F-SENSOR LOW VELOCITY SENSOR

- Ultra low air velocity measurement
- Output as linear Velocity or Air volume
- Excellent repeatability and reliability
- Excellent Zero Stability - Auto Zero
- Climate chamber compensated
- Long term zero and span stability
- Fast response and ultra low hysteresis
- Built in air filter for extra particle protection
- Factory logged burn in time and calibration
- Transducer SMD and PCB is made by CMR
- After Sales Service is provided by CMR
- 24 month warranty
- 30 Years field application experience

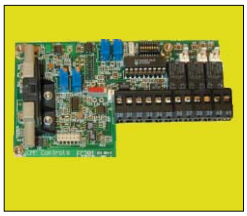
F-SENSOR Wall Mount with Keyboard and LED display

GENERAL
The F-Sensor is a wall mount low velocity Transmitter which provides an output signal of 0…10V and 4...20mA as well as Modbus communication over the selected range . The display can be adjusted via the keyboard to show the measured value in m/s, l/s, m3/s, m3/h and ACR (air change rate).

A PID control output can be selected, but still having one output for monitoring the pressure or volume. A Terminal is programmable to be an input as a set point for the PID loop. The Measurement range can be adjusted via the keyboard, but the base range is factory calibrated to be 0..1.5 m/s. The range can be adjusted via the keyboard to i.e. 0..1.00m/s.

Power supplies of 24Vdc/ac non-isolated or 24,110 and 230Vac isolated are available as standard.

THE TRANSDUCER
The transducer circuit is manufactured by CMR and consists of precision engineered components, high quality materials and SMD electronics. The principle of the transducer is the measurement of an air velocity passing through the sensor. The F-Sensor technology is based upon temperature-sensitive films laminated within thick film dielectric material.



CMR Transducer

They are suspended in the form of two bridges over an etched cavity in silicon. The chip is located within a precisely dimensioned air-flow channel to provide a reproducible flow response.

The air is filtered and then enters the channel and passes over a temperature sensor and then over a heating element which keeps a constant temperature of approx 160ºC. The high temperature burns off any particles which try to settle within the sensor.

Thereafter, the air passes over a second temperature sensor and by utilising a high precision comparator the signal is scaled into air velocity. Finally, the output is conditioned and scaled to a users signal in the form of m/s or m3/s and represented as 0..10V or 4..20mA.

All F-Sensors are temperature compensated in a computerised climate chamber and go through an ageing burn in cycle.

CMR Climate Chamber

KEYBOARD DISPLAY
A combined keyboard and LED Display is fitted into the lid and is connected to the F-Sensor board with a plug-in ribbon cable. All parameters can be accessed via the key pad. The display can also be programmed to switch off after a time and by touching a key to light up again. Normally it is always on.

PARAMETER CONFIGURATION
The duct width and height can be entered as well as the density and (mf) magnification (K) factors to scale Flowgrids, Veloprobes, Oval Flowprobes, Venturis or any other velocity pressure producing probes. The volume can be linearized over 8 points to provide extremely high accuracy in measurement.

The range can be changed from 0..0.80 m or 0.. 0.50m/s. The output signals can be changed to i.e. 2..10V, 1..5V or 5..19mA.
The F-Sensor has a configurable Volt Free alarm output relay.

The auto zero function is built in, which is of great advantage with this very low velocity measurement to have an accurate base point at all times. The auto zero can be turned off where it is not required.

The F-Sensor has a built in overload protection which makes it an ideal instrument also for heavy duty ventilation installations.

One of the outputs can be configured to be a PID control to drive fan inverters or modulating dampers and the other can be used for the actual pressure or air volume measurement for the BMS or PLC system. The set point can be sent from the BMS via modbus or if a terminal is not required for monitoring then this terminal can be used as analog input of an external set point.

The signals can be individually smoothed. The control output can be fast but the measurement output can be dampened.

A calibration mode can be selected so that all of the parameters remain the same as commissioned and only the base sensor shall be calibrated and displayed in m/s.

MODBUS rtu COMMUNICATION
The modbus communication can be used to read and write all parameters by the remote Host which can be the BMS , PLC or PC.

REMOTE ALARM DISPLAY
A remote display DIS110 without alarm or DIS125 with alarm and mute button can be connected via Modbus if the modbus is not used for the BMS. The alarm button has green and red Led light rings to show healthy or alarm status. A buzzer is also fitted. A separate power supply can be wired to the display.

