



## 1300 Series EDi



*Shaping  
the Future*



Built with passion

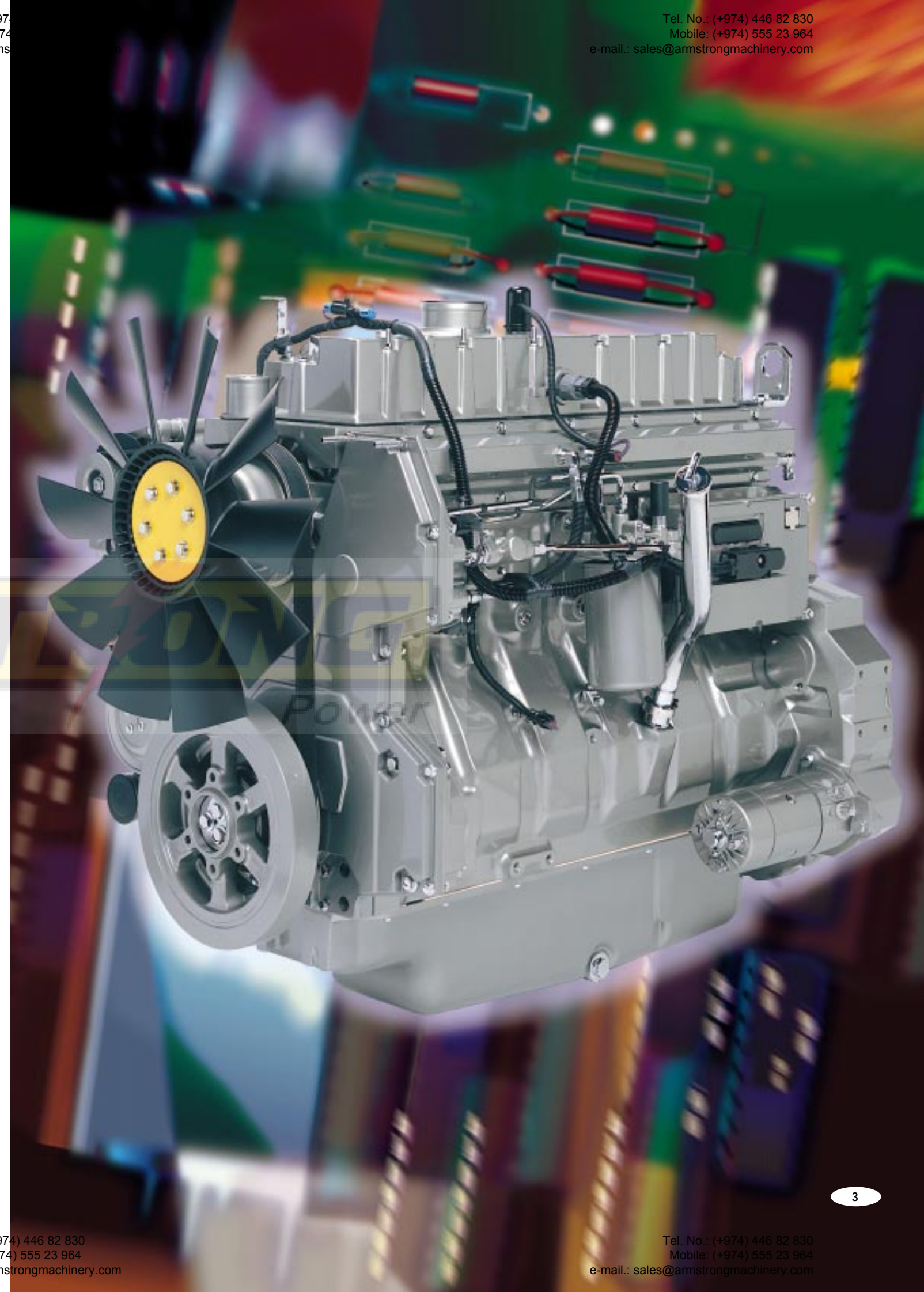
Over time the world's diesel engine industry has tried many ways to build its engines, but at Perkins we know of only one way - with passion.

An unremitting passion for excellence has ensured that Perkins has become a word meaning quality in all the many countries around the world where Perkins' engines are to be found. That very same quality also becoming a byword for the Perkins 1300 Series range of engines.

When launched, the 1300 Series was seen by many as an engine powerful enough to shape the future, challenging as it did all definitions of size, performance and cost of operation. Now with demands for off-highway machines producing even less noise and greater economy, plus the certainty of lower exhaust emissions into the next century, the range has evolved. As the 1300 Series EDi - further enhanced with sophisticated electronics, controlling a vastly superior fuel delivery and engine management system, it becomes a range delivering tomorrow's performance requirements, today.

