



# TELEDYNE HASTINGS INSTRUMENTS

## MODELS

HFM-D-300  
HFC-D-302

## FEATURES

- Flows from 0-5 sccm (N<sub>2</sub> Equivalent) up to 0-25 slm (N<sub>2</sub> Equivalent)
- Accuracy in Nitrogen ± (0.2% of Full scale + 0.5% of Reading)
- All Metal Seals, Kalrez® Valve Seat
- Flexible Operation with ±12, ±15 or 24 VDC Power Supply
- RS232/485
- Auto-Zero (HFC-302 Flow Controller Only)
- Self-Diagnostics –Sensor, Valve and Overflow
- Analog or Digital Control and Indication
- Can Store Up To 10 Gas Calibrations
- Can Provide Totalized Flow
- Can Provide Alarms

## APPLICATIONS

- Process gases
- Industrial gas distribution
- Fuel cell testing
- Pharmaceutical production
- Secondary calibration reference

## BENEFITS

- Enhanced Accuracy
- Superior Linearity
- Digital Communications

# Digital 300 Series - Low Capacity



## DESCRIPTION

The Teledyne Hastings Instruments Digital Metaline thermal mass flow meter or controller complements an extensive array of wide-ranged analog flow instruments.

The heart of the instrument is the same patented thermal transfer sensor and a patented laminar flow shunt assembly that are used in the analog HFM-300 series flow instrumentation. Each of these parts were improved over the standard parts by examining the physics behind the nonlinearities in the common thermal sensor and flow shunt design and altering the operation and construction of these to remove the primary sources of error.

The major source of non-linearity's for a laminar flow element is a result of pressure drops due to a fluid entering or exiting from a flow channel. The 300 series laminar flow element is designed such that the pressure drops that are measured occur in an annular region around the flow shunt after the entrance effects and before the exit effects. This greatly improves the linearity of the flow divider and minimizes the large changes in linearity that typically occur when the specific gravity of the flowing medium changes.

The typical errors in thermal sensors are due to the use of a difference in the voltage in the heating circuit between the upstream and downstream heater coil. The 300 series thermal sensor controls the heated coils to a - (cont)



## Design Features (cont)

constant temperature above the measured ambient temperature and measures the power difference to heat up the upstream and the downstream heater coils.

These instruments contain a number of features that set them apart from all others, for example:

- 1) An internal curve fitting routine removes the small non-linearities measured for the calibration gas.
- 2) The status word provides alarms and warnings to inform the user of overflow/underflow conditions.
- 3) Up to 10 different ranges/gas calibrations can be stored internally.
- 4) A totalized flow variable can be used to measure the total amount of gas added to a system.
- 5) The Digital Metaline can emulate an analog controller or it can operate with digital commands.

### Optional Features

- Fittings – VCR, VCO, Swagelok, Straight Thread, Surface Mount
- High-Pressure Rating (1000 psig)
- Oxygen Cleaning

### Accessories

- Power Supplies/Readouts Available with Totalizer Alarms
- Quick Start Kit
- Cables: 8', 25', 50', 100', & 200'

| <b>COMMON SPECIFICATIONS HFM-D-300/HFC-D-302</b>                             |  |
|--|--|
| <b>Accuracy</b> <sup>1</sup>   | ± (0.2% of F.S. + 0.5% of reading)                             |
| <b>Repeatability</b>   | ± 0.1% of F.S.   |
| <b>Maximum Operating Pressure</b>  | 500 psi  |
| <b>High-Pressure Option</b>  | 1000 psi (proof tested to 1500 psi)                            |
| <b>Pressure Coefficient</b>  | (Span) 0.01%/psi (N <sub>2</sub> ) (0-50 psig)                 |
| <b>Leak Integrity</b>  | < 1x10 <sup>-9</sup> sccs He                                   |
| <b>Operating Temperature</b>   | 0-50°C   |
| <b>Temperature Coefficient</b>   | (span) < 0.05%/°C of reading                                   |
| <b>FS Flow Ranges</b>  | Flows from 0-5 sccm up to 0-25 slm (N <sub>2</sub> Equivalent) |
| <b>Supply Voltage</b>  | 15 – 30 volts VDC unipolar or bipolar ±7.5 to ±17.5 volts      |
| <b>Available Outputs</b>   | 0-5 VDC, 0-10 VDC, 4-20 mA, 0-20 mA                            |
| <b>Connector</b>   | 15-pin subminiature D  |
| <b>*Attitude Sensitivity</b>   | Zero < 0.7% of FS Span < 0.05% of reading                      |
| <sup>1</sup> Calibration gas only<br><sup>*</sup> N <sub>2</sub> @ 19.7 psia |  |

