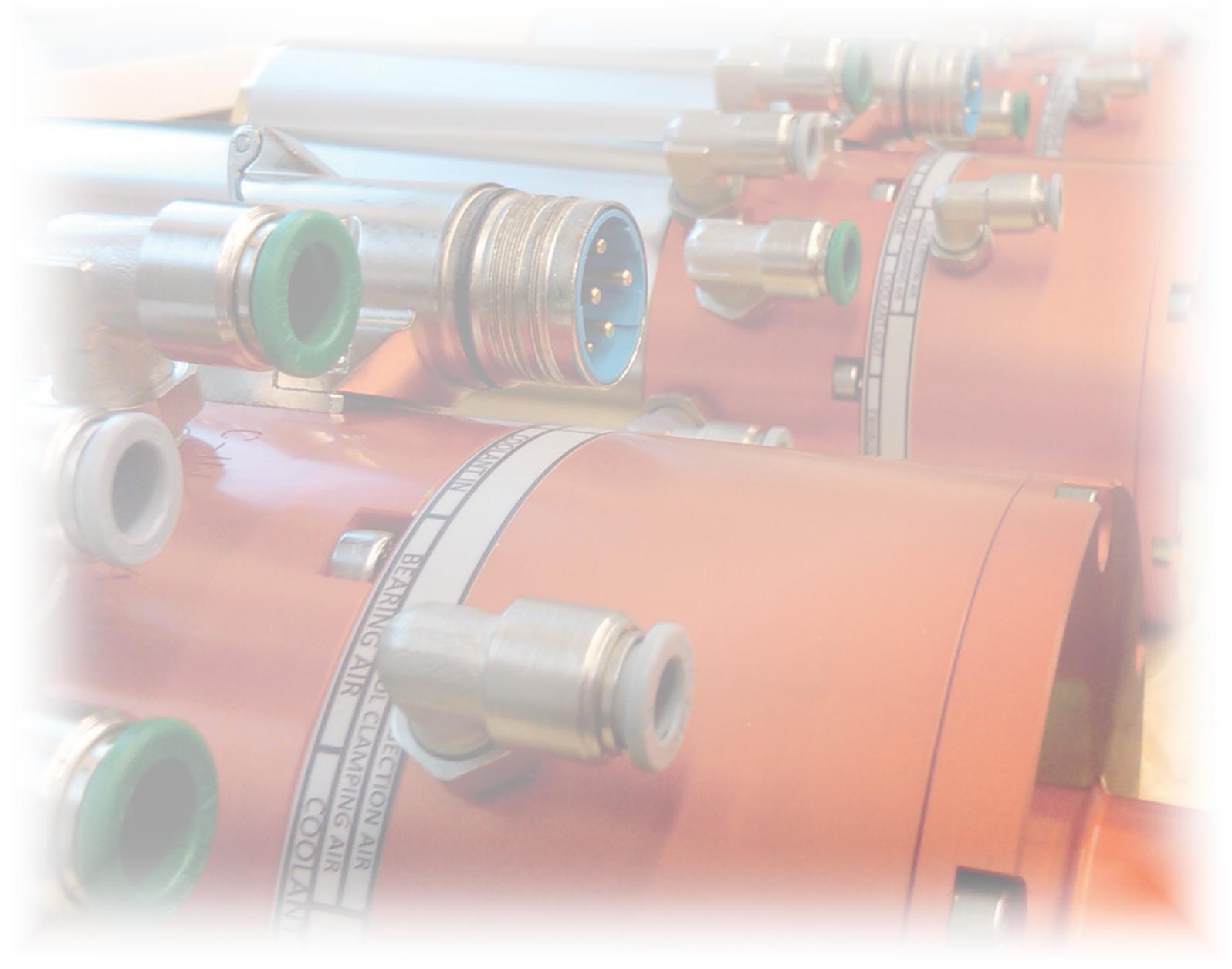




LEVITRON
NON-CONTACT PRECISION MOTION

UASD-H32 / UASD-H232A (HSK-E32, high-pressure-aerostatic tool spindle)



