

P8650

SERIES MULTI-CYLINDER ENGINE TEST BED WITH REMOTE CONSOLE AND DATA ACQUISITION FACILITY FOR PC

INTRODUCTION

A self-contained advanced engine test facility for automotive and industrial light duty multi-cylinder engines having an instrumentation and control 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.

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, fuel and air temperatures
- ◆ Pressure/time, pressure/volume and crank angle diagrams (with P4600/P4605)

DESCRIPTION

Cussons P8650 Series Data Logged Multi-Cylinder Automotive Engine Test Beds have been developed to provide a self contained facility for the practical demonstration of internal combustion engine technology.

A comprehensive instrumentation package mounted in a remote control console with data acquisition and computer analysis facilities allows experimental analysis of engine performance parameters such as power, torque, speed and efficiency under various operating conditions, controlled and measured by a dynamometer and ancillary instrumentation.

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

P8651 REMOTE CONTROLLED MULTI-CYLINDER ETB WITH HYDROKINETIC DYNAMOMETER & DATA ACQUISITION FACILITY.

P8652 REMOTE CONTROLLED MULTI-CYLINDER ETB WITH EDDY CURRENT DYNAMOMETER & DATA ACQUISITION FACILITY.

P8653 REMOTE CONTROLLED MULTI-CYLINDER ETB WITH REGENERATIVE DYNAMOMETER & DATA ACQUISITION FACILITY

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.

NB All measured variables are available as 0-10v signals for data acquisition purposes.

SPECIFICATION

The main engine test facility system comprises the following elements:

1) TEST STAND BASE & SERVICES FRAME DYNAMOMETER

The following dynamometer options can be supplied:

P8651 Hydraulic Dynamometer

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

P8652 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.

P8653 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 of 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.

