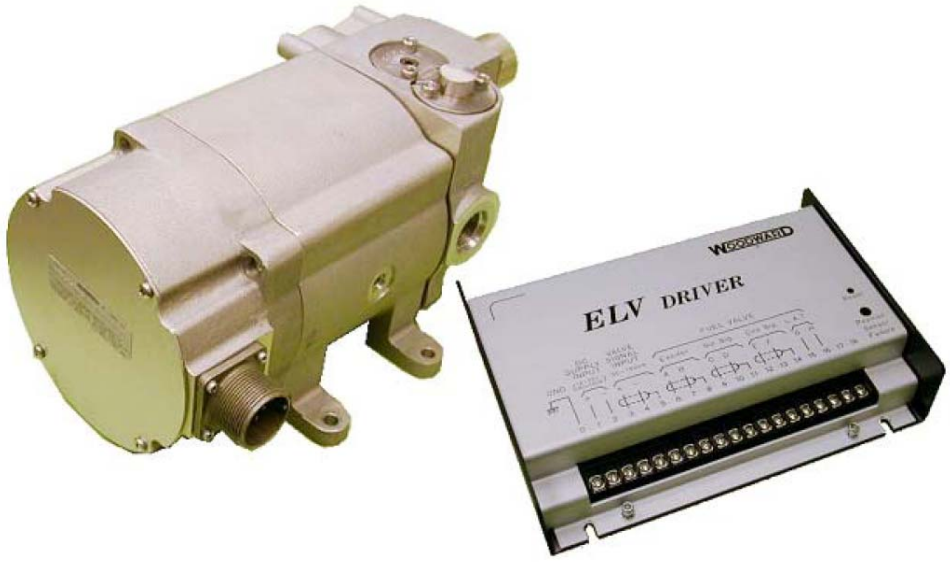
ELV

Electric Liquid Fuel Valve



- Accurate fuel metering
- Built-in all-electric actuator
- Hydraulic oil and hydraulic drive not needed
- Proportional fuel metering
- Adjustable fuel schedule
- Adjustable maximum fuel and minimum fuel
- Specific gravity adjustment mechanism
- Safety mechanism
- Return spring
- Failsafe on signal failure
- Relief valve

Features

Woodward's ELV electric liquid fuel valve is a small, liquid fuel-metering valve with an all-electric actuator to control the fuel flow to be supplied to a small industrial gas turbine.

The ELV controls the actuator proportionally to a 4–20 mA or 20–160 mA signal from a Woodward electronic control.

The ELV does not need the conventional linkage system between an actuator and a fuel-metering valve due to incorporation of an actuator and a valve. Applying an electric actuator eliminates an oil-pump-driving-gear system and hydraulic circuits, and this helps the designer cut the cost of a control system. If an electric control that accepts a 4–20 mA CDP signal is used, the ELV's flow schedule will be changeable based on this signal.

Users can standardize the fuel valve by using the ELV because the ELV can control various gas turbines with different flow schedules by controlling each turbine's acceleration fuel schedule with an electric control.

Description

The Woodward ELV consists of a fuel-metering valve with a built-in electric actuator and a driver box (which is separate from the valve) to drive the actuator.

This fuel-metering valve supplies fuel proportional to the control signal sent to the driver box. The fuel metering function is adjusted by the offset potentiometer and the range potentiometer on the driver box.

The fail-safe mechanism shuts down the fuel-metering valve to its minimum fuel position in case of power failure, feedback signal failure, or actuator signal failure. The fuel is bypassed to the relief valve when fuel inlet pressure (P1) exceeds the normal level.

