

Cooling and heating systems

Induction unit for mixing ventilation, for horizontal floor mounting, type IG-M-LB...



DS 4137 E 12.2007

Preliminary remark

For building facades with glazing over the room height, KRANTZ KOMPONENTEN provides compact high-capacity units for removing the cooling or heating loads resulting from large glass surfaces: induction units for mixing ventilation, designed for installation in a raised floor. Such induction units can also be installed in raised floors inside buildings whose facades are fitted with parapets because they obviate the need for parapet covers; this saves space which is thus available to the room user. The induction unit for mixing ventilation belongs to the line of air-and-water systems where the outdoor air flow rate required for reasons of hygiene is conditioned in a central air handling unit and the cooling or heating load removed via a 4-pipe water system. This air-and-water system is much more economical than a pure air system.

Construction design and mode of operation

The induction unit consists of a housing 1 with primary air connection 2. Inside the primary air box 3, the primary air is conveyed by nozzles 4 to the induction area 5 underneath the heat exchanger 6. The heat exchanger usually has a 4-pipe design, yet a 2-pipe design can also be used in the case change-over operation is required. The valves can also be lodged in the housing 1.

Owing to the suction effect of the nozzle jets, secondary air 7 is sucked in via the heat exchanger 6 where it is either heated or cooled. The blend of primary air and secondary air forms supply air 8 that enters the room via the floor grille 9 positioned in front of the facade or glazing 10. The raised floor 11 abuts the floor grille 9. The induction unit is fitted with feet 13 that are adjustable in height to make up for constructional tolerance values.

When heating at weekends or at night, primary air is not required; the induction unit then operates with self-convection, which saves energy (see Fig. 2). Right in front of the facade 10, the secondary air 7 flows via the floor grille 9 into the unit and, there, through the heat exchanger 6. The heated supply air 8 enters the room via the floor grille 9.

The floor grille 9 is available with bars being either parallel or at right angles to the facade.

As shown in Fig. 3, the induction unit is available with the primary air box being either positioned at the front (design A) or built-in (design B).

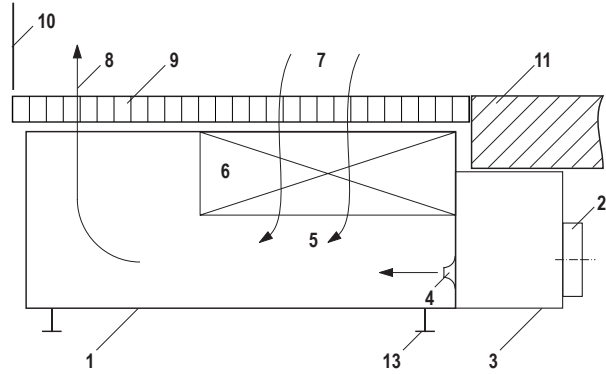


Fig. 1: Design and mode of operation of the induction unit when cooling and heating

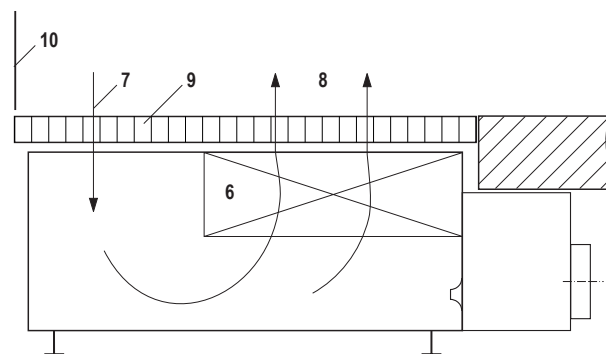


Fig. 2: Operation with self-convection

Key	7 Secondary air
1 Housing	8 Supply air
2 Primary air connection	9 Floor grille
3 Primary air box	10 Facade or glazing
4 Nozzle	11 Raised floor
5 Induction area	13 Feet, adjustable in height
6 Heat exchanger	14 Water connections

