




## MOTORCON INC.

### Motorcon Overview

Motorcon INC. located close to the Hsinchu Science Park specializes in automation system design and component supply, including robot controller, robot arm, camera, lens, and vision card. Motorcon provides customized design services according to customers' needs, including software HMI design, clip and fixture design, machine vision system design, information management system design and automation system integration.

Motorcon INC. is comprised of members from the ITRI (Industrial Technology Research Institute) automation research team that comes with years of experience in CNC technology research and development, including motion control technology, power control technology, CNC controller technology, machine design technology, mechatronics technology and machine vision technology. This team was awarded the best research gold medal many times by ITRI, and the team leader received an award for the most excellent young electrical engineer from the Chinese Institute of Electrical Engineering.

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Industrial Computing Solutions

## Motorcon Automation Solution

### ■ System Development Services

- Provide customized production line design service
- Provide customized controller HMI interface
- Provide machine vision design service
- Provide customized clip and fixture design service

### ■ Machine Vision

- Camera, lens, light
- Vision card
- Image analysis software

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Video Capture Solutions

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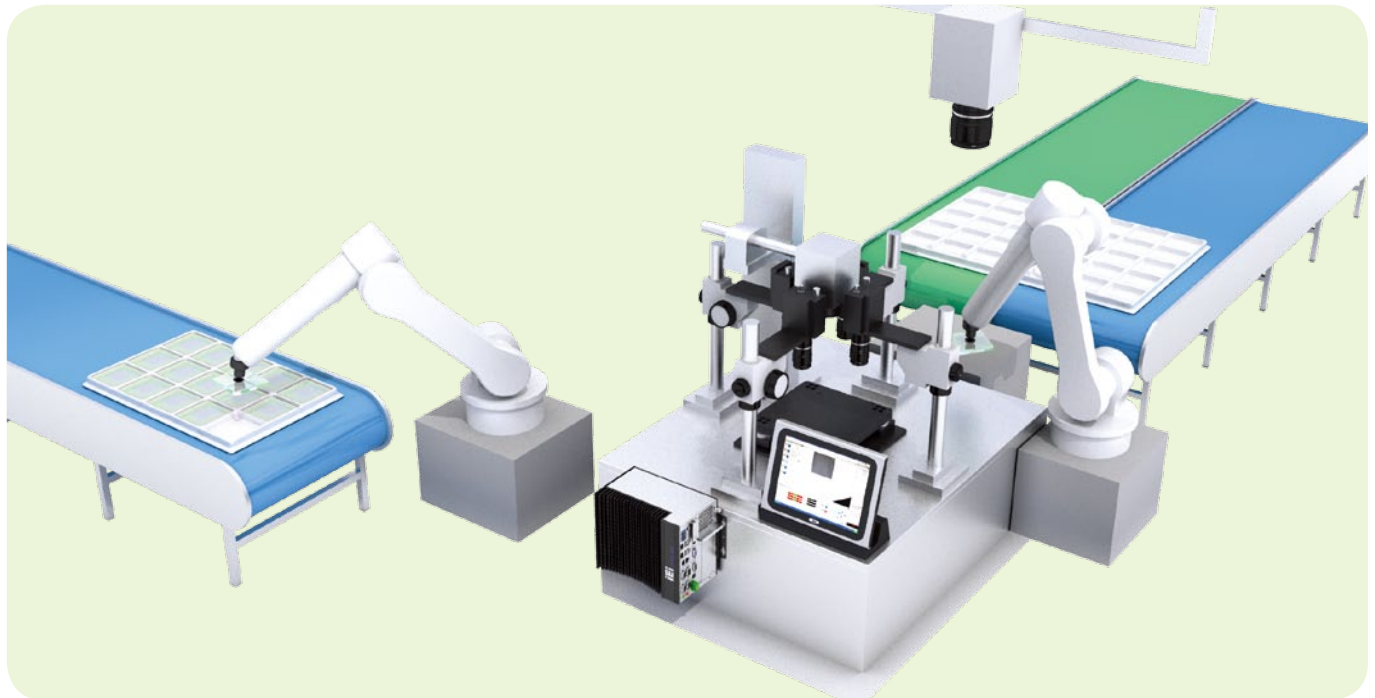
ORing Network Communication

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Power Supply/Peripherals

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Panel Solutions Introduction



### ■ Robot Controller

- 3 ~ 6 axes robot control function, including PTP, Line, Arc
- High-precision control +/-0.001mm
- Secure and reliable servo system
- Easy operation and network communication function

