# FREE FLEXING EXPANSION JOINTS

Senior Flexonics Canada low pressure (50 psi), Free Flexing expansion joints absorb pipe movement under pressure. Widely used in such applications as process and steam lines, ventilating lines, pump suction and discharge lines, turbine-to-condenser connections, fuel supply lines and bulkhead seals. Available with either Van Stoned flanges (FSF) or butt-weld ends (FSW) attached.

Dual expansion joints are available for applications where movement is greater than can be absorbed by a single unit. Contact factory for design information.

How to order:
Example P/N

| DIA | STYLE | ENDS | PRESSURE | CONS | LINER | COVER |
|---|---|---|---|---|---|---|
| 6 | FSF | VV | 50 | 8 | L | C |

## FREE FLEXING DATA

| | SINGLE |
|---|---|
| Size Range | 3" to 18"* NPS |
| Allowable Pressure Stainless Steel Bellows | Vacuum to 50 psig |
| Temperature Limits Stainless Steel Bellows | -20°F to 800°F. ** |
| Axial Traverse | To 7 1/2". . . (depending on size) |
| Lateral Motion | Up to 1 3/4". . . (depending on size) |

*For sizes larger than 18" consult factory for information.
**With special alloys, temperatures of minus 300°F. to plus 1600°F. can be handled.

## MATERIALS OF CONSTRUCTION

- BELLOWS: ASTM A240 T304
- PIPE: ASTM A53/A106
  50 lb. Series: Sch. 40
  150 lb. Series: Sch. 40
  300 lb. Series: Sch. 40
- FLANGES: A36/A516-70 Plate (Std)
  ASTM A105 (Opt)
  50 lb. Series: 150 lb. ANSI B16.5 R.F.S.O.
  150 lb. Series: 150 lb. ANSI B16.5 R.F.S.O.
  300 lb. Series: 300 lb. ANSI B16.5 R.F.S.O.
- COVERS: Carbon Steel
- TIE RODS: Carbon Steel
- LINERS: 300 Series Stainless Steel

1. Rated cycle life is 2000 cycles per EJMA 7th edition for any one movement tabulated.
2. To combine axial, lateral movements, refer to page 7.
3. Maximum axial extension movement is 10% of tabulated axial value.
4. To obtain greater movements or cycle life, contact the factory.
5. Catalogue pressure ratings are based upon a maximum bellows temperature of 800°F. Actual operating temperature should always be specified.
6. Maximum test pressure: 1 1/2 x maximum working pressure.

## 50 PSIG FREE FLEXING: STYLE FSF OR FS W

| Nominal Diameter (in.) | Con. Count | Axial (in.) | Lateral (in.) | Angular (Deg.) | Axial Sp Rate (lbs/in.) | Lateral Sp Rate (lbs/in.) | Angular Sp Rate (in.-lb/Deg.) | VV OAL (in.) | VV Wt. (lbs.) | WW OAL (in.) | WW Wt. (lbs.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3" Effective Area 17.5 in.² | 2 | .59 | .05 | 10 | 612 | 4096 | 30 | 6 | 14 | 8 7/8 | 5 |
| | 4 | 1.18 | .19 | 10 | 306 | 512 | 15 | 8 1/4 | 15 | 11 1/8 | 5 |
| | 6 | 1.67 | .40 | 10 | 354 | 263 | 17 | 10 1/2 | 15 | 13 3/8 | 6 |
| | 8 | 1.92 | .61 | 10 | 630 | 263 | 31 | 12 3/4 | 16 | 15 5/8 | 6 |
| | 10 | 2.41 | .95 | 10 | 504 | 134 | 24 | 15 | 17 | 17 1/8 | 6 |
| 4" Effective Area 23.6 in.² | 2 | .71 | .05 | 10 | 608 | 5043 | 45 | 6 1/2 | 29 | 11 1/2 | 9 |
| | 4 | 1.41 | .20 | 10 | 304 | 630 | 22 | 9 | 31 | 14 | 10 |
| | 6 | 1.99 | .42 | 10 | 324 | 267 | 21 | 11 1/2 | 33 | 16 1/2 | 11 |
| | 8 | 2.31 | .66 | 10 | 577 | 267 | 38 | 14 | 35 | 19 | 12 |
| | 10 | 2.53 | .90 | 10 | 461 | 136 | 31 | 16 1/2 | 37 | 21 1/2 | 13 |

*Movements shown are non-concurrent.

