

WBS Number: 62
WBS Title: Cryogenic Systems
Job Number: 6201
Job Title: Cryogenic Systems
Job Manager: Geoff Gettlefinger

Copper Tubing

Part Number: 895529 \$412.00 Each

Type: General Purpose Copper Tubing (Alloy 122)

Material: Single Line

Shape: 1"

Outside Dia. Tolerance: ±.001"

Inside Dia.: .997"

Wall Thickness: .065"

Maximum Pressure: 600 psi @ 70°F

Operating Temperature Range: -425° to +400° F

Netal Bendability: Bendable By Hand

Temper: Soft (Annealed)

Yensile Strength: Low

Netal Construction: Seamless

Cleaning and Capping: Not Cleaned and Capped

Netal Flareability: Flareable

Sterilize With: Steam (Autoclave)

Shipped As: Coil

Specification: American Society for Testing and Materials (ASTM) ASTM B75

Compatible Fittings: Compression and Wirt Copper W/

ZoneGuard Fixed Point Gas Detection Systems

ZoneGuard System Configuration Matrix

Part Number	ZoneGuard Sensor	Add To Part #	Integrally mounted sensor	(B)	(C)
54-16-00	O ₂ Oxygen		\$ 1,318.00	\$ 1,539.00	\$ 1,759.00
54-16-01	LEL Carbon Monoxide		N/A	N/A	\$ 1,729.00
54-16-01	CO Carbon Monoxide		\$ 1,428.00	\$ 1,649.00	\$ 1,869.00
54-16-02	H ₂ Hydrogen Sulfide		\$ 1,428.00	\$ 1,649.00	\$ 1,869.00
54-16-03	SO ₂ Sulfur Dioxide		\$ 1,428.00	\$ 1,649.00	\$ 1,869.00
54-16-08	Cl ₂ Chlorine		\$ 1,649.00	\$ 1,869.00	N/A
54-16-12	CO ₂ Carbon Dioxide		\$ 1,649.00	\$ 1,869.00	N/A
54-16-13	PH ₃ Phosphine		\$ 1,649.00	\$ 1,869.00	\$ 2,089.00
54-16-28	NO ₂ Nitrogen Dioxide		\$ 1,649.00	\$ 1,869.00	\$ 2,089.00

Oxygen Sensor

ZoneGuard Accessories

Part No.	Description	Price
54-17-A3101	Single integrally mounted external strobe for ZoneGuard (red)	\$ 194.00
54-17-A3103	Single integrally mounted external strobe for ZoneGuard (amber)	\$ 194.00
54-17-A3102	Dual integrally mounted external strobes for ZoneGuard (red and amber)	\$ 359.00
54-17-A3201	Remote programmable (volume adjustable) audible alarm	\$ 135.00
54-17-A3202	Remote high intensity audible alarm	\$ 249.00
54-17-A3203	Strobe guard for sensors installed in explosion proof remote housings	\$ 61.00
54-17-A3202	Strobe guard for sensors installed in standard housings	\$ 61.00
54-17-A3401	Wire, 22 gauge, 6 conductor, twisted pair, shielded with drain, used to connect Oxygen remote detectors with ZoneGuard controller, 50 feet	\$ 61.00
54-17-A3402	Wire, 22 gauge, 4 conductor, twisted pair, shielded with drain, used to connect toxic remote detectors with ZoneGuard controller, 50 feet	\$ 61.00

Brass Cryogenic Relief Valves

Ideal for extreme low-temperature, liquefied gases such as oxygen, nitrogen, and carbon dioxide. Spring is Type 302 stainless steel. Disc is Viton for set pressures below 150 psi; PTFE for set pressures 150 psi and above. Cleaned, degreased, and packaged for oxygen service. Pressure is not adjustable. Temperature range is -320° to +165° F.

Connections: NPT male bottom inlet and 3/4" 20 UNEF female top outlet. Optional pipe adapters are available to connect to top outlet. Adapter for the 1/4" and 3/8" inlet size provides a 3/8" NPT female outlet. Adapter for 1/2" inlet size provides a 1/2" NPT female outlet. [Go Online](#)

Please specify set pressure: 21, 35, 50, 75, 100, 125, 150, 200, 235 (235 for 3/8" valve), 250, 300, 350, 400, or 450 psi.

