INSPEX 2003

So You think you know how to use a micrometer

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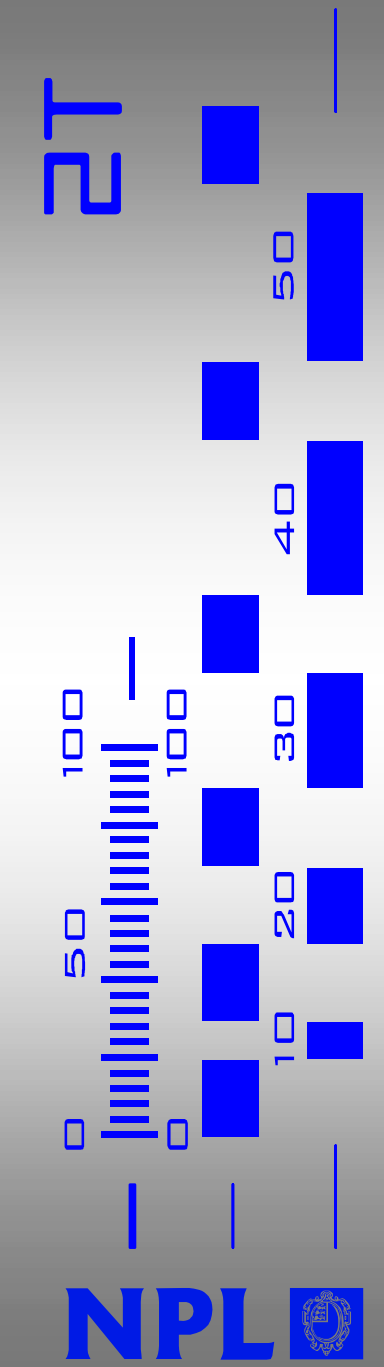

What I am not going to tell you how to do

Read a micrometer !

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So we all know how to use a micrometer!

We take it from its place of safe storage.

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So we all know how to use a micrometer!

Use it for its intended purpose.

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So we all know how to use a micrometer!

Replace it in its safe storage.

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Introduction

- Introduction to the Good Practice Guides on Callipers and micrometers
- Handling and storage
- Choosing the correct measuring tool
- Set up and preparation
- Setting a micrometer
- Temperature
- BS 870
- Errors
- Calibration and Uncertainties

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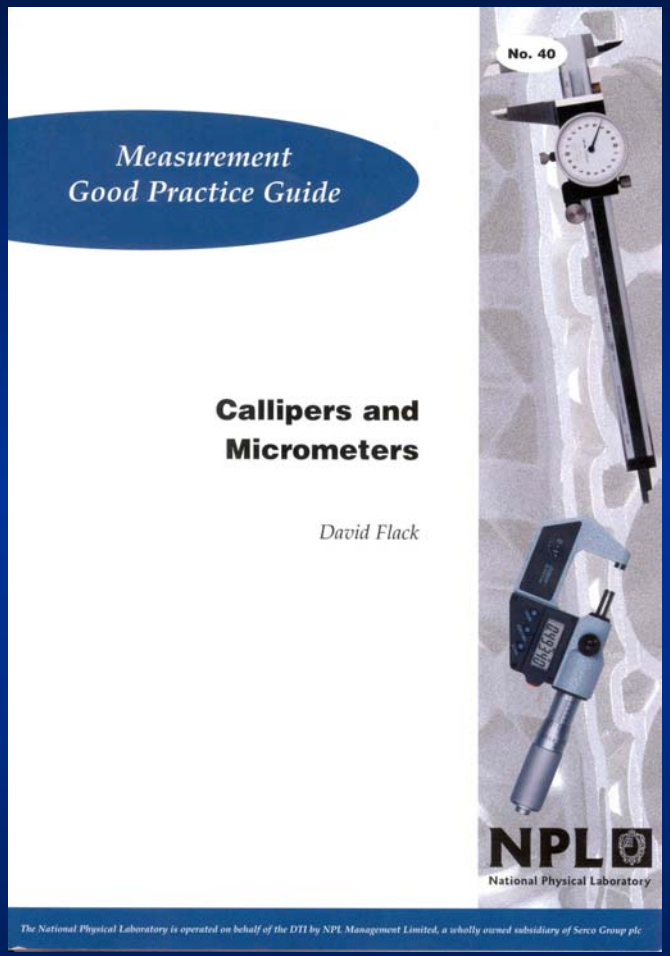
Introduction to the Best Practice Guides on Callipers and micrometers



Covers callipers and micrometers

Available from NPL e-store

www.npl.co.uk/e-store

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Handling and storage

Storage

- When storing the micrometer do not expose it to direct sunlight.
- Store the micrometer in a low humidity, well ventilated and dust free environment.
- Leave the measuring faces separated by 0.1 mm to 1 mm.
- Do not clamp the spindle
- Store the micrometer in its case.

