FANUC

α*i*-B series SERVO
β*i*-B series SERVO

High Speed, High Precision and High Efficiency Nano Control Servo

FANUC AC SERVO MOTOR αi-B/βi-B seri
FANUC AC SPINDLE MOTOR αi-B/βi-B se
FANUC SERVO AMPLIFIER αi-B/βi-B ser

αi-B and βi-B series SERVO are high speed, high precision and high efficiency intelligent servo system to make machine tools high performance, compact and energy saving.

Nano

Servo motor with ultra

Super high resolution 32,000,000/rev.

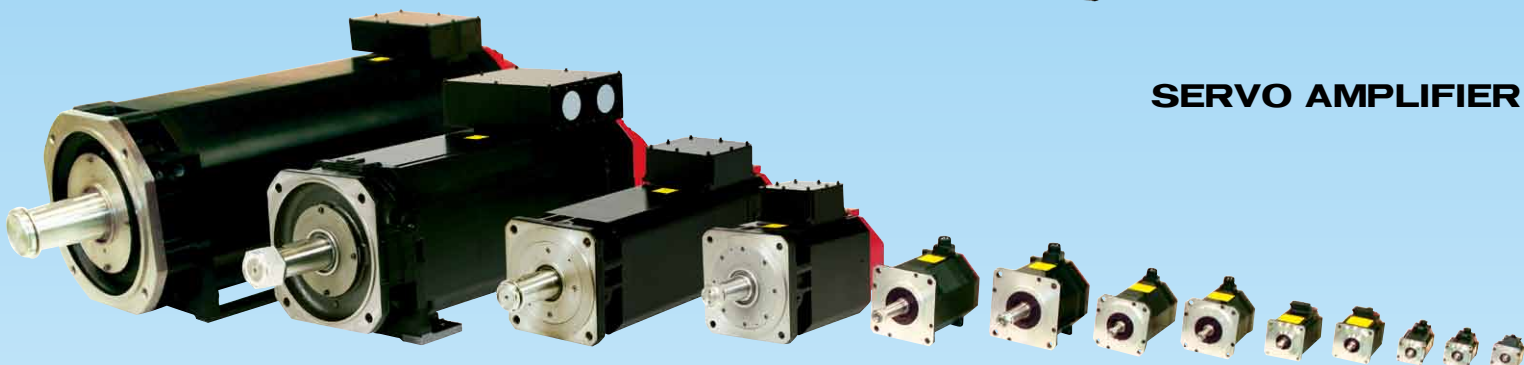Servo amplifier with current detector

High speed and high SERVO HRV Control

High Speed, High Efficiency

Spindle motor enables high speed and high acceleration

High response and high efficiency with SPINDLE HRV Control

Full Line-up

Full line-up from small to large scale models

Full line-up with both 200V and 400V input

SERVO AMPLIFIER

AC SERVO MOTOR αi-B/βi-B series

es
ries
ies

Control

smooth rotation

Pulsecoder with

high precision

precision with

Compact and Reduced Wiring

Servo and spindle motor with shorter length
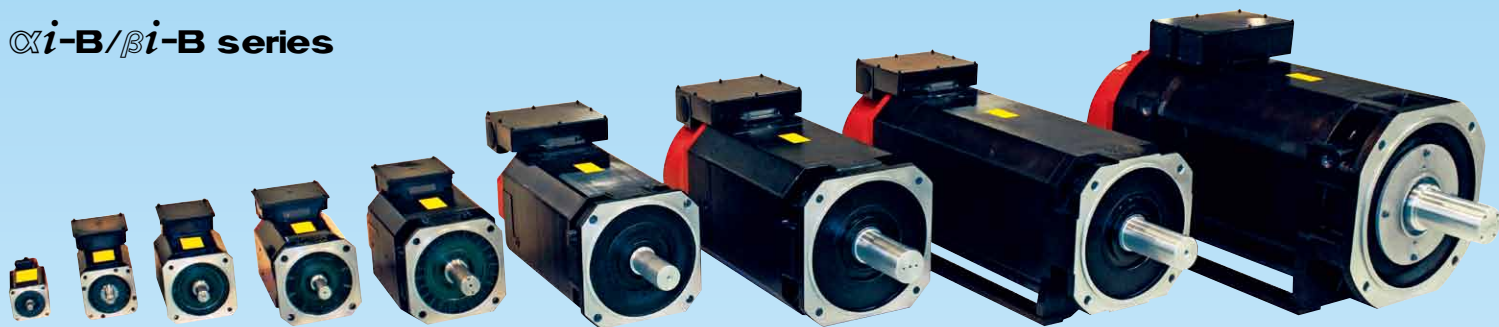
Compact and space saving servo amplifier

