



Monodraught

HYBRID VENTILATION

High-performance, low carbon ventilation

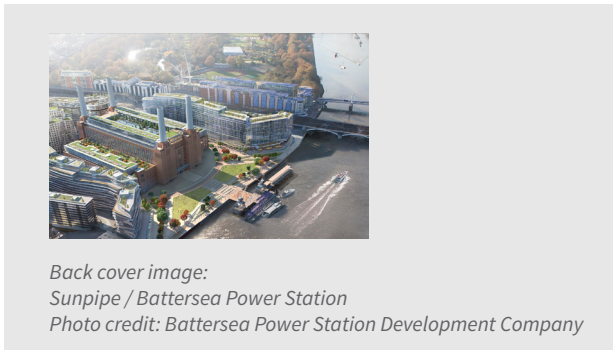


THE QUEEN'S AWARDS
FOR ENTERPRISE:
INNOVATION
2018



**We are
Pioneering British Greentech**

CONTENT



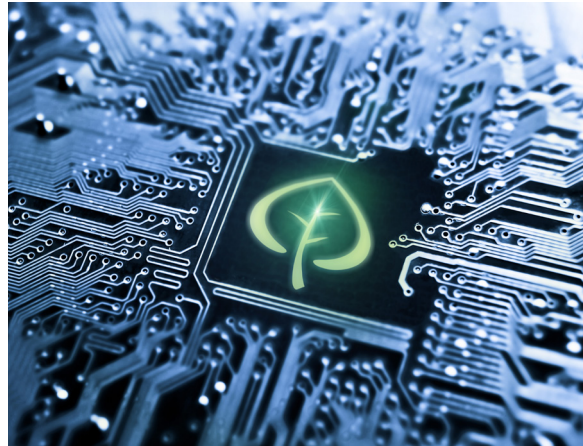
- Introduction to Monodraught 4
- Priority School Building Programme (PSBP) 7
- Facilities Output Specification (FOS) & BB101 8
- Why Choose Hybrid Thermal Mixing? 10
- What is Hybrid Thermal Mixing? 13
- Operation Modes 13
- Technical Specifications 14
- Controls & User Interface 16
- Fixing Options 18
- Additional Features 20
- Building Simulation 24
- Case Study 26
- Supply Only 30

As a pioneering British Greentech company, we design, install and maintain ventilation, cooling, heating and lighting solutions to commercial buildings in the most sustainable way possible.

We believe that businesses like ours have a responsibility to invest in our community. We purchase our materials from local suppliers, recycle where possible and are proud to partner with a local mental health charity, Buckinghamshire Mind.

Monodraught are committed to minimising the carbon footprint of every building to which we supply our products and services. Our in-house design team model the building, select the most energy efficient equipment and design controls to maximise comfort whilst reducing running costs. We continue to monitor performance post-installation ensuring that it continues to be effective year after year. Our installation and maintenance team are always on hand for support.

Trading for over 45 years, we are proud of our record of awards for innovation from prestigious organisations. These include Ashden, CIBSE and the Queen's Award for Enterprise



Awards & Accreditations:

- Queen's Awards for Enterprise: Innovation 2018 - COOL-PHASE
- CIBSE Building Performance Awards 2017 Shortlist - COOL- PHASE Hybrid
- Best Product/Service Range Category at the 2016 Best Business Awards
- Company of the Year Award 2016 - Buckinghamshire Business First
- Best Business in Wycombe District 2016 Award - Buckinghamshire Business First
- Ashden - Award for Energy Innovation for COOL- PHASE
- ISO 9001 and ISO 14001: Established quality and environmental management certificates
- BSI (British Standards Institute) Members
- CIBSE Building Performance Award 2012 - COOL- PHASE





**We are
With you all the way**

What is the Priority School Building Programme (PSBP)?

The **Priority School Building Programme (PSBP)** is a centrally managed programme set up to address the needs of the schools most in need of urgent repair.

Through the programme, 261 schools will be rebuilt or have their condition needs met by the **Education Funding Agency (EFA)**. All schools within the programme will be delivered by the end of 2017.

What is the Facility Output Specification (FOS)?

This document forms the basis for the design of the PSBP Schools. It has become the definitive guide to school design.

In addition, to meet the required ventilation levels, whenever spaces are occupied, purpose provided ventilation should provide external air supply to all teaching and learning spaces of:

- A minimum of 3 l/s per person (90 l/s)
- A minimum daily average of 5 l/s per person at any occupied time
- Provide capacity to achieve 8 l/s per person for night-time purge during summer
- Meet the acoustic requirements for BB93 - 35 dB(A) (mechanical ventilation noise plus an extra 5 dB(A) allowance for noise breakthrough from outside).
- Minimum air supply temperature into occupied zone of 15 °C.

PRIORITY SCHOOL BUILDING PROGRAMME

• Understanding PSBP

Was launched in 2014. The aim was to address the needs of schools that were most in need of repair. Phase 1 included 214 schools delivered using public funding and 46 schools delivered using private finance funding.

• Understanding PSBP2

Is also a capital funded project, which will undertake rebuilding and refurbishment projects across 277 schools from 2015 to 2021. Both programmes are managed centrally by the Education Funding Agency.



Tiffin School (top) - Sheffield Hallam University (bottom) - Cool-phase above ceiling

2.6 Environment and Fabric

2.6.1. The Contractor shall ensure that external envelope and structure should be used to achieve the internal environment required based on a passive approach. The principles being for a passive approach to assist the achievement of the internal environment by:

2.6.1.1.5. Optimising the benefits of daylight and natural, or hybrid ventilation.

Hybrid ventilation strategies are stated as an approved method of ventilation within FOS.

2.8 Indoor Environmental Requirements

2.8.1. The Contractor shall ensure that the design provides suitable, comfortable environmental conditions for all occupied spaces, including good lighting with optimum use of daylight, good air quality and acoustics, unobstructed ventilation and suitable temperatures throughout the year.

Monodraught ensure that products meet the requirements of the specification throughout the whole year with summer overheating requirements proving to be the most difficult aspect of the FOS.

2.8.16 Thermal Comfort

2.8.16.1. The Contractor shall demonstrate by thermal modelling how all parts of the buildings will comply with the minimum and maximum temperature requirements as shown in the ADS. **Monodraught provide full dynamic thermal modelling using IES, as standard, free of charge, for every project for PSBP. When approaching a school design up to three classrooms are modelled which represent the worst case scenarios for the classroom designs.**

2.8.16.2. The Contractor shall ensure that there are sufficient temperature control mechanisms provided to enable the staff and Pupils to adjust their environment and maintain a satisfactory level of thermal comfort. **HTM systems have the ability to provide boosted levels of ventilation when natural ventilation is unable to meet thermal and/or air quality requirements.**

2.8.16.3. In naturally ventilated spaces, the Contractor shall provide mixing of ventilation air with room air to avoid cold draughts in the occupied zone during winter-time. In winter-time the minimum air temperature of air delivered to the occupied zone at 1.4m above floor level shall be not more than 5 °C below the normal maintained air temperature.

Monodraught systems utilise air diffusion and thermal mixing to ensure temperature compliance. A number of sensors provide full control regulation.

2.8.17 Maximum Summer-time Temperatures

2.8.17.1. The Contractor shall design the Building so as to limit the maximum internal temperature. The Contractor shall assess its design for overheating using the most relevant weather files from CIBSE's Summer Design Reference Years.

Monodraught provide this service, free of charge.

2.8.17.2. The Contractor shall ensure that mechanical ventilation is not the sole method of summer-time ventilation in occupied spaces and that occupied space should wherever possible also have opening windows or vents. **HTM systems are designed in conjunction with natural ventilation openings and can provide full automatic control of additional natural ventilation openings to ensure optimum operation.**

2.8.17.3. The Contractor shall design the building to allow the air movement to be increased during the summer through opening windows or vents, switching on fans, or increasing the rate of mechanical ventilation systems. **HTM systems automatically vary the fan speed and fresh air rate based on temperature and air quality. At any time the users of the room can override the automatic controls. After a set period the controls will default (1 hour) back to an automatic mode.**

2.8.17.5. The Contractor shall calculate the indoor temperature for each of the months where the building is in free-running mode. The simulation tool used should be capable of calculating Operative Temperature, Top and Running Mean Temperature, Trm. Calculations should realistically account for the occupancy pattern of the building and the adaptive behaviour of the building occupants. **Conducted as part of Monodraught's building simulation services using full dynamic analysis.**

2.8.17.10. **Criteria 1** - Hours of Exceedance (He): For schools, the number of hours (He) that ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 40 hours.

2.8.17.11. **Criteria 2** - Daily Weighted Exceedance (We): To allow for the severity of overheating the weighted Exceedance (We) shall be less than or equal to 6 in any one day.

2.8.17.12. **Criteria 3** - Upper Limit Temperature (Tupp): To set an absolute maximum value for the indoor operative temperature the value of ΔT shall not exceed 4K.

The building will be deemed to fail the overheating design criteria if any two of the three criteria are exceeded.

This analysis forms the sizing requirements for Monodraught systems. At the same time advice is given based on occupancy levels, usage patterns or thermal mass requirements to ensure that the building passes.

2.8.17.17 Overheating - Performance in Use

2.8.17.17.1. The Contractor shall demonstrate within spaces that are occupied for more than 30 minutes at a time that, during the Required Period, the average internal air temperature does not exceed the average external air temperature by more than 5°C, both temperatures being averaged over the time period when the external air temperature is 20°C, or higher. **The HTM system provides high level of night time ventilation to ensure night cooling conditions are met. This design method ensures that greater levels of reliability against real world weather patterns.**

2.8.21 Ventilation

2.8.21.2.1. Where natural ventilation is used, the system is capable of providing enough fresh air so that the average concentration of carbon dioxide during the Required Period is less than 1500 ppm and so that the maximum concentration does not exceed 2000 ppm for more than 20 minutes each day. **The EFA have confirmed that the control strategy for HTM products maximise the level of natural ventilation provision and only provide boosted levels of ventilation when the room conditions are not met by natural means. On this basis the EFA have agreed to consider the HTM products as natural ventilation systems.**

2.8.21.6. The Contractor shall ensure that when outside air is introduced into a teaching space ventilation air and room air will be mixed to avoid cold draughts during winter-time. **The HTM systems ensure that ventilation air is mixed during winter-time.**

2.8.21.12. The Contractor shall ensure that the School is designed so that the air speed flowing across occupants in winter is <0.3 m/s in all teaching spaces. **Monodraught provide CFD analysis to ensure these criteria are met. By correct placement of ventilation diffusers, air is directed against the ceiling and projected**

to the depth of the classroom minimising duct work requirements and ensuring even distribution of air within the room.

2.8.21.14. The Contractor shall ensure that the rejection of energy laden warm or cool air is minimised in the building through the use of ventilation systems which limit the pre-heating of ventilation air and exploit the heat gains from occupancy and equipment.

HTM systems mix re-circulated room air with fresh ventilation air, automatically regulating the level of opening between volume control dampers. Control algorithms ensure optimum internal air quality and minimise heating requirements.

2.8.21.15. The Contractor shall ensure that HVAC systems are easily accessible for maintenance, so that measures can be taken to ensure children are not exposed to the bacteria found in moist conditions in ductwork.

HTM products have been designed to minimise the level of ductwork required. Large format grilles and diffusers are used with angled deflection to ensure mixing of ventilation air.



BB101 INFO

Hybrid Ventilation

HTM - Wren School

Ideal Environment



The Hybrid Thermal Mixing system creates a healthy and productive environment by monitoring internal air quality and ensuring there is a supply of fresh air.

The HTM is able to provide the ideal environment to school classrooms/areas. Designed to provide mixed tempered air during winter, boosted levels of ventilation during summer and secure night time cooling.

Smart Control



The HTM comprises an intelligent and fully automatic control system coupled with a low energy ventilation system which switches between operational modes dependant on season, external/internal temperature conditions and indoor air quality (IAQ).

The system is supplied as standard with full data logging facility, temperature and CO₂ controls. With optional BACnet and Modbus module, each unit has the ability to output key performance data to a central BMS.

Regulation Compliance



Following the release of the Facilities Output Specification for the PSBP programme, Monodraught have utilised their extensive knowledge, product testing, and building simulation skills to develop low energy ventilation systems which meet the FOS requirements in a cost efficient manner.

The HTM systems have been designed specially to meet and exceed BB93, Priority School Building Program and Annex F Facility Output Specification requirements.



WHAT IS

HYBRID THERMAL MIXING?

Hybrid Thermal Mixing (HTM) systems are designed to provide natural ventilation and hybrid ventilation incorporating mixed tempered air for winter periods. In addition, the systems have the ability to provide secure night time cooling, and boosted levels of ventilation during summer. The HTM systems are designed to work in conjunction with natural ventilation and can be used in single sided or cross flow ventilation strategies.

The HTM system is comprised of an intelligent and fully automatic control system coupled with a low energy ventilation system which switches between operational modes dependant on season, external/ internal temperature conditions and indoor air quality (IAQ).

The Monodraught HTM systems have exceptionally low specific fan powers and feature an intelligent control system, which is supplied as standard, with full data logging facility, temperature and CO₂ controls. With the optional BACnet and Modbus modules, each unit has the ability to output key performance data to a central BMS.

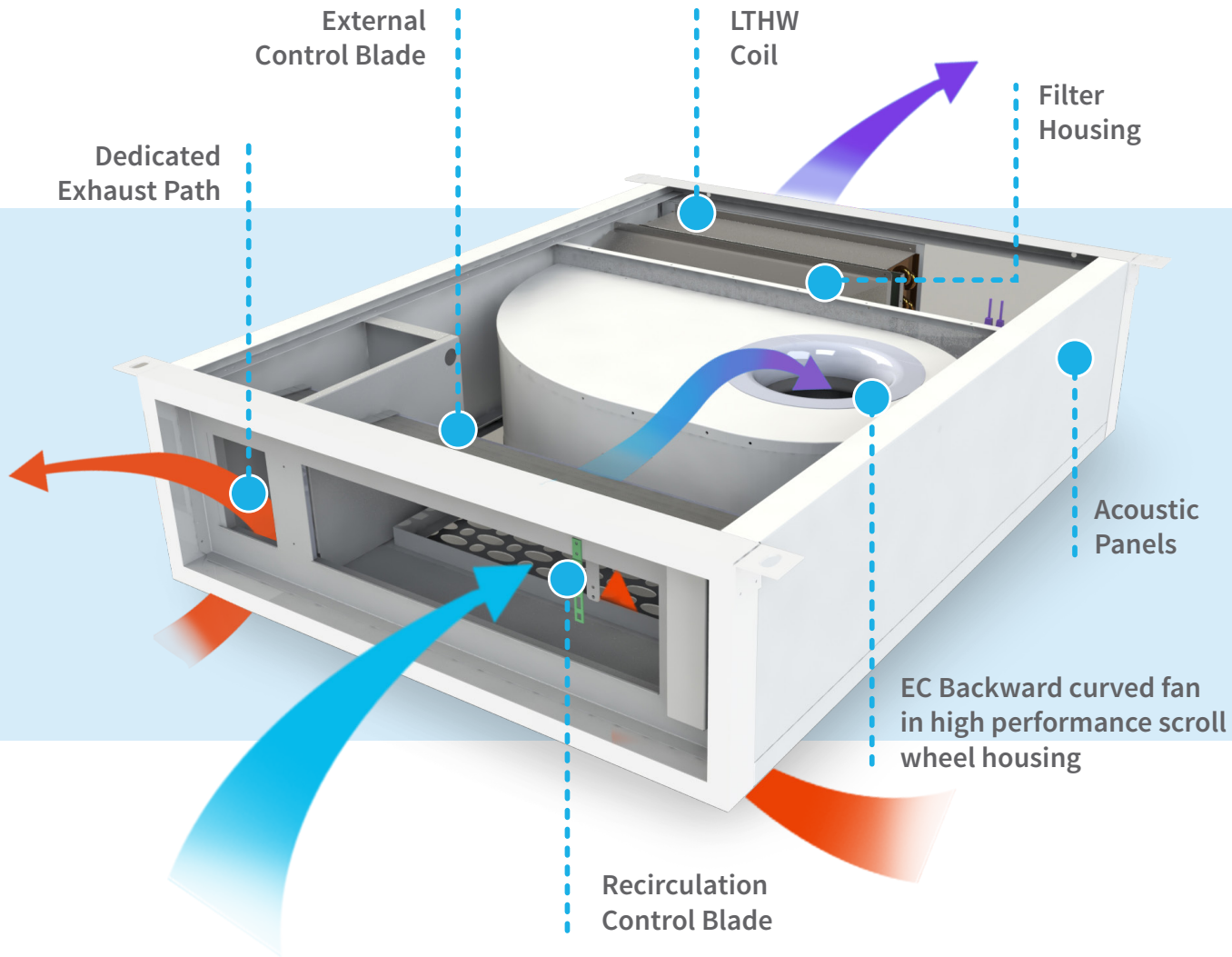


Kingfisher School (top) - Hessle High School (bottom) - Grenfell Community Centre (left)





KEY FEATURES



HTM systems work in conjunction with other forms of natural ventilation openings i.e. manual or automatic window / louvre openings to provide year round ventilation requirements.

With the addition of an internal LTHW coil, the Hybrid system is able provide the primary heat source within the space removing the requirement for additional radiators.



Three versions of Monodraught's HTM system are available, the HTM F, the HTM FS and the HTM FT. The "F" and "FT" types have been designed to have one unit per classroom, and the "FS" type two units per classroom.