Handling and storage

Handling

- Try not to heat the micrometer
- Do not close anvils too rapidly
- Keep the anvils clean
- Only use as a measuring tool
- Replace in its case when not in use
- Oil for long-term storage
- If you damage a micrometer – report it

Remember

Dirt is the enemy of precision measurement!

Perspiration is corrosive!

Steel surfaces corrode if left in contact!

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Choosing the correct tool

Micrometer or calliper

- Tolerance and uncertainty
  - Look at the component tolerance (use 10:1 rule)
  - Remember resolution is not the same as uncertainty
- Speed
  - Think about measurement speed. If callipers are adequate, use them.
- You may need to consider the use of alternative pieces of equipment e.g. bench micrometer or length measuring instrument.
- Use the correct type of micrometer

Choosing the correct tool

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Set up and preparation

Setup

- Allow the workpiece to cool
- Check the micrometers condition (anvils, spindle movement)
- Check micrometer for obvious signs of damage
- Clean the anvils (use a sheet of soft paper, never use compressed air)
- Check ratchet operation
- Check the zero point (adjust or allow for)
- Clean again if necessary (wipe off finger marks etc)
- Check micrometer is in calibration

Setting a micrometer

- Flat parts
  - Clean the anvils
  - Open slightly larger than part
  - Set anvil squarely against part
  - Use ratchet (set on first click)
  - Record reading
  - Repeat several times and average reading

Setting a micrometer

- Cylindrical parts
  - Clean the anvils (use soft paper pulled between anvils)
  - Open slightly larger than part
  - Set anvil squarely against part
  - Rock back and forth across diameter closing anvils in steps
  - Rock sideways to centre on anvils
  - Use ratchet (set on first click)
  - Record reading
  - Repeat several times and average reading

Setting a micrometer

- Cylindrical parts (cont)
  - Remember over tightening is perhaps the worst of all sins (of micrometer use)

Temperature

Micrometer is self compensating if part and micrometer are at the SAME TEMPERATURE and SAME MATERIAL, however

- Never measure parts straight from machine tool
- Wear gloves for larger micrometers
- Consider use of micrometer stand
- Measure materials other than steel at 20 °C
- Apply temperature correction if necessary

