The ultimate in air handling units: directly and indirectly fired

Mark has developed a range of air handling units with several options for a wide variety of applications. From a simple air intake unit to a fully automatically-controlled air handling unit suitable for both indoor or outdoor use.
There is a wide selection of heating systems, such as hot water batteries, gas or oil-fired modules, gas-fired make-up air systems or high performance gas-fired heating systems.
Heat recovery and cooling are of course also possible.

The air handling units can be for internal and external use.
Mark air handling units are made from seawater-resistant aluminium panels with double-walled insulation as standard.
This means lower weight and a longer lifespan. The Mark air handling unit is a highly developed, premium quality product that can be adjusted to the customer's requirements.

Features
- Air displacements up to 69,500 m^3/h
- Very economical to buy and use
- Integration of high-efficiency heating modules is possible
- Modular construction
- Easy to maintain
- Long life
- Flexible and variable
- Proven design
- Low weight

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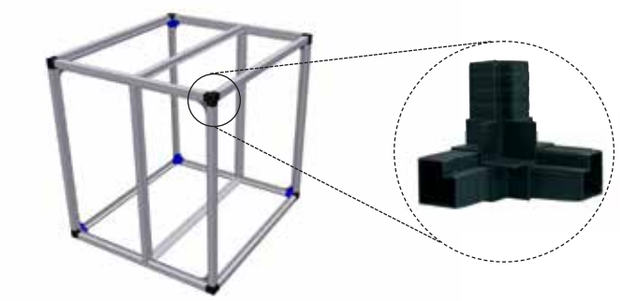
Dimensions

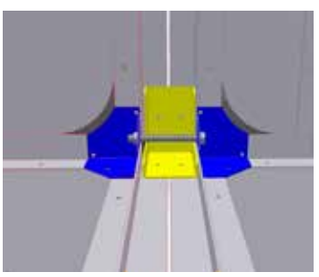
Type of air handling unit	Air displacement max.	Dimensions (Width x Height)
AHU 15 – 15	10 000 m3/h	975 x 975
AHU 15 – 20	14 150 m3/h	975 x 1280
AHU 20 – 20	19 150 m3/h	1280 x 1280
AHU 25 – 20	23 350 m3/h	1530 x 1280
AHU 30 – 20	29 150 m3/h	1890 x 1280
AHU 35 – 25	40 000 m3/h	2195 x 1530
AHU 35 – 35	60 000 m3/h	2195 x 2195
AHU 40 – 35	69 500 m3/h	2508 x 2195

Construction



- The air handling unit is of modular construction.
- The frame construction consists of profiled closed aluminium tube profiles.
- The individual cabinet modules can be installed in different ways, either in line, next to each other or on top of each other.
- The tube profiles are attached to each other using plastic angled profides to create a stable frame construction.

Modular construction



- The individual parts of the air handling unit are quick and easy to install due to a well thought out system.
- In almost every case, the modules are supplied pre-assembled.
- The individual modules are fixed to each other so that they are airtight.
- The double-walled aluminium panels are mounted in the frame in an airtight manner.
- The centering section in the corner of the module ensures correct installation to the next module.

Technical detail

The access doors are fitted with adjustable, maintenance-free hinges (adjustable both in height and at the sides). The hinges, or panel clips if required, are mounted on the outside of the air handling unit. This prevents dirt from building up on the inside of the unit.

The access doors of the air handling unit are fitted with lockable spring locks. The airtight closure of the doors against the housing is guaranteed by a special rubber profile.

