

DRAABE

success is in the air

Installation and Operating Instructions **Humidification system**

HighPur

HumCenter

HumSpot

HumPower

TurboFogNeo:

Model TFNeo1

Model TFNeo2

Model TFNeo2x1

Model TFNeo2x2

Model TFNeo8

NanoFog Evolution

Table	of	contents
1	Introduction	5
1.1	Read me first!	5
1.2	About this technical documentation	5
2	For your own safety	6
2.1	Intended use	6
2.2	General safety guidelines	6
3	Product overview	8
3.1	System types	8
3.1.1	Humidifying an area with NanoFog Evolution, TFNeo2	8
3.1.2	Humidification of two areas	9
3.2	System specification	10
3.2.1	High-pressure pulsation (HighPur) functional specification	11
3.2.1.1	Details for the HighPur Control unit	13
3.2.2	HighPur support base functional specification	14
3.2.3	HumCenter functional specification	14
3.2.4	HumSpot functional specification	17
3.2.5	HumPower functional specification	20
3.2.6	Maximum humidistat functional specification	20
3.2.7	TFNeo1, TFNeo2, TFNeo2x1, TFNeo2x2 functional specification	20
3.2.8	TFNeo8 functional specification	21
3.2.9	NanoFog Evolution functional specification	22
4	Planning basics	24
4.1	Information about planning a single-zone humidification system	24
4.1.1.1	Calculation of maximum humidification required	25
4.1.1.2	Determination of equipment needs	26
4.1.2.1	Calculation of maximum humidification required	27
4.1.2.2	Determination of equipment needs	27
4.1.3.1	Calculation of maximum humidification required	28
4.1.3.2	Determination of equipment needs	28
4.2	Planning guidance for a twin-zone air humidification system	29
4.2.1.1	Calculation of maximum humidification required	30
4.2.1.2	Determination of equipment needs	30
4.3	Guidance on water supply	31
5	Installation	33
5.1	Safety guidelines for installation	33
5.2	Guidance on siting and installation	33
5.2.1	HighPur support base	34

5.2.2	HighPurControl unit	35
5.3	Electrical installation	45
5.3.1	Mains plug	46
5.3.2	HighPur high-pressure pulsation	47
5.4.1	HumCenter	48
5.4.2.1	Bus connection, HighPur to HumCenter	49
5.4.2.2	Zone bus connection	50
5.4.2.3	Zone and container group alarm	50
5.4.2.4	Connection to BMS.....	51
5.4.2	HumSpot.....	54
5.4.3.1	Connecting HumSpots together	55
5.4.3.2	Connecting an external humidistat/BMS	56
5.4.3.3	Connecting the HumPower	57
5.4.3.4	Connecting the external maximum humidistat	58
5.4.3	Fogging units TFNeo1, 2, 2x1, 2x2	59
5.4.4	TFNeo8 fogging unit	61
5.4.5	NanoFog Evolution fogging unit	62
5.4	Material specifications	64
5.5.1	High-pressure	64
5.4.1	Electrical components	64
6	Operation.....	65
6.1	Start-up sequence for daily operation	65
6.2	Shut-down sequence for daily operation	66
6.3	Inspection work.....	67
7	Component replacement.....	69
7.1	HighPur high-pressure pulsation	69
7.2	TFNeo1, 2, 2x1, 2x2 fogging units	71
7.3	TFNeo8 fogging unit.....	72
7.4	NanoFog Evolution fogging unit	73
8	Technical data.....	74
8.1	HighPur high-pressure pulsation	74
8.2	HumCenter	74
8.3	TFNeo1, TFNeo2, TFNeo2x1, TFNeo2x2 fogging units	74
8.4	TurboFogNeo 8 fogging unit.....	75
8.5	NanoFog Evolution fogging unit	75
8.6	HumSpot.....	75
8.7	HumPower.....	76
8.8	Maximum humidistat.....	76

9	Appendix	76
9.1	Accessories/spare parts	76
9.2	h,x diagram	77
9.3	Fresenius test certificate	78
9.4	Declaration of Conformity	79

1 Introduction

1.1 Read me first!

Thank you for deciding to purchase a DRAABE humidification system.

The humidification system is the product of state-of-the-art manufacturing and industry best practice. Improper usage of the systems can nonetheless give rise to situations that endanger the user and/or third parties and/or cause property damage.

To ensure system operations remain safe, correct and cost-effective, please therefore observe and comply with all instructions and safety guidelines given in this technical documentation.

If you have any questions that are not (adequately) addressed by this documentation, please contact your local DRAABE regional representative or call our Service Hotline (+49 40 85 32 77-77). We will be happy to deal with your enquiry.

1.2 About this technical documentation

Scope

This technical documentation is provided for the DRAABE humidification system. Facility components (e.g. HighPur, fogging unit, etc.) are described only as is necessary for proper operation of the system. Since the system offers a wealth of expansion options, this documentation focuses on the core system only. Facility components can be supplied for a variety of applications and performance requirements. Increased humidification output will affect a range of facility components. While some accessories are not essential, others form part of the standard system configuration. For further information on accessory parts or individual custom solutions, please consult your customer-specific schematic diagram or get in touch with DRAABE Hamburg.

Details provided in this technical documentation are limited to

- the **planning** of a humidification system; and
- the **installation, commissioning, operation** and **maintenance** of the humidification system.

This technical documentation is supplemented by various other documents (brochures, purchase order forms, schematic diagrams, etc.). Where required, you will find the relevant cross-references to these publications in the technical documentation.

Conventions



This symbol highlights **safety and hazard warnings**: ignoring these warnings can result in personal injury and/or property damage. Safety and hazard warnings are also clearly indicated with the word **WARNING**.



This symbol highlights important information. This is also clearly indicated with the word **NOTICE**.



This symbol can be found on all equipment rating plates. It requests that you read the technical documentation before performing any work on the system. If anything remains unclear after reading through the technical documentation, please contact the manufacturer's technical customer service **before** carrying out any work on the system.

Storage

Please keep the technical documentation in a safe place where it is always ready to be consulted. In the event of the documentation becoming lost, please contact DRAABE Hamburg.

Language versions

This technical documentation is available in several languages. Please contact DRAABE Hamburg for further information.

2 For your own safety

2.1 Intended use

The humidification system is intended **to be used exclusively for controlled indoor humidification** within the operating conditions as specified and outside explosion hazard areas. Any other deployment is defined as "misuse" and can result in a situation where the system becomes unsafe.

The definition of "intended use" also includes following all information provided in these instructions (particularly the safety guidelines) and strict observation of the operating conditions.

2.2 General safety guidelines

- The humidification system must be installed and operated only by **persons** who are familiar with the product and **sufficiently well-qualified** for the work in question. Responsibility for ensuring the technical documentation is supplemented by internal directives dealing with supervision/reporting duties, work organisation, personnel qualifications, etc. is borne by the customer.
- **Before commencing work** on components within the humidification system, the system must be **taken offline** using the protocol given in Chapter 6.2 and secured against accidental start-up (isolate the power supply, shut off the water supply and depressurise the system).

- Observe any and all local **safety standards**
 - concerning the handling of mains-powered **electrical and electronic devices**; and
 - on the design of **water/low-pressure systems**.

- Poorly-maintained humidification systems can pose a health hazard. Accordingly, **always observe service schedules properly and perform maintenance work as required**.

- If it is reasonable to assume that **safe operation of the system is no longer possible, take the humidification system offline promptly, secure against accidental start-up** and notify DRAABE of the situation. This may be necessary in the following circumstances:
 - Components of the system have become damaged.
 - The system is no longer working properly.
 - Leaks are present in connections or supply lines.

- The HighPur has an IP21 rating. Ensure the unit is protected from water drops and splashed water at the place of installation.

- The humidification system's HumSpot has an IP30 rating. Ensure the unit is protected from splashed water at the place of installation.

-  **WARNING:** If the humidification system is installed in a room without a water drain, water sensors with automated shut-off valves must be installed in the room. These must securely shut off the water supply in the event of damage to the water supply system.

- To avoid water damage, you should not store any materials easily ruined by water under the facility components.

-  **WARNING:** Danger of corrosion! To avoid damage, no components susceptible to corrosion should be situated in the vicinity of the aerosol mist. Always observe the clearances beneath and in front of the fogging units as specified (see Chapter 5).

- Never operate the humidification system with water that has not been purified. Drinking water, well water and rainwater are all unsuitable. In addition, do not operate the system using deionised (DI) water (see also Chapter 4.3).

- Depending on the mineral content of the pure water (generated by water softeners and reverse osmosis), moderate to strong mineral precipitation can occur in the vicinity of the aerosol mist.

- Easily damaged materials or equipment must be given adequate protection or removed from this area.
- No work should be performed on any part of the humidification system excepting the procedures described in these instructions.
- Always use original accessory parts and spare parts supplied by DRAABE.
- No modifications may be made to the humidification system without obtaining written approval from DRAABE.
- If modifications are made to the system, acceptance must first be performed by DRAABE Customer Service or by persons authorised by DRAABE before initial start-up.



Recommended fire extinguisher system:

Fire extinguishers must be suitable for tackling fires in electrical installations to 1000 V. Extinguishing agents can be foam, water, powder or CO₂.

- Stringent hygiene standards are also followed when packing and shipping the goods. The goods must be stored in dry areas that are as clean as possible and where temperatures do not drop below zero Celsius. Do not unpack the goods until just before installing them, so as to protect them against any possible source of soiling. If facility components are required for commissioning, please leave these in the packing until just before commissioning.

3 Product overview

3.1 System types

The system is very versatile. Customer-specific facilities are oriented on the required level of humidification, the interior conditions and industry-specific needs. Essentially, there are two main variants: "humidification in one area" and "humidification in two areas".

An "area" in this sense is defined as a room whose air humidity is recorded by a HumSpot and whose air humidity is then conditioned within this one particular area.

If two areas are defined, the room air humidity for each is recorded separately and individually conditioned. A facility equipped with high-pressure pulsation (referred to below as "HighPur") offers the decentralised conditioning of multiple areas. When planning the system, care must be taken not to exceed the capacity of the HighPur unit.

3.1.1 Humidifying an area with NanoFog Evolution, TFNeo2

The minimum configuration (see below, system view) consists of a HumSpot, a HumPower, a high-pressure pulsation system (referred to below as "HighPur") and a TFNeo/NanoFog Evolution fogging unit. The HighPur provides the operating pressure of approx. 75 bar and has a maximum throughput of 300 l/h.

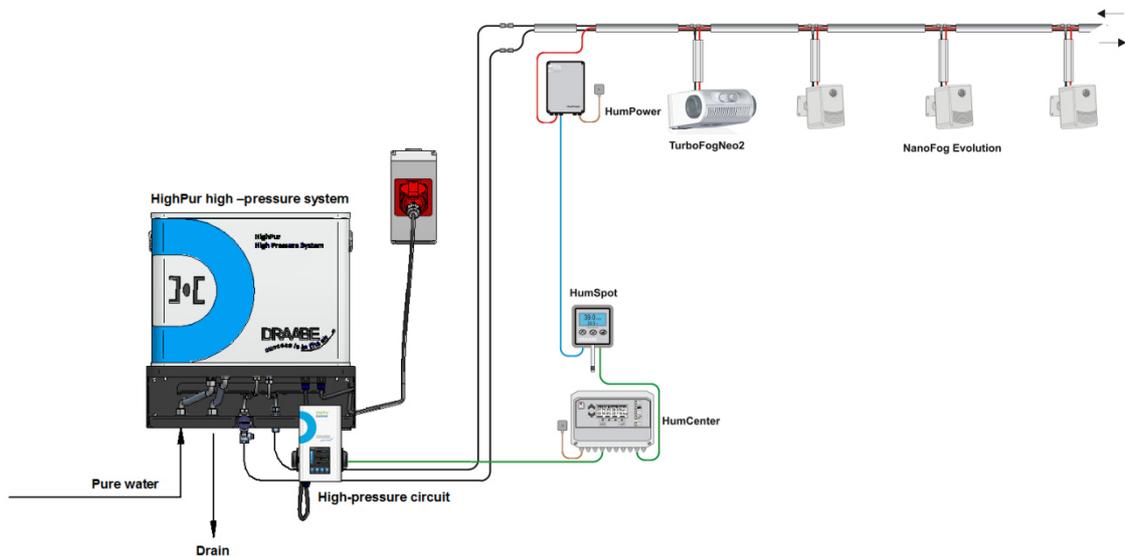
A maximum of 10 NanoFog fogging units can be connected up to a HumPower. The primary reason for this is that excessively large groups make it very difficult to keep humidity measurements (taken by HumSpot) reliable. Indeed, it is actually the case that several smaller groups ensure more homogeneous humidification of a very large area.



NOTICE: For humidification performance details, see Chapter 4, "Planning basics".

The HumSpot controls the overall system. It contains a humidity sensor that measures the air to be conditioned – i.e. the room humidity. It is also used to preselect the setpoint (the target room humidity). For further details of functionality and features see "HumSpot functional specification".

System view



3.1.2 Humidification of two areas

The minimum configuration (see below, system view) consists of two HumSpot units, a HumCenter, a HighPur and the respective fogging units.

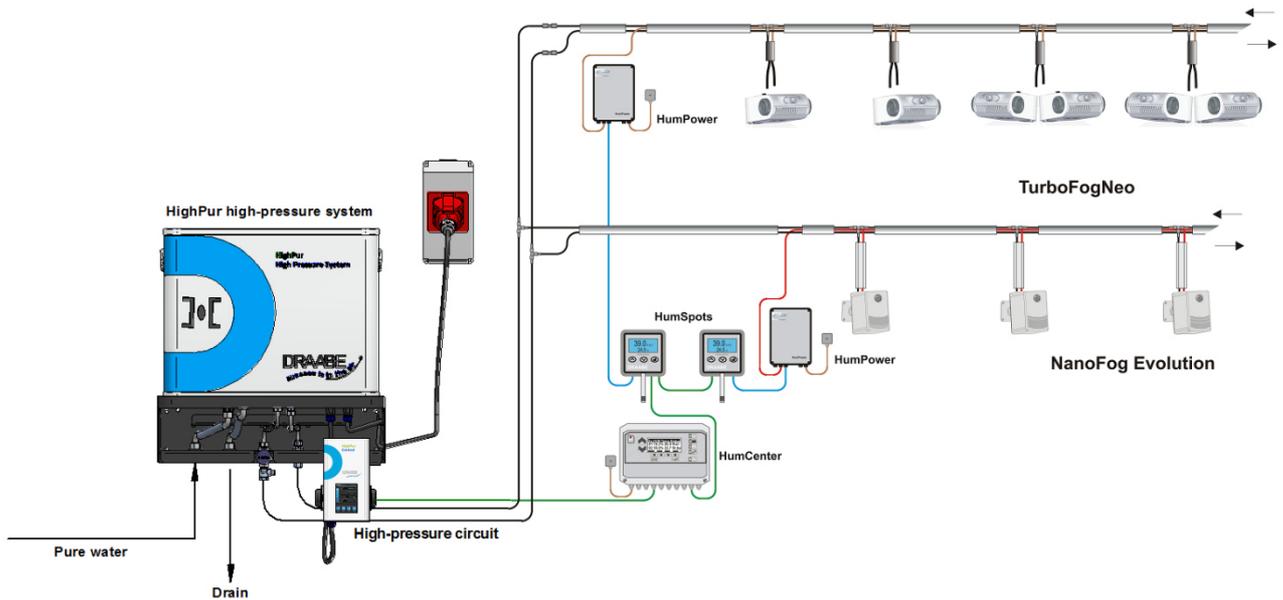
The HighPur provides the operating pressure of approx. 75 bar.



IMPORTANT: For humidification performance details, see Chapter 4, "Planning basics".

The HumSpot controls the overall system. At least one HumSpot must be installed in each area. For further details of functionality and features see "HumSpot functional specification".

System view



3.2 System specification

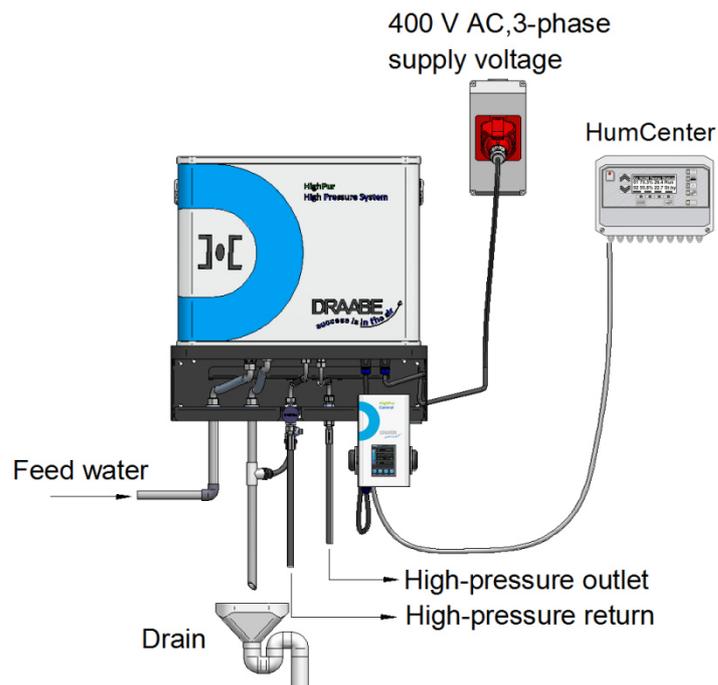
The DRAABE humidification system is a modern, single-component nozzle humidification system that guarantees maximum operating efficiency and ease of use.

The water is atomised using a special pressure-swirl nozzle with a very small aperture. Effectively silent and 100% drip-free, the atomisation itself is achieved using hydraulic high-pressure pulsation (HighPur).

The basic system configuration can be seen in the diagram (see Chapter 3.1.1–3.1.2).

The exact setup depends on the application and performance requirements. A range of separate facility components are available, which primarily differ as regards their performance specifications (e.g. pure water output, humidifier output). A higher level of performance for certain components can influence the choice of other facility components (e.g. water softener, high-pressure pulsation system) and their installation/operation. Dual and triple systems can be configured, and other accessory components can also be installed.

3.2.1 High-pressure pulsation (HighPur) functional specification



The HighPur unit generates a pulsating, hydraulic flow of water. The pump is driven by an electric motor and generates a working pressure of approx. 8.5 MPa (85 bar). From the HighPur unit, the water is fed into a ring main system (high-pressure output). This ring main then supplies the individual fogging units via stubs. The ring terminates at the HighPur again (high-pressure return).

The feed water is routed via a bioreactor. This sterilises the water via high-intensity UVC irradiation, which ensures hygienic, trouble-free operation.

The HighPur is connected to the control unit – HighPur Control – via a multicore cable. The HighPur Control unit manages all of the HighPur's internal processes.

This control unit is connected to the HumCenter and the HumSpots via the bus cable at device port 5 (see page 12).

If no humidification is required for a prolonged period, there is a risk of contamination via stagnation. To prevent this, the HighPur is equipped with an automated fresh water unit (AFU). The AFU works by replacing the water from the ring main.



WARNING: The AFU is an important component that safeguards system hygiene. The unit must have uninterrupted connectivity to the electrical and water mains at all times.



WARNING: Regular completion of scheduled maintenance/inspection work is a key part of safeguarding system hygiene. Steps must be taken to ensure this work is performed and documented either by the manufacturer or by authorised/qualified personnel.



WARNING: The bioreactor must be inspected every 6–9 months to verify that it is working properly. If this is not possible, the unit must be replaced. An original DRAABE bioreactor must be installed at all times. Failure to comply with this requirement can result in health problems, since safe sterilisation can no longer be guaranteed.

If humidification is required, the request is communicated from the HumSpot via the HumCenter to the HighPur Control unit. "Request active" is shown on the display. The HighPur unit starts. Once working pressure has risen to the required approx. 75 bar, this is communicated to the HumSpot, which then starts the fogging unit via HumPower. The HighPur Control unit display then shows the operating mode "Production".

Monitoring starts for inlet pressure, motor current and working pressure as soon as the pump is running.

The HighPur is supplied with water via the feed. The feed pressure switch monitors the pressure and powers the system down if the water supply is compromised. "Warning" is shown on the display.

Working pressure is monitored by a (minimum) pressure sensor. If the pressure sensor registers a value below the lower limit (while the pump is running), the system powers down. "Minimum pressure" is shown on the display. If the working pressure rises excessively, this is limited by a mechanically-operated combination valve. No error message is reported: instead, the water simply flows from the bypass into the drain.

If the equipment develops an internal leak (e.g. a burst hose line) then the unit powers down and "Leak" is shown on the display.

If the HumSpot ceases to send a request signal, the HighPur switches to Standby mode. To avoid unnecessary consumption of water, the pressure within the ring main system is maintained for 60 minutes. Only after 60 min. does the "relief" magnet valve release the pressure in the HighPur and the ring main system. This procedure takes a few seconds.

