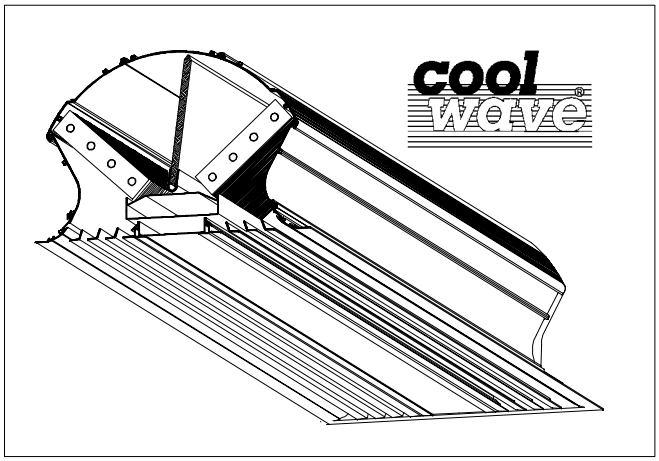
LTG Aktiengesellschaft

Cooling system cool wave®

A new dimension in room cooling



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Components for Room Air Technology

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Sontraer Str. 27
D-60386 Frankfurt am Main
Herr Schilling
☎ (069) 94 20 19-14, Fax -10
E-mail: Schilling@LTG-AG.de

Central office (Herborn)
Sales area:
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Sperberweg 16
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Herr Hartmann
☎ (02772) 570-725, Fax -727
E-mail: Hartmann@LTG-AG.de

Eastern office (Berlin)
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PLZ 10-25, 29, 39
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D-12487 Berlin
Herr Linke
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E-mail: Linke@LTG-AG.de

Eastern office (Chemnitz)
Sales area:
PLZ 01-09, 98, 99
Johannes-Ebert-Straße 20
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E-Mail: info@htk-went.pl

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E-Mail: info@argelo.pt

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Energo Plus

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E-Mail: info@energoplus.si

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Laminair AG

Kirchberstrasse 105
Ch-3400 Burgdorf
☎ (034) 420 02-10, (034) 420 02-11
E-Mail: info@laminair.ch

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Step Müh. Yapi Ltd.

Yali Yolu Sokak, Turanli Apt. No: 24 D.1
TR- 34744 Bostanci-Istanbul
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E-Mail: info@stepyapi.com.tr

The Program for Room Air Technology

Components

Air diffusers for walls, floors and ceilings · "LTG System clean®" · Coandatrol® and Coandavent® air diffusers · LTG cool wave® chilling fans · Klimavent® induction units · Raumluft® fan coil units · Facade fan coil units · Airflow control units · labair® system

Engineering services

Technical services for investors, architects, engineers and plant builders during design, construction and operation of buildings. Reliable and precise data relating to the ventilation of air conditioning system are given already before realization of the project, determined by measurements, calculations, building simulations and experiments.

Components for Process Air Technology

Japan

Toho Engineering Co. Ltd.

14-11, Shimizu 3-Chome, Kita Ku
Japan 462 Nagoya
☎ (052) 9 91-10 40, Fax (052) 9 14-98 22
E-Mail: main@tohoeng.com

The Program for Process Air Technology

Components

Axial-flow, centrifugal and tangential fans · Collector system for: coarse and fine particle filtration, separating and compacting, compressing and humidifying.

Engineering services

Technical services for construction engineers and plant designers during development and operation of assembly groups, machines and plants.

List of contents

Cooling system cool wave® - Selection data

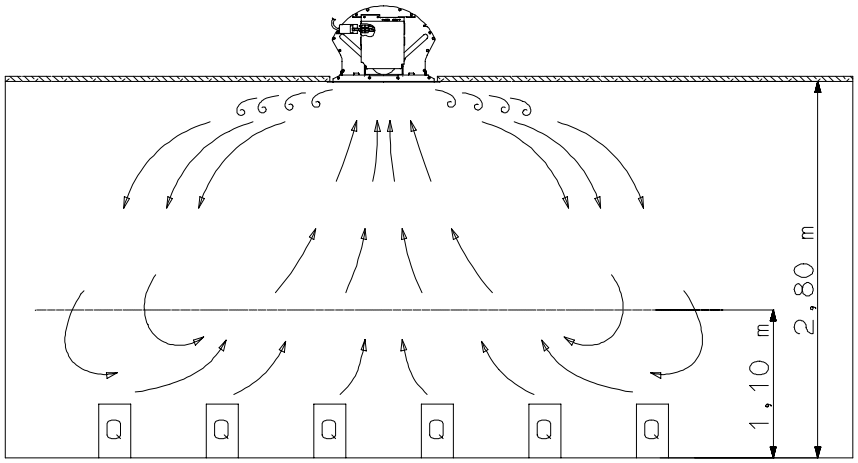
LTG chilled beam with oscillating fan is compact, ceiling-mounted unit which cools the air in a room by convection, making use of the recirculating principle. For reasons of hygiene, it should not be used for dehumidification.
The lowest water supply temperature for operation without condensation essentially depends on the humidity of the air and may be 1-2 K below the dew point of the ambient air. With the cooling fan inoperative, however, a water supply temperature as low as this may cause condensation to form on the heat exchanger plates, similar to the effect produced when windows are left open for a short time. A condensation trap in the cooling unit adequately accommodates occasional, short-term incidence of condensation.
Layout planning is straightforward since, apart from the question of size, only the water flow rate and temperature need to be taken into account as unspecified parameters. Oversizing does not impair the cooling effect but shortens the actual running time of the unit.
In contrast to ventilated ceilings, chilled beam with oscillating fan can be arranged at closer intervals in the ceiling in areas with a high cooling requirement. Surfaces heated by sunlight along an outside wall can be effectively cooled. Heat generated by high density computer workstation arrangements can largely be prevented from spreading into adjoining areas. The pressure loss applies only to the two heat exchangers arranged in series; technical data for the service valve available as an accessory are given separately.

Size		800	1000	1250
KFA/E:	specific nominal cooling capacity $Q_{kN}/\Delta t$ in W/K* (with nom. water flow rate see below)	37	50	-
	nominal cooling capacity Q_{kN} in W*(with Δt^{**} = 10 K and nom. water flow rate)	**370**	**500**	-
	Specific cooling capacity $Q_k/\Delta t$ in W/K* (with $\Delta t_W{}^{***}$ = 2 K)	32	46	-
	cooling capacity in $Q_{k\ in}$ W* with Δt_W = 2 K and water flow rate in kg/h (Δt = 10 K)	320/140	460/200	-
	Sound power level in dB(A)	30	31	-
KFA/S:	specific nominal cooling capacity $Q_{kN}/\Delta t$ in W/K* (with nom. water flow rate see below)	33	44	-
	nominal cooling capacity Q_{kN} in W*(with Δt^{**} = 10 K and nom. water flow rate)	**330**	**440**	-
	Specific cooling capacity $Q_k/\Delta t$ in W/K* (with $\Delta t_W{}^{***}$ = 2 K)	27	38.5	-
	cooling capacity in $Q_{k\ in}$ W* with Δt_W = 2 K and water flow rate in kg/h (Δt = 10 K)	270/120	385/170	-
	Sound power level in dB(A)	30	31	-
KFA/T+F:	specific nominal cooling capacity $Q_{kN}/\Delta t$ in W/K* (with nom. water flow rate see below)	44	49	60
	nominal cooling capacity Q_{kN} in W*(with Δt^{**} = 10 K and nom. water flow rate)	**440**	**490**	**600**
	Specific cooling capacity $Q_k/\Delta t$ in W/K* (with $\Delta t_W{}^{***}$ = 2 K)	41	44.5	56.5
	cooling capacity in $Q_{k\ in}$ W* with Δt_W = 2 K and water flow rate in kg/h (Δt = 10 K)	410/160	445/185	565/240
	Sound power level in dB(A)	30	30	31
KFA/L:	specific nominal cooling capacity $Q_{kN}/\Delta t$ in W/K* (with nom. water flow rate see below)	34	37	-
	nominal cooling capacity Q_{kN} in W*(with Δt^{**} = 10 K and nom. water flow rate)	**340**	**370**	-
	Specific cooling capacity $Q_k/\Delta t$ in W/K* (with $\Delta t_W{}^{***}$ = 2 K)	27	32.5	-
	cooling capacity in $Q_{k\ in}$ W* with Δt_W = 2 K and water flow rate in kg/h (Δt = 10 K)	270/115	325/135	-
	Sound power level in dB(A)	32	32	-
Power input in W		20	20	20
Water flow rate in kg/h		300	350	420
Water-side pressure loss in kPa (without valves)		10	16	27
Water-side pressure loss in kPa (with LTG valves)		21	30	48

* select t_{VL} in a manner that a condensation-free operation is guaranteed

** Δt temperature difference between ambient air and water inlet (t_R - t_{VL})
*** Δt_W temperature difference between water inlet and water outlet (t_{VL} - t_{RL})

Cooling system cool wave® - Power measuring method



Marginal conditions:
- determination of room temperature t_R at a height of 1.1 m
- uniformely distributed heat sources (Q) in the room.

Dimensioning

The selection may be realized by one of the two methods:

1. Determination of the water inlet temperature and the water flow rate:
   The cooling capacity diagram (page 6 and 7) will then state the specific cooling capacity $Q_k/\Delta t$.
2. Determination of the required temperature difference Δt_W (water inlet minus water outlet temp.):
   The cooling capacity diagram (page 6 and 7) will then indicate the specific cooling capacity $Q_k/\Delta t$ and the water flow rate.

Example 1 (with determination of the water inlet temperature and the flow rate):

given values:

room temperature:	t_R	= 26 °C	
water inlet temperature:	t_{VL}	= 16 °C	**=>** Δt^{**} **= 10 K**
set water flow rate:	w	= 350 kg/h	

taken from the cooling capacity diagramm for KFA 1000/F

specific cooling capacity: **$Q_k/\Delta t$ = 49 W/K**

=> cooling capacity KFA 1000/F: **Q_k** = 49 W/K · 10 K **= 490 W**

Example 2 (with determination of the temperature difference):

calculation of the quotient $\Delta t_W^{***}/\Delta t^{**}$

temperature difference	Δt_W	= 2 K	
room temperature:	t_R	= 26 °C	
water inlet temperature:	t_{VL}	= 16 °C	**=>** Δt **= 10 K** **=>** $\Delta t_W/\Delta t$ **= 0.2**

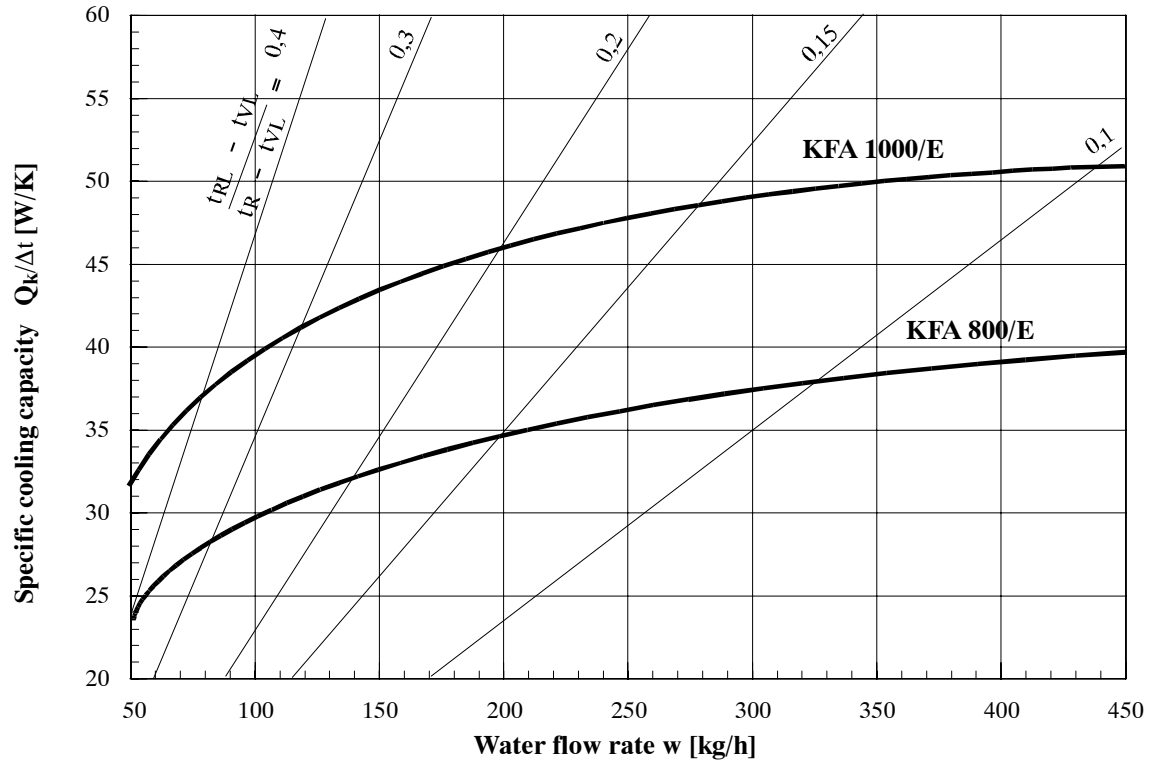
taken from the cooling capacity diagram for KFA 1000/E:

specific cooling capacity: **$Q_k/\Delta t$ = 46 W/K**
water flow rate **w = 197 kg/h**

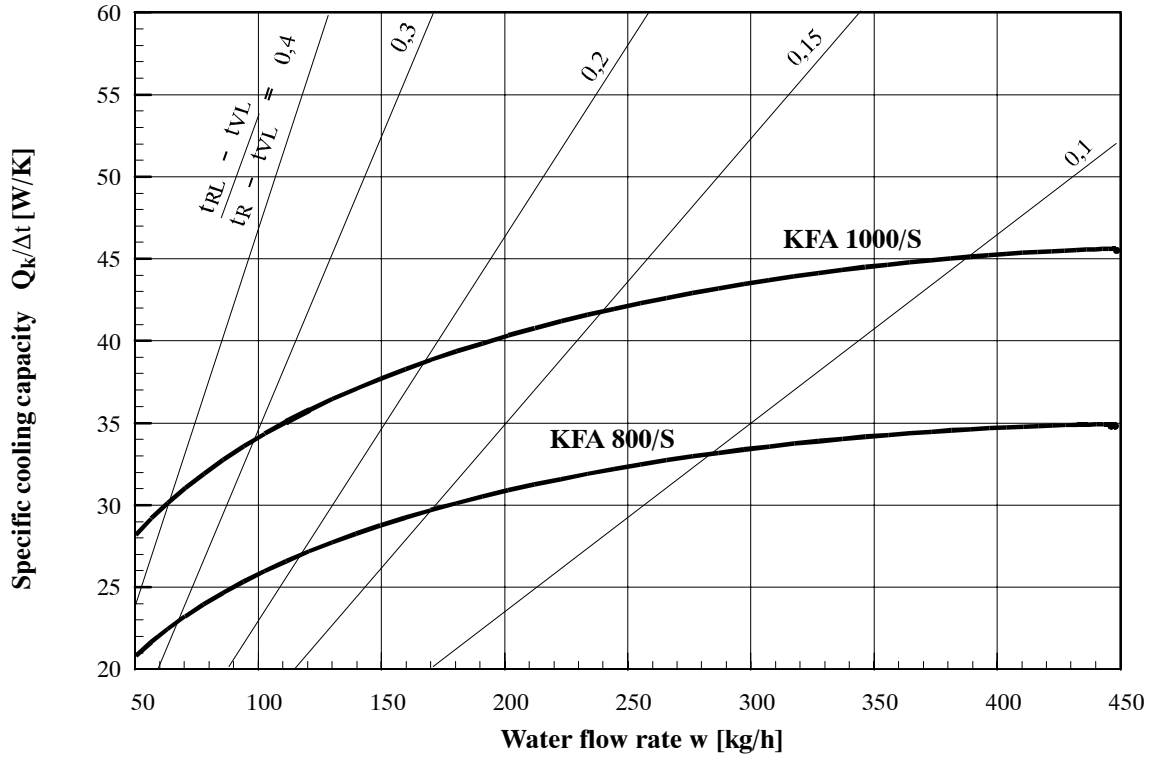
=> cooling capacity KFA 1000/E : **Q_k** = 46 W/K · 10 K **= 460 W**

** Δt temperature difference between ambient air and water inlet (t_R - t_{VL})
*** Δt_W temperature difference between water inlet and water outlet (t_{VL} - t_{RL})

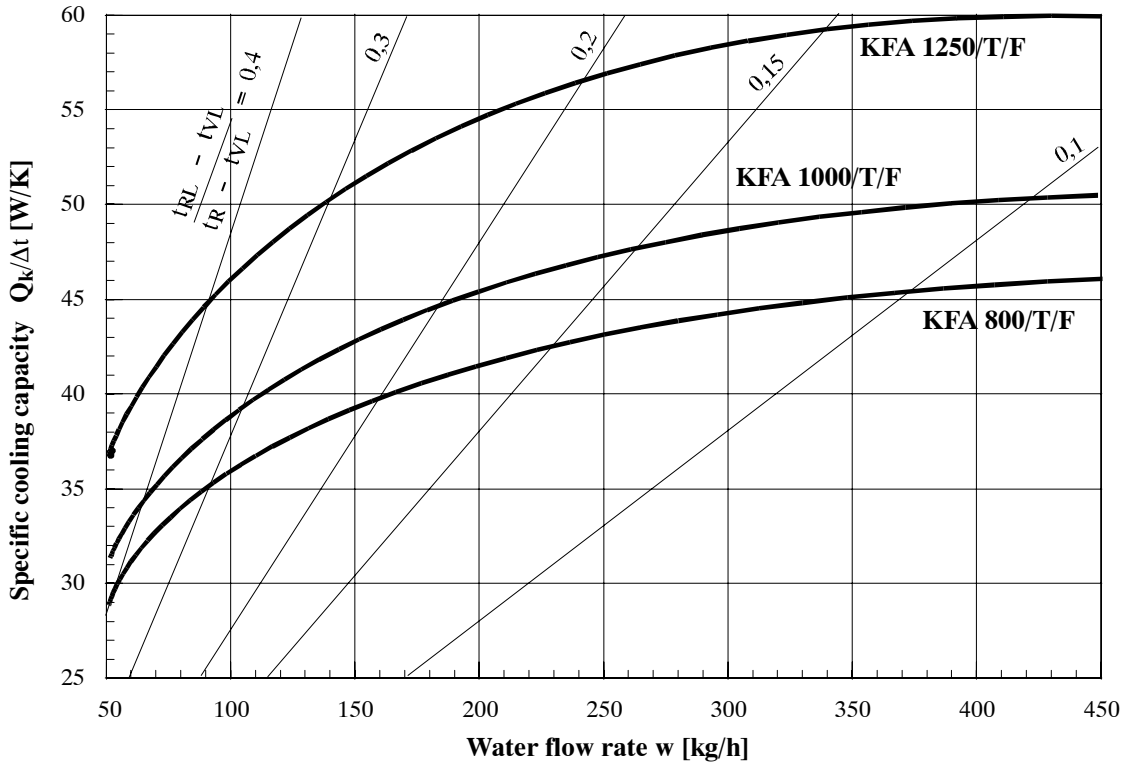
Performance data for KFA/ E (flush to ceiling)



