

# Labcell Limited Automotive Test Instrumentation



## Table of Contents

### CAN BUS Technology

CSM Measurement Modules

### Blow-by

M400MR Blow-by Monitor

### Exhaust Gas Analysis

ECM Engine Exhaust Gas Analysers

ECM Engine Test Modules

### Flow

Laminar Flow Elements

### Pressure Measurement

Meriam Smart Pressure Gauge

Meriam Digital Manometer

Tetratex CFO Gas Dosing Kit

### Reference

Engine Stoichiometry Chart

Labcell Contact Details



# Blow-by Meter

For Engine Testing, Lubricant Testing and Fleet Maintenance in Dynamometer Cells and Vehicles

The M400MR measures the flow of gases from an engine's crankcase. This flow, called Blow-by is the gas which is blown past the piston rings or which is caused by valve guide or turbocharger leakage.

Blow By data are used to determine engine condition and lubricating oil effectiveness. Blow By is quantified either by the flowrate at a given speed or load or by the time it takes for a certain volume of gas to flow over a given engine cycle.

The M400MR is compact, easy to use and versatile. With user selectable ranges from 4 to 400 LPM it will cover most Blow By requirements. Analogue output, selectable range and display are standard features. The sensor utilises vortex shedding technology which is solid state and enables the meter to be both small and light. The meter incorporates oil separation and damping volumes and is easy to install and connect to the hose from the engine.

Blow-by is quantified either by:

- The flowrate at a given engine load or speed
- The time it takes for a certain volume of gas to flow over a given engine cycle.

Measurement Types:

The M400MR has both flow rate and totaliser modes and therefore supports both types of measurement. The Blow-by meter operates on a vortex shedding principle which provides a fast response and an insensitivity to temperature, pressure and velocity. There are no moving parts in the meter and the vortex shedding principle ensures perfect zero stability.

## M400MR Specifications:

Repeatability	0.5% of reading
Accuracy 0-150 LPM:	1% of reading or 1 LPM whichever is greater
Accuracy 11-300 LPM:	1% of reading or 2 LPM whichever is greater
Accuracy 15-400LPM:	1% of reading or 3 LPM whichever is greater

## M400MR Features:

- Wide flow measurement range
- Suitable for spark ignition and diesel engines
- 0-5V linearised, programmable output or CAN
- Built in oil separators and dampers
- Integral ports for temperature and pressure probes
- Easy-to-read display
- Low flow restriction
- Flow rate and totaliser modes
- User-defined engineering units

## Flow Ranges:

Flow ranges are set by user adjustable by-pass ports:  
4 to 150 LPM (0.15 to 5.4 CFM)  
11 to 300 LPM (0.41 to 10.8 CFM)  
15 to 400 LPM (0.56 to 14.4 CFM)  
Total flow: 1,000 Litres, 100.0 ft<sup>3</sup>



# ECM Engine Exhaust Gas Analysers



ECM's NOx 5210 is a versatile and highly integratable NOx, Lambda and O2 analyser for the development of engines, combustion systems and after treatment systems. NOx, Lambda and O2 are measured using a ceramic sensor that is mounted in the exhaust of the engine.



ECM's Lambda 5220 is a powerful, "next generation" wideband Lambda and O2 analyser. The Lambda 5220 is suited for both dynamometer and in-vehicle work. Lambda is the most important parameter influencing the emissions, fuel economy and drivability of combustion engines and it is imperative that it be measured accurately.



Exhaust gas recirculation (EGR) is a powerful control used to suppress NOx emissions in engines. As important as EGR is to the operation of engines, in the past there has been no simple and compact way to measure it. Now there is with ECM's EGR 5230 Analyzer.



ECM's NOx/NH3 5240 Analyser is a remarkable instrument that combines the measurement of NOx, NH3, O2 and Lambda into a single, compact package. The NOx/NH3 5240 makes these difficult measurements with ease and is an indispensable tool for the development of modern engine systems.

