Bazooka

Vacuum Sleeves

VACUUM AWAY LOOSE SLUGS, SLIVERS OR FINISHED PARTS IN FABRICATING DIES

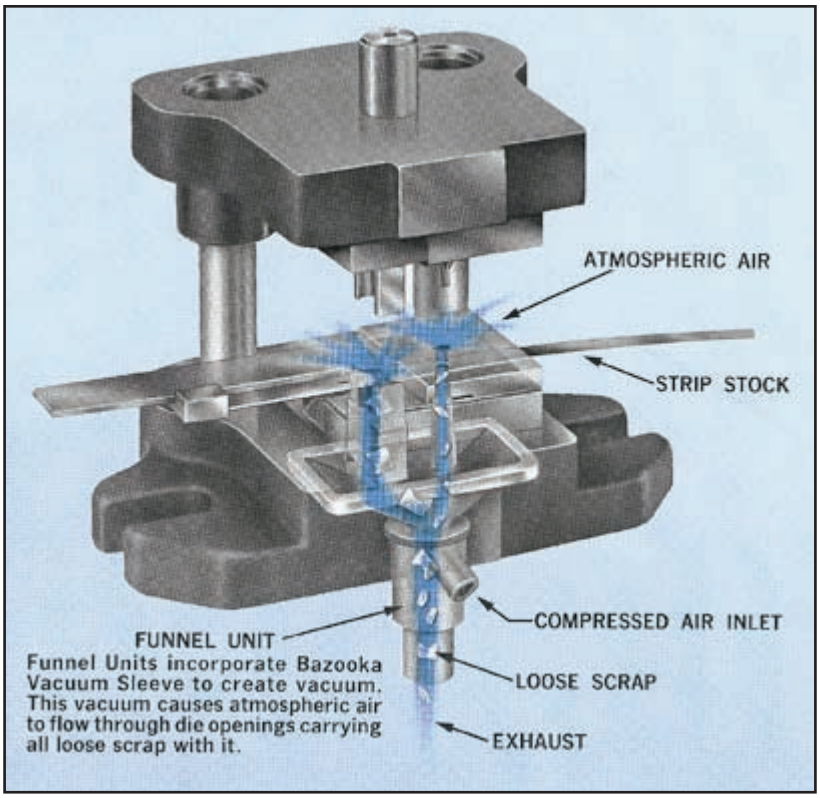
THE PROBLEM OF LOOSE SCRAP - AND HOW TO CONTROL IT.

(A) THE PROBLEM: In metal fabricating, machine operators are often troubled with uncontrolled loose scrap or small finished parts. The following are your costly losses:

(1) Production shut-downs.
(2) Shearing of expensive punches and dies.
(3) Damage to strip stock.
(4) Rejection of finished parts.
(5) Extra set-ups.

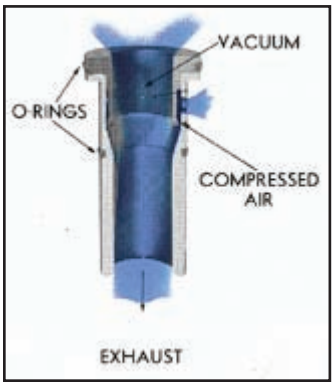
(B) THE CAUSES: Loose scrap or slugs in fabricating dies can be caused by the following factors:

(1) **Excessive clearance** between punch and die opening.
(2) Variation in stock **thickness.**
(3) Variation in stock **hardness.**
(4) Fabricating at **high speeds.**
(5) **Excessive wear** on the punch and die.
(6) **Lubricants** on stock strip cause slugs to stick to the punch.
(7) **Magnetized** punches.
(8) Slugs hang to punch due to **burrs.**
(9) **Vibrations** cause slugs to bounce out.



(C) THE SOLUTION: The BAZOOKA VACUUM SLEEVE was designed and developed as an easy method to remove loose slugs or scrap. The VACUUM SLEEVE will convert compressed air into a vacuum which is applied at the die opening. This vacuum not only **prevents slugs from pulling out with the punch, but it carries them away from the die surface** through the vacuum source and deposits them in a container.

The advantage of the vacuum system over plain compressed air is - with vacuum you have control of the slugs or parts. With compressed air - pieces can fly back onto the working surface interfering with the die operation.



SECTIONAL VIEW OF BAZOOKA VACUUM SLEEVE* illustrates how the metal scrap can pass through the sleeve without disrupting the vacuum flow or damaging the unit.

Center chamber is vacuum passage and allows removal of solid material.

Compressed air is forced to flow through the circular orifice creating the required vacuum.

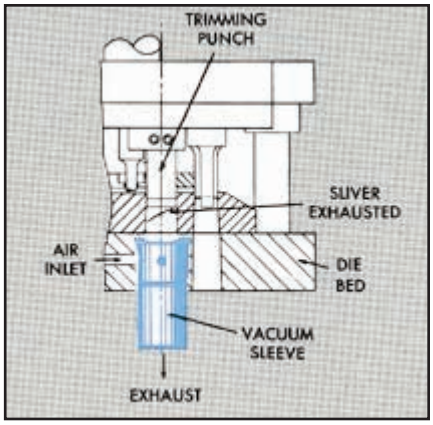
"O" Rings which seal compressed air allows liberal machining dimensions of housing for installing vacuum sleeve.

