

- Fuel Pump Test Stands
- Camboxes
- Calibration Rigs
- Injector Testers
- Injector Reconditioning
- Ultrasonic Cleaning Tanks
- Miscellaneous Accessories



Merlin Marine Test Equipment
Leading The Way in Diesel Technology



Merlin Marine Test Equipment

www.merlindiesel.com



PUMP TESTING



DC 80-EM TEST STAND

Merlin DC series test stands are designed principally for the calibration of larger, single cylinder fuel injection pumps of up to 50mm cam lift and 50mm plunger diameter as fitted in marine, rail and heavy-duty industrial applications.

Model DC 80-EM incorporates the Merlin S600M/20 positive displacement metering unit, replacing graduates fitted to the standard unit.

This special version has a 105 hp (80 kW) DC drive, large mass flywheel (270 kgm model MPC300/1 up-rated cambox).

- Drives available up to 120 hp (90 kW)
- Flywheel in excess of ISO standards
- Centre height from worktable to drive spindle is 300mm
- Camboxes and mounting plates for a range bucket and roller type pumps

Mobile calibrating and injector mounting rigs are also available for testing heavy-duty multi-cylinder fuel injection pumps.



DRIVE

DC Thyristor controlled, fan vented 82kW (110hp) motor, with speed range of 30-600 rpm at drive shaft, controlled via a rotary potentiometer. Ramp Rate variable by pre-set digital control.

MACHINE CONSTRUCTION

Heavy-duty box section frame, supported at 10 base positions on adjustable anti-vibration pads.

WORKTABLE

Drive shaft centre height from test bed of 300 mm.

FLYWHEEL

Mounted on heavy-duty bearings, the main spindle carries a 2300Kg flywheel.

DRIVE SHAFT

Torsional stiffness to ISO recommendations.

INSTRUMENTATION

Feed pressure: 0-9 Bar

Lube pressure: 0-8 Bar

Oil Temperature: $\pm 1^\circ\text{C}$

TACHOMETER

Digital display, accuracy ± 1 rpm with 0.5 seconds update.

Inductive sensor pick-up.

TEMPERATURE CONTROL

Water cooled heat exchanger with microprocessor-based digital controller with thermocouple fitted at the test bench fuel outlet connection.

Control provides $\pm 1^\circ\text{C}$ at 40°C with override facility.

FLOW METER

2 - 22 litres/min fitted in return line.

TEST OIL TANK

The 162 litre (36 gall) test oil tank incorporates two heater elements of 2.5 kW rating, which are connected thermostatically with the heat exchanger inlet solenoid. Also fitted with de-aeration system, sight level gauge, suction filter and float level switch to give low level warning.

TEST OIL SUPPLY PUMP

Motor driven supply pump with 1320 litres/hr capacity at 30 psi and generating a maximum pressure of 600 psi (controlled).

Note: This is a tandem pump with a single motor also driving the lube supply pump.

TEST OIL & LUBE OIL FILTERS

Standard replaceable spin-on cartridge type rated at 10 micron nominal, incorporating filter blocked warning light.

PULSATION DAMPERS

Test oil feed and return piping incorporate nitrogen filled accumulators (pulsation dampers) which remove pressure spikes from the fuel circuit. Each of these pulse dampers are pre-charged with Nitrogen to 30 psi (feed) and 1 psi (return).

LUBE OIL TANK

Working capacity of 30 litres, positioned in front left box frame section of test bed to allow gravity drain from cambox. Fitted with sight level gauge, suction filter and float level switch to give low-level warning.

LUBE OIL SUPPLY PUMP

Rated at 363 litres/hr.

WASTE OIL TANK

Positioned below test bed, fitted with sight level gauge and drain plug.

S600M/20 MEASURING SYSTEM - COLOUR VIDEO MONITORING

Monitoring and measurement in bar graph and numeric format on a 10.4" TFT display. Input/output data and control of measuring system is via Soft touch push button switches.

The injected fuel displaces the metering piston, the piston displacement is measured by an optical diffraction grating and an optical reading head, this produces a signal of one pulse per one micron of piston movement. This signal is received by the computer through control systems and software designed for Merlin Diesel Systems Ltd.

An additional signal from the test oil temperature measuring probe located in the piston chamber is used to calculate the volume of displacement at a test oil temperature of 40°C .

RANGE: 50-20,000 $\text{mm}^3/\text{stroke}$

PEED RANGE: 50 - 600 rpm.

DATA CAPTURE: (Optional Accessory)

Please contact **01772 694180** or sales@merlindiesel.com for more detailed information

Illustrations and technical data are non-binding. Subject to change as a result of technological progress.

SPRAY CHAMBER

Finished in black and illuminated to give a good view of injector spray form.

FUME EXTRACTION

Variable rate air operated fume extraction system. An optional perspex spray arrestor further assists the extraction operation.

FUEL TANK

Working capacity of approximately 3 imperial gallons (13.6 litres) Standard tank features include sight level gauge, quick release filler cap and magnetic drain plug.

AIR PUMP UNIT

Fully sealed unit, robust construction, pneumatically operated via normal workshop air supply.

FUEL FILTER

A replaceable paper element filter (2 micron filtration) protects both the air pump unit and the injector on test. Access to the filter is via the removable spillage tray and filler cap.

FLOW CONTROL VALVE

Provides full to minimum flow for critical testing.

OUTLET CONNECTION

Standard connection thread size is M14 x 1.5. An adaptor is supplied with a thread M22 x 1.5 for industrial and marine injector applications.

S500-2 DISPLAY MONITOR

The S500-2 Monitor has been designed for accurate performance testing, production line testing and quality over checking of Diesel Fuel Injectors and Nozzles. The repeatable and reliable digital display of pressure eliminates errors normally found in conventional analogue pressure gauges due to hysteresis in gauge readings, possible undetected mechanical damage, gauge inaccuracies and gauge needle bounce when setting 'Nozzle Opening Pressure' Back leakage timing errors are eliminated due to the absence of having to start and stop a remotely sited mechanical timer.

