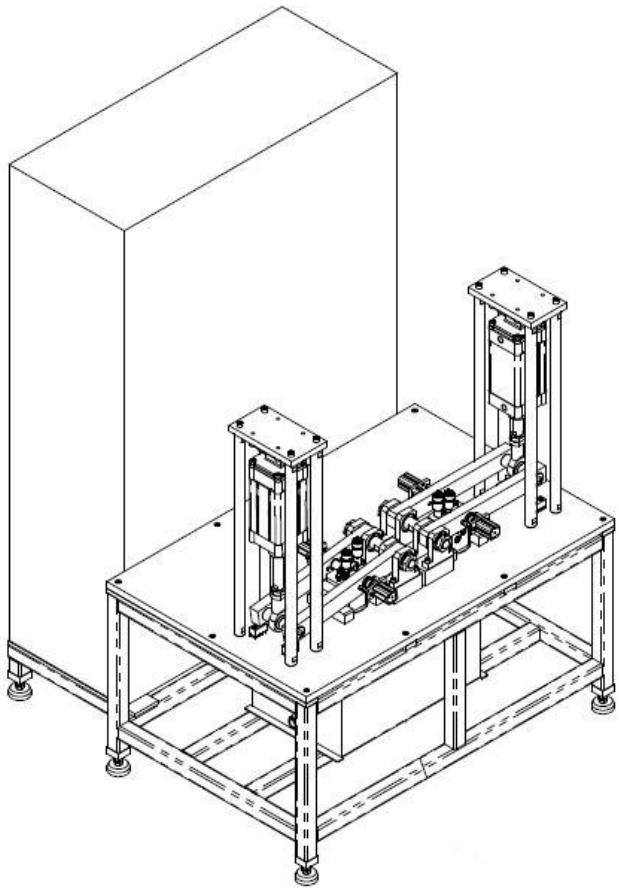
DESCRIPTION

The High-Pressure Direct Injection (HPDI) Dual Injector Test Stand is designed for end-of-line testing of fuel injectors. The test bench integrates the technology required to test the performance of an injector with two separate actuator heads in parallel, which inject a mixture of diesel fuel and natural gas into a common combustion chamber.

The purpose of the test machine is to fire the fuel injector through numerous pre-programmed injection sequences of varying pulse widths and duty cycles. Each injector actuator head is fired independently, in order to determine whether the resulting injection parameters satisfy the predetermined constraints. Standard industrial test fluid replacements are used for the diesel fuel and natural gas.

At the heart of the test bench is dual DC voltage power supply, linked to an arbitrary waveform generator, which is used to power the injector under test. An air piston pump with a high pressure intensification ratio is used to supply a pressure-controlling regulator, which in turn supplies the fuel pressure to the injector. The gas is supplied through pressurized storage tanks, also through a pressure-controlling regulator. A separate unit, in conjunction with a single-tube helical coil heat exchanger is used for thermal conditioning of each test fluid to a very tight tolerance. The injector under test sprays the fuel and gas mixture through a custom fixture into a measurement circuit. The measurement circuit allows for injector back-pressure control, while at the same time measuring and recording all relevant parameters, mainly the flow and discharge pressure, before venting the test fluid to the storage reservoir.

The test stand is managed by a PC-based control system, with an industrial touch screen monitor, keyboard and mouse interface. Along with the onboard data acquisition system and the custom ATA Engine Component Test Software, it allows for control, acquiring, monitoring and logging of all analog and digital input and outputs.



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Typical Test Stand Specifications	
TEST BENCH	
Footprint (L x W x H)	1.4m(55") x 1.3m(51") x 2.0m(78")
MAIN INJECTOR DRIVE	
Primary Power	20A @ 30VDC (600W)
Boost Power	600mA @ 100VDC (600W)
Frequency	0 - 100Hz (0 - 100% Duty Cycle)
DIESEL FUEL TEST MEDIUM	
Fluid	Viscor 1487
Volume	40L (11gal)
Temperature Control	20°C ±1°C (68°F ±2°F)
Filtration	10µm
NATURAL GAS TEST MEDIUM	
Fluid	Nitrogen Gas (Compressed)
Volume [AL Cylinder]	12,000L (3170gal) @ 6,000psi (415BAR)
Temperature Control	20°C ±1°C (68°F ±2°F)
Filtration	2µm
SUPPLY PARAMETERS	
Inlet Pressure [Gauge]	3.5 - 300BAR (50 - 4350psi)
Inlet Pressure Accuracy	±0.25% of Full-Scale Range
MEASUREMENT PARAMETERS	
Outlet Pressure [Gauge]	1 - 170BAR (15 - 2500psi)
Outlet Pressure Accuracy	±0.25% of Full-Scale Range
Viscor Flow Rate [Mass]	0 - 20kg/hr
Viscor Flow Rate Accuracy	±0.10% of Full-Scale Range
Nitrogen Flow Rate [Mass]	0 - 100kg/hr
Nitrogen Flow Rate Accuracy	±0.50% of Full-Scale Range
Temperature	0 - 200°C (32°F ±392°F) 3-Wire RTD
Temperature Accuracy	±0.20% of Full-Scale Range

OPTIONS SELECTED

- ✓ Custom fixture design for simple component under test interface
- ✓ Automatic part clamping using air cylinders
- ✓ Efficient pressure intensification system via unique piston air pump design
- ✓ Bladder-type hydraulic accumulators for pressure storage and pulsation dampening
- ✓ Differential pressure switches to indicate need for replacement of clogged filters
- ✓ Clear (transparent) tubing circuit for leak checking of zero frequency injector output

FEATURES

- ✓ Accurate injector supply temperature and pressure control
- ✓ Simple control of injector output frequency, pulse-width and number of shots to fire
- ✓ High-frequency and low-frequency feedback of injector output pressure
- ✓ Mass flow measurement of injector output
- ✓ Automatic machine safety shutdown on alarm

RESULTS OUTPUT

- ✓ Variable sampling frequency measurement of:
  - Supply Pressure & Temperature
  - Discharge Pressure & Temperature
  - Discharge Flow Rate
- ✓ Real-time graphing of selectable parameters
- ✓ Logging of all relevant header information (i.e. time & date, operator, serial & model numbers, test descriptions, etc.)

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