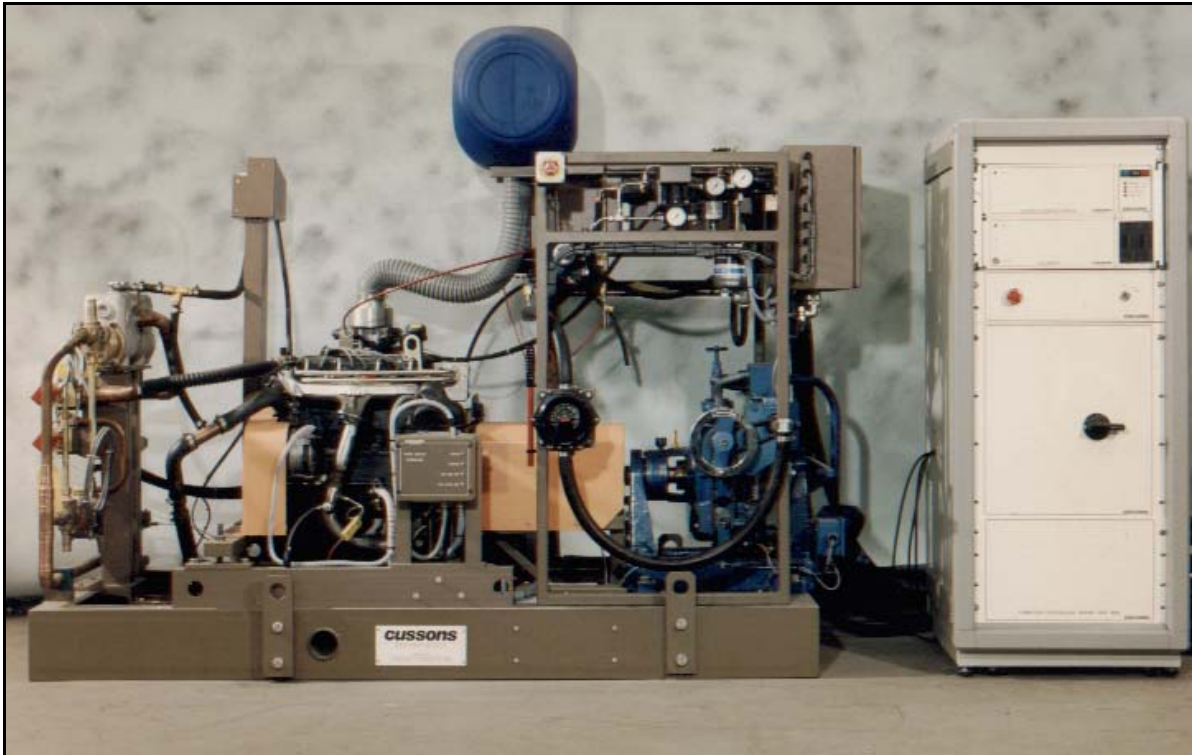
INSTRUMENTATION

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 kPa differential)
 - Fuel flow meter - turbine range 0 to 35 l/hour
 - Speed sensor - inductive pickup
 - Load sensor - strain gauge load cell
 - Temperature inputs - 15 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 for use with Cussons Exhaust Gas Calorimeter

Optional turbine coolant flowmeter range 0- 200 l/min (P5656) including Thermocouples

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



2) REMOTE CONTROL & INSTRUMENTATION CONSOLE

Comprising a 19" cubicle housing signal conditioning and display equipment and a desk accommodating a free standing manual control station.

The following measured variables are displayed digitally and also available as 0-10v signals for data analysis purposes:-

- Engine manifold pressure
- Engine oil pressure
- Barometric pressure
- Hours run indicator
- Air flow meter - orifice plate and digital differential pressure
- Fuel flow meter - turbine
- Speed indicator (digital)
- Load indicator (digital)
- Temperature indication - twelve-way multi-point indicator and Type K thermocouples

The following controls are provided on the manual control station:

- Three position key switch for engine starting.
- Remote throttle control - 10 turn potentiometer
- Dynamometer speed control - 10 turn potentiometer
- Emergency stop

NB P8655 Data Logging & Software Package including PC and Printer.

This package allows the 0-10v signals from the measured variables to be downloaded into spreadsheet templates containing engine related formulae, which can be customised to suit differing applications. A PC and printer

are included and the data can be stored in disk format or output graphically on the monitor/printer.

3) DYNAMOMETER CONTROL SYSTEM

As following, dependant on dynamometer supplied:

P8651 Hydraulic Dynamometer Control

This is a remote push button control for motorising the dynamometer sluice gates and is mounted in the remote console.

P8652 Eddy Current Dynamometer Control

This system houses a servo control board and servo driver unit which together regulate the dynamometer field excitation. The servo control board provides full PID control and incorporates on board fault detection. The servo driver is a pulse width modulating device which regulates dynamometer current; this unit also has on board fault detection. The system is configured to provide closed loop speed control of the dynamometer and the speed set point is adjusted via a 10 turn potentiometer on the control panel.

P8653 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. Speed set point is via a 10 turn potentiometer on the front panel. The system is fully interlocked and incorporates its own on board fault detection system.

SAFETY PROTECTION SYSTEM

Suitable trips are supplied for safety shutdown.

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 and control of ignition and fuel injection via Ford EEC IV engine management system.

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

P8655	Data logging and software package including PC and printer
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 P8651, P8652 and P8653
P8656	Turbine Coolant 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

P8651 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.

P8652 Eddy Current Dynamometer ETB

Electrical supply:- Dynamometer controller - 380/415V a.c., 16Amp, 50 Hz three phase.

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

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

P8653 DC Regenerative Dynamometer ETB

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

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

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

SHIPPING SPECIFICATIONS

Either **P8651** or **P8652** complete with one engine

Weight: 2940 Kg gross, 2510 Kg nett

Packed volume: 15.6 m³

Number of cases: 2

P8653 complete with one engine

Weight: 3590 Kg gross, 3010 Kg nett

Packed volume: 17.9 m³

Number of cases: 3

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