

# STAR™ Super Seal Key-Lock

## Applications

- Potable Water
- Produced Water
- Waste Water
- Seawater
- Crude Oil & Gas
- Hydrogen & CO2 Transport
- Brine
- Drainage Systems
- Sewage
- Brackish Water
- Pipe Rehabilitation
- General Industrial Service

## Product Description

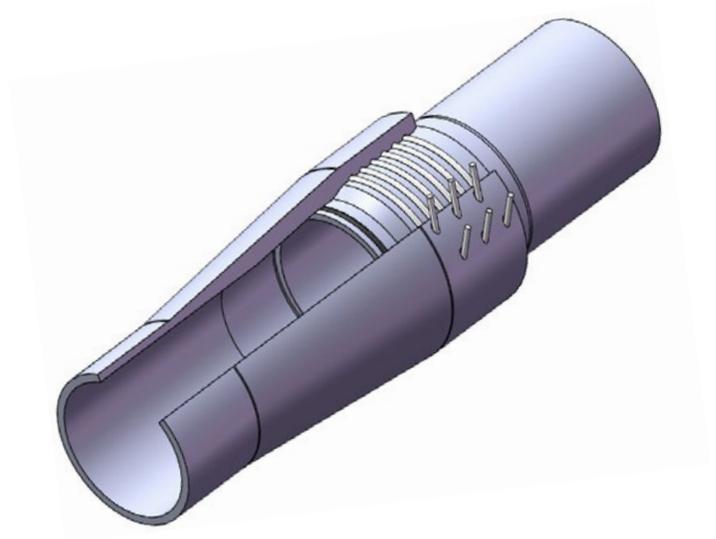
- **Sizes** - 8 through 40 inches (200-1000 mm)
- **Pressure** - 300 to 3,000 psi (2.1-20.7 MPa)
- **Temperature** - Up to 212°F (100°C)
- **Resin System** - Aromatic Amine
- **Reinforcement** - Premium Fiberglass
- **Joining Systems** - Filament-wound glass-fiber reinforced epoxy (GRE) with integral Key-Lock (KL) male and female mechanical joining system.
- **Joint Length** - 39 ft. (11.9 m), 49 ft. (14.9 m) or 60 ft. (18.3 m) nominal
- **Fittings** - Filament-wound glass-fiber reinforced fittings with integral KL female bells. A wide range of fittings are available.

## High Pressure Design

- **Design Life** - 20 years at full rating
- **Reinforced Wall Thickness** - Minimum
- **Hoop Stress** - 95% Lower Confidence Limit (LCL) of Long-Term Hydrostatic Strength (LTHS), ASTM D2992-B
- **Factory Hydro Test** - All sizes 1.5 times the series pressure rating

## Joining System

- **Key-Lock** - A self-restrained joint offering a quick assembly by utilizing ductile locking keys for mechanical restraint. Joint is directly inserted with no rotation. Available with one or more locking keys, depending on pressure requirements. Hydrostatic seal is made by means of an elastomeric O-ring.
- **Flanges** - Filament-wound GRE stub flanges with integral KL male spigot ends are available. Flange hole patterns per ASME B16.5 and ASME B16.47 with either Class 300, 600, 900 or 1500 standard.



Super Seal Key-Lock

## Benefits

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

# STAR Super Seal Key-Lock - Specification Guide

## 8 Inch (200 mm) Diameter

### 8.22 inch (208.8 mm) Actual Inside Diameter

Series	Pressure Rating								Nominal Outside Diameter		Nominal Connection Diameter		Nominal Wall		Minimum Reinforced Wall		Pipe Weight		Short-Term Tensile Rating		Keys	
	150°F (65°C)		180°F (82°C)		200°F (93°C)		212°F (100°C)		in.	mm	in.	mm	in.	mm	in.	mm	lbs/ft	kg/m	lbs	kN		EA
	psi	bar	psi	bar	psi	bar	psi	bar														
500	500	34.5	450	31.0	420	29.0	385	26.5	8.59	218	10.9	277	0.19	4.7	0.17	4.2	4.8	7.2	9600	43	2	
750	750	51.7	675	46.5	630	43.4	580	40.0	8.77	223	11.2	285	0.27	6.9	0.25	6.4	7.4	11.0	14700	65	3	
1000	1000	68.9	905	62.4	840	57.9	770	53.1	8.94	227	11.5	293	0.36	9.2	0.34	8.7	10.1	15.0	20000	89	3	
1250	1250	86.2	1130	77.9	1055	72.7	965	66.5	9.12	232	12.0	306	0.45	11.5	0.43	11.0	12.8	19.1	25500	113	4	
1500	1500	103.4	1355	93.4	1265	87.2	1160	80.0	9.31	236	12.6	320	0.54	13.8	0.52	13.3	15.7	23.4	31200	139	4	
1750	1750	120.7	1580	108.9	1475	101.7	1350	93.1	9.49	241	13.1	334	0.64	16.2	0.62	15.7	18.7	27.8	37200	166	5	
2000	2000	137.9	1805	124.5	1685	116.2	1545	106.5	9.68	246	13.7	349	0.73	18.6	0.71	18.1	21.8	32.5	43500	193	6	
2250	2250	155.1	2030	140.0	1895	130.7	1735	119.6	9.88	251	14.4	365	0.83	21.1	0.81	20.6	25.1	37.4	50000	222	6	
2500	2500	172.4	2255	155.5	2105	145.1	1930	133.1	10.08	256	15.0	382	0.93	23.6	0.91	23.1	28.5	42.4	56800	253	7	
2750	2750	189.6	2485	171.3	2315	159.6	2125	146.5	10.28	261	15.7	399	1.03	26.2	1.01	25.7	32.0	47.7	63900	284	7	
3000	3000	206.8	2710	186.8	2525	174.1	2315	159.6	10.49	267	16.4	416	1.14	28.9	1.12	28.4	35.7	53.2	71300	317	8	