## 1300 Series EDi

 with electronic engine management & fuel injection





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The 1300 Series EDi is a true family of in-line 6 cylinder turbocharged and turbo-aftercooled 7.6 and 8.7 litre engines, sharing a common profile.

In responding to ever rising demand for greater productivity and lower running costs, these 4 stroke, liquid cooled, electronically controlled diesel engines now bring a more sophisticated type of power to the 145.5 kW to 261 kW (195 hp to 350 hp) sector for agricultural, industrial, power generation and construction machines.

Whenever power is required off-highway, the Perkins 1300 EDi range will have a rating matched with precision and a torque curve tailored for the heaviest duty with the utmost economy. Furthermore, the benefits of the 1300 Series EDi do not stop there, as these engines also address the seven key areas foremost in machine design requirements.

Capability

In design and development centres around the world, manufacturers both large and small are engineering tomorrow's machines, now. Traditional values will be built upon, but for others a more sophisticated form of diesel power is the dream. For designers who want power combined with the ability to communicate and interact in total with machine systems, using electronic intelligence, the future has become a reality with the Perkins 1300 EDi range. Benefiting from the industry's most advanced electronic controls and fuel delivery system, the 1300 Series EDi is destined to change the way industry thinks about diesel engines.

The hydraulically operated, electronically controlled, unit injector (HEUI) system used on the 1300 Series EDi encompasses the advantages of both unit injectors and common rail technology whilst eliminating many of the drawbacks of each. Unlike traditional common rail systems, where the entire fuel line remains under very high pressure, the 1300 Series EDi's HEUI system uses a dual line rail. Here engine oil at high pressure, rather than the camshaft, provides the muscle to power fuel injection through one line, with the fuel for injection supplied at low pressure, in a second rail.

Low noise, low emissions, improved economy and heightened performance are the result of three important factors from this advanced fuel delivery and electronic control system; injection rate control, timing control and higher injection pressures.

