



Submittal Package
Revision 2020Q4



About this Document

This document is intended for submittal purposes only. Please refer to the latest version of the installation manual for detailed installation and commissioning procedures.

System Specifications

The following specifications should be reviewed before installation. If the operating environment is outside of these specifications please contact Eden Innovations for assistance.

System Specification:

- Inlet Pressure gas: 1...5psi
- Outlet pressure zero pressure regulator: -1...-5 inH₂O
- Supply Power: 24 to 32VDC
- Maximum current draw: 20A
- Nominal current draw: 6 A
- Environment: -15C...60C (5F...140F)
-15C - -40C (cold weather package required)

PLC Controller:

- Voltage Supply 9...32V
- Current Requirements: approx. 100mA without external load, stand-by < 1.5mA, max. total current 11A
- Operating Temperature: -40C...+80C (-40F...+176F)
- Environmental Rating: IP67, IP69k
- CE conformity
- Application Software: CoDeSys conforming to IEC 61131-3

Human Machine Interface (Display):

- Voltage Supply: 8..36V
- Operating Temperature: -30C...+80C (-40F...+176F)
- Environmental Rating: IP67, IP65
- Vibration: 5g@57-2000Hz, 150 h per axis
- Shock 30g, 11ms, 10 times per axis
- E1 and CE conformity

XCAN Power Transducer:

- Operating Temperature:-45C..+125C
- Current Consumption at 12.6V: 45mA
- Humidity: 95% Non-condensing
- AC Voltage Measure: 3-Phase, True RMS 0-600V, Wye or Delta Configurable
- AC Voltage Input Impedence: >1mOhm
- Voltage Accuracy: 0.2% of Full Scale +/- 1 Count
- AC Current Measure: 3-Phase, True RMS 0-5Amps Current Transformer Loop
- CT Burden Resistance: 50mOhm
- Current Ranging: 0-2.5A, 2.5-5A Auto ranging
- Current Accuracy: 1% of Full Scale +/- 1 Count
- Full Scale CT Ratios: 50,75,100,200,250,300,400,500,600,800,1000,1200A (jumper selectable)
- Frequency Measure: 0-70Hz, Zero-cross detection
- Frequency Accuracy: 0.1Hz +/- 1 Count

Vibration Transducer:

Operating Temperature: -25C...+80C (-13F..176F)
Conformity: UL -E251902 IFM Electronic GMBH, Friedrichstrasse 1, 45128 Essen,
Germany
2004/108/EC
2006/95/EC
EN 61000-6-6:2005 + Corr.2005
EN 50178:1997
DIN EN ISO 13849-1:2008

Electronic Throttle Valve:

Operating Temperature: -40C...105C (-40F...221F)
Power Supply: 9...32V
Conformity: ISO 14001
Class 1, Division 2, Groups A,B,C,D per CSA #1380416
EN 45014
EN61000-6-4:2001: EMC Part6-4
ENC61000-6-2:2001: EMC Part6-2
98/37/EEC
89/336/EEC

Zero Pressure Regulator: Operating Temperature: -15C...+60C (5F..140F)

Conformity: UNI EN 88-1, UNI EN88-2,2009/142/EC,94/9/EC

Solenoid: Operating Temperature: -15C...+60C (5F..140F)

Conformity: EN 161 2009/141/EC, 94/9/EC, 2004/108/EC, 2006/95/CE, 94/9/EC, UNI
EN 1127-1,
UNI EN13463-1, CE 0051

Filter: Operating Temperature: -20C...+70C (-4F..158F)

Conformity: CE 0051, CE 0497, EN 126, 2009/142/EC,97/23/EC

Thermocouple:

CAN J1939 Output
Sensor Accuracy: -40C...900C +/-8C (-40F...1652F +/- 46F)
Power Supply: 5VDC +/-0.25VDC
Maximum Current: 18 mA

System Functional Description

Application

The OptiBlend System has been designed for constant engine speed applications with isochronous governor control, or diesel engines with a narrow RPM operating range (+/- 500 RPM). The dual fuel kit can be used for continuous duty prime power, stand-by, or pumping applications.

Hydrocarbon gases such as propane and butane should not be used with the dual fuel kit. Pipeline gas with a high concentration of methane and low overall concentration of heavier hydrocarbon gases are recommended. Lower quality gases may produce reductions in engine efficiency and performance.

