



LEVIACRON
NON-CONTACT PRECISION MOTION

ASD-H25 / UASD-H25 (HSK-E25, radial spindle connectors)



Levicron

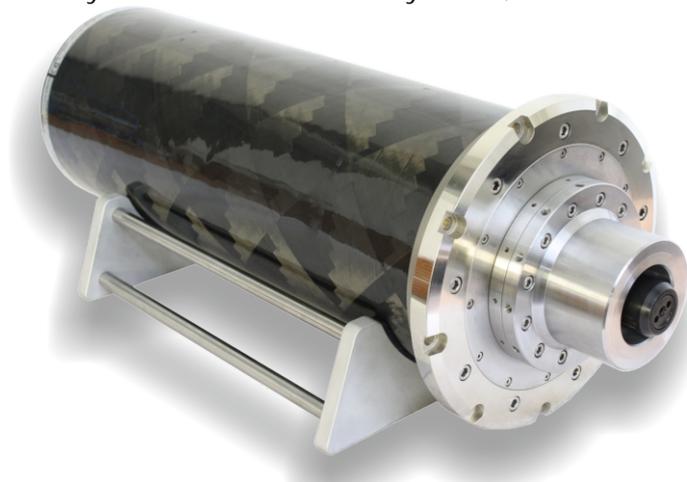
Development, manufacture and sales of motor spindle solutions with non-contact bearing technologies for ultra-precision and CNC machining are Levicron's core businesses. At Levicron bespoke analytical proven methods and simulation tools for structural analysis and fluid dynamics complement sound practical experiences in the field of spindle development and production.

Together with the first-ever aerostatic tool spindle comprising an industrial taper interfaces (HSK) and full CNC functionality, products from Levicron now are used to CNC-machine precision parts with optical surface finish all around the world.

Our very own requirements on our products and those from our customers prevent the use of off-the-shelf components. Therefore not only the patented bearing technology and patent-pending spring-free HSK taper damping systems can be found in our motor spindles, but also in-house developed motor and encoder and tool clamping solutions. A vertical manufacturing integration of more than 90% incorporates CNC turning, -milling, -diamond machining, -cylindrical /bore grinding, - wire cut EDM and bespoke machining solutions. Along with our production sophisticated test and dynamic balancing methods can all be found under one roof.

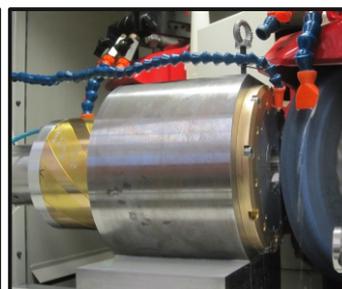
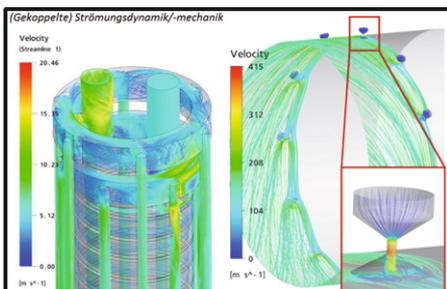
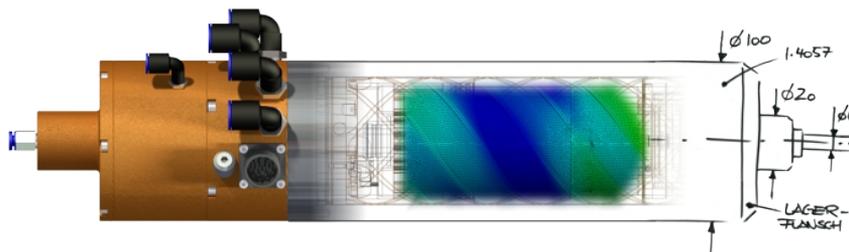
The quality, speed and accuracy of Levicron spindles and the requirements coming from the applications they are used for made it necessary to develop bespoke encoder and motor solutions as well as solutions for HSK tool clamping, HSK tool holding and others. Because of their unique performance and functionality some of these solutions have been made available for our customers as off-the-shelf items. Although Levicron had to re-invented the wheel more than once our customers can confirm that our wheels run smoother and faster than others.

