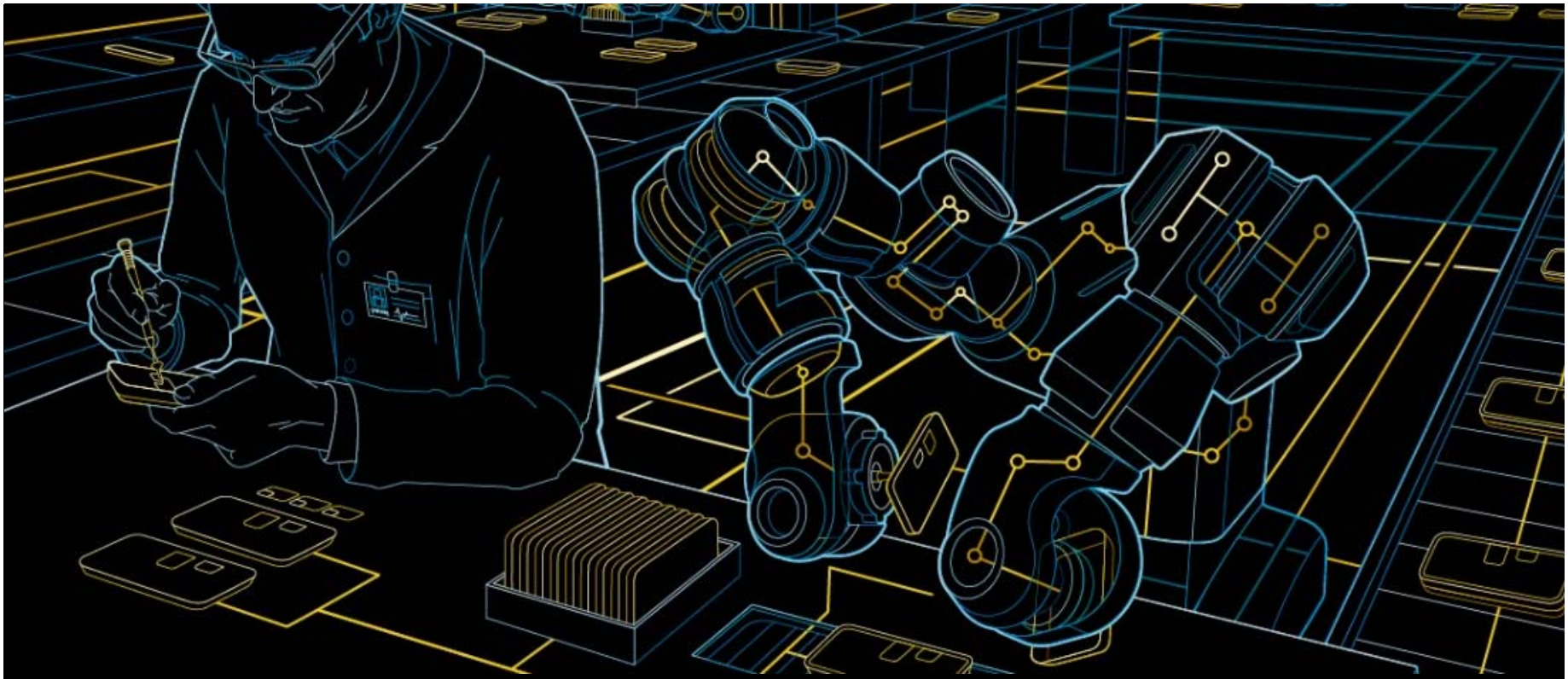


Phil Crowther, Product Management, April 2015

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

Target Industry
(Consumer)

- Small parts assembly
- 3C
- Consumer products
- Toy Industry
- Watch industry

Market Demand

- Cycle time performance
- Safe by design
- ESD compliance
- Work close with humans
- Easy to depoly/program

Market Demand
(continued)

- IP 30
- Accuracy and cost efficiency
- Size of human torso
- Portable

Most common feedback

- Fencing and saftey 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 depoly and program

Overview and vision
Target growth markets

Small Parts Assembly	Consumer Products	Toy Industry
▪ Collaborative Assembly ▪ Camera-based inspection and assembly ▪ Accurate and fast assembly ▪ Testing and packaging	▪ Collaborative Assembly (Plastic parts etc.) ▪ Packaging of small goods ▪ Multifunction hand for add components	▪ Collaborative Assembly (toys) ▪ Use of feeding and vision options

Overview and vision
Filling a gap

Small IRBs	IRB 14000

▪ 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

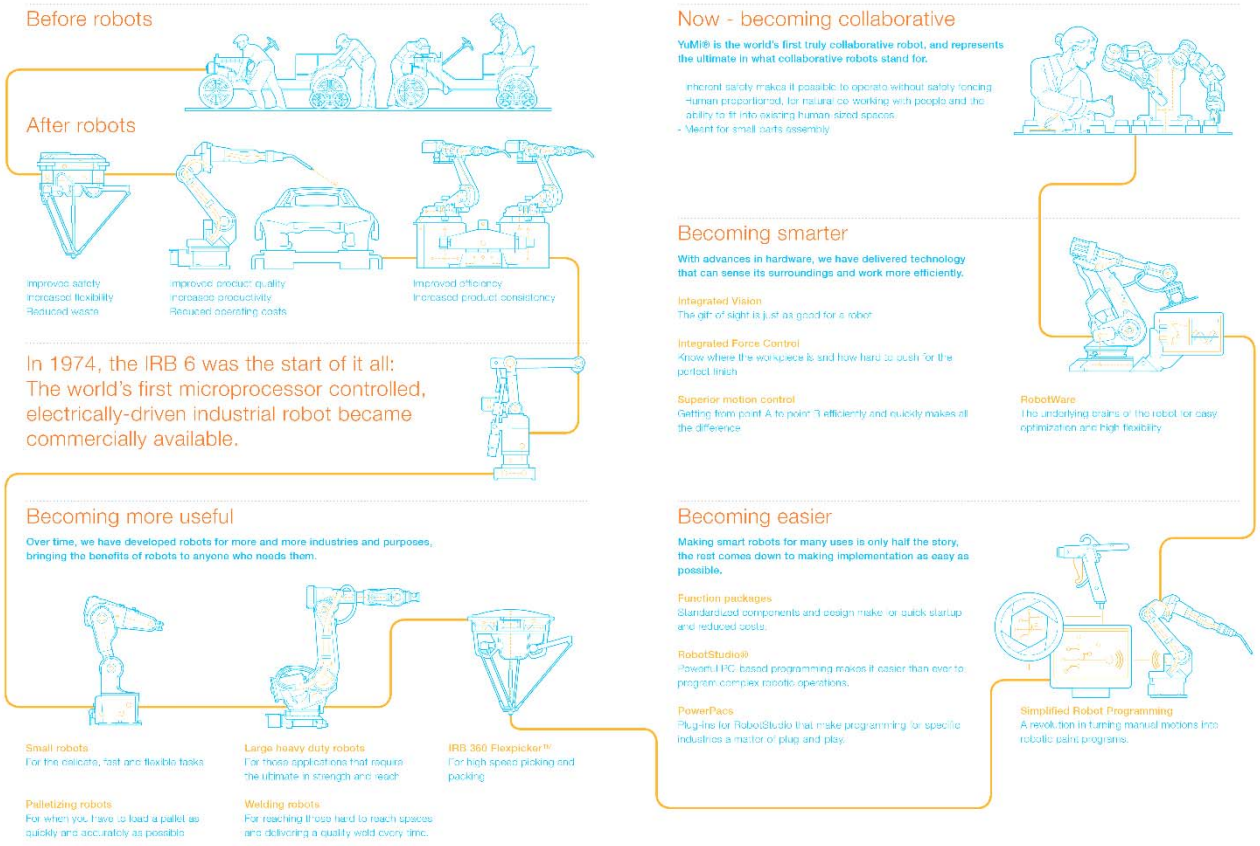
- More compact than the competitors
- More precise
- Equipped with an enclosed controller