Pipe Size	In.	Relief Valves Each	Pipe Adapters Each
1/4"	2 5/8"	4931971 \$31.00	4931904 \$7.30
3/8"	2 5/8"	4931972 \$35.40	4931904 \$7.30
1/2"	2 11/16"	4931973 \$37.00	4931906 \$7.90

Rigid Polyurethane Foam Insulation for Pipe, Tube, and Fittings

- Temperature Range: -297° to +300° F
- Heat Flow Rate (K-Factor): 0.19 Btu/hr. x in./sq. ft. @ 75° F
- Density: 2.05 lbs./cu. ft.
- Color: Pipe and Tube, Blue with white facing; Fittings, blue

Whether your piping is hot, cold, or somewhere in between, this foam insulation can handle wide temperature ranges. It's made of closed-cell foam with a slit for easy installation. For indoor use; can be used outdoors with additional jacketing. Cut with a knife or saw.

1" thick foam insulation meets ASTM E84 25/50 for flame and smoke and 2" thick foam insulation meets ASTM E84 25/450 for flame and smoke. Insulation for pipe and tube has a kraft paper and aluminum foil jacket that allows moisture to evaporate and results mild and moldew. Jacket has a self-sealing adhesive strip. Insulation for 90° elbows and tees fits over threaded connections.

FOR PIPE AND TUBE

Insulation ID	Lip	1" Thick		2" Thick		1" Thick		2" Thick	
		Each	Each	Each	Each	Each	Each	Each	Each
7/8"	3 R.	5431K14	90.10	5431K34	917.71	9097T11	35.03	9097T31	910.29
1"	3 R.	5431K15	8.57	5431K35	18.79	9097T12	5.41	9097T32	10.84
1 3/8"	3 R.	5431K16	9.36	5431K36	19.22	9097T13	5.94	9097T33	11.86
1 5/8"	3 R.	5431K17	10.60	5431K37	20.80	9097T14	6.78	9097T34	12.86
2"	3 R.	5431K18	11.21	5431K38	21.89	9097T15	7.20	9097T35	13.95
2 3/8"	3 R.	5431K21	12.84	5431K41	24.14	9097T16	8.53	9097T36	15.31
2 7/8"	3 R.	5431K23	15.40	5431K43	28.32	9097T17	11.88	9097T37	18.79
3 1/2"	3 R.	5431K25	19.87	5431K45	30.71	9097T18	11.68	9097T38	19.79
4"	3 R.	5431K26	24.40	5431K46	31.84	9097T19	13.41	9097T39	22.90
4 1/2"	3 R.	5431K27	18.20	5431K67	33.89	9097T21	14.50	9097T41	24.38

FOR 90° ELBOWS

Insulation ID	1" Thick	2" Thick
7/8"	9097T11	9097T31
1"	9097T12	9097T32
1 3/8"	9097T13	9097T33
1 5/8"	9097T14	9097T34
2"	9097T15	9097T35
2 3/8"	9097T16	9097T36
2 7/8"	9097T17	9097T37
3 1/2"	9097T18	9097T38
4"	9097T19	9097T39
4 1/2"	9097T21	9097T41

FOR TEES

Insulation ID	1" Thick	2" Thick
7/8"	9097T11	9097T31
1"	9097T12	9097T32
1 3/8"	9097T13	9097T33
1 5/8"	9097T14	9097T34
2"	9097T15	9097T35
2 3/8"	9097T16	9097T36
2 7/8"	9097T17	9097T37
3 1/2"	9097T18	9097T38
4"	9097T19	9097T39
4 1/2"	9097T21	9097T41

Rigid Polystyrene Foam Insulation

Lightweight and moisture-resistant, this closed-cell foam insulation is often used for packaging applications and is also ideal for cold room storage applications due to its low-temperature resistance. Cut with a utility knife or saw.

Motor Starters with Overload Relay

Built to IEC (International Electrotechnical Commission) standards, these motor starters are smaller than heavy duty motor starters, making them a good choice for use in tight spaces. They activate via an electrical signal (input voltage) and can be operated remotely. An adjustable overload relay allows you to set the exact overload ampereage you need. The overload relay has Class 10 overload relay trip time (trips in less than 10 seconds) with manual reset, as well as one normally open (NO) and one normally closed (NC) electrically isolated auxiliary contact. Additional auxiliary contacts (NO, NC, or other device) are sold separately below.

Open-frame starters can come in a number of styles:

- Open Frame
- Open-Frame Reversing
- Enclosed

Starter for Vaporizer

Open-frame starters can come in a number of styles: Open Frame, Open-Frame Reversing, Enclosed.

