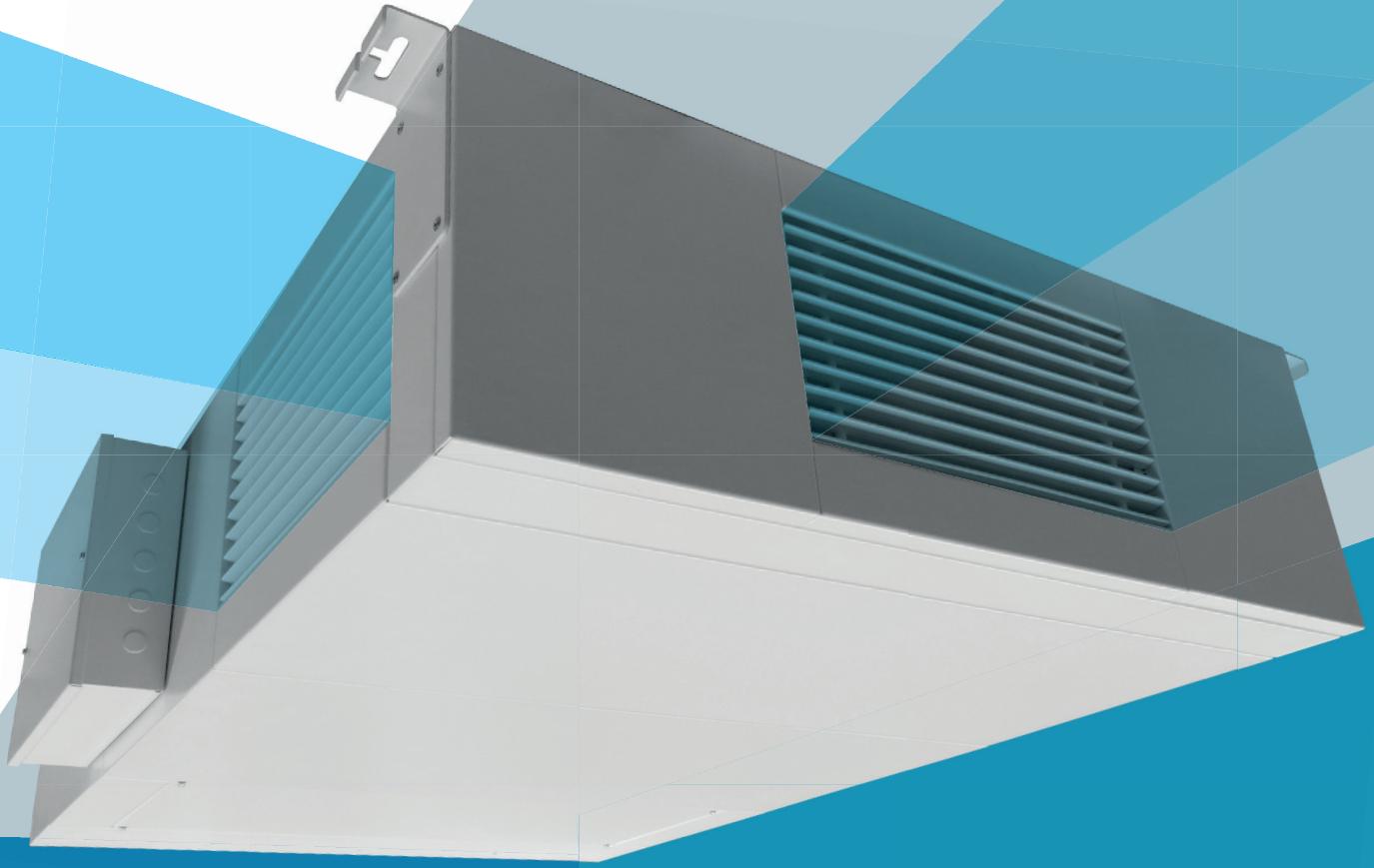


# Mistrale

## Fusion Terminal

PUBLICATION
NATURAL VENT. 1
SEPT 2015



## Features

- Slimline energy efficient ventilation solution
- Standard and high capacity terminals provide 128 or 256 L/s capacity
- Compliant with DoE guidance on ventilation
- Accurate air and temperature control with free cooling and heat recovery
- Full summer evacuation mode with fan boost to meet all BB101 and PBSP overheating requirements
- Includes CO2 override to meet current D of E guidelines
- Operator overrides with easily adjustable set points
- Clear indication of control strategy for users/occupants
- Single wall or façade location with no need for either transfer into corridors or a stack reducing both cost and noise transfer
- Low noise operation to meet current D of E guidelines (BB93)
- Optional glazing panel positioning to avoid builders work
- No ductwork requirement and maintenance free

