

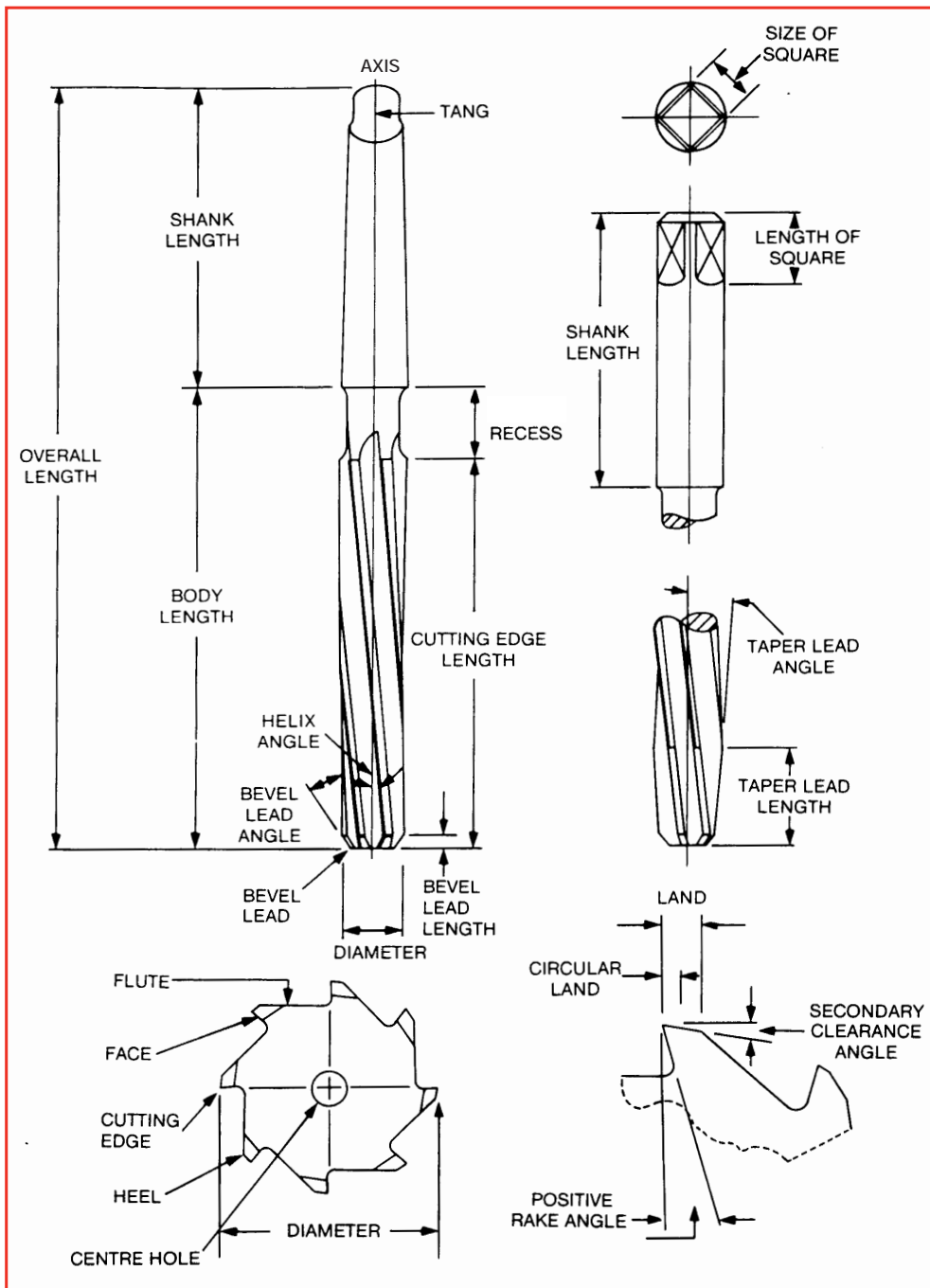


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Reamers - Nomenclature and Definitions



AXIS - The longitudinal centre-line of the reamer.

BODY - That portion of the reamer extending from the entering end of the reamer to the commencement of the shank.

SHANK - That portion of the reamer by which it is held and driven.

(i) *Straight or parallel shank for machine use.*

A cylindrically ground shank without square.

(ii) *Parallel hand shank.* A cylindrical ground shank provided with a square at its extreme for driving the reamer.

(iii) *Taper shank.* A shank of recognized standard taper for machine use.

RECESS - That portion of the body which is reduced in diameter below the cutting edges, pilot or guide diameters.

FLUTES - The grooves in the body of the reamer to provide cutting edges, to permit the removal of chips, and to allow cutting fluid to reach the cutting edges.

CUTTING EDGE - The edge formed by the intersection of the face and the circular land or the surface left by the provision of primary clearance.

FACE - That portion of the flute surface adjacent to the cutting edge on which the chip impinges as it is cut from the work.

LAND - That portion of the fluted body not cut away by the flutes; the surface or the surfaces included between the cutting edge and the heel.

CIRCULAR LAND - The cylindrically ground surface adjacent to the cutting edge, on the leading edge of the land.

HEEL - The edge formed by the intersection of the surface left by the provision of secondary clearance and the flute.

PRIMARY CLEARANCE - That portion of the land removed to provide clearance immediately behind the cutting edge.

SECONDARY CLEARANCE - That portion of the land removed to provide clearance behind the primary clearance or circular land.

TAPER LEAD - The tapered cutting portion at the entering end to facilitate the entry of the reamer into the hole. (It is not provided with a circular land).

BEVEL LEAD - The angular cutting portion at the entering end to facilitate the entry of the reamer into the hole. (It is not provided with a circular land).

BACK TAPER - The reduction in diameter per inch length of reamer from the entering end towards the shank.

ROTATION OF CUTTING - (i) *Right hand cutting reamer.* A reamer which rotates in a counter-clockwise direction when viewed on the entering end of the reamer.

