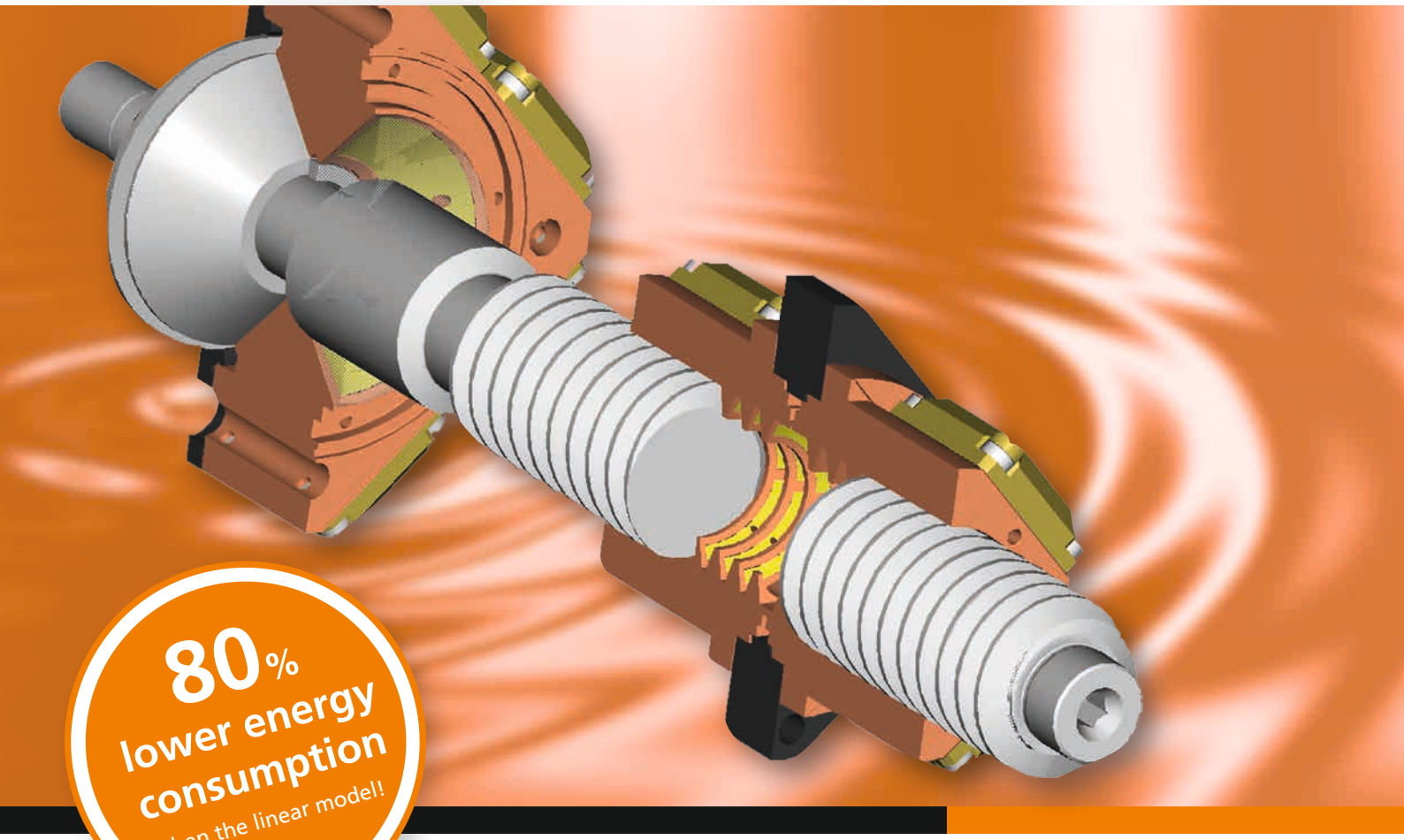
HYPROSTATIK®



80 % lower energy consumption than the linear model!

Hydrostatic screw drives

We make machine tools perform best

HYPROSTATIK® is the global technological leader for hydrostatic systems. Our hydrostatic screw drives, spindle bearings and patented progressive volume controllers make machine tools perform best: in terms of precision and efficiency, life, availability and reliability.