- 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

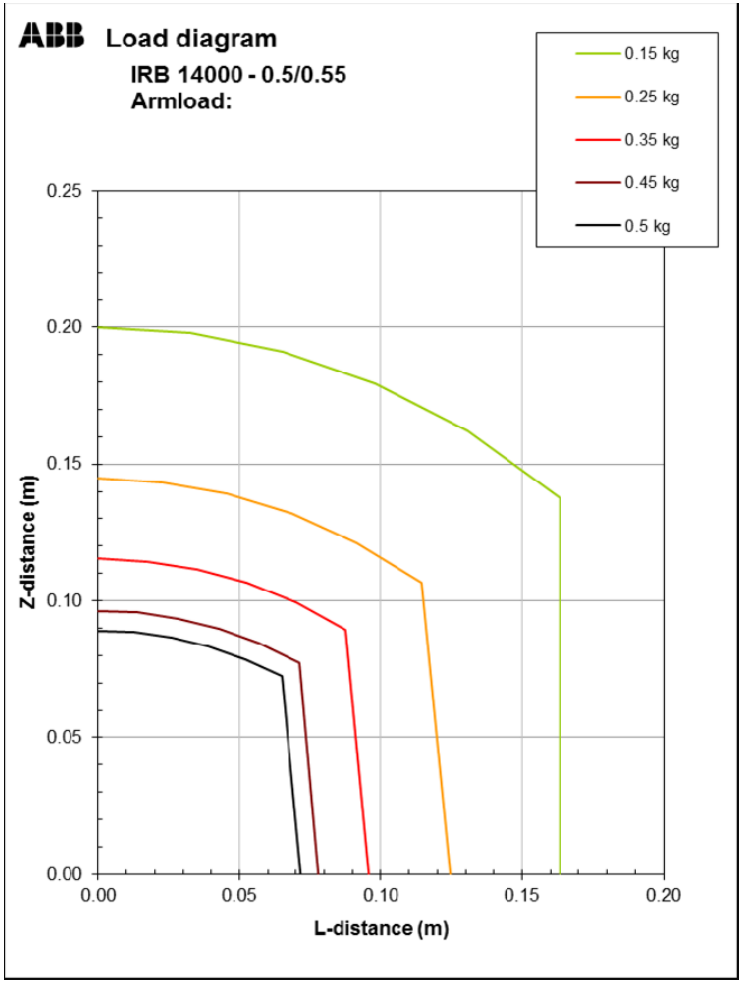
Overview and vision
New era in our portfolio



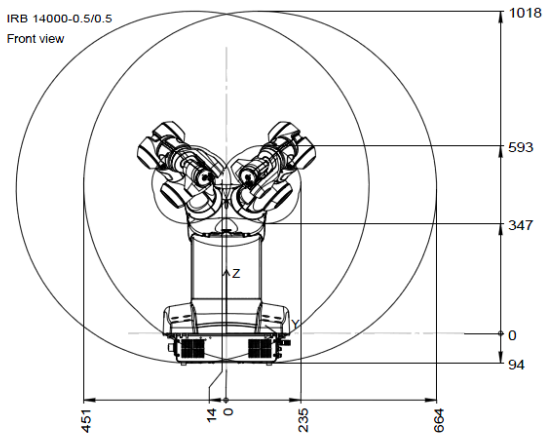
Main features

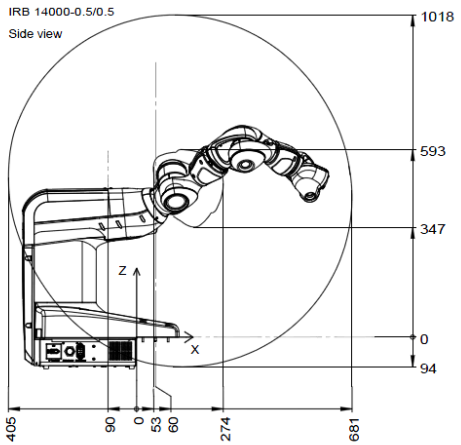
	IRB 14000 – 0.5/0.55
Payload	0.5 kg per arm
Reach	559 mm
Accuracy	0.02 mm
Footprint	399 mm * 497 mm
Customer interface	Foot interface
Weight	38 kg
Mounting position	Table
Temperature	5 C – 40 C deg
IP Protection	IP 30
Clean room / food grade	No