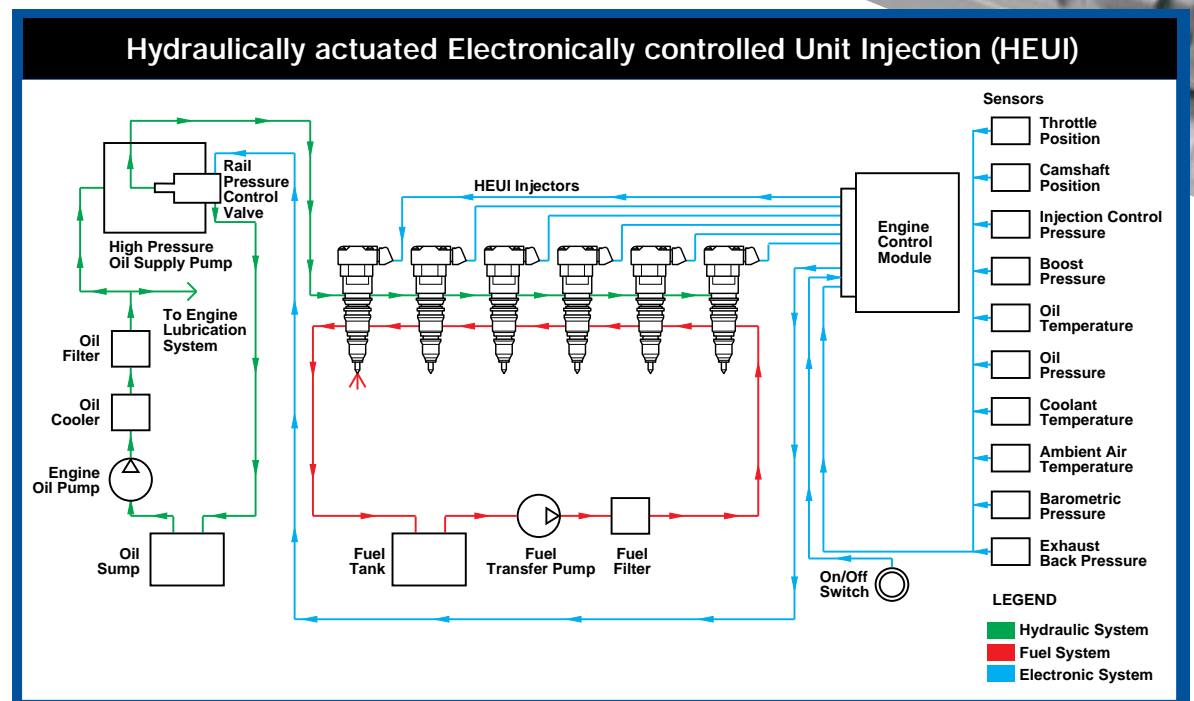
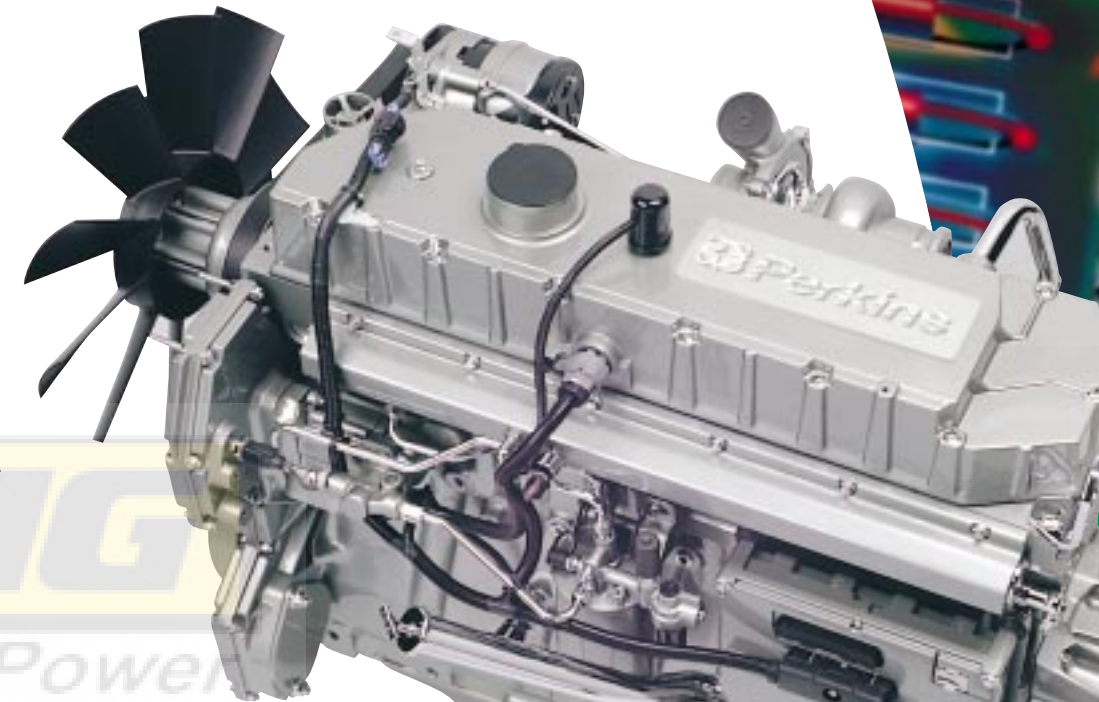


