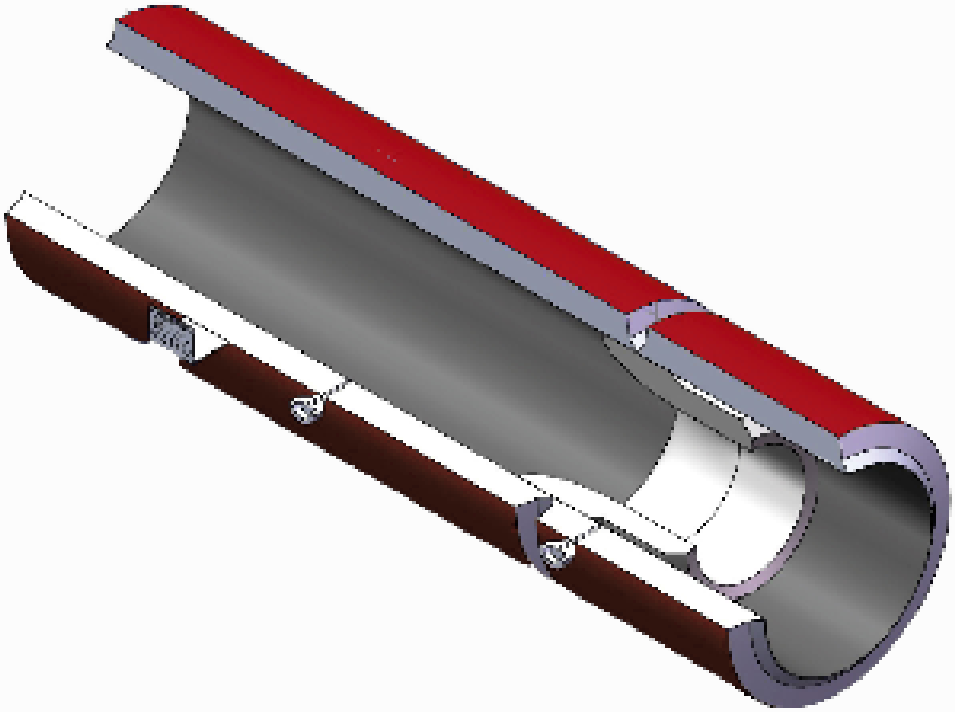
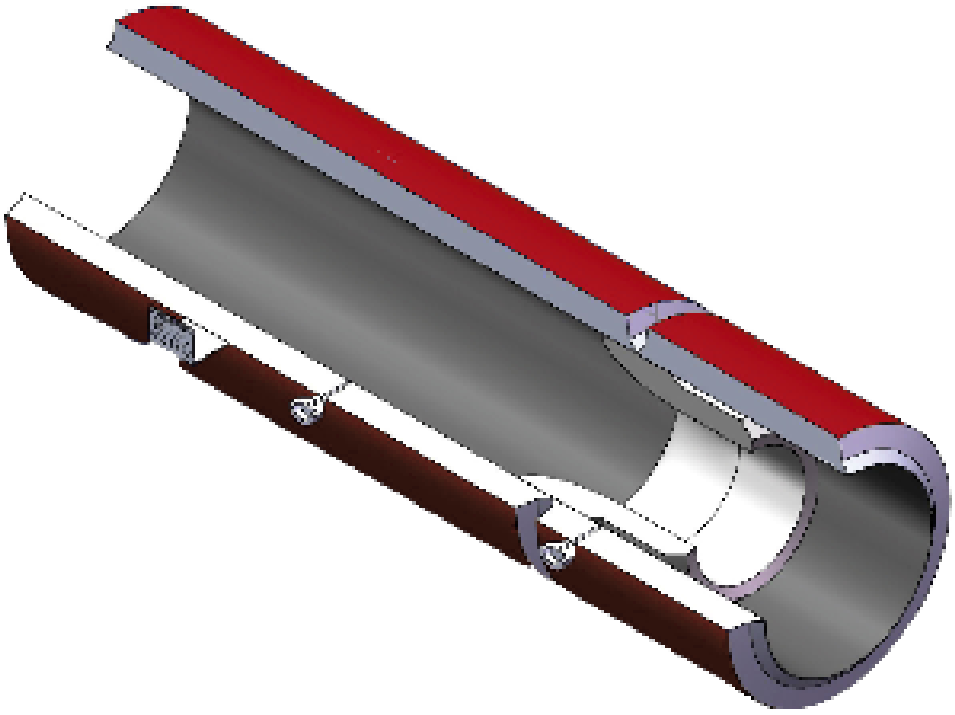
DANIEL®

FLOW NOZZLE
PRODUCT GUIDE

PRIMARY FLOW ELEMENTS



Decades Proven. Field Chosen.™



Flow Nozzles are manufactured by highly qualified craftsmen in strict accordance with the recommendations and piping codes set forth by A.S.M.E.

