AccuSense F900 Air Velocity and Air Temperature Sensor

User Manual

Table of Contents

MN001-A

DegreeC Warranty Information

Warranty:
DegreeC warrants its products to be free from defects in material and workmanship for a period of one (1) year from date of shipment. This is the only warranty made by DegreeC and can be amended only by written instrument signed by a duly authorized employee of DegreeC located in DegreeC's plant. DegreeC's warranty herein above set forth shall not be enlarged, waived, diminished or affected by and no obligation or liability shall arise or grow out of DegreeC's rendering of technical advice or service in connection with Buyer's order or the goods furnished hereunder. This warranty is invalid if the products have been misused, modified, adjusted or otherwise operated outside specifications.

Remedies and Damages:
If the goods furnished by DegreeC fail to conform with the warranty set out above, DegreeC's sole and exclusive liability shall be at DegreeC's option, (i) to repair or replace any such goods as hereinafter provided, or (ii) to credit Buyer's account for any such goods upon their return by Buyer, and for transportation charges prepaid by Buyer, provided that (a) DegreeC is promptly notified in writing upon discovery of such defects by Buyer with a detailed explanation of any alleged deficiencies, and (b) DegreeC's examination of such unit shall disclose, to its satisfaction that such defects have not been caused by misuse, neglect, improper installation, repair, alteration, accident, use of the equipment not meeting DegreeC's specification or any cause beyond the range of normal usage. Under no circumstances shall DegreeC be liable for loss of profits, loss of use, or consequential damages of any kind arising in connection with the use or inability to use our products. DegreeC's liability shall be for the above periods from date of shipment to original Buyer unless otherwise stated.

Returns:
Within the above time period any part of the goods that prove to be defective in material or workmanship may be repaired or replaced on an exchange basis with a new or functionally operative part free of charge.

After such warranty period, any labor, travel time, transportation and subsistence expense shall be borne by the Buyer. If preferred, Buyer may return goods to DegreeC's manufacturing plant with shipment both ways at Buyer's expense for repair work.

Parts returned damaged due to poor or insufficient packaging by the Buyer will not be accepted for service unless otherwise agreed.

Any time parts are returned where no problems are found, a service/handling charge, which will reflect the labor to test and verify the parts as well other incurred expenses, will be borne by the Buyer.

In no event shall DegreeC be liable for incidental or consequential damages, including, but not limited to, costs, or removal and reinstallation or such goods, goodwill, overhead expenses, loss of profit, and loss of use. The remedies are available only to the original Buyer. Buyer agrees to accept billing for service expense for service call resulting from other than a DegreeC goods failure or other DegreeC fault.

Modification of Terms and Conditions: No addition to or modification of any of the provisions herein shall be binding upon DegreeC unless made in writing and signed by a duly authorized employee of DegreeC located in DegreeC's plant.

Disclaimer: Due to design changes and product improvements, information in this manual is subject to change without notice. DegreeC reserves the right to change hardware and/or software design at any time, which can affect the contents of this manual.

MN001-A

AccuSense F900 Air Velocity & Air Temperature Sensor Introduction

The AccuSense F900 Air Velocity and Air Temperature Sensor is a product based on DegreeC's thermal anemometer technology. In addition to air at ambient pressure conditions, it can also be used in other inert gases. For details and compensation factors please contact AccuSense.

The F900 series offers both linearized airflow and air temperature readings taken by separate sensors only millimeters apart, which allows simultaneous measurement in real time. DegreeC has developed a new temperature compensation algorithm for this OEM sensor, which reads airflow accurately from 15-35°C at ambient pressure conditions. Applications include biological safety cabinets, animal cages, process control, electronics cooling, HVAC, and isolation rooms.

Theory of Operation: The AccuSense F900 Sensors use thermal anemometer technology, which measures heat loss from a heated device. Two thermistors on the sensor head detect airflow and ambient temperature simultaneously. The airflow reading is then compensated for temperature within the specified calibration range, linearized, and made available at the output. Each sensor is individually calibrated, which makes the F900 fully interchangeable.

Operator assistance is available weekdays from 9:00 AM to 5:00 PM Eastern Time to provide Customer Service and Technical Support. Assistance is also available from AccuSense Sales Representatives and Distributors throughout the world. Please check our web site for the representative or distributor in your area.