Fig 1



Capability Continued

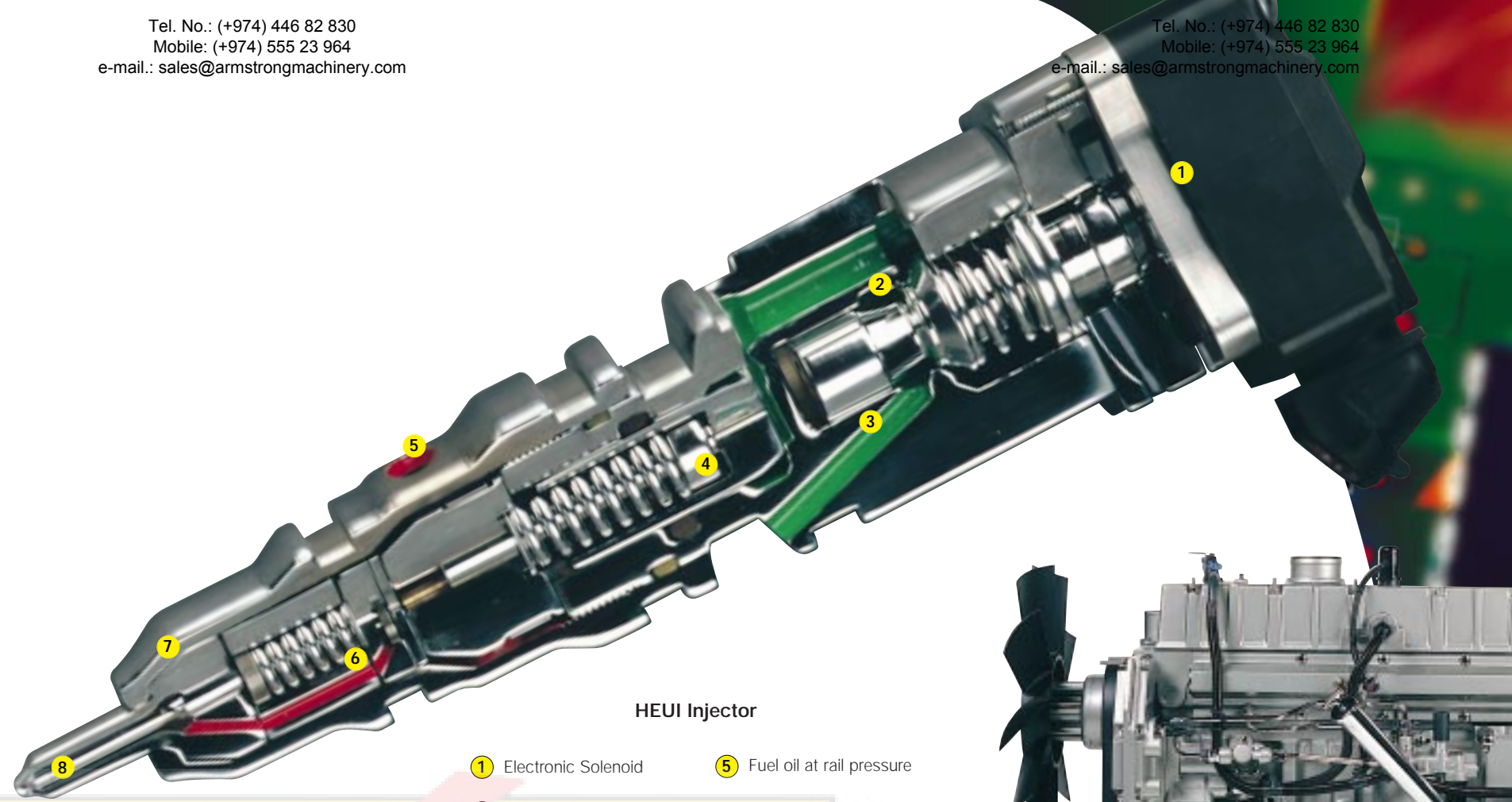
### Injection Rate Control

Because the injectors operate hydraulically under electronic instructions independent of engine speed, high injection pressure is available even at low revs. This is an advantage over mechanical systems where pressure increases with speed. The ability of electronic control to vary injection pressure has proven advantages in greatly improved low speed engine response plus noise, smoke and particulate reduction.

By varying the fuel delivered during the ignition delay period at the start of combustion then during main injection, the engines heat release characteristics are modified; this rate shaping again contributes to reduce noise and emissions. Combined with independent injection pressure control, rate shaping optimises engine performance providing the ideal rate of injection at idle, light load, rated speed and high load operations.

### Timing Control

Both the start and end of injection are controlled by the EDI's electronic control module. Unlike conventional electronically controlled mechanically actuated unit injectors, the plunger within HEUI injectors does not move until the solenoid is energised. This means that plunger movement is not limited to the shape or speed of a cam lobe. The ability to inject fuel at the optimum crankshaft angle, results in improved fuel consumption, reduced gaseous emissions and cold starts virtually free of smoke.



HEUI Injector

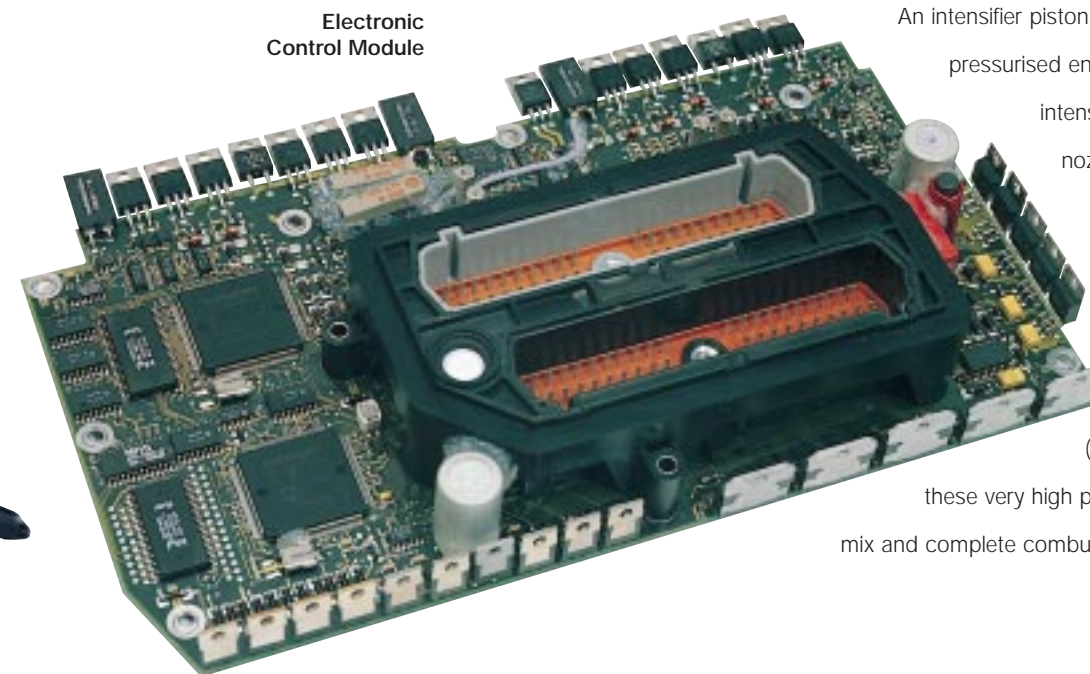
- |                          |                                  |
|--------------------------|----------------------------------|
| ① Electronic Solenoid    | ⑤ Fuel oil at rail pressure      |
| ② Poppet Valve           | ⑥ Fuel oil at injection pressure |
| ③ Pressurised engine oil | ⑦ Nozzle Assembly                |
| ④ Intensifier Piston     | ⑧ Nozzle Valve                   |



