

**FANUC**

# THE FACTORY AUTOMATION COMPANY



# Fine Surface Technology

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## High Quality Machining

**High quality machining is becoming more and more important in all factory processes, especially for:**

- Die molds
- Parts of mobile phone and tablet PC

**To achieve High Quality Machining, all the conditions involved in the process are dramatically important:**

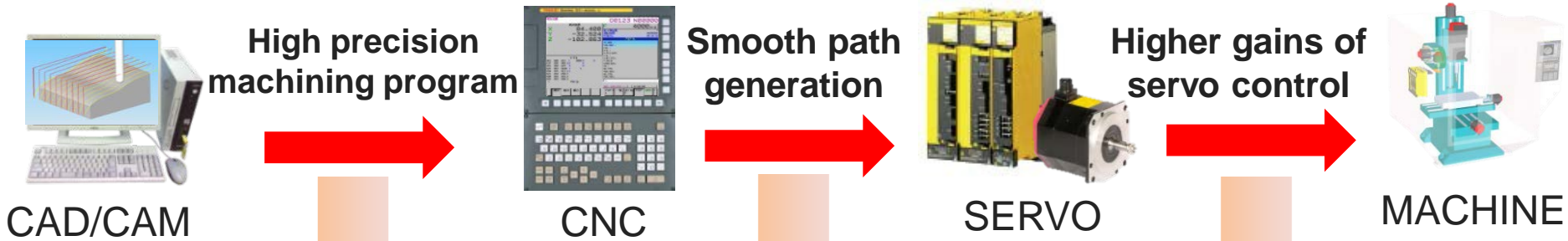
- Machine Tool
- Tooling
- Machining condition as well as CNC and Servo Control.



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**NEW**

## Machining Process



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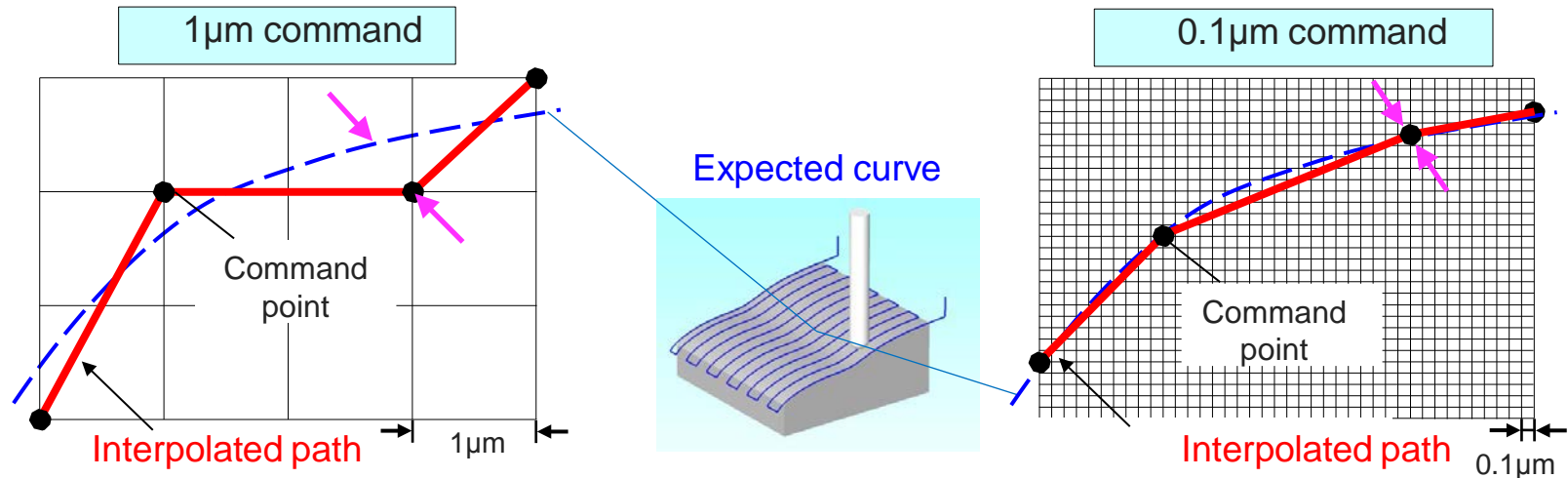
CNC and SERVO technology of FANUC achieving high quality machining

- High Precision Program Command
- Fast Package Option
- Smooth Tolerance+ Control
- Machin Condition Easy Setting
- SERVO HRV+ Control
- Smart Machine Control

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## High Precision Program Command

- Axis Command which value has one digit smaller than incremental system is already considered
- High precision machining program becomes executable
- No need to change increment system (No G-code activation is required, included in IS-C option J805)

