, as follows:

- Clean air and water filters and replace them if necessary.
- Clean atomizer nozzles.

You may have to adjust the cleaning interval depending on the quality of the compressed air and water supplies in use.

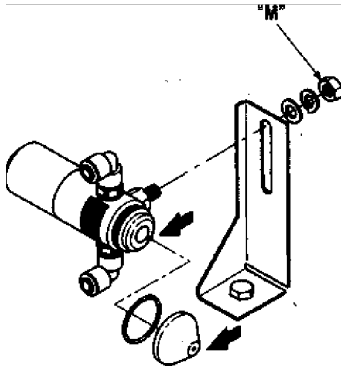
8.3 Cleaning operations

Air filter, water filter, oil and water separator

Information on cleaning the air filter, water filter and the oil/water separator will be found in the separate instructions for 2194e c5mponents.

Cleaning the AF-1 atomizer nozzle

- Take the system out of operation as described in section 7.3.
- Remove the water and compressed air tubing (quick release coupling: press the clamping ring against the coupling and pull the tube out).
- Loosen nut "M" and remove the atomizer nozzle.
- Unscrew the nozzle cap by hand. **Caution!** The atomizer nozzle must not be further dismantled by the customer.
- Carefully remove all incrustations on the nozzle cap and on the nozzle body using a brush or a pointed object made of wood or plastic (**risk of damage: do not use metallic objects**) and rub the components down with a rag. **Caution!** Do not use scouring cleaning agents or solvents.
- Check the O-ring, nozzle cap and nozzle body for damage and if necessary replace any damaged c5mponents.
- Screw the nozzle cap onto the nozzle body and tighten it by hand.
- Install the atomizer nozzles and align them c5rrectly.
- Connect the water and compressed air tubing.



9 Faults and their elimination

9.1 What if ...?

The following table lists possible faults that can occur during operation of the AF humidifier system. The causes and instructions for their elimination are also provided..

Fault	Cause	Remedy
Control unit switched on, green operation indicator does not light up.	Control unit not connected to the power supply (plug-in transformer not plugged in or service switch not on). Fuse (1 A load) in the in-building network has tripped. Plug-in transformer has no output voltage (24 Vac). Thermal fuse in the plug-in transformer has operated (short-circuit).	Plug in the plug-in transformer, switch service switch on. Check/replace fuse. Replace plug-in transformer.
Control unit switched on, no humidification takes place. Green operation indicator lights up, yellow humidification indicator does not light up.	Maximum humidistat has responded, or is defective. Instantaneous room humidity is higher than the set value. Shut-off valve in the compressed air line is closed. Oil in the compressed air line.	Check maximum humidistat: If necessary, reset or replace it. Set humidistat briefly to max. humidity setting. Open shut-off valve. Clean compressed air lines and nozzle caps. Check the oil and water separator in the compressed air system.
Control unit (AF-C1/C2, AF-S1) periodically switches on and off although humidity is being demanded.	Cleaning interval on the timer relay is incorrectly set.	Set timer relay correctly: 1 h operation, 5 seconds off (see section 6).
Humidifier output too low, set value is not achieved.	Room is too large for the unit being used. Air pressure on the nozzle too low. Water pressure too low.	Check the system layout. Increase the air pressure on the atomizer nozzle (min. 5 bar). Check compressed air system. Check water system (water filter, tubing, etc.). Min. water pressure 3 bar.
Aerosols too large.	Faulty setting of air/water ratio.	Set correct air/water ratio. Contact Geveke for this purpose.

	Cause	Remedy
Only air emerges from the atomizer nozzles.	Water feed shut-off valve closed. Water lines blocked. Filter in the water feed line blocked. AF-1 nozzles: deposits on the nozzle cap. System settings incorrect (atomization pressure, water pressure, adjuster nut on vacuum valve). Pressure relief blocked. Water system not sealed. In systems with AF-1 nozzles, there is no vacuum in the vacuum valve.	Open shut-off valve. Clean water lines. Clean water filter. Clean nozzle cap. Carry out settings as described in section 6. Clean pressure relief. Check and seal water system.
Humidifier nozzles dripping after system has been switched off.	AF-1 nozzle: nozzle needle does not close.	Clean atomizer nozzle. If the cleaning does not eliminate the fault, contact Geveke.