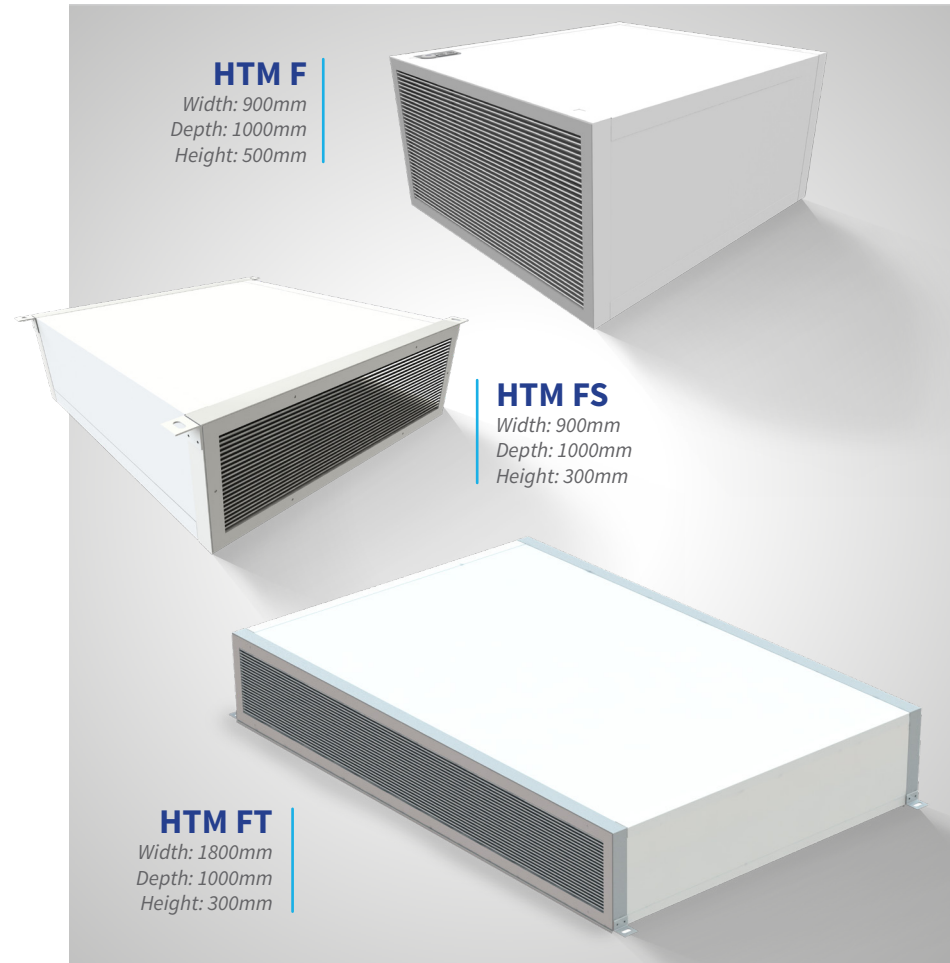
A powder coated steel frame makes the system robust and easy to install. This frame supports a body constructed from specialist acoustic panels which when combined with a low energy fan means that the systems maximum daytime operation sound level is well below 35dB.

A combination of an intelligent controls system and sensors measuring the room, external and mixed air temperatures & CO₂ levels allows the system to automatically control the internal environment. This control system can also be utilised for the operation of additional VENTS AIR façade systems and has a full data logging facility.

Options

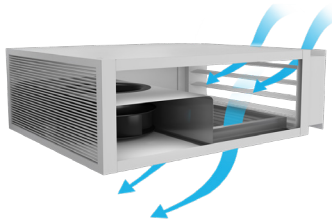
- Below ceiling or above ceiling installation
- Primary/Secondary mode to synchronise multiple units in a single zone
- Inhibit input to enable/disable HTM from BMS or Fire Alarm circuit
- Up to 6kW LTHW heating coil module
- 1kW Electric heating element (5A rated current)
- BACnet, MODBUS or BMS connection
- The external weather louvre and transition can be provided by Monodraught, please contact us for more details.
- More colours available on request
- Attenuator module and G4 & F7 filter modules.

HTM GENERAL DESCRIPTION



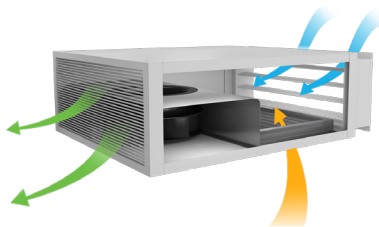
VENTILATION MODES

Natural Ventilation



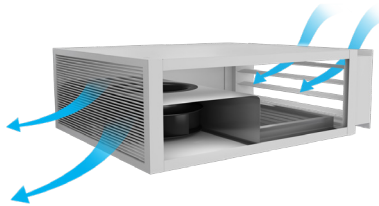
The system's primary function is to provide natural ventilation in conjunction with openable windows. In Natural Ventilation mode, the system operates by opening both the external and internal dampers, allowing fresh air to pass into the space.

Mixed Mode



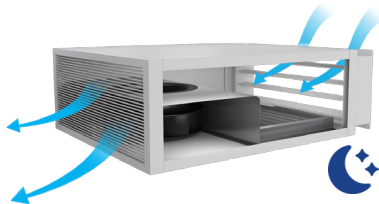
If the external temperature drops too low and fresh air is required, the system will operate in Mixed Mode. In this mode, the system will modulate the external and internal dampers and, by utilising the fan, will mix warm internal air with fresh external air to create a fresh and tempered indoor environment.

Boost Mode



If the internal temperature or CO₂ level rises too high, the system will operate in Boost Mode. In this mode, the system will open the external damper and blow air into the room until levels drop to acceptable levels.

Night-time Cooling

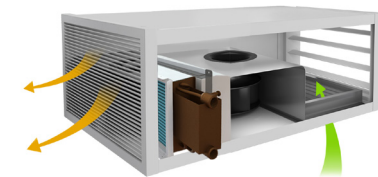


During the summer period, when the building is unoccupied and internal temperature is too high, the system will provide peak ventilation until the internal temperature reduces, removing warm air from the space and cooling the fabric of the building.

HEATING MODES (Available for HTM F-H, FS-H and FT-H systems)

Pre-heating Mode

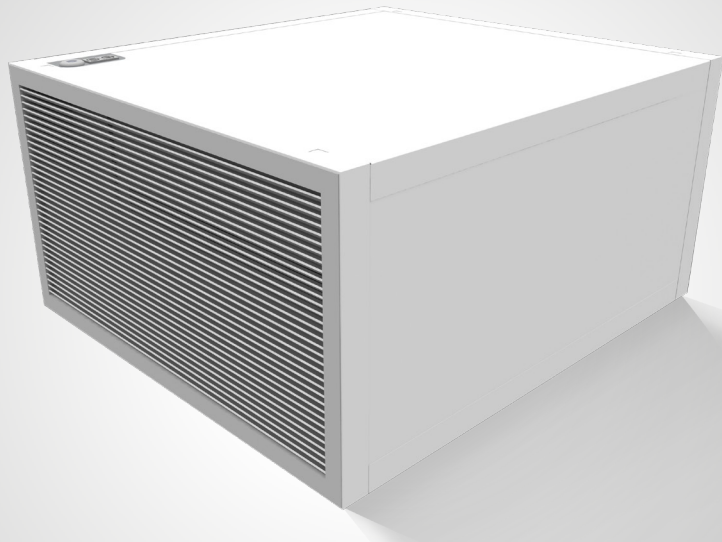
If the internal temperature of the space to be occupied is too low, the system will use its 'adaptive pre-heat' technology to estimate how long it will take to heat up the room to a comfortable temperature for the start of the day. It then activates the pre-heating mode where the system will actively heat the space by recirculating room air through the HTM system, which is then blown across the LTHW coil.



Occupied Heating Mode

While the space is occupied and if the internal temperature of the space is too low, the system will activate the 'occupied heating mode'. In this mode, off-coil air is limited to a maximum temperature and flow rate as to not create an uncomfortable environment for any of the occupants. The system will actively heat the space by recirculating room air through the HTM system, and also has the ability to warm external fresh air should the CO₂ level rise too high.





HTM F

The Hybrid Thermal Mixing (HTM) system from Monodraught is designed to provide natural ventilation, hybrid ventilation (incorporating mixed tempered air for winter periods), secure night time cooling and boosted levels of ventilation during summer.

The HTM systems are designed to work in conjunction with natural ventilation and can be used in single sided and cross flow ventilation strategies.

Each HTM is comprised of an intelligent and fully automatic control system coupled with a low energy ventilation system. It switches between operational modes dependant on season, external/internal temperature conditions and indoor air quality (IAQ).

Performance



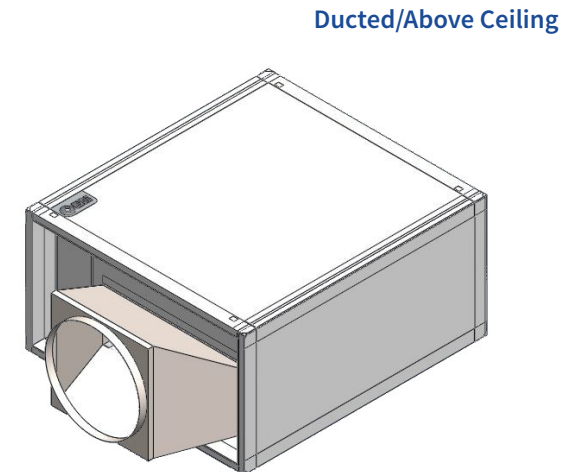
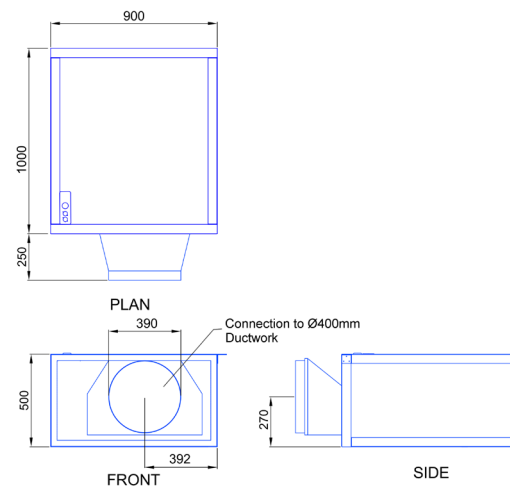
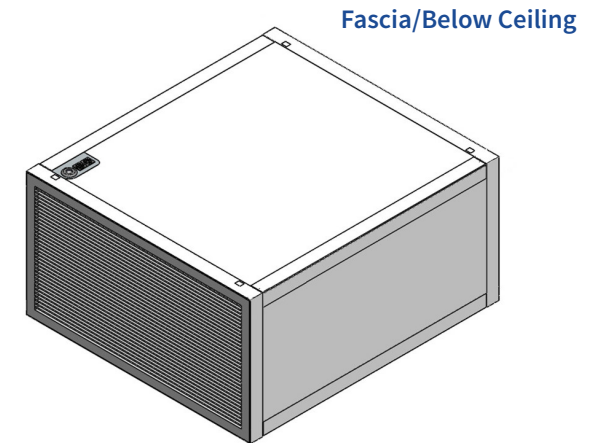
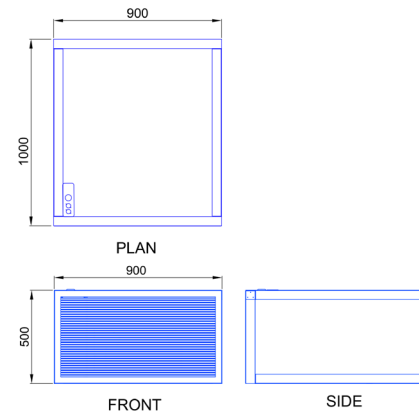
- The HTM systems are the most technologically advanced Hybrid ventilation systems supplied complete with an integrated intelligent and fully automatic control system.
- Able to provide 350l/s (SFP 0.16) of daytime ventilation and 530l/s (SFP 0.34) for night purge ventilation when required.
- The system is supplied as standard with full data logging facility, temperature and CO₂ controls. With an optional BACnet or Modbus module, each unit has the ability to output key performance data to a central BMS.
- A composite panel body provides high levels of acoustic attenuation.
- Available as an exposed unit with white fascia panels or as a ducted system with a plenum box and 4-way diffuser.
- An integrated exhaust path within the system's body removes the need for additional exhaust paths, therefore reducing the require number of façade openings.

Environment



- The HTM F has been designed specially to meet and exceed BB93, Priority School Building Programme (PSBP) and Annex F facility output specification requirements.
- The HTM is designed to provide single sided and cross flow ventilation strategies bringing fresh air into the room and reducing the CO₂ level to create an ideal environment to school classrooms/areas.
- The system is designed to provide mixed tempered air during winter, boosted levels of ventilation during summer and secure night time cooling.
- The system works in conjunction with natural ventilation provided by manual or automatic windows and VENTS AIR louvres.

Materials	Powder coated mild steel frame	Dimensions	900(w) x 500(h) x 1000 (l)
	Specialist acoustic panels		
	ABS low maintenance panels	Weight	
Installation	Units supported via a minimum of 3 No. fixings		
	Minimum ceiling void of 550mm - if required		
System Requirements	External weather louvre with minimum free area of 0.23m ²		
	Louvre panel to be supplied-fitted with anti-bird mesh		
Electrical Requirement	230V AC mains with switched fused 3A Spur		
Guarantee	5 year warranty		
	Mechanical and electrical components have a 1 year warranty		
Flowrates/SFP	Max Day - 350 l/s - SFP: 0.16		
	Max Night - 530 l/s - SFP: 0.34		
Sensors	External temp. sensor -20 °C to +90 °C		
	Recirculation temp. sensor -20 °C to +90 °C		
	Mixed air supply temp. sensor -20 °C to +90 °C		
	Room temp. sensor within wall controller -20 °C to +90 °C		
	Room CO ₂ sensor within wall controller 0-2000 ppm		
Data Monitoring	Data logging functionality as standard: all system operations, sensor readings and damper positions logged every 1 minute		
Additional Functions	Self-Test Mode via wall controller		
	Integrated exhaust path		
Options	BACnet / Modbus		
	Filter module EU-G4 bag filter		
	Filter module EU-F7 bag filter		
	Attenuation module		
Optional Electrical Connections	System enable input - NC volt-free contact to activate and deactivate the system		
	Fault output - NC relay output for fault indication		
	CAT5e Slave Connection - 2-4 No. HTM units synchronised to work in a Master/Slave configuration in a single zone		
VENTSAIR systems acting as automatic natural ventilation opening			



Controls Strategy

- The HTM incorporates a fully automatic control system based on seasonal control strategy which is determined by the systems internal time, date and weather compensation algorithm to pick up unseasonal conditions.
- The system provides natural ventilation as the default method of ventilation indicating when manual windows or automatically opening dampers should be utilised to maximise the IAQ and maintain the comfort levels.
- The control system incorporates a number of temperature sensors integral to the unit to monitor external temperature, mixed air temperature and supply air temperature.
- In addition, a wall mounted controller fitted with an internal temperature, CO₂ sensor and user override controls are included as standard.
- Data is stored per minute on an integral data card for data analysis and compliance requirements.

Season		Spring	Summer	Autumn	Winter	CO ₂
Start Date		01 Mar	01 May	01 Oct	01 Dec	
Finish Date		30 Apr	31 Sept	30 Nov	End of Feb	
Occupied hours 08:00 - 17:00	Nat Vent	21 °C	18 °C	21 °C	22 °C	900 ppm
	Nat Vent + Windows	23 °C	20 °C	23 °C	24 °C	1000 ppm
	Boost	24 °C	22 °C	24 °C	25 °C	1100 ppm
	Mixed Mode	23 °C	22 °C	23 °C	24 °C	900 ppm
Night time cooling 22:00 - 07:00		N/A	18 °C	N/A	N/A	N/A

Acoustic Information

Full acoustic testing has been conducted at SRL (Sound Research Laboratories) and the system was tested with a standard 50mm external louvre arrangement.

Sound Power Level at 350 l/s							
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
53.4	59	59.2	56.8	43.2	37.4	30.7	27.3
Sound Reduction Index Rw (C:Ctr) = 31 dB							



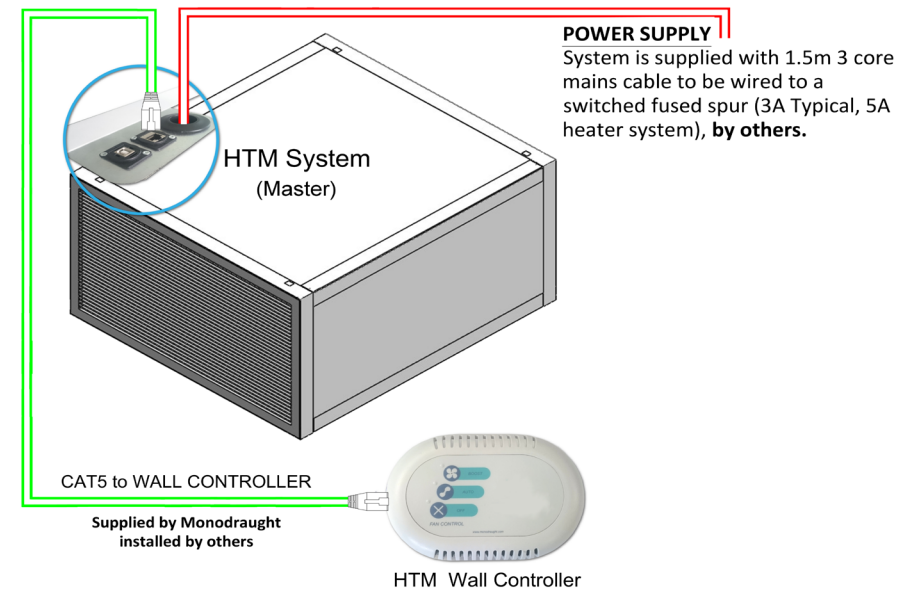
Operation

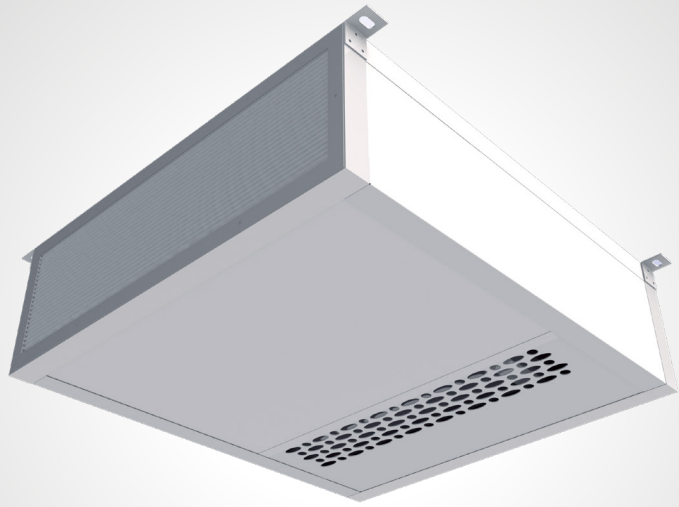
- HTM systems have eight operational fan speeds, at which a minimum air flow rate is supplied if installed in accordance with Monodraught recommendations.
- During normal occupied operation, the system will automatically operate between Fan Speeds 1-5 to provide fresh air ventilation and cooling (if conditions permit). The system is limited to a maximum of Fan Speed 5 (maximum AUTO daytime).
- The user is able to Boost the system's level of ventilation via the wall controller, increasing the system's operating fan speed by two fan speeds and in doing so the user is allowing the system to operate at an increased sound level.
- The system will time out and revert to its automatic operating fan speed after a default time period of 60 minutes. This time out is set via the wall controller with options of 20, 60 or 180 minutes.
- Fan speed 8 is reserved for night time cooling. During summer periods, when the building is unoccupied and when the internal temperature is above 18 °C the system will provide peak ventilation.

