



P8660

SERIES MULTI-CYLINDER ENGINE TEST BED WITH FULL COMPUTER CONTROL AND DATA MANAGEMENT SYSTEM

EXPERIMENTAL CAPABILITIES AND MEASUREMENTS

- ◆ Measurement of maximum torque and maximum power with plotting of full throttle/rack power against speed curve
- ◆ Determination of brake mean effective pressures
- ◆ Analysis of torque speed characteristics
- ◆ Determination of fuel consumption characteristics
- ◆ Calculation of brake specific fuel consumptions
- ◆ Analysis of load characteristics at constant speed
- ◆ Determination of volumetric efficiency
- ◆ Air consumption, fuel consumption, air/fuel ratios
- ◆ Brake thermal efficiencies
- ◆ Exhaust, water, oil and air temperatures
- ◆ Pressure/time, pressure/volume and crank angle diagrams (with P4600/P4605)

DESCRIPTION

Cussons P8660 Series Computer Controlled Multi-Cylinder Automotive Engine Test Beds have been developed to provide a self-contained advanced engine test facility for automotive and industrial light duty multi-cylinder engines having full AUTOTEST IV computer control and data management system purpose designed for engine performance, economy and energy balance measurements. With suitable ancillary equipment, as specified in subsequent items, the system can be used for data logging, exhaust emissions analysis work and high speed combustion data acquisition programmes.

The test facility is intended for installation within the client's acoustic test cell equipped with appropriate services for power, plant cooling water, fuel, ventilation air, exhaust silencing/dispersion and necessary mechanical lifting aids. Cussons can, if necessary, advise on the requirements for these services and can provide a complete facility design and procurement service at the client's request.

The test stand is designed for universal engine applications within the range of the dynamometer selected and can be provided with the various engines adapted for convenient installation.

We are able to offer the following versions of this facility dependent on the end users dynamometer requirements:

P8661 COMPUTER CONTROLLED MULTI-CYLINDER ETB WITH HYDROKINETIC DYNAMOMETER.

P8662 COMPUTER CONTROLLED MULTI-CYLINDER ETB WITH EDDY CURRENT DYNAMOMETER.

P8663 COMPUTER CONTROLLED MULTI-CYLINDER ETB WITH REGENERATIVE DYNAMOMETER

SPECIFICATION

The main engine test facility system comprises the following elements:

1) TEST STAND BASE & SERVICES FRAME DYNAMOMETER

The following dynamometers options can be supplied:

P8661 Hydraulic Dynamometer

Rated for 112kW (150 bhp) at 9000 rpm. The dynamometer is water cooled and a suitable driveshaft guarding arrangement is provided.

P8662 Eddy Current Dynamometer

A high speed eddy current dynamometer rated for 150 kW (200 bhp) power absorption, 500 Nm maximum torque and 8000 rev/min maximum operating speed. The dynamometer is water cooled and equipped with a safety flow switch. Calibration equipment for the precision dynamometer load cell can be provided. A suitable driveshaft guarding arrangement is provided.

P8663 Regenerative Dynamometer

A swinging field DC dynamometer rated for 90 kW (135 bhp) power absorption, 200 Nm maximum torque and 6000 rev/min maximum operating speed. The dynamometer is air cooled and equipped with field thermostats. Calibration equipment for the precision dynamometer load cell can be provided. A suitable driveshaft guarding arrangement is provided.

BEDPLATE

All the above dynamometers are fitted to a specially designed and fabricated steel bedplate, which also carries the engine coolant module and engine.

COOLING PACKAGE

An engine cooling package is installed at the front of the test stand using water/water and water/oil heat exchangers controlled via automatic thermostatic valves for regulation of the engines coolant and lubricating oil systems respectively. The coolant system is fully sealed enabling conventional automotive vehicle based pressurised operation to be achieved.

The test stand also houses a high capacity d.c. battery for engine starting and a services frame, housing fuel supply and measurement, air intake flow measurement, servo throttle actuator and control and signal interfaces.