### Higher injection pressures

An intensifier piston within the HEUI injector multiplies the hydraulic force from the pressurised engine oil supplied by the rail, the resulting downward movement of the intensifier piston and plunger pressurises the fuel in the plunger cavity and nozzle. When the fuel reaches the required pressure, the nozzle valve lifts off its seat and injection begins.

As long as the solenoid is energised, pressurised oil continues to flow in, pushing down the intensifier and plunger. This system can provide injection pressures of between 20.7 and 145 MPa (207-1,448 bar) as the engine adapts to operating conditions. At these very high pressures the fuel spray is exceedingly fine, enhancing the air/fuel mix and complete combustion, improving fuel economy, performance and gaseous emissions.



Electronic Control Module



Reliability

### Cylinder Head

The one-piece cast iron cylinder head incorporates helical inlet ports which provide swirl conditioned air for optimum combustion. Cylinder head integrity is ensured by directed coolant flow to heat sensitive areas, whilst the uniform clamp loads of six bolts per cylinder ensures effective, long life gasket sealing.

### Combustion System

Under electronic control and management, precise measures of fuel are injected at high pressure into the piston crown combustion chamber to mix and burn with air pre-conditioned by swirl and forced induction.

This combustion process results in superb fuel efficiency, high performance, low noise and low emissions, in a combination unsurpassed by others.

### Roller Cam Followers

Roller cam followers increase the wear resistance of tappets and camshaft lobes, this then benefits the owner with increased reliability and lower running costs as tappet check/adjustment is extended to 3,600 hours.

### Lub Oil System

The lub oil system includes such features as thermostatic temperature control for a fast warm up and a high pressure relief valve for cold start engine protection. A by-pass valve built into the filter, provides additional protection.

Oil temperature is maintained within the optimum range by an engine mounted oil cooler while two oil jets per cylinder spray the piston with cooling oil to maintain optimum temperature and prolong engine life.

Finally, the single filter and oil change at 450 hours ensures lower costs and more profitable hours spent at work.

### Pressure Balanced Pistons

The armoured top ring groove aluminium alloy pistons feature a state-of-the-art three ring pack where the top ring has a plasma facing, this and the keystone design, combine to reduce blow-by and extend liner life.

Making use of the pressure differential across the top ring, a positive seal is made against the bottom of the armoured groove and liner bore. This balanced pressure system and sophisticated ring pack reduces cost as it maintains optimum performance over a longer working life.

### HEUI injectors

These hydraulically actuated, electronically controlled unit injectors provide a significant improvement in operational capability, reliability and emissions performance over conventional fuel injection.

The injector uses four main elements to deliver these increased benefits. First, a solenoid; this is a fast acting electro-magnet, which when energised by the ECM pulls the 'poppet' valve off its seat. The 'poppet' valve is the second element, it is held against its seat by a spring until activated by the solenoid, thus allowing pressurised oil to act on an 'intensifier' piston plunger. This third element, the 'intensifier' piston, has an area seven times greater than the plunger therefore applying a seven times multiplication force to the fuel under the plunger, causing the nozzle to open. The final, nozzle element, is largely conventional in design, but with the addition of a ball check valve controlling leakage and fill, this seals during the downward, injection stroke of the plunger and unseats on the return, allowing the plunger cavity to refill.