## ECM NOx 5210

Ranges: NOx 0 to 5000 ppm,  $\lambda$  0.4 to 25, A/F 6 to 364,  $\Phi$  0.04 to 2.5, O2 0 to 25%  
Response Time: NOx Less than 1 s.  
Less than 150 ms ( $\lambda$ , AFR,  $\Phi$ , O2)  
Fuel Type: Programmable H:C, O:C, N:C ratios and H2  
Analogue Outputs: 6 channels, 0 to 5V linearized & programmable for NOx,  $\lambda$ , A/F,  $\Phi$ , O2 etc.  
CAN Programmable communication protocol

## ECM EGR 5230

Ranges: EGR 0 to 100%,  $\lambda$  0.4 to 25, AFR 6 to 364,  $\Phi$  0.04 to 2.5, O2 0 to 25%  
Response Times: Less than 1 second (%EGR). Less than 150 ms ( $\lambda$ , AFR,  $\Phi$ , %O2, Pressure)  
Fuel Type: Programmable H:C, O:C and N:C ratios and H2  
Analogue Outputs: 6 channels, 0 to 5V linearized & programmable for EGR,  $\lambda$ , AFR,  $\Phi$ , O, pressure etc  
CAN Programmable communication protocol

## ECM Lambda 5220

Ranges:  $\lambda$  0.4 to 25, A/F 6 to 364,  $\Phi$  0.04 to 2.5, O2 0 to 25%, Pressure: 0 to 517 kPa  
Response Time: Less than 150 ms  
Fuel Type: Programmable H:C, O:C, and N:C ratios and H2  
Analogue Outputs: 6 channels, 0 to 5V linearized & programmable for  $\lambda$ , A/F,  $\Phi$ , O2, pressure etc  
CAN Programmable communication protocol

## ECM NOx/NH3 5240

Ranges NOx 0 to 5000 ppm, NH3 0 to 1000 ppm  
O2 0 to 25%,  $\lambda$  0.4 to 25, AFR 6 to 364,  $\Phi$  0.04 to 2.5  
Response Times Less than 1 s (NOx, NH3). Less than 150 ms (O2,  $\lambda$ , AFR,  $\Phi$ )  
Fuels Supported: Programmable H:C, O:C, N:C ratios and H2  
Analogue Outputs: 6 channels, 0 to 5V linearized & programmable for NOx, NH3, O2,  $\lambda$ , AFR,  $\Phi$  etc.  
CAN Programmable communication protocol

# ECM Engine Test Modules



The ECM NOxCAN is a versatile and highly integratable NOx, Lambda and O2 measurement module for the development of all engines, combustion and after treatment systems.

The NOxCAN uses a ceramic NOx sensor that is mounted in the exhaust of the engine and communicates measured NOx, Lambda, O2 and all sensor parameters via its CAN port. Suitable for spark ignition and diesel engines.



ECM's LambdaCAN module is a powerful wideband Lambda, AFR and O2 measurement module with a CAN interface. Pressure compensation is also available.

In addition to providing outstanding measurement range and accuracy, LambdaCAN addresses the two principle sources of error with wideband sensor use: ageing and pressure sensitivity.



The performance of all air-breathing engines is highly dependent on intake air conditions. These can be measured by baroCAN thus eliminating weather variables of a particular day which are likely to influence and bias emissions and fuel economy.

ECM's baroCAN module is a compact and rugged measurement system that provides all the important air conditions: humidity, %O2, dew point, water vapour pressure, temperature and absolute pressure. Sensors can be easily mounted in a variety of locations and the measured parameters transmitted via CAN.



ECM's dashCAN is a small, two-channel remote display for LambdaCAN and NOxCAN networks.

Simply attach dashCAN to the CAN bus and any two parameters from the network can be displayed. Perfect for dashboard use, dashCAN uses tall, 15-segment LED digits for easy viewing at all cabin temperatures and lighting conditions.