Enhanced Maintenance

Trouble prediction function enabling preventive maintenance

Simple maintenance structure and various diagnostic functions for quick recovery

αi-B/βi-B series
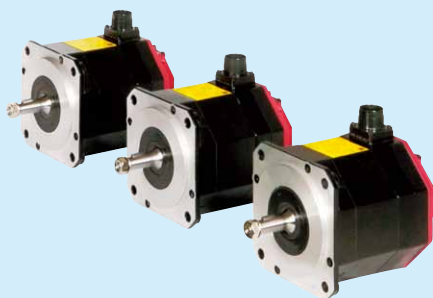
AC SPINDLE MOTOR αi-B/βi-B series

Compact, Reduced Wiring and Easy Maintenance

FANUC SERVO AMPLIFIER
α*i*-B series/β*i*-B series

FANUC AC SERVO MOTOR
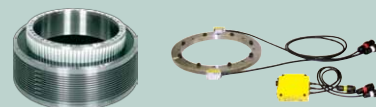α*i*-B series/β*i*-B series

FANUC AC SPINDLE MOTOR
α*i*-B series/β*i*-B series

FANUC LINEAR MOTOR
L*i*S-B series

FANUC SYNCHRONOUS
BUILT-IN SERVO MOTOR
D*i*S-B series

FANUC
BUILT-IN SPINDLE MOTOR
B*i*I-B series/B*i*S-B series

Servo Motor
for feed axis of machine tools and industrial machines

FANUC AC SERVO MOTOR
αiS-B series/αiF-B series

High performance AC SERVO MOTOR

· Machining Performance

Excellent torque characteristics enables quick acceleration to high-speed range to reduce the cycle time. 32,000,000/rev. or 4,000,000/rev. Pulsecoder and the special magnetic pole shape which minimizes torque ripples and the latest servo control HRV$^+$ enable extremely smooth motor rotation which realize high-precision, and high-quality machining. Large torque up to 3000Nm and large output up to 220kW are available with "Multi amplifiers drive technology". Further output is enabled by driving one axis with "Multi motors drive technology". Suitable for large machine tools, electric drive of press machines, injection molding machines.

· Minimizing Downtime

FANUC's unique seal structure provides excellent waterproofing.
Waterproof grade IP67 option available.

· Ease of Use

Various models with either 200V input or 400V input are available. Flexible selection is possible depending on the input voltage of the delivery area.
One-touch connector enables easy connecting and disconnecting of power connector.
Backlash reduction brake option available.

FANUC AC SERVO MOTOR
βiS-B series/βiF-B series

Enough performance and value AC SERVO MOTOR

· Machining Performance

1,000,000/rev. Pulsecoder and the special magnetic pole shape which minimizes torque ripples and the latest servo control HRV$^+$ enable extremely smooth motor rotation.

· Minimizing Downtime

FANUC's unique seal structure provides excellent waterproofing.
Waterproof grade IP67 option available.

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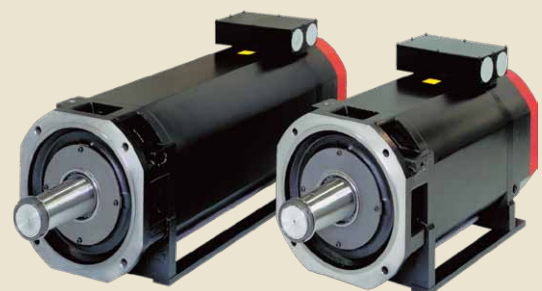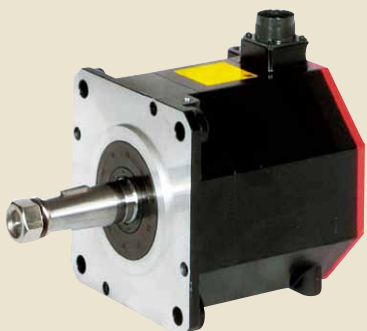
Spindle Motor
for spindles of machine tools

FANUC AC SPINDLE MOTOR
αiI-B series/ αiIP-B series/αiIT-B series/ αiIL-B series

High performance AC SPINDLE MOTOR

· Machining Performance

Optimum winding design and effective cooling structure enables power up to high speed and quick acceleration. Improving short-time heavy cutting and reducing acc./dcc. time by adding short-time rated output and torque.

S6 short-time rated output equal to S3 available due to FANUC original spindle control.

As for hollow shaft model for center through coolant, air-cooled αiIT-B series and liquid-cooled αiIL-B series available. Suited to direct connecting by high mechanical precision and low vibration. For large size machine tool, large output up to 200kW and large torque up to 2000Nm available with "Multi amplifiers drive technology". Further output is enabled by driving one axis with "Multi motors drive technology".

· Minimizing Downtime

Application of oil-seal provides excellent waterproofing.

· Ease of Use

Various models with either 200V input or 400V input are available. Flexible selection is possible according to the input voltage of the delivery area.

The spindle balance connection is possible at the rear of the motor after the motor is coupled to the spindle.

FANUC AC SPINDLE MOTOR
βiI-B series/βiIP-B series/βiIT-B series

Enough performance and value AC SPINDLE MOTOR

· Machining Performance

Optimum winding design and effective cooling structure enables high power and large torque with compact size. Improving short-time heavy cutting and reducing acc./dcc. time by adding short-time rated output and torque.

