EverTUFF® CPVC Schedule 40 & 80 Marine Pressure System



ENGINEERING GUIDE

TECHNICAL AND INSTALLATION INFORMATION WITH WEIGHTS & DIMENSIONS

Contact Spears® for any Information not found.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

The information contained in this publication is based on current information and product design at the time of publication and is subject to change without notification. Our ongoing commitment to product improvement may result in some variation. No representations, guarantees or warranties of any kind are made as to its accuracy, suitability for particular applications or results to be obtained therefrom. For verification of technical data or additional information not contained herein, please contact Spears® Technical Services Department [West Coast: (818) 364-1611 - East Coast: (678) 985-1263].

PURPOSE OF THIS MANUAL

This manual is intended as a resource for use by specification engineers, installers, and users in the selection, design and installation of CPVC marine systems installed using Spears® piping systems. All information contained within this manual is considered vital to obtain proper system performance and must be read and fully understood before attempting to install these products. If you have any questions about the safe and proper installation of these products, contact Spears® Manufacturing Company, 15853 Olden Street, Sylmar CA 91342 USA, Telephone (818) 364-1611.

Spears® CPVC Material

CPVC

Chlorinated polyvinyl chloride (CPVC) is created by post chlorination of the PVC polymer. This produces up to a 60°F higher heat handling capability than PVC and greater fire resistance, plus a broad range of chemical resistance. CPVC is excellent for use in marine process piping, hot and cold water service and other elevated temperature applications. CPVC provides relatively low cost compared to alternative materials for similar use.

CPVC pipe is manufactured by extrusion and CPVC fittings are manufactured by injection molding or fabrication. Spears® produces a variety of CPVC pipe, fittings, valves, systems accessories and specialty systems.

Spears® high quality CPVC compounds provide optimum chemical and corrosion resistance with a full range of pressure handling capabilities. Spears® CPVC materials are certified by NSF International to applicable standards including NSF® Standard 61 for use in potable water service, certified lead-free, and to ASTM D1784, Ridgid Poly (Vinyl Chloride) (PVC) Compound and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds that specifies Cell Classification for minimum physical property requirements. These include resin type, impact strength, tensile strength, modulus of elasticity in tension, heat deflection temperature and flammability. Spears® minimum CPVC Cell Classification is 23447 for ridgid (unplasticized) CPVC.

The ASTM Type and Grade is CPVC Type IV, Grade I and the typical long and short term strength designation of material for pressure piping is CPVC 4120. See Industry Standards and Test Methods, Physical Properties and Chemical Resistance sections for additional information.

Spears® CPVC Marine System Installation Information

EverTUFF® CPVC Marine Schedule 40/80 Pipe & Schedule 80 Fittings Installation Guide.

EverTUFF® CPVC CTS Marine Hot and Cold Water Distribution System Installation Guide.

OceanTUFF™ CPVC Marine Drainage System Installation Guide.

System Integrity

Spears® EverTUFF® CPVC marine schedule 40/80 piping systems have been developed and designed to be used as a total marine system consisting of pipe, fittings, accessories, solvent cement and thread sealant. All Spears® EverTUFF® components should be used in order to ensure a sound marine piping system. Substitution of other products for Spears® EverTUFF® CPVC marine pipe, fittings, or solvent cement may be detrimental to system integrity and is not recommended. The Spears® Limited Lifetime Warranty does not cover problems occurring within the marine piping system as the direct result of non-use of Spears® EverTUFF® CPVC marine system products. Spears® EverTUFF® CPVC marine schedule 40/80 piping systems are approved for use in non-essential spaces of a vessel by ABS and U.S. Coast Guard. Consult with Spears® Manufacturing Company for more information or visit www.spearsmfg.com/marine.htm.

Watertight Deck & Bulkhead Penetrations

Spears® CPVC marine products can be installed in deck and bulkhead penetrations according to their respective approval requirements. Be sure to check the fire stop system and CPVC material compatibility with the fire stop manufacturer. For more information please contact our Technical Support Department at (818) 364-1611.

Where it is intended to pass plastic pipes through bulkheads or decks, the original integrity of watertight bulkheads and decks is to be maintained at the location. If the bulkhead or deck is also a fire division and destruction by fire of plastic pipes may cause inflow of liquid from a tank, then a metallic shutoff valve operable from above the bulkhead deck is to be fitted at the bulkhead or deck.

Note: Spears® marine approved products have not been tested for "A", "B" or "F" class divisions in accordance with IMO resolution A.754(18), Recommendation on Fire Resistance Tests for "A", "B" and "F" Class Divisions.

Penetrating Structural Members

Wood Beams-Spears® EverTUFF® CPVC marine piping can be passed through beams without use of sleeves or insulators. Drill hole 1/4" larger than pipe diameter to allow for expansion and contraction. Floating pipe through beams is advisable.

Steel Beams-When EverTUFF® CPVC marine piping passes through steel beams, use compatible plastic insulators, rubber grommets, pipe insulation or similar devices to prevent abrasion and noise. Floating pipe through beams is advisable.

Important: Do not penetrate beams, columns or structural members before consulting design engineer.

"Lead Free" low lead certification - unless otherwise specified, all Spears® Plastic Piping specified here-in are certified by NSF International to ANSI/NSF® Standard 61, Annex G and is in compliance with California's Health & Safety Code Section 116825 (commonly known as AB 1953) and Vermont Act 193. Weighted average lead content <=0.25%.

CPVC Performance Engineered and Tested



SPEARS® EverTUFF® CPVC Marine pipe and fitting designs combine years of proven experience with computer generated stress analysis to yield the optimum physical structure and performance for each fitting. Material is uniformly placed in areas of high stress concentration for substantially improved pressure handling capability. Resulting products are subjected to numerous verification tests to assure the very best CPVC marine piping products available.

1/2" Through 12" Availability

Spears® comprehensive line of CPVC marine fittings and pipe offers a variety of configurations in Schedule 80 sizes 1/2" through 12".

Exceptional Chemical & Corrosion Resistance

Unlike metal, CPVC fittings never rust, scale or pit, and will provide many years of maintenance-free service and extended system life.

Higher Temperature Ratings

High Temperature CPVC thermoplastics can handle fluids at service temperatures up to 200°F, allowing a wide range of process applications.

Higher Flow Capacity

Smooth interior walls result in lower pressure loss and higher volume than conventional metal fittings.

Lower Installation Costs

Substantially lower material costs than copper or steel combined with lighter weight and ease of installation, can reduce installation costs by as much as 60% over conventional metal systems.

1/2" Through 12" CPVC Marine Pipe Availability

Spears® premium quality CPVC Schedule 80 is offered is offered in sizes 1/2" through 12". Schedule 40 CPVC marine pipe is also available.

United States Coast Guard Approval

Spears® EverTUFF® Marine Schedule 40 and Schedule 80 CPVC pipe and Schedule 80 fittings are USCG Approved for use in non-essential marine and offshore applications in nominal pipe sizes 1/2" through 12". Spears® USCG approval details and restrictions are available on the USCG equipment search website at www.cgmix@uscg.mil.

American Bureau of Shipping (ABS) Type Approval

Spears® EverTUFF® Marine Schedule 40 and Schedule 80 CPVC pipe and Schedule 80 fittings are ABS Type Approved use in non-essential marine and offshore applications in nominal pipe sizes 1/2" through 12". Type Approval details and restrictions are available on the ABS website at www.eagle.org.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

General Information

Recommendations for Installers and Users

Plastic piping systems should be **ENGINEERED, INSTALLED** and **OPERATED** in accordance with **ESTABLISHED DESIGN AND ENGINEERING STANDARDS AND PROCEDURES** for plastic piping systems. Suitability for the intended service application should be determined by the installer and/or user prior to installation of a plastic piping system. **PRIOR TO ASSEMBLY, all piping system components should be inspected for damage or irregularities. Mating components should be checked to assure that tolerances and engagements are compatible. Do not use any components that appear irregular or do not fit properly. Contact the appropriate manufacturer of the component product in question to determine usability. Consult all applicable codes and regulations for compliance prior to installation.**

Solvent Weld Connections - Use Marine-24 solvent cement and primers formulated for the intended service application, pipe size and type of joint. While the pipe and fitting materials may be compatible with the intended medium, the solvent cement may not be. Consult the manufacturers for suitability of use. Read and follow the cement and primer manufacturers' applications and cure time instructions thoroughly. Be sure to use the correct size applicator.

Threaded Connections - Use a quality grade thread sealant. **WARNING: SOME PIPE JOINT COMPOUNDS OR PTFE PASTES MAY CONTAIN SUBSTANCES THAT COULD CAUSE STRESS CRACKING TO PLASTIC.** Spears® Manufacturing company recommends the use of Spears® **BLUE 75™** Thread Sealant which has been tested for compatibility with Spears® products. Please follow the sealant manufacturers' application/installation instructions. Choice of an appropriate thread sealant other than those listed above is at the discretion of the installer. 1 to 2 turns beyond **FINGER TIGHT** is generally all that is required to make a sound plastic threaded connection. Unnecessary **OVERTIGHTENING** will cause **DAMAGE TO BOTH PIPE AND FITTING.**

EverTUFF® Marine Schedule 40/80 Pipe & Fittings Sample Engineering Specification

Spears® EverTUFF® Marine Schedule 40 and Schedule 80 pipe and Schedule 80 fittings shall be manufactured by Spears® Manufacturing Company from a Type IV, Grade I Chlorinated Polyvinyl Chloride (CPVC) compound with a Cell Classification of 23447 per ASTM D1784. The pipe and fittings shall be manufactured in strict compliance to ASTM F441 and ASTM F439 respectively consistently meeting the quality assurance test requirements of these standards. All Spears® EverTUFF® marine pipe and fittings shall be manufactured in the U.S.A. The pipe shall be provided with plain end in 20 foot or 10 foot cut lengths as specified and wrapped for protection. All Spears®EverTUFF® marine CPVC pipe and fittings shall be certified by NSF International for potable water applications and marked accordingly and available in sizes 1/2" through 12". All Spears® EverTUFF® marine CPVC schedule 40 and schedule 80 pipe shall be approved by the United States Coast Guard, meet the low flame spread requirements and smoke and toxicity requirements of the 2010 FTP Code Annex 1, Parts 2 and 5, and may be installed in accommodation, service and control spaces without meeting the additional requirements of 46 CFR 56.60-25(a)(2) as manufactured by Spears® Manufacturing Company.

All EverTUFF® Marine CPVC Schedule 40 and Schedule 80 pipe and Schedule 80 fittings shall be approved by the American Bureau of Shipping (ABS) and meet IMO FTP Code Annex 1, Part 5 for Surface Flammability and Part 2 for smoke and toxicity with a Limited Lifetime Warranty as manufactured by Spears® Manufacturing Company. Offshore applications for non-essential systems including fresh water, potable water and brine in services requiring no fire endurance testing or electrical conductivity testing. Piping to be used in non-hazardous areas only.

"Lead Free" low lead certification - unless otherwise specified, all Spears® Schedule 80 fittings specified here-in are certified by NSF International to ANSI/NSF® Standard 61, Annex G and is in compliance with California's Health & Safety Code Section 116825 (commonly known as AB1953) and Vermont Act 193. Weighted average lead content <=0.25%.

Typical Physical Properties of Spears® EverTUFF® CPVC Material

GENERAL	CPVC Value	Test Method
Cell Classification	23447	ASTM D 1784
Maximum Service Temperature	200°F	
Color	Medium Gray	
Specific Gravity, (g/cu.cm @ 73°F)	1.51	ASTM D 792
Water Absorption % increase 24 hrs @ 25°C	0.03	ASTM D 570
Hardness, Rockwell	117 - 119	ASTM D 785
Poisson's Ratio @ 73°F	0.370	
MECHANICAL		
Tensile Strength, psi @ 73°F	7,900	ASTM D 638
Tensile Modulus of Elasticity, psi @ 73°F	426,000	ASTM D 638
Flexural Strength, psi @ 73°F	15,000	ASTM D 790
Flexural Modulus, psi @ 73°F	360,000	ASTM D 790
Compressive Strength, psi @ 73°F	10,000	ASTM D 695
Izod Impact, notched, ft-lb/in @ 73°F	2.9	ASTM D 256
THERMAL		
Coefficient of Linear Expansion (in/in/°F)	3.2×10^{5}	ASTM D 696
Coefficient of Thermal Conductivity		ASTM C 177
Calories • cm/second • cm2 • °C	3.27×10^{4}	
BTU • inches/hour • Ft.2 • °F	0.95	
Watt/m/K	0.137	
Heat Deflection Temperature		
Under Load (264 psi, annealed)	235	ASTM D 648
ELECTRICAL		
Dielectric Strength, volts/mil	1,250	ASTM D 149
Dielectric Constant, 60Hz, 30°F	3.70	ASTM D 150
Volume Resistivity, ohm/cm @ 95°C	$34 \times 10_{12}$	ASTM D 150
Spears® CPVC Pipe is non-electrolytic		
FIRE PERFORMANCE		
Flammability Rating	V-0, 5VB, 5VA	UL-94
Flame Spread-Smoke Development-Toxicity	Annex 1, Part 5 & Part 2	2010 FTP Code
Flash Ignition Temp.	900°F	
Average Time of Burning (sec.).	<5	ASTM D 635
Average Extent of Burning (mm)	<10	
Burning Rate (in/min)	Self Extinguishing	
Limiting Oxygen Index (LOI)	60	ASTM D 2863

Note: The physical properties shown above are considered general for CPVC. Contact Spears® Technical Services for additional information if necessary.

FLOW VELOCITY & FRICTION LOSS

Friction Loss Through Pipe

The Hazen-Williams equation below is widely used to calculate friction loss for water through CPVC pipe

$$f = .2083 \times \frac{(100)^{1.852}}{C} \times \frac{G^{1.852}}{di^{4.8655}}$$

Where: f = Friction head of feet of water per 100' for the specific pipe size and I.D.
C = A constant for internal pipe roughness. 150 is the commonly accepted value for CPVC pipe.
G = Flow rate of gallons per minute (U.S. gallons).
di = Inside diameter of pipe in inches.

Friction Loss Through Fittings

Friction loss through fittings is expressed in equivalent feet of the same pipe size and schedule for the system flow rate.

Average Friction Loss for CPVC Fittings in Equivalent Feet of Straight Run Pipe

Item	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6	8	10	12
Tee Run	1.0	1.4	1.7	2.3	2.7	4.0	4.9	6.1	7.9	12.3	14.0	17.5	20.0
Tee Branch	3.8	4.9	6.0	7.3	8.4	12.0	14.7	16.4	22.0	32.7	49.0	57.0	67.0
90° Ell	1.5	2.0	2.5	3.8	4.0	5.7	6.9	7.9	11.4	16.7	21.0	26.0	32.0
45° Ell	.8	1.1	1.4	1.8	2.1	2.6	3.1	4.0	5.1	8.0	10.6	13.5	15.5

Pressure Drop In Valves & Strainer

Pressure drop calculations can be made for valves and strainers for different fluids, flow rates, and sizes using the CV values and the following equation:

Where:

$$P = \frac{(G)^2(Sg)}{(C_v)^2}$$

P = Pressure drop in PSI; feet of water = $\frac{PSI}{.4332}$

G = Gallons per minute
C_v = Gallons per minute water per 1 PSI pressure drop
S_g = Specific gravity of liquid (water =1)

C_v Values for Select Spears® Valves and Strainers

Nominal Size	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6	8	10	12
True Union 2000 Ball Valve[1]	29	63	120	243	357	599	856	1416	2865	1952	--	--	--
True Union 2000 Ball Check Valve	6.3	17	25	65	86	130	200	275	500	800	--	--	--
Butterfly Valve (90° - Full Open)	--	--	--	--	81	109	192	345	411	1125	2249	4440	6309

1 - Full Port Ball Valve Cv based on equivalent length of Schedule 80 pipe

Water Velocities

Velocities for water in feet per second at different GPM's and pipe inside diameters can be calculated as follows:

$$V = .3208 \frac{G}{A}$$

Where:
V = velocity in feet per secondr minute
G = gallons per minute
A = inside cross sectional area in square inchecs

FLOW VELOCITY & FRICTION LOSS

SCHEDULE 40

Flow Rate (Gallons/ Minute)	Flow Velocity (ft/sec.)	Friction Loss (Ft.Water/ 100ft)	Friction Loss (psi/ 100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft.Water/ 100ft)	Friction Loss (psi/ 100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft.Water/ 100ft)	Friction Loss (psi/ 100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft.Water/ 100ft)	Friction Loss (psi/ 100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft.Water/ 100ft)	Friction Loss (psi/ 100ft)	Flow Rate (Gallons/ Minute)
GPM	1/2"			3/4"			1"			1-1/4"			1-1/2"			GPM
1	1.13	1.16	0.50	0.63	0.28	0.12	0.39	0.09	0.04	0.22	0.02	0.01				1
2	2.25	4.19	1.82	1.26	1.03	0.44	0.77	0.31	0.13	0.44	0.08	0.03	0.32	0.04	0.02	2
5	5.63	22.88	9.92	3.16	5.60	2.43	1.93	1.69	0.73	1.10	0.43	0.19	0.81	0.20	0.09	5
7	7.88	42.66	18.49	4.42	10.44	4.53	2.70	3.14	1.36	1.55	0.81	0.35	1.13	0.38	0.16	7
10	11.26	82.59	35.80	6.31	20.21	8.76	3.86	6.08	2.64	2.21	1.57	0.68	1.62	0.73	0.32	10
15				9.47	42.82	18.56	5.78	12.89	5.59	3.31	3.32	1.44	2.42	1.55	0.67	15
20				12.63	72.95	31.63	7.71	21.96	9.52	4.42	5.65	2.45	3.23	2.64	1.15	20
25							9.64	33.20	14.39	5.52	8.55	3.71	4.04	4.00	1.73	25
30							11.57	46.54	20.17	6.62	11.98	5.19	4.85	5.60	2.43	30
35										7.73	15.94	6.91	5.65	7.45	3.23	35
40										8.83	20.41	8.85	6.46	9.54	4.14	40
45										9.94	25.39	11.00	7.27	11.87	5.15	45
50										11.04	30.86	13.38	8.08	14.43	6.25	50
60													9.69	20.22	8.87	60

GPM	2"			2-1/2"			3"			4"			6"			GPM
5	0.49	0.06	0.03													5
7	0.68	0.11	0.05	0.48	0.05	0.02										7
10	0.97	0.21	0.09	0.68	0.09	0.04	0.44	0.03	0.01							10
15	1.46	0.45	0.20	1.02	0.19	0.08	0.66	0.07	0.03							15
20	1.95	0.77	0.34	1.37	0.33	0.14	0.88	0.11	0.05	0.51	0.03	0.01				20
25	2.44	1.17	0.51	1.71	0.49	0.21	1.10	0.17	0.07	0.64	0.05	0.02				25
30	2.92	1.64	0.71	2.05	0.69	0.30	1.32	0.24	0.10	0.77	0.06	0.03				30
35	3.41	2.18	0.94	2.39	0.92	0.40	1.54	0.32	0.14	0.89	0.08	0.04				35
40	3.90	2.79	1.21	2.73	1.18	0.51	1.76	0.41	0.18	1.02	0.11	0.05				40
45	4.39	3.47	1.51	3.07	1.46	0.63	1.99	0.51	0.22	1.15	0.13	0.06				45
50	4.87	4.22	1.83	3.41	1.78	0.77	2.21	0.61	0.27	1.28	0.16	0.07	0.56	0.02	0.01	50
60	5.85	5.92	2.56	4.10	2.49	1.08	2.65	0.86	0.37	1.53	0.23	0.10	0.67	0.03	0.01	60
70	6.82	7.87	3.41	4.78	3.32	1.44	3.09	1.15	0.50	1.79	0.30	0.13	0.79	0.04	0.02	70
75	7.31	8.94	3.88	5.12	3.77	1.63	3.31	1.30	0.56	1.92	0.34	0.15	0.84	0.05	0.02	75
80	7.80	10.08	4.37	5.46	4.25	1.84	3.53	1.47	0.64	2.04	0.39	0.17	0.90	0.05	0.02	80
90	8.77	12.53	5.43	6.15	5.28	2.29	3.97	1.82	0.79	2.30	0.48	0.21	1.01	0.07	0.03	90
100	9.74	15.23	6.60	6.83	6.42	2.78	4.41	2.22	0.96	2.55	0.59	0.25	1.12	0.08	0.03	100
125	12.18	23.03	9.98	8.54	9.70	4.21	5.52	3.35	1.45	3.19	0.89	0.38	1.40	0.12	0.05	125
150				10.24	13.60	5.90	6.62	4.70	2.04	3.83	1.24	0.54	1.68	0.17	0.07	150
175							7.72	6.25	2.71	4.47	1.65	0.72	1.96	0.22	0.10	175
200							8.82	8.00	3.47	5.11	2.12	0.92	2.25	0.29	0.12	200
250							11.03	12.10	5.24	6.39	3.20	1.39	2.81	0.43	0.19	250
300										7.66	4.49	1.95	3.37	0.61	0.26	300
350										8.94	5.97	2.59	3.93	0.81	0.35	350
400										10.22	7.64	3.31	4.49	1.03	0.45	400
450													5.05	1.29	0.56	450
500													5.61	1.56	0.68	500

NOTE: Spears® recommends that Flow Velocities be maintained at or below 5 feet per second in large diameter piping systems (i.e. 6" diameter and larger) to minimize the potential for hydraulic shock. Refer to Spears® engineering section entitled "Hydraulic Shock" for additional information. Friction loss data based on utilizing mean wall dimensions to determine average ID; actual ID may vary.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
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FLOW VELOCITY & FRICTION LOSS

SCHEDULE 40

Flow Rate (Gallons/ Minute)	Flow Velocity (ft/sec.)	Friction Loss (Ft. Water/100ft)	Friction Loss (psi/100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft. Water/100ft)	Friction Loss (psi/100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft. Water/100ft)	Friction Loss (psi/100ft)	Flow Rate (Gallons/ Minute)
GPM	8"			10"			12"			GPM
100	0.65	0.02	0.01							100
125	0.81	0.03	0.01							125
150	0.97	0.04	0.02							150
175	1.13	0.06	0.03							175
200	1.29	0.08	0.03	0.82	0.02	0.01				200
250	1.62	0.11	0.05	1.03	0.04	0.02				250
300	1.94	0.16	0.07	1.23	0.05	0.02				300
350	2.27	0.21	0.09	1.44	0.07	0.03	1.01	0.03	0.01	350
400	2.59	0.27	0.12	1.64	0.09	0.04	1.16	0.04	0.02	400
450	2.91	0.34	0.15	1.85	0.11	0.05	1.30	0.05	0.02	450
500	3.24	0.41	0.18	2.05	0.14	0.06	1.44	0.06	0.02	500
750	4.85	0.87	0.38	3.08	0.29	0.12	2.17	0.12	0.05	750
1000	6.47	1.48	0.64	4.10	0.49	0.21	2.89	0.21	0.09	1000
1250				5.13	0.74	0.32	3.61	0.31	0.14	1250
1500				6.15	1.03	0.45	4.33	0.44	0.19	1500
2000							5.78	0.75	0.33	2000
2500							7.22	1.13	0.49	2500

NOTE: Spears® recommends that Flow Velocities be maintained at or below 5 feet per second in large diameter piping systems (i.e. 6" diameter and larger) to minimize the potential for hydraulic shock. Refer to Spears® engineering section entitled "Hydraulic Shock" for additional information. Friction loss data based on utilizing mean wall dimensions to determine average ID; actual ID may vary.

FLOW VELOCITY & FRICTION LOSS

SCHEDULE 80

Flow Rate (Gallons/ Minute)	Flow Velocity (ft/sec.)	Friction Loss (Ft. Water/ 100ft)	Friction Loss (psi/ 100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft. Water/ 100ft)	Friction Loss (psi/ 100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft. Water/ 100ft)	Friction Loss (psi/ 100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft. Water/ 100ft)	Friction Loss (psi/ 100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft. Water/ 100ft)	Friction Loss (psi/ 100ft)	Flow Rate (Gallons/ Minute)
GPM	1/2"			3/4"			1"			1-1/4"			1-1/2"			GPM
1	1.48	2.24	0.97	0.78	0.48	0.21	0.47	0.14	0.06	0.26	0.03	0.01	0.19	0.01	0.01	1
2	2.96	8.08	3.50	1.56	1.73	0.75	0.93	0.49	0.21	0.52	0.12	0.05	0.38	0.05	0.02	2
5	7.39	44.12	19.12	3.91	9.45	4.10	2.33	2.67	1.16	1.30	0.64	0.28	0.96	0.29	0.13	5
7	10.35	82.27	35.66	5.48	17.62	7.64	3.26	4.98	2.16	1.81	1.20	0.52	1.34	0.54	0.24	7
10	14.78	159.26	69.04	7.82	34.11	14.79	4.66	9.65	4.18	2.59	2.32	1.00	1.92	1.05	0.46	10
15				11.74	72.27	31.33	6.99	20.44	8.86	3.89	4.91	2.13	2.87	2.23	0.97	15
20				15.65	123.13	53.38	9.33	34.82	15.09	5.18	8.36	3.62	3.83	3.80	1.65	20
25							11.66	52.64	22.82	6.48	12.64	5.48	4.79	5.74	2.49	25
30							13.99	73.78	31.98	7.77	17.71	7.68	5.75	8.04	3.49	30
35							16.32	98.16	42.55	9.07	23.56	10.21	6.71	10.70	4.64	35
40							18.65	125.70	54.49	10.37	30.17	13.08	7.66	13.71	5.94	40
45										11.66	37.53	16.27	8.62	17.05	7.39	45
50										12.96	45.62	19.77	9.58	20.72	8.98	50
60										15.55	63.94	27.72	11.50	29.04	12.59	60
70										18.14	85.06	36.87	13.41	38.64	16.75	70
75										19.43	96.66	41.90	14.37	43.90	19.03	75
80										20.73	108.93	47.22	15.33	49.48	21.45	80
90													17.24	61.54	26.68	90
100													19.16	74.80	32.42	100
125													23.95	113.07	49.02	125
150													28.74	158.49	68.71	150

GPM	2"			2-1/2"			3"			4"			6"			GPM
1	0.11	0.00	0.00	0.08	0.00	0.00	0.05	0.00	0.00							1
2	0.22	0.02	0.01	0.16	0.01	0.00	0.10	0.00	0.00							2
5	0.56	0.08	0.04	0.39	0.03	0.01	0.25	0.01	0.01							5
7	0.78	0.15	0.07	0.55	0.06	0.03	0.35	0.02	0.01							7
10	1.12	0.30	0.13	0.78	0.12	0.05	0.50	0.04	0.02							10
15	1.67	0.63	0.27	1.17	0.26	0.11	0.75	0.09	0.04							15
20	2.23	1.07	0.47	1.56	0.45	0.19	1.00	0.15	0.07	0.57	0.04	0.02				20
25	2.79	1.63	0.70	1.95	0.68	0.29	1.24	0.23	0.10	0.71	0.06	0.03				25
30	3.35	2.28	0.99	2.34	0.95	0.41	1.49	0.32	0.14	0.85	0.08	0.04				30
35	3.91	3.03	1.31	2.73	1.26	0.55	1.74	0.43	0.18	1.00	0.11	0.05				35
40	4.46	3.88	1.68	3.11	1.62	0.70	1.99	0.54	0.24	1.14	0.14	0.06				40
45	5.02	4.83	2.09	3.50	2.01	0.87	2.24	0.68	0.29	1.28	0.17	0.08				45
50	5.58	5.87	2.54	3.89	2.45	1.06	2.49	0.82	0.36	1.42	0.21	0.09	0.63	0.03	0.01	50
60	6.69	8.22	3.56	4.67	3.43	1.49	2.99	1.15	0.50	1.71	0.30	0.13	0.75	0.04	0.02	60
70	7.81	10.94	4.74	5.45	4.56	1.98	3.48	1.54	0.67	1.99	0.39	0.17	0.88	0.05	0.02	70
75	8.37	12.43	5.39	5.84	5.18	2.25	3.73	1.74	0.76	2.14	0.45	0.19	0.94	0.06	0.03	75
80	8.93	14.01	6.07	6.23	5.84	2.53	3.98	1.97	0.85	2.28	0.51	0.22	1.00	0.07	0.03	80
90	10.04	17.42	7.55	7.01	7.26	3.15	4.48	2.45	1.06	2.56	0.63	0.27	1.13	0.09	0.04	90
100	11.16	21.18	9.18	7.79	8.83	3.83	4.98	2.97	1.29	2.85	0.76	0.33	1.25	0.10	0.04	100
125	13.95	32.02	13.88	9.73	13.34	5.78	6.22	4.49	1.95	3.56	1.16	0.50	1.57	0.16	0.07	125
150	16.74	44.88	19.45	11.68	18.70	8.11	7.47	6.30	2.73	4.27	1.62	0.70	1.88	0.22	0.10	150
175	19.53	59.70	25.88	13.63	24.88	10.79	8.71	8.38	3.63	4.98	2.16	0.93	2.19	0.29	0.13	175
200	22.32	76.45	33.14	15.57	31.86	13.81	9.96	10.73	4.65	5.70	2.76	1.20	2.51	0.37	0.16	200
250	27.90	115.58	50.10	19.47	48.17	20.88	12.44	16.22	7.03	7.12	4.17	1.81	3.13	0.57	0.25	250
300				23.36	67.52	29.27	14.93	22.74	9.86	8.55	5.85	2.54	3.76	0.79	0.34	300
350										9.97	7.78	3.37	4.38	1.05	0.46	350
400										11.39	9.96	4.32	5.01	1.35	0.59	400
450										12.82	12.39	5.37	5.64	1.68	0.73	450
500													6.26	2.04	0.89	500

NOTE: Spears® recommends that Flow Velocities be maintained at or below 5 feet per second in large diameter piping systems (i.e. 6" diameter and larger) to minimize the potential for hydraulic shock. Refer to Spears® engineering section entitled "Hydraulic Shock" for additional information. Friction loss data based on utilizing mean wall dimensions to determine average ID; actual ID may vary.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings
Spears® Manufacturing Company

FLOW VELOCITY & FRICTION LOSS

SCHEDULE 80

Flow Rate (Gallons/Minute)	Flow Velocity (ft/sec.)	Friction Loss (Ft. Water/100ft)	Friction Loss (psi/100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft. Water/100ft)	Friction Loss (psi/100ft)	Flow Velocity (ft/sec.)	Friction Loss (Ft. Water/100ft)	Friction Loss (psi/100ft)	Flow Rate (Gallons/Minute)
GPM	**8"**			**10"**			**12"**			**GPM**
125	0.89	0.04	0.02							**125**
150	1.07	0.06	0.02							**150**
175	1.25	0.07	0.03							**175**
200	1.43	0.10	0.04	0.91	0.03	0.01				**200**
250	1.78	0.14	0.06	1.13	0.05	0.02				**250**
300	2.14	0.20	0.09	1.36	0.07	0.03				**300**
350	2.50	0.27	0.12	1.59	0.09	0.04	1.12	0.04	0.02	**350**
400	2.85	0.34	0.15	1.81	0.11	0.05	1.28	0.05	0.02	**400**
450	3.21	0.43	0.19	2.04	0.14	0.06	1.44	0.06	0.03	**450**
500	3.57	0.52	0.23	2.27	0.17	0.07	1.60	0.07	0.03	**500**
750	5.35	1.10	0.48	3.40	0.36	0.16	2.40	0.16	0.07	**750**
1000	7.13	1.87	0.81	4.53	0.62	0.27	3.20	0.27	0.12	**1000**
1250				5.66	0.94	0.41	4.00	0.40	0.17	**1250**
1500				6.80	1.32	0.57	4.80	0.57	0.24	**1500**
2000							6.40	0.96	0.42	**2000**

NOTE: Spears® recommends that Flow Velocities be maintained at or below 5 feet per second in large diameter piping systems (i.e. 6" diameter and larger) to minimize the potential for hydraulic shock. Refer to Spears® engineering section entitled "Hydraulic Shock" for additional information. Friction loss data based on utilizing mean wall dimensions to determine average ID; actual ID may vary.

Hydraulic Shock

Hydraulic shock is the rapid increase in pressure due to a shock wave produced by a sudden change in system fluid velocity. If uncontrolled or insufficient pressure rated piping is used, these pressure surges can easily burst pipe and break valves or fittings. The term "water hammer" commonly used is derived from the sounds produced, but it is the hydraulic shock vibrations that can be damaging to piping systems. This is typically the result of sudden starting or stopping of a flowing column of liquid, such as water. Energy from the momentum of water in motion is converted to pressure when the flow is abruptly halted. A shock wave is produced that travels through the piping until it is stopped and bounces back to the original obstruction. This instantaneous shock to the system can lead to excessively high pressures. Hydraulic shock is frequently produced by rapid valve opening and closing, pumps starting and stopping, or even from a high speed wall of water hitting a change of direction fitting, such as an elbow. The effect is greater as piping systems is longer, the velocity change is greater and closing time is shorter.

Evaluating Hydraulic Shock Pressure Surges

An indication of the maximum surge pressure relative to velocity changes is essential in estimating the pressure rating requirements in designing a piping system. The following chart gives the maximum surge pressure at velocities of 1, 5 and 10 feet per second for different sizes of pipe, based on instantaneous valve closure in a PVC system. While listed, 10 feet per second is not recommended and is shown for comparative purposes. Velocity is best held to a maximum of 5 feet per second in plastic systems.

Schedule 40 Pipe Pressure Surge (psi) at Different Velocities

Size ⇨	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6	8	10	12
1 ft/sec	27.3	24.6	23.8	21.6	20.5	18.8	19.7	18.4	16.9	15.1	14.2	13.5	13.0
5 ft/Sec	136.3	123.2	119.1	108.1	102.6	94.2	98.5	91.8	84.5	75.4	70.8	67.4	65.2
10 ft/sec	272.7	246.3	238.2	216.3	205.1	188.3	196.9	183.5	169.0	150.9	141.6	134.8	130.5

Schedule 80 Pipe Pressure Surge (psi) at Different Velocities

Size ⇨	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6	8	10	12
1 ft/sec	32.2	29.2	28.0	25.5	24.3	22.6	23.2	21.8	20.3	18.9	17.8	17.3	17.1
5 ft/Sec	161	145.8	139.9	127.7	121.7	113.1	115.8	109.1	101.6	94.4	88.8	86.6	85.5
10 ft/sec	322	291.7	279.9	255.4	243.4	226.2	231.7	218.1	203.1	188.9	177.6	173.1	171.0

Controlling Hydraulic Shock in System Design & Operation

Since hydraulic shock is a function of speed, mass and time, there are several ways to prevent, minimize or eliminate system damage by limiting or controlling the magnitude of pressure surges.

- **Limit Fluid Velocity -** One of the safest surge control techniques in plastic systems is to limit fluid velocities to a maximum of 5 ft./second. Attempt to balance system operation flow demands and the magnitude of velocity variations.
- **Control Valve Closing Time -** Avoid rapid opening and closing. Pneumatic or electric actuation may be considered for greater control. Use of multi-turn or gear operated valves may also be beneficial in slowing valve opening and closing. When all valves and controls are properly sized and adjusted, surges generated by changes in pump flows and demands can be reduced to non-harmful levels.
- **Control Pump Operation -** Operate the system to maintain uniform pump flow rates. Use slow starting pumps where long runs and larger diameters are downstream. Where possible, partially close discharge valves to minimize volume when starting pumps, until lines are completely filled. Air chambers or surge relief tanks in conjunction with pressure regulating and surge relief valves can be used at pumping stations.
- **Check Valves -** Installing a check valve in pump discharge lines will aid in keeping the line full. Check valves operate on flow reversal and can be rapid closing. Place check valve at least ten pipe diameters from a pump or change of direction.

Thermal Expansion & Contraction

Attention must be given to installations where ambient temperature swings can cause thermoplastic systems to expand and contract both indoors and out. For example, a system installed in an unheated vessel during the winter months will expand considerably when temperatures rise. Conversely, systems installed at higher ambient temperatures will contract as temperatures fall. Refer to Thermal Expansion & Contraction section for additional information.

Calculating Linear Movement Caused by Thermal Expansion

The change in length caused by thermal expansion or contraction can be calculated as follows:

$\Delta L = 12\ y\ l\ (\Delta T)$

Where

ΔL = Expansion or contraction in inches
y = Coefficient of linear expansion of piping material selected
l = Length of piping run in feet
ΔT = (T1 - T2) temperature change °F

Where:

T1 = Maximum system temperature and
T2 = System temperature at installation or minimum system temperature

Coefficient of Linear Expansion (y) of Spears® Marine Products (in/in/°F) per ASTM D 696

Pipe Material	y
CPVC Schedule 40 & Schedule 80 Pressure Pipe	3.2×10^{-5}

Example 1: Calculate the change in length for a 100 foot straight run of 2" Schedule 80 CPVC pipe operating at a temperature of 73°F; installed at 32°F.

$\Delta L = 12\ y\ l\ (\Delta T)$

Where:

ΔL = linear expansion or contraction in inches y = 3.2×10^{-5} in/in/°F

l = 100ft

ΔT = 41°F (73°F - 32°F)

ΔL = 12 in/ft x 0.000032 in/in/°F x 100 ft x 41°F

ΔL = 1.57"

In this example the piping would expand approximately 1-1/2" in length over a 100 foot straight run once the operating temperature of 73°F was obtained.

Example 2: 100 foot straight run of 2" Schedule 80 CPVC pipe operating temperature 180°F; installed at 80°F

$\Delta L = 12\ y\ l\ (\Delta T)$

Where:

ΔL = Linear expansion or contraction in inches

y = 3.2×10^{-5} in/in/°F

l = 100 ft

ΔT = 100°F (180°F - 80°F)

ΔL = 12 in/ft x 0.000032 in/in/°F x 100ft x 100°F

ΔL = 3.84"

In this example the piping would expand approximately 4" in length over a 100 foot straight run once the operating temperature of 180°F was obtained.

Compensating for Movement Caused by Thermal Expansion/Contraction

Thermal expansion/ contraction are usually absorbed by the system at changes of direction. Long, straight runs are more susceptible to measurable movement with changes in temperature and the installation of expansion joints, expansion loops or offsets is required. This will allow the system to absorb expansion/contraction forces without damage.

Once the change in length (ΔL) has been determined, the length of an offset, expansion loop, or bend can be calculated as follows:

$$\ell = \sqrt{\frac{3ED\ (\Delta L)}{2S}}$$

Where:

ℓ = Length of expansion loop in inches

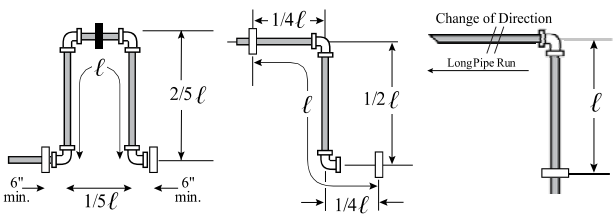
E = Modulus of elasticity

D = Average outside diameter of pipe

ΔL = Change in length of pipe due to temperature change

S = Working stress at max. temperature

LOOP **Offset** **Bend**



Hangers or guides should only be placed in the loop, offset, or change of direction as indicated above, and must not compress or restrict the pipe from axial movement. Piping supports should restrict lateral movement and should direct axial movement into the expansion loop configuration. Do not restrain "change in direction" configurations by butting up against joists, studs, walls or other structures. Use only solvent-cemented connections on straight pipe lengths in combination with 90° elbows to construct the expansion loop, offset or bend. The use of threaded components to construct the loop configuration is not recommended. Expansion loops, offsets, and bends should be installed as nearly as possible at the midpoint between anchors. Concentrated loads such as valves should not be installed in the developed length. Calculated support guide spacing distances for offsets and bends must not exceed recommended hanger support pacing for the maximum anticipated temperature. If that occurs, the distance between anchors will have to be reduced until the support guide spacing distance is equal to or less than the maximum recommended support spacing distance for the appropriate pipe size at the temperature used.

Example: 2" Schedule 80 CPVC pipe operating temperature 180°F; installed at 80°F where ΔL = 3.84"

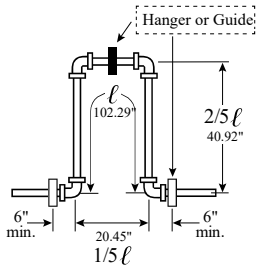
$$\ell = \sqrt{\frac{3ED\,(\Delta L)}{2S}}$$

$$\ell = \sqrt{\frac{3 \times 214{,}000 \times 2.375 \times 3.84}{2 \times 500}}$$

ℓ = 76.51"

2/5 ℓ = 30.60"

1/5 ℓ = 15.30"



Thermal Stress

Compressive stress in piping restrained from expanding can damage the piping system and in some cases damage hangers and supports. The amount of stress generated is dependent on the pipe material's coefficient of thermal expansion and its tensile modulus using the following equation:

S = EyΔT

Where

S = Stress induced in the pipe

E = Modulus of Elasticity at maximum system temperature y = Coefficient of thermal expansion

ΔT = Total temperature change of the system

The stress induced must not exceed the pipe material maximum allowable working stress (fiber stress). Increases in temperature will reduce the allowable stress as shown the table.

Example: 100 foot straight run of 2" Schedule 80 CPVC pipe operating temperature 180°F; installed at 80°F:

ΔL = 12 yl (ΔT) Where:

ΔL = Linear expansion or contraction in inches

y = 3.2 x 10^{-5} in/in/°F

l = 100ft

ΔT = 100°F (180°F - 80°F)

ΔL = 12 in/ft x 0.000032 in/in/°F x 100 foot x 100°F

ΔL = 3.84"

The piping would expand approximately 4" in length in a 100 ft straight run

The equation for determining induced stress can then be used:

S = EyΔT

Where:

S = Stress induced in the pipe

E = Modulus of Elasticity at 180°F = 214,000

y = Coefficient of thermal expansion = 3.2 x 10^{-5} in./in./°F

ΔT = Total temperature change of the system = 100°F

S = 214,000 x .000032 x 100

S = 685 psi

From chart, maximum allowable stress for CPVC at 180°F is 500 psi; Stress generated from this expansion in a restrained piping system exceeds the maximum allowable stress and will result in failure of the piping, unless compensation is made for thermal expansion.

Maximum Allowable Working (Fiber) Stress and Tensile Modulus at Various Temperatures

Temp (°F)		Maximum Allowable Working (Fiber) Stress, psi	Tensile Modulus of Elasticity, psi
CPVC	73	2,000	364,000
	90	1,820	349,000
	100	1,640	339,000
	110	1,500	328,000
	120	1,300	316,000
	140	1,000	290,000
	160	750	262,000
	180	500	214,000
	200	400	135,000

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
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Temperature Limitations

CPVC

The maximum operating temperature for CPVC Schedule 40/80 marine pipe is 200°F. As temperatures increase, impact strength typically increases while tensile strength and pipe stiffness decrease resulting in reduced applicable pressure ratings. Physical properties of CPVC pipe are generally specified at 73°F per applicable ASTM material test standards. The maximum allowable pressure at elevated temperatures is determined by multiplying the 73°F pressure rating by the applicable material de-rating factor for the elevated use temperature shown in the following chart. See Marine Pipe General Information for pipe pressure ratings @ 73°F.

De-Rating Factors

CPVC Pipe	
Temp (°F)	Working De-Rating Factor
73-80	1.00
90	0.91
100	0.82
110	0.72
120	0.65
130	0.57
140	0.50
150	0.42
160	0.40
170	0.29
180	0.25
200	0.20

Appropriate temperature de-rating factors must be applied at temperatures other than 73°F based on the material selected.

Multiply the collapse pressure rating of the selected pipe at 73°F, by the appropriate de-rating factor to determine the collapse pressure rating of the pipe at the elevated temperature chosen.

Weatherability

When rigid CPVC marine pipe is exposed to UV radiation from sunlight, the following conditions have been noted:

- A color change, slight increase in tensile strength, slight increase in modulus of tensile elasticity, and a slight decrease in impact strength may occur.
- Material directly exposed to UV radiation results in extremely shallow penetration depths (frequently less than 0.001 inch).
- The effects of UV exposure do not continue when exposure to UV is terminated.
- The effects of UV exposure do not penetrate even thin shields such as paint coatings, or wrapping.

It is recommended that CPVC piping products exposed to the direct affects of sunlight be painted with a light colored acrylic or latex paint that is chemically compatible with the CPVC products. Check with paint manufacture for compatibility. Oil-based paints should **NOT** be used.

Additional consideration should be given to the effects of expansion/contraction caused by heat absorption from sunlight in outdoor applications.

Installation Training & Information

ASME B31.3 installer training courses are available from Spears® at no cost. If you would like to arrange for training or have any questions about the safe installation and use of this system, contact Spears® Manufacturing Company, 15853 Olden Street, Sylmar, CA 91342 USA, Telephone (818) 364-1611.

Handling & Storage

Spears® marine products are packaged and shipped with care to avoid damage. Pipe and fittings should be stored and protected from direct exposure to sunlight. All pipe and accessories should be stored above ground and fully supported so as not to bend or excessively deflect under its own weight. Proper stacking can result in instability that may result in pipe damage or personnel injury.

Use care when transporting and storing the product to prevent damage. Piping products should not be dropped or have objects dropped on them. Do not drag pipe over articles or across the ground and do not subject pipe to external loads or over stacking. If extended storage in direct sunlight is expected, pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excessive heat accumulation.

Spears® marine products should not be stored or installed close to heat-producing sources. CPVC storage should not exceed 210°F. Handling techniques for CPVC marine pipe considered acceptable at warm temperatures may be unacceptable at very cold temperatures. When handling pipe in cold weather, consideration must be given to its lower impact strength. In subfreezing temperatures, extra caution in handling must be taken to prevent impact damage. All CPVC marine pipe should be inspected for any scratches, splits or gouges before use. Damaged sections must be cut out and discarded.

Plastic Piping Tools

Basic Tools used with Plastic Piping

Use tools that have been specifically designed for use with thermoplastic pipe and fittings when installing. A variety of tools that are designed for cutting, beveling, and assembling plastic pipe and fittings, are readily available through local wholesale supply houses dealing in plastic pipe and fittings.

•**Warning** Tools normally used with metal piping systems, such as hacksaws, water pump pliers, pipe wrenches, etc., can cause damage to plastic pipe and fittings. Visible and hidden fractures, scoring or gouging of material, and over tightening of plastic threaded connections are some of the common problems resulting from the use of incorrect tools and procedures.

Pipe Cutters

Pipe must be square-cut to allow for the proper joining of pipe end and the fitting socket bottom. Wheel type pipe cutters designed for plastic pipe provides easy and clean cuts on smaller pipe sizes. Care should be used with similar ratchet-type cutters to avoid damage to pipe. A slightly raised edge left on the outside of the pipe end after cutting with either device must be removed.

Pipe Cutters for Large Diameter Pipe

Blade cutters made for use with large diameter plastic pipe are easy to adjust and operate for square, burr-less cuts. Blades with carbide edges will provide longer life. With one style blade cutter, pipe ends may also be beveled for solvent joints while being cut by using an optional bevel tool in place of one cutter blade.

Hand Saws

A miter box or similar guide can be used with a fine-toothed saw blade (16 to 18 teeth per inch) having little or no set (maximum 0.025 inch).

Power Saws

Power saws are quite useful in operations where a large quantity of pipe is being cut. Blades designed for plastic pipe MUST be used. A cutting speed of 6,000 RPM, using ordinary hand pressure is recommended.

Pipe Beveling Tools

Power beveling tools, as well as hand beveling tools designed for use with plastic pipe are available. Pipe ends must be beveled (chamfered) to allow easy insertion of the pipe into the fitting and to help spread solvent cement and to prevent scraping cement from the inside of the fitting socket. A recommended bevel of 1/16" to 3/32" at a 10° to 15° angle can be achieved using a plastic pipe beveling tool, but can also be accomplished using a file designed for use on plastic.

Deburring Tools

Special plastic pipe deburring tools remove burrs from pipe ends quickly and efficiently. All burrs must be removed from the inside, as well as the outside, of the pipe ends to properly spread solvent cement when joining pipe and fitting.

Strap Wrenches

Strap wrenches with nylon straps treated for slip resistance and designed for use with plastic pipe provide gripping power for turning without scratching or deforming the pipe.

Chain Vises

Chain vises can be used to hold pipe. Vises made with jaws engineered for use with plastic pipe provide holding power without damage to the pipe.

Pullers & Joining Devices

Pipe and fitting pullers are available for joining large diameter plastic pipe and fittings. These tools are designed to allow the pipe to be inserted to the proper insertion depth, maintain proper alignment during assembly, and hold freshly solvent-cemented connections to prevent the fitting from backing-off until the initial set time is achieved.

Joining Methods - Solvent Cement Welding

Solvent cement welding is the most widely used joining method for PVC and CPVC pipe and fittings. Other methods such as threads, flanges and groove adapters can also be used. These are specifically useful where it is anticipated that the joint will have to be disassembled in the future.

Solvent Cement Safety Precautions

Solvent cement products are flammable and contain chemical solvents. Appropriate safety precautions must be taken BEFORE APPLYING PRIMER AND CEMENT. Read the cement can label!

•**CAUTION**

Virtually all solvent cements and primers for plastic pipe are flammable and should not be used or stored near heat, spark or open flames. Do not smoke during use. Eliminate all ignition sources. Primer should be stored in closed containers in the shade at temperatures between 40°F and 110°F; CPVC cement at temperatures between 40°F and 90°F. Use of a can with applicator attached to its lid is recommended. ***Verify expiration dates stamped on cements and primers prior to use.***

Avoid breathing vapors. *They should be used only with adequate ventilation. Explosion-proof general mechanical ventilation is recommended. In confined or partially enclosed areas, a ventilating device should be used. Containers should be kept tightly closed when not in use, and covered as much as possible when in use.*

Avoid contact with skin and eyes. May be absorbed through the skin; wearing PVA coated protective gloves and an impervious apron are recommended. May cause eye injury. Use eye protection and avoid eye contact. In case of contact, flush with plenty of water for 15 minutes. If irritation persists, get medical attention. If swallowed, call a physician immediately and follow precautionary statement given on side panel of cement container. Keep out of reach of children.

Refer to Solvent Cement Safety Data Sheet (SDS)

Use Caution with Welding Torches or other equipment where sparks might be involved at construction sites where plastic pipe has recently been solvent welded. Flammable vapors from cemented joints can stay within a piping system for some time. In all cases, lines should be flushed and purged to remove solvent vapors before welding.

Use Caution with Calcium Hypochlorite. Do not use a dry granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems. Granules or pellets of calcium hypochlorite (including their vapors) may react violently with solvent cements and primers if a water solution is not used. Chlorinated water solutions are nonvolatile and may be pumped into the piping system. Dry granular calcium hypochlorite should not be stored or used near solvent cements or primers.

Solvent Cement and Primer Spills

Protect work areas prior to starting by using drop cloths in the event of a spill. Accidental spills should be wiped up immediately before the cement sets. Cement and/or primer spills can cause irreparable damage depending on the type of surface affected. Consult the manufacturer of the affected surface for possible suggestions.

Basic Solvent Cement Joints

The following is a general description of basic techniques used to make solvent cement joints. Adjustments will need to be made to method and tools used according to size of piping, but the same principles apply. Additional guidance can be found in ASTM D 2855, Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings. **Important:** Installers should verify that they can make satisfactory joints under varying conditions and should receive training in installation and safety procedures.

Spears® offers Bonder Qualification Training (ASME B31.3) as required by the U.S. Coast Guard and Classification Societies. Contact Spears® for more information: (818) 364-1611.

To consistently make good joints in PVC and CPVC piping products, the following should be carefully understood:

1. The joining surfaces of pipe and fitting must be softened and made semi-fluid.

2. Sufficient cement must be applied to fill the gap between pipe and fitting.

3. Assembly of pipe and fittings must be made while the surfaces are still wet and fluid.

4. Joint strength develops as the cement dries (cures). In the tight part of the joint (interference area) the surfaces will fuse together; in the loose part the cement will bond to both surfaces.

Cutting the Pipe

CPVC pipe can be cut easily with a ratchet cutter, wheel-type plastic pipe cutter (**NOTE:** be sure to remove any raised ridge produced by wheel cutters), a power saw, or any other fine-tooth saw. It is important that the cutting tools being used are designed for plastic pipe. To ensure that the pipe is cut square, use a miter box when cutting with a saw. Cutting pipe as square as possible provides the maximum bonding surface area.



