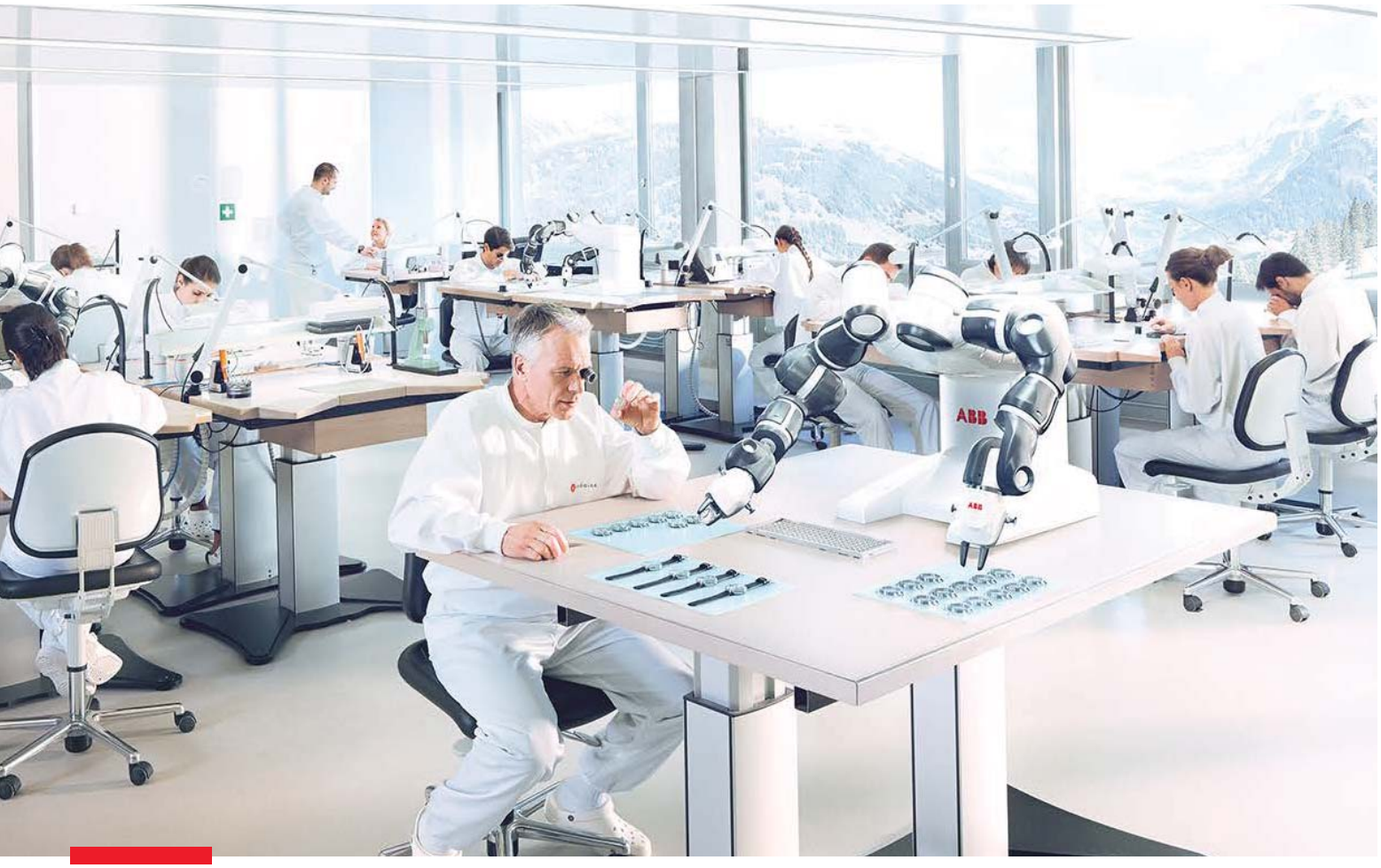


Robotics product range

Helping our customers make the journey to the flexible, efficient factory of the future while continuing to make work more meaningful

- **Collaboration: flexibility to accommodate low volume, high mix, short cycle production**
- **Simplification: managing increased automation complexity and making robots easier to use**
- **Digitalization: unlocking new levels of performance and reliability in connected robots**

ABB Robotics is a pioneer in industrial and collaborative robots and advanced digital services. As one of the world's leading robotics suppliers, we are active in 53 countries and over 100 locations and have shipped over 300,000 robot solutions in a diverse range of industries and applications. We help our customers to improve flexibility, efficiency, safety and reliability, while moving towards the connected and collaborative factory of the future.

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The Factory of the Future
Flexible for growth, efficient at every level

It is not easy to compete while the ground is shifting under your feet. In many industries ‘high mix, low volume’ is the new normal, while automation becomes more complex and product cycles shorter. Is your business ready?

Powerful performance can be unlocked by connecting the virtual world with physical robots, systems and equipment in factories.

The factory of the future is smart and connected. However, adapting to the realities of today’s manufacturing environment can carry unique pain points:

- Shop floor disruptions and higher engineering costs from more frequent line changes
- Managing increasingly complex automation processes and data
- Higher cost of downtime from shorter product lifecycles
- Lost productivity to maintain safety with the increased need for human and robot interaction

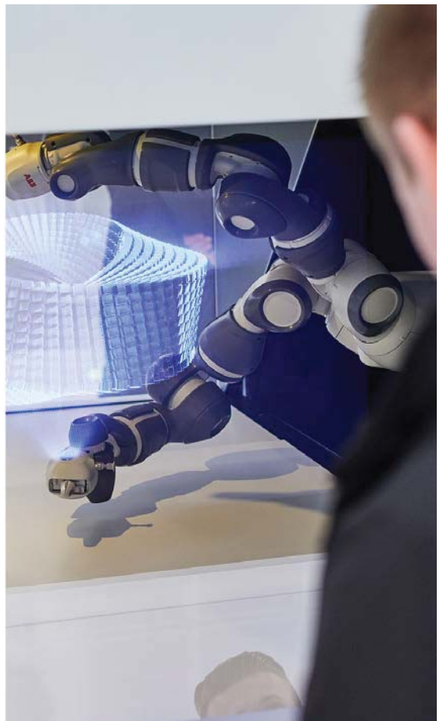
ABB is helping its customers make the journey to the factory of the future – one which is flexible for new growth opportunities and efficient through the entire automation lifecycle.

We combine the experience of 300,00 plus delivered robots with our deep domain expertise and first-mover advantage in digital to prepare our customers to meet tomorrow’s challenges, today.

ABB focuses on three building blocks for the factory of the future – Collaboration, Simplification, and Digitalization.







SafeMove2 allows people to work closer to robots without unnecessary stoppages.

Collaboration

Collaboration is not only about safety or ‘co-bots,’ it means people and robots working close together with flexibility and productivity. Collaboration also means your robotic solutions are part of the manufacturing ecosystem, not separate islands of automation.



Lead through programming allows even untrained users to quickly setup robots.

Simplification

Robots that are easy to install, program, and use are imperative to global enterprises & local manufacturing shops alike. As automation becomes more complex, it also becomes more critical to have intuitive dashboards that help people make better decisions.



ABB Ability™ Connected Services provides pro-active intelligence that can reduce incidents by up to 25%.

Digitalization

Securely connecting robots to the digital world can improve the efficiency of each step of the automation lifecycle: engineering, commissioning, operations and maintenance.

Advanced analytics can help improve the performance and reliability of single robots, systems, or even entire fleets across several locations.



YuMi®: Creating an automated future together.
You and Me.

— 01 YuMi assembles USB sticks at DEONET in the Netherlands.

— 02 YuMi manufactures sockets at ABB's plant in the Czech Republic.

— 03 YuMi makes electrical socket in Ede, the Netherlands.

The new era of robotic co-workers is here. YuMi® is the result of years of research and development, making collaboration between humans and robots a reality, but it is also much more.

ABB has developed a collaborative, dual arm, small parts assembly robot solution that includes flexible hands, parts feeding systems, camera-based part location and state-of-the-art robot control. YuMi is a vision of the future. YuMi will change the way we think about assembly automation. YuMi is "you and me", working together to create endless possibilities.

Human - robot collaboration
YumI is the innovative human-friendly dual arm robot with breakthrough functionality designed to unlock vast global additional automation potential in the industry.

YuMi is designed for a new era of automation, for example in small parts assembly, where people and robots work side-by-side on the same tasks. Safety is built into the functionality of the robot itself. YuMi® removes the barriers to collaboration by making fencing and cages a thing of the past.

At only 38 kg and approximately the size of a small human, YuMi is quickly and easily installed on the production line to work hand-in-hand with a human colleague. Lead-through programming means YuMi® can be taught a process by being physically guided through it, eliminating the need for complex, time-consuming code-based instruction.

World's first **truly collaborative** human sized dual-arm robot

Precise YuMi **is accurate enough** to thread a needle

Safe, Integrated collision detection, soft padding, and **eliminated** pinch points

Intuitive **lead-through** programming requries **no special training** or programming skills



— 01



— 02



— 03

Customer Service
Value-added services across the entire life cycle

—
ABB Robotics customer service is dedicated to securing your productivity - anytime. anywhere. For support, dial 1-800-HELP-365

At your service. Worldwide.
ABB Robotics Customer Service helps its customers to increase uptime, resolve issues faster and reduce lifetime ownership costs. This includes unlocking the benefits of connected robots & advanced analytics.

ABB Robotics is an innovator in advanced, digital services, having introduced its Remote Services offering over a decade ago, long before 'the Internet of Things" was even coined. Today all ABB robots are delivered with embedded connectivity, and there are more than 6,000 ABB connected robots in 750+ customer sites in 40 countries.

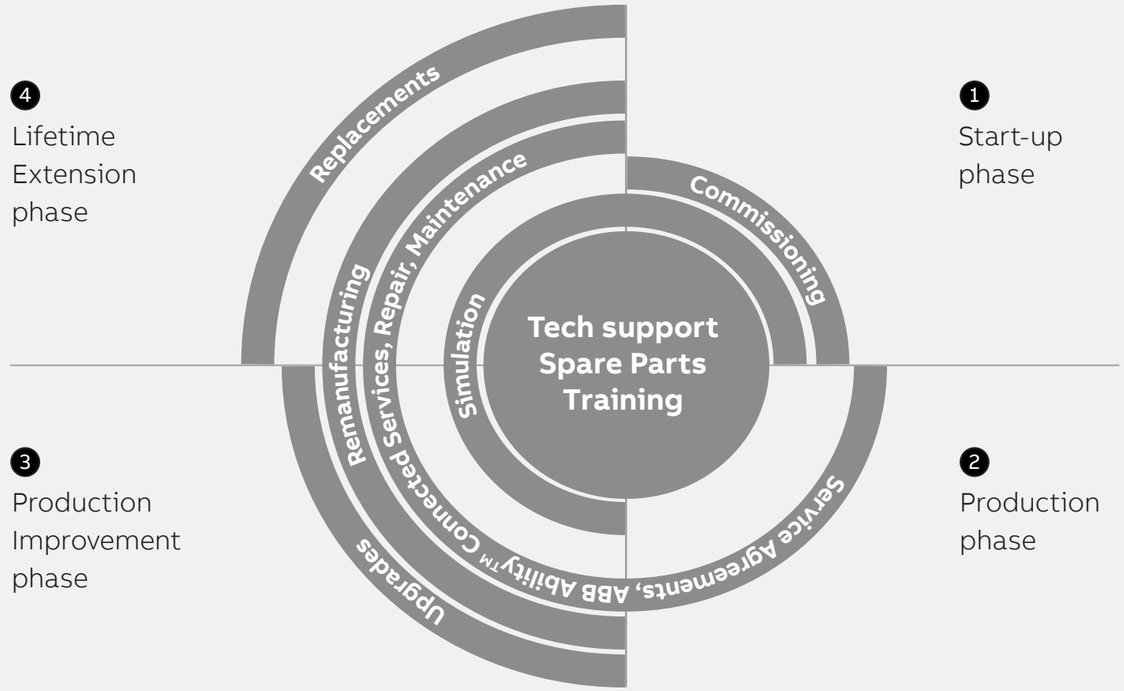
This is part of the largest service offering and broadest service network in the industry, including over 1,600 service professionals in 53 countries and 24/7 global support through dedicated call centers for immediate response. ABB's comprehensive offering also includes parts and logistics, field service, training, and expert systems and application services based on ABB's experience from having sold more than 300,000 robots.