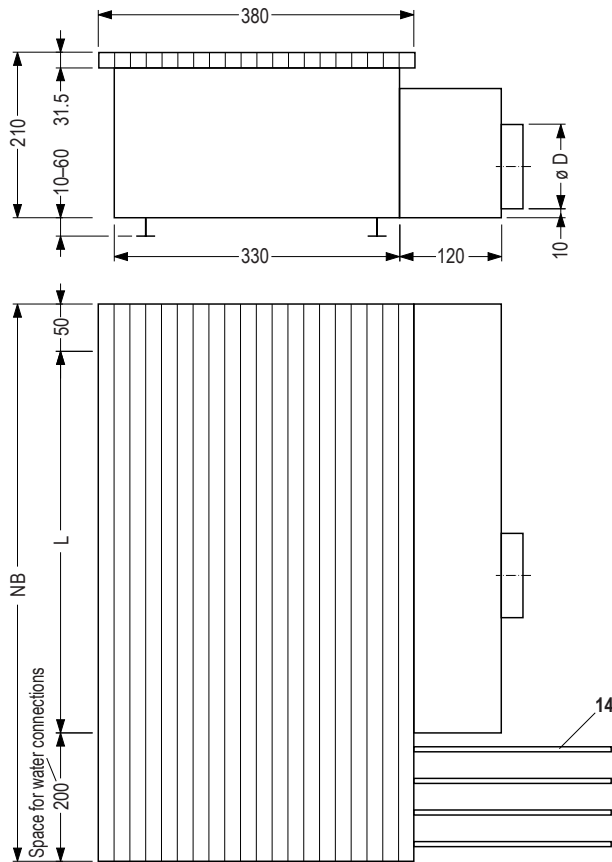
Technical selection

Cooling

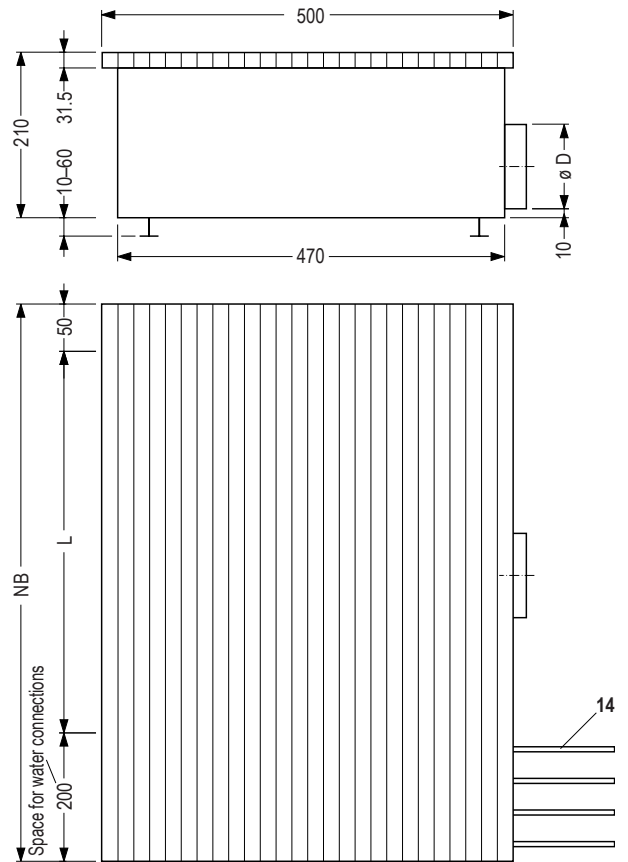
The cooling output of the induction unit is made up of the water-side and primary air-side cooling outputs. **Table 1** shows a preselection.

The water-side cooling output, which is transferred via the secondary air, depends on the primary air volume flow rate and the difference between mean water temperature and indoor air temperature. **Graph 1** (page 4) shows standard outputs per metre of air discharge width 'L' for a difference of -10 K, e.g. room temperature 26 °C, supply temperature 15 °C, return temperature 17 °C and mean water temperature 16 °C.

Design A



Design B



Nominal unit width NB in mm	Air discharge width L in mm	Connection spigot ø f. primary air ø D in mm		Weight approx. kg
		5-8	10	
800	550	99	99	18
900	650	99	124	21
1150	900	99	124	28
1350	1100	124	2 x 99	33
1600	1300	2 x 99	2 x 99	40

Fig. 3: Unit dimensions

For other layout cases, the outputs shown in **Graph 1** can be converted in a linear way, e.g. for a difference of 8 K instead of 10 K between mean water temperature and indoor air temperature, the conversion factor is 8/10 K and, thus, the conversion is 0.8 x output as per **Graph 1**. If a pressure loss higher than 170 Pa or a sound power level higher than 29 dB(A) ref. 10⁻¹² W is allowable, the maximum specific primary air volume flow rates can be selected according to this graph at the relevant nozzle diameters.

