



***Computerized Variable Compression Ratio Diesel Engine Test Rig with CRDI Open ECU and EGR***  
***(Product Code: CVCR02-OECU)***



### Features

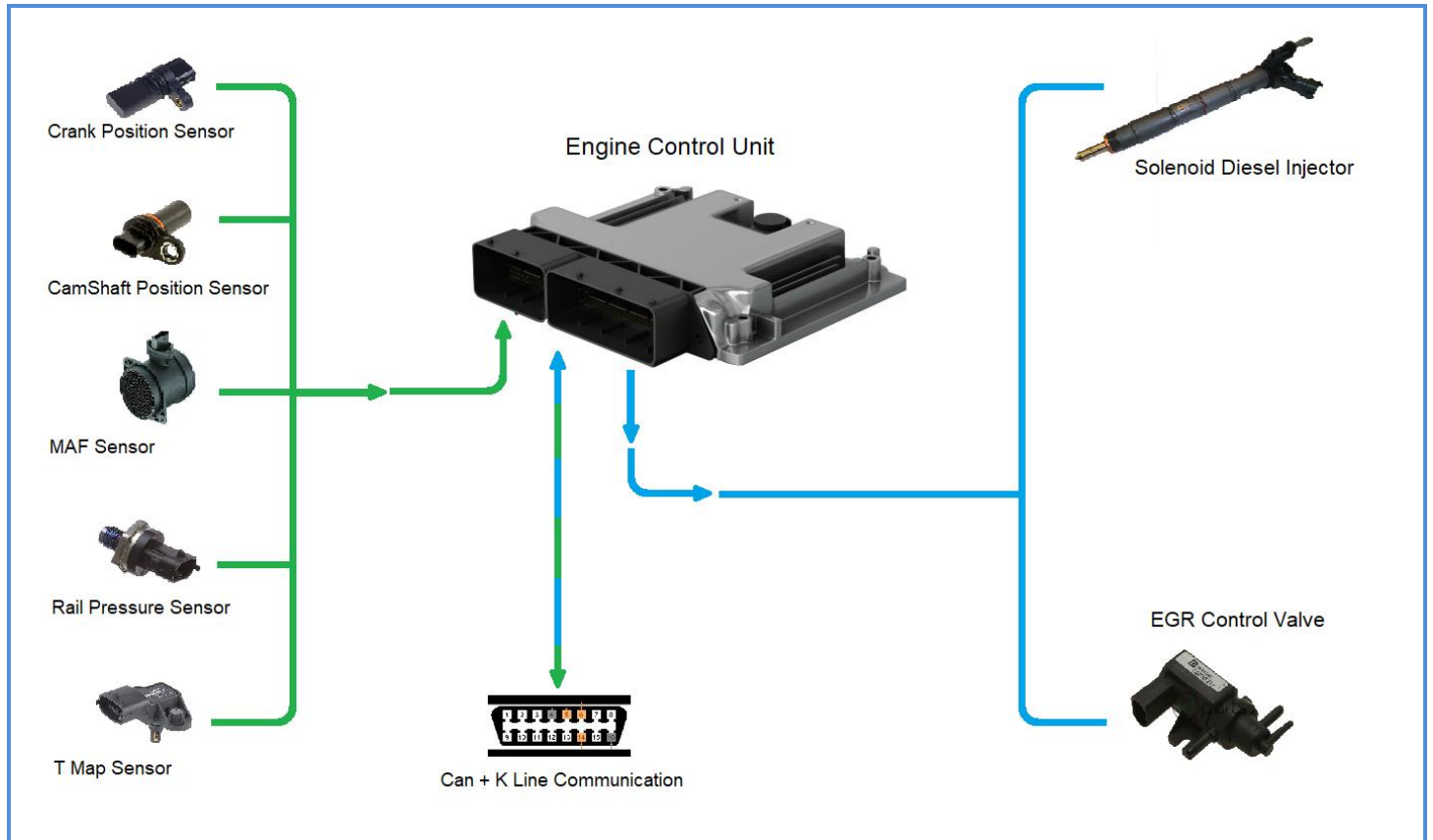
- CRDI Open ECU- Engine performance enhancement for diesel and alternative fuels
- Engine performance and combustion studies
- High Quality instrumentation
- Calculates BP, IP, FP, sfc, bsfc, BTE , Volumetric  $\eta$  & mechanical  $\eta$
- PV and P- $\theta$  diagrams
- Mass Fraction Burnt
- Estimated 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.



