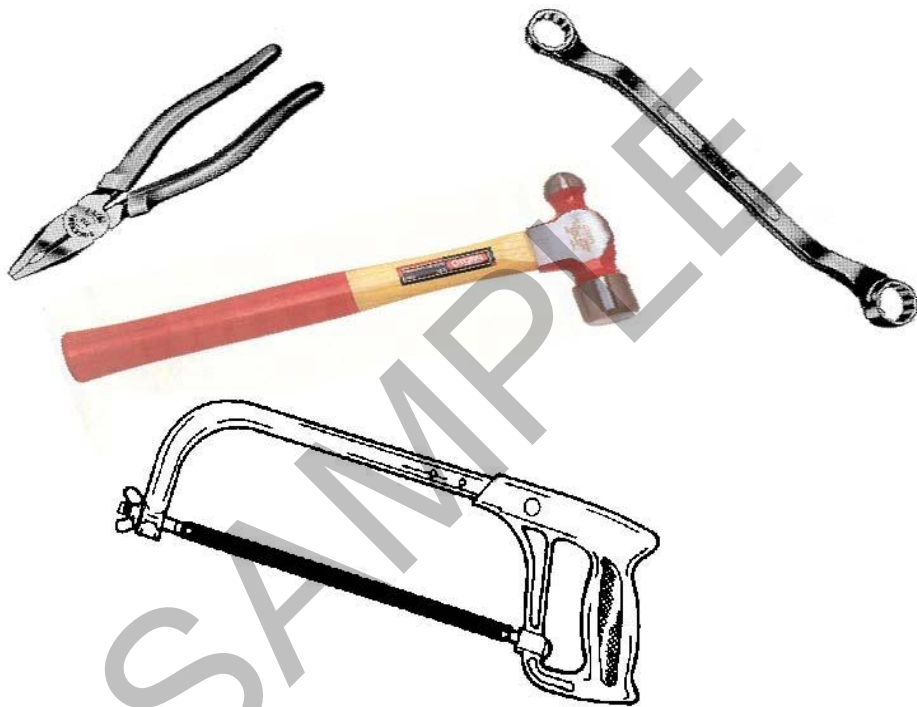


Module Resource Manual

SECOND EDITION

Hand Tools MEC072



Training and Education Support
Industry Skills Unit
Meadowbank



Product Code: 2795



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HAND TOOLS MEC072

CONTENTS

Introduction	3	
Module sections	7	
Section 1: Measuring		7
Section 2: Marking out and making a part		29
Section 3: Dismantling and assembling		67
Answers to review questions	85	

MODULE SECTIONS

Section 1: Measuring

PURPOSE

This section looks at common types of simple measuring tools and how to use them. In this section you will learn to identify various types of standard gauges and how to correctly use them to gauge engineering workpieces. You will also learn how to use a basic graduated measuring device such as a vernier caliper to measure engineering components and how to maintain, store and adjust the measuring device whilst maintaining safe workplace standards.

Objectives

At the end of this section you will be able to: ~ Compare features on components using standard gauges to an

accuracy of

± 0.1 mm.

- ~ Measure components using graduated measuring devices.
- ~ Check, adjust and store graduated devices appropriately.
- ~ Maintain workplace safety standards at all times.

Recommended resources

Tools

screw pitch gauge
radius gauge
feeler gauge
thickness gauge
form gauge
depth gauge
rules
tapes
vernier calipers

Equipment

6 different sized and different pitched threads (3 metric and 3 imperial)

6 components with different sized gaps to be measured with feeler gauges
3 internal (concave) radii
3 external (convex) radii
60°, 55° and 47 ½° screw cutting tools
3 different gauged pieces of sheet metal
components to measure with a rule.

Safety reminders

In the workplace always wear: safety glasses, safety boots, hair protection and suitable clothing.
Do not use a machine fitted with a Danger Tag.
Know where the First Aid station is.
No running or horseplay.
Use ear muffs or plugs to protect your hearing.
Be careful how you lift heavy objects.
Be careful of tools with sharp points and edges.
Keep work area and floor area clean and tidy to reduce the possibility of accidents.



