YuMi® – IRB 14000
Overview
YuMi: IRB 14000

Agenda

- Differentiated value proposition
- Overview and vision
- Main features
- Payload
- Working range
- Performance and accuracy
- Main dimensions
- Easy integration
- Outline manipulator

- Table mounting
- IP protection
- ESD protection
- Controller
- Customer benefits
- Key applications and segments
- Summary
Overview
Differentiated value proposition

No barriers, no cages, no zones, YuMi is the first truly collaborative robot solution.
Overview and vision

- The target is to make automation technically and economically feasible for small part assembly.
- The solution shall also be suitable for pre-processing, assembly and packaging of all 3C product and other small devices, e.g. digital cameras, toys, watches, ABB low voltage products.
- The automated cells will co-exist with manual assembly cells and interaction between manual and automated cells must be smooth and safe.
- The robot automation should in principle perform the same work as a skilled assembly worker.
- The robot automation shall be easy to adapt for new conditions and tasks.
Overview and vision
Demand from all industries

<table>
<thead>
<tr>
<th>Target Industry (Consumer)</th>
<th>Market Demand</th>
<th>Market Demand (continued)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Small parts assembly</td>
<td>• Cycle time performance</td>
<td>• IP 30</td>
</tr>
<tr>
<td>• 3C</td>
<td>• Safe by design</td>
<td>• Accuracy and cost efficiency</td>
</tr>
<tr>
<td>• Consumer products</td>
<td>• ESD compliance</td>
<td>• Size of human torso</td>
</tr>
<tr>
<td>• Toy Industry</td>
<td>• Work close with humans</td>
<td>• Portable</td>
</tr>
<tr>
<td>• Watch industry</td>
<td>• Easy to deploy/program</td>
<td></td>
</tr>
</tbody>
</table>

**Most common feedback**

- Fencing and safety are a big part of the cell cost
- Must be able to assemble same parts in fast and accurate manner whilst been safe
- Need to be able to deploy and program
Overview and vision
Target growth markets

Small Parts Assembly
- Collaborative Assembly
- Camera-based inspection and assembly
- Accurate and fast assembly
- Testing and packaging

Consumer Products
- Collaborative Assembly (Plastic parts etc.)
- Packaging of small goods
- Multifunction hand for add components

Toy Industry
- Collaborative Assembly (toys)
- Use of feeding and vision options
# Overview and vision

## Filling a gap

<table>
<thead>
<tr>
<th>Small IRBs</th>
<th>IRB 14000</th>
</tr>
</thead>
</table>
| - Our market in the Small Parts Assembly, has reached great potentials  
  - Good market reputation  
  - Good performance in terms of accuracy and robustness  
  - One major drawback – working close to humans and collaboration  
  - Aim of IRB 14000 is to fill this gap | - Goal is to provide a solution to small parts assembly while providing a cost competitive offering like  
  - Inherent safety  
  - Flexible feeding parts management  
  - Vision-Guided Assembly  
  - Best in class accuracy  
  - Speed effective assembly |
Overview and vision
Leading the competition

- More compact than the competitors
- More precise
- Equipped with an enclosed controller
- Universal parts feeding system
- High-end camera part location
- State of the art motion control
- First safe robot by design
Overview
Current portfolio

Strong robot offering from starting at the IRB 120 to the IRB 7600
Overview and vision
New era in our portfolio

Before robots

After robots

In 1974, the IRB 6 was the start of it all:
The world’s first microprocessor controlled, electrically-driven industrial robot became commercially available.

Becoming more useful
Over time, we have developed robots for many more industries and purposes, bringing the benefits of robots to everyone who needs them.

Becoming smarter

Now - becoming collaborative

Yumii is the world’s first truly collaborative robot, and represents the alliance in what collaborative robotics stand for:

- Mental safety makes it possible for operators to feel safe when working near human operators
- More autonomy for operators to operate in a factory environment

Becoming easier

Making smart robots for every use is only half the story. The real value comes down to making implementation as easy as possible.