ECM's dashCAN+ is an enhanced display and features 6 x analogue outputs. Using the menu, any parameter on the network can be converted into a 0-5V DC signal.

## Suitable for Dynamometer and In-Vehicle Applications

### Rack Mounting option for up to four ECM analysers



ECM (Engine Control and Monitoring) develops, manufactures and supplies test instrumentation and control systems for vehicle powertrains, engines and combustion systems.

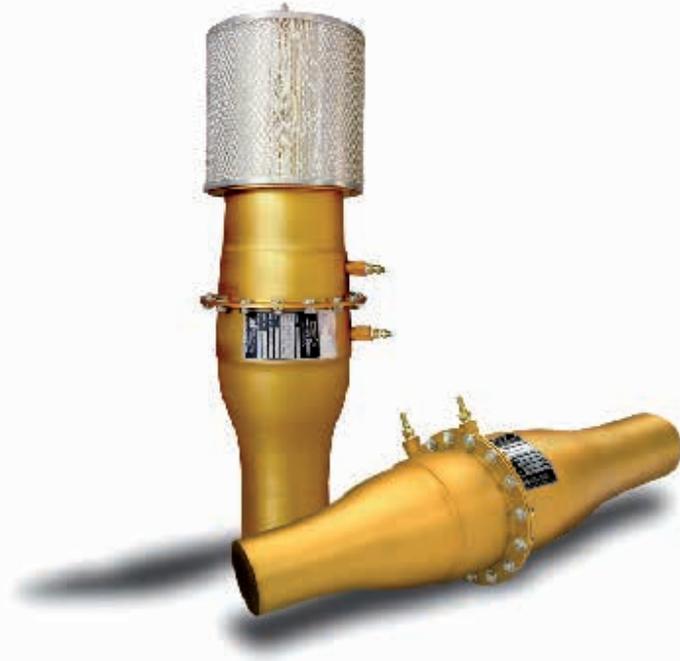
ECM's innovations include: the ceramic sensor-based NOx analyser, the ceramic sensor-based EGR (Exhaust Gas Recirculation) analyser, dynamic pressure compensation for ceramic sensors, "smart" ceramic sensors and fast-response temperature measurement.

ECM's tools are used by major vehicle manufacturers, engine manufacturers, combustion system manufacturers, research institutions and government agencies throughout the world



Example ECM Eight-Channel "LambdaCAN" System

## Precise Flow Instruments for the Measurement of Air Flow Including Engine Air Intake Applications



### LFE Features:

- Measures clean, dry air/gases
- Wide flow turndown (20:1)
- Flow ranges from 5 cc/min to 64,000 LPM
- Line sizes : 1/4" to 8" Diameter
- Accuracy: +/- 0.72 % of Reading
- Filtered meters available
- Choice of line connections (Hose, flanged or threaded)

### Applications Include:

- Engine Air Intake Measurement
- Emissions Analysis
- Flow Benches
- Calibration Standards/Reference
- Component Leak Detection

Meriam Laminar Flow Elements measure volume flow rate of gas by operating on capillary flow principles. The LFE generates a differential pressure which is near-linear to flow rate passed resulting in excellent performance in terms of accuracy, repeatability and turndown.

They are available in a number of line sizes to suit a choice of flow ranges and applications.

Each LFE is calibrated independently and supplied with co-efficients to allow flow rate to be determined by measuring differential pressure.

Engine Intake Air Flow is a measurement of the air flow demanded by an internal combustion engine. This measurement is required for any engine test or dynamometer cell where emissions are being monitored or the air fuel ratio is being determined. Also legislation in some instances requires operation under some predetermined air intake conditions be that as a flowrate or as a mass air input.

The 50MC2 model of LFE is an ideal choice for determining engine air intake. It is available in 4 different line sizes and measures up to 64,000 LPM.

