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Limit gauges for unified screw threads

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS B 0255 : 1975** is replaced with **JIS B 0255 : 1998**.

In this revision, limit gauges for unified fine screw threads specified in **JIS B 0256 : 1975** are also included in this Standard, and the said standard has been withdrawn, and the title of this Standard is amended as "Limit gauges for unified screw threads".

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Limit gauges for unified screw threads

Introduction This Japanese Industrial Standard has been prepared based on **JIS B 0255 : 1975** *Limit gauges for unified coarse screw thread* and **JIS B 0256 : 1975** *Limit gauges for unified fine screw thread*.

1 Scope This Japanese Industrial Standard specifies the limit gauges to be used for the dimensional inspection of metric screw threads specified in **JIS B 0210** and **JIS B 0212** (hereafter referred to as "limit gauges for screw threads"), and the gauges to be used for checking (hereinafter referred to as "checking gauges").

The limit gauges and the check gauges are simply referred to as "gauges".

Other inspection methods, for example, the measurement by the indicating instrument may be used, but the inspection shall be effected using the gauges in accordance with this Standard.

This Standard intends to specify the means to discriminate the work piece screw in the tolerance from others.

The following principles shall be used to ensure the interchangeability of the workpiece screws, and to avoid any dispute between the manufacturer and the purchaser.

- a) The manufacturer shall not ship any workpiece screws whose screw dimensions (for example, the single pitch diameter and the total pitch diameter) are out of the specified tolerances.
- b) The purchaser shall not reject any workpiece screws whose screw dimensions (for example, the single pitch diameter and the total pitch diameter) are within the specified tolerances.

To satisfy these two principles, this Standard specifies the classes and dimensions of the gauges required for the inspection of screws, conditions for using these screws, and the inspection of the workpiece screws.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards indicated below shall be applied.

JIS B 0206 *Unified coarse screw threads*

JIS B 0208 *Unified fine screw threads*

JIS B 0210 *Limits of sizes and tolerances for unified coarse screw threads*

JIS B 0212 *Limits of sizes and tolerances for unified fine screw threads*

JIS B 0261 *Measuring method for parallel screw gauges*

JIS B 3102 *Gauge blanks for screw thread limit gauges*

JIS B 7420 *Plain limit gauges*

3 Kinds, symbols, shapes, dimensions, permissible deviations and tolerances of gauges

3.1 Limit gauges for screw threads Kinds, symbols, shapes, dimensions, permissible deviations and tolerances of limit gauges for screw threads specified in this Standard shall be in accordance with Table 1.

Table 1 Kinds, symbols, shapes, dimensions, permissible deviations and tolerances of limit gauges for screw threads

Screw thread to be inspected	Part to be inspected	Kind of screw thread limit gauge	Gauge symbol	Applicable table for dimensions, permissible deviations and tolerances		Applicable standard of shapes
				For coarse screw specified in JIS B 0210	For fine screw specified in JIS B 0212	
External thread	Pitch diameter	GO thread ring gauge (common use for working and inspection)	GR	Attached Table 1	Attached Table 15	JIS B 3102
		NOT GO thread ring gauge for working	WR	Attached Table 2	Attached Table 16	
		NOT GO thread ring gauge for inspection	IR	Attached Table 3	Attached Table 17	
	Major diameter	GO plain snap gauge for working	WS ⁽¹⁾	Attached Table 4	Attached Table 18	JIS B 7420
		NOT GO plain snap gauge for working	WS ⁽¹⁾			
		GO plain snap gauge for inspection	IS ⁽¹⁾	Attached Table 5	Attached Table 19	
		NOT GO plain snap gauge for inspection	IS ⁽¹⁾			
	Internal thread	Pitch diameter	GO thread plug gauge (common use for working and inspection)	GP	Attached Table 6	Attached Table 20
NOT GO thread plug gauge for working			WP	Attached Table 7	Attached Table 21	
NOT GO thread plug gauge for inspection			IP	Attached Table 8	Attached Table 22	
Minor diameter		GO plain plug gauge for working	WM ⁽¹⁾	Attached Table 9	Attached Table 23	JIS B 3102 ⁽²⁾
		NOT GO plain plug gauge for working	WM ⁽¹⁾			
		GO plain plug gauge for inspection	IM ⁽¹⁾	Attached Table 10	Attached Table 24	
		NOT GO plain plug gauge for inspection	IM ⁽¹⁾			

Notes ⁽¹⁾ When the GO side and the NOT GO side are separately specified, the letters of "GO" and "NOT GO" shall be affixed to the gauge symbols.

