STAR™ Aliphatic Amine Line Pipe *(High Pressure - API 15HR DESIGN - Product Data)*

Product Description
- Pressure - Up to 3250 psi (22,4 MPa)
- Resin System - Aliphatic Amine Cured Epoxy
- Reinforcement - Premium Fiberglass
- Joining Systems - API 8rd Threaded
- Joint Length - 30 Feet (9,1 mts) Nominal Random Lengths of 20 to 32 Feet (6,1 to 9,8 mts)
- Temperature - Up to 200°F (93.3°C) Maximum
- Sizes - 1½ through 8 inches
- Fittings - A variety of filament wound API 5B threaded fittings are available. API 15HR design systems require higher rated fittings, refer to the STAR High Pressure Threaded Fittings Product Data sheet. Temperature interpolation is not recommended for fittings.

High Pressure Design ≥ 500 psi
- Design Life - 20 years at full rating
- Design Temperature - 150°F (65.6°C)
- Wall Thickness - Minimum
- Hoop Stress - Lower Confidence Limit (LCL) of Long Term Hydrostatic Strength according to ASTM D2992-B
- 100% Factory Hydro Test - All sizes at 1.5 times the Series pressure rating

Flow Factors
- Hazen Williams C=150
- Absolute Roughness = 0.00021 in. (0.00533 mm)

Nominal Moduli
- Hoop Modulus of Elasticity
  - 73°F - 4.3 x 10^6 psi (29.7 GPa)
  - 150°F - 3.6 x 10^6 psi (24.6 GPa)
  - 200°F - 2.5 x 10^6 psi (17.0 GPa)
- Axial Modulus of Elasticity
  - 73°F - 2.3 x 10^6 psi (16.1 GPa)
  - 150°F - 1.9 x 10^6 psi (13.3 GPa)
  - 200°F - 1.3 x 10^6 psi (9.2 GPa)
- Poisson's Ratio
  - ν_{ah} = 0.38 (minor)
  - ν_{ha} = 0.69 (major)

Physical Properties
- Density = 124 lbs/cu ft (1986 kgs/cu m)
- Specific Gravity = 1.99

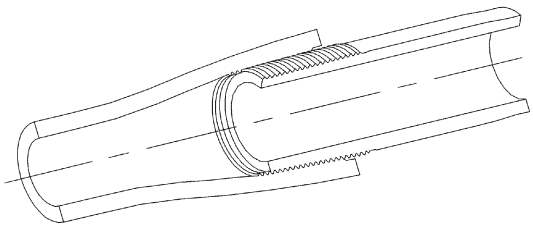
Thermal Properties
- Coefficient of Thermal Conductivity
  - 0.23 BTU/(ft•hr•°F) (0.4 W/(m•°C))
- Axial Coefficient of Thermal Expansion
  - 10.4 x 10^{-6} in/in/°F (18,8 x 10^{-6} mm/mm/°C)
- Hoop Coefficient of Thermal Expansion
  - 6.2 x 10^{-6} in/in/°F (11,2 x 10^{-6} mm/mm/°C)

Benefits
- Corrosion Control
- Reduced Installation Costs
- Improved Flow Efficiency
- Reduced Paraffin & Scale Build-Up
- Reduced Maintenance Cost

Applications
- Production Lines or Injection Lines
- Transfer Lines or Disposal Lines
- Oil, Gas, Saltwater, CO_2 and H_2S

Joining System

Advanced Composite Thread (ACT)



API Threads
- ACT - Molded threads using a graphite, ceramic and epoxy composite for high performance applications.
- All 1½" EUE 10rd and 2⅜" - 4½" EUE 8rd API threads conform to API 5B Table 14, 14th Edition (L4 is minimum) and all 5½" - 9⅝" OD 8rd casing threads conform to API 5B Table 7, 14th Edition (L4 is minimum).

