

**Original Instructions for Installation, Use
and Maintenance**

Active Chilled Beam HDC



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Table of contents

Safety Instructions	5
1 Transport and Storage	7
1.1 Transport Instructions	7
1.2 Storage	7
2 Function	8
2.1 Intended Use	8
3 Technical Specifications	9
3.1 Dimensions	9
3.2 Performance Data	11
3.3 Caloric Output Data	15
3.4 Acoustic Data	15
3.5 Hydraulic Data	15
3.6 Weight	15
4 Installation	16
4.1 Notes	16
4.2 Suspension	16
4.3 Water Connections	17
4.4 Primary Air	23
4.5 Check after Installation	26
5 First Use	27
6 Operation, Maintenance and Repair	27
6.1 Heat Exchanger, Water Connections and Condensate Tray	27
6.2 Filter	27
6.3 Two-pipe and Four-pipe System	28
6.4 Selecting the Room Temperature	28
6.5 Excessive Noise and Draught	28
6.6 Out-of-service Times	28
6.7 Repair	29
6.8 Trouble Shooting and Corrective Action	30
6.9 Maintenance Intervals of the Individual Components	33
7 Spare Parts	34
8 Decommissioning and Deposal	34

Carefully read the safety instructions before using any LTG induction 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.

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

Die elektrischen Anschlüsse eventueller Regelgeräte dürfen nur von hierzu befugten Personen entsprechend den örtlichen Sicherheitsvorschriften hergestellt, abgebaut oder geändert werden.

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.

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.

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.

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 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!

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:

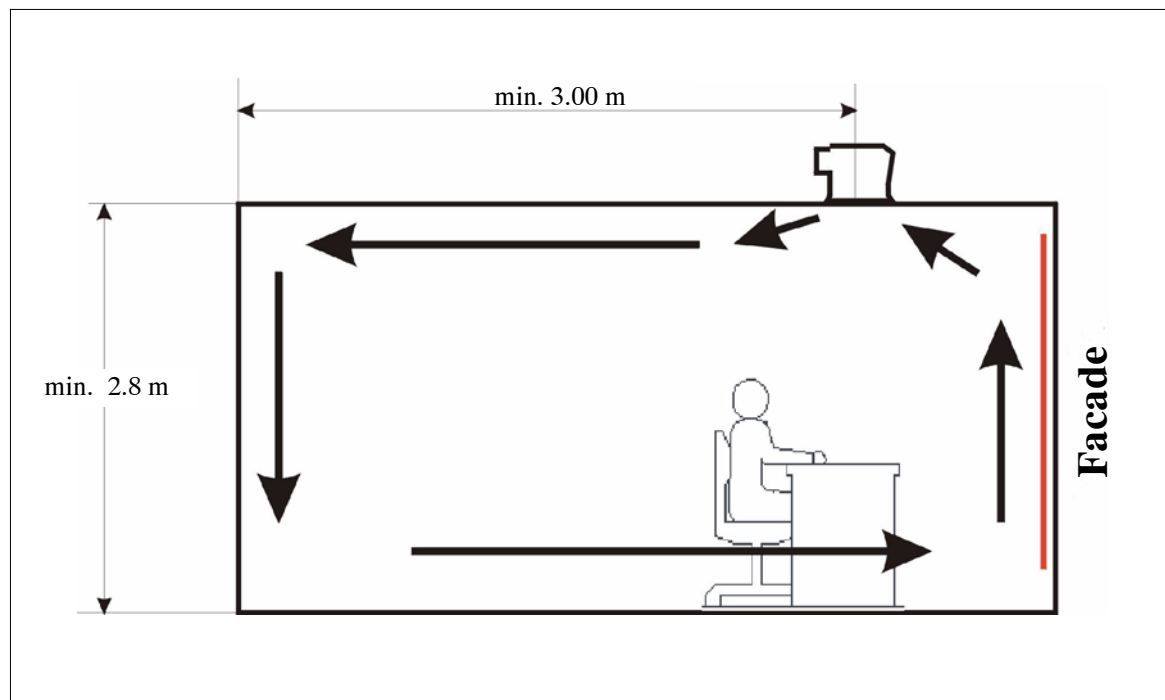
Temperature between +5 °C and +55 °C with a relative humidity of 90 % max. (non-condensing).

2. Function

The Active Chilled Beam HDC is specifically designed for installation in false ceilings. In the cooling mode room air is heated at the façade, entrained into the unit, cooled and recirculated to the space.

Primary air flow from internal metal nozzles, induces room air through a heat exchanger where it is cooled or heated. The primary air is mixed with the heated or cooled secondary air and delivered into the room.

Hygienic operation is achieved by avoiding dehumidification of the secondary air.



Section through a typical office room, length : 6 m, height : 2.8 m. Schematic illustration of indoor air flow.

Cooling mode

Room air heated at façade is drawn directly into the units where it is cooled. Supply air is diffused along the ceiling, mixes with the ambient air to reduce air speed and temperature difference.

High thermal comfort up to 50 W/m^2 or $7.5 \text{ m}^3/\text{hm}^2$ (primary air).

2.1 Intended Use

The induction unit type HDC is intended for use in closed rooms.

It is designed for ambient temperatures of $+5 \text{ }^\circ\text{C}$ to $+40 \text{ }^\circ\text{C}$ and a maximum relative humidity of up to 90% (non-condensing).

The maximum admissible supply temperature is, therefore, limited to $+80 \text{ }^\circ\text{C}$.

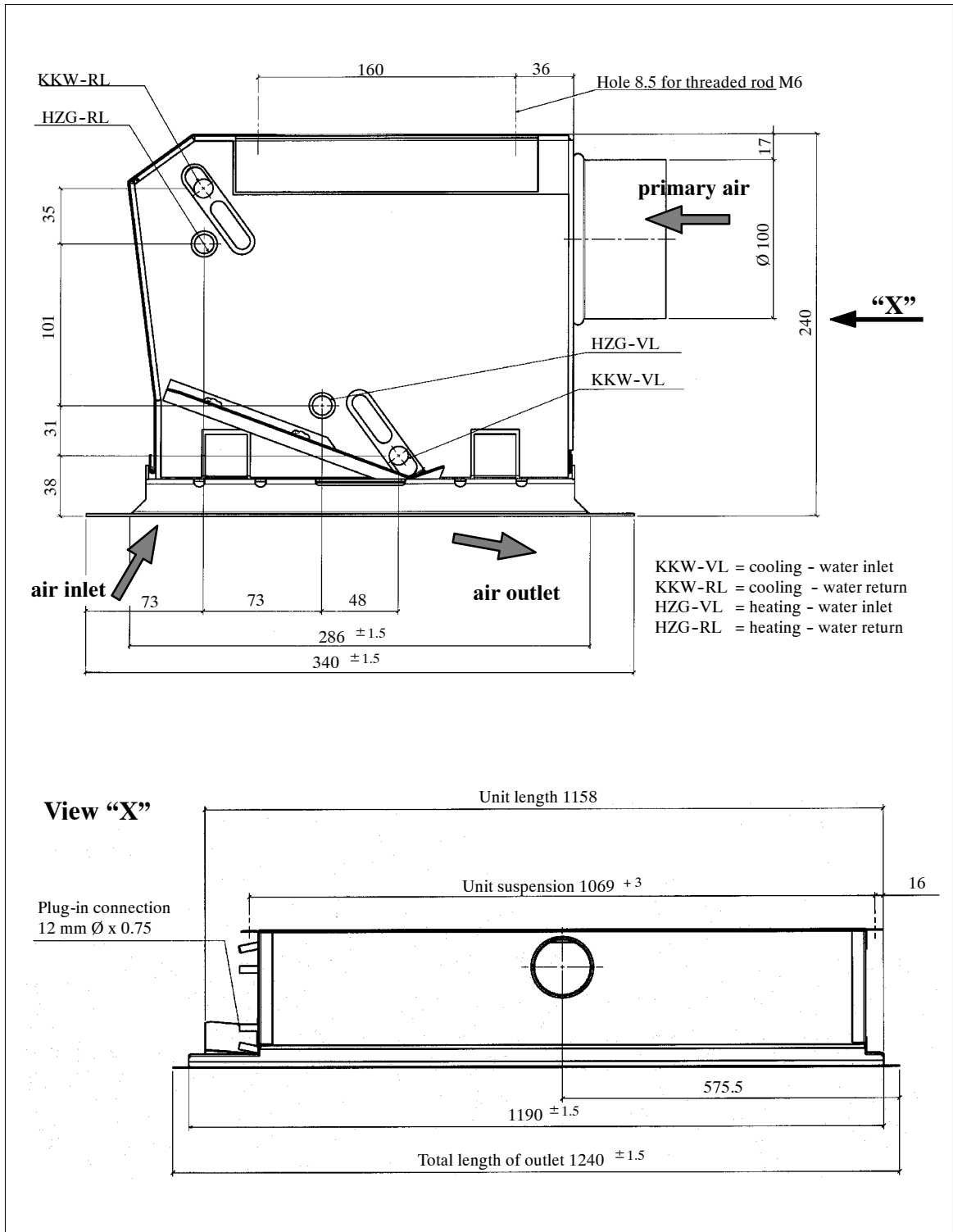
Any other operating conditions require the express and written permission of LTG Aktiengesellschaft.