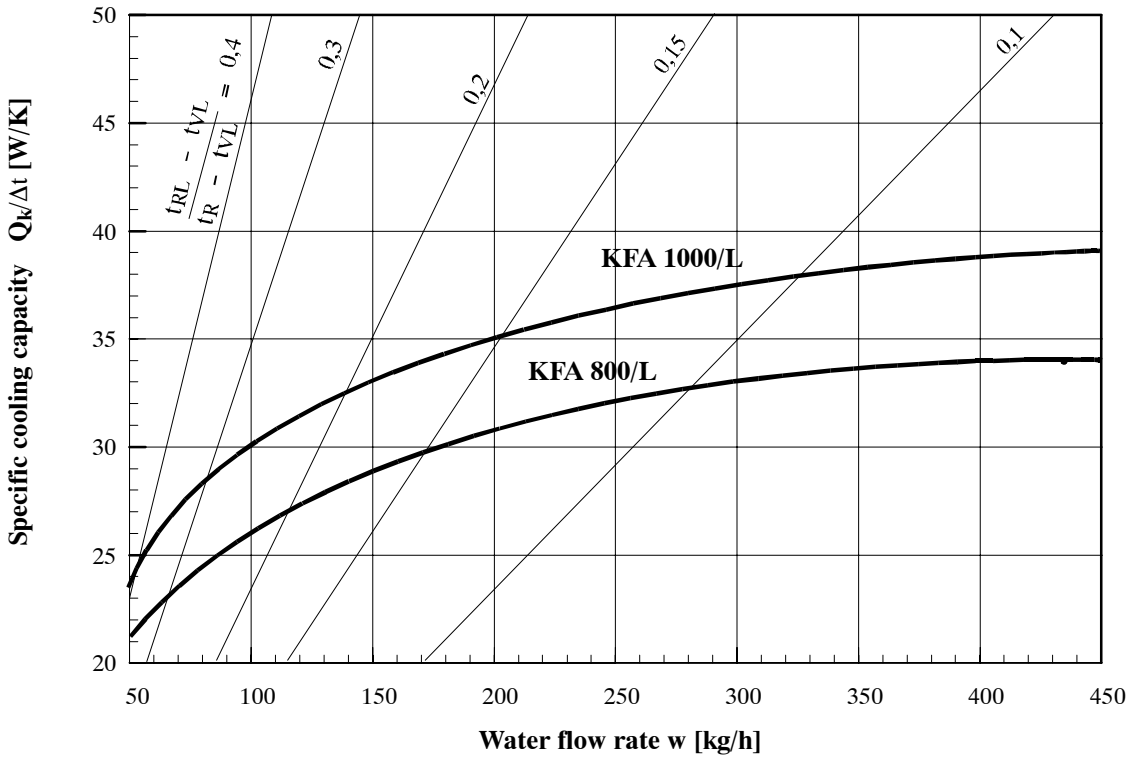
Performance data for KFA/ S (slim, flush to ceiling)



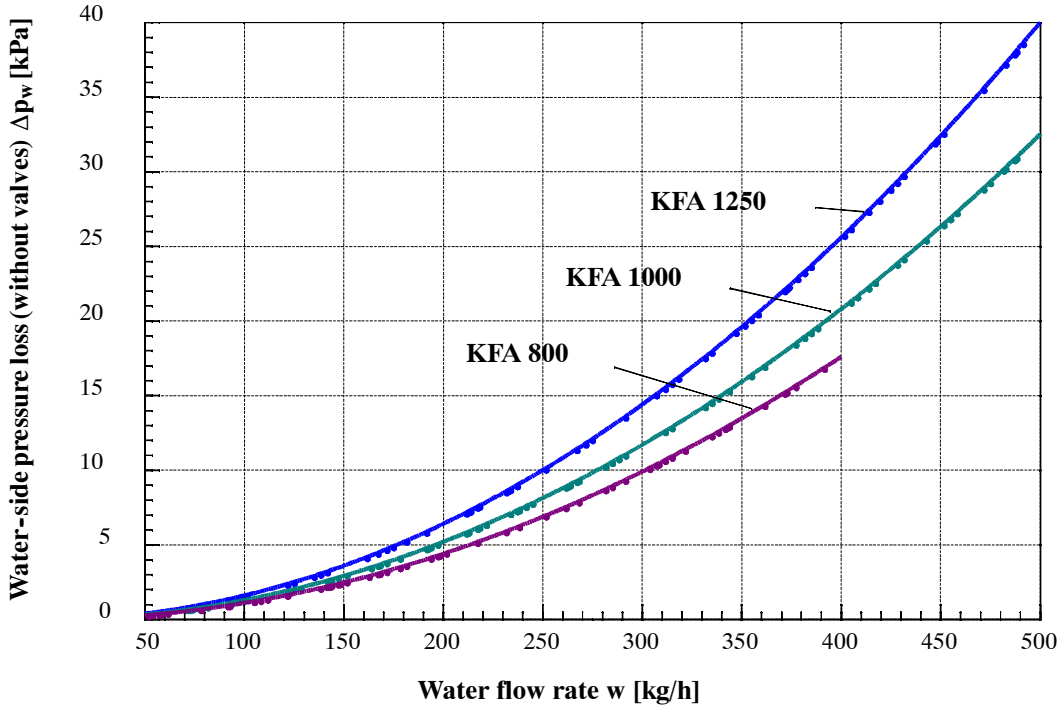
Performance data for KFA/ T and KFA/ F (semi-recessed and suspended)



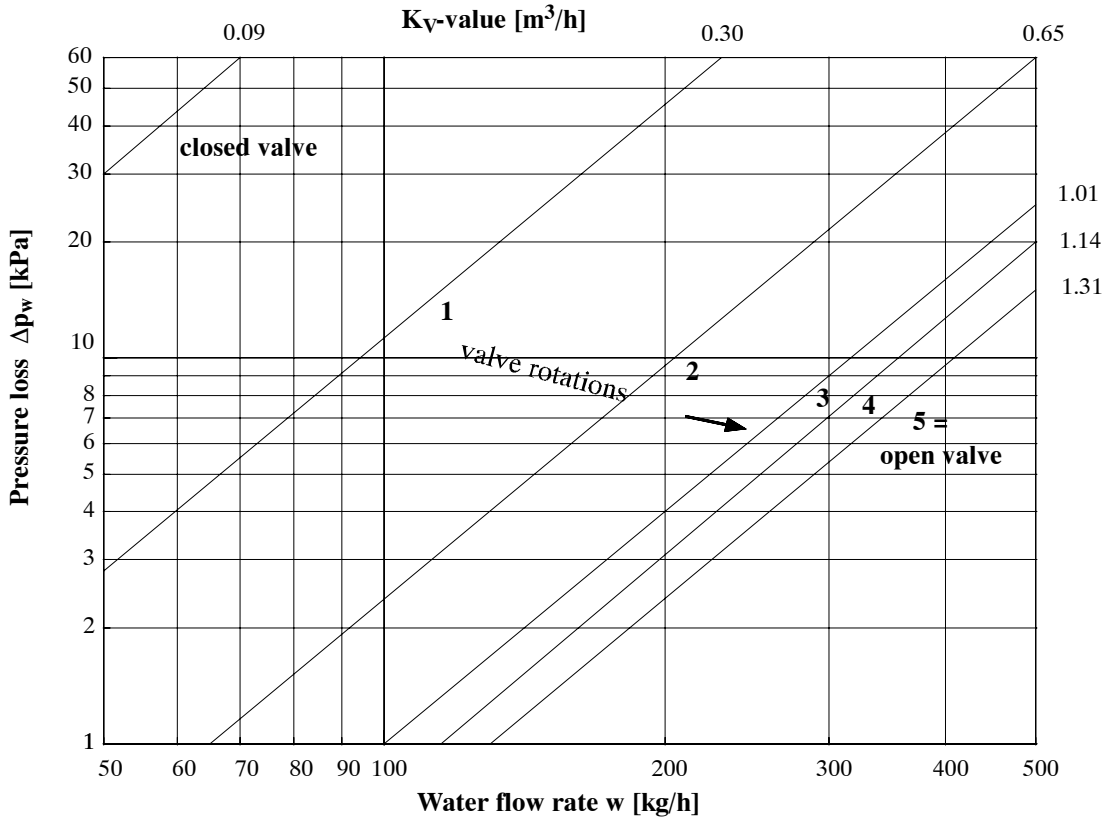
Performance data for KFA/ L (flush to ceiling, with luminaire)



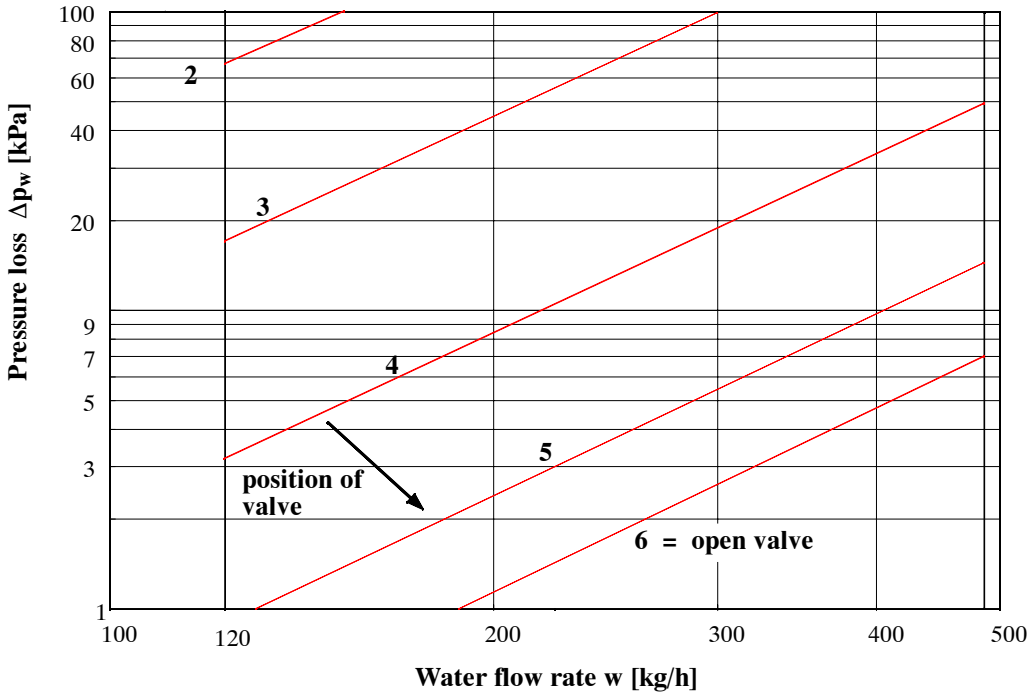
Pressure loss (for all KFA versions, without valves)



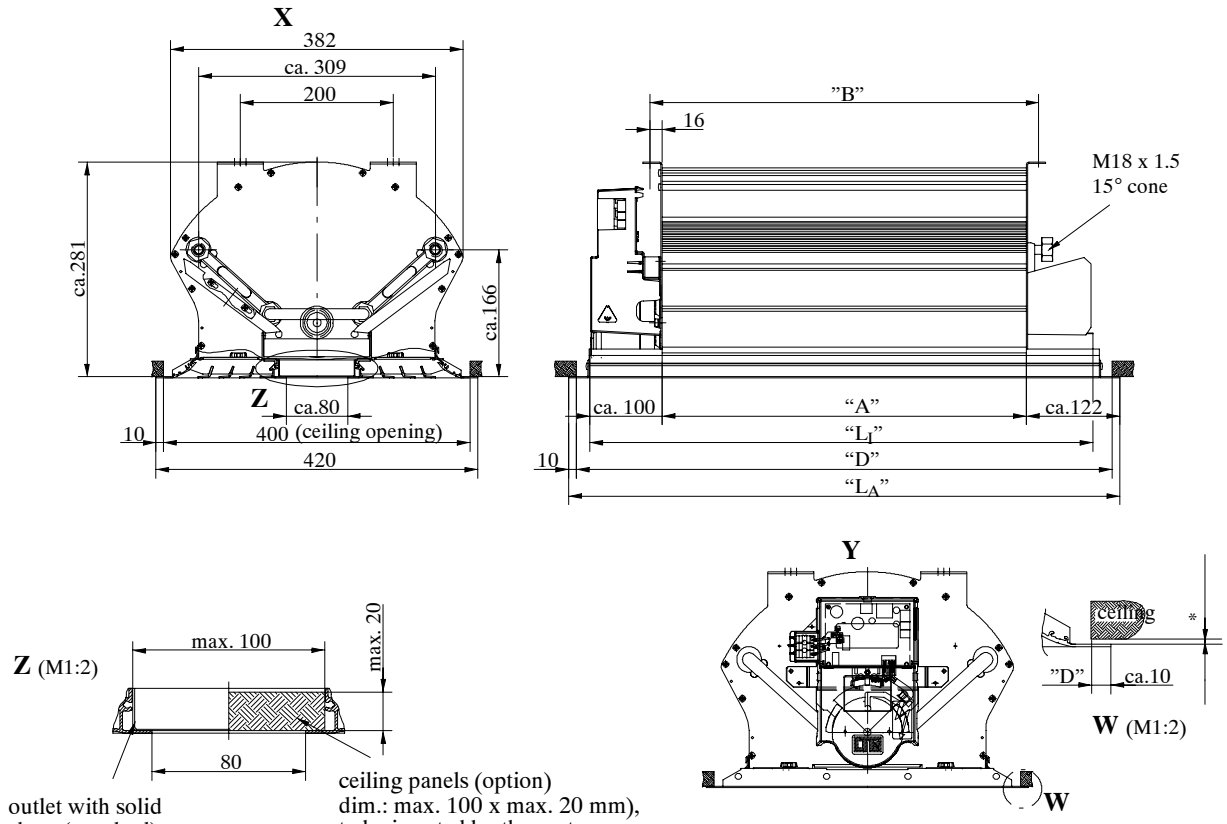
Pressure loss of LTG angle and straightway valves (per valve)



Pressure loss of LTG presetting valve with inspection glass



Dimensional diagram - KFA .../ E (flush to ceiling) - Version 1 for flanged installation



* Distance to the ceiling: 1-2 mm
Avoid any contact between the diffuser and any ceiling components.

Legend:

X = View from the water supply side (connections M18 x 1.5 - 15° cone)
Y = view from the power supply side

Size	**„A“** in mm (effective length)	**„B“** in mm (between mounting points)	**„L_I“** in mm (overall unit length)	**„D“** in mm (length of ceiling opening)	**„L_A“** in mm (overall diffuser length)
Size 800	776	808	approx. 980	1000	1020
Size 1000	976	1008	approx. 1180	1200	1220

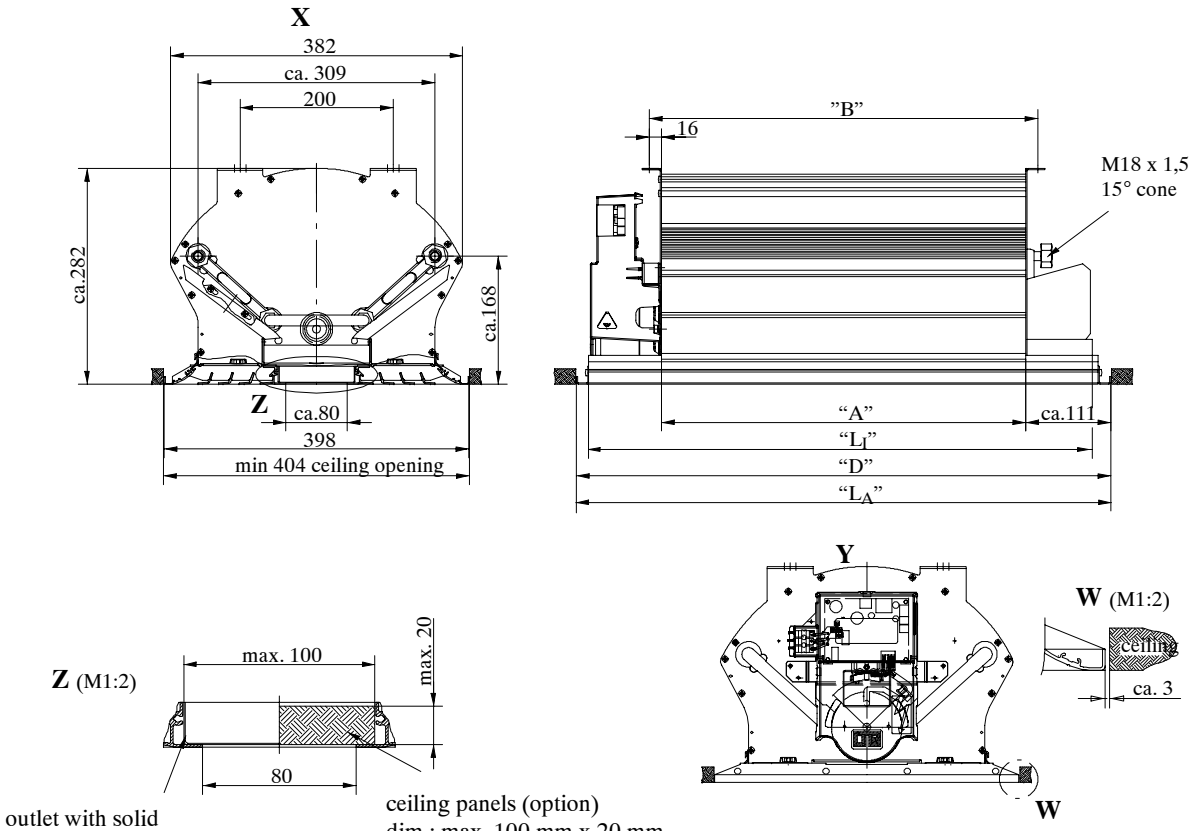
Tolerances

- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - KFA .../ E (flush to ceiling) - Version 2 for flangeless installation