SIZE		NOMINAL PIPE DIMENSIONS										Minimum Bending Radius		Short-Term Tensile Rating	
		Inside Diameter		Outside Diameter		Wall Thickness		Pipe Weight		Connection Diameter					
Pipe	Thread	In	(mm)	In	(mm)	In	(mm)	Lbs/ft	(kg/m)	In	(mm)	Ft	(m)	Lbs	(kgs)
Series 500 (3,4 MPa)[1]												**500@150°F (65.5°C), 450@180°F (82.2°C), 400@200°F (93.3°C)**			
3	3 1/2	2.94	(74,7)	3.07	(78,0)	0.07	(1,8)	0.70	(1,0)	4.20	(106,7)	154	(46,9)	1700	(771)
4	4 1/2	3.85	(97,8)	4.02	(102,1)	0.09	(2,3)	1.20	(1,8)	5.45	(138,4)	201	(61,3)	2900	(1315)
6	6 5/8	5.93	(150,6)	6.18	(157,0)	0.12	(3,0)	2.30	(3,4)	7.15	(181,6)	309	(94,2)	6700	(3039)
8	8 5/8	7.74	(196,6)	8.07	(205,0)	0.17	(4,3)	4.30	(6,4)	9.25	(235,0)	404	(123,1)	11800	(5352)
Series 750 (5,2 MPa)[1]												**750@150°F (65.6°C), 650@180°F (82.2°C), 600@200°F (93.3°C)**			
2	2 3/8	1.94	(49,3)	2.07	(52,6)	0.07	(1,8)	0.40	(0,6)	3.05	(77,5)	104	(31,7)	1100	(499)
2 1/2	2 7/8	2.37	(60,2)	2.52	(64,0)	0.08	(2,0)	0.60	(0,9)	3.55	(90,2)	126	(38,4)	1700	(771)
3	3 1/2	2.94	(74,7)	3.14	(79,8)	0.10	(2,5)	1.00	(1,5)	4.25	(108,0)	157	(47,9)	2700	(1225)
4	4 1/2	3.85	(97,8)	4.09	(103,9)	0.12	(3,0)	1.70	(2,5)	5.55	(141,0)	204	(62,2)	4300	(1950)
5	5 1/2 TC	4.74	(120,4)	5.04	(128,0)	0.15	(3,8)	2.60	(3,9)	6.25	(158,8)	252	(76,8)	6500	(2948)
6	6 5/8	5.50	(139,7)	5.85	(148,6)	0.18	(4,6)	3.20	(4,8)	7.35	(186,7)	293	(89,3)	8800	(3992)
6	6 5/8	5.93	(150,6)	6.31	(160,3)	0.19	(4,8)	3.50	(5,2)	7.35	(186,7)	316	(96,3)	10300	(4672)
8	8 5/8	7.74	(196,6)	8.23	(209,0)	0.25	(6,4)	6.20	(9,2)	9.55	(242,6)	411	(125,3)	17400	(7893)
Series 1000 (6,9 MPa)[1]												**1000@150°F (65.6°C), 900@180°F (82.2°C), 850@200°F (93.3°C)**			
2	2 3/8	1.94	(49,3)	2.11	(53,6)	0.08	(2,0)	0.50	(0,7)	3.10	(78,7)	105	(32,0)	1400	(635)
2 1/2	2 7/8	2.37	(60,2)	2.57	(65,3)	0.10	(2,5)	0.80	(1,2)	3.55	(90,2)	128	(39,0)	2200	(998)
3	3 1/2	2.94	(74,7)	3.19	(81,0)	0.13	(3,3)	1.20	(1,8)	4.40	(111,8)	160	(48,8)	3400	(1542)
4	4 1/2	3.85	(97,8)	4.20	(106,7)	0.18	(4,6)	2.30	(3,4)	5.65	(143,5)	210	(64,0)	6300	(2858)
