Take-out
ROBOT

YUDO
Consilience Technology

YUDO

Take-out Robot Solutions

www.yudo.com

Scan QR code,
You can see more information
through YUDO website.

YUDO Take-out Robot Solutions

IMC
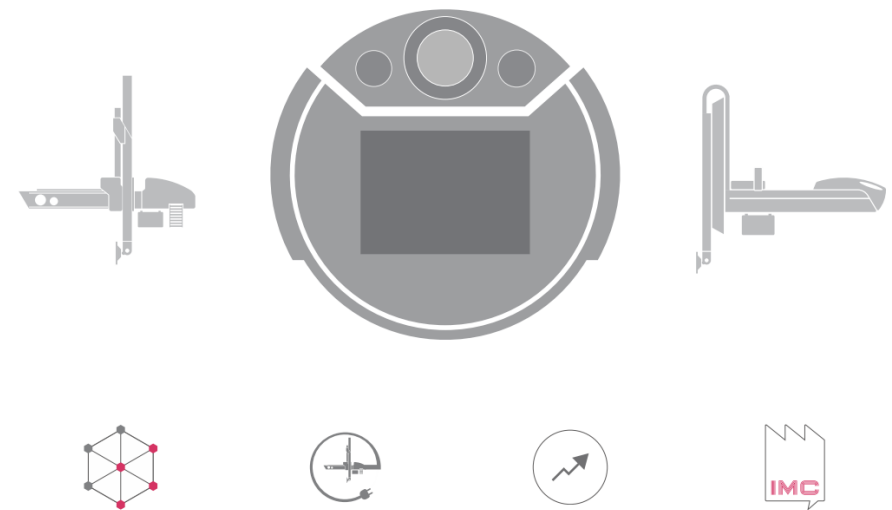
Advanced automation technology, optimized robot design

Optimized robot design, reliable drives and configurable control systems, available options and convenience features for the operator. Yudo robots provide the most practical solutions and excellent performance for our customers.
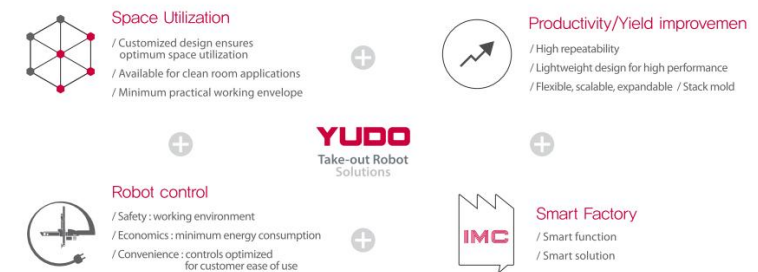A broad product line , precision control , fast cycle times, and high efficiency is aligned with the customer's business goals to produce the highest-quality products, and achieve maximum productivity.

Space Utilization
/ Customized design ensures optimum space utilization
/ Available for clean room applications
/ Minimum practical working envelope

Productivity/Yield improvemen
/ High repeatability
/ Lightweight design for high performance
/ Flexible, scalable, expandable / Stack mold

YUDO
Take-out Robot
Solutions

Robot control
/ Safety : working environment
/ Economics : minimum energy consumption
/ Convenience : controls optimized for customer ease of use

IMC **Smart Factory**
/ Smart function
/ Smart solution

YUDO is focused on providing robot and automation solutions that best fit the needs of our customers

YUDO has listened to the voice of the customer, analyzed trends in the plastics industry, and challenged ourselves to develop Robot and automation solutions that are relevant now, and for the future.
As a result, Yudo's MEGA, GIGA, SONIX, SEMA, SMUS robots and automation solutions demonstrate industry leading levels of performance that has been verified by our customers.
Yudo's expertise has designed an attractive robot product line that is a fast, precise, flexible, and reliable.
These robot solutions provide outstanding scalability that guarantee customers in all injection molding businesses the opportunity to maximize productivity, and to optimize product quality.
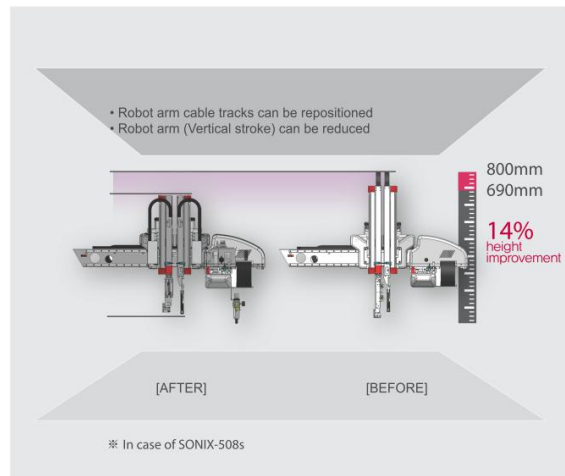
Smart user friendly robot controls

Precise robotic control is essential to accommodate a wide range of applications, complex processes, and for operations where strict quality assurance is required.
In any production environment, users need to access the frequently used control features quickly and easily.
YUDO has optimized the User Interface for reliable control through functions that are intuitive and user friendly.
Yudo's robot controller sets new standards for the customers injection molding business with improvements in cycle times, set –up times, safety, and energy efficiency.

