

HASTINGS

PRODUCT REVIEW

HASTINGS



TELEDYNE INSTRUMENTS

Hastings Instruments

A Teledyne Technologies Company

PROFILE

Teledyne Hastings Instruments manufactures a complete line of instruments for precise measurement and control of vacuum and gas flows.

Founded in 1944 as Hastings Instrument Company by Charles and Mary Hastings, the company boasts a long history of success. The late 1940s saw the introduction of thermocouple (TC) technology. This technology was the foundation for many early Hastings produced instruments such as air velocity indicators, thermal mass flowmeters, stack emission monitors and, of course, the thermopile vacuum sensor.

By 1964, Hastings Instruments had grown into one of the leading vacuum and thermal mass flow companies in America and in 1968 became part of Teledyne Incorporated.

Today the company operates within the Teledyne Instruments Group; a group of specialty instrumentation companies providing innovative measurement devices to monitor critical manufacturing processes, improve productivity, facilitate energy exploration and protect the environment.



OBE Dual Sensor Vacuum Gauge

Teledyne Hastings Instruments has earned the ISO certification, along with CE Mark approval, confirming a longstanding commitment to internationally accepted standards of quality. We are compliant with the ANSI/NCSL Z540-1-1994 Standard (Calibration Laboratories and Measuring and Equipment General Requirements).

Vacuum Instruments

With over 50 years of practical experience in vacuum technology, Teledyne Hastings Instruments maintains a full line of quality digital and analog vacuum instrumentation to satisfy stringent requirements of every market within the vacuum industry, including semiconductor processing, refrigeration, air conditioning, vacuum pump control and monitoring, metallurgy, food processing, neon sign and lighting production. Teledyne Hastings products are used in government, industrial and academic R&D labs throughout the world. Over the years, the Model VT and CVT instruments, together with the reliability of the rugged TC gauge tube technology, have proven themselves as the standard in the industry by OEM and other equipment suppliers.

The most versatile vacuum instrument in the Teledyne Hastings product line is the Model 2002[®] Dual Vacuum Sensor. This device measures above atmospheric pressure to 10^{-4} Torr pressure using a small, dual sensor. The OBE is an economical OEM version of the successful Model 2002.

Additional vacuum instruments offered by Teledyne Hastings Instruments include absolute pressure sensors which are independent of gas composition.



Model 2002[®]: wide range digital vacuum meter with evolutionary thermal conductive sensor and diagnostic tube.

PROFILE

Flow Instruments

The current Models HFM Mass Flowmeter and HFC Mass Flow Controller represent the culmination of more than 50 years' experience in manufacturing quality mass flow instruments. The basic design incorporates removable/replaceable components to provide users a low cost of ownership, maximum flexibility and reduced downtime.

The heart of the system is a replaceable sensor which virtually eliminates long downtimes due to clogging, the most common cause of failure in the industry. The modular design also offers adjustable range capabilities, in-line filtration, and replaceable electronics to allow users maximum flexibility in adjusting their system for changing requirements.

Current designs can accommodate flow rates from 5 sccm to 15,000 slm, with fast response and zero overshoot electronics. Other flow instruments include meters and controllers for specific applications, such as low pressure drop, high capacity flow, high temperature, high pressure and hermetically sealed systems. These instruments are an asset to any industry requiring accurate gas measurement and/or control. Primary industries include R&D process flow, vapor deposition, leak testing, gas blending, pollution monitoring, medical research, gas chromatography and semiconductor support processes.

Recently, new all metal-seal 300 Series Metaline® meters and controllers have been introduced both in analog and digital versions. They are designed to accurately measure mass flow without corrections or compensations for gas pressure and temperature. These are highly accurate instruments which approach a 0.5% of reading accuracy (digital instruments) level.

These Hastings mass flow instruments do not require periodic maintenance under normal operating conditions with clean gases. This product line features settling times less than 0.55 seconds.

The latest product line developed by Teledyne Hastings Instruments is the digital version of the high capacity flow instruments. These new digital instruments allow measurement and/or control up to 2500 slm. The new line complements the existing lower flow Digital Metaline (5 sccm to 30 slm).



Digital Metaline® 302 Mass Flow Controller

The two product lines, Digital Metaline and the new high capacity digital flow instruments, offer flow meters and controllers from 5 sccm to 2500 slm, with accuracy better than $\pm 0.5\%$ of reading. The lower flow Digital Metaline units have all-metal seals. A 4 μ -inch Ra finish is available for flow rates up to 10 slm. Multiple gas calibrations and stored gas conversion factors are key features that set these instruments apart from the analog versions.