	Fan Speed	Air Flow Rate (l/s)	Fan Speed Description	Boosted Fan Speed (l/s)
Air Flow Rate (l/s)	Fan Speed 1	152	Daytime FS1	FS3
	Fan Speed 2	206	Daytime FS2	FS4
	Fan Speed 3	249	Daytime FS3	FS5
	Fan Speed 4	304	Daytime FS4	FS6
	Fan Speed 5	350	Maximum AUTO Daytime	FS7
	Fan Speed 6	380	Daytime BOOST 1	N/A
	Fan Speed 7	420	Maximum Daytime BOOST	N/A
	Fan Speed 8	530	Night Time Cooling	N/A

SYSTEM OPERATION & WIRING DETAILS

Typical Schematic





HTM FS

The Hybrid Thermal Mixing (HTM) system is designed to provide natural ventilation, hybrid ventilation, secure night time cooling and boosted levels of ventilation during summer. The systems are designed to work in conjunction with natural ventilation and can be used in single sided and cross flow ventilation strategies.

Each HTM system is comprised of an intelligent and fully automatic control system coupled with a low energy ventilation system. It switches between operational modes dependant on season, external/internal temperature conditions and indoor air quality (IAQ).

A HTM FS system is typically comprised of two FS units synchronised to work as a pair in a Primary/Secondary configuration within a single zone.

 Monodraught

Performance



- The HTM systems are the most technologically advanced Hybrid ventilation systems supplied complete with an integrated intelligent and fully automatic control system.
- Able to provide 180l/s (SFP 0.15) of daytime ventilation and 250l/s (SFP 0.24) for night purge ventilation when required.
- The system is supplied as standard with full data logging facility, temperature and CO₂ controls. With an optional BACnet or Modbus module, each unit has the ability to output key performance data to a central BMS.
- A composite panel body provides high levels of acoustic attenuation.
- Available as an exposed unit with white fascia panels or as a ducted system with a plenum box and 4-way diffuser.
- An integrated exhaust path within the system's body removes the need for additional exhaust paths, therefore reducing the require number of façade openings.

Environment

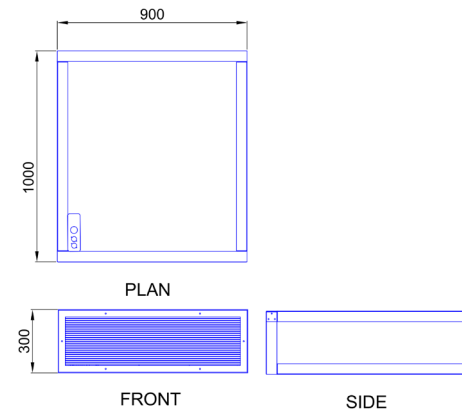


- The HTM FS has been designed specially to meet and exceed BB93, Priority School Building Programme (PSBP) and Annex F facility output specification requirements.
- The HTM is designed to provide single sided and cross flow ventilation strategies bringing fresh air into the room and reducing the CO₂ level to create an ideal environment to school classrooms/areas.
- The system is designed to provide mixed tempered air during winter, boosted levels of ventilation during summer and secure night time cooling.
- The system works in conjunction with natural ventilation provided by manual or automatic windows and VENTS AIR louvres.

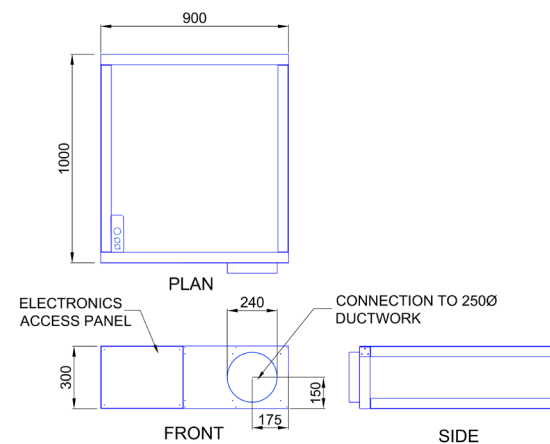
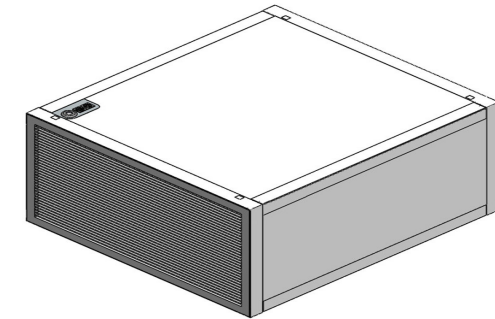


Materials	Powder coated mild steel frame	Dimensions	900(w) x 300(h) x 1000 (l)
	Specialist acoustic panels		
	ABS low maintenance panels	Weight	
Installation	Units supported via a minimum of 3 No. fixings Minimum ceiling void of 350mm - if required		
System Requirements	External weather louvre with minimum free area of 0.14m ² Louvre panel to be supplied-fitted with anti-bird mesh		
Electrical Requirement	230V AC mains with switched fused 3A Spur		
Guarantee	5 year warranty Mechanical and electrical components have a 1 year warranty		
Flowrates/SFP	Max Day - 180 l/s - SFP: 0.15 Max Night - 250 l/s - SFP: 0.24		
Sensors	External temp. sensor -20 °C to +90 °C		
	Recirculation temp. sensor -20 °C to +90 °C		
	Mixed air supply temp. sensor -20 °C to +90 °C		
	Room temp. sensor within wall controller -20 °C to +90 °C		
	Room CO ₂ sensor within wall controller 0-2000 ppm		
Data Monitoring	Data logging functionality as standard: all system operations, sensor readings and damper positions logged every 1 minute		
Additional Functions	Self-Test Mode via wall controller Integrated exhaust path		
Options	BACnet / Modbus Filter module EU-G4 bag filter Filter module EU-F7 bag filter Attenuation module		
Optional Electrical Connections	System enable input - NC volt-free contact to activate and deactivate the system		
	Fault output - NC relay output for fault indication		
	CAT5e Slave Connection - 2-4 No. HTM units synchronised to work in a Master/Slave configuration in a single zone		
	VENTSAIR systems acting as automatic natural ventilation opening 8 Core cable to Secondary unit (LSZH 0.35m ²) - if required		

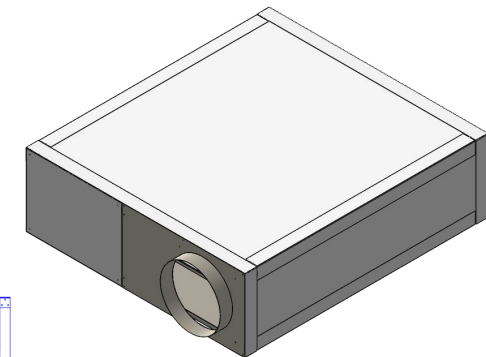
The above information corresponds to a single HTM FS unit.



Fascia/Below Ceiling



Ducted/Above Ceiling



Controls Strategy

- The HTM incorporates a fully automatic control system based on seasonal control strategy which is determined by the systems internal time, date and weather compensation algorithm to pick up unseasonal conditions.
- The system provides natural ventilation as the default method of ventilation indicating when manual windows or automatically opening dampers should be utilised to maximise the IAQ and maintain the comfort levels.
- The control system incorporates a number of temperature sensors integral to the unit to monitor external temperature, mixed air temperature and supply air temperature.
- In addition, a wall mounted controller fitted with an internal temperature, CO₂ sensor and user override controls are included as standard.
- Data is stored per minute on an integral data card for data analysis and compliance requirements.

Season		Spring	Summer	Autumn	Winter	CO ₂
Start Date		01 Mar	01 May	01 Oct	01 Dec	
Finish Date		30 Apr	31 Sept	30 Nov	End of Feb	
Occupied hours 08:00 - 17:00	Nat Vent	21 °C	18 °C	21 °C	22 °C	900 ppm
	Nat Vent + Windows	23 °C	20 °C	23 °C	24 °C	1000 ppm
	Boost	24 °C	22 °C	24 °C	25 °C	1100 ppm
	Mixed Mode	23 °C	22 °C	23 °C	24 °C	900 ppm
Night time cooling 22:00 - 07:00		N/A	18 °C	N/A	N/A	N/A

Acoustic Information

Full acoustic testing has been conducted at SRL (Sound Research Laboratories) and the system was tested with a standard 50mm external louvre arrangement.

Sound Power Level at 180 l/s							
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
51.8	54.9	52.8	47.0	40.0	31.7	21.3	23.3
Sound Reduction Index Rw (C:Ctr) = 31 dB							



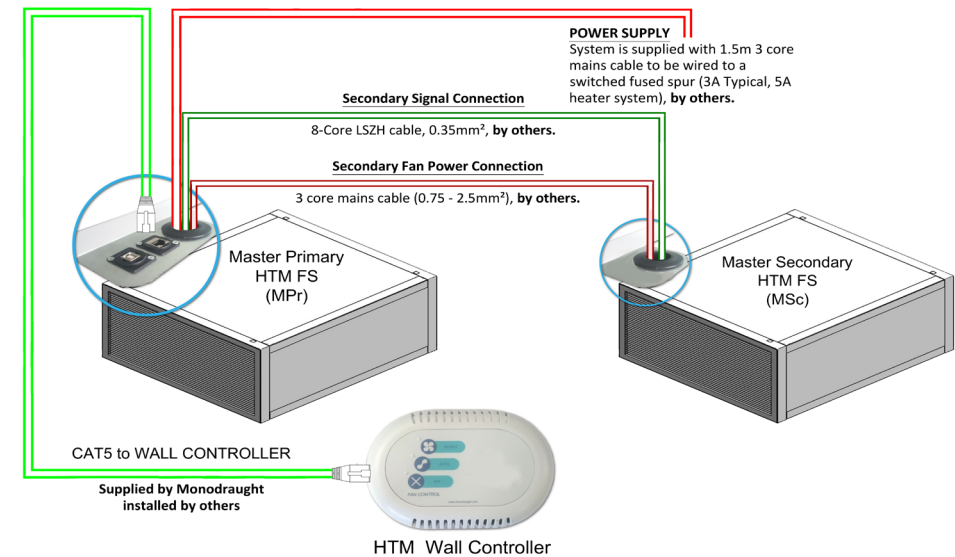
Operation

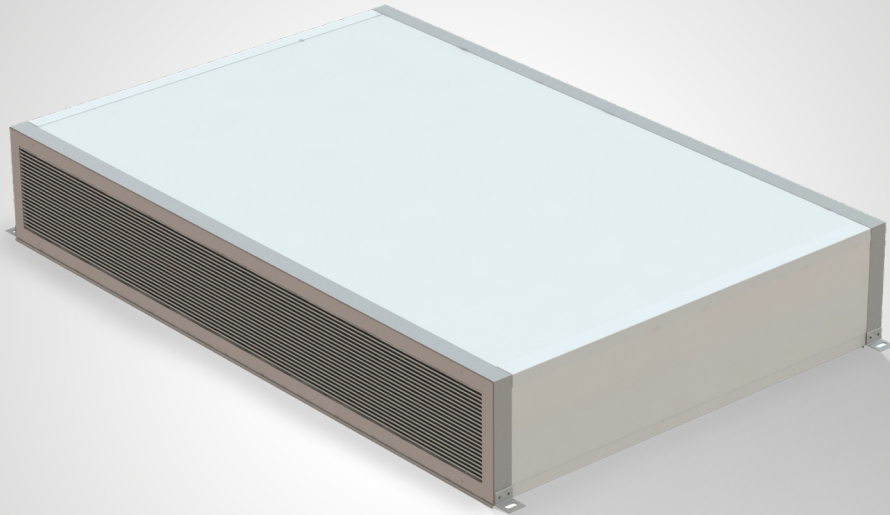
- HTM systems have eight operational fan speeds, at which a minimum air flow rate is supplied if installed in accordance with Monodraught recommendations.
- During normal occupied operation, the system will automatically operate between Fan Speeds 1-5 to provide fresh air ventilation and cooling (if conditions permit). The system is limited to a maximum of Fan Speed 5 (maximum AUTO daytime).
- The user is able to Boost the system's level of ventilation via the wall controller, increasing the system's operating fan speed by two fan speeds and in doing so the user is allowing the system to operate at an increased sound level.
- The system will time out and revert to its automatic operating fan speed after a default time period of 60 minutes. This time out is set via the wall controller with options of 20, 60 or 180 minutes.
- Fan speed 8 is reserved for night time cooling. During summer periods, when the building is unoccupied and when the internal temperature is above 18°C the system will provide peak ventilation.

	Fan Speed	Air Flow Rate (l/s)	Fan Speed Description	Boosted Fan Speed (l/s)
Air Flow Rate (l/s)	Fan Speed 1	100	Daytime FS1	FS3
	Fan Speed 2	121	Daytime FS2	FS4
	Fan Speed 3	143	Daytime FS3	FS5
	Fan Speed 4	164	Daytime FS4	FS6
	Fan Speed 5	180	Maximum AUTO Daytime	FS7
	Fan Speed 6	207	Daytime BOOST 1	N/A
	Fan Speed 7	229	Maximum Daytime BOOST	N/A
	Fan Speed 8	250	Night Time Cooling	N/A

SYSTEM OPERATION & WIRING DETAILS

Typical Schematic





HTM FT

The Hybrid Thermal Mixing (HTM) system from Monodraught is designed to provide natural ventilation, hybrid ventilation (incorporating mixed tempered air for winter periods), secure night time cooling and boosted levels of ventilation during summer.

The HTM systems are designed to work in conjunction with natural ventilation and can be used in single sided and cross flow ventilation strategies. Each HTM is comprised of an intelligent and fully automatic control system coupled with a low energy ventilation system. The unit switches between operational modes dependant on season, external/internal temperature conditions and indoor air quality (IAQ).

Performance



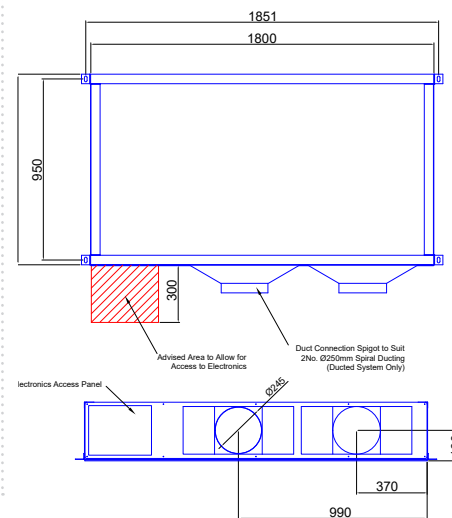
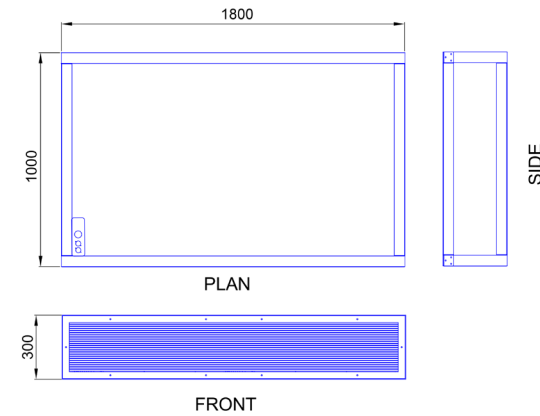
- Monodraught's HTM systems are the most technologically advanced hybrid ventilation systems, and are supplied complete with an integrated intelligent and fully automatic control system.
- Able to provide 350 l/s (SFP 0.15) of daytime ventilation and 530 l/s (SFP 0.24) for night purge ventilation when required.
- The system is supplied as standard with full data logging facility, temperature and CO₂ controls. With an optional BACnet or Modbus module, each unit has the ability to output key performance data to a central BMS.
- A composite panel body provides high levels of acoustic attenuation.
- Available as an exposed unit with white fascia panel or as ducted system with 3No. plenum boxes and 4-way diffuser.
- An integrated exhaust path within the system's body removes the need for additional exhaust paths, therefore reducing the required number of façade openings.

