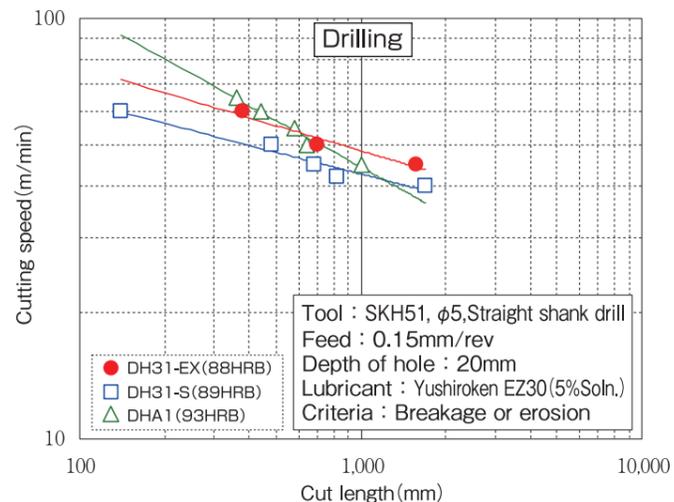
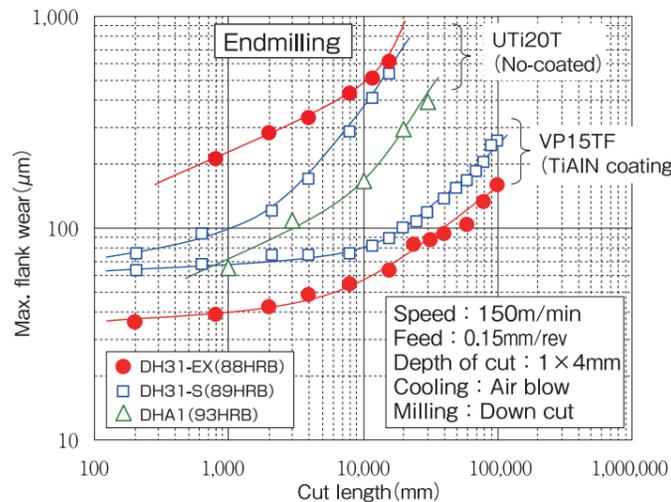


Machinability



Main applications

| Applications | Hardness(HRC) |
|-----------------------------|---------------|
| Al, Zn, Mg Die casting dies | 41~48 |
| Hot extrusion dies | 43~50 |
| Hot shear blades | 35~45 |
| Hot forging dies | 42~50 |

Physical properties

Quenching : 1030°C × 1h, Air cooling
Tempering : 610°C × 1h, Twice
Hardness : 45HRC

◆ Thermal expansion rate

| Temp. | 20~100°C | 20~200°C | 20~300°C | 20~400°C | 20~500°C | 20~600°C |
|-----------------------|----------|----------|----------|----------|----------|----------|
| × 10 ⁻⁶ /K | 11.0 | 11.4 | 11.7 | 12.1 | 12.5 | 12.7 |

◆ Thermal conductivity

| Temp. | 25°C | 100°C | 200°C | 300°C | 400°C | 500°C | 600°C |
|-------|------|-------|-------|-------|-------|-------|-------|
| W/m·K | 27.2 | 28.4 | 29.1 | 29.8 | 30.1 | 30.0 | 29.6 |

*Accuracy of repeated measurements is about ± 10%.

◆ Specific heat

| Temp. | 25°C | 100°C | 200°C | 300°C | 400°C | 500°C | 600°C |
|--------|------|-------|-------|-------|-------|-------|-------|
| J/kg·K | 468 | 513 | 557 | 588 | 657 | 712 | 825 |

◆ Young's modulus / Rigidity modulus / Poisson's ratio(25°C)

| Young's modulus | Rigidity modulus | Poisson's ratio |
|-----------------|------------------|-----------------|
| 211GPa | 81GPa | 0.29 |



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Document Disclaimer

The product characteristics included in this brochure are the representative values based on the result of our measurements, and do not guarantee the performance in use of the products. Please inquire the latest information to our department in charge as the information of this brochure is updated without previous notice as needed.

