The Innovation Company

LTG Aktiengesellschaft

Original Instructions for Installation, Use and Maintenance

Fan Coil Unit Ventotel® VKH

LTG Aktiengesellschaft
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AG-B 209.1e (Feb. 10)

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EC Declaration of Conformity

The Innovation Company
LTG Aktiengesellschaft

EC declaration of conformity

As defined by the EC Council Directive on Machinery 2006/42/EG, Annex II, Nr. 1A

We herewith declare that the machine described in the following conforms to all relevant provisions of the EC Machinery Directive 2006/42/EC.

Manufacturer:	**LTG Aktiengesellschaft, Grenzstr. 7, D-70435 Stuttgart**
Designation of machinery:	**Fan Coil Unit Ventotel®**
Machinery type:	**VKH**
	all sizes
Relevant EC Council Directives:	Machinery Directive (2006/42/EC)
Applied harmonized standards, in particular:	DIN EN ISO 13857, DIN EN 349, DIN EN ISO 12100-1, DIN EN ISO 12100-1, DIN EN 60335-1
Other standards:	VDI 6022

Stuttgart, 29.Dezember 2009

Signature of manufactorer

Position of signatory: Dr. Schaal ppa. Dehlwes

Air technology for humans and products. Since 1924

Konformitätserklärung-GB.docx/ Seite 1 of 1

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Trade register: district court Stuttgart, Nr. HRB 20451
Place of performance / court of jurisdiction Stuttgart
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HypoVereinsbank AG, Stuttgart (600 202 90) 3 887 729 64

Carefully read the safety instructions before using any LTG fan coil unit.
Always follow the safety instructions!

Safety Instructions

The units meet any pertinent safety standards.

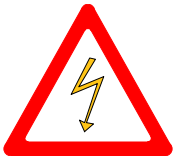
The installation and maintenance of air conditioning units may be dangerous because of high pressures and electrical components being alive. Therefore, the installation, maintenance, and repair must be performed by qualified and trained staff only.

In particular electrical connections are to be provided, removed, or modified by authorized persons only observing all relevant safety instructions.

Safety instructions in the technical documentation and on unit labels must be followed at all times.

Do not open the unit for cleaning, maintenance, or repair and do not remove covers and casings (air diffuser) unless all conducting lines have been completely disconnected. Do not connect or remove the plug-in connector when under tension.

Any work regarding the electrical equipment is to be performed by skilled and trained staff only. Connections to the main power supply and the safety earth terminal must be executed exactly as described in the wiring diagram.



Electrical operation of the unit in a partly disassembled condition or of individual components is not permitted since earth terminals might be interrupted.

The standard version of the heat exchangers is designed for an operating pressure of 10 bar (test pressure 16 bar). High water pressures may be hazardous. Higher operating pressures, therefore, require LTG's express permission. Wear safety glasses.

During continuous operation the motor may reach temperatures of up to 65 °C. If necessary, allow the motor to cool off or wear gloves.

Be careful when performing work on the heat exchangers. Blades and housing parts are sharp-edged. Wear gloves during work and handling.

Be careful when working overhead and provide protection against parts falling from above.

Never remove the protective grille of the fan impeller and the motor cover during operation.

Keep objects and dirt from entering the impeller. A damaged fan impeller or objects being ejected by the impeller may be hazardous.

The casing on site also serves as a protection and should be removed for maintenance and cleaning only.

Avoid any additional load to the unit or the suspensions since stability might be insufficient.

In the heating mode a temperature of up to 80 °C may be achieved. Water-carrying parts may be hot so do not touch with your bare hands to avoid burns.

The unit must be checked by an expert immediately

- **if it has been mechanically damaged or is suffering from a water damage,**
- **if the fan shows signs of damages (imbalance, damage to the bearing or motor),**
- **if the suspension or the casing show clear signs of corrosion or ageing.**

Do not put the unit back into operation before all necessary maintenance and repair has been performed!

Take the unit entirely off the main power supply until all repairs have been completed even if this might result in not being able to operate undamaged units

It is in any case imperative to take a damaged unit completely off the main power supply!

1. Transport and Storage

The unit requires dry and dust-free conditions during transport, storage, installation, and operation.

The unit is supplied in corrugated board boxes secured with straps.

Units are stacked on Euro or single trip pallets and secured with straps. Pallets may be moved using forklifts or cranes.

Do not remove the packaging unless immediately prior to installation on site to protect the unit from pollution and damages.

LTG Aktiengesellschaft will not take responsibility for any pollution of or damages to the unit.

1.1 Transport Instructions

Handle units appropriately and with care during transport.

Do not throw, let drop to the ground or bump into other items or walls.

Make sure that units are safely fastened during transport and avoid damage through other items.

It is recommended to always have units handled by at least two persons.

The packaging is not weather-resistant.

1.2 Storage

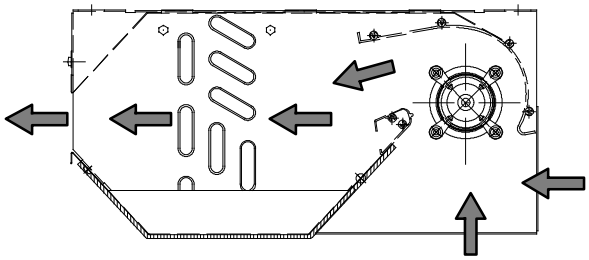
Make sure that units are entirely protected against weathering, humidity, and other adverse conditions that might result in damages during storage.

The storage location must meet the following climatic requirements:

Temperature between +5 °C and +55 °C with a relative humidity of 90 % max. (non-condensing).

2. Function

The fan coil unit is a recirculating air unit for cooling **or** heating (2-pipe) or for cooling **and** heating (4-pipe) the air.



The ceiling fan coil unit type VKH is specifically designed for use in hotels. It offers versatile possibilities for design of air distribution systems and is made for installation in a ceiling bulkhead.

The VKH's cross flow fan draws air through the heating/cooling heat exchanger laterally and discharges it from the opposite side.

Uniform distribution of the air across the entire fan is ensured by a cross-flow impeller extending over the entire width. The heat exchanger is usually equipped with a filter for protection.

Thermal energy transport to the heat exchanger is performed by water; water connection on the right or left.

If the cold water temperature drops in the cooling mode below dew point the condensate will be collected by a condensate tray with possible connecting socket. For reasons of hygiene, the unit should be dimensioned in a way to ensure that no condensation occurs during standard operation. For operation below dew point insulated units are available.

Output is water-side controlled by valves.

The fan speed is controlled by a five-speed capacitor motor with low energy consumption, with individual switch activation.

For group activation a total of 5 units may be connected in parallel.

Take care to connect in parallel identical speeds only, i.e. connect speed I of unit 1 to speed I of unit 2, etc.

With view to dimensioning, the most important data are the caloric output, the sound power level and the air flow rate.

The units' caloric output is determined through the fan speed, the water flow rate, and the valve setting which may be controlled by a regulating device.

The units' sound power and the air flow rate are determined through the fan speed.

The use of a filter results, at the same speed level, in a reduction of both the caloric output and the air flow rate while the sound power level of the units is higher when increasing the fan speed.

2.1 Intended Use

The fan coil unit type VKH is intended for use in closed rooms.

It is designed for ambient temperatures of +5 °C to +40 °C and a maximum relative humidity of up to 90% (non-condensing).

In order to ensure safe motor functioning the ambient temperature when installed should not exceed +40 °C.

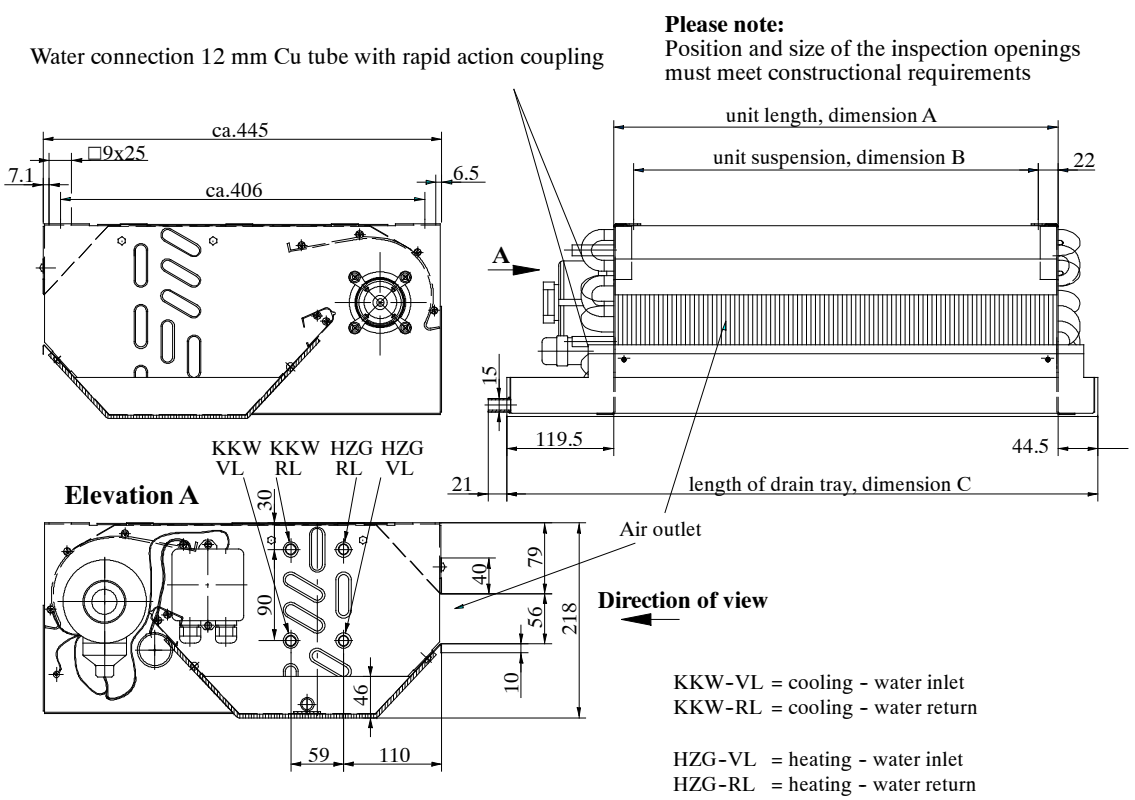
The maximum admissible supply temperature is, therefore, limited to +80 °C.
Any other operating conditions require the express and written permission of LTG Aktiengesellschaft.