(ii) *Left hand cutting reamer.* A reamer which rotates in a clockwise direction when viewed on the entering end of the reamer.

DIAMETER - The maximum cutting diameter of the reamer at the entering end. (See also definition 'Taper Reamers').

OVERALL LENGTH - The length over the extreme ends of the reamer.

CUTTING EDGE LENGTH - The axial length of that portion of the fluted body provided with primary clearances or circular lands and including the taper and bevel leads.

RECESS LENGTH - The length of that portion of the body which is reduced in diameter below the cutting edges, pilot or guide diameters.

SIZE OF SQUARE - The dimension across the flats of the squared portion at the extreme end of a parallel hand shank.

LENGTH OF SQUARE - The length of the squared portion at the extreme end of a parallel hand shank.

TAPER LEAD LENGTH - The length measured axially of the taper lead.

BEVEL LEAD LENGTH - The length measured axially of the bevel lead.

LEAD OF HELIX - The distance measured parallel to the reamer axis between corresponding points on the leading edge of a land in one complete turn of a flute.

TAPER REAMERS - (i) *Large end diameter.* The maximum diameter over the tapered cutting edges.

(ii) *Small end diameter.* The minimum diameter over the tapered cutting edges.

TAPER HOLE - Defined for size by stating the large end diameter and the taper per foot on diameter or the included angle of the taper, or as a taper ratio, e.g. 1 in 96 (included).

HELIX ANGLE - The angle between the cutting edge and the reamer axis.

TAPER LEAD ANGLE - The angle formed by the cutting edges of the taper lead and the reamer axis.

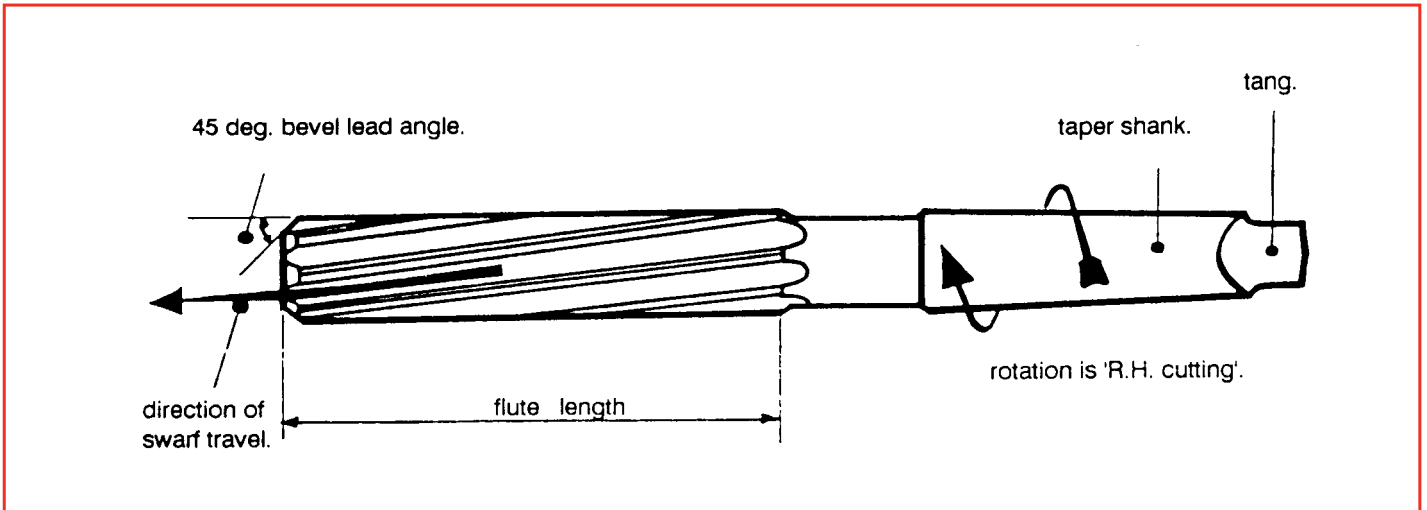
BEVEL LEAD ANGLE - The angle formed by the cutting edges of the bevel lead and the reamer axis.

CLEARANCE ANGLES - The angles formed by the primary or secondary clearance and the tangent to the periphery of the reamer at the cutting edge or behind the circular land. They are called primary clearance angle and secondary clearance angle respectively.

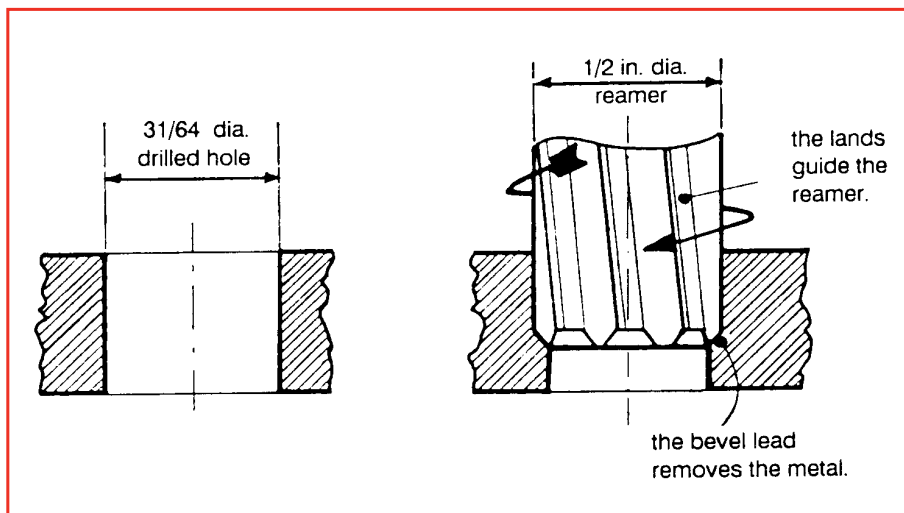
Reamers - Standard Solids

A Reamer is used to finish a pre-drilled hole to a high degree of accuracy and surface finish. It does this by removing a minimum amount of metal from the sides of the hole whilst being rotated in the same direction as a twist drill at a much slower speed than that used for drilling. However, the spiral flutes of a Reamer are the opposite hand to those of a drill. This pushes swarf away from the cutting edge (unlike a drill where the swarf travels up the flutes) in order to ensure that it does not interfere with the high finish produced.