If you cannot remedy a fault yourself, please contact Geveke. Our competent contact persons will be happy to help you.

+31 20 - 5822545

9.2 Replacement of defective system components



Caution! Before replacing defective system components, the humidifier system is to be taken out of operation as described in section 7.3. Place signs to indicate that work is being carried out on the system.

The replacement of defective system components must only be carried out by appropriately trained/qualified personnel. It is the customer's responsibility to monitor such qualifications.

For safety reasons, defective components must not be repaired by the customer. Instead, they must be replaced. Incorrectly repaired components can endanger safe operation of the AF humidifier system and cause damage to persons and property.

After replacing system components, the system is to be commissioned/started up as described in section 6.

The appendix in section 11 provides “exploded-view” illustrations of the individual systems and spares lists. These illustrations will help you to replace defective components correctly. However, if problems occur, please contact Geveke.

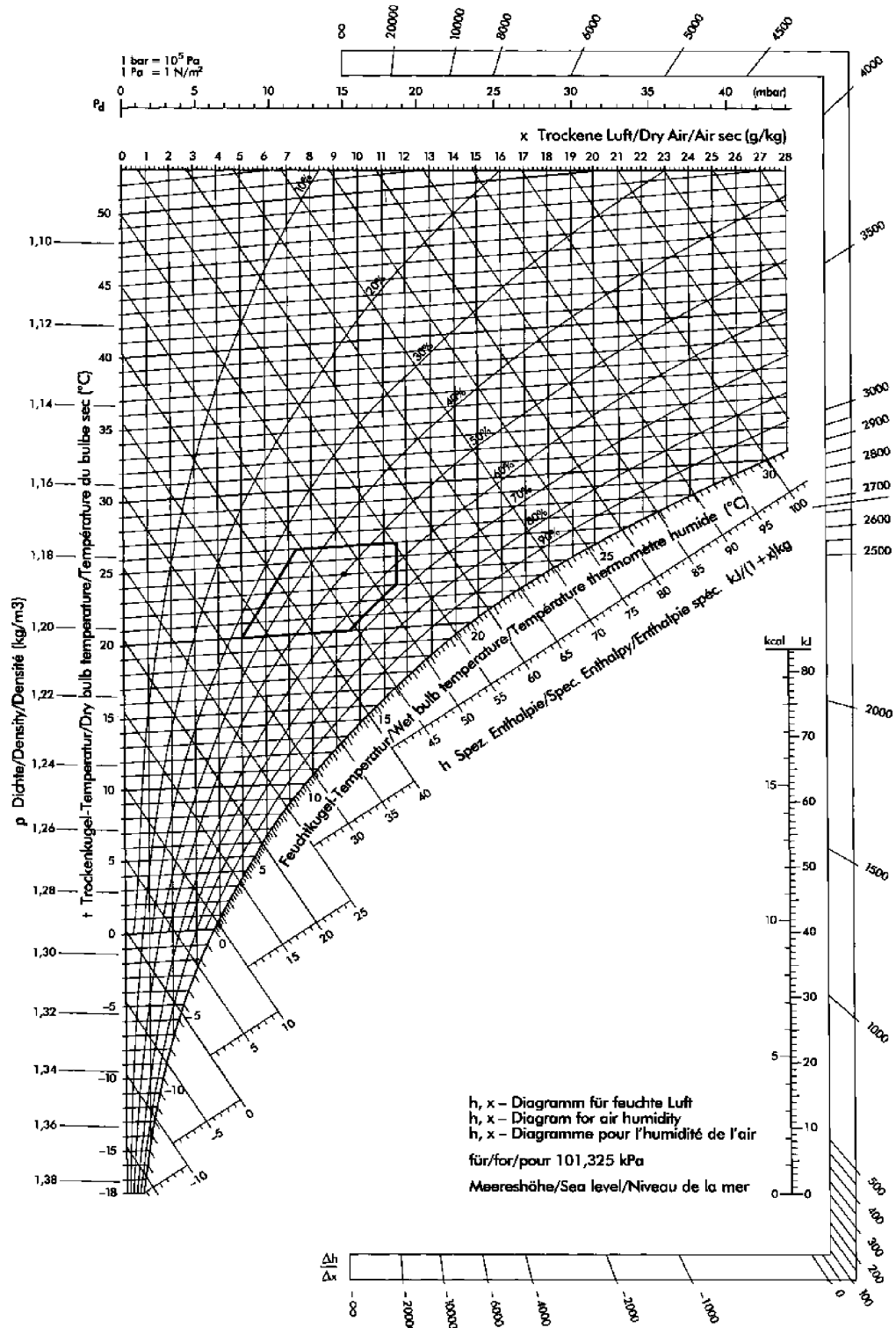
+31 20 - 5822545

10 Technical data

	Compact	Vario Easy	Vario
Nozzle type	AF-1	AF-1	AF-1
Material specifications of nozzles	INOX 1.4305	INOX 1.4305	INOX 1.4305
Max. humidification output/nozzle (at 5 bar air pressure)	7 l/h	7 l/h	7 l/h