5	5 1/2 TC	4.74	(120,4)	5.15	(130,8)	0.20	(5,1)	3.30	(4,9)	6.45	(163,8)	257	(78,3)	8900	(4037)
6	6 5/8	5.50	(139,7)	5.97	(151,6)	0.24	(6,1)	4.10	(6,1)	7.45	(189,2)	299	(91,1)	12000	(5443)
6	6 5/8	5.93	(150,6)	6.45	(163,8)	0.26	(6,6)	4.70	(7,0)	7.60	(193,0)	322	(98,1)	14000	(6350)
8	8 5/8	7.74	(196,6)	8.40	(213,4)	0.33	(8,4)	8.00	(11,9)	9.75	(247,7)	420	(128,0)	23800	(10796)
Series 1250 (8,6 MPa)[1]												**1250@150°F (65.6°C), 1100@180°F (82.2°C), 1050@200°F (93.3°C)**			
2	2 3/8	1.94	(49,3)	2.15	(54,6)	0.11	(2,8)	0.70	(1,0)	3.15	(80,0)	108	(32,9)	1900	(862)
2 1/2	2 7/8	2.37	(60,2)	2.63	(66,8)	0.13	(3,3)	1.00	(1,5)	3.65	(92,7)	132	(40,2)	2900	(1315)
3	3 1/2	2.94	(74,7)	3.26	(82,8)	0.16	(4,1)	1.50	(2,2)	4.35	(110,5)	163	(49,7)	4300	(1950)
4	4 1/2	3.85	(97,8)	4.26	(108,2)	0.21	(5,3)	2.70	(4,0)	5.75	(146,1)	213	(64,9)	7500	(3402)
6	6 5/8	5.50	(139,7)	6.09	(154,7)	0.30	(7,6)	5.30	(7,9)	7.60	(193,0)	305	(93,0)	15300	(6940)
6	7	5.93	(150,6)	6.58	(167,1)	0.32	(8,1)	6.10	(9,1)	8.10	(205,7)	329	(100,3)	17800	(8074)
8	9 5/8	7.74	(196,6)	8.57	(217,7)	0.42	(10,7)	11.50	(17,1)	11.15	(283,2)	429	(130,8)	30200	(13699)
Series 1500 (10,3 MPa)[1]												**1500@150°F (65.6°C), 1350@180°F (82.2°C), 1250@200°F (93.3°C)**			
1 1/2	1.90	1.44	(36,6)	1.67	(42,4)	0.11	(2,8)	0.60	(0,9)	2.70	(68,6)	83	(25,3)	1500	(680)
2	2 3/8	1.94	(49,3)	2.24	(56,9)	0.15	(3,8)	0.90	(1,3)	3.30	(83,8)	112	(34,1)	2700	(1225)
2 1/2	2 7/8	2.37	(60,2)	2.75	(69,9)	0.19	(4,8)	1.40	(2,1)	3.75	(95,3)	138	(42,1)	4400	(1996)
3	3 1/2	2.94	(74,7)	3.40	(86,4)	0.23	(5,8)	2.10	(3,1)	4.45	(113,0)	170	(51,8)	6400	(2903)
4	4 1/2	3.85	(97,8)	4.43	(112,5)	0.29	(7,4)	3.60	(5,4)	5.80	(147,3)	221	(67,4)	10700	(4854)
6	6 5/8	5.50	(139,7)	6.33	(160,8)	0.42	(10,7)	7.20	(10,7)	7.74	(196,6)	317	(96,6)	21900	(9934)
6	7	5.93	(150,6)	6.83	(173,5)	0.45	(11,4)	8.20	(12,2)	8.20	(208,3)	342	(104,2)	25400	(11521)
8	9 5/8	7.74	(196,6)	8.75	(222,3)	0.51	(13,0)	13.90	(20,7)	11.80	(299,7)	437	(133,2)	37200	(16874)

