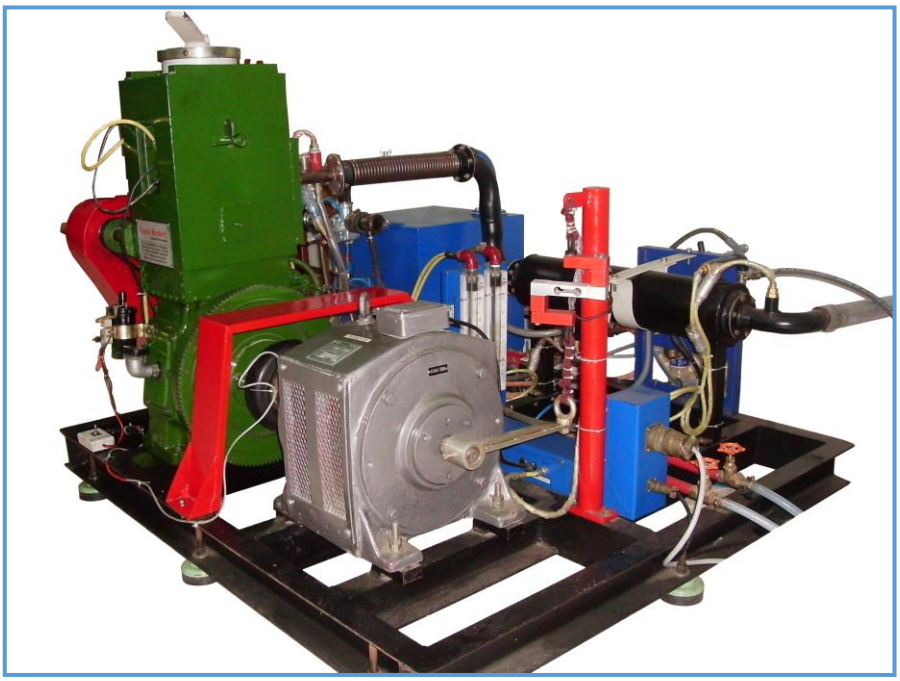
# *Computerized Variable Compression Ratio Petrol Engine Test Rig with GDI Open ECU and EGR*