S6 short-time rated output equal to S3 available due to FANUC original spindle control.

As for hollow shaft model for center through coolant, air-cooled βiIT-B series available with enough mechanical precision and low vibration for direct connection to machine spindle.

· Minimizing Downtime

Application of oil-seal provides excellent waterproofing.

· Ease of Use

Various models with either 200V input or 400V input are available. Flexible selection is possible according to the input voltage of the delivery area.

The spindle balance connection is possible at the rear of the motor after the motor is coupled to the spindle.

Servo Amplifier
Amplifier to Drive Servo Motor and Spindle Motor

FANUC SERVO AMPLIFIER α*i*SV-B series/α*i*SP-B series/α*i*PS-B series

Highly functional SERVO AMPLIFIER with wide variety lineup from small to large capacity

· Machining Performance

Short-time machining and high-precision/high-quality machining can be achieved using high-power and high-precision current control.

· Minimizing Downtime

Built-in leakage detection function can detect insulation deterioration in motors used under the harsh environments caused by coolant.
Fan motor can be exchanged from front easily.
Troubleshooting functions make it easier to find causes of alarms.

· Ease of Use

The servo amplifier meets the needs of a wide variety of current capacities.
External magnetic contactor for cutting power can be eliminated by using the Safe Torque Off function (STO).
The latest low loss power devices are employed for further energy saving.
Various models with either 200V input or 400V input are available.
Flexible selection is possible according to the input voltage of the delivery area.

FANUC SERVO AMPLIFIER β*i*SVSP-B series

Cost-effective all-in-one SERVO AMPLIFIER

· Machining Performance

Short-time machining and high-precision/high-quality machining can be achieved using high-power and-high precision current control.

· Minimizing Downtime

Fan motor can be exchanged from front easily.
Troubleshooting functions make it easier to find causes of alarms.

· Ease of Use

Simple wiring is realized by integrating servo function with spindle function.
External magnetic contactor for cutting power can be eliminated by using the Safe Torque Off function (STO) function.
The latest low loss power devices are employed for further energy saving.
Various models with either 200V input or 400V input are available.
Flexible selection is possible according to the input voltage of the delivery area.

Power Failure Backup Module MODEL B

Machine Protection at Power Failure
Damage of work pieces and tools at power failure is prevented in the area where a stable power supply cannot be expected.

· Gravity-axis drop prevention

Motor brake is quickly activated using power failure detection method in the standard α*i*PS-B.

· Stop distance reduction [1]

Feed axes are decelerated to stop in order to prevent feed axes to crash in case of high speed machine tools.

· Retract [2]

Tool is retracted from work piece keeping synchronization in such case of a gear cutting machine.

[1], [2] "Power Failure Backup Module (Hardware)" or "Power Failure Backup Function (Software)" shall be applied.

PFB-24   PFB-R   PFB-C
                               +
                               Capacitor Module