For a more detailed description of the control procedure, please consult the HighPur Control operating instructions.



WARNING: To confirm that the pressure has been released in the hose system (and the ring main system), consult the pressure gauge on the support base. Pressure has been safely released only when this gauge shows "0 bar".

The HighPur unit is built into a portable, compact container. This is then mounted onto the wall bracket. Quick-connect plugs are used to connect the system to the support base and disconnect it from the base in case of replacement.



This container system enables the replacement programme, whereby the HighPur unit is sent for a complete overhaul to the manufacturer every 6 to 8 months. This container system ensures maximum operational safety and a rapid response to incidents.

For those leasing the high-pressure pulsation system, supply of the replacement unit, container services, any necessary replenishment of wear parts and scheduled servicing are all completed free-of-charge.

3.2.1.1 Details for the HighPur Control unit

The PurControl unit is the processing hub for HighPur high-pressure pulsation. It monitors and controls all sensors and actuators. The controls are switched on/off using the switch (1). Note that this only isolates the PurControl unit from mains power – it does not power down the compact HighPur container. The control mode (Normal, Fault, Error) is indicated in a user-friendly manner with the LED (4), which lights up green, yellow or red. The control unit features multiple interfaces, which can be connected up using quick-connect plugs. Connections include the 12-core communication cable (6) to the HighPur container, the HumDigital cable (5) and the water softener (2) – this is not required for the HighPur, however. The USB port (3) can be used to update the control software and dump out various kinds of data. A detailed description of the PurControl unit is given in the HighPur Control Installation and Operating Instructions.

For further information, please contact DRAABE Customer Service.



WARNING:

The reset switch (1) on the PurControl unit deactivates control functionality. The HighPur container continues to be supplied with 400 V AC power. The container is not isolated from the mains until the power plug is disconnected.

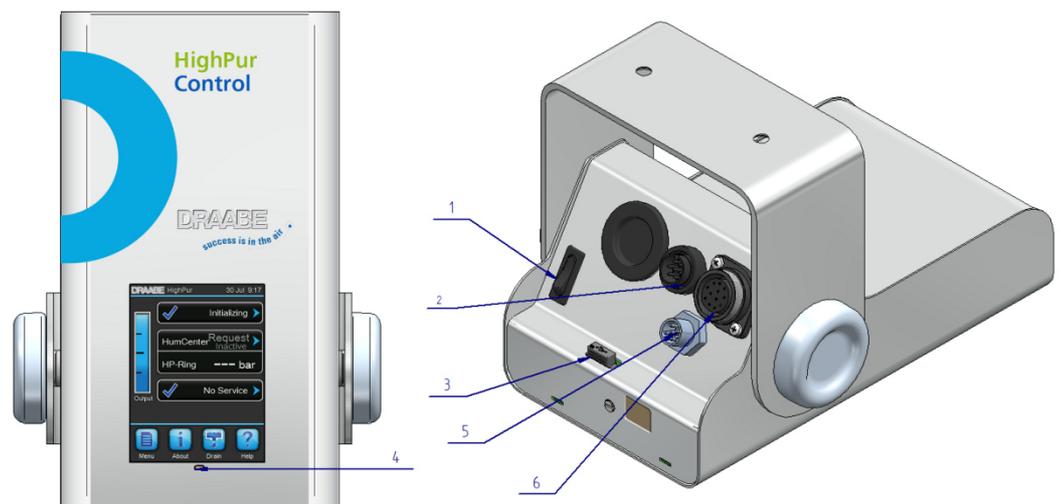


Figure 1 PurControl unit for HighPur

3.2.2 HighPur support base functional specification

The HighPur unit (1) stands on the support base (2) and forms the interface hub for all hydraulic lines running to the fixed wall mount. The HighPur sits securely on the support base, which also makes it easy to replace the HighPur container. The quick-connect plugs (6 to 9) ensure rapid connection and disconnection of the water supply lines. Since the quick-connect plugs (6 to 9) have automated shut-off valves, the HighPur operator can even hot-swap lines under water pressure.

The mounting bracket for the PurControl unit (5) can also be attached to the support base (2) if the unit needs to be mounted onto the support base. Alternatively, the PurControl unit can also be mounted onto the wall. The unit is supplied with electrical power via the quick-connect plugs (3 and 4).

The support base is also equipped with cable retainers that can be used to ensure the connection lead is securely routed. Predrilled holes for cable glands are located on the left- and right-hand sides.

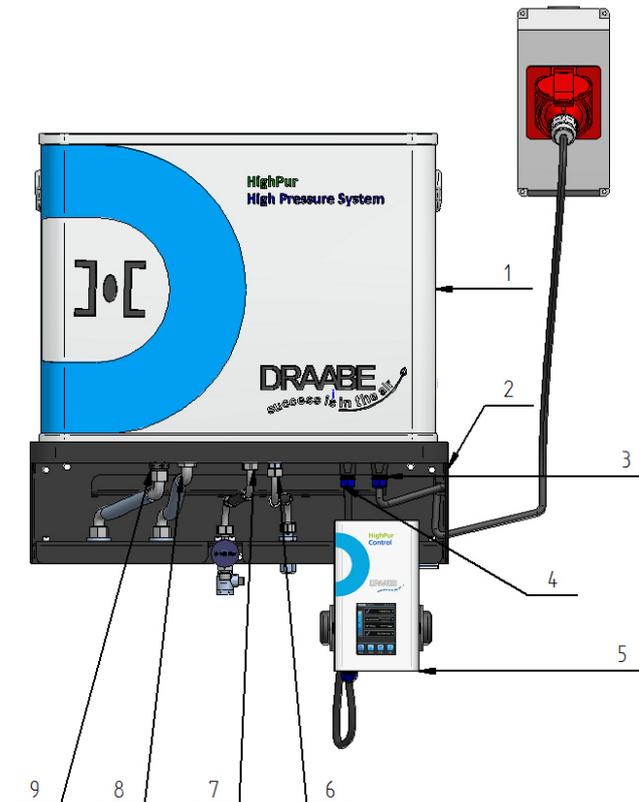
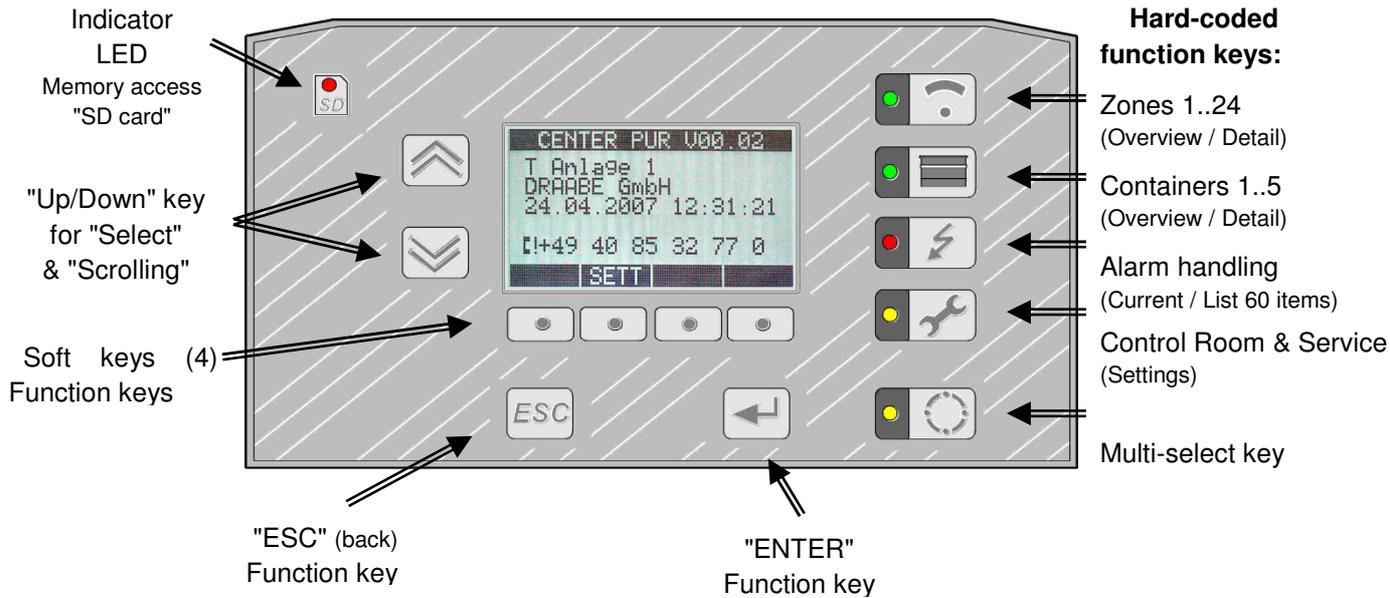


Figure 2 Support base with PurControl

3.2.3 HumCenter functional specification

The HumCenter is the master unit in the humidification system. The entire humidification system is connected to the HumCenter via a bus system. The master control unit handles monitoring and data exchange between the humidification zones and the systems.



The HumCenter consists of a display and multiple function keys, which can be used to access, select and work with the various menu items. The unit's functionality is described below. **For a detailed description of the individual menu items and their parameters, please see the HumDigital operating instructions.**

A summary of the zones, containers, alarms and the HumCenter is shown above the hard-coded function keys.

One use of the "Up/Down" keys is to select a zone, a container or an alarm. The keys can also be used to scroll the display screen, so as to access additional data items that cannot currently be shown on the screen.

Other functions are available via the soft keys underneath the display.

Zone menu

##	%RH	°C	Status
00	50.0	24.8	Stdby
01	0.0	0.0	ON
02	0.0	0.0	FWA
03	0.0	0.0	ON
04	0.0	0.0	Stdby
STAT			SETT

The Zone menu displays all of the zones (HumSpot) connected to the bus, along with the current relative room air humidity, temperature and mode. Once a zone has been selected, the soft keys can be used to display a detailed status report or configure settings for the zone.

Container menu

```
# TYPE STATUS
1 HIG ON
2 HIG Stby
3 SYN ON
4 PER ON
STAT
```

The Container menu displays all of the zones connected to the bus, along with the mode. Once a container has been selected, the soft keys can be used to display a detailed status report.

Alarms menu

```
PENDING ALARMS
▶ZON00 09.01.07 10:30
▶ZON01 09.01.07 10:28
▶ZON11 09.01.07 10:33
▶ZON13 09.01.07 10:34
LOG
```

If a fault occurs in the humidification system, a popup with a description of the error is shown on the display. The fault is also entered onto the Alarms menu. The Alarms menu is divided into two areas: "Pending Alarms" and "Alarm Log". The Pending Alarms area displays all of the current faults with the date and the time. This list is empty if there are no ongoing faults. The Alarm Log area displays all of the alarms (max. 64). Current alarms are shown with a triangle (▶) in front of the alarm message. Past alarms are shown without a triangle.

HumCenter menu

```
CENTER PUR U00.00
Test Anlage 1
Daniel Schnyder
03.01.2007 16:35
055 416 65 25
SETT
```

The HumCenter menu can be used to configure settings for the HumCenter itself. Input can include the system name, customer name, and the telephone number to call in the event of a system fault.

The HumCenter is supplied with an SD card: this can be used to store the relative room air humidity and temperature of the individual zones, as well as the system faults that have occurred. Data items are saved to a text file and can be imported by a PC application for reporting purposes.

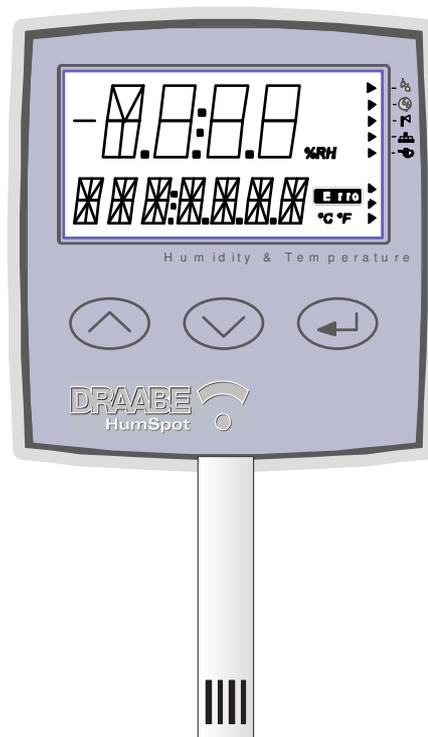


WARNING: When the SD LED is lit, the system is writing to the SD card. Do NOT remove the card at this time, otherwise the file on the SD card will become corrupted.

Various inputs/outputs are available. Usage and connection options for the inputs/outputs are described in 5.4.1, "Electrical installation".

3.2.4 HumSpot functional specification

The HumSpot unit is used to monitor room air humidity and control the fogging unit. The humidity setpoint is preselected on the unit. The room air humidity is then measured by the high-precision humidistat. The readings taken are shown on the HumSpot display and compared to the setpoint. If readings fall below the setpoint, a request is sent to the HighPur. Once the HighPur has reached working pressure (approx. 75 bar), it reports this to the HumSpot and activates the fogging unit via HumPower. The fogging unit switches off once the setpoint is reached.



If no humidification is required for a lengthy period (due to ambient conditions), there is a risk of contamination via stagnation. Water in the high-pressure hoses and fogging units stagnates, and bacteria or microbes such as fungi can multiply fast. To prevent this, the HighPur is equipped with an automated fresh water unit (AFU). It activates the fogging unit at regular intervals to replace the water with a fresh supply. The HighPur is also equipped with its own AFU (see chapter 3.2.1).



WARNING: The AFU is an important component that safeguards system hygiene. The unit must have uninterrupted connectivity to the electrical and water mains at all times.



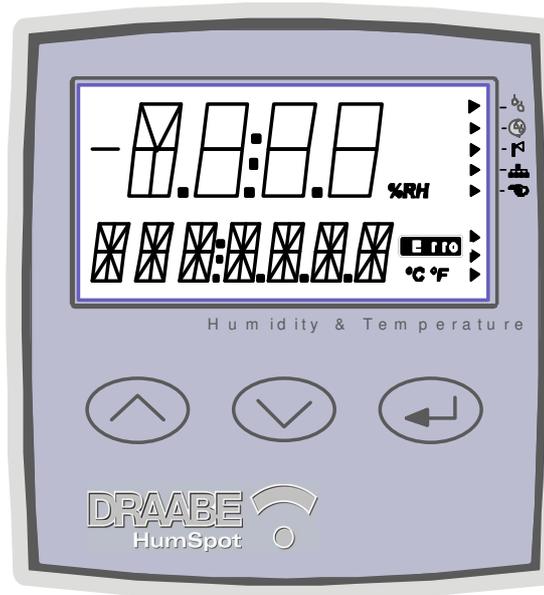
WARNING: Regular completion of scheduled maintenance/inspection work is a key part of safeguarding system hygiene. Steps must be taken to ensure this work is performed and documented either by the manufacturer or by authorised/qualified personnel.

Various inputs/outputs are available. Usage and connection options for the inputs/outputs are described in 5.4.2, "Electrical installation".

HumSpot menu system

Menus are designed to be intuitive. The section below briefly introduces the display screen and the various menus. **For a detailed description of the individual menu items and their parameters, please see the HumDigital operating instructions.**

Display screen



Humidity/temperature display

In normal operation, a key press activates the backlighting feature, and the room air humidity and temperature are shown on the display, along with a status arrow on the right-hand side.

This status arrow on the right-hand side indicates the current status.

Symbol	Function	Description
	Humidity request	Humidification being requested by the precision humidistat.
	AFU request	Humidification being requested by the AFU.
	Fogging active	The fogging units have been activated
	BUS active	Active connection to the CenterPur
	Manual operation	Manual operation active. This overrides the humidistat.
6-8	Average value	Average values for the last 15, 60 and 180 min.

FOG menu

The sub-menus are used to set the parameters for humidification.

"SETPT" sub-menu

This menu is used to specify the room humidity setpoint. Humidification is switched off when this value is reached.

"HYST" sub-menu

This menu is used to set the hysteresis. If the room air humidity drops by more than the hysteresis, humidification is activated.

"FOG" sub-menu

The "FOG" sub-menu is used to switch between demand-based humidification (AUTO) and no humidification (NO). The factory setting is "AUTO".

"CNT FWA" sub-menu

The "CNT FWA" sub-menu counts the number of automated freshwater unit (AFU) runs triggered and completed to date. This counter cannot be reset.

DISP menu

This menu's sub-menus are used to configure the display settings.

"BGL ON" sub-menu

Unit backlighting is switched off after a user-selectable delay. This menu is used to configure the backlighting duration.

"LCD OUT" sub-menu

Once the backlighting has been turned off, the LCD display can continue to show the humidity and temperature or can itself be switched off.

"UNIT T" sub-menu

This menu is used to configure the unit for displaying temperature (°C or °F).

KEYLO menu

The keyboard can be locked to prevent accidental misconfiguration of the parameters. To do so, a user-selectable four-digit lock code must be entered.

"CODE" sub-menu

This menu is used to enter the lock code (any code except 0000). The keyboard is then locked if no key is pressed within the next two minutes. Access to configure settings is possible only by entering the correct code.

The factory setting for the code is "0000". Using this code deactivates the keyboard lock feature.

"LOCK" sub-menu

This menu applies the code directly, with the effect of immediately locking the keyboard.

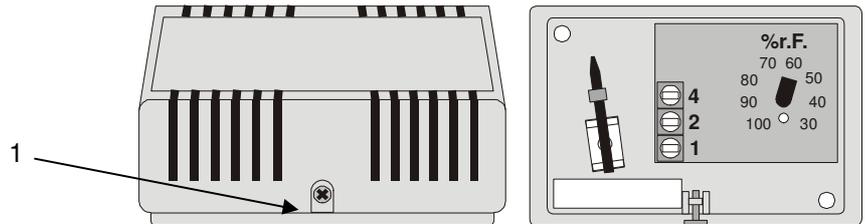
3.2.5 HumPower functional specification

The HumPower unit forms the interface between the HumSpot and the fogging units. It provides the supply voltage for powering the HumSpot and the fogging units. If readings fall below the setpoint, the HumPower is notified by the HumSpot and activates the downstream fogging units. The fogging units are switched off when the setpoint is reached.

Various inputs/outputs are available. Usage and connection options for the inputs/outputs are described in 5.4.3, "Electrical installation".

3.2.6 Maximum humidistat functional specification

The maximum humidity limiter must always be deployed in the system. It is a safety device that limits the room air humidity to the value predefined by the setpoint controls in the event of a malfunction in the high-precision humidistat or external humidistat. The setpoint selected should be 10% rH higher than that set for the high-precision/external humidistat. The limiter's factory setting is 65% rH. To change this value, remove the screw (1), set the required value, and then re-insert and tighten the screw.



NOTICE:

This important safety device can prevent over-wetting and thus a major damage event. Setpoint changes should be carried out by authorised personnel only. The system owner must ensure compliance with this safety notice.

3.2.7 TFNeo1, TFNeo2, TFNeo2x1, TFNeo2x2 functional specification

As single-component fogging units, the fogging units must only be provided with a power supply and a supply of water to atomise. The TFNeo1 and TFNeo2 models consist of a wall bracket with a support arm and the fogging unit itself (also called a "fogging head"). The TFNeo2x1 and TFNeo2x2 models consist of a wall bracket with two support arms and the two fogging heads.

The fogging unit heads are available in two models: TFNeo1 and TFNeo2. The only difference between the two is the number of nozzles: TFNeo1 has one nozzle, while TFNeo2 has two nozzles.

Unit configuration:

Unit model	TFNeo1	TFNeo2	TFNeo2x1	TFNeo2x2
Wall bracket	One arm	One arm	Two arms	Two arms
Fogging head	TFNeo1	TFNeo2	2x TFNeo1	2x TFNeo2

For all models, process water is provided by the HighPur unit, while the power supply (230 V AC, 50 Hz/24 V DC) is provided by the HumPower unit.

The HumSpot measures room air humidity and notifies the HighPur if the reading is lower than the setpoint. Once informed by the HighPur that the working pressure of 75 bar has been achieved, the HumSpot then routes the supply voltage to the fogging units. Once the fogging units have received this command, a fan and solenoid valve (SV) are activated; humidification is active.

The fogging units can be oriented on their horizontal and vertical axes, so as to direct the aerosol mist as required. For horizontal adjustment, disengage the socket screw (1) on the retaining bracket. For vertical adjustment, disengage the handles (2). Once the unit has been properly aligned, fix the unit in position by tightening the star-shaped grips.

The fogging units do not require regular maintenance. In very dusty environments, follow general good standards of hygiene and ensure that external dust and dirt is cleaned off the unit (see also chapter 6.3).

To replace (or clean) the unit, the fogging heads can be removed by disengaging the grips on the sides (please follow the unit replacement instructions given in chapter 7).



To keep the units in good working order, we recommend requesting a full service by DRAABE Customer Service every 2 years.