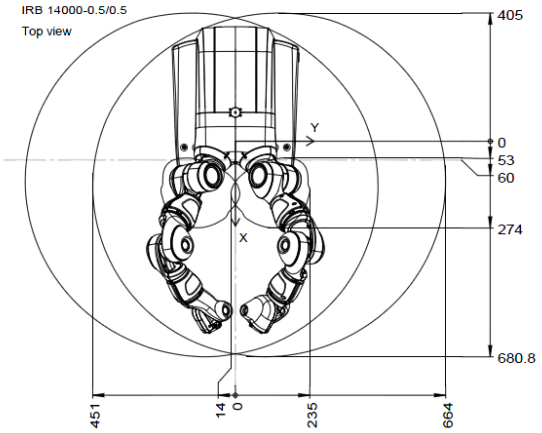
Payload
IRB 14000 0.5/0.55

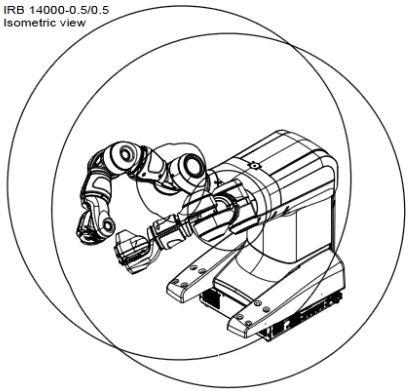


Working range
IRB 14000 0.5/0.55

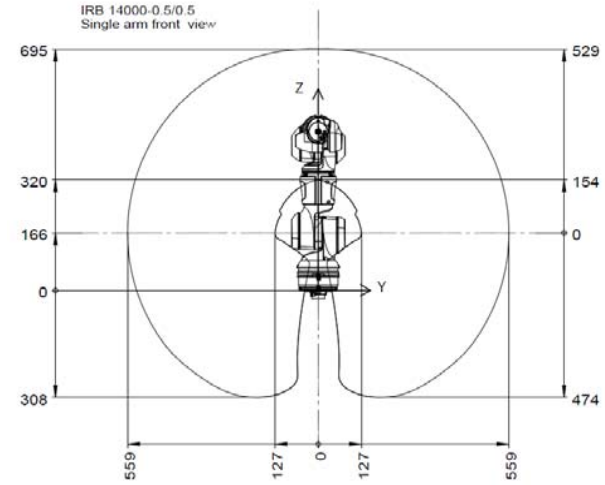


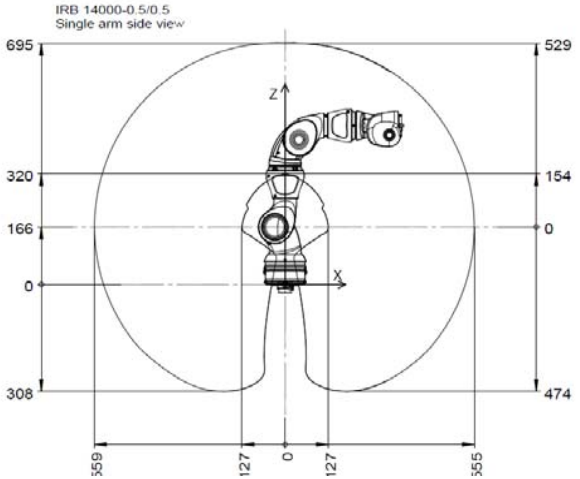


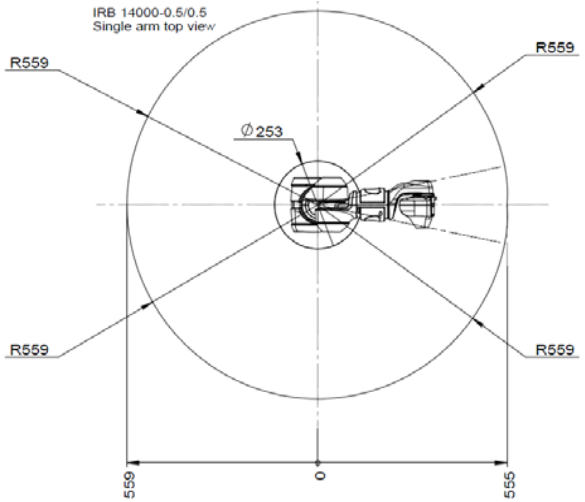


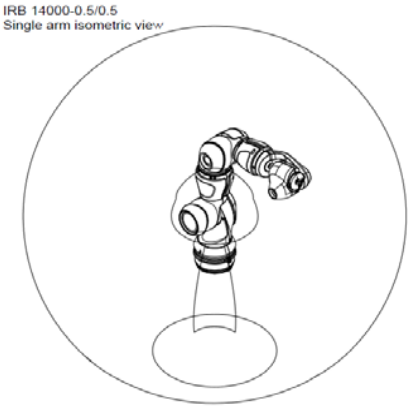


Working range: Single arm
IRB 14000 0.5/0.55





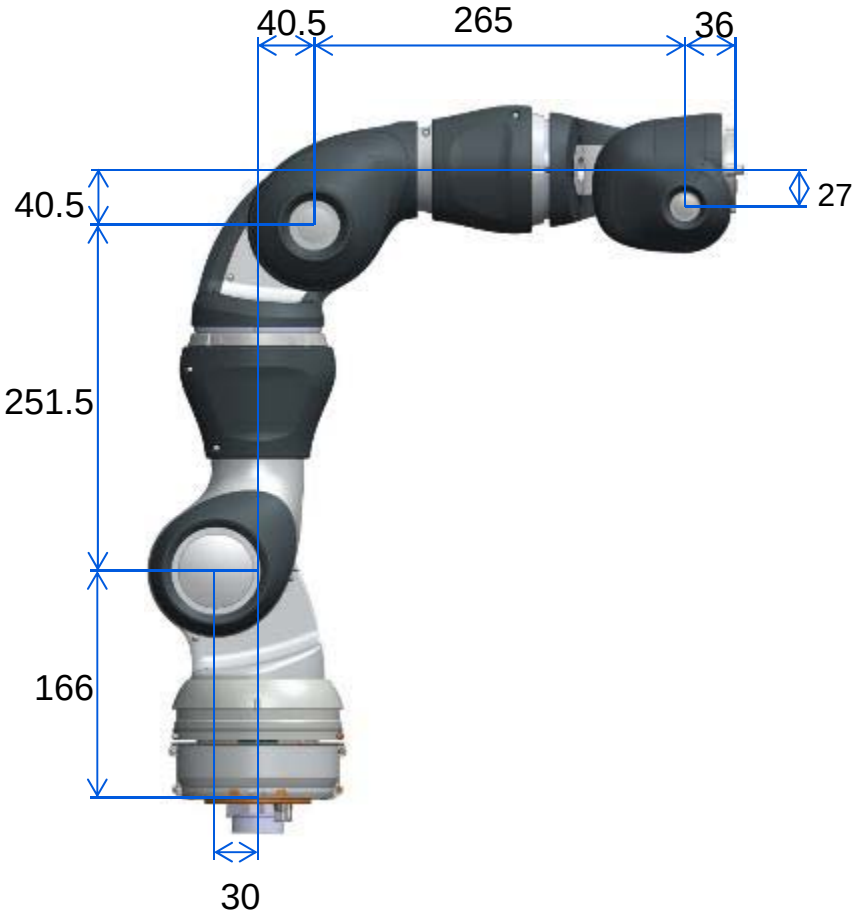