LTG Aktiengesellschaft does not assume responsibility for any damages resulting from unintended use.

3. Technical Specifications

3.1 Dimensions and Technical Specifications

Dimensions Type VKH-4A, 4-pipe System



Illustrated unit: water connection on the left (on request: on the right)
Motor always on the left (in direction of view)

Size	A [mm]	B [mm]	C [mm]
630	616	572	780
800	846	802	1010
1000	1046	1002	1210
1250	1246	1202	1410

Technical Specifications Type VKH-4A, 4-pipe System (legend see page 18)

Size 630 - 4-pipe-system - cooling and heating

n [-]	V [m^3/h]	L_{A18} [dB(A)]	L_{wA} [dB(A)]	$Q_k/\Delta t^1$ [W/K]	$Q_k{}^2$ [W]	$Q_{k\ sens}{}^2$ [W]	$w_{ok}/\Delta p_w$ [kg/h]/[kPa]	$Q_h/\Delta t$ [W/K]	$Q_h{}^3$ [W]	$w_{oh}/\Delta p_w$ [kg/h]/[kPa]	P_{el} [W]	I_{max} [mA]
I	160	24	30	43	1032	728	250/9.6	26	1040	100/0.8	22	170
II	235	30	36	56	1344	1070		32	1280		26	
III	310	34	40	66	1492	1245		35	1400		28	
IV	390	39	45	73	1606	1394		38	1520		32	
V	495	46	52	83	1793	1668		41	1640		39	

Size 800 - 4-pipe-system - cooling and heating

n [-]	V [m^3/h]	L_{A18} [dB(A)]	L_{wA} [dB(A)]	$Q_k/\Delta t^1$ [W/K]	$Q_k{}^2$ [W]	$Q_{k\ sens}{}^2$ [W]	$w_{ok}/\Delta p_w$ [kg/h]/[kPa]	$Q_h/\Delta t$ [W/K]	$Q_h{}^3$ [W]	$w_{oh}/\Delta p_w$ [kg/h]/[kPa]	P_{el} [W]	I_{max} [mA]
I	191	22	28	51	1226	865	250/12.2	31	1240	100/1	22	170
II	274	28	34	66	1611	1281		37	1480		26	
III	368	33	39	78	1771	1478		40	1600		28	
IV	457	38	44	86	1889	1639		42	1680		32	
V	582	46	52	98	2120	1974		46	1840		39	

Size 1000 - 4-pipe-system - cooling and heating

n [-]	V [m^3/h]	L_{A18} [dB(A)]	L_{wA} [dB(A)]	$Q_k/\Delta t^1$ [W/K]	$Q_k{}^2$ [W]	$Q_{k\ sens}{}^2$ [W]	$w_{ok}/\Delta p_w$ [kg/h]/[kPa]	$Q_h/\Delta t$ [W/K]	$Q_h{}^3$ [W]	$w_{oh}/\Delta p_w$ [kg/h]/[kPa]	P_{el} [W]	I_{max} [mA]
I	220	24	30	60	1426	1005	250/14.8	36	1440	100/1.2	22	180
II	330	30	36	78	1891	1504		44	1760		27	
III	430	36	42	91	2069	1727		47	1880		29	
IV	535	42	48	102	2243	1947		50	2000		33	
V	680	47	53	115	2484	2313		54	2160		39	

Size 1250 - 4-pipe-system - cooling and heating

n [-]	V [m^3/h]	L_{A18} [dB(A)]	L_{wA} [dB(A)]	$Q_k/\Delta t^1$ [W/K]	$Q_k{}^2$ [W]	$Q_{k\ sens}{}^2$ [W]	$w_{ok}/\Delta p_w$ [kg/h]/[kPa]	$Q_h/\Delta t$ [W/K]	$Q_h{}^3$ [W]	$w_{oh}/\Delta p_w$ [kg/h]/[kPa]	P_{el} [W]	I_{max} [mA]
I	265	24	30	70	1678	1183	250/17.8	42	1680	100/1.5	22	180
II	395	31	37	93	2241	1782		52	2080		27	
III	505	36	42	108	2441	2037		56	2240		29	
IV	625	41	47	122	2685	2330		60	2400		33	
V	800	47	53	136	2940	2737		64	2560		39	

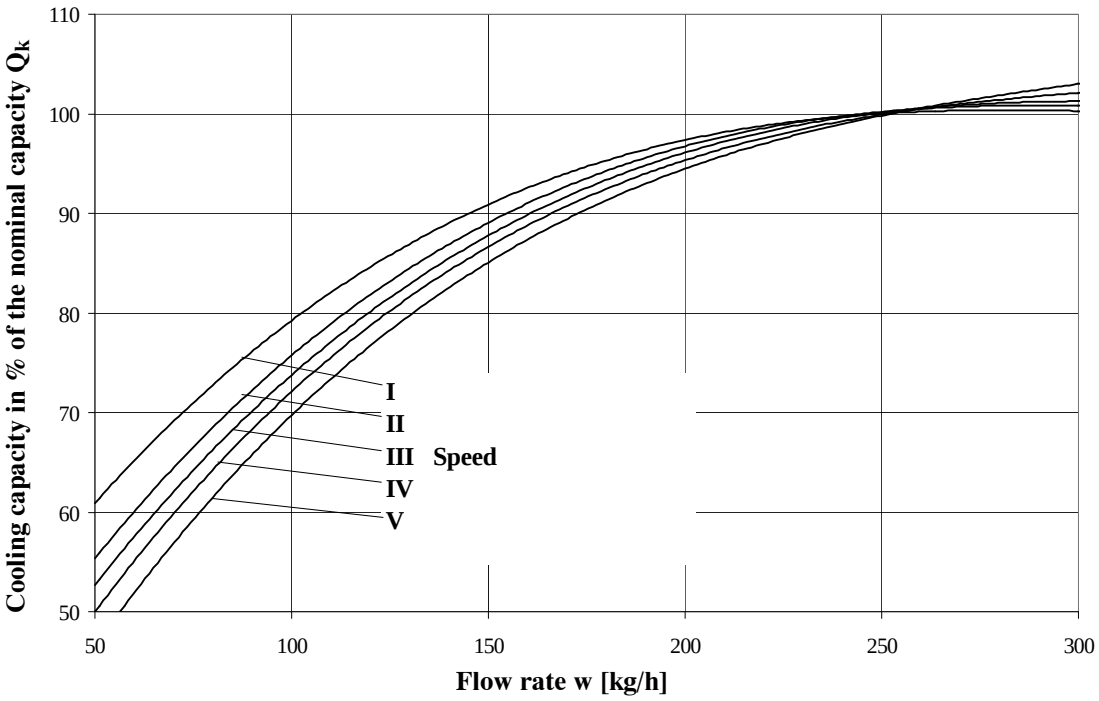
Values are given for the unit without ceiling coffer but including the filter and the air outlet grille, 8 W motor.

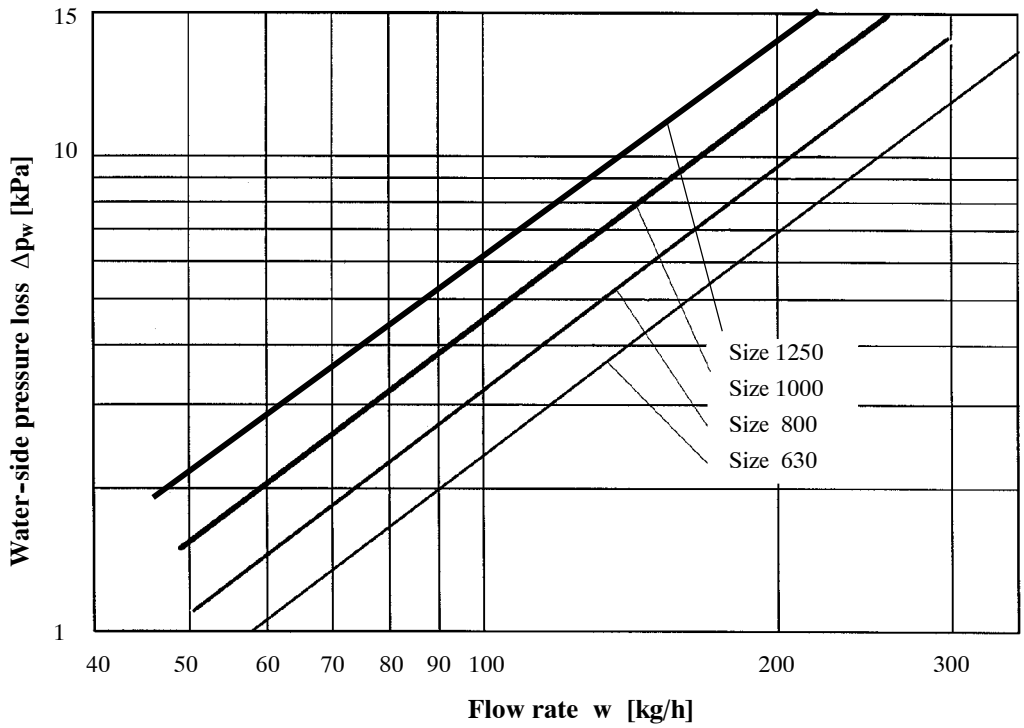
1 Water inlet: 16°C; induction air temperature before entering the heat exchanger: 26°C; non condensing operation.

