QUICK SELECTION GUIDE

Decentral Systems Industry
Multi*MAXX*® – Multi Flair® – Roof*JETT*

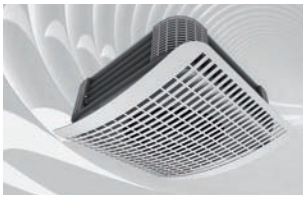
Optimal Assistance in Pre-Selection of Units

DencoHappel®

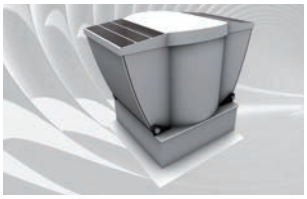
Decentral Systems for Commerce and Industry

Multi*MAXX*

Multi*MAXX* Vent



Multi Flair



Roof*JETT*

PR-2015-0018-GB • Subject to modifications • R0-02/2016

The signs of the times are clear

Investors, plant engineers, planners, and architects no longer ask "whether" but "how" they can enhance the degree of sustainability of their plants and building management systems. Buildings are unique objects. Location, size, construction quality, and increasingly – building engineering technology – determine values and returns. Energy states substantially gain in significance, since buildings account for about 40% of the world energy consumption and produce 21% of world-wide greenhouse gases. The proportion of the energy costs in the "second rent" for users and residents is constantly increasing.

Where heating, cooling, cleaning, filtering, humidification and dehumidification of air is required, DencoHappel is contributing to progress. Customized climate-control and air treatment, with the maximum possible reduction of energy consumption over the entire life cycle of the plant: this all pays out handsomely in euros and cents, in comfort, and in staff productivity. In highly sensitive areas, such as clinical and clean room applications, our solutions reliably satisfy all international standards. They furthermore set new standards for sustainability and perfect system integration in modern sport arenas, factory buildings, airport facilities, and swimming pools, as well as in offices, museums and hotels.

Whoever treats air must master it

The fact that our air treatment is neither seen nor heard, although one is agreeably aware of it, and that in the meantime it avoids energy and wasteful costs, is due to our precision air treatment work in both hardware and software.

DencoHappel stands for:

- Customized air quality and a healthy, comfortable room climate with extremely quiet operation
- Maximum energy efficiency and reduction in the CO_2 emission
- Precise monitoring and control, centrally and decentrally
- High adaptability to the most diverse tasks and environments
- Simple system integration
- Durability and high availability at low maintenance cost

During the transition period between spring and autumn, can a large-scale glassed building be simultaneously heated on its northern side and cooled on its southern side with only one system, without switching on the central heating system?

Does a plant in the pharmaceutical or electronic industry, for instance, which heats, cools, humidifies and dehumidifies the air, also offer protection from dirt and bacteria?

Can investors and building owners calculate the life cycle costs of a central plant air-handling unit, determine the effect of energy-saving equipment on the operating cost for this purpose, and thus select the optimal efficiency class right in the configuration stage of the plant?

DencoHappel has found answers to these and many other questions concerning air and climate control technology, and implemented solutions based on long experience with many different applications. This core offering consists of a broad spectrum of central and decentralized air-handling units, precipitators, and other filtering equipment, and extends to complete cleanroom systems. The function, control, and design of such facilities can be precisely customized according to the desired task, adapted to the design characteristics and infrastructure of specific buildings, and designed according to the calculation of operating costs as well as the highest standards of energy efficiency and climate protection. Cutting-edge control technology from our own development permits individual control in single rooms as well as central handling within a building management system.

Control units with access through interfaces to all leading systems of building automation provide a trouble-free integration of all equipment into the building management system. Building climate control, made to order, is a advantage whereby planners and user requirements can be accommodated in the earliest design stage at the facilities.

TÜV CERT DIN EN ISO 9001 Zertifikat: 09 100 4115

CE

EUROVENT CERTIFIED PERFORMANCE AIR FILTERS CLASS M5-F9 www.eurovent-certification.com

Benefit and characteristics

MultiMAXX – the flexible unit heater/ cooler

- Robust design
- ErP 2016 conform (Ecodesign Directive)
- Energy-saving execution with EC fan
- Flexibly selectable components (heat exchanger, fans, vents)
- Multifunctional potential applications in the industry
- Application-specific material properties
- Surmounting of high air-side resistance
- Explosion-protected characteristics with the HX model variant
- Hygienic characteristics with the HS variant

MultiMAXX Vent – the versatile fan

- Affects a reduction in the air stratification, especially in high halls
- ErP 2016 conform (Ecodesign Directive)
- Multifunctional potential applications of the ventilation
- Application-specific material properties
- Flexible selectable components (fans, vents)
- Explosion-protected characteristics with the VX model variant
- Hygienic characteristics with the VS variant

Multi Flair – the stylish unit heater/ cooler

- Stylish design for high requirements on the shape and form
- ErP 2016 conform (Ecodesign Directive)
- Silent operation with low energy consumption
- Multifunctional potential applications in the industry
- Optimal performance with low ceiling heights

Roof*JETT* – the robust extract fan

- Robust design
- ErP 2016 conform (Ecodesign Directive)
- Promotes productivity and safety
- Creates space for oxygen-rich and pleasant temperature-controlled air.
- Low noise and energy-saving operation
- Quick and easy maintenance and cleaning
- Explosion-protected characteristics with the RJxX /RJxY model variant

Functions and execution

MultiMAXX – the flexible unit heater/ cooler

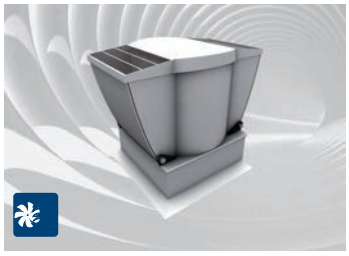
- 5 model sizes
- Air volume flows up to 12,500 m^3/h
- Thermal output to 200 kW
- Cooling capacity to 34 kW
- Assembly: wall, ceiling
- Air functions: fresh air, primary air, circulating air

MultiMAXX Vent – the versatile fan

- 5 model sizes
- Air volume flows up to 13,300 m^3/h
- Assembly: wall, ceiling
- Air functions: fresh air, primary air, circulating air

Multi Flair – the stylish unit heater/cooler

- 3 model sizes
- Air volume flow bis 3800 m^3/h
- Thermal output to 24 kW
- Cooling capacity to 11 kW
- Assembly ceiling
- Air function: primary air, recirculating air



Roof*JETT* – the robust extract fan

- 11 model sizes
- Air volume flows up to 13,500 m^3/h
- Standard motors up to 60 °C extract-air temperature
- Motors for the smoke exhaust 400 °C/2 h
- Assembly roof
- Air function: extract air

Legend:

Heating
Cooling
Ventilation

Heat exchange coils

For the preliminary design of the heat exchanger, different requirements regarding feed air are significant for the decision of which type of heat exchanger to employ for the application.

