8. THERMAL PAPER HANDLING PRECAUTIONS

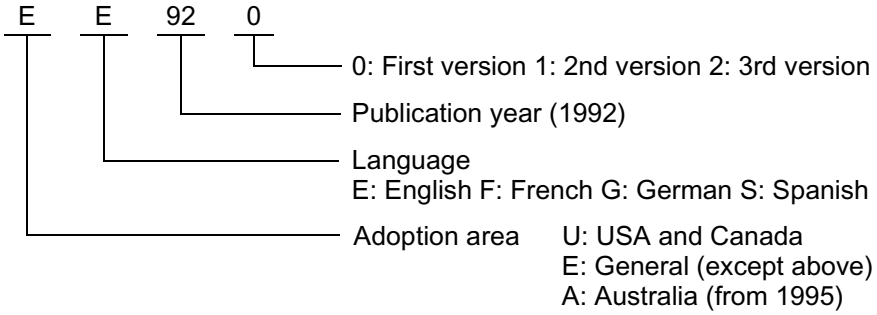
1) Observe the following precautions to avoid discoloration or fading of the thermal paper. Improper storage conditions can also result in loss of printed data.
2) High temperatures of 50°C (122°F) or higher and atmospheres containing thinner, alcohol, benzine or ammonia can cause the paper to turn black.
   Prolonged exposure to ultraviolet rays or contact with polyvinyl products, tape, glue containing thinner, etc., can cause fading of the printing.

9. REFERENCE

1) What is the CONSULT?
   Computerized ON-board System Universal Tester
   CONSULT represents a significant advance in the technology for diagnostic troubleshooting in electronic control system. Starting with some 1990 Nissan models, the vehicles are designed with CONSULT in mind.

2) Program number
   This number indicated publication year and specifications.

Ex.



- This program card can be used on compatible vehicles produced between 1990 and 1992 model years.
- Updating of card is responds to new technology.

3) Data of "TIME" indicated as below:
   This indicates how many times the engine started after the last detection of a failure. If the failure is being detected currently, the time data will be "0".

4) Function of ERASE
   When touched, the self-diagnostic results stored in the ECM are erased. You have to perform self-diagnosis again when you finish repairs.

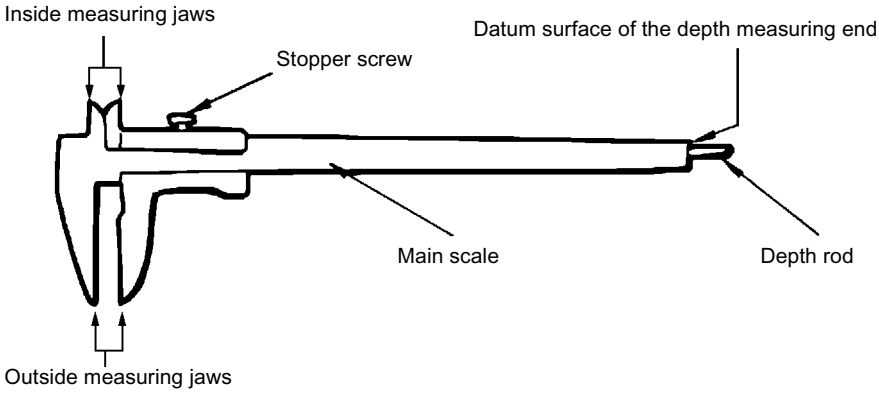
5) Function of PRINT
   When touched, the self-diagnostic results are printed out. (with system, date and ECM part number).

MEASURING TOOLS

1. VERNIER CALIPERS

(Function)

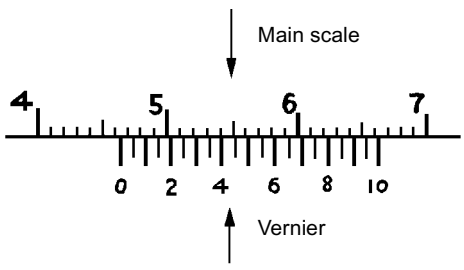
You can measure length, outer diameter, inner diameter and depth easily with vernier calipers. When you do the maintenance work on trucks, you use these vernier calipers mainly for measuring the outer diameter of a shaft, the inner diameter of a bushing, the height of a valve spring and the like.