Robot Care Service Agreements
A Robot Care service agreement from ABB, ensures that unplanned stops are reduced to a minimum, and if they occur, ABB can deliver a fast response tailored to your needs, further supported via ABB Ability™ Connected Services.

Within the selectable options of our service agreement configuration tool, our experts stand ready to help you choose the service solution that suits your needs. In addition to our flexible service agreements, we offer four standardized Robot Care service agreement packages that are based on extensive experience and an understanding of customer needs.

Value-added life cycle services
Our service teams are on call 24/7 to provide the support you need to maximize your productivity no matter the type, model or age of the robots. For optimized return on equipment investment, you can depend on ABB Robotics' support during the four life cycle phases of your robot system.





—
01 ABB Robotics' value-added life cycle services

Start-up phase
During the installation Start-up phase, ABB ensures a fast ramp-up, the right operations, and guarantees the longest possible equipment lifetime. This is enabled by simulation and offline programming with RobotStudio®, as well as commissioning services, training, spare part packages and technical support.

Benefits:
- Faster ramp-up
- Risk reduction
- Secured long equipment lifetime

Production phase
For the Production phase, ABB ensures production continuity, increased uptime, availability and cost control. This is secured by our service agreements with ABB Ability Connected Services, Preventive Maintenance and Repair services.

Benefits:
- Production continuity
- Increased uptime
- Increased availability
- Cost control

Production Improvement phase
In the Production Improvement phase, ABB ensures reduced cycle time, improved productivity, increased production output and reduced costs. This is achieved by equipment upgrades, remanufacturing, and ABB Ability Connected Services.

Benefits:
- Reduced cycle time
- Improved productivity
- Increased production output
- Reduced costs

Lifetime Extension phase
Finally, during the Lifetime Extension phase, ABB ensures secured production, maximized Return On Investment for the equipment, the latest technology performance and safety. This is achieved with the fast and secure replacement of manipulator, controller and complete robot.

Benefits:
- Secured production
- Maximized Return On Investment
- Latest technology
- Safety

Selection table
Robots

PRODUCT	BASIC SPECIFICATIONS	
IRB 120 and IRB 120T	Load (kg)	3.00
	Reach (m)	0.58
	Position repeatability (mm)	0.01
	Protection	Std: IP30 Option: Cleanroom class 5, certified by IPA
	Mounting	Floor, wall, inverted, and tilted angles
IRB 1200	Load (kg)	5.00 7.00
	Reach (m)	0.90 0.70
	Position repeatability (mm)	.025 0.02
	Protection	Std: IP40 Option: IP67, Clean room ISO 4, food grade lubricant
	Mounting	Any angle
IRB 140 and IRB 140T	Load (kg)	6.00
	Reach (m)	0.81
	Position repeatability (mm)	0.03
	Protection	Std: IP67 Option: Cleanroom class 6, Foundry Plus
	Mounting	Floor, wall, inverted, and tilted angles
IRB 1520ID	Load (kg)	4.00
	Reach (m)	1.50
	Position repeatability (mm)	0.05
	Protection	Std: IP40
	Mounting	Floor, inverted

PRODUCT	BASIC SPECIFICATIONS	
IRB 1600	Load (kg)	6.00 6.00 10.0 10.0
	Reach (m)	1.20 1.45 1.20 1.45
	Position repeatability (mm)	0.02 0.02 0.02 0.05
	Protection	Std: IP54 Option: Foundry Plus 2 with IP67
	Mounting	Floor, wall, inverted, tilted angles, and shelf
IRB 1660ID	Load (kg)	4.00 6.00
	Reach (m)	1.55 1.55
	Position repeatability (mm)	0.02 0.02
	Protection	Std: IP40 (wrist IP67)
	Mounting	Floor, wall, inverted, and tilted angles
IRB 2400	Load (kg)	12.0 20.0
	Reach (m)	1.55 1.55
	Position repeatability (mm)	0.03 0.03
	Protection	Std: IP54 Option: IP67 with foundry plus 2
	Mounting	Floor, inverted
IRB 2600 and IRB 2600ID*	Load (kg)	8.0* 12.0 12.0 15.0* 20.0
	Reach (m)	2.0* 1.65 1.85 1.85* 1.65
	Position repeatability (mm)	0.02 0.04 0.04 0.02 0.04
	Protection	Std: IP67; IP54 (axis 4) Option: Foundry Plus 2
	Mounting	Floor, wall, inverted, tilted angles, and shelf

PRODUCT	BASIC SPECIFICATIONS	
IRB 4400	Load (kg)	10.0 60.0
	Reach (m)	2.55 1.96
	Position repeatability (mm)	0.05 0.05
	Protection	Std: IP54 Option: IP67, Foundry Plus 2
	Mounting	Floor
IRB 4600	Load (kg)	20.0 40.0 45.0 60.0
	Reach (m)	2.50 2.55 2.05 2.05
	Position repeatability (mm)	0.05 0.06 0.05 0.06
	Protection	Std: IP67 Option: Foundry Plus 2, Foundry Prime 2
	Mounting	Floor, inverted, tilted angles, and shelf
IRB 6620 and IRB 6620LX*	Load (kg)	150 150*
	Reach (m)	2.20 1.90*
	Position repeatability (mm)	0.10 0.10
	Protection	Std: IP66 (linear axis) Option: Foundry Plus 2
	Mounting	Floor, inverted, tilted angles; Wall, inverted*
IRB 6640	Load (kg)	185 235
	Reach (m)	2.80 2.55
	Position repeatability (mm)	0.10 0.10
	Protection	Std: IP67 Option: Foundry Prime 2
	Mounting	Floor

PRODUCT	BASIC SPECIFICATIONS	
IRB 6650S	Load (kg)	90.0 125 200
	Reach (m)	3.90 3.50 3.00
	Position repeatability (mm)	0.13 0.13 0.14
	Protection	Std: IP67 Option: Foundry Plus 2, high pressure steam washable
	Mounting	Shelf
IRB 6660	Load (kg)	100 130 205
	Reach (m)	3.30 3.10 1.90
	Position repeatability (mm)	0.10 0.11 0.07
	Protection	Std: IP67 Option: Foundry Plus 2
	Mounting	Floor
IRB 6700 and IRB 6700LeanID	Load (kg)	150 155 175 200 205
	Reach (m)	3.20 2.85 3.05 2.60 2.80
	Load (continued)	235 245 300
	Reach (continued)	2.65 3.00 2.70
	Position repeatability (mm)	0.10
	Protection	Std: IP67 Option: Foundry Plus 2
	Mounting	Floor
IRB 6700 Inverted	Load (kg)	245 300
	Reach (m)	2.90 2.60
	Position repeatability (mm)	0.06 0.05
	Protection	Std: IP67 Option: Foundry Plus 2
	Mounting	Inverted

Selection table
Robots

PRODUCT	BASIC SPECIFICATIONS					
IRB 6790	Load (kg)	235	205			
	Reach (m)	2.65	2.80			
	Position repeatability (mm)	0.05	0.05			
	Protection	Std: IP69 Foundry Prime 3				
	Mounting	Floor				
IRB 7600	Load (kg)	150	325	340	400	500
	Reach (m)	3.50	3.10	2.80	2.55	2.55
	Position repeatability (mm)	0.19	0.10	0.27	0.19	0.08
	Protection	Std: IP67 Option: Foundry Plus 2				
	Mounting	Floor				
IRB 8700	Load (kg)	550	800	1000*		
	Reach (m)	4.20	3.50	Axis 6*		
	Position repeatability (mm)	0.10	0.10			
	Protection	Std: IP67, Foundry Plus 2				
	Mounting	Floor				
IRB 360 FlexPicker®	Load (kg)	1.00	1.00	3.00	6.00	8.00
	Reach (m)	1.13	1.60	1.13	1.60	1.13
	Position repeatability (mm)	0.10	0.10	0.10	0.10	0.10
	Protection	Std: IP54/67/IP69K Option: Wash down, Stainless Cleanroom, ISO class 5–7, IRB 360-1/1130 certified by IPA				

*Load up to 1000 kg while the wrist is down

PRODUCT	BASIC SPECIFICATIONS		
IRB 260	Load (kg)	30.0	
	Reach (m)	1.53	
	Position repeatability (mm)	0.03	
	Protection	Std: IP67	
	Mounting	Floor	
IRB 460	Load (kg)	110	
	Reach (m)	2.40	
	Position repeatability (mm)	0.20	
	Protection	Std: IP67	
	Mounting	Floor	
IRB 660	Load (kg)	180	250
	Reach (m)	3.15	3.15
	Position repeatability (mm)	0.05	0.05
	Protection	Std: IP67	
	Mounting	Floor	
IRB 760	Load (kg)	450	
	Reach (m)	3.18	
	Position repeatability (mm)	0.05	
	Protection	Std: IP67	
	Mounting	Floor	

4-AXIS ROBOT

PRODUCT	BASIC SPECIFICATIONS				
IRB 910 SC	Load (kg)	3.00	3.00	3.00	max 6.00
	Reach (m)	0.45	0.55	0.65	
	Position repeatability (mm)				
	Axis 1 + 2 Axis 3 Axis 4	±0.01 ±0.01 ±0.01 deg			
	Protection	Std: IP20			
	Mounting	Table			
IRB 14000 YuMi®	Load (kg)	0.50			
	Reach (m)	0.559			
	Position repeatability (mm)	0.02			
	Protection	Std:IP30 Clean room ISO 5			
	Mounting	Bench, table			
	Safety	PL b Cat B			
IRB 14050 single-arm YuMi	Load (kg)	0.50			
	Reach (m)	0.559			
	Position repeatability (mm)	0.02			
	Protection	Std:IP30 Clean room ISO 5			
	Mounting	All angles, including table, wall, & ceiling			
	Safety	PL d Cat 3 protective & emergency stop PL b Cat b speed super. SafeMove2 Pro option			

PRODUCT	BASIC SPECIFICATIONS	
IRB 6660RX	Load (kg)	75.0/50.0
	Reach (m)	3.10 + 1.3/1.45
	Protection	Offset 6th–7th axis: 1.30/1.45 m Height: 127 mm
IRB 7600RX	Load (kg)	85.0/80.0
	Reach (m)	3.50 + 1.3/1.45
	Protection	Offset 6th–7th axis: 1.30/1.45 m Height: 127 mm
IRB 6660FX	Load (kg)	40.0
	Reach (m)	3.10 + 1.40
	Protection	Stroke: ± 1.40 m Height: 130 mm Max. speed: 5.0 m Max. acceleration: 20 (m/s2)
IRB 7600FX (7-axis robot)	Load (kg)	100
	Reach (m)	3.10 + 1.75
	Protection	Stroke: ± 1.75 m Height: 130 mm Max. speed: 5 m Max. acceleration: 18 (m/s2)
IRB 760 Twin XB	Load (kg)	150 (crossbar, tooling, and part)
	Reach (m)	3.10 + 1.75

PRESS AUTOMATION

Selection table
Paint robots

PRODUCT	BASIC SPECIFICATIONS		
IRB 52 	Load (kg)	7.0	7.0
	Reach (m)	1.20	1.45
	Position repeatability (mm)	0.15	0.15
	Protection	Std: IP67, Ex	
	Mounting	Floor, wall, inverted	
IRB 580 	Load (kg)	10.0	10.0
	Reach (m)	2.20	2.60
	Position repeatability (mm)	0.30	0.30
	Protection	Std: IP67, Ex	
	Mounting	Floor	
IRB 580-13/14 	Load (kg)	10.0	10.0
	Reach (m)	2.20	2.60 Rail travel length: 1.0 - 14.0
	Position repeatability (mm)	0.30	0.30
	Protection	Std: IP67, Ex	
	Mounting	Clean-wall rail, in-booth rail	

