

## ELECTRIC SPINDLE vs MECHANICAL SPINDLE DRIVEN BY BELT

### ELECTRIC SPINDLE



BENEFITS	HANDICAPS
Possibility to reach high speeds in according to the bearings sizes and accuracies installed on it.	Large spindle housing in according to the electric spindle power or torque because the electrical part is built into the spindle.
The accuracy of the machining is very good, the tool works directly into the spindle shaft without any external transmittion.	The temperature afforded from the electrical part (winded stator and rotor built in) can increase the pre-load of the angular contact bearings and reduce the life if the spindle cooling is not congruous.
If the electric spindle is cooled by liquid the thermal expansion of the spindle shaft and the increase of the bearings pre-load due to the temperature of the electrical part (winding and rotor) is very low.	The stiffness and the diameter of the spindle shaft cannot be very high because the design must be calculated in according to the bearings sizes and to the maximum diameter available of the rotor.
The reliability of the bearings (angular contact bearings with ceramic balls) in good conditions of using is quite good: 4000-5000 hours. Consider that bearings life is base on the unusual increase of temperature and vibrations and on the lubrication (grease) life. The regular life of a high speed grease is about 3000 hours of work at maximum speed.	The electrical over load of the spindle during the machining (service S6 60% instead of service S1 100%) increases the heat flash of the rotor reducing the bearings life.
The electrical performance (power and torque) is higher than the independent motor used to drive the mechanical cartridge.	The cost of a new electric spindle is higher than a new mechanical spindle equipped with HF motor.
Low noisy at the maximum speed.	The maintenance cost is higher than a mechanical spindle especially when the winding is burned or in short circuit. The electric spindle must be completely disassembled for replacing the winding and the bearings, even if are OK, suffer the disassembling operations and you are forced to replace them.

## ELECTRIC SPINDLE vs MECHANICAL SPINDLE DRIVEN BY BELT

### MECHANICAL SPINDLE

ISO40 - 10000rpm



BENEFITS	HANDICAPS
Mechanical cartridge very compact. The front bearings bench works very close the rear bearings bench so the stiffness is very good.	It cannot reach very high speeds due to the transmission by belt, max speed in safe 9000-10000rpm. The bearings size installed into the mechanical cartridge are so big that the max speeds available are not very high.
Possibility to design the spindle shaft of the mechanical cartridge very big and stiff because the electrical part (stator and rotor) is not built in.	The accuracy of the machining on the work piece is not very high due to the vibration and the accuracy caused by the transmission by belt.
Very low thermal expansion of the spindle shaft due to the independent driven motor. No increase of temperature due to the electrical part (stator and rotor) of the motor.	Reliability of the rear bearings not very high: 2000-3000 hours due to the high radial load caused by the transmission by belt: angular contact bearings with balls are not sufficient to support that load.
The price of a new mechanical spindle or of the system: cartridge plus the HF motor is accessible.	The electrical performance of the High Frequency (HF) motor suitable to drive the cartridge lower than an electric spindle.
Very good cost for mechanical cartridge and HF motor maintenance. The main defect on the mechanical cartridge are bearings, drawbar, spring cups and clamping group and on the HF motor is the electrical winding.	The overall dimensions of the system: mechanical cartridge plus independent HF motor are quite large and the look on the machine is not very good even if there are some coverings.
	The noisy of the mechanical spindle at the maximum speed is higher than an electric spindle.