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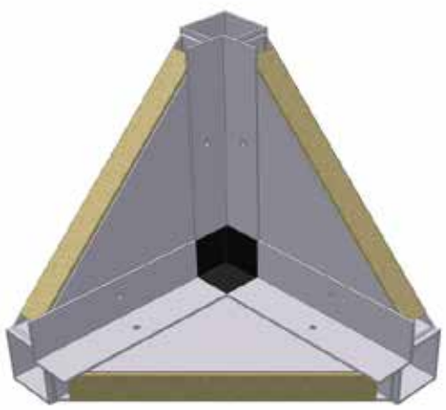
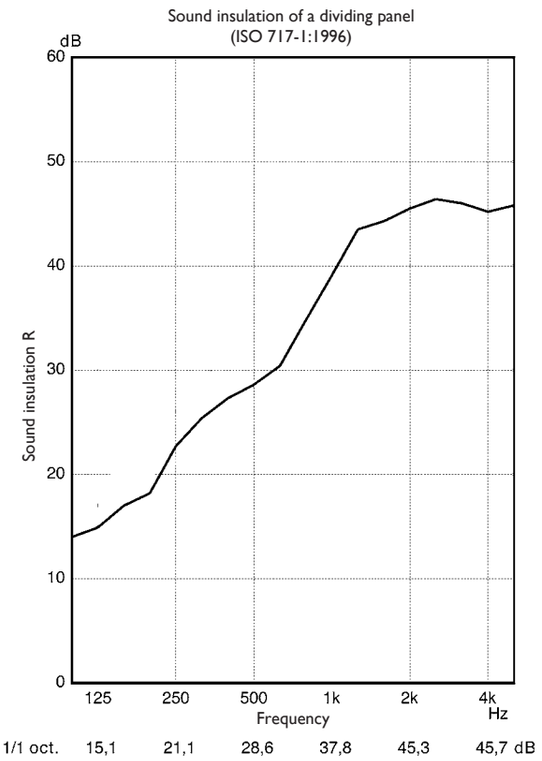
Sound and thermal insulation

Noise reduction is an important point for consideration in the design of an air handling unit. For this reason, we have opted to use a double-walled seawater-resistant aluminium panel with 30 mm rock wool insulation. This also results in excellent thermal insulation.

A lot of attention is paid to the smooth finishing on the inside of the unit, which makes it easy to clean. See table for sound insulation values.

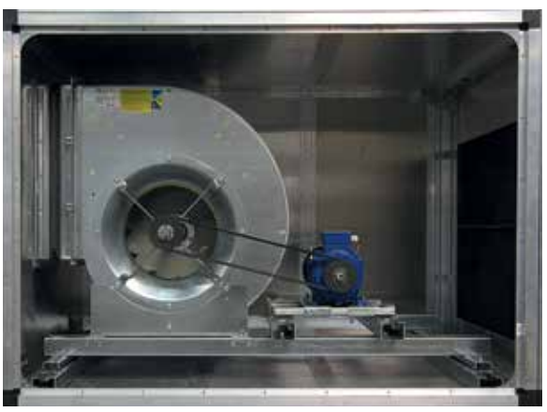


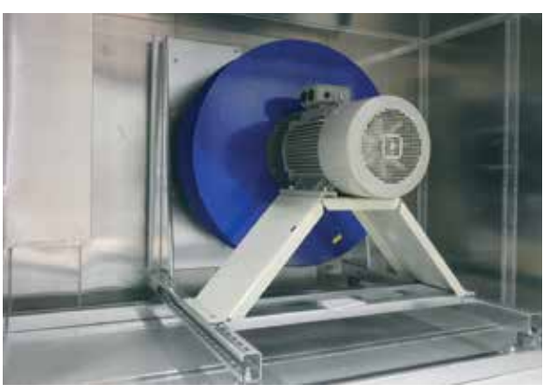


1/1 oct.	15,1	21,1	28,6	37,8	45,3	45,7 dB

Optimal fan power

- The heart of the air handling unit is the fan.
- Mark selects the most suitable fan for the application requested.
- Depending on the application, a fan with forward or backward curved blades or a free-running fan can be used.
- The fan and the motor are placed on a frame. The frame is set up on shock absorbers in the housing.
- Delta P air flow monitoring is possible.





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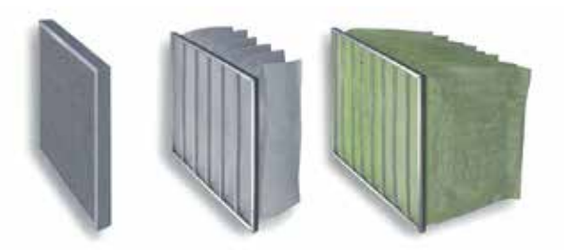
Filter section



To guarantee the right air quality, Mark offers a wide selection of filters.
All necessary care is taken in the sealing of the filter frames and filters.
Filters should be changed from the inside on the dirty side.
The filter options are:
– Panel filter
– Bag filter short
– Bag filter long
– High temperature filter
Special filters are available on request.
Delta P filter monitoring is possible.

Heating systems

Mark air handling units can be equipped with various heat generators.

