Compact-Line

Compact air handling units

Installation, operation and maintenance manual

| CL-2022-5-1-V-EN-1.0

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Content

1.0 GENERAL INFORMATION

1.1 Information about manufacturer

These instructions apply to all C-line air handling units supplied by Systemair d.o.o., Slovenia.

Manufacturer and supplier details:
Systemair d.o.o.
Špelina ulica 2
2000 Maribor
Slovenija
Responsible person: Anton Zupančič

Service and technical support:
Systemair d.o.o.
Brnčičeva 41c
1000 LJUBLJANA
Slovenija
tel: + 386 1 200 73 81
fax: + 386 1 423 33 46
e-mail: servis@systemair.si

1.2 Unit naming

The meanings of the different elements of the KA air handling unit code are provided in the following schematic.

Main range designation

KA HSI-CL3000-C-R-50F-TB2-L2

Air leakage class	L1 L2	
Thermal bridging class	TB2	
Panel execution	50F	50 mm fully glued
Service side	L R	Left Right
Design	C	Stacked
Size	1500, 3000, 4500, 6000, 8000	
Subrange name	CL	Compact-Line
Installation	I O	Indoor Outdoor
Execution	S	Standard
Profile type	H	THOR 50 mm profile
Range name	KA	Series

Sub range designation

CLP 3000-H-I-C-R-L2-C

Control system	C -	With control system No control system
Air leakage class	L1 L2	
Service side	L R	Left Right
Design	C D	Compact (in one piece) Devided
Installation	I O	Indoor Outdoor
Connections	H V	Horizontal Vertical
Size	1500, 3000, 4500, 6000, 8000	
Heat exchanger type (heat recovery)	P R	Plate (counter flow) Rotary
Subrange name	CL	Compact-Line

1.3 General description

C-line air handling units (hereinafter referred to as CL) are preconfigured modular devices that may be manufactured for a number of combinations of different crosssection dimensions, functional unit assemblies, material combinations, sizes and types of control. Depending on the particular version, CL air handling units are designed for comfort ventilation and ventilation of industrial premises.
The variety of available dimensions, shapes and constructions of CL air handling units allows them to be installed indoors on the floor or on a platform; they may also be installed outdoors.
The casing of CL air handling units consists of a thermally insulated and sound-insulated aluminum frame, thermally insulated and sound-insulated sheet covers at the bottom, top and sides, a door on the service side. CL air handling units made in one piece have a steel base frame to which legs can be fitted if so required. CL air handling units made in several pieces are without base frame and are always delivered with legs fitted directly to the bottom under the casing. The thickness of the CL air handling unit casing wall is 50 mm.

CL units are normal type of air handling unit. All the interior and exterior casing walls are made of ZM-coated galvanized steel sheet as the standard. The whole bottom of the unit is sealed on the inside between the frame and panels. Thefastening material is of galvanized steel quality.

CL units have a standard built-in electrical control cabinet and control system elements as standard. The units are fully wired in the factory. All components and all elements of the control system located on the basic part of the CL unit are connected to the terminals in the electrical control cabinet, and appropriately marked free terminals are prepared for the other elements to be installed on site. The operation of the control system is factory tested, and the test report, including the preset values and the electrical plan of the unit, are always supplied with the unit.

Casing technical properties according to EN 1886

Mechanical stability	D1
Thermal transmittance factor	T2
Thermal bridge factor	TB2
Casing air leakage class (+700 Pa)	L2; optionally L1
Casing air leakage class (-400 Pa)	L2; optionally L1
Filter bypass leakage class	F9

Casing sound attenuation

Casing with fully glued panels:

Hz	125	250	500	1000	2000	4000	8000
De dB	15	12	16	13	27	32	41

1.4 Declarations regarding the air handling unit

DECLARATION OF CONFORMITY	DECLARATION OF INCORPORATION
The declaration of conformity is issued for the device supplied together with the control system and for which manufacturer also makes first commissioning.	The declaration of incorporation is issued for a device supplied without a control system. **The declaration of conformity for this device must be issued by the company which assigned the device and put it into operation.**
CE	

Caution

The declaration of conformity or the declaration of incorporation shall be attached separately to each device.
If the customer makes changes or adds components to the device, he must issue a new EC declaration of conformity and a new CE sign for the machine.

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ES IZJAVA O SKLADNOSTI - primer
CE DECLARATION OF CONFORMITY - example

Proizvajalec / Manufacturer

SYSTEMAIR d.o.o.
Špelina ulica 2, SI-2000 MARIBOR

Proizvod: / Product:
KLIMATSKA NAPRAVA / AIR HANDLING UNIT

TIP – MODEL: / TYPE:
.....
Tovarniška številka: / Manufacturers number:
.....

Ustreza zahtevam naslednjih predpisov:
Is in conformity with the provisions of the following regulations:

Direktiva Evropske skupnosti o varnosti strojev **2006/42/EC**
Machinery Directive **2006/42/EC** 95/16/EC

Direktiva Evropske skupnosti o nizki napetosti **2014/35/EU**
Low Voltage Directive **2014/35/EU**

Direktiva Evropske skupnosti o elektromagnetni združljivosti **2014/30/EU**
EMC Directive **2014/30/EC**

in izpolnjuje zahteve naslednjih standardov:
and comply with the requirements of the following standards:

SIST EN ISO 12100:2011, SIST EN 60335 -2 – 40 : 2003, SIST EN ISO 13857: 2008, SIST EN 1037 : 1999+A1:2008, SIST EN 60034-1 : 2010, SIST EN 14121: 2009

Izjava o skladnosti velja le za pogoje, za katere je klimatska naprava dobavljena in vgrajena v objekt skladno s priloženimi navodili za vgradnjo. Zavarovanje ne velja za komponente, ki so dodane in za aktivnosti, ki so na napravi izvedene naknadno.

The declaration applies only for the conditions it was delivered in and installed in the facility in accordance with the included installation instructions. The insurance does not cover components that are added or actions carried out subsequently.

Leto, ko je bil CE znak nameščen na proizvod:
Year of affixing of CE mark:

Ljubljana, 05.08.2016

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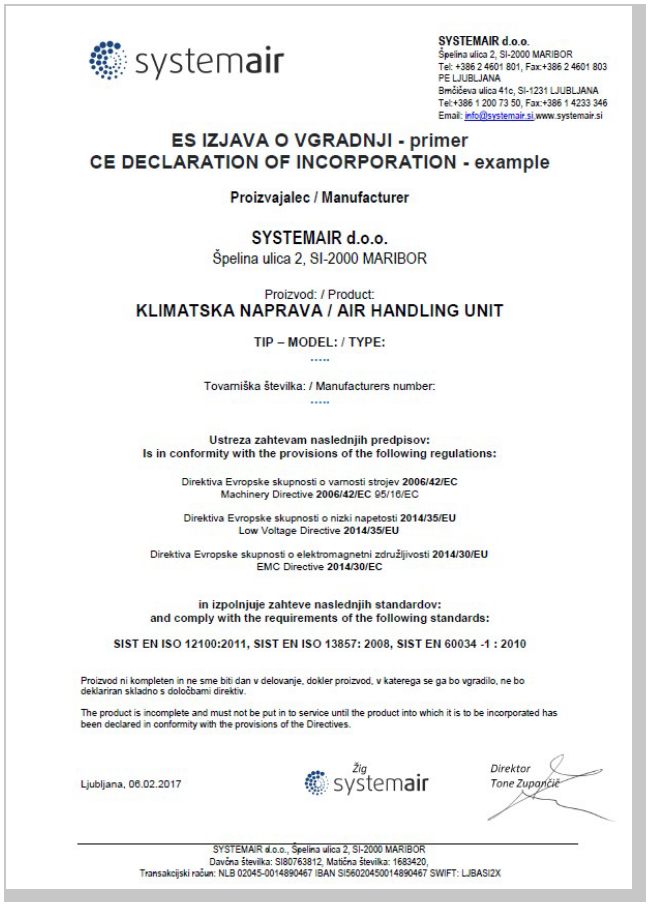
Direktor
Tone Zupančič

SYSTEMAIR d.o.o., Špelina ulica 2, SI-2000 MARIBOR
Davčna številka: SI80763812, Matična številka: 1683420,
Transakcijski račun: NLB 02045-0014890467 IBAN SI5602045001489046 7 SWIFT: LJBASI2X



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ES IZJAVA O VGRADNJI - primer
CE DECLARATION OF INCORPORATION - example

Proizvajalec / Manufacturer

SYSTEMAIR d.o.o.
Špelina ulica 2, SI-2000 MARIBOR

Proizvod: / Product:
KLIMATSKA NAPRAVA / AIR HANDLING UNIT

TIP – MODEL: / TYPE:
.....
Tovarniška številka: / Manufacturers number:
.....

Ustreza zahtevam naslednjih predpisov:
Is in conformity with the provisions of the following regulations:

Direktiva Evropske skupnosti o varnosti strojev **2006/42/EC**
Machinery Directive **2006/42/EC** 95/16/EC

Direktiva Evropske skupnosti o nizki napetosti **2014/35/EU**
Low Voltage Directive **2014/35/EU**

Direktiva Evropske skupnosti o elektromagnetni združljivosti **2014/30/EU**
EMC Directive **2014/30/EC**

in izpolnjuje zahteve naslednjih standardov:
and comply with the requirements of the following standards:

SIST EN ISO 12100:2011, SIST EN ISO 13857: 2008, SIST EN 60034 -1 : 2010

Proizvod ni kompleten in ne sme biti dan v delovanje, dokler proizvod, v katerega se ga bo vgradilo, ne bo deklariran skladno s določbami direktiv.

The product is incomplete and must not be put in to service until the product into which it is to be incorporated has been declared in conformity with the provisions of the Directives.

Ljubljana, 06.02.2017

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Direktor
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Example of declaration of conformity	Example of declaration of incorporation

1.5 Dangers and warnings

- The intended use, operational conditions, inlet and outlet parameters, composition of the functions, dimensions, shape, place of installation, dimensions of shipment units, method of transport and handling at the place of installation, as well as the control system variant and other specifications, are determined and confirmed at the time of placing the order.
- A CL air handling unit may only be installed, inspected, commissioned and maintained by qualified professionals, and such professionals must observe both the statutorily prescribed and local safety and other legal regulations in force at the time of the installation, operation and maintenance of the unit.
- In the process of installing, commissioning and maintaining the CL air handling unit, the functional elements of the manufacturer's instructions must be followed.
- Prior to any intervention in the unit, the entire unit must be isolated from the power supply by means of the main switch on the electric control cabinet.
- Upon the completion of work on or inside the unit, the unit must be cleaned and restored to the condition prior to the intervention.
- The instructions, electric diagrams and other data must be kept accessible to the personnel operating the unit.
- The CL air handling unit may only be used for the intended use and under the operating conditions determined in the

confirmation of the order according to which the unit was manufactured.

Caution

Any other use deviating from the so-determined intended use relieves the manufacturer of any obligation or liability.

- Systemair d.o.o, the manufacturer of the CL air handling unit, does not accept any liability in the event the directions indicated in these instructions are not adhered to while installing, commissioning, operating, testing or maintaining the air handling unit, or in the event of any alterations to the unit's electrical or mechanical elements by any person without the manufacturer's consent, unless such alterations have been explicitly allowed by the manufacturer. Any unauthorized intervention in the unit will also result in the warranty being void.
- The CL air handling unit manufacturer, Systemair d.o.o., does not accept liability for any damage suffered by persons or property as a direct or indirect consequence of non-compliance with the provisions of these instructions, or non-compliance with the safety at work regulations or other legal regulations in force.
- The CL air handling unit manufacturer, Systemair d.o.o., reserves the right to modify these instructions without prior notice or this giving rise to any obligation.

Caution

It is highly advisable that the commissioning of the unit is done after all construction and cleaning of the construction site is finished.
Commissioning of the unit before this might result in the filters, unit and duct system being affected by dust.