Remote Display Plate

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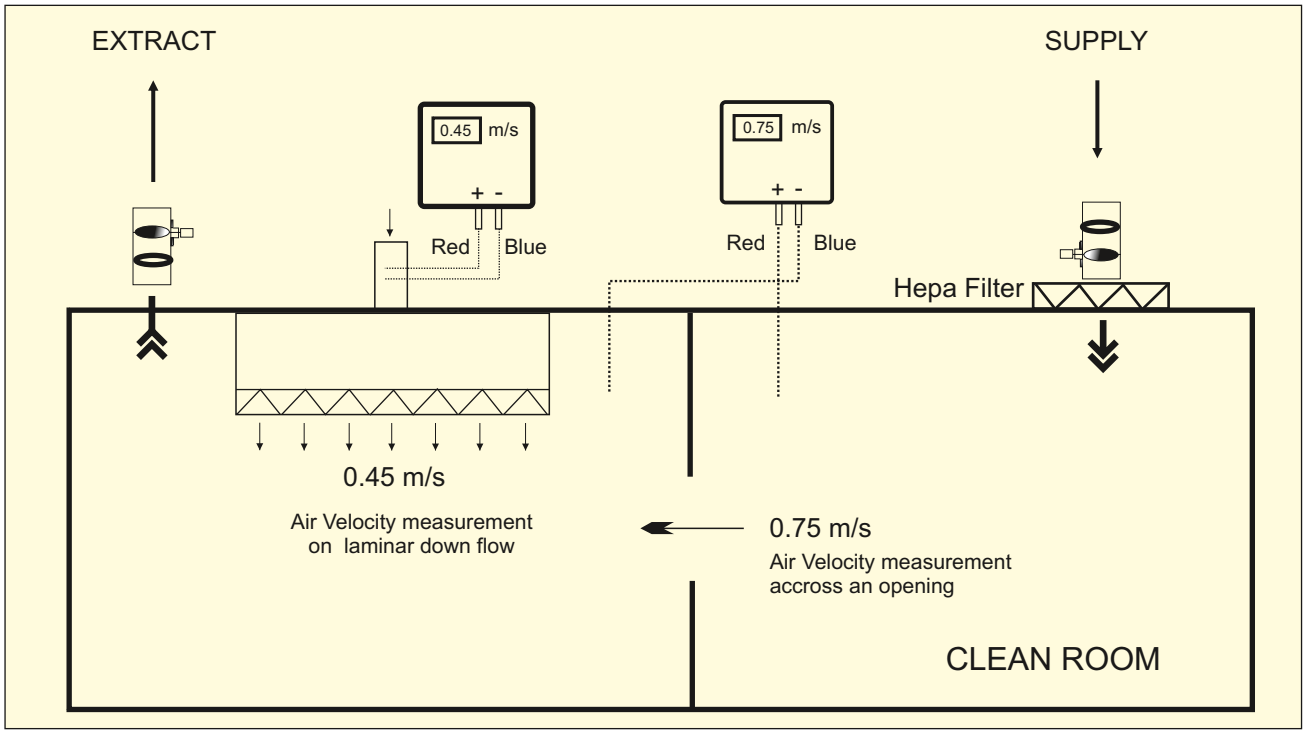
Issue F-GB-04-2

F-SENSOR VELOCITY APPLICATIONS

TYPICAL AIR VELOCITY OR VOLUME MEASUREMENT WITH CMR F-SENSORS



The CMR F-Sensor is a true Ultra Low Velocity Transmitter which has been designed to measure very low air volumes in Ventilation Systems accurately.

The built in scaling of the velocity and span scaling makes the F-Sensor the very versatile instrument. It can display in m/sand m3/s. Other units can be displayed such as m3/h, litres/s, litres/min or imperial measurement units are available on request .

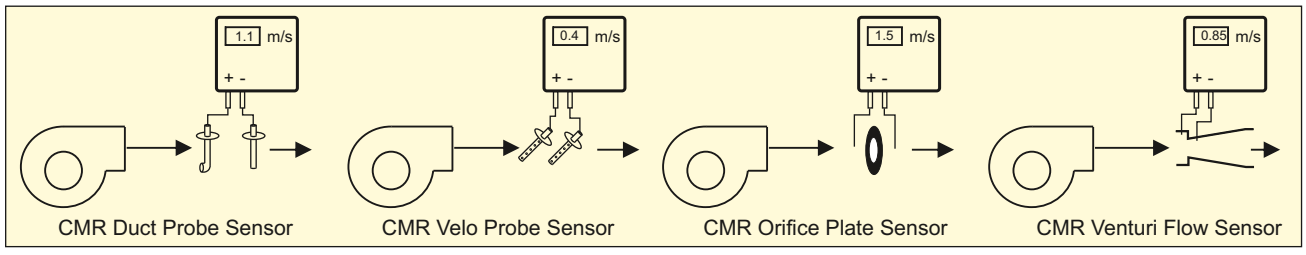
The F-Sensor is ideal for wall or plant room panel mount applications. The CMR PVC tubing can be run up to 5 m and the F-Sensor can be site calibrated to suit the tube length.

