| REVISIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| P | LTR |  | DATE | DWN | APVD |
|  | G | INITIAL RELEASE | 15JUL2021 | GCM | SH |



1. EXTRUDED TUBING IS FABRICATED FROM A MODIFIED POLYOLEFIN, CROSS LINKED BY IRRADIATION AND EXPANDED
2. EXPANDED TUBING WILL RETURN TO RECOVERED SIZE UPON BEING SUBJECTED TO TEMPERATURES IN EXCESS OF $110^{\circ} \mathrm{C}$
3. TUBING SHALL BE HOMOGENOUS AND ESSENTIALLY FREE FROM FLAWS, DEFECTS, PINHOLES, SEAMS, CRACKS OR INCLUSIONS
4. TUBING TO BE FABRICATED FROM MATERIALS WHICH MEET THE REQUIREMENTS OF U.S. PHARMACOPEIA CLASS V1 PLASTICS

5 SAMPLE PREPARATION AND EXTRACTION IS PER USP XXII. METALS

| Size | As Supplied |  | Recovered |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Inside Diameter (D) |  | Inside Diameter(d) |  | Wall Thickness (W) |  |
|  | in | mm | in | mm | in | mm |
| 1/32 | . $040 \pm .005$ | $02 \pm 0.13$ | . $013 \pm .002$ | $0.33 \pm 0.05$ | . $010 \pm .002$ | $0.25 \pm 0.08$ |
| 3/64 | .055 $\pm .005$ | $40 \pm 0.13$ | .020 $\pm .003$ | $0.51 \pm 0.08$ | . $016 \pm .003$ | . $41 \pm 0.08$ |
| 1/16 | . $072 \pm .005$ | . $83 \pm 0.13$ | . $027 \pm .004$ | $0.69 \pm 0.10$ | . $017 \pm .003$ | $0.43 \pm 0.08$ |
| 3/32 | . $107 \pm .008$ | $2.72 \pm 0.20$ | . $042 \pm .004$ | $1.07 \pm 0.10$ | .020 $\pm .003$ | $0.51 \pm 0.08$ |
| 1/8 | . $140 \pm .010$ | $3.56 \pm 0.25$ | . $057 \pm .005$ | $1.45 \pm 0.13$ | .020 $\pm .003$ | $0.51 \pm 0.08$ |
| 3/16 | . $205 \pm .010$ | $5.21 \pm 0.25$ | .086 $\pm .007$ | $2.18 \pm 0.18$ | .020 $\pm .003$ | $0.51 \pm 0.08$ |
| 1/4 | . $275 \pm .015$ | \$.99 | . $117 \pm .008$ | $2.97 \pm 0.29$ | . $025 \pm .003$ | $0.64 \pm 0.08$ |
| 3/8 | . $415 \pm .020$ | $10.54 \pm 0.5$ | . $171 \pm .016$ | $4.34 \pm 0.41$ | .025 $\pm .003$ | $0.64 \pm 0.08$ | ANALYSIS MAY BE COLORIMETRIC AS DESCRIBED IN USP XXII OR BY EQUIVALENT QUANTITATIVE ANALYTICAL METHOD

6. NOT ALL PARTS LISTED IN TABLE


| REVISIONS |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| P | LTR |  | DESCRIPTION | DATE | DWN | APVD |
|  | - | SEE SHEET 1 |  | - | - | - |