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

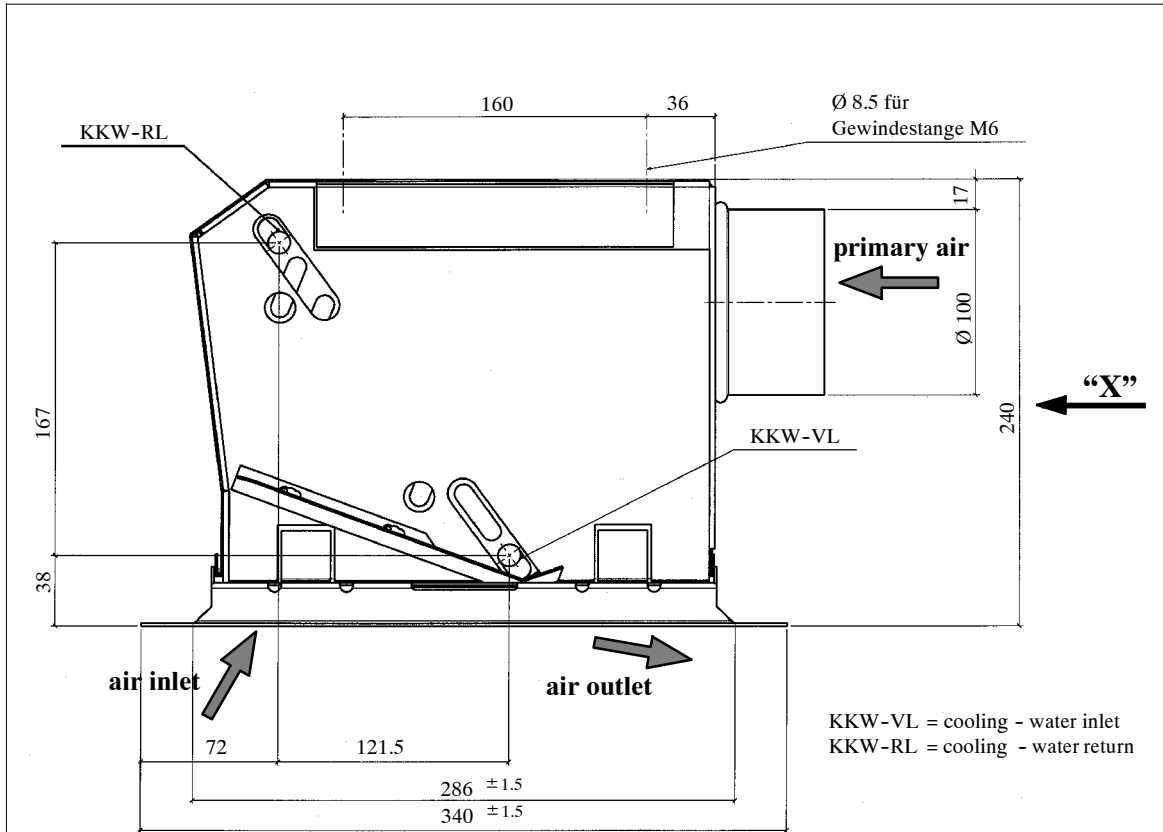
3. Technical Specifications

3.1 Dimensions

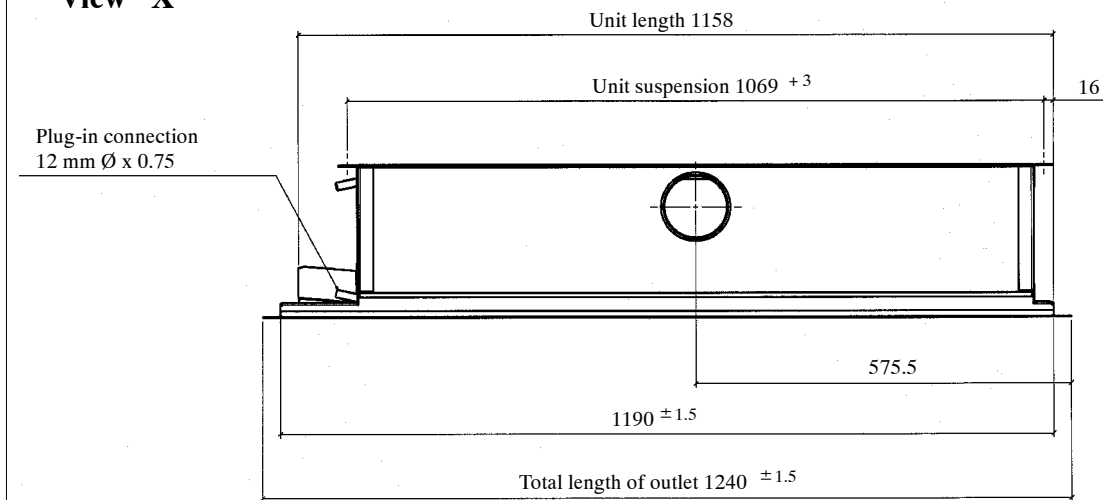
Dimensions 4-pipe-System, flanged Installation



Dimensions 2-pipe-System, flanged Installation



View "X"