Basic measuring tools

Standard gauges

Using gauges

When using screw pitch gauges, radius gauges or form type gauges, you should, where possible, hold the work piece and gauge in front of a light background. This allows you to clearly see any differences between the work piece and the gauge.

Screw pitch gauges

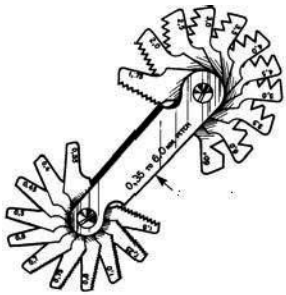
A screw pitch gauge is used to determine the pitch of a thread. The gauge is a series of thin blades which have different pitched teeth on each blade. The pitch of the teeth is marked on each blade. Thread pitch gauges also come in various standard thread forms such as metric, Whitworth, BSF, UNF, UNC and Acme, which allows not only the pitch of the thread to be gauged but the form or shape of the thread. to be checked as well. Each set of screw pitch gauges will have the thread form stamped on the protector plate on the outside of the gauges.

Measuring thread pitch

Before using a screw pitch gauge, you should measure the approximate pitch of the thread with a rule. To do this for metric threads:

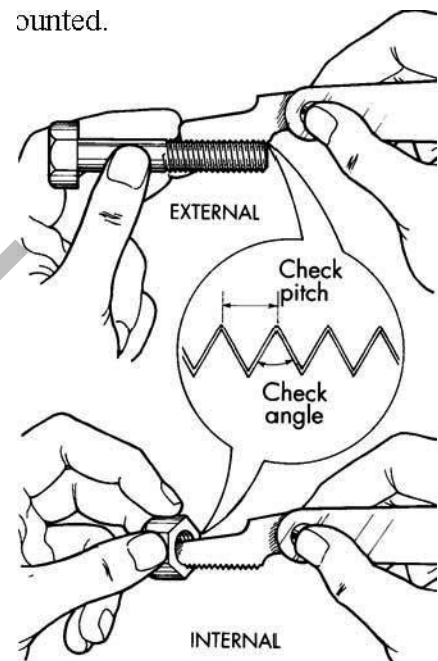
- put the rule on the thread parallel to the thread axis.
- line up a major division on the rule with the top or crest of the thread.
- count the number of crests to another major division, usually 20 - 30 mm.
- divide the length between the major divisions by the number of crest counted.
- the answer is the pitch of the thread.
- then choose the gauge closest to this pitch for the first try

For imperial threads the method is similar except that the pitch is given as threads per inch (TPI) and so the number of crests in one inch are counted.



Screw pitch gauge

ounted.



Use of screw pitch gauges

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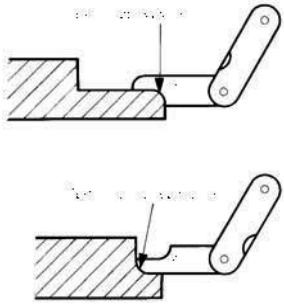
SAMPLE

Radius gauges

Radius gauges are used to check internal and external radii. The gauges are a set of thin blades with a convex (external) and concave (internal) radius of the same size on each blade. The size of the radius is marked on each blade. When the radius on the gauge less than 90 degrees, the gauge is called a fillet gauge. These gauges are available in metric and imperial sizes which covers most radius' up to 15 mm.