**U.S. PATENT NO. 3,031,127*

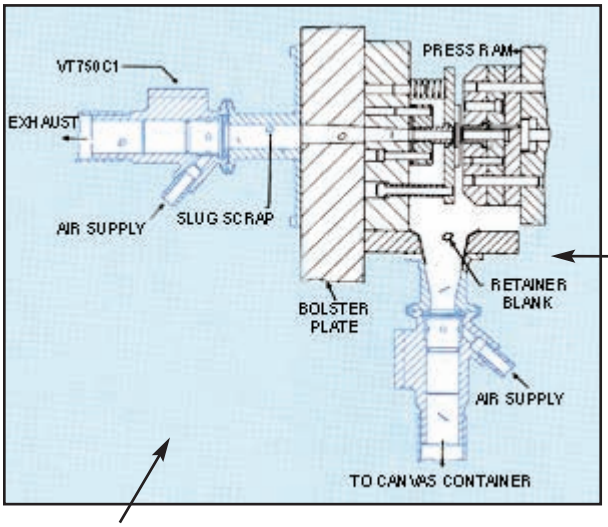
Applications

VERSITILE BAZOOKA VACUUM SLEEVES AND VACUUM TRANSDUCERS CAN BE INSTALLED MANY DIFFERENT WAYS TO CONTROL LOOSE SCARP AND PART REMOVAL

1 - VACUUM SLEEVE INSTALLATION PREVENTS LOOSE SHAVINGS FROM PULLING UP WITH PUNCH



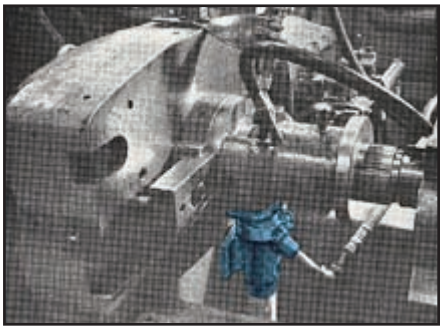
PROBLEM: Shaving, measuring .640 long x .030 wide x .020 thick, is loose and pulls up with punches.
SOLUTION: A VS-750 Vacuum Sleeve, with an "A" diameter of .75, is installed beneath the die opening in the die bed. The vacuum not only prevents shavings from pulling up with the punch, but also carries them away from the die surface through vacuum source into a suitable container. **Since there is only one shaving station, a single Vacuum Sleeve is used instead of a Vacuum Transducer & Funnel Unit.**



2 - VACUUM INCREASES USES OF HORIZONTAL PRESS SET-UP

PROBLEM No. 1: Fabricate miniature retainer  from .003 stainless steel and prevent nicking, bending, or marking of part. If run in a vertical press the retainer would have to be blown off causing marking or nicking.

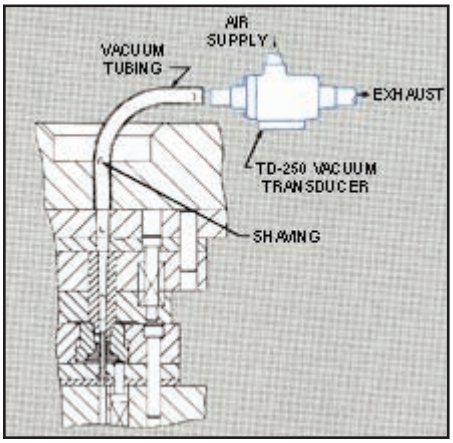
SOLUTION No.1: By using a horizontal press, the retainer blank falls free due to gravity helped by the BAZOOKA Vacuum Funnel Unit. Operating on very low pressure it creates just enough vacuum to cause a slight movement of atmospheric air downward into funnel unit. A canvas container is attached to exit end of funnel unit. **The above method produces unmarked flat retainer blanks.**



PROBLEM No. 2: An additional problem arises form the horizontal press. The center slug is pierced in a horizontal direction and must be prevented from falling back onto the die.

SOLUTION No.2: Removal of this slug is accomplished by the use of a Vacuum Transducer and Cap Unit. Installation is simple, as Cap Unit and Adapter are mounted to the bolster plate as shown in illustration. Unit prevents slug from interfering with running of strip stock.

A VT-750-C1 Vacuum Transducer and Cap Unit was selected instead of a Vacuum Sleeve in order to accommodate any number of different dies. Otherwise, individual Vacuum Sleeves would have to be installed in each die. The "A" dimension of .750 insure sufficient clearance for all slugs.