The designation of a standard Reamer is therefore - 'Left hand spiral, Right hand cutting'.



The 45 degree bevel lead at the point of the Machine Reamer shown is the cutting portion of the tool. The lands merely serve to guide and centralise the reamer in the hole produced by the bevel lead.

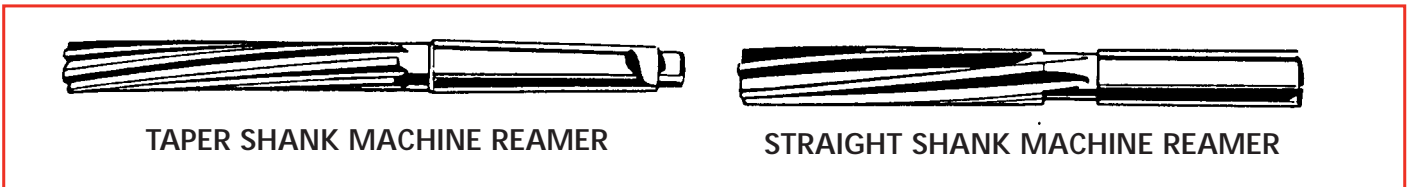


On a point of interest, the accuracy of a reamed hole is indicated by the fact that the total allowable variation (tolerance) on the diameter of a half inch reamer is 0.0003 in. (three ten thousandths of an inch).

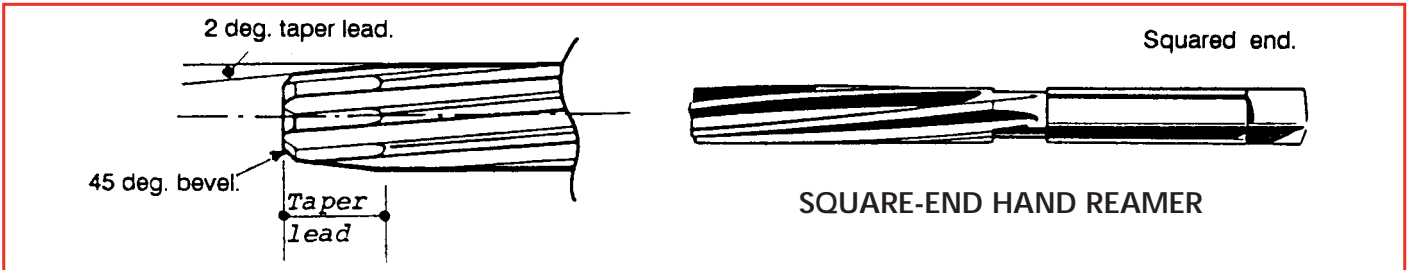
The amount of metal removed by a reamer is critical - if too little the tool will rub rather than cut. Conversely, a Reamer cannot remove metal from a hole whose diameter is less than the inner diameter of the bevel edge, (the cutting edge).

It is important to appreciate the difference between Machine Reamers and Hand Reamers to avoid confusion when dealing with customer enquiries

MACHINE REAMERS have either a Morse Taper or Straight Shank, but are **never** square ended.

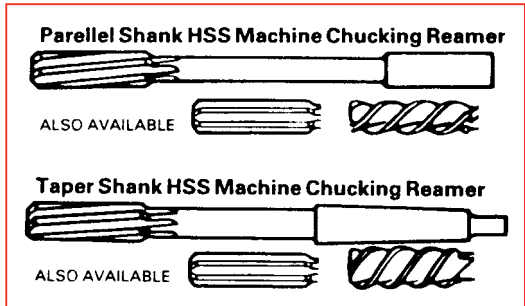


HAND REAMERS always have a square-ended shank for fitting a Tap Wrench. They also have an additional taper lead behind the 45 degree cutting bevel to help the tool centralise itself in the hole if there is any misalignment.



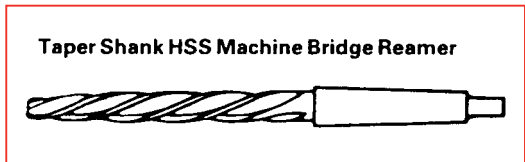
MACHINE CHUCKING REAMERS

Machine Chucking Reamers have short flutes and are designed for use in automatic Machine Tools. They are available in various shank and flute shapes as shown.



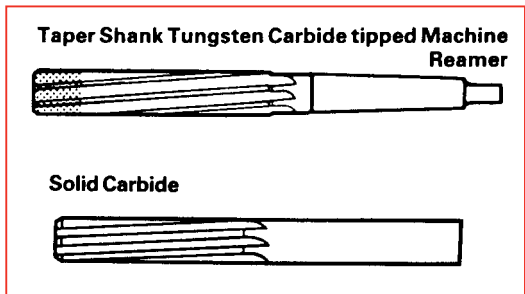
BRIDGE REAMER

Bridge Reamers have a Taper Lead angle of 1 in 10 on diameter. They are used for reaming pairs of holes which may be slightly out of alignment when assembled, such as structural steel components.



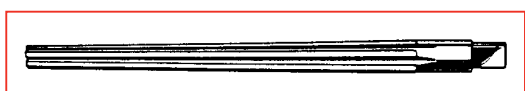
TUNGSTEN CARBIDE TIPPED (TCT) AND SOLID CARBIDE MACHINE REAMERS

The grade of Carbide used on both types of Reamer makes them suitable for general purpose jobs and reaming difficult materials such as Cast Iron and Cupro-Nickels. They can be used at high production rates to give a high surface finish and a long life. It is advisable to consult the manufacturer for advice about specific applications.



HAND TAPER PIN REAMER

Has straight flutes and a taper angle of 1 in 48 (imperial) or 1 in 50 (metric).