### ■ Robot Arm

- 7A6: 7kg loading / 6-axes / A-type
- 5S4: 5kg loading / 4-axes / SCARA type

# Automation System Development Services

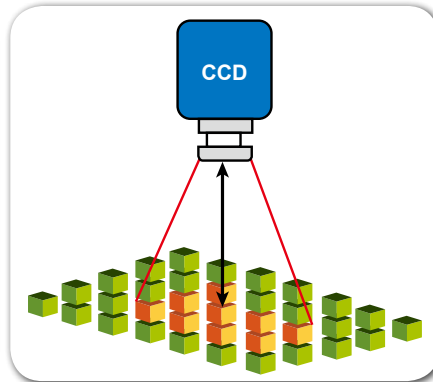
- Provide customized production line design service
- Provide customized controller HMI interface
- Provide machine vision design services, including
  - » image recognition program development
  - » optimized services for selecting CCD, lens and light source
  - » video capture card
  - » institutional development service
  - » system integration service
- Provide customized clip and fixture design service
- Provide remote information management system to monitor the on-site robot operation logs and analysis capacity



Automation System Design



Robot System



Machine Vision



Clip and Fixture Design

## Application Examples



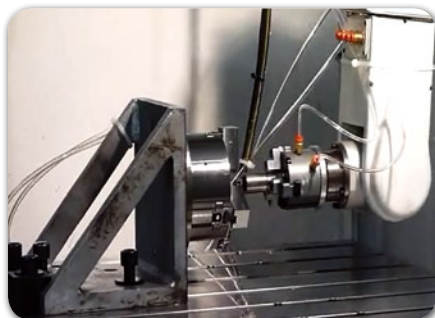
Loading / Unloading (CNC+Robot)



Pick and place (Robot+Vision)



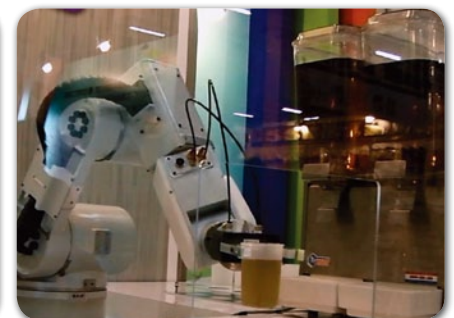
Deburring (Robot+Cutting tool)



Loading / Unloading (CNC+Robot)



Testing (Barcode reader+Robot)



Loading / Unloading (Drinks maker+Robot)

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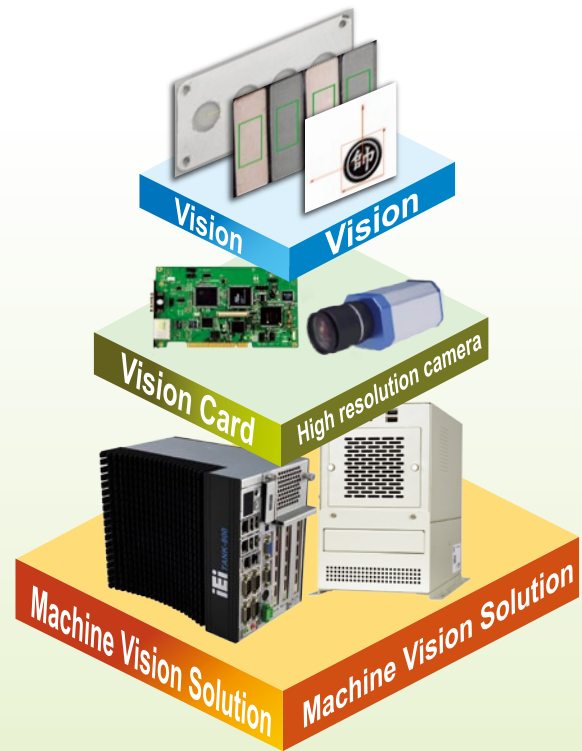
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Panel Solutions Introduction



## Machine Vision Solution

Motorcon provides integrated solutions for machine vision, including camera, lens, light, vision card, image analysis software and industrial image processing platform. We provide one-stop shopping service and customized service for machine vision equipment and software to shorten the time for developing a new process. The applications of the machine vision industry include automatic optical inspection, automatic optical inspection alignment, robot vision, etc..



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Introduction

### Machine Vision Products



#### Camera

- High resolution camera
- Using industrial CCD/CMOS sensor
- Good sensitivity
- Unique circuit design, excellent noise immunity



#### Light

LED light source, including bar-type light, quadrangular-type light, dome-type light, backlight light, coaxial light and outer coaxial light



#### Lens

- High resolution lens can be used with megapixel industrial camera
- With a variety of specifications
- Flexible



#### Vision Card

- Single card with four channels
- Total 120fps@D1 for D4 channels
- External GPIO daughter board with 4 inputs and outputs

*(please refer to page 2-34)*

### Image Analysis Tools

Supports NI machine vision software which has powerful image processing module to provide quick development services.



