



VENTILATION AND CENTRAL AIRCONDITIONING DEVICES

OPERATING AND INSTALLATION INSTRUCTIONS
AIR HEATER / AIR COOLER
INDUSTRY

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1. Information concerning this handbook

- Read this documentation before installation and commissioning. This is a requirement for safe working and fault-free operation.
- Adhere to the safety and warning notes in this documentation and on the product.
- This documentation is a permanent part of the product described and should be handed to the buyer in the event of a sale!

1.1 Description of symbols



Warning!

This symbol refers to safety procedures that are required to prevent injuries!



Caution!

This symbol refers to safety procedures that are required to prevent damage to goods!



Special information to improve comprehension and handling.

1.2 Regulations and standards

The following standards and regulations were applied during the design phase and also apply to installation, commissioning, operation and maintenance:

DIN EN ISO 12100	Safety of machinery – General principles for design – Risk assessment and risk reduction
DIN EN 60204-1	Safety of machinery – Electrical Equipment of machines – Part 1: General requirements
DIN EN 349	Safety of machinery – Minimum gaps to avoid crushing of parts of the human body
DIN EN ISO 13857	Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs
VDMA 24167	Fans - Safety requirements
2006/42/EC	Machinery Directive
97/23/EC	Pressure Equipment Directive
2004/108/EC	Electromagnetic Compatibility

1.3 Legal information

All data provided are only intended to describe the product. They do not guarantee a certain composition of the system or its suitability for a specific application. This information does not release the user from his obligation to perform evaluations and tests.

2. Safety information

Please take note of these issues to prevent injuries, fires and other hazards caused by inappropriate use and operation of the air heater / air cooler:



Warning!

Installation, electrical connection, media supply connection, maintenance, commissioning, repair, etc. may only be performed by trained staff.

Before any work on the air heater / air cooler is undertaken, it must be ensured that the power supply is switched off (all-pole separation) and secured against unauthorised re-operation!

Only operate the air heaters / air coolers once they have been completely assembled and provided with appropriate reach-in protection.

All claims for damages or warranties become void when the installation does not comply with our stipulations or when the fault/damage is causally related to inappropriate alterations, processing or other treatment. The user must prove that the fault is not due to inappropriate installation.

The general maintenance instructions in the operating and installation instructions for the AL-KO air heaters / air coolers must always be adhered to.

The implementation and design of the air heater / air cooler corresponds to the standards listed in the declaration of conformity and declaration of incorporation to minimise the risk potential posed by the air heater. The potential risk can only be minimised when these additional, applicable standards for the installation-ready system are adhered to by the system builder.

It must be ensured that all authorised persons have read and understood all of the operating and installation instructions and adhere to them!

All plant, company and work instructions of the user apply in addition to these operating instructions to prevent hazards within the company.

Personal protective equipment is required for work on the air heater / air cooler!

2.1 Appropriate use

The application range for AL-KO air heaters / air coolers is exclusively air heating or cooling and optionally ventilation (air heaters) and cleaning of outside air or air inside rooms and buildings with normal climate and normal atmosphere.

The air heaters / air coolers may only be operated in an environmental temperature range between -20 °C and +40 °C and a humidity range between 50% and 85% relative humidity without condensation.

Installation of the air heaters / air coolers at a location more than 800 m above sea level may lead to a drop in performance and has to be investigated on a case-by-case basis.

Different areas of application should be discussed with the manufacturing plant.

2.2 Possible inappropriate uses

AL-KO air heaters / air coolers may only be operated within the range specified in the technical data provided by AL-KO. Any other or further use that deviates from the description in Point "2.1" Appropriate use" is deemed inappropriate use. The manufacturer is not liable for damage resulting from such use.

Possible inappropriate use includes, for example:

- Transport of media with temperatures above or below the permitted range, aggressive media or media containing a lot of dust.
- Use in an explosive atmosphere.

2.3 Residual risks

The air heater / air cooler may pose risks when it is used by untrained persons or in an incorrect or inappropriate way.

Residual risks are potential risks that are not obvious, e.g.:

- Injuries due to not adhering to the safety instructions, standards, guidelines or regulations
- Injuries due to uncoordinated work.
- Risk due to working on the electrical system, the cables and the connections

2.4 Delivery

AL-KO air heaters / air coolers are delivered in cardboard boxes or on pallets incl. film packaging!

2.5 Storage, transport



Warning!



Caution!

- Store the air heaters / air coolers in their original packaging in a dry place and protected against the weather.
- Cover open pallets with tarpaulins and protect the air heaters / air coolers against dirt (e.g. chips, stones, wire, etc.)
- Additional, protective packaging must be used for transport under harsh conditions, (e.g. on open vehicles, exposed to unusual vibration, transport by sea or in subtropical countries).
- Prevent repeated and, in particular, sudden temperature changes. They are particularly harmful when the humidity can condense.
- Check the ease of movement of the fan bearings (turn them by hand) after storage periods longer than 1 year.
- The device can be transported with a fork lift or and industrial truck as described in Point 4.1 "Fork lift / industrial truck transport".
- Clear vision must be ensured during the transport (use support staff as required)
- No persons may remain in the transport area.
- The relevant worker safety and environmental protection regulations must be adhered to during transport.
- The air heater / air cooler may only be transported by educated, trained and instructed personnel and with appropriate consideration of safety issues.
- It must be ensured that drivers have appropriate driving licences when transporting devices requiring a driving licence.
- Avoid twisting of the housing or other forms of damage.
- Damage caused by in appropriate packaging, storage or transport are to be borne by the party that caused them.
- When the system stands still for more than one month, the fan must be turned once a month to prevent damage to the bearings.

2.6 Duties of the operating company

The operator of the AL-KO products must regularly train his staff with regard to the following:

- Adherence to and use of the operating and installation instructions as well as the legal regulations.
- Appropriate operation of the air heater / air cooler.
- Adhere to the instructions of the company security and the operating instructions of the operating company as required.
- Conduct in emergencies

2.7 Disposal of the packaging



Disposal of the packaging must be performed according to the currently valid, local environmental and recycling regulations of your country and your municipality.

3. Product description

AL-KO air heaters / air coolers of the INDUSTRY series consist of a stable, self-supporting steel sheet housing which is sendzimir-galvanised and has additional powder coating. A galvanised, adjustable diffusion grid with slats is installed and adjusted at the air outlet as a standard fitting. A maintenance-free axial fan ensures low-noise operation. The drives of the AL-KO air heaters / air coolers are external rotor motors. They have a permanently lubricated deep-groove ball bearing and the fan forms a single unit with the rotor. A heat exchanger for air heating / cooling is installed in the housing next to the fan. This is implemented as a finned heat exchanger depending on the type (Type N / NF made of Cu / Al, Type H / HF made of FeZn / FeZn, Type D / DF made of FeZn / Fe, Type S / SF made of FeZn / Fe) or as an electrical heating register (Type EL made of V4A). The air heating / air cooling devices can be extended by various attachment and electronic accessories.



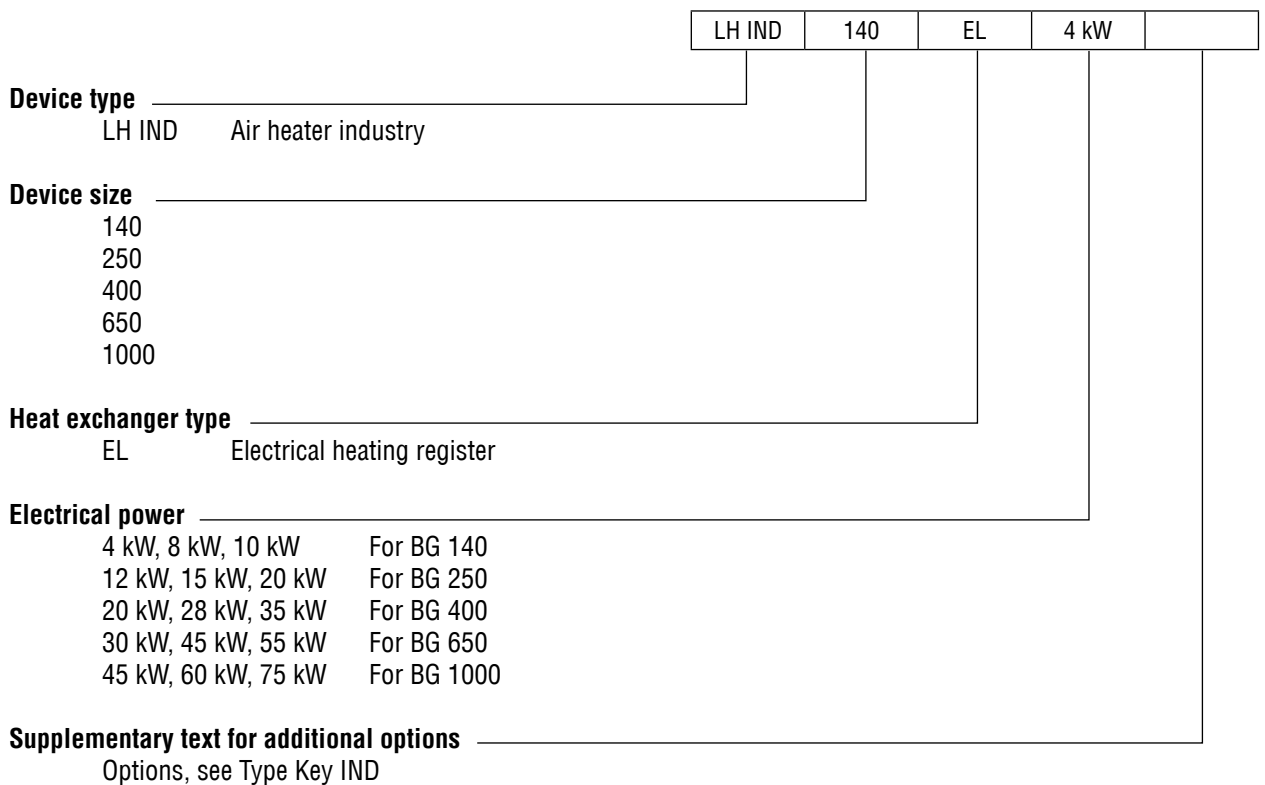
Our products are subject to continuous quality control and comply with the relevant, currently valid regulations.

Type key IND:

		LH IND	140	3	N	
Device type						
LH IND	Air heater industry					
LK IND	Air cooler Industry					
Device size						
140						
250						
400						
650						
1000 (only N/NF version)						
Heat exchanger type						
1	1 row of pipes, distance of fins 2.5 mm					For D/DF devices
2	2 rows of pipes, distance of fins 2.5 mm					For N/NF and D/DF devices
3	3 rows of pipes, distance of fins 2.5 mm					For N/NF devices
4	4 rows of pipes, distance of fins 2.5 mm					For N/NF devices
6	6 rows of pipes, distance of fins 3.5 mm					For N/NF devices
1.5	1 rows of pipes, distance of fins 2.5 mm					For H/HF devices
2.0	2 rows of pipes, distance of fins 4.0 mm					For H/HF and S/SF devices
2.5	2 rows of pipes, distance of fins 2.5 mm					For H/HF and S/SF devices
Device versions						
N	Standard version					
NF	Standard version with filter					
H	Steel version					
HF	Steel version with filter					
D	Steam version					
DF	Steam version with filter					
S	Special version					
SF	Special version with filter					
Supplementary text for additional options						
K	Bracket					
KD	Bracket for ceiling installation					
KM	Short bracket version					
KFM	Medium bracket version					
KFKM	Long bracket version					
Q	Crossbeams					
X	Support clamp set					
Z	Ceiling support (Z-profile)					

ZZ	Ceiling support (angle bracket)	
B	Broad air outlet	
AD	Outlet nozzle with slats	
D1	Outlet nozzle (gate air curtain outlet, narrow side)	
D2	Outlet nozzle (gate air curtain outlet, broad side)	
V	Four-side outlet	
IJ	Injection slats	
	IJ...WA	Wall mounting + automatic adjustment
	IJ...WH	Wall mounting + manual adjustment
	IJ...DA	Ceiling mounting + automatic adjustment
	IJ...DH	Ceiling mounting + manual adjustment
TA	Droplet separator (only for Type code LK)	
MLK	Mixed air box	
FK	Filter box	
ALK	External air box	
SG	Protective grid	
SGS	Canvas connector (for the side)	
SGW	Canvas connector (for wall feed-through)	
KA5	Duct connecting piece (0.5 m)	
KA10	Duct connecting piece (1.0 m)	
KAW5	Duct connecting piece (0.5 m for WG)	
KB	Channel elbow	
WG	External air intake grid (weather protection grid)	
KAR	Duct connection frame	
KARW	Duct connection frame (wall)	
ALH	External air connection hood	
RK	Rain collar	
UA	Recirculated air intake piece	
V4A	Stainless steel housing	
P	Condensate pump	

Type key for IND EL:



3.1 Declaration of incorporation

EG-EINBAUERKLÄRUNG

EC DECLARATION OF INCORPORATION
 DÉCLARATION DE MONTAGE CE



Hersteller / Manufacturer / Fabricant: **AL-KO THERM GMBH** | Hauptstraße 248-250 | 89343 Jettingen-Scheppach | Germany

Im Sinne der EG-Maschinenrichtlinie 2006/42/EG, Anhang II, Teil 1, Abschnitt B

As defined in EC Machinery Directive 2006/42/EC, Annex II, Part 1, Section B

Au sens de la directive Machines CE 2006/42/CE, annexe II, partie 1, section B

Maschine / Machine / Machine : Luftheiz- / Luftkühlgeräte, Deckenlüfter
 Air heating / air cooling devices, Ceiling fan
 Aérotherme / refroidisseur d'air, ventilateur de plafond

Serie / Series / Série : KOMFORT / COMFORT / COMFORT K, K/o, K/h, K/TA, KE/TA
 DESIGN ED-H ...; ED-K....
 DL-ENERGIE INDUSTRIE / -ENERGY INDUSTRY / - ÉNERGIE INDUSTRIE ...E;/E/h
 LK-INDN/NF
 Standard: LH-IND.....N/NF; H/HF; D/DF; S/SF; E/ELF
 Typ: 140; 250; 400; 650; 1000
 ATEX : LH-IND.....N/EX; NF/EX; H/EX; HF/EX; D/EX; DF/EX; E/EX; EF/EX
 Typ: 140; 250; 400; 650

Hiermit erklären wir, dass die oben genannte unvollständige Maschine den folgenden EG/EU- Richtlinien entspricht:

