MICHIGAN CUSTOM MACHINES, INC.

Product Highlight:
MODULAR TEST SYSTEM

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The purpose of the MCM Modular Test System is to provide oil and fuel supply to a hydraulically actuated fuel injector or engine product at a controlled temperature for testing and development purposes. The system is modular in that a detachable test station can be swapped out with another in about 15 minutes. The main power unit has two temperature contorlled tanks for providing high pressure and lower pressure fluids to the test station. The test station has dedicated servo valves and amplifiers so that it may be tailored to a specific product. Fluid connections between the two units are contained in an internal pocked for safety purposes. Typical calibration fluid is Viscor 1487 (IOS 4113) or C3112 type II. Oils are usually standard motor oils.

Background

The power unit is a two-fluid system of 50 gallon capacity each and individually temperature controlled. One system can achieve pressures up to 5000 PSI and the other 500 PSI. Temperature range for a standard unit is 29-95º Celsius in either tank. Optional units can achieve much higher temperatures, but require fire suppression and special test stations. The power unit is controlled by an industrial PLC that also communicates with the test station. Through this PLC, tests can be performed at the test station. A touch screen interface on the power unit allows the operator to manually control valves, pressures, and temperatures as well as monitor and control a test cycle. The intelligence in the power unit can detect when a test station is connected and locked down before opening supply valves. In the event of a component failure, the unit automatically shuts itself down.

The test station is the area that contains the special fixturing to accommodate the test article. There are two large access doors on either side of the fixture area that automatically lock when testing is in progress. The fixture area is surrounded by a very large stainless-steel sink that has an interface plate mounted to one side. This interface plate allows a hydraulic rail or rails to be bolted to it and in turn the actual fixturing that touches the test part. The test station has two servo valves that deliver the high-pressure feed (1st fluid) to two different rail locations in the fixture area. Typically, the highest pressure is used for actuating the test part, while the second pressure is lower and used for accessory items. The low-pressure feed (2nd fluid) id controlled by a proportional valve and is usually fed to the test part as the fuel supply. There is a leak decay pilot operated check that is built in to the servo manifold that allows a leak decay test to be performed through the rail volume to the test part. Information such as rail pressures and temperatures are fed back to the power unit where they are displayed. In some cases, additional signal conditioning is included in the test station for displacement measurement.

System Features:

- Scavenge tank in test station pumps high pressure fluid (usually oil) and sink fluid back to the power unit.
- Test stations can be fixtured for many different products.
- Test station utilizes customers engine controller to actuate test part.
- External DAQ equipment and control equipment can be connected to the system to accommodate the customer's existing equipment.
- MCM has also provided "control carts" that utilize an industrial PC with a custom program tailored to the customer's needs. The PC remotely controls the power unit and test station.
- External discharge and return ports on the test station allow external discharge measurement equipment to be connected when the test part is a fuel injector.
- Spray cover automatically lowers over test part when the doors are closed to minimize misting from test part. The cover automatically raises during a leak test.
- Mist collector on test station recovers test fluid vapor and returns it to the tank.
- Three stage temperature control system in power unit utilizes different sized heat exchangers depending on temperature setpoint.

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- Rail volumes used in test stations are designed to be variable with use of a volume spacer kit.
- Test stations are moved with a simple hand truck or fork lift.
- The system is completely designed around your purpose.

Specifications

Controlled Feature	Control Type	Description
High Pressure supply (Peak Pressure)	Programmable through interface	The high-pressure supply is top end regulated in the power unit up to 35,000 KPa. The pressure is controlled in the test station to ±10 KPa in two places. One of the locations controlled can be "consumed" by the test part, but not both at the same time. The secondary control is usually used for clamp loads or intermittent actuation.
Low Pressure Supply	Programmable through interface	The low-pressure circuit is usually used to supply fuel or Viscor to the test station. This pressure is programmable in the range 300-2500 KPa ±20 KPa.
Supply Temperature	Programmable through operator interface.	Controlled from 27º C to 95º C ±1º C based on 10 GPM, 55ºF externally supplied cooling water. Depending on options higher temperature ranges can be achieved at different accuracies.

Measurements

Feature	Method	Min	Max	Resolution
Rail Pressure	The rail pressure is monitored by the power unit and used to control the inner pressure control loop. External access to this measurement is available via BNC connector on the test station panel.	0 KPa	51,675 KPa	3 KPa
Fuel Pressure	Fuel pressure is also monitored by the power unit and is used to feedback the pressure control loop to the proportional valve. This valve is purposely tuned to be slow, so that it will not react with pressure spikes from the test part. External access to this measurement is available via BNC connector on the test station panel.	0 KPa	6,890 KPa	0.42 KPa
Fixture Pressure	The fixture pressure is the pressure supply to the fixture accessory. It controlled by means of a 200 Hz servo valve and is not intended to consume simultaneously with the rail pressure consumption. External access to this measurement is available via BNC connector on the test station panel.	0 KPa	51,675 KPa	3 KPa
Displacement	Measurement capabilities for displacement have been standard on most test stations. This 50 KHz measurement is useful for measuring real time displacement on a test article.	0 mm	3 mm	0.000183 mm

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Options

Although we can make anything to suit your needs, the following have been popular variations of this machine.

- High Temperature
- Fixturing for fuel injectors
- Fixturing for hydraulic engine component actuators
- Multi-sized detachable rail volumes
- Internal articulated hoist with hyperextension capability for fixture and rail manipulation
- Pre-charge circuit for viscous fluids