



S100 Switch User Manual



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1 Information

1.1 Overview

Thank you for your purchase of a DegreeC S100 Switch, a versatile, rugged, high-performance air velocity switch with field-adjustable velocity trip point and push-wire connections for a fast, convenient installation.



The S100 air velocity switch is designed to monitor airflow in ducts, air handling units, and hood and laboratory exhausts to warn of airflow degradation. It is also used in industrial processes and electronics systems and enclosures. The air velocity trip point is user adjustable, and a change or drop in flow is signaled by a relay output and on-board LED indicator.

With robust, spray resistant design, and UV tolerant construction, the S100 airflow monitor handles a wide range of applications where AC or DC supply voltages are encountered, or extreme environments down to -15°C (5°F). The S100 switch is manufactured as non-directional and will sense flow from either direction. Additionally, it is configured to order with your choice of 5-12VDC or 24VAC/VDC supply input and Normally Closed (N.C.) or Normally Open (N.O.) relay output alarm.

Installation is fast and easy with included mounting bracket options, convenient push-wire connections, and user-accessible trip point adjustment. Simply mount the S100, make electrical connections to the device, and then dial in the desired velocity trip point with the S100 installed in its application environment. The trip point is adjusted via a potentiometer, and positive stops at both ends of travel provide the user with a clear, well-defined range of adjustment. The high-performance S100 switch sets a new standard for ease of integration and in-the-field programmability.

1.2 Features

1.2.1 Mechanical Features

- User-accessible, single-turn potentiometer to set the air velocity trip point.
- Easy duct mounting, with two bracket options (parallel and perpendicular to sensor).
- Push-wire connections for fast installation.
- Optimized flow geometry with segregation of velocity and temperature elements for highest accuracy.
- Best in class acceptance angle performance.
- Robust probe assembly uses UV resistant materials.
- Red/green LED indication for power, alarm, and damaged sensor conditions.
- RoHS compliant

1.2.2 Electrical & Performance Features

- Trip point repeatability within $\pm 5\%$.
- Temperature compensated up to 60°C (140°F).
- Field-adjustable air velocity trip point.
- Choice of 5-12VDC or universal 24VAC/VDC input.
- Isolated relay signal output.
- <15 second warm up time above 0°C (32°F).

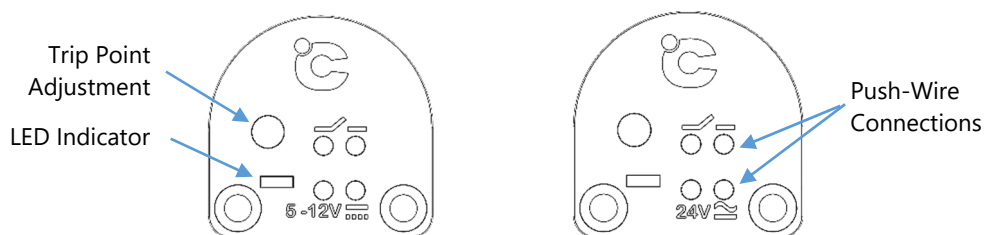


Figure 1 5-12VDC and 24VAC/DC Versions of the S100 Switch are Available.

2 Specifications

2.1 General

The S100 Switch monitors airflow. The LED indicator lights green when there is good airflow and lights red for an alarm condition. The relay output signals an alarm condition.

Item	Rating	
Velocity Range	0.15m/s to 20m/s (30fpm to 4,000fpm)	
Operating Temperature	-15°C to 60°C (5°F to 140°F)	
Storage Temperature	-40°C to 105°C (-40°F - 220°F)	
Relative Humidity	5-95% non-condensing	
Acceptance Angle	± 30°	
	5-12VDC Version	24VAC/VDC Version
Input Voltage	4.5 -13.5VDC	24VAC/VDC +/- 10%
Current Consumption	<125mA at 12VDC	<42mA at 24VDC
Alarm Delay	10 sec	
Recovery Point	15% deviation from trip point	
Trip Point Repeatability	±5%	
Trip Point Range	0.5m/s to 20m/s (100fpm to 4000fpm)	
Warm Up Time	< 15 sec < 15 sec (temperatures 0°C to 60°C (32°F to 140°F)) < 60 sec (temperatures <0°C (32°F))	
Response Time	10 sec	
Relay Output	Mechanical Relay - N.C. or N.O. N.C. (Standard Configuration) No Power – Contacts Open Flow Above Trip Point – Contacts Closed Flow Below Trip Point – Contacts Open N.O. No Power – Contacts Closed Flow Above Trip Point – Contacts Open Flow Below Trip Point – Contacts Closed 250VAC, 2A, 125VA Max or 220VDC, 2A, 60W Max Contact Impedance: 75mΩ max (initial) Insulation Resistance: 1000MΩ @ 500VDC Withstanding Voltage: 1500VAC for 1 minute (contact to coil)	

