22.1.3 NOT GO two-sector ring gauge The NOT GO two-sector ring gauge shall meet the requirements specified in figure 21 and table 127.

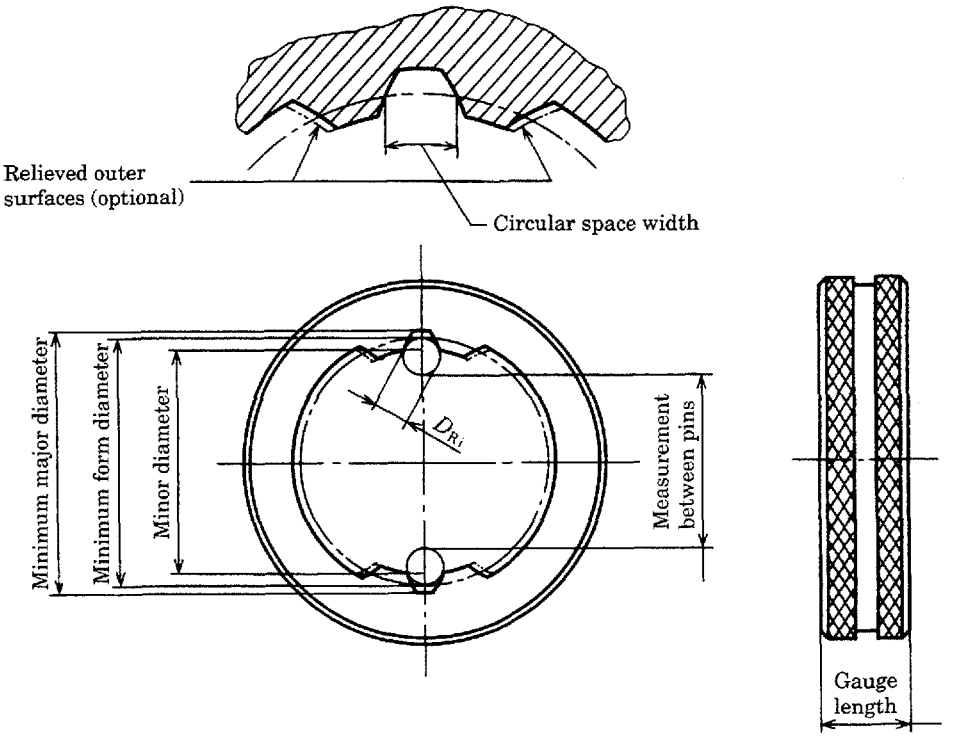


Figure 21 NOT GO two-sector ring gauge

Table 127 Dimensions and tolerances of NOT GO two-sector ring gauges

Gauge dimensions	Formulas	Manufacturing tolerances
Pitch diameter	D	
Minimum major diameter	$D_{ee\,max} + 2c_F^* + 0.1m$	
Minimum form diameter	$D_{ee\,max} + 2c_F^*$	
Minor diameter	$\frac{D + 2D_{Fe\,max}}{3}$	JS8**
Variation of form	E_1	
Circular space width at pitch diameter	S_{min}	$\pm H_1/2$
Pin diameter	D_{Ri} (the same as for corresponding internal part)	
Measurement between pins	see **23.3.4.1.2**	

The minimum major diameter shall clear the pin diameter.
Calibrating length of ring, see table 122.

* $c_F = 0.1m$

** See **ISO 286**, *ISO system of limits and fits.*

Note : See table 121 for the values of H_1 and E_1.

Gauge designation Taking the example from **12.3**, a NOT GO sector ring gauge for external splines

EXT $24z \times 2.5m \times 30\text{R} \times 5\text{f}$ **JIS B 1603**

shall be marked

NOT GO $24z \times 2.5m \times 30\text{R} \times 5\text{f}$ **JIS B 1603**

Number of sector teeth The number of sector teeth shall be specified in table 128.