Levicron

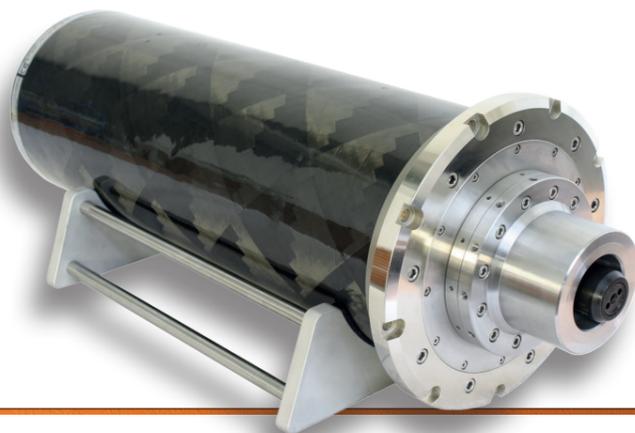
Development, manufacture and sales of motor spindle solutions with non-contact bearing technologies for ultra-precision and CNC machining are Levicron's core businesses. At Levicron bespoke analytical proven methods and simulation tools for structural analysis and fluid dynamics complement sound practical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

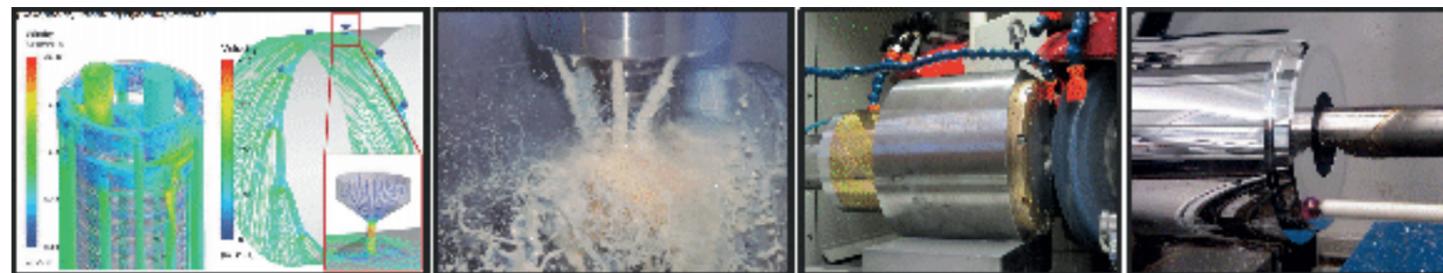
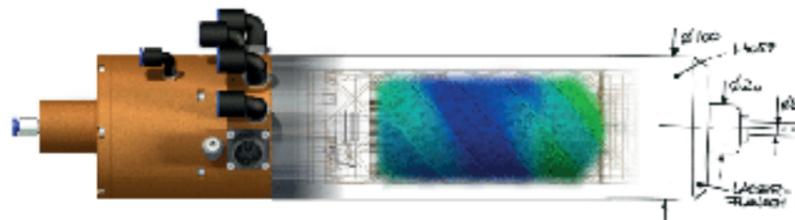
The quality, speed and accuracy of Levicron spindles and the requirements coming from the applications they are used for made it necessary to develop bespoke encoder and motor solutions as well as solutions for HSK tool clamping, HSK tool holding and others. Because of their unique performance and functionality 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

