

The plunger tip is a critical element of aluminum die casting process. Its' successful operation depends on a number of factors. The most important factor is its' efficient interaction with a round, straight, thermally and therefore dimensionally stable shot sleeve.

Castool's plunger tips were developed a number of years ago by Allper of Switzerland. The plunger materials have been developed jointly between Allper and SCHMELZMETALL over the last 30 years particularly for die-casting. All the copper alloys are refined from virgin materials, heated and casted in high vacuum to avoid oxides, forged and thermally precipitated. The alloy combines high fatigue, high hardness, high resistance to heat and high thermal conductivity.

PURPOSE

- Prevent alloy from penetrating between the shot sleeve and plunger, prolonging tooling life
- Move smoothly and consistently, with a minimum of lubrication, through the shot sleeve bore increasing casting properties
- Maintain a secure seal with the shot sleeve wall necessary for an effective vacuum to be drawn reducing porosity
- Cool the biscuit quickly to reduce cycle times

FUNCTION

The function of the plunger tip is the extension of the plunger rod, which pushes the molten alloy into the mold. There are a number of functions that must be satisfied by an effective plunger tip.

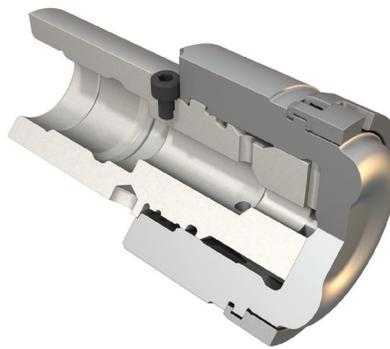
- To repeatedly transmit the force of the plunger rod, at high temperature, to the alloy.
- To maintain a seal with the shot sleeve wall during the shot, eliminating flash or blow-by and preventing air from being drawn into the alloy when using a vacuum.
- To remain thermally and therefore dimensionally stable throughout the shot, allowing consistent and repeatable shot velocities.
- Since the tip is dimensionally stable, and the gap controllable, steel wear rings can be attached to the plunger tip body to provide a guarantee that the seal is maintained.

FUNCTION continued on next page

The ABP Plunger

The Allper Bush Plunger ABP was developed for small to medium sized machines, from 40 mm up to 120 mm diameter. It is composed of a Con-Duct plunger body, a nitrided H-13 (1.2344) replaceable split wear ring, an ultra-high strength Beryllium Copper A-52 spring bush and a stainless steel M303 holder with a quick release bayonet coupling. Water flow is from the center of the shot rod, through the stainless holder, and directly to the inside face of the plunger tip where a turbulent flow is generated to maximize the heat transfer.

Con-Duct has impact toughness of 100J. The thermal conductivity of Con-Duct is 42W/mk versus H-13 which is 24W/mk. Con-Duct has better toughness and thermal conductivity and reduces thermal and impact stress. It is safer to use and has much longer life.



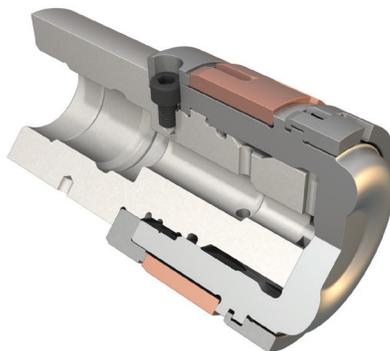
ABP-R 40 to 50 mm dia:

This ABP-R incorporates a forged Con-Duct steel body and a nitride hot work tool split ring.



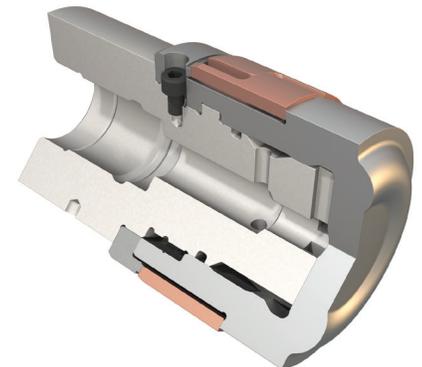
ABP-R 50 to 80 mm dia:

This ABP-R is slightly longer and incorporates a forged Con-Duct steel body, a nitride hot work tool split ring and a steel coupling.



ABP-R 50 to 120 mm dia:

This ABP-R incorporates a forged Con-Duct steel body, a forged BeCu bushing, a nitride hot work tool split ring and a steel coupling.



