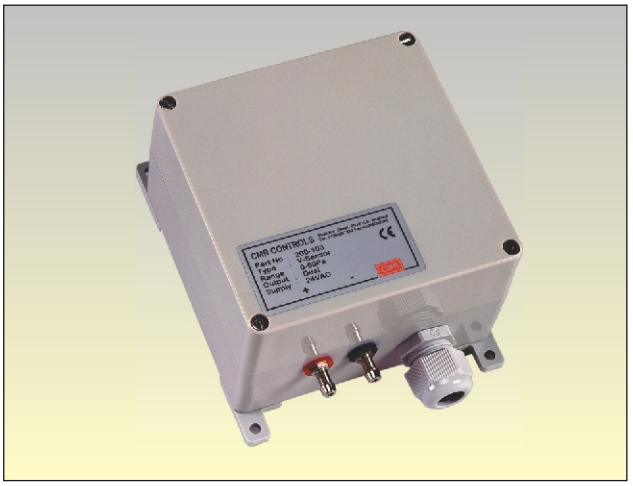
home

F-SENSOR LOW AIR VELOCITY SENSOR

- Ultra low air velocity measurement
- Output as linear Velocity or Air volume
- Excellent repeatability
- Excellent Zero Stability
- Climate chamber compensated
- Long term span stability
- Ultra low hysteresis
- Built in air filter
- Factory logged burn in time
- Transducer SMD and PCB is made by CMR
- After Sales Service is provided by CMR
- 24 month warranty
- 12 Years field application experience



F-SENSOR Wall Mount without LCD

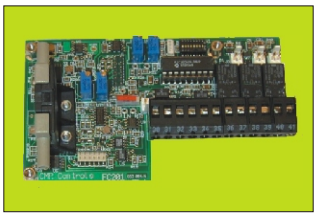
GENERAL DESCRIPTION

The F-Sensor is a wall mount low velocity Transmitter which provides an output signal of 0…10V and 4...20mA. The LCD connector always provides 0...10V and the Output Terminals have dual output 0...10V and 4...20mA. Other signal outputs can be supplied on special request.
An optional LCD display can show the actual velocity or volume in m/s or m3/s. Other engineering units such as litres/s can be supplied.

The 4...20mA is produced by the F-Sensor and could drive a number of devices. There are a few Velocity ranges available from 0..1.00 m/s up to 0..4.00 m/s.

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

LCD DISPLAY

An Optional LCD Display indicates the actual Velocity in m/s or Volume in m3/s. The LCD is factory calibrated but the user can adjust the zero and span to suit other scales The LCD display is fitted to the front lid and is for internal wall mount use.

REMOTE DISPLAY

A remote LCD or LED can be connected to display the information locally.

F-SENSOR with LCD Display

LED DISPLAY

An Optional LED Display either 3 1/2 or 4 1/2 digit can be supplied which indicates the actual Velocity in m/s or Volume in m3/s. The LED display is fitted into the front lid. It shall provide IP65 protection and is intended for wall mount use.

DISPLAY AND SIGNAL DAMPENING

The displays can be smoothed by means of a switch (LCD) or a jumper (LED) on the rear independently of the output signal of the sensor. The output signal can be smoothed by means of the 'Slow' adjustment on the PCB of the F-Sensor. This dampening acts on the 0..10V, 4...20 mA and the Display simultaneously.

MAGNIFICATION FACTOR SCALING

The display's zero and span has been factory scaled during manufacture. The magnification Factor can be adjusted on the PCB using the span (P2) to suit the CMR Flow Probes, Velo Probes and Velo Grids or any other velocity measurement devices.

ALUMINIUM ENCLOSURE

The F-Sensor can be supplied in an IP65 Aluminium Enclosure with 6mm or 1/4" ferule compression fittings and stainless Cable Gland.

It has either a plain lid or an optional IP65 LED display either 3 1/2 or 4 1/2 Digit is mounted into the Lid.

This construction is normally used in very harsh industrial environments.

