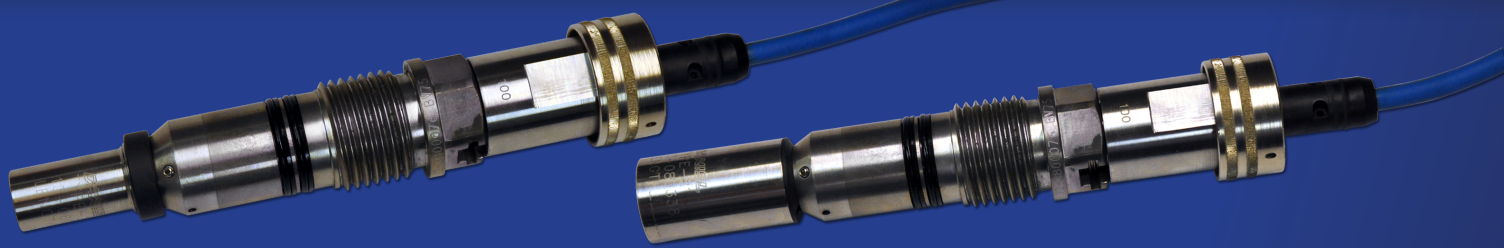
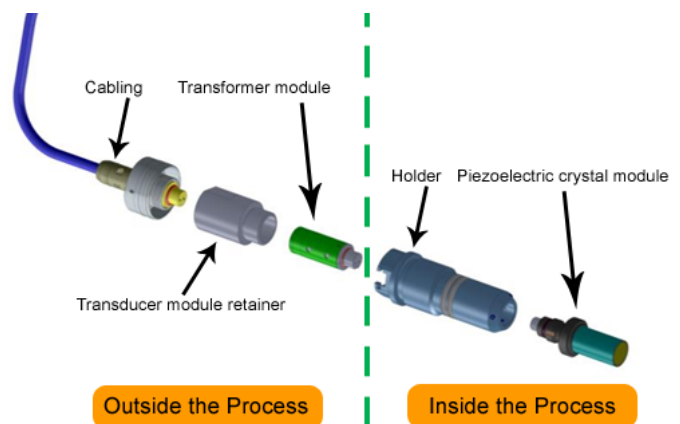


# Daniel T-20 Series Gas Ultrasonic Transducers



## Robust Performance

Designed for today's challenging application requirements, Daniel T-20 Series Transducers are more robust with an increased tolerance to wet, rich and/or dirty gas. This next-generation design expands on the capabilities of the widely used Daniel T-11 and T-12 Transducers to ensure reliable performance and increased longevity in shale plays and other tough environments by offering a non-wetted transformer located outside of the pressurized process. The possibility of corrosion is eliminated and operators can troubleshoot down to the transformer level without depressurizing the meter to simplify maintenance and minimize downtime. Existing meters can also be easily upgraded to T-20 Series Transducers to enhance long term meter performance.



Daniel T-20 Series ultrasonic transducer assembly

## Benefits

**Resistant to liquid borne dirt:** The transducer capsule is designed to minimize contact between liquids or liquid borne dirt and the holder pins as well as to reduce build-up of contaminants.

**Robust electrical connection:** Reduced build-up of liquid borne dirt prevents debris from weakening the electrical connection. Additionally, separating the transformer from the transducer capsule increases signal voltage from the piezoelectric crystal by a factor of 30 to 40, ensuring a continuous, stronger connection with the pin connectors.

**More tolerant of corrosive fluids, such as H<sub>2</sub>S:** The non-wetted transformer module increases tolerance to higher amounts of dirty gas components and the piezoelectric crystal is nickle plated, improving corrosion resistance.

**Less sensitive to process conditions:** Removed from the process, the transformer is less sensitive to pressure and temperature cycling.

**Longer lasting, low maintenance design:** The only element in the transducer capsule is the nickle-plated piezoelectric crystal, ensuring the life of transducer components is extended. Cleaning cycles can also be extended to minimize operator intervention.