## 10 Inch (250 mm) Diameter

### 10.35 inch (262.9 mm) Actual Inside Diameter

Series	Pressure Rating								Nominal Outside Diameter		Nominal Connection Diameter		Nominal Wall		Minimum Reinforced Wall		Pipe Weight		Short-Term Tensile Rating		Keys	
	150°F (65°C)		180°F (82°C)		200°F (93°C)		212°F (100°C)		in.	mm	in.	mm	in.	mm	in.	mm	lbs/ft	kg/m	lbs	kN		EA
	psi	bar	psi	bar	psi	bar	psi	bar														
500	500	34.5	450	31.0	420	29.0	385	26.5	10.81	275	13.2	336	0.23	5.8	0.21	5.3	7.7	11.4	15200	68	2	
750	750	51.7	675	46.5	630	43.4	580	40.0	11.03	280	13.6	347	0.34	8.6	0.32	8.1	11.7	17.4	23300	104	3	
1000	1000	68.9	905	62.4	840	57.9	770	53.1	11.25	286	14.4	365	0.45	11.4	0.43	10.9	15.9	23.7	31700	141	4	
1250	1250	86.2	1130	77.9	1055	72.7	965	66.5	11.48	291	14.8	376	0.56	14.3	0.54	13.8	20.3	30.3	40400	180	5	
1500	1500	103.4	1355	93.4	1265	87.2	1160	80.0	11.71	297	15.5	393	0.68	17.2	0.66	16.7	24.9	37.1	49500	220	5	
1750	1750	120.7	1580	108.9	1475	101.7	1350	93.1	11.94	303	16.2	411	0.80	20.2	0.78	19.7	29.7	44.2	59000	263	6	
2000	2000	137.9	1805	124.5	1685	116.2	1545	106.5	12.18	309	16.9	430	0.92	23.3	0.90	22.8	34.6	51.5	69000	307	7	
2250	2250	155.1	2030	140.0	1895	130.7	1735	119.6	12.43	316	17.7	451	1.04	26.4	1.02	25.9	39.8	59.2	79300	353	7	
2500	2500	172.4	2255	155.5	2105	145.1	1930	133.1	12.68	322	18.6	472	1.17	29.6	1.15	29.1	45.2	67.2	90000	401	8	
2750	2750	189.6	2485	171.3	2315	159.6	2125	146.5	12.94	329	19.4	494	1.29	32.9	1.27	32.4	50.8	75.6	101300	451	9	
3000	3000	206.8	2710	186.8	2525	174.1	2315	159.6	13.20	335	20.4	517	1.43	36.2	1.41	35.7	56.6	84.3	113000	503	10	