Power Failure Backup Module MODEL B
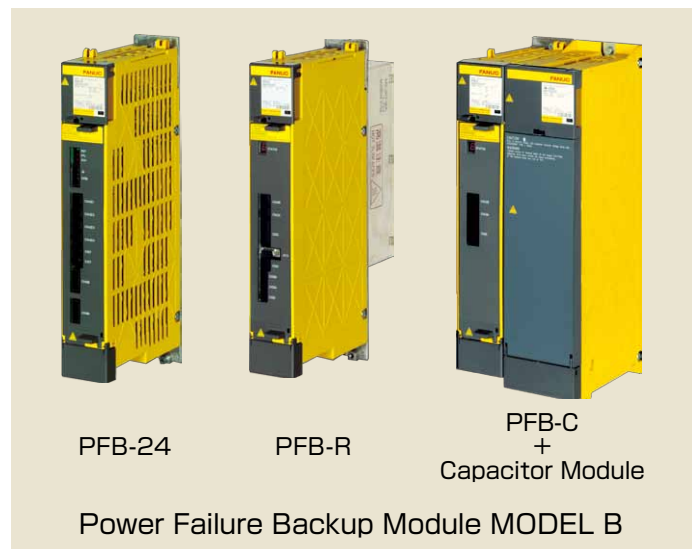
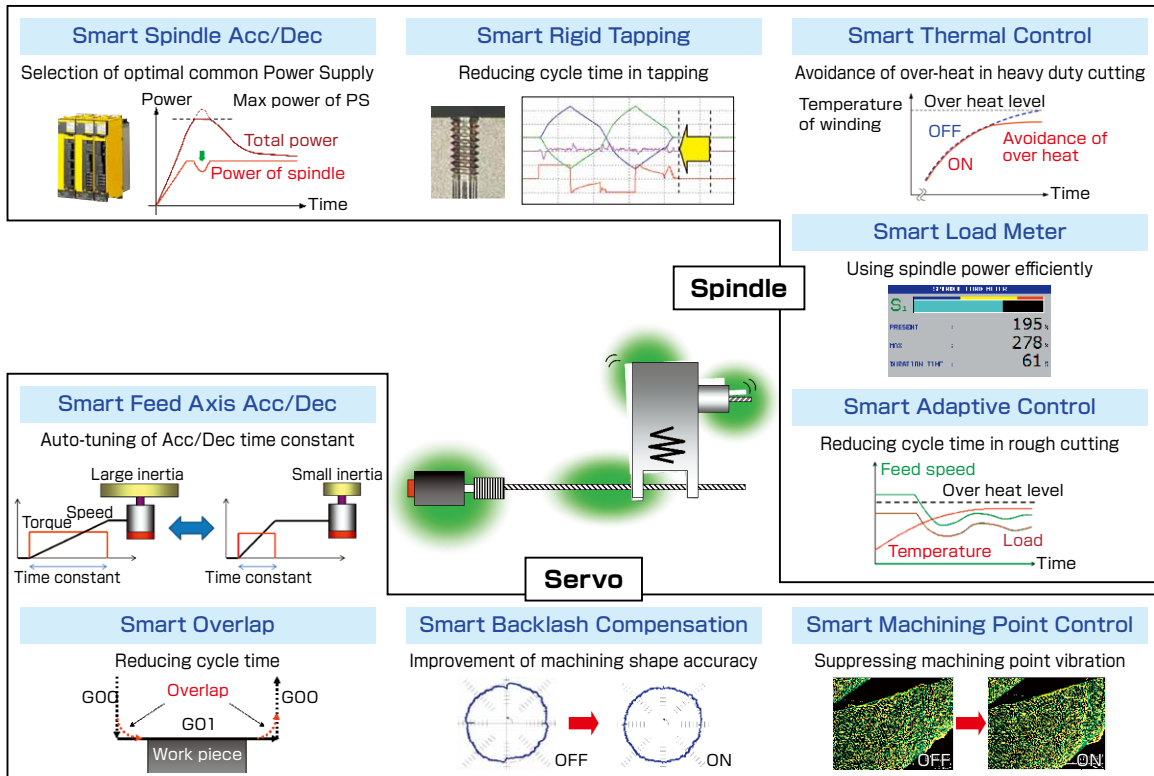# Machining Performance

Smart Machine Control

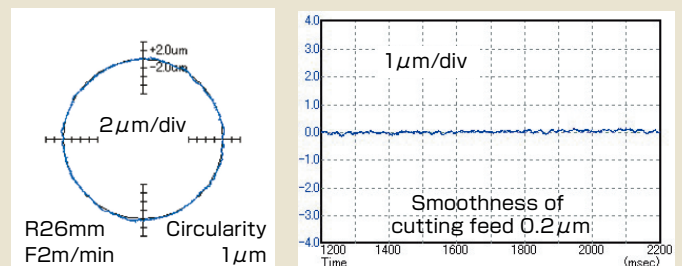### Optimizing control in real time

Smart machine control is a group of functions that help machines achieve high-speed, high-precision, and high-quality machining by optimizing control in real time by the control unit itself according to changes of machine conditions such as load, temperature, and position.

Smart Spindle Acc/Dec
Selection of optimal common Power Supply

Power   Max power of PS
Total power
Power of spindle
→ Time

Smart Rigid Tapping
Reducing cycle time in tapping

Smart Thermal Control
Avoidance of over-heat in heavy duty cutting

Temperature of winding   Over heat level
OFF
ON   Avoidance of over heat
→ Time

Spindle

Smart Load Meter
Using spindle power efficiently

S₁
PRESENT   195
MAX   278
VIBRATION TIME   61

Smart Feed Axis Acc/Dec
Auto-tuning of Acc/Dec time constant

Large inertia   Small inertia
Torque Speed
Time constant   Time constant

Servo

Smart Adaptive Control
Reducing cycle time in rough cutting

Feed speed
Over heat level
Temperature   Load
→ Time

Smart Overlap
Reducing cycle time

G00   Overlap   G00
G01
Work piece

Smart Backlash Compensation
Improvement of machining shape accuracy

OFF   ON

Smart Machining Point Control
Suppressing machining point vibration

OFF   ON

SERVO HRV Control

High-speed and high precision servo control

By combining hardware technology and software technology such as the latest servo control HRV+, high-speed and high precision control, at the nano-meter level, can be achieved. Mechanical resonance can be suppressed by automatic following the HRV filter though its frequency changes.
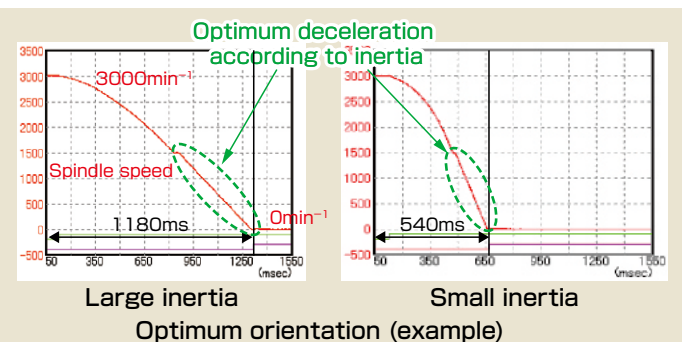
+2.0μm
-2.0μm
2μm/div
R26mm   Circularity
F2m/min   1μm