Note: Make sure the full-load amp rating of your motor falls within the starter's adjustable overload amp range. (Rated voltage is related to the control motor voltage may be different.)

Please specify input voltage: 24 VAC, 34 VDC, 120 VAC, 200/240 VAC, or 480 VAC (24 VDC motor dimensions may vary).

Adjustable Overload Amp Range	MAXIMUM MOTOR HORSEPOWER RATING, hp			Open-Frame Starters		Enclosed Starters			
	115 VAC	230 VAC	230 VAC	HL	Wt. Lbs.	Each			
Standard—For Single- and Three-Phase Motors									
1 1/2-3	1/2	1/2	1/2	1/2-3/4	4.3"	7603K56	134.04	7603K76	176.34
1 1/2-7	1/2	1/2	1/2	1/2-3/4	4.3"	7603K57	134.04	7603K77	176.34
2-4.5	3/4	3/4	3/4	1 1/2-2	4.3"	7603K58	134.04	7603K78	176.34
3-5.5	1/2	1/2-1/2	3/4-1	3	4.3"	7603K59	134.04	7603K79	176.34
3-5.5	1/2	1/2-1/2	3/4-1	1 1/2-2	4.3"	7603K60	134.04	7603K80	176.34
3-5.5	3/4	3/4-1	3	3	7 1/2"	7603K61	203.84	7603K81	259.62
12.5-18.0	3/4-1	3	3	3	9"	7603K62	203.84	7603K82	259.62
17.0-24.0	1 1/2	1 1/2	1 1/2	1 1/2	15"	7603K63	290.40	7603K83	364.04
22.0-30.0	2	2	2	2	18"	7603K64	364.04	7603K84	456.04
30.0-40.0	3	3	3	3	24"	7603K65	456.04	7603K85	576.04
37.0-50.0	3	3 1/2	3 1/2	3 1/2	15"	7603K66	290.40	7603K86	364.04
45.0-60.0	3	3 1/2	3 1/2	3 1/2	18"	7603K67	364.04	7603K87	456.04
45.0-60.0	3	3 1/2	3 1/2	3 1/2	24"	7603K68	456.04	7603K88	576.04
60.0-80.0	3	3 1/2	3 1/2	3 1/2	30"	7603K69	548.04	7603K89	696.04
75.0-100.0	3	3 1/2	3 1/2	3 1/2	36"	7603K70	640.04	7603K90	816.04
100.0-150.0	3	3 1/2	3 1/2	3 1/2	42"	7603K71	732.04	7603K91	936.04

NCSX June 2007 ETC
TABLE V - Basis of Estimate

WBS Number: 62
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Aluminum
This product matches all of your selections.

Part Number: 8868529 \$345.13 Each

Easy-to-Form Electrical Grade Aluminum (Alloy 1350)
Unfinished (MS)
Sheets, Bars, Strips, and Cubes

Material: Unfinished (MS)
Finish: Plain
Thickness: 0.004"
Length: 8.214"
Width: 48"
Standard
Without Material Certification

Temperature to Maintain Strength:
Specifications Post
ASTM Specifications

Aluminum for Evaporators

omega.com Your One-Stop Source for Process Measurement and Control (888) 70-OMEGA (USA/Canada) | (800) 358-1880 (International)

HOME QUICK ORDER PRODUCTS FREE LITERATURE MY OMEGA OMEGA INFO

search by: Part Number All Omega Search

1/32 DIN Autotune Temperature/Process Dual Setpoint Controllers
CN132 Series

\$169.00 CN132

Temperature Controller

- 1/32 DIN Cutout
- User Selectable Input
- Autotune PID
- Configurable Dual Output
- Second Setpoint and Output
- NEMA-4X Front Panel
- Full Cost Strategy
- Auto-Manual Operation
- Optional 12 Vac/dc or 24 Vac/dc Models
- UL Recognized (US)

View related products - Temperature and Process Controllers and Power Switching Devices

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Password: Go


Remember my login

Item Details **Duct Heater**

HWACR • Heating Equipment • Finned and Strip Heaters

Heater, Finned Duct
Finned Duct Heater, Power Rating 16000 Watts, Voltage Rating 480 Volts, Minimum Air Flow 600 CFM, Minimum Duct Depth 12 Inches, Element Width 24 Inches, 3 Phase

Grainier Item # 3H1797
Price (ea.) **\$1,551.00**
Brand VULCAN
Mfr. Model # VF1212-16C
Ship Qty. 1
Sell City (Will-Call) 1
Ship Weight (lbs.) 30.65
Usually Ships™ 1-3 Days
Catalog Page No. 3160



Catalog page 414

Globe Valves
For information about globe valves see page 413. For information about pipe size, see page 2-3.

