MISTRALE FUSION

Dynamic Hybrid Ventilation
Heat Recovery & Natural Ventilation

Publication | Natural Vent 2 | April 2023

ZERO CARBON EMISSIONS

MFS-HR

Solution Benefits

- Nett Zero Future
- DFE Output Specification
- BB101 Ventilation Compliant
- BB93 Acoustic Compliant
- TM52 Comfort Compliant
- Up to 75% Heat Recovery

GILBERTS

Pure and Hybrid Natural Ventilation

With climate change an established and worrying fact the world is now rushing to meet a target of Net Carbon Zero. Effectively we reach net zero when the amount of carbon dioxide that we add is no more than the amount taken away. This is not only a legal target for 2050, as set out by the Paris agreement, but also a great aspirational goal that is being adopted by responsible businesses all across the globe

Over the next 3 decades what we do to get to net zero will have a major impact on the world we live in.

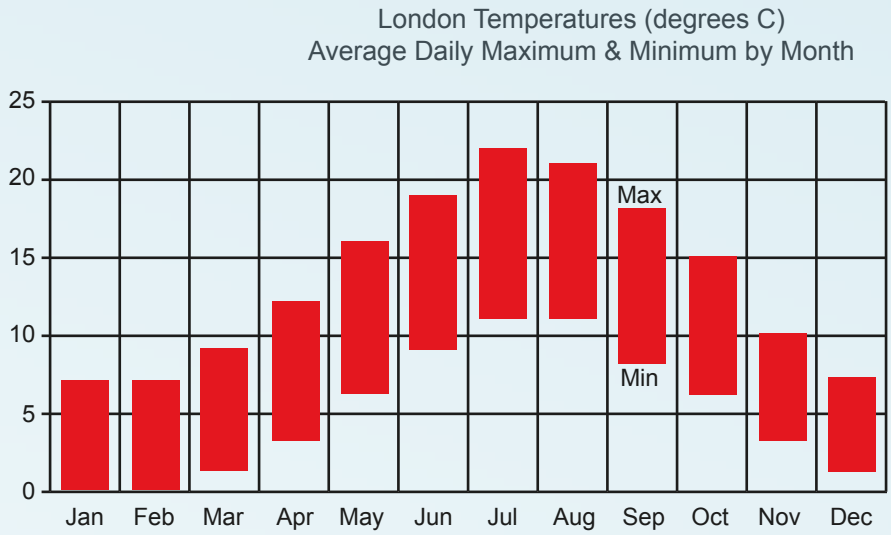
Together it is believed that building and construction are responsible for 39% of all carbon emissions in the world, with operational emissions (from energy used to heat, cool and light buildings) accounting for 28%. Reducing energy consumption in buildings has therefore become a key target.

Whilst recognising this we also understand the contrasting need to provide a natural healthy indoor environment. With air conditioning a key energy consumer in buildings moving away from mechanical driven systems is an understandable and admirable goal. The DFE recognise that natural ventilation has a key role to play in meeting future energy goals in schools combining, as it does, little or no energy consumption with a clean, comfortable and healthy working and learning environment.

The Practicalities: Weather Profile

If we want to move away from energy driven systems perhaps, unexpectedly the great British climate works to our advantage. With a mild maritime climate warmed by the gulf stream Britain experiences cool, wet winters and warm, wet summers. It rarely features the extremes of heat or cold that may be common in other climates.

This limited variation in extremes serves a beneficial purpose enabling us to reduce our need and dependence for cooling and ventilation on mechanical solutions.



Natural Ventilation, Hybrid Ventilation and Heat Recovery

Natural 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.

Hybrid Natural Ventilation Solutions (MFS)

Hybrid natural ventilation solutions have been available for some time now and marked a departure from pure natural ventilation solutions. A hybrid solution would typically be based on single side natural ventilation unit that also included an ultra low power fan. Although not in the strictest sense a full natural ventilation solution these hybrid modes allowed us to harness free natural cooling energy source reliably and efficiently… but with added benefits. Unlike a normal full natural ventilation solution hybrids include 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 ventilation requirements. It ensures adequate ventilation levels are maintained irrespective of external conditions And hybrids are truly energy efficient. With a design consumption of just 34kw per year per classroom our Mistrale MFS (see separate brochure) is a low energy solution that 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 strategies if required.

Hybrid Natural Ventilation Solution with Heat Recovery (MFS-HR)

As we are all aware the world is aiming for net zero by 2050 achieved by cutting energy consumption and reducing our carbon emissions. For our part this will involve adopting different building design and incorporating new energy efficient design technologies. In the built environment we have an important part to play since it is estimated that buildings are responsible for around 25% of all greenhouse emissions.

Natural ventilation and hybrid solutions have supported us so far however in order to meet these challenging energy reduction goals, and for schools in particular to meet the DFE output specification, we now require an even more sophisticated approach that includes heat recovery

Key Objectives - School Output Specification

1. Reduce Annual Energy Consumption
2. Optimise for mixed mode operation
3. Contain within one unit, allowing natural ventilation
4. Remove air circulation (COVID safe)
5. Reduce carbon footprint

Our solution is here with our latest design, MFS-HR. A new Mistrale solution we have developed that offers all the benefits of hybrid natural ventilation but also now provides up to 75% heat recovery in the cooler winter ranges.

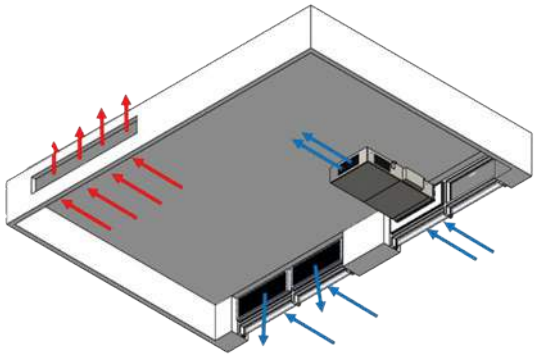
MFS-HR builds upon the framework of advantages provided by our standard MFS fusion unit but now includes a heat exchanger core that enables the unit to recover large volumes of heat from the occupied zone. Indeed, by incorporating two low energy fans and actuators MFS-HR provides numerous pathways that enable a range of cooling, heating and heat recovery modes.

