

Involute Serration

KES C-D009

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Explanation

1. Scope of Application

This standard specifies involute serration having the lateral profile of involute curved form and mainly used for connection between shaft and hole.

2. Definition of Terminology

The meaning of the terms to be used for this standard shall conform to KS B 2007 (involute serration).

3. Type

- (1) Serration is classified into balance serration and tapered serration.
- (2) Main components of serration are listed in Table 1.

Table 1. Main Components

Type	Module	Number of gear	Pressure Angle	Effective Tooth size	Amount of Shift	Taper
Balance serration	0.5	17~44	45°	0.8m	0.1m	0
	1.75					
	1.0					
Tapered serration	0.5	17~44	45°	0.8m	0.1m	1/16
	0.75					
	1.0					

4. Standard Shape of Gear

Standard rack of serration is shown in Fig. 1.

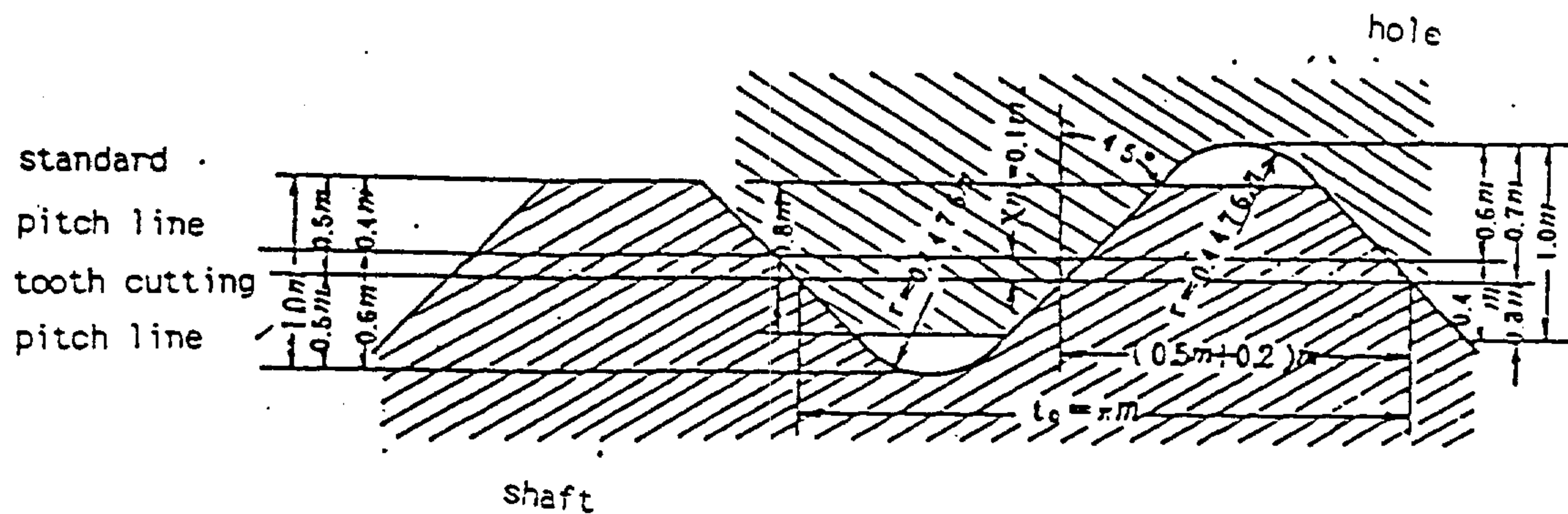


Fig.1. Standard Shape of Gear

5. Symbol and Formula

The fundamental symbol for this standard shall conform to KS B 0053 (Serration symbol), unless otherwise specified, and shall be given as follows so as to enable each dimension to be calculated out. (Refer to Fig. 2)

$$d \text{ (diameter)} = (z + 0.8 + 2x) \text{ m} = (z+1) \text{ m}$$

(z : Number of tooth, x : Shift coefficient, m : Module)

