



SPECIALTM
STEEL
The stars of Tool Steel

DATA SHEET



ASTROTM
Hot Work
Tool Steel

ABOUT US

RR Special Steel combines the experience & know-how of two specialists in their respective fields, Steel Making and Remelting (Rubiera Special Steel) and Forging and Heat Treatment (Ringmill).



RUBIERA SPECIAL STEEL

Since 1965 supplying high integrity ingots with superb homogeneity and cleanliness and since 2009 top quality large size ESR and VAR ingots to the market.

With RR Special Steel the ownership family, with a centenary experience in the steel and forging industry, has created the stars of tool steel.



RINGMILL

Since 1978 supplying top quality forgings to the most demanding markets using the latest state of the art technologies and machinery.

RR SPECIAL STEEL UNIQUENESS

VAR: The largest top-quality Vacuum Arc Remelted materials on the market.

ESR: The largest single electrode static Electro Slag Remelted materials on the market.

	Conventional material	ESR material	VAR material
Cleanliness	● ● ●	● ● ● ●	● ● ● ● ●
Homogeneity	● ● ●	● ● ● ● ●	● ● ● ● ●
Isotropy of toughness	● ●	● ● ● ●	● ● ● ● ●
Manufacturing complexity	● ● ●	● ● ● ●	● ● ● ● ●

CERTIFICATE QUALITY

Manufacturing parameters and material properties are monitored and controlled by RR's quality management system. The results of cleanliness, microstructure, and toughness for example are available for internal- and external certification at any time.

REFERENCE COMPOSITION OF STEEL GRADE RR ASTRO / 1.2343MOD.

C	Si	Cr	Mo	V
0.4 %	0.9 %	5.0 %	1.3 %	0.45 %

Comparable tool steel grades: NADCA #207 type D

MATERIAL PROPERTIES

- High polishability
- High properties at elevated temperatures
- High dimensional stability
- High resistance to wear
- High resistance to hot oxidation
- High level of micro cleanliness
- Low sensitivity to thermal shock
- Very low level of segregation
- Excellent structural homogeneity
- The steel can be nitrided