In basic natural ventilation mode MFS-HR provides free natural cooling during the warmer months using the natural buoyancy of air movement through the occupied zone. On occasions where natural air movement alone is insufficient to meet air quality or air change demands low energy fans are included which operate only when necessary to maintain required ventilation and temperature levels. Additional cooling can be provided with an optional cooling coil.

During the cooler months MFS-HR continues to naturally ventilate ensuring adequate ventilation rates and air changes per hour to meet the latest DFE guidelines. MFS-HR also includes the option of fitting a heating coil enabling the unit to not only ventilate but also provide for any space heating needs ranging from rapid early morning warm up to full space heating demands.

The real advantage is that MFS-HR also includes a heat recovery unit that, dependent on operational strategy and parameters, can provide impressive levels of up to 75% heat recovery.

Up to 75 % of wasted heat from the occupied zone can be captured and re-used by our MFS-HR solution.



Key Features

- Multi functional hybrid design, contained within a single unit.
- Reduces annual energy consumption and carbon footprint
- Optimised for mixed mode operation
- Removes air recirculation [Covid safe]
- Fully compliant with guidance and regulations from the DFE Output Specification

Key Benefits

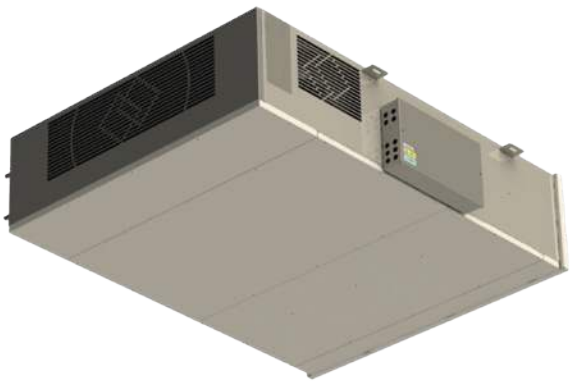
- Maximum airflow 484 litres/second
- Up to 75% heat recovery
- Up to 4kw heating
- Up to 2kw cooling
- Flow rate in Heat recovery mode 337 litres/second
- Flow Rate night time cooling 484 litres/second
- Noise level less than 35 dBA for standard classrooms and less than 30dBA for SEN classrooms

Mistrale Fusion MFS-HR

Key Features

Casing

Precision laser cut casing, with integral designer air inlets and outlets, manufactured from mild steel with a durable powder coated finish White RAL 9010 20% Gloss as standard. Other colours are available and are easily applied in our modern automated powder coating plant.



Insulation

Our casing is internally lined with various thickness of pyrosorb thermal and acoustic insulation material. This provides a noise reduction of 34RW and when in operation meets the requirements of BB93.

Damper & External Louvre

Dampers are manufactured using robust co-extruded insulated blades with leakage to meet the building requirements of below 3M3/HR/M2 at 50 Pascals. The dampers also provide a significantly low U value of less than 1. Specially designed facade louvres connect to the outside with the upper port carrying warm soiled air out of the building and the lower port to carry the fresh air in

Fans

Low specific fan power integral centrifugal fans combine EC technology to provide an extremely energy efficient solution that can deliver up to 484 L/S per classroom. The fans are run at varying speeds depending upon the room and outside air conditions and will reduce output and therefore energy consumption during its operation in various heat recovery and natural ventilation modes.

Heat Exchanger

Aluminium heat exchangers are used to achieve up to 75% heat recovery where necessary and can operate without the need for heating down to as little as -6 degrees. The high unit performance reduces the need for Photovoltaic roof panels for energy offsetting

Condensate Elimination

In winter MFS-HR draws cold air in from outside (which may be sub-zero) and passes it through an aluminium plate heat exchanger. Warm moist air possibly around 50%RH and 20c is passed through the alternate passage meaning that any surface below 9c will likely form condensation. As with all quality heat recovery units, a condensate tray is therefore provided under the HE module. Provision is also made for condensate collection under the water coil for applications where chilled water circulation is used in summer. The condensate system includes an automatic pump which transfers the condensate through the unit and out through the louvre or into connecting pipework.

Standard Operational Conditions

MFS-HR is designed to satisfy 4 key operational conditions

Winter (out of occupancy)

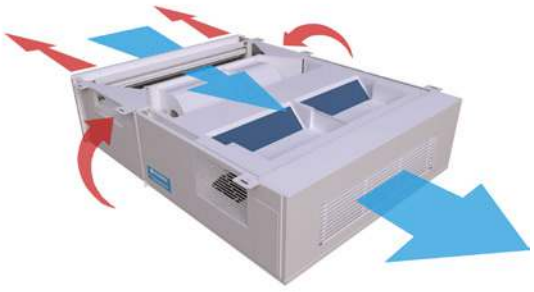
Many heat recovery solutions are remote from the actual façade which means that significant energy can be lost through the connecting ductwork and many may not necessarily contain full shut off dampers. With MFS-HR the primary damper is designed to sit directly adjacent to the façade and be set closed when not in operation. In this position we achieve a u value of less than 1, and a building seal of less than 3m3/hr/m2@50Pa. Building leakage should be tested in this status, and insulation rating should be calculated on this basis.

Night set-back (with heating coil option)

During the night, if the room temperature drops below 14°C the primary damper remains closed and MFS-HR will operate in recirculation mode with maximum airflow. The hot water coil will operate on full flow until the room temperature rises to 16°C at which point the fans turn off and the coil water flow is cut until the room temperature falls to 14°C again before the cycle is repeated.

Night time Cooling

In summer, during the night, the ventilation system will operate to provide full fresh air through the primary damper, running at full speed on both fans. This will take advantage of the cool night time outside air temperatures to reduce the fabric temperature of the building lowering the internal temperature to a minimum 18°C in readiness for the next day.



Morning warm-up (with heating coil option)

If the room air is below 16C, before the occupancy set time the warm-up cycle will be enabled. This means the primary damper will remain closed and both fans will run on high with the water flow rate controlled to bring the room temperature to set point. The heat input required for morning warm up will be dependent on the losses of the building. Once set point is reached, the unit is set back to auto.

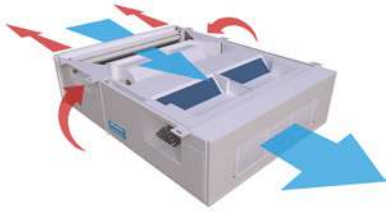
Operational Modes

There are 5 normal modes of operation which include:

- Morning warm up (winter room heating)
- Heat recovery (winter normal operation),
- Natural Ventilation (when units are meeting set-points unit is placed in natural ventilation mode with no fan assistance),
- Heat recovery by-pass (for summer conditions where heat recovery is not required)
- Night time cooling (for summer operation at night to cool the building out of occupation ready for a fresh start to a next summer school day).