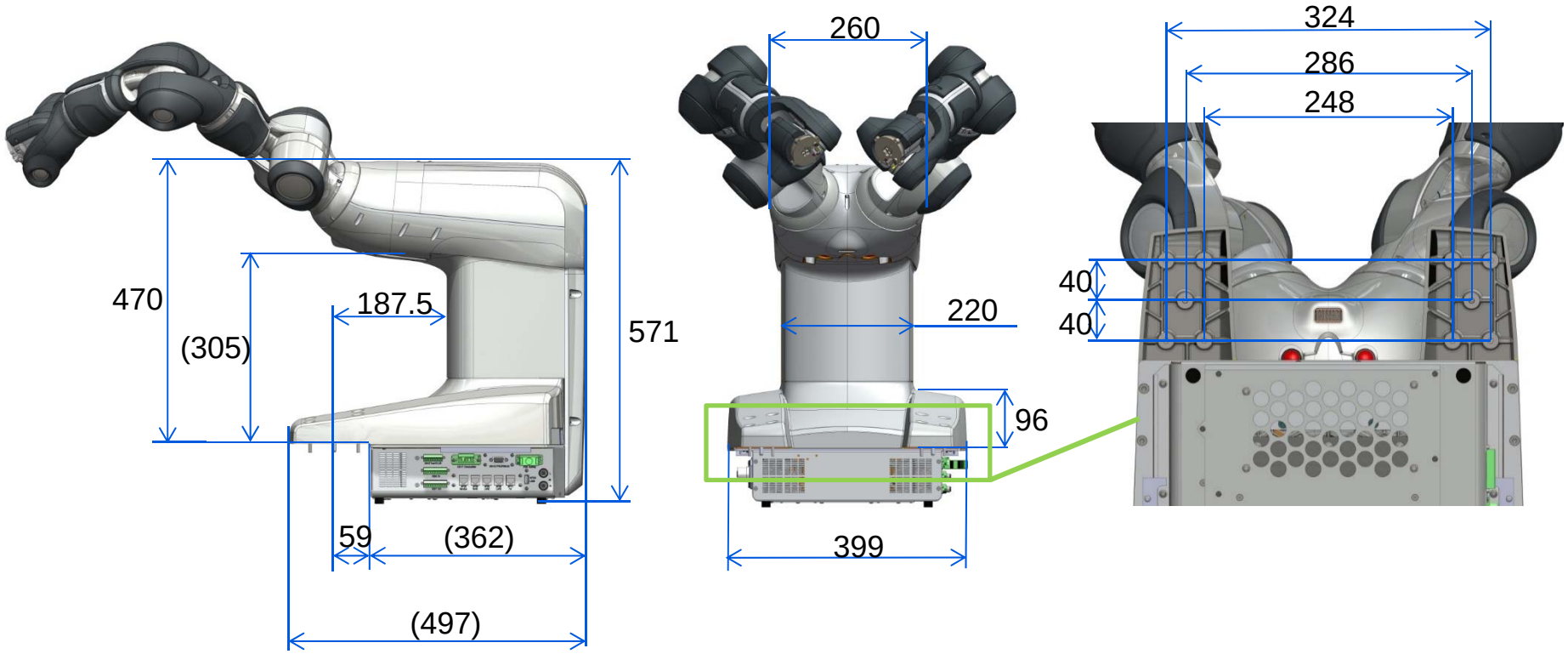
Working range
Maximum velocity

	Motion Range	Max. Velocity
Axis 1 Rotation	+168.5° to -168.5 °	180 °/s
Axis 2 Arm	+43.5° to -143.5 °	180 °/s
Axis 7 Rotation	+168.5° to -168.5 °	180 °/s
Axis 3 Arm	+80° to -123.5 °	180 °/s
Axis 4 Wrist	+290° to -290 °	400 °/s
Axis 5 Bend	+138° to -88°	400 °/s
Axis 6 Turn	+229° to -229 °	400 °/s