3.2 Performance Data

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

V [m ³ /h]	Δp [Pa]	L _{A18} [dB(A)]	L _{wA} [dB(A)]	Q _P / Δt [W/K]	Q _k / Δt [W/K]	Q _k ¹ [W]	Q _P ¹ [W]	w _{ok} / Δp_w [kg/h]/[kPa]	Q _h / Δt [W/K]	Q _h ² [W]	w _{oh} / Δp_w [kg/h]/[kPa]
40	50	22	28	13	23	230	130	100 / 6.3	18	720	100 / 2.4
50	77	23	29	17	28	280	170		22	880	
60	110	26	32	20	34	340	200		26	1040	
70	150	29	35	23	37	370	230		29	1160	
80	195	33	39	27	42	420	270		32	1280	

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

V [m ³ /h]	Δp [Pa]	L _{A18} [dB(A)]	L _{wA} [dB(A)]	Q _P / Δt [W/K]	Q _k / Δt [W/K]	Q _k ¹ [W]	Q _P ¹ [W]	w _{ok} / Δp_w [kg/h]/[kPa]	Q _h / Δt [W/K]	Q _h ² [W]	w _{oh} / Δp_w [kg/h]/[kPa]
40	50	22	28	13	24	240	130	100 / 8.5	20	800	100 / 6.2
50	77	23	29	17	30	300	170		25	1000	
60	110	26	32	20	36	360	200		30	1200	
70	150	29	35	23	40	400	230		33	1320	
80	195	33	39	27	45	450	270		37	1480	

Data is based on the unit with the inlet/outlet grille installed.

The induction air temperature at the unit is usually 1-2 K higher than the room temperature.

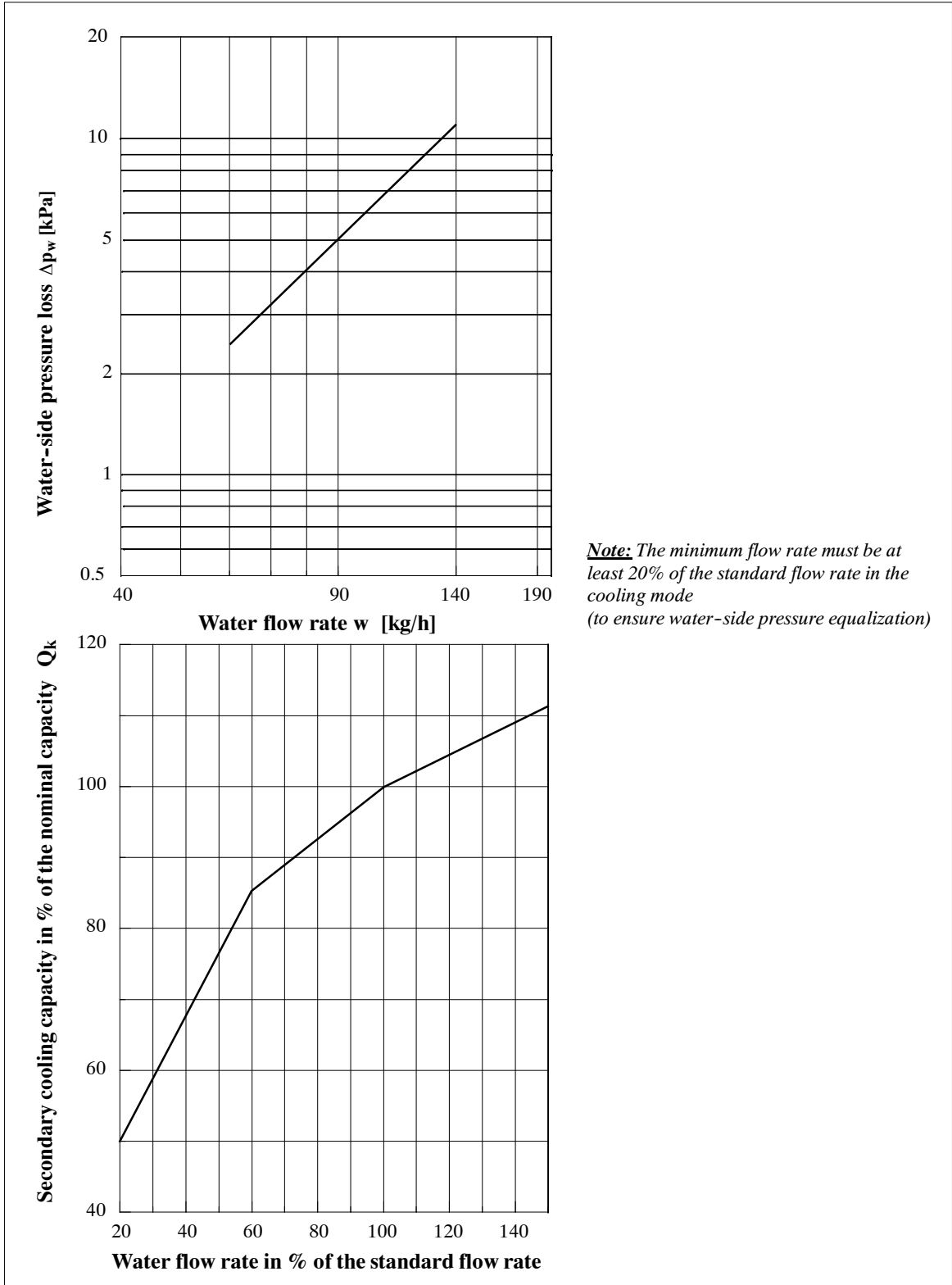
Standard water flow rate for heating and cooling: 100 kg/h. Correction values for other flow rates see the following pages.

- 1 Water supply temperature: 16 °C W; room temperature at a height of 1.1 m: 26 °C; non-condensing operation.
- 2 Water supply temperature: 60 °C; air inlet temperature: 20 °C.