TTL001

(Scale reading)

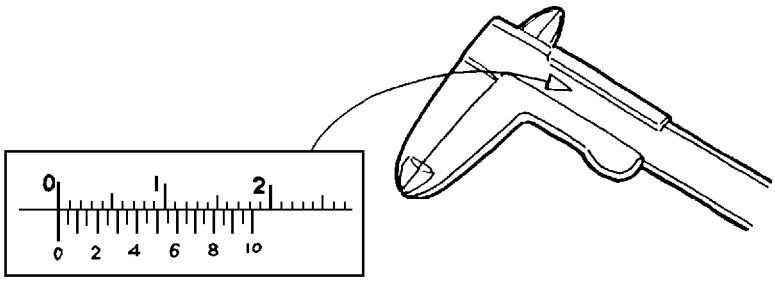
- Examples of the minimum scales you can read with vernier calipers are l/ 10, 1/20, and 1150 min. Let's take as an example the vernier calipers which provide a minimum reading of 1/20 min. As the illustration shows, the main scale is scaled in millimeters. In the vernier, 19 scales of the main scale are equally divided into 20. This means that one scale of the vernier is 19/20 mm (0.95 mm) and the difference of one scale between the main scale and the vernier is 1 min - 19/20 (0.95 mm) = 1/20 (0.05 mm). By using this principle, you can read 1/20 min.
- When a work is measured, the scale reads as is shown in the illustration. In this case, the value by the unit of millimeters is read by the main scale, and the fraction is read by the vernier where the main scale and the vernier meet. In the illustration, the reading on the main scale is 46, and the scale 4 of the vernier meets a scale on the main scale. Here, the value 4 of the vernier means 0.4 mm. So the total reading is 46 mm + 0.4 mm = 46.4 nun. If the vernier is divided into 20, the fraction can be found by multiplying 0.05 to the value of the vernier where both scales meet.
- You must read the scale in a right angle against the vernier calipers. If you read from the wrong angle, an error will arise due to the thickness of the vernier.



TTL002

(Important points)

- The measuring surfaces of vernier calipers and the measured surfaces of a work must be always kept clean to obtain a correct value with vernier calipers.
- Before using, check that the vernier calipers move smoothly, that the zero lines of both the main scale and the vernier exactly meet, and that the outer diameter measuring surfaces and the inner diameter measuring surfaces contact respectively in parallel without any gap. Existence of a gap between the measuring surfaces causes errors. Correct use of vernier calipers prevents such distortion. Misuse or negligence of maintenance leads to earlier occurrence of distortion, resulting in incorrect measurements. Application of unnecessarily large measuring force must be avoided.
- Measuring surfaces can be protected if the vernier calipers are kept after use with both of the measuring surfaces locked with a clearance gap between them.

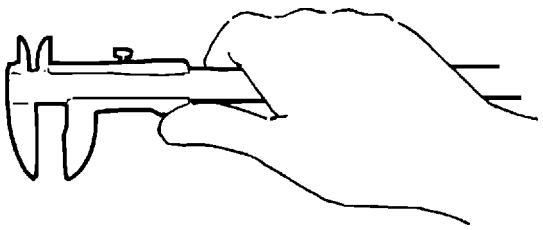


TTL003

(Measuring of outer diameter)

Basic way of holding vernier calipers

- Let the measuring surface of the jaw of the main scale contact the work, set your thumb on the knob of the vernier, and hold the work with measuring surface of the jaw of the vernier.



TTL004

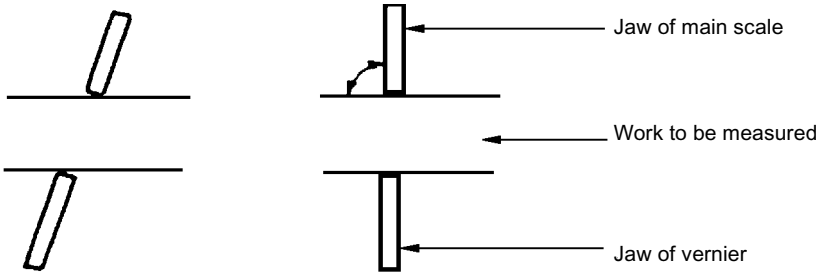
Use the roots of the jaws for measurement.

- Use of the tips of the jaws will bend the vernier as shown in the illustration, casing incorrect measurements. Application of an unnecessarily large measuring force also causes such bending even if the work is measured at the roots of the jaws. So, the measuring force (the force applied by your thumb) is another important factor.

TTL005

Vernier callipers and work are to be in a right angle.

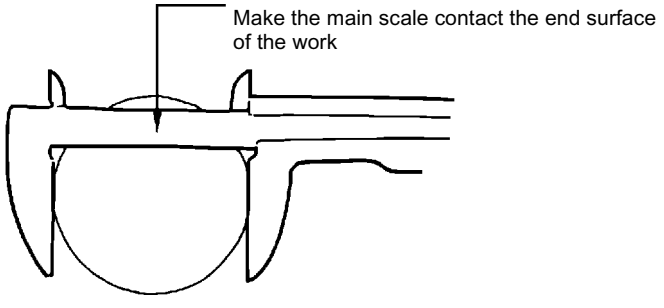
- This is the basic for measuring. If the work is not placed in right angle, rocking the callipers slightly in the horizontal direction with your thumb and pressing the vernier lightly will advance the vernier slightly, making the measuring surfaces contact (in right angle) closely to the work.