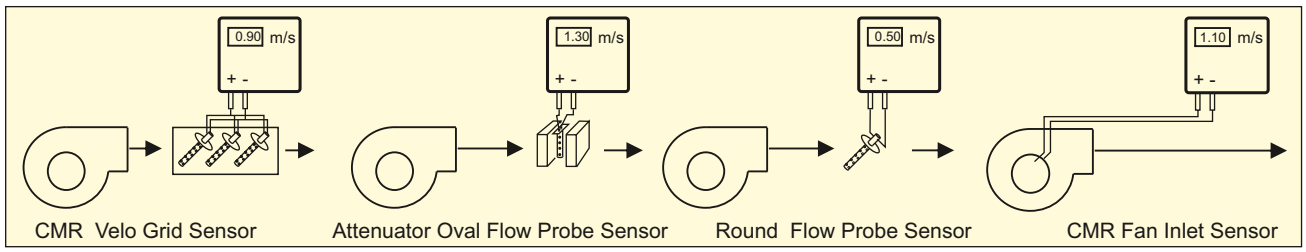
The F-Sensor is used for monitoring or controlling low Volume Flow such as fume cupboards, laminar flow ceilings, fresh air applications and general draught measurements.

The F-Sensor is designed to be connected to any CMR Veloprobes, Duct Probes or Velogrids, but it can also be connected to any existing or custom made duct Flow Measurement Device in applications where low velocities up to 1.5 m/s must be measured..

The measured values can be transmitted to remote display plates, Scada and BMS Monitoring Systems. An output signal of 0..10V and 4...20mA as well as modbus rtu is standard.

TYPICAL ULTRA LOW SUPPLY AIR VELOCITY OR VOLUME MEASUREMENT APPLICATIONS





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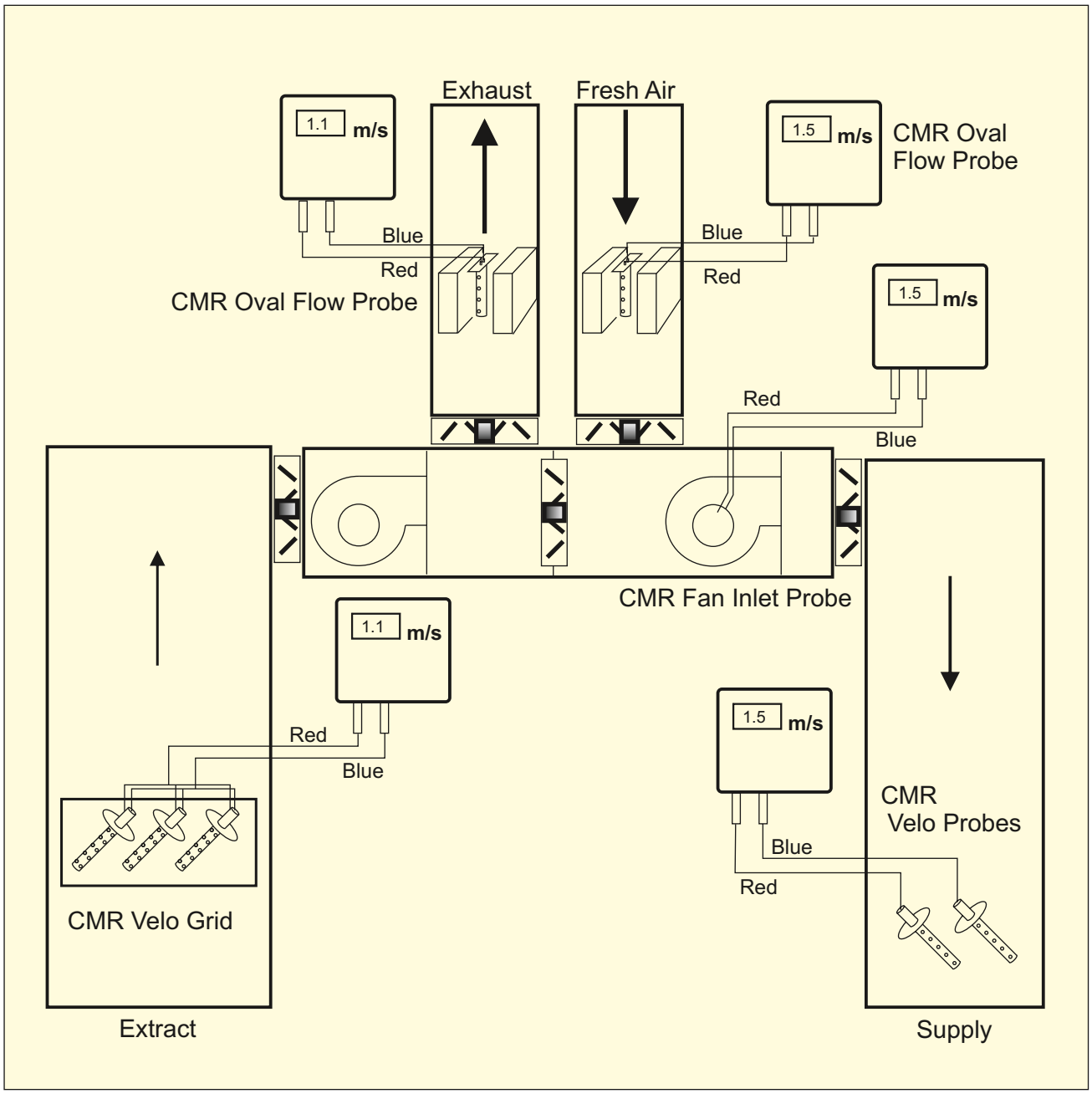
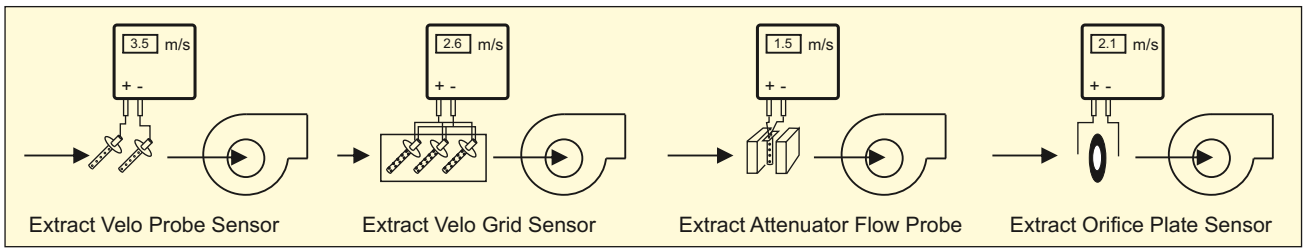
F-SENSOR AHU APPLICATIONS

