



LEVIACROM

NON-CONTACT PRECISION MOTION

UASD-H32 / UASD-H32A (HSK-E32, high-pressure-aerostatic tool spindle)



Levicron

The development, manufacturing, and sales of motor spindle solutions with non-contact bearing technologies for ultra-precision and CNC machining are Levicron's core businesses.

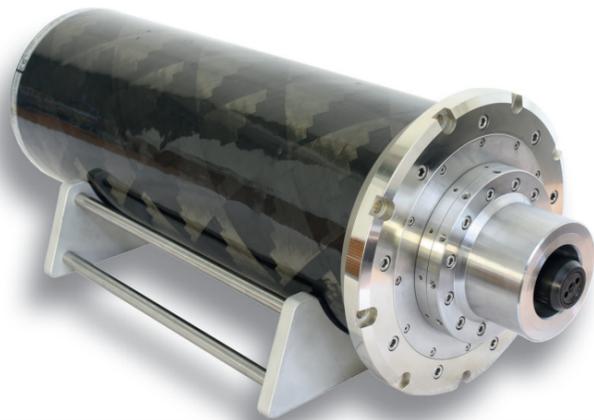
At Levicron, bespoke proven analytical methods and simulation tools for structural analysis and fluid dynamics complement sound practical experience of spindle development and production. Together with the first-ever aerostatic tool spindle comprising an industrial taper interface (HSK) and full CNC functionality, products from Levicron are now used for CNC-machine precision parts with optical surface finish all around the world.

Our requirements for our products and those of 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, 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. You can find all our sophisticated production tests and dynamic balancing methods under one roof.

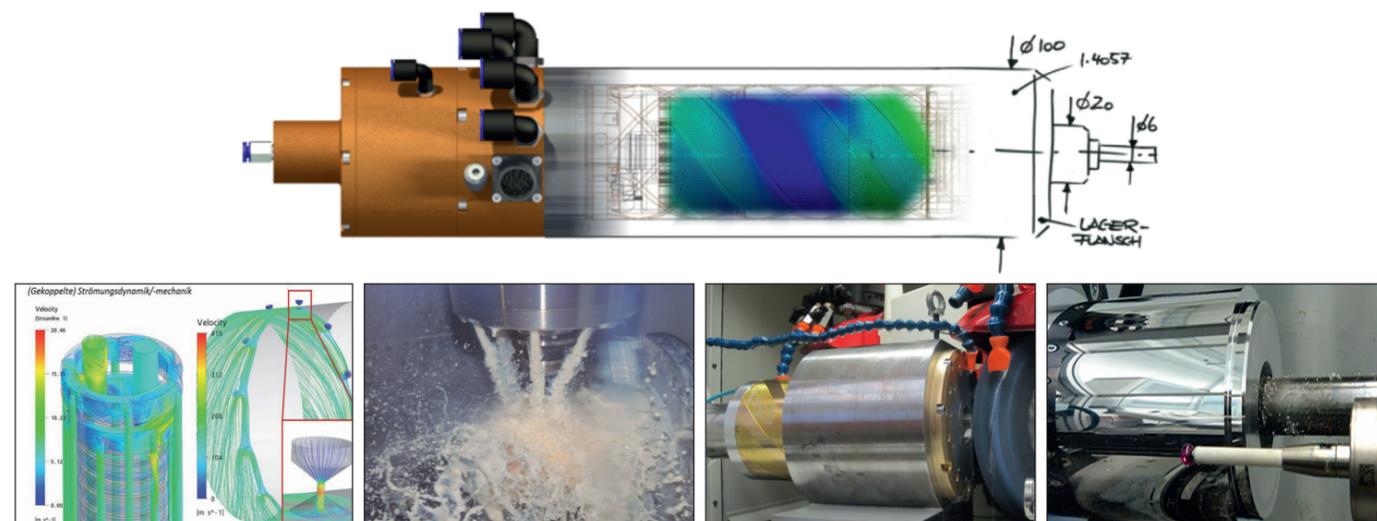
The quality, speed, and accuracy of Levicron spindles and the requirements coming from the applications are used to make it necessary to develop bespoke encoder and motor solutions as well as solutions for HSK tool clamping, HSK tool holding, and others. Because of their unique performance and functionality, some solutions have been made available for our customers as off-the-shelf items.