Both the Digital Metaline and the high-capacity digital flow instruments feature flexible operation with ± 12 , ± 15 or 24 VDC power supply and transparent operation in analog or digital modes. All digital units are available with RS232 or RS485 interface with baud rates up to 19.2 kbaud. In addition, the instruments offer convenient self-diagnostics including warnings and alarms for flow, sensor, and valve status.

For more information about any Teledyne Hastings Instruments please call or visit our website.



TELEDYNE HASTINGS VACUUM GAUGES



VT SERIES



CVT

ANALOG VACUUM METERS AND CONTROLLERS

VT Series

- Three Standard Ranges— 0 to 100 mTorr, 0 to 1000 mTorr and 0 to 20 Torr
- Fail Safe – Loss of Power = Loss of Vacuum
- Optional Single or Double Control Points
- Optional Instrument Configurations and Sensor Fittings
- Complete Installation and Calibration Accessories
- Hastings Calibration Reference Tubes Recommended
- Hastings Thermocouple Vacuum Gauge Tubes Required and Sold Separately



VH SERIES



CVH

ECONOMY ANALOG VACUUM METERS AND CONTROLLERS

VH Series

- Two Standard Ranges— 0 to 5 Torr and 0 to 50 Torr
- Dual Scale in Torr and mbar
- Optional Single or Double Control Points
- Ready for Panel Mounting
- Optional Instrument Configurations and Sensor Fittings
- Fail Safe – Loss of Power = Loss of Vacuum
- Complete Installation and Calibration Accessories
- Hastings Calibration Reference Tubes Recommended
- Hastings Thermocouple Vacuum Gauge Tubes Required and Sold Separately



HPM 4/6 WITH
CARRYING CASE



HPM 4/6

BATTERY OPERATED PORTABLE VACUUM METER

Model HPM 4/6

- Works with DV-6 and DV-4 Vacuum Gauge Tubes
- Switch between DV-6 and DV-4 Ranges
- Standard 8 Pin Octal Connector
- Operates on a Single 9 Volt Battery
- Available in Torr or mbar Scales
- Rugged Carrying Case Included
- Light Weight
- Easy to Use
- Hastings Thermocouple Vacuum Gauge Tubes Required and Sold Separately
- Hastings Calibration Reference Tubes Recommended



VACUUM GAUGE TUBES

THERMOCOUPLE VACUUM GAUGE TUBES

- The Original DV-4, DV-6 Vacuum Gauge Tubes and Other Range TC Technology
- Corrosion-Resistant
- Non-Contaminating
- Stable Calibration
- Rugged Under Demanding Conditions
- Color Coded For Easy Identification

TELEDYNE HASTINGS VACUUM GAUGES



MODEL 2002 WITH CONTROLLER AND DIAGNOSTIC TUBE



OBE



760 PLUS



REFERENCE TUBES



ACCESSORIES

DUAL VACUUM SENSOR Model 2002®

- Wide Dynamic Range– 1000 Torr to 10^{-4} Torr • Piezo and Patented Thin-Film Pirani Sensor in a Single Gauge Tube • Piezo is Inherently Linear • Piezo Accuracy $\pm 1.5\%$ of Reading • Piezo is Gas Independent • Piezo Sensitive to Atmosphere • Pirani Thin Film Sensor Sensitive to 10^{-4} Torr • Compact Sensor Design • Sensor Modules are Interchangeable • High Temperature Sensor Module Bake Out • Over Pressure to 150 psi • Diagnostic Tube Accessory Available

DUAL VACUUM SENSOR WITH ELECTRONICS OBE



- Award Winning Model 2002® Technology • Wide Dynamic Range– 1×10^{-4} Torr to 1000 Torr • Combined Piezo and Pirani Sensors in a Single Tube • Simple Sensor Replacement– No Calibration Required • Economical Electronics Module • Wide Input Voltage 9-30 VDC • Output Options Include: Analog or RS 232/485 or *DeviceNet™* • Configurations Available with Display and/or Process Control Relays

DIGITAL VACUUM CONTROLLER 760 Plus®

- FS Ranges from 0.1 Torr to 999.9 Torr • Accuracy $\pm 0.25\%$ of Full Scale • Resolution– 0.1 Torr • Two Control Points • Fast Response and Linear Output • Complete Installation and Calibration Accessories • Compact Design

760S STAND-ALONE SENSOR CONFIGURATION

- Input Voltage 15-30 VDC • Optional Outputs– 0-5 VDC, 0-10 VDC, 2-10 mA, 4-20 mA • Compact • Independent of Gas Composition

REFERENCE TUBES

- Instant Calibration Check • Recalibration of Hastings Instruments • Adjusts Gauge for Any Length Cable • Stable • Accurate • Rugged • Reliable

ACCESSORIES

- Save Time • Ease of Installation/Replacement of Tubes

DeviceNet is a trademark of the Open *DeviceNet* Association, Inc.

