UIP

INTERNATIONAL

WHERE QUALITY IS THE STANDARD

# METAL HOSE & ASSEMBLIES

UIP International, Inc. is the nation's foremost supplier of expansion joints and flexible connectors. Designs range from rugged spool-type expansion joints constructed out of any elastomer, to exotic alloy multi-ply dual bellows. Our space saving Teflon® Style 112 and 113 offer maximum chemical resistance in a compact connector while our exclusive Combined Technology products create a unique hybrid solution with enhanced capabilities for the most demanding applications. The need for metal hose built to exacting specifications,culminated in our engineering of Matchless Metal Hose presented in this catalog.

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UIP International supplies a complete line of annular metal hose in many different sizes, alloys and configurations. Our Matchless metal hose is ideal for absorbing vibration, misalignment, piping expansion or contraction and equipment motion.

Braiding enables use at high pressures and attenuates vibration. Each annular corrugation is a separate element engineered to impart optimal flexibility for each size of hose we offer.

## Types of Matchless Metal Hose and Availability of Other Alloys

| **Manufactured from 321 Stainless** | **Manufactured from Monel®** |
|---|---|
| MMH-SS0-Unbraided | MMH-SM0-Unbraided |
| MMH-SS1-Single Braid | MMH-SM1-Single Braid |
| MMH-SS2-Double Braid | MMH-SM2-Double Braid |
| **Manufactured from 316 Stainless** | Manufactured from 304 Stainless Steel |
| MMH-SQ0-Unbraided | MMH-SN0-Unbraided |
| MMH-SQ1-Single Braid | MMH-SN1-Single Braid |
| MMH-SQ2-Double Braid | MMH-SN2-Double Braid |

Please contact our customer service representatives for other hose alloys that may be required for special service applications. If a hose application requires a less flexible product UIP can supply an open pitch configuration.

## Matchless Metal Hose (MMH) Style “S” (321 Stainless)

MMH-SSO Unbraided Hose
MMH-SS1 Single Braided Hose
MMH-SS2 Double Braided Hose

## Construction Details

Type 321 Stainless Steel Butt Welded Tube
Annular Close Pitch Corrugations
Type 304 Stainless Steel Braid

| Nominal Hose I.D. (in.) | Hose Type | Nominal Hose O.D. (in.) | Max Working Pressure P.S.I.G. @70° | Max. Test Pressure P.S.I.G. @70° | Rated Burst Pressure P.S.I.G. @70° | Constant Flexing (in.) | Static Bend (in.) | Min. Live Length for Normal Vibration (in.) | Approx. Weight Lbs. Per Foot |
|---|---|---|---|---|---|---|---|---|---|
| 1/4 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | .48<br>.54<br>.60 | 200<br>1500<br>2250 | 300<br>2250<br>3375 | -<br>6000<br>9000 | 5 | 1 | 4 | .12<br>.21<br>.30 |
| 3/8 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | .66<br>.72<br>.78 | 125<br>1250<br>1875 | 185<br>1875<br>2800 | -<br>5000<br>7500 | 6 | 1-1/4 | 4-1/2 | .20<br>.33<br>.46 |
| 1/2 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | .82<br>.88<br>.94 | 90<br>1050<br>1575 | 135<br>1570<br>2355 | -<br>4200<br>6250 | 7 | 1-1/2 | 5 | .22<br>.35<br>.48 |
| 3/4 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | 1.22<br>1.28<br>1.35 | 75<br>880<br>1300 | 110<br>1320<br>1950 | -<br>3520<br>5400 | 8 | 2 | 6 | .45<br>.65<br>.85 |
| 1 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | 1.47<br>1.52<br>1.60 | 55<br>615<br>900 | 45<br>925<br>1350 | -<br>2460<br>3600 | 9 | 3 | 6-1/2 | .60<br>.80<br>1.0 |
| 1-1/4 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | 1.83<br>1.89<br>1.95 | 30<br>570<br>850 | 45<br>850<br>1275 | -<br>2275<br>3400 | 10 | 4 | 7 | .70<br>1.0<br>1.3 |
| 1-1/2 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | 2.08<br>2.14<br>2.20 | 25<br>425<br>637 | 35<br>637<br>955 | -<br>1700<br>2550 | 11 | 5 | 8 | 1.0<br>1.4<br>1.8 |
| 2 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | 2.61<br>2.69<br>2.77 | 15<br>470<br>695 | 22<br>710<br>1045 | -<br>1880<br>2780 | 13 | 6 | 9 | 1.2<br>1.8<br>2.4 |
| 2-1/2 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | 3.34<br>3.42<br>3.50 | 12<br>450<br>675 | 18<br>675<br>1012 | -<br>1800<br>2700 | 15 | 7 | 10 | 1.3<br>2.1<br>2.9 |
| 3 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | 3.88<br>3.99<br>4.11 | 10<br>285<br>400 | 15<br>428<br>600 | -<br>1140<br>1600 | 18 | 9 | 11 | 1.7<br>2.4<br>3.1 |
| 4 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | 4.80<br>4.90<br>5.00 | 8<br>250<br>325 | 12<br>375<br>487 | -<br>1000<br>1300 | 22 | 11 | 12 | 1.9<br>3.5<br>4.1 |
| 5 | MMH-SSO<br>MMH-SS1<br>MMH-SS2 | 5.80<br>6.02<br>6.24 | 8<br>225<br>335 | 12<br>338<br>480 | -<br>900<br>1330 | 28 | 14 | 13 | 3.9<br>5.4<br>6.9 |
| 6 | MMH-SSO<br>MMH-SS1 | 7.00<br>7.14 | 5<br>200 | 7<br>300 | -<br>800 | 34 | 16 | 14 | 4.2<br>6.1 |
| 8 | MMH-SSO<br>MMH-SS1 | 9.00<br>9.26 | 3<br>200 | 5<br>300 | -<br>800 | 42 | 20 | 16 | 5.4<br>9.4 |
| 10 | MMH-SSO<br>MMH-SS1 | 11.30<br>11.55 | 3<br>150 | 4.5<br>225 | -<br>600 | 50 | 24 | 18 | 6.9<br>13.3 |
| 12 | MMH-SSO<br>MMH-SS1 | 13.25<br>13.50 | 2<br>150 | 3<br>225 | -<br>600 | 58 | 28 | 20 | 8.6<br>15.0 |
| 14 | MMH-SSO<br>MMH-SS1 | 14.40<br>14.65 | 2<br>140 | 3<br>210 | -<br>560 | 66 | 36 | 22 | 11.9<br>18.0 |
| 16 | MMH-SSO<br>MMH-SS1 | 16.40<br>16.65 | 2<br>100 | 3<br>150 | -<br>400 | 74 | 40 | 26 | 16.0<br>22.1 |
| 18 | MMH-SSO<br>MMH-SS1 | 18.75<br>19.00 | 2<br>80 | 3<br>120 | -<br>320 | 82 | 46 | 28 | 18.0<br>24.4 |
| 20 | MMH-SSO<br>MMH-SS1 | 20.75<br>21.00 | 1<br>70 | 1.5<br>105 | -<br>280 | 90 | 52 | 30 | 20.1<br>26.7 |
| 22 | MMH-SSO<br>MMH-SS1 | 22.75<br>23.00 | 1<br>50 | 1.5<br>75 | -<br>200 | 98 | 56 | 32 | 22.2<br>29.0 |
| 24 | MMH-SSO<br>MMH-SS1 | 24.75<br>25.00 | 1<br>40 | 1.5<br>60 | -<br>160 | 104 | 60 | 36 | 24.3<br>31.0 |
| 30 | MMH-SSO<br>MMH-SS1 | 30.75<br>31.00 | 1<br>22 | 1.5<br>33 | -<br>88 | 128 | 80 | 48 | 30.5<br>40.1 |

