



**All Campbell couplings, fittings, ferrules and sleeves are engineered as integrated components to provide measurable and repeatable performance for the safest hose systems in the industry.**

***CampbellCrimpnology: it's all about the technology!***

*Included: performance ratings chart, test reports, temperature de-rating & crimp procedures.*

### Performance Ratings:

Campbell combines two sets of industry standards to establish performance and safety.

1. Performance is established by hydrostatic burst testing hose systems to the ASTM D380 standard.
  2. Safety is established by using the RMA safety factor of 3x, 4x, 5x or 10x, depending upon the hose application.
- That means when we say our air hose couplings are rated to 1000 psi., then you know they've been tested to beyond 4000 psi. (many times).

### Ratings Chart:

Hose System Components			Hose Size											
Fitting/Coupling	Attachment	Hose Type	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6	8	10
Combination Nipple	Short Sleeve	Rubber	400	350	300	275	250	225	210	200	175	150	100	75
Combination Nipple	Short Sleeve	Chemical	200	200	200	140	130	120	110	100	50	-	-	-
Combination Nipple	Short Sleeve	PVC	125	125	100	90	85	65	60	55	40	30	20	-
Suction Coupling	Short Sleeve	Rubber	-	-	-	275	250	225	210	200	175	150	100	-
Suction Coupling	Short Sleeve	PVC	-	-	-	90	85	65	60	55	40	30	20	-
Ball & Socket Cplg	Short Sleeve	Rubber	-	-	-	-	-	300	-	250	225	140	60	-
Ball & Socket Cplg	Short Sleeve	PVC	-	-	-	-	-	170	-	140	100	80	50	-
Crimpnology Nipple	Ferrule	Chem/Rubber	-	-	500	350	325	300	275	250	250	225	175	-
Crimpnology Nipple	Ferrule	Soft	-	-	200	175	150	150	125	100	75	-	-	-
Long Shank Nipple	Long Ferrule	Rubber	-	-	-	-	1000	1000	650	600	500	-	-	-
Crimpnology Flange	Ferrule	Chem/Rubber	-	-	-	-	285	285	275	250	250	225	-	-
Crimpnology Flange	Ferrule	Chem/Rubber	-	-	-	-	230	230	230	230	230	-	-	-
Campbell Cobra SS C&G	Ferrule	Chem/Rubber	-	-	250	-	250	250	150	150	100	-	-	-
Campbell Cobra AL C&G	Ferrule	Chem/Rubber	-	-	-	-	250	200	150	125	75	-	-	-
Viton Ground Joint Cplg	Staked Ferrule	Steam	1250	1250	1250	-	-	-	-	-	-	-	-	-
Viton Ground Joint Cplg	Long Ferrule	Rubber	1000	1000	1000	1000	1000	1000	650	400	400	-	-	-
Male Stem	Long Ferrule	Rubber	1000	1000	1000	1000	1000	1000	650	400	400	-	-	-
Male Stem	Staked Ferrule	Steam	1250	1250	1250	-	-	-	-	-	-	-	-	-
UniversaLock	Ferrule	Air	300	300	300	-	-	-	-	-	-	-	-	-
Universal	Ferrule	Air	150	150	150	-	-	-	-	-	-	-	-	-
Singl-Lock Cplg	Ferrule	Air	300	300	300	-	-	-	-	-	-	-	-	-
Double-Lock Cplg	Ferrule	Air	300	300	300	-	-	-	-	-	-	-	-	-
ChemJoint/Male Stem	Ferrule	Chemical	350	400	450	325	250	250	225	225	200	-	-	-
ChemJoint/Male Stem	Ferrule	Rubber	350	400	450	425	400	350	325	300	250	-	-	-

## Test reports: example of full engineering test report



### HYDROSTATIC TEST REPORT - DATE: 04-18-08

**Hose:** chemical hose: 2" Goodyear Viper rated to 200 psi.  
**Couplings:** cam & groove couplings: 2" Campbell Cobra stainless steel parts C x E - coupling/ferrule system rated to 250 psi. WP  
**Attachment:** crimped: stainless steel ferrules  
**Goal:** to burst hose beyond 800 psi. (hose WP of 200 psi. @ 4 to 1 Safety Factor)  
**Results:** hose burst at 1190 psi. (both hose and couplings exceeded 4 times WP)

All tests are conducted to ASTM (American Society of Testing Materials) D380 standards. See engineering details below.

**End connection #1:** Assembled by Campbell, C-316-200C, 2" Campbell Cobra stainless part C interlocking hose coupler with a FSS200240 stainless steel ferrule. The hose wall on this end measured between .276" and .312" for a .294" average. The current crimp chart due to expire on 12-31-8 was referenced and interpolated for a crimp  $\phi 2.589$ ". This end was crimped to  $\phi 2.589$ " on a Uniflex S10i using 62 dies. This end was connected to an A-SS-200 2" female NPT part A with a 2 X 1" reducing bushing with a GMS-4 1" male spud through our tester ground joint style connection. Teflon tape and pipe dope was used on the NPT threads. The tester nut was hand tight. See first connection photo.

