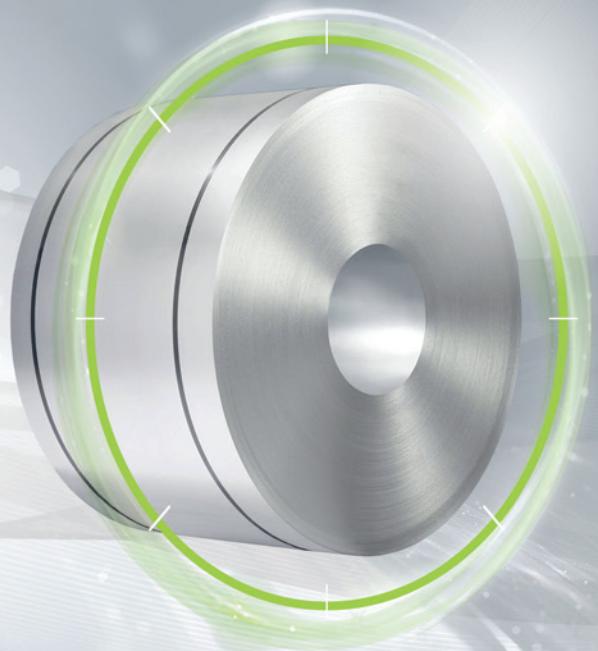


FULLY  
PROCESSED

## isovac 940-65 A

### The perfect solution for direct application

Manufactured in the most modern production lines, this fully processed isovac® grade exhibits highly homogeneous properties across the width and length of the entire strip. The result is excellent and consistent processability in the manufacture of highly efficient electrical components. Upon request, isovac 940-65 A can be supplied with an electrical steel insulation system and can be used directly in as-delivered condition.

#### Convincing advantages:

- » Best processability through consistent mechanical properties and homogeneous, clean surfaces
- » Excellent stackability resulting from high dimensional accuracy in rolling direction and perpendicular to rolling direction (thickness tolerance)
- » Innovative electrical steel insulation systems upon request

voestalpine supplies isovac 940-65 A, an electrical steel of the highest quality. We offer you a customer-focused overall package of products, service and logistics in addition to all the advantages of our integrated metallurgical facility and Steel Service Centers.

**Mechanical properties:**

Tensile test according to DIN EN ISO 6892-1 and hardness according to DIN EN ISO 6507-1 (Typical values);  
 Test direction: Transverse

| Grade named according to isovac® | Yield strength<br>R <sub>eH</sub><br>[MPa] | 0.2 %-Yield strength<br>R <sub>p0.2</sub><br>[MPa] | Tensile strength<br>R <sub>m</sub><br>[MPa] | Elongation<br>A <sub>80</sub><br>[%] | Hardness<br>HV5<br>[-] |
|----------------------------------|--------------------------------------------|----------------------------------------------------|---------------------------------------------|--------------------------------------|------------------------|
| isovac 940-65 A                  | 330                                        | 280                                                | 400                                         | 37                                   | 125                    |

**Magnetic properties:**

in as-delivered condition (Typical values)

Test direction: Mean value from longitudinal and transverse measurements at 50 Hz (60 Hz), single-sheet test

| Grade named according to isovac® | Specific total loss |                 |                 |                 | Magnetic polarization |                 |                   | Relative permeability   |
|----------------------------------|---------------------|-----------------|-----------------|-----------------|-----------------------|-----------------|-------------------|-------------------------|
|                                  | 1.0 T<br>P10        |                 | 1.5 T<br>P15    |                 | 2500 A/m<br>J25       | 5000 A/m<br>J50 | 10000 A/m<br>J100 | 1.5 T<br>μ <sub>r</sub> |
|                                  | 50 Hz<br>[W/kg]     | 60 Hz<br>[W/lb] | 50 Hz<br>[W/kg] | 60 Hz<br>[W/lb] | [T]                   | [T]             | [T]               | [-]                     |
| isovac 940-65 A                  | 2.95                | 1.74            | 6.40            | 3.78            | 1.65                  | 1.73            | 1.85              | 2300                    |

