Conax Technologies, LLC
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Sample Probe Design Calculation Datasheet (based on IEC/TR 61831)

Conax P/N: Test   Date: 14-Jul-20

Tag Number: Test   Customer: Test

                                                     Conax S/O No.: Test

Sample Probe Parameters

Probe Material:	316 SST	Fluid Media:	--other--
ρ_m = Probe Material Density:	7,916.45271353 kg/m³	T = Operating Temperature:	100 °F
σ_{YS} = Yield Strength at Temp:	20,000 PSI	P = Operating Pressure:	50 PSI
E_T = Modulus of Elasticity at Temp:	28,300,000 PSI	V = Operating Fluid Velocity:	5 m/s
D_o = Probe Outside Diameter:	25 mm	μ = Dynamic Viscosity:	.005 cP
D_i = Probe Inside Diameter:	13 mm	f_M = Fluid Mass Factor:	1.0
L = Overall Length:	.5 m	ρ = Fluid Density	.5 kg/m³
U = Unsupported Length (Z+Y):	14.961 in	S_t = Strouhal Number (as per spec)	0.20
Y = Shielding Length	.3 m	F_i = Insertion Force:	38.04 lbf
Z = Insertion Length:	.08 m		

Acceptance Criteria

$$\text{Eq. 1)} \quad U_{max}^2 = 0.90 \times \frac{0.23\, f_M\, D_o}{S_t\, u} \sqrt{\frac{E_T}{\rho_m}\,(D_o^2 + D_i^2)} \qquad \text{Eq. 2)} \quad \sigma_t = \sigma_f + \sigma_w$$

Notes:

1.) Reference IEC/TR 61831 for additional support equations.

2.) Equation 1 represents the Maximum allowed un-supported probe length constrained by Vortex Shedding with an applied 90% Safety Factor. Based on IEC/TR 61831 Equation B.5 adapted for English units. (Criteria: U ≤ U_{max})

3.) Equation 2 represents the Total Bending Stress (σ_t) from Flow (σ_f) and the Weight (σ_w) of the probe for worst case horizontal mounting installations. (Criteria: $\sigma_t < \sigma_{YS}$)

• Max Allowed Probe Length U_{max} = 21.752 in Is U ≤ U_{max}? Pass
• Bending Stress from Flow σ_f = 1 PSI
• Bending Stress from Weight σ_w = 329 PSI
• Total Bending Stress σ_t = 330 PSI   Is $\sigma_t < \sigma_{YS}$?   Pass

Conclusion

Is the Sample Probe Assembly design acceptible? Pass