TTL006

How to measure a large work

- A large work is measured at its end surface, and the trick to this is to make the main scale contact the end surface of the work. In this way, bending of the vernier calipers is avoided and correct measurement can be obtained.



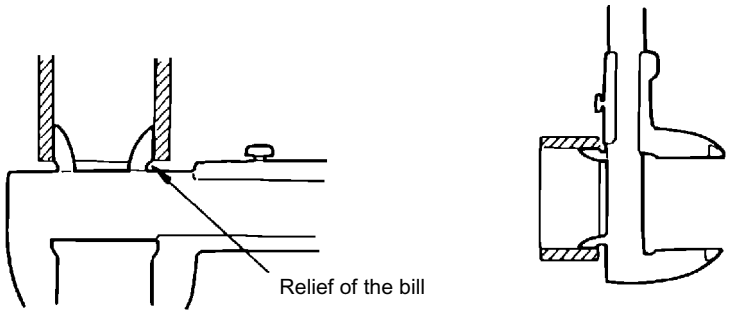
TTL007

(Measuring of inner diameter)

- Insert the bills of the vernier calipers into the work, and make the measuring surfaces contact the inside of the work by the pulling the vernier slightly with your thumb set on the knob of the vernier.

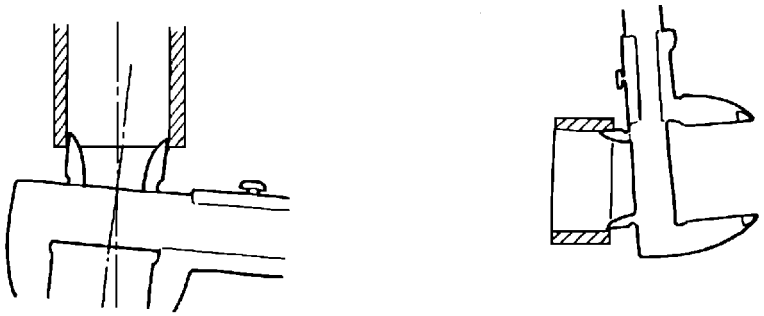
Correct way of applying the bills

- Insert the bills as deeply as possible, but not deeper than the relief of the bills. Moving the calipers slightly in longitudinal and lateral directions by pulling the vernier lightly with your thumb set on the knob of the vernier will open the vernier slightly, enabling the work to contact the measuring surfaces closely.



TTL008

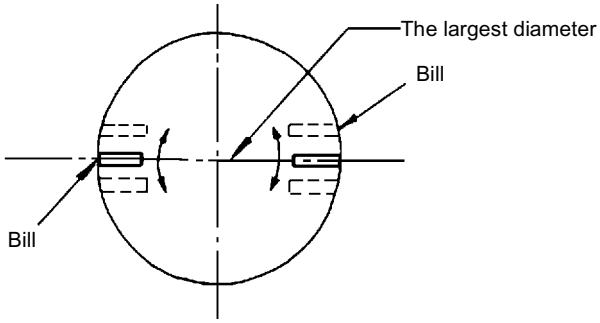
- If the bills are inserted too shallowly, the whole body of the vernier callipers tends to fall as shown in the illustration. Application of unnecessarily large measuring force is likely to cause distortion to the vernier.



TTL009

How to measure a round hole

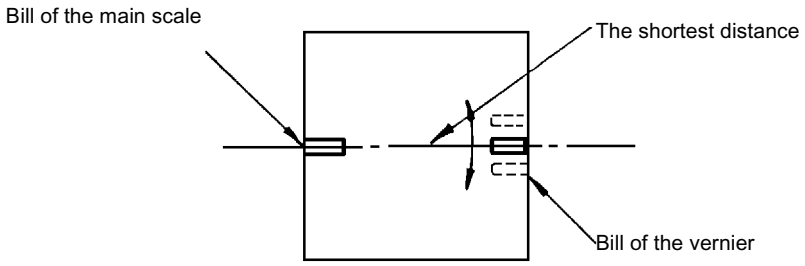
- A round hole (inner diameter) is to be measured at the largest diameter. The largest diameter can be found easily by pulling the vernier slightly and moving the calipers slightly as shown by the arrows.



