FORGING &
CASTING
DIVISION

GROUP
LUCCHINI RS

KEY® LOS 7225

Basic pre-hardened steel
for plastic moulds of small sizes

LOOK BEYOND

General characteristics

KeyLos® 7225 is a Chromium Molybdenum alloyed basic pre-hardened steel intended for dies of small size, up to 500 mm, bolsters or for mechanical components where short manufacturing time and low tooling cost are necessary.

KeyLos® 7225 represents a good equilibrium between:
- mechanical properties;
- machinability;
- micro-purity.

KeyLos® 7225 can be supplied in the pre-hardened state to gives hardness between 220 and 270 HB.

For the detected hardness values in standard sized products, the following correlation is usually valid and guaranteed:

$$(HB_{Surface,min\ required} - HB_{Core}) \leq 20HB$$

KeyLos® 7225 is 100% ultrasonically tested in accordance with the most stringent NDT standards.

KeyLos® 7225 represents a basic solution, when good mechanical properties combined with a good machinability and high finishing properties are required.

Also welding, in case of extreme repairing only, is possible. KeyLos® 7225 is the basic solution when looking for a tooling cost reduction, through a suited steel grade with good mechanical characteristics, without recourse to materials rich in alloying elements.

KeyLos® 7225 represents a quick and cost effective basic solution to obtain plastic parts at low cost.

KeyLos® 7225 is also designed with the aim to guarantee the minimum use of virgin materials, moving toward the use of scrap categories difficult to be recycled, that can became food for the steel making production of KeyLos® 7225 grade.

Chemical analysis

	Range	C [%]	Si [%]	Mn [%]	Cr [%]	Mo [%]
KEYLOS 7225 Alloying [% in weight]	min	0,38	0,20	0,60	0,90	0,20
	max	0,45	0,50	0,90	1,20	0,30

Table for comparison of international classification

W. Nr.	**1.7225**
DIN	**42CrMo4**
AFNOR	**42CD4**
UNI	**42CrMo4**

Lucchini RS's tool steels have been researched and formulated in order to optimize the material performances.

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

The pre hardened steel KeyLos® 7225 lends itself to the following applications:

Plastics moulding:
- dies of small size for the automotive industry;
- particular dies for the food industry;
- dies for the stamping of rubber;
- dies for compression stamping (SMC, BMC);
- die bolsters for plastic dies;
- mechanical components.

Physical and mechanical properties

Main physical properties

KEYLOS® 7225	20°C	250°C	500°C
Modulus of elasticity [GPa] (1GPa=1000 MPa)	210	196	177
Coefficient of thermal expansion [10^{-6}/K]	-	12,8	15,2
Thermal conductivity [W/mK]	33,5	34,0	34,2

Main mechanical properties

KEYLOS® 7225	20°C	200°C
Ultimate Tensile strength (UTS) [MPa]	820	680
Yield stress (YS) [MPa]	620	490

These values are average values obtained from the middle of the section of a 500 thick bar, subjected to LRS heat treatment.

Heat treatments

KeyLos® 7225 is supplied in the pre-hardened condition.

If it is necessary to obtain different hardness levels or if a heat treatment cycle is necessary, the parameters in the following table are recommended.

The attached data are for information purposes only and must be varied dependent on the heat treatment facility and the thickness of the bar.

Soft annealing

Recommended temperature	700°C
Soaking time	60 minutes every 25 mm of thickness
Cooling	Slow in the furnace at max 20 °C/h to **600 °C**, then at room temperature

Annealing can be useful where an improvement in the machinability of the material is required.

Stress Relieving

Recommended temperature	500°C
Soaking time	60 minutes very 25 mm of thickness
Cooling	Slow in the furnace at max 20 °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 always recommended, where it is necessary to eliminate residual stresses induced by mechanical working or by a preceding heat treatment.

Hardening

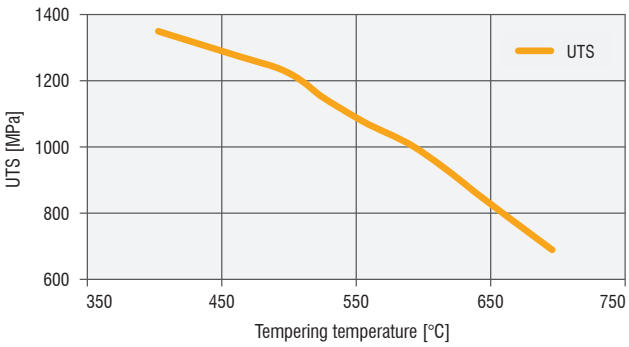
Recommended temperature	880°C
Soaking time	60 min every 25 mm thickness
Cooling	Polymerl or Water quench

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

Tempering

Suggested temperature	The tempering temperature may be selected from the graph attached in accordance with the mechanical properties to be achieved. See attached graph.
Soaking time	60 min every 25 mm thickness
Cooling	Room temperature

Tempering curve



Tempering curve obtained on a test piece austenitised at 880 °C. After tempering it may be useful to carry out a stress relieving cycle at 50 °C less.

Induction hardening

It is possible to interpose an induction hardening cycle. Air-cooling is recommended, followed by tempering.