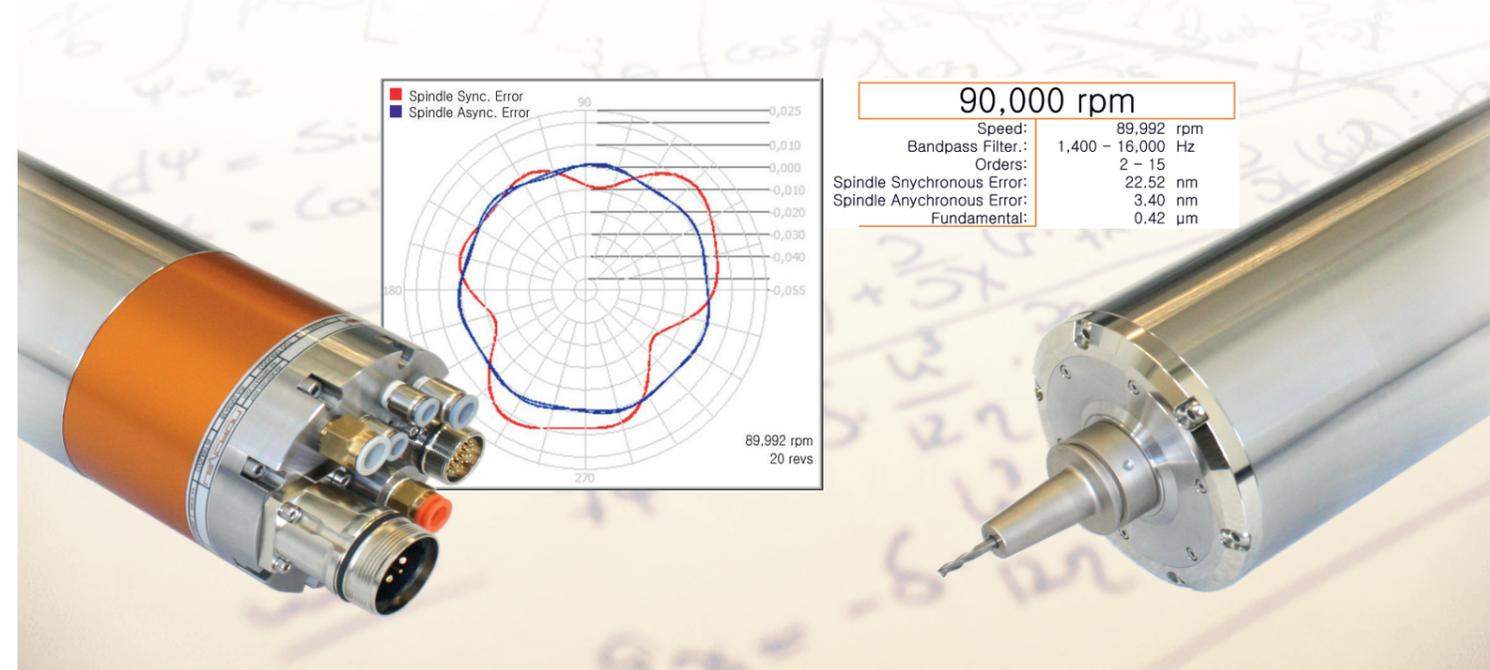
- Higher speeds: speeds of up to 100,000rpm with HSK-E25 tool holders
- Significantly smaller synchronous and asynchronous spindle errors: dynamic run-out values < 0.5 micron and errors in shaft motion of < 30nm at any speed
- Thermal stability: spindle soak time < 5min., axial shaft growth < 5 micron, 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 DIN69893 (HSK) taper clamping to give outstanding shaft dynamics and reliability
- Bespoke iron-less motor solutions for ultra-precision machining and high-power motor options with highest power density
 - In-house developed integral encoder systems with reduced number of parts and reduced size compared to industry standard
- DIN69893 (HSK) tool holder series UTS-x for ultra-precision machining



UASD-H32 / UASD-H32A

Ultra-precise aerostatic tool spindles with automatic, springless HSK-E25 tool interface and radially oriented spindle connections

Description

Due to the great success of our spindle solutions with high-pressure aerostac technology we have developed our UASD-H32 and UASD-H32A with HSK-E32 tool interface. Based on their sisters UASD-H25 and UASD-H25A our UASD-H32 and UASD-H32A only differ from the HSK-size. Like any other spindle solution with HSK taper interface from Levicron they feature our well-proven spring-less HSK clamping system SLH-x. As a result machine builders who prefer HSK32 now can resort to properties like speed and smooth running they know from our HSK-E25 models, but with enough stiffness and robustness for light roughing, coming from the high-pressure aerostac technology, and a larger HSK interface size. In combination with the high-pressure aerostac technology the integrated permanent magnet synchronous motor now reaches its limit right before the aerostac bearing system and gives thus a great deal of protection of the bearing system.

