



Product Manual 35111
(Revision -, 9/2022)
Original Instructions



StableSense™ HEGO Sensor
Part Number 1689-1295

Installation and Operation Manual



General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.



Revisions

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Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.



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If the cover of this publication states "Translation of the Original Instructions" please note:

The original source of this publication may have been updated since this translation was made. Be sure to check manual **26455**, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, to verify whether this translation is up to date. Out-of-date translations are marked with . Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

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Warnings and Notices

Important Definitions



This is the safety alert symbol used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER** - Indicates a hazardous situation, which if not avoided, will result in death or serious injury.
- **WARNING** - Indicates a hazardous situation, which if not avoided, could result in death or serious injury.
- **CAUTION** - Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
- **NOTICE** - Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT** - Designates an operating tip or maintenance suggestion.

IMPORTANT

NOTE—Woodward StableSense HEGO sensors are designed for use in industrial stationary applications only.



WARNING

Lockout/Tagout LOTO

Ensure that personnel are fully trained on LOTO procedures prior to attempting to replace or service a StableSense HEGO on a “live” running engine. All safety protective systems (overspeed, over temperature, overpressure, etc.) must be in proper operational condition prior to the start or operation of a running engine. Personnel should be equipped with appropriate personal protective equipment to minimize the potential for injury due to release of hot exhaust gases, exposure to hot surfaces and/or moving parts, or any moving parts that may be activated and are located in the area of control of the StableSense HEGO.



WARNING

Personal Protective Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- Eye Protection
- Hearing Protection
- Hard Hat
- Gloves
- Safety Boots
- Respirator

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.



WARNING

Start-up

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

 WARNING

Overspeed
Overtemperature
Overpressure

INDEPENDENT FUEL SHUTOFF REQUIRED:

The engine should be equipped with an independent fuel shut-off device to protect against fuel leakage or damage to the engine with possible personal injury, loss of life, or property damage. The fuel shut off device must be totally independent of the engine control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

 WARNING

IOLOCK

IOLOCK: driving I/O into a known state condition. When a control fails to have all the conditions for normal operation, watchdog logic drives it into an IOLOCK condition where all output circuits and signals will default to their de-energized state as described below. *The system MUST be applied such that IOLOCK and power OFF states will result in a SAFE condition of the controlled device.*

- Microprocessor failures will send the module into an IOLOCK state.
- Discrete outputs / relay drivers will be non-active and de-energized.
- Analog and actuator outputs will be non-active and de-energized with zero voltage or zero current.

Network connections like CAN stay active during IOLOCK. This is up to the application to drive actuators controlled over network into a safe state.

The IOLOCK state is asserted under various conditions, including:

- Watchdog detected failures
- Microprocessor failure
- PowerUp and PowerDown conditions
- System reset and hardware/software initialization
- PC tool initiated

NOTE—Additional watchdog details and any exceptions to these failure states are specified in the related section of the product manual.

NOTICE

Battery Charging
Device

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).
- Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.
- Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual **82715**, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Follow these precautions when working with or near the control.

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Touch your finger to a grounded surface to discharge any potential before touching the control, smart valve, or valve driver, or installing cabling connectors. Alternatively, ESD mitigation may be used as well: ESD smocks, ankle or wrist straps and discharging to a reference grounds surface like chassis or earth are examples of ESD mitigation.
 - ESD build up can be substantial in some environments: the unit has been designed for immunity deemed to be satisfactory for most environments. ESD levels are extremely variable and, in some situations, may exceed the level of robustness designed into the control. Follow all ESD precautions when handling the unit or any electronics.
 - I/O pins within connectors have had ESD testing to a significant level of immunity to ESD, however do not touch these pins if it can be avoided.
 - Discharge yourself after picking up the cable harness before installing it as a precaution.
 - The unit is capable of not being damaged or improper operation when installed to a level of ESD immunity for most installation as described in the EMC specifications. Mitigation is needed beyond these specification levels.

IMPORTANT

External wiring connections for reverse-acting controls are identical to those for direct-acting controls.

Regulatory Compliance

Electromagnetic Interference & Compatibility (EMI & EMC):

The StableSense HEGO is a “passive device” that does not have a function unless it is in a control system. As such, it is a part of the EMI / EMC environment as configured in the system.

The sensor has no regulatory marking requirements for EMC or EMI since it is a passive device.

As an example: the EMC Directive is not applicable under the CE Marking for the sensor. This is a general principal for EMC/EMI regulations.

EMC/EMI Compliance is determined at the package system level by the package OEM system integrator or aftermarket retrofit contractor.

EMC: Electromagnetic Compatibility including emissions and immunity

If the installation guidance for the air/fuel ratio control, sensor, and wiring installation are followed, the control system will not unduly interfere with other devices or be interfered with by other devices in its environment.

North American Compliance:

These listings are limited only to those units bearing the CSA agency identification.