## Matchless Metal Hose (MMH) Style “Q” (316 Stainless)

MMH-SQO Unbraided Hose
MMH-SQ1 Single Braided Hose
MMH-SQ2 Double Braided Hose

## Construction Details

Type 316 Stainless Steel Butt Welded Tube
Annular Close Pitch Corrugations
Type 304 Stainless Steel Braid

| Nominal Hose I.D. (in.) | Hose Type | Nominal Hose O.D. (in.) | Max Working Pressure P.S.I.G. @70° | Max. Test Pressure P.S.I.G. @70° | Rated Burst Pressure P.S.I.G. @70° | Constant Flexing (in.) | Static Bend (in.) | Min. Live Length for Normal Vibration (in.) | Approx. Weight Lbs. Per Foot |
|---|---|---|---|---|---|---|---|---|---|
| 1/4 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | .50<br>.56<br>.64 | 200<br>1425<br>2137 | 300<br>2137<br>3206 | -<br>5700<br>8550 | 5 | 1 | 4 | .12<br>.21<br>.30 |
| 3/8 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | .66<br>.72<br>.78 | 100<br>1187<br>1781 | 150<br>1781<br>2660 | -<br>4750<br>7125 | 6 | 1-1/4 | 4-1/2 | .20<br>.33<br>.46 |
| 1/2 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | .83<br>.89<br>.97 | 90<br>997<br>1496 | 135<br>1491<br>2237 | -<br>3990<br>5937 | 7 | 1-1/2 | 5 | .22<br>.35<br>.48 |
| 3/4 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | 1.22<br>1.28<br>1.35 | 75<br>836<br>1235 | 110<br>1254<br>1852 | -<br>3344<br>5130 | 8 | 2 | 6 | .45<br>.65<br>.85 |
| 1 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | 1.47<br>1.52<br>1.60 | 55<br>584<br>855 | 45<br>878<br>1282 | -<br>2337<br>3420 | 9 | 3 | 6-1/2 | .60<br>.80<br>1.0 |
| 1-1/4 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | 1.83<br>1.89<br>1.95 | 30<br>541<br>807 | 45<br>807<br>1211 | -<br>2161<br>2330 | 10 | 4 | 7 | .70<br>1.0<br>1.3 |
| 1-1/2 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | 2.08<br>2.14<br>2.20 | 25<br>403<br>605 | 35<br>605<br>907 | -<br>1615<br>2422 | 11 | 5 | 8 | 1.0<br>1.4<br>1.8 |
| 2 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | 2.61<br>2.69<br>2.77 | 15<br>446<br>660 | 22<br>674<br>992 | -<br>1786<br>2641 | 13 | 6 | 9 | 1.2<br>1.8<br>2.4 |
| 2-1/2 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | 3.34<br>3.42<br>3.50 | 12<br>427<br>641 | 18<br>641<br>961 | -<br>1710<br>2565 | 15 | 7 | 10 | 1.3<br>2.1<br>2.9 |
| 3 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | 3.88<br>3.99<br>4.11 | 10<br>270<br>380 | 15<br>406<br>570 | -<br>1083<br>1520 | 18 | 9 | 11 | 1.7<br>2.4<br>3.1 |
| 4 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | 4.80<br>4.90<br>5.00 | 8<br>237<br>308 | 12<br>356<br>462 | -<br>950<br>1235 | 22 | 11 | 12 | 1.9<br>3.5<br>4.1 |
| 5 | MMH-SQO<br>MMH-SQ1<br>MMH-SQ2 | 5.80<br>6.02<br>6.24 | 8<br>213<br>318 | 12<br>321<br>456 | -<br>855<br>1263 | 28 | 14 | 13 | 3.9<br>5.4<br>6.9 |
| 6 | MMH-SQO<br>MMH-SQ1 | 7.00<br>7.14 | 5<br>190 | 7<br>285 | -<br>760 | 34 | 16 | 14 | 4.2<br>6.1 |
| 8 | MMH-SQO<br>MMH-SQ1 | 9.00<br>9.26 | 3<br>190 | 5<br>285 | -<br>760 | 42 | 20 | 16 | 5.4<br>9.4 |
| 10 | MMH-SQO<br>MMH-SQ1 | 11.30<br>11.55 | 3<br>142 | 4.5<br>213 | -<br>570 | 50 | 24 | 18 | 6.9<br>13.3 |
| 12 | MMH-SQO<br>MMH-SQ1 | 13.25<br>13.50 | 2<br>142 | 3<br>213 | -<br>570 | 58 | 28 | 20 | 8.6<br>15.0 |
| 14 | MMH-SQO<br>MMH-SQ1 | 14.40<br>14.65 | 2<br>133 | 3<br>199 | -<br>532 | 66 | 36 | 22 | 11.9<br>18.0 |
| 16 | MMH-SQO<br>MMH-SQ1 | 16.40<br>16.65 | 2<br>95 | 3<br>142 | -<br>380 | 74 | 40 | 26 | 16.0<br>22.1 |
| 18 | MMH-SQO<br>MMH-SQ1 | 18.75<br>19.00 | 2<br>76 | 3<br>114 | -<br>304 | 82 | 46 | 28 | 18.0<br>24.4 |
| 20 | MMH-SQO<br>MMH-SQ1 | 20.75<br>21.00 | 1<br>66 | 1.5<br>99 | -<br>266 | 90 | 52 | 30 | 20.1<br>26.7 |
| 22 | MMH-SQO<br>MMH-SQ1 | 22.75<br>23.00 | 1<br>47 | 1.5<br>71 | -<br>190 | 98 | 56 | 32 | 22.2<br>29.0 |
| 24 | MMH-SQO<br>MMH-SQ1 | 24.75<br>25.00 | 1<br>38 | 1.5<br>57 | -<br>152 | 104 | 60 | 36 | 24.3<br>31.0 |
| 30 | MMH-SQO<br>MMH-SQ1 | 30.75<br>31.00 | 1<br>20 | 1.5<br>31 | -<br>83 | 128 | 80 | 48 | 30.5<br>40.1 |