Customized design ensures optimum space utilization

- Robot arm cable tracks can be repositioned
- Robot arm (Vertical stroke) can be reduced

800mm
690mm

14%
height improvement

[AFTER] [BEFORE]
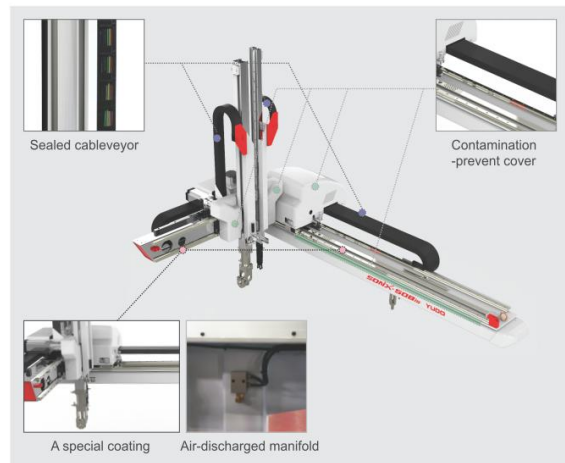
※ In case of SONIX-508s

Customized design ensures optimum space utilization (height 14% improvement)

Yudo has many ways to help customers quickly overcome space constraints at the job site.

• The robot arm cable tracks can be positioned to reduce the height of the robot, increasing clearance between the ceiling and robot.
• The overall height of the robot can be reduced by optimizing the arm length required to suit the extraction and drop positions
• All Yudo robot models can be readily adjusted by the customer to fit a broad range of molding applications.
Where necessary custom robot's can be designed to suit specific applications or environment requirements.

Minimum practical working envelope

Robots and automation can be installed in limited work space, improving labor efficiency, reducing investment, and improving productivity. Yudo offers robots with a wide range of working envelops to suit customers production environments.
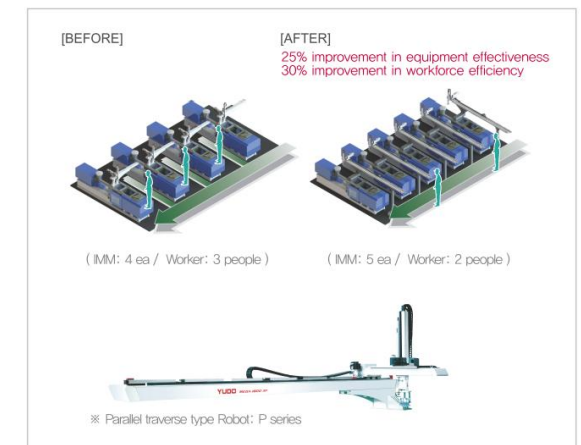Through the application of robots, we expect a 30% improvement in workforce efficiency, and a 25% improvement in equipment effectiveness.

ZEBA

• A side entry robot provides a solution where interference could occur with low ceilings, cranes, the injection molding machine or the surrounding environment.
• With payload capabilities to 5 kg, we offer air cylinder type robots and multi axis servo robots optimized for customers applications.
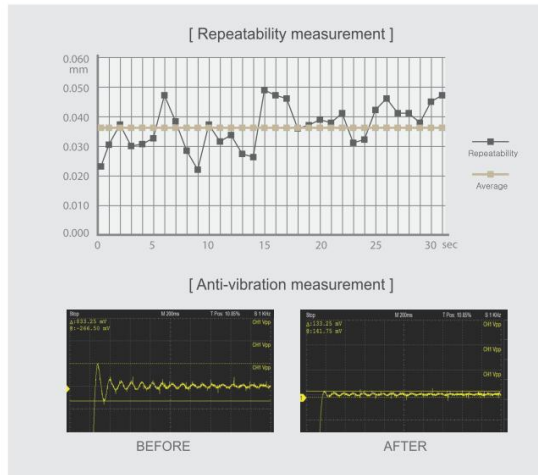
Parallel traverse type robot

• Longitudinal take out robots can improve productivity and efficiency by reducing the space required between adjacent injection molding machines.
• When using a parallel traverse type robot, a longitudinal take-out conveyor may not be required, reducing cost.
• By utilizing a shared transverse conveyor at the end of adjacent molding machines, robot and conveyor costs can be reduced, and workforce savings of up to 30% can be achieved.

[BEFORE] [AFTER]
25% improvement in equipment effectiveness
30% improvement in workforce efficiency

(IMM: 4 ea / Worker: 3 people) (IMM: 5 ea / Worker: 2 people)

※ Parallel traverse type Robot: P series

Sealed cableveyor

Contamination -prevent cover

A special coating   Air-discharged manifold

Clean room specified robots are suitable for (C/R Class 1000) environments

Clean room class 1000 robots are required to achieve the quality and yield for demanding components of high transparency and gloss, such as a light guides.