Be careful not to split the tube if using a ratchet-type cutter, especially in temperatures below 50°F. If any damage or cracking is evident, cut off at least 2" of the pipe beyond any visible crack.

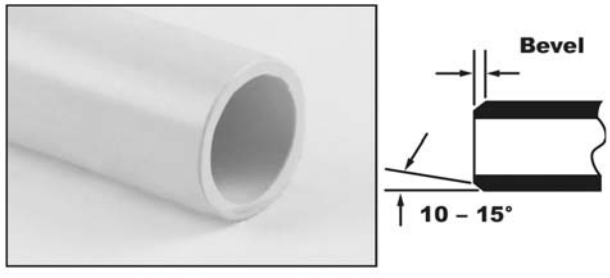
Deburring & Beveling

Burrs and filings can prevent contact between the tube and the fitting during assembly and must be removed from the outside and the inside of the pipe. A deburring/chamfering tool (or file) is suitable for this purpose:



Burrs Being Removed from Outside & Inside

A slight bevel (chamfer) must be placed at the outsided end of the pipe to ease the entry of the tube into the socket and minimize the chance of cement being wiped off the fitting:



Bevel Outside End

Fitting & Joining Preparation

1. Using a clean, dry rag, wipe any loose dirt and moisture from the fitting's socket and pipe end. Moisture can slow the cure time, and at this stage of assembly, excessive moisture can reduce joint strength.

2. Check the dry fit of the pipe and fitting. The pipe should enter the fitting's socket easily 1/3 - 2/3 of the way (interference fit) , or at least have interference between pipe and fitting bottom (net fit). **DO NOT** use any components that appear irregular or do not fit properly. Contact Spears® regarding any questions about usability.

3. Measure socket depth and mark on pipe for reference during cement application.

4. It is advisable to additionally mark pipe and fitting for alignment orientation position, especially with larger fittings.

Solvent Cementing Assembly

Verify the expiration date located on the solvent cement can. The cement can be used for a period of 2 years from the date stamped on the can. When cementing pipe and fittings in extremely cold temperatures, make sure the cement has not "JELLED." Jelled or expired cement must be discarded in an environmentally friendly fashion, in accordance with local regulations. To prolong the life of solvent cement, keep the containers tightly closed when not in use, and cover the container as much as possible during use. If an unopened solvent cement container is subjected to freezing temperatures, the cement may become extremely thick. Place the closed container in a room temperature area where, after a short time period, the cement will return to a usable condition. **DO NOT** attempt to heat solvent cement. The cement must be applied when the pipe and fittings are clean and free from any moisture and debris.

Primer Use - Softening of pipe and fitting joining surfaces can be achieved by the cement itself or by using a suitable primer. A primer will usually penetrate and soften the surfaces more quickly than the cement alone. The primer can be used for a period of 3 years from the date stamped on the can.

Apply Primer - USING AN APPLICATOR THAT IS AT LEAST 1/2 THE SIZE OF THE PIPE DIAMETER, vigorously scrub joining surface of fitting, of pipe and then again of fitting. Work quickly to apply 2-3 coats in this manner. SOLVENT CEMENT SHOULD THEN BE APPLIED WHILE PRIMER IS STILL WET.

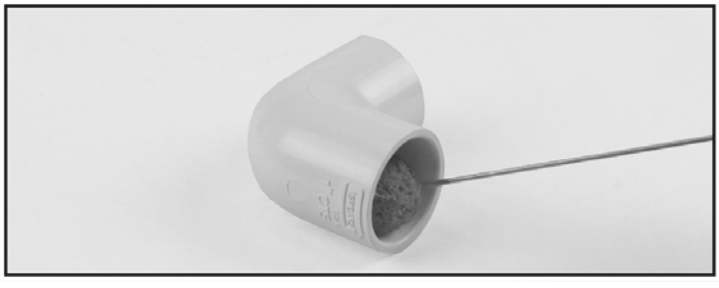
Apply Solvent Cement - USING AN APPLICATOR THAT IS AT LEAST 1/2 THE SIZE OF THE PIPE DIAMETER, WORK THE CEMENT INTO THE JOINING SURFACES USING A CONTINUOUS, CIRCULAR MOTION.

Use sufficient cement, but avoid puddling the cement on or within the fitting and pipe. Puddled cement causes excess softening and damage to the CPVC material. If interference fit was at the bottom of the socket, use extra cement and make a 2nd application to pipe. WORK QUICKLY SO THAT PIPE AND FITTING CAN BE JOINED WHILE CEMENT IS STILL WET.

Apply the cement in the sequence pictured below:



1. Apply a coat to the pipe to depth of fitting socket
Work the cement into the joining surfaces using a continuous, circular motion.

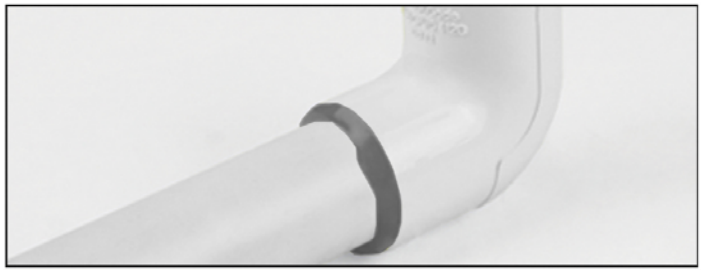


2. Apply a medium coat to the fitting socket
Avoid puddling the cement in the sockets and avoid getting cement in other sockets or threaded connections.

3. Apply a second coat to the pipe end for sizes 1-1/4 inch and larger joints, or if interference fit was at socket bottom during dry-fit.

Assemble Joint

Immediately insert pipe into the fitting socket while rotating the pipe 1/4 turn. Align the fitting in the proper orientation at this time. Make sure the pipe bottoms out at the fitting's stop. Hold the assembly for at least 30 seconds to ensure initial bonding. Tapered pipe sockets can result in pipe backing out of the joint if not held under constant pressure A bead of cement must be present around the pipe and fitting juncture. If this bead is not continuous around the socket's shoulder, insufficient cement was applied and the joint must be disassembled or cut out and replaced.



Any cement, in excess of the bead, can be wiped off with a dry, clean rag.

Set and Cure Times

SET TIME: The initial set time is the recommended waiting period before handling newly assembled joints. After initial set, the joints will withstand the stresses of normal installation. However, a badly misaligned installation will cause excessive stresses in the joint, pipe and fittings.

CURE TIME: The cure time is the recommended waiting period before pressurizing newly assembled joints.

The following basic guidelines should be used:

- The set and cure times for solvent cement depend on pipe size, temperature, relative humidity, and tightness of fit. Drying time is faster for drier environments, smaller pipe sizes, high temperatures, and tighter fits.
- Special care must be taken when assembling products in low temperatures (below 40°F) or high temperatures (above 80°F).
- Extra set and handling times must be allowed in colder temperatures. When cementing pipe and fittings in cold temperatures, make sure the cement has not "JELLED." Jelled cement must be discarded.
- In higher temperatures, make sure both surfaces to be joined are still wet with cement during assembly.
- The assembly must be allowed an initial set, without any stress on the joint
- Following the initial set period, the assembly can be handled carefully by avoiding stress on the joint.

Average Set Times

Temp. Range	Pipe Sizes 1/2"- 1-1/4"	Pipe Sizes 1-1/2"- 2"	Pipe Sizes 2-1/2"- 8"	Pipe Sizes 10"- 12"
60° - 100°F	2 Min.	5 Min.	30 Min.	2 Hrs.
40° - 60°F	5 Min.	10 Min.	2 Hrs.	8 Hrs.
0° - 40°F	10 Min.	15 Min.	12 Hrs.	24 Hrs.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings
Spears® Manufacturing Company

Average Cure Times

Relative Humidity 60% or Less*	Pipe Sizes 1/2" - 1-1/4"		Pipe Sizes 1-1/2" - 2"		Pipe Sizes 2-1/2" - 8"		Pipe Sizes 10" - 12"
Temperature Range During Assembly and Cure Periods	Up to 160 psi	Above 160 to 370 psi	Up to 160 psi	Above 160 to 315 psi	Up to 160 psi	Above 160 to 315 psi	Up to 100 psi
60° - 100°F	15 Min.	6 Hrs.	30 Min.	12 Hrs.	1-1/2 Hrs.	24 Hrs.	48 Hrs.
40° - 60°F	20 Min.	12 Hrs.	45 Min.	24 Hrs.	4 Hrs.	48 Hrs.	96 Hrs.
0° - 40°F	30 Min.	48 Hrs.	1 Hr.	96 Hrs.	72 Hrs.	8 Days	8 days

•NOTE In damp or humid weather allow 50% more cure time. The cure schedules shown are suggested as guides only. They are based on laboratory test data, and should not be taken to be the recommendations of all cement manufacturers. Individual solvent cement manufacturer's recommendations for the particular cement being used should be followed.

Special Considerations for Working with Solvent Cement Welding

Handling of Cement

Keep Marine-24 cement containers covered while not in use. Marine-24 Cement with the lid left off can become thick and viscous, or gel like. This condition is typically a result of tetrahydrofuran (THF) solvent evaporation and the cement is useless. Do not try to restore the Marine-24 cement by stirring in a thinner. Smaller containers of Marine-24 cement are recommended to be used, especially in warm or hot weather. Prior to opening cans of Marine-24 cement, shake vigorously to properly mix resin and solvents. Solvents contained in Marine-24 cement are highly flammable and should not be used near an open flame. The area in which the Marine-24 cement is being used should be well ventilated, and prolonged breathing of the fumes should be avoided, as well as contact with the skin or eyes. Verify the expiration dates stamped on the Marine-24 cement and primers prior to use.

CEMENT AND PRIMER SHELF LIFE

Spears® Products	Shelf Life	Spears® Products	Shelf Life
Primers / Cleaners	3 years	CPVC Solvent Cement	2 years

Hot Weather Use

Problems can be avoided when solvent cementing in 95°F or higher temperatures by taking a few special precautions. Solvent cements evaporate faster at elevated temperatures and can dry out prematurely. This is especially true when there is a hot wind blowing. Dry cement on pipe or fitting socket prior to assembly will not bond. If the pipe has been in direct sunlight for any length of time, surface temperatures may be 20°F to 30°F above air temperature. Solvents attack these hot surfaces faster, deeper and dry out quicker. As a result, it is very important to avoid puddling inside sockets, assemble immediately while wet and to wipe off excess cement at the joint exterior.

Tips for Solvent Cementing in High Temperatures:

1. Store solvent cements in a cool or shaded area prior to use.
2. If possible, store the fittings and pipe, or at least the ends to be solvent welded, in a shady area before cementing.
3. Cool surfaces to be joined by wiping with a damp rag. HOWEVER, be sure that surfaces are dry prior to applying solvent cement.
4. Try to do the solvent cementing in cooler morning hours.
5. Make sure that both surfaces to be joined are still wet with cement when putting them together.

Cold Weather Use

Marine-24 solvent cement and PRIM70 primers have excellent cold weather stability and are formulated to have well balanced drying characteristics even in subfreezing temperatures. Good solvent cemented joints can be made in very cold conditions provided proper care and a little common sense are used. In cold weather, solvents penetrate and soften surfaces more slowly than in warm weather. The plastic is also more resistant to solvent penetration, therefore, it becomes more important to pre-soften surfaces. A longer cure time is necessary due to slower evaporation.

Tips for Solvent Cementing in Cold Temperatures:

1. Prefabricate as much of the system as possible in a heated work area.
2. Store cements in a warmer area when not in use and make sure they remain fluid.
3. Take special care to remove moisture, including ice and snow.
4. Use special care to ensure joining surfaces are adequately softened; more than one application may be necessary.
5. Allow a longer cure period before the system is used.

Effects of Tolerances and Fits

CPVC marine pipe and fittings are manufactured to applicable ASTM Standards to produce an interference fit when assembled. However, minimum and maximum allowable tolerances permitted for pipe and fitting can result in variations. For example, fitting with the maximum diameter and the pipe with the minimum diameter, may result in a loose fit. Applying two coats of solvent cement will help assure a good joint. Conversely, if the pipe diameter is on the maximum side and the fitting on the minimum side, the interference may be too great and sanding of the pipe O.D. may be necessary to permit entrance.

Always check dry fits prior to making a joint. If fit is loose, multiple coats and use of an extra heavy bodied cement may be required. Mating components should be checked to assure that tolerances and engagements are compatible (see preceding Basic Solvent Cement Joints instructions). Inspect all pipe and fittings for damage or irregularities. Do not use any components that appear irregular or do not fit properly. Contact the appropriate manufacturer of the product in question to determine usability.

Large Diameter Pipe

Basic Solvent Cement Joint instructions apply to all sizes of pipe, but when making joints larger than 4", the use of two persons is recommended to properly apply cement and immediately assemble the joint while the cemented surfaces are still wet. Alignment of large diameter pipe and fittings during joining is critical since there is a greater potential for movement in the upper portion of a tapered socket that can result in misalignment. Special tools are commercially available for joining large diameter pipe.

Be sure to use an appropriate size roller applicator with large diameter pipe, along with Marine-24 CPVC heavy bodied cement. Marine-24 cement has increased gap filling capability and allow somewhat longer assembly time. However, applications of heavy coats of solvent cement and speed in making the joint is important. Under a damp or wet condition, solvent cement may absorb some moisture. Excessive moisture can slow down the cure and reduce joint strength. Spears® Marine-24 heavy body cement is excellent for joining large diameter pipe.

Estimated Quantities of Solvent Cement

A variety of conditions can affect the amount of solvent cement required for making reliable joints. These include pipe size, tolerances, socket depths as well as installation conditions and type of cement used. Fitting sockets are tapered for proper assembly, which produces a slight gap at the socket entrance when installed with pipe. It is best to use liberal amounts of solvent cement since insufficient cement use is one of the most common reasons for joint failure. The following information on cement usage is a recommendation only and other factors or unanticipated conditions may be encountered. Quantities are based on use with average socket lengths of Spears® molded and fabricated fittings.

Standard Pipe Joints

Fitting Size (in.)	Joints per Quart	Joints per Gallon
1/2	300	1200
3/4	200	800
1	125	500
1-1/4	140	560
1-1/2	90	360
2	60	240
2-1/2	50	200
3	40	160
4	30	120
6	10	40
8	5	20
10	2-3	4-6
12	1-2	2-4

Supplemental Information on Solvent Cementing

Applicators

A wide variety of daubers, brushes, and rollers are available. For proper solvent cement welding of pipe and fittings, the cement applicator must be no less than half the size of the pipe. Sufficient cement cannot be applied using daubers attached to the cement can lid on large diameter products (> 3"dia.) The following chart shows a variety of Spears® applicator sizes for use on different pipe diameters.

SPEARS® APPLICATOR SELECTION GUIDE

For proper solvent cement welding of pipe and fittings, the cement applicator must be no less than half the size of the pipe

DAUBERS	Pipe Diameters					
	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
3/8" Dauber	•	•				
1/2" Dauber		•	•			
3/4" Dauber				•	•	
1-1/4" Dauber						•

ROLLERS & SWABS	SIZE	FOR PIPE DIAMETERS
3020	3" Roller	3" - 6"
6020	4" Roller	3" - 8"
7020	7" Roller	6" +
5520	4" Roller	6" +
6520	6" Roller	6" +
4020	4" Swab	6" +
5020	4" Swab	3" - 8"
4520	4" Swab	6" +

Cleaners

Cleaners can be used to remove dirt, oil and grease from the bonding surfaces of CPVC pipe and fittings. Use of a cleaner is recommended before priming of pipe and fittings.

Primers

The use of Primer is necessary to penetrate and dissolve the surface of the pipe and fitting prior to the application of cement. Primer must be applied to both the pipe and fittings. Apply multiple coats of primer to the fitting socket and to the outside of the pipe ensuring that the entire surface is wet. Solvent cement must be applied immediately after primer while the surfaces are still tacky.

Solvent Cements

Solvent cements are typically formulated using tetra hydro furan (THF). When properly applied, this solvent dissolves the mating surfaces of the pipe and fittings. Cyclohexanone is a typical retardant used to slow the rate of solvent evaporation. Immediate joining of the wet mating surfaces in one minute or less is essential to eliminate dry spots that will not bond. The bond interface is strongest at the area of interference fit where the softened semi-fluid surfaces of the pipe and fitting chemically fuse. Plastic resin fillers (dissolved CPVC) in the cement fill the gaps between pipe and fitting.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings
Spears® Manufacturing Company

Joining Method - Threaded Connections

Threaded connections require the application of a thread sealant that is compatible with CPVC material. Spears® recommends the use of Spears® **Blue 75™** Thread Sealant.

CAUTION - Use only thread sealants recommended for CPVC plastic. Other joint compounds or pastes may contain substances that could cause stress cracks in CPVC materials.

Apply sealant to the male threads only. Make sure all threads are covered. **DO NOT** clog the waterway with excess sealant. If PTFE tape must be used, Spears® recommends a thickness of at least .0035" that meets or exceeds military specification, A-A-58092 (formerly MIL-T-27730A). **DO NOT** use a combination of tape and thread paste on the same joint. Apply PTFE tape in the direction of the threads by starting with the first full thread and continuing over the entire thread length. Make sure all threads are covered. Generally, 2 - 3 wraps are sufficient to produce a watertight connection

DO NOT over-torque any threaded connections. Generally, one to two turns beyond finger-tight are required for a threaded connection. Use a smooth-jawed wrench or strap wrench when installing threaded connections.

Threading Pipe

CPVC marine schedule 80 pipe can be threaded using either standard hand pipe stocks or power-operated equipment. Since rigid CPVC plastic pipe has the same outside diameter as standard steel pipe in comparable sizes, standard steel pipe taps and dies can be used. A cut thread or deep scratch results in a stress concentration point. As a result, only Schedule 80 pipe should be threaded. A 50% pressure de-rating is applied to threaded pipe to compensate for this. **DO NOT** thread Schedule 40 pipe. For optimum results in threading, use new taps and dies; but in any case, they should be cleaned and sharpened and in good condition. Power threading machines should be fitted with dies having a 5° negative front rake and ground especially for this type of pipe; tapered guide sleeves are not required. For hand stocks the dies should have a negative front rake of 5° to 10°. Dies which have been designed for use on brass or copper pipes may be used successfully. Carboloy dies give longer service. (Taps should be ground with a 0° to 10° negative rake, depending upon the size and pitch of the thread. Die chasers should have a 33° chamfer on the lead; a 10° front or negative rake; and a 5° rake on the back or relief edge).

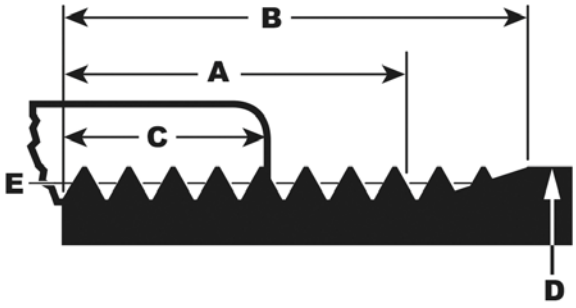
Self-opening die heads and collapsible taps, power threading machines and a slight chamfer to lead the tap or dies will speed production; however, taps and dies should not be driven at high speeds or with heavy pressure.

A tapered plug should be inserted into the pipe when threading, to hold the pipe round and to prevent the die from distorting and digging into the pipe wall. This ensures uniform thread depth all the way around. Pipe for threading should be held in a suitable pipe vise, but saw-tooth jaws should not be used. Flanges and close nipples should be threaded in jigs or tapping fixtures. To prevent crushing or scoring the pipe, some type of protective wrap, such as canvas, emery paper, or a light metal sleeve should be used; rounding of chuck jaws will also be helpful. Rigid CPVC plastic pipe should be threaded without use of lubricants. Standard cutting oils can cause stress cracking in plastics and should not be used. Water-soluble oil or plain water is recommended. Degreasing with any solvents is not recommended, nor should solvents be used in any cleanup. Always clear cuttings from the die.

DO NOT OVER THREAD - To obtain a tight, leak proof joint, the thread dimensions shown in the table should be used. If pipe is over threaded, fittings cannot be run on far enough to make a tight seal.

American National Standards Institute Code B1.20.1 covers dimensions and tolerances for tapered pipe threads. **Only Schedule 80 pipe should be threaded.**

Angle between sides of thread is 60 degrees. Taper of thread, on diameter, is 3/4 inch per foot. The basic thread depth is 0.8 x pitch of thread and the crest and root are truncated an amount equal to 0.033 x pitch, excepting 8 threads per inch which have a basic depth of 0.778 x pitch and are truncated 0.045 x pitch at the crest and 0.033 x pitch at the root.



PIPE THREADS

Nominal Size (in.) (Max.) (In.)	Outside Diameter (in.) D	Number of Threads Per Inch	Normal Engagement By Hand (in.) C	Length of Effective Thread (in.) A	Total Length: End of pipe to vanish point (in.) B	Pitch Diameter at end of Internal Thread (in.) E	Depth of Thread (Max.) (in.)
1/2	0.840	14	0.320	0.5337	0.7815	0.77843	0.05714
3/4	1.050	14	0.339	0.5457	0.7935	0.98887	0.05714
1	1.315	11-1/2	0.400	0.6828	0.9845	1.23863	0.06957
1-1/4	1.660	11-1/2	0.420	0.7068	1.0085	1.58338	0.06957
1-1/2	1.900	11-1/2	0.420	0.7235	1.0252	1.82234	0.06957
2	2.375	11-1/2	0.436	0.7565	1.0582	2.29627	0.06957
2-1/2	2.875	8	0.682	1.1375	1.5712	2.76216	0.10000
3	3.500	8	0.766	1.2000	1.6337	3.38850	0.10000
4	4.500	8	0.844	1.3000	1.7337	4.38713	0.10000
6	6.625	8	0.958	1.5125	1.9462	6.50597	0.10000

Joining Method - Flanged Connections

CPVC marine flanges are available in several designs, including solid one-piece flanges, two piece Van Stone style flanges featuring a moveable ring for bolt alignment, and blind flanges for capping off a piping run. Marine flanges are available in socket, spigot and are coupling devices designed for joining IPS (Iron Pipe Size) plastic piping systems where frequent disassembly may be required, can be used as a transitional fitting for joining plastic to metal piping systems, and for connection to other flanged type valves and equipment. A gasket is used between flanges to form a water-tight seal. Proper gasket material should be selected for fluids compatibility. Most plastic flanges carry a maximum working pressure rating of 150 psi non-shock for water at 73°F. Pressure ratings may vary according to size and construction of the flange. Consult flange manufacturer.

Gaskets

Select appropriate size and bolt pattern gasket. Full faced, 1/8" thick elastomer gaskets with a Shore "A" Durometer of approximately 70 are recommended. Verify that the gasket material is suitable for use with the application fluids.

Bolt Patterns & Selection

Most CPVC flanges are produced with ANSI B16.5 Bolt Patterns for Class 125/150 flanges. Optional Class 300 bolt patterns (NOT a 300 psi rating), certain ANSI/Metric dual pattern flanges, and metric bolt patterns can be produced. Proper bolt size, number and length should be selected for the specific flanges and equipment being assembled. Bolt length requirements will vary according to the flange or equipment manufacturer. Always use 2-wide flat washers for each bolt, one under the bolt head and one under the nut (do not use thin "fender" washers).

Bolt Torque

Threads should be cleaned and well lubricated (**WARNING:** Use only bolt lubricants compatible with PVC or CPVC material). Actual field conditions may require variations in these recommendations. **UNNECESSARY OVER TORQUING WILL DAMAGE THE FLANGE.** Torque should always be applied in approximately 5 ft-lb. increments using a 180° opposing sequence.

Flange Make-up

Follow proper solvent cementing procedures as applicable to join the flange to the pipe. Once a flange is joined to pipe, the method for joining two flanges is as follows:

1. Piping runs joined to the flanges must be installed in a straight line position to the flange to avoid stress at the flange due to misalignment. Piping must also be secured and supported to prevent lateral movement which can create stress and damage the flange.

2. With gasket in place, align the bolt holes of the mating flanges by rotating the ring into position.

3. Insert all bolts, washers (two standard flat washers per bolt), and nuts.

4. Make sure the faces of the mating surfaces are flush against gasket prior to bolting down the flanges.

5. Tighten the nuts by hand until they are snug. Establish uniform pressure over the flange face by tightening the bolts in 5 ft.-lb. increments according to the torque value shown in the following table using a 180° opposing sequence.

6. Care must be taken to avoid "bending" the flange when joining a Spears® flange to a "raised face" flange, or a wafer-style valve. Do not use bolts to bring together improperly mated flanges.

Recommended Flange Bolt Torque for Plastic Flanges

Flange Size (in.)	No. of Bolt Holes	Bolt Dia. (in.)	Min. Bolt Length (in.)[1]	Torque ft.-lb.
1/2	4	1/2	2	12
3/4	4	1/2	2	12
1	4	1/2	2-1/4	12
1-1/4	4	1/2	2-1/4	12
1-1/2	4	1/2	2-1/2	12
2	4	5/8	3	25
2-1/2	4	5/8	3-1/4	25
3	4	5/8	3-1/4	25
4	8	5/8	3-1/2	25
6	8	3/4	4	40
8	8	3/4	4-1/2	40
10	12	7/8	5	64
12	12	7/8	5	95

Note:

1 -Minimum bolt length is based on connecting two (2) Spears® flanges, two flat washers, gasket and nut. Adjustments will need to be made to accommodate valves and other equipment.

Joining Method - Mechanical Grooved Couplings

In many installations where transition to metal pipe, or where disassembly is a prime factor, metallic grooved style couplings with gasket seal can be used to join CPVC pipe to alternate IPS size piping materials. In addition to the ease of disassembly, this type of connection also allows for a certain degree of angular adjustment and expansion/contraction. Special rolled-groove pipe can be joined, but easy to use molded Grooved Coupling Adapters then can be solvent cemented to plain end pipe are available for use with metallic grooved couplings.

Only flexible style metallic grooved couplings are recommended for use with plastic pipe. Rigid style couplings should not be used as these can provide a compressive/shear load to plastic pipe resulting in failure. Always check the compatibility of the grooved coupling gasket material with the intended application fluids.

•NOTE A gasket/joint lubricant is recommended to prevent pinching the gasket and to assist the seating and alignment processes during assembly of grooved couplings. Certain lubricants may contain a petroleum base or other chemicals, which will cause damage to the plastic pipe, gasket and adapter. Always verify the suitability for use of the selected lubricant with the lubricant manufacturer.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

Installation

Outdoor Applications & Protection

CPVC marine piping systems must be protected from freezing. Many standard cold weather piping design and installation practices can be used to protect the system from freezing, such as use of pipe insulation, anti-freeze solutions, and heat trace tapes. The suitability and compatibility of these products for use with CPVC should be verified with product manufacturer prior to use.

Caution should be exercised in installing CPVC marine piping products in metal boxes or enclosures exposed to direct sunlight. Such enclosures can act as "ovens" that significantly increase the environmental temperatures over ambient air conditions, resulting in product damage and failure.

CPVC marine piping exposed to the direct sunlight (UV radiation) should be painted with a reflective, light colored acrylic or latex paint. Avoid dark colors, especially black. Heat absorption can exceed the heat handling capacity of the pipe and fitting material. Compatibility information regarding use with CPVC products should be confirmed with the paint manufacturer. Oil-based paints should not be used.

Hangers and Supports

Hanger Support Spacing

Support location and spacing depends on the pipe system operating temperature, and the location of any concentrated stress loads (i.e., valves, flanges, test equipment and any other heavy system components). Hangers must have at least 1/2" load-bearing surface free of any rough or sharp edges that could damage the pipe during use. Hangers also must not restrict linear movement of the system in order to allow thermal expansion and contraction from temperature changes.

Split ring pipe hangers and/or wrap around type brackets with adequate corrosion resistance can be used. Hangers should be smooth, free of burrs and provide at least 1/2" load-bearing surface.

Proper support spacing can be calculated similarly to that of metal systems by using simple and continuous beam calculations. This can be achieved using the maximum fiber stress of the material, or deflection based on the long term modulus of the material at the temperature selected as the limiting factors.

Hanger Selection

Hangers designed for metallic pipe can be used if they provide an adequate load-bearing surface, which is smooth and free of rough or sharp edges that could damage the pipe. Improper supports can generate excessive sag resulting in failure. Movement caused by thermal expansion/contraction and pressure fluctuations must be considered. Hangers and supports used must permit axial movement of the system, but not compress the pipe. Supplemental guides may be required in addition to hangers in order to maintain alignment and direct movement into in-line expansion joints.

Placement

Hangers should be installed within two feet of each side of a pipe joint; while changes in direction should be supported as close as possible to the fitting to reduce stress. Heavy system components such as valves, flanged assemblies, tees and other concentrated stress loads must be independently supported. Valves should additionally be adequately braced to prevent movement/stress loads from operational torque. Support of potential solids accumulation loads within the line should also be considered.

Precautions

Protective sleeves or pads used between the pipe and the hanger will distribute stress loads over a greater surface area, especially when using roller type hangers. Protective sleeves or pads should also be used when horizontal piping is resting on abrasive support structures. Do not allow piping to contact abrasive surfaces that could cause damage during axial movement. Avoid contact with heat producing sources.

Do not install plastic piping in close proximity to high temperature equipment without providing appropriate protection to prevent damage from distortion or expansion/contraction. Care should be taken to avoid over tightening of anchors, clamps or other support devices. This can distort or even fracture the piping. Vertical lines must be supported properly at intervals that will prevent excessive loading on the fitting at the lower end. Hangers and clamps suitable for this purpose include riser clamps or double bolt type clamps installed in such a manner that will allow for movement of the pipe due to thermal expansion and contraction.

Clamps and hangers used must not compress, distort, cut or abrade the piping. Common practice is to install clamps just below a coupling so that the shoulder of the coupling rests on the clamp. Fittings can be modified in the field to achieve this by cutting a coupling in two, just above the stop at the socket bottom, and then cutting this piece in half lengthwise to provide two halves which do not contain the stop. The two halves are then solvent cemented to the pipe at the proper location so that the shoulder of the modified coupling rests on the clamp. Riser clamps that utilize compression to support the pipe weight should not be used.

Anchor Guides

Anchors direct movement of the piping by providing restraint at key points such as long straight runs, at changes in direction of the system, and where expansion joints and other methods of thermal compensation are utilized. They may be used to control forces caused by expansion and contraction, generated by pressure surges, vibration, and other transient conditions. Guides are necessary to help direct this movement between anchors by allowing longitudinal movement while restricting lateral movement. Depending on the application and type, guides may or may not act as supports. Support guides should have the same load bearing surface and other requirements of hangers designed for the system. Guides must be rigidly attached to the structure to prevent lateral movement, but should not restrict longitudinal movement of the pipe through the guide. Anchors and guides must be engineered and installed without point loading the system.

Recommended Pipe Support Spacing

The following hanger support spacing recommendations are according to size, schedule, and operating temperatures. Do not clamp supports tightly - this restricts axial movement of the pipe. If short spacing is necessary, continuous supports may be more economical. These are considered conservative in nature and are based on straight runs of un-insulated lines with fluids with a specific gravity of 1.00 or less. These values do not consider concentrated weight loads or aggressive reagents.

Support Spacing Adjustment for Fluids of Different Specific Gravity

Recommendations for CPVC marine piping support spacing in the following table are based on straight runs of uninsulated lines conveying fluids with specific gravities up to 1.0 (water). For specific gravities greater than 1.0, the spacing from the Support spacing tables should be multiplied by the following correction factors. System components such as valves, flanged assemblies, tees and other forms of concentratred loads must be independently supported.

Specific Gravity	1.0	1.1	1.2	1.4	1.6	2.0	2.5
Correction Factor	1.00	.98	.96	.93	.90	.85	.80

Temp (F)	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	6"	8"	10"	12"
73	5-1/2	5-1/2	6	6-1/2	7	7	8	8	9	10	11	11-1/2	12-1/2
100	5	5-1/2	6	6	6-1/2	7	7-1/2	8	9	9-1/2	10-1/2	11	12-1/2
120	4-1/2	5	5-1/2	6	6	6-1/2	7-1/2	7-1/2	8-1/2	9	10	10-1/2	11
140	4-1/2	4-1/2	5	5-1/2	5-1/2	6	6-1/2	7	7-1/2		9	9-1/2	10-1/2
160	3	3	3-1/2	3-1/2	3-1/2	4	4-1/2	4-1/2	5	5-1/2	6	6-1/2	7-1/2
180	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	5	5-1/2	6	6-1/2

•**NOTE** his chart is based on continuous spans and for un-insulated line carrying fluids of specific gravity up to 1.00.

CPVC PIPE SUPPORT SPACING (ft.)

PIPE SIZE (in.)	SCHEDULE 40						SCHEDULE 80					
	73°F	100°F	120°F	140°F	160°F	180°F	73°F	100°F	120°F	140°F	160°F	180°F
1/2	5	4-1/2	4-1/2	4	2-1/2	2-1/2	5-1/2	5	4-1/2	4-1/2	3	2-1/2
3/4	5	5	4-1/2	4	2-1/2	2-1/2	5-1/2	5-1/2	5	4-1/2	3	2-1/2
1	5-1/2	5-1/2	5	4-1/2	3	2-1/2	6	6	5-1/2	5	31/2	3
1-1/4	5-1/2	5-1/2	5-1/2	5	3	3	6-1/2	6	6	5-1/2	31/2	3
1-1/2	6	6	5-1/2	5	3-1/2	3	7	6-1/2	6	5-1/2	31/2	3-1/2
2	6	6	5-1/2	5	3-1/2	3	7	7	6-1/2	6	4	3-1/2
2-1/2	7	7	6-1/2	6	4	3-1/2	8	7-1/2	7-1/2	6-1/2	41/2	4
3	7	7	7	6	4	3-1/2	8	8	7-1/2	7	41/2	4
4	7-1/2	7-1/2	7	6-1/2	4-1/2	4	8-1/2	9	8-1/2	7-1/2	5	4-1/2
6	8-1/2	8	7-1/2	7	5	4-1/2	10	9-1/2	9	8	51/2	5
8	9-1/2	9	8-1/2	7-1/2	5-1/2	5	11	10-1/2	10	9	6	5-1/2
10	10-1/2	10	9-1/2	8	6	5-1/2	11-1/2	11	10-1/2	9-1/2	61/2	6
12	11-1/2	10-1/2	10	8-1/2	6-1/2	6	12-1/2	12	11-1/2	10-1/2	71/2	6-1/2

•**NOTE** This chart based on continuous spans and for un-insulated line carrying fluids of specific gravity up to 1.00.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
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Spears® Manufacturing Company

Chemical Resistance Data For CPVC Marine Pressure Piping

Chemical Resistance

This section is to provide information on the transport of various chemicals using CPVC thermoplastic piping materials. This information is compiled from commercially available industry sources. These recommendations are guidelines for use and the final decision regarding material suitability must rest with the end-user.

Please note that Spears® CPVC marine piping products can be classified into two basic applications, pressure systems and marine drainage systems. The chemical resistance tables in this section are for Pressure Piping.

CPVC thermoplastic piping products are resistant to corrosion typically encountered with metal systems and the effects of galvanic and electrochemical corrosion are non-existent since both of these materials are non-conductors.

Types of Chemical Attack on Plastics

In general, chemicals that affect plastics do so in one of two ways. One effect is chemical solvation or permeation; the other is direct chemical attack. In the case of solvation or permeation, physical properties may be affected, but the polymer molecule structure itself is not chemically changed, degraded or destroyed. In solvation or permeation, gas, vapor or liquid molecules pass through the polymer, typically without damaging the plastic material itself. If the chemical can be removed completely, the plastic is generally restored to its original condition. Direct chemical attack occurs when exposure to a chemical causes a chemical alteration of the polymer molecules. Direct chemical attack may cause profound, irreversible changes that cannot be restored by removal of the chemical.

Other Considerations

While the effect of each individual chemical is specific, some chemicals can be grouped into general categories based on similarities in chemical characteristics. CPVC is inert to most mineral acids, bases, salts and paraffinic hydrocarbons, and compares favorably to other non-metals in these chemical environments.

Generally, the resistance of a particular plastic to a specific chemical decreases with an increase in concentration. Also, the resistance of a particular plastic to a specific chemical generally decreases as temperature increases, generally decreases with increasing applied stress, and generally decreases where temperature or applied stress are varied or cycled. These effects can be greater overall in combination.

In some cases, combinations of chemicals may have a synergistic effect on a thermoplastic material where the individual chemicals do not. It cannot be assumed that an individual chemical's lack of effect would apply for combinations that include several chemicals. When the possible combined effect of several chemicals is unknown, the material should be tested in the complete chemical mixture(s) in question.

Caution Areas

- Chlorinated and aromatic hydrocarbons, esters, or ketones are not recommended for use with CPVC thermoplastic piping materials. Although the chemical resistance of CPVC compounds is similar, they are not always the same.
- Chemical compatibility of a piping system must also take into consideration the compatibility of all system components. This includes elastomers (gaskets, O-rings, etc), valves and valve components, as well as thread pastes, lubricants, cleaning and wetting agents (surfactants).
- Applications involving certain oils, surfactants, and greases may result in environmental stress cracking. Environmental stress cracking occurs when system components are subjected to an incompatible chemical in the presence of stress.
- Certain substances called out on the following pages reference chemicals in a gaseous state. These substances are not recommended for pressure service. They are shown to provide the chemical resistance of CPVC when coming into contact with these substances. (i.e. exposure to or immersion in these substances).
- The following chemical resistance data is based primarily on plastic material test specimens that have been immersed in the chemical, and to a lesser degree, on field-experience. In most cases, detailed information on the test conditions (such as exposure time), and on test results (such as change in weight, change in volume, and change in strength) is not available.

Refrigeration Condensate Drains

Polyol Ester oil, commonly called POE oil, is a type of Synthetic oil used to lubricate refrigeration compressors. POE oil is highly incompatible with CPVC piping resulting in subsequent leaking. POE can enter the condensate system if the refrigerant circuit is opened during repair work. POE oil is also hygroscopic and can pick up moisture from the surroundings. In such cases, condensates may easily contain POE oils. Plastic piping in hydronic heating systems can also occasionally fail because of chemical contamination by POE lubricant oil used in the heat-exchanger refrigerant. While leaks in the heat exchanger are rare, when a leak does occur, it can lead to almost immediate failure of the piping system owing to chemical attack by the POE oil lubricant in the refrigerant. Today, there is substantial information commercially available on materials used in compressors and refrigeration equipment. It is the designer and installers responsibility to insure that all equipment and operating conditions in the system show good compatibility with both refrigerants and lubricants. This includes but is not limited to different coatings, metals, seals, and plastic components including condensate drains.

DISCLAIMER OF LIABILITY

There are many variables beyond our control in the application of thermoplastic piping in chemical service. All statements made herein are offered in good faith and believed to be accurate at the time of its preparation, but are offered without any warranty, expressed or implied, by information sources or Spears® Manufacturing Company. Compliance with all applicable federal, state and local laws and regulations remains the responsibility of the user.

Chemical Resistance Data For CPVC Marine Pressure Piping

R = Recommended NR = Not Recommended
C = Caution, actual testing suggested; suspect @ certain stress levels ? = Incomplete Data; actual testing required

CHEMICAL REAGENT	CPVC Type IV, Grade 1 4120 (23447)		
	73°F	140°F	180°F
Acetaldehyde	NR	NR	NR
Acetamide	NR	NR	NR
Acetic Acid, 10%	R	R	R
Acetic Acid, 20%	NR	NR	NR
Acetic Acid, Glacial	NR	NR	NR
Acetic Acid, pure	NR	NR	NR
Acetic Anhydride	NR	NR	NR
Acetone, < 5%	R	R	R
Acetone, > 5%	NR	NR	NR
Acetyl Nitrile	NR	NR	NR
Acetylene	C	C	C
Acrylic Acid	NR	NR	NR
Adipic Acid; sat. in water	R	R	R
Allyl Alcohol, 96%	C	C	C
Allyl Chloride	NR	NR	NR
Alum, all varieties	R	R	R
Aluminum Acetate	R	R	R
Aluminum Alum	R	R	R
Aluminum Chloride	R	R	R
Aluminum Fluoride	R	R	R
Aluminum Hydroxide	R	R	R
Aluminum Nitrate	R	R	R
Aluminum Oxylchloride	?	?	?
Aluminum Sulfate	R	R	R
Amines	NR	NR	NR
Ammonia (gas;dry)	NR	NR	NR
Ammonia (liquid)	NR	NR	NR
Ammonium Acetate	R	R	R
Ammonium Alum	R	R	R
Ammonium Bisulfate	R	R	R
Ammonium Carbonate	R	R	R
Ammonium Chloride	R	R	R
Ammonium Dichromate	R	R	R
Ammonium Fluoride, < 25%	R	R	R
Ammonium Fluoride, > 25%	R	R	R
Ammonium Hydroxide	NR	NR	NR
Ammonium Metaphosphate	R	R	R
Ammonium Nitrate	R	R	R
Ammonium Persulfate	R	?	?
Ammonium Phosphate	R	R	C
Ammonium Sulfate	R	R	R
Ammonium Sulfide	R	R	R
Ammonium Tartrate	R	R	R
Ammonium Thiocyanate	R	R	R
Amyl Acetate	NR	NR	NR
Amyl Alcohol	C	C	NR
Amyl Chloride	NR	NR	NR
Aniline	NR	NR	NR

CHEMICAL REAGENT	CPVC Type IV, Grade 1 4120 (23447)		
	73°F	140°F	180°F
Aniline Chlorohydrate	NR	NR	NR
Aniline Hydrochloride	NR	NR	NR
Anthraquinone	?	?	?
Anthraquinone Sulfonic Acid	?	?	?
Antimony Trichloride	R	R	R
Aqua Regia	R	NR	NR
Aromatic Hydrocarbons	NR	NR	NR
Arsenic Acid 80%	R	R	R
Arsenic Trioxide (powder)	R	NR	NR
Arylsulfonic Acid	?	?	?
Barium Carbonate	R	R	R
Barium Chloride	R	R	R
Barium Hydroxide 10%	R	R	R
Barium Nitrate	R	R	R
Barium Sulfate	R	R	R
Barium Sulfide	R	R	R
Beer	R	R	R
Beet Sugar Liquors	R	R	R
Benzaldehyde; 10%	NR	NR	NR
Benzaldehyde; > 10%	NR	NR	NR
Benzalkonium Chloride	NR	NR	NR
Benzene	NR	NR	NR
Benzoic Acid	R	C	NR
Benzyl Alcohol	NR	NR	NR
Benzyl Chloride	NR	NR	NR
Bismuth Carbonate	R	R	R
Black Liquor	R	R	R
Bleach (15% CL)	R	R	R
Borax	R	R	R
Boric Acid	R	R	R
Brine (acid)	R	R	R
Bromic Acid	R	R	R
Bromine Liquid	NR	NR	NR
Bromine Vapor 25%	NR	NR	NR
Bromine Water	?	?	?
Bromobenzene	NR	NR	NR
Bromotoluene	NR	NR	NR
Butadiene	C	C	C
Butane	C	C	C
Butanol: primary	C	C	C
Butanol: secondary	C	C	C
Butyl Acetate	NR	NR	NR
Butyl Carbitol	NR	NR	NR
Butyl Mercaptan	NR	NR	NR
Butyl Phenol	NR	NR	NR
Butyl Stearate	NR	NR	NR
ButylCellosolve	NR	NR	NR
Butyne Diol	?	?	?

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Chemical Resistance Data For CPVC Marine Pressure Piping

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CHEMICAL REAGENT	CPVC Type IV, Grade 1 4120 (23447)		
	73°F	140°F	180°F
Butyric Acid < 1%	R	R	R
Butyric Acid > 1%	NR	NR	NR
Cadmium Acetate	R	R	R
Cadmium Chloride	R	R	R
Cadmium Cyanide	R	R	R
Cadmium Sulfate	R	R	R
Caffeine Citrate	R	R	R
Calcium Acetate	R	R	R
Calcium Bisulfide	R	R	R
Calcium Bisulfite	R	R	R
Calcium Bisulfite Bleach Liquor	R	R	R
Calcium Carbonate	R	R	R
Calcium Chlorate	R	R	R
Calcium Chloride	R	R	R
Calcium Hydroxide	R	R	R
Calcium Hypochlorite	R	R	R
Calcium Nitrate	R	R	R
Calcium Oxide	R	R	R
Calcium Sulfate	R	R	R
Camphor (crystals)	NR	NR	NR
Cane Sugar Liquors	R	R	R
Caprolactam	NR	NR	NR
Caprolactone	NR	NR	NR
Carbitol	NR	NR	NR
Carbon Dioxide	R	R	R
Carbon Dioxide (aqueous solution)	R	R	R
Carbon Disulfide	NR	NR	NR
Carbon Monoxide	R	R	R
Carbon Tetrachloride	NR	NR	NR
Carbonic Acid	R	R	R
Carene 500	?	?	?
Castor oil	C	C	C
Caustic Potash	R	R	R
Caustic Soda	R	R	R
Cellosolve	NR	NR	NR
Cellosolve Acetate	NR	NR	NR
Chloral Hydrate	NR	NR	NR
Chloramine	R	R	R
Chloric Acid up to 20%	R	R	R
Chloride Water	R	R	R
Chlorinated Solvents	NR	NR	NR
Chlorinated Water (Hypochlorite)	R	R	R
Chlorine (dry liquid)	NR	NR	NR
Chlorine (liquid under pressure)	NR	NR	NR
Chlorine Dioxide aqueous (sat'd 0.1%)	R	?	?

