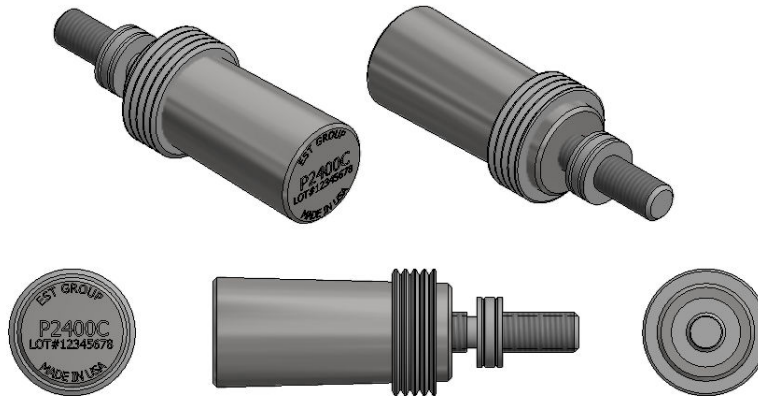


## P2 Application Data

This document lists specifications of the standard P2 heat exchanger tube plug and technical information concerning its field application. P2 plugs are part of the Pop-A-Plug® tube plugging system.



**Figure 1: P2 Pop-A-Plug, Model of P2-400-C is shown for reference only**

- For Plug Sizes, Ranges & Max. Pressure Ratings see Table 1.
- For Standard Plug Materials and Max. Temperature Ratings see Table 2.
- For other available Special Materials see Table 3 or contact EST Customer Service.

### Application Information

The P2 is designed to be installed in the near end of heat exchangers, which meet the above operating conditions. The material of the plug must be matched to the material into which it is being installed to minimize the effects of galvanic corrosion and thermal expansion. Cases where the plug material will differ from the surrounding material may require further evaluation in the form of calculations or tests.

The P2 must be installed directly into the tubesheet or into the tube in the area where it is restrained by the tubesheet. The P2 is not designed for use in unrestrained or unexpanded tubes.

For the best plug performance, all holes need to be free from pits, scars, and other defects. Preparation of the hole using a tube brush effectively prepares the tube surface and allows the plug to withstand the highest differential pressure.

\*The pressure rating for 0.981" through 2.000" (24.92 through 50.80mm) tube ID's was estimated by analysis of previous tests conducted for specific customer applications. Due to the limited sales potential of these plug sizes additional qualification testing cannot be justified. Requests or inquiries for plugs within this range will require qualification testing based on the specific operating requirements dictated by the customer. Any other applications which differ from those listed above shall be evaluated against the customer's application.