1.6 Symbols

Functional section symbols

	Fan section		Heat recovery section with plate heat exchanger
	Heating coil section – water		Heat recovery section with rotary heat exchanger
	Heating coil section – electric		Silencer
	Damper		Cooling coil section with water cooler
	Filter section		Cooling coil section with direct gas expansion
	Electric cabinet		Droplet eliminator

Danger and warning symbols

	Warning – danger of injury due to rotating parts		The frost protection cover must be freely removable - pay attention to the pipe installation!
	Warning – danger of contact with live electric components		Safety chain on the inside of the door. Return the chain to the safety position before closing!
	Warning – hot surfaces		Non-compliance with the instructions indicated in the warning signs may result in risk of injury and property damage.
	Opening doors during operation prohibited		Connection of electrical connectors.
	Turn off the main switch prior to opening the casing		

1.7 Personnel requirements, assignments and responsibilities

QUALIFICATION	DECLARATION OF INCORPORATION
Truck driver	Responsible for transporting the device from the factory to the system owner. Must have a truck driving test. Makes sure that all elements are fixed and properly supported during transportation. Is responsible for any damage done prior to unloading of the cargo.
Forklift driver	**Responsible for moving pallets with modules. Must have a forklift driving test and written permission from the system owner.**
Crane driver	**Responsible for moving pallets and modules from the transport vehicle and to the place of operation. Must have a crane driving test, be mentally and physically able to operate the crane independently and prove to the system owner the required type of skill.**
HVAC technician	**Is responsible for the installation and completion of all professional work in connection with mechanical installations. Must have in-depth knowledge and skills related to the required mechanical systems. Must have experience with the work in question, understand the potential hazards associated with the work and how to avoid it.**
Electrician technician	**Is responsible for the installation and completion of all professional work in connection with electrical installations. Must have in-depth knowledge and skills related to the required hardware systems. Must have experience with the work in question, understand the potential hazards associated with the work and how to avoid it.**
Network administrator	**Designs, installs, configures and maintains IT infrastructure in companies or organizations.**

1.8 Operation and control

The unit shall be furnished for fully automatic operation. The modifications of parameters via the hand-held terminal buttons and screen must be limited in the control system. An alternative may be a controller linked to a central monitoring system that enables the selection of parameters via a PC, tablet or smart phone.

Preferably, CL units are provided with a complete built-in control system at the factory including the commissioning, training of operating personnel, and issuing the control system operating and maintenance instructions. The manufacturer issues the declaration of conformity for the entire unit and provides the CE label.

Exceptionally, it is possible to supply a CL unit without a built-in electrical cabinet and control system. The complete control system is to be implemented by the customer; the customer is also responsible for commissioning the unit, providing the control system operation and maintenance instructions, training the operating personnel, issuing the declaration of conformity for the entire unit, and affixing the CE label on the device.

1.9 Annexes, responsibility and intended use

Drawings, diagrams, instructions for use, maintenance and repairs

The dimensions, shape and technical data of the unit are made separately for each device. They are printed on paper and delivered to the customer upon delivery of the device in a separate envelope or sent electronically by email.

Following instructions and documents are constituent parts of the unit:
• User manual (transport, installation, commissioning and maintenance, security warnings), • Data from the selection program – confirmed by the customer when ordering, • Position of the component in the device – taped on each supplied section.

Supplied with delivery:
• Declaration of conformity or declaration of incorporation, • Additional drawings for assembly of added elements, • Instructions for use of the built-in functional components (which are not described in these instructions), • Unpacking instructions, • List of enclosed non-installed equipment, • Quality protocol.

Supplied with delivery if a unit with a control system is ordered:
• Electrical plan of the built-in electrical control cabinet, • Instructions for use of the built-in controller or control system, • Control test, • Electric control cabinet protocol.

The responsibility of the operator for the operation, control and maintenance of the unit

Upon the commissioning and acceptance of the operating unit from the installer, the unit operates fully automatically. The operating indications and error indications are displayed via the control system display and signal lights on the electric control cabinet, or on the separate hand-held terminal. As an alternative, the controller may be linked to a central monitoring system and new parameters can be set via a PC, tablet or smart phone. Operators do not need to open the service doors in order to operate the unit.

Intended use and application options

- CL air handling units are designed to transport and treat air in a temperature range from -20 °C to +80 °C.
- At altitudes up to 1,000 m above sea level, the normal operating range of the fans and their electric motors is up to +40 °C.
- CL air handling units for **comfort** ventilation of premises such as offices, classrooms, hotels, shops, apartments and similar
  locations where a high level of comfort is required.
- **Indoor** CL air handling unit versions for installation indoors – on the floor or on a platform.

- **Outdoor** CL air handling unit versions for installation outdoors.

Uses other than the intended use

Caution

In the event the unit needs to operate at temperatures exceeding +40 °C or at altitudes exceeding 1000 m above sea level, such must be specified in the order. Similarly, any other conditions deviating from the conditions of intended use must also be specified in the order.

- At altitudes above 1000 m above sea level and at temperatures in the range from +40 °C to +60 °C, a reduction in the electric motor capacity should be taken into account, in accordance with the instructions of the motor manufacturer.
- In cases where the air temperature exceeds +60 °C, special versions of the fans and its electric motors should be applied.
- Indoor versions of CL air handling units designed for indoor installation cannot be installed outdoors.
- CL air handling unit cannot be used in environments requiring corrosion protection levels exceeding those provided by the materials specified as standard and determined in accordance with the minimum requirements of the relevant standards, or by the materials and solutions specified by the customer at the time of ordering the unit.
- The unit's inside-outside pressure differential may not exceed 2000 Pa.
- Prior to commissioning the unit, all the ducts must be installed and all the guards and protection devices must be in place to prevent access to the rotating parts of the fans.
- During operation, all the service doors must be closed and locked.
- Do not operate the unit without installing filters.
- Do not operate the unit when external dampers are in closed position.

2.0 INSTALLATION

2.1 Loading and transport

CL air handling units may be delivered as a single compact package (shipment unit) or in several compact packages (shipment units) to be assembled on site. They are delivered on transport pallets or on base frames. Loading, unloading and moving shipment units on site may be carried out with a forklift or a crane, by applying appropriate hoisting slings.

Individual compact packages (shipment units) or the parts thereof must be protected so as to prevent damage thereto during unloading or transport due to tipping over, sliding or uncontrolled drops from the transport vehicle, and to prevent threats to the safety and health of exposed persons.

On site, individual compact packages or assemblies of the CL air handling unit should be moved to the mountingsite with all the necessary guards and protection devices (stabilizers along diagonals, wooden supports or transport pallets under the base frame, protection foils, etc.).

Caution

Movement of the equipment during transport can only be carried out via the bottom base frame and transport pallet, without applying any pressure on the casing.

Unloading and moving with a forklift

The forklift forks must be long enough to avoid damage to the bottom surface of the shipment unit and to prevent the shipment unit from falling off the forks. In the case of shipment units with base frames, the forks must extend from the front side to the back side of the frame section.

In the case of shipment units without base frames but mounted on transport pallets, the forks must extend long enough beyond the unit's center of gravity to prevent the risk of the unit falling off the forks.

Unloading and hoisting with a crane

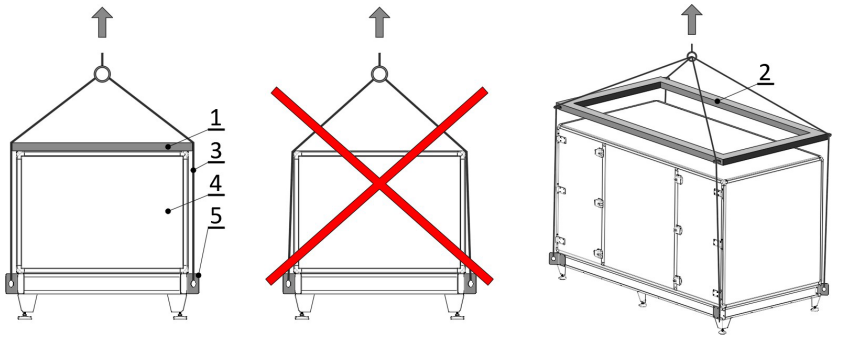
A compact shipment unit of an CL air handling unit may only be hoisted with a crane applying a base frame or a transport pallet positioned under the unit.
Appropriate hoisting beams with sufficient distance between the hoisting points should be used so as to prevent the hoisting slings from damaging the casing, the gutter or the handles, hinges, piping connections or other accessories (pressure gauges, pressure transducers, etc.) on the service side, or the electric control cabinet.

Delivery units with base frame

Lifting brackets are provided for lifting on the base frame of each individual unit. For lifting, use suitable lifting straps and use brackets with sufficient lifting grip spacing or use spacer supports long enough to ensure that the straps do not press against the casing of the delivered unit.

Caution

The lifting brackets are only removed when the units are in place, just before joining. In the event of relocation, the brackets must be reassembled.



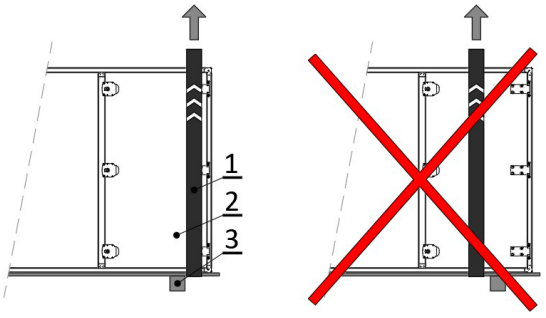
1 Spacer
2 Spacing frame
3 Lifting strap
4 Unit casing
5 Lifting brackets

Delivery of units without a base frame

Apply appropriate lifting stripes and lifting beams with sufficient distance between the hoisting points or adequate spacer supports in order to prevent the stripes from pressing against the shipment unit casing.

Caution

Place the lifting straps under the pallet on the outside of the support and secure them against slipping off the pallet.



1 Lifting strap
2 Units casing
3 Pallet

High and short shipment units

Some shipment units, e.g. a section with a rotary heat exchanger, a heat exchanger, etc., may be of significant height with very small length. Extra attention should be devoted to preventing such shipment units from tipping over. In the factory, such shipment units are protected so as to prevent the risk of their tipping over during transport and storage and endangering exposed persons.

Caution

High and short shipment units must be protected against tipping over. They may only be transported in the vertical position!

Storage before installation

Until installation, CL air handling units must be stored indoors, in dry areas, or be protected against the elements or other damage in some other appropriate manner. Remove the plastic foil wrapping and cover the equipment with a waterproof canvas or similar cover, and ensure adequate clearance between the cover and the equipment casing. This isnecessary to facilitate sufficient air circulation in order to avoid air humidity condensation and the consequent corrosionof the external surfaces.

Caution

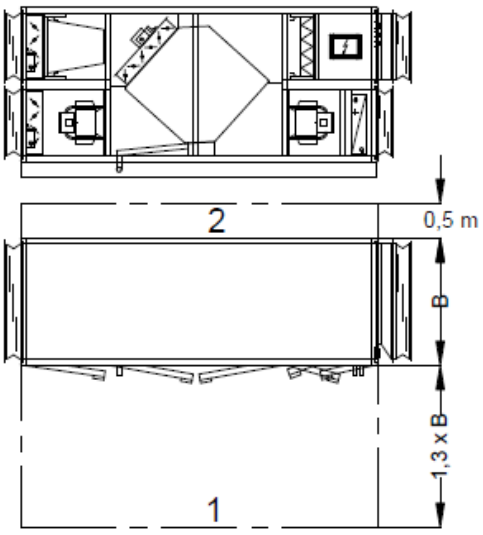
Until connecting the equipment to the ducting, protect the air inlet and outlet openings against the ingress of dust or other pollutants.
The allowable storage temperature ranges from -25 ° C to +55 ° C.

2.2 Mounting

Clear the space in front of and above the unit

In placing the equipment on the site, provide a clear area in front of the CL air handling unit in order to enable servicing, control and, when necessary, the drawing out and replacement of fans and heat exchangers; the width ofthe area should at least equal the external width of the air handling unit. In any event, the width of the clear area in front of air handling unit must not be less than 900 mm.
In order to facilitate the assembly and joining of shipment units, a clear space of at least 500 mm in width is also recommended at the back side of the unit.

1 service side; 2 back side; B unit width

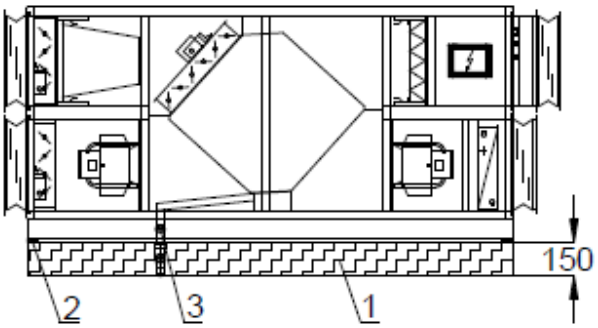


Caution

Where not practicable, the method of joining shipment units must be specified in the order.
The access to shipment unit joining points from the inside the unit casing must be specified.

The foundation for the unit

The supporting surface must be flat, horizontal, free of vibrations and capable of supporting the load created by the CL air handling unit. The weight of the entire CL air handling unit and its individual shipment units are listed in the technical documentation accompanying the equipment. Air ducts must be sound insulated and may not be fixed directly on concrete beams, structural timberwork or othercritical structural elements.
In the event of mounting on elevated support platforms,means for safe access and servicing must be provided. In the case of acoustically demanding buildings, the foundation slab should be isolated from the rest of the building structure by means of structural noise insulationof appropriate thickness, depending on the CL air handling unit mass and excitation frequency, as well as the insulation material's natural frequency.



