# S-STAR

## 32HRC Pre-Hardened or 53HRC Quench-Hardened Type Ultra-Hard, Mirror-Finish, Corrosion-Resistance Plastic Mold Steel

## Features

1. Excellent corrosion resistance
2. High hardness, maximum 53HRC, is obtained.
3. Super mirror-finished surface
4. Minimal distortion, less than 0.03%, after heat treatment
5. Excellent internal soundness by special melting
6. Uniform texture surface by process etching and excellent electric discharge-machining
7. It is available to provide pre-hardened materials with the hardness 32HRC

## Applications

1. Ultra mirror finish plastic molds
   - Lens
2. Ultra-hard, Corrosion-resistance plastic molds
   - Medical instruments, Cosmetic container, Food container
3. Resin
   - PMMA, PC, PP, PS, PVC, PE, PF, Flame resisting compound added resin

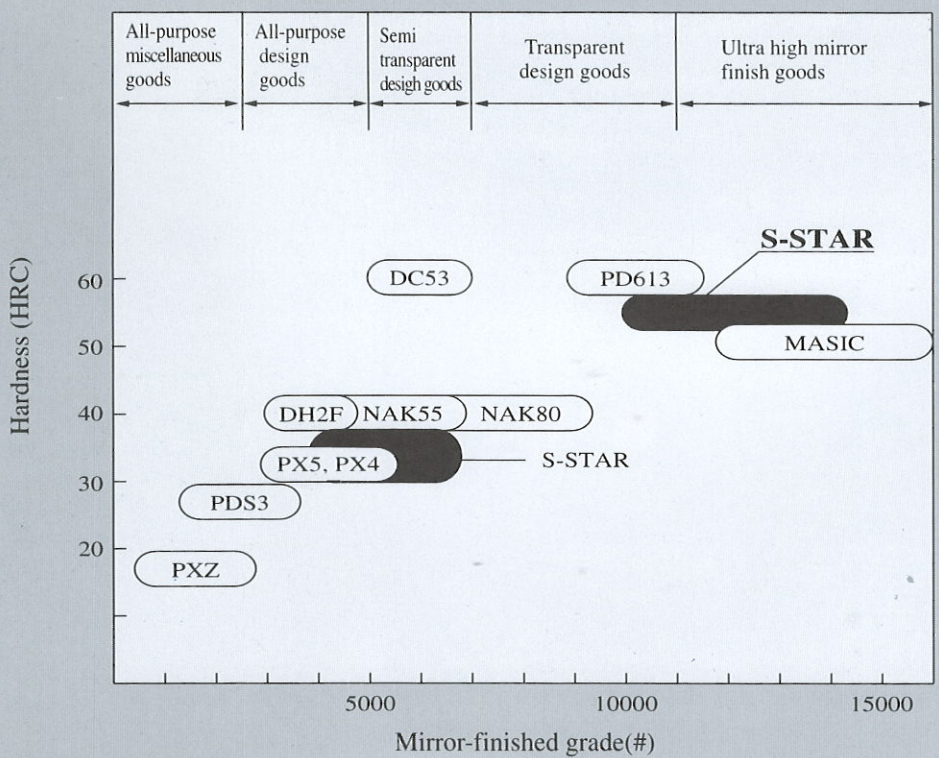
DAIDO STEEL

# Chemical Composition

| Daido Brand (JIS) | Supply Condition (hardness) | Chemical Composition (%) | | | | |
|---|---|---|---|---|---|---|
| | | C | Si | Cr | Mo | V |
| S-STAR (SUS420J2 mod.) | Annealing (HB ≦ 229) | 0.38 | 0.9 | 13.5 | 0.1 | 0.3 |
| | Pre-hardened (31~34HRC) | | | | | |

# Mirror Finish Properties

■ **Excellent corrosion resistance and mirror-finish surface are obtained with the high hardness: 53HRC.**