ABP-A (Solid):

In some cases, because of the die or shot sleeve configuration, it is difficult to use the split ring. In these cases, it is possible to use the ABP without a split ring.

FUNCTION continued...

- Because the ring is flexible, it makes continuous contact with the inside of the shot sleeve. Flash, which is a major cause of wear, is essentially eliminated. Shot speeds are consistent.
- Since the expanding wear ring ensures a secure seal between the plunger and the shot sleeve, a better vacuum can be drawn.
- An additional advantage is that the face of these is considerably cooler than that of other plunger tips. This cools the biscuit much faster and reduces the cycle time significantly.

BENEFITS of the Allper Plunger Tip

- Reduce cost per shot
- Increase plunger life
- Increase shot sleeve life
- Improve vacuum seal
- Reduce flash
- Reduce scrap rate
- Reduce downtime

With the Allper Plunger Tip, Castool again sets a new standard of excellence in the die cast industry.

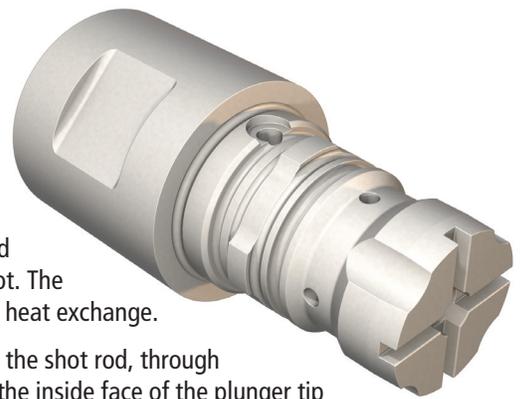
Results may vary depending on individual press characteristics and setup.



www.castool.com

ABP (Holder)

With the ABP, a stainless steel tip holder is screwed onto the shot rod, and the body is securely fastened to it with a quick release bayonet type connector. The front of the steel holder lies in full contact with the inside face of the plunger tip and absorbs the total pressure of the shot. The face can then be very thin for better heat exchange.



The water flow is from the center of the shot rod, through the stainless holder, and directly to the inside face of the plunger tip where a turbulent flow is generated to maximize the heat transfer. It then goes through four channels to the circular external coolant return passage.

Approximately 10 to 20 l/min. of water flow are necessary to use this system depending on plunger diameter.

ABP (Ring)

Replaceable wear rings create a superior seal for vacuum applications and reduces cost. The internal radius has been increased by 8 times, reducing the stress concentration factor by 1/3. The overlap length has also been reduced. The total effective stress from the reduced overlap and increased radius reduces the stress to at least 1/5 of the original milled ring.



Two pin hoods are now being machined into most rings. The split is kept away from the pour spout and also erosion prone area of the shot sleeve, under the pour spout. The ring complies to the ID of the shot sleeve better than with a single hood opposite the split. It is also easier for the operator to access the split for removing and installing a new ring.



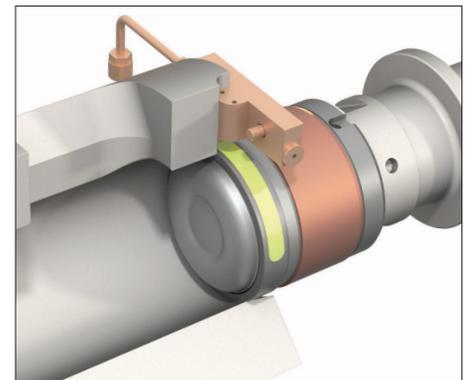
Shot Sleeve

The sleeve should be straight and round under production temperature. If it is not the case, aluminum will penetrate between the clearance of the plunger tip and sleeve. The good news is, that in most cases, shot sleeve expansion on small to medium size shot sleeves is easy to manage.

Lubrication

Lubrication should only be applied where it is needed. Every effort should be made to eliminate the possibility of non-metallic substance getting into the casting.

For small shot sleeves, a built-in slot and lubrication channel can be machined into the shot sleeve that delivers lube on top of the plunger ring.



For medium shot sleeves the bolt-on Allper Lube Drop (ALD) system delivers a precisely measured amount of lubricant directly on top of the plunger or plunger ring.

SCHMELZMETALL

HIGH VACUUM COPPER ALLOYS



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