OVERVIEW

First patented in 1979, the flow nozzle is a highly versatile flow meter that blends the simplicity of an orifice plate with the hydrodynamics of the venturi tube. Similar to the orifice meter, the flow nozzle has a short length that allows the meter to be installed in between flanges. However unlike the sharp edge of an orifice plate, the flow nozzle has a gradual, sloping profile that is similar in function to a venturi tube. This unique combination lends itself highly useful in high temperature, high pressure systems where high velocity fluids need to be measured. Flow nozzles are commonly used in power plants, refineries and processing facilities.

Depending on system requirements, Daniel offers flow nozzles in the following configurations: flanged, tapped, weld-in, and holding ring.

FEATURES

- High accuracy of ±0.8%, Repeatability of ±0.1%.
- Wide range of pipe sizes available from 2” to 24” and larger available by request.
- Multiple Flow Nozzle Configurations available including flanged, tapped, weld-in, and holding ring.
- All grades of SS, Duplex SS, Carbon Steel and any other weldable material available by request.

BENEFITS

- Flow capacity is 60% greater than that of an orifice plate with the same beta ratio.
- "Measurement accuracy improves as the flow rate increases.
- Ability to measure liquid, steam or gas.
- Excels in measurement in high pressure, high temperature applications.

FUNDAMENTALS

PRINCIPLE OPERATION

The flow nozzle estimates flow rate by restricting flow through the device and measuring the associated pressure drop. The restricted-ID throat has a gradual, sloping profile. The reduced ID of the throat creates a pressure drop that allows the flow rate to be calculated based on Bernoulli's principle.

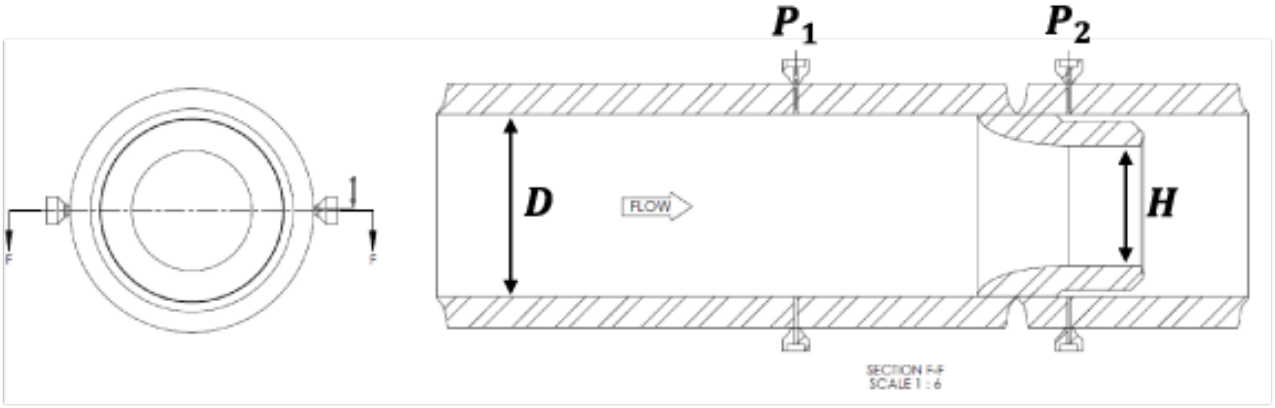
$$Q = K_c \times \sqrt{\Delta P}$$

Where:

- Q Flow Rate
- K_c Proportionality Constant
- ΔP Measured Differential Pressure

Daniel offers several configurations of flow noozles depending on the customer's needs. With all styles, there are two pressure taps located at the pipe inlet, measuring the static pressure. The low-pressure tap is located downstream of the reduceddiameter throat section; specific location will vary by flow nozzle type.