## 12 Inch (300 mm) Diameter

### 12.35 inch (313.7 mm) Actual Inside Diameter

Series	Pressure Rating								Nominal Outside Diameter		Nominal Connection Diameter		Nominal Wall		Minimum Reinforced Wall		Pipe Weight		Short-Term Tensile Rating		Keys	
	150°F (65°C)		180°F (82°C)		200°F (93°C)		212°F (100°C)		in.	mm	in.	mm	in.	mm	in.	mm	lbs/ft	kg/m	lbs	kN		EA
	psi	bar	psi	bar	psi	bar	psi	bar														
500	500	34.5	450	31.0	420	29.0	385	26.5	12.89	327	15.8	401	0.27	6.9	0.25	6.4	10.9	16.2	21600	96	2	
750	750	51.7	675	46.5	630	43.4	580	40.0	13.15	334	16.3	413	0.40	10.2	0.38	9.7	16.7	24.8	33100	147	3	
1000	1000	68.9	905	62.4	840	57.9	770	53.1	13.42	341	16.9	428	0.53	13.5	0.51	13.0	22.7	33.8	45100	201	4	
1250	1250	86.2	1130	77.9	1055	72.7	965	66.5	13.69	348	17.6	448	0.67	17.0	0.65	16.5	28.9	43.1	57600	256	5	
1500	1500	103.4	1355	93.4	1265	87.2	1160	80.0	13.96	355	18.4	468	0.81	20.5	0.79	20.0	35.5	52.8	70500	314	5	
1750	1750	120.7	1580	108.9	1475	101.7	1350	93.1	14.24	362	19.3	490	0.95	24.0	0.93	23.5	42.2	62.9	84100	374	6	
2000	2000	137.9	1805	124.5	1685	116.2	1545	106.5	14.53	369	20.2	514	1.09	27.7	1.07	27.2	49.3	73.4	98200	437	6	
2250	2250	155.1	2030	140.0	1895	130.7	1735	119.6	14.82	377	21.2	537	1.24	31.4	1.22	30.9	56.7	84.3	112900	502	7	
2500	2500	172.4	2255	155.5	2105	145.1	1930	133.1	15.12	384	22.1	562	1.39	35.2	1.37	34.7	64.3	95.7	128200	570	8	
2750	2750	189.6	2485	171.3	2315	159.6	2125	146.5	15.43	392	23.2	589	1.54	39.1	1.52	38.6	72.3	107.6	144200	641	9	
3000	3000	206.8	2710	186.8	2525	174.1	2315	159.6	15.75	400	24.3	616	1.70	43.1	1.68	42.6	80.6	120.0	160900	716	10	

# STAR Super Seal Key-Lock - Specification Guide

## 14 Inch (350 mm) Diameter

### 13.56 inch (344.4 mm) Actual Inside Diameter

Series	Pressure Rating								Nominal Outside Diameter	Nominal Connection Diameter	Nominal Wall	Minimum Reinforced Wall	Pipe Weight		Short-Term Tensile Rating		Keys					
	150°F (65°C)		180°F (82°C)		200°F (93°C)		212°F (100°C)						in.	mm	in.	mm		lbs/ft	kg/m	lbs	kN	EA
	psi	bar	psi	bar	psi	bar	psi	bar														
500	500	34.5	450	31.0	420	29.0	385	26.5	14.15	359	17.3	439	0.30	7.5	0.28	7.0	13.1	19.6	26100	116	2	
600	600	41.4	540	37.2	505	34.8	465	32.1	14.26	362	17.5	444	0.35	8.9	0.33	8.4	15.9	23.7	31600	140	3	
700	700	48.3	630	43.4	590	40.7	540	37.2	14.38	365	17.7	450	0.41	10.4	0.39	9.9	18.7	27.8	37100	165	3	
800	800	55.2	720	49.6	675	46.5	620	42.7	14.49	368	17.9	455	0.47	11.9	0.45	11.4	21.5	32.0	42800	190	3	
900	900	62.1	815	56.2	760	52.4	695	47.9	14.61	371	18.2	461	0.52	13.3	0.50	12.8	24.4	36.3	48500	216	4	
1000	1000	68.9	905	62.4	840	57.9	770	53.1	14.73	374	18.4	467	0.58	14.8	0.56	14.3	27.4	40.7	54400	242	4	
1100	1100	75.8	995	68.6	925	63.8	850	58.6	14.84	377	18.9	480	0.64	16.3	0.62	15.8	30.3	45.1	60300	268	5	
1200	1200	82.7	1085	74.8	1010	69.6	925	63.8	14.96	380	19.1	486	0.70	17.8	0.68	17.3	33.4	49.7	66300	295	5	
1300	1300	89.6	1175	81.0	1095	75.5	1005	69.3	15.08	383	19.3	491	0.76	19.3	0.74	18.8	36.4	54.2	72500	322	5	
1400	1400	96.5	1265	87.2	1180	81.4	1080	74.5	15.20	386	19.9	505	0.82	20.9	0.80	20.4	39.6	58.9	78700	350	6	
1500	1500	103.4	1355	93.4	1265	87.2	1160	80.0	15.32	389	20.1	511	0.88	22.4	0.86	21.9	42.8	63.6	85000	378	6	
1600	1600	110.3	1445	99.6	1345	92.7	1235	85.2	15.45	392	20.7	526	0.94	24.0	0.92	23.5	46.0	68.4	91500	407	6	
1700	1700	117.2	1535	105.8	1430	98.6	1310	90.3	15.57	396	20.9	532	1.01	25.5	0.99	25.0	49.3	73.3	98000	436	6	
1800	1800	124.1	1625	112.0	1515	104.5	1390	95.8	15.70	399	21.2	538	1.07	27.1	1.05	26.6	52.6	78.3	104700	466	6	
1900	1900	131.0	1715	118.2	1600	110.3	1465	101.0	15.82	402	21.8	554	1.13	28.7	1.11	28.2	56.0	83.3	111500	496	7	
2000	2000	137.9	1805	124.5	1685	116.2	1545	106.5	15.95	405	22.0	560	1.19	30.4	1.18	29.9	59.4	88.5	118400	526	7	
2100	2100	144.8	1895	130.7	1770	122.0	1620	111.7	16.08	408	22.7	577	1.26	32.0	1.24	31.5	62.9	93.7	125400	558	8	
2200	2200	151.7	1985	136.9	1850	127.6	1700	117.2	16.21	412	23.0	584	1.32	33.6	1.30	33.1	66.5	99.0	132500	589	8	
2300	2300	158.6	2075	143.1	1935	133.4	1775	122.4	16.34	415	23.2	590	1.39	35.3	1.37	34.8	70.1	104.4	139700	621	8	
2400	2400	165.5	2165	149.3	2020	139.3	1855	127.9	16.47	418	23.9	608	1.45	37.0	1.44	36.5	73.8	109.8	147100	654	9	
2500	2500	172.4	2255	155.5	2105	145.1	1930	133.1	16.60	422	24.2	614	1.52	38.6	1.50	38.1	77.5	115.4	154600	688	9	
2600*	2600	179.3	2350	162.0	2190	151.0	2005	138.2	16.74	425	24.9	633	1.59	40.3	1.57	39.8	81.4	121.1	162200	721	10	
2700*	2700	186.2	2440	168.2	2275	156.9	2085	143.8	16.87	429	25.2	639	1.66	42.1	1.64	41.6	85.2	126.8	169900	756	10	
2800*	2800	193.1	2530	174.4	2360	162.7	2160	148.9	17.01	432	25.4	646	1.72	43.8	1.70	43.3	89.2	132.7	177800	791	10	