Pipe OD to Pipe Size Conversions

Pipe OD	1/2"	3/4"	1"	1 1/4"	1 1/2"	1 3/4"	2"
Pipe Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	1 3/4"	2"

Low-Temp Long-Stem Bronze Globe Valves

- Maximum Pressure: C, W, P (cold water pressure): 1/2", 1", and 2" sizes: 600 psi @ 300° F, 1 1/2" size: 400 psi @ 100° F (Steam: Not rated)
- Temperature Range: -320° to +300° F
- Rising stem

Extended stem keeps the packing from freezing even at cryogenic temperatures and the CTRF disc provides a tighter-than-normal seal. Casted and packed for nitrogen service. Body and screw-in bonnet are bronze. Stem is 300 series stainless steel, packing is PTFE, and is reinforced in machinable form. Socket bearing and seal are glass-filled PTFE. Meet MSS-SP-80 Class 300.

Pipe Size	End-to-End Lg.	Height	Part No.	Each
1/2"	2 3/4"	9 3/4"	68419C12	\$103.31
3/4"	3 3/4"	10 1/2"	68419C15	241.54
1"	4 3/4"	14 3/4"	68419C18	399.92
1 1/2"	5 3/4"	15 1/4"	68419C38	508.08

Lever Arm Brass Globe Valves

- For compressed air and fluids only
- Maximum Pressure: See table
- Temperature Range: 50° to 200° F
- Rising stem

Often called whistle valves, these general service valves open quickly and are self-lubricating. Body and stem are brass. Gaskets and packing are Buna-N; spring is Type 302 stainless steel. Offered with two lever styles. Gaskets and stem are for hand operation and have an iron handle. Pull levers have a brass handle with a hole for cord or chain operation.

Pipe Size	End-to-End Lg.	Height	150 psi @ 50° F	400 psi @ 50° F
1/2"	2 5/8"	17 1/4"	40259B1	\$20.77
3/4"	2 5/8"	17 1/4"	40259B2	\$24.70
1"	2 5/8"	17 1/4"	40259B3	\$27.52
1 1/2"	2 5/8"	17 1/4"	40259B4	\$32.04

Isolation Valves

ACME CRYOGENICS 800-422-2770 ext. 601 • www.acmecryo.com
Fax 610-791-2402 • spetra@acmecryo.com

Quotation

To: Geoffrey Gettlefinger From: Brian Robinson
Company: PPPL (Princeton Plasma Physics Laboratory) Fax:
Phone: 609-248-2776 Date: May 30, 2007
Re: Request for Quotation
Quotation# EP6897 Pages: 2

Thank you for your interest in Acme Cryogenics. We appreciate the following quotation:

Vac Jacketed Valves

Line Item 1
CVI G12A Vent Valve, Standard Non-Jacketed
Part Number: 70-2542-00415
Quantity: 1 unit \$2,838.61 each
Delivery: Available to ship 2 weeks ARO

Line Item 2
CVI Model V-1060-100-S-J-5 1" Cryogenic Manual Globe Valve, Vacuum Jacketed, Schedule 5 Pipe Stub End Connections
Part Number: 81-2542-02634
Quantity: 1 unit \$2,838.18 each
Delivery: Available to ship 2 to 3 weeks ARO

Line Item 3
CVI Model V-1070-100-S-J-5 1" Cryogenic Remote Cylinder Operated (CRO) Globe Valve, Vacuum Jacketed, Schedule 5 Pipe Stub End Connections, with CVI Model C-125 A-Size Pneumatic Cylinder Actuator, 12.5 Square Inch, Fail Closed (Air to Open)
Part Number: 82-2542-02914
Quantity: 1 unit \$4,191.73 each
Delivery: Available to ship 2 to 3 weeks ARO

NCSX June 2007 ETC
TABLE V - Basis of Estimate

WBS Number: 62
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STANDARD BELLOW COMPANY
152 EAST GARDNER STREET
WINDSOR LOCKS, CT 06096
Telephone: (860) 232-3201
Fax: (860) 232-3201
http://www.stb.com

Cryo/Pneumatic Valve Element

Number: 0-21742
Date: March 6, 2007
Windsor Locks, CT
Please see below
Net 30 Days