Although Levicron had to reinvent 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 provide the customer with 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



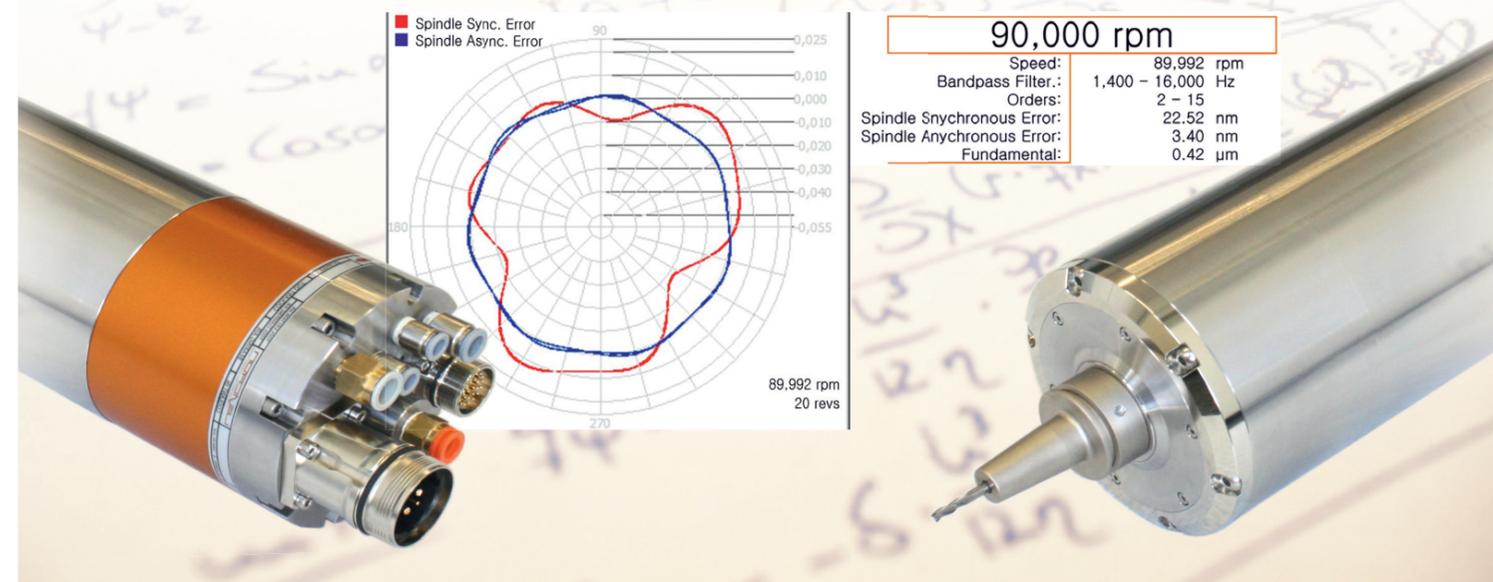
Why aerostatic bearing systems for tool and work-holding spindles?

Although it is difficult to believe for many engineers that the radial stiffness of our tool and work-holding spindles is comparable with the radial stiffness of actual roller-bearing spindles, the axial stiffness can even be higher. Compared to the tiny Hertzian contact in a roller bearing, ultra-thin bearing gaps combined with a large bearing surface lead to a comparable bearing stiffness. Combined with our high-pressure aerostatic bearing technology, it leads 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.

Technical benefits	Customer benefits
<ul style="list-style-type: none"> Higher speeds: speeds of up to 100,000 rpm with HSK-E25 tool holders Significantly more minor 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 	<ul style="list-style-type: none"> 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 & spindle stiffness
- ➔ Patented automatic and spring-less tool interface for DIN69893 (HSK) taper clamping to give the exceptional shaft dynamics and reliability
- ➔ Bespoke iron-less motor solutions for ultra-precision machining & high-power motor options
- ➔ In-house developed integral encoder systems with a reduced number of parts and a 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-E32 tool interface and radially or axially oriented spindle connections.

Description

Due to the great success of our spindle solutions with high-pressure aerostatic 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 spindle solution with an HSK taper interface from Levi-cron, they feature our well-proven spring-less HSK clamping system SLH-x.

What is the added value?

As a result, machine builders who prefer **HSK32** now resort to spindles 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 aerostatic technology, and a larger HSK interface size.