Main dimensions
IRB 14000 0.5/0.5



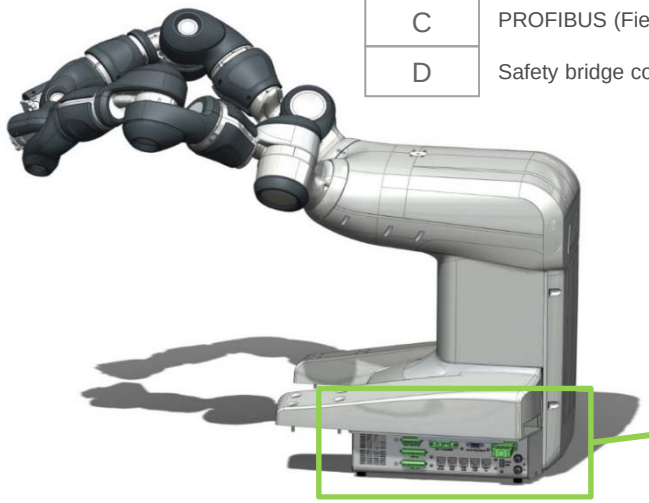
Main dimensions
IRB 14000 0.5/0.5

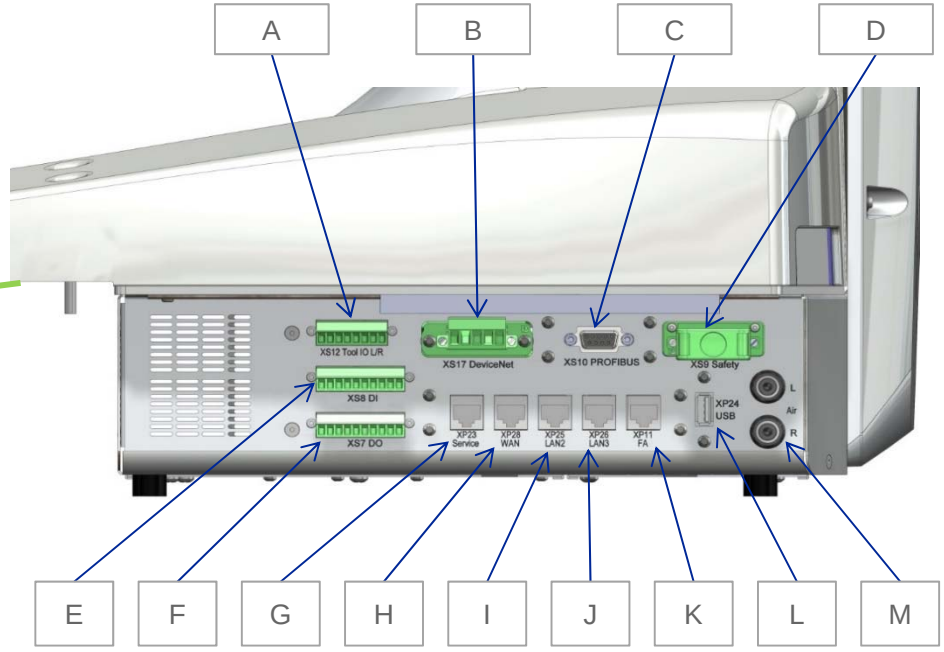


Easy integration
I/O: Customer interfaces

A	Tool IO L/R, (4+4 Digital IO signals), as alternative to Ethernet on Flange. To be cross-connected to XS8 and XS7.
B	DeviceNet M/S, (default). To internal PCI board.
C	PROFIBUS (Fieldbus Adapter option is needed)
D	Safety bridge connector

E	8 DI signals (5mA) and 0V, 24V (to internal DSQC652)
F	8 DO signals (500mA) and 0V, 24V (from internal DSQC652)
G	Service
H	WLAN



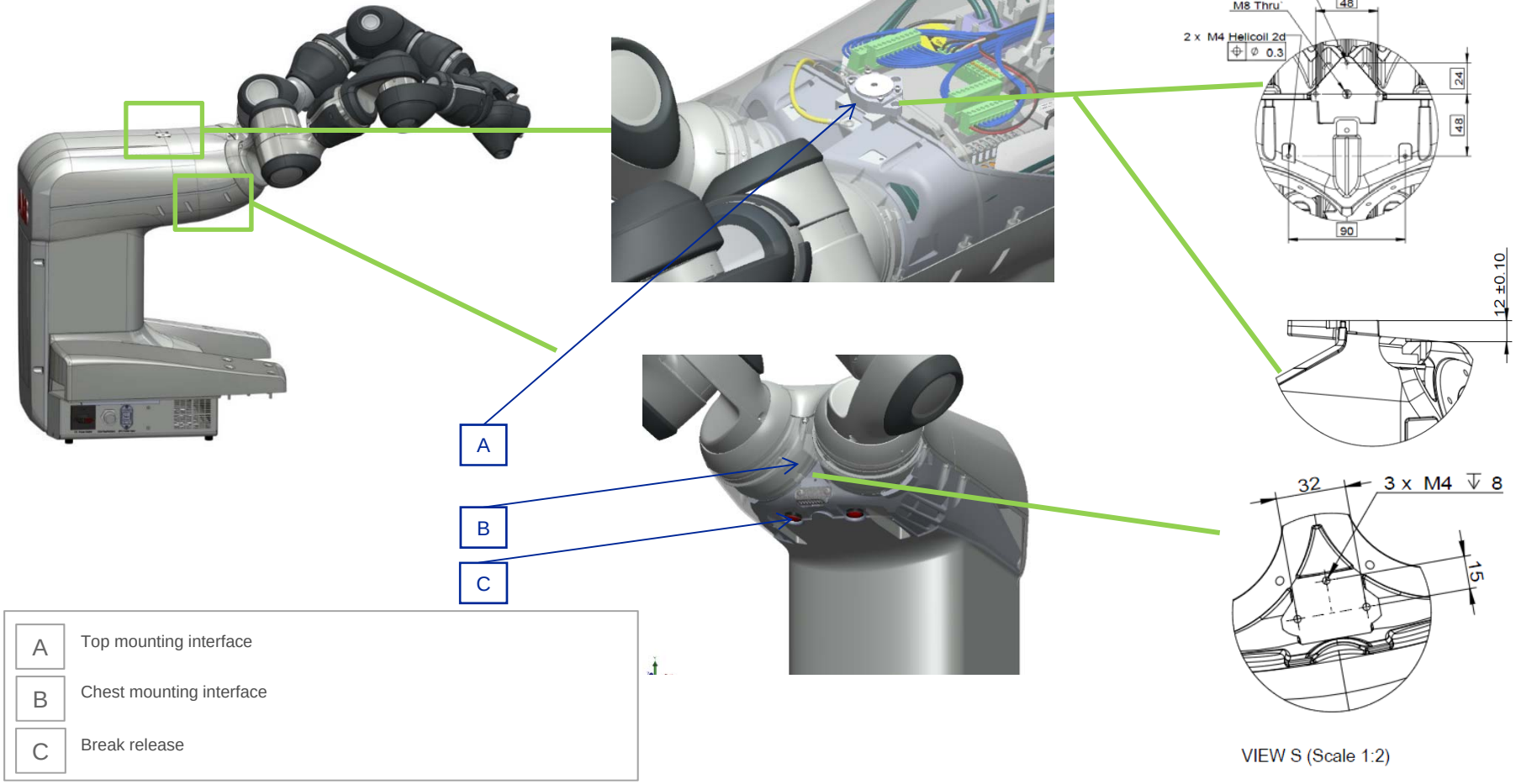


I	LAN2
J	LAN3
K	FA (with Fieldbus adapter options, EtherNet IP or ProfiNet)
L	X10.USB2 port from main computer
M	4mm air hose, 0.5MPa air pressure

