

DANIEL[®]

Daniel[®] Venturi Tubes and Flow Nozzles Brochure



EMERSON[™]
Process Management



Is unaccounted hydrocarbon draining your bottom line?

When the stakes are high, any amount of unaccounted hydrocarbon drains the bottom line. That's why companies like yours count on proven measurement technology and industry expertise from Daniel to improve service, reduce cost and add value.

Daniel® Overview

For more than 70 years Daniel has been at the forefront of measurement technology development for the Oil and Gas Industry. Daniel has become a leading figure in the development of the standards that govern orifice measurement around the world. With offices around the globe, Daniel is capable of offering the level of quality and service required by our most demanding clients. Daniel engineers its products to produce the most precise measurement solutions in the industry. Daniel relies on precision manufacturing to ensure that specifications are met or exceeded to offer the best quality product in the marketplace.

Daniel® Venturi Tubes

Daniel® Venturi Tubes

Daniel Venturi Tubes serve users with accurate measurement of non-viscous fluids in clean or dirty streams. Venturi Tubes are virtually maintenance-free and corrosion-resistant. Daniel Venturi Tubes are manufactured in strict accordance with ASME MFC-3M and ISO 5167 specifications. These measurement standards provide users with +/-1.0% uncertainty of discharge coefficient. For critical measurement applications flow calibration is recommended, which results in +/-0.25% uncertainty of discharge coefficient.

The Daniel Venturi Tube is a low-pressure-drop metering device identifiable by its tapered inlet, tapered outlet and straight, constricted middle section. It offers constant accuracy, low susceptibility to erosion, high-pressure recovery, and installation at any angle from horizontal to vertical. Corrosion-resistant and virtually maintenance-free, this measurement product performs in a wide variety of applications that include air, water, vapor, steam, gas, chemical substances, sludge and slurry applications. For extremely erosive service, internal surface hardening is available.

The Classical Venturi is a head pressure device that consists of a convergent cone section, cylindrical bore, and a divergent cone section. The cylindrical bore restricts the fluid flow resulting in a pressure drop. This differential pressure relates to the flow rate by applying Bernoulli's equation. The angled inlet and outlet cones help control the pressure recovery, making the Venturi the most efficient of all the differential meters available. This results in lower permanent pressure loss and greater capacity than other differential meters of the same size. Permanent pressure loss is typically 5% to 15% of the differential pressure, depending on the bore size selected.

Features and benefits:

- ▶ Can be used on slurries and dirty fluids
- ▶ Short upstream piping required
- ▶ Low installation costs
- ▶ Lower susceptibility to erosion
- ▶ High pressure recovery
- ▶ Low permanent pressure loss
- ▶ Extended product life with no moving parts
- ▶ Vertical or horizontal installation
- ▶ No moving parts, simple configuration, maintenance-free
- ▶ Availability in 2 to 48-inch sizes. Larger sizes available upon request.
- ▶ Available in all ANSI ratings (depending on line size).
- ▶ Available in wide variety of materials.



Daniel® Flow Nozzles

Daniel® Flow Nozzles

The Daniel Flow Nozzle is a differential flowmeter that creates a flow restriction for typically, high-velocity, non-viscous, erosive flows.

The rounded design provides a more effective sweep-through of particles in the flow stream, which extends product life by reducing wear and potential damage.

Long Radius Daniel Flow Nozzles are manufactured in strict accordance with ASME MFC-3M specifications, which provide users with $\pm 2.0\%$ uncertainty of discharge coefficient. For critical measurement applications, flow calibration is recommended, which results in $\pm 0.25\%$ uncertainty of discharge coefficient. ASME PTC-6 compliant flow nozzles are also available for acceptance testing of power generation plants.

Daniel Flow Nozzles are erosion-resistant, corrosion-resistant, consistently accurate and virtually maintenance-free. They perform in a wide variety of applications that include air, water, vapor, steam, gas, chemical substances, and high temperature applications. For extremely erosive service, internal surface hardening is available.

