ROVALMA

THE STEEL INNOVATOR

RV-2367
Hot Work Tool Steel

EN/DIN 1.2367 ESR

RV-2367 ESR

The hot work tool steel EN/DIN 1.2367 ESR is a chromium-molybdenum-vanadium alloyed hot work tool steel with high thermal fatigue resistance. It has been refined via ESR process to ensure highest quality standards in terms of grain size, segregation, micro-cleanliness, and purity. Furthermore, the thermal fatigue resistance is also often much higher than that of conventional hot work tool steel EN/DIN 1.2343, enabling longer die lifetime.

Applications

Typical applications of RV-2367 ESR are: small and middle size die casting dies for light alloys (aluminium, zamak, brass and magnesium), dies and molds for thermosets and thermoplastic injection molding dies. Further applications of RV-2367 ESR are: light alloys extrusion tooling, such as liners, mandrels, pressure pads, extrusion stems and dies; forging and hot stamping of light and heavy metals; closed dies, punches, stamps and jaws; hot rolling rolls, as well as hot cutting applications, such as circular cutting blades, straight cutting blades and angular cutting blades.

Typical Composition (in %)

C	Si	Mn	Cr	Mo	V
0.35 – 0.40	0.30 - 0.50	0.30 - 0.50	4.80 - 5.20	2.70 – 3.20	0.40 - 0.60

Physical and Mechanical Properties

Properties	300 K	Unit
Density	7.83	g/cm^3
Elastic Modulus	218	GPa
Mechanical Resistance	1590	MPa
Yield Strength 0.2 %	1420	MPa
Strain	8	%
Reduction of Area	38	%

The values given provided in the table are typical values (neither maximum nor minimum values), for properly heat treated material, at a hardness level of 48-50 HRc.

Thermal Properties

Properties	293 K	373 K	473 K	573 K	673 K	873 K	Unit
Linear Thermal Expansion Coefficient		11.5	12.0	12.2	12.9	13.0	$x\ 10^{-6}/K$
Thermal Conductivity	29.7					30.0	W/m·K
Specific Heat Capacity	0.44						J/g·K

The values given in the table are typical values (neither maximum nor minimum values), for properly heat treated materials at a hardness level of 48-50 HRc. Thermal conductivity values are calculated on the basis of thermal diffusivity values measured by laser flash.

Heat Treatment

Like most tool steels, hot work tool steel grade RV-2367 ESR obtains its optimized mechanical and physical properties through a corresponding heat treatment before final machining.

The following provides a general heat treatment guideline.

Austenization

- Heating from room temperature to 650 °C (duration 2 hours).
- Hold for homogenization at 650 °C for 2 hours.
- Heating to 850 °C (duration 2 hours).
- Hold for homogenization at 850 °C for 2 hours.
- Heating to temperature of austenization: 1030-1080 °C.
- Hold at austenization temperature for 45 minutes.
- Cool down in oil, salt bath at 500 °C, or air.
- At any case, the decarburised layer should be removed.
- Oil bath cooling should be stopped, when the temperature reaches 200 °C, thereafter cool in air until reaching 50-80 °C.

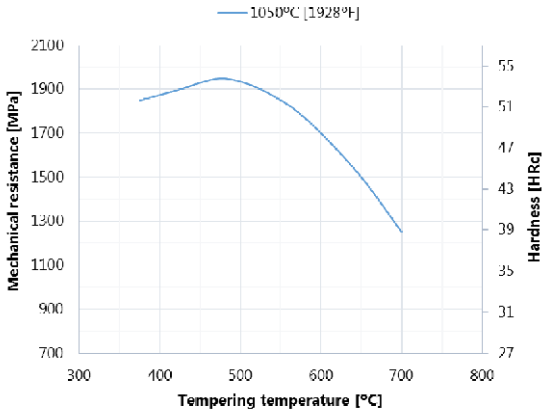
Notes

- Holding times start when the core reaches specified temperature levels, if no thermocouple is available, allow ½ minute for every millimetre of thickness.
- As it is customary with many hot work tool steels, a minimum material allowance of ca. 0.4 – 0.5 % should be left for finish machining after heat treatment. This does not take into account distortions coming from machining, so for severely machined geometries a corresponding extra allowance should be included.
- In order to relieve tensions from rough-machining and minimize the risk of bigger and potentially irregular distortions in the heat treatment previous to final machining, Rovalma, S.A. recommends the implementation of a stress relieving treatment after rough-machining.

Tempering

Tempering cycles should be carried out immediately after the hardening, when the piece has cooled down to room temperature.

- Select the tempering cycle temperature according to the desired hardness (see the tempering graph below).
- Perform 3 tempering cycles at the corresponding temperature for the desired hardness: Holding time recommendation: 2,5 minutes for every millimetre of thickness, with a minimum holding time of 1 hour.



Nitriding

Ionic nitriding as well as gas nitriding or salt bath nitriding are possible. Also, PVD coatings such as titanium nitride or titanium carbide nitride and other processes applied at temperatures below 580 °C (for higher temperature processes, please refer to the technical department of Rovalma, S.A.).

To avoid deformations and structural changes, it is recommended to temper 20 °C above the temperature at which the treatment will be done.

Welding

Joining and Surfacing Hardened Material

Preheat the part until the core reaches 500-550 °C. Weld the piece while keeping it at a temperature between 400-550 °C, reheat if necessary. After every weld bead, conduct a post weld upsetting to reduce tensions originating from solidification and cooling of the area. After welding, subject the pieces to one or two tempering cycles (depending on the geometry of the piece and the amount of welding conducted).

Joining and Surfacing Annealed Material

Weld the part directly, and after every weld bead, conduct a post weld upsetting to reduce tensions originating from solidification and cooling of the area. Conduct an annealing treatment at 760-800 °C before the part has cooled down.

Designer & Provider of First-Class Tool Materials

ROVALMA, S.A. provides innovation in tool materials. Thanks to comprehensive research, innovative design and development, most recent production techniques as well as in depth quality control, we have achieved significant advances in the knowledge about material forming processes and generated important know-how regarding the production and optimal usage of our materials for a specific application. As a result, we can provide you with **first-class tool steels** for cold and hot work material forming processes and outstanding technical assistance.

We are proud to make our High Performance Tool Steels available to you for your specific applications. Do not hesitate to contact us for the latest information.

Application Engineering Service

In order to fully exploit the advantages and the potentials of ROVALMA's High Performance Tool Steels, we offer our customers the support of our Application Engineering Service. Our highly qualified and dedicated engineers can assist you in selecting the optimized grade for your application and provide you with the corresponding technical recommendations. It is our mission to increase the competitive-advantage of our customers and support them in achieving the highest possible cost-effectiveness.

You can access our service directly by sending an email to: ae-fast@rovalma.com.

ROVALMA, S.A. carries out ongoing research for many applications regarding the usage of the materials here presented. This research often brings along significant advances in the knowledge of a given process and thus important information regarding the best possible usage of the materials for a specific application. We strongly recommend to get in contact with ROVALMA, S.A. for the latest information regarding a specific application.

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