Pressure Range: -	0 - 700bar, psi, MPa or kgf/cm ²
Time Range: -	0 - 99.9 seconds
Pressure: -	±1 bar
Time: -	±1 second
Transducer: -	±0.1% of full value
Linearity: -	±1 bar over full range
Memory: -	Data store/recall for injector type test plans.
Display: -	Tick/cross symbols advise user of NOP and back-leak pass/fail.
Compensation: -	Automatic compensation for variations in test oil temperature.
Test oil: -	Variable test oil compensation, Standard, (No compensation), Shell calibration fluid 'C' or ISO 4113 calibration fluid.
PRINTER:	Thermal printer for data recording.

VEE CLAMP ASSY: 13306 Heavy Duty Vee Clamp assembly.

HIGH PRESSURE TEST PIPE
Pipe supplied to customer requirements.

OPTIONAL ACCESSORIES: QUICK ACTION PIPE
T022-001: Quick Action Pipe assembly, complete with M14 x 1.5 threaded hand-wheel and M12 x 1.5 split adaptor.

ADDITIONAL SPLIT ADAPTORS FOR T022-001 Q/A Pipe
T022-003 M12 x 1.5 split adaptor
T022-004 M18 x 1.5
T022-006 ¼" B.S.P. (Gardner Injectors)
T022-007 9/16" U.N.F. x 18 T.P.I.
T022-008 5/8" U.N.F. x 18 T.P.I.
T022-009 M14 x 1.5 (long reach)

SPRAY ARRESTOR: SDS400 Perspex spray deflector.

CABINET : CAB400 Mounting cabinet for S400A-M.

STANDARD ELECTRICAL SPECIFICATION

DIMENSIONS: 60cm x 60cm x 77cm Nett Weight: 66kg

SHIPPING SPECIFICATION: 70cm x 70cm x 91cm
Gross Weight : 92 kg

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S31M INJECTOR TESTER

Suitable for most types of marine injectors

- Robust pump operating mechanism
- V supports for large injectors
- Perspex spray arrestor
- Gauge 0 - 700 bar (0 -10000 psi) with isolator valve

Marine quick action pipe

Outlet adaptor M22 x 1.5 thread suitable for use with a range of quick action pipes as per samples listed below.

Type to be nominated at point of order

T022-010 M22 x 1.5 thread	T022-011 M27 x 1.5 thread
T022-012 M24 x 1.5 thread	T022-013 M30 x 1.5 thread

High pressure pipe:

10mm O/D x 3 mm I/D
with M22x1.5 nut to suit S31M

Dimensions

600 x 457 x 304mm



S100A B&W TESTER

Self-contained mobile test unit for checking the correct operation of B&W Injectors.

- Atomisation
- Opening Pressure
- Dry Seat Test
- Slide Valve Operation
- Pressure Test To Check 'O' Ring Sealing

Instrumentation

Flowmeter	0.2-1.5 L/Min
Main Gauge	1200 Bar
Aux. Gauge	500 Bar
Aux. Gauge	250 Bar
Air Gauge	10 Bar

Supplied complete with connecting hose. Range of fixture assemblies available.

Installation: Air Supply 6 Bar

Shipping: Weight: 65kg

Tank Capacity 46 Litres

Dimensions: H1.7m X W0.6m X D0.5m





A low profile test stand for large single cylinder fuel pumps, with main drive options, flywheel inertia and drive specifications tailored to suit customer requirements

- Drives available up to 120 hp (90 kW).
- Flywheel in excess of ISO standards.
- Centre height from worktable to drive spindle is 300mm.
- Camboxes and mounting plates for a range bucket and roller type pumps.
- Mobile calibrating and injector mounting rigs are also available for testing heavy-duty multi-cylinder fuel injection pumps.

Similar to DC80-EM but with graduate metering system:-

- Solenoid operated bottom fill/bottom drain graduates.
- Three graduates, capacities as follows:-
 - o 0-250mm³
 - o 0-1000mm³
 - o 0-7000mm³
- Electronic shot count unit range 1 to 9999 adjustable in single selectable increments, display indicates decreasing count down.

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Drive System:

Electronic Thyristor controlled motor with full overload protection against low voltage, phase loss and over rating. (Optional drives available up to 80Kw (105hp) System provides regenerative braking and automatic speed compensation.

Speed Range:

0 - 1000rpm in both directions (or to suit customer application). Optional speed range up to 1800 rpm available.

Speed Control:

Speed controlled by electrical rotary dial potentiometer, provides for fast acceleration/deceleration, provides for fast acceleration/deceleration.

Drive/Shaft Stiffness:

To I.S.O. recommendations.

Flywheel:

Dynamically balanced. Provides an inertia 70.0 kg/m² (1660 ib/ft²) Optional flywheels available to suit customer specifications.

Instrumentation:

Digital indication by individual display meters for separate parameters as follows:- Pressure Recording: Test Oil Pressure - meter range: 0-10 bar (kgm/cm² optional) Lubrication oil pressure - meter range: 0-10 bar (kgm/cm² optional)

Tachometer:

Display accuracy to within ± 1 rpm, updates every 0.5 sees.

Temperature:

Display accuracy to within $\pm 1^\circ\text{C}$ of reading.

Hours Counter:

For scheduled maintenance.

Fuel (Test Oil) System:

1900 litres/hr test oil supply pump driven by a 0.75kW tandem pump unit. Damper unit fitted in normal feed line to remove injection pump back pressure pulses.

Filtration of test oil by single screw-on filter cartridge, filter retention to 5 microns.

Fuel Tank:

118 litre (24 gall) working capacity, fitted with internal deaeration system, sight level gauge and coarse filtration on suction outlets. Fuel tank finished in white stove enamel paint.

Temperature Control:

Two 2.5kW heater elements fitted in fuel tank, micro pressure based digital controller with thermocouple fitted to the test bench fuel pressure outlet connection. Control provides $\pm 1^\circ$ at 40°C with over-ride facility.