TYPICAL AIR HANDLING UNIT LOW VOLUME OR VELOCITY MEASUREMENTS WITH CMR F-SENSORS



The above schematic shows a practical application in Supply and Extract Air-Handling Unit Control Systems, where Supply and Extract Duct Volumes must be measured. The F-Sensor is ideal for Fresh Air, Re-circulation Air control and monitoring. The F-Sensor is suitable for very low Velocities in reasonable clean environments. The CMR F-Sensors are long term accurate.

TYPICAL ULTRA LOW EXTRACT AIR VELOCITY OR VOLUME MEASUREMENT APPLICATIONS



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F-SENSOR SPECIAL APPLICATIONS

GENERAL

The F-Sensor can be used for many low velocity applications i.e. duct velocity measurement in ventilation systems using Velo Probes as shown on the drawings below.

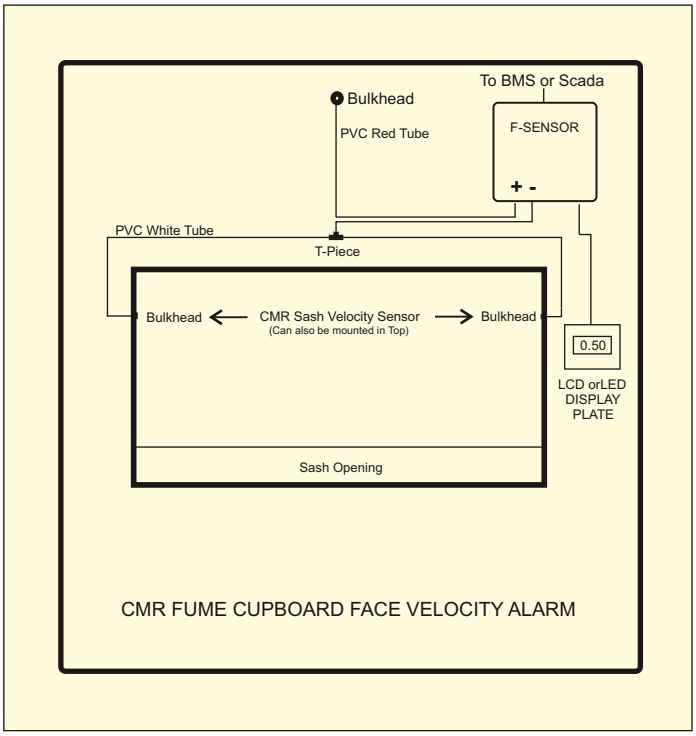
The output signals of 0..10V or 4..20mA as well as modbus rtu can be connected either to Building management systems for control purposes or Scada systems for operator safety and product protection alarm monitoring.