3 - UPWARD SHAVE OPERATION MADE POSSIBLE BY USE OF VACUUM

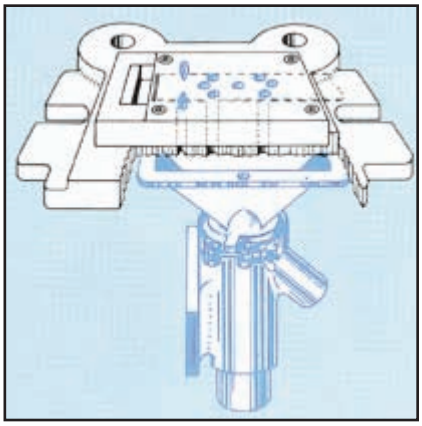
PROBLEM: Due to the design of the part a trimming operation has to be done upward, otherwise, secondary operation would be required. It is important to keep this shaving (.190 x .020) from falling back onto the surface of the die.

SOLUTION: A TD260 Vacuum Transducer was selected as the "A" diameter (.260) provides sufficient clearance. The installation is simple, as the tubing is used to connect the die opening to the Vacuum Transducer. By having vacuum in the die opening, the loose shavings pass upward through tubing, Vacuum Transducer and exhaust hose into scrap container.

Applications

VERSITILE BAZOOKA VACUUM SLEEVES AND VACUUM TRANSDUCERS CAN BE INSTALLED MANY DIFFERENT WAYS TO CONTROL LOOSE SCARP AND PART REMOVAL

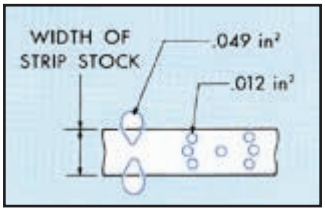
4 - ONE VACUUM TRANSDUCER AND FUNNEL UNIT REMOVES TWO NOTCHINGS AND SEVEN PIERCING SLUGS



PROBLEM: It was necessary to remove loose slugs from two notchings and seven piercings. By preventing this scrap from pulling up with the punches, you eliminate trouble from scrap accumulation and reduce down time while increasing production and die life.

SOLUTION: Since it would have been impractical to place individual Vacuum Sleeves under each die opening, a Funnel Unit was installed (as illustrated). This unit removes scrap from all nine openings and exhausts it into a container.

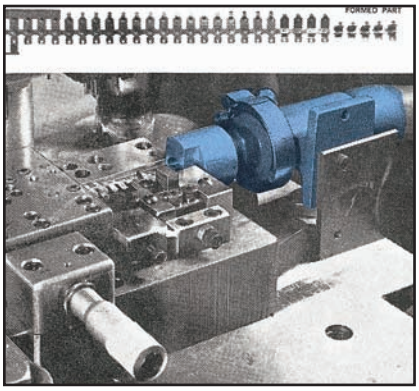
MEHTOD FOR SIZING UNIT:



To properly select a unit, you must consider all openings which allow air to flow into the Funnel Unit. The Vacuum Unit must be capable of maintaining sufficient vacuum into the Funnel. **To size the unit, add up the total area of all these openings and select a vacuum unit with an "A" Diam. that is equivalent to this area.**

In reference to the application shown, this total area equals .182 square inches. This area is equivalent to approx. 1/2 inch diameter hole. Therefore, the unit required for this particular application is a VT500F1, Vacuum Transducer and Funnel Unit.

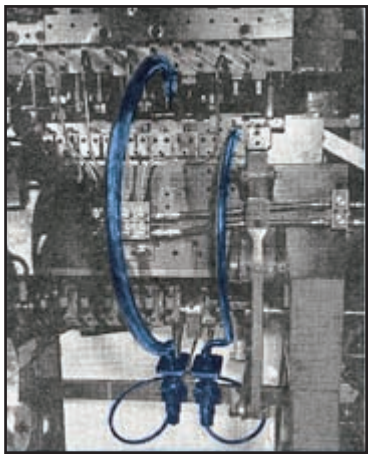
5 - VACUUM UNIT REMOVES FINISHED PART FROM THE SURFACE OF THE DIE



PROBLEM: Photograph shows the fabricating of a small formed part in a progressive die. The problem is to remove the finished part at the final cut-off station. The normal procedure is to use compressed air to blow this part into a container. Quite often this is inadequate as the parts could fly in various directions and often do not leave the die area. These parks would then interfere with the strip stock causing downtime or rejected parts.

SOLUTION: Use a standard Vacuum Transducer and Cap Unit and a simple adapter designed to locate the flow of vacuum as near as possible to this finished part. The flow of atmospheric air picks up each part as it is cut off, and removes it from the die area. It passes through the adapter & Vacuum Transducer into a suitable container.