Cambox Lubrication System:

450 litres/hr supply, in tandem with test oil pump. Supply pressure 0-5.5 bar (0-90 psi). Filter fitted in lube supply line. Lube supply and return hoses to cambox.

Calibration System:

Solenoid operated bottom fill/bottom drain graduates. Graduate capacity: Three tubes each of 0-250mm 0- 1000mm and 0-7000mm.

Shot (stroke counter):

Electronic shot count unit range 1 to 9999 adjustable in single selectable increments, display indicates decreasing count down.

Dual Control Facility:

Stop, start, shot-count, drain and speed control facilities are duplicated adjacent to cambox drive for operator convenience.

Note:

The DC Series will accept the Merlin range of camboxes and accessories for testing most single and multi-cylinder heavy-duty pumps.

Although large capacity glass measuring graduates are incorporated in the DC series, the Merlin range of S600M Positive Piston Displacement Metering Units with VDU measurement display are fully compatible with the test stand.

Refer to relevant pages in this catalogue for details of S600M, camboxes and calibration/injector mounts which are compatible with the DC range of test stands.

Test Bench Dimensions:

HD DC40 40hp (30kW)	
Height:	1650mm
Width:	1500mm
Depth:	3250mm
Weight (Dry)	3000Kg

Electrical:

To customer specification.

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The Merlin Autolap 200 is an injector nozzle seat honing machine which dispenses with time consuming hand lapping methods of nozzle reclamation.

- Range of application: Automotive through to Marine 'S', 'T', 'U' & 'V' nozzle sizes
- Separate large start button
- Honing tools and tips interchangeable with other manufacturers tools and tips
- Simple and speedy drive belt tension adjustment
- Reduction in labour content of injector reconditioning
- Repeatable results under controlled conditions
- No special skill required to operate machine
- Stone tips can be redressed on the Merlin NR3B reconditioning machine using dressing tool attachment Part No. B8424/1

Standard Accessories

- T023-001 'S' size short and long stem adaptor
- T023-008 Short weight
- T023-009 Long weight
- T023-010 Cutting fluid 5 litres

Optional Accessories (Adaptors)

- T023-002 'T' Size Short Stem
- T023-003 American Bosch/Bosch 'P'
- T023-004 'V' Size
- T023-005 'U' Size
- T023-006 Leyland/Gardner
- T023-007 Gardner

Optional Accessories (Shaft/Tip Assemblies)

- T024-001 Sulzer RD 90/96
- T024-002 MAN 11mm
- T024-003 MAN
- T024-004 6mm S/Stem 'S' size
- T024-005 6mm L/'S' size
- T024-006 Leyland Late Type
- T024-007 4.5mm L/Stem Ambac
- T024-008 10mm L/Stem 'U' size
- T024-009 6mm Bosch/Fiat
- T024-010 5mm S/Stem 'S' size
- T024-011 Gardner LW
- T024-012 Gardner LX
- T024-013 6mm S/Stem 'T' size
- T024-014 8mm L/Stem 'T' size
- T024-015 7mm S/Stem 'T' size
- T024-016 8mm S/Stem 'U' size
- T024-017 10mm 'U' size
- T024-018 12mm L/Stem 'V' size
- T024-019 4mm L/Stem 'P' size
- T024-020 Pielstick PC2
- T024-021 Sulzer RD 90
- T024-022 Sulzer RD 56
- T024-023 Pielstick PC3
- T024-024 5mm L/Stem 'S' size (lbs)

- T024-025 5.5mm L/Stem 'S' size
- T024-028 16MM L/Stem 'V' size

Stone Tips

- T024-035 T024-005, 009, 012, 024, 025
- T024-036 T024-001, 006, 007
- T024-037 T024-004, 014, 015
- T024-038 T024-008, 017
- T024-039 T024-010
- T024-040 T024-011
- T024-041 T024-013
- T024-042 T024-016
- T024-043 T024-022
- T024-044 T024-002
- T024-045 T024-018
- T024-046 T024-020
- T024-047 T024-021
- T024-048 T024-023



ELECTRICAL SPECIFICATIONS
100/120v - 1 - 50/60HZ
220/240v - 1 - 50/60HZ

DIMENSIONS
356 x 495 x 775mm (14" x 19.5" x 30.5")

WEIGHT: 80kg (176 lbs)

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M12A & M16A Lapping Machines

Merlin M12A and M16A lapping machines are self-contained units capable of finishing components to optical standards of flatness and a high degree of surface finish.

Once the machine is loaded and set in motion the process is automatic and electrically timed, allowing easy operation by unskilled personnel. It is not necessary for the machine to be bolted down, the adjustable feet on the bench model incorporate anti-vibration pads possessing a high co-efficient of friction. Machine lapping is a high quality finishing process able to meet the demands of modern quantity production requirements with consistent results.

The time taken to achieve the desired result varies depending on the component material, grade/type of abrasive, amount of stock to be removed and the self or superimposed loading on the component.

Specified by the world's most discerning manufacturers

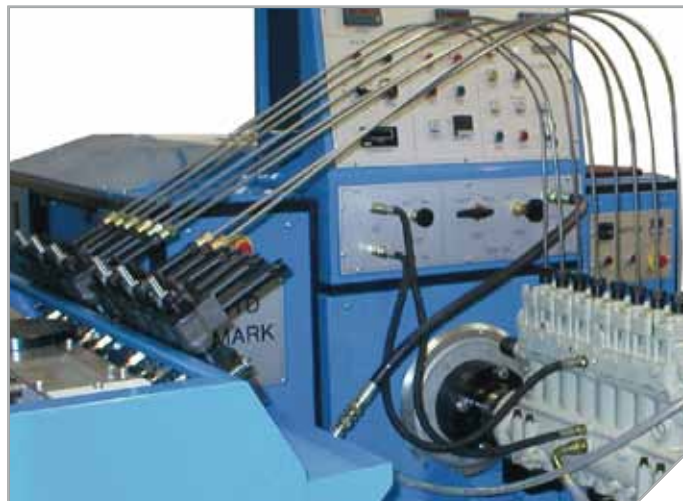
- Sturdy build ensures long trouble-free service
- Components lapped consistently to high standards of flatness
- Automatic process requires only unskilled operators
- Hard or soft materials, carbides to carbons
- 12" and 16" models available



Additional accessories: Polishing blocks greatly enhance the appearance of the lapped product. Please contact our technical department for details of the products which are currently available.