Table 128 Number of sector teeth

Total number of product teeth, z	$6<z\leq30$	$31<z\leq44$	$45<z\leq58$	$59<z\leq72$	$73<z\leq86$	$87<z\leq100$	$100<z$
Number of space widths in each sector	2	3	4	5	6	7	$0.075z$

22.1.4 Tapered tooth master plug gauge for NOT GO two-sector ring gauge
The tapered tooth master plug gauge for NOT GO two-sector ring gauge shall meet the requirements specified in figure 22 and table 129.

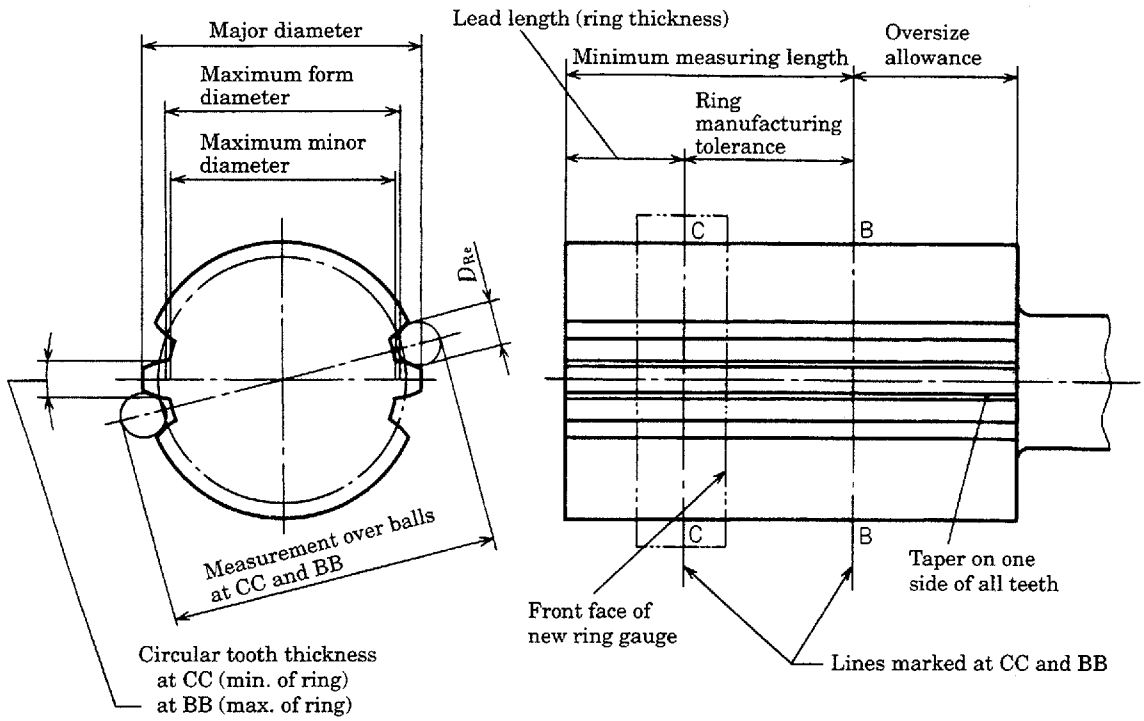


Figure 22 Tapered tooth master plug gauge for NOT GO two-sector ring gauge

Table 129 Dimensions and tolerances of tapered tooth master plug gauges for NOT GO two-sector ring gauges

Gauge dimensions	Formulas	Manufacturing tolerances
Pitch diameter	D	
Major diameter	$D_{ee\,min} - 2c_F$*	h8**
Maximum form diameter	$\frac{D + 2D_{Fe\,max}}{3} - 0.1m$	
Circular tooth thickness		
at CC (minimum of ring)	$S_{min} - H_1/2$	
at BB (maximum of ring)	$S_{min} + H_1/2$	
Variation of form	E_1	
Taper on one side	0.02 % min.	
Maximum minor diameter	$\frac{D + 2D_{Fe\,max}}{3} - 0.2m$	
Ball diameter	D_{Re} (the same as for corresponding external spline)	
Measurement over balls	see **23.3.4.1.1**	

The maximum minor diameter shall clear the ball diameter.

* $c_F = 0.1m$

** See **ISO 286**, *ISO system of limits and fits*.

Note : See table 121 for the values of H_1 and E_1.