6 - TWO REMOTE FUNNEL UNITS REMOVE FOUR PIECES OF SCRAP THROUGH FLEXIBLE TUBING



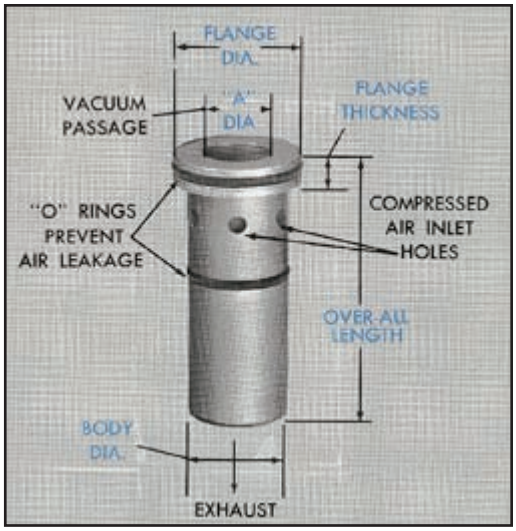
PROBLEM: At one station, a ring is split into two halves and vacuum is needed to prevent the ring portions from falling back onto the die surface. At a second station, there is a horizontal piercing which must be removed to insure continuous running of the press.

SOLUTION: Two funnel type units were mounted below the press at some convenient spot. A plate having two tubes was then mounted to the top flange of the Funnel. Flexible Tubing was then used to bring the vacuum from the Funnel Unit into the area where scrap was located. This is shown in detail in photograph.

The important thing to note in this application is that the vacuum units themselves can be mounted away from the area where the vacuum is required, and flexible or metal tubing can be used to bring vacuum into inaccessible areas.

Selecting the Proper Size Vacuum Sleeve

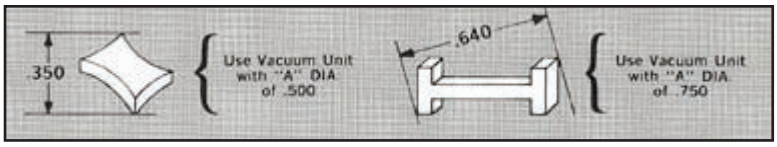
INTRODUCTION: A Vacuum Sleeve is a patented unit using compressed air to create a vacuum. It can be installed directly into a fabricating die.



HOW TO SELECT THE PROPER SIZE VACUUM SLEEVE:

There are 2 simple measurements to consider when selecting a vacuum sleeve for your application.
(1) Measure the longest dimension* of the pieces which are to pass through the vacuum sleeve and add approximately 1/8" .
(2) Select a vacuum sleeve having an "A" DIAMETER equal to, or greater than, this dimension.
(3) Listed below are 16 sizes of Vacuum Sleeves with an "A" DIAMETER ranging from .109" to 2.0"

*When determining the longest dimension, be sure to consider the stock thickness.
For EXAMPLE:

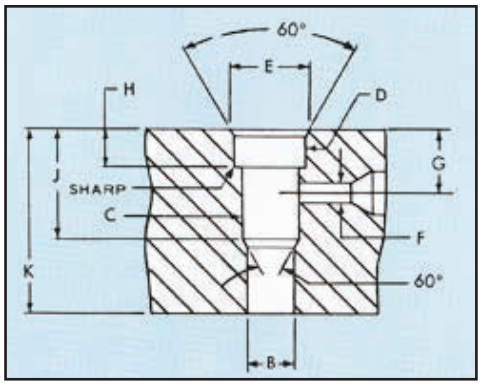


VACUUM SLEEVE CHART

Vacuum Sleeve Part Number	VS 110	VS 190	VS 250	VS 320	VS 380	VS 440	VS 500	VS 560	VS 620	VS 680	VS 750	VS 940	VS 1250	VS 1500	VS 1750	VS 2000
"A" DIA. + .003	0.109	0.191	0.261	0.323	0.377	0.4375	0.500	0.5625	0.625	0.6875	0.750	0.937	1.250	1.500	1.750	2.000
FLANGE DIA.	0.437	0.562	0.625	0.750	0.812	0.937	1.000	1.062	1.187	1.312	1.375	1.500	2.000	2.250	2.500	3.000
BODY DIA.	0.312	0.375	0.437	0.532	0.593	0.687	0.750	0.812	0.937	1.000	1.062	1.250	1.625	1.875	2.13	2.500
OVER-ALL LENGTH	1.250	1.437	1.625	1.687	1.750	1.937	2.312	2.500	2.562	2.625	2.687	2.687	3.500	4.000	4.250	4.656
FLANGE THICKNESS	0.243	0.243	0.258	0.258	0.258	0.258	0.276	0.276	0.276	0.276	0.276	0.267	0.324	0.324	0.32	0.36
VAC. AT 20 psig	6.5	6.0	6.0	5.5	5.0	5.0	3.8	3.5	3.0	3.0	1.5	1.0	0.5	0.4	0.2	0.2
VAC. AT 40 psig	12.5	12.0	12.0	11.5	11.5	11.5	8.0	7.5	6.5	6.5	5.0	3.8	2.3	2.0	1.0	1.0
VAC. AT 60 psig	20.0	20.0	19.5	18.5	18.5	17.5	12.3	12.0	9.5	9.5	7.5	5.5	3.2	3.0	2.2	2.1
VAC. AT 80 psig	24.5	24.0	24.0	23.5	23.0	21.0	16.5	16.5	13.2	13.0	10.5	7.5	4.0	4.0	3.0	2.7

Vacuum is measured in inches of mercury
For optimum vacuum flow, an operating pressure of 60 psig (max.) is recommended.

