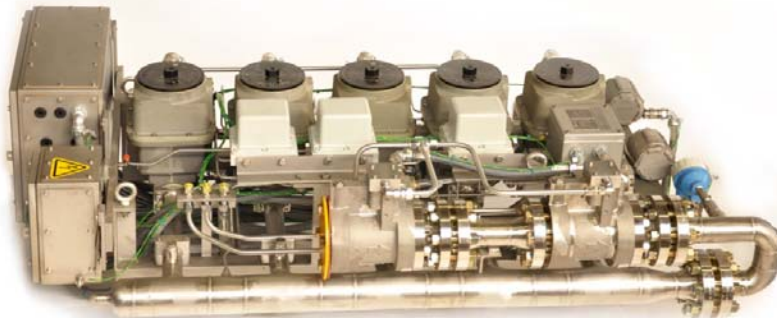


Fuel Metering Systems

DLE/DLN for Aeroderivative Turbine Platforms



5-valve GS6 parallel metering with integrated shutoff, temperature, pressure, and electrical junction boxes (~35 MW)

Applications

Woodward's complete line of Fuel Metering Systems or "fuel skids" incorporates the components needed for DLE engine operation for industrial aeroderivative gas turbine platforms. They represent the latest in a long line of fully validated, highly reliable systems made available to the market at cost-effective prices. These simple, drop-in solutions are typically applied to electrical power generation, gas compression, and mechanical drive system processes.

These metering system products perform with all-electric valves and instrumentation, eliminating the need for hydraulic or pneumatic input. Woodward has established a pedigree of highly accurate flow metering valves and instrumentation as well as highly effective system level solutions. Fuel skid users can benefit from Woodward's expertise and can expect high reliability, quality, service, and performance from these products.



Description



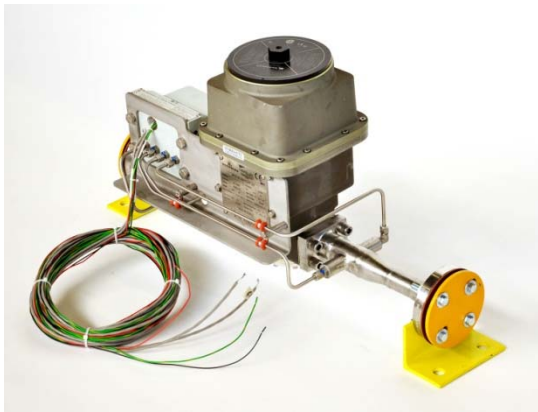
Woodward fuel metering skids consist of multipath metering legs, each individually controlled by a Woodward metering valve to the various combustor manifolds or cans. For each flow path, high-accuracy, high-bandwidth pressure-sensing transducers are incorporated in the fluid path to measure pressure. Temperature-sensing devices are also placed within the flow path to transmit the fuel temperature to the turbine control. The combination of these signals with the engine flow

demands to each leg allow the turbine control to compute the valve positions necessary to provide the correct flow to the engine. When integrated shutoff valves are incorporated, the skid can isolate the pressure supply from the engine in the event of a system shutdown. Vent connections are provided in various locations to allow a customer-connected exhaust gas stack.

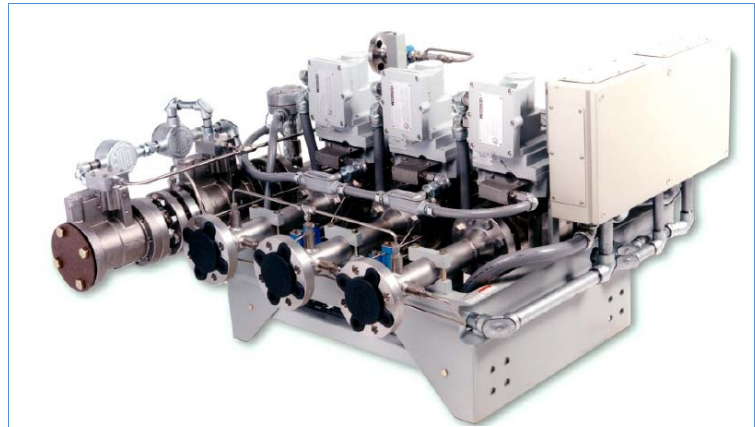
- Ideal for demanding DLE/DLN applications
- Integrated, optimized systems solution design
- Exceptional accuracy & precise fuel flow metering
- Common P1 Manifold Pressure Compensation
- Reduces commissioning cost and time
- Scalable, modular designs for various applications
- Maximum availability
- All-electric actuation with fast, repeatable dynamic performance
- Certified for use in many hazardous environments