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No.SC1302d 25.11.0.3 (DDD)

Daido's Hot Work Die Steel Series

DH31-EXTM

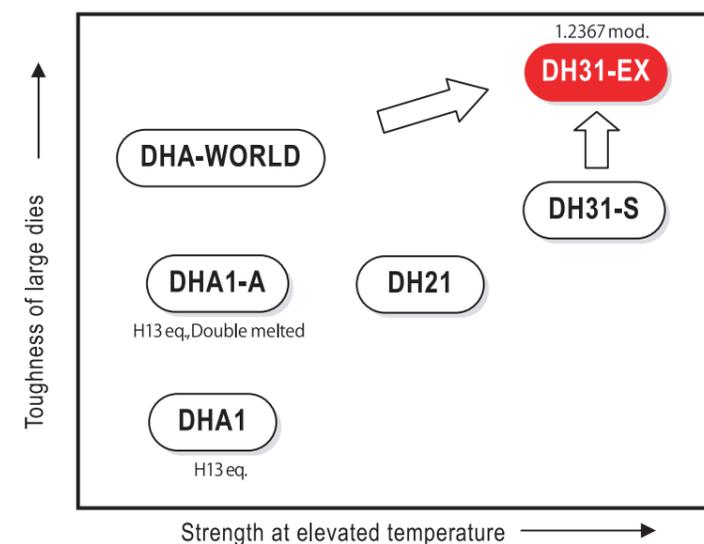


High Performance Hot Work Die Steel

Features

High toughness throughout large Die Casting Dies and Forging Dies contributes to prevent from the risk of gross cracking in service

- ◆ High hardenability : High toughness even in large sized dies
- ◆ High hot strength : Great heat checking and wear resistance
- ◆ Double melted : Homogeneous and almost isotropic properties throughout dies



Heat treatment

| Re-forging Temperature (°C) | Heat treatment(°C) | | | Hardness | | Transformation Temp.(°C) | |
|-----------------------------|-------------------------|--------------------------|------------------------|----------|---------------------|--------------------------|------------------------------|
| | Annealing | Quenching | Tempering | Annealed | Quenched & Tempered | Ac | Ms |
| 900~1200 | 820~870 Slow cooling | 1000~1050 Air cooling | 550~650 Air cooling | ≤ 235HBW | 35~53HRC | 805~885 | 300 (Austenitized at 1030°C) |

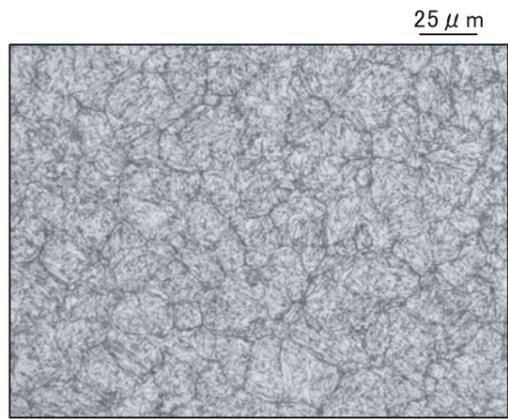


Properties

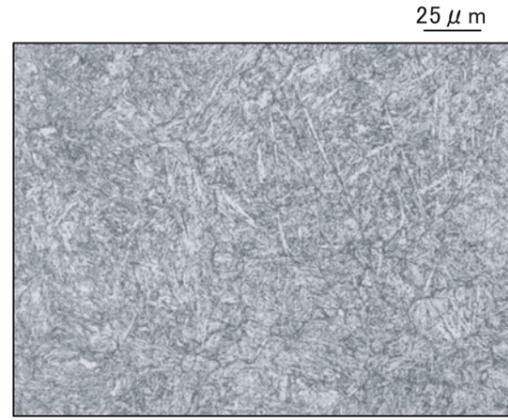
Material size : 200mm H × 800mm W

Microstructure (Quenched and Tempered)