F900 Notices, Warnings and Cautions

NOTICES, WARNINGS and CAUTIONS:

Below are important notices and safety instructions. Please read carefully, and follow all warnings and instructions marked on the sensor and in this manual.

NOTICE: DO NOT PLUG IN LIVE. ALWAYS TURN POWER OFF PRIOR TO CONNECTING AND DISCONNECTING A SENSOR. FAILURE TO DO SO CAN DAMAGE SENSORS, AND IS NOT COVERED UNDER DEGREEC'S WARRANTY.

NOTICE: DO NOT TRY TO REPAIR AN F900 SENSOR YOURSELF. THERE ARE NO CUSTOMER-SERVICEABLE PARTS INSIDE. OPENING THE CASE VOIDS DEGREEC'S WARRANTY.

CAUTION: Avoid exposing the Sensor to dust, water, and condensing humidity. Water can cause shorts, corrosion, and, at a minimum, inaccurate readings.

CAUTION: Avoid exposing the device to direct sunlight or other heat sources. Do not store the equipment inside a car or trunk exposed to direct sunlight.

WARNING: The sensor is not rated as explosion proof or intrinsically safe.

WARNING: The AccuSense F900 Sensor Series is designed for room air velocity measurement only. Air containing chemicals (for example, hazardous gases) may damage the sensor head permanently. Substances in the air or other gases can change the air's properties and cause a sensor's calibration to be inaccurate.

MN001-A

AccuSense F900 Sensor Head Options & Acceptance Angles

F900 Sensor Head Options
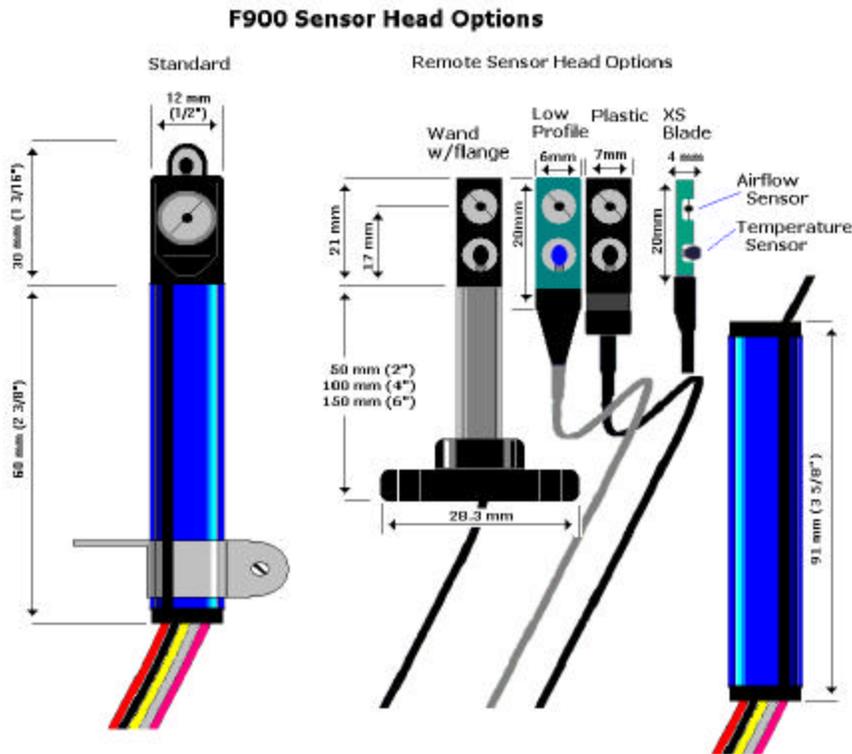
AccuSense F900 Part Numbering

| Identifying the part number: |
| :--- |
| |
| ***F900- V- A- B- S- L*** |
| V_ Velocity Range
   2: 2 m/s
   5: 5 m/s
   10: 10m/s |
| A: Accuracy
   5: ?5% of reading/1% of full-scale
   10: ?10% of reading/1% of full-scale |
| B: Body Type:
   0: Standard (default) – short tube.
   1: Long tube (for extended sensor heads) |
| S:Remote Sensor head options (applies only if B=1): |
| 0: Plastic |
| 1: Low Profile |
| 2: 50 mm (2")SS Wand with Flange |
| 4: 100 mm (4") SS Wand with Flange |
| 6: 150 mm (6") SS Wand with Flange |
| 9: XS Sensor Head |
| L: Length of cable: 2 meter shielded cable (from tube to remote sensor head) |

Sensor Head Acceptance Angles

Standard ?30°
Rod with flange ?30°
Plastic ?30°

Low-profile ?45°

XS Blade ?60°

Length of cable from tube to connector is ?300 mm (12 inches).

