



ENGLISH

# Model HFS

## INSTALLATION, OPERATION & MAINTENANCE MANUAL



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## 1. Introduction

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The Model HFS Flush Gas Control Station is utilized in conjunction with the Delta Controls Model HTP, HTS and HTX Thermocouple. The HFS provides several essential functions necessary for the proper operation and long service life of the thermocouple. The primary functions are:

- A. Provides a very low and constant amount of flush gas flow through the thermocouple assembly. The gas flow removes corrosive and contaminating atoms and molecules, which migrate through the ceramic thermowell. This is done before they can react or interact with the thermocouple element(s), causing corrosion and subsequent measurement errors and eventual failure.
- B. Provides a controlled positive pressure in the thermocouple assembly, which must be higher than the reactor operating pressure. This guarantees that reaction gases cannot leak into the thermocouple body in the event that there are any tiny cracks in the ceramic components or seals. The increased pressure differential discourages migration through the walls of the thermocouple's primary thermowell.
- C. Provides a very fine (5 micron) filtration of all incoming flush gas. This prevents plugging of the gas passages inside the thermocouple. It also provides a trap with a drain valve to catch water droplets and condensables that may be in the gas supply stream. Introduction of liquids into the thermocouple will cause reading errors, shorten its life or even cause outright failure. This effect is due to flashing of the liquid, which cools the sensor, and thermal shocks, which may crack or break the ceramic element protectors.
- D. Provides accurate reliable control of the thermocouple pressurizing and flushing functions.
- E. Provides a single place at the reactor where the operator can regularly monitor and verify proper operation of the flush gas stream. Instrumentation labels indicating correct setpoints are on the HFS faceplate.
- F. Many years of Delta Controls field experience has resulted in the optimum design, configuration, and materials of construction to achieve proper flush gas control. Easy to understand marking and labeling eliminates installation and piping errors and reduces the possibility of improper operation.

## 2. Installation & Mounting

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Install the HFS at eye level (approximately 5 Feet [1.5 M] above the floor), to allow for ease of observation and operation. This allows the operator to regularly verify that the purge is operating properly.

A vertical 2" pipe stand provides an ideal mounting for the HFS, which is furnished with two clamps for securing it to the pipe. A common way to erect the 2" pipe is to weld or clamp it to a handrail or the process equipment support structure.

The HFS may also be mounted on a vertical surface. To do this, discard the pipe clamps, drill 4 7/16" (11 mm) holes through the surface and secure the HFS with 3/8" (9mm) bolts.

## 3. Piping

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The HFS is normally connected to the thermocouple and flush gas supply stream with 1/4in tubing. Other sizes, including equivalent metric sizes, may be used providing that the connection adapters on the HFS and thermocouple are compatible.

The ports on the HFS are clearly marked as to what should be connected to each of them. Tubing may enter and leave from bottom, top, right side, left side or any combination thereof. The tubing run should be installed neatly and be easy to follow and understand. Make the runs straight as possible and support them well for best long term operating results.

It is essential that the "HFS to Thermocouple" line is connected to the inlet purge connection of the thermocouple. Reversing the connections may result in eventual thermocouple failure.

## 4. Operating

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**Set the Pressure** - Set the pressure to approx 5 psi (0.35 bar) above the maximum reactor operating pressure (typically 10 - 12 PSI (0.7 - 0.8 bar). Therefore, a pressure setting of 12-15 psi (0.83 - 1.0 bar) is satisfactory.

**Set the Flow Rate** - Set the flow rate control to a flow rate of about 11 L/h. No other adjustments are required. These setpoints must be continuously maintained. It serves no purpose to increase either the flow rate or the pressure beyond the recommended settings. Increased flow will cause the thermocouple to read erroneous low; increased pressure only increases the chance of leakage.

If either the pressure or flow is disrupted beyond few a days, corrosion of the thermocouple elements may begin, which will gradually cause inaccurate readings over time. Left uncorrected, eventual failure of the thermocouple will result.