Environment

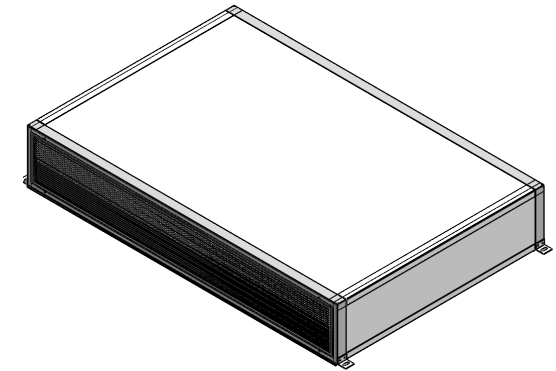


- The HTM FT has been specially designed to meet and exceed BB93, PSBP and Annex F facility output specification requirements.
- The HTM is designed to provide single sided and cross flow ventilation strategies, bringing fresh air into the room and reducing the CO₂ level to create an ideal environment for school classrooms/areas.
- The system is designed to provide mixed tempered air during winter, boosted levels of ventilation during summer and secure night time cooling.
- The system works in conjunction with natural ventilation provided by manual or automatic windows and VENTS AIR louvres.

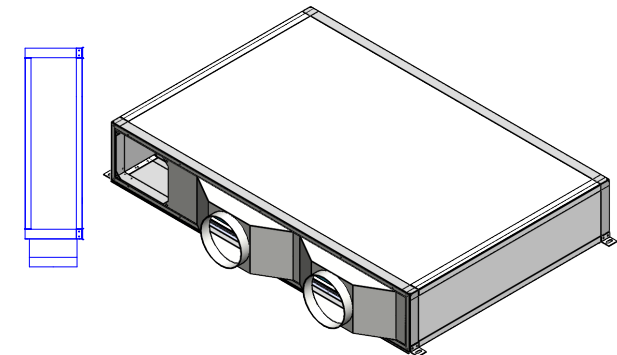
Materials	Powder coated mild steel frame	Dimensions	1800(w) x 300(h) x 1000 (l)
	Specialist acoustic panels		
	ABS low maintenance panels	Weight	
Installation	Units supported via a minimum of 4 No. fixings		
	Minimum ceiling void of 350mm - if required		
System Requirements	External weather louvre with minimum free area of 0.28m ²		
	Louvre panel to be supplied-fitted with anti-bird mesh		
Electrical Requirement	230V AC mains with switched fused 3A Spur		
Guarantee	5 year warranty		
	Mechanical and electrical components have a 1 year warranty		
Flowrates/SFP	Max Day - 350 l/s - SFP: 0.15		
	Max Night - 530 l/s - SFP: 0.24		
Sensors	External temp. sensor -20 °C to +90 °C		
	Recirculation temp. sensor -20 °C to +90 °C		
	Mixed air supply temp. sensor -20 °C to +90 °C		
	Room temp. sensor within wall controller -20 °C to +90 °C		
	Room CO ₂ sensor within wall controller 0-2000 ppm		
Data Monitoring	Data logging functionality as standard: all system operations, sensor readings and damper positions logged every 1 minute		
Additional Functions	Self-Test Mode via wall controller		
	Integrated exhaust path		
Options	BACnet / Modbus		
	Filter module EU-G4 bag filter		
	Filter module EU-F7 bag filter		
	Attenuation module		
Optional Electrical Connections	System enable input - NC volt-free contact to activate and deactivate the system		
	Fault output - NC relay output for fault indication		
	CAT5e Slave Connection - 2-4 No. HTM units synchronised to work in a Master/Slave configuration in a single zone		
	VENTSAIR systems acting as automatic natural ventilation opening		



Fascia/Below Ceiling



Ducted/Above Ceiling





Controls Strategy

- The HTM incorporates a fully automatic control system based on seasonal control strategy which is determined by the systems internal time, date and weather compensation algorithm to pick up unseasonal conditions.
- The system provides natural ventilation as the default method of ventilation indicating when manual windows or automatically opening dampers should be utilised to maximise the IAQ and maintain the comfort levels.
- The control system incorporates a number of temperature sensors integral to the unit to monitor external temperature, mixed air temperature and supply air temperature.
- In addition, a wall mounted controller fitted with an internal temperature, CO₂ sensor and user override controls are included as standard.
- Data is stored per minute on an integral data card for data analysis and compliance requirements.

Season		Spring	Summer	Autumn	Winter	CO ₂
Start Date	01 Mar	01 May	01 Oct	01 Dec		
Finish Date	30 Apr	31 Sept	30 Nov	End of Feb		
Occupied hours 08:00 - 17:00	Nat Vent	21 °C	18 °C	21 °C	22 °C	900 ppm
	Nat Vent + Windows	23 °C	20 °C	23 °C	24 °C	1000 ppm
	Boost	24 °C	22 °C	24 °C	25 °C	1100 ppm
	Mixed Mode	23 °C	22 °C	23 °C	24 °C	900 ppm
Night time cooling 22:00 - 07:00		N/A	18 °C	N/A	N/A	N/A



Acoustic Information

Full acoustic testing has been conducted at SRL (Sound Research Laboratories) and the system was tested with a standard 50mm external louvre arrangement.

Sound Power Level at 350 l/s							
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
53.4	59	59.2	56.8	43.2	37.4	30.7	27.3
Sound Reduction Index Rw (C:Ctr) = 31 dB							

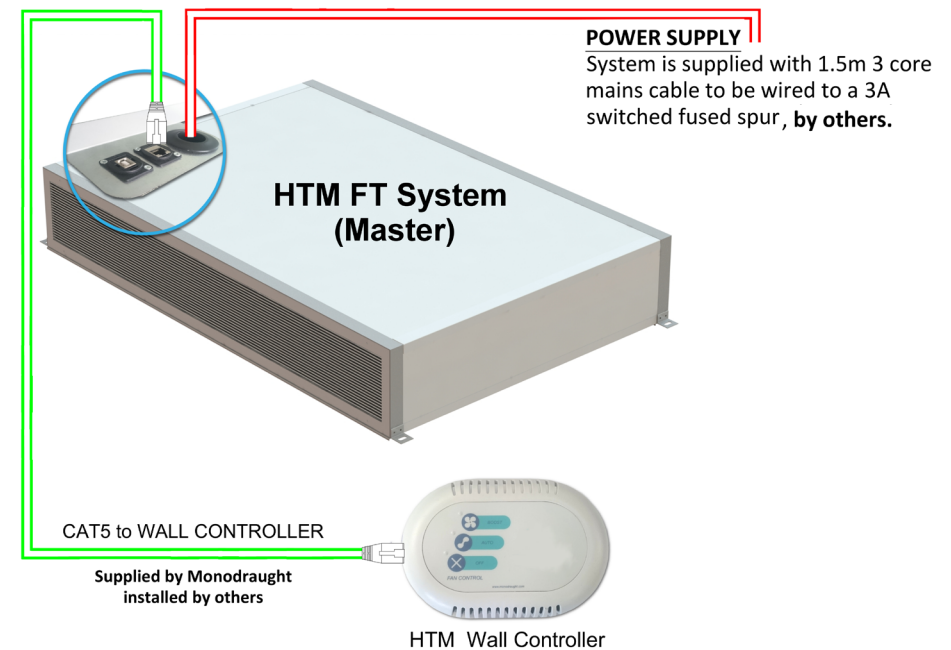


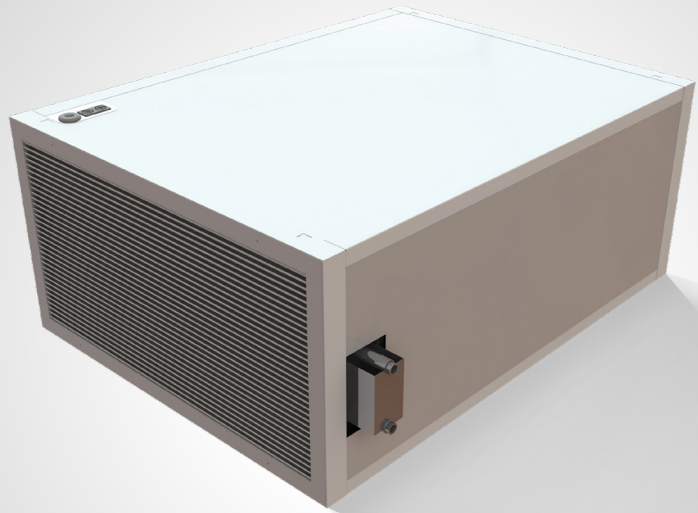

Operation

- HTM systems have eight operational fan speeds, at which a minimum air flow rate is supplied if installed in accordance with Monodraught recommendations.
- During normal occupied operation, the system will automatically operate between Fan Speeds 1-5 to provide fresh air ventilation and cooling (if conditions permit). The system is limited to a maximum of Fan Speed 5 (maximum AUTO daytime).
- The user is able to Boost the system's level of ventilation via the wall controller, increasing the system's operating fan speed by two fan speeds and in doing so the user is allowing the system to operate at an increased sound level.
- The system will time out and revert to its automatic operating fan speed after a default time period of 60 minutes. This time out is set via the wall controller with options of 20, 60 or 180 minutes.
- Fan speed 8 is reserved for night time cooling. During summer periods, when the building is unoccupied and when the internal temperature is above 18°C the system will provide peak ventilation.

	Fan Speed	Air Flow Rate (l/s)	Fan Speed Description	Boosted Fan Speed (l/s)
Air Flow Rate (l/s)	Fan Speed 1	150	Daytime FS1	FS3
	Fan Speed 2	200	Daytime FS2	FS4
	Fan Speed 3	250	Daytime FS3	FS5
	Fan Speed 4	300	Daytime FS4	FS6
	Fan Speed 5	350	Maximum AUTO Daytime	FS7
	Fan Speed 6	380	Daytime BOOST 1	N/A
	Fan Speed 7	420	Maximum Daytime BOOST	N/A
	Fan Speed 8	530	Night Time Cooling	N/A

SYSTEM OPERATION & WIRING DETAILS


Typical Schematic




HTM F-H

The Hybrid Thermal Mixing (HTM) system from Monodraught is designed to provide natural ventilation, hybrid ventilation, secure night time cooling and boosted levels of ventilation during summer.

The HTM systems are designed to work in conjunction with natural ventilation and can be used in single sided and cross flow ventilation strategies. Each HTM is comprised of an intelligent and fully automatic control system coupled with a low energy ventilation system. The unit switches between operational modes dependant on season, external/internal temperature conditions and indoor air quality (IAQ).

With the addition of an internal LTHW coil, the HTM F-H is able to provide the primary heat source within the space removing the requirement for additional radiators.

 Monodraught

Performance



- The HTM systems are the most technologically advanced hybrid ventilation systems, and are supplied complete with an integrated intelligent and fully automatic control system.
- The HTM F-H includes an LTHW coil encased within the HTM unit and installed directly over the supply opening of the system to provide up to 6kW of heating to a space.
- Able to provide 260 l/s (SFP 0.13) of daytime ventilation and 530 l/s (SFP 0.4) for night purge ventilation when required.
- The system is supplied as standard with full data logging facility, temperature and CO₂ controls.
- A composite panel provides high levels of acoustic attenuation.
- Available as an exposed unit with white fascia panel or as ducted system with 1No. plenum boxes and 4-way diffuser.
- An integrated exhaust path within the system's body removes the need for additional exhaust paths, therefore reducing the required number of façade openings.

Environment



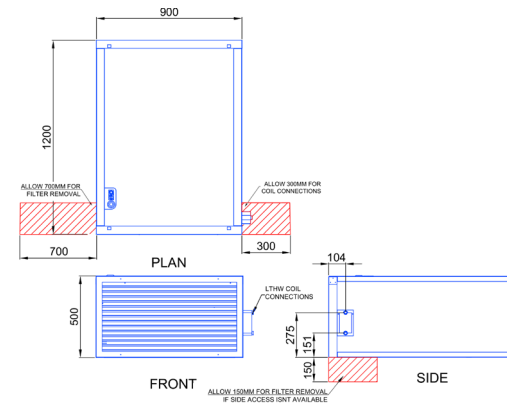
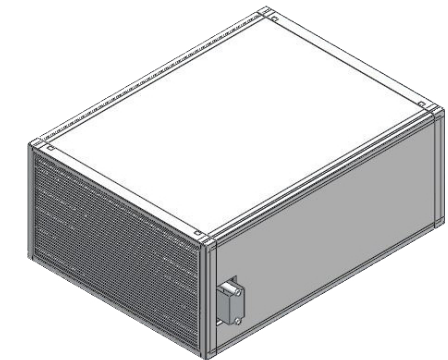
- The HTM F-H has been specially designed to meet and exceed BB93, PSBP and Annex F facility output specification requirements.
- The HTM is designed to provide single sided and cross flow ventilation strategies, bringing fresh air into the room and reducing the CO₂ level to create an ideal environment for school classrooms/areas.
- The system is designed to provide mixed tempered air during winter, boosted levels of ventilation during summer and secure night time cooling.
- The system works in conjunction with natural ventilation provided by manual or automatic windows and VENTS AIR louvres.



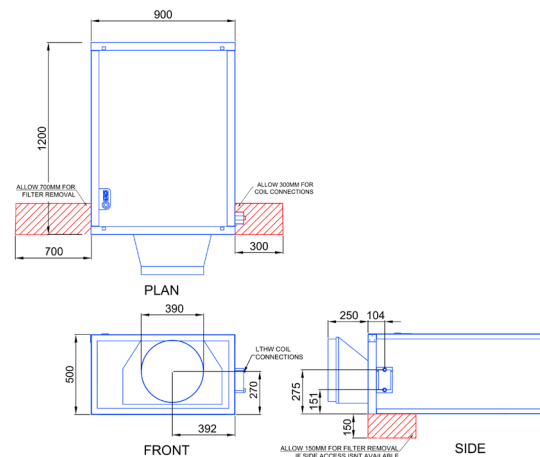
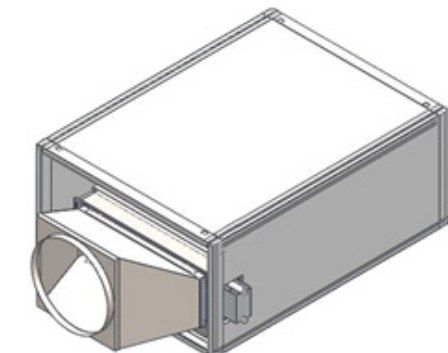
Materials	Unit	Powder coated mild steel frame Specialist acoustic panels ABS low maintenance panels	Dimensions	900(w) x 500(h) x 1200 (l)
	Coil	Copper piping Galvanised steel casing Aluminium fins		
Installation	Units supported via a minimum of 3 No. fixings Minimum ceiling void of 550mm - if required			
System Requirements	External weather louvre with minimum free area of 0.23m ²			
	Louvre panel to be supplied-fitted with anti-bird mesh			
	Suitable hot water supply for required heat output Actuated valve with 24V DC (0-10V modulation) actuator			
Electrical Requirement	230V AC mains with switched fused 3A Spur			
Guarantee	5 year warranty / Mechanical and electrical components have a 1 year warranty			
Flowrates/SFP	Max Day - 260 l/s - SFP: 0.13			
	Max Night - 530 l/s - SFP: 0.4			
Coil Performance	Up to 6kW of heat based upon water supply of 80 °C / 60 °C at 0.1 l/s			
Sensors	External temp. sensor -20 °C to +90 °C			
	Recirculation temp. sensor -20 °C to +90 °C			
	Mixed air supply temp. sensor -20 °C to +90 °C			
	Room temp. sensor within wall controller -20 °C to +90 °C			
Data Monitoring	Room CO ₂ sensor within wall controller 0-2000 ppm			
	Data logging functionality as standard: all system operations, sensor readings and damper positions logged every 1 minute			
Additional Functions	Self-Test Mode via wall controller			
	Integrated exhaust path			
Options	BACnet / Modbus			
	Filter module EU-G4 bag filter / Filter module EU-F7 bag filter Attenuation module			
Optional Electrical Connections	System enable input - NC volt-free contact to activate and deactivate the system			
	Fault output - NC relay output for fault indication			
	CAT5e Slave Connection - 2-4 No. HTM units synchronised to work in a Master/ Slave configuration in a single zone			
VENTSAIR systems acting as automatic natural ventilation opening				

TECHNICAL SPECIFICATIONS

Fascia/Below Ceiling



Ducted/Above Ceiling




Controls Strategy

- The HTM incorporates a fully automatic control system based on seasonal control strategy which is determined by the systems internal time, date and weather compensation algorithm to pick up unseasonal conditions.
- The system provides natural ventilation as the default method of ventilation indicating when manual windows or automatically opening dampers should be utilised to maximise the IAQ and maintain the comfort levels.
- The control system incorporates a number of temperature sensors integral to the unit to monitor external temperature, mixed air temperature and supply air temperature.
- In addition, a wall mounted controller fitted with an internal temperature, CO₂ sensor and user override controls are included as standard.
- Data is stored per minute on an integral data card for data analysis and compliance requirements.

Season		Spring	Summer	Autumn	Winter	CO ₂
Start Date		01 Mar	01 May	01 Oct	01 Dec	
Finish Date		30 Apr	31 Sept	30 Nov	End of Feb	
Occupied hours 08:00 - 17:00	Nat Vent	21 °C	18 °C	21 °C	22 °C	900 ppm
	Nat Vent + Windows	23 °C	20 °C	23 °C	24 °C	1000 ppm
	Boost	24 °C	22 °C	24 °C	25 °C	1100 ppm
	Mixed Mode	23 °C	22 °C	23 °C	24 °C	900 ppm
Night time cooling 22:00 - 07:00		N/A	18 °C	N/A	N/A	N/A
Heating		19 °C	16 °C	19 °C	20 °C	900 ppm
Adaptive Pre-heat		Up to 1 hour before occupied hours				N/A


Heating

- The HTM F-H is designed to preheat the room before the occupied periods, allowing more air at higher temperature to be provided, therefore heating the room more efficiently whilst keeping noise to a minimum during occupied periods.
- The space is actively heated by recirculating room air through the HTM system which is then blown across the LTHW coil. The system is also able to directly heat fresh air and therefore actively ventilate the indoor space by keeping CO₂ levels within a range of specific set points without chilling the occupants.


Acoustic Information

Full acoustic testing has been conducted at SRL (Sound Research Laboratories) and the system was tested with a standard 50mm external louvre arrangement.