Specimen : 200mmH × 600mmW × 300mmL(Center)
Quenching : 1030°C, Gas quenching with 6-9 bar in vacuum furnace



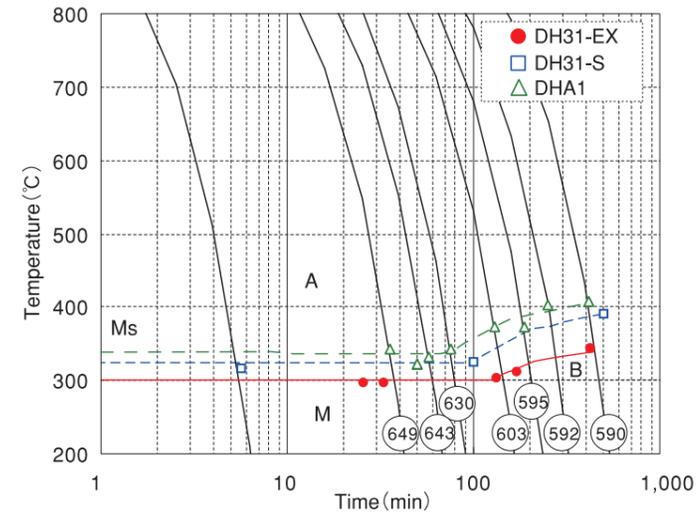
DH31-EX



DHA1

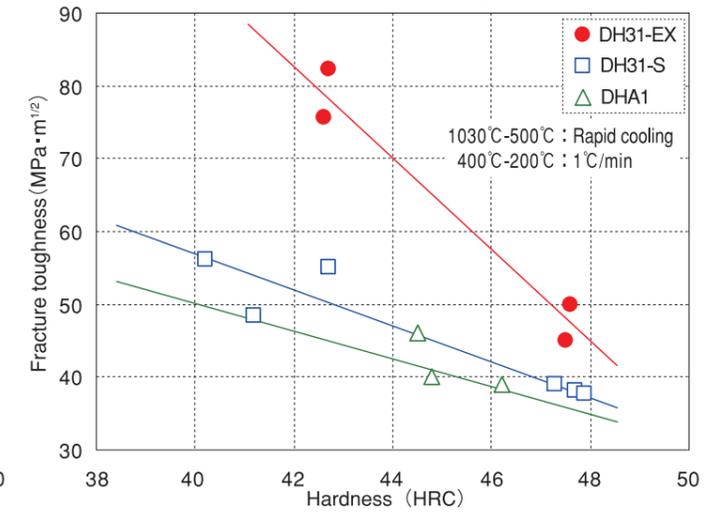
CCT diagram

Austenitizing : 1030°C × 15min



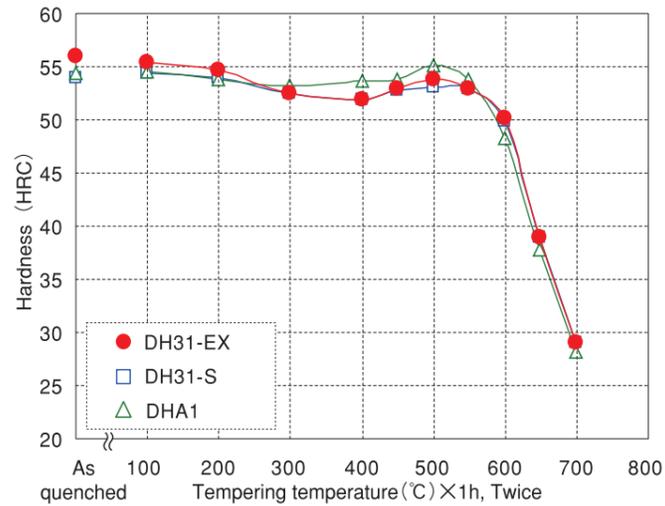
Fracture toughness