The drawing on the right shows a typical fume cupboard. The F-Sensor is used to monitor the face velocity by a remote computer system.

The bulkhead at the top outside of the fume cupboard is connected to the positive port of the F-Sensor. The inner bulkheads are connected via a T-Piece to the negative Port.

A small quantity of air is sucked from the laboratory through the F-Sensor and exits into the fume cupboard. As clean air enters the F-Sensor it can never be contaminated. The F-Sensor transducer translates this air flow into a velocity and provides a linear output signal to the monitoring computer. The information is also copied to the local LCD Display on the front face of the Fume Cupboard.

To calibrate the F-Sensor, measure the front face velocity at a specified sash opening with a reference instrument and work out the average across the face area then adjust the span via the keyboard.



F-Sensor with LED keyboard display and remote LCD or LED

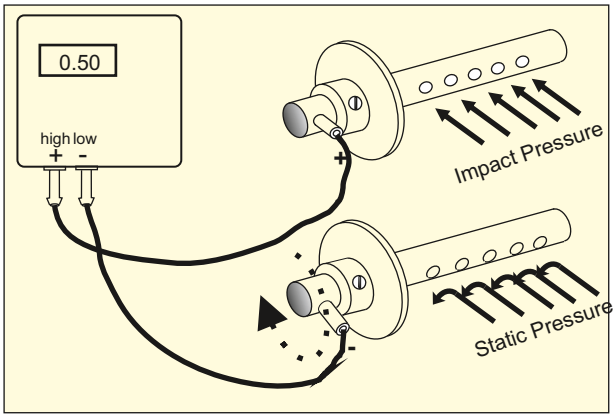
VELO PROBES AND F-SENSORS

F-SENSOR SCALING BY ADJUSTING THE VELO PROBES

Adjust the Impact Veloprobe to face the Airflow and and adjust the Static Veloprobe to approx. 40º away from the airflow.

Scaling the BMS in m/s
Look at the F-Sensor label and scale BMS to 0V = 0 m/s and 10V = F-Sensor range i.e. 2.00 m/s. Take a reading in the duct and if this is 1.00 m/s adjust the Static Veloprobe by turning it towards or away from the airflow until the BMS Screen shows 1.00 m/s.

Scaling the BMS in m3/s
Multiply the F-Sensor range i.e. 2m/s by the duct area i.e 1m x 1m = 1m2. The Sensor range is now 10V=2.00 m3/s. Scale the BMS to 2.00m3/s and work out the duct readings in m3/s. If the Volume is 0.50 m3/s, turn the Static Veloprobe until the Screen shows 0.50m3/s.



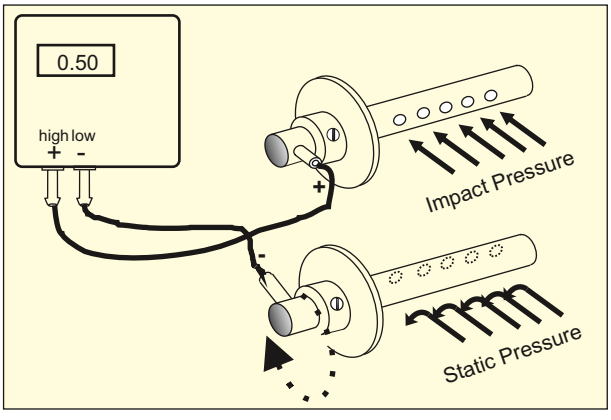
Calibrating by adjusting the Velo Probes

F-SENSOR SCALING BY ADJUSTING THE 'SPAN'

Adjust the Impact Veloprobe to face the Airflow and and adjust the Static Veloprobe to approx. 180º away from the airflow.

Scaling the BMS in m/s
Look at the F-Sensor label and scale BMS to 0V = 0 m/s and 10V = F-Sensor range i.e. 2.00m/s. Take a reading in the duct and if this is 1.00 m/s adjust the F-Sensor 'Span' Potentiometer until the BMS Screen shows 1.00 m/s.

Scaling the BMS in m3/s
Use the keyboard and enter duct height, duct width and check density and (mf) and touch the range button briefly. The LED shall indicate the range in the selected units. Scale the BMS by using this range. To fine tune the sensor range, adjust the (mf) magnification factor untilsatisfactory.



Calibrating by adjusting the F-Sensor Span.

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The bulkhead at the top outside of the fume cupboard is connected to the positive port of the F-Sensor. The inner bulkheads are connected via a T-Piece to the negative Port.