**Questions?** Contact EST Group Customer Service at any of the following locations.

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**TABLE 1: P2 PLUG SIZES, RANGES AND MAX PRESSURE RATINGS**

| SALES NUMBER <sup>(1)</sup> | PLUG SIZE | RANGE |       |       |       | MAX PRESSURE |       | SALES NUMBER <sup>(1)</sup> | PLUG SIZE | RANGE |       |       |       | MAX PRESSURE |      |
|-----------------------------|-----------|-------|-------|-------|-------|--------------|-------|-----------------------------|-----------|-------|-------|-------|-------|--------------|------|
|                             |           | MIN   | MAX   | MIN   | MAX   | PSIG         | BARG  |                             |           | MIN   | MAX   | MIN   | MAX   | PSIG         | BARG |
|                             |           | (in)  |       | (mm)  |       |              |       |                             |           | (in)  |       | (mm)  |       |              |      |
| P2-400-Q                    | 0.400     | 0.401 | 0.420 | 10.19 | 10.68 | 6000         | 414   | P2-1200-Q                   | 1.200     | 1.201 | 1.220 | 30.51 | 31.00 | 2000         | 138  |
| P2-420-Q                    | 0.420     | 0.421 | 0.440 | 10.69 | 11.19 |              |       | P2-1220-Q                   | 1.220     | 1.221 | 1.240 | 31.01 | 31.51 |              |      |
| P2-440-Q                    | 0.440     | 0.441 | 0.460 | 11.20 | 11.70 |              |       | P2-1240-Q                   | 1.240     | 1.241 | 1.260 | 31.52 | 32.02 |              |      |
| P2-460-Q                    | 0.460     | 0.461 | 0.480 | 11.71 | 12.21 |              |       | P2-1260-Q                   | 1.260     | 1.261 | 1.280 | 32.03 | 32.53 |              |      |
| P2-480-Q                    | 0.480     | 0.481 | 0.500 | 12.22 | 12.72 |              |       | P2-1280-Q                   | 1.280     | 1.281 | 1.300 | 32.54 | 33.04 |              |      |
| P2-500-Q                    | 0.500     | 0.501 | 0.520 | 12.73 | 13.22 |              |       | P2-1300-Q                   | 1.300     | 1.301 | 1.320 | 33.05 | 33.54 |              |      |
| P2-520-Q                    | 0.520     | 0.521 | 0.540 | 13.23 | 13.73 |              |       | P2-1320-Q                   | 1.320     | 1.321 | 1.340 | 33.55 | 34.05 |              |      |
| P2-540-Q                    | 0.540     | 0.541 | 0.560 | 13.74 | 14.24 |              |       | P2-1340-Q                   | 1.340     | 1.341 | 1.360 | 34.06 | 34.56 |              |      |
| P2-560-Q                    | 0.560     | 0.561 | 0.580 | 14.25 | 14.75 |              |       | P2-1360-Q                   | 1.360     | 1.361 | 1.380 | 34.57 | 35.07 |              |      |
| P2-580-Q                    | 0.580     | 0.581 | 0.600 | 14.76 | 15.26 |              |       | P2-1380-Q                   | 1.380     | 1.381 | 1.400 | 35.08 | 35.58 |              |      |
| P2-600-Q                    | 0.600     | 0.601 | 0.620 | 15.27 | 15.76 |              |       | P2-1400-Q                   | 1.400     | 1.401 | 1.420 | 35.59 | 36.08 |              |      |
| P2-620-Q                    | 0.620     | 0.621 | 0.640 | 15.77 | 16.27 |              |       | P2-1420-Q                   | 1.420     | 1.421 | 1.440 | 36.09 | 36.59 |              |      |
| P2-640-Q                    | 0.640     | 0.641 | 0.660 | 16.28 | 16.78 |              |       | P2-1440-Q                   | 1.440     | 1.441 | 1.460 | 36.60 | 37.10 |              |      |
| P2-660-Q                    | 0.660     | 0.661 | 0.680 | 16.79 | 17.29 |              |       | P2-1460-Q                   | 1.460     | 1.461 | 1.480 | 37.11 | 37.61 |              |      |
| P2-680-Q                    | 0.680     | 0.681 | 0.700 | 17.30 | 17.80 |              |       | P2-1480-Q                   | 1.480     | 1.481 | 1.500 | 37.62 | 38.12 |              |      |
| P2-700-Q                    | 0.700     | 0.701 | 0.720 | 17.81 | 18.30 |              |       | P2-1500-Q                   | 1.500     | 1.501 | 1.520 | 38.13 | 38.62 |              |      |
| P2-720-Q                    | 0.720     | 0.721 | 0.740 | 18.31 | 18.81 |              |       | P2-1520-Q                   | 1.520     | 1.521 | 1.540 | 38.63 | 39.13 |              |      |
| P2-740-Q                    | 0.740     | 0.741 | 0.760 | 18.82 | 19.32 |              |       | P2-1540-Q                   | 1.540     | 1.541 | 1.560 | 39.14 | 39.64 |              |      |