We hereby declare that the above-mentioned partly completed machinery conforms to all relevant provisions of the following EC/EU directives:

Nous déclarons par la présente que le Machine incomplète susnommé répond à toutes les dispositions pertinentes de la directive CE/UE suivante:

Maschinenrichtlinie 2006/42/EG / Machinery Directive 2006/42/EC / Directive Machines CE 2006/42/CE

Elektromagnetische Verträglichkeit 2014/30/EU / Electromagnetic Compatibility 2014/30/EU / Compatibilité électromagnétique 2014/30/UE

Druckgeräterichtlinie 2014/68/EU / Pressure Equipment Directive 2014/68/EU / Directive sur les appareils sous pression 2014/68/UE

(gilt nur für die Geräteausführung/ applicable only for instrument version/ applicable seulement pour la version de l'appareil: LH-IND..-D;-DF;-D/EX;-DF/EX)

Angewandte harmonisierte Normen / Applied harmonized standards / Normes harmonisées appliquées:

- DIN EN ISO 12100, Sicherheit von Maschinen – Allgemeine Gestaltungsleitsätze – Risikobeurteilung und Risikominderung
 Safety of machinery – General principles for design – Risk assessment and risk reduction
 Sécurité des machines – Principes généraux de conception – Appréciation et réduction du risque
- DIN EN 60204-1, Sicherheit von Maschinen – Elektrische Ausrüstung von Maschinen – Teil 1: Allgemeine Anforderungen
 Safety of machinery - Electrical equipment of machines - Part 1: General requirements
 Sécurité des machines – Equipement électrique des machines – Partie 1 : exigences générales
- DIN EN 349, Sicherheit von Maschinen - Mindestabstände zur Vermeidung des Quetschens von Körperteilen
 Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
 Sécurité des machines – Distances minimales de prévention des contusions de parties du corps humain
- DIN EN ISO 13857, Sicherheit von Maschinen – Sicherheitsabstände gegen das Erreichen von Gefährdungsbereichen mit den oberen und unteren Gliedmaßen
 Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
 Sécurité des machines – Distances de sécurité empêchant l'entrée dans les zones dangereuses des membres supérieurs et inférieurs
- DIN EN 61000-6-1, Störfestigkeit für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe
 Immunity standard for residential, commercial and light-industrial environments
 Résistance au brouillage pour le domaine d'habitation, les locaux commerciaux et professionnels ainsi que les petites exploitations
- DIN EN 61000-6-2, Störfestigkeit für Industriebereiche
 Immunity standard for industrial environments
 Résistance au brouillage pour les zones industrielles
- DIN EN 61000-6-3, Störaussendung für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe
 Immunity standard for residential, commercial and light-industrial environments
 Résistance au brouillage pour le domaine d'habitation, les locaux commerciaux et professionnels ainsi que les petites exploitations
- DIN EN 61000-6-4, Störaussendung für Industriebereiche
 Emission standard for industrial environments
 Émission d'interférences pour les zones industrielles

Zusätzlich angewendete nationale Normen und techn. Spezifikationen / Additional applied national standards and technical specifications / Les normes nationales et spécifications techniques, utilisées supplémentaires

- VDMA 24167, Ventilatoren – Sicherheitsanforderungen / Fans - Safety requirements / Ventilateurs – Exigences de sécurité

Die Inbetriebnahme unseres Produktes bleibt so lange untersagt, bis festgestellt wurde, dass die Ausführung der Anlage/ Maschine, in welcher der Einbau erfolgen soll oder von dem es ein Teil sein wird, mit den entsprechenden Rechtsvorschriften übereinstimmt.

Our product is not cleared for commissioning and use until it has been determined that the product is going to be integrated into a facility/machine and/or is used as part of an assembly, which agree with all applicable laws and regulations.

La mise en service de ce produit est interdite tant qu'il n'a pas été constaté, que le modèle de l'installation/ la machine, dans lequel il doit être incorporé, ou dont il deviendra une partie, est conforme aux dispositions légales correspondantes.

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen:

Authorized representative in charge of the technical document compilation:

Personne autorisée à constituer le dossier technique

Anschrift siehe Hersteller / see manufacturer's address above / Adresse, voir fabricant

Leiter der Abteilung Entwicklung

Head of Development Department

Chef du département de développement

Jettingen-Scheppach, 01.08.2018


 Dr. Christian Stehle
 Geschäftsführer/Managing Director/Directeur généra

3.2 Declaration of conformity

EG-KONFORMITÄTSERKLÄRUNG

EC DECLARATION OF CONFORMITY
 DÉCLARATION DE CONFORMITÉ CE



QUALITY FOR LIFE

Hersteller / Manufacturer / Fabricant: **AL-KO THERM GMBH | Hauptstraße 248-250 | 89343 Jettingen-Scheppach | Germany**

Im Sinne der EG-Maschinenrichtlinie 2006/42/EG, Anhang II, Teil 1, Abschnitt A

As defined in EC Machinery Directive 2006/42/EC, Annex II, Part 1, Section A

Au sens de la directive Machines CE 2006/42/CE, annexe II, partie 1, section A

Maschine / Machine / Machine :

Luftheiz- / Luftkühlgeräte, Deckenlüfter

Air heating / air cooling devices, Ceiling fan

Aérotherme / refroidisseur d'air, ventilateur de plafond

Serie / Series / Série :

KOMFORT / COMFORT / COMFORT K, K/o, K/h, K/TA, KE/TA

DESIGN ED-H ...; ED-K....

DL-ENERGIE INDUSTRIE / -ENERGY INDUSTRY / - ÉNERGIE INDUSTRIE ...E;/E/h

LK-INDN/NF

Standard: LH-IND.....N/NF; H/HF; D/DF; S/SF; E/ELF

Typ: 140; 250; 400; 650; 1000

ATEX : LH-IND.....N/EX; NF/EX; H/EX; HF/EX; D/EX; DF/EX; E/EX; EF/EX

Typ: 140; 250; 400; 650

Hiermit erklären wir, dass die oben genannte Maschine alle sicherheitstechnischen Anforderungen der folgenden anwendbaren EG/EU-Richtlinien erfüllt:

We hereby declare that the above-mentioned machine conforms to all relevant safety-provisions of the following EG/EC directives:

Nous déclarons par la présente que la machine susmentionnée correspond à toutes les des exigences de sécurité pertinentes de la directive CE/UE suivante:

Maschinenrichtlinie 2006/42/EG / Machinery Directive 2006/42/EC / Directive Machines CE 2006/42/CE

Elektromagnetische Verträglichkeit 2014/30/EU / Electromagnetic Compatibility 2014/30/EU / Compatibilité électromagnétique 2014/30/UE

Druckgeräte richtlinie 2014/68/EU / Pressure Equipment Directive 2014/68/EU / Directive sur les appareils sous pression 2014/68/UE

(gilt nur für die Geräteausführungen/applicable only for instrument version/applicable seulement pour la version de l'appareil: LH-IND..-D;-DF;-D/EX;-DF/EX)

Angewandte harmonisierte Normen / Applied harmonized standards / Normes harmonisées appliquées:

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 Sécurité des machines – Principes généraux de conception – Appréciation et réduction du risque
- DIN EN 60204-1, Sicherheit von Maschinen – Elektrische Ausrüstung von Maschinen – Teil 1: Allgemeine Anforderungen
 Safety of machinery - Electrical equipment of machines - Part 1: General requirements
 Sécurité des machines – Equipement électrique des machines – Partie 1 : exigences générales
- DIN EN 349, Sicherheit von Maschinen - Mindestabstände zur Vermeidung des Quetschens von Körperteilen
 Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
 Sécurité des machines – Distances minimales de prévention des contusions de parties du corps humain
- DIN EN ISO 13857, Sicherheit von Maschinen – Sicherheitsabstände gegen das Erreichen von Gefährdungsbereichen mit den oberen und unteren Gliedmaßen
 Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
 Sécurité des machines – Distances de sécurité empêchant l'entrée dans les zones dangereuses des membres supérieurs et inférieurs
- DIN EN 61000-6-1, Störfestigkeit für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe
 Immunity standard for residential, commercial and light-industrial environments
 Résistance au brouillage pour le domaine d'habitation, les locaux commerciaux et professionnels ainsi que les petites exploitations
- DIN EN 61000-6-2, Störfestigkeit für Industriebereiche
 Immunity standard for industrial environments
 Résistance au brouillage pour les zones industrielles
- DIN EN 61000-6-3, Störaussendung für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe
 Immunity standard for residential, commercial and light-industrial environments
 Résistance au brouillage pour le domaine d'habitation, les locaux commerciaux et professionnels ainsi que les petites exploitations
- DIN EN 61000-6-4, Störaussendung für Industriebereiche
 Emission standard for industrial environments
 Émission d'interférences pour les zones industrielles

Zusätzlich angewendete nationale Normen und techn. Spezifikationen / Additional applied national standards and technical specifications / Les normes nationales et spécifications techniques, utilisées supplémentaires

- VDMA 24167, Ventilatoren – Sicherheitsanforderungen / Fans - Safety requirements / Ventilateurs – Exigences de sécurité

Bei einer mit uns nicht abgestimmten Änderung der Maschine verliert diese Erklärung ihre Gültigkeit.

Any modification of this machine without confirmation shall automatically annul this declaration.

En cas de modification de la machine non convenue avec nous, la présente déclaration perd sa validité.

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen:

Authorized representative in charge of the technical document compilation:

Personne autorisée à constituer le dossier technique

Anschrift siehe Hersteller / see manufacturer's address above / Adresse, voir fabricant

Leiter der Abteilung Entwicklung

Head of Development Department

Chef du département de développement

Jettingen-Scheppach, 01.08.2018



Dr. Christian Stehle

Geschäftsführer/Managing Director/Directeur généra

3.3 Technical data

3.3.1 TYPE LH-... N/NF

Type	Dimensions in mm							Heat exchanger connection			
	a mm	b mm	c mm	d mm	e mm	f mm	g mm	2 Type N/NF	3 Type N/NF	4 Type N/NF	6 Type N/NF
LH-140 N/NF	560	440	360/500	399/539	344	98	167	3/4"	1"	1 1/4"	1 1/4"
LH-250 N/NF	640	515	360/500	402/542	419	98	167	3/4"	1"	1 1/4"	1 1/4"
LH-400 N/NF	800	630	360/500	427/567	534	98	167	1"	1 1/4"	1 1/4"	1 1/4"
LH-650 N/NF	880	740	390/500	501/611	644	98	167	1 1/4"	1 1/4"	1 1/2"	1 1/2"
LH-1000 N/NF	1040	890	390/500	465/575	794	98	167	1 1/4"	1 1/2"	1 1/2"	1 1/2"

Type	Weight in kg				Water content in l			
	2 Type N/NF	3 Type N/NF	4 Type N/NF	6 Type N/NF	2 Type N/NF	3 Type N/NF	4 Type N/NF	6 Type N/NF
LH-140 N/NF	24/27	25/28	28/31	30/32	1.8	2.5	2.0	2.6
LH-250 N/NF	31/34	33/37	36/39	39/41	3.0	3.9	2.7	3.6
LH-400 N/NF	42/46	46/50	48/52	54/58	4.6	6.2	4.4	6.0
LH-650 N/NF	55/59	59/67	64/67	71/75	5.6	8.4	6.4	8.6
LH-1000 N/NF	74/79	79/84	85/90	94/98	10.0	12.7	9.0	12.3

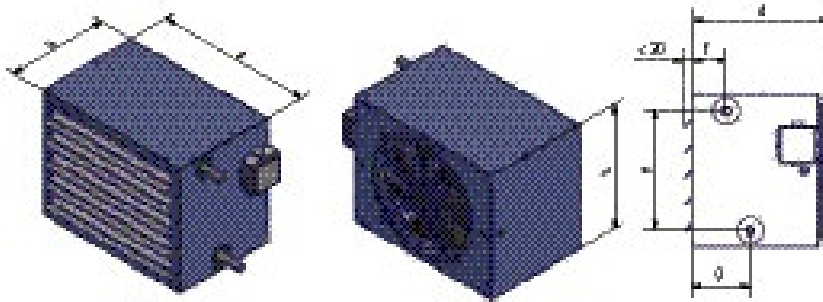


Fig.: Type LH...-N device series

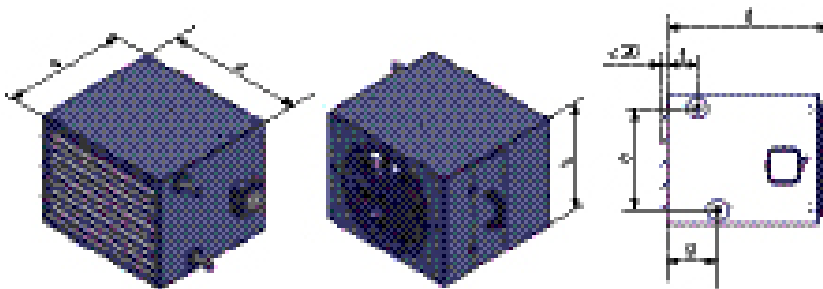


Fig.: Type LH...-NF device series

3.3.2 TYPE LH-... H/HF

Type	Dimensions in mm							Heat exchanger connection		
	a mm	b mm	c mm	d mm	e mm	f mm	g mm	1.5 Type H/HF;	2.0 Type H/HF;	2.5 Type H/HF;
LH-140 H/HF	560	440	360/500	399/539	335	98	167	3/4"	1"	3/4"
LH-250 H/HF	640	515	360/500	402/542	410	98	167	3/4"	1"	3/4"
LH-400 H/HF	800	630	360/500	427/567	524	98	167	1"	1 1/4"	1"
LH-650 H/HF	880	740	390/500	501/611	634	98	167	1"	1 1/4"	1 1/4"

Type	Weight in kg			Water content in l		
	1.5 Type H/HF	2.0 Type H/HF	2.5 Type H/HF	1.5 Type H/HF	2.0 Type H/HF	2.5 Type H/HF
LH-140 H/HF	44/47	59/62	61/64	4.0	8.0	8.0
LH-250 H/HF	59/62	74/78	84/87	5.0	11.0	11.0
LH-400 H/HF	84/88	108/112	125/129	7.0	15.0	15.0
LH-650 H/HF	108/112	138/142	159/162	9.0	19.0	19.0

