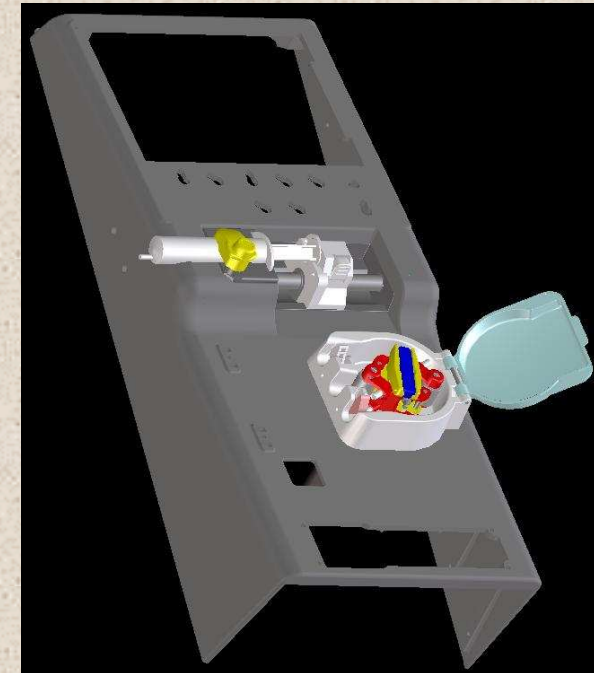


New Pump System for Hemodialysis Machines

SERVO
Motor Solution for Partners

1

*Quieter, Simpler, Safer
than Ever ...*



Nidec Servo Co., Ltd.
Kiryu Technical Center
The 4th Design Department
Engineering Team, Motor Application Systems

Core Competence of Our Company

2

- 1-1 Advanced control technologies for silent driving systems using precision stepping motors and brushless DC motors.
- 1-2 High durability and silent drive mechanism with gear trains for high power driving systems.
- 1-3 Excellent achievement in medical equipment safety system conforming to MDD.
 - The medical equipment manufacturing license in Japan has been approved.
 - The **CE** marking has been approved for syringe pump products.
- 1-4 Global production network in China and Indonesia to deliver our high quality products to customers with reasonable pricing.

2.

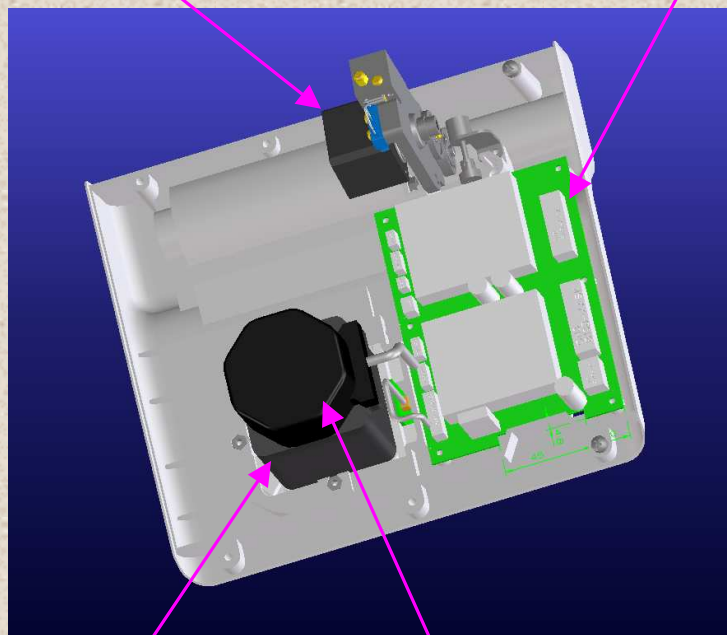
Product Introduction

Major Feature Locations on Hybrid Pump.