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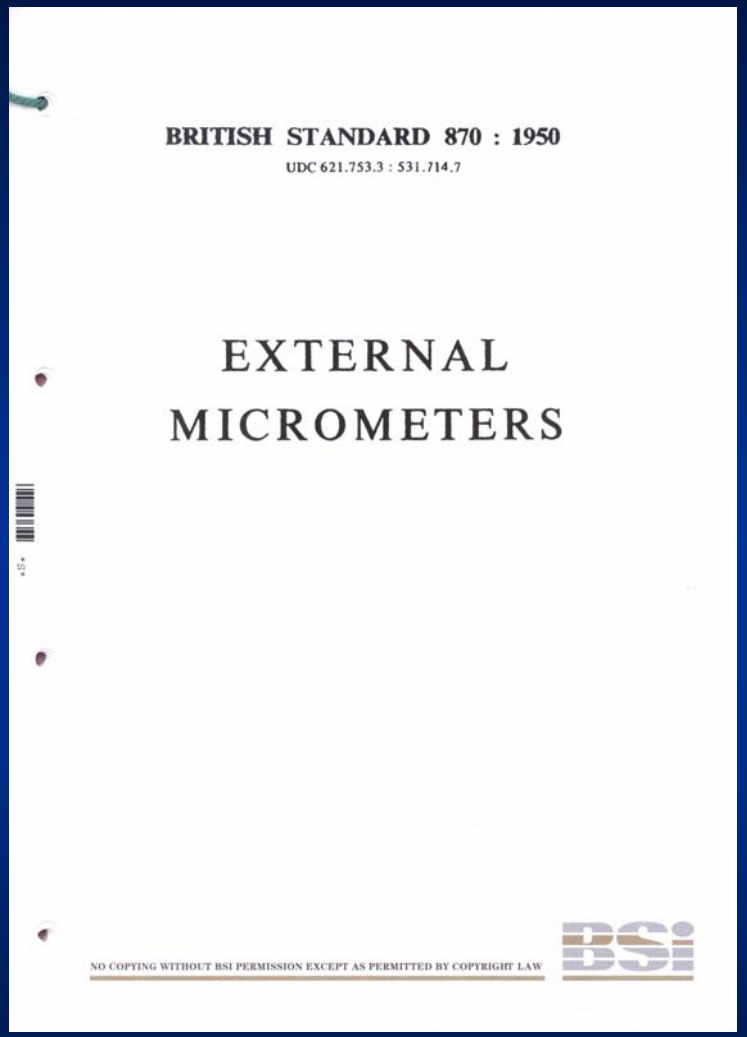
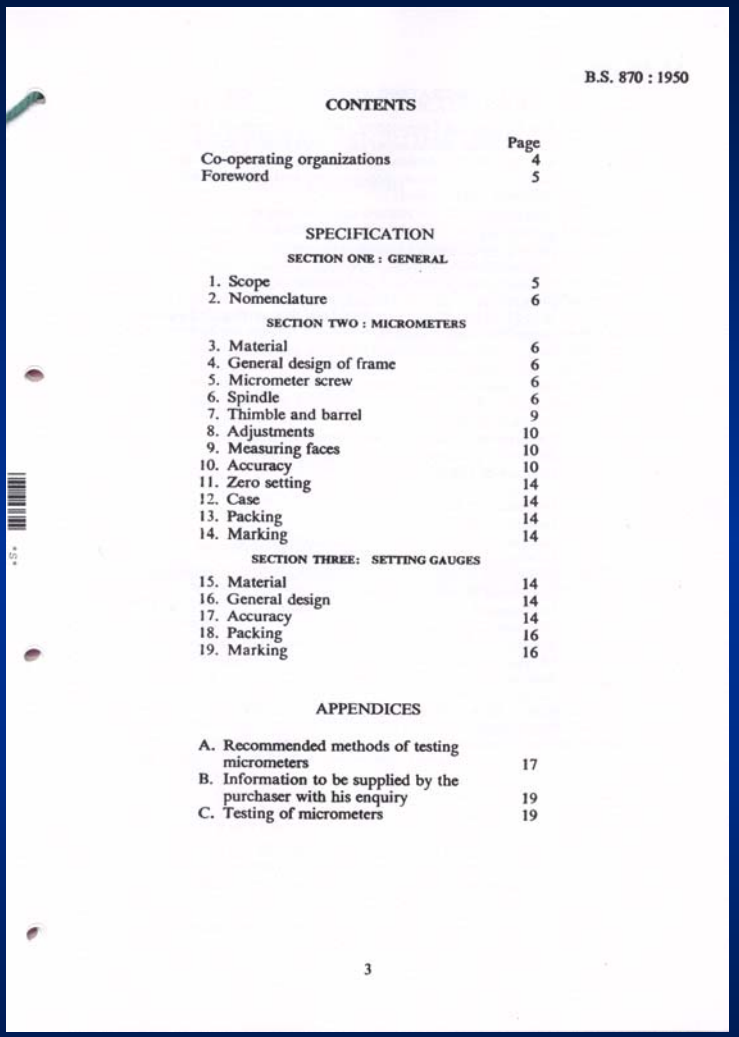
BS 870: 1950 External Micrometers



BRITISH STANDARD 870 : 1950

UDC 621.753.3 : 531.714.7

EXTERNAL MICROMETERS



CONTENTS

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Errors

Errors present in a micrometer

- Scale errors (progressive and periodic)
- Flatness of anvils
- Parallelism of anvils
- Distorted frame

Compare against a gauge block if you suspect a problem.
Use setting standard if supplied.