Example : WM GO, WM NOT GO

⁽²⁾ This shape may be in accordance with JIS B 7420.

3.2 Checking gauges Kinds, symbols, shapes, dimensions, permissible deviations and tolerances of checking gauges specified in this Standard shall be in accordance with Table 2.

Table 2 Kinds, symbols, shapes, dimensions, permissible deviations and tolerances of checking gauges

Screw thread limit gauge to be checked	Kind of checking gauge	Gauge symbol	Applicable table for dimensions, permissible deviations and tolerances		Applicable standard of shapes
			For coarse screw specified in JIS B 0210	For fine screw specified in JIS B 0212	
GO thread ring gauge (common use for working and inspection)	GO engagement checking thread plug gauge	GF	Attached Table 11	Attached Table 25	JIS B 3102
	GO wear checking thread plug gauge	GW	Attached Table 12	Attached Table 26	
NOT GO thread ring gauge for working	NOT GO engagement checking thread plug gauge for working	WF	Attached Table 13	Attached Table 27	
NOT GO thread ring gauge for inspection	NOT GO engagement checking thread plug gauge for inspection	IF	Attached Table 14	Attached Table 28	

4 Gauging of workpieces It is not necessary to use all the gauges mentioned in 3 when workpieces are inspected by limit gauges for screw threads. However, for each part to be inspected, it is essential that a GO and NOT GO gauging always be carried out with one of the GO screw gauges and one of the NOT GO screw gauges specified in 3.1.

Gauges for checking or for inspection shall be appropriately selected between users, and the workpieces shall be regarded acceptable when they are accepted by either gauges so long as these gauges are within the permissible deviations and within the wear limit.

4.1 Gauging of external threads

4.1.1 Purpose of limit gauge for external threads, and its use GO thread ring gauge (GR) and NOT GO thread ring gauge (WR or IR) shall be used for the inspection of the pitch diameter of external threads. Plain snap gauge (WS or IS) shall be used for the inspection of external threads.

The respective purposes and the uses shall be as follows.

- a) **GO thread ring gauge (GR)** This gauge shall be used for the inspection on GO side whether or not the total pitch diameter of external threads is within the specified permissible deviations, and if it passes over the whole length of the workpiece thread when screwed by hand without using excessive force, the external threads are acceptable in the dimensional inspection by the GO thread ring gauge (GR).

- b) **NOT GO thread ring gauge (WR or IR)** This gauge shall be used for the inspection whether or not the actual pitch diameter of external threads is more than the specified minimum permissible dimension, and the external threads are acceptable for the dimensional inspection by the NOT GO thread ring gauge (WR or IR) unless the gauges are screwed from both ends by not less than two turns of thread when screwed by hand without using excessive force. However, for the external threads with the thread length of not more than 3 threads, the NOT GO thread ring gauge (WR or IR) shall not pass through completely.
- c) **Plain snap gauge (WS or IS)** This gauge shall be used for the inspection on the GO side and NOT GO side whether or not the major diameter of external threads is within the specified permissible deviations, and the external threads are acceptable for the dimensional inspection by the plain snap gauge (WS or IS) unless the GO side of the plain snap gauge (WS or IS) passes through and the NOT GO side does not pass through from any direction by its own weight or the working load when the plain snap gauge (WS or IS) is screwed into the worked external threads.

4.2 Gauging of internal threads

4.2.1 Purpose of limit gauge for internal threads, and its use A GO thread plug gauge (GP) and NOT GO thread plug gauge (WP or IP) shall be used for the inspection of the pitch diameter of internal threads. A plain plug gauge (WM or IM) shall be used for the inspection of minor diameter.

The respective purposes and the uses shall be as follows.

- a) **GO thread plug gauge (GP)** This gauge shall be used for the inspection on GO side whether or not the total pitch diameter of internal threads is within the specified permissible deviations, and if it passes over the whole length of the workpiece thread when screwed by hand without using excessive force, the internal threads are acceptable in the dimensional inspection by the GO thread plug gauge (GP).
- b) **NOT GO thread plug gauge (WP or IP)** This gauge shall be used for the inspection whether or not the actual pitch diameter of internal threads is less than the specified maximum permissible dimension, and the internal threads are acceptable for the dimensional inspection by the NOT GO thread plug gauge (WP or IP) unless the gauges are screwed from both ends by not less than two turns of thread when screwed by hand without using excessive force. However, for the internal threads with the thread length of not more than 3 threads, the NOT GO thread plug gauge (WP or IP) shall not pass through completely.
- c) **Plain plug gauge (WM or IM)** This gauge shall be used for the inspection on the GO side and NOT GO side whether or not the minor diameter of internal threads is within the specified permissible deviations, and the internal threads are acceptable for the dimensional inspection by the plain plug gauge (WM or IM) if the GO side of the plain plug gauge passes through and the NOT GO side does not pass through when the plain plug gauge (WM or IM) is screwed into the worked internal threads by hand without using excessive force.