# FUSION CONTROL TERMINAL

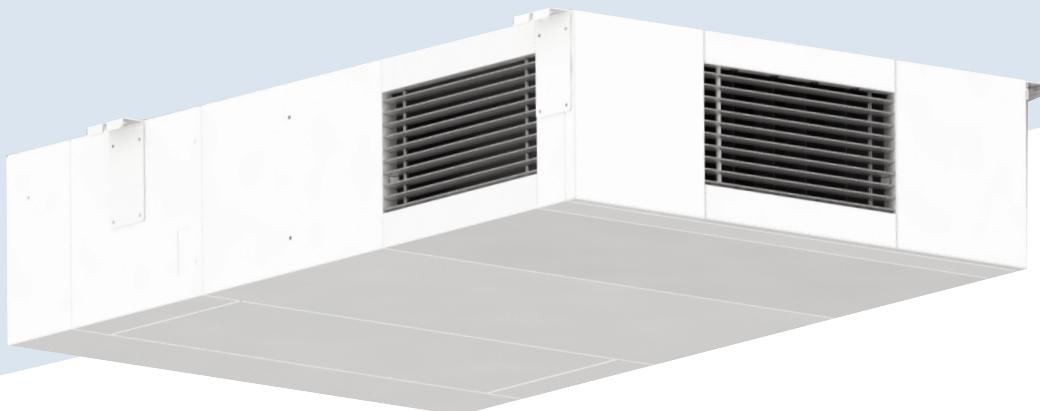
## Energy Efficient Ventilation

Natural ventilation, unlike mechanical fan forced ventilation, simply uses the naturally occurring pressure differential forces of air movement, wind and buoyancy to deliver a steady supply of fresh air for building ventilation and space cooling. In an era where energy conservation is at a premium this sounds ideal.

Indeed Naturally Ventilating a building can offer the best of both worlds combining little or no energy consumption with low capital costs, whilst still providing adequate fresh air and comfort temperature conditions throughout the year. With the plant room also eliminated, services space minimised and lower servicing/maintenance costs Natural Ventilation now makes for one the most practical choices of the day.

Modern buildings in the UK with their low  $u$  values, low air leakage and high heat gains typically have a high cooling requirement. The climate in the UK and many parts of central through Northern Europe is perfectly suited for Natural Ventilation type applications with low extremes of temperature providing an ample supply of fresh cooling air even in a typical summer.

Gilberts Mistrale series offers a range of products designed and engineered to provide a variety of energy efficient cooling and ventilation solutions.



## Fusion Terminal

Incorporating an ultra low power fan our new Mistrale MFS is not in the strictest sense a full natural ventilation solution however, instead, it does allow us to harness this free natural cooling energy source both reliably and efficiently... but with added benefits. One of the latest innovations in ventilation our new design "Fusion" terminal is able to provide an extremely low cost ventilation solution with the added benefits of heat recovery.

Unlike a normal full natural ventilation solution MFS is a dynamic hybrid that includes an ultra low power fan assistance feature able to energise in poor air movement conditions to ensure adequate ventilation at all times. Whilst fan power assistance may seem at odds with a low energy ventilation concept it is important to point out that the fan is there to provide only

occasional support ensuring that the terminal operates at all times to provide design heat recovery and ventilation requirements. And it is truly energy efficient. With a design consumption of just 34kw per year per classroom Mistrale MFS costs less than £5\* per classroom per year yet guarantees full operational ventilation and cooling efficiency at all times.

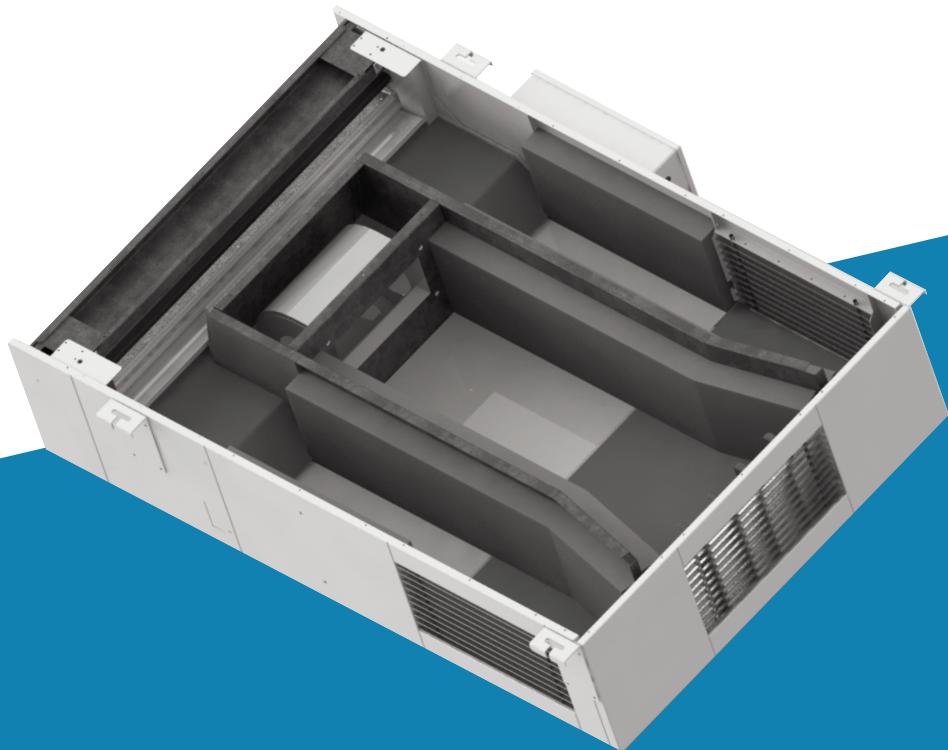
Unlike other designs, Mistrale MFS is a stand alone system providing adequate ventilation and cooling without the need for supportive systems such as opening windows although it can still be integrated with other heating, cooling or ventilation strategy if required.

\* Based upon energy cost of £0.12 per kw/h.