3

3-phase Stepping Motor

Single Board Driver for 3 Motors



Brushless DC Motor

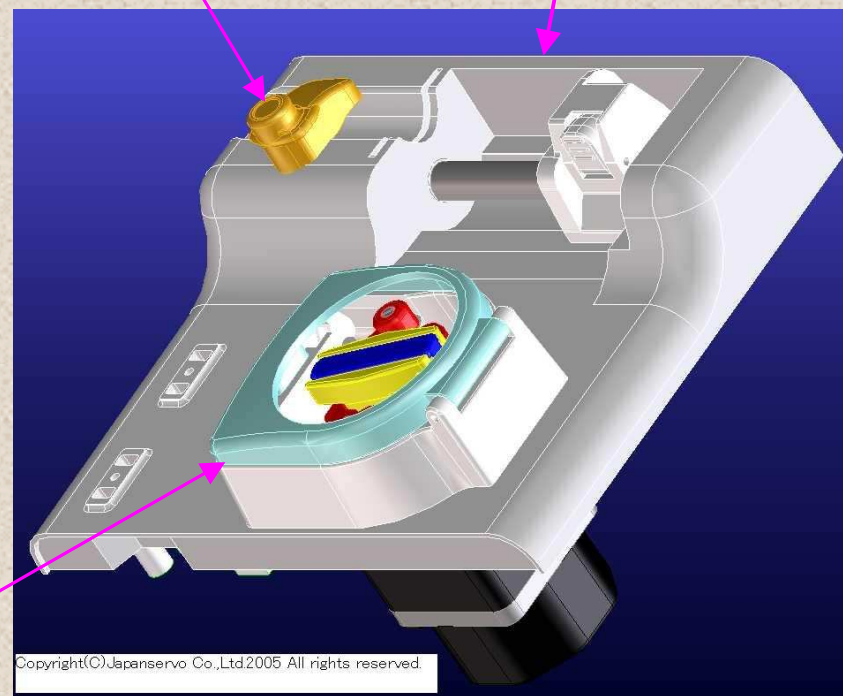
Silent Gear Head

Blood Pump

(It's possible to customize the layout of the pumps.)

[Integrated on a single panel]

Heparin Pump

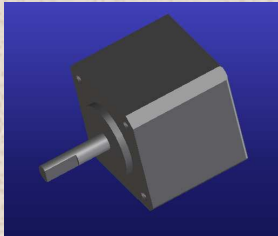


3. Benefit -- *Quieter*

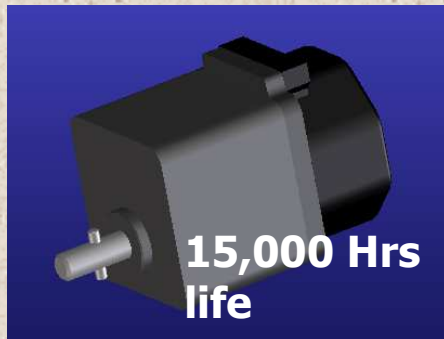
1. Our innovative stepping motors in the heparin pumps contribute toward keeping a quiet environment in the wards.
2. The gear heads customized for medical equipment and low vibration DC motors on the blood pump also prevent uncomfortable acoustic noise in the wards.