The primary air-side cooling output depends on the primary air volume flow rate and the difference between supply air and indoor air temperatures. The standard layout is often made with a difference of -8 K, i.e. with a primary air temperature of 18 °C and an indoor air temperature of maximum 26 °C.

Table 1: Preselection for cooling

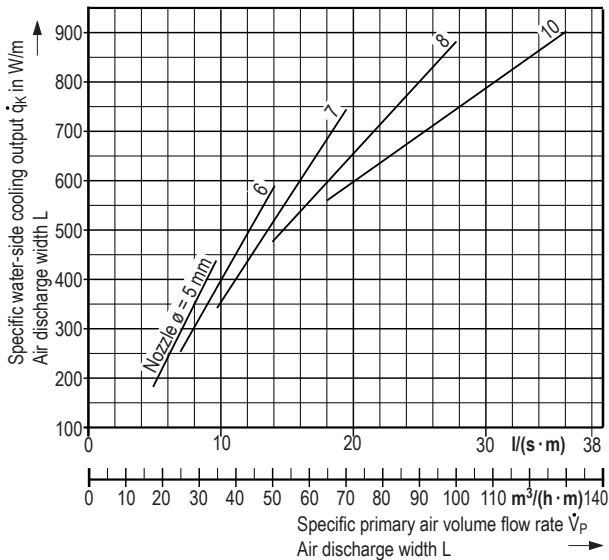
for $\Delta p = 170 \text{ Pa}$ and $L_{WA} \leq 29 \text{ dB(A) ref. } 10^{-12} \text{ W}$

Nominal unit width mm	Primary air volume flow rate		Nozzle diameter mm	Water flow l/h	Cooling output Secondary air ¹⁾ W	Cooling output Primary air ²⁾ W	Total cooling output W	Total specific cooling output ³⁾ W/m ²
	l/s	m ³ /h						
800	4	15	5	78	182	40	222	40
	6	20	6	95	221	54	275	50
	8	30	7	133	310	81	391	71
	11	40	8	155	364	108	472	86
	17	60	10	187	436	161	597	109
900	5	18	5	94	219	48	267	44
	7	25	6	120	279	67	346	57
	10	35	7	155	361	94	455	75
	14	50	8	194	452	134	586	97
	19	70	10	219	510	188	698	115
1150	7	25	5	130	304	67	371	50
	10	35	6	168	392	94	486	65
	14	50	7	222	517	134	651	88
	19	70	8	271	632	188	820	110
	25	90	10	288	671	242	913	123
1350	8	30	5	156	364	81	445	52
	13	45	6	218	508	121	629	74
	17	60	7	266	620	161	781	92
	24	85	8	330	768	228	996	117
	31	110	10	352	820	296	1116	131
1600	10	35	5	182	423	94	517	52
	13	50	6	239	558	134	693	70
	19	70	7	310	722	188	910	92
	28	100	8	388	904	269	1173	118
	36	130	10	416	969	349	1318	133

¹⁾ Supply/Return temperature 15/17 °C, secondary air temperature 26 °C

²⁾ Primary air temperature 18 °C, room temperature 26 °C

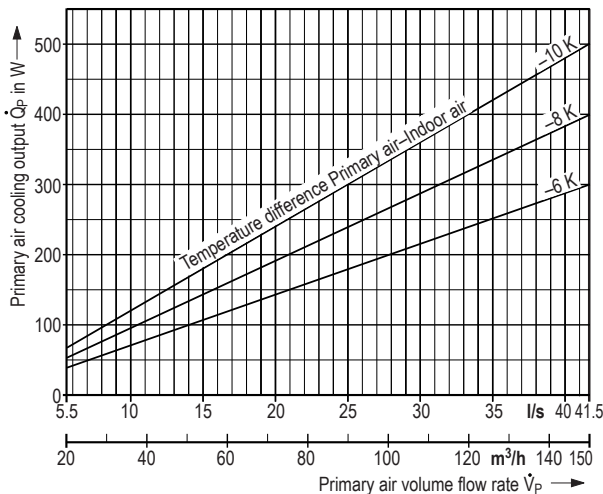
³⁾ Room axis-to-axis dimension (nominal unit width + 200 mm) · room depth 5.5 m