2 Water inlet: 6°C ; induction air temperature before entering the heat exchanger: 26°C; relative air humidity: 50%.

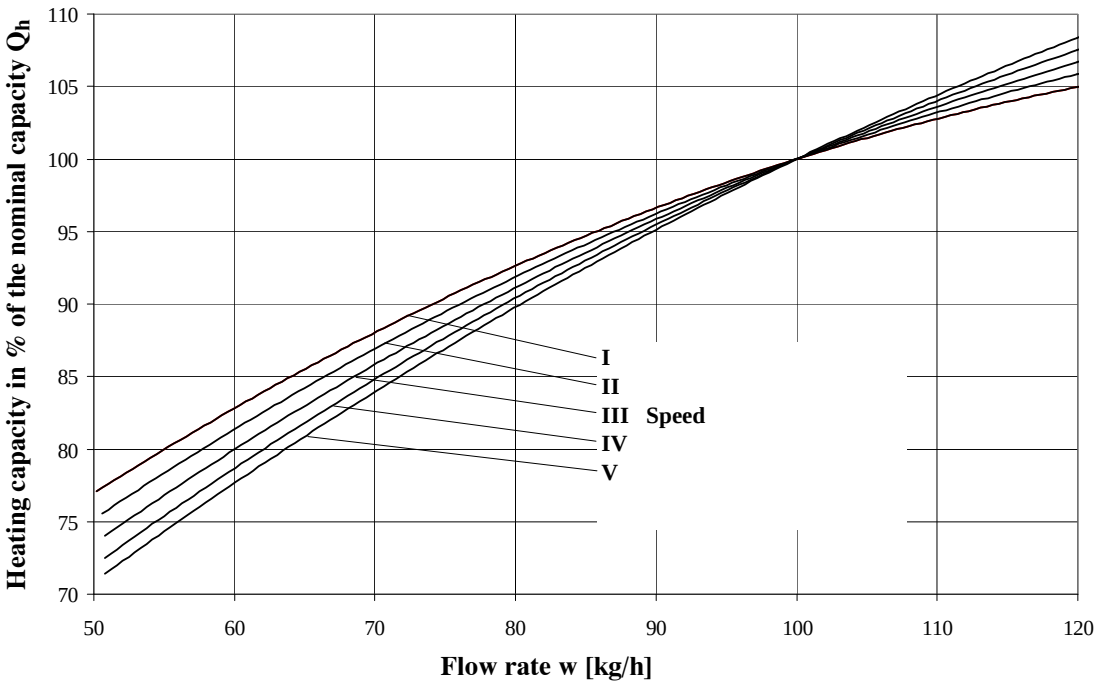
3 Water inlet: 60°C; induction air temperature before entering the heat exchanger: 20°C

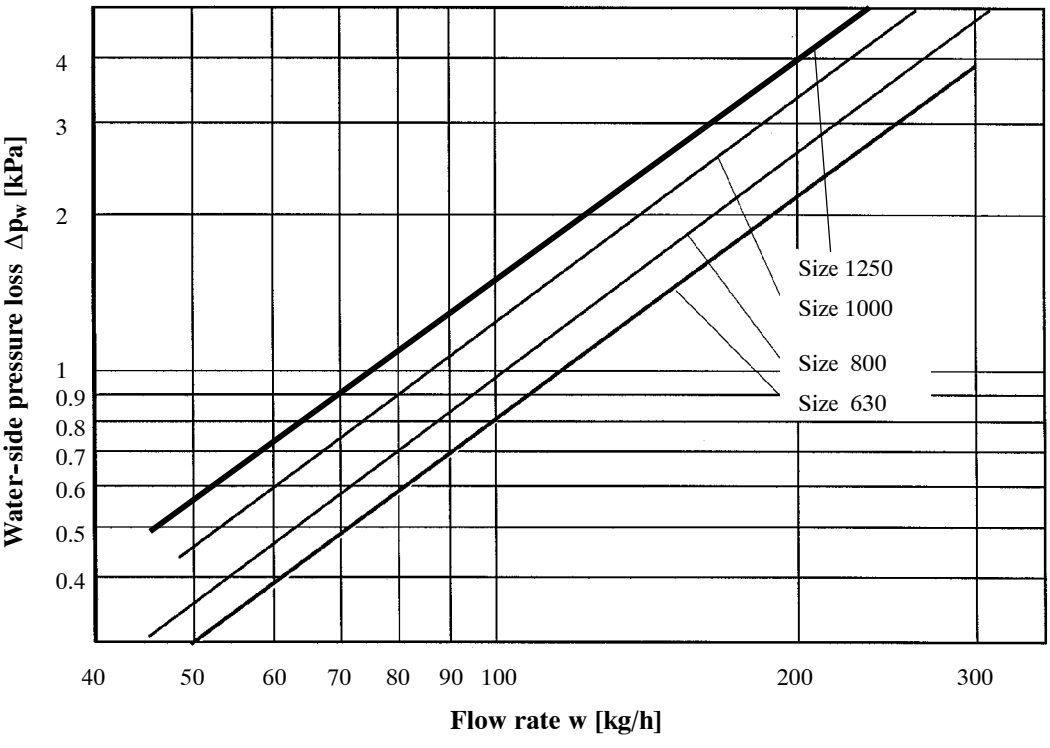
Water-side Pressure Loss and Cooling Capacity for different Water Flow Rates Type VKH-4A, 4-pipe-System



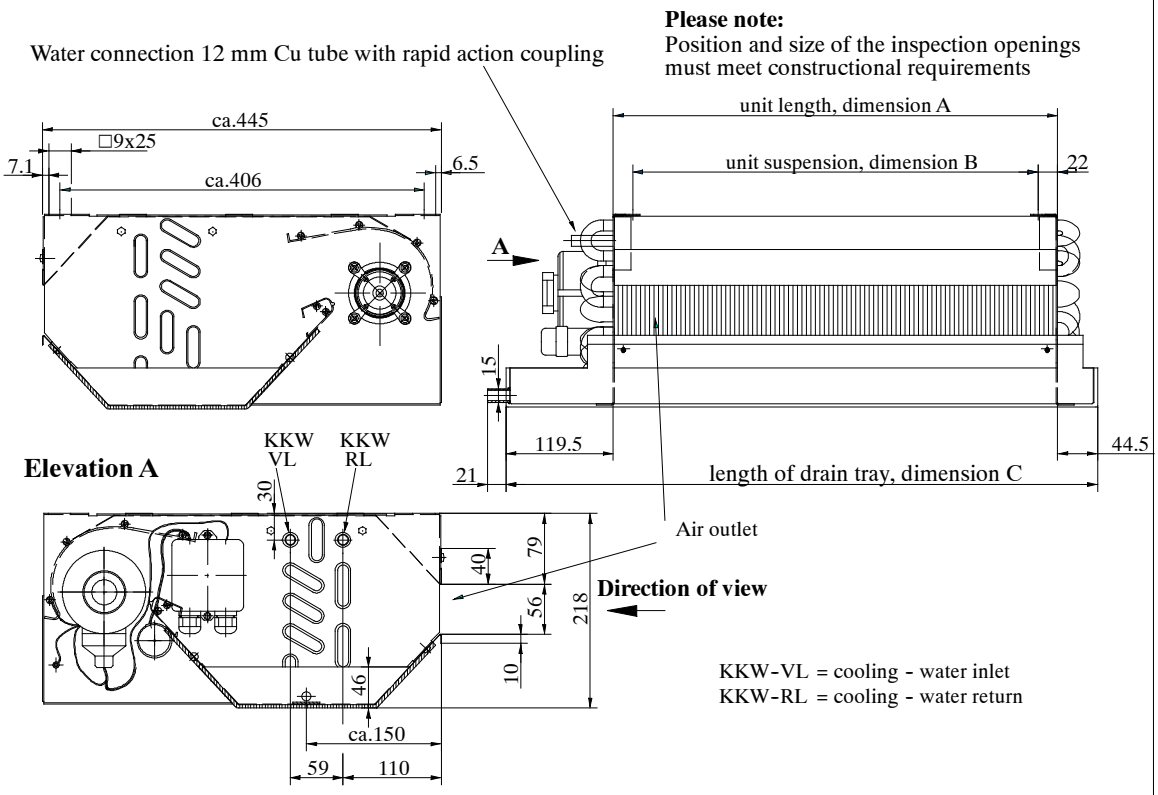


Water-side Pressure Loss and Heating Capacity for different Water Flow Rates Type VKH-4A, 4-pipe-System





Dimensions Type VKH-2A, 2-pipe System



Illustrated unit: water connection on the left (on request: on the right)
Motor always on the left (in direction of view)

Size	A [mm]	B [mm]	C [mm]
630	616	572	780
800	846	802	1010
1000	1046	1002	1210
1250	1246	1202	1410

Technical Specifications Type VKH-2A, 2-pipe System (legend see page 18)

Size 630 - 2-pipe-System - cooling or heating

n [-]	**V** [m^3/h]	L_{A18} [dB(A)]	L_{wA} [dB(A)]	$Q_k/\Delta t^1$ [W/K]	Q_k^2 [W]	$Q_{k\,sens}^2$ [W]	Q_h^3 [W]	$w_{ok}/\Delta p_w$ [kg/h]/[kPa]	P_{el} [W]	I_{max} [mA]
I	160	24	30	45	1080	762	1800	250/13.5	22	170
II	235	30	36	59	1416	1127	2360		26	
III	310	34	40	69	1559	1305	2760		28	
IV	390	39	45	79	1738	1509	3160		32	
V	495	46	52	90	1944	1808	3600		39	

Size 800 - 2-pipe-System - cooling or heating

n [-]	**V** [m^3/h]	L_{A18} [dB(A)]	L_{wA} [dB(A)]	$Q_k/\Delta t^1$ [W/K]	Q_k^2 [W]	$Q_{k\,sens}^2$ [W]	Q_h^3 [W]	$w_{ok}/\Delta p_w$ [kg/h]/[kPa]	P_{el} [W]	I_{max} [mA]
I	188	24	30	53	1274	988	2120	250/17	22	170
II	269	30	36	69	1662	1385	2760		26	
III	350	34	40	82	1868	1596	3280		28	
IV	426	39	45	93	2034	1800	3720		32	
V	540	46	52	106	2293	2143	4240		39	

Size 1000 - 2-pipe-System - cooling or heating

n [-]	**V** [m^3/h]	L_{A18} [dB(A)]	L_{wA} [dB(A)]	$Q_k/\Delta t^1$ [W/K]	Q_k^2 [W]	$Q_{k\,sens}^2$ [W]	Q_h^3 [W]	$w_{ok}/\Delta p_w$ [kg/h]/[kPa]	P_{el} [W]	I_{max} [mA]
I	220	24	30	62	1490	1050	2480	250/21	22	180
II	330	30	36	81	1978	1573	3240		27	
III	430	36	42	95	2164	1806	3800		29	
IV	535	42	48	110	2422	2102	4400		33	
V	680	47	53	124	2683	2497	4960		39	