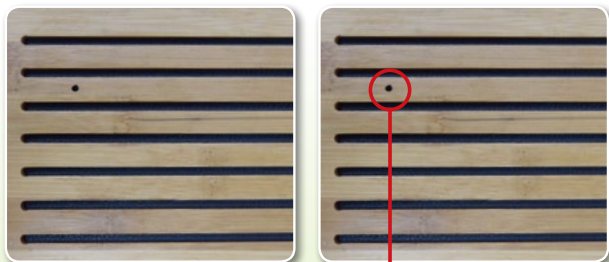
### Industrial Image Processing Platform

Fanless design. Maintain high system performance and reduce system failure caused by fans and extends the lifetime of the device

*(please refer to page 3-8)*

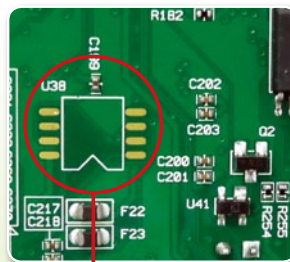
### Machine Vision Application Examples

#### Wood Inspection

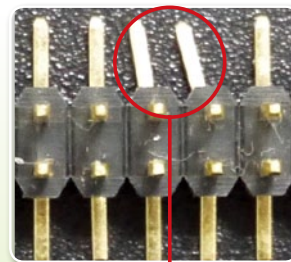


Defected

#### Electronics



Invalid



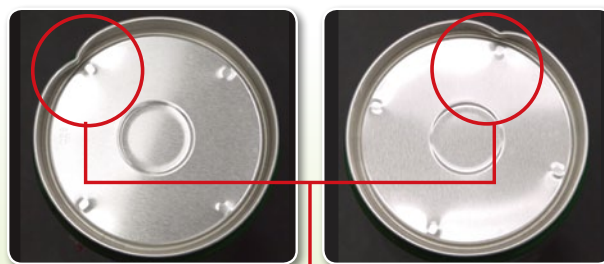
Crooked

#### Automotive



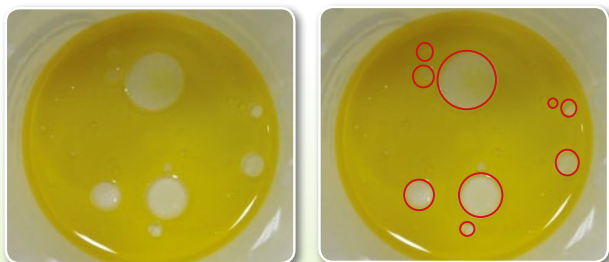
Determine gap

#### Manufacturing

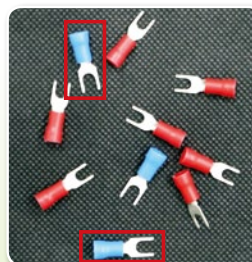


Dents

#### Analysis



#### Electronic Parts Inspection



#### Classification



#### Color Classification



#### Geometric Matching



#### Multiple Geometric Matching



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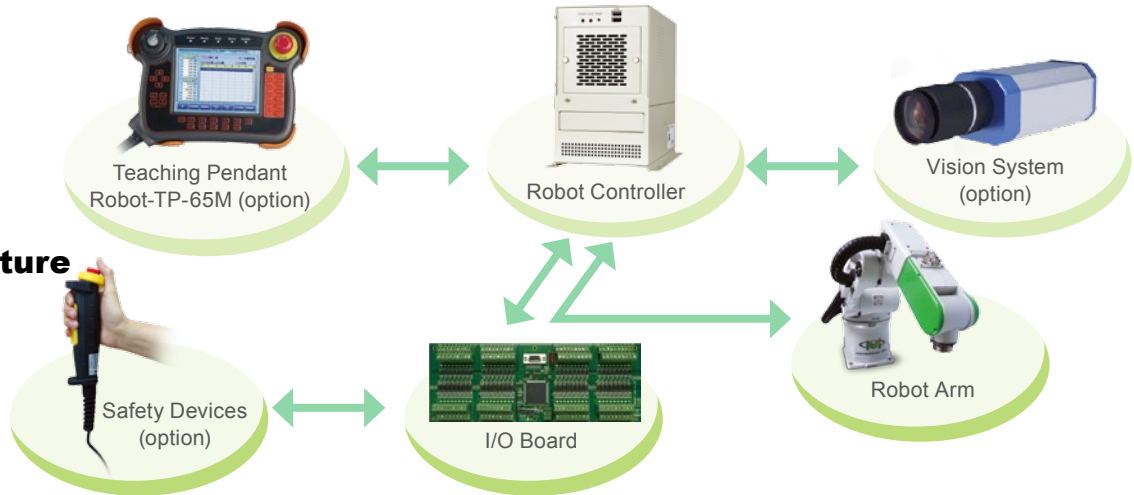
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Panel Solutions Introduction



# Robot Control Solution

## System Architecture



### Multi-axis robot arm control

- Includes serial motion control card, CNC-based motion control, robot kinematics function and machine vision function
- 3~6 axes robot control function, including PTP, Line, Arc

### Secure and reliable servo system

- Full-time closed-loop system can automatically detect the motion of each axis to prevent abnormal robot operation which may cause the collider problems and to enhance the safety of the robot system
- Unique singular point estimate method to prevent machines from performing unexpected actions