| MATERIAL QUALIFICATION PROPERTIES |  |  |  |
| :---: | :---: | :---: | :---: |
| PROPERTY | UNIT | REQUIREMENT | TEST METHOD |
| DIMENSIONS | INCHES (mm) | SEE CHART |  |
| LONGITUDINAL CHANGE | PERCENT | +0, - 10 MAXIMUM | ASTM D 2671 |
| CONCENTRICITY AS SUPPLIED | PERCENT | $\left.\begin{array}{ll}70 & \text { MINIMUM } \\ 60 & \text { MINIMUM } \\ (2: 1 & \text { EXP } \\ \text { (3:1 } & \text { EXATIO }\end{array}\right)$ | ASTM D 2671 |
| TENSILE STRENGTH | PSI (MPa) | 1500 MINIMUM (10.3) | ASTM D 2671, |
| ULTIMATE ELONGATION | PERCENT | 200 MINIMUM | 20"/MINUTE |
| 2\% SECANT MODULUS (EXPANDED) | PSI (MPa) | $2.5 \times 10^{4}$ MAXIMUM (172) | ASTM D 2671 |
| HEAT RESISTANCE <br> 168 HOURS AT $175^{\circ} \mathrm{C}\left(347^{\circ} \mathrm{F}\right)$ FOLLOWED BY TEST FOR: <br> ULTIMATE ELONGATION | PERCENT | 100 MINIMUM | ASTM D 2671, 20"/MINUTE |
| ELECTRICAL DIELECTRIC STRENGTH | VOLTS/MIL $(\mathrm{kV} / \mathrm{mm})$ | 500 MINIMUM (19.7) | ASTM D 2671 |
| $\begin{aligned} & \text { DIELECTRIC WITHSTAND } \\ & 3000 \mathrm{~V}, 60 \mathrm{~Hz} \end{aligned}$ | sec | 60 MINIMUM | ASTM D 2671 |
| CHEMICAL <br> FLUID RESISTANCE <br> 24 HOURS AT $23 \pm 3^{\circ} \mathrm{C}\left(73 \pm 5^{\circ} \mathrm{F}\right)$ <br> ISOPROPYL ALCOHOL <br> $5 \%$ SALINE SOLUTION <br> CIDEX* <br> FOLLOWED BY TESTS FOR: |  |  | ASTM D 2671 |
| DIELECTRIC STRENGTH | VOLTS/MIL ( $\mathrm{kV} / \mathrm{mm}$ ) | 400 MINIMUM (15.7) | ASTM D 2671 |
| TENSILE STRENGTH | PSI (MPa) | 1000 MINIMUM (6.9) | ASTM D 2671 |
| HEAVY METALS ANALYSIS CADMIUM MERCURY LEAD BISMUTH ANTIMONY | PPM | $\begin{aligned} & 1 \text { MAXIMUM } \\ & \text { (TOTAL OF ALL METALS) } \end{aligned}$ | USP XXII PHYSICOCHEMICAL TESTS-PLASTIC |




EXPANSION RATIO DIMENSIONS (MIN/MAX)

| EXPANSION |  |  | DIMENSIONS (MIN/MAX) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| STANDARD | AS SUPPLIED |  | RECOVERED |  |  |  |
| SIZES | INSIDE DIAMETER MINIMUM (D) |  | INSIDE DIAMETER MAXIMUM (d) |  | WALL THICKNESS (W) |  |
| SIZE | 1 NCH | mm | INCH | mm | 1 NCH | mm |
| . 032 | . 032 | 0.81 | . 011 | 0.28 | . $010 \pm .002$ | $0.25 \pm 0.05$ |
| . 047 | . 053 | 1.35 | . 013 | 0.33 | . $012 \pm .002$ | $0.31 \pm 0.05$ |
| . 063 | . 063 | 1.60 | . 021 | 0.53 | . $016 \pm .002$ | $0.41 \pm 0.05$ |
| . 078 | . 078 | 1.98 | . 025 | 0.64 | . $016 \pm .002$ | $0.41 \pm 0.05$ |
| . 094 | . 094 | 2.39 | . 031 | 0.79 | . $020 \pm .003$ | $0.51 \pm 0.08$ |
| . 110 | . 110 | 2.79 | . 034 | 0.86 | . $020 \pm .003$ | $0.51 \pm 0.08$ |
| . 125 | . 125 | 3.18 | . 042 | 1.07 | . $020 \pm .003$ | $0.51 \pm 0.08$ |
| . 188 | . 188 | 4.78 | . 063 | 1.60 | . $020 \pm .003$ | $0.51 \pm 0.08$ |
| . 250 | . 250 | 6.35 | . 083 | 2.11 | . $025 \pm .003$ | $0.64 \pm 0.08$ |
| . 375 | . 375 | 9.53 | . 125 | 3.18 | . $025 \pm .003$ | $0.64 \pm 0.08$ |