No. of nozzles per system (control circuit)	1 or 2	1...20	1...20
Max. humidification output per individual system (given 5 bar air pressure and max. no. of nozzles)	7 or 14 l/h	140 l/h	140 l/h
Air consumption per nozzle (at 5 bar)	11.5 l/min	11.5 l/min	11.5 l/min
Control	On/Off	On/Off	On/Off
Air:			
- Air quality	Breathing quality (oil-free)		
- Permissible air pressure	7...10 bar		
Water:			
- Water quality	Tap water or deionized water without additives , max. 1000 germs/ml		
- Permissible water pressure	3...10 bar		
- Permissible water temperature	1...40 °C		
Control units:			
- Electrical connection	24 VAC/50...60 Hz safety low voltage, as specified in EN-60 335, part 1		
- Power consumption	max. 20 VA		
- Protection class	IP30		
Test certificate	CE symbol		
Permissible ambient temperature	3...35°C		
Permissible ambient humidity	5...90 %rh, not condensing		
Material quality	Nozzle AF-1: Inox 1.4305		

11 Appendix

11.1 hx diagram



11.2 Accessories

The following accessories are available for the AF humidifier system:

“Vario Easy” accessories

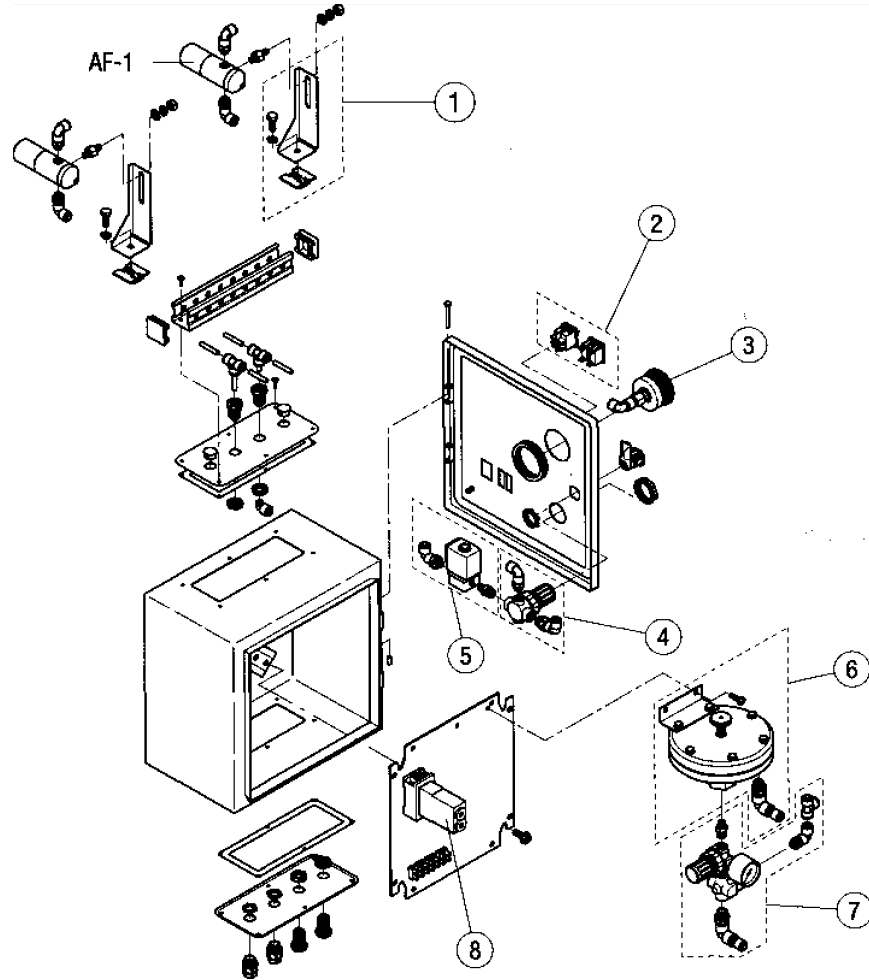
Art.-No.	Type	Description
1113702	AF-VE-PC	Console connector
1113703	AF-VE-SP1	Console profile, empty, 1.5 m
1113704	AF-VE-SP3	Console profile, empty, 3.0 m
1113705	AF-VE-WH	Wall mounting support
1113706	AF-VE-CH1	Ceiling mounting support, 1.5 m
1113707	AF-VE-CH3	Ceiling mounting support, 3.0 m