The flow range for the meter is designed by specifying the Beta ratio, which is the relationship between the diameter of the inlet pipe and the diameter of the throat. See the flow nozzle diagram below for additional details.



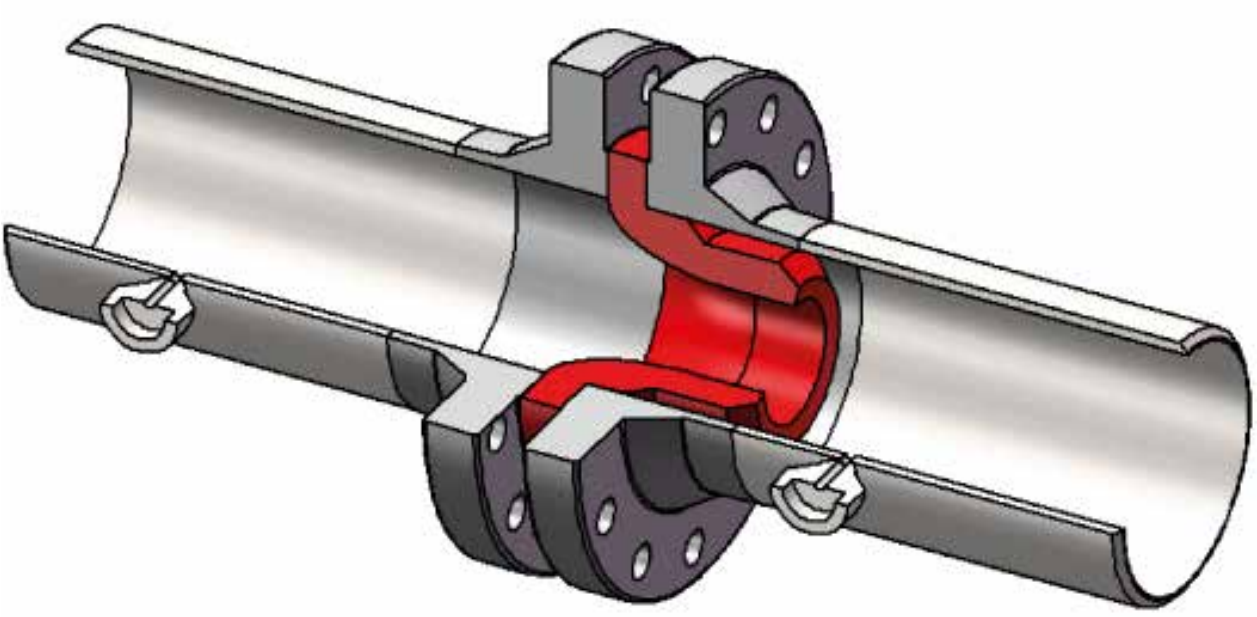
Consult the Daniel engineering team to select the proper dimensions, Beta ratio and construction materials to design the correct flow nozzle for your application.

SPECIFICATIONS

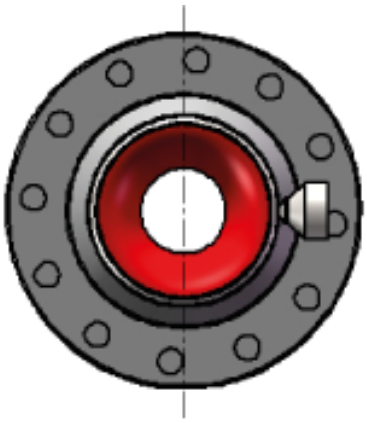
PERFORMANCE AND PHYSICAL SPECIFICATIONS	
Standard Accuracy	0.8% standard, 0.25% available with calibration
Flow Ranges (turndown)	10:1 or greater
Repeatability	± 0.1% or better
Permanent Pressure Loss	Varies with DP and Beta (H/D) Ratio
Beta Ratio	0.4, 0.5, 0.6, 0.7; Additional betas available by request.
Line Sizes and Pressure Ratings	2" to 24" – ANSI 150# thru 2500# 26"and larger – available in any flange specification.
Construction Materials	All Grades of Stainless Steel, Carbon Steel and Alloys or any other weldable material
End Configuration	Wafer, Flanged, Beveled, Threaded and Others