4.0
3.0
2.0
1.0   1μm/div
0.0
-1.0
-2.0
-3.0   Smoothness of cutting feed 0.2μm
-4.0
1200 1400 1600 1800 2000 2200
Time   (msec)

Application example of SERVO HRV+

SPINDLE HRV Control

High response and high efficiency spindle control

- Provides high gain control and low heat generation at high-speed rotation by fast sampling time of the current control loop
- Optimum orientation using the optimum deceleration level according to the inertia of works or tools
- Supports Nano Interpolation in position control enabling Nano CNC system for spindle as well as feed axis
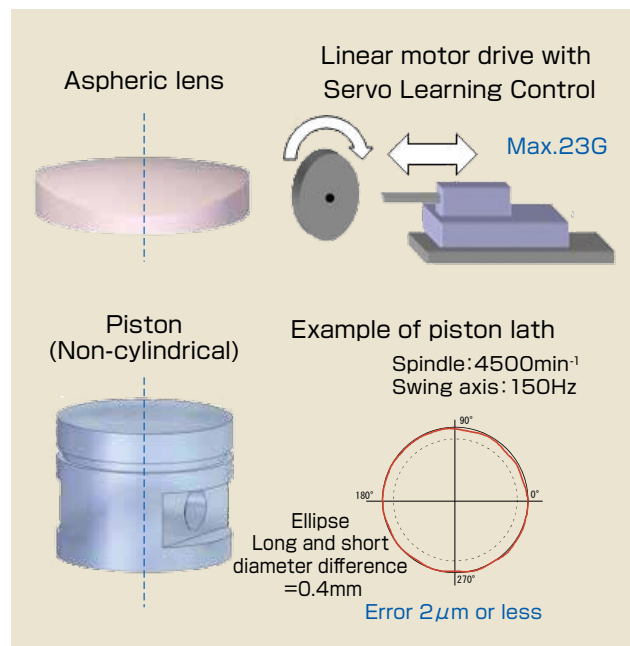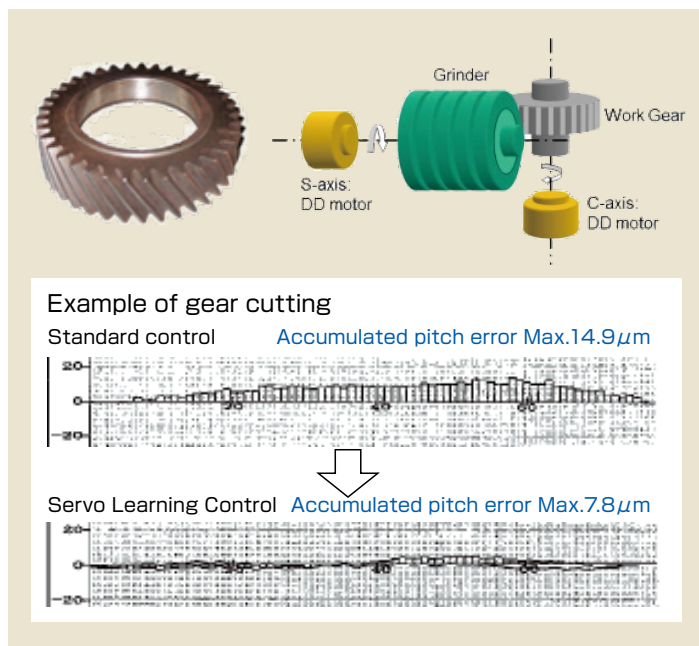
Optimum deceleration according to inertia
3000min⁻¹
Spindle speed
1180ms   0min⁻¹
540ms

Large inertia   Small inertia
Optimum orientation (example)

Servo Learning Control

High speed & high precision with Servo Learning Control, especially effective in combination with direct drive motor

Servo Learning Control reduces the effects of cutting disturbances that occur during gear machining by decreasing the synchronous error between controlled axes, to achieve high precision gear cutting.