Aluminium Enclosure with LED

CMR CONTROLS
Division of C.M.RICHTER EUROPE LTD

22 Repton Court Repton Close
Basildon Essex SS13 1LN GB
Website : http://www.cmr.co.uk

Tel +44 (0) 1268 287222
Fax +44 (0) 1268 287099
e-mail: sales@cmr.co.uk

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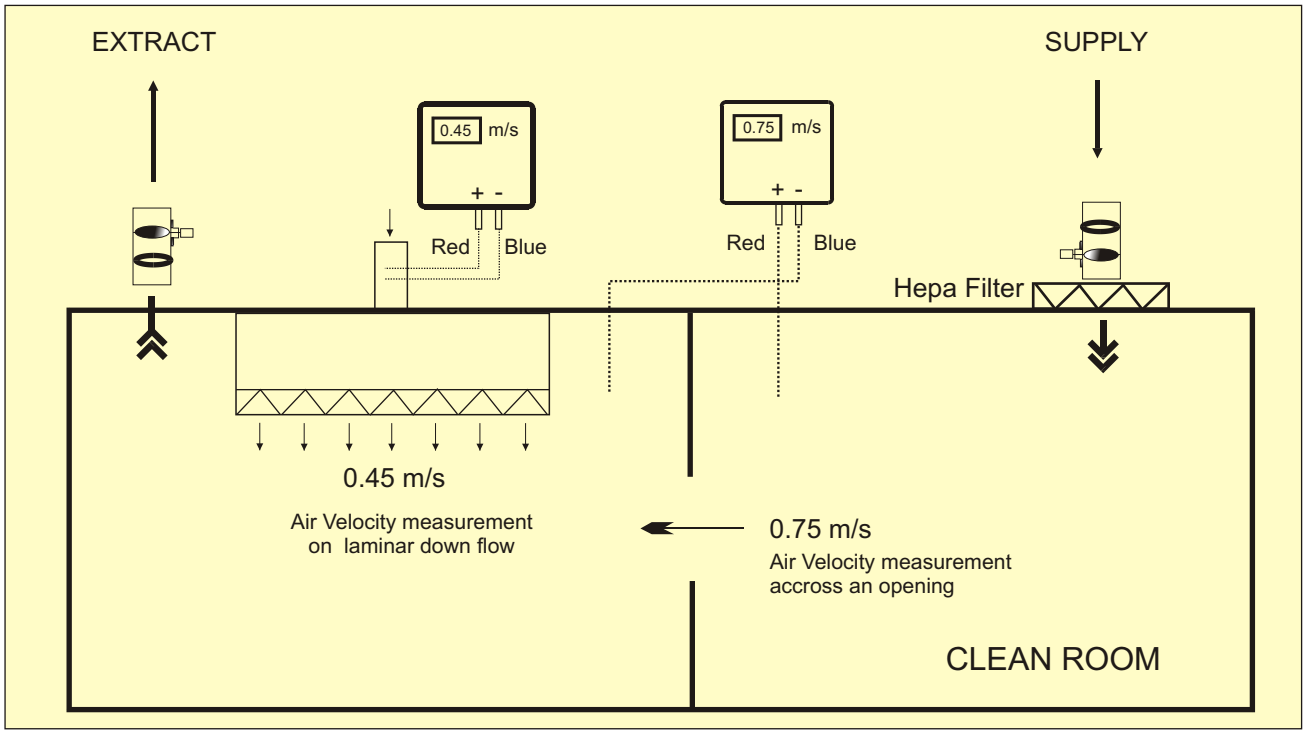
F-SENSOR VELOCITY APPLICATIONS

TYPICAL AIR VELOCITY OR VOLUME MEASUREMENT WITH CMR F-SENSORS



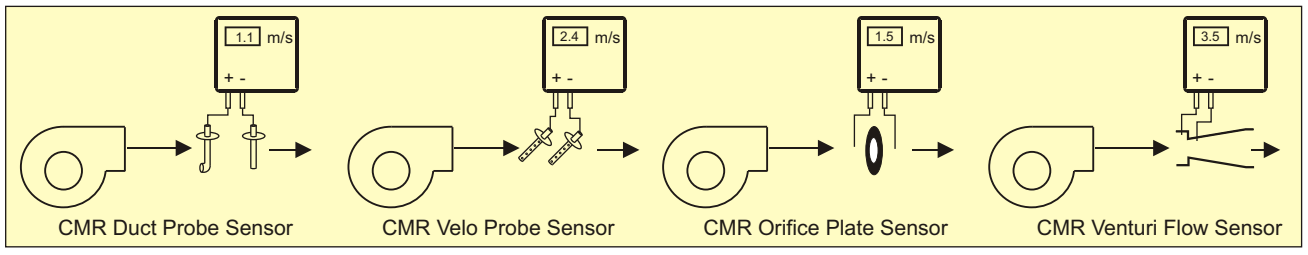
The CMR F-Sensor is a true Ultra Low Velocity Transmitter which has been designed to measure very low air volumes in Ventilation Systems accurately. The built in Square Root Extraction and span scaling makes the F-Sensor the most versatile instrument. It can display in m/s or m3/s. Other displays such as m3/h, litres/s, litres/min or any imperial measurement units are available on request .