CSA: CSA Certified for Hazardous Locations
For use in Canada and the United States
Certificate 70164620
Master Contract 160584

Class I, Division 2, Groups A, B, C and D, Temperature Code T3
Heater: 16Vdc, 1.4A max
Sensor: Max voltage 790 mV
Ambient Temperature Range: -40 °C to +85 °C

Special Conditions for Safe Use:

IMPORTANT

This oxygen sensor is to be used only in conjunction with certified ECM controller PCM128-HD or LECM.

IMPORTANT

Only the area outside the exhaust is considered Class I, Division 2 Hazardous Locations. The certification is valid only for applications where the interior of the exhaust is non-hazardous location.

! WARNING

The process fluid temperature must be taken into consideration by the local authority having jurisdiction when determining this product's suitability for hazardous locations application.

! WARNING

This device is open-type equipment that must be used within a suitable end-use system enclosure. The suitability of the enclosure is subject to investigation by the local authority having jurisdiction at the time of installation.

 WARNING

Wiring to or from this device that enters or leaves the system enclosure shall utilize wiring methods suitable for Class I, Division 2 Hazardous Locations. Field wiring must be suitable for at least $T_{amb}+10\text{ }^{\circ}\text{C}$.

 WARNING

Do not use non-Woodward approved mating connector. The ratings of this product rely upon the correct mating connectors. Use only Woodward approved connectors for specified ratings.

 WARNING

EXPLOSION HAZARD
Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 2 or Zone 2 applications.

 AVERTISSEMENT**RISQUE D'EXPLOSION**

Ne pas raccorder ni débrancher tant que l'installation est sous tension, sauf en cas l'ambiance est décidément non dangereuse.

La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, applications Division 2 ou Zone 2.

Chapter 1.

General Information and Specifications

Introduction

This manual describes the installation procedures for the Woodward StableSense Heated Exhaust Gas Oxygen (HEGO) sensor. The StableSense HEGO is designed to operate with Woodward's LECM or PCM128-HD. The sensor is designed for stationary, large gas engine applications, and is not intended for on-highway applications.

References

Manual B26309: PCM128-HD Stationary Industrial Controller

Manual B26757: Large Engine Control Module

Manual B35149: E6 Rich-Burn (application information regarding rich-burn stoichiometric engines with 3-way catalyst)

Table 1-1. StableSense HEGO Part Numbers

Woodward Part Number	Description
1689-1295	StableSense HEGO Sensor – Hazardous
8280-4049	E6 Rich AFR and Speed Controller
8280-4048	E6 Rich AFR and Speed Controller with Ignition
8280-4050	E6 Rich AFR and Speed Controller with Knock
8280-4051	E6 Rich AFR and Speed Controller with Ignition and Knock
8237-1238	PCM128-HD Stationary Industrial with HEGO Inputs
8280-1104	E3 Rich AFR Controller
8280-1105	E3 Rich AFR and Speed Controller

Mating Connector Kit (8928-7363) for StableSense HEGO

Table 1-2. Mating Connector Kit

Qty	Description	Woodward Part Number	AMP Part Number
1	Body	PE24-030-04	174257-2
1	Lock Plate	PE24-031-04	174258-7
4	Terminals	1607-813	173707-1
4	Wire Seal	1607-827	172888-2

Specifications

Electrical Input Characteristics

Table 1-3. Electrical Input Characteristics

Input voltage to heater	Nominal 12.6 VDC; maximum 16 VDC
Input current to heater	0.5A nominal; 1.4 A peak in-rush
Heater resistance @ room temperature (23 °C)	$13 \pm 1.3\Omega$

Electrical Output Characteristics

Table 1-4. Electrical Output Characteristics

Cold internal sensor impedance	> 5 k Ω
Nominal operational internal sensor impedance	120 Ω
Sensor output range	0 – 790 mV

Environmental Characteristics

Table 1-5. Environmental Characteristics

Housing	Sealed for water intrusion and protected against salt spray
Ambient operating temperature	-40 °C to +85 °C
Exhaust operating temperature	-40 °C to 950 °C (see Table 2-1)
Weight	0.06 kg (approx.)
Allowable vibration levels measured at hex	50G (650~ 2000 Hz)
Chemical resistance to . . .	Gasoline, engine coolant (long life coolant), engine oil, brake fluid, power steering fluid, windshield washer fluid

Chapter 2. Installation



WARNING

External fire protection is not provided in this product. It is the responsibility of the user to satisfy any applicable requirements for their system.



WARNING

**Overspeed
Overtemperature
Overpressure**

INDEPENDENT FUEL SHUTOFF REQUIRED:

The engine should be equipped with an independent fuel shut-off device to protect against fuel leakage or damage to the engine with possible personal injury, loss of life, or property damage. The fuel shut off device must be totally independent of the engine control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

Introduction

This chapter provides general information for selecting a mounting location and installation of the StableSense HEGO. The StableSense HEGO is designed to be mounted in the exhaust train and exposed to the exhaust stream of a gas engine. It is specifically designed for natural gas engines and provides immunity for methane and hydrogen interference.