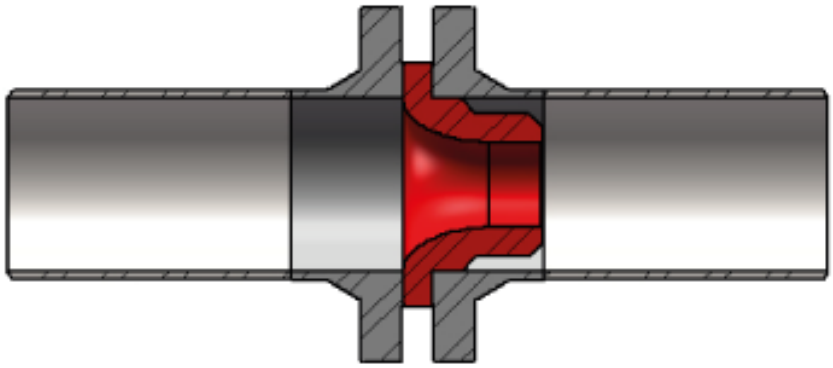
Daniel offers tailor-made solutions for your metering needs. All flow nozzles are built according to ASME recommendations. All components are customizable to fit your specific system. Just ask our engineering team, and we will find the solution.

FLANGED FNMT

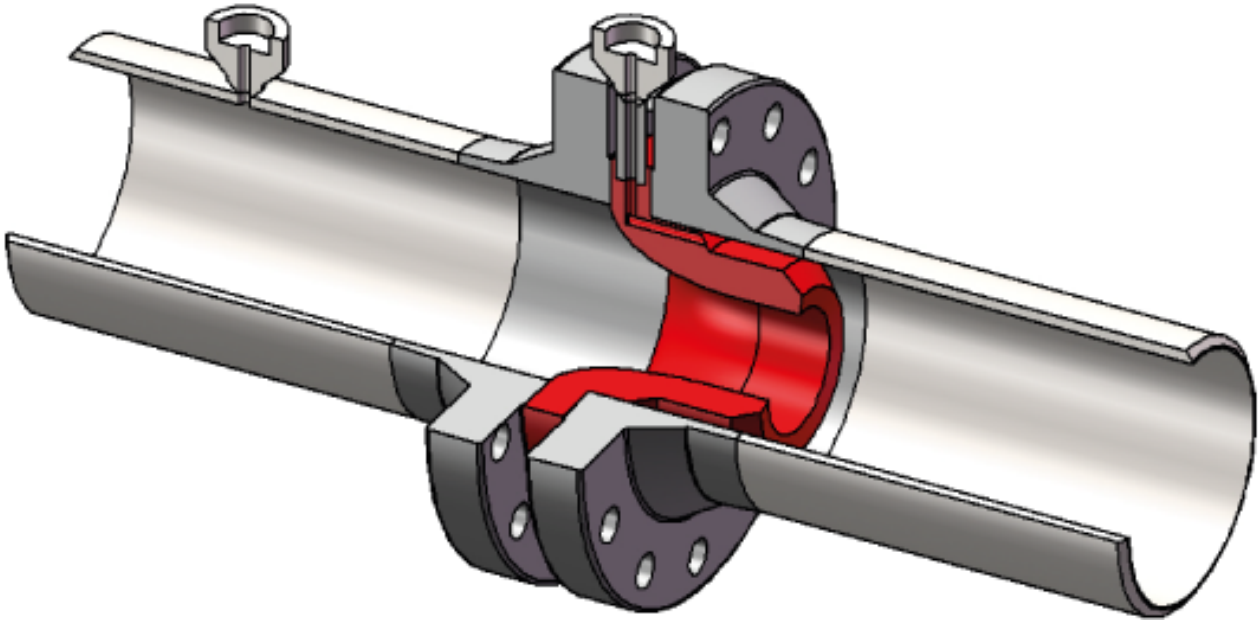


The flanged style flow nozzle is the most common design, with the nozzle inserted between pipe flanges. The pressure taps are located upstream and downstream of the flow nozzle and are located in the pipe wall. The specific location is determined by the beta ratio.