4

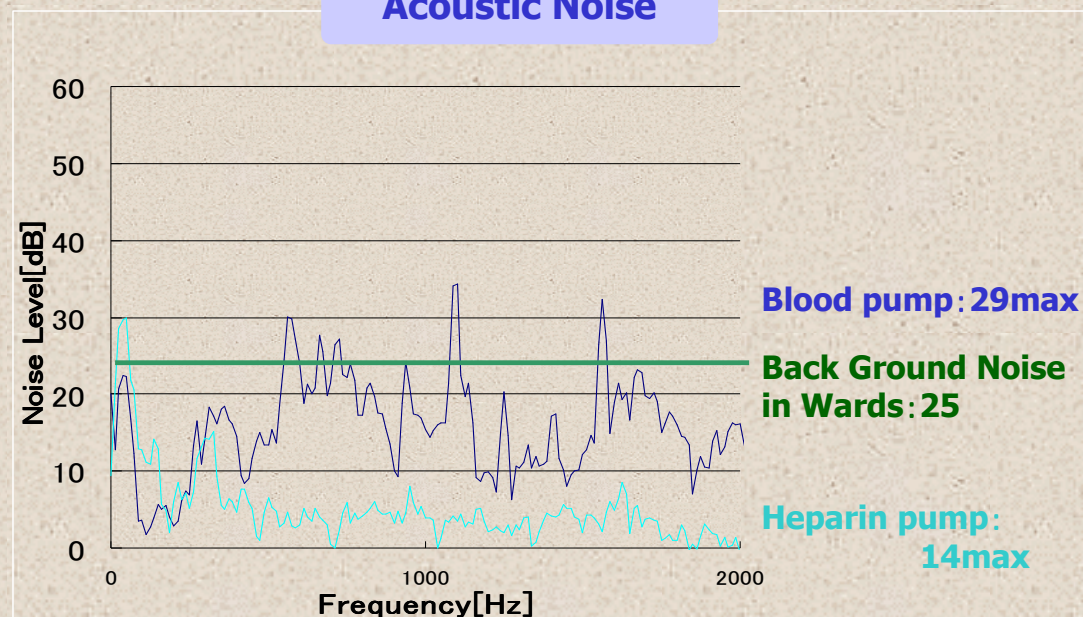
Stepping Motor



DC Motor + Gear Head



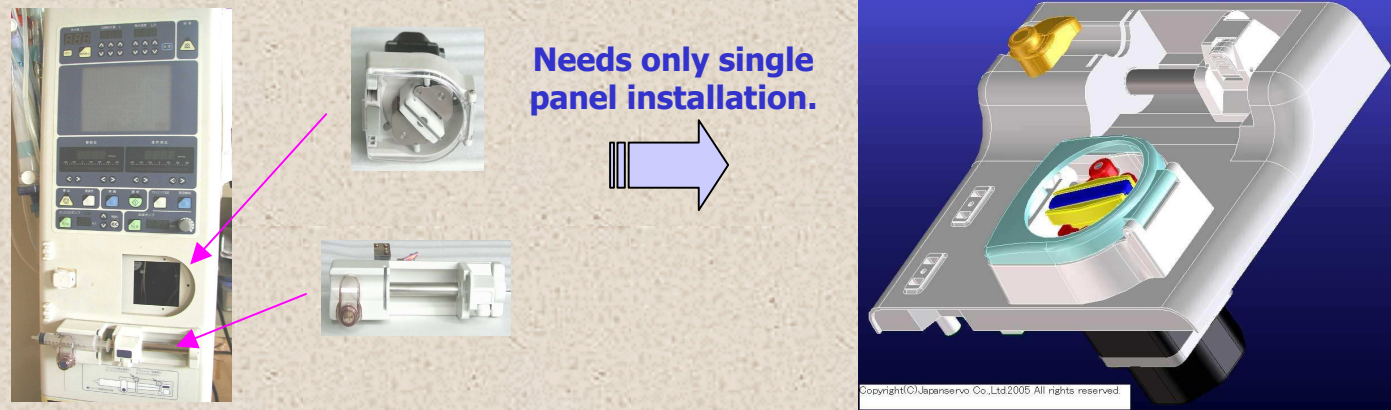
Acoustic Noise



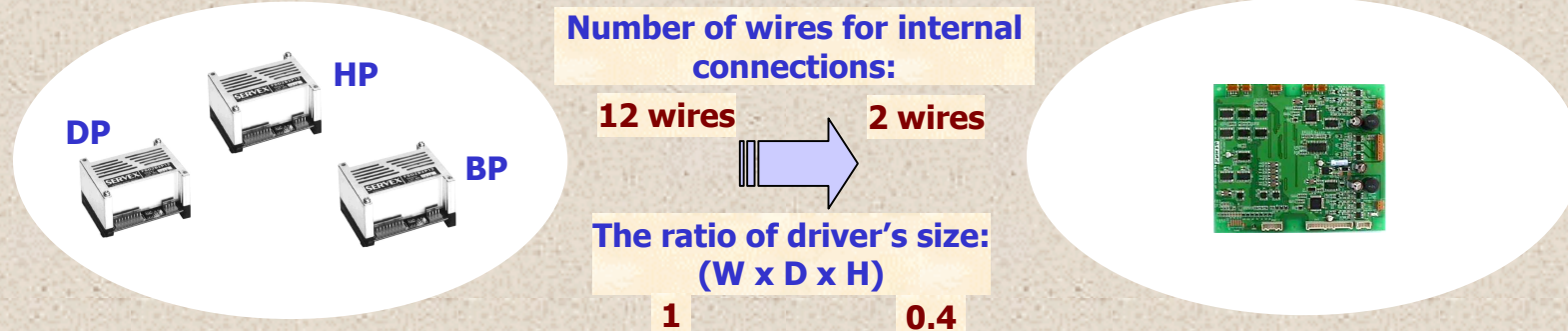
3. Benefit -- *Simpler*

1. The integrated Hybrid Pump provides you with simple installation of the