Multi*MAXX*

MultiFlair

Corrosiveness categories – Excerpt from the EN ISO 129944 standard

Examples for typical surroundings in a temperate climate

Interior areas

C1 Heated building with neutral atmospheres

C2 Unheated building and buildings in which condensation can occur

C3 Production rooms with high air humidity and some air contamination, such as food production, laundries, breweries

C4 Chemistry plants, swimming pools

C5 (I+M) Building or areas with nearly constant condensation and strong contamination

- Cu/Al (Standard)

- Cu/Cu (e.g. contaminated air)

- Steel galvanized (e.g. steam; burdened air)

- Stainless steel (e.g. steam; hygienic requirement)

		Heat exchange coils			
		Cu/Al	Cu/Cu	Galvanized steel	Stainless steel
Corrosiveness categories	C1	✓	✓	✓	✓
	C2	✓	✓	✓	✓
	C3		✓	✓	✓
	C4				
	C5 (I+M)		✓		✓
Medium	Water	✓	✓	✓	✓
	Steam			✓	✓
	Current				✓
	Gas				✓
Cooling mode		✓	✓		
Increased stability			✓	✓	✓

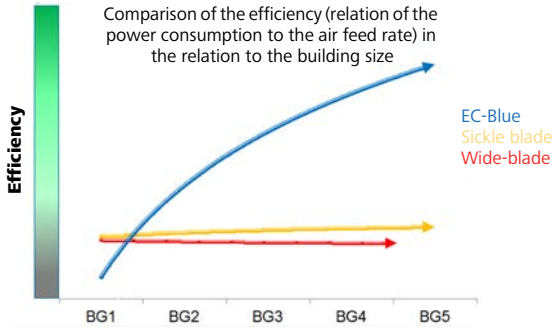
Fans

Multi*MAXX*

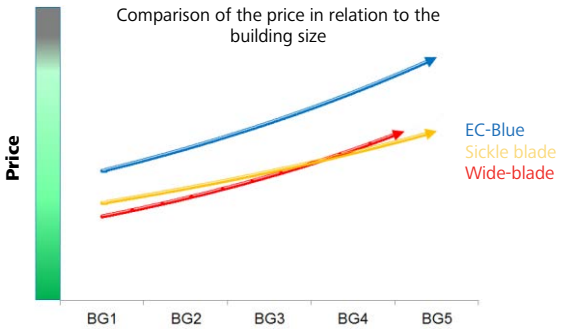
Multi*MAXX* Vent

MultiFlair

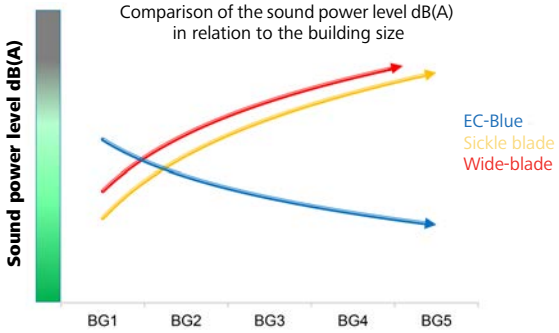
The sickle-blade EC is particularly efficient for medium-sized and large buildings.



Preferably in smaller and medium-sized building sizes, the wide wing is a stunningly advantageous variant.



For larger facilities, the sickle-blade EC offers impressively quiet operation.



Wide-blade AC

Sickle blade AC

Blue-EC

MultiMAXX – Multi Flair

If your requirements are met by the air function "heating" or "cooling", then take a look at MultiMAXX and Multi Flair. You can individually compare the features such as motor voltage, fan type, rotational speed, etc. to precisely select the best solution for your needs.

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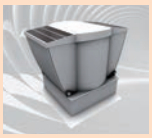
		MultiMAXX				MultiFlair
		HN	HE	HD	HG	M
						
Air function	Heating	✓	✓	✓	✓	✓
	Cooling	✓				✓
	Ventilation	✓	✓	✓	✓	✓
Air type	Recirculating air	✓	✓	✓	✓	✓
	Primary air	✓	✓	✓	✓	✓
Mounting type	Ceiling	✓	✓	✓	✓	✓
	Wall	✓	✓	✓	✓	
Capacity	Number of model sizes	5	3	4	2	3
	Air capacity (m^3/h)	1260 - 12500	1410 - 9900	1860 - 13350	1980 - 10425	310 - 3800
	Heating capacity 70/50 PWW (kW)	3.7 - 100	4 - 42	2.8 - 100	15 - 65	3 - 23.8
	Heating capacity: 8 bar steam (kW)	16 - 217		13 - 200		
	Cooling capacity 6 °C/12 °C PKW (kW)	3.8 - 34.1				1 - 11.4
Medium	PWW	✓		✓		✓
	PCW (pumped chilled water)	✓				✓
	Steam	✓		✓		
	Electro		✓			
	Gas				✓	
Heat exchanger	Cu/Al	✓		✓		✓
	Cu/Cu	✓		✓		
	Galvanized steel	✓		✓		
	Fully galvanized	✓		✓		
	Stainless steel		✓		✓	
Type of fan	Wide-blade AC	✓	✓		✓	✓
	Sickle-blade AC	✓			✓	
	Sickle-blade AC	✓		✓		for BG 3
Motor voltage	1 x 230 V	✓			✓	✓
	3 x 400 V	✓	✓	✓	✓	✓
	3 x 500 V	✓	✓			
Speeds	1-speed	✓				✓
	2-speed	✓	✓		✓	✓
	3-speed	✓	only 500 V			
	0 - 10 V (EC)	✓		✓		for BG 3
WT-casing	Design RAL 9002/RAL 7000	✓		✓		
	Industry RAL 7000	✓	✓	✓	✓	
	Design panel					✓
Fan casing	Galvanized steel	✓	✓	✓	✓	
	Sheet steel RAL 9010					✓
Controls	Terminal box	✓	✓	✓		✓
	Fan switch (rep switch)	✓		✓		
	MATRIX	✓		✓		✓
	Control units	✓	✓	✓	✓	✓

RoofJETT – MultiMAXX Vent

If your requirements are met by the air function "Ventilation", then RoofJETT and MultiMAXX Vent are the products for you. Compare the individual features such as motor voltage, fan type, rotational speed and so on to create a precise solution.

		RoofJETT	MultiMAXX Vent
		RJxL 	VN 
Air function	Ventilation	✓	✓
Air type	Recirculating air		✓
	Primary air		✓
	Extract air	✓	
Mounting type	Ceiling		✓
	Wall		✓
	Roof	✓	
Capacity	Number of model sizes	11	5
	Air capacity (m^3/h)	940 - 13500	1540 - 13300
Type of fan	Wide-blade AC		✓
	Sickle-blade AC		✓
	Sickle-blade EC		✓
	Centrifugal fan	✓	
	Centrifugal fan EC	✓	
Motor voltage	1 x 230 V	✓	✓
	3 x 400 V	✓	✓
	3 x 500 V		✓
Speeds	1-speed	✓	✓
	2-speed	✓	✓
	3-speed		✓
	0 - 10 V (EC)	✓	✓
WT-casing	Design RAL 9002/RAL 7000		✓
	Industry RAL 7000		✓
Fan casing	Galvanized steel		✓
	Sheet steel RAL 9002	✓	
Controls	Terminal box	✓	✓
	Fan switch (rep switch)	✓	✓
	MATRIX		✓
	Control units	✓	✓

Outlet diffuser

Multi*MAXX*

Multi*MAXX* Vent

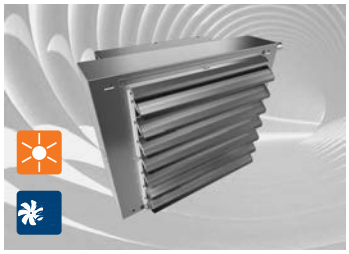
More than just air outlet

The different air outlets transport the treated air whereever it is required. This table provides you with all the information you need for a safe and transparent preliminary design.