Standard pitch : $t_c = \pi \text{ m}$

Basic circle diameter : $d_o \cos a_o$

Standard pitch circle diameter : $d_o = z_m$

Large diameter of hole : $D = (Z + 1.4)m = d + 0.4 \text{ m}$

Large diameter of shaft : $d = (Z + 0.8 + 2x)m = (Z + 1)m$

Small diameter of hole: $DK = (Z - 0.6)m = d - 1.6m$

Small diameter of shaft : $d_r = (Z - 1)m = d - 2m$

Involute limit diameter of hole : $DTIF = (Z + 1.1)m$

Involute limit diameter of shaft: $DTIF = (Z - 0.7) m$

Gear and size of hole : $h_w = (0.4 - x)m = 0.3m$

End size of shaft gear : $h_{te} = (0.4 + x)m = 0.5m$

Front size of hole gear : $h_{fi} = (0.6 + x)m = 0.7m$

Front size of shaft gear : $h_{fe} = (0.6 - x)m = 0.5m$

Hole width of gear on a standard pitch circle : $W_o = \left(\frac{\pi}{2} + 2x \tan a_o\right)m = (0.5\pi + 0.2)m$

Thickness of gear on a standard pitch circle : $S_o = W_o$

Over pin diameter of hole : $M_i = \frac{d_g}{\cos Q_1} - V$ (V : Diameter of the pin to be used for measurement)

(even numbered gear)

$$= \frac{d_g}{\cos Q_1} \cdot \cos \frac{\pi}{2Z} - V \quad (\text{odd numbered gear})$$

Let a be pressure angle formula of a_i at the centre of pin shall be like the one below

$$\text{Inva}_1 = \text{Inva}_0 + \frac{W_o}{d_o} - \frac{V}{d_g}$$

Over pin diameter of shaft : $M_e = \frac{d_g}{\cos a_e} + U$ (U : Diameter of the pin to be used for measurement)

(even number of gear)

$$= \frac{d_g}{\cos a_e} \cdot \cos \frac{\pi}{2Z} + u \quad (\text{odd number of gear})$$

If a_e be the pressure angle at the centre

$$\text{Invae} = \text{Inva}_o + \frac{S_o}{D_o} + \frac{u}{d_g} - \frac{\pi}{2}$$

Coefficient of over pin diameter of hole : $\frac{\Delta M_i}{\Delta W_o} = \frac{\cos a_o}{\sin a_i}$ (even number of gear)

$$= \frac{\cos a_o}{\sin a_i} \cdot \cos \frac{\pi}{2Z} \quad (\text{odd number of gear})$$

Coefficient of over pin diameter of shaft : $\frac{M_e}{S_o} = \frac{\cos a_o}{\sin a_e}$

(even number of gear)

$$\frac{\cos a_o}{\sin a_e} \frac{\cos \cdot \pi}{2z}$$

(odd number of gear)