As a result, tool and work-holding spindle solutions for turning, milling and grinding can be provided to the customer which provide a unique thermal stability and robustness at shaft dynamics, errors in shaft motion and speeds that have not been available so far.



Levicron

All in house developed and manufactured Ultra Precision Technology for CNC Machining



Why aerostatic bearing systems for tool and work-holding spindles?

Although difficult to believe for many engineers, the radial stiffness of our tool and work-holding spindles is indeed comparable with the radial stiffness of actual roller bearing spindles, the axial stiffness can even be higher. Ultra-thin bearing gaps combined with a large bearing surface - compared to the tiny Hertzian contact in roller bearings - lead to a comparable bearing stiffness and in combination with our high-pressure aerostatic bearing technology to even higher load capacities. Also, bearing gaps with only a few microns in width allow very high shear velocities and compensate for shape errors. This averaging effect of the air film between the shaft and the bearing allows a shaft rotation more controlled than the sum of all shape errors would actually allow.

Technical benefits:

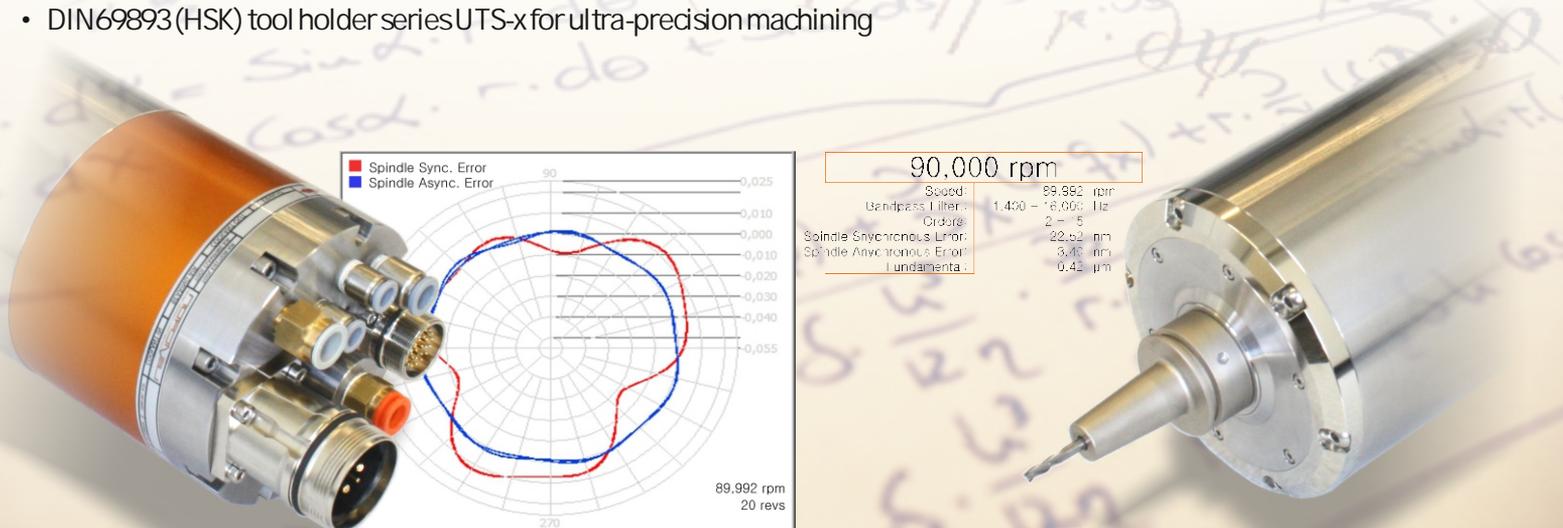
- Higher speeds
Speeds of up to 100,000 rpm with HSK-E25 tool holders
- Significantly smaller synchronous and asynchronous spindle errors
Dynamic run-out values < 0.5 micron and errors in shaft motion of < 30 nm at any speed
- Thermal stability:
Spindle soak time < 5 min., axial shaft growth < 5 micron, X/Y stability < 0.5 micron
- Wear-free and stable operation even at top speed
- Modular and service-friendly cartridge design
- Oil and grease-free operation