Legend:

X = View from the water supply side (connections M18 x 1.5 - 15° cone)
Y = view from the power supply side

Size	**„A“** in mm (effective length)	**„B“** in mm (between mounting points)	**„L_I“** in mm (overall unit length)	**„D“** in mm (length of ceiling opening)	**„L_A“** in mm (overall diffuser length)
Size 800	776	808	approx. 980	1006	998
Size 1000	976	1008	approx. 1180	1206	1198

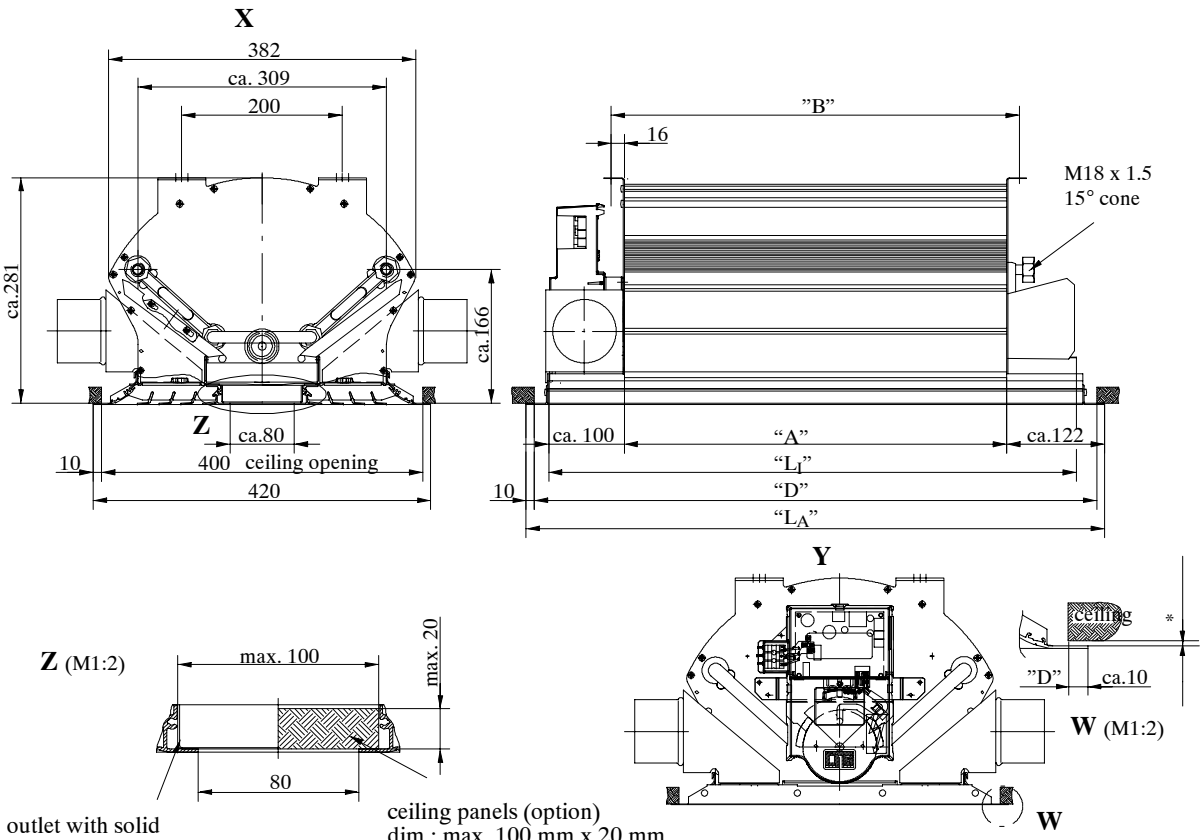
Tolerances

- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - KFA.../ E (flush to ceiling) with integrated boxes for fresh air supply



Legend:

X = view from the water supply side (connections M18 x 1.5 - 15° cone)
Y = view from the power supply side

Size	**„A“** in mm (effective length)	**„B“** in mm (between mounting points)	**„L_I“** in mm (overall unit length)	**„L_I“** in mm (overall unit length)	**„L_A“** in mm (overall diffuser length)
Size 800	776	808	approx. 980	1000	1020
Size 1000	976	1008	approx. 1180	1200	1220

Size	**„d“** in mm (socket diameter)	**max. volume flow rate in m^3/h** 1 fresh air box*	**max. volume flow rate in m^3/h** 2 fresh air boxes*
Size 800	79	40	70
Size 1000	79	40	70

* shown is the installation with two integrated fresh air boxes.

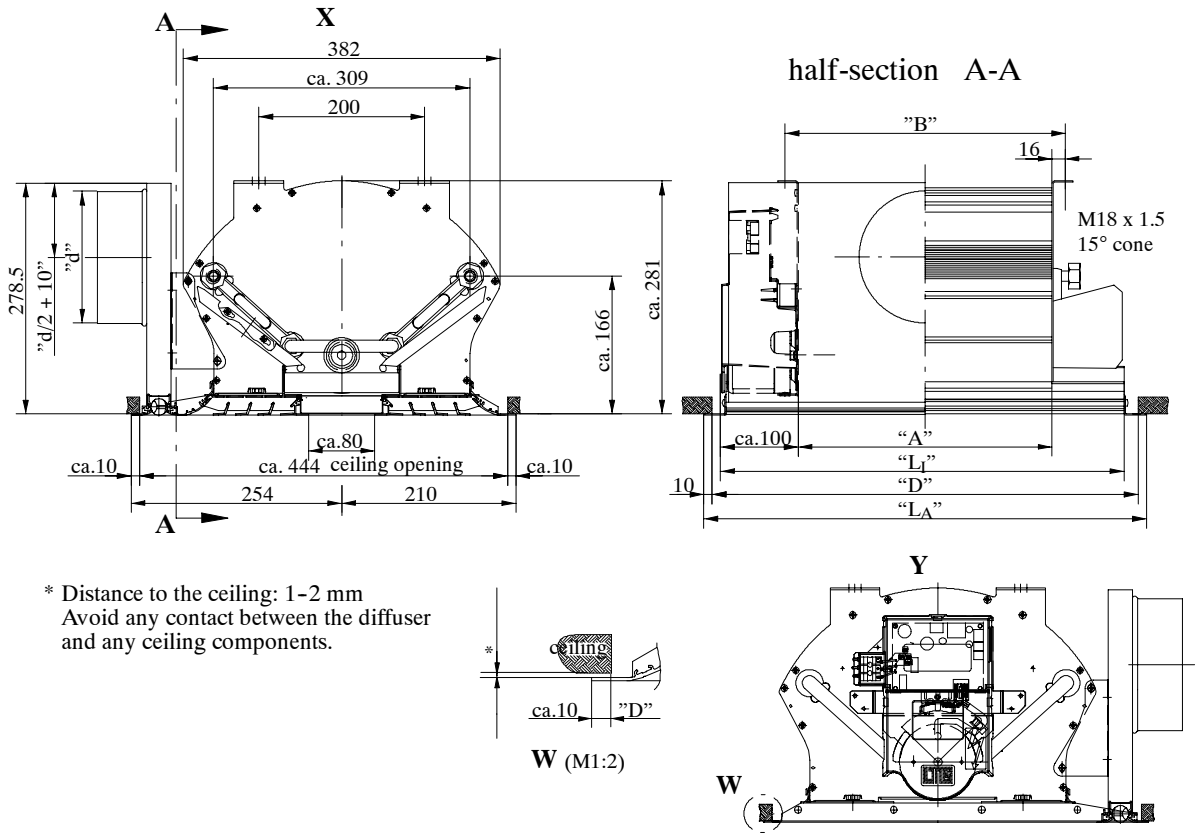
Tolerances

- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - KFA.../ E (flush to ceiling)
- with one built-in linear diffusers, type LDB 20/ 8/ 1 for fresh air



Legend:

X = view from the water supply side (connections M18 x 1.5 - 15° cone)
Y = view from the power supply side

Size	**„A“** in mm (effective length)	**„B“** in mm (between mounting points)	**„L_I“** in mm (overall unit length)	**„D“** in mm (length of ceiling opening)	**„L_A“** in mm (overall diffuser length)
Size 800	776	808	approx. 980	1000	1020
Size 1000	976	1008	approx. 1180	1200	1220

Size	**„d“** in mm (socket diameter)	**max. volume flow rate in m^3/h**
Size 800	124	60
Size 1000	159	75

Note: The fresh air box will be delivered separately. Diffuser also available as dummy rail without box.

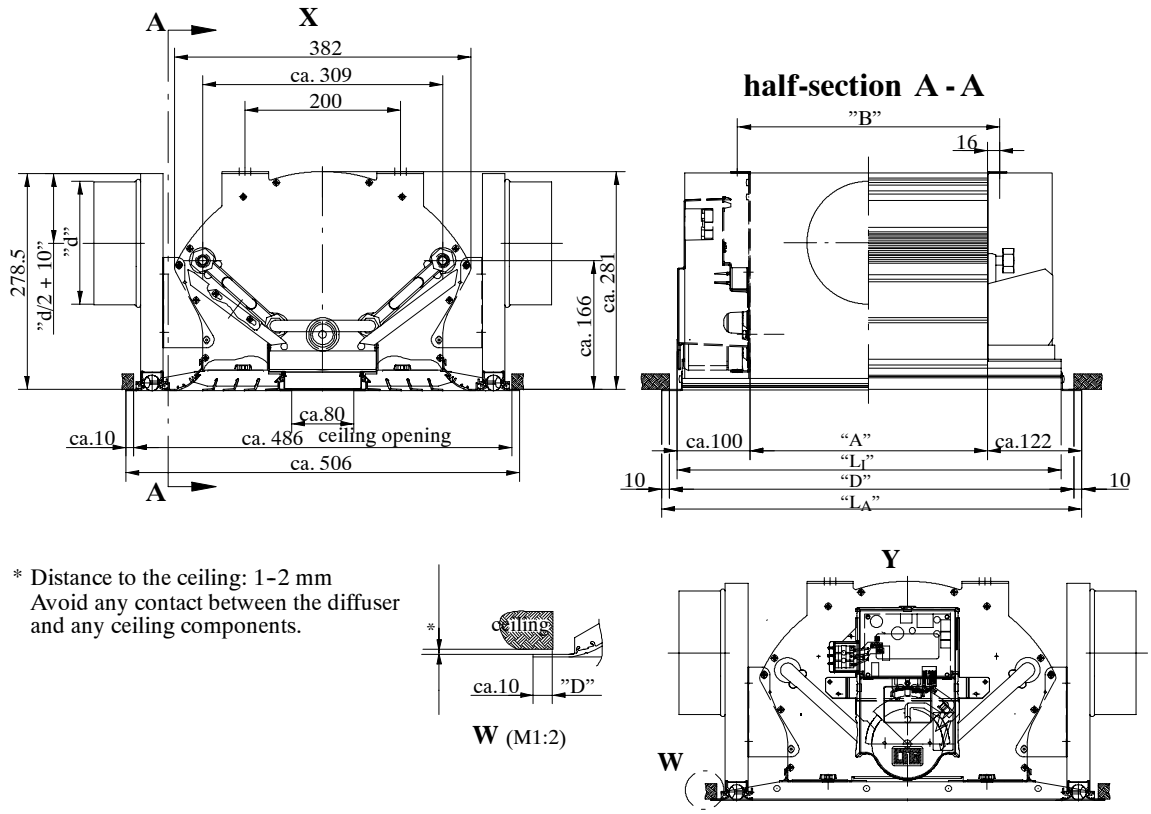
Tolerances

- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - KFA.../ E (flush to ceiling)
- with two built-in linear diffusers, type LDB 20/ 8/ 1 for fresh air



Legend:

X = view from the water supply side (connections M18 x 1.5 - 15° cone)
Y = view from the power supply side

Size	**„A“** in mm (effective length)	**„B“** in mm (between mounting points)	**„L_I“** in mm (overall unit length)	**„D“** in mm (length of ceiling opening)	**„L_A“** in mm (overall diffuser length)
Size 800	776	808	approx. 980	1000	1020
Size 1000	976	1008	approx. 1180	1200	1220

Size	**„d“** in mm (socket diameter)	**max. volume flow rate in m^3/h**
Size 800	124	110
Size 1000	159	130

Note: The fresh air box will be delivered separately. Diffuser also available as dummy rail without box.

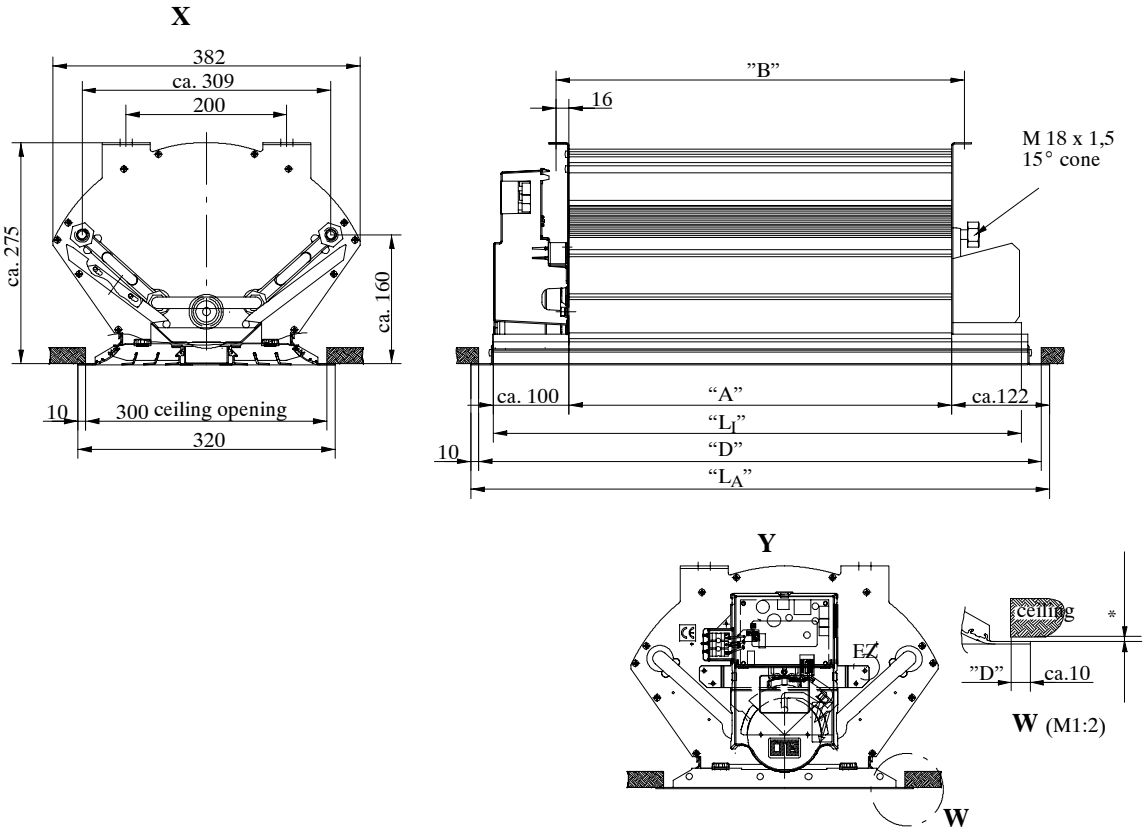
Tolerances

- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - KFA .../ S (slim, flush to ceiling) - Version 1 for flanged installation



* Distance to the ceiling: 1-2 mm
Avoid any contact between the diffuser and any ceiling components.