LED Indicator States	Green ON continuously when powered if there is no alarm condition Green ON - Flow Above Trip Point Green blinking¹ – Trip Point Set Mode Active or Trip Point Set Red blinking - Flow Below Trip Point Red ON - Damaged sensor or heater error
Wire Gauge	20 - 26 AWG solid core wire
Dimensions	See Appendix
Housing Construction	Polycarbonate (PC), UL94-V0

**In startup, the internal processor drives the output relay contacts closed for the N.C. configuration if there is good airflow and no alarm condition, or open for the N.O. configuration if there is good airflow and no alarm condition.*

Temperature Compensation: The S100 Switch is a thermal airflow switch; it is sensitive to changes in air density and measures velocity with reference to a set of standard conditions (21°C (70°F), 760mmHg (101.325kPa), and 0%RH). The S100 has been designed to automatically compensate for temperature effects up to 60°C.

Note: By default, all S100s are set to low side trip point alarming. If you need to operate outside of the standard parameters, call Degree Controls to discuss available customizations for volume orders.

2.2 Hardware Configuration

The S100 Switch is configured to order, with choices for supply voltage and relay output alarm. The part number format is S100 – S – O, where S represents supply voltage and O represents relay output configuration.

S100 – S – O

S = Supply Voltage

1 = 5-12VDC

2 = 24VAC/VDC

O = Output

1 = Normally Closed (N.C.)

2 = Normally Open (N.O.)

2.3 Field Adjustable Velocity Trip Point

The S100 features a user-accessible velocity trip point adjustment, allowing the user to dial in the desired trip point with the S100 installed in its application environment. Adjustment is linear, and positive stops at both ends of travel provide the user with a clear, well-defined range of adjustment.

Definitions and examples related to the S100 trip point are listed below:

- **Trip Point** – determines the point at which the switch will trip and open/close.
- **Alarm Delay** – defines the amount of time after the trip point has been passed before the alarm is triggered.

- **Recovery Point** – the point at which the switch moves out of its alarm state and reverts to normal state.
- **Alarm below the trip point** – The example below is for illustration only with the trip point set to 400 fpm and a 15% recovery point.

The switch will alarm when the velocity is less than 400 fpm, and the alarm delay time has been exceeded. The alarm will clear when the velocity goes above the recovery point of 460 fpm.