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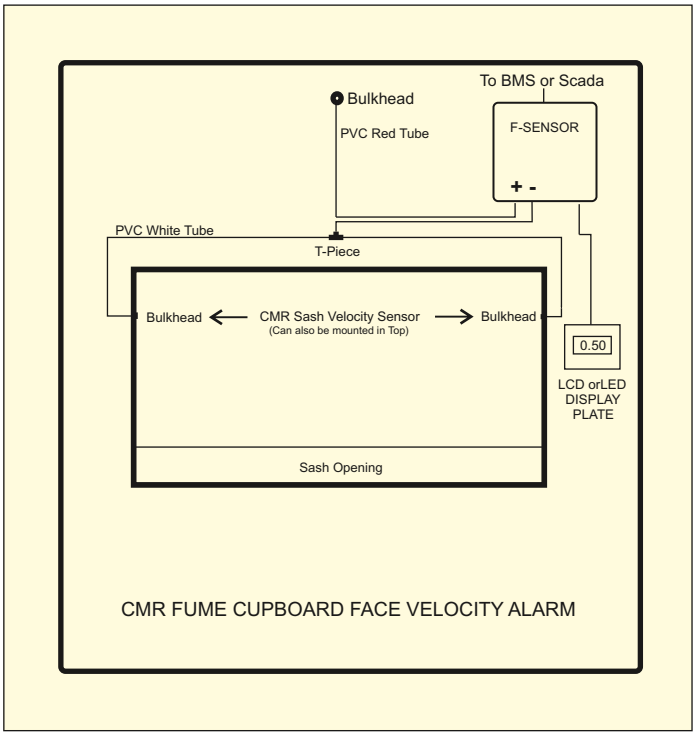

F-Sensor with LED keyboard display and remote LCD or LED

VELO PROBES AND F-SENSORS

F-SENSOR SCALING BY ADJUSTING THE VELO PROBES

Adjust the Impact Veloprobe to face the Airflow and and adjust the Static Veloprobe to approx. 40º away from the airflow.

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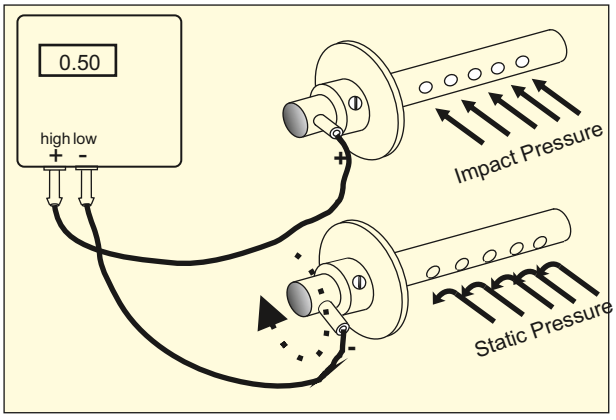

Calibrating by adjusting the Velo Probes

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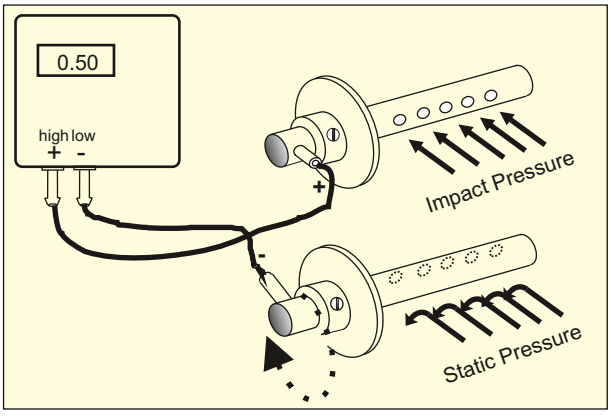
Scaling the BMS in m3/s
Use the keyboard and enter duct height, duct width and check density and (mf) and touch the range button briefly. The LED shall indicate the range in the selected units. Scale the BMS by using this range. To fine tune the sensor range, adjust the (mf) magnification factor untilsatisfactory.



Calibrating by adjusting the F-Sensor Span.

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F-SENSOR ORDER DESCRIPTION

GENERAL
CMR manufactures a limited range of F-Sensors to suit Ultra Low Velocity or Volume measurement applications. Because of the variety of velocities ranges, output signals and power supplies, it has been necessary to design an easy to use selection table for anybody to make up an F-Sensor specification to satisfy a requirement. On the F-Sensor Selection Table you will find all specifications available with the associated ordering Code.

F-SENSOR BASE PART NUMBER
The F-Sensor Part Number starts with the selection of the base part number with a code of Code '28' which is a standard ABS F-Sensor enclosure with 6 mm barbed nipples to fit CMR PVC Tube.
The Part Number therefore starts with '28'.

