

PIA Prime

Powertrain Injector Application: Test Stands for Injection Systems

Key challenges in the project:

- Replacement of series ECU with all functions needed for the high pressure fuel system for two high-pressure pumps and 8 injectors.
- Control of injection mass and rail fuel pressure.
- Freely configurable injection patterns (current profiles, boost- and hold voltages, multi injection) and fast adaptation of operating parameters.
- Precise control and acquisition of solenoid current and voltage curves.
- Easy to integrate into existing test stands and easy to use by test stand engineers.



How did we solve them?

- Electronic application system based on modular PIA Prime power stages for solenoids.
- Configurable power supplies for hold voltage and (back) boost voltages of injectors and pumps.
- Crank and camshaft angle detection for triggering.
- Control loops for injection mass and fuel rail pressure.
- Intuitive user interface configurable by stored set-ups of all operating parameters.

PIA Prime – the benefits:

- Internal trigger generation for stand-alone operation
- Compact ready-to-use solution
- Variable hold- and boost-voltage
- Current profiles freely parameterizable
- Integrated oscilloscope function
- Calibratable
- High-speed data acquisition for internal/ external signals
- Synchronization to incremental encoders

Purpose of the project

Berghof offers a suitable fuel control system for our customer's test stands for injection systems. At these test stands different experiments are carried out, like noise tests or function tests with fuel metering. Different types of high pressure systems are used with conventional and novel current patterns of pumps and injectors. Precise control as well as demands for various levels of hold and boost voltage are further requirements. All these aspects need a highly flexible and adaptable control system. Berghof and Inecosys can handle the customer's requirements optimally with their modular solution called PIA Prime.

Test keywords:

Powertrain injector, solenoid, high pressure, pump, fuel system, NVH, crank, camshaft



Technical requirements for the test system	
Category	Required
Dimensions	19"-4HE-standard slot
Power supply	230 VAC / 110 VAC
Standard system configuration	8 solenoid injectors and 2 high pressure pumps with solenoid metering valves
Type	Driver for solenoid direct injection valves and pumps with integrated data acquisition
Boost voltage	1 - 90 V freely adjustable for injectors and pumps individually
Hold voltage	1 - 24 V freely adjustable
Back-boost voltage	Clamped on boost voltage
Peak current	45 A
Continuous maximum current	4 A
Energization profile	Up to 10 phases can be freely configured: Timing, boost / hold voltage, current control (hysteresis, PWM) Switching conditions: reaching a threshold value / time value, etc.
Safety features	Detection of short circuits, open connections, current limit (software and hardware-based)
Fast data acquisition	Synchronous acquisition with 1 MS/s for internal (current, voltage) and external measurements, calibratable
Oscilloscope function	Visualization and management of fast data acquisition
Trigger	External triggering by crankshaft and camshaft signals (Hall-, VR-, test bench incremental encoder)
Remote control	Connection via Ethernet-LAN
Auxiliary data acquisition	Two rail pressure sensors can be connected and configured freely.
Software	Operating application for Windows PC

Other configurations of PIA Prime are possible (e.g. for up to 12 solenoid injectors).

Our partner:

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