### 4.1 Flush Gas Cooling Effect

Tests indicate that at the recommended flow rate, the cooling effect on the thermocouple junction is negligible.

In order to determine the cooling effect, first observe the indicated operating temperature. Then, turn the control valve on the flowmeter clockwise to reduce the flow rate to 0 L/h. Wait 3 minutes and observe the operating temperature and compare it with the temperature reading before shutting off the gas flow.

Make sure to return the gas flow to 11 L/h.

## 5. Maintenance

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The operator is to observe the pressure indicator and flow rate indicator during each shift to verify that the system is operating properly.

On a weekly basis, the filter bowl drain valve should be opened slightly to verify that the supply gas remains dry. If any liquid is observed, open this valve on a daily basis. If traces of liquids are observed, correct the source of the problem.

Liquids of any type in the flush gas can damage the thermocouple; hydrocarbons entering the flush gas passages may cause failure of the thermocouple.

### 5.1 Replacement & Spare Parts

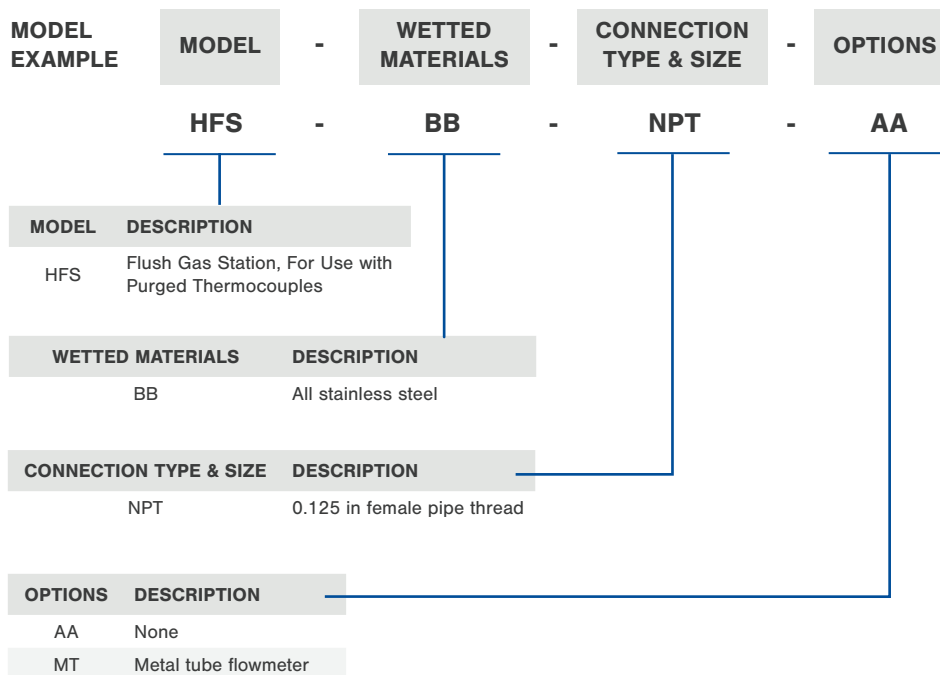
P/N	Description
24-098BB	Pressure Control Unit, all Stainless Steel
24-106AA	5 Micron Filter Element
12-056TT	Pressure Indicator, all Stainless Steel
24-185Z1	17 L/h Flow Indicator / Control Unit; all Stainless Steel
24-743AA	Flow Indicator / Control Unit; Metal Tube



