

**Aerospace and Defense**



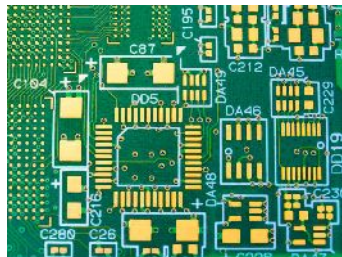
**Arms and Ammo**



**Automotive**



**Boards and Circuits**



**Bottling and Packaging**



**Connectors**



**Consumer Electronics**



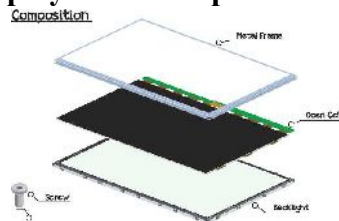
**Cutting Tools and Blades**



**Dental Tools and Implants**



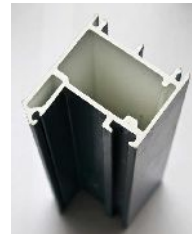
**Displays and Computer Parts**



**Electronic Components**



**Extrusions / Cross Sections**



**Fittings**



**Gaskets and Seals**



**Hand Tools**



**Keys and Locks**



**Batteries**



**Machined Metals**



**Implants and Bone Plates**



**Medical Consumables**



**Pharmaceutical**



**Medical Equipment**



**Rubber and Plastics**



**Sheet Metal Parts**



**Solar Industry**



**Springs**



**Fasteners**



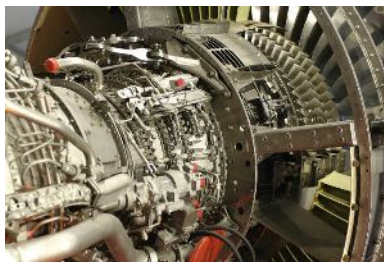
**Stents**



**Watch Components**

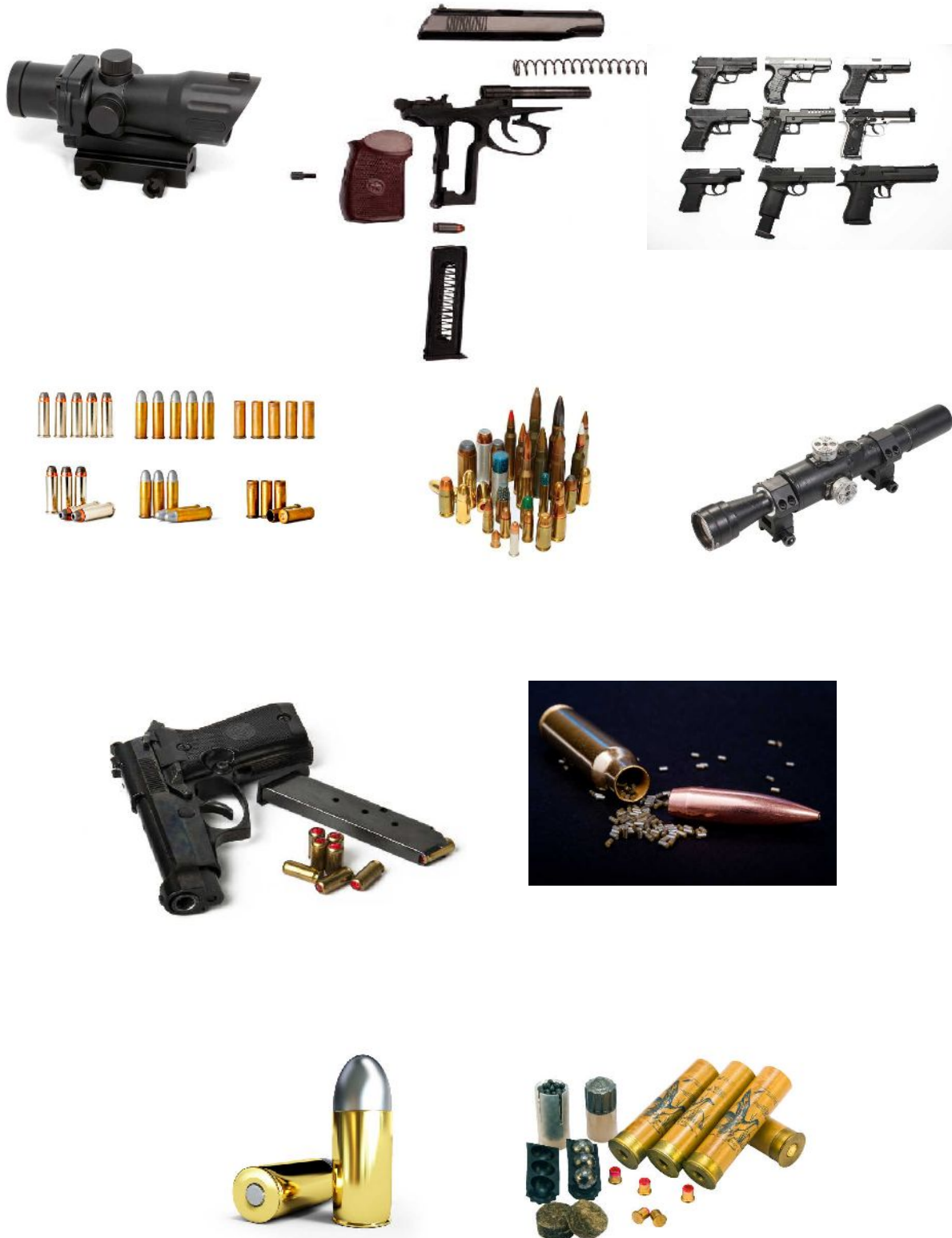