# MONEL®

## Matchless Metal Hose (MMH) Style "M" (Monel®)

MMH-SM0 Unbraided Hose
MMH-SM1 Single Braided Hose

## Construction Details

Monel® alloy butt welded Tube
Type 304 Stainless Steel Braid

| | | | Pressure Data | | | | Bend Radius | | |
|---|---|---|---|---|---|---|---|---|---|
| Nominal Hose I.D. (in.) | Hose Type | Nominal Hose O.D. (in.) | Max Working Pressure P.S.I.G. @70° | Max. Test Pressure P.S.I.G. @70° | Rated Burst Pressure P.S.I.G. @70° | Constant Flexing (in.) | Static Bend (in.) | Min. Live Length for Normal Vibration (in.) | Approx. Weight Lbs. Per Foot |
| 1/4 | MMH-SMO<br>MMH-SM1 | 1.5<br>1.56 | 60<br>680 | 90<br>1020 | 2720 | 9 | 3 | 7 | .85<br>1.12 |
| 1-1/4 | MMH-SMO<br>MMH-SM1 | 1.82<br>1.88 | 35<br>500 | 52<br>750 | 2000 | 10 | 3-1/2 | 8 | 1.15<br>1.53 |
| 1-1/2 | MMH-SMO<br>MMH-SM1 | 2.09<br>2.17 | 25<br>375 | 38<br>560 | 1590 | 11 | 4 | 9 | 1.60<br>2.05 |
| 2 | MMH-SMO<br>MMH-SM1 | 2.16<br>2.70 | 18<br>300 | 27<br>450 | 1200 | 12 | 5 | 10 | 2.00<br>2.63 |
| 2-1/2 | MMH-SMO<br>MMH-SM1 | 3.30<br>3.38 | 12<br>230 | 18<br>360 | 920 | 14 | 7 | 11 | 2.5<br>2.23 |
| 3 | MMH-SMO<br>MMH-SM1 | 3.80<br>3.90 | 10<br>225 | 15<br>338 | 900 | 18 | 8 | 12 | 2.6<br>2.25 |
| 4 | MMH-SMO<br>MMH-SM1 | 4.90<br>5.00 | 8<br>175 | 12<br>262 | 700 | 22 | 11 | 13 | 3.5<br>4.65 |

## Metal Hose Terminology

**Annular**-A Hose profile that is designed so each convolution is a separate circle or ring.

**Braid**-Woven wire cover placed over hose which prevents elongation of the hose and permits higher working pressure.

**Close Pitch**-More corrugations per foot which renders the longest fatigue life and minimum bend radius.

**Constant Flexing Bend Radius**-The minimum radius to which a hose can be repeatedly bent and render satisfactory flexure life.

**Constant Motion**-Motion that occurs on a regular cyclic basis at a constant travel.

**Fittings**-Parts attached to the ends of metal hose so that it can be connected other components such as flanges, unions, nipples, etc.

**Flow Velocity**-When the flow velocity exceeds 75 ft./second liquid, 150 ft./second gas in braided hose, a flexible metal liner should be used.

**Intermittent Motion**-Motion that occurs on a regular or irregular cyclic basis.

**Maximum Test Pressure**-Maximum pressure hose assembly should be subject to for testing purposes. Based on 150% of the Maximum Working Pressure.

**Media**-Conveyant in a hose assembly such as gases, liquids, etc.

**Operating Conditions**-Temperature, Pressure, Media, Motion and Application involved.

**Random Motion**-Uncontrolled motion that occurs usually from manual handling of hose.

**Rated Burst Pressure**-Pressure at which hose can be expected to fail. Braid will normally fail before core burst.

**Safety Factor**-Difference between working pressure and rated burst pressure.

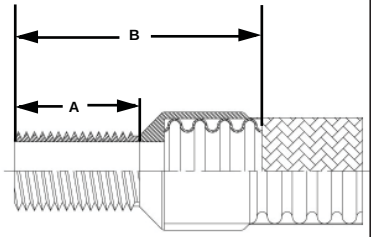
**Shock or pulsating Pressure**-Shock, pulsating or surge pressure can cause premature failure of hose.

**Static Bend**-Minimum center bend radius to which flexible metal hose may be bent for installation.

**Vibration**-High frequency, low amplitude

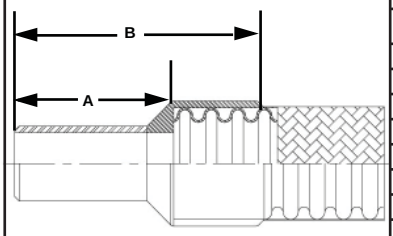
**Working Temperature**-Temperature to which hose will be subjected ruing operation

## Male Nipple (MN)



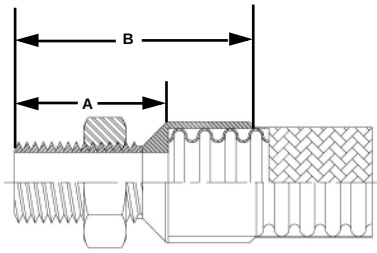

| Size | "A" | "B" |
|---|---|---|
| 1/4 | 1-1/2 | 2 |
| 3/8 | 1-1/2 | 2 |
| 1/2 | 1-1/2 | 2 |
| 3/4 | 1-1/2 | 2 |
| 1 | 2 | 2-1/2 |
| 1-1/4 | 2 | 2-1/2 |
| 1-1/2 | 2 | 2-1/2 |
| 2 | 2-1/2 | 3-1/2 |
| 2-1/2 | 3 | 4 |
| 3 | 3 | 4 |
| 4 | 3 | 4 |

## Weld Nipple (W)



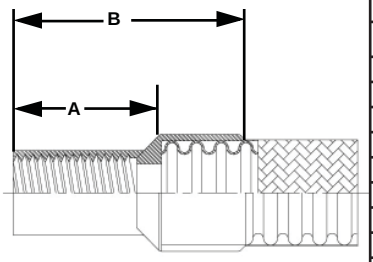

| Size | "A" | "B" |
|---|---|---|
| 3/4 | 2-1/2 | 3 |
| 1 | 2-1/2 | 3 |
| 1-1/4 | 2-1/2 | 3 |
| 1-1/2 | 3 | 4 |
| 2 | 3 | 4 |
| 2-1/2 | 3 | 4 |
| 3 | 4 | 5 |
| 4 | 4 | 5 |
| 5 | 4 | 5 |
| 6 | 6 | 7 |
| 8 | 6 | 7 |

## Hex Male (HM)



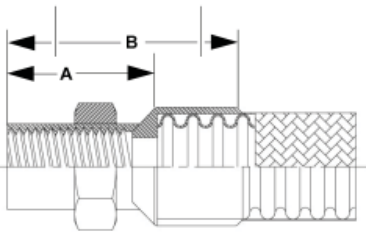

| Size | "A" | "B" |
|---|---|---|
| 1/4 | 1 | 1-1/2 |
| 3/8 | 1 | 1-1/2 |
| 1/2 | 1 | 1-1/2 |
| 3/4 | 1-1/4 | 1-3/4 |
| 1 | 1-1/2 | 2 |
| 1-1/4 | 2 | 2-1/2 |
| 1-1/2 | 2-1/4 | 2-3/4 |

## Female Coupling (C)



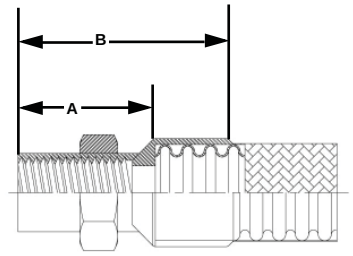

| Size | "A" | "B" |
|---|---|---|
| 1/4 | 11/16 | 1-1/16 |
| 3/8 | 3/4 | 1-1/8 |
| 1/2 | 3/4 | 1-1/8 |
| 3/4 | 3/4 | 1-1/8 |
| 1 | 1 | 1-3/4 |
| 1-1/4 | 1 | 1-3/4 |
| 1-1/2 | 1 | 1-3/4 |
| 2 | 1-1/4 | 2 |
| 2-1/2 | 1-7/16 | 2-7/16 |
| 3 | 1-5/8 | 2-5/8 |
| 4 | 1-7/8 | 2-7/8 |