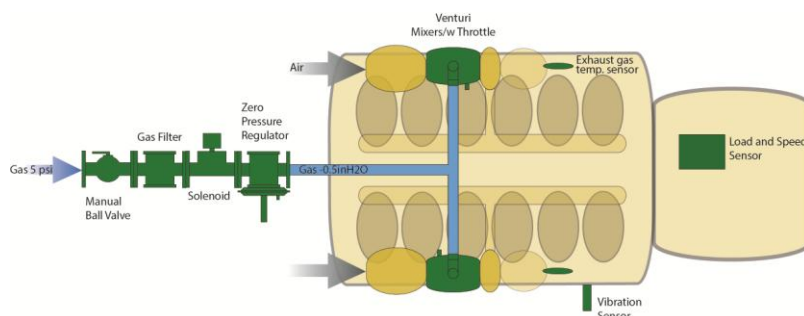
Theory of Operation

Diesel Fuel engines retrofitted with the dual fuel kit use natural gas as the primary fuel. The advantages are both economic and environmental. Typically 50-70% of the diesel fuel used can be safely displaced with natural gas. This greatly reduces the NO_x formation due to lower combustion temperature than diesel fuel. In addition, due to the lower carbon content of natural gas less CO₂ is generated. A partial oxidation catalyst can also be added to the kit, which will nearly eliminate HC and CO emissions.

Dual Fuel operates on the principal of putting additional energy into the combustion chamber in the form of natural gas, allowing the diesel engine controller to use less diesel to produce the same power. The engine retains its diesel response characteristics since the diesel engine controller is the primary driver of engine performance with gas augmenting the amount of diesel used.

The OptiBlend System is designed to allow for fuel switching during full or part load conditions, without interruption of engine speed or power. The natural gas is fumigated to the combustion chambers using the stock air intake system. When the diesel fuel is injected into the chamber it acts as a pilot, igniting the air-gas mixture. The fuel control valve adjusts the natural gas to air ratio based on the kW load.

The gas fuel controller is a Programmable Logic Controller. The PLC has two alarm levels. The first level will reduce the gas fumigated to the engine. The second level will disable gas flow by closing the gas solenoid. All alarm levels are programmed according to the engine specifications, and OptiBlend System calibration.



Components

Gas Train

The gas train consists of a manual gas ball valve, gas filter, gas lock off solenoid, and zero pressure regulator as pictured below.

CAUTION: If the gas supply is greater than 5 psi an additional regulator is required to avoid damage to the zero pressure regulator.



The gas filter protects the gas train and engine from particulate contaminants that may be present in the gas stream. The Gas Train is regulated to accept 1-5 psi gas pressure supply. The gas lock off solenoid is a 24V single stage solenoid, controlled by the PLC. The zero pressure regulator detects changes in engine vacuum through the mixer to maintain slightly below atmospheric pressure.

Fuel Control Valve

The fuel control valve has internal software with fault detection, and position control. The fuel control valve position is controlled by the PLC. The fuel control valve position is mapped versus load, and programmed during commissioning.



Air Gas Mixer

The air gas mixer has been designed by Hythane to provide the optimum air to gas ratio among many engine sizes. The mixer diameter and insert is determined by the engine air flow. The number of mixers is determined by the number of turbos.



Power Transducer

The XCAN power meter is J1939 communicating power meter with no display. Generator parameters are received by the controller, and displayed on the HMI. The XCAN is available only when Eden Innovations current transformers are installed.



Engine Vibration Transducer

At lower loads high levels of natural gas fumigation can cause misfire, generator instability, and engine vibration. The engine vibration transducer (E.V.T) provides a simple method to prevent these conditions. The E.V.T provides a 4-20mA signal indicating the engine vibration in inches per second.



Programmable Logic Controller

The OptiBlend system is controlled by a CAN BUS controller. The controller has been specially designed for harsh environments and off-highway work.



Thermocouple

The thermocouple provides the PLC with the engine exhaust gas temperature. The thermocouple is a type K thermocouple mated with a CAN transceiver.



Differential Pressure Sensor

The differential pressure sensor monitors the outlet pressure of the gas train. The pressure should be between $-1.0''\text{H}_2\text{O}$ and $+2.0''\text{H}_2\text{O}$. Pressure outside of the range indicates a component failure, no gas, or clogged filter.

Control Panel and HMI

The control panel comes with two LED's, and two switches. The Emergency Shutdown Switch controls power flow to all OptiBlend instrumentation. The Dual Fuel Enable switch allows dual fuel operation. The LED's indicate whether the system is operating and the alarm state. The cabinet is rated NEMA 4X. The HMI is a ruggedly designed fully enclosed operator terminal.



INPUT GAS REQUIREMENTS:

- 850 – 1100 BTU/SCF
- 1 – 5 PSI (UP TO 80 PSI WITH OPTIONAL PRIMARY)
- 6 SCFH/KW TOTAL INSTALLED GENERATOR POWER
- <20 GRAINS SULFUR PER 100 CFT
- <7 LBS WATER VAPOR PER MCF
- <5% PROPANE OR HIGHER BTU GAS