**Aerospace and Defense** have small and large parts with small and large features. Low production quantities and high reliability requirements mean high reliability requirements and 100% inspection on some parts. Part often have precision machining and tight tolerances.



## MEASUREMENT APPLICATIONS

**Arms and ammunition** have small features. High production volumes require constant monitoring with vision based systems. Scopes and magazines also have precision machining and tight tolerances.



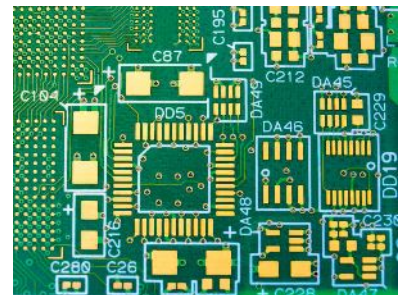
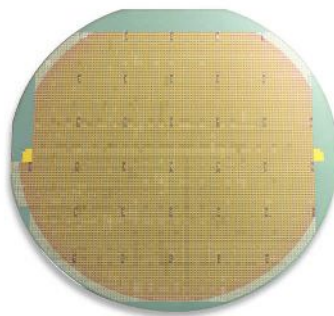
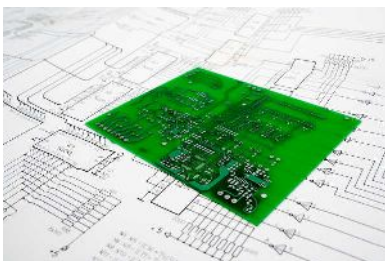
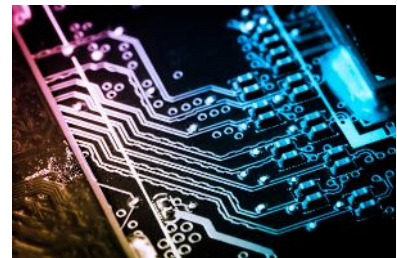
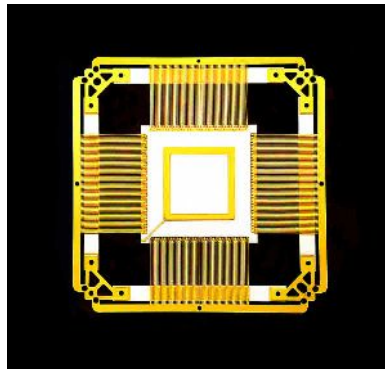
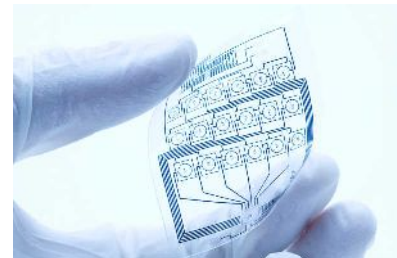
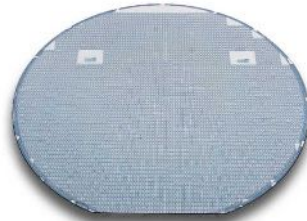
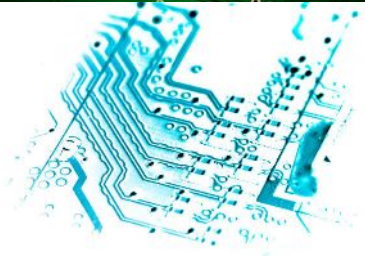
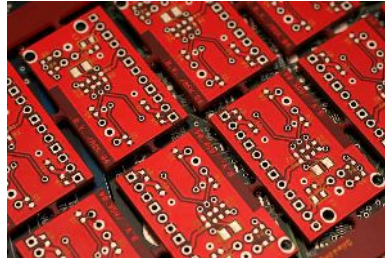
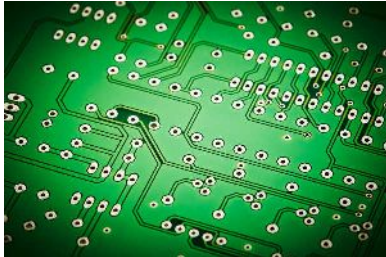
## MEASUREMENT APPLICATIONS