	M12A	M16A
Lapping Plate (outer diameter)	305 mm (12)	406 mm (16)
Control Rings-3 off (inner diameter)	114 mm	135 mm
Timer Range:	0-60 minutes	0-60 minutes
Lapping Plate Motor:	1/3 hp	1/3 hp
Pump Motor:	1/6 hp	1/6 hp
Electrical Supply: (Or to customer requirements)	220/240V-50Hz-1ph	220/240V-50Hz-1ph
Net Weight:	82 kg	120 kg
Dimensions:		
Overall height:	436 mm	438 mm
Overall length:	590 mm	700 mm
Overall width:	410 mm	600 mm

MK6 TEST STANDS



Merlin MK6 series test stands are designed for the calibration of larger, single and multi-cylinder fuel injection pumps as fitted in marine, rail and heavy duty industrial applications. A versatile low profile test stand for single or multi-cylinder fuel pumps, with main drive options, flywheel inertia and drive specifications tailored to suit customer requirements.

- Drives available up to 60 hp (45 kW)
- Flywheel in excess of ISO standards
- Centre height from worktable to drive spindle is 300mm

MK6 series test stands are fully compatible with the Merlin range of heavy duty camboxes and mobile calibration/injector rigs. They are also available with either integral or free standing remote control consoles, the latter normally offered when regulations require sound proof enclosure to be supplied.



MK6 with acoustic enclosure, remote control console and mobile calibration rig.



MAN BW pump on test.

**Test Bench Dimensions:
MK6 40hp (30kW)**

Height:	1760mm	69"
Width:	1785mm	70"
Depth:	3000mm	118"
Weight:	2032Kg	4480lbs

DRIVE

60hp (45kW) Thyristor controlled DC motor provides infinitely variable stepless drive in both directions, with pre-selection of speeds. Zero droop from maximum to minimum load provides for accurate governor setting. The acceleration/deceleration rate is 300 rpm per second. Speed range 30-1600 rpm in either direction.

DRIVE COUPLING

Standard Merlin two-dog drive couplings and phosphor bronze discs.

MACHINE CONSTRUCTION

Heavy-duty section frame, supported at 6 base positions on adjustable anti-vibration pads.

WORKTABLE

Drive shaft centre height from test bed of 300 mm.

FLYWHEEL

Mounted on heavy-duty bearings, the main spindle carries a flywheel with an inertia value of 52.0 kgm².

DRIVE SHAFT

Torsional stiffness to ISO recommendations.

EMERGENCY STOP

Emergency stop button on front main control panels.

DIGITAL DISPLAYS

Lube Oil Feed Pressure: 0-10 Bar

Test Oil Feed Pressure: 0-10 Bar

Test Oil Phase Pressure: 0-40 Bar

Test Oil Temperature: ± 1 °C

Tachometer: ± 1 rpm with 0.5 seconds update. Inductive sensor pick-up.

SHOT/STROKE COUNTER

Range 1 to 9999 in single selectable increments via push-buttons. LED digital display of countdown from pre-selected figure. Count cancel facility provided.

TEMPERATURE CONTROL/DISPLAY (TEST OIL)

Two off 2.5 kW Heater Elements fitted in fuel tank. Microprocessor based digital controller with thermocouple fitted at the test bench fuel pressure outlet connection. Control provides ± 1 ° at 40°C with over-ride facility to enable variations in choice of selectable temperature. Digital display of test oil temperature taken at fuel outlet connection.

Solenoid operated oil/water heat exchanger fitted in test oil circuit. Note: The above information is based on a maximum ambient temperature of 15°C.

PHASING

High pressure phasing supply suitable for multi-cylinder pumps.

TEST OIL TANK

The 36 imperial gallon (162 litres) fuel tank incorporates a fuel heater of 2 x 2.5 kW rating connected thermostatically with the heat exchanger inlet solenoid.

The tank incorporates a de-aeration system, sight level gauge, suction (coarse) filter, magnetic trap and float level switch to give low oil level warning.

TEST OIL SUPPLY

2.2 kw electric motor-driven supply pump with 1320 litres/hr capacity at 2.1 bar and generates a maximum pressure of 41.4 bar (controlled). This is a tandem pump with a single motor also driving the lube oil supply pump.

Supply pressure is variable between 0-8 bar. Pressure phase is variable between 0-40 bar. Phase/feed selection by a two position valve and pressure control of both operations by one regulator on the valve panel.

TEST OIL FILTER

Filtration is by single large capacity spin-on cartridge element of 3 micron rating.

LUBE OIL TANK

Located in the left hand side of the test bed frame. Working capacity of 25 litres. Fitted with sight level gauge and suction filter. A float level switch is also fitted to give low oil level warning.

LUBE OIL SUPPLY

2.2 kw electric motor-driven supply pump with 360 litre/hour capacity. Pressure relief valve pre-set to 8.0 bar.

Note: This is a tandem pump with a single motor also driving the test oil supply pump.

LUBE OIL FILTER

Filtration is by single large capacity spin-on cartridge element of 10 micron rating.

PULSATION DAMPERS

Test oil feed and return circuit incorporate nitrogen filled accumulators (pulsation dampers) which remove pressure spikes from the fuel circuit. Each of these pulse dampers are pre-charged with nitrogen to 3.1 bar.

HOURS COUNTER

Hours counter fitted for scheduled maintenance.

H1230E TEST STANDS



The MERLIN H1230E Test Stand has been designed principally to test heavy duty in-line, 'V' or single cylinder configuration diesel fuel injection pumps as fitted to heavy plant, generator sets, marine and railroad applications.