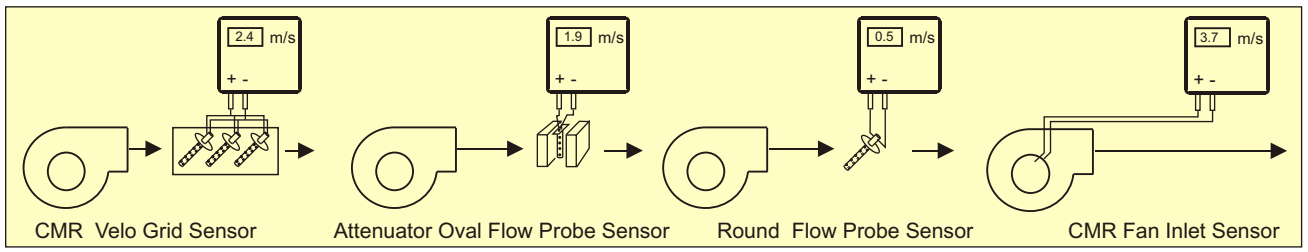
The F-Sensor is ideal for wall or plant room panel mount applications. The CMR PVC tubing can be run up to 10m and the F-Sensor can be calibrated to suit the tube length. The F-Sensor is used for monitoring or controlling low Volume Flow such as fume cupboards, laminar flow ceilings, fresh air applications 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 4.00 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 is standard.

TYPICAL ULTRA LOW SUPPLY AIR VELOCITY OR VOLUME MEASUREMENT APPLICATIONS





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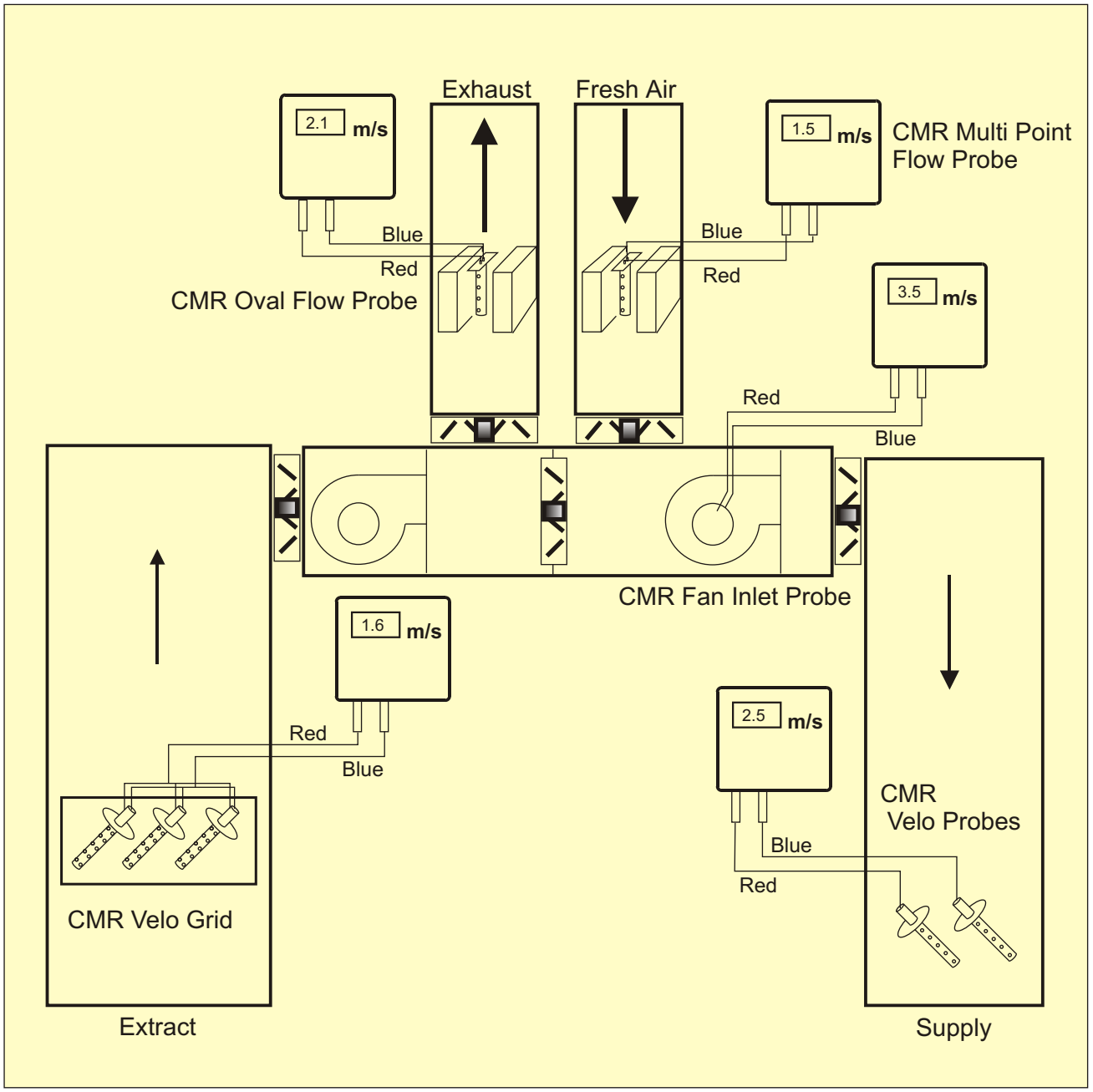
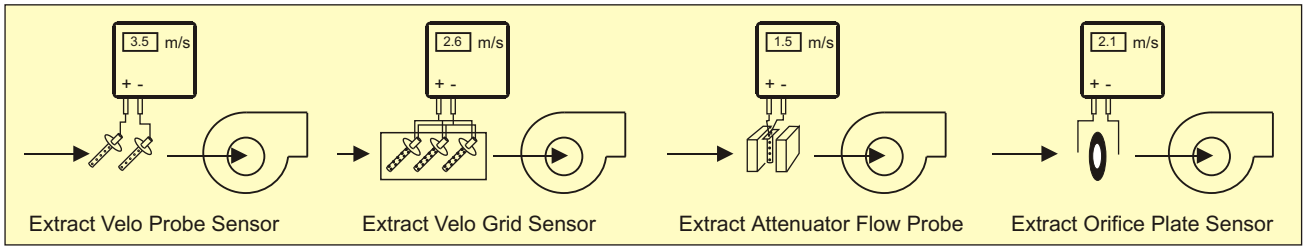
F-SENSORS IN AHU APPLICATIONS