FUEL SUPPLY

The fuel supply system can draw fuel from a small sample supply tank housed on the test set or from the client's bulk store system. Fuel flow measurement is via a 'Pelton Wheel' type flowmeter housed in the P8227 volumetric fuel flow system supplied as standard. This system also provides a facility for adjusting the delivery pressure to the engine to suit engine requirements.

AIR FLOW

Air flow measurement is via a capacity damping tank and interchangeable orifice plates designed to cover the engine ranges supplied.

THROTTLE CONTROL

A P8277 servo actuator is provided for control of throttle or rack position, and incorporates an overtravel device. Its position is adjustable to facilitate differing engine requirements.

INSTRUMENTATION

The following instrumentation and sensors are supplied:

- Pressure transducers - All transducers are connected via quick couplings
 - Fuel pressure (0 to 500 kPa gauge)
 - Engine manifold pressure (-1 to +150 kPa gauge)
 - Engine oil pressure (0 to 1000 kPa gauge)
 - Barometric pressure (0 to 120 kPa absolute)
 - Air flow differential pressure (0 to 750 Pa differential)

- Fuel flow meter - turbine range 0 to 35 l/hour

- Speed sensor - inductive pickup

- Load sensor - strain gauge load cell

- Temperature inputs - 16 Type K thermocouple inputs of which the following are fixed:

Air inlet, Fuel, Engine coolant outlet, Lubricating oil outlet, Exhaust manifold, (*) Exhaust gas inlet to calorimeter, (*) Coolant inlet to calorimeter, (*) Exhaust gas outlet calorimeter, (*) Coolant outlet from calorimeter

(*) These items are for use with Cussons Exhaust Gas Calorimeter

Optional turbine coolant flowmeter range 0-200 l/min (P8656)

Optional turbine type oil flowmeter range 5-50 l/min (P8657)

2) TEST BED COMPUTER CONTROL SYSTEM

The test bed is controlled and monitored by a specialised facility management computer package known as **AUTOTEST IV**.

Based on a modularised VME construction using advanced multi processor Motorola devices intended for powerful multi tasking control applications, in conjunction with a Pentium PC operator interface, the system is supplied with comprehensive source software designed for complex test facility operations, data analysis and data presentation including graphical displays.

The facility permits the generation of extensive fully automated testing sequences and can provide a very effective direct manual operating regime and a wide range of possible automatic - manual interactions. Applications programmes for basic facility operations are provided within the scope of supply and continuing assistance to the end users is available through the training and operational support packages.

AUTOTEST IV system shown with optional second desk display VDU.



AUTOTEST IV SPECIFICATION: Detailed specification is available on a separate document, but the main standard configurations are:-

- 64 Analogue input channels
- 16 Analogue output channels
- 64 Digital input channels
- 32 Digital (relay) output channels
- 16 Frequency input channels
- A 2 channel hardware in-cell display and manual control unit
- Operator display via single screen PC to specification detail attached

Note: a second operator desk display VDU system is available as optional additional equipment.

- System is supplied fully loaded with resident VME unit source code, PC operating system using 32 bit Windows NT (V 4 0) and PC resident Autotest operator source code. Application programmes to run the test set to a basic schedule and incorporating capabilities to run under manual control are provided as standard. User training in the use and development of application programmes is provided. Application programmes enable complex test sequences to be developed but require little computer knowledge as near plain level instruction sets are utilised. Cussons engineers are available as required to directly support the further development of application routines.
- Printer and stand.

The following controls are provided on the manual control station:

- Three position key switch for engine starting.
- Remote throttle control.
- Dynamometer speed control.
- Emergency stop.

SAFETY PROTECTION SYSTEM

Appropriate safety trips are incorporated in AUTOTEST IV for safe shutdown.

3) DYNAMOMETER CONTROL SYSTEM

As following, dependent on dynamometer supplied.

P8661 Hydraulic Dynamometer Control

Dynamometer sluice gate control is via Autotest IV

P8662 Eddy Current Dynamometer Control

This is a 19" rack mounted module for controlling field excitation. The controller is a thyristor unit, capable of being used as a current source and is a state of the art system with on board fault detection.

Control modes such as constant speed, constant torque etc. are available via Autotest IV.