TC - All products are integral joint unless indicated Threaded and Coupled

SIZE		NOMINAL PIPE DIMENSIONS										Minimum Bending Radius		Short-Term Tensile Rating	
		Inside Diameter		Outside Diameter		Wall Thickness		Pipe Weight		Connection Diameter					
Pipe	Thread	In	(mm)	In	(mm)	In	(mm)	Lbs/ft	(kg/m)	In	(mm)	Ft	(m)	Lbs	(kgs)
Series 1750 (12,1 MPa)[1]												**1750@150°F (65.6°C), 1600@180°F (82.2°C), 1500@200°F (93.3°C)**			
1 1/2	1.90	1.44	(36,6)	1.71	(43,4)	0.13	(3,3)	0.60	(0,9)	2.70	(68,6)	85	(25,9)	1800	(816)
2	2 3/8	1.94	(49,3)	2.31	(58,7)	0.19	(4,8)	1.20	(1,8)	3.35	(85,1)	116	(35,4)	3500	(1588)
2 ½	2 7/8	2.37	(60,2)	2.81	(71,4)	0.22	(5,6)	1.70	(2,5)	3.76	(95,5)	141	(43,0)	5100	(2313)
3	3 1/2	2.94	(74,7)	3.47	(88,1)	0.27	(6,9)	2.50	(3,7)	4.50	(114,3)	174	(53,0)	7500	(3402)
4	4 1/2	3.85	(97,8)	4.55	(115,6)	0.35	(8,9)	4.30	(6,4)	5.95	(151,1)	227	(69,2)	13100	(5942)
6	6 5/8	5.50	(139,7)	6.35	(161,3)	0.42	(10,7)	7.40	(11,0)	7.92	(201,2)	317	(96,6)	22400	(10161)
6	7	5.93	(150,6)	6.86	(174,2)	0.46	(11,7)	8.60	(12,8)	8.40	(213,4)	343	(104,5)	26200	(11884)
8	9 5/8	7.74	(196,6)	8.94	(227,1)	0.60	(15,2)	16.40	(24,4)	11.90	(302,3)	447	(136,2)	44600	(20231)
Series 2000 (13,8 MPa)[1]												**2000@150°F (65.6°C), 1800@180°F (82.2°C), 1700@200°F (93.3°C)**			
1 1/2	1.90	1.44	(36,6)	1.74	(44,2)	0.15	(3,8)	0.70	(1,0)	2.75	(69,9)	87	(26,5)	2000	(907)
2	2 3/8	1.94	(49,3)	2.36	(59,9)	0.21	(5,3)	1.30	(1,9)	3.40	(86,4)	118	(36,0)	4000	(1814)
2 ½	2 7/8	2.37	(60,2)	2.86	(72,6)	0.25	(6,4)	1.90	(2,8)	3.85	(97,8)	143	(43,6)	5800	(2631)
3	3 1/2	2.94	(74,7)	3.55	(90,2)	0.30	(7,6)	2.80	(4,2)	4.63	(117,6)	177	(53,9)	8700	(3946)
4	4 1/2	3.85	(97,8)	4.64	(117,9)	0.40	(10,2)	4.90	(7,3)	6.10	(154,9)	232	(70,7)	15000	(6804)
6	7	5.50	(139,7)	6.48	(164,6)	0.49	(12,4)	9.00	(13,4)	8.80	(223,5)	324	(98,8)	26100	(11839)
Series 2500 (17,2 MPa)[1]												**2500@150°F (65.6°C), 2250@180°F (82.2°C), 2100@200°F (93.3°C)**			
1 1/2	1.90	1.44	(36,6)	1.84	(46,7)	0.20	(5,1)	1.00	(1,5)	2.84	(72,1)	92	(28,0)	2900	(1315)
2	2 3/8	1.94	(49,3)	2.46	(62,5)	0.26	(6,6)	1.70	(2,5)	3.60	(91,4)	123	(37,5)	5000	(2268)
2 ½	2 7/8	2.37	(60,2)	2.91	(73,9)	0.27	(6,9)	2.10	(3,1)	4.03	(102,4)	145	(44,2)	6300	(2858)
3	3 1/2	2.94	(74,7)	3.61	(91,7)	0.34	(8,6)	3.20	(4,8)	4.85	(123,2)	181	(55,2)	9800	(4445)
3 ½	4 1/2	3.33	(84,6)	4.11	(104,4)	0.39	(9,9)	4.60	(6,8)	6.50	(165,1)	205	(62,5)	12800	(5806)
4	5 1/2	3.85	(97,8)	4.73	(120,1)	0.44	(11,2)	6.00	(8,9)	7.12	(180,8)	236	(71,9)	16800	(7620)
Series 3000 (20,7 MPa)[1]												**3000@150°F (65.6°C), 2700@180°F (82.2°C), 2550@200 (93.3°C)**			
1 1/2	1.90	1.44	(36,6)	1.92	(48,8)	0.24	(6,1)	1.20	(1,8)	2.98	(75,7)	96	(29,3)	3500	(1588)
2	2 3/8	1.94	(49,3)	2.49	(63,2)	0.27	(6,9)	1.80	(2,7)	3.65	(92,7)	124	(37,8)	5400	(2449)
2 ½	2 7/8	2.37	(60,2)	3.03	(77,0)	0.33	(8,4)	2.70	(4,0)	4.46	(113,3)	152	(46,3)	8000	(3629)
3	4 1/2[TC]	2.94	(74,7)	3.77	(95,8)	0.41	(10,4)	4.90	(7,3)	7.00	(177,8)	188	(57,3)	12300	(5579)
3 ½	4 1/2	3.33	(84,6)	4.27	(108,5)	0.47	(11,9)	5.50	(8,2)	6.75	(171,5)	213	(64,9)	15800	(7167)
4	5 1/2	3.85	(97,8)	4.93	(125,2)	0.54	(13,7)	7.40	(11,0)	7.47	(189,7)	247	(75,3)	25300	(11476)