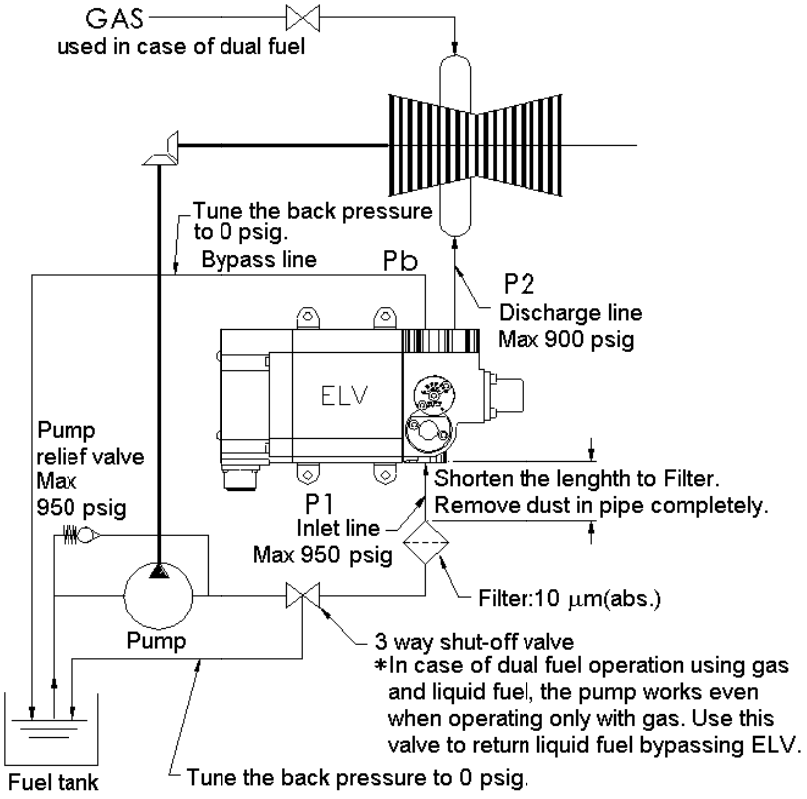
Specifications

Fuel Valve

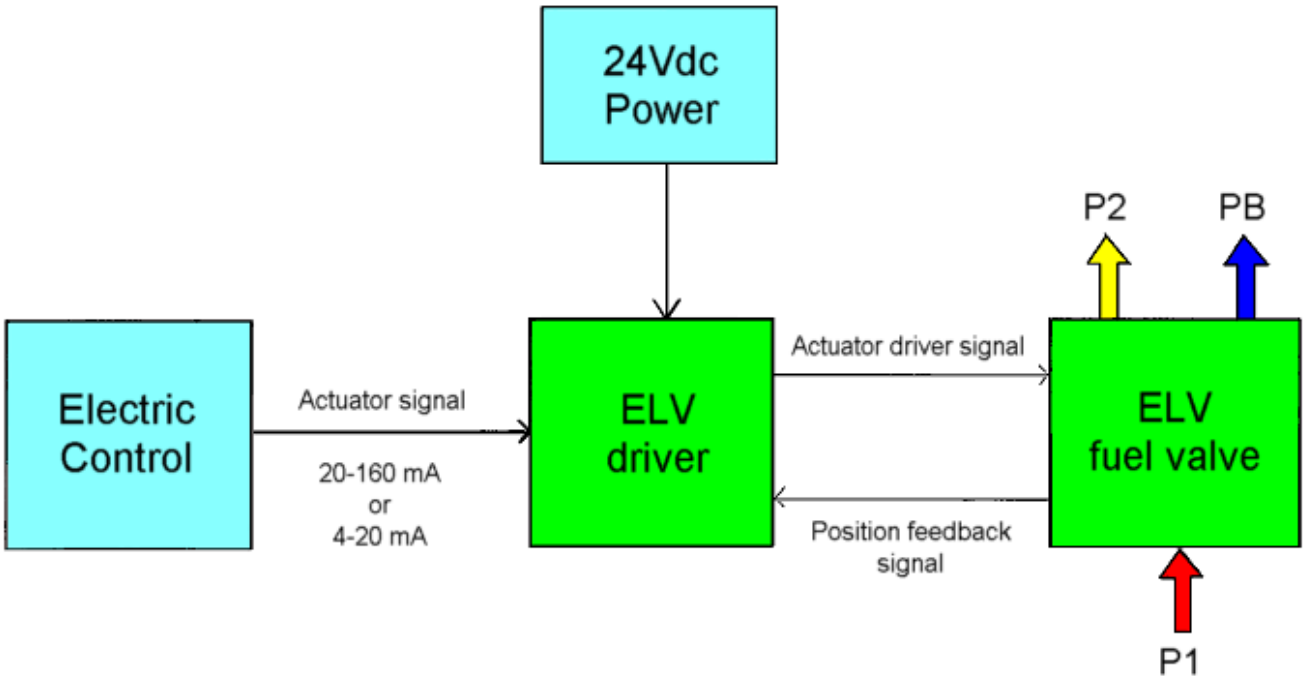
Fuel Type	Gas turbine fuel for aircraft, JP-4, JP-5, or diesel
Specific Gravity	0.70–0.85
Viscosity	1–10 cSt
Fuel Flow	(see figure on last page)
	20–450 pph (9–204 kg/h) 20–750 pph (9–340 kg/h)
	30–1250 pph (14–567 kg/h) 40–1800 pph (18–816 kg/h)
	80–3200 pph (36–1452 kg/h)
Fuel Pressure	
Inlet Fuel	6.55 MPa/950 psig (max)
Discharge Fuel	6.21 MPa/900 psig (max)
Static Test	9.65 MPa/1400 psig
Bypass Back Pressure	0.10 MPa/14.2 psig (max) ∗See the pipe connection example.
Relief Valve Pressure	7.34 ±0.28 MPa/1065 ±40 psig (use only for valve protection) ∗See the pipe connection example.
Flow Accuracy	±5% of flow point plus additional ±0.7% of max rated flow over the operating temperature range (see figure on last page)
Flow Hysteresis	Better than 1.0% of flow point or 3 pph, whichever is greater
Operating Temperature	−20 to +80 °C (fuel viscosity must be from 1 cSt to 10 cSt)
Humidity	85% (max); must be non-condensation prone environment
Fuel Filter	10 µm (absolute) near the valve's inlet. ∗See the pipe connection example.
Connectors	All connectors to connect to ELV are optional parts.
Attachment Surface	P2 hole and PB hole must face upward. P1 hole must face downward.
Weight	About 7 kg (15 lb)