		Function			Types		Mounting height / air throw			Assembly			Adjustability of the discharge angle		Use				
		Heating	Cooling	Profile	Basic	Sheet jet	low	medium	high	Ceiling	Wall	Gate	manually	by motor	Homogenious air distribution	Comfortable air distribution (cooling process)	With small heating/cooling load; Possibility of a smaller Model size	Air throw regulation	Control the air
Secondary-air louver*		✓	✓	✓			✓	✓		✓			✓	✓	✓	✓	✓	✓	✓
		✓		✓				✓	✓	✓			✓	✓	✓		✓	✓	✓
		✓	✓	✓				✓	✓		✓		✓	✓	✓		✓	✓	✓
Profile outlet		✓		✓				✓		✓			✓				✓	✓	✓
		✓	✓	✓				✓			✓		✓				✓	✓	✓
Basic outlet		✓			✓			✓		✓			✓						✓
		✓	✓		✓			✓			✓		✓						✓
Air deflection louver		✓			✓		✓			✓			✓						✓
Four-side outlet		✓	✓		✓		✓			✓			✓			✓			✓
Outlet nozzle		✓				✓			✓	✓									✓
Gate nozzle		✓				✓			✓			✓							✓

x = not for stainless steel and EX model variants

Hygiene and explosion protection



Multi*MAXX* HS – The hygienic solution

For use in areas with high hygienic demands, we offer you a MultiMAXX executed in stainless steel.

- Four model sizes with air volume flows to 10,400 m^3/h and heating output to 33 kW (PWW) and to 121 kW (steam)
- Assembly: wall, ceiling
- Air functions: fresh air, recirculating air
- Hygienic stainless steel construction

Multi*MAXX* HX – the safe solution

For use in explosion-hazardous areas, we offer the MultiMAXX HX tested according to ATEX.

- Four model sizes with air volume flows to 9190 m^3/h, heating output to 68 kW (PWW) and to 94 kW (steam), cooling capacities to 23 kW
- Assembly: wall, ceiling
- Air functions: fresh air, recirculating air
- ATEX-tested component for use in zone 1 and zone 2 with identification || 2G c ||B T3/T4

MultiMAXX Vent VX or VS – The safe or hygienic solution

For use in explosion-hazardous areas or in areas with high hygienic demands, we offer you the MultiMAXX Vent VX or a MultiMAXX Vent VS in stainless steel, tested according to ATEX .

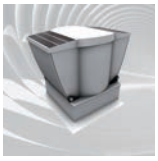
- Four model sizes with air volume flows to 11,000 m^3/h
- Assembly: wall, ceiling
- Air functions: fresh air, recirculating air
- VX: ATEX-tested components for zone 1 and zone 2 with identification || 2G c ||B T3/T4
- VS: Hygienic stainless steel execution

Roof*JETT* Ex or H/M – The safe solution

Equipped for every use: where there is any danger of explosion or flue gas, venting is necessary and a RoofJETT is used.

- Nine model sizes with air volume flows to 19,000 m^3/h
- Assembly roof
- Air function: extract air
- RJVX/RJVY: ATEX-tested components for the use in zone 1 with identification || 2G c ||B T3 or zone 2 with the identification || 2G c ||B+H2 T4
- RJVM: engine outside of the air flow, moving air to 105 °C
- RJVH: flue-gas venting, moving air to 400 °C/2 h

Hygiene and explosion protection



Roof*JETT* RJV(M,H,X,Y)

Multi*MAXX* HX

Multi*MAXX* HS

Multi*MAXX* Vent

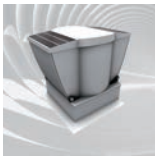
		Roof*JETT*			Multi*MAXX* Vent		Multi*MAXX*	
		RJxX, RJxY	RJxH	RJVM	VX	VSVS	HX	HS
Mounting type	Ceiling				✓	✓	✓	✓
	Wall				✓	✓	✓	✓
	Roof	✓	✓	✓				
Medium	PWW						✓	✓
	PKW						✓	
	Steam						✓	✓
Type of fan	Wide blade				✓	✓	✓	✓
	Centrifugal fan	✓	✓	✓				
Motor voltage	3 x 400 V	✓	✓	✓	✓	✓	✓	✓
	3 x 500 V				✓		✓	
Speeds	1-speed	✓	✓	✓	✓		✓	
	2-speed		✓		✓	✓	✓	✓
WT-casing	Industry RAL 7000				✓		✓	
	Stainless steel				✓	✓	✓	✓
Fan casing	Stainless steel				✓	✓	✓	✓
	Sheet steel RAL 9002	✓	✓	✓				
	Galvanized steel				✓		✓	
Controls	Terminal box	✓	✓	✓	✓	✓	✓	✓
	Fan switch (rep switch)	✓	✓	✓	✓	✓	✓	✓
	MATRIX							✓
	control units	✓	✓	✓	✓	✓	✓	✓

Product selection

Multi*MAXX*

Multi*MAXX* Vent

Multi Flair



Roof*JETT*

In this step, one must recognize which micro switch, step switch, additional functions and further control possibilities are available for the selected decentralized device.

			Heating steps	CET-EC	950EC1	MC301**	MC302**	MC303**	MC301EC**	MC331**	MC332**	MC333**	MC331EC**	985450	985420	986920	986960	986810	986811	997240	OSHGOSHG	OSHE**	5-level transformer	Speed regulator
Multi*MAXX*	HN	Recirculating air	1			✓																		
			2			✓	✓																	
			3			✓		✓																
			EC		✓				✓															
		Primary air	1							✓														
			2							✓	✓													
			3							✓		✓												
			EC										✓											
Multi*MAXX*	HD	Recirculating air	EC		✓				✓															
		Primary air	EC										✓											
	HE	Recirculating air	2																			✓		
		Primary air	2																			✓		
	HG	Recirculating air	2																		✓			
		Primary air	2																		✓			
	HS	Recirculating air	2			✓	✓																	
		Primary air	2							✓	✓													
	HX	Recirculating air	1															✓						
			2													✓								
		Mixed air	1																✓					
			2														✓							
MultiFlair	MF		1											✓										
			2				✓								✓									
			EC	✓	✓				✓															
Multi*MAXX*	Vent VN	Recirculating air	1			✓																		
			2			✓	✓																	
			3			✓		✓																
			EC		✓				✓															
		Primary air	1							✓														
			2							✓	✓													
			3							✓		✓												
			EC										✓											
Multi*MAXX*	Vent VS	Recirculating air	2			✓	✓																	
		Primary air	2							✓	✓													
	Vent VX	Recirculating air	1															✓						
			2													✓								
		Mixed air	1																✓					
			2														✓							
Roof*JETT*	RJVL	Extract air	1			✓				✓													✓	✓
			2				✓				✓												✓	✓
			EC		✓				✓				✓											
	RJVH	Extract air	1			✓				✓														
			2																	✓				
	RJVX/Y	Extract air	1															✓						