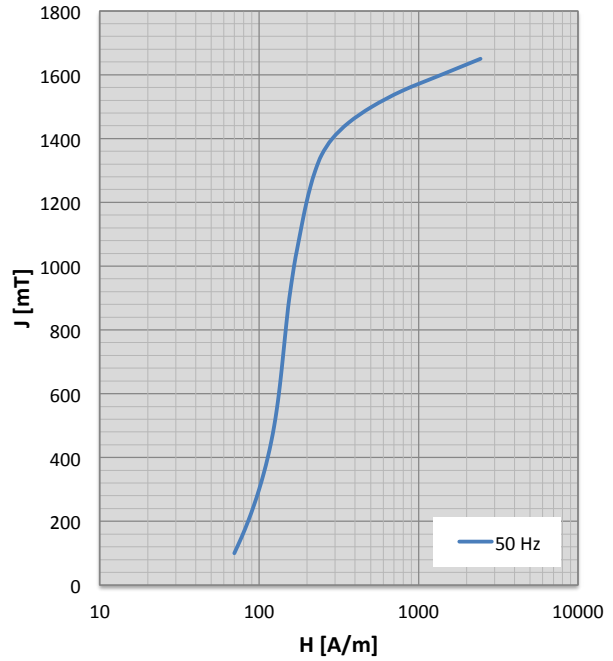
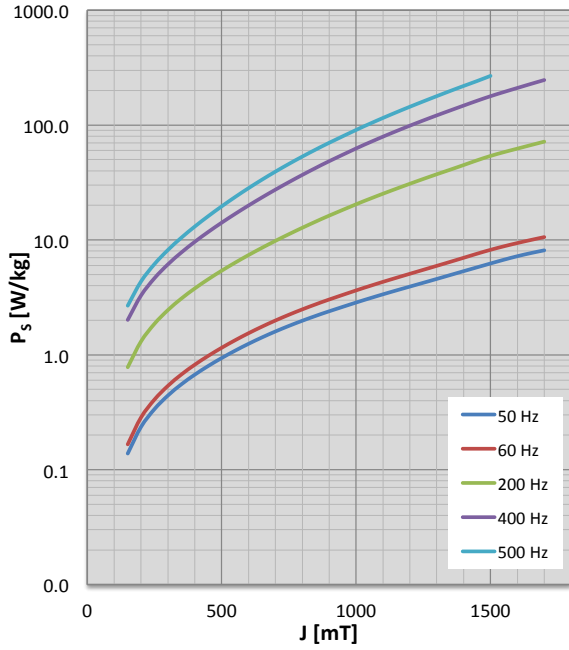
**Physical properties:**

Typical values

| Grade named according to isovac® | Density<br>ρ<br>[g/cm <sup>3</sup> ] | Specific electrical resistance<br>ρ <sub>s</sub><br>[μΩcm] | Thermal conductivity<br>λ<br>[W/mK] |
|----------------------------------|--------------------------------------|------------------------------------------------------------|-------------------------------------|
| isovac 940-65 A                  | 7.80                                 | 28.2                                                       | 42                                  |

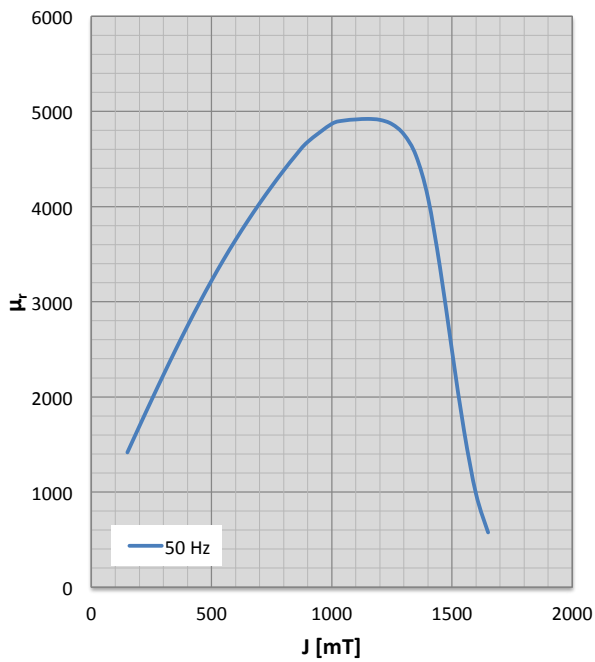
**Characteristics  $P_s/J$  loss curve and characteristics  $J/H$  magnetization curve**

Test direction: Mean value from longitudinal and transverse measurements at indicated frequencies, single-sheet test



**Characteristics  $\mu_r/J$  permeability curve**

Test direction: Mean value from longitudinal and transverse measurements at 50 Hz, single-sheet test



**Frequency dependence of magnetic properties**

Test direction: Mean value longitudinal and transverse at indicated frequencies and polarizations, single-sheet test