Nitriding

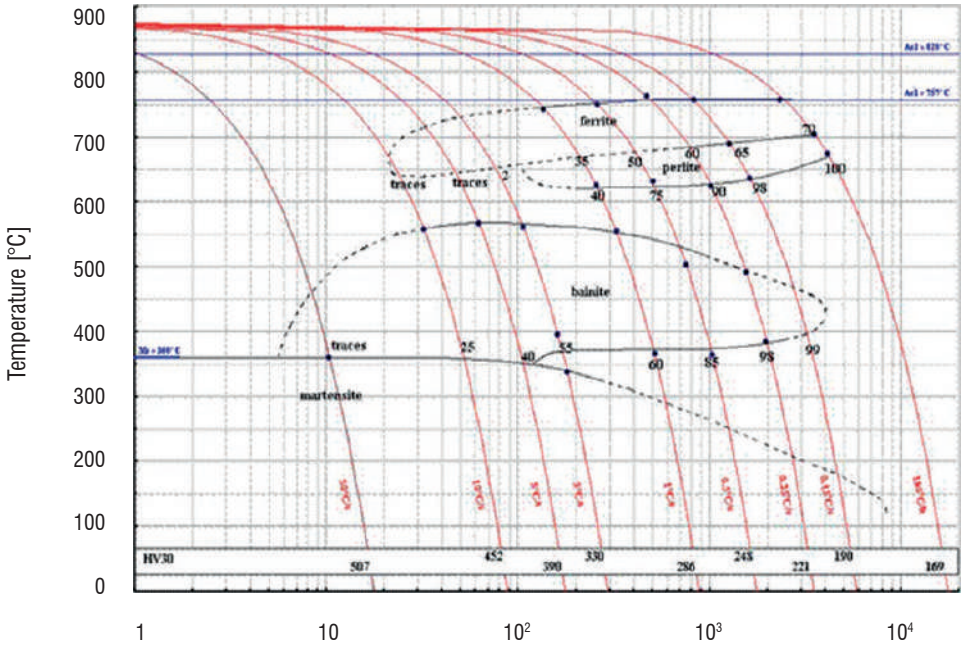
KeyLos® 7225 is suitable for ion and gaseous nitriding. Such a treatment is very advantageous in the case of extremely severe applications for the die or matrix.

The increase in surface hardness produced by the nitriding treatment prolongs the life of the component.

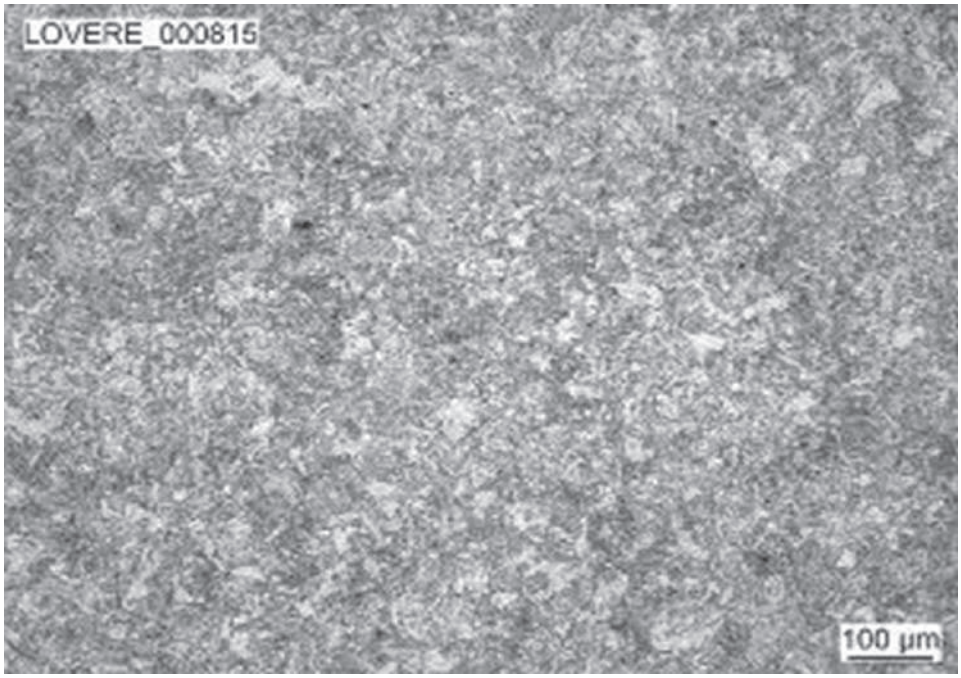
Modern nitriding procedures assure constant dimensions. It is recommended to treat the piece in the finish-machined state.

In any case, other properties can be analyzed and studied deeper by Lucchini RS on specific Customer request: please consult Lucchini RS specialists of MET Department.

CCT Curve



Microstructure of KEYLOS® 7225



The microstructure of KeyLos® 7225 detected about 20 mm under surface is tempered martensite.

Welding

KeyLos® 7225 can be welded with good results by observing the following procedures:

Welding technique	TIG	MMA
Preheated to	250÷300 °C	
Stress relieving	Stress relieving (see heat treatment paragraph)	

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 of its tool steel grades, putting eco-effectiveness into practice.

The main adopted steps are:

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

Electrical Discharge Machining (EDM)

KeyLos® 7225 can be machined by EDM to obtain complex shape.

Afterwards it is advisable to stress relieving the material.

Photo-engraving

KeyLos® 7225, in view of the modern production processes employed and the low Sulphur content, lends itself to embossing to obtain various shapes.

Polishing

KeyLos® 7225 offers good polishing characteristics.