## *(Product Code: CVCR01-OECU)*



## Features

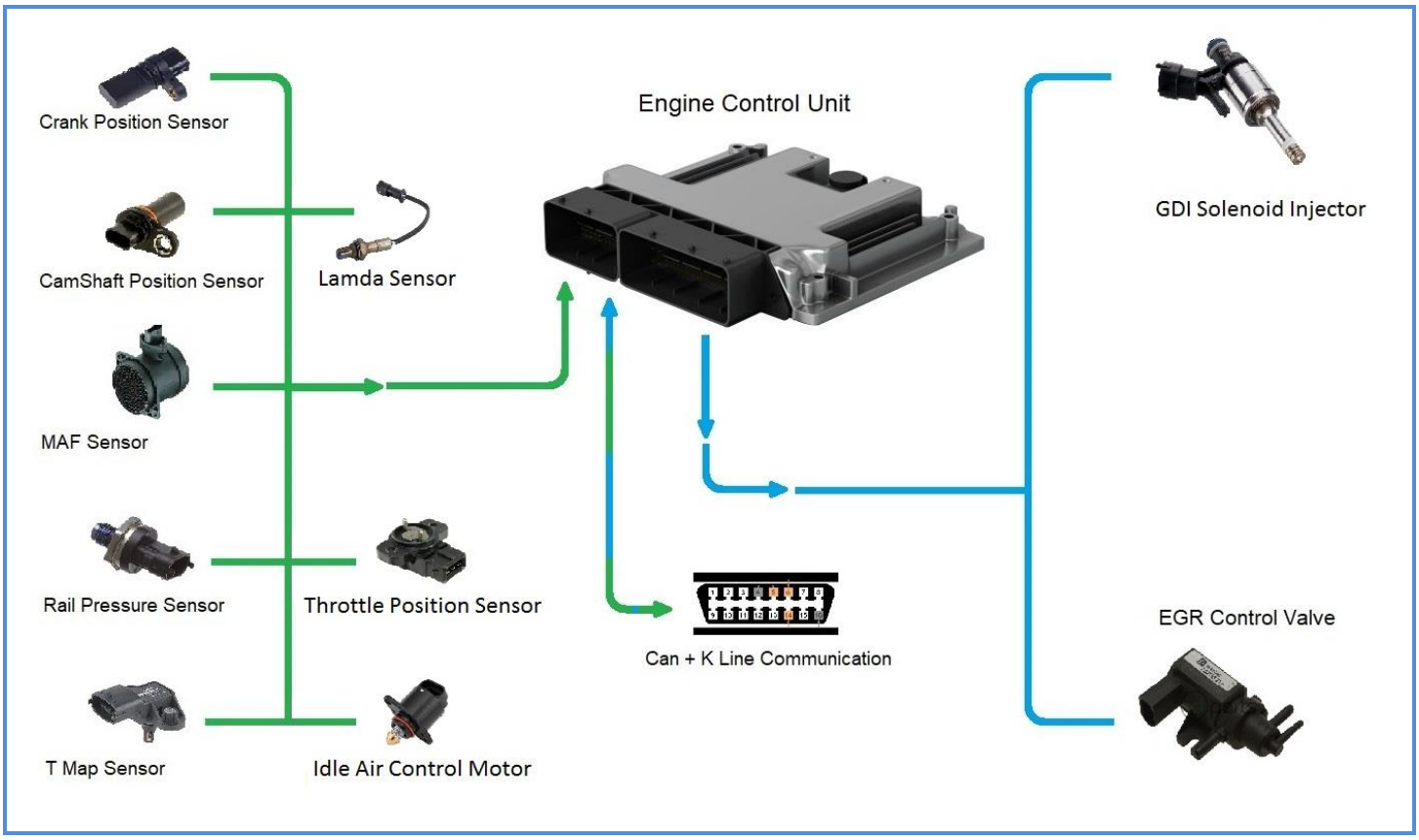
- GDI Open ECU- Engine performance enhancement for Petrol and alternative fuels
- Engine performance and combustion studies
- High Quality instrumentation
- Calculates BP, IP, FP, sfc, bsfc, BTE , Volumetric η & mechanical η
- PV and P-θ diagrams
- Mass Fraction Burnt
- Estimated End of Combustion Angle (EEOC)
- Calculates Gross IMEP
- Calculates Maximum Heat Release Rate
- Calculates Start of Combustion
- Calculates Combustion Duration and many more parameters

## Product Description

The engine is mounted on Sturdy base frame. The base frame is fabricated with mild steel “C” channel. The engine and the dynamometer are coupled using standard tyre coupling. The air tank is fitted with a differential pressure sensor for measuring the Actual volume of air drawn into the cylinder. The thermocouple and necessary signal conditioner for the measurement of temperature at various points in the calorimeter are suitably provided. Liquid Level Sensor is used to measure the fuel flow consumption of the engine. Rota meter is used to measure the water flow of the engine and exhaust gas calorimeter. The load of the engine is measured using a load cell. The panel is fabricated with suitable SWG CR sheet and as per IS standard; the front portion of the panel is provided with provision for mounting computer, Printer, UPS and all instrumentations and signal conditioner related components. Power and control wiring are suitably marked using ferule for easy troubleshooting. The panel is finished with powder coating.