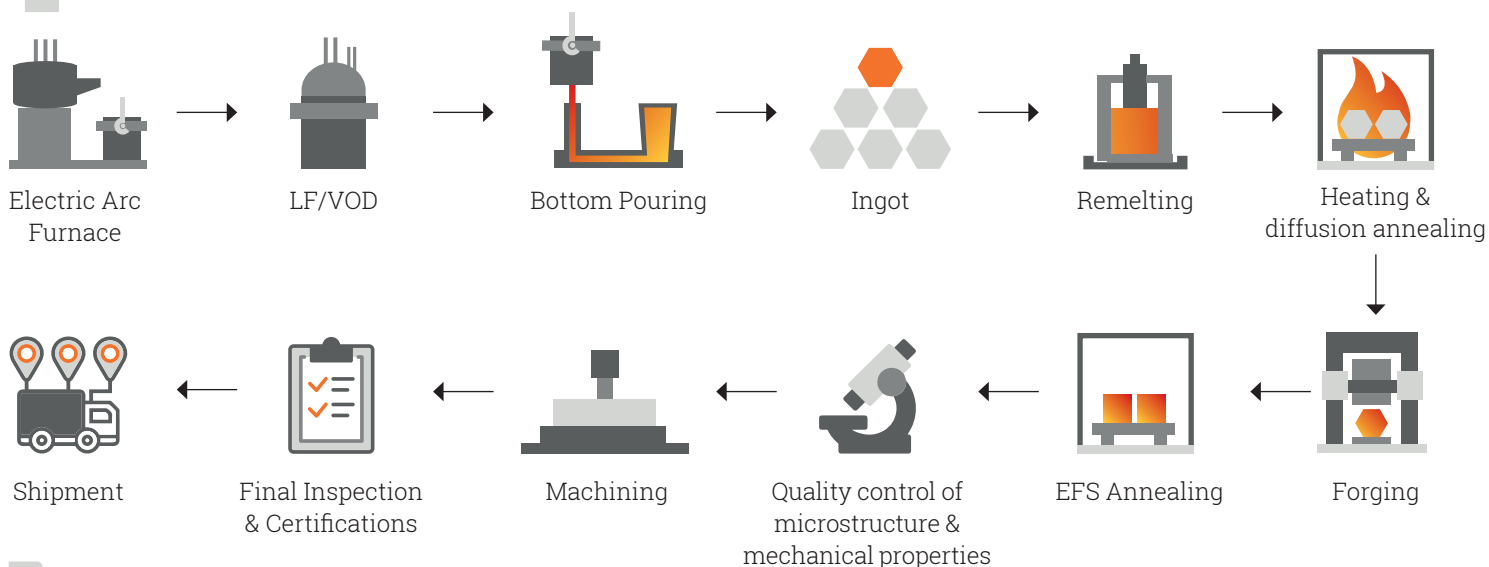
APPLICATIONS

- Dies for pressure casting of light metals
- Mold for plastic injection, such as automotive lightings
- Molds for abrasive polymers
- Molds for reinforced polymers
- Dies for extrusion of aluminium
- Dies for friction and mechanical presses for hot forging of steels, brass, aluminum and its alloys
- Hot work shear blades
- Glassware molds
- Hot forging dies

PROPERTIES	STEEL GRADE*	1	2	3	4	5	
Toughness & Ductility	ASTRO	●	●	●	●		Good toughness and ductility due to homogeneity and isotropy. According to NADCA #207 Charpy-V is guaranteed. Standard Charpy-V toughness is about 20J at 44-46 HRC and room temperature.
	1.2343	●	●	●	●		
	1.2344	●	●	●			
	1.2367	●	●				
Tempering Resistance	ASTRO	●	●	●			Very good high-temperatures properties. High resistance against softening improves life time.
	1.2343	●	●				
	1.2344	●	●	●			
	1.2367	●	●	●	●	●	
Heat Checking Resistance	ASTRO	●	●	●	●		High toughness gives better crack resistance under thermal shock conditions during operations and stops fast growing of heat checking.
	1.2343	●	●	●			
	1.2344	●	●				
	1.2367	●	●	●			
Erosion & Hot Wear Resistance	ASTRO	●	●	●			Tempering resistance helps against wear and erosion by keeping high hardness. Optimizing of design and process parameter and nitriding/coating may be decisive factors as well.
	1.2343	●	●				
	1.2344	●	●	●			
	1.2367	●	●	●	●	●	
Resistance to Al sticking (Soldering)	ASTRO	●	●	●			Sticking means that the temperature is high at that region. Try to decrease temperature or/and use nitriding or coating.
	1.2343	●	●	●			
	1.2344	●	●	●			
	1.2367	●	●	●			
Machinability	ASTRO	●	●	●	●		Tough material can be even more tough in machining - optimize machining parameters. We help by providing a low EFS hardness.
	1.2343	●	●	●	●		
	1.2344	●	●	●	●		
	1.2367	●	●	●			
Polishability	ASTRO	●	●	●	●	●	ISO/SPI: NO/A-1 at 48-52 HRC: "lense quality". Keep attention on right polishing steps.
	1.2343	●	●	●	●		
	1.2344	●	●	●			
	1.2367	●	●				
Weldability	ASTRO	●	●	●			CET= 0.85% acc. DIN EN 1011-2: pre- and after-heating necessary.
	1.2343	●	●	●			
	1.2344	●	●	●			
	1.2367	●	●				
Texturability	ASTRO	●	●	●	●	●	Hardened and homogeneous material is excellent for texturing.
	1.2343	●	●	●	●		
	1.2344	●	●	●			
	1.2367	●	●	●			
Nitridability	ASTRO	●	●	●	●		Hardness of nitrided surface 900-1250 HV1: avoid brittle surface layer.
	1.2343	●	●	●			
	1.2344	●	●	●	●		
	1.2367	●	●	●	●		
Chrome Plating Ability	ASTRO	●	●	●	●		High cleanliness improves Cr plating ability.
	1.2343	●	●	●	●		
	1.2344	●	●	●			
	1.2367	●	●	●			

*All grades in the remelted condition

PRODUCTION TECHNOLOGY



PRODUCT RANGE

	Form	Thickness (mm)	Width (mm)	Length (mm)	Weight (Kg)
RR ASTRO	Square/Rectangular Bar	max. 600	max. 1,500	max. 6,000	max. 20,000
	Round Bar	max. 700	N/A	max. 6,000	max. 20,000