General accessories

Art.-No.	Type	Description
1113708	AF-NS	Nozzle support
1112944	H5	Humidistat, room 25...80 %rh
1112945	H5V	Humidistat, room >80 %rh
1113477	AF-230/24	Plug-in transformer 230 VAC/24 VAC, 50...60 Hz
1113818	AF-Z-100	Remote operating and fault indication (continuous)
1114863	AF-Z-101	Remote operating and fault indication (on/Off)
1101080	AF-Z-1	10" filter for air or water (3/4"-3/4")
1105820	AF-Z-2	Filter cartridge 10"/5 µm
1107174	AF-Z-3	Filter cartridge 5"/5 µm
1113815	AF-Z-4	Coupling set, filter (4 x 3/4"-10 x 8)
1113816	AF-Z-5	Quick coupling set, main supply (4 x 3/8"-10 x 8)
1115942	AF-Z-6	Transition couplings (4 x 3/8"-10 x 8)
1107495	AF-Z-10	PE tube, black Ø10/8mm (roll with 50m)
1107629	AF-Z-11	PE tube, transparent Ø10/8mm (roll with 50m)
1109673	AF-Z-12	PE tube, black Ø6/4mm (roll with 50m)
1109749	AF-Z-13	PE tube, transparent Ø6/4mm (roll with 50m)
1114211	AF-Z-40	Set of elbow connectors Ø6x4-Ø6x4 (4 pcs.)
1114212	AF-Z-41	Set of elbow connectors Ø10x8-Ø10x8 (4 pcs.)
1113819	AF-Z-50	Set of T-connectors Ø6x4 - Ø6x4 (4 pcs.)
1113820	AF-Z-51	Set of T-connectors Ø10x8 - Ø10x8 (4 pcs.)
1113821	AF-Z-60	Set of reducer connectors Ø10x8 - Ø6x4 (4 pcs.)
1113822	AF-Z-70	Set of L-connectors Ø6x4 - Ø1/8" (4 pcs.)
1114125	AF-Z-80	Set of equipment keys
1113814	AF-Z-90	Tube cutter (max. Ø10 mm)