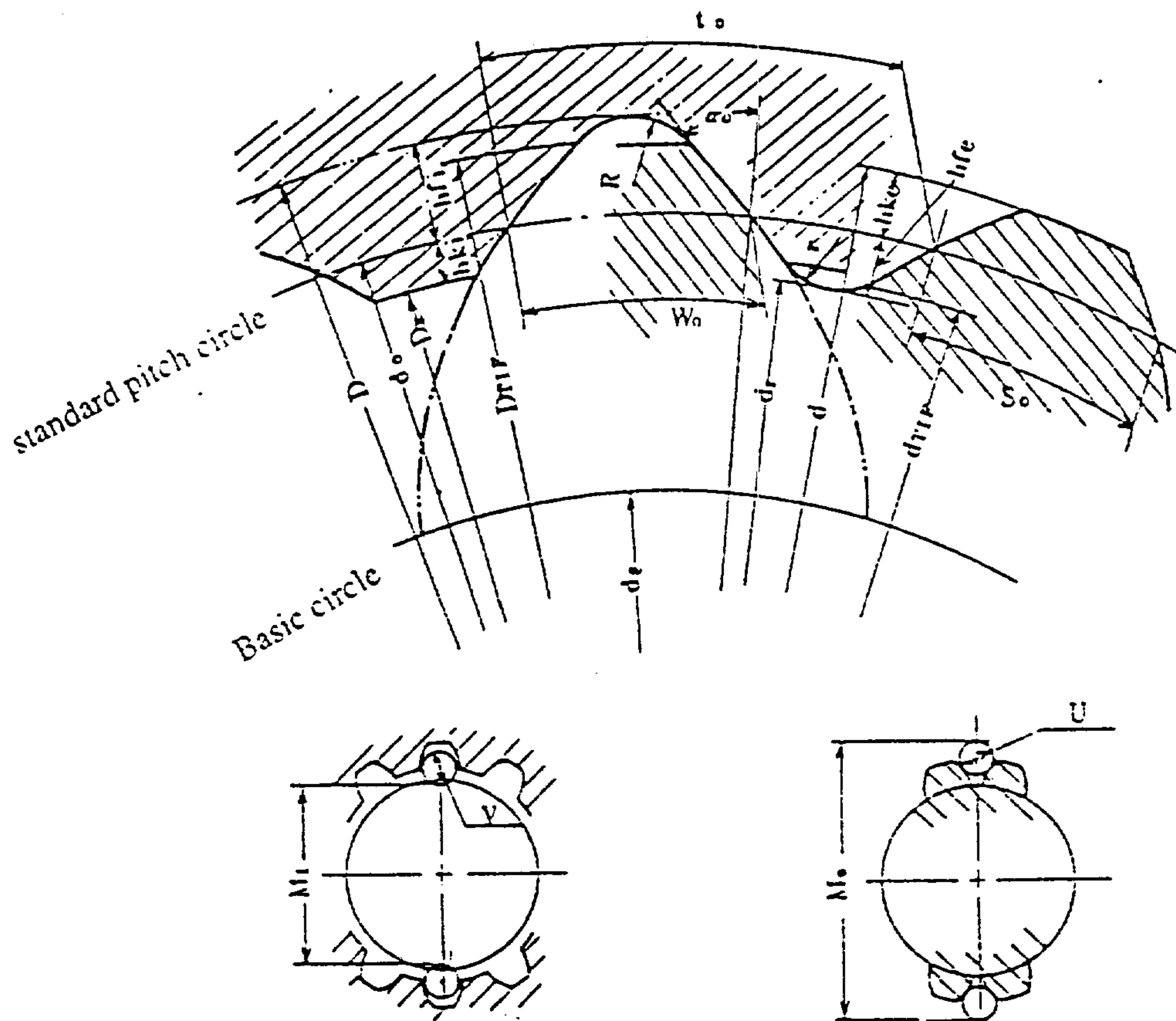


Fig. 2 Symbols

6. Center Alignment and Fitting fit the gear face

- (1) Center alignment shall be of tooth face to tooth face fitting.
- (2) fitting types shall be as given in table 2.

Table 2. Types of Fitting

Types	Allowance of effective dimension in gear face	
	Hole	Shaft
Fixed fitting 1	H 10	js 10
Fixed fitting 2	H 10	h 10

Remark: The shaft may be tightened slightly in order to eliminate the interval in the fitting parts.

7. Processing Dimensions and Overall Allowable Error

Processing dimensions of gear face shall be specified as a hole to be large and a shaft to be small by the amount of overall allowable error rather than following the actual dimensions which decide fitting.

The overall allowable error (e) is fixed at 60% - the sum of 1) grade 4 accumulative pitch error in JIS B 1702-1960 (Precision of Standard Gear and Helical Gear), 2) twice the fixed value of tooth form error, and 3) error in tooth trace direction of fitting length.

However, when the processing condition is favorable, values smaller than 60%, and when the processing condition is bad, values larger than 60% may be used. (Refer to Fig. 3, 4, and explanation)