PAINT ROBOT

PRODUCT	BASIC SPECIFICATIONS		
IRB 5400-12 Slim Arm 	Load (kg)	25.0	
	Reach (m)	3.10	
	Position repeatability (mm)	0.15	
	Protection	Std: IP67, Ex	
	Mounting	Floor	
IRB 5400-13/14 Slim Arm 	Load (kg)	25.0	
	Reach (m)	3.10	Rail travel length: 1.0 - 14.0
	Position repeatability (mm)	0.15	
	Protection	Std: IP67, Ex	
	Mounting	Clean-wall rail, in-booth rail	
IRB 5400-22 Process Arm 	Load (kg)	25.0	
	Reach (m)	3.10	
	Position repeatability (mm)	0.15	
	Protection	Std: IP67, Ex	
	Mounting	Floor	

PAINT ROBOT

PRODUCT	BASIC SPECIFICATIONS		
IRB 5400-23/24 Process arm 	Load (kg)	25.0	
	Reach (m)	3.10	Rail travel length: 1.0 - 14.0
	Position repeatability (mm)	0.15	
	Protection	Std: IP67, Ex	
	Mounting	Clean-wall rail, in-booth rail	
IRB 5500-22 Process Arm 	Load (kg)	13.0	
	Reach (m)	3.00	
	Position repeatability (mm)	0.15	
	Protection	Std: IP67, Ex	
	Mounting	Floor, wall, tilted, inverted	
IRB 5500-23 Process Arm 	Load (kg)	13.0	
	Reach (m)	3.00	Rail travel length: 1.0 - 14.0
	Position repeatability (mm)	0.15	
	Protection	Std: IP67, Ex	
	Mounting	Clean-wall rail	

PAINT ROBOT

PRODUCT	BASIC SPECIFICATIONS		
IRB 5500-25 Elevated rail 	Load (kg)	13.0	
	Reach (m)	3.00	Rail travel length: 1.0 - 14.0
	Position repeatability (mm)	0.15	
	Protection	Std: IP67, Ex	
	Mounting	Elevated Robot: tilted, upright, inverted	

PAINT ROBOT

PRODUCT	BASIC SPECIFICATIONS		
IRB 5350 3-axis/4-axis 	Load (kg)	5.00	
	Reach (m)	1.35	Rail travel length: 3.0 - 10.0
	Position repeatability (mm)	0.15	
	Protection	Std: IP67, Ex	
	Mounting	Floor, rail	

DOOR OPENER ROBOT

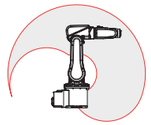
Robots

IRB 120

IRB 120 and IRB 120T



Certified by IPA

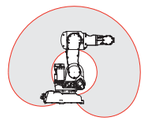
	IRB 120-3/0.58	Main applications
Load (kg)	3.00	Assembly Machine tending Material handling Packaging Dispensing
Reach (m)	0.58	
Position repeatability (RP) (mm)	0.01	
Working range		
Protection available	Std: IP30, cleanroom class 5 Option: Food Grade Lubrication	
Mounting	Floor, wall, inverted, and tilted angles	

IRB 140

IRB 140 and IRB 140T



Certified by IPA

	IRB 140-6/0.81	Main applications
Load (kg)	6.00	Arc welding Assembly Cleaning/spraying Deburring Machine tending Material handling Packing
Reach (m)	0.81	
Position repeatability (RP) (mm)	0.03	
Working range		
Protection available	Std: IP67, cleanroom class 6 Option: Foundry Plus 2	
Mounting	Floor, wall, inverted, and tilted angles	

IRB 910SC

IRB 910SC-3/0.45,
IRB 910SC-3/0.55, and
IRB 910SC-3/0.65



Certified by IPA

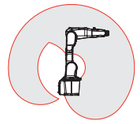
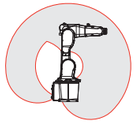
		IRB910-3/0.45	IRB910-3/0.55	IRB910-3/0.65	Main applications
Load (kg)		3, max 6	3, max 6	3, max 6	Assembly Component placement Machine loading Maching unloading Kitting
Reach (m)		0.45	0.55	0.65	
Position repeatability (RP) (mm)	Axis 1 + Axis 2	±0.01	±0.01	±0.01	
	Axis 3	±0.01	±0.01	±0.01	
	Axis 4	±0.01 deg	±0.01 deg	±0.01 deg	
Working range					
Protection available		Std: IP20	Std: IP20	Std: IP20	
Mounting		Table	Table	Table	

IRB 1200

IRB 1200-5/0.9 and
IRB 1200-7/0.7



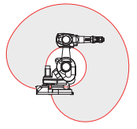
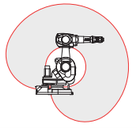
Certified by IPA

	IRB 1200-5/0.9	IRB 1200-7/0.7	Main applications
Load (kg)	5.00	7.00	Assembly Machine tending Material handling
Reach (m)	0.90	0.70	
Position repeatability (RP) (mm)	0.025	0.02	
Working range			
Protection available	Std: IP40, cleanroom class 3. Option: IP67, Foundry Plus 2, Food Grade Lubrication		
Mounting	Floor, wall, inverted, and tilted angles		

IRB 1600

IRB 1600-6/1.2 and
IRB 1600-10/1.2

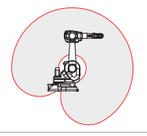
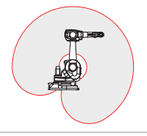


	IRB 1600-6/1.2	IRB 1600-10/1.2	Main applications
Load (kg)	6.00	10.00	Assembly Cleaning/spraying Extraction Machine tending Material handling Packing
Reach (m)	1.20	1.20	
Position repeatability (RP) (mm)	0.02	0.02	
Working range			
Protection available	Std: IP54 Option: IP67 with Foundry Plus 2		
Mounting	Floor, wall, tilted, inverted, shelf		

IRB 1600

IRB 1600-6/1.45 and
IRB 1600-10/1.45



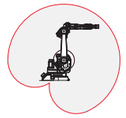
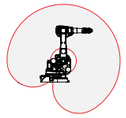
	IRB 1600-6/1.45	IRB 1600-10/1.45	Main applications
Load (kg)	6.00	10.00	Arc welding Assembly Cleaning/spraying Cutting Machine tending Material handling Packing
Reach (m)	1.45	1.45	
Position repeatability (RP) (mm)	0.02	0.05	
Working range			
Protection available	Std: IP54 Option: IP67 with Foundry Plus 2		
Mounting	Floor, wall, tilted, inverted, shelf		

Robots

IRB 1660ID

IRB 1660ID-4/1.55 and
IRB 1660ID-6/1.55

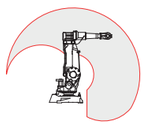
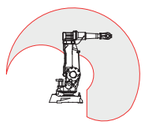


	IRB 1660ID-4/1.55	IRB 1660ID-6/1.55	Main applications
Load (kg)	4.00	6.00	Arc welding Machine tending Material handling
Reach (m)	1.55	1.55	
Position repeatability (RP) (mm)	0.02	0.02	
Working range			
Protection available	Std: IP40	Std: IP67 (base, lower arm, wrist), IP54 (axis 4)	
Mounting	Floor, inverted, tilted	Floor, tilted, inverted, shelf	

IRB 2400

IRB 2400-10/1.55 and
IRB 2400-16/1.55

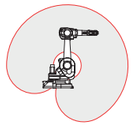
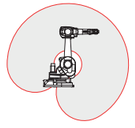


	IRB 2400-10/1.55	IRB 2400-16/1.55	Main applications
Load (kg)	12.0	20.0	Cutting/deburring Grinding/polishing
Reach (m)	1.55	1.55	
Position repeatability (RP) (mm)	0.03	0.03	
Working range			
Protection available	Std: IP54 Option: IP67 with Foundry Plus 2		
Mounting	Floor, inverted		

IRB 2600

IRB 2600-12/1.65 and
IRB 2600-20/1.65

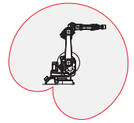


	IRB 2600-12/1.65	IRB 2600-20/1.65	Main applications
Load (kg)	12.0	20.0	Arc welding Assembly Cleaning/spraying Cutting Dispensing Machine tending Material handling Packing
Reach (m)	1.65	1.65	
Position repeatability (RP) (mm)	0.04	0.04	
Working range			
Protection available	Std: IP67 Option: Foundry Plus 2		
Mounting	Floor, wall, tilted, inverted, shelf		

IRB 2600

IRB 2600-12/1.85

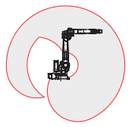


	IRB 2600-12/1.85	Main applications
Load (kg)	12.0	Arc welding Assembly Cleaning/spraying Cutting Dispensing Machine tending Material handling Packing
Reach (m)	1.85	
Position repeatability (RP) (mm)	0.04	
Working range		
Protection available	Std: IP67 Option: Foundry Plus 2	
Mounting	Floor, wall, tilted, inverted, shelf	

IRB 2600ID

IRB 2600ID-8/2.00

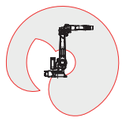


	IRB 2600ID-8/2.00	Main applications
Load (kg)	8.00	Arc welding Dispensing Machine tending Material handling
Reach (m)	2.00	
Position repeatability (RP) (mm)	0.02	
Working range		
Protection available	Standard: IP67 (base, lower arm, wrist), IP54 (axis 4)	
Mounting	Floor, wall, tilted, inverted, shelf	

IRB 2600ID

IRB 2600ID-15/1.85



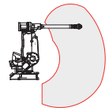
	IRB 2600ID-15/1.85	Main applications
Load (kg)	15.0	Arc welding Assembly Dispensing Machine tending Material handling
Reach (m)	1.85	
Position repeatability (RP) (mm)	0.02	
Working range		
Protection available	Standard: IP67 (base, lower arm, wrist), IP54 (axis 4)	
Mounting	Floor, wall, tilted, inverted, shelf	

Robots

IRB 4400

IRB 4400/L10

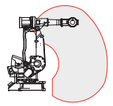


	IRB 4400/L10	Main applications
Load (kg)	10.0	Cutting/deburring
Reach (m)	2.55	Die spraying
Position repeatability (RP) (mm)	0.05	Dispensing
Working range		Grinding/polishing
		Measuring
Protection available	Std: IP54 Option: IP67, Foundry Plus 2	
Mounting	Floor	

IRB 4400

IRB 4400/L60

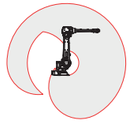


	IRB 4400/L60	Main applications
Load (kg)	60.0	Cutting/deburring
Reach (m)	1.96	Dispensing
Position repeatability (RP) (mm)	0.05	Grinding/polishing
Working range		Measuring
Protection available	Std: IP54 Option: IP67, steam washable - Foundry Plus 2	
Mounting	Floor	

IRB 4600

IRB 4600-20/2.50 and
IRB 4600-40/2.55

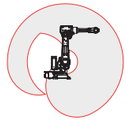
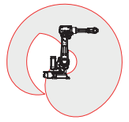


	IRB 4600-20/2.50	IRB 4600-40/2.55	Main applications
Load (kg)	20.0	40.0	Arc welding
Reach (m)	2.50	2.55	Assembly
Position repeatability (RP) (mm)	0.05	0.06	Dispensing
Working range			Laser welding Machine tending Material handling Packing/palletizing Press brake tending
Protection available	Std: IP67 Option: Foundry Plus 2, Foundry Prime 2		
Mounting	Floor, tilted, inverted, shelf		

IRB 4600

IRB 4600-45/2.05 and
IRB 4600-60/2.05

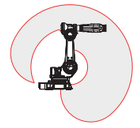


	IRB 4600-45/2.05	IRB 4600-60/2.05	Main applications
Load (kg)	45.0	60.0	Assembly
Reach (m)	2.05	2.05	Deburring
Position repeatability (RP) (mm)	0.05	0.06	Dispensing
Working range			Machine tending Material handling Packing/palletizing Press brake tending
Protection available	Std: IP67. Option: Foundry Plus 2, Foundry Prime 2 (valid for 60 kg variant)		
Mounting	Floor, tilted, inverted, shelf		