TELEDYNE HASTINGS MASS FLOW CONTROLLERS



HFM-200, HFC-202



HFM-201



HFC-203



HFM-200 WITH LFE



LFE CONFIGURATIONS



H SERIES TRANSDUCER



NALL POWER SUPPLY

LOW CAPACITY MASS FLOWMETER & CONTROLLER HFM 200, HFC 202

- FS Ranges from 10 to 30,000 sccm (N₂ Equivalent) • Accuracy $\pm 1\%$ of Full Scale • Operating Pressure— 500 psi Standard, 1000 psi Optional • NIST Traceable Calibration • Proven Reliability • Optional Features Include— Fittings, O-Ring Seals, Fast Response Circuitry, High Pressure Rating and Oxygen Service Cleaning • Wetted Materials Include— 316 SS, Nickel, Viton®, 87/13 Au/Ni Braze, Teflon® • Accessories Include— Power Supplies/Readout, Flow Totalizers, Alarm Set Points and Cables

MEDIUM CAPACITY MASS FLOWMETER & CONTROLLER HFM 201, HFC 203

- FS Ranges from 50 to 500 slm (Air Equivalent) • Accuracy $\pm 1\%$ of Full Scale • Operating Pressure— 500 psi Standard, 1000 psi Optional • NIST Traceable Calibration • Proven Reliability • Optional Features Include— Fittings, O-Ring Seals, Fast Response Circuitry, High Pressure Rating and Oxygen Service Cleaning • Wetted Materials Include— 316 SS, Nickel, Viton, 87/13 Au/Ni Braze, Teflon • Accessories Include— Power Supplies/Readout, Flow Totalizers, Alarm Set Points and Cables

HIGH CAPACITY MASS FLOWMETER HFM-200 with LFE (Laminar Flow Element)

- FS Ranges from 25 to 15,000 slm (Air Equivalent) • Accuracy $\pm 1\%$ of Full Scale • Inherently Linear Response • Lowest Pressure Drop • Excellent Rangeability • Modular Construction • 15-Pin "D" Connector • NIST Traceable Calibration

LFE CONFIGURATIONS FLOWMETER

- FS Ranges from 25 to 15,000 slm • All Welded, Modular Construction • Available in Various Sizes and Configurations from 3/8" NPT Up To 8" Flanged • NIST Traceable Calibration

NALL SERIES MASS FLOWMETER

- FS Ranges from 10 sccm to 500 scfm • High Temperature Option to 200°C • Working Pressures up to 1000 psig • Hermetically Sealed Transducer • 15 Standard Flow Ranges • Accuracy $\pm 1\%$ of Range for 20% Variation in Pressure and Temperature

®Kalrez is a registered trademark of Dupont Dow Elastomers L.L.C.

®Teflon is a registered trademark of E.I. Dupont de Nemours.

®Viton is a registered trademark of Dupont Dow Elastomers L.L.C.

TELEDYNE HASTINGS MASS FLOW CONTROLLERS



HFM-300



HFC-302



HFM-301



HFC-303



HFM-305



HFC-307



HPS-100

METALINE® MASS FLOWMETER & CONTROLLER HFM-300, HFC-302

- FS Ranges from 5 to 30,000 sccm (N₂ Equivalent) • Accuracy $\pm 0.75\%$ of Full-Scale @ 3 Sigma • Settling Time ≤ 500 msec (Model 300), 750 msec (Model 302) • Operating Pressure— 500 psi Standard, 1000 psi Optional
- NIST Traceable Calibration • Low Wetted Surface Area • Large Diameter Sensor Tube • Wetted Materials Include— 302 SS, 316L SS, Nickel 200, Kalrez®

300 SERIES MASS FLOWMETER & CONTROLLER HFM-301, HFC-303

- FS Ranges from 25 to 1000 slm (Air Equivalent) • Accuracy $\pm 1.0\%$ of Full-Scale • Rapid Settling Time ≤ 0.4 seconds (Model 301), ≤ 2.0 seconds (Model 303) • Operating Pressure— 500 psi Standard, 1000 psi Optional
- NIST Traceable Calibration • Wetted Materials Include— Viton, 302 SS, 316L SS, Nickel 200, Kalrez, Au/Ni Braze