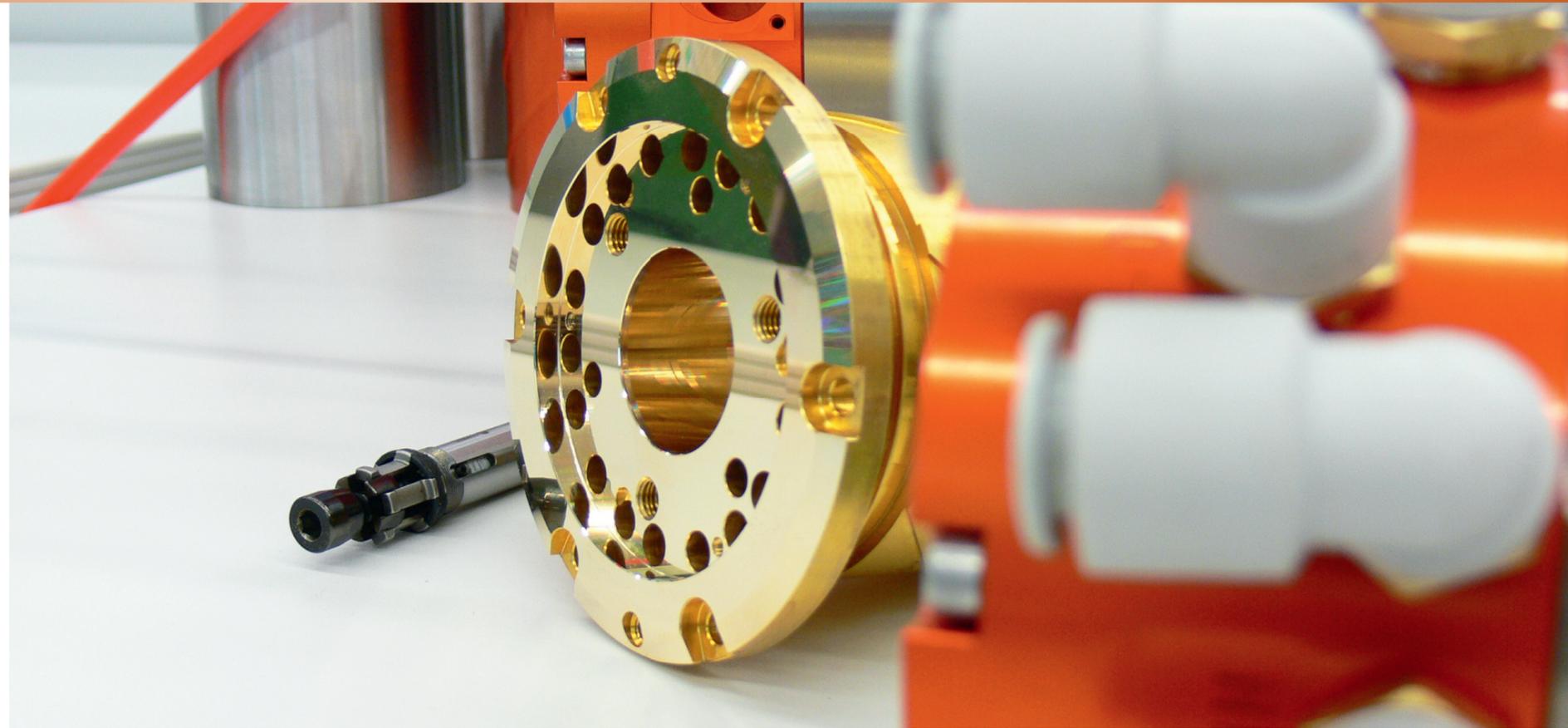
The integrated permanent magnet synchronous motor reaches its limit right before the aerostatic bearing system in combination with the high-pressure aerostatic technology. It gives thus excellent deal protection to the bearing system.

At a glance, UASD-H32 / UASD-H32A

Tool interface	HSK-E32, automatic, spring-less (SLH32)
Body diameter	100 mm
Motor options	400 V max., „High-power“, 0.7 Nm S1
	200 V max., „High-power“, 0.7 Nm S1
	400 V max., „Iron-less“, 0.33 Nm S1
	200 V max., „Iron-less“, 0.33 Nm S1
Angular position control	1 VSS SinCos, 80 lines, zero-flag
Nominal speed	60,000 rpm
	80,000 rpm
Tool change system	pneumatic 4bit tool clamp status monitoring taper cleaning air
Spindle cooling	Thin-film liquid cooling
Bearing system	aerostatic (ASD-H32) *)
	high-pressure (UASD-H32)
Accuracy, dynamics	dynamic tool run-out < 0,8 µm **)
	Error-motion < 35 nm
Cutting fluid feedthrough	n.a.
Spindle connectors	axially oriented, UASD-H32A (Dmax 100mm)
	radially oriented, UASD-H32