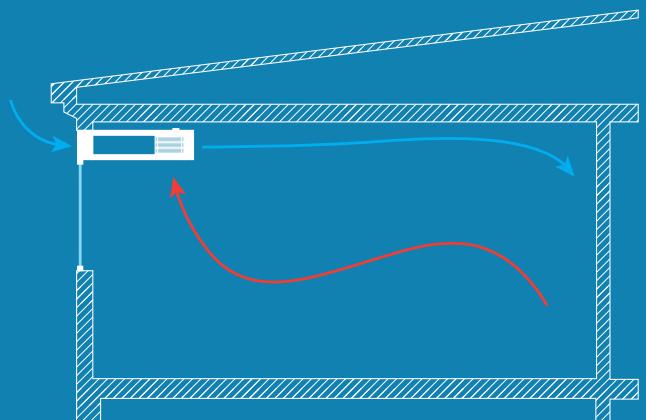
## Design Profile

- Standard slimline terminal MFS/128 (128 L/s)
- High capacity slimline terminal output MFS/256 (256 L/s)
- Highly energy efficient ventilation solution
- Compliant with DoE guidance on ventilation
- Accurate air and temperature control with free cooling and heat recovery
- Full summer evacuation mode with fan boost to meet all BB101 and PBSP overheat requirements
- Includes CO<sub>2</sub> override to meet current D of E guidelines
- Operator overrides with easily adjustable set points
- Clear indication of control strategy for users/occupants
- Single wall or façade location with no need for either transfer into corridors or a stack reducing both cost and noise transfer
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The terminal uses natural air buoyancy with low power fan assistance to deliver a steady supply of fresh air from a single wall/window façade whilst allowing it to blend controlled amounts of mixed extract air for heat recovery.

The concept is simple and was driven by the need to enhance our natural ventilation solutions to include a unit situated in just a single wall or façade but able to control the internal room space accurately all year round irrespective of weather, wind or temperature conditions and with the added benefit of using previously discarded warm air for heat recovery without a heat exchanger.



# FUSION CONTROL TERMINAL

## How does the Mistrale Fusion Terminal work?-

Clearly throughout a typical year both the external and internal environments vary greatly depending upon weather and occupancy factors.

### Normal mode

Normal mode would be during typical winter, autumn or mild weather conditions with temperatures ranging between -5 and +20°C. In these instances standard room heating (radiators etc) would be employed to bring the room up to temperature (around 20°C)

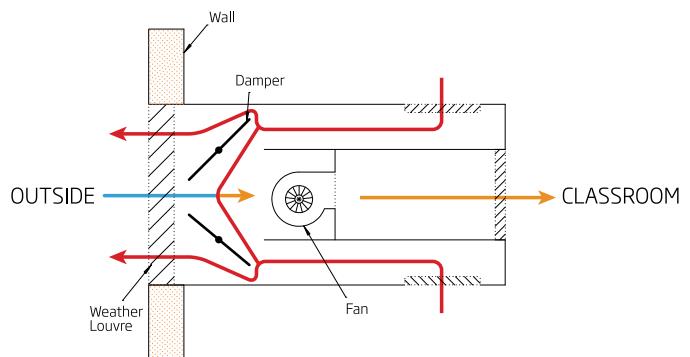
As the room becomes occupied we can expect the heat load to increase and room temperature to rise. At a given set point (typically 22°C) the terminals will come on line and open the fresh air inlet damper allowing cool air to permeate into the room space. The fan is also energised to assist with air distribution ensuring that 2 MFS/128 units can deliver the full provision of 256 litres/sec of fresh air (8 l/sec for a 32 person classroom).

The fan provides the correct air velocity to avoid dumping and to ensure an even distribution of airflow throughout the space.

Whilst fresh air provision must be maintained for comfort conditions we also need to be careful to avoid any differentials between the room and cooling air. To ensure the fresh inlet air stays within these parameters the terminal includes temperature sensors that control a mixing damper which modulates to allow warm exhaust air to be re-circulated. By doing so the terminal can temper the cool air to ensure a maximum temperature differential of 10°C.

The room temperature and ventilation will continue to be controlled automatically within the set point criteria for the room. The terminal includes a CO<sub>2</sub> sensor as well as room temperature sensor and can vary fresh air inlet and recirculation to ensure that maximum CO<sub>2</sub> levels are not breached.

When heat loads are removed, such as during breaks or lunch, the room will be balanced to a neutral status and the unit will go into standby. Fresh air dampers will be closed and the fan switched off. The terminal will remain in standby until either temperature or CO<sub>2</sub> levels exceed their set points

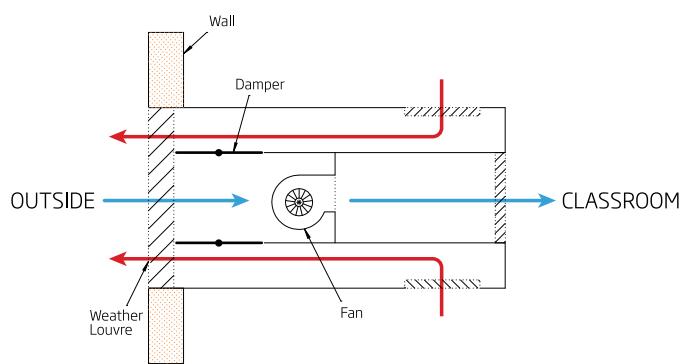


### Summer mode

Outside of normal hours of operation when the set point for the room exceeds 20 degrees the damper will fully open and the fan will cycle providing 100% fresh air cooling for warm air evacuation.

Once room temperature drops below set point (typically 20°C) the fan shuts down and cooling air will be drawn in naturally until room temperature hits the minimum room set back (typically 16°C). The fan will provide additional boost if outside temperatures do not fall sufficiently for natural cooling.

Once the room temperature is achieved the damper will close and seal the building.