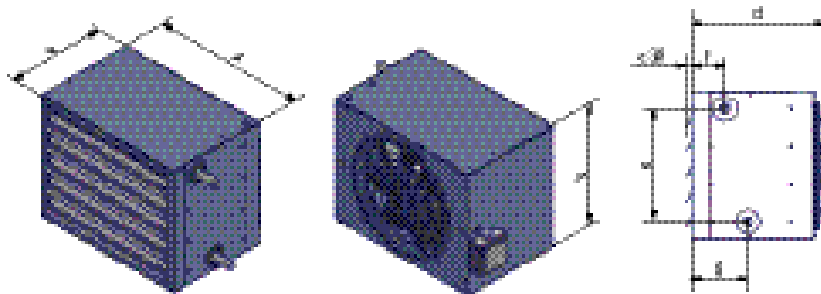


Fig.: Type LH...-H device series

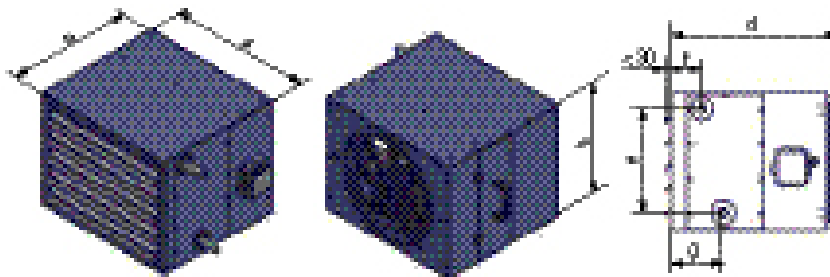


Fig.: Type LH...-HF device series

3.3.3 TYPE LH-... D/DF

Type	Dimensions in mm								NW 1 heat exchanger connection	
	a mm	b mm	c mm	d mm	e mm	f mm	g mm	h mm	1.0 Type D/DF	2.0 Type D/DF
LH-140 D/DF	560	440	360/500	399/539	321	153	103	88	DN 25	DN 40
LH-250 D/DF	640	515	360/500	402/542	396	153	103	88	DN 25	DN 40
LH-400 D/DF	800	630	360/500	427/567	513	148	103	88	DN 32	DN 50
LH-650 D/DF	880	740	390/500	501/611	621	143	103	88	DN 40	DN 50

Type	Weight in kg		Water content in l	
	1.0 Type D/DF	2.0 Type D/DF	1.0 Type D/DF	2.0 Type D/DF
LH-140 D/DF	47/50	54/57	4.0	9.0
LH-250 D/DF	60/63	88/91	6.0	12.0
LH-400 D/DF	84/87	106/109	8.0	16.0
LH-650 D/DF	105/108	146/149	10.0	21.0

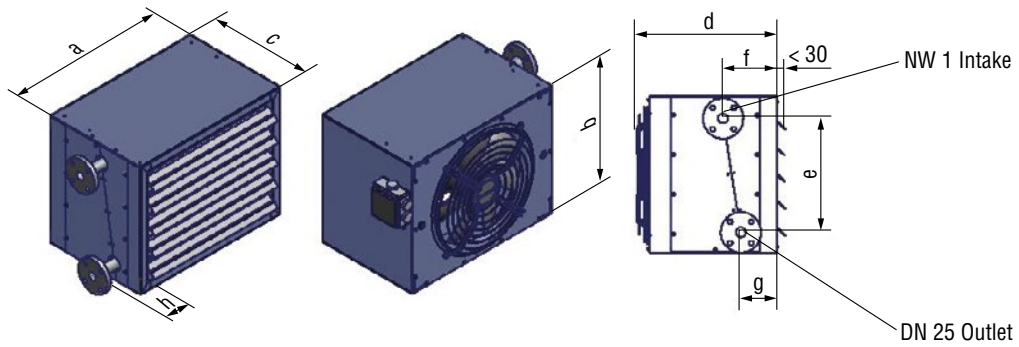


Fig.: Type LH...-D device series

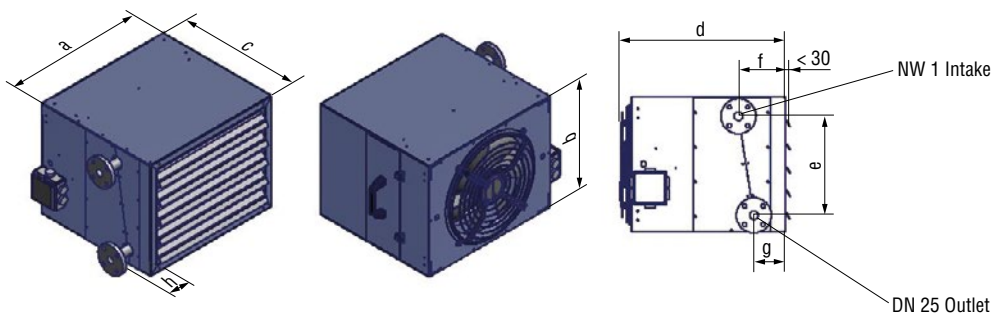


Fig.: Type LH...-DF device series

3.3.4 TYPE LH-... S/SF

Type	Dimensions in mm								Heat exchanger connection	
	a mm	b mm	c mm	d mm	e mm	f mm	g mm	i mm	2.0 Type S/SF	2.5 Type S/SF
LH-140 S/SF	560	440	360/500	399/539	316	204	100	104	3/4"	3/4"
LH-250 S/SF	640	515	360/500	402/542	406	204	100	104	3/4"	3/4"
LH-400 S/SF	800	630	360/500	427/567	522	202	102	100	1"	1"
LH-650 S/SF	880	740	390/500	501/611	620	197	107	90	1"	1"

Type	Weight in kg		Water content in l	
	2.0 Type S/SF	2.5 Type S/SF	2.0 Type S/SF	2.5 Type S/SF
LH-140 S/SF	63/73	67/77	4	9
LH-250 S/SF	75/85	80/90	6	12
LH-400 S/SF	108/118	117/127	8	16
LH-650 S/SF	138/148	150/160	10	21

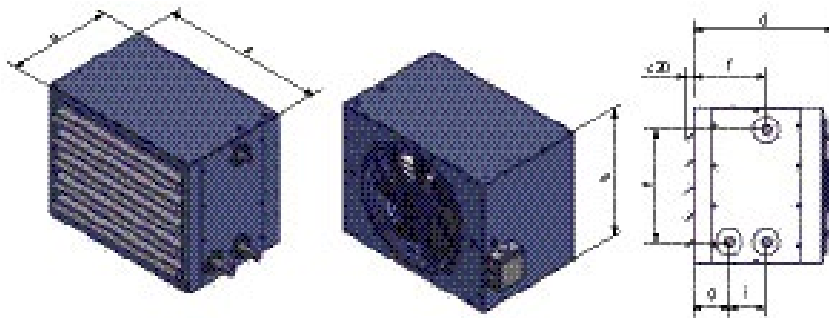


Fig.: Type LH...-S device series

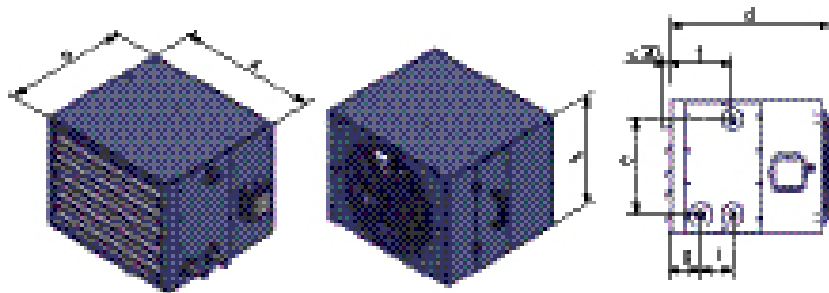


Fig.: Type LH...-SF device series

3.3.5 TYPE LH-... EL

Type	Dimensions in mm							Weight in kg			
	a mm	b mm	c mm	d mm	e mm	f mm	h mm	Type 4 kW	Type 8 kW	Type 10 kW	Type 12 kW
LH-140 EL	560	440	360	399	386	98	150	28	31,5	31.5	-
LH-250 EL	640	515	360	402	460	98	150	-	-	-	38,5
LH-400 EL	800	630	360	427	734	98	150	-	-	-	-
LH-650 EL	880	740	390	501	684	98	150	-	-	-	-
LH-1000 EL	1040	890	390	465	834	98	150	-	-	-	-

Type	Weight in kg									
	Type 15 kW	Type 20 kW	Type 28 kW	Type 35 kW	Type 30 kW	Type 45 kW	Type 55 kW	Type 60 kW	Type 75 kW	
LH-140 EL	-	-	-	-	-	-	-	-	-	
LH-250 EL	38.5	42.5	-	-	-	-	-	-	-	
LH-400 EL	-	53,5	59,5	65,5	-	-	-	-	-	
LH-650 EL	-	-	-	-	71,5	78,5	84,5	-	-	
LH-1000 EL	-	-	-	-	-	105,5	-	113,5	128,5	

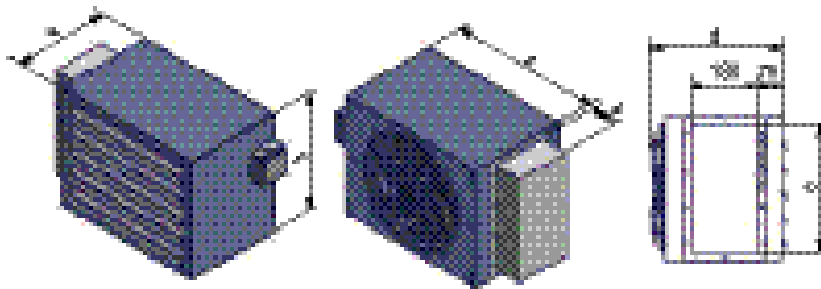


Fig.: Type LH...-EL device series

3.3.6 TYPE LK-... N/B/K; N/B/K/P

Type	Dimensions in mm										
	a mm	b mm	c mm	d mm	e mm	f mm	g mm	h mm	m mm	n mm	o mm
LK-140 N/B/K; N/B/K/P	560	440	360	399	344	98	167	270	591	490	497/492
LK-250 N/B/K; N/B/K/P	640	515	360	402	419	98	167	270	671	490	572/567
LK-400 N/B/K; N/B/K/P	800	630	360	427	534	98	167	270	831	490	687/682
LK-650 N/B/K; N/B/K/P	880	740	390	501	644	98	167	340	911	520	797/792
LK-1000 N/B/K; N/B/K/P	1040	890	390	465	794	98	167	390	1071	520	947/942

Type	Heat exchanger connection			Weight in kg		
	3 Type N	4 Type N	6 Type N	3 Type N/B/K Type N/B/K/P	4 Type N/B/K Type N/B/K/P	6 Type N/B/K Type N/B/K/P
LK-140 N/B/K; N/B/K/P	1"	1 1/4"	1 1/4"	35/36	36.5/37.5	37.5/39
LK-250 N/B/K; N/B/K/P	1"	1 1/4"	1 1/4"	43/44	45/46.5	48/49.5
LK-400 N/B/K; N/B/K/P	1 1/4"	1 1/4"	1 1/4"	61/62	62.5/64	69/70
LK-650 N/B/K; N/B/K/P	1 1/4"	1 1/2"	1 1/2"	79/80	83/84	89.5/91
LK-1000 N/B/K; N/B/K/P	1 1/2"	1 1/2"	1 1/2"	102/103.5	108/109	117/118.5

Water content in l		
3 Type N/B/K Type N/B/K/P	4 Type N/B/K Type N/B/K/P	6 Type N/B/K Type N/B/K/P
2.5	2.0	2.6
3.9	2.7	3.6
6.2	4.4	6.0
8.4	6.4	8.6
12.7	9.0	12.3

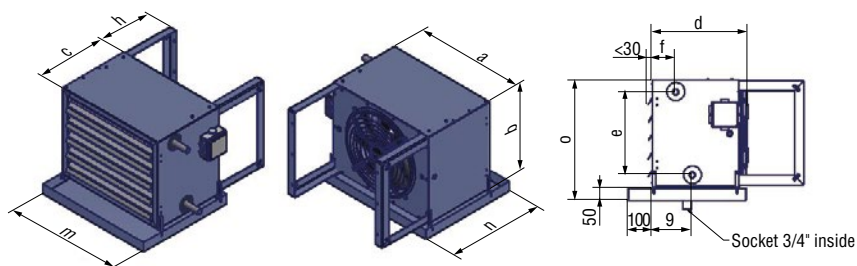


Fig.: Type LK...-N/B/K device series

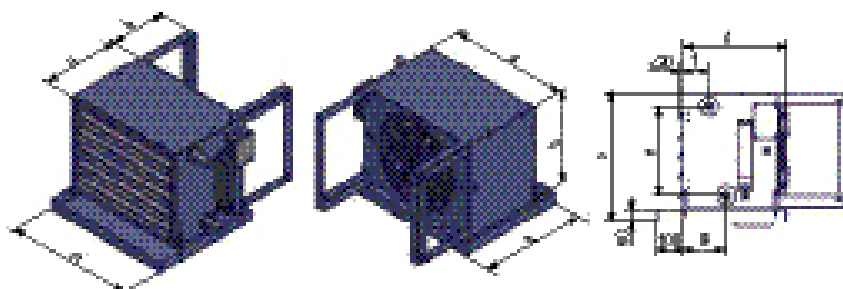


Fig.: LK...-N/B/K/P device series

3.4 Condensate pump

The compact condensate pump is suited for removing accumulated condensate. The condensate pump is a self-priming rotation membrane pump with condensate sensor.

The condensate is pumped through a flexible condensate pipe with an internal diameter of 6 mm.

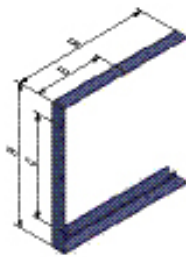


Please take note of the installation and safety instructions in the chapter assembly.

3.5 Accessory

Bracket K

Bracket Set K is suited for wall and ceiling mounting of the air heaters and for wall mounting of the air coolers. It consists of two brackets and the fastening screws for the air heater.



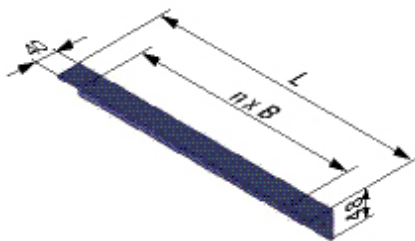
* Distance Wall - air heater

** Weight of one bracket

Type	B mm	H mm	C mm	D mm*	Weight kg**
K-140	420	432	310	270	2.1
K-250	420	507	385	270	2.2
K-400	420	622	500	270	2.4
K-650	490	732	610	340	2.9
K-1000	540	882	760	390	3.3

Bracket KD

The KD bracket set is suitable for ceiling mounting of the air heating devices of Type N and NF with the MLK mixed air box. The bracket is directly attached to the mixed air box. The distance of the mixed air box to the ceiling is approx. 10 cm. The set consists of two brackets and the fastening screws for the mixed air box.