#472/5, Srigandhadakavalu, Kottigepalya.
Vishwaneedam Post. Bangalore -560091.
Ph.: 080-23587927, 9740987814, 9448428695, 9448451476, 9845114738
Email: info@legionbrothers.com. www.legionbrothers.com, www.legionbrothers.in

## GDI Open ECU with EGR




## Components of GDI Open ECU with EGR

- Crankshaft position sensor (Measures crankshaft position)
- Camshaft position sensor - (Measures camshaft position)
- MAF Sensor - (Measures mass air flow)
- Rail pressure sensor - (Measures common rail pressure)
- T Map sensor - (Measures manifold temperature and pressure)
- Engine Control Unit - (To Measure sensors and control series of actuators on an internal combustion engine and ensure excellent engine performance)
- Petrol solenoid injector – (For fuel injection)
- EGR Valve - (Re-circulates controlled flow of exhaust gas into the intake)
- Can + K line - (For calibration and Troubleshoot)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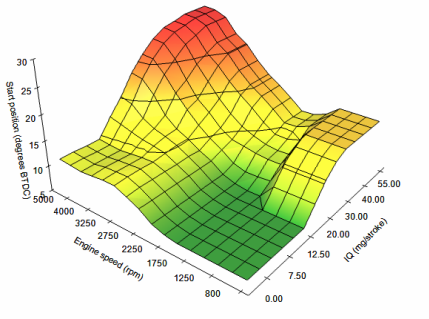
Email: info@legionbrothers.com. www.legionbrothers.com, www.legionbrothers.in

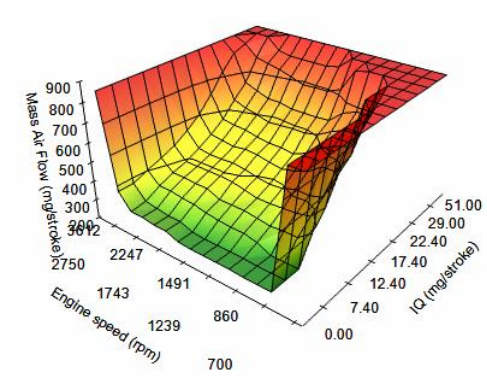
## GDI Open ECU with EGR Functionality (Tunable Maps)

- Set idle Speed - (The user can set the required idle speed of the engine)
- Closed loop control for idling - (ECU controls the injection until engine idle)
- Start injection angle for homogeneous operation-(The user can set the start of injection angle as desired)
- End injection angle for stratified operation-(The user can set the end of injection angle)
- Start angle for spark ignition-(The user can set the spark timing)
- Injection Duration - (The user can set the Injection duration in terms of crank angle as desired)
- Open loop rail pressure - (This is an special feature in which an user can set the Injection Pressure in terms Bar, variable from 10 to 180 bar)
- EGR - (The user can set the EGR flow as desired)
- Calibration charts are provided for Injection Quantity at various pressure

| MG/ST RPM | 0.00 | 5.00 | 7.50 | 10.00 | 12.50 | 15.00 | 20.00 | 25.00 | 30.00 | 35.00 | 40.00 | 45.00 | 55.00 | 60.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5000 | 13.5° | 13.5° | 13.5° | 13.5° | 16.1° | 18.2° | 21.0° | 23.7° | 25.8° | 27.1° | 27.6° | 28.1° | 28.1° | 28.1° |
| 4500 | 13.1° | 13.1° | 13.1° | 13.1° | 15.1° | 17.5° | 20.5° | 23.4° | 25.5° | 26.8° | 27.3° | 27.9° | 27.9° | 27.9° |
| 4000 | 12.4° | 12.4° | 12.4° | 12.4° | 13.8° | 15.4° | 18.1° | 21.0° | 23.1° | 25.0° | 25.9° | 27.0° | 27.0° | 27.0° |
| 3500 | 11.4° | 11.4° | 11.4° | 11.4° | 12.6° | 13.7° | 15.1° | 18.4° | 19.9° | 21.8° | 23.0° | 24.1° | 24.1° | 24.1° |
| 3250 | 11.0° | 11.0° | 11.0° | 11.0° | 11.8° | 12.8° | 13.3° | 15.9° | 16.9° | 19.0° | 21.1° | 22.5° | 22.5° | 22.5° |
| 3000 | 10.4° | 10.4° | 10.4° | 10.4° | 10.9° | 11.7° | 11.6° | 13.8° | 15.1° | 16.3° | 18.6° | 19.8° | 19.8° | 19.8° |
| 2750 | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 12.0° | 12.7° | 14.0° | 16.5° | 17.6° | 17.6° | 17.6° |
| 2500 | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.5° | 11.2° | 12.2° | 14.7° | 15.9° | 15.9° | 15.9° |
| 2250 | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.8° | 11.1° | 12.5° | 14.0° | 14.0° | 14.0° |
| 2000 | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.4° | 10.9° | 12.0° | 12.0° | 12.0° |
| 1750 | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.1° | 10.8° | 12.1° | 12.1° | 12.1° |
| 1500 | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.0° | 10.1° | 11.5° | 13.0° | 13.0° | 13.0° |
| 1250 | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° |
| 1000 | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° |
| 800 | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° | 12.0° |