Reamers - Re-Grindables and Adjustables

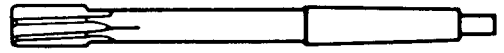
TAPER SHANK REGRINDABLE MACHINE REAMERS (H.S.S. AND T.C.T.)

Regrindable Machine reamers allow a small amount of adjustment to compensate for wear. The body of the reamer can be expanded by turning a centre screw as detailed below.

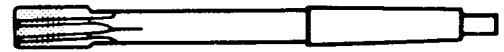
The adjusting screw should never be backed off and any downsizing can only be achieved by grinding.

The amount of allowable expansion for different reamer diameters is shown in the table.

Taper Shank Regrindable HSS Machine Reamer (109m)



Taper Shank Regrindable TCT Machine Reamer (109m)



Method of Adjustment

The appropriate size of socket screw key (or wrench) is inserted in the adjusting screw socket and turned in a clockwise direction until sufficient body expansion is achieved for economical regrinding.

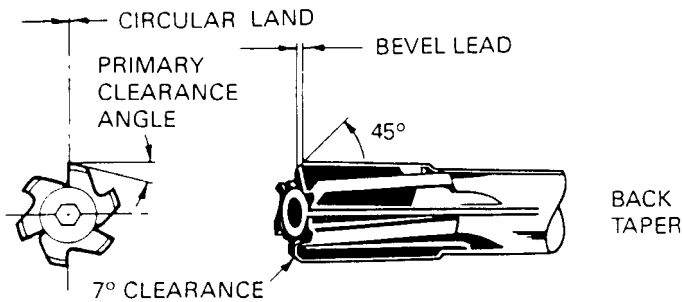
Note that the maximum possible size expansion is stated in the table on the right.

Size check is by any normal method such as micrometer, vernier or gauge.

Circular land width and relief angle for the bevel cutting lead are as normal for a solid reamer of equivalent size. Back taper from the bevel lead should be between 0.0003 and 0.0005 in on diameter per inch of flute length.

The guide lines stated above apply equally to High Speed Steel and tungsten Carbide Tipped reamers with the necessary alteration of relief clearance angles for the TCT type.

It is essential that you should - **only regrind with the adjusting screw tightly secured.**



Expansion:

0.40 mm	from 10 mm up to 25 mm
0.35 mm	from 26 mm up to 38 mm
0.30 mm	from 39 mm up to 50 mm

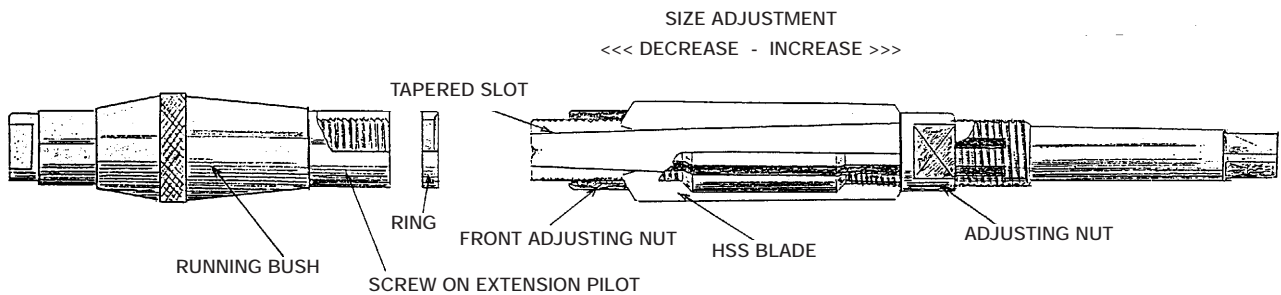
Length of Carbide Tips:

9.50 mm	from 10 mm up to 11 mm
12.70 mm	from 12 mm up to 21 mm
19.00 mm	from 22 mm up to 30 mm
17.40 mm	from 31 up up to 50 mm

It is important to appreciate the difference between a Regrindable Machine Reamer and an Adjustable Hand Reamer to avoid misinterpretation of customer orders, since the former type are sometimes wrongly referred to as 'adjustable reamers'.

Always check whether they are Machine or Hand use.

ADJUSTABLE HAND REAMER



TYPES B33 FERROUS, B47 NON-FERROUS - SIZE RANGE 1/4" to 3-11/32"

Adjustable Hand Reamers are versatile tools each capable of reaming a series of odd sized holes over a limited range of adjustment which goes from about 0.31 in (0.8 mm) in the smaller diameters up to around 0.593 in (15.0 mm) in the larger sizes.

Adjustment is easily done with two screwed collars which raise or lower the cutting blades by moving them along tapered seatings. They are locked in position when the required diameter is reached.

Note that replacement blades are always supplied and fitted as a matched set.

Reamers - Adjustable Floating

A·F Reamers

Adjustable

Inbuilt micrometer adjustment giving infinite sizing within the Reamer range and allowing instant setting to finished size on machine.

Floating

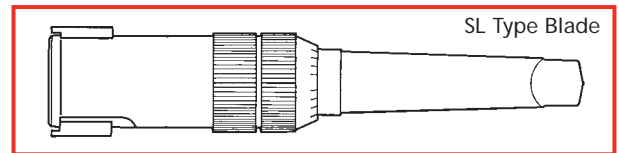
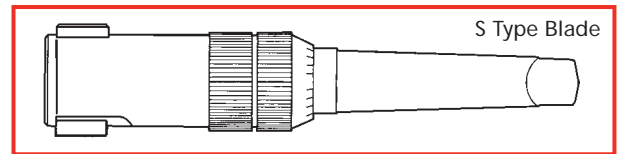
Fully floating blades(HSS/TCT) minimise any misalignment caused by worn machine spindles and poor clamping set up.

The Range

The range of Taylor & Jones A·F Reamers comprising 19 different sizes covering bores from 12.7mm to 101.6mm (1/2" to 4") includes two types, the 'SS' Reamer for sizes from 12.7mm to 19mm (1/2" to 3/4") and the 'S' type from 19mm to 101.6mm (3/4" to 4").