TTL010

How to measure a s

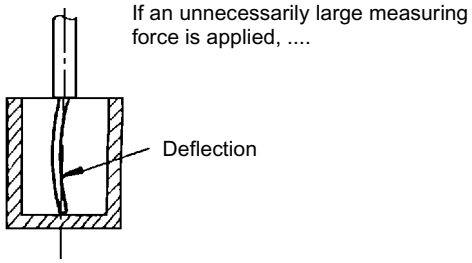
- A square hole is a be measured, contrary to a round hole, at the shortest distance or the place where the largest reaction is felt. The shortest distance can be found using the following procedure. Let the measuring surface of the bill the main scale contact the measuring surface of the square hole lightly, and then stop it. Then, set your thumb on the knob of the vernier, and move the bill of the vernier slightly while pulling it lightly as shown by arrows. The trick is to narrow down the width to move the bill gradually.



TTL011

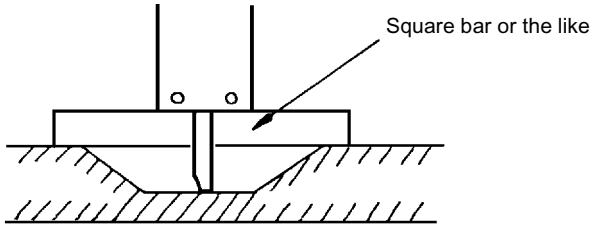
(How to measure depth)

- Apply the datum surface of the depth measuring end closely to the datum surface of the depth (length) of the work and slide the vernier till the tip of the depth bar contacts the bottom. Application of an unnecessarily large measuring force causes the floating of the main scale or the distortion of the datum surface, and in the case of a deep hole, the depth bar may be deflected as shown in the illustration, making correct measurement impossible.



TTL012

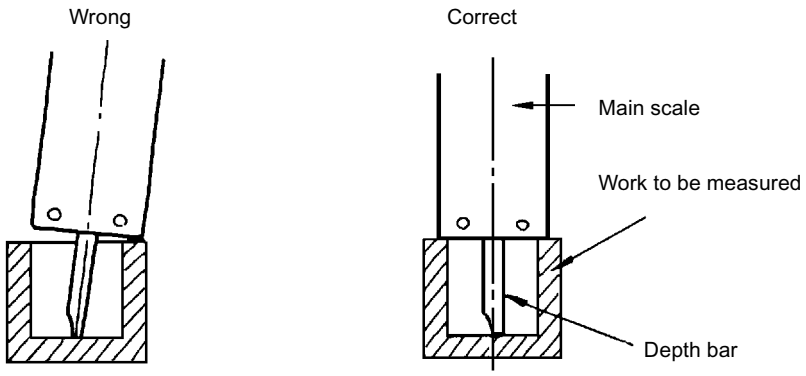
In case the depth can not be measured directly. If the depth bar can not be applied directly due to the taper provided at the inner surface of the work, use a square object such as a square bar which can be used as a datum, and then subtract the thickness of the square object from the actually measured value.



TTL013

How to measure a small hole

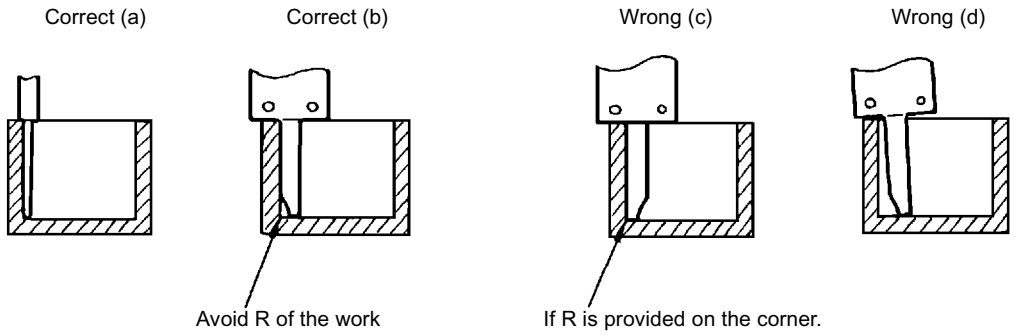
The datum surface of the depth measuring end is to be bridged across the hole. It is important to make both datum surfaces contact closely. Correct value can not be obtained if one side is floating.



TTL014

How to measure a large hole

The trick is to contact the depth bar tightly to the inner surface of the work to be measured as shown in (a) and (b). After it is machined, the R (curvature) will remain more or less at the corner. Correct value can not be obtained by the method shown in (c) since the corner of the depth bar contacts the R. It is important to make the relief of the depth bar face the R as shown in (b). A slanted datum surface shown in (d) will cause the error of at least 0.1 mm to 0.2 nun.

