BEYLOS® 2714

Steel designed for plastic moulding and hot working

LUCCHINI RS

Edition December 2008

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Eliminato: ¶

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Edition October 2005

Formattato: Centrato

Formattato: Tipo di carattere: 10 pt, Non Corsivo

General characteristics

BeyLos® 2714 is alloy steel designed for the manufacture of dies, moulds, punches and other components subjected to high working temperatures.

BeyLos® 2714 is also suitable for plastic moulding applications, where high mechanical properties are required.

The best features of this steel are:

- high resistance to thermal shock and to heat cracking
- good mechanical characteristics in hot condition
- excellent mechanical characteristics in cold status
- excellent toughness in hot condition and in cold status.

BeyLos® 2714 is obtained through a special 'super clean' production process, which allows a high level of micro-purity.

BeyLos® 2714 is normally supplied in the annealed condition with hardness values lower than 250 HB, thereby guaranteeing a good machinability.

For plastic moulding applications, BeyLos® 2714 is normally supplied in the pre-hardened condition, with a hardness value of 370-410 HB.

If subjected to suitable hardening, BeyLos® 2714 can reach a hardness of 46 HRc without affecting the toughness.

In order to improve further the mechanical characteristics of the surface, BeyLos® 2714 can be coated with PVD or PA/CVD methods. Alternatively it can be hardened through flame hardening, induction tempering or subjected to nitriding.

The high micro-purity and structural homogeneity levels give this grade good suitability to polishing and photo-engraving.

Chemical analysis

BEYLOS 2714		Alloying %	
C	0,50 ÷ 0,60	Cr	0,60 ÷ 1,20
Si	0,10 ÷ 0,40	Mo	0,25 ÷ 0,55
Mn	0,65 ÷ 0,95	V	0,07 ÷ 0,12
Ni	1,50 ÷ 1,80		

Table for comparison of international classification

W. Nr. 1.2714

EN ISO 55NiCrMoV7

AISI-SAE L6

Lucchini RS's tool steels have been researched and formulated to optimize the performance of the materials.
The brand name identifies the Lucchini RS product and the number evokes the Werkstoff classification or other means of reflecting the characteristics of use.

Main Applications

BeyLos® 2714 is suitable for the following applications:

- large sized die blocks
- plastic moulds
- moulds subjected to low pressure
- chill moulds for gravity casting
- containers for die-casting presses
- bolsters / die holders
- sleeves for extrusion presses
- injection moulds.

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AFNOR 55NCDV7¶
AISI L6¶
UNI 56NiCrMoV7KU¶

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Physical and mechanical properties

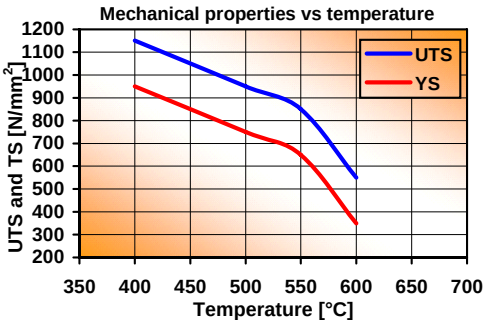
Main physical properties

BeyLos 2714	at 20°C	at 400°C	at 600°C
Modulus of elasticity [kN/mm^2]	210	198	178
Coefficient of thermal expansion from 20 °C at [10^{-6}/K]	-	13,3	14,2
Thermal conductivity [W/mK]	25,5	25,0	24,6

Main mechanical properties

BeyLos 2714	at 20°C	at 400°C	at 500°C	at 550°C	at 600°C
Ultimate Tensile strength (**UTS**) [N/mm^2]	1420	1300	1150	950	550
Yield stress (**YS**) [N/mm^2]	1240	1090	950	750	350

These are average values obtained on a sample which has been hardened at 850 °C, quenched in oil and tempered at 530 °C to achieve a hardness of 44 HRc.



Heat treatments

BeyLos® 2714 is supplied in the annealed condition or in the pre-hardened condition, depending on the application. If a different hardness is required or if heat treatment is needed, we suggest applying the following parameters. This information is only indicative and must be adapted depending on the different heat treatment facilities employed and on the thickness of the bar.