** Weight of one bracket

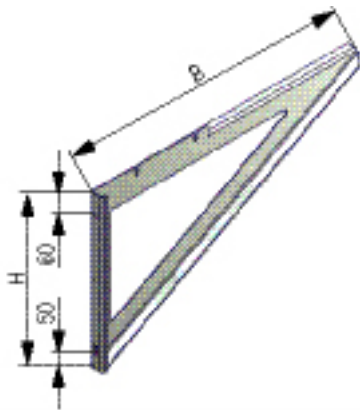
Type	L mm	n mm	B mm	Weight kg*
KD-140	437	1	357	1.2
KD-250	512	1	432	1.3
KD-400	627	2	273.5	1.6
KD-650	737	2	328.5	1.9
KD-1000	887	3	269	2.3

Bracket KM and KFM

The KM bracket set is suitable for wall mounting the Type N air heater with the MLK mixed air box.

The KFM bracket set is suitable for wall mounting the Type NF air heater with the MLK mixed air box.

It consists of two brackets and the fastening screws for the air heater. The mixed air box is mounted at approx. 100 mm distance from the wall to allow easy installation of an STW canvas connector.

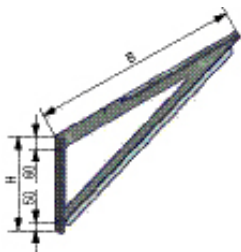


Type	B mm	H mm	Weight kg*
KM-140	760	450	4.1
KM-250	810	500	4.4
KM-400	860	550	4.8
KM-650	940	580	5.2
KM-1000	990	600	5.4
KFM-140	900	490	6.2
KFM-250	950	590	6.9
KFM-400	1000	690	7.7
KFM-650	1050	690	7.9
KFM-1000	1100	690	8.2

** Weight of one bracket

KFKM bracket

The KFKM bracket set is suitable for wall mounting the Type N air heater with the FK filter box and the MLK mixed air box or for wall mounting the Type N air heater with the FK filter box. It consists of two brackets and the fastening screws for the air heater.

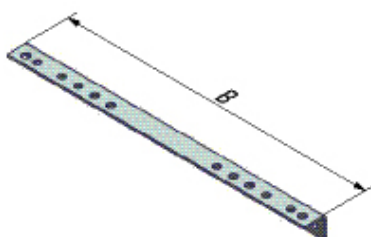


Type	B mm	H mm	Weight kg*
KFKM-140	1115	490	7.2
KFKM-250	1165	590	8.0
KFKM-400	1215	690	8.7
KFKM-650	1295	690	9.1
KFKM-1000	1345	690	9.3

** Weight of one bracket

Crossbeams Q

When air heaters / air coolers are mounted in places where the mounting surface is narrower than the distance between the brackets, an additional Crossbeam Q is required with Bracket K (e.g. concrete pillars, support beams, lintels). A cross beam set consists of two angle irons with appropriate holes (fitting the inner dimensions of the mounted brackets) including the necessary screws and nuts to fasten them to the brackets.

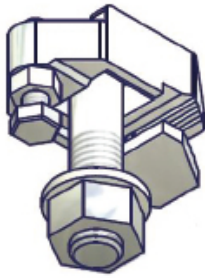


Type	B mm	Weight kg*
Q-140	400	2.1
Q-250	400	2.2
Q-400	400	2.4
Q-650	470	2.9
Q-1000	520	3.3

** Weight of one bracket

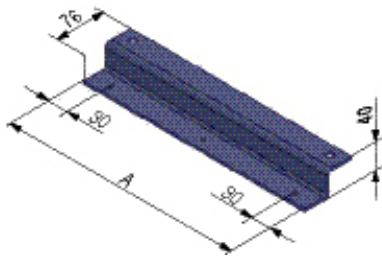
Support Clamp Set X

The Support Clamp Set X is, for example, used to mount the Crossbeam Q to a steel girder (also see Chapter 5.1). The Support Clamp Set X has an adjustment screw for continuous adjustment to different flange sizes. The cam height adjusted must correspond to the thickness of the flange to be clamped (max. 30 mm).



Ceiling Support Z

The Ceiling Support Z is suitable for horizontal installation of the industrial air heaters / air coolers Industry directly below the ceiling. The Ceiling Support Z is pre-installed on the air heater / air cooler. The distance to the ceiling is 40 mm. The set consists of two supports and their attachment screws.

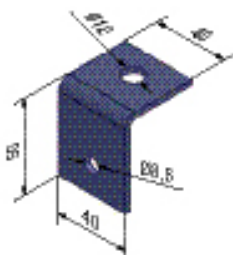


Type	A mm	Weight kg*
Z-140-400	360	1.2
Z-650-1000	390	1.3

* Weight of one support

Ceiling Support ZZ

The Ceiling Support ZZ is suitable for horizontal installation of industrial air heaters with MLK mixed air box directly below the ceiling. The Ceiling Support ZZ is pre-installed on the air heater and the MLK. The distance of the mixed air box to the ceiling is 25 mm. The set consists of six angle irons and the fastening screws.

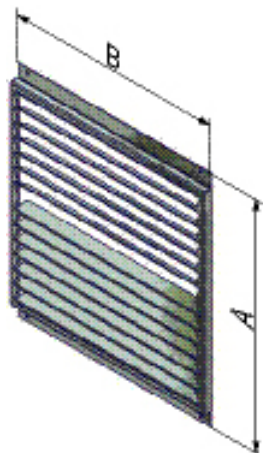


Type	Weight kg*
ZZ-140-1000	0.076

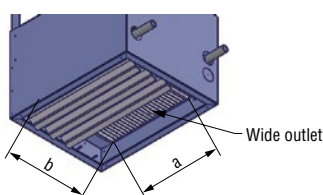
* Weight of one support

Broad Air Outlet B

When a broader, lateral spread of the air stream is desired, the AL-KO air heaters / air coolers can be equipped with a Broad Air Outlet Louvre B. The diffusion grid with the vertical guide fins is mounted immediately before the horizontal outlet louvre. The outside dimensions of the air heaters / air coolers do not change. The spread of the air stream can be optimally adjusted to the installation conditions.

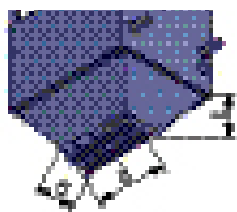


Type	a mm	b mm	A mm	B mm	Weight kg
B-140	360	358	405	358	3.9
B-250	440	438	485	438	5.8
B-400	600	558	645	558	9.6
B-650	680	670	725	670	12.9
B-1000	840	820	885	820	19.1



Outlet nozzle with Slats AD

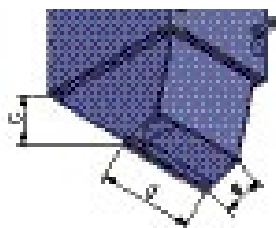
The Outlet Nozzle AD is used in high halls to increase the throwing distance. The reduced outlet area increases the air flow speed and therefore the vertical penetration depth of the air stream. Secondary air is pulled along. The Outlet Nozzle AD can also be used with wall-mounted systems. The integrated air direction slats can be adjusted to draw a larger amount of secondary air.



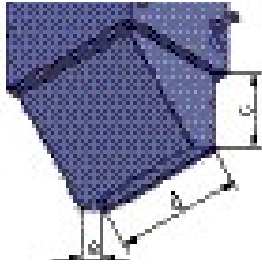
Type	c mm	d mm	e mm	Weight kg
AD-140	185	310	165	3.7
AD-250	230	385	200	5.2
AD-400	270	500	270	8.4
AD-650	300	580	320	10.2
AD-1000	350	740	380	15.6

D1 outlet nozzle (gate air curtain)

Air heating devices with a D1 or D2 outlet nozzle are suitable as air curtain devices at gates. During the installation, care has to be taken that the air jet must be directed against the gate towards the outside. The D1 outlet nozzles have the same cross-section reduction as the AD outlet nozzles. The outlet temperature of air heaters used as air curtains at gates should be selected at approx. 10 – 15 °C above the room temperature. When the gates are rather broad, the D2 nozzle form is used. The nozzle is wider than that of the D1 nozzles.



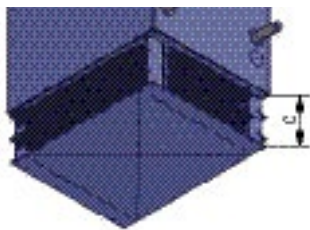
Type	c mm	d mm	e mm	Weight kg
D1-140	330	370	144	5.5
D1-250	385	445	180	7.5
D1-400	485	560	240	11.4
D1-650	590	670	275	15.8
D1-1000	690	820	340	22.1

D2 outlet nozzle (gate air curtain)

Type	c mm	d mm	e mm	Weight kg
D2-140	335	500	105	6.0
D2-250	395	580	135	8.0
D2-400	485	735	185	12.2
D2-650	590	815	227	16.5
D2-1000	690	975	285	22.9

Four-side Air Outlet V

Air heaters in low rooms can be equipped with a four-side air outlet that can be adjusted on all sides. The flat air outlet stream can be set to blow out on four, three or two sides. This prevents unpleasant draft effects immediately below the device.

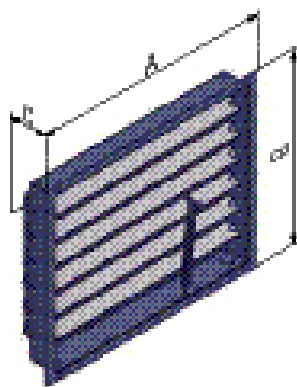


Type	C mm	throwing distance w		Weight kg
		m (n_o)	m (n_u)	
V-140	170	9	6	7.1
V-250	170	11	8	8.9
V-400	170	13	10	12.4
V-650	240	15	12	18.0
V-1000	240	16	13	23.7

The throwing distance is measured at a room air temperature of $t = 20\text{ }^\circ\text{C}$.
 n_u = lower rotation speed, n_o = upper rotation speed

Injection louvre IJ – wall mounting

The fins in wall-mounted systems are directed downwards during heating-up mode. During normal operation, the air stream is ducted straight into the room. All fins move in parallel.



Type	A mm	B mm	C mm WH/WA	Weight kg
IJ-140-W..	555	434	71/105	4.9
IJ-250-W..	635	509	71/105	5.8
IJ-400-W..	795	624	71/105	8.2
IJ-650-W..	875	734	71/105	9.6
IJ-1000-W..	1035	884	71/105	13.1

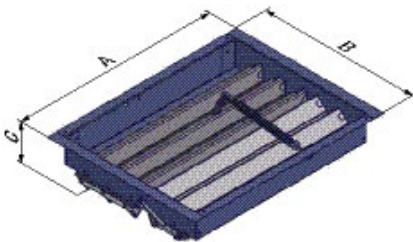
Versions

For wall-mounted air heater + automatic adjustment IJ-...-WA

For wall-mounted air heater + manual adjustment IJ-...-WH

Injection louvre IJ – ceiling mounting

The fins in ceiling-mounted systems are directed vertically downwards in heating-up mode. During normal operation, the air stream can be distributed towards the right and left side of the room.



Type	A mm	B mm	C mm DH/DA	Weight kg
IJ-140-D..	555	434	71/105	4.9
IJ-250-D..	635	509	71/105	5.8
IJ-400-D..	795	624	71/105	8.2
IJ-650-D..	875	734	71/105	9.6
IJ-1000-D..	1035	884	71/105	13.1

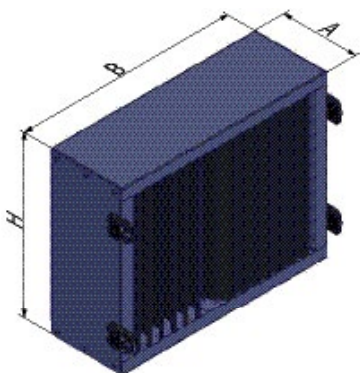
Versions

For ceiling-mounted air heater + automatic adjustment IJ-...-DA

For ceiling-mounted air heater + manual adjustment IJ-...-DH

TA droplet separator

The droplet separator is used in connection with the INDUSTRY air cooling device. Specially shaped fins catch the humidity and drain it downwards. The outlet louvres normally attached to air coolers and the broad air outlet are attached to the droplet separator!

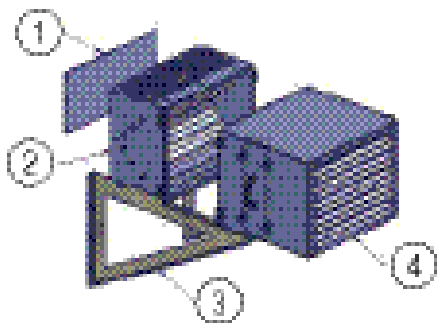


Type	B mm	H mm	A mm	Weight kg
TA-140	560	440	195	9.8
TA-250	640	515	195	12.0
TA-400	800	630	195	15.2
TA-650	880	740	195	17.5
TA-1000	1040	890	195	22.2

Mixed air box MLK

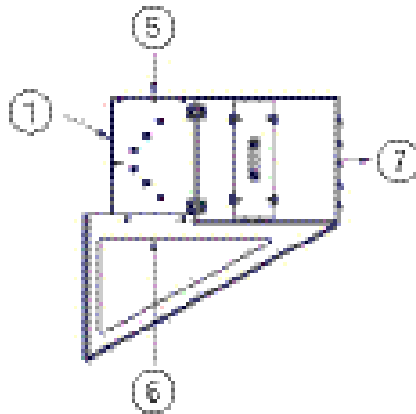
The mixed air box in combination with the air heater is used to heat and ventilate work shops, halls, sports facilities, etc. Appropriate attachment of the variable cover can be used to adapt the final version on site. The V-shaped, internal arrangement of the slat valves ensures mixing of the air streams and good flow. The mixing ratio can be continuously adjusted with a hand lever or an attached slat actuator motor.

The use of a filter is recommended when external air is used.