| <b>SPECIFICATIONS HFM-D-300</b> |  |
|---------------------------------|--|
| <b>Settling Time</b>            | 1 second 0-100% F.S. <sup>2</sup>        |
| <b>Power Requirements</b>       | 5.5 watts                                |
| <b>Temperature Coefficient</b>  | (zero) < 0.2%/°C of Full Scale           |
| <b>Wetted Materials</b>         | 316L SS, Nickel 200, 302 SS**, Viton®*** |
| <b>Weight (approx.)</b>         | 2.0 lb (0.9 kg)                          |

| <b>SPECIFICATIONS HFC-D-302</b> |   |
|---------------------------------|---|
| <b>Settling Time</b>            | 2 seconds 0-100% F.S. <sup>2</sup>                |
| <b>Power Requirements</b>       | 7.5 watts   |
| <b>Temperature Coefficient</b>  | (zero) < 0.2%/°C of Full Scale                    |
| <b>Wetted Materials</b>         | 316L SS, Nickel 200, Kalrez®, 302 SS**, Viton®*** |
| <b>Weight (approx.)</b>         | 3.2 lb (1.4 kg)                                   |

Hastings Instruments reserves the right to change or modify the design of its equipment without any obligation to provide notification of change or intent to change.

\*\* 302SS is present only when flow range > 10 slm N<sub>2</sub>

\*\*\* Viton is present only when 6mm fitting is selected

2 Estimated value, compliance data not complete on this

Viton® is a registered trademark of Dupont Performance Elastomers  
 Kalrez® is a registered trademark of DuPont Dow Elastomers  
 Teflon® is a registered trademark of E.I. Dupont de Nemours & Co.  
 VCR® is a registered trademark of Swagelok Company.