**Automotive** parts are produced in high quantities and require high reliability. CMMs have dominated the automotive markets. Measurement times can be significantly reduced with multisensor technology.



## MEASUREMENT APPLICATIONS

**PCB, boards, and circuits** are great vision applications. Flat parts often only require profile light. Small features and short run production require fast inspection with vision based systems. Laser probe improves speed of height measurements on component pads. The laser can also be used to evaluate warp. Masks and stencils are related applications. Gerber and Excellon import translators simplify programming.

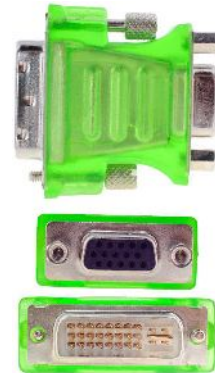
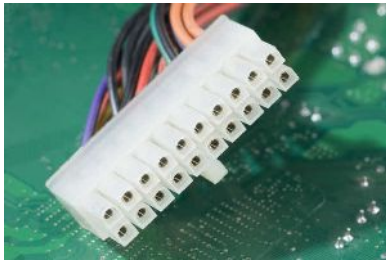


## MEASUREMENT APPLICATIONS

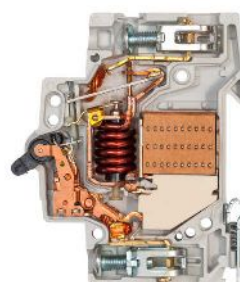
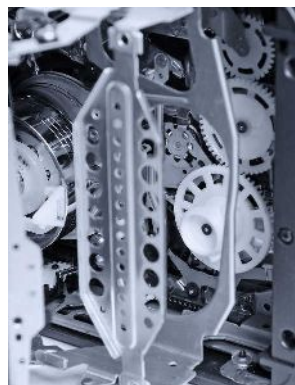
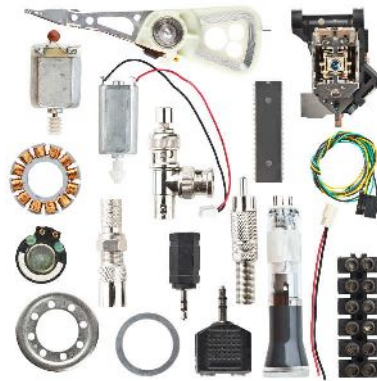
**Bottles, lids, packaging, and caps** are good vision applications. Length, width, shoulder, thread start, pitch, ID, and OD are common dimensions. High production volumes can mean 100s of parts a day require inspection.



**Connectors** are great vision applications. Smaller pin and hole features require precise positioning in XY and in Z. Laser probe can assist with speed of connector heights. Vision can see and measure down small holes. Manufactures cross into auto, medical, and electronics industries.