| 50 Hz  |         |                       |                    | 60 Hz  |         |                       |                    | 200 Hz |         |                       |                    |
|--------|---------|-----------------------|--------------------|--------|---------|-----------------------|--------------------|--------|---------|-----------------------|--------------------|
| J [mT] | H [A/m] | P <sub>s</sub> [W/kg] | μ <sub>r</sub> [-] | J [mT] | H [A/m] | P <sub>s</sub> [W/kg] | μ <sub>r</sub> [-] | J [mT] | H [A/m] | P <sub>s</sub> [W/kg] | μ <sub>r</sub> [-] |
| 100    | 70      | 0.04                  | 1140               | 100    | 68      | 0.05                  | 1177               | 100    | 72      | 0.26                  | 1114               |
| 150    | 78      | 0.14                  | 1417               | 150    | 77      | 0.17                  | 1433               | 150    | 83      | 0.78                  | 1319               |
| 200    | 85      | 0.24                  | 1692               | 200    | 85      | 0.29                  | 1688               | 200    | 94      | 1.31                  | 1521               |
| 250    | 93      | 0.34                  | 1965               | 250    | 94      | 0.41                  | 1940               | 250    | 106     | 1.86                  | 1718               |
| 300    | 100     | 0.44                  | 2232               | 300    | 102     | 0.54                  | 2188               | 300    | 117     | 2.45                  | 1907               |
| 350    | 107     | 0.55                  | 2493               | 350    | 109     | 0.67                  | 2431               | 350    | 128     | 3.09                  | 2084               |
| 400    | 113     | 0.67                  | 2746               | 400    | 116     | 0.82                  | 2667               | 400    | 139     | 3.78                  | 2248               |
| 450    | 119     | 0.80                  | 2989               | 450    | 123     | 0.98                  | 2895               | 450    | 149     | 4.55                  | 2396               |
| 500    | 124     | 0.94                  | 3222               | 500    | 129     | 1.15                  | 3114               | 500    | 159     | 5.40                  | 2524               |
| 550    | 129     | 1.09                  | 3442               | 550    | 134     | 1.34                  | 3323               | 550    | 169     | 6.34                  | 2630               |
| 600    | 133     | 1.25                  | 3650               | 600    | 138     | 1.54                  | 3520               | 600    | 179     | 7.39                  | 2715               |
| 650    | 137     | 1.42                  | 3847               | 650    | 142     | 1.76                  | 3705               | 650    | 189     | 8.55                  | 2779               |
| 700    | 140     | 1.60                  | 4034               | 700    | 146     | 1.99                  | 3878               | 700    | 200     | 9.82                  | 2822               |
| 750    | 143     | 1.79                  | 4211               | 750    | 150     | 2.23                  | 4038               | 750    | 212     | 11.23                 | 2844               |
| 800    | 147     | 1.98                  | 4380               | 800    | 154     | 2.49                  | 4183               | 800    | 226     | 12.77                 | 2846               |
| 850    | 150     | 2.18                  | 4539               | 850    | 158     | 2.75                  | 4314               | 850    | 241     | 14.45                 | 2829               |
| 900    | 155     | 2.39                  | 4680               | 900    | 163     | 3.03                  | 4429               | 900    | 258     | 16.29                 | 2797               |
| 1000   | 165     | 2.85                  | 4869               | 1000   | 175     | 3.64                  | 4596               | 1000   | 295     | 20.43                 | 2711               |
| 1050   | 173     | 3.10                  | 4904               | 1050   | 182     | 3.97                  | 4645               | 1050   | 314     | 22.76                 | 2667               |
| 1100   | 180     | 3.36                  | 4915               | 1100   | 190     | 4.32                  | 4674               | 1100   | 335     | 25.26                 | 2621               |
| 1150   | 189     | 3.64                  | 4921               | 1150   | 198     | 4.68                  | 4681               | 1150   | 356     | 27.94                 | 2574               |
| 1200   | 198     | 3.93                  | 4911               | 1200   | 209     | 5.07                  | 4646               | 1200   | 379     | 30.83                 | 2526               |
| 1250   | 210     | 4.24                  | 4867               | 1250   | 223     | 5.49                  | 4559               | 1250   | 401     | 33.96                 | 2478               |
| 1300   | 225     | 4.58                  | 4758               | 1300   | 238     | 5.95                  | 4454               | 1300   | 427     | 37.30                 | 2425               |
| 1350   | 247     | 4.95                  | 4536               | 1350   | 257     | 6.45                  | 4332               | 1350   | 456     | 40.88                 | 2366               |
| 1400   | 288     | 5.35                  | 4093               | 1400   | 294     | 6.99                  | 4003               | 1400   | 481     | 44.86                 | 2316               |
| 1450   | 365     | 5.78                  | 3361               | 1450   | 371     | 7.59                  | 3316               | 1450   | 507     | 49.32                 | 2258               |
| 1500   | 511     | 6.24                  | 2484               | 1500   | 519     | 8.20                  | 2445               | 1500   | 593     | 53.86                 | 2031               |
| 1550   | 792     | 6.73                  | 1644               | 1550   | 803     | 8.81                  | 1620               | 1550   | 834     | 58.12                 | 1525               |
| 1600   | 1391    | 7.22                  | 979                | 1600   | 1399    | 9.40                  | 972                | 1600   | 1412    | 62.37                 | 966                |
| 1650   | 2445    | 7.68                  | 576                | 1650   | 2446    | 9.99                  | 577                | 1650   | 2461    | 66.92                 | 593                |
| 1700   | 3843    | 8.12                  | 370                | 1700   | 3836    | 10.59                 | 373                | 1700   | 3865    | 71.73                 | 386                |