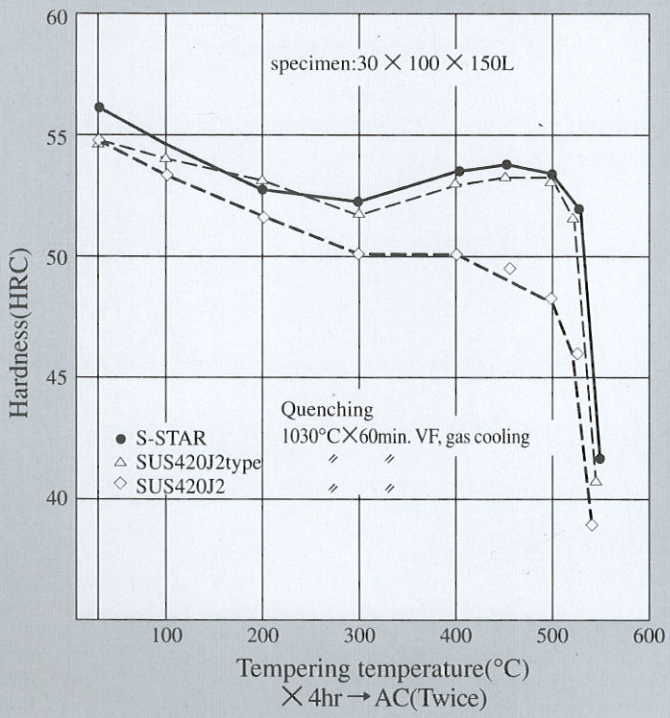

(Normal polishing procedures)
Turning
Milling ┐
├ Grinding(~#220 → #320 → #400)
-Emery paper polishing(#320 → #400 → #600 → # 800 → #1000 → #1200 → #1500) →
Diamond paste finishing(#1200 → #1800 → #3000 → #8000 → #14000)

With NAK55, surface might be roughed to aventurine finish surface when the method of polishing of #5000 or finer polishing is attempted.

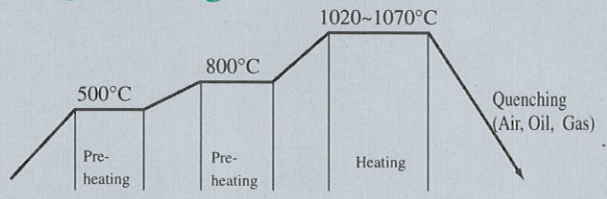
# Heat Treatment

## ■Hardened-Tempered Hardness

Maximum hardness of 53HRC is obtained.



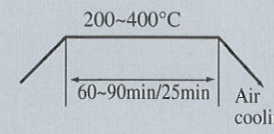

## ■Quenching



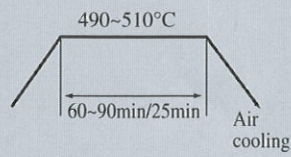

## ■Tempering

Double tempering is recommended for both low and high temperature tempering.

For higher corrosion resistance and less dimentional change




To prevent cracking after EDM

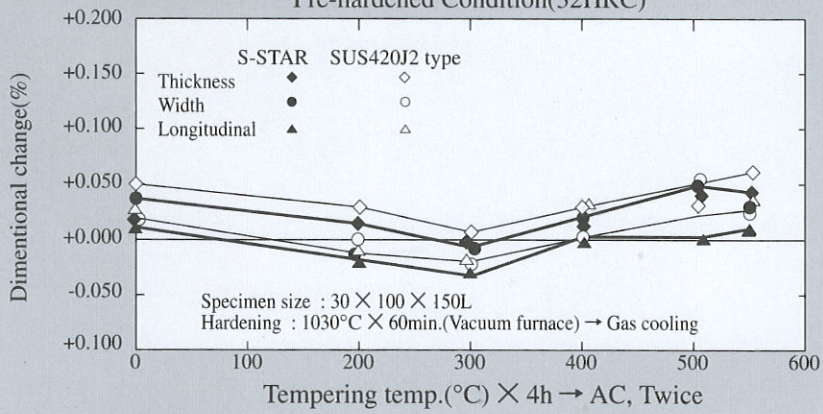



Note:
- For higher corrosion resistance, tempering should be carried out at temperatures of 400°C or lower.
- To prevent from cracking in EDM tempering is recommended at 490 to 510°C.
- When aging dimensional stability is deemed important, carry out low temperature tempering at 200 to 400°C or sub-zero processing.

