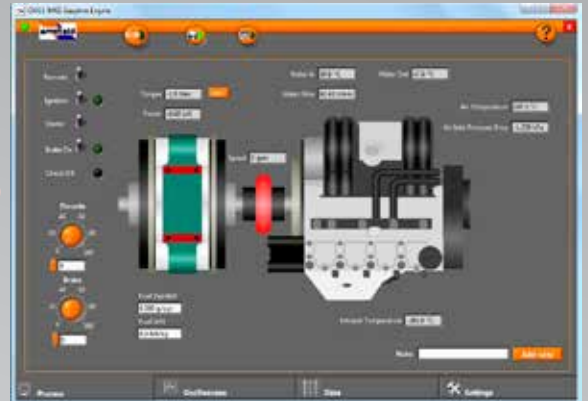


BIOFUEL COMPATIBLE



Typical CM11MkII mimic diagram



Integrated eddy current dynamometer to vary engine load

FEATURES

- > Modern, high efficiency, 3-cylinder automotive engine
- > Biofuel compatible
- > Integrated 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
- > User control of ignition timing and fuel injection now standard
- > Secondary water cooling by heat exchanger, with measurement of temperature change and flow rate
- > MkII version fitted with wideband Lambda sensor for improved performance
- > Remote emergency stop, and facility for safety interlocks
- > Optional operation on LPG as well as gasoline and biofuel
- > Optional measurement of cylinder pressure, and plotting this on a p-V diagram

The Armfield CM11MkII biofuel compatible, Gasoline Engine provides a self-contained engine test rig, which enables students to investigate a range of engine performance characteristics.

The unit is designed to be linked to a computer, and is supplied with sophisticated educational data acquisition software.



* Excluding DLM range

DESCRIPTION

The Armfield CM11MkII is a self-contained integrated, multi-cylinder engine, dynamometer and instrumentation system, based on a VAG (Volkswagon Automotive Group) 1.2 Litre, 3-cylinder engine, as used in a number of VW cars. This engine is a modern design, with electronic engine management of ignition and fuel injection settings.

The Armfield CM11MkII can be run on a wide variety of biofuels and ethanol mixes. It 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 standard gasoline.)

An eddy current dynamometer provides a variable load on the engine, enabling 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, which makes installation into a closed test cell very straightforward, and enables for remote operation. A safety 'watchdog' facility ensures the system shuts down safely in the event of computer failure or software lock-up.

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.

A feature of the system is the Engine Control Unit (ECU), which controls the ignition timing and fuel injection characteristics. The user has full access to this information, and advanced users can vary the parameters to explore engine performance under different conditions.

Also the injector opening times are available from the ECU software and they can be used to calculate accurate fuel consumption.

The ECU software can either be run on the same computer as is used for control and data logging, or can be run on a separate computer.

TECHNICAL SPECIFICATION

Engine Data

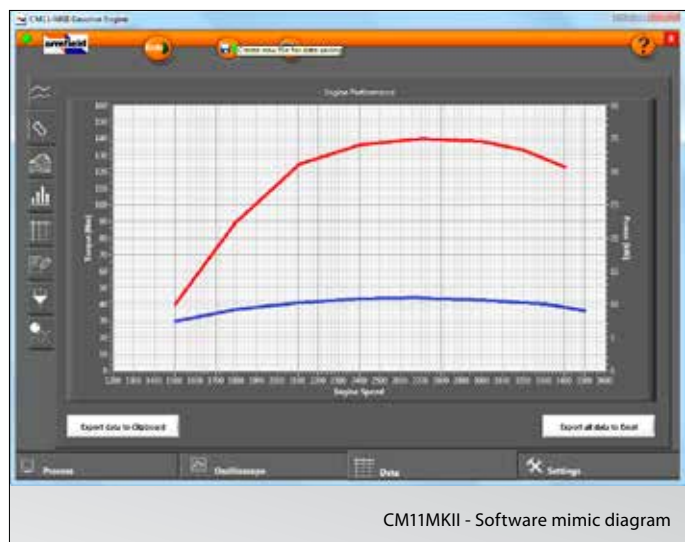
Engine Model:	VAG type AWY
Displacement:	1198cc
Bore:	76.5mm
Stroke:	86.9mm
Cylinders:	3 (6 valve)
Nominal Power:	40kW @ 4700 rpm (running on gasoline)
Nominal Torque:	106Nm @ 3750 rpm (running on gasoline)