NOTICE:

The high-pressure nozzle is a high-precision stainless steel part with ultrafine machined holes that can suffer wear from erosion and chemical corrosion. The nozzles should therefore be renewed at regular intervals (and 2 years at the most) to keep them in good working order.

3.2.8 TFNeo8 functional specification

The TFNeo8 fogging units are fitted with 8 nozzles. As a single-component fogging unit, the unit must be provided only with a power supply and a supply of water to

atomise. Process water is provided by the HighPur unit, while the power supply (230 V AC, 50 Hz) is provided by the HumSpot.

The HumSpot measures room air humidity and notifies the HighPur if the reading is lower than the setpoint. Once informed by the HighPur that the working pressure of 75 bar has been achieved, the HumSpot then routes the supply voltage to the fogging units. Once the fogging unit has received this command, a fan and solenoid valve (SV) are activated; humidification is active.

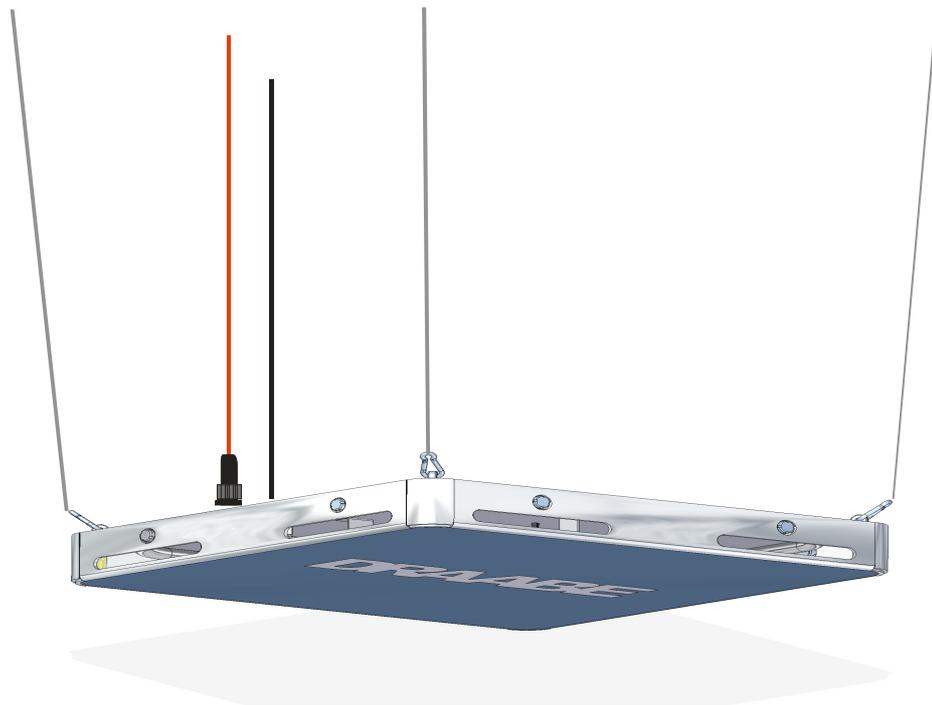
The fogging units do not require regular maintenance. Environments with high levels of dust or lint may cause the unit to malfunction. We recommend conducting regular inspections (see chapter 6.3).

To keep the units in good working order, we recommend requesting a full service by DRAABE Customer Service every 2 years.



NOTICE:

The high-pressure nozzle is a high-precision stainless steel part with ultrafine machined holes that can suffer wear from erosion and chemical corrosion. The nozzles should therefore be renewed at regular intervals (and 2 years at the most) to keep them in good working order.



3.2.9 NanoFog Evolution functional specification

As a single-component fogging unit, the fogging units must only be provided with a power supply and a supply of water to atomise. The NanoFog Evolution fogging unit consists of a wall bracket (1) and the fogging unit itself (2) (also called a "fogging head").

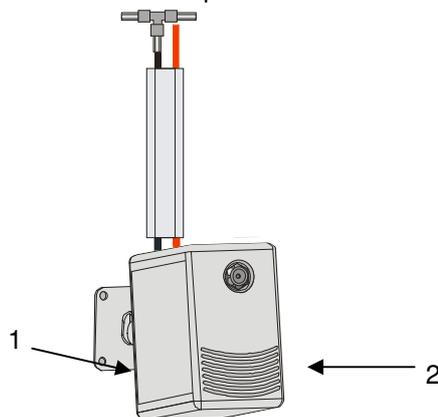
Process water is provided by the HighPur unit, while the power supply (230 V AC, 50 Hz; 24 V DC) is provided by the HumPower.

The HumSpot measures room air humidity and notifies the HighPur if the reading is lower than the setpoint. Once informed by the HighPur that the working pressure of 75 bar has been achieved, the HumSpot then routes the supply voltage to the fogging units via HumPower. Once the fogging units have received this command, a fan and solenoid valve (SV) are activated; humidification is active.

The fogging units can be oriented on their horizontal and vertical axes, so as to direct the aerosol mist as required. For adjustment, disengage the cross-headed screw (1). Once the unit has been properly aligned, fix the unit in position by tightening the cross-headed screws. To orient the fogging unit horizontally, the unit merely needs to be rotated into the chosen position.

The fogging units do not require regular maintenance. In very dusty environments, follow general good standards of hygiene and ensure that external dust and dirt is cleaned off the unit (see also chapter 6.3).

To replace (or clean) the unit, the fogging head can be removed from the wall bracket (please follow the unit replacement instructions given in chapter 7).



To keep the units in good working order, we recommend requesting a full service by DRAABE Customer Service every 2 years.



NOTICE:

The high-pressure nozzle is a high-precision stainless steel part with ultrafine machined holes that can suffer wear from erosion and chemical corrosion. The nozzles should therefore be renewed at regular intervals (and 2 years at the most) to keep them in good working order.

4 Planning basics

The basic planning steps described below are theoretical in nature. In practice, the level of humidification performance required will be influenced by parameters that exceed the scope of this documentation. In many cases, these theoretically determined values must therefore be augmented or replaced by best practice values. Our consultants will be happy to advise you in this matter.

4.1 Information about planning a single-zone humidification system

Steps to complete when selecting and/or designing the air humidification system:

- Determination of room volume and air change rate
- Definition of setpoints (temperature and humidity/relative humidity)
- Definition of the humidification zones
- Calculation of maximum humidification required
- Determination of equipment needs

The following chapters provide all of the details needed to complete the individual planning steps. In each planning step, a **calculation example** is given, which is based on assumptions about facility data. The three separate examples are intended to clarify the methodology used. It is naturally impossible to cater to all applications with a single example. The DRAABE humidification system offers a wealth of solutions for the customer-specific humidification of a very diverse range of interiors.

The DRAABE Sales and Customer Service team is happy to respond to your enquiries and provide solutions to any problem. **Phone: + 49 40 853277-77**

4.1.1 Example 1 (TFNeo1, TFNeo2)

This considers the scenario where only one room requires humidification.

EXAMPLE 1

A DRAABE humidification system will be installed for direct room humidification in the paper warehouse of a large print shop. System parameters are as follows:

Room dimensions (L x W x H) in m: 40.0 x 30.0 x 4.0

<i>Number of air changes per hour:</i>	<i>2.2</i>
<i>Exterior air quality (winter):</i>	<i>-15 °C/90% rH</i>
<i>Target room temperature:</i>	<i>21 °C</i>
<i>Target relative air humidity:</i>	<i>53% rH</i>
<i>Zones:</i>	<i>One</i>

4.1.1.1 Calculation of maximum humidification required

Maximum humidification can be calculated using the following formula:

$$\text{mH2O} = \frac{V \times 1.2 \times \text{AC/h} \times (x_2 - x_1)}{1000}$$

mH2O : Maximum humidification output in **kg/h**

V : Volume of air to humidify in **m³**
(Formula: L x W x H)

AC/h : Number of air changes per hour
The air changes per hour depend on the purpose for which the room is used and must be determined by the facility planner in advance. The following reference values can be used as a starting-point:

- Textile processing: 3–7 AC/h
- Printing works: 2–5 AC/h
- Warehouses: 1–3 AC/h
- Cold stores: Max. 1 AC/h

1.2 : Constant for the specific weight of air in **kg/m³**

x2 : Target value for absolute humidity of room air in **g/kg**

x1 : Minimum absolute humidity before humidification in **g/kg**



NOTICE:

Where the outside air proportion is 100%, outside air conditions in winter must be factored in. If an air recirculation is used (30% outside air, 70% recirculated air), apply the resulting mixed air parameters.

For **x2** and **x1** values, consult the **h,x diagram** in the Appendix (p. 55).



NOTICE:

The formula given does not take into account moisture absorption or release by materials in the humidified room. As the atomised water evaporates, this process draws heat out of the ambient air. To achieve the target room temperature, the room air must be heated. **WARNING:** This heating is typically already provided by the waste heat from machinery.

SOLUTION FOR EXAMPLE 1

The humidification output required for the example is calculated as **105 kg/h**.

If you have any queries concerning the calculation of humidification output, please contact DRAABE Hamburg.

4.1.1.2 Determination of equipment needs

One key figure – required humidification output – is now available for this calculation. The specifications below for fogging unit and HighPur capacity form the second figure.

TFNeo1/TFNeo2 capacity 4/8 kg/h
HighPur capacity 200 kg/h

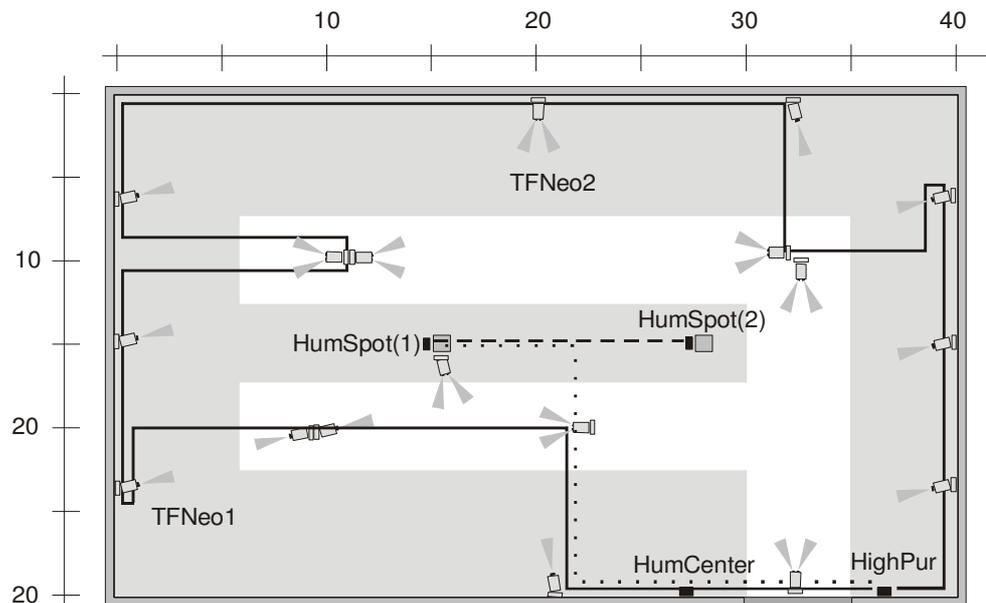
EXAMPLE 1

Total water quantity (mH2O) = 105 kg/h

Units required:

- 1 unit HumCenter
- 2 units HumSpot
- 10 units TFNeo1
- 8 units TFNeo2
- 1 unit HighPur

High-pressure requirements depend on hose layout and routing. Calculations are based on the layout plan. For this example, an **est. 140 m** of the DRAABE quick-fit kit (**QFK**) is calculated. The QFK provides the necessary cabling, high-pressure hoses and fittings.



4.1.2 Example 2 (TFNeo2x1, TFNeo2x2)

The basic approach to planning used here is described in chapters 4.1 to 4.1.1.2.

EXAMPLE 2

A DRAABE TF humidification system will be installed for direct room humidification in a large print shop. System parameters are as follows:

Paper warehouse (L x W x H) in m:	50.0 x 30.0 x 5.0
Number of air changes per hour:	2.2
Exterior air quality (winter):	-15 °C/90% rH
Target room temperature:	21 °C
Target relative air humidity:	53% rH
Zones:	One

4.1.2.1 Calculation of maximum humidification required

The calculations is performed as described in 4.1.1.1.

SOLUTION for EXAMPLE 2

The humidification output required for the example is calculated as **164 kg/h**.

4.1.2.2 Determination of equipment needs

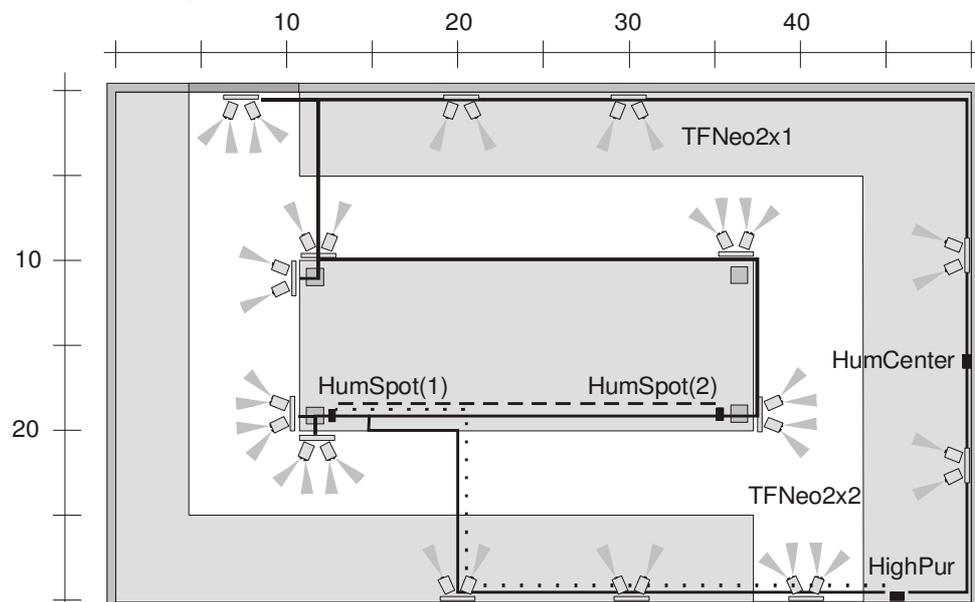
TFNeo2x1/TFNeo2x2 capacity	8/16 kg/h
HighPur capacity	200 kg/h

EXAMPLE 2

Total water quantity (mH₂O) = 164 kg/h; units required:

1	unit	HumCenter
2	units	HumSpot
6	units	TFNeo2x2
8	units	TFNeo2x1
1	unit	HighPur

High-pressure requirements depend on hose layout and routing. Calculations are based on the layout plan. For this example, an **est. 180 m** of the DRAABE quick-fit kit (**QFK**) is calculated. The QFK provides the necessary cabling, high-pressure hoses and fittings.



4.1.3 Example 3 (TFNeo8)

The basic approach to planning used here is described in chapters 4.1 to 4.1.1.2.

EXAMPLE 3

A DRAABE TF humidification system will be installed for direct room humidification in a large print shop. System parameters are as follows:

<i>Paper warehouse (L x W x H) in m:</i>	<i>50.0 x 30.0 x 6.0</i>
<i>Number of air changes per hour:</i>	<i>2.2</i>
<i>Exterior air quality (winter):</i>	<i>-15 °C/90% rH</i>
<i>Target room temperature:</i>	<i>21 °C</i>
<i>Target relative air humidity:</i>	<i>53% rH</i>
<i>Zones:</i>	<i>One</i>

4.1.3.1 Calculation of maximum humidification required

The calculations is performed as described in 4.1.1.1.

SOLUTION for EXAMPLE 3

*The humidification output required for the example is calculated as **177 kg/h**.*

4.1.3.2 Determination of equipment needs

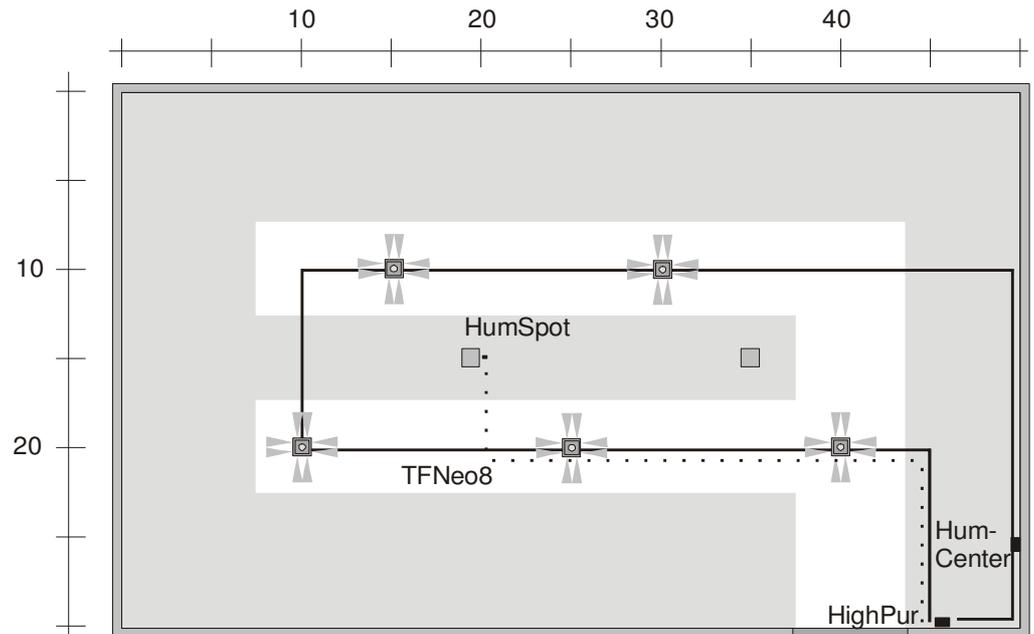
TFNeo8 capacity	32 kg/h
HighPur capacity	200 kg/h (max. 6 units TFNeo8)

EXAMPLE 3

Total water quantity (mH₂O) = 195 kg/h; units required:

<i>1</i>	<i>unit</i>	<i>HumCenter</i>
<i>1</i>	<i>unit</i>	<i>HumSpot</i>
<i>5</i>	<i>units</i>	<i>TFNeo8</i>
<i>1</i>	<i>unit</i>	<i>HighPur</i>

High-pressure requirements depend on hose layout and routing. Calculations are based on the layout plan. For this example, an **est. 100 m** of the DRAABE quick-fit kit (**QFK**) is calculated. The QFK provides the necessary cabling, high-pressure hoses and fittings.



4.2 Planning guidance for a twin-zone air humidification system

This considers the scenario where only one room is available but will be divided up into two humidification zones. If a room contains zones with varying thermal loads or if the air change rate is not constant for the entire room, then a humidistat (HumSpot) alone will not supply accurate readings. Certain zones will be under- or over-supplied. In this and similar scenarios, the room can be divided into two humidification zones. In addition, the differences in humidification performance shown by the two fogging units TFNeo1 and TFNeo8 offer the option of targeted (spot) humidification or even restricting humidification output.

4.2.1 Example 4 (TFNeo2x2 and TFNeo8)

The room plan is used to specify the humidification zones.

EXAMPLE 3

A DRAABE TF humidification system will be installed for direct room humidification in a large print shop. System parameters are as follows (index 1 for zone 1, index 2 for zone 2):

<i>Room (L x W x H) in m:</i>	<i>50.0 x 40.0 x 8.0</i>
<i>Zone 1:</i>	<i>30.0 x 40.0 x 8.0</i>
<i>Zone 2 (suspended ceiling):</i>	<i>20.0 x 40.0 x 5.0</i>
<i>Number of air changes per hour:</i>	<i>3.0₁, 1.5₂</i>
<i>Exterior air quality (winter):</i>	<i>-15 °C/90% rH</i>
<i>Target room temperature:</i>	<i>21 °C</i>
<i>Target relative air humidity:</i>	<i>53% rH</i>
<i>Zones:</i>	<i>Two</i>

4.2.1.1 Calculation of maximum humidification required

The calculations is performed as described in 4.1.1.1.

SOLUTION FOR EXAMPLE 4

The humidification output required for Zone 1 in the example is calculated as **257 kg/h**.

The humidification output required for Zone 2 in the example is calculated as **54 kg/h**.

