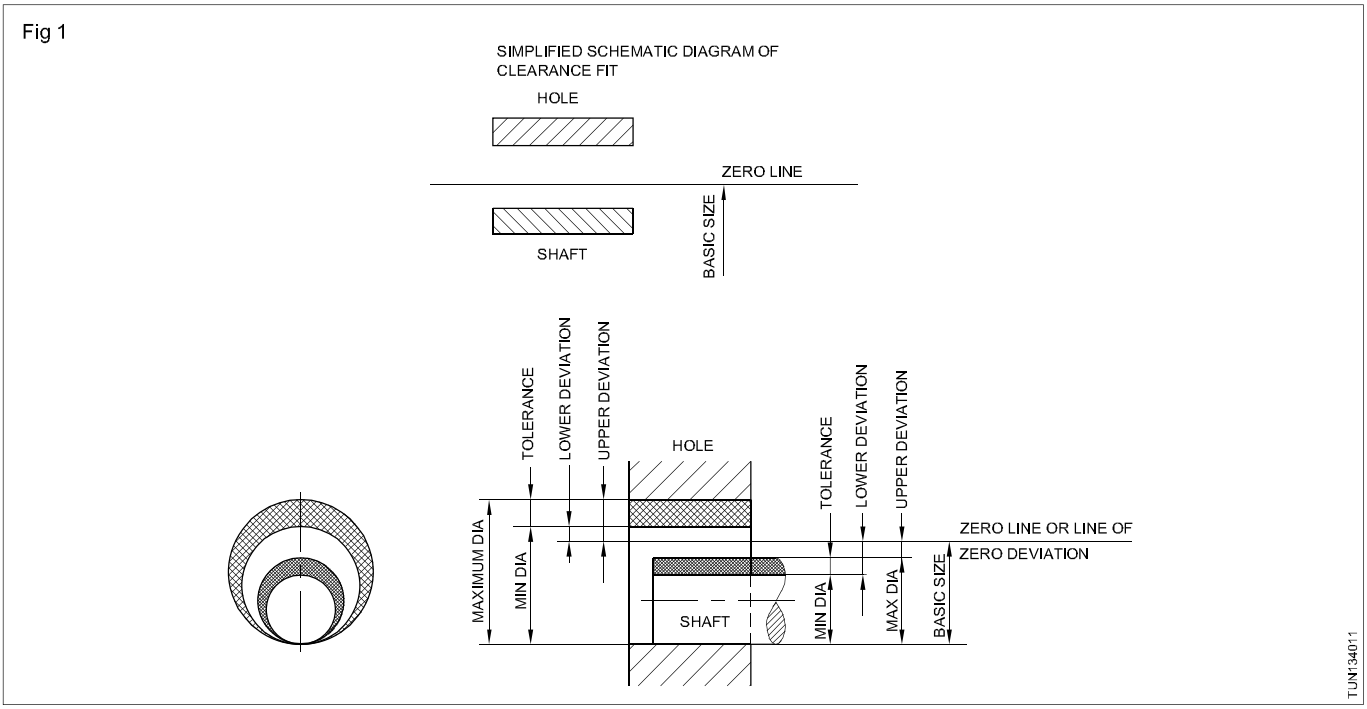
Fig 1



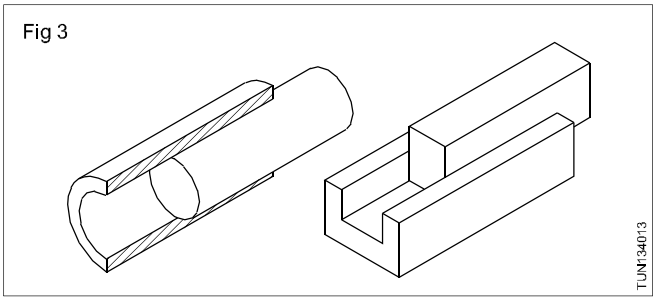
Hole

In the BIS system of limits & fits, all internal features of a component including those which are not cylindrical are designated as * hole'. (Fig 3)

Shaft

In the BIS system of limits & fits, all external features of a component including those which are not cylindrical are designated as shaft. (Fig 3)

Fig 3



Deviation

It is the algebraic difference between a size, to its corresponding basic size. It may be positive, negative or zero. (Fig 2)

Upper deviation

It is the algebraic difference between the maximum limit of size and its corresponding basic size. (Fig 2) (Table 1)

Lower deviation

It is the algebraic difference between the minimum limit of size and its corresponding basic size. (Fig 2) (Table 1)

Upper deviation is the deviation which gives the maximum limit of size. Lower deviation is the deviation which gives the minimum limit of size.

TABLE 1 (Examples)

Sl. No.	Size of Components	Upper Deviation	Lower Deviation	Max-Limit of Size	Min-Limit of Size
1	$20.00^{+0.008}_{-0.005}$	+0.008	- 0.005	20.008	19.995
2	$20.00^{+0.028}_{+0.007}$	+0.028	+0.007	20.028	20.007
3	$20.00^{-0.012}_{-0.021}$	-0.012	-0.021	19.988	19.979

Actual deviation

It is the algebraic difference between the actual size and its corresponding basic size. (Fig 2)

Tolerance

It is the difference between the maximum limit of size and the minimum limit of size. It is always positive and is expressed only as a number without a sign. (Fig 2)

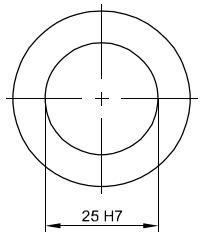
Zero line

In graphical representation of the above terms, the zero line represents the basic size. This line is also called as the line of zero deviation. (Figs 1 and 2).

Fundamental deviation

There are 25 fundamental deviations in the BIS system represented by letter symbols (capital letters for holes and small letters for shafts), i.e for holes - ABCD....Z excluding I,L,O,Q & W. (Fig 4)

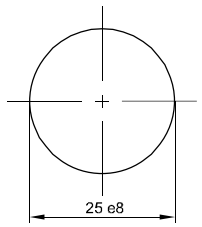
Fig 4



In addition to the above, four sets of letters JS, ZA, ZB & ZC are included. For fine mechanisms CD, EF and FG are added. (Ref.IS:919 Part II -1979)

For shafts, the same 25 letter symbols but in small letters are used. (Fig 5)

Fig 5



The position of tolerance zone with respect to the zero line is shown in Figs 6 and 7.

Fundamental tolerance

This is also called as 'grade of tolerance'. In the Indian Standard System, there are 18 grades of tolerances represented by number symbols, both for hole and shaft, denoted as IT01, IT0, IT1....to IT16. (Fig 8) A high number gives a large tolerance zone.

The grade of tolerance refers to the accuracy of manufacture.