\* Consult FGS Application Engineering for Availability

## 16 Inch (400 mm) Diameter

### 15.50 inch (393.7 mm) Actual Inside Diameter

Series	Pressure Rating								Nominal Outside Diameter	Nominal Connection Diameter	Nominal Wall	Minimum Reinforced Wall	Pipe Weight		Short-Term Tensile Rating		Keys					
	150°F (65°C)		180°F (82°C)		200°F (93°C)		212°F (100°C)						in.	mm	in.	mm		lbs/ft	kg/m	lbs	kN	EA
	psi	bar	psi	bar	psi	bar	psi	bar														
500	500	34.5	450	31.0	420	29.0	385	26.5	16.17	411	19.5	496	0.34	8.5	0.32	8.0	17.2	25.5	34100	152	2	
600	600	41.4	540	37.2	505	34.8	465	32.1	16.30	414	19.7	502	0.40	10.2	0.38	9.7	20.8	30.9	41200	183	3	
700	700	48.3	630	43.4	590	40.7	540	37.2	16.43	417	20.0	508	0.46	11.8	0.45	11.3	24.4	36.3	48500	216	3	
800	800	55.2	720	49.6	675	46.5	620	42.7	16.56	421	20.2	514	0.53	13.5	0.51	13.0	28.1	41.9	55900	249	3	
900	900	62.1	815	56.2	760	52.4	695	47.9	16.69	424	20.5	521	0.60	15.2	0.58	14.7	31.9	47.5	63400	282	4	
1000	1000	68.9	905	62.4	840	57.9	770	53.1	16.83	427	20.8	527	0.66	16.9	0.64	16.4	35.7	53.2	71000	316	4	
1100	1100	75.8	995	68.6	925	63.8	850	58.6	16.96	431	21.4	543	0.73	18.6	0.71	18.1	39.6	59.0	78800	350	5	
1200	1200	82.7	1085	74.8	1010	69.6	925	63.8	17.10	434	21.6	549	0.80	20.3	0.78	19.8	43.6	64.9	86700	386	5	
1300	1300	89.6	1175	81.0	1095	75.5	1005	69.3	17.23	438	21.9	555	0.87	22.0	0.85	21.5	47.6	70.9	94700	421	5	
1400	1400	96.5	1265	87.2	1180	81.4	1080	74.5	17.37	441	22.5	571	0.94	23.8	0.92	23.3	51.7	76.9	102800	457	6	
1500	1500	103.4	1355	93.4	1265	87.2	1160	80.0	17.51	445	22.7	578	1.01	25.5	0.99	25.0	55.9	83.1	111100	494	6	
1600	1600	110.3	1445	99.6	1345	92.7	1235	85.2	17.65	448	23.4	596	1.08	27.3	1.06	26.8	60.1	89.4	119500	532	7	
1700	1700	117.2	1535	105.8	1430	98.6	1310	90.3	17.79	452	23.7	602	1.15	29.1	1.13	28.6	64.4	95.8	128100	570	7	
1800	1800	124.1	1625	112.0	1515	104.5	1390	95.8	17.94	456	24.0	609	1.22	30.9	1.20	30.4	68.7	102.3	136800	608	7	
1900	1900	131.0	1715	118.2	1600	110.3	1465	101.0	18.08	459	24.7	627	1.29	32.8	1.27	32.3	73.2	108.9	145600	648	8	
2000	2000	137.9	1805	124.5	1685	116.2	1545	106.5	18.23	463	25.0	634	1.36	34.6	1.34	34.1	77.7	115.6	154600	688	8	
2100	2100	144.8	1895	130.7	1770	122.0	1620	111.7	18.37	467	25.7	654	1.44	36.5	1.42	36.0	82.2	122.4	163800	729	9	
2200	2200	151.7	1985	136.9	1850	127.6	1700	117.2	18.52	470	26.0	661	1.51	38.4	1.49	37.9	86.9	129.3	173100	770	9	
2300*	2300	158.6	2075	143.1	1935	133.4	1775	122.4	18.67	474	26.3	668	1.58	40.3	1.57	39.8	91.6	136.4	182600	812	9	
2400*	2400	165.5	2165	149.3	2020	139.3	1855	127.9	18.82	478	27.1	689	1.66	42.2	1.64	41.7	96.4	143.5	192200	855	10	
2500*	2500	172.4	2255	155.5	2105	145.1	1930	133.1	18.97	482	27.4	696	1.74	44.1	1.72	43.6	101.3	150.8	202000	898	10	