4.2.1.2 Determination of equipment needs

TFNeo2x2 capacity	16 kg/h
TFNeo8 capacity	32 kg/h
HighPur capacity	200 kg/h

EXAMPLE 4

Total water quantity (mH2O) = 311 kg/h

Units required:

1 unit HumCenter

3 units HumSpot

2 units HighPur

Extra for Zone 1:

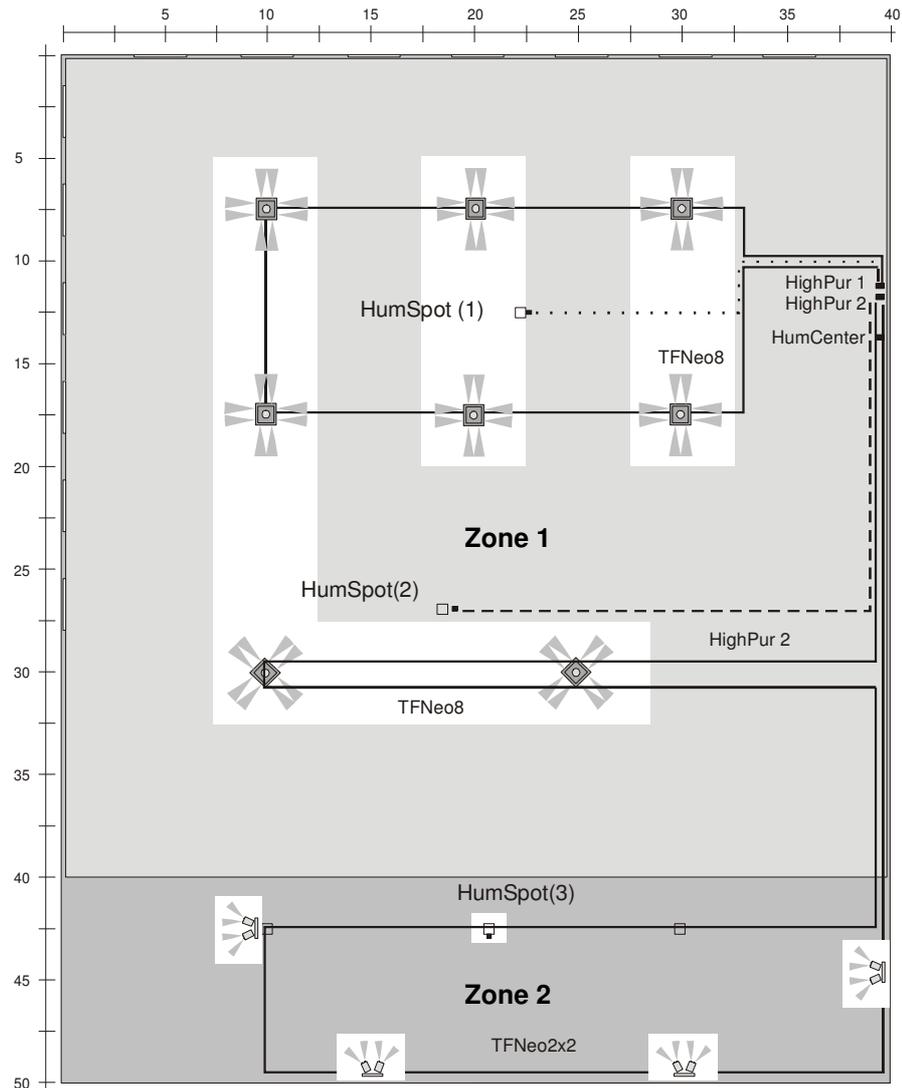
6 units TFNeo8

2 units TFNeo8

Extra for Zone 2:

4 units TFNeo2x2

High-pressure requirements depend on hose layout and routing. Calculations are based on the layout plan. For this example, an **est. 400 m** of the DRAABE quick-fit kit (**QFK**) is calculated. The QFK provides the necessary cabling, high-pressure hoses and fittings.



4.3 Guidance on water supply

As a single-component system, the DRAABE humidification system makes particular demands on the water to be atomised. The system must be operated with demineralised, virtually microbe-free pure water.

As a rule, only specially treated water may be utilised. This means that water must **always** pass through a three-tiered treatment process before the water is supplied to the HighPur as feed water.

Each and every one of the requirements listed below is **absolutely essential** to ensuring the safe and hygienic operation of the system. They are satisfied by installing a DRAABE pure water system – which must of course be subjected to regular inspection and maintenance.

Definitions:

- **Raw water:** This type of water is used to mean the feed water for water treatment. This water must be treated. Other synonyms for "raw water" are "drinking water" and "mains water".

- **Soft water:** See also 4.3.2. This is water with hard ions removed.
- **Pure water:** This type of water means the product of the water treatment process. Another synonym for "pure water" is "reverse osmosis water".



WARNING: Even if these requirements are satisfied, bacterial growth in the system can never be completely excluded. Regular inspection of the system by the system owner is essential in order to guard against health hazards.

4.3.1 Requirements for the raw water

The system owner is responsible for ensuring the requirements below are satisfied over the long term.

- The water must not contain any suspended solids >5 µ.
- As a general rule, water must be free from colloids and organic substances.
- Well water, rain water and DI water are not suitable.
- It should be of drinking water quality (e.g. organic substance count).
- The bacterial count must not exceed 1000 microbes/ml.
- It must be free from chemical substances/additives (e.g. chlorine, ozone, disinfectants).
- No additional equipment may be deployed that alters the properties of the raw water (e.g. dosing appliances).
- Water temperature 6–20 °C
- Working pressure 3–4 bar

4.3.2 Requirements for water treatment plant

- A three-stage water treatment system must be deployed:
 - Water softening (<0.1 °dH at outlet)
 - Filtration (particulate filter 5 µ + activated charcoal filter)
 - Demineralisation via reverse osmosis (inorganic membrane)
- Water values at water treatment outlet:

⇒ Water hardness	< 0.1 °dH
⇒ Conductance	5–10 µS
⇒ Water temperature	6–25 °C
⇒ Working pressure	2–3.5 bar
- The product must be conducted within a closed system until exiting from the nozzle and must not have contact with the air at any point.
- Do not deploy water tanks with a float switch control mechanism. Instead, use closed, membrane reservoir tanks made of stainless steel or plastic for secondary storage of the product (pressure control).
- Both fittings and piping must be made from materials that are approved for food industry use (plastic, stainless steel). Do NOT use copper or brass components.

The pure water must be free from organic constituents.

5 Installation

5.1 Safety guidelines for installation



NOTICE:

- All assembly and installation work must be performed by properly instructed and well-qualified personnel (e.g. plumbing or electrical fitters). Checking personnel qualifications is the responsibility of the installation client.
- All local regulations and directives covering electrical/plumbing installation work must be complied with and observed.
- Ensure full compliance with the specifications and regulations given in this chapter for installation, the electrical subsystem and the siting of system components.
- The entire water cycle – from the drinking water supply to the water treatment plant and the high-pressure facility – must be designed as a closed system (incl. the reservoir tanks).

5.2 Guidance on siting and installation

Typically, the siting of a system is determined at the planning stage and set down in the facility documentation. The following general guidance on component siting should be observed in all cases, however:

- Before starting installation, check the delivery against shipping documents to ensure it is complete and undamaged.
- Installation work must be performed in accordance with industry good practice and the supply (fitting) regulations from local utilities.
- Take care to ensure that structures (walls, stanchions, ceilings, etc.) to which equipment/system components is/are to be mounted have sufficient load-bearing capacity and are suitable for installing the apparatus.
- System components should be installed in a way that ensures adequate clearance for maintenance work and operation.
- Position the fogging units so that the aerosol mist can diffuse freely. Obstacles in the path of the aerosol mist (such as ceilings, beams, etc.) produce overconcentration and eddying, which may lead to condensation.
- If the atomiser nozzles are mounted opposite one another, take to comply with the minimum distance of 8 m between nozzles, so that aerosol streams do not cause condensation by interfering with one another.
- Take airflows in the room into account: do not place fogging unit nozzles in the immediate vicinity of an exhaust air outlet or a cold air inlet.
- Do not point fogging unit nozzles at cold parts of buildings such as exterior walls or windows (condensation risk).

- Cold-water pipework near the aerosol stream should be lagged (condensation risk).
- The evaporation process draws heat out of the ambient air. Accordingly, ensure that the aerosol stream does not point towards personnel or flow directly over workplaces.
- To guarantee optimum humidification, ensure fogging units are distributed sensibly around the room.
- System components should be installed in a way that ensures adequate clearance for maintenance work and operation.
- No independent retooling or modification work is permitted on the equipment as supplied.
- Installation of any additional fittings (e.g. valves, etc.) not indicated on the installation schematic is prohibited within the entire DRAABE system.
- These installation instructions cover standalone systems only. The manufacturer supplies individual plant schematics for customer facilities. Guidance on installation work is also provided. Installation instructions, schematics and guidance are binding for the given layout.
- Ensure compliance with material specifications (5.5).

5.2.1 HighPur support base

- Where possible, the unit should be installed in an operations room accessible only to a limited number of people.
- The ambient temperature must be a constant +7 °C to +35 °C throughout the year.
- The installation site should be chosen so that it is shielded from thermal and solar radiation.

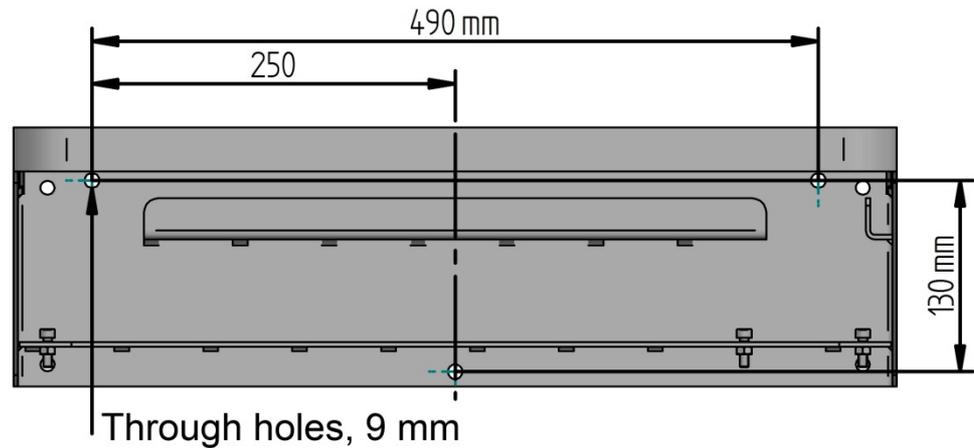


NOTICE:

Ensure the wall is load-bearing before mounting (load bearing capacity min. 50 kg).

The high-pressure pulsation system is supplied ready for commissioning with a 400 V CEE-format 16 A plug.

When installing the three-phase current socket, ensure that the wall outlet is mounted approx. 25 cm to the right of the wall bracket at the height of the high-pressure pulsation unit.



Take care to provide for a clearance of 50 cm above the entire width of the support base. Ensure a clearance of 20 cm to the left and the right of the support base. The distance from the lower edge to the floor should be at least 1.2 m.



WARNING:

Electrically live parts or components must not be installed/stored underneath the support base, since these could be damaged in the event of a leak.

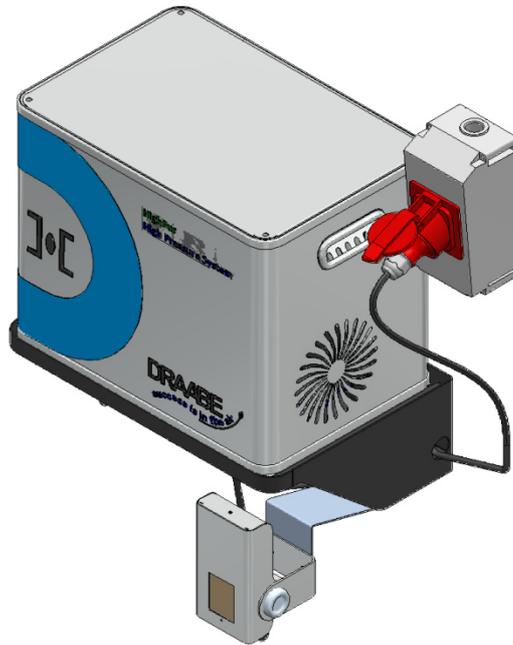
5.2.2 HighPurControl unit

- The PurControl unit can be mounted directly onto the support base by using the bracket included.
- Alternatively, the control unit bracket can also be used to mount the PurControl unit to the wall.

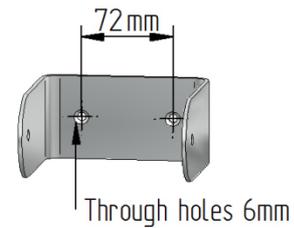


WARNING:

The reset switch on the PurControl unit deactivates control functionality. The HighPur compact container continues to be supplied with 400 V AC power. The container is not isolated from the mains until the power plug is disconnected.



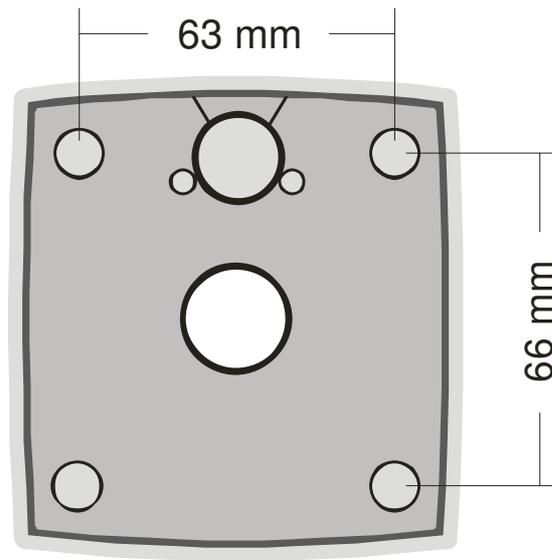
Wall mounting



5.3.1 HumSpot and maximum humidistat

- Mount the unit so it is easily accessible at eye height.
- The installation site should be chosen so that direct solar radiation cannot fall onto the humidistat.
- Do not mount either the unit or the humidistat onto cold exterior walls (impairs humidity control functionality).
- Shield the humidistat from the warmth and cold emitted by machinery, heating, refrigerator units, etc.
- The humidistat must be positioned so that the room air is free to circulate around the humidistat. (Do not install into alcoves, etc.)
- Ensure a clearance of about 50 cm around the unit and the humidistat.

HumSpot



Maximum humidistat

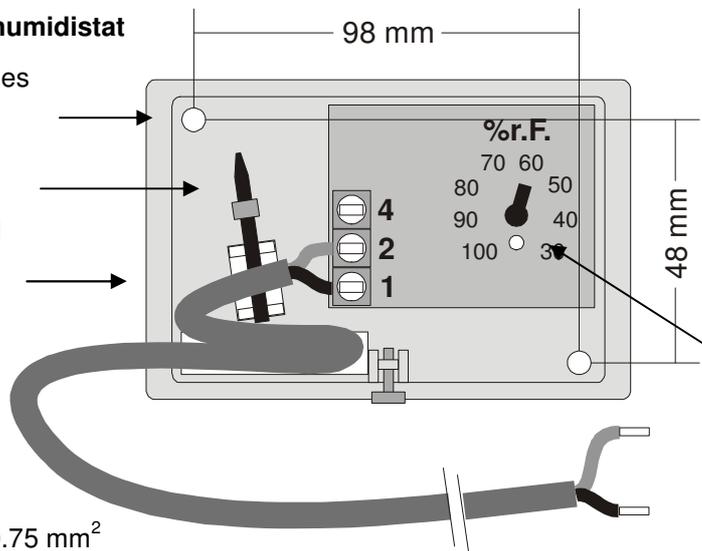
Through holes

3.5 mm

Strain relief

Cable gland

(in cover)

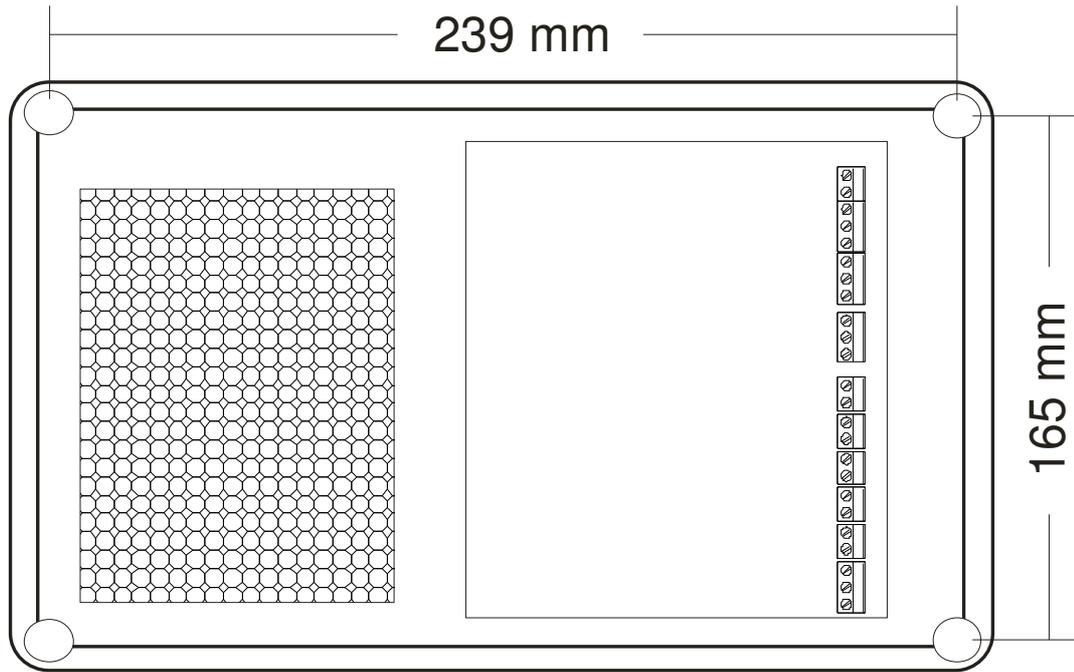


Cable: 2 x 0.75 mm²

Maximum length: 10 m

5.3.2 HumPower

- The unit can be installed in a crawl space.
- The distance from HumSpot must not exceed 30 metres.



5.3.3 TFNeo1, 2, 2x1, 2x2 fogging unit

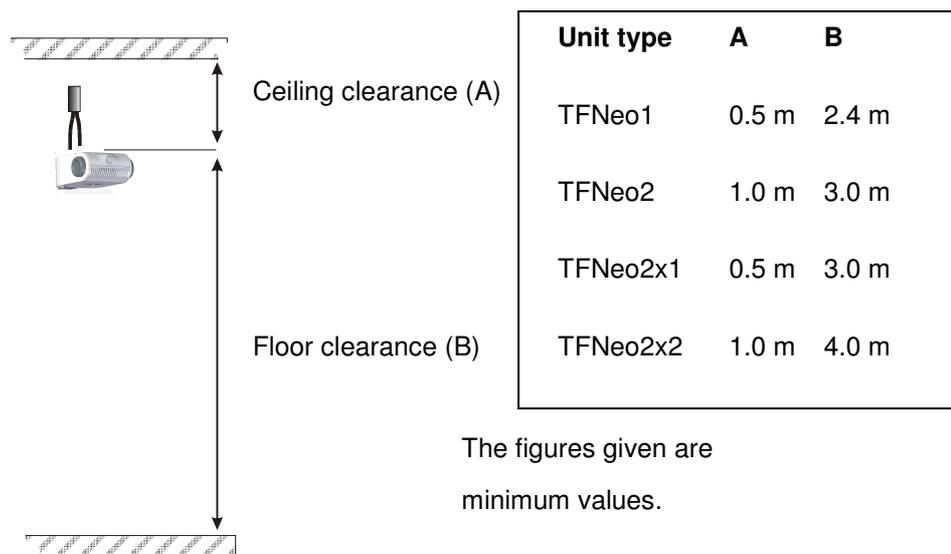
Siting

- The fogging unit must not be placed directly above workplaces or machinery.



WARNING: Keep baffles out of the path of the fogging unit flow. Otherwise, condensation or precipitation can occur, leading to pools of dripping water.

- To the front, the air space should be free to an angle of 90° and over a distance of 4 m.
- Keep ventilation ducting, facility parts or other moisture-sensitive components/products out of this volume of free space (air space to the front, ceiling and floor clearance).
- Stub lines with the high-pressure DN4 hose, leading away from the reduced T-piece (ring main), must not be longer than 4 m.



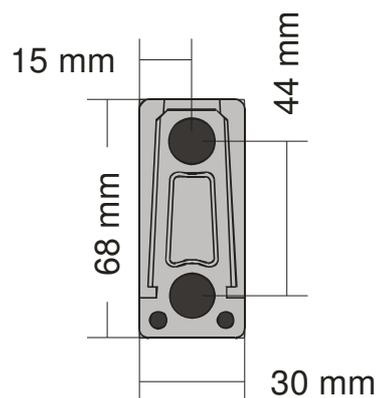
NOTICE:

The high-pressure nozzle is a high-precision stainless steel part with ultrafine machined holes that can suffer wear from erosion and chemical corrosion. The nozzles should therefore be renewed at regular intervals (and 2 years at the most) to keep them in perfect working order.