** Voltage regulator: PXET 6Q; PKDM 3; PXET 6 AQ 1; PXDM 3*
***available with extra functions*

PR-2015-0018-GB • Subject to modifications • R0-02/2016

Mixed air/recirculating air functions

Multi*MAXX*

Multi*MAXX* Vent

Multi Flair

In this step, you can select possible switchgear according to function:

	Temperature-regulated Speed regulation 0-100%	Temperature-controlled Air switching On/Off	Manual speed selection (levels)	Manual speed selection (continuous)	Heater/fan operation	Valve control Open/Close	Standby indicator light	Malfunction indicator light	Connection of room themostat/ room sensor	Connection for anti-freeze device	Control system Secondary-air louver	Status and error messages volt free*	Connection for shut-off valve	Operating and volt-free alarm signal	Connection for actuator Outside-air damper	Full motor protection	Display
Recirculating-air unit																	
MC30x*		✓	✓				✓	✓	✓		✓	✓	✓	✓		✓	
MC301EC*		✓		✓			✓	✓	✓		✓	✓	✓	✓		✓	
CET-EC	✓		✓			✓			✓								
950EC1				✓													
986920		✓	✓				✓	✓	✓				✓			✓	
986810		✓	✓				✓	✓	✓				✓			✓	
985450		✓	✓				✓		✓							✓	
985420		✓	✓				✓		✓							✓	
OSHE*		✓	✓				✓	✓	✓		✓					✓	
OSHGOSHG		✓	✓					✓	✓		✓					✓	✓
Mixed-air, primary-air units																	
MC33x*		✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MC331EC*		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
986960		✓	✓		✓		✓	✓	✓	✓			✓		✓	✓	
986811		✓	✓		✓		✓	✓	✓	✓			✓		✓	✓	
OSHE*		✓	✓				✓	✓	✓		✓				✓	✓	
OSHGOSHG		✓	✓					✓	✓		✓				✓	✓	✓

**additional functions*

Extract air function

Roof*JETT*

	Temperature-regulated Speed regulation 0-100%	Temperature-controlled Air switching On/Off (room thermostat) required	Manual speed selection (levels)	Manual speed selection (continuous)	Standby indicator light	Malfunction indicator light	Connection room themostat/room sensor	Status and error messages Potential-free	Replace for actuation Motor closing flap	Full motor protection	Display
Extract air											
997240		✓	✓		✓	✓	✓			✓	
986810		✓	✓		✓	✓	✓			✓	
MC30x		✓	✓		✓	✓	✓	✓		✓	
MC33x		✓	✓		✓	✓	✓	✓	✓	✓	
MC301EC		✓		✓	✓	✓	✓	✓		✓	
MC331EC		✓		✓	✓	✓	✓	✓	✓	✓	
5-level transformer with MV		✓	✓		✓		✓		✓	✓	
5-level transformer without MV			✓		✓						
Frequency converter (MRM)				✓							
950EC1				✓							
PXET 6Q	✓			✓	✓	✓	✓			✓	
PKDM 3	✓			✓			✓	✓		✓	
PXET 6 AQ 1	✓			✓	✓	✓	✓	✓		✓	✓
PXDM 3	✓			✓	✓	✓	✓	✓		✓	✓

DencoHappel MATRIX – Control system

Multi*MAXX*

Multi*MAXX* Vent

Multi Flair

Roof*JETT*

	Features	Use	Matrix		
			2000	3000	4000
Unit type	2-pipe systems "only heating"	Operating possibilities	✓	✓	✓
	2-pipe systems "only cooling"	Operating possibilities	✓	✓	✓
	2-pipe systems "heating or cooling"	Operating possibilities	✓*	✓	✓
Fan	up to 3 levels (3 - 400 V)	Operating possibilities	✓	✓	✓
	1-level (1 ~ 230 V)	Operating possibilities	✓	✓	✓
	Continuous (1 phase 230 V)	Operating possibilities		✓	✓
Operating principle	Temperature-dependent fan control	Savings in operating costs	✓	✓	✓
	Minimum speed 1	Uniform air circulation	✓	✓	✓
	Motor monitoring with external thermal contact	Safety	✓	✓	✓
Valve control	Valve drive	Comfort	✓**	✓**	✓
	Silent control (semiconductor relay)	Comfort			✓
Frost protection	Indoor Anti-Freeze Protection	Safety	✓	✓	✓
	Unit Anti-Freeze Protection	Safety			✓
Control inputs	Economy mode or gate/window contact	Savings in operating costs	✓**	✓	✓
	Economy mode or gate /window contact, device off, 0 free operation mode	Savings in operating costs			✓
Recording	Mixed-air operation	Comfort			✓
Outdoor temperature	Summer-winter compensation	Comfort	✓**	✓**	✓
Recording Inlet temperature	Heating and cooling switchover	Lower capital costs for the planner (2-pipe system)	✓**	✓	✓
Recording Return-air temperature	Temperature control	Comfort/Accuracy	✓	✓	✓
Recording Supply-air temperature	Min/Max limitation, constant supply-air temperature	Comfort			✓
Connector Filter monitoring	with local diff. switch	Service/maintenance			✓
Messages	Alarm condensate level with unit disconnection	Safety	✓	✓	✓
	Heating and/or cooling request	Comfort			✓
	Status signal via change-over contact	Safety		✓	✓
	Fault signal via change-over contact	Safety		✓	✓
Regulation Mixing-air damper	Open/close or continuous 0-100 %	Comfort/operation cost saving			✓
Extract air control	1 speed via relay output	Comfort			✓
	via power unit / extract fan controller	Comfort			✓
Motor control of the SLJ		Comfort		✓	✓
Control types	Room-air temperature control	Savings in operating costs	✓	✓	✓
	Supply-air temperature control	Constant air warming		✓	✓
	Cascade room, Supply-air temperature control/source ventilation	Efficiency, reduction air draught		✓	✓
Bus system MATRIX.Net can be extended by:	MATRIX.DI (digital input module)	Higher-ranking control	✓	✓	✓
	MATRIX.AI (analog input module)	Higher-ranking control	✓	✓	✓
	MATRIX.DO (digital output module)	Higher-ranking control	✓	✓	✓
	MATRIX.V (Valve module)	Higher-ranking control	✓	✓	✓
	MATRIX.EM (extract-air manager)	Higher-ranking control			✓
	MATRIX.LON (interface to the LON)	Higher-ranking control	✓	✓	✓
Service tools	MATRIX.PC (Service Program)	Service/maintenance/comfort	✓	✓	✓
Control panels	MATRIX OP21x	Comfort	✓		
	MATRIX OP30x	Comfort		✓	✓
	MATRIX OP31x	Comfort		✓	✓
	MATRIX OP44x	Comfort		✓	✓
	MATRIX OP50x/51x	Comfort		✓	✓
	MATRIX OP71x	Comfort	✓	✓	✓

** Only for slave units; ** only with add-on modules*

Planning

Air circulation

Good air and temperature distribution in halls or commercial rooms are achieved by frequent, intensive recycling of the entire hall air volume.

Not only the primarily air jets of the individual air-heating units contribute to this, but also to a considerable degree the secondary turbulence, which is induced by the primary air flow. Air circulation or the air circulation rate determines how often the entire geometric hall or room volume is conveyed through unit heaters in an hour.

