

Precision Inspection Standard of Center Gage

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1.Scope of Application

This standard is to specify Tolerance of Limit Gage, Wear Limit, Allowable Error of Dimension, Hole Axis, Wear Allowance in Tolerance used in holding the dimension within limit which allowable error of upper dimension and lower dimension specified by KS B 0401(Dimension tolerance and fitting) express.

And the limit gage used in dimension of machine part except hole, axis follows this standard.

2. Definition of Terminology

2.1 Limit gage

This is the gage have the measuring end face on the base of maximum allowable dimension of hole and axis and minimum allowable dimension. The limit gage with fixed measuring end face is defined as fixed limit gage and the limit gage is said as this kind of gage in this standard.

2.2 Pass direction and stop direction

In limit gage for hole, it is said that the part that have an end face on the base of minimum allowable dimension is pass direction and the part that have an end face on the base of maximum allowable dimension is stop direction.

In limit gage for axis, it is said that the part that have an end face on the base of maximum allowable dimension is pass direction and the part that have an end face on the base of minimum allowable dimension is stop direction.

2.3 Normal dimension

The normal dimension of limit gage is the standard dimension that expresses the size of hole which apply the gage or the size of axis.

2.4 Tolerance of limit gage

Tolerance of limit gage means difference of maximum allowable dimension and minimum allowable dimension that is admissible for pass direction and stop direction when manufacturing the limit gage.

2.5 Wear limit dimension, allowable error of wear limit dimension and wear allowance

(1) Wear limit dimension means limit dimension that is acceptable to be used as limit gage in wearing state.

(2) Allowable error of wear limit dimension means the difference between the minimum allowable error of hole and wear limit dimension in the limit gage for hole, the difference between the maximum allowable error of axis and wear limit dimension in the limit gage for axis and in need of considering the uncertain area (In limit gage for hole for measuring, α_1 in limit gage for axis) modify the value of y or y_1 and marking the modified value with y' or y_1'

(3) Wear allowance means difference of wear limit dimension and the dimension which moves standard dimension of go end of new product, gage from maximum (Minimum) allowable dimension of hole or axis to tolerance of hole or axis considering wear. Of wear allowance, the part within hole or axis tolerance is wear allowance in hole and axis allowance.

3. Judgement of Pass by the Limit Gage

Judge the hole and axis which pass through the inspection by the limit gage specified by this standard is within allowance error of upper dimension and low dimension specified by KS B 0401. (Refer to figure 1, 2)

4. Standard temperature

The value of this standard is the value in 20 °C

5. Tolerance of limit gage, allowable error of wear limit dimension, wear allowance in tolerance of hole and axis, tolerance of limit gage, allowable error of wear limit dimension and wear allowance in tolerance of hole and axis are shown as table1, 2.

Table 1 For hole gauge

Unit : 0.001 mm

Division of Dimension (mm)	IT 5				IT 6				IT 7				IT 8				IT 9			
	Z	H	Y	Y'	Z	H	Y	Y'	Z	H	Y	Y'	Z	H	Y	Y'	Z	H	Y	Y'
More than 1 less than 3	1	2	1	-	1.5	2	1	-	2	2	1.5	-	3	3	2	-	6	3	0	-
" 3 " 6	1	2	1	-	2	2	1	-	2.5	2	1.5	-	3.5	3	2	-	7	3	0	-
" 6 " 10	1	2	1	-	2	2	1	-	2.5	2	1.5	-	4	3	2	-	8	3	0	-
" 10 " 18	2	2	1.5	-	2.5	2	1.5	-	3	2	1.5	-	5	3	2	-	9	3	0	-
" 18 " 30	2	2	1.5	-	2.5	2	1.5	-	3.5	2	1.5	-	6	4	2	-	11	4	0	-
" 30 " 50	3	3	2	-	4	3	2	-	4	3	2	-	7	4	3	-	13	4	0	-
" 50 " 80	4	3	2	-	5	3	2	-	5	3	2	-	9	5	3	-	15	5	0	-
" 80 " 120	5	4	3	-	6	4	3	-	6	4	3	-	11	6	4	-	17	6	0	-
" 120 " 180	6	5	3	-	7	5	3	-	8	5	3	-	12	8	5	-	20	8	0	-
" 180 " 250	6	7	3	2	7	7	4	2	9	7	5	2	14	10	7	3	25	10	0	-4
" 250 " 315	7	8	3	1.5	8	8	5	2	11	8	6	2	16	12	8	2	28	12	0	-6
" 315 " 400	7	9	4	1.5	10	9	6	2	13	9	6	0	18	13	9	2	31	13	0	-7
" 400 " 500	8	10	4	1	12	10	7	2	15	10	7	0	20	15	10	1	35	15	0	-9

Division of Dimension (mm)	IT 10				IT 11		IT 12		IT 13		IT 14		IT 15		IT 16	
	Z	H	Y	Y'	Z	H	Z	H	Z	H	Z	H	Z	H	Z	H
More than 1 less than 3	6	4	0	-	7	5	9	7	14	9	25	14	40	25	60	40
" 3 " 6	7	4	0	-	8	5	12	8	18	12	30	18	48	30	75	48
" 6 " 10	8	4	0	-	9	6	15	9	22	15	36	22	58	36	90	58
" 10 " 18	9	5	0	-	11	8	18	11	27	18	43	27	70	43	110	70
" 18 " 30	11	6	0	-	13	9	21	13	33	21	52	33	84	52	130	84
" 30 " 50	13	7	0	-	16	11	25	16	39	25	62	39	100	62	160	100
" 50 " 80	15	8	0	-	19	13	30	19	46	30	74	46	120	74	190	120
" 80 " 120	17	10	0	-	22	15	35	22	54	35	87	54	140	87	220	140
" 120 " 180	19	12	0	-	25	18	40	25	63	40	100	63	160	100	250	160
" 180 " 250	29	14	0	-7	29	20	46	29	72	46	115	72	185	115	290	185
" 250 " 315	33	16	0	-9	32	23	52	32	81	52	130	81	210	130	320	210
" 315 " 400	38	18	0	-11	36	25	57	36	89	57	140	89	230	140	360	230
" 400 " 500	44	20	0	-14	40	27	63	40	97	63	155	97	250	155	400	250

Remark 1. The meaning of symbol used at the above table is as follows.

