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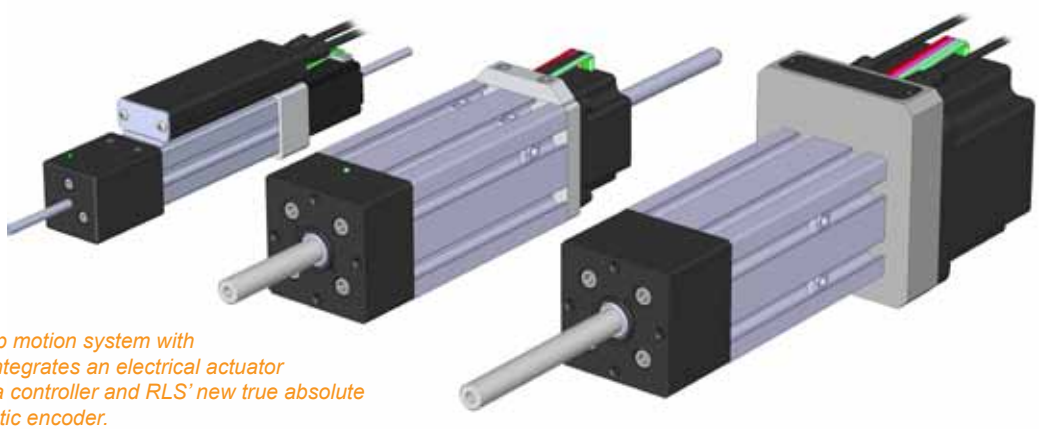
New in-axis magnetic encoder integrated into linear actuators provides best accuracy in closed-loop applications



Taurus is a closed-loop motion system with a unique design that integrates an electrical actuator with a stepper motor, a controller and RLS' new true absolute in-axis LinACE magnetic encoder.

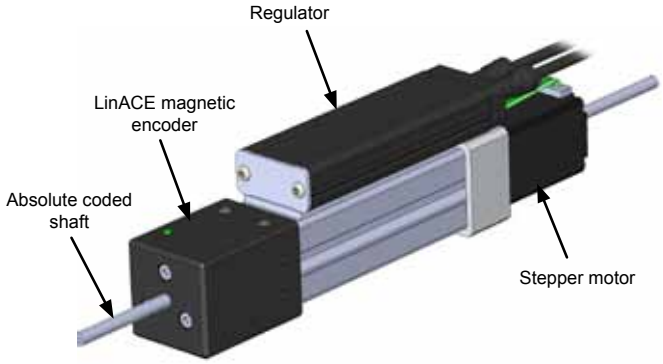
RLS adds to its proven magnetic encoder range with the new true absolute in-axis magnetic encoders

RLS has taken a step further in linear actuator applications with the introduction of the new true absolute LinACE magnetic encoder which uses its unique direct on-the-spot position reading of the encoded shaft to provide accurate closed-loop positioning with minimum space consumption. These features reinforce RLS' new in-axis magnetic encoder range which brings a range of user benefits including reduced set-up times, small space consumption and improved position control.

Taurus closed-loop motion system

With its compact, yet robust design and best environmental protection, LinACE, fitted to a closed-loop motion system such as RLS' new Taurus, brings reliable solutions for harsh environments where most encoders would fail.

In an assembly no larger than that of usual open loop system actuators the Taurus motion system incorporates a motor, an actuation axis, the LinACE absolute encoder and a controller in a single compact closed-loop linear actuator.

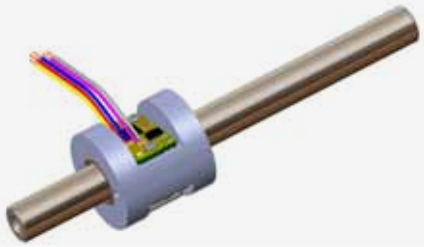


Although combining an encoder with a closed-loop system is no news to the linear actuator world, RLS have taken a step further by developing technology that enables the encoder to read the absolute code written in a solid steel chrome-coated shaft. With this innovative feature, to obtain position information by reading directly off the actuator axis, the effect of a system error and environmental conditions on accuracy is minimized.

The heart of the beast – LinACE in-axis absolute linear encoder

The heart of Taurus' innovation is an extremely robust absolute linear LinACE encoder system. It has been designed for integration into hydraulic, pneumatic and electromechanical actuators as a feedback element for position/velocity closed loop applications.