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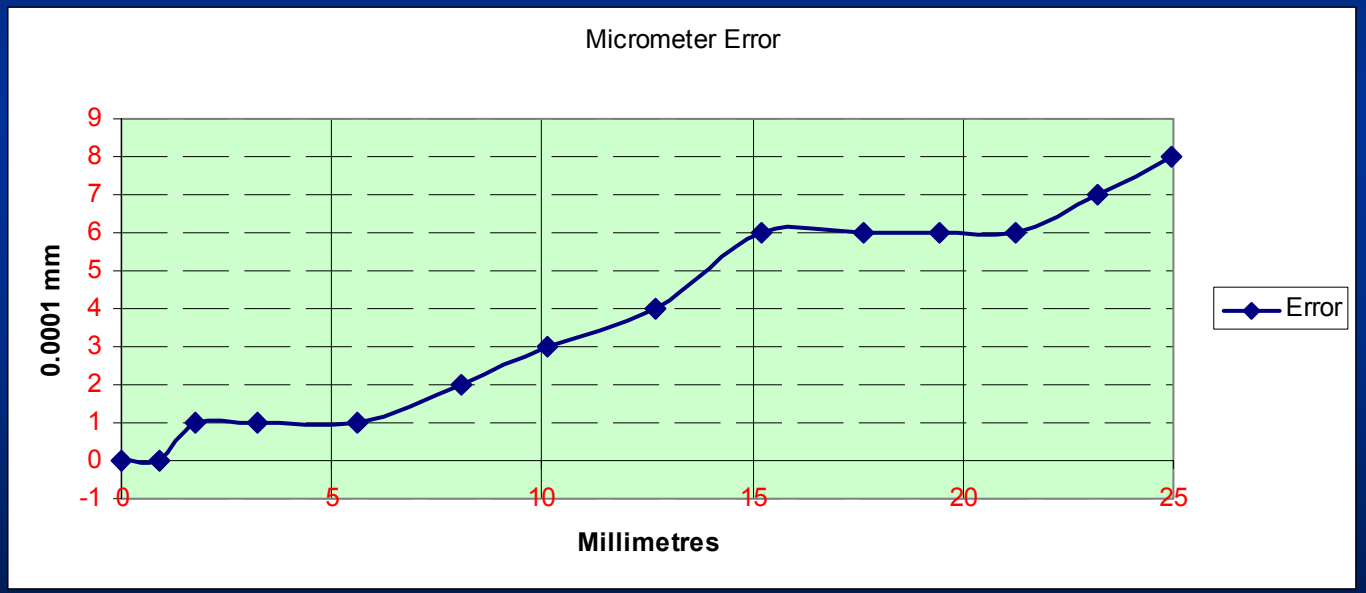
Errors

Errors present in a micrometer

- Scale errors (progressive and periodic)
- BS 870 tests both



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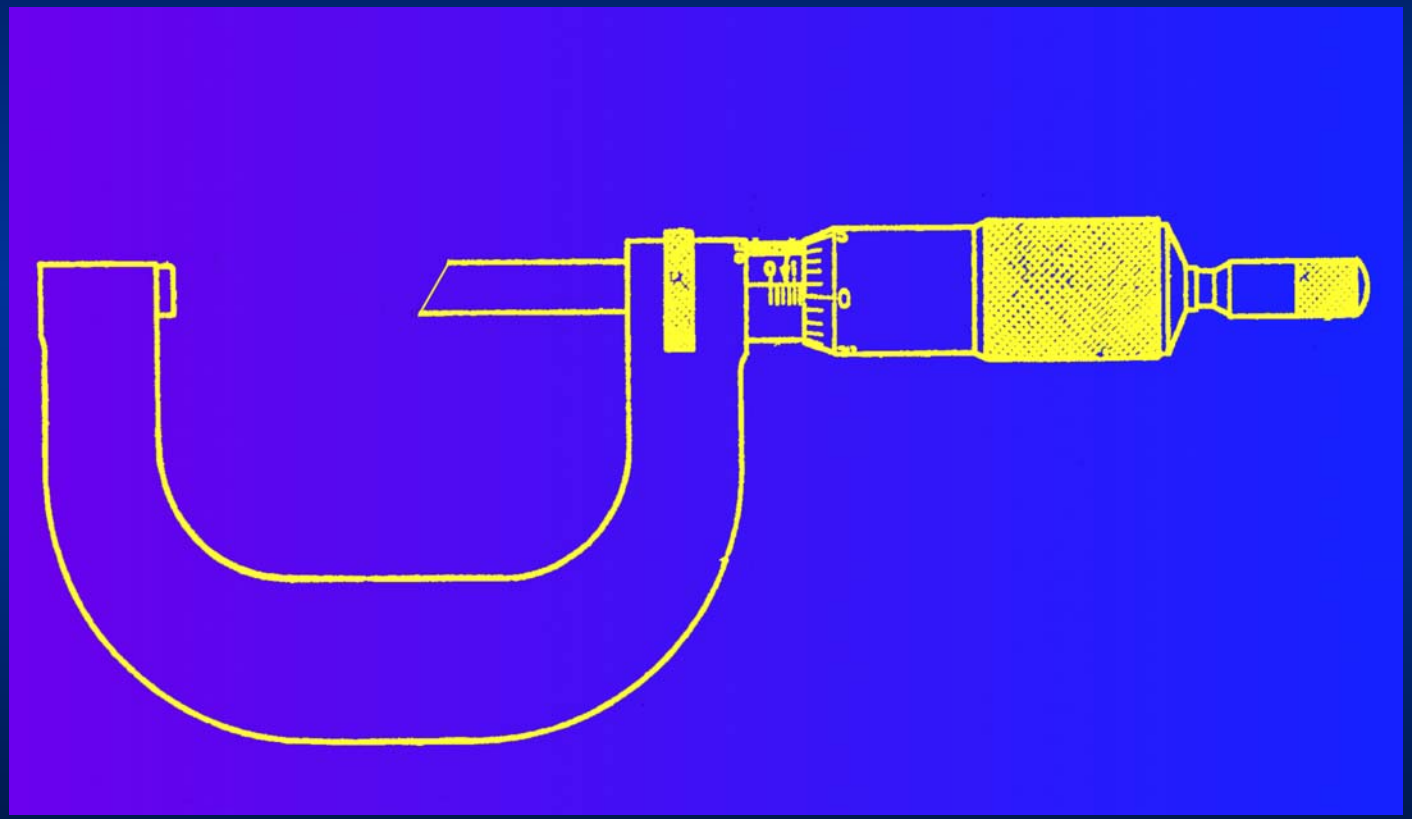
Errors