The 'SS' type Reamer has HSS or TCT blades and is suitable for reaming thro' bores.

The 'S' type Reamer also has HSS or TCT blades suitable for reaming thro' bores but can be fitted with 'SL' type L-shaped blades for reaming blind or stepped bores.



Setting and Adjustment

Set the blades to a size approximately 0.02mm (0.0008in) below the required size of bore, using a micrometer. Make a short cut and measure the bore size. Adjust the blade setting using the adjusting dial ring, noting that the direction of rotation is given looking from the shank end.

The adjusting dial ring is graduated to give an overall blade movement of 0.025mm (0.001in) for one increment of graduation.

To increase the blade setting

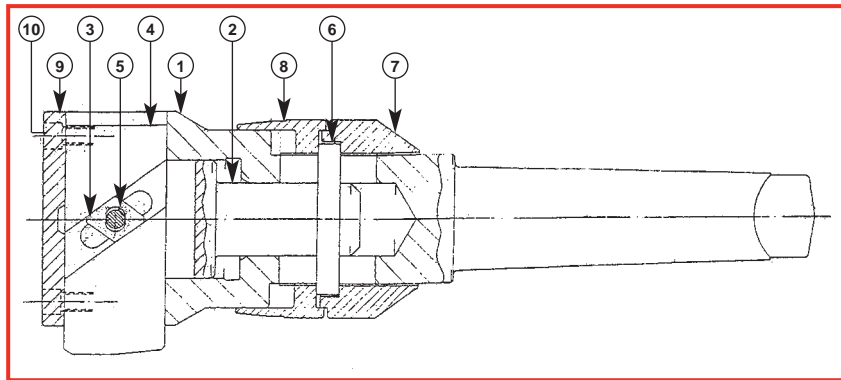
- 1) Rotate the adjusting dial ring anti-clockwise through the number of divisions necessary to make the required adjustment.
- 2) Rotate the adjusting lock ring anti-clockwise until the two rings are firmly locked together.

To decrease the blade setting

- 1) Rotate the adjusting lock ring clockwise to free the adjusting dial ring.
- 2) Rotate the two adjusting rings in a clockwise direction until the adjusting dial ring has moved through the number of divisions necessary to make the required adjustment.
- 3) Rotate the adjusting lock ring anti-clockwise until the two rings are firmly locked together.

A-F Reamers - Component Parts

Section through S Type HSS Reamer



<i>Item</i>	<i>Job No.</i>	<i>Description</i>	<i>No. off</i>
1	217010	Body	1
2	217020	Plunger	1
3	217030	Wedge	1
4	217041	HSS Blade	2
5	217050	Pin	1
6	217060	Key	1
7	217070	Dial Nut	1
8	217080	Lock Nut	1
9	217092	Cap	1
10	217101	Screws	2

Blade Removal

SS Type

- 1) Remove the end cap.
- 2) Cause the plunger to protrude from the body by rotation of the adjusting rings. Continue the rotation until the float limiting pin is clear of the body.
- 3) Press out the float limiting pin and withdraw the blades, complete with rhomboidal key, from the plunger.
- 4) Separate the blades and remove the rhomboidal key.

S and SL Types

- 1) Rotate the adjusting lock ring clockwise and the adjusting dial ring anti-clockwise, looking from the shank end, until there is sufficient space between the two to remove the transverse key.
- 2) Remove the transverse key.
- 3) Remove the end cap.
- 4) Withdraw the blade/plunger assembly.
- 5) Press out the float limiting pin and withdraw the blades, complete with rhomboidal key, from the plunger.
- 6) Separate the blades and remove the rhomboidal key.

To reassemble both types of reamer the procedure used to dismantle is exactly reversed.

Operation

General Reaming Guidelines apply for stock removal and rates of speed and feed. The optimum operating criteria will be found by adjustment to guide valves when taking into account variations in material, machine set up and finish requirements. Extra care should be taken when blind hole reaming using SL reamers.

Reamers - Usage - General Guidelines

The conditions under which reamers are used and the results which are desired vary so widely that it is impossible to set up any guide to cover each possible combination. A few of the variables which affect reamer cutting action are listed below:

1. Speed.
2. Feed
3. Use of guide bushings
4. Material
5. Condition of Machine
6. Rigidity of set-up
7. Rake of cutting edges
8. Clearance of reamer
9. Amount of stock to be removed
10. Finish required
11. Tolerance of hole

GENERAL HINTS ON REAMING

To obtain the best results when using Reamers it is essential to make them 'work'. It is a common fault to prepare holes for reaming with too little stock left in. If insufficient stock is left in the hole before reaming then the Reamer will rub, quickly show wear and will result in loss of diameter. It is equally important for performance not to leave too much stock in the hole.

1. Select the optimum Reamer speeds and feeds for the application. Ensure that pre-drilled holes are the correct diameter.
2. The work piece must be held rigid and the machine spindle should have no play.
3. The chuck in which a straight shank Reamer is held must be good quality. If the Reamer slips in the chuck and the feed is automatic, breakage of the Reamer can follow.
4. When driving a Morse taper shank Reamer into a socket always use a soft faced hammer. Make sure there is a good fit between the Reamer shank and the Sleeve or Socket otherwise misalignment will occur and the Reamer may cut oversize.
5. Use recommended lubricants to enhance the life of the tool and ensure they reach the cutting edge of the Reamer. As reaming is not a heavy cutting operation, soluble oil 40:1 dilution is normally satisfactory; air blasting may be used with grey Cast Iron.
6. Do not allow the Flutes of a Reamer to become choked with Swarf.
7. Before the Reamer is reground, check concentricity between centres. In most instances only the bevel lead will need regrinding.
8. Keep Reamers sharp. Frequent regrinding is good economy, but it is important to understand that Reamers cut only on the bevel and taper leads and not on the lands. Consequently only these leads need regrinding.