Fig 6

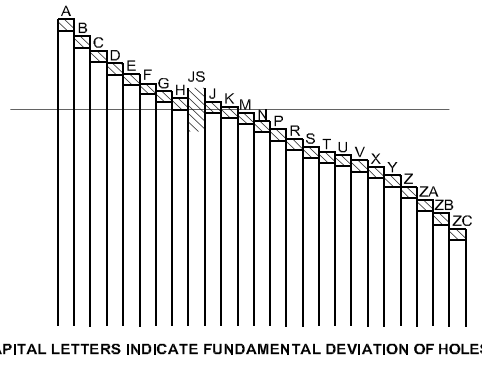


Fig 7

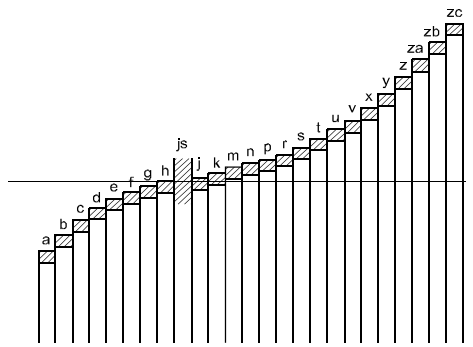
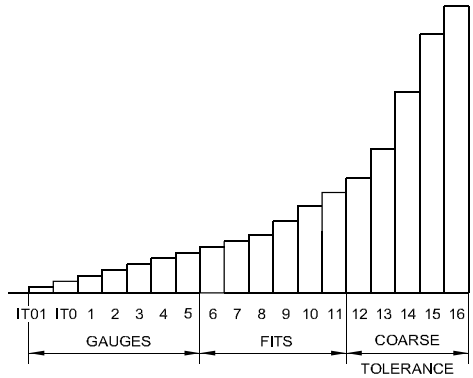


Fig 8



In a standard chart, the upper and lower deviations for each combination of fundamental deviation and fundamental tolerance are indicated for sizes ranging up to 500 mm. (Refer to IS 919)

Toleranced size

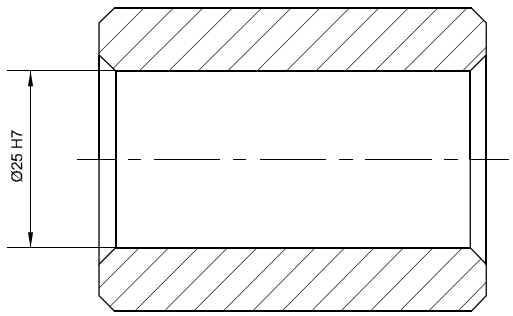
This includes the basic size, the fundamental deviation and the grade of tolerance.

Example

25 H7 - toleranced size of a hole whose basic size is 25. The fundamental deviation is represented by the letter symbol H and the grade of tolerance is represented by the number symbol 7. (Fig 9)

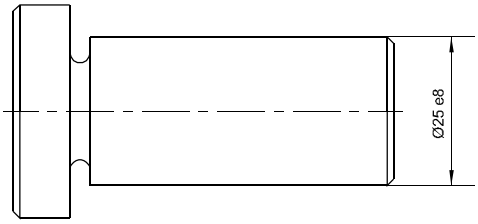
25 e8 - is the toleranced size of a shaft whose basic size is 25. The fundamental deviation is represented by the letter symbol 'e' and the grade of tolerance is represented by the number 8. (Fig 10)

Fig 9



TUN13401B

Fig 10



TUN13401A

A very wide range of selection can be made by the combination of the 25 fundamental deviations and 18 grades of tolerances.

Example

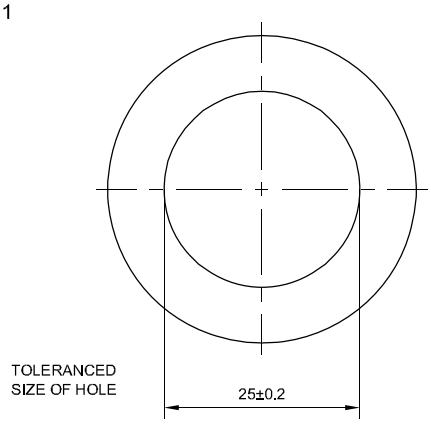
In figure 13, a hole is shown as 25 ± 0.2 which means that 25 mm is the basic dimension and ± 0.2 is the deviation.

As pointed out earlier, the permissible variation from the basic dimension is called 'DEVIATION'.

The deviation is mostly given on the drawing with the dimensions.

In the example 25 ± 0.2, ± 0.2 is the deviation of the hole of 25 mm, diameter. (Fig 11) This means that the hole is of acceptable size if its dimension is between.

Fig 11



TUN13401B

25 + 0.2 = 25.2 mm

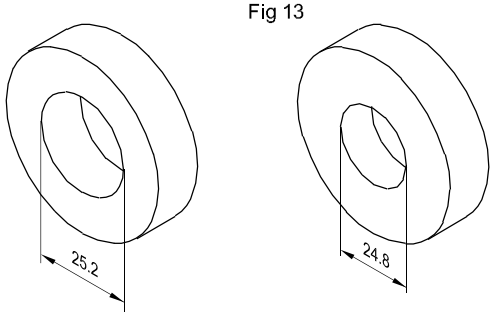
or 25 - 0.2 = 24.8 mm.

25.2 mm is known as the maximum limit. (Fig 12)

24.8 mm is known as the minimum limit. (Fig 13)

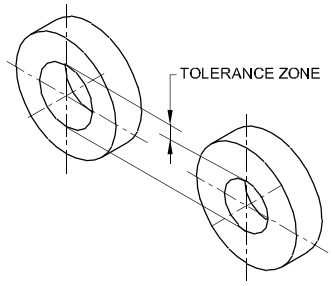
The difference between the maximum and minimum limits is the TOLERANCE. Tolerance here is 0.4 mm (Fig 14)

Fig 12 Fig 13



TUN13401C

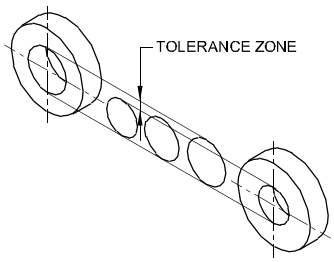
Fig 14



TUN13401E

All dimensions of the hole within the tolerance zone are of acceptable size as in Fig 15.

Fig 15



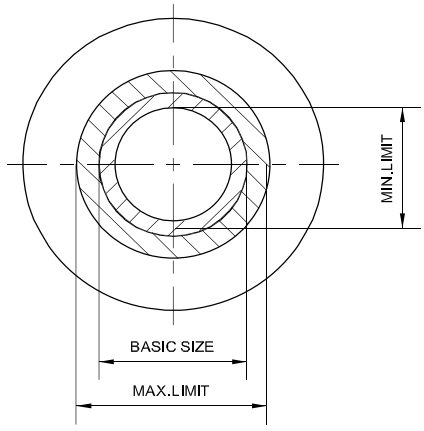
TUN13401F

As per IS 919, while dimensioning the components as a drawing convention, the deviations are expressed as tolerances.