Legend:

X = view from the water supply side (connections M18 x 1.5 - 15° cone)
Y = view from the power supply side

Size	**„A“** in mm (effective length)	**„B“** in mm (between mounting points)	**„L_I“** in mm (overall unit length)	**„D“** in mm (length of ceiling opening)	**„L_A“** in mm (overall diffuser length)
Size 800	776	808	approx. 980	1000	1020
Size 1000	976	1008	approx. 1180	1200	1220

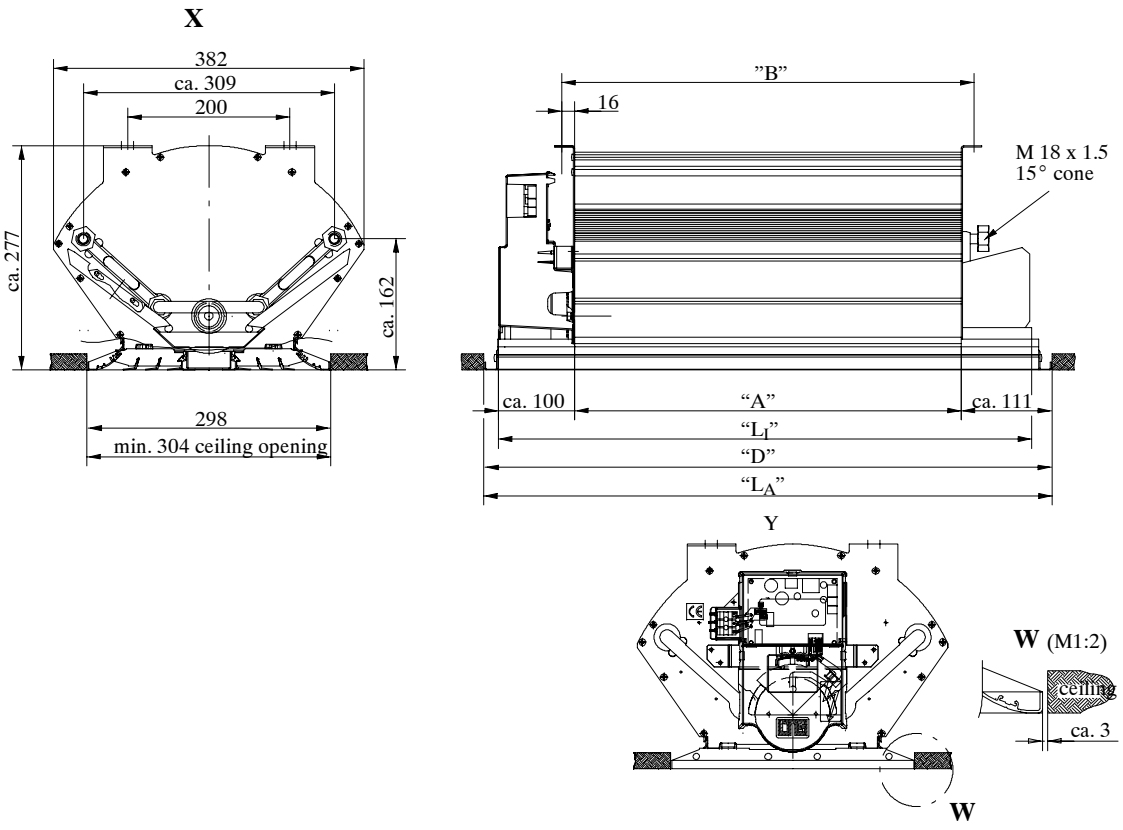
Tolerances

- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram KFA .../ S (slim, flush to ceiling) - Version 2 for flangeless installation



Legend:

X = View from the water supply side (connections M18 x 1.5 - 15° cone)
Y = View from the power supply side

Size	**„A“** in mm (effective length)	**„B“** in mm (between mounting points)	**„L_I“** in mm (overall unit length)	**„D“** in mm (length of ceiling opening)	**„L_A“** in mm (overall diffuser length)
Size 800	776	808	approx. 980	1006	998
Size 1000	976	1008	approx. 1180	1206	1198

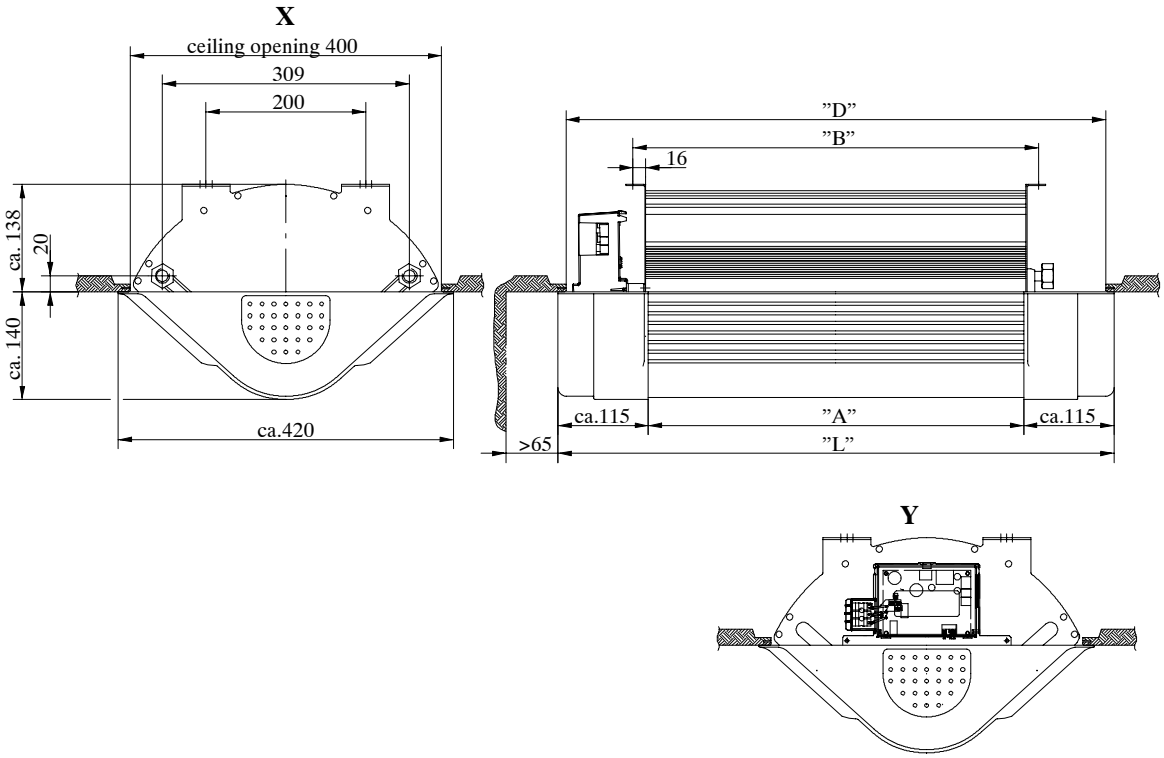
Tolerances

- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - KFA .../ T (semi-recessed)



Key:

X = view from the water supply side (connections M18 x 1.5 - 15° cone)
Y = view from the power supply side

Size	**„A“** in mm (effective length)	**„B“** in mm (between mounting points)	**„L“** in mm (overall length)	**„D“** in mm (ceiling aperture)
Size 800	770	808	approx. 1000	ca. 980
Size 1000	970	1008	approx. 1200	ca. 1180
Size 1250	1215	1253	approx. 1445	ca. 1425

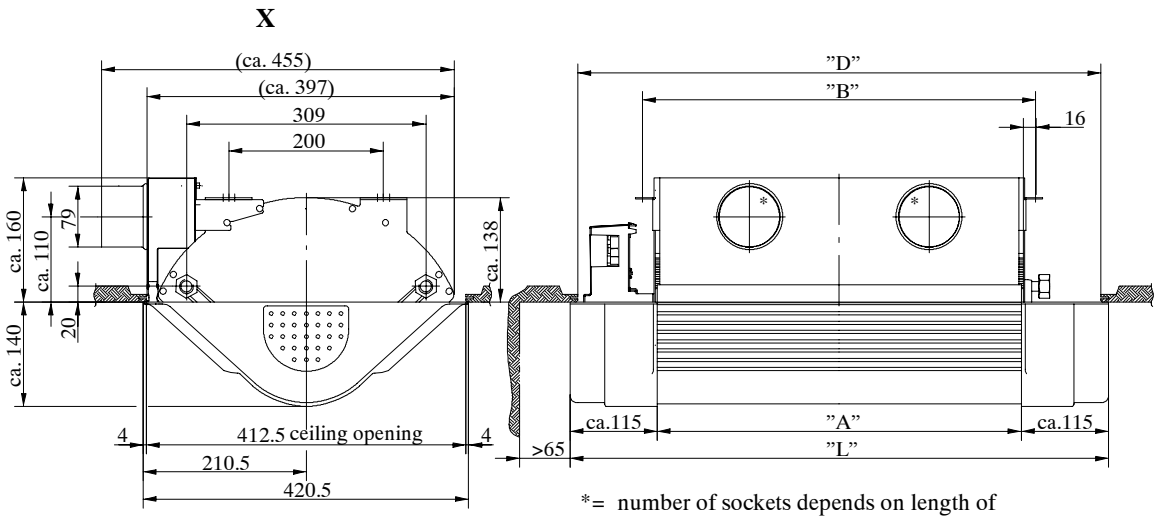
Tolerances

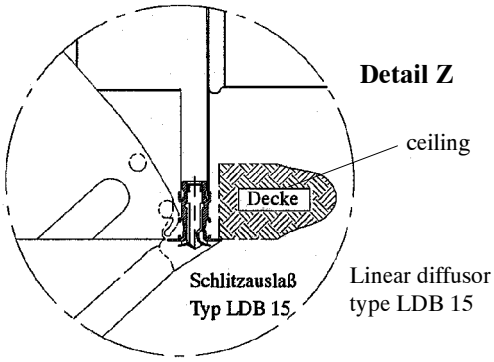
- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

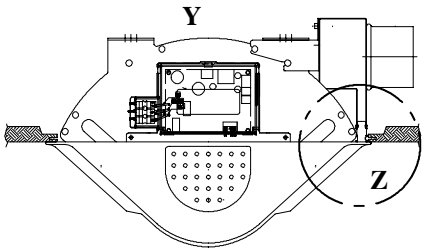
Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - KFA .../ T with a built-in linear diffuser, type LDB 15 for fresh air







Legend:

X = view from the water supply side (connections M18 x 1.5 - 15° cone)
Y = view from the power supply side

Size	„A“ in mm (effective length)	„B“ in mm (between mounting points)	„L“ in mm (overall length)	„D“ in mm (ceiling aperture)
Size 800	770	808	approx. 1000	approx. 980
Size 1000	970	1008	approx. 1200	approx. 1180
Size 1250	1215	1253	approx. 1445	approx. 1425

Size	number x diameter socket	max. volume flow rate in m^3/h
Size 800	1 x 79	45
Size 1000	2 x 79	55
Size 1250	2 x 79	65

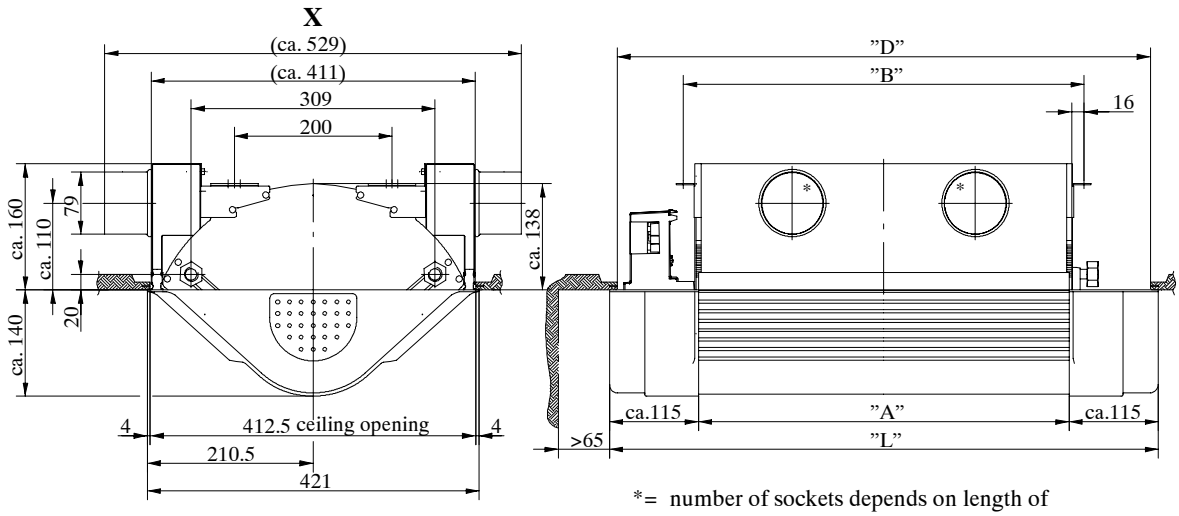
Tolerances

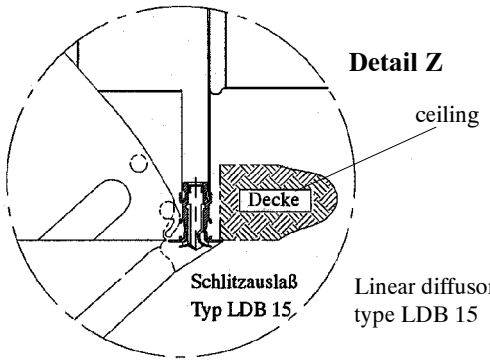
- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

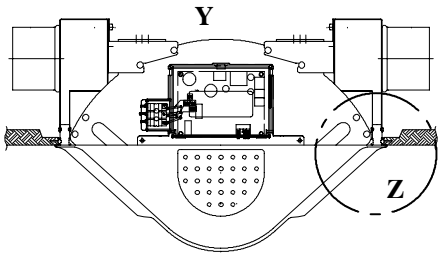
Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - KFA.../ T-
with two built-in linear diffusers, type LDB 15 for fresh air







Legend:
X = view from the water supply side (connections M18 x 1.5 - 15° cone)
Y = view from the power supply side

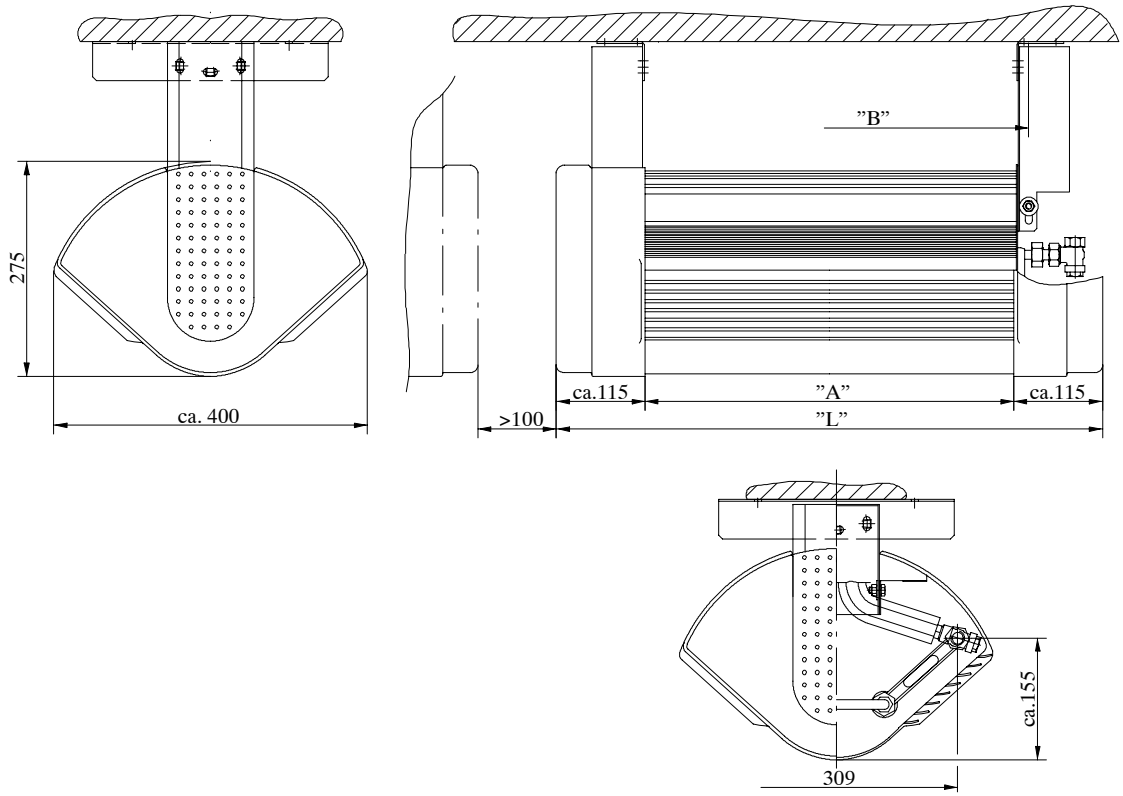
Size	„A“ in mm (effective length)	„B“ in mm (between mounting points)	„L“ in mm (overall length)	„D“ in mm (ceiling opening)
Size 800	770	808	approx. 1000	approx. 980
Size 1000	970	1008	approx. 1200	approx. 1180
Size 1250	1215	1253	approx. 1445	approx. 1425

Size	number x diameter socket	max. volume flow rate in m^3/h
Size 800	1 x 79	80
Size 1000	2 x 79	100
Size 1250	2 x 79	120

Tolerances
- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

Surface Finishes
- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - KFA.../ F (suspended)



Legend:

Size	„A“ in mm (effective length)	„B“ in mm (between mounting points)	„L“ in mm (overall length)
Size 800	770	808	approx. 1000
Size 1000	970	1008	approx. 1200
Size 1250	1215	1253	approx. 1445

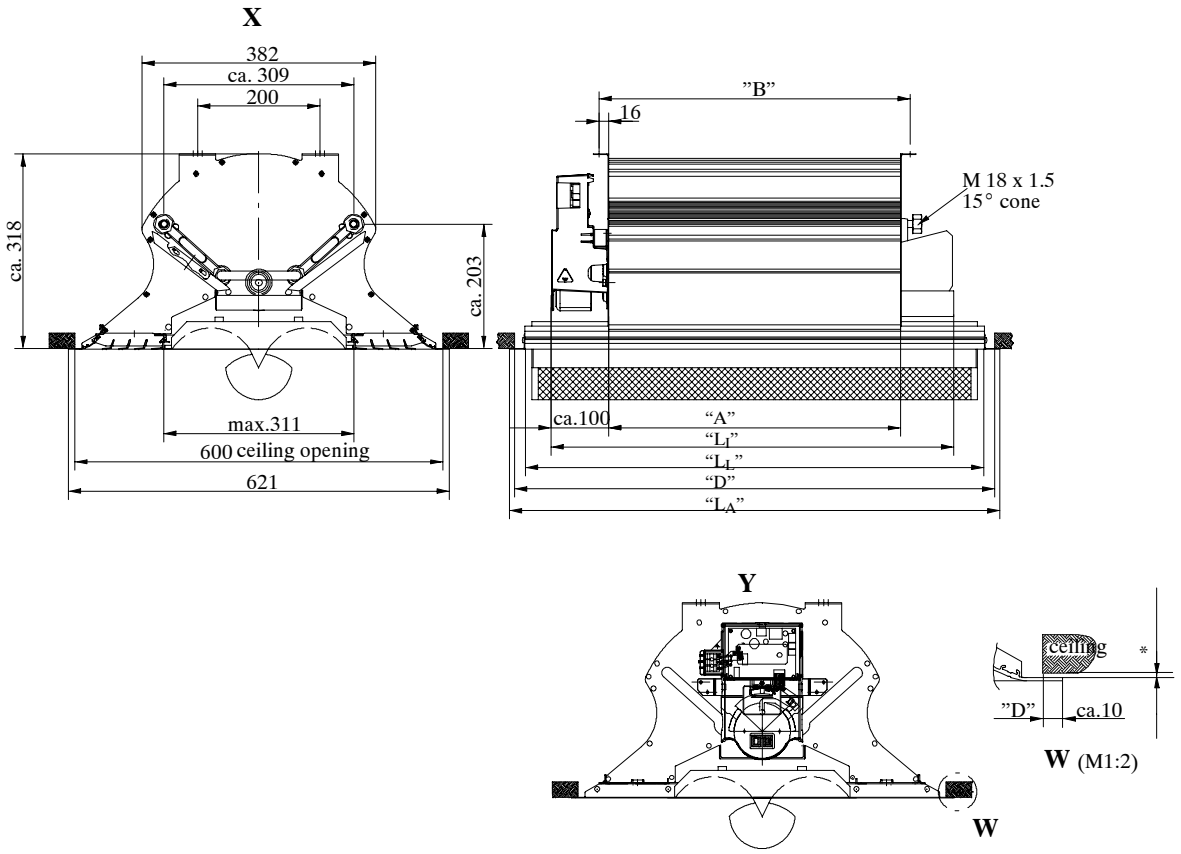
Tolerances

- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - KFA.../ L (flush to ceiling) - with luminaire Version 1 for flanged installation



* Distance to the ceiling: 1-2 mm
Avoid any contact between the diffuser and any ceiling components.

