1907 Large Liquid Fuel Valve
with EM-35 Actuator

Applications

The 1907 large liquid fuel valve accurately meters liquid fuel to a gas turbine during acceleration, steady-state operation, and deceleration. The valve may be used for almost any liquid-fueled industrial gas turbine application within its range of fuel flow 68 to 11,340 kg/h (150 to 25,000 lb/h). When used in conjunction with an EM-35 actuator and EM-35 digital driver, the 1907 valve delivers the demanding accuracy needed for DLE applications.

The EM-35 actuator is all electric, so hydraulic contamination and maintenance problems are eliminated. Cost is reduced since there is no HPU to maintain or replace. In addition, the EM-35 actuator is designed for long life, although it may be replaced in the field if necessary. The EM-35 actuator is designed for use with both analog and digital EM-35 motor drivers. The motor is a brushless dc motor with a motor clutch and gearhead assembly. The motor uses Samarium Cobalt permanent magnets bonded and sleeved to the rotor element. Rotor position sensing is performed through the use of a brushless field director, and motor velocity feed is performed by means of a brushless tachometer.

Features

The EM-35 motor assembly is housed in a cast aluminum explosion-proof housing. A thermal potting compound is used to transfer heat generated by the motor to the cast housing and out to the ambient environment.

EM-35 Analog Driver

The analog driver contains an analog position controller that receives a demand signal via a 4–20 mA input. The feedback signal is generated by a brushless resolver that is mounted on the fuel metering valve. The driver contains fault detection circuitry which provides the status of the 4–20 mA interface, position controller, driver, and feedback to the shutdown logic. A fault condition or an external shutdown command will disable the output (removing power from the motor), which in turn causes the valve return spring to close the valve. An analog velocity controller is used to reduce the effect of friction in the valve.
# 1907 Large Liquid Fuel Valve Specifications

## SUPPLY CHARACTERISTICS

| Fuel Type | The valve is compatible with most types of diesels, kerosenes, gasolines, heavy and light distillates including naphtha, gas turbine fuels and fuel oils, and other liquid fuels such as biodiesel that are compatible with fluorocarbon (FKM) type elastomers and conform to international standards for utility, marine, and aviation gas turbine service. Ultra low sulfur diesels are also acceptable with proper lubricity additives. Other fuels such as ethanol or methanol may be acceptable with internal seal compound substitutions. Contact Woodward for these and other special fuel applications. |
| Fuel Viscosity | Fuel viscosity must be between 0.5 and 12.0 centistokes. |
| Fuel Cleanliness | Liquid fuel must be filtered to limit particulate size to 20 µm or smaller. Water content must be limited to 0.1% by volume. Solids, sediment, and particulates must be limited to 1.0 mg per liter of fuel. |

### Fuel Schedule (Nominal)

| Minimum Flow | 68 kg/h (150 lb/h) |
| Maximum Flow | 11 340 kg/h (25,000 lb/h) |
| Maximum Bypass Flow | 13 608 kg/h (30,000 lb/h) |

## FUEL PRESSURE

| Inlet maximum operating pressure | 9377 kPa (1360 psig) with aluminum body |
| Outlet maximum operating pressure | 9032 kPa (1310 psig) with aluminum body |
| Differential Pressure | 345 to 827 kPa (50 to 120 psig) |

## PORTING

- **Overboard Drain**: MS33649-4
- **Inlet and Bypass**: MS33786
- **Outlet**: MS16142 (-20) (except minor diameter to accept “J” threads)
- **Flow Range**: 30 to 1
- **Valve Travel**: 60°

## General Specifications

- **Operating Temperature**: -18 to +121 °C (0 to 250 °F)
- **Mounting Configuration**: any configuration
- **Construction Material**: stainless steel or aluminum (1907 valve)

## WEIGHT

<table>
<thead>
<tr>
<th>Material</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>3.1 kg (6.8 lb)</td>
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<tr>
<td>Stainless Steel</td>
<td>8.5 kg (18.8 lb)</td>
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</tbody>
</table>

## EM-35 Actuator Specifications

### MECHANICAL

- **Output Shaft Rotation**: 60° (rotation limited by valve stops)
- **Continuous Output Torque**: 25 N·m (+220 lb-in) maximum
- **Peak Output Torque**: 45 N·m (+400 lb-in) minimum

### ELECTRICAL

- **Power Input**: 24 Vdc nominal
  - 18–32 Vdc operating
- **Current**: 25 A, maximum for 100 ms
  - 15 A, maximum continuous
  - 3 A, expected steady state

### PERFORMANCE

- **Slew Rate**: >400°/sec (24 Vdc @ motor)
- **Bandwidth**: >4.5 Hz
- **Position Accuracy**: 0.50° analog
  - 0.10° digital
Outline Drawing of EM-35 Actuator and 1907 Large Liquid Valve
(Do not use for construction)
EM-35 Digital Driver

This driver, designed for use with a Woodward NetCon® control system, consists of a position controller module and a remote driver. The position controller module and the digital driver exchange information over serial communication lines. The digital form of the data preserves the 16-bit feedback resolution necessary to meet the system accuracy requirements. The position controller module is configured during the system initialization with data selected off-line by the Menu Oriented Editor (MOE™) or the Graphical Application Program (GAP™) software. Controller, driver, and feedback status is provided by the IACT_EM software block.

Outline Drawing of EM-35 Digital Driver
(Analog driver dimensions are identical.)
(Do not use for construction)