The standard VS-110 thru VS-940 are made from steel
The standard VS-1250 thru VS-2000 are made from aluminum.



TO PROPERLY INSTALL VACUUM SLEEVES FOLLOW THESE MACHINING SPECIFICATIONS:

- Break all sharp edges.
- "B" and "D" Diameters to have smooth surface finish.
- "B" Diameter to be concentric with "D" Diameter within .005 T.I.R.

The inside diameter of hoses, tubing and fittings of air supply line must be as large as the "F" Diameter shown in the drawing at the right.

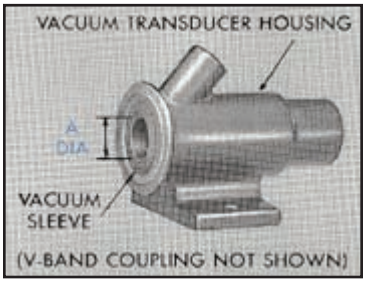
MACHINING SPECIFICATIONS

Vacuum Sleeve Part Number	VS 110	VS 190	VS 250	VS 320	VS 380	VS 440	VS 500	VS 560	VS 620	VS 680	VS 750	VS 940	VS 1250	VS 1500	VS 1750	VS 2000
"B" DIA. + .003	0.3125	0.375	0.4375	0.5312	0.5937	0.6875	0.750	0.8125	0.9375	1.000	1.0625	1.250	1.625	1.875	2.125	2.500
"C" DIA. + .005	0.358	0.4375	0.500	0.625	0.6875	0.8125	0.875	0.9375	1.0625	1.125	1.1875	1.375	1.812	2.060	2.310	2.872
"D" DIA. + .003	0.4375	0.5625	0.625	0.750	0.813	0.938	1.000	1.0625	1.1875	1.3125	1.375	1.500	2.000	2.250	2.500	3.000
"E" DIA. +/- .005	0.483	0.608	0.670	0.795	0.858	0.983	1.045	1.108	1.233	1.358	1.420	1.545	2.041	2.291	2.541	3.041
"F" DIA. + .003	0.125	0.1562	0.188	1.875	0.219	0.219	0.2187	0.250	0.25	0.281	0.2812	0.312	0.562	0.562	0.562	0.562
"G" +/- 0.010	0.437	0.492	0.507	0.507	0.507	0.527	0.568	0.568	0.568	0.568	0.568	0.620	0.875	0.875	0.875	1.125
"H" +/- 0.002	0.249	0.249	0.264	0.264	0.264	0.264	0.282	0.282	0.282	0.282	0.282	0.282	0.330	0.330	0.330	0.367
"J" +/- 0.010	0.625	0.734	0.750	0.750	0.750	0.790	0.854	0.854	0.854	0.854	0.854	0.958	1.343	1.343	1.343	1.812
"K" (MIN.)	1.000	1.125	1.125	1.188	1.188	1.250	1.312	1.312	1.312	1.312	1.312	1.312	1.875	1.875	1.875	2.5

VT Series Vacuum Transducers

WITH STANDARD FUNNELS & STANDARD CAPS

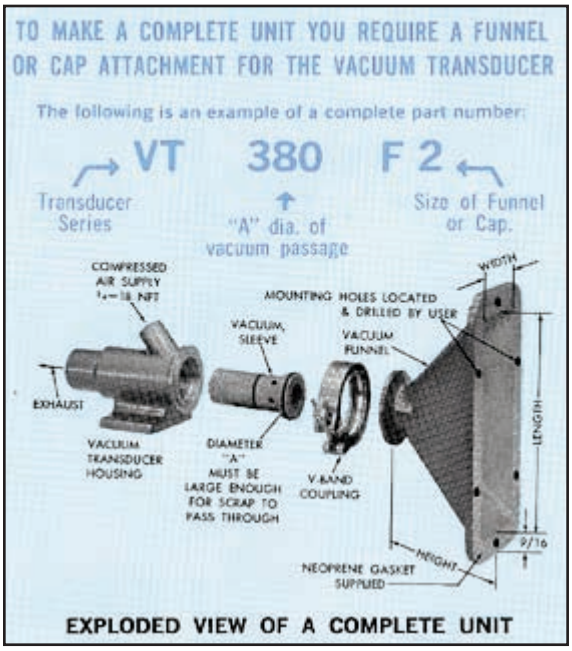
INTRODUCTION: A Vacuum Transducer is a complete vacuum source to which a compressed air line is attached. There is no machining necessary for installation. Air-Vac provides several different housings and attachments to make it easy for you to adapt Transducers to your application. There are 3 different Models of Transducers. The most popular are the VT Series, and are available in sizes from VT320 to VT940. They are always used with either a Funnel or a Cap.

