

**LUCCHINI 2711**

**SPECIAL ALLOYED STEEL DESIGNED  
FOR MEDIUM-SURFACE PLASTIC MOULDS  
AND FOR HOT WORK TOOLS**

**FORGING  
VALUES  
IN TOOL  
STEELS**

IMPROVEMENT  
COURAGE  
PEOPLE  
PASSION  
SPIRIT  
GROUP  
CUSTOMER  
SUCCESS

GROUP  
**LUCCHINI RS**

## General characteristics

---

Lucchini 2711 is an alloy steel grade designed for the manufacture of dies, moulds, punches and other components subjected to high working temperatures and for high quality surface finishes.

Lucchini 2711 is also suitable for plastic moulding applications, where high mechanical properties are required and it is recommended for processing transparent melts and for medium-surface plastic parts.

If subjected to suitable hardening, LUCCHINI 2711 can reach a hardness of 46 HRC without affecting the toughness.

In order to improve further the mechanical characteristics of the surface, LUCCHINI 2711 can be coated with PVD or PA/CVD methods.

## Delivery conditions

---

LUCCHINI 2711 is supplied the pre-hardened condition in a dimensional range up to 500 mm in thickness.

The surface hardness is 370 – 410 HB and the mid-thickness hardness value is guaranteed in section up to 500 mm, according to the following correlation:  $(HB_{\text{Surface, min required}} - HB_{\text{Core}}) \leq 25HB$

## Main features

---

- 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.

## Main application

---

- 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.

## Chemical analysis

	Range	C [%]	Si [%]	Mn [%]	Cr [%]	Mo [%]	Ni [%]	V [%]
<b>LUCCHINI 2711</b> Alloying [% in weight]	min	0,50	0,15	0,60	0,85	0,30	1,50	0,07
	max	0,60	0,35	0,90	1,15	0,55	1,80	0,12

Comparison with international classifications:  
**W. Nr. 1.2711**

## Physical and mechanical properties

### Main physical properties

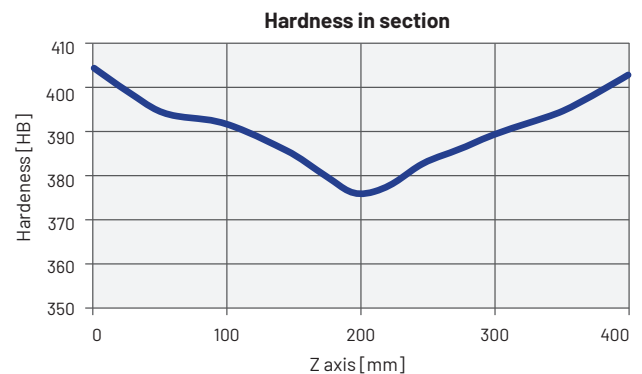
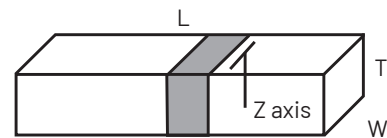
<b>LUCCHINI 2711</b>	20°C	400°C	600°C
Young modulus E [MPa]	210	198	178
Coefficient of linear thermal expansion $\alpha$ [ $10^{-6}/K$ ]	-	13,3	14,2
Thermal conductivity $\lambda$ [W/mK]	25,5	25,0	24,6

### Main mechanical properties

<b>LUCCHINI 2711</b>	20°C	400°C	500°C	550°C	600°C
Ultimate tensile strength UTS [MPa]	1420	1300	1150	950	550
Yield strength YS [MPa]	1240	1090	950	750	350

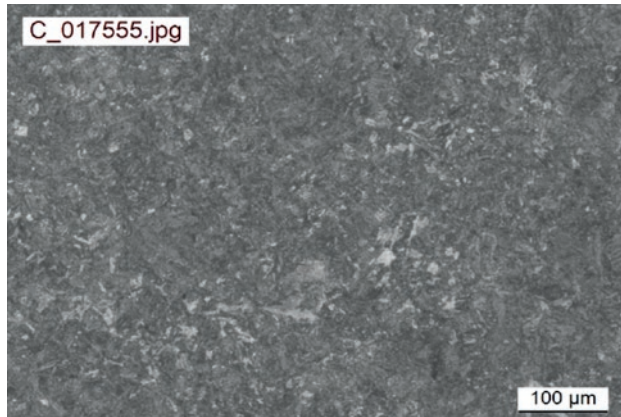
The above mentioned are average values of a sample hardened at 850 °C, quenched and tempered to achieve hardness value of 44 HRC

### Hardness profile

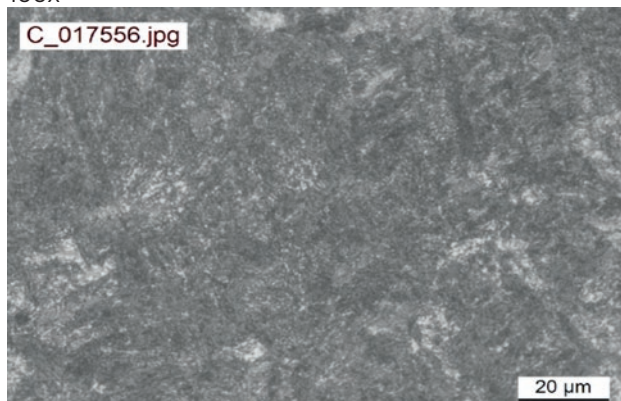


## Microstructure

The main microstructure of LUCCHINI 2711 is tempered martensite.