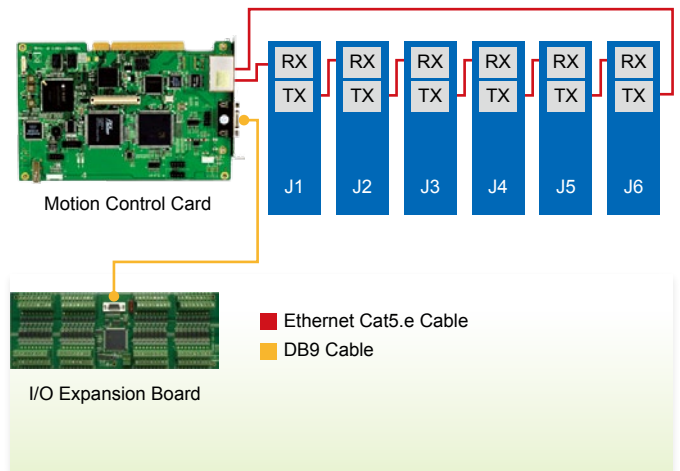
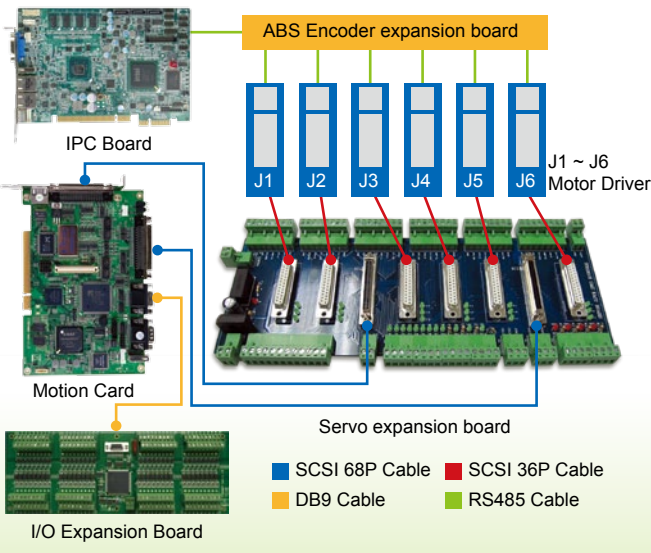
### High-precision control

- The Cartesian coordinate command resolution:  $\pm 0.001\text{mm}$
- The joint coordinates command resolution:  $\pm 0.001^\circ$

### Easy operation and network communication function

- Intuitive human-machine interface (easy to learn, easy to use and easy to maintain)
- The controller has built-in multiple robot arm programming instructions
- Compliant with a variety of external device communication standards. (ex. Ethernet)

### Traditional motion control v.s. serial motion control



- Traditional motion control transmitted command by pulse
  - » Unable to confirm whether the pulse is disturbed or not
- Need additional wiring to read absolute encoder data
- The wiring of system is very complex
  - » Difficult to maintain

- Serial communication transmitted command with the CRC Check
  - » Able to confirm the correctness of the command
- The wiring of system is very simple
  - » Stable and reliable

win!

	Traditional Motion Control	Advanced Serial Motion Control
I/O expansion Board	DB9 Cable x 1	DB9 Cable x 1
Servo expansion Board	SCSI 36P Cable X 6	
Motion Card	SCSI 68P Cable X 2	Ethernet Cat5.e Cable x 7
ABS Encoder expansion board	RS485 Cable x 7	

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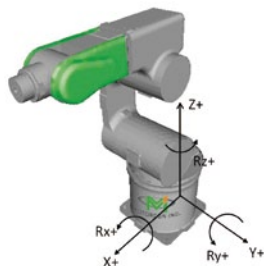
## iR-X6 Software Features

### Control Function

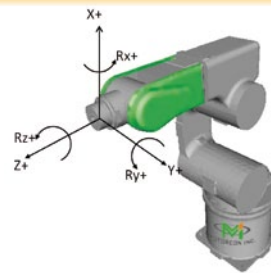
#### Joint coordinates



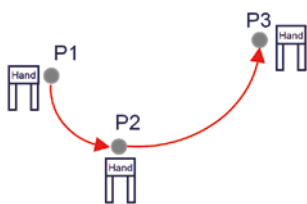
#### Cartesian coordinates



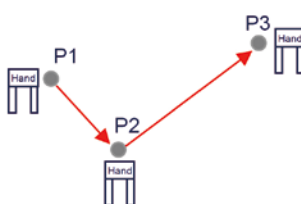
#### Tool coordinates



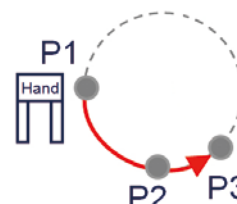
#### Joint compensation motion control



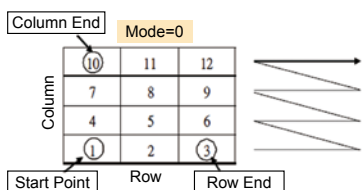
#### Linear compensation motion control



#### Arc compensation motion control



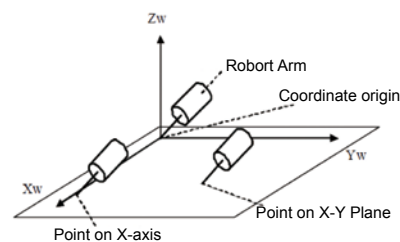
#### Multiple-tray operation



#### Visual integration control



#### Work coordinates computing



## User-friendly HMI

#### Intuitive function menu



Convenient to switch between function menus

#### Manual control mode



Include three motion modes and two coordinate modes for users to save information without hassles