## 6. Specifications

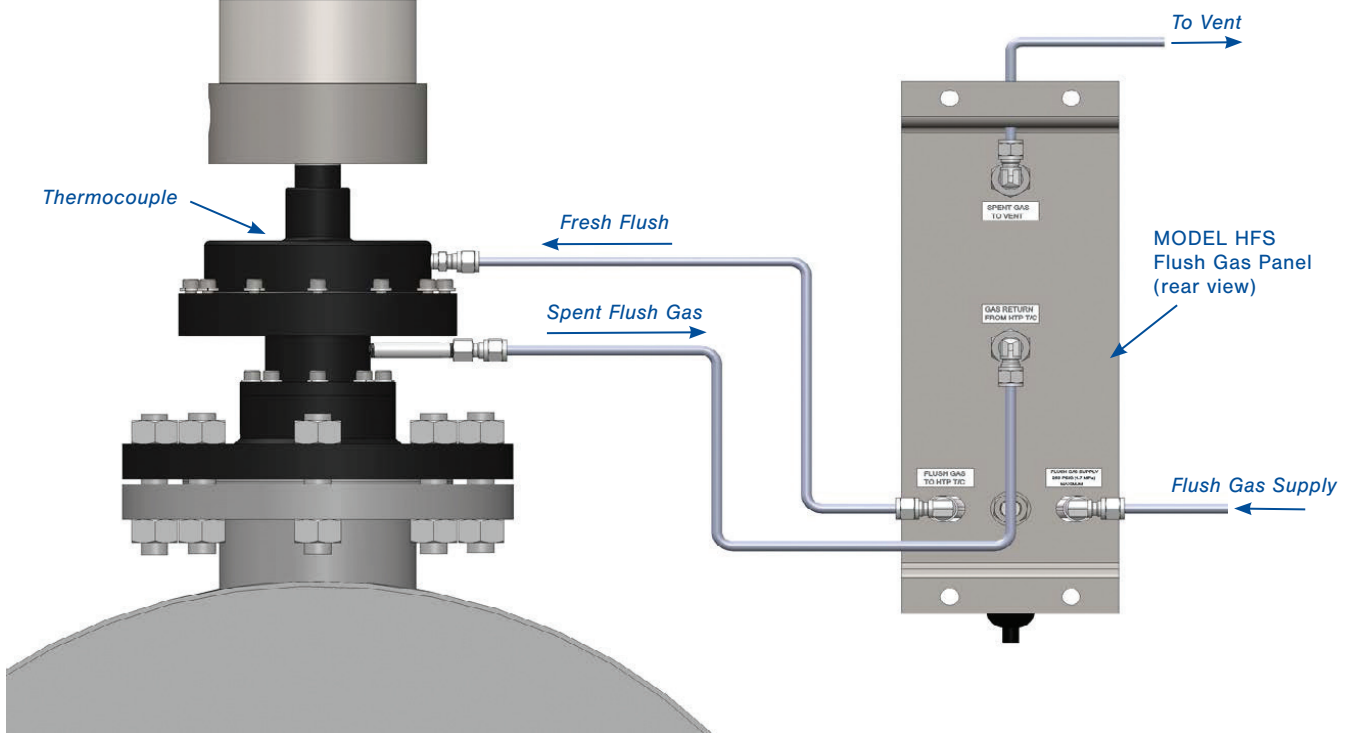
<b>Flow Range:</b>	2 L/h to 17 L/h
<b>Supply Pressure:</b>	25 psig to 250 psig (1.75 bar to 17 bar)
<b>Supply Gas:</b>	Nitrogen
<b>Pressure Indicator:</b>	2.5 in diameter; 0 psig to 60 psig (0 bar to 4 bar)
<b>Flow Control:</b>	Constant mass flow rate type
<b>Pressure Control:</b>	2 psig to 50 psig (0.1 bar to 3.5 bar)
<b>Filter:</b>	5 µm sintered polypropylene
<b>Drain:</b>	Manual Valve
<b>Meter Body:</b>	Stainless Steel
<b>Pressure Body:</b>	Stainless Steel
<b>Connection Fittings:</b>	Stainless Steel, 0.125 in FPT
<b>Mounting Plate:</b>	Stainless Steel
<b>Pipe Clamps:</b>	Stainless Steel