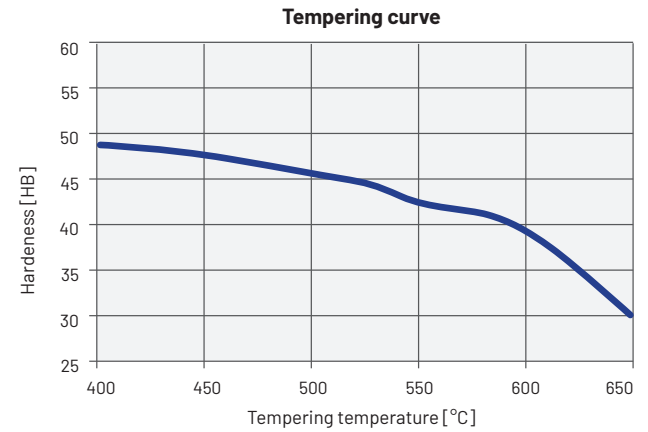


100x



500x

## Surface hardness vs tempering temperature



**Remark:** the above data are representative of the typical behaviour of a 400 mm thick block made in LUCCHINI 2711 and are reported for information only

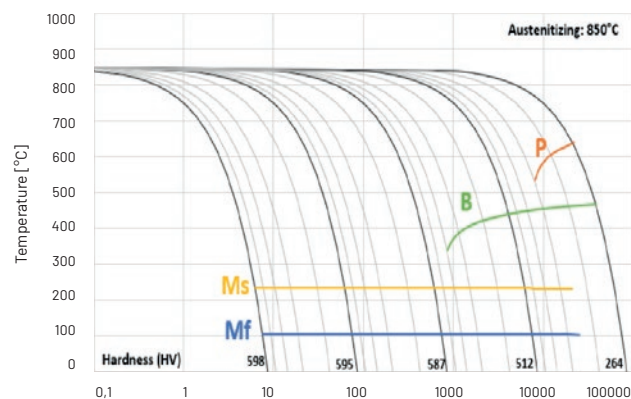
## Heat treatment

LUCCHINI 2711 is supplied in quenched and tempered conditions with no need for additional heat treatment operations.

However, if different hardness/heat treatment procedure are required, we recommend the following parameters.

Note that the reported data are for information purpose only and must be adjusted to the heat treatment facility and the dimensions of the block therefore, before carrying out any heat treatment operation, it is strongly recommended to contact Lucchini RS for help and support.

### Continuous cooling transformation curve (CCT)



### Soft annealing

<b>Suggested temperature</b>	700 °C
<b>Soaking time</b>	60 min every 25 mm thickness
<b>Cooling</b>	Slow cooling in furnace (20°C/h)

Soft annealing is useful to improve machinability reducing hardness at 250 HB.

### Stress relieving

<b>Suggested temperature</b>	550 °C
<b>Soaking time</b>	60 min every 25 mm thickness
<b>Cooling</b>	Slow cooling in furnace (20°C/h)

Stress relieving is recommended to reduce the tensions generated by certain manufacturing operations (e.g. machining) without affecting the hardness in the as-delivered conditions.

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.

### Hardening

<b>First pre-heating temperature</b>	550°C
<b>Soaking time</b>	60 min every 25 mm thickness
<b>Austenitising temperature</b>	850°C
<b>Soaking time</b>	60 min every 25 mm thickness
<b>Cooling</b>	Air, vacuum cooling, salt bath, polymer, water quench

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

## Tempering

<b>Suggested temperature</b>	Depends on the required mechanical properties
<b>Soaking time</b>	60 min every 25 mm thickness
<b>Cooling</b>	At room temperature

The tempering temperature should be selected from the graph "Tempering curve" reported above.

After tempering we suggest to carry out stress relieving at temperature 50°C lower than the last tempering temperature.

Other properties can be deeper analysed against specific Customer request: please contact our Metallurgy Department.

## 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.

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.

## Polishing and photo-engraving

Lucchini 2711 is the suitable material when polishing and photoengraving are needed. Thanks to its integrated manufacturing process, those material manufactured by Lucchini RS are characterized by a high degree of purity.