Legend:

X = View from the water supply side (connections M18 x 1.5 - 15° cone)
Y = View from the power supply side

Size	„A“ in mm (effective length)	„B“ in mm (between mounting points)	„L_I“ in mm (overall unit length)	„L_L“ in mm (space for lamp)	„L_A“ in mm (overall diffuser length)	„D“ in mm (ceiling opening)
Size 800/36	776	808	approx. 980	1247	1300	1282
Size 1000/36	976	1008	approx. 1180	1247	1300	1282
Size 1000/58	976	1008	approx. 1180	1547	1600	1582

Tolerances

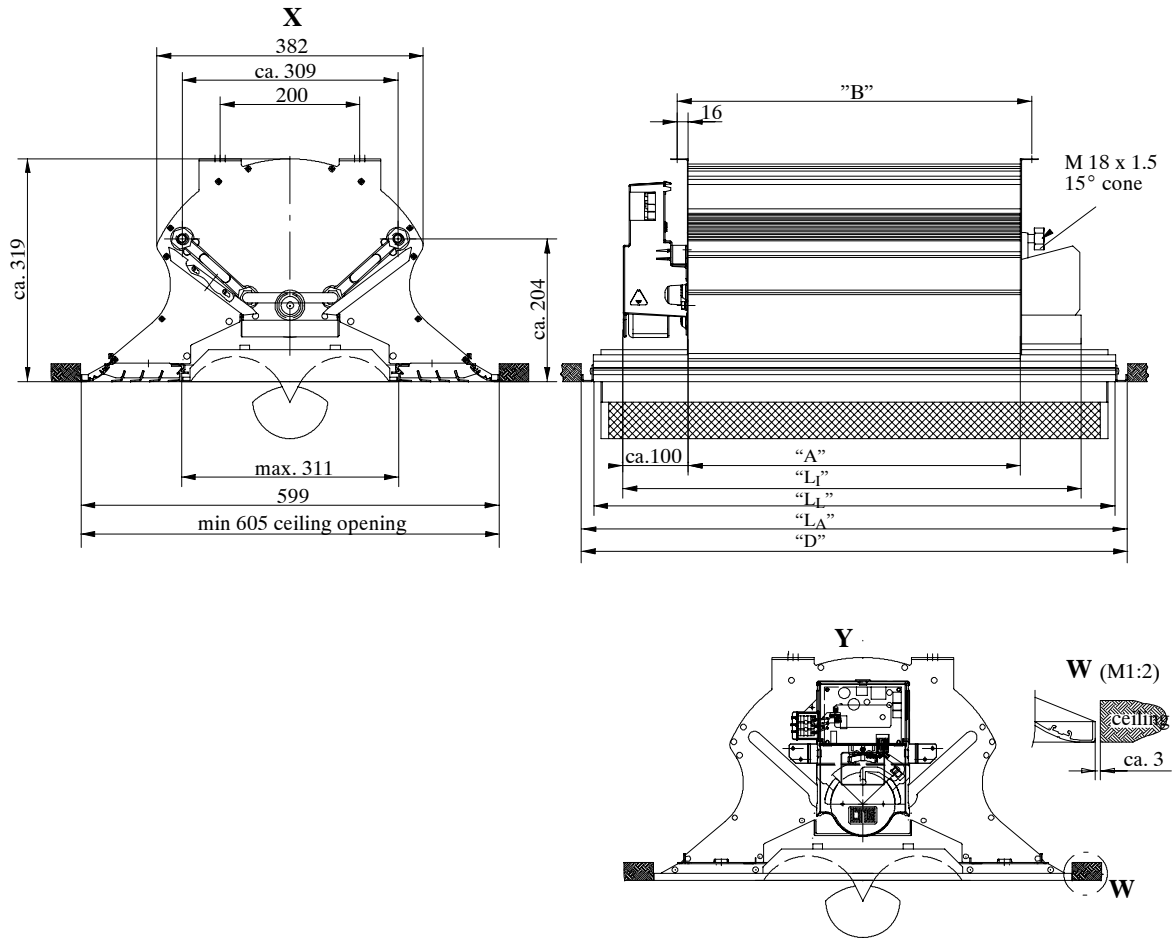
- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - KFA.../ L (flush to ceiling) - with luminaire

Version 2 for flangeless installation



Legend:

X = view from the water supply side (connections M18 x 1.5 - 15° cone)
Y = view from the power supply side

Size	**„A“** in mm (effective length)	**„B“** in mm (between mounting points)	**„L_I“** in mm (overall unit length)	**„L_L“** in mm (space for lamp)	**„L_A“** in mm (overall diffuser length)	**„D“** in mm (ceiling opening)
Size 800/36	776	808	approx. 980	1247	1281	1286
Size 1000/36	976	1008	approx. 1180	1247	1281	1286
Size 1000/58	976	1008	approx. 1180	1547	1581	1586

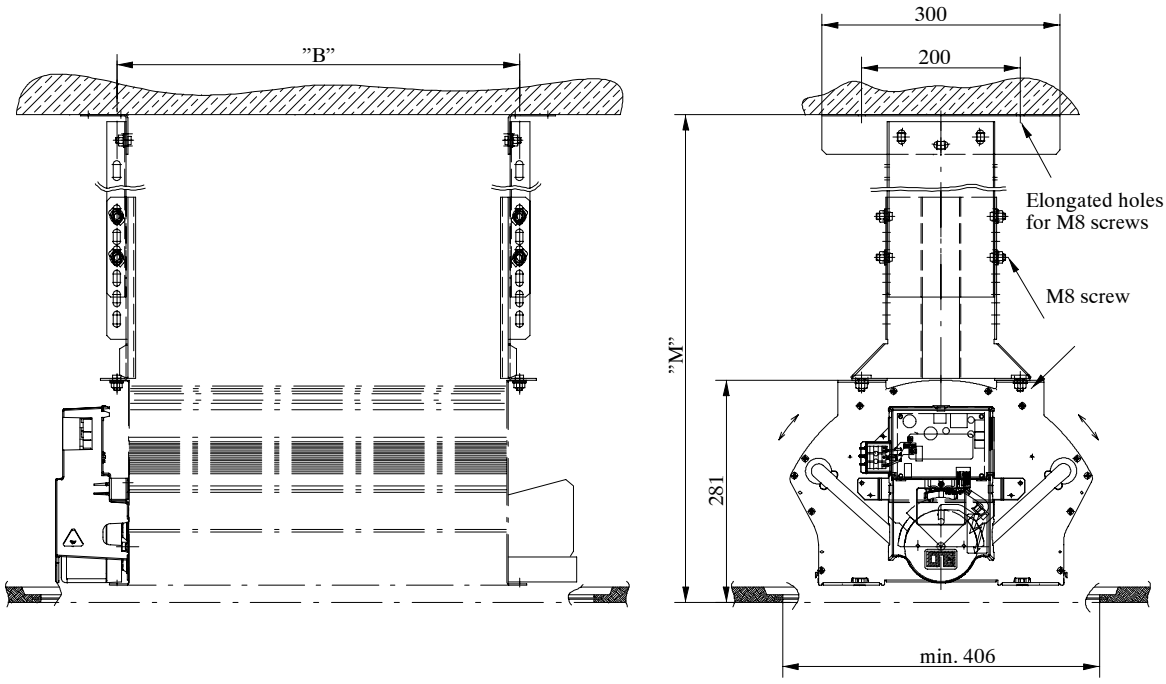
Tolerances

- Concerning the values given in these technical specifications, the general tolerances acc. to DIN 7168-sg apply.
- Straightness and torsion tolerances acc. to DIN EN 12020-2.

Surface Finishes

- The surface finishes meet standard indoor use requirements, i.e. room climate requirements acc. to DIN 1946 Part 2.
- Other finishes meeting special use requirements are available on request.

Dimensional diagram - Suspension of KFA .../ E (slim, flush to ceiling)



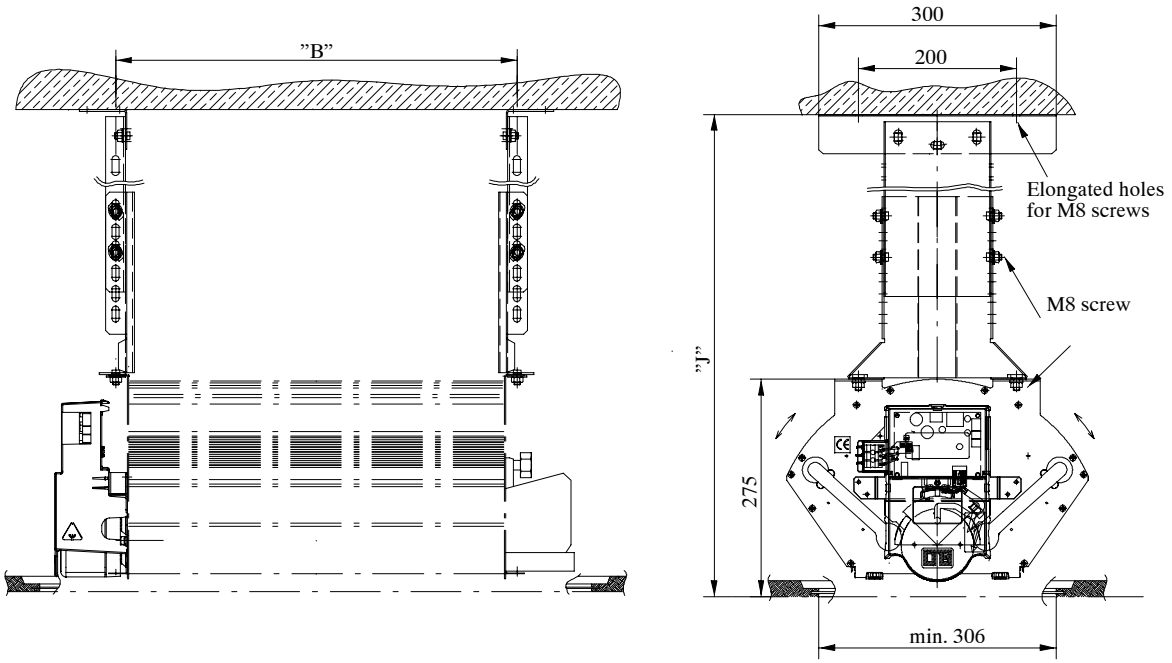
With dimension M < 430 threaded bars may be used for assembly.
The instrument mounting must be rigid and the fixing bolts must be locked

Legend:

„M" in mm (intermediate ceiling height)
430 .. 580
560 .. 770

Size	**„B"** in mm (between mounting points)
Size 800	808
Size 1000	1008

Dimensional diagram - Suspension of KFA .../ S (flush to ceiling)



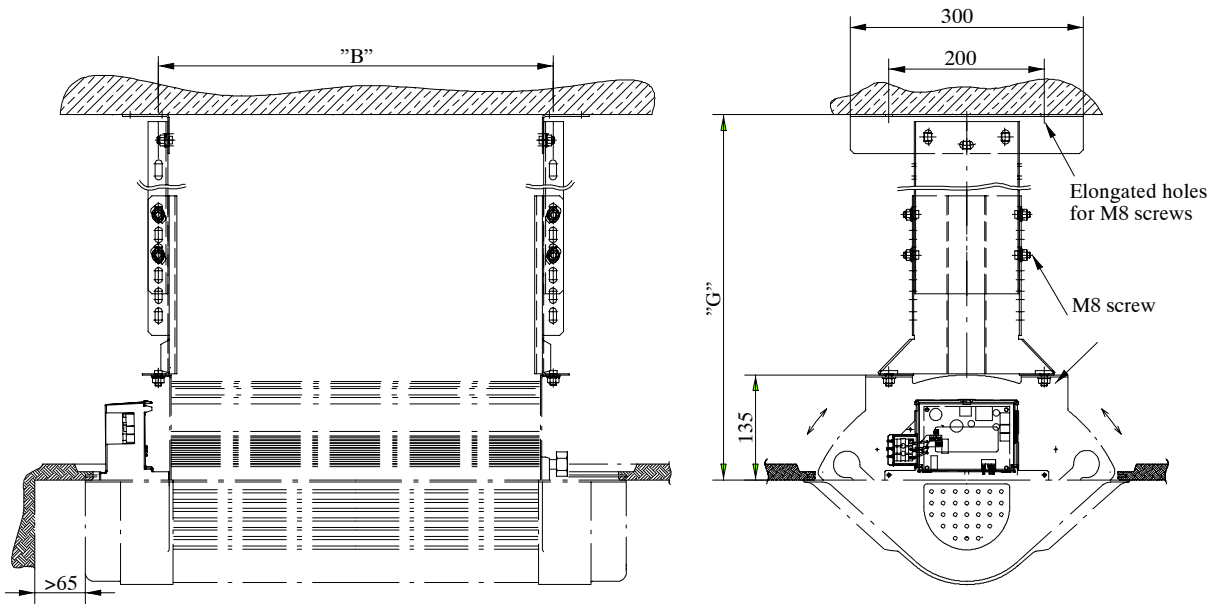
With dimension J < 424 threaded bars may be used for assembly.
The instrument mounting must be rigid and the fixing bolts must be locked

Legend:

„J“ in mm (intermediate ceiling height)
424 .. 574
554 .. 764

Size	**„B“** in mm (between mounting points)
Size 800	808
Size 1000	1008

Dimensional diagram - Suspension of KFA .../ T (semi-recessed)



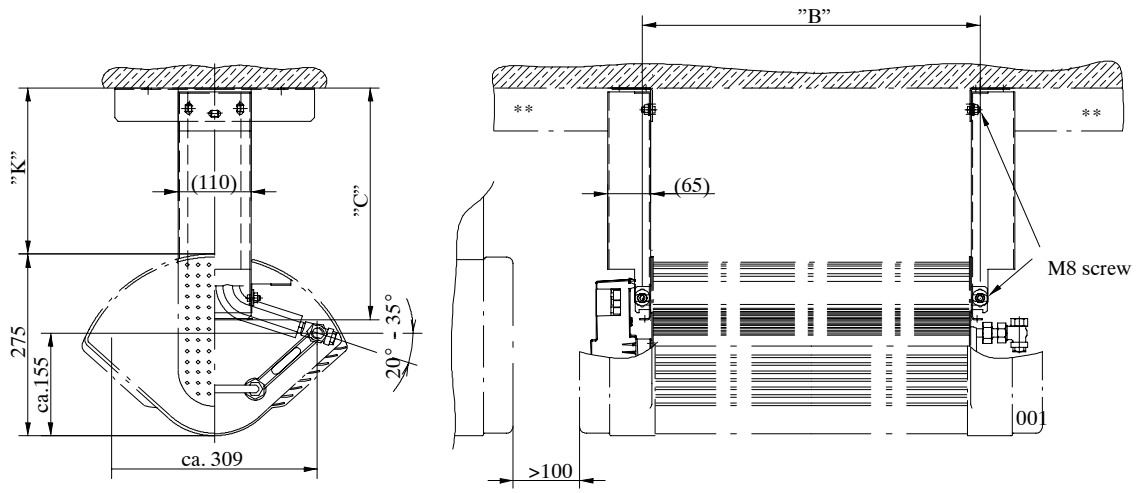
With dimension G < 285 threaded bars may be used for assembly.
The instrument mounting must be rigid and the fixing bolts must be locked

Legend:

„G“ in mm (intermediate ceiling height)
285 .. 435
416 .. 622

Size	**„B“** in mm (between mounting points)
Size 800	808
Size 1000	1008
Size 1250	1253

Dimensional diagram - Suspension of KFA .../ F (suspended)



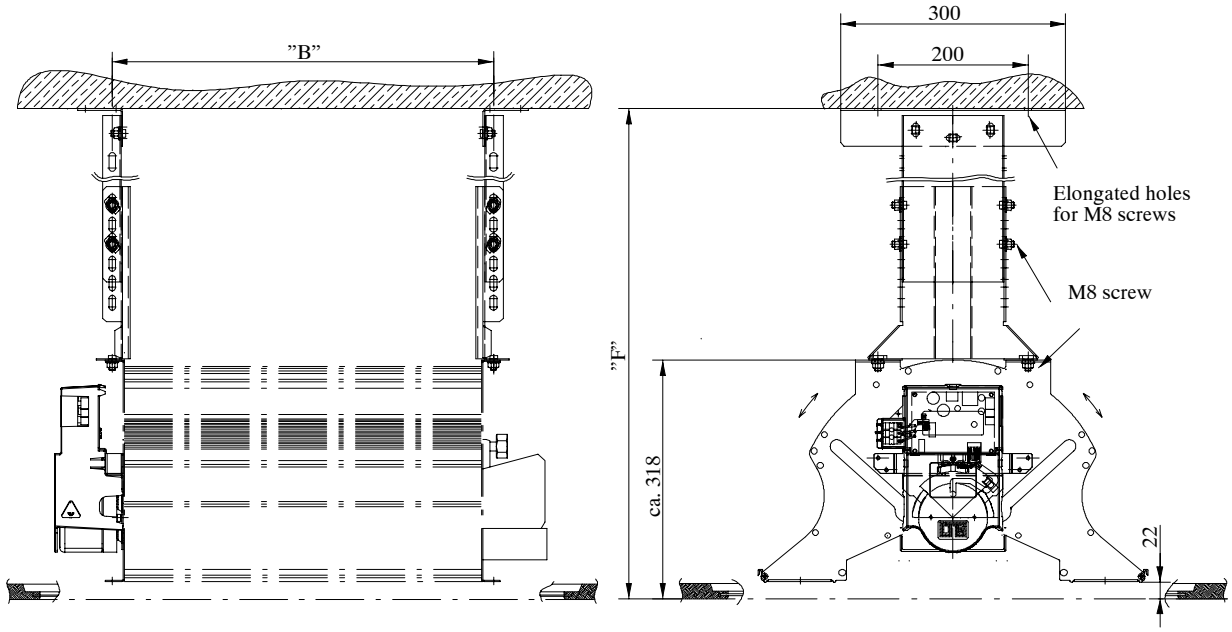
** = evt. cable duct (110 mm x 65 mm) for supply lines

Legend:

„C“ in mm (canal length)	**„K“** in mm (upper edge of KFA.../F)
245	150 (138 - 163)
395	300 (288 - 313)
545	450 (438 - 463)
695	600 (588 - 613)

Size	**„B“** in mm (between mounting points)
Size 800	808
Size 1000	1008
Size 1250	1253

Dimensional diagram - Suspension of KFA .../ L (flush to ceiling) - with luminaire



With dimension F < 468 threaded bars may be used for assembly.
The instrument mounting must be rigid and the fixing bolts must be locked

Legend:

„F“ in mm (intermediate ceiling height)
468 .. 618
600 .. 805

Size	**„B“** in mm (between mounting points)
Size 800/36	808
Size 1000/36	1008
Size 1000/58	1008

Cooling system cool wave®

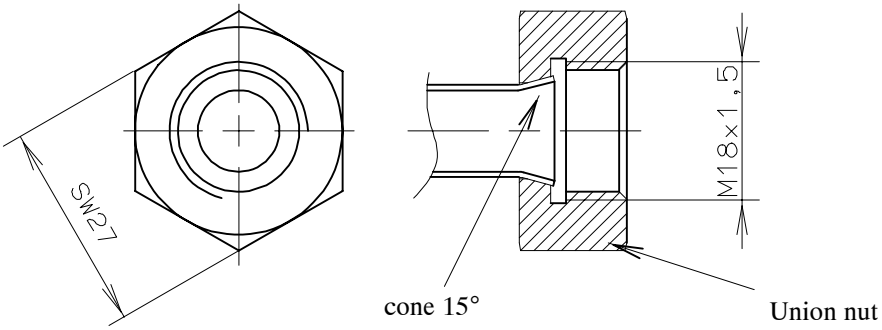
Water Connection

For the water connection of cool wave®, only flexible hoses must be used.