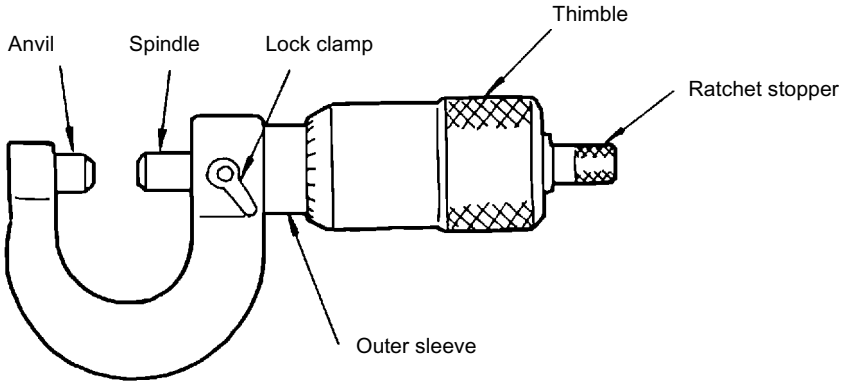


TTL015

1. MICROMETER

(Function)

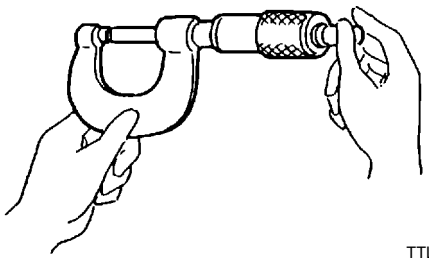
A micrometer is used mainly for measuring outer diameter or length. The minimum reading of an ordinary one is 0.01 mm.
A standard gauge is used to inspect the scale error.



TTL016

(Prior inspection)

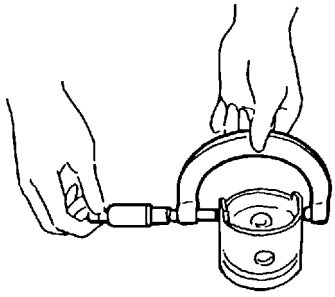
1) Loosen the clamp.
2) Wipe the hole body with a waste cloth. Pay attention so that the measuring surface are free from dust and the like.
3) Check the turning condition of the spindle by holding and turning the ratchet stopper.
4) Close the space between the measuring surface until the ratchet stopper turns idly (ticketing sound) and confirm the zero point.



TTL017

(Hold a work)

1) Put the work in a stable position.
2) Hold the frame with your left hand and turn the thimble to open the measuring space a little wider than the work.
3) Place the work in the space between the measuring surfaces, turn the ratchet stopper with the thumb and the point finger of your right hand and hold the work between the anvil and the spindle.



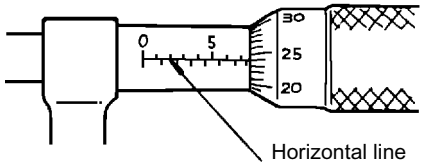
TTL018

4) Press the work until the ratchet stopper turns idly (ticking sound) two or three times.

(How to read the scale)

1) The scale is to be read with the work held.
2) In order to measure the work which is located at a place where the scale is hard to read, clamp and fix the spindle, and remove the micrometer gently from the work to read the scale.
3) Read the scale on the sleeve at the end of the thimble for the valve of the unit of 0.5mm. Then, read the scale on the circumference of the thimble for the valve of the unit of 0.01mm at the point where the circumference scale on the thimble meets the horizontal line of the sleeve.

[Example]



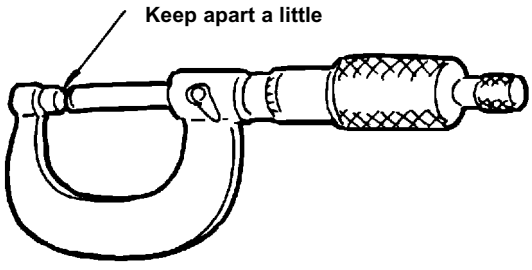
TTL019

The reading on the sleeve at the end of the thimble = 7.5 mm
The reading on the circumference of the thimble = 0.24 mm

Measured value = 7.5 mm + 0.24 mm = 7.74 mm

(Maintenance after use)

- Lock this micrometer with the clamp with the anvil and spindle kept apart a little, and keep it in the case. That way, deviation of the scale, which may occur due to thermal expansion by a temperature rise, etc. if the anvil and the spindle are kept in close contact, can be avoided.

