

# Mistrale Natural Ventilation Control

The Mistrale fresh air Natural Ventilation unit marks a new era for room environmental controls. It greatly simplifies the building infrastructure normally required with fan coil units by removing the need for large air handling units and ducting systems within the building. Fresh air is supplied directly to each room space as required avoiding cross contamination and providing a level of freshness 'like opening a window'. Mistrale has no fan. It is therefore quiet and energy efficient.

Mistrale units are available with the following control options...

- Manual fresh air control with no heating or cooling requirement.
- Fresh air control with free cooling.
- Fresh air control with free cooling and hot water heating coil.
- Fresh air control with free cooling, chilled water cooling and hot water heating.

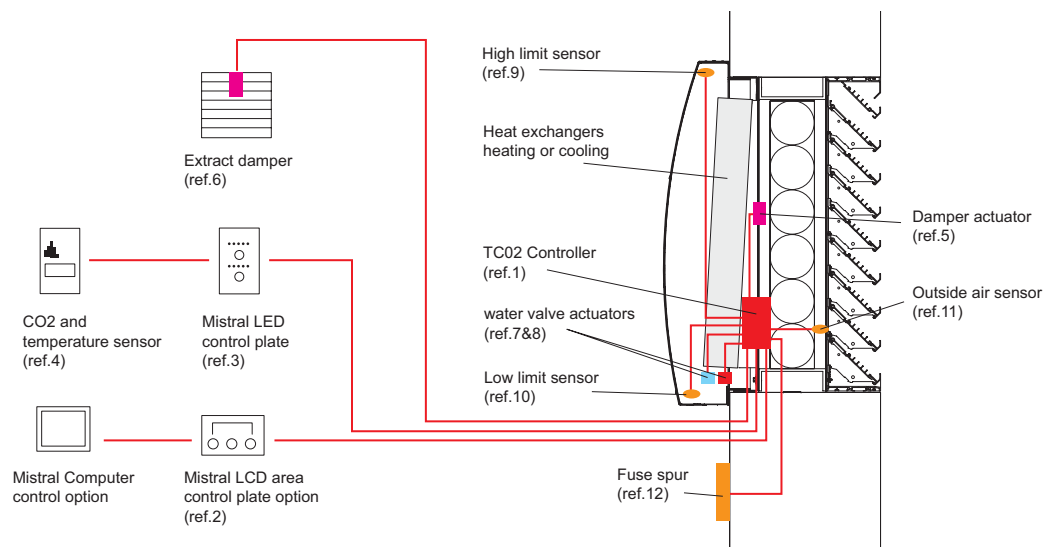
Air quality can be maintained by fitting a room CO<sup>2</sup> sensor to any of the above options. This provides automatic fresh air control. A humidity sensor can also be fitted to manage condensation in bathrooms and wet areas.

The controls are mounted inside the ventilation unit and manage the complex relationship between dampers, actuators and temperature measurements.

An attractive LED wall control provides a simple intuitive control for settings such as space temperature and fresh air level. A 3 button 2 line LCD control panel is used to set up the control parameters, set-points and options for a room or local area. The LCD also displays system parameters and fault conditions such as sensor fail or low temperature conditions.

The room space temperature sensor and CO<sup>2</sup> sensor are mounted on the wall in a small brushed stainless steel enclosure which matches the wall control plate and provides durability.

The system extracts air at a high level using body heat and temperature gradients within the space to drive the airflow. Extract dampers are controlled directly from the unit. Controllers in different room spaces can be linked by a twisted pair network to control a common extract damper.



Ref	Component description	Positioned by	Wiring Connection
Ref1	TC02 controller din rail mount with transformer	Gilberts	Gilberts
Ref2	TCB LCD panel display for area control	Client	Client to controller (Belden 8723)
Ref3	TCB LED panel display for room control	Client	Client to controller (Belden 8723)
Ref4	CO <sup>2</sup> and temperature sensor unit	Client	Client to controller (Belden 8723)
Ref5	Damper Actuator	Gilberts	Gilberts within unit
Ref6	Damper Actuator	Gilberts	Gilberts within unit
Ref7	Water valve actuator	Client	Client to controller flying lead
Ref8	Water valve actuator	Client	Client to controller flying lead
Ref9	High limit sensor	Client	Gilberts flying lead
Ref10	Low limit sensor	Client	Gilberts flying lead
Ref11	Fresh air sensor	Client	Gilberts flying lead
Ref12	Fused spur 230 Vac	Client	Client power flex

The system maintains space air at the requested temperature set-point with closed loop PID control by monitoring a wall mounted air temperature sensor.