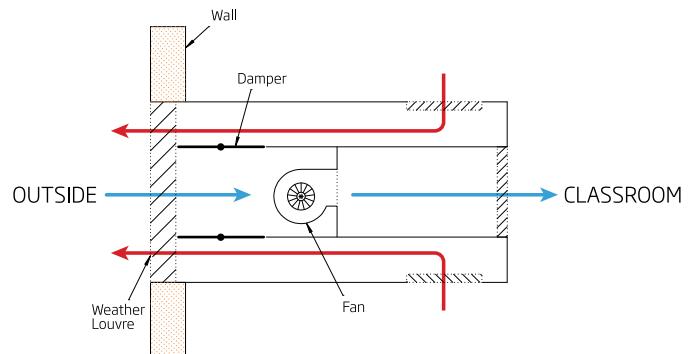




## Night cooling mode

Outside of normal hours of operation when the set point for the room exceeds 20 degrees the damper will fully open and the fan will cycle providing 100% fresh air cooling for warm air evacuation.

Once room temperature drops below set point (typically 20°C) the fan shuts down and cooling air will be drawn in naturally until room temperature hits the minimum room set back (typically 15°C). The fan will provide additional boost if outside temperatures do not fall sufficiently for natural cooling. Once the room temperature is achieved the damper will close and seal the building.



## Department for Education Guidance

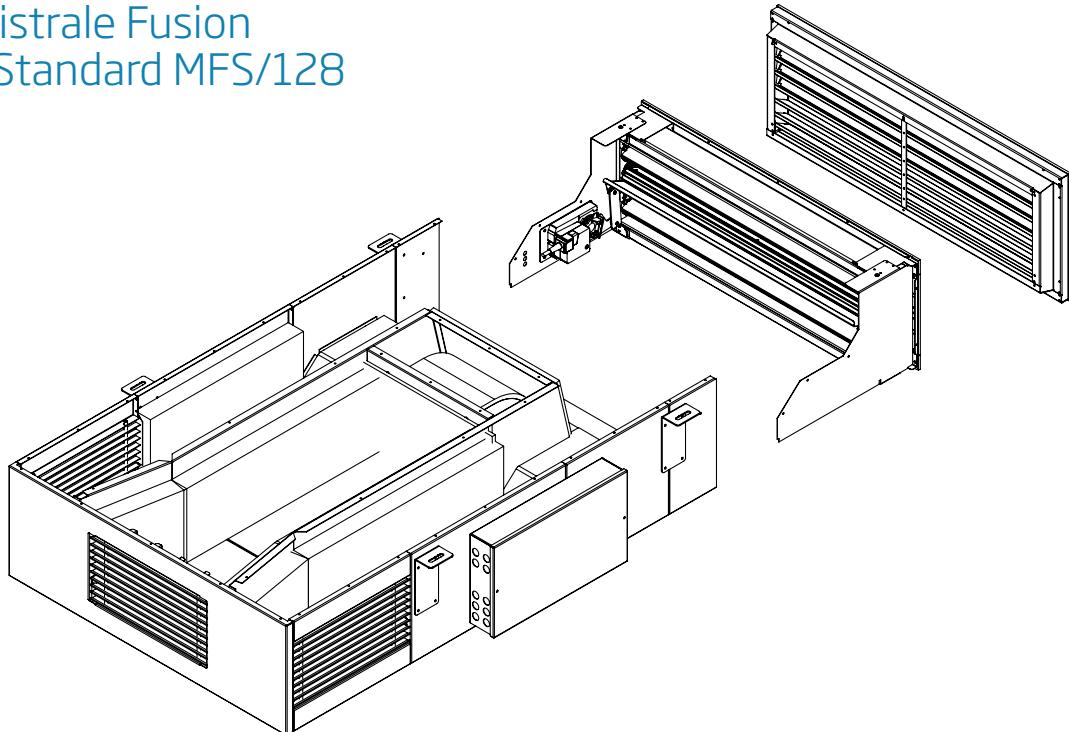
The Department of education has issued detailed guidance on the ventilation, comfort and indoor air quality requirements for school buildings and sets clear performance standards that they should meet. Gilberts design team have worked in close consultation with this framework to ensure that our solutions are proven to meet or exceed these key requirements

## Specification

- **Average internal air temperature is not to exceed 5°C over the average external air temperature.**
- Mistrale design solution is engineered to control the air temperature to the standard with additional fan boost to ensure compliance.
- **Fresh air rate of 5 l/s per person. This is to ensure adequate ventilation and control levels of CO<sub>2</sub>.**
- Each Mistrale MFS terminal is designed to deliver 128 (standard) or 256 (high capacity) litres per sec of fresh air... naturally. The eco boost fan will cycle to ensure this demand is met under all climatic and temperature conditions.
- **Ventilation design should where possible recover heat gains from occupancy.**
- By design Mistrale MFS includes heat recovery where warm re-circulated air is recycled to improve efficiency and performance.
- **Noise levels in a standard classroom should be at or below 35 dBA.**
- Mistrale MFS is designed to operate under silent natural ventilation conditions with occasional eco fan boost. Running at low voltage and speed the fan operation is quiet with acoustic insulation in the terminal casing ensuring whisper quiet operation.
- **Staff override control of ventilation should be provided to provide extra control over noise and ventilation levels.**
- Mistrale terminals and controls feature a simple and clear override for occupant control.