Flow Nozzles have a smooth elliptical inlet leading to a throat section with a sharp outlet. This restriction in the fluid flow causes a pressure drop, which relates to the flow rate by applying Bernoulli's equation. The smooth inlet of the flow nozzle results in a higher coefficient of discharge than most other differential meters. This higher efficiency means greater flow capacity when compared to most other differential meters of the same size.

Features and benefits:

- **Rounded inlet not subject to wear or damage, extending product life**
- **Better sweep-through effect for debris and liquids, eliminate damming effect**
- **Direct welding into line, eliminating potential of leaking gaskets**
- **No moving parts, simple configuration, maintenance-free**
- **Availability in 2 to 48-inch sizes. Larger sizes available upon request**
- **Available in all ANSI ratings (depending on line size)**
- **Available in wide variety of materials**



Daniel® Meter Tubes

Meter Tubes

Daniel Meter Tubes are accurate and dependable instruments that adhere to the highest quality standards. They are an integral piece of the Daniel Flow Nozzle and Venturi Tube Meters.

Quality Fabrication

Close quality control guarantees highly accurate fabrication of Meter Tubes for Daniel Flow Nozzles and Venturi Tube Meters. Special jigs and fixtures are used to assure precise alignment of tube and fitting so there are no steps or offsets. All welds are ground and micrometer readings are made.

Testing

Radiography and hydrostatic testing is available for Daniel Flow Nozzles and Venturi Tube Meters to ensure measurement accuracy. Micrometer and internal surface roughness readings are recorded and supplied with each meter tube.

Paint and Coating

A special quick-drying paint is applied as standard on Meter Tubes. Sand-blasting and corrosion-resistant coatings are also available.



Daniel® Engineered Systems

Daniel Measurement and Control is the industry leader in designing, constructing and commissioning of complex oil and gas metering systems to exacting standards.

This global organization offers decades of petroleum fiscal flow measurement application experience. Customers rely confidently on Daniel's Systems Group international fabrication facilities, customized engineering and its successes in field-testing and support. From the simplest single-stream skid to complex on-site installations, Daniel Systems delivers both natural gas and liquid petroleum turnkey applications. Daniel Systems designs, constructs and commissions the metering project, blending up-to-the-minute technology with decades of understanding what customers need and expect.

Components of a Daniel Systems installation typically include meters, valves, provers, flow-control instruments, instrumentation and read-out equipment and process management components. Computer software and hardware are integrated with the measurement system. Standard calculation methods include AGA3 (now API-MPMS-14.3), ISO 5167, AGA5/7/8, AGA9 and the API Manual for Petroleum Measurement Standards.

Daniel DMSS-2000 Supervisory Control Systems utilize a sophisticated Graphical User Interface, database server, and a dedicated PLC for the metering skid/MOV interface. Redundancy is often used for custody transfer systems and/or when system integrity is essential.

A dedicated Project Manager and Project Team are assigned to each measurement system project. This team is responsible for overall system design and project construction from start to finish. A separate internal QA/QC group reviews all design details, inside and outside fabrication, assembly and system testing.

Whether it is a pipeline, offshore production facility or a loading facility for ocean-going tankers, the Daniel Systems group is a proven, single-source solution for customers throughout the world.

Daniel® Measurement Services, Inc.

Daniel® Measurement Services, Inc. takes pride in being there with the right solution for customers with gas and liquid fiscal flow measurement applications.

Around the clock and around the world, Daniel Measurement Services has experienced, highly qualified people prepared to assist customers with:

- **Startup and commissioning**
- **Preventative maintenance**
- **Product repair / upgrades**
- **Project management and integration**
- **Meter tube inspection and recertification**
- **Educational services**
- **Remote diagnostics**
- **Warranty Plus!**

The Solution can be a warranty-enhancement program or a remote dial-up check of installed equipment that keeps desired performance a fingertip away.

Daniel Measurement Services also offers a series of educational courses essential to customer success, taught at the factory or the customer's location by a credentialed engineer, technician or other trainer. Courses include product instruction on proper operation of Daniel gas chromatographs, ultrasonic meters, presets and other instruments for fiscal flow measurement applications.

Daniel Measurement Services' educational courses and the commitment to being the world's leading provider of value-added measurement services affirm that Daniel support of its customers has never been stronger.



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