Soft annealing

Suggested temperature	**700 °C**
Soaking time	60 min every 25 mm thickness
Cooling	Slow in the furnace

Eliminato: at max 25 °C/h to **600 °C**, then at room temperature

Soft annealing is recommended if optimum machinability of the material is important. After soft annealing a hardness of around 250 HB is achieved.

Stress Relieving

Suggested temperature	**550°C**
Soaking time	60 min every 25 mm thickness
Cooling	Slow in the furnace

Eliminato: at max 25 °C/h to **200°C**, then at room temperature

If the suggested temperature is lower than the tempering temperature, the stress relieving temperature will be 50° C lower than the tempering temperature previously applied

Stress relieving is recommended where it is necessary to eliminate residual stresses induced by mechanical working or by a preceding heat treatment.

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Hardening

Hardening should be carried out after the material has been pre-heated according to the following table.

First pre-heating temperature	**550 °C**
Soaking time	60 min every 25 mm thickness

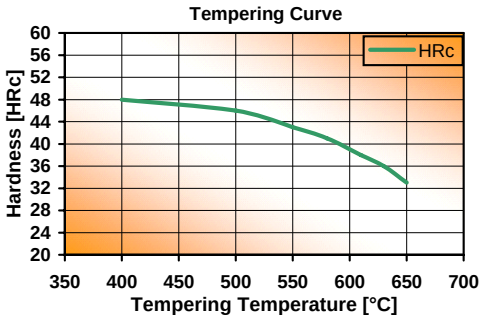
Austenitising temperature	**850°C**
Soaking time	60 min every 25 mm thickness
Cooling	Air, vacuum cooling, salt bath, oil
Hardness after oil quenching	57 ÷ 58 HRc

We suggest to carry out hardening on material supplied in the annealed condition and tempering immediately afterwards.

Tempering

The temperature of the temper must be set on the basis of the required mechanical properties. A second temper at a temperature of 30-50° C below the maximum temperature previously applied will function as a stress relieving cycle.

Suggested temperature	Set on the basis of the required mechanical properties, see tempering curve
Soaking time	60 min every 25 mm thickness
Cooling	Room temperature



Tempering curve of a sample which has been austenitised at 850 °C and oil quenched .

Dimensional variations during heat treatment

During the heat treatment of BeyLos® 2714 the phase transformation points are exceeded. Inevitably this causes a variation in the volume of the material. For this reason we recommend leaving enough machining allowance to compensate for the change of dimension due to heat treatment. All the corners should be rounded off.

Nitriding

The purpose of nitriding is to increase the resistance of the material to wear and abrasion. This treatment is very useful for components where high performance is necessary, as it extends the life of the material. We suggest nitriding the component in the hardened and tempered condition. The tempering temperature must be at least 50 °C higher than the nitriding temperature.
Modern nitriding processes allow the original dimensions of the component to be maintained. We recommend heat treating the component in the finish machined condition.