1 Base 2 Anti-vibration pads 3 Drain siphon

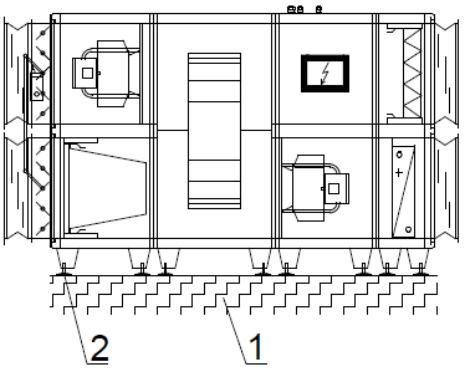
Caution

The minimum foundation height is determined by the elevation of the drain syphon for the sections (namely 150 mm).

Mounting of unit without a foundation

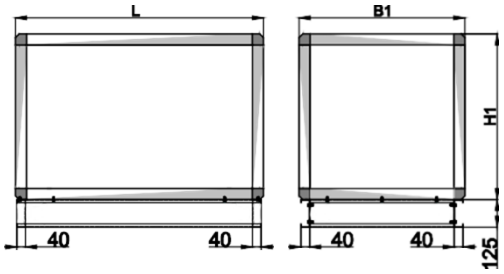
The foundation may be substituted by purpose-built legs with a level-adjustment screw system with an adjustment range of 30 mm.

1 Base 2 Leg



Base frame

The base frame is always fixed to the bottom of the CL air handling unit in the factory. The frame construction depends on the version and size of the CL air handling unit. The dimensions and construction are furnished to the customer at the time of delivery in printed form in a separate envelope or in electronic form by e-mail.
Standard frame height is 125 mm.

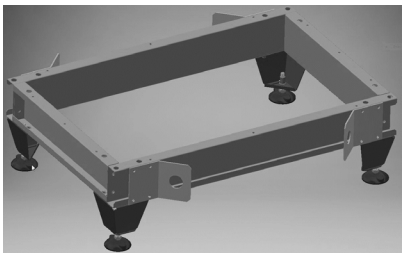


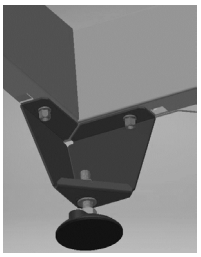
Supporting legs and adjustable feet

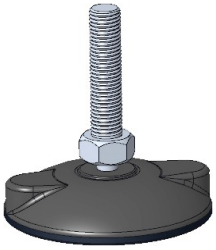
Caution

Supporting legs with adjustable feet are not designed for pulling or pushing of device across the ground. All movements require lifting.
Before installing and connecting the unit, the transport screws must be removed and replaced with a adjustable feet.

Supporting legs are made of galvanized sheet metal and depending on the execution already mounted on the supporting frame (at one piece execution) or directly on the casing (at divided execution). To protect the adjustable feet, a transport screw M12 x 30 mm is mounted on the leg during transport. This screw is remove after insertion and installation in to the site and replace with the screw of the adjustable foot.
The screw on the adjustable foot is adjustable in the range of 30 mm.







Mounting of an outdoor-type unit

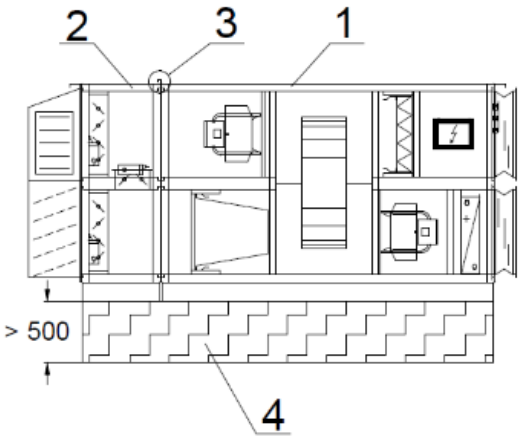
Mount the CL air handling unit on a foundation of adequate height. In determining the foundation height, observe all the factors that may affect the operation of the unit: the mounting site, the depth of snow cover, requirements for the intake air quality, the position of the intake and extract duct connections, the types of connectors for heat exchangerpiping, the laying of electric cables, etc.

Caution

The foundation (4) height for an outdoor unit should not be less than 500 mm.

Design the foundation so as to protect the unit or sections thereof against sliding or tipping over under wind loads. To this end, carry out a check of wind forces.

The roof elements are already installed on the basic CL unit in the factory. In the case that a mixing section is added, the joint (3) between the basic unit (1) and the mixing section (2) must be sealed at the installation site. All necessary material is included in the delivery.



The joints between the intake and extract air ducting connections and the ducts must be watertight. In the case intake air into and extract air out of the air handling unit run through ducts, the joints between the duct connections and the ducts must be watertight, as well.
For CL air handling units installed on the roof or at an elevation, provide safe access with a platform if necessary. The platform in front of the unit service side or around the unit should be constructed so as to avoid the build-up of snow infront of the intake air opening in winter, which might lead to excessive snow ingress into the unit.
The platform must ensure safe climbing to and descending from the unit and safe maintenance.

Caution

The openings for the outdoor and exhaust air are protected by a mesh with a grid 12 x 12 mm inside the rain hood. Depending on the weather conditions at the installation site, ice can form on the entire cross-section of the opening. The condition of the mesh should be checked periodically and, if icing has occurred, the ice should be removed manually.

2.3 Assembly

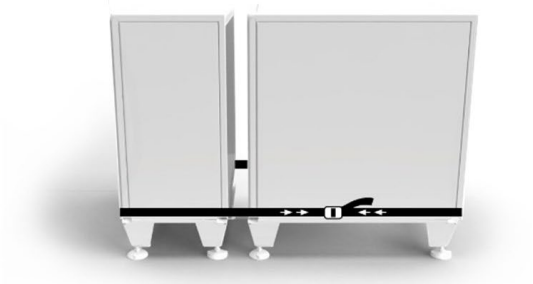
2.3.1 Joining of unit modules

- Deliver the shipment unit to a location as close as possible to the mounting location. With a manual forklift, hoist the shipment unit so as to align its bottom with the foundation's top surface.
- Slide the shipment unit into its position on the foundation, using stripes or some other appropriate method. You may need to apply heavy or extra-heavy furniture hauling trolleys.

Caution

Fastening connections are not intended for pulling of modules together. Pulling is done by means of slings.
Tightening is required on the bottom of the unit near base frame or bottom profiles.

- Apply sealing tape on the shipment unit's joining surfaces (connecting profiles). Slide and press the shipment units together by means of slings. We recommend slings with brackets, applied so as to prevent damage to the casings.


- Tighten the thread connections on all the joining elements.

Joining of corner reinforcements


Fastening material

For one connection following fastening material is always supplied:
- 1x Screw DIN 933 Zn M10 x 40
- 1x Nut DIN 934 M10 Zn
- 2x Washer DIN 9021 10,5 Zn

The supplied material is the same whether it is a large or small reinforcement.

Joining of connecting elements

Fastening material

For one connection following fastening material is always supplied (above left):
- 1x Screw DIN 933 Zn M8 x 40
- 1x Nut DIN 934 M8 Zn

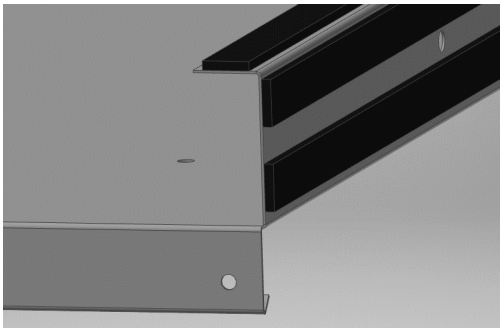
For one connection following fastening material is always supplied (above right):
- 1x Screw DIN 933 Zn M8 x 70
- 1x Nut DIN 934 M8 Zn
- 2x Washer DIN 9021 8,4 Zn

2.3.2 Mounting of roof

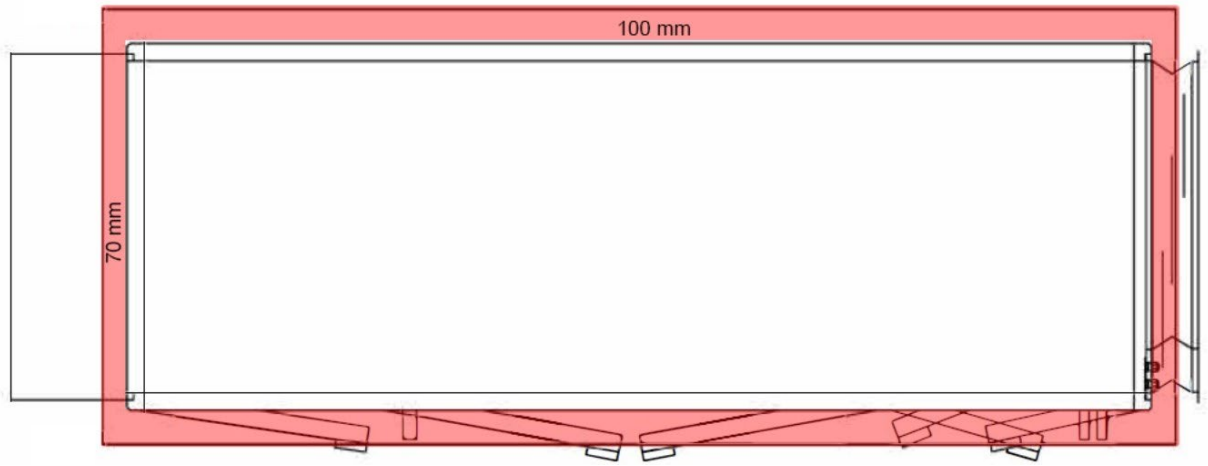
Caution

If possible, avoid walking on the roof with point force during installation. Use boards for more uniform force distribution
Make sure that the screws are always screwed perpendicular to the drilling plane and that the correct torque is used.

- Remove the protective foil from the roof and panels.



- Apply the supplied 15 x 3 mm gasket 3 times in length to each part of the roof bent upwards in a "C" shape.
- After connecting the unit, apply the supplied 15 x 3 mm gasket on the entire device along the upper outer profiles (red area in the picture below).
- Lay parts of the roof on the connected unit and position them so that the roof leans over the unit 100 mm at the front and rear and 70 mm at the connections.



If a compact outdoor unit has been ordered, the roof is installed at the factory

- Fasten the roof parts together with supplied special screws with a rubber washer.

Fastening material

For one connection following fastening material is always supplied:

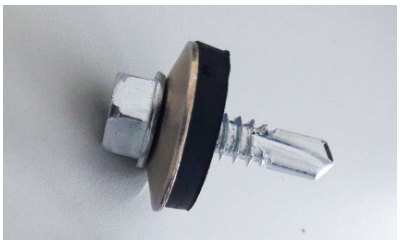
- 1x Screw DIN 933 A2 M6 x 25
- 1x Nut DIN934 M6 A2
- 2x Washer DIN 9021 6,3 A2 + Ø22/Ø6,7x3 EPDM

- Fasten the roof to the unit with supplied special self-tapping screws with a rubber washer.

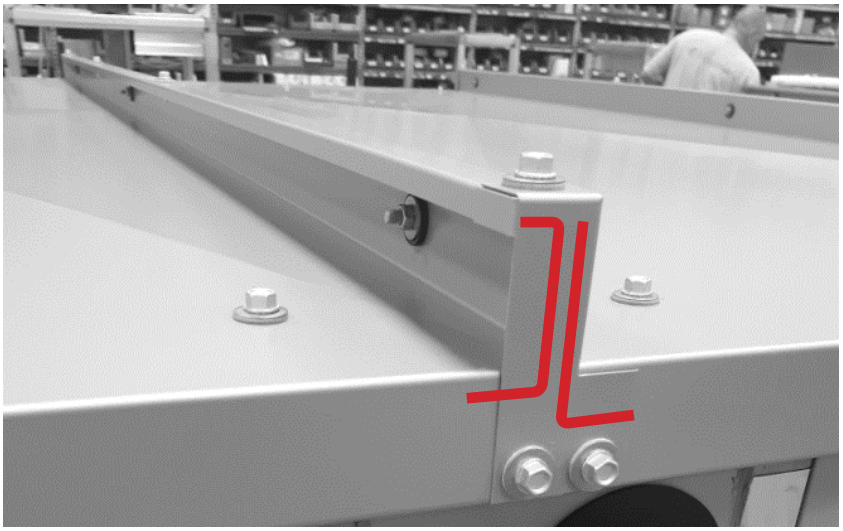
Fastening material

For one connection following fastening material is always supplied:

- 1x Screw DIN 7504 K 410 HP 6,3 x 25
- 1x EPDM 22



- Attach the sealing plates to the sides of the device where the two roofs meet and screw them on. Since the left and right pieces are different, make sure that the »L« from cover always looks in the other direction than »C« from the roof and the gap between the pieces of the roof is always covered.