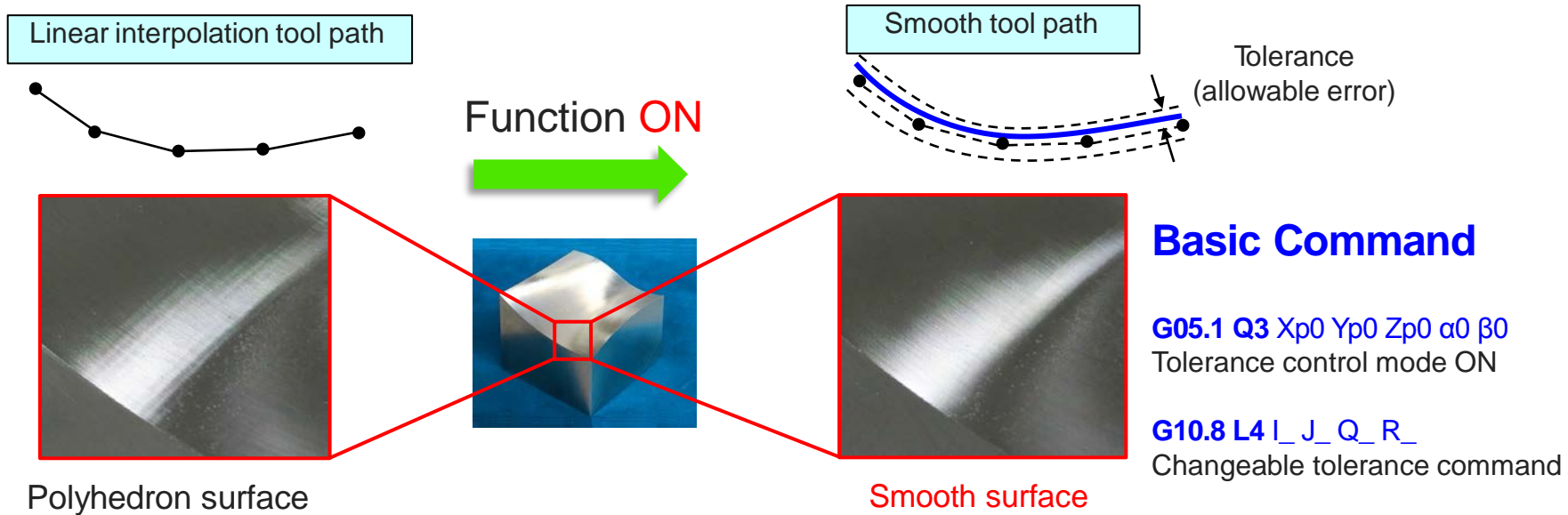


- Reduce speed variation owing to improved rounding error
- 0.1 nanometer command available for ultra-precision machine

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## Smooth Tolerance<sup>+</sup> Control

- Achieve high-quality machining in die & mold application specified with continuous small segments



Better surface quality achieved with high precision machining program

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## Machining condition easy setting

- **Easy parameters setting** (PATTERN) related to high-speed and high-precision machining.
- **3 kinds of parameter settings** are available for machining process (Roughing, Semi-Finish, Finishing)
- **Selectable level** according to the machining conditions during automatic operation:
  - G-code (G05.1 Q1 R\_ "level" )
  - PMC Signal (MSSP1, MSSP2<Gn589.5, 6>)
  - Fanuc Setting Screen
- Setting value of Smooth **tolerance+ control** are also **integrated**

MACHINING COND. EASY SETTING 00000 N00000

EASY SETTING

X AXIS	ROUGHING	MEDIUMFINING	FINISHING
ACC FOR DIPL (mm/sec <sup>2</sup> )	4000.000	2000.000	1600.000
ACC CHG TIME(CELL) (msec)	20	32	00
MAX ACC (mm/sec <sup>2</sup> )	3000.000	1500.000	1200.000
T-CDN RIPL ACC/DEC (msec)	24	16	16
CORNER FEED DIFFER (mm/min)	500.000	500.000	400.000
TOLERANCE (mm)	0.020	0.010	0.005

MACHINING COND. EASY SETTING 00000 N00000

PATTERN SELECT

PATTERN SWITCHING	TOLERANCE
= ROUGHING	0.020 mm
= MEDIUMFINING	0.010 mm
= FINISHING	0.005 mm

EFFECTIVE PATTERN IS SWITCHED.