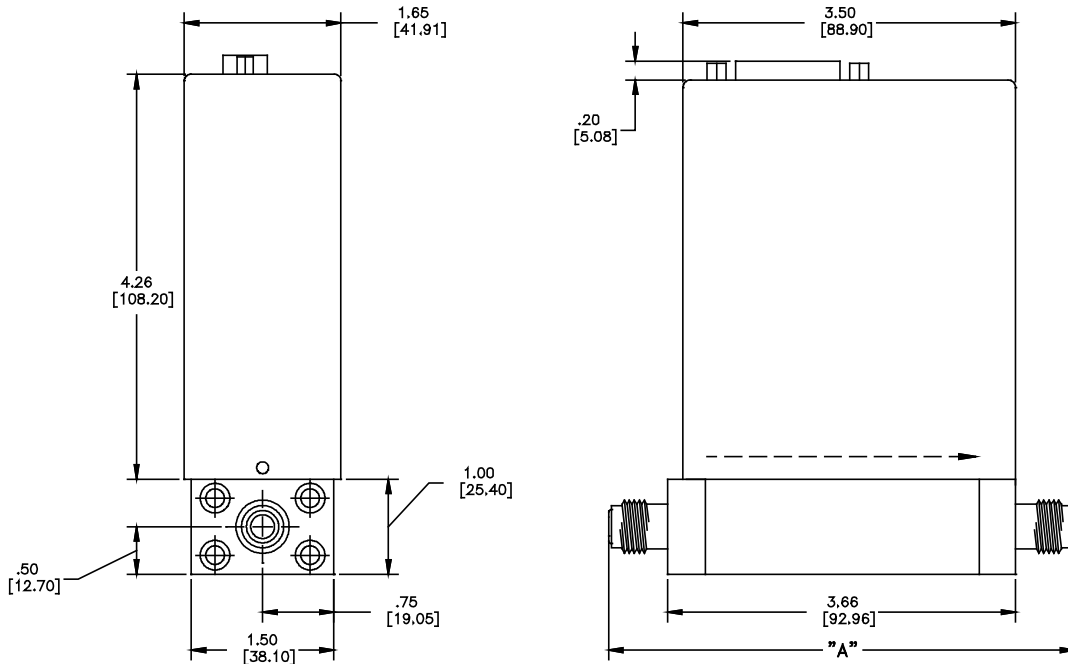


**TELEDYNE**  
**HASTINGS INSTRUMENTS**  
 A Teledyne Technologies Company

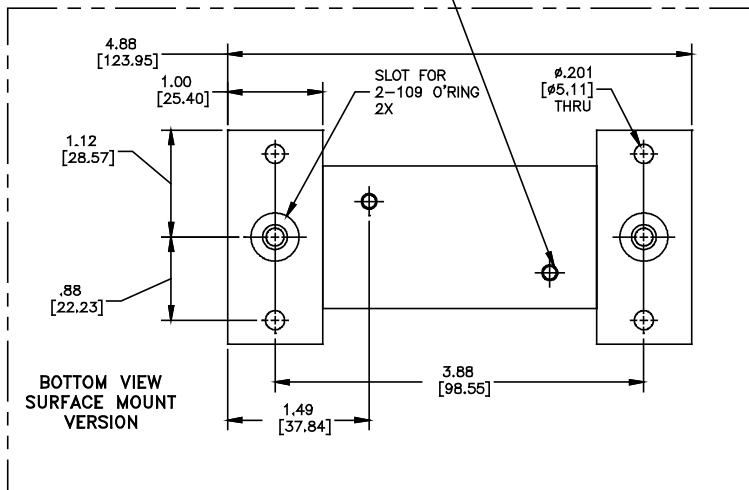
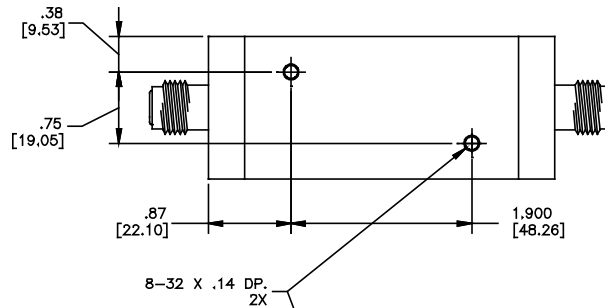


**ISO9001:2000**  
**KEMA CERTIFIED**

Outline Drawing



| FITTING TYPE    | DIM "A"       |
|-----------------|---------------|
| 9/16"-18 FEMALE | 4.05 [102.87] |
| SWAG 1/8" W NUT | 5.09 [129.29] |
| SWAG 1/8" BARE  | 4.57 [116.08] |
| SWAG 1/4" W NUT | 5.15 [130.81] |
| SWAG 1/4" BARE  | 4.57 [116.08] |
| VCO FACE 1/4"   | 4.57 [116.08] |
| VCR FACE 1/4"   | 4.88 [123.95] |
| SURFACE MOUNT   | 5.66 [143.76] |
| SWAG 6MM W NUT  | 5.68 [144.27] |



# Selection Chart

|                        |                |               |                 |                 |            |                |
|------------------------|----------------|---------------|-----------------|-----------------|------------|----------------|
| <b>Model No.</b>       | <b>Pin Out</b> | <b>Output</b> | <b>Fittings</b> | <b>Pressure</b> | <b>Cal</b> | <b>Digital</b> |
| HFM-D-300<br>HFC-D-302 |                |               |                 |                 |            |                |

| Order No.          | Options                               |
|--------------------|---------------------------------------|
| <b>Pinout</b>      |                                       |
| 01                 | H Pin (std)                           |
| 02                 | U Pin                                 |
| <b>Output</b>      |                                       |
| 01                 | 0-5 volt (std)                        |
| 02                 | 0-10 volt                             |
| 03                 | 4-20 mA                               |
| 04                 | 0-20 mA                               |
| <b>Fittings</b>    |                                       |
| 01                 | 1/4" VCR®                             |
| 02                 | 1/4" Swagelok (std)                   |
| 03                 | 1/8" Swagelok                         |
| 04                 | 1/4" VCO®                             |
| 05                 | 9/16-18 Fm St Threads                 |
| 06                 | Surface Mount                         |
| 07                 | 6 mm Swagelok                         |
| <b>Pressure</b>    |                                       |
| 01                 | 500 psig (std)                        |
| 02                 | 1000 psig                             |
| <b>Calibration</b> |                                       |
| 01                 | N2/Air (std)                          |
| 02                 | 2 NIST Traceable Calibration Reports  |
| 03                 | 3 NIST Traceable Calibration Reports  |
| 04                 | 4 NIST Traceable Calibration Reports  |
| 05                 | 5 NIST Traceable Calibration Reports  |
| 06                 | 6 NIST Traceable Calibration Reports  |
| 07                 | 7 NIST Traceable Calibration Reports  |
| 08                 | 8 NIST Traceable Calibration Reports  |
| 09                 | 9 NIST Traceable Calibration Reports  |
| 10                 | 10 NIST Traceable Calibration Reports |
| <b>Digital</b>     |                                       |
| 01                 | RS232 (std)                           |
| 02                 | RS485                                 |

**For both Instruments**

**Range Information**

Each calibration will require the following information:

**Range** \_\_\_\_\_

**Flow Units** \_\_\_\_\_

**Gas** \_\_\_\_\_

\* **Std Conditions** \_\_\_\_\_

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**For the 302 Instrument only**

**Upstream Pressure** \_\_\_\_\_  
*(maximum & minimum)*

**Downstream Pressure** \_\_\_\_\_  
*(maximum & minimum)*

**Does the downstream pressure change with flowrate? Y/N** \_\_\_\_\_

\* For volumetric units the standard temperature and pressure of the unit is also required  
0°C & 760 Torr will be used when other values are not specified