## Male Union (MU)



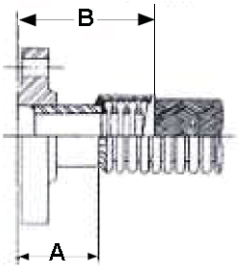

| Size | "A" | "B" |
|---|---|---|
| 1/4 | 2-1/4 | 2-5/8 |
| 3/8 | 2-1/2 | 3 |
| 1/2 | 2-3/4 | 3-1/4 |
| 3/4 | 3-1/8 | 3-7/8 |
| 1 | 3-3/8 | 4-3/8 |
| 1-1/4 | 3-3/4 | 4-3/4 |
| 1-1/2 | 4 | 5-1/4 |

## Female Union (FU)



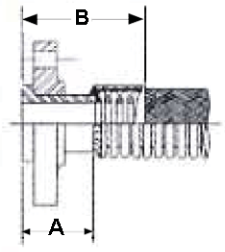

| Size | "A" | "B" |
|---|---|---|
| 1/4 | 1-7/16 | 2-1/16 |
| 3/8 | 1-5/8 | 2-1/8 |
| 1/2 | 1-13/16 | 2-3/16 |
| 3/4 | 2 | 2-1/2 |
| 1 | 3-3/16 | 3-3/16 |
| 1-1/4 | 3-7/16 | 3-7/16 |
| 1-1/2 | 3-5/8 | 3-5/8 |
| 2 | 4 | 4 |
| 2-1/2 | 4-1/4 | 4-1/4 |
| 3 | 4-1/2 | 4-1/2 |

## Fixed Flange (F)




| Size | "A" | "B" |
|---|---|---|
| 1 | 2 | 2-5/8 |
| 1-1/4 | 2 | 2-3/4 |
| 1-1/2 | 2 | 2-3/4 |
| 2 | 2-1/2 | 3-3/8 |
| 2-1/2 | 2-1/2 | 3-3/8 |
| 3 | 2-1/2 | 3-3/8 |
| 4 | 3 | 3-3/4 |
| 5 | 3 | 3-3/4 |
| 6 | 3-1/2 | 4-1/2 |
| 8 | 4 | 5 |

## Floating Flange (V)

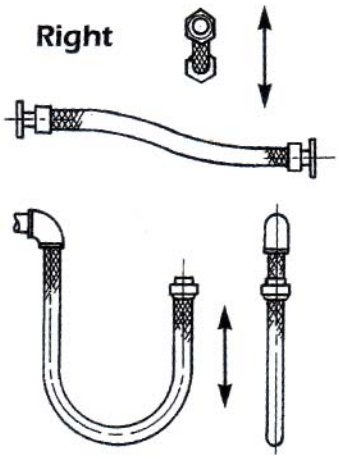



| Size | "A" | "B" |
|---|---|---|
| 1 | 2 | 2-5/8 |
| 1-1/4 | 2 | 2-3/4 |
| 1-1/2 | 2 | 2-3/4 |
| 2 | 2-1/2 | 3-1/2 |
| 2-1/2 | 2-1/2 | 3-1/2 |
| 3 | 2-1/2 | 3-1/2 |
| 4 | 3 | 3-3/4 |
| 5 | 3 | 3-3/4 |
| 6 | 3-1/2 | 4-1/2 |
| 8 | 4 | 5 |

The variety of fittings available for weld attachment to metal hose is nearly unlimited. If the required end fitting is not shown above, please specify what your system requires. Our standard fittings are carbon steel, but stainless steel is readily available. Simply add the prefix "S" to any of the designations for 304 stainless steel.

# Installation, Use and Precautions

UIP International Matchless Metal Hose will render maximum service life when properly installed. The following precautions should be observed when installing flexible metal hose.

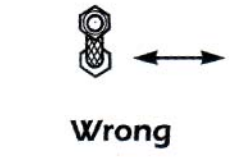



### Avoid Torque

Torque or twisting is harmful to hose and substantially reduces service life. Installation torque can be avoided by using a floating flange or union at one end of an assembly in place of a rigid connection. Always install hose so that flexing takes place in one plane.

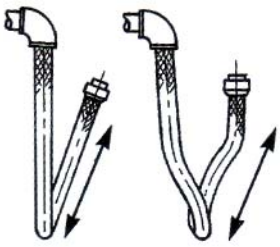
### Avoid Overbending

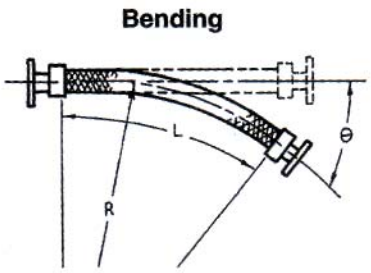
If metal hose is bent below the minimum recommended bend radius, fatigue and premature failure can result. This bending often occurs at end connections and can be avoided by installing an interlock guard or elbow.

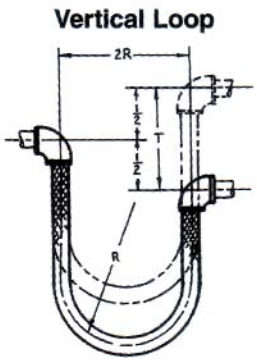


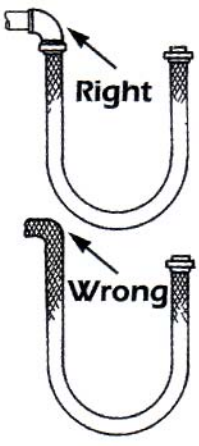

### Avoid Improper Handling

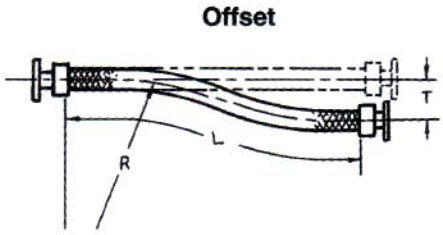
Always lift hose—do not drag. Do not permit hose to be stored in an area where it is subject to spills, corrosive sprays, etc.

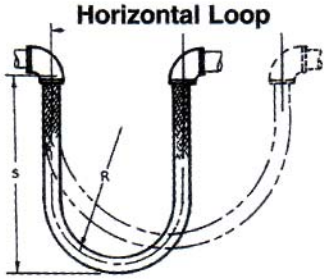




# Intermittent Offset Motion

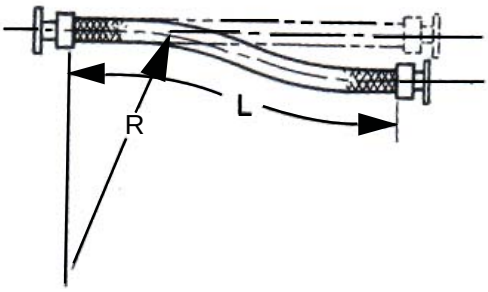
Note: The values shown in bold are applicable to non-moving bends only. For intermittent flexing, the offset motion should not exceed 25% of the center line bend radius.