Customer benefits:

- Higher productivity and reduced tool wear
- Remarkably better surface finishes in any material; suitable for ultra-precision machining
- Stable operation at any speed with no time limit
- Cost-effective assembly due to a modular spindle design
- Oil- and grease-free operation - suitable for medical parts and applications within the food industry

Solutions from Levicron - bespoke solutions to not compromise accuracy and performance:

- Patented bearing technology for outstanding shaft errors in motion, minimized air consumption and spindle stiffness
- Patented automatic and spring-less tool interface for DIN 69893 (HSK) taper clamping to give outstanding shaft dynamics and reliability
- Bespoke iron-less motor solutions for ultra-precision machining and high-power motor operations with highest power density
- In-house developed integral encoder systems with reduced number of parts and reduced size compared to industry standard
- DIN 69893 (HSK) tool holder series UTS-x for ultra-precision machining



ASD-H25 / UASD-H25

Ultra-precision aerostatic tool spindle with automatic spring-less HSK-E25 tool interface and radially oriented spindle connectors

Our spindle models ASD-H25 and UASD-H25 fulfill all your requirements on a high-quality CNC motor spindle to generate high-precision parts with an optical surface finish. They combine robustness and CNC functionality with high spindle speeds for micro machining and low errors in shape motion to machine optical components. Both models feature an automatic spring-less HSK-E25 tool clamping, a high-resolution rotary encoder, a highly efficient thin-film liquid cooling, tool clamp status monitoring and a robust steel housing with a standardized diameter.

If used in CNC machine tools the user not only gets outstanding precision, thermal stability and speed, but also, and for the first time ever, the ability to create parts with optical surface finish. For ultra-precision machining on the other hand our ASD-H25 and UASD-H25 now enables significantly increased chip loads and automated tool change to increase productivity at an ultra precision level.

Both models are also available with axial spindle connectors (ASD-H25A und UASD-H25A).



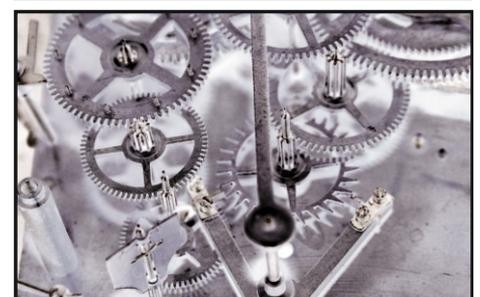
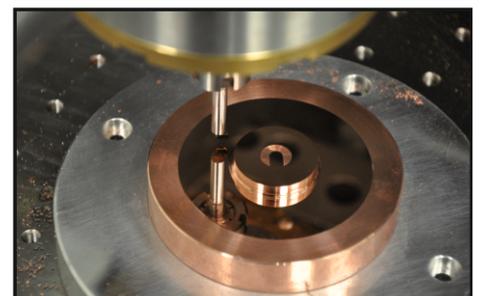
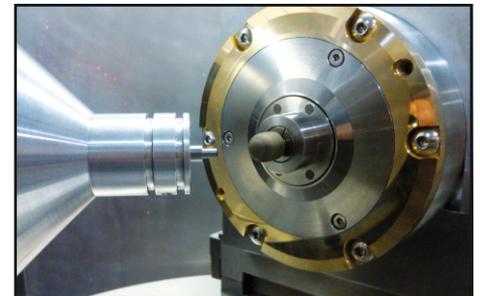
*„The way to get rid of temptation is to yield to it.“
Oscar Wilde*

Passionate Precision
Made in Germany

At a glance, ASD-H25 / UASD-H25

Tool interface	HSK-E25, automatic, spring-less
Motor options	400 V max., high-power, 0.66 Nm S1
	208 V max., high-power, 0.66 Nm S1
	400 V max., iron-less, 0.33 Nm S1
	208 V max., iron-less, 0.33 Nm S1
Position control	1 VSS Si nCos, 80 lines, zero-flag
Nominal speed	60,000 rpm
	80,000 rpm
	90,000 rpm
Tool change system	pneumatic, 4bit tool clamp status monitoring, taper cleaning air
Cooling	Thin-film liquid cooling
Bearing system	aerostatic (ASD-H25)
	high-pressure aerostatic (UASD-H25)
Accuracy, Dynamics	Dynamic tool run-out < 0.5 µm *)
	Error-motion < 30 nm
Connectors	radially oriented