Graph 1: Specific water-side cooling output at a difference of -10 K between mean water temperature and secondary air temperature

Graph 2 shows cooling outputs for this and other temperature differences, in relation to the primary air volume flow rate. The outputs are independent of the unit size, i.e. they are influenced only by the primary air volume flow rate and the temperature difference.

The total cooling output of the induction unit is the sum of primary air output and secondary air output (water-side).



Graph 2: Primary air-side cooling output

Heating

The heating output of the induction unit is delivered economically via the secondary air, i.e. via the heat exchanger. Values are given in Table 2 for various nominal unit widths and nozzle diameters in order to facilitate the preselection. Additional heating output can be delivered

via the primary air but, as a rule, this is not necessary because of the high water-side outputs.

In winter, if the primary air is supplied at a temperature lower than that of the indoor air, additional heating is required which, besides transmission heat losses of the building, is to be covered by the secondary air. This is for instance the case when other inner rooms are to be provided with cooling from the central plant in winter too.

Table 2: Preselection for heating

for $\Delta p = 170\text{ Pa}$ and $L_{WA} \leq 29\text{ dB(A) ref. } 10^{-12}\text{ W}$

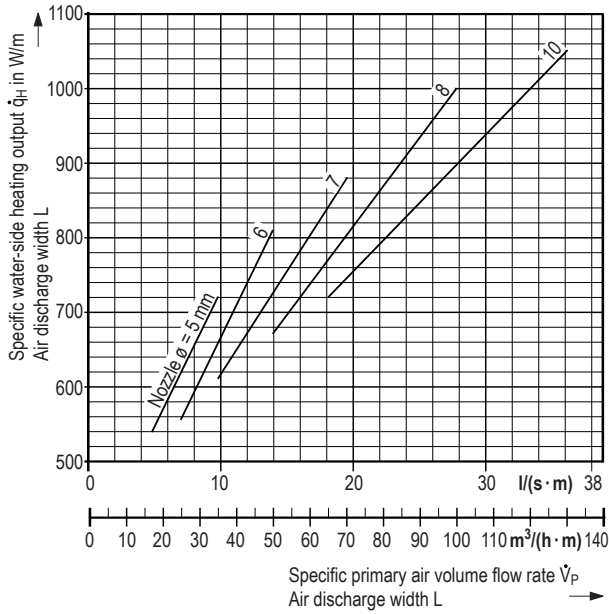
Nominal unit width mm	Primary air volume flow rate		Nozzle diameter mm	Water flow l/h	Heating output Secondary air ¹⁾ W	Total specific heating output ²⁾ W/m ²
	l/s	m ³ /h				
800	4	15	5	70	362	66
	6	20	6	70	380	69
	8	30	7	74	429	78
	11	40	8	80	464	84
	17	60	10	92	532	97
900	5	18	5	74	431	71
	7	25	6	80	463	77
	10	35	7	87	504	83
	14	50	8	97	566	94
	19	70	10	107	624	103
1150	7	25	5	103	598	81
	10	35	6	111	645	87
	14	50	7	122	710	96
	19	70	8	136	789	106
	25	90	10	142	828	112
1350	8	30	5	125	725	85
	13	45	6	139	811	95
	17	60	7	148	859	101
	24	85	8	165	960	113
	31	110	10	174	1012	119
1600	10	35	5	147	852	86
	13	50	6	159	926	94
	19	70	7	173	1008	102
	28	100	8	195	1132	114
	36	130	10	206	1196	121

¹⁾ Supply/Return temperature $45/40\text{ }^\circ\text{C}$, secondary air temperature $22\text{ }^\circ\text{C}$