front panel and helps you to reduce your assembly cost/errors.

5



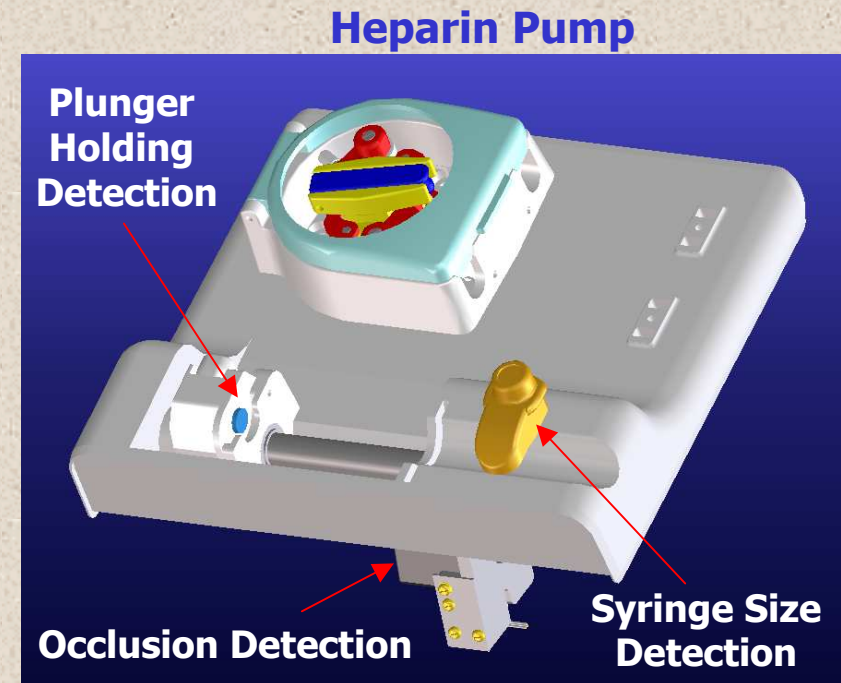
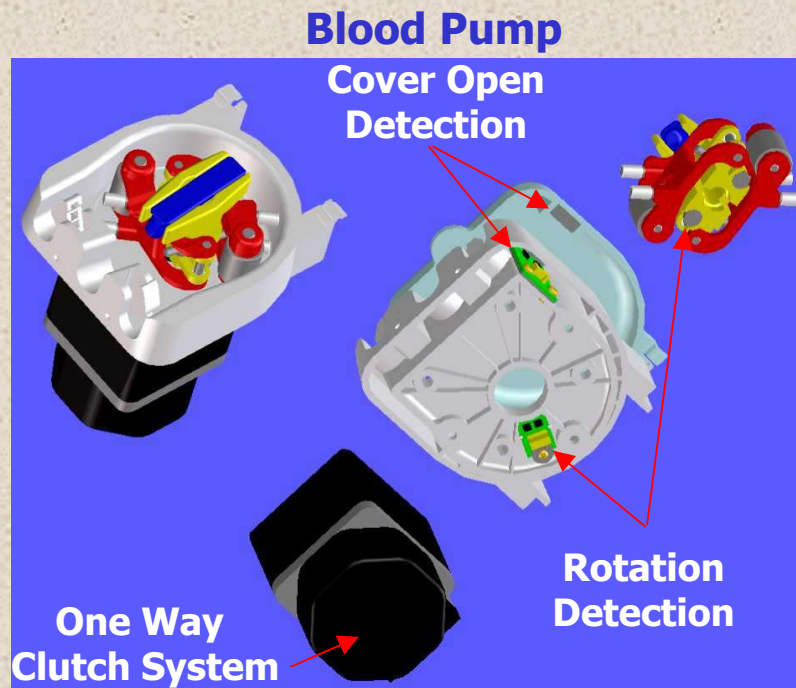
2. The single board driver also helps reduce the number of wires for internal connections, and as a result supports high reliability.