| P2-760-Q                    | 0.760     | 0.761 | 0.780 | 19.33 | 19.83 |              |       | P2-1560-Q                   | 1.560     | 1.561 | 1.580 | 39.65 | 40.15 |              |      |
| P2-780-Q                    | 0.780     | 0.781 | 0.800 | 19.84 | 20.34 |              |       | P2-1580-Q                   | 1.580     | 1.581 | 1.600 | 40.16 | 40.66 |              |      |
| P2-800-Q                    | 0.800     | 0.801 | 0.820 | 20.35 | 20.84 | P2-1600-Q    | 1.600 | 1.601                       | 1.620     | 40.67 | 41.16 |       |       |              |      |
| P2-820-Q                    | 0.820     | 0.821 | 0.840 | 20.85 | 21.35 | P2-1620-Q    | 1.620 | 1.621                       | 1.640     | 41.17 | 41.67 |       |       |              |      |
| P2-840-Q                    | 0.840     | 0.841 | 0.860 | 21.36 | 21.86 | P2-1640-Q    | 1.640 | 1.641                       | 1.660     | 41.68 | 42.18 |       |       |              |      |
| P2-860-Q                    | 0.860     | 0.861 | 0.880 | 21.87 | 22.37 | P2-1660-Q    | 1.660 | 1.661                       | 1.680     | 42.19 | 42.69 |       |       |              |      |
| P2-880-Q                    | 0.880     | 0.881 | 0.900 | 22.38 | 22.88 | P2-1680-Q    | 1.680 | 1.681                       | 1.700     | 42.70 | 43.20 |       |       |              |      |
| P2-900-Q                    | 0.900     | 0.901 | 0.920 | 22.89 | 23.38 | P2-1700-Q    | 1.700 | 1.701                       | 1.720     | 43.21 | 43.70 |       |       |              |      |
| P2-920-Q                    | 0.920     | 0.921 | 0.940 | 23.39 | 23.89 | P2-1720-Q    | 1.720 | 1.721                       | 1.740     | 43.71 | 44.21 |       |       |              |      |
| P2-940-Q                    | 0.940     | 0.941 | 0.960 | 23.90 | 24.40 | P2-1740-Q    | 1.740 | 1.741                       | 1.760     | 44.22 | 44.72 |       |       |              |      |
| P2-960-Q                    | 0.960     | 0.961 | 0.980 | 24.41 | 24.91 | P2-1760-Q    | 1.760 | 1.761                       | 1.780     | 44.73 | 45.23 |       |       |              |      |
| P2-980-Q                    | 0.980     | 0.981 | 1.000 | 24.92 | 25.42 | P2-1780-Q    | 1.780 | 1.781                       | 1.800     | 45.24 | 45.74 |       |       |              |      |
| P2-1000-Q                   | 1.000     | 1.001 | 1.020 | 25.43 | 25.92 | P2-1800-Q    | 1.800 | 1.801                       | 1.820     | 45.75 | 46.24 |       |       |              |      |
| P2-1020-Q                   | 1.020     | 1.021 | 1.040 | 25.93 | 26.43 | P2-1820-Q    | 1.820 | 1.821                       | 1.840     | 46.25 | 46.75 |       |       |              |      |
| P2-1040-Q                   | 1.040     | 1.041 | 1.060 | 26.44 | 26.94 | P2-1840-Q    | 1.840 | 1.841                       | 1.860     | 46.76 | 47.26 |       |       |              |      |
| P2-1060-Q                   | 1.060     | 1.061 | 1.080 | 26.95 | 27.45 | P2-1860-Q    | 1.860 | 1.861                       | 1.880     | 47.27 | 47.77 |       |       |              |      |
| P2-1080-Q                   | 1.080     | 1.081 | 1.100 | 27.46 | 27.96 | P2-1880-Q    | 1.880 | 1.881                       | 1.900     | 47.78 | 48.28 |       |       |              |      |
| P2-1100-Q                   | 1.100     | 1.101 | 1.120 | 27.97 | 28.46 | P2-1900-Q    | 1.900 | 1.901                       | 1.920     | 48.29 | 48.78 |       |       |              |      |
| P2-1120-Q                   | 1.120     | 1.121 | 1.140 | 28.47 | 28.97 | P2-1920-Q    | 1.920 | 1.921                       | 1.940     | 48.79 | 49.29 |       |       |              |      |
| P2-1140-Q                   | 1.140     | 1.141 | 1.160 | 28.98 | 29.48 | P2-1940-Q    | 1.940 | 1.941                       | 1.960     | 49.30 | 49.80 |       |       |              |      |
| P2-1160-Q                   | 1.160     | 1.161 | 1.180 | 29.49 | 29.99 | P2-1960-Q    | 1.960 | 1.961                       | 1.980     | 49.81 | 50.31 |       |       |              |      |
| P2-1180-Q                   | 1.180     | 1.181 | 1.200 | 30.00 | 30.50 | P2-1980-Q    | 1.980 | 1.981                       | 2.000     | 50.32 | 50.82 |       |       |              |      |
|                             |           |       |       |       |       | P2-2000-Q    | 2.000 | 2.001                       | 2.020     | 50.83 | 51.32 |       |       |              |      |

