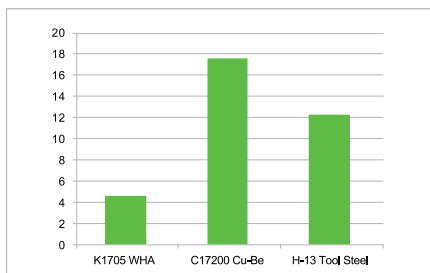


Tungsten Alloys for Die Casting Applications

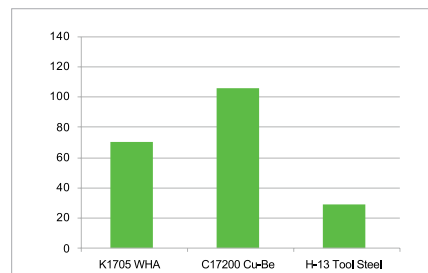
Advantages:

- Good thermal fatigue resistance due to high thermal conductivity and low coefficient of expansion
- Longer tool and die life
- Less down time
- Readily machined
- Additional cooling due to high thermal conductivity
- High resistance to die soldering and chemical erosion due to lower reactivity in molten aluminum
- No heat treatment necessary
- Lower price per casting
- Better equipment utilization
- Fewer casting rejects
- Better surface finish on cast parts

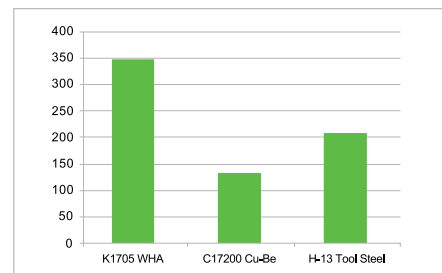
Coefficient of Thermal Expansion (ppm/°K)



Thermal Conductivity (W/m°K)



Elastic Modulus (GPa)



Enhanced Quality and Cost Performance with Tungsten Alloys

H.C. Starck Solutions' tungsten alloys provide superior material properties compared to conventional tool steel, ultimately resulting in lower machine downtime, reliably high casting quality, and shorter cycle times. Using inserts made from tungsten alloys improves the tool's resistance to heat checking and wear and ensures a smooth part release since die soldering is virtually eliminated. Through improved thermal management the risk of hot tearing can be lowered, and a higher net thermal conductivity allows for faster solidification and less external cooling.

TYPICAL PROPERTIES

| Density |
|------------------------------|
| 17.3 ± 0.2 g/cm ³ |

| Hardness [HRC RT] | 26-34 |
|----------------------|-------|
| Hot Hardness [HV 10] | |
| at 300 °C | >220 |
| at 600 °C | >190 |
| at 800 °C | >120 |

| Coef. of Expansion [10 ⁻⁶ /K] | |
|--|-----|
| [20-100 °C] | 4.5 |
| [20-400 °C] | 5.2 |
| [20-600 °C] | 5.4 |
| [20-800 °C] | 5.7 |

| Thermal Conductivity [W/mK] | 128 |
|-----------------------------|-----|
|-----------------------------|-----|

| Ult. Tensile Strength [MPa] | |
|-----------------------------|------|
| at 540 °C | >700 |
| at 650 °C | >650 |
| at 815 °C | >450 |
| at 1095 °C | >200 |

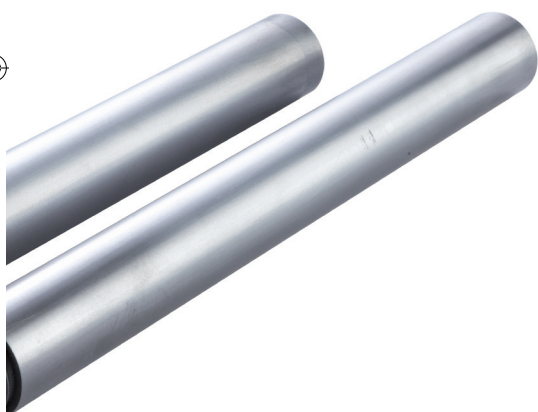
| Yield Strength [R..MPa] | >800 |
|-------------------------|------|
| at 300 °C | >220 |
| at 600 °C | >190 |
| at 800 °C | >120 |

| Elastic Modulus [GPa] | 338 |
|-----------------------|-----|
|-----------------------|-----|

| Elongation [% RT] | 7 |
|-------------------|-----|
| at 540 °C | 8 |
| at 650 °C | 10 |
| at 815 °C | 6.5 |
| at 1095 °C | 4 |

| Bending | |
|-------------------------|------|
| Mod of Rupture [MPa RT] | 1520 |

| Impact | 7 |
|----------------------|----|
| Charpy V-notched [J] | 3 |
| Charpy unnotched [J] | 23 |



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The values in this publication are typical values and do not constitute a specification.

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