### Electronic Control Module (ECM)

The engine mounted ECM is a microprocessor based system monitoring key inputs and outputs from the engine and machine, controlling the operation of the entire fuel system. By comparison to a traditional mechanical governor, it has many more external operational inputs ( see fig 1, page 5 ) such as engine speed, crankshaft angle, timing, rail pressure, boost pressure etc, thus determining optimum fuel rate and timing for any operational condition.

The ECM also has the ability to store data, for example, fuel used and hours worked. Safety failure detection and shutdown is also included, as is the capture and store of fault codes for rapid analysis of failure and cause with electronic diagnostics, should that ever be required.

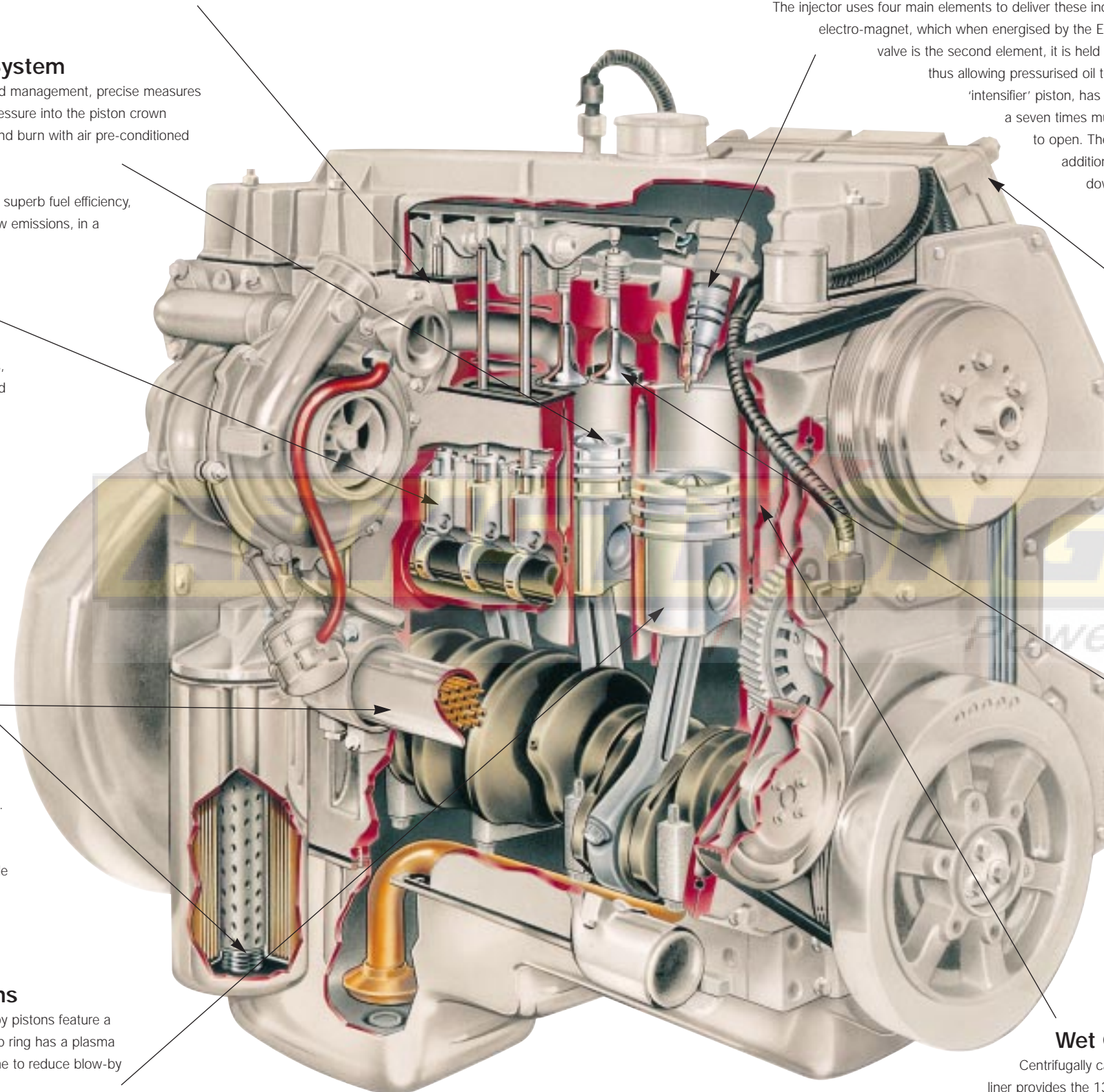
### Valve Train

The Perkins 1300 Series EDI engines use powder metal valve guides and alloy valve seats. These inserts are not only technically superior to parent metal systems, they are also replaceable, so the cylinder head is quickly brought back to 'as new' condition for a second or subsequent service life. In addition, positive rotation of the valves provides excellent heat and wear resistance, adding reliability and extending life.