When selecting the mounting location of the HEGO(s), consider the following items:

Physical Installation

- Care must be taken to ensure the wiring is protected from high temperatures and physical impact.
- Ensure access for replacement; most sensors in high-duty cycle applications should be replaced semi-annually.
- The sensor has an M18x1.5-6e thread which should be coated with anti-seize similar to LOCTITE® LB 771 for future removal.
- Mount the sensor such that the tip extends as much as possible into the exhaust stream.

Sensor Life

- Sensor operating temperature has a strong impact on durability; follow temperature recommendations in Table 2-1 closely to extend life of sensor. Sensor locations too close to the engine outlet may exhibit high temperatures and should be avoided.
- If the temperature of the sensor is too high, then the heater voltage setting may be reduced.
- If heater temperature exceeds 900 °C, heater should be turned off.
- To extend sensor life it is recommended to locate the HEGO sensor close to the catalyst. This also allows the StableSense to get a better read of what the air/fuel ratio measures as it enters the catalyst element. The sensor should NOT be mounted on the catalyst housing if possible as this typically moves the sensor out of the exhaust stream.
- Water accumulation inside the sensor will cause premature failure. Mount on top 160° of exhaust piping directed down and within 5° of vertical (see Figures 2-2 and 2-3).
- For vertical mount, ensure that sensor is not directed greater than 5° facing into the exhaust stream (see Figure 2-4).
- There is a dew point timer adjustment called thermal shock delay; take this to 5 minutes or greater to allow the condensation to burn off before turning on the heater.
- High ambient temperatures and lack of air movement will increase the temperature of the sensor and reduce life. Ensure ambient air temp air movement around the sensor body.
- Sensor shields are sometimes used with bare exhaust to shield the sensor from radiant heat transfer. However, if the exhaust is insulated, a shield is not required and generally reduces

cooling and fresh air circulation. A shield can even conduct exhaust temperatures to areas further down the sensor that are sensitive to high temps.

Table 2-1. StableSense HEGO Sensor Limits

Ref #	Temperature Zone (see Figure 2-1)	Maximum		
		Minimum	Survival	Continuous
1	Tip temp - operational	350 °C	950 °C×40hrs	900°C
2	Hexagon temp	-40 °C	650 °C×40hrs	600°C
3	PTFE filter temp	-40 °C	280 °C×40hrs	260°C
4	Grommet temp	-40 °C	250 °C×40hrs	210°C
1	Temp change gradient at the ceramic tip		100 °C / sec	
2	Temp change gradient at the hex of sensor housing		150 °C / sec	
2	Allowable vibration levels measured at hex		50G (650~ 2000 Hz)	
	Allowable input current to sensor element	-10 µA	+10 µA	