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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22 Repton Court Repton Close
Basildon Essex SS13 1LN GB
Website : http://www.cmr.co.uk

Tel +44 (0) 1268 287222
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F-SENSORS 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.

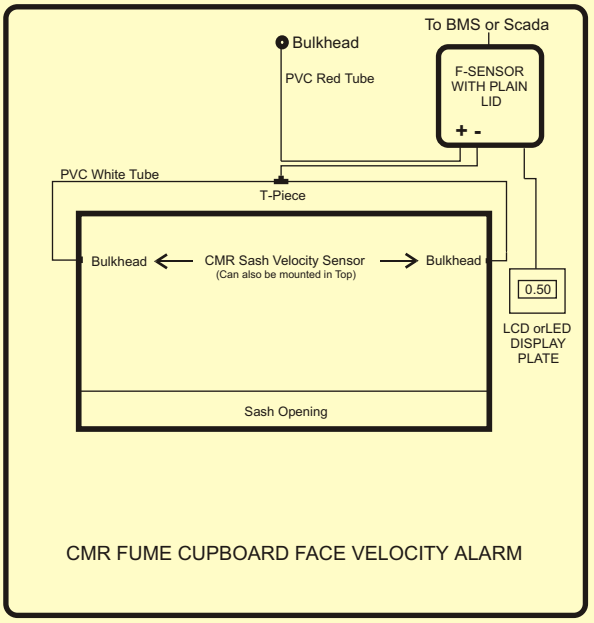
The output signals of 0..10V or 4..20mA can be connected either to Building management systems for control purposes or Scada systems for operator safety and product protection alarm monitoring.

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 or LED 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 P2 (span) so that the same value shows on the computer screen.



F-Sensor with Plain Lid and remote LED Display

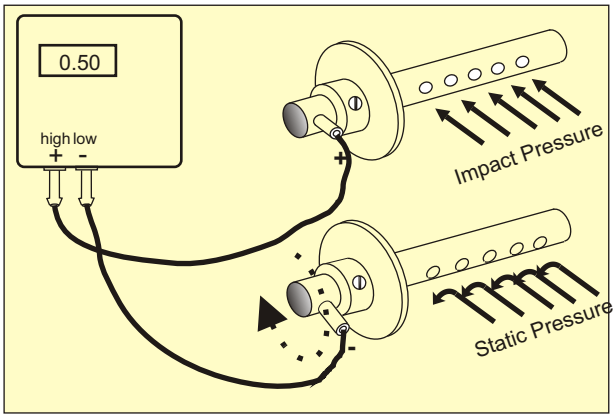
VELO PROBES AND F-SENSORS

F-SENSOR SCALING BY ADJUSTING THE VELO PROBES

Adjust the Impact Veloprobe to face the Airflow and and adjust the Static Velo probe 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.