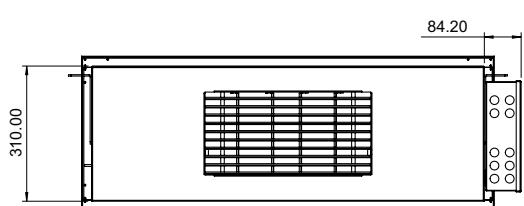
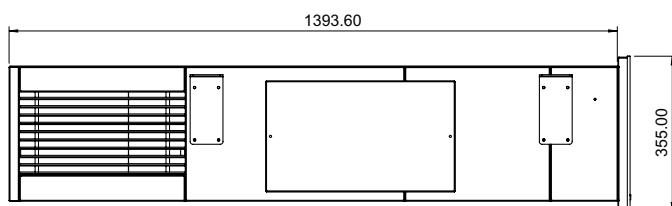
# FUSION CONTROL TERMINAL

Mistrale Fusion  
- Standard MFS/128

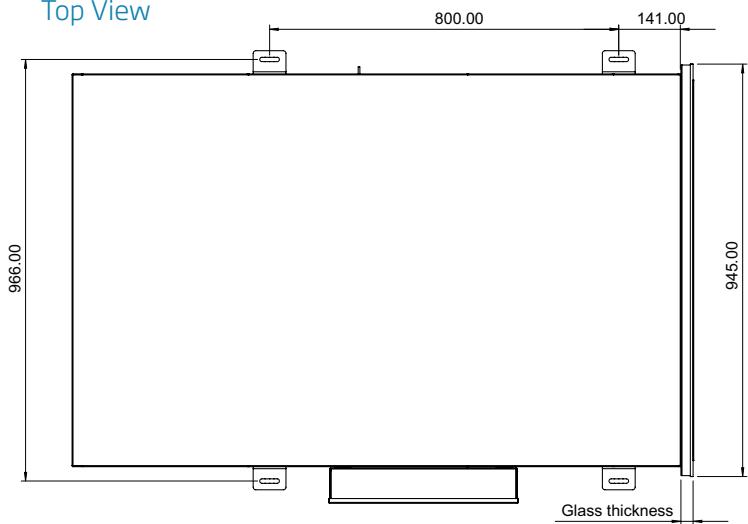


Side Elevation

Front Elevation

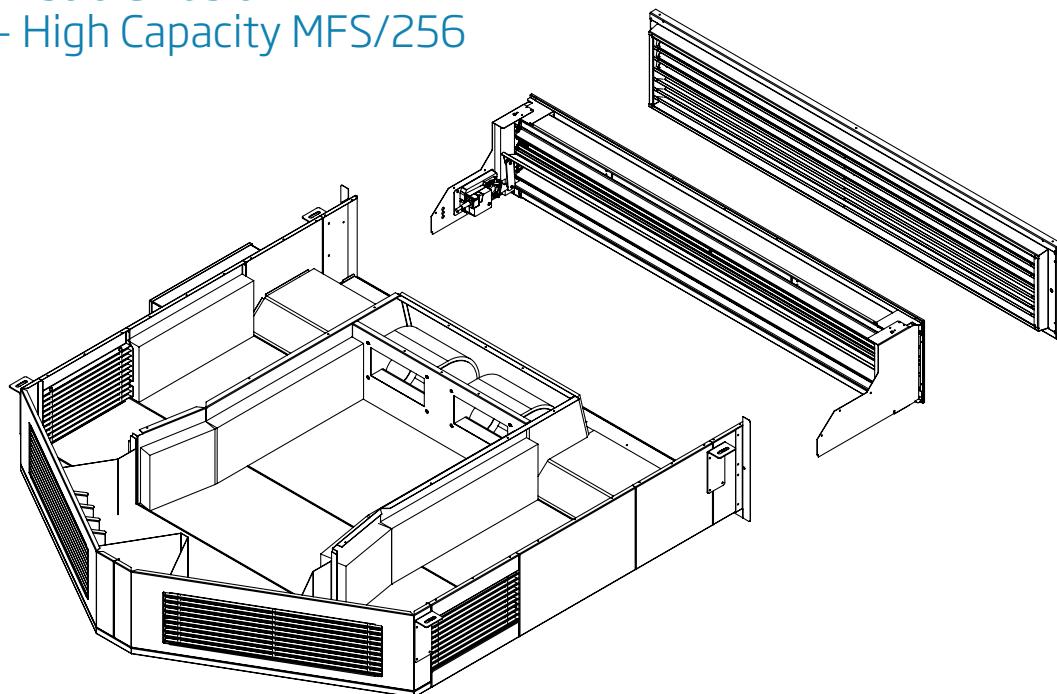


Top View



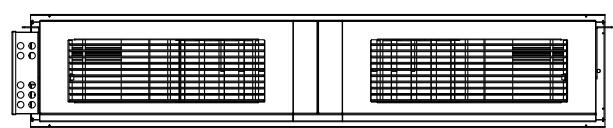
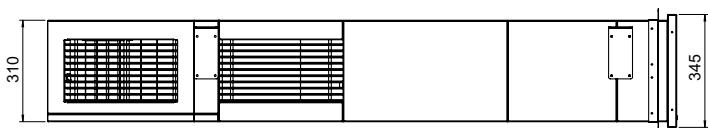