4.3 Dealing with disagreement in judgment on acceptance/rejection by limit gauges for screw threads in trade When disagreement occurs in the judgment on acceptance/rejection by the limit gauges for screw threads due to the difference in gauges

to be used by the manufacturer and the user, the screw threads shall be considered to comply with the dimensional inspection by the gauges if the gauge judging the acceptance satisfies this Standard (taking the permissible wear into consideration).

5 Inspection of limit gauges for screw threads by checking gauges

5.1 Inspection of GO thread ring gauges

5.1.1 Purpose of checking gauges for GO thread ring gauges, and its use The purpose of checking gauges for GO thread ring gauges, and its use shall be as follows.

- a) **GO engagement checking thread plug gauge (GF)** This engagement checking thread plug gauge shall be used in the inspection for the total pitch diameter of a GO thread ring gauges (GR) newly manufactured, and this checking thread plug gauge shall be screwed by hand without using excessive force into the GO thread ring gauge (GR) without any play.
- b) **GO wear checking thread plug gauge (GW)** This wear checking thread plug gauge shall be used for checking whether or not the pitch diameter of the GO thread ring gauge (GR) does not exceed the specified wear limit, and this wear checking thread plug gauge shall not pass through the GO thread ring gauge (GR).

5.2 Inspection of NOT GO thread ring gauges

5.2.1 Purpose of checking gauges for NOT GO thread ring gauges, and its use The purpose of the gauge for checking the NOT GO thread ring gauges, and its use shall be as follows.

- a) **NOT GO engagement checking thread plug gauge for working (WF)** This engagement checking thread plug gauge shall be used in the inspection for the total pitch diameter of a NOT GO thread ring gauges for working (WR) newly manufactured, and this checking thread plug gauge shall be screwed by hand without using excessive force into the NOT GO thread ring gauge for working (WR) without any play.
- b) **NOT GO engagement checking thread plug gauge for inspection (IF)** This engagement checking thread plug gauge shall be used in the inspection of the total pitch diameter of a NOT GO thread ring gauges for inspection (IR) newly manufactured, and this checking thread plug gauge shall be screwed by hand without using excessive force into the NOT GO thread ring gauge for inspection (IR) without any play.

6 Reference temperature The dimensions of both the gauge and the workpiece shall be those at a temperature of 20 °C.

If the workpieces and gauges have the same coefficient of linear expansion (e.g. steel workpieces and steel gauges), the checking temperature may deviate from 20 °C without errors in the results, provided that the temperatures of both gauges and workpieces are the same.

If the workpieces and gauges have different coefficients of linear expansion [e.g. steel workpieces and carbide gauges or brass workpieces and gauges of steel (or carbide)], the temperature of both shall be (20 ± 2) °C at the time of gauging. Otherwise the difference between the thermal expansions of the workpiece and the gauge shall be taken into consideration.

7 Relative positions between tolerances of threads and tolerances of screw thread limit gauges or checking gauges

The relative positions between tolerances of threads and tolerances of screw thread limit gauges or checking gauges are shown in Fig. 1.

Major diameter of external thread	Gauge for external thread (including checking gauge)										Pitch diameter of external thread	Gauge for internal thread								Minor diameter of internal thread
	Gauge for major diameter				Gauge for pitch diameter							Gauge for pitch diameter				Gauge for minor diameter				
	Plain snap gauge for working		Plain snap gauge for inspection		Engagement checking screw plug gauge	NOT GO thread ring gauge for inspection		Engagement checking screw plug gauge	NOT GO thread ring gauge for working	Wear checking screw plug gauge		Engagement checking screw plug gauge	GO thread ring gauge (common use for working and inspection)	GO screw plug gauge (common use for working and inspection)	NOT GO screw plug gauge for working	NOT GO screw plug gauge for inspection	Plain plug gauge for inspection	Plain plug gauge for working		
	GO	NOT GO	GO	NOT GO		Same purpose as right	Same purpose as right												Same purpose as right	
	Position of basic dimension of major diameter																			
Position of basic dimension of pitch diameter																				
Position of basic dimension of minor diameter																				

Remarks : The diagrammatical indications of tolerance zone and wear allowance in the above diagram have the following meanings, respectively:

	Tolerance on pitch diameter or major diameter of external thread		Tolerance on pitch diameter or minor diameter of internal thread		Tolerance for thread ring gauge or plain snap gauge
	Tolerance for screw plug gauge or plain plug gauge		Minimum wear allowance		

Fig. 1 Explanatory diagram of relative positions between tolerances of threads and tolerances of screw thread limit gauges or checking gauges

(Example of gauges for unified screw threads 2A and 2B)

8 Thread profile of gauges

8.1 Profile with complete flanks, and its application (Refer to Figs. 2 and 3)

The profile with complete flanks, and its application shall comply with Table 3.