- 30 or 40hp (22.5 or 30kW)
- Electronic DC thyristor main drive
- Standard flywheel: provides an inertia of 120 lb/ft² (5.0 kg/m²)
- Built in lube oil system
- Heater/cooler
- Digital tachometer

A combination of mobile injector mounting and calibration rigs makes this test equipment extremely versatile. The C400 series unit is available with various options of test graduate capacity and the R400 series can be arranged to accept either conventional test injectors or specific engine injector types.

Options are available in 4, 6, 8, 16 and 18 cylinder capacity and where suitable both units can be combined. A range of camboxes and mounting brackets are available for many popular pump types. Illustration above shows H1230E test stand with C412-1 free standing calibration unit, R412-1 injector mounting unit and PA6/PC2.2 camboxes and in-line pump brackets.

Illustration above shows H1230E test stand with C412-1 free standing calibration unit, R412-1 injector mounting unit and PA6/PC2.2 camboxes and in-line pump brackets.

H1230 TYPICAL SPECIFICATION

Drive:

30hp (22kW) thyristor controlled DC motor with full overload protection against low voltage phase loss and over rating. (40hp (30kW) model also available.

Speed range:

0-4200 rpm (Or to customer requirements)

Stop:

Emergency stop buttons on main panel and on each side of console.

Flywheel:

Provides an inertia of 120 lb/ft² (5.0 kg/m²)

Drive shaft:

Provides an inertia of 120 lb/ft² (5.0 kg/m²)

Drive shaft:

Torsional stiffness to ISO recommendations.

Fuel supply system:

Test oil supply pump with 2280 litres/hr (500 gal/hr) driving the lube oil supply pump). Pressure phasing/feed pressure/vacuum selection by three position valve on console and pressure control of both operations by single valve on main control panel.

Normal feed pressure - 760mm Hg (30in.Hg) vacuum to +7 bar.

Phasing pressure - 3.8 to 52 bar (55 - 750psi).

Damper unit fitted in normal feed line to remove injection pump back pressure pulses.

Filtration of test oil by two screw on cartridge type filters.

Retention to 5 microns.

Fuel tank:

162 litre (36 imp.gal) working capacity with internal deaeration tank, sight level gauge and coarse filtration on suction outlets.

Temperature Control:

Heater of 2.5kW rating incorporated in fuel tank. Solenoid operated oil/water heat exchanger operation automatically controlled by temperature selection on the Eurotherm controller. Temperature variable from 20 to 50

Calibration system:

Mobile injector mounting and calibrating units (bottom fill/bottom drain) are available up to 18 cylinder capacity. A wide range of tube options are available from stock or manufactured to suit application.

Shot count (Strokes):

Electronic shot count. Range 0 to 9999 in single increments.

Instrumentation:

LED digital display meters standard.

Lube system:

Lube oil supply pump with 363 litres/hr (80 gal/hr) capacity, producing 0 - 5.5 bar (0 - 90psi) supply pressure. Filter fitted in lube supply line is the throw away paper element type.

Bed/table connections:

8 off comprising -Test oil supply and return, direct filtered suction, lube oil supply and return, secondary filter in and out, auxiliary gauge connection.

D.C. Supply:

Built in 0 - 24v variable D.C. supply for injection pump solenoid operation.

Hours counter:

For scheduled maintenance.

Installation requirements:

Electrical - Three phase to suit customer requirements. For non-standard electrical specification, price on application.

Water flow rate/pressure - 270 litres/hr (60 gal/hr) @ 3 bar min.

Shipping specification:

Test bench only - Packing case 290 x 112 x 188CM. Gross weight 1950kg.

Calibration Rig and Injector Rig - Dependent on model type.

**DIMENSIONS
TEST STAND ONLY**

Height	1.53 metres	Width	0.86 metres
Length	2.64 metres	Weight	2000 kg

C416 CALIBRATION UNIT

Height	2.08 metres	Width	1.10 metres
Depth	0.65 metres	Weight	400 kg

R416 INJECTOR MOUNTING UNIT

Height	1.39 metres	Width	1.18 metres
Depth	0.60 metres	Weight	350 kg

Please contact **01772 694180** or sales@merlindiesel.com for more detailed information

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The Merlin NR3B is an injector needle reconditioning machine capable of accurately grinding needle seat angles to manufacturers' settings. It is suitable for reconditioning all types of nozzles ranging from automotive to rail traction, generating and marine applications.

The following features are incorporated in the NR3B: -

- Independent direct motor drive to work-head, there is no flexible drive
- Easily replaceable cartridge type extra precision grinding wheel spindle
- Operative angles 44 to 106 degrees
- All handles grouped at front/side for ease of operation
- All moving parts are adjustable to ensure and maintain accuracy
- Optional cabinet is available, with ample storage space for laps, paste and equipment

Specification:

Capacity: Nozzle valves, laps upto 25mm diameter & 250mm long. (Use optional oversize vee-blocks for diameters in excess of 7mm).

Operative Angles: 44° to 106° and with attachments 14° to 136°

Accuracy of Angle: 1' of included angle

Grinding Head: Instantly replaceable cartridge type extra precision grinding wheel spindle

Motor: 1/3 hp (.25 kW)

Spindle speed: 4000 rpm

Work spindle speed: 150 rpm

Work-head: Swivels through 180 degrees. Rubber friction drive of needle valve, adjustable from spindle back plate. Slides and bearings are fully adjustable.

Angle setting: Comprises V-block anvil mounting and dial gauge angle adjustment

Chuck: 0-13.5mm capacity. (General purpose, e.g. nozzle lapping)

Magnifier/light: Provides clear view of contact between the lap and grinding wheel



Standard equipment includes:

- Set of V-blocks, capacity 7 mm diameter
- 4" diameter 240 grit grinding wheel
- Setting tool & clamp for 30° & 45° angles
- Dial gauge & holder for angle setting tool
- Diamond wheel dresser
- Lifting hooks & rubber mounting pads
- Set allen keys & spanner

Optional Equipment:

Oversize V-block, 8 -13 mm capacity.	P/No. 7793-4
Oversize V-block, 14-25 mm cap.	P/No. B3619-284B
15° Angle V-block and backstop.	P/No. 8057-2
Dual angle setting tool 15° x 60°.	P/No. A10570
Stone lap dressing attachment kit*	P/No. B8424/1
Sturdy purpose built steel cabinet.	P/No. NR3C

*Must be ordered when using Autolap 200

Electrical Specification:

Wide range of voltages available 50 or 60Hz.

