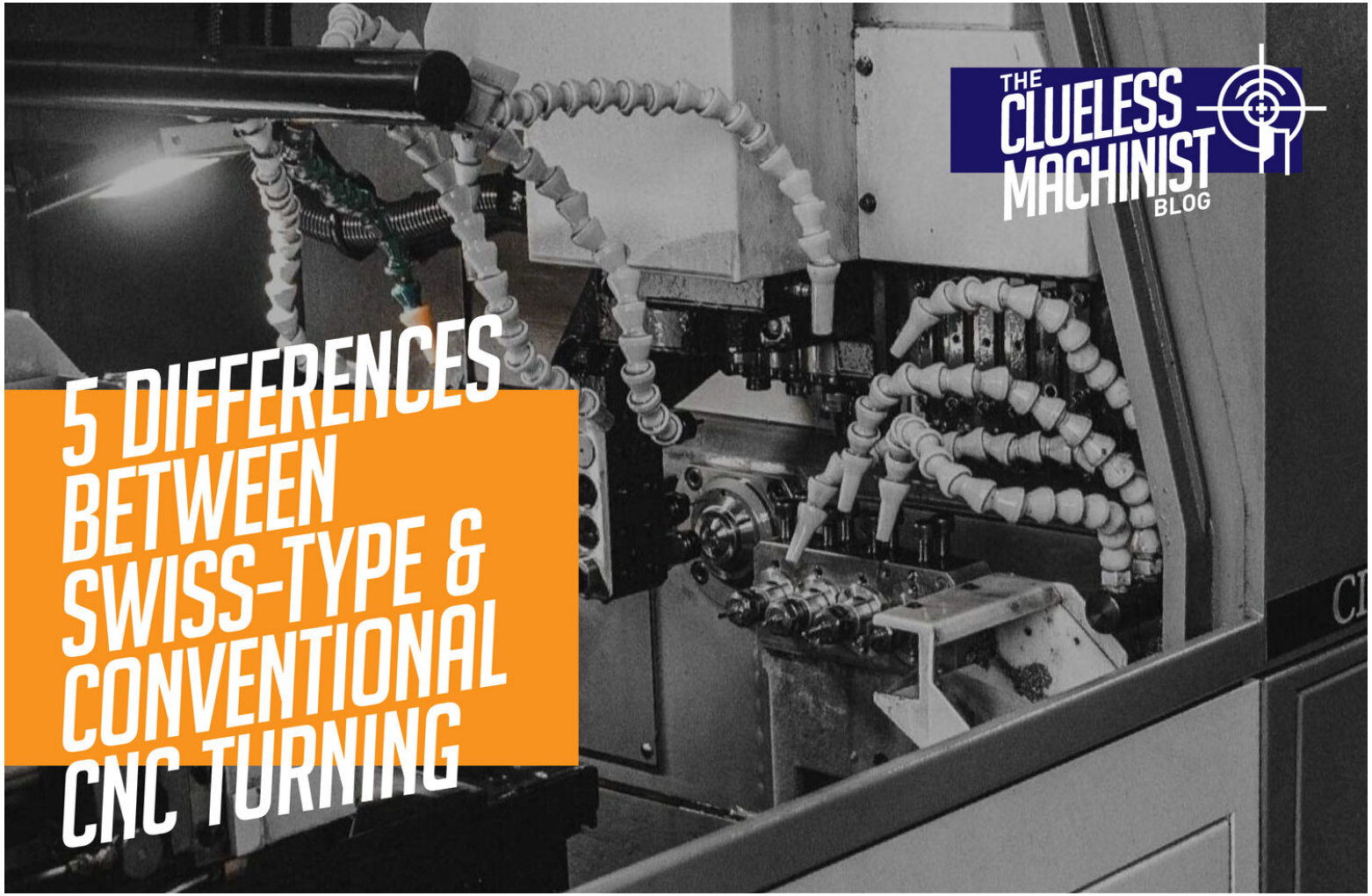
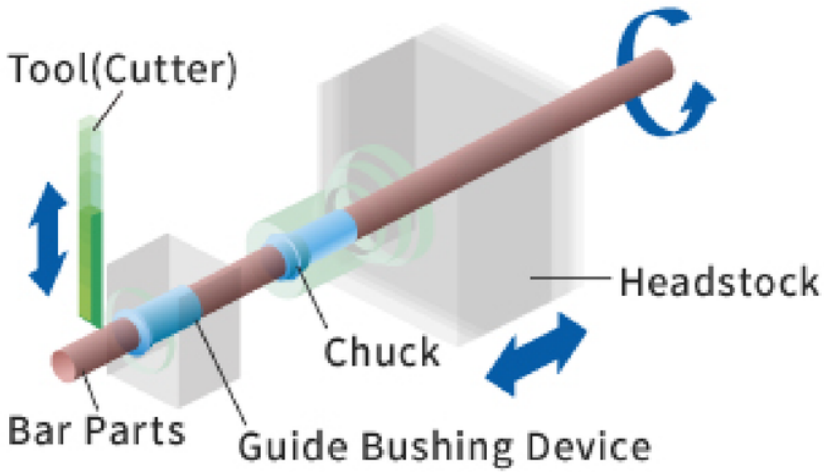
5 DIFFERENCES THAT MATTER BETWEEN SWISS-TYPE & CONVENTIONAL TURNING

Swiss type turning centres offer distinct advantages over conventional turning centres for the precise machining of small parts with micrometer sized features.