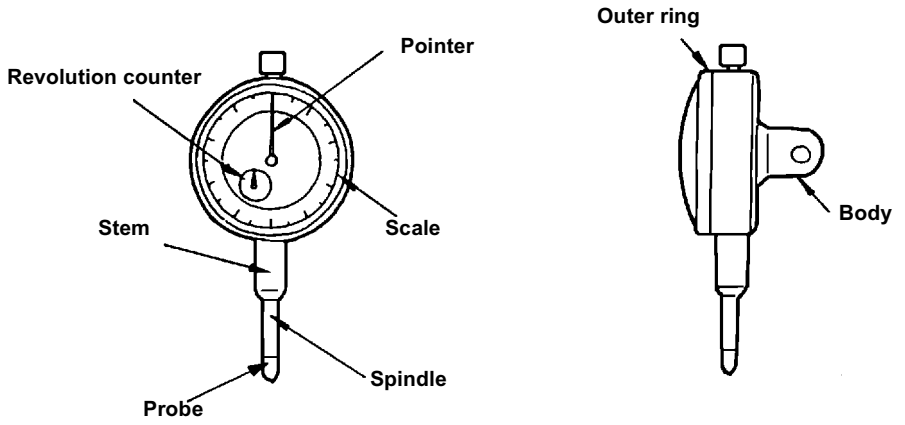


TTL020

1. DIAL INDICATOR

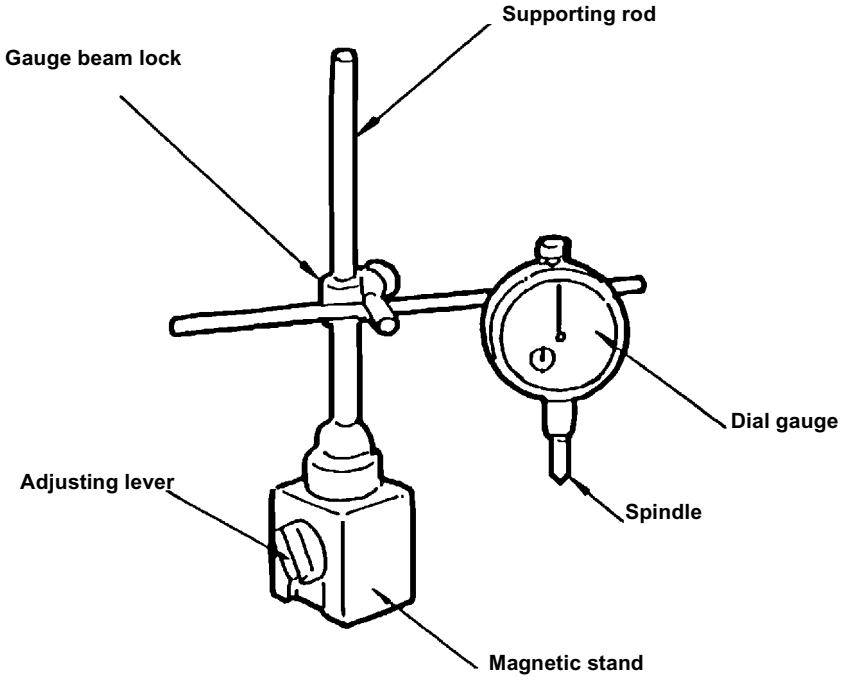
(Function)

- A dial indicator is used to measure a bend or a runout of a shaft, parallelism or surface roughness.
- A dial indicator is so constructed that axial movement of a spindle (probe) is converted into rotary motion of the pointer by means of gears.
- A dial indicator is scaled in 1/100 mm. Movement of 1 mm of the spindle causes one revolution of the pointer.



TTL021

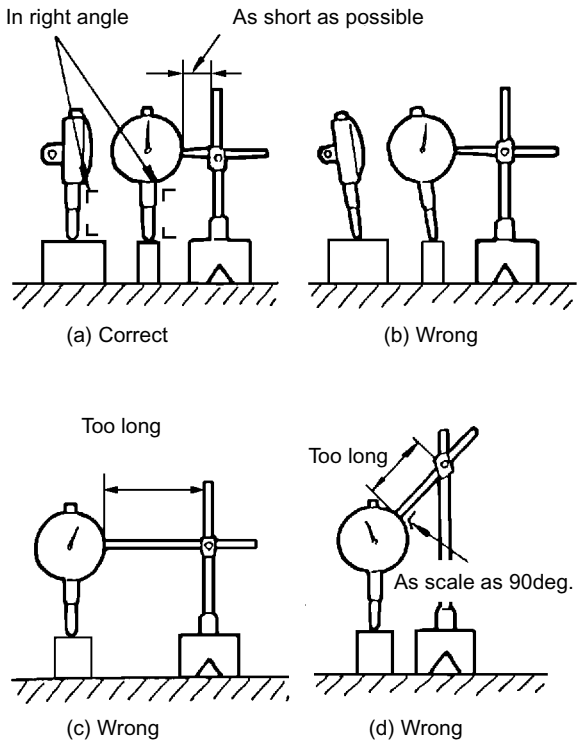
- The magnetic base of the dial indicator can be fixed to a surface plate by means of a magnet.



