WOODWARD

Product Specification **03428**
(Revision B, 11/2024)

Side Feed Gaseous (SFG) Injector

Part Number 1309-6234

Applications

The Side Feed Gaseous (SFG) Injector is designed for compressed natural gas (CNG) and vapor phase Liquefied Natural Gas (LNG) for on-highway, commercial engines.

CNG or LNG is preconditioned on the vehicle to the appropriate fuel temperature and pressure before delivery to the injector. A peak-and-hold driver circuit commands the required pulse width to the injector to provide the desired fuel mass to the engine.

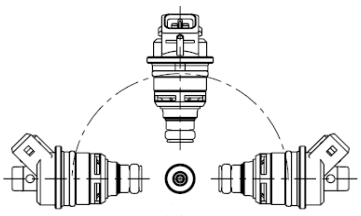
Description

Flow Direction
Fuel admission is through a 25 µm filter screen and side ports around the injector body circumference. Metered fuel is discharged through the outlet nozzle at the bottom of the injector.

Permitted Media
Vapor phase natural gas consisting of primarily methane (typically 85% minimum) with balance of longer hydrocarbons such as ethane or propane, and inert gases such as nitrogen or carbon dioxide.

Media Constraints
Fuel sulfur levels must be in accordance with ISO 15403-2:2006. Upstream particulate filtration is required with 95% efficiency at rating of 1 µm or smaller.

Installation Guidelines



Orientation
- Inlet above outlet (see diagram).

Installation Procedure
- O-rings must be lightly lubricated with oil before installation (clean 0W-16 full synthetic motor oil).
- Using a light twisting motion, gently push injector into installation pod.

Retention
Injector must be retained in installation pod by means of a hold-down clamp or clip applied over main body flange. 260° of flange circumference should be supported in order to meet final assembly burst and leakage specification, and the retaining clamp must be supported by no less than two fasteners adjacent to each injector, spaced evenly (180°) apart.

Mating Electrical Connector
Use Packard Housing P/N 12129140 connector, with 2x Packard Terminal P/N 12077939, or equivalent.

- Designed for heavy duty on-highway applications
- Cartridge-style body for simple fuel block or rail integration
- Fluorosilicone and low-temperature fluorocarbon O-rings for operation in cold environments
- Proven through 400 million cycle endurance testing on LNG
- ECE R110 Certification
  (E4 110R-010650)

Specifications

Electrical and Driver

Coil Resistance	(4.2 ± 0.50) Ω @ 20 °C
Inductance (reference)	11.4 mH @ 20 °C
Insulation Resistance	10 MΩ minimum @ 500 V (dc)
Operating Voltage Nominal	27.6 V (18 to 36) V
Driver	3 A peak with 0.75 A hold

Do not operate without flow

Performance Specification

Static Flow Rate	19.69 kg/h ±5%
Dynamic Flow Rate	15.87 mg/pulse ±7% @ 3.0 ms pulse width
External Leakage	0.25 sccm at 9 bar differential
Internal Leakage	0.25 sccm at 9 bar differential

Flow Test Conditions

Engineering Test Stand Voltage	FI-ETS1 (27.60 ± 0.05) V (dc)
Pulse Period (frequency)	10.0 ms (100 Hz)
Drive Circuit Type	Peak and Hold
Drive Card Number	U9122-765
Peak/Hold Current Levels	3 A / 0.75 A
Peak Dwell Time	2 ms
Test Fluid Type	Nitrogen
Test Fluid Spec	Grade 4.0
Pressure	(10.00 ± 0.01) bar absolute
Temperature	(25 ± 1) °C

Minimum Pulse Width

Linearity ± 5 %	2.5 ms
Duration of Injection	1.2 ms

Resistance Flow Values

Reference Fluid	Compressed natural gas
Static Flow Rate	14.74 kg/h
Dynamic Flow Rate	11.40 mg/pulse

Operating Pressure

Maximum Operating Pressure	10.0 bar absolute
Minimum Operating Inlet Pressure	5.0 bar absolute

Operating Temperature

Operating Temperature Range (media and ambient)	–40 °C to +125 °C

Storage Temperature

Long Term	–40 °C to +60 °C

Cold Opening

-40 °C, 9 bar differential, open within 30 pulse 16ms 3A

Burst Pressure
No release of components below 114 bar gauge

Overpressure without Damage
Short term operation with pressure spikes no larger than 21.7 bar gauge

Weight

Dry	75 g (approx.)

Operating Environment

- Automotive under hood
- Tolerant of external exposure to water, condensing and non-condensing petrochemicals (oil, fuel, exhaust emissions, gasoline, diesel, natural gas)

Environmental Verification Procedures

Salt Fog	144 hour salt fog test, 5% aqueous NaCl, (33 to 36) °C Upon completion, unit must pass leakage specification.
Vibration	Random vibration to demonstrate 20 000 h field life at up to 6 Grms.
Shock	MIL-STD 810F, Method 516.2, Procedure 1, Basic Design Test at 40 g, 11 ms sawtooth pulse, in each of 3 planes, 3 shocks per axis.
Endurance	Bench durability to 400 million cycles at 100 Hz, low pressure LNG. Tolerance limits: static flow shift (±7%), dynamic flow shift (±15%) and room temperature internal leakage (≤ 0.25 sccm).

Permitted Flushing (Cleaning) Solutions
It is permitted to clean the injector wetted parts and external surfaces with n-Heptane, Stoddard solvent, or Jet A-1. Methanol-containing solutions are not allowed for cleaning. For LNG applications, injector must be flushed internally with fresh clean 0W-16 full synthetic motor oil after cleaning; see manual 51490 for cleaning and oiling procedure.

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