F-SENSOR ISSUE No
The F-Sensor will have a version number to identify the model. The Code is '1 for version 1'.
The Part Number extends to '281'

TUBE CONNECTORS
6 mm barbed nipples to fit CMR PVC Tube are fitted as standard into the ABS box. They have the Code 'A'.
The example has 6 mm barbed nipples, which is standard.
The Part Number therefore extends to '281A'.

NEGATIVE VELOCITY RANGE
The Negative Range is not available with F-Sensors as negative velocity pressures are never measured and cannot be square rooted.
The Code '0000' always applies to any F-Sensors
The Part Number extends to '28A 0000'.

VELOCITY UNITS
The base sensor must be expressed in units i.e. m/s. The CMR F-Sensor transducers are in m/s as standard.
In the example m/s was selected with Code 'V'.
The Part Number extends '281A 0000 V'

POSITIVE VELOCITY RANGE
It is important to determine the velocity. Normally, this information is supplied by the Designer of the Ventilation System. On the F-Sensor Selection Table are a number of standard velocity ranges listed.

We have chosen 0..2.00 m/s which has the Code '2000'.
The Part Number extends to '28A 0000 V 2000'

LABEL UNITS
As the F-Sensor has a fixed label next to the LED display, i.e. m/s, m3/s, m3/h, l/s etc. It is necessary to specify the label when selecting the part number as this is all part of the validation of the instrument.
In the example we have selected Code 'V'.
The Part Number extends to '281A0000 V 2000 V'

OUTPUT SIGNAL
The Industry Standards for Output Signals are 0-10V or 4-20mA, but other signals can be adjusted via the keyboard.

In the Example, we have selected the standard Dual (0..10V & 4..20mA) which has the Code '1'.
The Part Number extends to '281A0000 V 2000 V 1'

POWER SUPPLY
CMR can supply 24Vdc/24Vac Non-Isolated which does not have an isolation transformer and is also suitable for 3-Wire connection. Most common is the 24Vac Isolated. 110Vac and 230Vac are less used, but also selectable. In the example we have selected 24Vac which has the Code '3'.
The Part Number extends to '281A0000 V 2000 V 13'.

FINAL PART NUMBER
The Part Number to order is '281A0000 V 2000 V 13'.

Now try and select your own F-Sensor using the F-Sensor Order Selection Table.

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F-SENSOR ORDER SELECTION TABLE

The Selection Table has been prepared to make ordering easy. Each column contains a number of different options which are available and a Part Number can be established depending on a specific requirement.

The Example Part Number 281A0000V2000V13 which is printed above the Selection Table and identified as being a F-Sensor with ABS enclosure, having an LED Display and Keyboard, an issue No 1, with 6mm barbed tube connectors, a Negative Pressure Range of 0000 , Range Units in V (m/s) and a Positive Range of 2.000 m/s, labelled in m/s (velocity) with Dual Output Signals of 0-10V & 4-20mA,which would mean in this case 0V = 0 m/s and 10V = 2.000 m/s. The Power Supply is an isolated 24Vac (4 wire).

The F-Sensor would be supplied with a 5 digit LED-Display-Keyboard mounted into the Lid and the measured Units are m/s (meter per second). It comes standard with a traceable calibration certificate to national and international Standards (UKAS).

EXAMPLE PART NUMBER SELECTION (The code after the (=) sign is used i.e. 6mm = A)

28	1	A	0000	V	2000	V	1	3
P-Sensor	**ISSUE**	**Nipple**	**Negative**	**Range**	**Positive**	**Label**	**Output**	**Power**
Part No.	**No**	**Size**	**Range**	**Units**	**Range**	**Units**	**Signal**	**Supply**
Base = 28	Issue = 1	6mm = A	0000	m/s = V	1m/s =1000	m/s = V	Dual = 1	24Vdc/ac = 2
					2m/s =2000	m3/s = Q		24 Vac = 3
						m3/h = M		110 Vac = 4
						l/s = L		230 Vac = 5
						ACR = A		

HOW TO ORDER

EXAMPLE
A wall mount pressure transmitter is required of the Type F-Sensor
An LED complete with Keyboard is required as standard with an issue No 1.
The tube connections must be 6mm for CMR PVC Tube.
The negative pressure range is always 0000
The measured units must be in m/s
The positive pressure range must be 1.000 m/s
The units on the LED display must in m/s as well as on the Product label.
The output signal must be Dual (0-10V & 4-20mA)
The power supply must be 24Vdc non-isolated