IRB 6620

IRB 6620-150/2.20



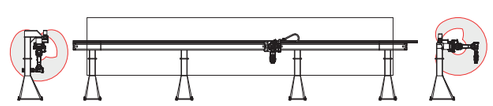
	IRB 6620-150/2.20	Main applications
Load (kg)	150	Assembly
Reach (m)	2.20	Cleaning/spraying
Position repeatability (RP) (mm)	0.10	Cutting/deburring
Working range		Dispensing Grinding/polishing Machine tending Material handling Spot welding
Protection available	Standard: IP54 Option: Foundry Plus 2	
Mounting	Floor, tilted, inverted*	

*on linear axis

IRB 6620LX

IRB 6620LX-150/1.90



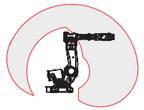
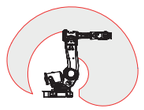
	IRB 6620LX-150/1.90	Main applications
Load (kg)	150	Machine tending
Reach (m)	1.90	Material handling
Position repeatability (RP) (mm)	0.10	Spot welding
Working range		
Protection available	5-axis robot arm: Std IP54 Option: Foundry Plus 2 Std: IP66 (linear axis)	
Mounting	Wall, inverted	

Robots

IRB 6640

IRB 6640-185/2.80 and
IRB 6640-235/2.55



	IRB 6640-185/2.80	IRB 6640-235/2.55	Main applications
Load (kg)	185	235	Machine tending Material handling Spot welding
Reach (m)	2.80	2.55	
Position repeatability (RP) (mm)	0.05	0.05	
Working range			
Protection available	Std: IP67 Option: Foundry Plus 2		
Mounting	Floor		

IRB 6650S

IRB 6650S-90/3.9,
IRB 6650S-125/3.5 and
IRB 6650S-200/3.0

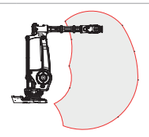
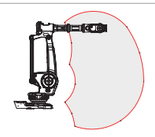


	90/3.9	125/3.5	200/3.0	Main applications
Load (kg)	90.0	125	200	Machine tending Material handling Spot welding
Reach (m)	3.90	3.50	3.00	
Position repeatability (RP) (mm)	0.13	0.13	0.14	
Working range				
Protection available	Std: IP67. Opt: Foundry Plus 2, High pressure steam			
Mounting	Shelf	Shelf	Shelf	
DressPack option	-	LeanID	LeanID	

IRB 6660

IRB 6660-100/3.3 and
IRB 6660-130/3.1

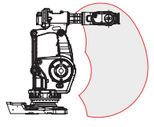


	IRB 6660-100/3.3	IRB 6660-130/3.1	Main applications
Load (kg)	100	130	Machine tending Material handling Press tending
Reach (m)	3.30	3.10	
Position repeatability (RP) (mm)	0.10	0.11	
Working range			
Protection available	Std: IP67 Option: Foundry Plus 2		
Mounting	Floor		

IRB 6660

IRB 6660-205/1.9

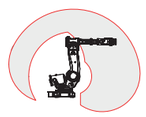
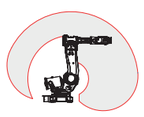


	IRB 6660-205/1.9	Main applications
Load (kg)	205	Cutting Grinding Machining Milling Sawing
Reach (m)	1.90	
Position repeatability (RP) (mm)	0.07	
Working range		
Protection available	Std: IP67, incl. chip protection Option: Foundry Plus 2	
Mounting	Floor	

IRB 6700

IRB 6700-155/2.85 and
IRB 6700-200/2.60



	IRB 6700-155/2.85	IRB 6700-200/2.60	Main applications
Load (kg)	155	200	Assembly Cutting/deburring Grinding/polishing Machine tending Material handling Spraying Spot welding
Reach (m)	2.85	2.60	
Position repeatability (RP) (mm)	0.10	0.10	
Working range			
Protection available	Std: IP67. Option: Foundry Plus 2		
Mounting	Floor	Floor	
DressPack option	LeanID	LeanID	

IRB 6700

IRB 6700-150/3.20,
IRB 6700-175/3.05 ,
IRB 6700-205/2.80 and
IRB 6700-235/2.65



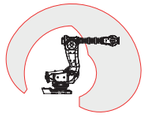
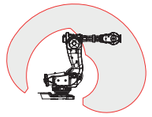
	150/3.20	175/3.05	205/2.80	235/2.65	Main applications
Load (kg)	150	175	205	235	Assembly Cutting/deburring Grinding/polishing Machine tending Material handling Spraying Spot welding
Reach (m)	3.20	3.05	2.80	2.65	
Position repeatability (RP) (mm)	0.10	0.10	0.10	0.10	
Working range					
Protection available	Std: IP67. Option: Foundry Plus 2				
Mounting	Floor	Floor	Floor	Floor	
DressPack option	LeanID	LeanID	LeanID	LeanID	

Robots

IRB 6790

IRB 6790-235/2.65 and
IRB 7600-205/2.80

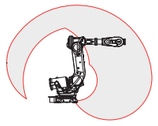
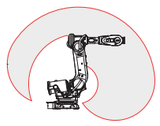


	IRB 6790-235/2.65	IRB 7600-205/2.80	Main applications
Load (kg)	235	205	Washing & cleaning
Reach (m)	2.65	2.80	Machine tending
Position repeatability (RP) (mm)	0.05	0.05	Material handling
Working range			
Protection available	Std: IP69 Foundry Prime 3		
Mounting	Floor	Floor	
DressPack options	-	-	

IRB 6700

IRB 6700-245/3.00 and
IRB 6700-300/2.70

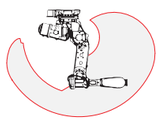
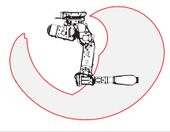


	IRB 6700-245/3.00	IRB 6700-300/2.70	Main applications
Load (kg)	245	300	Assembly
Reach (m)	3.00	2.70	Cutting/deburring
Position repeatability (RP) (mm)	0.10	0.11	Grinding/polishing
Working range			Machine tending Material handling Spraying Spot welding
Protection available	Std: IP67. Option: Foundry Plus 2		
Mounting	Floor	Floor	
DressPack options	LeanID	LeanID	

IRB 6700 inverted

IRB 6700 inverted-245/2.9 and
IRB 6700 inverted-300/2.6



	IRB 6700 inverted-245	IRB 6700 inverted-300	Main applications
Load (kg)	245	300	Assembly
Reach (m)	2.90	2.60	Cutting/deburring
Position repeatability (RP) (mm)	0.06	0.05	Grinding/polishing
Working range			Machine tending Material handling Spraying Spot welding
Protection available	Std: IP67. Option: Foundry Plus 2		
Mounting	Inverted	Inverted	
DressPack options	LeanID	LeanID	

IRB 7600

IRB 7600-325/3.10,
IRB 7600-340/2.80 ,
IRB 7600-400/2.55 and
IRB 7600-500/2.55

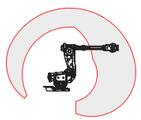


	325/3.10	340/2.80	400/2.55	500/2.55	Main applications
Load (kg)	325	340	400	500	Assembly
Reach (m)	3.10	2.80	2.55	2.55	Cutting/deburring
Position repeatability (RP) (mm)	0.10	0.27	0.19	0.08	Grinding/polishing
Working range					Machine tending Material handling Spraying Spot welding
Protection available	Std: IP67. Option: Foundry Plus 2				
Mounting	Floor	Floor	Floor	Floor	
DressPack option	LeanID	LeanID	LeanID	LeanID	

IRB 7600

IRB 7600-150/3.50

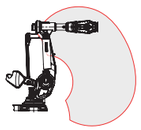
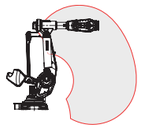


	IRB 7600-150/3.50	Main applications
Load (kg)	150	Assembly
Reach (m)	3.50	Cutting/deburring
Position repeatability (RP) (mm)	0.19	Grinding/polishing
Working range		Machine tending Material handling
Protection available	Std: IP67. Option: Foundry Plus 2	
Mounting	Floor	
DressPack options	-	

IRB 8700

IRB 8700-550/4.20 and
IRB 8700-800/3.50



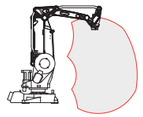
	IRB 8700-550/4.20	IRB 8700-800/3.50	Main applications
Load (kg)	550	800	Machine tending
Reach (m)	4.20	3.50	Material handling
Position repeatability (RP) (mm)	0.10	0.10	Machining
Working range			Spot welding
Protection available	Std: IP67, Foundry Plus 2		
Mounting	Floor	Floor	
DressPack options	LeanID	LeanID	

Robots
4-axis and delta robots

IRB 260

IRB 260-30/1.5

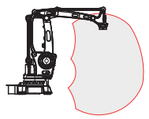


	IRB 260-30/1.5	Main applications
Load (kg)	30.0	Packing
Reach (m)	1.53	
Position repeatability (RP) (mm)	0.03	
Working range		
Protection available	Std: IP67	
Mounting	Floor	

IRB 460

IRB 460-110/2.4

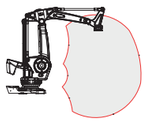
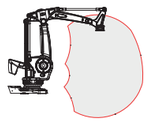


	IRB 460-110/2.4	Main applications
Load (kg)	110	Material handling Depalletizing Palletizing
Reach (m)	2.40	
Position repeatability (RP) (mm)	0.20	
Working range		
Protection available	Std: IP67	
Mounting	Floor	

IRB 660

IRB 660-180/3.15 and
IRB 660-250/3.15

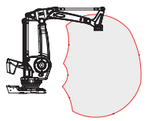


	IRB 660-180/3.15	IRB 660-250/3.15	Main applications
Load (kg)	180	250	Material handling Palletizing
Reach (m)	3.15	3.15	
Position repeatability (RP) (mm)	0.05	0.05	
Working range			
Protection available	Std: IP67		
Mounting	Floor		

IRB 760

IRB 760-450/3.2



	IRB 760-450/3.2	Main applications
Load (kg)	450	Depalletizing Full layer palletizing Material handling Palletizing
Reach (m)	3.18	
Position repeatability (RP) (mm)	0.05	
Working range		
Protection available	Std: IP67	
Mounting	Floor	

IRB 360

IRB 360-1/1130 and
IRB 360-3/1130



	IRB 360-1/1130	IRB 360-3/1130	Main applications
Load (kg)	1.00	3.00	Assembly Material handling Packing Picking
Reach (m)	1.13	1.13	
Position repeatability (RP) (mm)	0.10	0.10	
Working range			
Protection available	Std: IP54/67/IP69K. Option: Wash down, Stainless Cleanroom, ISO class 5–7, IRB 360-1/1130 certified by IPA		

*on linear axis

IRB 360

IRB 360-8/1130,
IRB 360-1/1600 and
IRB 360-6/1600



	IRB 360-8/1130	IRB 360-1/1600	IRB 360-6/1600	Main applications
Load (kg)	8.00	1.00	6.00	Assembly Material handling Packing Picking
Reach (m)	1.13	1.60	1.60	
Position repeatability (RP) (mm)	0.10	0.10	0.10	
Working range				
Protection available	Std: IP54. Option: Cleanroom ISO class 5–7 (for IRB 360-1/1600)			

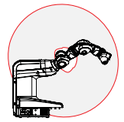
Robots
Collaborative robots

YuMi®

IRB 14000



Certfied by IPA

	IRB 14000-0.5/0.559	Main applications
Load (kg)	0.50	Small parts material handling
Reach (m)	0.559	
Position repeatability (RP) (mm)	0.02	Small parts asembly
Working range		
Protection available	Std: IP30 and Clean Room ISO 5	
Mounting	Table	
Functional safety	PL b Cat B	