CHEMICAL REAGENT	CPVC Type IV, Grade 1 4120 (23447)		
	73°F	140°F	180°F
Chlorine Gas (dry)	NR	NR	NR
Chlorine Gas (wet)	NR	NR	NR
Chlorine Water (sat'd 0.3%)	R	R	R
Chlorine(trace in air)	R	R	R
Chloroacetic Acid	NR	NR	NR
Chloroacety Chloride	NR	NR	NR
Chlorobenzene	NR	NR	NR
Chloroform	NR	NR	NR
Chloropicrin	NR	NR	NR
Chlorosulfonic Acid	NR	NR	NR
Chlorox Bleach Solution	C	C	C
Chrome Alum	R	R	R
Chromic Acid 10%	R	R	R
Chromic Acid 40%	R	R	R
Chromic Acid 50%	?	?	?
Chromic Acid/Sulfuric Acid/water-50%/15%/35%	?	?	?
Chromic/Nitric Acid (15%/35%)	R	C	NR
ChromiumNitrate	R	R	R
Citric Acid	R	R	R
Citrus Oils	NR	NR	NR
Coconut Oil	NR	NR	NR
Copper Acetate	R	R	R
Copper Carbonate	R	R	R
Copper Chloride	R	R	R
Copper Cyanide	R	R	R
Copper Fluoride	R	R	R
Copper Nitrate	R	R	R
Copper Sulfate	R	R	R
Corn Oil	NR	NR	NR
Corn Syrup	R	R	R
Cottonseed Oil	NR	NR	NR
Creosote	NR	NR	NR
Cresylic Acid,50%	NR	NR	NR
Crotonaldehyde	NR	NR	NR
Crude Oil	NR	NR	NR
Cumene	NR	NR	NR
Cupric Fluoride	R	R	R
Cupric Sulfate	R	R	R
Cuprous Chloride	R	R	R
Cyclanones	?	?	?
Cyclohexane	NR	NR	NR
Cyclohexanol	NR	NR	NR
Cyclohexanone	NR	NR	NR
D.D.T. (Xylene Base)	NR	NR	NR
Desocyephedrine Hydrochloride	?	?	?
Detergents	C	C	C
Dextrin	R	R	R

Chemical Resistance Data For CPVC Marine Pressure Piping

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CHEMICAL REAGENT	CPVC Type IV - Grade 1 4120 (23447)		
	73°F	140°F	180°F
Dextrose	R	R	R
Diacetone Alcohol	C	?	?
Diazo Salts	?	?	?
Dibutoxy Ethyl Phthalate	NR	NR	NR
Dibutyl Phthalate	NR	NR	NR
Dibutyl Sebacate	NR	NR	NR
Dichlorobenzene	NR	NR	NR
Dichloroethylene	NR	NR	NR
Diesel Fuels	NR	NR	NR
Diethyl Ether	NR	NR	NR
Diethylamine	NR	NR	NR
Diglycolic Acid	NR	NR	NR
Dill Oil	NR	NR	NR
Dimethyl Hydrazine	NR	NR	NR
Dimethylamine	NR	NR	NR
Dimethylformamide	NR	NR	NR
Dioctylphthalate	NR	NR	NR
Dioxane (1, 4)	NR	NR	NR
Disodium Phosphate	R	R	R
Distilled Water	R	R	R
EDTA Tetrasodium	R	R	R
Ethyl Ester (ethyl acrylate)	NR	NR	NR
Epsom Salt	R	R	R
Esters	NR	NR	NR
Ethanol > 5%	C	C	C
Ethanol up to 5%	R	R	R
Ethers	NR	NR	NR
Ethyl Acetate	NR	NR	NR
Ethyl Acrylate	NR	NR	NR
Ethyl Alcohol	C	C	C
Ethyl Chloride	NR	NR	NR
Ethyl Chloroacetate	NR	NR	NR
Ethyl Ether	NR	NR	NR
Ethylene Bromide	NR	NR	NR
Ethylene Chlorohydrin	NR	NR	NR
Ethylene Diamine	NR	NR	NR
Ethylene Dichloride	NR	NR	NR
Ethylene Glycol	C	C	C
Ethylene Oxide	NR	NR	NR
Fatty Acids	C	C	C
Ferric Acetate	R	R	R
Ferric Chloride	R	R	R
Ferric Hydroxide	R	R	R
Ferric Nitrate	R	R	R
Ferric Sulfate	R	R	R
Ferrous Chloride	R	R	R
Ferrous Hydroxide	R	R	R
Ferrous Nitrate	R	R	R

CHEMICAL REAGENT	CPVC Type IV Grade 1 4120 (23447)		
	73°F	140°F	180°F
Ferrous Sulfate	R	R	R
Fish Solubles	?	?	?
Fluorine Gas	NR	NR	NR
Fluorine Gas (wet)	NR	NR	NR
Fluoroboric Acid	?	?	?
Fluorosilisic Acid 25%	R	C	C
Formaldehyde	NR	NR	NR
Formic Acid < 25%	R	R	R
Formic Acid > 25%	C	?	NR
Freon 11	NR	NR	NR
Freon 113	NR	NR	NR
Freon 114	NR	NR	NR
Freon 12	NR	NR	NR
Freon 21	NR	NR	NR
Freon 22	NR	NR	NR
Fructose	R	R	R
Fruit juices & pulp	R	R	R
Furfural	NR	NR	NR
Gallic Acid	?	?	?
Gas (Coke Oven)	?	?	?
Gasoline	NR	NR	NR
Gasoline, HighOctane	NR	NR	NR
Gasoline Jet Fuel	NR	NR	NR
Glucose	R	R	R
Glycerine	R	R	R
Glycol	C	C	C
Glycol Ethers	NR	NR	NR
Glycolic Acid	?	?	?
Grape Sugar	R	R	R
Green Liquor	R	R	R
Halocarbon Oils	NR	NR	NR
Heptane	C	?	?
Hercolyn	?	?	?
Hexane	C	C	C
Hexanol,Tertiary	C	C	C
Hydrazine	NR	NR	NR
Hydrobromic Acid 20%	?	?	?
Hydrochloric Acid 10%	R	R	R
Hydrochloric Acid 30%	R	R	R
Hydrochloric Acid 36%	R	R	C
Hydrochloric Acid Concentrated	?	?	?
Hydrochloric Acid pickling	R	R	R
Hydrocyanic Acid	?	?	?
Hydrofluoric Acid 3%	R	?	?
Hydrofluoric Acid 48%	NR	NR	NR
Hydrofluoric Acid 50%	NR	NR	NR
Hydrofluoric Acid 70%	NR	NR	NR
Hydrofluorsilicic Acid 30%	R	?	C

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Chemical Resistance Data For CPVC Marine Pressure Piping

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CHEMICAL REAGENT	CPVC Type IV Grade 1 4120 (23447)		
	73°F	140°F	180°F
Hydrogen	C	C	C
Hydrogen Peroxide 30%	R	?	?
Hydrogen Peroxide 90%	?	?	?
Hydrogen Phosphide	?	?	?
Hydrogen Sulfide	R	R	R
Hydroquinone	R	R	R
Hydroxylamine Sulfate	?	?	?
Hypochlorite (Potassium & Sodium)	R	R	R
Hypochlorous Acid	R	R	R
Iodine	R	R	R
Iodine Solution 10%	?	?	?
Isopropanol	C	C	C
Kerosene	C	C	C
Ketones	NR	NR	NR
Kraft Liquors	R	R	R
Lactic Acid 25%	R	R	R
Lactic Acid 80%	R	C	C
Lard Oil	C	C	C
Lauric Acid	C	C	C
Lauryl Chloride	NR	NR	NR
Lead Acetate	R	R	R
Lead Chloride	R	R	R
Lead Nitrate	R	R	R
Lead Sulfate	R	R	R
Lemon Oil	NR	NR	NR
Limonene	NR	NR	NR
Linoleic Acid	C	C	C
Linoleic Oil	C	C	C
Linseed Oil	NR	NR	NR
Liquors	?	?	?
Lithium Bromide	R	R	R
Lithium Sulfate	R	R	R
Lubricating Oils, ASTM#1	?	?	?
Lubricating Oils, ASTM#2	?	?	?
Lubricating Oils, ASTM#3	?	?	?
Lux Liquid	?	?	?
Machine Oil	C	C	C
Magnesium Carbonate	R	R	R
Magnesium Chloride	R	R	R
Magnesium Citrate	R	R	R
Magnesium Fluoride	R	R	
Magnesium Hydroxide	R	R	R
Magnesium Nitrate	R	R	R
Magnesium Oxide	R	R	R
Magnesium Salts	R	R	R
Magnesium Sulfate	R	R	R
Maleic Acid 50%	R	R	R
Manganese Chloride	R	R	R

CHEMICAL REAGENT	CPVC Type IV, Grade 1 4120 (23447)		
	73°F	140°F	180°F
Manganese Sulfate	R	R	R
Mercural Ointment Blue 5%	?	?	?
Mercuric Chloride	R	R	R
Mercuric Cyanide	R	R	R
Mercuric Sulfate	R	R	R
Mercurous Nitrate	R	R	R
Mercury	R	R	R
Mercury Ointment Ammoniated	?	?	?
Methanol <10%	R	R	R
Methanol >10%	NR	NR	NR
Methoxyethyl Oleate	NR	NR	NR
Methyl Cellosolve	NR	NR	NR
Methyl Chloride	NR	NR	NR
Methyl Ethyl Ketone	NR	NR	NR
Methyl Formate	NR	NR	NR
Methyl Iso-Butyl Ketone	NR	NR	NR
Methyl Methacrylate	NR	NR	NR
Methyl Salicylate	NR	NR	NR
Methyl Sulfate	?	?	?
Methyl Sulfuric Acid	?	?	?
Methylamine	NR	NR	NR
Methylene Bromide	NR	NR	NR
Petroleum Liquifier	?	?	?
Petroleum Oils (Sour)	C	C	C
Phenol	R	R	R
Phenylhydrazine	NR	NR	NR
Phenylhydrazine Hydrochloride	NR	NR	NR
Phosgene, Gas	NR	NR	NR
Phosgene, Liquid	NR	NR	NR
Phosphoric Acid, up to 85%	R	R	R
Phosphorous Pentoxide	R	R	R
Phosphorous Trichloride	NR	NR	NR
Phosphorous, (Yellow)	R	R	R
Photographic Solutions: Dektal Developer	?	?	?
Photographic Solutions: DK #3	?	?	?
Photographic Solutions: Kodak Fixer	?	?	?
Photographic Solutions: Kodak Short Stop	?	?	?
Picric Acid	NR	NR	NR
Plating Solutions: Brass	R	R	R
Plating Solutions: Cadmium	R	R	R
Plating Solutions: Copper	R	R	R
Plating Solutions: Gold	R	R	R
Plating Solutions: Indium	R	R	R
Plating Solutions: Lead	R	R	R
Plating Solutions: Nickel	R	R	R
Plating Solutions: Rhodium	R	R	R
Plating Solutions: Silver	R	R	R
Plating Solutions: Tin	R	R	R

Chemical Resistance Data For CPVC Marine Pressure Piping

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CHEMICAL REAGENT	CPVC TypeIV Grade 1 4120 (23447)		
	73°F	140°F	180°F
Plating Solutions: Zinc	R	R	R
Polyethylene Glycol	NR	NR	NR
Potash (Sat.Aq.)	R	R	R
Potassium Acetate	R	R	R
Potassium Alum	R	R	R
Potassium Amyl Xanthate	?	?	?
Potassium Bicarbonate	R	R	R
Potassium Bichromate	R	R	R
Potassium Bisulfate	R	R	R
Potassium Borate	R	R	R
Potassium Bromate	R	R	R
Potassium Bromide	R	R	R
Potassium Carbonate	R	R	R
Potassium Chlorate	R	R	R
Potassium Chloride	R	R	R
Potassium Chromate	R	R	R
Potassium Cyanate	R	R	R
Potassium Cyanide	R	R	R
Potassium Dichromate	R	R	R
Potassium Ethyl Xanthate	?	?	?
Potassium Ferricyanide	R	R	R
Potassium Ferrocyanide	R	R	R
Potassium Fluoride	R	R	R
Potassium Hydroxide	R	R	R
Potassium Hypochlorite	R	R	R
Potassium Iodide	R	R	R
Potassium Nitrate	R	R	R
Potassium Perborate	R	R	R
Potassium Perchlorate	R	R	R
Potassium Permanganate 10%	R	R	R
Potassium Permanganate 25%	R	R	C
Potassium Persulfate	R	?	?
Potassium Phosphate	R	R	R
Potassium Sulfate	R	R	R
Potassium Sulfide	R	R	R
Potassium Sulfite	R	R	R
Potassium Tripolyphosphate	R	R	R
Propane	C	C	C
Propane Gas	C	C	C
Propanol 0.5%	R	?	R
Propanol > 0.5%	C	C	C
Propargyl Alcohol	C	C	C
Propionic Acid 2%	R	R	R
Propionic Acid > 2%	NR	NR	NR
Propylene Dichloride	NR	NR	NR
Propylene Glycol 25%	C	C	C
Propylene Propylene Glycol >25%	C	C	C
Propylene Oxide	NR	NR	NR
Pyridine	NR	NR	NR

CHEMICAL REAGENT	CPVC Type IV Grade 1 4120 (23447)		
	73°F	140°F	180°F
Pyrogallic Acid	?	?	?
Rayon Coagulating Bath	?	?	?
Refinery Crudes	C	C	C
Rochelle Salts	R	R	R
Salicylic Acid	R	R	R
Santicizer	?	?	?
Sea Water	R	R	R
Selenic Acid	?	?	?
Sewage	R	R	R
Silicic Acid	R	?	?
Silicone Oil	R	?	?
Silver Chloride	R	R	R
Silver Cyanide	R	R	R
Silver Nitrate	R	R	R
Silver Sulfate	R	R	R
Soaps	R	R	R
Sodium Acetate	R	R	R
Sodium Alum	R	R	R
Sodium Arsenate	R	?	?
Sodium Benzoate	R	R	R
Sodium Bicarbonate	R	R	R
Sodium Bichromate	R	R	R
Sodium Bisulfate	R	R	R
Sodium Bisulfite	R	R	R
Sodium Borate	R	R	R
Sodium Bromide	R	R	R
Sodium Carbonate	R	R	R
Sodium Chlorate	R	R	R
Sodium Chloride	R	R	R
Sodium Chlorite	R	R	R
Sodium Chromate	R	R	R
Sodium Cyanide	R	R	R
Sodium Dichromate	R	R	R
Sodium Ferricyanide	R	R	R
Sodium Ferrocyanide	R	R	R
Sodium Fluoride	R	R	R
Sodium Formate	R	R	R
Sodium Hydroxide 50%	R	R	R
Sodium Hypobromite	R	R	R
Sodium Hypochlorite	R	R	R
Sodium Iodide	R	R	R
Sodium Metaphosphate	R	R	R
Sodium Nitrate	R	R	R
Sodium Nitrite	R	R	R
Sodium Perchlorate	R	R	R
Sodium Peroxide	R	R	R
Sodium Silicate	R	R	R
Sodium Sulfate	R	R	R
Sodium Sulfide	R	R	R

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CHEMICAL REAGENT	CPVC Type IV Grade 1 4120 (23447)		
	73°F	140°F	180°F
Sodium Sulfite	R	R	R
Sodium Thiosulfate	R	R	R
Sodium Tripolyphosphate	R	R	R
Sour Crude Oil	C	C	C
Soybean Oil	NR	NR	NR
Stannic Chloride	R	R	R
Stannous Chloride	R	R	R
Stannous Sulfate	R	R	R
Starch	R	R	R
Stearic Acid	R	?	?
Stoddards Solvent	C	C	C
Styrene	NR	NR	NR
Succinic Acid	R	R	R
Sugar	R	R	R
Sulfamic Acid	R	R	R
Sulfite Liquor	?	?	?
Sulfur	R	?	?
Sulfur Dioxide dry	R	R	R
Sulfur Dioxide wet	R	R	R
Sulfur Trioxide	R	R	R
Sulfuric Acid 70%	R	R	R
Sulfuric Acid 80%	R	R	R
Sulfuric Acid 85%	R	C	NR
Sulfuric Acid 90%	R	C	NR
Sulfuric Acid 98%	R	NR	NR
Sulfuric Acid Fuming	NR	NR	NR
Sulfuric Acid Pickling	R	R	R
Sulfurous Acid	?	?	?
Tall Oil	C	C	C
Tan Oil	?	?	?
Tannic Acid 30%	R	?	?
Tanning Liquors	?	?	?
Tartaric Acid	R	?	?
Terpenes	NR	NR	NR
Terpineol	NR	NR	NR
Tetraethyl Lead	?	?	?
Texanol	NR	NR	NR
Thionyl Chloride	NR	NR	NR
Thread Cutting Oil	C	C	C
Titanium Tetrachloride	?	?	?
Toluol or Toluene	NR	NR	NR
Transformer Oil	C	C	C
Tributyl Citrate	NR	NR	NR
Tributyl Phosphate	NR	NR	NR
Trichloroacetic Acid	NR	NR	NR
Trichloroethylene	NR	NR	NR
Triethanolamine	NR	NR	NR
Trilones	?	?	?
Trimethyl Propane	?	?	?

CHEMICAL REAGENT	CPVC TypeIV Grade 1 4120 (23447)		
	73°F	140°F	180°F
Trimethylamine	?	?	?
Trisodium Phosphate	R	R	R
Turpentine	NR	NR	NR
Urea	R	R	R
Urine	R	R	R
Vaseline	?	?	?
Vegetable Oils	NR	NR	NR
Vinegar	R	R	R
Vinyl Acetate	NR	NR	NR
Water: Acid Mine	R	R	R
Water: Deionized	R	R	R
Water: Demineralized	R	R	R
Water: Distilled	R	R	R
Water: Fresh & Salt	R	R	R
Water: Swimming Pool	R	R	R
WD-40	C	C	C
Whiskey	R	R	R
White Liquor	R	R	R
Wines	R	R	R
Xylene or Xylol	NR	NR	NR
Zinc Acetate	R	R	R
Zinc Carbonate	R	R	R
Zinc Chloride	R	R	R
Zinc Nitrate	R	R	R
Zinc Sulfate	R	R	R

Basic Conversions

VOLUME

Convert From	Into	Multiply By
Acre-feet	Cu feet	43560
	Cu meters	1233.482
	Cu yards 1613.33	
	Gallons (US)	3.259×10^{5}
Cu Centimeters	Cu feet	3.5315×10^{-5}
	Cu inches	0.06102
	Cu meters	1×10^{-6}
	Cu yards 1.308×10^{-6}	
	Gallons (US liq)	0.00026
	Liters	0.00099
	Ounces (US liq)	0.03381
	Pints (US liq)	0.00211
	Quarts (US liq)	0.00106
Cu Feet	Acre-feet 2.296×10^{-5}	
	Cu centimeters	28316.8
	Cu inches	1728.0
	Cu meters	0.02832
	Cu yards 0.03704	
	Gallons (US liq)	7.48052
	Liters	28.316
	Ounces (US liq)	957.506
	Pints (US liq)	59.8442
	Quarts (US liq)	29.922
Cu Inches	Acre-feet 1.329×10^{-8}	
	Cu centimeters	16.3871
	Cu feet	0.000579
	Cu meters	1.639×10^{-5}
	Cu yards 2.143×10^{-5}	
	Gallons (US liq)	0.00433
	Liters	0.01639
	Ounces (US liq)	0.55411
	Pints (US liq)	0.03463
	Quarts (US liq)	0.01732
Cu Meters	Acre-feet 0.00081	
	Cu centimeters	1 x 106
	Cu feet	35.147
	Cu inches	61023.7
	Cu yards 1.30795	
	Gallons (US liq)	264.172
	Liters	999.97
	Pints (US liq)	2113.38
	Quarts (US liq)	1056.69
Cu Yards	Acre-feet 6.198×10^{-4}	
	Cu centimeters	764554.9
	Cu feet	27
	Cu inches	46656
	Cu meters	0.76455
	Gallons (US liq)	201.974
	Liters	764.553
	Quarts (US liq)	807.896
Gallons (US liq)	Acre-feet 3.068×10^{-6}	
	Cu centimeters	3785.41
	Cu feet	0.13368
	Cu inches	231
	Cu meters	0.00378
	Cu yards	0.00495
	Liters	3.7853
	Ounces (US liq)	128
	Pints (US liq)	8
	Quarts (US liq)	4
Liters	Acre-feet 8.106×10^{-7}	
	Cu centimeters	1.000.03
	Cu feet	0.03532

VOLUME - continued

Convert From	Into	Multiply By
	Cu inches	61.002
	Cu meters	0.00100003
	Cu yards	0.00131
	Gallons (US liq)	0.26148
	Ounces (US liq)	33.81497
	Pints (US liq)	2.1134
	Quarts (US liq)	1.0567
Ounces (US liq)	Cu Centimeters	29.5737
	Cu inches	1.80469
	Cu meters	2.957×10^{-5}
	Gallons (US liq)	0.00781
	Liters	0.02957
	Pints (US liq)	0.0625
	Quarts (US liq)	0.0312
Pints (US liq)	Cu Centimeters	473.176
	Cu feet	0.01671
	Cu inches	28.875
	Cu yards	0.000619
	Gallons (US liq)	0.125
	Liters	0.47316
	Quarts (US liq)	0.5

PRESSURE

Convert From	Into	Multiply By
Atmospheres	BAR	1.01325
	Ft H_2O @ 68°F	33.96
	Grams/sq cm	1033.23
	In Hg @ 32°F	29.9213
	In H_2O @ 68°F	407.5
	Kg/sq cm	1.03322
	Kg/sq meter	10332
	kilo Pascals	101.3
	mm Hg @ 32°F	760
	Pounds/sq ft	2116
	Pounds/sq in	14.6960
BAR	Atmospheres	0.98692
	Ft H_2O @ 68°F	33.51
	Grams/sq cm	1019.72
	In Hg @ 32°F	29.530
	In H_2O @ 68°F	407.5
	Kg/sq cm	1.01972
	Kg/sq meter	10197
	kilo Pascals	100
	mm Hg @ 32°F	0.1333
	Pounds/sq ft	2089.0
	Pounds/sq in	14.5038
Ft H_2O @ 68°F	Atmospheres	0.98692
	BAR	2.984×10^{-2}
	In Hg @ 32°F	0.8812
	In H_2O @ 68°F	12
	Kg/sq cm	3.043×10^{-2}
	Kg/sq meter	304.3
	kilo Pascals	2.984
	mm Hg @ 32°F	22.38
	Pounds/sq ft	62.32
	Pounds/sq in	0.4328
Grams/sq cm	Atmospheres	0.00097
	BAR	0.00098
	In Hg @ 32°F	0.02896
	Kg/sq cm	1.01972
	Kg/sq meter	1000
	kilo Pascals	100
	mm Hg @ 32°F	0.73556

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Basic Conversions

PRESSURE - continued

Convert From	Into	Multiply By
	Pounds/sq ft	2.0481
	Pounds/sq in	0.01422
In Hg @32°F	Atmospheres	0.03342
	BAR	0.03386
	Ft H_2O @ 68°F	1.135
	Grams/sq cm	34.532
	In H_2O @ 68°F	13.62
	Kg/sq cm	3.453×10^{-2}
	Kg/sq meter	345.3
	kilo Pascals	3.386
	mm Hg @ 32°F	25.4
	Pounds/sq ft	70.73
	Pounds/sq in	0.4912
In H_2O @ 68°F	Atmospheres	2.454×10^{-3}
	BAR	2.49×10^{-3}
	Ft H_2O @ 68°F	8.333×10^{-2}
	In Hg @ 32°F	7.343×10^{-2}
	Kg/sq cm	2.53×10^{-3}
	Kg/sq meter	25.38
	kilo Pascals	0.249
	mm Hg @ 32°F	1.865
	Pounds/sq ft	5.197
	Pounds/sq in	3.609×10^{-2}
Kg/sq cm	Atmospheres	0.9678
	BAR	0.98066
	Ft H_2O @ 68°F	32.87
	In Hg @ 32°F	28.959
	In H_2O @ 68°F	394.4
	Kg/sq meter	1×10^4
	kilo Pascals	98.07
	mm Hg @ 32°F	735.6
	Pounds/sq ft	2048
	Pounds/sq in	14.22
Kg/sq meter	Atmospheres	9.678×10^{-5}
	BAR	9.807×10^{-5}
	Ft H_2O @ 68°F	3.287×10^{-3}
	Grams/sq cm	0.1
	In Hg @32°F	0.0029
	In H_2O @ 68°F	3.944×10^{-2}
	Kg/sq cm	0.001
	kilo Pascals	9.807×10^{-3}
	mm Hg @32°F	0.07356
	Pounds/sq ft	0.20482
	Pounds/sq in	1.422×10^{-3}
kilo Pascals	Atmospheres	9.869×10^{-3}
	BAR	0.01
	Ft H_2O@68°F	0.3351
	In Hg @32°F	0.2953
	In H_2O @ 68°F	4.022
	Kg/sq cm	1.02×10^{-2}
	Kg/sq meter	102
	mm Hg @32°F	7.501
	Pounds/sq ft	20.89
	Pounds/sq in	0.145
mm Hg @32°F	Atmospheres	1.316×10^{-3}
	BAR	1.333×10^{-3}
	Ft H_2O@68°F	4.468×10^{-3}
	Grams/sq cm	1.3595
	In Hg @32°F	3.937×10^{-2}
	In H_2O @ 68°F	0.5362
	Kg/sq cm	1.36×10^{-3}
	Kg/sq meter	13.595
	kilo Pascals	0.1333

PRESSURE - continued

Convert From	Into	Multiply By
	Pounds/sq ft	2.7845
	Pounds/sq in	0.0193
Pounds/sq ft	Atmospheres	4.73×10^{-4}
	BAR	4.79×10^{-4}
	Ft H_2O@68°F	1.605×10^{-2}
	Grams/sq cm	0.48824
	In Hg @32°F	2.036
	In H_2O @ 68°F	0.1926
	Kg/sq cm	4.88×10^{-4}
	Kg/sq meter	4.882
	kilo Pascals	4.79×10^{-2}
	mm Hg @32°F	0.3591
	Pounds/sq in	6.945×10^{-3}
Pounds/sq in	Atmospheres	6.805×10^{-2}
	BAR	6.895×10^{-2}
	Ft H_2O @ 68°F	1.605×10^{-2}
	Grams/sq cm	70.307
	In Hg @ 32°F	2.036
	In H_2O @ 68°F	27.73
	Kg/sq cm	7.031×10^{-2}
	Kg/sq meter	703.1
	kilo Pascals	6.895
	mm Hg @ 32°F	51.72
	Pounds/sq ft	144

VELOCITY (Distance-time)

Convert From	Into	Multiply By
Feet/day	Feet/ second	1.157×10^{-5}
	Kilometers/hour	1.27×10^{-5}
	Meters/second	3.528×10^{-6}
	Miles/hour	7.891×10^{-6}
Feet/ second	Feet/ day	8.64×10^4
	Kilometers/hour	1.097
	Meters/second	0.3048
	Miles/hour	0.6818
Kilometers/hour	Feet/day	7.874×10^4
	Feet/ second	0.9113
	Meters/second	0.2778
	Miles/hour	0.6214
Meters/second	Feet/day	2.835×10^5
	Feet/ second	3.281
	Kilometers/hour	3.6
	Miles/hour	2.237
Miles/hour	Feet/day	1.267×10^5
	Feet/ second	1.467
	Kilometers/hour	1.609
	Meters/second	0.447

DISCHARGE RATES (Volume-time)

Convert From	Into	Multiply By
Acre-feet/day	Cu feet/second	0.5042
	Cu meters/day	1234
	Gallons/minute	226.3
	Liters/second	14.28
Cu feet/second	Acre-feet/day	1.983
	Cu meters/day	2447
	Gallons/minute	448.8
	Liters/second	28.32
Cu meters/day	Acre-feet/day	6.051 X 106
	Cu feet/second	3.051 X 106
	Gallons/minute	1.369×10^9
	Liters/second	8.64×10^7

Basic Conversions

DISCHARGE RATES - continued

Convert From	Into	Multiply By
Gallons/minute	Acre-feet/day	4.419×10^{-3}
	Cu feet/second	2.228×10^{-3}
	Cu meters/day	5.45
	Liters/second	6.309×10^{-2}
Liters/second	Acre-feet/day	7.005×10^{-2}
	Cu feet/second	3.531×10^{-2}
	Cu meters/day	86.4
	Gallons/minute	15.85

TORQUE

Convert From	Into	Multiply By
Foot-pounds	Inch-pounds	12
	KF force-meters	1382.552×10^{-4}
	Newton-meters	1.356
Inch-pounds	Foot-pounds	0.8333
	KF force-meters	11547.344×10^{-6}
	Newton-meters	11559.357×10^{-5}
KF force-meters	Foot-pounds	7.233
	Inch-pounds	86.8
	Newton-meters	9.807
Newton-meters	Foot-pounds	$7374.631X\ 10^{-4}$
	Inch-pounds	8.651
	KF force-meters	10196.798×10^{-5}

DENSITY

Convert From	Into	Multiply By
Pounds/Cu inch	Pounds/Cu feet	1728
	Pounds/gallon	231
	Grams/Cu cm	27.68
	Grams/liter	2.768×10^{4}
Pounds/Cu feet	Pounds/Cu inch	5.787×10^{-4}
	Pounds/gallon	0.1337
	Grams/Cu cm	1.6×10^{-2}
	Grams/liter	16.02
Pounds/gallon	Pounds/Cu inch	4.33×10^{-3}
	Pounds/Cu feet	7.481
	Grams/Cu cm	0.1198
	Grams/liter	119.8
Grams/Cu cm	Pounds/Cu inch	3.61×10^{-2}
	Pounds/Cu feet	62.43
	Pounds/gallon	8.345
	Grams/liter	1000
Grams/liter	Pounds/Cu inch	3.61×10^{-5}
	Pounds/Cu feet	6.24×10^{-2}
	Pounds/gallon	8.35×10^{-3}
	Grams/Cu cm	0.001

ENERGY

Convert From	Into	Multiply By
British Thermal Unit (BTU)	Foot-pound	777.9
	Horsepower-hr	3.929×10^{-4}
	Joules	1055
	Calorie	252
	Kilowatt-hr	2.93×10^{-4}
Foot-pound	BTU	1.285×10^{-3}
	Horsepower-hr	5.051×10^{-7}
	Joules	1.356
	Calorie	0.3239
	Kilowatt-hr	3.766×10^{-7}
Horsepower-hr	BTU	2545
	Foot-pound	1.98×10^{6}
	Joules	2.685×10^{6}
	Calorie	6.414×10^{5}

ENERGY - continued

Convert From	Into	Multiply By
	Kilowatt-hr	0.7457
Joules	BTU	9.481×10^{-4}
	Foot-pound	0.7376
	Horsepower-hr	3.725×10^{-7}
	Calorie	0.2389
	Kilowatt-hr	2.778×10^{-7}
Calorie	BTU	3.968×10^{-3}
	Foot-pound	3.087
	Horsepower-hr	1.559×10^{-6}
	Joules	4.186
	Kilowatt-hour	1.163×10^{-6}
Kilowatt-hr	BTU	3413
	Foot-pound	2.655×10^{6}
	Horsepower-hr	1.341
	Joules	3.6×10^{6}
	Calorie	8.601×10^{5}

MASS

Convert From	Into	Multiply By
Ounce	Pound	0.0625
	Kilogram	0.02834952
	Short ton	$3.125X\ 10^{-5}$
	Long ton	$2.79X\ 10^{-5}$
	Metric ton	$2.835X\ 10^{-5}$
Pound	Ounce	16
	Kilogram	0.4536
	Short ton	0.0005
	Long ton	0.0004464
	Metric ton	0.0004536
Kilogram	Ounce	35.27396
	Pound	2.20462
	Short ton	0.001102
	Long ton	0.00098
	Metric ton	0.091
Short ton	Ounce	32000
	Pound	2000
	Kilogram	907.18
	Long ton	0.89266
	Metric ton	0.90718
Long ton	Ounce	35840
	Pound	2240
	Kilogram	1016.05
	Short ton	1.12
	Long ton	1.10605

MASS - continued

Convert From	Into	Multiply By
Metric ton	Ounce	35273.98
	Pound	2204.62
	Kilogram	1000
	Short ton	1.1023
	Long ton	0.98421

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

Pressure Rating

$$P = \frac{2St}{D-t} \qquad S = \frac{P(D-t)}{2t}$$

P is the pressure rating in psi.
S is the Hydrostatic Design Basis (usually 4000 psi) divided by the safety factor (which is 2 for the three standards).
DR is the Dimension Ratio for D2241 and C905 but is OD/t for D1785

Where:
P = Pressure, psi
S = Circumferential stress, psi
D = Outside diameter of pipe, inches
d = Inside diameter of pipe, inches (average based on mean wall)
t = Average wall thickness, inches

Volume capacity-gallons per ft. length = VG = V x 0.004329

Volume capacity-cubic inches per ft. length = V = 0.7854 x d^2 x 12

Outside pipe surface, sq. ft per ft. length = AO = $\frac{D^2\pi}{12}$

Inside pipe surface, sq. ft. per ft. length = $A_I = \frac{d\pi}{12}$

Cross-sectional plastic area, sq. in. = A = $\frac{(D^2 - d^2)\pi}{4}$

Cross sectional flow area, sq. in. = $A_F = \frac{d^2\pi}{4}$

Weight of CPVC pipe, lb. per ft. length = W_{CPVC} =.705 x A

Weight of water in pipe, lb. per ft. length = W_W = 0.433 A_F

Weight of water filled pipe, lb. per ft. length = $W_{WFP} = W_{PVC}$ (or W_{CPVC}) + W_W

Radius of gyration, inches = $r_g = \sqrt{\frac{D^2 + d^2}{4}}$

Moment of inertia, inches fourth = I = Ar_g^2.0491(D^4 - d^4)

Section modulus, inches cube = Z = $\frac{2I}{D}$ = 0.0982 x $\frac{(D^4 - d^4)}{D}$

Thermal Expansion and Contraction

Δ L = 12 yL (Δ T)
Where:
Δ L = Expansion or contraction of pipe in inches
y = Coefficient of thermal expansion
(see CPVC material Thermal properties) L = Length of pipe run in feet
Δ T = Temperature change °F (Maximum temperature - Temperature @ Installation or maximum system temperature - lowest system temperature, whichever is greater)

Friction Loss (Hazen-Williams equations)

$$f = .2083 \times (100/C)^{1.852} \times \frac{G^{1.852}}{d^{4.8655}}$$

Where:
f = Friction head of feet of water per 100' for the specific pipe size and I.D.
C = A constant for internal pipe roughness (=150 for thermoplastic pipe)
G = Flow rate of U.S. gallons per minute
d = Inside diameter of pipe in inches

Water Velocities

$$V = .3208 \times \frac{G}{A}$$

Where:
V = Velocity in feet per second
G = Gallons per minute
A = Inside cross sectional area in square inches

Gallons Per Minute Through Pipe

GPM = 0.0408 x Pipe Diameter Inches 2 x Feet Per Minute Velocity

Pressure Drop in Valves

$$P = \frac{G^2 \times S_g}{CV^2}$$

Where:
P = Pressure drop in PSI; feet of water = PSI/.4332
G = Gallons per minute
S_g = Specific gravity of liquid
C_V = Gallons per minute per 1 PSI pressure drop (see Valve product Cv from manufacturer)

Water Conversions

1 foot of head = 0.434 PSI
1 gallon = 231 cubic inch = 8.333 pounds
1 pound water = 27.7 cubic inches
1 cubic foot water = 7.5 gallon = 62.5 pounds (salt water = 64.3 pounds)
1 miner's inch = 9 to 12 gallons per minute

$$\text{Horsepower to Raise Water} = \frac{\text{Gallons Per Minute} \times \text{Total Head in Feet}}{3960}$$

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
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Spears® Manufacturing Company

CPVC MARINE PIPE DIMENSIONS

Schedule 40

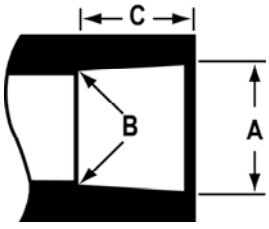
Nom. Pipe Size (in)	O.D.	Average I.D.	Min. Wall	Nominal Wt./Ft.	Maximum W.P. PSI*
1/2	0.840	0.602	0.109	0.170	600
3/4	1.050	0.804	0.113	0.226	480
1	1.315	1.029	0.133	0.333	450
1-1/4	1.660	1.360	0.140	0.450	370
1-1/2	1.900	1.590	0.145	0.537	330
2	2.375	2.047	0.154	0.720	280
2-1/2	2.875	2.445	0.203	1.136	300
3	3.500	3.042	0.216	1.488	260
4	4.500	3.998	0.237	2.118	220
6	6.625	6.031	0.280	3.733	180
8	8.625	7.942	0.322	5.619	160
10	10.750	9.976	0.365	7.966	140
12	12.750	11.889	0.406	10.534	130

Schedule 80

Nom. Pipe Size (in)	Average O.D.	Average I.D.	Min. Wall	Nominal Wt./Ft.	Maximum. W.P. PSI*
1/2	.840	.526	0.147	0.225	850
3/4	1.050	.722	0.154	0.304	690
1	1.315	.936	0.179	0.449	630
1-1/4	1.660	1.255	0.191	0.617	520
1-1/2	1.900	1.476	0.200	0.751	470
2	2.375	1.913	0.218	1.040	400
2-1/2	2.875	2.290	0.276	1.582	420
3	3.500	2.864	0.300	2.121	370
4	4.500	3.786	0.337	3.2101	320
6	6.625	5.709	0.432	6.200	280
8	8.625	7.565	0.500	9.042	250
10	10.750	9.493	0.593	13.018	230
12	12.750	11.294	0.687	18.350	230

ASTM STANDARD DIMENSIONS

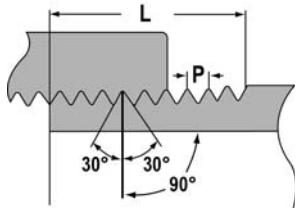
CPVC SCHEDULE 80 SOCKET DIMENSIONS ASTM F 439



Nominal Size In.	Diameter			Socket Length Minimum C
	Entrance A	Bottom B	Tolerance A	
1/2	.848	.836	± .004	.688
3/4	1.058	1.046	± .004	.719
1	1.325	1.310	± .005	.875
1-1/4	1.670	1.655	± .005	.938
1-1/2	1.912	1.894	± .005	1.094
2	2.387	2.369	± .006	1.156
2-1/2	2.889	2.868	± .006	1.156
3	3.516	3.492	± .007	1.750
4	4.518	4.491	± .008	1.875
6	6.647	6.614	± .010	3.000
8	8.655	8.610	± .011	3.000
10	10.780	10.735	± .015	4.000
12	12.780	12.735	± .015	5.000

ANSI STANDARD DIMENSIONS

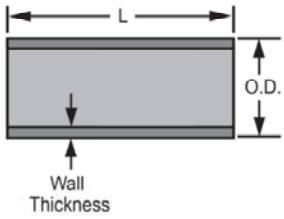
AMERICAN NATIONAL STANDARD TAPER PIPE THREADS (NPT) ANSI B1.20.1,ASTM F 1498



Nominal Size In.	Threads Per Inch.	Effective Thread Length L	Pitch Of Thread P
1/2	14	.5337	.07143
3/4	14	.5457	.07143
1	11-1/2	.6828	.08696
1-1/4	11/12	.7068	.08696
1-1/2	11/12	.7235	.08696
2	11/12	.7565	.08696
2-1/2	8	1.1375	.12500
3	8	1.2000	.12500
4	8	1.3000	.12500
6	8	1.5125	.12500
8	8	1.7125	.12500

Pipe - CPVC Schedule 40 Plain End - Marine

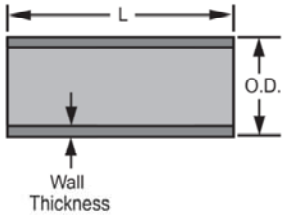
10' Lengths, Price Per Foot



Part Number	Size	L	AVG.O.D.	Minimum Wall	Approx. Wt. (Lbs.)
CG-PD400-005C10	1/2	10	.840	.109	.18
CG-PD400-007C10	3/4	10	1.050	.113	.23
CG-PD400-010C10	1	10	1.315	.133	.35
CG-PD400-012C10	1-1/4	10	1.660	.140	.47
CG-PD400-015C10	1-1/2	10	1.900	.145	.56
CG-PD400-020C10	2	10	2.375	.154	.77
CG-PD400-025C10	2-1/2	10	2.875	.203	1.20
CG-PD400-030C10	3	10	3.500	.216	1.57
CG-PD400-040C10	4	10	4.500	.237	2.23
CG-PD400-060C10	6	10	6.625	.280	3.94
CG-PD400-080C10	8	10	8.625	.322	5.95
CG-PD400-100C10	10	10	10.750	.365	8.53
CG-PD400-120C10	12	10	12.750	.406	10.83

Pipe - CPVC Schedule 40 Plain End - Marine

20' Lengths, Price Per Foot



Part Number	Size	L	AVG.O.D.	Minimum Wall	Approx. Wt. (Lbs.)
CG-PD-400-005C	1/2	20	.840	.109	.18
CG-PD-400-007C	3/4	20	1.050	.113	.23
CG-PD-400-010C	1	20	1.315	.133	.35
CG-PD-400-012C	1-1/4	20	1.660	.140	.47
CG-PD-400-015C	1-1/2	20	1.900	.145	.56
CG-PD-400-020C	2	20	2.375	.154	.77
CG-PD-400-025C	2-1/2	20	2.875	.203	1.20
CG-PD-400-030C	3	20	3.500	.216	1.57
CG-PD-400-040C	4	20	4.500	.237	2.23
CG-PD-400-060C	6	20	6.625	.280	3.94
CG-PD-400-080C	8	20	8.625	.322	5.95
CG-PD-400-100C	10	20	10.750	.365	8.53
CG-PD-400-120C	12	20	12.750	.406	10.83

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Spears® Manufacturing Company

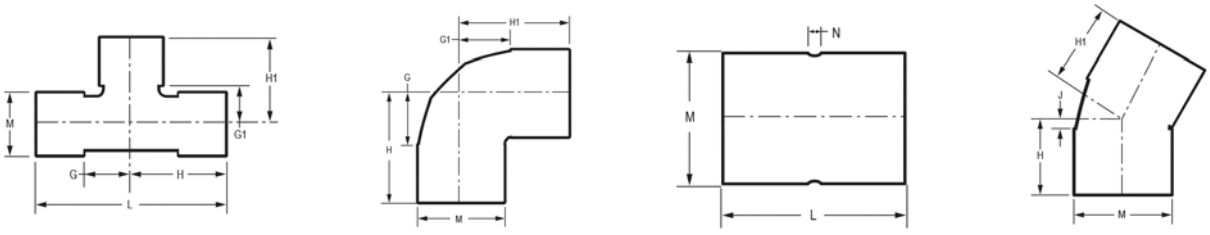
Injection Molded Dimension References:

G = (LAYING LENGTH) Intersection of center lines to bottom of socket/thread; 90° elbows, tees, crosses; ± 1/32 inch.
H = Intersection of center lines to face of fitting; 90° elbows tees, crosses; ± 1/32 inch.
J = Intersection of center lines to bottom of socket/thread; 45° elbows; ± 1/32 inch
L = Overall length of fittings; ± 1/16 inch.
M = Outside diameter of socket/thread hub; ± 1/16 inch.
N = Socket bottom to socket bottom; couplings; ± 1/16 inch.
W = Height of cap; ± 1/16 inch.

Fabricated Dimension References:

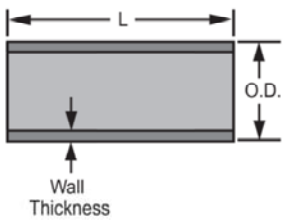
G = (LAYING LENGTH) Intersection of center lines to bottomof socket/thread; 90° elbows, tees, crosses; ± 1/4 inch; 14" & larger ± 1/2 inch.
H = Intersection of center lines to face of fitting; 90° elbows ± 1/4 inch, 14" & larger ± 3/4 inch; wyes ± 1/2 inch; tees, crosses ± 1/4 inch; 14" larger ± 1/2 inch.
J = Intersection of center lines to bottom of socket/thread;45° elbows; ± 1/4 inch; 14" & larger ± 1/2 inch.
L = Overall length of fittings; ± 1/2 inch.; wyes ± 1 inch; 14" & larger ± 1 inch.
M = Outside diameter of socket/thread hub; ± 1/4 inch.
N = Socket bottom to socket bottom; couplings; ± 1/2 inch.
W = Height of cap; ± 1/4 inch.

Typical Fabricated Dimension References



Pipe - CPVC Schedule 80 Plain End - Marine

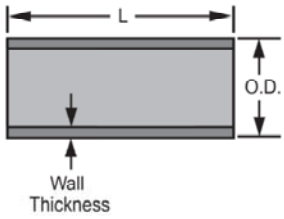
10' Lengths, Price Per Foot



Part Number	Size	L	AVG.O.D.	Minimum Wall	Approx. Wt. (Lbs.)
CG-PD800-005C10	1/2	10	.840	.147	.22
CG-PD800-007C10	3/4	10	1.050	.154	.30
CG-PD800-010C10	1	10	1.315	.179	.44
CG-PD800-012C10	1-1/4	10	1.660	.191	.61
CG-PD800-015C10	1-1/2	10	1.900	.200	.75
CG-PD800-020C10	2	10	2.375	.218	1.03
CG-PD800-025C10	2-1/2	10	2.875	.276	1.58
CG-PD800-030C10	3	10	3.500	.300	2.12
CG-PD800-040C10	4	10	4.500	.337	3.10
CG-PD800-060C10	6	10	6.625	.432	5.92
CG-PD800-080C10	8	10	8.625	.500	9.04
CG-PD800-100C10	10	10	10.750	.593	13.01
CG-PD800-120C10	12	10	12.750	.687	18.35

Pipe - CPVC Schedule 80 Plain End - Marine

20' Lengths, Price Per Foot

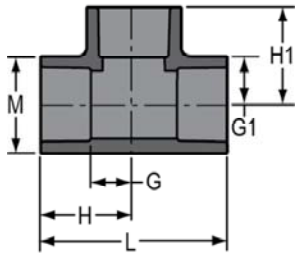


Part Number	Size	L	AVG.O.D.	Minimum Wall	Approx. Wt. (Lbs.)
CG-PD-800-005C	1/2	20	.840	.147	.22
CG-PD-800-007C	3/4	20	1.050	.154	.30
CG-PD-800-010C	1	20	1.315	.179	.44
CG-PD-800-012C	1-1/4	20	1.660	.191	.61
CG-PD-800-015C	1-1/2	20	1.900	.200	.75
CG-PD-800-020C	2	20	2.375	.218	1.03
CG-PD-800-025C	2-1/2	20	2.875	.276	1.58
CG-PD-800-030C	3	20	3.500	.300	2.12
CG-PD-800-040C	4	20	4.500	.337	3.10
CG-PD-800-060C	6	20	6.625	.432	5.92
CG-PD-800-080C	8	20	8.625	.500	9.04
CG-PD-800-100C	10	20	10.750	.593	13.01
CG-PD-800-120C	12	20	12.750	.687	18.35

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Tee - Marine

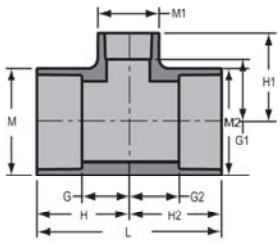
Socket x Socket x Socket



Part Number	Size	G	G1	H	H1	L	M	Approx. Wt. (Lbs.)
CG-801-005C	1/2	19/32	19/32	1-15/32	1-15/32	2-15/16	1- 3/16	.11
CG-801-007C	3/4	11/16	11/16	1-11/16	1-11/16	3- 3/8	1-13/32	.16
CG-801-010C	1	27/32	27/32	2	2	4	1-23/32	.29
CG-801-012C	1-1/4	1- 1/32	1- 1/32	2- 9/32	2- 9/32	4-19/32	2- 3/32	.39
CG-801-015C	1-1/2	1- 3/16	1- 3/16	2- 9/16	2- 9/16	5- 1/8	2- 3/8	.53
CG-801-020C	2	1-7/16	1-7/16	2-15/16	2-15/16	5-7/8	2- 7/8	.86
CG-801-025C	2-1/2	1-23/32	1-23/32	3- 1/2	3- 1/2	7	3-15/32	1.68
CG-801-030C	3	2- 1/16	2- 1/16	3-31/32	3-31/32	7-15/16	4- 5/32	2.43
CG-801-040C	4	2- 1/2	2- 1/2	4- 3/4	4- 3/4	9- 1/2	5- 1/4	3.71
CG-801-060C	6	4- 1/32	4- 1/32	7- 3/32	7- 3/32	14- 5/32	7-19/32	12.18
CG-801-080C	8	4-13/16	4-13/16	8- 7/8	8- 7/8	17- 3/4	9-23/32	21.58
CG-801-100C	10	5- 3/4	5- 3/4	10-13/16	10-13/16	21- 5/8	11-19/32	38.18
CG-801-120C	12	6-15/16	6-15/16	12-15/16	12-15/16	25- 7/8	14- 1/4	55.92

Tee - Reducing - Marine

Socket x Socket x Socket

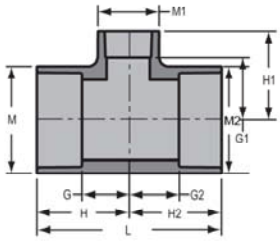


Part Number	Size	G	G1	G2	H	H1	H2	L	M	M1	M2	Approx. Wt. (Lbs.)
CG-801-101C	3/4X1/2	19/32	11/16	19/32	1-19/32	1-9/16	1-19/32	3-3/16	1-13/32	1-3/16	1-13/32	.14
CG-801-130C	1X1/2	19/32	7/8	19/32	1-23/32	1-3/4	1-23/32	3-7/16	1-3/4	1-3/16	1-3/4	.20
CG-801-131C	1X3/4	11/16	27/32	11/16	1-27/32	1-27/32	1-27/32	3-11/16	1-3/4	1-13/32	1-3/4	.24
CG-801-157C	1-1/4X1X3/4	11/16	1-1/16	11/16	1-7/8	2-1/16	1-15/16	3-3/4	2-3/32	1-13/32	1-23/32	.32
CG-801-158C	1-1/4X1X1	7/8	27/32	25/32	2-1/8	1-31/32	1-15/16	4	2-1/8	1-3/4	1-3/4	.32
CG-801-159C	1-1/4X1X1-1/4	15/16	15/16	15/16	2-7/32	2-7/32	2-3/32	4-5/16	2-3/32	2-3/32	1-23/32	.40
CG-801-166C[1]	1-1/4X1/2	5/8	1-11/32	5/8	1-15/16	2-1/4	1-15/16	3-7/8	2-3/32	1-13/32	2-3/32	.32
CG-801-167C	1-1/4X3/4	5/8	31/32	5/8	1-15/16	1-31/32	1-15/16	3-7/8	2-3/32	1-13/32	2-3/32	.29
CG-801-168C	1-1/4X1	27/32	1-1/32	27/32	2-3/32	2-5/32	2-3/32	4-7/32	2-3/32	1-3/4	2-3/32	.35
CG-801-202C	1-1/2X1-1/4X1	27/32	1-1/32	27/32	2-1/4	2-5/32	2-1/4	4-1/2	2-11/32	1-23/32	2-3/32	.42
CG-801-209C	1-1/2X1/2	19/32	1-3/32	9/16	1-31/32	1-31/32	1-31/32	3-15/16	2- 3/8	1-3/16	2-3/8	.36
CG-801-210C	1-1/2X3/4	11/16	1-1/32	11/16	2-1/16	2-1/32	2-3/32	4-3/16	2-11/32	1-13/32	2-11/32	.37
CG-801-211C	1-1/2X1	27/32	1-5/32	27/32	2-1/4	2-5/16	2-1/4	4-1/2	2-11/32	1-3/4	2-11/32	.43
CG-801-212C	1-1/2X1-1/4	1-3/16	1-1/32	1-3/16	2-9/16	2-9/32	2-9/16	5-1/8	2-11/32	2-3/32	2-11/32	.57
CG-801-247C	2X1/2	9/16	1-13/32	9/16	2-3/32	2-9/32	2-3/32	4-3/16	2-27/32	1-5/32	2-27/32	.45
CG-801-248C	2X3/4	11/16	1-13/32	11/16	2-3/16	2-13/32	2-3/16	4-3/8	2-27/32	1-3/8	2-27/32	.51
CG-801-249C	2X1	27/32	1-7/16	27/32	2-11/32	2-9/16	2-11/32	4-23/32	2-7/8	1-3/4	2-7/8	.57
CG-801-250C	2X1-1/4	1-1/32	1-11/32	1-1/32	2-9/16	2-19/32	2-9/16	5-3/32	2-27/32	2-3/8	2-7/8	.65

Tee - Reducing - Marine

(Continued)

Socket x Socket x Socket



Part Number	Size	G	G1	G2	H	H1	H2	L	M	M1	M2	Approx. Wt. (Lbs.)
CG-801-251C	2X1-1/2	1-3/16	1-7/16	1-3/16	2-11/16	2-27/32	2-11/16	5-3/8	2-7/8	2-3/8	2- 7/8	.79
CG-801-254C[1]	2X2X4	3-21/32	2-15/32	3-11/16	5-3/16	4-23/32	5-3/16	10-11/32	5-1/4	5-1/4	5-1/4	5.92
CG-801-287C	2-1/2X1/2	19/32	1-19/32	19/32	2-3/8	2-15/32	2-3/8	4-23/32	3-1/2	1-3/16	3-1/2	.78
CG-801-288C	2-1/2X3/4	21/32	1-1/2	21/32	2-7/16	2-17/32	2-7/16	4-27/32	3-15/32	1-13/32	3-15/32	.83
CG-801-289C	2-1/2X1	7/8	1-11/16	7/8	2-5/8	2-13/16	2-5/8	5-1/4	3-1/2	1-23/32	3-1/2	1.03
CG-801-290C	2-1/2X1-1/4	1-1/32	1-23/32	1-1/32	2-27/32	2-31/32	2-27/32	5-11/16	3-1/2	2-3/32	3-1/2	1.16
CG-801-291C	2-1/2X1-1/2	1-3/16	1-3/4	1-3/16	2-15/16	3-1/8	2-15/16	5-7/8	3-1/2	2-11/32	3-1/2	1.27
CG-801-292C	2-1/2X2	1-13/32	1-5/8	1-13/32	3-3/16	3-1/8	3-3/16	6-3/8	3-1/2	2- 7/8	3-1/2	1.34
CG-801-333C[1]	3X1/2	27/32	2-1/2	27/32	2-3/4	3-13/32	2-3/4	5-1/2	4-3/16	1-23/32	4-3/16	1.35
CG-801-334C[1]	3X3/4	11/16	2-1/16	11/16	2-19/32	3-3/32	2-19/32	5-3/16	4-3/16	1-13/32	4-3/16	1.20
CG-801-335C	3X1	7/8	1-31/32	7/8	2-3/4	3-1/8	2-3/4	5-15/32	4-3/16	1-23/32	4-3/16	1.28
CG-801-336C[1]	3X1-1/4	1-3/8	2-1/4	1-3/8	3-5/16	3-17/32	3-5/16	6-5/8	4-3/16	2-7/8	4-3/16	1.93
CG-801-337C	3X1-1/2	1-5/32	2-1/16	1-5/32	3-1/16	3-7/16	3-1/16	6-1/8	4-3/16	2-3/8	4-3/16	1.49
CG-801-338C	3X2	1-7/16	1-13/16	1-7/16	3-5/16	3-5/16	3-5/16	6-5/8	4-3/16	2-7/8	4-3/16	1.73
CG-801-339C	3X2-1/2	1- 3/4	1-15/16	1- 3/4	3- 5/8	3-11/16	3- 5/8	7- 1/4	4- 3/16	3-1/2	4- 3/16	2.11
CG-801-415C[1]	4X1/2	7/8	3-1/8	7/8	3-1/8	4-11/32	3-1/8	7-11/32	5- 1/4	1-3/4	5- 1/4	2.06
CG-801-416C	4X3/4	1-7/16	3-1/8	1-7/16	3-11/16	4-1/8	3-11/16	7-3/8	5-1/4	2-7/8	5-1/4	2.02
CG-801-417C	4X1	7/8	2-5/8	7/8	3-1/8	3-3/4	3-1/8	6-1/4	5-1/4	1-3/4	5- 1/4	1.99
CG-801-418C[1]	4X1-1/4	1-1/8	2-7/8	1-1/8	3-3/8	4-1/8	3-3/8	6-3/4	5-1/4	2-3/8	5-1/4	2.27
CG-801-419C	4X1-1/2	1-1/8	2-9/16	1-1/8	3-3/8	3-15/16	3-3/8	6-3/4	5-1/4	2-3/8	5-1/4	2.20
CG-801-420C	4X2	1- 7/16	2-7/16	1- 7/16	3-11/16	3-15/16	3-11/16	7- 3/8	5- 1/4	2- 7/8	5- 1/4	2.41
CG-801-421C[1]	4X2-1/2	2-1/8	2-29/32	2-1/8	4-3/8	5	4-3/8	8-3/4	5- 1/4	4-3/16	5-1/4	3.48
CG-801-422C	4X3	2- 1/8	2-13/16	2- 1/8	4- 3/8	4-19/32	4- 3/8	8-3/4	5- 1/4	4- 3/16	5- 1/4	3.07
CG-801-426C	4X6	5-1/32	3-25/32	5-1/32	7-9/32	6-25/32	7-9/32	14-9/16	7-9/16	7-9/16	7-9/16	18.00
CG-801-524C[1]	6X3/4	7/8	3-31/32	7/8	3-7/8	5	3-7/8	7-3/4	7-9/16	1-23/32	7- 9/16	4.47
CG-801-525C	6X1	7/8	3-23/32	7/8	3- 7/8	4-27/32	3- 7/8	7- 3/4	7- 9/16	1-23/32	7- 9/16	4.43
CG-801-526C[1]	6X1-1/4	1- 7/16	4- 3/16	1- 7/16	4- 7/16	5-15/32	4- 7/16	8- 7/8	7-9/16	2- 7/8	7-9/16	5.59
CG-801-527C[1]	6X1-1/2	1- 7/16	4- 3/32	1- 7/16	4- 7/16	5-15/32	4- 7/16	8- 7/8	7-9/16	2- 7/8	7-9/16	5.54
CG-801-528C	6X2	1- 7/16	3-3/4	1- 7/16	4- 7/16	5- 1/4	4- 7/16	8- 7/8	7-9/16	2- 7/8	7-9/16	5.39
CG-801-529C[1]	6X2-1/2	2-21/32	4-7/8	2-21/32	5-11/16	4-7/8	5-11/16	11-3/4	7- 9/16	5-1/4	7- 9/16	7.11
CG-801-530C	6X3	2- 1/16	3- 3/4	2- 1/16	5- 3/32	5- 5/8	5- 3/32	10- 3/16	7-9/16	4-3/16	7-9/16	6.70
CG-801-532C	6X4	2-11/16	3-13/16	2-11/16	5-11/16	6-1/16	5-11/16	11- 3/8	7-9/16	5- 1/4	7-9/16	7.54
CG-801-578C[1]	8X2	2-5/8	6	2-5/8	6-5/8	7-1/2	6-5/8	13-1/4	9-23/32	5-1/4	9-23/32	13.37
CG-801-580C[1]	8X3	2-5/8	5-31/32	2-5/8	6-5/8	7-17/32	6-5/8	13-1/4	9-23/32	5-1/4	9-23/32	13.12
CG-801-582C[1]	8X4	2-5/8	4-7/8	2-5/8	6-5/8	7-1/8	6-5/8	13-1/4	9-23/32	5-1/4	9-23/32	12.26
CG-801-585C	8X6	3- 7/8	4-15/16	3- 7/8	7-29/32	8	7-29/32	15-13/16	9-23/32	7-9/16	9-23/32	15.60
CG-801-621C	10X2	3-13/16	7-29/32	3-13/16	9-7/16	9-7/16	9-7/16	18-7/8	12-1/8	7-5/8	12-1/8	28.50
CG-801-623C[1]	10X3	3-25/32	7-1/2	3-25/32	9-3/8	9- 3/8	9-3/8	18-3/4	12- 1/16	7- 9/16	12-1/16	28.55
CG-801-624C[1]	10X4	3-25/32	7-1/8	3-25/32	9- 3/8	9-3/8	9- 3/8	18- 3/4	12- 1/16	7- 9/16	12- 1/16	28.40
CG-801-626C	10X6	3- 7/8	5-13/16	3- 7/8	9- 3/8	8-27/32	9- 3/8	18- 3/4	12- 1/16	7- 9/16	12- 1/16	25.50
CG-801-628C[1]	10X8	5-27/32	7-7/32	5-27/32	10-29/32	11-7/32	10-29/32	21-13/16	12- 1/8	12-1/8	12-1/8	48.73
CG-801-664C[1]	12X4	4-7/8	9-3/8	4-7/8	11-15/32	11-5/8	11-15/32	22-15/16	14- 1/4	9-3/4	14-1/4	49.53