- Clean the roof of the drill chips and dirt accumulated during installation.

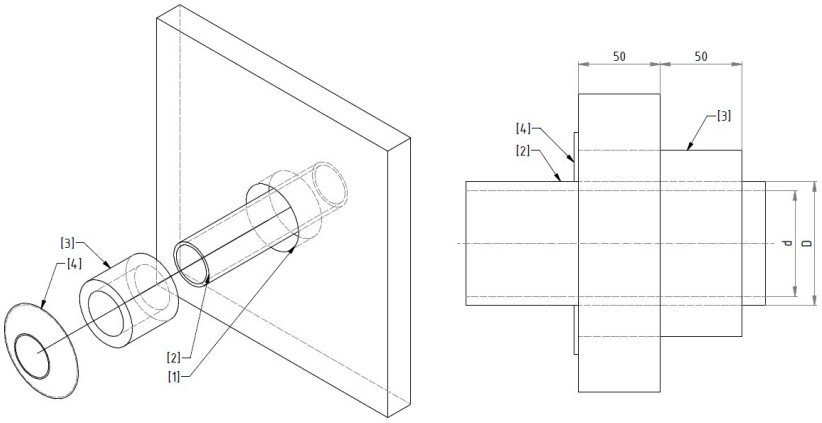
2.3.3 Connection of ducting

Caution

In all cases, the CL air handling unit must be connected to the ducting by means of flexible connections. Theflexible connections should always be almost fully stretched (50-90%).
In special cases, e.g. with vertical duct runs, buoyancy effects may induce an air flow that drives (rotates) a fan impeller even with the drive motor off. The rotating impeller poses a risk of injury during repair or maintenance works. This danger can be prevented by applying motor drives with counter-springs that automatically shut the dampers also in the event of power supply failure.

2.3.4 Connection of piping

Heat exchangers must be connected to the piping in a manner that enables the free opening of the service doors of adjacent sections and allows the dismantling and drawing out of heat exchanger components when necessary for maintenance or replacement purposes.
In order to allow condensate discharge from the pan in the event of negative pressure in the unit, respectively, or in order to prevent air leakage from the unit into the drain pipe in the event of positive pressure in the unit, a negative pressure or positive pressure syphon must be installed.



- [1] The point where you want to make a passage is to be located on the panel, and a hole is drilled through it with a hole saw with dimension as close as possible according to the table below (see the "Hole" column).
- [2] The piping is mounted through the hole as centered as possible.
- [3] An insulating tube is mounted on the pipe through the hole according to the table below (see column "Insulation"). The length of the tube must be at least 100 mm so that the pipe on the outside covers the panel flat and no insulation is visible. The inner tube faces inside at least 50 mm.
- [4] On the outside, a rubber rosette is attached to the tube according to the table below (see column "Rubber"). The rosette is glued to the panel from the outside and must be aligned with the panel.
- After connecting the external installation, the external pipes must be thermally insulated up to the rubber rosette.

Dimension		Coper tube			Steel tube		
DN		Insulation	Hole	Rubber	Insulation	Hole	Rubber
mm	inch	mm	mm	mm	mm	mm	mm
10	3/8	12 x 19	44	10/75	18 x 19	51	15/75
15	1/2	15 x 19	51	15/75	22 x 19	56	20/90
20	3/4	22 x 19	56	20/90	28 x 19	65	25/90
25	1	28 x 19	65	25/90	35 x 19	70	30/90
32	1 1/4	35 x 19	70	30/90	42 x 19	79	40/110
40	1 1/2	42 x 19	79	40/110	48 x 19	79	45/116
50	2	54 x 19	92	50/100	60 x 19	92	56/131
65	2 1/5	64 x 19	102	60/130	76 x 19	111	71/142
80	3	76 x 19	111	71/142	89 x 19	121	82/150
100	4	108 x 19	140	100/170	114 x 19	152	112/180

Connection of piping to hydraulic circuit

To connect the unit to the hydraulic circuit, apply threaded joints (fittings) or flanged joints for a nominal pressure of 16 bar, depending on the piping size.

The water heater connection pipes always run through the casing on the front. There is no space inside casing for mounting the valve, pump and other parts of the hydraulic circuit. In the case of external installation of the CL, the elements of the hydraulic circuit must be protected against external weathering or installed somewhere in the engine room and protected against frost.

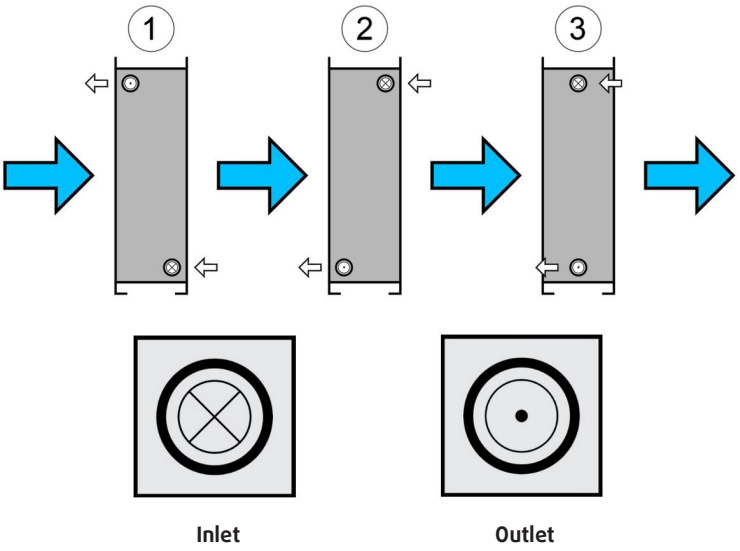
Make sure to connect the piping installations properly and observe the following:

- Heat transfer medium and air must move in a counter flow configuration.
- The pipes of the heating or cooling system and the connections of the direct evaporator must not impede the extraction of droplet eliminator as well as the antifreeze protection frame from unit, if it is installed in the immediate vicinity.
- When tightening piping connections, apply counter-force by means of an appropriate tool (a pipe wrench with pads) to avoid damaging the heat exchanger tubing system.
- Connect the heat exchanger by means of a dismountable threaded joint or a pair of flanges. Do not apply welding joints.
- Connect the heat exchanger two piping connections to the hydraulic circuit so as to ensure the air and heat transfer medium counter flow. The air inlet into the heat exchanger should be closer to the return pipe – in the case of both horizontal air flow and vertical air flow.
- The pump may be mounted in either the horizontal or in the vertical section of the piping; however, the pump axis must always be horizontal.
- The control valve may be installed in the supply pipe or return pipe; however, the distance between the supply pipe and the return pipe and the distance between the control valve and the bypass pipe should preferably not be less than 500 mm.
- Upstream from the heat exchanger supply pipe end, install a dirt trap to protect the control valve and the circulation pump.
- Downstream from the connection shut-off valve, as well as at the heat exchanger inlet and outlet, install temperature sensors.
- At the lowest point of the piping installation, install a heat transfer medium draining valve to facilitate heat exchanger draining.
- At the highest point of the piping system, make provisions for venting, to ensure an unobstructed flow of the transfer medium through the heat exchanger (as a rule, the heat exchangers are factory-fitted with venting / draining valve at the highest / lowest point of the collector or distribution pipe).
- Clean any filing debris and other dirt from the piping system

Caution

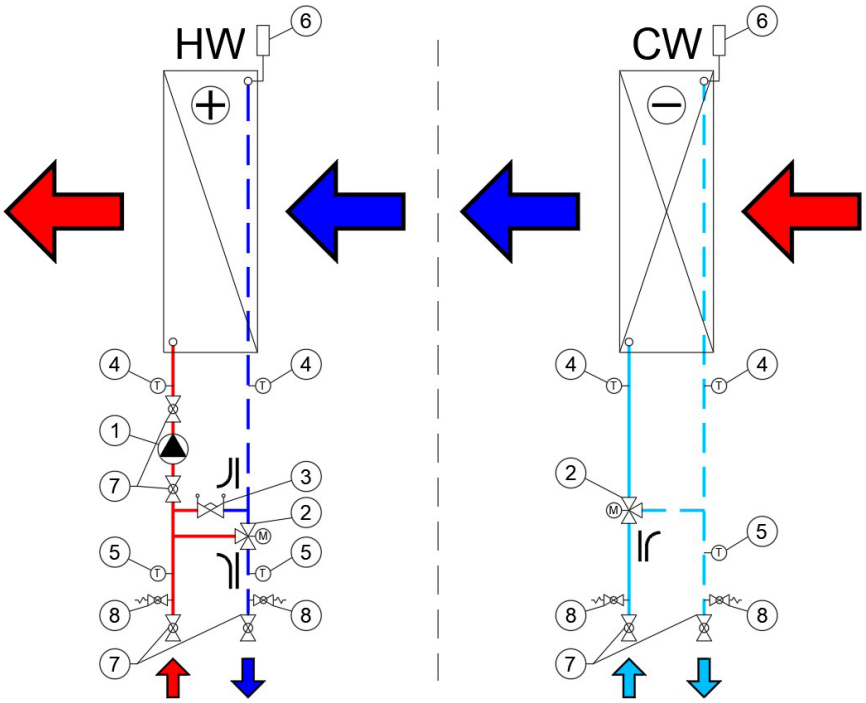
Improper connection of hydraulic circuit can result in lower heat exchanger efficiency.

The direction of the connections is mostly tied in the counter flow direction with respect to the direction of the air.
The figure below shows the connections according to the medium:
1 – Water (heating and cooling)
2 – Freon (heating, cooling or combination)
3 – Steam (heating)



Example of hydraulic circuit

HW – heating coil
CW – cooling coil
1 – circulation pump
2 – 3-way valve
3 – balancing valve
4 – thermometer
5 – thermometer
(optional)6 – venting valve
7 – ball valve
8 – drain valve



Caution

3-way valve for cooling hydraulic circuit can be mounted on the inlet or outlet.
It is important to install it with the required flow direction.

2.3.5 Connection of syphons

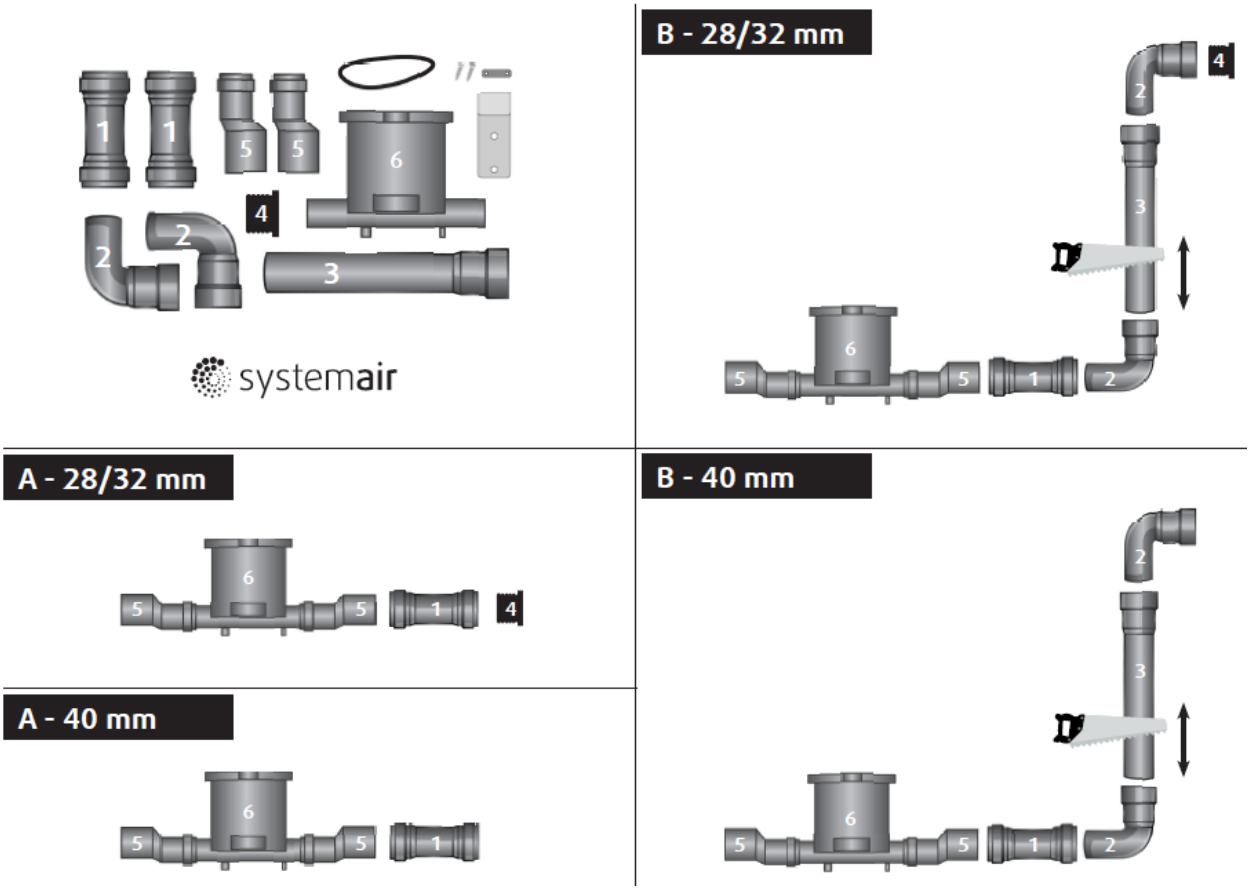
Caution

Discharge pipes from the negative pressure or positive pressure syphons may not be connected directly to the sewage plumbing. The discharge of condensate into sewage plumbing must be arranged so that water condensate freely discharges into a funnel-shaped collector and from there into the sewage plumbing.
In no event may a negative pressure syphon and a positive pressure syphon be connected to a common discharge pipe.
The syphon should be installed outside the unit. Discharge pipes must run such that they are pitched a min. 2% towards the outlet.
The installation of a smaller syphon can results in a sudden leakage of air and water.