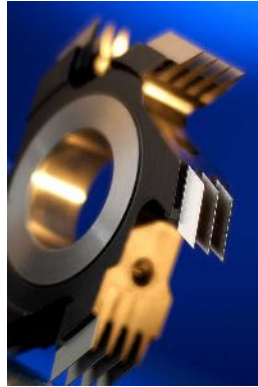


**Consumer electronics** are great vision applications. Small components and high production requires constant monitoring with vision based systems. Sometimes touch, laser, or rotary are used.



## MEASUREMENT APPLICATIONS

**Cutting tools and blades** are good vision and rotary applications. Cutting angles can be viewed with vision and through a mirror. The indexer can help position multiple teeth for inspection. High magnification and laser can be used to evaluate small cutting surfaces.



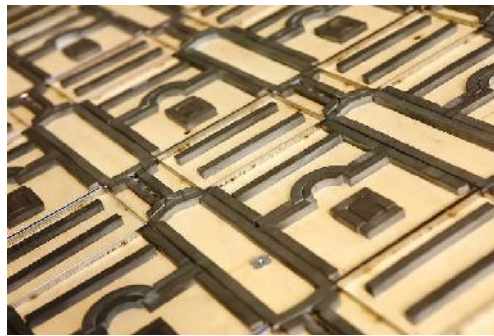
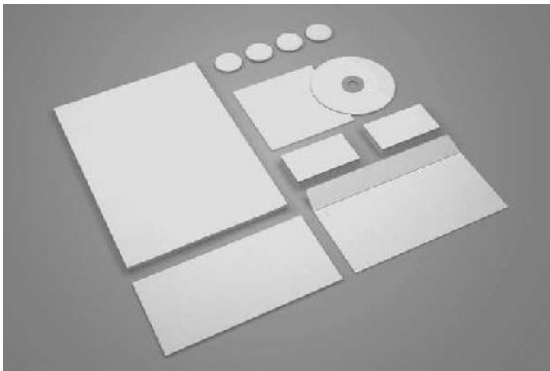
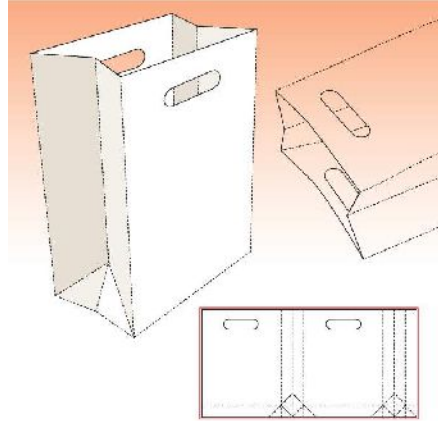
## MEASUREMENT APPLICATIONS

**Dental applications** are good rotary applications. Features are small and often require high magnification and high accuracy. The custom nature of the implant industry means a lot of measurements on limited numbers of parts. Bits and tools are another side of the industry.



## MEASUREMENT APPLICATIONS

**Die cut industry parts** are great vision applications. Profile light is all that is needed for the outer dimensions of label, tags, security strips, and face plates. Rotary die cut processes have large sheet part capacity requirements and relatively loose tolerances. Customers look for the most capacity per dollar and find Excel machines to be competitively priced.



**Displays and computer components** are great vision applications. Display parts are large and flat. High production requires constant monitoring with vision based systems. Plastic and aluminum covers, sheet metal structures, glass and thin film screen components, and electronics are all well suited for vision.



## MEASUREMENT APPLICATIONS

**Electronics components** are great vision applications. Small components and high production requires constant monitoring with vision based systems. Laser probe improves speed of height measurements on component legs, BGAs and lead frames.



## MEASUREMENT APPLICATIONS

**Extrusions and cross sections** are great vision applications. Smaller features are difficult to probe with touch or laser. Vision can see material separations and defects. Preparing samples is the most difficult step. Faces should be square and clean when possible.



**Gas, oil, water, and air fittings** are excellent vision and multisensor applications. Small features such as thread starts, fillets, and o-ring groove are easy to locate and measure with vision. ODs, IDs, seating surfaces, and interior depths can be located and measured. Production numbers are high and in progress inspection is required.