P8663 Regenerative Dynamometer Control

This is a floor mounting unit housing a microprocessor controlled Thyristor drive for controlling dynamometer excitation. The controller is an advanced 4 quadrant system, capable of configuring the dynamometer to both motor the engine or regenerate engine load efficiently back into the mains supply. The system is fully interlocked and incorporates its own on board fault detection system.

Control is via Autotest IV.

ENGINE OPTIONS

The test beds are designed to accept a wide variety of engines whose power ratings fall within the dynamometer operating envelope. Where engines are supplied by Cussons Technology they will be suitably modified and flexibly mounted on a subframe which can quickly and easily fitted to the test bed.

P8613 Four Cylinder Water Cooled Spark Ignited Engine

Ford MVH 418, 1800cc four cylinder water cooled gasoline engine, rated 85kW at 5500 rpm. The engine has twin overhead camshafts with 4 valves per cylinder, multipoint sequential fuel injection via Ford EEC IV engine management.

P8621 Four Cylinder Water Cooled Compression Ignition Engine

Ford XLD 418, 1800cc four cylinder water cooled IDI diesel engine, rated 44kW at 4800rpm. The engine has a single overhead camshaft and rotary fuel injection pump.

P8622 Four Cylinder Turbocharged Compression Ignition Engine

Ford XLD 418T, 1800cc four cylinder water cooled turbocharged IDI diesel engine, rated 55kW at 4800rpm. The engine has a single overhead camshaft, exhaust driven turbocharger and rotary fuel injection pump.

NB The engines specified above are offered subject to availability and we reserve the right to supply an alternative of similar specification/performance.

Additional engines available on request.

OPTIONAL EQUIPMENT

| | |
|--------------|--|
| P8262 | Exhaust gas calorimeter |
| P8632 | Ignition advance meter for gasoline engines |
| P8633 | Modification of each engine to accept P4600/P4605 Engine Electronic Indicating equipment |
| P8634 | Dynamometer calibration equipment |
| P8635 | Installation materials kit suitable for P8661, P8662 and P8663 |
| P8656 | Turbine Type Coolant Flowmeter |
| P8657 | Turbine Type Oil Flowmeter |

P4600 4 Channel Comprehensive Electronic Engine Indicating & Combustion Analysis System for Gasoline & Diesel

P4605 4 Channel Basic Electronic Engine Indicating & Combustion Analysis System for Gasoline & Diesel

P8390/5 Basic Emissions Analyser for HC, CO, CO₂, O₂, Lamda and AFR.

SERVICES

P8661 Hydraulic Dynamometer ETB

Electrical supply:- Dynamometer controller - 380/415V a.c., 6 Amp, 50 Hz three phase.

Control Console - 240V a.c., 1 Amp, 50 Hz single phase.

Water supply:- 40 litre per kilowatt per hour.

P8662 Eddy Current Dynamometer ETB

Electrical supply:- Dynamometer controller - 220/240V a.c., 10Amp, 50 Hz single phase.

Control Console - 240V a.c., 5 Amp, 50 Hz single phase.

Water supply:- 200 l/min, minimum pressure 1 bar, maximum pressure 4 bar.

P8663 DC Regenerative Dynamometer ETB

Electrical supply:- Dynamometer controller - 380/415V a.c., 250Amp, 50 Hz three phase.

Control Console - 240V a.c., 5 Amp, 50 Hz single phase.

Water supply:- 100 l/min, minimum pressure 1 bar, maximum pressure 6 bar.

SHIPPING SPECIFICATIONS

Either **P8661** or **P8662** complete with one engine

Weight: 3140 Kg gross, 2700 Kg nett

Packed volume: 17.6 m³

Number of cases: 2

P8663 complete with one engine

Weight: 3750 Kg gross, 3300 Kg nett

Packed volume: 19.5 m³

Number of cases: 3

Cussons Technology Ltd.

102 Great Clowes Street, Manchester M7 1RH, England

Tel. +(44)161 833 0036

Fax. +(44)161 834 4688

E-mail: sales@cussons.co.uk Web: www.cussons.co.uk

The Company may alter detail specifications at its discretion and without notice, in line with its policy of continuous development.