



High Speed Steel

TG M-2A (Special Grade for Taps)

Steel properties : Comparing to M2, Grade TGM2A has low percentage of carbon, added Niobium. With low percentage of carbon to increase toughness, and Niobium added to fined crystal grains of steel to obtain high strength and toughness. This grade is specially suitable for tabs of thread tools.

Material : Forged/Hot Rolled round bars - Spherodized annealed - Grinding/turned/peeled.

Chemical Composition: (%)

| TG | Chemical Analysis Typical Value % (Min - Max) | | | | | | | | | | | Delivery Condition | |
|--------|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------|--------------------|----------|
| | C | S | P | Si | Mn | Nb | Cr | Mo | V | W | other | Heat Treatment | Hardness |
| TGM-2A | 0.83-0.85 | Max 0.010 | Max 0.030 | 0.30-0.40 | 0.20-0.40 | 0.10-0.12 | 3.90-4.20 | 4.80-4.85 | 1.80-1.90 | 6.00-6.20 | *** | Annealed | <255 |

Production process:

EAF→LF→VD→ESR→BLOOM IN FOLLOWING MACHINE :
QUICK FORGING (12.5MN), HAMMER, PRECISION FORGING

| | | |
|---|-------------------------------------|------------------------|
| } | Precision Forging | : Φ 81-255mm |
| | Hot Rolled & Annealed Peeled (HRAP) | : Φ 14.5-80.0mm |
| | Hot Rolled & Annealed Peeled (HRAP) | : Φ 2.0 -13.5mm (Coil) |
| | Cold Drawn / Centreless Ground | : Φ 2.0 -14.4mm |

SIZE : Rounds

| Cold Drawn/Ground Bar | Hot Rolled Annealed & Peeled Bar | Forged + Annealed + Turned Bar | Coil |
|-----------------------|----------------------------------|--------------------------------|----------------|
| Φ 2.0 - 14.4mm | Φ 14.5 - 80.0mm | Φ 81.0 - 255.0mm | Φ 2.0 - 13.5mm |

UNDER ANNEALED CONDITION :
Hardness : Max. 255HB

STRAIGHTNESS ::
Max. 2.0 mm/m

OVALITY :
1/2 *TOLERANCE

NON-METALIC INCLUSIONS : Acc. to ASTM E 45 method

A th. 1.0 / heavy 0.5 - B th. 1.0 / heavy 0.5 - C th. 1.0 / heavy 0.5 - D th. 1.5 / heavy 0.5.

MICROSTRUCTURE: Acc. to SEP 1615

| | ≤16mm | ≤16-25mm | ≤25-40mm | ≤40-63mm | ≤63-100mm | ≤100-160mm | ≤160-200mm |
|----------|-------|----------|----------|----------|-----------|------------|------------|
| | A | A | A | A | A | A | A |
| | B | B | B | B | B | B | B |
| | C | C | C | C | C | C | C |
| TG Stage | 1B | 2B | 3B | 4B | 5B | 6A, 5B | 7A, 6B |

GRAIN SIZE : The grain size (ASTM) should be 10~11.5#

ULTRASONIC TEST : According to SEP 1921 class E/e/3, 100% scanning.

HEAR TREATMENT :

Soft annealing
780-860°C

Cooling
10-20°C/h furnace

Hardness
max.280HB

Stress relief annealing
600-650°C

Cooling
furnace

1st pre heating
up to approx.450°C

2nd and 3rd pre heating
a) 850°C
b) 850-1050°C

Hardening
1200-1220°C

Quenching
saltbath 550°C
oil, air, vacuum

Tempering :

Thrice 550-560°C Hardness after tempering 63-66HRC.