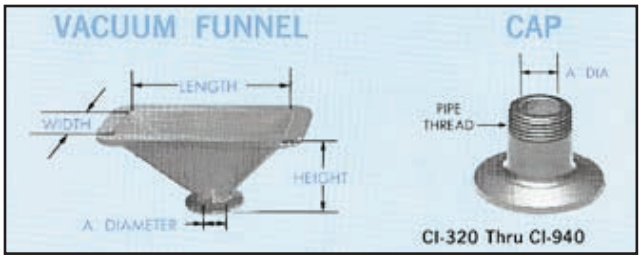


Vacuum Transducer Part Number	VT320	VT380	VT440	VT500	VT560	VT620	VT680	VT750	VT940
Uses Vacuum Sleeve Part Number	VS320	VS380	VS440	VS500	VS560	VS620	VS680	VS750	VS940
"A" DIA. of Vacuum Sleeve	0.323	0.377	0.437	0.500	0.562	0.625	0.687	0.750	0.937
Area of "A" DIA. (sq.in.)	0.082	0.112	0.149	0.196	0.248	0.307	0.371	0.441	0.690

NOTE: See **Vacuum Sleeve Chart** of Page 4 for this catalog for vacuum readings at various pressures. Price of unit includes Vacuum Sleeve, Housing, & V-Band Coupling.

TO MAKE A COMPLETE UNIT YOU REQUIRE A FUNNEL OR CAP ATTACHMENT FOR THE VACUUM TRANSDUCER - The following is an example of a complete part number: VT 380 F2



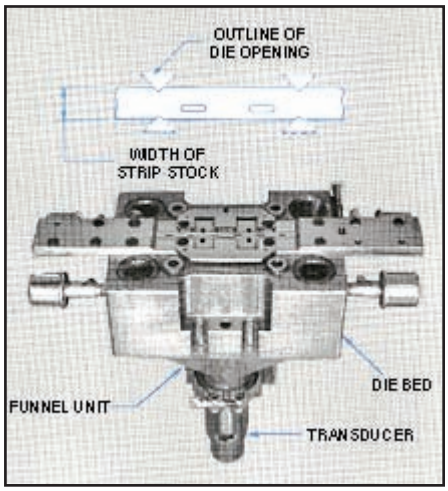


VACUUM FUNNEL PART NUMBERS							
	F1	F2	F3	F4	F5	F6	F7
Width	1-5/16	1-13/16	2-5/16	3	4-3/8	2-3/8	2-7/8
Length	3-1/8	4-9/16	6	10	8-3/4	6	8-3/4
Height	1-9/16	2-5/16	3-1/16	5	4-1/2	2-3/4	5

FUNNELS F1 - F4 WILL FIT VT 320 - VT940
FUNNELS F5 - F6 WILL FIT RT1250 - RT2000
FUNNEL F7 WILL FIT RT1250 - RT1500
Indicate "A" DIAMETER when ordering CAPS or FUNNELS separately.
Example: F6-1250, C1-750, F2-500

HOW TO SELECT THE PROPER TRANSDUCER AND FUNNEL UNIT

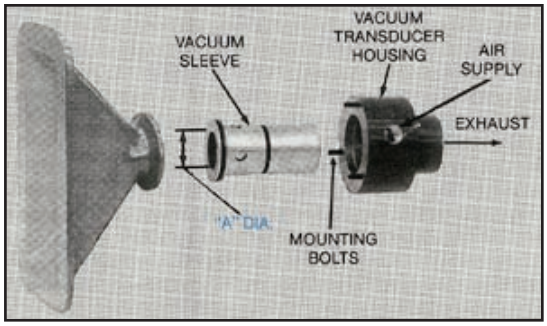
NOTE: Many applications make it impractical to install just a Vacuum Sleeve by itself. Shown is a strip layout and portion of a die which requires vacuum to prevent 4 notches and 2 oblong slugs from pulling up with the punches. Since it would be impractical to install a **separate Sleeve** under each **separate die opening**, a vacuum Transducer and Funnel Unit (which incorporates the Vacuum Sleeve) was attached to the bottom of the die bed to accommodate all six openings in one unit.



The "A" dia. of the unit is selected according to the following factors:
1. The "A" DIA. must be approximately 1/8" larger than the longest dimension on pieces of scrap.
2. The "A" DIA. must be equal in area to the total area of the die openings into funnel.

For the example shown, the longest dimension is 5/16", which is the length of the oblong slug. The total area of the 4 triangular die openings and 2 oblong die openings equals .224 square inches. This is approximately equivalent to an "A" DIAMETER of 9/16" (.248 square inches). Therefore, the TOTAL AREA FACTOR is greater than the LENGTH OF SCRAP FACTOR, and determines the size of the unit. The complete Part Number was VT 560 F2 Vacuum Transducer and Funnel Unit.

RT Series Vacuum Transducers

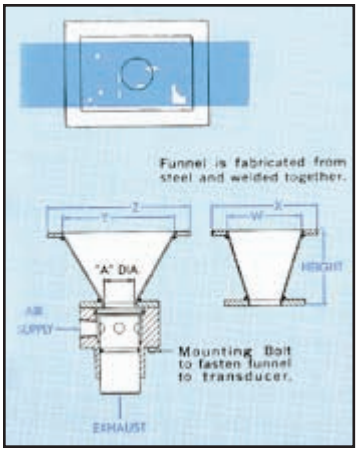


Each unit consists of a Vacuum Transducer with replacement Vacuum Sleeve combined with one of three funnels.
When ordering, list the Vacuum Transducer part number first and the funnel size added as a suffix. E.G.: RT1500-F5.