3. Benefit -- *Safer*

Our pump units have safety sensor systems shown in the following figures to protect patients from any risks of medical accident.

6



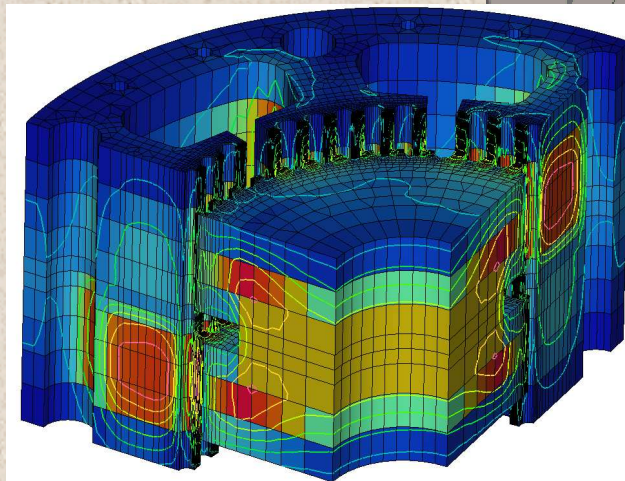
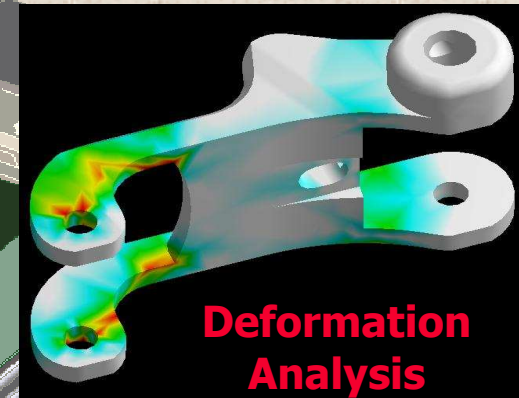
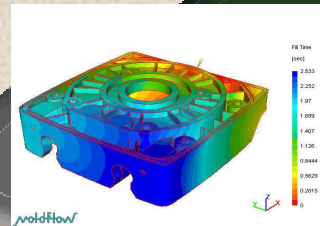
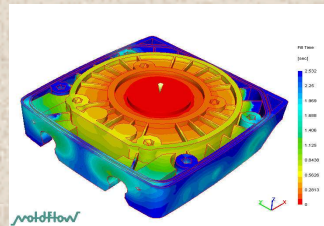
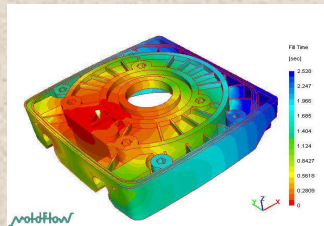
4.

Technology Introduction

Simulation Technologies

- Analysis Leads Design (ALD) System

Plastic Mold Flow Analysis



5. 3-phase Stepping Motors

Medical Devices



Silence is important.

A super silent drive has been achieved in combination with the KT series stepping motors and micro step drives.