\* Consult FGS Application Engineering for Availability

# STAR Super Seal Key-Lock - Specification Guide

## 18 Inch (450 mm) Diameter

### 17.08 inch (433.8 mm) Actual Inside Diameter

Series	Pressure Rating								Nominal Outside Diameter		Nominal Connection Diameter		Nominal Wall		Minimum Reinforced Wall		Pipe Weight		Short-Term Tensile Rating		Keys	
	150°F (65°C)		180°F (82°C)		200°F (93°C)		212°F (100°C)		in.	mm	in.	mm	in.	mm	in.	mm	lbs/ft	kg/m	lbs	kN		EA
	psi	bar	psi	bar	psi	bar	psi	bar														
500	500	34.5	450	31.0	420	29.0	385	26.5	17.81	452	21.3	542	0.37	9.3	0.35	8.8	20.8	31.0	41400	184	2	
600	600	41.4	540	37.2	505	34.8	465	32.1	17.96	456	21.6	549	0.44	11.1	0.42	10.6	25.2	37.5	50100	223	3	
700	700	48.3	630	43.4	590	40.7	540	37.2	18.10	460	21.9	555	0.51	13.0	0.49	12.5	29.7	44.1	58900	262	3	
800	800	55.2	720	49.6	675	46.5	620	42.7	18.25	463	22.1	562	0.58	14.8	0.56	14.3	34.2	50.8	67900	302	3	
900	900	62.1	815	56.2	760	52.4	695	47.9	18.39	467	22.7	576	0.66	16.6	0.64	16.1	38.7	57.7	77000	342	4	
1000	1000	68.9	905	62.4	840	57.9	770	53.1	18.54	471	22.9	583	0.73	18.5	0.71	18.0	43.4	64.6	86200	384	4	
1100	1100	75.8	995	68.6	925	63.8	850	58.6	18.69	475	23.6	600	0.80	20.4	0.78	19.9	48.1	71.6	95700	426	5	
1200	1200	82.7	1085	74.8	1010	69.6	925	63.8	18.84	478	23.9	607	0.88	22.3	0.86	21.8	52.9	78.8	105200	468	5	
1300	1300	89.6	1175	81.0	1095	75.5	1005	69.3	18.99	482	24.2	614	0.95	24.2	0.93	23.7	57.8	86.0	115000	511	5	
1400	1400	96.5	1265	87.2	1180	81.4	1080	74.5	19.14	486	24.9	632	1.03	26.2	1.01	25.7	62.8	93.4	124900	555	6	
1500	1500	103.4	1355	93.4	1265	87.2	1160	80.0	19.29	490	25.2	639	1.11	28.1	1.09	27.6	67.8	100.9	134900	600	6	
1600	1600	110.3	1445	99.6	1345	92.7	1235	85.2	19.45	494	25.9	659	1.18	30.1	1.16	29.6	73.0	108.6	145100	646	6	
1700	1700	117.2	1535	105.8	1430	98.6	1310	90.3	19.60	498	26.2	666	1.26	32.0	1.24	31.5	78.2	116.3	155500	692	6	
1800	1800	124.1	1625	112.0	1515	104.5	1390	95.8	19.76	502	26.5	673	1.34	34.0	1.32	33.5	83.5	124.2	166100	739	6	
1900	1900	131.0	1715	118.2	1600	110.3	1465	101.0	19.92	506	27.3	694	1.42	36.1	1.40	35.6	88.8	132.2	176800	787	7	
2000	2000	137.9	1805	124.5	1685	116.2	1545	106.5	20.08	510	27.6	701	1.50	38.1	1.48	37.6	94.3	140.3	187800	835	7	
2100*	2100	144.8	1895	130.7	1770	122.0	1620	111.7	20.24	514	28.5	723	1.58	40.2	1.56	39.7	99.9	148.6	198900	885	8	
2200*	2200	151.7	1985	136.9	1850	127.6	1700	117.2	20.40	518	28.8	731	1.66	42.2	1.64	41.7	105.5	157.0	210200	935	8	
2300*	2300	158.6	2075	143.1	1935	133.4	1775	122.4	20.57	522	29.1	739	1.74	44.3	1.72	43.8	111.3	165.6	221700	986	8	