Standard values for air-circulation numbers	
Halls up to 6 m	Large air-circulation numbers (approx. 2 to 5-fold)
Halls over 6 m	Small air circulation numbers (approx. 2 to 4-fold)

Heating requirement

Approximated values for free-standing halls	
to year of construction 1995	approx. 15 to 20 W/m^3
to year of construction 1995	Approx. 10 to 15 W/m^3

Discharge temperature

The discharge temperature of the heating units should be of prime importance in planning decentralized RLT facilities. High, unnecessary discharge temperatures unnecessarily intensify the buoyancy of the air in the hall and increase the temperature difference between ceiling and occupied zone.

The following difficulties result for the plant operator as a result of a too high discharge temperature:

- High operating costs (temperature difference between ceiling and floor becomes greater)
- Employee vexation from too high temperatures in the primary air currents
- Local overheating of the hall, resulting in greater energy costs
- Reduction of air throw and suspension height of the unit heaters

Recommended discharge temperatures for unit heaters

Recirculating-air operation

The maximum discharge temperature should be no more than 20 K above room temperature.

2. Outdoor-air or mixed-air operation

For a weather-oriented heating line control system, the discharge temperature of the air heaters for standard weather conditions should be at least 20 K above the room temperature to avoid air draughts being blown in at too low temperatures.

Planning

Sound power level

The sound power level is the logarithmic relationship of sound power W to the reference magnitude W0.

Sound pressure level

The sound pressure level is the logarithmic relationship of sound pressure p to the reference magnitude p0.

Addition of sound pressure level

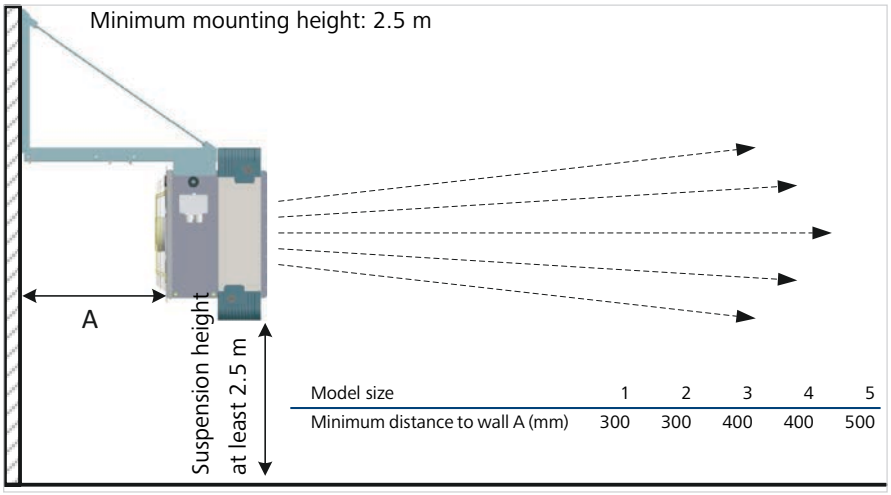
For the measurement of a noise composed of several individual sound sources, the overall noise level is mainly determined by the sound level of the loudest acoustic source . The impact the weaker sounds is dependent on the difference between the sound levels of the sound sources .

Calculation

$L_p = 10*\log(10^{L1/10} + 10^{L2/10} ...(n))$

Wall mounting

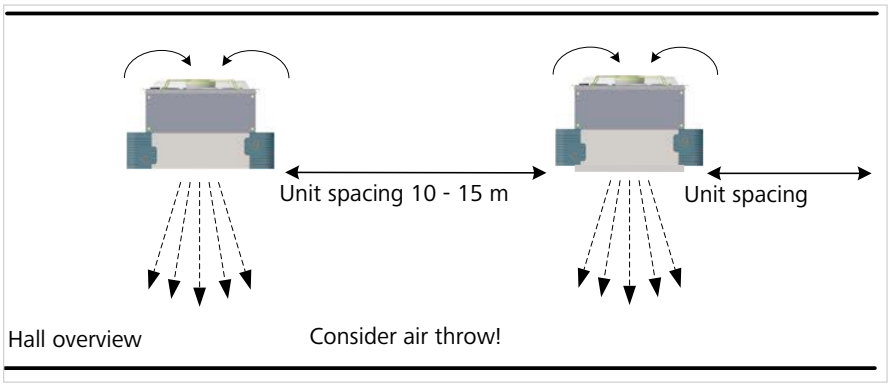
The installation height of a unit heater in wall arrangement should be at least 2.5 m above the floor. This avoids annoyances caused by primary currents in the occupied zone.



Model size	1	2	3	4	5
Minimum distance to wall A (mm)	300	300	400	400	500

Unit spacing

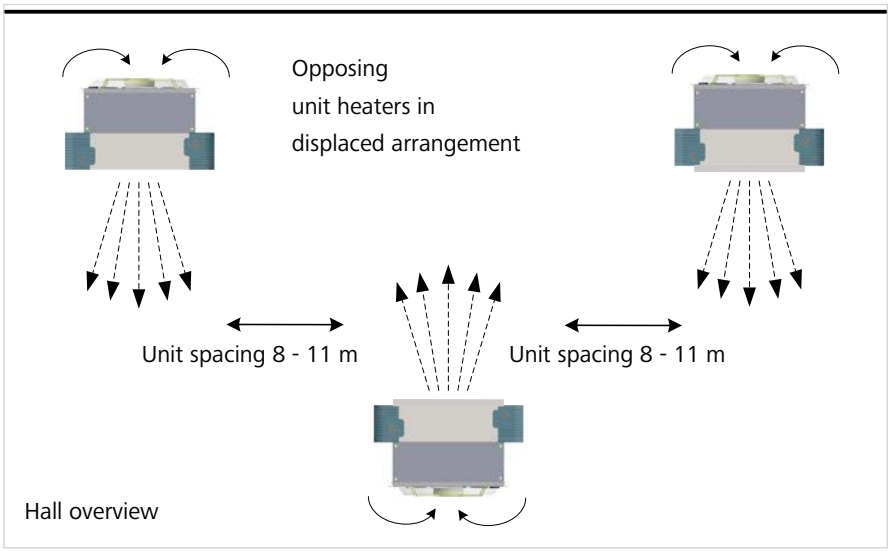
The total heat requirement of a hall should be uniformly distributed over the unit heaters. The unit spacing should be 10 to 15 m.



For installation on walls opposite each other, a displaced arrangement is recommended. The air throw of the unit heaters must be considered (it should be at least 2/3 of the hall width).

Wall installation

Alternatively, halls can also be heated with unit heaters in ceiling arrangement. This saves on installation costs, since supply and return lines must only be installed once in the middle of the hall.



Air throws

Air throw specifies the distance of air discharge of the unit heater at which an acceptable warming of the room air in industrial and commercial halls is also given.

