Detailed Introduction to Thread Ring Gauge



I. Definition and Purpose of Thread Ring Gauge

A thread ring gauge is a precision measuring tool specifically designed to measure the correctness of external thread dimensions. In industries such as machinery manufacturing, automotive industry, aerospace, and numerous fields that require threaded connections, thread ring gauges play a crucial role. They ensure that the dimensional accuracy of external threads meets standards, thus guaranteeing the reliability and interchangeability of threaded connections.

II. Structure of Thread Ring Gauge

Thread ring gauges are typically made of high-quality alloy steel or tool steel through elaborate manufacturing processes. Their structure mainly consists of the following parts:

- 1. **Ring-shaped Body**: It has a ring-shaped appearance and serves as the main bearing part of the thread ring gauge. Generally, it is made of steel that has undergone special heat treatment, possessing good hardness and wear resistance, which can ensure the dimensional stability during long-term use.
- 2. Internal Thread Profile: On the inner surface of the ring-shaped body, an accurate thread profile matching the measured external thread is machined. The design of the thread profile strictly follows relevant standards. For example, the thread angle of ordinary threads is 60°, and other types of threads such as pipe threads also have their specific thread profile designs. These thread profiles are the key parts for measuring the dimensions of the measured external threads.

3. Go Gauge and No-Go Gauge:

- **Go Gauge**: It has a complete thread profile and is used to check whether the major diameter, pitch diameter, and minor diameter of the thread are within the specified tolerance range, ensuring that the thread can be smoothly screwed together. When the go gauge can freely screw into the entire length of the measured external thread, it indicates that the basic dimensions of the external thread meet the requirements and have good screwing properties.
- No-Go Gauge: Its thread profile is relatively short and mainly used to control the maximum limit size of the pitch diameter of the thread to prevent the thread from being too loose. Under normal circumstances, the no-go gauge can only be screwed into the measured external thread for no more than two pitches. If it is screwed in too much, it indicates that the pitch diameter of the thread is too large and does not meet the standard requirements.

[Insert a comparison picture of the go gauge and no-go gauge of the thread ring gauge here. Picture source: [specific picture website]. Picture description: The go gauge (left) and no-go gauge (right) of the thread ring gauge. It can be clearly seen that the go gauge has a complete thread profile, and the no-go gauge has a shorter thread profile.]

III. Specifications and Models of Thread Ring Gauge

Thread ring gauges are available in a wide variety of specifications and models, commonly ranging from M3 to M500 and other sizes to meet the measurement requirements of external threads in different fields and products. The following is an example table of some common specifications and models:

Specification Model	Pitch (mm)
M3	0.5
M4	0.7
M5	0.8
M6	1.0
M8	1.25
M10	1.5
M12	1.75
M14	2.0

Specification Model	Pitch (mm))
M16	2.0	
M18	2.5	
M20	2.5	
M500	Subject specific standards	to

It should be noted that for different thread types (such as coarse threads, fine threads, pipe threads, etc.), even if the nominal diameters are the same, the pitches may vary. When selecting a thread ring gauge, it is necessary to accurately match according to actual needs.

IV. Working Principle of Thread Ring Gauge

The working principle of the thread ring gauge is based on the screwing operation with the measured external thread to determine whether its dimensions are qualified. During the measurement process, the following steps are followed:

- 1. **Go Gauge Detection**: Align the go gauge with the measured external thread, and then gently rotate the go gauge with the thumb and index finger to make it screw into the measured thread in a free state. If the go gauge can smoothly screw through the entire length of the thread, it means that the major diameter, pitch diameter, and minor diameter of the measured thread are all within the specified upper tolerance limit, and the basic dimensions of the thread are qualified, with good screwing conditions.
- 2. No-Go Gauge Detection: After the go gauge detection is qualified, then use the nogo gauge for detection. Similarly, align the no-go gauge with the measured external thread and slowly rotate the no-go gauge to make it screw in. Under normal circumstances, the no-go gauge can only be screwed into the measured external thread for no more than two pitches. If the no-go gauge is screwed in more than two pitches, it indicates that the pitch diameter of the thread is too large and exceeds the minimum limit size specified in the standard, and the external thread is unqualified; if the no-go gauge cannot be screwed in or the screwing amount is within the specified range, it indicates that the pitch diameter of the thread meets the requirements. Only when the go gauge can be smoothly screwed in and the screwing amount of the no-

go gauge meets the standard can the external thread dimensions be judged to be completely qualified.

