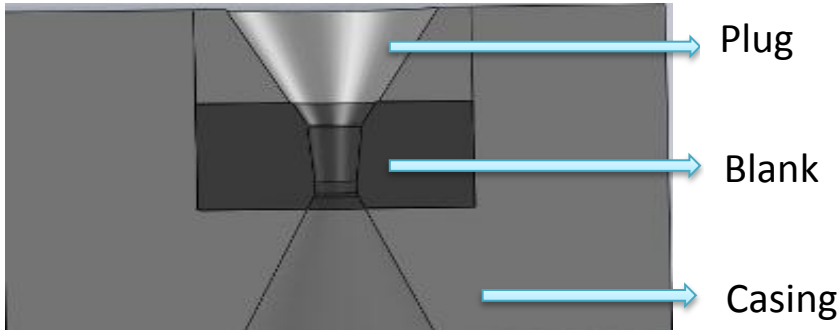


PARTS OF A DIAMOND DIE :

Natural diamonds, mono and PCD blanks are fitted into a steel casing. The casing is used as the diamond on wire drawing machine.



The diamond die basically has 3 parts :

The Natural diamond, Mono and PCD blanks are fitted into SS casing by sintering or by shrink fitting.

During sintering of diamonds (ND, Mono and SS PCD's and smaller TCS PCD's), metal is used to fix the diamond in the casing by heating and simultaneously applying pressure. Induction or Resistance type sinter press is used.

Shrink fitting is only used for big TCS PCD blanks. During Shrink fitting of PCD's, appropriate casing is selected with proper interference with PCD blank. The casing is heated upto 300°C and a plug is pressed in.

Casing : casing is the material which seats the diamond. The material of the casing and plug used in both the above cases is SS 303 grade. The case size is given by the customer depending upon the die holder size in the wire drawing machine.

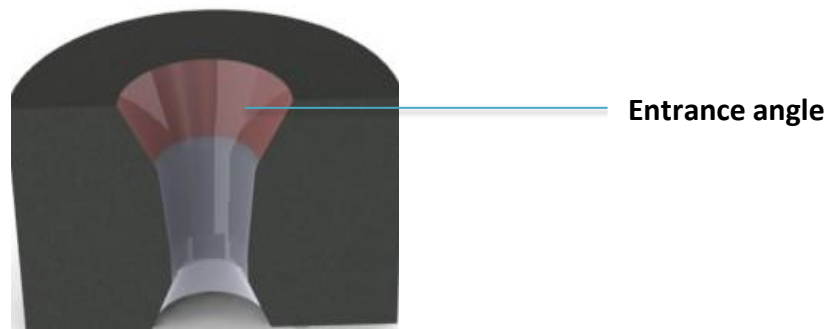
The standard case sizes are 18 x 6, 25 x 6, 25 x 8, 25 x 10, 25 x 12, 28 x 6, 28 x 8, 28 x 12, 43 x 23, 43 x 25, 43 x 27 and 55 x 30 mm.

Profile & Parts of the drawing die.

The inner profile of the die consists of the following parts or zone :

- 1 Entry angle
- 2 Approach angle
- 3 Reduction angle
- 4 Intersection
- 5 Bearing length
- 6 Back relief angle
- 7 Exit angle

1. Entrance angle :



The function of the entry is for the free entry or guiding of wire into the die and to ensure the flow of drawing lubricant along with the wire. The entrance is designed with an angle and height. The standard entrance angle for a drawing die is $60^\circ \pm 10^\circ$. The height of the entrance is designed based on the diamond height and usually maintained at 15% +/- of the total diamond height.

This zone can be left rough without any polishing because no wire contact takes place here. With polished entry, especially for multiwire drawing dies and small sizes at high speed maximum lubricant flows freely without any friction. This helps in smooth drawing.

The entry angle should be well blended into the reduction zone of the die to avoid wire scrap producing metal dust. In some cases especially for big size dies, where the contact point is a sharp edge, the minimum entrance height is provided in the die profile to give maximum height to reduce the angle.