**Serviceability without process interruption:** The operator does not have to depressurize the meter to troubleshoot down to the transformer level. Additionally, T-21 and T-22 transformers are not matched and can be replaced individually rather than in pairs.

## New Challenges, New Solutions

Ultrasonic flow meters have historically been installed at custody transfer points in natural gas transmission and distribution pipelines known for clean dry natural gas composition. Today, with new sources of natural gas entering the value chain, gas quality managers are working hard to maintain quality natural gas in the pipelines.

Increases in horizontal drilling and improvements in drilling efficiency are driving the need for ultrasonic flow meter technology to move closer to the well head.

### Applications now include:

- Gas gathering prior to gas processing
- Shale gas
- Offshore allocation and custody transfer measurement
- New production from wet, dirty gas fields coming online
- Rich gas production from deep water offshore wells

Shale gas is often wet with natural gas liquids and water from the fracking process. Deep water offshore production brings up rich gas very high in ethane and propane.

The increased use of gas ultrasonic meters in shale gas

plays and upstream applications, where wet contaminated gases are prevalent, require a more robust ultrasonic transducer design that is tolerant of these harsher fluids. These gases contain corrosive components such as H<sub>2</sub>S, free liquids and are prone to liquid borne debris.

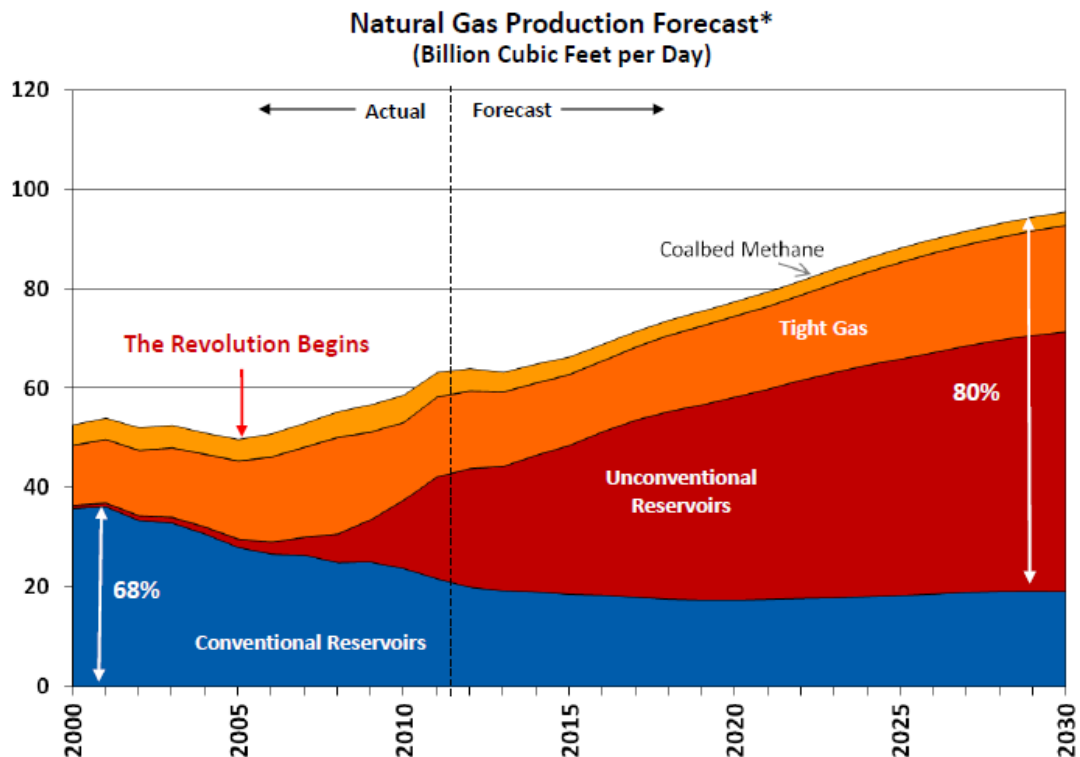
### Unconventional Gas

Over the past five years, US natural gas production has risen from 52 billion cubic feet (Bcf) per day to 65 Bcf per day—a 25% increase. This rapid rise was driven primarily by shale gas production. Today, shale gas accounts for 37% of total natural gas production. In 2000, shale gas accounted for just 2% of total natural gas production.