A >\_ FINISHING

HDI \*\*\*\*\* 12:00:00

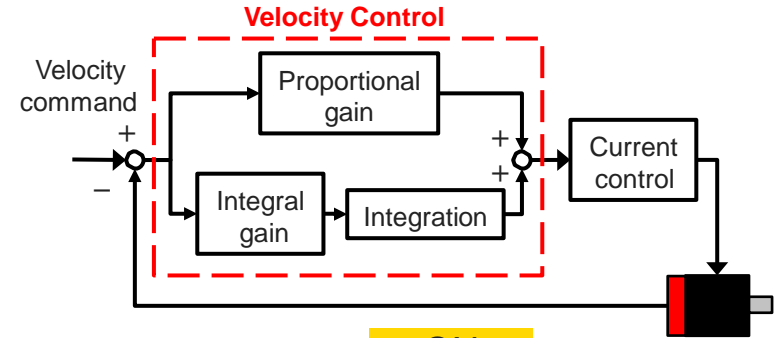
MCNSET SELECT <OPRT> +



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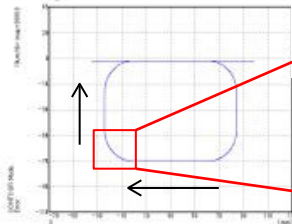
## SERVO HRV<sup>+</sup> Control

- Improve disturbance suppression by optimization of velocity loop gain
- Reduce path error and make machining surface quality higher



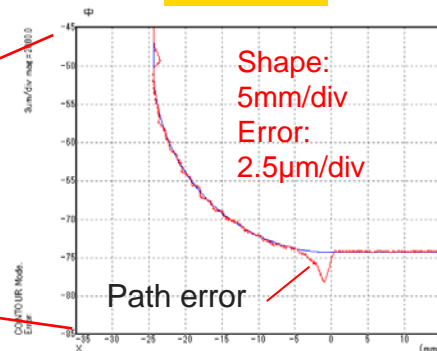
### Examples

R-Square,  
F4000, HRV3+  
Control

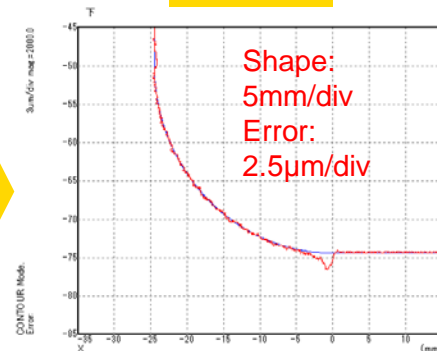


Enlarge

OFF



ON



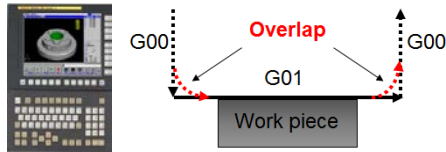
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## Smart Machine Control

### Smart Overlap

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Reducing cycle time



### Smart Backlash Compensation

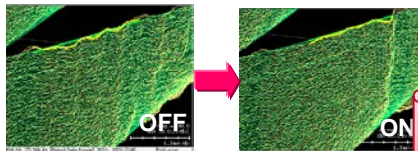
Improvement of machining shape accuracy

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### Smart Machining Point Control

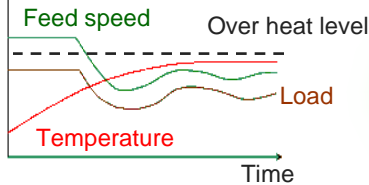
Suppressing machining point vibration



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### Smart Adaptive Control

Reducing cycle time in rough cutting



Servo motor

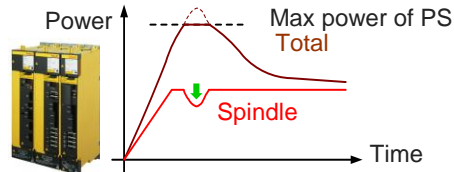
Ball screw

Machine

Spindle

### Smart Spindle Acc/Dec

Selection of optimal common Power Supply



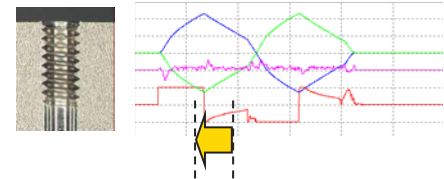
### Smart Load Meter

Using spindle power most efficiently



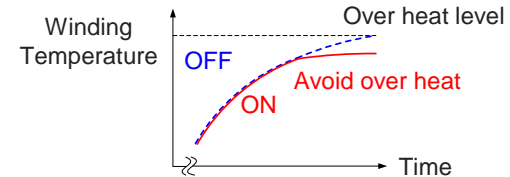
### Smart Rigid Tapping

Reducing cycle time in tapping



### Smart Thermal Control

Avoidance of over-heat in heavy duty cutting



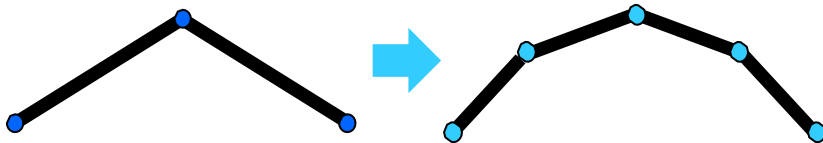
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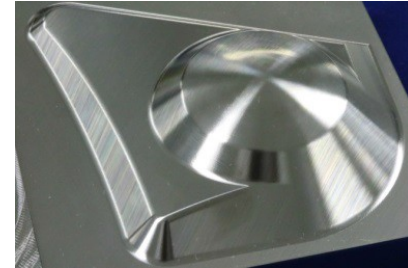
## AICC II+ - Look-Ahead enhanced specification

