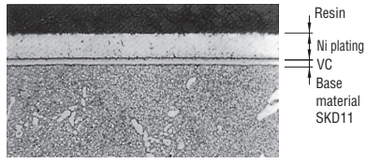
DICOAT® Punches

DICOAT® punches are revolutionary standard punches that have superior properties made possible by a vanadium carbide layer produced by the TD process. With a surface hardness of 3200～3800 HV, these punches are not only effective as wear resistant and seizure resistant punches, but also can deliver reductions in total costs.
Thanks to the license for "TD process treatment and sales for die standard parts" granted to MISUMI by Toyota Central R&D Labs, Inc., MISUMI has succeeded in creating an integrated process from punch production to TD process treatment for DICOAT® punches which ensures the same dimensional accuracy as with conventional punches.
The TD process is a process of "surface hardening by diffusion" that was developed by Toyota Central R&D Labs, Inc., an organization which acts as the general research institute for the Toyota Group. With this method, certain elements (carbides) are diffused to penetrate the metaland form a surface layer with superior wear resistance and seizure resistance. This method was first commercialized in 1970, and since that time has been widely used to improve the performance of press dies, cold forging steel dies, casting dies, and other dies, as well as blades, jigs, and machine parts.

[Fig. 1] DICOAT® punch cross section structure

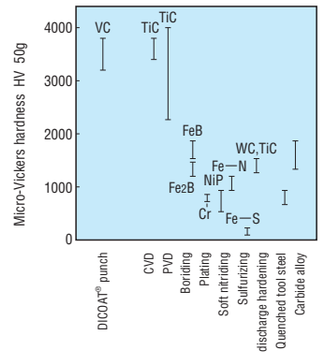


Features of DICOAT® punches

1. Wear resistance: Surface hardness

- The tip of a DICOAT® punch is coated with a 4～7 μm vanadium carbide (VC) film.
- VC is extremely hard (3200～3800 HV), demonstrating superior wear resistance when punching all types of materials.

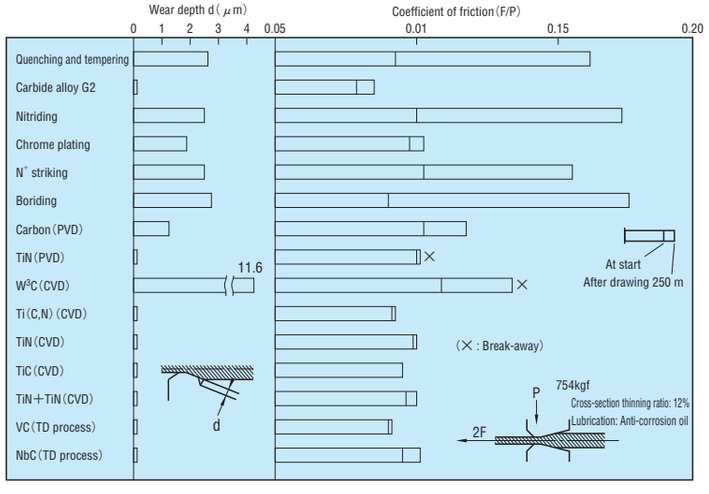
[Fig. 2] Comparison on surface layer hardness



2. Resistance to seizure and abrasion

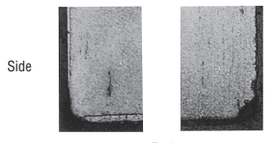
- DICOAT® punches demonstrate superior wear resistance when used with all types of materials.
  These punches have an excellent product surface that is resistant to scratching.

[Fig. 3] Comparison of wear resistance and seizure resistance in press-thinning process



[Fig. 4] Cross-section structure of punch tip after use

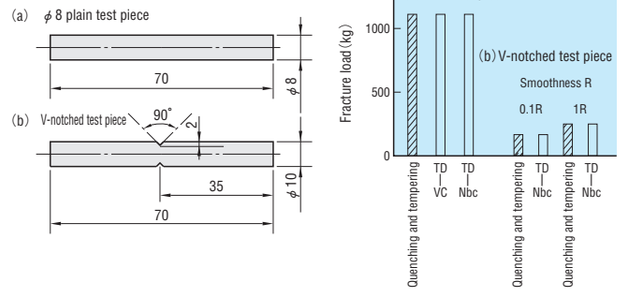
(Punched material: SPCC t=3.2 mm)



3. Toughness

- VC coating does not decrease the toughness of the base metal.
  In addition, because DICOAT® punches are tempered at high temperatures, they have high toughness and feature lower risk of breakage compared with ordinary punches.

[Fig. 5] Comparison of traverse rupture force



Advantages of DICOAT® punches

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

DICOAT® punches offer other advantages in addition to improved life spans, particularly in the following circumstances.

(1) Cases in which ordinary punches experience severe wear, and required a large amount of regrinding
Because the amount of necessary regrinding is small, the required regrinding time is short. This raises the number of possible regrinds before the punch is scrapped, increasing the total number of punches which the punch can complete in its lifetime.

(2) Cases in which quality control is carried out based on burr height
Because the speed at which burr height increases is low, quality control based on burr height can be accomplished with minimal man-hours.

(3) Cases when the product surface is a major concern
Because scratching rarely occurs, stable production of products with high surface quality is possible.

(4) Cases when a lubricant with poor workability or a highly expensive lubricant is used. Because scratching is unlikely and wear is low, the lubricant requirements are not strict. Moreover, it is possible to reduce the overall amount of lubricant used.

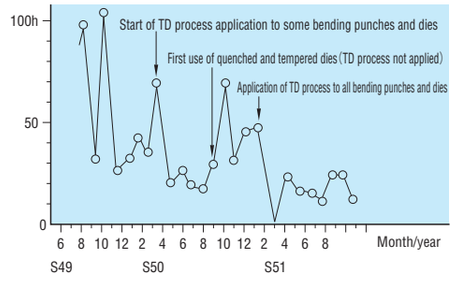
2. Stock materials that can be used with a DICOAT® punch

Steels	SS, SPC, SPH, SC, SCM, SK, SUS, high tensile-strength steels, silicon steels, others
Surface-treated steel sheets	Sn plated steels, Zn plated steels, aluminized steels, plastic-coated steels
Nonferrous metals	Al, Al alloys, Cu, Cu alloys, Zn alloys, Ni alloys, others
Non-metal materials	Rubber, fabric-reinforced rubber, fabric-reinforced bakelite, others

3. Reduction in man-hours required for die repair

Figure 6 shows the results from an investigation conducted at Company B of the relationship between the time required for repair of progressive dies and the effects of the TD process.
The time required for repair shown here includes all repair time including the time required for regrinding of bending and blanking punches, and for incidents resulting from operator error.
Although the use of TD parts for these progressive dies was limited to bending punches and dies, a close relationship is clearly evident between the start of TD process use and the required repair time. Before the use of the TD process, the repair time per 100,000 units produced was 50 hours, a figure which was reduced to 15 hours after the introduction of the TD process. The benefit to Company B was thought to be considerable, considering its large production volume.

[Fig. 6] Changes in die repair index by TD treatment



Trimming and bending progressive dies
SCM—3 2.0t
Trimming : 8 points
Bending : 3 points
Cutting and bending : 2 points
Chamfering : 1 point
Stamping : 1 point