#### Programming interface



Simple programming interface allowing users to edit robot motion paths

#### Automatic execution



Run the programmed commands automatically. The cyclic operation mode is also supported.

#### System alarm



Record alarm logs to understand the robot operation status

#### External I/O status



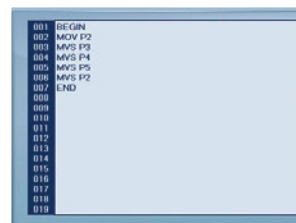
Visualize the operation status of all 64 inputs and 64 outputs

#### Virtual keyboard



Virtual keyboard eases data input

#### Online help



Online FAQ and help center

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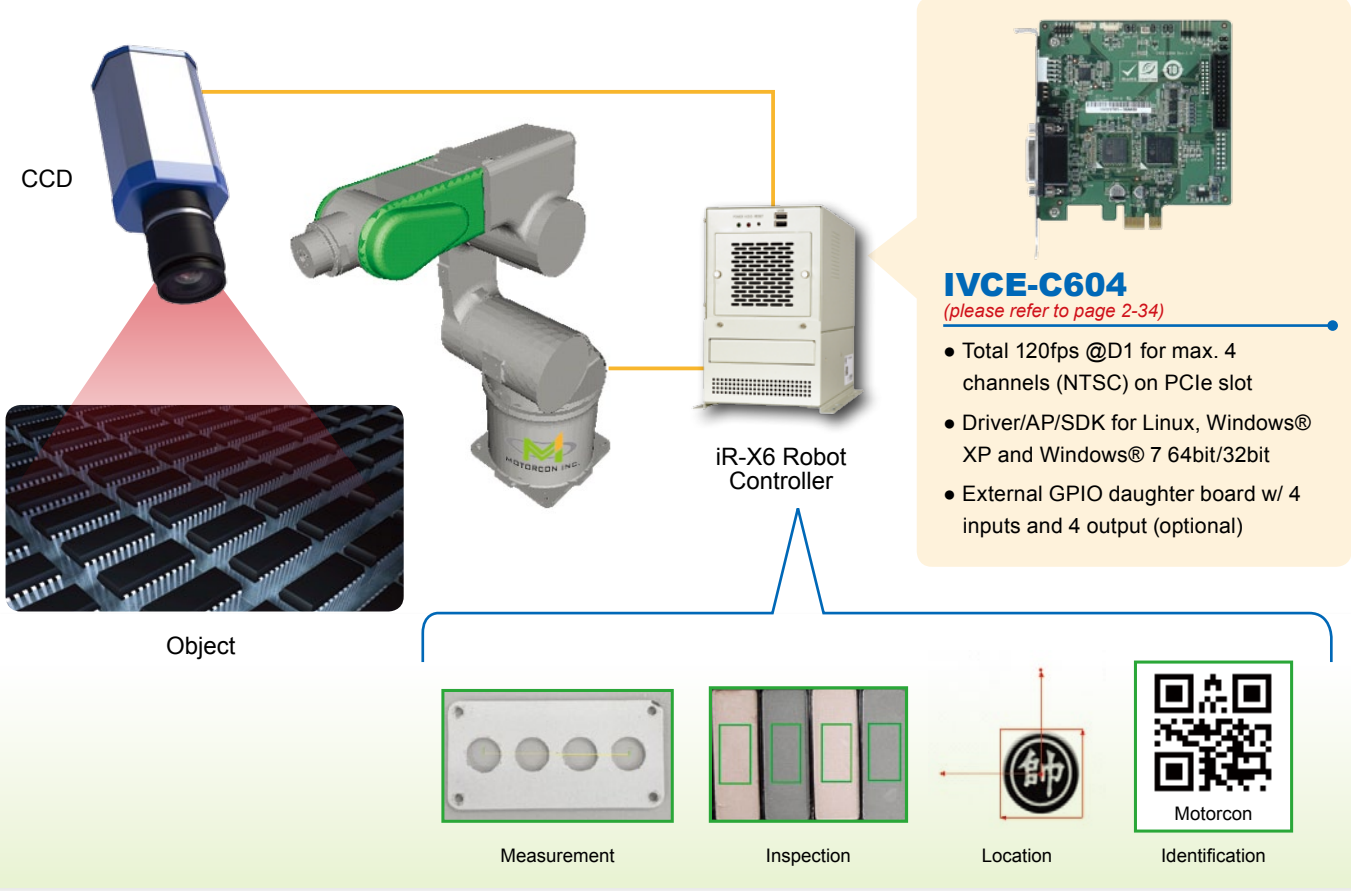
Power Supply/Peripherals