Single-Arm YuMi

IRB 14050



Certfied by IPA

	IRB 14050-0.5/0.559	Main applications
Load (kg)	0.50	Small parts material handling
Reach (m)	0.559	
Position repeatability (RP) (mm)	0.02	Pick and place
Working range		
Protection available	Std: IP30 and Clean Room ISO 5	
Mounting	All angles, including table, wall, and ceiling	
Functional safety	PL d Cat 3 protective stop and emergency stop, PL b Cat b speed supervision, SafeMove2 Pro option	

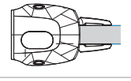


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IRB 14050 single-arm YuMi

Grippers

Small parts modular servo gripper



	Grippers	Main applications
Weight (g)	215 - 280 depending on configuration	Small parts assembly
Load (g)	Up to 285	**Options:** Five possible configurations using function modules: • Servo • Servo + Vacuum • Servo + Vacuum 1 + Vacuum 2 • Servo + Vision • Servo + Vision + Vacuum
Position repeatability - servo gripper (RP) (mm)	0.05	
Finger stroke (mm)	50	
Stroke	 0 - 50 mm	
Protection	Std: IP30	
Mounting	YuMi® toolflange	
Vacuum spec. (bar)	Input max 6, Vacuum max 0.050	

Small parts storage, feeding and presentation

FlexFeeder™



	FlexFeeder - Single	FlexFeeder - Double	Main applications
Max. Feature Dimension	< 25	< 30	Small parts presentation 3D to 2D
Min. Feature Dimension	> 0.50	> 0.50	
Product weight	< 0.1	< 0.1	Storage and parts handling
Feeder weight	27.0	40.0	
Feeder dimension (mm)	754x737x125	754x737x230	For integration with 2D vision
Illumination area dimension (mm)	90x160	200x160	

Robots
Press automation robots

IRB 6660RX (7-axis robot)

IRB 6660RX



	IRB 6660RX	Main applications
Load (kg)	75/50	Press automation Machine tending Material handling
Reach (m)	3.10 + 1.3/1.45	
7th axis rotational	Offset 6th–7th axis: 1.30/1.45 m Height: 127 mm	

IRB 7600RX (7-axis robot)

IRB 7600RX



	IRB 7600RX	Main applications
Load (kg)	85/80	Press automation Machine tending Material handling
Reach (m)	3.50 + 1.3/1.45	
7th axis rotational	Offset 6th–7th axis: 1.30/1.45 m Height: 127 mm	

IRB 6660FX (7-axis robot)

IRB 6660FX



	IRB 6660FX	Main applications
Load (kg)	40	Press automation Machine tending Material handling
Reach (m)	3.10 + 1.40	
7th axis linear	Stroke: ± 1.40 m Height: 130 mm Max. speed: 5 m Max. acceleration: 20 (m/s2)	

IRB 7600FX (7-axis robot)

IRB 7600FX



	IRB 7600FX	Main applications
Load (kg)	100	Press automation Machine tending Material handling
Reach (m)	3.10 + 1.75	
7th axis linear	Stroke: ± 1.75 m Height: 130 mm Max. speed: 5 m Max. acceleration: 18 (m/s2)	

IRB 760 Twin XB - TRX

IRB 760 Twin XB - TRX



	IRB 760 Twin XB - TRX	Main applications
Load (kg)	150 (Crossbar, tooling, and part)	Press automation Material handling
Reach (m)	3.50 + 1.3/1.45	
Reorientation axes	α-α': ± 20º / + 90º in bolster ATC position β-β': ± 5º γ-γ': ± 20º	

IRB 760FX

IRB 760FX



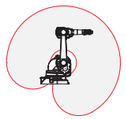
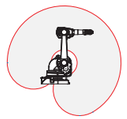
	IRB 760FX	Main applications
Load (kg)	100	Press automation Machine tending Material handling
Reach (m)	3.20 + 1.65	
7th axis linear	Stroke: 1.65 m Height: 175 mm	
Tilting module	+/- 30	

Robots
Paint robots

IRB 52

IRB 52/1.2 and IRB 52/1.45

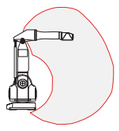


	IRB 52/1.2	IRB 52/1.45	Main applications
Load (kg)	7.00	7.00	Painting
Reach (m)	1.20	1.45	
Position repeatability (RP) (mm)	0.15	0.15	
Working range			
Protection available	Std: IP67, Ex (wrist IP54)		
Mounting	Floor. Wall and inverted are optional		

IRB 580

IRB 580-12, 1220 mm

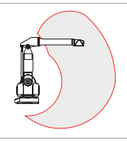


	IRB 580-12, 1220 mm	Main applications
Load (kg)	10.0	Painting
Reach (m)	2.20	
Position repeatability (RP) (mm)	0.30	
Working range		
Protection available	Std: IP67, Ex	
Mounting	Floor	

IRB 580

IRB 580-12, 1620 mm



	IRB 580-12, 1620 mm	Main applications
Load (kg)	10.0	Painting
Reach (m)	2.60	
Position repeatability (RP) (mm)	0.30	
Working range		
Protection available	Std: IP67, Ex	
Mounting	Floor	

IRB 580

IRB 580-13/14
Rail mounted

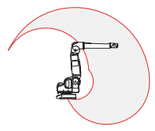


	IRB 580-13/14 with 1220 mm arm	IRB 580-13/14 with 1620 mm arm	Main applications
Load (kg)	10.0	10.0	Painting
Reach (m)	2.20	2.60	
Rail travel length (m)	1.00 - 14.0	1.00 - 14.0	
Position repeatability (RP) (mm)	0.30	0.30	
Working range			
Protection available	Std: IP67, Ex (wrist IP54)		
Mounting	Clean wall rail, In-booth rail		

IRB 5400

IRB 5400-12 Slim arm

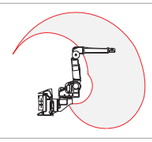


	IRB 5400-12	Main applications
Load (kg)	25.0	Painting
Reach (m)	3.10	
Position repeatability (RP) (mm)	0.15	
Working range		
Protection available	Std: IP67, Ex	
Mounting	Floor	

IRB 5400

IRB 5400-13/14 Slim arm,
Rail mounted



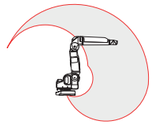
	IRB 5400-13/14	Main applications
Load (kg)	25.0	Painting
Reach (m)	3.10, rail travel length: 1.00 - 14.0	
Position repeatability (RP) (mm)	0.15	
Working range		
Protection available	Std: IP67, Ex	
Mounting	Clean wall rail, In-booth rail	

Robots
Paint robots

IRB 5400

IRB 5400-22 Process arm

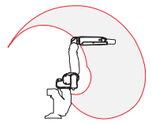


	IRB 5400-22	Main applications
Load (kg)	25.0	Painting
Reach (m)	3.10	
Position repeatability (RP) (mm)	0.15	
Working range		
Protection available	Std: IP67, Ex	
Mounting	Floor	

IRB 5400

IRB 5400-23/24 Process arm, Rail mounted



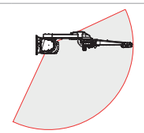
	IRB 5400-23/24	Main applications
Load (kg)	25.0	Painting
Reach (m)	3.10, rail travel length: 1.00 - 14.0	
Position repeatability (RP) (mm)	0.15	
Working range		
Protection available	Std: IP67, Ex	
Mounting	Clean wall rail, In-booth rail	

IRB 5500

IRB 5500-22 Process arm



Bending backwards possibility on axis 3 (may be limited by the hose guiding on the robot)

	IRB 5500-22	Main applications
Load (kg)	13.0	Painting
Reach (m)	3.00	
Position repeatability (RP) (mm)	0.15	
Working range		
Protection available	Std: IP67, Ex	
Mounting	Wall, floor, tilted, inverted	

IRB 5500

IRB 5500-23 Process arm, Rail mounted



Bending backwards possibility on axis 3 (may be limited by the hose guiding on the robot)

	IRB 5500-23	Main applications
Load (kg)	13.0	Painting
Reach (m)	3.00, rail travel length: 1.00 - 14.0	
Position repeatability (RP) (mm)	0.15	
Working range		
Protection available	Std: IP67, Ex	
Mounting	Clean-wall rail	

IRB 5500

IRB 5500-25 Elevated rail

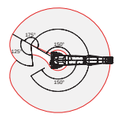


	IRB 5500-25	Main applications
Load (kg)	13.0	Painting
Reach (m)	3.00, rail travel length: 1.00 - 14.0	
Position repeatability (RP) (mm)	0.15	
Working range		
Protection available	Std: IP67, Ex	
Mounting	Elevated. Robot: tilted, upright and inverted	

IRB 5350 door opener

IRB 5350 3-axis/4-axis



	IRB 5350 3-axis/4-axis	Main applications
Load (kg)	5.00	Painting
Reach (m)	1.35, rail travel length: 3.00 - 10.0	
Position repeatability (RP) (mm)	0.15	
Working range		
Protection available	Std: IP66, Ex	
Mounting	Floor, rail	

Controllers

OmniCore™ controller



	Omnicore controller
Size H x W x D (mm)	449 x 443 x 170
Electrical connections	Single phase 220/230 V, 50-60 Hz
Protection	Std: IP20
IRB support	The controllers are designed to support new small robots.
Features	Built-in SafeMove2, Built-in connectivity to the ABB Ability™ Connected Services

IRC5 single cabinet controller and drive module



	Single cabinet	Drive module
Size H x W x D (mm)	970 x 725 x 710	720 x 725 x 710
Electrical connections	200–600 V, 50–60 Hz	200–600 V, 50–60 Hz
Protection	Std: IP54 (IP33 in rear compartment)	Std: IP54 (IP33 in rear compartment)
IRB support	All robots except IRB 910 SC	All robots except IRB 910 SC
	Based on advanced dynamic modelling, the IRC5 optimizes the performance of the robot for the physically shortest possible cycle time (QuickMove™) and precise path accuracy (TrueMove™).	

IRC5 compact controller



	IRC5 compact controller
Size H x W x D (mm)	320 x 449 x 490
Electrical connections	220–230 V, 50–60 Hz, single phase
Protection	Std: IP20
IRB support	IRB 120, IRB 140, IRB 260, IRB 360, IRB 1200, IRB 1410, IRB 1600, IRB 910SC

IRC5 panel mounted controller



	Control module	Drive module small	Drive module large
Size H x W x D (mm)	375 x 498 x 271	375 x 498 x 299	658 x 498 x 425
Electrical connections	200–600 V, 50–60 Hz	200–600 V, 50–60 Hz	200–600 V, 50–60 Hz
Protection	Std: IP20	Std: IP20	Std: IP20
IRB support	IRB 140, IRB 260, IRB 360, IRB 1200, IRB 1600 (small drive unit), IRB 2400, IRB 2600, IRB 4400, IRB 4600, IRB 6620, IRB 6640, IRB 6650S, IRB 6700, IRB 7600, IRB 460, IRB 660, IRB 760 (large drive unit)		

IRC5P paint robot controller



	IRC5P
Size H x W x D (mm)	1450 x 725 x 710
Electrical connections	200–600 V, 50–60 Hz
Protection	Std: IP54 (IP33 in rear compartment)
IRB support	Paint robots

New FlexPendant



	New FlexPendant
Size	8” graphical multi-touch color touch screen
Protection	Std: IP54
IRB support	The new FlexPendant is designed to support new small robots.
Functions	Joystick, hot-swapable-add/remove during operation, membrane keyboard with 12 buttons, USB 3.0 support

FlexPendant



	FlexPendant
Size	6.5” color touch screen / 1 kg
Protection	Std: IP54
IRB support	Non-paint robots