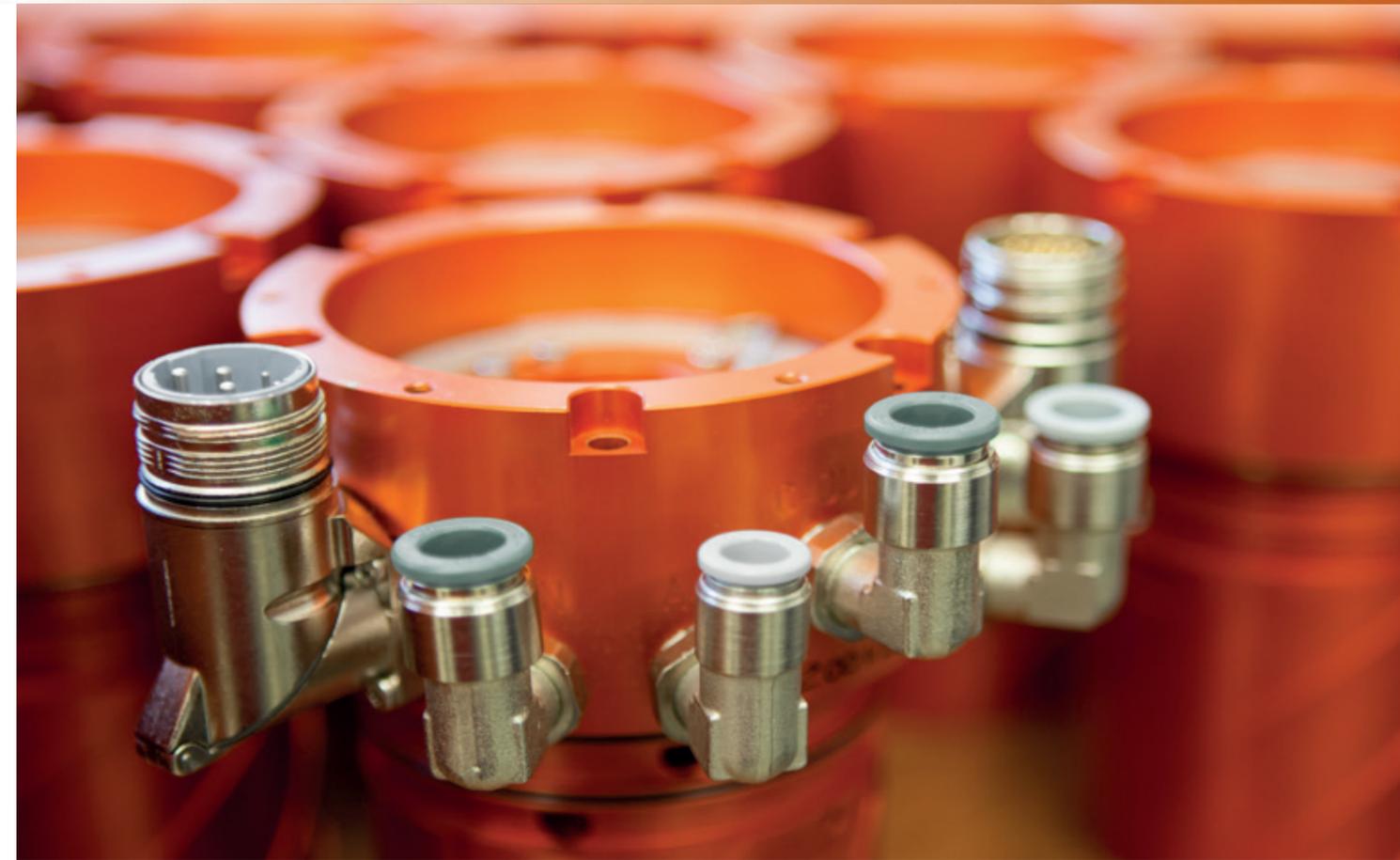
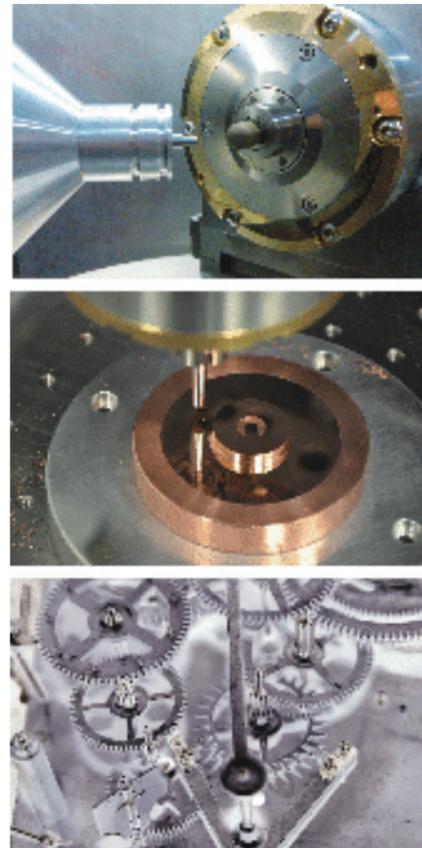
Convention and high-pressure aerostatic in comparison