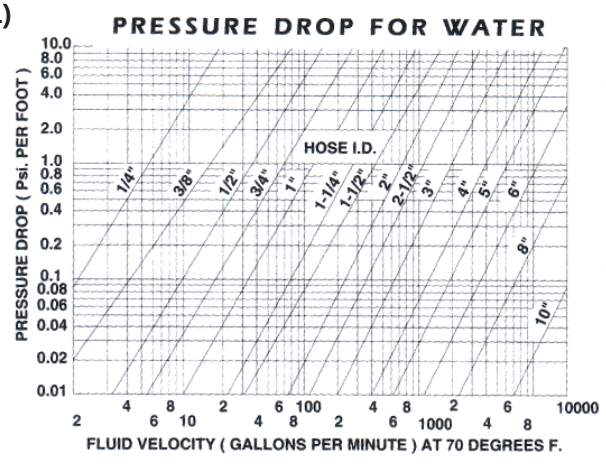
| Center Line Radius in.=(R) | 24-1/4Maximum Distance From Centerline=(T) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1/8” | 1/4” | 3/8” | 1/2” | 3/4” | 1” | 1-1/2” | 2” | 3” | 4” | 5” | 6” | 8” | 10” |
| 2 | 1-1/4 | 1-3/4 | 2-1/4 | 2-1/2 | 3-1/4 | 3-3/4 | 4-1/2 | 5-1/4 | 6-3/4 | 8 | 9-1/4 | 10-1/2 | 11-3/4 | 15 |
| 4 | 1-3/4 | 2-1/2 | 3 | 3-1/2 | 4-1/4 | 5 | 6-1/4 | 7-1/4 | 9 | 10-3/4 | 12 | 13-1/2 | 16 | 18-1/2 |
| 6 | 2-1/4 | 3-1/4 | 3-3/4 | 4-1/4 | 5-1/4 | 6-1/4 | 7-1/2 | 8-1/4 | 10-3/4 | 12-3/4 | 14-1/4 | 16 | 19 | 21-1/2 |
| 8 | 2-1/2 | 3-1/2 | 4-1/4 | 5 | 6 | 7 | 8-3/4 | 10 | 12-1/2 | 14-1/2 | 16-1/4 | 18 | 20-1/2 | 24-1/4 |
| 10 | 2-3/4 | 4 | 4-3/4 | 5-1/2 | 6-3/4 | 8 | 9-3/4 | 11-1/4 | 13-3/4 | 16 | 18 | 20 | 23-1/2 | 26-1/2 |
| 12 | 3 | 4-1/4 | 5-1/4 | 6 | 7-1/2 | 8-1/2 | 10-1/2 | 12-1/4 | 15 | 17-1/2 | 19-1/2 | 21-1/2 | 25-1/2 | 28-3/4 |
| 14 | 3-1/4 | 4-3/4 | 5-3/4 | 6-1/2 | 8 | 9-1/4 | 11-1/4 | 13-1/4 | 16-1/4 | 18-3/4 | 21 | 23-1/2 | 27-1/4 | 30-3/4 |
| 16 | 3-1/2 | 5 | 6 | 7 | 8-1/2 | 10 | 12-1/4 | 14 | 17-1/4 | 20 | 22-1/2 | 25 | 29 | 32-3/4 |
| 18 | 3-3/4 | 5-1/4 | 6-1/2 | 7-1/2 | 9 | 10-1/2 | 13 | 15 | 18-1/4 | 21-1/4 | 24 | 26 | 30-1/2 | 34 |
| 20 | 4 | 5-1/2 | 6-3/4 | 7-3/4 | 9-1/2 | 11 | 13-1/2 | 16-3/4 | 19-1/4 | 22-1/2 | 25 | 27-1/2 | 32-1/4 | 36-1/4 |
| 25 | 4-1/2 | 6-1/4 | 7-1/2 | 8-3/4 | 10-3/4 | 12-1/4 | 15 | 17-1/2 | 21-1/2 | 25 | 28 | 30-1/2 | 35-3/4 | 40 |
| 30 | 4-3/4 | 6-3/4 | 8-1/4 | 9-1/2 | 11-3/4 | 13-1/2 | 16-1/2 | 19 | 23-1/2 | 27-1/4 | 30-1/2 | 33-1/2 | 39 | 43-3/4 |
| 35 | 5-1/4 | 7-1/4 | 9 | 10-1/4 | 12-1/2 | 14-1/2 | 18 | 20-3/4 | 26-1/4 | 29-1/2 | 32-3/4 | 36 | 42 | 47 |
| 40 | 5-1/2 | 7-3/4 | 9-1/2 | 11 | 13-1/2 | 15-1/2 | 19 | 22 | 27 | 31-1/4 | 35 | 38-1/2 | 44-3/4 | 50 |
| 45 | 6 | 8-1/4 | 10 | 11-3/4 | 14-1/4 | 16-1/2 | 20-3/4 | 23-1/2 | 28-1/2 | 33-1/4 | 37 | 41 | 47-1/2 | 53 |
| 50 | 6-1/4 | 8-3/4 | 10-3/4 | 12-1/4 | 15 | 17-1/2 | 21-1/2 | 24-3/4 | 30 | 35 | 39 | 43 | 50 | 56 |
| 60 | 6-3/4 | 9-1/2 | 11-3/4 | 13-1/2 | 16-1/2 | 19 | 23-1/4 | 27 | 33 | 38-1/4 | 43 | 47 | 54-1/2 | 61 |
| 70 | 7-1/4 | 10-1/4 | 12-3/4 | 14-3/4 | 17-3/4 | 20-1/2 | 25-1/4 | 29 | 35-1/2 | 41-1/2 | 46 | 51 | 58-3/4 | 35-3/4 |
| 80 | 7-3/4 | 11 | 13-1/2 | 15-1/2 | 19 | 22 | 27 | 31 | 38 | 44 | 49-1/2 | 54 | 62-3/4 | 70 |
| 90 | 8-1/4 | 11-3/4 | 14-1/4 | 16-1/2 | 20-1/4 | 23-1/2 | 28-1/2 | 33 | 40-1/2 | 46-3/4 | 52 | 57-1/4 | 66-1/4 | 74-1/4 |
| 100 | 8-3/4 | 12-1/4 | 15 | 17-1/2 | 21-1/4 | 24-1/2 | 30-1/2 | 35 | 42-1/2 | 49-1/4 | 55 | 60-1/2 | 69-3/4 | 78-1/4 |
| 110 | 9-1/4 | 13 | 15-3/4 | 18-1/4 | 22-1/2 | 25-3/4 | 31-3/4 | 36-1/2 | 44-3/4 | 51-1/2 | 58 | 63-1/4 | 73-1/4 | 82 |
| 120 | 9-1/2 | 13-1/2 | 16-1/2 | 19 | 23-1/4 | 27 | 33 | 38-1/4 | 46-3/4 | 54 | 60-1/2 | 66 | 76-1/2 | 85-1/2 |
| 130 | 10 | 14 | 17-1/4 | 20 | 24-1/4 | 28 | 34-3/4 | 39-3/4 | 48-1/2 | 56 | 62-3/4 | 68-3/4 | 79-1/2 | 89 |

**Live Length=(L)**

## Assembly Length/O.A.L.

After the hose is selected for the application, the live length and overall length of the assembly must be determined. After the live length has been determined, the overall length (O.A.L.) is calculated by adding the dimensions for the selected end fitting.



# Temperature Correction Factors for Elevated Temperature

As the service temperature increases, the maximum pressure a hose assembly can withstand decreases. The material from which the hose is made and the method is fitting attachment (mechanical, soldered, welded, silver brazed) determine the maximum pressure at which an assembly can be used. By using the factors given in the chart below, the approximate safe working pressure at elevated temperatures can be calculated for assemblies with welded or mechanically attached fittings.