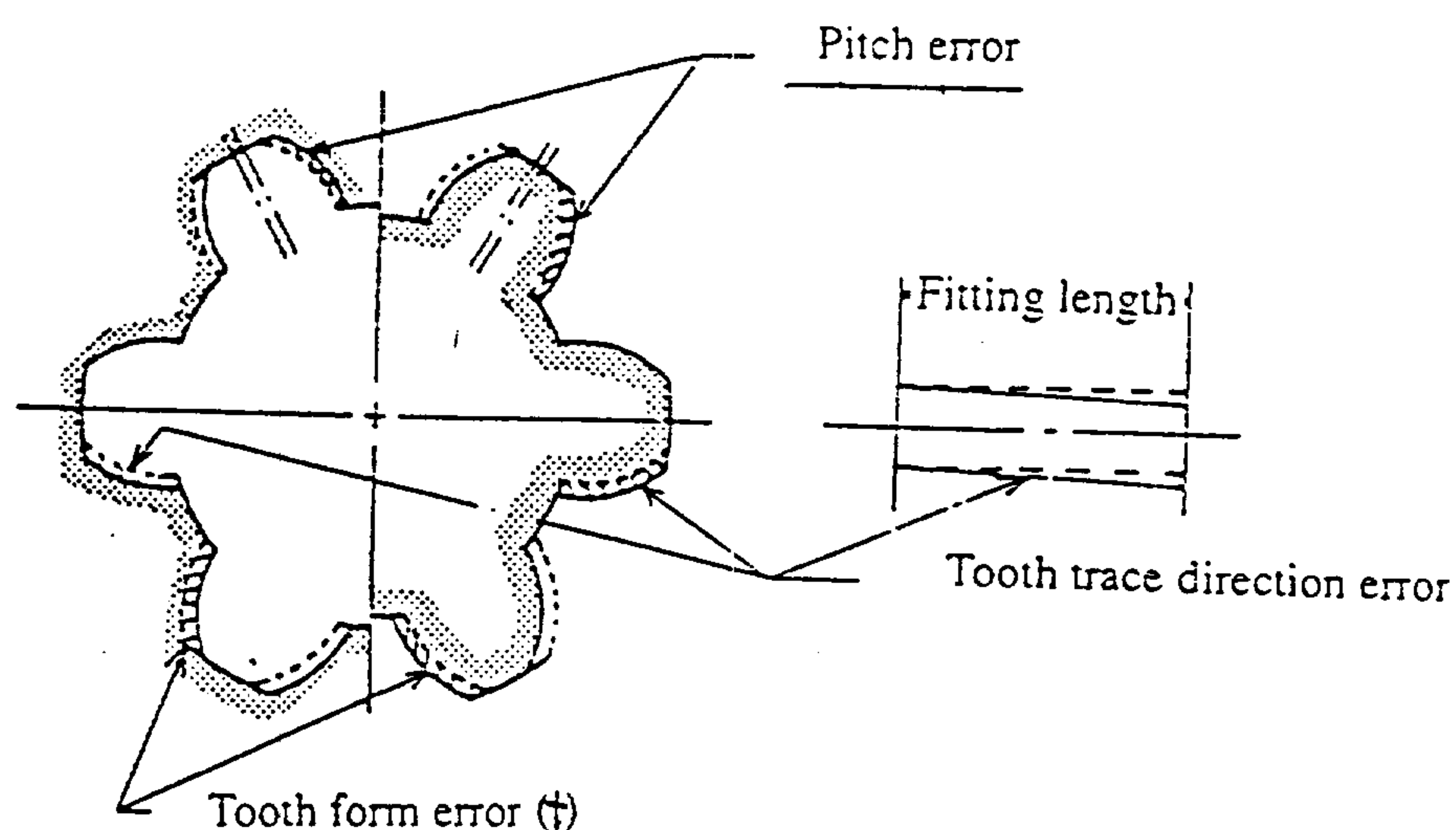


Fig. 3 Types of error in serration

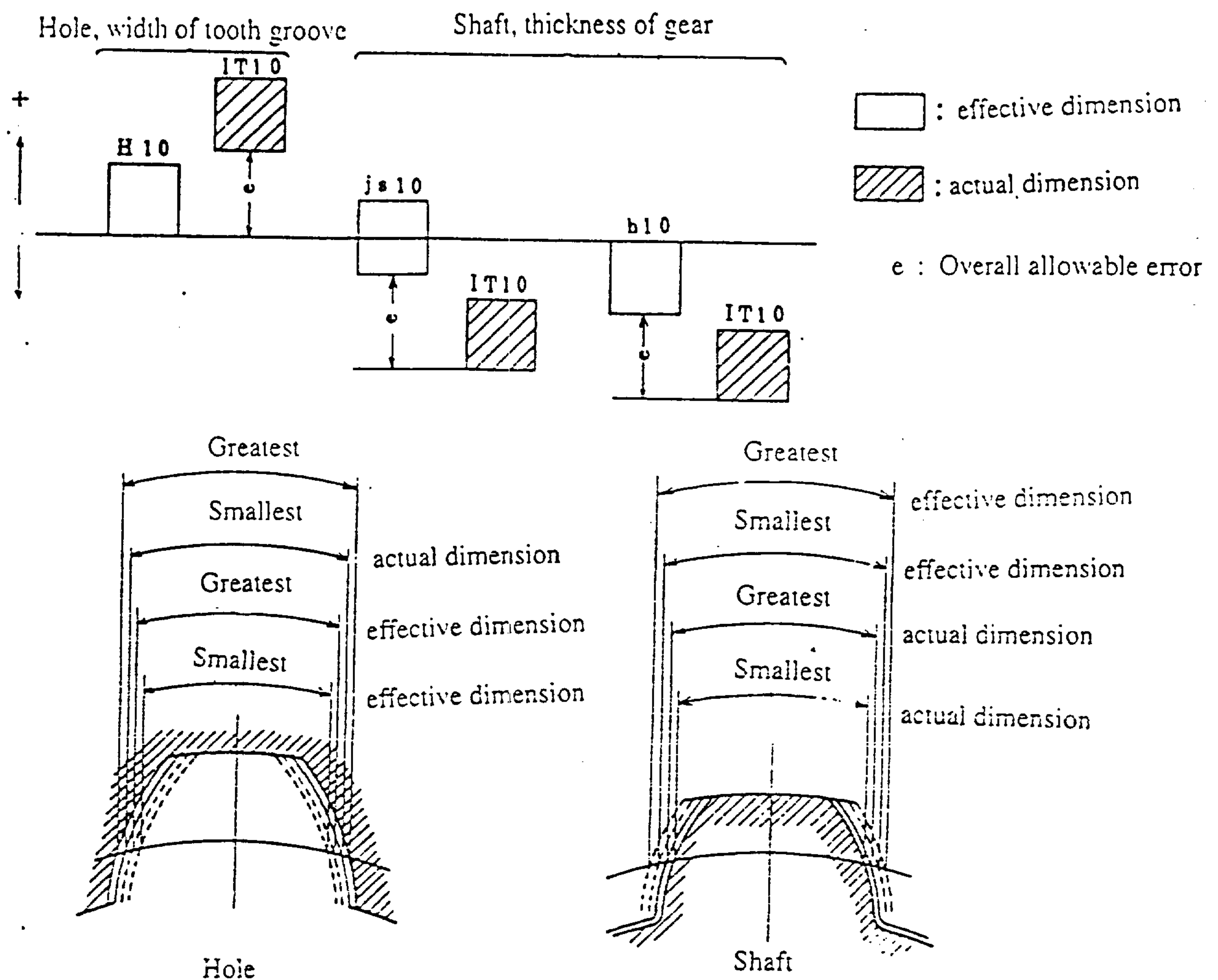


Fig. 4 Overall allowable error relationship in actual dimension and processing dimension

8. Dimension of each part and Dimensional allowance

Dimensions of each part in serration and dimensional allowance conform to in Appendix 1-3.

Except. in the case of tapered serration, these dimensions are applied in the standard circle diameter.

9. Indication Method on Drawing

Drawings of serration conform principally to Fig. 5 and 6.

Remark : In case of giving tooth trace twist of shaft and the case of tapered serration, inserting the greatest space in the fitting may not be needed.

