ENGINEERING BULLETIN #112

Operating Conditions and Reduction Factors Consideration

When selecting a hose for a specific pressure application among various factors that must be taken into consideration, the operating temperature and dynamic stress (pressure spikes, vibration, frequent movements etc.) are the most important parameters to consider.

The working pressures published in Penflex's product catalog apply to operating conditions at 70°F and therefore at higher operating temperature, they need to be reduced by applying temperature adjustment factor.

Because braid is the main component of the assembly that prevents the hose from elongation due to internal pressure, temperature adjustment factors should be based on the alloy used in the braid wire and are listed in the table below.

TEMPERATURE ADJUSTMENT FACTOR
(BASED ON BRAID ALLOY)

Temp. °F	304/304L Stainless Steel	316L Stainless Steel	321 Stainless Steel	Carbon Steel	Monel	Bronze
70	1.00	1.00	1.00	1.00	1.00	1.00
150	.95	.93	.97	.99	.93	.92
200	.91	.89	.94	.97	.90	.89
250	.88	.86	.92	.96	.87	.86
300	.85	.83	.88	.93	.83	.83
350	.81	.81	.86	.91	.82	.81
400	.78	.78	.83	.87	.79	.78
450	.77	.78	.81	.86	.77	.75
500	.77	.77	.78	.81	.73	
600	.76	.76	.77	.74	.72	
700	.74	.76	.76	.66	.71	
800	.73	.75	.68	.52	.70	
900	.68	.74	.62			
1,000	.68	.74	.62			

Temp. °F	304/304L Stainless Steel	316L Stainless Steel	321 Stainless Steel	Carbon Steel	Monel	Bronze
1,100	.58	.67	.58			
1,200	.53	.61	.53			
1,300	.44	.55	.46			
1,400	.35	.48	.42			
1,500	.26	.39	.37			

For example, to calculate the Maximum Allowable Working Pressure (MAWP) for 3/4″ ID, 321 Stainless Steel Corrugated hose single-braided with 304L braid, which will be used at operating temperature of 800°F, the following calculations should be performed.

MAWP = Working Pressure at 70°F x Temp. Adjustment Factor = 792 PSI x 0.73 = 578 PSI

If the assembly will be subjected to dynamic stress such as fluctuations in pressure, then additional reduction factors should be applied to calculate MAWP. Some reduction factors for common pressure fluctuations (designated by NAHAD) are listed in the table below.

Pressure Fluctuation	Derating Factor
Normal	1.00
Pulsating	0.50
Spike	0.17

So, if our assembly (from the example above) will be subjected not only to high temperature environment, but also will be experiencing pulsating pressure fluctuations, then MAWP has to be reduced even further:

MAWP = 792 PSI x 0.73 = 578 PSI x 0.50 = 289 PSI

If you have any questions or comments, please contact us.

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