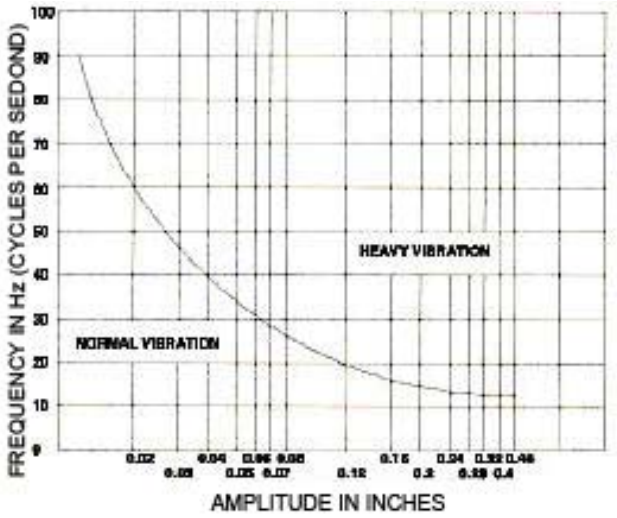
**Example:**
Determine if 3/4" annular stainless hose with welded fittings is satisfactory for the given operating conditions.

**Given:**
Maximum operating temperature is 600 Deg. F. Maximum operating pressure is 300PSIG.

**Computation:**
From the Series MMH-SSI Hose Type-nominal rated burst pressure is 3/4" MMH series with welded fittings is 3520 PSIG. From temperature Correction Factors Chart factor for stainless T321 at 600 Deg F is 0.74.

**Results:**
Since the maximum operating pressure for MMH-551 Hose Type at 600 Deg F is 651 PSIG. The hose will meet the required operating conditions outlined above.

| Temperature Correction Factors | | | |
|---|---|---|---|
| **Temp (Deg F.)** | **T321 / T3161** | **T304** | **Carbon Steel** |
| 70F | 1 | 1 | 1 |
| 105F | 0.97 | 0.96 | 0.99 |
| 200F | 0.94 | 0.92 | 0.97 |
| 250F | 0.92 | 0.91 | 0.96 |
| 300F | 0.88 | 0.86 | 0.93 |
| 350F | 0.86 | 0.85 | 0.91 |
| 400F | 0.83 | 0.82 | 0.87 |
| 450F | 0.81 | 0.8 | 0.86 |
| 500F | 0.78 | 0.77 | 0.81 |
| 600F | 0.74 | 0.73 | 0.74 |
| 700F | 0.7 | 0.69 | 0.66 |
| 800F | 0.66 | 0.64 | 0.52 |
| 900F | 0.62 | | |
| 1000F | 0.6 | | |
| 1100F | 0.58 | | |
| 1200F | 0.55 | | |
| 1300F | 0.5 | | |
| 1400F | 0.44 | | |
| 1500F | 0.4 | | |



## Thermal Expansion of Pipe (inches per 100 ft.)

| Pressure PSI Gauge Vacuum Inches of HG | Temp. Degrees F. | Carbon Steel | 4-6% Cr Alloy Steel | 18 Cr-8 Ni Stainless Steel | Monel® Alloy 400 |
|---|---|---|---|---|---|
| Saturated Steam, Vacuum In. Hg Below 212° F, Pressure PSI Gauge Above 212° F | -200 | -1.282 | -1.250 | -2.030 | -1.64 |
| | -160 | -1.066 | -1.030 | -1.670 | -1.32 |
| | -100 | -0.698 | -0.7000 | -1.090 | -0.82 |
| | -60 | -0.428 | -0.430 | -0.670 | -0.49 |
| | -40 | -0.288 | -0.290 | -0.450 | -0.32 |
| | -20 | -0.145 | -0.145 | -0.225 | -0.17 |
| | 0 | 0 | 0 | 0 | 0 |
| | 20 | 0.148 | 0.140 | 0.223 | 0.197 |
| | 32 | 0.230 | 0.234 | 0.356 | 0.315 |
| - | 40 | 0.285 | 0.280 | 0.446 | 0.394 |
| 29.39 | 60 | 0.448 | 0.430 | 0.669 | 0.591 |
| 28.89 | 80 | 0.580 | 0.600 | 0.892 | 0.790 |
| 27.99 | 100 | 0.753 | 0.750 | 1.115 | 0.985 |
| 26.48 | 120 | 0.910 | 0.900 | 1.338 | 1.18 |
| 24.04 | 140 | 1.064 | 1.050 | 1.545 | 1.38 |
| 20.27 | 160 | 1.223 | 1.220 | 1.784 | 1.58 |
| 14.63 | 180 | 1.383 | 1.370 | 2.000 | 1.77 |
| 6.45 | 200 | 1.546 | 1.520 | 2.230 | 1.97 |
| 8 | 212 | 1.643 | 1.600 | 2.361 | 2.09 |
| 10.03 | 240 | 1.875 | 1.825 | 2.680 | 2.36 |
| 20.7 | 260 | 2.038 | 2.000 | 2.920 | 2.56 |
| 52.3 | 300 | 2.374 | 2.320 | 3.375 | 2.95 |
| 103.3 | 340 | 2.717 | 2.625 | 3.840 | 3.35 |
| 180.9 | 380 | 3.066 | 2.980 | 4.346 | 3.74 |
| 293.7 | 420 | 3.421 | 3.300 | 4.800 | 4.14 |
| 451.3 | 460 | 3.784 | 3.650 | 5.335 | 4.53 |
| 664.3 | 500 | 4.151 | 4.000 | 5.800 | 4.92 |
| 945.3 | 540 | 4.525 | 4.350 | 6.320 | 5.32 |
| 1308 | 580 | 4.906 | 4.740 | 6.835 | 5.71 |
| 1768 | 620 | 5.292 | 5.110 | 7.370 | 6.11 |
| 2346 | 660 | 5.686 | 5.470 | 7.900 | 6.50 |
| 3080 | 700 | 6.084 | 5.850 | 8.425 | 6.89 |
| | 740 | 6.490 | 6.220 | 8.932 | 7.29 |
| | 800 | 7.105 | 6.800 | 9.750 | 7.88 |
| | 840 | 7.517 | 7.200 | 10.270 | 8.28 |
| | 900 | 8.168 | 7.770 | 11.075 | 8.86 |
| | 960 | 8.830 | 8.360 | 11.900 | 9.46 |
| | 1000 | 9.276 | 8.760 | 12.432 | 9.85 |

# Master Flexible Metal Pump Connectors

"Master" Metal Pump Connectors are designed with a flexible core of corrugated-type 321 stainless steel tubing under the braid. Flat face flanges are standard: however other types (150# R.F., 300#, stainless, millimetric, male nipples) are available. A wire braid is used over the flexible core on most designs to provide strength for the rated operating pressure. Braid for stainless steel core is either type 321 or 304 stainless steel.