Involute serration hole, shaft		
Appendum modification coefficient	0.1	
Module	1	
Pressure angle	45°	
number of gears	36	
Standard pitch circle diameter	36	
Tooth trace twist	0°	
Fitting	H10 / h10	
maximum size of fitting	-	
Fitting gap	Greatest	0.080
	Smallest	0
Overpin diameter	-0.047 39.431-0.086 (pin diameter 2.0 ϕ)	
Product number	× × × × × × × × × ×	

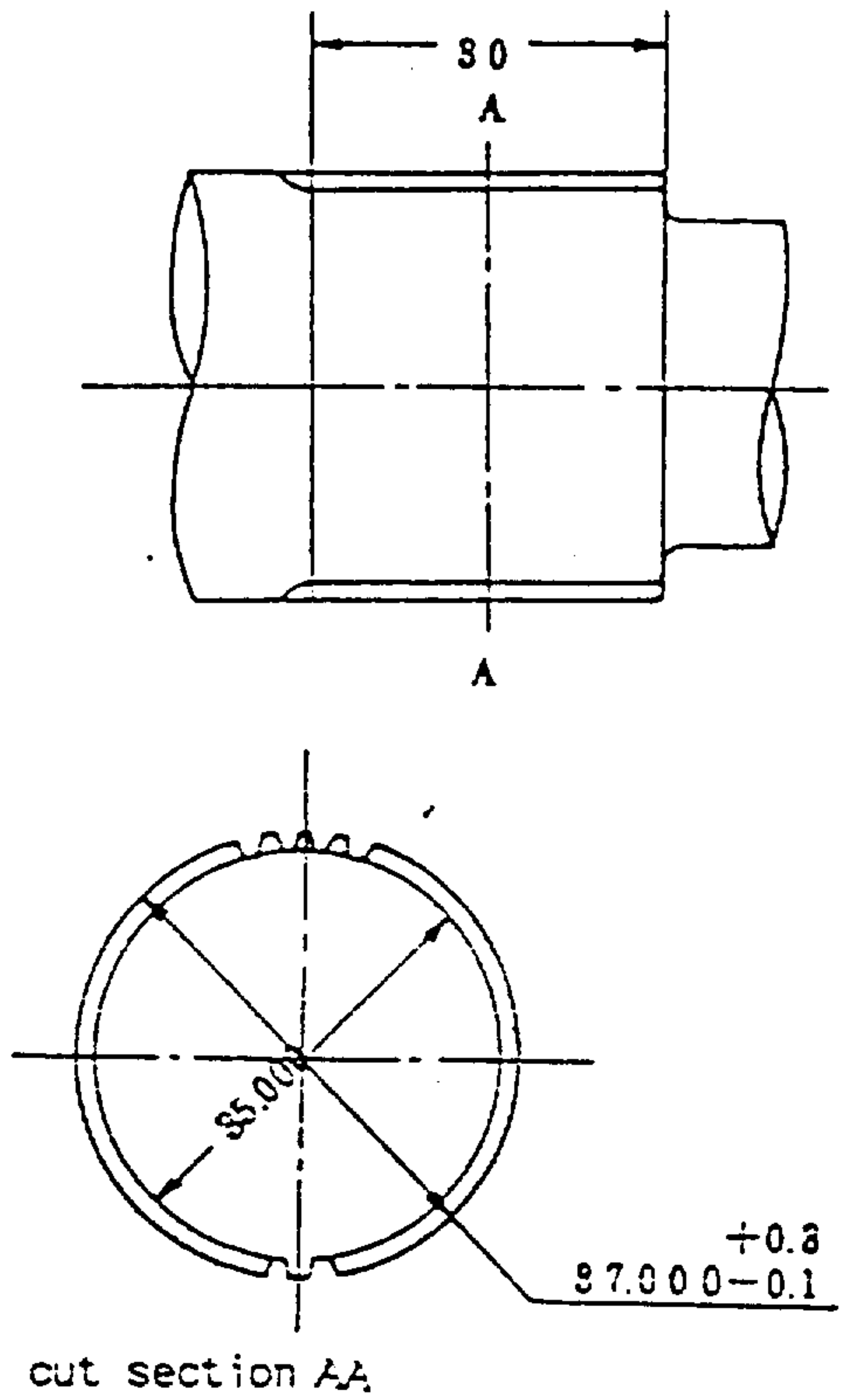


Fig.5 example of drawing indication(balance serration)

Involute serration hole, shaft		
Addendum modification coefficient	0.1	
Module	0.75	
Pressure angle	45°	
number of gears	28	
Standard pitch circle diameter	21	
Tooth trace twist	0°	
Fitting	H10 / js10	
Maximum size fitting	-	
Fitting interval	Greatest	-
	Smallest	-
Overpin diameter	+0.088 18.690+0.046 (pin diameter 1.5 ϕ)	
Product number	× × × × × × × × × ×	