The upstream filter option allows the meter to be used in dynamometer conditions and connected via flexible hosing, to the intake of an engine.

A suitably scaled transmitter can be fitted to output flow vs DP vs V out (typically 0-5 VDC). In addition, a CAN output option is also available.

### Specifications for Laminar Flow Elements:

Line Size	2"	4"	6"	8"
Max Flow (scfm)	100	400	1,000	2,250
Max Flow (Lites/min)	2,800	11,000	28,000	64,000
Filter Option	Yes	Yes	Yes	Yes

## M2110P Smart Pressure Gauge



The M2110P is a microprocessor based programmable pressure sensing device. The device can be programmed through the front keypad or via the RS232C port.

- Measures gauge, vacuum & absolute pressure
- Accuracy of 0.05% of full scale
- Ranges for 20 psi to 2000 psi
- 4 1/2 Digit Display
- RS232C, 4-20mA and relay outputs

## M2 Smart Manometer



Meriam's M2 Series Smart Manometers bring high precision and value to handheld, digital manometer users. Pressure ranges from 10" H2O F.S. to 3000 PSIG F.S. are available. M2 pressure sensors are available to measure gauge, differential, absolute or vacuum pressure.

- Leak Test, this function allows the user to view min/max pressure values and calculates leak rate
- Auto Record documents up to 240 readings
- Damping Rates, user selectable time constant from 0.1 to 25 seconds.
- Field Re-cal, the M2 can be recalibrated in the field for zero, span and linearity.
- Auto Shut-Off with user selectable limits
- Accuracy 0.05% F.S. or optional 0.025%

## Tetratec CFO gas dosing kit



The Tetratec CFO-Sx00 is commonly used for calibration of CVS dilution system or SHED chamber. It uses electronic control to inject a known dose of gas (either propane or carbon monoxide) into the CVS system to check the calibration of the measurement instrumentation.

- CVS calibration with wide flow turndown capability
- SHED test option
- Compliant with EPA standards
- Electronic pressure control
- Fully portable and self contained housing
- Certification supplied

### Specifications:

Power: 110-260 VAC, 50/60Hz, 24VDC max. 100W

Outputs: Ethernet, RS-232 & RS-485

Display: 3 x 6 digits text LED (Red)

Housing: Aluminium case

(373 x 358 x 300mm)

Approx 11 kg weight

Process connection: AN4a, 316 ssteel gas inputs; flexible ss mantled PTFE tube connections also available

Media compatibility: Propane, carbon monoxide and any clean, dry, non-corrosive gas.

The CFO-Sx00 is available with one or two critical orifices (according to the CVS air flow volume under test) and flow rate is set and controlled via an electronic regulator.