Overpressure or under pressure may occur in the section where condensate drainage is equipped.

$Pa+ > P_0$	Section has overpressure
$Pa- > P_0$	Section has under pressure

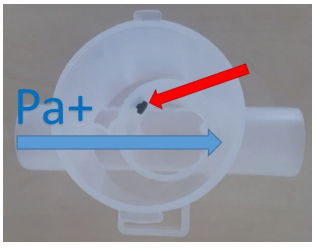
Set of siphon elements for connection to a drain pipe with a diameter of 28 or 40 mm in case of overpressure or under pressure:

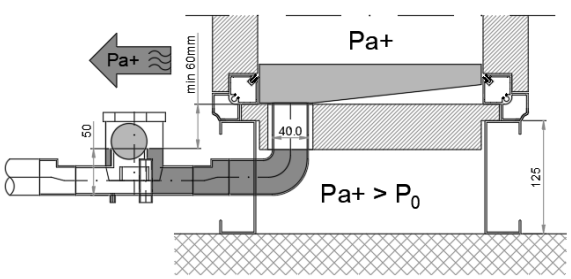


A quick calculation of the syphon height with respect to under pressure or overpressure:

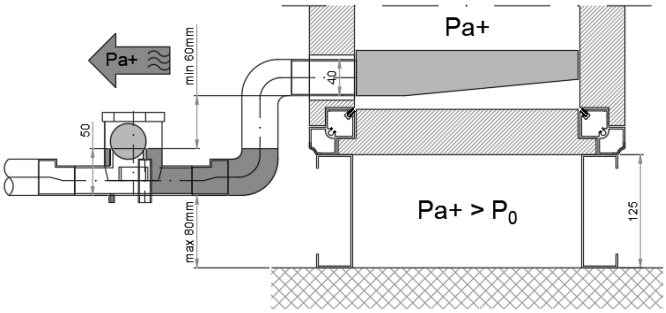
Overpressure connection

Caution	
Pa+	Shows direction of the drainage flow in Over pressure section.
	When syphon is connected in overpressure, the plastic black button has to be removed.





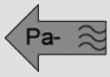
Drain over bottom panel

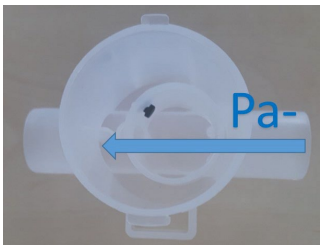


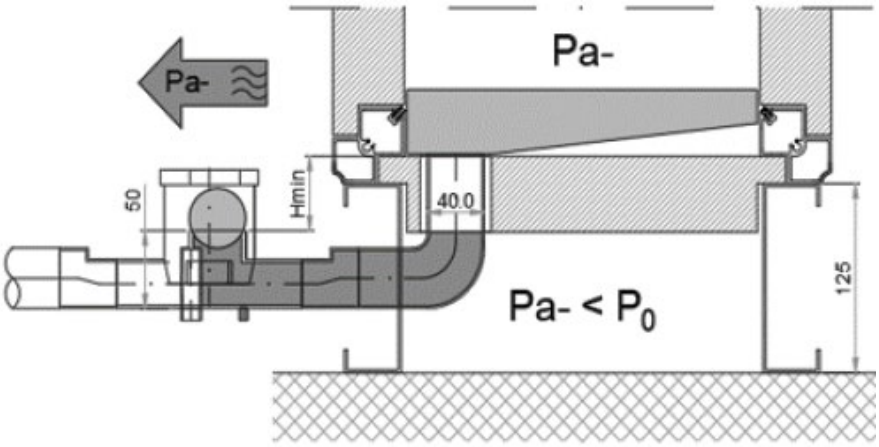
Drain over side panel

H_{min} is a minimum of 60 mm regardless of the overpressure in the device.

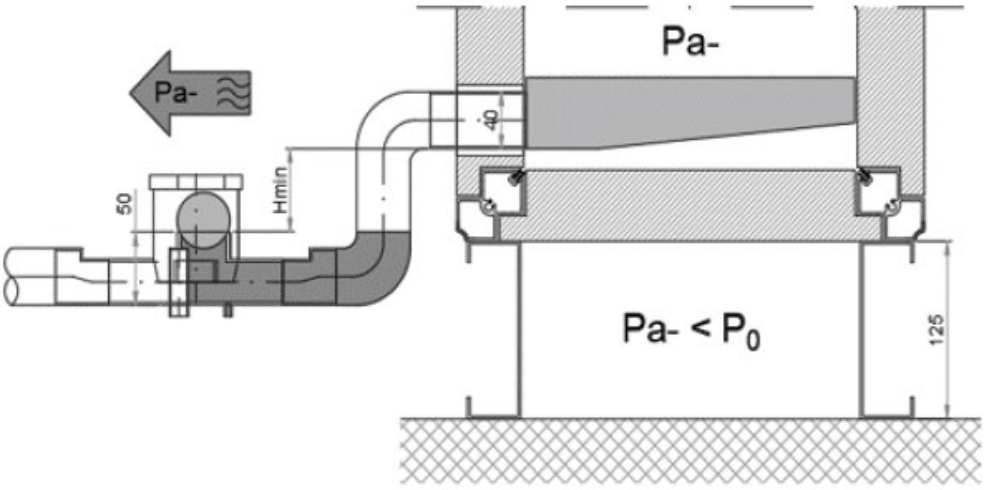
Under pressure connection

Caution	
	Shows direction of the drainage flow in Under pressure section.





Drain over bottom panel



Drain over side panel

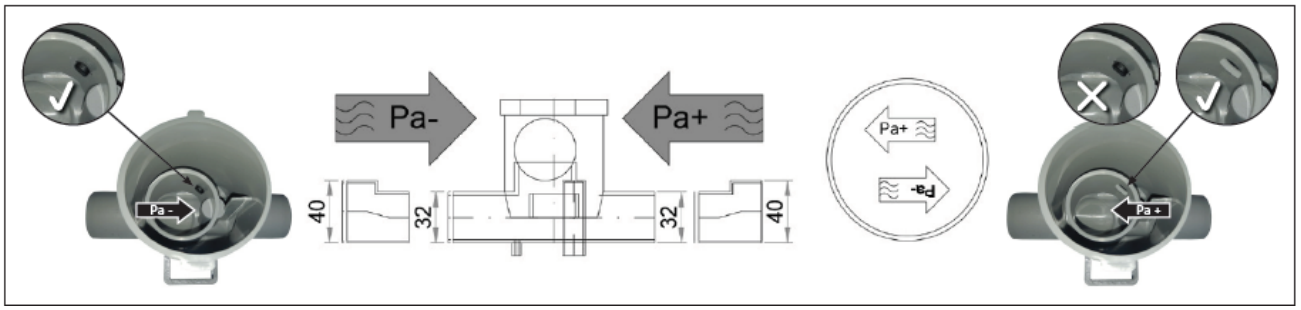
H_{min} depends on the maximum under pressure (Pa -) in the condensation section.

$$H_{min} = \frac{\Delta P}{10} + 10 = \frac{P_0 - Pa\_}{10} + 10\ [mm]$$

	Pa+ > P_0	Pa- < P_0
ΔP	H_{min}	H_{min}
Pa	mm	mm
200	30	30
400	50	50
600	70	70
800	90	90
1000	110	110
1200	130	130

Caution

It is important to watch how you turn syphon. The arrow on the cap should point in the direction of water outflow. In case of overpressure in the section, look at the arrow Pa +. In case of under pressure in the section, look at the arrow Pa -.



Caution

The syphon connection is suitable for a base frame of 125 mm at any time at overpressure, if only Hmin > 60 mm. In the case of a under pressure, the height of the base of 125 mm corresponds to under pressure of 700 Pa, or Hmin = 80 mm.

2.3.6 Connection of electrical installation

Electrical installations must be connected so as not to prevent or hinder the checking, servicing or replacement of functional components. Connection must be carried out in accordance with the design documents, the manufacturer's guidelines and the provisions of the technical regulations and standards.
The installer and user should be aware of the risks arising from lightning. The installation of overvoltage protection devices, which safely divert high voltage energy in the event of a lightning strike to earth, must be implemented in accordance with local regulations.
The penetration of power and control cables through the casings or internal partition walls must be carried out so as to ensure the protection of cables from damage in contact with sharp metal sheet edges. All the penetrations must be airtight. For penetrations of cables through partition walls and other structural elements inside the casing, membrane rubber fittings or cable glands of appropriate sizes must be applied. In most cases, the holes for such fittings are punched and the fittings are installed in the factory.
For penetrations of cables through casing walls, cable glands and custom-made extension pieces must be applied. For penetrations of cables through two casing walls, e.g. in the case of stacked or parallel units, apply combinations of rubber fittings and stiff PVC tubes or cable glands and custom-made extension pieces.
Power cord size according to the electrical power and length can be determined in the table below.

Caution

Electric power is provided for three-phase current.
Sensors, actuators and other external measuring equipment can be connected with a 0.75 m2 cable.

Power	Current	1.5	2.5	4	6	10	16	25	35	50	70	95
kW (3p)	A	mm²	mm²	mm²	mm²	mm²	mm²	mm²	mm²	mm²	mm²	mm²
1,5	2.3	100 m	165 m	265 m	395 m	-	-	-	-	-	-	-
3	4.6	33 m	84 m	135 m	200 m	335 m	530 m	-	-	-	-	-
4,5	6.8	30 m	57 m	90 m	130 m	225 m	355 m	565 m	-	-	-	-
6	9	25 m	43 m	68 m	100 m	170 m	265 m	430 m	595 m	-	-	-
7,5	11.5	20 m	34 m	54 m	80 m	135 m	210 m	340 m	470 m	630 m	-	-
9	13.5	17 m	29 m	45 m	66 m	110 m	180 m	285 m	395 m	520 m	-	-
10,5	16	14 m	24 m	39 m	56 m	96 m	155 m	245 m	335 m	450 m	-	-
12	18	-	21 m	34 m	49 m	84 m	135 m	210 m	295 m	395 m	580 m	-
13,5	20	-	19 m	30 m	44 m	75 m	120 m	190 m	260 m	350 m	515 m	-
15	23	-	-	27 m	39 m	68 m	105 m	170 m	235 m	315 m	460 m	630 m
18	27	-	-	23 m	32 m	56 m	90 m	140 m	195 m	260 m	385 m	530 m
21	32	-	-	-	28 m	48 m	76 m	120 m	170 m	225 m	330 m	460 m
24	36	-	-	-	-	42 m	67 m	105 m	145 m	195 m	290 m	400 m
27	41	-	-	-	-	38 m	60 m	94 m	130 m	175 m	255 m	355 m
30	45	-	-	-	-	34 m	54 m	84 m	120 m	155 m	230 m	320 m
36	55	-	-	-	-	-	45 m	70 m	92 m	130 m	190 m	265 m
42	64	-	-	-	-	-	38 m	60 m	84 m	110 m	165 m	230 m
48	73	-	-	-	-	-	-	53 m	74 m	99 m	145 m	200 m
54	82	-	-	-	-	-	-	47 m	65 m	88 m	125 m	175 m
60	91	-	-	-	-	-	-	-	59 m	79 m	115 m	160 m

Connection of electrical installations with quick connectors between modules at divided execution of CL air handling units

Before mechanically connecting the device housing to the factory-fitted electrical control cabinet, control system elements and wiring, connect the electrical cables and wires using the quick connectors. All connectors where the connectors need to be connected are marked with a sticker.
All cables, wires and also connectors are numbered. Connect the male and female part of the connector with the same number.
In the case of the unit with a factory-made electrical control cabinet, which is intended for independent, separate installation and the elements of the control system are installed and electrically connected in the factory, all cables or conductors are connected to terminals in a plastic electrical distribution cabinet located on the outside of the housing. All terminals are appropriately marked for connection to an electrical control cabinet. Prior to the mechanical connection of the supply units, it is also necessary to connect the electrical cables and wires at the joints of the supply units with the help of quick connectors.