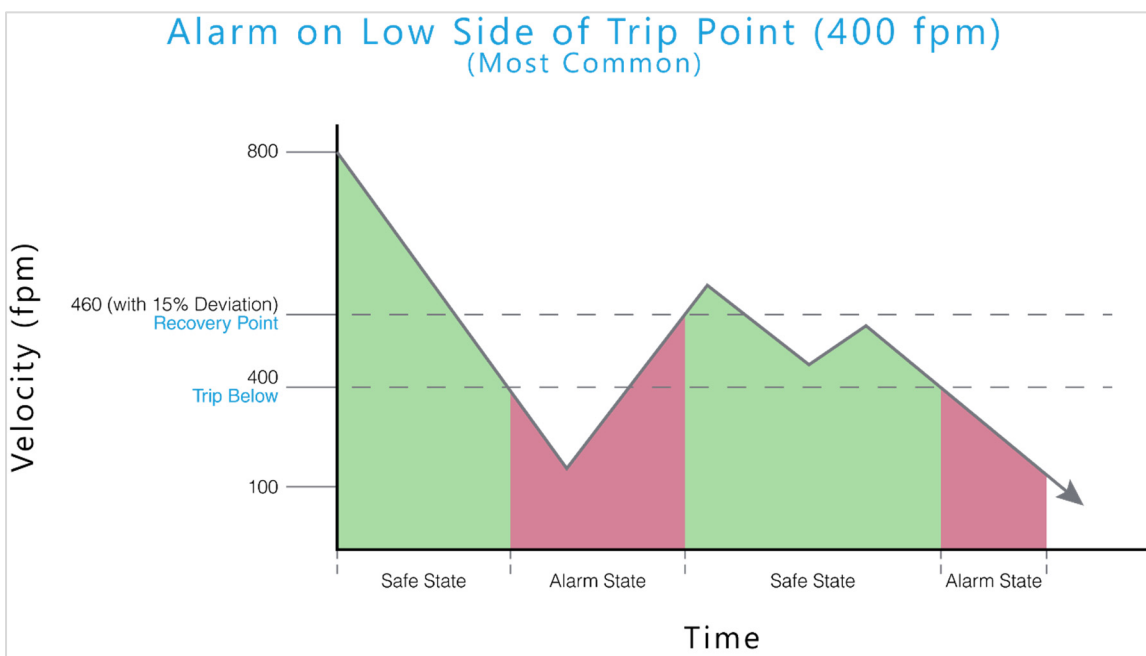


Figure 2 Example Trip Point Configuration – Alarm on Low Side of Trip Point

3 Connector and Wiring Information

The S100 employs push-wire connections for fast, convenient installation. Use 20AWG to 26AWG solid core wire with a maximum insulation diameter of 1.6mm [0.06in].

Note: If you wish to connect to the S100 using wire ferrules, Phoenix Contact 3200645 is suggested.

3.1 Connector Pinout

Input Voltage			Relay Output	
	5-12VDC Version	24VAC/VDC Version	Pin	Description
Pin	Description	Description		
1	5-12VDC	24VAC/VDC	1	Relay 1
2	5-12V Return	24V Return	2	Relay 2

See connector pinouts below.

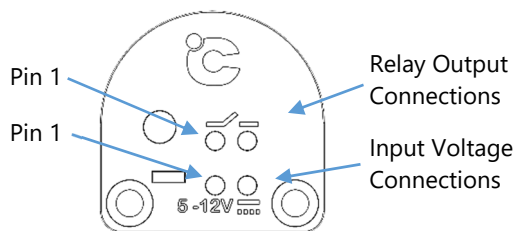


Figure 3 Connections, 5-12VDC Version

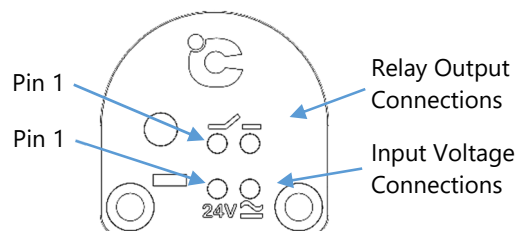


Figure 4 Connections, 24VAC/VDC Version

3.2 Wire Insertion and Extraction

Insulation strip length for 20/22/24/26AWG wires is recommended to be 3.5mm [0.14in] to 4.5mm [0.18].

For wire insertion, push the wire with insulation through the hole in the S100 base plate until the stop face is reached. Take care to stop pushing as soon as the stop face is reached as over insertion can buckle small diameter wires.

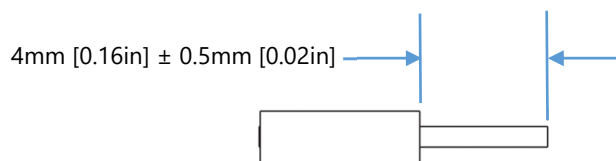


Figure 5 Wire Strip Length

For wire extraction, gently rotate the wire, while pulling, until extraction is complete. Tools are not required for wire extraction.