Size 1250 - 2-pipe-System - cooling or heating

n [-]	**V** [m^3/h]	L_{A18} [dB(A)]	L_{wA} [dB(A)]	$Q_k/\Delta t^1$ [W/K]	Q_k^2 [W]	$Q_{k\,sens}^2$ [W]	Q_h^3 [W]	$w_{ok}/\Delta p_w$ [kg/h]/[kPa]	P_{el} [W]	I_{max} [mA]
I	265	24	30	73	1752	1235	2920	250/26	22	180
II	395	31	37	97	2328	1852	3880		27	
III	505	36	42	113	2554	2131	4520		29	
IV	625	41	47	132	2904	2520	5280		33	
V	800	47	53	147	3175	2955	5880		39	

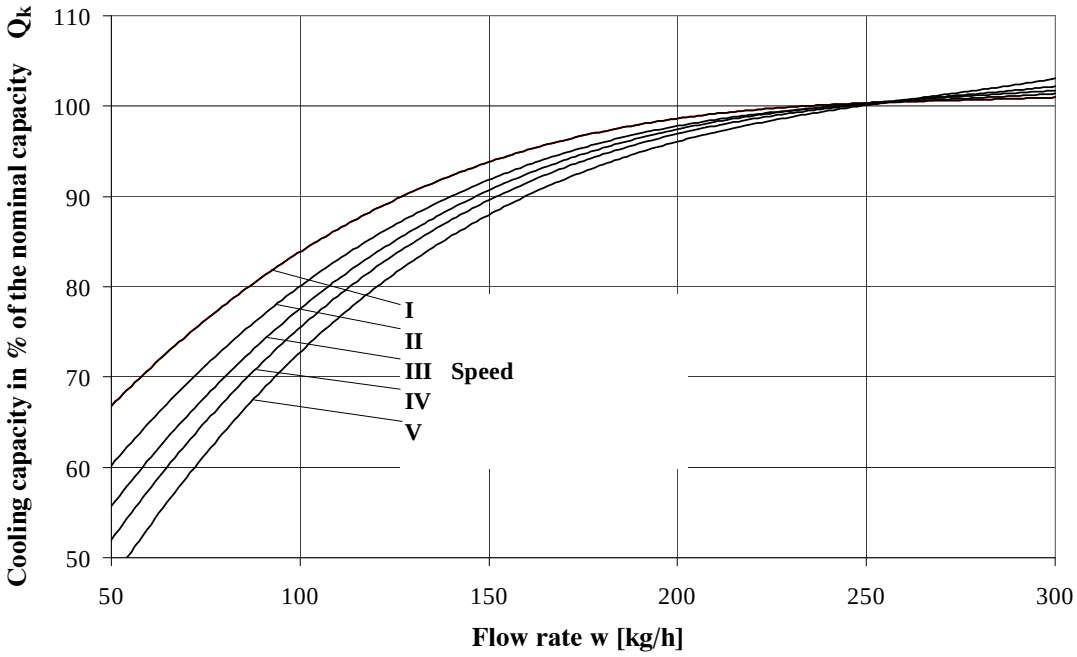
Values are given for the unit without ceiling coffer but including the filter and the air outlet grille, 8 W motor.

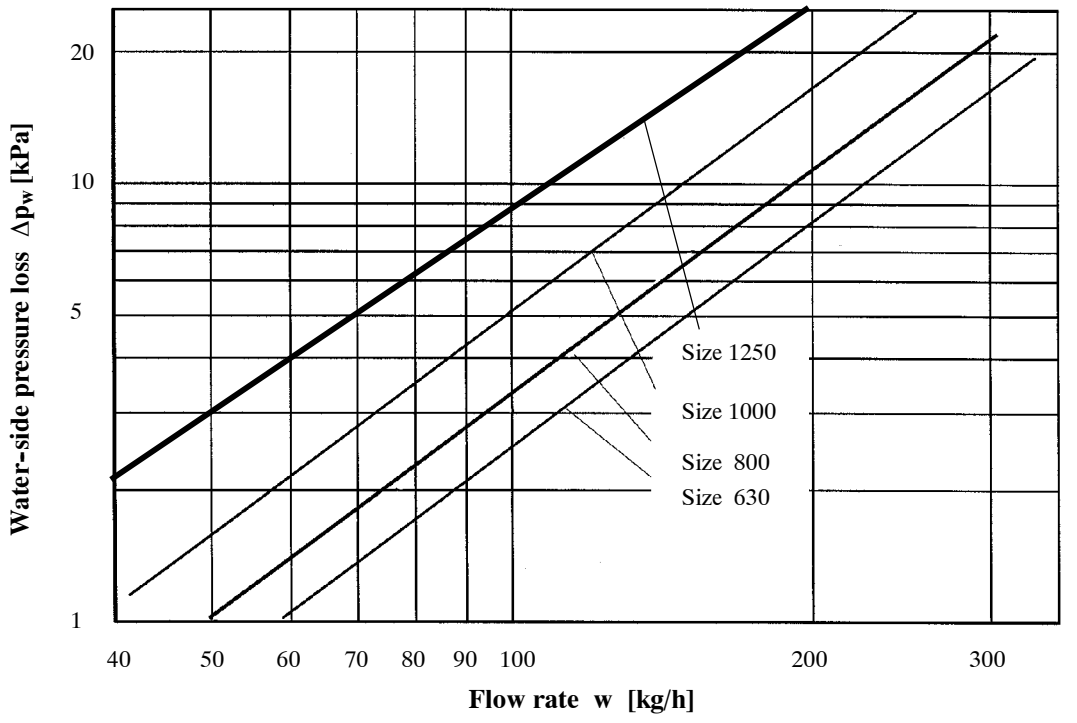
1 Water inlet: 16°C; induction air temperature before entering the heat exchanger: 26°C; non condensing operation.

2 Water inlet: 6°C ; induction air temperature before entering the heat exchanger: 26°C; relative air humidity: 50%.

3 Water inlet: 60°C; induction air temperature before entering the heat exchanger: 20°C

Water-side Pressure Loss and Cooling Capacity for different Water Flow Rates Type VKH-2A, 4-pipe-System





Legend

n - speed

V - flow rate
(approx. values, tolerance ±10%)

L_{A18} - sound pressure level, 18 m^2 Sabine

L_{wA} - sound power levell ±3 dB(A)
(without casing)

Δt - temperature difference between
induction air temperature before entering the heat exchanger
and water supply

Q_k - total cooling capacity

$Q_{k\ sens}$ - sensible cooling capacity

w_{ok} - standard flow rate at cooling capacity

Δp_w - water-side pressure loss

Q_h - total heating capacity

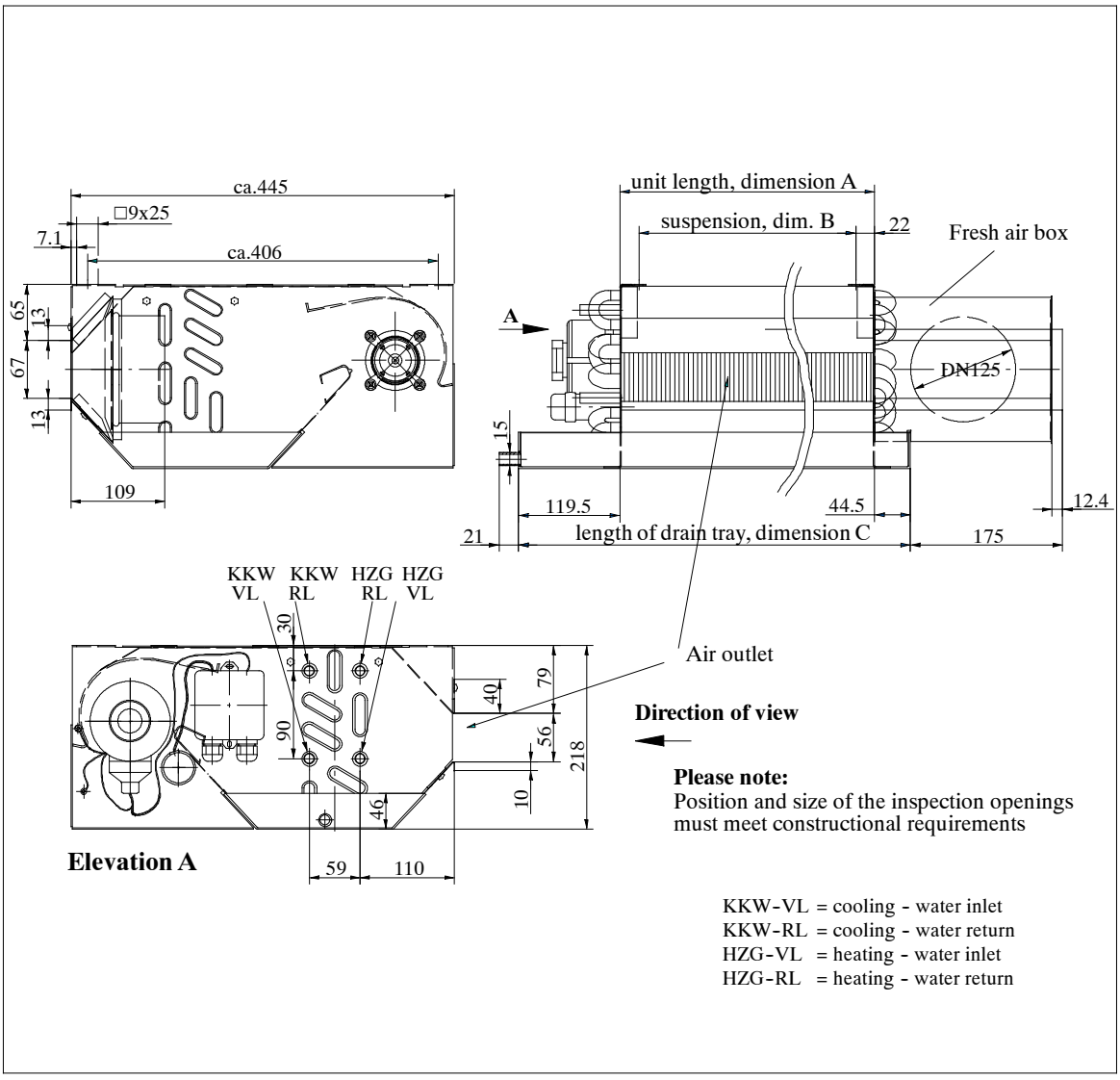
w_{oh} - standard flow rate at heating capacity

P_{el} - electric power consumption (± 20%)

I_{max} - maximum current input at speed V

Accessory Fresh Air Box

Length including fresh air box:
Air distribution box always on the left,
opposite of the motor (in direction of discharge)



Size	A [mm]	B [mm]	C [mm]
630	616	572	780
800	846	802	1010
1000	1046	1002	1210
1250	1246	1202	1410

3.2 Caloric Output Data

Caloric output data were determined at a test stand in the LTG test lab.