**End connection #2:** Assembled by Campbell, E-316-200C, a new 2" Campbell Cobra stainless part E interlocking hose adapter with a FSS200240 stainless steel ferrule as above. The hose wall on this end measured between .268" and .298" for a .283" average. The same chart was interpolated for a crimp of  $\phi 2.571$ " using the same crimper and dies. This end was connected to a previously used B-316-200 2" male NPT coupler with a 2" female valve adapter with valve attached. Teflon tape and pipe dope was used on the NPT threads. See second connection photo.

**Test:** The assembly was filled with water and air was evacuated from the system by use of the valve at the free end. Due to a slightly cool room and component temperatures, warm water of about 71°F was flowed through the assembly for about 20 minutes to get an assembly test temperature of 70° F. See inlet temp and in tester photos. The assembly was made up and crimped 24 hours before the test. The cam and groove parts were put together just before going in the tester.

Because of the straightness of the hose as seen in the in tester photo, elongation measurements were made at 0, 200, 400, 600, 800 & 1000 psi and were 34", 34 1/2", 35 1/2", 36 1/4", 37" & 37 1/2" respectfully. The hose did exhibit 3 1/2" max elongation (at the 1000 psi) from the original 14" exposed length, which calculates to a 25% elongation.

Pressure was raised steadily until the hose failed in the middle of the exposed length of hose, see burst photo and close up photo. **The highest pressure recorded was 1190 psi.**, see peak photo. There was no movement or leaks detected until the hose failed. The first end showed about 1/32" of the hose elongation between the ferrule and fitting, see first end photo. The second end showed no elongation between the fitting and ferrule, see second end photo. Neither end had any movement of the end of the hose under the ferrule.



## Test reports *continued*: abbreviated reports and results

Campbell engineering has conducted hundreds of hydrostatic tests. The following are results from several popular products. Please contact our customer support team to receive test reports on other Campbell products.



### HYDROSTATIC TEST REPORT - DATE: 04-15-09 by RK

- Hose:** fuel drop hose: 3" Goodyear Infinity rated to 100 psi.
- Couplings:** cam & groove couplings: 3" Campbell Cobra aluminum C x E  
- coupling/sleeve system rated to 100 psi. WP
- Attachment:** crimped: aluminum sleeves
- Goal:** to burst hose beyond 400 psi. (hose WP of 100 psi. @ 4 to 1 Safety Factor)
- Results:** hose burst at 508 psi. (both hose and couplings exceeded 4 times WP)



### HYDROSTATIC TEST REPORT - DATE: 12-23-09 by RK

- Hose:** oilfield hose: 4" Goodyear "frac" hose rated to 400 psi.
- Couplings:** male thread: 4" Campbell long shank Crimpnology nipple both ends\*  
- fitting/ferrule system rated to 500 psi WP
- Attachment:** crimped: steel long shank ferrules
- Goal:** to burst hose beyond 1600 psi. (hose WP of 400 psi. @ 4 to 1 Safety Factor)
- Results:** hose burst at 1751 psi. (exceeded 4 times WP)  
\* NOTE: similar successful results have been achieved with the Campbell "one-piece"



### HYDROSTATIC TEST REPORT - DATE: 04-18-08 by RK

- Hose:** high pressure air: 2" Dayco Wildcatter rated to 3000 psi.\*
- Couplings:** ground joint couplings: 2" Campbell Viton® Seal female x male  
- coupling/ferrule system rated to 1000 psi. WP
- Attachment:** crimped: steel long shank ferrules
- Goal:** This test was to establish the limits of the coupling/ferrule system and was performed with the wing nut tightened only by hand. \* NOTE: Campbell system is only rated to 1000 psi.
- Results:** hose burst at 9500 psi. (couplings exceeded WP by more than 9 times WP)



### HYDROSTATIC TEST REPORT - DATE: 04-18-08 by RK

- Hose:** chemical hose: 2" Goodyear XLPE rated to 150 psi.
- Couplings:** ChemJoint® Coupling: 2" male x female  
- coupling/ferrule system rated to 250 ps. WP (swivel nut tightened by hand)
- Attachment:** crimped: stainless steel ferrules
- Goal:** to burst hose beyond 600 psi. (hose WP of 150 psi. @ 4 to 1 Safety Factor)
- Results:** hose burst at 1426 psi. (both hose and couplings exceeded 4 times WP)