4 Installation

4.1 Airflow Direction

To ensure that the Switch actuates within its published specifications, proper mounting precautions must be followed:

- The main airflow cavity that surrounds the flow thermistor must be orientated perpendicular to the airflow being monitored.
- When monitoring air velocity within a pipe or duct, mount the sensor so that the main flow cavity is in the center of the pipe or duct. Avoid mounting the sensor in turbulent locations caused by elbows or duct size changes. The sensor should be located in the best laminar (stable) flow possible and placed at least two duct diameters away from duct elbows and constrictions. Follow ASHRAE best practices.

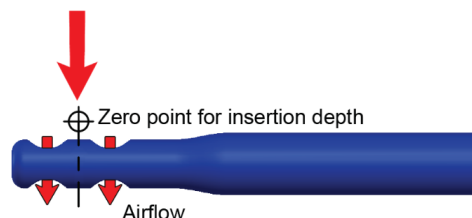


Figure 6 Direction of Airflow

4.2 Mounting Bracket Installation

In the case of a duct installation, drill a 13mm [0.51in] hole through the surface for the sensor housing, and drill two 4.3mm (0.17") pilot holes for the bracket. Insert the sensor into the bracket and secure the bracket to the surface using two screws. See the Appendix for mechanical drawings.

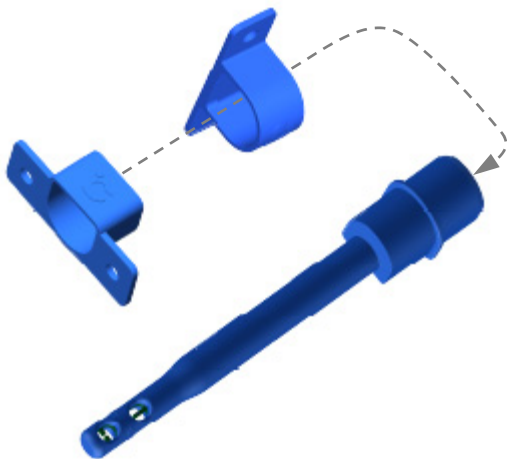


Figure 7 Two Bracket Options, Parallel or Perpendicular to Sensor



Figure 8 S100 Installed in Clamp End Mount

4.3 Installation

1. Determine the mounting location and note the direction of airflow marked on the sensor.
2. Select the appropriate mounting flange. Two styles are provided, and both may be mounted on either side of the sensor flange. For a permanent connection, a plastic adhesive may be used.
3. The S100 is a 4-wire device, with 2 wires for power and 2 wires for the alarm output. It employs push-wire connections for fast and easy termination.
4. Mount the S100 and make wiring connections. With mounting and wiring complete, ensure airflow is at the desired velocity.
5. Apply power, and note the following:
 - The LED indicator lights green upon startup for approximately 10 seconds to indicate that the switch is powered.
 - The LED indicator then lights green for good airflow or red for an alarm condition (blinking red for low flow, solid red for sensor error).
6. Set the velocity trip point by adjusting the potentiometer CW and CCW (clockwise and counterclockwise) to zero in on it:

When the potentiometer is first turned, it initiates a 10 second internal timer and the LED blinks green 3-4 times to indicate that trip point set mode is active. While in set point mode, the 10 second timer will restart whenever the potentiometer is turned. When the 10 second timer expires, the LED blinks green again to confirm that the trip point has been set.

- If the LED indicator remains green after power up:
 - Turn the potentiometer slowly CW until the LED blinks red, for an alarm condition.
 - Turn the potentiometer again slowly CCW until the LED lights green.
- If the LED indicator blinks red after power up, turn the potentiometer slowly CCW until the LED lights green.

The S100 is now commissioned and ready for operation. The S100 goes into alarm when the flow drops below the set point for 10 seconds or more. It will automatically clear the alarm if flow rises 15% or more above the trip point, for more than 10 seconds.

4.4 Troubleshooting

Symptom	Possible Cause	Corrective Action
Switch does not respond, LED indicator does not light	No power	Check input voltage.
LED indicator blinks red	Low airflow	Resolve issue causing low airflow.
	Turbulent airflow	Find a new location for the sensor. The sensor will see more stable airflow as it is distanced from the source of turbulence.
Switch does not trip	Airflow is out of range	Use a handheld measuring instrument to verify airflow.

