# ATT 2738 MOD ESR

## CHEMICAL ANALYSIS (PERCENTAGE BY MASS)

| | C | Si | Mn | Mo | Cr |
|---|---|---|---|---|---|
| Guide analysis | 0.27 | 0.20 | 1.60 | 0.70 | 1.80 |

## CHARACTERISTICS

ATT 2738 MOD ESR is a selectively modified, ESR plastic mold steel specifically developed for manufacturing of plastic injection molds with high surface finishing combined with good machinability. It is an alternative to pre-hardened steels with 40 HRC for plastic molds applications which demand high polishability, wear resistance and good machinability.

| | |
|---|---|
| AISI | P20 |
| DIN | 1.2738 |

Other main features include:

- Excellent polishability and photo-etching responses
- Excellent nitriding response
- Good machinability on the pre-hardened condition
- Good weldability
- High uniformity of hardness
- High reproducibility of performance

## APPLICATIONS

- Molds for injection of non-chlorinated plastics with high surface finish requirements
- Molds for injection of reinforced plastics with abrasive fillers
- Plastic mold applications which demand higher strength than P20 and 1.2738
- Dies for extrusion of non-chlorinated thermoplastics
- Structural components

## DELIVERED CONDITION

Pre-hardened to 350-390 HB.
Annealed on request.

## PHYSICAL PROPERTIES

| | | | | | |
|---|---|---|---|---|---|
| Density, kg/dm³ at | 20°C<br>7.85 | | | | |
| Thermal Conductivity (W/m.K) at | 20°C<br>37.0 | 200°C<br>39.0 | 500°C<br>35.0 | | |
| Thermal Expansion (µm/m) from 20°C to | 100°C<br>12.5 | 200°C<br>12.9 | 300°C<br>13.3 | 400°C<br>13.7 | 500°C<br>14.0 |
| Tensile strength at room temperature* | Hardness (HRC)<br>41 | $\sigma_{0.2}$ (MPa)<br>1087 | $\sigma_{Rup}$ (MPa)<br>1246 | Elongation $A_5$ (%)<br>10 | Reduc. in area Z(%)<br>31 |

**Advanced Tooling Tek Shanghai Co., Ltd.**
No, 1-3, Lane 499, Xin Miao San Road, Xianqiao Town,
Songjiang Dist., Shanghai, 201612 China
Tel: +86 21 3373 8146 | Fax: +86 21 3373 8193 | info@att-metal.com

www.att-metal.com WeChat



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## HEAT TREATMENT

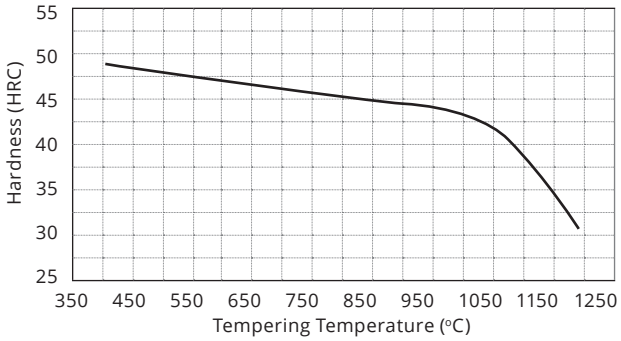
Stress relieving : to be implemented after rough machining. Slowly heat the tool to 500°C, holding time 2 hours. Furnace cool to 200°C and then freely in air.

Hardening : preheating at 600-750°C, normally in two steps. Equalize surface to center at each step. Austenitizing temperature at 880-900°C. Hold the temperature until complete homogenization of the tool.

Quenching media :

- Pressurized vacuum furnace, preferably with at least 5 bar overpressure capability or
- Warm oil, 40-70°C

Tempering : tools must be tempered immediately after hardening, as soon as they reach 50-70°C. Temper at least twice. Cool to room temperature between tempers. Always high temperature temper ATT 2738 MOD ESR, as shown in the graph. Holding time at temperature is a minimum 2 hours. For tools larger than 70 mm, the time should be calculated based on size. Use one hour per 25 mm of cross sectional thickness.



Specimens with cross section of 20 x 20 mm$^2$,
Tempering time : 2 hr

## SURFACE TREATMENT

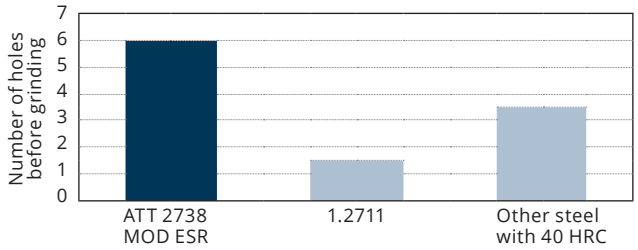
Nitriding : recommended when high wear resistance is required. The surface hardenss and the nitride depth obtained depend on the process applied. ATT 2738 MOD ESR exhibits excellent nitriding response reaching surface hardness of 750-850 HV.

## PROCESSING OPERATIONS

Electro discharge machining (EDM) : when ATT 2738 MOD ESR is used, it is recommended that the recast layer and heat affected zone be removed, and the steel stress tempered at a temperature of 50°C lower than the last tempering temperature.

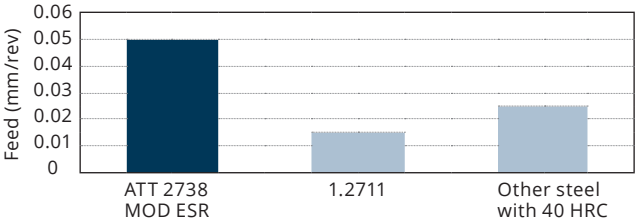
Machining : ATT 2738 MOD ESR has good machinability in all types of operation processes such as turning, milling, drilling and grinding. This steel is pre-hardened to 40 HRC and its machinability should not be compared with other grades pre-hardened to 30 HRC. Please refer to the charts, it shows drilling tests are performed on three different steels with 40 HRC, during the manufacturer of automotive plastic molds.

TOOL LIFE IN DRILLING



HSS drills with 7 mm diameter; holes with 100 mm long;
Vc =9 m/min, feed = 0.05 mm/rev

DRILLING PERFORMANCE



HSS drills with 7 mm diameter; holes with 100 mm long;
Vc =9 m/min, Stop drilling each 2.0 mm

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