*) if used with tool holder series UTS25





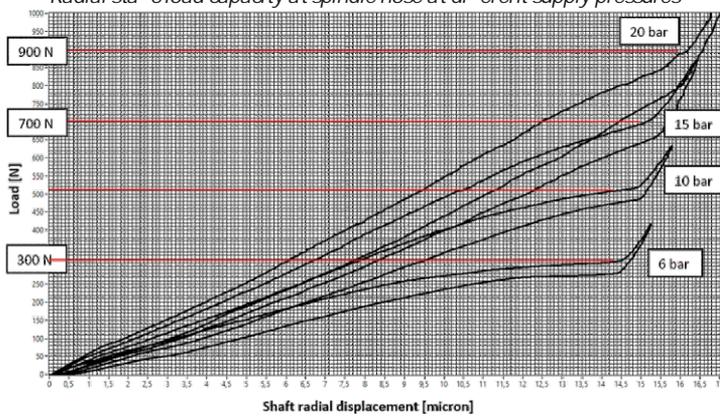
ASD-H25 and UASD-H25, comparison

The aerostatic bearing system of the UASD-H25 and UASD-H25A type spindles has specifically been designed and manufactured for the use with supply pressures of 20- 30bar. The result is an increase in load capacity at the spindle nose of approximately 300% compared to the standard models.

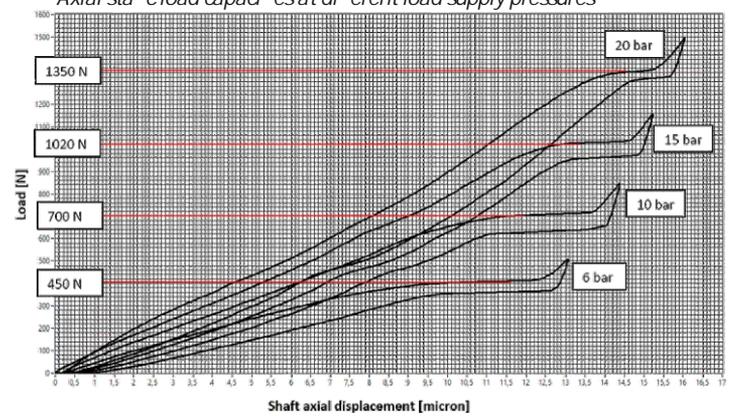
The new axial bearing and bearing orifice design reduce the air consumption significantly to provide economic operation even at higher supply pressures.

An alternative air compressor to your machines standard may be required to operate UASD-x models.

Radial static load capacity at spindle nose at different supply pressures



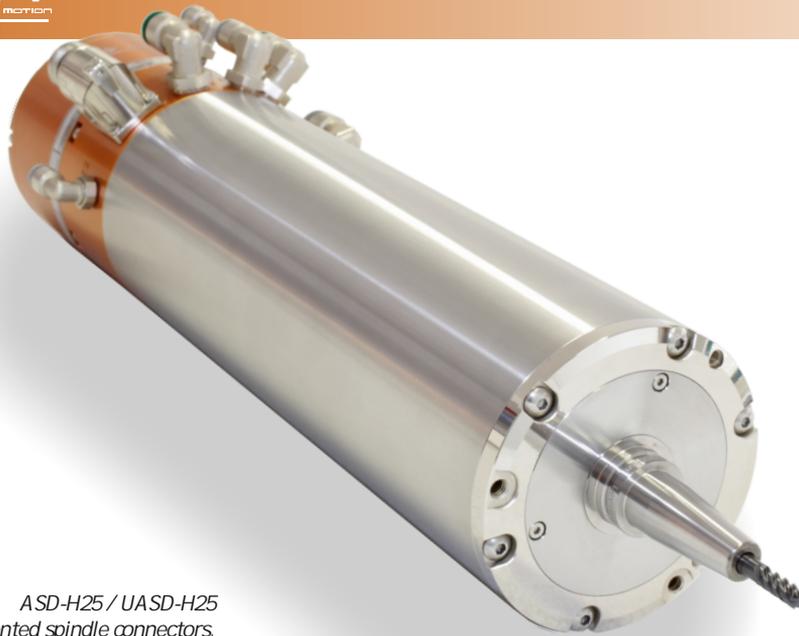
Axial static load capacity at different load supply pressures



