



## 1.3343 | M-2 | Z85WDCV06-05-04-02 | SKH51

M2 High Speed Steel is a tungsten-molybdenum high speed steel with a very much adjusted arrangement reasonable for a wide variety of uses.

This grade is described by balanced combination of abrasion resistance, toughness and good red hardness. Because of its nearly low carbon content, M2 has a great mix of strength properties and abrasion resistance when properly hardened and tempered. M2 is widely used in cutting device, blade and punch and kick and die applications.

### Chemical Composition

| W.nr   | EQUIVALENT |         |           | C         | Si    | Mn    | S     | P     | Cr        | W         | Mo        | V         |
|--------|------------|---------|-----------|-----------|-------|-------|-------|-------|-----------|-----------|-----------|-----------|
|        | JIS        | DIN     | AISI/ASTM |           |       |       |       |       |           |           |           |           |
| 1.3343 | SKH51      | HS6-5-2 | M2        | 0.87-0.95 | <0.45 | <0.40 | <0.03 | <0.03 | 3.80-4.50 | 5.90-6.70 | 4.70-5.20 | 1.70-2.10 |

### Physical Properties

| Properties    | Metric                 | Imperial                 |
|---------------|------------------------|--------------------------|
| Density       | 8.16 g/cm <sup>3</sup> | 0.294 lb/in <sup>3</sup> |
| Melting point | 4680°C                 | 2600°F                   |

### Mechanical Properties

| Properties  | Metric      | Imperial        |
|---|-------------|-----------------|
| Hardness, Rockwell C (tempered at 1150°F, quenched at 2200°F)     | 62          | 62              |
| Hardness, Rockwell C (as hardened, quenched at 2200°F)            | 65          | 65              |
| Compressive yield strength (when tempered at 300°F)               | 3250 MPa    | 471000 psi      |
| Izod impact unnotched (when tempered at 300°F)                    | 67 J        | 49.4 ft-lb      |
| Abrasion (loss in mm <sup>3</sup> , as-hardened; ASTM G65)        | 25.8        | 25.8            |
| Abrasion (loss in mm <sup>3</sup> , tempered at 1275°F; ASTM G65) | 77.7        | 77.7            |
| Poisson's ratio   | 0.27-0.30   | 0.27-0.30       |
| Elastic modulus   | 190-210 GPa | 27557-30458 ksi |



## Thermal Properties

| Properties                                | Metric                                    | Imperial                                    |
|---|---|---|
| CTE, linear (@20.0 - 100°C/ 68.0 - 212°F) | 10 $\mu\text{m}/\text{m}^\circ\text{C}$   | 5.56 $\mu\text{in}/\text{in}^\circ\text{F}$ |
| CTE, linear (@20.0 - 500°C/68.0 - 932°F)  | 12.2 $\mu\text{m}/\text{m}^\circ\text{C}$ | 6.78 $\mu\text{in}/\text{in}^\circ\text{F}$ |
| CTE, linear (@20.0 - 850°C/68.0 - 1560°F) | 12.6 $\mu\text{m}/\text{m}^\circ\text{C}$ | 7 $\mu\text{in}/\text{in}^\circ\text{F}$    |

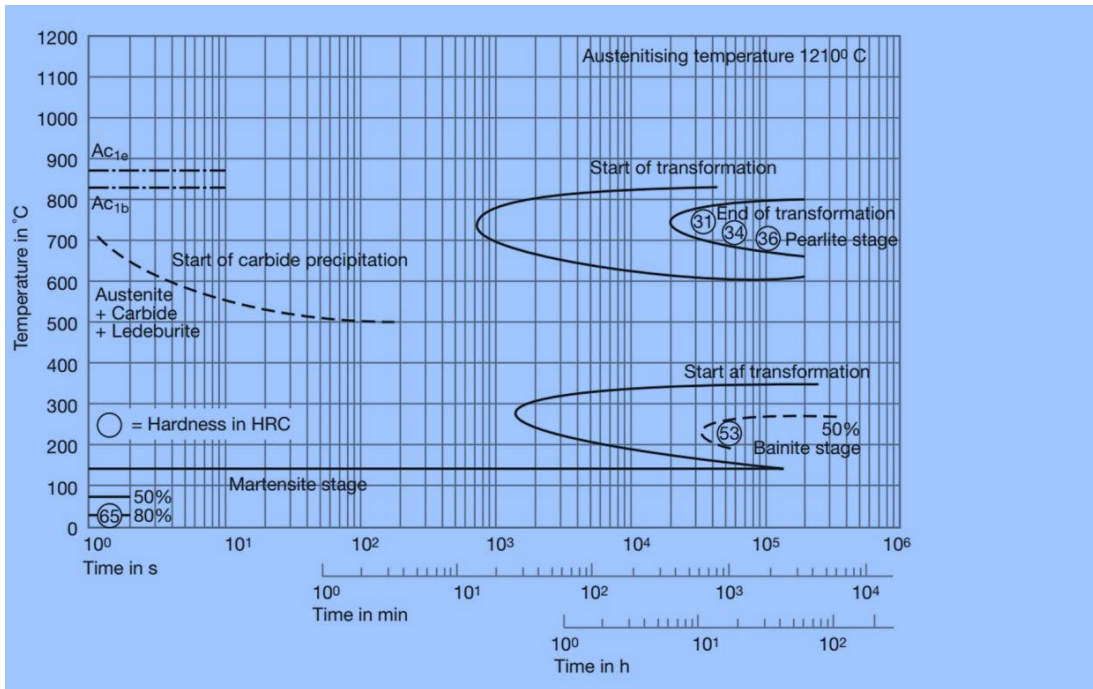
## Heat Treatment

| TREATMENT                  | TEMPERATURE          | COOLING | HARDNESS |
|----------------------------|----------------------|---------|----------|
| Annealing                  | Heat to 770 – 860 °C | Furnace | max. 269 |
| Stress-relief annealing °C | Heat to 630 – 650 °C | Furnace | -        |

| 1st pre-heating °C                              | 2nd and 3rd pre-heating °C | Hardening1 °C | Quenching           | Tempering °C             | Quenching |
|---|----------------------------|---------------|---------------------|--------------------------|-----------|
| up to approx. 400 in an air-circulating furnace | a) 850                     | 1190 – 1230   | a) Saltbath, 550 °C | at least twice 530 – 560 | 64 – 66   |
| -   | b) 850 and 1050            | -             | b) Oil              | -                        | -         |
| -   | -                          | -             | c) Air              | -                        | -         |

For cold-forming tools with a complex geometry, a hardening temperature at the lower end of the quoted range is recommended. The stated hardening temperatures apply to saltbath hardening only. For vacuum hardening, we suggest a reduction of 10 °C to 30 °C.

## Isothermal time temperature transformation diagram



## Tempering diagram