Data are valid if the following applies:

- unit at operating temperature, steady-state condition
- steady-state condition during measurements
- no condensation at the heat exchanger in the cooling mode
- water without additives (drinking water quality)*
- water supply temperatures from 12 °C to 16 °C in the cooling mode and 50 °C - 60 °C in the heating mode.

Parameters used:

- specific heat capacity of the water 4186 J/(kgK)
- specific heat capacity of the air 1004 J/(kgK)
- air density 1.2 kg/m^3

To ensure easy transferability, the specific caloric outputs - i.e. the absolute caloric outputs in relation to the temperature difference between water intake and induction air before entering the heat exchanger - are given with varying fan speeds.

The outputs given in the chart do apply with specific nominal flow rates only. These are stated for each type and size.

The correction charts give a graphic illustration of how outputs change with other flow rates compared to nominal flow rate output.

Flow rates have been determined through calculation and may vary by about 10%.

* **Addition of ethylene glycol to lower the freezing point:**

To lower the freezing point, cooling water is often added some ethylene glycol. The lower specific thermal capacity of the mixture reduces the unit's cooling capacity.

3.3 Acoustic Data

Acoustic data have been determined in a reverberation chamber in the LTG test lab.
The technical data sheet contain the A weighted sound pressure levels L_{A18} for different fan speeds.

Sound pressure levels apply to a room absorption surface of 18 m^2 which equals a room absorption of about 6 dB(A). Thus, sound power levels may easily be calculated.

$L_{WA} = L_{A18} + 6$ dB(A)

The data given apply to one unit, i.e. one room axle. If more than one unit is installed in the same room, the sound pressure level will rise accordingly.

Increase in sound level with several sound sources of the same type:

Number of sound sources of the same type	1	2	3	4
Sound level increase [dB]		3	5	6

Measuring accuracy is ± 10%.

3.4 Hydraulic Data

Heat exchangers are approved for an operating pressure of 10 bar max. (test pressure 16 bar).
Pressures exceeding 10 bar require the express permission of LTG.

Water-side pressure losses have been measured directly at the heat exchanger connections. Further resistances will have to be added.

Measuring accuracy is ± 10%.

3.5 Weight

Weights (without packaging) in kg

Size	
630	18 kg
800	23 kg
1000	28 kg
1250	33 kg

For version with fresh air box add 1 kg

3.6 Electrical Data

3.6.1 Electrical Connection (on-site control)

Connect the unit to a residual current device (RCD).

All units are provided with a terminal box installed inside the unit, degree of protection IP 44.

A total of 5 units may be connected in parallel and triggered through a single switch.

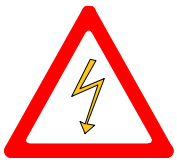
Take care to connect in parallel identical speeds only, i.e. connect speed I of unit 1 to speed I of unit 2, etc.

For a safe start of the fans it is indispensable to use speed III.

The main power supply on site is to be performed according to the wiring diagram and by skilled and trained staff only.

Electrical lines on site must be realized using the outputs on the terminal box and on the unit housing.

It is not permitted to work on the electrical equipment with the unit being alive.



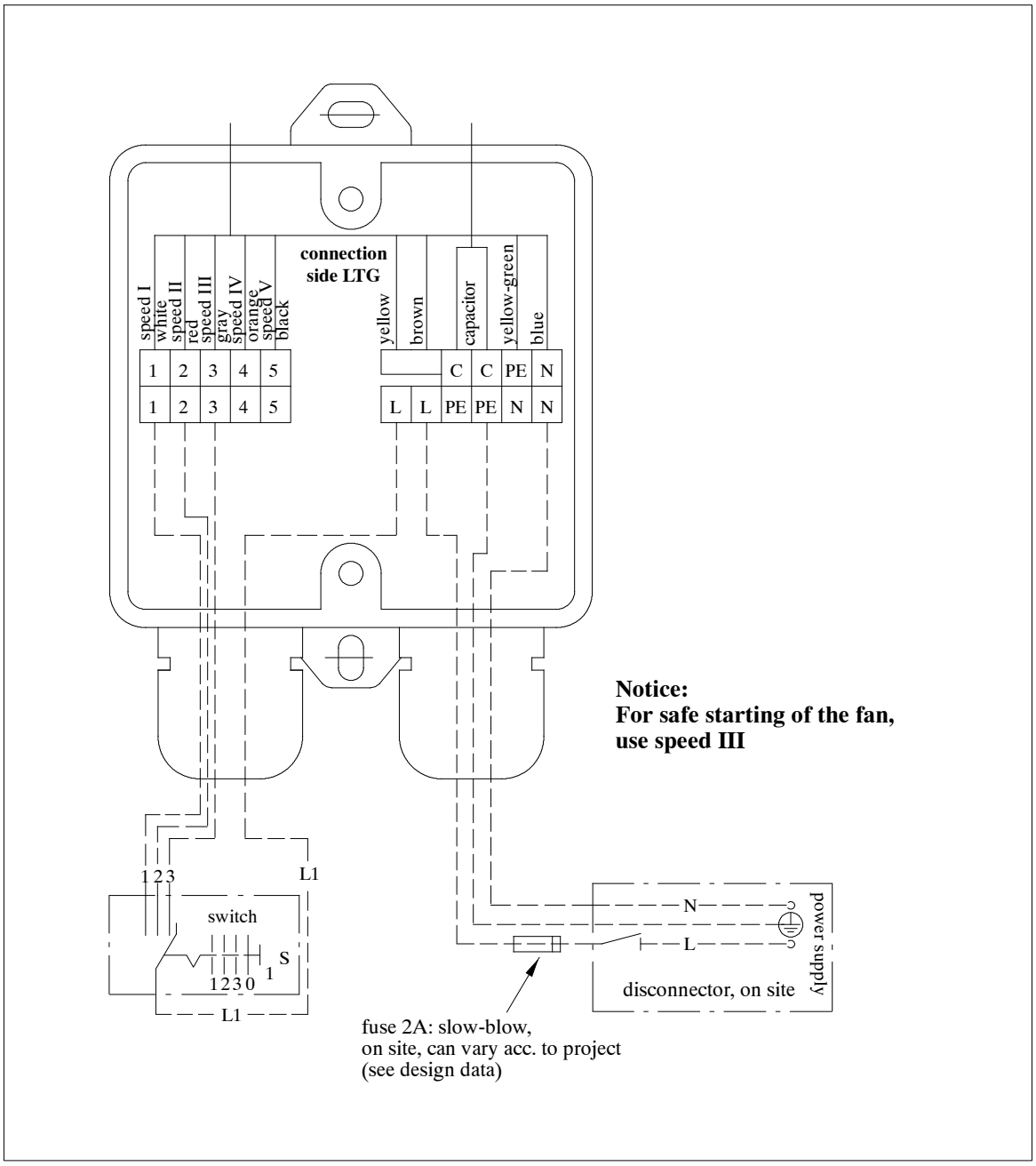
Units must be provided with a possibility to completely disconnected them from the main power supply!

Any work must be performed in compliance with national regulations and safety instructions.

The technical specifications contain the electrical output data for the units.

For an individual activation all units are equipped with a terminal box mounted to the unit.
A total of 5 units may be connected in parallel and triggered using a single switch.

Connection to the main power supply on site is to be performed according to the wiring diagram and by skilled and trained staff only.
It is not permitted to work on the electrical equipment with the unit being alive.
Units must be provided with a possibility to completely disconnect them from the main power supply.
It is not permitted to operate the units in a partly disassembled condition.



4. Installation

4.1 Suspension

Please consider the following when installing the units:

- To ensure unit stability and rigidity, use screws of at least the stated property class when fixing the unit. Fixings required for installation are not included.
- Use only the existing holes on the unit for the fixing elements.
- Do not use the air conditioning units as supporting elements for other components and avoid loading them in any other way.

Do not operate the unit unless properly installed and fixed!

Protect yourself from parts falling from above when working overhead!

The units are provided with holes to take fixing elements.
For suspension hole details refer to chapter 3.

It is the installer's responsibility to ensure that units are fixed using the fixations provided for on the unit and in a way to ensure sufficient rigidity and stability.

Please note:

- Fix the unit with a minimum of 4 fixing elements (e.g. threaded rods) and do not use but the holes provided for on the unit (at least 2 on each unit side).
- Fixing elements must be at least property class M6 (4.6) to ensure sufficient rigidity and stability.
- Avoid any contact with ceiling elements and connected air diffusion boxes since such contact would result in structure-borne sound transmission.
- Use vibration dampers when fixing the units to muffle structure-borne sound.

For unit weights refer to chapter 3.5.

4.2 Water Connections

Remove the heat exchanger plugs prior to water connection

Units are provided with heat exchangers with copper tubes and aluminum blades for 4-pipe operation with separate heating and cooling circuits or for 2-pipe operation.

The heat exchangers have been approved for a maximum operating pressure of 10 bar (other pressures on request).

Depending on the unit type, water connections are supplied in the following versions:

1. copper fitting with 12 mm outer diameter.
   This connection is only suitable for flexible connection with quick coupling.
2. 1/2" internal thread fitting, conical and sealing.