2. Approach angle:



The junction between the Entrance zone and the Reduction zone is called Approach zone. If the approach angle is sharp, the inlet wire will be scraped and metal dust will be formed. This

3. Reduction angle (RA):



This is the "HEART" of the die. This zone has an angle and a height. In this zone the inlet wire

- 1 The plastic flow of metal takes place affecting the physical & mechanical properties especially
- 2 Sufficient lubrication layer is formed on the wire due to the pressure developed by hydrodynamic
- 3 The RA sizes the incoming wire at the intersection but it cannot maintain the size.

The point where the wire touches the reduction angle is called "Contact Point". The contact point is the most critical area of the die. By years of practical experience, many trials conducted, based on the data analysed and conclusions drawn. The angle of the reduction zone is designed based on the hardness of the material drawn, in

Usually the Reduction angle is maintained at ± 2 degrees with respect to the desired angle. T

- 1 Hard metals need narrow angle and soft metals needs a wider angle.
- 2 Higher drawing speeds require wider angle and Vice versa.
- 3 Higher % Area reduction and % Elongation require wider angle and Vice versa.

The reduction angle height (profile height) plays an important role in wire drawing especiall
 The latest trend in high speed drawing machine is that, the bottom 2/3rd height of the reduct
 There are 2 undesired cases - Too narrow RA & Too wider RA.

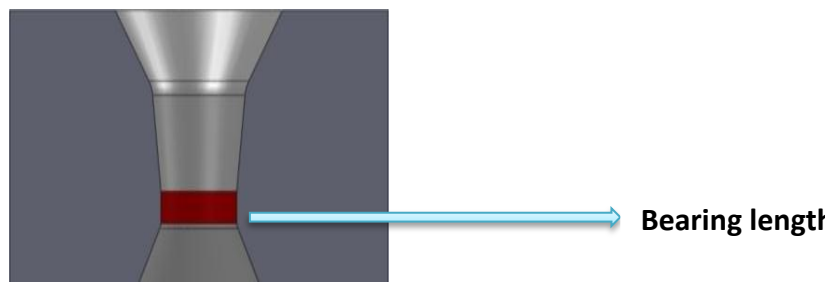
A. If the RA is too narrow than the desired angle, then the

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B. If the RA is too wider than the desired angle, then the

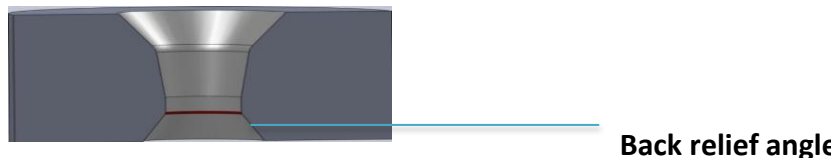
In view of the above, For best wire drawing results, it is important to maintain the desired r
 By understanding the effects of CP position in the RA height, in every wire drawing industr
 For more information on Central bursting, whirlpool effect & delta factor, pls refer to the te

4. Bearing Zone (BL):



The function of the bearing length is to control the diameter of the drawn wire and ensuring

5. Back Relief angle (BR):



Back relief allows the wire to freely exit from the bearing without coming in contact with an

6. Exit angle:

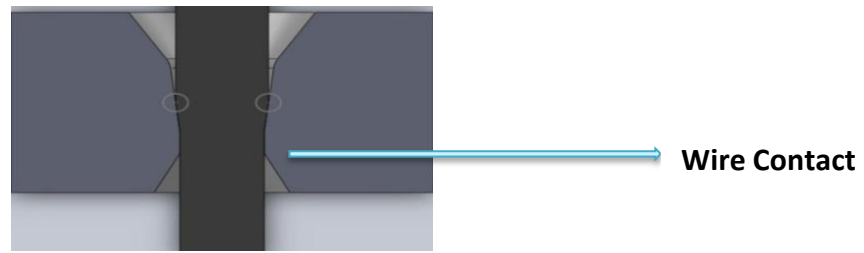


This allows the wire to exit freely from the die. Normally the exit angle is maintained at 50+

The transition between the different parts within the profile should be properly blended to ensure a smooth connection of the different area

Wire Contact Point (CP) :





Contact point is the point where the wire touches inside the die profile.

In die design, the contact point plays very important role for die life, wire surface finish and

For successful deformation of wire, the contact point should take place between $1/3$ rd to $2/3$

When the Contact point is very close to the bearing or on the top of the reduction angle, ther

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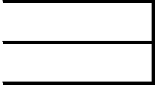
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