Installation

Woodward fuel skids are custom designed to fit into customer-specified turbine package envelopes. Easy drop-in capability helps to reduce cost and installation time. The detailed documentation provided with each skid helps users achieve compliance and pass quality inspections.



Single GS6 Flow Leg with integrated pressure measurement



3 valve 3103/EM-35MR parallel metering with integrated shutoff, temperature, pressure, and electrical junction boxes (~45 MW)

Product Differentiators

Pedigree

Woodward has more than 20 years of design and system level control experience with aeroderivative fuel metering systems. Currently there are more than 250 units in the field. We supply durable, high quality, reliable metering technologies. Woodward fuel metering systems address end-user needs with speedy time to market and drop-in, turnkey products.

Our engineering capabilities range from customizable hardware designs to system-level optimization analysis. Woodward's state-of-the-art, dynamic and steady-state flow test facility enables us to meet your rigorous requirements.

Product Features

- High accuracy, high precision metering technologies
- Digital communications allowing interface to multiple customer engine control platforms with the highest level of accuracy
- High-speed, real-time synchronous control capabilities
- All-electric products
- Scalable, modular, customizable, compact
- Designed for ease of maintenance and access
- Alternative fuels—capable of metering blended and low-energy fuels

Compliance

Woodward is exceptionally competent in conforming to and understanding the industrial hazardous location compliance and installation practices for most regulating entities.



Common P1

Common P1 is a cost reduction feature that utilizes a compensation model to optimize the skid performance to a particular engine flow profile. The model algorithms simultaneously predict multi-path pressure losses in the piping to reduce the number of pressure-sensing elements required in the system from as many as 20 sensors to 12. The model maintains system-sensing redundancy and system pressure measurement accuracy. Ask Woodward how this solution can be applied to your system for pressure-sensing cost reductions.

System Integration Capabilities

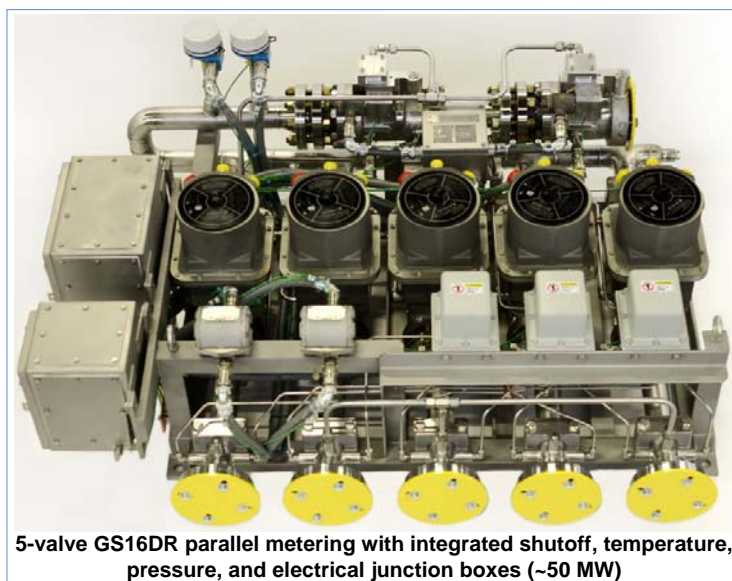
Systems Analysis

- Numerical Analysis:
- CFD—Computational Fluid Dynamics
- FEA—Finite Element Analysis of system parameters
- Design-to-cost product optimization
- Algorithm validation for third-party control implementation
- Utilize Woodward or non-Woodward control platforms
- Applied system knowledge of DLE engine operation
- System FMEA and risk analysis

Integrated Solutions

Woodward offers world class integration of OEM-qualified Woodward and non-Woodward commercial catalog components.