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### Image Processing Function

The optional capture card is available on the iR-X6 robot controller. That includes image processing functions (measurement, inspection, location, identification)



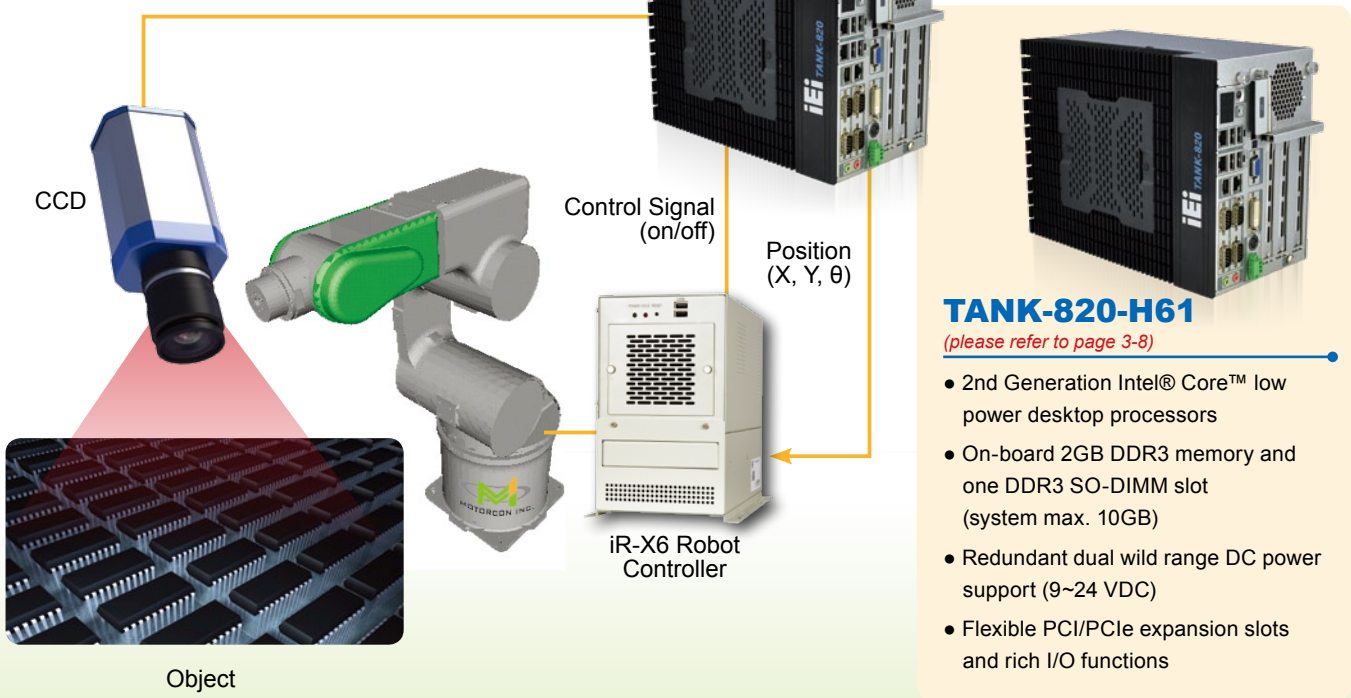
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### External Control Function

- Support standard Ethernet communication protocols (TCP/IP)
- Support external trigger control (ex. machine vision)
- Support control of other devices

### Machine Vision System



4 Automation Control

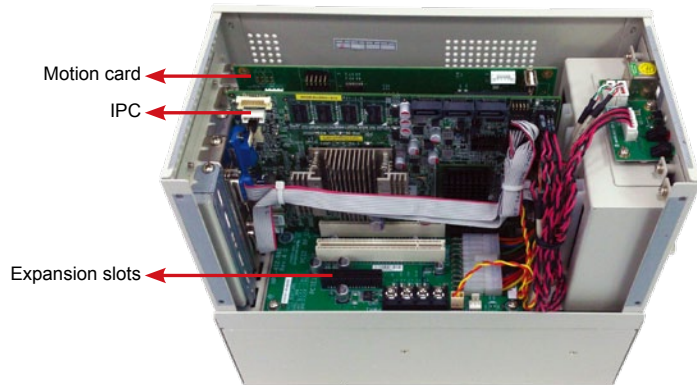
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## iR-X6 Hardware Composition



- Small size
- Easy to install
- Simple maintenance
- One PCIe expansion slot

Motion Control Card  
IPC Board: PICOe-PV-D5251  
*(please refer to page 1-39)*  
I/O Expansion Board

**iR-X6 Hardware (include)**

Teaching Pendant  
Robot-TP-65M  
Vision Card: IVCE-C604  
*(please refer to page 3-8)*

