

BELLOWS DESIGN DATA SHEET EJMA 10th EDITION

Bellows Design Calculation - EJMA 10

Calculation: MM/2017/461 Revision: 0

Supplied by: **TRIAD BELLOWS DESIGN AND MANUFACTURING**

Client: ANY COMPANY	Draw ing Number: 50-180-011213	Calculation Date: 5/22/2017
Project No: AC-123456	Draw ing Revision: 1	Calculated By: MGM
Project Desc: EXHAUST EXPANSION JOINT	Item Number: 18" PIPE T-321 S/S	Bellow s Number: SAMPLE EJMA CALCULATION

Design Data

Design Temp: 1000 F	Axial Movement: -3.250 / 0.000 in	Req. Fatigue Cycles: 10000
Design Press: 5.0 psig	Lateral Movement: 0.000 / 0.375 in	Addit. Fatigue Safety Factor: 1
	Angular Rotation: 0.00 / 0.00 degr	Annealed Bellow s: No
		Weld Factor: 0.7

Dimensions

Bellow s ID: 18.00 in	Tool Radius: 0.166 in	Nipple Length: 0.0 in
Bellow s OD: 20.30 in	Pitch: 0.75 in	Nipple Mass: 0.0 lb
No of Convol: 16	Tangent End ID: 18.00 in	Nipple Angle: 0.00 degr
Layer Thickness: 0.0120 in	Tangent Length: 0.63 in	Pipe End Length: 0.0 in
No of Layers: 2	Collar Length: 0.00 in	Pipe End Thickness: 0.00 in
	Collar Thickness: 0.0000 in	Bellow s Type: Unspecified

Materials

Bellow s: ASME SA 240 321 2013 ed	Pipe Ends:	Bellow s material's Yield: 30,000 psi
Nipple:	Collar:	Bellow s in Creep Range: No

Calculation Results

Cd: 1.55	Rated Max Axial Mov Compr Only: 5.9 in	Allowed Cycles: 195,398
Cf: 1.37	Tot Equivalent Axial Movement: 5.71 in	Convol Depth w: 1.13 in
Cp: 0.71	Bellow s Allow able Stress: 16,200 psi	Bellow s Length Le: 13.3 in
S1: 1,683 psi	Bellow s E at Temperature: 2.28E7 psi	Bellow s Length Lb: 12.0 in
S'1: 0 psi	Bellow s Yield at Temp by EJMA: 36,180 psi	Bellow s Length Lu: 0.0 in
S2: 580 psi	Axial Working Spring Rate: 50 lbs/in	Total Length: 12.0 in
S3: 121 psi	Lateral Working Spring Rate: 191 lbs/in	Thickness tp: 0.0116 in
S4: 8,265 psi	Bending Working Spring Rate: 40 in-lbs/degr	Effective Area Ae: 288.02 in^2
S5: 350 psi	Limiting Column Instability: 6.7 psi	Factor Ku: 1.50
S6: 99,464 psi	Limiting Inplane Instability: 21.3 psi	Thrust Force: 1,440 lbs

EXPANSION JOINT DESIGN STARTS WITH THE METAL BELLOWS

When the exhaust bellows is designed correctly you can be guaranteed years of trouble free service. At Triad Bellows our goal is to engineer metal bellows with both performance and value in mind. We follow the Expansion Joint Manufacturers Association latest 10th Edition guidelines to insure that we meet our goal.

Axial and Lateral Spring Rate: In order to evaluate the loads upon piping, supports, or equipment, it is necessary to determine the axial forces and moments required to move an Expansion Joint. The bellows resistance factor or working spring rate is shown in lbs per inch of compression or extension.

Allowed Cycles: The fatigue life expectancy can be defined as the total number of complete cycles which can be expected from the expansion joint. A cycle is defined as one complete movement from the initial position in the piping system to the operating position and back to the initial position. Cycle Life is theoretical and is dependent upon the maximum stress range to which the bellows is subjected. The fatigue life expectancy of an expansion joint is affected by various factors such as: operating pressure, operating temperature, the material from which the bellows is made, the movement per convolution, the thickness of the bellows, the convolution pitch, the depth and shape of the convolution. Any change in these factors will result in a change in the life of the Expansion Joint. The work hardening of austenitic stainless steel, induced during the forming of convolutions, generally improves the fatigue life of an Expansion Joint often to a marked degree.

Contact Triad Bellows Engineering for other data sheet definitions: (714)-204-4444 or (888) 866-1080