The superior performance of linear motors with the high precision of Servo Learning Control achieves shorter cycle times for aspheric workpieces by turning instead of milling.
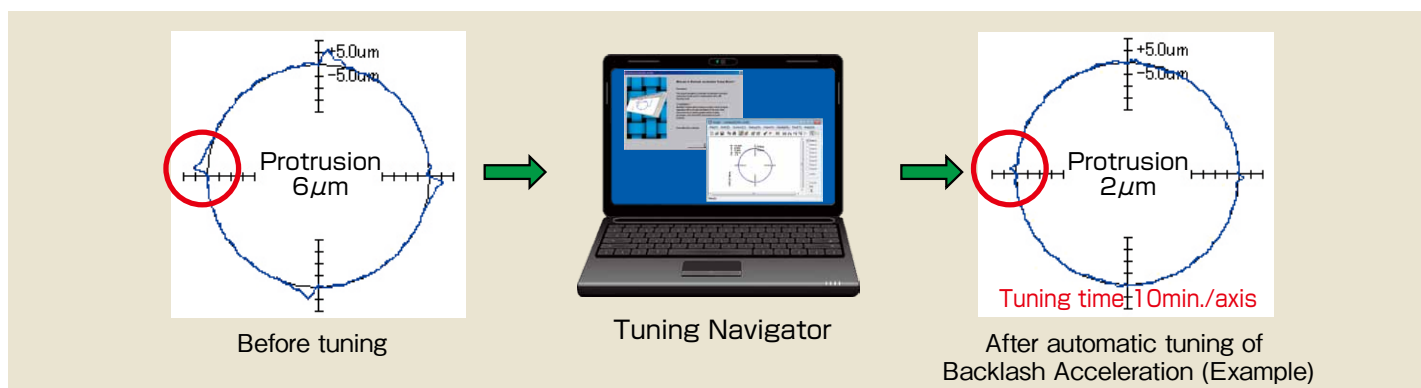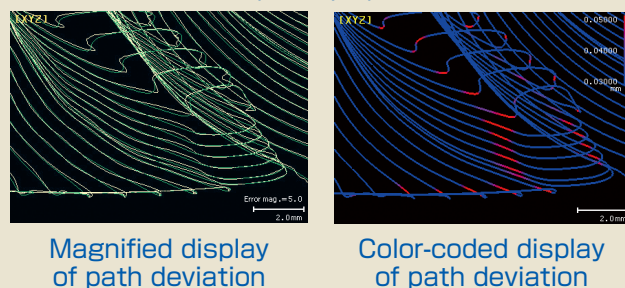

Grinder
Work Gear
S-axis:
DD motor
C-axis:
DD motor

Example of gear cutting
Standard control   Accumulated pitch error Max.14.9μm

Servo Learning Control   Accumulated pitch error Max.7.8μm

Aspheric lens

Linear motor drive with Servo Learning Control
Max.23G

Piston
(Non-cylindrical)

Example of piston lath
Spindle：4500min⁻¹
Swing axis：150Hz

Ellipse
Long and short diameter difference
=0.4mm

Error 2μm or less

Ease of Use

Servo Tuning Tool FANUC SERVO GUIDE

Integrated tuning tool for Servo and Spindle

SERVO GUIDE is an integrated software solution that supports the test program generating, parameter setting, and data measurement required for servo and spindle tuning. Easy to connect PC to CNC. The 3-D View Function displays tool path deviation for 5-axis machining , and supports magnified display and color-coded display. It makes tuning parameters more efficiently. Tuning Navigator can reduce tuning time by automatic tuning gains, filters, and more. The automatic tuning function for quadrant protrusion can drastically reduce the tuning time for high speed and high precision.

3-D View Function (Example)

Magnified display of path deviation

Color-coded display of path deviation

+5.0um
−5.0um
Protrusion 6μm

Before tuning

Tuning Navigator

+5.0um
−5.0um
Protrusion 2μm

Tuning time 10min./axis

After automatic tuning of Backlash Acceleration (Example)

Minimizing Downtime

Reliable

Molded Fan Motor

Improved Cutting Fluid Tolerance

Molded fan motor with printed circuit board and windings covered with resin has a high tolerance to cutting fluid.
This can prevent printed circuit board failure due to cutting fluid and help minimize machine downtime.

Rechargeable Battery Unit

Prevention of data loss

Rechargeable Battery Unit eliminates the need for battery replacement in both Pulsecoder and CNC and prevents the loss of parameter or reference point data.

Maintenance cost saving

Eliminating battery replacement will reduce maintenance costs.

Environmentally-friendly

Used battery disposal is not necessary.

Predictable

Trouble Prediction Function

Enable preventive maintenance

By detecting the abnormal sign of the motor, amplifier, fan motor, unexpected machine stop is prevented and preventive maintenance becomes availabel.

Leakage Detection Function

Leakage detection function measures the insulation resistance of the motor, and detects insulation deterioration.

Capacitor Check Function

Capacitor check function measures the capacitance for main circuit in servo amplifier, and detects the drop of capacitance.

Fan motor speed detection function

Fan motor speed detection function measures the speed of the fan motor in servo amplifier, and detects the fall of fan motor speed.

Brake check function

The brake check function measures the brake condition and detects a failure of the brake.