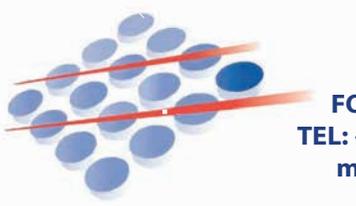
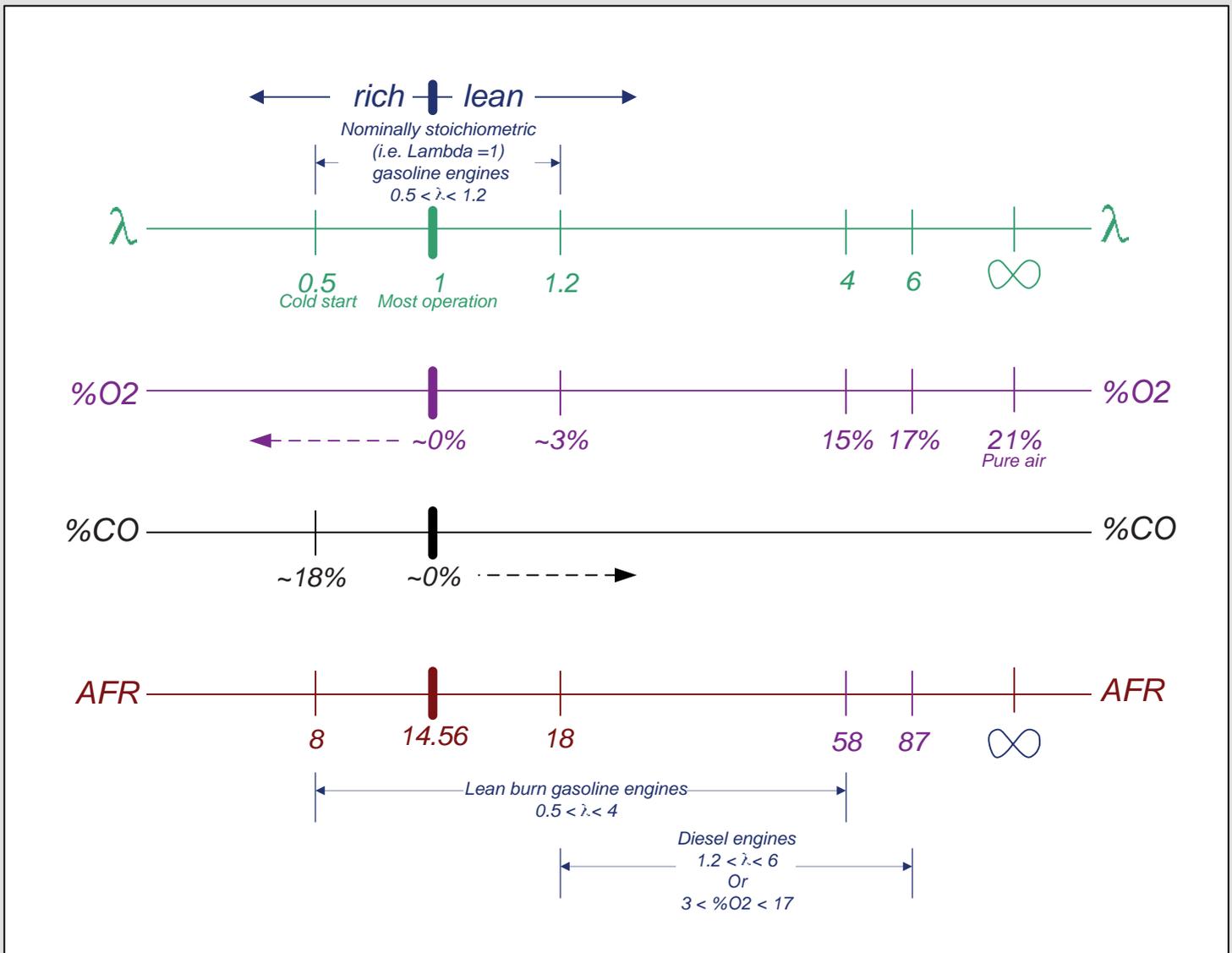
# Technical Note - Engine Stoichiometry

The fueling of an engine (i.e. stoichiometry) can be described six different ways; Lambda ( $\lambda$ ), AFR (air-fuel ratio), FAR (fuel-air ratio), Equivalence ratio ( $\Phi$ ), %O<sub>2</sub> and %CO.

There is a relationship between these six different quantities. The relationship is shown here for Lambda, AFR, %O<sub>2</sub> and %CO.

Equivalence ratio is not shown since it is just the inverse of Lambda ( $1/\lambda$ ). Similarly, FAR is not shown since it is simply the inverse of AFR ( $1/AFR$ ). Note that some relationships are non-linear. For example, a %O<sub>2</sub> of 20.946% (pure air) means infinite Lambda. For this reason, it is better to report diesel stoichiometry in %O<sub>2</sub> instead of Lambda.

All piston engines sold today fit into one of three categories; Nominally stoichiometric gasoline, lean-burn gasoline and diesel. The Lambda, etc. range of operation of these three engines is shown below.



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