- Dialysis machines
- Liquid analyzers (stirring)
- Blood component analyzers
- Infusion pumps
- Peristaltic pumps
- Packing machines
- Roentgen film developers (film feed)



8



$$T_m > S (J (d\omega / dt) + T_f)$$



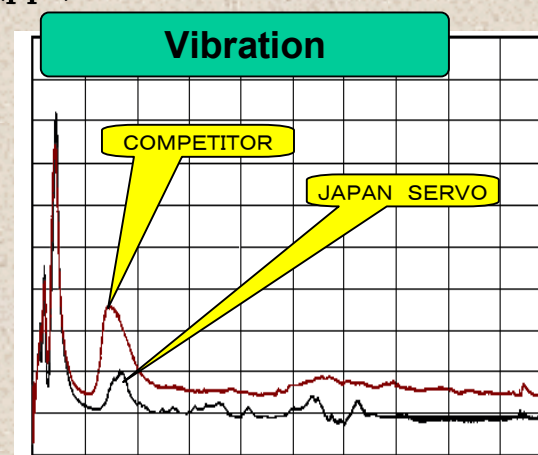
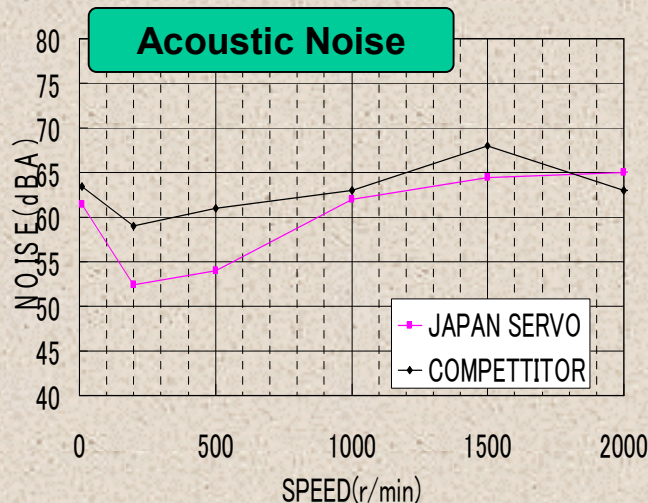
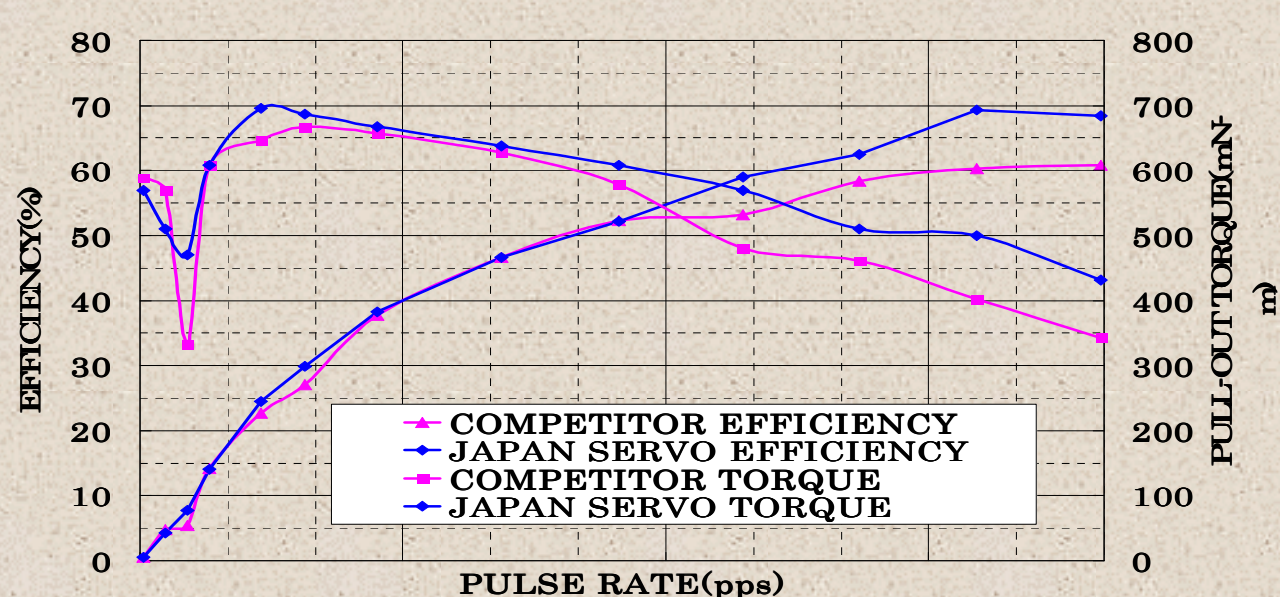
パルスレート (pps)