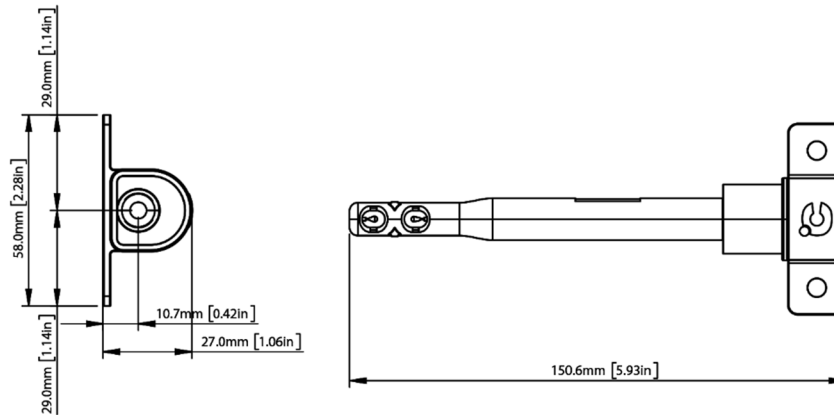


Figure 11 S100 with Clamp Side Mount

5.1.2 Mounting Brackets

The S100 can be configured with either an end mount or side mount bracket. The end mount bracket provides a mounting flange surface that is parallel to sensor airflow, while the side mount bracket provides a mounting flange surface that is perpendicular to sensor airflow. Bracket drawings are shown below.

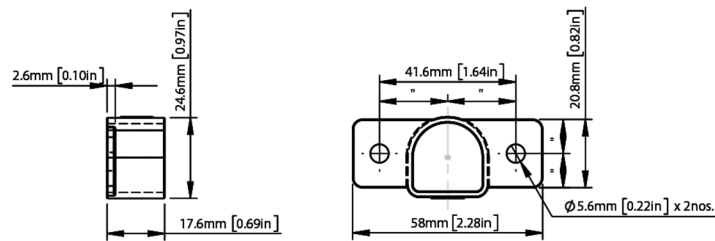


Figure 12 Clamp End Mount

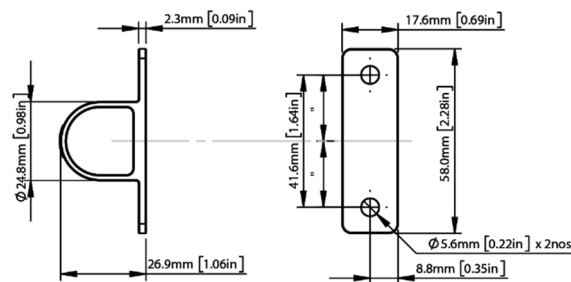
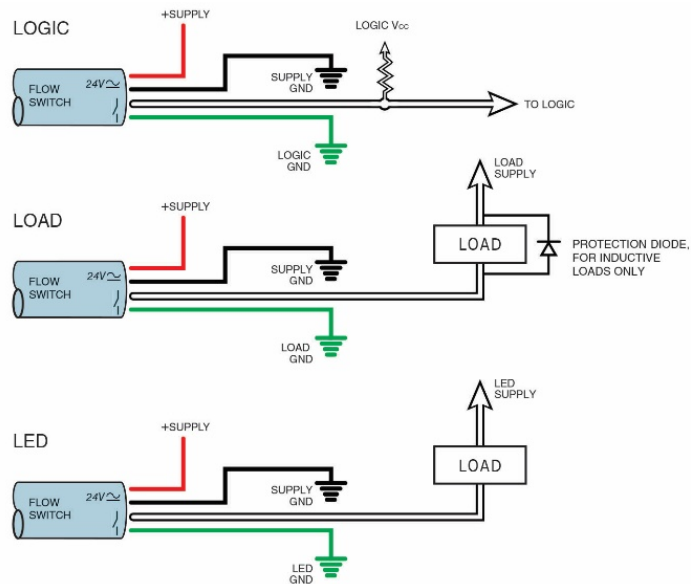


