PH10
Motorised indexing heads

What is it?
Where is it used?
Why do you need it?
What is a PH10?

- A PH10 is an indexing probe holder which allows the probe to be orientated and locked in any of 720 positions during the inspection cycle.
- Renishaw offers a family of PH10’s that can be matched to your specific application.

PH10T  PH10M  PH10MQ
## Differences

<table>
<thead>
<tr>
<th></th>
<th>Head mount</th>
<th>Probe mount</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH10T</td>
<td>Shank</td>
<td>M8</td>
</tr>
<tr>
<td>PH10M</td>
<td>Shank</td>
<td>Autojoint</td>
</tr>
<tr>
<td>PH10MQ</td>
<td>In-quill</td>
<td>Autojoint</td>
</tr>
</tbody>
</table>
• The PH10 family gives DCC machines the added capability of probe reorientation, allowing the probe to inspect features at the optimum angle, considering access requirements and probing best practise

• PH10’s can be mounted to a variety of different sized bridge or horizontal arm machines for touch trigger, optical or scanning probing
Where is it used?

- The PH10 range is a universal family of products used in many industries including aerospace and automotive.
- Compatible with a full range of sensors and extensions the position, size and form of critical highly tolerated features can be determined.
- The PH10 is an established reliable product that provides a cost effective probing solution.
The PH10 family brings many benefits that will improve the way you inspect components and assemblies. These benefits include:

- Flexibility
- Increased throughput
- Maximum accessibility
- Improved accuracy
- Minimal risk to head and CMM
- Low cost of ownership
Flexibility:

- The PH10T can be used with Renishaw’s range of M8 thread probes and extension bars (maximum recommended length of 300mm). TP20 and TP200 permit module and stylus changing.
Flexibility:

- The PH10M / MQ can be used with Renishaw’s range of autojoint probes and extension bars (maximum recommended length of 300mm) allowing automatic probe changing using ACR3

Why do you need it?
The PH10 family brings many benefits that will improve the way you inspect components and assemblies.

These benefits include:

- Flexibility
- *Increased throughput*
- Maximum accessibility
- Improved accuracy
- Minimal risk to head and CMM
- Low cost of ownership
**Increased throughput:**

- The ability of the PH10 to **index** reduces the number of stylus changes required **increasing the throughput** of your machine. Indexing is faster than stylus changing.

- The PH10 family of products can move through **90 degrees in 3.5 seconds** keeping the time that you are not inspecting to a minimum.

- The highly repeatable **kinematic autojoint** on the PH10M/MQ allows for DCC probe or extension bar changing using ACR3 **without** the need for re-qualification of the stylus tip thereby **reducing inspection time** and allowing un-manned inspection cycles.

**Why do you need it?**

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*Image description:* A close-up of a machine tool with a Renishaw probe attached, highlighting the precision and mechanical parts of the equipment. The probe tip is clearly visible, indicating the accuracy and functionality of the device in industrial applications.
Why do you need it?

High speed indexing minimises cycle times

Rapid indexing during CMM positioning moves give flexible access with no impact on cycle times
The PH10 family brings many benefits that will improve the way you inspect components and assemblies.

These benefits include:

- Flexibility
- Increased throughput
- **Maximum accessibility**
- Improved accuracy
- Minimal risk to head and CMM
- Low cost of ownership
Why do you need it?

Accessibility:

• PH10’s can articulate in **7.5 degree increments** in both the A (105 degrees) and B (+/- 180 degrees) axes giving **720 repeatable positions**

• Long **extension bars** and a comprehensive range of **styli** increase the access range of the PH10 family

• The PH10MQ **increases** the available **working volume** with its B axis housed within the quill of the CMM. An 80mm quill is required
Why do you need it?

The PH10 family brings many benefits that will improve the way you inspect components and assemblies.

These benefits include:

- Flexibility
- Increased throughput
- Maximum accessibility
- **Improved accuracy**
- Minimal risk to head and CMM
- Low cost of ownership
Accuracy:

- The PH10 family can achieve 0.5μm repeatability at 62mm radius providing accurate positioning even when using long extensions.

- The accuracy that the PH10 enables you to achieve improves inspection routines and can help to reduce the level of scrap experienced.