Fall of Fan motor speed

insulation deterioration

·Insulation resistance
·Fan motor speed
·Capacitance

Drop of capacitance

Brake condition
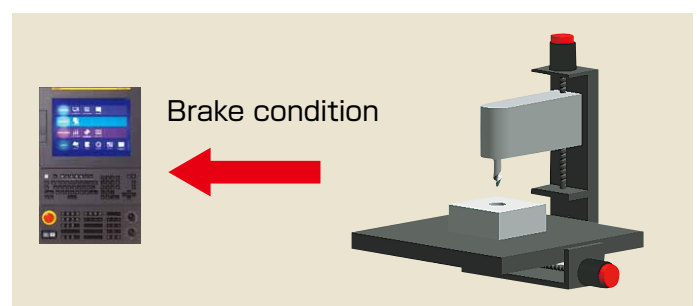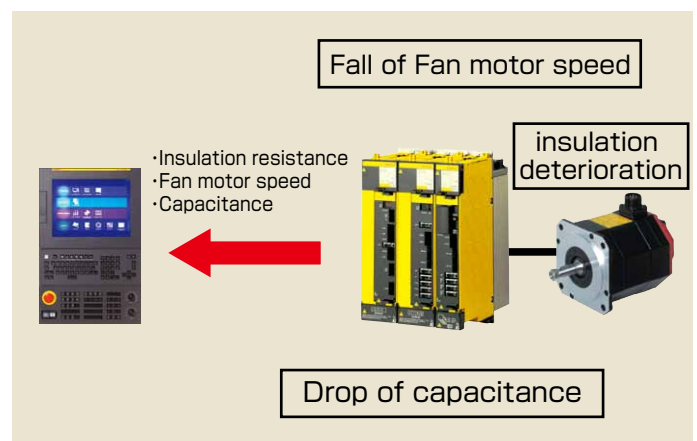
Easy to repair

Quick Replacement of Fan motor

Minimizing repair time

Repair time is shortened by easy access to replace fan motor from front side without removing amplifiers from power magnetics cabinet.

Internal cooling fan

Radiator cooling fan

Radiator cooling fan
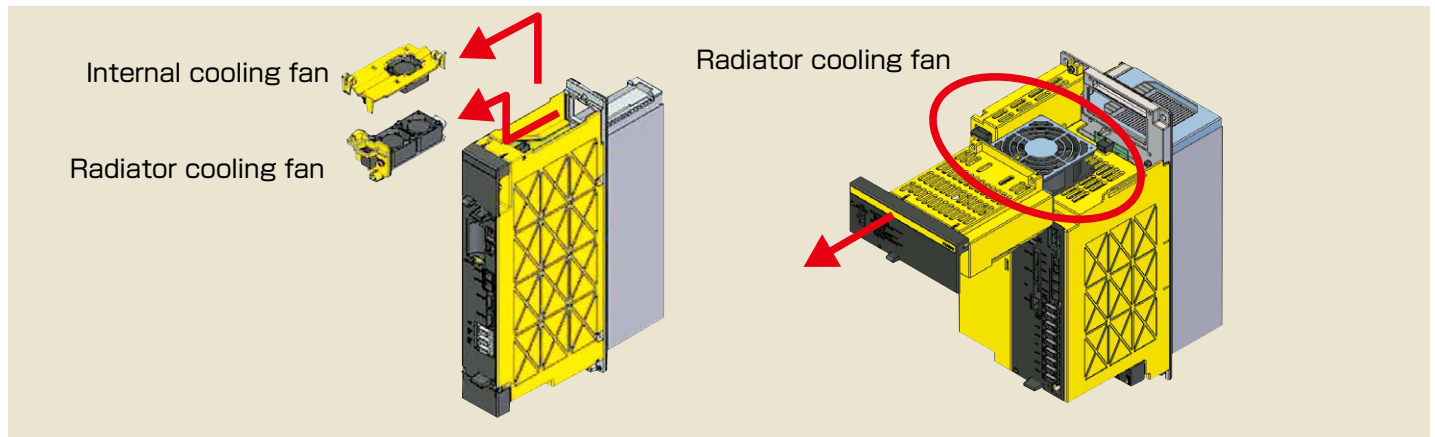
One-touch connector

The power and signal connector of the servomotor can be installed and removed with one touch. It reduces work time during motor maintenance and contributes to improvement of reliability during replacement work.

Trouble Diagnosis Function

Quick finding cause of alarms

The trouble diagnosis function is prepared in combination with the Series 30i-MODEL B CNC and the Series Oi-MODEL F CNC.
The diagnostic information which is useful for trouble shooting at the time of alarm occurrence can be seen on a CNC screen.