PRE-REAMING HOLE SIZE AND FINISH

Drilled hole must be round, free of scoring and of known size.

REAMING ALLOWANCE

The amount of metal to be removed by the Reamer depends on:

1. Application (Hand or Machine).
2. Size of hole.
3. Metal being reamed.

Recommendations:

1. Hand reaming allowance approximately two-thirds machine reaming allowance.
2. On free cutting mild steel, machine reaming allowance guide:
 - Holes up to 6 mm dia, use up to 0.2mm
 - Holes over 6mm dia up to 12 mm dia, use from 0.2 mm to 0.3 mm
 - Holes over 12 mm dia up to 25 mm dia, use from 0.3 mm to 0.5 mm
 - Holes over 25 mm dia, use from 0.4 mm to 0.8 mm
3. Usually the more difficult the metal being reamed the smaller the reaming allowance.

SPEEDS AND FEEDS

General practice is to use half drilling speeds and double the feeds used for drilling as a starting point.

RESHARPENING

Must be done by skilled personnel on the proper machine tools - on no account must free-hand grinding be done; when regrinding is done remember that the lead performs the cutting action - for lands and clearances reproduce those on a new reamer of the same size.

Speeds and Feeds for Reamers

Material	Speed = V Feed = s Revolution = n	Nominal Reamer Diameter in mm								
		5	8	10	15	20	25	30	40	50
Steel up to 700 N/mm ²	V = m/min s = mm/U n = U/min	8-12 0,10 700	8-12 0,15 500	8-12 0,20 400	8-12 0,25 250	8-12 0,30 200	8-12 0,30 160	8-12 0,35 125	8-12 0,40 90	8-12 0,50 80
Steel 700 to 900 N/mm ²	V = m/min s = mm/U n = U/min	6-8 0,10 500	6-8 0,15 400	6-8 0,20 350	6-8 0,25 220	6-8 0,30 160	6-8 0,30 125	6-8 0,35 90	6-8 0,40 80	6-8 0,50 65
Steel > 900 N/mm ²	V = m/min s = mm/U n = U/min	4-6 0,08 400	4-6 0,10 300	4-6 0,15 250	4-6 0,20 160	4-6 0,25 125	4-6 0,25 100	4-6 0,30 80	4-6 0,35 65	4-6 0,40 50
Cast Steel up to 900 N/mm ²	V = m/min s = mm/U n = U/min	4-6 0,08 400	4-6 0,10 300	4-6 0,15 250	4-6 0,20 160	4-6 0,25 125	4-6 0,25 100	4-6 0,30 80	4-6 0,35 65	4-6 0,40 50
Cast Steel > 900 N/mm ²	V = m/min s = mm/U n = U/min	2-4 0,06 250	2-4 0,10 180	2-4 0,15 125	2-4 0,20 80	2-4 0,25 65	2-4 0,25 50	2-4 0,30 40	2-4 0,32 32	2-4 0,40 25
Grey Cast Iron Malleable Cast Iron up to 200 HB	V = m/min s = mm/U n = U/min	6-10 0,15 600	6-10 0,20 450	6-10 0,25 375	6-10 0,30 230	6-10 0,32 180	6-10 0,40 140	6-10 0,50 100	6-10 0,60 80	6-10 0,70 65
Grey Cast Iron Malleable Cast Iron > 200 HB	V = m/min s = mm/U n = U/min	4-6 0,10 400	4-6 0,15 300	4-6 0,20 250	4-6 0,25 160	4-6 0,25 125	4-6 0,32 100	4-6 0,40 80	4-6 0,50 65	4-6 0,60 50
Copper	V = m/min s = mm/U n = U/min	8-12 0,15 700	8-12 0,20 500	8-12 0,20 400	8-12 0,25 250	8-12 0,30 200	8-12 0,32 160	8-12 0,35 125	8-12 0,40 90	8-12 0,50 80
Brass Short Chipping	V = m/min s = mm/U n = U/min	14-20 0,20 1000	14-20 0,25 800	14-20 0,30 500	14-20 0,35 300	14-20 0,40 250	14-20 0,40 200	14-20 0,45 180	14-20 0,50 125	14-20 0,60 90
Brass Long Chipping	V = m/min s = mm/U n = U/min	8-12 0,15 700	8-12 0,20 500	8-12 0,25 400	8-12 0,30 250	8-12 0,35 200	8-12 0,35 160	8-12 0,40 125	8-12 0,45 90	8-12 0,50 80
Titanium Alloys	V = m/min s = mm/U n = U/min	4-6 0,06 400	4-6 0,10 300	4-6 0,15 250	4-6 0,18 160	4-6 0,20 125	4-6 0,25 100	4-6 0,30 80	4-6 0,32 65	4-6 0,40 50
Aluminium Alloys	V = m/min s = mm/U n = U/min	14-20 0,15 1000	14-20 0,18 800	14-20 0,20 500	14-20 0,25 300	14-20 0,30 250	14-20 0,30 200	14-20 0,35 180	14-20 0,40 125	14-20 0,40 90
Aluminium Alloys High Silicon	V = m/min s = mm/U n = U/min	8-12 0,15 700	8-12 0,18 500	8-12 0,20 400	8-12 0,25 250	8-12 0,30 200	8-12 0,30 160	8-12 0,35 125	8-12 0,40 90	8-12 0,40 80
Duroplastic	V = m/min s = mm/U n = U/min	4-6 0,20 400	4-6 0,25 300	4-6 0,30 250	4-6 0,35 160	4-6 0,40 125	4-6 0,45 100	4-6 0,45 80	4-6 0,50 65	4-6 0,50 50
Thermoplastic	V = m/min s = mm/U n = U/min	6-10 0,25 600	6-10 0,30 450	6-10 0,35 375	6-10 0,40 230	6-10 0,45 180	6-10 0,50 140	6-10 0,55 100	6-10 0,60 80	6-10 0,60 65

The following notes are a few factors which could lead to poor finish and loss of tool life.