Improved Block processing capability

Programs with small-block output from CAD/CAM can be executed at high speed



Effective for mold machining



Example of mold machining

- Part program storage size using memory card: 2GB → **16GB**

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## AICC II<sup>+</sup> - Look-Ahead enhanced specification

Processing capability on simultaneous 3 axes machining (blocks/sec):  
Realization in software, No need to change hardware

Series	AI Contour Control II (Current)	AI Contour Control II <sup>+</sup>
30i-B	2500	<b>4600</b> *With high-speed processing
0i-F Type 1	1000	<b>2300</b>



Improvement processing capability with High-speed CPU

Series	AI Contour Control II (Current)	High-speed CPU (CPU card D) AI Contour Control II <sup>+</sup>
30i-B	2500	<b>5500</b> *With high-speed processing



# Fine Surface Technology

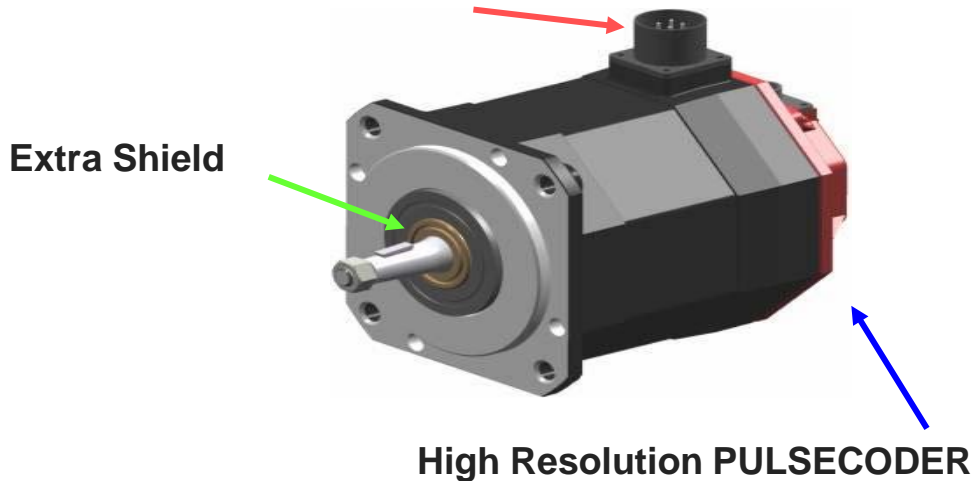
## Milling Standard Packages

Up to 3 Option Packages for each kind of machining center:

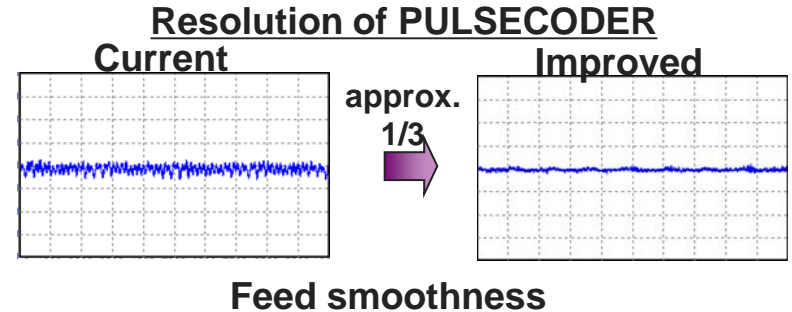
	3-axes Machining	Indexing Machining	Simultaneous 5-axis Machining
<b>High Quality Machining</b> With Fine Surface Technology	<b>Milling Standard Package I</b>	<b>Milling Standard Package II</b>	<b>Milling Standard Package III</b>
<b>Function</b>	R370	R371	R372

# Enhanced AC Servo Motor

- Feed smoothness enhanced by high resolution PULSECODER and the latest control technology
- Water-proof performance enhanced by special sealing structure
- Easy connecting and disconnecting by bayonet connector conformed to MIL Standard



	Current series	New series
$\alpha i$	1,000,000/rev	4,000,000/rev
	16,000,000/rev	32,000,000/rev
$\beta i$	128,000/rev	1,000,000/rev





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