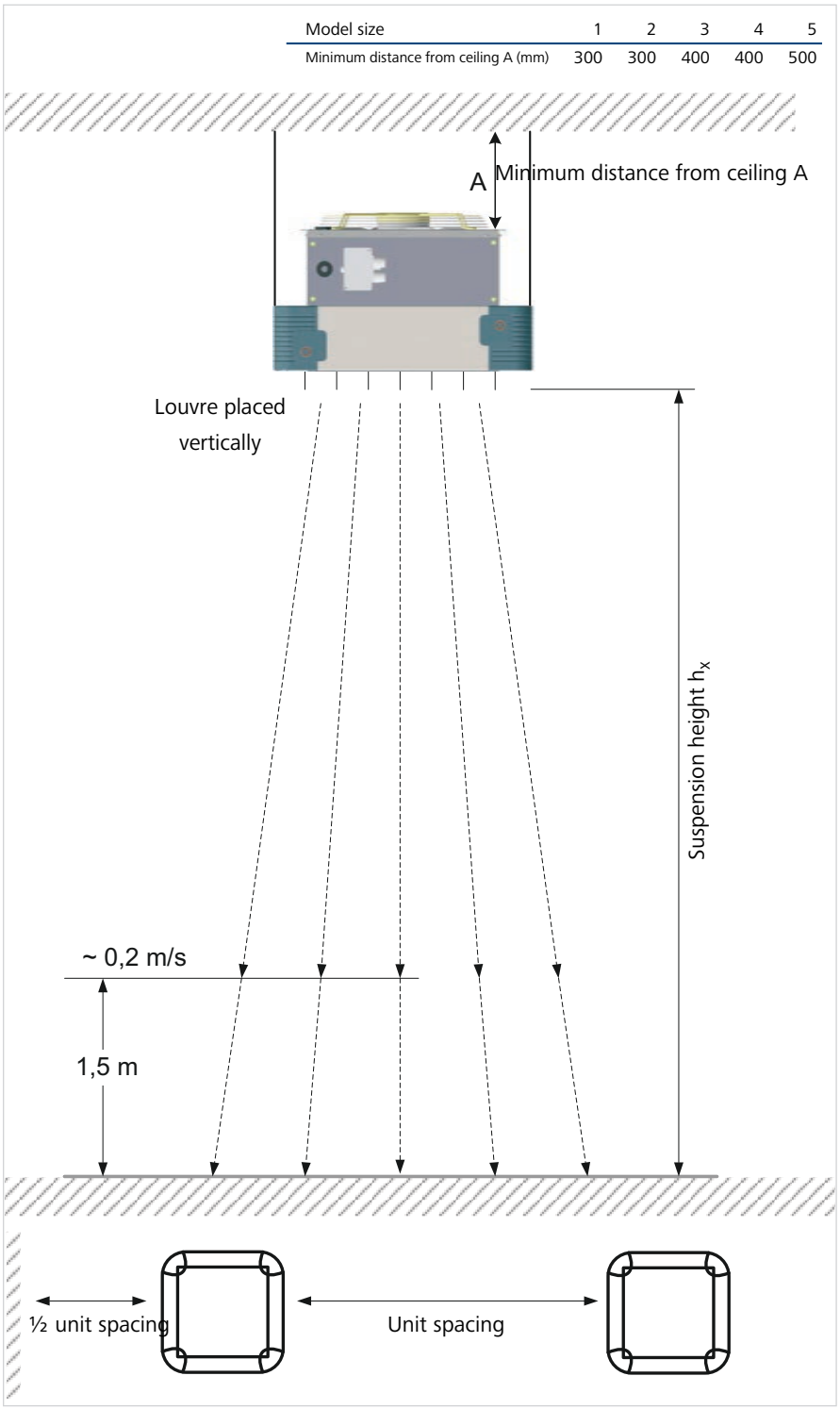
The air throw depends on:

- Initial speed of the primary air current
- Form and type of air outlet
- Excess temperature of the air flow rate compared to room temperature
- Room geometry
- Air dispersion current in the room

Ceiling mounting

The unit spacing results from the ground area of the hall and the area covered by the primary air currents and their secondary vortex.

The area covering depends on the distance between the outlet of the unit heaters and the floor. This distance is termed the installation distance .



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Ceiling mounting

Suspension height for ceiling installation of unit heaters

Model size	Outlet	Suspension height (m)		Air capacity (m^3/h)		Heating capacity (kW)	
		1 row	2 rows	1 row	2 rows	1 row	2 rows
Size 1	Basic outlet	2-15,6	1.5-10.3	685-3540	635-3200	3.5-8.2	5.1-14.1
	Profile outlet	2.5-19	1.9-12.6	645-3300	605-3000	3.4-7.9	4.9-13.6
	SLJ	3.5-26	2.6-17.3	645-3270	605-2980	3.4-7.9	4.9-13.6
Size 2	Basic outlet	1.9-14.3	1.4-9,8	925-4670	830-4290	5.4-12.6	7.3-20.7
	Profile outlet	2.3-17.7	1.7-12.2	850-4400	770-4045	5.1-12.3	6.8-20.1
	SLJ	3.2-24.1	2.4-16,6	840-4370	770-4015	5-12.2	6.8-20
Size 3	Basic outlet	1.9-13.8	1.3-9.1	1290-6535	1125-5840	7.7-18.5	10.2-30.3
	Profile outlet	2.2-16.5	1.7-11.1	1165-6030	1055-5455	7.1-17.9	9.5-29.2
	SLJ	3-22.5	2.3-15.2	1155-5970	1055-5405	7.1-17.8	9.5-29
Size 4	Basic outlet	2.2-15.7	1.7-10,8	2095-10290	1975-9530	12-28.3	17.4-47.5
	Profile outlet	2.8-19.6	2.1-13,6	2005-9750	1885-9060	11.6-27.6	16.8-46.3
	SLJ	3.8-26.6	2.9-18.4	1995-9680	1875-9010	11.6-27.5	16.7-46.2

Values apply for: 230 V EC motor; 20 °C room temperature; 70 °C inlet temperature/50 °C return temperature
SLJ = secondary air louver
RR = Pipe row

Below the **suspension height** hx of a unit heater, the distance is defined at which there is still a measurable air velocity of 0.15 to 0.25 m/s with vertical outlet louvres and a distance of 1.5 m above the floor.
The suspension height **hx** is dependant on the:

- Exit velocity of the air
- Form of the air discharge
- Excessive temperature of the air blast to the ambient temperature
- Air dispersion of blast possible in the room

If the **installation distance** of the unit heater with outlet louvers lies above or also below the possible **suspension height hx**, an adjustment of the outlet louvers can create a limited alteration the air flow in the occupied space .

