

**THEPRA - Direct Fuel Injection FSI**

**Inputs**                      **Processing**                      **Outputs**  
Sensors                      Control unit                      Actuators

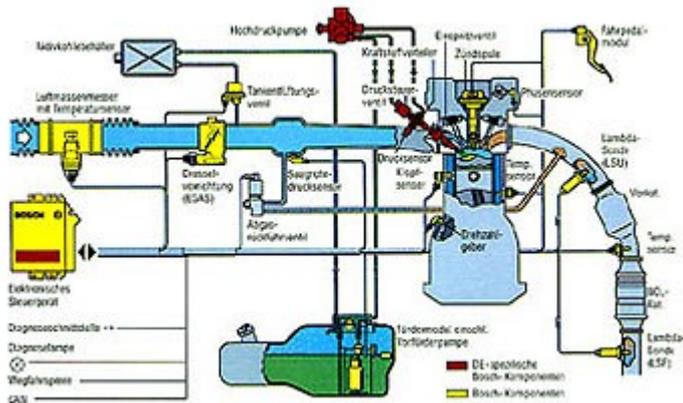


**Order No. 38 069 000**

Inputs		Processing	Outputs
<ul style="list-style-type: none"> <li>• Ignition switch with immobilizer</li> <li>• Fuel pressure sensor</li> <li>• Hot film air mass meter</li> <li>• Induction-pipe pressure transducer</li> <li>• Aspirated-air temperature sensor</li> <li>• Distributor coolant temperature input</li> <li>• Distributor coolant temperature output</li> <li>• Distributor accelerator pedal position</li> <li>• Angle transmitter throttle valve position</li> <li>• Lambda probe</li> <li>• Distributor NO<sub>x</sub></li> <li>• Control unit NO<sub>x</sub> sensor</li> </ul>	<ul style="list-style-type: none"> <li>• Sensor exhaust-gas temperature</li> <li>• Sensor engine speed</li> <li>• Hall generator camshaft position</li> <li>• Sensor induction-pipe flap position</li> <li>• Potentiometer exhaust-gas recirculation</li> <li>• Pressure sensor brake booster</li> <li>• Brake-light switch</li> <li>• Brake-pedal switch</li> <li>• Clutch switch</li> <li>• Switch clutch pedal</li> <li>• Air conditioner compressor</li> <li>• Air conditioning stand-by</li> <li>• Door contact</li> </ul>	<ul style="list-style-type: none"> <li>• FSI control unit</li> <li>• Input options</li> <li>• Microprocessor and memory</li> <li>• Output options</li> <li>• Diagnostic connection for original tester</li> </ul>	<ul style="list-style-type: none"> <li>• Fuel pump relay</li> <li>• Control valve fuel pressure</li> <li>• Valve fuel metering</li> <li>• Fuel injection valves</li> <li>• Valve camshaft adjustment</li> <li>• Thermostat mapping-controlled engine cooling</li> <li>• Ignition coils with output stages</li> <li>• Throttle angle drive</li> <li>• Heating lambda sensor</li> <li>• Heating NO<sub>x</sub> sensor</li> <li>• Control unit fan coolant</li> <li>• Valve exhaust-gas recirculation</li> <li>• Valve induction-pipe control</li> <li>• Solenoid valve activated carbon canister</li> </ul>

FSI is a high pressure injection system for directly injecting Otto engines which distinguishes clearly from the systems known so far considering functionality and construction. The central component of the system is a common high-pressure storage (Rail) and a high-pressure pump. The injection pressure, up to 120 bars, is created independent of the rotational speed and can be chosen within wide limits. Because of that, the fuel can at any time be injected via electromagnetic injection valves directly into the combustion chamber. The aspirated air mass is freely-adjustable by means of the electronically-controlled throttle valve and is established by the aid of an air mass meter. The broad-band Lambda probe in front of the catalytic converters in the exhaust-gas flow is used for the mixture control. Controlled by its measurement values, the engine control unit regulates the two main operation modes of the Otto engine with direct injection:

- "Stratified charge operation" with Lambda values greater 1 and
- "Homogeneous operation" in case of Lambda = 1