Driver

Input Power Voltage	24Vdc nominal (18–32 Vdc)
Input Signal Current	4–20 mA or 20–160 mA
Power Consumption	100 W (max)
Operating Temperature	−20 to +60 °C
Storage Temperature	−20 to +80 °C
Humidity	85% (max); non-condensation prone
Installation Orientation	Any orientation
Weight	About 1.1 kg (2.4 lb)
Vibration	RV5 (2 hrs/axis, 1.04 Grms, 10–500 Hz)
Shock	MS2 (30G, 11 ms half-sine pulse)

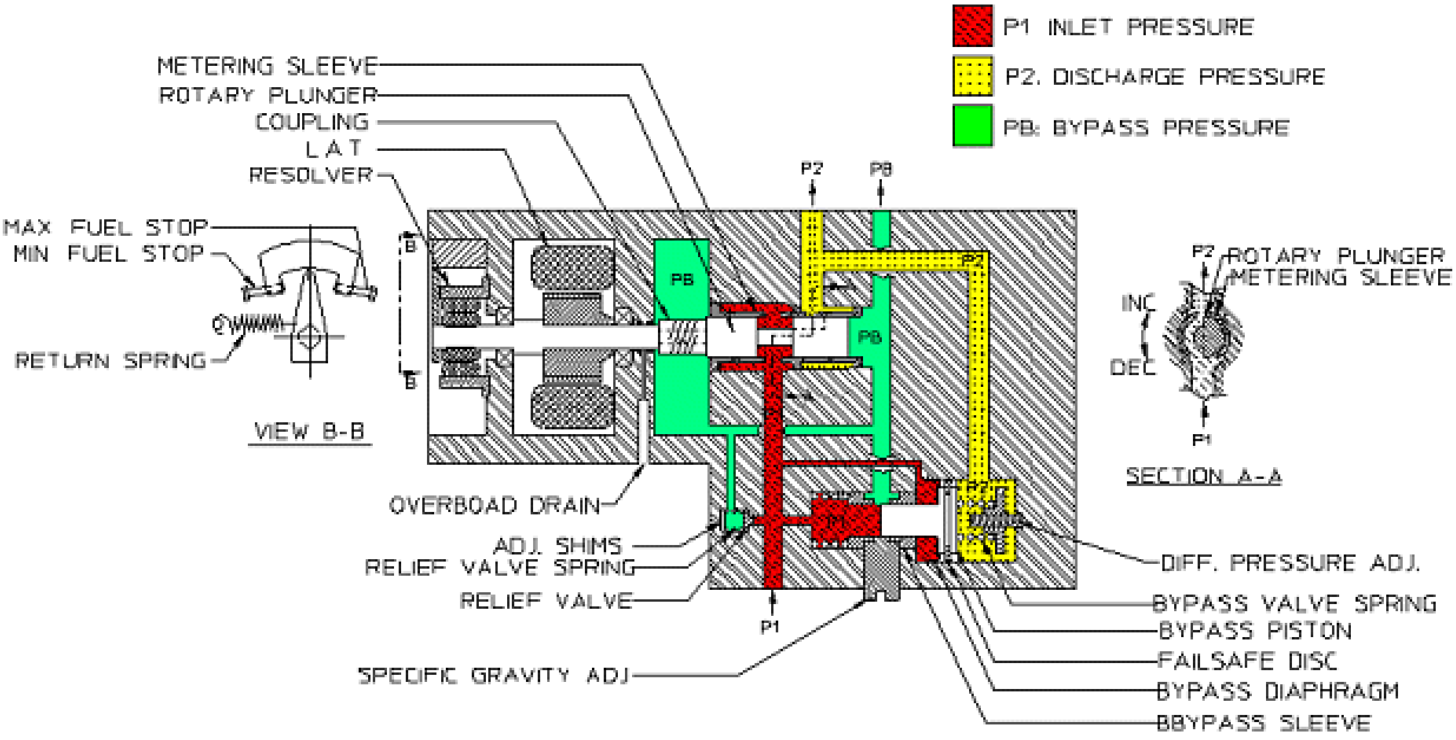