FlexPaint Pendant



	FlexPaint Pendant
Protection	Std: IP54, EX protected
IRB support	Paint robots

Body-in-white

Gate Framer



	Gate Framer
Strokes (mm)	3000
Repeatability (mm)	+/- 0.1
Max tooling weight (gate) (kg)	3000
Max speed	1.10 m/s for setters – 2.10 m/s for storages
Cycle time	18 second gate change (excluding tooling clamping and unclamping)
Stiffness/flexibility	S = 100 daN/mm
Max static force in Y	300 daN for each side
Lifetime	> 1 million cycles
Weight	70 tons (6 models)

ModulFlex



	ModulFlex
Repeatability (mm)	X & Y : +/- 0.1 , Z : +/- 0.5
Max tooling weight (kg)	3000
Max speed	4 sec from storage to carriage
Cycle time	Tooling change within 12 seconds
Stiffness	0.01 mm/daN
Flexibility	Up to 6 models
Robots in the Framer	4x SW, 2x MH
Dimensions: 6 models	14 x 15 m

Roller hemming head



	Roller hemming head
Hemming force (typical)	60 to 100 daN for 0.8 mm panel
Hemming force (maximum)	300 daN at air supply: 5 bars minimum 160 daN for C-push head
Force variation speed	600 daN/s
Flange angle	Up to 130°
Hemming stroke (mm)	Up to 20
Roll-in (mm)	0.20
Embedded rollers	2 rollers plus additional roller, blade, or pointer

Medium track motion platform

IRBT 2005



	IRBT 2005
Max speed (m/s)	2.00
Protection available	Standard and covered version
Mounting position	Floor
Travel length (m)	0.80 – 19.80 (in steps of 1.0 m)
Acc/Ret (m/s²)	2.50 up to 4.00, depending on actual load
Robot model	IRB 1520 IRB 1600 IRB 2600 IRB 4600

Track motion platform

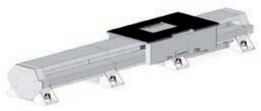
IRBT 4004, IRBT 6004, and IRBT 7004



	IRBT 4004	IRBT 6004	IRBT 7004
Max speed (m/s)	2.00	1.60	1.20
Protection available	Std: Foundry, IP65	Std: Foundry, IP65	Std: Foundry, IP65
Mounting position	Floor	Floor	Floor
Travel length (m)	1.90–19.90 (in steps of 1.0 m)	1.70–19.70 (in steps of 1.0 m)	1.70–19.70 (in steps of 1.0 m)
Acc/Ret (m/s²)	2.50	2.00	1.80
Robot model	IRB 4400-60 IRB 4600	IRB 6620 IRB 6640 IRB 6650S IRB 6700	IRB 7600

FlexTrack

IRT501-66, IRT501-66R, IRT501-90, and IRT501-90R



	IRT501-66	IRT501-66R	IRT501-90	IRT501-90R
Max speed (m/s)	2.00	1.50	1.50	1.20
Load (kg)	900	2000	2000	2950
Travel length (m)	1.00 - 25.0	1.00 - 25.0	1.00 - 25.0	1.00 - 25.0
Track length (m)	2.10 - 105	2.10 - 105	2.10 - 105	2.10 - 105
Width (m)	0.66	0.66	0.90	0.90
Acc/Ret (m/s²)	2.00	1.20	1.20	1.00
Robot model	None (material handling track motion)			

Body-in-white

FlexLifter

IRL 100 and IRL 190



	IRL 100	IRL 190
Load (kg)	1000	500
Lifting height (mm)	100	190
Speed (mm/s)	40.0	76.0
Lift time (sec)	2.50	2.50
Rotation	Optional 360° rotation	Optional 360° rotation
Mounting	Floor or FlexTrack, IRT501-66R, 90, 90R	Floor or FlexTrack, IRT501-66R, 90, 90R

FlexLifter

IRL 600



	IRL 600
Load (kg)	600
Lifting height (mm)	600
Speed (mm/s)	200
Lift time (sec)	3.00
Rotation	
Mounting	Floor or FlexTrack, IRT501-66,66R

FlexPLP

IRPLP220



	IRPLP220			
Pos. repeatability (mm)	± 0.025			
Linear axis speed (mm/s)	200			
Dynamic payload (kg)	220			
	1st horizontal axis (ball screw)	1st horizontal axis (rack & pinion*)	Second horizontal axis	Vertical axis
Available strokes (mm)	190	990	190	190
	270	1150	270	270
	350	1630	350	350
	430	2110	430	430
	510		510	510
	590		590	
	670			
Number of axes**	1 to 3 (X, Y, Z, X+Y, X+Z, X+Y+Z)			

* Rack and pinion drive type for the first horizontal axis can have up to 2110mm stroke for a single carriage, and can be increased in steps of 480mm when multiple carriages are mounted.

**Additional carriages can be mounted on the floor axis. - 2 carriages max. on floor axis with ball screw drive type. - No limit on floor axis with rack and pinion drive type.

FlexPLP

IRPLP050, 1 axis horizontal



	H300	H400
Repeatability (mm)	+/- 0.05	+/- 0.05
Speed (mm/s)	200	200
Stroke (mm)	300	400
Dynamic load (kg)	50.0	50.0
Static load (kg)	150	150

FlexPLP

IRPLP050, 1 axis vertical



	V200
Repeatability (mm)	+/- 0.05
Speed (mm/s)	100
Stroke (mm)	200
Dynamic load (kg)	50.0
Static load (kg)	150

FlexPLP

IRPLP050, 3 axis



	3 axis
Repeatability (mm)	+/- 0.05
Speed (mm/s)	100
Stroke (mm)	X = 400, Y = 300, Z = 200
Dynamic load (kg)	30.0
Static load (kg)	150

Positioners

IRBP A

IRBP A-250, IRBP A-500, and IRBP A-750



	A-250	A-500	A-750
Max handling capacity (kg)	250	500	750
Max working envelope ø (mm)	1000	1450	1450
Max length (mm)	900	950	950

IRBP B

IRBP B-250, IRBP B-500, and IRBP B-750

	B-250	B-500	B-750
Max handling capacity (kg)	250 (each side)	500 (each side)	750 (each side)
Max working envelope ø (mm)	1000	1450	1450
Max length (mm)	900	1000	1000

IRBP C

IRBP C-500 and IRBP C-1000



	C-500	C-1000
Max handling capacity (kg)	500 (each side)	1000 (each side)
Max working envelope ø (mm)	-	-
Max length (mm)	-	-

IRBP D

IRBP D-600



	D-600
Max handling capacity (kg)	600 (each side)
Max working envelope ø (mm)	1200
Max length (mm)	2000

IRBP K

IRBP K-300, IRBP K-600 and IRBP K-1000



	K-300	K-600	K-1000
Max handling capacity (kg)	300 (each side)	600 (each side)	1000 (each side)
Max working envelope ø (mm)	1200	1400	1400
Max length (mm)	4000	4000	4000

IRBP L

IRBP L-300, IRBP L-600, IRBP L-1000, IRBP L-2000 and IRBP L-5000

	L-300	L-600	L-1000	L-2000	L-5000
Max handling capacity (kg)	300	600	1000	2000	5000
Max working envelope ø (mm)	1500	1500	1500	1500	1500
Max length (mm)	4000	4000	4000	4000	4000

IRBP R

IRBP R-300, IRBP R-600 and IRBP R-1000



	R-300	R-600	R-1000
Max handling capacity (kg)	300 (each side)	600 (each side)	1000 (each side)
Max working envelope ø (mm)	1000	1200	1200
Max length (mm)	1600	2000	2000

Application equipment
Arc welding

Arc welding

WeldGuide IV



WeldGuide IV is the most powerful robotic though-the arc joint seam tracker on the market. To perform accurate welding it is important not only to see the arc, but also to listen to the sound of the welding process. We had this in mind when developing the thru-the-arc tracking sensor WeldGuide. It uses two sensor inputs - the welding current and the arc voltage. Measurements are synchronized with the weave pattern of the robot along the weld seam and provides both vertical and horizontal correction signals to the robot controller, to ensure consistent location of the welding arc along the seam. The WeldGuide sensor reads the real values from the welding arc 25,000 times per second, which means it is up to 25 times faster than traditional tracking methods.

Arc welding

Welding torches



We offer a wide range or welding torches from the leading brands for local installation. For delivery with the Esab AristoMig 5000i process equipment we offer the Binzel ABIROB A and ABIROB W torch packages with air and water cooling. For delivery with the RPC process equipment we offer the Binzel ABIROB A torch package (air cooling) for IRB 1520ID and the Esab PSF315 welding torch kit (air cooling) for IRB 1410.

Arc welding

TSC Torch Service Center 2013



Our Torch Service Center is an integrated system for the mechanical removal of spatter from welding torches.

The robot control system operates and supervises the cleaning operation to ensure it does not start until the torch is clamped in the correct position. This guarantees that no vibrations or shocks reach the robot and the torch is locked in the same position every time for more precise cleaning and less wear on the parts being cleaned.

Arc welding

Bull's Eye



The Bull's Eye provides the user with a fully automated tool center point calibration giving the highest possible level of utilization, quality and productivity from your robot station.

Customised pre-defined programs enable fully automatic tool centre point calibration during production execution, reducing down time to almost zero.

Arc welding

Esab AristoMig 5000i



	Esab AristoMig 5000i
Voltage range (V)	8.00 - 60.0
Current range (A)	16 - 500
Permissible load at MIG/MAG	60% duty cycle: 500A/40V, 100 % duty cycle: 400A/36V
Process methods MIG/MAG	Short arc, Spray arc, Rapid arc, Pulse arc

Esab AristoMig 5000i process equipment standard packages with the Esab AristoMig integrated GUI. Available for IRB 1600, IRB 1600ID, IRB 2600 and IRB 2600ID.

Arc welding

Power Source RPC S-400



	RPC S-400
Voltage range (V)	400 (-15%... + 20%)
Current range (A)	400 80% duty cycle
Welding mode	Synergic MIG/MAG

ABB RPC S-400 process equipment standard packages with the ABB RPC S integrated GUI. Available for IRB 1410 and IRB 1520ID. Only for the Asian market.

Arc welding

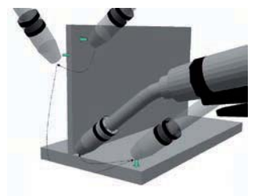
GUI's



Available for Fronius, RPC, Esab, Lincoln and Miller power source packages. The easy-to-use FlexPendant GUI provides operators with a single point of programming, an overview of cell status and a display of important quality and production data. With just a few buttons, an intuitive and PC-like, multilingual interface, the operator can organize the welding operation with a minimum of training. By integrating the power source interface on the FlexPendant the operator can have full control over voltage, current, speed, gas flow, etc.

Arc welding

Seam finder SmarTac



	SmartTac
Search speed (mm/s)	20–50 (depending on position accuracy required)
Accuracy (mm)	+/- 0.25 (with search speed 20 mm/sec)
Search time per point/one dimension (sec)	2–6 (depending on workpiece complexity)

Application equipment
Dispensing & machine tending

Dispensing

Doser (single or double, heated or not heated)



Gross volume (cm³)	80.0	155	560
Nominal flow (ml/s)	24.0	37.50	80.0
Peak flow (ml/s)	28.0	44.0	96.0
Nominal pressure / peak pressure (bar)	150/250	150/250	150/250
Dimensions* (mm)	170 x 460 x 950	180 x 470 x 960	200 x 510 x 1390

*Max. envelope volume; not heated single doser, incl. inlet and outlet valves; no cabling.

Dispensing

Pump (single or double barrel, heated or not heated)



Barrel size (l)	30.0	50.0	200
Follower plate (ø) (mm)	280	355	571
Pressure ratio	65:1	65:1	65:1
Delivery volume per double stroke (cm³)	150	150	150
Dimensions* (mm)	1070 x 700 x 2350	1070 x 700 x 2350	1070 x 700 x 2350

*Width, depth, maximum height.

Dispensing

Applicators

Gluing	SPA470 Sealing	SPA410 Sealing	Material Temperature Conditioning	
	1 nozzle*	3 nozzles	Peltier 600W**	Peltier 800W**









*Optional with nozzle changer.
**Air- or watercooled.