The major features of the trouble shooting function are as follows:
· "Trouble diagnosis guidance" screen for figuring out alarm causes according to the failure diagnosis flow
· "Trouble diagnosis monitor" screen for monitoring the states of servo circuits and spindles during normal operation and enabling data to be latched at alarm occurrence
· "Trouble diagnosis graphic" screen for making it possible to display waveforms observed at the occurrence of a servo or spindle alarm.

```
        TROUBLE DGN. GUIDANCE
NC-SV0411                    01/01
   Xax:EXCESS ERROR ( MOVING )
PROBABLE CAUSE :
  1.TOO HEAVY LOAD OF MACHINE
  2.SV AMP FAILURE
  3.SV MOTOR OR POWER CABLE FAILURE
GUIDANCE :
   There might be a disconnection
   of motor winding or power cable.


                          LATCHED
```

Encoder Communication Check Circuit
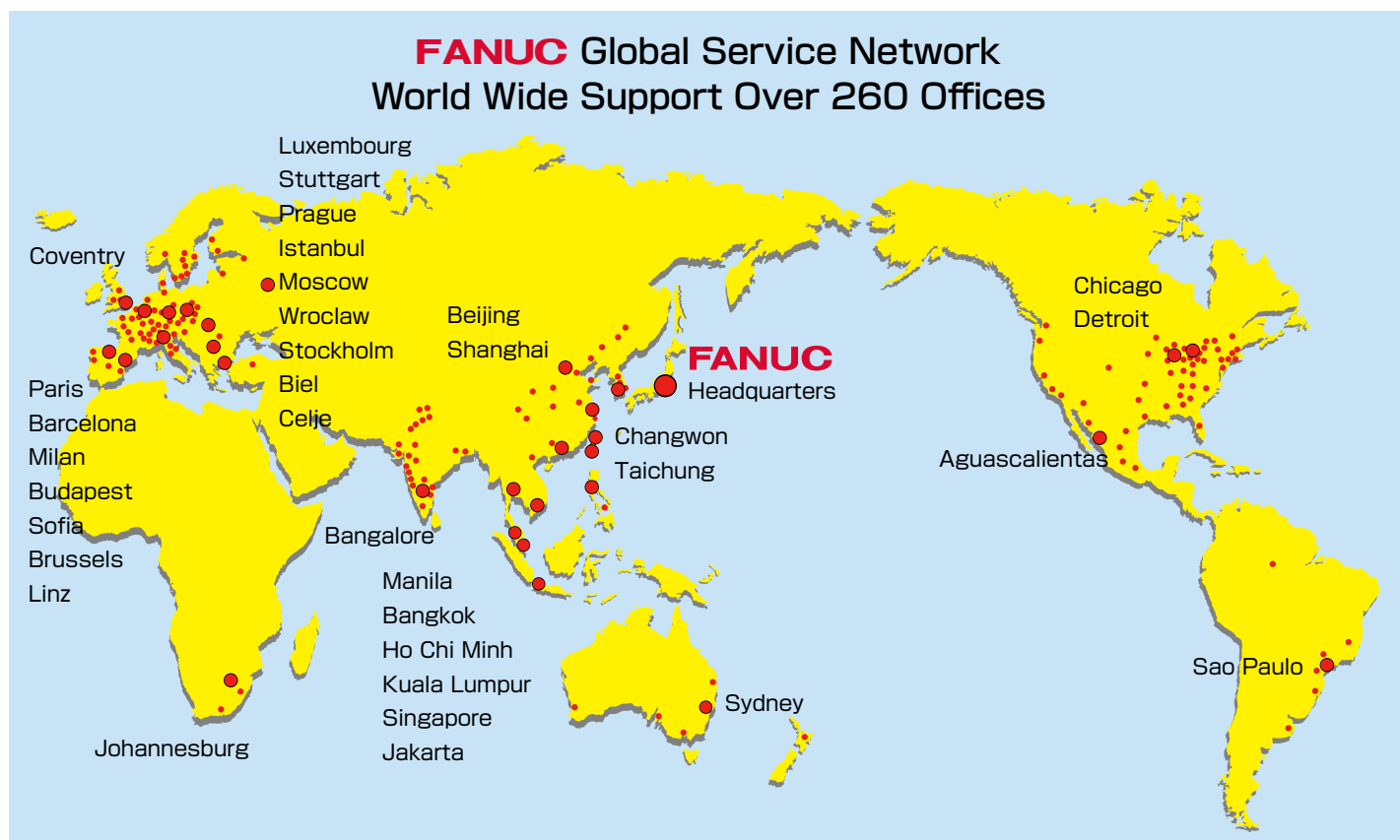
Quick identification of defective part

As there are three possible sources at communication alarm of the encoder, which include encoder, feedback cable and servo amplifier, it can take a longer time to identify the source, thereby extending down time. The Encoder Communication Check Circuit outputs compatible signals of the encoder in order to identify the source of the defect quickly.

11

Maintenance and Customer Support

Worldwide Customer Service and Support

FANUC operates customer service and support network worldwide through subsidiaries and affiliates. FANUC provides the highest quality service with the prompt response at any location nearest you.

FANUC Global Service Network
World Wide Support Over 260 Offices

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Stockholm
Shanghai
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Milan
Taichung
Aguascalientas
Budapest
Sofia
Bangalore
Brussels
Linz
Manila
Johannesburg
Bangkok
Ho Chi Minh
Kuala Lumpur
Sydney
Sao Paulo
Singapore
Jakarta

FANUC Training Center

FANUC Training Center operates versatile training courses to develop skilled engineers effectively in several days.

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