ASD-H25 and UASD-H25, test results

		ASD060H25	UASD060H25
Bearing air supply pressure	[bar]	6 - 10	20 - 30
Speed	[rpm]	0 - 60,000	0 - 60,000
Radial load capacity	[N]	330	900 (275 %)
Axial load capacity	[N]	550	1.400 (255 %)
Static radial stiffness at spindle nose	[N/μm]	41	83 (202 %)
Static axial stiffness	[N/μm]	65	120 (180 %)
Static air consumption	[Nl/min]	50	90 (180 %)
Dynamic tool run-out	[μm]	< 0.4	< 0.3
Shaft error in motion	[nm]	< 23	< 28





ASD-H25 / UASD-H25
 with radially oriented spindle connectors,
 „front view“

Data sheet, ASD-H25

		ASD060H25	ASD080H25	ASD090H25
General	Body diameter [mm]	100	100	100
	Total length [mm]	472	472	472
	Weight [kg]	16	16	16
	Speed [Upm]	0 - 60,000	0 - 80,000	0 - 90,000
	Automatic tool interface [-]	HSK-E25, springless	HSK-E25, springless	HSK-E25, springless
	Tool clamp status monitoring [-]	4bit digital	4bit digital	4bit digital
Motor option "high-power", 400 V max.	Type [-]	3 phases, synchronous	3 phases, synchronous	3 phases, synchronous **)
	Constant torque [Nm]	0.66	0.66	0.66
	Poles [-]	2	2	2
	max. phase voltage, RMS [V]	270	370	405
	Rated current [A]	10	10	10
	Peak current, RMS [A]	20	20	20
Motor option "high-power", 208 V max.	Shaft Power [kVA]	4,3	5,8	6,5
	Type [-]	3 phases, synchronous	3 phases, synchronous	3 phases, synchronous **)
	Constant torque [Nm]	0.66	0.66	0.66
	Poles [-]	2	2	2
	max. phase voltage, RMS [V]	155	180	210
	Rated current [A]	18	18	18
Motor option "ultra-precision", 400 V max.	Peak current, RMS [A]	36	36	36
	Shaft Power [kVA]	4,2	5,6	6,3
	Type [-]	3 phases, synchronous	3 phases, synchronous	3 phases, synchronous
	Constant torque [Nm]	0.33	0.33	0.33
	Poles [-]	2	2	2
	max. phase voltage, RMS [V]	260	330	370
Motor option "ultra-precision", 208 V max.	Rated current [A]	5	5	5
	Peak current, RMS [A]	11	11	11
	Shaft Power [kVA]	1,9	2,6	2,8
	Type [-]	3 phases, synchronous	3 phases, synchronous	3 phases, synchronous
	Constant torque [Nm]	0.33	0.33	0.33
	Poles [-]	2	2	2
Rotary encoder	max. phase voltage, RMS [V]	160	180	210
	Rated current [A]	5	5	5
	Peak current, RMS [A]	11	11	11
	Shaft Power [kVA]	1,9	2,6	2,8
Bearing system	Type [-]	incremental	incremental	incremental
	Lines [-]	80	80	80
	Signal A/B [-]	1VSS SinCos	1VSS SinCos	1VSS SinCos
	Zero flag [-]	yes (digital/analog)	yes (digital/analog)	yes (digital/analog)
	Bearing air supply pressure [bar]	6 - 10	6 - 10	6 - 10
Stability and precision	Air cleanliness, ISO8573 [-]	3, or any better	3, or any better	3, or any better
	Static radial zero position stiffness at spindle nose [N/μm]	> 40	> 25	> 20
	Static radial load capacity at spindle nose [N]	> 330	> 300	> 280
	Static axial zero position stiffness [N/μm]	> 65	> 45	> 35
	Axial load capacity [N]	> 600	> 550	> 500
Stability and precision	Taper run-out TIR [nm]	< 100	< 100	< 100
	Shaft error in motion [nm]	< 30	< 30	< 30
	Dynanmic tool run-out *) [μm]	< 0.5	< 0.5	< 0.5
	Spindle soak time [Min]	< 3	< 3	< 3
	Axial shaft growth [μm]	< 3	< 5	< 6