Dimensions & Weights

NR3B H15 x W26 x L30"	38 x 66 x 76cm
NR3B Nett weight	264lbs 120kg
Cabinet H35 x W26 x L30"	82 x 66 x 76cm
Cabinet Nett weight	88lbs 40kg

Please contact 01772 694180 or sales@merlindiesel.com for more detailed information

Illustrations and technical data are non-binding. Subject to change as a result of technological progress.

PUMP TESTING

S400 SERIES MOBILE CALIBRATION AND INJECTOR MOUNTING STANDS



Merlin 400 series calibration and injector mounting units are available in 4, 6, 8, 12, 16 and 18 cylinder versions with options of test graduate capacity. All versions of the 400 series units are fully compatible with DC40/MK6 test stands and extend the range of these single cylinder test stands to cater for multi-cylinder block pumps as fitted to marine and industrial engines. They are also standard equipment with the H1230E Fuel Pump Test Stand. Special versions can be manufactured to customers' requirements, as shown in the following illustrations.



Examples of special production calibrating and injector mounting units R418/3 and C418-3 consisting of 18 x 1000cc and 3 x 3600cc graduates and 18 S or T injector mounts plus 3 x engine injector mounts.

C series calibration units operate in tandem with the 'R' series injector stands. Heavy duty flexible hoses provide supply and return of test oil to test bench. The standard unit is supplied with 0 - 500cc glass graduates calibrated in increments of 1.0cc divisions. A wide range of graduate options are available from stock or manufactured to suit customer application.

MERLIN'S patented solenoid operated bottom fill / bottom drain system eliminates aeration and frothing of test oil normally caused by top fill systems. Bottom fill system enables instant readings to be taken on completion of count sequence. Rapid drain system automatically returns fuel level to a pre-set zero position.

R series injector mounting units can be suitably positioned to accommodate various injector pipe lengths and operator convenience. Ease of mobility enables access for quick injector changes to be made.

A built in high pressure damping system ensures injection pulses are reduced to a steady and aeration free flow prior to final calibration.

Injector mounting arrangements can be provided to suit customer requirements. Master injectors are not supplied as standard equipment.

Please contact **01772 694180** or **sales@merlindiesel.com** for more detailed information

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The MERLIN range of camboxes is available for testing bucket & roller tappet type fuel pumps and unit injectors. Test cams from 10 to 40mm lift and special profiles to engine manufacturers specification can also be supplied.

A comprehensive range of mounting and adaptor plates are available to facilitate the mounting of fuel pump types of the following manufacture:- LUCAS-BRYCE (WOODWARD), BOSCH, BENDIX, ALSTHOM, ZEXEL, L'ORANGE, NIPPONDENSO, O.M.T etc. Specials versions can also be supplied to suit customer requirements. All heavy duty camboxes are pressure lubricated from the test stand lube oil supply.

- A)** MPU 300-1 Uprated cambox for W46, ZA40S size/type pumps (300mm).
- B)** MPU 300 General purpose heavy duty cambox generally for up to 35mm test cam lift (300mm).
- C)** MPU 50 For EMD, Woodward, Caterpillar 3500 EUI & MUI, Volvo, Scania, Iveco EUI (125 or 175mm).
- D)** MPU 45 For L'Orange, Ruston, Woodward and Allen applications (175mm).
- E)** MPC175 1, 3 or 4 cylinder cambox with maximum 24mm test cam lift (175mm).
- F)** MPC125 For smaller test benches (125mm).
- G)** CAT 3600 Special production cambox for Caterpillar 3600 mechanical unit injector.

Dimensions in brackets refer to centre height. Where possible, 175 to 300mm height adaptor brackets can be supplied. Test cams of 10, 12, 15, 18, 20, 25, 25.4, 30, 35 and 40mm lift as well as specials designed to engine manufacturers requirement can also be supplied.



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T021-009 NOZZLE CLEANING KIT FOR MARINE APPLICATIONS

Consisting of: -

- | | |
|---|--------------------------------------|
| 3x Nozzle seat scrapers | 1x Gallery scraper |
| 1x Brass cleaning brush | 1x Pricker wire holder |
| 1x Pack of pricker wire in
6 sizes: 0.12, 0.20, 0.30, 0.34, 0.78,
0.90mm (Other sizes available) | 1x Cleaning pin holder |
| 12x Cleaning pins: | 1.0-1.5, 1.8-2.0, 2.6, 2.8, 3.0 mm Ø |
| Dimensions: 27x17x4cm | Weight: 0.6kg |



T021-011 NOZZLESCOPE

Extremely light in weight and battery operated for portability, this instrument will find a host of uses in diesel servicing. Observation of nozzle seats is achieved by the use of a probe which provides a bright light source at it's tip. The nozzle seat can be examined by means of the 3 x magnifier. A view through the fuel feed holes is also afforded. Batteries and spare bulb are included.

- | | |
|----------------------------|-----------------------------------|
| Packing Dimensions: | 245 x 125 x 70 mm (10" x 5" x 3") |
| Weight: | 0.75 kgs (1.75 lbs) |



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INJECTOR TESTING



S450-CR INJECTORMASTER

The S450-1 Injectormaster has been designed for the performance testing of the larger and higher pressure conventional diesel fuel injectors as used in marine, rail and power generation applications.

The S450-1 is air operated, eliminating operator fatigue, and is designed to carry out all standard tests i.e. nozzle opening pressure, chatter test (atomization), spray pattern, seat leakage and back-leak.

During atomisation the large illuminated spray chamber with built in fume extraction system offers a clear view of the nozzle tip.