## CRDI Open ECU with EGR



### Components of CRDI Open ECU with EGR

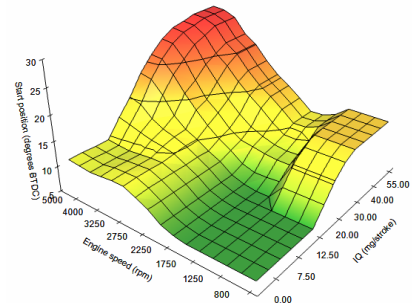
- Crankshaft position sensor (Measures crankshaft position)
- Camshaft position sensor - (Measures camshaft position)
- MAF Sensor - (Measures mass air flow)
- Rail pressure sensor - (Measures common rail pressure)
- T Map sensor - (Measures manifold temperature and pressure)
- Engine Control Unit -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



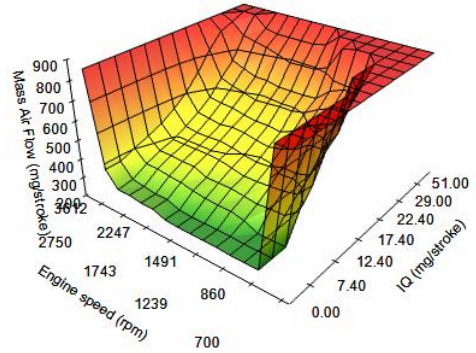
## CRDI Open ECU with EGR Functionality (Tunable Maps)

- 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 angle of Pilot injection - (The user can set the start of injection angle as desired)
- Start angle of main injection- (The user can set the start of injection angle as desired)
- 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 200 to 1100 bar)
- EGR - (The user can set the EGR flow as desired)
- Calibration charts are provided for Injection Quantity at various pressure

MGST 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°	23.2°	25.8°	27.1°	27.8°	28.10	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°	16.4°	19.3°	21.8°	23.0°	24.10	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°	15.5°	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°	10.4°	10.9°	12.0°	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°	10.1°	11.5°	13.0°	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	13.0°	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°



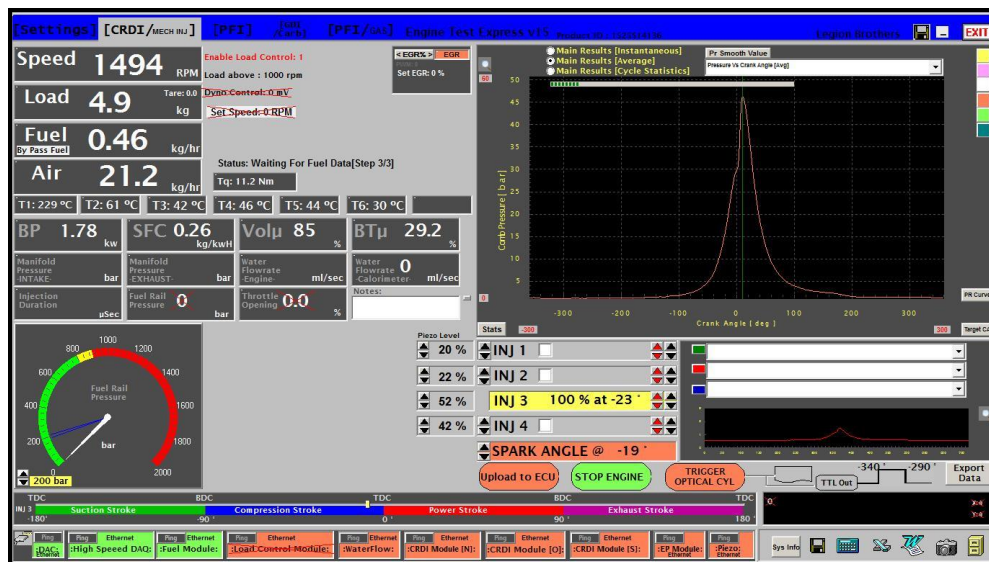
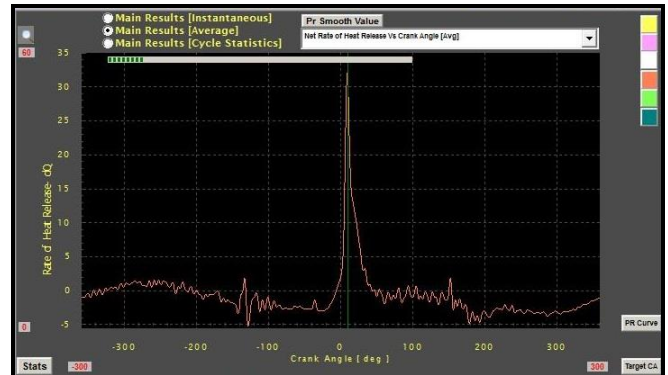
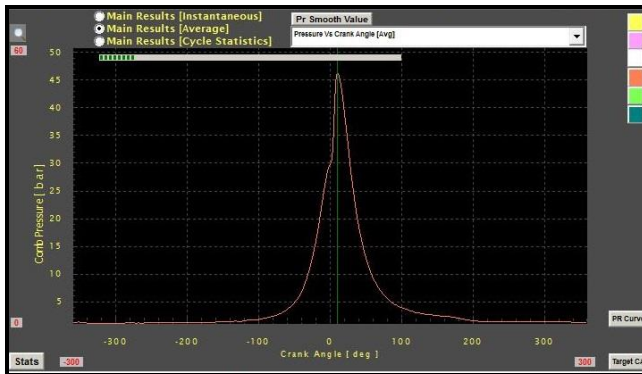
MGST RPM	0.00	3.00	7.40	10.00	12.40	15.00	17.40	20.00	22.40	25.00	29.00	33.00	51.00
3612	850.00	850.00	850.00	850.00	850.00	850.00	850.00	850.00	850.00	850.00	850.00	850.00	850.00
3423	365.00	365.00	395.00	420.00	450.00	495.00	550.00	630.00	720.00	795.00	820.00	850.00	850.00
2750	285.00	295.00	335.00	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	490.00	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	630.00	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