5. 3-phase Stepping Motors

Comparison -Dynamic Performance

(KH56 series
stepping motor)

EFFICIENCY CHARACTERISTIC

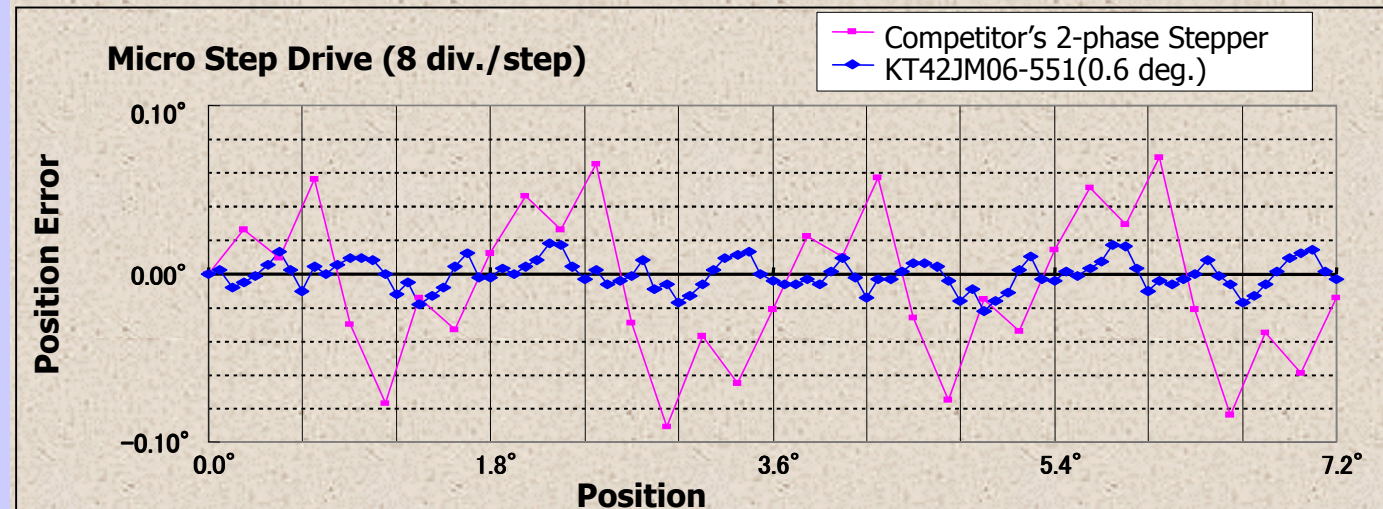


5. 3-phase Stepping Motors

Comparison -Position Accuracy

(3-phase HB type
stepping motor)

10



Features of our 3-phase Stepping Motors

	Step Angle: 1.8 degrees	Step Angle: 0.6 degrees	Step Angle: 3.75 degrees
	KH39,42,56	KT42,60	KR42
Speed(rpm)	Low-Midle (200-1000)	Low-Midle (200-1000)	High (1000 MIN.)
Pos. Accuracy	Good	Excellent	Little Poor
Vibration	Good	Excellent	Excellent
Torque	Excellent	Good	Little Poor
Acoustic Noise	Good	Good	Excellent
Features & Application	High Torque LBP, PPC	Low Vibration at low speed(200-300rpm) PPC	Low vibration and low noise for the whole region PPC, Medical Device