6

F900 Block Diagram

MN001-A

www.degreeC.com
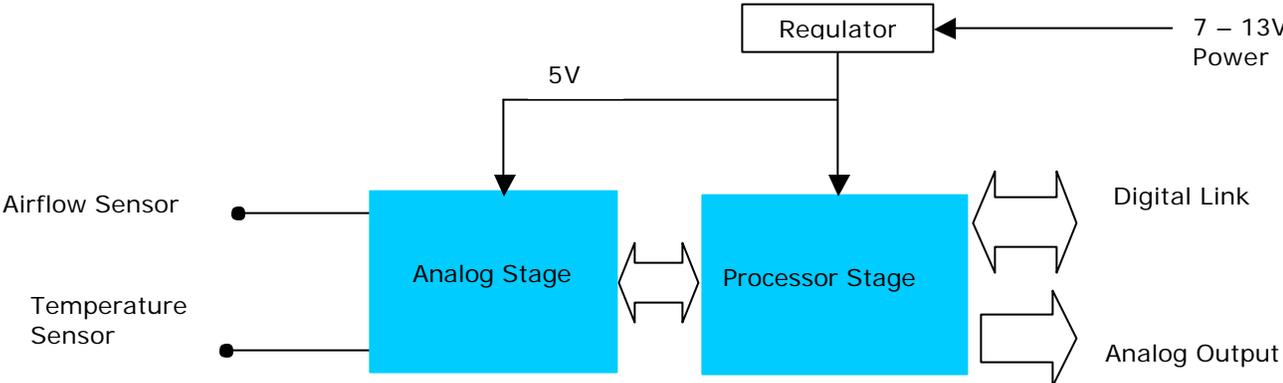
AccuSense F900 Specifications

Electrical Specifications

Standard medium is air at standard pressure (101.3 kPa, 29.95″ Hg). For altitude compensation and use with other gases, please contact AccuSense.	
Supply Voltage:	7-13 VDC
Supply Current:	40-75 mA
Current Loop Load:	**200 ohm minimum(10K ohm nominal) on voltage output**
Time Constant:	**100-200ms**
Warm-up Time:	<5 seconds
Repeatability @ 21°C:	±1% of reading
Operating Temperature:	0 -70°C (32 - 158°F)
Storage Temperature	-10?-100?C

| Output Pin Configuration:		
Black	PIN 1:	Supply Return
Red	PIN 2:	Supply 7-13VDC
White	PIN 3:	Analog Airflow output 0-4 for calibrated range to a max of 4.9vdc beyond calibrated range.
Orange	PIN 4:	Digital output from F900 – 19200 BPS, RS232 protocol, TTL level, 8 bit, 1 stop bit
Yellow	PIN 5:	Digital output to F900 – 19200 BPS, RS232 protocol, TTL levels, 8 bit, 1 stop bit
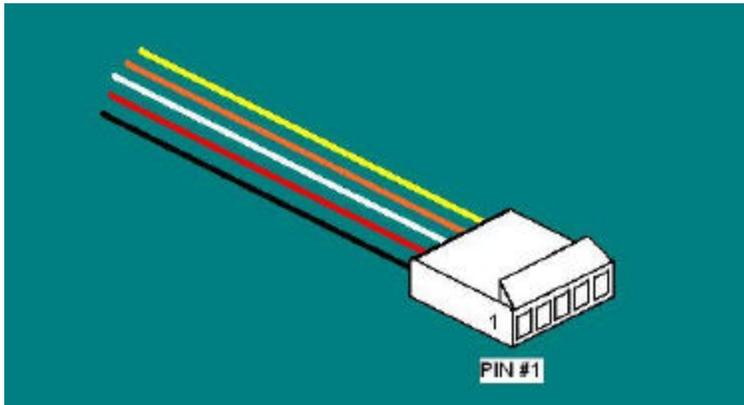
Measurement Specifications