## 50 PSIG FREE FLEXING: STYLE FSF (CONTINUED)

| Nominal Diameter (in.) | Con. Count | Axial (in.) | Lateral (in.) | Angular (Deg.) | Axial Sp Rate (lbs/in.) | Lateral Sp Rate (lbs/in.) | Angular Sp Rate (in.-lb/Deg.) | VV OAL (in.) | VV Wt. (lbs.) | WW OAL (in.) | WW Wt. (lbs.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5” Effective Area 33.2 in.² | 2 | .76 | .05 | 10 | 769 | 8882 | 80 | 6 3/4 | 34 | 13 1/2 | 15 |
| | 4 | 1.52 | .18 | 10 | 384 | 1110 | 40 | 9 1/4 | 36 | 16 | 16 |
| | 6 | 2.11 | .38 | 10 | 414 | 478 | 39 | 11 3/4 | 38 | 18 1/2 | 17 |
| | 8 | 2.41 | .58 | 10 | 736 | 478 | 69 | 14 1/4 | 40 | 21 | 19 |
| | 10 | 2.52 | .76 | 10 | 1123 | 467 | 106 | 16 3/4 | 42 | 23 1/2 | 20 |
| 6” Effective Area 53.8 in.² | 2 | 1.12 | .07 | 10 | 856 | 7353 | 131 | 7 3/4 | 43 | 16 1/2 | 24 |
| | 4 | 2.23 | .30 | 10 | 428 | 919 | 65 | 11 1/4 | 47 | 20 | 27 |
| | 6 | 3.35 | .67 | 10 | 285 | 272 | 43 | 14 3/4 | 51 | 23 1/2 | 30 |
| | 8 | 4.05 | 1.08 | 10 | 408 | 219 | 62 | 18 1/4 | 54 | 27 | 33 |
| | 10 | 5.07 | 1.69 | 10 | 326 | 112 | 49 | 21 3/4 | 58 | 30 1/2 | 36 |
| 8” Effective Area 85.0 in.² | 2 | 1.16 | .08 | 10 | 1218 | 10673 | 314 | 9 3/4 | 69 | 17 1/2 | 26 |
| | 4 | 2.32 | .32 | 10 | 609 | 1334 | 157 | 14 1/4 | 72 | 22 | 30 |
| | 6 | 3.48 | .72 | 10 | 406 | 395 | 104 | 18 3/4 | 76 | 26 1/2 | 35 |
| | 8 | 4.34 | 1.20 | 10 | 580 | 317 | 149 | 23 1/4 | 81 | 31 | 39 |
| | 10 | 5.42 | 1.87 | 10 | 464 | 162 | 119 | 27 3/4 | 85 | 35 1/2 | 44 |
| 10” Effective Area 121 in.² | 2 | 1.10 | .10 | 10 | 687 | 10583 | 235 | 10 3/8 | 62 | 17 1/2 | 48 |
| | 4 | 2.53 | .29 | 10 | 738 | 2147 | 252 | 14 7/8 | 99 | 22 | 54 |
| | 6 | 3.80 | .66 | 10 | 492 | 636 | 168 | 19 3/8 | 104 | 26 1/2 | 60 |
| | 8 | 4.67 | 1.08 | 10 | 704 | 551 | 241 | 23 7/8 | 110 | 31 | 66 |
| | 10 | 5.83 | 1.68 | 10 | 563 | 262 | 192 | 28 3/8 | 116 | 35 1/2 | 72 |
| 12” Effective Area 175 in.² | 2 | 1.56 | .08 | 10 | 1174 | 19003 | 559 | 10 3/4 | 136 | 17 1/2 | 61 |
| | 4 | 3.11 | .31 | 10 | 587 | 7375 | 279 | 15 1/4 | 143 | 22 | 70 |
| | 6 | 4.67 | .69 | 10 | 391 | 703 | 186 | 19 3/4 | 150 | 26 1/2 | 78 |
| | 8 | 5.71 | 1.12 | 10 | 559 | 566 | 266 | 24 1/4 | 158 | 31 | 86 |
| | 10 | 7.13 | 1.75 | 10 | 447 | 289 | 213 | 28 3/4 | 165 | 35 1/2 | 94 |
| 14” Effective Area 206 in.² | 2 | 1.60 | .07 | 10 | 1352 | 27285 | 803 | 11 | 189 | 17 1/2 | 65 |
| | 4 | 3.20 | .29 | 10 | 676 | 3410 | 401 | 15 1/2 | 196 | 22 | 74 |
| | 6 | 4.80 | .65 | 10 | 451 | 1010 | 267 | 20 | 204 | 26 1/2 | 84 |
| | 8 | 5.84 | 1.06 | 10 | 644 | 812 | 383 | 24 1/2 | 212 | 31 | 93 |
| | 10 | 7.30 | 1.66 | 10 | 515 | 416 | 306 | 29 | 220 | 35 1/2 | 102 |
| 16” Effective Area 261 in.² | 2 | 1.66 | .07 | 10 | 1561 | 39578 | 1165 | 11 1/2 | 206 | 17 1/2 | 76 |
| | 4 | 3.32 | .27 | 10 | 780 | 4947 | 582 | 16 | 213 | 22 | 87 |
| | 6 | 4.98 | .61 | 10 | 520 | 1465 | 388 | 20 1/2 | 223 | 26 1/2 | 97 |
| | 8 | 5.98 | .97 | 10 | 744 | 1179 | 555 | 25 | 234 | 31 | 107 |
| | 10 | 7.48 | 1.52 | 10 | 595 | 603 | 444 | 29 1/2 | 240 | 35 1/2 | 118 |
| 18” Effective Area 322 in.² | 2 | 1.71 | .06 | 9.59 | 1769 | 55088 | 1622 | 12 | 271 | 17 1/2 | 86 |
| | 4 | 3.42 | .25 | 10 | 884 | 6886 | 811 | 16 1/2 | 281 | 22 | 98 |
| | 6 | 5.13 | .56 | 10 | 589 | 2040 | 540 | 21 | 291 | 26 1/2 | 110 |
| | 8 | 6.00 | .88 | 10 | 843 | 1641 | 773 | 25 1/2 | 301 | 31 | 122 |
| | 10 | 7.50 | 1.37 | 10 | 674 | 840 | 618 | 30 | 311 | 35 1/2 | 134 |

