- The installation of special motors (induction/synchronous) allows us to have large rotor diameters which results in a dynamically robust construction with excellent power density.

➢ **Customer benefit** = high chip volume, use of long tools possible

- Matched hybrid bearing sets (steel rings, ceramic balls) in combination with grease lubrication or the Step –Tec outer ring direct oil-air lubricating system (DOL) allow high speeds, despite large and rigid bearings.
  Additionally, the reduction of the axial displacement of the spindle shaft (system OptiCool and COOL-Core) allows a higher manufacturing accuracy by using rigid bearing seating at the spindle's front end and sliding bearing seating at the rear end, all monitored by temperature sensors and axial movement sensor.

➢ **Customer benefit** = Increased productivity and better product quality

- High Precision manufactured parts and the use of high quality components guarantee durability (1) and reliability (2).

➢ **Customer benefit** = 1) Guarantees return of investment and 2) high productivity

- The teachable analog sensor system, which monitors the clamping system, allows adjustments without touching the spindle and is less prone to break downs.

➢ **Customer benefit** = Easy maintenance, increased availability of the system

- The optional V1D (1D vibration monitoring) enables monitoring of vibrations and excessive temperatures during the machining process (in conjunction with the diagnostic module SDM20).

➢ **Customer benefit** = visualization of machining vibrations
enables machining process control
greater tool service life
longer spindle service life

- The optional V3D (3D vibration monitoring) enables monitoring of vibrations in all in three planes (X, Y, Z) as well as crash events and excessive temperatures during the machining process (in conjunction with the diagnostic module SDM20). Data communication to the CNC machine control is provided by means of Profibus.

➢ **Customer benefit** = precise analysis of the three directional vibration signals
enables fine tuning of machining process
real time data recording of all parameters (incidents) for the last hour
minimizing of machine down time
greater tool service life
longer spindle service life

- The option SDM20 (successor of SDM11) offers a broader range of spindle parameters for monitoring and process control of the spindle. Data communication to the CNC machine control is provided by means of Profibus. With this newly SDM20, real time data recording of all parameters (incidents) for the last hour of operation is possible that can be utilized for analysis purposes and fine tuning of the machining process.
  A new Spindle-Diagnostic-Software (SDS) developed for he SDM20 gives the service personnel the right tool to access the spindle online for diagnosis and optimization.

➢ **Customer benefit** = precise optimization of machining process
real time data recording of all parameters (incidents) for the last hour data logging of spindle
minimizing of machine down time

- Optimum support for the proper integration of a spindle system into the machine (Project Planning Manual will be handed to the machine manufacturer), as well as customized monitoring devices and accessories resulting in shorter assembly time of the machine/spindle system.

➢ **Customer benefit** = short commissioning

- Standardized key spindle elements allow multiple use of well proven components such as the motor module, spindle module, cylinder module (tool clamping system), media connection module and sensory modules.

➢ **Customer benefit** = minimized risk for new customer specific spindle developments

- On-going improvement and development process insures a high quality standard.

➢ **Customer benefit** = long term market value

- All spindles are compatible with today's standard drive technology (Siemens, Heidenhain, Fanuc, Indradrive, etc.).
New: Electrical connection Universal **X > compatible with all drive systems**

➢ **Customer benefit** = axis drives and main spindle drive modules of the same brand

- Layout and design of the spindle's bearing system is specified and verified by computer assisted FEM programs.

➢ **Customer benefit** = dynamic limit behavior can be calculated (milling simulations are possible).

- Optimized bearing layout for greatest possible bearing life for grease, continuous grease lubrication and oil lubricated spindles.

➢ **Customer benefit** = Long maintenance intervals = high productivity

- Torque, power and thermal behavior of new developed motor spindles are measured and documented on the Step-Tec motor spindle test bench.

➢ **Customer benefit** = verified and documented performance data

- Coded Connector System (fast coupling system) in case of a spindle replacement

➢ **Customer benefit** = shortest out of order period for your machine

- Dual circuit tool coolant spray ring for coolant lube and air

➢ **Customer benefit** = optimized setup for your customer application

- Coolant through units are dry run safe, equipped with hybrid bearings or bearing less leakage poor sealant design (friction less)
Models for air in rotation possible, coolant pressure up to 2900 psi (200 bar), minimum volume lubrication possible, speed up to 60,000 rpm

➢ **Customer benefit** = optimized application for the tool coolant requirements

- State-of-the-art testing facilities with automatic data logging and monitoring of each and every spindle leaving the factory allow maximal product quality.

➢ **Customer benefit** = 100% approved key component for your machining center