Gauge designation Taking the example from **12.3**, a master plug gauge for sector ring

NOT GO $24z \times 2.5m \times 30\text{R} \times 5\text{f}$ **JIS B 1603**

shall be marked

master NOT GO ring $24z \times 2.5m \times 30\text{R} \times 5\text{f}$ **JIS B 1603**

(or master NOT GO ring may be replaced by M.N.G.R.)

Number of sector teeth The number of teeth of each master plug gauge sector shall always be equal to the number of space widths of each sector of the checked NOT GO ring.

22.1.5 NOT GO composite ring gauge The NOT GO composite ring gauge shall meet the requirements specified in figure 23 and table 130.

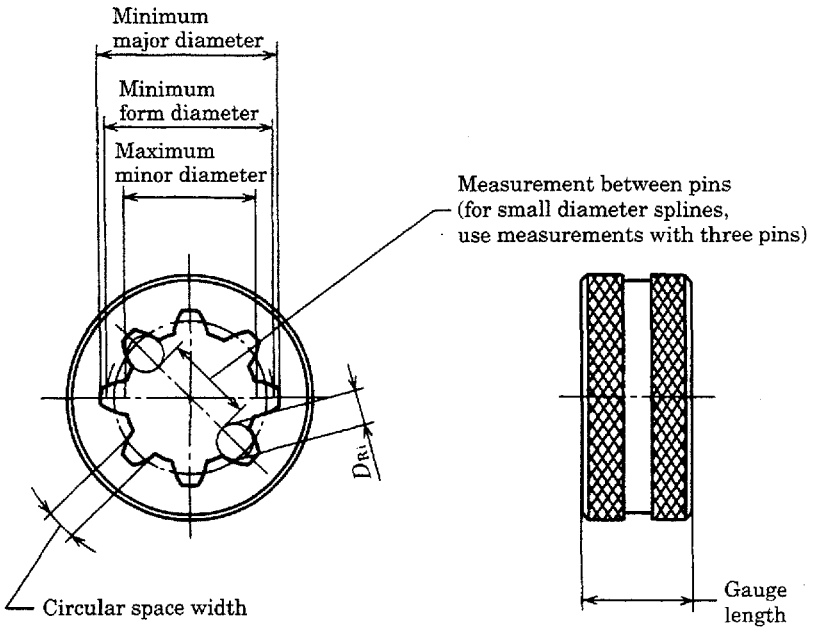


Figure 23 NOT GO composite ring gauge

Table 130 Dimensions and tolerances of NOT GO composite ring gauges

Gauge dimensions	Formulas	Manufacturing tolerances
Pitch diameter	D	
Minimum major diameter	$D_{ee\,max} + 2c_F^* + 0.1m$	
Minimum form diameter	$D_{ee\,max} + 2c_F^*$	
Maximum minor diameter	$\frac{D + 2D_{Fe\,max}}{3}$	JS8**
Circular space width at pitch diameter	$S_{v\,min} = S_{min} + \lambda$	$\pm H_1/2$
Variation of form	E_1	
Pin diameter	D_{Ri} (the same as for hub pin)	
Measurement between pins	see **23.3.4.1.2**	
The minimum major diameter shall clear the pin diameter.		
Calibrating length of ring: see table 122.		

* $c_F = 0.1m$

** See **ISO 286**, *ISO system of limits and fits.*

Note : See table 121 for the values of H_1 and E_1.

Gauge designation Taking the example from **12.3**, a NOT GO composite ring gauge for external splines

EXT $24z \times 2.5m \times 30R \times 5f$ **JIS B 1603**

shall be marked

NOT GO $24z \times 2.5m \times 30R \times 5f$ **JIS B 1603**

22.1.6 Tapered tooth master plug gauge for NOT GO composite ring gauge The tapered tooth master plug gauge for NOT GO composite ring gauge shall meet the requirements specified in figure 24 and table 131.