Control valves are provided to facilitate both fault diagnosis and injector setting and a variable pumping rate allows for critical analysis of nozzle spray form and also holds line pressure to enable 'dry seat testing'.

A separate pressurised test oil supply is provided for checking injector coolant circuits.

The robust self-draining horizontal worktable will accommodate the largest of injectors. Quick release V-clamps secure the injector in the working position and if required, special mountings can be manufactured to customer requirements.

The S450-1 is supplied with a dual scale analogue pressure gauge and for optimum accuracy and consistency of test results, the proven Merlin S500-2 digital injector opening pressure/back-leak timing digital display monitor with integral printer.

SPECIFICATION

Pumping Unit: Air operated hydraulic pump unit supplied by normal workshop air supply.

Spray Chamber/Fume Extraction: The spray chamber is illuminated for easy observance of nozzle atomization, spray pattern etc.

Fumes are extracted from the spray chamber via an extractor fan which can be connected to the workshop air extraction system. Test oil is returned to a secondary tank within the main fuel tank. A spray deflector is fitted to the spray chamber to improve operator working conditions by further reducing escape of spray from front of chamber.

Pressure Gauge: 6" diameter dual scale analogue pressure gauge with isolator valve.
Range: 0-700 bar (0-10000 psi) Accuracy: 1% full scale.

Variable Volume Device: Fitted to rear of pressure gauge to control trapped volume. Pre-set at the factory.



Flow Control Valve: Provides full to minimum flow for critical testing.

Fuel Tank: A working capacity of approximately 100 litres is provided. Standard tank features include sight level gauge, quick release filler cap and magnetic drain plug.

Filtration: A replaceable screw-on filter element and gauze filter elements within the main tank protects both the hydraulic air pump & coolant supplies.

S500-2 Display monitor: Pressure Range: 0-700 Bar.

Printer: Thermal printer with own company header if required. Option available to print to PC if required.

Injector Mounting: The standard 'v' clamps will accommodate most injector holders. Special fixtures can be manufactured and supplied on receipt of dimensional details for specific injector types.

Test Pipes: The S450-1 high pressure outlet connection thread size is M22 x 1.5. An adaptor is also supplied to reduce this outlet connection to M14x1.5.

Special pipes can be produced to customers specifications if required. e.g.- M24 x 1.5, M27 x 1.5, M30 x 1.5.

Standard Electrical Specification: 220-240v / 1 ph / 50Hz. Alternative specifications available on request.

Dimensions: 1500 x 850 x 1360mm **Weight:** 250kg

Positive piston displacement heavy duty metering units specifically designed for end of production line testing of large single cylinder pumps and unit injectors, the S600M is also available to the F.I.E. field service operator where more critical over-checking of pump delivery is essential.

MEASURING SYSTEM

Monitoring and measurement in bar graph and numeric format on a 10" TFT colour display. Input/output data and control of measuring system is either by touch screen menu or soft touch push button switches. The injected fuel displaces the metering piston, this movement is measured by an optical non-contact linear encoder which produces a signal of one pulse per one micron of piston movement.

Control systems and software designed for Merlin Diesel Systems Ltd compute this signal and displays the fuel delivery on the screen in the measurement units and updates selected by the operator. An additional signal from the test oil temperature measuring probe located in the piston chamber is used to calculate the volume of displacement at a test oil temperature of 40°C.

OPERATIONAL RANGE

- Model S600M/5: 5 - 5,000 mm³/stroke
- Model S600M/20: 50 - 20,000 mm³/stroke

(This unit is incorporated in the DC-40/80EM Test Stands)

STANDARD EQUIPMENT

- High pressure feed hose x 2.5M long
- Return hose x 2.5M long
- Quick release air connector to suit 3/8" (10mm) hose
- Mains electrical lead x 3M long
- Inductive probe for customer test stand
- Inductive probe lead x 5M long
- Universal fixing kit for inductive probe

OPTIONAL ACCESSORIES

- RS 232 interface plus extension lead x 2M long

SERVICES REQUIRED

- Electrical: 110 volt/single phase/50 or 60 Hz
- 220 volt/single phase/50 or 60 Hz
- Air supply: Compressed air – 80 psi (5.5 bar) min.

DIMENSIONS

- Height: 174 cm
- Width: 76.5 cm
- Depth: 76.5 cm

WEIGHT

- Net weight: 185kgs



Please contact **01772 694180** or sales@merlindiesel.com for more detailed information

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Marine Test Equipment



Merlin Diesel Systems Limited

Our test equipment division manufactures Merlin diesel fuel injection test equipment, cleaning tanks and engine valve re-facing machines.

The product range covers automotive, marine, rail and power generation applications and includes test equipment for electronic unit injectors, common rail injectors and electronic governed fuel pumps. Ultrasonic cleaning tanks, tachometers, service tools and test bench spares, plus a comprehensive selection of reconditioned test equipment complement the range.

Parts Division

Merlin Diesel Systems Parts Division supply diesel injection spare parts and complete units for Delphi, Bosch, Zexel, Denso, Yanmar, Stanadyne and Woodward applications. These include nozzles, fuel pumps, injectors, lift pumps, filters and glow plugs.
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Test Equipment Division

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INJECTOR TESTING



S450-CR INJECTORMASTER

The Merlin S450-CR INJECTORMASTER is a heavy duty injector tester specially designed to test some common rail marine injectors as well as conventional injectors found in Rail, Traction, Industrial, Marine and Power Generation applications.

Air operated, the S450-CR eliminates operator fatigue which may arise from manual operation of conventional mechanical lever operated injector testers.

It is of robust design with an all steel frame construction. The self-draining horizontal work table and 'V' clamps accommodate and secure the largest injectors and the built-in fume extraction system can easily be connected to any workshop extraction system.

Common rail injectors are mounted horizontally using special adaptors suited to the nozzle size being tested. When used for conventional injector testing the S450-CR will perform all standard tests, i.e. nozzle opening pressure, chatter test (atomization), spray pattern, seat leakage and back-leak.