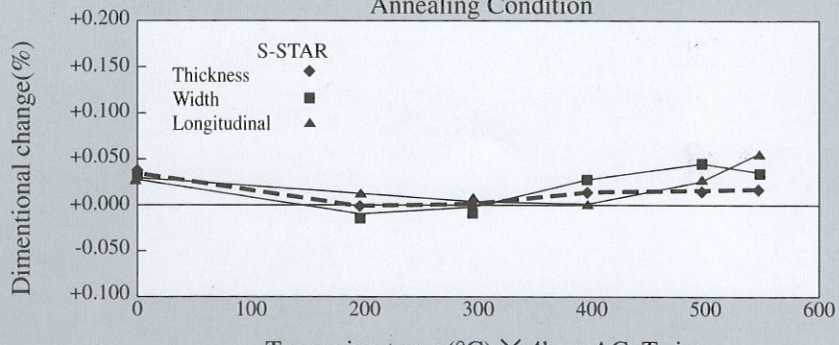
## ■Dimensional change

Dimensional change is the smallest by tempering about 300°C.

Pre-hardened Condition(32HRC)

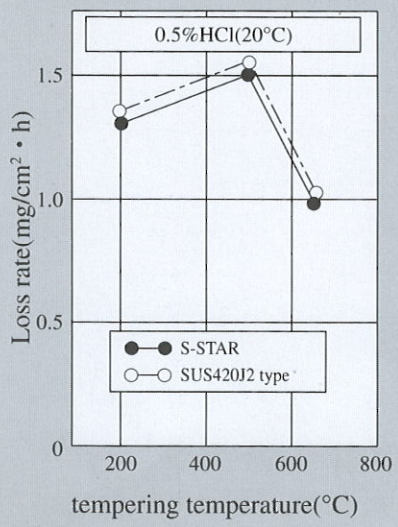



Annealing Condition

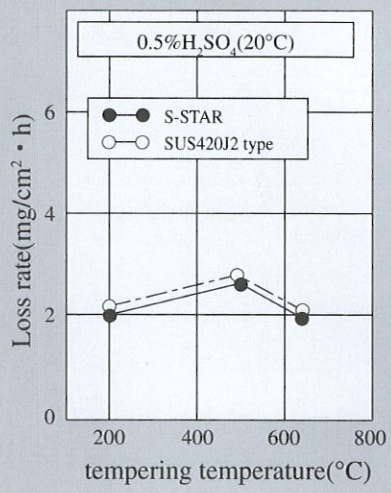


# Corrosion Resistance

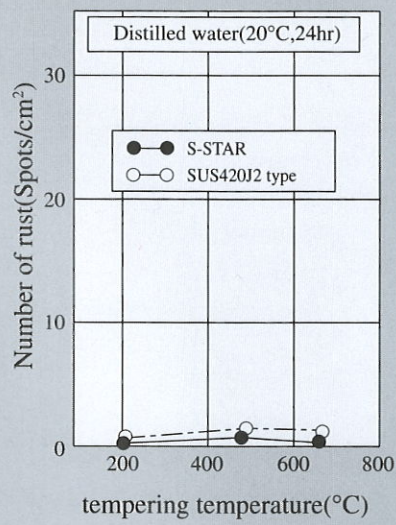
## ■ Hydrochroric acid




## ■ Sulphuric acid



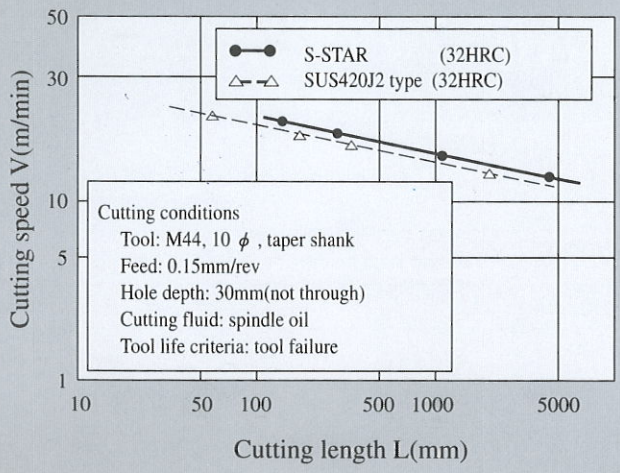

## ■ Distilled water



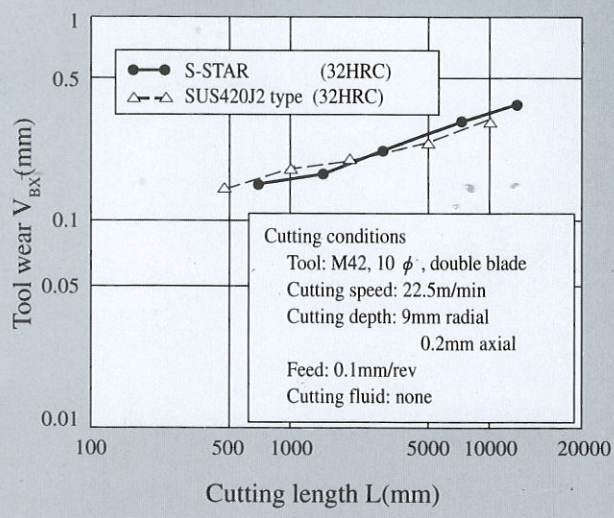

# Machinability

● **Good machinability under quench-tempered conditions.**

## ■ Drill tool life(pre-hardened)




## ■ Endmill tool life(pre-hardened)



# Mechanical and Physical Properties

## Mechanical Properties

| | Hardness(HRC) | |
|---|---|---|
| | 32 | 53 |
| Tensile strength (N/mm²) | 1100 | 1940 |
| 0.2% Proof stress (N/mm²) | 890 | 1540 |
| Elongation (%) | 15 | 9 |
| Reduction in area (%) | 55 | 28 |
| Charpy impact value 2uE20°C(J/cm²) | 60 | 25 |

## Thermal expansion coefficient

| Thermal expansion(×10⁻⁶/°C) | | | |