Example of Pipe Connection

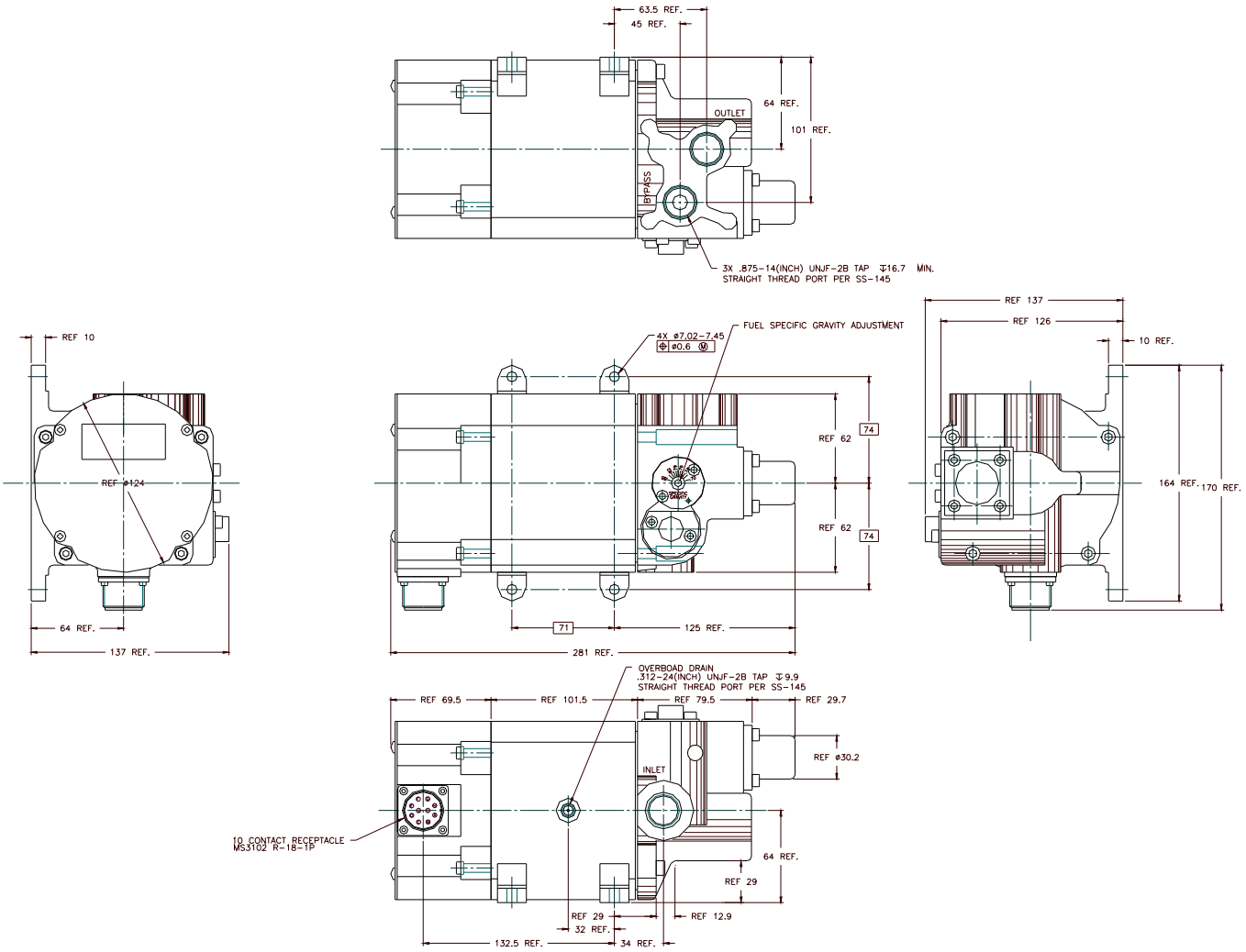


ELV Flow diagram

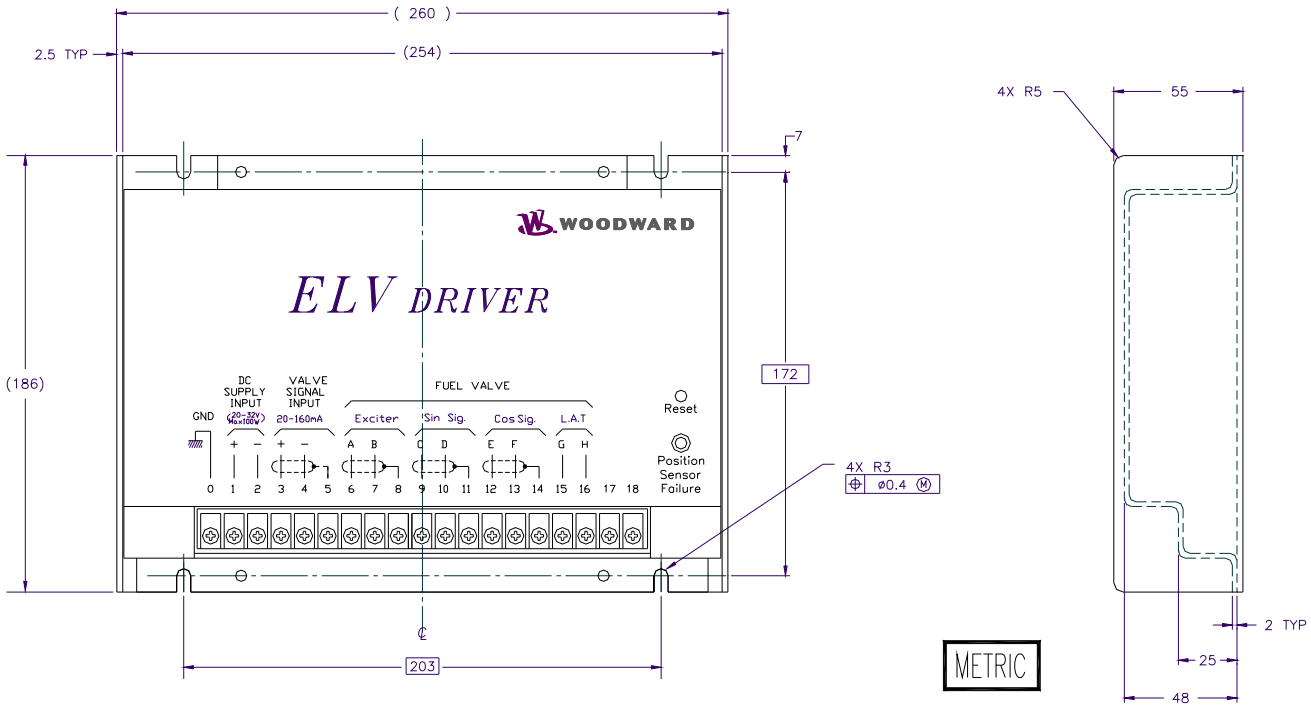
P1: Fuel inlet pressure
P2: Fuel discharge pressure
PB: Bypass pressure