DELIVERY CONDITIONS

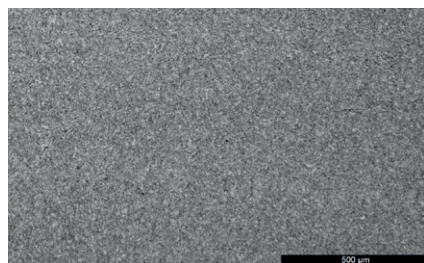
Heat treatment: EFS Annealing

Hardness: ≤ 220 HBW

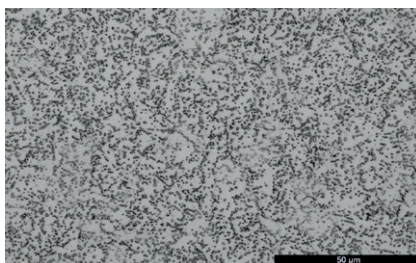
Surface: machined

PHYSICAL PROPERTIES

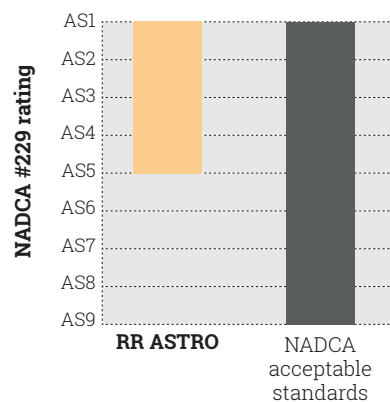
MICROGRAPHIC EXAMINATION IN EXTRA FINE ANNEALED CONDITION (EFS)



EFS macrostructure at 50X: very low microsegregation of ESR material



EFS microstructure at 500X: AS1-2 rating



* The examined surface is parallel to the principal direction of deformation

	20°C	400°C	500°C
Elastic Modulus [kN/mm ²]	205,000	--	190,000
Thermal Expansion Coefficient [10 ⁻⁶ /K]	--	12.4	13.2
Thermal Conductivity [W/mK]	21	30	32

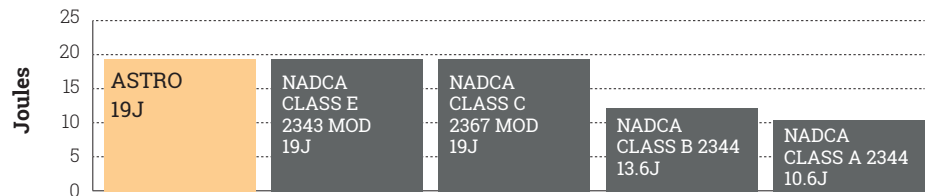
HEAT TREATMENT	TEMPERATURE
Soft Annealing	780-830°C
Stress Relieving (before Q+T)	600-650°C
Hardening (Vacuum)	1000-1020°C
Tempering (2-3X)	580-630°C

MECHANICAL PROPERTIES AFTER QT

HARDNESS	44 HRC	48 HRC	50 HRC
Yield Strength Rp02 [N/mm ²]	~ 1,200	~ 1,400	~ 1,500
Tensile Strength, Rm [N/mm ²]	~ 1,500	~ 1,680	~ 1,800

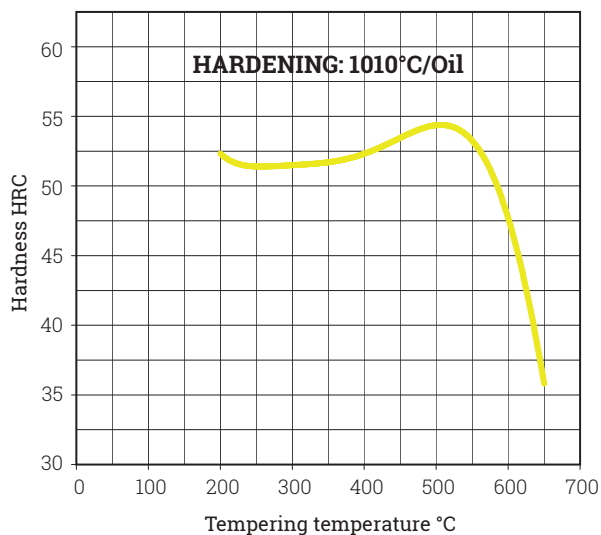
Toughness Properties

Chap- V toughness on oil-hardened & double tempered samples, 44-46 HRC, transversal direction, 1/4T, 20°C.