Errors present in a micrometer (Squareness and parallelism)



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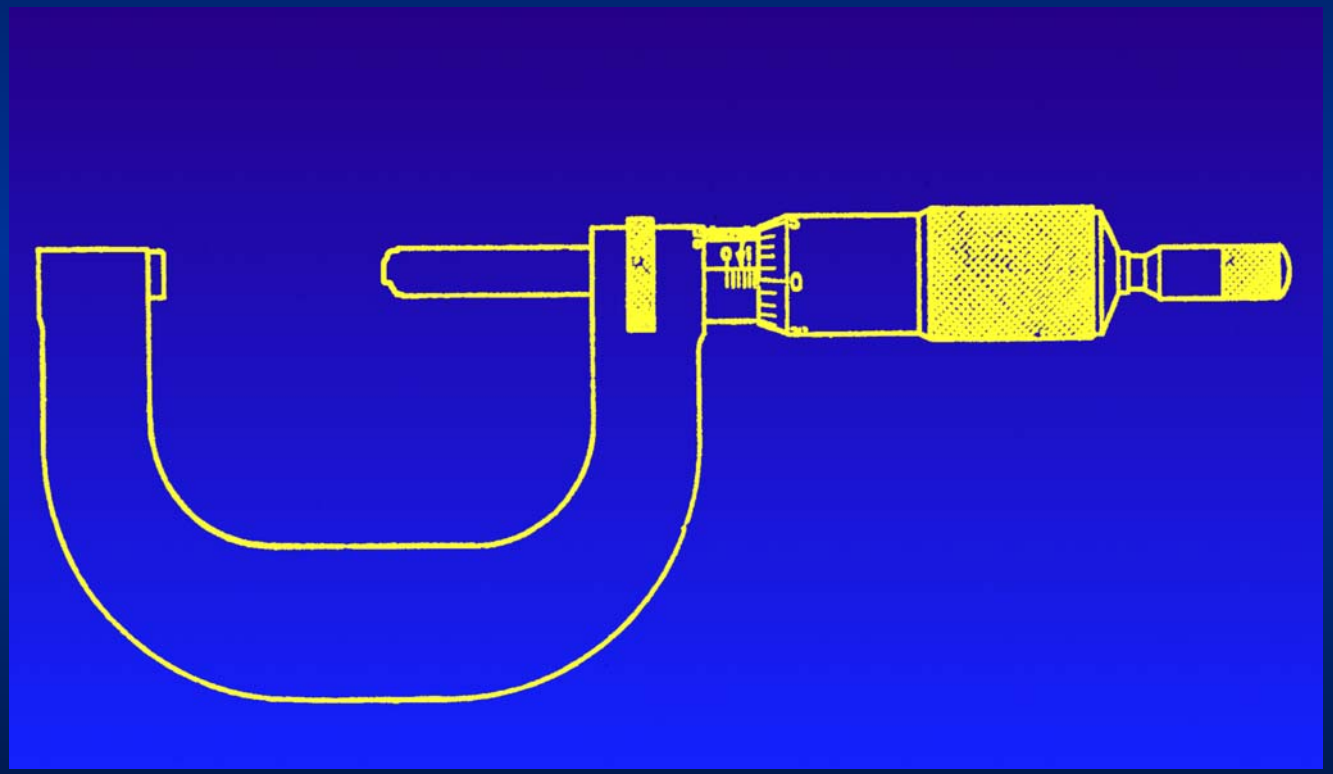
Errors