See Chart on page 4 for vacuum performance at various pressures.

FUNNELS F5 - F6 WILL FIT R1250 - RT2000
FUNNEL F7 WILL FIT RT1250 - RT1500
Indicate "A" DIAMETER when ordering funnel only.
Example: F6-1250

Vacuum Transducer Part Number	RT1250	RT1500	RT1750	RT2000
Uses Vacuum Sleeve Part Number	VS1250	VS1500	VS1750	VS2000
"A" DIA. of Vacuum Sleeve	1.250	1.500	1.750	2.000
Area of "A" DIA. (sq.in.)	1.220	1.760	2.410	3.410

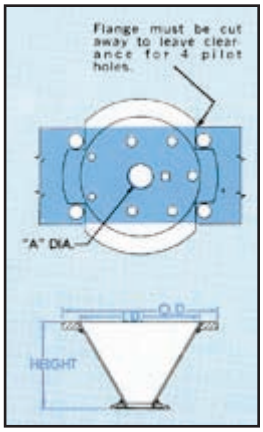


SELECTING VACUUM TRANSDUCER AND FUNNEL SIZE

How to Size Rectangular Funnel Units:

The "A" DIAMETER of the unit is selected according to the following factors:
1. The "A" DIAMETER must be approximately 1/8" larger than the longest dimension on pieces of scrap. In this example, the dimension is 15/16".
2. The "A" DIAMETER must equal in area the total area of die openings into funnel. In this example, the area equals .39 square inches - which is approximately equivalent to 11/16" diameter.

Therefore, the LENGTH OF SCRAP FACTOR was greater than the TOTAL AREA FACTOR, and determined the size of the unit. When 1/8" was added to scrap length for clearance, a unit with "A" DIAMETER of 1.250" was selected.



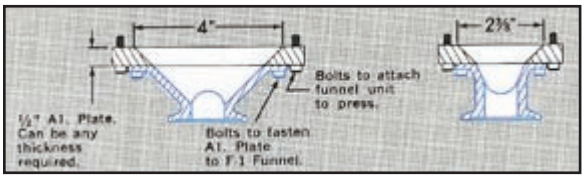
How to Size Round Funnel Units:

1. The "A" DIAMETER must be approximately 1/8" larger than the longest dimension on pieces of scrap. In this example, the dimension is 9/16".
2. The "A" DIAMETER must equal in area the total area of die openings into funnel. In this example, the combined area of 8 slugs was .609 square inches - which is approximately equivalent to 15/16" diameter.

Therefore, the TOTAL AREA FACTOR was greater than the LENGTH OF SCRAP FACTOR, and a VT940 unit was required. However if the funnel had been designed to include the four pilot holes, the total area allowing atmospheric air into the funnel would have been 1.35 square inches an RT1250 unit would be required.

How to Extend Use of a Standard Funnel to Fit a Special Application

Standard Funnel opening can be changed to meet your requirements. For example, by mounting an aluminum plate to the flange of a standard F1 Funnel, the 1-15/16' x 3-1/8" opening can be increased up to 2-3/8' x 4".

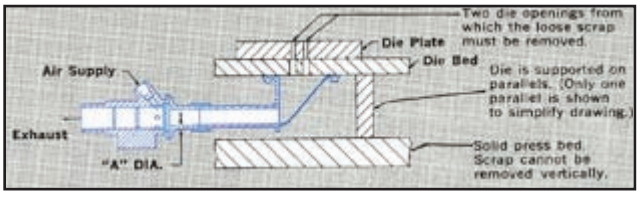


How to Utilize an Air-Vac Funnel for Horizontal Scrap Removal

In the application below, a solid press bed made it necessary to remove loose scrap horizontally. A standard VT750 C1 Vacuum Transducer with Cap Unit and Funnel was mounted under the bottom die.

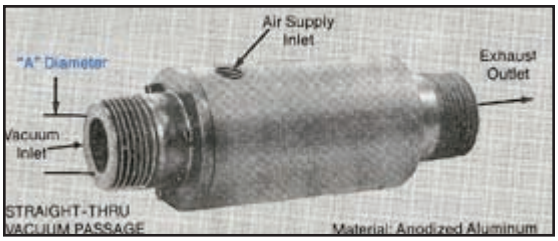
Two die openings from which loose scrap must be removed.
Die is supported on parallels. (only one parallel is shown to simplify drawing.)

Solid press bed. Scrap cannot be removed vertically.



TDRH Series Vacuum Transducers

Threaded Vacuum inlet and exhaust connections. Two piece construction eliminates need for vacuum sleeve.