300 SERIES MASS FLOWMETER & CONTROLLER HFM-305, HFC-307

- FS Ranges from 1000 to 2500 slm (Air Equivalent) • Accuracy $\pm 1\%$ of Full-Scale • Higher Flow Limits up to 3000 with Accuracy of $\pm 2\%$ • Rapid Settling Time ≤ 0.4 seconds (Model 305), ≤ 2.0 seconds (Model 307) • Operating Pressure— 500 psi • NIST Traceable Calibration • Wetted Materials Include— 302SS, 316SS, Nickel 200, Viton, Kalrez (Valve Seat), Teflon

POWER SUPPLIES

POWER SUPPLIES HPS-100

- Single Channel Power Supply for Flowmeters, Controllers and All-Media Pressure Transducers • 100 to 240 VAC • 4-1/2 Digital LCD Display • Alarm Outputs, RS232

MULTIPLE CHANNELS MODELS 40, 200, 400

- Half-Rack Panel Mount • 3-1/2 Digital LCD Display • Power for Two to Four Flow Instruments • External Reference Inputs for Slaving of Controllers and/or Computer Generated Setpoints • Converts 0-5 VDC Meter Output to Appropriate Flow Units

TELEDYNE HASTINGS MASS FLOW CONTROLLERS



HFC-D-302



HFC-D-303



HFC-D-307



HFM-E-200, HFC-E-202

DIGITAL METALINE® MASS FLOWMETER & CONTROLLER HFM-D-300, HFC-D-302

- FS Ranges from 5 to 30,000 sccm (N_2 Equivalent) • Multiple Gas Calibrations • Accuracy $\pm 0.50\%$ of Reading, $\pm 0.1\%$ Full Scale • Linear Sensor and Flow Divider design • Settling Time < 500 msec (Model 300), 750 msec (Model 302) • NIST Traceable Calibration • Low Wetted Surface Area • Large Diameter Sensor Tube • Wetted Materials Include— 302 SS, 316L SS, Nickel 200, Kalrez • 4μ Ra finish available • ± 12 , ± 15 or 24 VDC Power Supply • Isolated Outputs • RS232 or RS485 up to 19.2K baud • Auto Zero • Runs Transparently in Analog or Digital Modes

DIGITAL 300 SERIES MASS FLOWMETER & CONTROLLER HFM-D-301, HFC-D-303

- FS Ranges from 25 to 1000 slm (N_2 Equivalent) • Multiple Gas Calibrations • Accuracy $\pm 0.50\%$ of Reading, $\pm 0.1\%$ Full Scale • Linear Sensor and Flow Divider Design • Rapid Settling Time ≤ 0.4 seconds (Model 301), ≤ 2.0 seconds (Model 303) • NIST Traceable Calibration • Large Diameter Sensor Tube • Wetted Materials Include— 302 SS, 316L SS, Nickel 200, Kalrez, Teflon • 4μ Ra finish available • ± 12 , ± 15 or 24 VDC Power Supply • Isolated Outputs • RS232 or RS485 up to 19.2K baud • Auto Zero • Runs Transparently in Analog or Digital Modes

DIGITAL 300 SERIES MASS FLOWMETER & CONTROLLER HFM-D-305, HFC-D-307

- FS Ranges from 1000 to 2500 slm sccm (N_2 Equivalent) for an Accuracy of 1% of Reading • Higher Flow Limits up to 3000 slm for an Accuracy of 2% of Reading • Multiple Gas Calibrations • Linear Sensor and Flow Divider Design • Rapid Settling Time < 0.4 seconds (Model 305), < 2.0 seconds (Model 307) • NIST Traceable Calibration • Low Wetted Surface Area • Large Diameter Sensor Tube • Wetted Materials Include— 302 SS, 316L SS, Nickel 200, Kalrez, Teflon • 4μ Ra finish available • ± 12 , ± 15 or 24 VDC Power Supply • Isolated Outputs • RS232 or RS485 up to 19.2K baud • Auto Zero • Runs Transparently in Analog or Digital Modes

EDGE CARD LOW CAPACITY MASS FLOWMETER & CONTROLLER

HFM-E-200, HFC-E-202

- FS Ranges from 10 to 30,000 sccm (N_2 Equivalent) • Accuracy $\pm 1\%$ of Full Scale • Operating Pressure— 150 psi Standard, 1000 psi Optional • NIST Traceable Calibration • Proven Reliability • Optional Features Include— Fittings, O-Ring Seals, Fast Response Circuitry, High Pressure Rating and Oxygen Service Cleaning • Wetted Materials Include— 316 SS, Nickel, Viton, 87/13 Au/Ni Braze, Teflon • Drop-in Replacement



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