**Polishing for graining: 3 Very good**

**Suitability for medium gloss polishing: 3 Very good**

**Suitability for mirror polishing: 2 Good**

**Suitability for engraving: 2 Good**

Rating scale:

**4 Excellent – 3 Very good – 2 Good – 1 Normal – 0 Unsuitable**

## Guidance for machining

The following parameters are approximate only and must be adjusted to the specific application and machine tool.

### Turning

Type of insert	Rough machining		Finish machining	
	P20-P40 coated	HSS	P10-P20 coated	Cermet
$V_c$ cutting speed [m/min]	150 ÷ 190	(*)	190 ÷ 230	260 ÷ 320
$a_r$ cutting depth [mm]	5	(*)	< 1	< 0,5

### Milling

Type of insert	Rough machining		
	P25-P35 not coated	P25-P35 coated	HSS
$V_c$ cutting speed [m/min]	120 ÷ 140	160 ÷ 180	(*)
$f_z$ feed [mm]	0,15 ÷ 0,3	0,15 ÷ 0,3	(*)
$a_r$ cutting depth [mm]	2 ÷ 4	2 ÷ 4	(*)

Type of insert	Pre-finishing		
	P10-P20 not coated	P10-P20 coated	HSS
$V_c$ cutting speed [m/min]	140 ÷ 160	180 ÷ 200	(*)
$f_z$ feed [mm]	0,2 ÷ 0,3	0,2 ÷ 0,3	(*)
$a_r$ cutting depth [mm]	< 2	< 2	(*)

Type of insert	Finishing		
	P10-P20 not coated	P10-P20 coated	Cermet P15
$V_c$ cutting speed [m/min]	200 ÷ 240	250 ÷ 270	300 ÷ 340
$f_z$ feed [mm]	0,05 ÷ 0,2	0,05 ÷ 0,2	0,05 ÷ 0,2
$a_r$ cutting depth [mm]	0,5 ÷ 1	0,5 ÷ 1	0,3 ÷ 0,5

(\*) not advisable

## Drilling

Type of insert	tip with interchangeable inserts	HSS	brazed tip
$V_c$ cutting speed [m/min]	130 ÷ 160	(*)	90 ÷ 120
$f_z$ feed per turn [mm/turn]	0,05 ÷ 0,15	(*)	0,15 ÷ 0,25

(\*) not advisable

## General formulae

Type of machining	Drilling	Milling
n: number of turns of mandrel	$V_c * 1000 / \pi * D_c$	$V_c * 1000 / \pi * D_c$
$V_f$ : feed speed [m/min]	$V_f = f_z * n$	$V_f = f_z * n * z_n$
$f_z$ feed per turn [mm/turn]	-	$f_n = V_f / n$
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



## Welding

Welding of Lucchini 2711 can give good results if the recommended procedure is observed.

Being steel with high Carbon Equivalent content, Lucchini 2711 is very sensitive to cracking.

We recommend carrying out pre-heating and heat treatment after welding.

<b>Material condition</b>	Annealed with hardness 250 HB max	
<b>Welding technique</b>	TIG	MMA
<b>Pre-heating at</b>	250 – 300°C	
<b>Recommended Heat treatment</b>	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	

<b>Material condition</b>	Hardened and tempered	
<b>Welding technique</b>	TIG	MMA
<b>Pre-heating at</b>	250 – 300°C	
<b>Recommended Heat treatment</b>	550 °C or 50 °C lower than the tempering temperature previously applied	

## Electrical Discharge Machining (EDM)

LUCCHINI 2711 can be machined by EDM to obtain complex shape. Afterwards we advise to carry out the stress relieving procedure.

### Process and materials selection for product recyclability

According to the potential of steel recycling, Lucchini RS is adopting a strategy for environmental excellence in designing and manufacturing its tool steel grades, putting eco-effectiveness into practice.

The main adopted steps are:

- to carry out an environmental assessment on processes and products, with the minimum use of virgin materials and non-renewable forms of energy;
- to move toward zero-waste manufacturing processes, considering that the ultimate destination of scrapped steel moulds becomes food for the next steel making process, that is the “waste equals food” philosophy;
- to carry out a life cycle assessment for each product and process, minimizing the environmental cost of product and service over its complete life cycles, from creation to disposal, that is the “Cradle to Cradle” philosophy

Lucchini RS S.p.A. All rights reserved. All contents of this document and all the related industrial and intellectual rights belongs exclusively to Lucchini RS S.p.A. that owns and manages the original version of it. The reproduction, disclosure, dissemination and/or changing of this document, in whole or in part, as well as the utilization of its content and/or the communication there of to third party without express written authorization of Lucchini RS S.p.A. are prohibited.

Via Giorgio Paglia, 45  
24065 LOVERE (BG) - Italy  
Phone +39 035 963724



[www.lucchinirs.com](http://www.lucchinirs.com)

*GROUP*  
**LUCCHINI** *RS*