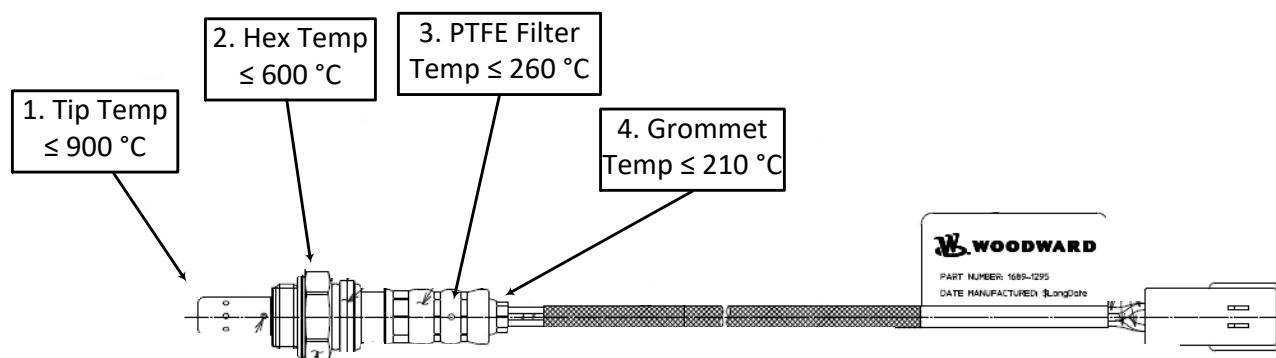


Figure 2-1. StableSense HEGO Sensor Layout Diagram

Mounting Recommendations

LOCATE THE HEGO IN THE
SHADED AREA TO AVOID
CONDENSATION ACCUMULATION

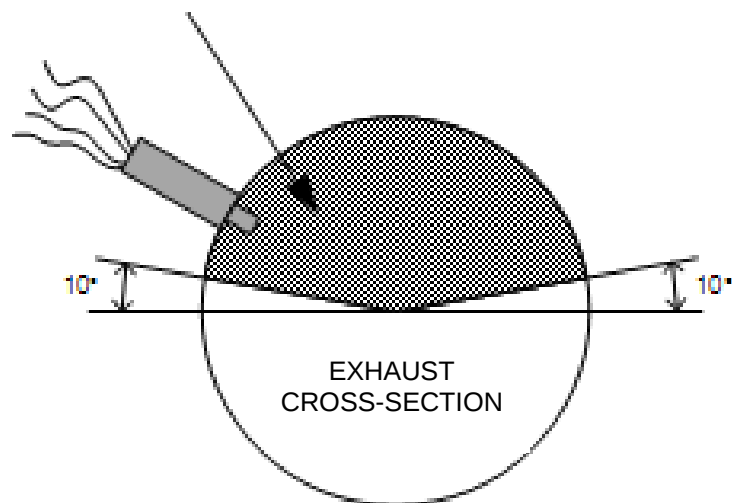


Figure 2-2. StableSense HEGO Exhaust Cross-Section Limits

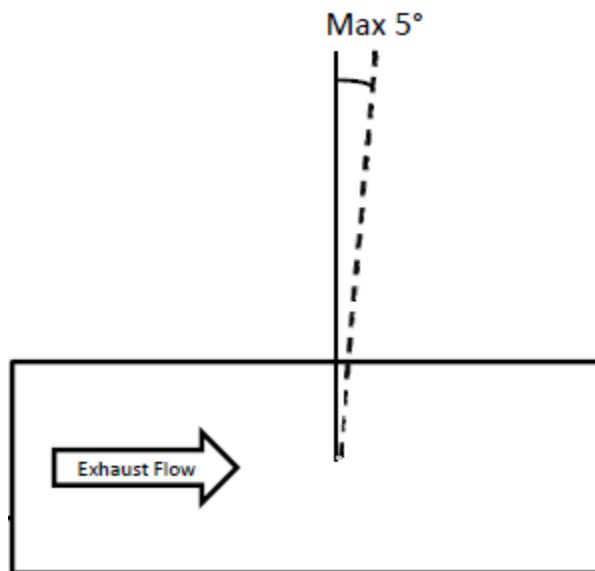


Figure 2-3. StableSense HEGO Exhaust Horizontal Mounting

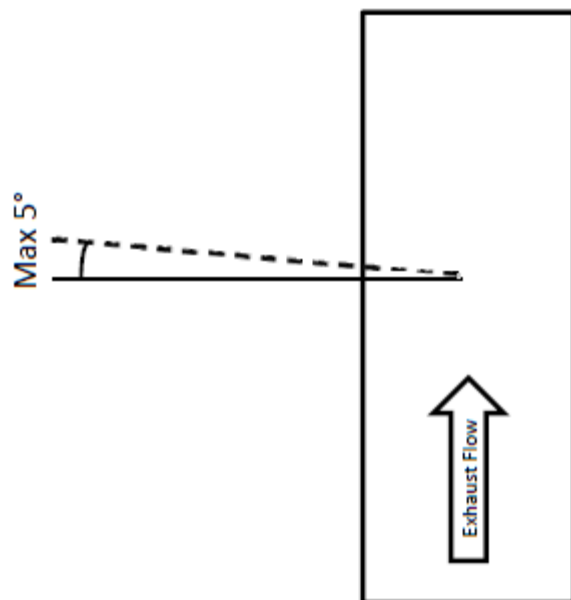


Figure 2-4. StableSense HEGO Exhaust Vertical Mounting

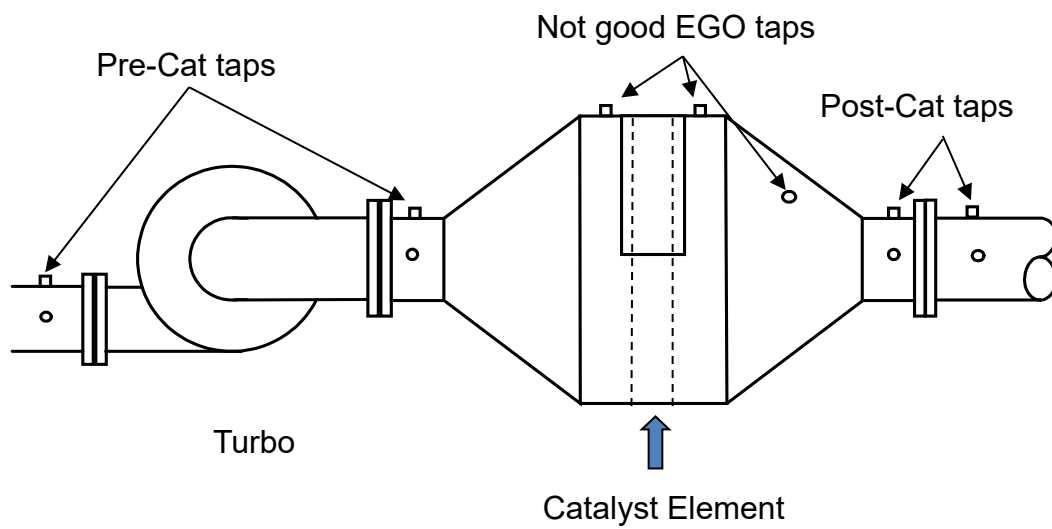


Figure 2-5. StableSense HEGO Exhaust Mounting Recommendations

Mounting Locations

- When mounting dual-bank sensors, Pre-Cat HEGO mounts on a stereo engine should not be closer than 2 pipe diameters from the Y to reduce cross bank signal interference. See Figure 2-6.
- When mounting post-catalyst sensor, it should not be closer than 2 pipe diameters from the stack exit to reduce ambient air interference. See Figure 2-7.

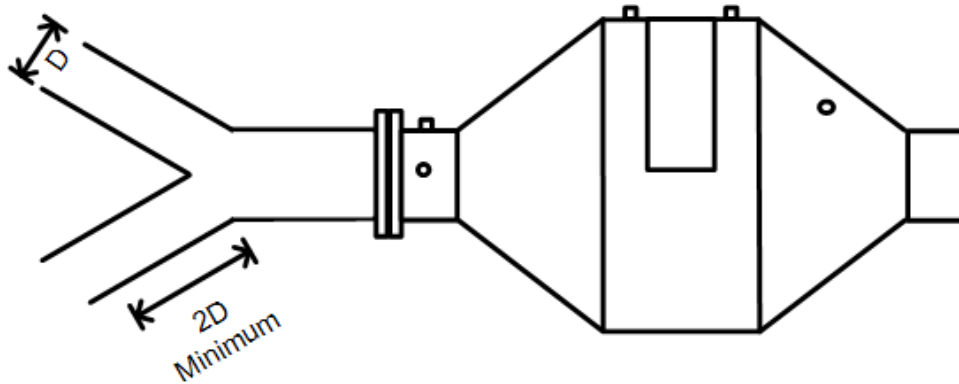


Figure 2-6. StableSense HEGO Dual Bank Exhaust Mounting Recommendations

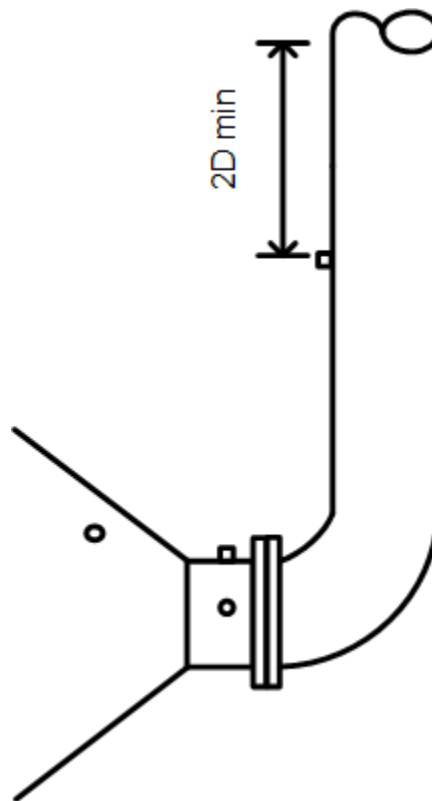


Figure 2-7. StableSense HEGO Post-Catalyst Exhaust Mounting Recommendations

Thread Boss

- A thread boss should be used to provide a flush gasket contact surface. An example of an approved thread boss is a 25 mm diameter (1 inch) and 6 – 12 mm (1/4 – 1/2 inch) deep stainless steel donut with M18 thread inside. See Figure 2-8.
- Weld the boss flush with the exterior of the exhaust manifold; this will allow for the greatest protrusion of the sensor element into the exhaust stream.