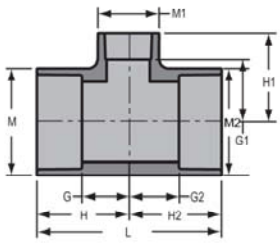
Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas

See Spears® Product Sourcebook for product offerings

Tee - Reducing - Marine

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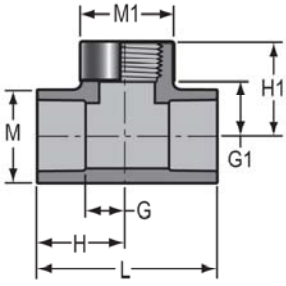
Socket x Socket x Socket



Part Number	Size	G	G1	G2	H	H1	H2	L	M	M1	M2	Approx. Wt. (Lbs.)
CG-801-666C[1]	12X6	4-7/8	8-1/2	4-7/8	11-15/32	11-1/2	11-15/32	22-15/16	14-9/32	9-23/32	14-9/32	49.36
CG-801-668C	12X8	4-7/8	7-1/8	4-7/8	11-15/32	11-15/32	11-15/32	22-15/16	14- 1/4	9-3/4	14- 1/4	44.00
CG-801-670C	12X10	6- 15/16	8-13/32	6- 15/16	12-15/16	13-13/32	12-15/16	25-7/8	14-3/16	14-3/16	14-3/16	69.75

Tee- Special Reinforced - Marine

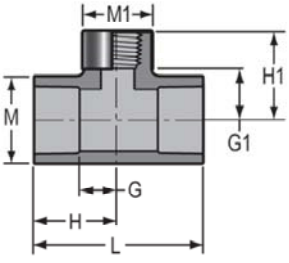
Socket x Socket x SR Fipt - Stainless Steel Collar



Part Number	Size	G	G1	H	H1	L	M	M1	Approx. Wt. (Lbs.)
CG-802-005CSR	1/2	5/8	5/8	1-15/32	1- 3/8	2-15/16	1- 7/32	1- 7/32	.15
CG-802-007CSR	3/4	19/32	11/16	1-19/32	1-13/32	3- 3/16	1-13/32	1-13/32	.15
CG-802-010CSR	1	21/32	11/16	1-13/16	1- 5/8	3- 5/8	1-23/32	1-23/32	.34
CG-802-012CSR	1-1/4	13/16	1- 1/16	2- 3/32	1-15/16	4- 3/16	2- 3/32	2- 1/16	.38
CG-802-015CSR	1-1/2	15/16	1- 7/32	2-11/32	2- 5/32	4-11/16	2-11/32	2- 7/16	.52
CG-802-020CSR	2	1- 5/16	1- 1/2	2-13/16	2-13/32	5-21/32	2- 7/8	3- 1/32	.83
CG-802-030CSR	3	1-27/32	2- 3/32	3-23/32	3-17/32	7- 7/16	4- 9/32	4- 9/32	2.43
CG-802-040CSR	4	2-11/32	2-21/32	4- 5/8	4- 5/32	9- 7/32	5- 1/4	5- 1/4	3.55

Tee - Special Reinforced Reducing - Marine

Socket x Socket x SR Fipt - Stainless Steel Collar

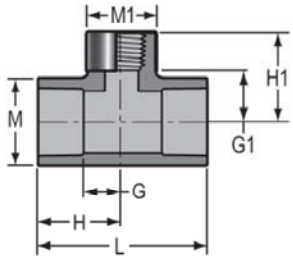


Part Number	Size	G	G1	H	H1	L	M	M1	Approx. Wt. (Lbs.)
CG-802-101CSR	3/4X1/2	19/32	25/32	1-19/32	1-7/16	3- 7/32	1-13/32	1- 3/16	.15
CG-802-130CSR	1X1/2	7/16	29/32	1- 9/16	1- 5/8	3- 1/8	1-23/32	1- 3/16	.20
CG-802-131CSR	1X3/4	21/32	7/8	1-13/16	1-19/32	3-19/32	1-23/32	1- 3/8	.22
CG-802-166CSR	1-1/4X1/2	7/16	1- 1/8	1-11/16	1-27/32	3-13/32	2- 3/32	1- 3/16	.26
CG-802-168CSR	1-1/4X1	27/32	1- 1/32	2- 3/32	1-29/32	4- 7/32	2- 3/32	1-11/16	.36
CG-802-211CSR	1-1/2X1	27/32	1- 7/32	2- 1/4	2- 1/8	4-15/32	2- 3/8	1-11/16	.43
CG-802-212CSR	1-1/2X1-1/4	1- 1/32	1- 5/32	2- 7/16	2- 3/32	4-27/32	2- 3/8	2- 1/16	.51

Tee - Special Reinforced Reducing - Marine

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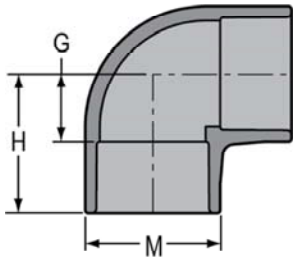
Socket x Socket x SR Fipt - Stainless Steel Collar



Part Number	Size	G	G1	H	H1	L	M	M1	Approx. Wt. (Lbs.)
CG-802-247CSR	2X1/2	1/2	1- 1/2	2	2- 1/4	4	2- 7/8	1- 3/16	.48
CG-802-248CSR	2X3/4	19/32	1-13/32	2- 1/8	2- 1/8	4- 1/4	2- 7/8	1- 3/8	.50
CG-802-287CSR	2-1/2X1/2	9/16	1- 3/4	2- 5/16	2- 1/2	4-19/32	3- 1/2	1- 7/32	.79

90° Ell - Marine

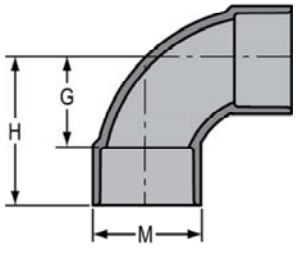
Socket x Socket



Part Number	Size	G	H	M	Approx. Wt. (Lbs.)
CG-806-005C	1/2	9/16	1-15/32	1- 3/16	.08
CG-806-007C	3/4	11/16	1-11/16	1-13/32	.12
CG-806-010C	1	7/8	2	1- 3/4	.20
CG-806-012C	1-1/4	1-1/32	2- 9/32	2-3/32	.31
CG-806-015C	1-1/2	1- 5/32	2- 9/16	2-11/32	.41
CG-806-020C	2	1-13/32	2-15/16	2- 7/8	.62
CG-806-025C	2-1/2	1-5/8	3-3/8	3-15/32	1.14
CG-806-030C	3	2-1/16	4	4- 3/16	1.70
CG-806-040C	4	2-19/32	4-27/32	5- 1/4	2.92
CG-806-060C	6	3-13/16	6-13/16	7-19/32	7.97
CG-806-080C	8	4-25/32	8-25/32	9- 3/4	15.11
CG-806-100C	10	5-25/32	10-13/16	12-1/16	27.41
CG-806-120C	12	7	13	14-1/4	45.01

90° Ell - Sweep - Marine

Socket x Socket



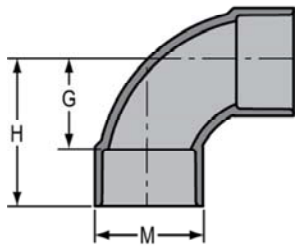
Part Number	Size	G	H	M	Approx. Wt. (Lbs.)
CG-806-005SC	1/2	27/32	1-23/32	1- 3/16	.07
CG-806-007SC	3/4	1- 1/32	2- 1/32	1-13/32	.12

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

90° Ell - Sweep - Marine

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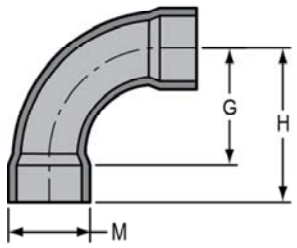
Socket x Socket



Part Number	Size	G	H	M	Approx. Wt. (Lbs.)
CG-806-010SC	1	1- 5/16	2- 7/16	1-23/32	.21
CG-806-012SC	1-1/4	1- 9/16	2-13/16	2- 3/32	.31
CG-806-015SC	1-1/2	1- 3/4	3- 1/8	2-3/8	.43
CG-806-020SC	2	2- 5/16	3-13/16	2- 7/8	.67

90° Ell - Long Sweep - Marine

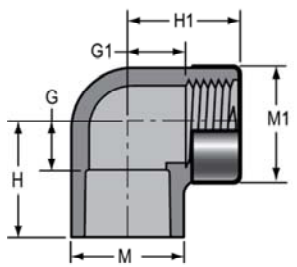
Socket x Socket



Part Number	Size	G	H	M	Approx. Wt. (Lbs.)
CG-806-005LSCF	1/2	1- 7/8	2- 3/4	1- 1/8	.15
CG-806-007LSCF	3/4	2- 7/16	3- 7/16	1- 7/16	.26
CG-806-010LSCF	1	2- 7/8	4	1-11/16	.40
CG-806-012LSCF	1 1/4	3- 5/8	4- 7/8	2- 1/16	.56
CG-806-015LSCF	1 1/2	4- 1/8	5- 1/2	2- 5/16	.65
CG-806-020LSCF	2	4- 3/4	6-1/4	2-13/16	1.18
CG-806-025LSCF	2-1/2	5-3/4	7-3/4	3-7/16	1.70
CG-806-030LSCF	3	7	9	4- 1/8	2.46
CG-806-040LSCF	4	9	11- 1/4	5- 3/16	4.85
CG-806-060LSCF	6	13	16- 1/4	7- 1/2	11.76
CG-806-080LSCF	8	23-1/2	27-3/4	9-5/8	31.25
CG-806-100LSCF	10	27	32-1/4	11-15/16	54.83

90° Ell - Special Reinforced - Marine

Socket x SR Fipt - Stainless Steel Collar

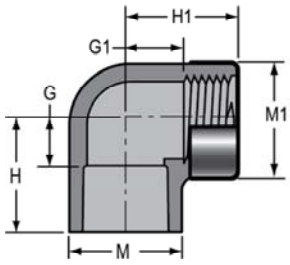


Part Number	Size	G	G1	H	H1	M	M1	Approx. Wt. (Lbs.)
CG-807-005CSR	1/2	15/32	23/32	1-11/32	1- 9/32	1- 3/16	1- 7/32	.09
CG-807-007CSR	3/4	9/16	21/32	1- 9/16	1-13/32	1- 3/8	1- 3/8	.11

90° Ell - Special Reinforced - Marine

(Continued)

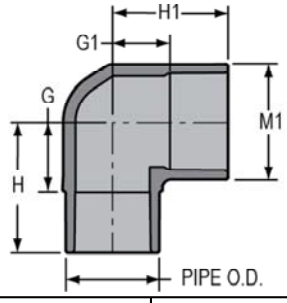
Socket x SR Fipt - Stainless Steel Collar



Part Number	Size	G	G1	H	H1	M	M1	Approx. Wt. (Lbs.)
CG-807-010CSR	1	19/32	13/16	1-23/32	1-23/32	1-11/16	1-23/32	.21
CG-807-012CSR	1-1/4	23/32	1- 1/32	1-31/32	1-31/32	2- 1/16	2- 1/16	.31
CG-807-015CSR	1-1/2	31/32	1- 5/32	2- 3/8	2- 1/8	2-11/32	2- 7/16	.42
CG-807-020CSR	2	1-13/32	1- 1/2	2-15/16	2-17/32	3	3-1/32	.87
CG-807-030CSR	3	1-13/16	2- 7/32	3-23/32	3- 9/16	4- 9/32	4- 9/32	1.98
CG-807-040CSR	4	2- 9/32	2-25/32	4- 9/16	4- 7/32	5- 1/4	5- 1/4	3.03

90° Street Ell - Marine

Spigot x Socket

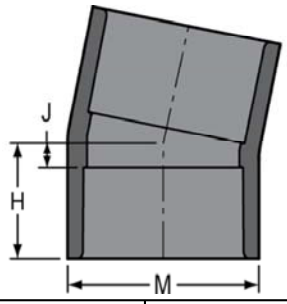


Part Number	Size	G	G1	H	H1	M1	Approx. Wt. (Lbs.)
CG-809-005C	1/2	13/16	7/16	1-21/32	1- 7/16	1- 5/32	.07
CG-809-007C	3/4	29/32	11/16	1-27/32	1-11/16	1- 3/8	.11
CG-809-010C	1	1-3/32	27/32	2- 7/32	2	1-23/32	.20
CG-809-012C	1-1/4	1-5/16	1-1/32	2-9/16	2-9/32	2- 3/32	.31
CG-809-015C	1-1/2	1- 7/16	1- 3/16	2-13/16	2- 9/16	2- 3/8	.42
CG-809-020C	2	1-23/32	1- 7/16	3-7/32	2-15/16	2- 7/8	.64
CG-809-025C	2-1/2	4-7/32	1- 5/8	6-7/32	3- 3/8	3-15/32	1.54
CG-809-030C	3	2- 3/8	1-13/16	4- 1/4	3-11/16	4- 3/16	1.70
CG-809-040C	4	3-1/32	2-9/16	5-9/32	4-9/16	5- 1/4	2.94
CG-809-060C	6	5-13/16	3-13/16	8-13/16	6-13/16	7- 9/16	9.27
CG-809-080C	8	7-13/16	4-13/16	11-13/16	8-13/16	9- 3/4	17.33
CG-809-100C	10	8-7/8	5-7/8	13-7/8	10-7/8	12- 1/16	34.95
CG-809-120C	12	11	7	17	13	4-5/16	57.29

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings
Spears® Manufacturing Company

11-1/4° Ell - Marine

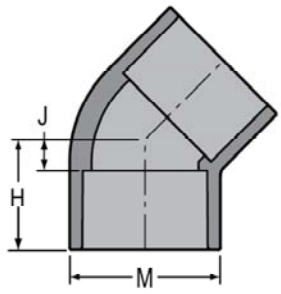
Socket x Socket



Part Number	Size	H	J	M	Approx. Wt. (Lbs.)
CG-811-005CF	1/2	1-5/16	5/16	1-1/8	.06
CG-811-007CF	3/4	1-5/16	5/16	1-3/8	.08
CG-811-010CF	1	1-9/16	5/16	1-11/16	.14
CG-811-012CF	1-1/4	2	1/2	2-1/16	.25
CG-811-015C	1-1/2	1-19/32	7/32	2- 3/8	.25
CG-811-020C	2	1-23/32	7/32	2-27/32	.35
CG-811-025CF	2-1/2	2-11/16	11/16	3- 7/16	.88
CG-811-030C	3	2- 3/16	5/16	4- 1/8	.91
CG-811-040C	4	2-21/32	13/32	5- 1/4	1.58
CG-811-060CF	6	4- 1/4	1	7- 1/2	4.68
CG-811-080CF	8	5- 3/8	1- 1/8	9- 5/8	8.72
CG-811-100CF	10	6-11/16	1- 7/16	11-15/16	15.81
CG-811-120CF	12	7-13/16	1- 9/16	14- 1/8	29.05

45° Ell - Marine

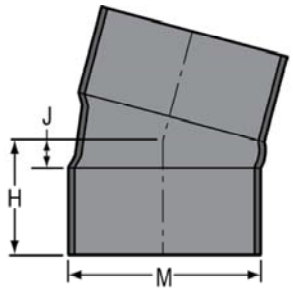
Socket x Socket



Part Number	Size	H	J	M	Approx. Wt. (Lbs.)
CG-817-005C	1/2	1- 1/8	1/4	1- 3/16	.06
CG-817-007C	3/4	1- 5/16	5/16	1- 7/16	.09
CG-817-010C	1	1- 7/16	5/16	1-23/32	.16
CG-817-012C	1-1/4	1- 5/8	3/8	2- 1/8	.22
CG-817-015C	1-1/2	1-13/16	7/16	2- 3/8	.31
CG-817-020C	2	2- 1/8	5/8	2- 7/8	.47
CG-817-025C	2-1/2	2-7/16	11/16	3- 1/2	.88
CG-817-030C	3	2-29/32	29/32	4- 5/32	1.21
CG-817-040C	4	3- 5/16	1- 1/16	5- 1/4	2.14
CG-817-060C	6	4- 3/4	1- 3/4	7-19/32	5.58
CG-817-080C	8	6	2	9- 3/4	10.54
CG-817-100C	10	7-5/8	2-19/32	12-1/8	20.08
CG-817-120C	12	9-1/16	3-3/16	15-3/8	32.86

15° Ell - Marine

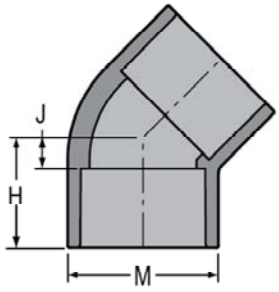
Socket x Socket



Part Number	Size	H	J	M	Approx. Wt. (Lbs.)
CG-818-005CF	1/2	1-5/16	5/16	1-1/8	.13
CG-818-007CF	3/4	1-5/16	5/16	1-3/8	.08
CG-818-010CF	1	1-5/8	3/8	1-11/16	.15
CG-818-012CF	1-1/4	2	1/2	2-1/16	.25
CG-818-015CF	1-1/2	2	1/2	2-5/16	.26
CG-818-020CF	2	2- 5/16	9/16	2-13/16	.48
CG-818-025CF	2-1/2	2- 3/4	3/4	3- 7/16	.88
CG-818-030CF	3	3	3/4	4- 1/8	1.25
CG-818-040CF	4	3- 1/8	7/8	5- 3/16	1.79
CG-818-060CF	6	4- 3/8	1- 1/8	7- 1/2	4.77
CG-818-080CF	8	4- 1/2	1- 1/4	9- 5/8	8.81
CG-818-100CF	10	6-15/16	1-11/16	11-15/16	17.29
CG-818-120CF	12	8- 1/16	1-13/16	14- 1/8	27.73

45° Street Ell - Marine

Spigot x Socket

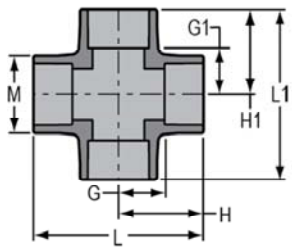


Part Number	Size	H	H1	J	J1	M1	Approx. Wt. (Lbs.)
CG-827-005C	1/2	1- 9/32	1- 5/16	11/32	7/16	1- 3/16	.06
CG-827-007C	3/4	1- 1/2	1- 1/2	7/16	1/2	1-13/32	.09
CG-827-010C	1	1-25/32	1- 1/2	19/32	3/8	1- 3/4	.15
CG-827-012C	1-1/4	2	1-23/32	5/8	15/32	2- 3/32	.24
CG-827-015C	1-1/2	2- 1/32	2- 1/8	19/32	25/32	2-11/32	.31
CG-827-020C	2	2- 5/16	2-11/32	11/16	3/8	2-27/32	.46
CG-827-025C	2-1/2	3-11/16	2- 9/16	1-11/16	13/16	3- 1/2	1.28
CG-827-030C	3	3- 1/4	2-13/16	1- 3/16	29/32	4- 5/32	1.25
CG-827-040C	4	3-13/16	3-13/16	1- 9/32	1- 9/16	5- 1/4	2.19
CG-827-060C	6	5- 3/32	4-25/32	2- 1/16	2- 1/16	7-19/32	5.91
CG-827-080C	8	6- 5/8	5-31/32	2-19/32	1- 3/4	9- 3/4	11.14
CG-827-100C	10	10-21/32	8- 3/16	2-19/32	5- 5/16	12- 3/16	25.44
CG-827-120C	12	13- 1/4	9-11/16	6- 3/8	3- 3/32	14-13/32	45.35

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings
Spears® Manufacturing Company

Cross - Marine

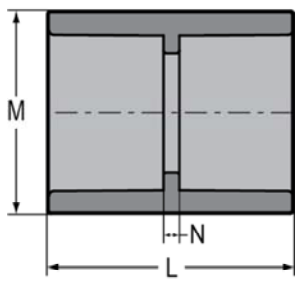
Socket x Socket x Socket x Socket



Part Number	Size	G	G1	H	H1	L	L1	M	M1	Approx. Wt. (Lbs.)
CG-820-005C	1/2	19/32	19/32	1-15/32	1-15/32	2-15/16	2-15/16	1- 3/16	1- 3/16	.14
CG-820-007C	3/4	5/8	5/8	1- 5/8	1- 5/8	3- 9/32	3- 9/32	1-13/32	1-13/32	.21
CG-820-010C	1	31/32	31/32	2- 3/32	2- 3/32	4-3/16	4-3/16	1-23/32	1-23/32	.39
CG-820-012C	1-1/4	1- 3/32	1- 3/32	2- 3/8	2- 3/8	4- 3/4	4- 3/4	2- 1/8	2- 1/8	.65
CG-820-015C	1-1/2	1- 1/4	1- 1/4	2- 5/8	2- 5/8	5- 1/4	5- 1/4	2- 3/8	2- 3/8	.86
CG-820-020C	2	1- 1/2	1- 1/2	3	3	6	6	3	3	1.40
CG-820-025C	2-1/2	1-11/16	1-11/16	3-7/16	3-7/16	6-7/8	6-7/8	3-17/32	3-17/32	2.11
CG-820-030C	3	2- 3/32	2- 3/32	3-31/32	3-31/32	7-15/16	7-15/16	4-11/32	4-11/32	3.39
CG-820-040C	4	2- 5/8	2- 5/8	4- 7/8	4- 7/8	9- 3/4	9- 3/4	5-1/4	5-1/4	5.50
CG-820-060CF	6	6- 1/4	6- 1/4	9- 1/2	9- 1/2	19	19	7- 1/2	7- 1/2	16.93
CG-820-080CF	8	7- 5/8	7- 5/8	11- 7/8	11- 7/8	23- 3/4	23- 3/4	9- 5/8	9- 5/8	30.81
CG-820-100CF	10	9	9	14- 1/4	14- 1/4	28- 1/2	28- 1/2	11-15/16	11-15/16	54.55
CG-820-120CF	12	11- 1/4	11- 1/4	17- 1/2	17- 1/2	35	35	14- 1/8	14- 1/8	96.33

Coupling - Marine

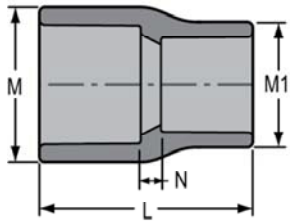
Socket x Socket



Part Number	Size	L	M	N	Approx. Wt. (Lbs.)
CG-829-005C	1/2	1- 7/8	1- 3/16	1/8	.07
CG-829-007C	3/4	2- 1/8	1-13/32	1/8	.10
CG-829-010C	1	2-15/32	1-23/32	3/16	.12
CG-829-012C	1-1/4	2-11/16	2- 7/32	3/16	.25
CG-829-015C	1-1/2	2- 7/8	2-11/32	3/32	.22
CG-829-020C	2	3- 1/8	2-27/32	3/32	.32
CG-829-025C	2-1/2	3-11/16	3-15/32	1/4	.58
CG-829-030C	3	3-31/32	4- 5/32	3/16	.81
CG-829-040C	4	4- 3/4	5- 5/16	1/4	1.36
CG-829-060C	6	6- 3/8	7- 9/16	1/4	3.87
CG-829-080C	8	8- 1/4	9-23/32	3/8	6.77
CG-829-100C	10	10- 9/32	12- 1/16	1/4	12.31
CG-829-120C	12	12- 3/8	14- 7/32	3/8	20.05

Coupling - Reducing - Marine

Socket x Socket

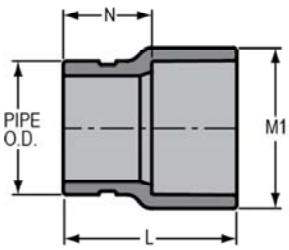


Part Number	Size	L	M	M1	N	Approx. Wt. (Lbs.)
CG-829-101C	3/4X1/2	2- 3/32	1-13/32	1- 5/32	7/32	.06
CG-829-130C	1X1/2	2- 3/16	1-23/32	1-13/32	7/32	.12
CG-829-131C	1X3/4	2-13/32	1-23/32	1-13/32	1/4	.15
CG-829-166C	1-1/4X1/2	2- 9/16	2- 3/32	1- 5/32	7/16	.14
CG-829-167C	1-1/4X3/4	2-19/32	2- 3/32	1- 5/8	11/32	.17
CG-829-168C	1-1/4X1	2-11/16	2- 1/8	1- 3/4	5/16	.18
CG-829-209C	1-1/2X1/2	2-27/32	2-11/32	1- 3/16	19/32	.20
CG-829-210C	1-1/2X3/4	2- 7/8	2- 3/8	1-13/32	17/32	.22
CG-829-211C	1-1/2X1	2- 7/8	2-11/32	1-15/16	3/8	.26
CG-829-212C	1-1/2X1-1/4	2-13/16	2-13/32	2- 1/8	5/32	.22
CG-829-247C	2X1/2	3- 3/32	2- 7/8	1- 5/32	11/16	.31
CG-829-248C	2X3/4	3- 7/32	2- 7/8	1-13/32	23/32	.32
CG-829-249C	2X1	3-1/2	3	1-23/32	27/32	.37
CG-829-251C	2X1-1/2	3- 7/32	2-27/32	2-11/32	1/4	.31
CG-829-290C	2-1/2X1-1/4	3-29/32	3-1/2	2-3/8	15/16	.57
CG-829-291C	2-1/2X1-1/2	3- 3/4	3- 1/2	2- 3/8	19/32	.50
CG-829-292C	2-1/2X2	3-21/32	3-15/32	2-27/32	13/32	.51
CG-829-335C	3X1	4- 7/16	4- 1/8	2- 7/8	1- 7/16	1.02
CG-829-336C	3X1-1/4	4- 7/32	4- 5/32	2-29/32	1- 1/16	.98
CG-829-337C	3X1-1/2	3- 1/2	4- 3/16	2-3/8	7/32	.70
CG-829-338C	3X2	4	4- 5/32	2-7/8	19/32	.77
CG-829-339C	3X2-1/2	4-1/8	4- 5/32	3- 15/32	1/2	.79
CG-829-416C	4X3/4	5-23/32	5- 9/32	2-29/32	2-13/32	1.79
CG-829-417C	4X1	5-15/16	5- 9/32	2-29/32	2-17/32	1.77
CG-829-419C	4X1-1/2	5-23/32	5- 9/32	2-29/32	2- 1/16	1.67
CG-829-420C	4X2	5- 1/2	5- 9/32	2- 7/8	1-25/32	1.52
CG-829-421C	4X2-1/2	4- 9/16	5- 3/16	3- 1/2	17/32	1.27
CG-829-422C	4X3	4-19/32	5- 1/4	4- 3/16	15/32	1.32
CG-829-528C	6X2	7- 1/16	7- 1/2	5	2- 9/16	4.55
CG-829-529C	6X2-1/2	6-31/32	7-19/32	5- 9/32	2- 3/16	4.71
CG-829-530C	6X3	7- 1/8	7- 9/16	5- 9/32	2- 1/4	4.30
CG-829-532C	6X4	6- 5/8	7- 5/8	5- 5/16	1- 7/16	3.44
CG-829-580CF	8X3	15-1/4	9- 1/2	5- 3/16	9	8.74
CG-829-582C	8X4	8-29/32	9-23/32	5- 1/4	2-15/32	6.43
CG-829-585C	8X6	8	9- 3/4	7- 1/2	1	6.48
CG-829-621CF	10X2	21- 1/2	11- 3/4	5- 3/16	14-15/16	17.04
CG-829-623CF	10X3	21-3/4	11- 3/4	5- 3/16	14-1/2	17.18
CG-829-624CF	10X4	21- 1/8	11- 3/4	5- 3/16	13- 5/8	16.03
CG-829-626C	10X6	10-19/32	12- 1/32	7-19/32	2-17/32	11.46
CG-829-628C	10X8	10- 5/8	12	9- 3/4	1-17/32	11.62
CG-829-664CF	12X4	28- 3/8	13-15/16	5- 3/16	19- 7/8	29.44
CG-829-666CF	12X6	24- 7/8	13-15/16	7- 1/2	15- 3/8	29.92
CG-829-668C	12X8	12- 5/8	14- 7/32	9- 3/4	2- 7/16	18.35
CG-829-670CF	12X10	16- 3/8	13-15/16	11-15/16	4- 7/8	20.77

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings
Spears® Manufacturing Company

Grooved Coupling Adapter - Marine

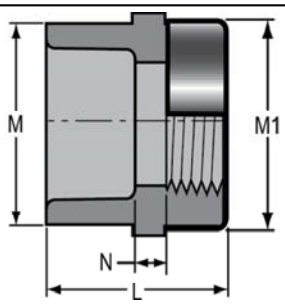
Groove x Socket



Part Number	Size	L	M1	N	Approx. Wt. (Lbs.)
CG-833-012C	1-1/4	2-13/16	2- 1/16	1- 9/16	.16
CG-833-015C	1-1/2	2-29/32	2-11/32	1- 1/2	.19
CG-833-020C	2	3- 1/16	2- 7/8	1- 9/16	.29
CG-833-025C	2-1/2	3- 3/8	3- 1/2	1- 5/8	.52
CG-833-030C	3	3- 9/16	4- 3/16	1-11/16	.72
CG-833-040C	4	4-17/32	5- 1/4	2- 9/32	1.37
CG-833-060C	6	5- 5/16	7- 9/16	2- 5/16	2.99
CG-833-080CF	8	8- 3/16	9- 5/8	3-15/16	6.59
CG-833-100CF	10	9- 7/8	11-15/16	4- 5/8	10.90
CG-833-120CF	12	10- 7/8	14- 1/8	4- 5/8	17.84

Female Adapter - Special Reinforced - Marine

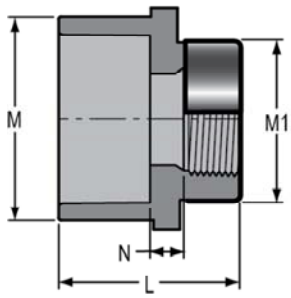
Socket x SR Fipt - Stainless Steel Collar



Part Number	Size	L	M	M1	N	Approx. Wt. (Lbs.)
CG-835-005CSR	1/2	1-23/32	1- 5/32	1- 3/16	3/32	.06
CG-835-007CSR	3/4	1- 7/8	1-13/32	1- 3/8	3/32	.08
CG-835-010CSR	1	2- 1/8	1-23/32	1-11/16	3/32	.12
CG-835-012CSR	1-1/4	2- 5/16	2- 3/32	2- 1/16	3/32	.24
CG-835-015CSR	1-1/2	2- 7/16	2-13/32	2- 7/16	7/32	.28
CG-835-020CSR	2	2-23/32	3	3- 1/32	1/4	.45
CG-835-025CSR	2 1/2	3- 1/4	3- 9/16	3- 9/16	11/32	.72
CG-835-030CSR	3	3- 1/2	4- 1/4	4- 9/32	7/32	1.01
CG-835-040CSR	4	3-31/32	5- 7/32	5- 1/4	7/32	1.35
CG-835-060CSR	6	4-31/32	7- 5/8	7-21/32	1/4	3.16

Female Adapter - Special Reinforced Reducing - Marine

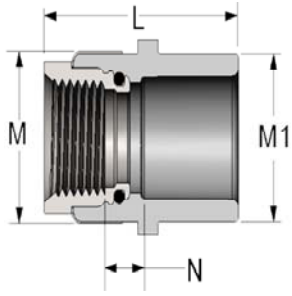
Socket x SR Fipt - Stainless Steel Collar



Part Number	Size	L	M	M1	N	Approx. Wt. (Lbs.)
CG-835-074CSR	1/2X3/4	1- 3/4	1- 3/16	1- 3/8	7/32	.07
CG-835-101CSR	3/4X1/2	1- 7/8	1- 3/8	1- 3/16	3/16	.07
CG-835-102CSR	3/4X1	2- 1/16	1- 7/16	1-11/16	7/32	.12
CG-835-130CSR	1X1/2	2	1-11/16	1- 3/16	7/32	.10
CG-835-131CSR	1X3/4	2- 3/32	1- 3/4	1- 3/8	1/4	.12

Female Adapter - Stainless Steel Transition - Marine

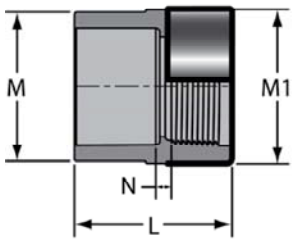
Socket x Fipt With Type 316 Stainless Steel Thread Insert



Part Number	Size	L	M	M1	N	Approx. Wt. (Lbs.)
CG-835-005CSS	1/2	1-3/4	1-7/32	1-7/32	1/4	.10
CG-835-007CSS	3/4	2	1-3/8	1-13/32	1/4	.14
CG-835-010CSS	1	2-1/4	1-11/16	1-11/16	1/4	.24
CG-835-012CSS	1-1/4	2-3/8	2-1/16	2-3/32	1/4	.28
CG-835-015CSS	1-1/2	2-1/2	2-1/2	2-1/2	3/8	.64
CG-835-020CSS	2	2-7/16	3	2-7/8	7/16	.84

Female Adapter - Encapsulated Special Reinforced - Marine

Socket x ESR Fipt

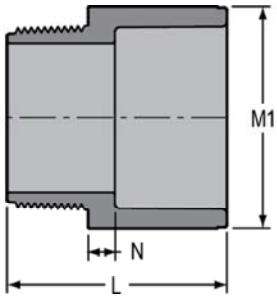


Part Number	Size	L	M	M1	N	Approx. Wt. (Lbs.)
CG-835-005CESR	1/2	1- 7/8	1- 3/16	1- 9/32	9/32	.07
CG-835-007CESR	3/4	2	1-13/32	1-15/32	1/8	.09
CG-835-010CESR	1	2- 1/4	1- 3/4	1-13/16	1/8	.14
CG-835-012CESR	1-1/4	2- 7/16	2- 1/8	2- 5/32	3/16	.26
CG-835-015CESR	1-1/2	2- 9/16	2-13/32	2- 1/2	1/4	.31
CG-835-020CESR	2	2-27/32	3	3- 3/32	13/32	.48

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

Male Adapter - Marine

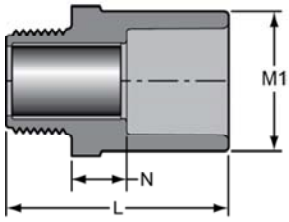
Mipt x Socket



Part Number	Size	L	M1	N	Approx. Wt. (Lbs.)
CG-836-005C	1/2	1-23/32	1- 5/32	3/16	.04
CG-836-007C	3/4	1-7/8	1-9/16	7/32	.06
CG-836-102C	3/4X1	2- 9/32	1- 3/4	17/32	.10
CG-836-131C	1X3/4	2- 1/16	1-13/32	1/4	.12
CG-836-010C	1	2- 5/32	1-23/32	7/32	.10
CG-836-012C	1-1/4	2- 1/4	2- 1/8	9/32	.15
CG-836-015C	1-1/2	2-9/16	2- 13/32	9/32	.19
CG-836-020C	2	2- 7/8	2- 7/8	5/16	.30
CG-836-025C	2-1/2	3-21/32	3-17/32	11/32	.53
CG-836-030C	3	3- 7/8	4- 1/4	3/8	.77
CG-836-040C	4	4-13/32	5- 5/16	13/32	1.18
CG-836-060C	6	5- 1/2	7- 9/16	19/32	3.03
CG-836-080CF	8	8- 3/16	9- 5/8	2- 3/16	6.67
CG-836-100CF	10	10- 3/8	11-15/16	3- 3/16	11.27
CG-836-120CF	12	11- 1/8	14- 1/8	2- 3/4	22.93

Male Adapter - Internal Reinforced - Marine

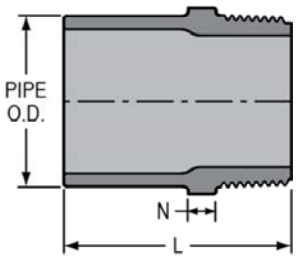
R Mipt x Socket - Stainless Steel Sleeve



Part Number	Size	L	M1	N	Approx. Wt. (Lbs.)
CG-836-005CR	1/2	2- 3/32	1- 5/32	9/16	.05
CG-836-007CR	3/4	2- 1/4	1- 3/8	9/16	.08
CG-836-010CR	1	2-21/32	1-23/32	11/16	.15

Male Spigot Adapter - Marine

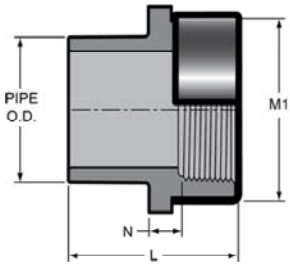
Spigot x Mipt



Part Number	Size	L	N	Approx. Wt. (Lbs.)
CG-861-005C	1/2	1-13/16	5/16	.03
CG-861-007C	3/4	1-31/32	5/16	.04
CG-861-010C	1	2- 3/32	1/4	.07
CG-861-131C	1X3/4	2	1/4	.07
CG-861-012C	1-1/4	2- 9/32	1/8	.12
CG-861-015C	1-1/2	2- 5/8	11/32	.14
CG-861-020C	2	2-13/16	13/32	.24

Female Spigot Adapter - Special Reinforced - Marine

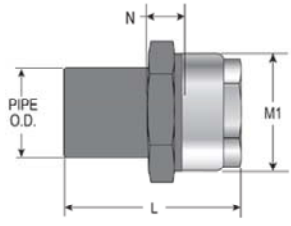
Spigot x SR Fipt - Stainless Steel Collar



Part Number	Size	L	M1	N	Approx. Wt. (Lbs.)
CG-878-005CSR	1/2	1- 3/4	1- 3/16	5/32	.05
CG-878-007CSR	3/4	1-15/16	1- 3/8	3/16	.07
CG-878-010CSR	1	2- 1/4	1-11/16	7/32	.12
CG-878-012CSR	1-1/4	2-15/32	2- 1/16	1/4	.18
CG-878-015CSR	1-1/2	2-21/32	2- 7/16	13/32	.26
CG-878-020CSR	2	2-13/16	3	3/8	.40
CG-878-030CSR	3	3-27/32	4- 9/32	5/16	.96
CG-878-040CSR	4	4- 3/8	5- 1/4	5/8	1.42

Female Spigot Adapter - Stainless Steel Transition - Marine

Spigot x Fipt With Type 316 Stainless Steel Thread Insert



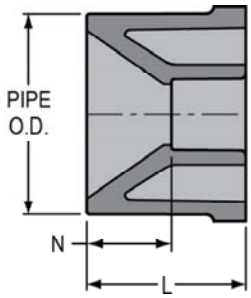
Part Number	Size	L	M1	N	Approx. Wt. (Lbs.)
CG-878-005CSS	1/2	1-15/16	1-3/16	15/32	.09
CG-878-007CSS	3/4	2-5/32	1-3/8	17/32	.14
CG-878-010CSS	1	2-9/32	1-23/32	13/32	.36

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas

See Spears® Product Sourcebook for product offerings

Reducer Bushing Flush Style - Marine

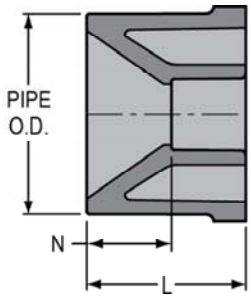
Spigot x Socket



Part Number	Size	L	N	Approx. Wt. (Lbs.)
CG-837-101C	3/4X1/2	1- 7/32	11/32	.02
CG-837-130C	1X1/2	1-3/8	1/2	.06
CG-837-131C	1X3/4	1-11/32	5/16	.03
CG-837-166C	1-1/4X1/2	1- 1/2	5/8	.12
CG-837-167C	1-1/4X3/4	1- 1/2	1/2	.09
CG-837-168C	1-1/4X1	1-19/32	15/32	.06
CG-837-209C	1-1/2X1/2	1-23/32	13/16	.15
CG-837-210C	1-1/2X3/4	1- 5/8	5/8	.16
CG-837-211C	1-1/2X1	1- 9/16	13/32	.12
CG-837-212C	1-1/2X1-1/4	1- 9/16	9/32	.06
CG-837-247C	2X1/2	1-29/32	1	.29
CG-837-248C	2X3/4	1-29/32	21/32	.27
CG-837-249C	2X1	1-25/32	5/8	.24
CG-837-250C	2X1-1/4	1-11/16	7/16	.20
CG-837-251C	2X1-1/2	1- 3/4	11/32	.15
CG-837-289C	2-1/2X1	2- 1/32	29/32	.43
CG-837-290C	2-1/2X1-1/4	2- 5/32	13/32	.40
CG-837-291C	2-1/2X1-1/2	2- 5/32	3/4	.40
CG-837-292C	2-1/2X2	2-1/4	3/4	.29
CG-837-333C	3X1/2	2-3/16	1-5/16	.64
CG-837-334C[1]	3X3/4	2- 9/16	1-17/32	.70
CG-837-335C	3X1	2- 9/32	1- 1/8	.66
CG-837-336C	3X1-1/4	2- 1/4	1	.70
CG-837-337C	3X1-1/2	2- 9/32	7/8	.66
CG-837-338C	3X2	2-7/32	9/16	.63
CG-837-339C	3X2-1/2	2-7/32	7/16	.43
CG-837-416C[1]	4X3/4	2-27/32	1-27/32	1.37
CG-837-418C[1]	4X1-1/4	2-27/32	1-19/32	1.14
CG-837-419C	4X1-1/2	2-19/32	1-3/16	1.07
CG-837-420C	4X2	2-21/32	1- 5/32	1.10
CG-837-421C	4X2-1/2	2-17/32	25/32	1.07
CG-837-422C	4X3	2- 9/16	11/16	.85
CG-837-525C[1]	6X1	3-31/32	2-13/16	3.25
CG-837-527C[1]	6X1-1/2	3-3/4	2-11/32	3.15
CG-837-528C	6X2	3-17/32	2- 1/32	3.00
CG-837-530C	6X3	3-17/32	2- 1/8	3.05
CG-837-532C	6X4	3- 9/16	1- 1/4	2.90
CG-837-578C[1]	8X2	4-15/16	3- 3/8	6.63
CG-837-580C	8X3	5- 1/8	3- 1/4	6.39
CG-837-582C	8X4	4- 1/2	2- 1/4	5.53
CG-837-585C	8X6	4- 3/8	1- 3/8	5.36
CG-837-621C[1]	10X2	5-13/16	4-7/16	13.40
CG-837-624C[1]	10X4	6	3- 3/4	13.30

Reducer Bushing Flush Style - Marine

Spigot x Socket

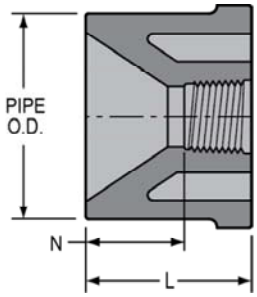


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Part Number	Size	L	N	Approx. Wt. (Lbs.)
CG-837-626C	10X6	5- 5/16	2-5/16	10.39
CG-837-628C	10X8	5-11/32	1-5/16	10.55
CG-837-664C[1]	12X4	6-13/16	4-9/16	24.01
CG-837-668C	12X8	6- 7/8	2- 7/16	18.48
CG-837-670CF	12X10	6	1	12.31

Reducer Bushing Flush Style - Marine

Spigot x Fipt



Part Number	Size	L	N	Approx. Wt. (Lbs.)
CG-838-101C	3/4X1/2	1-7/32	15/32	.02
CG-838-130C	1X1/2	1-11/32	21/32	.06
CG-838-131C	1X3/4	1- 3/8	21/32	.05
CG-838-166C	1-1/4X1/2	1-17/32	3/4	.11
CG-838-167C	1-1/4X3/4	1- 7/16	23/32	.09
CG-838-168C	1-1/4X1	1-17/32	5/8	.09
CG-838-207C	1-1/2X1/4	1- 9/16	1- 3/16	.14
CG-838-209C	1-1/2X1/2	1-11/16	31/32	.16
CG-838-210C	1-1/2X3/4	1- 9/16	27/32	.14
CG-838-211C	1-1/2X1	1-23/32	13/16	.15
CG-838-212C	1-1/2X1-1/4	1- 1/2	9/16	.10
CG-838-247C	2X1/2	1-29/32	1- 5/32	.27
CG-838-248C	2X3/4	1- 7/8	1- 5/32	.29
CG-838-249C	2X1	1-29/32	1	.26
CG-838-250C	2X1-1/4	1-19/32	21/32	.25
CG-838-251C	2X1-1/2	1- 9/16	5/8	.20
CG-838-287C	2-1/2X1/2	2- 3/8	1-21/32	.45
CG-838-288C	2-1/2X3/4	2- 7/16	1- 5/8	.48
CG-838-289C	2-1/2X1	2- 5/32	1- 1/4	.41
CG-838-290C	2-1/2X1-1/4	2-13/32	1- 3/8	.45
CG-838-291C	2-1/2X1-1/2	2- 3/8	1-13/32	.51
CG-838-292C	2-1/2X2	2- 1/16	1- 1/16	.26
CG-838-334C	3X3/4	2- 9/32	1- 1/2	.62
CG-838-335C	3X1	2- 9/32	1-11/32	.61
CG-838-336C	3X1-1/4	2- 1/4	1- 3/8	.61
CG-838-337C	3X1-1/2	2- 1/4	1- 5/8	.59

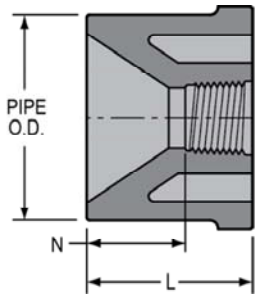
Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas

See Spears® Product Sourcebook for product offerings

Reducer Bushing Flush Style - Marine

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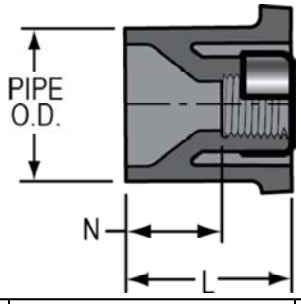
Spigot x Fipt



Part Number	Size	L	N	Approx. Wt. (Lbs.)
CG-838-338C	3X2	2- 3/16	1- 7/32	.57
CG-838-339C	3X2-1/2	2- 3/8	3/4	.50
CG-838-420C	4X2	2-11/16	1-21/32	1.19
CG-838-421C	4X2-1/2	2-21/32	1- 1/16	1.10
CG-838-422C	4X3	2- 5/8	1	.84
CG-838-528C	6X2	3-1/4	2-9/32	2.77
CG-838-530C	6X3	3-17/32	2- 1/8	3.14
CG-838-532C	6X4	3-17/32	2- 1/32	2.79

Reducer Bushing - Special Reinforced - Marine

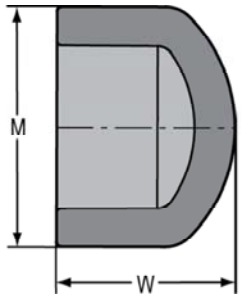
Spigot x SR Fipt - Stainless Steel Collar



Part Number	Size	L	N	Approx. Wt. (Lbs.)
CG-838-209CSR	1-1/2X1/2	1-23/32	31/32	.17
CG-838-210CSR	1-1/2X3/4	1- 9/16	13/16	.16
CG-838-247CSR	2X1/2	1-29/32	1- 5/32	.28
CG-838-248CSR	2X3/4	1-29/32	1- 5/32	.29
CG-838-249CSR	2X1	1- 7/8	31/32	.28
CG-838-334CSR	3X3/4	2- 9/32	1-17/32	.62
CG-838-335CSR	3X1	2- 9/32	1-11/32	.63
CG-838-336CSR	3X1-1/4	2- 1/4	1- 5/16	.63
CG-838-337CSR	3X1-1/2	2- 1/4	1- 3/8	.64
CG-838-528CSR	6X2	3- 1/2	2- 9/16	2.73
CG-838-530CSR	6X3	3-17/32	2- 1/8	3.07
CG-838-532CSR	6X4	3-27/32	2	2.75

Cap - Marine

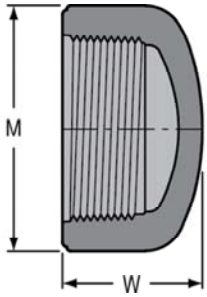
Socket



Part Number	Size	M	W	Approx. Wt. (Lbs.)
CG-847-005C	1/2	1- 3/16	1- 7/32	.03
CG-847-007C	3/4	1- 3/8	1-13/32	.04
CG-847-010C	1	1-23/32	1- 5/8	.08
CG-847-012C	1-1/4	2- 3/32	1-27/32	.12
CG-847-015C	1-1/2	2-11/32	2	.17
CG-847-020C	2	2-27/32	2- 9/32	.26
CG-847-025C	2-1/2	3-17/32	2- 5/8	.46
CG-847-030C	3	4- 5/32	3- 1/32	.73
CG-847-040C	4	5- 1/4	3-19/32	1.36
CG-847-060C	6	7-9/16	5-7/16	3.42
CG-847-080C	8	9-23/32	7-3/16	6.93
CG-847-100CF	10	12- 1/4	5-15/16	7.48
CG-847-120CF	12	14- 1/4	7- 1/8	12.11

CAP - Marine

Fipt

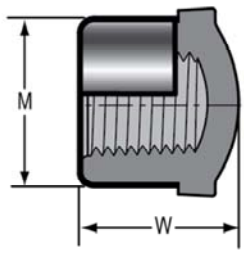


Part Number	Size	M	W	Approx. Wt. (Lbs.)
CG-848-005C	1/2	1- 3/16	1- 1/16	.03
CG-848-007C	3/4	1- 3/8	1- 7/32	.04
CG-848-010C	1	1-27/32	1- 7/16	.10
CG-848-012C	1-1/4	2- 7/32	1-17/32	.15
CG-848-015C	1-1/2	2-17/32	1- 5/8	.20
CG-848-020C	2	3- 5/32	1-25/32	.29
CG-848-025C	2-1/2	3- 5/8	2- 7/16	.58
CG-848-030C	3	4- 3/8	2- 7/16	.77
CG-848-040C	4	5- 7/16	3- 1/16	1.37
CG-848-060CF	6	7-3/16	4-3/8	2.20
CG-848-080CF	8	9-3/8	4-3/8	3.76

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings
Spears® Manufacturing Company

Cap - Special Reinforced - Marine

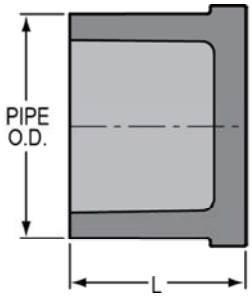
SR Fipt - Stainless Steel Collar



Part Number	Size	M	W	Approx. Wt. (Lbs.)
CG-848-005CSR	1/2	1-3/16	1-1/16	.04
CG-848-007CSR	3/4	1- 3/8	1- 3/32	.05
CG-848-030CSR	3	4- 9/32	2- 7/16	.84