A Hot water battery
B Gas-fired condensing modulating high-efficiency air heater (> 106% efficiency)
C Gas-fired air heater module.
D Direct gas- or oil-fired air heater.
E Direct gas-fired make-up air burner, only applicable if all intake air is expelled in a controlled manner.

Benefits:
Gas- and oil-fired air heaters
– No heat intermediary
– No heat loss during stoppages
– Large selection of heating capacities
– High-efficiency
– Good temperature control
– The air handling unit can be supplied as plug & play.

Hot water batteries

Hot water batteries are designed as standard in copper-aluminium. The heat exchanger connections can be fitted internally or externally.

Optional:
– Hot-dip galvanised
– Anti-corrosion coating
– Steam, thermal oil
– Frost protection thermostat

Gas-fired condensing pulsating air heater

– Efficiency >106%
– Closed design.
– Electronic ignition of the main burner.
– Control: modulating.
– Module suitable for installation in an air handling unit..

Type		35	40	60	80	100	150
Nominal load (upper value)	kW	34,9	40	60	80	103	150
Efficiency at 100% load	%	95,7	94,8	94,2	94,3	94,2	94,8
Efficiency at min. load	%	107,3	107,3	107,4	106,3	106,3	107,0
Burner turndown ratio	+/-	4:1	5:1	5:1	4:1	4:1	4:1
Air volume, min.	m^3/h	3760	3760	5640	7520	9400	14200
Air volume, max.*	m^3/h	7200	7200	8640	13680	16200	20880

* Larger air volumes using a bypass.

Gas-fired air heater module

– Closed design.
– Electronic ignition of the main burners by a pilot flame.
– Control: on/off, high/low or pulsing.
– Module suitable for installation in an air handling unit.

TWIN type		66	74	88	98	104[1)]	104
Nominal power	kW	120,6	130,6	160,8	174,2	183,6	191,6
Nominal load (lower value)	kW	134,0	145,2	178,6	193,6	204,0	213,0
Air volume, min.	m^3/h	8000	8000	10000	10000	10000	10000
Air volume, max.*	m^3/h	11980	11980	15820	15820	15820	15820

* Larger air volumes using a by-pass.
1) Low NO_x

MONO type		18	21	24	28	33	37	44	49	55	59	66	74	88	98	104[1)]	104
Nominal power	kW	20,4	21,8	25,1	27,2	30,2	32,7	40,2	43,6	50,2	54,5	60,3	65,3	80,4	87,1	91,8	95,8
Nominal load (lower value)	kW	22,7	24,2	27,9	30,2	33,5	36,3	44,7	48,4	55,8	60,5	67,0	72,6	89,3	96,8	102,0	106,5
Air volume, min.	m^3/h	1960	1960	2440	2440	2970	2970	3960	3960	4940	4940	6000	6000	8000	8000	8000	8000
Air volume, max.*	m^3/h	3920	3920	4880	4880	5940	5940	7920	7920	9980	9980	11980	11980	15820	15820	15820	15820

* Larger air volumes using a by-pass.
1) Low NO_x

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Direct gas- or oil-fired air heater

Burner
– Gas or oil

Combustion chamber
– Stainless steel AISI 321
– Chrome steel (AISI 409) for the sizes 335/400

Heat exchanger
– Stainless steel AISI 304

Type		115	160	210	270	335	400
Nominal load (lower value)	kW	130,9	182,2	239,2	307,6	381,6	455,4
Nominal power	kW	119,0	166,0	218,0	280,0	347,0	415,0
Air volume, min.	m^3/h	6728	9361	12286	15796	19599	23402
Air volume, max.*	m^3/h	9611	13372	17551	22566	27998	33431

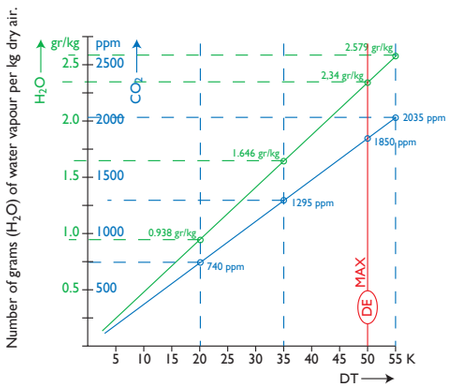
* Larger air volumes using a by-pass.