Legend

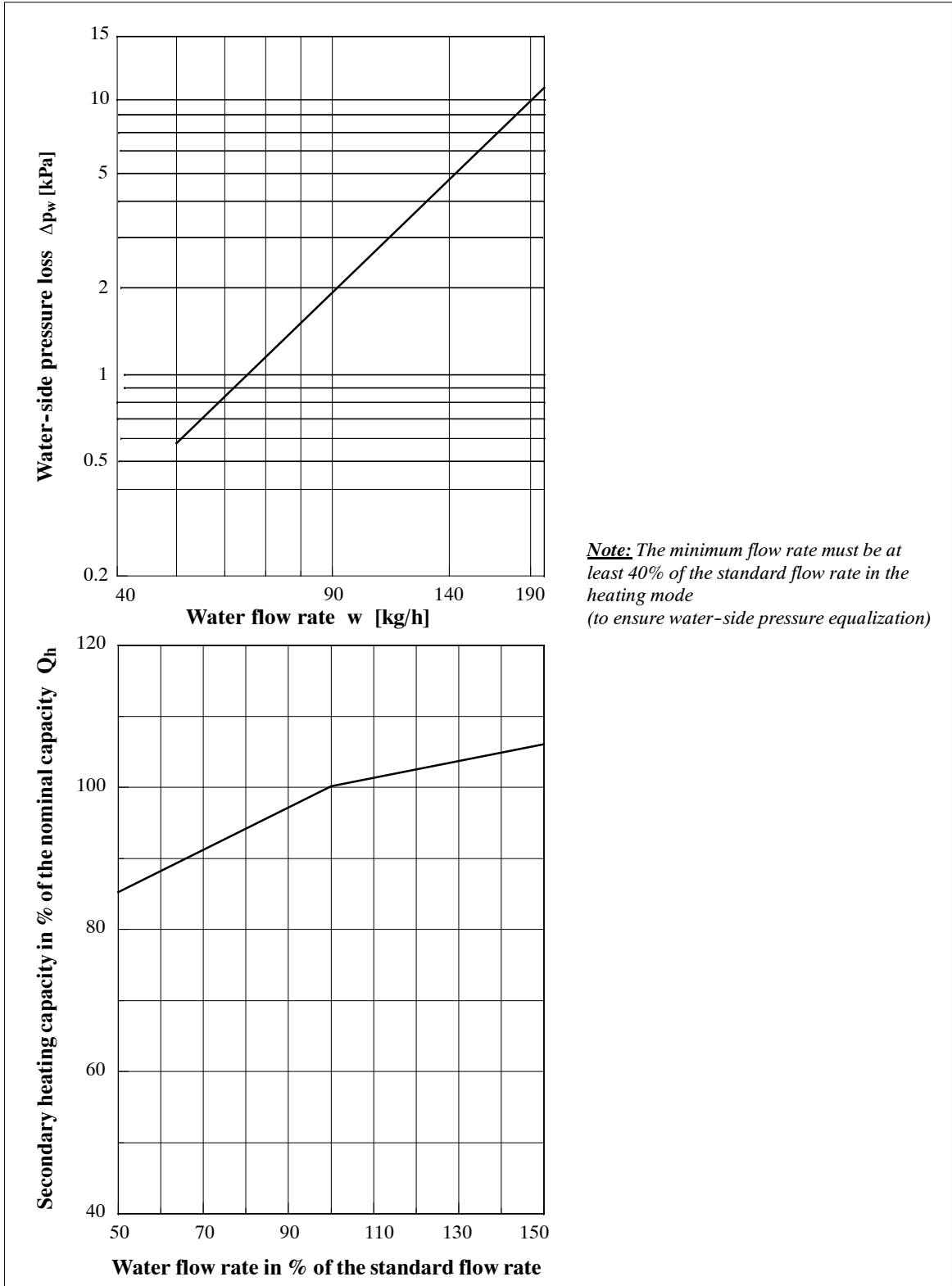
- V - flow rate ($\pm 10\%$)
- Δp - static pressure at primary air spigot
- L_{A18} - sound pressure level (± 3 dB)
- L_{wA} - sound power level (± 3 dB) (without ceiling)
- Q_P - primary cooling capacity (fresh air) ($\pm 5\%$)
- Q_k - cooling capacity, secondary (heat exchanger) ($\pm 5\%$)
- Δt - temperature difference between room air and water supply
- w_{ok} - standard flow rate at cooling capacity
- Δp_w - water-side pressure loss
- Q_h - heating capacity, secondary ($\pm 5\%$)
- w_{oh} - standard flow rate at heating capacity

Water-side Pressure Loss and Cooling Capacity with different water Flow Rates
Type HDC, 4-pipe System, standard Flow Rate 100 kg/h



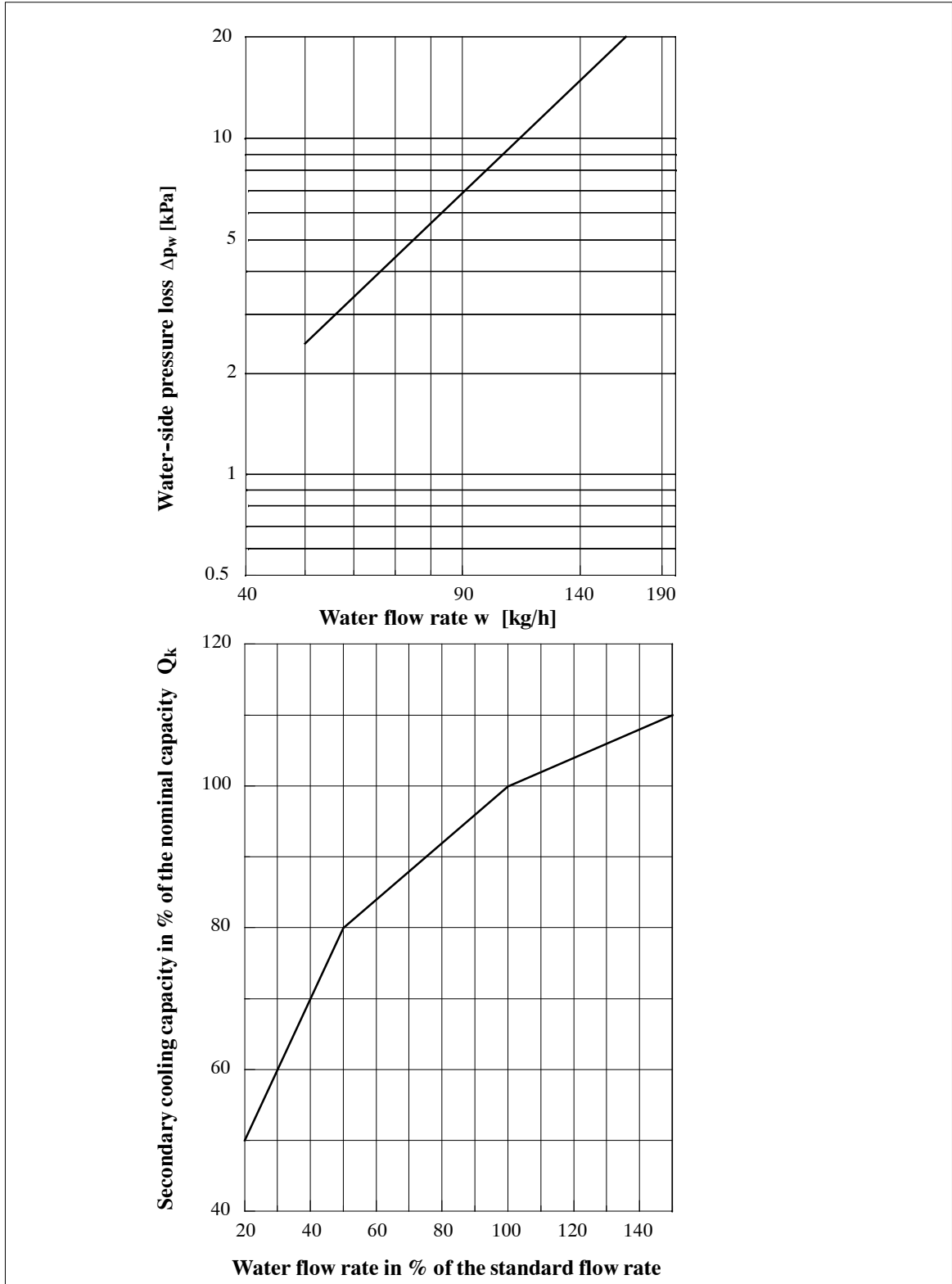
Note: The minimum flow rate must be at least 20% of the standard flow rate in the cooling mode (to ensure water-side pressure equalization)

Water-side Pressure Loss and Heating Capacity with different water Flow Rates
Type HDC, 4-pipe System, standard Flow Rate 100 kg/h



Note: The minimum flow rate must be at least 40% of the standard flow rate in the heating mode (to ensure water-side pressure equalization)

Water-side Pressure Loss and Cooling Capacity with different water Flow Rates
Type HDC, 2-pipe System, standard Flow Rate 100 kg/h



3.3 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/m³

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.

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.

3.4 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 primary air flow rates/static pressures at primary air socket.