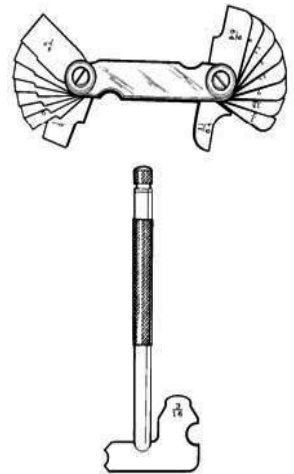
Feeler gauges

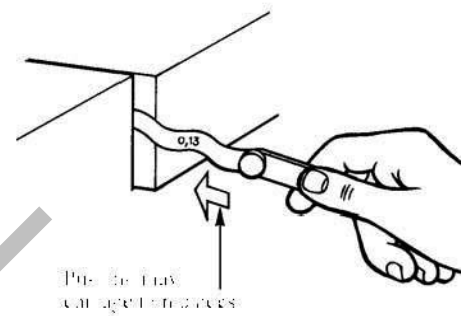
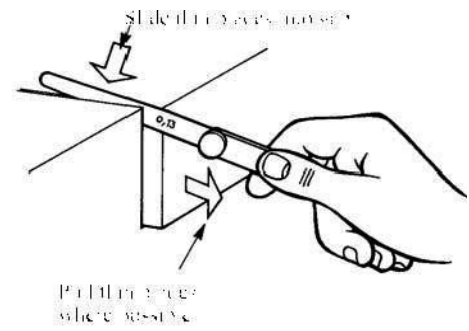
Feeler gauges are used to check small gaps and clearances between components. The gauge set is made up from a number of blades each one a different thickness. The thickness is marked on each blade. Feeler gauges are used to measure or set clearances between mating parts or for measuring the width of small slots or grooves. In a metric set of feeler gauges the thickness ranges from 0.05 mm to approximately 1 mm in varying steps. The gauges can be built up to produce the thickness required. When using the thinner gauges care should be taken to pull the gauge through a gap rather than push, as by pushing, the gauge will tend to bend and wrinkle or possibly if a sideways movement is used the gauge will tear.



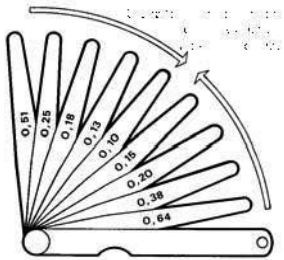
Using a radius gauge

SAMPLE





Checking clearances with feeler gauges



Feeler gauges

SAMPLE

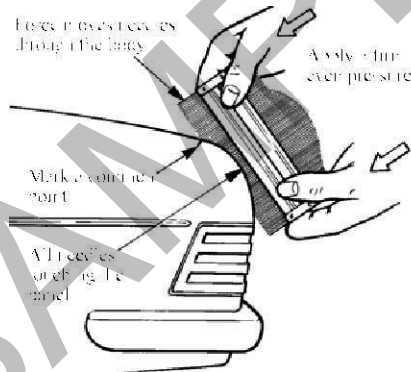
Thickness gauges

A thickness gauge is used to quickly measure the thickness of material using a plunger and dial. These gauges are used to measure sheet materials such as paper, plastics, cardboard, leather and sheet metals. Because these types of gauges use a delicate dial indicator, they must be handled carefully and kept away from dirt and moisture. Ideally, they should be returned to their storage box immediately after use.

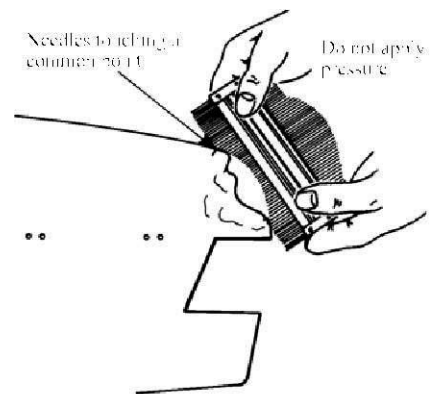


Form or profile gauges

These types of gauges are used to compare measurements and shapes. Profile gauges may be a fixed shape or profile, or an adjustable type as shown. With the adjustable type, the gauge is set to the master shape as shown, and then compared to the shape being checked. One of the major uses of this type of gauge is in the automotive body repair industry. A fixed profile gauge is shown.



Take a profile from an undamaged panel



Compare the profile on the panel being repaired