

Model CDMS 501 Fiber Optic Combustion Dynamics Monitoring System



DavidsonSensors™ provide the safest, most reliable and cost-effective instrumentation for use in harsh industrial applications.

This product data sheet describes Model CDMS 501 fiber optic combustion dynamics monitoring system. This system is designed for use in the Siemens 501 series of gas turbines and does not require any modifications to the engines.

Performance Specifications

Frequency Response

2 Hz to 10 kHz +/- 0.4 dB

Pressure Sensitivity

100 mV per psi (nominal)

Pressure Range

+/-10 psi

Static Pressure Limit

1000 psi

Acceleration Sensitivity

< 0.001 psi per g

Thermal Stability

Calibrated for 800° F;
1% per 100° F variance

Thermal Sensitivity

Insensitive to Transient Thermal Events

Transducer Temperature Limit

1200° F

Background

Dynamic instabilities that occur during the combustion process can severely damage an engine. Combustion dynamics monitoring systems can be used to tune the engine and maintain dynamic stability, minimize emissions, and detect problems. Early detection of combustion instabilities can enable the operators to avoid catastrophic damage to the engines. The result is high operating efficiency, low emissions, and new insight into the health of the engines.

Davidson offers fully integrated combustion dynamics monitoring systems. These integrated systems include all of the transducers, cabling, and signal conditioning equipment required of a combustion dynamics monitoring system.

Davidson fiber optic transducers can tolerate temperatures up to 1200° F. The transducers have flexible probes that allow them to be installed directly on the combustor “top hat” at an existing port were they penetrate through the existing acoustic waveguide along side the basket all the way to the inner surface of the basket. This direct-coupled method provides the greatest fidelity in the signal and eliminates the need for electronic transducers, charge amplifiers, “infinite” length tubes, and associated purging systems.

The result of this direct measurement is a more reliable and higher quality signal with lower installation and maintenance costs. Davidson combustion dynamics monitoring systems are the best value for combustion dynamics monitoring.

System Configuration

The CDMS 501 system consists of the following major subsystems:

- Pressure Transducers (one per combustor)
- Fiber Optic Cables and Junction Box
- Signal Conditioner
- Dynamic Monitoring System Display

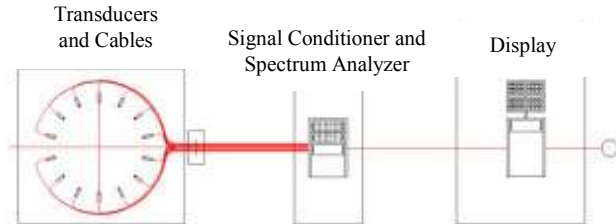


Figure 1 – CDMS 501 System Schematic

Subsystem Details

Transducers - Davidson fiber optic pressure pulsation transducers are designed for installation through the top hat where the existing acoustic waveguides are located. The transducer design allows the sensor to be positioned flush with the end of the existing acoustic waveguide located along side the combustion basket.



Figure 2 – GT1200-501 Transducer

The sensor is located at the tip of the transducer and has a superalloy diaphragm that functions as an optical interferometer. The diaphragm is protected by a thermal radiation shield and the sensing element is completely enclosed behind the diaphragm in the transducer housing.

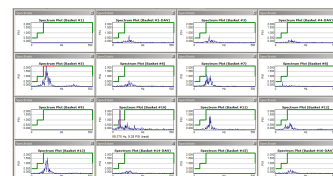
Cables – The cables connect the transducers to the junction box and then to the signal conditioner. The first five feet of the cable rated for 550° F. The rest of the cabling is rated for 180° F. The first ten feet of the cable is sheathed in stainless steel armor for mechanical protection. The cables are terminated with ruggedized ST connectors.

Fiber Optic Signal Conditioner – The fiber optic signal conditioner transmits light to each of the transducers via a separate fiber optic cable. The light is modulated by the sensor at the tip of the transducer and reflected back to the signal conditioner where it is converted from an optical signal into an electronic signal. The electronic signal is processed by a high speed micro-processor that converts the signal into pressure readings at up to 30 kHz and provides an analog output signal, i.e. +/- 5 Volts, proportional to the pressure. The result is unprecedented measurement reliability, accuracy, and frequency response in harsh industrial environments.

Dynamic Monitoring System and Software - The monitoring system consists of an industrial rackmount computer and a 19" LCD display for each turbine. The computer receives the signals from the transducers and displays the signals according to a variety of options to be defined during the training session prior to installation. Setup normally entails a computer configuration with a TCP/IP address that can be connected to the plant network and provides Virtual Network Computing (VNC) access for external users.

The monitoring software consists of the following:

- **Basic Combustion Measurements** - This package provides the basic combustion analysis software and allows the user to configure the display to provide a visual representation of the engine, to set thresholds for alerts and warnings, and to enter calibration constants for the transducers.
- **Criteria Trending** - This package provides the trend analysis software and allows the user to detect long term changes in the frequency spectrum of each combustor.
- **MODBUS Interface** - This package provides an interface and necessary software.



Installation, Commissioning, and Training

Davidson provides turnkey installation, commissioning, and training for the system operators. Consider the following when developing a plan for installation of a CDMS:

- A pre-site conference call should be conducted to walk through the installation identifying the need for penetrations, permits, power, special needs, etc.
- The turbine must be shutdown and cool at the time the transducers are installed.
- Electrical power needs to be available at the location of the monitoring system and the fiber optic signal conditioners.
- For planning purposes, assume that installation and commissioning can be accomplished by two technicians in three days.

Testing and Calibration

Standard test and calibration includes the following:

Each transducer is calibrated at the factory at ambient temperature at 0.5 psi dynamic pressure.

Documentation

Calibration data sheets will be provided for each transducer upon request.

An operator's manual is provided with each system.

Safety (Transducer with Cable)

Intrinsically-safe and suitable for use in:

- Class I, Division 1, Groups B, C, and D
- Class II, Division 1, Groups E, F, and G
- Class III, Division 1

Other Applications

For information about other Davidson products, see www.davidson-instruments.com

Guide to Configuring a Fiber Optic Sensing System

For information to assist you in planning a fiber optic sensing system, see

www.davidson-instruments.com

Ordering Data – Complete System

Model Number	CDMS 501
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Optional Spares

16-Channel Fiber Optic Signal Conditioner	DSC1400-16
Four Channel Card for Fiber Optic Signal Conditioner	DSC1400M4
Pressure Transducer	GT1200 501
Dynamic Monitoring System 16 – Channel Chassis	SA-1216

U.S. Patents 5,202,939; 5,392,117; U.S. Patent Pending

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