



armfield

AUTOMOTIVE DIESEL ENGINE

CM12
issue 2

Biodiesel compatible



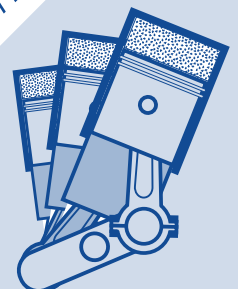
The Armfield CM12 is a self-contained diesel engine test rig which allows students to investigate typical engine performance parameters. The unit is designed to be linked to a computer and is supplied both with educational data acquisition and control software, as well as the engine manufacturers diagnostic software for monitoring the status of the Engine Control Unit (ECU).

FEATURES

- *4-cylinder automotive engine*
- *Eddy current dynamometer to vary engine load*
- *Plotting of characteristic torque and power curves against engine speed*
- *Full software control of system, including load and throttle settings*
- *Closed loop software control of brake loading to maintain constant engine speed during measurements*
- *Secondary water cooling by heat exchanger, with measurement of temperature change and flow rate*
- *Engine manufacturer's diagnostic software (displays fuel injection characteristics)*
- *Remote emergency stop, and facility for safety interlocks*
- *Optional measurement of cylinder pressure, and displaying this on a p-v diagram*

Internal Combustion Engines

CM



DESCRIPTION

CM12 is a self-contained integrated multi-cylinder engine, dynamometer and instrumentation system. It is based on a 1.9 litre, 4 cylinder automotive diesel engine as used in Volkswagen cars. This engine is a modern design, with electronic engine management of fuel injection settings.

The Armfield CM12 can be run on a wide variety of biodiesel fuels and can be used for fuel testing and comparison exercises. (After each run on non-standard fuel, the engine should be run for a short time on a standard diesel fuel approved to EN590).

An eddy current dynamometer provides a variable load on the engine, allowing the characteristic power and torque curves to be reproduced in the laboratory. The system comes complete with extensive instrumentation, including rpm measurement, torque (from which power can be calculated), plus various temperatures, pressures and flows (see Technical Specification)

The whole system is designed to be linked to a computer using the software provided. This provides real time monitoring of the various sensors, with a wide range of data logging and graphical display options.

The dynamometer and throttle can both be controlled electronically from the software, which makes installation into a closed test cell very straightforward, and allows for remote computer operation. A safety 'watchdog' facility ensures the system shuts down safely in the event of computer failure or software lock-ups. The interfaces are compatible with packages such as LabView and MatLab for users who wish to provide their own control and monitoring software. A further advantage of the computer control is that stable rpm readings can be easily achieved using the closed loop control function on the dynamometer drive.

A closed loop primary water-cooling system is incorporated, complete with a heat exchanger for connecting into a secondary cold water supply.

TECHNICAL DATA

Engine Data:

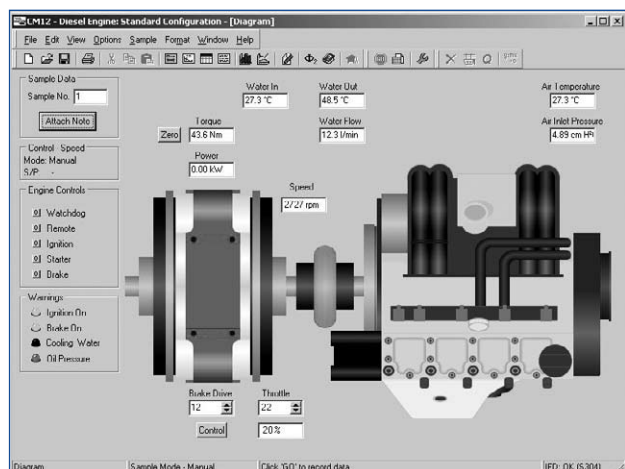
Engine Model:	Volkswagen ADG
Displacement:	1896cc
Bore:	79.5 mm
Stroke:	95.5 mm
Cylinders:	4
Nominal Power:	44 KW @ 3600 rpm
Nominal Torque:	130 Nm @ 2200 rpm

Dynamometer Data:

Dynamometer type:	Eddy Current
Cooling:	Air cooled
Max Power:	55 kW for 20 minutes

Instrumentation and Sensors:

Engine speed counter
Load cell to measure torque
Inlet air flow measured by orifice plate
Inlet air temperature
Secondary cooling water flow and temperatures (inlet and outlet)
The VW diagnostic software can also be used to monitor a wide range of engine functions. In particular the injection characteristics can be used to establish the fuel consumption rate.