Unilateral & bilateral system

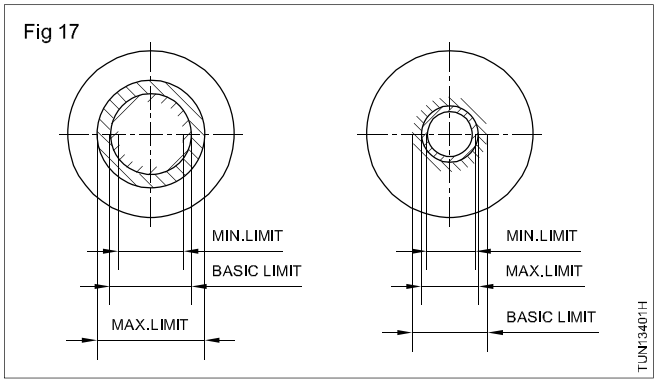
When the deviations given for a particular combination of the symbols are positive and negative so as to give the maximum limit more than the basic size and the minimum limit less than the basic size, then we call it bilateral tolerancing. (Fig 16) If the deviations have only positive

Fig 16



TUN13401G

or negative values and have both the maximum limit and minimum limit more than the basic size or less than the basic size respectively, then it is called unilateral tolerancing. (Fig 17)



Fits and their classification as per the indian standard IS : 919

Fit

It is the relationship that exists between two mating parts, a hole and a shaft, with respect to their dimensional differences before assembly.

Expression of a fit

A fit is expressed by writing the basic size of the fit first, (the basic size which is common to both the hole and the shaft,) followed by the symbol for the hole, and by the symbol for the shaft.

Example

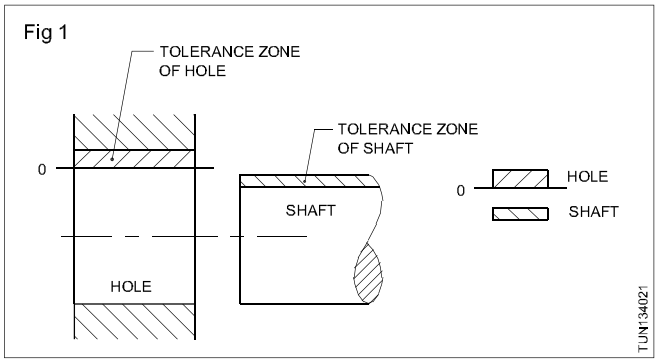
30 H7/g6 or 30 H7 - g6 or 30 H7/g6

Clearance

In a fit the clearance is the different between the size of the hole and the size of the shaft which is always positive.

Clearance fit

It is a fit which always provides clearance. Here the tolerance zone of the hole will be above the tolerance zone of the shaft. (Fig 1)



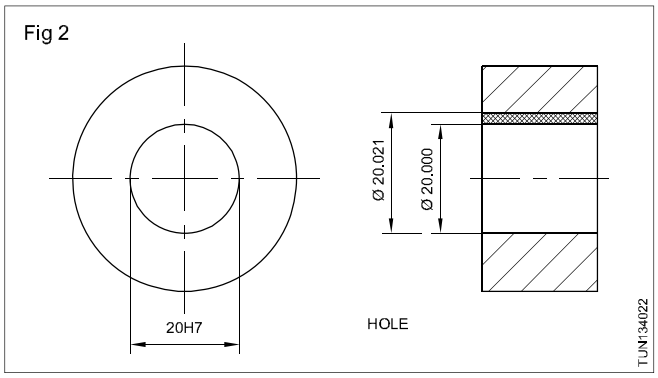
Example 20 H7/g6

With the fit given, we can find the deviations from the chart.

For a hole 20 H7 we find in the table + 21.

These numbers indicate the deviations in microns. (1 micrometre = 0.001 mm)

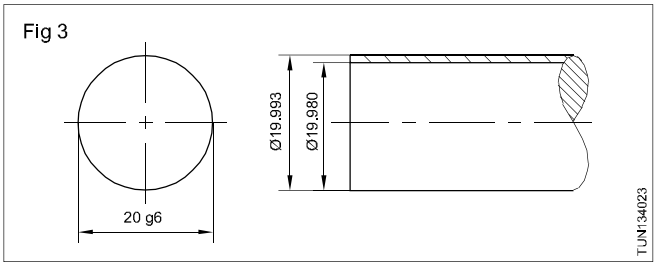
The limits of the hole are 20 + 0.021 = 20.021 mm and 20.000 + 0 = 20.000mm. (Fig 2)



For a shaft 20 g6 we find in the table - 7

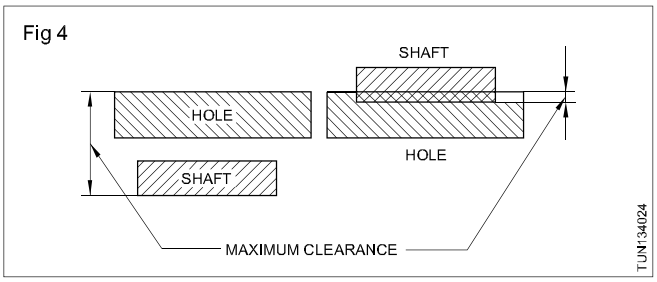
- 20.

So the limits of the shaft are 20-0.007 =19.993 mm and 20 - 0.020 =19.980mm.(Fig 3)



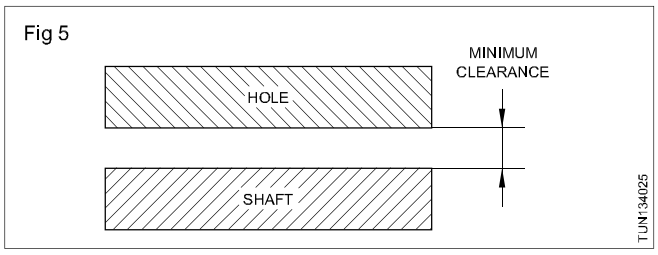
Maximum clearance

In a. clearance fit or transition fit, it is the difference between the maximum hole and minimum shaft. (Fig 4)



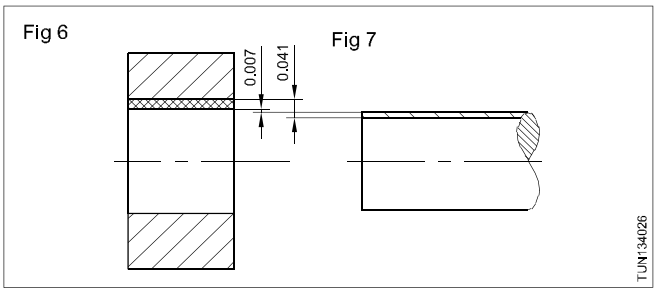
Minimum Clearance

In a clearance fit, it is the difference between the minimum hole and the maximum shaft. (Fig 5)



The minimum clearance is 20.000 -19.993 = 0.007mm. (Fig 6)

The maximum clearance is 20.021 -19.980 = 0.041 mm. (Fig 7)



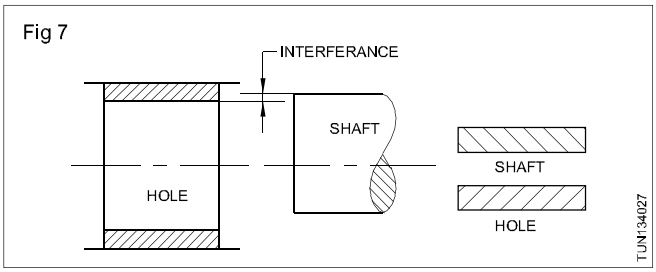
There is always a clearance between the hole and the shaft. This is the clearance fit.