Always follow the installation instructions for the water connections attached to each unit.

Connections must be strainless.

Connecting lines must be able to expand.

Attention:
Prior to allowing water to enter the unit the flexible water connection hoses will have to be checked for proper and leakproof fixation. Even though hoses to the heat exchanger are preinstalled, fixations might have loosened during transport or installation of the unit on site.

You may use off-the-shelf control valves and shut-off valves.

When tightening the fittings, avoid damaging the heat exchanger pipes through bending or twisting. Pipe fittings must always be flush.

In order to adjust the water volume specified in the selection data, a regulating device or restricting olive will be required. If identical units with exactly the same water volume and pressure losses are used, an individual regulating device for each unit is superfluous. In this case, one regulating device for the entire line may be sufficient. Otherwise, a regulating device will be required for each heat exchanger.

If removal of a heat exchanger without draining the entire system is a requirement, two or four isolation valves will have to be provided for each unit. You may use off-the-shelf shut-off valves.

The unit fitting will only be provided with an integrated vent if specifically asked for. The water speed inside the heat exchanger is usually sufficient to carry along air bubbles and one ventilation device per line is therefore appropriate. In a case of emergency, the line may be ventilated by slightly loosening the standard fitting of the unit.

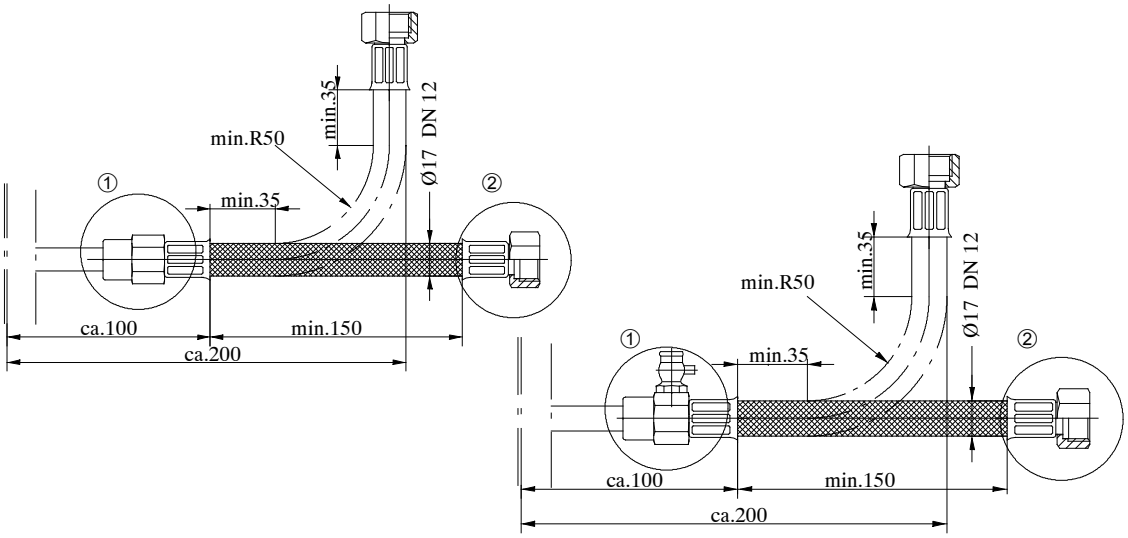
Due to possible condensation, the connections to the heat exchanger for cooling should be insulated, e.g. using Armaflex insulation.

The water connection side is to be specified when ordering the unit. Some units offer a possibility to still change the side during installation by removing 4 bolts.

Execute the heat exchanger connection as follows:

- Vertical heat exchangers: water supply below, water return above
- Horizontal heat exchangers: unit's front side: water supply, unit's back side: water return

Example for water connection using flexible hose
(Quick coupling connection to heat exchangers)

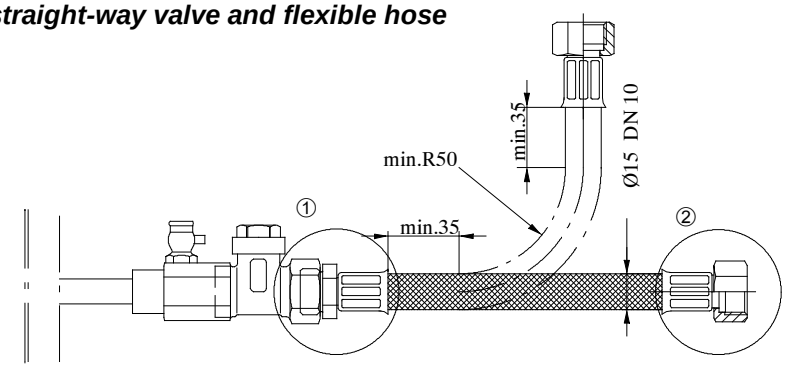


Hose without insulation. For insulated hoses, dimensions will change accordingly (10 mm Armaflex insulation).

① Hose for connection to heat exchanger with smooth tube end diameter 12 mm, connection types: quick coupling, quick coupling with venting

② Different hose connections, thread diameter acc. to customer requirements or standard 1/2"

Example for water connection using transition - LTG description VSG 10/ 2 EH (venting) -, straight-way valve and flexible hose

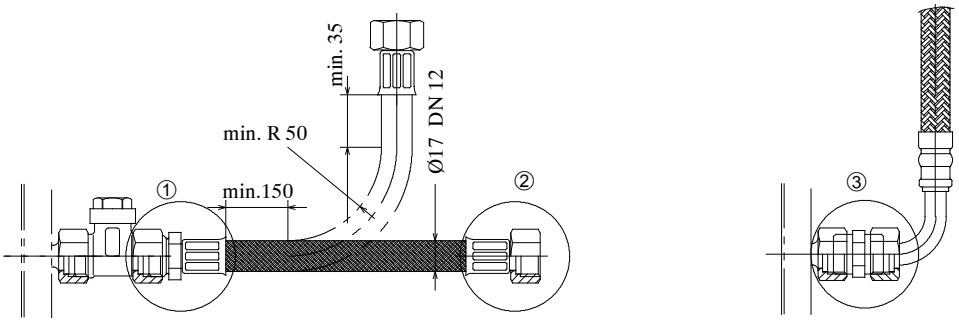


Hose without insulation. For insulated hoses, dimensions will change accordingly.

① Hose for connection to angle or straight-way valve, connection type: AGK, external thread, tapered 1/2"

② Different hose connections, thread diameter acc. to customer requirements or standard 1/2"

Example for water connection using valve and flexible hose (straight and 90 ° variant)



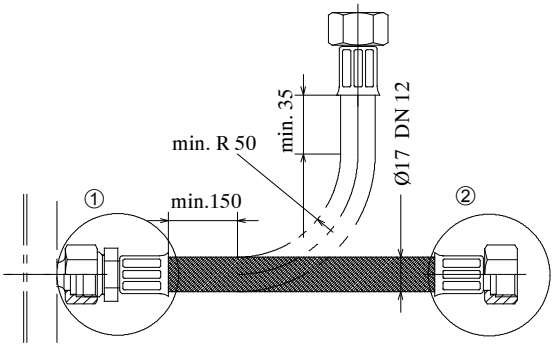
Hose without insulation. For insulated hoses, dimensions will change accordingly.
(10 mm Armaflex insulation

① Hose for connection to angle or straight-way valve,
Connection type AGK, external thread, tapered 1/2”

② Different hose connections, thread diameter acc. to customer requirements or standard 1/2”

③ Connection for direct screwing into the heat exchanger in case of angle connection,
Connection type: double nipple 1/2”-1/2”; UFD hose connection, 1/2” flat seal union nut

Example for water connection for direct screwing into the heat exchanger



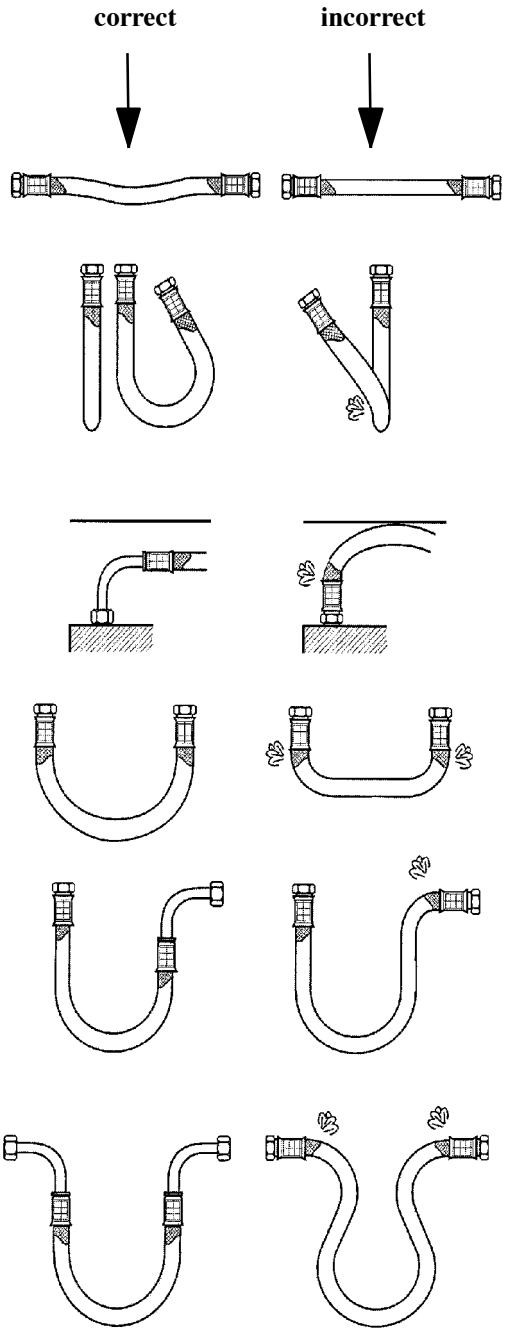
Hose without insulation. For insulated hoses, dimensions will change accordingly.