CM12 - Software Mimic diagram

OPTIONS

CM12-12 Engine Indicator Set

The engine indicator set comprises a high temperature pressure sensor installed into one of the cylinders in place of the glow plug. A separate charge amplifier provides signal conditioning to generate a voltage which can be logged on the computer. A special routine in the Armfield software allows for the high speed data acquisition of this signal, and automatically plots the results on a p-v diagram.

INSTALLATION AND SERVICES

The CM12 should be installed in a well ventilated area with exhaust gas extraction facilities. The unit is supplied on wheels for ease of movement, but it is recommended that the wheels are removed and the unit bolted to the floor for permanent installation.

Apart from the master on/off switch, and the cooling water, everything can be controlled by computer, allowing the engine to be installed in a dedicated test cell, and operated from outside the cell. It is supplied with a 5 metre USB lead, giving a maximum distance between the unit and the controlling computer of approx. 4 metres.

The following services are required:

Electricity:

220-240V, single phase, 10 Amp

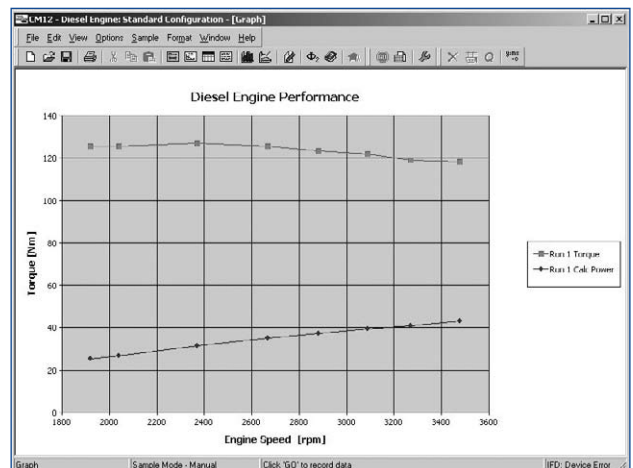
Cooling Water:

6L/min at 3 bar pressure, <20°C

ESSENTIAL EQUIPMENT

The user must have access to one or two PCs (according to preference).

Two free USB ports are required, one to run the Armfield data logging and control software, and one to run the VW diagnostic software. The operating system requirements are Windows 98, 2000, ME or XP.



CM12 - Software graphical display

ORDERING SPECIFICATION

- ***A 4-cylinder, water cooled, 1.9 litre Volkswagen diesel engine, complete with services and ancillaries required to run the engine in a laboratory environment***
- ***Variable load eddy current dynamometer which acts as a brake, allowing direct measurement of engine torque.***
- ***Biodiesel compatible***
- ***Supported on strong steel framework via flexible mounts. The frame also houses the fuel tank, battery and electrical enclosures.***
- ***Protected by guards around the moving parts. Safety interlocks and emergency stops are provided.***
- ***Supplied with educational software for data logging and control***
- ***Supplied with the engine manufacturer's diagnostic software.***
- ***Starter, throttle and dynamometer can be controlled from a computer***
- ***Standard instrumentation includes sensors for:***
 - ***Engine speed***
 - ***Torque***
 - ***Air flow***
 - ***Cooling water temperature (inlet and outlet of heat exchanger)***
 - ***Cooling water flow***
- ***Optional engine indicator set for measuring cylinder pressure through the cycle***

OVERALL DIMENSIONS

Height: 1.20m (without castors)
Width: 1.5m
Depth: 0.92m

SHIPPING SPECIFICATION

Volume: 3.2m³
Weight: 550kg (approx)

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