A variable pumping rate allows for critical analysis of nozzle spray pattern and line pressure can be held to enable 'Dry Seat Testing' and a fuel volume control valve is provided to facilitate both fault diagnosis and injector setting.

The proven Merlin S500-2 digital injector opening pressure/back-leak timing monitor has been designed for accurate performance testing, production line testing and quality over checking of diesel fuel injectors and nozzles. Individual test results can be recorded on the S500-2-s built-in printer.



When testing common rail injectors the interlocked safety screen has to be in position. Injector operation is controlled with the Merlin S300-1M common rail injector test system and fuel delivery is displayed digitally on the S600M-5 metering unit's TFT display panel.

The injected fuel displaces the metering piston, movement of which is measured by an optical diffraction grating and an optical reading head which produce a signal of one pulse per one micron of piston movement.

An additional signal from the test oil temperature measuring probe located in the piston chamber is used to calculate the volume of displacement at a test oil temperature of 40°C.

These signals are received by the computer through control systems and software specially designed for Merlin Diesel Systems Ltd.



PNEUMATIC PUMP

Air operated hydraulic pump unit supplied by normal workshop air supply.

PRESSURE REGULATOR

Controls flow to injector.

FLOW CONTROL VALVE

Provides full to minimum flow for critical testing.

FUEL TANK

A working capacity of approximately 100 litres is provided. Standard tank features include sight level gauge, quick release filler cap and magnetic drain plug.

FILTRATION

A replaceable cartridge spin-on 5 micron filter element and gauze strainers within the main tank protect the hydraulic air pump and coolant circuits. Additionally, a tubular magnet is positioned near the lip of the weir which is located within the main tank. A 40 micron filter protects the S600M/5 metering unit circuit.

SPRAY CHAMBER AND FUME EXTRACTION

The spray chamber is illuminated for easy observance of nozzle atomization, spray pattern etc. Fumes are extracted from the spray chamber via a rate air operated extraction system for final connection to the workshop extraction system while test oil is returned to the main fuel tank via a weir. A spray deflector is fitted to the spray chamber inlet to improve operator working conditions by further reducing escape of spray from front of chamber.

INJECTOR MOUNTING

The standard 'V'clamps for injector holders with nozzles of T, U and V size. Common rail injectors are mounted horizontally in a special adaptor and injector pot suited to the nozzle size being tested.

TEST PIPES

A M14 flexi-pipe with one adaptor is supplied as standard. The S450-1 high pressure outlet connection thread size is M22 x 1.5 but an adaptor is supplied to reduce this outlet connection down to M14 x 1.5.

A range of high pressure test pipes are available:- M24 x 1.5, M27 x 1.5, M30 x 1.5. Additional adaptors and special CR connectors can be produced to customers specifications, if required.

S500-2 INJECTOR OPENING PRESSURE MONITOR

Pressure range:- 0-1000 bar (psi, MPa or kgf/cm²)

Timer range:- 0 - 99.9 seconds.

Pressure:- ±1 bar.

Time:- ±1 second.

Transducer:- ±0.1% of full value.

Linearity:- ±1 bar over full range.

Memory:- Data store/recall for injector test plans.

Display:- Tick/cross symbols advise user of NOP and back-leak pass/fail.

Compensation:- Automatic compensation for variations in test oil temperature.

Test oil:- Variable test oil compensation, Standard, (No compensation), Shell calibration fluid 'C' ISO 4113 calibration fluid.

PRINTER

Thermal image printer used for conventional injector testing. On completion of a test the results of the are automatically sent to the serial printer port. A print out of the last test, whether passed or failed, can be requested by selecting "PRINT" on the display screen.

S300-1M COMMON RAIL SYSTEM TEST UNIT

Excitation voltage:- 85v dc (Bosch/Delphi/Denso) 135v dc (Siemens)

Pulse-width range:- 0.5 - 3.0ms.

Repetition rate:- Fixed in this application.

Injector current:- 25A (Bosch/Delphi/Denso)

Fault detection:- Injector short circuit, injector open circuit, incorrect injector type connected.

Calibration:- Since the unit is microprocessor controlled, no calibration is required.

S600M/5 METERING UNIT

Operational range:5 - 5,000 mm³ /stroke

Speed range:- Minimum 50 rpm.

Maximum 800 rpm, but dependent on fuel quantities delivered.

Data capture:- RS232 Interface (Depending on model)

STANDARD ELECTRICAL SPECIFICATION

220-240v / 1 ph / 50Hz.

Alternative specifications available on request.

DIMENSIONS

1325 x 850 x 1560mm

WEIGHT

250kg

S400A-M

The Merlin S400A-M is a 700 bar air operated injector tester used for testing and adjusting smaller marine type injectors, before and after reconditioning.

Operating handle not required, all controls and instruments are grouped together for operator convenience and include the latest **Merlin S500-2 display monitor**, flow control valve, light and fume extraction control. Print out of test results from the thermal image printer.

Designed to carry out all tests detailed in ISO 8984-2, i.e. Nozzle Opening pressure, chatter test (atomisation), spray pattern, seat leakage and back-leakage. Fully sealed air pump unit, robust construction, pneumatically operated via normal workshop air supply. Illuminated spray chamber to give a good view of injector spray form. A variable rate air operated fume extraction system with optional perspex spray arrestor further assists the extraction operation.

Standard tank features include sight level gauge, quick release filler cap and magnetic drain plug. Fitted with a heavy duty V-clamp assembly and a M22x1.5 male threaded outlet connector to suit marine injector test pipes, available from stock or made to customer specification.

The **Merlin S500-2 Display Monitor** has been designed for accurate performance testing, production line testing and quality over checking of diesel fuel injectors and nozzles. The repeatable and reliable digital display of pressure eliminates errors normally found in conventional analogue pressure gauges due to hysteresis in gauge readings, possible undetected mechanical damage, gauge inaccuracies and gauge needle bounce when setting 'Nozzle Opening Pressure'. Back leakage timing errors are eliminated due to the absence of having to start and stop a remotely sited mechanical timer.