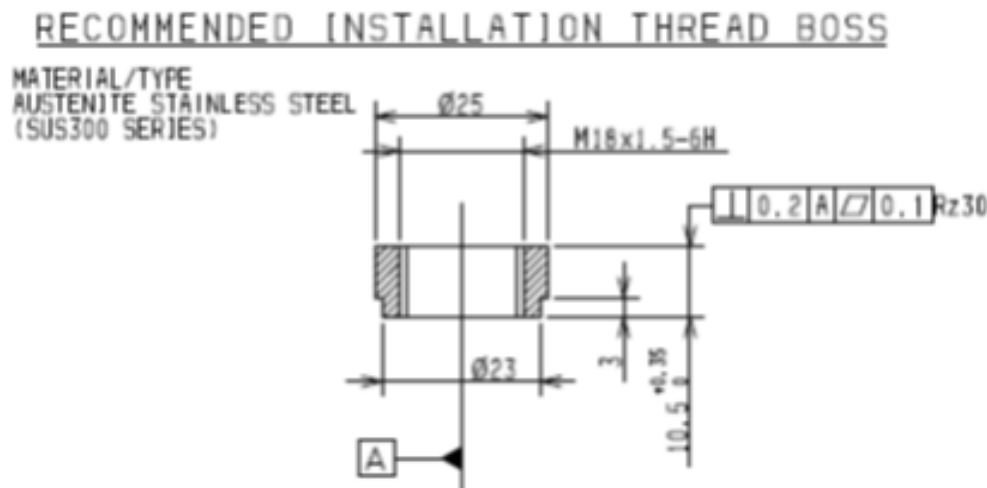


Figure 2-8. StableSense HEGO Exhaust Mounting Boss

IMPORTANT

NOTE—Woodward StableSense HEGO sensors are designed for use in industrial stationary applications only.

NOTICE**HANDLING**

- DO NOT drop or use an oxygen sensor that has been dropped as this may cause shock damage to the ceramic cell.
- DO NOT use any compounds on or around the sensor unless labeled as oxygen sensor friendly products.
- DO NOT use impact wrench or conventional socket type wrench to install sensor.
- DO NOT allow sensor or lead wires to touch exhaust manifold or any other hot component.
- DO NOT expose this product to water, oil, anti-corrosion oil, grease, terminal cleaner, etc.
- DO NOT store under high-humidity conditions.

Mounting Hardware

Mounting hardware is included with the sensor and consists of a crush gasket that deforms upon initial installation (see Figure 2-9). Repeated removal and installation will degrade the seal and potentially allow dangerous gasses to leak outside the exhaust or allow oxygen intrusion that will affect the sensor measurement and therefore the emissions levels. A 100 unit kit is available as Woodward PN 5419-166.



Figure 2-9. HEGO Installation Gasket

WARNING

Leak-check all gaseous fuel connections. Leaking gaseous fuel can cause explosion hazards, property damage, or loss of life.

WARNING

SENSOR CLEARANCE

Do not pack insulation around the sensor since the zone operating temperatures of the sensor may rise to a level that can damage the sensor.

WARNING

HEARING PROTECTION

This sensor is used on engines that typically have a high noise level. Always use appropriate hearing protection while working around the engine.

WARNING

HOT SURFACE

The exhaust from a running or recently running engine is very hot and will heat the sensor to dangerous levels and can cause severe burns. Always wear the proper Personal Protective Equipment (PPE) when handling hot sensors.

HIGH PRESSURE

DO NOT remove or install an exhaust sensor while the engine is running, since the back pressure and hot exhaust can turn the sensor into a projectile with the potential for serious injury.

Installation Instructions

- Remove protector cap just prior to installation.
- If not already coated, apply anti-seize to oxygen sensor threads.
- Install sensor body ensuring lead wires are not twisted or bent.
- Install all sensors with new gasket supplied.
- Install finger tight then 1/2 – 3/4 turn with 22 mm wrench (7/8 inch) or O2 sensor socket; torque to 35-45 Nm (26-33 ft-lb).
- Connect and route lead wires away from heat sources.

Wiring

Sensor Wiring

Sensor body is not connected to any of the sensor leads so the exhaust grounding integrity is not important.

Woodward provides a mating connector kit: p/n **8928-7363** (see Table 1-2 for contents).



WARNING

PROPER WIRING

Due to the location listings associated with this product, proper wire type and wiring practices are critical to operation.

MATING CONNECTOR

The IP rating depends on the proper use of the mating connector. Use this manual to determine the power and maximum ambient temperature for the specific application.

The wiring from the E6 or E3 control module or to the HEGO sensor must be 18 AWG (0.823mm²) (GXL or SXL stranded) wires. The input connection is designed to mate with AMP style plug. The input connection kit is available from Woodward as a separate orderable part number **8928-7363**. The StableSense HEGO uses a 4-pin connection (input + and input – and heater + and heater –). The polarity of the heater is not important and the mating connector pinout can be found in Figure 2-11.

The StableSense HEGO sensor wiring is shown in Figure 2-10.