\* Consult FGS Application Engineering for Availability

## 20 Inch (500 mm) Diameter

### 18.98 inch (482.1 mm) Actual Inside Diameter

Series	Pressure Rating								Nominal Outside Diameter		Nominal Connection Diameter		Nominal Wall		Minimum Reinforced Wall		Pipe Weight		Short-Term Tensile Rating		Keys	
	150°F (65°C)		180°F (82°C)		200°F (93°C)		212°F (100°C)		in.	mm	in.	mm	in.	mm	in.	mm	lbs/ft	kg/m	lbs	kN		EA
	psi	bar	psi	bar	psi	bar	psi	bar														
500	500	34.5	450	31.0	420	29.0	385	26.5	19.79	503	23.4	594	0.41	10.3	0.39	9.8	25.7	38.3	51100	227	3	
600	600	41.4	540	37.2	505	34.8	465	32.1	19.95	507	23.7	602	0.48	12.3	0.47	11.8	31.1	46.3	61800	275	3	
700	700	48.3	630	43.4	590	40.7	540	37.2	20.11	511	24.0	609	0.56	14.3	0.55	13.8	36.6	54.5	72700	324	3	
800	800	55.2	720	49.6	675	46.5	620	42.7	20.27	515	24.3	616	0.65	16.4	0.63	15.9	42.2	62.8	83800	373	4	
900	900	62.1	815	56.2	760	52.4	695	47.9	20.43	519	25.0	635	0.73	18.4	0.71	17.9	47.8	71.2	95100	423	4	
1000	1000	68.9	905	62.4	840	57.9	770	53.1	20.60	523	25.3	642	0.81	20.5	0.79	20.0	53.6	79.8	106500	474	4	
1100	1100	75.8	995	68.6	925	63.8	850	58.6	20.76	527	26.0	661	0.89	22.6	0.87	22.1	59.4	88.5	118100	526	5	
1200	1200	82.7	1085	74.8	1010	69.6	925	63.8	20.93	532	26.3	668	0.97	24.7	0.95	24.2	65.4	97.3	130000	578	5	
1300	1300	89.6	1175	81.0	1095	75.5	1005	69.3	21.09	536	26.6	676	1.06	26.9	1.04	26.4	71.4	106.3	142000	632	5	
1400	1400	96.5	1265	87.2	1180	81.4	1080	74.5	21.26	540	27.4	697	1.14	29.0	1.12	28.5	77.5	115.4	154200	686	6	
1500	1500	103.4	1355	93.4	1265	87.2	1160	80.0	21.43	544	27.7	705	1.23	31.2	1.21	30.7	83.8	124.6	166600	741	6	
1600	1600	110.3	1445	99.6	1345	92.7	1235	85.2	21.61	549	28.6	727	1.31	33.4	1.29	32.9	90.1	134.1	179200	797	7	
1700	1700	117.2	1535	105.8	1430	98.6	1310	90.3	21.78	553	28.9	735	1.40	35.6	1.38	35.1	96.5	143.6	192100	854	7	
1800	1800	124.1	1625	112.0	1515	104.5	1390	95.8	21.95	558	29.2	743	1.49	37.8	1.47	37.3	103.1	153.4	205100	912	7	
1900*	1900	131.0	1715	118.2	1600	110.3	1465	101.0	22.13	562	30.1	766	1.58	40.0	1.56	39.5	109.7	163.3	218400	971	8	
2000*	2000	137.9	1805	124.5	1685	116.2	1545	106.5	22.31	567	30.5	774	1.66	42.3	1.64	41.8	116.5	173.3	231900	1031	8	