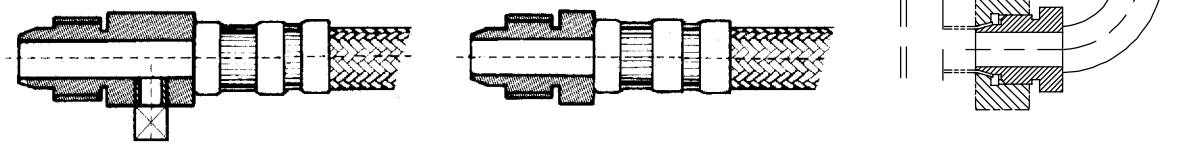
Unit water connection (heat exchanger)

cool wave® as delivered

Heat exchanger fitting: LTG special cone (15°) with union nut M18 x 1.5



Hose versions for direct connection to LTG heat exchangers



AGSKEB + Eh
special cone with external thread
special fitting for LTG units
with small air bleed cock 1/8“

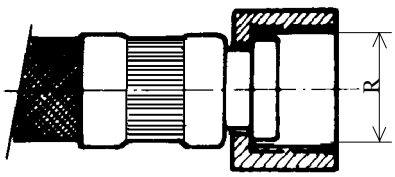
AGSK
special cone with external thread
special fitting for LTG units

RBSK
special cone with external thread
special fitting for LTG units

Hose fitting versions for customer's water connection

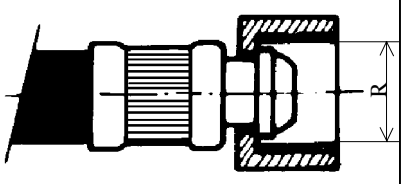
- thread diameter according to customer's requirements or standard 3/8“, if required, hose with insulation.

UFD



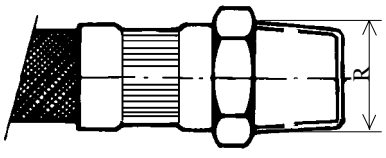
Union nut
(flat seal)
R: 3/8“ or 1/2“

UKD



Union nut
(tapered seal)
R: 3/8“, 1/2“ or 3/4“

AGK



External thread
(tapered)
R: 3/8“ or 1/2“

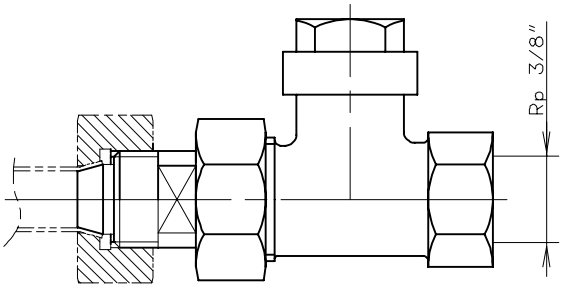
Cooling system cool wave® - Accessories for water connection

Water connection using angle or straightway valve and flexible hose

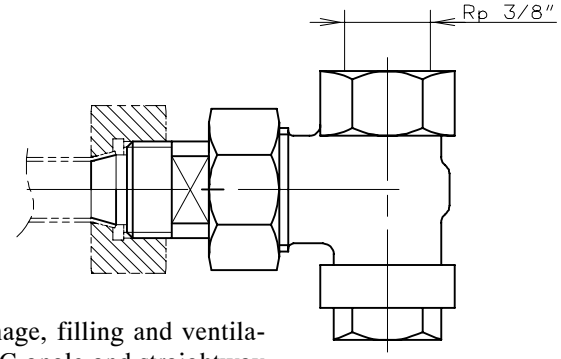
Available are angle or straightway valves suitable for connection to LTG heat exchangers and to the mains supply using a 3/8“ union nut, tapered seal.

Attention: For cool wave® type KFA .../F, the use of angle valves (included in the delivery, in a separate bag) is required.

LTG straightway valve

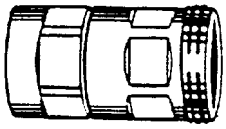


LTG angle valve (included in the delivery of KFA.../F)



flexible connecting hose,
type AGK,
external thread, tapered 3/8“

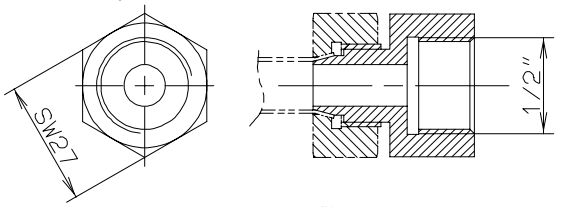
For easy drainage, filling and ventilation on the LTG angle and straightway valves, a fitting with a 1/2“ hose connection is available as accessory.



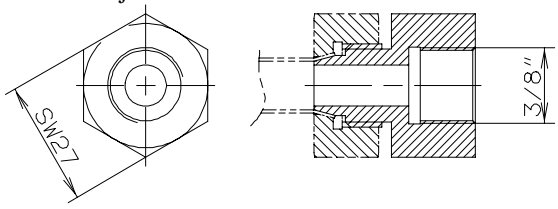
Water connection with transition fitting and flexible hose

Available are transition fittings (banjo bolts) in dimensions of 3/8“ and 1/2”.

banjo bolt 1/2“



banjo bolt 3/8“

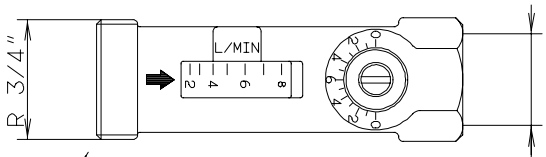


flexible connecting hose,
type AGK,
external thread, tapered 3/8“ or 1/2“

Water connection, using flexible hoses, a presetting valve and a shut-off valve

The presetting valve is inserted in the water return between the flexible hose and the pipe. With the water supply pipe a shut-off valve (straightway) is used.

Presetting valve for a quick setting of the water flow, with inspection glass (incl. shut-off function)
Max. service pressure 10 bar
Measuring range (setting 120 - 480 l/h)

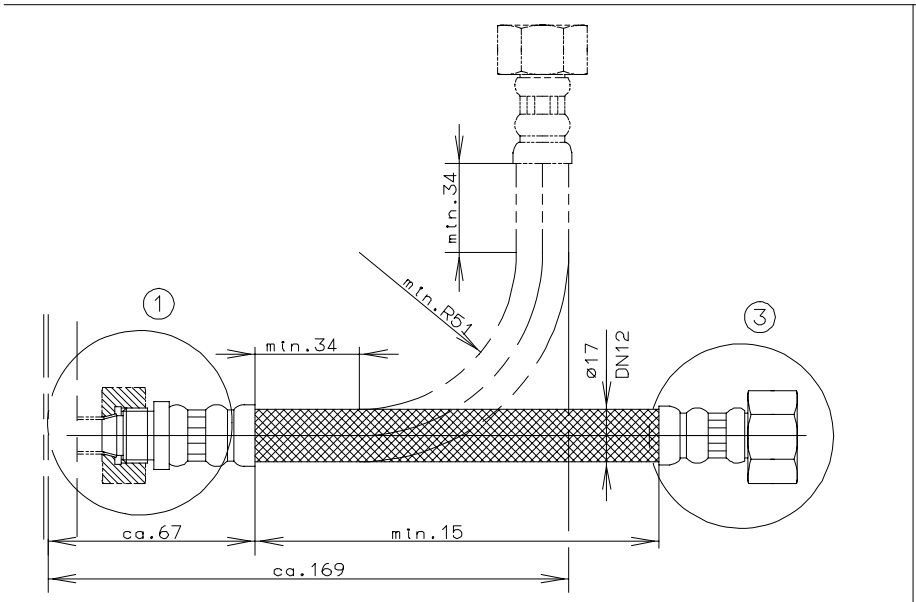


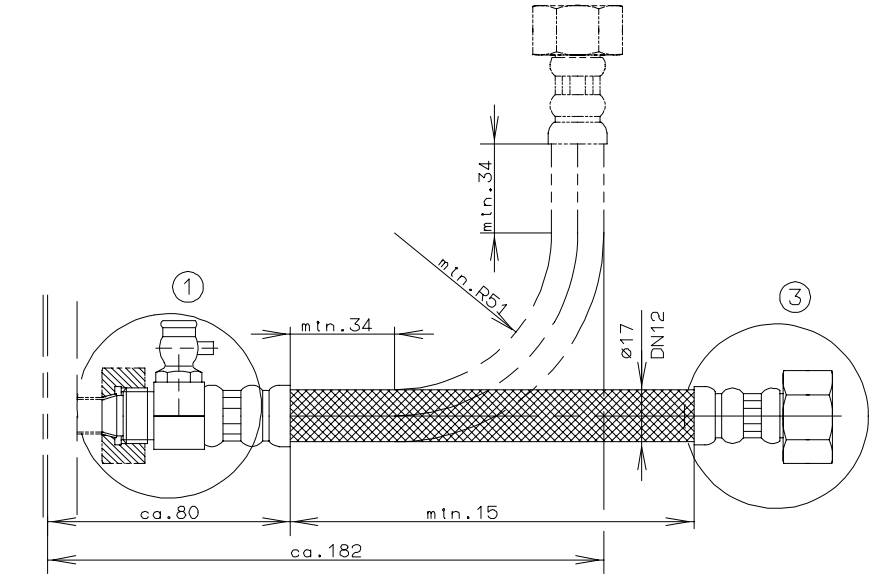
For hose connection:
union nut 3/4“,
tapered seal (UKD 3/4“)

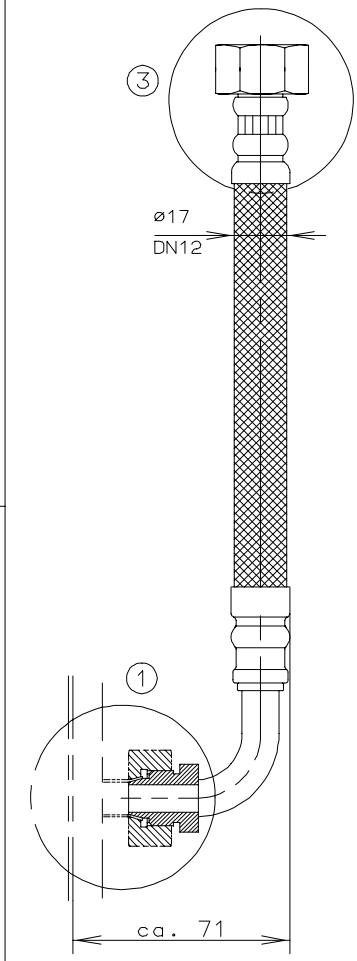
Cooling system cool wave® - Examples for water connections

Please note: For connection of the unit to the main water supply, the use of flexible hoses is **in any case** binding.

Water connection using flexible hoses (special cone with external thread for LTG heat exchangers)







Please check with the hose manufacturer's instructions !
Hose without insulation. For hoses with insulation, dimensions will change accordingly.

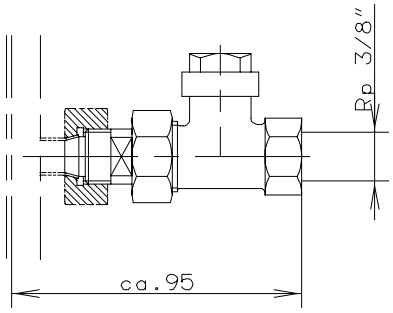
① Hose for connection to LTG heat exhanger (M18 x 1.5 - 15° cone)
Connection types: AGSK
AGSKEB + Eh
RBSK

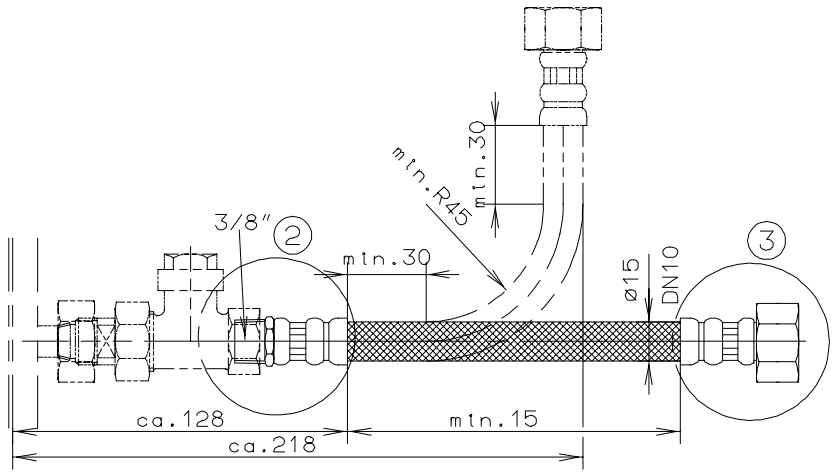
③ Different hose connections (see page 28)
Thread diameter acc. to customer's requirements or standard 1/2"

Cooling system cool wave® - Examples for water connections

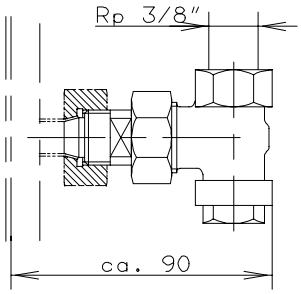
Water connection using angle or straightway valves and flexible hoses

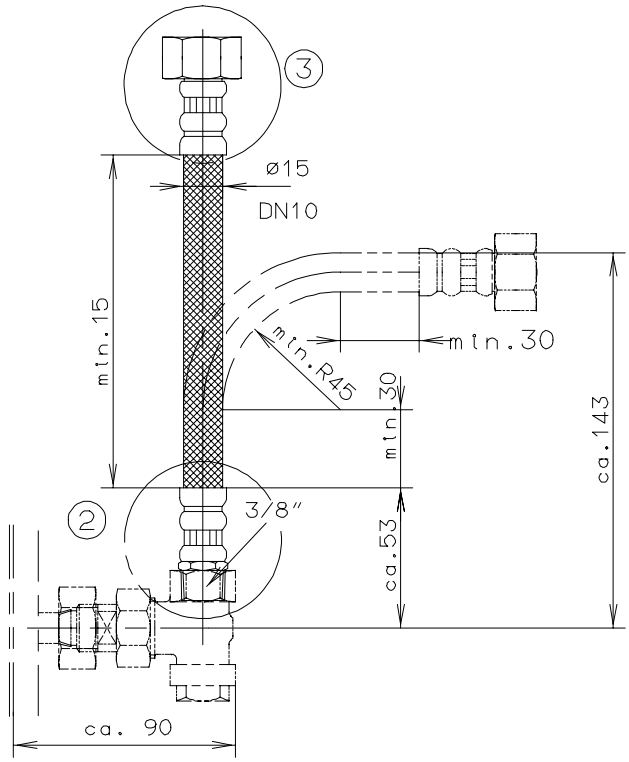
LTG straightway valve





LTG angle valve (included in the delivery of KFA .../F)





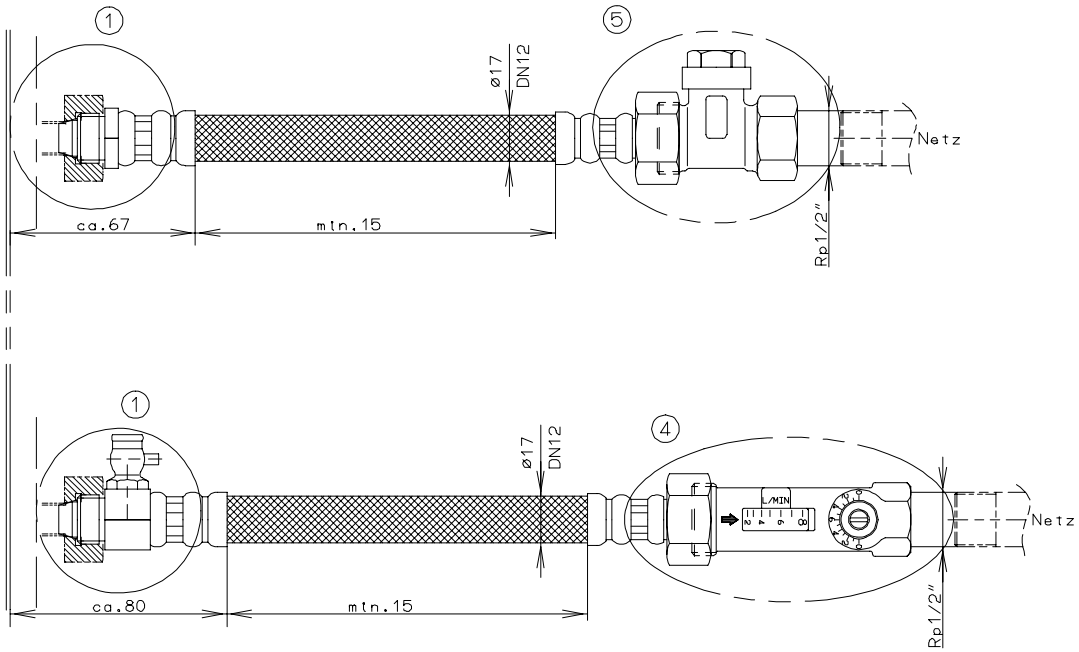
Please check with the hose manufacturer's instructions !
Hose without insulation. For hoses with insulation, dimensions will change accordingly.