• The use of racks, and design features like low friction belt drives help to minimize the generation of dust.
• Portions of the robot can be covered to protect the mold from airborne contamination.
• Robot process air is collected and discharged outside of the clean air environment.
• Enclosures and applied a special coating and sealed cableveyor.
• Clean room specifications can be applied to all Yudo robot models.

Repeatable, Flexible, Scalable, Expandable

[Repeatability measurement]

[Anti-vibration measurement]

BEFORE   AFTER

High precision position accuracy (repeatability±0.1mm)

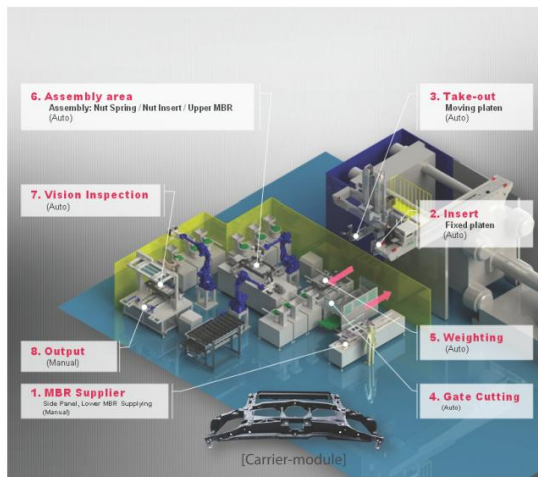A high level of repeatability ensures high-quality products can be maintained consistently.

- Repeatability of ±0.1mm is essential for part take-out, insert or transfer molding.
- High linear speeds of 4m/s, fast controls response, and auto vibration damping all contribute to increased productivity, and reduced defects during operations such as insert molding, or interfacing with secondary automation.
- Suitable for insert molding and secondary automation.
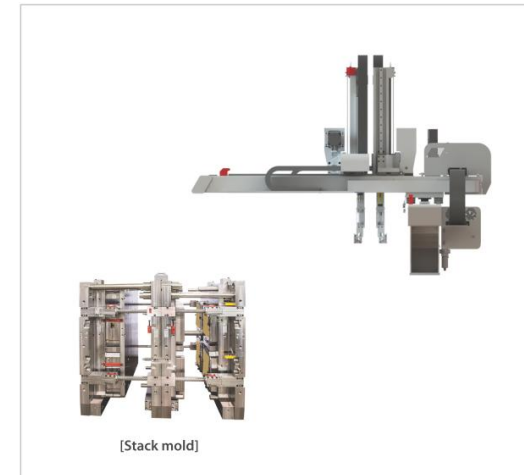
[Stack mold]

High−speed / precision robotic solutions for Stack mold

Our system provides customers with the robot design and precision control solutions optimized for stack mold; mass production/and high-speed injection molding

- Our stack mold robot has two arms controlled to operate at the same time, it provides a fast and reliable way to remove product from the two faces of a stack mold.
- We custom engineer compact End of Arm Tooling (EOAT) for each application. The required stack mold opening stroke is reduced by using the low profile EOAT's, this results in improved overall cycle times.
- The rigidity of the robot frame is increased to minimize the vibration of the robot arm, that can be occur when operating two take outs taking out two simultaneously.

6. Assembly area
Assembly: Nut Spring / Nut Insert / Upper MBR
(Auto)

7. Vision Inspection
(Auto)

8. Output
(Manual)

1. MBR Supplier
Side Panel, Lower MBR Supplying
(Manual)

3. Take-out
Moving platen
(Auto)

2. Insert
Fixed platen
(Auto)

5. Weighting
(Auto)

4. Gate Cutting
(Auto)

[Carrier-module]

Flexible for expanded applications and downstream integration

Through available built in secondary functions, robots can be easily and reliably integrated into expanded automation systems to provide customers a distinct competitive advantage.

- The YUDO robot provides various applications to support secondary automation.
- This minimizes the risks associated with interfacing with secondary automation equipment.
- Rapid implementation can be achieved, reducing the time to full production, increasing productivity.
- The robot can be quickly adapted for changing products or production plant layouts.
- Supports communications for automation system management and maintenance.

[GIGA series]

[ZeMA series]

Lightweight robot module solutions for high performance

By using innovative materials and the latest design technologies, we offer a high-performance robots that are optimized for high speed operation and vibration control.

- The use of CFRP (carbon fiber plastic composite) for the robot arm mechanism has reduced weight and improved vibration control performance. This has facilitated the implementation of a high speed take out axis that provides precision performance at 4.2m/s.
- We design our robot for high-speed operation and optimal vibration control based on the structural and dynamics analysis.
- YUCON-700 family of high-performance robot controller is employed to provide high-speed / precision performance with fast response and vibration control function, at speeds of 4m/s.