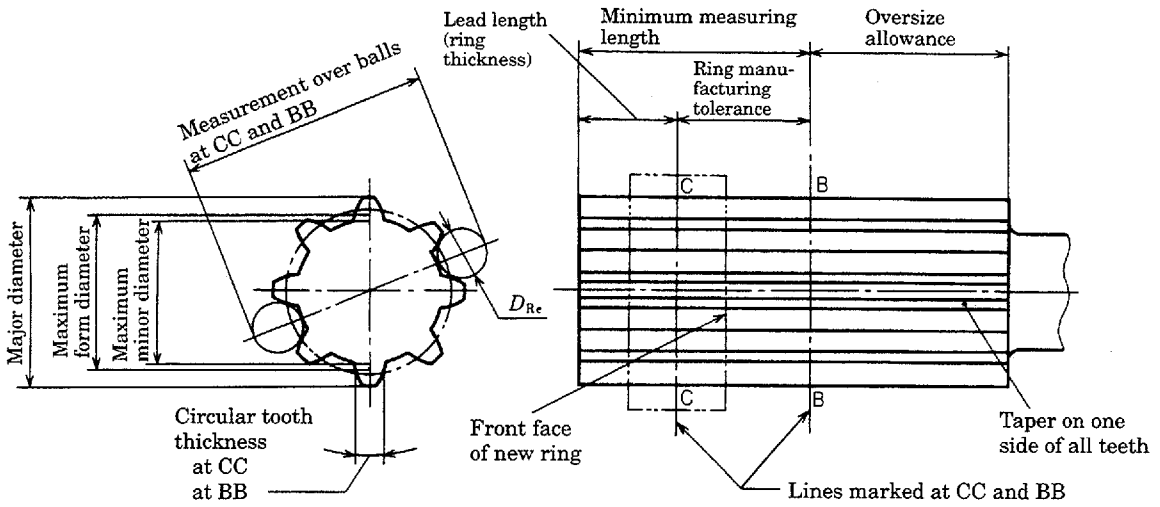


Figure 24 Tapered tooth master plug gauge for NOT GO composite ring gauge

Table 131 Dimensions and tolerances for tapered tooth master plug gauges for NOT GO composite ring gauges

Gauge dimensions	Formulas	Manufacturing tolerances
Pitch diameter	D	
Major diameter	$D_{ee\,min} - 2c_F$*	h8**
Maximum form diameter	$\frac{D + 2D_{Fe\,max}}{3} - 0.1m$	
Circular tooth thickness		
at CC (minimum of ring)	$S_{v\,min} - H_1/2$	
at BB (maximum of ring)	$S_{v\,min} + H_1/2$	
Taper on one side	0.02 % min.	
Maximum minor diameter	$\frac{D + 2D_{Fe\,max}}{3} - 0.2m$	
Variation of form	E_1	
Ball diameter	D_{Re} (the same as for corresponding external spline)	
Measurement over balls	see **23.3.4.1.1**	

The maximum minor diameter shall clear the ball diameter.

* $c_F = 0.1m$

** See **ISO 286**, *ISO system of limits and fits*.

Note : See table 121 for the values of H_1 and E_1.

Gauge designation Taking the example from **12.3**, a master plug gauge for composite ring

NOT GO $24z \times 2.5m \times 30R \times 5f$ **JIS G 1603**

shall be marked

master NOT GO ring $24z \times 2.5m \times 30R \times 5f$ **JIS B 1603**

(or master NOT GO ring may be replaced by M.N.G.R.)

22.2 Inspection of internal splines

22.2.1 GO composite plug gauge The GO composite plug gauge shall meet the requirements specified in figure 25 and table 132.