\* Consult FGS Application Engineering for Availability

# STAR Super Seal Key-Lock - Specification Guide

## 24 Inch (600 mm) Diameter

### 22.78 inch (578.6 mm) Actual Inside Diameter

Series	Pressure Rating								Nominal Outside Diameter		Nominal Connection Diameter		Nominal Wall		Minimum Reinforced Wall		Pipe Weight		Short-Term Tensile Rating		Keys	
	150°F (65°C)		180°F (82°C)		200°F (93°C)		212°F (100°C)		in.	mm	in.	mm	in.	mm	in.	mm	lbs/ft	kg/m	lbs	kN		EA
	psi	bar	psi	bar	psi	bar	psi	bar														
500	500	34.5	450	31.0	420	29.0	385	26.5	23.75	603	27.7	704	0.48	12.3	0.46	11.8	37.1	55.2	73600	327	3	
600	600	41.4	540	37.2	505	34.8	465	32.1	23.94	608	28.1	713	0.58	14.7	0.56	14.2	44.9	66.7	89100	396	4	
700	700	48.3	630	43.4	590	40.7	540	37.2	24.13	613	28.4	721	0.67	17.1	0.65	16.6	52.7	78.5	104800	466	4	
800	800	55.2	720	49.6	675	46.5	620	42.7	24.32	618	28.8	733	0.77	19.6	0.75	19.1	60.8	90.4	120700	537	4	
900	900	62.1	815	56.2	760	52.4	695	47.9	24.52	623	29.6	752	0.87	22.0	0.85	21.5	68.9	102.6	136900	609	5	
1000	1000	68.9	905	62.4	840	57.9	770	53.1	24.71	628	30.0	761	0.97	24.5	0.95	24.0	77.2	114.9	153400	682	5	
1100	1100	75.8	995	68.6	925	63.8	850	58.6	24.91	633	30.9	784	1.06	27.0	1.05	26.5	85.6	127.4	170200	757	6	
1200	1200	82.7	1085	74.8	1010	69.6	925	63.8	25.11	638	31.2	793	1.16	29.6	1.14	29.1	94.2	140.1	187200	833	6	
1300	1300	89.6	1175	81.0	1095	75.5	1005	69.3	25.31	643	31.6	802	1.27	32.1	1.25	31.6	102.9	153.1	204500	910	6	
1400	1400	96.5	1265	87.2	1180	81.4	1080	74.5	25.51	648	32.6	828	1.37	34.7	1.35	34.2	111.7	166.2	222100	988	7	
1500	1500	103.4	1355	93.4	1265	87.2	1160	80.0	25.72	653	32.9	837	1.47	37.3	1.45	36.8	120.7	179.6	240000	1068	7	

## 30 Inch (750 mm) Diameter

### 29.53 inch (750.1 mm) Actual Inside Diameter

Series	Pressure Rating								Nominal Outside Diameter		Nominal Connection Diameter		Nominal Wall		Minimum Reinforced Wall		Pipe Weight		Short-Term Tensile Rating		Keys	
	150°F (65°C)		180°F (82°C)		200°F (93°C)		212°F (100°C)		in.	mm	in.	mm	in.	mm	in.	mm	lbs/ft	kg/m	lbs	kN		EA
	psi	bar	psi	bar	psi	bar	psi	bar														
500	500	34.5	450	31.0	420	29.0	385	26.5	30.77	782	35.4	900	0.62	15.8	0.60	15.3	62.3	92.7	123700	550	3	
600	600	41.4	540	37.2	505	34.8	465	32.1	31.02	788	36.2	919	0.74	18.9	0.72	18.4	75.4	112.2	149700	666	4	
700	700	48.3	630	43.4	590	40.7	540	37.2	31.27	794	36.6	930	0.87	22.0	0.85	21.5	88.6	131.9	176100	783	4	
800	800	55.2	720	49.6	675	46.5	620	42.7	31.52	801	37.0	941	0.99	25.2	0.97	24.7	102.1	152.0	202900	902	5	
900	900	62.1	815	56.2	760	52.4	695	47.9	31.77	807	38.2	970	1.12	28.4	1.10	27.9	115.8	172.4	230100	1024	5	
1000	1000	68.9	905	62.4	840	57.9	770	53.1	32.02	813	38.6	981	1.25	31.7	1.23	31.2	129.7	193.1	257800	1147	5	
1100	1100	75.8	995	68.6	925	63.8	850	58.6	32.28	820	39.9	1012	1.37	34.9	1.35	34.4	143.9	214.1	286000	1272	6	
1200	1200	82.7	1085	74.8	1010	69.6	925	63.8	32.54	826	40.3	1024	1.50	38.2	1.48	37.7	158.3	235.5	314600	1399	6	
1300*	1300	89.6	1175	81.0	1095	75.5	1005	69.3	32.80	833	40.8	1036	1.63	41.5	1.61	41.0	172.8	257.2	343700	1529	6	