**Gaskets, Seals and O-Rings** are excellent vision machine applications. Low profile parts are difficult on touch CMMs and materials often react to contact. Z heights and profiles are common and easily measured with focus or laser.



## MEASUREMENT APPLICATIONS

**Hand Tools** are excellent vision and multisensor applications. Piece parts have small and large features. The parts are smaller and lighter than industrial machinery parts. Production numbers are high and in progress inspection is required. Complex geometries require metrology software.



**Locks, keys, and batteries** are good vision applications. Small features and high production requires constant monitoring with vision based systems.



## MEASUREMENT APPLICATIONS

**Machined Metals** are excellent multisensor applications. Tolerances range from microns on precision surfaces to millimeters on castings. Many customer already have touch CMMs and are not familiar with the advantages of vision machines. Demos show programming and runtime speed.

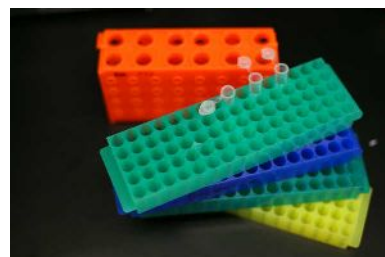


**Medical applications** are excellent multisensor applications. From micron tolerances on precision surfaces to millimeter tolerances on plastic covers, the industry has a broad mix of plastics, precision metal, die-cut, and even pharmaceutical molds for pills. If it is medical, it has to be measured. Touch, rotary, and laser are common accessories.

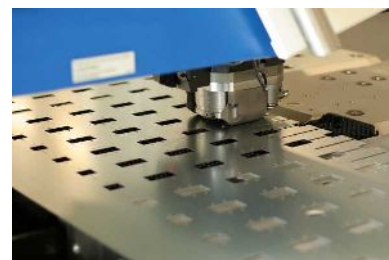
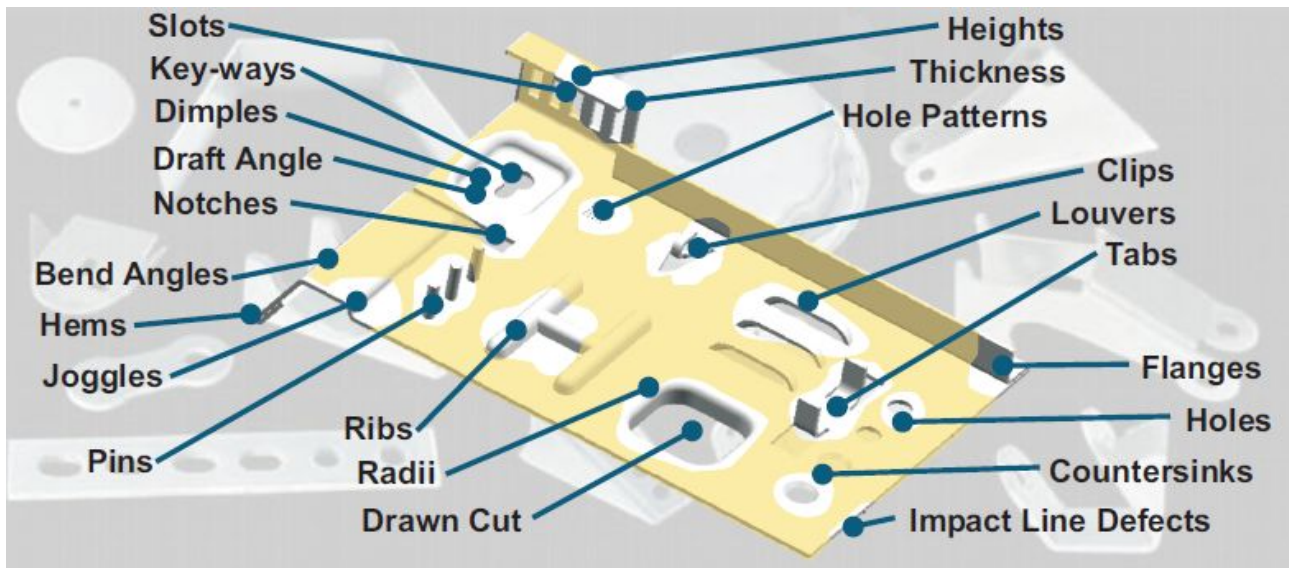