Sound Power Level at 260 l/s							
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
60.1	60.8	56.9	49.7	44.7	36.9	28.1	24.4
Sound Reduction Index Rw (C:Ctr) = 31 dB							


Operation

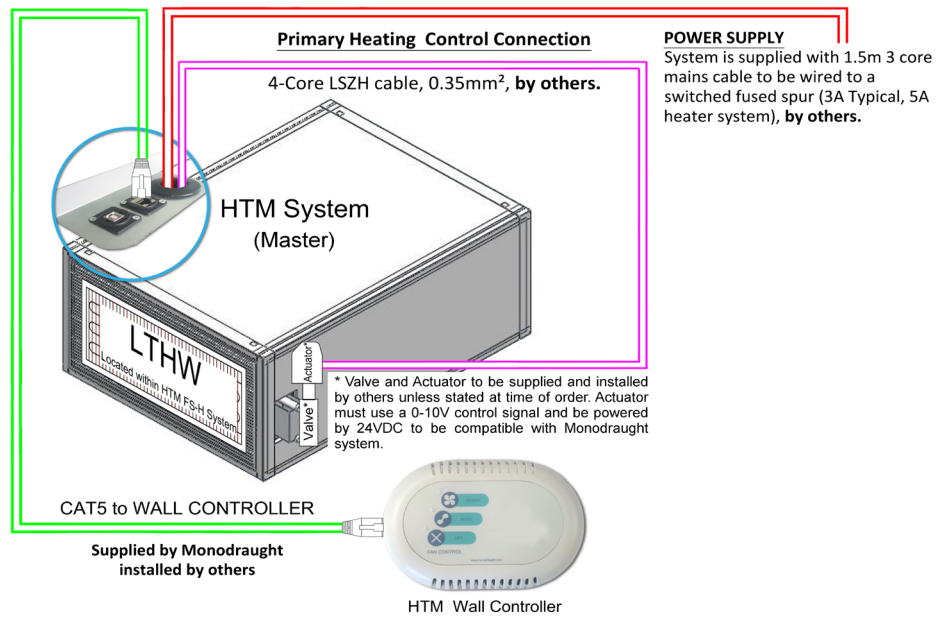
- HTM systems have eight operational fan speeds, at which a minimum air flow rate is supplied if installed in accordance with Monodraught recommendations.
- During normal occupied operation, the system will automatically operate between Fan Speeds 1-5 to provide fresh air ventilation and cooling (if conditions permit). The system is limited to a maximum of Fan Speed 5 (maximum AUTO daytime).
- The user is able to Boost the system's level of ventilation via the wall controller, increasing the system's operating fan speed by two fan speeds and in doing so the user is allowing the system to operate at an increased sound level.
- The system will time out and revert to its automatic operating fan speed after a default time period of 60 minutes. This time out is set via the wall controller with options of 20, 60 or 180 minutes.
- Fan speed 8 is reserved for night time cooling. During summer periods, when the building is unoccupied and when the internal temperature is above 18°C the system will provide peak ventilation.

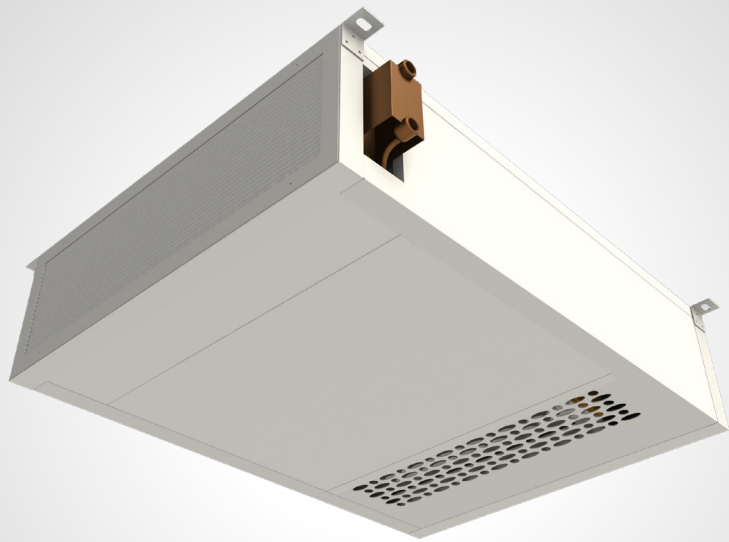

LTHW Coil Operation

Fan Speed	Fan Speed Description	Boosted Fan Speed (l/s)	Air Flow Rate (l/s)	Heating Mode			Max. Water Pressure Drop (kPa)	Coil Water Capacity	Coil Water Capacity	Maximum Working Pressure (MPa)	Connections	Valve and Actuator requirement
				Max. Off Coil Temp (°C)	Max Coil Output (kW)	Recommended Water Flow Rate (l/s)						
Fan Speed 1	Daytime FS1	FS3	152	30	6	0.1/0.22	1.9	1.9 Litres	1.9	1.6	2 No. 3/4" BSP	Modulating valve required to clients requirement with 24VDC actuator with 0-10VDC Control system
Fan Speed 2	Daytime FS2	FS4	206									
Fan Speed 3	Daytime FS3	FS5	249									
Fan Speed 4	Daytime FS4	FS6	304									
Fan Speed 5	Maximum AUTO Daytime	FS7	350									
Fan Speed 6	Daytime BOOST 1	N/A	380									
Fan Speed 7	Maximum Daytime BOOST	N/A	420									
Fan Speed 7	Preheating	N/A	420	40								
Fan Speed 8	Night-time Cooling	N/A	530									

** Maximum On Coil Temperature to allow for stated coil output (kW) to be achieved - HTM systems are designed to maintain a minimum internal temperature of 14°C in unoccupied periods, therefore this should be the minimum On Coil Temperature during the heating period.

 Typical Schematic





HTM FS-H

The Hybrid Thermal Mixing (HTM) system from Monodraught is designed to provide natural ventilation, hybrid ventilation, secure night time cooling and boosted levels of ventilation during summer.

The HTM systems are designed to work in conjunction with natural ventilation and can be used in single sided and cross flow ventilation strategies. The unit switches between operational modes dependant on season, external/internal temperature conditions and indoor air quality (IAQ). A HTM FS-H system is usually comprised of two HTM FS-H Units synchronised to work as a pair in a Primary/Secondary configuration within a single zone.

With the addition of an internal LTHW coil, the HTM FS-H is able to provide the primary heat source within the space removing the requirement for additional radiators.

Performance



- The HTM systems are the most technologically advanced hybrid ventilation systems, and are supplied complete with an integrated intelligent and fully automatic control system.
- The HTM FS-H includes an LTHW coil encased within the HTM unit and installed directly over the supply opening of the system to provide up to 6kW of heating to a space.
- Able to provide 130 l/s (SFP 0.17) of daytime ventilation and 250 l/s (SFP 0.4) for night purge ventilation when required.
- The system is supplied as standard with full data logging facility, temperature and CO₂ controls.
- A composite panel provides high levels of acoustic attenuation.
- Available as an exposed unit with white fascia panel or as ducted system with 2No. plenum boxes and 4-way diffuser.
- An integrated exhaust path within the system's body removes the need for additional exhaust paths, therefore reducing the required number of façade openings.

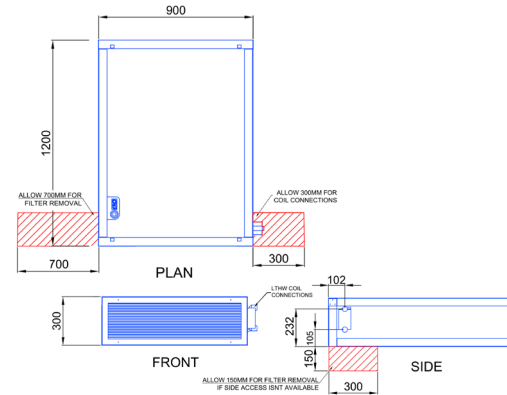
Environment



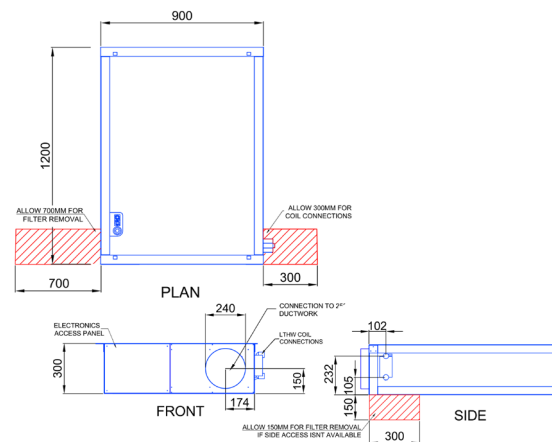
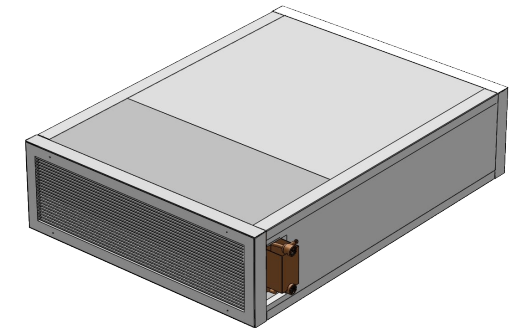
- The HTM FS-H has been specially designed to meet and exceed BB93, PSBP and Annex F facility output specification requirements.
- The HTM is designed to provide single sided and cross flow ventilation strategies, bringing fresh air into the room and reducing the CO₂ level to create an ideal environment for school classrooms/areas.
- The system is designed to provide mixed tempered air during winter, boosted levels of ventilation during summer and secure night time cooling.
- The system works in conjunction with natural ventilation provided by manual or automatic windows and VENTS AIR louvres.

Materials	Unit	Powder coated mild steel frame Specialist acoustic panels ABS low maintenance panels	Dimensions	900(w) x 300(h) x 1200 (l)		
	Coil	Copper piping			Weight	50kg
		Galvanised steel casing				
Aluminium fins						
Installation	Units supported via a minimum of 3 No. fixings Minimum ceiling void of 350mm - if required					
System Requirements	External weather louvre with minimum free area of 0.14m ²					
	Louvre panel to be supplied-fitted with anti-bird mesh					
	Suitable hot water supply for required heat output Actuated valve with 24V DC (0-10V modulation) actuator					
Electrical Requirement	230V AC mains with switched fused 3A Spur					
Guarantee	5 year warranty / Mechanical and electrical components have a 1 year warranty					
Flowrates/SFP	Max Day - 130 l/s - SFP: 0.17					
	Max Night - 250 l/s - SFP: 0.4					
Coil Performance	Up to 6kW of heat based upon water supply of 80 °C / 60 °C at 0.1 l/s					
Sensors	External temp. sensor -20 °C to +90 °C					
	Recirculation temp. sensor -20 °C to +90 °C					
	Mixed air supply temp. sensor -20 °C to +90 °C					
	Room temp. sensor within wall controller -20 °C to +90 °C					
	Room CO ₂ sensor within wall controller 0-2000 ppm					
Data Monitoring	Data logging functionality as standard: all system operations, sensor readings and damper positions logged every 1 minute					
Additional Functions	Self-Test Mode via wall controller					
	Integrated exhaust path					
Options	BACnet / Modbus					
	Filter module EU-G4 bag filter / Filter module EU-F7 bag filter					
	Attenuation module					
Optional Electrical Connections	System enable input - NC volt-free contact to activate and deactivate the system					
	Fault output - NC relay output for fault indication					
	CAT5e Slave Connection - 2-4 No. HTM units synchronised to work in a Master/Slave configuration in a single zone					
VENTSAIR systems acting as automatic natural ventilation opening						

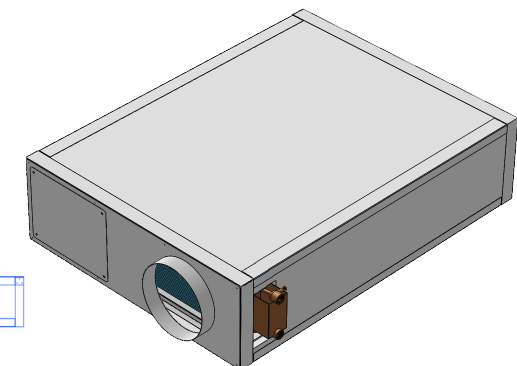
The information above corresponds to a single HTM FS-H unit.



Fascia/Below Ceiling



Ducted/Above Ceiling





Controls Strategy

- The HTM incorporates a fully automatic control system based on seasonal control strategy which is determined by the systems internal time, date and weather compensation algorithm to pick up unseasonal conditions.
- The system provides natural ventilation as the default method of ventilation indicating when manual windows or automatically opening dampers should be utilised to maximise the IAQ and maintain the comfort levels.
- The control system incorporates a number of temperature sensors integral to the unit to monitor external temperature, mixed air temperature and supply air temperature.
- In addition, a wall mounted controller fitted with an internal temperature, CO₂ sensor and user override controls are included as standard.
- Data is stored per minute on an integral data card for data analysis and compliance requirements.

Season		Spring	Summer	Autumn	Winter	CO ₂
Start Date		01 Mar	01 May	01 Oct	01 Dec	
Finish Date		30 Apr	31 Sept	30 Nov	End of Feb	
Occupied hours 08:00 - 17:00	Nat Vent	21 °C	18 °C	21 °C	22 °C	900 ppm
	Nat Vent + Windows	23 °C	20 °C	23 °C	24 °C	1000 ppm
	Boost	24 °C	22 °C	24 °C	25 °C	1100 ppm
	Mixed Mode	23 °C	22 °C	23 °C	24 °C	900 ppm
Night time cooling 22:00 - 07:00		N/A	18 °C	N/A	N/A	N/A
Heating		19 °C	16 °C	19 °C	20 °C	900 ppm
Adaptive Pre-heat		Up to 1 hour before occupied hours				N/A



Heating

- The HTM FS-H is designed to preheat the room before the occupied periods, allowing more air at higher temperature to be provided, therefore heating the room more efficiently whilst keeping noise to a minimum during occupied periods.
- The space is actively heated by recirculating room air through the HTM system which is then blown across the LTHW coil. The system is also able to directly heat fresh air and therefore actively ventilate the indoor space by keeping CO₂ levels within a range of specific set points without chilling the occupants.



Acoustic Information

Full acoustic testing has been conducted at SRL (Sound Research Laboratories) and the system was tested with a standard 50mm external louvre arrangement.

Sound Power Level at 130 l/s							
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
58.1	59.1	57.2	51.7	42.9	34.1	27.1	25.5
Sound Reduction Index Rw (C:Ctr) = 31 dB							


Operation

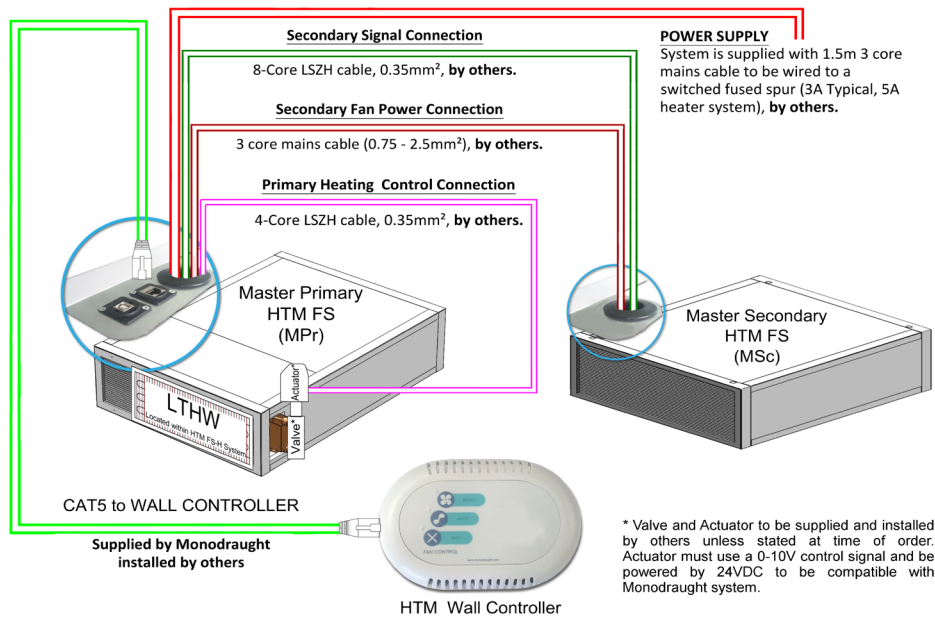
- HTM systems have eight operational fan speeds, at which a minimum air flow rate is supplied if installed in accordance with Monodraught recommendations.
- During normal occupied operation, the system will automatically operate between Fan Speeds 1-5 to provide fresh air ventilation and cooling (if conditions permit). The system is limited to a maximum of Fan Speed 5 (maximum AUTO daytime).
- The user is able to Boost the system's level of ventilation via the wall controller, increasing the system's operating fan speed by two fan speeds and in doing so the user is allowing the system to operate at an increased sound level.
- The system will time out and revert to its automatic operating fan speed after a default time period of 60 minutes. This time out is set via the wall controller with options of 20, 60 or 180 minutes.
- Fan speed 8 is reserved for night time cooling. During summer periods, when the building is unoccupied and when the internal temperature is above 18°C the system will provide peak ventilation.