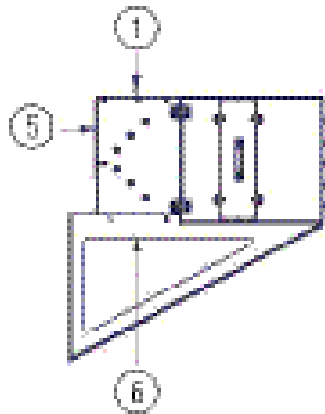


1	Variable cover
2	Mixed air box MLK
3	Bracket for wall-mounting KFM
4	LH IND Type NF air heater
5	Air Stream 1
6	Air Stream 2
7	Air outlet

a) Rear cover



b) Top cover



c) Bottom cover

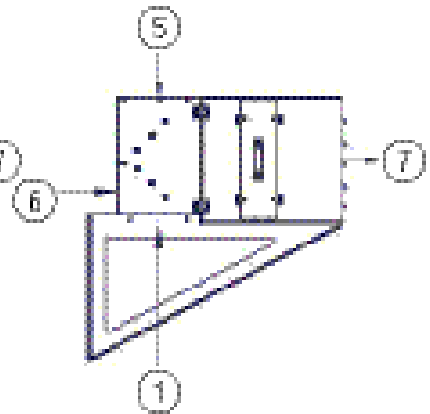
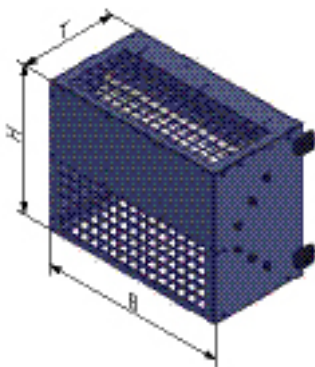


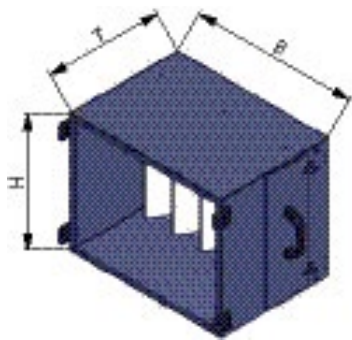
Table of dimensions



Type	B mm	H mm	T mm	Weight kg
MLK-140	560	440	300	13.0
MLK-250	640	515	350	17.5
MLK-400	800	630	400	25.0
MLK-650	880	740	450	31.5
MLK-1000	1040	890	500	43.5

Filter box FK

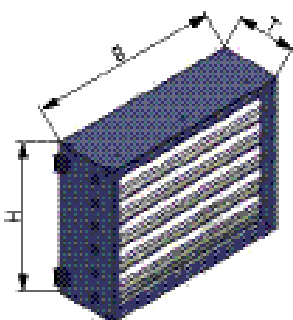
With laterally extendable bag filter insert (Filter Class G3, depth 100 mm)



Type	B mm	H mm	T mm	Weight kg
FK-140	560	440	400	11.0
FK-250	640	515	400	12.2
FK-400	800	630	400	15.5
FK-650	880	740	400	18.0
FK-1000	1040	890	400	21.2

ALK external air box

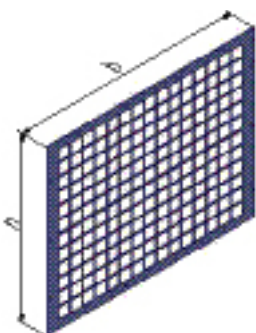
The external air box can be used to block the supply air flow when external air is used. It can be used as shut-off damper upstream of an air heater, as shut-off damper in duct systems or as shut-off damper for ceiling extractors (natural convection).



Type	B mm	H mm	T mm	Weight kg
ALK-140	560	440	180	7.4
ALK-250	640	515	180	11.9
ALK-400	800	630	180	19.4
ALK-650	880	740	180	25.9
ALK-1000	1040	890	230	35.9

SG protective grid

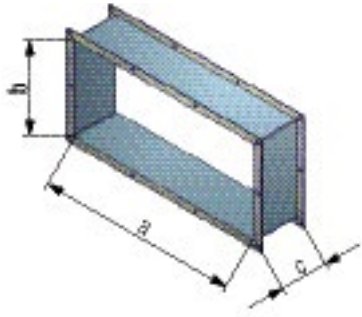
The protective grid can be used to cover the filter box when air is taken directly from the room into the filter box.



Type	b mm	h mm	Weight kg
SG-140	555	435	0.8
SG-250	635	510	1.1
SG-400	795	625	1.6
SG-650	875	735	1.9
SG-1000	1035	885	2.9

Canvas connector SGS

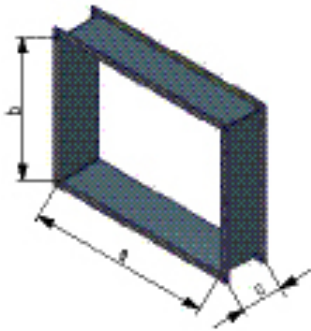
Canvas connector for the side (air intake at the mixed air box at the top or bottom)



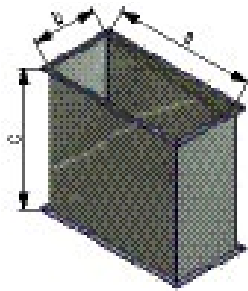
Type	a mm	b mm	c mm	Weight kg
SGS-140	520	240	120	3.7
SGS-250	600	310	120	4.4
SGS-400	760	360	120	5.4
SGS-650	840	410	120	6.1
SGS-1000	1000	460	120	7.1

Canvas connector SGW

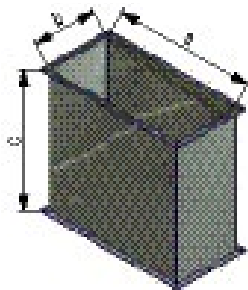
Canvas connector for the wall feed-through to connect a KAW5 duct connection piece and a WG external air intake grid



Type	a mm	b mm	c mm	Weight kg
SGW-140	520	400	120	4.5
SGW-250	600	475	120	5.3
SGW-400	760	590	120	6.6
SGW-650	840	700	120	7.5
SGW-1000	1000	850	120	9.1

KA 5 duct connection piece

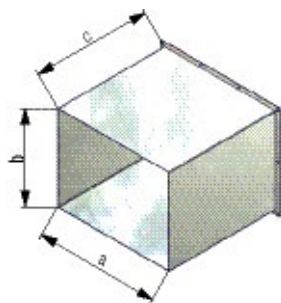
Type	a mm	b mm	c mm	Weight kg
KA5-140	520	240	500	7.2
KA5-250	600	310	500	8.6
KA5-400	760	360	500	10.5
KA5-650	840	410	500	11.7
KA5-1000	1000	460	500	13.6

KA 10 duct connection piece

Type	a mm	b mm	c mm	Weight kg
KA10-140	520	240	1000	13.2
KA10-250	600	310	1000	15.7
KA10-400	760	360	1000	19.3
KA10-650	840	410	1000	21.5
KA10-1000	1000	460	1000	25.1

KAW5 duct connection piece

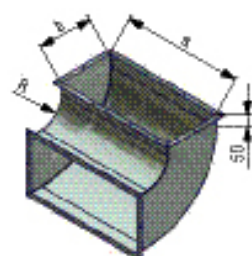
The KAW 5 duct connection piece consists of a duct piece with a flange at one side. It is used for a wall feed-through and connecting a WG external air intake grid.



Type	a mm	b mm	c mm	Weight kg
KAW5-140	520	400	500	8.0
KAW5-250	600	485	500	9.4
KAW5-400	760	590	500	11.7
KAW5-650	840	700	500	13.3
KAW5-1000	1000	850	500	16.0

KB duct elbow

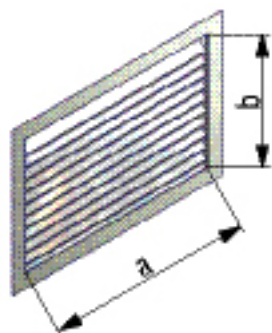
symmetrical structure, 90°



Type	a mm	b mm	R mm	Weight kg
KB90-140	520	240	100	6.5
KB90-250	600	310	100	8.5
KB90-400	760	360	100	11.1
KB90-650	840	410	100	13.2
KB90-1000	1000	460	100	16.3

WG external air intake grid (weather protection grid)

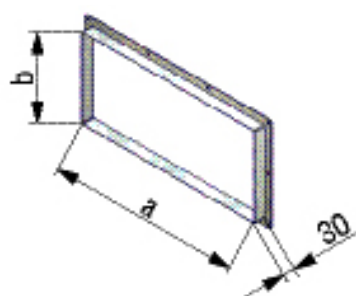
The WG external air intake grid is mounted on the outside wall. The WG external air intake grid can be placed onto the KAW5 duct connection piece or the SGW canvas connector.



Type	a mm	b mm	c mm	Weight kg
WG-140	520	400	50	3.8
WG-250	600	485	50	4.6
WG-400	760	590	50	6.6
WG-650	840	700	50	8.4
WG-1000	1000	850	50	11.5

KAR duct connection frame

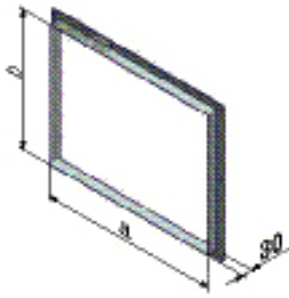
for lateral duct connection



Type	a mm	b mm	Weight kg
KAR-140	520	240	0.9
KAR-250	600	310	1.1
KAR-400	760	360	1.4
KAR-650	840	410	1.5
KAR-1000	1000	460	1.8

KARW duct connection frame

For wall connection

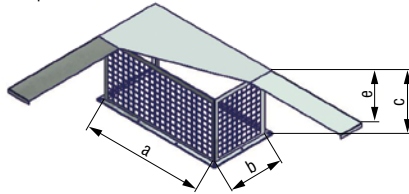


Type	a mm	b mm	Weight kg
KARW-140	520	400	0.9
KARW-250	600	475	1.1
KARW-400	760	590	1.4
KARW-650	840	700	1.5
KARW-1000	1000	850	1.8

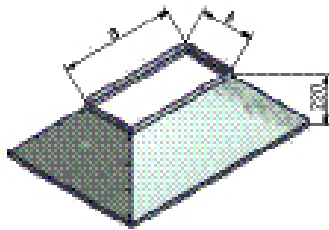
ALH external air intake hood

The ALH external air intake hood is always used in connection with an RK rain collar.

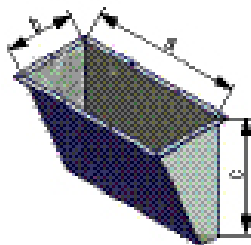
Simplified section of the hood.



Type	a mm	b mm	c mm	e mm	Weight kg
ALH-140	520	240	260	230	8.5
ALH-250	600	310	290	230	10.4
ALH-400	760	360	290	230	12.7
ALH-650	840	410	400	340	19.8
ALH-1000	1000	460	420	360	24.1

RK rain collar

Type	a mm	b mm	Weight kg
RK-140	520	240	6.3
RK-250	600	310	7.1
RK-400	760	360	8.2
RK-650	840	410	8.9
RK-1000	1000	460	10.1

UA recirculated air intake piece

Type	a mm	b mm	c mm	Weight kg
UA-140	520	240	400	4.5
UA-250	600	310	450	5.7
UA-400	760	360	650	9.2
UA-650	840	410	800	12.0
UA-1000	1000	460	900	15.4

4. Transport



Caution!

- The individual components of the system may only be moved with the transport devices intended for this purpose.
- Do not step or work under suspended loads.
- Only permitted lifting tools with sufficient carrying capacity may be used.
- The lifting tools must be fault-free.
- The load-handling equipment must be checked for carrying capacity and damage before use.
- Protective gloves should be worn during transport and installation of the devices (risk of cutting).
- Only remove the packaging immediately before installation.

4.1 Fork lift / industrial truck transport

AL-KO air heaters / air coolers can be transported in their original packaging with a fork lift or an industrial truck!



Caution!

Always place the lifting forks of the fork lift against the timbers. Pay attention to possibly protruding objects (e.g. media connections, condensate drain)

- Use suitable fork lengths to prevent damage to the device.
- Use suitable intermediate timber layers.

5. Assembly



Warning!

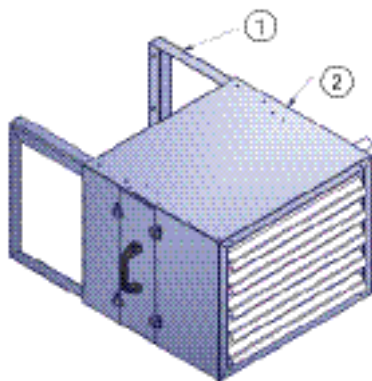
Installation, electrical connection, media supply connection, maintenance, commissioning, repair, etc. may only be performed by trained staff.

- The place of installation as well as the installation structure must provide permanent and vibration-free support of the devices.
The place of installation and the installation structure has to be checked by a structural engineer, if required.
- AL-KO air heaters / air coolers are delivered in pre-assembled form.
- The manufacturer documentation must be considered before installation or removal.
- The air heaters / air coolers must be levelled during installation!
- Air heaters with electric heating element series LH ... EL: It is urgent to ensure that all sides are sufficiently far away from flammable materials.

5.1 Wall-mounting the devices

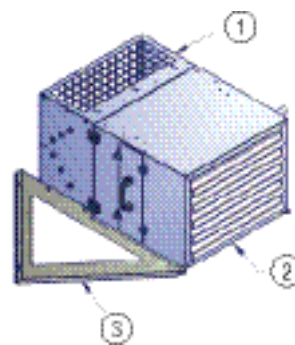
- Attach the bracket set to the air heater / air cooler when it was not pre-installed by the factory.
- Drill fastening holes into the wall.
- Attach the air heater / air cooler to the wall.