\* Consult FGS Application Engineering for Availability

## 36 Inch (900 mm) Diameter

### 35.43 inch (900.0 mm) Actual Inside Diameter

Series	Pressure Rating								Nominal Outside Diameter		Nominal Connection Diameter		Nominal Wall		Minimum Reinforced Wall		Pipe Weight		Short-Term Tensile Rating		Keys	
	150°F (65°C)		180°F (82°C)		200°F (93°C)		212°F (100°C)		in.	mm	in.	mm	in.	mm	in.	mm	lbs/ft	kg/m	lbs	kN		EA
	psi	bar	psi	bar	psi	bar	psi	bar														
500	500	34.5	450	31.0	420	29.0	385	26.5	36.91	938	41.9	1063	0.74	18.8	0.72	18.3	89.7	133.5	178100	792	3	
600	600	41.4	540	37.2	505	34.8	465	32.1	37.21	945	43.2	1097	0.89	22.6	0.87	22.1	108.5	161.5	215500	959	4	
700	700	48.3	630	43.4	590	40.7	540	37.2	37.51	953	43.7	1110	1.04	26.3	1.02	25.8	127.6	189.9	253500	1128	4	
800	800	55.2	720	49.6	675	46.5	620	42.7	37.81	960	44.2	1123	1.19	30.2	1.17	29.7	147.0	218.8	292100	1299	4	
900	900	62.1	815	56.2	760	52.4	695	47.9	38.11	968	45.6	1159	1.34	34.0	1.32	33.5	166.7	248.1	331300	1474	5	
1000	1000	68.9	905	62.4	840	57.9	770	53.1	38.42	976	46.1	1172	1.49	37.9	1.47	37.4	186.8	278.0	371200	1651	5	

## 40 Inch (1000 mm) Diameter

### 39.37 inch (1000 mm) Actual Inside Diameter

Series	Pressure Rating								Nominal Outside Diameter		Nominal Connection Diameter		Nominal Wall		Minimum Reinforced Wall		Pipe Weight		Short-Term Tensile Rating		Keys	
	150°F (65°C)		180°F (82°C)		200°F (93°C)		212°F (100°C)		in.	mm	in.	mm	in.	mm	in.	mm	lbs/ft	kg/m	lbs	kN		EA
	psi	bar	psi	bar	psi	bar	psi	bar														
500	500	34.5	450	31.0	420	29.0	385	26.5	41.02	1042	46.4	1178	0.82	20.8	0.80	20.3	110.8	164.9	219900	978	3	
600	600	41.4	540	37.2	505	34.8	465	32.1	41.34	1050	47.7	1213	0.98	25.0	0.97	24.5	134.0	199.4	266100	1184	4	
700	700	48.3	630	43.4	590	40.7	540	37.2	41.67	1059	48.3	1227	1.15	29.2	1.13	28.7	157.6	234.5	313000	1392	4	

# STAR Super Seal Key-Lock - Specification Guide

## Typical Mechanical Properties

Pipe Property		70°F	21°C	150°F	65°C	200°F	93°C	Method
		psi	MPa	psi	MPa	psi	MPa	
Hydrostatic Design Basis	(LTHS)	18,700 <sup>(1)</sup>	129 <sup>(1)</sup>	18,700	129	17,500	121	ASTM D2992, Proc. B (20 yrs)
	(LCL)	18,000 <sup>(1)</sup>	124 <sup>(1)</sup>	18,000	124	15,800	109	
Ultimate Hoop Stress at Weeping		36,000	248	45,400	313	48,400	334	ASTM D1599
<b>Circumferential</b>								
Hoop Tensile Modulus		3.87 x 10 <sup>6</sup>	26,500	2.91 x 10 <sup>6</sup>	19,700	2.31 x 10 <sup>6</sup>	15,500	NOV FGS
Poisson's Ratio $\nu_{ha}$		0.61		0.72		0.79		NOV FGS
<b>Longitudinal</b>								
Axial tensile strength		8,700	60	9,000	62	9,200	63.4	ASTM D2105
Axial Modulus		2.24 x 10 <sup>6</sup>	15,500	1.62 x 10 <sup>6</sup>	11,200	1.27 x 10 <sup>6</sup>	8,550	ASTM D2105
Poisson's Ratio $\nu_{ah}$		0.35		0.40		0.43		ASTM D2105
Axial Bending Strength		8,700	60	-	-	-	-	NOV FGS
Axial Bending Modulus		2.24 x 10 <sup>6</sup>	15,500	1.75 x 10 <sup>6</sup>	12,100	1.43 x 10 <sup>6</sup>	9,900	ASTM D2925
Shear Modulus		1.76 x 10 <sup>6</sup>	12,100	1.65 x 10 <sup>6</sup>	11,400	1.58 x 10 <sup>6</sup>	10,900	NOV FGS

<sup>(1)</sup> Value obtained at 150°F (65°C)

## Typical Physical Properties

Pipe Property	Value	Value	Method
Thermal Conductivity	0.19 BTU/hr·ft·°F	0.33 W/m·°C	NOV FGS
Thermal Expansion - Axial	12.0 x 10 <sup>-6</sup> in/in·°F	21.6 x 10 <sup>-6</sup> mm/mm·°C	ASTM D696
Flow Coefficient, Hazen Williams	150		-
Absolute Roughness	1.7 x 10 <sup>-5</sup> ft	5.3 x 10 <sup>-6</sup> m	-
Density	121 lbs/ft <sup>3</sup>	1940 kg/m <sup>3</sup>	ASTM D792
Specific Gravity	1.95		ASTM D792
Specific Heat	0.22 BTU/lb·°F	910 J/kg·°C	-

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