✗ **highest precision** ✗ **highly resilient** ✗ **wear and maintenance-free**

Hydrostatic screw drives

Hydrostatic screw drives convince due to their low position variation range, are highly resilient, work wear-free and outclass linear motors with far lower operating costs. Good reasons to rely on hydrostatic screw drives for linear drives for cutting and shaping machines.

Physical basics:

Electrical energy can be transformed into mechanical energy highly effectively with relatively low forces and high speeds. Therefore, high-speed engines with screw drives to generate slow slide speeds and high feed forces are used for electrical feed drives. The electromotive force is transferred to the slide through a very large lever that can be moved highly precisely with the respective quality of transfer elements at low forces.

The linear motor generates – at high energy consumption – the required forces through strong magnetic fields, i.e. through electric currents and/or spools with high inductivity. Electric fields have to be permanently generated alternately – even if the slide only has to be held in position. Though a lot of energy is consumed time lags incur due to the inertness of the system leading to several times larger position variation ranges than the hydrostatic screw drive.

Superior principle:

Like a ball screw drive the hydrostatic screw drive transforms the rotary motion of a servomotor into a linear movement. The nut of the hydrostatic screw drive floats on a hydrostatic oil film and is thus absolutely wear-free.

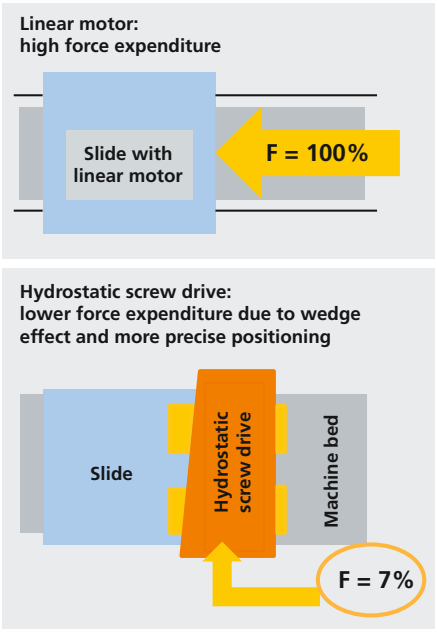
The patented HYPROSTATIK® progressive volume controllers keep the oil film thickness almost constant – widely independent of the load and speed. Double to triple stiffness of the nut to the spindle and absolutely zero backlash are achieved when compared to ball screw drives.

The robust progressive volume controllers are fastened to the nut and automatically control the oil flows without auxiliary energy depending on the pressure in the hydrostatic pockets. Operators only require a feed line for the hydrostatic oil to the nut.

Despite the high stiffness of the nut the hydrostatic screw drive has a very low friction moment. It is proportional to the rotational speed so that no rapid change of the drive torque incurs when the movement direction is reversed. This assures highest position precision and path accuracy as well as smallest possible travel lengths and precise slow movements.

The hydrostatic screw drive works like an excellent shock absorber for dynamic movements. It runs noiselessly and without vibration.

Different principles – different effects



Clear benefits

Highest precision:

The static stiffness of a relatively small hydrostatic screw drive (nominal diameter 50mm, spindle length 400mm) amounts to approx. 480 N/µm; the dynamic stiffness is even higher. This leads to a **hardly measurable position deviation** with the hydrostatic screw drive. Linear motor manufacturers mention (without frequency indication) dynamic stiffness of up to 30 N/µm (slide weight 100kg) or 120 N/µm (600kg). This means much larger position deviation with a linear motor (see charts on the reverse side).

High load capacity:

Even the small hydrostatic screw drive with a nominal diameter of 50mm enables static and dynamic loads of up to 20 kN; hydrostatic screw drives of up to **1,000 kN** are available. The currently strongest linear motors only enable loads of up to approx. 10 kN.

Long life:

Hydrostatic screw drives have an extremely long life. A screw drive for 30t tensile force had been used in **three-shift operation** for 9 years before it was damaged due to the breakdown of a machine control.

Enormous energy consumption reduction:

The energy consumption of the hydrostatic screw drive amounts to approx. 4 – 5 kW being **80 – 90%** lower than that of a linear motor (see example on the reverse side) for medium-size cutting machine tools (an axis).

Significant cost reduction:

The much lower energy consumption to cool the hydrostatic screw drive leads to **significant cost savings** – that can be used as investment reserve (see example on the reverse side) – compared to the linear motor.