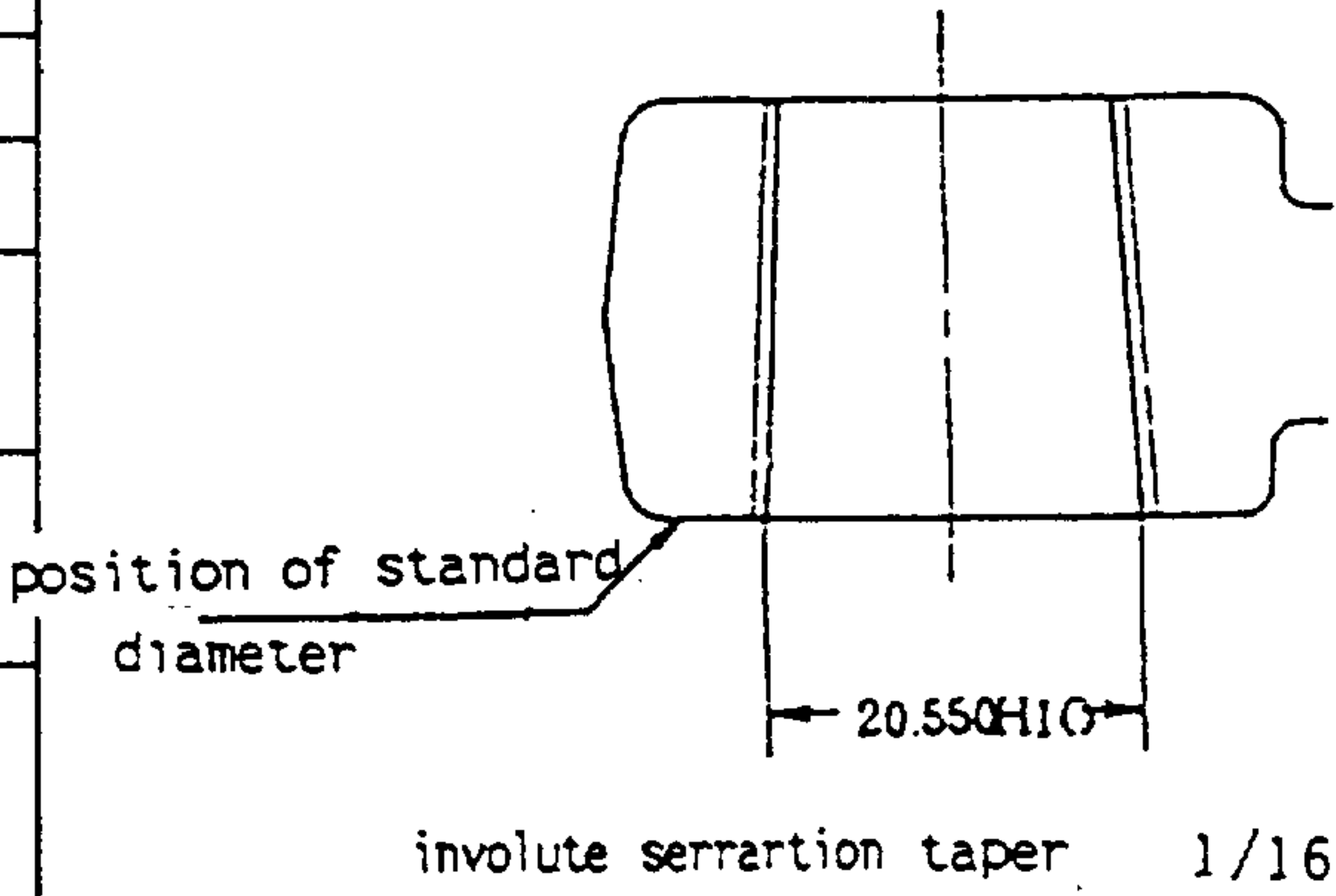


Fig.6. Example of drawing indication(tapered serration)