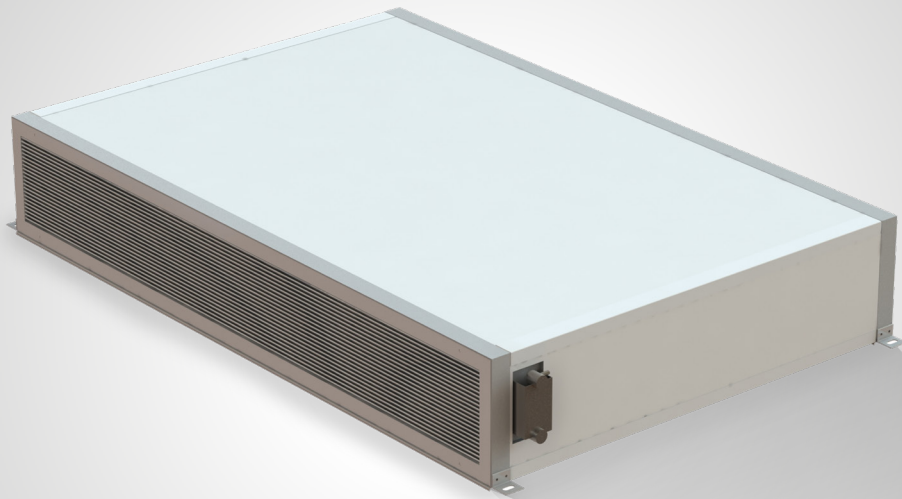

LTHW Coil Operation

Fan Speed	Fan Speed Description	Boosted Fan Speed (l/s)	Air Flow Rate (l/s)	Heating Mode			Max. Water Pressure Drop (kPa)	Coil Water Capacity	Coil Water Capacity	Maximum Working Pressure (MPa)	Connections	Valve and Actuator requirement
				Max. Off Coil Temp (°C)	Max Coil Output (kW)	Recommended Water Flow Rate (l/s)						
Fan Speed 1	Daytime FS1	FS3	100	30	6	0.1/0.14	3.9	0.98 Litres	1.9	1.6	2 No. 3/4" BSP	Modulating valve required to clients requirement with 24VDC actuator with 0-10VDC Control system
Fan Speed 2	Daytime FS2	FS4	121									
Fan Speed 3	Daytime FS3	FS5	143									
Fan Speed 4	Daytime FS4	FS6	164									
Fan Speed 5	Maximum AUTO Daytime	FS7	180									
Fan Speed 6	Daytime BOOST 1	N/A	207									
Fan Speed 7	Maximum Daytime BOOST	N/A	229									
Fan Speed 7	Preheating	N/A	229	40								
Fan Speed 8	Night-time Cooling	N/A	250									

** Maximum On Coil Temperature to allow for stated coil output (kW) to be achieved - HTM systems are designed to maintain a minimum internal temperature of 14°C in unoccupied periods, therefore this should be the minimum On Coil Temperature during the heating period.

 Typical Schematic





HTM FT-H

The Hybrid Thermal Mixing (HTM) system from Monodraught is designed to provide natural ventilation, hybrid ventilation, secure night time cooling and boosted levels of ventilation during summer.

The HTM systems are designed to work in conjunction with natural ventilation and can be used in single sided and cross flow ventilation strategies. Each HTM is comprised of an intelligent and fully automatic control system coupled with a low energy ventilation system. The unit switches between operational modes dependant on season, external/internal temperature conditions and indoor air quality (IAQ).

With the addition of an internal LTHW coil, the HTM FT-H is able to provide the primary heat source within the space removing the requirement for additional radiators.



Performance



- Monodraught's HTM systems are the most technologically advanced hybrid ventilation systems, and are supplied complete with an integrated intelligent and fully automatic control system.
- The HTM FT-H includes an LTHW coil encased within the HTM unit and installed directly over the supply opening of the system to provide up to 6kW of heating to a space.
- Able to provide 260 l/s (SFP 0.17) of daytime ventilation and 530 l/s (SFP 0.4) for night purge ventilation when required.
- The system is supplied as standard with full data logging facility, temperature and CO₂ controls.
- A composite panel body provides high levels of acoustic attenuation.
- Available as an exposed unit with white fascia panel or as ducted system with 2No. plenum boxes and 4-way diffuser.
- An integrated exhaust path within the system's body removes the need for additional exhaust paths, therefore reducing the required number of façade openings.

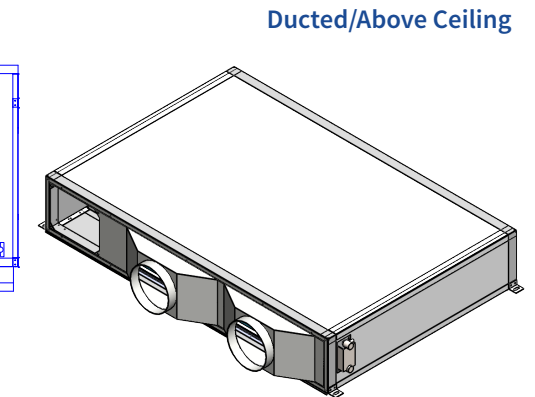
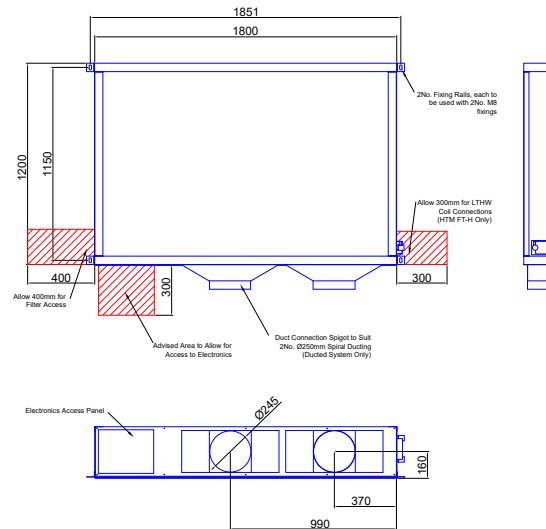
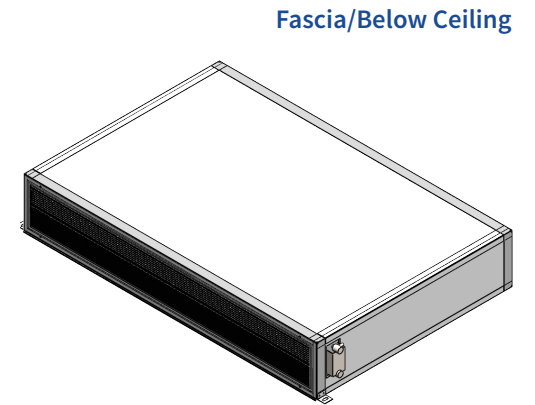
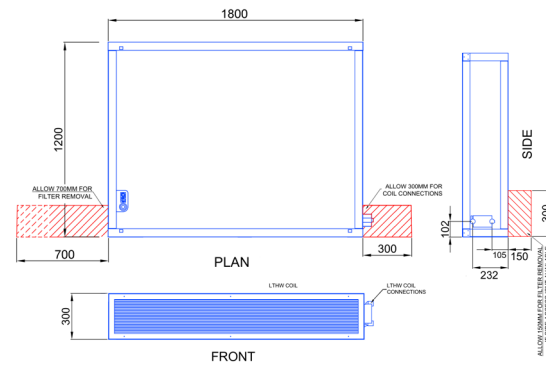
Environment



- The HTM FT-H has been specially designed to meet and exceed BB93, PSBP and Annex F facility output specification requirements.
- The HTM is designed to provide single sided and cross flow ventilation strategies, bringing fresh air into the room and reducing the CO₂ level to create an ideal environment for school classrooms/ areas.
- The system is designed to provide mixed tempered air during winter, boosted levels of ventilation during summer and secure night time cooling.
- The system works in conjunction with natural ventilation provided by manual or automatic windows and VENTS AIR louvres.



Materials	Unit	Powder coated mild steel frame Specialist acoustic panels ABS low maintenance panels	Dimensions	1800(w) x 300(h) x 1200 (l)		
	Coil	Copper piping			Weight	90kg
		Galvanised steel casing Aluminium fins				
Installation	Units supported via a minimum of 4 No. fixings Minimum ceiling void of 350mm - if required					
System Requirements	External weather louvre with minimum free area of 0.28m ²					
	Louvre panel to be supplied-fitted with anti-bird mesh					
	Suitable hot water supply for required heat output Actuated valve with 24V DC (0-10V modulation) actuator					
Electrical Requirement	230V AC mains with switched fused 3A Spur					
Guarantee	5 year warranty / Mechanical and electrical components have a 1 year warranty					
Flowrates/SFP	Max Day - 260 l/s - SFP: 0.17					
	Max Night - 530 l/s - SFP: 0.4					
Coil Performance	Up to 6kW of heat based upon water supply of 80 °C / 60 °C at 0.1 l/s					
Sensors	External temp. sensor -20 °C to +90 °C					
	Recirculation temp. sensor -20 °C to +90 °C					
	Mixed air supply temp. sensor -20 °C to +90 °C					
	Room temp. sensor within wall controller -20 °C to +90 °C					
Data Monitoring	Room CO ₂ sensor within wall controller 0-2000 ppm					
	Data logging functionality as standard: all system operations, sensor readings and damper positions logged every 1 minute					
Additional Functions	Self-Test Mode via wall controller					
	Integrated exhaust path					
Options	BACnet / Modbus					
	Filter module EU-G4 bag filter / Filter module EU-F7 bag filter Attenuation module					
Optional Electrical Connections	System enable input - NC volt-free contact to activate and deactivate the system					
	Fault output - NC relay output for fault indication					
	CAT5e Slave Connection - 2-4 No. HTM units synchronised to work in a Master/ Slave configuration in a single zone					
VENTSAIR systems acting as automatic natural ventilation opening						




Controls Strategy

- The HTM incorporates a fully automatic control system based on seasonal control strategy which is determined by the systems internal time, date and weather compensation algorithm to pick up unseasonal conditions.
- The system provides natural ventilation as the default method of ventilation indicating when manual windows or automatically opening dampers should be utilised to maximise the IAQ and maintain the comfort levels.
- The control system incorporates a number of temperature sensors integral to the unit to monitor external temperature, mixed air temperature and supply air temperature.
- In addition, a wall mounted controller fitted with an internal temperature, CO₂ sensor and user override controls are included as standard.
- Data is stored per minute on an integral data card for data analysis and compliance requirements.

Season		Spring	Summer	Autumn	Winter	CO ₂
Start Date		01 Mar	01 May	01 Oct	01 Dec	
Finish Date		30 Apr	31 Sept	30 Nov	End of Feb	
Occupied hours 08:00 - 17:00	Nat Vent	21 °C	18 °C	21 °C	22 °C	900 ppm
	Nat Vent + Windows	23 °C	20 °C	23 °C	24 °C	1000 ppm
	Boost	24 °C	22 °C	24 °C	25 °C	1100 ppm
	Mixed Mode	23 °C	22 °C	23 °C	24 °C	900 ppm
Night time cooling 22:00 - 07:00		N/A	18 °C	N/A	N/A	N/A
Heating		19 °C	16 °C	19 °C	20 °C	900 ppm
Adaptive Pre-heat		Up to 1 hour before occupied hours				N/A


Heating

- The HTM FT-H is designed to preheat the room before the occupied periods, allowing more air at higher temperature to be provided, therefore heating the room more efficiently whilst keeping noise to a minimum during occupied periods.
- The space is actively heated by recirculating room air through the HTM system which is then blown across the LTHW coil. The system is also able to directly heat fresh air and therefore actively ventilate the indoor space by keeping CO₂ levels within a range of specific set points without chilling the occupants.


Acoustic Information

Full acoustic testing has been conducted at SRL (Sound Research Laboratories) and the system was tested with a standard 50mm external louvre arrangement.

Sound Power Level at 260 l/s							
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
60.1	60.8	56.9	49.7	44.7	36.9	28.1	24.4
Sound Reduction Index Rw (C:Ctr) = 31 dB							


Operation

- HTM systems have eight operational fan speeds, at which a minimum air flow rate is supplied if installed in accordance with Monodraught recommendations.
- During normal occupied operation, the system will automatically operate between Fan Speeds 1-5 to provide fresh air ventilation and cooling (if conditions permit). The system is limited to a maximum of Fan Speed 5 (maximum AUTO daytime).
- The user is able to Boost the system's level of ventilation via the wall controller, increasing the system's operating fan speed by two fan speeds and in doing so the user is allowing the system to operate at an increased sound level.
- The system will time out and revert to its automatic operating fan speed after a default time period of 60 minutes. This time out is set via the wall controller with options of 20, 60 or 180 minutes.
- Fan speed 8 is reserved for night time cooling. During summer periods, when the building is unoccupied and when the internal temperature is above 18°C the system will provide peak ventilation.

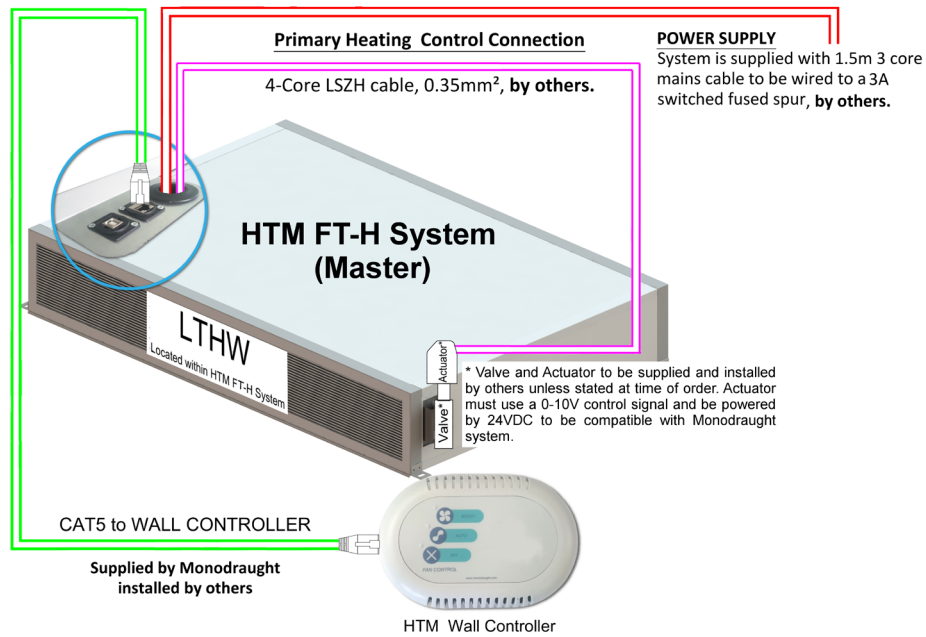

LTHW Coil Operation

Fan Speed	Fan Speed Description	Boosted Fan Speed (l/s)	Air Flow Rate (l/s)	Heating Mode	Based on an 80°C/60°C Water Supply with 30°C Max. Occupied and 40°C Max Pre Heating Limit			Max. Water Pressure Drop (kPa)	Coil Water Capacity	Coil Water Capacity	Maximum Working Pressure (MPa)	Connections	Valve and Actuator requirement
					Max. Off Coil Temp (°C)	Max Coil Output (kW)	Recommended Water Flow Rate (l/s)						
Fan Speed 1	Daytime FS1	FS3	152	Occupied Heating	36	6	0.1/0.22	1.9	1.9 Litres	1.9	1.6	2 No. 3/4" BSP	Modulating valve required to clients requirement with 24VDC actuator with 0-10VDC Control system
Fan Speed 2	Daytime FS2	FS4	166										
Fan Speed 3	Daytime FS3	FS5	190										
Fan Speed 4	Daytime FS4	FS6	304										
Fan Speed 5	Maximum AUTO Daytime	FS7	350										
Fan Speed 6	Daytime BOOST 1	N/A	380	Preheating	40								
Fan Speed 7	Maximum Daytime BOOST	N/A	420										
Fan Speed 7	Preheating	N/A	420	Preheating	40								
Fan Speed 8	Night-time Cooling	N/A	530										

REVIEW DATA

** Maximum On Coil Temperature to allow for stated coil output (kW) to be achieved - HTM systems are designed to maintain a minimum internal temperature of 14°C in unoccupied periods, therefore this should be the minimum On Coil Temperature during the heating period.

 Typical Schematic



Controls and User Interface

Monodraught offer three wall controller options, each dependant on the room design, layout and the user's requirements. One wall controller is required to be mounted within each room and will give the user certain functionality over the systems.

The HTM systems have the ability to perform a Self-test operation which is delivered via the system's wall controller. The HTM runs an automatic diagnostics test, operating and monitoring each element to search for any faults. If any faults are found, they will be indicated to the user by the wall controller.

Self-test Mode

All Monodraught's HTM systems have the ability to perform a Self-test operation which is operated via the system's wall controller. The HTM runs an automatic diagnostics test, operating and monitoring each element to search for any faults. If any faults are found, they will be indicated to the user by the wall controller. This test can be initiated by either a Monodraught engineer or a facility manager.

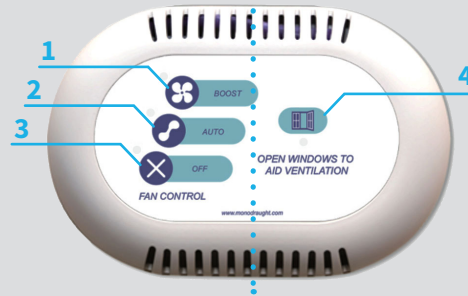
Openable Window Option (Available for HTM F, FS and FT types)

Allows the user to control the fan speed but will also indicate when they need to open windows to aid the system in providing ventilation.

- 1. Boost mode:** Will provide a boosted level of ventilation.
- 2. Auto mode:** Allows the HTM system to operate within its 3 automatic modes.
- 3. Off mode:** Closes the high level exhaust damper and stops the fan from operating.
- 4. LED:** Illuminates to notify users when it is necessary to open a window.

Left hand side provides control and indication of the current operation mode of the HTM system.

Right hand side provides indication for the openable windows.



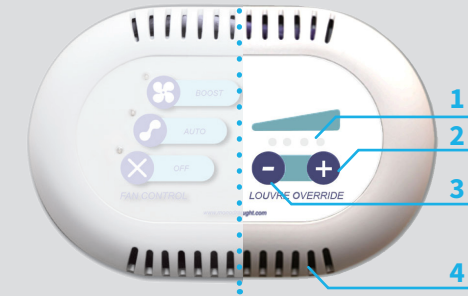
Louvre Override Option (Available for HTM F, FS and FT types)

Allows the user to not only control the fan speed of the units, but also regulate the amount that the VENTS AIR Façade system opens by if fitted.