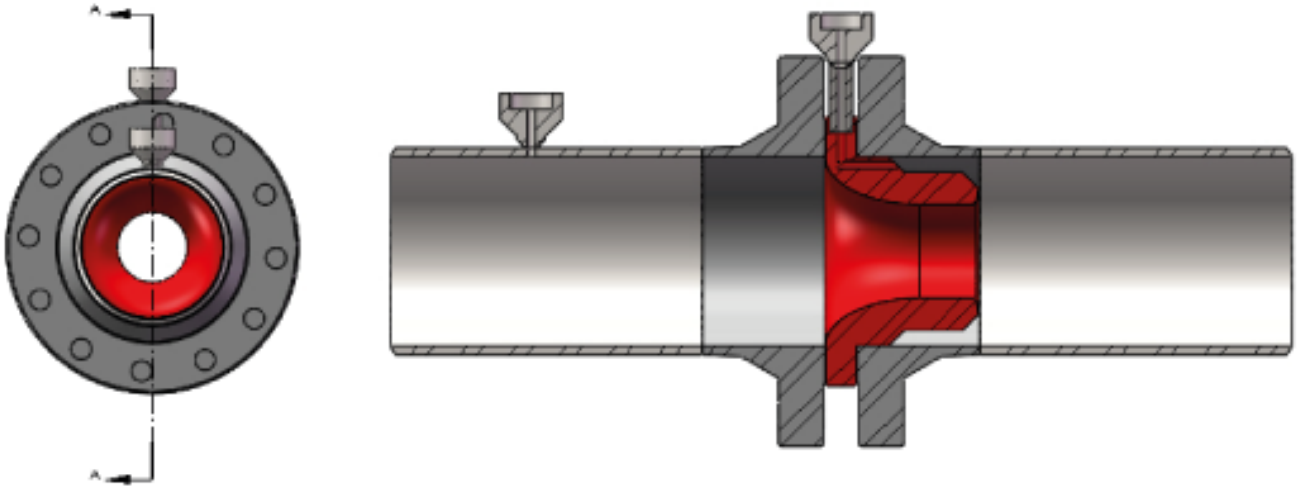




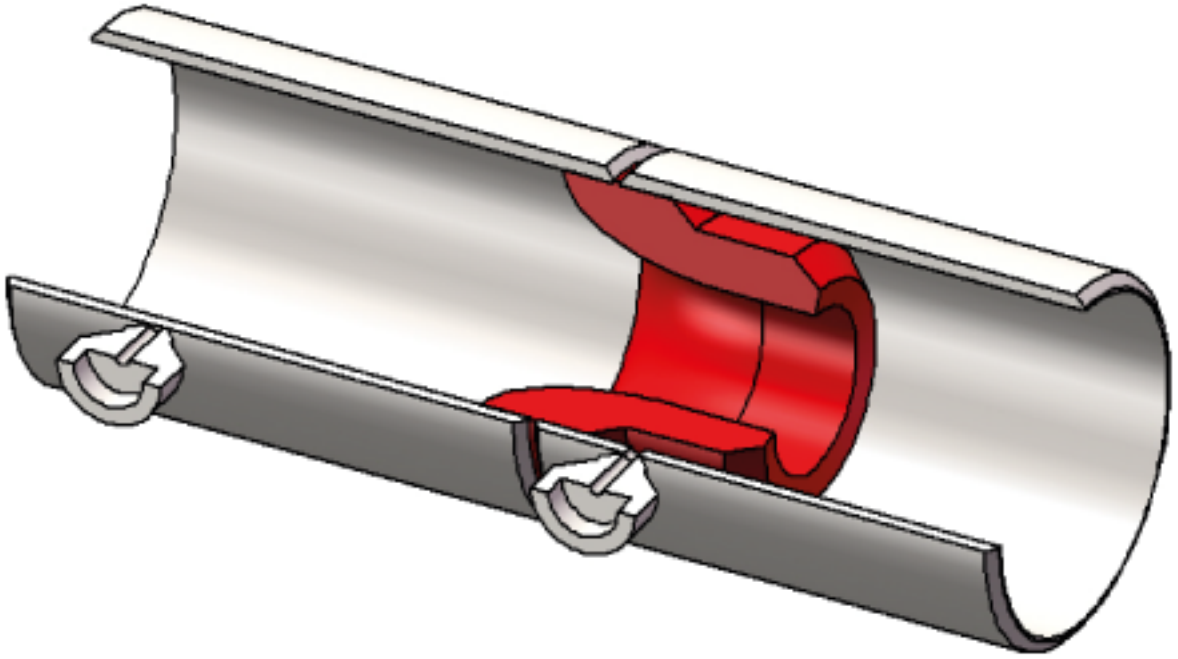
TAPPED FNMT



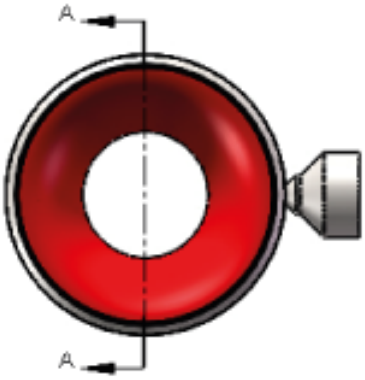
The tapped style flow nozzle is similar to the flanged design, but the downstream pressure tap is located in the nozzle. This design is recommended for smaller line sizes where the downstream tap location interferes with the holding flange or pipe weld.