Interference

It is the difference between the size of the hole and the shaft before assembly, and this is negative. In this case, the shaft is always larger than the hole size.

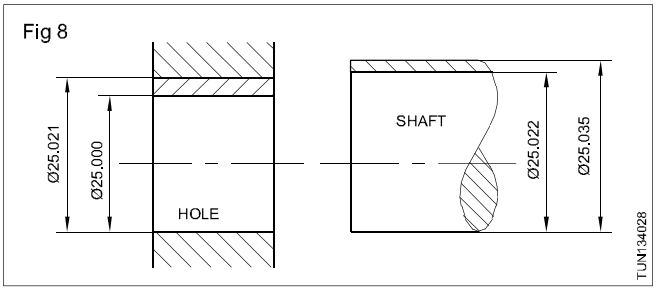
Interference Fit

It is a fit which always provides interference. Here the tolerance zone of the hole will be below the tolerance zone of the shaft. (Fig 8)



Example Fit 25H7/p6 (Fig 9)

The limits of hole are 25.000 and 25.021 mm and the limits of the shaft 25.022 and 25.035 mm. The shaft is always bigger than the hole. This is an interference fit.

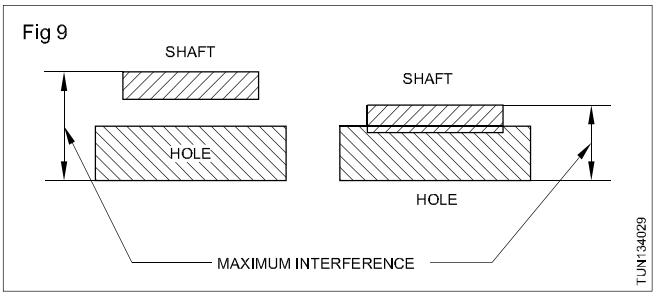


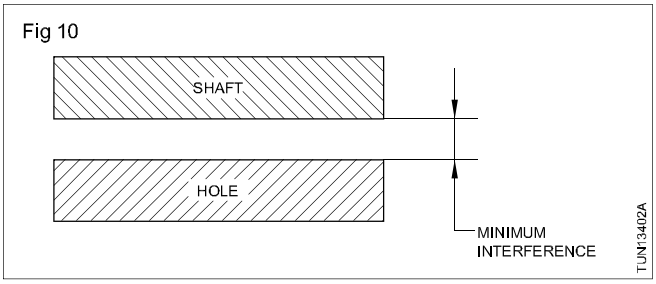
Maximum interference

In an interference fit or transition fit, it is the algebraic difference between the minimum hole and the maximum shaft. (Fig 10)

Minimum interference

In an interference fit, it is the algebraic difference between the maximum hole and the minimum shaft. (Fig 11)





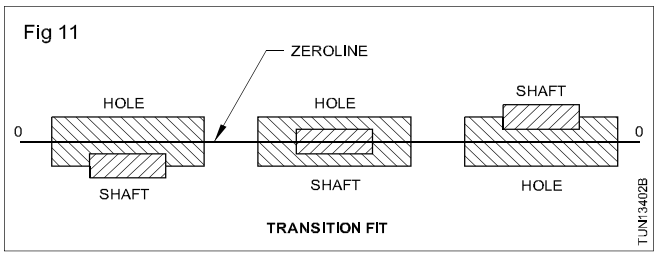
In the example shown in figure 9

The maximum interference is = 25.035 - 25.000
= 0.035

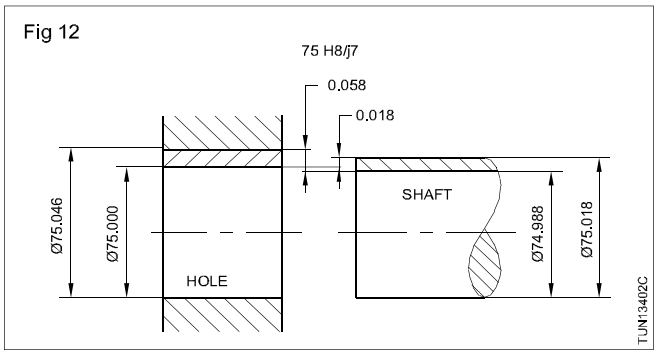
The minimum interference is = 25.022 - 25.021
= 0.001

Transition fit

It is a fit which may sometimes provide clearance, and sometimes interference. When this class of fit is represented graphically, the tolerance zones of the hole and shaft will overlap each other. (Fig 12)



Example Fit 75 H8/j7 (Fig 13)



The limits of the hole are 75.000 and 75.046 mm and those of the shaft are 75.018 and 74.988 mm.

Maximum Clearance = 75.046 - 74.988 = 0.058 mm.

If the hole is 75.000 and the shaft 75.018 mm, the shaft is 0.018 mm, bigger than the hole. This results in interference. This is a transition fit because it can result in a clearance fit or an interference fit.

Symbols for holes, shaft, hole basis & shaft basis system, representation of tolerance in drawings

Objectives : At the end of this lesson you shall be able to
- **learn the symbols for hole & shaft**
- **understand Hole Basis system & its importance Shaft Basis system**
- **read the tolerance limits shown in the drawing**
- **identify the tolerance limits from the symbols shown in the drawing.**

Introduction

In the Engineering manufacturing process, it is difficult to produce components to the exact size, as indicated in the drawing. Particularly in mass production there is bound to be certain variations in dimensions between each component. Such variations do occur due to machine inaccuracy, lack of skill of the operator, method adopted etc., Hence certain variations, over the specified sizes (Nomonal size) in the drawing has to be allowed in practice. These permitted variations are called tolerance.

In Engineering assemblies, tolerance has to be provided for both male (shaft) and female (hole) parts. The permissible tolerance are based on the exact applications and is given IS:919 standard in the form of tables. The permissible tolerance varies with the size of the part for each grade. Higher the size of component, higher the tolerance permitted. The above standard gives tolerance for each grade from 0 to 500 mm nominal size.

Symbols for Holes/Shafts

The tolerance has two limits, the upper limit and lower limit. The upper limit is represented as Es/ls indicating Ecart Superior and the lower limites represented Ei/e. Ecart Inferior.

These tolerances are applicable separately for Shafts and Holes. To distinguish the permissible tolerance for shaft and hole, the Indian standards IS:919 given the symbols as detailed below.

Shafts (external features of a component) e

Holes (Internal features of a component) E

eg. ø 25g represents dia 25 shaft of h grade

ø 50H rerpesents HOle 50 of H grade

There are 25 grades of tolerance (fundamental deviations) form A grade to Z grade Holes and also tolerances of a to z grade shafts are indicated in the Standard.