Airflow accuracy:	Option 1	@ 15-35°C	Greater of ±5% of reading or ±0.05m/s (10 fpm) or 1% of full scale
	Option 2	@ 10-60°C	Greater of ±10% of reading or ±0.05m/s (10 fpm) or 1% of full scale
Temperature accuracy:		0-70°C	±1.5C above 1 m/s (200 fpm), ?2.5 degreec below 1 m/s (200 fpm)

*Gas Measurement: **The F900 can be exposed to inert gases such as helium and nitrogen. Please contact customer service for density corrections.***

Mechanical Specifications

Standard Bracket
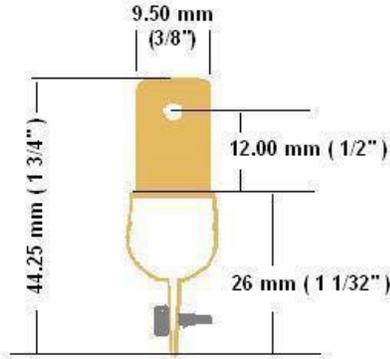
Standard Tube and Probe Head
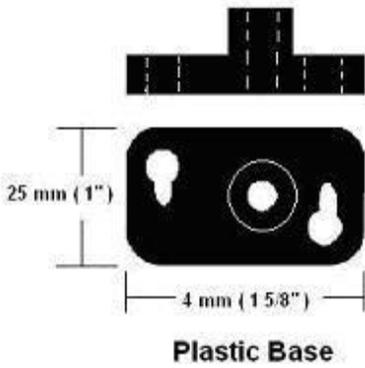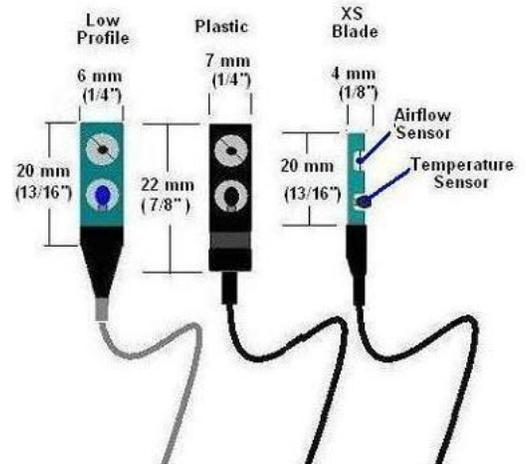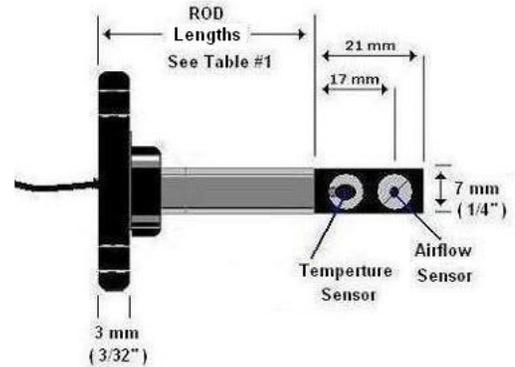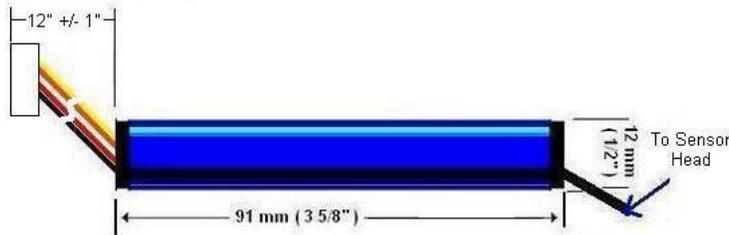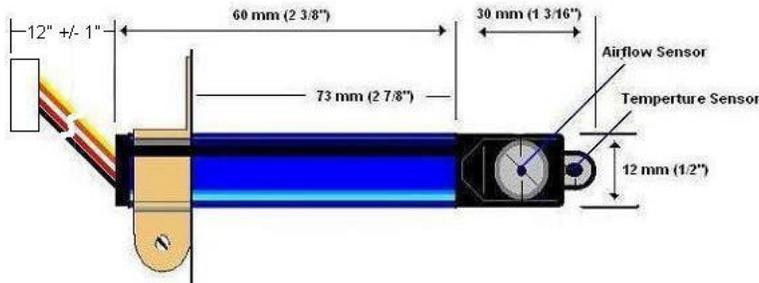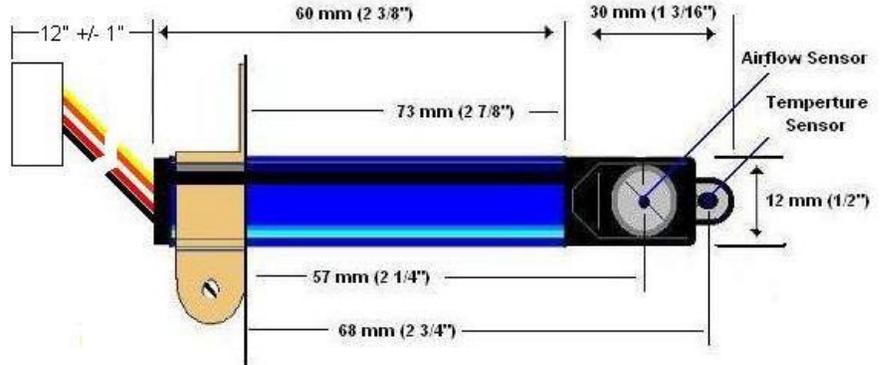
Table #1