Poor Rigidity of Workpiece resulting in chatter, poor finish and loss of cutting edge

Worn Machine Spindle resulting in Bell mouthed, or mis-aligned holes

Incorrect Lubricant resulting in bad cutting action, poor finish and loss of tool life

Incorrect Feeds & Speeds resulting in poor finish, work hardening of materials, glazing in the bore and loss of tool life

Mis-alignment of Workpiece resulting in oversized and bell mouthed holes due to uneven tooth loading

Insufficient Material left in Bore resulting in burnishing action rather than correct cutting giving undersized holes and loss of tool life

Reamers - Manufacturing Tolerances

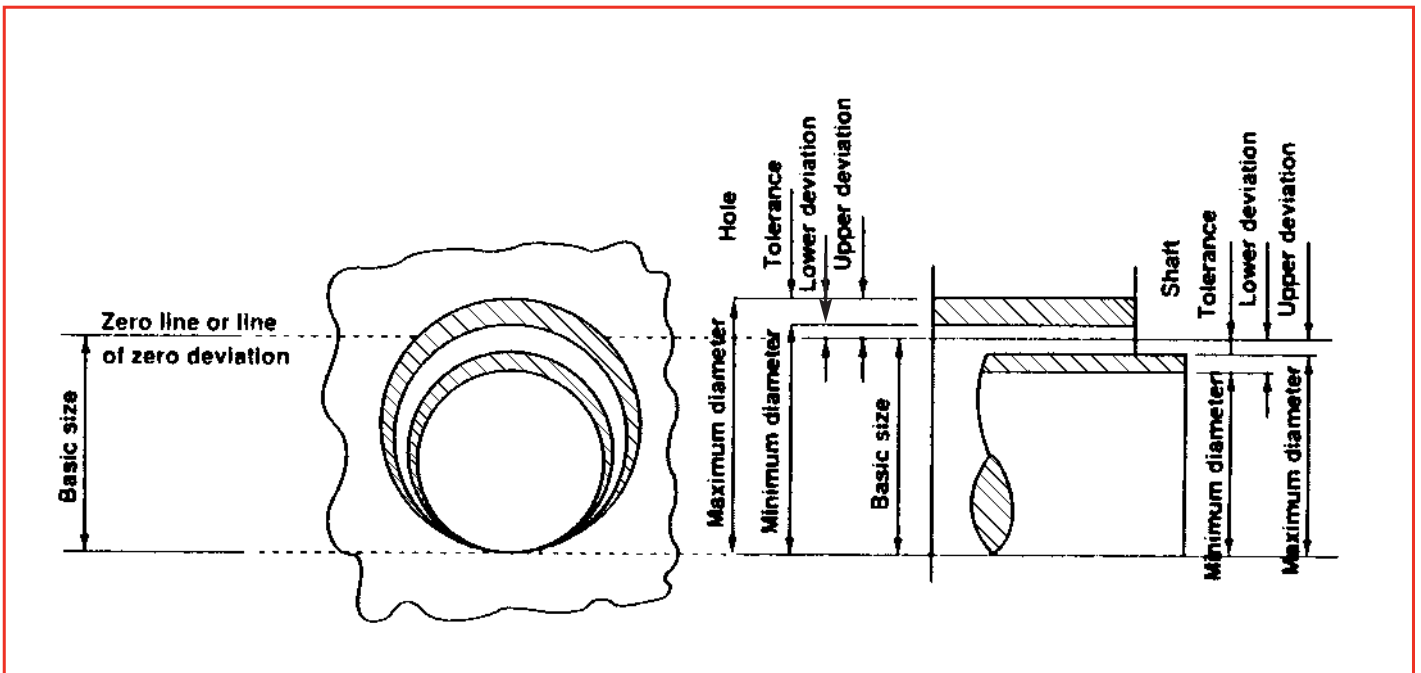
DEFINITION

The Oxford dictionary defines tolerance as willingness to tolerate, forbearance, capacity to tolerate. However, in engineering terms the word tolerance refers to the permissible fundamental deviation in the measurement of a workpiece when applied to the physical dimensions, be it width, breadth or diameter. (Quite a mouthful). When you consider the complex combination of the various options which may be applied to the matching parts of two components it can be confusing to say the least and it is hoped the following will assist in the better understanding of the system of tolerances.

With very little exception the limits we encounter in the cutting tool industry apply to either a hole or a shaft, these are defined by the use of both capital letters and lower case letters, i.e. if a tolerance number is prefixed by a capital letter this signifies a hole tolerance, a small prefix letter conversely refers to a shaft tolerance.

Capital letter = Hole
Small letter = Shaft

By the selection of a combination of tolerances it is possible to determine the interaction between a shaft and a hole. The various combinations have given rise to numerous engineering terms such as force fit, push fit, running fit, interference fit etc.



The degree of deviation as in table 1 remains constant for any given IT number only the letters change the position of placement (ie at 12.00mm IT7 deviation is 0.018mm; H7 tolerance is 12.00mm + 0.018 + .000mm but F7 is 12.00mm + 0.034 + 0.016mm). Tolerances which have either two pluses or two minuses are "unilateral" and tolerances with both plus and minus qualities are "bilateral". To put tolerances into perspective a typical 25mm hole to a H7 tolerance would have a total tolerance of 0.021mm, only half the thickness of the average human hair!