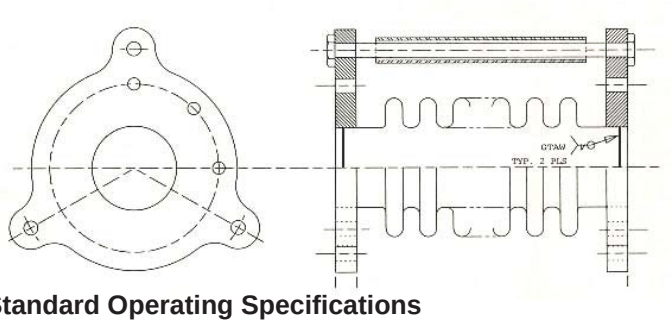
| Flanged Metal Pump Connector Specifications | | | | |
|---|---|---|---|---|
| **Part Number** | **Flange IPS and Nominal Hose ID (in.)** | **Overall Length** | **Max W.P. at Room Temp. (psi)** | **Approx. Wt. (lbs.) Per Unit** |
| SFPC 025 | 2-1/2 | 9" | 300 | 16 |
| SFPC 03 | 3 | 9" | 250 | 19 |
| SFPC 04 | 4 | 9" | 200 | 23 |
| SFPC 05 | 5 | 11" | 200 | 32 |
| SFPC 06 | 6 | 11" | 200 | 40 |
| SFPC 08 | 8 | 12" | 200 | 62 |
| SFPC 10 | 10 | 13" | 150 | 101 |
| SFPC 12 | 12 | 14" | 125 | 153 |
| SFPC 14 | 14 | 14" | 100 | 200 |
| **Threaded Male Pump Connector Specifications** | | | | |
| **Part Number** | **Flange IPS and Nominal Hose ID (in.)** | **Overall Length** | **Max W.P. at Room Temp. (psi)** | **Approx. Wt. (lbs.) Per Unit** |
| SMPC 0.5 | 1/2 | 6-1/2" | 950 | 1/2 |
| SMPC 0.75 | 3/4 | 7" | 700 | 1 |
| SMPC 01 | 1 | 8" | 550 | 1 |
| SMPC 0.125 | 1-1/4 | 8-1/2" | 420 | 1-1/2 |
| SMPC 0.15 | 1-1/2 | 9" | 380 | 2 |
| SMPC 02 | 2 | 10-1/2" | 300 | 2-1/2 |
| SMPC 0.25 | 2-1/2 | 12" | 300 | 2-1/2 |
| SMPC 03 | 3 | 14" | 250 | 4 |
| SMPC 04 | 4 | 16" | 200 | 4-1/2 |

# Serpent Rubber Covered Metal Hose

There are those applications where a corrugated inner liner of stainless steel, bronze or Monel® are the answer to your chemical transfer problems. When this is the case, you do not have to sacrifice the handling characteristics, safety and durability of a rubber hose. UNAFLEX® combines the two through a proprietary vulcanization process which adheres the scuff and abrasion resistant cover directly to the wire reinforced metal hose.

# Series 5000 BPC Bellows Pump Connector Assemblies

| Metal Bellows Pump Connector Dimensions | | | |
|---|---|---|---|
| Dash Number | Nominal ID (in.) | Overall Length | Flange Thickness (in.) |
| -032 | 2 | 3-1/2 | 5/8 |
| -040 | 2-1/2 | 3-1/2 | 5/8 |
| -048 | 3 | 4 | 5/8 |
| -056 | 3-1/2 | 4 | 5/8 |
| -064 | 4 | 4-1/2 | 5/8 |
| -080 | 5 | 4-1/2 | 5/8 |
| -096 | 6 | 5 | 5/8 |
| -128 | 8 | 5 | 5/8 |
| -160 | 10 | 6 | 3/4 |
| -192 | 12 | 6 | 3/4 |
| -224 | 14 | 8 | 1 |
| -256 | 16 | 8 | 1 |



**Standard Operating Specifications**

| | |
|---|---|
| Max Operating Pressure | 150 PSI |
| Max. Operating Temp. | 800° F |

**Movement**

| | |
|---|---|
| Axial Comp (2” to 8” Nom.) | 1/2” |
| Axial Comp (10” to 16” Nom.) | 3/4” |
| Axial Ext. (All sizes) | 1/4” |
| Lateral Offset (All sizes) | 1/8” |

Flanges to mate with ANSI B16.5 150# Flange Drilling. If flow velocity exceeds 25 F.P.S. a liner must be added.

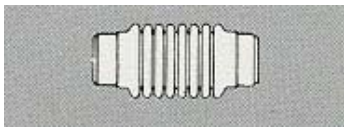
**Ordering Code**
Nom. Size, Dash Number, Liner
Example:
3” BPC-048L
Standard end configuration-44 (welded)

# Bellows Exhaust Connectors

Tube-Flex Series 7000 Stainless Steel Engine exhaust Expansion Joints are manufactured from a butt welded stainless steel tube. This tubular body is formed into corrugations creating a bellows providing a highly flexible and durable connection for the extremes of exhausting engine gases.

## End Connections

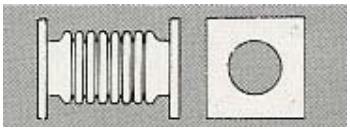
Type W-Welding Nipples



Type T-IPT Threaded Nipples

Type FP-1/2” Thick plate flange (specify O.D., Bolt pattern and diameter

Type SFP-Square plate flange (specify outside dimension, Bolt pattern and diameter)



| Part Number | Pipe Size | Max. Operating Pressure @ 70° F | Standard Length (in.) |
|---|---|---|---|
| 7001 | 1” | 40 | 18 |
| 7101 | 1-1/4” | 24 | 18 |
| 7201 | 1-1/2” | 20 | 18 |
| 7002 | 2” | 15 | 18 |
| 7003 | 3” | 8 | 18 |
| 7004 | 4” | 5 | 18 |
| 7005 | 5” | 3 | 18 |
| 7006 | 6” | 3 | 18 |
| 7008 | 8” | 3 | 18 |
| 7010 | 10” | 2 | 18 |
| 7012 | 12” | 2 | 18 |

# Special Hose Assemblies

For many years UIP International has combined technologies of metal hose with expansion joints into composite assemblies to perform in special applications. When an unusual or difficult problem must be solved, UIP Engineering can create a solution. Some examples are shown below.

Large diameter metal hose are frequently the only practical transfer hose for various chemicals, particularly if elevated temperatures are included.

***Need even more flexibility?*** UIP Engineering can vary core widths, height and metal gauge to provide a custom hose based on your design requirements. Consult factory for details.

### Jacketed Assembly

When conveyants must be maintained at a specified temperature, steam jacketing is used frequently, often in lieu of electric tracing.

### Guarded Assembly

Use of an external flexible armor protects metal hose from abuse due to rough handling, abrasion and bending below its limits. Often a rubber cover can accomplish this as well as armor if temperatures will permit.

