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BELLOWS DESIGN CALCULATION SPREADSHEET

Design Code:	EJMA Standards, 10th Edition	Author :	BEDİHA
Allowable Stress Basis:	ASME Section II-D, 2019 Edition	Issues:	27.01.2026

BELLOWS DESIGN INFORMATION

Bellows Material:	SA240-T321		Sa at Design Temp.:	132	(MPa)
Collar Material:	N/A		Sa at 70 deg F:	138	(MPa)
Reinforcing Ring Mat:	N/A		E at Design Temp.:	186.096	(MPa)
Design Pressure:	25,0	(barg)	E at 70 deg F:	195.129	(MPa)
Design Temperature:	150	(degC)	Weld efficiency:	1,00	
Axial Extension:	0,00	(mm)	Cycle Life:	653	cycles
Axial Compression:	100,00	(mm)	Cycle Life Based on:	EJMA Standards, 10th Edition	
Lateral (+):	0,00	(mm)			
Lateral (-):	0,00	(mm)			
Angular (+):	0,00	(deg.)			
Angular (-):	0,00	(deg.)	EJMA fc factor:	1,00	

SPRING RATE INFORMATION

	Total Expansion Joint	Spring Forces
Axial Spring Rate:	459 (N/mm)	Axial : 45.900 (N)
Lateral Spring Rate:	4.967 (N/mm)	Lateral : N/A (N)
Angular Spring Rate:	189 (N-m/deg)	Angular : N/A (N-m/deg)
Torsional Spring Rate:	263.377 (N-m/deg)	

BELLOWS GEOMETRY

Bellows Inside Diameter (ID):	406,00	(mm)	Convolution Height:	27,0	(mm)
Bellows Outside Diameter (OD):	464,8	(mm)	Re-roll (2r):	12,0	(mm)
Number of convolutions:	9		Bellows Convolute Length (Ln):	250,00	(mm)
Individual Ply Thickness (t):	0,800	(mm)	Center Spool Length:	N/A	(mm)
Number of Plies (n):	3		Theoretical Neutral Length:	259	(mm)

BELLOWS STRESS ANALYSIS

		Design Stress	Allowable Stress
S1	Tangent Circumferential Membrane Stress Due to Pressure	110 MPa	132 MPa
S'1	Collar Circumferential Membrane Stress Due to Pressure	N/A MPa	N/A MPa
S2	Circumferential Membrane Stress Due to Pressure	97 MPa	132 MPa
S'2	Reinforcing Ring Membrane Stress Due to Pressure	N/A MPa	N/A MPa
S3	Meridional Membrane Stress Due to Pressure	15 MPa	N/A MPa
S4	Meridional Bending Stress Due to Pressure	309 MPa	N/A MPa
S3+S4	Meridional Mem. + Bending Stress Due to Pressure	324 MPa	395 MPa
S5	Meridional Membrane Stress Due to Deflection	21 MPa	N/A MPa
S6	Meridional Bending Stress Due to Deflection	2.031 MPa	N/A MPa
St	Total Stress Range for All Movements	2.278 MPa	N/A MPa
S"1	Collar Circumferential Bending Stress Due to Pressure	N/A MPa	N/A MPa
S'1+S"1	Collar Circumferential Bending + Membrane Stress Due to Press	N/A MPa	N/A MPa
Squirm	Maximum Design Pressure Based Upon Squirm	27,9 barg	

MISCELLANEOUS INFORMATION

Bellows Annealed/Not-Annealed After Forming	Not-Annealed	
Reinforcing Rings Utilized/Not Utilized	Not-Utilized	
Reinforcing Ring Area	N/A	cm^2
Bellows Weight:	17,1	kg
Bellows Effective Area:	1.490,0	cm^2
Pressure Thrust:	372.190	N
Convolution Switch Value (for manufacturing):	69	mm
Pitch:	27,8	mm