For your information:

Suspension height = value determined by previously-described factors

Installation distance = actual distance between the discharge and the floor

Unit spacing

Based on experience, the unit spacing of the ceiling-mounted unit heaters should be selected as follows:
Air-handling units model size 1 and 2
Unit spacing = suspension height X * 2 (m)
Air-handling units model size 3, 4 and 5
Unit spacing = suspension height X * 1.7 (m)

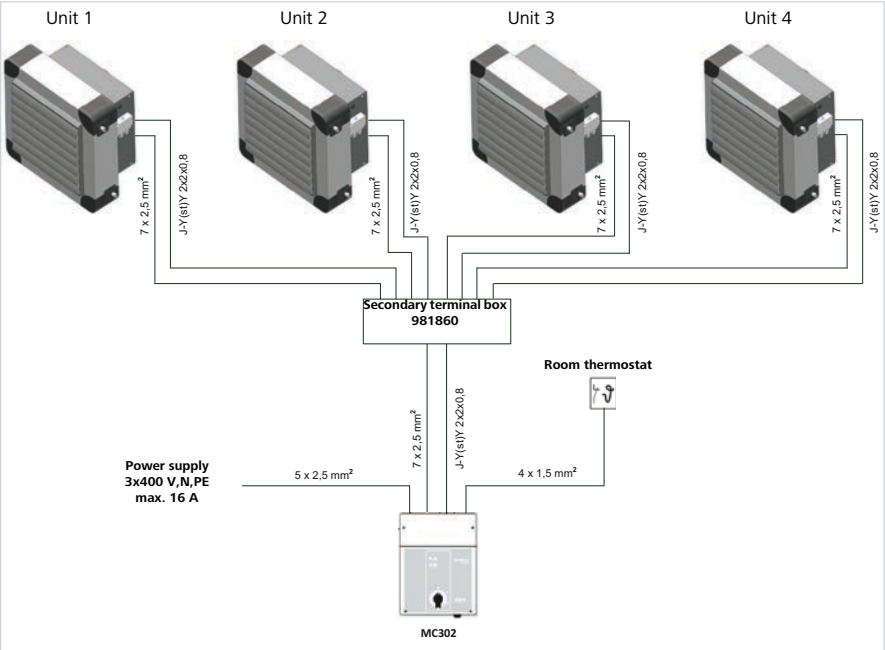
Surface covering

The area covering per device is limited by empirical values such as:

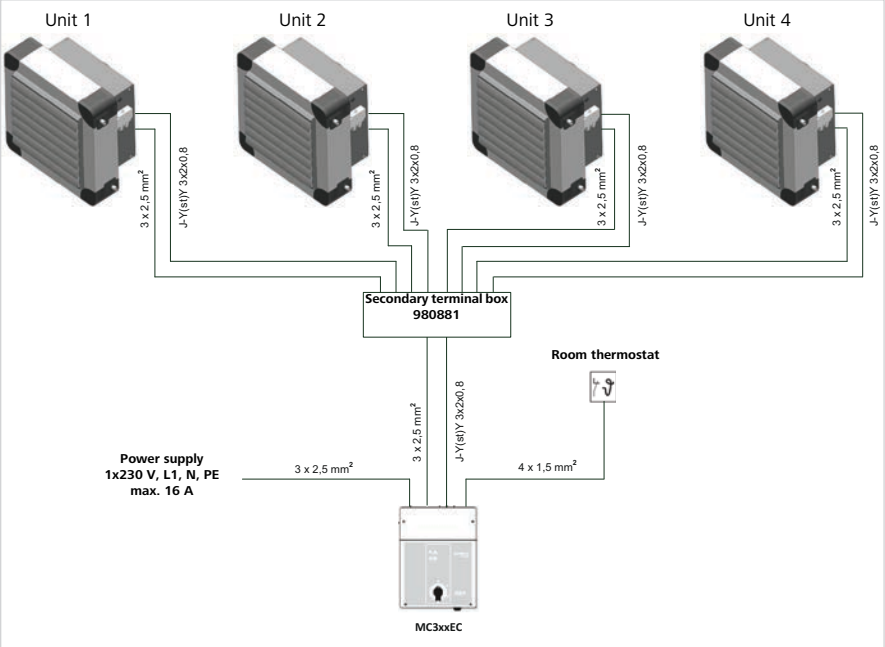
Suspension height	Surface
< 3 m	< 100 m^2
3 to 6 m	100 to 150 m^2
> 6 m	150 to 200 m^2

Wiring schematics

Two-level with thermostatic switch

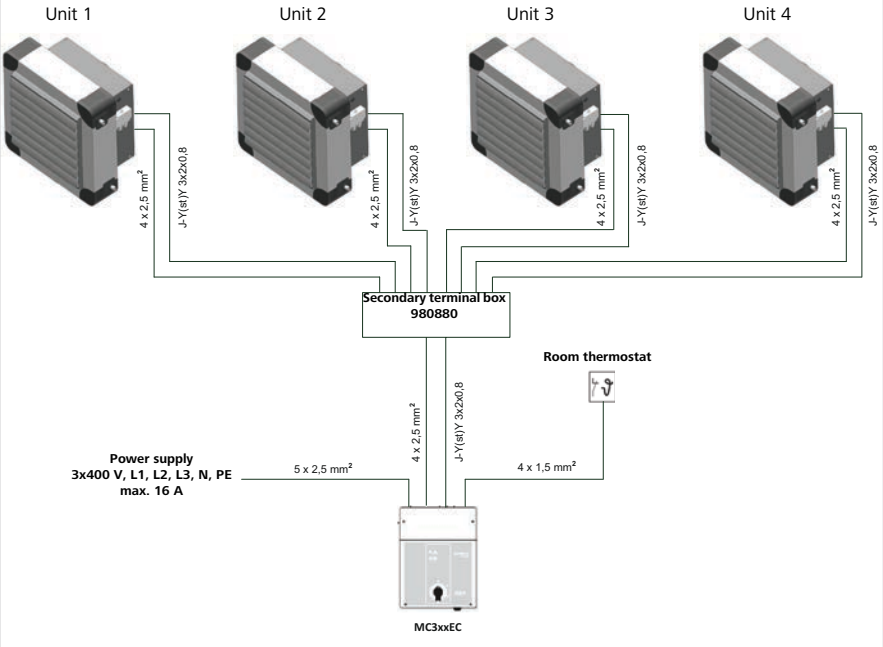


EC continuous – 230 V

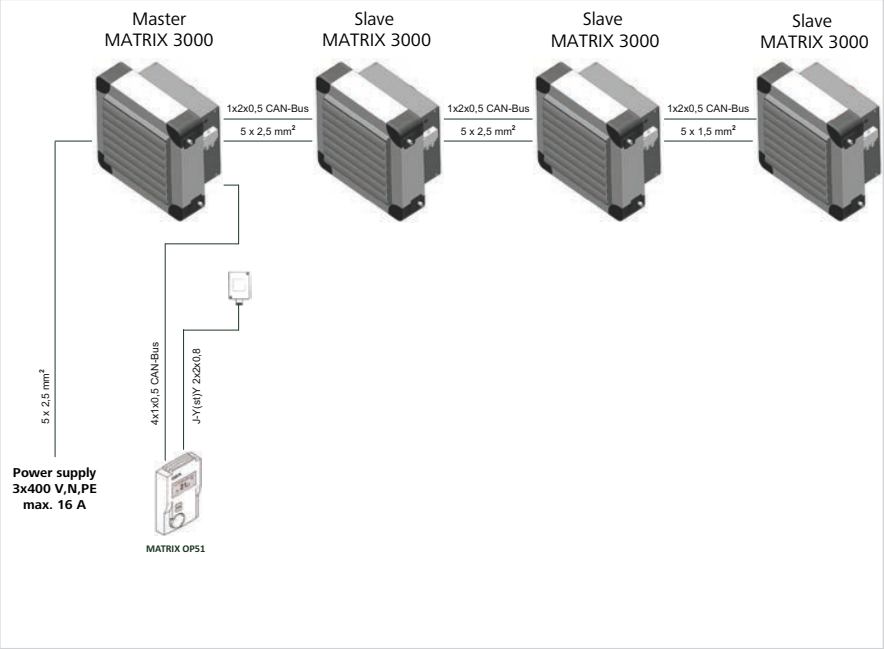


Wiring schematics

EC continuous – 400 V



With Matrix 3000



To set up the MATRIX.Net, use cables according to DIN 19245 T3 and EN 50170, whose wires are twisted pairs and who possess a braided shield (no vaporized film); wave impedance =120.