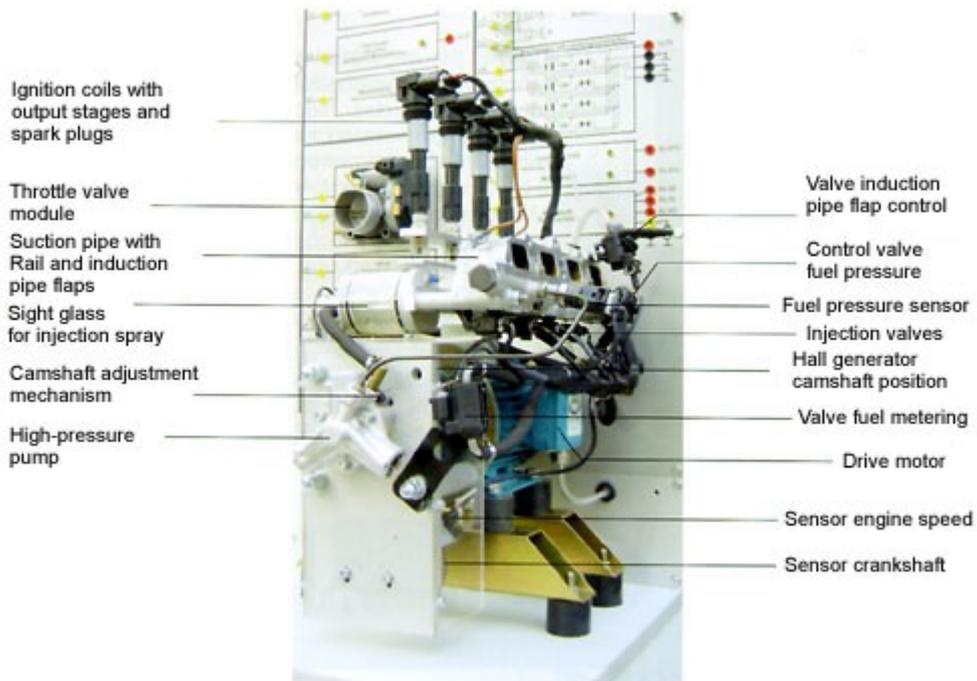


This mobile function demonstration stand is equipped with original components of an FSI direct petro injection. It can be used both for teachers' tests and students' tests during laboratory and practical lessons.

The original FSI components of a VW Otto engine are mounted easily to survey on an aluminium board with screen-printing.



## Unit of pumps, induction pipe, ignition and injection valve with original components



The FSI control unit is enabled by the ignition switch with immobilizer. The flywheel with reference mark sensor, the camshaft gear wheel, the high-pressure pump are driven mechanically via a continuously adjustable three-phase motor (speed range 0 to cut-off speed, as in the vehicle).

The engine speed is indicated by means of the vehicle's original speed indicator. The fuel pressure, the voltage level of the air flow sensor, and the injection quantity read out at digital displays. The adjustment of the accelerator pedal can be changed continuously. The position is indicated on a scale.

All control unit Pins are connected directly to 4 mm measurement sockets and lead through on the front board. They are usefully arranged according to the components and provided with ECU PIN designation.

**The system is equipped with a transfer module for student's workplace and error switchgear. As an option, PC measuring data recording and evaluation is possible.**

### Experimental and demonstration possibilities

- Checking the power supply sector.
- Checking the sensors.
- Checking the actuators.
- Establishing the influence of various sensors on the different actuators.
- Recording and evaluating the actuation of the actuators corresponding to the input values.
- Representing the stratified charge operation.
- Representing the homogenous operation.
- Representing pressure conditions as a function of sensor signals and engine speed.
- Recording and evaluating the delivery rate of injection time and quantity as a function of the preset sensor signals.
- Representing, recording, and evaluating near-reality condition faults.
- Self-diagnosis via fault reader (original tester)

Additional equipment			Order No.
PC-Interface			<b>38 069 020</b>
Software			<b>38 069 030</b>
Interface card PCI -universal-			<b>38 079 131</b>
Interface card USB -universal-			<b>38 079 132</b>
Measuring value decoupler -universal -			<b>38 099 050</b>
Error switchgear			<b>38 099 080</b>
Mask for error switch gear			<b>38 099 090</b>
Universal Circuit Diagram Base Plate - universal -	per workplace	1 pce.	<b>38 099 100</b>
Circuit Diagram Mask	per workplace	1 pce.	<b>38 099 150</b>
Intermediate cable 1m	per workplace	1 pce.	<b>38 099 500</b>
Bridging cable 3m			<b>38 099 550</b>
<b>Dimensions:</b> Length 1260mm, Height 1910mm, Width 710mm Weight: 182 kg Power supply: 230V / 10A single phase Changes reserved!			