2.3.7 Vibration and structure-borne noise

Reduction of vibration transmission to the building is possible by connecting the device to the duct network via flexible connections and by placing the device on appropriate vibration isolators.
To mitigate structural noise, we recommend using rubber or an elastomeric pads under the device. To keep unit properly alligned and working, carefully check the air conditioning alignment (opening and closing the door, connecting the modules).

Caution

We recommend that the anti-vibration pads, including the material and layout plan, are selected and determined through a professional company.

Preventing of structure-borne noise

Anti-vibration elements or anti-noise layer under the unit can help reduce the transmission of vibrations from the unit to the load-bearing structure:

- If the unit is to be installed on a flat floor without special sound insulation requirements on the structure, we recommend placing rubber or elastomeric pads between the unit and the base.
- For sound insulation, compare the requirement with the sound power level of the unit (see data sheet) and determine the necessary measures, advised to be determined by the acoustic engineer.

Risk of injury

The anti-vibration elements or the anti-noise layer must not affect the safety of the construction of the device. Ensure the following:

- Use a sufficient number of anti-vibration elements and anti-noise layers and install them correctly, otherwise the base may slip.
- Note that different unit modules differ in weight; this must not cause any height differences in the whole unit.

3 COMMISSIONING AND MAINTENANCE

Caution

The unit commissioning may only be carried out by a qualified professional. Before starting up the air handling unit, check all the electrical connections and unit control settings.

3.1 General instructions

Before maintenance

- The power supply must be switched off completely and the service switch must be switched off and locked.
- It is necessary to check whether all rotating parts are stationary (fan, belts, rotary heat exchanger, blinds).
- It is necessary to check whether the temperature in the heat exchangers and hydraulic systems has adapted to the ambient temperature.
- The unit must not be in an explosive atmosphere during service.
- Protective clothing and footwear are required (helmet, mask for changing filters, gloves and shoes...).
- All service accessories is required: tools, service switch lock key...
- As the entire electrical installation is switched off during servicing, external, separate lighting is required.
- A special key is required to open and close the service door.

During maintenance

- Check the condition of the section. In case of dirt or corrosion, immediate cleaning is required.
- Check the gasket at the contact of the panel or door and casing. If the gasket is damaged or detached, it must be completely removed, the surface cleaned and gasket replaced.

After maintenance

- Clean any dirt from maintenance.
- Check that all mechanical and electrical components are in place and securely fastened.
- Make sure that no one is in the danger area of the device or its surroundings.
- Make sure you have removed all tools or other objects from the device.
- Close the service door and lock the handle locks.

3.2 Schedule for control and maintenance

ACTIVITY	Time interval (months)						COMMENT
	1/2	1	3	6	12	24	
CASING							
Inspection of soiling, damage and corrosion					X		
FAN							
Inspection of soiling, damage and corrosion				X			
Clean the fan parts in contact with air					X		
FILTER							
Check for a pressure drop		X					
Inspection of contamination and damage			X				
Replace the filters					X		
PLATE HEAT EXCHANGER							
Inspection of soiling, damage and corrosion			X				
Inspect the sealing of the air partition walls			X				
Carry out a functional test of the syphon.			X				
Cleaning				X			
ROTARY HEAT EXCHANGER							
Check the drive operation.			X				
Inspection of soiling, damage and corrosion					X		
Inspect the sealing of the air partition walls					X		
CONTROL DAMPER							
Inspection of soiling, damage and corrosion					X		
WATER HEATING COIL							
Inspection of soiling, damage and corrosion			X				
WATER COOLING COIL							
Inspection of soiling, damage and corrosion			X				
Carry out a functional test of the syphon			X				
Cleaning				X			
DIRECT EXPANSION (DX)							
Inspection of soiling, damage and corrosion			X				
Carry out a functional test of the syphon			X				
Cleaning				X			
DROPLET ELIMINATOR							
Inspection of soiling, damage and corrosion			X				
Carry out a functional test of the syphon			X				
Cleaning				X			
SOUND ATTENUATOR							
Inspection of soiling, damage and corrosion					X		

Caution

Hygienic inspection is organized according to hygienic requirements.
Cleaning the unit with cleaning agent always includes rinsing with water, drying and if necessary, disinfection.
Inspection and cleaning of the component with added water droplet eliminator also includes inspection and cleaning of eliminator.

3.3 Fan

Caution

See also section 3.1 General instructions.

3.3.1 Electric motor connection

Caution

The motor is factory set.

- Prior to Commissioning, check the congruence of the connection parameters as stated on the electrical consumer nameplates or in the electrical diagram posted in the air handling unit control cabinet with the parameters of the mains power supply installation.
- Electric motor connection may only be carried out by a qualified professional in accordance with the applicable technical regulations and standards and with the electrical installation design documents for the site where the air CL air handling unit comprising the fan section is to be installed, as well as with the electric motor manufacturer'sinstructions. Electric motors must be grounded.
- If a fan section within an CL air handling unit is not fitted with a repair switch, connect the electric motor to the mainssupply via a device that allows the isolation of all the poles from the mains supply, with a clearance of 3 mm between the contacts in the open state.
- Integrate an automatic switch (contactor) and thermal guard in the electric motor energising circuit.
- Electric motors up to 7.5 kW may be started directly – their wiring is indicated on the motor nameplate.
- Electric motors must be fitted with thermal guard, which is to be selected by taking into account the nominal current and which must protect the motor against current overloading and the resulting overheating.

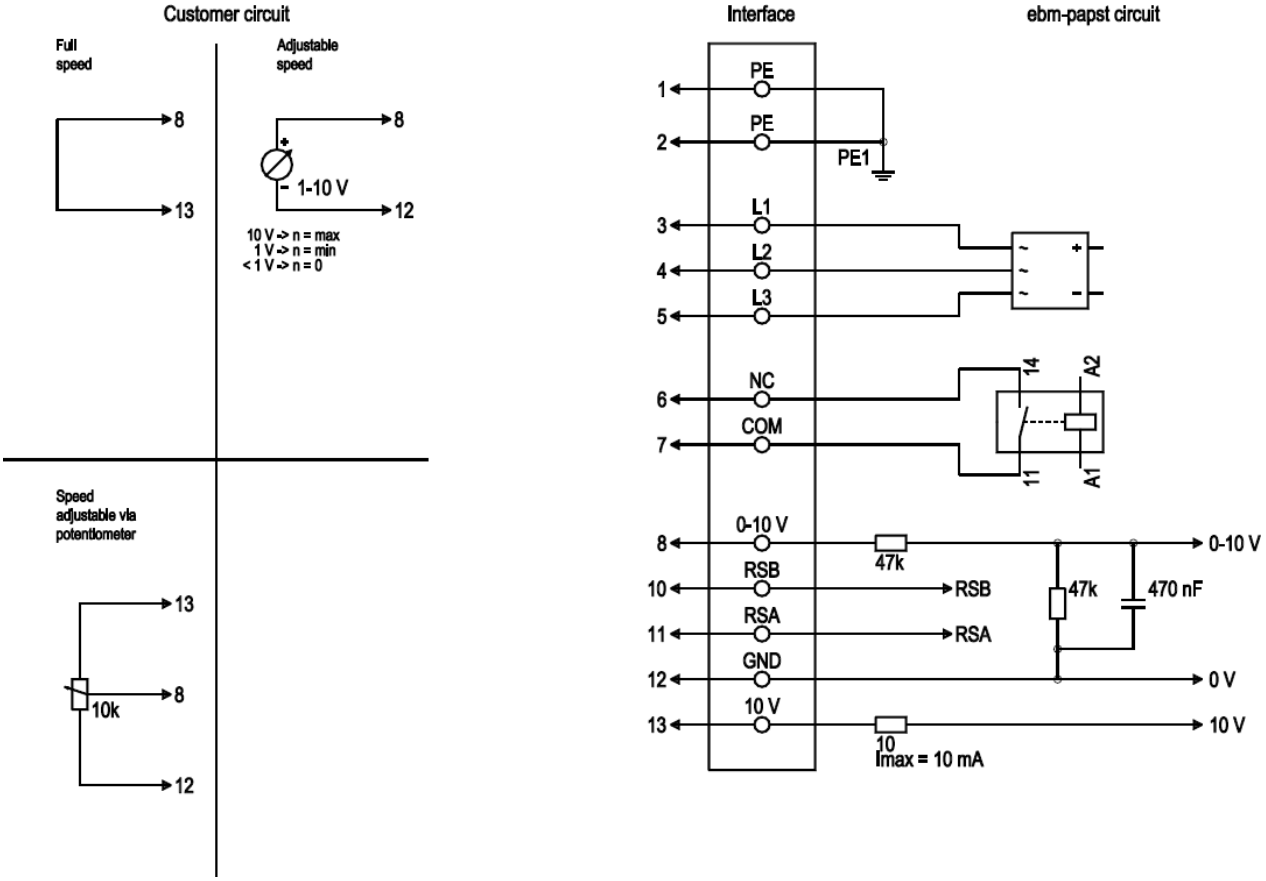
Motor connection

- Step 1: First, connect the grounding cable
- Step 2: Connect the wires with staples in a star or delta connection. See the nameplate for more information.

- Use a screened / armored motor cable to comply with EMC emission specifications (or install the cable in metal conduit).
- Keep the motor cable as short as possible to reduce the noise level and leakage currents.

3.3.2 Connection of EC fan

Wiring diagram



1,2	PE	green/yellow	Protective earth
3	L1	Black	Power supply
4	L2	Black	Power supply
5	L3	Black	Power supply
6	NC	White 1	Status relay, floating status contact, break for failure, contact rating 250 VAC / 2 A (AC1) / min. 10 mA; reinforced insulation on supply side and basic insulation on control interface side
7	COM	White 2	Status relay, floating status contact, break for failure, contact rating 250 VAC / 2 A (AC1) / min. 10 mA; reinforced insulation on supply side and basic insulation on control interface side
8	0-10V	Yellow	Analog input (set value), 0-10 V, Ri = 100 kΩ, adjustable curve, SELV
10	RSB	Brown	RS485 interface for MODBUS, RSB; SELV
11	RSA	White	RS485 interface for MODBUS, RSA; SELV
12	GND	Blue	Reference ground for control interface, SELV
13	+10	Red	Fixed voltage output 10 VDC, +10 V ±3%, max. 10 mA, short-circuit-proof power supply for external devices (e.g. pot), SELV

Check before commissioning

- The mounting of the fan on the frame and the mounting of the electric motor on the tensioning bracket,
- the parallelism of the motor drive shaft and of the fan shaft; in the case of deviation, adjust the electric motor by means of the tensioning bracket, and once the adjustment has been completed, firmly tighten all the screws,
- the mounting of the rotor on the shaft and its free rotation in the casing,
- the mounting of the vibration isolators,
- the correct installation of the grounding,
- the correct installation of the electrical connections and their operation (fuse sizes, contactors, thermal protection),
- for the presence of any tools or other foreign materials in the section,
- the mounting of all the covers and doors.
- Thermal protection is essential for the safety of the electric motor, therefore, before starting the motor, check if it has the correct settings for the nominal current of the motor, and check its operation. Once this test has been successfully completed, seal the thermal protection device.

Commissioning

- Before checking the correct fan installation and operation, switch off the repair switch of the fan section in which you intend to intervene, or alternatively switch off the main switch on the air handling unit electric control cabinet, and lock the switch in the off position, to break the current supply circuit to the drive electric motor.
- Prior to starting the electric motor, remove any mechanical interlocks on vibration isolators.
- The fan must not be operated if the door of the fan unit is open.
- By means of a pulse start, check the correct direction of the fan rotation. The rotor must rotate in the direction of the arrow on its casing. In the event of an incorrect direction of rotation, switch two phases on the contactor. The procedure for checking the direction of rotation must be carried out with the fan section door closed.
- After the first start, measure the electric motor current. If the electric current is less than or equal to the nominal current, you may proceed to set up the air volume flow rate.
- The air volume flow rate is adjusted by changing the position (opening or closing) of the control dampers. Once the air volume flow rate is set up, measure the electric motor current again. An electric current lower than or equal to the nominal current indicates the correct operation of the fan section. If the motor current exceeds the nominal value, shut down the electric motor and establish the cause of its incorrect operation.

