



## ATT 2343 ESR

### CHEMICAL ANALYSIS (PERCENTAGE BY MASS)

	C	Si	Cr	Mo	V
Guide analysis	0.38	1.00	5.00	1.30	0.45

### CHARACTERISTICS

ATT 2343 ESR is a hot work steel with high toughness. It has adequate response to nitriding and polishing and may be water cooled. ATT 2343 ESR is indicated for application where resistance to initiation and propagation of mechanical or thermal cracks is essential. In these situations, toughness is the most important property and determines tool life. It is also refined through ESR (electro-slag refining), obtaining isotropy and good mechanical properties, such as toughness.

AISI	H11
WNo.	1.2343

### APPLICATIONS

Dies and components for die casting of aluminum alloys and other non-ferrous alloys, such as zinc, tin and lead. Tools for hot extrusion of Aluminum alloys, brass and magnesium alloys. Dies and punches for forging including, hot-upsetting, use as inserts, shear blades and all types of dies for hot work that involves shock.

### DELIVERED CONDITION

Annealed to maximum hardness of 230HB.

### PHYSICAL PROPERTIES

Density, kg/dm <sup>3</sup> at	20°C					
	7.85					
Thermal Conductivity (W/m.K) at	20°C		350°C		700°C	
	25.0		28.8		29.5	
	100°C		200°C		300°C	
Thermal Expansion (µm/m) from 20°C to	100°C	200°C	300°C	400°C	500°C	600°C
	11.5	12.0	12.2	12.5	12.9	13.0

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### HEAT TREATMENT

Before starting operation, pre-heat slowly between 200-300°C, to obtain thermal homogenization of core and surface. Apply periodic stress relieving during the use of tools.

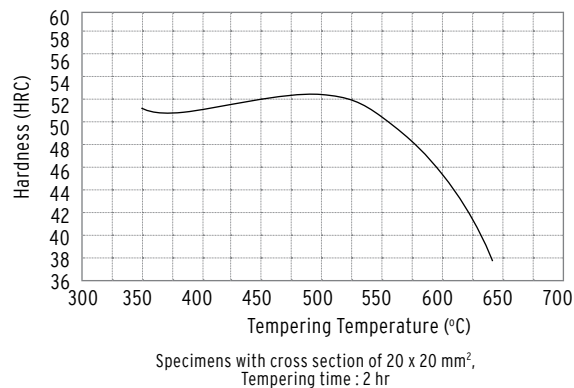
Stress relieving : must be employed after machining and before hardening. The stress relief is necessary in dies with draws and profiles, in which the machining removal has been higher than 30%, in order to minimize distortions after hardening. The procedure employs slowly heating to 500-600°C and furnace cooling until 200°C. After tooling, the stress relief must employ a temperature 50°C lower than that of the last tempering.

Hardening : the austenitizing temperature should be between 1000-1020°C. The heating cycle must provide preheating, in accordance with the dimensional part.

Cooling:

- Pressurized vacuum furnace (>5 bar, according to NADCA)
- Oil between 40-70°C

Tempering : tools must be tempered immediately after hardening, as soon as they reach 60°C. It is necessary, at least, double tempering. After each tempering, tools must be slowly cooled to room temperature. Tempering temperature between 550-650°C, depending on the desired hardness, as shown on the curve below. The time of each tempering must be at least 2 hours. For tools larger than 70 mm, the time should be calculated according to their size. Consider one hour per 25 mm of cross sectional thickness.



### SURFACE TREATMENT

Nitriding : recommended when higher levels of surface hardness and high abrasion wear resistance are required. It must be employed after hardening and tempering, since the temperature is at least 50°C lower than the last tempering temperature.

### PROCESSING OPERATIONS

Electro-erosion : when employed in heat treated dies or molds, it is recommended the removal of the altered layer with the fine grinding wheel and tempering the die again in a temperature around 50°C lower than that of the last tempering.