Mounting the wall bracket (with one/with two support arms) and high-pressure connection

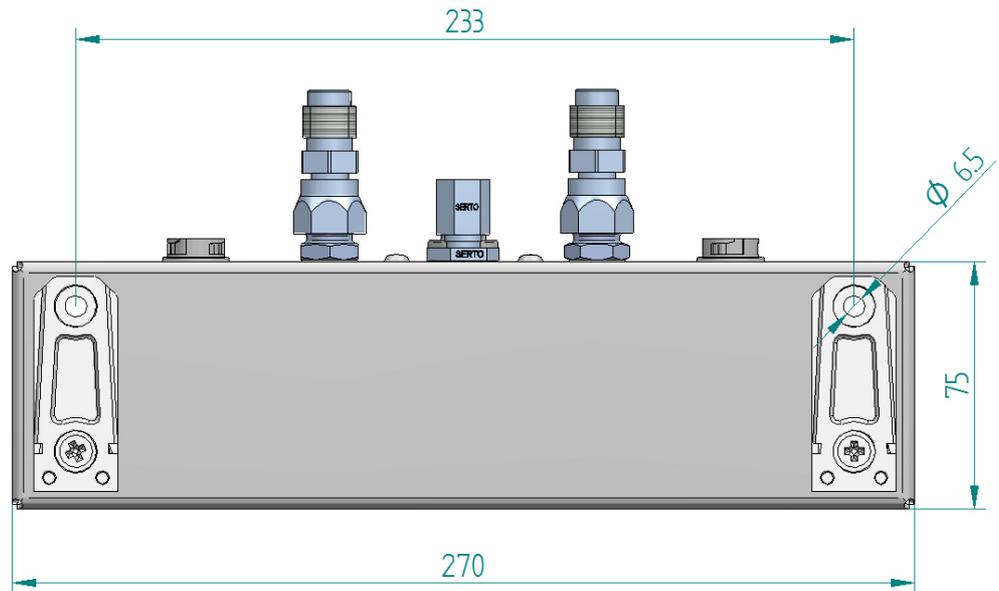
The wall bracket (WB) is fixed to the wall using an appropriate type of screw (and with wall plug anchors as required).

WB for TFNeo1, TFNeo2



The through holes for all wall brackets are 6.5 mm in size.

WB for TFNeo2x1, TFNeo2x2



The through holes for all wall brackets are 6.5 mm in size.

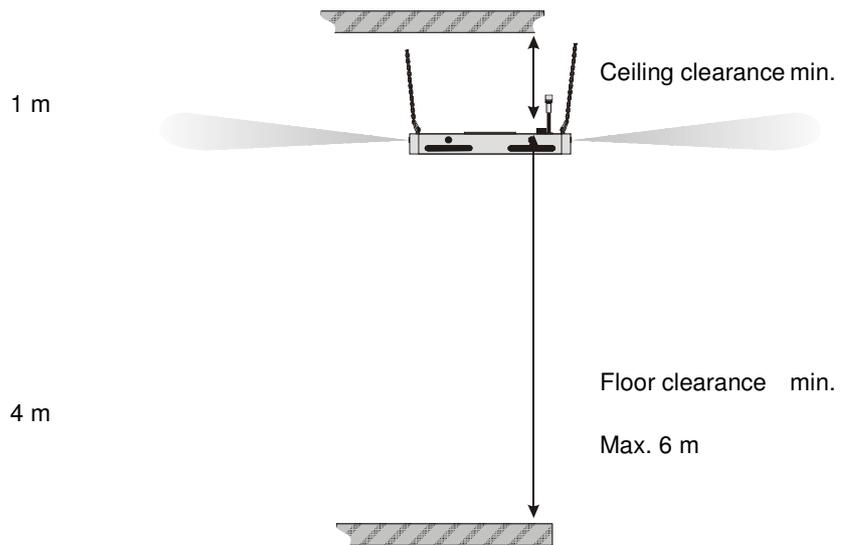
5.3.4 TFNeo8 fogging unit

Siting

The same conditions apply as for the fogging units from chapter 5.3.4. In addition, also observe the following fogging unit-specific conditions:

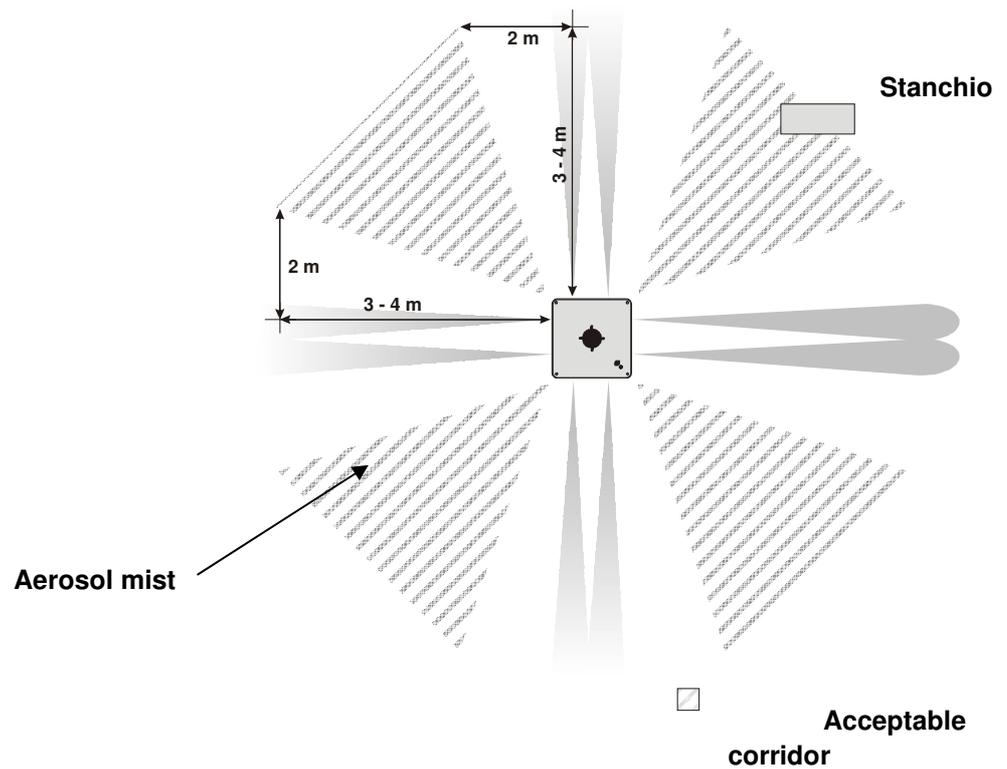
- Do not exceed the maximum mounting height, so as to avoid making fogging unit access unnecessarily difficult.
- To the front, the air space should be free to an angle of 360° and over a distance of 4 m. (For further advice, see the diagram on page 34.)
- Stub lines with the high-pressure DN4 hose, leading away from the reduced T-piece, must not be longer than 6 m.

Keep this specified clearance volume free of ALL machinery, ventilation ducting or other moisture-sensitive products.

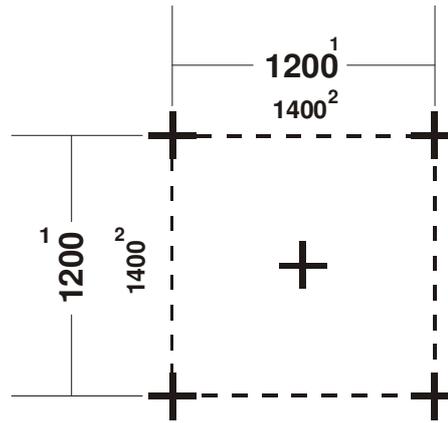


When positioning, ensure that you can keep baffles out of the aerosol mist radius. A corridor between the nozzles – where stanchions are located, for example – is acceptable.

n



Anchor point hole pattern
for the ceiling mount
(chains):



- 1: Chain length approx. 1.2 m
2: Chain length approx. 1.8 m



NOTICE:

The high-pressure nozzle is a high-precision stainless steel part with ultrafine machined holes that can suffer wear from erosion and chemical corrosion. The nozzles should therefore be renewed at regular intervals (and 2 years at the most) to keep them in perfect working order.

5.3.5 NanoFog Evolution fogging unit

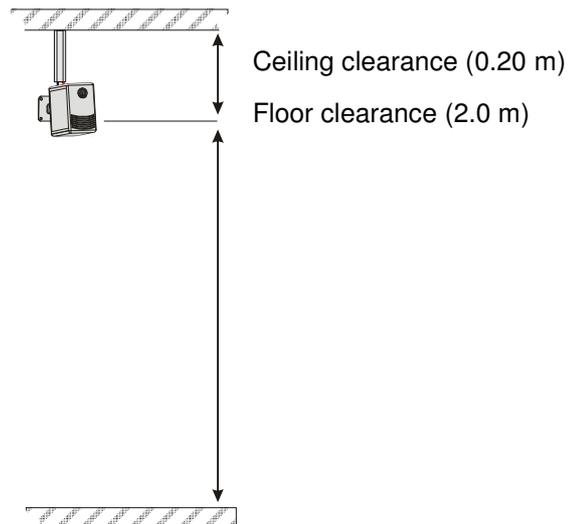
Siting

- The fogging unit must not be placed directly above workplaces or machinery.



WARNING: Keep baffles out of the path of the fogging unit flow. Otherwise, condensation or precipitation can occur, leading to pools of dripping water.

- To the front, the air space should be free to an angle of 90° and over a distance of 4 m.
- Keep ventilation ducting, facility parts or other moisture-sensitive components/products out of this volume of free space (air space to the front, ceiling and floor clearance).
- Stub lines with the high-pressure DN4 hose, leading away from the reduced T-piece (ring main), must not be longer than 4 m.
- The stub line and the cable must be routed to the wall bracket in a cable duct (45 x 30 mm). To ensure simple replacement of the fogging unit, the cable duct cover must be cut through once at a distance of 30 cm from the wall bracket.



The details given refer to the wall bracket and must be taken as minimum values.

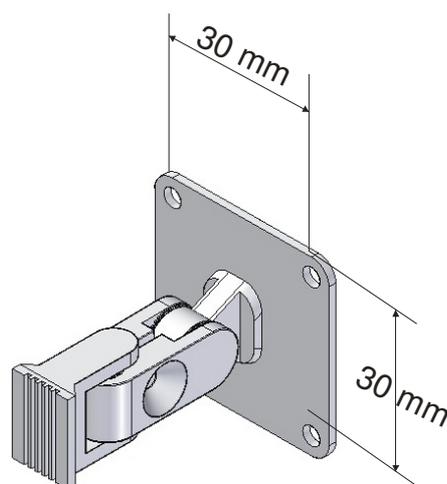


NOTICE:

The high-pressure nozzle is a high-precision stainless steel part with ultrafine machined holes that can suffer wear from erosion and chemical corrosion. The nozzles should therefore be renewed at regular intervals (and 2 years at the most) to keep them in perfect working order.

Mounting the wall bracket and high-pressure connection

The wall bracket (WB) is fixed to the wall using an appropriate type of screw (and with wall plug anchors as required).



The through holes for all wall brackets are 3.5 mm in size.

5.3.6 High-pressure hosing

From the HighPur's support base, the water – pressurised to 75 bar – is fed into the high-pressure ring (DN8). The high-pressure ring is used to supply the individual fogging units (stub line, DN4). Each fogging unit is equipped with a T-piece that makes this connection possible.

- All parts used must comply with the material specifications.
- Hoses must be laid in protective piping, especially when routed through walls.



WARNING:

When laying hoses, take EXTRA care to ensure that corners, wall bushings, external wall openings, etc. do not become abrasion points that can cause serious damage to the high-pressure hosing. ALWAYS bear in mind that hosing can expand or contract as a result of pressure and/or temperature gradients.

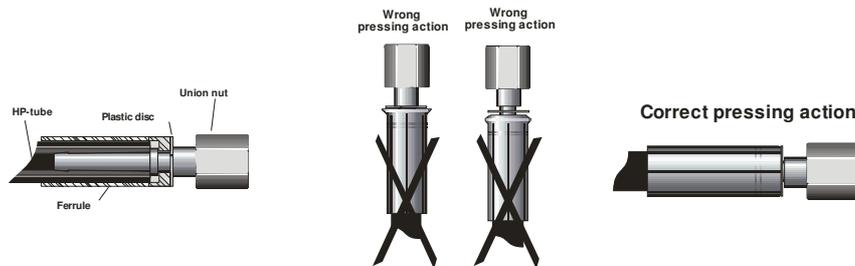
- If a length of hosing (with or without a press fitting) needs to be routed through a wall opening, seal off the hose end beforehand to prevent dirt getting into the hose.

- Do not bend hosing beyond the minimum bending radii given below:

DN8 hose: 115 mm

DN4 hose: 40 mm

- For press fittings, always follow the specifications given in the table. Always inspect the press dimensions and correct press operation for each fitting. Replace press fittings if the fit is faulty.



Press dimensions:

Schlauch	Hose inner diameter in mm	Fitting	Ferrule diameter before crimping in mm	Ferrule diameter after crimping between collar in mm	Tolerance in mm	Crimping setting on set screw of UNIFLEX HD Tolerance in mm
DRAABE HD2000 (week/year) DN04 batchno. 12,5MPa 125bar	4	DKOL-06L-DN-4	13	11	±0,1	2
DRAABE HD2000 (week/year) DN08 batchno. 12,5MPa 125bar	7,9	DKOL-10L_DN-8	19	16	±0,1	3

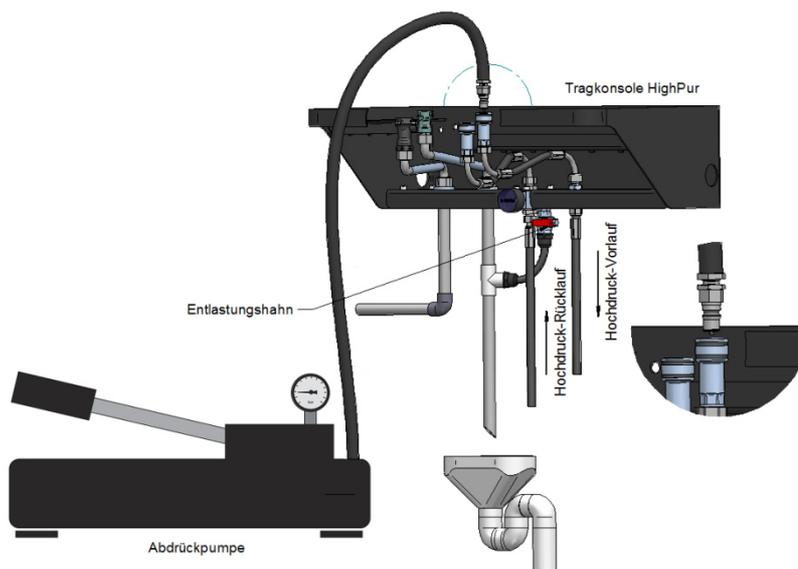
5.3.7 Pressure testing the high-pressure hosing

- After complete installation of the high-pressure hose system, always conduct a pressure test.
- Connect the pressure-test apparatus to the left-hand inlet of the support base (08 l), see diagram below.
- Maintain a test pressure of 120 bar for 30 minutes. Use water as a test medium. Raise the pressure gradually in 20-bar steps. You can already start looking for leaks at this time (hosing, fittings, wall mounting brackets, etc.).
- If neither a leak nor a pressure loss occurs during the 30 minutes, the test has concluded successfully. In all other cases, the pressure test must be repeated after correcting the fault.



NOTICE:

During commissioning, the system is tested by the DRAABE customer service technician to confirm compliance with specifications. If incorrectly installed, the technician is entitled to terminate the commissioning process.



5.3 Electrical installation

This documentation does not cover the installation of the power supply. It does cover the specifications of the same, however. Installation of the TF electrical components is illustrated, and where these need a connection to the power supply.



WARNING:

The layout of the electrical installation – including the supply voltage – must comply with local safety regulations and standards.



GUIDANCE on the electrical installation:

- Cables must be terminated with appropriate wire end ferrules.

- For fuse ratings, observe the values given.
- Without exceptions, all installations must comply with the wiring diagrams discussed here.
- During installation work, isolate the power supply and ensure that it cannot be accidentally switched back on.
- The protection class for all equipment is IP00. If it is impossible to prevent the ingress of water into the equipment on a permanent basis – e.g. in cases where several containers are mounted one above the other – the power supply must be protected with a residual current device.



WARNING:

All equipment covered by this documentation requires a 230 V AC/50 Hz power supply (HighPur: 400 V AC, 50 Hz). As this power is provided by the building mains, fuse protection for all consumers must include the deployment of a residual-current device (with overload protection, RCBO). An RCBO offers excellent protection both against accidental shock and overloading.

RCBO requirements:

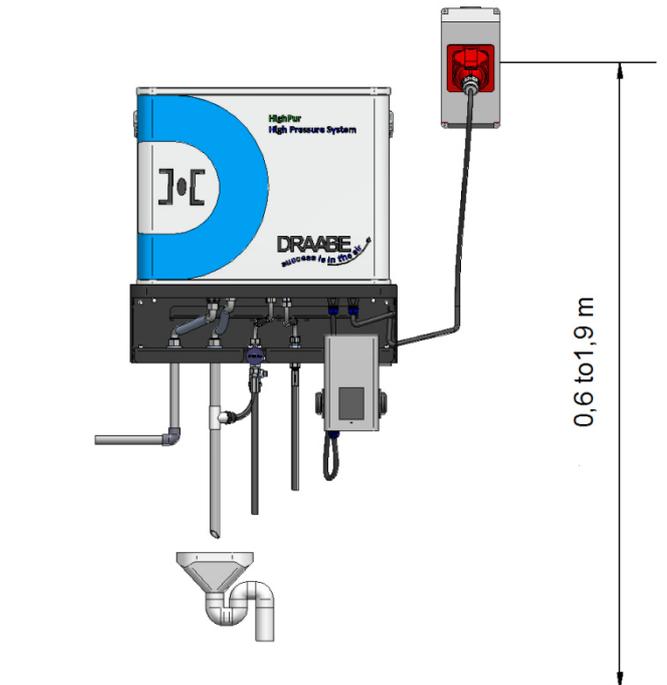
Type:	A (EN 61008)
Trip current:	0.03 A or less
Pin count:	2
Protection class:	IP40
Overcurrent	10 A
Fitted with test button	

Requirements for the HighPur RCBO:

Type:	B, according to DIN VDE 0664 T10 VDE 0664 T100 EN 61 008-1
Trip current:	0.03 A
Pin count:	4
Protection class:	IP40
Overcurrent	≥16 A
Fitted with test button	

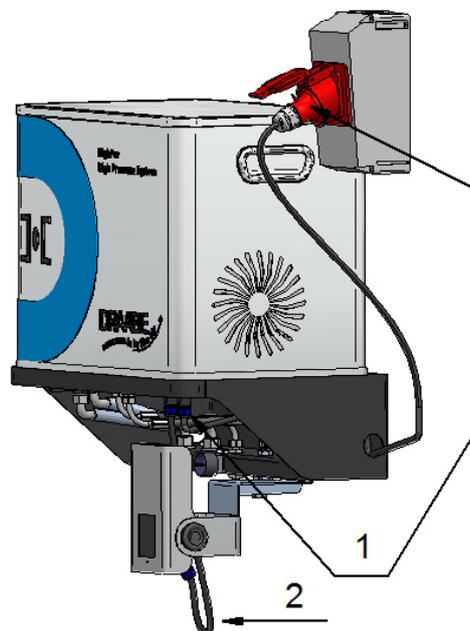
5.3.1 Mains plug

The mains plug, a 5-pin earthed plug (L1–L3+N+PE) included in the HighPur package contents, must be positioned so that it is easily accessible at all times, and at a height of 0.6–1.9 m from the floor (recommended height: 1.7 m).



5.3.2 HighPur high-pressure pulsation

The system supply voltage is provided via a wall outlet and the connection lead supplied in the scope of delivery (1, fitted with a 5-pin earthed plug).