TC - All products are produced integral joint unless indicated Threaded and Coupled

NOTE: Additional pressure classes are available on request.

[1]**SERIES PRESSURE (API 15HR)** - Based on minimum wall thickness dimensions and API 15HR Edition 3, for a 20 year life expectancy. API monogrammable pipe available on request.

Joining System Information (API 8rd Thread)

Joining System Pipe Size - Inches		1 ½	2	2 ½	3	4	5	6	6	8	8
Thread Size		1.90" EUE 10rd	2 3/8" EUE 8rd	2 7/8" EUE 8rd	3 1/2" EUE 8rd	4 1/2" EUE 8rd	5 1/2" OD 8rd	6 5/8" OD 8rd	7" OD 8rd	8 5/8" OD 8rd	9 5/8" OD 8rd
• Pin Upset O.D.	In	2.15	2.60	3.10	3.75	4.75	5.55	6.65	7.05	8.65	9.65
	(mm)	(54,6)	(66,0)	(78,7)	(95,3)	(120,7)	(141,0)	(168,9)	(179,1)	(219,7)	(245,1)
• Thread Length	In	2.36	2.94	3.25	3.50	3.88	4.75	4.25	4.88	4.85	5.13
	(mm)	(59,9)	(74,7)	(82,6)	(88,9)	(98,6)	(120,7)	(108,0)	(124,0)	(123,2)	(130,3)
• Make Up Length Loss	In	2.06	2.56	2.86	3.13	3.50	4.38	3.88	4.50	4.50	4.75
	(mm)	(52,4)	(65,1)	(73,0)	(79,4)	(88,9)	(111,1)	(98,4)	(114,3)	(114,3)	(120,7)

API CONNECTIONS - All products are produced integral joint unless indicated (TC) Threaded and Coupled. All 1 1/2" EUE 10rd and 2 3/8" - 4 1/2" EUE 8rd API threads conform to API 5B Table 14, 14th Edition (L4 is minimum) and all 5 1/2" - 9 5/8" OD 8rd casing thread conform to API 5B Table 7, 14th Edition (L4 is minimum).

Performance Ratings vs. Temperature

ASTM D2992-B		73.4° F (23°) C	150° F (65.6°) C	180° F (82.2°) C	200° F (93.3°) C
11.4 Year Life, LTHS	psi	26,353	22,203	20,578	19,494
	MPa	(181,7)	(153,1)	(141,9)	(134,4)
20 Year Life, LTHS (Long-Term Hydrostatic Stress)	psi	26,004	21,404	19,602	18,401
	MPa	(179,3)	(147,6)	(135,2)	(126,9)
20 Year Life, LCL (Lower Confidence Limit)	psi	24,596	20,335	18,666	17,554
	MPa	(169,6)	(140,2)	(128,7)	(121,0)

* 150° F and 180° F data are interpolated

Pipe Capacity

Size	Inside Diameter		Capacity	
Pipe	in	(mm)	Bbls/1,000 ft.	(m^3/km)
1½	1.44	(36,6)	2.01	(1,1)
2	1.94	(49,3)	3.66	(1,9)
2½	2.37	(60,2)	5.46	(2,8)
3	2.94	(74,7)	8.40	(4,4)
3½	3.33	(84.6)	10.77	(5.6)
4	3.85	(97,8)	14.40	(7,5)
5	4.74	(120,4)	21.83	(11,4)
6	5.50	(139,7)	29.39	(15,3)
6	5.93	(150,6)	34.16	(17,8)
8	7.74	(196,6)	58.20	(30,4)

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