

**PRODUCT INFORMATION****WAKE FREQUENCY CALCULATION INFORMATION**

Wake frequency calculations are performed on thermowells for assurance the designed well can withstand the stresses applied to it without failure. Thermowells that are exposed to flow can fail if the wake frequency comes within 20% of the natural frequency. If the wake frequency (the turbulent wake created by the flow of the process media past the thermowell) is too close to the natural frequency (the frequency at which the thermowell will oscillate/vibrate without external forces) the vortex shedding that occurs will destroy the thermowell. Other forces and stresses that can cause serious failures are also considered with this calculation.

Wake frequency calculations are executed per the ASME PTC 19.3 TW-2010 standard.

These calculations can also be referred to as Von Karman, velocity or vibration calculations. Ashcroft Inc. uses variation code XW5 within the thermowell part number to identify this variation.

This process is performed prior to the manufacture of the well. Should the thermowell fail, shortening of the "U" dimension or increasing the wall thickness are just a couple of the recommended solutions. The calculation is then rerun to determine if the design change is acceptable. Once approved, the well is manufactured.

In order to run the calculations six pieces of information are mandatory.

- 1. Thermowell part number or complete thermowell details**
- 2. Maximum operating temperature**
- 3. Maximum operating pressure**
- 4. Velocity of the process media in feet or meters per second**
- 5. Density of the process media**
- 6. Viscosity of the process media**

The attached form providing this information, ***must be completed for each*** thermowell requiring a wake frequency calculation (XW5) and submitted to your Inside Sales Rep at Ashcroft Inc. along with the purchase order. Pricing for this variation can be found in the Thermowell portion of the Ashcroft Price List, within the Tests and Certifications section.

# Wake Frequency Calculation Information Request Form (Required for each XW5)

Date: \_\_\_\_\_ Tag No. \_\_\_\_\_

Completed by: \_\_\_\_\_  
(Must include name and company)

Complete Thermowell PN: \_\_\_\_\_

Maximum Operating Temperature:	
Maximum Operating Pressure:	
Velocity of the process media <i>in feet or meters per second</i>	
Density of the process media:	
Viscosity of the process media:	

Any other reference numbers: \_\_\_\_\_

Additional Information:

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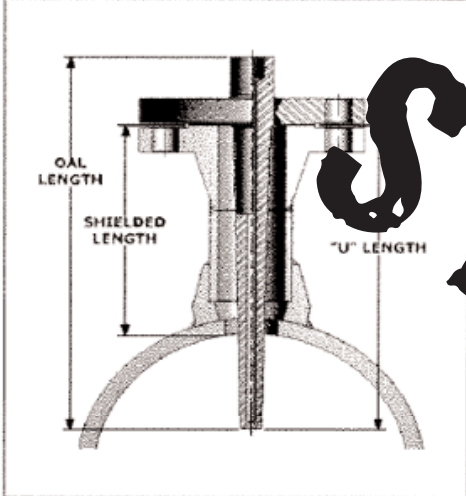
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Example of an approved Wake Frequency Calculation per the ASME PTC 19.3-TW-2010

## Wake Calc System

In accordance with ASME PTC-19.3-TW-2010

Report Information	
Customer: ASHCROFT	Date / Time: 1/24/2012
Tag Numbers: 0	Reference #: 20020619



Process Operating Conditions	
Process Fluids:	0
Pipe Size / Schedule:	0
Max Temperature (T) / Pressure (P):	176 °F / 215 psi
Fluid Flow Rate:	
Fluid Velocity (v):	9.8 ft/s
Fluid Density:	62.4 lb/ft <sup>3</sup>
Fluid Viscosity:	0.385 centipoise

Thermowell Material Properties	
Weight Density (Pm):	0.319 lb/in <sup>3</sup>
Elongation Modulus, E(T):	25400000 psi
Allowable Stress (S) / Fatigue Stress (Sf):	16400 psi/9100 psi

Stress (Support Point)	
In-Line Reson. Velocity (VR):	9.42 m/s
Bending Stress at VIR (So,max):	709217.93 psi
Dynamic Stress at V (So,max):	734.43 psi
Stress (Root):	638.2 psi

Frequency			
Frequency Limit:	0.40	Reynolds # (Re):	150684
Frequency must be below:	78.07 [Hz]	Strouhal # (Ns):	0.1909
Installed Natural Freq (fnc):	195.17 [Hz]	Scruton # (Nsc):	0.03
Strouhal Frequency (fs):	29.35 [Hz]	Freq Ratio (fnc):	0.15

Pressure	
Allowable Stem Pressure(Pc):	4922.66psi
Allowable Tip Pressure(Pt):	53179.75psi

Thermowell Rating		
	Status	Value
Oscillating Stress (psi)	PASS	734.42
Steady-State Stress (psi)	PASS	898.451
Pressure (psi)	PASS	215
Frequency (Hz)	PASS	29.34

The thermowell design has PASSED the wake frequency calculation