Quantity: 1
Description: Bellows Assembly P/N 200-125-4-BB \$ 400.00 Each
00 Bellows Assembly P/N 200-125-4-BB \$ 165.00 Each
1 Bellows Assembly P/N 200-125-5-BB \$ 458.00 Each
00 Bellows Assembly P/N 200-125-5-BB \$ 204.00 Each
1 Bellows Assembly P/N 325-225-4-BB \$ 541.00 Each
00 Bellows Assembly P/N 325-225-4-BB \$ 259.00 Each
1 Bellows Assembly P/N 325-225-5-BB \$ 599.00 Each
00 Bellows Assembly P/N 325-225-5-BB \$ 328.00 Each

Quantity: 1
Description: Qty: 1 = 4.5 Weeks ARO
Qty: 00 = 6-7 Weeks ARO

Thank you for your inquiry
David D. Eckert
David D. Eckert
Sales Engineer

SEC Accepts Visa & MasterCard

Swagelok

R.S. CRUM & COMPANY
1181 GLOBE AVENUE
MOUNTAINSIDE, NJ 07092-2999
Phone: NJ (808) 232-4444
Fax: (808) 232-6291
Phone: NY (212) 662-2266

QUOTE
97364575

Cust Order No: 45523
Bid Number: 45523
Ship To: 45523
** SEE IN **
PRINCETON FORRESTAL CAMPUS

C/O PRINCETON UNIV/ACCOUNTING
P.O. BOX 451 PLASMA PHYS. LAB
PRINCETON NJ 08543

RECEIVING #3
PLASMA PHYSICS LAB
PRINCETON NJ 08543

We Accept:

Quote Date	FOB Description	Expiration Date	Terms	Quote Number
01/18/07	Shipping Point	03/19/07	****NET 30 DAYS*****	97364575

Item	Description	Quantity	Unit Price	Disc	Amount
1	B-8BG-CU + 6-7 WEEK DELIVERY	60	183.84	0	11,030.40

Cryo/Pneumatic Valve Element

Print | How can we improve?

Plastic > PTFE Material > Outside Dia. > Inside Dia. > Compare Items

Tubing

This product matches all of your selections.

Part Number: 52315K184
1-04 Ft. \$1.37 per Ft.
25 or more \$1.08 per Ft.

Distribution Tubing

Type: Extreme-Temperature PTFE Choose-A-Color Tubing
Material: PTFE (Polytetrafluoroethylene)
Shape: Single Line
Outside Dia.: 1/4" (.25")
Inside Dia.: 3/16" (.1875")
Wall Thickness: 1/32" (.0312")
Reinforcement: Unreinforced
Color: Orange Red
Maximum Pressure: 150 psi @ 70°F
Operating Temperature Range: -450°F to +500°F
Performance Characteristics: Vacuum Rated
Vacuum Rating: 29" Hg at 72°F
Bend Radius: 1"
Diameter: 9/16-450 (Hard)
Tensile Strength: 2,500-4,000 psi
Sterilize With: Gamma
Specifications Met: CFR21 177.1550
FDA Specification: Compression
Compatible Fittings: 5, 10, 25
Chemical Compatibility Link: 52315KAC

Thermax Inc.
888 Barnwood St. Dartmouth, MA 01948 USA
Telephone: 508-248-2800
Fax: 508-248-2800
Email: sales@thermax.com
Web: www.thermax.com

QUOTATION

May 30, 2007

Princeton University
Princeton Plasma Physics Laboratory
P.O. Box 451
Princeton, NJ 08543

Attention: Geoffrey A. Gettlefinger
Reference: Thermax T007-21088

Application:
Fluid: Nitrogen
Flow Rate: 5000 SCFH, max
Outlet Temp: -200 to 50°F
MW: 350-500
Pressure Drop: 20 psi
Site Electric: 480V/3PH/3W
Special Considerations: Cryogenic block, DCR control, NEMA 4 box

Based on the above conditions, Thermax is pleased to provide you with the following quotation:

Item	Qty (1)	Description
1	1	Thermaxcal Electric Vaporizer, Model HSA-C Stainless steel tube cast in aluminum block Regionally fabricated steel cartridge heater Control cabinet w/SCS controls including high temp block limit Vaporizer Connections: 1/2" NPT inlet, 1/2" NPT outlet 20 W/ power (60Hz) Approx dimensions: 24 in x 14 in x 35 in Price each: \$16,420.00

Please allow 12 weeks to ship.

Vaporizer