## Introduction

**Standard Fitting**

Heldon's standard copper fittings are substantially thicker on average than other fittings available on the market today as they are manufactured to exceed B 16.22-1989. As a consequence, they also have a higher pressure rating. Heldon's copper fittings are available in sizes up to 4 1/8"

**R400 Series fittings**

Heldon's R400 Series fittings are packed or stamped R400 and are suitable for R410A, R407C and many other 400 series refrigerants, with Fitting Safe Working Presures ($F_{SWP}$) of approximately 5,000kPa at ambient, in sizes currently up to 1 5/8". Heldon 'Standard' fittings up to 2 5/8" are also available for the Low Pressure side of R410A systems (2,500kPa).

**Special Fittings**

Can be designed and made to customer requirements in many sizes.

Heldon's coper fittings are suitable for use with the American 'Copper Tubes for Air-conditioning and Refrigeration Field Service – ASTM B280' and 'Australian and New Zealand standard AS/NZS 1571.'

Heldon Copper fittings are still the best choice, especially as the industry moves to higher pressure refrigerants.

**Wall Thickness and Pressure Ratings**

Working pressure is a function of the wall thickness, diameter and working temperature. Often it appears that fittings are thinner than the tube they are joining, but this may be explained by the allowance designed into the tube for thinning when it is bent of formed. This can be as much as 25%, but the average is 20% for fittings up to 2 5/8". Also, some standard tubes may be thicker than required, due to limited tube availability vs optimum design.

In summary, the standards AS1571, AS4041, and ASME B280 give a safe working pressure for annealed tube, with a 5 times safety factor to the nominal pressure.

$T_{SWP}$ = Tube Safe Working Pressure
= Burst pressure approx / 5

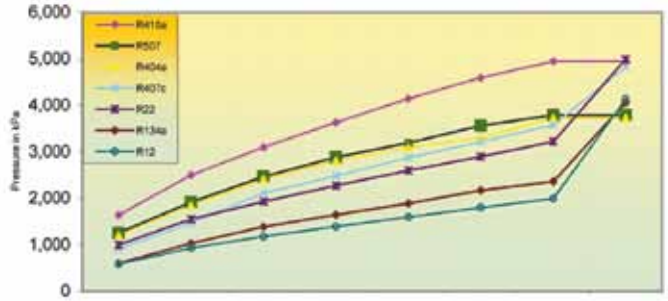
Fittings have a wall thickness reduction of approximately 20%, but a similar safe working pressure. This is because fittings have a 4 times safety factor, as specified by ASME B16.22 2001.

$F_{SWP}$ = Fitting Safe Working Pressure
= Burst pressure min / 4

## Popular Refrigerants and their Pressure Temperature Characteristics

Systems using new refrigerants can be up to double the pressure of older R12 and R22 systems through the normal working range.

From AS1677, UL 207 and A-Gas Solvay pocket manual, converted from Absolute to Gauge pressures.



## Joining

Silver Solder or Brazing is recommended for high pressure joining systems. 15% silver (Brown tip) should be used. Fittings must be cleaned and a suitable flux used for a good flow of solder. Joints must be then leak and system pressure tested.

**Suitability for applications**

**Copper can work harden.** These product specifications are based on static in-house tests, calculated data, information from material suppliers and relevant standards. Heldon cannot predict the conditions or unique dynamics created in the working environment by the combination of temperature, pressure, vibration and pulsation, that will vary for each particular application. The end user or system designer must satisfy themselves of a part's suitability for use in their system.

## Temperature and Pressure Ratings for Copper Fittings

Copper has a considerable drop in allowable stress with increased operating temperatures, reducing by 17% between 50$^0$C and 75$^0$C. Safe Working Pressure tables are listed for most fittings types.

R410a fittings, according to AIRAH, should be rated for 4,200 kPa at 65$^0$C, equivalent to 4,670kPa at 50$^0$C based on allowable stress. Most Heldon R410a fittings meet 5,000kPa which gives a SWP of 4,150kPA at 75$^0$C.