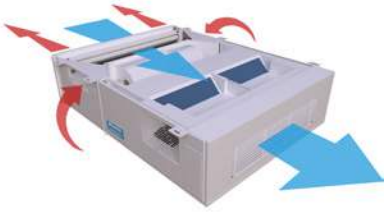
Morning Warm Up Mode

- Room air enters the MFS-HR through the side inlet grilles and passes through the Heat Exchanger into the secondary fans
- Air from the secondary fan is then channelled through to the primary fans
- Air from the primary fans by-passes the heat exchanger passing under it and through the heating coil
- The total airflow passes through the heating coil and into the room



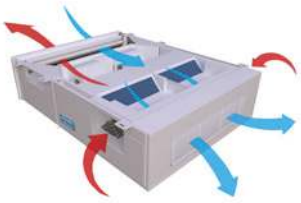
Summer Mode

- Fresh air enters through the lower face of the façade damper
- Fresh air passes into the primary fans through an exhaust air damper
- Fresh air by passes the heat exchanger
- Total fresh air passes through the coil (if fitted) and into the room
- Additional cooling can be provided by pumping cold water through the coil (if fitted)



Night Time Cooling Mode

- Operates in same manner as Heat Recovery Mode
- Allows cool night time air to condition the room
- Reduces classroom temperature to ensure comfortable moving conditions
- Reduces energy required for cooling



Natural Ventilation Mode

- Damper open to outside to allow flow of air in and out of room
- No mechanical fans used in this mode
- Natural ventilation occurs via buoyancy and stack effect

Heat Recovery Mode

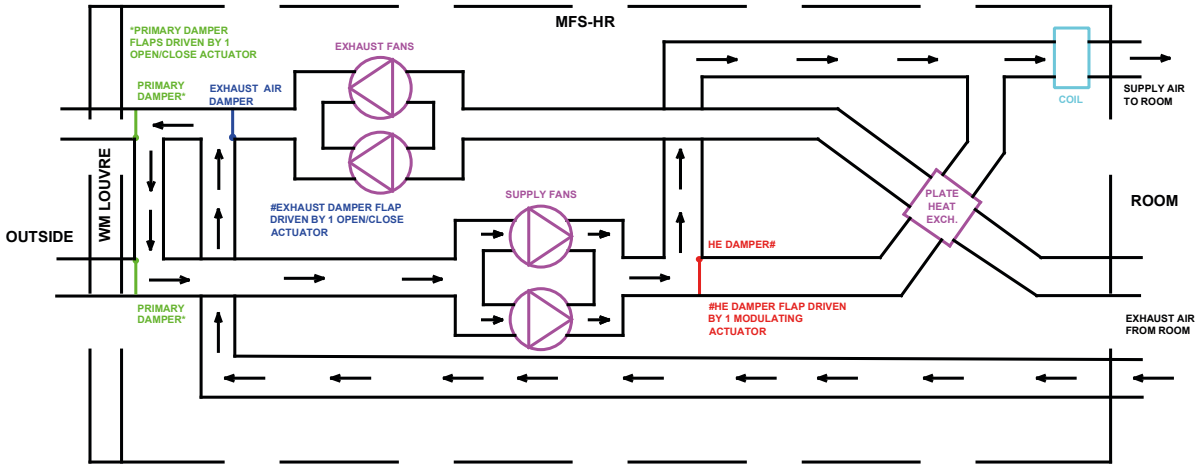
- Fresh air enters and part deflected through heat recovery section
- Room air returned into heat exhaust section and removed via extract fan
- Volume of air through each chamber adjusted to meet room temp + Co2 requirements
- Air volume adjusted to suit amount of heat recovery required

Operational Modes

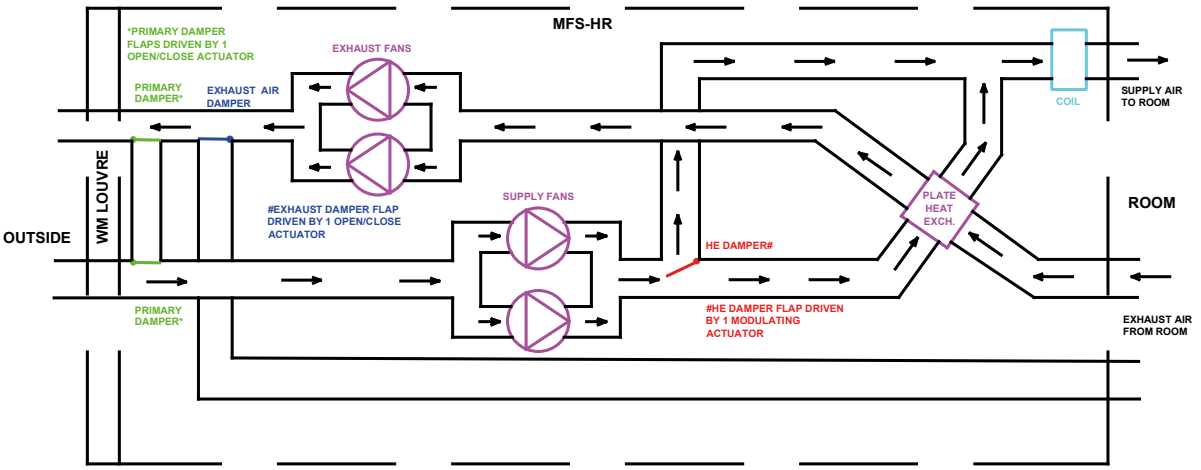
Airflow Map

The airflow maps show the routing of air pathways during morning warm up, winter heat recovery and normal summer conditions. Each mode offers different air pathways routing the air through fan packs, damper arrays, heat exchangers and heating coils to provide a clean uninterrupted and uncontaminated air supply