Z : Wear allowance in hole tolerance of limit gage for hole

H : Manufacturing tolerance of limit gage for hole

Y : Allowable error of wear limit dimension of limit gage for hole

(When being 180 mm or less)

Y' : Allowable error of wear limit dimension of limit gage for hole

(When being 180 mm or more)

2. Gauge for hole mean to plug gauge and parallel plug gauge.

Table 2 For shaft gauge

Unit : 0.001 mm

Division of Dimension (mm)	IT 5				IT 6				IT 7				IT 8			
	Z ₁	H ₁	Y	Y ₁	Z ₁	H ₁	Y	Y ₁	Z ₁	H ₁	Y	Y ₁	Z ₁	H ₁	Y	Y ₁
More than 1 less than 3	1	2	1	-	1.5	2	1	-	2	3	1.5	-	3	3	2	-
" 3 " 6	1	2	1	-	2	2	1	-	3	3	1.5	-	3.5	3	2	-
" 6 " 10	1	2	1	-	2	2	1	-	3	3	1.5	-	4	3	2	-
" 10 " 18	2	2	1.5	-	2.5	2	1.5	-	3.5	3	2	-	5	3	2	-
" 18 " 30	2	2	1.5	-	2.5	2	1.5	-	3.5	4	2	-	6	4	2	-
" 30 " 50	3	3	2	-	4	3	2	-	5	4	3	-	7	4	3	-
" 50 " 80	4	3	2	-	5	3	2	-	6	5	3	-	9	5	3	-
" 80 " 120	5	4	3	-	6	4	3	-	8	6	4	-	11	6	4	-
" 120 " 180	6	5	3	-	7	5	3	-	9	8	4	-	12	8	5	-
" 180 " 250	6	7	3	2	7	7	4	2	10	10	6	3	14	10	7	3
" 250 " 315	7	8	3	1.5	8	8	5	2	12	12	7	3	16	12	8	2
" 315 " 400	7	9	4	1.5	10	9	6	2	14	13	8	2	18	13	9	2
" 400 " 500	8	10	4	1	12	10	7	2	16	15	9	2	20	15	10	1

Division of Dimension (mm)	IT 9				IT 10		IT 11		IT 12		IT 13		IT 14		IT 15	
	Z ₁	H ₁	Y'	Y' ₁	Z ₁	H ₁	Z ₁	H ₁	Z ₁	H ₁	Z ₁	H ₁	Z ₁	H ₁	Z ₁	H ₁
More than 1 less than 3	6	4	0	-	6	3	9	7	14	9	25	14	40	25	60	40
" 3 " 6	7	4	0	-	7	5	12	8	18	12	30	18	48	30	75	48
" 6 " 10	8	4	0	-	8	6	15	9	22	15	36	22	58	36	90	58
" 10 " 18	9	5	0	-	9	8	18	11	27	18	43	27	70	43	110	70
" 18 " 30	11	6	0	-	11	9	21	13	33	21	52	33	84	52	130	84
" 30 " 50	13	7	0	-	13	11	25	16	39	25	62	39	100	62	160	100
" 50 " 80	15	8	0	-	15	13	30	19	46	30	74	46	120	74	190	120
" 80 " 120	17	10	0	-	17	15	35	22	54	35	87	54	140	87	220	140
" 120 " 180	20	12	0	-	19	18	40	25	63	40	100	63	160	100	250	160
" 180 " 250	25	14	0	-4	29	20	48	29	72	46	115	72	185	115	290	185
" 250 " 315	28	16	0	-6	33	23	52	32	81	52	130	81	210	130	320	210
" 315 " 400	31	18	0	-7	38	25	57	36	89	57	140	89	230	140	360	230
" 400 " 500	35	20	0	-9	44	27	63	40	97	63	155	97	250	155	400	250

Remark 1. The symbols used in above table mean that

Z_1 : Wear allowance in axis tolerance of limit gage for axis

H_1 : Manufacturing tolerance of limit gage for axis

Y_1 : Allowable error of wear limit dimension of limit gage for axis

(When being 180 mm or less)

Y'_1 : Allowable error of wear limit dimension of limit gage for axis

(When being 180 mm or more)

2. Gauge for axis mean to plug gauge and parallel plug gauge.

The allowable error of upper dimension and low dimension in stop direction and pass direction of limit gage, and allowable error of upper dimension and low dimension of the gage produced newly are calculated as following table3.

Table 3

Gauge for hole	Stop direction	Allowable error of upper dimension	$U + \frac{H}{2}$
		Allowable error of low dimension	$U - \frac{H}{2}$
	Pass direction	Allowable error of upper dimension	$L + Z + \frac{H}{2}$
		Allowable error of low dimension	$L + Z - \frac{H}{2}$
Gauge for shaft	Stop direction	Allowable error of upper dimension	$L_1 + \frac{H_1}{2}$
		Allowable error of low dimension	$L_1 - \frac{H_1}{2}$
	Pass direction	Allowable error of upper dimension	$U_1 - Z_1 + \frac{H_1}{2}$
		Allowable error of low dimension	$U_1 - Z_1 - \frac{H_1}{2}$