Machine tending

Tool System TS 2600ID



The Tool System for the IRB 2600ID enables access to tight spaces while having full control of the DressPack by routing the cables and hoses through the robots upper arm. The manifold delivers air, power and signals to any gripper while the optional tool changer is suitable for automatic tool change increasing the flexiblity of the tool system. This is giving added benefits of less wear and tear, no restrictions of the robots movement and increased prductivity.

Handling capacity (kg)	60.0
Max air pressure (bar)	10.0
Air connections	G 1/8"
Max voltage (V)	60.0
Max current (A)	3.00

Application equipment
Force control & vision

Integrated force control

Integrated force control



Conventional robotic solutions are controlled by predefined paths and speeds. However, with Integrated Force Control, the robot reacts to its surrounding and can deviate from its programmed path or speed based on feedback from the force sensor. It is possible to automate complex tasks which previously required skilled personnel and advanced fixed automation.

Integrated force control

Integrated force control

Capacity	Sensor 165	Sensor 660	Sensor 2500	Main applications
Fx, Fy	165 N	660 N	2500 N	Grinding
Fz	495 N	1980 N	6250 N	Milling
Mx, My, Mz	15.0 Nm	60.0 Nm	400 Nm	Polishing
Dimensions				Deburring
Height (mm)	40.0	40.0	62.0	Assembly
Diameter (ø mm)	104	104	168	Product testing

Integrated vision

Integrated vision



Compact smart cameras that are easily programmed in RobotStudio® together with the robots makes vision guided robots viable for any user. The vision system is highly robust and proven in industrial solutions under tough conditions. The product comes complete with cables, filters, lenses, cameras and software.

Application equipment
Material handling

Material handling DressPack

To support different production needs a family of DressPacks has been developed for Material Handling.

Common features:
- Well documented solutions including training material, circuit diagram and CAD models.
- Easy to maintain including spare part support.
- Supports parallel signals as well as common fieldbus communication.

Material handling DressPack

Integrated DressPack - LeanID



This type of DressPack creates flexibility for a variety of production demands. It is intended for production where there are high demands on flexibility and accessibility. For operations with many complex wrist movements and where the need for flexibility in changing products is high. No individual adjustment are needed for DressPack.

Robot model
IRB 6700
IRB 6650S
IRB 7600
IRB 8700

Material handling DressPack

External DressPack with retract arm function



External DressPack with a retract arm pulling the cables away from the wrist. Minor individual adjustment needed for DressPack.

Robot model
IRB 6620

Material handling DressPack

External DressPack



External DressPack targeting production with basic needs for robot handled tool. Individual adjustment needed for DressPack.

Robot model
IRB 6620
IRB 6650S
IRB 6700
IRB 7600
IRB 8700

Application equipment
Motor and gear units

Gear units

Gear units MTD / MID



	MTD 250	MTD 500	MTD 750	MTD 2000	MTD 5000	MID 500	MID 1000
Max handling capacity (kg)	300	600	1000	2000	5000	1300	3300
Max continous torque (Nm)	350	650	900	3800	9000	1400	3800
Max bend moment (Nm)	650	3300	5000	15000	60000	5000	15000

Motor units

Motor units MTD / MID



	MU 100	MU 200	MU 250	MU 300	MU 400
Rated speed (rpm)	3300	5000	4750	5000	4700
Max dynamic torque (Nm)	4.30	14.0	28.0	42.80	50.0

Application equipment
Palletizing

Palletizing grippers		
FlexGripper - Claw		Claw
	Handled products	1
	Max. weight per lift (kg)	50.0
	Gripper weight (kg)	70.0
	Finger pitch (mm)	75.0
	Bag dimensions	Bag height range 120 - 240 mm Bag length range 300 - 750 mm Bag width range 250 - 450 mm
	Main application	Bag palletizing

Palletizing grippers			
FlexGripper - Clamp			
	Handled products	1 - 2	1 - 5
	Max. weight per lift (kg)	40.0	60.0
	Gripper weight (kg)	45.0	80.0
	Finger pitch (mm)	1-zone	2-zone
	Bag dimensions (LxWxH range) (mm)	(200-650) x (200-500) x (150-330)	(200-1200) x (200-500) x (150-330)
	Main application	Case palletizing	Case palletizing

Palletizing grippers		
FlexGripper - Vacuum		Vacuum
	Handled products	1 - 5
	Max. weight per lift (kg)	40.0
	Gripper weight (kg)	75.0
	Finger pitch (mm)	10.0
	Bag dimensions (LxWxH range) (mm)	Minimum product size (LxWxH) 200 x 200 x 10 mm
	Main application	Case palletizing handled pallet types: GMA/AUS/EUR/ISO

Application equipment
Press automation

Press automation		
Carbon fiber tooling	Our modular tooling concept combines carbon fiber for structural components (1 & 2) with aluminum components (3) for adaptation to each specific part. Carbon fiber improves performance thanks to a dramatic reduction in deflection, vibrations and weight. Its design features a reduced height for optimum cycle time. The carbon fiber boom (1) is an extension of the robot arm. With a length of 1450 mm, it has been dimensioned to handle up to 100kg. The carbon fiber gondola arm (2) is a common component for 6- and 7- axis robots. There are two length variants: 1000 and 1400 mm.	Main applications Press automation Material handling
		

Press automation	
DDC - Dynamic Drive Chain (Press servotechnology)	DDC allows new and existing presses to take full advantage of servo technology with limited peak power, using a servo motor to open and close the press faster while performing the stamping process with the energy accumulated in the flywheel. It consists of a servo kit (gear motor plus drive) that is integrated in the same master control as the automation. The DDC line is capable of running 30% faster than common lines. Energy losses decrease thanks to regeneration capability of both motors.
	

Application equipment
Painting

Color change unit

Color change unit



Our color change units are specifically designed for fast color change. The internal bores of the color change unit are without “dead-ends,” reducing the cleaning cycle to a minimum. Both plastic and steel versions are available, with or without recirculation. The ABB color change units are compatible with solvent based and water borne paint materials used in 1K and 2K systems.

2K mixer unit

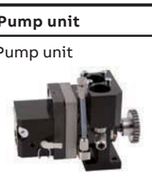
2K mixer unit



Our 2K mixers are specifically designed for precise mixing of two component fluids and optimized for fast material change. The 2K mixer unit is using the same fluid valves as in the color change unit (common parts). 2K mixer unit is designed and optimized to be used in combination with ABB’s gear pumps (and IPS software).

GearPump unit

GearPump unit



Our precision paint pump provides constant and consistent fluid regulation for automatic coating applications. It is specifically designed for fast color change. The ABB gear pumps can be used for paint, catalyst and clear coat and are available in sizes: 1.2 cc/rev, 3 cc/rev, 6 cc/rev and 9 cc/rev. The compact design uses light weight materials and is optimized for low material waste and color change time.

M-PAC color change module

M-PAC color change module



The modular concept of M-PAC paint application equipment makes it easy to combine the various components to build compact and light units for integration on the robot arms. This enables for the robots to use high acceleration and the application solution to have minimum material waste. The color change module can be mounted directly on a gear pump module for maximum paint savings and minimum color change time. This complete assembly is designed to be integrated in the robot with the shortest possible supply line to the atomizer (typically less than 650 mm).

Compact CBS unit and C-CBS2

Compact CBS unit and C-CBS2



The Compact CBS is an optimized solution for internal charge waterborne materials. This CBS unit is used to prepare and change the paint cartridges in the CBS bell atomizer which is handled and controlled by the ABB paint robot. It is a cost effective solution, prepared for 1 or 2 filling stations with flushable cartridges. Flushable cartridges are used when the cartridges are connected to a color change unit for changing the paint material in the same cartridge. Color change waste in a flushable cartridge is slightly more than with dedicated cartridges (< 30 ml).

IRB 5320 workpiece positioner

IRB 5320 workpiece positioner



The IRB 5320 Workpiece Positioner is a manipulator that is integrated with a six-axis paint robot, simplifying the painting process. It operates with either one or three axes. The three-axis version of the IRB 5320 is used to precisely position workpieces for painting. The turntables are controlled by the fully-integrated robot servo unit alternating as the loading/unloading station and as the place where the robot paints the workpieces. This single-axis positioner is built, with precision and reliability, on the proven ABB robotics gear box and delivered in several thousand units prior to this introduction.

IRB 5330 paint external axis kit

Paint external axis kit



Our pre-engineered Paint External Axis Kit is for the control and positioning of ABB paint robots on linear or vertical axes solutions. This ex-certificated servo unit is specially designed to be used, together with customized track motion systems, as an engineering building block for paint application, extending possibilities for large object painting with the use of a standardized external axis solution.

Air control unit

Air control unit



Our Air Control Unit (ACU) is a high performance, cost-efficient air flow controller typically used for high volume paint applications. This extremely accurate and reliable unit controls the air flow destined to a paint gun or paint bell and contains three different channels that control spray patterns, bell rotation and even paint flow for some applications.

Atomizers (RB1000-SAD, -SSD)

RB1000-SAD, -SSD



The Robobel family of internal charged bells consist of highly efficient, high performance rotary atomizers for solvent borne paint, providing high finish quality and high transfer efficiency. It includes the popular 926 atomizer, the 951 with pattern control function, and the RB1000 high performance atomizer with up to 1000cc/min paint flow capacity.

Atomizers - CBS

RB1000-WSC



Our Cartridge Bell System (CBS) is the optimal solution for saving paint, both for water borne and solvent borne paints. Color changing is done by changing the paint cartridge, resulting in near zero paint-loss for dedicated color-cartridges. For efficient use of space and cost a flushable version is also available. Key features are: Pattern control for high transfer efficiency, and high flow capacity for high acceleration robots.

Atomizers

RB1000-EXT



Our external charged bell is a highly efficient atomizer designed for waterborne paint. By utilizing the same air motor as the RB1000 series, the rotation speed performance is up to max 80,000 rpm with a paint flow of 700cc/min in primer. The atomizer is designed with an air heater-free system and has an newly designed electrodes, providing high transfer efficiency.

Atomizers

RB1000-CE



The RB1000-CE has a small atomizer head with the o30-mm bell cup and the compact COPES ring. This allows easy access to confined and narrow spaces such as automobile interiors while significantly increaseing painting performance.

Application equipment
Painting

Atomizers

ABB Ability™ Connected Atomizer



The RB1000i is the first connected, sensor-equipped, robotic paint atomizer that allows real-time smart diagnostics by providing an environmentally friendly system turnkey solution for increasing uptime and ensuring zero quality defects.

The atomizer increases transfer efficiency by 10%, reduces paint loss inside atomizer during color changes by 75%, and reduces compressed air consumption by 20%, in total to save customers millions of dollars in cost.

Atomizers

ROBOBEL031-PC



The 031-PC bell is easiest way for general industry customers to gain access to ABB's bell atomizer technology. The circle spray pattern and variable pattern control of ROBOBEL031-PC bring a lot of benefits to users that normally use spray gun. Since the 031-PC uses no high-voltage, not only both water-borne and solvent-borne but also coating materials can be used. There are widely line-up bell cup and selectable for suitable size.

Application package

Paint Application Packages (PAP)



ABB's standardized paint application packages are complete solution designed to have your system up and running very quickly. They are pre-engineered and pre-connected to enable fast installation. They require less field tuning and come documented with standardized interfaces. The packages are flexible. You can choose between gun or bell, select the number of colors, pump sizes, cable length, etc.

Application package

Simplified Robot Programming (SRP)



The ABB Simplified Robot Programming solution combines modern motion tracking technology, with smart software and a teaching handle (tracing device) which resembles a traditional spray gun. Recording mode is activated from the teaching tool and records paint commands along the motion path, visually guided by a line laser to see where the trigger on points are located on the object. Speed, accuracy and fluidness of motion are fully editable in RobView once the recording has stopped.

Feather duster

Feather duster



Designed for the cleaning of car bodies preliminary to Painting, The FeatherDuster system advantageously replace purpose-built "tack off" machines with robotic technology that is incredibly flexible and built on well-established standards to achieve higher quality, efficiency and ease of use.