**NOTES:**

<sup>(1)</sup> The suffix "-Q" in the Part Number column is the plug material designator

Replace the "-Q" with the appropriate material designator from Tables 2 or 3.

Example: P2-400-B for Brass, P2-400-C for Carbon Steel

**Special sizing and extended range plugs available, please contact EST Customer Service for assistance**

**Questions?** Contact EST Group Customer Service at any of the following locations.



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**TABLE 2: STANDARD 'P2' PLUG MATERIALS & MAX. TEMPERATURE RATINGS**

| STANDARD MATERIALS |                                 |           |      |           |     |
|--------------------|---------------------------------|-----------|------|-----------|-----|
| CODE               | DESCRIPTION                     | MIN. TEMP |      | MAX. TEMP |     |
|                    |                                 | °F        | °C   | °F        | °C  |
| -B                 | BRASS 360/464                   | -325      | -198 | 400       | 204 |
| -C                 | CARBON STEEL (1018 AND/OR 1045) | -20       | -29  | 700       | 371 |
| -E                 | 304/304L STAINLESS STEEL        | -321      | -196 | 900       | 482 |
| -H                 | COPPER NICKEL 70/30             | -423      | -253 | 500       | 260 |
| -S                 | 316/316L STAINLESS STEEL        | -76       | -60  | 900       | 482 |
| -T                 | TITANIUM                        | -75       | -59  | 900       | 482 |

Standard materials are generally available in stock.

**TABLE 3: SPECIAL MATERIALS & MAX. TEMPERATURE RATINGS**

| SPECIAL MATERIALS AVAILABLE |                                  |           |      |           |     |
|-----------------------------|----------------------------------|-----------|------|-----------|-----|
| CODE                        | DESCRIPTION                      | MIN. TEMP |      | MAX. TEMP |     |
|                             |                                  | °F        | °C   | °F        | °C  |
| -317L                       | 317L STAINLESS STEEL             | -320      | -196 | 900       | 482 |
| -904L                       | 904L STAINLESS STEEL             | -20       | -29  | 900       | 482 |
| -A                          | ALLOY 4142                       | -20       | -29  | 900       | 482 |
| -AL                         | ALUMINUM ALLOY 6061/7075         | -20       | -29  | 500       | 260 |
| -B3                         | HASTELLOY B3                     | -20       | -29  | 900       | 482 |
| -CB                         | ALLOY 20 (20C3B STAINLESS STEEL) | -20       | -29  | 900       | 482 |
| -D                          | DUPLEX 2205 STAINLESS STEEL      | -20       | -29  | 900       | 482 |
| -F11                        | ALLOY STEEL A-182 (F11)          | -20       | -29  | 900       | 482 |
| -F22                        | ALLOY STEEL A-182 (F22)          | -20       | -29  | 900       | 482 |
| -F5                         | ALLOY STEEL A-182 (F5)           | -20       | -29  | 900       | 482 |
| -F9                         | ALLOY STEEL A-182 (F9)           | -20       | -29  | 900       | 482 |
| -H20                        | HASTELLOY 2000                   | -20       | -29  | 900       | 482 |
| -HC                         | HASTELLOY C276                   | -20       | -29  | 900       | 482 |
| -I                          | INCONEL 600                      | -20       | -29  | 800       | 427 |
| -K                          | 410 A-479 STAINLESS STEEL        | -20       | -29  | 900       | 482 |
| -L7                         | ALLOY 4140                       | -150      | -101 | 900       | 482 |
| -LTC                        | LOW TEMP A-350 LF2 CL1           | -50       | -46  | 700       | 371 |
| -M                          | MONEL 405                        | -325      | -198 | 900       | 482 |
| -N                          | COPPER NICKEL 90/10              | -325      | -198 | 500       | 260 |
| -NI                         | NICKEL 200/201                   | -325      | -198 | 800       | 427 |
| -P                          | 430 A-479 STAINLESS STEEL        | -20       | -29  | 900       | 482 |
| -S10                        | 310 STAINLESS STEEL              | -20       | -29  | 900       | 482 |
| -S21                        | 321 STAINLESS STEEL              | -320      | -196 | 900       | 482 |
| -S347                       | S347 A-479 STAINLESS STEEL       | -320      | -196 | 900       | 482 |
| -SD                         | SUPER DUPLEX (UNS S32750)        | -20       | -29  | 900       | 482 |
| -SO254                      | 254 SMO STAINLESS STEEL          | -20       | -29  | 900       | 482 |
| -W                          | INCONEL 625                      | -20       | -29  | 800       | 427 |
| -X                          | AL6XN                            | -320      | -196 | 900       | 482 |
| -Y                          | INCOLOY (825 & 800)              | -110      | -79  | 900       | 482 |
| -Y800                       | INCOLOY 800                      | -110      | -79  | 900       | 482 |
| -ZC                         | ZIRCONIUM                        | -20       | -29  | 500       | 260 |

\* Various specialty materials are available and plugs can be made to order. If the material you require is not found in either Table 2 or Table 3, please contact EST Customer Service for assistance.

\*\*Increased temperature or pressure ratings available, please contact EST Customer Service for assistance.

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