(2) Hose for connection to angle or straightway valve
Connection type: AGK external thread, tapered 3/8"

(3) Different hose connections (see page 28)
Thread diameter acc. to customer's requirements or standard 1/2"

Cooling system cool wave® - Examples for water connections

Water connection using flexible hoses, one presetting valve and one shut-off valve



Please check with the hose manufacturer's instructions !
Hose <u>without</u> insulation. For hoses <u>with</u> insulation, dimensions will change accordingly.

① Unit without valve. Connection to LTG heat exchanger, e.g.AGSK oder AGSKEB+Eh

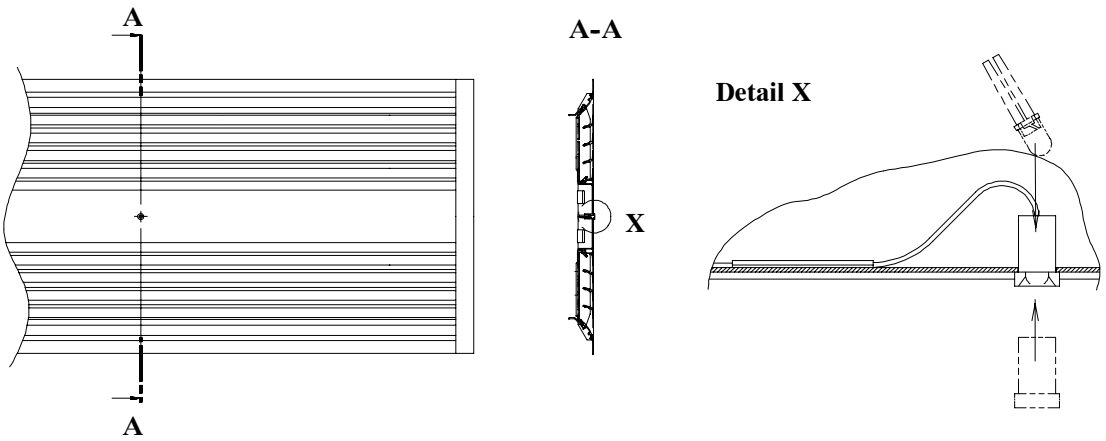
④ Presetting valve with presetting and shut-off function as well as flow measurement (hose UKD 3/4")

⑤ Shut-off valve

Accessories

Running light (LED)

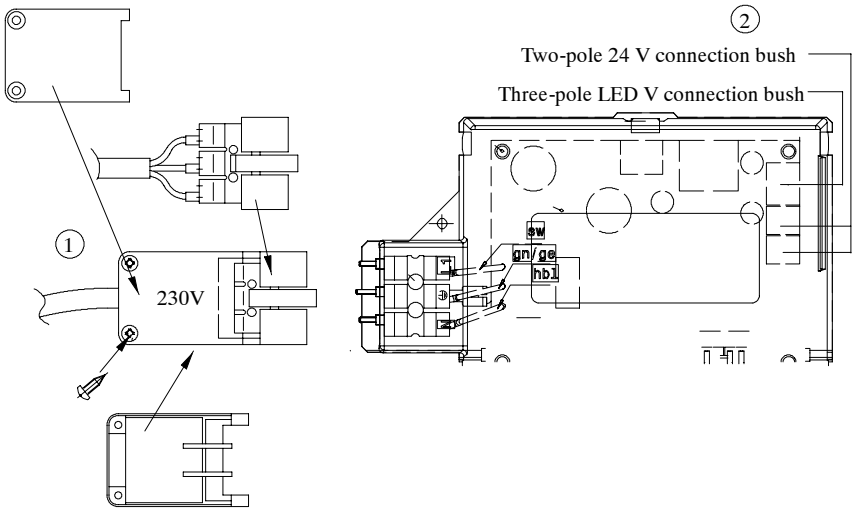
Indication of the operation mode by means of a green LED with white reflector which is centered in the outlet



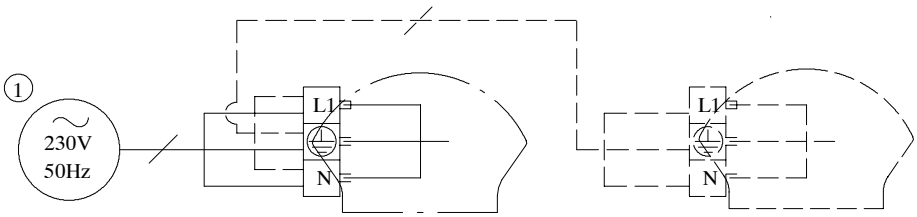
Cooling system cool wave® - Power Supply

Size	Voltage	Output	Power consumption during operation	Fuse max.
800	230 V_{AC}	20 W	abt. 100 mA	10 A
1000		20 W		
1250		20 W		

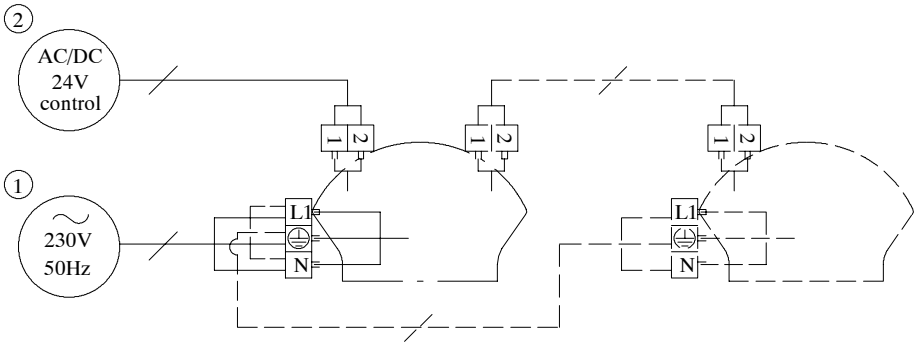
Dimensional diagram - Electronic unit connection



Trigger 230V



Trigger 24V



①: Unit mains supply 230 V_{AC} (plug included in delivery).
②: Control voltage supply 24 $V_{AC/DC}$ (plug not included in delivery;
Resilient housing, 2-pole, make Weidmüller BLAC 2 OR, crimp spring for conductor cross section 0.07 - 0.05 mm^2 make Weidmüller.
Screened feeder lines to be used.
Screen foil one-sided and applied directly on PE-potential

Cooling system cool wave® - Control unit KFR 110 for cool wave® KFA

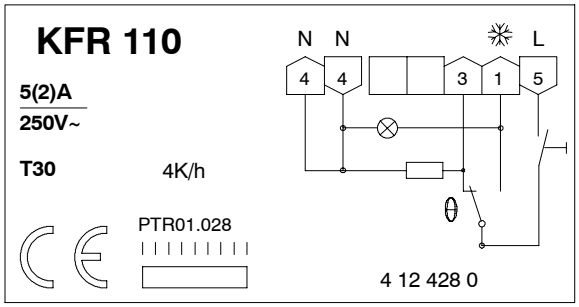
Construction:

The operating unit comprises of room temperature probe including the temperature set point adjuster and operating switch. The set point adjuster is infinitely variable between 16 °C and 30 °C. The operating switch may be set to either "OFF" or "Automatic". The LED indicates the cooling system's actual state of operation.
The operating unit is designed for wall mounting. A maximum of 6 cool wave® units may be connected to one control unit.

Assembly note:

As the operating unit includes the room temperature probe, the location for installation of the device must be chosen carefully to guarantee a free air circulation (vertical mounted!). Avoid draught and direct heat exposure. For massive walls (steel, concrete etc.) a heat insulating layer must be provided. Recommended mounting height: at approx. 1.5 m in the occupied zone and at least 50 cm from an adjacent wall.

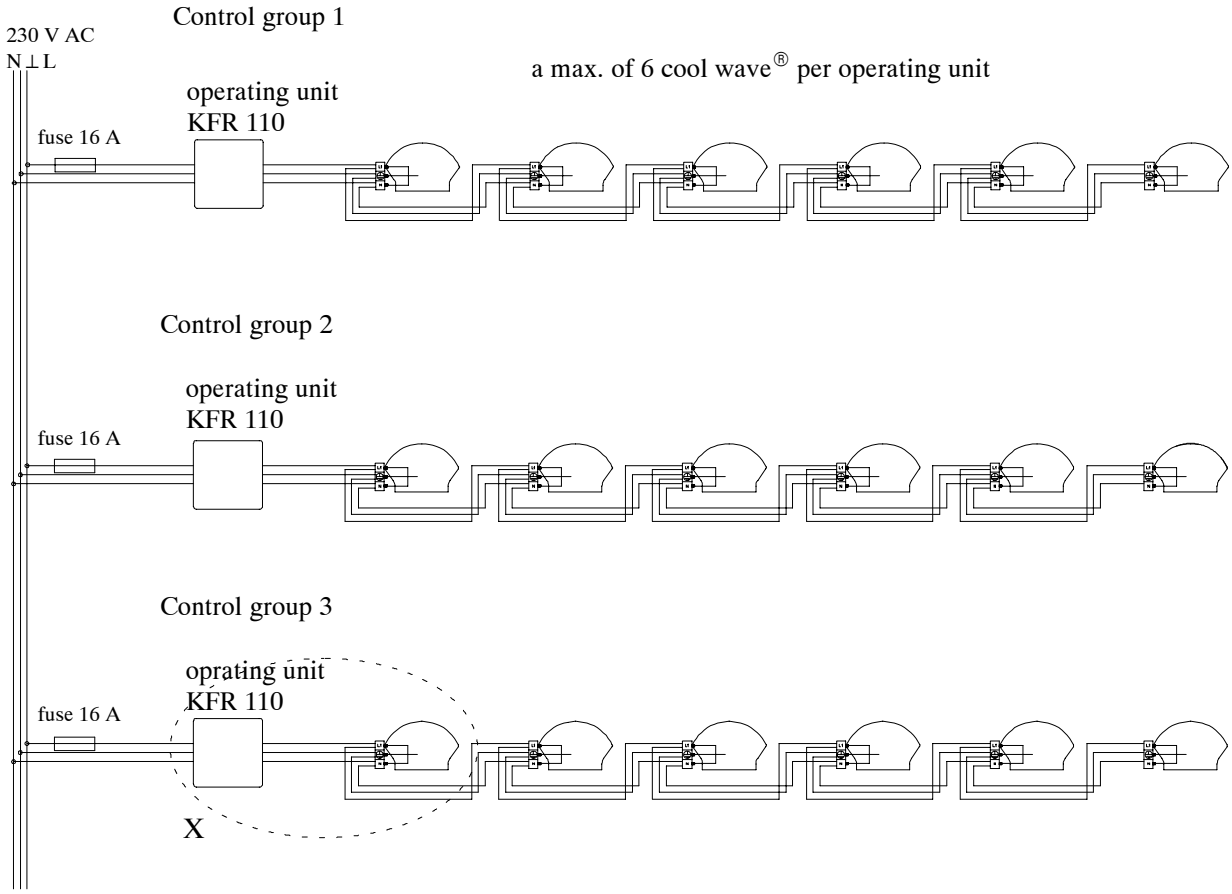
Dimensions: 75 x 75 x 21 mm

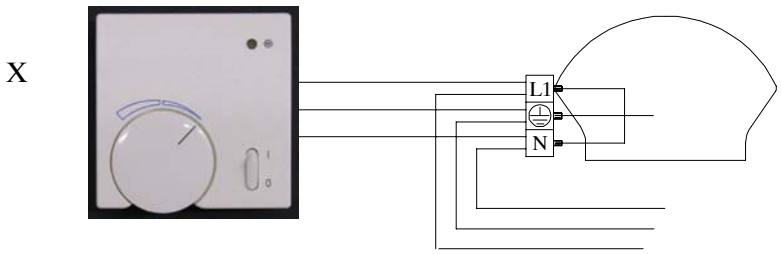


Limit min. 16 °C
Limit max. 30 °C

Cooling system cool wave® - Wiring

Wiring example for a 230 V controlled cool wave® system

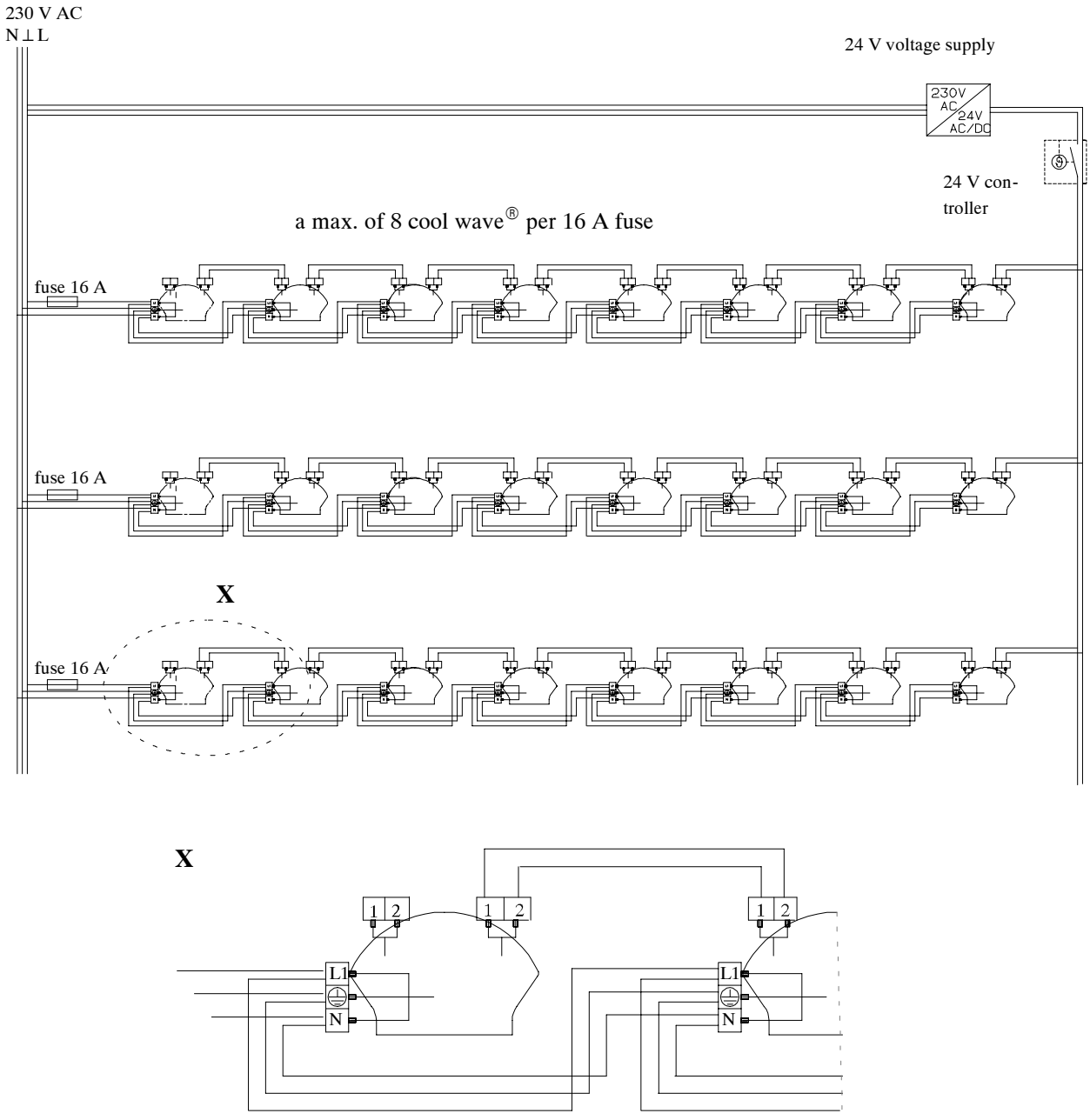




Fuse: 16 A
FI protection: 30 mA (a max of 10 cool wave® per 30 mA FI)
Operating unit: KFR 110

Cooling system cool wave® - Wiring

Wiring example for a 24 V controlled cool wave® system



Fuse:	16 A (a max. of 8 cool wave® per fuse)
FI protection:	30 mA (a max of 10 cool wave® per 30 mA FI)
24 V Controller:	to be provided by the customer
	Attention! The 24 V control is preset by the factory. Please state with your order !