*Movements shown are non-concurrent.

# CONTROLLED FLEXING EXPANSION JOINTS

Senior Flexonics Canada Controlled Flexing Expansion Joints combine a corrugated pressure carrier with closely mated neck rings and reinforcing or control rings. This construction permits their use with higher pressures (150 psig and 300 psig) in applications where large amounts of axial movement are required.

Dual expansion joints are available for applications where movement is greater than can be absorbed by a single unit. Contact factory for design information.

## CONTROLLED FLEXING DATA

| | SINGLE |
|---|---|
| Size Range | 3" to 18"* NPS |
| Allowable Pressure Stainless Steel Bellows | Vacuum to 300 psig |
| Temperature Limits Stainless Steel Bellows | -20°F to 800°F. ** |
| Axial Traverse | To 7 1/2". . . (depending on size) |
| Lateral Motion | Up to 1 1/2". . . (depending on size) |

*For sizes larger than 18" consult factory for information.
**With special alloys, temperatures of minus 425°F. to plus 1600°F. can be handled.

How to order:
Example P/N

| DIA | STYLE | ENDS | PRESSURE | CONS | LINER | COVER |
|---|---|---|---|---|---|---|
| 8 | CSF | FF | 300 | 6 | L | C |

## MATERIALS OF CONSTRUCTION

- BELLOWS: ASTM A240 T304
- PIPE: ASTM A53/A106
  50 lb. Series: Sch. 40
  150 lb. Series: Sch. 40
  300 lb. Series: Sch. 40
- FLANGES: A36/A516-70 Plate (Std)
  ASTM A105 (Opt)
  50 lb. Series: 150 lb. ANSI B16.5 R.F.S.O.
  150 lb. Series: 150 lb. ANSI B16.5 R.F.S.O.
  300 lb. Series: 300 lb. ANSI B16.5 R.F.S.O.
- COVERS: Carbon Steel
- TIE RODS: Carbon Steel
- LINERS: 300 Series Stainless Steel

1. Rated cycle life is 2000 cycles per EJMA 7th edition for any one movement tabulated.
2. To combine axial, lateral movements, refer to page 7.
3. Maximum axial extension movement is 10% of tabulated axial value.
4. To obtain greater movements or cycle life, contact the factory.
5. Catalogue pressure ratings are based upon a maximum bellows temperature of 800°F. Actual operating temperature should always be specified.
6. Maximum test pressure: 1 1/2 x maximum working pressure.