### Wet Cylinder Liners

Centrifugally cast, induction hardened and plateau honed, the high specification wet liner provides the 1300 Series EDI engines with optimum heat transfer from cylinder bore to coolant. High accuracy manufacturing also means a virtually perfect piston ring fit for superior combustion sealing and oil control.

The wet liner system also has an added benefit in that it allows a simple in-frame rebuild to original factory specifications.



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# In harmony with the environment

## Emissions

Perkins cares about the environment and by working closely with legislative bodies, makes sure the diesel engine is in harmony with environmental needs now and in the future. The 1300 Series EDi range with its high specification, electronically controlled fuel delivery system, comfortably satisfies European and North American Off-Highways Stage 1 emissions legislation and provides a ready platform for progression to Stage 2.

## Packaging

In researching the basic needs of manufacturers in this sector, not unnaturally they demanded more user benefits and a simple engineering task. The engine they desired was not 'bigger and better', but better in a smaller, lighter package, powerful with a wide choice of ratings and speeds.

This has been done. The Perkins 1300 Series EDi is a remarkably compact engine range taking a smaller percentage of machine space than others. And featuring a single, unobtrusive engine mounted electronic control module, providing along with the benefits of two different swept volumes a wide choice of power output and speed. Thus with a cubic capacity of either 7.6 or 8.7 litres within a common profile, the 1300 Series EDi diesel engines add a new dimension to industrial power.



## Durability

To exceed our customers' expectations is to find even higher levels of reliability and provide more engine life. Here the Perkins 1300 Series EDi excels, with all critical components designed to extract maximum performance with a comfortable reserve.

For instance, wet liners and roller cam followers bring large engine technology to this sector. And, securely supported by the deep skirted cylinder block, a micro alloy forged crankshaft with generous main and small end bearings adds further to an exceptionally long life.

Whether operating conditions demand long life under continuous operation, or intermittent high performance in specialist use, the Perkins 1300 Series EDi is the ideal power solution for manufacturers around the world.



## Driving down maintenance costs

Perkins engines consistently lead the race in lowering operating costs and 1300 Series EDi powered machines will be amongst the lowest. In addition to an advanced mechanical specification the engine mounted electronic control module also now plays a key role. This sophisticated computerised system continually monitors vital engine characteristics and stores the information. Technicians using an industry standard diagnostic tool, can look at a brief operational history of the engine's performance to aid in diagnosis, anticipating and correcting problems before they occur.

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# Options

For many, Perkins has led the way in providing an individually tailored power solution to the widely varied demands of different market sectors. This product tailoring capability continues with the 1300 Series EDi range through a wide range of ratings, mechanical dress options and electronic functions.

## Basic Engine Data

**Combustion System** Direct Injection

**Induction System** T – Turbocharged  
 TA – Air to Air Chargecooled

### Compression Ratio

7.64 litres (466.4 cu.in) 16.4:1  
 8.71 litres (531 cu.in) 16.6:1 or 16.3:1

**Configuration** In-line, 6 cylinder

**Cooling** Liquid

### Cooling System Capacity

12.8 litres (22.5 imp pints) engine only

### Lubricating System Capacity

26.4 litres (46.5 imp pints) (inc. filter)

### Gross Performance To SAE J1995 3.1

**Rotation** Counter clockwise, facing the flywheel

**†Dry Engine Weight** 656 kg  
 (1446 lbs)

### Bore & Stroke

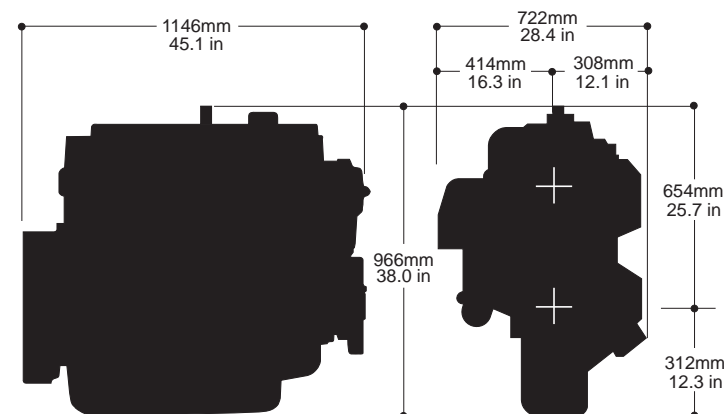
**1306 E76T & TA -**  
 109.2mm x 135.9mm  
 (4.301 x 5.350in)

