

**DICOAT® PUNCH**

DICOAT® punches are epoch-making standard punches that have superior properties made possible by a vanadium carbide layer produced by the TD process. Having a surface hardness of 3200HV to 3800 they can be effectively used as anti-abrasion and counter-seizure punches. As a result, overall expenses will be minimized when these punches are used.

MISUMI undertakes the overall production of these punches and applies the TD process under license, "TD Process Application to Metallic Mold Standard Items and Sales", granted by Toyota Central Research Institute Co., Ltd. This has enabled MISUMI to establish a production line for DICOAT® punches having the same dimensional precision as other punches.

The TD process, known as "surface hardening by diffusion", was developed by Toyota's general research institute, Toyota Central Research Institute Co., Ltd. With this method, a certain element (carbide) is diffused to penetrate through the surface of the metal to form an anti-abrasion and an anti-seizure film. Since its first practical use in 1970, the TD process has been widely applied to press dies, cold forging steel dies and casting dies, cutters, jigs and machine parts to improve their performance.

**Features of DICOAT® PUNCH**

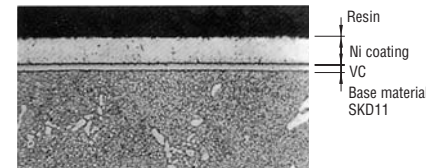
**1. anti-abrasion : Surface hardness**

- The tip of DICOAT® punch is coated with a 4~7 μm vanadium carbide (VC) film.
- The surface hardness of DICOAT® punch is 3200HV~3800 resulting in a minimal degree of abrasion when punching all types of materials.

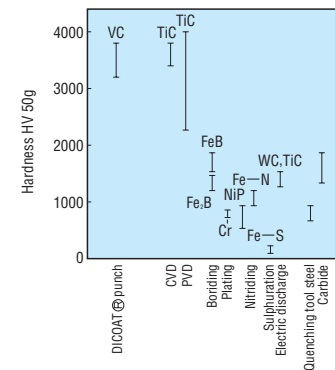
**2. anti-seizure & anti-abrasion**

- DICOAT® punches have high anti-seizure and anti-abrasion characteristics when used with all types of materials. The punches are virtually flawless and have polished surfaces.

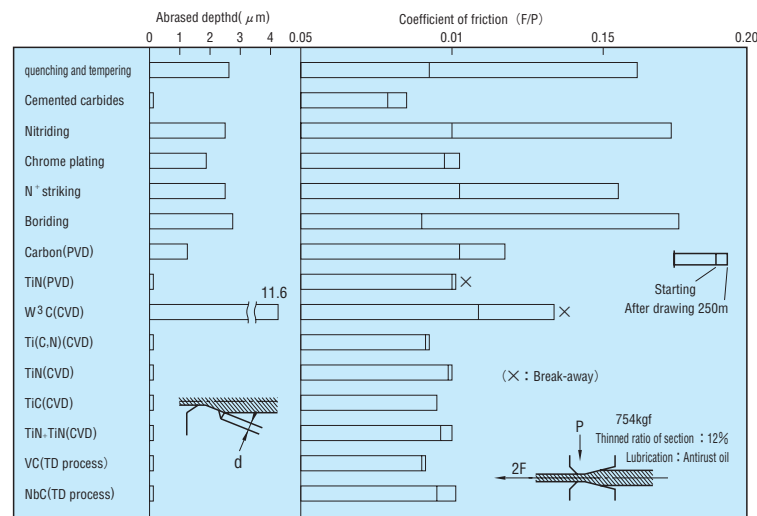
**[Fig.—1] Photograph of DICOAT® punch section**



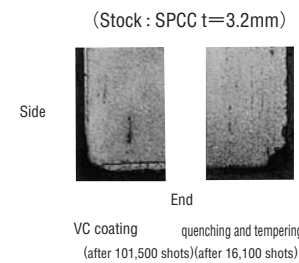
**[Fig.—2] Comparison of surface hardness**



**[Fig.—3] Comparison of anti-abrasion and anti-seizure in press-thinning process**



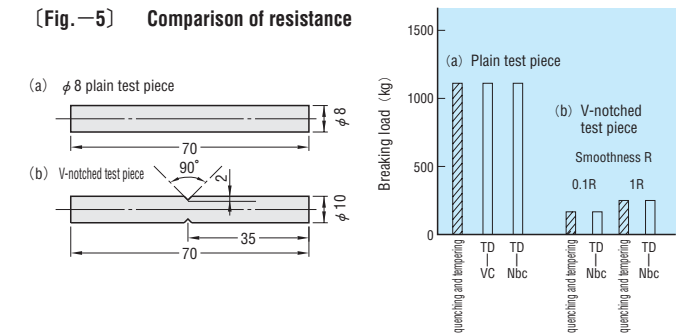
**[Fig.—4] Section structure of piercing punch tip after punching**



**3. Toughness**

- VC coating does not result in revised toughness of base metal. Also, DICOAT® as high tempered, which results in minimal breakage as compared with other punches.

**[Fig.—5] Comparison of resistance**



**Effect of DICOAT® PUNCH**

**1. DICOAT® punches exhibit excellent abrasion and seizure resistance under a wide range of conditions.**

Especially under the following circumstances, the benefits extend throughout the life of the punch :

- (1) Because DICOAT® punches have a smaller regrinding allowance and shorter regrinding times, even when the regrinding allowance and abrasion is severe, and the potential span is increased.
- (2) Because the speed at which the burr height increases is low, quality control based on the burr height can be accomplished with minimal steps.
- (3) When the product surface is important :  
As scuffing hardly occurs, stable production of smooth-surfaced products is possible.
- (4) When using ineffective or expensive lubricants :  
The DICOAT® punches are designed to minimize scuffing and degree of abrasion which allows of use of any type of lubricant at reduced amounts.

**2. DICOAT® PUNCH adoptable stocks**

Steels	SS, SPC, SPH, SC, SCM, SK, SUS, High tensile strength steels, Silicon steels
Surface treated steel sheets	Sn plated steels, Zn plated steels, Aluminized steels, Plastic coating steels
Nonferrous metals	Al, Al alloy, Cu, Cu alloy, Zn alloy, Ni alloy
non-metal	Rubber, Cloth-inserted rubber, Asbestos, Cloth-inserted bakelite

**3. Reduction of number of die repair-steps**

Figure 6 shows the relationship between the time needed to repair progressive dies used at company B and the effect of applying the TD process. The time needed for repair includes the regrinding of bending and trimming punches, and other problems resulting from mis-operation.

Bending punches and dies are the only TD processed parts used in progressive dies. Nevertheless, a close relationship is clearly evident between the start of TD process application and repair times. For example, the repair time was about 50 hours per production run of 100,000 and was reduced to 15 hours after the introduction of the TD process. Due to company B's production quantity, the increase in profit from repair time reductions was significant.

**[Fig.—6] Changes in die repair index by TD process**