Direct gas-fired make-up air burner

Direct gas-fired air make-up air heaters are integrated into the air handling unit.
This type of air heater is suitable only if the heated air is expelled in a controlled manner.

Adjustment:
modulating 20:1.

CO ≤ 5 ppm
NO ≤ 1 ppm
NO_2 ≤ 1 ppm



ΔT as a function of the added CO_2 in ppm.

1 m^3 air 15°C = 1.20 kg.

MONO type		55	110	165	220	275	330	385	440	495	550	660	770
Nominal load (upper value)	kW	71	142	213	284	356	427	498	569	640	712	854	996
Nominal load (lower value)	kW	64	128	192	256	320	384	448	512	576	640	768	896
Minimum load (lower value)	kW	3,2	6,4	9,6	12,8	16,0	19,2	22,4	25,6	28,8	32,0	37,4	44,8
Air volume, min.	m^3/h	3500	7020	10450	14130	17510	20800	24350	27820	31210	39730	41680	48700
Air volume, max.	m^3/h	9600	19200	28800	38400	48000	57600	67200	69500	69500	69500	69500	69500

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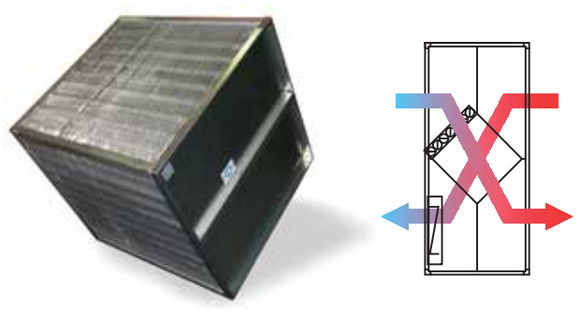
Heat recovery

Operating costs can be reduced and the environment protected by the use of heat recovery. Heat can be recovered using the following systems:

Cross-flow plate heat exchanger

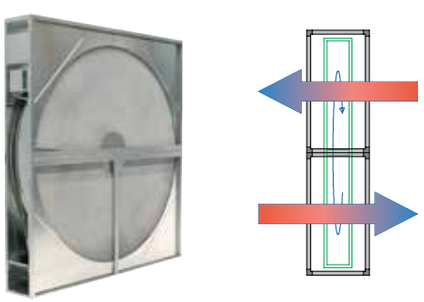


Benefits:
- Durable, no mechanical moving parts
- Reliable
- Simple installation
- Separate air flows
- Air flow via a by-pass is possible
- Very economical solution for heat recovery
- Efficiency > 50%

Twin-coil heat exchanger

Benefits:
- Fresh air and return air can be separated spatially
- Short installation length
- Suitable for installation in existing units
- Can also be used at higher temperatures, large selection of heat exchangers, number of tube rows and materials used (Cu/Al or galvanized steel)
- Efficiency up to approx. 50%

Heat wheel



Benefits:
- Low pressure drop
- Compact construction
- High heat-exchanging power
- Option to re-use latent heat
- Option to re-use available humidity
- Efficiency between 60% and 90% can be selected

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Mixing boxes

The air handling unit can be equipped with a mixing box. This box is placed between the air extraction section and the air inlet section.
The mixing box can be fitted with servomotor-controlled dampers.

Optional:
- Modulating - or open/closed control
- 24 V or 230 V.

Cooling

Direct cooling (air cooling), "DX system"
Indirect cooling (water cooling), "Chiller"
Adiabatic cooling, "soft cool" (optional)

Indirect cooling

Water is cooled in the cooling unit. Cold water is pumped into a cold water battery in the air handling unit. This will cool the air flow.

Benefits:
- The cooling unit is installed separately from the air handling unit.
- Low investment costs
- Short installation length
- Low operating costs
- Good cooling efficiency
- Excellent air dehumidification.
- Control sends the quantity of cold water through the air-cooled cold water battery.
- The cooling unit ensures the water temperature is constant.
- Highly adjustable
- Guaranteed cooling capacity.

Direct cooling

The air flow is cooled directly, the humidifier is situated directly in the air flow that needs to be cooled.

Benefits:
- Low investment costs
- Short installation length
- Low operating costs
- No water-related problems (risk of freezing, glycol concentrate, corrosion).
- Good cooling efficiency
- Excellent air dehumidification.

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