① Connection for direct screwing into the heat exchanger
Connection type: AGK, external thread, tapered 1/2”

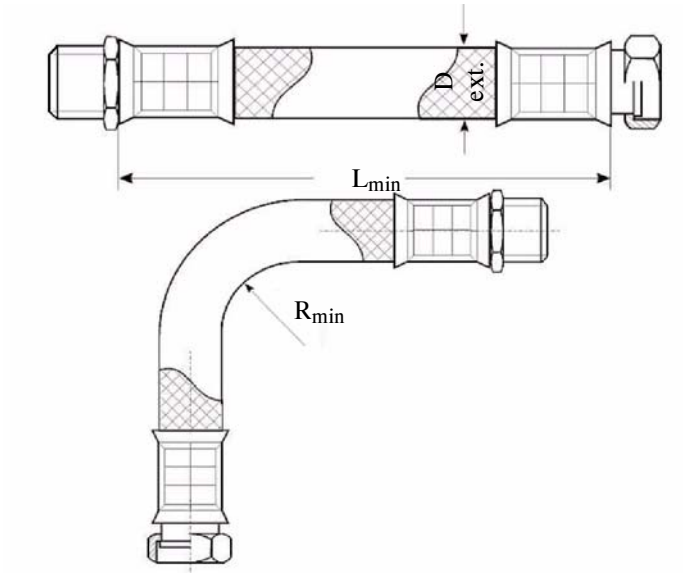
② Different hose connections, thread diameter acc. to customer requirements or standard 1/2”

4.2.1 Instructions for Installation of Water Connections Using Flexible Hoses

Warranty will only apply if the following instructions are observed and if installation is performed in compliance with DIN-EN regulations.
In particular, corrosive, electrochemical, and bacteriological charges are to be excluded taking appropriate preventive measures.



- Pressure and exposition to heat may result in slight elongation of the hose. Therefore, newly placed hoses must consider such potential elongation.
- Do not fall below the admissible bending radius R_{min} (chart), neither during transport, nor during installation or when installed.
  If it should turn out impossible to keep the admissible bending radius, choose a different installation type.
- For minimum length see chart below.
  If the hose is being placed by bending it, check whether there is sufficient hose length to allow for an open bow in order to avoid kinking and destruction of the hose at the connecting points.
- Absolutely avoid distorting or kinking the flexible connection.
- Do not subject the hose to any tensile or pressure loads applied from outside, neither during installation nor operation.
- Do not retighten rigid connections (outer thread) after fixing the second connection since this might result in distortion of or damage to the hose.
- In general, tightness of the connection (hose/connector) is the responsibility of the technician performing the installation.
- Any sealing material included in the delivery is to be verified by the technician for its suitability since the hose manufacturer has no information about the material or geometry of the connections.



Armoured hose Oxystop up to +70 °C (diffusion inhibiting, marked through weaved-in blue strip)
Armoured hose EPDM up to +93 °C (vapour permeable, not marked)

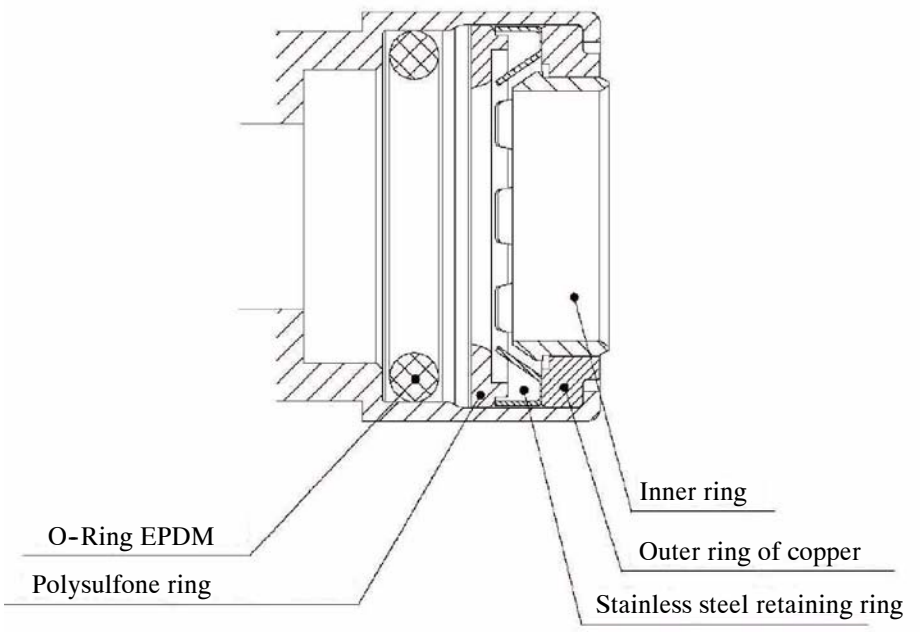
ND hose	D_A	PN [bar]	R_{min}	L_{min}	L_{min} α = 90°	L_{min} α = 180°	L_{min} α = 360°
06/08	12	15	27	60	140	180	260
10	14	15	40	60	190	250	260
12	18	15	60	80	260	360	550
15	22	12	70	95	300	420	640
19	27	10	80	100	350	480	730
25	34	10	100	125	430	590	900
32	44	10	160	140	650	900	1400
40	54	6	180	160	750	1030	1600
50	64	6	230	210	940	1300	2020

Armoured hose Oxyblock

* at + 30 °C / 10 bar at + 50 °C (vapour impermeable, marked through weaved-in blue-white strip)

ND hose	D_A	PN [bar]	R_{min}	L_{min}	L_{min} α = 90°	L_{min} α = 180°	L_{min} α = 360°
08	13,5	16 *	110	100	310	490	830
10	16	16 *	130	100	380	580	990
12	17	16 *	150	100	450	680	1150

4.2.2 Plug-in Connection Cuprofit



Tube connection of plug-in fitting and bright copper tube according to EN 1057 and RAL 641/1 or suitable brass or red brass socket.

This permanently tight connection is suitable for concealed installation.

Using special tools, this connection may be detached up to three times when not under pressure.
Prior to reconnection, check for undamaged condition of the seal.

Check every installation for tightness when completed.

Due to their specific design, Cuprofit connectors are not suitable for use as grounding conductors for electrical installations and therefore not to be considered in the compensation of potential.

Maximum operating pressure 10 bar / 93 °C. Test pressure 16 bar / 30 °C.

4.3 Condensate Connection

Remove the condensate drainage plugs before connecting the condensate lines!

Condensate formation occurs when the cold water supply temperature is below the ambient air dew point temperature. Neither LTG Induction Units nor LTG Fan Coil Units have been designed for an operation with steady condensate formation which is why special care must be taken when setting the water inlet temperature not to fall below the dew point temperature. If necessary, provide a continuous control of the water temperature based on outside air humidity.

On request, units are available in a special insulated version for condensing operation (please consider when designing and ordering). In any case, please observe the following:

- **Air conditioning with centralized cooling and dehumidification** (water temperature > 13 °C)
  A certain water supply temperature will result in condensate formation since the temperature is below the ambient air dew point. This dew point, however, depends on indoor air humidity. The water supply temperature may be 1-2 K below the dew point of the air since the air temperature on the pipes is higher than the actual water temperature.
  If rooms are ventilated with a maximum supply air humidity of e.g. 8.5 g/kg L_{tr} the water supply temperature may be lowered to 15°C without risk of condensate formation.
  In case of an increased humidity of the air, there a two solutions:

  Case A: Condensate tray not connected (condensate socket closed by plug)
  - If outside air humidity is high keep windows closed.
  - Alternative: If windows are opened use a window contact with closing/time-delayed opening system.
  - Alternative: A central system controls the water supply temperature based on the outside air humidity whenever windows are opened, i.e. in case of a high humidity of the air the water supply temperature is increased. This will, however, reduce the cooling capacity.

  Case B: Condensate tray connected
  - No need for a window contact or central cold water supply temperature raise in case of high outside air humidity.
  - If a short-term increase of the indoor air humidity is probable (unit in the intermediate ceiling above a wet room, e.g. a hotel) it is recommended to provide the tray with a thermal insulation.
  - In general, VPI 6022 requirements are to be met with the installation of any condensate drain connection on site.

- **Ventilation without dehumidification or window opening** (water temperature > 16 °C)
  In case of a ventilation without dehumidification the water supply temperature must be 16 °C or up.
  If the supply air is not dehumidified or the ventilation is realized by opening windows, the air humidity might be very high which is why the following case will have to be considered:

  The condensate tray must be connected.
  - A central cold water control and weather related cold water supply temperature raise is recommended since opening the windows might result in outside air with a high humidity entering the room and the temperature dropping below the air's dew point.

Whatever the case of application, all water carrying pipes and fittings outside the condensate tray's range must be insulated.
If a condensate drainage system is connected there must be sufficient slope and proper drainage of the condensate produced. Condensate trays and the condensate drainage system require cleaning and sanitation checks on a regular basis.

4.4 Check after Installation

Verify for the unit's proper connection to a residual current device (RCD).

Mechanical Check

Having completed the installation the unit is to be checked for any mechanical damages. Remainders of the packaging material and dust in or on the unit must be removed.

Check the following:

- leakproofness of the water connections (including heat exchanger connections),
- the insulation of all cold water carrying components to the heat exchanger for damage,
- the condensate drainage (optional) for clear passage and sufficient slope,
- the fixing screws for proper fit,
- the suspension for rigidity and sufficient load-bearing capacity (ceiling units),
- the unit for not contacting the facade and the raw floor except via the seals provided and the supporting feet (floor units),
- the line voltage and frequency to match the data given on the type plate,
- the electrical connections for proper execution and conformity to pertinent regulations,
- proper functioning of the control (optional),
- proper functioning of the motors (fan, actuators) without friction noises,
- the unit's fixation,
- the diffusion area/diffusion grille of the unit to be free of any obstructions,
- proper horizontal alignment, accurate to dimension,
- sufficient water hose lengths and strainless laying,

Check for Media Supply

- Check for proper availability of primary air, cold water, warm water, and electrical power or compressed air for the control.
- Check whether voltage and line frequency comply with the data given on the actuator's type plate. Never operate control devices with inappropriate voltage or frequency since this might result in destruction of the units and put people at risk.