All values taken at 6 bar bearing air supply pressure (gauge pressure)

*) If used with tool holder series UTS25

**) If used with field weakening technology



ASD-H25 / UASD-H25
with radially oriented spindle connectors,
„rear view“

Data sheet, UASD-H25

		UASD060H25	UASD080H25	UASD090H25
General	Body diameter [mm]	100	100	100
	Total length [mm]	472	472	472
	Weight [kg]	16	16	16
	Speed [Upm]	0 - 60,000	0 - 80,000	0 - 90,000
	Automatic tool interface [-]	HSK-E25, spring-less	HSK-E25, spring-less	HSK-E25, spring-less
	Tool clamp status monitoring [-]	4bit digital	4bit digital	4bit digital
Motor option "high-power", 400V max.	Type [-]	3 phases, synchronous	3 phases, synchronous	3 phases, synchronous **)
	Constant torque [Nm]	0.66	0.66	0.66
	Poles [-]	2	2	2
	max. phase voltage, RMS [V]	270	370	405
	Rated current [A]	10	10	10
	Peak current, RMS [A]	20	20	20
Shaft Power [kVA]	4,3	5,8	6,5	
Motor option "high-power", 208V max.	Type [-]	3 phases, synchronous	3 phases, synchronous	3 phases, synchronous **)
	Constant torque [Nm]	0.66	0.66	0.66
	Poles [-]	2	2	2
	max. phase voltage, RMS [V]	155	180	210
	Rated current [A]	18	18	18
	Peak current, RMS [A]	36	36	36
Shaft Power [kVA]	4,2	5,6	6,3	
Motor option "ultra-precision", 400V max.	Type [-]	3 phases, synchronous	3 phases, synchronous	3 phases, synchronous
	Constant torque [Nm]	0.33	0.33	0.33
	Poles [-]	2	2	2
	max. phase voltage, RMS [V]	260	330	370
	Rated current [A]	5	5	5
	Peak current, RMS [A]	11	11	11
Shaft Power [kVA]	1,9	2,6	2,8	
Motor option "ultra-precision", 208V max.	Type [-]	3 phases, synchronous	3 phases, synchronous	3 phases, synchronous
	Constant torque [Nm]	0.33	0.33	0.33
	Poles [-]	2	2	2
	max. phase voltage, RMS [V]	160	180	210
	Rated current [A]	5	5	5
	Peak current, RMS [A]	11	11	11
Shaft Power [kVA]	1,9	2,6	2,8	
Rotary encoder	Type [-]	incremental	incremental	incremental
	Lines [-]	80	80	80
	Signal A/B [-]	1VSS SinCos	1VSS SinCos	1VSS SinCos
	Zero flag [-]	yes (digital/analog)	yes (digital/analog)	yes (digital/analog)
Bearing system	Bearing air supply pressure [bar]	20 - 30	20 - 30	20 - 30
	Air cleanliness, ISO8573 [-]	3, or any better	3, or any better	3, or any better
	Static radial zero position stiffness at spindle nose [N/μm]	> 70	> 50	> 35
	Static radial load capacity at spindle nose [N]	> 900	> 800	> 750
	Static axial zero position stiffness [N/μm]	> 150	> 120	> 80
Axial load capacity [N]	> 1300	> 1200	> 1100	
Stability and precision	Taper run-out TIR [nm]	< 100	< 100	< 100
	Shaft error in motion [nm]	< 30	< 30	< 30
	Dynamic tool run-out *) [μm]	< 0.5	< 0.5	< 0.5
	Spindle soak time [Min]	< 3	< 3	< 3
	Axial shaft growth [μm]	< 3	< 5	< 6

All values taken at 20 bar bearing air supply pressure (gauge pressure)

*) If used with tool holder series UTS25

**) If used with field weakening technology



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