Figure 13 Clamp Side Mount

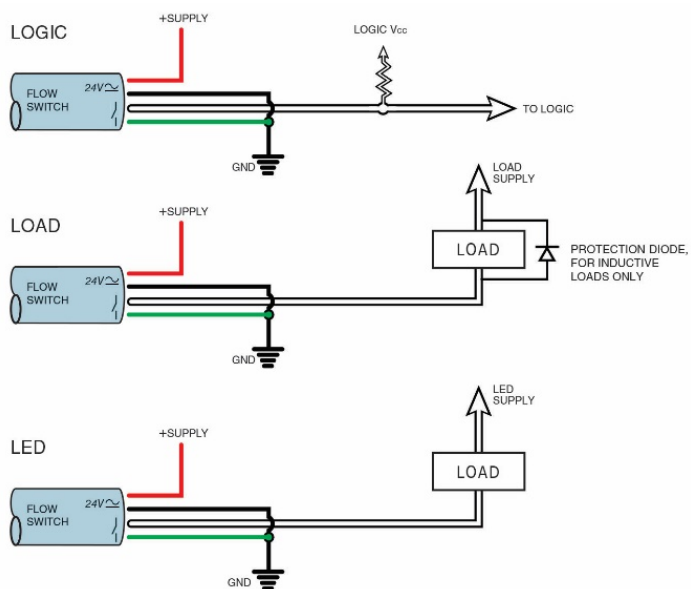
5.2 Wiring Diagrams

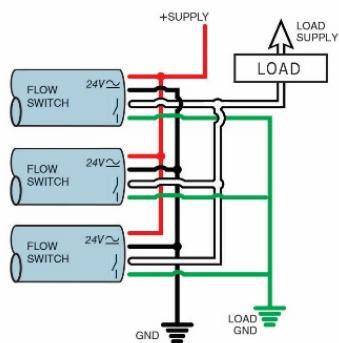
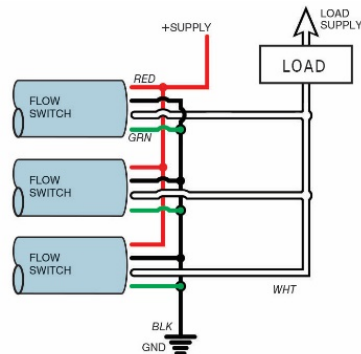
Wiring diagrams for the mechanical relay output in various installation scenarios are included below.

Isolated Grounds



Non-Isolated Grounds



Multiple Isolated Grounds*Multiple Non-Isolated Grounds*

5.3 Timing

Warm up time for the S100 includes initial startup delay, sensor heat up time, and alarm delay time.

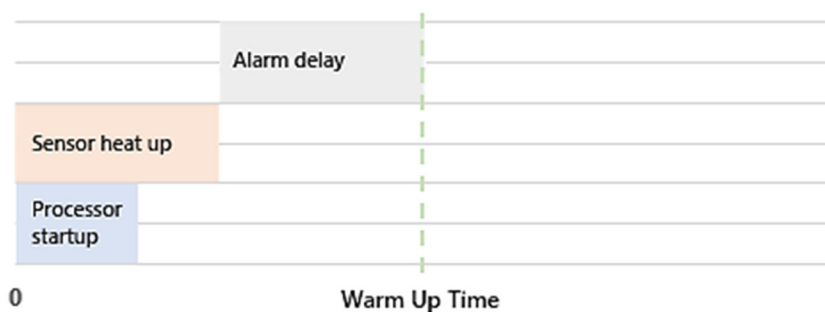


Figure 14 Warm Up Time

Warm up time could be longer, or the sensor may not start up, if the sensor is used outside of manufacturer's specifications. For example, the sensor may not start up at a velocity of 10m/s (2000fpm) at -20°C (-4°F), a higher velocity at a colder temperature.

Processor startup time – Processor startup time, or initial startup delay, is the time it takes for the relay to find its position once input voltage is applied to the sensor.

Sensor heat up time – Sensor heat up time is the time it takes for the sensor to heat up for normal operation.

Alarm delay – Alarm delay defines the amount of time after the trip point has been passed before the alarm is triggered.

6 Degree Controls Inc. Product Warranty

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