Specimen : 12.5mm × 61mm × 64mm
Quenching : 1030°C, Gas cooling



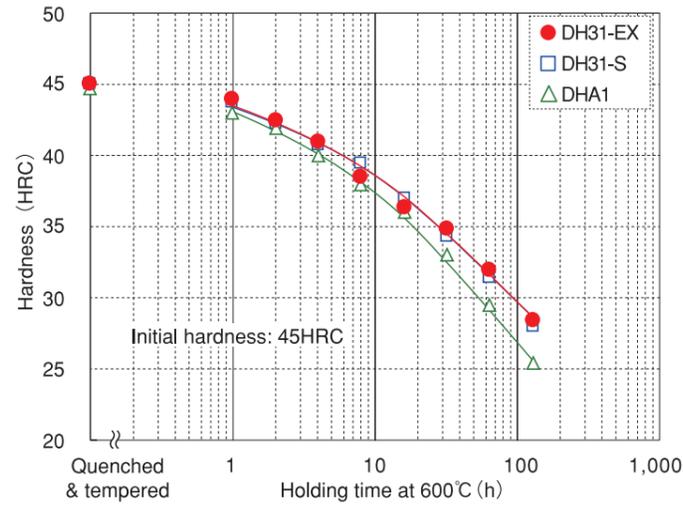
Tempered hardness

Specimen : 10mm × 15mm × 20mm
Quenching : 1030°C × 15min, AC



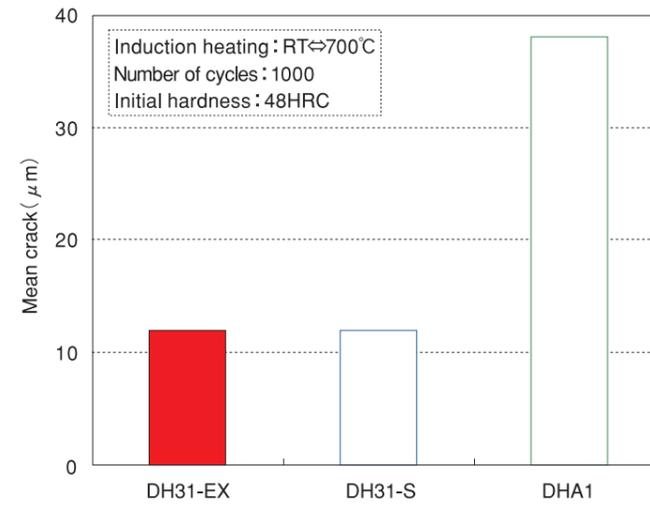
Softening resistance

Specimen : 200mmH × 600mmW × 300mmL(Center)
Quenching : 1030°C, Gas quenching with 6-9bar