| MG/ST RPM | 0.00 | 3.00 | 7.40 | 10.00 | 12.40 | 15.00 | 17.40 | 20.00 | 22.40 | 25.00 | 29.00 | 33.00 | 51.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3612 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| 3423 | 365.00 | 365.00 | 395.00 | 420.00 | 450.00 | 495.00 | 550.00 | 630.00 | 720.00 | 795.00 | 820.00 | 850.00 | 850.00 |
| 2750 | 285.00 | 295.00 | 335.00 | 365.00 | 385.00 | 420.00 | 460.00 | 510.00 | 585.00 | 650.00 | 760.00 | 850.00 | 850.00 |
| 2499 | 285.00 | 285.00 | 335.00 | 365.00 | 385.00 | 410.00 | 450.00 | 500.00 | 560.00 | 625.00 | 745.00 | 790.00 | 850.00 |
| 2247 | 275.00 | 275.00 | 325.00 | 360.00 | 385.00 | 410.00 | 440.00 | 495.00 | 545.00 | 600.00 | 730.00 | 775.00 | 850.00 |
| 1995 | 275.00 | 275.00 | 320.00 | 360.00 | 385.00 | 415.00 | 450.00 | 480.00 | 525.00 | 600.00 | 710.00 | 775.00 | 850.00 |
| 1743 | 250.00 | 250.00 | 305.00 | 330.00 | 380.00 | 405.00 | 445.00 | 470.00 | 530.00 | 585.00 | 685.00 | 775.00 | 850.00 |
| 1596 | 245.00 | 245.00 | 295.00 | 330.00 | 365.00 | 390.00 | 430.00 | 470.00 | 535.00 | 585.00 | 690.00 | 775.00 | 850.00 |
| 1491 | 245.00 | 245.00 | 290.00 | 330.00 | 350.00 | 380.00 | 420.00 | 460.00 | 535.00 | 585.00 | 690.00 | 790.00 | 850.00 |
| 1386 | 245.00 | 245.00 | 290.00 | 320.00 | 350.00 | 385.00 | 435.00 | 490.00 | 550.00 | 590.00 | 720.00 | 850.00 | 850.00 |
| 1239 | 245.00 | 245.00 | 275.00 | 310.00 | 355.00 | 410.00 | 460.00 | 540.00 | 590.00 | 650.00 | 835.00 | 850.00 | 850.00 |
| 924 | 240.00 | 240.00 | 240.00 | 315.00 | 360.00 | 405.00 | 510.00 | 575.00 | 620.00 | 680.00 | 850.00 | 850.00 | 850.00 |
| 860 | 240.00 | 240.00 | 240.00 | 315.00 | 375.00 | 425.00 | 515.00 | 600.00 | 620.00 | 680.00 | 850.00 | 850.00 | 850.00 |
| 750 | 240.00 | 240.00 | 240.00 | 370.00 | 450.00 | 574.00 | 622.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| 700 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| 0 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |






*Legion Brothers*
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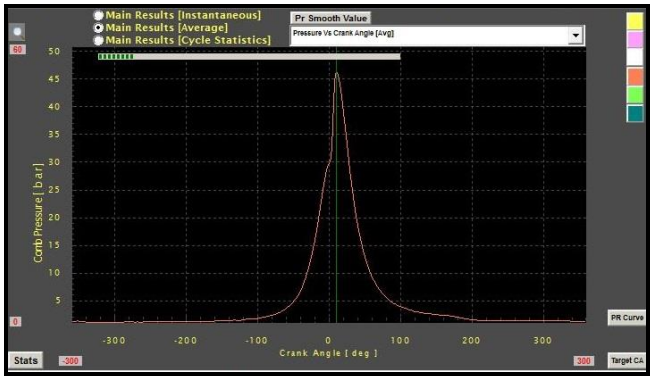
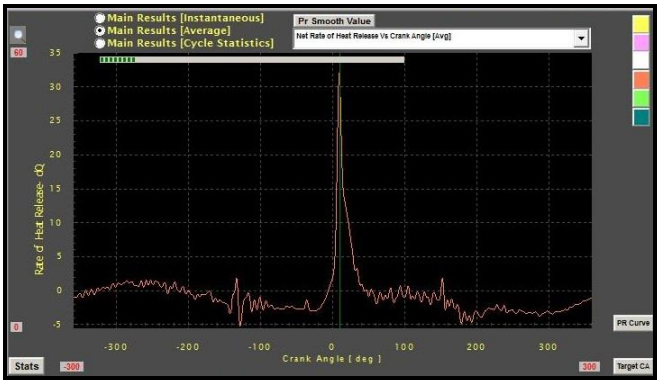
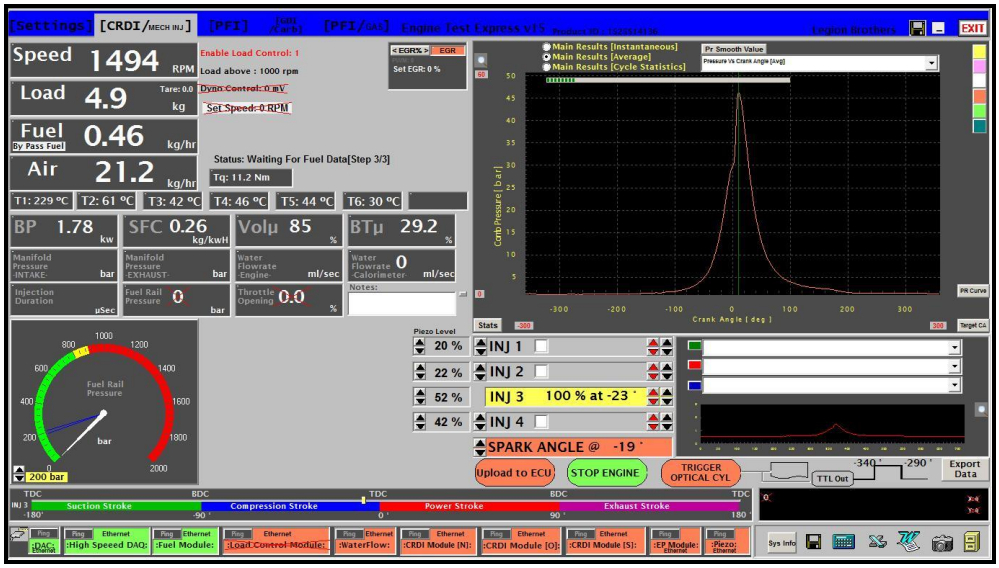
## Software (Engine Test Express)

Windows based powerful software for real time data measurement, auto zoom graphs, analog and digital display of data in the computer, store indefinite no of graphs for analysis. Facilities to export data to Microsoft excel. The data acquisition software is developed by legion brothers.