Control Technical Equipment

Supply of control devices by LTG Aktiengesellschaft is optional, however it is the rule for actuators for units with dampers. Control valves are often factory-mounted.

Check for Proper Functioning

Turn the temperature control's selection knob slowly from one end position to the other while keeping an eye on the control dampers and linkage or the valves. Dampers and valves must move correspondingly quite smoothly and without rattling noises from one end position to the other. No exceptional noise must be produced by the electric actuators. In case the units show damages have them properly repaired by an expert. Damper linkages have been gauge adjusted in the factory and, therefore, require LTG Aktiengesellschaft's skilled personnel for readjustment.

Starting Standard Operation

Then set the temperature controller to the desired temperature. After a certain time the indoor air temperature should meet the setpoint.

5. First Use

Prior to first use any installation work and all checks must have been completed.

Check for proper water and power supply.

Please take special care to ensure that the starting voltage is adequate.

Having started the unit an air flow should be perceivable from the outlet grille. Only very minor air diffusion and motor sounds should be audible. Other sounds such as friction or impact might indicate damages resulting from transport or installation.

6. Operation, Maintenance and Repair

All units are virtually maintenance free, however certain things should be observed.

Any maintenance and repair work must be performed by skilled and trained staff only.

Before starting any maintenance or repair work the unit is to be completely disconnected from the main power supply!

6.1 Heat Exchanger, Water Connections and Condensate Tray

It is recommended to vacuum clean the heat exchanger and the dry condensate tray on a regular basis.

The heat exchanger blades are sharp-edged. Wear gloves for protection!

Check water connections and heat exchanger for tightness and possible corrosion damages.
If corrosion occurs inside the heat exchangers skilled staff must check the water treatment.
In case of condensation and existing condensate drainage the condensate tray will have to be wet cleaned and checked for contamination on a regular basis as required by VDI 6022.

6.2 Filter

Unit with filter

If a recirculated air filter exists it requires replacement about 2-3 months after first use of the unit. By that time, it will probably be saturated from carpet lints and construction dust residues.
Exact timing is subject to local conditions.

The filter must be replaced on a regular basis, every 6 months to 2 years depending on dust formation.

A 6-month filter change interval will be required if the unit is operated in an environment with heavy dust load, a lot of foot traffic, and only minimum primary air filter quality.

A 2-year filter change interval might be appropriate if the unit is operated under conditions without foot traffic, in a clean environment, and with a very good primary air filter quality.

Unit without filter

The exchanger(s) is/are to be vacuum cleaned about 2 to 3 months after their putting into operation. By that time, heat exchangers are usually visibly polluted from carpet lints and construction dust remainders. Exact timing is subject to local conditions.

Heat exchanges will then have to be vacuum cleaned on a regular basis, every 6 months to 2 years depending on dust formation. This gains particular importance considering that condensate formation might result in hard-to-remove dust caking.

A 6-month cleaning interval might be required if the unit is operated in an environment with heavy dust load, a lot of foot traffic, and only minimum primary air filter quality, in case of condensate formation on the cooler even sooner.

A 2-year cleaning interval might be appropriate if the unit is operated under conditions without foot traffic, in a clean environment, with a very good primary air filter quality and without condensate formation on the cooler.

6.3 Fan

The fan is virtually maintenance-free. However, after an operating time of about 20,000 hours a failure of the fan may occur. The fan must be checked for smooth and proper running, possible imbalance, and damages to the bearing. The fan must also be checked on a regular basis, every 6 to 12 months, for potential dust and foreign bodies on the impeller. Severe pollution and foreign bodies may result in premature wear of the bearing and fan.

6.4 Repair

If the damage is not obviously a mere ”damage to the bodywork”, e.g. on the condensate tray or outlet, units should be completely replaced and checked by the factory (in case of defects to the fan it might be sufficient to replace the fan unit without need to disconnect the system entirely from the water supply system).

First, the unit is to be completely disconnected from the power supply by an expert.

The filter in front of the heat exchanger is easy to replace since it is fixed to the unit with a simple adhesive strip.

Replacement of the control unit should be performed by skilled staff only or by the factory.

Replacement of individual components, e.g. a fan bearing, is not recommended since the greater number of settings can only be performed in the factory using special equipment.

Warranty applies to complete fans only.

6.5 Troubleshooting and Corrective Action

Trouble	Source	Action
No heating or cooling by the unit despite of fan running	Cold or hot water supply not operating. Heat exchanger and water supply lines have room temperature	Ensure cold or hot water supply Check and remove trouble Check fan coil unit shut-off valve
No air movement at the unit's outlet grille	The unit's fan is not operating	Put fan into operation. If necessary, force starting with highest speed level Check fan power supply. If necessary, replace fuses or switch on main power supply Replace drive unit.
No control signal is applied to the (valve) actuator, or it is not the one according to setting	Deficient control	Have unit checked by a specialized technician replacing or repairing broken parts
No valve spindle movement when actuator motor signal is being changed	Actuator is stuck	Try to release the stuck actuator by setting the temperature controller from "max. hot" to "max. cold" and vice versa. If unsuccessful, remove actuator, clean or replace
Unit is heating or cooling, but set temperature is not achieved	Window is open	Close window
Despite highest fan speed only weak air movement at the fan diffuser	Filter or heat exchanger polluted Suction or diffuser opening blocked or polluted	Replace filter Clean heat exchanger Remove objects in front of the diffuser and protective grille. Observe a minimum distance of 10 cm in front of the casing. Clear of objects
Measured cold water temperature is lower than the setting (ask technician for setting). Therefore, diffused air temperature is extremely low	Cold water temperature to the units is too low	Check cold water control including valve and actuator. If necessary, restore proper settings, replace or repair broken parts

Trouble	Source	Action
Part of the condensate trays is overflowing despite of drainage system	Condensate drainage system clogged	Remove clogging In the meantime, increase inlet temperature or shut off unit
Unit drips	Leaking or overflowing condensate tray	Replace leaking condensate tray Check condensate pump Check drainage system
	Inlet temperature too low	Increase inlet temperature
	Below dew point with window ventilation even if inlet temperatures are relatively high	Close window and, if necessary, increase inlet temperatures
Increased indoor air humidity perceivable	Considerable moisture sources in the room	Remove moisture sources If impossible, temporarily shut off unit water-side
Water inlet/return temperature difference too low	Water volume possibly too high	Check water volume balancing
	Fan not running or not conveying sufficient air	Check fan and terminals Maybe speed is too low Heat exchanger and filter polluted
	Inlet temperature too high in the cooling mode	Check temperature and cooling circuit
Audible impact noises	Fan bearing damage	Replace bearing or drive (only by ***LTG Aktiengesellschaft***)
	Foreign bodies in the fan	Remove foreign body from impeller (only with the unit off)
Audible buzzing	Starting voltage too low	Increase starting voltage
	Fan running out of balance	Check balance and true running
Vibration sounds	Structure-borne sound transmission due to - rigid fixation - contact of casing components or diffuser boxes with ceiling elements	Check suspension and casing components for contact with ceiling elements

6.6 Maintenance Intervals of the Individual Components

Component	Activity	To perform	
		months	as required
Unit, in general	Check for pollution, damage, corrosion, correct positioning and fixation	**12**	
Filter	Check for pollution, damage and odours	**3**	
	Check the filter layer for tightness	**3**	
	Replace filter medium (document)	**12***	**x**
	Check for hygienic condition	**3**	
Heat exchanger	Check for pollution, damage and corrosion	**6**	
	Clean to maintain function	**6**	**x**
	Check water connections	**12**	
	Check proper function of entry and return	**12**	
	Vent		**x**
	Check for hygienic condition	**6**	
Dirt and condensate tray	Check for pollution, damage, leak tightness and corrosion	**3**	
	Clean to maintain function		**x**
	Check for hygienic condition	**3**	
	Check heat insulation for damage (visual check)		**x**
	Check drain and siphon for proper functioning		**x**
Fan	Check for pollution, damage, corrosion and proper fixation	**6**	
	Clean to maintain function		**x**
	Check impeller for imbalance	**12**	
	Check bearing for noises	**12**	
	Check vibration damper for proper functioning	**12**	
	Check safety device for proper functioning	**12**	
	Clean chambers from the inside		**x**
	Check for hygienic condition	**6**	

*Shorten replacement intervals if outside or recirculating air are extremely dust loaded.

VDI 6022 sanitation requirements must be observed.

7. Spare Parts

The following spare parts are available and may be ordered from ***LTG Aktiengesellschaft*** stating unit type and description.

Quantity	Ident No.	Description	Minimum order quantity
1	1011384	4-pipe heat exchanger size 630, VKH-4A	1
1	1009800	4-pipe heat exchanger size 800, VKH-4A	1
1	1011568	4-pipe heat exchanger size 1000, VKH-4A	1
1	1010981	4-pipe heat exchanger size 1250, VKH-4A	1
1	1011553	2-pipe heat exchanger size 630, VKH-2A	1
1	1011554	2-pipe heat exchanger size 630, VKH-2A	1
1	1014702	2-pipe heat exchanger size 630, VKH-2A	1
1	1011555	2-pipe heat exchanger size 630 1250, VKH-2A	1
1		Drain tray size 630, water right	5
1		Drain tray size 800, water right	5
1		Drain tray size 1000, water right	5
1		Drain tray size 1250, water right	5
1		Drain tray size 630, water left	5
1		Drain tray size 800, water left	5
1		Drain tray size 1000, water left	5
1		Drain tray size 1250, water left	5
1	1008313	Terminal box electrical connection	2
1	1004411	Motor for BG 630 and 800	1
1	1004413	Motor for BG 1000 and 1250	1
1	1004190	Capacitor 1 mF	5
1	1003167	Capacitor 1,5 mF	5
1	33069	Filter mats in rolls of 40 m	1 roll
1	20280	Adhesive Velcro tape	100 m

For heat exchangers please state connection (1/2”, smooth copper tube)

8. Decommissioning, disposal

When the fan is taken out of service, is no longer used and is disposed of as waste, the following must be complied with:

- all steel parts are waste for recycling
- all plastic parts are waste for recycling
- all secondary substances and lubricants must be disposed of in accordance with the provisions of the EWC (European Waste Catalogue) classification.