Example for wall mounting:



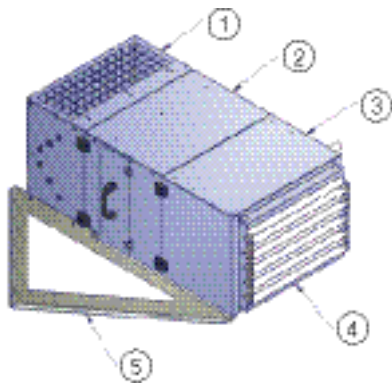
1	Bracket K for wall/ceiling mounting
2	LH IND Type NF air heater

Fig.: Wall-mounting the air heater



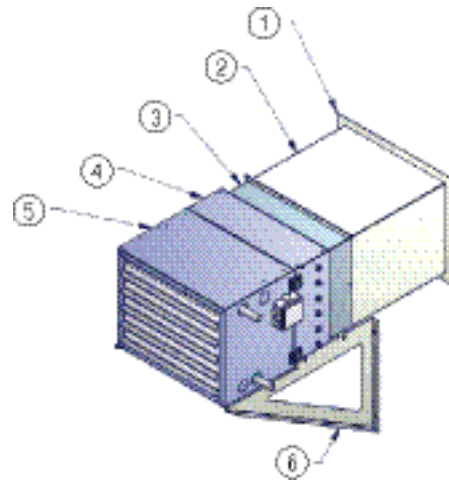
1	Mixed air box MLK
2	LH IND Type NF air heater
3	KFM bracket for wall mounting

Fig.: Wall-mounting LH with mixed air box



1	Mixed air box MLK
2	Filter box FK
3	LH IND Type N
4	Option: IJ injection louvre
5	KFKM bracket

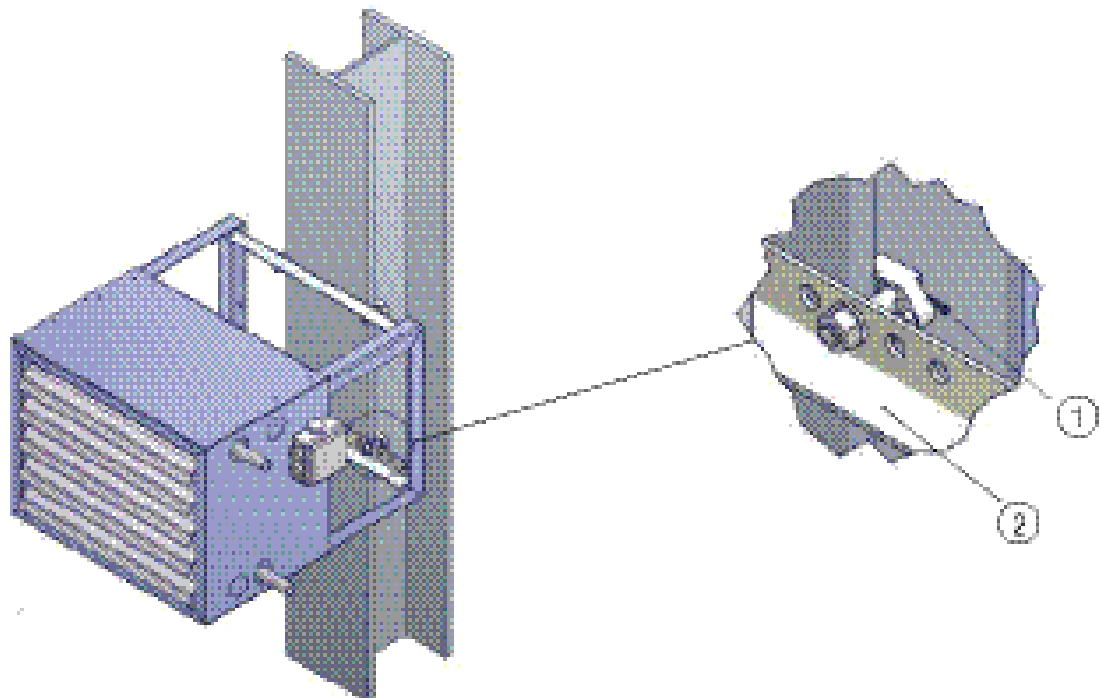
Fig.: Wall-mounting the air heater with mixed air box and filter box



1	WG weather protection grid
2	KAW5 duct connection piece
3	Canvas connector SGW
4	ALK external air box
5	LH IND TYPE N
6	Console KFM

Fig.: Wall-mounting the air heater with external air box, canvas connector and duct connection piece

- The air heater / air cooler can alternatively also be mounted on steel girders by using the Crossbeams Q and the Support Clamp Set X that are available as accessories.



1	Support Clamp X
2	Crossbeam Q

Fig.: Attachment to steel girder

- Attach the supply connections according to the "Heat exchanger connection" and "Electrical connection" chapters.

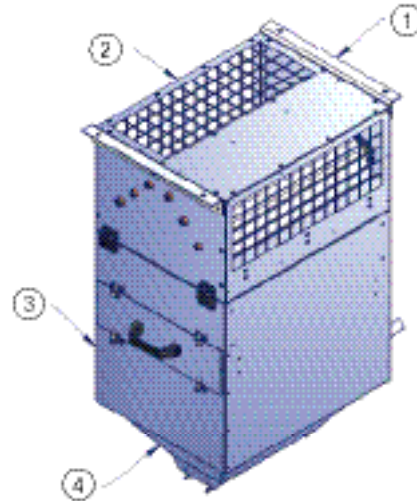
5.2 Ceiling installation of the devices

- Install the bracket set on the air heater/cooler when it was not pre-installed by the factory.
- Drill fastening holes into the ceiling.
- Attach the air heater / air cooler to the ceiling.

Example for ceiling mounting:



Fig.: Ceiling-mounting the air heater



1	Bracket KD
2	Mixed air box MLK
3	Air heater Type NF
4	Option: Outlet Nozzle AD

Fig.: Ceiling-mounting LH with mixed air box

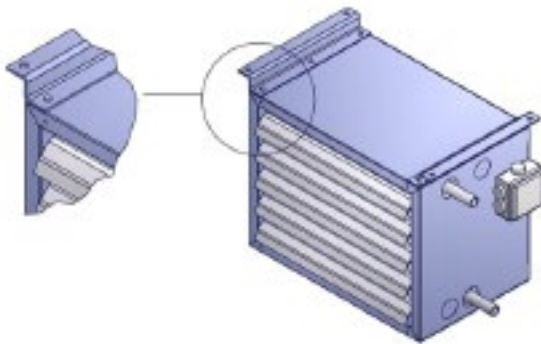


Fig.: Ceiling-mounting LH with Ceiling Support Z

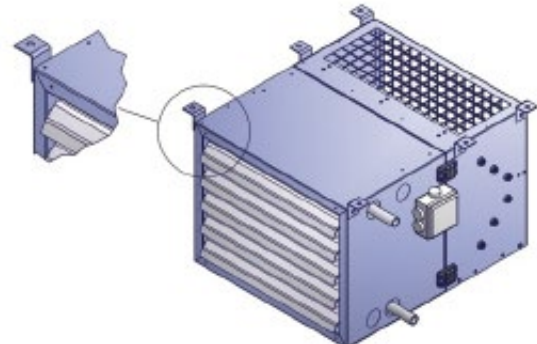
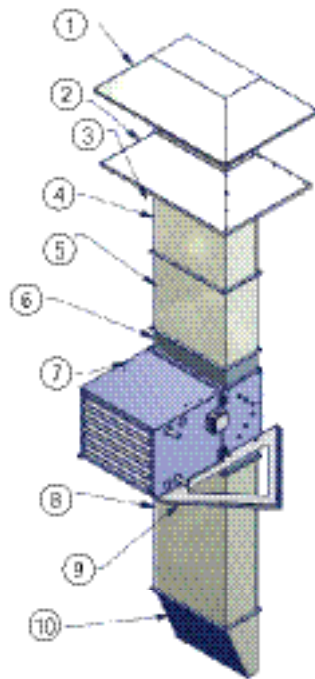
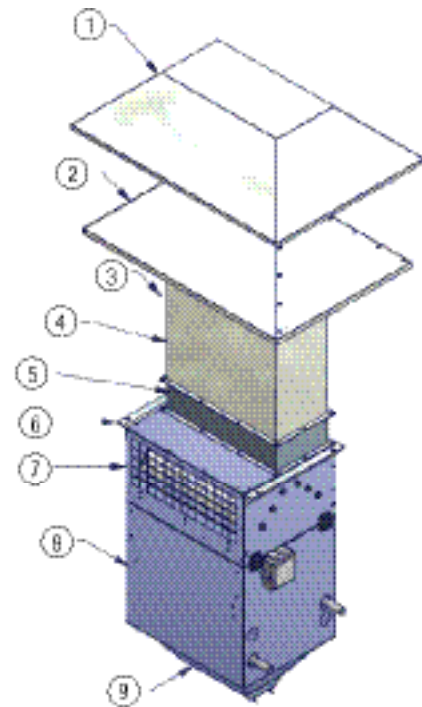


Fig.: Ceiling-mounting LH with Ceiling Support ZZ



1	ALH external air intake hood
2	RK rain collar
3	Roof feed-through (not shown)
4	KA10 duct connection piece
5	KA5 duct connection piece
6	Canvas connector SGS
7	Air heater LH IND Type NF and mixed air box MLK
8	KA10 duct connection piece
9	KFM bracket for wall mounting
10	UA recirculated air intake piece

Fig.: Installation example LH roof



1	ALH external air intake hood
2	RK rain collar
3	Roof feed-through (not shown)
4	KA duct connection piece
5	Canvas connector SGS
6	Bracket KD
7	Mixed air box MLK
8	LH IND Type NF
9	Option: Outlet Nozzle AD

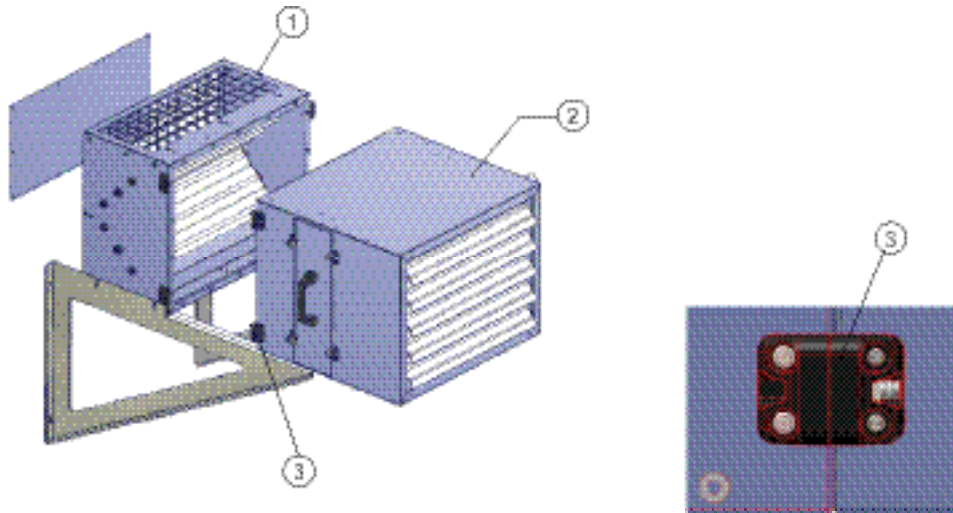
Fig.: Ceiling-mounting LH with MLK and duct

- The air heater / air cooler can alternatively also be fastened to steel girders with the crossbeams and support clamps that are available as accessories (see Figure "Fastening to the steel girder" in the "Wall-mounting the devices" chapter).
- Attach the supply connections according to the "Heat exchanger connection" and "Electrical connection" chapters.

5.3 Mounting the accessory components

- Ordered accessory components are pre-installed in the factory!
- They are attached by using the device connectors located at the sides.
- When this is not the case, the accessory components must be attached at the appropriate places using the fastening material supplied.

Example for accessory attachment:



1	Mixed air box MLK
2	Air heating device LH IND -NF
3	Device connector

Fig.: Accessory attachment

5.4 Heat exchanger connection



Take care not to mix up the feed and reflux pipe during the pipe installation. The medium inlet is at the air outlet side (Figure Counter-current principle). Does not apply to the steam heat exchanger!

For connection of steam heat exchanger see the technical data!



Caution!

Hold the connectors in place with a suitable tool (e.g. pipe wrench) when connecting the heat exchanger to prevent damage.

Attach pipes and connectors to ensure free access to the heat exchangers for maintenance purposes.

When temperatures below the freezing point occur, the heat exchanger must either be emptied and blown out with compressed air or a standard anti-freeze with corrosion protection must be filled in to prevent damage due to frost or corrosion!

Heat exchanger copper/aluminium (CU/AL):

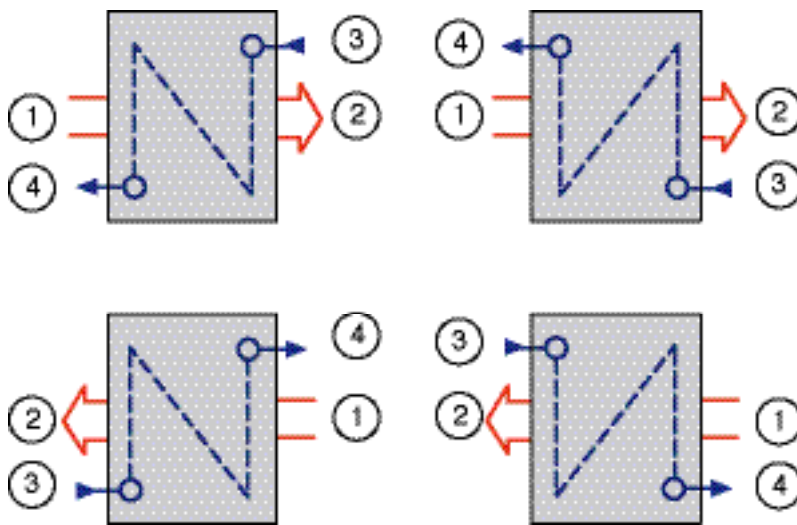
- Maximum operating pressure: 16 bar
- Maximum flow temperature: Unit size 140 and 250 max. 80 °C
Unit size from 400 to 1000 max. 120 °C

Heat exchanger galvanised steel (FeZn/FeZn):

- Maximum operating pressure: 10 bar
- Maximum flow temperature: Unit size 140 and 250 max. 80 °C
Unit size from 400 to 1000 max. 120 °C

Heat exchanger steam (FeZn/Fe):

- Maximum operating pressure: 4.5 bar
- Maximum flow temperature: Unit size 140 and 250 not available
Unit size from 400 to 1000 max. 120 °C
- Feed and reflux pipes must be connected according to the professional regulations.
- May only be operated with water that has no corrosive properties (e.g. no high-purity water) and that contains neither oxygen or carbon dioxide!
- Thermal condensate drains are not suitable for condensate drains with steam heat exchangers. Please only use float condensate drains.
- Valves and actuators must be professionally mounted (provided by customer).
- Carefully bleed the heat exchanger.
- The bleeding and draining facilities for the heat exchanger must be provided by the customer.
- The complete piping must be checked for leaks!