### HYDROSTATIC TEST REPORT - DATE: 07-16-04 by DS

- Hose:** layflat hose: 1-1/2" Kuriyama rated to 75 psi.
- Couplings:** aluminum pin-lug: 1-1/2" Campbell male x female  
- coupling/sleeve system rated to 150 psi.
- Attachment:** crimped: carbon steel sleeves
- Goal:** to burst hose beyond 225 psi. (hose WP of 75 psi. @ 3 to 1 Safety Factor)
- Results:** hose burst at 228 psi. (both hose and couplings exceeded 3 times WP)

## Test reports *continued*: Crimpnology and the effects of temperature

The effect of high temperature on any hose system is significant and often overlooked. Since the lay line of most hoses indicates the maximum WP **and** the maximum temperature, it can be assumed the hose assembly can achieve both at the same time. When hot, hoses get softer and more pliable, hampering the ability of the attachment, whether it is a band clamp, bolt clamp or crimped ferrule, to hold the couplings securely on the hose. Since all pressure ratings are established by testing at 70F, Campbell established a pressure de-rating chart.

Below is an example of an elevated temperature test.

Hose system de-rating multipliers for elevated temperatures (temperature includes affect of both media and environment)									
Hose Type	70F	90F	150F	200F	250F	300F	350F	400F	450F
steam, hot tar, asphalt	1.00	0.95	0.81	0.68	0.56	0.44	0.32	0.20	0.08
PVC	1.00	0.82	0.30	n/r	n/r	n/r	n/r	n/r	n/r
all other	1.00	0.91	0.64	0.42	0.20	n/r	n/r	n/r	n/r



### HYDROSTATIC TEST REPORT - DATE: 09-15-10 by EMS

**Hose:** chemical hose: 3" Goodyear Viper, rated to 200 psi.

**Couplings:** male thread: 3" Campbell Crimpnology nipples  
- coupling/ferrule system rated to 250 psi.

**Attachment:** crimped: stainless steel ferrules

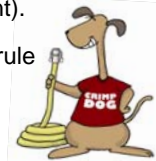
**Goal:** to test hose at 180F, verify de-rating factor of .51 (250 x 4 x .51 = 510 psi.)

**Results:** hose burst at 689 psi. (both hose and couplings exceeded 4 times de-rated WP)

## Crimp procedures: how to get a perfect crimp in 3 easy steps!

Campbell publishes procedures and crimp specifications for all Campbell products (sample page below) and provides extensive on-sight crimp training.

- Measure the hose wall (hose wall is easier to measure and more accurate than OD measurement).
- Based on that measurement, use the **Crimpology Chart** (abbreviated below) to identify the ferrule or sleeve and precise crimp specification for the appropriate fitting.
- Crimp your assembly into a perfect **system!**



crimp dia. (dec.)	crimp dia. (x-x/64)	crimp dia. (mm.)	C-SS-200	GJF-8	HAX-8	CxB-8	C-xx-200
			E-SS-200	IMS-8	HEX-6X8	CSS-8	E-xx-200
			(cat. pages 47-48) preferred ferrule	(cat. pages 17-18) preferred ferrule	(cat. pages 5-6) preferred sleeve	(cat. page 7) preferred sleeve	(cat. pages 47-49) preferred sleeve
2.309	2-20/64	58.65			Sxx200224S	Sxx200224S	Sxx200224
2.322	2-21/64	58.97			Sxx200224S	Sxx200224S	Sxx200224
2.334	2-21/64	59.28			Sxx200224S	Sxx200224S	Sxx200224
2.346	2-22/64	59.59			Sxx200224S	Sxx200224S	Sxx200224
2.359	2-23/64	59.91			Sxx200224S	Sxx200224S	Sxx200224
2.371	2-24/64	60.22			Sxx200224S	Sxx200224S	Sxx200224
2.383	2-25/64	60.53			Sxx200224S	Sxx200224S	Sxx200224
2.396	2-25/64	60.85			Sxx200224S	Sxx200224S	Sxx200224
2.408	2-26/64	61.16	Fxx200232	FPS200232L	Sxx200232S	Sxx200232S	Sxx200232
2.420	2-27/64	61.47	Fxx200232	FPS200232L	Sxx200232S	Sxx200232S	Sxx200232
2.433	2-28/64	61.79	Fxx200232	FPS200232L	Sxx200232S	Sxx200232S	Sxx200232
2.445	2-28/64	62.10	<b>Fxx200232</b>	FPS200232L	Sxx200232S	Sxx200232S	Sxx200232
2.457	2-29/64	62.41	Fxx200232	FPS200232L	Sxx200232S	Sxx200232S	Sxx200232
2.470	2-30/64	62.73	Fxx200232	FPS200232L	Sxx200232S	Sxx200232S	Sxx200232
2.482	2-31/64	63.04	Fxx200232	FPS200232L	Sxx200232S	Sxx200232S	Sxx200232
2.494	2-32/64	63.36	Fxx200232	FPS200232L	Sxx200232S	Sxx200232S	Sxx200232