**iR-X6 Hardware (Option)**

### iR-X6 Controller

Standard	Fanless	
iRX6-MCT400	iRX6-MCT800	iRX6-MCT820

### Vision Card

4-Channel
IVCE-C604

### Teaching Pendant

Standard	Advance
Robot-TP-84M <i>(coming soon)</i>	Robot-TP-65M

### iR-X6 Robot Controller Specifications

	iRX6-MCT400	iRX6-MCT800 <i>(coming soon)</i>	iRX6-MCT820 <i>(coming soon)</i>
IPC	PICOe-PV-D5251	TANK-800-D525	TANK-820-H61
CPU	Intel® Atom™ D525 Dual Core 1.8GHz	Intel® Atom™ D525 Dual Core 1.8GHz	Intel® Core™ i5 Dual Core 2.7GHz
Chipset	Intel® ICH8M	Intel® ICH8M	Intel® H61
Ethernet	2 x RJ-45	2 x RJ-45	2 x RJ-45
I/O Interface	4 x USB 2.0 3 x RS-232	4 x USB 2.0 4 x RS-232	4 x USB 2.0 2 x USB 3.0 4 x RS-232
Display	1 x VGA	1 x VGA	1 x VGA
Memory	1GB	1GB	2GB
Storage	4GB CF Card	4GB CF Card	8GB CF Card
Fan	Yes	No	No
Chassis	PAC-400	TANK-800	TANK-820
Expansion Slots	PCI Express	PCI Express	PCI Express
Power Supply	130W	130W	180W

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## Teaching Pendant Specifications

- 6.5" easy-to-use control terminal
  - » 800 nits high luminance control terminal with touchscreen to present its graphical user interface.
  - » 6-meter long all-in-one cable allows easy installation
  - » Ergonomic body design, easy to operate
- Durable construction
  - » Completely dust-and splash proof (IP64) design
  - » 1 meter drop resistance
  - » 0°C~50°C extended operating temperature
- Programming with 33-key membrane keypad and safety functions (Emergency stop, 3-position dead-man switch, mode select switch with key)



Robot Controller



Mobile Display

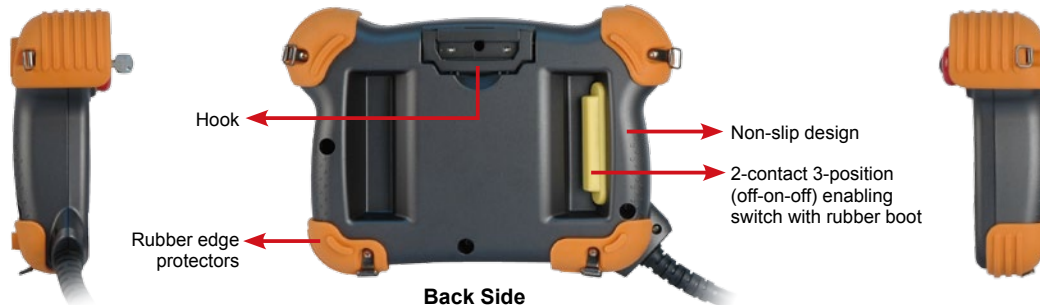
### Optimized keyboard layouts

Taking advantages of both real buttons the interface is straightforward for all users.



Robot-TP-65M

### Equally suitable for right- or left-handed operation



### Allows hours of fatigue-free working

- Adopts strap design to reduce user fatigue.
- Allows the operator to release the hands to do other jobs.
- Greatly enhance the efficiency of the operator.

#### Handheld front view



#### Handheld side view



#### Stably placed on the table



### Ordering Information

Part NO	Description
Robot-TP-65M/K-ML-R10	6.5" 800cd/m <sup>2</sup> VGA TFT LCD teach pendant with touch screen, key switch, 3-position dead-man switch, emergency button, 37-pin military connector, R10
Robot-TP-65M/K-R10	6.5" 800cd/m <sup>2</sup> VGA TFT LCD teach pendant with touch screen, key switch, 3-position dead-man switch, emergency button, R10
Robot-TP-84M/K-ML-R10 (coming soon)	8.4" 250cd/m <sup>2</sup> SVGA TFT LCD teach pendant with touch screen, key switch, 3-position dead-man switch, emergency button, 37-pin military connector, R10
Robot-TP-84M/K-R10 (coming soon)	8.4" 250cd/m <sup>2</sup> SVGA TFT LCD teach pendant with touch screen, key switch, 3-position dead-man switch, emergency button, R10
Robot-TP-84M-R10 (coming soon)	8.4" 250cd/m <sup>2</sup> SVGA TFT LCD teach pendant with touch screen, emergency button, R10

