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:	-3.000 / 0.000	in	Req. Fatigue Cycles:	3000	
Design Press:	5.0	psig	Lateral Movement:	0.000 / 0.000	in	Addit. Fatigue Safety Factor:	1	
			Angular Rotation:	0.00 / 0.00	degr	Annealed Bellows:	No	
			Collar Weld Factor:			Weld Factor:	0.7	

Dimensions

			Tool Radius:	0.1110	in	Nipple Length:	0.0	in
Bellows ID:	8.000	in	Pitch:	0.5000	in	Nipple Mass:	0.0	lb
Bellows OD:	9.298	in	Tangent End ID:	8.000	in	Nipple Angle:	0.00	degr
No of Convol:	18		Tangent Length:	0.625	in	Pipe End Length:	0.0	in
Layer Thickness:	0.0120	in	Collar Length:	0.000	in	Pipe End Thickness:	0.00	in
No of Layers:	2		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:	33,959	
Cf:	1.43		Tot Equivalent Axial Movement:	3.00	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:	306	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:	898	psi	Limiting Column Instability:	19.4	psi	Factor Ku:	1.50	
S6:	137,834	psi	Limiting Inplane Instability:	72.2	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.