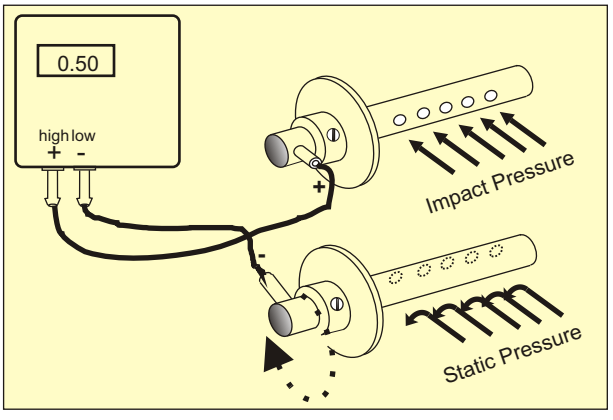
Calibrating by adjusting the Velo Probes

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
Multiply the F-Sensor range i.e. 2 m/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 2.00 m3/s and work out the duct readings in m3/s. If the Volume is 0.50 m3/s, turn the F-Sensor 'Span' Potentiometer until the Screen shows 0.50 m3/s.



Calibrating by adjusting the F-Sensor Span.

CMR CONTROLS
Division of C.M.RICHTER EUROPE LTD

22 Repton Court Repton Close
Basildon Essex SS13 1LN GB
Website : http://www.cmr.co.uk

Tel +44 (0) 1268 287222
Fax +44 (0) 1268 287099
e-mail: sales@cmr.co.uk

F-SENSOR OPERATING INSTRUCTIONS

CALIBRATION INSTRUCTIONS

CALIBRATION
The F-Sensor's electronic is accessible by removing the Lid. Connect a Voltmeter to the Terminals 1 and 2 or use a molex connector on the LCD Display connector J7. The output signal on the LCD connector is always 0...10V.

Connect a mA Meter to the Terminals 3 and 4. It is important to know that the F-Sensor's base calibration is based on 0...10V, which means, all calibrations must be carried out in 0...10V first. The 4...20mA circuit is simply a convertor of the 0...10V and is factory set. It is therefore recommended never to touch P6 and P5 unless they have been tampered with.

To calibrate the 4...20mA circuit it is necessary to have a Voltmeter and a mA Meter connected to obtain overall accuracy.

ZERO ADJUSTMENT
Switch Slide Switch to UP position which is the linear Pressure Signal Output on the J2 Terminals. Turn the SM potentiometer fully anti clockwise with no small value shut off.

P1 scales the Zero of the Sensor. Turn the 'SLOW' P8 Potentiometer completely anti clockwise to remove any dampening. Remove all Tubes and let the Sensor settle. Connect a tube from (+) to the (-) nipple to short circuit the air to stop any draught going through the sensor.

If the Voltmeter is connected to the LCD connector or to 1 and 2, adjust P1 until 0.00V is achieved.

If the mA Meter is connected to 3 and 4, adjust P1 until 4.00mA is achieved.

If the Voltmeter, which is connected to the LCD connector or Terminal 1 and 2, displays 0.00V but the mA Meter connected to 3 and 4 is not at 4.00mA only then adjust P6 to achieve 4.00 mA.

SPAN ADJUSTMENT
Check the Zero Adjustment above first. Switch the square root switch back to the down position. P2 scales the Span of the F-Sensor.
Measure the air velocity in the application with a reference instrument and work out the average velocity. Adjust the span (P2) of the F-Sensor to the measured value i.e. if the F-Sensor is scaled to 0..2.00m/s and the measured value is 1.00m/s the output voltage must be adjusted to 5.00V on P2 which is half the range of the sensor.
Note: the span adjustment must always be done with the square root switch in down position.

If the Voltmeter, which is connected to the LCD connector or Terminal 1 and 2, displays 5.00V but the mA Meter connected to 3 and 4 is not at 12.00mA only then adjust P5 to achieve 12.00 mA.

