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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: 702 cycles
Axial Compression: 105,00 (mm)	Cycle Life Based on: EJMA Standards, 10th Edition
Lateral (+): 0,00 (mm)	EJMA fc factor: 1,00
Lateral (-): 0,00 (mm)	
Angular (+): 0,00 (deg.)	
Angular (-): 0,00 (deg.)	

SPRING RATE INFORMATION

	Total Expansion Joint	Spring Forces
Axial Spring Rate: 500 (N/mm)	Axial : 52.500 (N)	
Lateral Spring Rate: 6.189 (N/mm)	Lateral : N/A (N)	
Angular Spring Rate: 315 (N-m/deg)	Angular : N/A (N-m/deg)	
Torsional Spring Rate: 464.708 (N-m/deg)		

BELLOWS GEOMETRY

Bellows Inside Diameter (ID): 508,00 (mm)	Convolution Height: 27,0 (mm)
Bellows Outside Diameter (OD): 566,8 (mm)	Re-roll (2r): 12,0 (mm)
Number of convolutions: 10	Bellows Convoluted Length (Ln): 280,00 (mm)
Individual Ply Thickness (t): 0,800 (mm)	Center Spool Length: N/A (mm)
Number of Plies (n): 3	Theoretical Neutral Length: 288 (mm)

BELLOWS STRESS ANALYSIS

	Design Stress	Allowable Stress
S1 Tangent Circumferential Membrane Stress Due to Pressure	123 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	119 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	14 MPa	N/A MPa
S4 Meridional Bending Stress Due to Pressure	313 MPa	N/A MPa
S3+S4 Meridional Mem. + Bending Stress Due to Pressure	327 MPa	395 MPa
S5 Meridional Membrane Stress Due to Deflection	19 MPa	N/A MPa
S6 Meridional Bending Stress Due to Deflection	1.990 MPa	N/A MPa
St Total Stress Range for All Movements	2.238 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	27,3 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:	23,5 kg
Bellows Effective Area:	2.270,4 cm ²
Pressure Thrust:	567.282 N
Convolution Switch Value (for manufacturing):	69 mm
Pitch:	28,0 mm