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# *Computerized Variable Compression Ratio Petrol Engine Test Rig with GDI Open ECU and EGR (Product Code: CVCR01-OECU)*

## Product / Component Specification

| | |
|---|---|
| Product | Computerized Variable Compression Ratio Petrol Engine Test Rig with GDI open ECU and EGR |
| Product code | CVCR01-OECU |
| Engine | Make : Legion Brothers<br>Compression Ratio : 3.5:1 to 10:1<br>No of cylinder : One<br>Cooling : water<br>Speed : 1500-1750 Rpm<br>Power : 5HP<br>Starting : Electric Start |
| Dynamometer | Type : Eddy Current<br>Cooling : Air cooled<br>Capacity : 5HP |
| Coupling | Tyre Coupling |
| Calorimeter | Single shell and tube-Mild Steel |
| Air tank | 500mm cubic-Mild steel |
| Panel | Mild steel powder coated with provision for mounting computer, ups, printer and instrumentation |
| Base frame | C channel-Mild steel |
| Combustion pressure sensor | Piezo-electric 0-100 bar |
| Crank angle encoder | 360 ppr, 1 Deg resolution with TDC pulse |
| Air measurement | DP sensor with inline transmitter |
| Fuel measurement | Optical liquid level sensor constant volume, fully automatic |
| Dynamometer load | Strain gauge load cell with inline transmitter |
| Temperature | “k” type with inline signal transmitter |
| Water flow | Rota meter-Acrylic |
| Daq | 200 Ks/s |
| Software | Engine test express for engine combustion analysis and performance software |
| **GDI Open ECU with EGR** | |
| ECU processor | Infineon |
| Crankshaft position | Crank trigger wheel |
| Camshaft position | Cam trigger wheel |
| Crank position sensor | Variable reluctance sensor |
| Cam position sensor | Hall effect sensor |
| T-map | NTC |
| Mass air flow | Hot wire type |
| Software | Engine control system |
| High pump | Bosch CP-1 |


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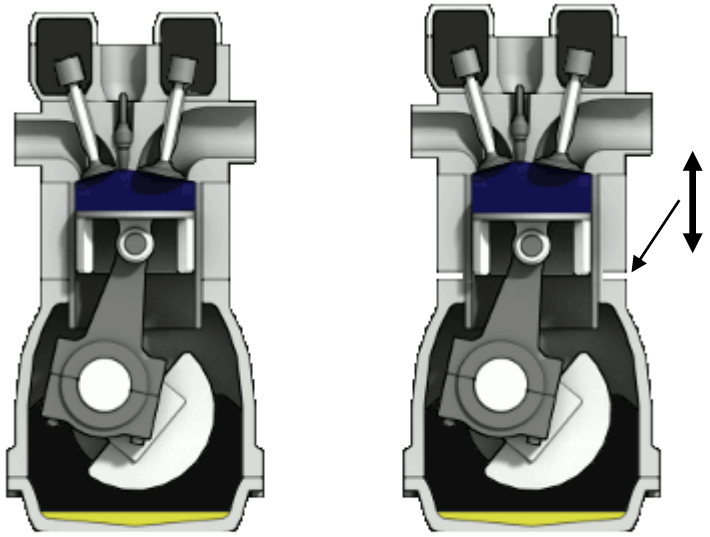
| | |
|---|---|
| Open ECU Capabilities | • Set idle Speed - (The user can set the required idle speed of the engine)<br>• Closed loop control for idling - (ECU controls the injection until engine idle)<br>• Start injection angle for homogeneous operation-(The user can set the start of injection angle as desired)<br>• End injection angle for stratified operation-(The user can set the end of injection angle)<br>• Start angle for spark ignition-(The user can set the spark timing)<br>• Injection Duration - (The user can set the Injection duration in terms of crank angle as desired)<br>• Open loop rail pressure - (This is an special feature in which an user can set the Injection Pressure in terms Bar, variable from 10 to 180 bar)<br>• EGR - (The user can set the EGR flow as desired)<br>• Calibration charts are provided for Injection Quantity at various pressure |

## Variable Compression Ratio Mechanism



Higher CR Lower CR

### Features

- Easy change of compression ratio
- Compression ratio variable from 5:1 to 20:1
- SI and CI mode operation without changing engine head
- Vertical 90 Deg lift ensures no mechanical stress in the connecting rod and piston
- Valve timing unchanged during change in compression ratio

The desired compression ratio can be achieved by vertically lifting the engine head and bore together, resulting in increased clearance volume. The variable compression ratio is achieved without change in combustion chamber geometry. Operate on both SI and CI mode without changing the engine head.



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