## Mistrale Fusion - High Capacity MFS/256

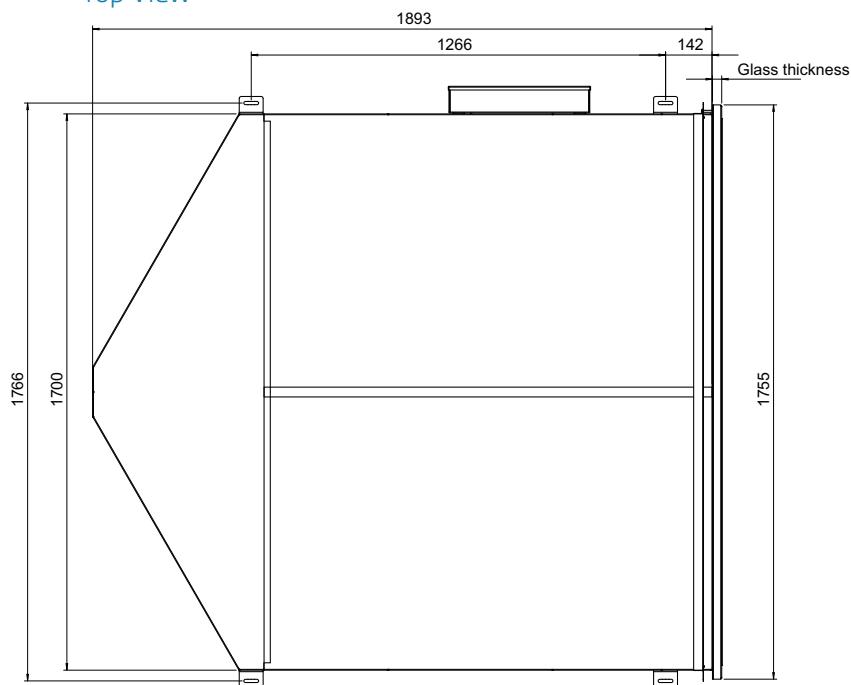


Side Elevation

Front Elevation



Top View



# FUSION CONTROL TERMINAL

## Fan Efficiency

The integral high efficiency fans can deliver air volumes of 128 L/s for the MFS/128 or 256 L/s for the MFS/256 with the acoustic insulation ensuring that noise levels meet classroom use requirements (typically less than 35 dbA)

### SFP value is just 0.09

In terms of energy the fan consumption for the MFS Terminals is less than 23 Watts per classroom. This equates to less than £5 per annum per classroom during occupied times at current electricity costs (typ 0.12p per kw/h).



## Performance Validation

Mistrale MFS has undergone a rigorous and exacting test regime to validate its performance

The test program was developed within Gilberts own R&D Test Facility which has a raised floor and a fully glazed wall adjacent to a cold space area which can be heated or cooled down to minus 5°C. This space can therefore effectively simulate both outside winter and summer conditions.

The MFS units were installed at ceiling height into openings through the wall into the cold space. The Classroom comfort conditions are maintained via dampers within the MFS units mixing room air with conditioned outside air.

All tests and measurements were carried out using certified and calibrated instrumentation

### Results

A series of temperature and velocity readings were recorded at designated positions (see results table template below).

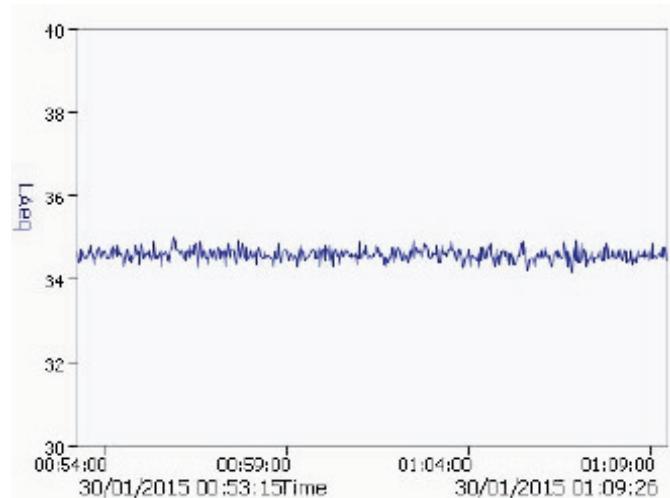
- All environmental conditions were satisfied.
- Room temperature set point maintained.
- Velocities within the occupied zone were less than 0.25M/s in all conditions.
- Even distribution of temperatures within the occupied zone and within 2 degrees of set point.
- Excellent mixing of air within the room with no “dead zones”.



## Class leading quiet Operation

### Internal Noise

Mistrale is very quiet in operation even with fan running. At a total air volume of 270l/s (over 8 l/s per occupant) noise levels below indicate compliance with the required 35 dbA standard classroom limit.