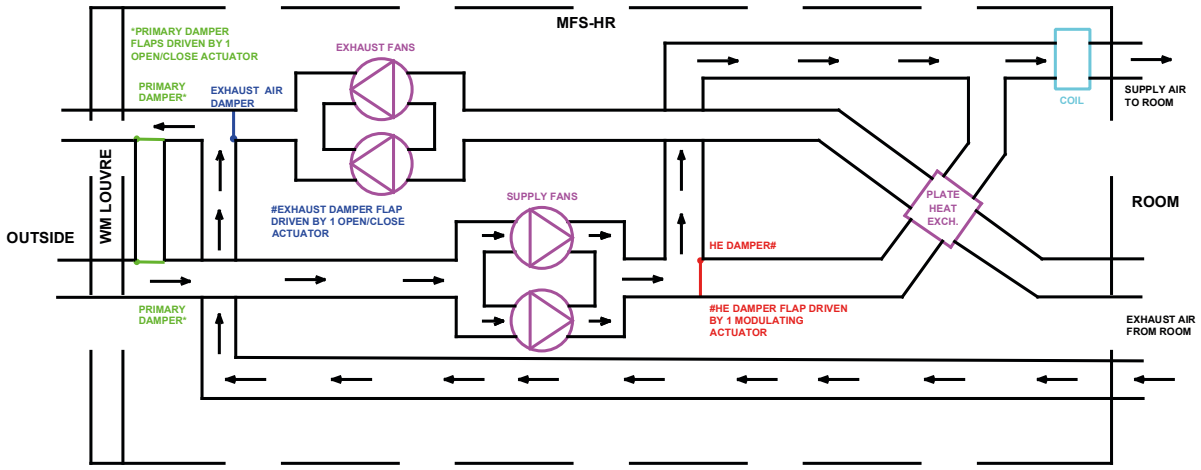
Morning Warm Up



Winter Heat Recovery (in occupancy)



Summer (in occupancy)



Headline Performance – An outstanding 75% Heat Recovery

MFS-HR is a market hybrid leading solution offering an unrivalled 75% of heat recovery.

Impressive numbers, but what does it actually mean and how does this translate into end user benefit?

The following chart illustrates the difference between 42% and 65% heat recovery for a single classroom (Taking min temperature as -5°c outside air temp)

Energy Requirements for typical Classroom with 2 No. MFS-HR1 units

Conditions						Air Swap			Optimum Heat Recovery 65% max								Heat Recovery 42% max							
OAT	Occ. Hrs*	Heat Load -Occ's	Heat Load- Other	Heat Loss- Building	Nett Heat Load	Fresh Air Flow Rate	l/s pp	Energy Lost Through Fresh Air	Energy Recov'd	HR#	Spare Capacity of HR	Suppl. Heating Power	Suppl. Heating Energy	Total Fan Power	SFP	Fan Energy	Energy Recov'd	HR#	Spare Capacity of HR	Suppl. Heating Power	Suppl. Heating Energy	Total Fan Power	SFP	Fan Energy
°C	h /yr	W	W	W	W	l/s	l/s	W	W	%	W	W	kWh	W	W/l/s	kWh	W	%	W	W	kWh	W	W/l/s	kWh
-5	1	2240	800	1300	1740	160	5	5376	3494	65	0	142	0	22.0	0.14	0.0	2258	42	0	1378	1	17.0	0.11	0.0
-4	3	2240	800	1250	1790	160	5	5184	3370	65	0	24	0	22.0	0.14	0.1	2177	42	0	1217	4	17.0	0.11	0.1
-3	1	2240	800	1200	1840	160	5	4992	3152	63	93	0	0	22.0	0.14	0.0	2097	42	0	1055	1	17.0	0.11	0.0
-2	4	2240	800	1150	1890	160	5	4800	2910	61	210	0	0	22.0	0.14	0.1	2016	42	0	894	4	17.0	0.11	0.1
-1	7	2240	800	1100	1940	160	5	4608	2668	58	327	0	0	22.0	0.14	0.2	1935	42	0	733	5	17.0	0.11	0.1
0	22	2240	800	1050	1990	160	5	4416	2426	55	444	0	0	22.0	0.14	0.5	1855	42	0	571	13	17.0	0.11	0.4
1	50	2240	800	1000	2040	160	5	4224	2184	52	562	0	0	22.0	0.14	1.1	1774	42	0	410	20	17.0	0.11	0.9
2	38	2240	800	950	2090	160	5	4032	1942	48	679	0	0	22.0	0.14	0.8	1693	42	0	249	9	17.0	0.11	0.6
3	34	2240	800	900	2140	160	5	3840	1700	44	796	0	0	22.0	0.14	0.7	1613	42	0	87	3	17.0	0.11	0.6
4	43	2240	800	850	2190	160	5	3648	1458	40	913	0	0	22.0	0.14	0.9	1458	40	74	0	0	17.0	0.11	0.7
5	56	2240	800	800	2240	160	5	3456	1216	35	1030	0	0	22.0	0.14	1.2	1216	35	236	0	0	17.0	0.11	1.0
6	58	2240	800	750	2290	160	5	3264	974	30	1148	0	0	22.0	0.14	1.3	974	30	397	0	0	17.0	0.11	1.0
7	70	2240	800	700	2340	160	5	3072	732	24	1265	0	0	22.0	0.14	1.5	732	24	558	0	0	17.0	0.11	1.2
8	95	2240	800	650	2390	160	5	2880	490	17	1382	0	0	22.0	0.14	2.1	490	17	720	0	0	17.0	0.11	1.6
9	111	2240	800	600	2440	160	5	2688	248	9	1499	0	0	22.0	0.14	2.4	248	9	881	0	0	17.0	0.11	1.9
									Max	65			0			13	Max	42			60			10

Percentage of heat recovered

* Gatwick weather file used, hours shown are for occupied hours at temperatures where HR is used

Note, Gatwick is one of the warmer weather files, more northerly ones may indicate a greater saving as 'spare capacity' is used up

	Annual energy requirement to supplement the HR units
	Annual energy requirement to operate the Fans in the HR mode

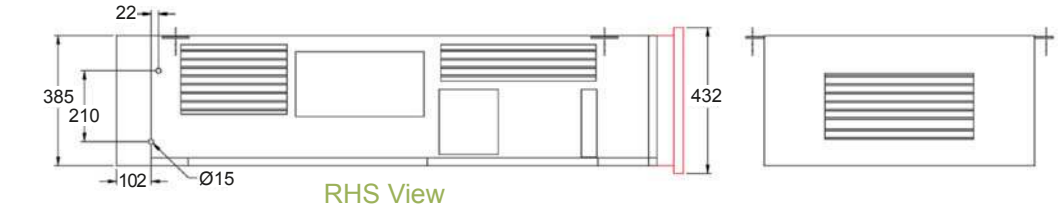
Energy lost through air swap based on 21C room average, and 23C high level where air exhausts