Productivity/Yield improvement solution

YUCON The most advanced robot control solution available for automating and optimizing performance

YUCON-700

The YUCON-700 Controller is a premium control solution that delivers high productivity with ease of operation. Automatic entry systems are configured and optimized for each industry application as a smart CNC technology.

Basic Specifications

Human Machine Interface
• Intel Celeron 400 Processor
• Windows CE, VNC client, 6.5" touch screen
• Ethernet 10/100, USB1.1

Controls & I/O
• Intel® Atom™ 600 MHz
• Board: High speed ethernet, ethernet power-link, USB, compact flash memory
• Module type interface for field bus

Servo Drive & Motor
• Total braking resistor, EMC filter equipped
• Smart CNC technology / Dynamic motion control

Customer value

Economics (Energy Savings)
• Various energy saving features
• Robot durability improvement
- Increased life cycle through optimization function

Convenience
• Improved teaching function for various applications
• Diagnostics through network service is provided

Safety
• Real-time monitoring ensures safety
• Control circuitry is based upon international certified standards

YUCON-670

The YUCON-670 Controller is a robot control solution designed for increased productivity.
The intuitive UI design permits simple and user friendly setup, providing reliable operation with enhanced take-out times and increased productivity.

Basic Specifications

Human Machine Interface
• 8" a-Si TFT LCD (800 x 600 size)
• 24 bit True Color
• 5 different languages
• USB: Software Upload / Download

Controls & I/O
• Hitachi High speed SH4 CPU
• 4 times faster processing speed

Servo Drive & Motor
• Integrated 3 & 2 Axis Servo Drive
• Dynamic motion control
• Max 16 Axes

Customer value

Performance
• Faster cycle time compared to previous generation controls
• Precise control of the take-out robot with the vibration control function

Economics (Energy Savings)
• Effective power management is realized through the "Eco-Vacuum" and "Servo Sleep" functions

Convenience
• Friendly User interface design
• Easy guide functions are provided for the users

Safety
• A Facility Protection function provides collision detection and monitoring

Flexibility
• IMC, Automation

Solutions for improved working environments

Lock out Tag out

The LOTO system monitors the energy in real time to ensure it remains locked out during maintenance to prevent injuries.

Lock out
• Ensures the energy isolating device does not function until the lock has been you removed
• Locks the energy isolating device in accordance with prescribed procedures

Tag out
• Shows that the energy isolating device has been disconnected from the energy source. The energy isolating device should not be reactivate
• Labels the energy isolating device in accordance with prescribed procedures

Conflict Prevention

The robot is able to recognize collisions in the event of possible user mishandling, or the erroneous operation of the robot and peripheral equipment, and apply reverse torque as necessary to prevent damage of the equipment and keep workers safe.
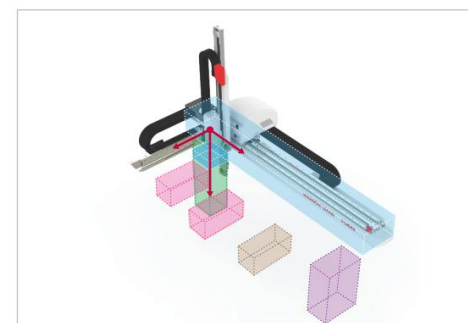
3D virtual space, safety and security settings

The robot monitors the operating area (take-out position, mid-traverse-position, release-position, and stand-by position) in virtual space during operation.
If a user mishandles the robot operation or a robot malfunction occurs, the robot emergency stop can be activated in advance to ensure worker safety and prevent damage to the equipment.

Solutions for improving the working environments
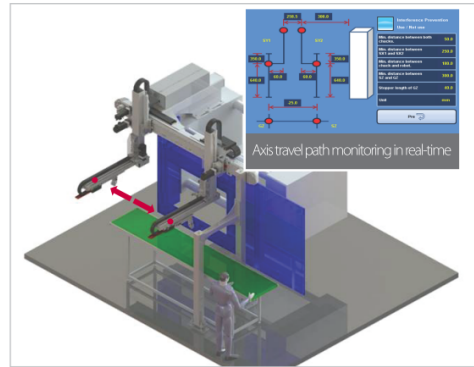
Prevent interference between axes

When two robot arms are used in combination with a three plate mold, the possibility of the two robot arms colliding due to an operator input error exists.

To prevent this problem, sensors are equipped on the robot that monitor the position of each arm in real time, and stop the robot motion if the arms are on a conflicting path.

EUROMAP E67 & E73 Interfaces

Provides safe and appropriate interface specifications for European molding machines.

• **Activating the emergency stop of the injection molding machine will stop the motion of the robot**
• **Opening the safety gate of the injection molding machine will stop the motion of the robot**

YUDO manufactures to European specifications and provides DOC for CE compliance, as well as KCs certification from Korea.
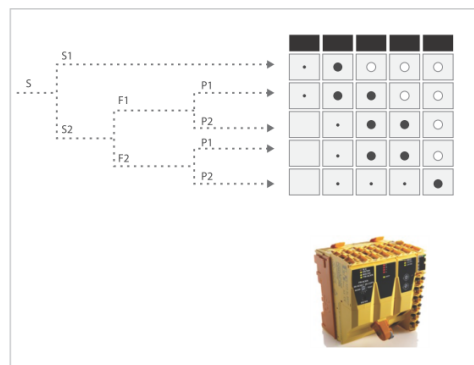
Safety Module

The robot complies with Category level 4 of the CE standard, and also utilizes its own CPU to independently monitor and control its operation.