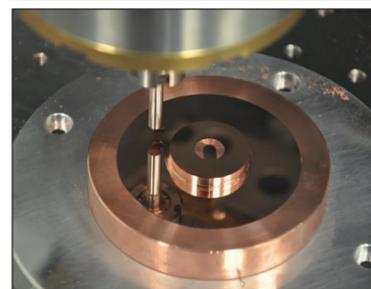
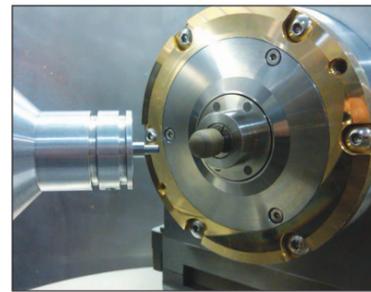
*) only with approval

**) if used with the tool holders series UTS-32

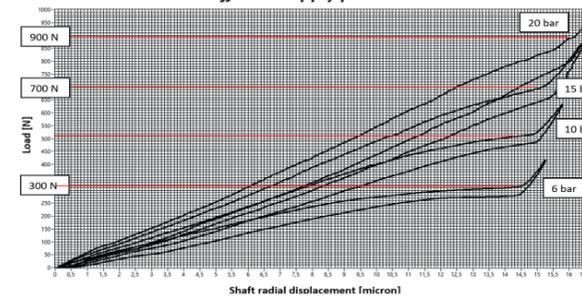


Convention and high-pressure aerostatic in comparison

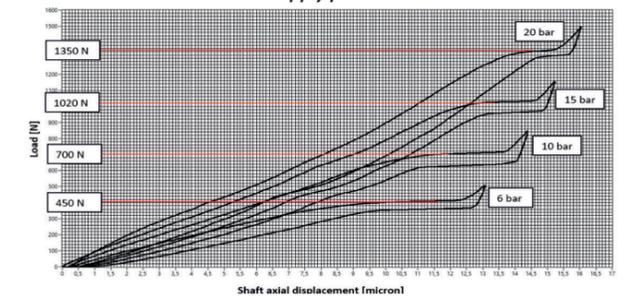
The patented high-pressure aerostatic bearing system of our UASD models has been designed and manufactured for operation at 20-30 bar air supply pressure, which thus allows a load capacity at the spindle nose of 300% of the standard bearing at 6 bar, as verified in customer tests. The new thrust bearing design and the patented capillary technology significantly reduce the air throughput and also allow economical use here. To operate the UASD-x high-pressure variants, you may need a different air compressor or an additional pressure booster.



Radial static load capacity at spindle nose at different supply pressures



Axial static load capacity at different load supply pressures

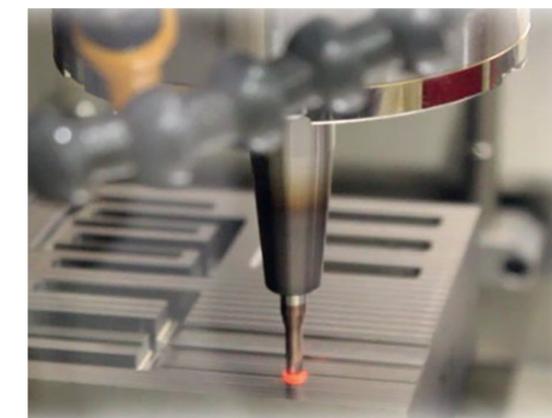


ASD-H25A and UASD-H32A, test results

		ASD060H25A	UASD060H32A *)
Bearing air supply pressure	[bar]	6 - 10	20 - 30
Speed	[rpm]	0 - 60,000	0 - 60,000
Static radial ult. load capacity at the spindle nose	[N]	330	900 (273 %)
Static ult. load capacity	[N]	650	1,300 (200 %)
Static radial stiffness at the spindle nose	[N/µm]	41	83 (202 %)
Static axial stiffness	[N/µm]	60	75 (125 %)
Static air consumption	[l/min]	50	90 (180 %)
Dynamic tool run-out **)	[µm]	< 0.4	< 0.5
Shaft error in motion **)	[nm]	< 23	< 30

*) all values are taken at 20 bar bearing air supply pressure

**) if used with the UTS-32 tool holder series





UASD-H32
with axially oriented spindle connectors („front view“)



UASD-H32
with radially oriented spindle connectors („front view“)

Data Sheet UASD060H32/ UASD060H32A (Speed up to 60.000 rpm)