**Safe Working Pressures at Different Temperatures**

| Size | Heldon Standard Fittings Safe Working Pressure in kPa | | | | Size | Heldon R410A Fittings Safe Working Pressure in kPa | | | |
|---|---|---|---|---|---|---|---|---|---|
| | -29$^0$C to 50$^0$C | up to 65$^0$C | up to 75$^0$C | up to 120$^0$C | | -29$^0$Cto 50$^0$C | up to 65$^0$C | up to 75$^0$C | up to 120$^0$C |
| 3/16" | 10,000 | 8,900 | 8,300 | 8,000 | 3/16" | 10,000 | 8,900 | 8,300 | 8,000 |
| ¼" | 10,000 | 8,900 | 8,300 | 8,000 | ¼" | 10,000 | 8,900 | 8,300 | 8,000 |
| 5/16" | 8,5000 | 7,565 | 7,055 | 6,800 | 5/16" | 8,5000 | 7,565 | 7,055 | 6,800 |
| ½" | 6,000 | 5,340 | 4,980 | 4,800 | ½" | 6,000 | 5,340 | 4,980 | 4,800 |
| 5/8" | 5,600 | 4,984 | 4,648 | 4,480 | 5/8" | 5,600 | 4,984 | 4,648 | 4,480 |
| ¾" | 5,000 | 4,450 | 4,150 | 4,000 | ¾" | 5,000 | 4,450 | 4,150 | 4,000 |
| 7/8" | 4,500 | 4,005 | 3,735 | 3,600 | 7/8" | 5,000 | 4,450 | 4,150 | 4,000 |
| 1" | 4,500 | 4,005 | 3,735 | 3,600 | 1" | 5,000 | 4,450 | 4,150 | 4,000 |
| 1 1/8" | 4,000 | 3,560 | 3,320 | 3,200 | 1 1/8" | 5,000 | 4,450 | 4,150 | 4,000 |
| 1 ¼" | 3,900 | 3,471 | 3,237 | 3,120 | 1 ¼" | 5,000 | 4,450 | 4,150 | 4,000 |
| 1 3/8" | 3,500 | 3,115 | 2,905 | 2,800 | 1 3/8" | 5,000 | 4,450 | 4,150 | 4,000 |
| 1 ½" | 3,500 | 3,115 | 2,905 | 2,800 | 1 ½" | 5,000 | 4,450 | 4,150 | 4,000 |
| 1 5/8" | 3,300 | 2,937 | 2,739 | 2,640 | 1 5/8" | 5,000 | 4,450 | 4,150 | 4,000 |
| 1 ¾" | 3,500 | 3,115 | 2,905 | 2,800 | 1 ¾" | | | | |
| 2" | 3,100 | 2,759 | 2,573 | 2,480 | 2" | | | | |
| 2 1/8" | 2,900 | 2,407 | 2,320 | 2 1/8" | | | | | |
| 2 ¼" | 2,700 | 2,403 | 2,241 | 2,160 | 2 ¼" | | | | |
| 2 ½" | 2,700 | 2,403 | 2,241 | 2,160 | 2 ½" | | | | |
| 2 5/8" | 2,700 | 2,403 | 2,241 | 2,160 | 2 5/8" | | | | |
| 3" | 2,200 | 1,958 | 1,826 | 1,760 | 3" | | | | |
| 3 1/8" | 2,180 | 1,940 | 1,809 | 1,744 | 3 1/8" | | | | |
| 3 1/2"' | 2,100 | 1,869 | 1,743 | 1,680 | 3 ½" | | | | |
| 3 5/8" | 2,090 | 1,860 | 1,735 | 1,672 | 3 5/8" | | | | |
| 4" | 2,050 | 1,825 | 1,702 | 1,640 | 4" | | | | |
| 4 1/8" | 2,020 | 1,825 | 1,702 | 1,616 | 4 1/8" | | | | |

**Note: Stop Ends, U Bends and Y-Pieces have a lower SWP due to design shape. Consult Heldon for details.**

**Note: R410A & $CO_2$ ticks on following pages are based on a safe working pressure of 4200Kpa for R-410A & 5200Kpa for $CO_2$**