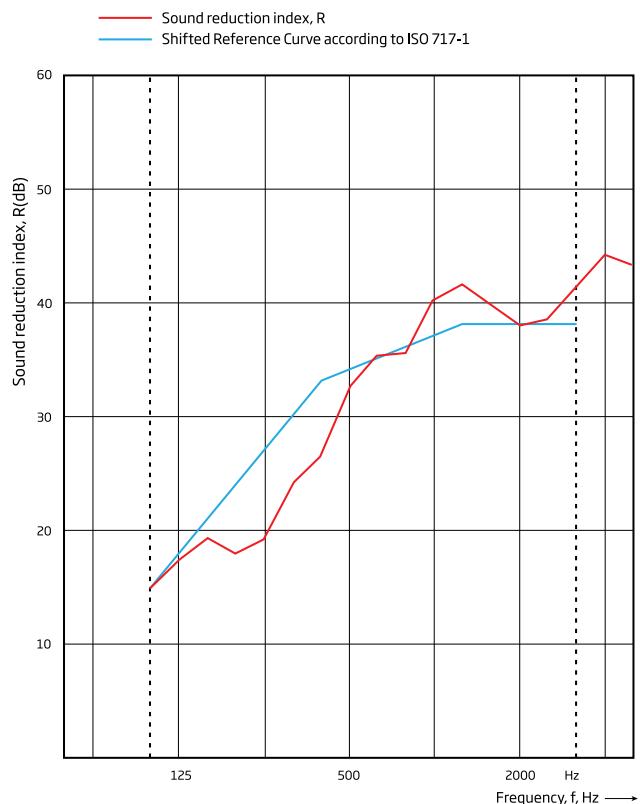
### External Noise

Further noise tests have also been carried out at a UKAS laboratory (Salford University) to determine the sound absorption capabilities of the terminal for outside noise (general and traffic). to determine the units will not break past the 35dbA general classroom criteria.

Noise reduction values according to BS EN ISO 10140-2 are detailed below:

With the damper full open Mistrale MFS achieved a noise reduction level of 34Rw and a Ctr (traffic weighted value) of 27.-

If a 60dBA non traffic noise was the source a 34 DB reduction would apply with noise reduced to 26dbA in the room space. On this basis if average outside traffic noise source was 60dbA the noise reduction through the unit would lower room noise ingress to just 33dbA.



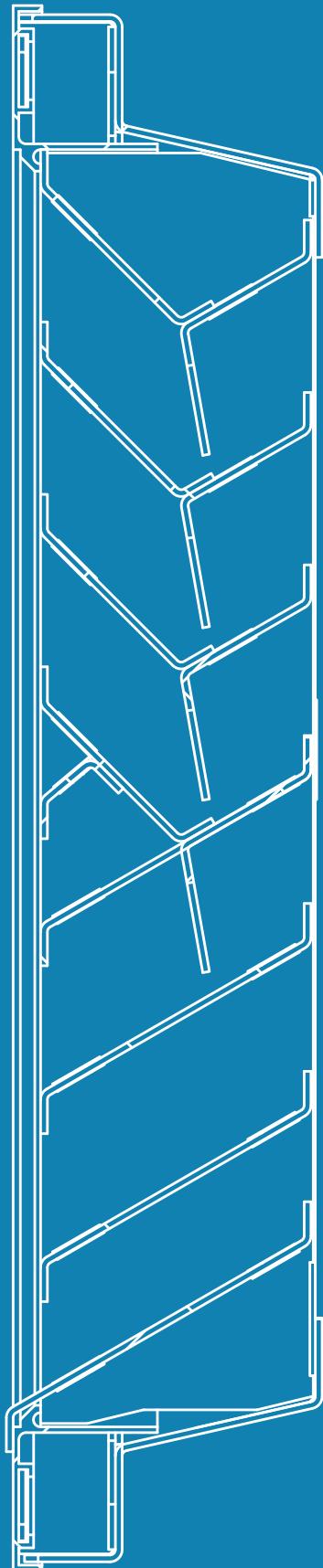
# FUSION CONTROL TERMINAL

## CROSS CONTAMINATION

The design of Mistrale MFS means that cross contamination (where stale air enters the supply/fresh airstream) is eliminated.

The terminal includes separate internal supply and return air chambers which connect to a specially design external louvre. In turn the louvre is profiled and segregated to exhaust warm stale air through the top section and draw cool fresh air through the lower section.

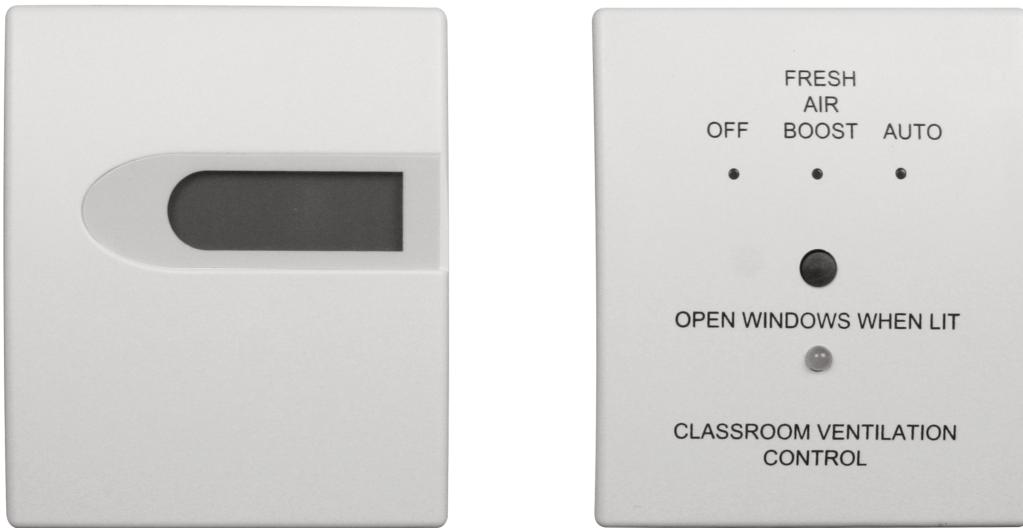
This unique design feature ensures that air transference is not possible.





## Mistrale MCi Room Controller

The MCi Room Controller has been designed to offer an effective, efficient and user friendly control solution for our Mistrale Natural ventilation solutions.



MCi can be used as a standalone unit or networked to give individual room control using global common signals such as wind, rain and security closing.