Easy integration
Customer interfaces

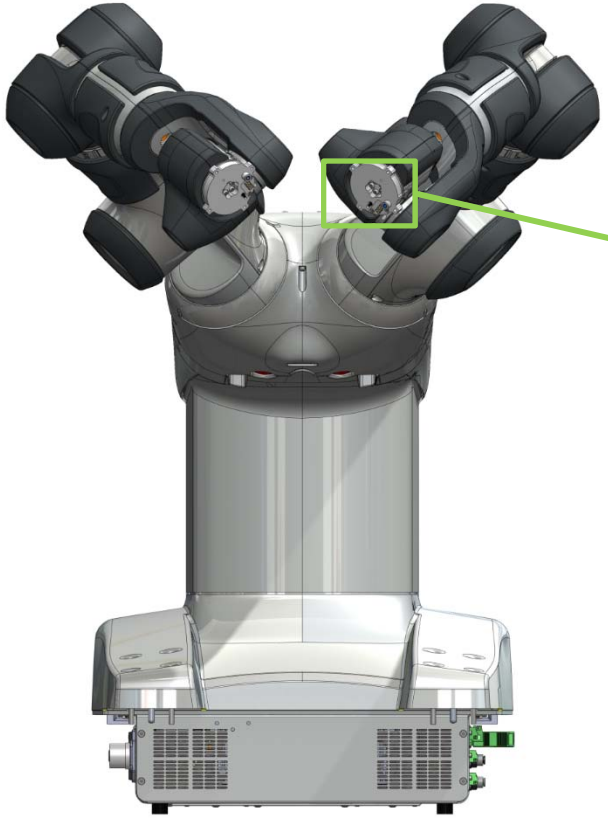
A	Power Switch
B	FlexPendant
C	Power Inlet type (IEC 60320-1 C14) 100-240VAC, 50-60Hz

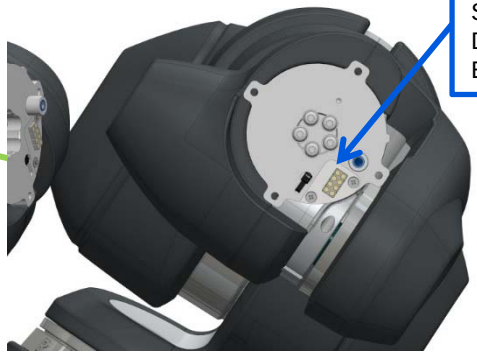
Easy integration
I/O: Customer interfaces



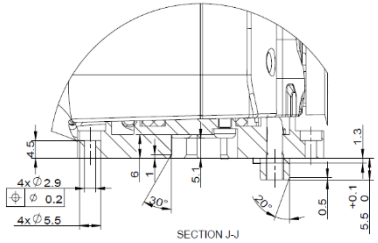
A	Top mounting interface
B	Chest mounting interface
C	Break release

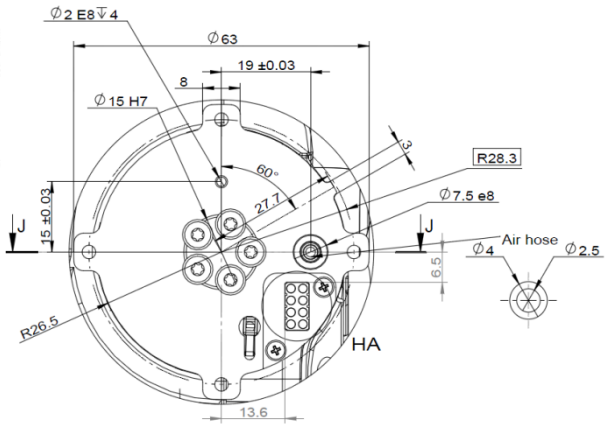
Easy integration
I/O: Customer interfaces

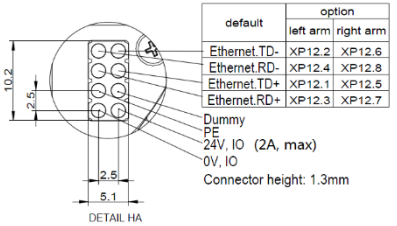




Tool connector type:
Spring-Loaded Header
Double Row
Example：Mill-Max 813-22-008-30-000101



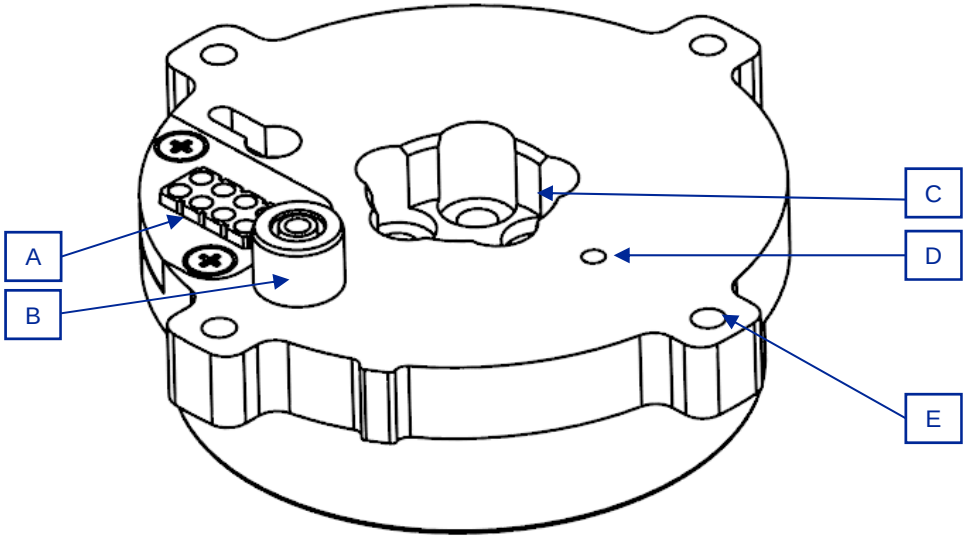




default	option	
	left arm	right arm
Ethernet.TD-	XP12.2	XP12.6
Ethernet.RD-	XP12.4	XP12.8
Ethernet.TD+	XP12.1	XP12.5
Ethernet.RD+	XP12.3	XP12.7

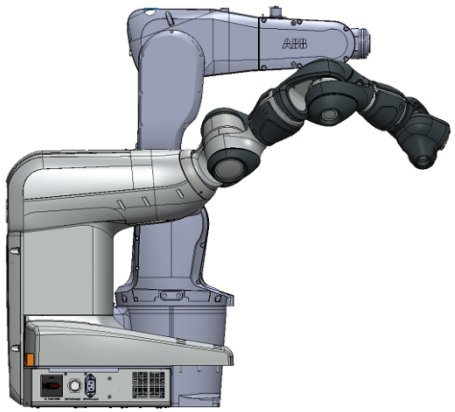
Dummy
PE
24V, IO (2A, max)
0V, IO
Connector height: 1.3mm