ABB’s innovative solutions

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## Main features

<table>
<thead>
<tr>
<th>Feature</th>
<th>IRB 14000 – 0.5/0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payload</td>
<td>0.5 kg per arm</td>
</tr>
<tr>
<td>Reach</td>
<td>559 mm</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.02 mm</td>
</tr>
<tr>
<td>Footprint</td>
<td>399 mm * 497 mm</td>
</tr>
<tr>
<td>Customer interface</td>
<td>Foot interface</td>
</tr>
<tr>
<td>Weight</td>
<td>38 kg</td>
</tr>
<tr>
<td>Mounting position</td>
<td>Table</td>
</tr>
<tr>
<td>Temperature</td>
<td>5 C – 40 C deg</td>
</tr>
<tr>
<td>IP Protection</td>
<td>IP 30</td>
</tr>
<tr>
<td>Clean room / food grade</td>
<td>No</td>
</tr>
</tbody>
</table>
Payload
IRB 14000 0.5/0.55
Working range
IRB 14000 0.5/0.55
Working range: Single arm
IRB 14000 0.5/0.5
## Working range
### Maximum velocity

<table>
<thead>
<tr>
<th>Axis</th>
<th>Motion Range</th>
<th>Max. Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axis 1 Rotation</td>
<td>+168.5° to -168.5°</td>
<td>180 °/s</td>
</tr>
<tr>
<td>Axis 2 Arm</td>
<td>+43.5° to -143.5°</td>
<td>180 °/s</td>
</tr>
<tr>
<td>Axis 7 Rotation</td>
<td>+168.5° to -168.5°</td>
<td>180 °/s</td>
</tr>
<tr>
<td>Axis 3 Arm</td>
<td>+80° to -123.5°</td>
<td>180 °/s</td>
</tr>
<tr>
<td>Axis 4 Wrist</td>
<td>+290° to -290°</td>
<td>400 °/s</td>
</tr>
<tr>
<td>Axis 5 Bend</td>
<td>+138° to -88°</td>
<td>400 °/s</td>
</tr>
<tr>
<td>Axis 6 Turn</td>
<td>+229° to -229°</td>
<td>400 °/s</td>
</tr>
</tbody>
</table>
Main dimensions
IRB 14000 0.5/0.5
Main dimensions
IRB 14000 0.5/0.5
Easy integration
I/O: Customer interfaces

Tool IO L/R, (4+4 Digital IO signals), as alternative to Ethernet on Flange. To be cross-connected to XS8 and XS7. DeviceNet M/S, (default). To internal PCI board.

PROFIBUS (Fieldbus Adapter option is needed)

Service
WLAN

8 DI signals (5mA) and 0V, 24V (to internal DSQC652)
8 DO signals (500mA) and 0V, 24V (from internal DSQC652)

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Easy integration
Customer interfaces

A: Power Switch
B: FlexPendant
C: Power Inlet type (IEC 60320-1 C14) 100-240VAC, 50-60Hz
Easy integration
I/O: Customer interfaces

- Top mounting interface
- Chest mounting interface
- Break release
Easy integration
I/O: Customer interfaces

Tool connector type:
Spring-Loaded Header
Double Row
Example: Mill-Max 813-22-008-30-000101
Easy integration
Mounting interfaces

8 pad Millmax connector for 24V and Ethernet or IO
7.5e8 and 4.4F10 for air
15H7 for alignment
2E8 pin hole for alignment
4 x 2.9 thru holes for M2.5 screws
IRB 14000 0.5/0.55 vs IRB 1200-7/0.7
Outline manipulator
YuMi: IRB 14000
Table mounting
IP protection

IP 30 (Standard)

- It is sufficient for assembly
ESD protection

It makes it possible to handle static sensitive parts
YuMi: IRB 14000
Controller

- Embedded controller based on IRC5
- Portable (38kg)
- External connectors
- Built-in 8 in / 8 out
Customer benefits