## MEASUREMENT APPLICATIONS

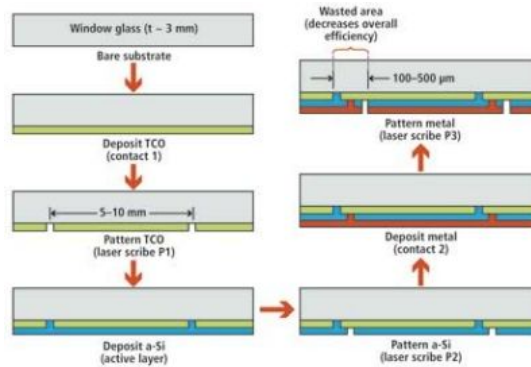
**Plastics** are great multisensor applications. Many parts are created from 2-sided molds so parts can be measured with a top and bottom program with vision. Captured images help document shrinkage and other part variation. Touch probes and rotary help with side features while laser probes can help measure with surface dimensions. Vision measures black, white, and colored parts as well as clear, transparent, translucent, and opaque parts.



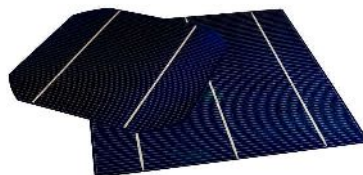
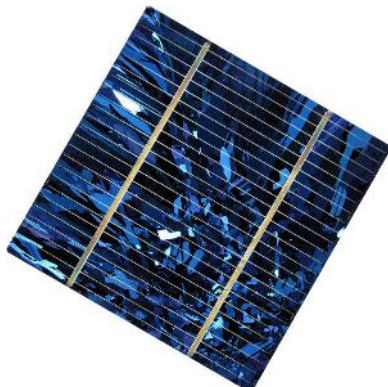
**Sheet metal applications** are great vision applications. Tolerances are often low and speed requirements are usually high. Laser scanning can speed up height, warp, radii, angles, and other surface characteristics.



**Solar panels** are great vision applications. For thin film processes, P1, P2, and P3 laser scribes are measured with vision to control parallelism and spacing. Spacing between cells affects performance. Mounting hardware, connectors, inverters, and frames are applications in the solar industry.



(Image from “[Scribing thin film solar panels](#),” *Industrial Laser Solutions*, February 2008)

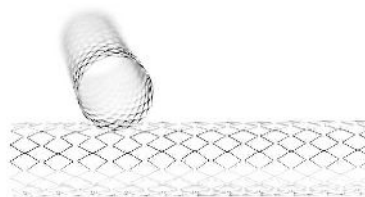
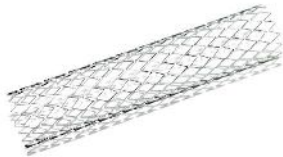
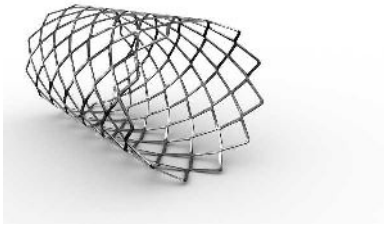


**Springs and Fasteners** are good vision applications. Fastener features such as thread starts, taper angle, fillets, pitch, helix angle, lead angle, major diameter, minor diameter, flank, root, and crest dimensions are similar to spring dimensions such as ID, OD, wire diameter, gap, pitch, free length, coil count, leg and leg length. Production numbers are high and in process inspection is required.



## MEASUREMENT APPLICATIONS

**Stent and catheter applications** are good multisensor applications. Crown radii, weld thickness, strut thickness, and angles are a common measurements. Rotary, mandrel, and diffuser accessories assist with mounting and lighting.



## MEASUREMENT APPLICATIONS

**Watch and Clock parts** are excellent vision CMM and multisensor applications. Z heights and profiles are common and easily measured. Specialized probe tips assist with small geometries that cannot be measured with vision.