**1306 E87T & TA -**  
 116.6mm x 135.9mm  
 (4.590 x 5.350in)

† excluding electrics  
 inc. flywheel and hsg

## Standard Equipment

- Automatic, polyvee belt tensioner
- Coolant filter/conditioner
- Crankshaft damper
- Engine mounted oil cooler
- Fan drive
- Flywheel housing
- Hydraulically actuated Electronically controlled Unit Injectors
- Engine Mounted Electronic Control Module (ECM)
- Induction manifold
- Lifting plates
- Sensor positions for ECM
- SAE 'B' flange for PTO
- Oil fill tube and dipstick
- Spin-on full flow lub oil filter
- Spin-on full flow fuel filter, with hand primer pump
- Turbocharger
- Water inlet connection
- Wet sump
- 24 volt Electrics
- Alternator brackets



## 1300 Series EDi Range - Agricultural, Industrial & Construction Power

	Power			Torque		
	kW	(hp)	rev/min	Nm	(lbf.ft)	rev/min
1306-E76T	145.5	(195)	@2400	746	(550)	@1600
1306-E76T	156.5	(210)	@2400	847	(625)	@1600
1306-E76TA	205.0	(275)	@2400	1085	(800)	@1600
1306-E87T	153.0	(205)	@2200	828	(611)	@1600
1306-E87T	168.0	(225)	@2200	908	(670)	@1600
1306-E87TA	186.5	(250)	@2200	1024	(755)	@1600
1306-E87TA	246.0	(330)	@2000	1424	(1050)	@1300

## 1300 Series EDi Gen Set Power

	Gross Engine Output kWm (hp)	
	@1500 rev/min	@1800 rev/min
1306-E87T	149.0 (200)	171.5 (230)
	160.0 (215)	--
1306-E87TA	186.5 (250)	201.5 (270)
	205.0 (270)	227.5 (305)
	223.0 (300)	242.5 (325)
	231.0 (310)	--
	246.0 (330)	261.0 (350)

## Optional Equipment

- **Accessory Drives**
  - 41 kW (55 hp) gear drive from the timing case
  - 149 kW (200 hp) power take-off from the flywheel hsg
  - Crankshaft pulley, axial power take off to a limit of 420 Nm (310 lbf.ft) for hydrostatic pump
  - 308 Nm (230 lbf.ft) for air compressor
  - Fan drive pulley, radial power take capacity
- **Air compressors**
  - TU-FLO 550 368 1/min (13 cfm)
  - TU-FLO 750 453 1/min (16 cfm)
- **Alternator\*** - 12 volt/60 amp or 24 volt/55 amp
- **Exhaust Outlet** - Elbow
- **Fan** - Pusher or puller types 559mm (22 in) to 711mm (28 in), 6-10 blades
- **Fan Drive** - 384mm (15.1 in) or 465mm (18.3 in) centres

\* Polyvee belt included with an alternator option

- **Flywheel** - To suit various clutches, torque converters and transmissions
- **Flywheel Housing** - SAE No 1, 2 or 3 with pad type mounts
- **Fuel Pre-Filter** - Glass bowl type
- **Lub Oil Sump** - Front, rear or high inclination use centre well, plus shallow flat bottomed
- **Lub Oil Filler** - Long reach, variable position tube and dipstick or short tube and dipstick
- **Mounting Bracket** - Single or two point front brackets
- **Oil Pressure** - Switch
- **Starter Motor** - 12 volt or 24 volt
- **Turbocharger Mounting** - Side mounted choice of front or rear air inlet
- **Water Inlet** - 45 degree or horizontal connections
- **Air Cleaner** - 14 in
- **Radiators**

# Power Range

Since the company was founded in 1932, close to 15 million Perkins engines have been built. Today, throughout almost every county in the world, more than 1000 leading producers of powered equipment put their trust in Perkins.

Whatever the requirement for industrial engines, Perkins can supply a tailored power solution from its' range of heavy duty off-highway diesels.

From smaller 4kW (5bhp) models to the 1939 kW\* (2600 bhp\*) heavyweights, Perkins engines benefit the user with clean, quiet, productive power while setting enviable standards for reliability and durability. The 1300 Series EDi continues a tradition of value, quality and robustness, taking diesel engineering into the 21st century.



## World-wide After Sales Support

The 1300 Series EDi is supported by Perkins' international distribution network of over 4000 dealers.

Known under the name Powerpart, our comprehensive support service is more than just a brand name. Powerpart offers you a total product service including technical information and efficient service support. In addition you have direct and rapid access 24 hours a day, 365 days a year to over 35,000 parts and exchange units throughout 160 countries.

Distributors have their own workshops and supply field service back-up. Each one is totally committed to Perkins philosophy of Total Quality, where perfect customer satisfaction is the goal.



\* Refers to CV engine range

# Worldwide Support