Solutions

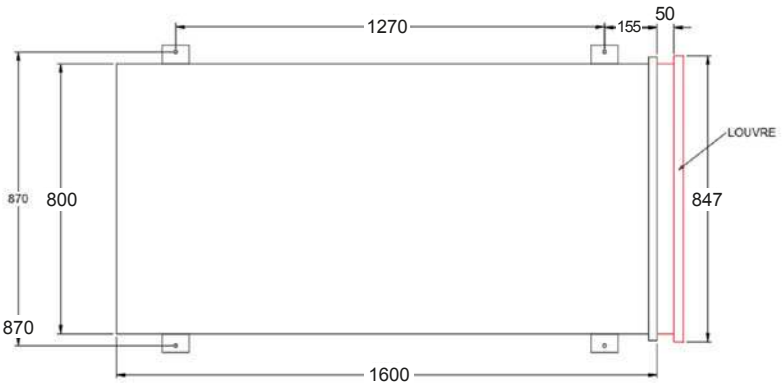
MFS-HR1 Exposed

Standard solution is to fix at high window level and leave units exposed. With a white powder coat the MFS-HR provides a white goods appearance perfectly at home in an office or classroom environment.

Dimensions



RHS View



Top View

Front View

Daytime Performance (2 units per room)

	SPL dBA	Winter Heat Recovery		Summer Bypass		Mean Annual SFP
		Fresh	SFP	Fresh	SFP	
		l/s	w/l/s	l/s	w/l/s	
Coil	30	124	0.27	216	0.16	0.19
	35	158	0.27	261	0.17	0.20
	40	198	0.30	318	0.20	0.23
	45	238	0.36	382	0.25	0.28
No Coil	30	144	0.25	276	0.12	0.16
	35	182	0.25	338	0.13	0.17
	40	222	0.27	406	0.15	0.19
	45	262	0.32	482	0.22	0.25

Sizing Example:

For a classroom with 35 dBA noise requirement and 8 l/s of air per pupil (256 l/s total) the table indicates 261 l/s and 338 l/s can be used to meet the fresh air requirements.

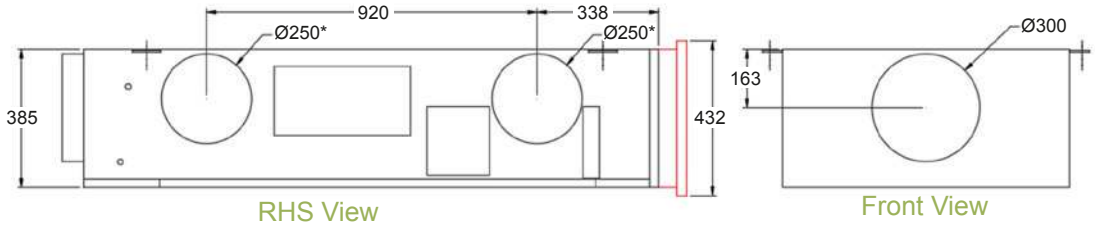
Winter Heat Recovery is always 5 l/s per pupil

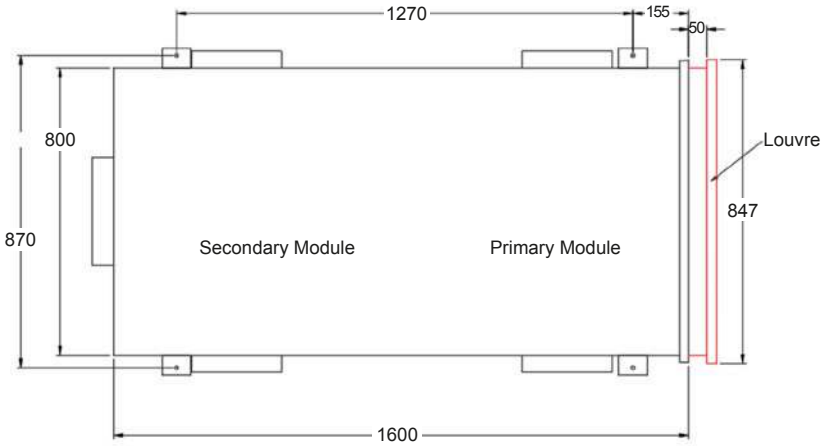
Solutions

MFS-HR1 Concealed (above Ceiling)

Where space permits MFS-HR can be installed above the ceiling. A suspended ceiling will conceal whilst giving the benefits of easy access but plasterboard is also a practical solution with ducted outlets allowing connection to a variety of air distribution grilles.

Dimensions





Daytime Performance (2 units per room)

	SPL dBA	Winter Heat Recovery		Summer Bypass		Mean Annual SFP
		Fresh	SFP	Fresh	SFP	
		l/s	w/l/s	l/s	w/l/s	
Coil	30	148	0.28	252	0.16	0.19
	35	198	0.29	304	0.19	0.22
	40	238	0.36	372	0.29	0.31
	45	296	0.46	440	0.42	0.43
No Coil	30	166	0.26	282	0.15	0.18
	35	208	0.28	340	0.17	0.20
	40	258	0.34	410	0.22	0.26
	45	308	0.40	484	0.33	0.35

Sizing Example:

For a classroom with 35 dBA noise requirement and 8 l/s of air per pupil (256 l/s total) the table indicates 304 l/s and 340 l/s can be used to meet the fresh air requirements.