LINEARITY CHECK
Ckeck the air velocity at various levels. If the F-Sensor is a 0..2.00m/s Sensor then test it at the following flows:

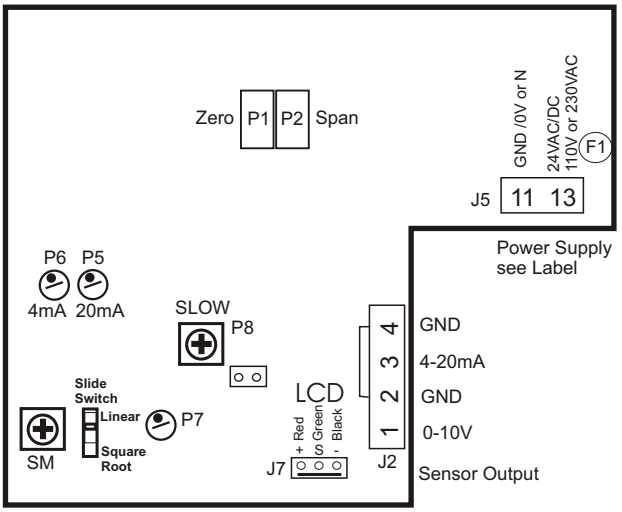
25 % = 0.50 m/s or 2.50V - 8.00mA
50 % = 1.00 m/s or 5.00V - 12.00mA .
100% = 2.00 m/s or 10.00V - 20.00mA

The Linearity is the accuracy of the Sensor less any Calibrator deviation. See the following Example:

Zero of Sensor = 0.00 V Zero of Calibrator = 0.00 m/s
Span of Sensor = 5.00 V Span of Calibrator = 1.00 m/s
The Sensor is 100% linear compared with the Calibrator.

Repeat the Zero and Span adjustments a few times.

F-SENSOR LINKS AND POTENTIOMETER SETTINGS



SQUARE ROOT CHECK
The Square Root circuit is factory adjusted. In order to check its accuracy disconnect the tubes and short circuit the (+) and (-) nipple to stop any draught.

Slide the square root switch into up position (linear mode) and adjust the zero (P1) potentiometer to 0.10V output on terminal 1 and 2 or LCD Connector.

Slide the square root switch to down position (square root) and the output should read 1.00V. The square rooter is then accurate over the whole range. If the output is not 1.00V adjust P7 until 1.00V is achieved.

Re-adjust P1 to 0.00V with the square root switch in up position. Once finished, put the slide switch back into down position (square root) and reconnect all tubes..

SLOW OR DAMPENING OF OUTPUT SIGNAL
Adjust 'SLOW' P8 clockwise for signal output dampening.
This adjustment is useful in monitoring applications where the output signal must be smoothed to eliminate fluctuations in the digital data input channels of Scada Monitoring or BMS Computer Systems.

During Calibration of the F-Sensor set P8 fully anti-clockwise.

SM SMALL VALUE SHUT OFF
At very low velocity pressures the output signal is extremely high when square rooted. In order to force the signal to have 0V output when there is no airflow, turn the SM Potentiometer clockwise until the signal shows 0V.

During calibration turn the SM Potentiometer fully anti clockwise otherwise the zero adjustment is not correct.

MAGNIFICATION FACTOR SCALING
There is no Scaler on the F-Sensor board and any magnified velocity pressures must be scaled by the P2 span potentiometer so that the correct voltage output is achieved. Use a reference instrument to measure the air velocity or volume and then adjust P2 span to read the same value of the F-Sensor.

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Tel +44 (0) 1268 287222
Fax +44 (0) 1268 287099
e-mail: sales@cmr.co.uk

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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 PART NUMBER
The F-Sensor Part Number starts with the selection of the enclosure which depends on the Tube connections. In the Example we have chosen Code '28A' which is a standard ABS F-Sensor enclosure with 6 mm barbed nipples to fit CMR PVC Tube.
The Part Number therefore starts with ' 28A '.

Smaller nipples with a 3 mm O./D to fit the small bore CMR Silicone Tube cannot be utilised with the F-Sensor.

Aluminium enclosures are supplied with compression fittings to suit either Stainless or Copper Tube i.e ALU 6 mm Code '28C' or ALU 1/4" Code '28D'.

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 '000' always applies to any F-Sensors
The Part Number extends to '28A 000'.

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 SelectionTable are a number of standard velocity ranges listed.

We have chosen 0..2.00 m/s which has the Code '015'.
The Part Number extends to '28A 000 015'

OUTPUT SIGNAL
The Industry Standard for Output Signals is 0...10V and 4...20mA, but other signals can be supplied by CMR on request and are listed in the Selection Table. The F-Sensor has a dual output as standard .