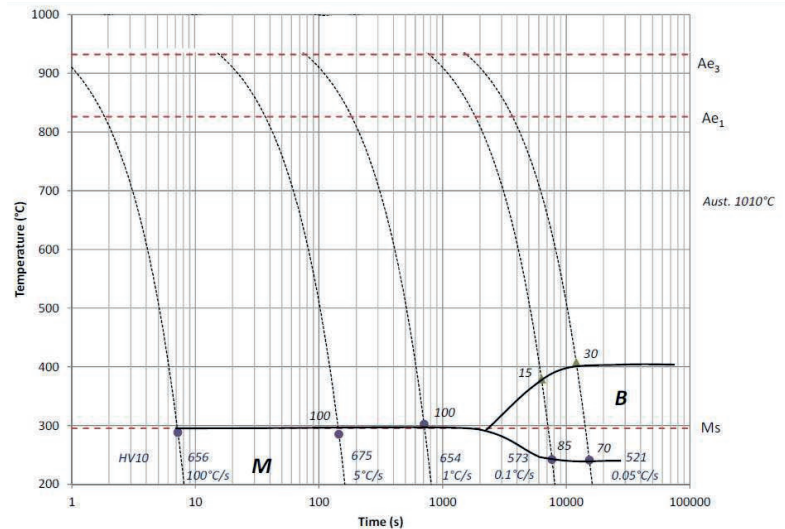


DIAGRAMS

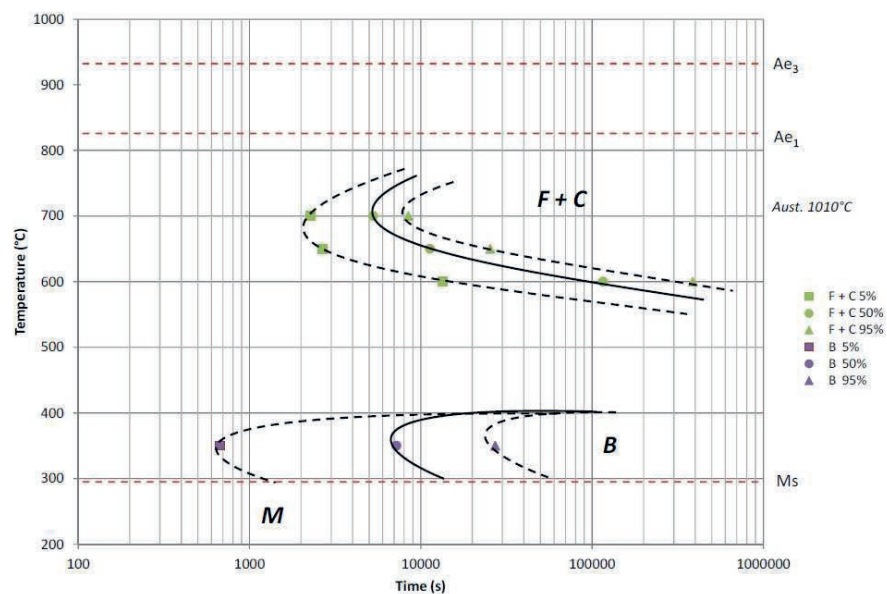
TEMPERING DIAGRAM



CCT DIAGRAM



TTT DIAGRAM





SPECIALTM STEEL

The stars of Tool Steel



ASTROTM
Hot Work
Tool Steel

Ring Mill SpA
Via Valeriana, 103 | 23015 Dubino (SO) - Italy
VAT IT00122100142 | Ph. +39 0342 688111
RR Special Steel is a Ring Mill trademark

© RINGMILL SpA 2021 - All rights reserved. This brochure may not be, entirely or partially, reproduced, copied, distributed or modified, without the explicit authorization by Ring Mill SpA. In particular, it is prohibited to alter the contents and/or use, any information provided herein, out of context. All information provided herein is for general information purposes only. Further information may be obtained writing at info@ringmill.it.