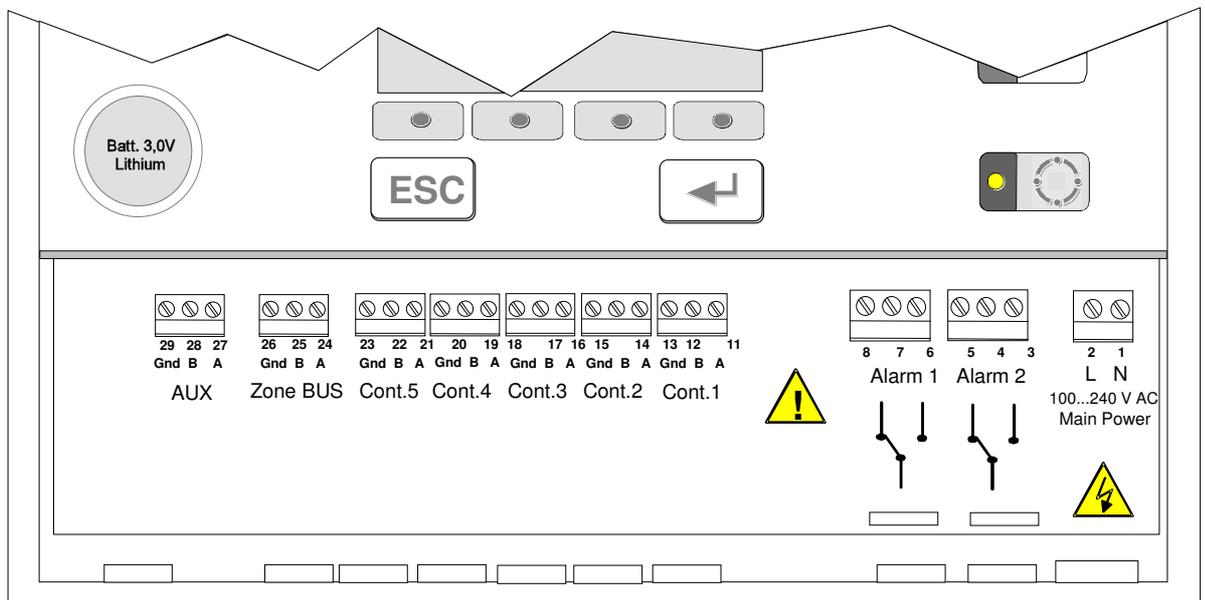


HighPur supply voltage: 400 V AC, $\pm 10\%$, 3-phase
 Electric fuse : RCBO, 0.03 A, 4-pin, 16 A, slow-blow fuse
 Type B
 Cores: L1–3, N, PE
 Cable diameter: 1.5 mm²

The scope of delivery for the HighPur support base also includes a preassembled 12-core communication cable (2, consisting of two 12-pin plugs, for connection to the HighPur Pur Control unit).

5.4.1 HumCenter

The HumCenter has various input/output connections, which are marked with names and numbers.

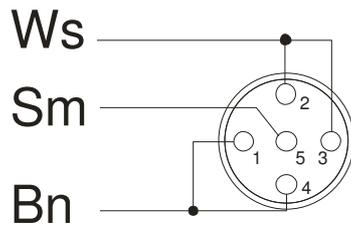


Connection	Description
L/N (1, 2)	230 V AC 50 Hz power supply
Alarm 2 (3–5)	Output to container group alarm. Dry contact
Alarm 1 (6–8)	Output to zone group alarm. Dry contact
Con.1 (9–11)	Container bus connection
Con.2 (12–14)	Container bus connection
Con.3 (15–17)	Container bus connection
Con.4 (18–20)	Container bus connection
Con.5 (21–23)	Container bus connection
Zone bus (24–26)	Zone bus connection
AUX (27–29)	Reserve bus connection, second HumCenter

5.4.2.1 Bus connection, HighPur to HumCenter

1. HighPur to bus connection

The QFK includes a two-core bus cable and straight plug for connecting the HighPur to the HumCenter. The angled plug is connected to socket 5 on the PurControl unit (see p. 12). The plug is to be connected as follows:



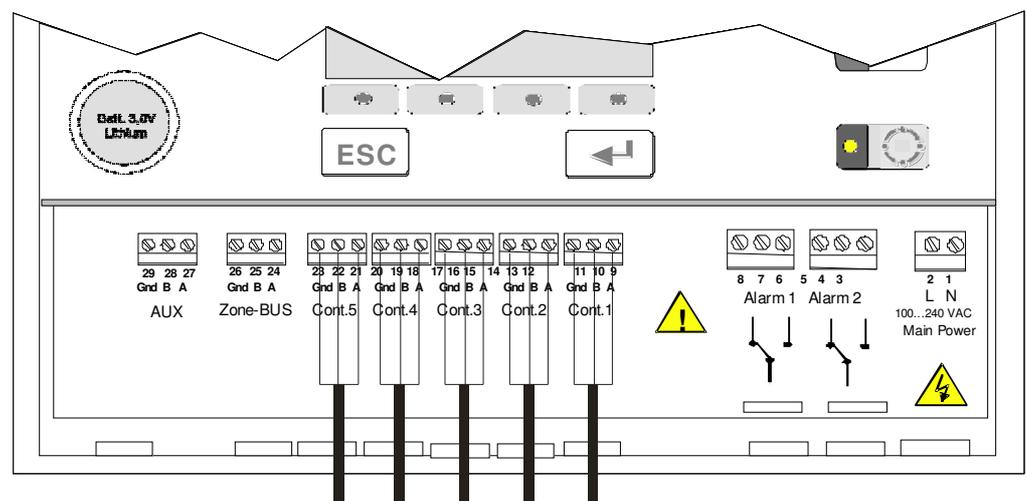
Pin	Colour code	Colour
1 and 4	Bn	Brown
2 and 3	Wh	White
5	Sh	Shielding



WARNING: Take care to ensure that this pin-out is complied with at all times, since otherwise no communication can be established. The shielding must also be insulated with heat-shrink tubing.

2. HumCenter to bus connection

Each container is connected to the HumCenter via the bus. Strict observation of the connection sequence (Cont.1 – Cont.5) is not necessary. The HumCenter identifies the type of the connected system automatically.



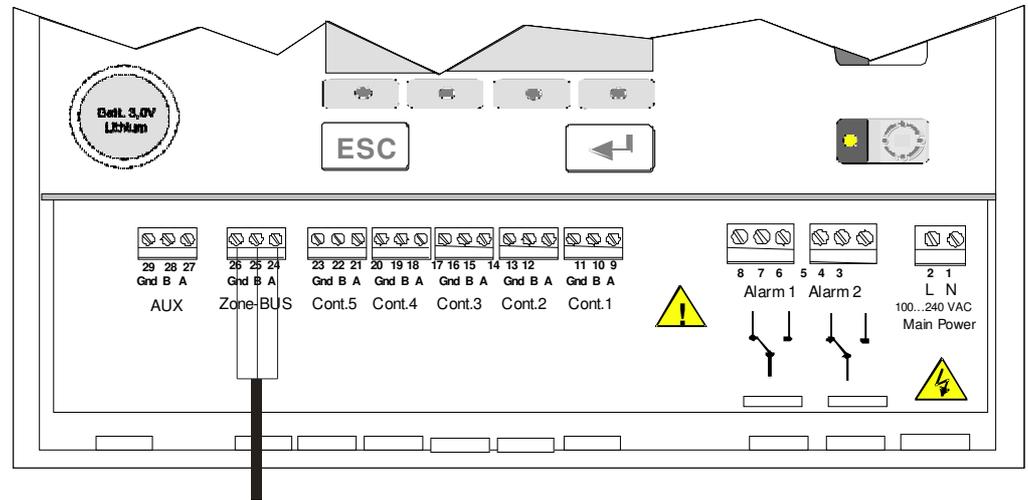
Connection	Colour
A	White
B	Brown
GND	Shielding



WARNING: Take care to ensure that this pin-out is complied with at all times, since otherwise no communication can be established. The shielding must also be insulated with heat-shrink tubing.

5.4.2.2 Zone bus connection

Unlike the container bus connection, the HumCenter only connects to the first HumSpot.



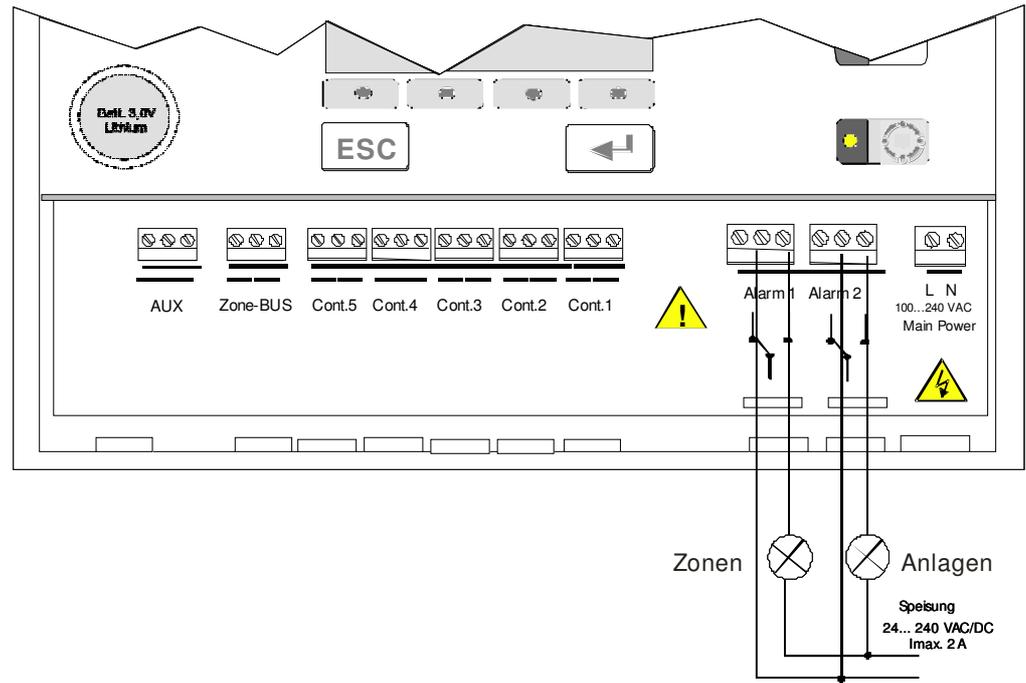
Connection	Colour
A	White
B	Brown
GND	Shielding



WARNING: Take care to ensure that this pin-out is complied with at all times, since otherwise no communication can be established. The shielding must also be insulated with heat-shrink tubing.

5.4.2.3 Zone and container group alarm

These two outputs support a great many applications. Two entirely separate contacts are available. The alarm outputs can be used either as normally-open contacts or normally-closed contacts.



5.4.2.4 Connection to BMS

The HumCenter is equipped with an interface to connect to the building management system. The HumCenter was designed so that the parameters to be communicated can be converted to the bus system by using an external converter (e.g. RS232 – Ethernet converter).

The converted is connected to the RS232 interface, which is located on the top of the HumCenter next to the SD card slot. The max. cable length between the HumCenter and the converter is 3 m.

The converter must be supplied by the system owner.

Parameters

The following parameters are transmitted:

- Date/time
- Zone alarms
- Container alarms
- Zone current values (humidity, temperature)

The individual parameters are tagged with identifiers in the telegram:

Identifier	Parameter	Format	Comments
A	Date/time	U8;U8;U16;U8;U8;U8 (DD;MM;YYYY;HH;MM;SS) Example: A07;11;2007;11;45;15	Telegram transmission time
B	Zone alarms	U64 Bit0=Zone1, Bit1=Zone2, etc. Examples: B0 = No alarm B1 = Alarm Zone 1 B3 = Alarm Zone 1 and Zone 2	
C	Container alarms	U8 Bit0=Container1, etc. Examples: C0 = No alarm C1 = Alarm Container 1	
D	Zone current values	Float, float (FF.F;TT.T) Example: D1:39.5;23.8	FF.F in [%RH] TT.T in [°C]
Z	CRC	U16	

The parameters transmitted can be parsed only: making changes to the settings via the BMS is not possible.

Telegram

Every 5 seconds, the HumCenter transmits a telegram containing the above parameters. The characters used in the telegram and the telegram structure are explained below by means of an example.

The following characters are using in the telegram:

Character	Description	Comments
*	Start character	Telegram begins
A .. Z	Identifier	Identifies the parameters
:	Index	Index for array data (D:1)
;	Data separator	Separates the data (D:1;25.0;50.0 ";" separates the data from the index and temperature from humidity)
.	Decimal separator	
CR+LF	Terminator	The telegram line is terminated with a "carriage return" and "line feed".

Sample telegram structure for the following configuration:

- 3 zones (HumSpots)
- 2 containers

Telegram:

*A07;11;2007;11;29;04;B0C2D:1;43.3;24.8;D:2;42.5;23.3;D3:40.8;20.1Z32219

The following information can be parsed from this telegram:

- **Date/time:** 11 Nov. 2007, 11:29:04 (A07;11;2007;11;29;04)
- **Zone alarms:** No alarm (B0)
- **Container alarms:** Alarm Container 2 (C2)
- **Values Zone 1:** Humidity: 43.3% rH, temp.: 24.8 °C (D:1;43.3;24.8)
- **Values Zone 2:** Humidity: 42.5% rH, temp.: 23.3 °C (D:1;42.5;23.3)
- **Values Zone 3:** Humidity: 40.8% rH, temp.: 20.1 °C (D:1;40.8;20.1)
- **Checksum:** 32219 (Z32219)

Transmission parameters

- 19200 bit/s
- Data bits: 8
- Stop bit: 1
- Parity: none
- Flow control: none

CRC checksum

Calculating and evaluating the checksum is usually not necessary.

If required, it can be calculated as follows:

Up to and including the identifier "Z", the function "crc_one_byte()" is called for each character in the telegram, whereby "*oldchecksum" is initialised to 0 on telegram start.

Algorithm

```

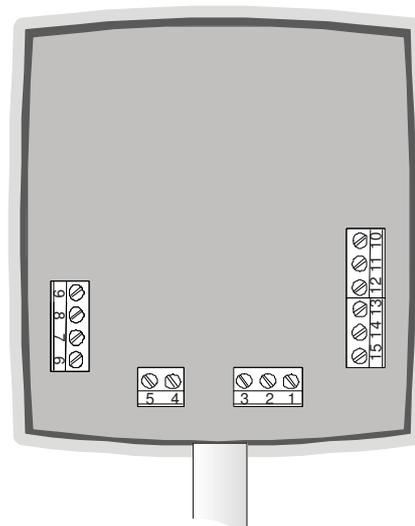
/* Calculate 16-bit CRC */
/* At the start of the calculation, *oldchecksumP */
/* must be initialised to 0 */
/* oldchecksumP (IO): Pointer to (previous) checksum */
/* b: Next byte in data stream */
void crc_one_byte(u16 *oldchecksumP, unsigned char b)
{
    u16 result;
    unsigned char a=b ^ (*oldchecksumP)>>8 ^ (*oldchecksumP)>>4 ^
(*oldchecksumP)>>1 ^ (*oldchecksumP)<<1;
    result = (*oldchecksumP)<<8 | a ^ a>>7;
    *oldchecksumP = result;
}

```

5.4.2 HumSpot

Various connection options are available.

Connection	Description
Power 1–3	Supply voltage and fogging unit release
ExtHRequ (4–5)	External humidistat/BMS connection
HighPur (6–9)	Request/release HighPur (only required if no HumCenter is connected).
Bus IN (10–12)	Zone bus connection (from HumCenter or previous HumSpot) prior
Bus OUT (13–15)	Zone bus connection (to next HumSpot)



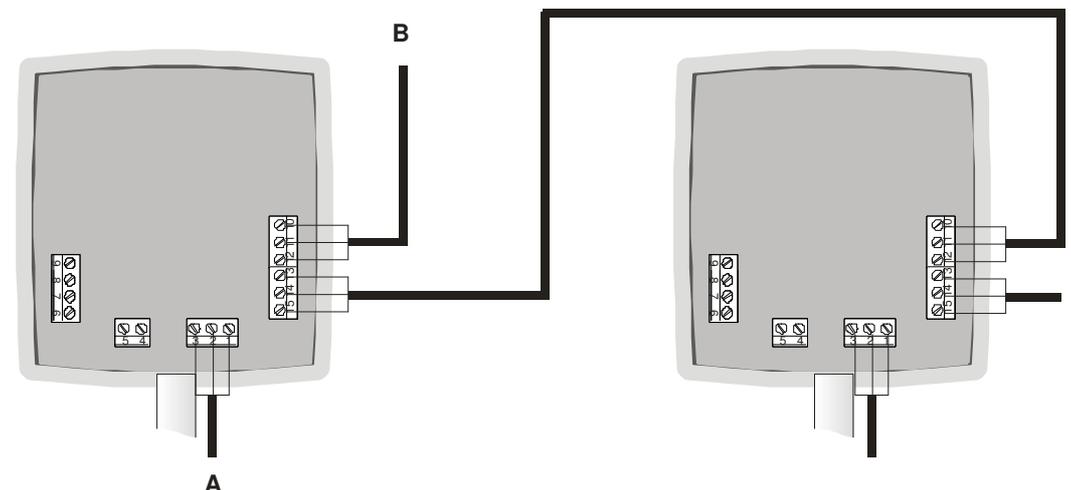
5.4.3.1 Connecting HumSpots together

The **HumSpot electrically controls only its own group** of fogging units. When fogging is required of these units, they receive their power from the HumPower. In terms of **water hydraulics, multiple groups** can be supplied by **one** HighPur. This is limited only by the HighPur's capacity.

The individual groups must be capable of sending requests to the HighPur independently and the HighPur must be able to notify each group that working pressure has been achieved. To enable this, the terminals "Request HighPur" and "Working pressure achieved" **or** "Bus IN" and "Bus OUT" are connected in parallel from unit to unit. Note that a precise assignment of colours or cable numbers must be systematically followed, otherwise malfunctions can occur.

Bus connection

On the first HumSpot, the HumCenter bus lead is connected to "Bus IN". From "Bus OUT", the bus lead is connected to "Bus IN" on the next HumSpot.



The power supply (24 V DC) is connected up using the "A" cable. Cables must be terminated with wire end ferrules.

Type **A** connection lead:

Connection	Colour
1: V+	Brown
2: FogOn	White
3: GND	Green

Cable type: LIYY 3x 0.75 mm² (colour/numeric code)

With the "B" bus leads, take care to ensure precise parallel wiring. Cables must be terminated with wire end ferrules. If "Bus Out" is required, the resistor must be removed.

Type **B** connection lead:

Connection	Colour
11: A	White
10: B	Brown
12: GND	Shielding

Cable type: LIYCY 2x 0.25 mm² (colour/numeric code)



WARNING: Take care to ensure that this pin-out is complied with at all times, since otherwise no communication can be established. The shielding must also be insulated with heat-shrink tubing.



WARNING: Remove the resistor ONLY if "Bus Out" is required. The resistor must be present on the last HumSpot, since otherwise a communications fault will occur.

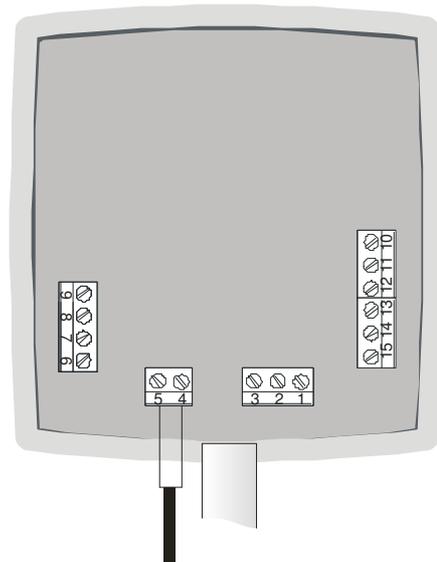
5.4.3.2 **Connecting an external humidistat/BMS**

The HumSpot's **precision humidistat** measures the local room humidity and temperature. This is inadequate for some applications. In such cases, an **external humidistat** can be added to the unit. This will deactivate both the precision humidistat and the setpoint configuration: the unit is then controlled by the external humidistat.

Specifications for the **external humidistat**: The unit must feature a setpoint controller. A 24 V DC contact must open when the setpoint is reached. Other parameters, such as the housing (IP class, etc.) are project-specific. The external humidistat should be located within 50 metres of the HumSpot.

In some cases, the humidification system should not be controlled by its own precision humidistat, but by a **building management system (BMS)** present on the owner's premises. In this case, too, the precision humidistat and setpoint controls will be deactivated.

Specifications for the **BMS**: The BMS merely needs to provide a 24 V DC contact, which closes when humidification is required. The connection type may mean that the distance between the HumSpot and the BMS plays a role in safe system operation. Distances exceeding 300 metres should be avoided.



Connection	
4: Ext-	GND
5: Ext+	24 V DC

For both applications:

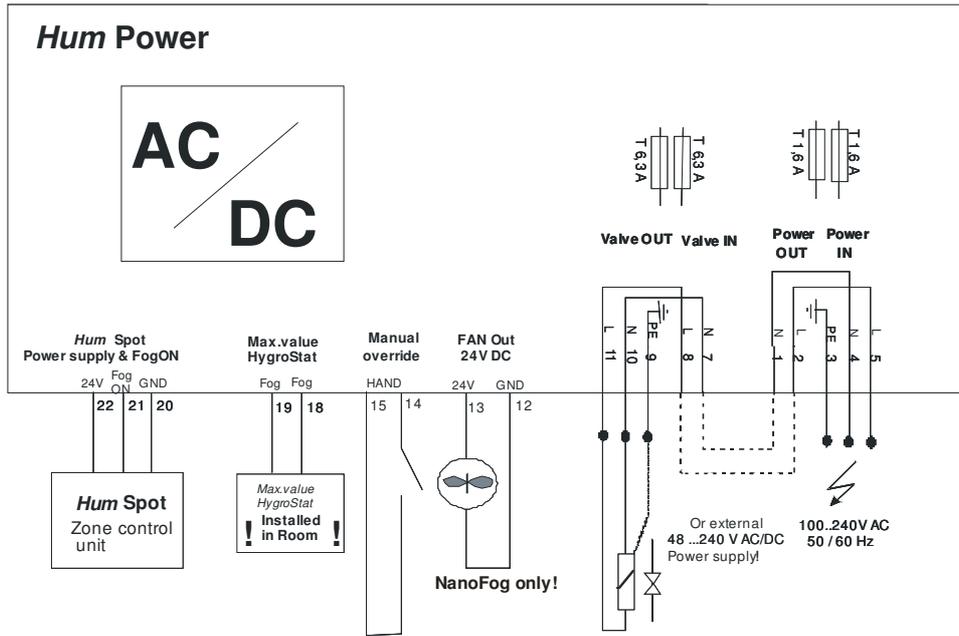
Cable type : LIYY 2x 0.75 mm²

Input : ExtHRequ (4–5).