- High speed shut-off valves
- Integrated sensing elements
- Custom and standard cable, connector, and interconnect solutions
- Built-in redundancy
- Localized customer junction and terminal enclosures

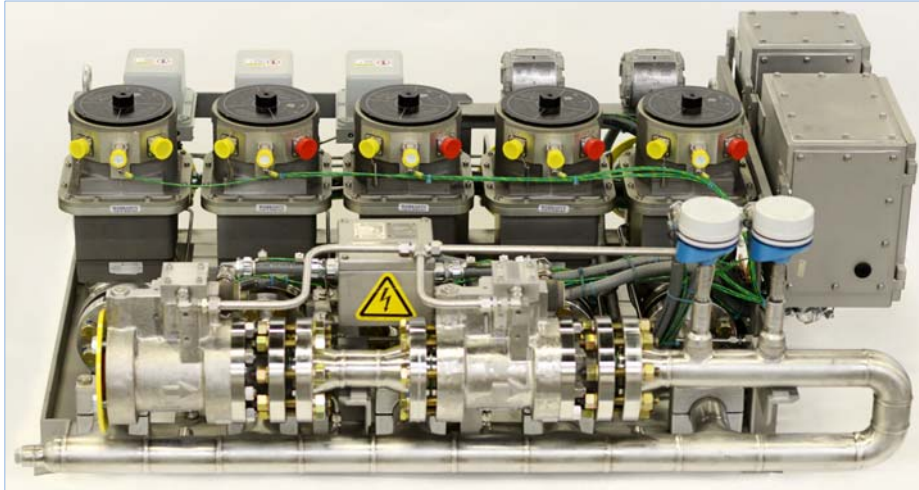


Specifications

Valve Parameters—Many specifications vary based on application and valve requirements. Contact Woodward for more information.

Typical Gas Flow Range:	(4.5 to 18 144) kg/h / (10 to 40 000) lb/h—Minimum and maximum flow capacities are dependent upon gas conditions, engine demand, port size, and valve type
Gas Supply Pressure:	(345 to 5170) kPa / (50 to 900) psig—Pressure range is dependent upon gas conditions, application, port size, and component ratings
Gas Filtration Recommendations:	25 μ m absolute
Valve Metering Port Size:	Dependent upon gas conditions, applications, and valve type
Supported Valve Driver Types:	Digital Valve Positioner (DVP) [off-Board], Valve Position Controller (VPC) [on-board], EM Digital Driver [off-board]
Supported Valve Types:	GS16DR, GS6, 3103/EM-35MR
Valve Position Demand Signal:	Varied based on valve and driver type—Typical signals are analog (4 to 20) mA, CANopen, RS-485, or DeviceNet *
Valve Position Feedback Signal:	Varied based on valve and driver—Typical signals are analog (4 to 20) mA, CANopen, RS-485, or DeviceNet *
Ambient Temperature:	Varies per design and customer requirements—Typical range (–20 to +80) °C / (–4 to +176) °F

* Trademark of Open DeviceNet Vendor Association, Inc. (ODVA)



PO Box 1519, Fort Collins CO, USA 80522-1519
1000 East Drake Road, Fort Collins CO 80525
Tel.: +1 (970) 482-5811 • Fax: +1 (970) 498-3058
www.woodward.com

Distributors & Service

Woodward has an international network of distributors and service facilities. For your nearest representative, call the Fort Collins plant or see the Worldwide Directory on our website.

This document is distributed for informational purposes only. It is not to be construed as creating or becoming part of any Woodward contractual or warranty obligation unless expressly stated in a written sales contract.

Copyright © Woodward 2013, All Rights Reserved

For more information contact: