

# 4.1 VitalSensors Technologies VS-3000 / VS-1000 Sensor Systems Installation and Planning Guide





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**Contact:** VitalSensors Technologies LLC  
577 Main Street #105  
Hudson, MA USA 01749  
Tel: +1 978-635-0450  
Fax: +1 978-310-7074  
Web: [www.vitalsensorstech.com](http://www.vitalsensorstech.com)

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#### Other Product Guides and Help:

The *VS-3000* and *VS-1000* User Guides provide more details on the subjects covered in this document. Application Guides are also available for all fieldbus protocols. Available protocols are EtherNet/IP, 4-20mA with Remote/Relay, ProfibusDP (product option). These guides are available at <http://vitalsensortech.com> and can also be found on the documentation CD shipped with all *VS-3000 / 1000* systems.

## 1. Introduction

This installation and planning guide describes the most important technical setup properties and procedures for *VS-3000 / VS-1000 Sensor Systems*, the *Sensor Management Station (SMS)* and software applications. The *VS-3000 / VS-1000 Sensor System* measures dissolved ingredient concentrations using direct infrared measurement. Typical installations include pipes, tanks, blenders or fillers. *VS-3000 / VS-1000 Sensors* do not require flow to operate. The *VS-3000 / VS-1000 Sensor* is designed to operate 24 x 7 and requires no routine maintenance except for typical CIP procedures.

The VitalSensors *VS-3000 / VS-1000 Dashboard Software* provides a management platform for all *VS-3000 / VS-1000 Sensor* functions and displays measurement data. *VS-3000 / VS-1000 Dashboard* operation is achieved through an intuitive user interface.

The *Sensor Management Station (VS-300SMS only)* uses a digital display to continuously report the measured concentration(s) in the fluid. The units of each parameter are sensor and application dependent. The *SMS* records concentration measurements in a log file stored locally. The *VS-300/VS-200 SMS* has facilities to implement gain and offset adjustments to fine-tune the sensor readings to plant-specific conditions.

*VS-3000 / VS-1000 Sensor Systems* can be used as a standalone unit or as part of an automated process system under PLC control.

The *Sensor Monitor Remote Client Software* is an optional, Windows<sup>®</sup>-based application shipped with each system. This program allows the user to view sensor data on a remote laboratory computer, as well as make adjustments to sensor in the form of brand changes and offset adjustment. The *Sensor Monitor* provides for the implementation of specification limits and control limits to aid in process management. The *Sensor Monitor* can be used to manage the sensor or used as a repeater in conjunction with a PLC.

## 2. Safety Instructions

This reference manual does not claim to address all of the safety issues associated with the use of the *VS-3000 / VS-1000 Series Sensor Systems* and samples. It is the responsibility of the user to establish health and safety practices and determine the applicability of regulatory limitations prior to use.

Before installing the *VS-3000 / VS-1000 Series Sensors* read this reference manual.

- VitalSensors Technologies LLC only warrants the proper functioning of the *VS-3000 / VS-1000 Series Sensors* if no unauthorized adjustments have been made to mechanical parts, electronic parts, software and the following points are adhered to.
- Follow all hints and instructions contained in this reference manual to ensure the correct and safe functioning of the *VS-3000 / VS-1000 Series Sensors*.
- Do not use the *VS-3000 / VS-1000 Series Sensors* for any purpose other than described in this reference manual. VitalSensors Technologies LLC is not liable for damages caused by incorrect use of the *VS-3000 / VS-1000 Series Sensors*.
- Do not use the *VS-3000 / VS-1000 Series Sensors* with any accessories other than those supplied or approved by VitalSensors Technologies LLC.
- The installation procedure should only be carried out by authorized plant engineer who is familiar with the installation instructions / industry best practices.
- Ensure that all operators are fully trained to use the instrument correctly and safely.
- Do not use the *VS-3000 / VS-1000 Series Sensors* if a malfunction is suspected, or damages, injuries or loss of life cannot be excluded under all circumstances.
- The **standard** *VS-3000 / VS-1000 Series Sensors* are not explosion-proof instruments and therefore must not be operated in areas where there is a risk of explosion. (Please contact VitalSensors prior to ordering if you require an explosion-proof instrument.)
- Due to the nature of the infrared measurement, *VS-3000 / VS-1000 Sensor* readings not only depend on the correct use and functioning of the sensor, but may also be influenced by other factors. We therefore recommend that suspect results are plausibility tested offline before consequential actions are taken.
- Repair and service procedures may only be carried out by authorized personnel or by VitalSensors Technologies LLC.
- In areas where strong electromagnetic fields are present or there is electrostatic discharge into the housing or cable, it may cause drift in the measuring results.

### 3. Symbols in the User's Guide

The following symbols are used in the user's guide:



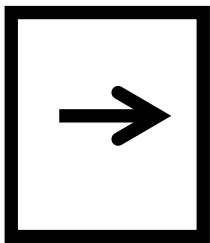
#### Warning:

The "Warning" sign indicates a **hazard**. It calls attention to an operating procedure, practice, etc. which, if not correctly performed or adhered to, could result in **injury or damage to goods**. Do not proceed beyond a "Warning" sign until the indicated conditions are fully understood and met.



#### Important:

The "Important" sign indicates a **hazard**. It calls attention to an operating procedure, practice, etc. which, if not correctly performed or adhered to, could result in damage to the instrument or parts of it. Do not proceed beyond an "Important" sign until the indicated conditions are fully understood and met.



#### Hint:

The "Hint" sign calls attention to any **additional information** which might be of use to the operator.

## 4. Supplied Items

### Standard Supplied Items

Pieces	Part
1	VS-3000 or VS-1000 Series Inline Infrared Sensor
1	Sensor Management Station (controller) & connectors (VS-300 or VS-200)
1	7.62meter / 25ft cable for connecting sensor connection cable
1	CD with User Guides
1	Sensor Monitor Remote Client Software on CD (use is optional)
2	Laminated Quick Start Sheets

**Procurement and Installation of a Varivent Process Connection (68mm, Type N) or other recommended process connection pipe/tank fitting for the VS-1000 / VS-3000 Sensor is a customer responsibility and required for use of the sensor (See Section 6). The use of non-recommended process connection flanges voids the product warranty.**

**4.1** The VS-3000 / VS-1000 Inline Infrared Sensor (pictured in Figure 4.1) fits into a pipe or tank using a Tuchenhagen Varinline® Inline Access unit (or other approved process connection based on the form factor purchased). The sensor head requires no routine maintenance. The purpose of the sensor is to measure analytes in fluids and send the measurement data to the Sensor Management Station via the supplied cable.



*Fig. 4-1*

VS-3000 / VS-1000 Sensors are available in Tuchenhagen Varivent (standard) or 1.5 Tri-Clamp form factors. The sensor is shipped with a cable (hermetic connectors) to connect with the *Sensor Management Station* (controller). The VS-3000 / VS-1000 Sensor Head, the cable, and *Sensor Management Station* are all waterproof (IP67).

**The cable connector(s) or safety cap(s) should always be mated to the sensor and SMS to avoid water and dust from accumulating on the exposed connection terminals.**



The VS-3000 / VS-1000 Sensor is hermetically sealed and has no user serviceable parts inside. **DO NOT OPEN THE SENSOR FOR ANY REASON. OPENING THE SENSOR VOIDS THE WARRANTY AND ADVERSELY AFFECTS SENSOR PERFORMANCE.**

The VS-3000 / VS-1000 Series Sensors are tested and calibrated as part of the manufacturing process.

### Materials Classifications

Sensor body is 316L Stainless Steel, 3.1B certificate for fittings, 2.2 certificate for fittings, O-Ring seals FDA conform, HASTELLOY C-2000 is optional

Sensor crystal is sapphire an ultra hard material, crystal is rated to 700°C and is chemically inert

Sensor crystal seal is PEEK - FDA, USDA and 3A Dairy approved – PEEK seal material can be used continuously to 250°C

Sensor protection class is IP67 – hermetically sealed device

**4.2 The Sensor Management Station** (pictured in Figure 9.1) should be mounted on a firm fixture within 25 feet / 7.62 meter (cable length) of the sensor. The role of the *Sensor Management Station* is the following:

- Supply power to all devices
- Receive measurement data from the sensor. Outputs data/alarms to a fieldbus, local display, *Sensor Monitor Remote Client Software* and the *VS-3000 / VS-1000 Dashboard* desktop
- Enable implementation of brands and offsets via pushbuttons on the front panel or through a plant communications network

- Allows for the adjustment of product brand specific offsets as long as the brands have previously been set up on the *VS-3000 / VS-1000 Dashboard* application.
- Contains the communications controllers for the various Fieldbuses supported by *VS-3000 / VS-1000* Sensor System

### **Material Classifications**

- *VS-300 Sensor Management Station* (standard form factor) enclosure material is made of self extinguishing, glass-fiber-reinforced and halogen free polyester. IP67 protection degree. Enclosure can withstand -5°C / 23°F to 50°C / 122°F ambient temperatures. Impact resistance degree of IK10. *VS-300EXP* ATEX certified enclosure or *VS-200SMS* DIN Rail enclosure is optional.

Color: Off-White

Mounting: Wall, Panel, Pipe mounting

Cable glands: 4 or 5 breakthroughs

- Power
- Sensor Connector
- Ethernet
- 1 or 2 fieldbus ports
- 

Weight: 5 lbs.

## 5. VS-3000 / VS-1000 Sensor System Overview

### 5.1 Theory of Operation

The *VS-3000 / VS-1000 Sensor System* is a state of the art, solid-state, inline, infrared sensor that is designed to operate 24x7 without maintenance. No adjustment to the sensor's physical parts are required.

In production, adjustments to the sensor's product offsets are made **if required** during the normal production QA/QC operations or when normal concentration reference samples are taken. These adjustments are made through the pushbuttons on the *Sensor Management Station* or the *VS-3000 / VS-1000 Dashboard* software.

Unlike traditional / mechanical process instruments, the *VS-3000 / VS-1000 sensor* measures concentrations in fluids directly through the use of mid-infrared detectors. There are moving parts to service. The sensor operates in flow or no flow. The infrared measurement is not affected by temperature, pressure, density, color, viscosity or turbidity. The infrared detectors in the sensor actually bounce light off the chemical bonds in the fluid and measure the absorption. This measurement is translated by the sensor's microprocessor and software and displayed for the user or sent as output to a Fieldbus network.

The *VS-3000 / VS-1000 Sensor* is a compact solid state "smart" spectrometer comprised of infrared detectors with optical filters that use reference wavelengths and an active wavelength to monitor the molecular absorption of the substance being measured.

The sensor uses an ATR (attenuated total reflection) crystal. The ATR crystal permits a cumulative increase in absorption resulting in an improvement in signal to noise ratio, which is additive by number of reflections and improves accuracy and resolution. ATR is an ideal sampling technique for inline monitoring because there is no path through air and very rugged optical elements including diamond and sapphire can be used for the sample interface.

## 5.2 Installation Checklist

- Install 68mm (type N) Tuchenhagen Varinline® Inline Access unit or 1.5” Tri-Clamp fitting depending on form factor purchased. Vertical installation is ideal. See Section 6
- Insert *VS-3000 / VS-1000 Sensor* into process connection. Secure in place using the Tuchenhagen Hinge Clamp and 10mm wrench.
- Immediately** attach the sensor cable (supplied). The cable forms an IP68 seal, if the cable is disconnected for any reason, immediately install the IP68 safety cap (attached).
- Secure the *Sensor Management Station* (controller) at a location within 7.62 meters / 25 ft of the sensor head. See Section 8
- Connect a dedicated power source and breaker for *Sensor Management Station*. If using AC power, conditioned power is required. The *SMS* should run on an **Uninterruptable Power Supply (UPS)** with Voltage Regulating capability to ensure a virtual ground. See fig 7-2
- Connect the sensor cable to *Sensor Management Station* port labeled “SENSOR.” See fig 7-4
- Connect *Sensor Management Station* to fieldbus network (optional). Connection ports are located on the bottom of the *SMS* (See fig. 7-4). Wiring instructions and protocol instructions are provided with all *VS-3000 / VS-1000* systems on the documentation CD, these guides are also available at [vitalsensortech.com](http://vitalsensortech.com).
- Turn the *Sensor Management Station* power switch on. The sensor will automatically start data logging. This data is important for field commissioning. **DO NOT TURN THE SYSTEM OFF**, even if there is no fluid running in the pipe. For detailed commissioning advice please consult the *VitalSensors Field Commissioning Advice Guide*. This guide can be found hard copy shipped with all systems and soft copy on the documentation CD.
- The Sensor infrared optics and detectors will settle in over the first few hours

## 6. Installing VS-1000 / VS-3000 Sensor Head

The VS-3000 / VS-1000 Series Sensors are designed to mount into a 68mm (type N) Tuchenhausen Varinline<sup>®</sup> Inline Access unit or on a 1.5 Tri-Clamp Ferrule.

The Tuchenhausen<sup>®</sup> Flange / Sensor should be installed in a section of pipe where the **analytes being measured are completely dissolved**. VERTICAL INSTALLATION is ideal to reduce the potential for bubbles / frothing. If vertical installation is impossible, use an upward 45° angle on a horizontal pipe (Tuchenhausen Flange / Sensor crystal point up from 4 O'clock to 10 O'clock). DO NOT install the sensor directly on the top or the bottom of the horizontal pipe. If installing on a tank, the flange should be positioned on a side wall.

It is important to note that the VS Series sensors are optical instruments which are extremely precise. They will detect any product and CIP residue that sticks to process piping.



Fig. 6-1

**Vertical pipe installation**

**Direction of product flow shown by arrow**

**For a tank, installation on a side wall is recommended**

**Install in section where the analytes are fully dissolved.**

**Installations too close to injection or blending points may result in measurement errors due to un-dissolved concentrations and non-homogenous solution**

Install a **sampling port** for field commissioning reference sampling. The sample port should be located **close to sensor and on the same pipe run**. It is not uncommon for reference samples taken at long distances from the sensor to have different values. Downstream tanks, centrifuges or mixers homogenize / change the product.

### 6.1 Installation of VS-3000 / VS-1000 Sensors – VARIVENT Form Factor

Tuchenhagen Varinline® Inline Access unit provides for instrumentation free of dead pockets. Here is a sample of TYPE N Inline Access units available from Tuchenhagen which fit the VS-3000 / VS-1000 sensor and are available for pipe sizes from 1.5” to 10”.



Fig. 6-2

Pipe diameter	Tuchenhagen Part number	Overall length
1.5”	<u>TOD1.5”-112KEIN-1.4404</u>	180mm
2.0”	<u>TOD2”-112KEIN-1.4404</u>	180mm
2.5”	<u>TOD2.5”-112KEIN-1.4404</u>	250mm
3.0”	<u>TOD3.0”-112KEIN-1.4404</u>	250mm
4.0”	<u>TOD4”-112KEIN-1.4404</u>	250mm



**NOTE:** VitalSensors Technologies LLC does not warrant or guarantee VS-1000 / VS-3000 Sensor performance if is installed in a process connection other than those explicitly listed in this installation guide.

The clamp used to connect the sensor to the flange is as shown below (Fig 6.3) and is also available from Tuchenhagen (2 clamps ship standard with the Inline Access Unit). Make sure to order a sight glass for the inline access unit. The Tuchenhagen part numbers for the sight glass mechanism are 221-106.35 (quantity 1) and 221-106.45 (quantity 1).

- The VS-3000 / VS-1000 Sensor should be inserted into the Tuchenhausen Varinline® Inline Access unit and tightened down with the hinge clamp in Figure 6-3 (requires 10mm wrench), making sure that the Sensor O-Ring is on the face of the sensor.
- For installations in tanks where the tanks are stirred or agitated the sensor crystal requires a clearance of 6.35 mm or .5 inches. The actual sensor crystal protrudes 6.35 mm or .25 inches from the sensor face.
- The cable shipped with the unit part number 60011 and pictured in Figure 6-10 should be connected to the sensor at the end with the silver connector and gray strain relief. The red dot on the sensor connector should be aligned with the red dot on the cable connector for correct alignment. Insert the connector until it locks. **The sensor and cable should always be mated to insure IP68 protection. If the sensor is disconnected for any reason, immediately affix the safety cap (attached to the rear of the sensor).** Unmated connectors may lead to pin corrosion and dirt build up. This will make the sensor unreliable and void the product warranty.
- VS-3000 / VS-1000 Sensors are rated at 120mA at 5.5 volts or 0.66 watts maximum.



Hinged clamp connection for process connection,  
*Fig. 6-3*

VS-1000 / VS-3000 Sensor mounted vertically in 68mm Inline Access



*Fig. 6-4*

U.S. Contact: Tuchenhausen Flow Components, LLC, 90 Evergreen Drive, Portland, ME 04103 USA 207-797-9500 – (Fax) 207-797-2100 - or [www.tuchenhausen-fc.com](http://www.tuchenhausen-fc.com)

## 6.2 Installation of VS-3000 / VS-1000 Sensors – TRI-CLAMP Form Factor

The VS-3000 / VS-1000 Series Sensors are also designed to mount on a *1.5 Tri-Clamp Short Weld Ferrule*. The ferrule must be welded onto pipes or onto the side-wall of a tank. Using a sanitary T is not recommended because of the potential for dead-space in the flow.

The sensor mates with size **1.5 Short Weld Ferrule** (shown at right)

Inside diameter of the ferrule: 1.37" / 34.798 mm (A)

Outside diameter of the ferrule: 1.984" / 50.39 mm (B)

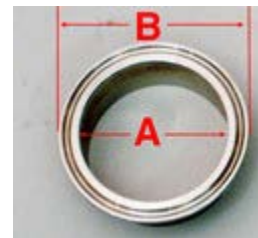


Fig. 6-5

The sensor is secured using a size *1.5 Clamp* (customer-supplied) and *1.5 Gasket* (customer-supplied)



Fig. 6-6



Fig. 6-7

### 6.3 Installation of “ET” Extended Temperature Versions

The Extended Temperature versions of VS-3000 / VS-1000 Sensors come with an integrated cooling jacket attached to the back of the sensor. The **cooling jacket contains no wetted parts** and supports integration to the plant coolant line for sensor operation at temperatures above of the standard maximum tolerance of 85°C / 185°F.

Attached to the cooling jacket are two **.3125”** (#SS-500-1-4) **Swagelok** adapters attached to two **.25” MALE NPT** fittings. The customer must procure two **.25” female NPT** fittings to make the connection between the cooling jacket and plant coolant loop/lines.

Coolant requirements are 15 liters/min with a recommended pressure drop is 25 PSIG.

- Maximum Process Temperature when cooling with Water @ 0.55°C / 33°F
  - 100°C / 212°F
- Maximum Process Temperature when cooling with Glycol @ -10°C / 14°F
  - 120°C / 248°F

It is a customer responsibility to supply the chiller for cooling water or glycol. The coolant must be active / running 24x7 when the sensor is in process



Fig. 6-8



Fig. 6-9

#### 6.4 Installation of “EXP” Sensors

The EXP versions of the VS-3000 / VS-1000 Sensors are Class I, Div I instruments. EXP sensors use less than one watt of power and are hermetically sealed using an inert gas. The sensors are shipped from the plant with an integral 3/4” NPT thread on the back of the sensor to enable a cable jacket for a hazardous environment.

3/4” Conduit must be used and in place at all times to maintain the Class I, Div I rating

The EXP sensors are currently available for use with a Varivent process connection fitting or a 1” (25.4mm) swage lock port.



*Fig. 6-10*

Due to the nature of the design, the cable to sensor connector must be mated while aligning the red dot on the sensor connector with the red not on the cable connector. If the connector removable is required **use a pair of needle nose pliers using gentle force.**

## 7. Installation of the *Sensor Management Station*

The *Sensor Management Station (SMS)* provides power, control and communication for the VS-1000 / VS-3000 sensor head. Each sensor is shipped with its own SMS.

The SMS comes in three configurations:

<b>VS-300 SMS</b>	<b>VS-200 SMS</b>	<b>VS-300 EXP</b>
<p>Fiberglass NEMA 4X case, IP67 rated for wet/washdown environments. IP68 cable connectors are supplied.</p> <p><b>User Interface:</b>            Push-Buttons + VFD Display            Remote Desktop            Keyboard + Mouse + Monitor            Sensor Monitor Remote Client            PLC Inputs</p> <p><b>Fieldbus:</b>            EtherNet/IP (two- way)            4-20mA (4-channel, 16 bit)            Digital I/O Remote-Relay            Profibus DP (option)</p> <p><b>Power:</b>            120/240 VAC (auto sensing)            Consumes 50 watts</p> <p>24 VDC (customer-supplied)            Consumes 12 watts</p> <p><b>Ambient Temperature:</b>            Max 40° C Min -5° C</p> <p><b>Dimensions:</b>            223mm 291mm 140mm            W H D</p>	<p>Mounts on 35mm DIN Rail inside customer-supplied NEMA cabinet. Not rated for wet environments</p> <p>Remote Desktop            Keyboard + Mouse + Monitor            Sensor Monitor Remote Client            PLC Inputs</p> <p>EtherNet/IP (two- way)            ProfibusDP (upon request)</p> <p>24 VDC (customer-supplied)            Consumes 12 watts</p> <p>Max 60° C Min -5° C</p> <p>63.5mm 127mm 161mm            W H D</p>	<p>ATEX rated, explosion-proof enclosure for SMS. 3/4" NPT threads for cable conduits. 22 bolts supplied for locking.</p> <p>Push-Buttons + VFD Display            Remote Desktop            Keyboard + Mouse + Monitor            Sensor Monitor Remote Client            PLC Inputs</p> <p>EtherNet/IP (two- way)            4-20mA (4-channel, 16 bit)            Digital I/O Remote-Relay            Profibus DP (option)</p> <p>120/240 VAC (auto sensing)            Consumes 50 watts</p> <p>Max 40° C Min -5° C</p> <p>369mm 463.5mm 254            W H D</p>

**The SMS must be installed within 7.62m / 25 ft of the sensor head due to the cable length.**

## 7.1 Installation of the VS-300 Sensor Management Station – NEMA 4X enclosure

The VS-300 SMS is housed in a NEMA 4X enclosure. It is rated IP67 and designed for wet environments (completely sealed including IP68-rated connectors). Therefore, the SMS **should not be installed inside of an instrumentation cabinet**, due to the potential for high temperatures.

A minimum of two cables must go to the VS-300 Sensor Management Station: 1) cable from the VS-3000 / VS-1000 Sensor - supplied; and 2) electrical power – 120 / 240 VAC or 24VDC. When the SMS is to become part of a factory network, there is a third cable – the Fieldbus cable connected to the factory network.

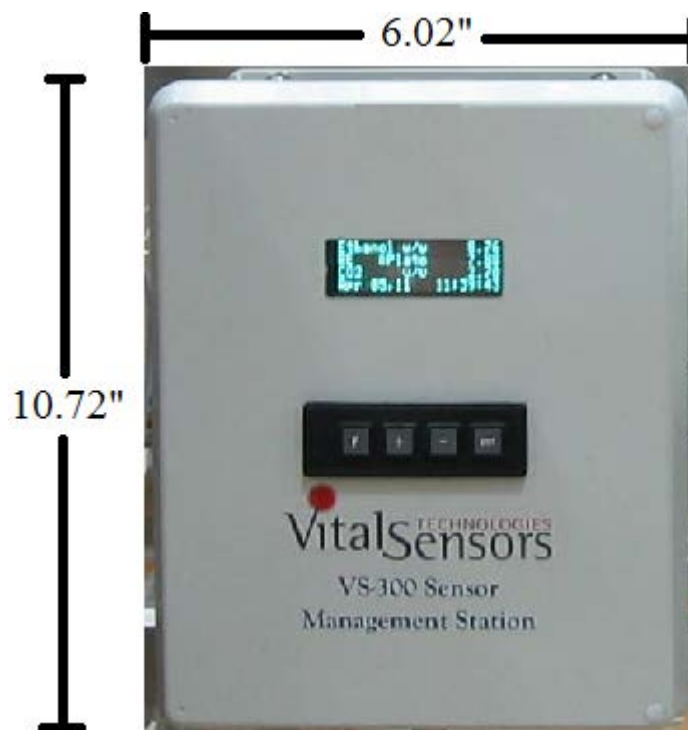


Fig. 7-1

The AC power (120/240 VAC) cable runs through the marked grommet (labeled Power) on the bottom of the VS-300 Sensor Management Station. The power plug is connected to the inside end of the power cable and plugged into the power supply as shown below in Figures 8-2 and 8-3. AC Power to the unit should be on a dedicated breaker and conditioned to avoid fluctuations and spikes. **The installation procedure should be performed by a qualified electrician. Voltages and ground should be measured.**

**An Uninterruptable Power Supply (UPS) with Voltage Regulating Capability should be used if operating with AC power.**

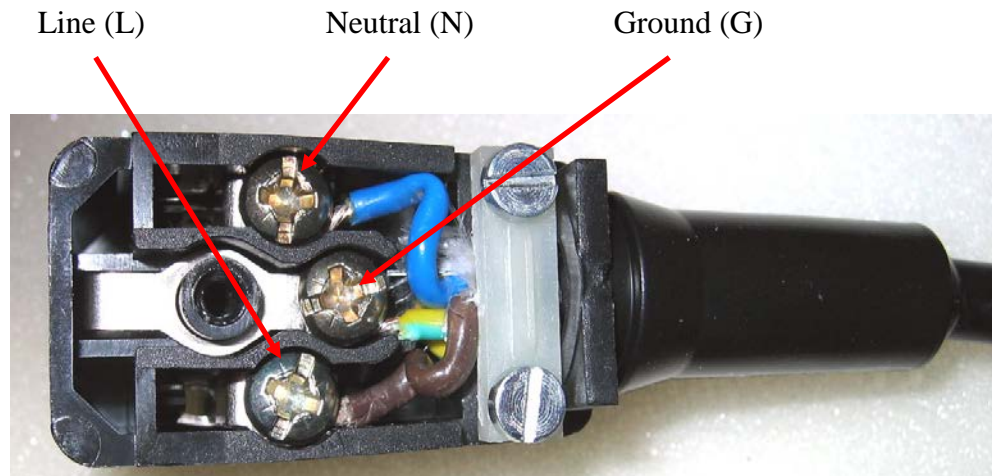


Fig. 7-2

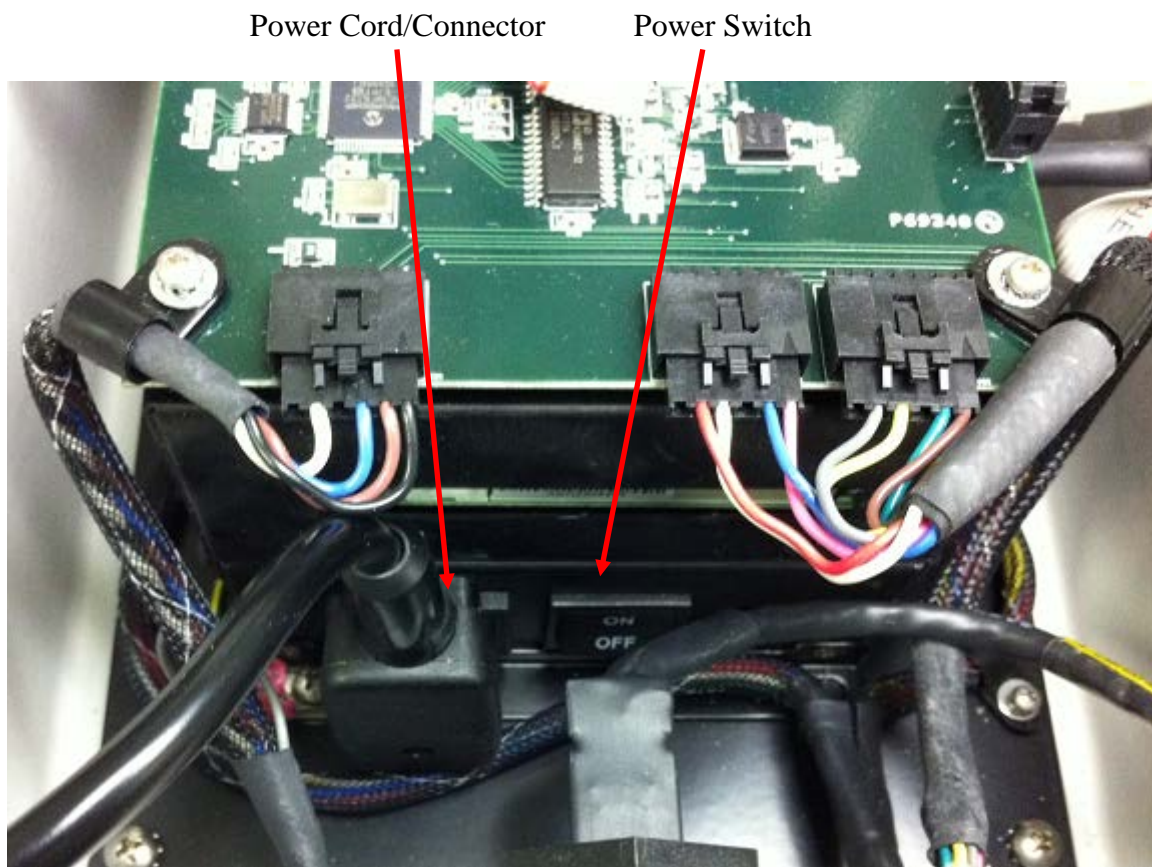


Fig. 7-3

Connect the SMS to the sensor head and turn on the SMS (Fig 7-3). This allows for a settle-in prior to commissioning. **The power on/off switch to the VS-300 Sensor Management Station is inside the enclosure on the bottom end of the processing unit.** Once the unit is powered, it should be left ON 24x7 for the purposes of data logging which is required for field commissioning.

The sensor input and communications ports are labeled clearly on the bottom of the VS-300 Sensor Management Station as shown below:

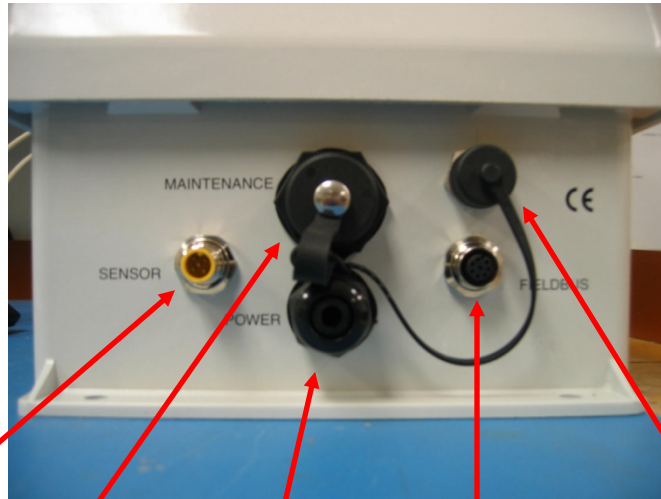


Fig. 7-4

- Sensor**
- Ethernet Port  
Maintenance  
EtherNet/IP  
Fieldbus (std)  
Sensor Monitor Comm.**
- Power**
- Fieldbus Output  
4-20mA (std)  
Profibus DP (opt)**
- Remote-Relay I/O(opt)**

The yellow connector on the sensor cable should be connected to the **SENSOR** port on the SMS.

The output ports labeled **FIELDBUS** supports the 4-20mA, Digital I-O Remote-Relay and Profibus DP (depending on what option is ordered with the system).

Once the physical installation is completed and power turned on, the *Sensor Management Station* automatically starts the *VS-3000 / VS-1000 Dashboard Software*.



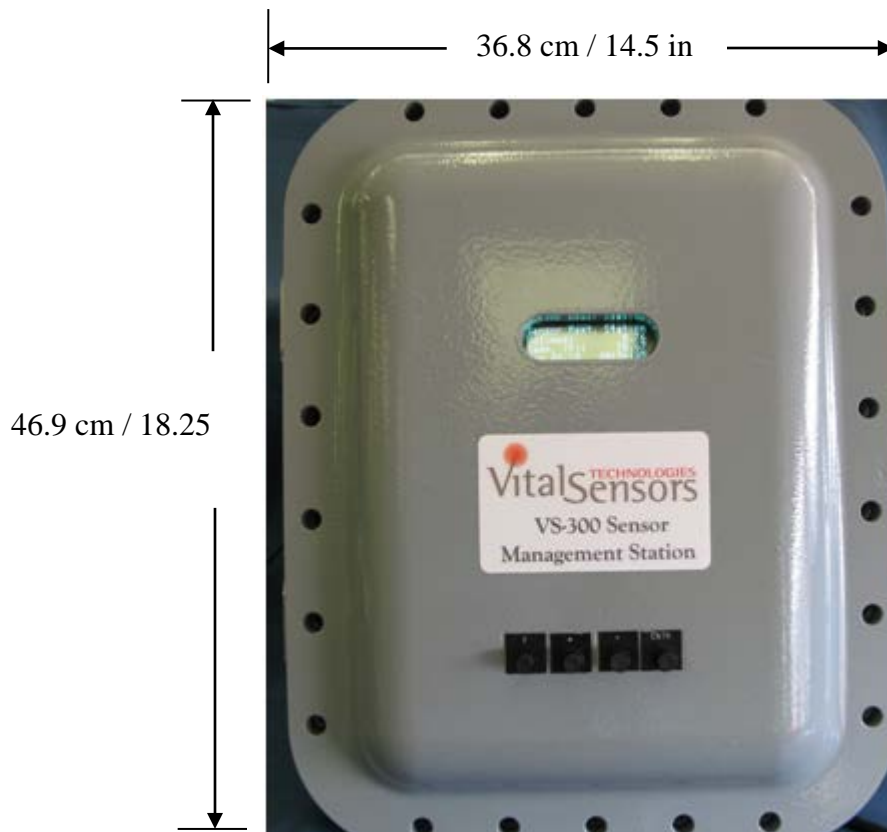
Note: Disconnect power to the unit at the breaker prior to any servicing.

Please make sure that the connectors on the sensor and the VS-200/300 SMS are protected from water and spray when the cables are not mated. To eliminate any problems always have the cable connected/mated for an IP68 seal.

Unmated connections that are exposed to plant spray, caustic, etc. are subject corrosion and oxidation. This will cause the V-1000 / VS-3000 System to malfunction and potentially requires removal for factory repairs.

## 7.2 Installation of the VS-300 Sensor Management Station - ATEX Enclosure

The VS-300 Sensor Management Station is offered **optionally** in configurations suitable for explosion proof environments. The functionality of the systems is the same but differ in mechanical form factor



### Notes:

1. Install ground on left side with screw provided on enclosure
2. Four 1/2" NPT threaded holes for cables and cable jackets on enclosure bottom
3. Interthane 990 light gray industrial coating paint – gloss finish

Fig. 7-5

Figure 7-6 shows the internal connections/layout of the SMS in the explosion-proof enclosure

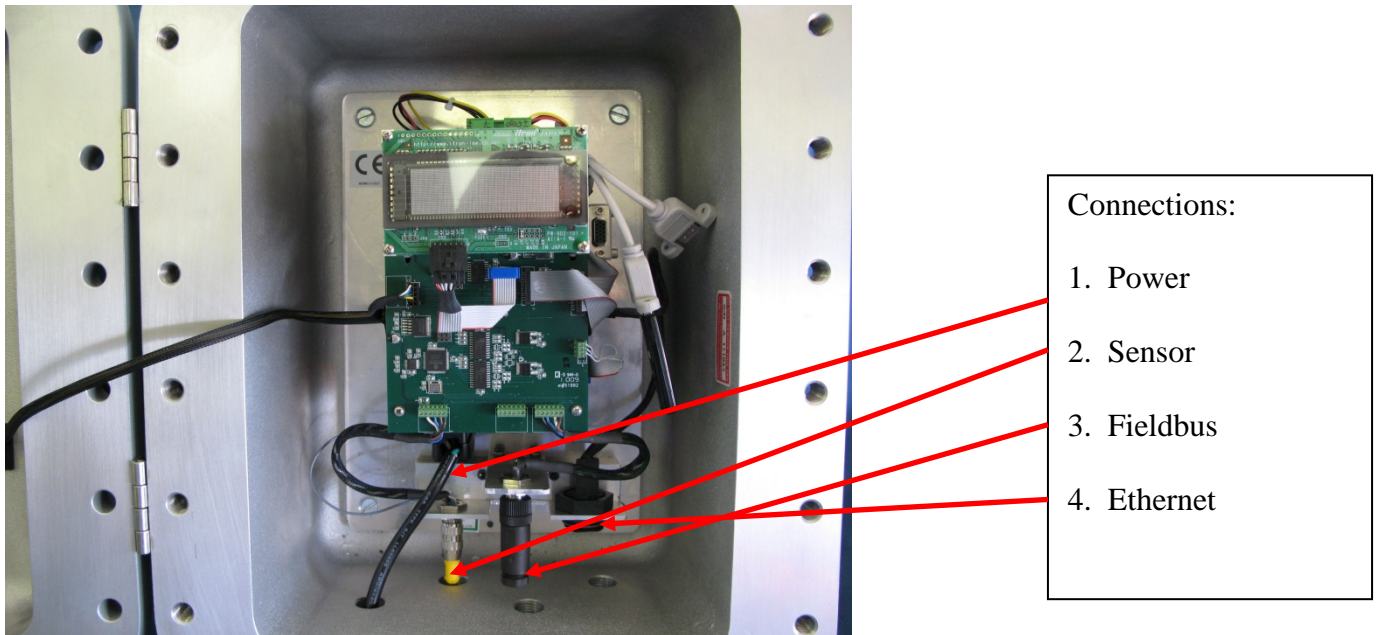


Fig. 7-6

**CAUTION:** When using the VS-300 SMS in the VS-300 ATEX enclosure, the following conditions must be observed:

- 1.) Customer must supply **Class I, Div I, Zone 0, Fault Protected, 24VDC** explosion-proof power

### 7.3 Installation of the VS-200 Sensor Management Station – DIN RAIL mounted

The VS-200 SMS is designed to be mounted on a standard 35mm DIN rail. The VS-200 SMS is **NOT RATED FOR WET ENVIRONMENTS** and must be installed inside of a NEMA 4 enclosure. Maximum ambient temperature in the instrumentation cabinet is 60°C / 140°F.

VS-200 SMS is powered by a customer-supplied, 24 VDC power supply. The DIN rail configuration is not shipped with a local display or push-buttons. The only method of control is via remote-desktop or the *Sensor Monitor Remote Client Software*. The only fieldbus supported by the VS-200 is two-way EtherNet/IP (see *User Guide 2.2.2 VS-3000 CompactLogix EIP / PLC5 Application Guide*).

A minimum of two cables must go to the VS-200 Sensor Management Station:

- 1) Sensor cable from the VS-3000 / VS-1000 Sensor - supplied
- 2) Electrical power – 24 VDC.

When the SMS is to become part of a factory network, there is a third cable – the EtherNet/IP (CAT5) cable connected to the factory network. See Fig 8.7 below

The sensor input and communications ports are labeled below. Fig 7-7 is a bottom view of the VS-200 Sensor Management Station

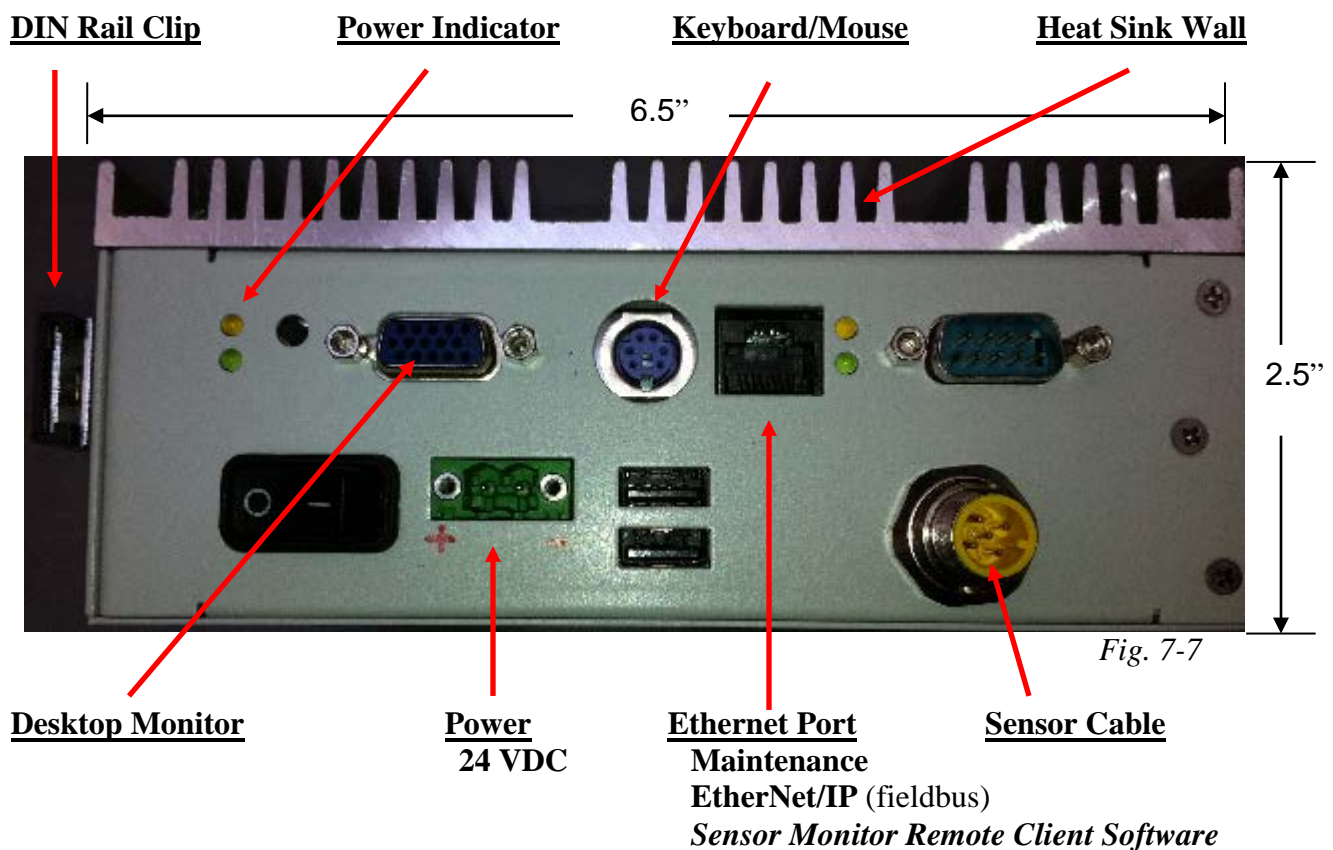


Fig. 7-7

**CAUTION:** When using the VS-200 SMS in **explosion-proof environments** the following conditions must be observed:

- 1.) Customer must supply **Class I, Div I, Zone 0, Fault Protected, 24VDC** explosion-proof power
- 2.) The VS-200SMS must be mounted in a customer-supplied explosion-proof cabinet/enclosure

## 8. Field Commissioning

Field commissioning is the process by which the *VS-3000 / VS-1000 Sensor System* is adjusted to match laboratory readings. For a successful commissioning, the sensor needs to “see” the full range of products / brands expected during normal production. For example, highest alcohol brand and lowest alcohol brand. Simultaneous, time-stamped laboratory data should be taken often for comparison to sensor readings. After the necessary range of products and several CIP cycles have been run, brands and coefficients can be implemented with the assistance of VitalSensors engineering personnel.

For detailed commissioning advice please consult the *VitalSensors Field Commissioning Advice Guide*. This guide can be found hard copy shipped with all systems and soft copy on the documentation CD.



**The VS-3000 / VS-1000 Sensor is hermetically sealed and has no user serviceable parts inside. DO NOT OPEN THE SENSOR FOR ANY REASON. OPENING THE SENSOR VOIDS THE WARRANTY AND MORE IMPORTANTLY ADVERSELY AFFECTS SENSOR PERFORMANCE.**

## 9. Declaration of Conformity

Tel: 978-635-0450  
 Fax: 978-635-0590  
[www.vitalsensorstech.com](http://www.vitalsensorstech.com)

3 Post Office Square  
 Acton, MA 01720  
 USA



### Declaration of conformity Konformitätserklärung Déclaration de conformité

We/Wir/Nous \_\_\_\_\_

VitalSensors Technologies LLC  
 3 Post Office Square  
 Acton, MA 01720  
 USA

declare under our sole responsibility that the product,  
 drklären in alleiniger Verantwortung, dass dieses Produkt,  
 éclarons sous notre seule responsabilité que le produit

Description

**VS-1000 Sensor and VS-300 Sensor Management Station  
 VS-3000 Sensor and VS-300 Sensor Management Station**

Beschreibung/

Description \_\_\_\_\_

to which this declaration is in conformity with the following standard(s) or other  
 normative document (s)  
 auf welches sich diese Erklärung bezieht, mit der/den folgenden Norm(en)  
 oder Richtlinie(n) übereinstimmt.  
 Auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x)  
 document(s) normative(s).

Low-voltage directive/Nieder-  
 Spannungs-Richtlinie/  
 Directive basse tension \_\_\_\_\_

**72/23/EWG**

Norm/Standard/Standard \_\_\_\_\_

**EN 61010-1**

EMC Directive/EMV-Richtlinie  
 Directive concernant la CEM \_\_\_\_\_

**89/336/EWG**

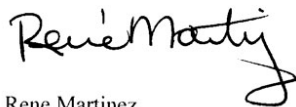
Norm/Standard/Standard \_\_\_\_\_

<b>EN 55022</b>	<b>EN 61326</b>	<b>EN 61000-4-2</b>
<b>EN 61000-4-3</b>	<b>EN 61000-4-4</b>	<b>EN 61000-4-5</b>
<b>EN 61000-4-6</b>	<b>EN 61000-4-11</b>	<b>EN 61000-3-2 and -3</b>

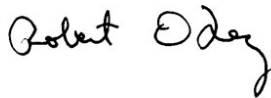
**Place and Date of Issue**  
**Ausstellungsort/-Datum**  
**Lieu et date d' emission**

**Acton, 1 May 2009**

VitalSensors Technologies LLC



Rene Martinez  
 President



Robert O'Leary  
 VP & Chief Technology Officer

## EMC Emissions Conformity

- EN 55022:1998/A1:2000/A2:2003 Class A ITE emissions requirement EU
- ICES-003 Issue 4 Class A Digital Apparatus emissions requirements (Canada)

*This Class A digital apparatus complies with Canadian ICES-003*

*Cet appareil numérique de la classe A est conforme a la norme NMB-003 du Canada*

- FCC 47 CFR Part 15 Class A emissions requirements (USA)

*This device complies with part 15 of the FCC Rules. Operation is subject to the following conditions: 1) This device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation.*

*Note: this equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

- VCCI Class A ITE emissions requirements (Japan)
- AS/NZS CISPR 22:2002 Class A ITE emissions requirements (Australia)
- EN 61000-3-2:2000 Limits for harmonic current emissions (equipment input current up to and including 16A per phase)
- EN 61000-3-3:1995/A1:2001 Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16A

## EMC Emissions and Immunity:

- EN 61326:1997/A1:1998/A2:2001 EMC requirements for Electrical equipment for measurement, control and laboratory use – Industrial and General Use (with the exception of EN 61000-4-4 EFT testing)

## 10. End-User License Agreement for VitalSensors Technologies Software

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### VitalSensors VS-300 Sensor Management Console Software Kit

Important--READ CAREFULLY: This End-User License Agreement (“EULA”) is a legal agreement between you (either an individual or a single entity) licensee of the VitalSensors Technologies *VS-300 Sensor Management Console Software™ (VS-300 SMC)* Software being licensed by VitalSensors Technologies LLC (VITALSENSORS) for the software product (s) identified above (“SOFTWARE PRODUCT or “SOFTWARE”). You may not use the software except in conjunction with a VS-3000 Series Inline Sensor. The SOFTWARE PRODUCT includes computer software, the associated media, any printed materials, and any “on-line” or electronic documentation. By installing, copying or otherwise using the SOFTWARE PRODUCT you agree to be bound by the terms of this EULA. If you do not agree to the terms of this EULA, VITALSENSORS is unwilling to license the SOFTWARE PRODUCT to you. In such event, you may not use or copy the SOFTWARE PRODUCT, and you should promptly contact VITALSENSORS or your reseller for instructions on return of the unused *VS-1000™ and VS-3000™ Sensors and Dashboard* Software for a refund.

---

### SOFTWARE PRODUCT LICENSE

The SOFTWARE PRODUCT is owned by VITALSENSORS and is protected by copyright laws and international copyright treaties, as well as other intellectual property laws and treaties. The SOFTWARE PRODUCT is licensed, not sold and VITALSENSORS retains all rights not expressly granted. You acknowledge and agree that the copyright, patent, trade secret, and all other intellectual property right of whatever kind in the SOFTWARE PRODUCT and *VS-1000™, and VS-3000™ Sensors* and related specifications and documentation shall remain the property of VitalSensors Technologies LLC.

#### 1. GRANT OF LICENSE:

This EULA grants you the following rights:

**Software:** You may install and use one copy of the SOFTWARE PRODUCT on the VITALSENSORS VS-300 Sensor Management Station.

**Network Services:** If the SOFTWARE PRODUCT includes functionality that enables the VS-300 Sensor Management Station to act as a network server, any number of computers may access or otherwise utilize the basic network services of the server. The basic network services are more fully described in the printed materials accompanying the SOFTWARE PRODUCT.

**Storage and Network Use:** You may also store or install a copy of the computer software portion of the SOFTWARE PRODUCT on the COMPUTER to allow your other computers to use the SOFTWARE PRODUCT over an internal network. However, you must acquire and dedicate a license for the SOFTWARE PRODUCT for each computer on which the SOFTWARE PRODUCT is used or to which it is distributed. A license for the SOFTWARE PRODUCT may not be shared or used concurrently on different computers.

**Back-up:** You may make a single back-up copy of the SOFTWARE PRODUCT. You may use the back-up copy solely for archival purposes.

**Right to Audit End User:** VitalSensors reserves the right to audit the end user to verify compliance with the EULA.

## 2. DESCRIPTION OF OTHER RIGHTS AND LIMITATIONS:

**Limitations on Reverse Engineering, Decompilation, and Disassembly:** You may not reverse engineer, decompile, or disassemble the SOFTWARE PRODUCT, except and only to the extent that such activity is expressly permitted by applicable law notwithstanding this limitation.

**Separation of Components:** The SOFTWARE PRODUCT is licensed as a single product. Its component parts may not be separated for use on more than one computer.

**Single COMPUTER:** The SOFTWARE PRODUCT is licensed to a VS-300 Sensor Management Station where the *VS-1000 or VS-3000 Sensors* are installed as a single integrated product. The SOFTWARE PRODUCT may only be used with that VS-300 Sensor Management Station.

**Rental:** You may not rent or lease the SOFTWARE PRODUCT individually. The renting or leasing of a complete VS-300 Sensor Management Station and *VS-1000 or VS-3000 Sensors* as a system where the SOFTWARE PRODUCT is one component is allowed however.

**Software Transfer:** You may permanently transfer all of your rights under this EULA only as part of a sale or transfer of the VS-300 Sensor Management Station and *VS-1000 or VS-3000 Sensors* provided you retain no copies, you transfer SOFTWARE PRODUCT (including all component parts, the media and printed materials, any upgrades, this EULA and, if applicable the recipient agrees to the terms of this EULA. If the SOFTWARE PRODUCT is an upgrade, any transfer must include all prior versions of the SOFTWARE PRODUCT.

**Termination:** Without prejudice to any other rights, VitalSensors may terminate this EULA if you fail to comply with the terms and conditions of this EULA. In such event, you must destroy all copies of the SOFTWARE PRODUCT and all its component parts.

### 3. UPGRADES:

If the SOFTWARE PRODUCT is an upgrade from another VitalSensors product, you may use or transfer the SOFTWARE PRODUCT only in conjunction with that upgraded product and the associated VitalSensors *VS-1000or VS-3000 Sensors*. If the SOFTWARE PRODUCT is an upgrade of a VitalSensors product, you may use that upgraded product only in accordance with this EULA. If the SOFTWARE PRODUCT is an upgrade of a component package of software programs which you licensed as a single product package, the SOFTWARE PRODUCT may be used and transferred only as part of that single product package and may not be separated for use on more than one COMPUTER and ADAPTER.

### 4. COPYRIGHT:

All title and copyrights in and to the SOFTWARE PRODUCT (including but not limited to all images, and text incorporated into the SOFTWARE PRODUCT), the accompanying printed materials, and any copy of the SOFTWARE PRODUCT, are owned by VitalSensors or its suppliers. The SOFTWARE PRODUCT is protected by copyright laws and international treaty provisions. You may not copy the printed materials accompanying the SOFTWARE PRODUCT.

### 5. DUAL-MEDIA SOFTWARE:

You may receive the SOFTWARE PRODUCT in more than one medium. Regardless of the type of medium you receive, you may use only one medium that is appropriate for your single COMPUTER. You may not loan, rent, lease, or otherwise transfer the other medium to another user except as a permanent transfer (as provided above) of the SOFTWARE PRODUCT.

### 6. PRODUCT SUPPORT:

Product support for the SOFTWARE PRODUCT is provided by VitalSensors.

### 7. U.S. GOVERNMENT RESTRICTED RIGHTS:

The SOFTWARE PRODUCT and documentation are provided with RESTRICTED RIGHTS. Use, duplication, or disclosure by the Government is subject to restrictions set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause DFARS 252.227-7013 or subparagraphs (c)(1) and (2) of the Commercial Computer Software - Restricted Rights at 48 CFAR 52.227-19 as applicable. The Manufacturer is VitalSensors Technology LLC, 577 Main St. #105 Hudson MA, 01749.

## 8. EXPORT LAWS AND REGULATIONS:

The end user agrees to comply with the export laws and regulations of the United States and other governing jurisdictions

**FOR THE LIMITED WARRANTIES PLEASE REFER TO YOUR WARRANTY BOOKLET INCLUDED IN THIS PACKAGE OR PROVIDED WITH THE SOFTWARE PRODUCT PRINTED MATERIALS.**

## **11. Standard Terms and Conditions of Sale for VitalSensors Technologies LLC Products**

### **1. CONTRACT:**

All sales transactions are expressly subject to these terms and conditions. Modification or additions will be recognized only if accepted in writing by an officer of VitalSensors Technologies LLC (Seller) or an officially designated representative. Provisions of Buyer's Purchase Order or other documents that add to or differ from these Terms and Conditions are EXPRESSLY rejected. No waiver of these Terms and Conditions or acceptance of others shall be construed as failure of Seller to raise objections.

### **2. QUOTATIONS AND PUBLISHED PRICES:**

Quotations automatically expire 30 calendar days from the date issued unless otherwise stated in the quotation and are subject to withdrawal by notice within that period. Seller reserves the right to extend such quotation up to 6 months from the date of issuance. Prices shown on the published price lists and other published literature issued by Seller are not unconditional offers to sell, and are subject to change without notice. Seller's prices for equipment, unless otherwise specified, do not include an allowance for installation and or final on site adjustment. Prices shall be subject to adjustment to those in effect at time of shipment. Project documents and quotations must not be duplicated or given to third parties with the Seller's consent.

### **3. REPAIR ORDERS:**

In carrying out repair orders, Seller reserves the right to modify prices based on findings which become apparent during the repair order execution. Expenses for estimates of repair and maintenance or for expert instrument or process valuations shall be invoiced to Buyer.

### **4. TAXES:**

Seller's prices do not include any applicable sales, goods and services, use, excise or similar taxes and the amount of any such tax which Seller may be required to pay or collect will be added to each invoice and paid by the Buyer unless the Buyer has furnished Seller with a valid tax exemption certificate acceptable to the taxing authorities prior to shipment. If, upon subsequent sales, use, excise, or similar tax audit, an exemption certificate, provided

to Seller by Buyer is, through no fault of Seller, determined to be invalid, Seller will attempt to acquire a valid exemption certificate, notarized affidavit of exempt use or other necessary documentation from Buyer. If Buyer fails to furnish a valid exemption certificate, notarized affidavit or other necessary documentation, in a timely manner the previously unpaid sales, use or similar excise tax will be billed to and paid by the Buyer.

#### **5. TERMS OF PAYMENT:**

Unless explicitly agreed to elsewhere in writing, terms are 30% at time of order, 70% prior to shipment. Amounts past due are subject to a service charge of 1.5% per month (or fraction thereof) or maximum contract rate permitted by law. If Seller deems that by reason of the financial condition of the Buyer or otherwise, the continuance or production or shipment on the terms specified is not justified, Seller may require full or partial payment in advance. Payment shall be made in United States currency and remitted as set forth in the invoice

#### **6. DELIVERY:**

Delivery dates indicated in the contract documents are approximate and are based on prompt receipt of all necessary information regarding the equipment covered by the contract and down payment. Seller will use reasonable efforts to meet the indicated delivery dates, but cannot be held responsible for its failure to do so. Title to the equipment and risk of loss shall pass to Buyer upon delivery to a carrier at Seller factory. In the event of any delay in delivery caused by the Buyer, Seller will store and handle all items ordered at the Buyer's risk and will invoice the Buyer for the unpaid portion of the contract price, plus storage, insurance, and handling charges on or after the date which the equipment is ready for delivery. The invoice will be payable in full within 30 days from the invoice date. Seller has the right to make partial shipments and bill for those shipments. The buyer will make payment in accordance with terms referenced in Article 5 above.

#### **7. SHIPPING AND HANDLING CHARGES:**

Shipments are Ex Works Seller. Unless the Buyer elects a freight collect shipment, shipping charges plus the applicable Seller handling charge will be prepaid and billed as a separate item on the equipment invoice.

#### **8. CHANGES:**

Buyer may with the express written consent of Seller make changes in the specifications for equipment or work covered by the contract. In such event the contract price and delivery dates shall be equitably adjusted. Seller shall be entitled to payment for reasonable profit plus costs and expenses incurred by it for work and materials rendered unnecessary as a result of such changes and for work and materials required to effect said changes.

## **9. CANCELLATION AND RETURN OF EQUIPMENT:**

Undelivered parts of any order may be canceled by the Buyer only with the written approval of Seller. If the Buyer makes an assignment for the benefit of creditors, or in the event that Seller for any reason feels insecure about the Buyer's willingness or ability to perform, Seller shall have the unconditional right to cancel this sales transaction. In the event of any cancellation of this order by either party, the Buyer shall pay to Seller the reasonable costs and expenses (including engineering and technician expenses and all shipping costs and commitments to its suppliers and subcontractors) incurred by Seller prior to receipt of notice of such cancellations, plus Seller's usual rate of profit for similar work. The minimum cancellation charge shall be 15% of the contract price.

Products that are substantially customized for a Buyer's specific application and at Buyer request cannot be cancelled.

## **10. SECURITY INTEREST:**

Buyer agrees to pay for the equipment according to Seller's payment terms and does hereby grant to Seller a purchase money security interest in the equipment until such time as it is fully paid. Buyer will assist Seller in taking the necessary action to perfect and protect Seller's security interest. In the event of a default by Buyer, Seller shall be entitled to any of the rights and remedies provided by law, including but not limited to repossession of the equipment.

## **11. DEFAULT:**

Upon default and placing of the buyer's account for collection or repossession of equipment, the Buyer agrees to reimburse collection cost, legal fees, and court cost incurred by Seller in connection therewith.

## **12. WARRANTIES:**

**ABSENT A SEPARATE WARRANTY ISSUED TO BUYER BY SELLER, SELLER EXPRESSLY WARRANTS THE EQUIPMENT MANUFACTURED AND THE SERVICES PERFORMED BY IT TO BUYER SOLELY AS SET FORTH HEREIN. SELLER DISCLAIMS ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED (INCLUDING WITHOUT LIMITATION WARRANTIES AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE). THESE WARRANTIES MAY BE TRANSFERRED TO A SUBSEQUENT PURCHASER OF THE EQUIPMENT ONLY WITH THE PRIOR WRITTEN CONSENT OF SELLER. IN ADDITION, THE FOLLOWING SHALL CONSTITUTE THE SOLE AND EXCLUSIVE REMEDIES OF BUYER FOR ANY BREACH BY SELLER OF ITS WARRANTY HEREUNDER.**

#### **A. PRODUCT –**

Seller warrants that the equipment covered by this warranty will be free from defects in workmanship and materials, under normal use, for a period of 12 months from the date of shipment to Buyer. Should any such defects be found and reported during the term of the warranty, Seller will, at its option, grant a fair price reduction or correct such defects, furnishing replacement parts and labor free of charge to Buyer. Seller will also furnish travel up to 80 kilometers (50 miles) from the nearest Seller service representative or authorized Seller service provider free of charge during the warranty period.

#### **B. SOFTWARE –**

Seller warrants that software developed by Seller will perform substantially the functions described in the software documentation when properly installed. Seller does not warrant that the software is error-free, that Buyer will be able to operate the software without interruption, or that the software will be free of vulnerability to intrusion or attack. The warranty period will be the same as the warranty period for Seller equipment within which the software is embedded. If the software is not embedded within Seller equipment, the terms and conditions of the respective end user license agreement of Seller shall apply exclusively. If no end user license agreement is applicable, the warranty period will be 90 days from the date of purchase by Buyer.

#### **C. SERVICE –**

Seller warrants that services will be performed in a workmanlike manner in conformity with standard industry practice. Should any nonconformity be detected within 30 days after the work is completed and prompt notification is made by Buyer in writing to Seller, Seller will supply the necessary service, direction or consultation to correct the nonconformity.