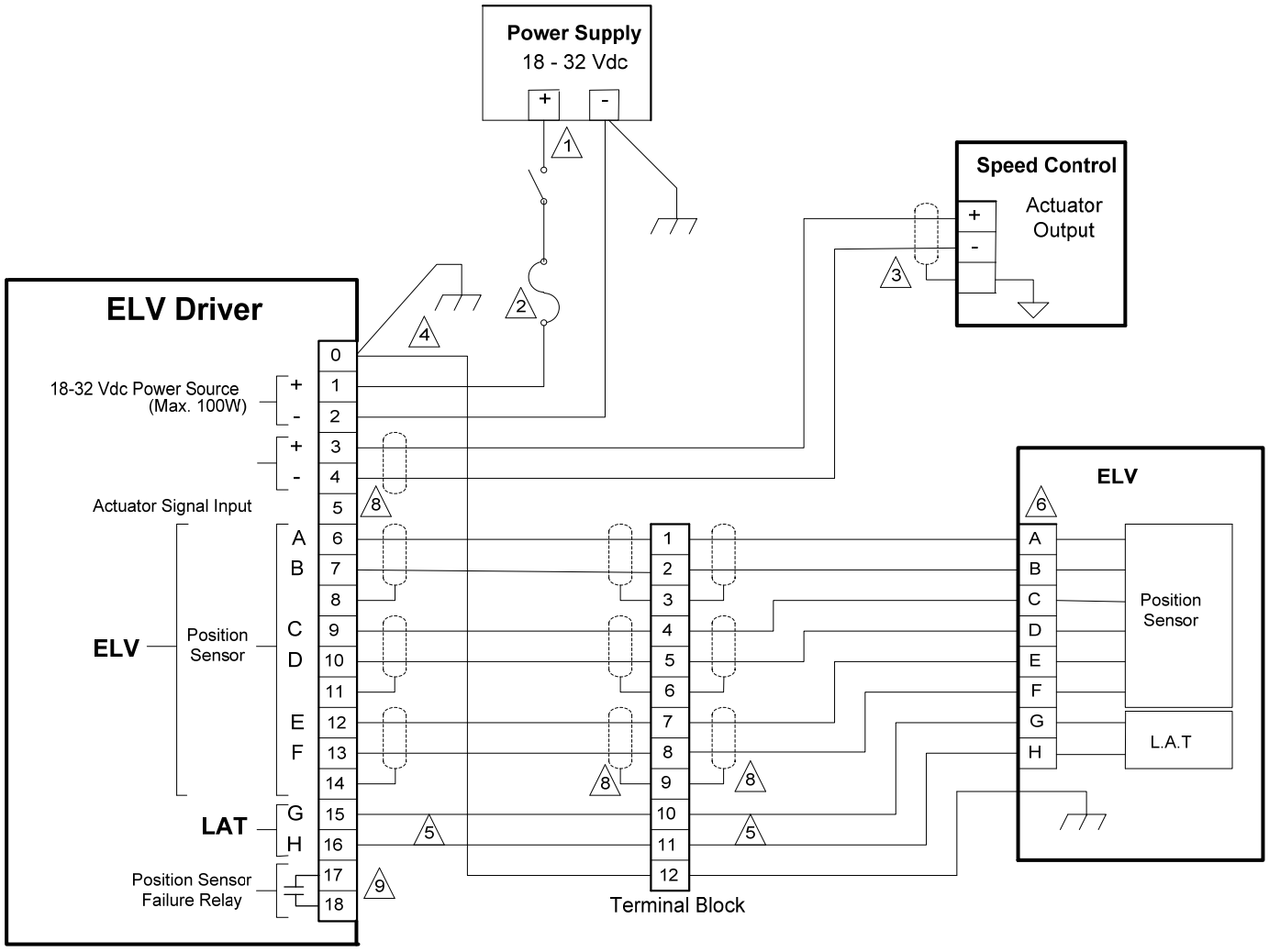
Schematic Diagram – ELV Liquid Fuel Valve