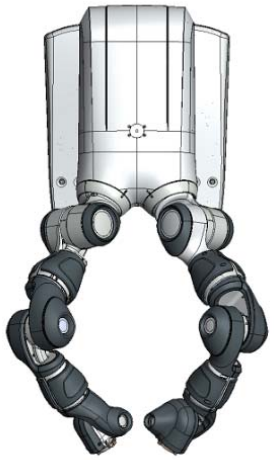
Easy integration
Mounting interfaces

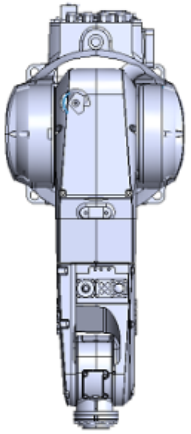


A	8 pad Millmax connector for 24V and Ethernet or IO
B	7.5e8 and 4.4F10 for air .
C	15H7 for alignment
D	2E8 pin hole for alignment
E	4 x 2.9 thru holes for M2.5 screws

IRB 14000 0.5/0.55 vs IRB 1200-7/0.7
Outline manipulator

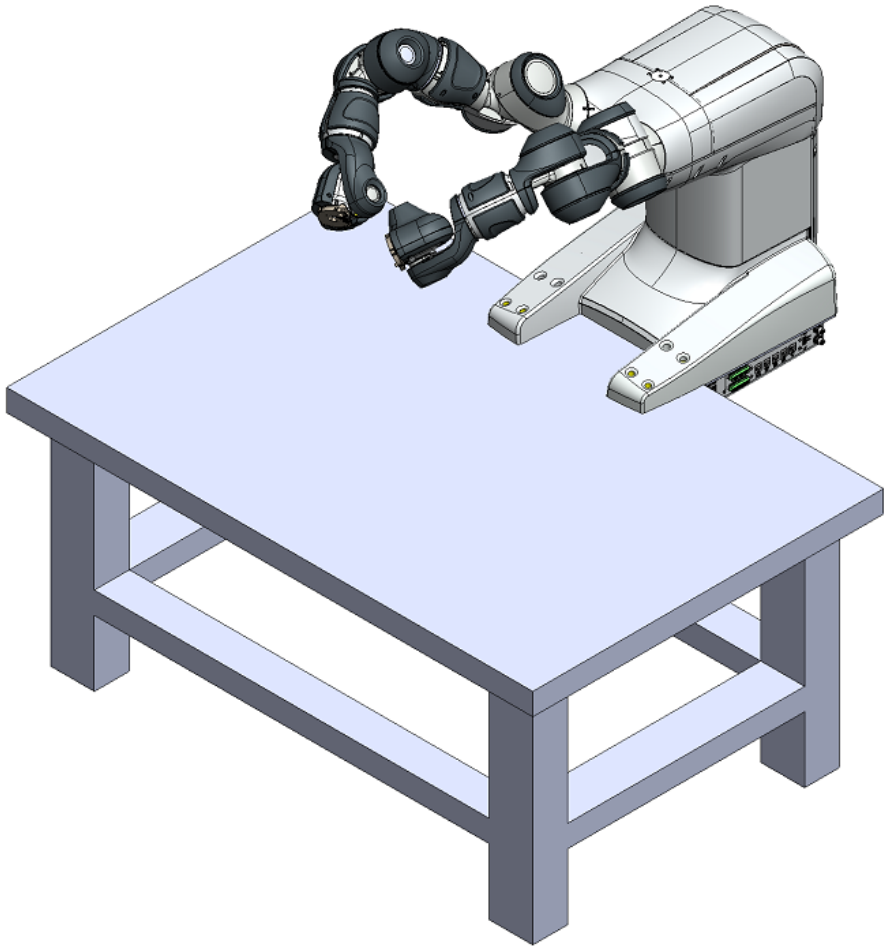






Front view | **Side view** | **Top view**

YuMi: IRB 14000
Table mounting

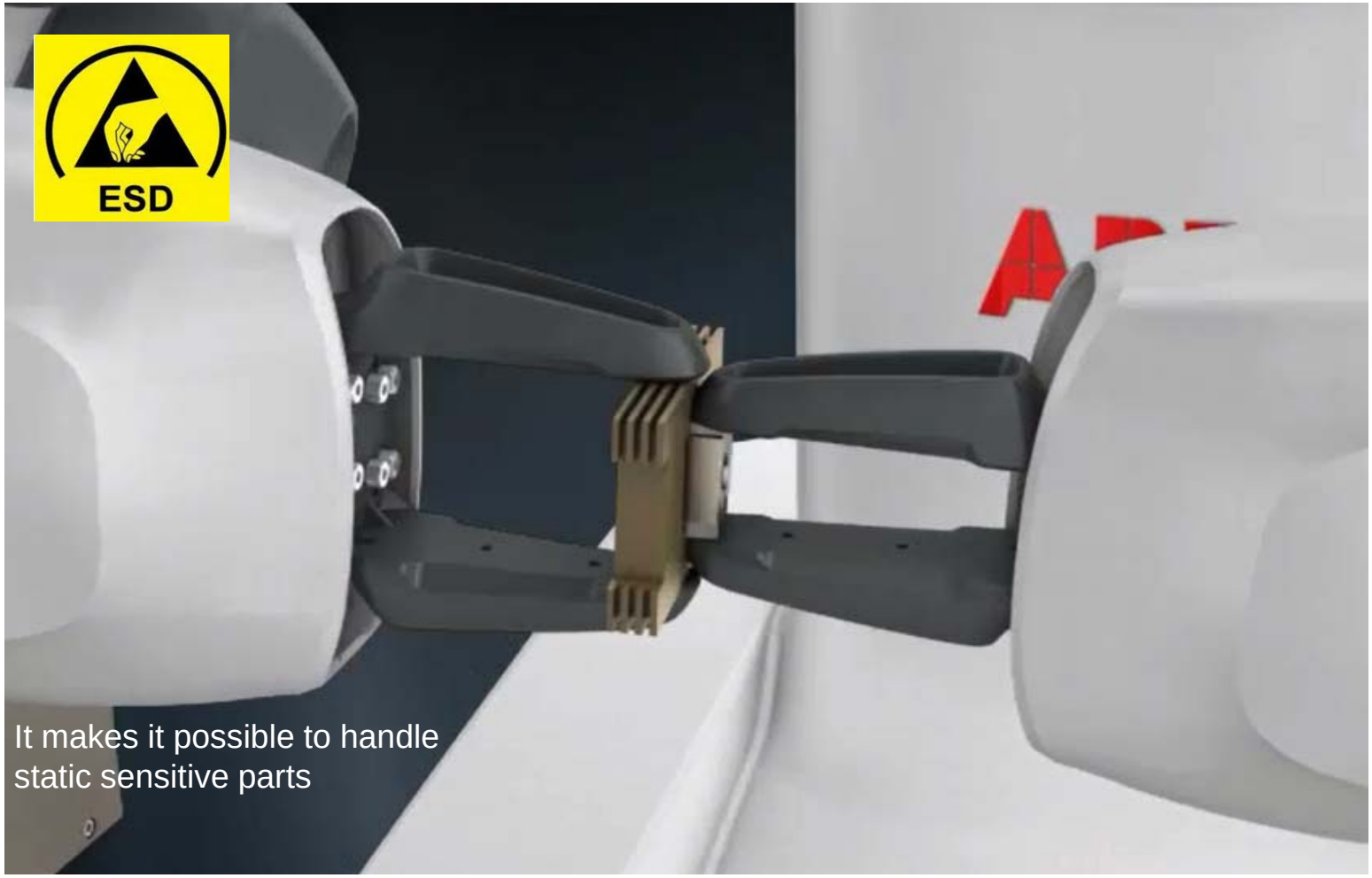


IP protection

IP 30 (Standard)

- It is sufficient for assembly

ESD protection



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 Programing
- **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 in to 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

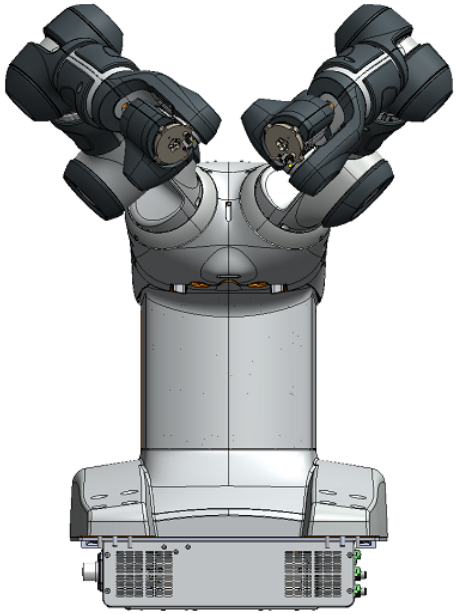
- No problem to connect other devices