Recommendation: Manufacturer: HELUKABEL, Type: CAN BUS flexible 4x1x0.5 mm^2, or 1x2x0.5 mm^2. Independent of cross-section and the number of participants, the absolute maximum line length including the feed lines is 600 m. The length of the feed line may not exceed 25 m. The total length of all feed lines may be max. 150 m.

Design sample – requirements...

Demand

- Hall area 1200 m^2
- Hall volume 7200 m^3
- Installation distance of the unit heaters is 6 m above the floor
- Heating medium 70/50 °C PWW
- Outdoor temperature 12 °C / indoor temperature 17 °C
- Good price
- Low degree of fouling
- Easy cleaning

Total heat requirement

Approximated values for free-standing halls

- From the year of construction 1995: 10-15 W/m^3
- Total heat requirement = 7200 * 12.5 = **90 kW**

Determination of the number of unit heaters for the hall with ceiling mounting

Depending on the ground plan and plant: 100-150 m^2 for each unit heater at 5.3 m Installation distance (see page 20 ff)
Number of unit heaters = hall ground area in m^2/100 150 m^2 =
1200 m^2/100 m^2 = **12 units**

Determination of the required air volume flow of a device

For good air and temperature distribution, a 4-fold air circulation in the hall is specified (see page 6 ff).
V_{total} = 7200 m^3 * 4/h = 28800 m^3/h
$V_{individual}$ = 28800 m^3/h/12 = 2400 m^3/h

Determination of the required heating output of a device
$Q_{unit} = Q_{tot}$/(No. of units)l
Q_{Unit} = 90 kW/12 = 7.5 kW

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Design sample - ... and selection

Heat exchange coils

Corrosivity category C2/light cleaning (increased stability)/PWW 70/50 °C ⇐ **Demand**
Cu/Cu-heat exchanger ⇐ **Selection**

Fan

good price ⇐ **Demand**
AC wide blade ⇐ **Selection**

Unit Selection

Heating output 7.5 kW; air flow rate 2400 m^2/h; Cu/Cu heat exchanger; wide wing; 6 m suspension height; favorable price ⇐ **Demand**
Multi*MAXX* HN BG 2 with 2 speeds Wide wing, 1 row of Cu/Cu heat exchangers, industrial cladding, basic outlet ⇐ **Selection**

Controls

Multi*MAXX* HN, recirculating air, 2-speed ⇐ **Demand**
MC302 ⇐ **Selection**

Arrangement of the units

Ceiling suspension, 6m suspension height, 1 row of heat exchangers, 2 size, basic outlet ⇐ **Demand**

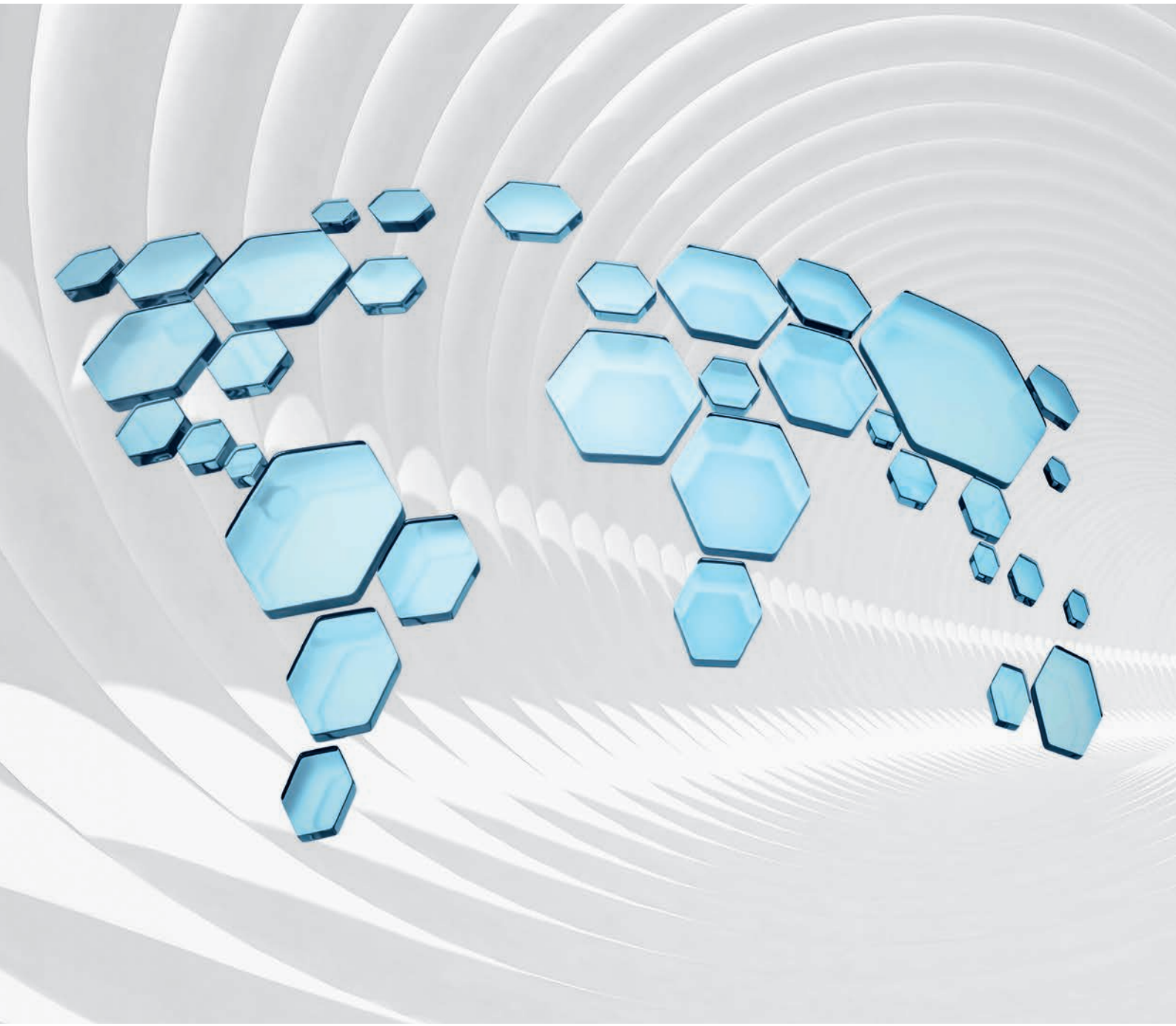
- Suspension heights are maintained = 6.2 - 7.8 m at 6.2 - 7.8 kW heating output and 2320 - 2790 m^3/h air capacity

- Unit spacing = air throw X * 2 (m) = 6 * 2 m = 12 m at minimum wall spacing 300 mm

- Cabling schematic see page 24 f

DencoHappel is a global company with expertise in air treatment, air conditioning and air filtration.

Our nearest sales and service teams will be glad to discuss ideas and develop creative and effective solutions with you.



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