Sound pressure levels apply to a room absorption surface of 18 m² which equals a room absorption of about 6 dB(A). Thus, sound power levels may easily be calculated.

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

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 $\pm 10\%$.

3.5 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 $\pm 10\%$.

3.6 Weight

Standard units (without water) 17 kg, diffuser 6 kg.

4. Installation

4.1 Notes

Shipping of Unit

If not required otherwise, units are shipped in wrapping boxes which may also serve as a protection during installation. Boxes must be stored in an upright position as indicated by the arrow on the box. The packaging is disposable and not to be returned to LTG.

Timing of Installation

Installation of the units should not be performed unless the prefabricated floor has been finished, the window sill installed, the intermediate ceiling and any other dust producing work completed.

Handling of Units

Handle units with care during transport and installation. Avoid dropping to the ground.

4.2 Suspension

Please observe the following when installing air conditioning units:

- For reasons of stability and rigidity, never use bolts with a property class inferior to the one indicated. Fixing elements are not included in the delivery.
- Do not use other than the holes provided for to fasten fixing elements.
- Do not use the air conditioning units as load-bearing elements for other components and avoid any other loading.



Fixing elements must be chosen in a way to ensure that any sound transmission is avoided.

4.3 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.

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.

Included in the unit price and also in general provided with the unit - (unless special fittings such as transitions, straight-way or angle valves or hose connections are ordered) is a complete compression fitting for unit-side water connection, appropriate to take copper pipes with a 12 mm outer diameter, wall thickness of 0.7 - 1.0 mm, suitable for connecting hoses. The union nut is fixed to the heat exchanger pipe's flared end, while olive and banjo bolt will be delivered in packs of 2 or 4 - according to type of unit - in a bag attached to the unit.

Exception: The water connections of units HFG-4 and HFS-4 are provided with a sleeve with fixed internal thread or a soldered-on smooth 12 mm tube to take a quick coupling.

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

Original Instructions for Installation, Use and Maintenance
Active Chilled Beam Type HDC

Section: AG-B 213.1e
Page: 18
Date: Feb. 2010

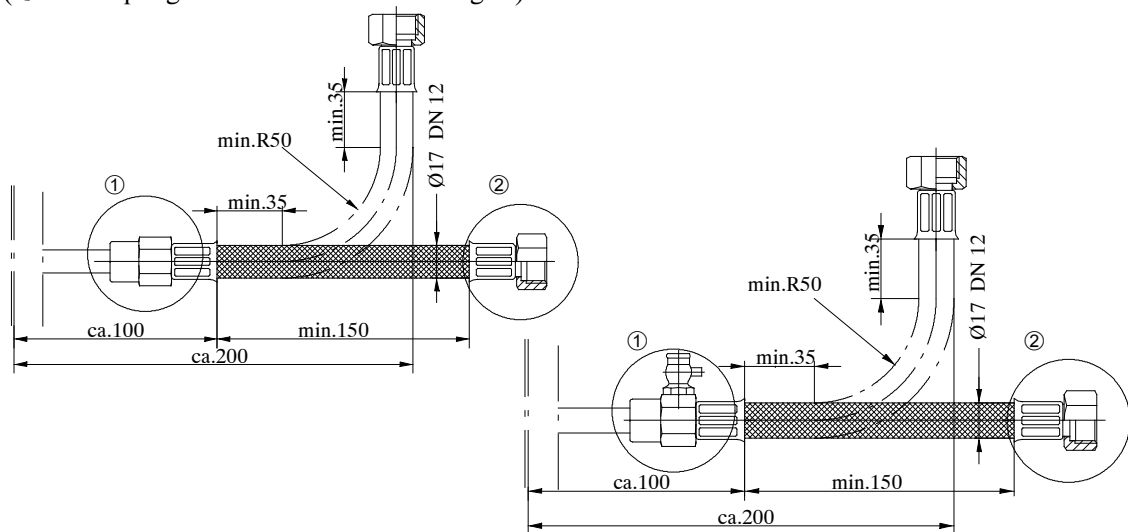
The water connection side is to be specified when ordering the unit. Some units offer a possibility to still change the side during installation by removing 4 bolts.

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

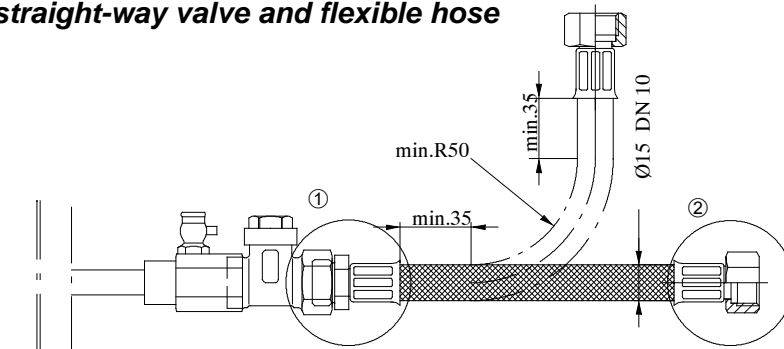
(Quick coupling connection to heat exchangers)



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"

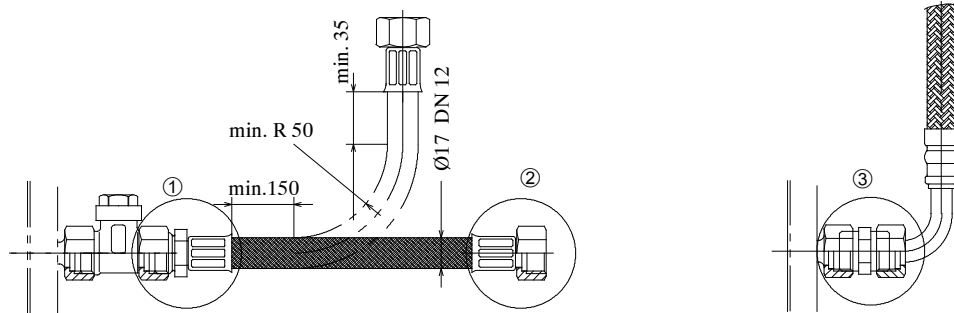
Example for water connection using transition - LTG description VSG 10/2 EH (venting) -, straight-way valve and flexible hose



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"

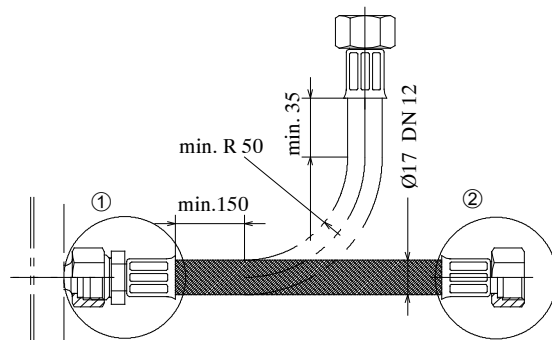
Example for water connection using valve and flexible hose (straight and 90° variant)



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"