## 150 PSIG CONTROLLED FLEXING: STYLE CSF OR CS W

| Nominal Diameter (in.) | Con. Count | Axial (in.) | Lateral (in.) | Angular (Deg.) | Axial Sp Rate (lbs/in.) | Lateral Sp Rate (lbs/in.) | Angular Sp Rate (in.-lbs/Deg.) | VV OAL (in.) | VV Wt. (lbs.) | FF OAL (in.) | FF Wt. (lbs.) | WW OAL (in.) | WW Wt. (lbs.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3" Effective Area 17.5 in.² | 2 | .875 | .05 | 10 | 1383 | 5307 | 69 | 7 1/4 | 30 | 8 7/16 | 35 | 11 7/16 | 21 |
| | 4 | 1.75 | .18 | 10 | 691 | 663 | 34 | 10 1/4 | 41 | 11 7/16 | 46 | 14 7/16 | 32 |
| | 6 | 2.625 | .41 | 10 | 800 | 341 | 40 | 13 1/4 | 52 | 14 7/16 | 57 | 17 7/16 | 43 |
| | 8 | 3.50 | .72 | 10 | 1423 | 341 | 71 | 16 1/4 | 63 | 17 7/16 | 68 | 20 7/16 | 54 |
| | 10 | 4.375 | 1.13 | 10 | 1139 | 174 | 57 | 19 1/4 | 74 | 20 7/16 | 79 | 23 7/16 | 65 |
| 4" Effective Area 23.6 in.² | 2 | .875 | .04 | 10 | 1204 | 5283 | 81 | 8 3/8 | 48 | 9 13/16 | 60 | 15 1/16 | 40 |
| | 4 | 1.75 | .17 | 10 | 602 | 660 | 40 | 11 5/8 | 67 | 13 1/16 | 79 | 18 5/16 | 58 |
| | 6 | 2.625 | .38 | 10 | 697 | 339 | 46 | 14 7/8 | 86 | 16 5/16 | 97 | 21 9/16 | 77 |
| | 8 | 3.50 | .67 | 10 | 1239 | 339 | 83 | 18 1/8 | 104 | 19 9/16 | 116 | 24 13/16 | 95 |
| | 10 | 4.375 | 1.05 | 10 | 1890 | 331 | 127 | 21 3/8 | 123 | 22 13/16 | 134 | 28 1/16 | 114 |

*Movements shown are nonconcurrent.