Available Rod "ALUM" Lengths

50 mm (2")
100 mm (4")
150 mm (6")

Plastic Base

Connector: *The F900 uses an AMP 5 pin connector part number 22-01-2057. For non-standard cable lengths and custom connector options please contact DegreeC.*

9

AccuSense F900 Serial Data Input/Output User Spec

Electrical Protocol:
The Digital Input/Output is RS232 without the level shift. With 5 Volt logic. Placing a external RS-232 level shift makes the device fully RS-232 compliant. Without the level shift, the customer may hook the digital Input/Output pins directly to their UART (**u**niversal **a**synchronous **r**eceiver-**t**ransmitter), or microprocessor.

Connection Via Serial Terminal:
The sensor may be connected via a serial terminal program such as Hyper terminal, minicom, or Procomm. Serial port settings are 19200 BPS 8N1. Eight data bits, no parity, 1 stop bit.

Valid Serial Commands:

The F900 series works in polled mode as a slave. It will only respond to requests for information.

*E Command
The *E command will provide the time, velocity and temperature

Example:
*E
21:11:35.32 0.000 18.77!CRC=0xDE4

HH:MM:SEC (velocity in m/s) (Temp in degrees C) ! (CRC16 value)

HH is hours since sensor power on
MM is minutes
SEC is seconds. !NOTE! The part after the decimal point is 64ths of a second, not 100ths

Velocity is in meters per second.

Temp in Degrees C

the "!" terminates the data

The CRC16 value provides the CRC value of the data up to and including the "!". It does not include the *E that would be echoed back to you if the echo is on. the echo would come back, before the data.

*V Command

The *V command will output velocity and temperature data.

Example:

<SD>
<VEL Units="m/s">1.234</VEL>
<TEMP Units="C">21.5</TEMP>
</SD>CRC=0x1234

The *V command provides the CRC 16 Value of the all data of the <SD> through </SD>

*X Command is provides backwards compatibility to Accutrac version 4.0 and higher.

Format is:

Hour Minute Seconds.Fraction_64   Flow_FPM Temp_Deg_C
Example:

*X
0 1 31.12 520 15.00

The part after the decimal point of the seconds is in 1/64 of a second.

XML output:
The sensor output will be in XML format as specified by ISO 8879
http://www.w3.org/XML/

CRC 16 Value:

The CRC is a CRC 16   that includes all the data including the <SD> and the </SD>.   This will include carriage
returns(CR) and new lines(linefeed/LF).   Since the CRC16 includes carriage returns and newlines, if using a PC,
you must take care to set you set the serial port in RAW mode.   No CR-->LF or LF-->CR translation .

Example code:

```
unsigned short int  SensorClass::CalcCRC16(string CRCData)
{
    unsigned short crc = 0xFFFF;
    unsigned short temp;
    unsigned short quick;
    unsigned char byte;

    for(unsigned int i=0; i < CRCData.size(); i++)
    {
        byte=CRCData[i];

        temp = (crc >> 8) ^ byte;
        crc <<= 8;
        quick = temp ^ (temp >> 4);
        crc ^= quick;
        quick <<= 5;
        crc ^= quick;
        quick <<= 7;
        crc ^= quick;
    }


    return crc;
}
```

AccuSense F900 Interface Board