• **Severity Ra (S)**
If the control system has a fault, the degree of failure will be determined; S1 for light damage, or S2 for serious damage.

• **Exposure Frequency (F)**
If a person is exposed to danger, the degree of danger will be determined; F1 for light exposure, or F2 for frequently and high exposed in danger.

• **Avoidance of Danger (P)**
Danger avoidance is also determined; P1 if avoidable, or P2 if unavoidable.

Effective Energy Consumption Solution

[Comparison of compressed air usage: In case of SONIX-H]

[Compressed air usage monitoring]
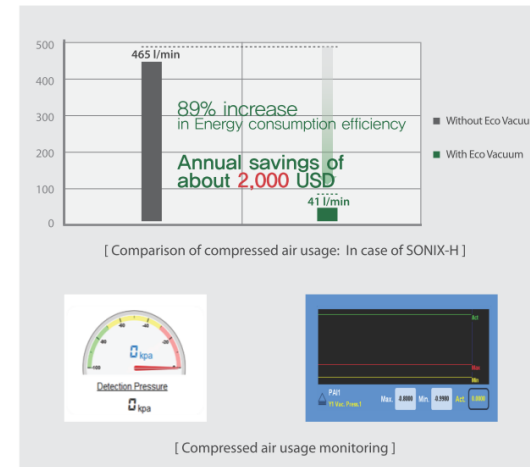
Eco Vacuum Function

• The Eco Vacuum function optimizes compressed air usage with smaller capacity compressors.
• The robot suction pressure is controlled to minimize the energy usage of the compressor.
• The robot air pressure is also precisely controlled and further minimize the energy usage of the compressor by automatic measurement of air pressure during robot operation.
• Compressed air energy usage can be improved by up to 89%.

Servo Sleep Function
(Standby power of the servo motor)

• Without Servo Sleep : Power consumption 0.869kw / hr
• With Servo Sleep : Power consumption 0.771kw / hr
• Energy cost per robot can be reduced by up to 30 USD (In case of Zema-508i, 300 days/24hr operation, standby time 5 sec)

• The power supply to the servo motor is removed during idle periods when no signal from molding machine is present.
• This reduces power consumption and extends the life of the main drive system by preventing a unnecessary power use.
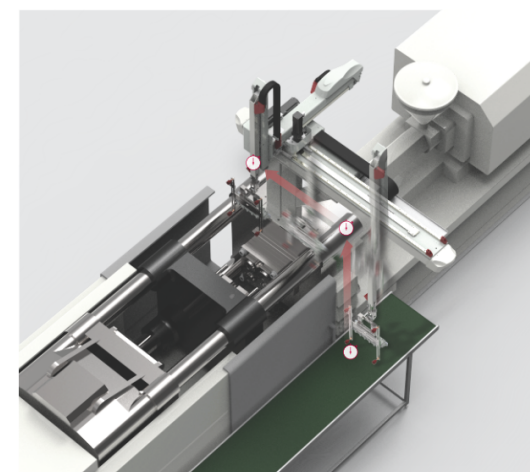
Smart Speed Control
(Optimizing the speed of each section)