Table 3 Profile with complete flanks, and its application

Applicable gauge	Profile
GO screw plug gauge GO engagement checking screw plug gauge NOT GO engagement checking screw plug gauge for working NOT GO engagement checking screw plug gauge for inspection	See Fig. 2 ⁽³⁾ .
GO thread ring gauge	See Fig. 3 ⁽⁴⁾ .

Notes (3) The shape of the root of the profile with complete flanks shall be provided with a suitable undercut so as to leave a clearance between the root and the minimum dimension of the minor diameter of the inspected internal thread, or the minor diameter of the inspected thread ring gauge.

(4) The shape of the root of the profile with complete flanks shall be provided with a suitable undercut so as to leave a clearance between the root and the maximum dimension of the major diameter of the inspected external thread.

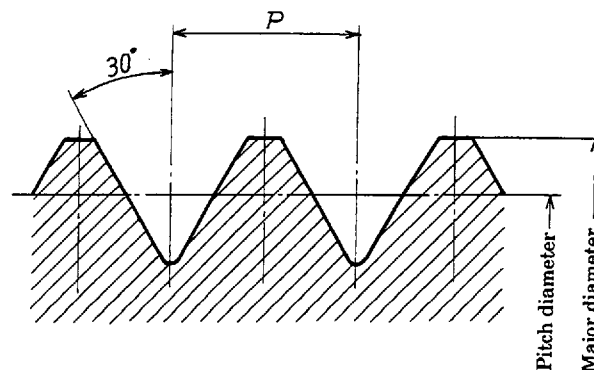


Fig. 2 Profile with complete flanks (thread plug gauge)

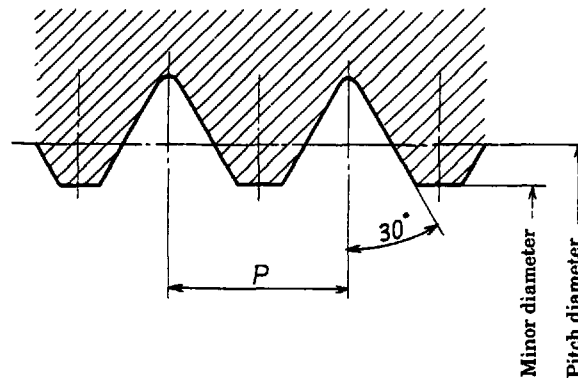


Fig. 3 Profile with complete flanks (thread ring gauge)

8.2 Profile with truncated flanks, and its application (Refer to Figs. 4 and 5) The profile with truncated flanks, and its application shall comply with Table 4.

Table 4 Profile with truncated flanks, and its application

Applicable gauge	Profile
NOT GO screw plug gauge for working NOT GO screw plug gauge for inspection GO wear checking screw plug gauge	See Fig. 4 ⁽⁵⁾ .
NOT GO thread ring gauge for working NOT GO thread ring gauge for inspection	See Fig. 5 ⁽⁶⁾ .

Notes ⁽⁵⁾ In case of the NOT GO thread plug gauges, the shape of the root of the profile with truncated flanks shall be of Shape A shown in Fig. 4 so that those parts other than the shortened flank are not brought into contact with the inspected internal thread. However, in case of the gauges to be used for the screw whose thread number exceeds 20 for each 25.4 mm, the shape of the root may be of Shape B shown in Fig. 4 which the flank is extended close to the root.

In case of the GO wear checking thread plug gauge, the shape of the root may be of Shape B shown in Fig. 4 which the flank is extended close to the root so as to leave a clearance between the root and the minimum dimension of the minor diameter of the inspected thread ring gauge.

⁽⁶⁾ The shape of the root of the profile with truncated flanks shall be of Shape A shown in Fig. 5 so that those parts other than the shortened flank are not brought into contact with the inspected external thread. However, in case of the gauges to be used for the screw whose thread number exceeds 20 for each 25.4 mm, the shape of the root may be of Shape B shown in Fig. 5 which the flank is extended close to the root.