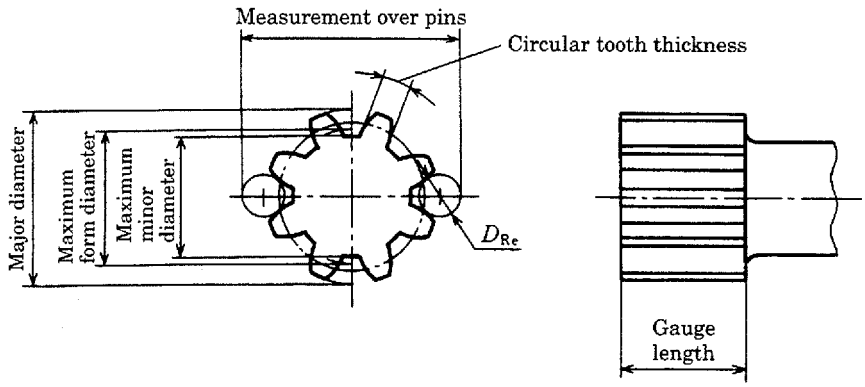


Figure 25 GO composite plug gauge

Table 132 Dimensions and tolerances of GO composite plug gauges

Gauge dimensions	Formulas	Manufacturing tolerances
Pitch diameter	D	
Major diameter	$D_{Fi\,min}$	K7**
Maximum form diameter	$D_{ii\,min} - 2c_F$*	
Maximum minor diameter	$D_{ii\,min} - 2c_F$* $- 0.1m$	
Circular tooth thickness at pitch diameter:		
New gauge	$E_{v\,min} = E_{min} - \lambda$	$+Z \pm H/2$
Wear limit	$E_{v\,min} - Y$	
Variation of form	E	
Pin diameter	D_{Re} (the same as for corresponding internal spline)	
Measurement over pins: New gauge	see **23.3.4.1.1**	
Worn gauge	see **23.3.4.1.1**	

The maximum minor diameter shall clear the form diameter and the pin diameter.
Calibrating length of the plug, see table 123.

* $c_F = 0.1m$

** See **ISO 286**, *ISO system of limits and fits.*

Note : See table 121 for the values of H, Z, Y and E.

Gauge designation Taking the example from **12.3**, a GO composite plug gauge for internal splines

INT $24z \times 2.5m \times 30R \times 5H$ **JIS B 1603**

shall be marked

GO $24z \times 2.5m \times 30R \times 5H$ **JIS B 1603**

22.2.2 NOT GO two-sector plug gauge The NOT GO two-sector plug gauge shall meet the requirements specified in figure 26 and table 133.

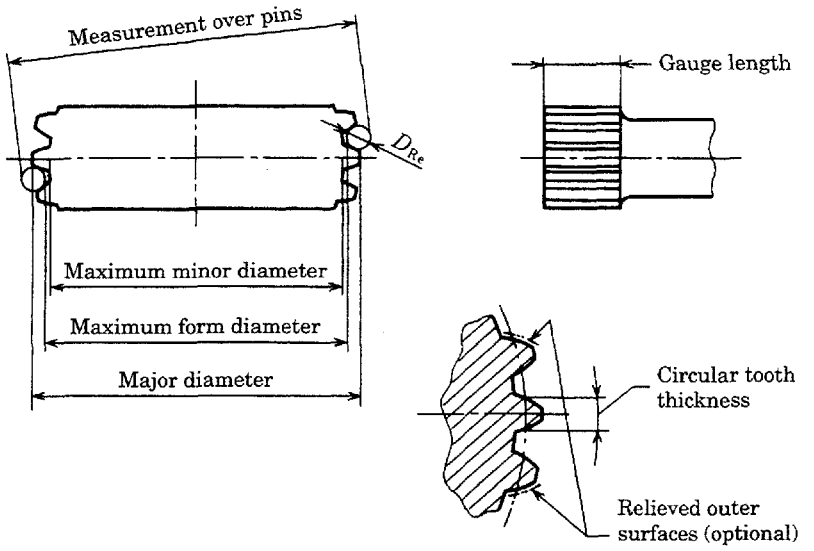


Figure 26 NOT GO two-sector plug gauge

Table 133 Dimensions and tolerances of NOT GO two-sector plug gauges

Gauge dimensions	Formulas	Manufacturing tolerances
Pitch diameter	D	
Major diameter	$\frac{D + 2D_{Fi\,min}}{3}$	JS8**
Maximum form diameter	$D_{ii\,min} - 2c_F$*	
Maximum minor diameter	$D_{ii\,min} - 2c_F$* $- 0.1m$	
Circular tooth thickness at pitch diameter	E_{max}	$\pm H/2$
Variation of form	E	
Pin diameter	D_{Re} (the same as for corresponding external product)	
Measurement over pins	see **23.3.4.1.1**	

The maximum minor diameter shall clear the pin diameter.
Plug calibrating length: see table 123.

