cussons
TECHNOLOGY

P1300/P1301

LAMDASCAN III

FAST RESPONSE AIR-FUEL RATIO ANALYTICAL SYSTEM

FEATURES

- Fast Response Time with High Accuracy
- Automatic Range Change and Calibration
- Operation on all HC and Alcohol Fuels
- Externally Controllable
- Built-in Statistical Functions
- Heated Sampling for Durability and Accuracy
- Wide Sample Pressure Tolerance
- GPIB (IEEE 488) Interface as Standard
- Simple to Operate, with Pre-set Programs
- Microprocessor Based

APPLICATIONS

- Performance Monitoring
- Transient Phase Examination
- Checking of Mixture Quality in Engine Fuelling Systems
- Driveability Characteristics Monitoring
- Catalytic Exhaust Control Systems Checking

OPTIONS

LAMDASCAN III comprises 2 main units, a Sample Handling Unit and a Control Module.

- Model P1300: The Control unit is supplied mounted directly on the Sample handling unit
- Model P1301: The units are separate, and have a 6 metre interconnecting cable

Other options include:

- P1302 Chart recorder
- P9116 Single point interface oven for harsh environments
- P9121 Multipoint (4 or 6) interface oven
- P9123 Single point interface oven
- P9124 Multipoint (4 or 6) interface oven for harsh environments

PRINCIPLES

The value of the fast response measurement of Air-Fuel ratios (AFR) has long been appreciated in the study of both fuel delivery systems and in-cylinder combustion processes.

The CUSSONS Lamdascan principle is a well established one. Exhaust sample gas is taken from a source, passed through a heated sample line and diluted with an accurately metered quantity of ‘dope’ gas, which is usually ambient air. The diluted sample is oxidised over a platinum catalyst and passed to a high temperature zirconia cell. Residual oxygen, which is directly proportional to the engine AFR and the known quantity of dope gas, is measured by the zirconia cell.

Bottled gases (oxygen and nitrogen) may be used in place of the dope air when it is considered that the ambient air is sufficiently contaminated with carbon monoxide or hydrocarbons to cause inaccurate measurement.

Heated sampling prevents condensation of any hydrocarbon compounds and water vapour, and so increases accuracy and durability.

Statistical functions (Average Value, Standard Deviation, and Peak to Peak), are obtained over a 30 second sampling time, and are shown as the Equivalence Ratio (Lambda), or Air-Fuel Ratio, dependent upon display selected.

Automatic range change by dope gas switching ensures that the zirconium cell is operating at optimum oxygen concentration, and thus at best accuracy. AFR results from 5:1 to 50:1 may be obtained without loss of test data. Range changes may also be selected manually.

The GPIB (IEEE 488) is a standard feature which suits most forms of computer interface, and permits several Lamdascan sample handling units to be controlled from one master Lamdascan control unit. This feature is particularly useful for investigating transient mixture distributions.

Pre-set programs are selectable by positive action push button switches. The hinged front panel of the controller opens to allow access to switches for hydrogen/carbon (HC) and oxygen/carbon (OC) ratios of the fuel used, oxygen/nitrogen ratios of dope and reference gas - normally air, and external analogue signal zero and span settings.

Critical pressures are displayed on gauges on the sample handling unit to allow monitoring of correct operating conditions.

SPECIFICATION

MEASUREMENT RANGE
5–50 AFR by four steps. Automatic range change mode selectable

ACCURACY
± 0·04% volume of O_2 which is typically equivalent to better than ± 0·1 AFR, ± 0·005λ

STABILITY
Better than ± 0·02% volume O_2 over 2 hour measurement period

RESOLUTION
± 0·01% volume O_2, ± 0·01 AFR, ± 0·001λ

REPEATABILITY
Better than ± 0·02% volume O_2. Typically equivalent to better than ± 0·05 AFR, ± 0·003λ

LAG TIME WITH 3M HEATED LINE
Less than 500 milliseconds

RESPONSE RISE TIME WITH 3M HEATED LINE
Air to Nitrogen; 90% change in less than 300 milliseconds without digital frequency compensation

EXHAUST SAMPLE INLET PRESSURE; TOLERANCE
–200 mbar to +1 bar, resulting ± 0·003λ at low dope, ± 0·01λ at high dope

EXHAUST SAMPLE FLOW
Approximately 5 litres per minute

EXHAUST SAMPLE TEMPERATURE
For 0º to 400ºC use Models P9121 of P9123
For –40º to 100ºC use Models P9116/7 or P9124

WARM UP TIME
60 minutes

TYPICAL CATALYST LIFE
500 hours unleaded fuel, 50 hours leaded fuel

AMBIENT TEMPERATURE
0 to 50ºC

RECORDER OUTPUTS (STANDARD)
0 to 1V = 0 to full scale for λ/AFR/O_2
0 to 1V ≡ 0 to 10% O_2

COMPUTER INTERFACE
GPIB (IEEE 488) standard

HC RATIO ADJUSTMENT RANGE
0·00 to 9·99

OC RATIO ADJUSTMENT RANGE
0·00 to 9·99

HEATED SAMPLE LINES
3 metres length standard, 1, 5, 8 or 10 metres, options directly interchangeable

CONNECTING CABLE - CONTROL UNIT TO SAMPLE HANDLING UNIT
17 way x 6 metre long. Other lengths 1 to 25 metres to order

SAMPLE FILTER
19 mm x 90 mm Whatman extraction thimble

ELECTRICAL POWER REQUIREMENTS
Single Phase, 2·8kW, 100-120/200-240V, 50/60Hz

GAS SUPPLIES

Purge Air	10 litre/mm at 2 to 6 bar
N_2 Zero Gas	5 litre/mm at 2 to 3 bar
O_2/N_2 Cal Gas	5 litre/mm at 2 to 3 bar

DIMENSIONS	*Width*	*Height*	*Depth*
P1300 Integral Unit	480	1050	620
P1301 Remote Option:-			
Control Unit (19" rack)	430	176	350
Sample Handling Unit	440	820	620

WEIGHTS

P1300 Integral Unit	89 kg
P1301 Remote Option:-	
Control Unit	13 kg
Sample Handling Unit	76 kg

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