Plug - Marine

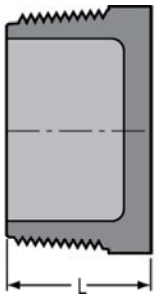
Spigot



Part Number	Size	L	Approx. Wt. (Lbs.)
CG-849-005C	1/2	1- 1/8	.03
CG-849-007C	3/4	1- 1/4	.03
CG-849-010C	1	1- 3/8	.06
CG-849-012C	1-1/4	1-17/32	.10
CG-849-015C	1-1/2	1-11/16	.14
CG-849-020C	2	1- 7/8	.22
CG-849-025CF[4]	2-1/2	5- 3/8	1.12
CG-849-030CF[4]	3	5-7/8	1.55
CG-849-040CF[4]	4	6- 1/2	2.66
CG-849-060CF[4]	6	9-5/8	6.75
CG-849-080CF[4]	8	12-3/16	13.50
CG-849-100CF[4]	10	12-1/4	17.99
CG-849-120CF[4]	12	14- 1/8	28.85

Plug - Marine

Mipt

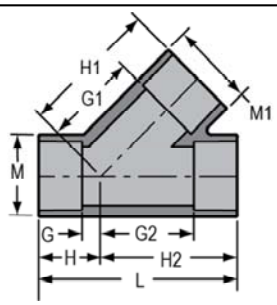


Part Number	Size	L	Approx. Wt. (Lbs.)
CG-850-005C	1/2	13/16	.01
CG-850-007C	3/4	7/8	.02
CG-850-010C	1	1-1/16	.05
CG-850-012C	1-1/4	1- 9/32	.07
CG-850-015C	1-1/2	1-11/32	.10
CG-850-020C	2	1- 3/8	.16
CG-850-025C	2-1/2	1-25/32	.29
CG-850-030C	3	1- 7/8	.45
CG-850-040C	4	2- 3/32	.81
CG-850-060C	6	2- 3/32	1.79
CG-850-080C	8	2-3/8	3.53
CG-850-100CF[4]	10	8- 7/16	13.76
CG-850-120CF[4]	12	10-5/8	24.34

Wye - Marine

Socket x Socket x Socket

1/2" - 2" - 235 psi Maximum Internal Pressure Rating @ 73°F (23°C) 2-1/2" - 6" - 150 psi Maximum Internal Pressure Rating @ 73°F (23° C) 8" - Larger & All Fabricated Sizes - 100 psi Maximum Internal Pressure Rating @ 73°F (23° C)



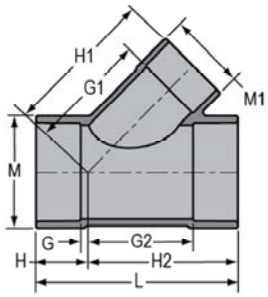
Part Number	Size	G	G1	G2	H	H1	H2	L	M	M1	Approx. Wt. (Lbs.)
CG-875-005C	1/2	1/4	1-3/16	1-3/16	1- 1/8	2- 1/16	2-1/16	3- 3/16	1- 5/32	1- 5/32	.12
CG-875-007C	3/4	5/16	1- 3/8	1- 3/8	1- 5/16	2- 3/8	2- 3/8	3-23/32	1- 3/8	1- 3/8	.19
CG-875-010C	1	5/16	1- 3/4	1- 3/4	1- 7/16	2-29/32	2- 7/8	4-11/32	1-11/16	1-11/16	.32
CG-875-012C	1-1/4	13/32	2- 5/32	2- 5/32	1-21/32	3-13/32	3-13/32	5- 3/32	2- 1/16	2- 1/16	.52
CG-875-015C	1-1/2	17/32	2- 1/2	2- 1/2	1-29/32	3- 7/8	3- 7/8	5-13/16	2- 5/16	2- 5/16	.73
CG-875-020C	2	5/8	3- 7/32	3- 7/32	2- 5/32	4- 7/8	4- 7/8	6- 7/8	2- 7/8	2- 7/8	1.27
CG-875-025C	2-1/2	27/32	3-31/32	3-31/32	2-19/32	5-23/32	5-23/32	8- 5/16	3- 1/2	3- 1/2	2.04
CG-875-030C	3	31/32	4- 3/4	4-25/32	2-27/32	6- 5/8	6-21/32	9- 1/2	4- 3/16	4- 3/16	3.12
CG-875-040C	4	1- 1/4	6- 1/32	6- 1/32	3- 1/2	8- 9/32	8- 9/32	11-25/32	5- 1/4	5- 1/4	5.35
CG-875-060C	6	1- 5/32	8-25/32	8- 3/16	4- 3/16	11-25/32	11- 3/16	15- 3/8	7- 9/16	7- 9/16	13.21
CG-875-080C	8	1-15/16	11-11/32	11-11/32	5-31/32	15-11/32	15-11/32	21- 5/16	9- 3/4	9- 3/4	28.12

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings
Spears® Manufacturing Company

Wye - Reducing - Marine

Socket x Socket x Socket

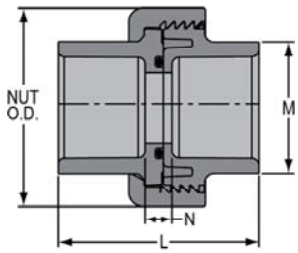
1/2" - 2" - 235 psi Maximum Internal Pressure Rating @ 73°F (23°C) 2-1/2" - 6" - 150 psi Maximum Internal Pressure Rating @ 73°F (23° C) 8" - 12" 100 psi Maximum Internal Pressure Rating @ 73°F (23°C)



Part Number	Size	G	G1	G2	H	H1	H2	L	M	M1	Approx. Wt. (Lbs.)
CG-875-101C[1]	3/4X1/2	9/32	1-3/4	1-13/32	1-5/16	2-5/8	2-3/16	3-11/16	1-3/8	1-3/8	.21
CG-875-130C[1]	1X1/2	11/32	2-3/16	1-3/4	1-15/32	3-3/32	2-29/32	4-3/8	1-11/16	1-11/16	.39
CG-875-131C[1]	1X3/4	11/32	2-1/16	1-3/4	1-15/32	3-3/32	2-29/32	4-3/8	1-11/16	1-11/16	.36
CG-875-166C[1]	1-1/4X1/2	13/32	2-13/16	2-13/16	1-21/32	3-23/32	3-15/32	5-1/8	2-1/16	2-1/16	.65
CG-875-167C[1]	1-1/4X3/4	3/8	2- 3/4	2- 1/4	1- 5/8	3- 3/4	3- 1/2	5- 1/8	2- 1/16	2- 1/16	.62
CG-875-168C[1]	1-1/4X1	3/8	2- 5/8	2- 1/4	1- 5/8	3- 3/4	3- 1/2	5- 1/8	2- 1/16	2- 1/16	.59
CG-875-209C[1]	1-1/2X1/2	15/32	3-13/32	2-19/32	1-7/8	4-9/32	3-31/32	5-27/32	2-11/32	2-11/32	.89
CG-875-210C[1]	1-1/2X3/4	1/2	3- 1/2	2- 9/16	1- 7/8	4- 1/2	3-15/16	5-13/16	2-11/32	2-11/32	.90
CG-875-211C[1]	1-1/2X1	1/2	3	2- 9/16	1- 7/8	4- 5/32	3-15/16	5-13/16	2-11/32	2-11/32	.86
CG-875-212C[1]	1-1/2X1-1/4	1/2	3- 1/4	2- 9/16	1- 7/8	4- 1/2	3-15/16	5-13/16	2-11/32	2-11/32	.80
CG-875-247C[1]	2X1/2	5/8	4-1/8	4-3/4	2-5/32	5	4-3/4	6-29/32	2-7/8	2-7/8	1.57
CG-875-248C[1]	2X3/4	5/8	4- 5/32	3- 7/32	2- 5/32	5- 5/32	4- 7/8	6- 7/8	2- 7/8	2- 7/8	1.55
CG-875-249C[1]	2X1	5/8	3-7/8	3-1/4	2-5/32	5	4-3/4	6-29/32	2-7/8	2-7/8	1.52
CG-875-250C[1]	2X1-1/4	5/8	3- 5/16	3- 3/8	2- 5/32	5	4- 3/4	6- 7/8	2- 7/8	2- 7/8	1.48
CG-875-251C[1]	2X1-1/2	1/2	3-23/32	3-11/32	2- 1/32	5- 3/32	4- 7/8	6- 7/8	2- 7/8	2- 7/8	1.43
CG-875-335C[1]	3X1	11/16	5- 7/8	4- 7/32	2- 9/16	6-15/16	6- 1/8	8-23/32	4- 3/16	4- 3/16	3.79
CG-875-336C[1]	3X1-1/4	7/8	5- 3/4	4- 1/8	2- 3/4	7	6	8- 3/4	4- 3/16	4- 3/16	3.83
CG-875-337C[1]	3X1-1/2	15/16	5-11/16	4-3/4	2-13/16	7-1/16	6-5/8	9-7/16	4-3/16	4-3/16	3.79
CG-875-338C[1]	3X2	1	5-11/32	4- 3/4	2- 7/8	6-31/32	6- 5/8	9- 1/2	4- 3/16	4- 3/16	3.76
CG-875-339C[1]	3X2-1/2	7/8	4- 1/8	4-21/32	2- 3/4	6- 3/4	6	8- 3/4	4- 3/16	4- 3/16	3.53
CG-875-420C	4X2	-3/16	4-31/32	4-15/32	2-1/6	6-15/32	6-23/32	8-25/32	5-1/4	2-29/32	3.13
CG-875-422C	4X3	5/8	5- 7/16	5-1/4	2-7/8	7- 5/16	7-1/2	10-3/8	5- 1/4	4-5/32	4.18
CG-875-528C[1]	6X2	1/16	8-13/16	6- 9/16	3- 1/16	10- 5/16	9- 9/16	12- 5/8	7- 9/16	5- 7/16	11.18
CG-875-530C[1]	6X3	1/16	8- 3/8	6-11/16	3	10- 1/4	9-11/16	12- 5/8	7- 9/16	5- 3/8	10.94
CG-875-532C	6X4	31/32	6- 9/16	5-11/16	3-15/16	8-27/32	8-23/32	12-21/32	7- 9/16	5- 7/16	10.08
CG-875-578C[1]	8X2	2	14-15/16	11- 1/4	6	16- 9/16	16- 7/16	21- 1/4	9-11/16	9-11/16	16.42
CG-875-580C[1]	8X3	11/16	9-3/4	8-9/32	3-5/16	11-11/16	12-5/16	15-5/8	9-3/4	5-1/4	16.17
CG-875-582C	8X4	-11/16	9- 1/8	8-1/4	3- 5/16	11- 3/8	12-1/4	15-9/16	9-3/4	5- 1/4	15.31
CG-875-585C[1]	8X6	2	12-15/16	11- 1/4	6	15-15/16	15- 1/4	21- 1/4	9-11/16	9-11/16	33.48
CG-875-626C	10X6	-3/16	12	11	4-13/16	15	16	20-25/32	12- 1/16	7-21/32	29.73
CG-875-628C	10X8	1-7/8	12-5/8	11-15/16	6-15/16	16-5/8	16-15/16	23-13/16	12- 1/32	9-3/4	37.73

Union 2000 - Socket/FKM - Marine

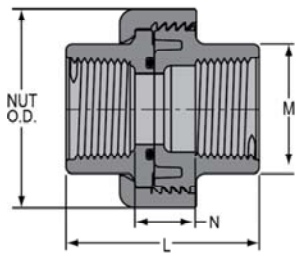
Socket x Socket with FKM O-ring Seal
235 psi Maximum Internal Pressure Rating @ 73° F (23°C)



Part Number	Size	L	M	N	NUT O.D.	Approx. Wt. (Lbs.)
CG-8057-005C	1/2	2- 3/32	1- 3/16	11/32	1- 7/8	.12
CG-8057-007C	3/4	2- 3/8	1-13/32	3/8	2- 9/32	.20
CG-8057-010C	1	2-11/16	1-23/32	7/16	2- 9/16	.28
CG-8057-012C	1-1/4	2-15/16	2- 3/32	7/16	3- 3/32	.41
CG-8057-015C	1-1/2	3- 1/4	2- 3/8	1/2	3- 1/2	.54
CG-8057-020C	2	3-17/32	2- 7/8	17/32	4- 9/32	.90
CG-8057-025C	2-1/2	4- 7/32	3- 1/2	25/32	6- 5/32	2.25
CG-8057-030C	3	4- 1/4	4- 3/16	1/2	6- 5/32	2.27
CG-8057-040C	4	5- 1/8	5- 1/4	5/8	7- 3/4	4.02
CG-8057-060C	6	6-27/32	7- 1/2	25/32	11- 5/8	12.26

Union 2000 - Fipt/FKM - Marine

Fipt x Fipt with FKM O-ring Seal
235 psi Maximum Internal Pressure Rating @ 73° F (23°C)

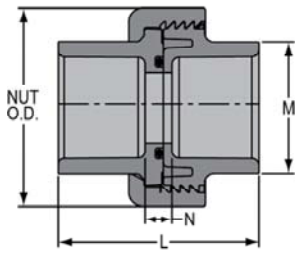


Part Number	Size	L	M	N	NUT O.D.	Approx. Wt. (Lbs.)
CG-8058-005C	1/2	1-29/32	1- 3/16	17/32	1- 7/8	.13
CG-8058-007C	3/4	2- 1/16	1- 3/8	9/16	2- 9/32	.20
CG-8058-010C	1	2-17/32	1-11/16	25/32	2- 9/16	.29
CG-8058-012C	1-1/4	2-21/32	2- 1/32	3/4	3- 1/8	.42
CG-8058-015C	1-1/2	2-25/32	2- 3/8	29/32	3- 1/2	.56
CG-8058-020C	2	3- 1/8	3	1- 3/16	4- 7/32	.94
CG-8058-025C	2-1/2	4- 1/32	3- 9/16	1-15/32	6- 5/32	2.41
CG-8058-030C	3	4- 5/32	4- 9/32	1-13/32	6- 5/32	2.48
CG-8058-040C	4	4-21/32	5- 1/4	1-21/32	7- 3/4	4.05
CG-8058-060C	6	6- 1/8	7-21/32	2-13/16	11-19/32	11.96

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

Union 2000 - Socket/EPDM - Marine

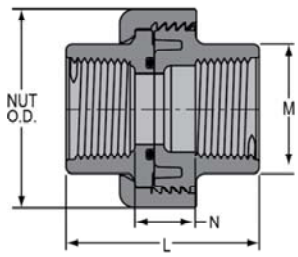
Socket x Socket with EPDM O-ring Seal
235 psi Maximum Internal Pressure Rating @ 73° F (23°C)



Part Number	Size	L	M	N	NUT O.D.	Approx. Wt. (Lbs.)
CG-8097-005C	1/2	2- 3/32	1- 3/16	11/32	1- 7/8	.12
CG-8097-007C	3/4	2- 3/8	1-13/32	3/8	2- 9/32	.20
CG-8097-010C	1	2-11/16	1-23/32	7/16	2- 9/16	.27
CG-8097-012C	1-1/4	2-15/16	2- 3/32	7/16	3- 3/32	.41
CG-8097-015C	1-1/2	3- 1/4	2- 3/8	1/2	3- 1/2	.53
CG-8097-020C	2	3-17/32	2- 7/8	17/32	4- 9/32	.90
CG-8097-025C	2-1/2	4- 7/32	3- 1/2	25/32	6- 5/32	2.24
CG-8097-030C	3	4- 1/4	4- 3/16	1/2	6- 5/32	2.26
CG-8097-040C	4	5- 1/8	5- 1/4	5/8	7- 3/4	4.00
CG-8097-060C	6	6-27/32	7- 1/2	25/32	11- 5/8	12.22

Union 2000 - Fipt/EPDM - Marine

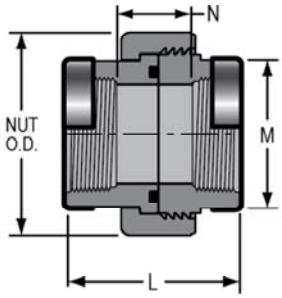
Fipt x Fipt with EPDM O-ring Seal
235 psi Maximum Internal Pressure Rating @ 73° F (23°C)



Part Number	Size	L	M	N	NUT O.D.	Approx. Wt. (Lbs.)
CG-8098-005C	1/2	1-29/32	1- 3/16	5/32	1- 7/8	.13
CG-8098-007C	3/4	2- 1/16	1- 3/8	1/16	2- 9/32	.20
CG-8098-010C	1	2-17/32	1-11/16	9/32	2- 9/16	.29
CG-8098-012C	1-1/4	2-21/32	2- 1/32	5/32	3- 1/8	.42
CG-8098-015C	1-1/2	2-25/32	2- 3/8	1/32	3- 1/2	.55
CG-8098-020C	2	3- 1/8	3	1/8	4- 7/32	.93
CG-8098-025C	2-1/2	4- 1/32	3- 9/16	1-15/32	6- 5/32	2.40
CG-8098-030C	3	4- 5/32	4- 9/32	13/32	6- 5/32	2.47
CG-8098-040C	4	4-21/32	5- 1/4	1/8	7- 3/4	4.03
CG-8098-060C	6	6- 1/8	7-21/32	2-13/16	11-19/32	11.92

Union 2000 - Special Reinforced Fipt/FKM - Marine

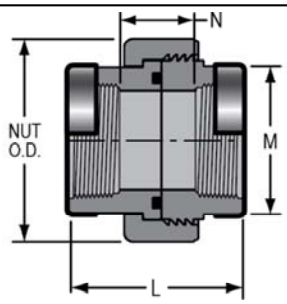
SR Fipt x SR Fipt w/FKM O-ring Seal - Stainless Steel Collar
235 psi Maximum Internal Pressure Rating @ 73° F (23°C)



Part Number	Size	L	M	N	NUT O.D.	Approx. Wt. (Lbs.)
CG-8058-005CSR	1/2	2	1- 3/16	5/8	1- 7/8	.15
CG-8058-007CSR	3/4	2- 5/32	1- 3/8	21/32	2- 9/32	.22
CG-8058-010CSR	1	2- 9/16	1-11/16	13/16	2- 9/16	.34
CG-8058-012CSR	1-1/4	2-23/32	2- 1/32	13/16	3- 1/8	.46
CG-8058-015CSR	1-1/2	2-27/32	2-13/32	29/32	3-17/32	.62
CG-8058-020CSR	2	3- 7/32	3- 1/32	1- 3/16	4- 7/32	1.02
CG-8058-025CSR	2-1/2	4-3/32	3-9/16	1-15/32	6-5/32	2.51
CG-8058-030CSR	3	4- 3/16	4- 9/32	1- 3/8	6- 5/32	2.58
CG-8058-040CSR	4	4-23/32	5- 1/4	3/4	7-3/4	4.24
CG-8058-060CSR	6	6- 3/16	7-11/16	2-13/16	11- 5/8	12.25

Union 2000 - Special Reinforced Fipt/EPDM - Marine

SR Fipt x SR Fipt w/EPDM O-ring Seal - Stainless Steel Collar
235 psi Maximum Internal Pressure Rating @ 73° F (23°C)



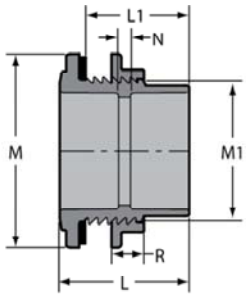
Part Number	Size	L	M	N	NUT O.D.	Approx. Wt. (Lbs.)
CG-8098-005CSR	1/2	2	1- 3/16	5/8	1- 7/8	.15
CG-8098-007CSR	3/4	2- 5/32	1- 3/8	21/32	2- 9/32	.22
CG-8098-010CSR	1	2- 9/16	1-11/16	13/16	2- 9/16	.34
CG-8098-012CSR	1-1/4	2-23/32	2- 1/32	13/16	3- 1/8	.46
CG-8098-015CSR	1-1/2	2-27/32	2-13/32	29/32	3-17/32	.61
CG-8098-020CSR	2	3- 7/32	3- 1/32	1- 3/16	4- 7/32	1.02
CG-8098-025CSR	2-1/2	4- 3/32	3- 9/16	1-15/32	6- 5/32	2.50
CG-8098-030CSR	3	4- 3/16	4- 9/32	1- 3/8	6- 5/32	2.57
CG-8098-040CSR	4	4-11/16	5- 1/4	1-11/16	7- 3/4	4.22
CG-8098-060CSR	6	6- 3/16	7-11/16	2-13/16	11- 5/8	12.21

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings
Spears® Manufacturing Company

Tank Adapters, Standard with Neoprene Gaskets - Marine

Socket x Socket

150 psi Maximum Internal Pressure Rating @ 73° F (23°C)

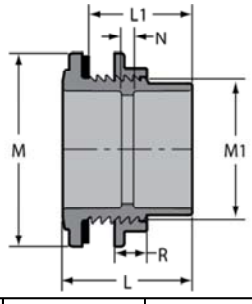


Part Number	Size	L	L1	M	M1	N	R	Min Hole Size	Approx. Wt. (Lbs.)
CG-8170-005C	1/2	2-15/16	2- 3/16	2- 1/16	1-15/32	1- 1/8	5/8	1-1/2	.22
CG-8170-007C	3/4	2-15/16	2- 3/16	2- 1/4	1- 5/8	15/16	5/8	1-3/4	.24
CG-8170-010C	1	3- 5/16	2- 9/16	2- 5/8	2	1- 1/16	5/8	2	.37
CG-8170-012C	1-1/4	3- 7/16	2- 5/8	3- 1/8	2- 5/16	15/16	5/8	2-3/8	.48
CG-8170-015C	1-1/2	3- 5/8	2-13/16	3- 5/8	2-11/16	13/16	5/8	2-3/4	.66
CG-8170-020C	2	4- 1/8	3- 1/4	4- 7/8	3- 1/4	1- 1/16	3/4	3-3/8	1.29
CG-8170-025C	2-1/2	4-27/32	3- 7/8	5- 1/4	3- 9/16	29/32	1	3-7/8	1.22
CG-8170-030C	3	5- 1/2	4- 1/2	6	4- 9/16	1-11/16	1	4-5/8	2.61
CG-8170-040C	4	5	4	7- 1/2	5- 1/2	7/16	1- 1/4	5-1/2	3.21
CG-8170-060C	6	5	4	10-3/32	8	1/8	1-1/4	8	5.76
CG-8170-080C	8	8- 5/8	7	12-15/16	10- 1/4	1/2	1- 1/2	10-3/8	17.30

Tank Adapters, Standard with EPDM Gaskets - Marine

Socket x Socket

150 psi Maximum Internal Pressure Rating @ 73° F (23°C)

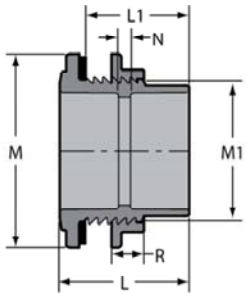


Part Number	Size	L	L1	M	M1	N	R	Min Hole Size	Approx. Wt. (Lbs.)
CG-8170E-005C	1/2	2-15/16	2- 3/16	2- 1/16	1-15/32	1- 1/8	5/8	1-1/2	.23
CG-8170E-007C	3/4	2-15/16	2- 3/16	2- 1/4	1- 5/8	15/16	5/8	1-3/4	.25
CG-8170E-010C	1	3- 5/16	2- 9/16	2- 5/8	2	1- 1/16	5/8	2	.38
CG-8170E-012C	1-1/4	3- 7/16	2- 5/8	3- 1/8	2- 5/16	15/16	5/8	2-3/8	.49
CG-8170E-015C	1-1/2	3- 5/8	2-13/16	3- 5/8	2-11/16	13/16	5/8	2-3/4	.67
CG-8170E-020C	2	4- 1/8	3- 1/4	4- 7/8	3- 1/4	1- 1/16	3/4	3-3/8	1.31
CG-8170E-025C	2-1/2	4-27/32	3- 7/8	5- 1/4	3- 9/16	29/32	1	3-7/8	.86
CG-8170E-030C	3	5- 1/2	4- 1/2	6	4- 9/16	1-11/16	1	4-5/8	2.62
CG-8170E-040C	4	5	4	7- 1/2	5- 1/2	7/16	1- 1/4	5-1/2	3.24
CG-8170E-060C	6	5	4	10-3/32	8	1/8	1-1/4	6	5.73
CG-8170E-080C	8	8- 5/8	7	12-15/16	10- 1/4	1/2	1- 1/2	10-3/8	16.85

Tank Adapters, Standard with FKM Gaskets - Marine

Socket x Socket

150 psi Maximum Internal Pressure Rating @ 73° F (23°C)

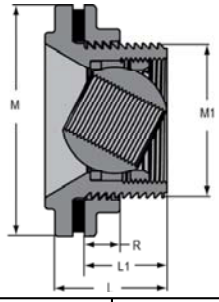


Part Number	Size	L	L1	M	M1	N	R	Min Hole Size	Approx. Wt. (Lbs.)
CG-8170V-005C	1/2	2-15/16	2- 3/16	2- 1/16	1-15/32	1- 1/8	5/8	1-1/2	.23
CG-8170V-007C	3/4	2-15/16	2- 3/16	2- 1/4	1- 5/8	15/16	5/8	1-3/4	.25
CG-8170V-010C	1	3- 5/16	2- 9/16	2- 5/8	2	1- 1/16	5/8	2	.38
CG-8170V-012C	1-1/4	3- 7/16	2- 5/8	3- 1/8	2- 5/16	15/16	5/8	2-3/8	.50
CG-8170V-015C	1-1/2	3- 5/8	2-13/16	3- 5/8	2-11/16	13/16	5/8	2-3/4	.69
CG-8170V-020C	2	4- 1/8	3- 1/4	4- 7/8	3- 1/4	1- 1/16	3/4	3-3/8	1.37
CG-8170V-025C	2-1/2	4-27/32	3- 7/8	5- 1/4	3- 9/16	29/32	1	3-7/8	.91
CG-8170V-030C	3	5- 1/2	4- 1/2	6	4- 9/16	1-11/16	1	4-5/8	2.68
CG-8170V-040C	4	5	4	7- 1/2	5- 1/2	7/16	1- 1/4	5-1/2	3.36
CG-8170V-060C	6	5	4	10-3/32	8	1/8	1-1/4	8	5.88
CG-8170V-080C	8	8- 5/8	7	12-15/16	10- 1/4	1/2	1- 1/2	10-3/8	16.92

Tank Adapter, Self Aligning with Neoprene Gasket - Marine

Fipt

75 psi Maximum Internal Pressure Rating @ 73°F (23°C)

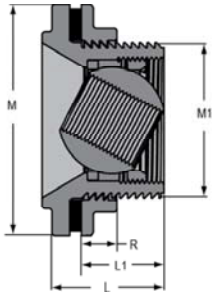


Part Number	Size	L	L1	M	M1	R	Approx. Wt. (Lbs.)
CG-8172SA-010C	1	2- 9/16	1- 3/4	4- 7/8	3- 1/4	3/4	2.70
CG-8172SA-020C	2	2-11/16	1- 3/4	6	4- 9/16	1	9.03
CG-8172SA-030C	3	3- 1/4	2- 1/4	7- 1/2	5- 1/2	1- 1/4	3.14

Tank Adapter, Self Aligning with EPDM Gasket - Marine

Fipt

Tank Adapter, CPVC Self Aligning with EPDM Gasket



Part Number	Size	L	L1	M	M1	R	Approx. Wt. (Lbs.)
CG-8172ESA-010C	1	2- 9/16	1- 3/4	4- 7/8	3- 1/4	3/4	2.71
CG-8172ESA-020C	2	2-11/16	1- 3/4	6	4- 9/16	1	9.05
CG-8172ESA-030C	3	3- 1/4	2- 1/4	7- 1/2	5- 1/2	1- 1/4	3.16

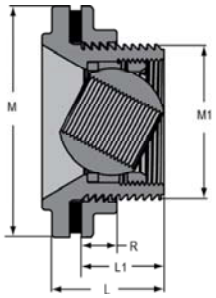
Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas

See Spears® Product Sourcebook for product offerings

Tank Adapter, Self Aligning with FKM Gasket - Marine

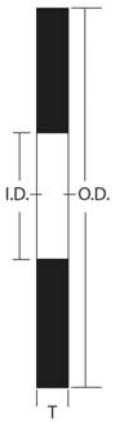
Fipt

75 psi Maximum Internal Pressure Rating @ 73°F (23°C)



Part Number	Size	L	L1	M	M1	R	Approx. Wt. (Lbs.)
CG-8172VSA-010C	1	2- 9/16	1- 3/4	4- 7/8	3- 1/4	3/4	2.78
CG-8172VSA-020C	2	2-11/16	1- 3/4	6	4- 9/16	1	9.11
CG-8172VSA-030C	3	3- 1/4	2- 1/4	7- 1/2	5- 1/2	1- 1/4	3.29

TANK ADAPTER GASKET SECTION



SIZE	O.D.*	I.D.*	T
1/2	2.25	1.33	3/16
3/4	2.49	1.69	3/16
1	2.79	1.94	3/16
1-1/4	3.81	2.39	3/16
1-1/2	3.81	2.39	3/16
2	4.89	3.51	3/16
3	6.30	4.49	3/16
4	7.33	5.50	3/16

Tank Adapter Gasket & Hole Size Requirements

Tank Adapter Size	Recommended Minimum Hole Size	Minimum Inside Curvature Radius (inches)	Maximum Tank Wall Thickness (inches)
1/2	1-1/2	4.00	.756
3/4	1-3/4	5.00	.75
1	2	7.00	.86
1-1/4	2-3/8	9.50	.86
1-1/2	2-3/4	12.00	.86
2	3-3/8	18.50	1.19
2-1/2	3-7/8	23.50	1.50
3	4-5/8	32.50	2.00
4	5-1/2	43.50	1.25
6	8	79.50	2.06
8	10-3/8	98.00	4.25

* Both outside and inside dimensions are +/- .03 shore hardness 65-70

The information contained in this publication is based on current information and Product design at the time of publication and is subject to change without notification. Our ongoing commitment to product improvement may result in some variation. No representations, guarantees or warranties of any kind are made as to its accuracy, suitability for particular applications or results to be obtained therefrom. For verification of technical data or additional information not contained herein, please contact Spears® Technical Services Department [West Coast: (818) 364-1611 - East Coast: (678) 985-1263].

GENERAL INFORMATION

Recommendations For Installers And Users

CPVC marine piping systems should be **ENGINEERED, INSTALLED**, and **OPERATED** in accordance with **ESTABLISHED DESIGN AND ENGINEERING STANDARDS AND PROCEDURES** For plastic piping systems. Suitability for the intended service application should be determined by the installer and /or user prior to installation of a plastic piping system. **PRIOR TO ASSEMBLY, all marine piping system components should be inspected for damage or irregularities. Mating components should be checked to assure that tolerances and engagements are compatible. Do not use any components that appear irregular or do not fit properly. Contact the appropriate manufacturer of the component product in question to determine usability.**

Solvent Weld Connections - Use only marine approved quality solvent cements and primers formulated for the intended service application, pipe size and type of joint. While the pipe and fitting materials may be compatible with the intended medium, the solvent cement may not be. Consult the manufacturer for suitability of use. Read and follow the cement and primer manufacturers' applications and cure time instructions thoroughly. Be sure to use the correct size applicator.

Threaded Connections - Use a quality grade thread sealant. **WARNING: SOME PIPE JOINT COMPOUNDS OR PTFE PASTES MAY CONTAIN SUBSTANCES THAT COULD CAUSE STRESS CRACKING TO PLASTIC.** Spears® Manufacturing Company recommends the use of Spears® **BLUE 75™** thread sealant which has been tested for compatibility with Spears® products. Please follow the sealant manufacturer's application/installation instructions. Choice of an appropriate thread sealant other than those listed above is at the discretion of the installer. 1 to 2 turns beyond **FINGER TIGHT** is generally all that is required to make a sound plastic thread connection. Unnecessary **OVERTIGHTENING** will cause **DAMAGE TO BOTH PIPE AND FITTING.**

"Lead Free" low lead certification - unless otherwise specified; all Spears® Thermoplastic Flanges specified here-in are certified by NSF International to ANSI/NSF® Standard 61, Annex G and is in compliance with California's Health & Safety Code Section 116825 (commonly known as AB1953) and Vermont Act 193. Weighted average lead content <=0.25%.

CPVC Marine Flange Sample Engineering Specification

All EverTUFF™ CPVC marine flanges shall be produced by Spears® Manufacturing Company from CPVC materials, with a cell classification of 23447 in accordance with ASTM Standard D 1784. All injection-molded marine flanges shall be designed and manufactured to meet CL150 bolt pattern per ANSI Standard B16.5 and be certified by NSF International for use with potable water service. CG-M851 and CG-M854 series hubs shall accept ASTM IPS pipe. Rings shall be manufactured to accept bolt patterns in ANSI Class 150, B.S. 4504 PN10, B.S. 4504 PN16, B.S. 10 Table E for size 10". Metric Duetsche Industrie Norm (DIN) flange hubs shall accept 3" or 4" ASTM IPS Pipe. Rings shall be manufactured to DIN 8063-4 PN 10 and PN 16 bolt patterns. CPVC CL300 flanges shall accept ASTM IPS Pipe. CL300 rings shall be manufactured to the Class 300 bolt hole pattern from ANSI B16.5 and shall be pressure rated to 150psi @ 73° F.

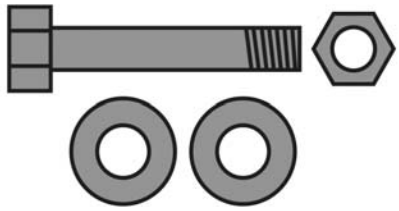


Bolt Kit Selection Guide

Bolt Hardware Kits Available
For Connection of 2-Spears® Flanges
Includes Bolts, Nuts & Flat Washers for Specified Flange Size

Order Gaskets & Bolt Kits Separately

- Pre-coated, Anti-seize Lubricated Bolts
- Available in Zinc Coated Steel, Type 316 Stainless Steel or Type 304 Stainless Steel



Flange Size	Bolts* Per Kit	Diameter (in.-TPI)	Length (in.)	Kit Part Number		
				Zinc	316 SS	304 SS
1/2	4	1/2 - 13	2	HK-005	HK1-005	HK2-005
3/4 & 1	4	1/2 - 13	2-1/4	HK-010	HK1-010	HK2-010
1-1/4 & 1-1/2	4	1/2 - 13	2-1/2	HK-015	HK1-015	HK2-015
2	4	5/8 - 11	3	HK-020	HK1-020	HK2-020
2-1/2	4	5/8 - 11	3-1/4	HK-025	HK1-025	HK2-025
3	4	5/8 - 11	3-1/2	HK-030	HK1-030	HK2-030
4	8	5/8 - 11	3-1/2	HK-040	HK1-040	HK2-040
6	8	3/4 - 10	4	HK-060	HK1-060	HK2-060
8	8	3/4 - 10	4-1/2	HK-080	HK1-080	HK2-080
10 & 12	12	7/8 - 9	5	HK-120	HK1-120	HK2-120

* Each Bolt Includes Nut & Two (2) Flat Washers

Bolt Torque

Recommended Bolt Torque is shown in **Table 1.** Threads should be clean and well lubricated. Actual field conditions may require variations in these recommendations. **CAUTION: UNNECESSARY OVER TORQUING WILL DAMAGE THE FLANGE.**

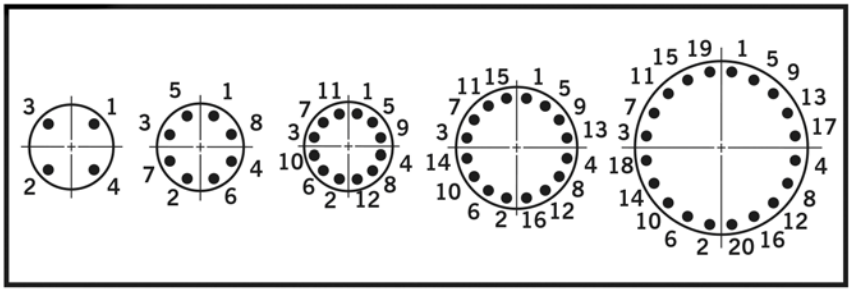
Table 1

Flange Size (in.)	Recommended Torque (ft. lbs.)
1/2 - 1-1/2	12
2 - 4	25
6 - 8	40
10	64
12	95

Torque Sequence

Bolt Torque sequence is shown Below in **Table 2**.

Table 2



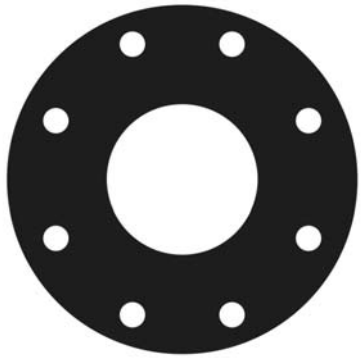
Gaskets

Full faced, 1/8" thick elastomer gaskets with a Shore "A" Durometer of approximately 70 is recommended.

Gasket Selection Guide

Following Gasket Numbers Available from Spears®

Order Gaskets & Bolt Kits Separately
- 1/8" Full-Face design with ANSI Class 150 Bolt Patterns
- Pressure rated to 150 psi @ 73°F
- Available in Buna-N, EPDM, or FKM



Flange Size	Bolts Per Kit	Gasket Part Number		
		Buna-N	EPDM	FKM
1/2	4	GK1-005	GK2-005	GK3-005
3/4	4	GK1-007	GK2-007	GK3-007
1	4	GK1-010	GK2-010	GK3-010
1-1/4	4	GK1-012	GK2-012	GK3-012
1-1/2	4	GK1-015	GK2-015	GK3-015
2	4	GK1-020	GK2-020	GK3-020
2-1/2	4	GK1-025	GK2-025	GK3-025
3	4	GK1-030	GK2-030	GK3-030
4	8	GK1-040	GK2-040	GK3-040
6	8	GK1-060	GK2-060	GK3-060
8	8	GK1-080	GK2-080	GK3-080
10	12	GK1-100	GK2-100	GK3-100
12	12	GK1-120	GK2-120	GK3-120

Flange Make-up

Once a flange is joined to pipe, the method for joining two flanges is as follows:

1. Piping runs joined to the flanges must be installed in a straight line position to the flange to avoid stress at the flange due to misalignment. Piping must also be secured and supported to prevent lateral movement which can create stress and damage the flange.
2. With gasket in place, align the bolt holes of the mating flanges by rotating the ring into position.
3. Insert all bolts, washers (two standard flat washers per bolt), and nuts.
4. Make sure the faces of the mating surfaces are flush against gasket prior to bolting down the flanges.
5. Tighten the nuts by hand until they are snug. Establish uniform pressure over the flange face by tightening the bolts in 5 ft.-lbs. increments according to the sequence shown in **Table 2** following a 180° opposing sequence.
6. Care must be taken to avoid "bending" the flange when joining a Spears® flange to a "raised face" flange, or a wafer-style valve. Do not use bolts to bring together improperly mated flanges.

Configuration Terminology

Multi-Bolt Pattern Ring - Bolt hole drilling accepts ANSI and Metric Flanges
Socket - Slip socket connection for solvent cement welding
Spigot - Pipe O.D. connection for solvent welding
IPS - Iron Pipe Size

Molded Flange Technical Information

Application

Molded CLASS 150 Flange fittings are coupling devices designed for joining IPS (Iron Pipe Size) plastic piping systems, where frequent disassembly may be required, and can be used as a transitional fitting for joining plastic to metal piping systems. Suitability of application is at the discretion of the user.

Pressure Rating

150 psi, water at 73°F.

Flange Types

One Piece - Available in socket configuration, sizes 1/2" through 8"; threaded and SR threaded (Special Reinforced) configuration sizes 1/2" through 4".

Van Stone Style - Two-piece design with rotating flange ring, available in socket configurations, sizes 1/2" through 18"; threaded configurations, sizes 1/2" through 4" and spigot configurations, sizes 1/2" through 12".

Blind - Closed ring design for capping off a mating flange, flanged fitting or flanged valve, available in sizes 1/2" through 12".

Materials

All injection molded flanges are produced from CPVC materials approved for potable water use by NSF International (NSF®).

Glass-filled CPVC materials may be used in certain Van Stone Style flange rings and large diameter Blind flanges where additional reinforcement is deemed necessary.

Conformance Standards

Socket I.D. & Spigot O.D. - ASTM D 2467 (CPVC).

Bolt Hole Pattern - ANSI B16.5; ASTM D 4024.

Material - ASTM D 1784 (PVC Cell Classification 12454-B).

Weights & Dimensions

Specified minimum bolt lengths are based on the use of two Spears® marine flanges, two standard flat washers, standard nut and 1/8" thick elastomer full face gasket. Mating with other brands or accessories may require variation. Bolts and gaskets are not supplied with flanges.

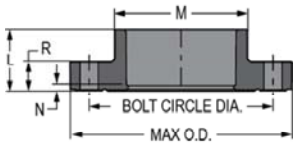
Dimension references:

L = Overall length of hub, ± 1/16 inch.
M = Outside diameter of socket hub, ± 1/16 inch.
N = (Laying Length) socket/spigot bottom to seal-ring face of flange, ± 1/16 inch.
R = Height (thickness) of flange ring, ± 1/16 inch.
Max O.D. = Outside diameter of ring, ± 1/16 inch.
Bolt Circle Diameter = ANSI B 16.5 Standard; ASTM D 4024, ± 1/16 inch.

Flange One Piece - Marine

Socket

150 psi Maximum Internal Pressure Rating @ 73° F (23°C)

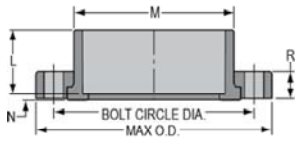


Part Number	Size	L	M	N	R	Bolt Circle Dia.	Bolt Size	Max. O.D.	Min. Bolt Length	No of Bolts	Approx. Wt. (Lbs.)
CG-851-005C	1/2	1-1/16	1-9/32	1/8	9/16	2-3/8	1/2	3-1/2	2	4	.21
CG-851-007C	3/4	1-3/16	1-1/2	1/8	5/8	2-3/4	1/2	3-7/8	2	4	.28
CG-851-010C	1	1-5/16	1-13/16	3/16	3/4	3-1/8	1/2	4-1/4	2-1/4	4	.46
CG-851-012C	1-1/4	1-3/8	2-3/16	3/32	21/32	3-1/2	1/2	4-5/8	2-1/4	4	.44
CG-851-015C	1-1/2	1-19/32	2-1/2	3/16	23/32	3-7/8	1/2	5-1/16	2-1/2	4	.60
CG-851-020C	2	1-27/32	3	5/16	27/32	4-3/4	5/8	6	3	4	.95
CG-851-025C	2-1/2	2-1/4	3-1/2	1/2	1	5-1/2	5/8	7	3-1/4	4	1.54
CG-851-030C	3	2-5/16	4-9/32	3/8	1-1/16	6	5/8	7-1/2	3-1/4	4	1.83
CG-851-040C	4	2-7/16	5-7/32	3/16	1-5/32	7-1/2	5/8	9-1/16	3-1/2	8	2.78
CG-851-060C	6	3-1/4	7-9/16	1/4	1-3/8	9-1/2	3/4	11	4	8	4.34
CG-851-080C	8	4-17/32	9-3/4	1/2	1-7/16	11-11/16	3/4	13-5/8	4-1/2	8	8.04
CG-851-100C	10	5-3/8	11-25/32	13/32	1-21/32	14-1/4	7/8	16	4	12	13.52
CG-851-120C	12	6-7/16	13-15/16	1/2	1-11/16	17	7/8	19	5	12	20.98

Flange Van Stone Style with Plastic Ring - Marine

Socket

150 psi = maximum internal pressure rating @ 73°F (23°C)

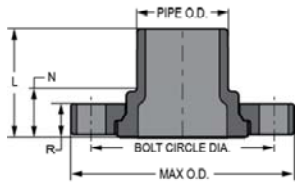


Part Number	Size	L	M	N	R	Bolt Circle Dia.	Bolt Size	Max. O.D.	Min. Bolt Length	No of Bolts	Approx. Wt. (Lbs.)
CG-854-005C	1/2	1-1/32	1-7/32	5/32	17/32	2-3/8	1/2	3-1/2	2	4	.19
CG-854-007C	3/4	1-1/8	1-7/16	5/32	9/16	2-3/4	1/2	3-7/8	2	4	.27
CG-854-010C	1	1- 9/32	1- 3/4	5/32	5/8	3- 1/8	1/2	4- 1/4	2-1/4	4	.37
CG-854-012C	1-1/4	1-13/32	2-5/32	5/32	11/16	3- 1/2	1/2	4-5/8	2-1/4	4	.45
CG-854-015C	1-1/2	1-17/32	2-7/16	3/16	3/4	3-7/8	1/2	5	2-1/2	4	.59
CG-854-020C	2	1-11/16	2-15/16	3/16	13/16	4-3/4	5/8	6	3	4	.91
CG-854-025C	2-1/2	2	3-1/2	3/16	31/32	5-1/2	5/8	7	3-1/4	4	1.48
CG-854-030C	3	2-1/8	4-1/4	1/4	1-1/16	6	5/8	7-1/2	3-1/4	4	1.75
CG-854-040C	4	2-1/2	5-1/4	1/4	1-1/8	7-1/2	5/8	9	3-1/2	8	2.83
CG-854-060C	6	3-3/8	7-9/16	7/16	1-9/32	9-1/2	3/4	11	4	8	4.73
CG-854-080C	8	4-3/8	9-5/16	9/32	1-3/8	11-3/4	3/4	13-1/2	4-1/2	8	7.00
CG-854-100C	10	5-11/16	11-3/4	21/32	1-5/8	14-1/4	7/8	16	5	12	12.12
CG-854-120C	12	7-1/4	13-3/4	5/8	1-5/8	17	7/8	19	5	12	17.73

Flange Van Stone Style with Plastic Ring - Marine

Spigot

150 psi Maximum Internal Pressure Rating @ 73° F (23°C)

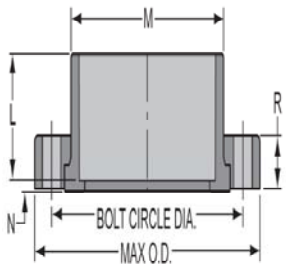


Part Number	Size	L	N	R	Bolt Circle Dia.	Bolt Size	Max. O.D.	No of Bolts	Approx. Wt. (Lbs.)
CG-856-005C	1/2	1-3/4	29/32	17/32	2-3/8	1/2	3-1/2	4	.21
CG-856-007C	3/4	1-15/16	31/32	9/16	2-3/4	1/2	3-7/8	4	.29
CG-856-010C	1	2-3/16	1-1/32	5/8	3-1/8	1/2	4-1/4	4	.41
CG-856-012C	1-1/4	2-11/32	1-3/32	11/16	3-1/2	1/2	4-5/8	4	.50
CG-856-015C	1-1/2	2-5/8	1-9/32	3/4	3-7/8	1/2	5	4	.67
CG-856-020C	2	2-7/8	1-11/32	13/16	4-3/4	5/8	6	4	1.00
CG-856-025C	2-1/2	3-1/16	1-9/32	1	5-1/2	5/8	7	4	1.61
CG-856-030C	3	3-3/8	1-7/16	1-1/16	6	5/8	7-1/2	4	1.92
CG-856-040C	4	3-7/8	1-5/8	1-1/4	7-1/2	5/8	9	8	3.12
CG-856-060C	6	4-3/4	1-25/32	1-9/32	9-1/2	3/4	11	8	4.74
CG-856-080C	8	5-7/8	1-15/16	1-3/8	11-3/4	3/4	13-1/2	8	8.16
CG-856-100C	10	8	2-1/4	1-5/8	14-1/4	7/8	16	12	16.45
CG-856-120C	12	8-1/2	2-3/16	1-5/8	17	7/8	19	12	23.09

Flange Van Stone Style Class 300 Bolt Pattern Fabricated with Plastic Ring - Marine

Socket

Molded with fabricated ring - 150 psi = maximum internal pressure rating @ 73°F (23°C)

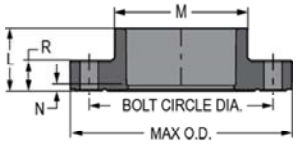


Part Number	Size	L	M	N	R	Bolt Circle Dia.	Bolt Size	Max. O.D.	No of Bolts	Approx. Wt. (Lbs.)
CG-854005CL300C	1/2	1	1-3/16	3/16	1/2	2-5/8	1/2	3-3/4	4	.42
CG-854007CL300C	3/4	1-1/8	1-3/8	3/16	1	3-1/4	5/8	4-5/8	4	1.32
CG-854010CL300C	1	1-1/4	1-3/4	3/16	1	3-1/2	5/8	4-7/8	4	.62
CG-854012CL300C	1-1/4	1-3/8	2-1/8	1/8	1	3-7/8	5/8	5-1/4	4	2.03
CG-854015CL300C	1-1/2	1-1/2	2-7/16	3/16	1	4-1/2	5/8	6-1/8	4	2.46
CG-854020CL300C	2	1-11/16	2-15/16	3/16	1	5	5/8	6-1/2	8	2.64
CG-854025CL300C	2-1/2	2	3-9/16	1/4	1	5-7/8	3/4	7-1/2	8	3.62
CG-854030CL300C	3	2-1/8	4-1/4	1/4	1	6-5/8	3/4	8-1/4	8	5.47
CG-854040CL300C	4	2-1/2	5-1/4	1/4	1-1/2	7-7/8	3/4	10	8	11.94
CG-854060CL300C	6	3-5/16	7-9/16	5/16	1-1/2	10-5/8	3/4	12-1/2	12	24.16
CG-854080CL300C	8	4-3/8	9-3/8	5/16	1-1/2	13	7/8	15	12	25.01
CG-854100CL300C	10	5-11/16	11-3/4	5/8	1-1/2	15-1/4	1	17-1/2	16	45.98
CG-854120CL300C	12	6-5/8	13-11/16	5/8	1-1/2	17-3/4	1-1/8	20-1/2	16	59.28

Flange One Piece Multi-Bolt Pattern* - Marine

ASTM Socket x Multi-bolt Pattern Ring

150 psi Maximum Internal Pressure Rating @ 73° F (23°C)



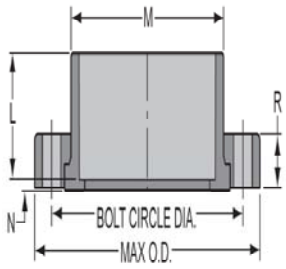
Part Number	Size	L	M	N	R	Bolt Circle Dia.	Bolt Size	Max. O.D.	No of Bolts	Approx. Wt. (Lbs.)
CG-M851-100C	10	5-3/8	11-25/32	13/32	1-21/32	13-25/32	7/8	16	12	13.52
CG-M851-120C	12	6-7/16	13-15/16	1/2	1-11/16	15-3/4	7/8	19	12	20.98

Hubs fit 10" and 12" ASTM IPS pipe. Rings are manufactured to accept bolt patterns in size 10" and 12" in ANSI Class 150, B.S. 4504 PN10, B.S. 4504 PN16, B.S. 10 Table E for size 10". Consult Spears® Manufacturing Company Technical Services for additional information. Not for use with wafer valves.