Set within a small attractive wall-mounted panel, the Controller includes integrated sensors, switches and a backlit LCD display that provides the user with the a wide choice of features without the need for separate sensors within the room:

- CO2 monitoring and level display.
- Temperature monitoring and level display.
- Humidity monitoring and level display (requires additional sensor).
- User control via inbuilt switches with ten increments of operation.
- Output signal for external devices such as central heating control etc.
- Lock out function to prevent misuse.
- Time clock for strategy and security closing.
- Vent position/open output signal.
- Fresh air 'morning start' setting.
- Intuitive menu for setpoint adjustment via a security dongle.
- Continuous data logging for performance analysis where a Modbus network is available.

The system will control room CO2 levels to a variable profile ensuring that Indoor Air Quality is always maintained. The bespoke temperature control strategy will modulate and increase the ventilation rate before internal temperatures escalate and become uncontrollable.

Including multiple temperature control strategies based on external temperature, and occupancy MCi will provide appropriate temperature control throughout the year. A night purge cooling strategy is also included for a fresh morning start.

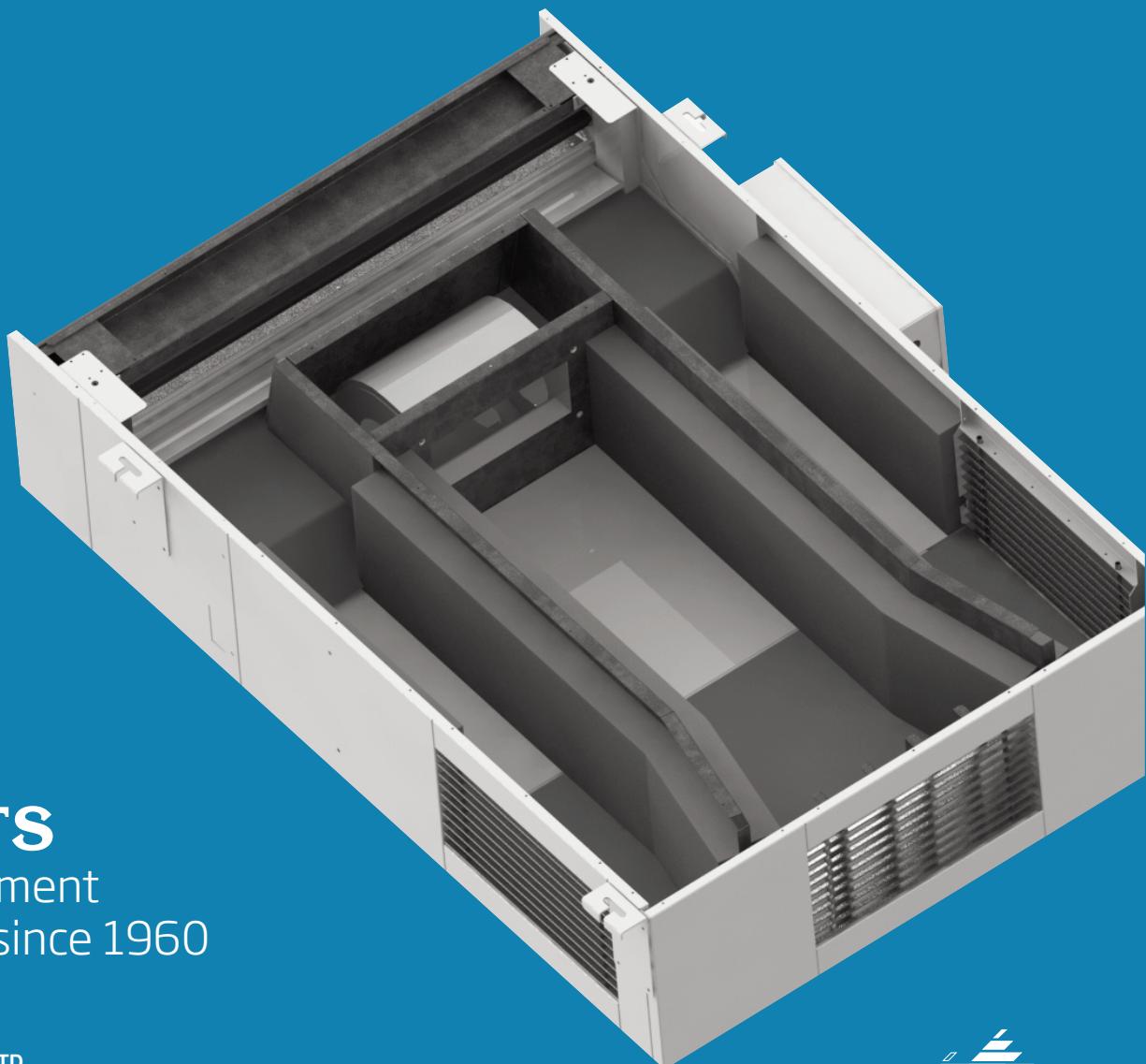


The new MFS Fusion terminal offers an alternative departure from traditional full natural ventilation solutions. Its hybrid mode of operation provides all of the benefits of natural ventilation but with the added advantages of both heat recovery and guaranteed air movement performance.

The MFS is a stand alone system that does not rely on any supportive systems such as opening windows (though the solution will work with these) the low cost fan energy consumption ensure that the benefits derived far outweigh the low energy running costs.

Where natural ventilation is the design ethos Mistrale MFS is a purpose designed solution specifically tailored and engineered as a full natural ventilation alternative. Modular in design it will fit easily and conveniently into the building structure

For selection and technical assistance please contact our Natural ventilation team



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