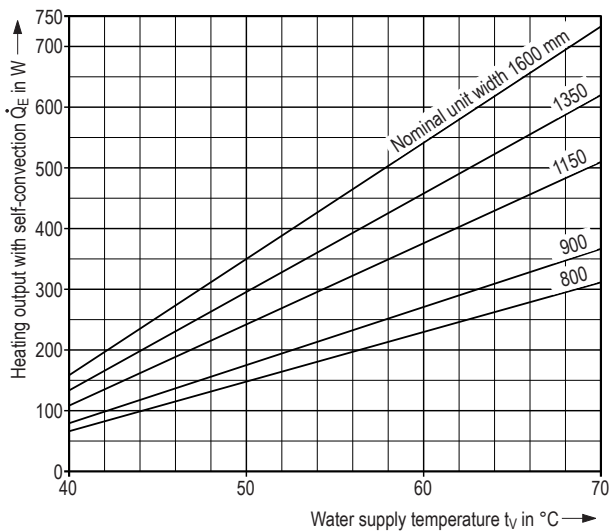
²⁾ Room axis-to-axis dimension (nominal unit width + 200 mm) · room depth 5.5 m

Graph 3 shows outputs for a difference of 20 K between mean water temperature and room temperature. Other values can be converted in a linear way.

The induction unit can also be operated with pure self-convection, without primary air (Fig. 2 on page 2). For the purposes of economy this is mainly used at night and at weekends. Related heating outputs can be read off Graph 4; they apply for a water flow rate of 70 l/h. At a higher water flow rate, the heating output rises a little, e.g. by 3% at 100 l/h.



Graph 3: Specific water-side heating output at a difference of +20 K between mean water temperature and secondary air temperature



Graph 4: Heating output with self-convection, room temperature 22 °C, water flow rate 70 l/h

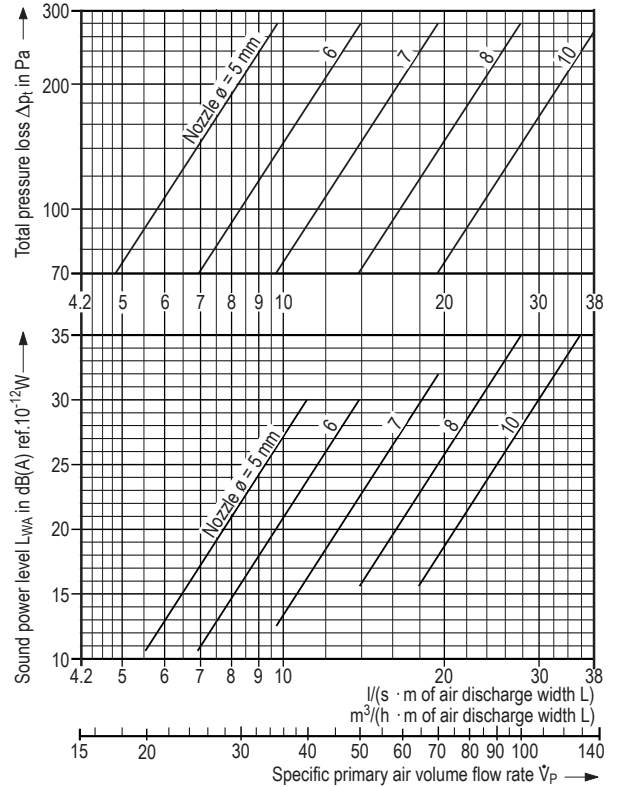
Sound power level

The sound power level is shown in **Graph 5** in relation to the specific primary air volume flow rate.

To read it from the graph, you must first adapt the volume flow rate of the selected nominal unit width to the air discharge width (see Fig. 3 on page 3).

Example:

Nominal unit width: 1150 mm
Air discharge width: 900 mm
Primary air volume flow rate: 22 l/s [80 m³/h]
Specific primary air volume flow rate related to air discharge width: 25 l/(s·m) [89 m³/(h·m)]
Nozzle diameter: 10 mm
Sound power level: 25 dB(A) ref. 10⁻¹² W