Flange Van Stone Style with Plastic Ring ASTM - Marine

Socket x Multi-bolt Pattern Ring

150 psi Maximum Internal Pressure Rating @ 73° F (23°C)



Part Number	Size	L	M	N	R	Bolt Circle Dia Max	Bolt Circle Dia Min	Bolt Size	Max. O.D.	No of Bolts	Approx. Wt. (Lbs.)
CG-M854-020C	2	1-11/16	2-15/16	3/16	13/16	4-15/16	4- 1/2	5/8	6	4	.86
CG-M854-060C	6	3- 3/8	7- 9/16	7/16	1- 9/32	9-1/2	9-7/32	3/4	11	8	4.78

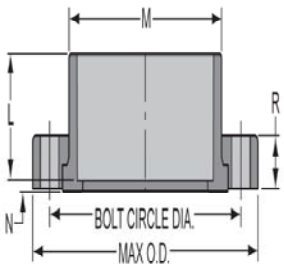
Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas

See Spears® Product Sourcebook for product offerings

(Continued)

Flange Van Stone Style with Plastic Ring ASTM - Marine

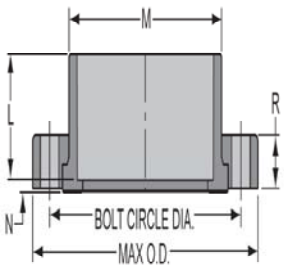
Socket x Multi-bolt Pattern Ring
150 psi Maximum Internal Pressure Rating @ 73° F (23°C)



Part Number	Size	L	M	N	R	Bolt Circle Dia Max	Bolt Circle Dia Min	Bolt Size	Max. O.D.	No of Bolts	Approx. Wt. (Lbs.)
CG-M854-080C	8	4- 3/8	9- 5/16	3/8	1- 3/8	11-3/4	11- 1/2	3/4	13- 1/2	8	7.14

Flange Van Stone Style with PN 10/16 Drilling CPVC Ring - Marine

ASTM Socket x DIN PN 10/16 Drilling
150 psi Maximum Internal Pressure Rating @ 73° F (23°C)



Part Number	Size	L	M	N	R	Bolt Circle Dia.	Bolt Size	Max. O.D.	No of Bolts	Approx. Wt. (Lbs.)
CG-854-030CDIN	3	2-1/16	4-1/4	1/4	1-1/16	6-5/16	5/8	7-7/8	8	2.00
CG-854-040CDIN	4	2-9/16	5-1/4	1/4	1-1/8	7-3/32	5/8	8-9/16	8	2.40

Hubs fit 3" or 4" ASTM IPS Pipe. Rings are manufactured to DIN 8063-4 PN 10 and PN 16 bolt patterns.





MARINE CLAMP-ON SADDLES
Simple Two-Piece Design Engineered for Reliability



Spears® EverTUFF™ CPVC Marine Clamp-On Saddles allow quick, easy and reliable addition of branch lines to existing piping system lines. These versatile saddle units can be used in either temporary or permanent installations on all types of CPVC marine pipe with IPS (Iron Pipe size) outside diameter, including PVC, CPVC, polyethylene, polypropylene and steel.

Excellent Metal-to-Plastic System Transition
Easily installs on metal pipe as a transition to plastic system.

Tee or Cross Configurations
Available in 2" - 12" IPS pipe saddle with socket outlets in sizes 1/2" - 6" and Special Reinforced (SR) threaded outlets in sizes 1/2" - 6", single Tee configurations.

O-ring Options
Choice of high grade EPDM or FKM O-rings for Schedule 80, for application specific selection and optimum chemical resistance.

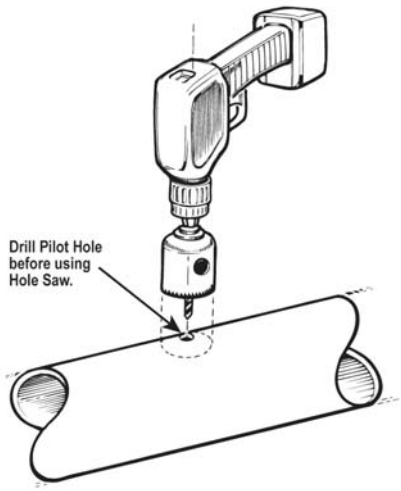
Excellent Pressure Capabilities
Maximum internal pressure rating of 235 psi through 4", 200 psi for 6", and 150 psi for 8" - 12" at 73°F.

CPVC Clamp-On Saddle Sample Engineering Specification
All thermoplastic marine saddles shall be clamp-on type with O-ring seal constructed from CPVC Type IV cell classification 23447. All O-rings shall be EPDM or FKM. All saddles shall be piloted at O-ring area for positive positioning in pipe. All bolt clamping hardware shall be stainless steel. All saddle outlets shall have dimensions to connect to IPS piping. Saddles shall be pressure rated at 235 psi for use on pipe sizes through 4" nominal IPS diameters, 200 psi for use on 6" pipe, and 150 psi for use on 8" - 12" pipe, maximum internal pressure for water at 73°F, as manufactured by Spears® Manufacturing Company. Saddles shall be suitable for use with Spears® U.S. Coast Guard Approved piping systems only.

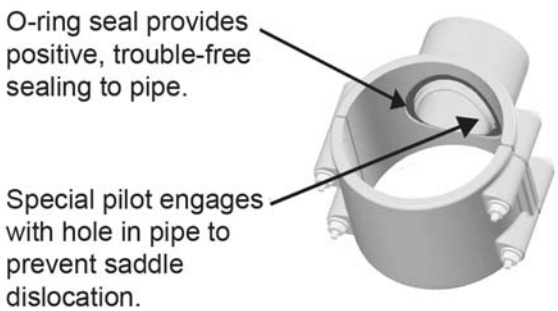
Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

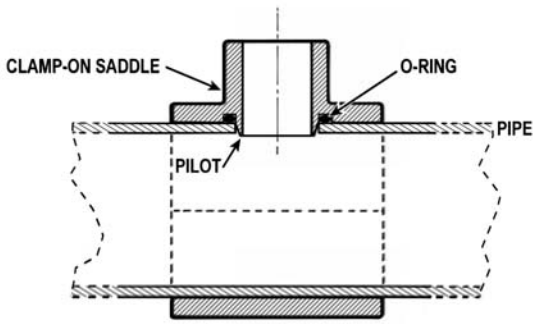
Clamp-On Saddle Installation Instructions

1. Using a standard industrial grade hole-saw, cut specified hole in desired position on pipe according to recommended hole saw size engraved on the saddle. **Note:** Care must be taken to deburr hole and remove all residue from hole area to assure tight fit and avoid leakage.
2. Fully seat O-ring in groove on underside of saddle outlet component. Position over hole and fully seat saddle onto pipe. Note: Certain saddle outlets are piloted. Be sure pilot lip fully engages with hole in pipe.
3. Place strap component opposite outlet and secure with bolts (4), nuts (4) and washers (8). Important: Washers MUST be placed under each bolt head (1) and under each nut (1) to avoid damage to saddle.
4. Tighten bolts to specified torque.

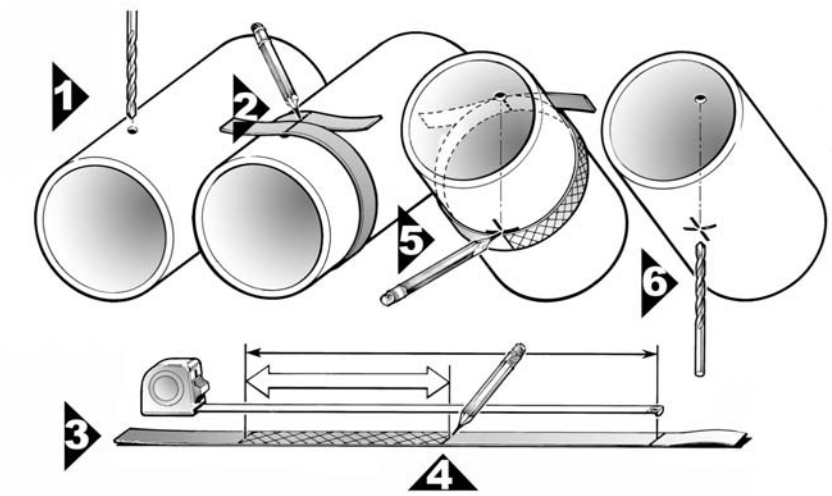


Saddle Size	2	3	4	6 & up
Recommended Bolt-Torque -ft/lb	8	8	8	10





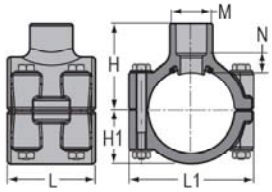
For Double Outlet Saddle Installation —Determine second outlet hole position as shown



Clamp-On Saddle x Socket Single Outlet, - Marine

with EPDM O-ring Seal & SS Hardware

2"- 4" 235, 6" 200, 8"-12" 150 psi @ 73°F (23°C)



Part Number	Size	H	H1	L	L1	M	N	Bolt Torque FT./LBS.	No of Bolts	Approx. Wt. (Lbs.)
CG-866S-247C	2X1/2	2- 3/8	1- 1/2	2- 7/16	3- 7/16	1- 3/16	5/16	8	4	.61
CG-866S-248C	2X3/4	2- 1/2	1- 1/2	2- 7/16	3- 7/16	1- 3/8	5/16	8	4	.62
CG-866S-249C	2X1	2- 5/8	1- 1/2	2- 7/16	3- 7/16	1-11/16	5/16	8	4	.64
CG-866S-250C	2X1-1/4	2- 3/4	1- 1/2	2- 7/16	3- 7/16	2- 1/16	5/16	8	4	.66
CG-866S-251C	2X1-1/2	2-15/16	1- 1/2	2- 7/16	3- 7/16	2- 3/8	5/16	8	4	.73
CG-866S-291C	2-1/2X1-1/2	3- 3/16	1-11/16	4- 1/16	4	2- 3/8	3/8	8	4	1.09
CG-866S-333C	3X1/2	3- 5/16	2- 1/16	3	4- 5/8	1- 3/8	13/16	8	4	.92
CG-866S-334C	3X3/4	3- 1/16	2- 1/16	3	4- 5/8	1- 3/8	9/32	8	4	.89
CG-866S-335C	3X1	3- 3/16	2- 1/16	3	4- 5/8	1-11/16	5/16	8	4	.92
CG-866S-336C	3X1-1/4	4- 1/32	2- 1/16	4- 3/32	4- 5/8	3	1- 1/32	8	4	1.50
CG-866S-337C	3X1-1/2	4- 1/32	2- 1/16	4- 3/32	4- 5/8	3	29/32	8	4	1.45
CG-866S-338C	3X2	3- 5/8	2- 1/16	4- 3/32	4- 5/8	3	3/8	8	4	1.29
CG-866S-415C	4X1/2	4- 3/32	2- 5/8	3	5- 9/16	2- 3/8	31/32	8	4	1.37
CG-866S-416C	4X3/4	4- 3/32	2- 5/8	3	5- 9/16	2- 3/8	27/32	8	4	1.33
CG-866S-417C	4X1	3-13/16	2- 5/8	3	5- 5/8	1-11/16	7/16	8	4	1.30
CG-866S-418C	4X1-1/4	4-13/32	2- 5/8	4- 3/32	5- 5/8	2- 3/8	29/32	8	4	1.73
CG-866S-419C	4X1-1/2	4- 1/8	2- 5/8	4- 3/32	5- 9/16	2- 3/8	1/2	8	4	1.66
CG-866S-420C	4X2	4- 3/16	2- 5/8	4- 1/8	5- 5/8	3	7/16	8	4	1.78
CG-866S-421C	4X2-1/2	5	2- 5/8	5- 7/16	5-23/32	4- 9/32	3/4	8	4	2.95
CG-866S-422C	4X3	4- 5/8	2-19/32	5- 7/16	5-11/16	4- 1/4	1/2	8	4	2.54
CG-866S-523C	6X1/2	5-13/32	3- 7/8	3	7- 3/4	1-11/16	1- 7/32	8	4	2.48
CG-866S-524C	6X3/4	5- 7/16	3- 7/8	3	7- 3/4	1-11/16	1- 1/8	10	4	2.45
CG-866S-525C	6X1	5- 1/8	3- 7/8	3	7-15/16	1-11/16	11/16	10	4	2.42
CG-866S-526C	6X1-1/4	5-15/16	3- 7/8	4- 1/8	7- 3/4	3	1- 3/8	10	4	3.42
CG-866S-527C	6X1-1/2	5-15/16	3- 7/8	4- 1/8	7- 3/4	3	1- 1/4	10	4	3.37
CG-866S-528C	6X2	5- 1/2	3- 7/8	4- 1/8	7- 3/4	3	11/16	10	4	3.22
CG-866S-529C	6X2-1/2	6- 7/16	3- 7/8	6	7-15/16	4- 1/4	1- 1/8	10	4	5.05
CG-866S-530C	6X3	5-15/16	3- 7/8	6	7-15/16	4- 1/4	25/32	10	4	4.62
CG-866S-532C	6X4	6	3-29/32	6	7-15/16	5- 3/16	5/8	10	6	5.43
CG-866S-573C	8X1/2	7- 3/4	4- 7/8	8-1/2	9-7/8	5- 5/16	1- 1/2	10	6	8.63
CG-866S-574C	8X3/4	8- 3/32	4- 7/8	8- 1/2	9-7/8	5- 1/4	2- 3/4	10	6	10.11
CG-866S-575C	8X1	8- 3/32	4- 7/8	8- 1/2	9-7/8	5- 1/4	2- 5/8	10	6	8.58

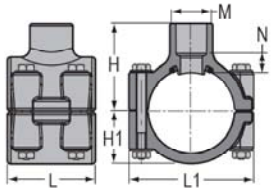
Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas

See Spears® Product Sourcebook for product offerings

Clamp-On Saddle x Socket Single Outlet, - Marine

with FKM O-ring Seal & SS Hardware

2"- 4" 235, 6" 200, 8"-12" 150 psi @ 73°F (23°C)



Part Number	Size	H	H1	L	L1	M	N	Bolt Torque FT./LBS.	No of Bolts	Approx. Wt. (Lbs.)
CG-866SV-247C	2X1/2	2- 3/8	1- 1/2	2- 7/16	3- 7/16	1- 3/16	5/16	8	4	.62
CG-866SV-248C	2X3/4	2- 1/2	1- 1/2	2- 7/16	3- 7/16	1- 3/8	5/16	8	4	.62
CG-866SV-249C	2X1	2- 5/8	1- 1/2	2- 7/16	3- 7/16	1-11/16	5/16	8	4	.65
CG-866SV-250C	2X1-1/4	2- 3/4	1- 1/2	2- 7/16	3- 7/16	2- 1/16	5/16	8	4	.66
CG-866SV-251C	2X1-1/2	2-15/16	1- 1/2	2- 7/16	3- 7/16	2- 3/8	5/16	8	4	.73
CG-866SV-291C	2-1/2X1-1/2	3- 3/16	1-11/16	4- 1/16	4	2- 3/8	3/8	8	4	1.09
CG-866SV-333C	3X1/2	3- 5/16	2- 1/16	3	4- 5/8	1- 3/8	13/16	8	4	.93
CG-866SV-334C	3X3/4	3- 1/16	2- 1/16	3	4- 5/8	1- 3/8	9/32	8	4	.89
CG-866SV-335C	3X1	3- 3/16	2- 1/16	3	4- 5/8	1-11/16	5/16	8	4	.92
CG-866SV-336C	3X1-1/4	4- 1/32	2- 1/16	4- 3/32	4- 5/8	3	1- 1/32	8	4	1.50
CG-866SV-337C	3X1-1/2	4- 1/32	2- 1/16	4- 3/32	4- 5/8	3	29/32	8	4	1.45
CG-866SV-338C	3X2	3- 5/8	2- 1/16	4- 3/32	4- 5/8	3	3/8	8	4	1.30
CG-866SV-415C	4X1/2	4- 3/32	2- 5/8	3	5- 9/16	2- 3/8	31/32	8	4	1.37
CG-866SV-416C	4X3/4	4- 3/32	2- 5/8	3	5- 9/16	2- 3/8	27/32	8	4	1.34
CG-866SV-417C	4X1	3-13/16	2- 5/8	3	5- 5/8	1-11/16	7/16	8	4	1.30
CG-866SV-418C	4X1-1/4	4-13/32	2- 5/8	4- 3/32	5- 5/8	2- 3/8	29/32	8	4	1.73
CG-866SV-420C	4X2	4- 3/16	2- 5/8	4- 1/8	5- 5/8	3	7/16	8	4	1.79
CG-866SV-421C	4X2-1/2	5	2- 5/8	5- 7/16	5-23/32	4- 9/32	3/4	8	4	2.96
CG-866SV-419C	4X1-1/2	4- 1/8	2- 5/8	4- 3/32	5- 9/16	2- 3/8	1/2	8	4	1.66
CG-866SV-422C	4X3	4- 5/8	2-19/32	5- 7/16	5-11/16	4- 1/4	1/2	8	4	2.55
CG-866SV-523C	6X1/2	5-13/32	3- 7/8	3	7- 3/4	1-11/16	1- 7/32	8	4	2.49
CG-866SV-524C	6X3/4	5- 7/16	3- 7/8	3	7- 3/4	1-11/16	1- 1/8	10	4	2.46
CG-866SV-525C	6X1	5- 1/8	3- 7/8	3	7-15/16	1-11/16	11/16	10	4	2.42
CG-866SV-526C	6X1-1/4	5-15/16	3- 7/8	4- 1/8	7- 3/4	3	1- 3/8	10	4	3.43
CG-866SV-527C	6X1-1/2	5-15/16	3- 7/8	4- 1/8	7- 3/4	3	1- 1/4	10	4	3.38
CG-866SV-528C	6X2	5- 1/2	3- 7/8	4- 1/8	7- 3/4	3	11/16	10	4	3.23
CG-866SV-529C	6X2-1/2	6- 7/16	3- 7/8	6	7-15/16	4- 1/4	1- 1/8	10	4	5.05
CG-866SV-530C	6X3	5-15/16	3- 7/8	6	7-15/16	4- 1/4	25/32	10	4	4.64
CG-866SV-532C	6X4	6	3-29/32	6	7-15/16	5- 3/16	5/8	10	6	5.45
CG-866SV-573C	8X1/2	7- 3/4	4- 7/8	8-1/2	9-7/8	5- 5/16	1- 1/2	10	6	8.64
CG-866SV-574C	8X3/4	8- 3/32	4- 7/8	8- 1/2	9-7/8	5- 1/4	2- 3/4	10	6	10.13
CG-866SV-575C	8X1	8- 3/32	4- 7/8	8- 1/2	9-7/8	5- 1/4	2- 5/8	10	6	8.59
CG-866SV-576C	8X1-1/4	8- 3/32	4- 7/8	8- 1/2	9-7/8	5- 1/4	2- 1/2	10	6	10.32
CG-866SV-577C	8X1-1/2	8- 3/32	4- 7/8	8- 1/2	9-7/8	5- 1/4	2- 3/8	10	6	10.29
CG-866SV-578C	8X2	6-1/2	4- 7/8	8- 1/2	9-7/8	3	11/16	10	6	8.33
CG-866SV-579C	8X2-1/2	8- 5/32	4- 7/8	8-1/2	9-7/8	5- 7/32	2- 1/2	10	6	9.83
CG-866SV-580C	8X3	7-11/16	4- 7/8	8- 1/2	9- 7/8	5- 7/32	2- 1/16	10	6	9.62
CG-866SV-582C	8X4	7- 5/16	4- 7/8	8- 1/2	9-7/8	5- 1/4	11/16	10	6	8.76
CG-866SV-585C	8X6	8- 3/32	4- 7/8	8- 1/2	9-7/8	7- 5/8	11/16	10	6	10.12
CG-866SV-624C	10X4	8-15/32	6- 1/32	8- 1/2	12- 5/16	5- 1/4	13/16	10	6	12.75
CG-866SV-626C	10X6	9- 9/32	6- 1/32	8- 1/2	12- 5/16	7- 5/8	13/16	10	6	13.77
CG-866SV-664C	12X4	9- 9/16	7- 5/32	8- 1/2	14- 5/16	5- 1/4	7/8	10	6	16.45
CG-866SV-666C	12X6	10- 3/8	7- 5/32	8- 1/2	14- 5/16	7- 5/8	7/8	10	6	17.47

[1] Outlet-sized with Bushing

Allows Connection to Existing Pipeline Under Pressure



Specially designed tapping saddle allows pipe branch connection to pressurized "Hot" lines without system shut-down.

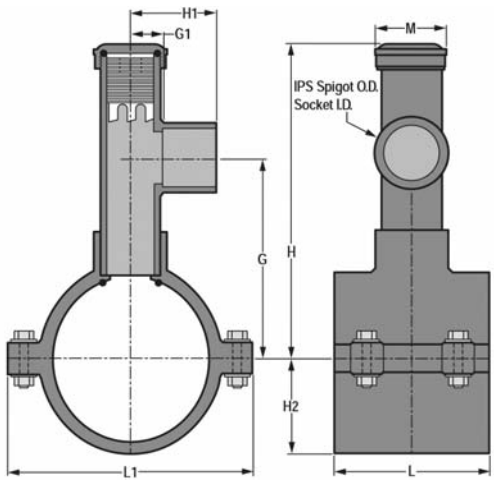
- Marine Grade Bolt-on Saddle with EPDM or FKM O-ring Seals and Type 316 Stainless Steel Hardware.
- Built-in Stainless Steel Cutter Easily Cuts Hole in PVC, CPVC, HDPE and PP Pipe. Special Design Captures and Retains Coupon from Hole.
- Pressure Rated up to 235 psi @ 73°F.
- Available to fit IPS Pipe 2" through 8" with Versatile 3/4" Socket - 1" Spigot Combination Branch Outlet or 1-1/2" Socket - 2" Spigot Combination Branch Outlet

TECHINICAL DATA

Maximum Service Temperatures		Pressure Rating @ 73°F	
		2" - 4"	235 psi
CPVC	200°F	6"	200 psi
		8"	150 psi

NOTE: Elevated service temperatures required system pressure de-rating.

NOTE: Some leakage is possible during the tapping process, therefore "hot-taps" are not recommended for corrosive or dangerous fluid medium.



CPVC Hot Tap Saddle Engineering Specification

All thermoplastic marine hot tap saddles shall be clamp-on type with O-ring seal constructed from CPVC Type IV cell classification 23447. All O-rings shall be EPDM or FKM. All saddles shall be piloted at O-ring area for positive positioning in pipe. All bolt clamping hardware shall be stainless steel. Pipe cutter shall be machined from stainless steel. All saddle outlets shall have dimensions to connect to IPS piping. Saddles shall be pressure rated at 235 psi for use on pipe sizes through 8" nominal IPS diameters maximum internal pressure for water at 73°F, as manufactured by Spears® Manufacturing Company. Hot tap saddles shall be Type Approved by The American Bureau of Shipping and suitable for use with Spears® U.S. Coast Guard Approved piping systems.

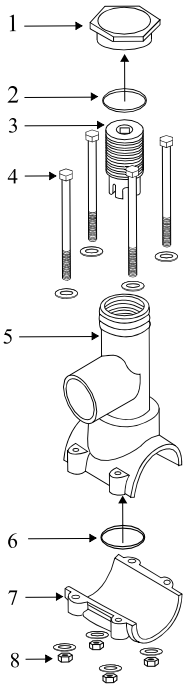
Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

Basic Installation

Marine Hot-Tap Saddles are designed for adding branch connections to piping systems under live ("hot") pressure. Marine Hot-Tap Saddle branch outlets are either 3/4" socket (with 1" Spigot O.D.) or 1-1/2" socket (with 2" Spigot O.D.) in saddle sizes 2" through 8" to fit IPS pipe using a built-in O-ring seal. Internal cutter is operated using conventional ratchet and drive extension and permanently retains coupon cut from pipe. Maximum operating pressure at 73°F is 235 psi for saddle sizes 2" - 4", 200 psi for 6" saddles & 150 psi for 8".

SEE PRODUCT INSTALLATION INSTRUCTION FOR DETAILS

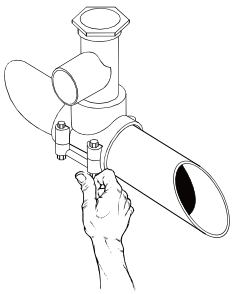
COMPONENTS



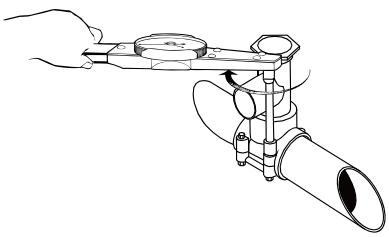
The Hot-Tap Saddle includes the following components :

1. Cap
2. Upper O-ring
3. Hot-Tap Cutter
4. Bolt/Washer
5. Saddle Body
6. Lower O-ring
7. Saddle Bottom
8. Nut/Washer

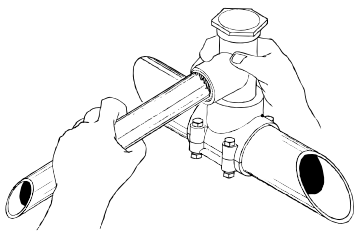
STEP 1 Assemble on Pipe



STEP 2 Torque to Specifications

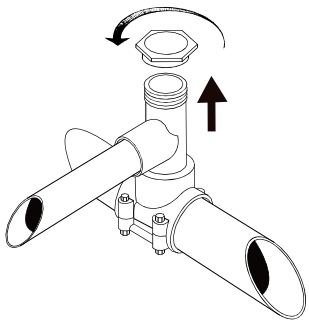


STEP 3 Cement Branch Take-off

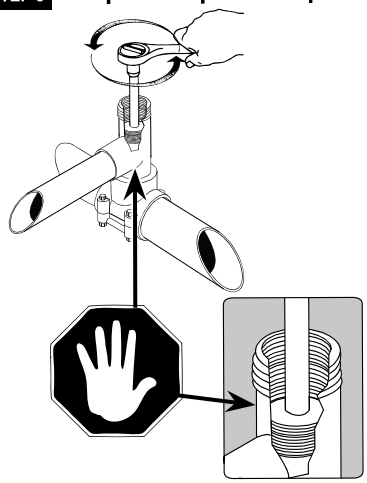


Allow joint to cure.

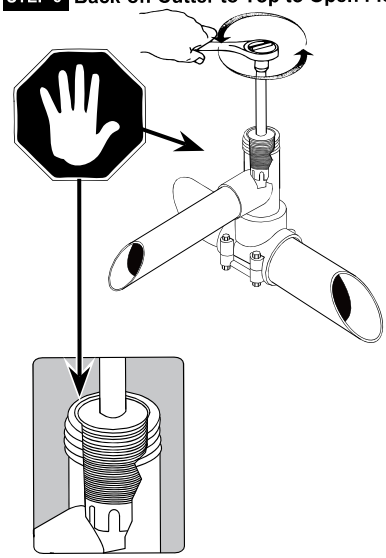
STEP 4 Remove Cap



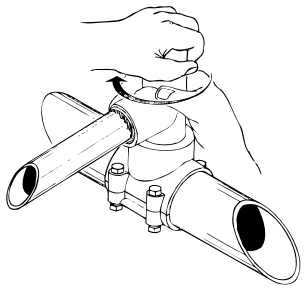
STEP 5 Tap to Required Depth



STEP 6 Back-off Cutter to Top to Open Flow

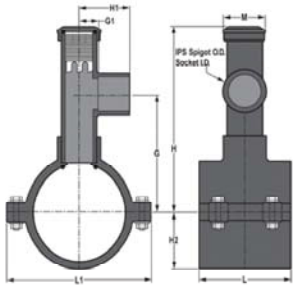


STEP 7 Reinstall Opening Sealed Cap



Hot-Tap Saddle - Marine

EPDM with Stainless Steel Cutter & Bolts
2"- 4" 235, 6" 200, 8" 150 psi @ 73°F (23°C)

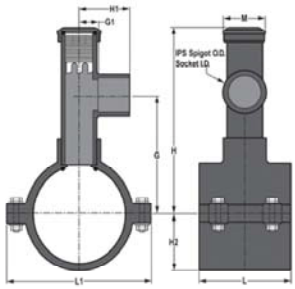


Part Number	Size	G	G1	H	H1	H2	L	L1	M	Approx. Wt. (Lbs.)
CG-HT2S-248C	2X3/4	3-9/16	1	6-3/16	2	1-1/2	2-7/16	3-1/2	2	1.10
CG-HT2S-251C	2X1-1/2	4-9/16	1-1/4	8-15/16	2-11/16	1-1/2	2-7/16	3-1/2	2-7/8	2.25
CG-HT2S-288C	2-1/2X3/4	3-15/16	1	6-9/16	2	1-3/4	4-1/8	4-1/8	2	2.05
CG-HT2S-291C	2-1/2X1-1/2	4-13/16	1-1/4	9-3/16	2-11/16	1-3/4	4-1/8	4-1/8	2-7/8	2.61
CG-HT2S-334C	3X3/4	4-1/16	1	6-11/16	2	2	3	4-3/4	2	1.37
CG-HT2S-337C	3X1-1/2	5-1/4	1-1/4	9-5/8	2-11/16	2	4-1/8	4-3/4	2-7/8	2.99
CG-HT2S-416C	4X3/4	4-11/16	1	7-5/16	2	2-5/8	3	5-13/16	2	1.76
CG-HT2S-419C	4X1-1/2	5-13/16	1-1/4	10-3/16	2-11/16	2-5/8	4-1/8	5-13/16	2-7/8	3.46
CG-HT2S-524C	6X3/4	6	1	8-5/8	2	3-7/8	3	8-1/8	2	2.61
CG-HT2S-527C	6X1-1/2	7-1/8	1-1/4	11-1/2	2-11/16	3-7/8	4-1/8	8-1/8	2-7/8	4.65
CG-HT2S-574C	8X3/4	7-1/4	1	9-7/8	2	4-7/8	8-1/2	9-7/8	2	9.69
CG-HT2S-577C	8X1-1/2	8-9/16	1-1/4	12-9/16	2-11/16	4-7/8	8-1/2	9-7/8	2-7/8	10.01

Lead Free

Hot-Tap Saddle - Marine

FKM with Stainless Steel Cutter & Bolts
2"- 4" 235, 6" 200, 8" 150 psi @ 73°F (23°C)



Part Number	Size	G	G1	H	H1	H2	L	L1	M	Approx. Wt. (Lbs.)
CG-HT3S-248C	2X3/4	3-9/16	1	6-3/16	2	1-1/2	2-7/16	3-1/2	2	1.11
CG-HT3S-251C	2X-1-1/2	4-9/16	1-1/4	8-15/16	2-11/16	1-1/2	2-7/16	3-1/2	2-7/8	2.24
CG-HT3S-288C	2-1/2X3/4	3-15/16	1	6-9/16	2	1-3/4	4-1/8	4-1/8	2	2.04
CG-HT3S-291C	2-1/2X1-1/2	4-13/16	1-1/4	9-3/16	2-11/16	1-3/4	4-1/8	4-1/8	2-7/8	2.61
CG-HT3S-334C	3X3/4	4-1/16	1	6-11/16	2	2	3	4-3/4	2	1.38
CG-HT3S-337C	3X1-1/2	5-1/4	1-1/4	9-5/8	2-11/16	2	4-1/8	4-3/4	2-7/8	3.00
CG-HT3S-416C	4X3/4	4-11/16	1	7-5/16	2	2-5/8	3	5-13/16	2	1.77
CG-HT3S-419C	4X1-1/2	5-13/16	1-1/4	10-3/16	2-11/16	2-5/8	4-1/8	5-13/16	2-7/8	3.47
CG-HT3S-524C	6X3/4	6	1	8-5/8	2	3-7/8	3	8-1/8	2	2.61
CG-HT3S-527C	6X1-1/2	7-1/8	1-1/4	11-1/2	2-11/16	3-7/8	4-1/8	8-1/8	2-7/8	4.66
CG-HT3S-574C	8X3/4	7-1/4	1	9-7/8	2	4-7/8	8-1/2	9-7/8	2	9.68
CG-HT3S-577C	8X1-1/2	8-9/16	1-1/4	12-9/16	2-11/16	4-7/8	8-1/2	10-1/8	2-7/8	7.64

Lead Free

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

Triple O-ring Sealed Telescoping Design Available With 6" and 12" Travel



Spears® Marine Expansion Joint allows a telescoping movement of an inner pipe within a firmly mounted outer tube to eliminate such damage. Available for CPVC 1/2" through 12" IPS piping systems in 6" or 12" maximum travel lengths.

Compact Installation - Eliminates Need For Expansion Loops

Telescoping design allows more compact installation than possible with conventional expansion loops and permits rigid mounting between two fixed points.

EPDM or FKM Pressure O-ring Seal with Dual "Wiper" O-ring for Extended Life

Designed for sealing dependability, O-ring pressure seal utilizes two (2) additional "wiper" O-rings to remove dirt and particles that would normally wear joint seals during operation. Long-life Expansion Joint requires no repair or replacement. Choice of either EPDM or FKM O-rings.

Support Piston Eliminates Binding, Minimizes Alignment Problems

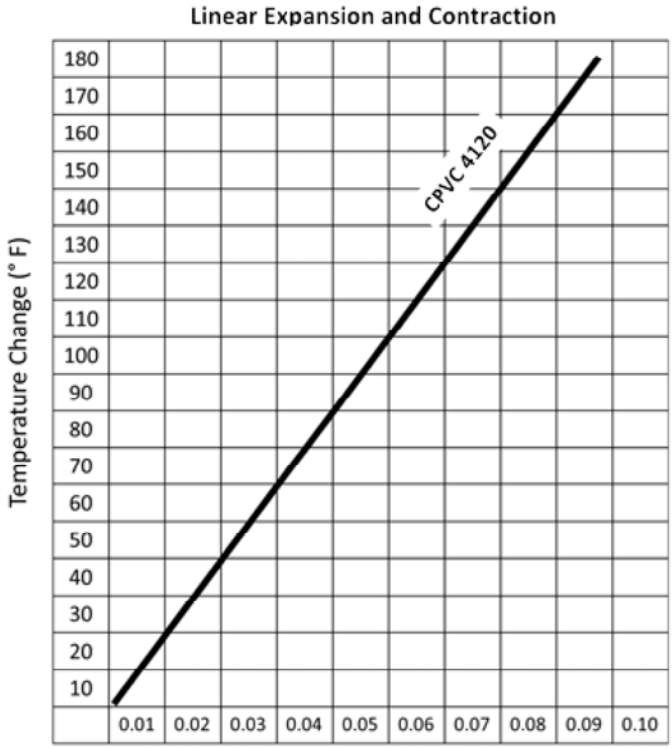
Alignment is critical in use of expansion joints. Specially designed support piston eliminates binding and minimizes alignment problems which can result in cocking or breakage.

Excellent For Use as a Repair Coupling

Simply cut damaged pipe section from line, collapse expansion joint, solvent cement ends and expand halfway to install.

Sample Engineering Specifications

All Marine Expansion Joints shall be telescoping design with triple (3) EPDM or FKM O-ring seals, including center pressure seal and outer debris seals, and internal support piston. Maximum joint travel length shall be either 6" or 12". All Expansion Joints shall be pressure rated according to the manufacturer's specifications [see table] for water at 73°F. All Expansion Joints shall be fabricated from CPVC material conforming to ASTM D 1784. All sockets shall meet the dimensional requirements of ASTM D 2467, as manufactured by Spears® Manufacturing Company. Marine expansion joints in sizes 1/2" through 12" shall be type approved by the American Bureau of Shipping (ABS). Expansion Joints shall be suitable for use with Spears® U.S. Coast Guard approved piping systems.



Coefficient of Thermal Linear Expansion

CPVC 4120 = 3.4×10^{-5} in/in/°F

DETERMINING TRAVEL LENGTH NEEDED

General Rule: For CPVC systems, allow 1/2" expansion for every 10°F change in temperature per 100 feet of pipe, (all diameters). For example, a 6" travel expansion joint will accommodate approximately 120°F temperature change in 100 ft. of CPVC pipe (12 x 1/2" = 6").

INSTALLATION

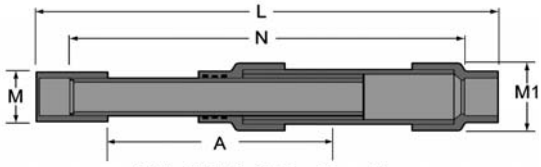
Expansion Joints consist of two telescoping tubes with internal O-ring seals. For proper operation, the outer tube should be firmly anchored to allow free movement of the inner tube or "piston". Support and thrust block the system to direct movement squarely into the Expansion Joint. Alignment is critical, axial guides should be installed to ensure straight movement into expansion joint. Provisions should be made to protect the cylinder shaft from scratches, damage and debris to prevent leaks. Expansion Joints can be installed at the travel range midpoint for most general installations and are shipped from the factory in this position. If desired, the extended position for installation may be additionally adjusted to specific system and installation parameters using the following calculation:

$$P = E\left(\frac{T-A}{T-F}\right)$$

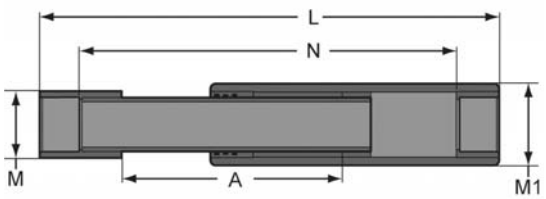
T = Maximum Temperature of Pipe Exposure
A = Temperature of Pipe at time of Installation
F = Minimum Temperature of Pipe Exposure
E = Maximum Expansion Joint Travel (6" or 12")
P = Piston Extension for Installation Position (inches)

Example: A straight run of pipe will operate at temperatures between 60°F and 110°F. Temperature at time of installation is 75°F using a 6" travel Expansion Joint.

$$P = 6\left(\frac{110-75}{110-60}\right) = 4.2 \text{ inches extended at installation.}$$



1/2", 3/4" & 1" Configuration



1-1/4" & Up Configuration

6" EXPANSION JOINT DIMENSION

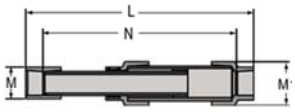
Size	M	M1	L-CLOSED	L-OPEN	N-CLOSED	N-OPEN	Pressure Rating @ 73°F
1/2"	1-3/16	1-3/4	10-9/16	16-9/16	8-13/16	14-13/16	235
3/4"	1-7/16	2-1/8	12	18	10	16	235
1"	1-5/8	2-3/8	12-1/2	18-1/2	10-1/4	16-1/4	235
1-1/4"	2-1/4	2-3/8	13-1/16	19-1/16	10-1/2	16-1/2	235
1-1/2"	2-3/8	2-7/8	13-1/4	19-1/4	10-7/16	16-7/16	235
2"	2-7/8	3-1/2	14-7/16	20-7/16	11-7/16	17-7/16	235
2-1/2"	4-3/16	4-1/2	16-1/4	22-1/4	12-3/4	18-3/4	150
3"	4-3/16	4-1/2	15-5/8	21-5/8	11-13/16	17-13/16	150
4"	5-1/4	5-9/16	16-15/16	22-15/16	12-9/16	18-9/16	150
6"	7-9/16	8-5/8	19-3/4	25-3/4	13-5/8	19-5/8	150
8"	9-11/16	10-3/4	24-1/2	30-1/2	16-9/16	22-9/16	150
10"	12-1/16	12-3/4	28-7/8	34-7/8	18-7/8	24-7/8	150
12"	14-1/4	16	34	40	22	28	150

12" EXPANSION JOINT DIMENSIONS

Size	M	M1	L-CLOSED	L-OPEN	N-CLOSED	N-OPEN	Pressure Rating @ 73°F
1/2"	1-3/16	1-3/4	16-9/16	28-9/16	14-13/16	26-13/16	235
3/4"	1-7/16	2-1/8	18	30	16	28	235
1"	1-5/8	2-3/8	18-1/2	30-1/2	16-1/4	28-1/4	235
1-1/4"	2-1/4	2-3/8	19-1/16	31-1/16	16-1/2	28-1/2	235
1-1/2"	2-3/8	2-7/8	19-1/4	31-1/4	16-7/16	28-7/16	235
2"	2-7/8	3-1/2	20-7/16	32-7/16	17-7/16	29-7/16	235
2-1/2"	4-3/16	4-1/2	22-1/4	34-1/4	18-3/4	30-3/4	150
3"	4-3/16	4-1/2	21-5/8	33-5/8	17-13/16	29-13/16	150
4"	5-1/4	5-9/16	22-15/16	34-15/16	18-9/16	30-9/16	150
6"	7-9/16	8-5/8	25-3/4	37-3/4	19-5/8	31-5/8	150
8"	9-11/16	10-3/4	30-1/2	42-1/2	22-9/16	34-9/16	150
10"	12-1/16	12-3/4	34-7/8	46-7/8	24-7/8	36-7/8	150
12"	14-1/4	16	40	52	28	40	150

Fabricated Expansion Joints - Marine

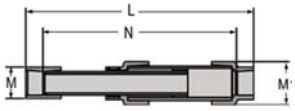
6" Travel with EPDM O-rings
1/2" - 2" 235 psi @ 73°F (23°C) 2-1/2" - 12" 150 psi @ 73°F (23°C)



Part Number	Size	L-Closed	L-Open	M	M1	N-Closed	N-Open	T	Approx. Wt. (Lbs.)
CG-826E-005X6C	1/2	10-9/16	16-9/16	1-3/16	1-3/4	8-13/16	14-13/16	6	.74
CG-826E-007X6C	3/4	12	18	1-7/16	2-1/8	10	16	6	1.04
CG-826E-010X6C	1	12-1/2	18-1/2	1-5/8	2-3/8	10-1/4	16-1/4	6	1.41
CG-826E-012X6C	1 1/4	13-1/16	19-1/16	2-1/4	2-3/8	10-1/2	16-1/2	6	1.79
CG-826E-015X6C	1-1/2	13-1/4	19-1/4	2-3/8	2-7/8	10-7/16	16-7/16	6	2.64
CG-826E-020X6C	2	14-7/16	20-7/16	2-7/8	3-1/2	11-7/16	17-7/16	6	4.05
CG-826E-025X6C	2-1/2	16-1/4	22-1/4	4-3/16	4-1/2	12-3/4	18-3/4	6	6.76
CG-826E-030X6C	3	15-5/8	21-5/8	4-3/16	4-1/2	11-13/16	17-13/16	6	5.90
CG-826E-040X6C	4	16-15/16	22-15/16	5-1/4	5-9/16	12-9/16	18-9/16	6	9.26
CG-826E-060X6C	6	19-3/4	25-3/4	7-9/16	8-5/8	13-5/8	19-5/8	6	32.97
CG-826E-080X6C	8	24-1/2	30-1/2	9-11/16	10-3/4	16-9/16	22-9/16	6	49.85
CG-826E-100X6C	10	28-7/8	34-7/8	12-1/16	12-3/4	18-7/8	24-7/8	6	89.98
CG-826E-120X6C	12	34	40	14-1/4	16	22	28	6	188.77

Fabricated Expansion Joints - Marine

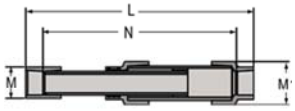
12" Travel with EPDM O-rings
1/2" - 2" 235 psi @ 73°F (23°C) 2-1/2" - 12" 150 psi @ 73°F (23°C)



Part Number	Size	L-Closed	L-Open	M	M1	N-Closed	N-Open	T	Approx. Wt. (Lbs.)
CG-826E-005X12C	1/2	16-9/16	28-9/16	1-3/16	1-3/4	14-13/16	26-13/16	12	1.01
CG-826E-007X12C	3/4	18	30	1-7/16	2-1/8	16	28	12	1.40
CG-826E-010X12C	1	18-1/2	30-1/2	1-5/8	2-3/8	16-1/4	28-1/4	12	1.87
CG-826E-012X12C	1-1/4	19-1/16	31-1/16	2-1/4	2-3/8	16-1/2	28-1/2	12	2.41
CG-826E-015X12C	1-1/2	19-1/4	31-1/4	2-3/8	2-7/8	16-7/16	28-7/16	12	3.17
CG-826E-020X12C	2	20-7/16	32-7/16	2-7/8	3-1/2	17-7/16	29-7/16	12	5.49
CG-826E-025X12C	2-1/2	22-1/4	34-1/4	4-3/16	4-1/2	18-3/4	30-3/4	12	8.66
CG-826E-030X12C	3	21-5/8	33-5/8	4-3/16	4-1/2	17-13/16	29-13/16	12	7.80
CG-826E-040X12C	4	22-15/16	34-15/16	5-1/4	5-9/16	18-9/16	30-9/16	12	11.13
CG-826E-060X12C	6	25-3/4	37-3/4	7-9/16	8-5/8	19-5/8	31-5/8	12	40.14
CG-826E-080X12C	8	30-1/2	42-1/2	9-11/16	10-3/4	22-9/16	34-9/16	12	57.51
CG-826E-100X12C	10	34-7/8	46-7/8	12-1/16	12-3/4	24-7/8	36-7/8	12	105.67
CG-826E-120X12C	12	40	52	14-1/4	16	28	40	12	183.13

Fabricated Expansion Joints - Marine

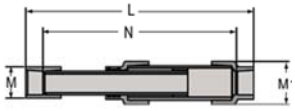
6" Travel with FKM O-rings
1/2" - 2" 235 psi @ 73°F (23°C) 2-1/2" - 12" 150 psi @ 73°F (23°C)



Part Number	Size	L-Closed	L-Open	M	M1	N-Closed	N-Open	T	Approx. Wt. (Lbs.)
CG-826-005X6C	1/2	10-9/16	16-9/16	1-3/16	1-3/4	8-13/16	14-13/16	6	.77
CG-826-007X6C	3/4	12	18	1-7/16	2- 1/8	10	16	6	1.07
CG-826-010X6C	1	12-1/2	18-1/2	1-5/8	2-3/8	10-1/14	16-1/4	6	1.44
CG-826-012X6C	1-1/4	13-1/16	19-1/16	2-1/4	2- 3/8	10-1/2	16-1/2	6	2.44
CG-826-015X6C	1-1/2	13-1/4	19-1/4	2-3/8	2- 7/8	10-7/16	16-7/16	6	2.66
CG-826-020X6C	2	14-7/16	20-7/16	2- 7/8	3- 1/2	11-7/16	17-7/16	6	4.10
CG-826-025X6C	2-1/2	16-1/4	22-1/4	4- 3/16	4- 1/2	12-3/4	18-3/4	6	7.25
CG-826-030X6C	3	15-5/8	21-5/8	4- 3/16	4- 1/2	11-13/16	17-13/16	6	6.37
CG-826-040X6C	4	16-15/16	22-15/16	5-1/4	5- 9/16	12-9/16	18-9/16	6	9.32
CG-826-060X6C	6	19-3/4	25-3/4	7-9/16	8- 5/8	13-5/8	19-5/8	6	33.06
CG-826-080X6C	8	24-1/2	30-1/2	9-11/16	10- 3/4	16-9/16	22-9/16	6	49.97
CG-826-100X6C	10	28-7/8	34-7/8	12-1/16	12- 3/4	18-7/8	24-7/8	6	90.45
CG-826-120X6C	12	34	40	14-1/4	16	22	28	6	188.48

Fabricated Expansion Joints - Marine

12" Travel with FKM O-rings
1/2" - 2" 235 psi @ 73°F (23°C) 2-1/2" - 12" 150 psi @ 73°F (23°C)



Part Number	Size	L-Closed	L-Open	M	M1	N-Closed	N-Open	T	Approx. Wt. (Lbs.)
CG-826-005X12C	1/2	16-9/16	28-9/16	1-3/16	1-3/4	14-13/16	26-13/16	12	1.04
CG-826-007X12C	3/4	18	30	1-7/16	2- 1/8	16	28	12	1.42
CG-826-010X12C	1	18-1/2	30-1/2	1-5/8	2-3/8	16-1/4	28-1/4	12	1.90
CG-826-012X12C	1-1/4	19-1/16	31-1/16	2-1/4	2- 3/8	16-1/2	28-1/2	12	2.44
CG-826-015X12C	1-1/2	19-1/4	31-1/4	2-3/8	2- 7/8	16-7/16	28-7/16	12	3.74
CG-826-020X12C	2	20-7/16	32-7/16	2- 7/8	3- 1/2	17-7/16	29-7/16	12	5.54
CG-826-025X12C	2-1/2	22-1/4	34-1/4	4- 3/16	4- 1/2	18-3/4	30-3/4	12	9.15
CG-826-030X12C	3	21-5/8	33-5/8	4- 3/16	4- 1/2	17-13/16	29-13/16	12	8.27
CG-826-040X12C	4	22-15/16	34-15/16	5-1/4	5- 9/16	18-9/16	30-9/16	12	11.88
CG-826-060X12C	6	25- 3/4	37-3/4	7-9/16	8- 5/8	19-5/8	31-5/8	12	42.17
CG-826-080X12C	8	30-1/2	42-1/2	9-11/16	10- 3/4	22-9/16	34-9/16	12	57.61
CG-826-100X12C	10	34-7/8	46-7/8	12-1/16	12- 3/4	24-7/8	36-7/8	12	106.13
CG-826-120X12C	12	40	52	14-1/4	16	28	40	12	212.61

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

GripLoc™ Marine Coupling

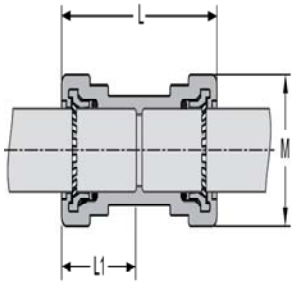


GripLoc™ Marine Coupling

Specially designed stainless steel Gripper Ring to firmly grip pipe and prevent potential pull-out.
Compressed Gland Ring ensures positive O-ring seal against pipe.

GripLoc™ Coupling - Marine

WARNING: DO NOT INSERT FINGERS
EPDM Gasket
Pressure Rated to 235 psi @ 73°F
Do Not Use Solvent Cement.

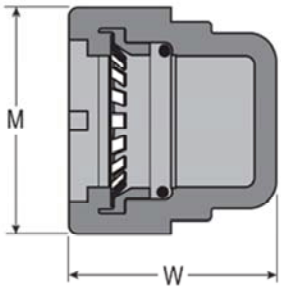


Part Number	Size	L	L1	M	Approx. Wt. (Lbs.)
CG-GL429-005C	1/2	3-27/32	1-27/32	1-5/8	.20
CG-GL429-007C	3/4	4	1-15/16	1-29/32	.27
CG-GL429-010C	1	4-5/32	2	2-1/4	.38
CG-GL429-012C	1-1/4	4-9/32	2-1/16	2-23/32	.51
CG-GL429-015C	1-1/2	4-11/32	2-3/32	3	.60
CG-GL429-020C	2	4-15/32	2-5/32	3-1/2	.89

Gripper is 410 Stainless Steel

GripLoc™ Cap - Marine

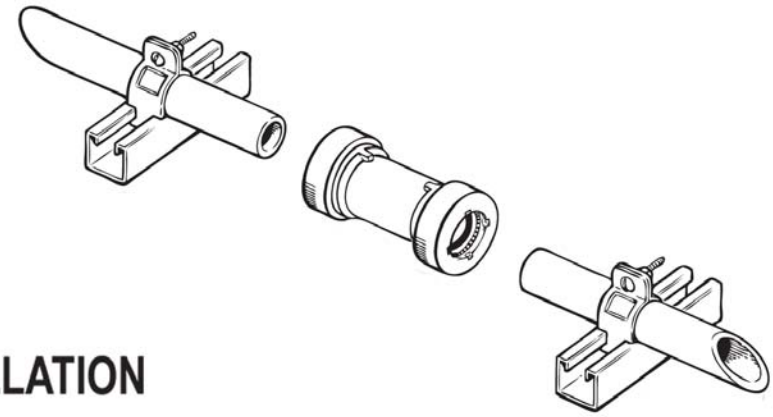
WARNING: DO NOT INSERT FINGERS
EPDM Gasket
Pressure Rated to 235 psi @ 73°F
Do Not Use Solvent Cement.



Part Number	Size	M	W	Approx. Wt. (Lbs.)
CG-GL447-005C	1/2	1-5/8	1-9/16	.11
CG-GL447-007C	3/4	1-29/32	1-11/16	.14
CG-GL447-010C	1	2-5/16	2	.20
CG-GL447-012C	1-1/4	2-3/4	2-3/16	.29
CG-GL447-015C	1-1/2	3	2-5/16	.37
CG-GL447-020C	2	3-9/16	2-7/16	.53

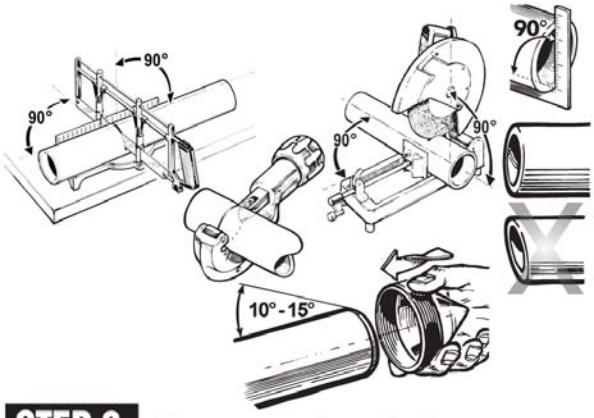
Gripper is 410 Stainless Steel

GripLoc™ Marine Coupling Installation

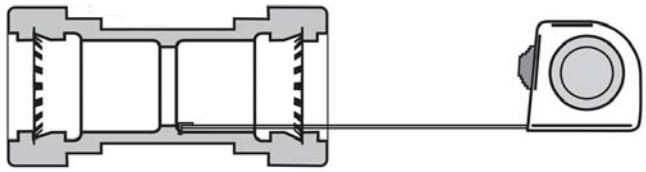


EASY INSTALLATION

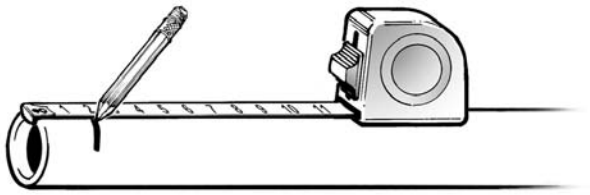
STEP 1 Cut pipe square. Deburr and bevel.



