

Punch and Die Materials Offered by Danly

High strength tool steels are used in punch components and are heat treated to assure uniform characteristics and relieve thermal stresses. The structural strength is also enhanced by the precision grinding process, which minimizes stress concentration.

The standard steels used include:

A2

A2- 5% chrome - high performance tool steel. Hardness Rc 60 - 63.

A good combination of toughness and wear resistance, it is used where shock and abrasion are prime considerations.

M2

M2- HSS triple tempered high speed steel. Hardness Rc 60 - 63.

Suitable for long runs where abrasion resistance is a main requirement. It also will withstand high temperatures without softening, and this makes it suitable for performing at high speeds.

PM4

PM4 - High vanadium, high carbon particle metal steel. Also triple tempered. Hardness Rc 62 - 64.

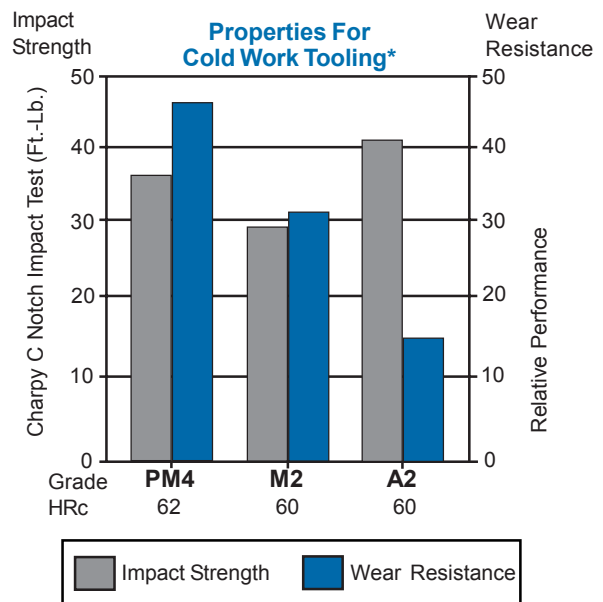
PM4 has improved wear and impact characteristics over M2, together with the ability to withstand high temperatures without softening.

Selection of a suitable steel

Danly will assist you with your material selection, to help you gain optimum performance from your punches and die buttons.

If you do not select a steel for the punches and dies that you order, Danly will supply M2 for punches, and A2 for die buttons.

Comparative properties



*Source: Crucible Service Centers

Other steels available

Danly will also make available other types of tool steel, on special order, to meet any custom requirements you may have.

Surface Coatings

See other side for surface coating information.

Surface Coating of Punches

Available as a service to Danly Customers, for applications requiring special wear resistance and lubricity.

A Selection of more popular Physical Vapor Deposition (PVD) Coatings Suitable for Metal Forming and Piercing Punches is given below.

PVD coatings generally have a film thickness of 40-200 micro-inches (1-5 microns). Since the recommended application is PVD, as opposed to CVD (Chemical Vapor Deposition), there is minimal effect on the heat treated hardness of the punch material. Danly does not usually recommend the use of CVD coatings, for this reason.

TiN (Titanium Nitride)

An excellent general purpose coating for the protection of punch surfaces against abrasive and adhesive wear.

TiCN (Titanium Carbonitride)

This coating has a fine grain interlocked structure that has excellent toughness. It is particularly effective for punching applications that encounter excessive mechanically stressed cutting edges. Also effective in the punching of highly abrasive and/or gummy materials, such as brass, stainless steel, and aluminum alloys.

CrN (Chromium Nitride)

Suitable for wear problems where titanium-based coatings are not successful. It resists adhesive wear, corrosion, and oxidation, and is recommended primarily for use with titanium and copper.

Strip/Part Material	Suitable Coating
Ferrous	TiCN/TiN
Aluminum	TiCN/TiN
Copper	CrN/TiCN
Titanium	TiCN/CrN
Nickel	TiCN/CrN

Physical Properties of these Coatings

Coating Type	Visual Appearance	Vickers Micro-Hardness	Thermal Stability	Dry Coeff. of Friction vs. Steel	Resist. to Abrasive Wear	Protection vs. Cold Welding and Galling
TiN	Gold/Yellow	2300 (80-85 Rc)	1100° F (600°C)	0.4	Very Good	Excellent
TiCN	Blue/Gray	3000 (90 Rc)	750° F (400°C)	0.3	Excellent	Excellent
CrN	Silver/Gray	1750 (75-80 Rc)	1300° F (700°C)	0.5	Good	Very Good

General Ranking of Coatings by Key Characteristics

Key Charactersitics	1	2	3
Hardness	TiCN	TiN	CrN
Toughness	TiCN	TiN	CrN
Heat Transition	CrN	TiN	TiCN
Chemical Stability	TiN	TiCN	CrN
Corrosion Resistance	CrN	TiCN	TiN

Technical Information supplied courtesy of Balzer's Tool Coating Inc.

Ordering Information

After catalog number, dimensions, and material, specify "TiN coated", or other coating selected.

Nitriding as a surface treatment is also available on request.