## 150 PSIG CONTROLLED FLEXING: STYLE CSF (CONTINUED)

| Nominal Diameter (in.) | Con. Count | Axial (in.) | Lateral (in.) | Angular (Deg.) | Axial Sp Rate (lbs/in.) | Lateral Sp Rate (lbs/in.) | Angular Sp Rate (in.-lbs/Deg.) | VV OAL (in.) | VV Wt. (lbs.) | FF OAL (in.) | FF Wt. (lbs.) | WW OAL (in.) | WW Wt. (lbs.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5" Effective Area 33.2 in.² | 2 | .875 | .04 | 10 | 1537 | 9458 | 145 | 8 5/8 | 60 | 10 1/16 | 71 | 17 1/16 | 50 |
| | 4 | 1.75 | .14 | 10 | 768 | 1182 | 72 | 11 7/8 | 80 | 13 5/16 | 91 | 20 5/16 | 70 |
| | 6 | 2.625 | .32 | 10 | 890 | 608 | 84 | 15 1/8 | 101 | 16 9/16 | 112 | 23 9/16 | 91 |
| | 8 | 3.50 | .57 | 10 | 1582 | 608 | 149 | 18 3/8 | 121 | 19 13/16 | 132 | 26 13/16 | 111 |
| | 10 | 4.375 | .89 | 10 | 2413 | 593 | 228 | 21 5/8 | 142 | 23 1/16 | 153 | 30 1/16 | 132 |
| 6" Effective Area 53.8 in.² | 2 | 1.50 | .06 | 10 | 1536 | 8959 | 235 | 10 1/2 | 82 | 12 1/8 | 99 | 20 7/8 | 76 |
| | 4 | 3.00 | .25 | 10 | 768 | 1119 | 117 | 14 3/4 | 116 | 16 3/8 | 133 | 25 1/8 | 110 |
| | 6 | 4.50 | .56 | 10 | 512 | 331 | 78 | 19 | 150 | 20 5/8 | 167 | 29 3/8 | 144 |
| | 8 | 6.00 | 1.00 | 10 | 732 | 266 | 112 | 23 1/4 | 184 | 24 7/8 | 201 | 33 5/8 | 178 |
| | 10 | 7.50 | 1.57 | 10 | 585 | 136 | 89 | 27 1/2 | 218 | 29 1/8 | 235 | 37 7/8 | 212 |
| 8" Effective Area 85.0 in.² | 2 | 1.50 | .06 | 10 | 2061 | 13651 | 496 | 11 3/8 | 136 | 12 7/8 | 159 | 21 1/4 | 121 |
| | 4 | 3.00 | .24 | 10 | 1030 | 1706 | 248 | 16 3/8 | 192 | 17 7/8 | 216 | 26 1/4 | 177 |
| | 6 | 4.50 | .53 | 10 | 687 | 505 | 165 | 21 3/8 | 249 | 22 7/8 | 272 | 31 1/4 | 234 |
| | 8 | 6.00 | .94 | 10 | 982 | 406 | 236 | 26 3/8 | 306 | 27 7/8 | 329 | 36 1/4 | 290 |
| | 10 | 7.50 | 1.47 | 10 | 786 | 208 | 189 | 31 3/8 | 362 | 32 7/8 | 386 | 41 1/4 | 347 |
| 10" Effective Area 121 in.² | 2 | 1.50 | .05 | 10 | 2623 | 24731 | 899 | 12 | 188 | 13 7/8 | 222 | 21 7/8 | 145 |
| | 4 | 3.00 | .20 | 10 | 1311 | 3091 | 449 | 17 | 267 | 18 7/8 | 300 | 26 7/8 | 223 |
| | 6 | 4.50 | .45 | 10 | 874 | 915 | 299 | 22 | 346 | 23 7/8 | 379 | 31 7/8 | 302 |