* $c_F = 0.1m$

** See **ISO 286**, *ISO system of limits and fits*.

Note : See table 121 for the values of H and E.

Gauge designation Taking the example from **12.3**, a NOT GO sector plug gauge for internal spline

INT $24z \times 2.5m \times 30R \times 5H$ **JIS B 1603**

shall be marked

NOT GO $24z \times 2.5m \times 30R \times 5H$ **JIS B 1603**

Number of sector teeth The number of sector teeth shall be specified in table 134.

Table 134 Number of sector teeth

Total number of product teeth, z	$6<z\leq30$	$31<z\leq44$	$45<z\leq58$	$59<z\leq72$	$73<z\leq86$	$87<z\leq100$	$100<z$
Number of teeth in each sector	2	3	4	5	6	7	$0.075z$

22.2.3 NOT GO composite plug gauge The NOT GO composite plug gauge shall meet the requires specified in figure 27 and table 135.

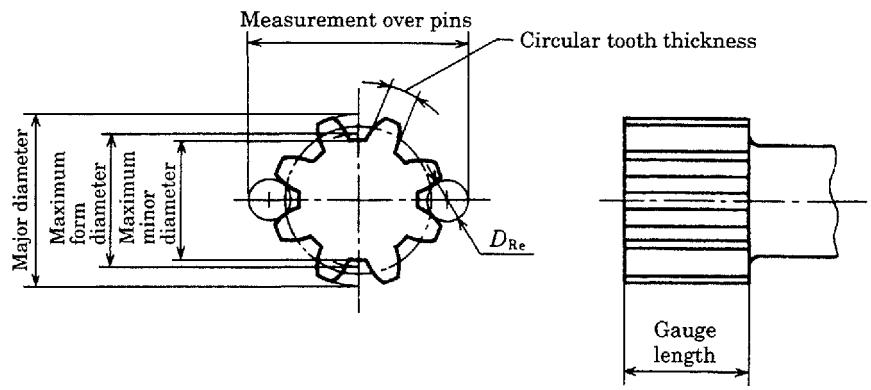


Figure 27 NOT GO composite plug gauge

Table 135 Dimensions and tolerances of NOT GO composite plug gauges

Gauge dimensions	Formulas	Manufacturing tolerances
Pitch diameter	D	
Major diameter	$\frac{D+2D_{Fi\,min}}{3}$	JS8**
Maximum form diameter	$D_{ii\,min}-2c_F^*$	
Maximum minor diameter	$D_{ii\,min}-2c_F^*-0.1m$	
Circular tooth thickness at pitch diameter	$E_{v\,max}=E_{max}-\lambda$	$\pm H/2$
Variation of form	E	
Pin diameter	D_{Re} (the same as for corresponding external product)	
Measurement over pins	see **23.3.4.1.1**	

The maximum minor diameter shall clear the pin diameter.
Plug calibrating length: see table 123.

* $c_F = 0.1m$

** See **ISO 286**, *ISO system of limits and fits.*

Note : See table 121 for the values of H and E.

Gauge designation Taking the example from **12.3**, a NOT GO composite plug gauge for internal spline

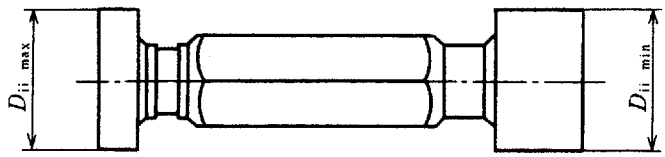
INT $24z \times 2.5m \times 30R \times 5H$ **JIS B 1603**

shall be marked

NOT GO $24z \times 2.5m \times 30R \times 5H$ **JIS B 1603**

22.3 Inspection with plain gauges for internal and external splines

22.3.1 Inspection of minor diameter — internal spline Double plain gauge for toleranced minor diameter (D_{ii}) inspection of internal splines



