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Intelligent Control

# Beyond the Limits of Control



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# Smart Move - Intelligent Control

## 1. Model Based State Space Controller

Smart Move controller technology uses mathematical models of motor and mirror combinations. Based on these models we calculate the most powerful controllers in the market, enabling you to overcome the limits of conventional scanning solutions and to go to the physical limits of your system.

## 2. Gain of Speed

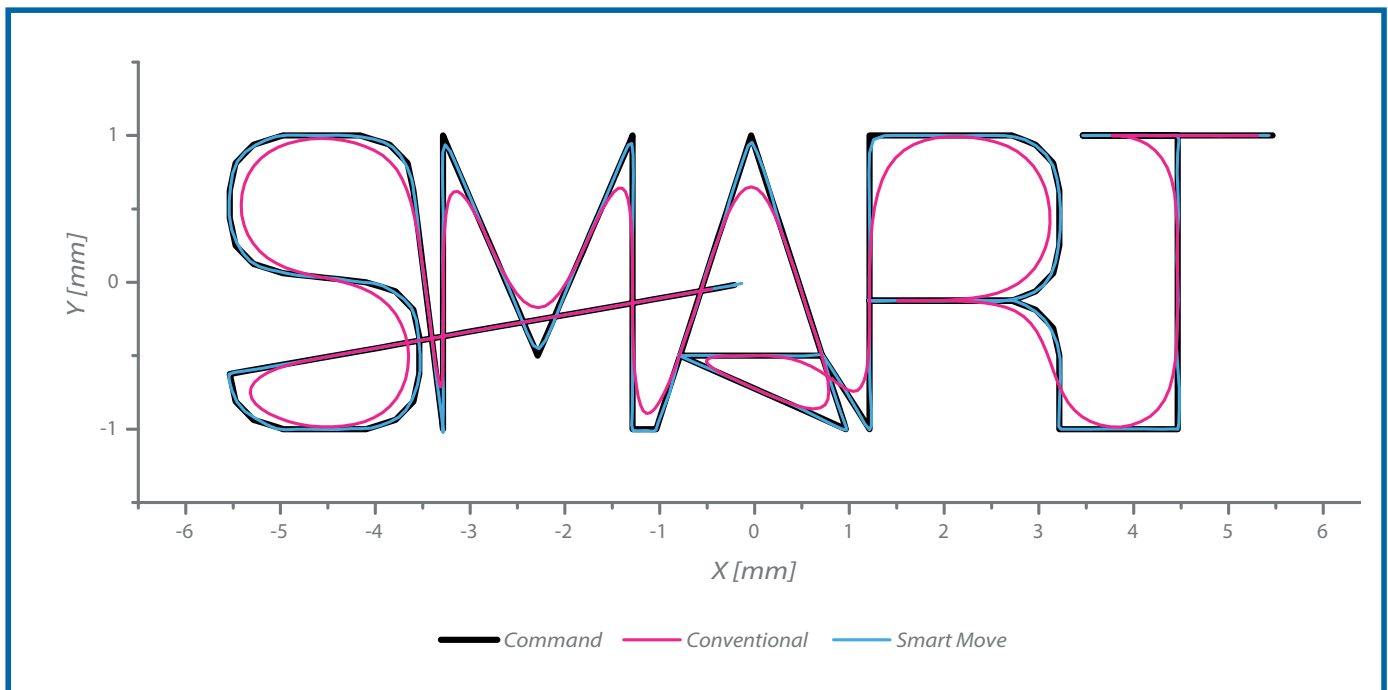
Restricted by the linearity of their controller principle, conventional PID controllers do not use the maximum available voltage for driving the motors.