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# Robot Arm Solution

## 7A6 Robot Specifications

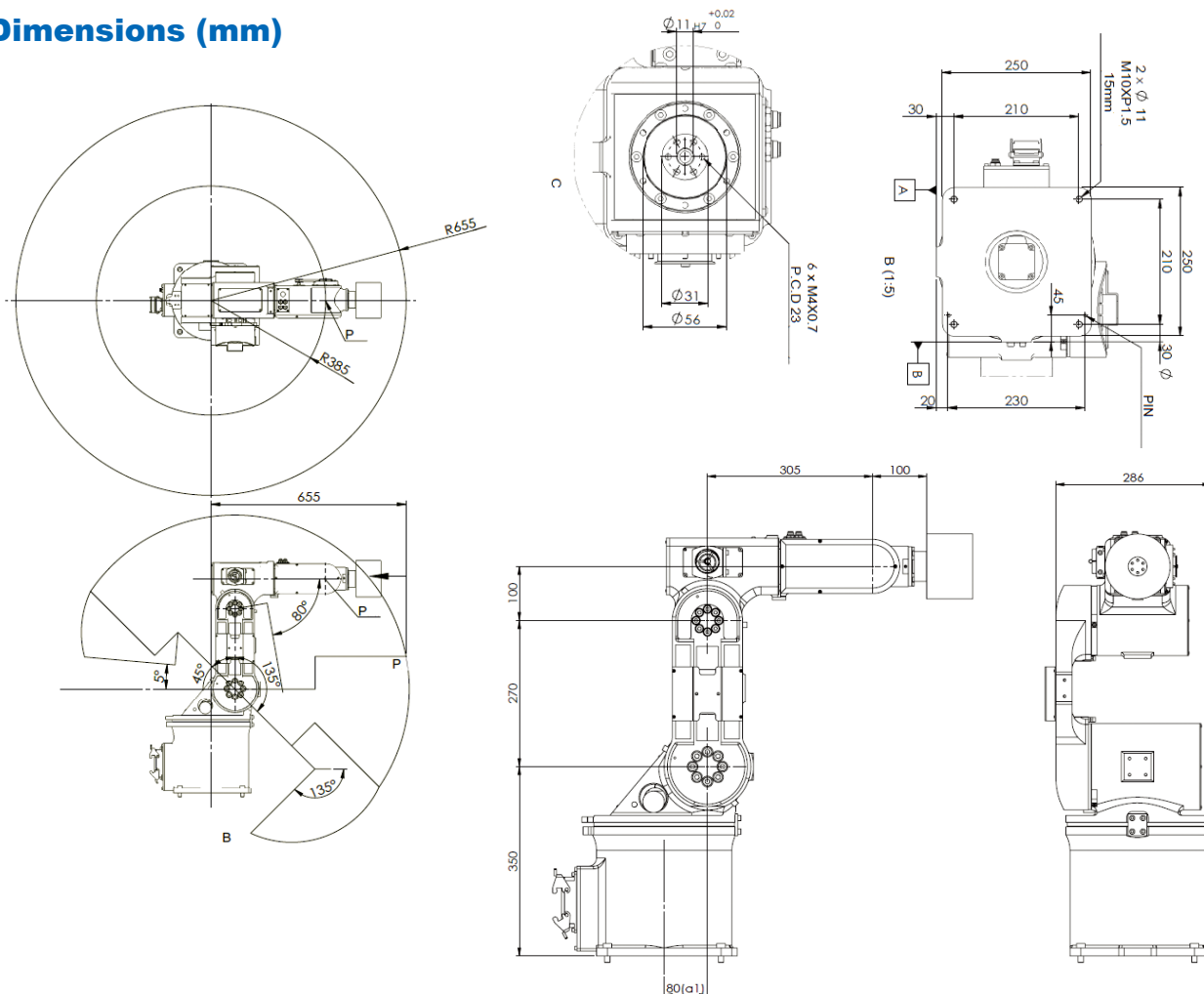
<b>Model</b>	<b>7A6</b>	
<b>P-point Reach (max.)*</b>	655 mm	
<b>P-point Reach (min.)</b>	305 mm	
<b>Maximum Payload</b>	7 kg	
<b>Net Weight</b>	49 kg	
<b>Robot Footprint</b>	250 mm x 250 mm	
<b>Second Arm</b>	305 mm	
<b>Maximum Composite Speed</b>	6165 mm/s	
<b>Point-to-point Cycle Time**</b>	0.7 sec	
<b>Position Repeatability</b>	±0.03 mm	
<b>Allowable Torque</b>	J4, J5	14.0 Nm
	J6	5.8 Nm
<b>Allowable Inertia</b>	J4, J5	0.42 kg-m <sup>2</sup>
	J6	0.1 kg-m <sup>2</sup>
<b>Motion Angle</b>	J1	340° (+170° ~ -170°)
	J2	195° (+135° ~ -60°)
	J3	210° (+170° ~ -40°)
	J4	360° (+180° ~ -180°)
	J5	200° (+100° ~ -100°)
	J6	720° (+360° ~ -360°)



\* : From J1 axis core  
 \*\* : Point-to-point path



### Dimensions (mm)



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