|---|---|---|---|
| 20~100°C | 20~200°C | 20~300°C | 20~400°C |
| 10.8 | 11.1 | 11.3 | 11.5 |

## Thermal conductivity

| Thermal conductivity(W/m·K) | | | | |
|---|---|---|---|---|
| 20°C | 100°C | 200°C | 300°C | 400°C |
| 23.0 | 23.4 | 23.9 | 24.7 | 25.1 |

## Longitudinal elastic modulus

| Longitudinal elastic modulus(N/mm²) | | | | |
|---|---|---|---|---|
| 20°C | 100°C | 200°C | 300°C | 400°C |
| 214,500 | 212,500 | 209,500 | 200,000 | 190,000 |

## Specific weight

| Specific weight | | | | |
|---|---|---|---|---|
| 20°C | 100°C | 200°C | 300°C | 400°C |
| 7.80 | 7.78 | 7.75 | 7.73 | 7.70 |

## Specific heat

| Specific heat(J/kg·K) |
|---|
| 20°C |
| 460 |

# Welding Properties

## Build-up Welding Procedures

| Heat treatment | Welding rod | Pre and post-heating | |
|---|---|---|---|
| | | Pre-heating | Post-heating |
| Pre-hardened (32HRC) | AWS:ER420 (JIS SUS420J2) | 200~250°C | 650°C |
| Quench-tempered (52HRC) | | 200~250°C | 250°C Twice or 510°C Twice (Below tempering temperature) |