The patented high-pressure aerostatic bearing system of our UASD models has been designed and manufactured for operation at 20-30 bar air supply pressure, which thus allows a load capacity at the spindle nose of 300% of the standard bearing at 6 bar, as verified in customer tests. The new thrust bearing design and the patented capillary technology significantly reduce the air throughput and also allow economical use here. To operate the high-pressure variants UASD-x, you may need a different air compressor or an additional pressure booster. High chip removal and an auto-mated tool change for a significant increase in productivity and automation. Our ASD-H25 and UASD-H25 spindles are also available with axially oriented spindle connections (ASD-H25A and UASD-H25A).

At a glance, UASD-H32 / UASD-H32A

Tool interface	automatic HSK-E32; spring-less (SLH-32)
Body diameter	100 mm
Motor options	400 V max., „High-power“, 0,7 Nm S1
	208 V max., „High-power“, 0,7 Nm S1
	400 V max., „Iron-less“, 0,33 Nm S1
	208 V max., „Iron-less“, 0,33 Nm S1
Angular position control	1 VSS SinCos, 80 lines, zero-flag
Nominal speed	60,000 Upm
	80,000 Upm
Tool change system	pneumatic
	4bit tool clamp status monitoring taper cleaning air
Cooling	Thin-film liquid cooling
Bearing system	aerostatic (ASD-H32)
	high-pressure (UASD-H32)
Accuracy, dynamics	dynamic tool run-out < 0,8 µm *)
	Shaft error in motion < 30 nm
Spindle connectors	axially oriented, UASD-H32A (Dmax 100mm)
	radially oriented, UASD-H32

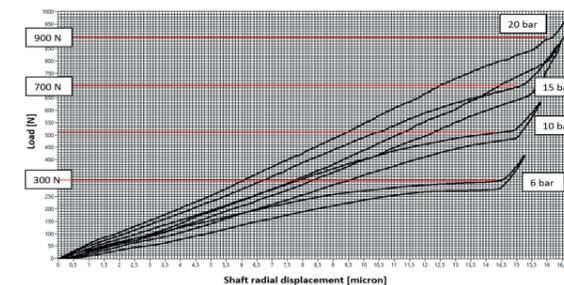
*) If used with UTS-32 tool holder series