- Articulating heads with simplified styli configurations improve the accuracy and dynamics achieved.

- Repeatable extension bar and probe / module changing also enhances the accuracy and flexibility of the system.
Accuracy:

The graph below shows typical PH10M indexing repeatability test results ($2\sigma$ at the stylus tip) for various probe/extension bar configurations. Testing was carried out on a high accuracy CMM under controlled conditions.
Why do you need it?

Head repeatability test results:

• **Method:**
  - 50 measurements of calibration sphere at {A45,B45}, then 50 with an index of the PH10M head to {A0,B0} between each reading
  - TP200 trigger probe with 10mm stylus

• **Results:**

<table>
<thead>
<tr>
<th>Result</th>
<th>Span fixed</th>
<th>Span index</th>
<th>Δ [Span]</th>
<th>Δ [Repeatability]</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>0.00063</td>
<td>0.00119</td>
<td>0.00056</td>
<td>± 0.00034</td>
</tr>
<tr>
<td>Y</td>
<td>0.00039</td>
<td>0.00161</td>
<td>0.00122</td>
<td>± 0.00036</td>
</tr>
<tr>
<td>Z</td>
<td>0.00045</td>
<td>0.00081</td>
<td>0.00036</td>
<td>± 0.00014</td>
</tr>
</tbody>
</table>

• **Comment:**
  - Indexing head repeatability has a similar effect on measurement accuracy to stylus changing repeatability
Indexing repeatability affects the measured position of features

– Size and form are unaffected

Most features relationships are measured ‘in a plane’

– Feature positions are defined relative to datum features in the same plane (i.e. the same index position)
  
  • Datum feature used to establish a part co-ordinate system

– Therefore indexing typically has no negative impact on measurement results, but many benefits
The PH10 family brings many benefits that will improve the way you inspect components and assemblies.

These benefits include:

- Flexibility
- Maximum throughput
- Maximum accessibility
- Improved accuracy
- Minimal risk to head and CMM
- Low cost of ownership
Why do you need it?

**Minimal risk to head and CMM:**

- The PH10 has a recommended maximum torque of 0.45Nm. This safety feature ensures that in the event of an accidental collision the head will *overtravel* protecting itself and the CMM from damage.

- The ACR3 autochange rack uniformly controls the changing of probes and extensions *removing* the element of *human error* and the possibility of damage when manually changing probes.

Quick and repeatable sensor changing for maximum flexibility.
The PH10 family brings many benefits that will improve the way you inspect components and assemblies.

These benefits include:

- Flexibility
- Maximum throughput
- Maximum accessibility
- Improved accuracy
- Minimal risk to head and CMM
- Low cost of ownership
Low cost of ownership:

• The items within a PH10 system are individually priced giving you the added flexibility of choosing and growing the best system for your application when required

• Renishaw offers a wide range of service options for all their products in order to minimise the customers downtime

• The cost of the repair is determined from the extent and nature of the damage and consultation takes place before any work is undertaken

• In the case of PH10’s the customer also has the option of purchasing a replacement from the Repair By Exchange (RBE) scheme in the interests of fast turn around and minimal downtime
The PH10 system comprises:

- PH10 head (T, M or MQ), extension bars, probes, styli, rack, controller (the PH10 can be integrated with the Renishaw Universal CMM Controller UCC1), hand control unit.
Summary

With PH10 you can:

• measure using touch trigger, optical or scanning probes depending on your application
• index your stylus tip for increased accessibility
• increase throughput by stylus changing without having to re-qualify
• automatically change extension bars up to 300mm long for increased accessibility
• achieve accuracy of 0.5µm at 62mm radius
• protect your investment through integral overtravel protection
• be assured that any machine downtime will be kept to a minimum through Renishaw’s expert service and support
Responsive service and expert support

- Application and product support wherever you are
  - Renishaw has offices in **over 30 countries**
  - responsive service to keep you running
  - optional **advance RBE** (repair by exchange) service on many products
    - we ship a replacement on the day you call
  - trouble-shooting and FAQs on [www.renishaw.com/support](http://www.renishaw.com/support)

Service facility at Renishaw Inc, USA