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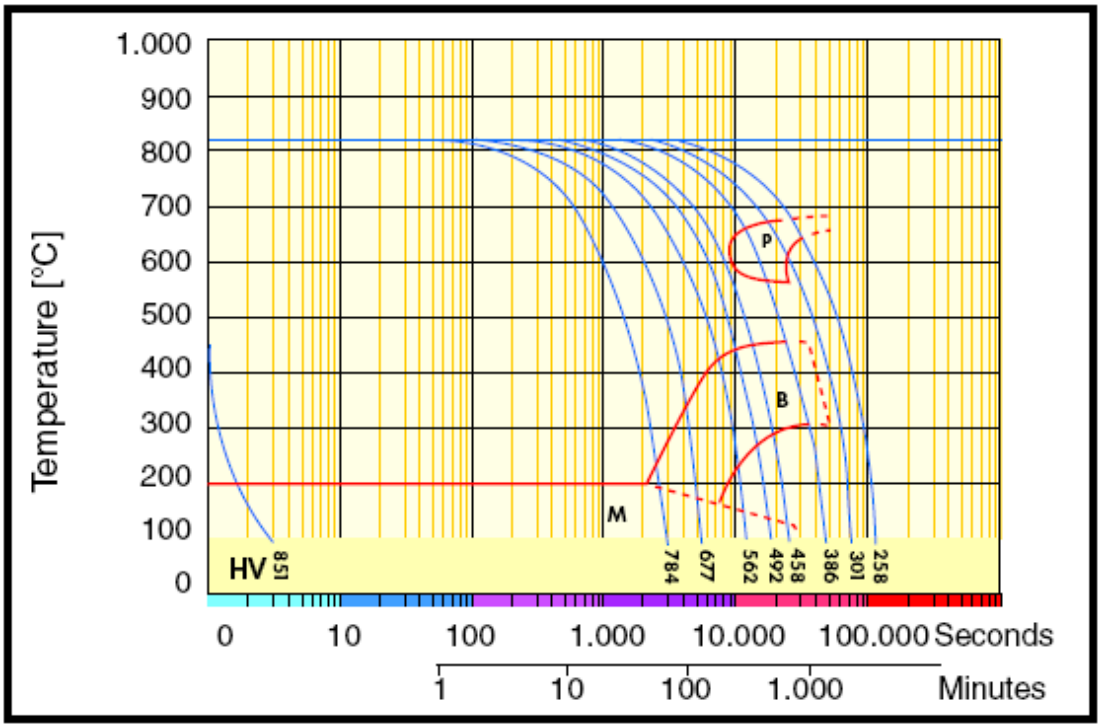
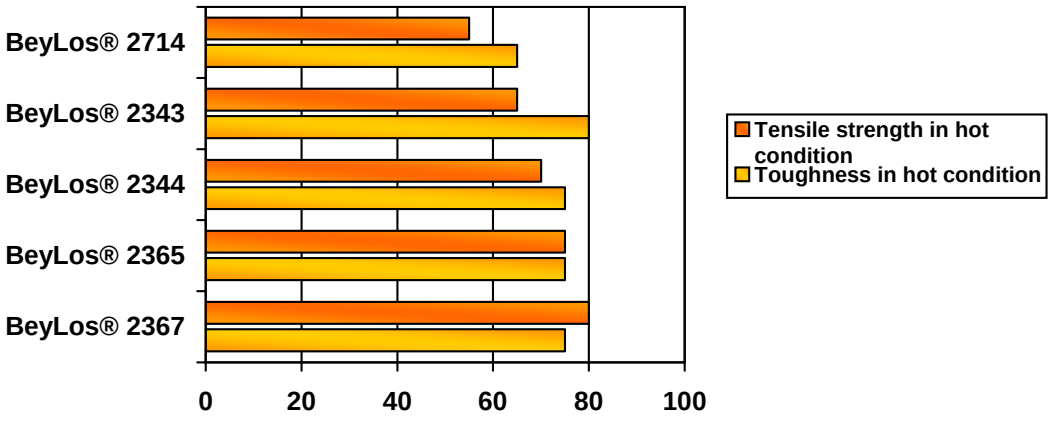
CCT Curve



Critical points

Ac1	**690°C**	**Ms**	**200°C**
Ac3	**770°C**	**Mf**	**20°C**

Comparison of properties of different hot work tool steels



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Welding

Welding of BeyLos® 2714 can give good results if the recommended procedure is followed. Being steel with high carbon equivalent content, BeyLos® 2714 is very sensitive to cracking. We recommend carrying out pre-heating and heat treatment after welding.

Condition of material	Annealed with hardness 250 HB max	
Welding technique	TIG	MMA
Pre-heating at	250÷300 °C	
Recommended heat treatment	Heating of the material at 700 °C, cooling in the furnace to 600 °C at a rate of 20 °C/h, cooling at room temperature	
Condition of material	Hardened and tempered	
Welding technique	TIG	MMA
Pre-heating at	250÷300 °C	
Recommended heat treatment	50 °C lower than the tempering temperature previously applied	

For further information, please refer to the brochure.