To save energy the system utilises free heating or cooling as required.

There are 4 modes of operation, 2 heating and 2 cooling...

- Free heating (if supply fresh air is warmer than inside air temperature)
- Standard heating (if supply fresh air is cooler than inside air temperature)
- Free cooling (if fresh air is cooler than inside air temperature)
- Standard cooling (if fresh air is warmer than inside air temperature)

If the unit enters free heating or cooling mode the system will stay in this mode until it has remained at 100% capacity for 5 minutes (default) without achieving set-point temperature. Only after this period will it switch to using heating or cooling energy.

The system offers four fresh air level settings. With manual fresh air control the dampers are opened by fixed amounts for each setting with automatic control the dampers maximum opening is limited to the setting. These amounts are configurable from the LCD display. For example setting 1 opens the dampers to 25%, setting 2 to 50%, setting 3 to 75% and setting 4 to 100%. In automatic mode the damper position is regulated according to the difference between actual and requested temperature.

During free heating or cooling the fresh air level settings have no effect as the dampers are modulated to control space temperature.

Space set-point and fresh air level settings are controlled from a wall mounted plate this has two buttons and 10 LEDs, 5 for set-point and 5 for fresh air level. Set-point is selectable by pressing the top button which cycles through the five settings (LED colour in brackets), from left to right these are 17°C (blue), 19°C (blue), 21°C (green), 23°C (red), 25°C (red). Fresh air level is indicated by 5 green LEDs as off, 1, 2, 3, and 4. These settings are also available for the LCD unit.

The fresh air damper will close if the water coils are in danger of freezing (outside air temperature below 2°C default). The maximum opening position of the fresh air damper will be limited to a fixed value (default 10%) under extreme low outside temperature conditions (default below 10°C). Under these conditions the fresh air dampers will not be influenced by the CO<sup>2</sup> sensor.

The CO<sup>2</sup> level of the room air is monitored and at 950ppm (CO<sup>2</sup> hi default) the fresh air and extract dampers are opened by approximately 3% more. Once triggered, for every 1 minute period (default) that the CO<sup>2</sup> level remains above 950ppm (CO<sup>2</sup> hi default) the dampers are opened by a further 3% until fully open. For every 1 minute period (default) the CO<sup>2</sup> level falls below 900ppm (CO<sup>2</sup> lo default) the dampers are closed by 3% until back to its original position. The damper position is left unchanged if the level remains between the CO<sup>2</sup> hi and CO<sup>2</sup> lo limits.

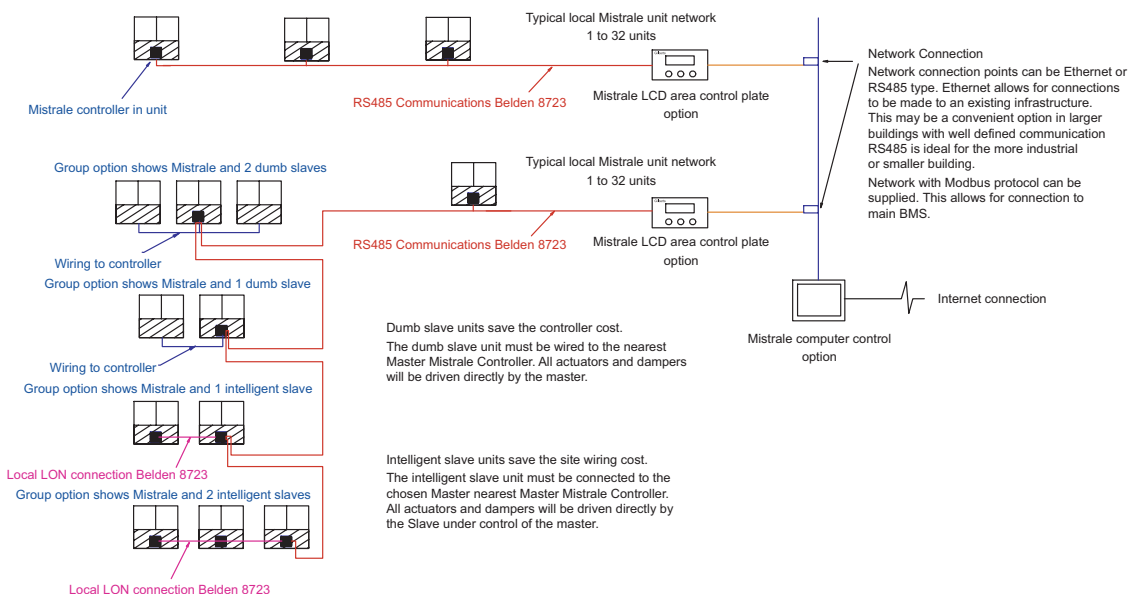
During free cooling the fresh air temperature entering the room is monitored and if it is 3°C less than the set-point temperature is tempered with the heating coil. The cool air entering the room will never be more than 3°C below the set-point. This avoids a very cold layer of air building up at floor level.