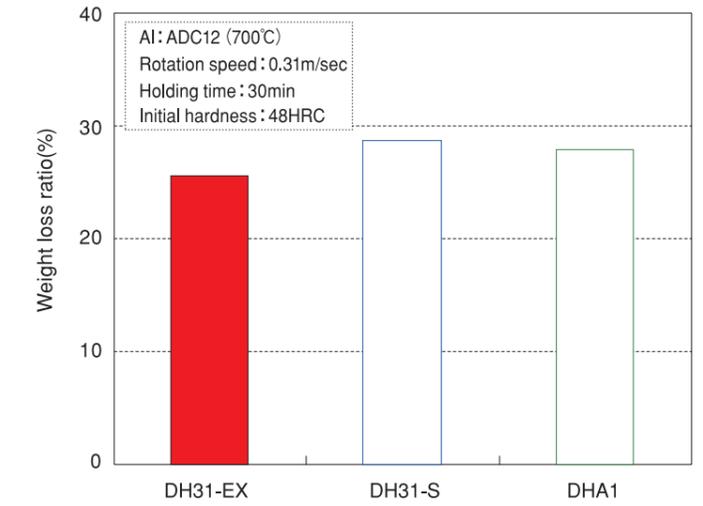
Heat checking resistance

Specimen : φ 15 × 5mm
Quenching : 1030°C, Gas cooling



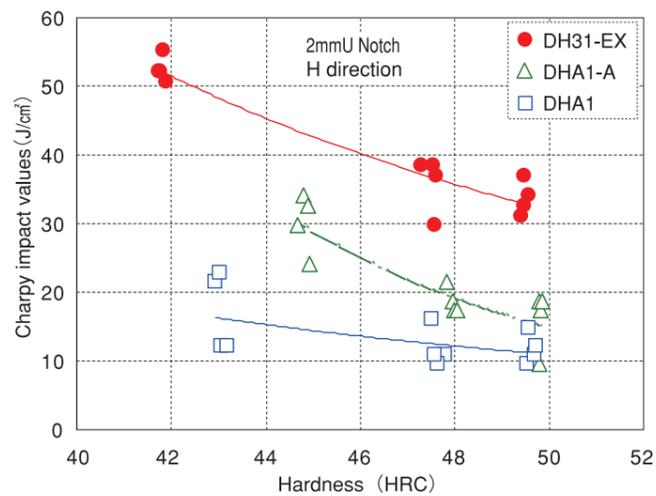
Al erosion resistance

Specimen : φ 10 × 30mm
Quenching : 1030°C, Gas cooling

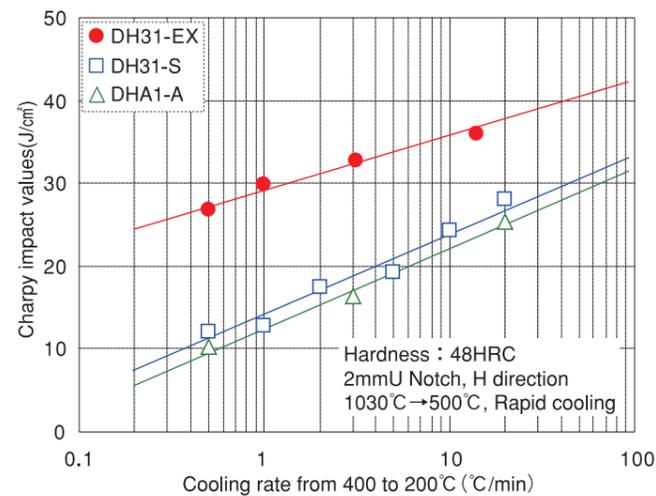


Toughness

Specimen : 200mmH × 600mmW × 300mmL(center)
Quenching : 1030°C, Gas quenching with 6-9bar

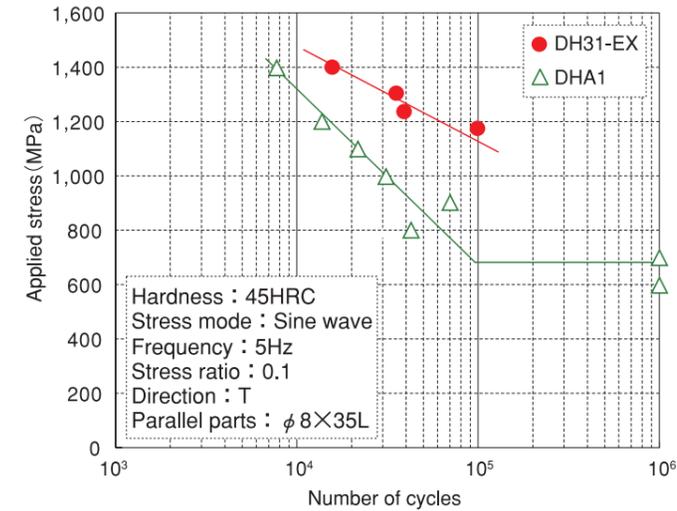


Specimen : 10 × 10 × 55mm
Quenching : 1030°C × 1h, Gas cooling



Fatigue properties

Specimen : φ 26 × 180mm
Quenching : 1030°C, Gas cooling



Nitriding characteristics

Nitriding : PS treatment
Initial hardness : 45HRC