1	Air inlet
2	Air outlet
3	Media inlet
4	Media outlet

Fig.: Counter-current principle

5.5 Condensate pump

Pump control:

Electricity supply: 230 V / 50 Hz
 blue: neutral to N
 brown: live to L
 green/yellow: to ground

The mains cable that supplies the pump must be fused with a 1A fine fuse.

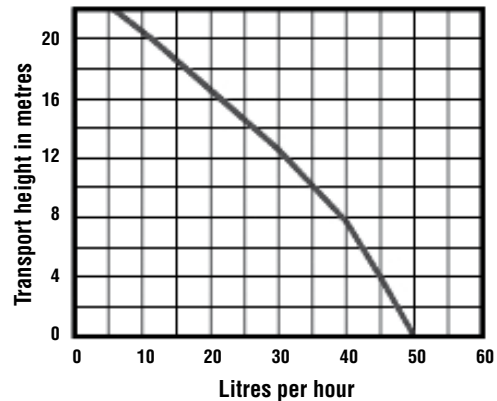
Floating alarm contact:

Black: common line
 Yellow: contact closed during operation, opens during alarm
 Red: contact open during operation, closes during alarm

The alarm function only works when the pump is supplied with voltage and the sensor is connected to the pump.

Performance data:

max. transport volume: 50 l/h
 max. suction height: 7 m
 max. transport height: 20 m
 connection Ø: 6 mm
 Dimensions: 273 x 52 x 62 (L x W x H)



Safety information:

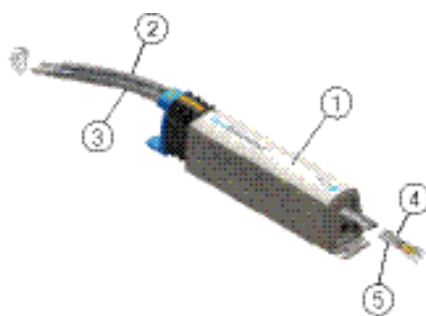


Warning!



Caution!

- Ensure that the power supply is interrupted at the fuse box before connecting, removing or replacing the condensate pump.
- Do not use the pump to remove flammable or explosive liquids.
- Do not operate the pump in an explosive atmosphere.
- The pump may only be used for pumping liquids that do not attack the pump material.
- Do not touch the pump with wet hands or while standing on a wet floor.
- The pump is not suitable for outside areas. It may not be dipped into water or exposed to frost.
- Ensure that the pump is not more than 7 m (max. suction height) above the drip tray exit and not more than 20 m (max. transport height) below the highest point of the condensate drain.
- Connect a flexible condensate drain pipe (internal Ø6 mm) to the pump outlet sleeve and duct it into an appropriate drain. Ensure that the flexible condensate drainage line does not have sharp kinks, is not twisted and does not touch any moving or sharp-edged objects.
- We recommend testing the function of the pump in relation to the transport height before the initial operation of the system. Fill the water into the collecting container of the device and check the function of the pump. Ensure that the pump switches on after the starting point has been reached and switches off once pumping has been completed.
- The air cooling system must switch and the media supply must be stopped once the alarm contact has been reached or in the event of a fault.



1	Condensate pump
2	Suction pipe
3	Pressure pipe
4	Floating alarm contact
5	Connection cable 3-core

Fig.: Condensate pump

5.6 Electrical connection



Warning!

The electrical connection may only be performed by a registered electrician and with consideration of the DIN and VDE regulations and the directives of the local energy supply company.

- The electrical connection of the AL-KO air heater / air cooler must be performed according to the connection plans. Only use the device-specific circuit diagram to connect the device.
- The air heaters / air coolers must be grounded.
- It must be possible to switch off all poles of the supply line with a maintenance switch.
- Fluctuations or deviations from the mains voltage may not exceed the tolerances specified in the technical data, as malfunction can otherwise not be excluded.
- All electrical motors of the fans have a thermal contact as standard equipment. It must be integrated into the controller.

5.6.1 Fan

Check the rotation direction of the fan.

The rotation direction must correspond with the rotation direction arrow on the fan blade or the fan housing.

Technical data for 400-V fan:

Type	140		250		400		650		1000	
Operating voltage in V	3~400 V/50 Hz		3~400 V/50 Hz		3~400 V/50 Hz		3~400 V/50 Hz		3~400 V/50 Hz	
	Δ	Y	Δ	Y	Δ	Y	Δ	Y	Δ	Y
Power consumption in kW	0.19	0.14	0.28	0.19	0.34	0.21	0.62	0.44	0.85	0.47
Nominal current in A	0.40	0.23	0.58	0.31	0.70	0.38	1.25	0.72	1.45	0.83
Operating speed rpm	1390	1170	1340	1080	870	630	900	720	830	540
Insulation class	THCL 155 (F)		THCL 155 (F)		THCL 155 (F)		THCL 155 (F)		THCL 155 (F)	
Protection type	IP 54		IP 54		IP 54		IP 54		IP 54	
Motor contactor	Thermal contact		Thermal contact		Thermal contact		Thermal contact		Thermal contact	

Terminal strip heating without AL-KO rotation speed control

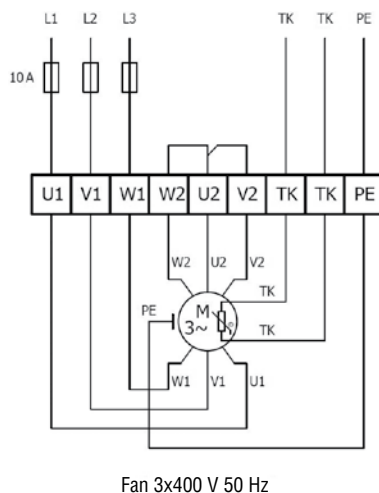


Fig.: Connection scheme for 1-level operation
Low rotation speed (star connection)

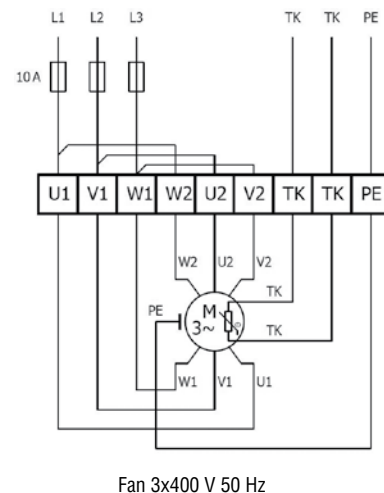


Fig.: Connection scheme for 1-level operation
High rotation speed (delta connection)

Terminal strip cooling without AL-KO rotation speed control

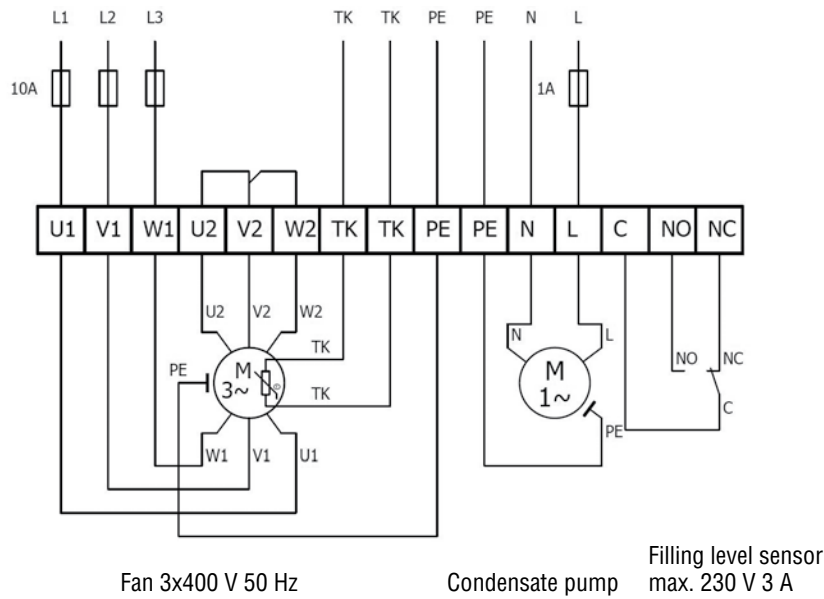


Fig.: Connection scheme for 1-level operation
Low rotation speed (star connection)

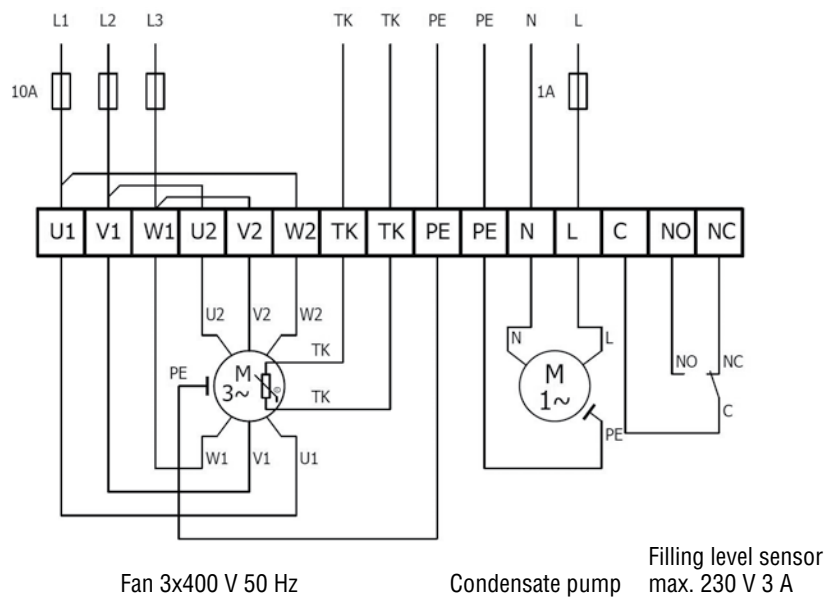


Fig.: Connection scheme for 1-level operation
High rotation speed (delta connection)

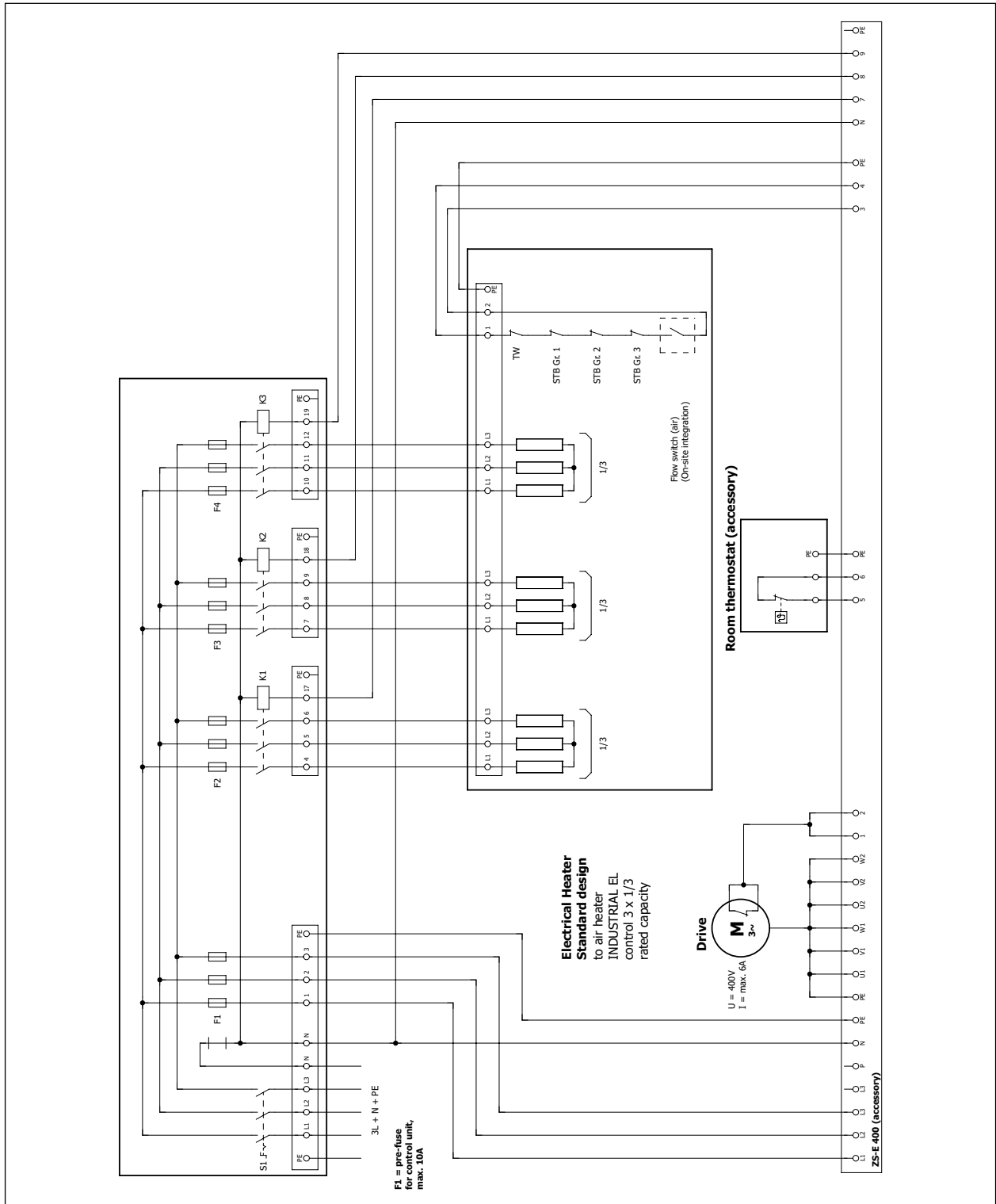
5.6.2 Electrical air heater

- The electrical air heater is wired in one or several switching groups. Each switching group for three-phase power has three connection terminals plus one terminal for grounding each switching group.
- Devices with electrical air heaters require a separate mains connection for the electrical air heater.
- This supply line must be fused by the customer.