Weights of the units and capacity of the condensate receiver

cool wave® KFA .../E:

Size		800	1000
Basic unit	[kg]	15	18
Diffuser	[kg]	4.5	5
Water volume of heat exchanger	[kg]	0.6	0.8
Capacity of condensate receiver	[l]	2.2	2.7

cool wave® KFA .../S:

Size		800	1000
Basic unit	[kg]	15	18
Diffuser	[kg]	4	4.5
Water volume of heat exchanger	[kg]	0.6	0.8
Capacity of condensate receiver	[l]	1.6	2

cool wave® KFA .../T and KFA .../F:

Size		800	1000	1250
Basic unit	[kg]	13	16	19
Water volume of heat exchanger	[kg]	0.6	0.8	1.0
Capacity of condensate receiver	[l]	1.7	2.0	2.5

cool wave® KFA .../L (without luminaire):

Size		800	1000
Basic unit	[kg]	16	19
Diffuser	[kg]	4.5	5
Water volume of heat exchanger	[kg]	0.6	0.8
Capacity of condensate receiver	[l]	2.2	2.7

Built-in lamp:	36 W = 6.7 kg	58 W = 8.0 kg
Suspended lamp:	36 W = 7.7 kg	58 W = 9.5 kg

Nomenclature (for your order)

KFA 1000 / E1 / 9010 / - / - / ---- / -- / --- / --- / --- / ---- / --- / ---

Type
chilled beam with oscillating fan

Size
800; 1000; 1250

Type of installation
E1 - flush to ceiling (flanged)
E2 - flush to ceiling (flangeless)
S1 - slim, flush to ceiling (flanged)
S2 - slim, flush to ceiling (flangeless)
T - semi-recessed
F - suspended
L - flush to ceiling with luminaire

Color similar to RAL
for KFA .../E .../S .../L: diffuser
for KFA .../T: lateral cover, condensate receiver
for KFA .../F: lateral cover, suspension, condensate receiver

Shutoff valve
-- - without
D - straightway valve (only possible for KFA /E. /S, /T, /L)
E - angle valve (included in the delivery of KFA /F)
A - presetting set (1 presetting valve for the water return, (1 shut-off valve for water supply)

Suspension
S - rail
K - duct (included in the delivery of KFA/F)

Height of intermediate ceiling
KFA/E = Dimension M KFA/S = Dimension J
KFA/T = Dimension G KFA/F = Dimension K
KFA/L = Dimension F

Water hose
-- - without
WO - with (1 pair)
WE - with (incl. air bleed cock)
WG - with (1 pc. incl. air bleed cock, 1 pc. without air bleed cock)
IO - insulated (1 pair)
IE - insulated (incl. air bleed cock)
IG - insulated (1 pc. incl. air bleed cock, 1 pc. without air bleed cock)

Length water hose in mm

Hose connection, main water supply
UFD - union nut, flat seal
UKD - union nut, tapered seal
AGK - external thread, tapered

Size of fitting
3/8“, 1/2“ oder 3/4“

Control
230 V or 24 V

Running light
-- - without
LED - green LED, white reflector

Fresh air (only for KFA/E, KFA/T, KFA/L; view from water side)
-- - without
SAL - on the left (KFA/E, KFA/L: LDB 20; KFA/T: LDB 15)
SAR - on the right (KFA/E, KFA/L: LDB 20; KFA/T: LDB 15)
SAB - on both sides (KFA/E, KFA/L: LDB 20; KFA/T: LDB 15)
IKL - integrated box on the left (KFA/E, KFA/L, installed on water side)
IKR - integrated box on the right (KFA/E, KFA/L, installed on water side)
IKB - 2 integrated boxes for both sides (KFA/E, KFA/L, 1 x on water side, 1 x on electronic side)
ILL - 2 integrated boxes on the left (KFA/E, KFA/L, 1 x on water side, 1 x on electronic side)
IRR - 2 integrated boxes on the right (KFA/E, KFA/L, 1 x on water side, 1 x on electronic side)

Order Checklist for LTG cool wave®, type KFA .../ E

In order to enable us to process your purchase order as fast as possible, please complete the following checklist and include it in your LTG order.

Model: ..... pcs. BG 800
..... pcs. BG 1000

Control: ☐ 230V
(factory-set) ☐ 24V

Outlet: Color: RAL .....

Outlet type: ☐ Version 1 (flanged installation, B = 420 mm)
☐ Version 2 (flangeless installation, B = 398 mm)

Service indication: ☐ green LED (only possible in combination with white outlets)

Suspension: ..... pair rail (height of intermediate ceiling 430-580 mm)
..... pair rail (height of intermediate ceiling 360-770 mm)

Valves: ..... pair angle valves
..... pair straightway valves
..... pair 1 presetting valve with inspection glass and 1 shut-off valve

Hoses: ..... pair ..... mm long insulated / non-insulated

Unit side: ☐ suitable for LTG valves
☐ suitable for direct connection to KFA
☐ suitable for direct connection to KFA with air bleed cock

Water side: - union nut, flat seal
☐ R3/8“ ☐ R1/2” ☐ R3/4“ (internal thread)
- union nut, tapered seal
☐ R3/8“ ☐ R1/2” ☐ R3/4“ (internal thread)
- external tapered thread
☐ R3/8“ ☐ R1/2” ☐ R3/4“ (external thread)

Fresh air: Integrated fresh air box: ..... pcs. left (installed on water side)
(with view onto the water side) ..... pcs. right (installed on water side)
..... pair left and right (installed on water side)
..... pair left and left (on water + electr. side)
..... pair right and right (on water + electr.side

LDB20 attachmant: ..... pcs. unilateral left
(with view on water side) ..... pcs. unilateral right
..... pair active on both sides
..... pair active on the left side and blind rail on the right
..... pair active on the right side and blind rail on the left
..... pair blind rail on both sides

Room thermostat: ..... pcs. LTG room thermostat KFR110 (230 V)

Order Checklist for LTG cool wave®, type KFA .../ S

In order to enable us to process your purchase order as fast as possible, please complete the following checklist and include it in your LTG order.

Model: ..... pcs. BG 800 ..... pcs. BG 1000

Control:: (factory set) ☐ 230V ☐ 24V

Outlet: Color: RAL .....

Outlet type: ☐ Version 1 (flanged installation, B = 420 mm)
☐ Version 2 (flangeless installation, B = 398 mm)

Service indication: ☐ green LED (only possible in combination with white outlets)

Suspension: ..... pair rail (height of intermediate ceiling 430 - 580 mm)
..... pair rail (height of intermediate ceiling 360 - 770 mm)

Valves: ..... pair angle valves
..... pair straightway valves
..... pair 1 presetting valve with inspection glass and 1 shut-off valve

Hoses:..... pair: ..... mm long insulated / uninsulated

Unit side: ☐ suitable for LTG valves
☐ suitable for direct connection to KFA
☐ suitable for direct connection fo KFA with air bleed cock

Water side:
- union nut. flat seal
  ☐ R3/8“ ☐ R1/2” ☐ R3/4“ (internal thread))
- union nut, tapered seal
  ☐ R3/8“ ☐ R1/2” ☐ R3/4“ (internal thread)
- external tapered thread
  ☐ R3/8“ ☐ R1/2” ☐ R3/4“ (external thread))

Room thermostat: ..... pcs. LTG room thermostat KFR110 (230V)

Order Checklist for LTG cool wave®, type KFA .../ T

In order to enable us to process your purchase order as fast as possible, please complete the following checklist and include it in your LTG order.

Model: ..... pcs. BG 800 ..... pcs. BG 1000 ..... pcs. BG 1250

Control: (facory set) ☐ 230V ☐ 24V

Covers and drip channel: Color: RAL .....
(fins of the outlet grid made of naturally anodized aluminum, „grey")

Suspension: ..... pair rail (height of intermediate ceiling 385-435 mm)
..... pair rail (height of intermediate ceiling 416-622 mm)

Valves: ..... pair angle valves
..... pair straightway valves
..... pair 1 presetting valve with inspection glass and 1 shut-off valve

Hoses:..... pair: ..... mm long insulated / non-insulated

Unit side:
☐ suitable for LTG valves
☐ suitable for direct connection to KFA
☐ suitable for direct connection to KFA with air bleed cock

Water side:
- union nut, flat seal
  ☐ R3/8" ☐ R1/2" ☐ R3/4" (internal thread
- union nut, tapered seal
  ☐ R3/8" ☐ R1/2" ☐ R3/4" (internal thread)
- external tapered thread
  ☐ R3/8" ☐ R1/2" ☐ R3/4" (external thread))

Fresh air:

LDB15 attachment: (with view to the water side)
..... pcs. unilateral left
..... pcs. unilateral right
..... pair active on both sides
..... pair active on the left side and blind rail on the right side
..... pair active on the right side and blind rail on the left side
..... pair blind rail on both sides

Room thermostat: ..... pcs. LTG room thermostat KFR110 (230 V)

Order Checklist for LTG cool wave®, type KFA .../ F

In order to enable us to process your purchase order as fast as possible, please complete the following checklist and include it in your LTG order.

Model: ..... pcs. BG 800
....pcs. BG 1000
..... pcs. BG 1250

Control: (factory set) ☐ 230V ☐ 24V

Covers, drip channel and duct suspension: Color: RAL .....
(fins of the outlet grid made of naturally anodized aluminum, "grey")

Duct suspension: Dimension K (clearance upper edge KFA / bare ceiling)

☐ 150mm ☐ 300mm ☐ 450mm
☐ 600mm

Hoses: ☐ Standard: insulated/non-insulated 500 mm long
☐ Special length: insulated/non-insulated, ... mm long

Water side:
- union nut, flat seal
  ☐ R3/8" ☐ R1/2" ☐ R3/4" (internal thread))
- union nut, tapered seal
  ☐ R3/8" ☐ R1/2" ☐ R3/4" (internal thread)
- external tapered thread
  ☐ R3/8" ☐ R1/2" ☐ R3/4" (external thread)

Room thermostat: ..... pcs. LTG room thermostat KFR110 (230 V)

Note: The price for KFA.../F includes 1 pair of angle valves and 1 pair of duct suspensions (in the stated lengths).

Order Checklist for LTG cool wave®, type KFA .../ L

In order to enable us to process your purchase order as fast as possible, please complete the following checklist and include it in your LTG order.

Model: ..... pcs. BG 800 / 36W
..... pcs. BG 1000/ 36W
..... pcs. BG 1000/ 58W

Control: (factory set) ☐ 230V ☐ 24V

Outlet: Color: RAL .....

Outlet type: ☐ Version 1 (flanged installation, width = 621 mm)
☐ Version 2 (flangeless installation, width = 599 mm)

Suspension: ..... pair rail (height of suspended ceiling 430-580 mm)
..... pair rail (height of suspended ceiling 560-770 mm)

Valves: ..... pair angle valves
..... pair straightway valves
..... pair 1 presetting valve with inspection glass and 1 shut-off valve

Hoses:..... pair: ..... mm long insulated / uninsulated

Unit side: ☐ suitable for LTG valves
☐ suitable for direct connection to KFA
☐ suitable for direct connection to KFA with air bleed cock

Water side: - union nut, flat seal
☐ R3/8“ ☐ R1/2” ☐ R3/4“ (internal thread)
- union nut, tapered seal
☐ R3/8“ ☐ R1/2” ☐ R3/4“ (internal thread))
- external tapered thread
☐ R3/8“ ☐ R1/2” ☐ R3/4“ (external thread)

Romm thermostat:: ..... pcs. LTG room thermostat KFR110 (230V)

Luminair:

..... pcs. Siemens	Siluna	36 W	Ballast:
..... pcs. Zumtobel	Mildes Licht	36W	☐ low lost ballast
..... pcs. Siemens	Siluna	58W	(not compensated)
..... pcs. Zumtobel	Mildes Licht	58W	☐ electronic ballast (compensated)

Note: The corresponding fluorescent luminaires (LM) T26 are not included in the delivery.

Fresh air: Integrated fresh air box: (with view to the water side)
..... pcs. left (installed on water side
..... pcs. right (installed on water side)
..... pair left and right (installed on water side)
..... pair left and left (on water + electr. side)
..... pair right and right (on water + electr.side)

LDB20 attachment: (with view to the water side)
..... pcs. unilateral left
..... pcs. unilateral right
..... pair active on both sides
..... pair active on the left side and blind rail on the right side
..... pair active on the right side and blind rail on the left side
..... pair blind rail on both sides

Qty.	Performance specification	Unit price in €	Total price in €
	LTG chilled beam with oscillating fan cool wave® **A ceiling mounted room cooling appliance producing a pulsating airflow** The unit consists of an elongated casing containing two heat exchangers arranged in a V configuration, with an oscillating fan in between, actuated by a motor producing a smooth pendulum-like movement. Thus, two air chambers are created, separated by the fan, into which warm air is sucked in from the room, cooled and re-discharged on alternate sides. The cooled air is redirected by a diffuser in such a way that fast moving eddies are formed. As the eddies rapidly decay, they mix intensively with the ambient air, so that the gathering zone is provided with a wide, well distributed, continous flow of slow moving air. The fan is so quiet that it fulfills even the highest acoustic requirements (noise power level 31 dB(A)). It is controlled by an on/off switch. **Casing:** made of torsion resistant aluminum shells with galvanized sheet steel side panels, containing two heat and vibration insulated 2-pipe heat exchangers with copper pipes and press-fitted 0.18 mm aluminum fins. Maximum operating pressure 10 bar. A common condensate receiver for both heat exchangers taking lower condensate quantities, and an additional condensate receiver underneath the water connections. **Drive system:** mounted in long-life ball bearings, electrical power consumption: 20 W **Fan:** low weight per unit area, in a ball-bearing on one end. **Standard version:** Plug connection of the unit to a 230 V main power supply. Up to 8 units may be connected using a 16 A fuse. Control, to be provided by the customer, by an on/off thermostat (230 VAC), to be included in the power supply cable. According to the maximum inrush current permitted for the thermostat, up to 6 units may be connected forming one group (serial wired plug connections). If a 24 VAC switching voltage is used, several units may be controlled simultaneously using a master-slave arrangement. -2-		

Qty.	Performance specification	Unit price in €	Total price in €

-2-

Versions:

- **Type KFA .../E** (flush to ceiling) including a linear diffuser, in widths of 398 mm (flangeless) and 420 mm (flanged), and in lengths of 1000 to 1500 mm acc. to the unit size (800/1000). Diffuser powder coated similar to RAL 9010.
- **Type KFA .../S** (slim, flush to ceiling) including a linear diffuser, in widths of 298 mm (flangeless) and 320 mm (flanged), and in lengths of 1000 to 1500 mm acc. to the unit size (800/1000). Diffuser powder coated similar to RAL 9010.
- **Type KFA .../T** (semi-recessed preferably for intermediate ceilings with installation heigths of 140 mm to 250 mm (greater heights on request), completely with slatted diffuser of natural anodized aluminum, lateral plastic covers (cover and condensate receiver painted in colors similar to RAL).
- **Type KFA .../F** (suspended) for suspension under ceiling, ventilator with casing and slatted diffuser of natural anodized aluminum, lateral plastic covers (cover and condensate receiver painted in colors similar to RAL).
- **Type KFA .../L** (flush to ceiling) designed to take a luminaire brand Siemens, type "Siluna" or brand Zumtobel, type "Mildes Licht", including a linear diffuser, in a width of 599 mm (flangeless) or in an width of 621 mm (flanged) and in lengths of 1281 mm and 1581 mm acc. to the luminaire and the unit size (800/1000). Diffuser powder coated similar to RAL 9010; noise power level 32 dB(A)

Size	spec. cooling capacity [W/K]				Nominal water flow rate [kg/h]	water-side pressure loss [kPa]
	../E	..T/F	../L	../S		
800	37	44	34	33	300	10
1000	50	49	37	44	350	16
1250		60			420	27

-3-

Qty.	Perormance specification	Unit price in €	Total price in €
	-3- **Optional extras:** - **for KFA .../E, S, T, L:** 2 telescopic rails for rigid supension for greater heights of suspended ceilings, rails of galvanized sheet steel, displacement: 315 mm; - 2 shutoff valves, as angle valves (or straightway valves, possible for **KFA.../E, S, L, T**), for supply and return, pressure loss adjustment and ventilation; transition fitting to 3/8“ tapered seal; suitable for direct connection to KFA heat exchanger; - Tool for ventilation and drainage of the shutoff valves; - 1 presetting valve with presetting, shut-off and flow measurement function, with inspection glass (possible for **KFA.../E, S, L, T),** for installation in the water return between the flexible hose and the pipe, measuring range 120...480 l/h, max. service pressure 10 bar, connection to hose: external threadtapered 3/4“, connection to tube: internal thread, 1/2“; - 1 shut-off valve for water supply (becomes necessary with the use of a presetting valve for water return. Possible with **KFA.../E, L, S, T**). Connection to flexible hose: external thread 3/4“, tapered seal. Connection to water net: internal thread 1/2“; - 2 flexible hoses, with or without insulation, 500 mm long (other lengths on request); - Room thermostat KFR 110 for a 230 VAC supply, for control of up to 6 units; - **for KFA .../E, S:** Running light (green LED) with a white reflector, mounted in a centered position inside the outlet. - Linear diffuser as optical dummy element same as for **KFA .../E**, in widths of 398 mm (flangeless) or 420 mm (flanged) for all unit sizes, and in lengths of 1000 to 1500 mm, acc. to the unit size (800/1000/1250). Diffuser powder coated similar to RAL 9010 with inner cover sheet facing the empty space of the intermediate ceiling, black colored; - Linear diffuser as optical dummy element same as for **KFA .../S**, in widths of 298 mm (flangeless) or 320 mm (flanged) for all unit sizes, and in lengths of 1000 to 1500 mm, acc. to the unit size (800/1000/1250). Diffuser powder coated similar to RAL 9010 with inner cover sheet facing the empty space of the intermediate ceiling, black colored. - 4 -		

Qty.	Performance specification	Unit price in €	Total price in €
	-4- - **for KFA .../E, L:** front-side, plug-in air distribution box for low-volume-flow, diffuser-integrated fresh air supply. Box of galvanized sheet steel, air connecting socket (unmounted) with 79 mm (KFA .../E) or 99 mm (KFA .../L) nominal width; - **for KFA .../E:** lateral plug-in air diffuser (powder coated similar to RAL) for separate fresh air supply, type LDB 20, linear, with adjustable cylindrical nozzles, compact air distribution box of galvanized sheet steel, air connecting socket with ..... mm nominal width; - **for KFA...T:** lateral plug-in air diffuser for separate fresh air supply type LDB 15 with white nozzles and naturally anodized aluminium profiles, with compact air distribution box of galvanized sheet steel, air connection socket (unmounted) nominal width 79 mm; - **for KFA .../L:** built-in luminaire incl. mounting fittings * built-in lamp, brand Siemens, type "Siluna" *Tube* for size 800 or 1000: 5 LJ 681 7-1C with EVG *36 W* 5 LJ 681 1-1C mit VVG *36 W* for size 1000 or 1250: 5 LJ 681 7-1E with EVG *58 W* 5 LJ 681 1-1E with VVG *58 W* ** built-in luminaire, brand Zumtobel, type "Mildes Licht" for size 800 or 1000: RCE 1/32 W EVG T26 *36 W* for size 1000 or 1250: RCE 1/50 W EVG T26 *58 W* *(Legend: EVG = electronical ballast, VVG = low-lost ballast)* **Manufacturer:** **LTG Aktiengesellschaft Stuttgart** **Type:** **Cooling system cool wave®**		