5.4.3.3 Connecting the HumPower

Various connection options are available.

Connection	Description
Power IN (3–5)	Supply voltage connection (100–240 V AC, 50–60 Hz)
Power OUT (1–2)	Supply voltage output. A cable jumper can be used to connect the voltage to "Valve IN" (supply voltage for the fogging units).
Valve IN (6–8)	Supply voltage connection for fogging units. Cable jumpers can be used to connect the voltage from "Power OUT".
Valve OUT (9–11)	Fogging unit connection
Fan Out (12–13)	24 V DC connection for the NanoFog fans.
Max. val. humidistat (18–19)	Connection for external maximum humidistat.
HumSpot (20–22)	HumSpot connection.



The 3-core HumSpot cable is to be connected up as follows:

HumSpot connection	Colour
20: GND	Green
21: Fog ON	White
22: 24 V	Brown

Connect the 3-core cable for the TF fogging heads as follows:

TF connection	Colour
9: PE	Green/yellow
10: N	Blue
11: L	Black

Connect the 5-core cable for the NanoFog Evolution/TF Neo fogging heads as follows:

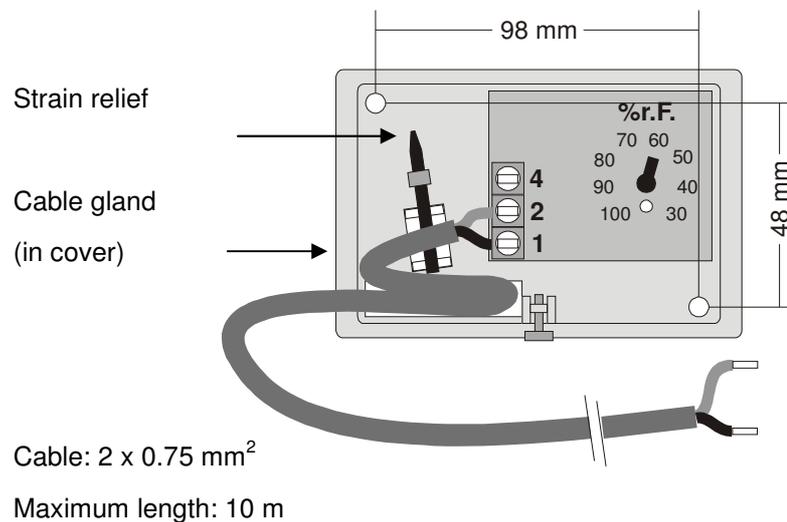
Connection	Colour
9: PE	Green/yellow
10: N	Black 3
11: L	Black 1
12: GND	Black 2
13: 24 V	Black 4

5.4.3.4 Connecting the external maximum humidistat



GUIDANCE on the electrical installation:

- Route the connection cables through the cable glands as required.
- Secure the cable using the strain relief provided.
- Cables must be terminated with appropriate wire end ferrules.
- Without exceptions, all installations must comply with the wiring diagrams discussed here.
- During installation work, isolate the power supply and ensure that it cannot be accidentally switched back on.



The cable must be connected in the form as shown. From here, it leads to the HumPower input. Here, it must be routed through the cable bushing and connected to the max. value humidistat **input** (terminals 18 and 19, see p. 57).

5.4.3 Fogging units TFNeo1, 2, 2x1, 2x2

The supply voltage is provided by the HumPower unit. If fogging is required, this unit routes the 230 V AC/50 Hz and 24 V DC supply to all connected fogging heads.

Supply voltage:	230 V AC, 50 Hz, 1-phase, null and protective earth
(same for all types)	24 V DC
Electric fuse:	In HumPower



WARNING: Before and during work on the unit, ensure that all electrical connections are isolated from mains power, and that the power supply is secured against accidental switch-on.

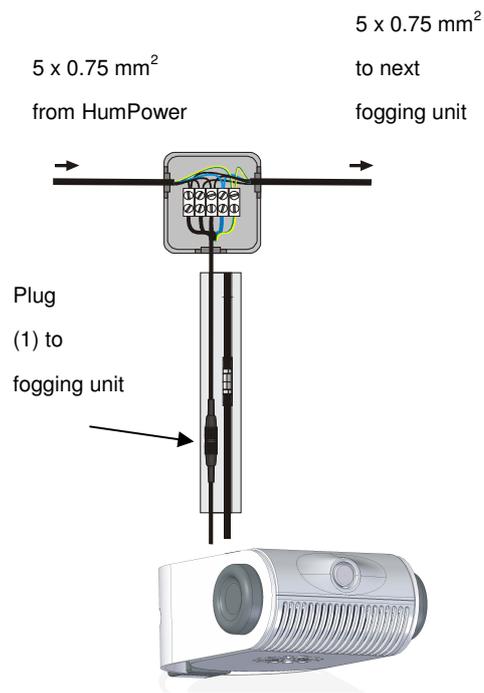
The package contents of the quick-fit kit (QFK) includes a preassembled 3 m power cable. Only this component is to be used to connect up the fogging unit. It includes a fitted plug for the fogging unit (1, see figure below), the cable itself (see material specifications) and a junction box.

Always double-check to ensure that the protective earth (colour: green/yellow) is connected. All cables must be terminated with wire end ferrules.

The connection pin-out is as follows:

Core	Description
1	Phase L1
2	0 V DC
3	Neutral conductor N
4	24 V DC
Green/yellow	Protective earth

TFNeo1, TFNeo2



TFNeo2x1, TFNeo2x2



5.4.4 TFNeo8 fogging unit

The supply voltage is provided by the HumPower unit. If fogging is required, this unit routes the 230 V AC/50 Hz supply to all connected fogging heads.

Supply voltage: 230 V AC, 50 Hz, 1-phase, null and protective earth

Electric fuse: In HumPower



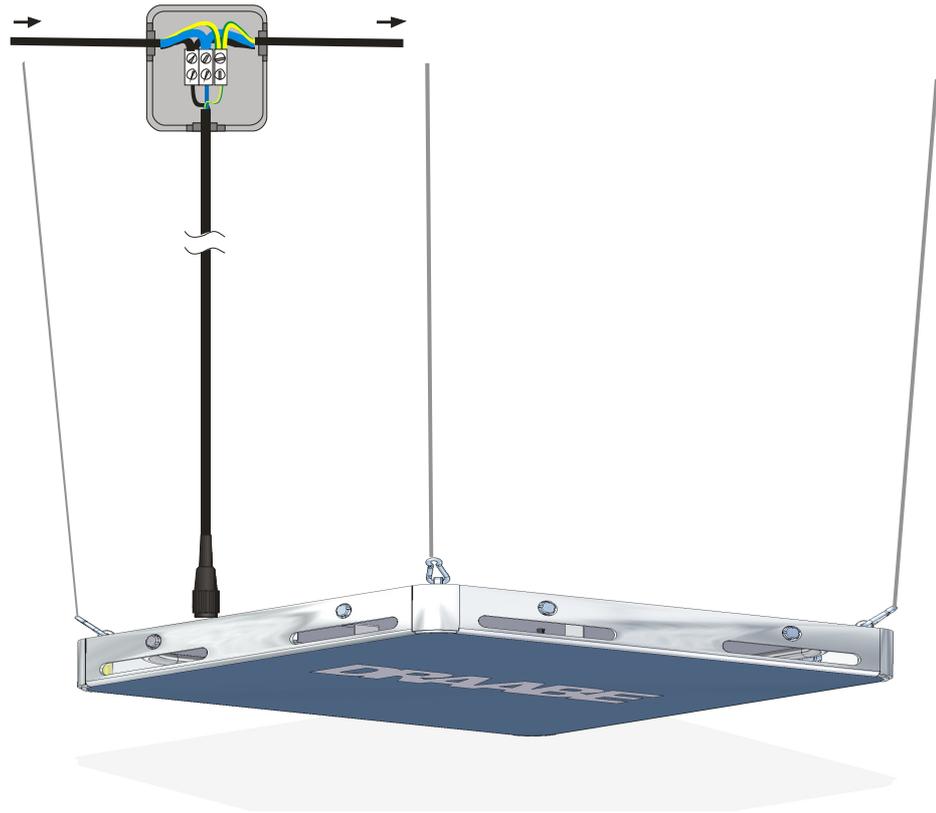
WARNING: Before and during work on the unit, ensure that all electrical connections are isolated from mains power, and that the power supply is secured against accidental switch-on.

The package contents of the quick-fit kit /QFK) includes a 4-core line socket (female) for the fogging unit. Only this component is to be used to connect up the unit.

Always double-check to ensure that the protective earth (colour: green/yellow) is connected. All cables must be terminated with wire end ferrules.

The line socket connection pin-outs are as follows:

Pin	Description
1	Phase L1
2	Neutral conductor N
3	Not assigned
PE	Protective earth



5.4.5 NanoFog Evolution fogging unit

The supply voltage is provided by the HumPower unit. If fogging is required, this unit routes the 230 V AC/50 Hz and 24 V DC supply to all connected fogging heads.

Supply voltage: 230 V AC, 50 Hz, 1-phase, null and protective earth; 24 V DC

Electric fuse: In HumPower



WARNING: Before and during work on the unit, ensure that all electrical connections are isolated from mains power, and that the power supply is secured against accidental switch-on.

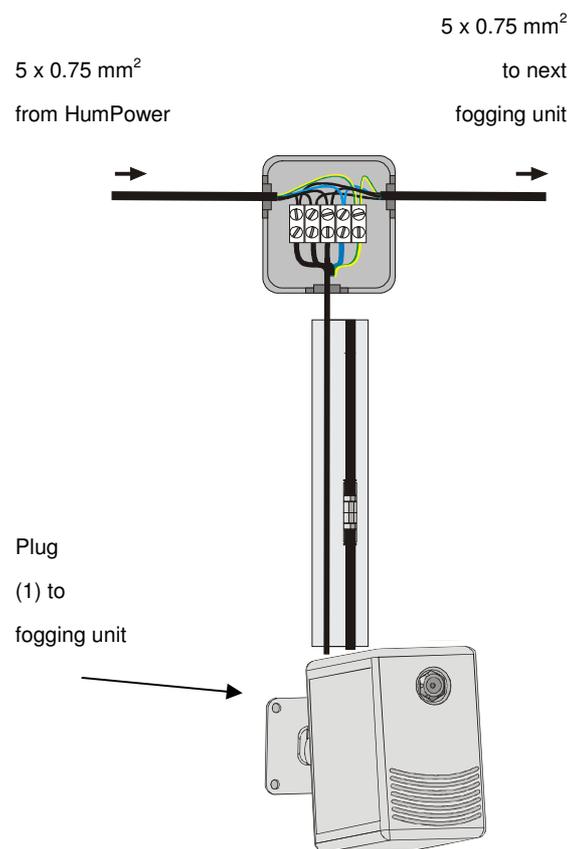
The package contents of the wall brackets (WBs) includes a preassembled 4 m power cable. Only this component is to be used to connect up the fogging unit. It includes a fitted plug for the fogging unit (1, see figure on p. 62), the cable itself (see material specifications) and a junction box.

Always double-check to ensure that the protective earth (colour: green/yellow) is connected. All cables must be terminated with wire end ferrules.

The connection pin-out is as follows:

Core	Description
1	Phase L1
2	0 V DC
3	Neutral conductor N
4	24 V DC
Green/yellow	Protective earth

NanoFog Evolution



5.4 Material specifications



WARNING:

The material specifications provided below must be complied with at all times. They form an integral part of the product warranty. ALWAYS use the installation materials as supplied by DRAABE.

5.5.1 High-pressure

High-pressure hose

DN 8

DRAABE HD 2000 R 1 12* DN 8 125

*("1 12" = production batch)

DN 4

DRAABE HD 2000 R 1 12* DN 4 125

*("1 12" = production batch)

High-pressure fittings

Press fitting with O-ring (DIN 2353 – V4A)

Materials:

NBR	> O-Ring
1.4571	> all metals

Type 1:	DKOL 10L-DN-8
---------	---------------

Type 2:	DKOL 06L-DN-4
---------	---------------

Reduced T-piece

Material:	1.4571 steel
-----------	--------------

EXMAR type:	XTVR-10-06-10-L
-------------	-----------------

Straight screw fitting

Material:	1.4571 steel
-----------	--------------

EXMAR type:	XGV-10L
-------------	---------

5.4.1 Electrical components

Electrical cabling

Use:	From building mains to HumPower.
Designation:	H05VV-F 3 x 0.75 mm ² (green/yellow protective earth)
Provided by:	System owner/fitter

Use:	From building mains to HumCenter.
Designation:	H05VV-F 2 x 0.75 mm ² (no protective earth)
Provided by:	System owner/fitter

Use:	From HumPower to HumSpot (cable A).
Designation:	LIYY 3 x 0.75 mm ² (colour/numeric code)
Provided by:	DRAABE QFK scope of delivery

Use:	Bus line from HighPur to HumCenter and from HumCenter to HumSpot (cable B).
Designation:	LIYCY 2x 0.25 mm ² (colour/numeric code)
Provided by:	DRAABE QFK scope of delivery
Use:	From HumPower to TFNeo8 fogging head (cable C).
Designation:	H05VV-F 3 x 0.75 mm ² (green/yellow protective earth)
Provided by:	DRAABE QFK scope of delivery
Use:	From HumPower to TFNeo1, 2, 2x1, 2x2 fogging unit (cable C).
Designation:	JZ-600 5x 0.5 mm ² (with green/yellow protective earth)
Provided by:	DRAABE QFK scope of delivery
Use:	From HumPower to NanoFog Evolution fogging head (cable C).
Designation:	JZ-600 5x 0.5 mm ² (with green/yellow protective earth)
Provided by:	DRAABE QFK scope of delivery

Three-phase power socket (wall mounting)

Use:	High-pressure pulsation, HighPur
Tech. data:	400 V AC, 16 A, switching capacity min. 2 kW, splash-proof earthed, L1, L2, L3, N, PE

6 Operation

The HighPur high-pressure pulsation unit may not be operated by the system owner or a person the owner has authorised until acceptance testing for commissioning has been completed by DRAABE Customer Service or persons authorised by DRAABE. The system owner must also have been instructed in operation of the unit by DRAABE. Once commissioning and training in the operation of the unit is complete, the system owner must ensure that the system is operated only by trained personnel. This is an integral part of the DRAABE product warranty conditions and non-compliance will void the product warranty.

6.1 Start-up sequence for daily operation

The unit must be powered up in the reverse order to which it was powered down (whether partially or completely). (See also the **replacement instructions** for the individual units.) Basic principles:

HighPur:	Bring the water supply online first, then hook up the 400 V AC power supply, then press the reset switch (1, see p. 12) on the PurControl unit.
HumSpot:	Reconfigure the setpoint to its target value.
Fogging unit:	First reconnect the high-pressure supply, then connect the power supply plug.

6.2 Shut-down sequence for daily operation

In the event of maintenance work, the replacement of facility components that are defective or need servicing, or system faults, it may be necessary to shut the facility down. Events requiring shutdown are described in more detail in chapter 8.



WARNING: If the unit needs to be powered down, always ensure that supply systems (water and/or power supply, depending on shutdown type) cannot be accidentally switched back on. Always inform staff of the circumstances.

Complete shutdown.

In this case, facility components or the entire facility is/are isolated and the water supply is shut off.

HighPur: Switch off the unit using the reset switch (1, see p. 12) on the PurControl unit.
 If the wall outlet has a switch, switch this to the off position ("0") as well. If no switch is present, unplug the three-phase plug. Shut off the water supply.

HumSpot: Configure setpoint to 20% rH.

Fogging unit: Disconnect the power supply plug. If necessary, switch off the high-pressure supply (**WARNING:** ensure that the HighPur cannot be accidentally switched back on).



WARNING:

In the event of prolonged downtime (longer than 24 h), there is a danger of system stagnation (automated freshwater unit (AFU) inactive). Please ALWAYS inform DRAABE Customer Service before (or immediately after) a full shutdown.

Partial shutdown.

This is designed only to prevent a system restart during parts replacement.

HighPur: Disconnect the bus plug (device socket 5, see p. 12) from the PurControl unit. The HighPur and fogging unit can now no longer power up. Shut off the water supply (only if the HighPur is to be replaced).

HumSpot: Configure setpoint to 20% rH > the HighPur and fogging unit can now only start fogging if triggered by the automated freshwater unit (every 12 hours for 6 minutes).

Fogging unit: Disconnect the power supply plug. If necessary, switch off the high-pressure supply (**WARNING:** ensure that the HighPur cannot be accidentally switched back on).



WARNING:

In the event of prolonged downtime (longer than 24 h), there is a danger of system stagnation (AFU inactive). Please ALWAYS inform DRAABE Customer Service before (or immediately after) a full shutdown.

6.3 Inspection work

If abnormalities or malfunctions are discovered during inspection work, inform DRAABE Customer Service without delay! All inspection work must be completed by trained personnel. Verification of qualifications and training is the responsibility of the system owner.



WARNING:

The system owner is responsible for ensuring that personal performing inspection and/or maintenance work on the system have qualifications relevant for VDI Guideline 6022 (Sheet 4).



WARNING:

For reasons of hygiene, DRAABE recommends disinfecting the complete water system every 2 years. DRAABE offers a range of maintenance plans that offer many advantages for the system owner alongside disinfection. Please call DRAABE Customer Service for details.

HighPur: **Operating pressure:** Check the working pressure on the pressure gauge; it should be between 75 and 85 bar. If the HighPur is not running, the setpoint on the HumSpot can be turned up high until the unit starts up (**WARNING:** do not forget to reset the setpoint).

Interval: Every 2 weeks

Fogging unit:

Check **aerosol mist** and/or fogging performance. From time to time, check that all nozzles fog properly, so as to produce a uniform aerosol mist.



WARNING: This inspection is an important step: early detection of sub-standard fogging performance can avoid premature damage to the units. Drop size increases as fogging performance becomes progressively worse. Falling drops of water can result in corrosion damage.

In environments with a high level of dust precipitation or soiling, the fans can become clogged, impairing fogging unit performance. Inspect units appropriately and remove soiling as necessary.

Interval: Every 2 weeks



WARNING: Do not clean off with water or any other kind of detergent – **vacuum off ONLY**. To clean the unit, disconnect the power and secure against accidental switch-on.

Interval: Every 4 weeks

HumSpot:

The switching point of the precision humidistat can be checked using a humidity meter. If the setpoint controller is moved around this

switching point, the red LED indicates whether the reading is below or at the switching point. Deviations of $\pm 3\%$ rH are acceptable.

Interval: **Once a month**



WARNING: The humidity meter must be calibrated. DRAABE Customer Service is happy to advise you on the selection of a suitable instrument. Measurements must be taken by trained personnel only. Such inspections are very important: humidistat malfunctions can lead to over-wetting and thus to incidents of damage.

In areas with a high level of dust precipitation/soiling, any sensor units affected or clogged machine guards can seriously impair the functionality of the humidification system. Inspect units appropriately and remove soiling as necessary.



WARNING: Do not clean off with water or any other kind of detergent – **vacuum off ONLY**.

Interval: **Once a month**

Maximum humidistat: The switching point of the humidistats can be checked using a humidity meter. The setpoint controller clicks as it is moved around this switching point. Permissible deviations will depend on the model used (see also chapter 8, "Technical Specifications").