4.3.1 Instructions for Installation of Water Connections Using Flexible Hoses



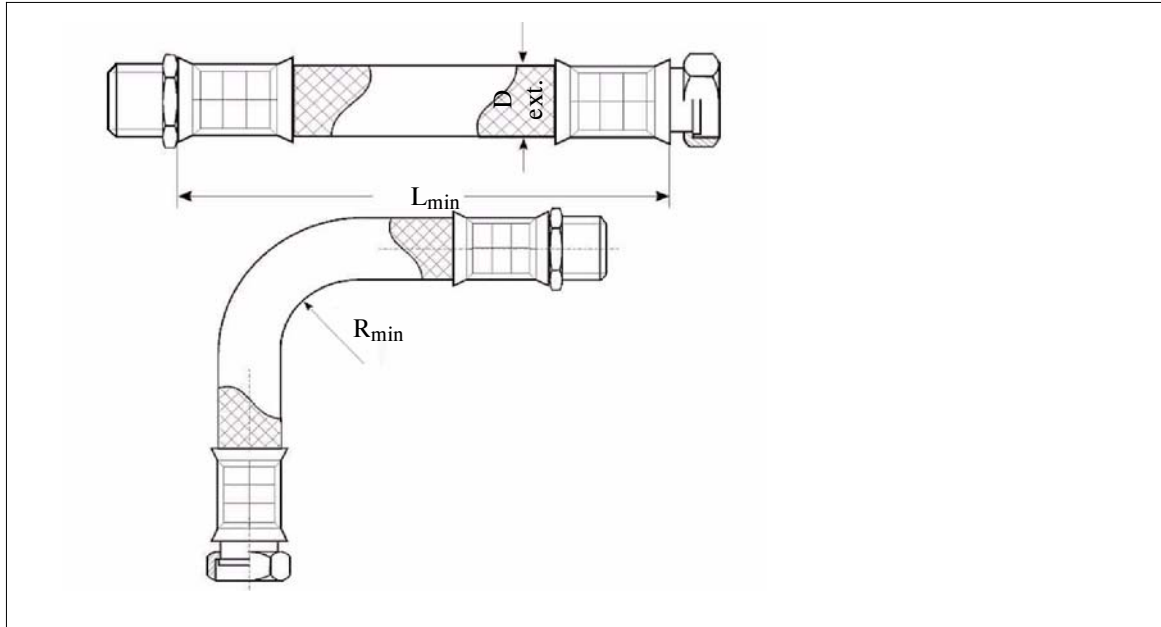
Warranty will only apply if the following instructions are observed and if installation is performed in compliance with DIN-EN regulations. In particular, corrosive, electrochemical, and bacteriological charges are to be excluded taking appropriate preventive measures.

correct	incorrect

- 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.

Original Instructions for Installation, Use and Maintenance
Active Chilled Beam Type HDC

Section: AG-B 213.1e
 Page: 21
 Date: Feb. 2010



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)

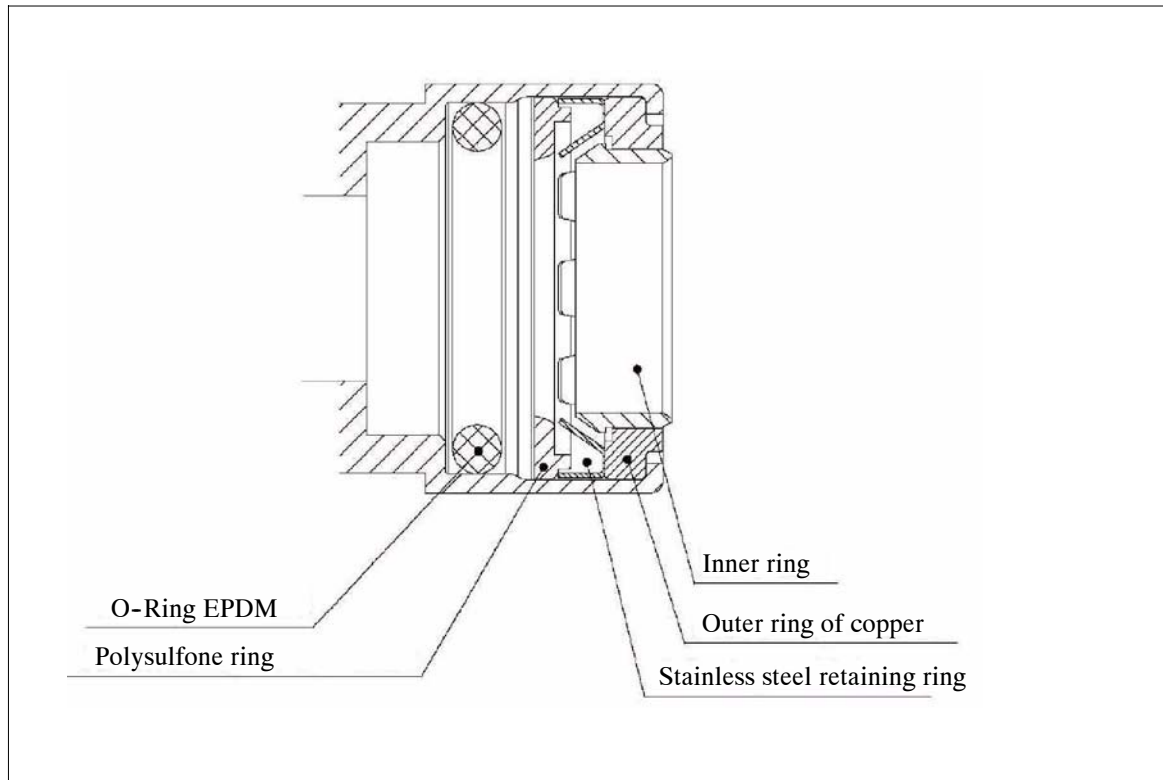
ND hose	D _A	PN [bar]	R _{min}	L _{min}	L _{min} α = 90°	L _{min} α = 180°	L _{min} α = 360°
06/08	12	15	27	60	140	180	260
10	14	15	40	60	190	250	260
12	18	15	60	80	260	360	550
15	22	12	70	95	300	420	640
19	27	10	80	100	350	480	730
25	34	10	100	125	430	590	900
32	44	10	160	140	650	900	1400
40	54	6	180	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

4.3.2 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.

4.4 Primary Air

Connection

All units are provided with primary air sockets with a (normally) 100 mm outer diameter (special versions: DN 80 or 125). Sockets are in general provided on both sides so that your mechanic can change the connection side, if required (floor units: connection on front).

If specifically required, air connection may also be provided on the bottom side.

Connection may be performed using e.g. flex tubes fixed with pipe clips. When installing the flex tubes take special care to ensure free movement of the clamping lever. Absolutely avoid any contact between the clip and the lever.

It is, therefore, recommended to use a thin flexible hose and to install the clip in a way to ensure a 2 mm minimum clearance between clamping screw and clip.

Primary air side pressure balance

One way to adjust the primary air volume is the use of a throttling device which may be integrated in the socket as original equipment (KLI 100/1) or retrofitted as an accessory (KLXG 100/1).

If supplied as an accessory (KLXG) it must be installed and will thus increase the constructional length.

Primary air flow control

When dimensioning the units the nozzle pressure and the corresponding flow rate are defined through selection of the nozzles with their specific diffusion section.

The air volume meets the calculated data if the set nozzle pressure is present. It is, therefore, highly recommended to random check the unit's nozzle pressure during the adjustment at start-up. The air volume cannot be measured directly at the socket. It requires sufficient measuring length. If the expected output is not achieved while water side conditions are alright, it means that something is wrong with the nozzle pressure since the nozzle sections are very precise as lab measurements have documented.

Use a pressure gauge to determine the pressure by inserting a hose into the nozzle.