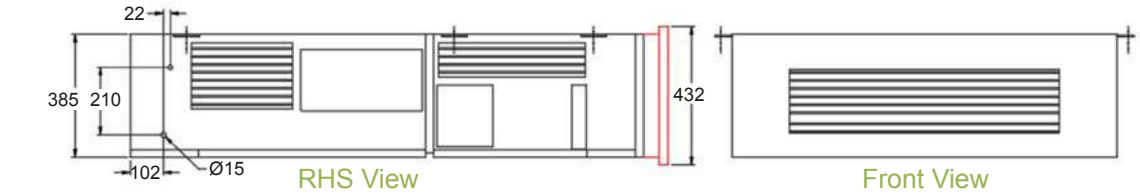
Winter Heat Recovery is always 5 l/s per pupil

Solutions

MFS-HR2 Exposed

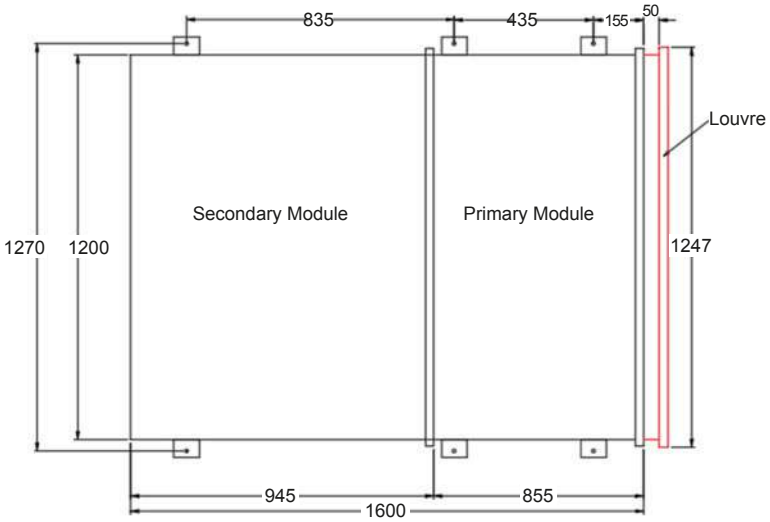
Standard solution is to fix at high window level and leave units exposed. With a white powder coat the MFS-HR provides a white goods appearance perfectly at home in an office or classroom environment.

Dimensions



RHS View

Front View



Top View

Daytime Performance

	SPL dBA	Winter Heat Recovery		Summer Bypass		Mean Annual SFP
		Fresh	SFP	Fresh	SFP	
		l/s	w/l/s	l/s	w/l/s	
Coil	30	169	0.18	211	0.13	0.15
	35	199	0.19	258	0.14	0.16
	40	232	0.24	291	0.17	0.19
	45	273	0.32	342	0.22	0.25
No Coil	30	185	0.11	250	0.05	0.07
	35	218	0.15	290	0.07	0.09
	40	255	0.19	340	0.10	0.13
	45	300	0.27	395	0.16	0.19

Sizing Example:

For a classroom with 35 dBA noise requirement and 8 l/s of air per pupil (256 l/s total) the table indicates 258 l/s and 290 l/s can be used to meet the fresh air requirements.

Winter Heat Recovery is always 5 l/s per pupil

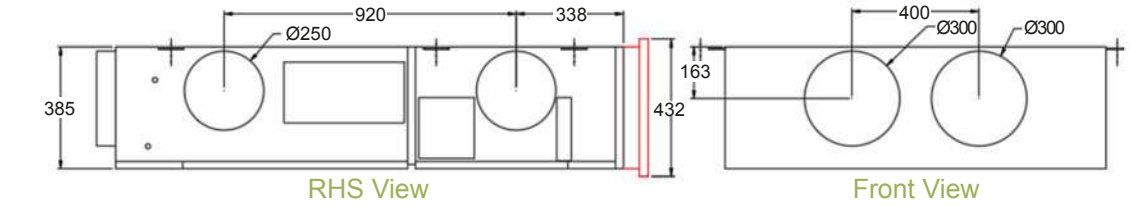
Solutions

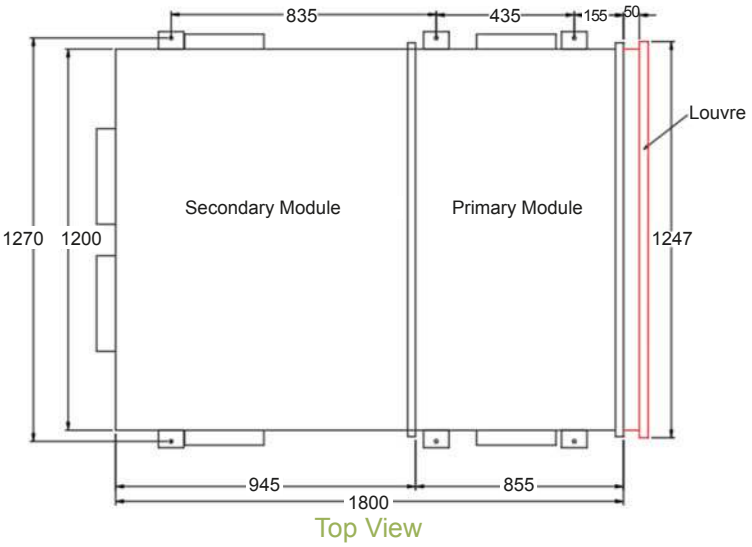
MFS-HR2 Concealed (above Ceiling)

Where space permits MFS-HR can be installed above the ceiling. A suspended ceiling will conceal whilst giving the benefits of easy access but plasterboard is also a practical solution with ducted outlets allowing connection to a variety of air distribution Grilles.

Ceiling tiles removed for clarity

Dimensions





Daytime Performance

	SPL dBA	Winter Heat Recovery		Summer Bypass		Mean Annual SFP
		Fresh	SFP	Fresh	SFP	
		l/s	w/l/s	l/s	w/l/s	
Coil	30	196	0.19	248	0.13	0.15
	35	236	0.21	287	0.15	0.17
	40	277	0.26	336	0.18	0.20
	45	324	0.33	384	0.23	0.26
No Coil	30	213	0.17	270	0.10	0.12
	35	251	0.19	310	0.12	0.14
	40	292	0.24	353	0.15	0.18
	45	337	0.31	404	0.20	0.23

Sizing Example:

For a classroom with 35 dBA noise requirement and 8 l/s of air per pupil (256 l/s total) the table indicates 287 l/s and 310 l/s can be used to meet the fresh air requirements.

Winter Heat Recovery is always 5 l/s per pupil

External Louvre Solution

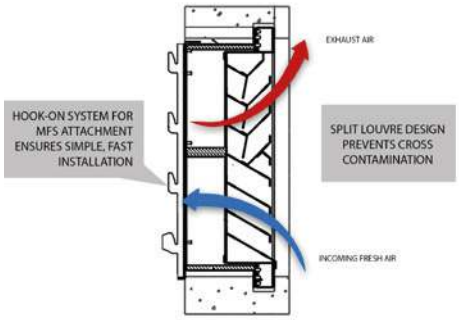
Intake/Discharge Combined Louvre

Designed as the air inlet and exhaust outlet for the MFS terminals. Specific frame borders allow the unit to glaze into windows or be fitted to wall and cladding surfaces.