A temperature sensor also monitors the low pressure hot water system and only allows the damper to open if hot water is available.

The surface temperature of the outlet grille can be optionally monitored to limit the surface temperature to approximately 40°C.

A seven day time clock is available with two on/off settings per day. At switch on time the default room set-point and fresh air settings are automatically selected. During the off period the unit can be manually turned on from the LED wall plate, after two hours the unit will automatically switch off.

A night cooling feature is available during the summer months, which allows cool air to enter the room space during the night cooling the building infrastructure. This provides a level of free cooling the following day.



# Control Display Options

## MISTRALE LCD display

The LCD unit may be used to provide a programmable interface to the Radiator system for overall strategy and comfort control.

A switch on the LCD unit displays its module address for about 4 seconds.

Up to 8 LCD units can be connected to the LON cable, which can be up to 100m long. Each LCD unit must be given a different module address (0 to n). To set the LCD module address hold down all three buttons for >10 seconds.

The unit will then display "module X", press the right button to increase the module address and the left button to decrease it.

Pressing the centre button selects the next menu item, which is the LCD backlight on time, this can be between 1 and 25 seconds or OFF for always off and ON for always on. Once set up just wait 10 seconds (without pressing a button) for the display to return to normal and the new settings to be saved.

## MODBUS

The TC02 unit supports the MODBUS RTU open network protocol. This allows connection to any standard BMS, a PC based area control system or HID panel.

The hardware interface is half duplex RS485 (single twisted pair) and we normally use a unit load driver chip with +/-60 volt line protection (LT1785CN8).

There are four screw terminal connections on the board these are RS485 B, RS485 A, Shield In, and Shield Out. Either or both Shield In and Shield Out can be connected to local ground via a jumper link. Normally only the Shield Out is linked to local ground.

The open protocol we use is MODBUS RTU at 19200 baud, no parity, 8 data bits, and 1 stop bit. Each unit has a network address ID from 1 to 247 (8bit) settable from the LCD interface.

The following MODBUS function codes are implemented...

Read Holding Registers (3)

Write Single Register (6)

Write Multiple registers (16)

## LON LED HVAC plate Specification

The LON LED HVAC plate is design as a direct replacement for the standard plastic wall units found on many HVAC systems.

The unit consist of user display board of approximately 95 x 60 mm fitted with a stainless steel front plate. This board has ten LEDs and two push buttons for controlling damper positions and set point. It is connected to the TC range of control units via a twin twisted pair cable.

- Can be surface or flush mounted in a standard UK back-box or patress.
- Simple multi-drop digital twin twisted pair connection to controller.
- Powered via the twisted pair cable.
- Five temperature settings indicated by multi-colour LED's
- Four Fresh Air damper positions and 'closed' indicated by five LED's.
- Flashing LED's indicate status information such as Damper or sensor fail.
- Engineering mode for full system status.
- Front plate Standard Supply is Brushed Stainless Steel (plates can be customised to client requirements, e.g. brass or anodised aluminium.)