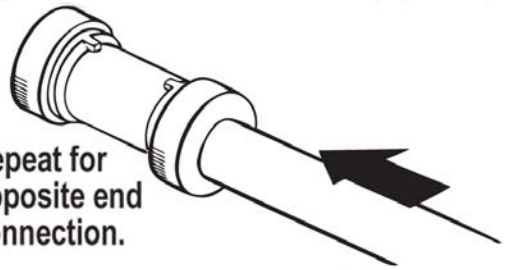
STEP 2 Measure from pipe stop to the end of the coupling.



STEP 3 Measure and mark pipe.



STEP 4 Insert pipe all the way to mark. Pipe should bottom out at the pipe stop.



Repeat for opposite end connection.

WARNING: DO NOT INSERT FINGERS. ENSURE THAT PIPE AND FITTINGS ARE FREE OF DIRT AND DEBRIS PRIOR TO INSTALLATION.

EverTUFF® CPVC Schedule 40 & 80 Marine Pressure System



Features

This multi-featured, space saving quarter-turn shutoff valve is designed to meet the demands of today's marine and chemical processing applications. CPVC marine valves are available in IPS sizes 1/2" through 6", regular thread thru 2" and 8" venturied valve socket ends.

- Chemical & Corrosion Resistant CPVC Construction
- Interchangeable with all True Union 2000 Valves Mates with Union 2000 Pipe Unions
- High Impact Polypropylene Handle
- Built-in Handle Lockout
- Schedule 80 Full-Port Design
- Strong, Buttress Thread Union Nuts
- Spears® Double O-ring Safe-T-Shear® Stem Design
- EPDM or FKM O-rings
- Spears® Safe-T-Blocked® Seal Carrier
- Self Adjusting PTFE Floating Seat Design
- Fully Serviceable, Replaceable Components
- Sizes 1/2"-4" Pressure Rated to 235 psi @ 73°F. Sizes 6" and 8" Venturied and all Flanged to 150 psi @ 73°F.
- EPDM Valves NSF® Certified for Potable Water use
- Assembled with Silicone-Free, Water Soluble Lubricants
- Manufactured to ASTM F 1970

Sample Engineering Specification

All thermoplastic 2000 marine ball valves shall be True Union 2000 manufactured to ASTM F 1970 and constructed from CPVC Type IV, ASTM D 1784 Cell Classification 23447 per ASTM D 1784. All O-rings shall be EPDM or FKM. All valves shall have Safe-T-Shear® stem with double O-ring stem seals. All valve handles shall be polypropylene with built-in lockout mechanism. All valve union nuts shall have Buttress threads. All seal carriers shall be Safe-T-Blocked®. All valve components shall be replaceable. All valves with EPDM elastomers shall be certified by NSF International for use in potable water service. All 1/2" through 4" valves shall be pressure rated to 235 psi, with a Limited Lifetime Warranty as manufactured by Spears® Manufacturing Company. CPVC marine ball valves in sizes 1/2" thru 4" shall be type approved by the American Bureau of Shipping (ABS). CPVC marine ball values in sizes 1/2" thur 8" are suitable for use with Spears® U.S. Coast Guard Approved piping systems.

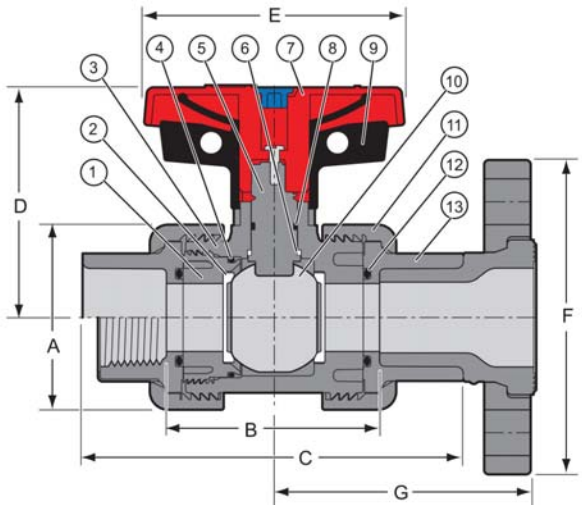
Quick-View Valve Selection Chart

Valve Size	O-ring Material	CPVC Part Number		Pressure Rating
		Socket	Threaded	
1/2	EPDM	CG-1829-005C	included	235 psi Non-Shock Water @ 73°F
	FKM	CG-1839-005C	included	
3/4	EPDM	CG-1829-007C	included	
	FKM	CG-1839-007C	included	
1	EPDM	CG-1829-010C	included	
	FKM	CG-1839-010C	included	
1-1/4	EPDM	CG-1829-012C	included	
	FKM	CG-1839-012C	included	
1-1/2	EPDM	CG-1829-015C	included	
	FKM	CG-1839-015C	included	
2	EPDM	CG-1829-020C	included	(Flanged 150 psi Non-Shock) Water @ 73°F
	FKM	CG-1839-020C	included	
2-1/2	EPDM	CG-1822-025C	N/A	
	FKM	CG-1832-025C	N/A	
3	EPDM	CG-1822-030C	N/A	
	FKM	CG-1832-030C	N/A	
4	EPDM	CG-1822-040C	N/A	
	FKM	CG-1832-040C	N/A	
6	EPDM	CG-1822-060C	N/A	150 psi Non-Shock Water @ 73°F
	FKM	CG-1832-060C	N/A	
8[1]	EPDM	CG-1822-080C	N/A;	
	FKM	CG-1832-080C	N/A	

1) Venturied Valves are 6" ball valves fitted with 6x8 end connector adapters.

Optional Accessories

- Retro-Fit End Connector Sets for Valve Replacement
- Split-Nut Repair Kits for Union Nut Replacement
- Supplemental End Connectors
- Round Safety Handles
- Handle Lockout Ring
- Stem Extension Kits
- Square Operator Nuts
- Multi Mount Valve/Actuation Mounting Kits
- Mini-Mount Actuation Mounting Kits



Replacement Parts

No.	Component	Qty.	Material
1	Seal Carrier	1	CPVC
2	Seat	2	PTFE
3	Body	1	CPVC
4	Carrier O-ring	1	EPDM/FKM
5	Stem	1	CPVC
6	Stem Bearing	1	PP
7	Handle	1	PP
8	Stem O-ring	2	EPDM/FKM
9	Handle Lock	1	PP
10	Ball	1	CPVC
11	Union Nut	2	CPVC
12	End Connector O-ring	2	EPDM/FKM
13	End Connector	2	CPVC

1: An additional O-ring is used behind each seat on 2-1/2" or larger.

Dimensions, Weights, Operating Torque & C_v Values

Nominal Size	Dimensions Reference (inches, ± 1/16)							Approx. Wt. (Lbs.)	Oper. Torque[2] (in. lbs.)	C_v [3] Values
	A	B[1] Soc/Thd	C Socket	D	E	F	G	CPVC		Soc/Thdx
1/2	1-7/8	2-3/8	4-3/16	2-9/16	2-13/16	3-1/2	2-31/32	.38	16	29
3/4	2-1/4	2-3/4	4-3/4	2-7/8	3-3/8	3-7/8	3-5/16	.58	17	63
1	2-1/2	2-7/8	5-1/8	3-1/8	3-7/16	4-1/2	3-5/8	.77	22	120
1-1/4	3-1/16	3-1/4	5-3/4	3-5/8	3-7/8	4-5/8	3-31/32	1.19	28	243
1-1/2	3-1/2	3-1/2	6-1/4	4	4-3/16	5	4-3/8	1.60	61	357
2	4-5/16	4-25/32	7-3/4	4-1/2	5-3/32	6	5-1/4	2.85	77	599
2-1/2	5-3/8	6-31/32	10-7/16	5-1/8	6-1/4	7-1/2	6	7.70	132	856
3	6-3/16	7	10-11/16	5-7/8	7-5/8	7-1/2	6-13/16	7.81	132	1416
4	7-3/4	7-5/16	11-7/8	6-3/4	9	9	7-1/2	12.48	396	2865
6	11-5/8	11-1/16	17-1/16	8-1/8	14-5/16	11-1/4	10-3/16	40.55	732	6638
8[4]	11-5/8	23-3/16	31-7/8	8-1/8	14-5/16	13-1/2	17-13/16	55.92	732	N/A

1: Valve Lay Length

2: Torque required at valve maximum internal pressure rating, 5ft/sec. Flow velocity; due to adjustment differences during installation, actual values may vary.

3: Gallons per minute at 1 psi pressure drop. Valves calculated from laying length, based on derivative of Hazen-Williams equation with surface roughness factor of C=150.

4: Venturied Valves are 6" ball valves fitted with 6x8 end connector adapters.

Temperature Pressure Rating

System Operating Temperature °F (°C)			100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)	200 (93)	210 (99)
Valve Pressure Rating psi (MPa)	1/2" - 4"	CPVC	235 (1.62)	219 (1.51)	170 (1.17)	145 (1.00)	130 (.90)	110 (.76)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)	-0- (-0-)
	6" - 8"		150 (1.03)	140 (.97)	130 (.90)	120 (.83)	110 (.76)	100 (.70)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)	-0- (-0-)

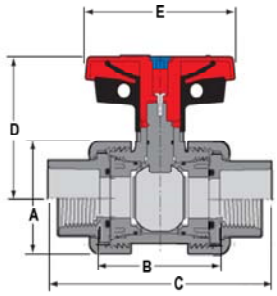
1/2" - 4" ABS Approved

1/2" - 8" U.S. Coast Guard Applications

NOTE: Flanged Valves have a base pressure rating of 150 psi.

True Union 2000 Industrial Ball Valves - EPDM - Marine

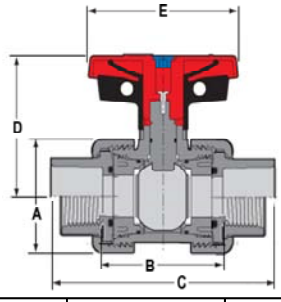
Socket



Part Number	Size	A	B	C	D	E	Cv Values	Approx. Wt. (Lbs.)
CG-1829-005C	1/2	1- 7/8	2- 3/8	4- 3/16	2- 9/16	2-13/16	29	.48
CG-1829-007C	3/4	2- 1/4	2- 3/4	4- 3/4	2- 7/8	3- 5/16	63	.72
CG-1829-010C	1	2-1/2	2- 7/8	5- 7/32	3- 1/8	3- 7/16	120	1.00
CG-1829-012C	1-1/4	3- 1/16	3- 1/4	5-13/16	3- 5/8	3-13/16	243	1.48
CG-1829-015C	1-1/2	3- 1/2	3- 1/2	6- 1/4	4	4- 3/16	357	1.96
CG-1829-020C	2	4-5/16	4-11/16	7- 3/4	4- 1/2	5- 1/8	599	3.38
CG-1822-025C	2-1/2	6- 3/16	6-31/32	10- 9/16	5- 7/8	7- 5/8	856	8.51
CG-1822-030C	3	6- 3/16	6- 7/8	10-11/16	5- 7/8	7- 5/8	1416	8.34
CG-1822-040C	4	7- 3/4	7- 1/2	12	6- 3/4	9- 3/16	2865	14.46
CG-1822-060C	6	11- 5/8	11- 9/32	17- 1/8	8- 1/8	14- 5/16	6638	41.34
CG-1822-080C	8	11-5/8	23-3/16	31-7/8	8-1/8	14-5/16	6638	53.45

True Union 2000 Industrial Ball Valves - FKM - Marine

Socket



Part Number	Size	A	B	C	D	E	Cv Values	Approx. Wt. (Lbs.)
CG-1839-005C	1/2	1- 7/8	2-31/32	5- 7/32	2- 9/16	2-13/16	29	.48
CG-1839-007C	3/4	2- 1/4	2- 3/4	4- 3/4	2- 7/8	3- 5/16	63	.72
CG-1839-010C	1	2- 1/2	2- 7/8	5- 1/8	3- 1/8	3- 7/16	120	1.00
CG-1839-012C	1-1/4	3- 1/16	3- 1/4	5-13/16	3- 5/8	3-13/16	243	1.48
CG-1839-015C	1-1/2	3- 1/2	3- 1/2	6- 1/4	4	4- 3/16	357	1.98
CG-1839-020C	2	4-5/16	4-11/16	7- 3/4	4- 1/2	5- 1/8	599	3.40
CG-1832-025C	2-1/2	6- 3/16	6-31/32	10- 9/16	5- 7/8	7- 5/8	856	8.56
CG-1832-030C	3	6- 3/16	6- 7/8	10-11/16	5- 7/8	7- 5/8	1416	8.39
CG-1832-040C	4	7- 3/4	7- 1/2	12	6- 3/4	9- 3/16	2865	14.52
CG-1832-060C	6	11- 5/8	11- 9/32	17- 1/8	8- 1/8	14- 5/16	6638	41.48
CG-1832-080C	8	11-5/8	23-3/16	31-7/8	8-1/8	14-5/16	6638	53.60

EverTUFF® CPVC Schedule 40 & 80 Marine Pressure System



Features

Economical, low profile quarter-turn shutoff valve is excellent for marine and many O.E.M applications. CPVC valves are available in IPS sizes 1/2" through 4".

- New Actuator-Ready Body — Accepts Spears® Improved Mini-Mount Actuator Mounting Kits
- New Double O-ring Stem Seal
- Schedule 80 Full-Port Design
- Spears® Safe-T-Shear Stem
- PTFE/HDPE Self Adjusting Floating Seats
- EPDM or FKM O-ring Seals
- Sizes 1/2" - 2" Pressure Rated to 235 psi @ 73°F. Sizes 2-1/2" - 4" and all Flanged to 150 psi @ 73°F.
- EPDM valves NSF® Certified for Use with Potable Water
- Manufactured to ASTM F 1970

Sample Engineering Specification

All thermoplastic Standard marine ball valves shall be True Union 2000 series manufactured to ASTM F 1970 and constructed from CPVC Type IV, ASTM D1784 Cell Classification 23447 per ASTM D1784. All O- rings shall be EPDM or FKM. All valves shall have Safe-T-Shear® stem with double O-ring stem seals. All valve handles shall be polypropylene. All valve union nuts shall have Buttress threads. All seal carriers shall be Safe-T- Blocked®. All valve components shall be replaceable. All valves with EPDM elastomers shall be certified by NSF International for use in potable water service. Valves 1/2" through 2" shall be pressure rated to 235 psi, 2-1/2" through 4" and all flanged valves shall be pressure rated to 150psi @ 73°F. with a Limited Lifetime Warranty as manufactured by Spears® Manufacturing Company. All CPVC Standard Marine Ball Valves 1/2" through 4" shall be type approved by the American Bureau of Shipping (ABS) and suitable for use with Spears® U.S. Coast Guard Approved piping systems.

Optional Accessories

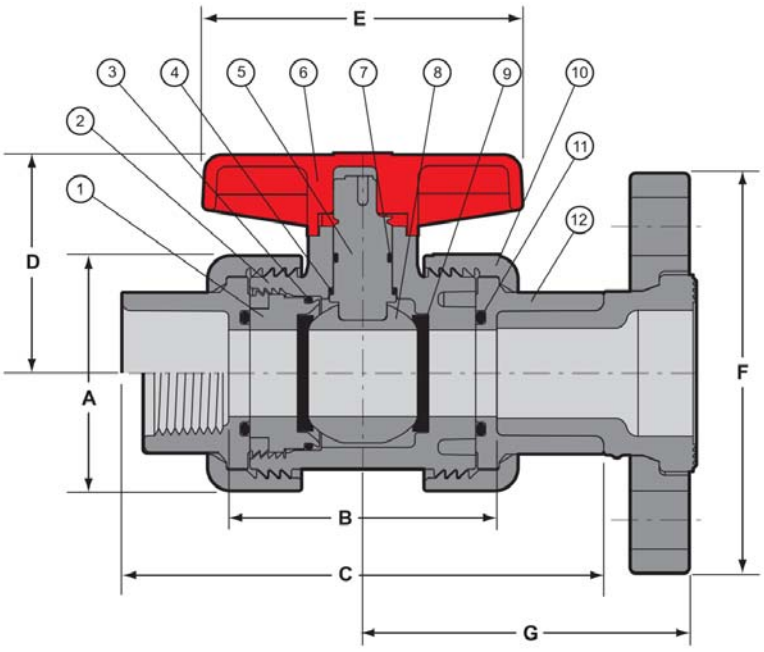
- Round Safety Handles
- Stem Extension Kits
- Square Operator Nuts
- Multi Mount Valve/Actuation Mounting Kits
- Mini-Mount Actuation Mounting Kits

Quick-View Valve Selection Chart

Valve Size	O-ring Material	CPVC Part Number		Pressure Rating
		Socket	Threaded	
1/2	EPDM	CG-3629-005C	Included	235 psi Non-Shock Water @73°F (Flanged 150 psi Non-Shock) Water @73°F
	FKM	CG-3639-005C	Included	
3/4	EPDM	CG-3629-007C	Included	
	FKM	CG-3639-007C	Included	
1	EPDM	CG-3629-010C	Included	
	FKM	CG-3639-010C	Included	
1-1/4	EPDM	CG-3629-012C	Included	
	FKM	CG-3639-012C	Included	
1-1/2	EPDM	CG-3629-015C	Included	
	FKM	CG-3639-015C	Included	
2	EPDM	CG-3629-020C	Included	
	FKM	CG-3639-020C	Included	
2-1/2	EPDM	CG-3622-025C	N/A	
	FKM	CG-3632-025C	N/A	
3	EPDM	CG-3622-030C	N/A	
	FKM	CG-3632-030C	N/A	
4	EPDM	CG-3622-040C	N/A	
	FKM	CG-3632-040C	N/A	

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas

See Spears® Product Sourcebook for product offerings



Replacement Parts

No.	Component	Qty.	Material
1	Seal Carrier	1	CPVC
2	Body	1	CPVC
3	Carrier O-ring	1	EPDM/FKM
4	Stem Bearing [1,2]	1	PP
5	Stem	1	CPVC
6	Handle	1	PP
7	Stem O-ring	1	EPDM/FKM
8	Ball	1	CPVC
9	Seat	2	PTFE/HDPE
10	Union Nut	2	CPVC
11	End Connector O-ring	2	EPDM/FKM
12	End Connector	2	CPVC

1: O-Ring up to 2"
2: PTFE Thrust Bearing: 2-1/2", 3" & 4"
3: An additional O-ring is used behind each seat on 2-1/2" or larger.

Dimensions, Weights, Operating Torque & C_v Values

Nominal Size	Dimensions Reference (inches, ± 1/16)							Approx. Wt. (Lbs.)	Oper. Torque[2] (in. lbs.)	C_v [3] Values
	A	B[1] Soc/Thd	C Socket	D	E	F	G	CPVC		Soc/Thdx
1/2	1-7/8	2-7/16	4-3/16	1-5/8	2-1/2	3-1/2	2-31/32	.35	12	29
3/4	2-1/4	2-3/4	4-3/4	2	3	3-7/8	3-5/16	.54	20	63
1	2-1/2	2-7/8	5-1/8	2-5/16	3-7/16	4-1/4	3-5/8	.75	25	120
1-1/4	3-1/16	3-1/4	5-3/4	2-13/16	3-9/16	4-5/8	3-31/32	1.17	35	243
1-1/2	3-1/2	3-1/2	6-1/4	3-1/16	3-7/8	5	4-3/8	1.53	45	357
2	4-1/4	4-3/4	7-3/4	3-3/4	5	6	5-1/4	2.75	94	599
2-1/2	6-3/16	7-1/8	10-5/8	5-1/2	7-5/8	7	6-9/16	7.70	120	856
3	6-3/16	7-5/32	10-15/16	5-1/2	7-5/8	7-1/2	6-7/8	7.81	120	1416
4	7-3/4	7-13/32	11-15/16	6-1/8	9	9-1/16	7-1/2	12.48	336	2865

1: Valve Lay Length
2: Torque required at valve maximum internal pressure rating, 5ft/sec. flow velocity; due to adjustment differences during installation, actual values may vary.
3: Gallons per minute at 1 psi pressure drop. Valves calculated from laying length, based on derivative of Hazen-Williams equation with surface roughness factor of C=150.

Temperature Pressure Rating

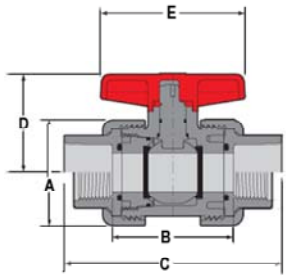
System Operating Temperature °F (°C)			100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)	200 (93)	210 (99)
Valve Pressure Rating psi (MPa)	1/2" - 4"	CPVC	235 (1.62)	219 (1.51)	170 (1.17)	145 (1.00)	130 (.90)	110 (.76)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)	-0- (-0-)
			150 (1.03)	140 (.97)	130 (.90)	120 (.83)	110 (.76)	100 (.70)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)	-0- (-0-)

1/2" - 4" ABS Approved
1/2" - 8" U.S. Coast Guard Applications

NOTE: Flanged Valves have a base pressure rating of 150 psi.

True Union 2000 Standard Ball Valves - EPDM - Marine

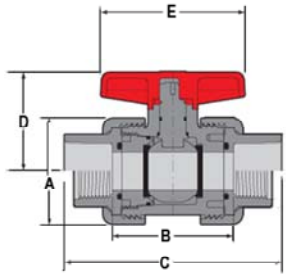
Socket



Part Number	Size	A	B	C	D	E	Cv Values	Approx. Wt. (Lbs.)
CG-3629-005C	1/2	1- 7/8	2- 7/16	4- 3/16	1- 5/8	2- 1/2	29	.45
CG-3629-007C	3/4	2- 9/32	2-13/16	4-13/16	1-31/32	2-31/32	63	.68
CG-3629-010C	1	2-5/8	2- 7/8	5- 1/8	2- 5/16	3-3/8	120	.96
CG-3629-012C	1-1/4	3- 1/16	3- 1/4	5- 3/4	2-13/16	3- 9/16	243	1.43
CG-3629-015C	1-1/2	3- 1/2	3- 1/2	6- 1/4	3- 1/16	3- 7/8	357	1.89
CG-3629-020C	2	4- 5/16	4- 7/8	7- 7/8	3-15/16	4-15/16	599	3.28
CG-3622-025C	2-1/2	6- 3/16	6- 7/8	10- 7/16	5- 7/8	7- 5/8	856	8.38
CG-3622-030C	3	6- 3/16	7	10-11/16	5- 7/8	7- 5/8	1416	8.17
CG-3622-040C	4	7- 5/8	7- 5/16	11- 7/8	6- 3/4	8- 3/8	2865	14.17

True Union 2000 Standard Ball Valves - FKM - Marine

Socket



Part Number	Size	A	B	C	D	E	Cv Values	Approx. Wt. (Lbs.)
CG-3639-005C	1/2	1- 7/8	2- 7/16	4- 3/16	1- 5/8	2- 1/2	29	.45
CG-3639-007C	3/4	2- 9/32	2-13/16	4-13/16	1-31/32	2-31/32	63	.68
CG-3639-010C	1	2-5/8	2- 7/8	5- 1/8	2- 5/16	3-3/8	120	.96
CG-3639-012C	1-1/4	3- 1/16	3- 1/4	5- 3/4	2-13/16	3- 9/16	243	1.44
CG-3639-015C	1-1/2	3- 1/2	3- 1/2	6- 1/4	3- 1/16	3- 7/8	357	1.91
CG-3639-020C	2	4- 5/16	4- 7/8	7- 7/8	3-15/16	4-15/16	599	3.30
CG-3632-025C	2-1/2	6- 3/16	6- 7/8	10- 7/16	5- 7/8	7- 5/8	856	8.42
CG-3632-030C	3	6- 3/16	7	10-11/16	5- 7/8	7- 5/8	1416	8.21
CG-3632-040C	4	7- 5/8	7- 5/16	11- 7/8	6- 3/4	8- 3/8	2865	14.23

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas

See Spears® Product Sourcebook for product offerings





Versatile design provides multiple port and configuration options for controlling flow distribution in marine applications. Choose Vertical 3-Way (L-Port Diverter) or Horizontal T-Port configurations with open branch (no shutoff) design. Valves are available in IPS sizes 1/2" through 4" with socket end connectors. Venturied 6" (4" valves with 4 x 6 reducers) with socket end connections.

- Chemical & Corrosion Resistant CPVC Construction
- Vertical 3-Way or Horizontal Diverter Design (no branch shutoff)
- L-Port, & T-Port Ball Configuration Options
- Interchangeable with all True Union 2000 Valves, Mates with Union 2000 Pipe Unions
- High Impact Polypropylene Handle
- Built-in Handle Lockout
- Strong, Buttress Thread Union Nuts
- Spears® Double O-ring Safe-T-Shear® Stem Design
- EPDM or FKM O-rings
- Spears® Safe-T-Blocked® Seal Carrier
- Self Adjusting PTFE Floating Seat Design
- Fully Serviceable, Replaceable Components
- Sizes 1/2" - 2" pressure rated to 235 psi @ 73°F Sizes 2-1/2" - 4" and all Flanged to 150 psi @ 73°F
- EPDM Valves NSF® Certified for Potable Water use
- Assembled with Silicone-Free, Water Soluble Lubricants
- Manufactured to ASTM F 1970

Sample Engineering Specification

All thermoplastic marine ball valves shall be True Union 2000 3-Way specify horizontal or vertical type with specify port option manufactured to ASTM F 1970 and constructed from CPVC Type IV, ASTM D 1784 Cell Classification 23447. All O-rings shall be EPDM or FKM. All valves shall have Safe-T-Shear® stem with double O-ring stem seals. All valve handles shall be polypropylene with built-in lockout mechanism. All valve union nuts shall have Buttress threads. All seal carriers shall be Safe-T-Blocked®. All valve components shall be replaceable. All valves with EPDM elastomers shall be certified by NSF International for use in potable water service. All CPVC 1/2" through 2" valves shall be pressure rated to 235 psi, all 2-1/2" through 4" valves and all flanged valves shall be pressure rated to 150 psi for water at 73°F as manufactured by Spears® Manufacturing Company. Ball Valves shall be suitable for use with Spears® U.S. Coast Guard Approved piping systems only.

Quick-View Valve Selection Chart
3-Way Vertical Ball Valve

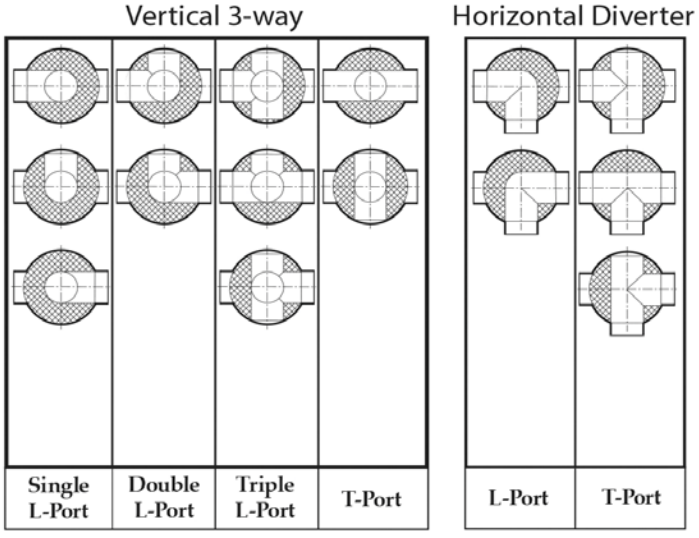
Valve Size	O-ring Material	PVC Part Number Socket	Pressure Rating
1/2	EPDM	CG-4722L1-005C	235 psi Non-Shock Water @ 73°F
	FKM	CG-4732L1-005C	
3/4	EPDM	CG-4722L1-007C	
	FKM	CG-4732L1-007C	
1	EPDM	CG-4722L1-010C	
	FKM	CG-4732L1-010C	
1-1/4	EPDM	CG-4722L1-012C	
	FKM	CG-4732L1-012C	
1-1/2	EPDM	CG-4722L1-015C	
	FKM	CG-4732L1-015C	
2	EPDM	CG-4722L1-020C	
	FKM	CG-4732L1-020C	
2-1/2	EPDM	CG-4722L1-025C	150 psi Non-Shock Water @ 73°F
	FKM	CG-4732L1-025C	
3	EPDM	CG-4722L1-030C	
	FKM	CG-4732L1-030C	
4	EPDM	CG-4722L1-040C	
	FKM	CG-4732L1-040C	

Quick-View Valve Selection Chart
3-Way Horizontal Diverter Valve (no branch shutoff)

Valve Size	O-ring Material	CPVC Part Number Socket	Pressure Rating
1/2	EPDM	CG-5022L1-005C	235 psi Non-Shock Water @ 73°F
	FKM	CG-5032L1-005C	
3/4	EPDM	CG-5022L1-007C	
	FKM	CG-5032L1-007C	
1	EPDM	CG-5022L1-010C	
	FKM	CG-5032L1-010C	
1-1/4	EPDM	CG-5022L1-012C	
	FKM	CG-5032L1-012C	
1-1/2	EPDM	CG-5022L1-015C	
	FKM	CG-5032L1-015C	
2	EPDM	CG-5022L1-020C	
	FKM	CG-5032L1-020C	
2-1/2	EPDM	CG-5022L1-025C	150 psi Non-Shock Water @ 73°F
	FKM	CG-5032L1-025C	
3	EPDM	CG-5022L1-030C	
	FKM	CG-5032L1-030C	
4	EPDM	CG-5022L1-040C	
	FKM	CG-5032L1-040C	

3-Way Port Options

Diverter Valves have no shut-off on branch.



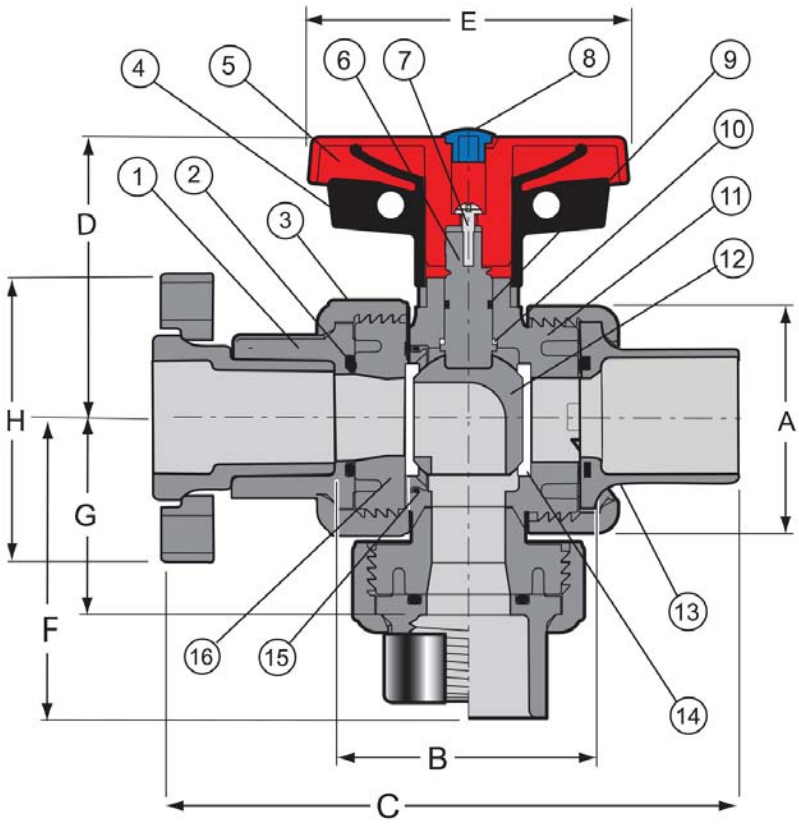
Ball Port Options viewed from top of valve.

Optional Accessories*

- Retro-Fit End Connector Sets for Valve Replacement
- Split-Nut Repair Kits for Union Nut Replacement
- Supplemental End Connectors
- Stem Extension Kits
- Square Operator Nuts
- Multi Mount Valve/Actuation Mounting Kits

* See ***"BALL VALVE ACCESSORIES"*** section for details of individual products.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings



Replacement Parts

No.	Component	Qty.	Material
1	End Connector	3	CPVC
2	End Connector O-ring	3	EPDM/FKM
3	Union Nut	3	CPVC
4	Handle Lock	1	PP
5	Handle	1	PP
6	Stem	1	CPVC
7	Screw	1	Stainless Steel
8	Handle Cover	1	PP
9	Stem O-ring	2	EPDM/FKM
10	Stem Bearing*	1	PTFE
11	Body	1	CPVC
12	Ball	1	CPVC
13	End Connector Collar	3	Stainless Steel
14	Seat	2	PTFE
15	Carrier O-ring	1	EPDM/FKM
16	Seal Carrier	1	CPVC

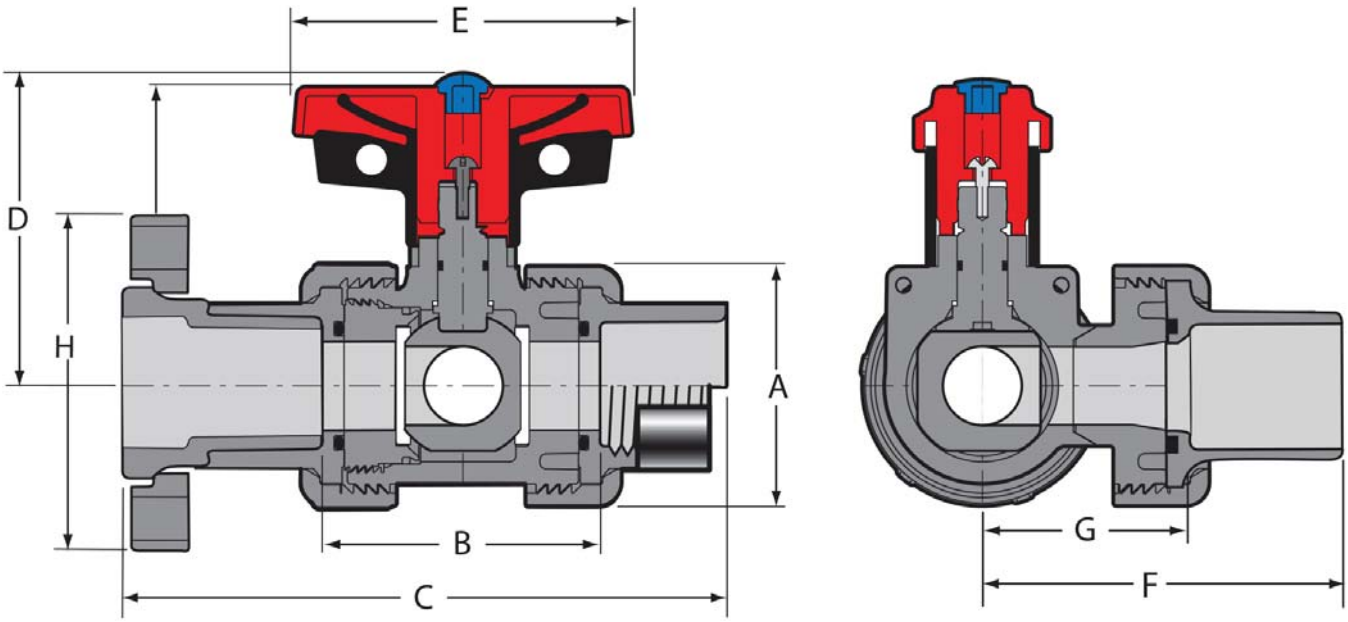
Note: Applies to both Vertical and Horizontal configurations.
* For sizes 2-1/2, 3 & 4 only.

NOTE: Diverter style valve has no shutoff on branch.

Vertical 3-Way Ball Valves — Dimensions & Operating Torque

Dimensions Reference (Inches,± 1/16)								Oper. Torque[2] (in. lbs.)	Approx. Wt. (lbs.) CPVC
Nominal Size	A	B[1] Socket	C Socket	D	E	F	G		
1/2	1-7/8	2-7/16	4-1/4	2-9/16	2-13/16	2-9/16	1-11/16	12	0.54
3/4	2-1/4	2-3/4	4-3/4	2-7/8	3-5/16	3	2	12	0.83
1	2-1/2	2-7/8	5-1/8	3-1/8	3-7/16	3-1/4	2-1/8	20	1.12
1-1/4	3-1/16	3-1/4	5-3/4	3-5/8	3-13/16	3-3/4	2-3/8	25	1.72
1-1/2	3-1/2	3-1/2	6-5/16	4	4-3/16	4-3/16	2-13/16	40	2.30
2	4-1/4	4-3/4	7-3/4	4-1/2	5-1/8	5	3-1/2	67	4.02
2-1/2	5-3/8	5-7/8	9-5/16	5-1/8	6-1/4	5-7/8	4-1/8	120	9.92
3	6-3/16	6-7/8	10-11/16	5-7/8	7-5/8	6-11/16	4-3/4	120	10.11
4	7-1/2	7-1/4	11-13/16	6-3/4	9-3/16	7-1/8	5-7/8	336	21.72

1: Valve Lay Length
2: Torque required at valve maximum internal pressure rating, 5ft/sec. Flow velocity; due to adjustment differences during installation, actual values may vary.



NOTE: Diverter style valve has no shutoff on branch

Horizontal Diverter 3-Way Ball Valves Dimensions & Operating Torque

Dimensions Reference (Inches,± 1/16)								Oper. Torque[2] (in. lbs.)	Approx. Wt. (lbs.) CPVC
Nominal Size	A	B[1] Socket	C Socket	D	E	F	G		
1/2	1-3/16	2-7/16	4-3/16	2-9/16	2-13/16	2-9/16	1-11/16	12	0.55
3/4	2-1/4	2-3/4	4-3/4	2-7/8	3-5/16	3	2	12	0.84
1	2-1/2	2-7/8	5-1/8	3-1/8	3-7/16	3-1/4	2-1/8	20	1.11
1-1/4	3-1/16	3-1/4	5-3/4	3-5/8	3-13/16	3-3/4	2-3/8	25	1.72
1-1/2	3-1/2	3-1/2	6-5/16	4	4-3/16	4-3/16	2-13/16	40	2.24
2	4-1/4	4-3/4	7-3/4	4-1/2	5-1/8	5	3-1/2	67	4.04
2-1/2	5-3/8	5-7/8	9-5/16	5-1/8	6-1/4	5-7/8	4-1/8	120	9.84
3	6-3/16	6-7/8	10-11/16	5-7/8	7-5/8	6-11/16	4-3/4	120	10.03
4	7-1/2	7-1/4	11-13/16	6-3/4	9-3/16	7-1/8	5-7/8	336	17.71

1: Valve Lay Length
2: Torque required at valve maximum internal pressure rating, 5ft/sec. Flow velocity; due to adjustment differences during installation, actual values may vary.

Temperature Pressure Rating

System Operating Temperature °F (°C)			100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)	200 (93)	210 (99)
Valve Pressure Rating psi (MPa)	1/2" - 2"	CPVC	235 (1.62)	219 (1.51)	170 (1.17)	145 (1.00)	130 (.90)	110 (.76)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)	-0- (-0-)
	2-1/2" - 4"	CPVC	150 (1.03)	140 (.97)	130 (.90)	120 (.83)	110 (.76)	100 (.70)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)	-0- (-0-)

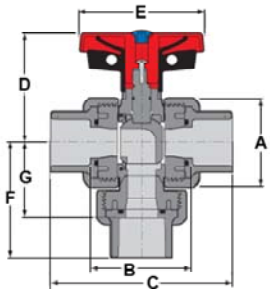
1/2" - 4" U.S. Coast Guard Applications

Note: Flanged Valves have a base pressure rating of 150 psi.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

True Union 2000 Vertical 3-Way Ball Valves - L-Port - EPDM - Marine

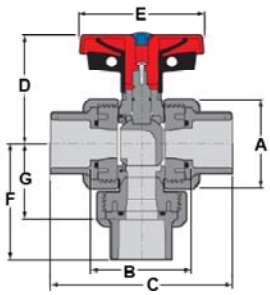
Socket



Part Number	Size	A	B	C	D	E	F	G	Approx. Wt. (Lbs.)
CG-4722L1-005C	1/2	1- 7/8	2- 7/16	4- 3/16	2- 9/16	2-13/16	2- 9/16	1-11/16	.54
CG-4722L1-007C	3/4	2- 1/4	2- 3/4	4- 3/4	2- 7/8	3- 5/16	3	2	.83
CG-4722L1-010C	1	2- 9/16	2- 7/8	5- 1/8	3- 1/8	3- 7/16	3- 1/4	2- 1/8	1.12
CG-4722L1-012C	1-1/4	3- 1/16	3- 1/4	5- 3/4	3- 5/8	3-13/16	3- 3/4	2- 3/8	1.72
CG-4722L1-015C	1-1/2	3- 1/2	3- 1/2	6- 1/4	4	4- 3/16	4- 3/16	2- 9/16	2.32
CG-4722L1-020C	2	4- 1/4	4- 3/4	7- 3/4	4- 1/2	5- 1/8	5	3- 1/2	4.02
CG-4722L1-025C	2-1/2	5- 3/8	5- 7/8	9- 5/16	5- 1/8	6- 1/4	5- 7/8	4- 3/8	9.92
CG-4722L1-030C	3	6- 3/16	6- 7/8	10-11/16	5- 7/8	7- 5/8	6-11/16	4- 7/8	10.11
CG-4722L1-040C	4	7- 1/2	7- 1/4	11-13/16	6- 3/4	9- 3/16	7- 1/8	5- 7/8	21.72

True Union 2000 Vertical 3-Way Ball Valves - L-Port - FKM - Marine

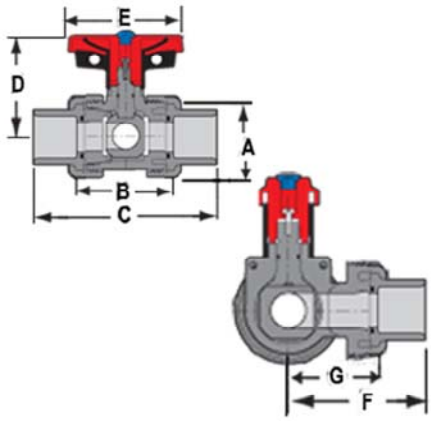
Socket



Part Number	Size	A	B	C	D	E	F	G	Approx. Wt. (Lbs.)
CG-4732L1-005C	1/2	1- 7/8	2- 7/16	4- 3/16	2- 9/16	2-13/16	2- 9/16	1-11/16	.53
CG-4732L1-007C	3/4	2- 1/4	2- 3/4	4- 3/4	2- 7/8	3- 5/16	3	2	.83
CG-4732L1-010C	1	2- 9/16	2- 7/8	5- 1/8	3- 1/8	3- 7/16	3- 1/4	2- 1/8	1.12
CG-4732L1-015C	1-1/2	3- 1/2	3- 1/2	6- 1/4	4	4- 3/16	4- 3/16	2- 9/16	2.34
CG-4732L1-012C	1-1/4	3- 1/16	3- 1/4	5- 3/4	3- 5/8	3-13/16	3- 3/4	2- 3/8	1.73
CG-4732L1-020C	2	4- 1/4	4- 3/4	7- 3/4	4- 1/2	5- 1/8	5	3- 1/2	4.04
CG-4732L1-025C	2-1/2	5- 3/8	5- 7/8	9- 5/16	5- 1/8	6- 1/4	5- 7/8	4- 3/8	9.98
CG-4732L1-030C	3	6- 3/16	6- 7/8	10-11/16	5- 7/8	7- 5/8	6-11/16	4- 7/8	10.16
CG-4732L1-040C	4	7- 1/2	7- 1/4	11-13/16	6- 3/4	9- 3/16	7- 1/8	5- 7/8	21.80

True Union 2000 Horizontal 3-Way Diverter Ball Valves - EPDM - T-Port - Marine

Socket



Part Number	Size	A	B	C	D	E	F	G	Approx. Wt. (Lbs.)
CG-5022T1-005C	1/2	1- 7/8	2- 7/16	4- 1/4	2- 9/16	2-13/16	2- 3/4	1-11/16	.55
CG-5022T1-007C	3/4	2- 1/4	2- 3/4	4- 3/4	2- 7/8	3- 5/16	3	2	.84
CG-5022T1-010C	1	2- 1/2	2- 7/8	5- 1/8	3- 1/8	3- 7/16	3- 1/4	2- 1/8	1.11
CG-5022T1-012C	1-1/4	3- 1/16	3- 1/4	5- 3/4	3- 5/8	3-13/16	3- 3/4	2- 3/8	1.72
CG-5022T1-015C	1-1/2	3- 1/2	3- 1/2	6- 1/4	4	4- 3/16	4- 3/16	2- 9/16	2.24
CG-5022T1-020C	2	4- 1/4	4- 3/4	7- 3/4	4- 1/2	5- 1/8	5	3- 1/2	4.04
CG-5022T1-025C	2-1/2	5- 3/8	5- 7/8	9- 5/16	5- 1/8	6- 1/4	5- 7/8	4- 3/8	9.84
CG-5022T1-030C	3	6- 3/16	6- 7/8	10-11/16	5- 7/8	7- 5/8	6-11/16	4- 7/8	10.03
CG-5022T1-040C	4	7- 1/2	7- 1/4	11-13/16	6- 3/4	9- 3/16	7- 1/8	5- 7/8	17.71

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas

See Spears® Product Sourcebook for product offerings

EverTUFF® CPVC Schedule 40 & 80 Marine Pressure System



Sample Engineering Specification

All thermoplastic marine check valves shall be True Union 2000 Industrial Ball Check type manufactured to ASTM F 1970 and constructed from CPVC Type IV, ASTM D 1784 Cell Classification 23447. All O-rings shall be EPDM or FKM. All valve union nuts shall have Buttress threads. All valve seats shall be a standard O-ring type. All seal carriers shall be Safe-T-Blocked®. All valve components shall be replaceable. All valves with EPDM Elastomers shall be certified by NSF International for use in potable water service. All CPVC 1/2" through 4" valves shall be pressure rated to 235 psi, and all flanged valves shall be pressure rated to 150 psi for water at 73°F with a Limited Lifetime Warranty as manufactured by Spears® Manufacturing Company. All CPVC Industrial Ball Check Valves 1/2" through 4" shall be type approved by the American Bureau of Shipping (ABS). All CPVC Ball Check Valves 1/2" through 8" shall be suitable for use with Spears® U.S. Coast Guard Approved piping systems.

Quick-View Valve Selection Chart

Valve Size	O-ring Material	CPVC Part Number		Pressure Rating
		Socket	Threaded	
1/2	EPDM	CG-4529-005C	Included	235 psi Non-Shock Water @ 73°F
	FKM	CG-4539-005C	Included	
3/4	EPDM	CG-4529-007C	Included	
	FKM	CG-4539-007C	Included	
1	EPDM	CG-4529-010C	Included	
	FKM	CG-4539-010C	Included	
1-1/4	EPDM	CG-4529-012C	Included	
	FKM	CG-4539-012C	Included	
1-1/2	EPDM	CG-4529-015C	Included	
	FKM	CG-4539-015C	Included	
2	EPDM	CG-4529-020C	Included	
	FKM	CG-4539-020C	Included	
2-1/2	EPDM	CG-4522-025C	N/A	
	FKM	CG-4532-025C	N/A	
3	EPDM	CG-4522-030C	N/A	
	FKM	CG-4532-030C	N/A	
4	EPDM	CG-4522-040C	N/A	
	FKM	CG-4532-040C	N/A	
6	EPDM	CG-4522-060C	N/A	150 psi Non-Shock Water @ 73°F
	FKM	CG-4532-060C	N/A	
8[1]	EPDM	CG-4522-080C	N/A	
	FKM	CG-4532-080C	N/A	

1) Venturied valves are 6" ball check valves with 6x8 end connectors adapters.

Features

Flow tested design provides quick response with positive seal for prevention of system back flow in marine and chemical processing applications. Valves are available in IPS sizes 1/2" through 6" with socket end connectors and 8" venturied valve with socket ends.

- Chemical & Corrosion Resistant CPVC Construction
- Strong, Buttress Thread Union Nuts
- Schedule 80 Full-Port Design
- Spears® Safe-T-Blocked ® Seal Carrier
- Uses Standard O-ring Seat
- EPDM or FKM O-rings
- Fully Serviceable, Replaceable Components
- Sizes 1/2" - 4" Pressure Rated to 235 psi @ 73°F, Sizes 6" - 8" Venturied Pressure Rated to 150 psi @ 73°F
- Suitable for Either Horizontal or Vertical Installations
- EPDM valves NSF® Certified for Potable Water use
- Assembled with Silicone-Free, Water Soluble Lubricants
- Manufactured to ASTM F 1970

Optional Accessories*

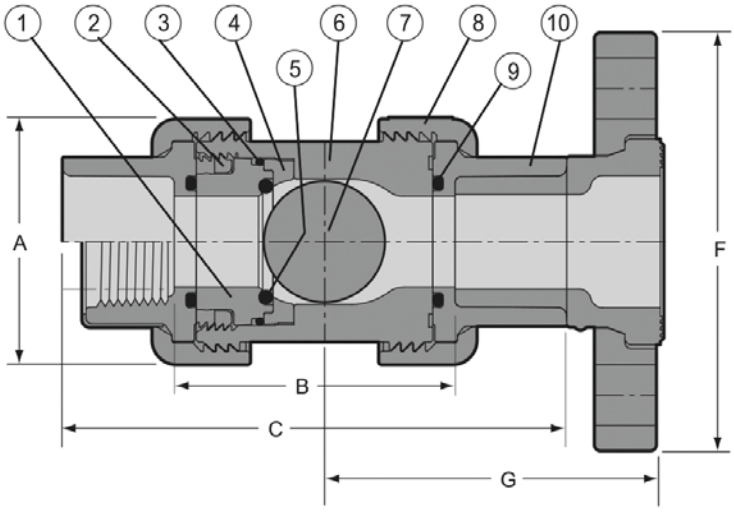
- Retro-Fit End Connector Sets for Valve Replacement
- Split-Nut Repair Kits for Union Nut Replacement
- Supplemental End Connectors

* See ***"BALL VALVE ACCESSORIES"*** section for detial of individual products.

Ball Check Foot Valves



Spears® Ball Check Valves easily convert to foot valves utilizing optional Foot Valve Screen adapters found in Ball Valve Accessories section.



Replacement Parts

No.	Component	Qty.	Material
1	Seal Carrier	1	CPVC
2	Seal Carrier Nut	1	CPVC
3	Carrier O-ring	1	EPDM/FKM
4	Seat Plate	1	CPVC
5	Seat O-ring	1	EPDM/FKM
6	Body	1	CPVC
7	Ball	1	CPVC
8	Union Nut	2	CPVC
9	End Connector O-ring	2	EPDM/FKM
10	End Connector	2	CPVC

Dimensions, Weights, & C_v Values

Nominal Size	Dimensions Reference (inches, ± 1/16)					Approx. Wt. (Lbs.)	C_v Values[3]	Horizontal Closing	
	A	B[1] Soc/Thd	C Socket	F	G	CPVC	Soc/Thd	Feet of Head (water)	GPM (minimum)
1/2	1-7/8	2-7/16	4-3/16	3-1/2	2-31/32	.33	29	1.6	.10
3/4	2-1/4	2-3/4	4-3/4	3-7/8	3-5/16	.50	63	1.6	.10
1	2-1/2	2-7/8	5-1/8	4-1/4	3-5/8	.74	120	1.6	.25
1-1/4	3-1/16	3-1/4	5-3/4	4-5/8	3-31/32	1.09	243	1.6	.40
1-1/2	3-1/2	3-1/2	6-1/4	5	4-3/8	1.45	357	1.6	.75
2	4-5/16	4-25/32	7-3/4	6	5-1/4	2.62	599	1.6	.75
2-1/2	6-3/16	5-7/8	9-5/16	7-1/2	6	7.25	856	1.0	1.50
3	6-3/16	6-7/8	10-11/16	7-1/2	6-13/16	7.35	1416	1.0	4.00
4	7-3/4	7-5/16	11-13/16	9	7-1/2	12.96	2865	1.0	5.50
6	11-5/8	11-1/6	17-1/16	11-1/4	10-3/16	39.98	6638	N/A	N/A
8[4]	11-5/8	23-3/16	31-7/8	13-1/2	17-13/16	55.92	N/A	N/A	N/A

1: Valve Lay Length
2: Torque required at valve maxomum internal pressure rating. 5ft/sec Flow velocity, due to adjustment difference during installation, actual may vary.
3: Gallons per minute at 1 psi pressure drop. Valves calculated from laying length, based on derivative of Hazen-Williams equation with surface roughness factor of C=150
4: Venturied Valves are 6" ball valves fitted with 6x8 end connector adapters.