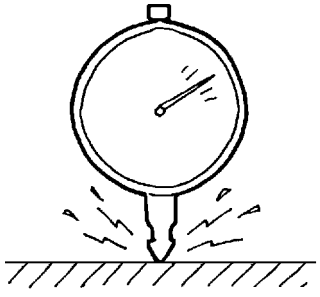
TTL022

(Important hints)
(When measuring a flat plane, the spindle is to be set in right angle against that plane.)

- The spindle is to be set in a right angle against the work surface when seen from either the front or the side as shown in (a). The beam of the stand is to be as short as possible. The beam of the stand is to be as short as possible. The angle between the beam and the dial indicator is to be as close as possible to 90'.
- If the spindle is inclined as shown in (b), the spindle will not move in the axial direction precisely, but if pulled sideways, this will cause the unstableness of the pointer, resulting in incorrect measuring.
- Even if the spindle is in a right angle against the work, and if the beam is too long as shown in (c) or (d), the dial indicator is liable to vibrate, which causes incorrect measuring.
- Scale is to be read from the very front of the dial indicator. Reading from a wrong angle causes incorrect reading.
- After the dial indicator is set to the work, the pointer is to be set to zero by turning the outer ring. Then, hold the spindle with your fingers, and move it lightly several times to check that the pointer always returns to zero of the scale.
- A dial indicator is a precision machine like a watch. Handle one with care so as not to drop it or give it a shock.
- The area between the spindle and the stem is to be kept free from oil or grease. Oil or dust between them causes rough movement of the spindle.



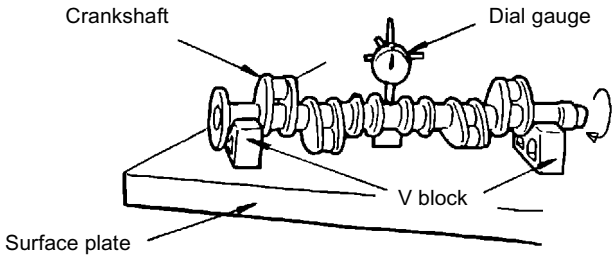
TTL023


TTL024

(How to measure)

Example: To measure a runout of a crankshaft

- Place V blocks on the surface plate as shown in the illustration and set the shaft on the V blocks.



TTL025

- Set the dial indicator fixed to the stand with caution so that the spindle will contact the uppermost surface of the journal and fix the stand to the surface plate by applying the magnet. Fix the dial indicator at the height where the dial indicator is pushed to about half Of the full stroke of the spindle. Use caution so that the spindle will be in a right angle against the journal surface.
- Turn the crankshaft slowly and find the surface where the pointer points to the smallest reading. Then turn the outer ring to set the zero point to the pointer.
- Turn the crankshaft slowly and read the gauge pointer to find the runout.

USAGE OF MEASURING TOOLS

1. TORQUE WRENCH

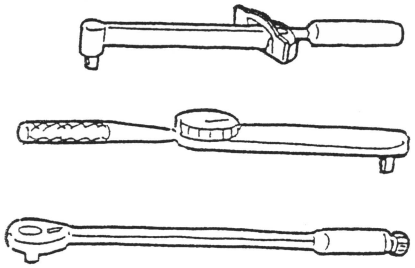
Function

- A torque wrench is used to tighten a bolt or a nut to a specified torque. This wrench is to be used with a socket.

1) Plate-spring-type

2) Bar-spring-type

3) Auto-limit-type



TTL026

- The arm of a plate-spring-type torque wrench is made of one sheet of plate spring. While tightening a bolt or a nut, this plate spring deflects. By using this deflection, the tightening torque is directly indicated at the place close to the handle of this wrench.

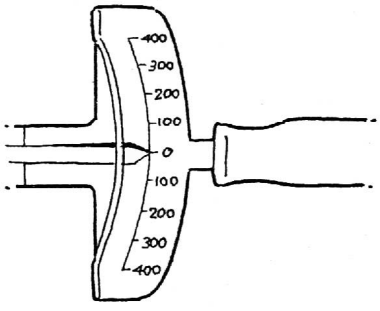
- An auto-limit-type torque wrench is so designed that predetermined torque can be set by turning a sleeve at the end of the handle to the desired scale. Then, the completion of tightening at the predetermined torque can be easily known by a sound and hand feeling.

1) PLATE-SPRING-TYPE

How to use the torque wrench properly.

(1) Check on zero point.

- Check that the pointer clearly indicates zero before using a plate-spring-type torque wrench.