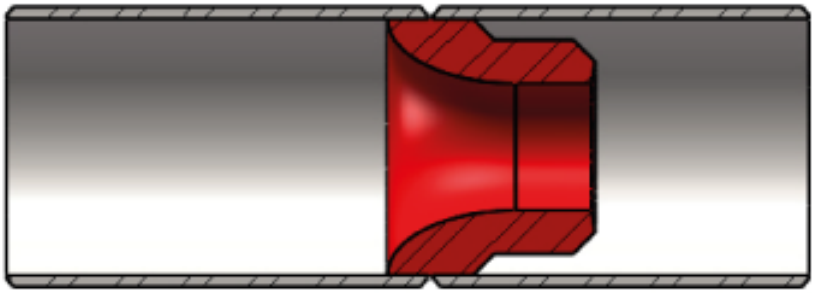


WELD-IN FNMT

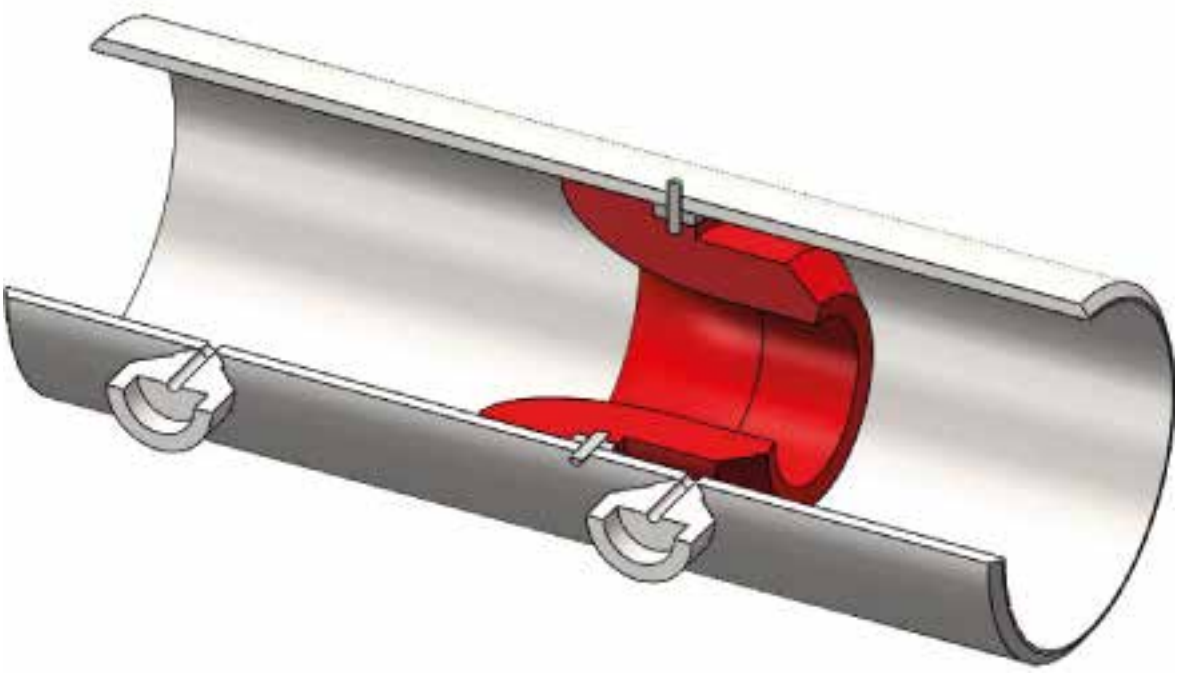


The weld-in style flow nozzle is permanently installed inside the pipe section. This is a common configuration where high temperature and high pressures prohibit the use of flanges such as in power plant feed water installations.