The table for tolerance for shafts for all grades for sizes 0 to 6500 mm (nominal size) is given separately, so also for the Holes. In order to find the tolerance limits, select the horizontal row pertaining to the size of component and vertical column (the grade & upper limit/lower limit)

NSDC founded in 2008, with HQ ND was set a Public, Private partnership Co. in order to create and fund vocational training instructions & create support system for skill development.

Intersecting gives the two limits of tolerance for the components.

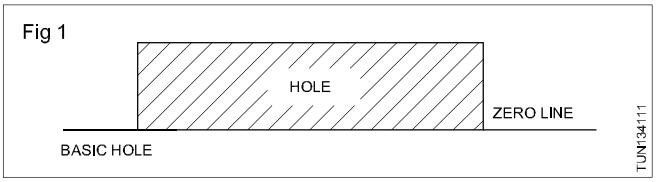
Hole Basis/shaft Basis system

Hole basis system

In a standard system of limits and fits, where the size of the hole is kept constant and the size of the shaft is varied to get the different class of fits, then it is known as the hole basis system.

The fundamental deviation symbol 'H' is chosen for the holes, when the hole basis system is followed. This is because the lower deviation of the hole 'H' is zero. It is known as "basic hole'. (Fig 1)

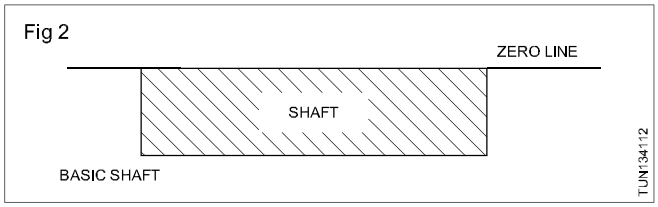
Fig 1



Shaft basis system

In a standard system of limits and fits, where the size of the shaft is kept constant and the variations are given to the hole for obtaining different class of fits, then it is known as shaft basis. The fundamental deviation symbol 'h' is chosen for the shaft when the shaft basis is followed. This is because the upper deviation of the shaft "h" is zero. It is known as basic shaft'. (Fig 2)

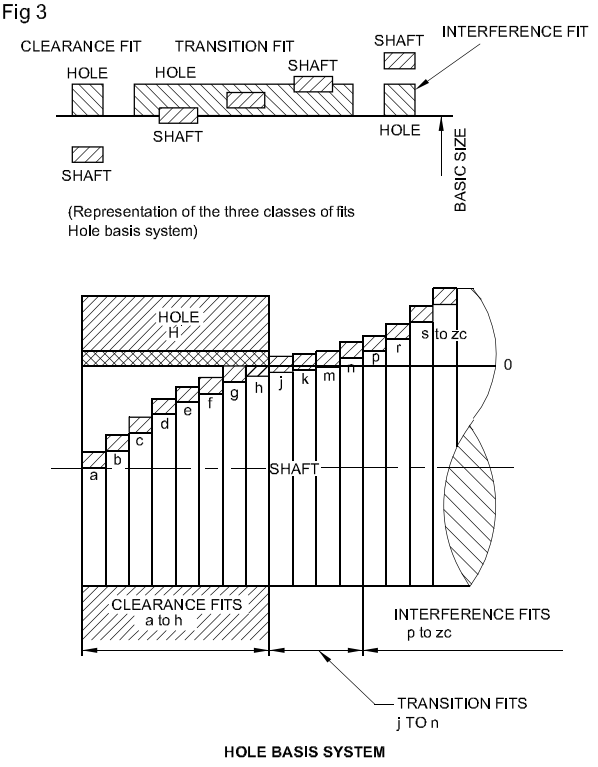
Fig 2



The hole basis system is followed mostly. This is be-cause, depending upon the class of fit, it will be always easier to alter the size of the shaft because it is external, but it is difficult to do minor alterations to a hole. Moreover the hole can be produced by using standard toolings.

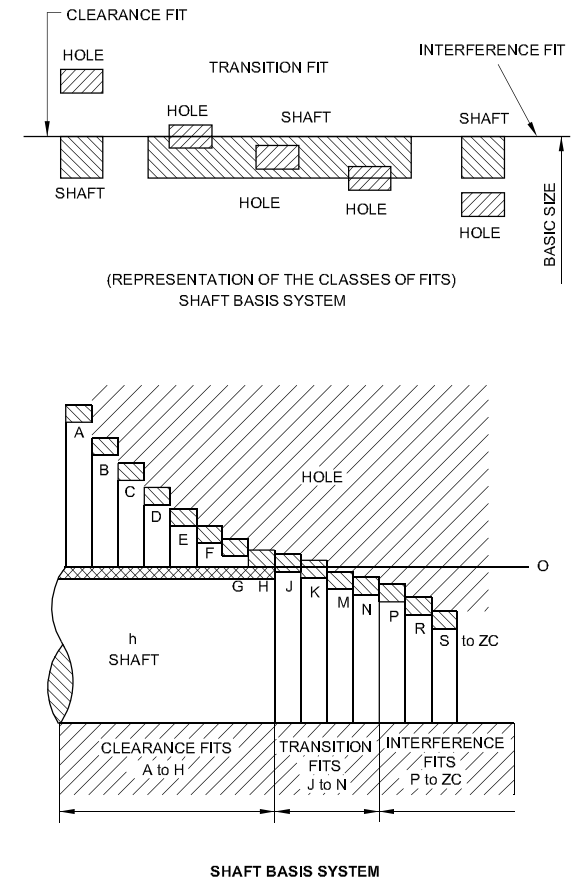
The three classes of fits, both under hole basis and shaft basis, are illustrated in Fig 3 & 4.

Fig 3



HOLE BASIS SYSTEM

Fig 4

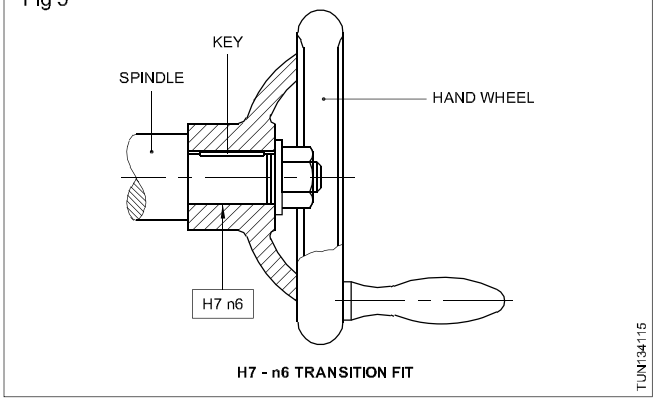


SHAFT BASIS SYSTEM

Hole basis tolerance applications

The hand wheel is fitted to the end of the spindle and held in place by a self-locking nut and washer. (Fig 5)