Call CMR for assistance at any time

The part Number for this P-Sensor is 28 1 A 0000 V 1000 V 1 2

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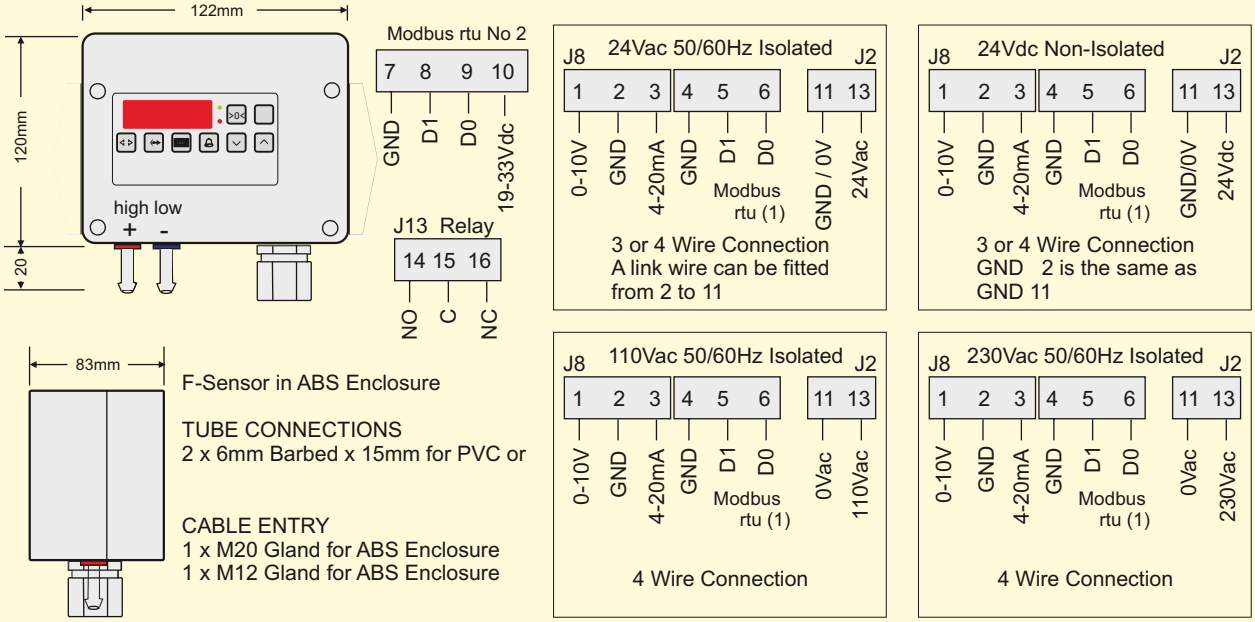
F-SENSOR TECHNICAL SPECIFICATION

Measurement Range	See Order Selection Table F-Sensor
Optional Range	Any Range from 0..1.00 m/s up to 0..2.00 m/s (max 2.5 m/s).
Overload Capacity	To 340 mBar
Media	Non Corrosive Gases such as Air,N2,O2,CO2,N2 O, inert Gases
Output Voltage drift	-25°C to +25°C = +6% FSO +25° to +85°C = 7% FSO all depending on air density
AC Power Supplies	24 VAC 50/60Hz 140mA Fuse 300mA Auto Reset
	110VAC 50/60Hz 32mA Fuse 315mA Wickmann
	230VAC 50/60Hz 16mA Fuse 315mA Wickmann
DC Power Supplies	24 VDC (19 to 31VDC) smoothed. Sensor with remote LCD and mA output (80 mA)
Voltage Output Signal	0-10V (0...100% of Range) 0..2.00 m/s in square root mode RL = 5kOhm min.
Current Output Signal	4...20mA (0...100% of Range) i.e. 0..2.00m/s RL = 500 Ohm max.
	The mA circuit is a direct conversion of the 0..10V and therefore all calculations should be
	made in 0..10V. The 4..20mA is linear from 0..10.00V.
Hysteresis/Repeatability	0.5% Typical of Full Scale
Linearity (Accuracy)	2.5% of Full Scale in Square Root Mode
Zero Drift	0.05%K (+10°C to +50°C)
Operating Temperature	0..+40°C Storage -40°C to +90°C
Mounting Position	Any Plane
Weight	0.6 kg
Electrical Connections	1 x M20 - 1 x M12 Gland Internal Plugs with Screw Connections
Air Tube Connections	Positive and Negative Velocity Barbed Nipple 6.5mm O/D x 15mm long in ABS enclosure
Enclosure	ABS Grey Protection IP65 with LED Display
Conformity	EN61326-1 EMC EN61010-1 SAFETY
Calibration Certificate	Must be calibrated against a reference instrument on site to suit application.

F-SENSOR DIMENSIONS AND CONNECTIONS



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