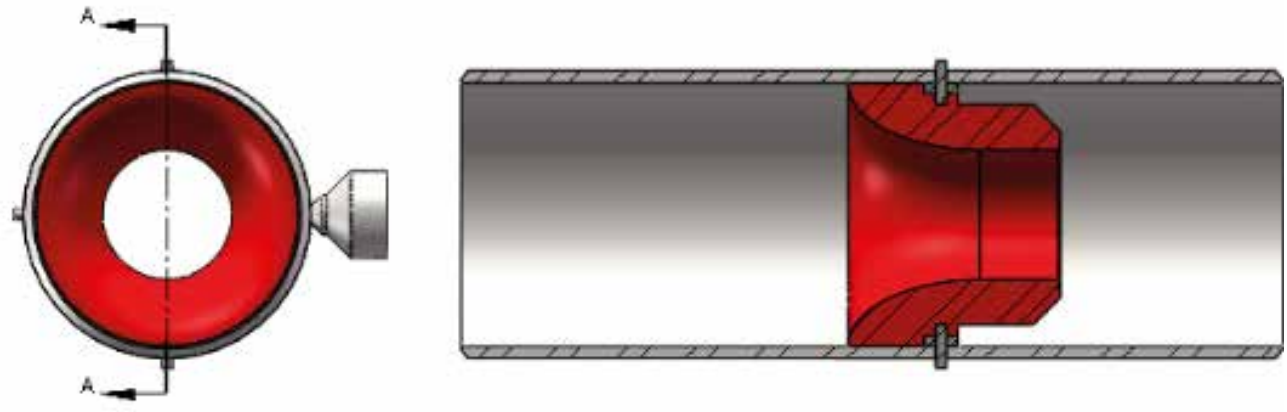




HOLDING RING FNMT



The holding ring style flow nozzle eliminates the welding of dissimilar materials. A special holding ring, of the same metallurgy of the pipe, is installed around the flow nozzle. This allows the nozzle to be made of a different material than the pipe.



FLOW NOZZLE

ORDERING INFORMATION

TO PLACE AN ORDER

Review the flow nozzle catalog and select one option from each of the categories below to identify the part number for your application. Provide the part number to Daniel for a detailed quote at sales@daniel.com

Flow Nozzle - FNZ Part Number String (1 of 2)

FNZ	XX	X	XX	XX

Pipe Size

2"	02
3"	03
4"	04
6"	06
8"	08
10"	10
12"	12
14"	14
16"	16
18"	18
20"	20
24"	24
Larger	XX

End Configuration

Flanged	F
Beveled	B
Wafer	W
Other	X

Throat Material

304/L Stainless	34
316/L Stainless	36
Carbon Steel	CS
Low Temp Carbon Steel	LT
Other	XX

Body Material

304/L Stainless	34
316/L Stainless	36
Carbon Steel	CS
Low Temp Carbon Steel	LT
Other	XX

(continued on next page)

FLOW NOZZLE

ORDERING INFORMATION

TO PLACE AN ORDER

Review the flow nozzle catalog and select one option from each of the categories below to identify the part number for your application. Provide the part number to Daniel for a detailed quote at sales@daniel.com

Flow Nozzle - FNZ Part Number String (2 of 2)

CVT	XX	X	XX	XX	X	X	X	X	X	X

Flow Nozzle Type

Flanged	F
Tapped	T
Weld-in	W
Holding Ring	H

Pipe Schedule

Standard	1
X-StrongWall	2
Other	X

Process Connection

ANSI 150# Flange	1
ANSI 300# Flange	2
ANSI 600# Flange	3
ANSI 900# Flange	4
ANSI 1500# Flange	5
ANSI 2500# Flange	6

Instrument Connection

¼" NPT or SW	1
½" NPT or SW	2
Other	X

Calibration

None	0
Third Party Lab Calibration	1

NDE Testing

Visual Inspection	0
Hydrostatic	1
Radiography	2
Magnetic Particle/Dye Penetrant	3
PMI (SS only)	4
Other	X

(continued from previous page)

With over 90 years of experience, Daniel is the only manufacturer that has the knowledge and experience to engineer and offer superior products that are trusted to provide the most reliable and accurate measurements in the global oil and gas industry.

Contact Us
Email: sales@Daniel.com
Phone: +1 (346) 509-3700

Decades Proven. Field Chosen.™