- 1. Louvre LED's:** No LED = Closed / 1 LED = 10% open / 2 LED = 25% / 3 LED = 60% / 4 LED = Fully open.
- 2. Plus:** Opens the Ventsair louvre by 1 setting.
- 3. Minus:** Closes the Ventsair louvre by 1 setting.
- 4. Sensor:** Temperature and air quality sensor.

Left hand side provides control and indication of the current operation mode of the HTM system.

Right hand side provides control and indication for the opening level of the Ventsair wall louvres.



Temperature Set Point Option

(Available for systems with LTHW coil module)

- Boost Mode:** will provide a boosted level of ventilation via the low energy fan.
- Auto Mode:** Allows the ventilation system to operate within its automatic modes.
- Off Mode:** Closes the high level exhaust damper and stops the fan from operating.
- Temperature Set Point Adjust:** 1 LED = -2°C / 2 LED = -1°C / 3 LED = Set Point / 4 LED = +1°C / 5 LED = +2°C.
- Plus:** Adjusts the temperature set point +1.
- Minus:** Adjusts the temperature set point -1.
- Sensor:** Temperature and air quality sensor.

Left hand side provides control and indication of the current operation mode of the HTM system.

Right hand side provides control and indication for temperature set point adjust.

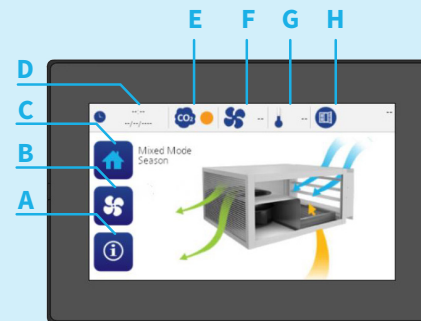


Smart Screen Option

(Available for all HTM types)

The controller displays the room temperature, air quality (IAQ) and fan speed via a capacitive touch LCD screen. The user is also able to explore how the system works and adjust the settings in order to maintain a comfortable environment with minimal energy usage.

- View system information
- Change fan speed
- Return to Home Page
- Time and date
- CO₂ level indicator
Red: High / Yellow: Medium / Green: Low
- Current fan speed
- Room temperature
- If additional ventilation is required, it will display the "windows opening" icon.



The Smart Screen works in conjunction with a modular combined CO₂ & Temperature sensor with a CO₂ range of 400 - 2000 ppm and a temperature range of 0 - 50°C.

The CO₂ sensor features an automatic background calibration which will recalibrate the sensor back to a background level during unoccupied periods to cancel sensor drift and maintain accuracy over the typical product lifespan.



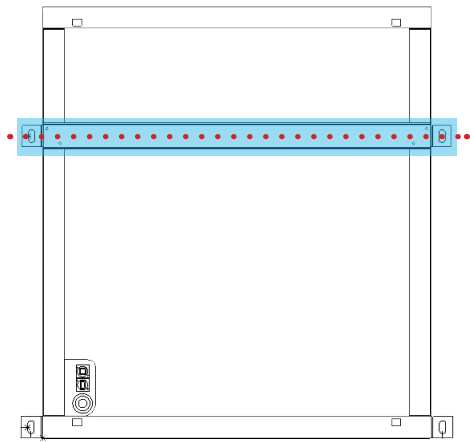
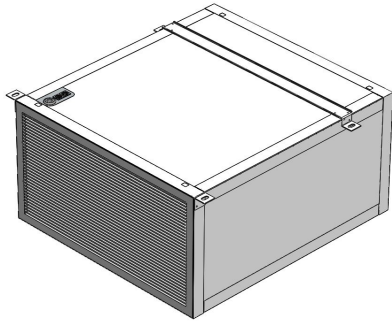
HTM F - Littleport Academy
Photo Credit: Archant



FIXING OPTIONS

Fixing Rail

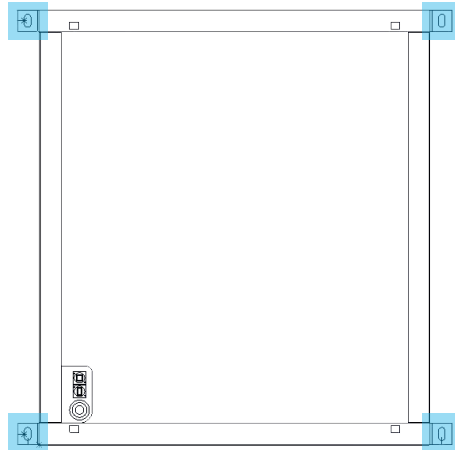
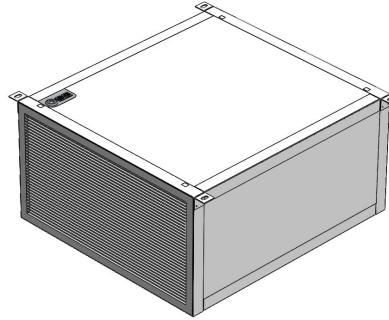
(Available for all HTM types)



Note: Fixing rail to be located no less than 700mm from the front face for standard systems, and no less than 900mm for LTHW type systems.

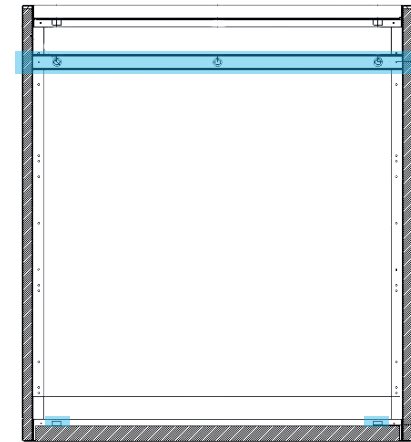
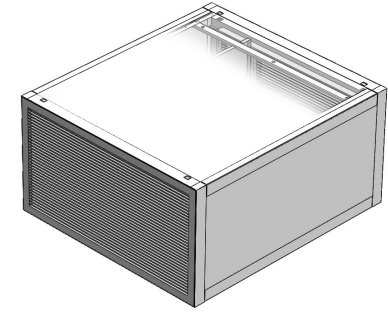
Corner Brackets

(Available only for HTM F, FS, F-H and FS-H types)



Fixing Bar

(Available only for HTM F and F-H types)



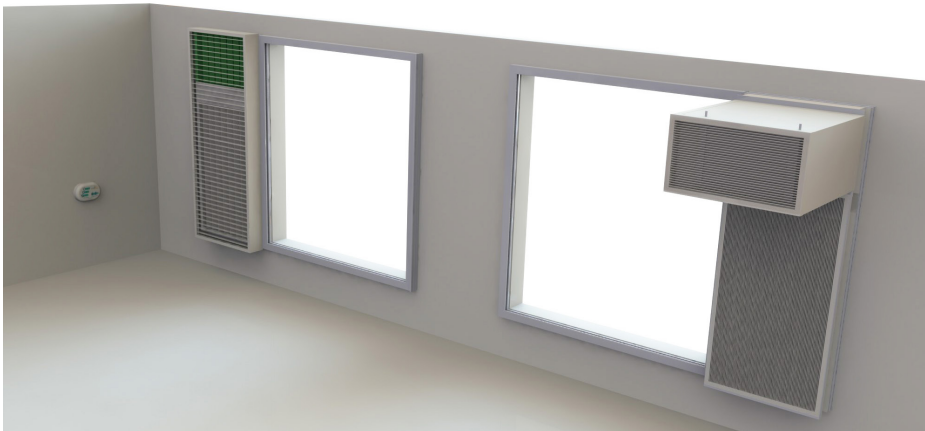


Ventsair

Monodraught's HTM is designed to work with and control a range of Ventsair Façade Ventilation systems (VAF) which are often used in lieu of a manual window. These systems typically comprise of an external aluminium louvre, a high specification volume control damper and an internal grille, and are used to provide controlled fresh air during the day and secure night time cooling via cross flow and stack ventilation principles.

Depending on their location within a room, they can assist in stack, cross flow and single sided flow ventilation. The HTM will automatically control these additional vents and the vents can also be opened and closed manually via the system's control panel.

The system can be specified to suit glazed frames or fitted with a flange to suit wall openings.

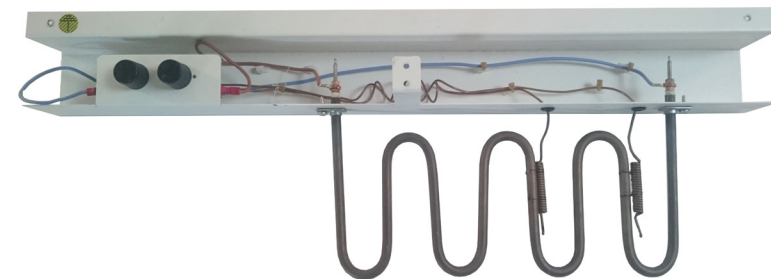


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ADDITIONAL FEATURES

Heater Module

HTM F systems are available with a 1kW Electric Heater Module. The module is installed within the system's air path and is designed to warm the incoming fresh air to ensure a minimum supply temperature is achieved when external temperatures drop below -3°C . The module is installed in conjunction with a relay linked flow switch and twin thermal cut outs.



 Monodraught

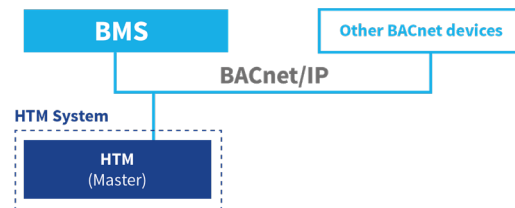
BACnet

Monodraught's HTM systems are available with an additional BACnet module that allows the system to be installed on to a BACnet/IP network and display a number of systems variables.

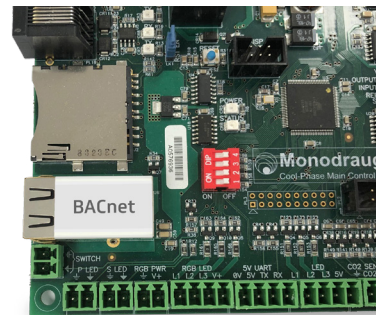
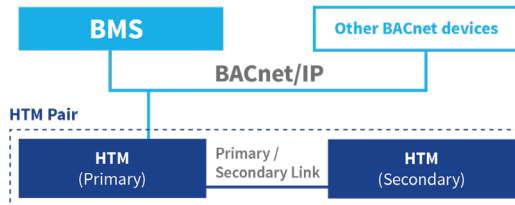
The BACnet module plugs into the Control Board and interfaces with the on-board micro-controller to provide BACnet visibility of the HTM system.

The BACnet module requires an RJ45 Ethernet connection (by others) from the BACnet/ IP network to each Primary HTM unit.

- HTM F, FT, F-H and FT-H types



- HTM FS and FS-H types



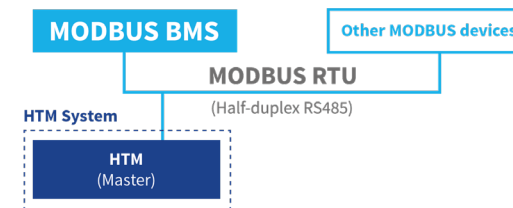
Modbus

The MODBUS module allows an HTM system to be installed on to a MODBUS RTU network and make visible a number of system variables to the master MODBUS device.

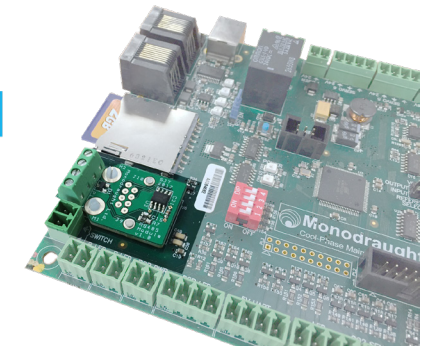
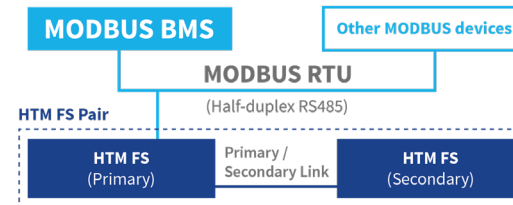
Each system has its own unique MODBUS number allocated 1 to 247 within the configuration header of the HTM.

The MODBUS module requires a 1.5 or 2 pair shielded cable daisy chained between each of the Modbus modules located in the Master units. Cable is to be supplied and installed by others.

- HTM F, FT, F-H and FT-H types



- HTM FS and FS-H types



Attenuation Module

HTM systems are available with an additional Attenuation module. The module is installed between the HTM system and the external façade to reduce noise break-in and noise break-out. This is especially useful when installing a system to a façade close to a very busy road or in a residential area.

2 Internal Splitters							
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
6	5.8	8.7	14.7	21.8	23.5	27.1	29.3
Weighted Sound Reduction Index R_w (C:Ctr) = 19dB							

Attenuation Module Sizes			
	Width (mm)	Height (mm)	Depth (mm)
F	900	500	500
FS	900	300	500
FT	1800	300	500
F-H	900	500	500
FS-H	900	300	500
FT-H	1800	300	500



Filter Module

Monodraught's HTM systems are available with an additional Filter module. The module is installed between the HTM system and the external façade.

The filter module is available with either an EU-G4 or EU-F7 bag filter. It is constructed from a powder coated mild steel frame and specialist acoustic panelling.

Filter Module Sizes			
	Width (mm)	Height (mm)	Depth (mm)
F	900	500	500
FS	900	300	500
FT	1800	300	500
F-H	900	500	500
FS-H	900	300	500
FT-H	1800	300	500



Within the IES-VE software, Monodraught has developed a performance model of the HTM, utilising data that has been collected from component tests and on site monitoring, to produce an accurate representation for modelling.

A typical school has been prepared, considering all aspects of occupancy, solar gain, and sensible and latent heat gains, based around the design requirements stated within the Facilities Output Specification.

Monodraught's standard approach is to consider the total heat gains in the area and provide a natural ventilation strategy to dissipate this heat gain. Furthermore, the aim is to provide sufficient fresh air to the occupants of the area so that indoor air quality and thermal comfort are maintained.

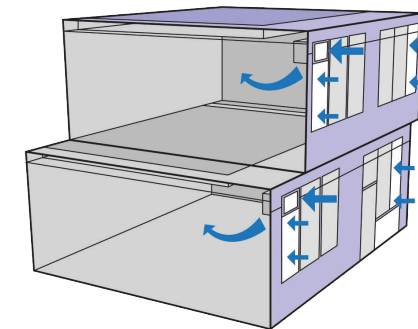
The suitable CIBSE DSY weather file for the project location is utilised to provide the expected local environmental conditions to the building being modelled.

1 Building Construction Inputs

Item		Construction Data
Construction U Values & Thermal Mass (Cm)	Walls	0.26 W/m ² .K, 180 kJ/(m ² .K)
	Floor	0.22 W/m ² .K, 100 kJ/(m ² .K)
	Roof	0.18 W/m ² .K, 180 kJ/(m ² .K)
	Glazing	0.16 W/m ² .K
Glazing g-Value		0.4
Infiltration Rate		0.25 Air Changes per Hour
Floor Area		55 m ²
Internal Room Height		3.1 m
Glazing Area		9.3 m ²
Effective Low Level Opening		0.93 m ²
Heating Set Point		18.0 °C
Occupancy (people)		34 No.
Occupancy Heat Gain		75 W (sensible), 55 W (latent)
Occupied Hours		08:30 - 12:30, 13:30 - 16:00
Lighting		10.0 W/m ²
Equipment		15.0 W/m ²

2 Natural Ventilation Performance

With a combination of the ModelIT Building Modeller and MacroFlo Air Movement modules of IES-VE, Monodraught can demonstrate the natural ventilation performance of the system within the modelled room, during the non-heating season.

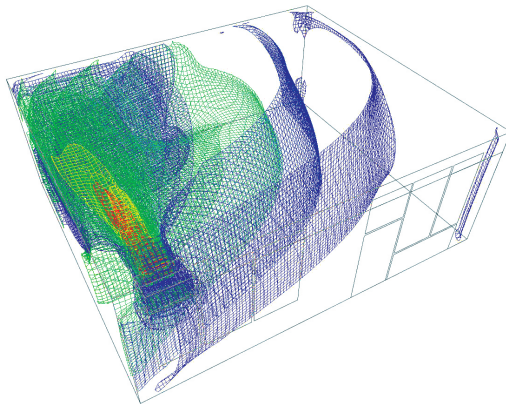


Monodraught's HTM fully automatic control strategy is replicated within the MacroFlo module of IES, to provide a continuously regulated flow of natural ventilation through the system, dependant on the conditions of the internal classroom. During occupied periods of the non-heating season, the HTM system will also work in conjunction with additional openings to the external façade of the room, to provide greater level of ventilation.

3 Hybrid Ventilation Performance

The HTM system is designed to operate in a Hybrid mode, utilising the internal low energy fan, during peak summer day time periods and summer night periods.

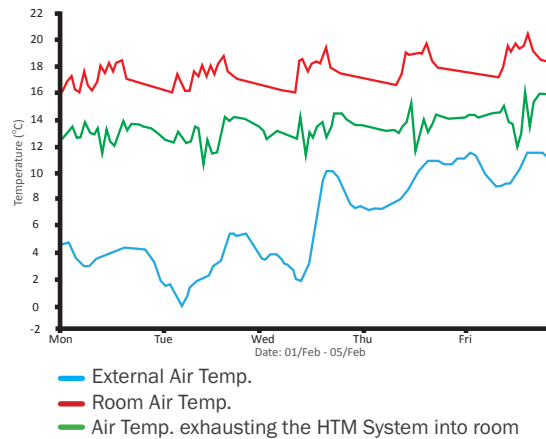
Working within the ApacheHVAC System Simulation Interface module of IES-VE and utilising test data of Monodraught's low energy fan, Monodraught have developed an accurate modulating profile for the fan assisted natural ventilation strategy, to provide a boost of external fresh air through the HTM system and into the classroom.