Causes and corrections

The possible causes are the following: an incorrect motor connection, an incorrect supply voltage, an incorrect supply frequency, incorrect electric leads, an incorrectly selected size of the electric motor, incorrect pressure drops, an excess air volume flow rate.

In order to correct the air volume flow rate, control voltage of the EC motor has to be adjuted. In order to correct the pressure levels, adjust the control dampers.

After remedying all the causes of incorrect operation, measure the electric motor current again. An electric current lower than or equal to the nominal current indicates the correct operation of the fan section.

For rooms with an excess supply air, any failure of the intake air fan must result in the automatic shutdown of the discharge air fan, too, in order to prevent any reversal of the air flow from the room to the neighbouring rooms. If excess discharge air is required, the interlock logic of the preceding sentence is reversed.

In the case of the use of air recirculation in hygienic-type air handling units, check whether there are any hygienic-toxicological concerns associated with the contamination of the supply air by harmful gases, i.e. whether the use of air recirculation is allowable at all.

Caution

During operation, all the covers and service doors of the section must be kept closed at all times. The fan may not operate with the fan section door open.

Prior to any intervention in the fan section, switch off the repair switch on the fan section in which you intend to intervene, and lock the switch in the off position, in order to break the current supply circuit to the drive electric motor.

Proper maintenance is also a prerequisite for safe unit operation. Regularly check the tightness of all the threaded joints, electrical connection terminals, grounding and section casing sealing.
Overloads and excessive temperatures may damage the bearings and lead to excessive operating noise. Replace damaged bearings.
With proper maintenance, approx. 20,000 hours of service life of the bearings can be achieved at a minimum; the specific service life value is quoted by the fan manufacturer.

Check monthly

- The mounting of the rotor on the shaft,
- the tightness of all the threaded joints,
- the rotor run,
- the vibration isolators of the fan-electric motor assembly,
- the flexible connections, and
- the shaft bearings; if axial shifts of shafts in the bearings are detected, consult the fan manufacturer and remedy
- the fault.

3.4 Filter

Caution

See also section 3.1 General instructions.
By appropriately setting the CL air handling unit control system, make sure that the relative humidity in thesecond filtering stage does not exceed 90% and the relative humidity in the first filtering stage or in thestage upstream thereof does not exceed 80% for three consecutive days.
Irregular replacement of filter cartridges causes dust to enter unit and its components. As a result, the effectiveness of the operation is reduced and damage to the device and system can occur.

- For smooth operation, inspect the filter medium and replace the cartridges in good time. The frequency of changing the filter medium depends on the air flow, air pollution and the degree of filtration of the filter medium.
- Replace all the filters of a particular filter stage or filter unit at the same time. Replacement of an individual filter in a filter stage is only allowable in the event of filter damage, provided that no more than 6 months have passed from the previous replacement.
- The pressure difference in front of and behind the filter medium must not be more than 30 Pa above the recommended final value.
- Following insertion into the filter frame, filter cassettes must not be damaged.
- When replacing the filters, be careful not to contaminate the new filters with dust from old filters or in any other manner.
- Store new filters such that they are protected from dust and against damage.
- Do not use filters whose shelf life, as specified by the filter manufacturer, has expired.
- Only use filters that are in compliance with the EN 16890-1 standard, as demonstrated by the manufacturer.
- Handle contaminated filters in accordance with environmental protection regulations.
- In the case of outdoor-type air handling units, the filter in the first filtering (pre-filter) stage may become clogged by snow in extreme weather conditions. Filters may also freeze. In such an event, immediately clean or replace the filters.
- In order to measure the pressure drop, apply the following instruments: A U tube, inclined tube manometer or an electronic manometer with acoustic or light signalling. Connect the manometers to the measurement ports upstream of and downstream of the filter, which are provided on the service side on the section external wall, except in the case of outdoor-type air handling units, where these ports are provided inside the casing.
- Keep the inner and outer surface of the inspection glass clean. If you notice fouling, thoroughly clean the glass immediately.
- Insert only clean and undamaged filters.

Comparison of minimum filter classes between EN 779 and ISO 16890 and values of recommended final pressure drops:

EN 779	ISO 16890
G4	coarse 60%
M5	ePM10 60%
M6	ePM2,5 50%
F7	ePM1 60%
F8	ePM1 75%
F9	ePM1 85%

Filter class	Recommended final pressure drop
G1 - G4	150 Pa
M5 - F7	200 Pa
F8 - F9	300 Pa
E10 - H13	500 Pa

Filter class	Recommended final pressure drop (lower value)
ISO coarse	50 Pa + starting pressure drop or 3x starting pressure drop
ISO ePM1	100 Pa + starting pressure drop or 3x starting pressure drop
ISO ePM2,5	
ISO ePM10	

Number of filtering cells per cross section

	CLP 1500 CLR 1500	CLP3000 CLR3000	CLP 4500 CLR4500	CLR 6000	CLP 6000 CLP 8000 - extract	CLP 8000 supply CLR 6000
SIZE	2 - 1	3 - 1,5	4 - 1,5	4 - 2	5 - 2	5 - 3
592 x 592				2	2	2
592 x 287	1					2
287 x 592					1	1
287 x 287						1
592 x 490		1	2			
287 x 490		1				

3.4.1 Bag or cassette filter

Caution

During operation, all the covers and service doors of the section must be kept closed at all times. The fan may not operate with the fan section door open.

Commissioning

If not already installed, insert the filter cassettes into the support frame:

- insert the filter cassettes into the support frame,
- with one level (the entire cross section) filled with filter cassettes, press the cassettes by means of the lock profile against the guide, which has sealing tape applied,
- repeat the procedure until the entire cross section of the section casing is filled,
- check the connection of the pressure measuring hoses to the pressure measurement ports and connect the hoses if necessary.

Maintenance

The filters must retain their filtering efficiency throughout their service life. In order to guarantee their performance in terms of maintaining air quality, regularly check the following, for each filter stage:

- the pressure drop
- the accumulated hours of operation
- the visual appearance of filters (cracks in the filtering medium, leakage between the filters and the filter frame).

Caution

In the event of noticeable contamination, cracking in the filtering medium or leakage between the filters and the frame, replace the filters regardless of the current pressure drop or hours of operation.

Time to replace filters:

- when the allowable final pressure drop is achieved,
- when the replacement interval has expired,
- when the filter performance, in mechanical or hygienic terms, is no longer adequate,
- if the filters become contaminated following air handling unit installation or reconstruction,
- if requested by the sanitary inspection.

Replace the filters:

- Loosen the closing profiles,
- slide out the contaminated filter cassettes,
- clean the section casing if necessary,
- inspect the condition of the sealing tape on the sealing contact surface and repair or replace the tape if necessary,
- insert clean and undamaged filters.

3.5 Heat recovery units

3.5.1 Plate heat exchanger

Caution

See also section 3.1 General instructions.
See the values in the selection program data and on the nameplate.

Commissioning

- Prior to starting the section up, check the tightness of the threaded joints and tighten them if required. Also check the correct installation and connection of the control dampers with the damper electric motor drive, as well as the damper operation.
- Make sure to allow for unobstructed removal of the water droplet eliminator from the air handling unit casing.
- Make sure to install an adequately-sized syphon in the condensate collection and draining pan discharge pipe. The instructions for the construction, installation and connection of syphons are provided in Section 2.3.5 Connection of syphon.

Maintenance

Regularly clean the plate heat exchanger. Fouling of the insert increases the pressure drop and decreases the efficiency.
A simple way to check for plate heat exchanger fouling is to remove the covers on the service side and inspect the cleanliness of the insert front surfaces, and, with the aid of a torch lamp, also the cleanliness of the air channels through the insert.
If the insert contamination consists of dry dust, the insert can be cleaned without disassembly through the service openings:

- With compressed air (a maximum of 10 bar of pressure); in this operation, the use of personal protective equipment is obligatory.
- If the insert contamination consists of greasy or sticky debris, slide out the insert from the heat exchanger section casing and clean it with a jet of hot water (temperature up to 90 °C, a maximum pressure of 6 bar) with an appropriate cleaning agent added.
- The contamination may also be removed by means of soaking in warm water with a detergent added.

Disassemble the insert from the casing:

- Remove the partition profiles on the service side by undoing the mounting screws,
- remove the rubber gasket,
- undo the top guide profile mounting screws, while only loosening the side guiding profiles, and then remove the top guide profile,
- slide out the insert from the section casing,
- replace the cleaned inserts in the section in the reverse order of the mentioned steps.

Caution

Since the insert filler material is made of a very thin aluminium foil, be careful not to damage the front surfaces of the insert when disassembling.
With any maintenance or inspection intervention, also clean the condensate discharge at the bottom of the pan and top up the water in the syphon.

3.5.2 Rotary heat exchanger

Caution

See also section 3.1 General instructions.
See the values in the selection program data and on the nameplate.
Mount and install the heat exchanger in accordance with the manufacturer's instructions, which are appended to these instructions.
All the electrical installations and wiring must be carried out by an authorised and qualified professional in accordance with the heat exchanger manufacturer's instructions and applicable regulations.

Commissioning

Before Commissioning, check the following:

- the correct mounting of the rotary heat exchanger in the casing,
- the tightness of the threaded joints,
- the air tightness / positioning of the sealing rings between the rotor and the casing,
- the free rotation of the rotor,
- the adequate tension of the drive belt,
- the operation of the motor drive and the settings of the frequency converter parameters,
- the operation of the rotation monitoring magnet,
- clean any debris from the section.

Maintenance

The honeycomb structure may be cleaned with compressed air, water, steam or special cleaning agents. Clean it manually or by means of the installed cleaning nozzles. Pressures of up to 150 bar can be applied.

Caution

The humidity transfer rotors may not be cleaned with water or steam.

3.6 Control damper

Caution

See also section 3.1 General instructions.

For standard item temperature stability check the values below:

- Gear: -15 °C to +80 °C.
- Sealing tape: -20 °C to +70 °C.

Commissioning

Control dampers are mounted on the casing from the outside or from the inside, depending on the project specifications, the customer's requirements and the air handling unit version.

- Two control dampers can be linked to a common drive by means of a lever mechanism (ball joints, drive levers and rods).
- When installing and linking the dampers, make sure to provide space for the movement of the motor drive and the lever mechanism.
- Prior to starting the section up, check the correct opening and closing of the damper, in particular in the case of dampers with a common drive.
- Before commissioning of the fan, check external dampers are fully open.
- On the outside, protect the control dampers with ducts or protection mesh if not factory protected.
- Mount and start the motor drive in accordance with the manufacturer's instructions and electric control cabinet start-up instructions.
- The required capacity of the motor drive depends on the control damper size and on the pressure differential across the damper. The required rotating torque is stated in the section technical sizing calculation. For safety factor use a minimum of 20% reserve.

Maintenance

In the case of outdoor-type air handling units, in extreme weather conditions (low temperatures combined with thick fog, wet snow), the protection mesh on the intake air suction section may freeze. In such an event, clean the mesh by mechanical means or defrosting.

Check the following:

- the condition of the gears and blades,
- the tightness of the threaded joints on ball joints and drive levers,
- whether the damper blades open and close correctly and
- whether the motor drive is firmly mounted.

3.7 Heating and cooling coils

Caution

See also section 3.1 General instructions.

We suggest that the piping is made in such a way that in the case of maintenance or replacement of the register, emptying the system and dismantling the piping is as easy as possible.

Filling of water piping:

- Partially open the transfer medium supply valve and wait for the blade register to uniformly warm up / cool down.
- Fully open the transfer medium supply valve.
- Vent the system.
- Start the fan.

Draining of water piping:

- Close the transfer medium supply valve.
- Slowly open the draining valve until the pressure is released from the heat exchanger, then fully open the draining valve and the venting valve.

3.7.1 Frost protection

The protection of the heating coil against freezing is always carried out with a contact temperature sensor mounted on the return pipe of the heating fluid and with automatic regulation. The contact sensor must be set to 14 °C.
As an option, a capillary thermostat with a capillary mounted in a frame over the entire cross-section of the air conditioner can be installed. The thermostat must be set to 5 °C.

As the temperature drops below the set value, the thermostat and the automatic control system must carry out the

- Stop the fan,
- close the outdoor air intake control damper,
- fully open the heating medium valve and
- start the circulation pump.

Caution

In the case of air handling units that include a cooling coil, preheater and re-heater, anti-frost protection at the preheater is sufficient.
In the event of a prolonged interruption of the power supply (or unit shut-down) or an interruption of the heating medium supply, drain the heating coil to prevent it from freezing. In order to absolutely prevent the risk of freezing, dry the tube bank by blowing it with compressed air after draining.
If the automatic control of the air handling unit is supplied by Systemair, the anti-frost protection is integrated in the unit in the factory; if the control system is implemented by the customer or another installer, arrangements for heating coil anti-frost protection are obligatory.
The type, connection, operation and maintenance of the capillary thermostat are specified in the operating instructions for the electrical control cabinet, regardless of whether the air conditioning control is manufactured by Systemair or determined and manufactured by the customer.