| | 8 | 6.00 | .79 | 10 | 1250 | 736 | 428 | 27 | 424 | 28 7/8 | 458 | 36 7/8 | 380 |
| | 10 | 7.50 | 1.24 | 10 | 1000 | 377 | 342 | 32 | 503 | 33 7/8 | 536 | 41 7/8 | 459 |
| 12" Effective Area 175 in.² | 2 | 1.50 | .04 | 9.10 | 3180 | 40314 | 1465 | 11 1/4 | 251 | 13 5/8 | 300 | 21 1/8 | 210 |
| | 4 | 3.00 | .17 | 10 | 1590 | 5039 | 732 | 16 1/4 | 367 | 18 5/8 | 416 | 26 1/8 | 326 |
| | 6 | 4.50 | .38 | 10 | 1060 | 1493 | 488 | 21 1/4 | 483 | 23 5/8 | 532 | 31 1/8 | 442 |
| | 8 | 6.00 | .68 | 10 | 1516 | 1201 | 698 | 26 1/4 | 599 | 28 5/8 | 648 | 36 1/8 | 558 |
| | 10 | 7.50 | 1.07 | 10 | 1212 | 614 | 558 | 31 1/4 | 715 | 33 5/8 | 764 | 41 1/8 | 674 |
| 14" Effective Area 206 in.² | 2 | 1.50 | .04 | 8.19 | 3727 | 60809 | 2211 | 12 | 302 | 14 | 366 | 21 3/8 | 231 |
| | 4 | 3.00 | .15 | 10 | 1863 | 7601 | 1105 | 17 | 432 | 19 | 496 | 26 3/8 | 361 |
| | 6 | 4.50 | .34 | 10 | 1242 | 2252 | 737 | 22 | 562 | 24 | 626 | 31 3/8 | 491 |
| | 8 | 6.00 | .61 | 10 | 1776 | 1811 | 1053 | 27 | 692 | 29 | 756 | 36 3/8 | 621 |
| | 10 | 7.50 | .96 | 10 | 1421 | 927 | 843 | 32 | 822 | 34 | 885 | 41 3/8 | 751 |
| 16" Effective Area 261 in.² | 2 | 1.50 | .03 | 7.24 | 4286 | 87934 | 3197 | 11 3/4 | 376 | 14 1/4 | 416 | 21 1/8 | 272 |
| | 4 | 3.00 | .14 | 10 | 2143 | 10991 | 1598 | 16 3/4 | 528 | 19 1/4 | 568 | 26 1/8 | 424 |
| | 6 | 4.50 | .31 | 10 | 1428 | 3256 | 1065 | 21 3/4 | 680 | 24 1/4 | 720 | 31 1/8 | 576 |
| | 8 | 6.00 | .54 | 10 | 2043 | 2619 | 1524 | 26 3/4 | 832 | 29 1/4 | 872 | 36 1/8 | 728 |
| | 10 | 7.50 | .85 | 10 | 1634 | 1341 | 1219 | 31 3/4 | 984 | 34 1/4 | 1024 | 41 1/8 | 880 |
| 18" Effective Area 322 in.² | 2 | 1.50 | .03 | 6.81 | 4847 | 122102 | 4439 | 12 3/8 | 449 | 14 3/4 | 514 | 21 1/4 | 338 |
| | 4 | 3.00 | .12 | 10 | 2423 | 15262 | 2219 | 17 3/8 | 617 | 19 3/4 | 682 | 26 1/4 | 506 |
| | 6 | 4.50 | .28 | 10 | 1615 | 4522 | 1479 | 22 3/8 | 785 | 24 3/4 | 850 | 31 1/4 | 674 |
| | 8 | 6.00 | .49 | 10 | 2310 | 3637 | 2116 | 27 3/8 | 953 | 29 3/4 | 1018 | 36 1/4 | 842 |
| | 10 | 7.50 | .77 | 10 | 1848 | 1862 | 1692 | 32 3/8 | 1121 | 34 3/4 | 1186 | 41 1/4 | 1010 |