## 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.





## **Computerized Variable Compression Ratio Diesel Engine Test Rig with CRDI Open ECU and EGR (Product Code: CVCR02-OECU)**

### **Product / Component Specification**

Product	Computerized Variable Compression Ratio Diesel Engine Test Rig with CRDI open ECU and EGR	
Product code	CVCR02-OECU	
Engine	Make	: Legion Brothers
	Compression Ratio	: 5:1 to 20:1
	No of cylinder	: One
	Cooling	: water
	Speed	: 1400-1500 Rpm
	Power	: 3 to 5HP
	Starting	: Electric Start
Dynamometer	Type	: Eddy Current
	Cooling	: Air cooled
	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	
<b>CRDI Open ECU with EGR</b>		
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	

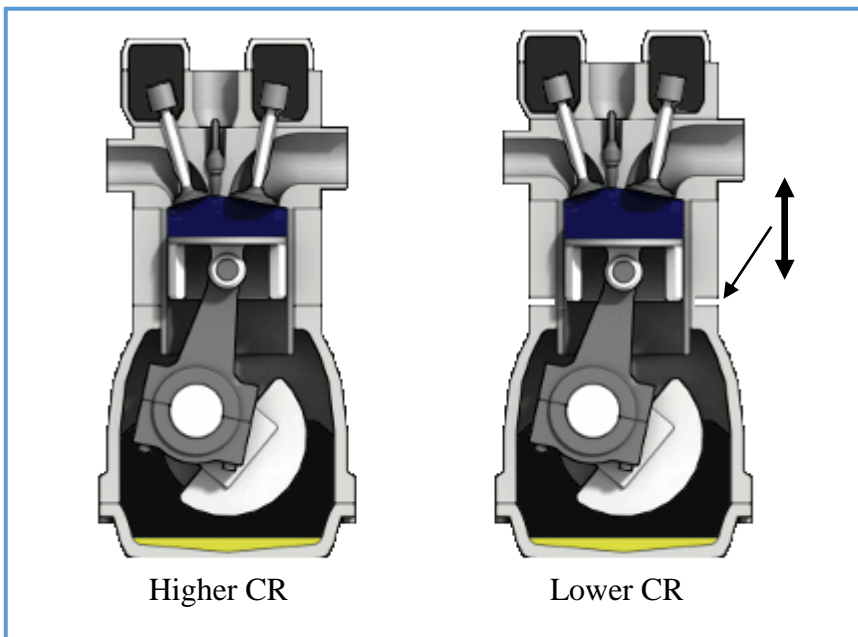




#### Open ECU Capabilities

- 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 angle of Pilot injection - (The user can set the start of injection angle as desired)
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- 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 200 to 1100 bar)
- EGR - (The user can set the EGR flow as desired)
- Calibration charts are provided for Injection Quantity at various pressure

#### Variable Compression Ratio Mechanism



#### 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.