OMC Technical Brief - Portable Arm CMM

A portable arm CMM measures the location of a probe point by measuring the angles between the various parts of the arm

What does it do?

The portable arm CMM measures to points in three dimensions by the operator moving the "finger" of a device similar to the human arm to touch something that requires measuring. The arm is often a material such as aluminum tubing and the joints have optical encoders that enable the angle of the joint to be determined. By measuring all of the joint angles and knowing the location of the finger (a typical CMM probe) it is possible to measure to any point within the reach of the device.

Why use this technique?

- The portable arm CMM is, as its name implies, can be taken to the job. This is a major advantage in many industries where the object cannot be moved and measurement checks are required.
- The system is relatively cheap compared to other systems so that the cost of the equipment is often comparable with or exceeds the benefits of having the system.
- The portable arm is able to reach into hidden areas as the system is not limited by lines of sight as with optical systems

What are Portable Arm CMM's used for?

Measurement of:

- molds and dies
- aircraft structures
- tooling
- tubes
- assembly fixtures

For

- production control
- reverse engineering
- quality control
- diagnostics

Type of information obtained?

Point measurements that can be used to measure circles, lines, alignments, and build up CAD models or components or surfaces. Output in the following formats: DXF, SAT, IGES, ACL, VDA, ASCII, WMF

How does it work?

The portable arm is made up of a number of joints connected by tubes and fixed to a base. The base could be fixed to a tripod or to the item being measured. Each joint will be constructed of a high precision bearing to ensure rotation about a single axis and will also have a an angle encoder to enables the absolute angle of movement between the two parts of the joint to be measured. The accuracy of the angle encoder is a key element to this system and any systematic errors are likely to be modeled out as far as possible. The arms will be made of a rigid material that will expand as the temperature changes. Temperature compensation will often be required to ensure that the expansion of the system is taken into account. A probe will be fixed to the last arm in the system that will be interchangeable depending on the measurement task being undertaken. The probe

What are the benefits?

- Good cost to performance ratio
- Portability
- Reaches into hidden places inaccessible to optical systems
- Reasonable accuracy
- Large user installed base for these systems > 2500
- Lightweight
- Simple mounting
- Can leap-frog to extend range
- Can be integrated with other technologies such as light stripers

For further information contact: enquiries@optical-metrology-centre.com www.optical-metrology-centre.com

What are the limitations?

- May not be accurate enough
- Measures one point at a time
- Objects must be manually touched by the operator
- Mechanical link to the probe head
- Arm must be able to get to item to be measured
- Reliance on the mechanical integrity of the system (no self-checking)