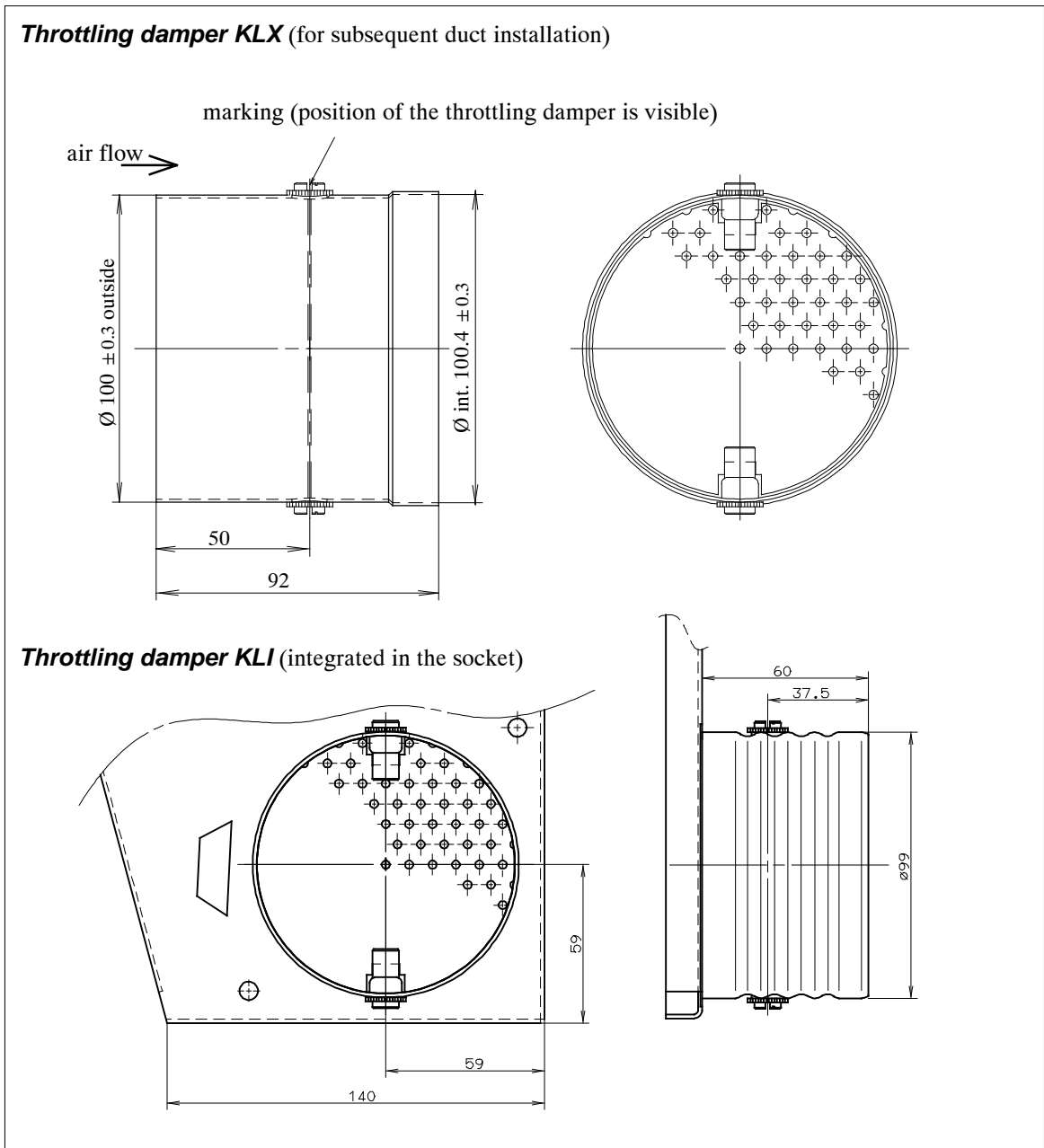
If subsequently changing the air volume is a requirement, nozzles may be replaced (simply remove the plastic nozzles and carefully insert and fix the new nozzles).

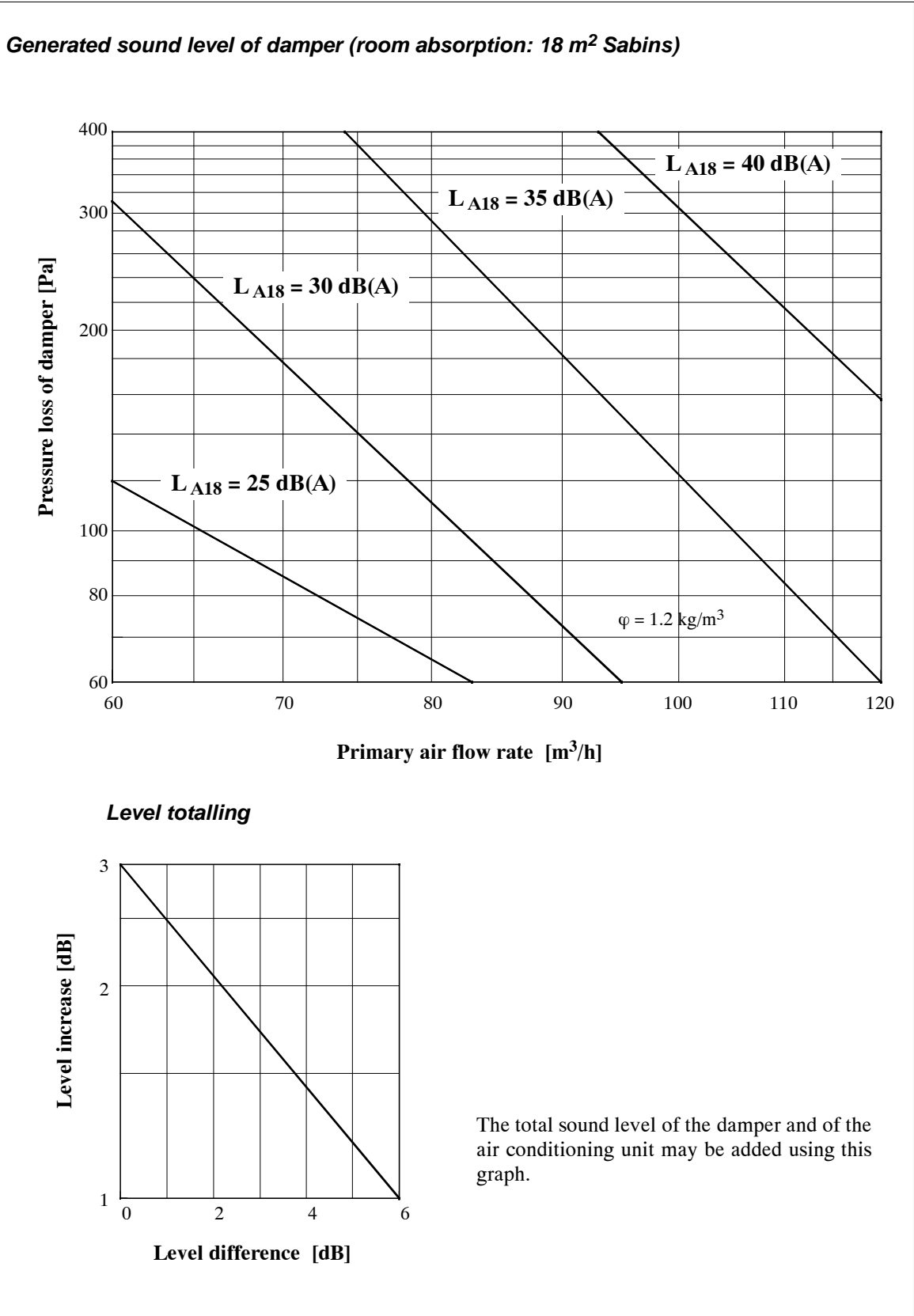
Throttling Damper for Primary Air - Type KLX / Type KLI

If required, a throttling damper for adjusting the primary air volume may be provided at the inlet socket of the unit (type KLX 100/1, delivered in a separate bag for subsequent installation) or may be factory-installed in the socket (type KLI) (please specify in your order). However, this device for adjusting the air volume should only be used if other means have failed to result in pressure compensation, (balancing should be as far from outlet as possible).