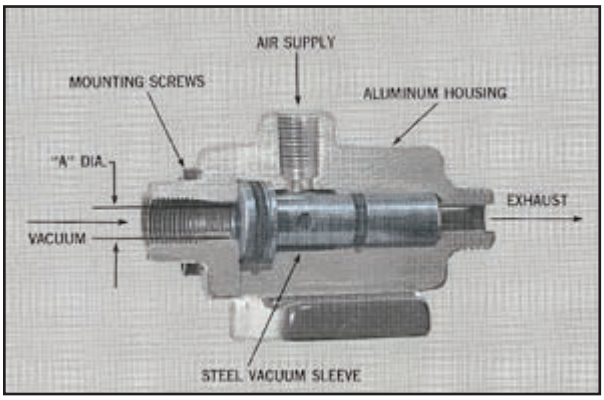


Model Number	TDRH1250L	TDRH1500L	TDRH1750L	TDRH2000L
Vacuum Force ("Hg)	2.7	2.3	2.1	2.0
Vacuum Flow (scfm)	76.0	95.0	115.0	126.0
Air Consumption (scfm)	37.3	50.0	50.0	50.0
"A" Diameter (in.)	1-1/4	1-1/2	1-3/4	2
Air Supply Thread (NPT)	1/4(F)	3/8(F)	3/8(F)	3/8F
Vacuum Thread (NPT)	1-1/4(M)	1-1/2(M)	2(M)	2(M)
Exhaust Thread (NPS)	1-1/4(M)	1-1/2(M)	2(M)	2(M)
Weight (oz.)	20	40	52	52
Size: Dia. x Length (in.)	2.25x6.75	3.0x7.50	3.25x7.68	3.50x7.68

TDS Series Vacuum Transducers

(STANDARD CAP UNITS AVAILABLE)

The TDS Series Vacuum Transducer incorporates a Steel Vacuum Sleeve (described on page 4) in an Aluminum Housing. This provides a wear resistant and durable unit used primarily for small chip and dust removal applications. Can be used on any drilling, milling or grinding operations. Most popular installation is to mount unit at some convenient spot on the machine and use tubing to bring vacuum to area where cleaning is required.



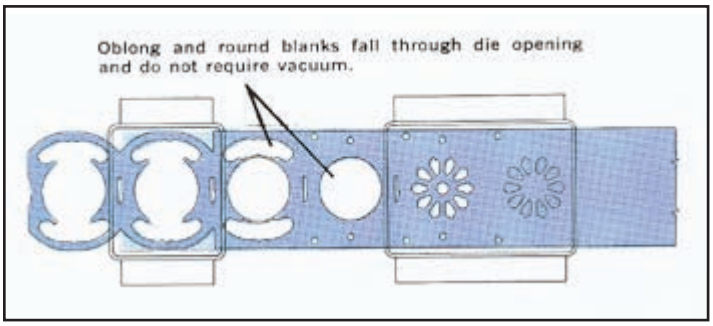
Vacuum Transducer Part No.	Used Vacuum Sleeve Part No.	"A" Dia. of Sleeve	Vacuum ("Hg)	Vacuum Flow (cfm)
TDS110	VS110	0.109	24	1.9
TDS190	VS190	0.191	24	4.5
TDS260	VS260	0.261	24	7.0
TDS320	VS320	0.323	23	13.2

Air-Vac Technical Assistance

IF YOU HAVE A LOOSE SCRAP PROBLEM, WHY NOT TAKE ADVANTAGE OF OUR TECHNICAL ASSISTANCE WITHOUT ANY OBLIGATION TO YOU? SIMPLY FURNISH THE FOLLOWING INFORMATION TO AIR-VAC ENGINEERING COMPANY- OR CONTACT YOUR LOCAL AIR-VAC REPRESENTATIVE.

(1) Is application in design stage?
(2) Strip Layout indicating material to be removed.
(3) Die Drawing Layout
(4) Stock Thickness
(5) Speed of Press
(6) Press Bed Opening
(7) Bolster information
(8) Is strip stock lubricated?

EXAMPLE OF AIR-VAC PROPOSAL FOR LAMINATION DIE
Customer furnished strip layout indicating scrap (dark blue area) to be removed with vacuum unit.



SIZING OF UNIT 1
1. The “A” DIAMETER must be approximately 1/8” larger than the longest dimension on the pieces of scrap. For Unit 1 this dimension is _”
2. The “A” DIAMETER must equal in area the total area of die opening into funnel. For Unit 1 this area equals .645 square inches, which is approx. equivalent to a 15/16” diameter.

Therefore, the TOTAL AREA FACTOR was greater than the LENGTH OF SCRAP FACTOR. The size unit required was a VT940 having an “A” DIAMETER of .937”.

SIZING OF UNIT 2
1. The “A” DIAMETER must be approximately 1/8” larger than the longest dimension on the pieces of scrap. For Unit 2 this dimension is 11/16”
2. The “A” DIAMETER must equal in area the total area of die opening into funnel. For Unit 2 this area equals 1.18 square inches, which is approx. equivalent to a 1-1/4” diameter.

Therefore, the TOTAL AREA FACTOR was greater than the LENGTH OF SCRAP FACTOR. The size unit required was a RT1250 having an “A” DIAMETER of .1.250”.