0-20mA which has the Code 'B' or 5 - 19mA which has the Code 'C' are also available.
In the Example, we have chosen dual output 0...10 V and 4..20mA which has the Code 'A'.
The Part Number extends to '28A 000 015 A'.

POWER SUPPLY
The Industry Standard is 24VDC or 24VAC. 110VAC and 230VAC are less used today for safety and EMC protection reasons. The 15VDC versions are seldom used.

In the Example we have chosen 24VDC which has the Code '2'.
The Part Number extends to '28A 000 015 A 2'.

INTERNAL LCD OR LED BUILT INTO LID
A 3 1/2 digit LCD Display can be supplied as an optional extra to be mounted into the Lid of the F-Sensor. The LCD is a Liquid Crystal Display without illumination. The Protection is IP44 and is only suitable for indoor applications. This LCD is the most popular display as it incorporates the Engineering Units as legends i.e. m/s or m3/s.

We have chosen this 3 1/2 digit LCD which has the Code 'A' .
The Part Number extends to '28A 000 015 A 2 A '.

Please Note, if an IP65 enclosure is required the red illuminated LED displays in 3 1/2 or 4 1/2 digits must be used. The legends are not available on these glasses.

SCALED UNITS
The range is printed on a product label fixed to the lid of the sensor. Normally, the range is printed as m/s but other ranges can be selected under this order code. If and LCD or LED is required then the LCD's or LED's must be scaled to suit the application
i.e. 0..2.00m/s which means it is scaled in m/s.

The Code 'A' 3 1/2 Digit LCD Display has the additional benefit that a small legend m/s appears on the glass of the LCD. All other LED's have no descriptions on the glass.

The LCD or LED's can be scaled in m3/s, but the exact duct area must be known. Consult CMR to confirm the scaling.

We have chosen the Code '1' .
The Part Number extends to ' 28A 000 015 A 2 A 1'.

DECIMAL PLACES
If no LCD is fitted then this is N/A (not applicable).
The 3 1/2 digit LCD can only display 1999 or 199.9 or 19.99 or 1.999. The 4 1/2 digit LCD or LED can display 19999 or 1999.9 or 199.99 or 19.999 all depending on the decimal place setting..

It is essential to know the velocity or volume in order to determine the display on the LCD/LED glass. In the example we have chosen two decimal places, which can display i.e. 2.00m/s .

Two decimal places has the Code 'C'.
The Part Number extends to ' 28A 000 015 A 2 A 1 C'.

COLUMN 15 AND 16
These two columns are not used and must always have a 'N' and 'N' Code.

The Part Number extends to ' 28A 000 015 A 2 A 1 C N N'.

FINAL PART NUMBER
The Part Number to order is 28A000015A2A1CNN.

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

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Website : http://www.cmr.co.uk
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e-mail: sales@cmr.co.uk

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 28A 000 015 A 2 A 1 C N N which is printed above the Selection Table can be identified as being an F-Sensor Ultra Low Velocity Sensor having 6mm barbed tube connectors with a Negative Range of 0 m/s and a Positive Range of 2.00m/s, with a dual Output Signal of 0-10V and 4-20mA. The power Supply is 24VDC. The Sensor would be supplied with a 3 1/2 digit LCD Display mounted internally. The display is scaled in m/s. The Decimal Points are adjusted to 2 which indicates 0..2.00 m/s. The last two columns are not used and represent N for None.

EXAMPLE PART NUMBER SELECTION (The code after the (=) sign is used i.e. 6mm = 28A)

28A	000	015	A	2	A	1	C	N	N
F-SENSOR	Negative	Positive	Output	Power	Internal	Scaled	Decimal	Not used	Not used
Part No.	Range	Range	Signal	Supply	LCD/LED	Units	Points		
6mm = 28A	0m/s = 000	1.00 m/s = 010	Dual = A	15 VDC = 1	NONE = N	m/s = 1	N/A = N	None = N	None = N
6cp = 28C		2.00 m/s = 015	0..20mA = B	24 VDC = 2	LCD 3 1/2 = A	% = 2	000 = A		
1/4cp = 28D		3.00 m/s = 020	5..19mA = C	24 VAC = 3	LED 3 1/2 = B	m3/s = 3	00.0 = B		
		4.00 m/s =0 25		110 VAC = 4	LED 4 1/2 = C	m3/h = 4	0.00 = C		
				230 VAC = 5		lit/s = 5	.000 = D		
						ACR = 6			