CO_2 emissions:

The linear motor has a much higher energy consumption that not only leads to respectively higher costs but also significantly higher **CO_2 emissions.**

Electromagnetic compatibility:

Electromagnetic radiation **(electrosmog)** of the hydrostatic screw drive is clearly lower than that of the linear motor.

Slide speed and acceleration:

The usual slide speeds in machine tool building amount to 40 to max. 60 m/min – which is easily achieved by the hydrostatic screw drive.

Robustness, reliability and availability:

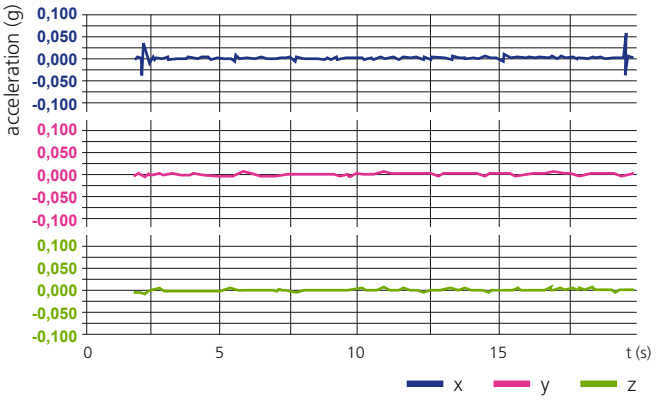
The hydrostatic screw drive can be set up and hydraulically connected **simply and without adjustments.** It is wear and maintenance-free and thus significantly reduces costs for machine breakdowns or maintenance.

Noiseless and vibration-free:

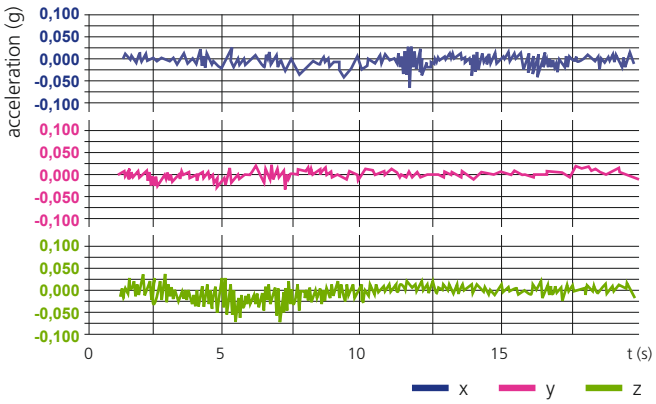
Compared to ball screw drives the hydraulic screw drive is **absolutely noise and vibration-free.**

Highest precision

Vibrations of a test axis with hydrostatic guide and hydrostatic screw drive



Vibrations of a test axis with roller guide and linear drive



Enormous energy consumption reduction (example compared to an axis)

Hydrostatic screw drive		Linear motor	
Feed force	10.000 N	Feed force	6.600 N
Drive pressure pump and oil re-cooling *)	0,5 kW	Dissipation	5,4 kW
Servomotor **)	0,1 kW	Re-cooling	3,2 kW
Total energy requirement	0,6 kW	Total energy requirement ***)	8,6 kW

*) Pump pressure 50 bar, oil flow 2.5 l/min **) Feed rate 400 mm/min ***) at average load 5.6 kW

Significant cost reduction

Per axis	One-shift operation	Three-shift operation
Operating hours/year	2.000	6.000
Minimum consumption/axis	5 kW	5 kW
Cost reduction/year *)	1.600 EUR	4.800 EUR
Capitalised costs **)	13.300 EUR	40.000 EUR

*) at 0.16 €/kW, without additional costs for power supply **) 12% for interest, amortisation and depreciation

Application examples

The first screw drives were supplied in 1997 for grinding machines to produce tools for gear-shaving equipment. These customers have not reported any breakdowns so far. See homepage for references and further application examples.

Supply programme

Nominal thread diameter	mm	40	50	63	80	100	125	160	200	230
Normal incline	mm	8	10	12	15	18	25	25	28	32
Increased incline I	mm	16	20	25	25	30				
Increased incline II	mm	25	30	40	40	50				
Maximum permissible load	kN	10	20	32	50	78	125	200	320	450
Extreme permissible load	kN					200	340	500	750	1.000

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