#### **D. GENERAL –**

The foregoing warranties are further subject to the following general conditions:

- (1) Buyer giving immediate notice in writing of any defects that have occurred. Buyer shall prove immediately the presence of a defect; in particular he shall make available immediately to Seller all material, installation drawings and data in his possession.
- (2) Consumables, accessories, normal wear and tear, wear parts and perishables are expressly excluded from the foregoing warranties.
- (3) If Buyer requests the performance of warranty work provided for under the foregoing warranties during other than normal Seller work periods, Buyer will be required to pay for all premium time.

- (4) These warranties will not apply where Seller's equipment and/or software has been subjected to: accident, alteration, misuse, abuse, failure on the part of Buyer to ensure proper storage, operation and/or maintenance, installation or servicing by other than Seller authorized personnel, the addition or supply of equipment not approved for incorporation into Seller's product, integration into the Buyer's environment, or Buyer/ third party supplied software or interfacing.
- (5) Seller's warranty obligation shall not extend to any defects due to assembly and installation work not undertaken by Seller, inadequate equipment, or due to non-compliance with installation requirements, use of non-approved process connections and operating conditions, overloading of parts in excess of design values in Seller's product specifications, negligent or faulty handling or the use of inappropriate materials, nor for defects in materials attributable to material supplied by the buyer. Nor shall the Seller be liable for damage due to acts of third parties or excess voltages and chemical influences.
- (5) Products of other manufacturers sold by Seller as such are warranted by Seller solely to the extent of any remaining warranty provided by the original manufacturer.
- (6) In the event equipment is repaired by Seller, the performance of such repair work will not extend existing nor generate new warranty coverage for the equipment as a whole or for those parts not repaired or replaced by Seller.

#### **E. METHODS OF CORRECTION OF DEFECTS DURING WARRANTY –**

To correct defects Seller may attempt to diagnose and resolve the defect over the telephone or electronically. Certain equipment contains remote support capabilities for direct problem reporting, remote problem determination, and resolution with Seller. When Buyer contacts Seller for warranty work, it must follow the problem determination, resolution and procedure that Seller specifies. At any time following or to assist in problem determination, Seller may require return of the part or product to depot for service. If Seller determines on-site work is required, a service technician will be scheduled for on-site work. If Buyer gives notice of a defect to Seller and requests Seller for on-site work when the defect could have been remedied remotely, or if Seller responds to Buyer's notice of defect and no defect is found for which Seller is liable, Seller shall be entitled to compensation for any work performed and costs it has incurred as a result of Buyer's request. Seller encourages Buyer to use available remote support technologies. Failure to install and use available remote connectivity tools and equipment for direct problem reporting, remote problem determination and resolution may result in increased response-time and additional costs to Buyer.

#### **12. INDEMNITY:**

Seller agrees to indemnify Buyer and hold it harmless from and against any direct loss suffered and any direct liability to third parties whenever such loss or liability is directly due to bodily injury (including death) to any third party or direct damage to any third party

property occurring in the course of, and caused exclusively by, any negligent act or omission by Seller on the premises of Buyer that occurs in the performance of the work contemplated herein. This indemnity shall include reasonable legal fees and settlements of claim or suit. Buyer shall provide prompt written notice to Seller of any actual or anticipated claims against it that might trigger the foregoing indemnity; failure to do so waives Buyer's right to indemnification hereunder. Following such written notice, Seller shall have the sole and exclusive right to manage the defense of any indemnified claims and shall be authorized to settle or compromise such claims at its sole and exclusive discretion. Buyer shall cooperate in the defense of all indemnified claims as deemed necessary by Seller.

### **13. PATENT INFRINGEMENT:**

Seller shall defend any suit or proceeding brought against Buyer so far as the same is based on a valid claim that any Equipment of Seller's design furnished hereunder, or any part thereof, constitutes an infringement of any applicable patent, if notified promptly in writing and given authority, information and assistance (at Seller's expense) for the defense of the same and if such alleged infringement is not the result of a design or other special requirement specified by Buyer or the result of the application of the use to which such Equipment is put by Buyer or others. Seller will pay all damages and costs finally awarded in such suit or proceeding against Buyer provided that Seller has the sole and exclusive right to defend, settle or compromise any suit or proceedings and Buyer takes no action that would materially detract from Seller's ability to conduct an effective defense, settlement or compromise. In such case Equipment or part in such suit held to infringe any such patent and the use thereof is enjoined, Seller will at its expense either, at its option; (a) obtain for Buyer the right to continue using such Equipment or part or; (b) replace the same with non infringing Equipment, or; (c) modify the same so that it becomes non infringing or; (d) remove said Equipment and refund the purchase price and the transportation and installation costs thereof. The foregoing states the entire liability of Seller to Buyer for patent infringement.

### **14. REGULATORY LAWS AND OR STANDARDS:**

The performance of the parties hereto is subject to the applicable laws of the United States or Canada, depending on the location of delivery of the product or service. Seller takes reasonable steps to keep its products in conformity with various nationally recognized standards and such regulations, which may affect its products. However, Seller recognizes that its products are utilized in many regulated applications and that from time to time standards and regulations are in conflict with each other. Seller makes no promise or representation that its product will conform to any federal, provincial, state or local laws, ordinances, regulations, codes or standards except as particularly specified and agreed upon for compliance in writing as a part of the contract between Buyer and Seller. Seller prices do not include the cost of any related inspections or permits or inspection fees.

**15. INTELLECTUAL PROPERTY:**

The sale and delivery of Seller's equipment and/or software to Buyer will in no way transfer to Buyer any right of ownership in any patents, copyrights, trademarks, technologies, designs, specifications, drawings, or other intellectual property incorporated into the equipment and/or software.

**16. DISCLAIMER:**

OF DAMAGES: IN NO EVENT SHALL SELLER BE LIABLE FOR ANY TYPE OF SPECIAL CONSEQUENTIAL, INCIDENTAL OR PENAL DAMAGES, WHETHER SUCH DAMAGES ARISE OUT OF OR ARE A RESULT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE. Such damages shall include but not be limited to loss of profits or revenues, loss of use of the equipment or associated equipment, cost of substitute equipment, facilities, down time costs, increased construction costs or claims of Buyer's customers or contractors for such damages. Buyer agrees that in the event of a transfer, assignment, or lease of the equipment sold hereunder Buyer shall secure for Seller the protection afforded to it in this paragraph.

**17. LIMITATION OF LIABILITY:**

Seller will not be liable for any loss, claim, expense or damage caused by, contributed to or arising out of the acts or omissions of Buyer and third parties, whether negligent or otherwise. In no event will Seller's aggregate liability for any and all types of damages or losses related to this agreement or the products or services sold or delivered pursuant hereto exceed the cost of the item giving rise to the claim, whether based in contract, warranty, indemnity, or tort (including negligence). Any suit arising hereunder must be commenced within one year from the date on which the cause of action accrues.

**18. NO RESPONSIBILITY FOR GRATUITOUS INFORMATION OR**

ASSISTANCE: If Seller provides Buyer with assistance or advice which concerns any parts, products, service supplied hereunder or any system or equipment in which any such part product service may be installed and which is not required pursuant hereto, the furnishing of such assistance or advice shall not subject Seller to any liability, whether based in contract warranty, tort (including negligence) or otherwise.

**19. INTERPRETATION:**

Should any term or provision contained in the contract contravene or be invalid under applicable law, the contract shall not fail by reason thereof but shall be construed in the same manner as if such term or provision had not appeared therein.

**20. INSURANCE:**

Upon request, Seller shall provide evidence of insurance in accordance with its standard coverage and limits. Seller does not provide third parties direct access to its insurance or give additional rights to its insurance, such as naming additional insured parties.

**21. FORCE MAJEURE:**

The inability of Seller to fulfill its obligations required under these terms and conditions resulting from defaults or delays caused by conditions beyond Seller's reasonable control including, but not limited to strikes, insurrection, acts of God, war, terrorist activities, emergencies, shortages or unavailability of materials, weather, change in law or other similar causes, will extend the period for the performance of the obligations for the period equal to the period(s) of any such delays(s) and Buyer will not have the right to termination; provided that Seller will continue to perform to the extent feasible in view of such force majeure.

**22. EXPORT CONTROL:**

Buyer acknowledges that the equipment may include technologies and software that are subject to export control regulations in Europe or the United States of America or countries in which the equipment is delivered or used. The Buyer is solely responsible for adherence to these restrictions in case the Buyer exports or re-exports the equipment and the Buyer agrees to indemnify and hold Seller harmless from, or in connection with, any violation of such export restrictions by Buyer, or its employees, consultants, agents, or customers.

**23. GOVERNING LAW AND PLACE OF JURISDICTION:**

The legal relationship between Buyer and Seller shall be governed by the laws of the United States of America. Exclusive place of jurisdiction shall be Boston, Massachusetts. Seller however reserves the right to initiate court proceedings against the Buyer at any other court of competent jurisdiction. The United Nations Convention on Contracts for the International Sale of Goods is explicitly excluded