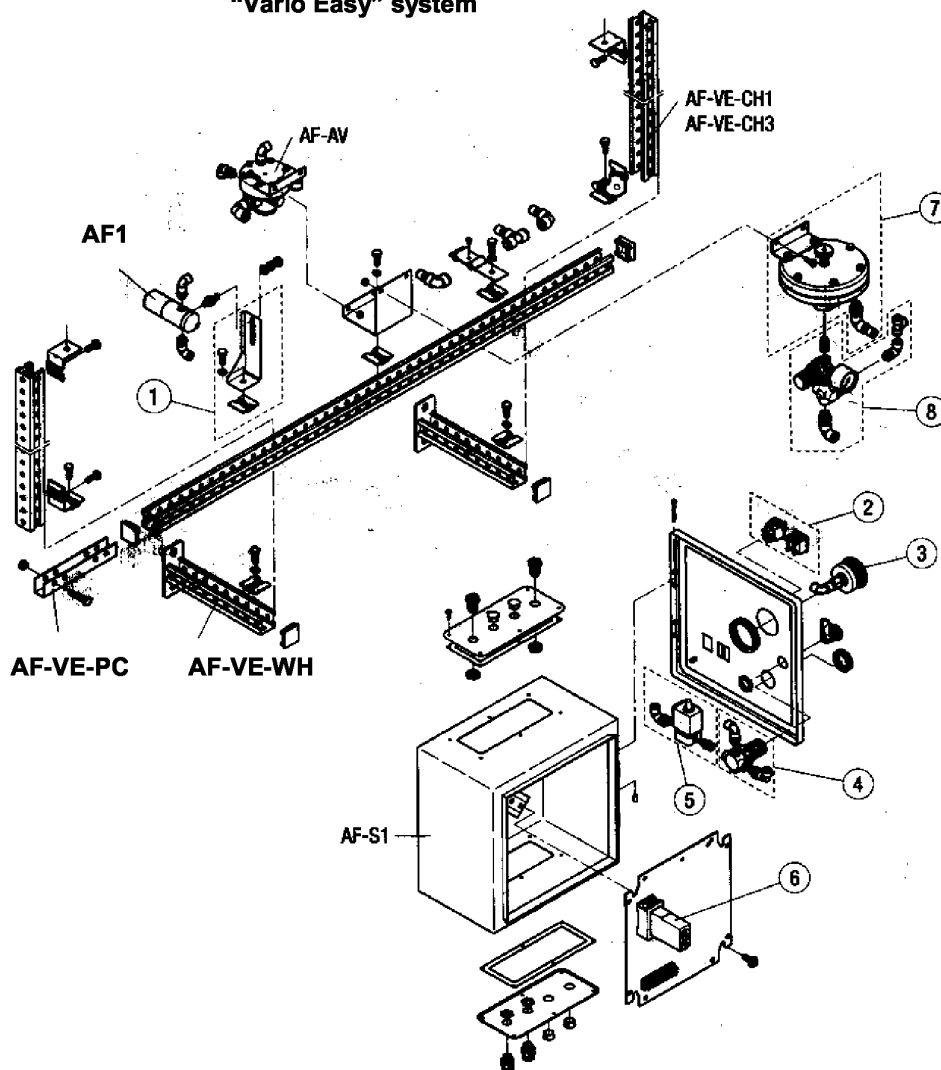
11.3 Spares Lists

“Compact” system



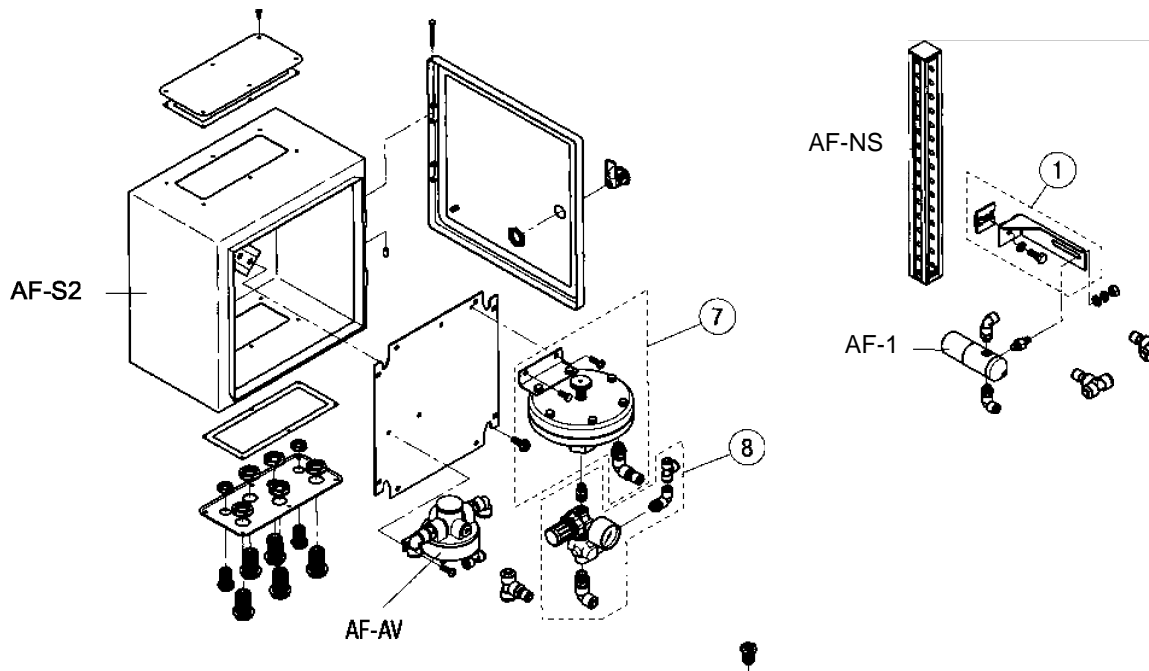
Pos. No.	Article No.	Description
1	1113976	Nozzle holder, complete
2	1113877	Switch and signal light set
3	1113978	Air manometer, complete
4	1113979	Air pressure reducing valve, complete
5	1113980	2/2-way solenoid valve (24 VAC), complete
6	1113982	Membrane unit for vacuum valve, complete
7	1113983	Valve unit for vacuum valve, complete
8	1113984	Timer relay (without socket)
	1113985	Set of unit couplings (1 x panel mount connector 6-6, panel mount connector 10-10, cap 16x18.3, cable gland)
	1102077	Injector needle set AF-1
	1115683	Set of rubber seals for nozzle Af-1
	1116491	Membrane Inox for water valve Af-WV

"Vario Easy" system



Pos. No.	Article No.	Description
1	1113976	Nozzle holder, complete
2	1113977	Switch and signal light set
3	1113978	Air manometer, complete
4	1113979	Air pressure reducing valve, complete
5	1114378	3/2-way solenoid valve (24 VAC), complete
6	1113984	Timer relay (without socket)
7	1113982	Membrane unit for vacuum valve, complete
8	1113983	Valve unit for vacuum valve, complete
	1113985	Set of unit couplings (1 x panel mount connector 6-6, panel mount connector 10-10, cap 16x18.3, cable gland)