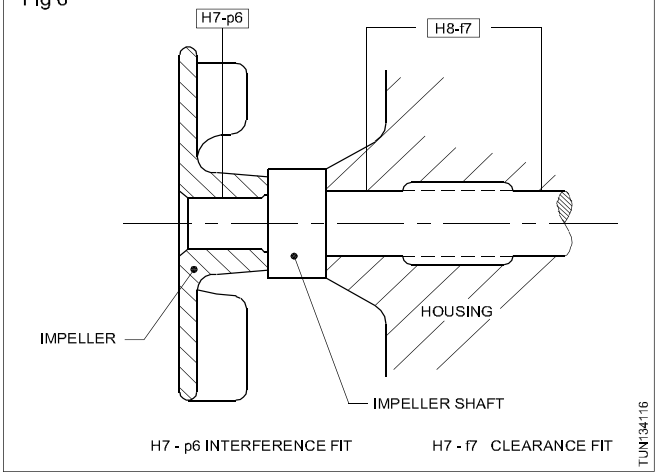
Fig 5



H7 - n6 TRANSITION FIT

A light alloy pump impeller is shown pressed on to steel shaft which runs on two bearings. (Fig 6)

Fig 6



H7 - p6 INTERFERENCE FIT H7 - f7 CLEARANCE FIT

The main bore is shown produced to an H7 limit and it is used to provide support and location for the free end of the boring bar, not directly but through the medium of a pilot bush. Such a bush is made of brass or phosphor bronze. The outside diameter of the busih is made to g6 limits to provide for a close running location fit, and the bore to H8 limits to fit on an j7 bar end to give a normal running fit. Such a machining operation would take place at a slow speed. The fit of the blade tool in its bar slot can be treated in the same way. (Fig 7)

Fig 7

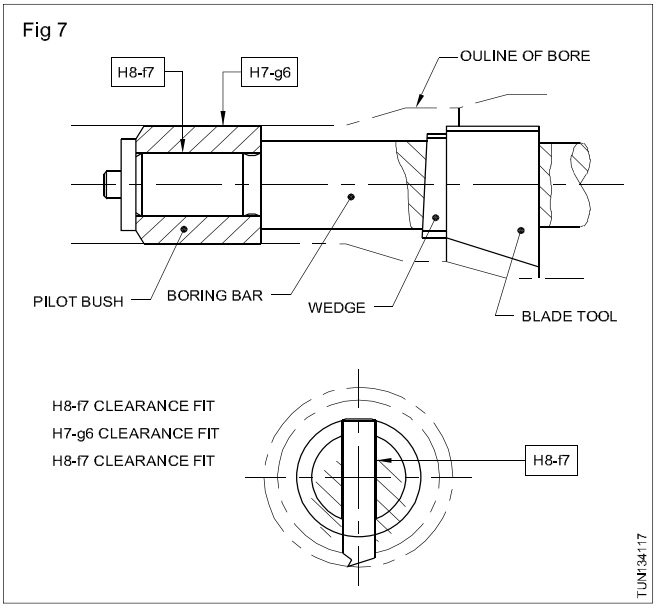
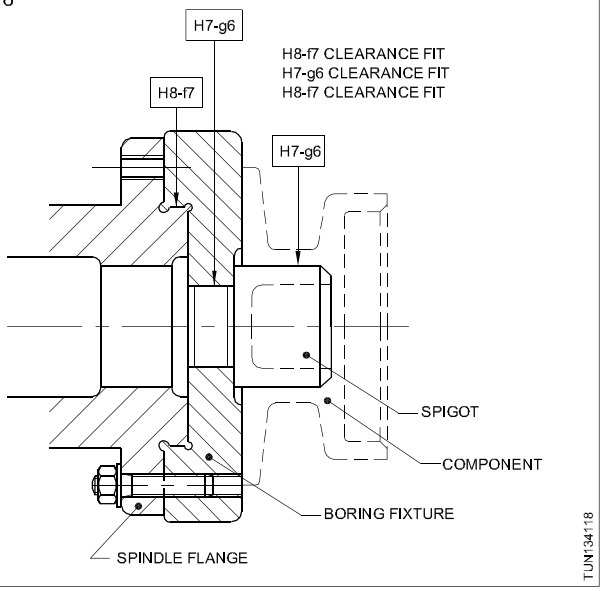


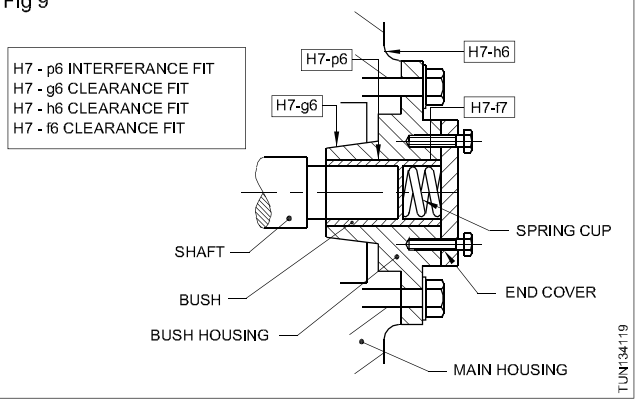
Figure 8 illustrates a flanged spindle nose of a turret lathe with a boring fixture attached. For simplicity in this example, the clamps holding the component to the fixture have been omitted.

Fig 8



The detail shows the end mounting of the crank shaft of a reciprocating type of compressor. (Fig 9)

Fig 9



This (Fig 10) details a sectional view of a part of a gearbox in which the upper gears rotate with the drive shaft.

This (Fig 11) illustrates a diagram of a bevel gear driven camshaft, which is supported in two bearing bushes housed in brackets attached to a machine bed.

Fig 10

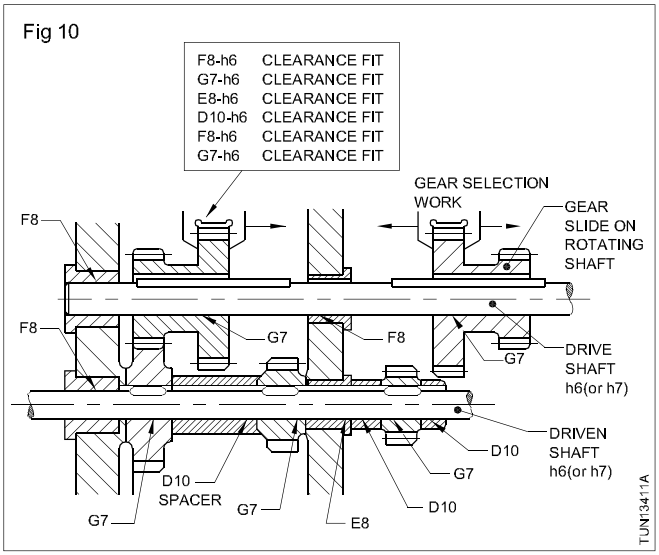
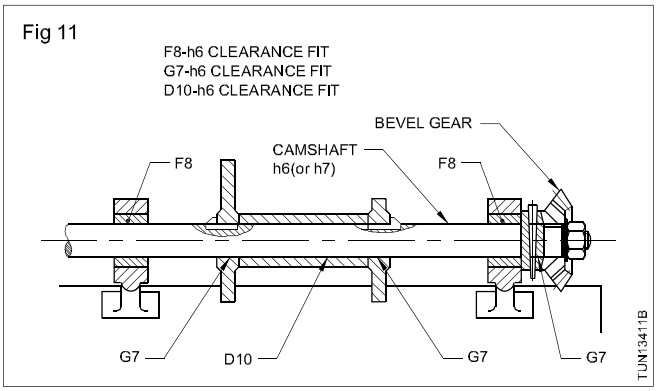
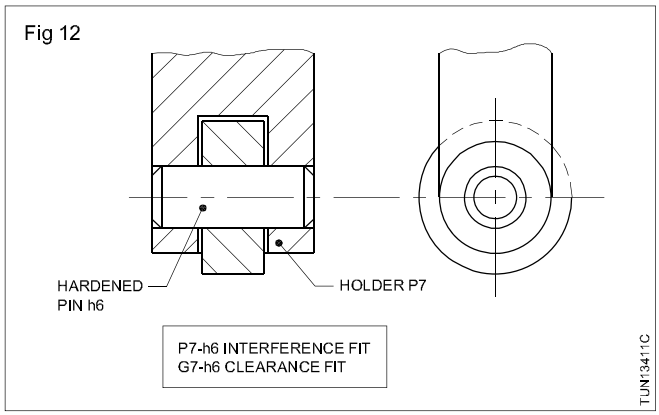