[Insert an operation picture of using a thread ring gauge to measure an external thread here. Picture source: [specific picture website]. Picture description: Workers are using a thread ring gauge to measure the external thread of a workpiece, clearly showing the operation process of the go gauge screwing into the measured thread.]

V. Detailed Explanation of Thread Ring Gauge Parameters

Thread ring gauges have several important parameters, which determine their applicable range and measurement accuracy. The following is a table introducing the main parameters:

Parameter Name	Meaning and Explanation
Nominal Diameter	The standard thread diameter corresponding to the thread ring gauge, such as M3, M10, M500, etc. It is a key parameter for identifying the thread specification.
Pitch	The axial distance between two corresponding points on the pitch line of adjacent teeth. Different specifications and types of threads have specific pitch values. Coarse threads generally have relatively large pitches, fine threads have smaller pitches, and pipe threads also have their unique pitch standards.
Tolerance Grade	It reflects the manufacturing accuracy level of the thread ring gauge. Common tolerance grades include 6H, 6g, 7H, 8g, etc. The higher the tolerance grade, the higher the manufacturing accuracy, and the more precise the control of the measured thread dimensions. However, the corresponding manufacturing cost is also higher. When selecting a thread ring gauge, it is necessary to match according to the tolerance grade of the measured thread to ensure accurate measurement.
Thread Angle	The included angle between two adjacent flanks on the thread profile. The thread angle of ordinary threads is 60°. Other special threads (such as trapezoidal threads, buttress threads, etc.) have different thread angle designs. The accuracy of the thread angle directly affects the fit properties and connection strength of the thread.
Hardness	The hardness value of the surface of the thread ring gauge after heat treatment is generally HRC58 - 62. Higher hardness ensures

Parameter Name	Meaning and Explanation
	that the ring gauge is not easily worn during long-term use and maintains stable measurement accuracy.
Measurement Range	The measurement range of external thread dimensions that the thread ring gauge can measure. For example, for a ring gauge with a measurement range of M3 - M500, it covers external threads with nominal diameters ranging from 3mm to 500mm.

VI. Usage Method of Thread Ring Gauge

- 1. Select the Appropriate Ring Gauge: According to the specifications of the measured thread (nominal diameter, pitch, tolerance grade, etc.), carefully select a thread ring gauge that completely matches it. Ensure that the accuracy grade and deviation code of the ring gauge are consistent with those of the measured thread. Otherwise, it will lead to inaccurate measurement results and misjudgments.
- 2. Cleaning and Preparation Work: Before use, it is necessary to thoroughly clean the surface of the measured thread and the go and no-go ends of the thread ring gauge with a clean cloth or cotton yarn to remove any substances such as oil stains, impurities, and iron filings that may affect the measurement accuracy. At the same time, check whether there are scratches, wear, or deformation on the measurement surface of the ring gauge. If there are problems, repair or replace the new ring gauge in a timely manner.
- 3. **Go Gauge Detection Operation**: Gently align the go end of the thread ring gauge with the measured external thread, and then slowly rotate the go gauge with the thumb and index finger to make it screw into the measured thread in a natural state without forced external force. During the screwing process, closely observe the screwing situation of the go gauge. If the go gauge can smoothly screw through the entire length of the thread, it indicates that the maximum limit dimensions of the major diameter, pitch diameter, and minor diameter of the measured thread meet the requirements.
- 4. No-Go Gauge Detection Operation: After the go gauge detection is completed and the result is qualified, then conduct the no-go gauge detection. Similarly, align the no-go gauge with the measured external thread and gently rotate the no-go gauge to make it screw in. Pay attention to observing the screwing depth of the no-go gauge. Under normal circumstances, the no-go gauge can only be screwed into the measured external thread for no more than two pitches. If the no-go gauge is screwed in more than two pitches, it indicates that the pitch diameter of the thread is too large and exceeds the minimum limit size specified in the standard, and the thread is unqualified; if the no-go gauge cannot be screwed in or the screwing amount is within the specified range, it indicates that the pitch diameter of the thread meets the standard.
- 5. Measurement Result Judgment: Only when the go gauge can smoothly screw

through the entire length of the measured thread and the screwing amount of the no-go gauge does not exceed two pitches can the external thread dimensions be judged to be completely qualified. If the go gauge cannot be screwed in, it indicates that the major diameter, pitch diameter, or minor diameter of the thread is too small; if the no-go gauge is screwed in beyond the specified range, the pitch diameter of the thread is too large, and both do not meet the standard requirements. It is necessary to adjust or reprocess the thread.