4 Analysis of Winter Performance

For the HTM operation during the heating season, Monodraught are able to utilise the ApachePro module to demonstrate tempering of the incoming fresh air. The detailed design of Monodraught's system, allowing for the mixing of external air and re-circulated room air, ensures that even with an external air temperature of 0 °C, the HTM system is able to provide a supply air temperature into the room at approximately 13 °C.

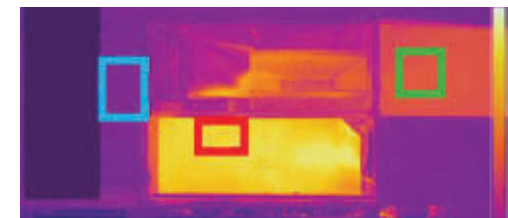
By locating the HTM system at high level within the room, the supply air benefits from further air mixing. Mixed air supply is directed towards the ceiling through angled louvres, entraining additional room air within the air flow and allowing further mixing to take place.



Climate Testing

During December 2013 an HTM system was installed within a climatic test chamber and a special heat sensitive membrane was fitted running through the centre of the system. An insulated chamber fitted below the HTM system was heated to 23 °C to represent an internal room condition.

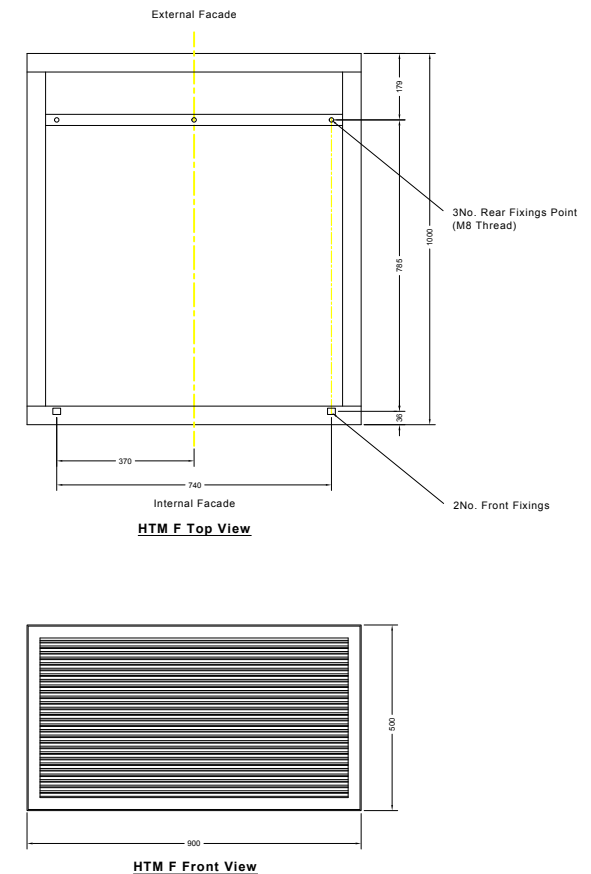
Thermal imaging video cameras were used to record the temperature profile of the mixing of air in real time. The cameras were set to record three zones with averaged temperature readings within each zone: external air temp., internal room air temp. and mixed supply air temp. The system was then set to provide 200 l/s of mixed ventilation air to represent maximum daytime variation rates.



- Zone 1 is recording the external air temperature with an average temp. of 11.7 °C
- Zone 2 is recording an internal room temperature with an average temp. of 22.7 °C
- Zone 3 is recording the mixed air supply temperature with an average temp. of 16.4 °C

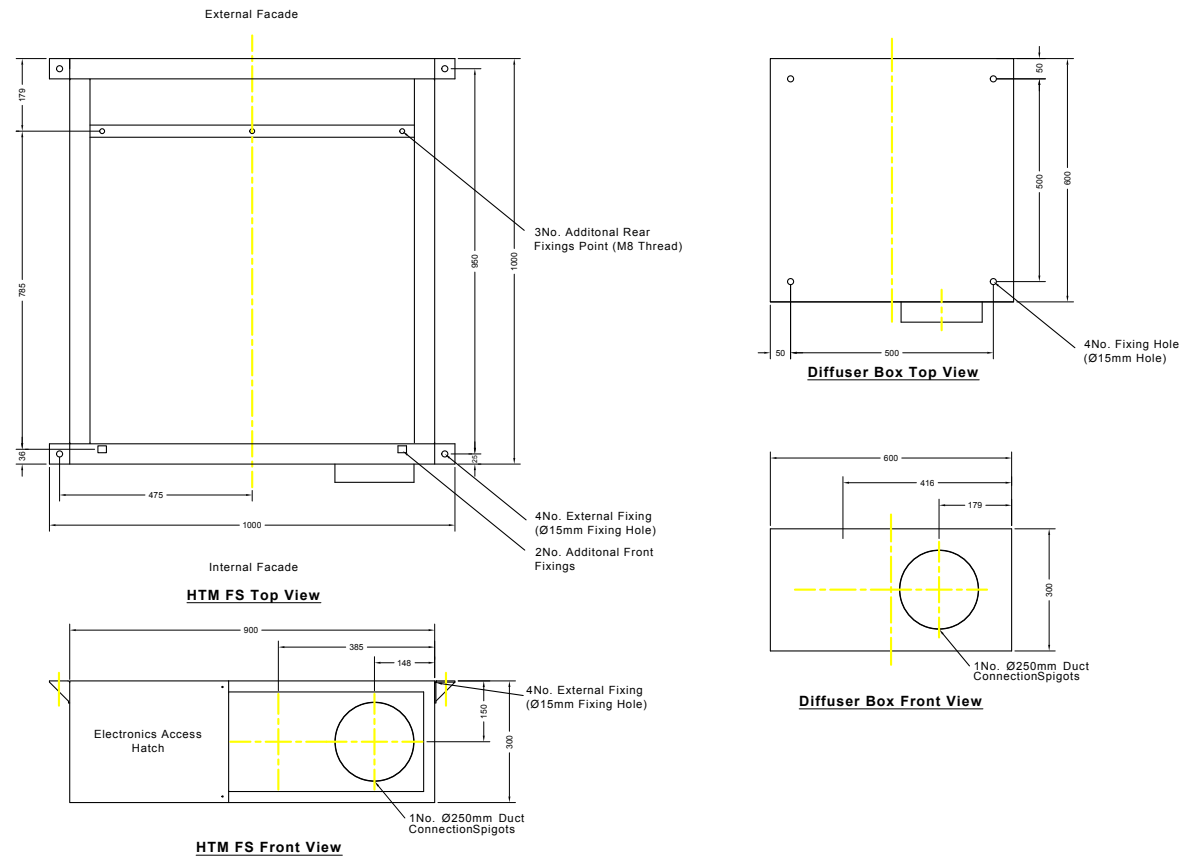
NOTE: The HTM units can weigh up to 70 kg and therefore should always be lifted by a suitable number of people. The unit will be delivered within a protective cardboard box, complete with nylon straps. The box is designed to be lifted with these handles positioned toward the bottom on the box. It is recommended that the unit and its components are positioned close to their final install point to avoid damage.

1. Ensure external louvres and external connection spigot are positioned and installed correctly to Monodraught specifications. Using the correct detail, mark the location for the support fixings and fasten the correct support fixings for the ceiling construction. Note: the external spigot will protrude by 30 mm into the rear of the system.
2. HTM F units: Two Internal Front Fixings must be installed along with 1 or 2 Internal Rear Fixings to ensure the system is suitably balance and supported. HTM FS units: Standard Fixing method is via the 4No. 90° External Fixings, if these are used all four must be utilised. Note: It is also possible to install the HTM FS units using the Additional Front & Rear Fixings, as per the HTM F unit. Should these fixing point be required this must be stipulated at point of order.
3. Cut the required number of M8 drop rods to length for supporting the unit.
4. Position the system as close to the final position as possible and tear the box away from the unit and remove the front grille if installed.
5. Ensure all of the required fixing points are clear of debris.
6. Only if using Internal Rear Fixings: Insert drop rod lengths, into the pre-tapped rear fixing points of the system as required. Wind the length into the system until approximately 20 mm of thread is left protruding. Run 2No. nuts down this length until they are flush with the system.
7. Using a suitable mechanical lift raise the system into position so that the system is clear of the spigot. Once level with the spigot move the system so that the spigot protrudes into the system by 30 mm making sure that the gap is consistent on all edge and that no weight is being exerted onto the spigot. The support fixings should now align with the fixing points.
8. Only if using Internal Rear Fixings: Wind the rear drop rod out of the system and fully into the support fixings until tight. Use the two nuts to lock the drop rod in place.
9. Insert a drop rod through each fixing point being used and attach a washer and followed by two M8 nuts. Wind the drop rods fully into the support fixings until tight and lock with the top nut.
10. Feed a washer and nut onto the bottom of each of the drop rods and wind up until flush with the system. These nuts are then to be wound further to level out the system. Once the system is level, tighten the remaining nut and washer on top of the system to lock it in place.



Ducting Install

1. Connect the Duct Spigot Plate to the HTM FS Supply Spigot.
2. Ensure correct duct length have been supplied and trim to length as necessary.
3. Using the detail mark the location for the support fixings for the Diffuser Box and Ducting and fasten the correct support fixings for the ceiling construction. Ensure the Diffuser will align with the ceiling grid and HTM FS unit.
4. Cut four M8 rod lengths to a suitable length that will allow the Diffuser Box to sit flush with the ceiling raft. Wind a nut onto the end of each drop rod length then wind the drop rods fully into the support fixings until tight and lock into place with the nut.
5. Feed another nut onto the bottom end of each drop rod and wind up by approximately 50 mm.
6. Offer the Diffuser Box up to the drop rods and wind a washer and nut onto each drop rod to support and then level the box. Once the box is level, wind down and tighten the top nuts on top of the Diffuser Box to lock the box in place.
7. Attach flexible ducting to the end of spiral duct length and secure in place with band-clip.
8. Secure the ducting to the ceiling via a suitable fixing method and adjust the ducting to correct height. Slip the duct ends fully over the HTM spigots and draw flexi ducting over the Diffuser Box Spigots, securing at both end with a band clamp.
9. Attached 4-way diffuser.



System Connections

For Monodraught's HTM wiring details, please refer to document "Wiring Details" section. To obtain the correct document, please contact us at: inof@monodraught.com

MULTI-MILLION POUND SCHOOL COMPLEX BENEFITS FROM WIDE RANGE OF MONODRAUGHT VENTILATION SOLUTIONS

- **Sector:** Education
- **Contacts:**
 - **Consultants:** Morgan Sindall
 - **M&E Contractor:** Imtech G&H (Yorks)
 - **End-customer:** Cambridge County Council
 - **Location:** Ely, Cambridgeshire
- **Products Installed:**
 - 16 No. Monodraught WINDCATCHER X-Air 200 Natural Ventilation Systems
 - 4 No. Monodraught WINDCATCHER X-Air 170 Natural Ventilation Systems
 - 3 No. Monodraught WINDCATCHER X-Air 140 Natural Ventilation Systems
 - 4 No. Monodraught WINDCATCHER X-Air 110 Natural Ventilation Systems
 - 48 No. Monodraught HTM f Hybrid Ventilation Systems
 - 1 No. Monodraught HTM FS Hybrid Ventilation System
 - 74 No. Monodraught VENTS AIR Wall Mounted Natural Ventilation Systems

A £37.5m pound school development was recently opened in Ely, Cambridgeshire. Morgan Sindall were appointed to build Littleport Academy in 2016. Littleport Academy includes a primary school, a 3 storey secondary school and a SEN School. It currently accommodates over 650 pupils with room for further growth.





Morgan Sindall and their M&E partner Imtech have successfully achieved their targeted BREEAM “very good” rating for the building, which includes structural insulated panels for thermal efficiency.

Monodraught were specified to provide hybrid and natural ventilation across all three schools and the onsite sport centre including our HTM F and FS systems. These systems were designed specifically to meet the needs of the Priority School Building Programme and EFA regulations.

In addition, our well-established Windcatcher solution provides low energy natural ventilation in spaces such as Sports Halls, dining rooms, staff rooms or reception areas.

We take great pride in the quality of our engineering. Our systems are designed in accordance with our company ethos: innovation, sustainability, reliability and performance. Systems are tested extensively in house and by third party academic and research organisations to ensure that our solutions deliver the best possible results in buildings where the Windcatchers are installed.

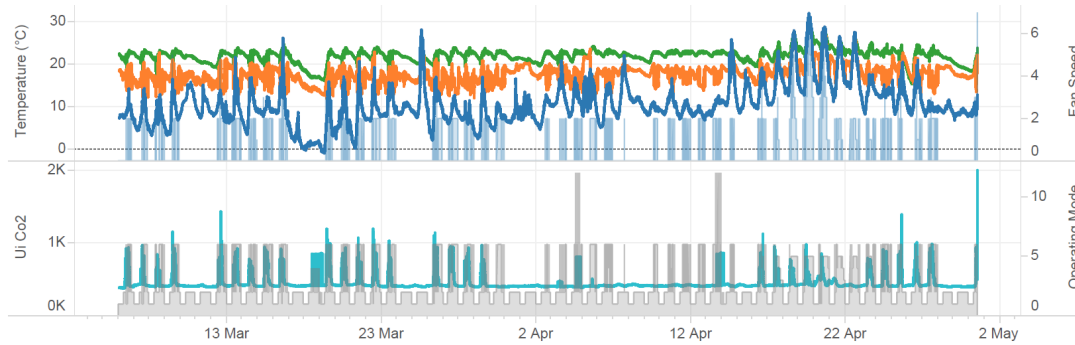
The HTM F and FS systems are designed to provide natural ventilation and hybrid ventilation (incorporating mixed tempered air for winter periods), with secure night time cooling and boosted levels of ventilation during summer.

Our experienced team were able to install these solutions and are on-hand to provide ongoing maintenance and support.

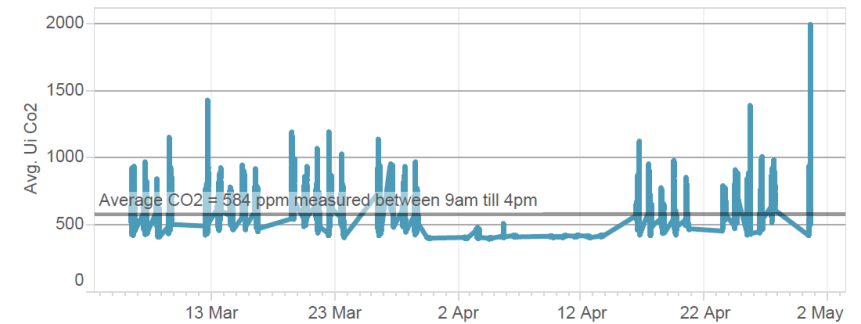
Our data monitoring over the initial period has showed that temperatures and CO₂ levels have remained consistent at an average of 584ppm during occupied hours, with an average mixed supply temperature of 17.7 °C

Performance is continually monitored to allow for improvements in performance and product development.

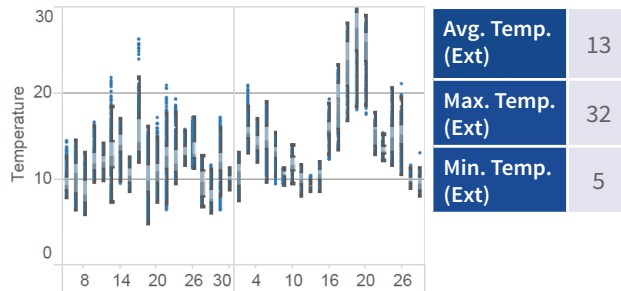
TEMPERATURE AND CO₂ ANALYSIS



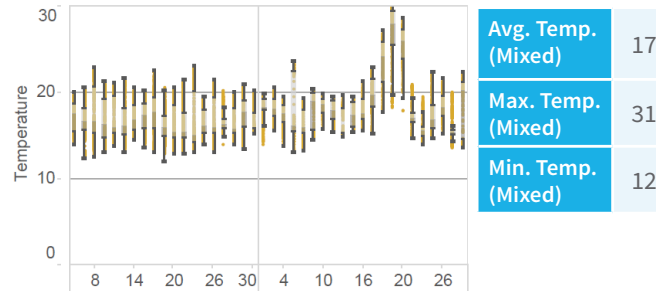
ROOM AIR QUALITY



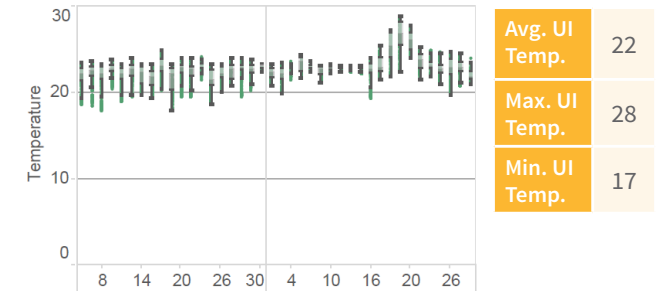
AVERAGE EXTERNAL TEMPERATURE



MIXED SUPPLY TEMPERATURE



ROOM TEMPERATURE





WE ARE WITH YOU ALL THE WAY



R&D and Manufacture



Our large R&D team are continually challenging the boundaries developing new products to ensure customers continue to receive market leading products for which Monodraught are renowned. These products are all manufactured within our High Wycombe factory and as R&D is in the same location as production, then the highest levels of quality can be ensured.

Building Simulation



To help architects and consultants deliver ultra low energy efficient designs, Monodraught and building performance analysis specialist IES have developed Performance Components. Our Project Design Engineers are able to work with you to create the right design for your building.

Installation



We have a team of contract managers who will work with you and your clients from order creation through to delivery and maintenance if required. Our own team of installers work across England and Wales with partner agencies installing in Scotland, Ireland and worldwide. We will visit your site ahead of installation to ensure that everything goes smoothly.

Maintenance



We can provide on-going service and maintenance of our installed products. This helps provide performance data for our customers and structured feedback that can assist product development, resulting in a system running at optimum performance whilst keeping costs to a minimum.



Copperbox Arena - Olympics Handball Stadium



Monodraught



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Buckinghamshire, HP12 3SE



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