Fig 11



This (Fig 12) shows a hardened steel roller fitted into a soft steel holder. The roller must be free to rotate on the hardened steel pin which does not itself rotate.

Fig 12



Further classification of fits their applications and service conditions

Fit designation	Classification	Typical applications and service conditions
Clearance H11 - c11	Extra loose running it	Where large clearance is required and where dirty conditions or corrosion are problems. Ex. Agricultural and steel mill pulleys.
Clearance H9 - d10	Loose running fit	Large bearings or pulley and parts requiring ease of assembly.
Clearance H9 - e9	Easy running fit	For smaller applications where a fairly large clearance can be permitted, and where there is more than one bearing on a shaft : Ex. Camshafts, selection shafts in gearboxes, rocker shafts.
Clearance H8 - f7	Normal running fit	Generally used in medium and light engineering for easily produced quality fits as required on gearbox shaft bearings, gears on fixed shafts, guide bushes.
Clearance H7 - g6	Close running fit or location	Although called a running fit, the very small clearance makes it unsuitable for continuous running and should be used only for intermittent or light loadings. May be used for spigot locators.
Clearance H7 - h6	Precision slide fit or	Although there is zero fundamental deviation, in practice there is very small clearance enabling this fit to be used on non-running combinations, such as, precision sliding and jig location fits.
Transition H7 - k6	Push or easy keying fit	For location fits, not requiring frequent removal or where vibration of the part is to be prevented.
Transition H7 - n6	Tight keying fit	Care needed in this selection as a transition fit. Some combinations may, in practice, give an interference fit.
Interference H7 - p6	Light drive fit	This is a true interference fit, providing a press fit for ferrous parts which are not to be damaged or overstrained in any subsequent dismantling.
Interference H7 - s6	Heavy drive fit	For ferrous parts requiring permanent or semi-permanent assembly. (Light and heavy drive fits are frequently used for the assembly of non-ferrous parts such as bearing sleeves and bushes, the actual type of fit, depending upon the size of bush and its function.)

Representation of tolerance in drawings:

The tolerance permissible as per drawing as shown in capital for Holes and small letters for shaft as shown below.

The drawing will only indicate the grade the value of tolerance has to be obtained from IS: Table.

Fig 13

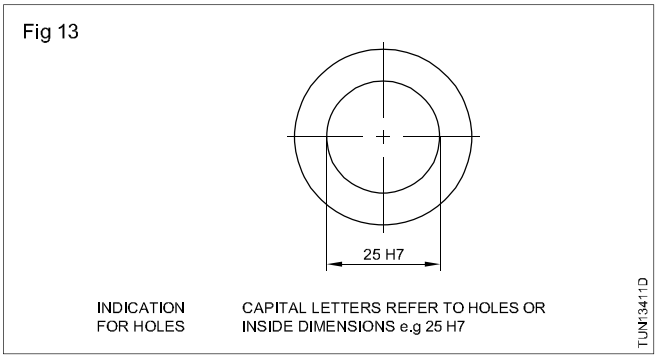


Fig 14

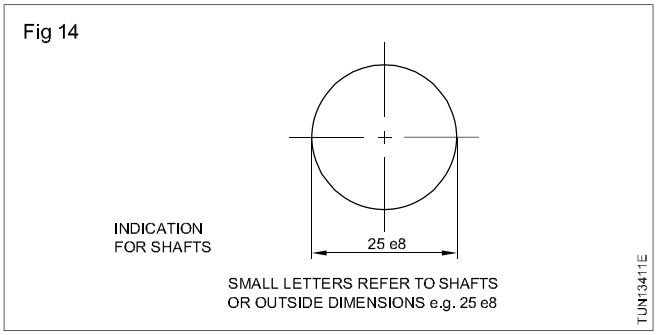


TABLE 1 FOR TOLERANCE ZONES & LIMITS (DIMENSIONS IN m m)