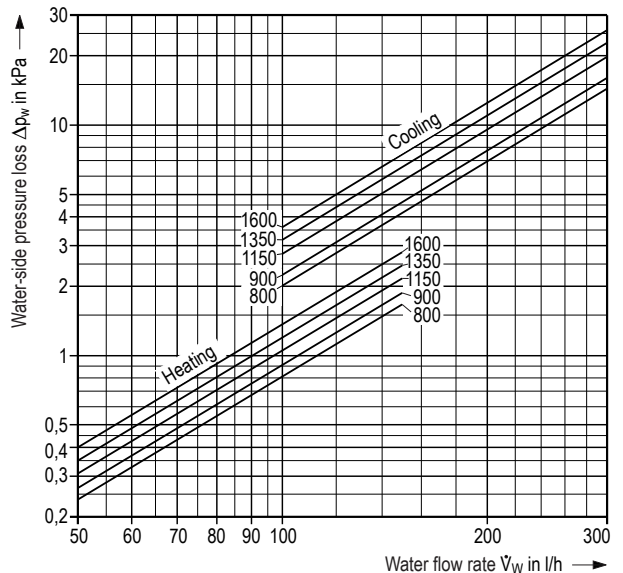


Graph 5: Sound power level and pressure loss

The pressure loss on the primary air side is shown in **Graph 5** in relation to the specific primary air volume flow rate. To read it from the graph, you must first adapt the volume flow rate of the selected nominal unit width to the air discharge width (see Fig. 3 on page 3).

The pressure loss on the water side, i.e. in the secondary air heat exchanger, is shown in **Graph 6** for heating and cooling respectively.

The minimum water flow rate for all unit sizes is 70 l/h.



Graph 6: Water-side pressure loss of heat exchanger

Features

- For cooling, heating, and fresh air supply along the facade, via a raised floor, while providing a high level of thermal comfort
- Primary air volume flow rate: 4 to 36 l/s [15 to 130 m³/h]
- Low pressure loss (70 to 200 Pa), therefore energy-saving operation
- Low sound power level
- Heating also possible without primary air, which saves energy when heating at night and at weekends
- Heat exchanger cleanable from the top or the bottom (in compliance with requirements of VDI 6022). The large fin spacing enables easy cleaning and obviates the need for a filter.
- Suitable for new or refurbished buildings
- Optional accessory: condensate tank below the heat exchanger, inclusive of drain with ½" connector

Type code

IG – M – LB – – –

Induction unit | Mixing ventilation | Placement | Grille depth | Nominal unit width

Placement

LB = in raised floor, horizontally

Grille depth

A = Design A (380 mm)
B = Design B (500 mm)

Nominal unit width

800, 900, 1150, 1350, 1600

Tender text

..... units

Induction unit for cooling, heating, and fresh air supply along the facade, via a raised floor.

Item 1

Unit with primary air connection and built-in metallic primary air nozzles, consisting of:

water heat exchanger made from copper pipes with aluminium fins and separate circuits for heating and cooling; fins with large spacing for easy cleaning as per VDI 6022;

primary air box with inspection cover as per VDI 6022;

water connections built into the left part of the housing.

Item 2

Air outlet element with bars parallel to the facade for screening of window facade when cooling or heating; quick jet velocity decay without formation of uncomfortable tangential air patterns. Element designed as a stiff, walkable grille from anodized aluminium with small bar spacing and aluminium frame; free area: 62.5%, bar dimensions: 16 x 5 mm, bar spacing: 8.5 mm.

Technical data

Primary air volume flow rate l/s [m³/h]
Allowable sound power level dB(A) ref. 10⁻¹²W
Pressure loss on air side Pa

Cooling mode
Total cooling output W
Water supply temperature °C
Water flow rate l/h
Pressure loss on water side kPa

Heating mode
Heating output (secondary) W
Water supply temperature °C
Water flow rate l/h
Pressure loss on water side kPa

Material
Housing: galvanized sheet metal
Air outlet element: aluminium

- anodized in natural colour
- painted to RAL 9006 ¹⁾

Heat exchanger: copper / aluminium

Dimensions
Nominal unit width ²⁾: mm
Grille depth: mm
Height, without feet ³⁾: 210 mm
Allowable operating pressure of heat exchanger: 16 bars

Make: KRANTZ KOMPONENTEN

Type: IG – M – LB – – –

– Subject to technical alteration –

¹⁾ Other colours available on request

²⁾ Other sizes available on request

³⁾ Feet adjustable between 10 and 60 mm