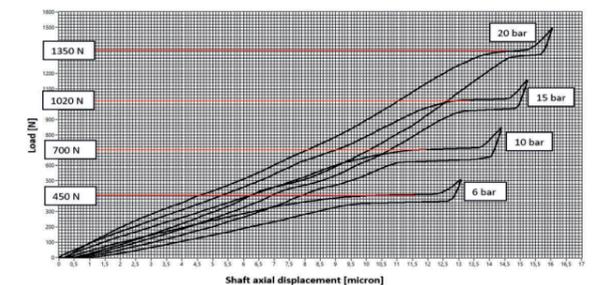
ASD-H32/ A and UASD-H32/ A, comparison

The aerostatic bearing system of the UASD-H32 and UASD-H32A spindles has specifically been designed manufactured for the use with supply pressures of 20-30 bar. 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 consumptions significantly to provide economic operation even at higher supply pressures.

Radial static load capacity at spindle nose at different supply pressures



Axial static load capacity at different load supply pressures

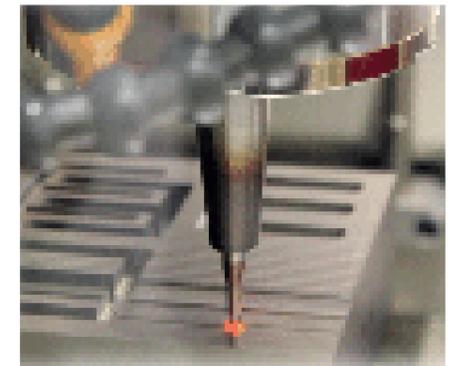


ASD-H32A and UASD-H32A, test results

		ASD060H32/A	UASD060H32/A *)
Bearing air supply pressure	[bar]	6-10	20-30
Speed	[krpm]	0-60,000	0-60,000
Radial load capacity at spindle nose	[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	[NI/min]	50	90 (180%)
Dynamic tool run-out **)	[µm]	< 0.4	< 0.5
Shaft error in motion **)	[µm]	< 23	< 30

*) All values taken at 20 bar bearing air supply pressure

**) If used with UTS-32 tool holder series



Data sheet UASD-H32/ UASD-H32A (Speed up tp 60.000 upm)

		UASD060H25	UASD060H25A
General	Body diameter [mm]	100	100
	Total length [mm]	470	408
	Weight [kg]	16	16
	Speed [Upm]	0 - 60,000	0 - 60,000
	Automatic tool interface [-]	HSK-E32, SLH32	HSK-E25, SLH-H32
	Tool clamp status monitoring [-]	4bit digital	4bit digital
Motor option „high-power“, 400 V max.	Type [-]	3 Phasen, synchron	3 Phasen, synchron
	Constant torque [Nm]	0.7	0.7
	Poles [-]	2	2
	max. phase voltage, RMS [V]	270	270
	Rated current [A]	10	10
	Peak current, RMS [A]	20	20
Motor option „high-power“, 208 V max.	Shaft Power [kVA]	4.3	4.3
	Type [-]	3 Phasen, synchron	3 Phasen, synchron
	Constant torque [Nm]	0,7	0,7
	Poles [-]	2	2
	max. phase voltage, RMS [V]	155	155
	Rated current [A]	10	10
Motor option „ultra-precision“, 400 V max.	Peak current, RMS [A]	20	20
	Shaft Power [kVA]	4,2	4,2
	Type [-]	3 Phasen, synchron	3 Phasen, synchron
	Constant torque [Nm]	0,35	0,35
	Poles [-]	2	2
	max. phase voltage, RMS [V]	260	260
Motor option „ultra-precision“, 208 V max.	Rated current [A]	5	5
	Peak current, RMS [A]	11	11
	Shaft Power [kVA]	1,9	1,9
	Type [-]	3 Phasen, synchron	3 Phasen, synchron
	Constant torque [Nm]	0,33	0,33
	Poles [-]	2	2
Rotary encoder	max. phase voltage, RMS [V]	160	160
	Rated current [A]	5	5
	Peak current, RMS [A]	11	11
	Shaft Power [kVA]	1,9	1,9
Bearing system	Type [-]	inkrementell	inkrementell
	Lines [-]	80	80
	Signal A/B [-]	1VSS SinCos	1VSS SinCos
	Zero flag [-]	ja (digital/ analog)	ja (digital/ analog)
Bearing system	Bearing air supply pressure [bar]	20-30	6-10
	Air cleanliness, ISO8573 [-]	3 oder besser	3 oder besser
	Dew point at supply pressure [°C]	3	3
	Static radial zero position stiffness at spindle nose [N/μm]	> 70	> 70
	Static axial zero position stiffness [N]	> 900	> 900
	Axial load capacity [N/μm]	> 150	> 150
Stability and precision	Axiale Tragfähigkeit [N]	> 1,300	> 1,300
	Taper run-out TIR [nm]	< 100	< 100
	Shaft error in motion [nm]	< 30	< 30
	Dynamic tool run-out *) [μm]	< 0,7	< 0,7
	Spindle soak time [Min]	< 3	< 3
	Axial shaft growth [μm]	< 3	< 3