		s6	r6	p6	n6	k6	js6	h6	h7	h9	h11	g6	f7	e8	d9	c11	b11	a11	S7	R7	P7	N7	K7	JS7	H7	H8	H9	H11	G7	F8	E9	D10	C11	B11	A11
From	1	+20	+16	+12	+10	+6	+3	0	0	0	0	-2	-6	-14	-20	-60	-140	-270	-14	-10	-6	-4	0	+5	+10	+14	+25	+60	+12	+20	+39	+60	+120	+200	+330
up to	3	+14	+10	+6	+4	0	-3	-6	-10	-25	-60	-8	-16	-28	-45	-120	-200	-330	-24	-20	-16	-14	-10	-5	0	0	0	0	+2	+6	+14	+20	+60	+140	+270
Over	3	+27	+23	+20	+16	+9	+4	0	0	0	0	-4	-10	-20	-30	-70	-140	-270	-15	-11	-8	-4	+3	+6	+12	+18	+30	+75	+16	+28	+50	+78	+145	+215	+345
up to	6	+19	+15	+12	+8	+1	-4	-8	-12	-30	-75	-12	-22	-28	-60	-145	-215	-345	-27	-23	-20	-16	-9	-6	0	0	0	0	+4	+10	+20	+30	+70	+140	+270
Over	6	+32	+28	+24	+19	+10	+4.5	0	0	0	0	-5	-13	-25	-40	-80	-150	-280	-17	-13	-9	-4	+5	+7.5	+15	+22	+36	+90	+20	+35	+61	+98	+170	+240	+370
up to	10	+23	+19	+15	+10	+1	-4.5	-9	-15	-36	-90	-14	-28	-47	-76	-170	-240	-370	-32	-28	-24	-19	-10	-7.5	0	0	0	0	+5	+13	+25	+40	+80	+150	+280
Over	10																																		
up to	14	+39	+34	+29	+23	+12	+5.5	0	0	0	0	-6	-16	-32	-50	-95	-150	-290	-21	-16	-11	-5	+6	+9	+18	+27	+43	+110	+24	+43	+75	+120	+205	+260	+400
Over	14	+28	+23	+18	+12	+1	-5.5	-11	-18	-43	-110	-17	-34	-59	-93	-205	-260	-400	-39	-34	-29	-23	-12	-9	0	0	0	0	+7	+16	+32	+50	+95	+150	+290
up to	18																																		
Over	18																																		
up to	24	+48	+41	+35	+28	+15	+6.5	0	0	0	0	-7	-20	-40	-65	-110	-160	-300	-27	-20	-14	-7	+6	+10.5	+21	+33	+52	+130	+28	+53	+92	+149	+240	+290	+430
Over	24	+35	+28	+22	+15	+2	-6.5	-13	-21	-52	-130	-20	-41	-73	-117	-240	-290	-430	-48	-41	-35	-28	-15	-10.5	0	0	0	0	+7	+20	+40	+65	+110	+160	+300
up to	30																																		
Over	30															-120	-170	-310															+280	+330	+470
up to	40	+59	+50	+42	+33	+18	+8	0	0	0	0	-9	-25	-50	-80	-280	-330	-470	-34	-25	-17	-8	+7	+12.5	+25	+39	+62	+160	+34	+64	+112	+180	+120	+170	+310
Over	40	+43	+34	+26	+17	+2	-8	-16	-25	-62	-160	-25	-50	-89	-142	-130	-180	-320	-59	-50	-42	-33	-18	-12.5	0	0	0	0	+9	+25	+50	+80	+290	+340	+480
up to	50															-290	-340	-480															+130	+180	+320
Over	50	+72	+60													-140	-190	-340	-42	-30													+330	+380	+530
up to	65	+53	+41	+51	+39	+21	+9.5	0	0	0	0	-10	-30	-60	-100	-330	-380	-530	-72	-60	-21	-9	+9	+15	+30	+46	+74	+190	+40	+76	+134	+220	+140	+190	+340
Over	65	+78	+62	+32	+20	+2	-9.5	-19	-30	-74	-190	-29	-60	-106	-174	-150	-200	-360	-48	-32	-51	-39	-21	-15	0	0	0	0	+10	+30	+60	+100	+340	+390	+550
up to	80	+59	+43													-340	-390	-550	-78	-62													+150	+200	+360
Over	80	+93	+73													-170	-220	-380	-58	-38													+390	+440	+600
up to	100	+71	+51	+59	+45	+25	+11	0	0	0	0	-12	-36	-72	-120	-390	-440	-600	-93	-73	-24	-10	+10	+17.5	+35	+54	+87	+220	+47	+90	+159	+260	+170	+220	+380
Over	100	+101	+76	+37	+23	+3	-11	-22	-35	-87	-220	-34	-71	-126	-207	-180	-240	-410	-66	-41	-59	-45	-25	-17.5	0	0	0	0	+12	+36	+72	+120	+400	+460	+630
up to	120	+79	+54													-400	-460	-630	-101	-76													+180	+240	+410
Over	120	+117	+88													-200	-260	-460	-77	-48													+450	+510	+710
up to	140	+92	+63													-450	-510	-710	-117	-88													+200	+260	+460
Over	140	+125	+90	+68	+52	+28	+12.5	0	0	0	0	-14	-43	-85	-145	-210	-280	-520	-85	-50	-28	-12	+12	+20	+40	+63	+100	+250	+54	+106	+185	+305	+460	+530	+770
up to	160	+100	+65	+43	+27	+3	-12.5	-25	-40	-100	-250	-39	-83	-148	-245	-460	-530	-770	-125	-90	-68	-52	-28	-20	0	0	0	0	+14	+43	+85	+145	+210	+280	+520
Over	160	+133	+93													-230	-310	-580	-93	-53													+480	+560	+830
up to	180	+108	+68													-480	-560	-830	-133	-93													+230	+310	+580
Over	180	+151	+106													-240	-340	-660	-105	-60													+530	+630	+950
up to	200	+122	+77													-530	-630	-950	-151	-106													+240	+340	+660
Over	200	+159	+109	+79	+60	+33	+14.5	0	0	0	0	-15	-50	-100	-170	-260	-380	-740	-113	-63	-33	-14	+13	+23	+46	+72	+115	+290	+61	+122	+215	+355	+550	+670	+1030
up to	225	+130	+80	+50	+31	+4	-14.5	-29	-46	-115	-290	-44	-96	-172	-285	-550	-670	-1030	-159	-109	-79	-60	-33	-23	0	0	0	0		+15	+50	+100	+170	+260	+380	+740
Over	225	+169	+113													-280	-420	-820	-123	-67													+570	+710	+1110
up to	250	+140	+84													-570	-710	-1110	-169	-113													+280	+420	+820
Over	250	+190	+126													-300	-480	-920	-138	-74													+620	+800	+1240
up to	280	+158	+94	+88	+66	+36	+16	0	0	0	0	-17	-56	-110	-190	-620	-800	-1240	-190	-126	-36	-14	+16	+26	+52	+81	+130	+320		+69	+137	+240	+400	+300	+480	+920
Over	280	+202	+130	+56	+34	+4	-16	-32	-52	-130	-320	-49	-108	-191	-320	-330	-540	-1050	-150	-78	-88	-66	-36	-26	0	0	0	0	+17	+56	+110	+190	+650	+860	+1370
up to	315	+170	+98													-650	-860	-1370	-202	-130													+330	+540	+1050
Over	315	+226	+144													-360	-600	-1200	-169	-87													+720	+960	+1500
up to	355	+190	+108	+98	+73	+40	+18	0	0	0	0	-18	-62	-125	-210	-720	-960	-1560	-226	-144	-41	-16	+17	+28.5	+57	+89	+140	+360	+75	+151	+265	+440	+360	+600	+1200
Over	355	+244	+150	+62	+37	+4	-18	-36	-57	-140	-360	-54	-119	-214	-350	-400	-680	-1350	-187	-93	-98	-73	-40	-28.5	0	0	0	0	+18	+69	+125	+210	+760	+1040	+1710
up to	400	+208	+114													-760	-1040	-1710	-244	-150													+400	+680	+1350
Over	400		+272	+166												-440	-760	-1500	-209	-103													+840	+1160	+1900
up to	450	+232	+126	+108	+80	+45	+20	0	0	0	0	-20	-68	-135	-230	-840	-1160	-1900	-272	-166	-45	-17	+18	31.5	+63	+97	+155	+400	+83	+165	+290	+480	+440	+760	+1500
Over	450	+292	+172	+68	+40	+5	-20	-40	-63	-155	-400	-60	-131	-232	-385	-480	-840	-1650	-229	-109	-108	-80	-45	-31.5	0	0	0	0	+20	+68	+135	+230	+880	+1240	+2050
up to	500	+252	+132													-880	-1240	-2050	-292	-172													+480	+840	+1650