Cross Contamination

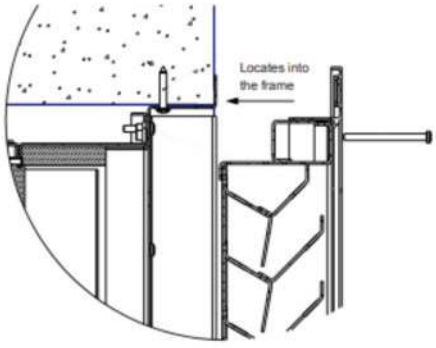
The design of Mistrale MFS Combination Louvre means that cross contamination (where stale air enters the supply/fresh airstream) is eliminated. The terminal includes separate internal supply and return air chambers which connect to the specially designed external louvre.

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.

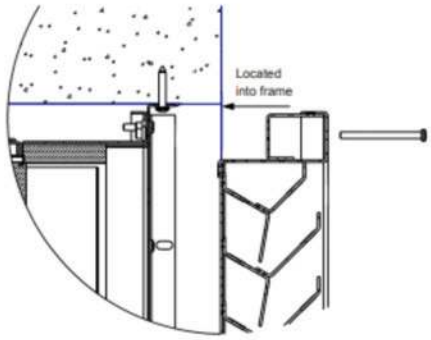


Border Styles

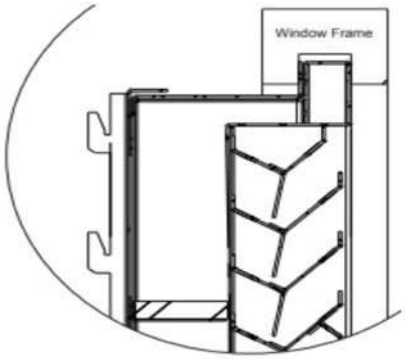
WMF-Flanged Louvre



WMC-Channel Louvre



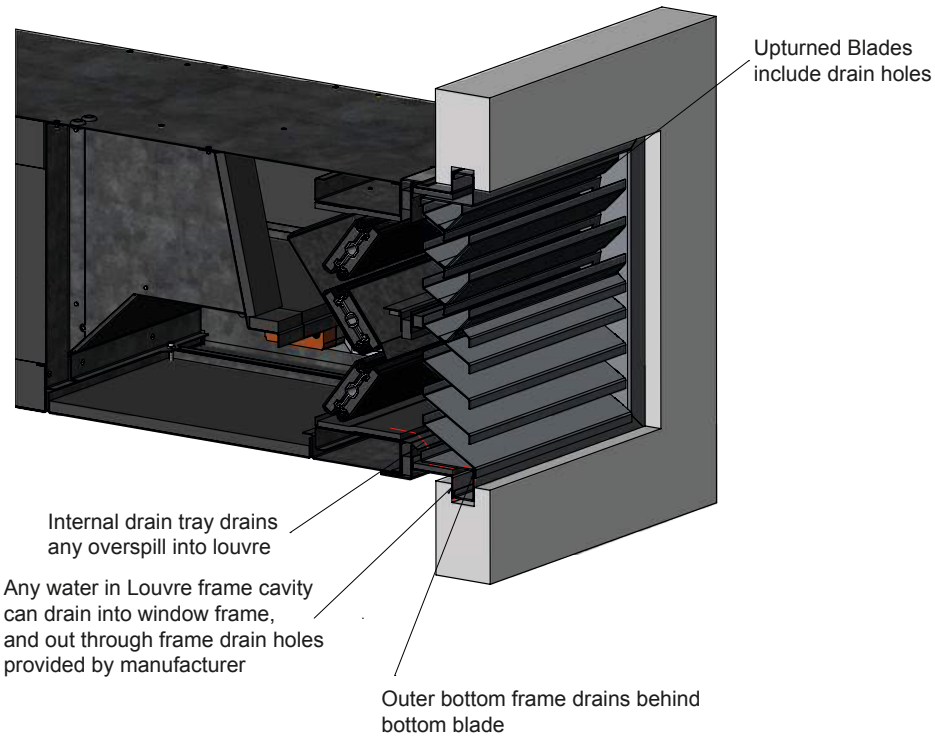
WMZ-Glazed In Louvre



Louvre Arrangements

Louvre-Standard Solution

The standard louvre solution comprises of a louvre that connects directly to the MFS-HR unit.
The louvre can bead into a window or be fitted directly to the wall cladding