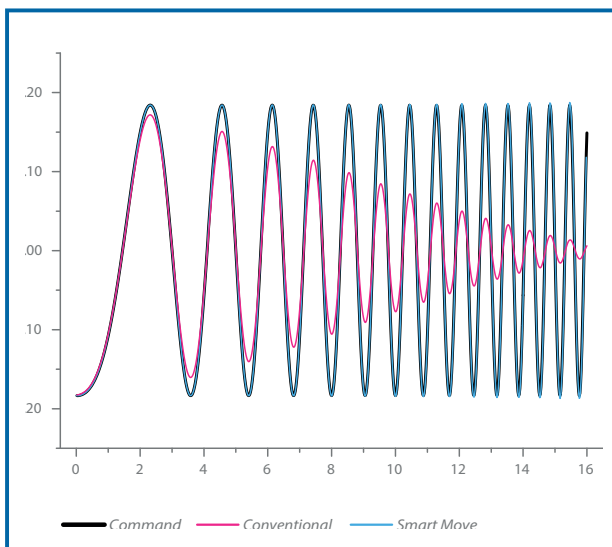
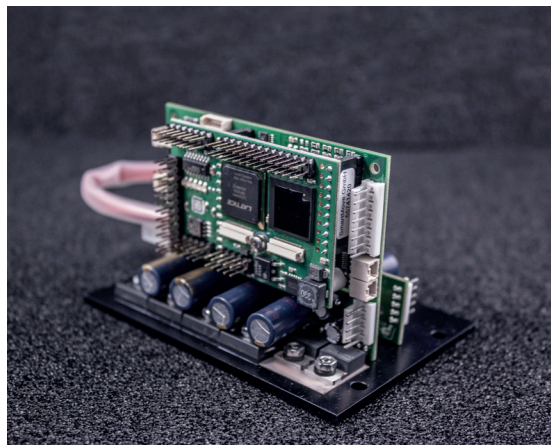
This means they are not acting with the fastest available response time. Smart Move's state space controllers are always applying the needed voltage in order to follow a de-

sired step within the given physical limits. Combined with the elimination of tracking errors and direct mirror control, we achieve up to 4 times faster marking rates than common controllers do.

## 3. Auto Tuning

Several physical characteristics of the motor-mirror combination are measured during the start-up process of our controllers. The DSP then calculates a controller which is perfectly adapted to the unique behavior of the physical system. This means there is no need for any additional time consuming manual tuning process. In the unlikely event of a replacement of a broken mirror or motor, the controller will automatically adapt to the new equipment, ending up in the same system behavior as before.





## 4. Breaking the Bandwidth Limits

By using Smart Move's DCC electronics, known bandwidth limitations and the need of notch filters no longer exist. We can control the motor-mirror system within and through the resonant frequencies. Therefore we are able to achieve so far unseen wobble frequencies. When other controllers are failing to mark or drill circles at high speed, we are just doing the job.

## 5. Controlling the Mirror On Top of the Motor

During fast acceleration of the motor, you will recognize the rear end of the motor axis moving ahead while the mirror will fall behind. The motor axis behaves like a torsion spring and causes significant distortions during challenging markings. Only a model based approach taking the motor and mirror combination into account can eliminate this effect. Therefore we are

taking care that the mirror is exactly following the desired path in the desired time frame, marking the sharpest corners at highest speed.

## 6. No Tracking Error

Commonly used PID controllers are in a way surprised by the incoming position signals. In contrast, our controller locks on the track and "simply" follows the desired path within the physical limits of the motor controller system. This is why we do not encounter smearing effects caused by tracking errors. As a result, there is no need for time consuming pre-distortion of input signals. Instead we accomplish faster marking rates and shorter retrace times in raster applications.

## Products:

- SF50, Ultrafast Z-Axis Motor with up to 40 g acceleration and encoder based position control
- SH10E, 10mm Scan Head with unique encoder technology
- SH10, 10mm Scan Head
- SH15, 15mm Scan Head
- SH20, 20mm Scan Head
- SH30, 30mm Scan Head
- SH50, 3D 50mm Scan Head



## Beyond the Limits of Control

Smart Move is supporting the laser scanning industry for more than 15 years with superior digital state space controllers. In the year 2001, we have been the first company in the market to introduce this technology. Since then we are constantly extending our capabilities and setting new standards. Smart Move's state of the art laser Scan Heads are providing up to 4 times faster marking rates than competitors' PID controlled systems.

Smart Move is serving international customers with the fastest and most accurate scanning solutions. We are working closely with our customers on their development targets, achieving machine productivities beyond the limits.

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