Errors present in a micrometer (Flatness of anvils)



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Calibration and Uncertainties

Calibration certificate

Will either give the errors in the micrometer at the tested positions or will state if the micrometer complies with BS870

- Ideally correct readings for scale errors in micrometer. The uncertainty contribution to the total error budget is then the expanded uncertainty quoted on the certificate divided by the appropriate *k* value.

- Otherwise the contribution is the *specification* limits (or maximum error) divided by the square root of 3.

- Combine with Type A variation from repeated measurements

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Calibration and Uncertainties

- Remember the four key items in any measurement system

  - The part
  - The instrument (or system)
  - The observer (operator bias)
  - The environment

All contribute to the measurement uncertainty

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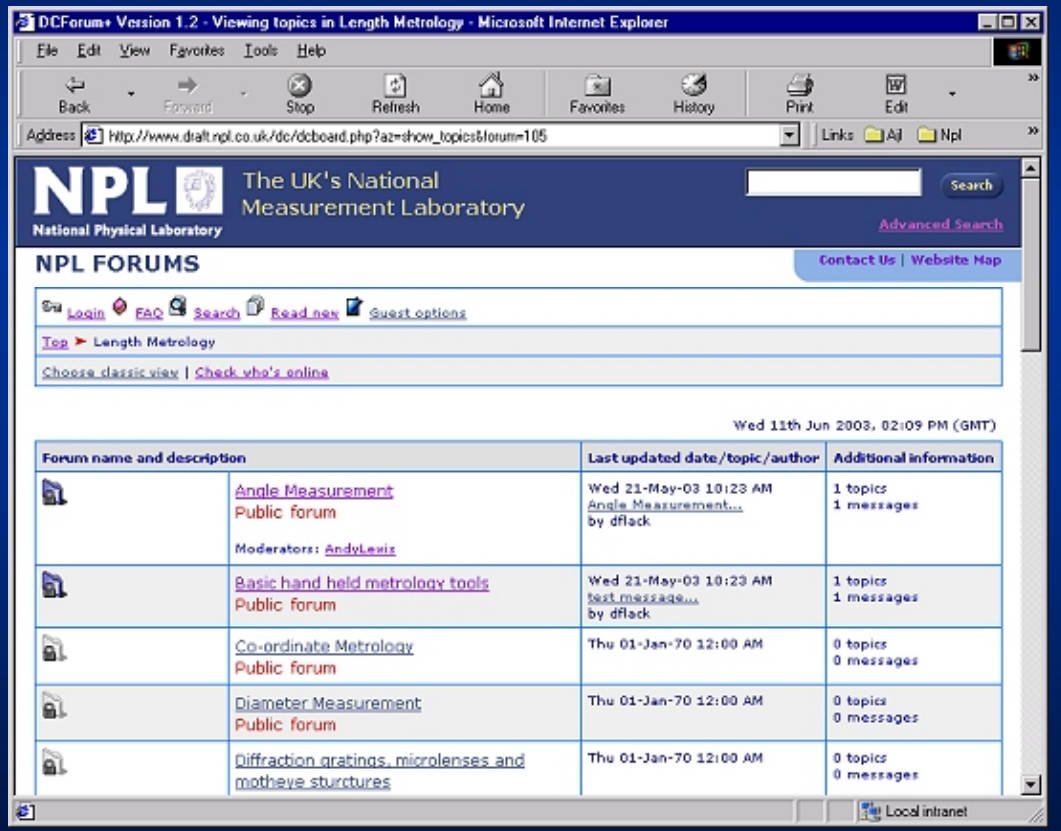
Remember

Help always available from the NPL helpline, NPL website(www.npl.co.uk) and the Length Bulletin Board (www.npl.co.uk/length)



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