*Movements shown are non-concurrent.

## 300 PSIG CONTROLLED FLEXING: STYLE CSF (CONTINUED)

| Nominal Diameter (in.) | Con. Count | Axial (in.) | Lateral (in.) | Angular (Deg.) | Axial Sp Rate (lbs/in.) | Lateral Sp Rate (lbs/in.) | Angular Sp Rate (in.-lbs/Deg.) | VV OAL (in.) | VV Wt. (lbs.) | FF OAL (in.) | FF Wt. (lbs.) | WW OAL (in.) | WW Wt. (lbs.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3" Effective Area 17.5 in.² | 2 | .875 | .05 | 10 | 1383 | 5307 | 69 | 8 | 40 | 9 7/16 | 45 | 11 7/16 | 21 |
| | 4 | 1.75 | .18 | 10 | 691 | 663 | 34 | 11 | 51 | 12 7/16 | 56 | 14 7/16 | 32 |
| | 6 | 2.625 | .41 | 10 | 800 | 341 | 40 | 14 | 62 | 15 7/16 | 67 | 17 7/16 | 43 |
| | 8 | 3.50 | .72 | 10 | 1423 | 341 | 71 | 17 | 73 | 18 7/16 | 78 | 20 7/16 | 54 |
| | 10 | 4.375 | 1.13 | 10 | 1139 | 174 | 57 | 20 | 84 | 21 7/16 | 89 | 23 7/16 | 65 |
| 4" Effective Area 23.6 in.² | 2 | .875 | .04 | 10 | 1204 | 5283 | 81 | 9 3/8 | 71 | 10 15/16 | 78 | 15 1/16 | 40 |
| | 4 | 1.75 | .17 | 10 | 602 | 660 | 40 | 12 5/8 | 90 | 14 3/16 | 97 | 18 5/16 | 58 |
| | 6 | 2.625 | .38 | 10 | 697 | 339 | 46 | 15 7/8 | 109 | 17 7/16 | 115 | 21 9/16 | 77 |
| | 8 | 3.50 | .67 | 10 | 1239 | 339 | 83 | 19 1/8 | 127 | 20 11/16 | 134 | 24 13/16 | 95 |
| | 10 | 4.375 | 1.05 | 10 | 1890 | 331 | 127 | 22 3/8 | 146 | 23 15/16 | 153 | 28 1/16 | 114 |
| 5" Effective Area 33.2 in.² | 2 | .875 | .04 | 10 | 1537 | 9458 | 145 | 9 5/8 | 88 | 11 3/16 | 98 | 17 1/16 | 50 |
| | 4 | 1.75 | .14 | 10 | 768 | 1182 | 72 | 12 7/8 | 108 | 14 7/16 | 118 | 20 5/16 | 70 |
| | 6 | 2.625 | .32 | 10 | 890 | 608 | 84 | 16 1/8 | 129 | 17 11/16 | 138 | 23 9/16 | 91 |
| | 8 | 3.50 | .57 | 10 | 1582 | 608 | 149 | 19 3/8 | 149 | 20 15/16 | 159 | 26 13/16 | 111 |
| | 10 | 4.375 | .89 | 10 | 2413 | 593 | 228 | 22 5/8 | 169 | 24 3/16 | 179 | 30 1/16 | 132 |
| 6" Effective Area 53.8 in.² | 2 | 1.50 | .06 | 10 | 4854 | 53492 | 743 | 12 | 132 | 13 1/8 | 142 | 20 7/8 | 76 |
| | 4 | 3.00 | .25 | 10 | 2427 | 4629 | 371 | 16 1/4 | 166 | 17 3/8 | 176 | 25 1/8 | 110 |
| | 6 | 4.50 | .56 | 10 | 1631 | 1253 | 249 | 20 1/2 | 200 | 21 5/8 | 210 | 29 3/8 | 144 |
| | 8 | 6.00 | 1.00 | 10 | 2193 | 906 | 336 | 24 3/4 | 234 | 25 7/8 | 244 | 33 5/8 | 178 |
| | 10 | 7.50 | 1.57 | 10 | 2830 | 728 | 433 | 29 | 267 | 30 1/8 | 278 | 37 7/8 | 212 |
| 8" Effective Area 85.0 in.² | 2 | 1.50 | .06 | 10 | 6889 | 57029 | 1658 | 12 3/8 | 195 | 14 1/4 | 218 | 21 1/4 | 121 |
| | 4 | 3.00 | .24 | 10 | 3764 | 6924 | 906 | 17 3/8 | 251 | 19 1/4 | 274 | 26 1/4 | 177 |
| | 6 | 4.50 | .53 | 10 | 2713 | 2139 | 653 | 22 3/8 | 308 | 24 1/4 | 331 | 31 1/4 | 234 |
| | 8 | 6.00 | .94 | 10 | 3466 | 1510 | 834 | 27 3/8 | 364 | 29 1/4 | 388 | 36 1/4 | 290 |
| | 10 | 7.50 | 1.47 | 10 | 4300 | 1186 | 1035 | 32 3/8 | 421 | 34 1/4 | 444 | 41 1/4 | 347 |
| 10" Effective Area 121 in.² | 2 | 1.50 | .05 | 10 | 7497 | 88345 | 2569 | 13 1/2 | 272 | 15 1/4 | 298 | 21 7/8 | 145 |
| | 4 | 3.00 | .20 | 10 | 4172 | 10924 | 1429 | 18 1/2 | 350 | 20 1/4 | 377 | 26 7/8 | 223 |
| | 6 | 4.50 | .45 | 10 | 2982 | 3347 | 1022 | 23 1/2 | 429 | 25 1/4 | 455 | 31 7/8 | 302 |
| | 8 | 6.00 | .79 | 10 | 3829 | 2375 | 1312 | 28 1/2 | 507 | 30 1/4 | 534 | 36 7/8 | 380 |
| | 10 | 7.50 | 1.24 | 10 | 5681 | 2231 | 1947 | 33 1/2 | 586 | 35 1/4 | 612 | 41 7/8 | 459 |
| 12" Effective Area 175 in.² | 2 | 1.50 | .04 | 9.10 | 4983 | 81695 | 2376 | 13 1/4 | 391 | 15 | 403 | 21 1/8 | 210 |
| | 4 | 3.00 | .17 | 10 | 2900 | 10565 | 1383 | 18 1/4 | 507 | 20 | 519 | 26 1/8 | 326 |
| | 6 | 4.50 | .38 | 10 | 2028 | 3166 | 967 | 23 1/4 | 623 | 25 | 635 | 31 1/8 | 442 |
| | 8 | 6.00 | .68 | 10 | 3152 | 2780 | 1503 | 28 1/4 | 739 | 30 | 751 | 36 1/8 | 558 |
| | 10 | 7.50 | 1.07 | 10 | 3953 | 2160 | 1885 | 33 1/4 | 855 | 35 | 867 | 41 1/8 | 674 |

*Movements shown are non-concurrent.