*) If used with UTS-32 tool holder series

Data sheet UASD-H32/ UASD-H32A (Speed up tp 80.000 upm)

		UASD080H25	UASD080H25A
General	Body diameter [mm]	100	100
	Total length [mm]	470	408
	Weight [kg]	16	16
	Speed [Upm]	0 - 80,000	0 - 80,000
	Automatic tool interface [-]	HSK-E25, SLH-H32	HSK-E25, SLH32
	Tool clamp status monitoring [-]	4bit digital	4bit digital
Motor option „high-power“, 400 V max.	Type [-]	3 Phasen, synchron	3 Phasen, synchron
	Constant torque [Nm]	0.7	0.7
	Poles [-]	2	2
	max. phase voltage, RMS [V]	180	180
	Rated current [A]	10	10
	Peak current, RMS [A]	20	20
Motor option „high-power“, 208 V max.	Shaft Power [kVA]	5.8	5.8
	Type [-]	3 Phasen, synchron	3 Phasen, synchron
	Constant torque [Nm]	0,7	0,7
	Poles [-]	2	2
	max. phase voltage, RMS [V]	180	180
	Rated current [A]	10	10
Motor option „ultra-precision“, 400 V max.	Peak current, RMS [A]	20	20
	Shaft Power [kVA]	5,6	5,6
	Type [-]	3 Phasen, synchron	3 Phasen, synchron
	Constant torque [Nm]	0,35	0,35
	Poles [-]	2	2
	max. phase voltage, RMS [V]	330	330
Motor option „ultra-precision“, 208 V max.	Rated current [A]	5	5
	Peak current, RMS [A]	11	11
	Shaft Power [kVA]	2,6	2,6
	Type [-]	3 Phasen, synchron	3 Phasen, synchron
	Constant torque [Nm]	0,33	0,33
	Poles [-]	2	2
Rotary encoder	max. phase voltage, RMS [V]	180	180
	Rated current [A]	5	5
	Peak current, RMS [A]	11	11
	Shaft Power [kVA]	2,6	2,6
Bearing system	Type [-]	inkrementell	inkrementell
	Lines [-]	80	80
	Signal A/B [-]	1VSS SinCos	1VSS SinCos
	Zero flag [-]	ja (digital/ analog)	ja (digital/ analog)
Bearing system	Bearing air supply pressure [bar]	20-30	20-30
	Air cleanliness, ISO8573 [-]	3 oder besser	3 oder besser
	Dew point at supply pressure [°C]	3	3
	Static radial zero position stiffness at spindle nose [N/μm]	> 50	> 50
	Static axial zero position stiffness [N]	> 800	> 800
	Axial load capacity [N/μm]	> 120	> 120
Stability and precision	Axiale Tragfähigkeit [N]	> 1,200	> 1,200
	Taper run-out TIR [nm]	< 100	< 100
	Shaft error in motion [nm]	< 35	< 35
	Dynamic tool run-out *) [μm]	< 1	< 1
	Spindle soak time [Min]	< 3	< 3
	Axial shaft growth [μm]	< 5	< 5

*) If used with UTS-32 tool holder series



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