The dimensions of the throttling damper are given below. The free area is 10.7 %.

The diagram on the following page shows the throttling damper resistance and the sound level area. The noise perceivable in the room may be determined by adding the noise of the air conditioning unit and the noise of the damper, using the graph for level totalling.





4.5 Check after Installation

Mechanical Check

Having completed the installation the unit is to be checked for any mechanical damages. Reminders 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.

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 Two-pipe and Four-pipe System

Here a few explanations regarding **two-pipe systems** and **four-pipe systems** for easier understanding:

The **two-pipe system** has 2 water connections (supply and return) with one heat exchanger for either heating or cooling, or for heating in winter and cooling in summer.

The **four-pipe system** has 4 water connections (2 each for supply and return, one each for warm water and cold water) with 2 heat exchangers or one heat exchanger with separate water circuits, for heating and cooling.

6.4 Selecting the Room Temperature

Set the room temperature controller to the desired value (usually in the range's center). If, after a certain time, you consider this too cold turn the knob in direction of "warmer". If considered too warm, turn the knob in direction of "cooler".

In order to find the right setting meeting your personal needs adjust in small steps and allow sufficient time for walls, ceilings, floors, and furniture to adapt (about 1/2 to 1 hour).

There is a wide variety of temperature selectors with scales in ° C, in temperature steps such as 1 to 10, or only "warmer" - "cooler" (+1-, red for warmer, blue for cooler etc.). For more information check with the installation manufacturer.

6.5 Excessive Noise and Draught

It might occur, especially after cleaning, that the units display increased noise and draught. It means that primary air duct nozzles have loosened or fallen off. Reinstall or replace them. Some units on the same pipe run may be blocked (e.g. polluted nozzles) resulting in the unit being operated with an increased primary air volume. In that case have the unit repaired.

6.6 Out-of-service Times

If the primary air system is not to be operated for a longer period of time in summer, shut off the cold water supply to the induction units' heat exchangers to avoid condensate formation, overflow, and thus damages.

6.7 **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.

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, is not recommended since the greater number of settings can only be performed in the factory using special equipment.

6.8 Troubleshooting and Corrective Action

6.8.1 Room Temperature is not achieved

Trouble	Source	Action
No air movement at the unit's outlet grille	No primary air supply	Activate primary air supply unit, check fire protection flaps and, if necessary, open. It is imperative to investigate, find, and remedy the cause for the flaps closing. In case of shut-off flaps for entire floors and duct runs, check and, if necessary, open. Check control.
No valve spindle movement when actuator motor signal is being changed.	Actuator is stuck	Set the temperature controller from "max. hot" to "max. cold" and vice versa, may be the actuator can thus be released. If unsuccessful, remove actuator, clean resp. change it.
Unit is heating or cooling, but set temperature is not achieved	Window is open	Close window
No air movement, poor air movement or only perceivable in parts of the diffuser grille	Suction opening or diffuser opening blocked or severely impeded	Remove objects from grilles and openings.
Water supply lines to the unit and heat exchanger are at room temperature	No cold or hot water supply	Ensure cold and hot water supply, eliminate cold or hot water-related problems, open shut-off valves to supply
No control signal is applied to the (valve) actuator, or it is not the one according to setting (Actuator performs wrong or no movement). Refer to separate instructions for control	Deficient control	Have unit checked by a specialized technician replacing or repairing broken parts

Original Instructions for Installation, Use and Maintenance
Active Chilled Beam Type HDC

Section: AG-B 213.1e
 Page: 31
 Date: Feb. 2010

Trouble	Source	Action
<p>Only poor air movement perceivable on the induction unit diffuser</p>	<p>Filter or heat exchanger polluted</p> <p>Primary air nozzles polluted and, thus, partly blocked</p>	<p>Replace filter, clean heat exchanger</p> <p>Replace nozzles* or clean, if possible (dust deposits are usually hard to remove which makes replacement, in general, more economical than cleaning). This may be performed through the unit neck without need to remove the induction unit by simply lifting the diffuser grille and the protective grille located underneath. It is imperative to check the filter in the primary air center. Check for existence of a 2-step filtering with the 2nd step meeting at least EU 7, better EU 8 requirements according to DIN 24185, Part 2.</p>

* Order replacement nozzles with LTG Aktiengesellschaft stating the 7-digit LTG order number, unit type, and nozzle assembly.

These data may be taken from the oblong type plate.

Please contact LTG Aktiengesellschaft to first check since replacing older nozzles for new ones may not always be possible without certain restrictions.

6.8.2 Condensate formation

LTG induction units are **not** designed for operation with continuous condensate formation. For a short-term condensate formation, units are provided with a condensate tray underneath the cooler which may also be connected to a drainage system. In case this condensate tray is not connected to a drainage system it may serve for short-term collection of condensate which will again evaporate from the tray. LTG Aktiengesellschaft does not recommend units without condensate drainage system unless either the windows cannot be opened or, in case the windows can be opened, all induction units of the corresponding room are automatically water-side disconnected. If there is no such device, users must reliably disconnect the induction units water-side whenever windows are opened and if cooling is required since the condensate trays would overflow when the unit is operated with a long-term condensate formation resulting in considerable damages to the building and equipment.

If, during operation, condensate is overflowing close open windows without delay. If all windows were already closed units must be disconnected. Immediately catch any overflowed water and remove to minimize potential damages to building and equipment.

Then investigate and remedy the cause of such excessive condensate formation.

Trouble	Source	Action
Increased indoor humidity, increased condensate formation	Window open	Close window, continue unit operation
No air movement at the induction unit outlets	Primary air unit failure	Switch unit back on and remove trouble, if any (see specific instructions)
Diffused air temperature at the induction unit diffuser outlets is extraordinarily high, in the primary air center no or too little water precipitation on the cooler	No or too little cooling of the primary air unit, therefore no or too little dehumidification	Check cooling system, remove trouble if any, check shut-off valves and dirt trap in the cold water ducts; if necessary, open valves and clean dirt traps; check control including valves and actuators; if necessary readjust parameter settings; repair/replace broken parts
Increased indoor air humidity perceivable	Considerable moisture sources in the room	Remove moisture sources If impossible, temporarily shut off unit water-side
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
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

6.9 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
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.

Qty.	Ident-No.	Description	Minimum order quantity
1	1014486	Heat exchanger, size 1000 for 4-pipe	1
1	1008632	Heat exchanger, size 1000 for 2-pipe	1
1	1015015	Flanged frame, standard, according to RAL	1
1	1015231	Recessed frame, standard, according to RAL	1

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.