### Lined Assembly

If high conveyant velocities are required, use of an internal flexible metal liner will prevent damage and reduce abrasion problems.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetic Acid | 70° | A | A | B | Chromic Acid (10%) | Boil | C | B | B | Paraffin | Hot | A | A | A |
| Acetic Anhydride | Boil | A | A | B | Cider | 70° | A | A | A | Phosph. Acid (20%) | Boil | C | B | B |
| Acetone | Boil | A | A | A | Citric Acid (15%) | Boil | B | A | B | Potass. Carbonate | Hot | A | A | A |
| Acetylene | 70° | A | A | A | Coffee | Boil | A | A | A | Potass. Chlor. (5%) | Boil | B | B | B |
| Alcohols | Boil | B | A | A | Copper Chloride (5%) | 70° | C | C | A | Potas. Chrom. (25%) | Boil | A | A | B |
| Aluminum Chloride | 70° | C | C | A | Copper Nitrate | Hot | A | A | C | Potas. Cyanide | 70° | A | A | A |
| Aluminum Hydrox. | 70° | A | A | B | Copper Sulfate | Boil | A | A | B | Potas. Hydrox. (50%) | Boil | B | A | A |
| Aluminum Sulfate | Boil | B | A | B | Corn Oil | 70° | A | A | A | Potas. Sulfate (5%) | Hot | B | A | B |
| Ammonia-Dry | Hot | A | A | A | Cottonseed Oil | 70° | A | A | A | Propane | 70° | A | A | A |
| Ammonia-Moist | Boil | A | A | C | Creosote | Hot | A | A | A | Rosin | Molten | A | A | A |
| Ammonium Hydrox. | 70° | A | A | A | Crude Oil | Hot | B | A | A | Sea Water | 70° | B | B | B |
| Ammonium Chlor. | Boil | B | A | A | Ethers | 70° | A | A | A | Sewage | 70° | A | A | A |
| Ammonium Nitrate | 70° | A | A | C | Ethyl Acetate (conct) | 70° | A | A | B | Soap Solutions | 70° | A | A | A |
| Ammonium Sulfate | Boil | B | A | B | Ethyl Chloride | 70° | A | A | B | Sodium Bicarb. (5%) | 150° | A | A | A |
| Amyl Ace. (conct) | 70° | A | A | A | Ethylene Glycol | 70° | A | A | A | Sodium Bisulfite | 70° | A | A | B |
| Amyl Alcohol | 70° | A | A | A | Ferric Chloride | 70° | C | C | B | Sodium Carb. (50%) | Boil | A | A | A |
| Aniline (conct) | 70° | A | A | A | Ferric Sulfate (10%) | Boil | B | A | C | Sodium Chlor. (5%) | 150° | C | B | B |
| Aniline Hydrochlor. | 70° | C | C | A | Ferrous Sulfate | Boil | B | A | B | Sodium Cyanide | 70° | A | A | B |
| Asphalt | Hot | A | A | A | Formaldehyde (40%) | 70° | B | B | A | Sodium Hydroxide | Boil | A | A | A |
| Atmosphere, Indust. | 70° | A | A | A | Formic Acid (50%) | 50° | B | A | B | Sodium Hyp. (5%) | 70° | C | B | B |
| Barium Carbonate | 70° | A | A | B | Freon | 70° | A | A | A | Sodium Nitrate | 70° | A | A | A |
| Barium Chloride | Hot | B | A | A | Fruit Juices | 70° | A | A | A | Sodium Perox. (10%) | 150° | A | A | B |
| Barium Hydroxide | Hot | A | A | B | Furfural | 70° | A | A | A | Sodium Phosphate | 70° | A | A | A |
| Barium Sulfate | 70° | A | A | B | Gasoline | 70° | A | A | A | Sodium Sulf. (10%) | 150° | B | A | A |
| Barium Sulfide | 70° | A | A | C | Gelatine | 70° | A | A | A | Sodium Thiosulfate | 70° | A | A | A |
| Beer | 70° | A | A | A | Glue (Acid Solution) | 70° | B | A | A | Steam | 200° | A | A | A |
| Benzine | Hot | A | A | A | Glycerine | 70° | A | A | A | Stearic Acid | 70° | B | A | B |
| Benzoic Acid | 70° | A | A | B | Hydrobromic Acid | 70° | C | C | C | Sugar Solutions | 70° | A | A | A |
| Benzol | Hot | A | A | A | Hydrochloric Acid | 70° | C | C | B | Sulfur, Dry | 350° | A | A | A |
| Black Liquor | Hot | B | B | A | Hydrocyanic Acid | 70° | A | A | B | Sulfur, Molten | 200° | C | B | B |
| Bleaching Pow., wet | 70° | C | C | B | Hydrofluoric Acid | 70° | C | C | B | Sulfur Chloride, Dry | Hot | C | C | A |
| Borax (5%) | Hot | A | A | A | Hydrogen Peroxide | 70° | A | A | B | Sulfur Dioxide, Dry | 70° | A | A | B |
| Boric Acid | Boil | A | A | B | Hydrogen Sulfide, Dry | 70° | A | A | A | Sulfur Dioxide, Mo. | 70° | C | B | C |
| Bromine, Dry | 70° | C | C | A | Hydrogen Sulfide, Mo. | 70° | B | A | B | Sulfur Trioxide, Dry | 70° | A | A | A |
| Bromine, Moist | 70° | C | C | B | Kerosene | 70° | A | A | A | Sulfur. Ac. (95-100%) | 70° | A | A | B |
| Butate | 70° | A | A | A | Lacquers | 70° | A | A | A | Sulfur. Ac. (80-95%) | 70° | B | B | B |
| Buttermilk | 70° | A | A | A | Lacquer Solvents | 70° | A | A | A | Sulfur Ac. (40-80%) | Boil | C | C | C |
| Butyl Alcohol | 70° | A | A | A | Lactic Acid (5%) | | B | A | B | Sulfur Ac. (40%) | 300° | C | C | C |
| Butyric Acid (5%) | Boil | A | A | B | Lime | 70° | A | A | A | Tannic Acid | 70° | A | A | B |
| Calcium Chloride | 70° | B | A | B | Lime-Sulfur | 70° | B | B | B | Tar | 70° | A | A | A |
| Calcium Hydr. (20%) | Boil | A | A | B | Linseed Oil | 70° | A | A | A | Tartaric Acid (10%) | 70° | B | A | B |
| Calcium Hyp. (20%) | 70° | C | B | B | Magnesium Chl. (5%) | Hot | C | B | B | Toluene | 70° | A | A | A |
| Cane Sugar Syrups | Hot | A | A | A | Magnesium Sulfate | Hot | B | A | A | Trichloracetic Acid | 70° | C | C | B |
| Carbolic Acid (Phe.) | Boil | A | A | B | Mercury | 70° | A | A | B | Trichlorethylene, Dry | 70° | A | A | A |
| Carbon Dioxide, Dry | Hot | A | A | A | Mercury Salts | 70° | C | C | A | Trichlorethylene, Mo. | 70° | C | B | B |
| Carbon Dioxide, M | Hot | A | A | A | Methyl Chloride, Dry | 70° | A | A | A | Turpentine | 70° | A | A | A |
| Carbonated Water | 70° | A | A | A | Milk | Hot | A | A | A | Varnish | 70° | A | A | A |
| Carbonated Bevera. | 70° | A | A | A | Mine Water | 70° | A | A | B | Vinegar | 70° | A | A | B |
| Carbon Tetra., Dry | Boil | A | A | A | Natural Gas | 70° | A | A | A | Water | 70° | A | A | A |
| Carbon Tetra., Moist | Boil | C | C | B | Nitric Acid (contc) | Boil | A | A | C | Zinc Chloride | Boil | C | C | B |
| Chlorine, Dry | 70° | C | B | A | Nitrogen | 70° | A | A | A | Zinc Sulfate | Boil | B | A | B |
| Chlorine, Moist | 70° | C | C | B | Oleic Acid | Boil | B | A | A | | | | | |
| Chlorinated Water | 70° | C | C | A | Oxalic Acid (10%) | Boil | C | B | B | | | | | |
| Chloroform, Dry | 70° | A | A | A | Oxygen | 70° | A | A | A | | | | | |

# Corrosion Resistance Guide

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