Interval: **Once a month**



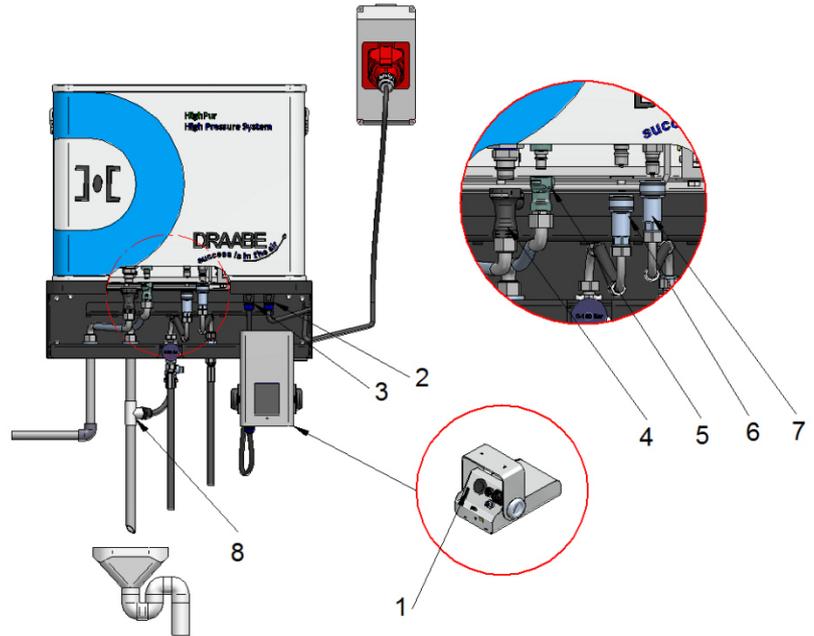
WARNING: The humidity meter must be calibrated. DRAABE Customer Service is happy to advise you on the selection of a suitable instrument. Measurements must be taken by trained personnel only. Such inspections are very important: humidistat malfunctions can lead to over-wetting and thus to incidents of damage.

In areas with a high level of dust precipitation/soiling, any sensor units affected or clogged machine guards can seriously impair the functionality of the humidification system. Inspect units appropriately and remove soiling as necessary.



WARNING: Do not clean off with water or any other kind of detergent – **vacuum off ONLY**.

Interval: **Once a month**



NOTICE: The HighPur unit may display an inlet pressure fault (red LED, display "Inlet pressure" on the display). Verify that the upstream water treatment system is supplying a pressure of between 2 and 3 bar, and confirm that the humidistat is indicating a value lower than the configured setpoint.



NOTICE: After being restarted, the HighPur unit conducts an AFU run automatically. This takes about 10 minutes.

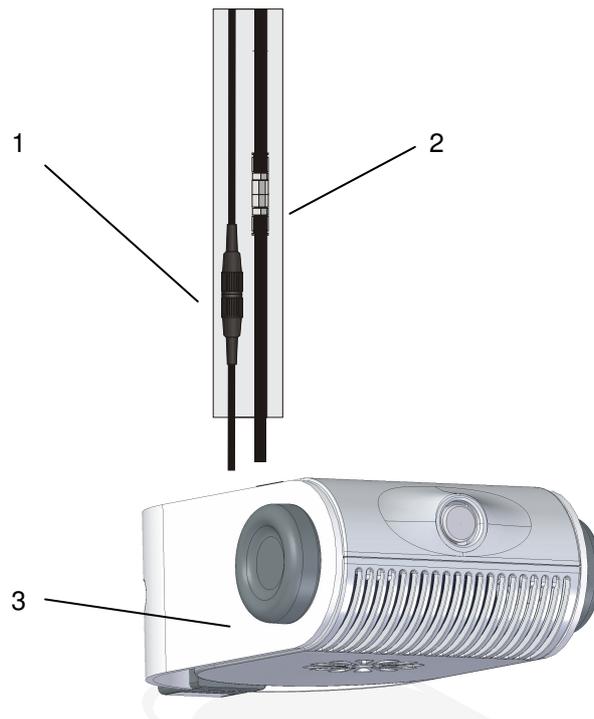


WARNING: After bringing the system back into service, make sure you check for potential leaks. Inspect the unit occasionally over the next two days.

7.2 TFNeo1, 2, 2x1, 2x2 fogging units



- Remove the line socket (1) on the fogging unit. **WARNING: 230 V AC!**
- Remove the high-pressure line and quick-connect plug (2) on the fogging unit. Use a bucket to catch any residual water.
- Remove the fogging unit by disengaging the handles (3).
- Complete the steps above in reverse to install the new fogging unit.



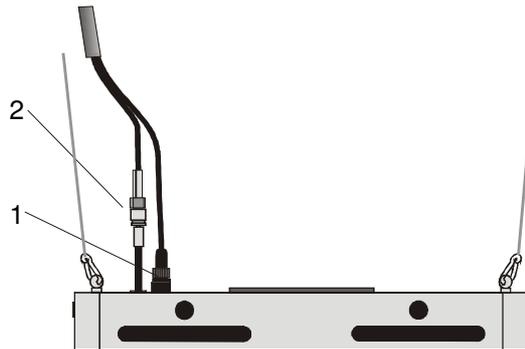
NOTICE: When **commissioning** the replacement unit, bear in mind that the fogging unit requires several power cycles (on/off cycles triggered by the configured HumSpot setpoint) before it powers down without producing water droplets. Relocate or cover equipment/goods as appropriate. This is caused by air in the replacement unit's high-pressure circuit. Once the unit can power down without producing droplets, it will continue to do so.



WARNING: After bringing the system back into service, make sure you check for potential leaks. Inspect the unit occasionally over the next two days.

7.3 TFNeo8 fogging unit

- Remove the line socket (1) on the TFNeo. To do so, undo the socket's thumb ring. **WARNING: 230 V AC!**
- Remove the high-pressure line (2) on the TFNeo. Use a bucket to catch any residual water.
- Remove the fogging unit from the snap hooks.
- Complete the steps above in reverse to install the new fogging unit.



NOTICE: When **commissioning** the replacement unit, bear in mind that the fogging unit requires several power cycles (on/off cycles triggered by the configured HumSpot setpoint) before it powers down without producing water droplets. Relocate or cover equipment/goods as appropriate. This is caused by air in the replacement unit's high-pressure circuit. Once the unit can power down without producing droplets, it will continue to do so.

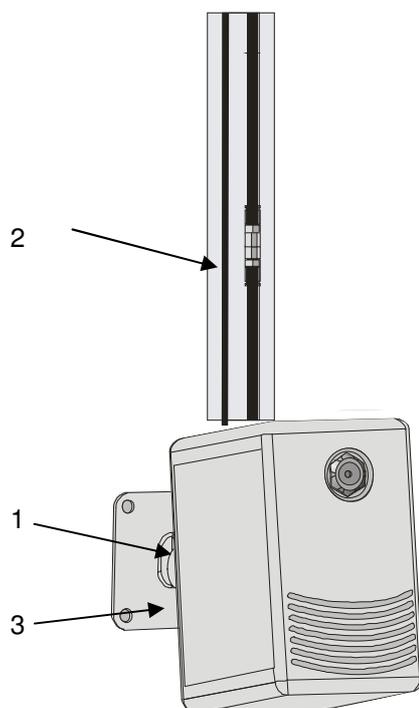


WARNING: After bringing the system back into service, make sure you check for potential leaks. Inspect the unit occasionally over the next two days.

7.4 NanoFog Evolution fogging unit



- Open the cable tray.
- Remove the line socket (1, back of fogging unit). **WARNING: 230 V AC!**
- Remove the high-pressure line and quick-connect plug (2). Use a bucket to catch any residual water.
- Remove the fogging unit from the wall bracket (3).
- Complete the steps above in reverse to install the new fogging unit.



NOTICE: When **commissioning** the replacement unit, bear in mind that the fogging unit requires several power cycles (on/off cycles triggered by the HumSpot setpoint controller) before it powers down without producing water droplets. Relocate or cover equipment/goods as appropriate. This is caused by air in the replacement unit's high-pressure circuit. Once the unit can power down without producing droplets, it will continue to do so.



WARNING: After bringing the system back into service, make sure you check for potential leaks. Inspect the unit occasionally over the next two days.

8 Technical data

8.1 HighPur high-pressure pulsation

	HighPur 60	HighPur 120	HighPur 200	HighPur 300
Output	60 kg/h	120 kg/h	200 kg/h	300 kg/h
Operating pressure	75 bar			
Dimensions	600 x 400 x 400 mm			
Weight	Approx. 52 kg			
Operating voltage	400 V AC, 3-phase, 50 Hz, ±10%			
Power consumption	1.5 kW			
Overvoltage category	II			
Pollution grade	2			
Application	Indoor use only			
Height above sea level	2,000 m			
Ambient temperature	7–35 °C			
Ambient humidity	Max. 80%, guard against condensation			

8.2 HumCenter

Location	Wall-mounted
Dimensions	228 x 202 x 65 mm
Weight	0.7 kg
Operating voltage	100–240 V AC, 50–60 Hz ±10%
Power consumption	Max. 30 W (typ. 5 W)
Contact rating (dry outputs, OUT 1/2)	2 A, 230 V AC, 50–60 Hz
Overvoltage category	II
Pollution grade	2
Application	Indoor use only
Height above sea level	2,000 m
Ambient temperature/humidity	7–35 °C / max. 80%, guard against condensation.

8.3 TFNeo1, TFNeo2, TFNeo2x1, TFNeo2x2 fogging units

	TFNeo1	TFNeo2	TFNeo2x1	TFNeo2x2
Output (kg/h)*	4	8	8	16
Operating pressure	Approx. 85.0 MPa			
Droplet size (Sauter)	<15 μ			
Dimensions	142 x 211 x 68 mm		372 x 210 x 68 mm	
Weight (kg)	1	1.1	2.2	2.4
Operating voltage	230 V AC, 50–60 Hz; 24 V DC ±10%			
Power consumption	6.2 W		12.4 W	
Overvoltage category	II			
Pollution grade	2			
Application	Indoor use only			
Height above sea level	2000 m			
Ambient temperature	7–35 °C			
Ambient humidity	Max. 95%, prevent condensation			

* : Depends on the nozzle used

8.4 TurboFogNeo 8 fogging unit

Output (kg/h)*	32
Operating pressure	Approx. 85.0 MPa
Droplet size (Sauter)	<15 μ
Dimensions	500 x 500 x 64 mm
Weight	8 kg
Operating voltage	230 V AC, 50–60 Hz, \pm 10%
Power consumption	34 W
Overvoltage category	II
Pollution grade	2
Application	Indoor use only
Height above sea level	2000 m
Ambient temperature	7–35 $^{\circ}$ C
Ambient humidity	Max. 95%, prevent condensation

* : Depends on the nozzle used

8.5 NanoFog Evolution fogging unit

Output (kg/h)*	3
Operating pressure	Approx. 85.0 MPa
Droplet size (Sauter)	<15 μ
Dimensions	60 x 100 x 150 mm
Weight	0.6 kg
Operating voltage	230 V AC, 50–60 Hz, \pm 10% 24 V DC
Power consumption	8 W
Overvoltage category	II
Pollution grade	2
Application	Indoor use only
Height above sea level	2000 m
Ambient temperature	7–35 $^{\circ}$ C
Ambient humidity	Max. 95%, prevent condensation

* : Depends on the nozzle used

8.6 HumSpot

Meter (humidistat)	Capacitive
Control range	10–90% relative humidity (rH)
Location	Wall-mounted
Dimensions	185 x 110 x 55 mm
Weight	0.7 kg
Operating voltage	24 V DC, \pm 20%
Power consumption	1 W (without backlighting) 1.5 W (with backlighting)
Overvoltage category	II
Pollution grade	2
Application	Indoor use only
Height above sea level	2000 m
Ambient temperature	7–35 $^{\circ}$ C
Ambient humidity	Max. 95%, guard against condensation.

8.7 HumPower

Location	Wall-mounted
Dimensions	250 x 180 x 65 mm
Weight	2.5 kg
Operating voltage	100–240 V AC, 50–60 Hz ±10%
Power consumption	Max. 30 W
Contact rating (dry outputs, OUT 1/2)	2 A, 230 V AC, 50–60 Hz
Overvoltage category	II
Pollution grade	2
Application	Indoor use only
Height above sea level	2,000 m
Ambient temperature/humidity	7–35 °C / max. 80%, guard against condensation.

8.8 Maximum humidistat

Meter (humidistat)	Plastic
Setpoint controller	In unit
Control range	30–100% relative humidity (rH)
Location	Wall-mounted
Dimensions	115 x 70 x 42 mm
Weight	0.3 kg
Application	Indoor use only
Height above sea level	2,000 m
Ambient temperature	7–35 °C
Ambient humidity	Max. 95%, guard against condensation.

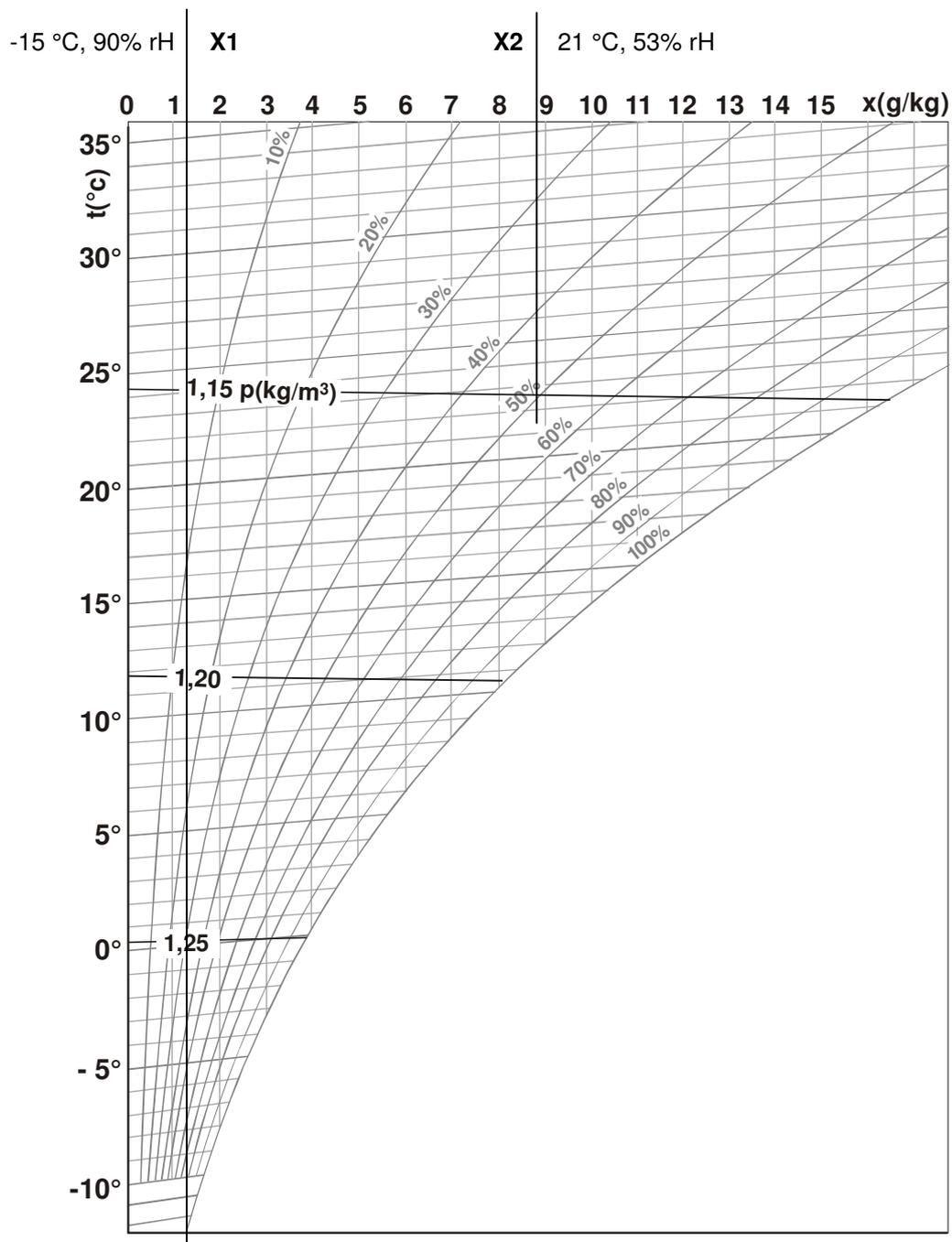
9 Appendix

9.1 Accessories/spare parts

Item	Part no.	Designation
1	145002	HumSpot precision humidistat
2	001286	Maximum humidistat

9.2 h,x diagram

Humidification **shortfall** = $X_2 - X_1 = 8.3 \text{ g/kg}$



Test report
 Order no. 479652
 Customer no. 5464400

Test certificate

Dr Ansgar Ferner/Th
 Tel. +49 6128/744-266, Fax -203
 ansgar.ferner@institut-fresenius.de

Subject of test:

Product designation: Humidification system
 Type: PUR

Consumer Testing Services
 Meat & Food Management Systems

Units tested:

DRAABE pure water system PerPur, SynPur
 DRAABE high-pressure system HighPur
 DRAABE humidification system Turbo Fog (TF4, TF16, TF32)
 DI Flex (ED/HT), BS

SGS INSTITUT FRESENIUS GmbH
 Im Maisel 14
 65232 Taunusstein, Germany

Test period:

The DRAABE equipment listed under "Units tested" underwent microbiological testing in our facility in 2005 over a period of 6 months. At regular intervals, repeat microbiological tests were conducted on the system, so as to also ensure long-term confirmation of the results.

Test conditions and requirements:

To pass this test, the system must prove it can operate hygienically over a long time period. The test conditions also replicate the "worst-case scenario". These conditions are as follows:

- The entire system is operating in Standby mode.
- No humidification is being requested.
- Room air requires no conditioning in terms of humidity (% rH).

The hygiene components must ensure compliance with the requirements given below for the entire period of testing (3% humidification ON). No procedures were employed that result in an additional discharge of chemicals/biocides in the room air.

In the course of testing, the system was 3x contaminated with a microbe mixture. The system configuration used all available expansion options for the DRAABE system (see above). The result is documented in the form of a detailed analysis report.

Contents of the analysis report:

Materials tested, experiment description, test microbes, contamination interval, microbial load, individual results, composition and quantity of the microbe mixture (used for contamination).

Result:

The DRAABE system we tested satisfied the requirements specified above in their entirety. In this respect, the conditions are satisfied for issuing a FRESENIUS INSTITUTE quality label. The DRAABE system tested is hygienically sound in its operation and satisfies the current requirements (date: December 2005) set by BG Print and Paper Processing (Wiesbaden).

The following total microbial counts were not exceeded:

Feed water, humidification 150 CFU/ml

Humidification water 150 CFU/ml

The evaluation of the test results is based on data from a system operated in accordance with the operating guidelines and service schedules as specified by DRAABE.

Taunusstein, May 2011

SGS INSTITUT FRESENIUS GmbH

Dr Ansgar Ferner

Franz-Josef Schäfer

9.4 Declaration of Conformity

EC Declaration of Conformity

pursuant to Appendix II of the Machinery Directive 2006/42/EC

The manufacturer: Draabe Industrietechnik GmbH
Schnackenburgallee 18
22525 Hamburg, Germany

hereby declares that the following products:

Type: **HighPur**
 HumSpot
 HumPower
 HumCenter
 TurboFogNeo
 NanoFog Evolution

have been designed, engineered and manufactured in compliance with EU Directive 2006/42/EC.

The following EU directives and harmonised standards were applied:

2006/95/EC	Low Voltage Directive
EN 60204-1	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
EN 954-1:2006	Safety of machinery – Safety related parts of control systems – Part 1: General principles for design

Person authorised to compile the technical file (MD 2006/42/EC): Michael de Boer

Hamburg, 3 Sept 2014

Michael de Boer, Head of Development

Place, date

Signatory and job role

Signature

1st English edition 09/2014

Documentation © 2014, DRAABE Industrietechnik GmbH, Germany.

All rights reserved. These operating instructions may not be reproduced, duplicated or revised in any form whatsoever and whether in whole or in part without the written permission of the publisher. It is possible that these operating instructions may contain typos or errors resulting from the printing process. The details of these operating instructions are regularly reviewed, however, and corrections are then made in the next issue. We accept no liability for technical or printing errors, nor for the consequences of such errors.

Changes reflecting technical enhancements to products may be made without prior notice.

DRAABE Industrietechnik GmbH

Member of the Condair Group
Schnackenburgallee 18
22525 Hamburg, Germany

Tel.: +49 40 853277-0

Fax: +49 40 853277-79

Email: draabe@draabe.de

www.draabe.de

Technical Support

Tel.: +49 40 85 32 77 77

Hours of business:

Mon – Fri 8 a.m. – 5 p.m.

Email: technical.support@draabe.de

This technical documentation is available in several languages. Please contact DRAABE Hamburg for further information.

DRAABE Industrietechnik GmbH
Member of the Condair Group
Schnackenburgallee 18 • 22525 Hamburg, Germany
Tel.: +49 40 853277-0
Fax: +49 40 853277-79
draabe@draabe.de • www.draabe.de

Commerzbank AG
Sort code: 200 400 00
Account: 0401 1359 00
IBAN DE65 2004 0000 0401 1359 00
BIC COBADEFFXXX

Managing directors:
Tomas Kleitsch, Oliver Zimmermann
Registered head office: Hamburg
Court of register: Hamburg HRB 36575
Place of jurisdiction: Hamburg
VAT Reg. No.: DE 118 544 017