• The robot monitors the injection molding machine cycle to minimize the robot intrusion time, and optimize all other robot motions to match the overall cycle time for the application.
• It operates with minimum power/speed during the moving intervals that do not affect to injection machine cycle time.
• It also reduces power consumption and extends the life cycle of main drive system by minimizing unnecessary high speed motions.
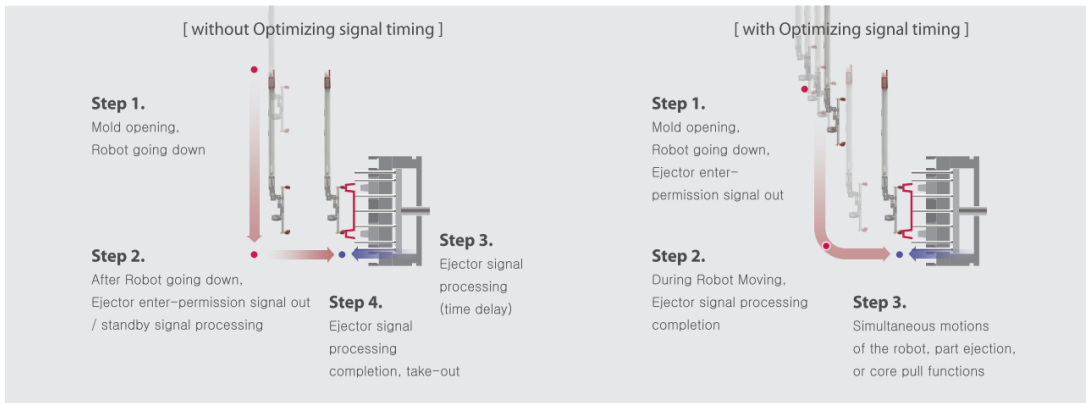
Effective Energy Consumption Solution
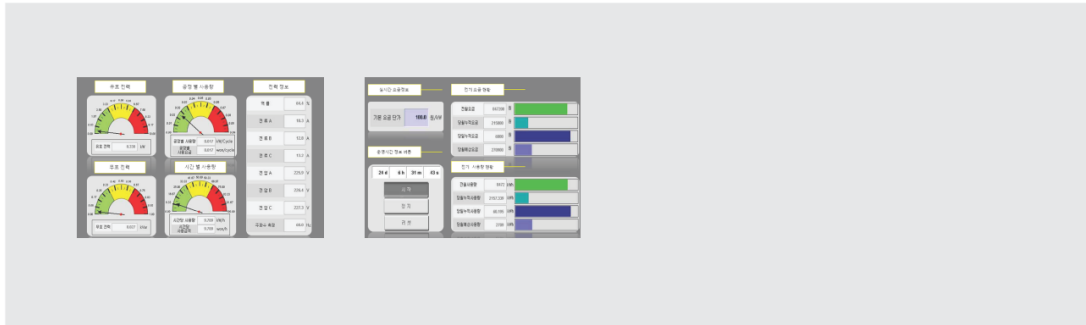
Energy Monitoring Solution (Optional)

• The total power consumption of the robot is monitored.
• The actual cumulative cost of the energy used is displayed on the user interface in real time.
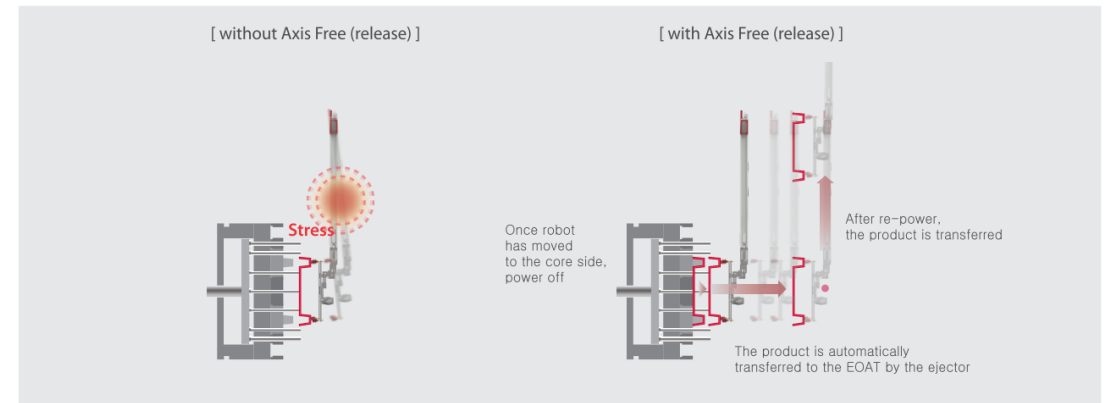

[without Optimizing signal timing]   [with Optimizing signal timing]

Step 1.
Mold opening,
Robot going down

Step 2.
After Robot going down,
Ejector enter-permission signal out
/ standby signal processing

Step 3.
Ejector signal
processing
(time delay)

Step 4.
Ejector signal
processing
completion, take-out

Step 1.
Mold opening,
Robot going down,
Ejector enter-
permission signal out

Step 2.
During Robot Moving,
Ejector signal processing
completion

Step 3.
Simultaneous motions
of the robot, part ejection,
or core pull functions

Optimizing Signal Timing

• When the robot enters the molding area, the reaction and operation signals for each robot and ejector motion occurs sequentially.
During this time, the time delays generated between the robot and injection machine signal processing is a significant factor that affects the production cycle time.
• YUDO robots analyze the motions of the molding machine, and are able to optimize the exchange timing of the signals. The optimum time/position of each motion is computed for simultaneous motions of the robot, part ejection, or core pull functions where permissible. The result is faster cycle times by decreasing unnecessary standby and signal communication times.

Vibration Control Function

• The vibration control function optimizes the robot motion for a fast and smooth movement.
• The improved take-out performance aids in maintaining a high quality product.
• This enhanced motion is automatically regulated as the robot detects the weight of product and controls the vibration accordingly.
• The Vibration control function is applied without the requirement for user input.