Small mechanical parts are pervasive in applications across electronics, medical, automotive and aerospace industries. Be it inner micro parts for injection pumps, electrical probes or implants for surgery; these parts are now lighter, more compact and more efficient thanks to the precise turning processes performed by the new generation of Swiss type turning centres.

With the latest advancements in materials science and motion control technology Swiss-type machines have become the industry standard for the machining of cost-effective miniature parts with very high accuracy and repeatability:



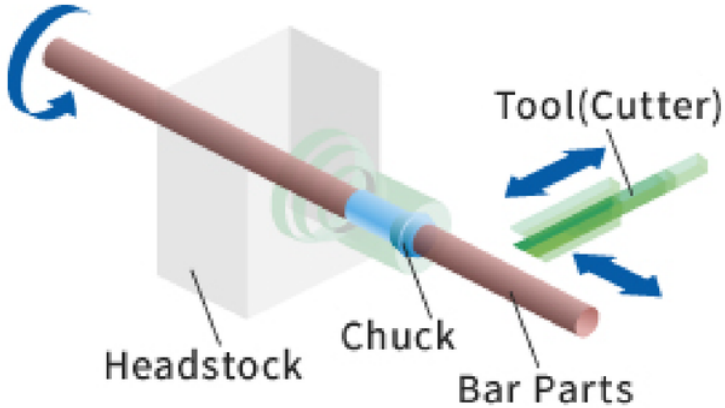
GUIDE BUSHING

In Swiss type turning centres the guide bushing supports the part at a distance from the collet.

During machining the bar material is clamped in a collet that can slide along the headstock behind the guide bushing. In this configuration, cutting tool operates very near the guide bushing.

Such mechanical configuration prevents any significant deflections during machining which is why Swiss-type turning centres can machine such precise parts and stay within the desired tolerances despite the length of the workpiece.

However, on a conventional turning centre the workpiece is stabilized at the collet of the main spindle. This configuration might not be suitable for longer workpieces because of the deflection of the material as mentioned above:



FASTER CYCLE TIMES FOR COMPLEX PARTS

Swiss type turning centres are capable of performing simultaneous machining with a 5-axis control which drastically reduces cycle-time and higher throughput.

Swiss type turning centres typically feature between 7 and 13 axes and can perform multiple operations on the part in a single machining cycle; thread cutting, end-face grooving, drilling, slotting, milling, cut-off and back drilling in a single run.

In comparison, conventional turning centres feature only 3 or 4 axes and at times are not able to complete machining of a part in a single cycle. Because of that, some mildly complex parts may even require machining on multiple machines, drastically increasing cycle time.

MACHINING IN SEGMENTS

Because Swiss type turning centres provide high rigidity during machining due to the mechanical configuration of sliding headstock and guide bushing the workpiece always needs to be machined near the guide bushing.

This is done by machining in segments to guarantee the final part dimensions are within the desired tolerances. In a conventional turning centre turning is done procedurally as a roughing pass, a finishing pass and then machining of the features. The movement of the cutter instead of the bar stock is what makes this toolpath strategy more natural for the conventional turning centre.

COOLANT TYPE

Swiss type turning centres usually require oil as a coolant liquid, while conventional lathes, water.

The heat capacity of oil is lower than that of water. This means that the machining oil will heat up faster than water during the machining. Hence, heat gets transferred away from the cutting edge of the tools more easily. This is what helps Swiss type turning centres achieve better tolerance because of reduced dimensional change from thermal expansion.

REVERSED OFFSET

In conventional turning centres the turning tool moves in both (X) and (Z) direction to make contact with the part. The bar stock extends out by a specified length and the face of the workpiece looking away from the collet is classified as 'zero' of (Z) direction. The direction along the part toward the collet is in the 'negative' (Z) direction.

On the other hand the stock moves in the (Z) direction in Swiss type turning centres and the tool comes into contact with the feed from (X) direction to realize the turning. The face of the part looking away from the guide busing is considered as 'zero' of the (Z) axis. The direction along the workpiece towards the guide bushing is now viewed as 'positive' (Z) direction. This "polarity" difference is usually what causes machine crashes when machinists switch over from conventional turning to Swiss-type turning.

CONCLUSION

Swiss type turning centres allow for the machining of intricate designs utilizing drilling, turning, milling, knurling and other unique processes on a single machine. Parts machined on them usually find their place in connectors and contacts used in the electronics industry, medical devices and implants, watch parts, and miniature shafts. These are usually small, long and complicated mechanical parts.