VII. Maintenance and Upkeep of Thread Ring Gauge

- 1. **Cleaning**: After each use, immediately clean the thread ring gauge with a clean soft cloth or brush to remove oil stains, iron filings, impurities, etc. attached to it. For stubborn stains, a special cleaning agent can be used for cleaning, but pay attention that the cleaning agent cannot corrode the material of the ring gauge.
- 2. **Rust Prevention**: Wipe dry the cleaned thread ring gauge and then apply a thin layer of anti-rust oil to prevent the ring gauge from rusting. Especially in a humid environment or when not in use for a long time, rust prevention work is particularly important.
- 3. **Storage**: Store the thread ring gauge in a special measuring tool box. The box should be equipped with appropriate cushions to avoid collisions and scratches between the ring gauges. The storage environment should be kept dry and clean, with relatively stable temperature and humidity, away from heat sources, magnetic fields, and corrosive substances.
- 4. **Regular Calibration**: To ensure the measurement accuracy of the thread ring gauge, it is necessary to send it to a professional metrology institution for calibration regularly. The calibration cycle can be determined according to the frequency of use and the actual working environment. Generally, it is recommended to calibrate once every six months or one year. During the calibration process, if there are problems such as wear or deformation of the ring gauge, repair or replace it in a timely manner.
- 5. **Proper Use**: When using the thread ring gauge, strictly follow the operating procedures, avoid excessive force or forced screwing, and prevent damage to the ring gauge. It is strictly prohibited to use the thread ring gauge for non-measurement purposes, such as using it as a wrench to tighten nuts, etc., to avoid reducing the accuracy of the ring gauge.

VIII. Applications of Thread Ring Gauge in Various Industries

- 1. Machinery Manufacturing Industry: In the processing of mechanical parts, thread ring gauges are used to detect whether the external thread dimensions of various shaft parts, screws, bolts, and other parts meet the design requirements. Ensuring the accuracy of threads can guarantee the firm and reliable connection between parts, avoid assembly problems caused by thread dimension deviations, and improve the overall performance and stability of mechanical equipment.
- 2. Automotive Manufacturing Industry: There are a large number of threaded connections in key components such as automotive engines, transmissions, and chassis. Thread ring gauges are used in the manufacturing process of automotive parts to detect the dimensional accuracy of these threads, ensuring the engine's sealing performance, the smooth shifting of the transmission, and the safety of the

connections of various chassis components. Any unqualified thread dimension may affect the performance and safety of the vehicle. Therefore, thread ring gauges play a crucial role in quality control in automotive manufacturing.

- 3. Aerospace Industry: The aerospace field has extremely high requirements for the quality and reliability of parts. As one of the important connection methods, the accuracy of threaded connections is directly related to the safe operation of aircraft. Thread ring gauges are used to detect the threaded connectors in aircraft engines, landing gears, fuselage structures, and other parts, ensuring high-precision and consistency of thread dimensions. In aerospace manufacturing, high-precision thread ring gauges are usually used, and the measurement process and quality are strictly controlled to ensure that the safety and reliability of aircraft reach the highest standards.
- 4. **Electronics Industry**: In the manufacturing of electronic equipment, thread ring gauges are used to detect the dimensions of internal threaded connectors, such as the fastening screws of the electronic equipment housing and the threaded mounting holes on the circuit board. Although the thread sizes in the electronics industry are relatively small, the requirements for accuracy are equally strict to ensure the assembly accuracy and stability of electronic equipment and prevent equipment failures or damage caused by threaded connection problems.

[Insert a puzzle picture of the application scenarios of thread ring gauges in various industries here. Picture source: [specific picture website]. Picture description: From left to right, it shows workers in a machinery manufacturing workshop using thread ring gauges to detect shaft parts, an automotive factory detecting engine threads, an aerospace laboratory detecting aircraft part threads, and an electronics factory detecting the threaded connectors on circuit boards, demonstrating the application scenarios of thread ring gauges in different industries.]

As an important tool for measuring external thread dimensions, thread ring gauges play an indispensable role in various industries. Correct selection, use, and maintenance of thread ring gauges are of great significance for ensuring product quality, improving production efficiency, and ensuring the safe operation of equipment.