H10 for $0.25 \leq m \leq 0.75$

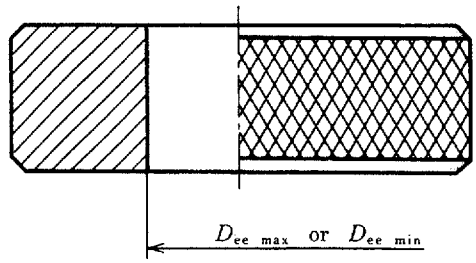
H11 for $1 \leq m \leq 1.75$

H12 for $2 \leq m \leq 10$

Gauge blanks: in accordance with **ISO 3670**.

Figure 28 Double plain gauge

22.3.2 Inspection of major diameter — external spline GO plain ring and NOT GO plain ring for toleranced major (D_{ee}) diameter inspection of external splines shall be as defined in figure 29.



h10 or $0.25 \leq m \leq 0.75$

h11 for $1 \leq m \leq 1.75$

h12 for $2 \leq m \leq 10$

Gauge blanks: in accordance with **ISO 3670**.

Figure 29 GO or NOT GO plain ring

22.3.3 Gauge designation Taking the example from **12.3**, a double plain gauge (TLD) for internal spline

INT $24z \times 2.5m \times 30\text{R} \times 5\text{f}$ **JIS B 1603**

shall be marked

DII H10 or DII H11 or DII H12

GO DEE h10 or GO DEE h11 or GO DEE h12

NOT GO DEE h10 or NOT GO DEE h11 or NOT GO DEE h12

23 Analytical inspection Analytical inspection is characterized by the fact that it consists of an inspection element by element of each dimensional or variation of form.

Analytical inspection allows each variation to be evaluated separately (whereas inspection with limit gauges is a "composite" inspection) and thus permits, in case a part is rejected by the gauge, identification of the element(s) of this part causing rejection.

Analytical inspection as described below mainly concerns:

a) the analytical control of variations of form (total profile variation, total index variation, total lead variation);

b) the measurement over pins (for external splines) or between pins (for internal splines);

c) the measurement over k number of teeth (for external splines).

Note : Analytical inspection applies to both parts and gauges.

23.1 General Analytical inspection is the measurement of individual dimensions and variations.

It allows checking of roundness and concentricity if required. It also allows, when inspecting the profile, the checking of form diameters and the tooth tip chamfers.

Inspection need not be carried out at the pitch diameter, provided it occurs at a well defined circle, to be determined by agreement between the purchaser and the supplier and indicted in the inspection report.

Other inspection methods than those specified below can be used but in case of dispute only those specified in **23.2** and **23.3** shall be used as reference.

23.2 Measurement of spline variations The effect of these variations is dealt with in clause **9**.

23.2.1 Total index variation Index variations are the variations in the spacing of all corresponding tooth profiles from theoretical spacing with respect to the arbitrarily selected tooth side in the corresponding flanks series.

The total index variation is the sum of the absolute values of the two greatest variations of opposite sign (this value of total index variation includes eccentricity) (see **8.3**).

The total index variation may be measured directly or obtained indirectly by measuring circular pitch variations, which are the variations from the theoretical pitch variations.

The measurement of circular pitch variations is of little value for splines unless converted to total index variation.

23.2.1.1 Index variation of tooth profiles is not identical with the index variation of the centrelines of spaces or teeth. Measurement of either variation is acceptable, since only a percentage of the total index variation is assumed to be reflected in the fit. Where readings must be repeatable, it is necessary to describe in detail the manner of inspection. Measurements taken on the centreline of internal spaces and external teeth may be more suitable for determining the effective variation since they are not influenced by space width and tooth thickness variations. Furthermore, determination of the spacing of tooth profile permits contact analysis and separate inspection of drive and coast sides. Index variation is usually measured normal to the tooth surfaces as shown in figure 31 b). This practice yields readings smaller than the variation at the pitch circle [see figure 31 a)] but is generally accepted.