[without Axis Free (release)]   [with Axis Free (release)]

Stress

Once robot
has moved
to the core side,
power off

After re-power,
the product is transferred

The product is automatically
transferred to the EOAT by the ejector

Forward and Backward Axis Free (Release)

• When the mold is in close contact with the robot arm during ejection, the repeated external forces of the molded part with the robot arm could cause stress.
Free function of the forward and backward robot axes reduces these forces and leads to a more stable and reliable robot operation.
• Once the robot has moved to the core side, the servo motor power is released to a free state to minimize force. After that, the product is automatically transferred to the EOAT by the ejector.
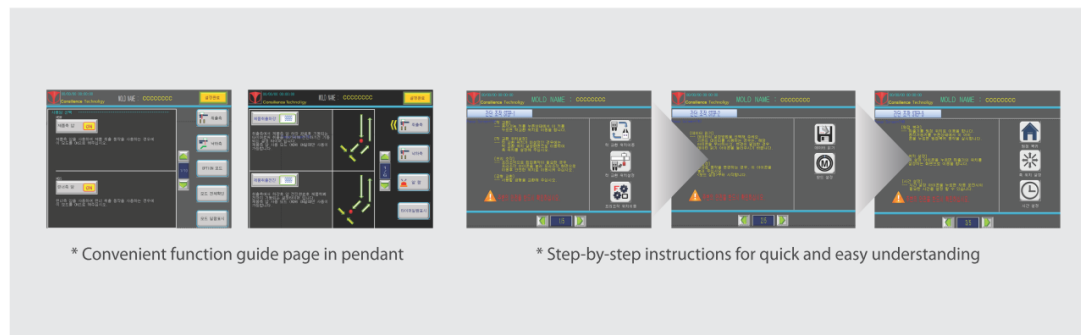• The robot energy consumption is reduced during this time.

Optimized user solutions

1. Moving the robot arm by the operator

2. Saving the positions of the robot arm to the pendant
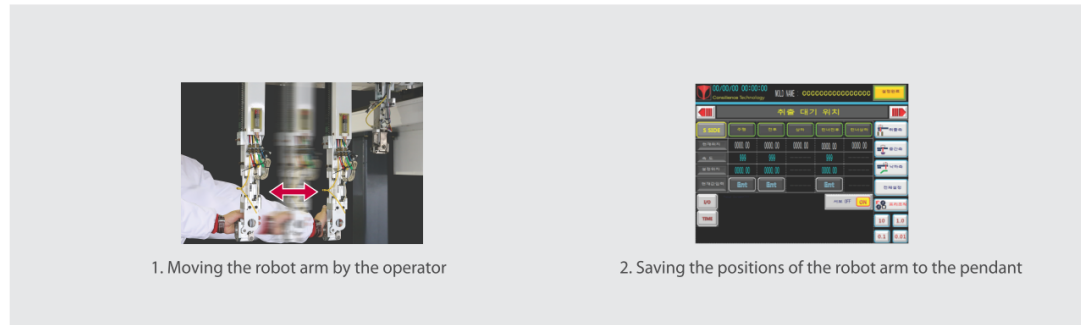
Functions for fast teaching

• YUDO controllers provide a jog function and an "Servo Free" function (electrically disengaged) so users can teach the robot positions by moving each axis to the required locations by hand.
• The operator can reduce set up time by saving the robot arm positions during the teaching process.

Simple teaching function

• Operator can check 3D image describing robot motions on the pendant screen.
• The robot function can be learned conveniently by the operator before actually using the robot.

* Convenient function guide page in pendant

* Step-by-step instructions for quick and easy understanding

Operator guide

• Five step guide line for the operator.
• Quick and easy step by step instructions are displayed on the user interface for all robot set up functions, from mold change to automatic operation.

Operator program menus

• Preprogrammed menus are available for the production environment like the take-out/inserting of products/auto-mation.
• Motion modifications can be performed via the pendant at the machine.
Communication with automotive equipment and simple motion application can be achieved.

Optimized operator solutions

Maintenance schedule management

• Displays state of main controller like CPU, battery recharging, maintenance.
• The pre-scheduled maintenance alert displays automatically on the pendant. Operator can perform or schedule maintenance following the check list on the pendant display.
• Efficiency parameters are collected and periodically displayed.
• Operations efficiency can be increased by the operator when following the maintenance check list.
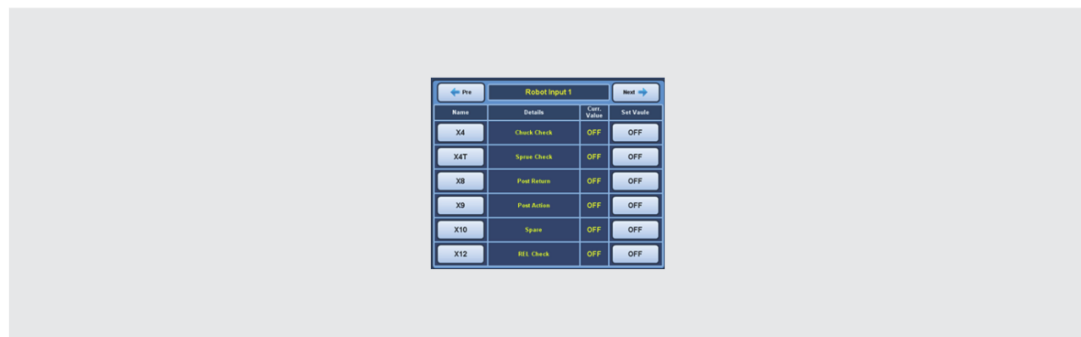
Pre-inspection mode

• During the manual operation of robot, operator can terminate the On/Off for input/output.
• In pre-inspection mode, operator can check sensor, solenoid valve, and communication status between robot and molding machine.