Electrical Discharge Machining (EDM)

BeyLos® 2714 can be machined by EDM to obtain complex shape. Afterwards it is advisable to stress relieving the material.

Chrome Plating

BeyLos® 2714 can be chrome plated in order to enhance the mechanical characteristics on the surface. Within 4 hours of chrome plating, in order to prevent hydrogen embitterment it is advisable to carry out heat treatment at 200 °C for about 4 hours.

Photo-engraving

Thanks to modern production processes and to the low sulphur content, BeyLos® 2714 is suitable for photo-engraving to obtain various patterns. For further information, please refer to the brochure.

Polishing

BeyLos® 2714 is particularly suitable for polishing. For further information, please refer to the brochure.

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Eliminato: **Guidance for machining**¶
The following parameters are indicative only and must be adapted to the particular application and to the machinery employed. The data refer to material in the annealed condition. Hardness 250 HB max.¶
Turning¶
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Interruzione di sezione (continua)
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Interruzione di sezione (continua)

Guidance for machining

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Turning

Interruzione di sezione (continua)

	Rough machining	Finish machining		
Type of insert	**P20-P40 coated**	**HSS**	**P10-P20 coated**	**Cermet**
V_c cutting speed [m/min]	170 ÷ 220	(*)	200 ÷ 250	240 ÷ 300
a_r cutting depth [mm]	1 ÷ 5	(*)	< 1	< 0,5

Interruzione di sezion

Milling

Interruzione di sezione (continua)

	Rough machining		
Type of insert	**P25-P35 not coated**		
V_c cutting speed [m/min]	140 ÷ 200		
f_z feed [mm]	0,15 ÷ 0,3		
a_r cutting depth [mm]	2 ÷ 4		

	Pre-finishing		
Type of insert	**P10-P20 not coated**	**P10-P20 coated**	**HSS**
V_c cutting speed [m/min]	160 ÷ 240		
f_z feed [mm]	0,2 ÷ 0,3		
a_r cutting depth [mm]	1 ÷ 2		

	Finish machining		
Type of insert	**P10-P20 not coated**		**P**
V_c cutting speed [m/min]	200 ÷ 260		
f_z feed [mm]	0,05 ÷ 0,2		
a_r cutting depth [mm]	0,5 ÷ 1		

interruzione pagina

Interruzione di sezione (continua)

Drilling

Type of insert	**tip with interchangeable inserts**	**HSS**	**brazed tip**
V_c cutting speed [m/min]	190 ÷ 220	(*)	60 ÷ 80
f_n feed per turn [mm/turn]	0,05 ÷ 0,15	(*)	0,15 ÷ 0,25

Interruzione di sezione (continua)

(*) not advisable

Interruzione di sezione (continua)

General formulae

Type of machining	**Drilling**	**Milling**
n: number of turns of mandrel	$\frac{V_c * 1000}{\pi * D_c}$	$\frac{V_c * 1000}{\pi * D_c}$

V_f: feed speed [m/min]	$V_f = f_z * n$	$V_f = f_z * n * z_n$
f_n: feed per turn [mm/turn]	-	$f_n = \frac{V_f}{n}$
Note	D_c: Milling cutter or tip diameter [mm] V_c: cutting speed [m/min] f_z: feed [mm]	f_n: feed per turn [mm/turn] z_n: No. of milling cutter inserts

Interruzione di sezione (pagina successiva)

Approximate equivalent values between hardness and ultimate tensile strength.

HB	530	520	512	495	480	471	458	445	430	415	405	390	375
HRc	54	53	52	51,1	50,2	49,1	48,2	47	45,9	44,5	43,6	41,8	40,5
N/mm^2	1.900	1.850	1.800	1.750	1.700	1.650	1.600	1.550	1.500	1.450	1.400	1.350	1.300

HB	360	350	330	320	305	294	284	265	252	238	225	209	195
HRc	38,8	37,6	35,5	34,2	32,4	31	29	27	--	--	--	--	--
N/mm^2	1.250	1.200	1.150	1.100	1.050	1.000	950	900	850	800	750	700	650

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