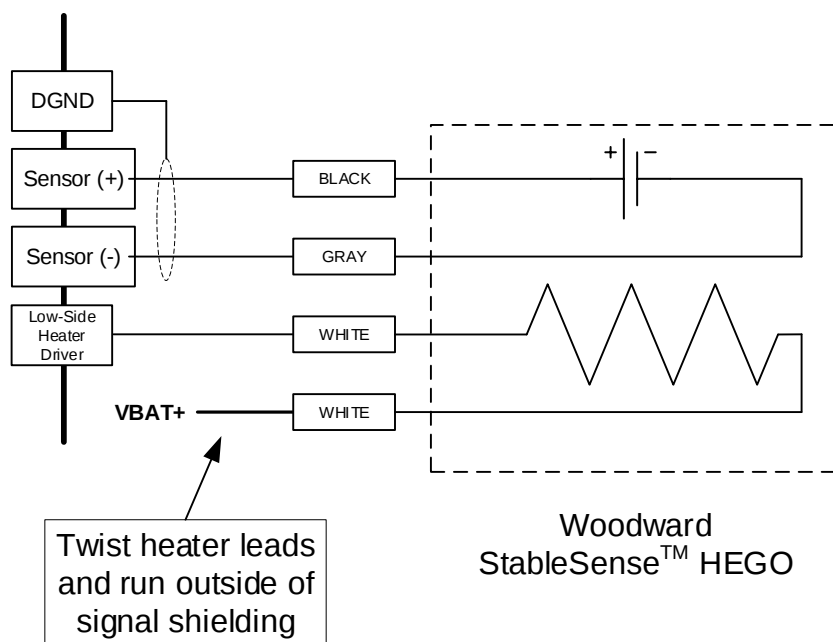


Figure 2-10. StableSense HEGO Sensor Wiring Diagram

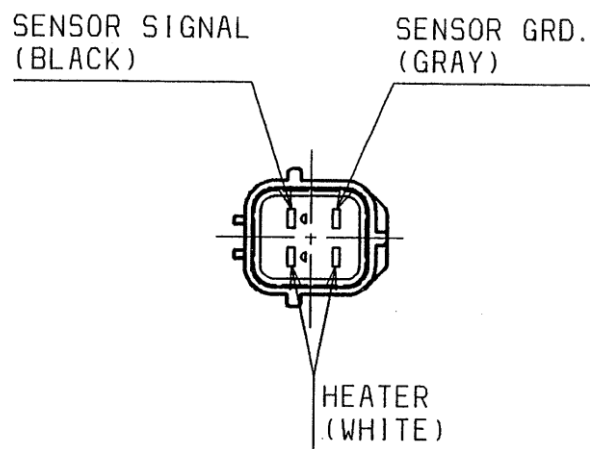


Figure 2-11. StableSense HEGO Sensor Connector Wiring Diagram
(Looking into the Connector)

IMPORTANT

It is recommended that the wires from the HEGO sensor(s) to the E6 or E3 control be shielded and twisted to reduce the levels of EMI. For best performance shield and twist the heater wires separately to reduce noise emissions.

Chapter 3. Product Support and Service Options

Product Support Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

1. Consult the troubleshooting guide in the manual.
2. Contact the **OE Manufacturer or Packager** of your system.
3. Contact the **Woodward Business Partner** serving your area.
4. Contact Woodward technical assistance via email (EngineHelpDesk@Woodward.com) with detailed information on the product, application, and symptoms. Your email will be forwarded to an appropriate expert on the product and application to respond by telephone or return email.
5. If the issue cannot be resolved, you can select a further course of action to pursue based on the available services listed in this chapter.

OEM or Packager Support: Many Woodward controls and control devices are installed into the equipment system and programmed by an Original Equipment Manufacturer (OEM) or Equipment Packager at their factory. In some cases, the programming is password-protected by the OEM or packager, and they are the best source for product service and support. Warranty service for Woodward products shipped with an equipment system should also be handled through the OEM or Packager. Please review your equipment system documentation for details.

Woodward Business Partner Support: Woodward works with and supports a global network of independent business partners whose mission is to serve the users of Woodward controls, as described here:

- A **Full-Service Distributor** has the primary responsibility for sales, service, system integration solutions, technical desk support, and aftermarket marketing of standard Woodward products within a specific geographic area and market segment.
- An **Authorized Independent Service Facility (AISF)** provides authorized service that includes repairs, repair parts, and warranty service on Woodward's behalf. Service (not new unit sales) is an AISF's primary mission.
- A **Recognized Engine Retrofitter (RER)** is an independent company that does retrofits and upgrades on reciprocating gas engines and dual-fuel conversions, and can provide the full line of Woodward systems and components for the retrofits and overhauls, emission compliance upgrades, long term service contracts, emergency repairs, etc.

A current list of Woodward Business Partners is available at www.woodward.com/directory.

Product Service Options

Depending on the type of product, the following options for servicing Woodward products may be available through your local Full-Service Distributor or the OEM or Packager of the equipment system.

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

Replacement/Exchange: Replacement/Exchange is a premium program designed for the user who is in need of immediate service. It allows you to request and receive a like-new replacement unit in minimum time (usually within 24 hours of the request), providing a suitable unit is available at the time of the request, thereby minimizing costly downtime.

This option allows you to call your Full-Service Distributor in the event of an unexpected outage, or in advance of a scheduled outage, to request a replacement control unit. If the unit is available at the time of the call, it can usually be shipped out within 24 hours. You replace your field control unit with the like-new replacement and return the field unit to the Full-Service Distributor.