3.7.2 Water heating coil

Caution

See also section 3.1 General instructions and 3.7 Heating and cooling coils.
In the event of high heating medium temperatures (above 70 °C), arrangements must be provided to protect the fan electric motor from overheating during unit idling; this is achieved by automatically shutting off the supply of the heating medium into the heating coil and continued operation of the fan for a certain period of time (3 to 5 min) after unit operation has stopped.

Check before Commissioning

- The tightness of the threaded joints; tighten them if required,
- the proper functioning of the heat exchanger automatic anti-frost protection,
- the tightness of the piping joints,
- the proper functioning of the automatic shut-off of the supply of the heating medium into the heat exchanger at a heating medium temperature of 70 °C, to protect the electric motor against overheating.

Maintenance

In order to ensure smooth performance of the heat exchangers, the following operations should be carried out regularly:

- Check that the water connections are leakage-free and that the air joints are firmly mounted and leakage-free.
- Check the venting fan operation. In the event of disturbances in the medium flow through the heat exchanger or the formation of air cushions, vent the piping system.
- Check the operation of the heat exchanger automatic anti-frost protection.
- Periodically check the operation of the automatic shut-off of the supply of the heating medium into the heat exchanger with the unit stopped.
- Check the continued operation of the fan (for 3 to 5 min) after the unit is stopped to protect the electric motor against overheating.
- Regularly check the heating coil fins for dust build-up. Dust or scale build-up on fins reduces the heat exchanger capacity. Clean the fins at regular time intervals – approx. every 500 hours of operation.

To clean the fins, blow them with compressed air in the direction opposite the air flow direction.
If such cleaning proves insufficient, disconnect the heating coil, slide it out, and wash with low-pressure water or steam. Do not use high-pressure water or steam in order to avoid deforming the aluminium fins. If washing with water, the pressure thereof must not exceed 15 bar and the jet must be directed strictly parallel to the fins. Exposure to a waterjet at an angle will damage the fins. This applies even more so to the blades at the edge, since these are even more fragile.

Caution

Under no circumstances should you attempt to clean the fins with a hard object.

3.7.3 Water cooling coil

Caution

See also section 3.1 General instructions and 3.7 Heating and cooling coils.
Be sure to install a properly sized syphon on the drain pipe to collect and drain the condensate. Instructions for the construction, installation and connection are given in section 2.3.5 – Connection of syphon.

Check before Commissioning

- The tightness of the threaded joints; tighten them if required,
- the tightness of the piping joints.

Cooling coil anti-frost protection

The cooling circuit is filled with water:

- anti-frost protection relies on the anti-frost protection of the heating coil, which must be installed upstream of the cooling coil, or
- anti-frost protection relies on full draining of the system before the cold (winter) season, during which the system is to be shut down.

The cooling circuit is filled with a glycol/water mixture:

- anti-frost protection relies on the correct concentration of the glycol/water mixture. When handling glycol, follow the directions on the glycol safety data sheet.

Maintenance

In order to ensure smooth performance of the heat exchangers, the following operations should be carried out regularly:

- Check that the water connections are leakage-free and that the air joints are firmly mounted and leakage-free.
- Check the venting fan operation. In the event of disturbances in the medium flow through the heat exchanger or the formation of air cushions, vent the piping system.
- Check the adequacy of the cooling coil anti-frost protection.
- Regularly check the heat exchanger's blades for dust build-up. Dust or scale build-up on fins reduces the heat exchanger capacity. Clean the fins at regular time intervals – approx. every 500 hours of operation.

To clean the fins, blow them with compressed air in the direction opposite the air flow direction.
If such cleaning proves insufficient, disconnect the heating coil, slide it out, and wash with low-pressure water or steam. Do not use high-pressure water or steam in order to avoid deforming the aluminium fins. If washing with water, the pressure thereof must not exceed 15 bar and the jet must be directed strictly parallel to the fins. Exposure to a waterjet at an angle will damage the fins. This applies even more so to the fins at the edge, since these are even morefragile.

Caution

Under no circumstances should you attempt to clean the blades with a hard object.

3.7.4 Direct expansion (DX)

Caution

See also section 3.1 General instructions.
Be sure to install a properly sized syphon on the drain pipe to collect and drain the condensate. Instructions for the construction, installation and connection are given in section 2.3.5 – Connection of syphon.

Piping connections

- Refrigerant and air must move in a counter flow configuration.
- Connect the piping and fittings so as to allow free access to the cooling coil and its sliding out for inspection and maintenance, without hindering access to adjacent sections.
- Considering the direction of air flow, connect the DX coil piping so that the air inlet into the DX coil is closer to the return pipe – in the case of either horizontal air flow or vertical air flow, to ensure medium and air counter flow.
- The method of joining is soldering. The thermal insulation of the evaporator suction pipe must provide avapour barrier in accordance with applicable standards.
- In installing the thermostat expansion valve, follow the manufacturer's instructions; install the valve on the horizontal pipe leg, as close as practicable to the DX, upstream of the pressure equalisation and at a proper inclination considering the pipe thickness. The sensor must be insulated to avoid the interference effects of the surrounding air. The same applies to the valve sensor and pressure equalisation. We recommend the use of valves with external pressure equalisation in order to avoid the interference effects of the pressure drop across the evaporator.
- The Venturi head must be mounted in a vertical position.
- Since the evaporator is not fitted with automatic fins defrosting, arrange the electric installation so as to block the compressor if the DX fan is not running. If larger variations of intake air temperatures are anticipated (larger proportions of ambient air), which in turn means DX operation at low power compared to the nominal power, we recommend the application of cooling power modulation.
- Clean any filing debris and other dirt from the piping system.

Caution

When planning the layout of piping, consider the oil recovery and other phenomena associated with refrigerant flow.

Caution

Connection of the cooling system and filling with refrigerant may only be carried out by a qualified professional.
Connection should be made with copper pipes, which should be cleaned, dried and blown with dry nitrogen and plugged at both ends.
When selecting the combination, make sure to properly match the compressor and the DX section with other cooling circuit elements.

When installing, pay attention to the following:

- the maximum allowable distance between the DX section and the remaining part of the cooling circuit is 25 m,
- discharge pipes should be laid along the shortest route with the minimum practicable number of elbows (elbow radius R > 3.5 d - pipe diameter).

Check before Commissioning

- the condensate discharge line,
- the tightness of the soldered joints,
- that the pressure testing and drying of the refrigerant lines has been successfully completed, as well as their connection to the air-cooled condenser and filling with refrigeration.

Maintenance

For smooth performance of the DX coil, the following operations should be carried out regularly:

- check the soldered joints,
- check the system pressure,
- periodically check the inspection glass for the appearance of bubbles and humidity,
- check the cooling circuit protection elements – mechanical and electrical,
- check the operation of the DX fan,
- regularly check the DX fins for dust build-up. Dust or scale build-up on the fins reduces the heat exchanger capacity. Clean the fins at regular time intervals – approx. every 500 hours of operation.

To clean the fins blow them with compressed air in the direction opposite to the air flow direction.
If such cleaning proves insufficient, disconnect the heat exchanger, slide it out and wash with low-pressure water or steam. Do not use high-pressure water or steam in order to avoid deforming the aluminium fins. If washing with water, the pressure thereof must not exceed 15 bar and the jet must be directed strictly parallel to the fins. Exposure to a water jet at an angle will damage the fins. This applies even more so to the fins at the edge, since these are even more fragile.

Caution

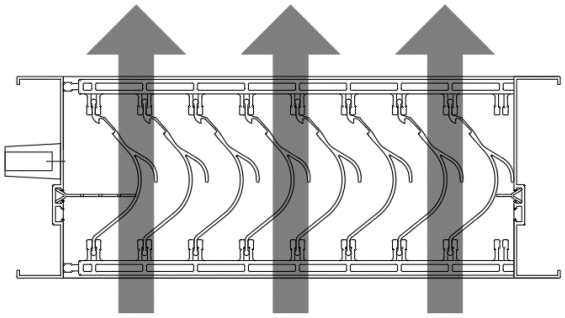
Under no circumstances should you attempt to clean the blades with a hard object.

3.7.5 Droplet eliminator

Caution

See also section 3.1 General instructions.
No piping (e.g. cooling system piping, electrical cable conduits, etc.) is to be laid through the eliminator blades in such a manner so as to spread the blades apart.
The blades are to be free of water scale and other salt build-up. Regularly check the soiling of the blades (once a year), and clean or replace the eliminator if necessary.
Be sure to install a properly sized syphon on the drain pipe to collect and drain the condensate. Instructions for the construction, installation and connection are given in section 2.3.5 – Connection of syphon.

Correct air flow direction is illustrated in figure.



Maintenance

Regularly check the soiling of the blades, and clean or replace the eliminator if necessary, as follows:

- Slide the eliminator out.
- Clean the blades with a scale removal agent.
- Check the sealing and replace them if necessary.
- Insert the eliminator back into the casing.

3.7.6 Electric air heater

Caution

See also section 3.1 General instructions.
The connection of the electric air heater must be carried out by a qualified professional in accordance with the applicable regulations.
Connection, commissioning and maintenance to be carried out according to the manufacturer's instructions.

Connection

- Any functional section containing temperature-sensitive materials should be separated from the electric air heater section by an empty section at least 300 mm in length.
- The air velocity through the electric air heater must not be less than 1,5 m/s; the air inflow must be evenly distributed across the entire cross section.
- The maximum operating air temperature is 50 °C.
- Connection terminals in the electric air heater connection box are accessible from the section service side.
- Lead the electric cables into the connection box through the cable glands and make sure the cable run does not obstruct the servicing of the adjacent functional sections.
- The electric heating elements are connected to the mains voltage of 3 x 230 V or 3 x 400 V and achieve surface temperatures depending on air velocity from 200 up to 500 °C during operation.
- An CL air handling unit that includes an electric air heater section must be fitted with an air flow control function.
- The electric air heater may only be switched on after the fan has started and built up an adequate air flow.
- After the electric air heater has been switched off, the fan must continue to run for 3 to 5 minutes to cool down the electric heating elements.
- The safety temperature limiter and safety thermostat sensors must always be installed in the upper part of the electric air heater section – above the electric heating elements, where the temperature reaches the highest levels in the event of air flow interruption.
- The electric air heater is not waterproof (IP43), therefore, it must not be installed in a location exposed to water or water steam.

Maintenance

Once a month, check the following:

- how well the electric connections are attached,
- the installation of the temperature safety limiter and thermostat sensors,
- the operation of the temperature safety limiter and safety thermostat,
- the operation of the air flow control equipment,
- the operation of the relays for starting the fan in advance and delayed stopping of the fan,
- the proper mounting and attachment of the guards to protect against contact (the service cover, the connection box cover, the protection mesh, etc.).

3.8 Sound attenuator

Maintenance
Splitters and section must be checked for dirt, damage and corrosion. In case of damage or soiling, cleaning is required. A vacuum cleaner can be used to clean dust and dirt.

3.9 Electric control cabinet

Caution
See also section 3.1 General instructions.

The electric control cabinet consists of a connection part and a measuring part, which are mechanically separated from each other. It consists of the following basic elements: cabinet sinks, door with point closing and lock, elements for flow protection, separation and KS protection and measuring equipment.

The electric control cabinet is installed inside the air handling unit casing with access to the interior from the service side in such a manner that it does not obstruct the inflow of air to the adjacent functional elements or the maintenance thereof. There are enough pre-installed cable glands in the immediate vicinity to be connected to the power supply and to connect the external control components from the range of available accessories.

At the horizontal compact indoor and outdoor version, the electric control cabinet is located on the upper part, next to the extract air opening. Free cable glands are installed on the narrow front panel on the cross section side next to the opening for the inlet of the extract air.

At the horizontal divided indoor version, the electric control cabinet is located on the upper part, between the filter for extract air and heat recovery section. Free cable glands are installed on the ceiling panel above the section with built in electric control cabinet.

At the vertical compact and divided indoor version, the electric control cabinet is located on the lower part, next to the heat recovery section under the section of the outdoor air filter or exhaust air fan, depending on the type of heat recovery. Free cable glands are mounted on the top front panel above the electrical cabinet.

The operation of the control system is factory tested. The test reports, including the preset values and the electrical plan of the unit, are always supplied with the unit.

4 REMOVAL AND DISPOSAL

Caution
See also section 3.1 General instructions.

At the end of unit's service life, the device must be removed from use and decommissioned in accordance with applicable environmental regulations and legislation. Disassembly of the unit may only be performed by an authorized company.

All substances (eg oils, refrigerant, batteries) must be disposed of in accordance with local regulations.

All metal and plastic parts must be separated and sent for recycling.

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