	1113986	Coupling set AF-AV (2 x L-connectors 6-1/4", 2 x L-connectors 10-1/4", 1 x T-connector 6-1/4", 1 x plug)
	1113987	Coupling set AF-WV (2 x L-connectors 10-1/4", 1 x L-connector 6-1/8", 1 x tube clamp)
	1102077	Injector needle set AF-1
	1115683	Rubber gasket set for nozzle AF-1
	1116491	Membrane Inox for water valve Af-WV

"Vario" system



Pos. No.	Article No.	Description
1	1113976	Nozzle holder, complete
2	1113977	Switch and signal light set
3	1113978	Air manometer, complete
4	1113979	Air pressure reducing valve, complete
5	1114378	3/2-way solenoid valve (24 VAC), complete
6	1113984	Timer relay (without socket)
7	1113982	Membrane unit for vacuum valve, complete
8	1113983	Valve unit for vacuum valve, complete
	1113985	Set of unit couplings (1 x panel mount connector 6-6, panel mount connector 10-10, cap 16x18.3, cable gland)
	1113986	Coupling set AF-AV (2 x L-connectors 6-1/4", 2 x L-connectors 10-1/4", 1 x T-connector 6-1/4", 1 x plug)
	1113987	Coupling set AF-WV (2 x L-connectors 10-1/4", 1 x L-connector 6-1/8", 1 x tube clamp)
	1102077	Injector needle set AF-1
	1115683	Rubber gasket set for nozzle AF-1
	1116491	Membrane Inox for water valve Af-WV