		UASD060H32	UASD060H32A
General	Body diameter [mm]	100	100
	Total length [mm]	470	408
	Weight [kg]	16	16
	Speed [rpm]	0 - 60,000	0 - 60,000
	Automatic tool interface [-]	HSK-E32, spring-less	HSK-E32, spring-less
	Tool clamp status monitoring [-]	4bit digital	4bit digital
Motor option „high-power“, 400 V max.	Type [-]	3 Phases, DC	3 Phases, DC
	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“, 200 V max.	Type [-]	3 Phases, DC	3 Phases, DC
	Constant torque [Nm]	0.7	0.7
	Poles [-]	2	2
	max. phase voltage, RMS [V]	170	170
	Rated current [A]	18	18
	Peak current, RMS [A]	36	36
Motor options „iron-less“, 400 V max.	Type [-]	3 Phases, DC	3 Phases, DC
	Constant torque [Nm]	0.33	0.33
	Poles [-]	2	2
	max. phase voltage, RMS [V]	260	260
	Rated current [A]	5	5
	Peak current, RMS [A]	11	11
Motor options „iron-less“, 200 V max.	Type [-]	3 Phases, DC	3 Phases, DC
	Constant torque [Nm]	0,33	0,33
	Poles [-]	2	2
	max. phase voltage, RMS [V]	160	160
	Rated current [A]	9	9
	Peak current, RMS [A]	18	18
Rotary encoder	Type [-]	incremental	incremental
	Lines [-]	80	80
	Signal A/B [-]	1VSS SinCos	1VSS SinCos
	Zero flag [-]	yes (digital/ analog)	yes (digital/ analog)
Bearing system	Bearing air supply pressure [bar]	20 - 30	20 - 30
	Air cleanliness, ISO8573 [-]	3 or better	3 or better
	Dew point at supply pressure [°C]	3	3
	Static radial zero position stiffness at the spindle nose [N/μm]	> 70	> 70
	Static radial load capacity at the spindle nose [N]	> 900	> 900
	Static axial zero position stiffness [N/μm]	> 80	> 80
Stability and precision	Axial load capacity [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 the UTS-32 tool holder series

Data Sheet UASD080H32/ UASD080H32A (Speed up to 80.000 rpm)

		UASD080H32	UASD080H32A
General	Body diameter [mm]	100	100
	Total length [mm]	470	408
	Weight [kg]	16	16
	Speed [rpm]	0 - 80,000	0 - 80,000
	Automatic tool interface [-]	HSK-E32, spring-less	HSK-E32, spring-less
	Tool clamp status monitoring [-]	4bit digital	4bit digital
Motor option „high-power“, 400 V max.	Type [-]	3 Phases, DC	3 Phases, DC
	Constant torque [Nm]	0.7	0.7
	Poles [-]	2	2
	max. phase voltage, RMS [V]	370	370
	Rated current [A]	10	10
	Peak current, RMS [A]	20	20
Motor option „high-power“, 200 V max.	Type [-]	3 Phases, DC	3 Phases, DC
	Constant torque [Nm]	0.7	0.7
	Poles [-]	2	2
	max. phase voltage, RMS [V]	205	205
	Rated current [A]	18	18
	Peak current, RMS [A]	36	36
Motor options „iron-less“, 400 V max.	Type [-]	3 Phases, DC	3 Phases, DC
	Constant torque [Nm]	0.33	0.33
	Poles [-]	2	2
	max. phase voltage, RMS [V]	330	330
	Rated current [A]	5	5
	Peak current, RMS [A]	11	11
Motor options „iron-less“, 200 V max.	Type [-]	3 Phases, DC	3 Phases, DC
	Constant torque [Nm]	0,33	0,33
	Poles [-]	2	2
	max. phase voltage, RMS [V]	180	180
	Rated current [A]	9	9
	Peak current, RMS [A]	18	18
Rotary encoder	Type [-]	incremental	incremental
	Lines [-]	80	80
	Signal A/B [-]	1VSS SinCos	1VSS SinCos
	Zero flag [-]	yes (digital/ analog)	yes (digital/ analog)
Bearing system	Bearing air supply pressure [bar]	20 - 30	20 - 30
	Air cleanliness, ISO8573 [-]	3 or better	3 or better
	Dew point at supply pressure [°C]	3	3
	Static radial zero position stiffness at the spindle nose [N/μm]	> 60	> 60
	Static radial load capacity at the spindle nose [N]	> 800	> 800
	Static axial zero position stiffness [N/μm]	> 70	> 70
Stability and precision	Axial load capacity [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 the UTS-32 tool holder series



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