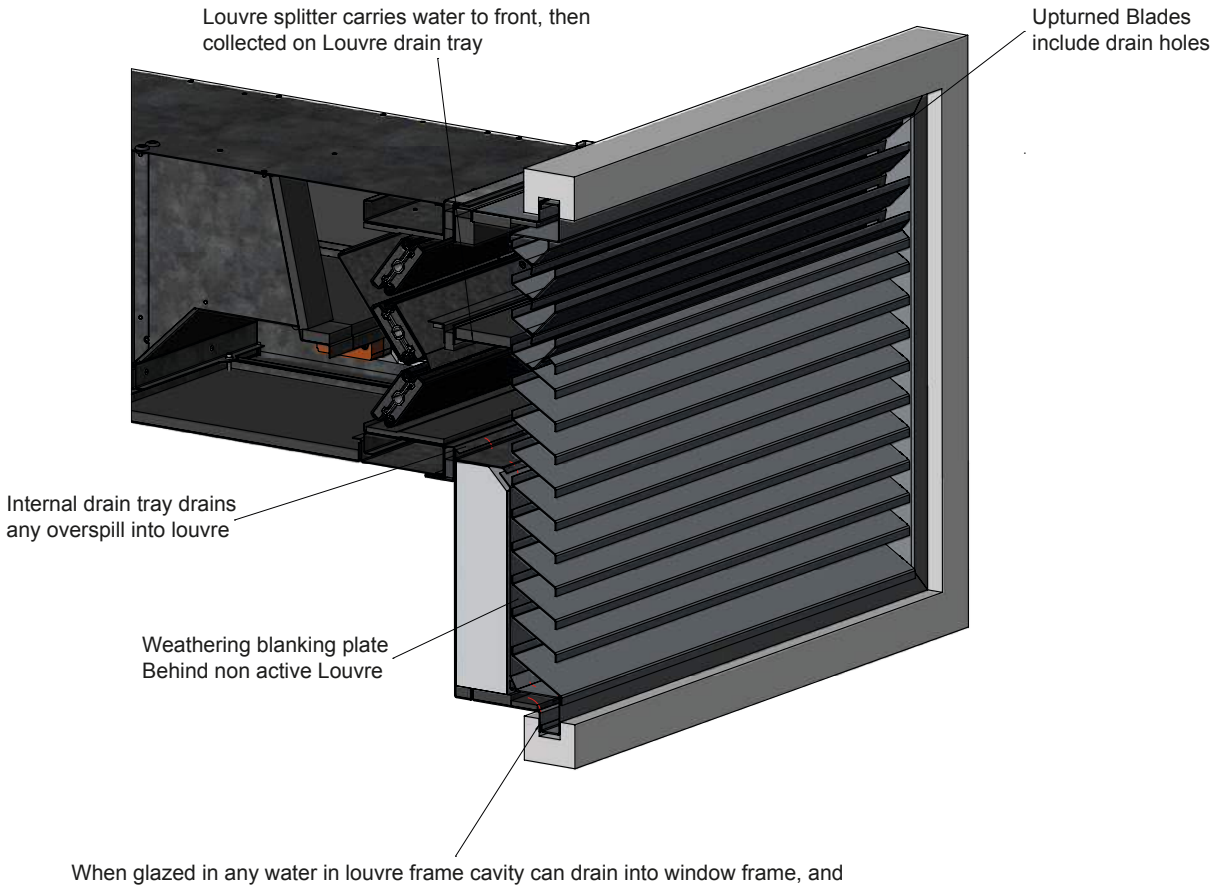
Notes

1. The internal drain tray has up-turned edges behind drive gears and internally behind blades ensuring any droplets landing on the blades are collected and drained into the louvre and out
2. — Std water >99.5%, Up to 13m/s wind speed
   — Rejection of 0.5% not captured by Louvre but rejected via drain trays.

Louvre-Large Format Solution

The louvre has been designed with added size flexibility which means that it does not have to match the size of the MFS-HR unit. The louvre can be manufactured larger in length, height or both dimensions in order either to match the glass aperture size, match with any other louvres or create a design aesthetic.

In all cases integrity against water rejection and cross contamination of airflow is maintained.



Technical Specification

1. Building Interface -The Louvre

A. The external louvre is designed specifically to work with MFS-HR. Key features include an inverted chevron top exhaust section that directs the soiled air (which is always warmer and more buoyant) upwards preventing contamination and recirculation of the fresh air. Specific test reports are available illustrating how this configuration is the optimum interface arrangement. (FOS 4.4.1.2)

B. The external louvre is tested to Class 'A' weathering performance. (FOS 4.4.18.2). The testing has been carried out at BSRIA, but since this type of louvre is not available in 1m2 individual modules it has been tested with the highest inward airflow rate for each section of the louvre. Test report available on request.

C. The louvre has special drainage points to ensure all the water collected is directed out over the bottom blade of the louvre to ensure that the glazing internal drainage system is not overwhelmed.

D. All grilles and louvres comply with Annex 2C: External Fabric and Annex 2D: Internal Finishes. (FOS 4.4.17.1.a)

E. The louvre is designed to fit into many different types of glazing system and can cater for various thicknesses. The frame is with a two-piece fabrication comprising an outside section , which includes the blades, and an inside section which includes the thermal insulation and a splitter that ensures that the warm outgoing air is deflected upwards. The two halves are separated using plastic spacers to ensure no cold bridging (FOS 4.4.10.1.i).

F. Where a larger louvre needs to be used to match the glazing on the façade, the rear half of the louvre includes an integrated blanking plate for any areas not used by the MFS-HR. The blanking plate is insulated with 50mm insulation to minimise any unnecessary energy losses, (FOS 4.4.10.1.i) and to prevent external ambient noise break in. (FOS 4.4.1.3)

G. The inside glazing bead face of the louvre is part of the rear blanking plate system and is fully sealed from inside prior to fixing to the exterior louvre section. When the louvre is installed in the façade it creates an excellent air seal between the room and the window frame. (FOS 4.4.17.1.b)

H. The louvre is fitted with a 'hanging flange' to facilitate easy jointing and an integrated seal between the external louvre and the heat recovery unit. A suite of specially designed 'hang on' duct sections are available if the MFS cannot be directly fitted to the louvre.

2. MFS-HR Primary Components

Primary Air Control damper.

A. Immediately behind the louvre is an insulated high seal air damper. The Façade air seal when the damper is closed is less than 3 m3/hr/m2, and the energy loss through the section of the façade which is allocated to the ventilation system is less than 1W/m2/K. (FOS 4.4.18.1) With our WM louvre building interface arrangement the ventilation equipment does not require to be 'bagged off' when testing to prove the building seal.

3. MFS-HR Primary Components - Fans

A. The MFS-HR contains fans, arranged along with some internal dampers to operate in a number of different ways. They may be operated to operate in parallel or separately with one as an intake, and the other one as exhaust in conjunction with a heat exchanger.

B. The fans are selected to be most efficient at the design airflows/pressure drops for the installed system. Fans comply with AD-L (FOS 4.4.14.2.a)

C. Although the fans are maintenance free, access to for maintenance is required (FOS 4.4.14.2.b). To gain access, a removable panel on the underside reveals the fans, providing enough space to remove or replace.

Green Manufacturing

We take environmental awareness seriously and we go beyond just the basics. We deliberately design engineer every component to balance performance and cost effectiveness with its final environmental impact.

We invest in machinery that supports optimisation of our environmental policies. Our 2019 powder coating plant uses less powder, less water and less gas whilst achieving superior finish application and quality. Our 2021 combi laser and punch press now nests and optimises components to minimise wastage. As far as possible our primary materials are aluminium and steel which are highly recyclable. We employ LED lighting throughout, voltage optimisation hardware and benefit from a 300kw array of solar panels on our roof space.

For our clients we aim to minimise the embodied life cycle carbon of our products and for our manufacturing we aim to minimise our total carbon footprint.

GILBERTS

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