Unconventional natural gas—which includes shale gas, as well as natural gas from tight sands formations and coal bed methane—accounts for nearly 65% of current US natural gas production.

Natural gas production is currently growing faster than demand, creating a temporary surplus. By the end of the decade, natural gas production will likely reach nearly 80 Bcf per day—almost 75% of which will originate from unconventional activity.

## The Unconventional Natural Gas Revolution in the U.S.



**Production rises, with further growth forecast**

\*Source: Wood Mackenzie, Spring 2012

# Converting to the T-20 Series Transducers

Current Daniel gas ultrasonic meter installations using T-10 Series transducers (T-11 and T-12) can convert to the new T-20 Series transducers (T-21 and T-22) in pairs regardless of firmware or electronics.

All Daniel gas ultrasonic meters can be retrofitted with the new transducers. Both the T-10 Series and the new T-20 Series transducers can operate in the same meter.

All of the new transducer components can be supplied individually. This includes transducer capsules in pairs, single transformers and retaining rings.

The T-20 Series transducers will also be supplied as replacements to T-10 Series transducers should they ever need to be replaced. All new Daniel gas ultrasonic meters will be equipped with the T-20 Series ultrasonic transducers.

## T-20 Series Specifications

### Product Compatibility

Daniel gas ultrasonic flow meter models:

- 3400 SeniorSonic™/JuniorSonic™
- 3410 Series

### Materials of Construction

- 316L SS

### Fluid Types

- Hydrocarbons, industrial gases, H<sub>2</sub>S limit 10,000 ppm (1%)

### Fluid Temperature

- **T-22:** -50°C to 100°C (-58°F to +212°F)
- **T-21:** -20°C to 100°C (-4°F to +212°F)

### Operating Pressure

- **T-22:** 0 to 689 kPag (0 to 100 psig)<sup>(1)</sup>
- **T-21/22:** 345 to 27,579 kPag (100 to 4,000 psig)

### Operating Frequency

- 125 kHz

### Safety Classifications

Underwriters Laboratories (UL / cUL)  
Hazardous Locations – Class I, Div 1, Groups C & D

T-20 Series Transducers are approved for use in hazardous areas with Daniel 3410 and Mark III electronics only. T-20 Series Transducers are not electrically certified for use with Mark II or prior electronics. Refer to the flowmeter datasheets for additional specifications.

## Ordering Conversion Kits

### T-22 and T-21 Transducer Conversion Kits and Itemized Parts for Daniel Gas Ultrasonic Meters

For low pressure applications at 0 to 689 kPag (0 to 100 psig), isolated transducer mounts are available. Please contact a Daniel service specialist for additional information.

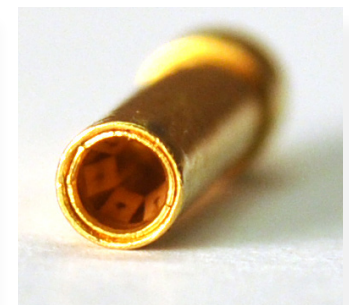
T-22 (meters 4" – 12")	T-21* (meters over 12")	
Part Numbers	Part Numbers	Upgrade Kits
1-360-03-210	1-360-03-200	Single Pair/Transformer Assembly/Housing Retainer
1-360-03-211	1-360-03-201	Four Pair/Transformer Assembly/Housing Retainer
Part Numbers	Part Numbers	Individual Replacement Parts
1-360-03-103	1-360-03-083	Transducer Pair
1-360-03-110	1-360-03-090	Transformer Assembly
1-360-01-958	1-360-01-958	Transformer Housing Retainer

\* All JuniorSonic™ ultrasonic meters have T-21 transducers.

### Non-wetted transformer



### Robust connector



(1) For low pressure applications 0 to 689 kPag (0 to 100 psig), the meter must be equipped with isolated transducer mounts.