- Not locked into one option
- Pick your standard so you do not have to train your staff

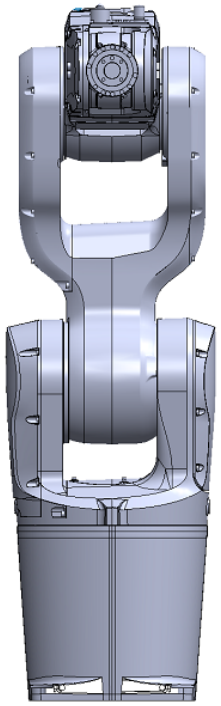
Customer benefits

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 vison 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

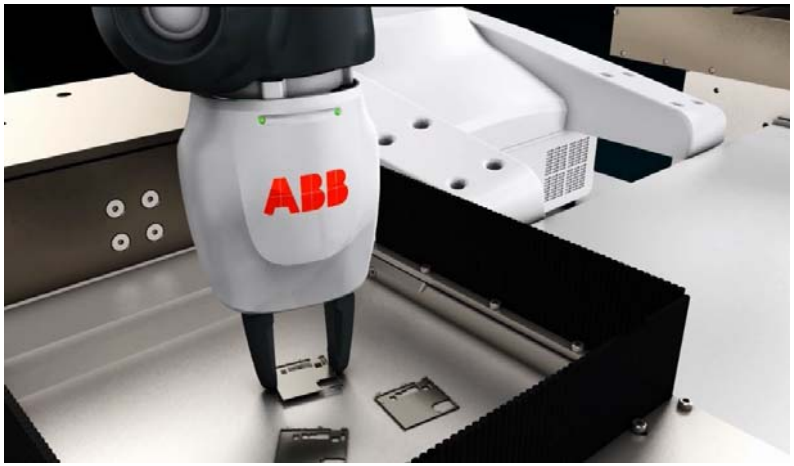
- IRB 14000 is the perfect alternative/complementary for IRB 120 or IRB 1200 in small parts assembly
- Safe collaborative assembly
- Precise 0.02 repeatability for small tasks

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

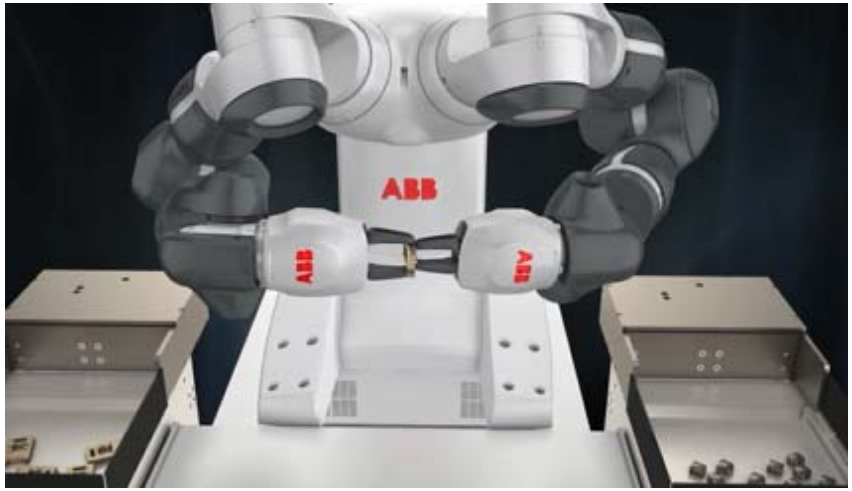


Small Parts Assembly using the FlexFeeder™s and ABB gripper

- 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 Handing

- 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 communcations 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™