

Bellows Design Calculation - EJMA 10



Calculation: /2024/427

Revision: 0

Supplied by: TRIAD BELLOWS DESIGN AND MANUFACTURING

Client:	Drawing Number:	Calculation Date: 11/12/2024
Project No:	Drawing Revision:	Calculated By: GIOVANNY MENDOZA
Project Desc:	Item Number:	Bellows Number:

Design Data

Design Temp:	1000 F	Axial Movement:	0.000 / 0.000 in	Req. Fatigue Cycles:	3000
Design Press:	5.0 psig	Lateral Movement:	0.000 / 1.000 in	Addit. Fatigue Safety Factor:	1
		Angular Rotation:	0.00 / 0.00 degr	Annealed Bellows:	No
		Collar Weld Factor:		Weld Factor:	0.7

Dimensions

Bellows ID:	8.000 in	Tool Radius:	0.1110 in	Nipple Length:	0.0 in
Bellows OD:	9.298 in	Pitch:	0.5000 in	Nipple Mass:	0.0 lb
No of Convol:	18	Tangent End ID:	8.000 in	Nipple Angle:	0.00 degr
Layer Thickness:	0.0120 in	Tangent Length:	0.625 in	Pipe End Length:	0.0 in
No of Layers:	2	Collar Length:	0.000 in	Pipe End Thickness:	0.00 in
		Collar Thickness:	0.0000 in	Bellows Type:	Unspecified
		Collar Area:	0.000 in^2		

Materials

Bellows: ASME SA 240 321 2023 ed	Pipe Ends:
Nipple:	Collar:
Bellows material's Yield: 30,000 psi	Bellows in Creep Range: No

Calculation Results

Cd:	1.69	Rated Max Axial Mov Compr Only:	4.1 in	Allowed Cycles:	42,302
Cf:	1.43	Tot Equivalent Axial Movement:	2.88 in	Convol Depth w:	0.63 in
Cp:	0.66	Bellows Allowable Stress:	16,200 psi	Bellows Length Le:	10.3 in
S1:	836 psi	Bellows E at Temperature:	2.28E7 psi	Bellows Length Lb:	9.0 in
S'1:	0 psi	Bellows Yield at Temp by EJMA:	36,180 psi	Bellows Length Lu:	0.0 in
S2:	355 psi	Axial Working Spring Rate:	110 lbs/in	Total Length:	9.0 in
S3:	68 psi	Lateral Working Spring Rate:	152 lbs/in	Thickness tp:	0.0115 in
S4:	2,419 psi	Bending Working Spring Rate:	18 in-lbs/degr	Effective Area Ae:	58.75 in^2
S5:	863 psi	Limiting Column Instability:	19.4 psi	Factor Ku:	1.50
S6:	132,458 psi	Limiting Inplane Instability:	72.0 psi	Thrust Force:	294 lbf

Evaluation

All stresses and values are acceptable if not otherwise stated below.
Temperature is too high or material has no published fatigue values.
Justify fatigue data by testing or other means.