HOW TO ORDER

Make up your own F-Sensor selection below using the empty cells

EXAMPLE
A wall mount ultra low velocity transmitter is required of the Type F-Sensor.
The tube connections must be 6mm for CMR PVC Tube
The negative velocity range must be 0.00m/s (no others can be supplied)
The positive velocity range must be 4.00 m/s
The output signal must be dual 0-10V and 4-20mA.
The power supply must be 24V AC isolated
The internal LCD Display must be a 3 1/2 digit LCD with legends.
The scaled units must be in metres/second (m/s)
The indication must be 4.00 with two decimal points

Call CMR for assistance at any time

The part Number for this F-Sensor is 28A 000 025 A 3 A 1 C N N

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Website : http://www.cmr.co.uk
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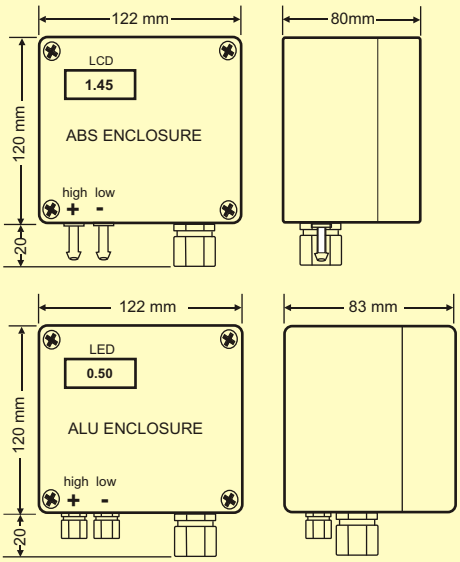
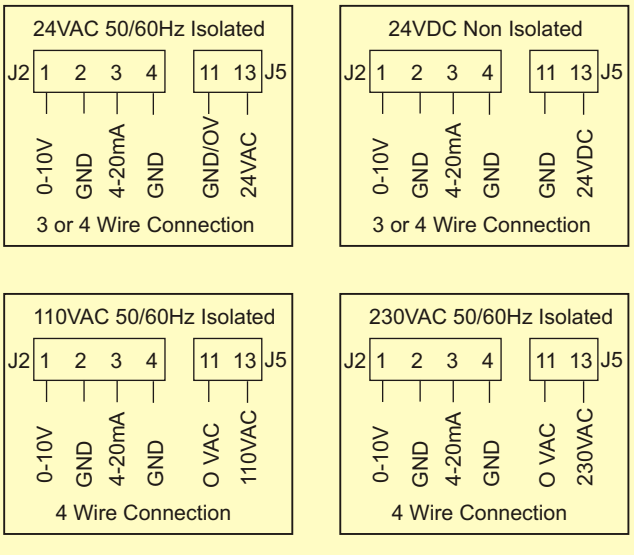
Fax +44 (0) 1268 287099
e-mail: sales@cmr.co.uk

F-SENSOR TECHNICAL SPECIFICATION

Measurement Range	See Order Selection Table F-Sensor
Optional Range	Any Range from 0..2.00 m/s up to 0..4.00 m/s (max 5.00 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 10mA Fuse 315mA Wickmann
DC Power Supplies	15 VDC smoothed. Sensor without remote LCD and Volt output only. (50mA)
	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 RI = 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 PG13 Gland Internal Plugs with Screw Connections (Other Gland Sizes on request)
Air Tube Connections	Positive and Negative Velocity Barbed Nipple 6.5mm O/D x 15mm long in ABS enclosure
	or 6 mm / 1/4" Compression fittings in Aluminium enclosures.
Enclosure	ABS Grey Protection IP65 without LCD. With CMR LCD IP44 and ABS or ALU with/without LED IP65
Conformity	EN61326-1 EMC EN61010-1 SAFETY
Calibration Certificate	Must be calibrated against a reference instrument on site to suit application.

DIMENSIONS AND CONNECTIONS





TUBE CONNECTIONS
ABS 2 x 6mm for PVC Tube
ALU 2 x Compression Fittings for 6mm or 1/4" O/D

CABLE ENTRY GLANDS
1 x PG13 Gland for ABS Enclosure
1 x PG13 Metal Gland for Aluminium Enclosure

CMR CONTROLS
Division of C.M.RICHTER EUROPE LTD

22 Repton Court Repton Close
Basildon Essex SS13 1LN GB
Website : http://www.cmr.co.uk

Tel +44 (0) 1268 287222
Fax +44 (0) 1268 287099
e-mail: sales@cmr.co.uk

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