Flat Rate Repair: Flat Rate Repair is available for many of the standard mechanical products and some of the electronic products in the field. This program offers you repair service for your products with the advantage of knowing in advance what the cost will be.

Flat Rate Remanufacture: Flat Rate Remanufacture is very similar to the Flat Rate Repair option, with the exception that the unit will be returned to you in "like-new" condition. This option is applicable to mechanical products only.

Returning Equipment for Repair

If a control (or any part of an electronic control) is to be returned for repair, please contact your Full-Service Distributor in advance to obtain Return Authorization and shipping instructions.

When shipping the item(s), attach a tag with the following information:

- return number;
- name and location where the control is installed;
- name and phone number of contact person;
- complete Woodward part number(s) and serial number(s);
- description of the problem;
- instructions describing the desired type of repair.

Packing a Control

Use the following materials when returning a complete control:

- protective caps on any connectors;
- antistatic protective bags on all electronic modules;
- packing materials that will not damage the surface of the unit;
- at least 100 mm (4 inches) of tightly packed, industry-approved packing material;
- a packing carton with double walls;
- a strong tape around the outside of the carton for increased strength.

NOTICE

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Replacement Parts

IMPORTANT

There are no serviceable parts on the sensor.

When ordering replacement parts for controls, include the following information:

- the part number(s) (XXXX-XXXX) that is on the enclosure nameplate;
- the unit serial number, which is also on the nameplate.

Engineering Services

Woodward's Full-Service Distributors offer various Engineering Services for our products. For these services, you can contact the Distributor by telephone or by email.

- Technical Support
- Product Training
- Field Service

Technical Support is available from your equipment system supplier, your local Full-Service Distributor, or from many of Woodward's worldwide locations, depending upon the product and application. This service can assist you with technical questions or problem solving during the normal business hours of the Woodward location you contact.

Product Training is available as standard classes at many Distributor locations. Customized classes are also available, which can be tailored to your needs and held at one of our Distributor locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability.

Field Service engineering on-site support is available, depending on the product and location, from one of our Full-Service Distributors. The field engineers are experienced both on Woodward products as well as on much of the non-Woodward equipment with which our products interface.

For information on these services, please contact one of the Full-Service Distributors listed at www.woodward.com/directory.

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory at www.woodward.com/directory, which also contains the most current product support and contact information.

You can also contact the Woodward Customer Service Department at one of the following Woodward facilities to obtain the address and phone number of the nearest facility at which you can obtain information and service.

Products Used in Electrical Power Systems

<u>Facility</u>	<u>Phone Number</u>
Brazil -----	+55 (19) 3708 4800
China -----	+86 (512) 6762 6727
Germany:	
Kempen----	+49 (0) 21 52 14 51
Stuttgart -	+49 (711) 78954-510
India -----	+91 (124) 4399500
Japan-----	+81 (43) 213-2191
Korea-----	+82 (51) 636-7080
Poland -----	+48 12 295 13 00
United States-----	+1 (970) 482-5811

Products Used in Engine Systems

<u>Facility</u>	<u>Phone Number</u>
Brazil -----	+55 (19) 3708 4800
China -----	+86 (512) 6762 6727
Germany -----	+49 (711) 78954-510
India -----	+91 (124) 4399500
Japan-----	+81 (43) 213-2191
Korea-----	+82 (51) 636-7080
The Netherlands--	+31 (23) 5661111
United States-----	+1 (970) 482-5811

Products Used in Industrial Turbomachinery Systems

<u>Facility</u>	<u>Phone Number</u>
Brazil -----	+55 (19) 3708 4800
China -----	+86 (512) 6762 6727
India -----	+91 (124) 4399500
Japan-----	+81 (43) 213-2191
Korea-----	+82 (51) 636-7080
The Netherlands--	+31 (23) 5661111
Poland -----	+48 12 295 13 00
United States-----	+1 (970) 482-5811

Technical Assistance

If you need to contact technical assistance, you will need to provide the following information. Please write it down here before contacting the Engine OEM, the Packager, a Woodward Business Partner, or the Woodward factory:

General

Your Name _____

Site Location _____

Phone Number _____

Fax Number _____

Prime Mover Information

Manufacturer _____

Engine Model Number _____

Number of Cylinders _____

Type of Fuel (gas, gaseous, diesel, dual-fuel, etc.) _____

Power Output Rating _____

Application (power generation, marine, etc.) _____

Control/Governor Information

Control/Governor #1

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number _____

Control/Governor #2

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number _____

Control/Governor #3

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number _____

Symptoms

Description _____

If you have an electronic or programmable control, please have the adjustment setting positions or the menu settings written down and with you at the time of the call.

Revision History

New Manual—

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication **35111**.



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Email and Website—www.woodward.com

Woodward has company-owned plants, subsidiaries, and branches, as well as authorized distributors and other authorized service and sales facilities throughout the world. Complete address / phone / fax / email information for all locations is available on our website.