Valve Outline Drawing

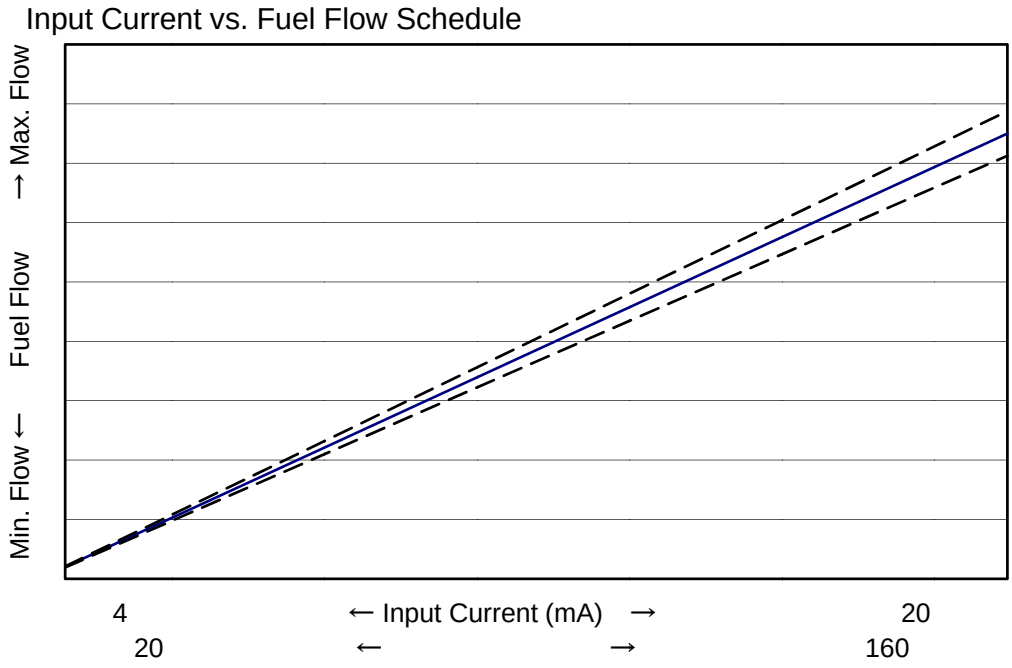


Driver Outline Drawing



ELV Wiring Diagram

1. Run the power leads directly from a conditioned, regulated power source to the ELV driver. DO NOT power other devices with leads common to the driver. Use 12 AWG (3 mm²) wire or larger for wiring, and the wiring length MUST be less than or equal to 20 m (65 ft).
2. Use only a 15 A time delay fuse (slow blow type).
3. Use only shielded twisted conductor pairs for wiring all signal lines, and connect all shields to the ground at the end of the ELV driver except the cable from the governor/controller. Use 18 AWG (0.8 mm³) wire or larger for signal line wiring.
4. Connect earth ground to terminal 0 with 12 AWG wire (1 meter max.). Additionally, connect ground wire to valve unless ELV driver and valve are at the same potential.
5. Use 12 AWG (3 mm²) wire for wiring, and the max wiring length must be 50 m (164 ft).
   In case the wiring length is near the maximum and the power supply voltage is approximately 18 V, the response of the ELV will deteriorate. The power supply voltage needs to exceed 24 V to improve the response in this case.
6. Use the 10-conductor receptacle with 1.125-18 NEF THREAD. Fitting connector is MS 3106A-18-1S or Woodward P/N 203694.
7. If there is no terminal to connect the shield to the ground at the governor/controller end, terminal 5 of the ELV driver can be used to connect the shield to the ground.
8. The shield must be considered as a separate circuit when wiring the system. The shield must be carried through connectors without interruption.
9. Contact open when position sensor fails.



Type of ELV

Fuel Flow Range	Input Current Range (mA)
9–204 kg/h (20–450 pph)	4–20
	20–160
9–340 kg/h (20–750 pph)	4–20
	20–160
14–567 kg/h (30–1250 pph)	4–20
	20–160
18–816 kg/h (40–1800 pph)	4–20
	20–160
36–1451 kg/h (80–3200 pph)	4–20
	20–160

Input Current vs Fuel Flow for the ELV

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