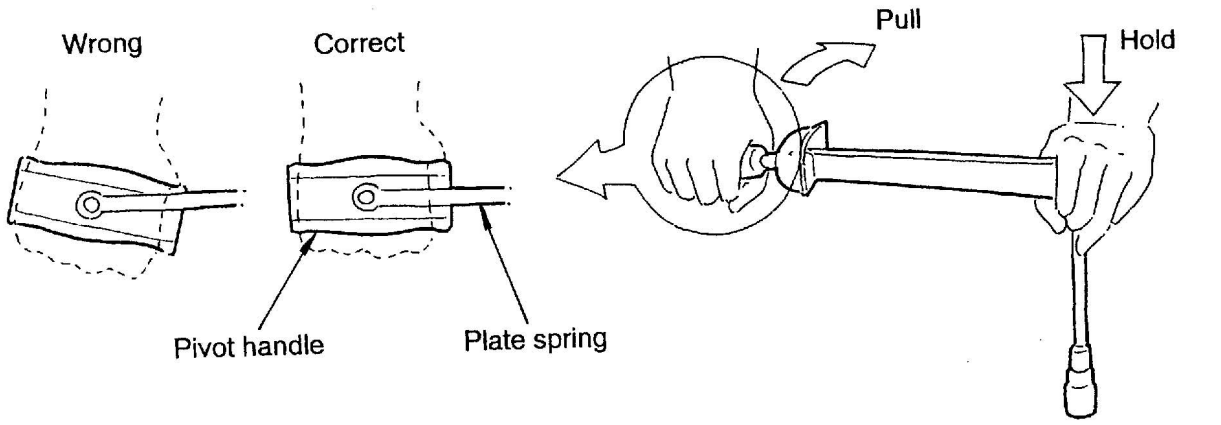
TTL027

(2) Select a socket

- Select a socket which just fits to the bolt or a nut and engage them. When using a torque wrench, hold the socket joint with one hand so that the socket and the torque wrench are not separated.

(3) How to apply force

- Be sure that the pivot handle and the plate spring will not contact each other when you measure the torque with a torque wrench. If they contact, you can not measure the torque correctly.



TTL028

(4) How to operate

- Hold the handle of the torque wrench and pull it toward you to apply force.
- Pull the handle in the right direction against the arm.

1) AUTO-LIMIT-TYPE

Tightening torque depends on where the tool is used.
The completion of tightening can be easily known by a sound, “click”.

How to use the torque wrench properly.

(1) Set a torque

a) Turn the locker to the left to unlock the Supplementary Graduation.

b) Turn the Supplementary Graduation to set a torque (combination of valves on the Main and Supplementary Graduation).

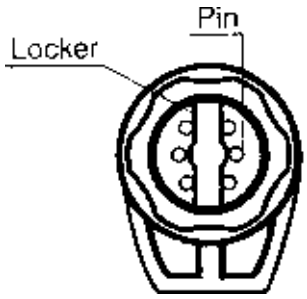
c) Turn the locker to the right to lock the Supplementary Graduation (Reposition the pin if it contacts the locker).

(2) Insert the squared drive into the socket.

(3) Apply the socket on to a bolt head nut.

(4) Turn the torque wrench clockwise to fasten the bolt.

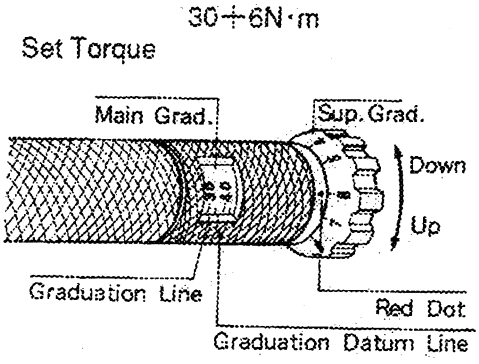
(5) Stop pulling the wrench when you hear a "click".



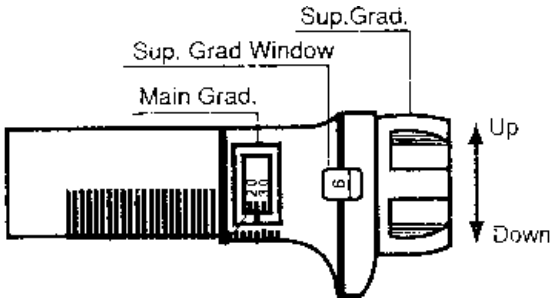
TTL029

Example: To set torque at 36 N-m

1. While reading Main Graduation, turn Supplementary Graduation until 36N-m on Main Graduation comes close to Graduation Datum Line and then, align 0 on Supplementary Graduation with the Supplementary Graduation Window. Now, torque set is 36N-m.
2. While reading Supplementary Graduation, turn clockwise until 6 on Supplementary Graduation is aligned with the Supplementary Graduation Window. Torque is set at 36N-m.



TTL030



TTL031