Quick Operation start mode

• When the robot is restarted, it can be operated without origin return within the operation area.
• When the robot is located in the release-position, auto-button automatically moves the robot to the origin position and the stand-by position to enable automatic operation.

Robot operation continue mode

• User can choose continuous operation if robot misses the part or drops product in the mold.
• Input "continuous operation", robot runs normally.
• Input "Stop operation", robot stops.

Hidden mode

• Various complex robot controller functions are pre-programmed for the automotive process, however hidden on the display to avoid operator confusion.
• YUDO controller provides an intuitive HMI [Human Machine Interface] displaying only the necessary function.

Robot control solution

Smart solution
(IMC lite⁺ with Smart function)

IMC

Smart Solution from YUDO for process optimization and injection molding system production planning.
Robot data collection is used by IMC for the Manufacturing Execution System, Management by Objectives, Overall Equipment Efficiency. ˙The Smart Function, provides product weight data, temperature data, eliminating static.
YUDO Smart Solution maximizes the productivity, and contributes the value for customers.

IMC.lite⁺

IMC Lite⁺ is monitoring production output, achievement ratio, and operations status in real-time. daily, weekly, monthly data from take-out robot is analyzed, so provides effective planned production and used for production planning.

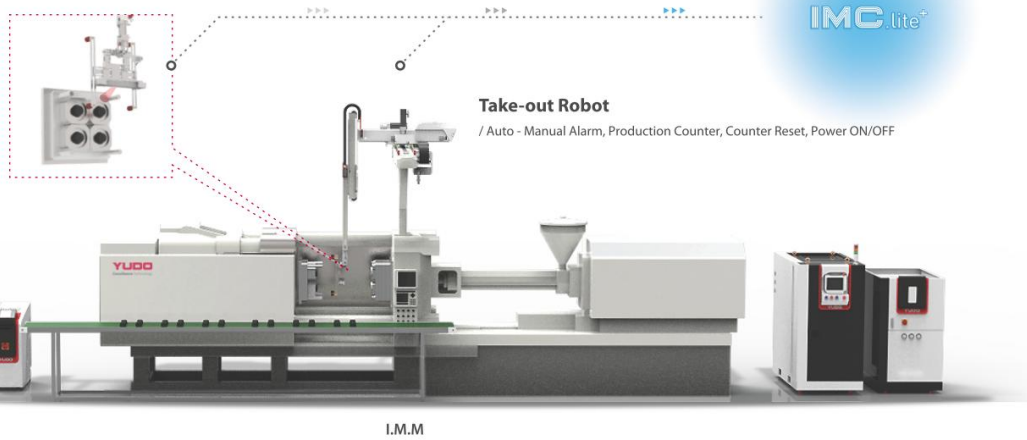MES : Manufacturing Execution System   MBO : Management by Objectives   OEE : Overall Equipment Effectiveness

Smart function

Real time data measurement ▶ Management of data history ▶ Data Analysis ▶ The total management of smart Robot by IMC Lite

IMC.lite⁺

Take-out Robot
/ Auto - Manual Alarm, Production Counter, Counter Reset, Power ON/OFF

I.M.M

Smart Function, Main function for productivity and quality improvement

Smart function removes the elements which affects quality and productivity. It monitors main factors and gradually implements the best quality process.

Product weight measuring (Load cell)

Automatic part weight measurement and defective part recognition can be achieved by a load cell.

• Up to 4 cavity can be measured
• Gravimetric monitoring
• Monitored real time and archived in IMC-Lite

Mold surface temperature measurement (Infrared sensor)

An infrared sensor measures inconsistencies in the mold surface temperature that IMC can correlate to reject part data.

• Up to 4 locations can be measured (error : ±1 ℃)
• Mold temperature monitoring
• Monitored real time and archived in IMC-Lite

* Part weight measurement

Part weight can be checked by means of load cells integrated in the EOAT (up to 4 cavities at the same time) as they are ejected from the mold.

• This data (part weight & mold surface temperature by means of a infrared sensor on the EOAT) can be exported to the plant's Integrated Monitoring & Control (YUDO-IMC-Lite) software.

Static elimination (Ionizer)

An ionizer eliminates the static on mold and product surfaces, preventing dust and foreign particles accumulation.

• ION generation method : Soft X-Ray type
(Decay time: ±1,000V to ±100V in 1 sec at 150mm)
(No additional compressed air supply required due to ionization without electromagnetic wave, ozone)
• Monitoring for static accumulation
→ Maintaining an ION balance of 0V
• Monitored real time and archived in IMC-Lite

Smart factory solution