- **Padded arms** - Including internal wiring and air
- **Integral controller** - New in ABB portfolio
- **Light construction** – Makes the robot portable
- **Ease-of-use** – Lead Through Programming
- **Enclosed design** – Lower maintenance
- **Wide range of communications options** – easy to interface
- **High speed 1500mm** – ROI is increased
- **Dual arm** – Multi-tasking
- **Integrated vision** – Built into product
- **ESD compliance** – Can work with open electronics
- **Safety certified** – Certified by an independent body
- **Integrated hand** – Easy to integrate
Customer benefits

Padded arms

- Adds to safety of operators if there is an unlikely contact during operation
- The robot can be run faster due to added protection
- Faster robot means the ROI will be greater
Customer benefits

**Integral controller**
- Saves working space
- Better cell layout
- Equipment can be placed closer to, or around, robot without interference
- Robot is more streamlined and easy to relocate
- No floor cables or control cables
Customer benefits

Lightweight construction

- Makes the robot portable
- Added to safety of the robot
- Smaller frame to mount the robot
Customer benefits

Ease-of-use

- Lead-Through Programming makes the programming easy
- Integrated vision can pick unsorted parts
- Tablet programming can be wireless saving the need for wires
- Standard IRC5 rapid as other ABB robots
Customer benefits

Enclosed design, which allows all wiring and air to go through the inside of the robot

- Reduced maintenance
- Less risk of cable and air hose damaged
- Can be used in confined spaces
- Easy to keep clean
- No risk of dust collecting on cables
Customer benefits

Wide range of communications options

- No problem to connect other devices
- Not locked into one option
- Pick your standard so you do not have to train your staff
Customer benefits

Best in class 1500 mm/sec collaboration speed

- Higher output, increases productivity
- Speed and safety at the same time
- Cutting-edge design standards
Customer benefits

Dual arm

- Possible to achieve contact force assembly between arms
- Can process two tasks at the same time
- Operation similar to a human assembling
Customer benefits

Integrated vision

- Cameras embedded in gripper
- Integrated hands makes it possible to use the hand for vision guided
- Can be used for simple inspection
Customer benefits

**ESD compliance**

- No problems with static discharge
- Perfect for electronic assembly
- No need to test as we have certified the robot
Customer benefits

Safety certified

- No need to certify the robot
- Can be included in your risk assessment of the cell
- Independent body has certified the robot
- PL b Cat b
Customer benefits

Integrated hand

- No need to design your own hand
- Multi-option hand with five options
- Integrated communications and air
- Servo
- Vacuum
- Camera
Key applications and segments

- **Applications**
  - **Be suitable for**
    - Small Parts Assembly
    - Collaborative Assembly
    - Accurate and fast assembly
    - Testing and packaging
  - **Be not suitable for**
    - Paint
    - Food grade
    - Clean room

- **Segments**
  - Electronics assembly
    - Collaborative Assembly
    - Packaging of small goods
    - Multi-functional hand for odd sized components
  - Toy industry
    - Collaborative Assembly (plastics)
    - Use of feeding and vision options
Key applications and segments
Assembly

Small Parts Assembly
- IRB 14000 is the perfect alternative/complementary for IRB 120 or IRB 1200 in small parts assembly
- Safe collaborative assembly
- Precise 0.02 repeatability for small tasks
Key applications and segments

Vision Guided-Assembly

- Vision included in hands as package
- Vision can also be connected to robot for external devices like flex feeders
- This makes it possible to have less jigging and move to a more flexible cell design
Key applications and segments

Small Parts Assembly using the FlexFeeder™s and ABB gripper

- Gripper and FlexFeeders make it possible to have a complete solution from part handling to assembly

- Odd sorted parts can be placed in FlexFeeders and presented to the robot in a two dimensional plane
Key applications and segments

Small Parts Material Handling

- After the assembly process is complete the robot can place the finished product in box ready for shipment

- YuMi working side-by-side handing finished parts to be packed
Summary

Safe and collaborative
- No cages needed
- Padded arms and light weight design
- Speed limited

Increased ROI
- fast accurate assembly, lower maintenance costs

Ease-of-integration
- Wide range of communications interfaces
- Integrated hand equipped with vision
- Integrated controller
- Light weight and portable

Ease-of-use
- Lead-Through Programming
Power and productivity for a better world™