The LinACE encoder consists of a sliding encoder readhead module and an encoded shaft.



The sensing core of the readhead is a Hall sensor array ASIC. The readhead housing is made of stainless steel with two bronze bearings pressed-in from each side. With the sensor module positioned in between the bearings, the optimal alignment between the sensor module and the shaft is maintained, thus ensuring best performance.

The shaft is used as a load-bearing functional part of the motion system and as an information carrier read by the readhead. It is made of hardened steel, which is magnetic and the position information is written into the surface using non-magnetic material (like hard chrome or copper). The information pattern consists of small grooves filled with non-magnetic material and since the grooves encompass the

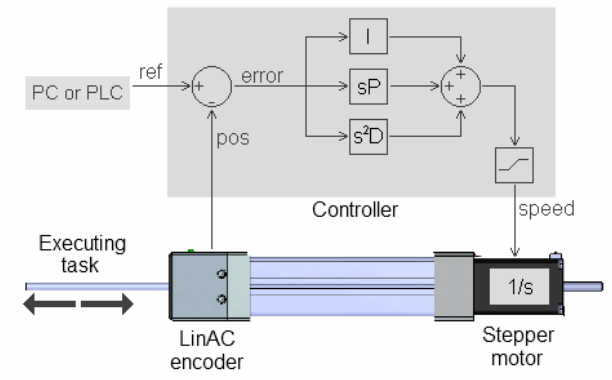
whole circumference the encoder does not loose position even if the shaft rotates. Finally, the whole shaft surface is hard chrome plated and the pattern is hidden. The shaft is immune to external magnetic fields and is perfectly suited for the harshest of environments.

Easy integration into existing designs

With a combined package of user-friendly features the Taurus motion system allows for easy integration into existing machines.

The absolute position encoder sensor enables the system to be switched on and off without the need for recalibration.

The regulator enables the user to control the position by continuously sending the required position in a given time. This can be sent to the controller from a PC or a PLC via a serial high-speed USB port (with optional CAN bus, RS232 or RS485). The closed-loop system regulates the given position according to the position required by the user, ensuring that the actuator follows the path as closely as possible.



Velocity algorithm controls the position of the piston rod

The regulation is done by setting the speed of a stepper motor depending on the position error. This kind of regulation algorithm, where the motor itself takes the function of an integrator, is known as velocity (or incremental) algorithm. By using a velocity algorithm, no error integration is needed to perform stable regulation with no stationary state error. The proportional gain of the regulator takes the role of the system's integral gain and the derivative gain of the regulator takes the role of the system's proportional gain. For the derivative component, a second derivative of the error is needed. The proportional and derivative constants are pre-adjusted but can also be readjusted by the user. Other parameters that can easily be adjusted to suit the nature and demands of the user application are maximum speed, acceleration and power of the stepper motor.

With the Taurus' combination of a controller and the LinACE absolute encoder a repeatability of ±5 µm can be achieved

Additionally, the controller can output the current position of the actuator and can therefore be used as a measuring device. For specific tasks, the controller offers performance modes such as stopping at an obstacle, adjusting to the (unpredictable) loss of step failure or automatically adjusting the parameters of the process to suit the demands of a certain task.

Taurus software

Taurus software for Windows OS provides a user-friendly interface for controlling the Taurus linear actuator. It enables the user to control and read the position, to plan positioning related tasks and to set (and save) the regulation parameters and system parameters and limitations. It also displays the required position, the current position and the position error on the running time – position plot. The software enables the user to:

- control the position,
- display the position,
- set regulation parameters (P, I and D gains),
- set system parameters (velocity, acceleration and deceleration limit),
- store and load regulation and system parameter settings,
- plan a certain task to be performed as a sequential task or as a continuous regulation task,
- continue the task from the point where it stopped in case of a communication breakdown or temporary power loss.

Taurus applications

With its wide range of available shaft sizes and a range of selectable communication interfaces the Taurus motion system is suitable for use in different industrial sectors (medical, transportation, renewal energy, civil enginnering, industry). RLS also offers custom design solutions, providing the most accurate, light-weight, robust and cost-effective motion systems.

Taurus is also backed by a trusted worldwide Renishaw network of service, support and applications expertise. For further information visit www.rls.si.