Temperature Pressure Rating

System Operating Temperature °F (°C)			100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)	200 (93)	210 (99)
Valve Pressure Rating psi (MPa)	1/2" - 4"	CPVC	235 (1.62)	219 (1.51)	170 (1.17)	145 (1.00)	130 (.90)	110 (.76)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)	-0- (-0-)
	6" and 8"		150 (1.03)	140 (.97)	130 (.90)	120 (.83)	110 (.76)	100 (.70)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)	-0- (-0-)

1/2" - 4" ABS Approved
1/2" - 8" U.S. Coast Guard Applications

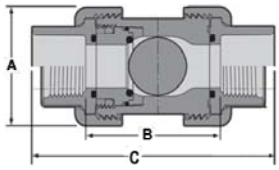
NOTE: Flanged valves have a base pressure rating of 150 psi

General Installation Information: Ball check valves may be installed in either horizontal or vertical position. A minimum of ten (10) pipe diameters distance maintained from any pump or other source of turbulence. Check valves **MUST** be installed with the valves **FLOW** arrow pointing in the direction of flow.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings
Spears® Manufacturing Company

True Union 2000 Industrial Ball Check Valves - EPDM - Marine

Socket

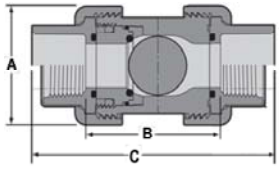


Part Number	Size	A	B	C	Cv Values	Approx. Wt. (Lbs.)
CG-4529-005C	1/2	1- 7/8	2- 7/16	4- 1/4	6.3	.39
CG-4529-007C	3/4	2- 9/32	2- 3/4	4- 3/4	17	.61
CG-4529-010C	1	2- 9/16	2-15/16	5- 3/16	25	.87
CG-4529-012C	1-1/4	3- 1/16	3- 1/4	5- 3/4	65	1.38
CG-4529-015C	1-1/2	3- 1/2	3- 1/2	6- 1/4	86	1.78
CG-4529-020C	2	4- 5/16	4- 7/8	7- 7/8	130	3.09
CG-4522-025C	2-1/2	6- 3/16	5- 7/8	9- 5/16	200	7.38
CG-4522-030C	3	6- 3/16	7- 1/16	10-13/16	275	7.65
CG-4522-040C	4	7- 1/2	7- 1/4	11-13/16	500	13.05
CG-4522-060C	6	11- 5/8	11- 5/16	17- 1/8	800	40.27
CG-4522-080C	8	11-5/8	23-3/16	31-7/8	800	52.39

True Union 2000 Industrial Ball Check Valves - EPDM - Marine

(Continued)

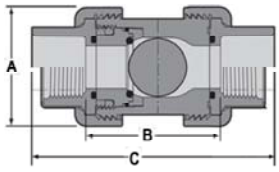
Socket



Part Number	Size	A	B	C	Cv Values	Approx. Wt. (Lbs.)
CG-4529-020C	2	4- 5/16	4- 7/8	7- 7/8	130	3.09
CG-4522-025C	2-1/2	6- 3/16	5- 7/8	9- 5/16	200	7.38
CG-4522-030C	3	6- 3/16	7- 1/16	10-13/16	275	7.65
CG-4522-040C	4	7- 1/2	7- 1/4	11-13/16	500	13.05
CG-4522-060C	6	11- 5/8	11- 5/16	17- 1/8	800	40.27
CG-4522-080C	8	11-5/8	23-3/16	31-7/8	800	52.39

True Union 2000 Industrial Ball Check Valves - FKM - Marine

Socket



Part Number	Size	A	B	C	Cv Values	Approx. Wt. (Lbs.)
CG-4539-005C	1/2	1- 7/8	2- 7/16	4- 1/4	6.3	.39
CG-4539-007C	3/4	2- 9/32	2- 3/4	4- 3/4	17	.61
CG-4539-010C	1	2- 9/16	2-15/16	5- 3/16	25	.88
CG-4539-012C	1-1/4	3- 1/16	3- 1/4	5- 3/4	65	1.39
CG-4539-015C	1-1/2	3- 1/2	3- 1/2	6- 1/4	86	1.81
CG-4539-020C	2	4- 5/16	4- 7/8	7- 7/8	130	3.12
CG-4532-025C	2-1/2	6- 3/16	5- 7/8	9- 5/16	200	7.43
CG-4532-030C	3	6- 3/16	7- 1/16	10-13/16	275	7.70
CG-4532-040C	4	7- 1/2	7- 1/4	11-13/16	500	13.11
CG-4532-060C	6	11- 5/8	11- 5/16	17- 1/8	800	40.42
CG-4532-080C	8	11-5/8	23-3/16	31-7/8	800	52.38

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

EverTUFF® CPVC Schedule 40 & 80 Marine Pressure System



Features

Economical, low profile quarter-turn shutoff valve is excellent for marine and many O.E.M applications. CPVC valves are available in IPS sizes 1/2" through 2" with socket connectors.

- New Actuator-Ready Body — Accepts Spears® Improved Mini-Mount Actuator Mounting Kits
- New Double O-ring Stem Seal
- Schedule 80 Full-Port Design
- Spears® Safe-T-Shear Stem
- PTFE/HDPE Self Adjusting Floating Seats
- EPDM or FKM O-ring Seals
- Sizes 1/2"-2" Pressure Rated to 235 psi @ 73°F
- EPDM valves NSF® Certified for Use with
- Manufactured to ASTM F 1970

Sample Engineering Specification

All thermoplastic ball valves shall be 2000 Compact type manufactured to ASTM F1970 and constructed from CPVC Type IV, ASTM D 1784 Cell Classification 23447. All O-rings shall be EPDM or FKM. All valves shall have Safe-T-Shear® stem with O-ring stem seal. All handles shall be Polypropylene. All valves with EPDM elastomers shall be certified by NSF International for use with potable water. All 1/2" - 2" valves shall be pressure rated to 235 psi, for water @ 73°F, as manufactured by Spears® Manufacturing Company. All CPVC Marine Compact Ball Valves shall be suitable for use with Spears® U.S. Coast Guard Approved piping systems only.

Optional Accessories*

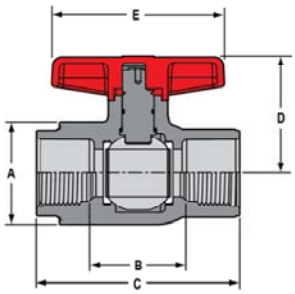
- Round Safety Handles
- Stem Extension Kits
- Square Operator Nuts
- Multi Mount Valve/Actuation Mounting Kits
- Mini-Mount Actuation Mounting Kits

Quick-View Valve Selection Chart

Valve Size	O-ring Material	CPVC Part Number Socket	Pressure Rating
1/2	EPDM	CG-6629-005C	235 psi Non-Shock Water @73°F (Flanged 150 psi Non-Shock) Water @73°F
	FKM	CG-6639-005C	
3/4	EPDM	CG-6629-007C	
	FKM	CG-6639-007C	
1	EPDM	CG-6629-010C	
	FKM	CG-6639-010C	
1-1/4	EPDM	CG-6629-012C	
	FKM	CG-6639-012C	
1-1/2	EPDM	CG-6629-015C	
	FKM	CG-6639-015C	
2	EPDM	CG-6629-020C	
	FKM	CG-6639-020C	

Compact 2000 Ball Valves - EPDM - Marine

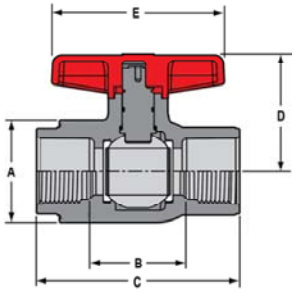
Socket



Part Number	Size	A	B	C	D	E	Cv Values	Approx. Wt. (Lbs.)
CG-6622-005C	1/2	1- 7/16	1- 1/4	3	1- 5/8	2- 1/2	42	.19
CG-6622-007C	3/4	1-3/4	1- 1/2	3-1/2	2	3	87	.31
CG-6622-010C	1	2- 1/16	1-23/32	4	2- 5/16	3-11/32	157	.46
CG-6622-012C	1-1/4	2-9/16	2-1/8	4- 5/8	2-7/8	3-1/2	311	.71
CG-6622-015C	1-1/2	3	2-1/2	5- 1/4	3- 1/16	3- 7/8	429	1.00
CG-6622-020C	2	3- 5/8	3	6	3- 3/4	5	768	1.63

Compact 2000 Ball Valves - FKM - Marine

Socket



Part Number	Size	A	B	C	D	E	Cv Values	Approx. Wt. (Lbs.)
CG-6632-005C	1/2	1- 7/16	1- 1/4	3- 1/16	1- 5/8	2- 1/2	42	.19
CG-6632-007C	3/4	1-3/4	1- 1/2	3-1/2	2	3	87	.31
CG-6632-010C	1	2- 1/16	1- 3/4	4	2- 5/16	3-3/8	157	.46
CG-6632-012C	1-1/4	2-9/16	2-1/8	4- 5/8	2-7/8	3-1/2	311	.71
CG-6632-015C	1-1/2	3	2-1/2	5-1/4	3-1/16	3-7/8	429	1.00
CG-6632-020C	2	3- 5/8	3	6	3- 3/4	5	768	1.63

USCG Application Only

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas

See Spears® Product Sourcebook for product offerings

Standard Butterfly Value



Lever Handle



Gear Operated

Features

Spears® patented marine Butterfly Valve design departs from traditional liner-seat type valve to eliminate seat creep, reduce operating torque and provide positive seal-off. Ideally suited for flow control or throttling, this high-performance valve is offered with a full variety of options for greater application versatility in marine and chemical processing applications. Available in IPS sizes 1-1/2" - 12" in Standard Lug style.

- Special off-set Disc lifts quickly from seat to reduce wear and reduce operating torque
- Patented Limited Contact Seat design provides free travel - eliminates seat creep, extrusion and wear. Field replaceable without full valve disassembly
- Interlocking Body & Seat prevents wash-out or blow-out
- Fully Isolated Solid Type 316L Stainless Steel Stem
- Reversible High Impact Polypropylene Lever Handle with 7-Position stops & Built-in Lockout (standard handle on 1-1/2" – 8" valves; not available on 10" & larger valves)
- High Efficiency Gear Operator with Cast Aluminum Housing, Polypropylene Handwheel, and Built-in Position Indicator (available for all sizes; standard on 10" & larger valves)
- Painted Marine Grade Gear Operator Available
- Standard valve through 12" accepts field-installable Lug Inserts Set option
- Pressure Rated to 150 psi @ 73°F including Dead-End Service through 12"
- ANSI/ASME B16.5 Class 150 Bolt Pattern
- Valves with EPDM Seals & Seats are NSF® Certified for Potable water use

Optional Accessories

- Stem Extension Kit
- PTFE Seat Sleeve
- Lever Handle Kit (standard on 1-1/2" - 8" valves)
- Gear Operator Kit (standard on 10" & larger valves)
- T-Handle Kit
- Field Installable Lug Insert Sets (for Standard valve)
- Speed Handle (for gear operated valves)
- 2" Square/T-Style Operator Nut (for gear operated valves)
- Chainwheel Operator Kit (for gear operated valves)
- Positive Stem Stop (for gear operated valves)
- Submersible Gear Operators

Sample Engineering Specification

All thermoplastic valves shall be marine butterfly type constructed from CPVC Type IV Cell Classification 23447. All valve seats and O-rings shall be EPDM or FKM. Valves with EPDM seats and seals shall be listed by NSF International. Seat shall be a non-liner type interlocked to valve body. Bolt hole patterns shall conform to ANSI/ASME B16.5 Class 150. Disc shall be offset design with fully isolated Type 316L stainless steel stem and Type 316 stainless steel hardware. Lever operated valves shall be equipped with high impact polypropylene handle having built-in lockout capability. Valves shall be pressure rated at 150psi for water @ 73° F, with a Limited Lifetime Warranty as manufactured by Spears® Manufacturing Company. CPVC marine butterfly valves 1-1/2" through 6" shall be type approved by the American Bureau of Shipping (ABS). CPVC marine butterfly valves 1-1/2" through 12" shall be suitable for use with Spears® U.S. Coast Guard approved piping systems.

Standard & Gear Operator Style Quick-View Valve Selection Chart

Valve Size	O-ring Material	CPVC Part Number		Pressure
		With Level Handle	With Gear Operator	
1-1/2	EPDM	CG-722311-015C	N/A	150 psi Non-Shock Water @ 73°F
	FKM	CG-723311-015C	N/A	
2	EPDM	CG-722311-020C	N/A	
	FKM	CG-723311-020C	N/A	
2-1/2	EPDM	CG-722311-025C	N/A	
	FKM	CG-723311-025C	N/A	
3	EPDM	CG-722311-030C	N/A	
	FKM	CG-723311-030C	N/A	
4	EPDM	CG-722311-040C	N/A	
	FKM	CG-723311-040C	N/A	
6	EPDM	CG-722311-060C	N/A	
	FKM	CG-723311-060C	N/A	
8	EPDM	CG-722311-080C	N/A	
	FKM	CG-723311-080C	N/A	
10	EPDM	N/A	CG-722321-100C	
	FKM	N/A	CG-723321-100C	
12	EPDM	N/A	CG-722321-120C	
	FKM	N/A	CG-723321-120C	

Temperature Pressure Rating

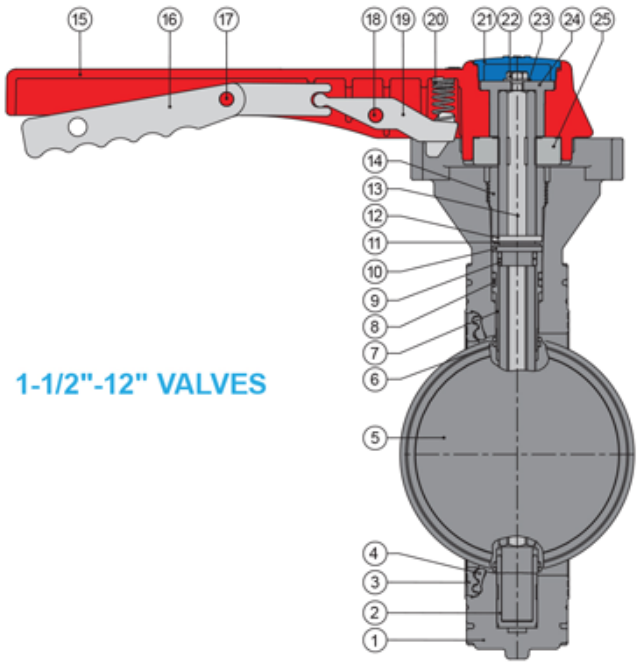
System Operating Temperature °F (°C)		100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)	200 (93)	210 (99)
Valve Pressure Rating psi (MPa)	CPVC	150 (1.03)	140 (.97)	130 (.90)	120 (.83)	110 (.76)	100 (.70)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)	-0- (-0-)

1-1/2" - 6" ABS Approved
1-1/2" - 12" U.S. Coast Guard Applications

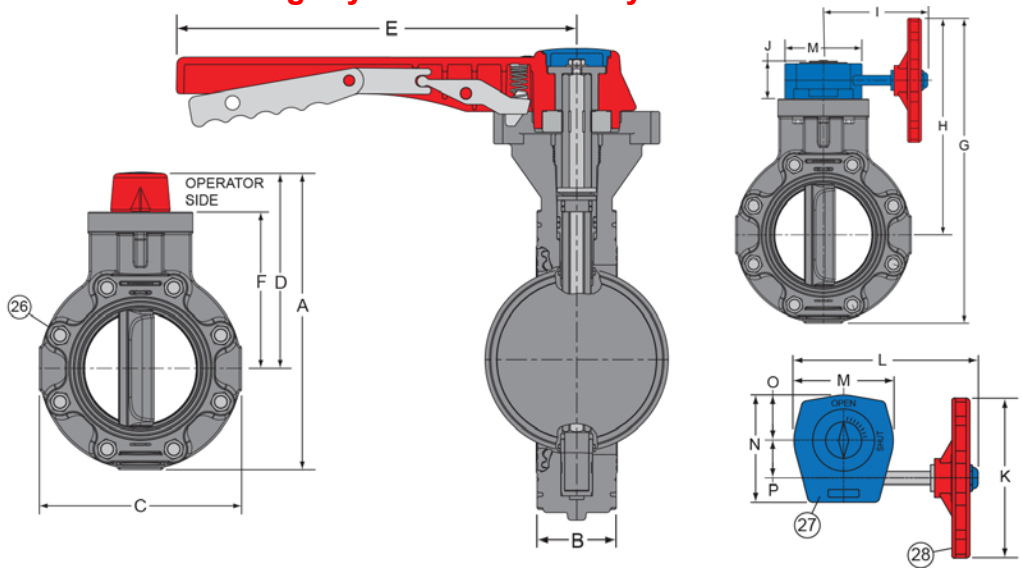
Note: Flanged valves have a base pressure rating of 150 psi.

Replacement Parts for 1-1/2" - 12" CPVC Standard Marine BFV Valves

No	Component	Qty.	Material
1	Body	1	CPVC
2	Stem Bearing	1	PTFE/GFPP
3	Seal Carrier	1	CPVC/PP
4	Seat	1	EPDM, FKM
5	Disc	1	CPVC/PP
6	Disc O-ring	2	EPDM, FKM
7	Stem Bushing	1	PTFE/GFPP
8	Stem Bushing O-ring	2	EPDM, FKM
9	Stem O-ring	2	EPDM, FKM
10	Stem Washer - Hex	1	PTFE
11	Stem Washer - Slot*	1-2	SS 316
12	Stem Washer - Round	1	PTFE/GFPP
13	Stem	1	SS 316
14	Stem Nut	1	CPVC
15	Handle Body	1	PP
16	Handle Grip	1	GFPVC
17	Grip Pin	1	PP
18	Lock Pin	1	PP
19	Handle Lock	1	GFPVC
20	Handle Spring	1	SS 316
21	Handle Cover	1	PP
22	Hex Bolt	1	SS 316
23	Flat Washer	1	SS 316
24	Handle Bushing	1	GFPVC
25	Disc Timing Stop	1	CPVC
26	Lug Insert	1	SS/Zinc Plated Steel
27	Gear Operator Assembly	1	Cast Aluminum
28	Hand Wheel	1	PP



Standard Lug Style Marine Butterfly Valve Dimensions



Dimensions

Nominal Size	Pressure Rating[1] (psi)	A	B Standard Lug Style	C	D	E	F	G	Approx. Wt. (lbs)
1-1/2	150	8-5/32	1-9/16	5	5-19/32	9-3/32	4-3/32	11-5/32	2.59
2	150	9-11/32	1-15/16	6	6-13/32	9	4-3/4	13-1/8	3.33
2-1/2	150	10-9/32	2	7	6-25/32	9-1/4	5-1/4	13-1/8	4.10
3	150	11-1/2	2-3/32	7-1/2	7-27/32	12	5-5/8	14-5/32	6.28
4	150	13	2-9/32	9	8-1/2	12	6-1/4	15-5/8	7.90
6	150	16-19/32	2-3/4	10-31/32	11-3/32	13-7/8	8-19/32	19-7/32	13.29
8	150	18-5/8	2-15/16	13-1/2	12	13-15/16	9-1/2	21-7/16	19.64
10	150	N/A	3-1/4	16	N/A	N/A	11	26-5/8	33.42
12	150	N/A	3-1/2	19	N/A	N/A	12	29-1/8	46.93

Nominal Size	H	I	J	K	L	M	N	O	P
1-1/2	8-21/32	6-7/16	2-3/8	8	8-13/16	4-13/16	5-3/16	2-13/16	1-27/32
2	10-1/8	6-7/16	2-3/8	8	8-13/16	4-13/16	5-3/16	2-13/16	1-27/32
2-1/2	9-5/8	6-7/16	2-3/8	8	8-13/16	4-13/16	5-3/16	2-13/16	1-27/32
3	10-17/32	6-7/16	2-3/8	8	8-13/16	4-13/16	5-3/16	2-13/16	1-27/32
4	11-1/8	6-7/16	2-3/8	8	8-13/16	4-13/16	5-3/16	2-13/16	1-27/32
6	13-23/32	6-7/16	2-13/32	7-15/16	8-7/8	4-27/32	5-5/32	2-7/32	1-27/32
8	14-11/16	6-7/16	2-13/32	7-15/16	8-7/8	4-27/32	5-3/16	2-7/32	1-27/32
10	18-5/8	7-1/8	2-3/8	8	9-13/16	5-3/8	5-15/16	2-7/16	2-11/32
12	19-5/8	7-1/8	2-3/8	8	9-13/16	5-3/8	5-15/16	2-7/16	2-11/32

1: Maximum Internal Pressure Rating @ 73°F

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

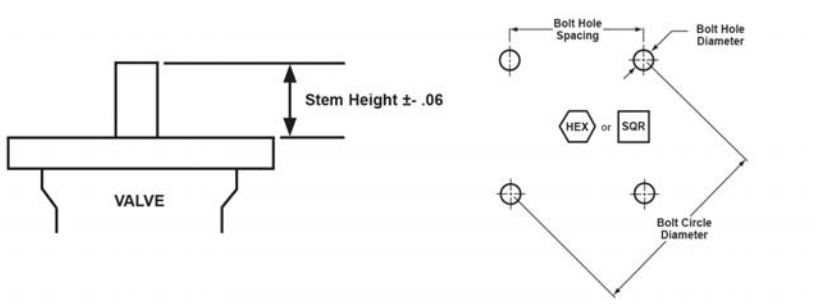
C_V Values & Operating Torque

Valve Size	C_V[1] Degrees Open						Operating[2] Torque (in.-lbs.)
	15°	30°	45°	60°	75°	90°	
1-1/2	2	8	20	36	61	81	100
2	3	11	27	49	82	109	110
2-1/2	5	19	48	86	144	192	206
3	9	35	86	155	259	345	360
4	10	41	103	185	308	411	420
6	28	113	281	506	844	1125	720
8	56	225	562	1012	1687	2249	1200
10	111	444	1110	1998	3330	4440	1320
12	158	631	1577	2839	4732	6309	1920

1: Gallons per minute at 1 psi pressure drop.
2: Operating torque for large diameter valves varies significantly with system operating pressure, flow direction and velocity. Contact Spears® for torque requirement based on application.

Actuator Mounting Dimensions For Custom Actuation

Size	Bolt Hole Spacing		Bolt Hole Diameter		Bolt Circle Diameter		Hex +.000 -.006	Square +.000 -.002	Stem Height	
	Standard	Wafer	Standard	Wafer	Standard	Wafer	Standard	Wafer	Standard	Wafer
1-1/2	1.95	N/A	.34	N/A	2.75	N/A	.375	N/A	.75	N/A
2	1.95	2.47	.34	.40	2.75	3.50	.500	.375	.75	1.30
2-1/2	1.95	2.47	.34	.40	2.75	3.50	.500	.375	.75	1.34
3	2.65	2.47	.41	.40	3.75	3.50	.563	.500	1.00	1.34
4	2.65	2.47	.41	.40	3.75	3.50	.625	.500	1.04	1.37
6	3.17	2.83	.41	.40	4.48	4.00	.875	.750	1.27	1.80
8	3.17	3.17	.41	.40	4.48	4.48	1.000	.875	1.29	1.96
10	3.54	3.54	.41	.41	5.00	5.00	1.125	1.000	1.38	1.38
12	3.54	3.54	.41	.41	5.00	5.00	1.250	1.000	1.38	1.38



Note: Hex = Standard, Lug Style Valves
SQR = Wafer Style Valves

General Installation Information

Spears® CPVC Marine Butterfly Valves are designed for system connections either between two flanges, or with single-side (flange one-side only) connection for dead-end service using lug style valves. Lug Insert Valves require attention to flow direction; True Lug valves may be installed either direction. The valve handle (or gear operator) is reversible 180° for either left or right side operation. Spears® Butterfly Valves are designed for installation with user supplied 1/8" full-faced gaskets, hex bolts, nuts and flat washers.

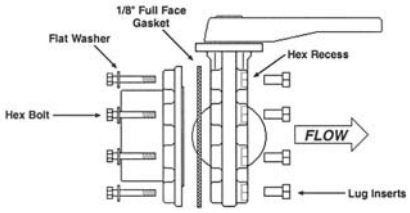
Caution: Spears® Butterfly Valves are designed for use with flanges or flanged equipment having minimum waterway inside diameter no less than that of Schedule 80 PVC pipe (ASTM D 1785). ***Use of smaller inside diameter flange connections may result in obstruction and damage to the valve disc.***

CPVC Marine Butterfly Valve Torque and Hardware Requirements

Valve Size (in.)	No. of Bolt Holes	Bolt Torque (ft.- lb.)	Standard Valve					Valve with Lug Inserts				
			Bolt Lengths[1] (in.)		Bolt Diameter (in.)	Bolt Threads per inch	Flat Washer O.D. (in.)	Bolt Lengths[1] (in.)		Bolt Diameter (in.)	Lug Threads per inch	Flat Washer O.D. (in.)
			Single Side	Dual Flange[3]				Single Side	2nd Flange[2]			
1-1/2	4	12	3-1/4	4-1/4	1/2	13	1-3/8	1-3/4	1-1/2	1/2	13	1-3/8
2	4	25	3-3/4	4-3/4	5/8	11	1-3/4	2	1-3/4	5/8	11	1-3/4
2-1/2	4	25	4-1/4	5-1/4	5/8	11	1-3/4	2-1/4	2	5/8	11	1-3/4
3	4	25	4-1/4	5-1/2	5/8	11	1-3/4	2-1/4	2	5/8	11	1-3/4
4	8	25	4-1/2	5-3/4	5/8	11	1-3/4	2-1/2	2	5/8	11	1-3/4
6	8	40	5-1/4	6-3/4	3/4	10	2	3-1/4	2-1/4	3/4	10	2
8	8	40	5-3/4	7-1/4	3/4	10	2	3-3/4	2-1/4	3/4	10	2
10	12	64	6-1/2	8-1/4	7/8	9	2-1/4	4	3	7/8	9	2-1/4
12	12	95	6-3/4	8-1/2	7/8	9	2-1/4	4-1/4	3	7/8	9	2-1/4

1: Minimum bolt lengths based on use of Spears® flanges, 1/8" full faced gaskets, standard S.A.E. hex bolts and Standard Plate Series flat washers.
2: Specified bolt lengths are maximum allowable for maintaining proper clearance in initial Single-Side installation with Lugs where anticipated 2nd Flange installation option is to be retained without removal of valve.
3: Minimum bolt length through 2-flanges, 2-gaskets, 2-flat washers and 1-valve body.

Single-Side (flange one side) Installation Using Standard Valve with Lug Inserts (for field installable Insert Sets)



CAUTION: *Flange must be installed on side of valve* ***opposite*** *the hex nut recesses for Single-Side Installation as illustrated.*

**(Flange, bolts, nuts, washers and gaskets not included.
Lug inserts may be ordered separately.)**



Sample Engineering Specification

All thermoplastic marine valves shall be Wafer Butterfly type constructed from CPVC Type IV Cell Classification 23447 per ASTM D1784. All valve seats and O-rings shall be EPDM or FKM Seat shall be a non-liner type mounted to the valve disc. All valves shall have built-in Santoprene™ Thermoplastic Elastomer (TFE) flange gaskets. Wafer style valves shall be for mounting between two flanges having bolt hole pattern that conform to ANSI/ ASME B16.5 CL 150. Disc shall be offset design with Type 316L stainless steel stem. Stem shall be isolated from the process medium for dry operation. Lever operated valves shall be equipped with high impact polypropylene handle having 7-position stops and built-in lockout capability. Valves shall be pressure rated at 150 psi for water at 73° F, with a Limited Lifetime Warranty as manufactured by Spears® Manufacturing Company. CPVC Marine Wafer Butterfly Valves 2" through 6" shall be type approved by the American Bureau of Shipping (ABS). CPVC Marine Wafer Butterfly Valves 2" through 12" shall be suitable for use with Spears® U.S. Coast Guard approved piping systems.

Features

Spears® CPVC Marine Wafer Butterfly Valve is a multi-featured design incorporating laying lengths that allow direct replacement of common Cast Iron valves such as Keystone Model 228 and Bray Series 30 Butterfly Valves. Wafer Valves feature built-in Santoprene™ Thermoplastic Elastomer (TPE) flange gaskets, easy operating disc-mounted seat, and fully isolated stem design. Available in sizes 2" through 12", with choice of EPDM or FKM Seats on CPVC Valves.

CPVC Marine Wafer Butterfly Valves Pressure Rated to 150 psi for water @ 73°F(23° C)

Wafer Butterfly Quick-View Selection Chart

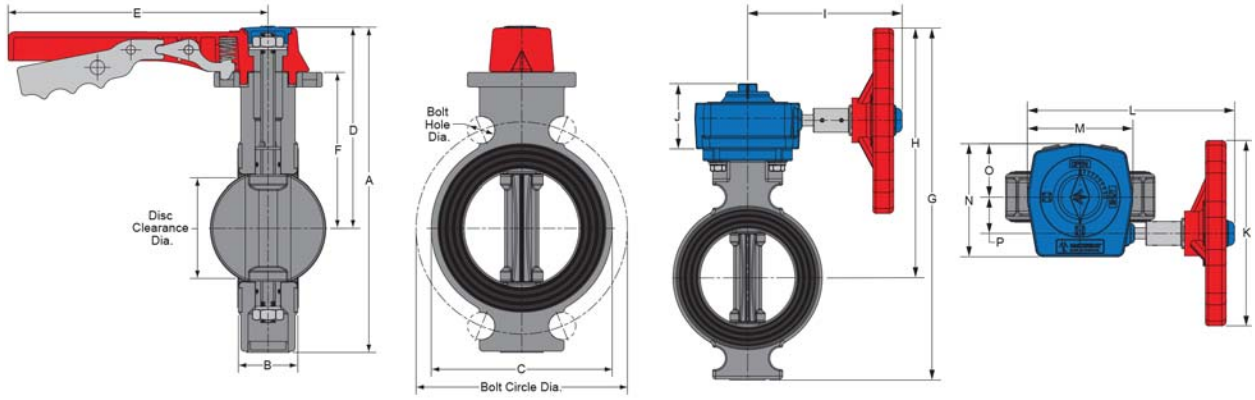
Valve Size	O-ring Material	CPVC Part Number		Pressure Rating
		w/Lever Handle	w/Gear Operator	
2	EPDM	CG-752311-020C	N/A	150 psi Shock Water @ 73 °F
	FKM	CG-753311-020C	N/A	
2-1/2	EPDM	CG-752311-025C	N/A	
	FKM	CG-753311-025C	N/A	
3	EPDM	CG-752311-030C	N/A	
	FKM	CG-753311-030C	N/A	
4	EPDM	CG-752311-040C	N/A	
	FKM	CG-753311-040C	N/A	
6	EPDM	CG-752311-060C	N/A	
	FKM	CG-753311-060C	N/A	
8	EPDM	CG-752311-080C	N/A	
	FKM	CG-753311-080C	N/A	
10	EPDM	N/A	CG-752321-100C	
	FKM	N/A	CG-753321-100C	
12	EPDM	N/A	CG-752321-120C	
	FKM	N/A	CG-753321-120C	

General Installation Information

Spears® CPVC Marine Wafer Butterfly Valves are designed for system connections between two flanges having ANSI B16.5 Class 150 bolt hole patterns. The valve handle (or gear operator) is reversible 180° for either left or right side operation. Wafer Butterfly Valves have built-in flange gaskets and are designed for installation with user supplied hex bolts, nuts and flat washers. The valve must be positioned with gasket areas evenly located between mating flange sealing surfaces. Valve Bolt Specification bolt lengths in table below are minimums based on use of two (2) Spears® flanges, valve with built-in gaskets, standard S.A.E. hex bolts and Standard Plate "W" Series flat washers.

Caution: Spears® CPVC Marine Wafer Butterfly Valves are designed for use with flanges or flanged equipment having minimum waterway inside diameter no less than that of Schedule 80 CPVC pipe (ASTM D 1785). ***Use of smaller inside diameter flange connections may result in obstruction and damage to the valve disc and seat.***

- Chemical & Corrosion Resistant CPVC Construction
- Special Designed Laying Lengths for Direct Replacement of Common Cast Iron Butterfly Valves
- Built-in Santoprene Thermoplastic Elastomer (TPE) gaskets on Valve Flanges
- Easy Operating Disc Mounted Seat in Choice of EPDM, or FKM
- Fully Isolated (Dry) Solid Type 316L Stainless Steel Stem
- Reversible High Impact Polypropylene Lever Handle with 7-Position Stops and Built-in Lockout Capability
- Optional High Efficiency Gear Operator with Cast Aluminum Housing, Polypropylene Handwheel and Built-in Position Indicator Painted Marine Grade Gear Operator Available
- Compatible with ANSI/ASME B16.5 Class 150 Bolt Pattern Flanges



CPVC Marine Wafer Butterfly Valve Bolt Specifications & Dimensions

Valve Size	Bolt Diameter (in.)	Bolt Length (in.)	No. of Bolt Holes
2	5/8	4-1/2	4
2-1/2	5/8	5	4
3	5/8	5	4
4	5/8	5-1/2	8
6	3/4	6	8
8	3/4	6-1/2	8
10	7/8	7	12
12	7/8	7-1/2	12

Size	A	B	C	D	E	F	Bolt Circle Diameter[2]			No. of Bolts[3]	Bolt Hole Dia.	Disc Clearance Dia.	Approx. Wt. (lbs.)
							ANSI	PN16 (mm)	PN10 ISO DIN (mm)				
2	8-5/8	1-11/16	3-3/4	5-9/16	9	4	4-3/4	125	125	4	13/16	1-1/2	2.66
2-1/2	9-5/8	1-13/16	4-1/2	6-1/16	9	4-1/2	5-1/2	145	145	4	13/16	1-15/16	3.18
3	10-1/8	1-13/16	5	6-7/16	9	4-7/8	6	NA	NA	4	7/8	2-3/4	3.60
4	11-13/16	2-1/16	6-1/4	6-15/16	9	5-3/8	7-1/2	180	180	4 (8)	15/16	3-7/16	3.80
6	14-7/8	2-3/16	8-9/16	9-3/8	11-7/8	7-1/8	9-1/2	240	240	4 (8)	7/8	5-7/16	6.25
8	17-7/16	2-9/16	10-3/4	10-5/8	13-13/16	8-7/16	11-3/4	NA	295	4 (8)	15/16	7-3/16	14.67
10[1]	NA	2-9/16	12-7/8	NA	NA	10-11/16	14-1/4	355	350	4 (12)	1-1/8	9-3/16	26.84
12[1]	NA	3-1/16	15-9/16	NA	NA	11-11/16	17	410	400	4 (12)	1-1/2	11-1/8	32.46

1: 10" and 12" valves are only available with gear operator.
2: Holes are oversized to accommodate different bolt patterns — ASME/ANSI B16.1 — Cast Iron Pipe Flanges and Flanged Fittings - Class 150 Bolt Patterns; PN10 & PN16 = B54504 — Circular Flanges for Pipes, Valves and Fittings (PN - Designated); DIN = DIN8063 Part 4 — Pipe Joint Assemblies and Fittings for Unplasticized Polyvinyl Chloride (PVC-U) Pressure Pipe.
3: Valve is positioned with 4 of 8 required Flange Bolts in sizes 4 to 8 inches and 4 of 12 in sizes 10 and 12 inches.

Size	G	H	I	J	K	L	M	N	O	P
2	12-1/4	9-1/8	6-1/2	2-3/4	8	8-3/4	4-1/2	4-3/4	2-1/4	1-1/2
2-1/2	13-1/8	9-1/2	6-1/2	2-3/4	8	8-3/4	4-1/2	4-3/4	2-1/4	1-1/2
3	13-5/8	10	6-1/2	2-3/4	8	8-3/4	4-1/2	4-3/4	2-1/4	1-1/2
4	14-3/4	10-1/2	6-1/2	2-3/4	8	8-3/4	4-1/2	4-3/4	2-1/4	1-1/2
6	17-3/4	12-1/4	6-1/2	2-3/4	8	8-3/4	4-1/2	4-3/4	2-1/4	1-1/2
8	20-3/8	13-1/2	6-1/2	2-3/4	8	8-3/4	4-1/2	4-3/4	2-1/4	1-1/2
10	24	15-7/8	6-3/4	3	8	9-1/4	5-1/8	5-7/8	2-1/2	2-1/8
12	26-3/8	16-7/8	6-3/4	3	8	9-1/4	5-1/8	5-7/8	2-1/2	2-1/8

Temperature Pressure Rating

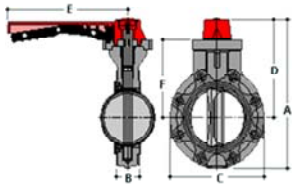
System Operating Temperature °F (°C)		100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)	200 (93	210 (99)
Valve Pressure Rating psi (MPa)	CPVC	150 (1.03)	140 (.97)	130 (.90)	120 (.83)	110 (.76)	100 (.70)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)	-0- (-0-)

2" - 6" ABS Approved
2" - 12" U.S. Coast Guard Applications

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

Butterfly Valve - Standard - EPDM - Marine

Lever Handle

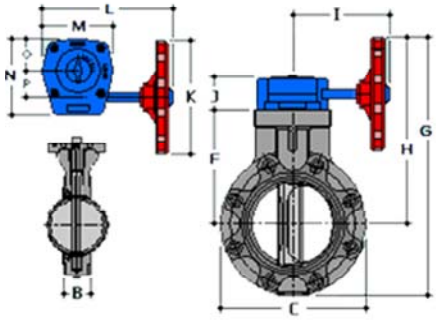


Part Number	Size	A	B	C	D	E	F	Bolt Circle Dia.	Bolt Size	No of Bolts	Approx. Wt. (Lbs.)
CG-722311-015C	1-1/2	8- 5/32	1- 9/16	5	5-19/32	9- 3/32	4- 3/32	3- 7/8	1/2	4	2.59
CG-722311-020C	2	9-11/32	1-15/16	6	6-13/32	9	4- 3/4	4- 3/4	5/8	4	3.33
CG-722311-025C	2-1/2	10- 9/32	2	6- 3/4	6-25/32	9- 1/4	5- 1/4	5- 1/2	5/8	4	4.10
CG-722311-030C	3	11- 1/2	2- 3/32	7- 1/2	7-27/32	12	5- 5/8	6	5/8	4	6.28
CG-722311-040C	4	13	2- 9/32	9	8- 1/2	12	6- 1/4	7- 1/2	5/8	8	7.89
CG-722311-060C	6	16-13/32	2- 3/4	11- 1/16	10- 7/8	13-15/16	8- 5/8	9- 1/2	3/4	8	13.29
CG-722311-080C	8	18- 5/8	2-31/32	13- 1/2	12	13-15/16	9- 1/2	11- 3/4	3/4	8	19.64

1-1/2" - 6" ABS type approved 1-1/2" - 12 USCG applications

Butterfly Valve - Standard - EPDM - Marine

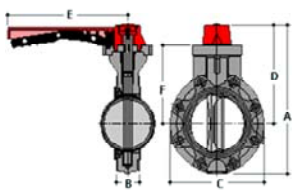
Gear Operator



Part Number	Size	B	C	F	G	H	I	J	K	L	M	N	O	P	Bolt Circle Dia.	Bolt Size	No of Bolts	Approx. Wt. (Lbs.)
CG-722321-100C	10	3- 1/4	16	11	26- 5/8	18- 5/8	7- 1/8	2- 3/8	8	9-13/16	5- 3/8	5-15/16	2- 7/16	2-11/32	14- 1/4	7/8	12	36.27
CG-722321-120C	12	3- 1/2	19	12	29- 1/8	19- 5/8	7- 1/8	2- 3/8	8	9-13/16	5- 3/8	5-15/16	2- 7/16	2-11/32	17	7/8	12	49.87

Butterfly Valves - Standard - FKM - Marine

Lever Handle

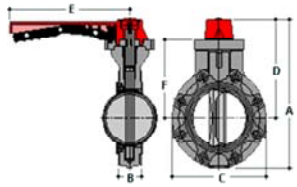


Part Number	Size	A	B	C	D	E	F	Bolt Circle Dia.	Bolt Size	No of Bolts	Approx. Wt. (Lbs.)
CG-723311-015C	1-1/2	8- 5/32	1- 9/16	5	5-19/32	9- 3/32	4- 3/32	3- 7/8	1/2	4	2.59
CG-723311-020C	2	9-11/32	1-15/16	6	6-13/32	9	4- 3/4	4- 3/4	5/8	4	3.34
CG-723311-030C	3	11- 1/2	2- 3/32	7- 1/2	7-27/32	12	5- 5/8	6	5/8	4	6.31

Butterfly Valve - Standard - EPDM - Marine

(Continued)

Lever Handle

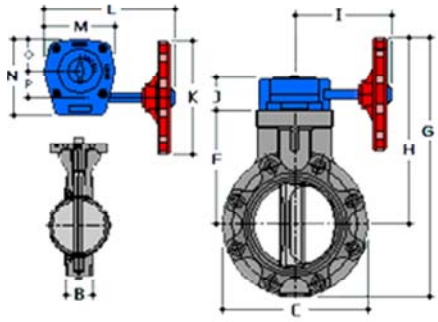


Part Number	Size	A	B	C	D	E	F	Bolt Circle Dia.	Bolt Size	No of Bolts	Approx. Wt. (Lbs.)
CG-722311-040C	4	13	2- 9/32	9	8- 1/2	12	6- 1/4	7- 1/2	5/8	8	7.89
CG-722311-060C	6	16-13/32	2- 3/4	11- 1/16	10- 7/8	13-15/16	8- 5/8	9- 1/2	3/4	8	13.29
CG-722311-080C	8	18- 5/8	2-31/32	13- 1/2	12	13-15/16	9- 1/2	11- 3/4	3/4	8	19.64

1-1/2" - 6" ABS type approved 1-1/2" - 12 USCG applications

Butterfly Valve - Standard - EPDM - Marine

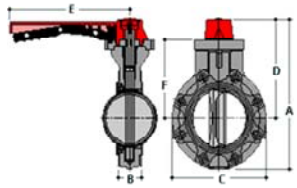
Gear Operator



Part Number	Size	B	C	F	G	H	I	J	K	L	M	N	O	P	Bolt Circle Dia.	Bolt Size	No of Bolts	Approx. Wt. (Lbs.)
CG-722321-100C	10	3- 1/4	16	11	26- 5/8	18- 5/8	7- 1/8	2- 3/8	8	9-13/16	5- 3/8	5-15/16	2- 7/16	2-11/32	14- 1/4	7/8	12	36.27
CG-722321-120C	12	3- 1/2	19	12	29- 1/8	19- 5/8	7- 1/8	2- 3/8	8	9-13/16	5- 3/8	5-15/16	2- 7/16	2-11/32	17	7/8	12	49.87

Butterfly Valves - Standard - FKM - Marine

Lever Handle



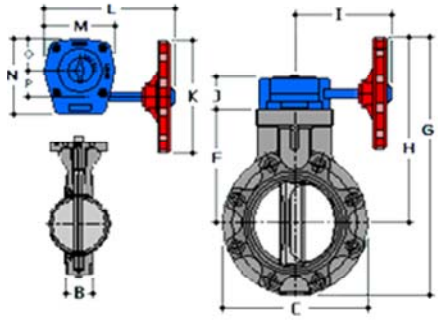
Part Number	Size	A	B	C	D	E	F	Bolt Circle Dia.	Bolt Size	No of Bolts	Approx. Wt. (Lbs.)
CG-723311-015C	1-1/2	8- 5/32	1- 9/16	5	5-19/32	9- 3/32	4- 3/32	3- 7/8	1/2	4	2.59
CG-723311-020C	2	9-11/32	1-15/16	6	6-13/32	9	4- 3/4	4- 3/4	5/8	4	3.34
CG-723311-030C	3	11- 1/2	2- 3/32	7- 1/2	7-27/32	12	5- 5/8	6	5/8	4	6.31
CG-723311-040C	4	13	2- 9/32	9	8- 1/2	12	6- 1/4	7- 1/2	5/8	8	7.92
CG-723311-060C	6	16-13/32	2- 3/4	11	10- 7/8	13-15/16	8- 5/8	9- 1/2	3/4	8	13.37
CG-723311-080C	8	18- 5/8	2-15/16	13- 1/2	12	13-15/16	9- 1/2	11- 3/4	3/4	8	25.76

1-1/2" - 6" ABS type approved 1-1/2" - 12 USCG applications

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

Butterfly Valve - Standard - FKM - Marine

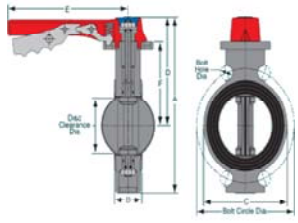
Gear Operator



Part Number	Size	B	C	F	G	H	I	J	K	L	M	N	O	P	Bolt Circle Dia.	Bolt Size	No of Bolts	Approx. Wt. (Lbs.)
CG-723321-100C	10	3- 1/4	16	11	26- 5/8	18- 5/8	7- 1/8	2- 3/8	8	9-13/16	5- 3/8	5-15/16	2- 7/16	2-11/32	14- 1/4	7/8	12	36.40
CG-723321-120C	12	3- 1/2	19	12	29- 1/8	19- 5/8	7- 1/8	2- 3/8	8	9-13/16	5- 3/8	5-15/16	2- 7/16	2-11/32	17	7/8	12	49.46

Wafer Butterfly Valves - EPDM - Marine

Lever Handle

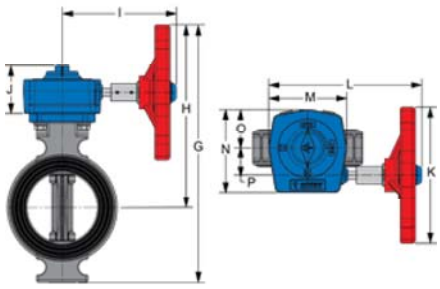


Part Number	Size	A	B	C	D	E	F	Bolt Circle Dia.	Bolt Size	No of Bolts	Approx. Wt. (Lbs.)
CG-752311-020C	2	8- 5/8	1-11/16	3- 3/4	5- 9/16	9	4	4-13/16	5/8	4	2.66
CG-752311-025C	2-1/2	9- 5/8	1-13/16	4- 1/4	6- 1/16	9	4- 1/2	5- 9/16	5/8	4	3.18
CG-752311-030C	3	10- 1/8	1-13/16	5	6- 7/16	9	4- 7/8	6- 1/8	5/8	4	3.60
CG-752311-040C	4	11-13/16	2- 1/16	6- 1/4	6-15/16	9	5- 3/8	7- 5/16	5/8	8	3.80
CG-752311-060C	6	14- 7/8	2- 3/16	8- 9/16	9- 3/8	11- 7/8	7- 1/8	9- 7/16	3/4	8	6.25
CG-752311-080C	8	17- 7/16	2- 9/16	10- 3/4	10- 5/8	13-13/16	8- 7/16	11-11/16	3/4	8	14.67

2" - 6" ABS type approved 2" - 12 USCG applications

Wafer Butterfly Valve - Standard - Marine

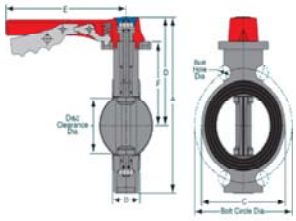
Gear Operator



Part Number	Size	B	C	G	H	I	J	K	L	M	N	O	P	Bolt Size	No of Bolts	Approx. Wt. (Lbs.)
CG-752321-100C	10	2- 9/16	12- 7/8	24	15- 7/8	6- 3/4	3	8	9- 1/4	5- 1/8	5- 7/8	2- 1/2	2- 1/8	7/8	12	29.67
CG-752321-120C	12	3- 1/16	15- 9/16	26- 3/8	16- 7/8	6- 3/4	3	8	9- 1/4	5- 1/8	5- 7/8	2- 1/2	2- 1/8	7/8	12	35.30

Wafer Butterfly Valves -FKM - Marine

Lever Handle



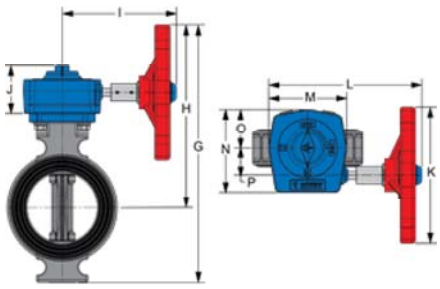
Part Number	Size	A	B	C	D	E	F	Bolt Circle Dia.	Bolt Size	No of Bolts	Approx. Wt. (Lbs.)
CG-753311-020C	2	8- 5/8	1-11/16	3- 3/4	5- 9/16	9	4	4-13/16	5/8	4	2.67
CG-753311-025C	2-1/2	9- 5/8	1-13/16	4- 1/4	6- 1/16	9	4- 1/2	5- 9/16	5/8	4	3.19
CG-753311-030C	3	10- 1/8	1-13/16	5	6- 7/16	9	4- 7/8	6- 1/8	5/8	4	3.62
CG-753311-040C	4	11-13/16	2- 1/16	6- 1/4	6-15/16	9	5- 3/8	7- 5/16	5/8	8	3.82
CG-753311-060C	6	14- 7/8	2- 3/16	8- 9/16	9- 3/8	11- 7/8	7- 1/8	9- 7/16	3/4	8	6.22
CG-753311-080C	8	17- 7/16	2- 9/16	10- 3/4	10- 5/8	13-13/16	8- 7/16	11-11/16	3/4	8	14.67

2" - 6" ABS type approved 2" - 12 USCG applications

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas
See Spears® Product Sourcebook for product offerings

Wafer Butterfly Valve - Standard - FKM - Marine

Gear Operator



Part Number	Size	B	C	G	H	I	J	K	L	M	N	O	P	Bolt Size	No of Bolts	Approx. Wt. (Lbs.)
CG-753321-100C	10	2- 9/16	12- 7/8	24	15- 7/8	6- 3/4	3	8	9- 1/4	5- 1/8	5- 7/8	2- 1/2	2- 1/8	7/8	12	29.67
CG-753321-120C	12	3- 1/16	15- 9/16	26- 3/8	16- 7/8	6- 3/4	3	8	9- 1/4	5- 1/8	5- 7/8	2- 1/2	2- 1/8	7/8	12	35.15

CPVC Marine-24 Solvent Cement - Gray - Marine

Requires primer



Part Number	Size	Approx. Wt. (Lbs.)
CG-MARINE24-030	Quart	2.29
CG-MARINE24-040	Gallon	9.03

PRIMER-70 Purple Industrial Strength Primer - Marine



Part Number	Size	Approx. Wt. (Lbs.)
PRIM70P-030	Quart	2.02
PRIM70P-040	Gallon	7.94

PRIMER-70 Clear Industrial Strength Primer - Marine



Part Number	Size	Approx. Wt. (Lbs.)
PRIM70C-030	Quart	2.02
PRIM70C-040	Gallon	7.94

Average Number of Joints per Quart of Solvent Cement

Pipe Diameter	1/2"	3/4"	1"	1-1/2"	2"	3"	4"	6"	8"	10"	12"
Number of Joints	300	200	125	90	60	40	30	10	5	2-3	1-2

NOTE: These figures are based on laboratory tests. Due to many field variations, these should be used as a general guide only.

Suitable for Oil-Free air handling to 25 psi, not for distribution of compressed air or gas