## Model Numbering System



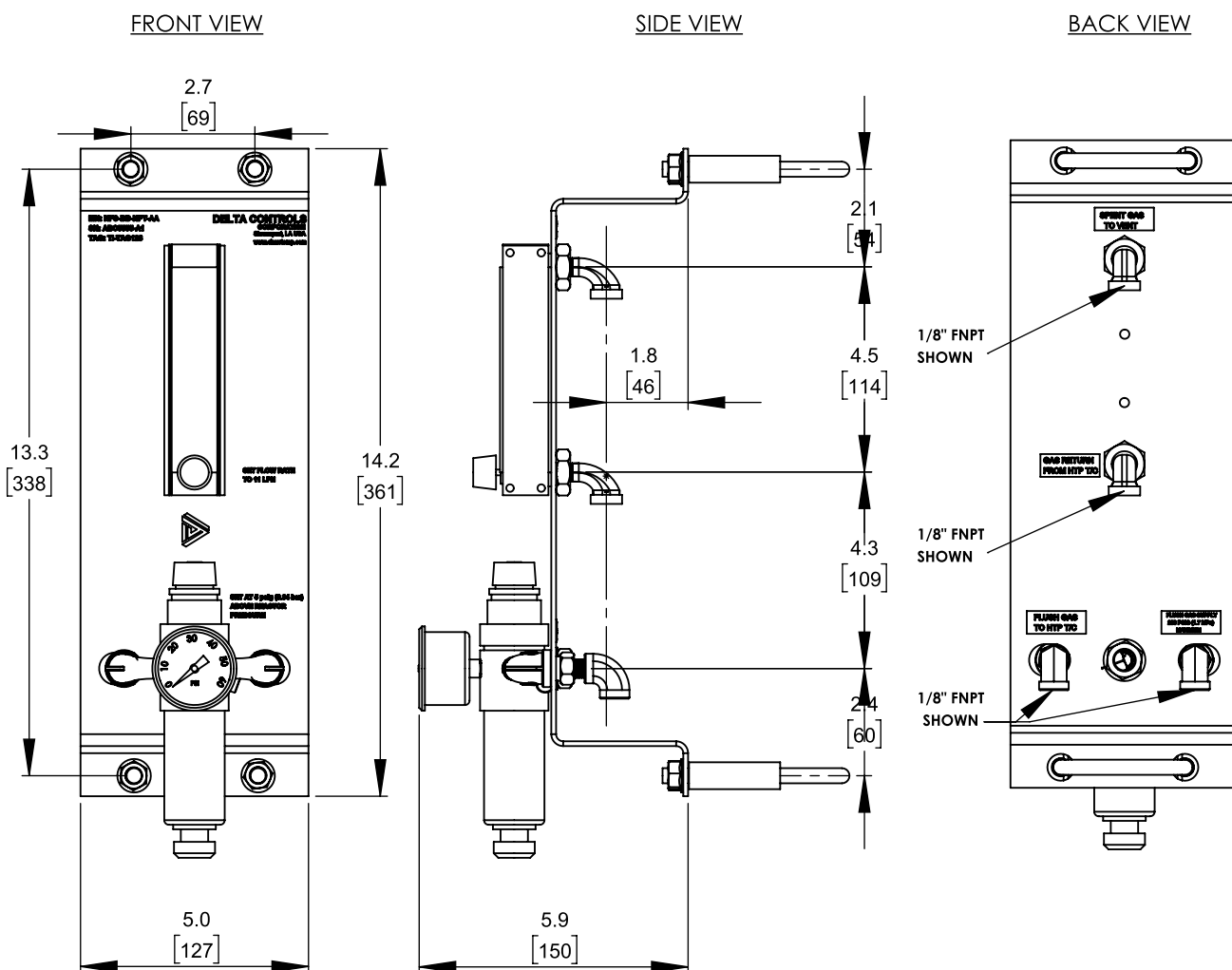
# Typical Flush Gas Connection

Model HFS Flush Gas Station





## Model HFS Layout & Dimensional Drawing



## Contact Us

Since 1972 • All products made at the Shreveport, LA USA factory

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