Dynamometer Data

Dynamometer Type:	Eddy current
Cooling:	Air cooled
Max Power:	55kW 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)
- Lambda sensor (wideband)



CM11MKII - Software mimic diagram

OPTIONS

The CM11MkII can be ordered with a number of optional accessories. These must be ordered with the CM11MkII. They cannot be fitted retrospectively.

CM11-12 Engine Indicator Set

The engine indicator set comprises a high temperature pressure sensor integrated into a spark plug. A separate charge amplifier provides signal conditioning to generate a voltage that can be logged on the computer. A special routine in the Armfield software enables for high speed data acquisition of this signal, and automatically plots the results on a p-V diagram. Note: The spark plug used in this arrangement is not identical to the other sparkplugs. This sensor is a high precision unit and is physically delicate.

CM11-13 LPG Fuel System

The Liquid Petroleum Gas (LPG) option includes the pipework, solenoid valves, injectors and an LPG control unit to enable the engine to be run on LPG as well as gasoline. The engine is started on gasoline, and when hot enough, can be switched to run under LPG.

The equipment is supplied with a flexible feed pipe terminating in a 6mm OD copper tube and a self sealing quick release connector suitable for fitting to the LPG bottles available in many countries.

The user must supply a liquid offtake LPG bottle, and if necessary a suitable fitting to the feed pipe.

INSTALLATION

The CM11MkII should be installed in a well ventilated area with exhaust gas extraction facilities. The unit is supplied on wheels for ease of movement, these can be 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 remotely enabling the engine to be installed in a dedicated test cell, and operated from outside the cell.

It is supplied with a 5m USB lead, giving a maximum distance between the unit and the controlling computer of approximately 4m.

REQUIREMENTS

Electricity: 220-240V, single phase , 10 Amps

Cooling water: 6 l/min at 3 bar pressure, <20°C

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

See Essential Equipment for further requirements.

ESSENTIAL EQUIPMENT

Two free USB ports are required, one to run the Armfield data logging and control software, and one to run the ECU software.

OVERALL DIMENSIONS

Height: 1.50m

Width: 1.50m

Depth: 1.00m

SHIPPING SPECIFICATION

Volume: 3.00m³

Weight: 500kg (approx.)

THE CM RANGE OF EQUIPMENT

CM11-MkII: Gasoline Engine	BIOFUEL COMPATIBLE
CM12: Automotive Diesel Engine	BIODIESEL COMPATIBLE
CM14: Axial Flow Gas Turbine	

ORDERING SPECIFICATION

- A modern, automotive, high efficiency 3-cylinder, 1.2 litre, water cooled, normally aspirated engine complete with all services and ancillaries required to run the engine in a laboratory environment
- Biofuel compatible
- Variable load, eddy current dynamometer, which acts as a brake, enabling direct measurement of engine torque
- Dynamometer completely integrated with the engine, mounted within the same frame
- Ignition and Injection Control system as standard, enables user to investigate the effects of alterations to fuel injection and ignition timing
- Supported on strong tubular steel framework via flexible mounts. Frame houses fuel tanks, battery, electrical enclosures, etc.
- Protected by guards around all moving parts, and around key hot surfaces
- Throttle and brake load can be controlled remotely
- Standard instrumentation includes sensors for:
 - Engine speed
 - Torque
 - Air flow
 - Cooling water temperature (inlet and outlet of heat exchanger)
 - Cooling water flow
 - Exhaust gas Lambda sensor
- Sensor variables are logged in real time on a customer supplied computer via a USB interface, using sophisticated educational software. The software includes full data logging and analysis functions, and incorporates detailed teaching material
- Optional Engine Indicator Set enables production of real time p-V diagram
- Optional LPG System enables engine to run on LPG fuel



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* Excluding DMM range



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