**Frequency dependence of magnetic properties**

Test direction: Mean value longitudinal and transverse at indicated frequencies and polarizations, single-sheet test

| 400 Hz |         |                       |                    | 500 Hz |         |                       |                    |
|--------|---------|-----------------------|--------------------|--------|---------|-----------------------|--------------------|
| J [mT] | H [A/m] | P <sub>s</sub> [W/kg] | μ <sub>r</sub> [-] | J [mT] | H [A/m] | P <sub>s</sub> [W/kg] | μ <sub>r</sub> [-] |
| 100    | 82      | 0.77                  | 975                | 100    | 90      | 1.07                  | 883                |
| 150    | 95      | 2.01                  | 1151               | 150    | 103     | 2.68                  | 1051               |
| 200    | 108     | 3.29                  | 1323               | 200    | 116     | 4.35                  | 1214               |
| 250    | 121     | 4.65                  | 1486               | 250    | 129     | 6.17                  | 1369               |
| 300    | 135     | 6.13                  | 1638               | 300    | 144     | 8.18                  | 1510               |
| 350    | 149     | 7.78                  | 1773               | 350    | 159     | 10.46                 | 1634               |
| 400    | 164     | 9.64                  | 1889               | 400    | 176     | 13.08                 | 1737               |
| 450    | 180     | 11.74                 | 1980               | 450    | 195     | 16.11                 | 1813               |
| 500    | 196     | 14.14                 | 2044               | 500    | 215     | 19.61                 | 1859               |
| 550    | 214     | 16.86                 | 2076               | 550    | 238     | 23.64                 | 1872               |
| 600    | 234     | 19.95                 | 2082               | 600    | 263     | 28.25                 | 1857               |
| 650    | 255     | 23.46                 | 2066               | 650    | 290     | 33.48                 | 1821               |
| 700    | 277     | 27.41                 | 2033               | 700    | 319     | 39.35                 | 1771               |
| 750    | 302     | 31.86                 | 1988               | 750    | 351     | 45.91                 | 1714               |
| 800    | 330     | 36.83                 | 1937               | 800    | 385     | 53.19                 | 1657               |
| 850    | 360     | 42.37                 | 1883               | 850    | 421     | 61.24                 | 1605               |
| 900    | 392     | 48.49                 | 1828               | 900    | 459     | 70.13                 | 1558               |
| 1000   | 462     | 62.58                 | 1722               | 1000   | 542     | 90.67                 | 1470               |
| 1050   | 500     | 70.58                 | 1673               | 1050   | 587     | 102.47                | 1425               |
| 1100   | 539     | 79.25                 | 1625               | 1100   | 634     | 115.32                | 1382               |
| 1150   | 580     | 88.64                 | 1579               | 1150   | 683     | 129.25                | 1340               |
| 1200   | 622     | 98.78                 | 1535               | 1200   | 734     | 144.33                | 1301               |
| 1250   | 667     | 109.68                | 1495               | 1250   | 788     | 160.68                | 1263               |
| 1300   | 712     | 121.40                | 1452               | 1300   | 846     | 178.51                | 1223               |
| 1350   | 760     | 134.01                | 1407               | 1350   | 910     | 198.00                | 1182               |
| 1400   | 813     | 147.75                | 1371               | 1400   | 978     | 218.98                | 1140               |
| 1450   | 872     | 162.72                | 1350               | 1450   | 1049    | 241.64                | 1100               |
| 1500   | 925     | 178.32                | 1291               | 1500   | 1126    | 267.97                | 1060               |
| 1550   | 1016    | 194.03                | 1149               |        |         |                       |                    |
| 1600   | 1432    | 210.39                | 949                |        |         |                       |                    |
| 1650   | 2420    | 228.02                | 727                |        |         |                       |                    |
| 1700   | 3851    | 246.62                | 494                |        |         |                       |                    |

### Available Dimensions

| Grade named according to isovac® | Delivery form           | Width [mm] | Length [mm] |
|----------------------------------|-------------------------|------------|-------------|
| isovac 940-65 A                  | Wide strip / Slit strip | 19 – 1590  | -           |
|                                  | Cut-to-length sheets    | 300 – 1590 | 300 – 5000  |

### Deliverable coating systems

| Grade named according to isovac® | Uncoated | C-3 | Backlack | C-5 | C-6 |
|----------------------------------|----------|-----|----------|-----|-----|
| isovac 940-65 A                  | ✔        | ✔   | ☰        | ✔   | ✔   |

✔ Available ☰ On request

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