Technical data for the electrical heating register:

Device type	Voltage	Electrical power	Number of switching groups	Distribution of the switching groups	Distribution of the power	Distribution of the current	Supply line	Protection type Standard/V4 A
LH 140	3~400 V/50 Hz	4.00 kW	3	1/3 1/3 1/3	3 x 1,33 kW	3 x 1,9 A	4 G 1,5 mm ²	IP 40 / IP 54
		8.00 kW	3	1/3 1/3 1/3	3 x 2,67 kW	3 x 3,8 A	4 G 1,5 mm ²	IP 40 / IP 54
		10.00 kW	3	1/3 1/3 1/3	3 x 3,33 kW	3 x 4,8 A	4 G 1,5 mm ²	IP 40 / IP 54
LH 250	3~400 V/50 Hz	12.00 kW	3	1/3 1/3 1/3	3 x 4,0 kW	3 x 5,8 A	4 G 1,5 mm ²	IP 40 / IP 54
		15.00 kW	3	1/3 1/3 1/3	3 x 5,0 kW	3 x 7,2 A	4 G 2,5 mm ²	IP 40 / IP 54
		20.00 kW	3	1/3 1/3 1/3	3 x 6,67 kW	3 x 9,6 A	4 G 2,5 mm ²	IP 40 / IP 54
LH 400	3~400 V/50 Hz	20.00 kW	3	1/3 1/3 1/3	3 x 6,67 kW	3 x 9,6 A	4 G 2,5 mm ²	IP 40 / IP 54
		28.00 kW	3	1/3 1/3 1/3	3 x 9,33 kW	3 x 13,5 A	4 G 2,5 mm ²	IP 40 / IP 54
		35.00 kW	3	1/3 1/3 1/3	3 x 11,67 kW	3 x 16,8 A	4 G 4 mm ²	IP 40 / IP 54
LH 650	3~400 V/50 Hz	30.00 kW	3	1/3 1/3 1/3	3 x 10,0 kW	3 x 14,4 A	4 G 4 mm ²	IP 40 / IP 54
		45.00 kW	3	1/3 1/3 1/3	3 x 15,0 kW	3 x 21,7 A	4 G 6 mm ²	IP 40 / IP 54
		55.00 kW	3	1/3 1/3 1/3	3 x 18,33 kW	3 x 26,5 A	4 G 6 mm ²	IP 40 / IP 54
LH 1000	3~400 V/50 Hz	45.00 kW	3	1/3 1/3 1/3	3 x 15,0 kW	3 x 21,7 A	4 G 6 mm ²	IP 40 / IP 54
		60.00 kW	3	1/3 1/3 1/3	3 x 20,0 kW	3 x 28,9 A	4 G 10 mm ²	IP 40 / IP 54
		75.00 kW	3	1/3 1/3 1/3	3 x 25,0 kW	3 x 36,1 A	4 G 10 mm ²	IP 40 / IP 54

Circuit diagram:



- Air heating devices with electrical air heaters must be operated to ensure that the air heater cannot be switched on when the fan is switched off.
- The electrical air heaters must be deactivated as soon as the air flow is inappropriately reduced.
- The switching-off procedure for the electrical air heater must be implemented to ensure that the fan runs for at least 3 minutes after the electrical air heater has been switched off in order to prevent overheating.
- The temperature should be adjusted to 30°C.
- The electrical connection may only be performed by a registered electrician and with consideration of the DIN VDE 0100-420 regulations and the local energy supply company.

5.6.3 Cable list



The cable cross-sections are specified without guarantee.
The type of installation and possible cumulation are not considered!

Devices with three-phase motor:	Supply line (400 V, AC/3 Ph)
Device type	Cable
LH 140; LH 250; LH 400; LH 650; LH 1000	6 G 1,5 mm ² (1-level); 9 G 1,5 mm ² (2-level)
Devices with three-phase motor:	Supply line (230 V, DC/1 Ph)
Device type	Cable
Condensate pump	3 G 0,75 mm ²
Cable for optional field devices:	
Field device	
see "Controllers and regulators for air-heating devices / air-cooling devices" documentation	

6. Operation / general information

The total air volume recirculated by the devices should correspond to 4 or 5 times per hour of the air volume in the room. The system responds slowly and heat is trapped when the air recirculation volume is insufficient. A higher recirculation volume is welcome. It makes the system more responsive!

Cooling

The air outlet temperature during cooling should be at most 6 - 8°C below the environmental temperature to prevent unpleasant draft effects. Too high temperature differences (> 8°C) may lead to the formation of cold-air zones.

Heating

The air outlet temperature of the air heater should not be below 34 °C or above 42 °C.

An air outlet temperature below 34 °C poses the risk of unpleasant draft effects in the area of the work stations. An air outlet temperature above 42 °C results in a strong thermal air movement. The penetration depth of the warm air stream is reduced. The cold air in the occupied area is only insufficiently penetrated by and mixed with the heated air. A "cold air zone" forms in the occupied area while more pent-up heat collects in the ceiling area (heat loss).

7. Switch cabinet

AL-KO air heaters / air coolers can be optionally extended with various control accessories.

Connecting a third-party frequency converter at the customer side constitutes a change to the device and is therefore not permitted!

Further details and information are provided in the "Controllers and regulators for air-heating devices / air-cooling devices" documentation.



Caution!

Heating media temperatures of more than 120 °C require the heating agent supply to be cut off when the fan is switched off and the fan continuing to operate for approx. 3-4 minutes.

8. Maintenance

The operator is obliged to have the system regularly maintained by specialised staff. AL-KO undertakes this task when a maintenance contract has been concluded.

8.1 Safety



Warning!

Maintenance, repair, work on the electrical system, etc. may only be performed by educated, trained and instructed specialist personnel.



Warning!

The device must be switched to a voltage free state and the main switch and/or the maintenance switch must be switched off (all poles) and secured against unauthorised re-operation before any work is performed.

The impeller continues running for approx. 1 to 3 minutes after switching off the device. The impeller may never be slowed down by hand or another object.

Once work on the device has been completed, the person responsible must ensure that all protective devices installed in the factory are fully functional before the device is re-operated.

8.2 Consumables and spare parts



Caution!

Only use original consumables and spare parts. This is required to ensure safe operation. The warranty might otherwise become invalid!

8.3 Maintenance plan

No.	Component / activity	Measures	Inspections to be performed at n-month intervals as specified below			
			1	3	6	12
1.	Air inlet and outlet					
	Check for dirt, damage and corrosion	Completely clean and repair				X
2.	Device housing					
	Check for dirt, damage and corrosion on the air inlet side	Clean and repair				X
	Check for water (condensate, leaks)	Clean and determine the cause			X	
	Check the steps of the function	Clean as required				X
	Flexible connections	Check for leaks				X
3.	Air filters					
	Check for unacceptable pollution, damage (leaks) and smell (air filters must retain the separation capacity according to their filter class during their whole service life)	A filter that shows noticeable pollution or leaks must be exchanged. Exchange the whole filter when the last exchange was longer than 6 months ago.		X		
	Latest filter exchange					X
	Control of the state of hygiene					X

No.	Component / activity	Measures	Inspections to be performed at n-month intervals as specified below			
			1	3	6	12
4.	Heat exchanger					
	When cleaning in the installed state is not sufficient, the heat exchanger must be pulled out or de-installed and cleaned in an appropriate manner					
	Check for dirt, damage and corrosion	Clean and repair		X		
	Check the wet cooler, condensate tray and droplet separator for dirt, corrosion and appropriate function	Repair		X		
	Check the function of the siphon	Repair		X		
	Control of the state of hygiene				X	
	Heater					
	Check the air-side for dirt, damage and corrosion	Clean and repair			X	
	Cleaning to retain function (air side)				X	
	Check the function of the feed and reflux				X	
	Bleed				X	
	Electrical heater					
	Check for scale deposits and corrosion				X	
	Cleaning to retain function (air side)				X	
	Check for appropriate function				X	
	Check the function of the control and safety devices				X	
	Cooler					
		The siphon (customer side) must be appropriately dimensioned and arranged to allow the condensed water to escape without delay.				
	Check for dirt, damage and corrosion	Clean and repair		X		
	Clean the wet cooler, droplet separator and the trays			X		
	Check the function of the feed and reflux				X	
	Bleed				X	
	Check the hygiene state				X	
5.	Louvre flaps					
	Check for dirt, damage and corrosion	Clean as required			X	
	Check mechanical function				X	
	Flap actuators	Check the function			X	
6.	Fans					
	Check the fan for dirt, damage and corrosion	Clean and repair		X		
	Check the impeller for dirt, imbalance and running noises	Briefly switch on the motor			X	
7.	Switch cabinet					
	Visually inspect terminal and plug-in connections	Check for firm attachment and clean as required.			X	

8.4 Checking the components

Components must be regularly checked to detect and repair faults at an early stage.

The regular controls include the following and other measures:

Visual control of the relevant device area for faults such as dirt, rust formation and damage.

8.4.1 Checking the heat exchanger

- Check the heat exchanger form pollution at the air side, damage and corrosion.
- Check connectors and screw connections.
- Check the bleeding valve and the filling of the heat exchangers.
- Check the anti-freeze concentration.
- Check the syphon and top it up as required.
- Check the function of the water drains.

8.4.2 Checking the condensate pump

- Check the condensate pump for dirt, damage and appropriate function.
- Check the condensate hose for dirt and damage.
- Check the filling level sensor (DrainStick) for dirt, damage and appropriate function.
- Check the condensate tray for dirt and damage.

8.4.3 Check the louvre slats

- Check the louvre slats for dirt, damage and corrosion.
- Check the mechanical function of the louvre slats.
- Check the end position of the flap actuators and adjust as required.

8.4.4 Checking the fans

- The fan is maintenance free, due to its ballpoint bearing with life-long lubrication. An exchange of the bearings is required at the end of the fan lifespan (for standard applications approx. 30 – 40.000 h).
- Check the fans for dirt, damage and corrosion.
- Check the fan attachment and fasten all attachment screws.
- Check the function of the protective devices.
- Take note of atypical bearing noises and vibration-free running.



Caution!

Humid atmosphere:

It is recommended to run the fans at least for two hours per month during prolonged standstill periods to ensure that accumulated humidity is evaporated.

8.4.5 Check the filters

The filters must regularly be checked for dirt and damage!

8.5 Cleaning the components

Components identified as dirty during the inspection must immediately be cleaned. No aggressive, paint-dissolving cleaning agents may be used for cleaning.

8.5.1 Clean the heat exchangers

- The heat exchangers can be cleaned with compressed air.

**Caution!**

The use of high-pressure water cleaners with conventional one-jet nozzles is not permitted due to the risk of damage!

After a prolonged standstill, corrosion due to sulphate-reducing bacteria may occur in the heat exchangers. These sulphides mainly attack the soldering seams, but also the basic copper material.

We recommend the following steps to reduce this type of corrosion:

- Use sulphate-free water in the cycle.
- Ensure that the cycle is tight
- Avoid frequent topping-up with fresh water.
- Use material-compatible inhibitors or biocides.

8.5.2 Cleaning the condensate pump

- Regularly clean the condensate pump, condensate hose, condensate sensor (DrainStick) and condensate tray.

8.5.3 Cleaning the louvre slats

- Regularly clean the louvre slats.

8.5.4 Clean the fans

- Regularly clean the fan impeller, motor and grid.
- The whole fan can be cleaned with a damp cleaning cloth.
- Do not use high-pressure cleaners or water beams for cleaning.
- Avoid penetration of water into the motor and the electrical installation.
- After the cleaning process, the motor must be operated for 30 minutes at 80-100% max. rotation speed to evaporate any water that may have entered.

8.6 Exchanging components

**Warning!**

Maintenance, repair, work on the electrical system, etc. may only be performed by educated, trained and instructed specialist personnel.

8.6.1 Exchanging the filter bags



Worn air filters must be replaced and not washed and reused. The hygiene requirements can otherwise not be achieved!

- Open the clamping seals and remove the service lid.
- Pull the filter element out of the device.
- Insert a new filter element.
- Replace the service lid and fasten the clamping seals.

8.6.2 Exchanging the heat exchanger

- Switch the device to a voltage-free state.
- Disconnect the electricity connections.
- Disconnect the medium connectors of the heat exchanger.
- Remove the device.
- Disconnect the fan cables in the fan terminal box.
- Carefully pull out the fan cable.
- Remove the rear wall with the fan.
- Loosen the fastening screws of the heat exchanger.
- Pull out the heat exchanger towards the back or, after removing the lateral cover sheet, towards the side.
- Install the heat exchanger in reverse order!

8.6.3 Exchanging the condensate pump

- Switch the device to a voltage-free state.
- Disconnect the electricity connections.
- Loosen the condensate hoses and unplug the connector for the sensor.
- Loosen the fastening screws for the condensate pump.
- The condensate pump is installed in reverse order!

8.6.4 Exchange the outlet vents

- Push the outlet louvre sideways
- Unhook the bolt and remove the outlet louvre.
- Install the outlet louvre in reverse order!

8.6.5 Exchanging the fan

- Switch the device to a voltage-free state.
- Disconnect the fan cables in the fan terminal box.
- Carefully pull out the fan cable.
- Loosen the fastening screws of the fan.
- Install the fan in reverse order!

9. Help with faults



Warning!

Diagnosis, fault removal and reoperation may only be performed by duly authorised persons. This applies, in particular, to work on the electrical devices within the switch cabinet (e.g. test work, exchange, etc.).

9.1 Contact person

Please address all questions in connection with our products to the installer of your air system, to one of our branches or directly to:

AL-KO THERM GMBH	Tele- phone:	(+49) 8225/ 39-0
Hauptstraße 248-250	Fax:	(+49) 8225/ 39-2113
89343 Jettingen-Scheppach	E-mail:	luftheizung@al-ko.de
Germany	Web:	www.al-ko.com

9.2 General faults

Fault	Possible cause of fault / action
Only cold air is blown out	There is air in the cycle ■ Bleed the heating system
Condensate collects although the system is switched off	Cold water supply continues ■ Stop the cold water supply as soon as the device is switched off

10. Shut-down

10.1 Decommissioning

Switch the system to a voltage-free state (all poles disconnected) and secure it against unauthorised switching on before any work is performed.



Caution!

Some parts of the system are pressurised.



Caution!

In winter, there is a risk that individual components might freeze. Take appropriate steps, e.g. fill in anti-freeze, as required.

The system must always be bled before re-operation and the points listed in the Maintenance chapter must be adhered to.

10.2 Dismantling

Switch the system to a voltage-free state (all poles disconnected) and secure it against unauthorised switching on before any work is performed.



Caution!

Some parts of the system are pressurised.

The dismantling may only be performed by trained specialist staff. The dismantling must be performed according to the relevant work and accident prevention regulations valid at the time.

10.3 Disposal



Do not dispose of work out devices as domestic waste!

The relevant, local environmental and recycling regulations valid in your country and your municipality at the time must be adhered to when disposing of the air heater / air cooler, the operating materials and the accessories.

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