Nominal Sizes mm		Tolerance Grades																	
Over	Up to and including	IT 01	IT 0	IT 1	IT 2	IT 3	IT 4	IT 5	IT 6	IT 7	IT 8	IT 9	IT 10	IT 11	IT 12	IT 13	IT 14	IT 15	IT 16
3	3	0.3	0.5	0.8	1.2	2	3	4	6	10	14	25	40	60	100	140	250	400	600
	6	0.4	0.6	1	1.5	2.5	4	5	8	12	18	30	48	75	120	180	300	480	750
6	10	0.4	0.6	1	1.5	2.5	4	6	9	15	22	36	58	90	150	220	360	580	900
10	18	0.5	0.8	1.2	2	3	5	8	11	18	27	43	70	110	180	270	430	700	1100
18	30	0.6	1	1.5	2.5	4	6	9	13	21	33	52	84	130	210	330	520	840	1300
30	50	0.6	1	1.5	2.5	4	7	11	16	25	39	62	100	160	250	390	620	1000	1600
50	80	0.8	1.2	2	3	5	8	13	19	30	46	74	120	190	300	460	740	1200	1900

DEVIATIONS IN MICROMETRES

TOLERANCE FACTORS IN RELATION TO HOLE FINISHES

The ever increasing demand for Reamers to produce hole tolerances rather than a specific reamer tolerance transfers the onus from the user to the supplier when making tool requests, however when placing orders it is important to consider the established fact that it is not possible to predict in advance the exact sized hole a reamer will produce. The only known factor is the size of the tooling to be used in the operation, as the material being cut, reaming allowance, speeds and feeds, jigs and machine set-up are all variables and can each cause a different result. In order to give maximum versatility for the majority of standard engineering requirements our tooling is manufactured to the appropriate standard relevant to the type of reamer, which in the case of Hand and Machine Reamers will be satisfactory to produce H7 holes in most materials under optimum machining conditions.

Tolerance Limits

1. ON THE CUTTING DIAMETER OF STANDARD REAMERS

The diameter is measured across the circular lands immediately behind the bevel or taper lead. The tolerance is in accordance with DIN 1420 and is intended to produce H7 holes.

MILLIMETRES			
Diameter		Tolerance Limit	
Over	Up to and including	High +	Low +
	3	0.008	0.004
3	6	0.010	0.005
6	10	0.012	0.006
10	18	0.015	0.008
18	30	0.017	0.009
30	50	0.021	0.012
50	80	0.025	0.014
80	120	0.029	0.016

2. ON A H7 HOLE

MILLIMETRES			
Diameter		Tolerance Limit	
Over	Up to and including	High +	Low +
	3	0.010	0
3	6	0.012	0
6	10	0.015	0
10	18	0.018	0
18	30	0.021	0
30	50	0.025	0
50	80	0.030	0
80	120	0.035	0

3. When it is necessary to define the dimensions of a special reamer, which is intended to cut to a specific tolerance, eg. H8, this well proven guide can be used.

Example of a 10mm hole with tolerance H8.
 Maximum diameter of hole = 10.022
 Minimum diameter of hole = 10.000
 Hole tolerance (IT8) = 0.022

The maximum limit for the reamer is the maximum limit of the hole size reduced by 0.15 times the tolerance for the hole. The value is rounded up to the next higher multiple of 0.001mm.

0.15 x Hole tolerance (IT8) = 0.0033
 Rounded up = 0.004

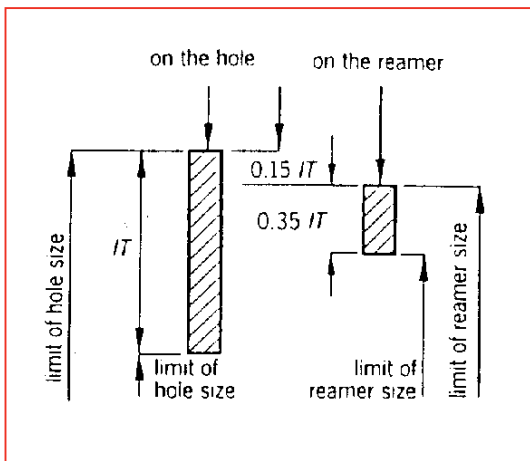
The minimum limit for the reamer is the maximum limit of the reamer reduced by 0.35 times the tolerance for the hole. The value is rounded up to the next higher multiple of 0.001mm.

0.35 x Hole tolerance (IT8) = 0.0077
 Rounded up = 0.008

Maximum limit for reamer = 10.022 - 0.004 = 10.018

Minimum limit for reamer = 10.018 - 0.008 = 10.010

A similar method can be used for other tolerances when required.



USEFUL TOLERANCES

Tol.	MILLIMETRES							
	from 1 to 3	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30	over 30 to 50	over 50 to 80	over 80 to 120
e8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89	-60 -106	-72 -126
f6	-6 -12	-10 -18	-13 -22	-16 -27	-20 -33	-25 -41	-30 -49	-36 -58
f7	-6 -16	-10 -22	-13 -28	-16 -34	-20 -41	-25 -50	-30 -60	-36 -71
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16	0 -19	0 -22
h7	0 -10	0 -12	0 -15	0 -18	0 -21	0 -25	0 -30	0 -35
h8	0 -14	0 -18	0 -22	0 -27	0 -33	0 -39	0 -46	0 -54
h9	0 -25	0 -30	0 -36	0 -43	0 -52	0 -62	0 -74	0 -87
h11	0 -60	0 -75	0 -90	0 -110	0 -130	0 -160	0 -190	0 -220
h12	0 -100	0 -120	0 -150	0 -180	0 -210	0 -250	0 -300	0 -350
js14	+125 -125	+150 -150	+180 -180	+215 -215	+260 -260	+310 -310	+370 -370	+435 -435
js16	+300 -300	+375 -375	+450 -450	+550 -550	+650 -650	+800 -800	+950 -950	+1100 -1100
H7	+10 0	+12 0	+15 0	+18 0	+21 0	+25 0	+30 0	+35 0
H8	+14 0	+18 0	+22 0	+27 0	+33 0	+39 0	+46 0	+54 0
H9	+25 0	+30 0	+36 0	+43 0	+52 0	+62 0	+74 0	+87 0
H12	+100 0	+120 0	+150 0	+180 0	+210 0	+250 0	+300 0	+350 0
P9	-6 -31	-12 -42	-15 -51	-18 -61	-22 -74	-26 -88	-32 -106	-37 -124

DEVIATIONS IN MICROMETRES

Remember a reamer is a precision tool and its successful use depends as much on the machinery and operative as the tool itself.