Modular solutions

3D inspection

Robotic 3D inspection system



The turnkey Robotic 3D inspection system is the ultimate answer for industries looking for a fast ROI while reaching 100% quality control with a productivity ramp up, and operative costs reduction. ABB's 3D robotic inspection system is a new generation of standardized measuring cells, which are designed to deliver cost-effective, state-of-theart robotic 3D inspection operations. All cells deliver maximum performance whilst making optimum use of available space.

FlexWasher

FlexWasher W60



The FlexWasher™ technology combines the durability of a single ABB Foundry Prime2 robot and industry proven part cleaning methods integrated into a complete system. The technology is based on a common platform capable of handling unique part types with varying size and complexity in geometry.

Laser welding

FexCutLaser & FlexWeldLaser



The FlexCutLaser and FlexWeldLaser cells are ABB's integrated solution for high performance laser welding and cutting. These laser welding solutions offer self-contained modular designs which utilize compact, pre-engineered cells in a variety of configurations, allowing for easy cell transport, minimum set up time, and maximum flexibility in a limited amount of floor space.

Palletizing

PalletPack



PalletPack is a package of pre-engineered products to make end-of-line and bag palletizing solutions more accessible and easier to use. The package includes robot, gripper and easy-to-use wizard on Flexpendant for setting up different palletizing tasks. A PLC including safety is included for control of the complete line.

Packing

RacerPack



RacerPack is a robot function package for packing of flow wrapped products. Receiving flow wraps on a high speed in feed conveyor, RacerPack distributes the products into an indexing belt from which the IRB 360 picks up the products and pack them into boxes. The product is modular and can be ordered with full configuration or modules depending on the need.

Spot welding

FlexSpot



FlexSpot is a new generation of standardized spot welding cells, which are designed to deliver cost-effective, state-of-the-art robotic spot welding operations. All cells deliver maximum performance whilst making optimum use of available space. Composed with modular equipment, the production FlexSpot cells can be used independently or combined together to build up an assembly line, mini-assembly zones or a complete workshop.

Modular solutions
FlexArc® standard arc welding cells

ABB FlexArc robotic welding cells are complete robot systems available in several flexible and versatile standard modular packages, designed to deliver cost-effective, state of-the-art robotic welding operations.

—
ABB Robotics FlexArc cells offer modular, standardized, "plug & produce" robot welding cells

Optimal productivity requires equipment that combines effective operation with maximum cost-efficiency. Modular, pre-engineered robot cells are an established way of providing this type of solution. FlexArc cells deliver max. performance while making optimum use of available space. All equipment is installed on the common platform which provides for easy relocation within facilities. The complete cell is tested in production, allowing customers to obtain a fully functioning solution without need for further on-site commissioning. The FlexPendant GUI not only provides operators with an overview of the cell's status, but also important quality and production data.

Cells based on A-type positioners

FlexArc A



Robot	IRB 1520ID, IRB 1600(ID), IRB 2600(ID), IRB 4600
Number of robots	1 - 2
Positioners	IRBP A-250, IRBP A-500, IRBP A-750
Handling capacity	Max 750 kg
Process equipment package	Fronius, SKS, ESAB, Kemppi

Cells based on B-type positioners

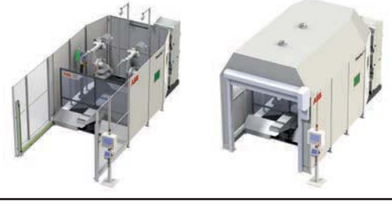
FlexArc B



Robot	IRB 1520ID, IRB 1600(ID), IRB 2600(ID), IRB 4600
Number of robots	1 - 2
Positioners	IRBP B-250, IRBP B-500, IRBP B-750
Handling capacity	Max 750 kg
Process equipment package	Fronius, SKS, ESAB, Kemppi
Welding torch	Fronius, Dinse, Binzel, SKS
Safety equipment	Complete system of safety features: safety fencing, light curtains, laser scanner, roll doors, safety locks, safety PLC

Cells based on C-type positioners

FlexArc C



Robot	IRB 1520ID, IRB 1600(ID), IRB 2600(ID), IRB 4600
Number of robots	1 - 2 (up to 3 on request)
Positioners	IRBP C-500, IRBP C-1000
Handling capacity	Max 1000 kg
Process equipment package	Fronius, SKS, ESAB, Kemppi
Welding torch	Fronius, Dinse, Binzel, SKS
Safety equipment	Complete system of safety features: safety fencing, light curtains, laser scanner, roll doors, safety locks, safety PLC

Cells based on D-type positioners

FlexArc D



Robot	IRB 1520ID, IRB 1600(ID), IRB 2600(ID), IRB 4600
Number of robots	1 - 2 (up to 3 on request)
Positioners	IRBP D-300, IRBP D-600
Handling capacity	Max 600 kg
Process equipment package	Fronius, SKS, ESAB, Kemppi
Welding torch	Fronius, Dinse, Binzel, SKS
Safety equipment	Complete system of safety features: safety fencing, light curtains, laser scanner, roll doors, safety locks, safety PLC

Cells based on K-type positioners

FlexArc K



Robot	IRB 1520ID, IRB 1600(ID), IRB 2600(ID), IRB 4600
Number of robots	1 - 2 (up to 4 on request)
Positioners	IRBP K-300, IRBP K-600, IRBP K-1000
Handling capacity	Max 1000 kg
Process equipment package	Fronius, SKS, ESAB, Kemppi
Welding torch	Fronius, Dinse, Binzel, SKS
Safety equipment	Complete system of safety features: safety fencing, light curtains, laser scanner, roll doors, safety locks, safety PLC

Cells based on R-type positioners

FlexArc R



Robot	IRB 1520ID, IRB 1600(ID), IRB 2600(ID), IRB 4600
Number of robots	1 - 2 (up to 4 on request)
Positioners	IRBP R-300, IRBP R-600, IRBP R-1000
Handling capacity	Max 1000 kg
Process equipment package	Fronius, SKS, ESAB, Kemppi
Welding torch	Fronius, Dinse, Binzel, SKS
Safety equipment	Complete system of safety features: safety fencing, light curtains, laser scanner, roll doors, safety locks, safety PLC

Cells based on 2L-type positioners or fixed tables

FlexArc 2L



Robot	IRB 1520ID, IRB 1600(ID), IRB 2600(ID), IRB 4600
Number of robots	1 - 2 (up to 4 on request)
Positioners	2 IRBP L
Handling capacity	Max 300 kg
Process equipment package	Fronius, SKS, ESAB, Kemppi
Welding torch	Fronius, Dinse, Binzel, SKS
Safety equipment	Complete system of safety features: safety fencing, light curtains, laser scanner, roll doors, safety locks, safety PLC

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Modular solutions
FlexLoader™ machine tool tending cells

ABB FlexLoader is the next generation of standardized and flexible machine tool tending cells designed to feed your machines and automate handling of workpieces in production.

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When compared with manual labor, robotic automation increases machine tool utilization by up to 60%.

With more efficient and advanced machine tools entering the market the demands on more intelligent and flexible robotic automation for machine tool tending is ever increasing. All cells in the FlexLoader family are standardized and built using the latest technology to meet the increasing requirements for a flexible and cost-effective production.

The FlexLoader cells from ABB provide reliable and predictable output from robot and machine tool. It facilitates higher machine tool utilization, typically in the range of above 90% compared with traditional manual machine tools, which often are in the range of 50%. This results in a much faster ROI and gives a sustainable competitive advantage.

FlexLoader SC 3000

FlexLoader SC 3000



Standardized and flexible solution that increases machine tool utilization by as much as 60% while reducing operating costs. The key characteristics of this model are its modularity, small footprint, and ease of use.

The FlexLoader SC 3000 is a preengineered, welltested and reliable automation solution with safety built in. Modularity means users can customize the robot cell to meet any need, for example workpieces can be loaded by conveyor or drawer.

Benefits
- Great modularity and small footprint
- Extremely simple to operate and teach-in for new workpieces
- One-day installation

FlexLoader SC 6000

FlexLoader SC 6000



The FlexLoader SC 6000 is available in two variants, with the IRB 2600 robot (20kg/1.65m reach) and with the IRB 4600 robot (60kg/2.05m reach). Both come complete with a robot controller inside its fully integrated control cabinet. The FlexLoader SC 6000 is a pre-engineered, well-tested and reliable automation solution.

Designed to load and unload machine tools using vision guided robotics, the integrated solution is capable of handling a variety of additional manufacturing operations such as marking, deburring and cleaning with air.

Benefits
- Extremely simple to operate and teach-in for new workpieces
- Can be equipped with six standard plug-and-play options
- One-day installation

FlexLoader FP 100

FlexLoader FP 100



It’s compact but has a wide range of functions. Even if you’re only processing two workpieces, FlexLoader FP 100 is a good investment. It completely replaces conventional bowl feeders. The buffer is located outside of the cell, making it simple to tip in workpieces.

With the feeder on a mobile fixture, it’s easy to move it between applications. A large number of small workpieces (up to 60 mm depending on their geometry) can be fed without having to change the hardware. Many adjustments can be made during operation. The significance of different parameters is displayed on a screen. The operator can easily teach the robot to pick up new products in just a few minutes, right at the machine. The gripper fingers are all that need to be adjusted.

FlexLoader FP 300

FlexLoader FP 300



It replaces manual tending and other feeders when a short cycle time is required. FlexLoader FP 300 is quickly and easily installed or moved. The whole cell, including the robot, is built on a single baseplate and takes up very little space.

With the right robot and FlexLoader Vision system, the robot cell is very flexible. Workpieces are poured into a buffer, then vibrated forward to the camera conveyor belt where they are picked up automatically.

Like all FlexLoader robot cells, FlexLoader FP 300 is extremely easy to operate. It doesn’t require any mechanical adjustments and changeover time is short. The operator will be able to teach in new workpieces in under 10 minutes for FlexLoader FP 300 after just a few days of training.

FlexLoader FP 400

FlexLoader FP 400



The cell will with high speed and great accuracy handle workpieces up to 250 mm long and approximately 3 kg in weight. Workpieces are either tipped directly onto a buffer conveyor, or a pallet tipper can be connected.

The model of robot is chosen according to the needs in reach and payload as well as the desired cycle time. The shortest possible cycle time is approximately 2.3 seconds.

FlexLoader FP 400 is easy to operate, works for extended periods of time without attendance, and can manage most feeding tasks. The operator can teach in new workpieces in less than 10 minutes.

FlexLoader FP 600

FlexLoader FP 600



It replaces fixtures with traditional conveyors, is very flexible and has no limits for size or weight of workpieces. It can be adapted for different kinds of machine tending, but can also be equipped with add-on options for deburring, air cleaning station, workpiece marking, washing and quality control. New workpieces are programmed in just a few minutes.

Workpieces are placed manually on a conveyor belt that also functions as a buffer. FlexLoader FP 600 can be unmanned for long periods of time while the robot picks up workpieces from the belt and feeds them on to one or more processing machines.

The system can be integrated into existing production lines where workpieces come separated from each other. The robot can also place finished workpieces directly onto pallets, sometimes with dividers.

FlexLoader FP 800

FlexLoader FP 800



It is a fully automated feeder for all kinds of workpieces, picking straight from the pallet as long as the workpieces are semi-oriented or arranged in layers, with or without dividers.

Thanks to the high standardization of all FlexLoader function packages, FlexLoader FP 800 can easily be adapted to all kinds of post- and pre-processes such as pallet handling, deburring, air cleaning, workpiece marking, washing and quality control.

FlexLoader FP 850

FlexLoader FP 850



It handles workpieces that are in disarray just as well as those arranged in layers, with or without dividers.

Rather than using traditional 2d or 3d vision, FlexLoader FP 850, utilizes a laser sensor that is placed in the gripping tool to guide the robot to the workpieces. The advantage is that less hardware is required, such as no computer or camera tower. FlexLoader FP 850 is also very compact. A robot and a pallet, that’s all there is to it. It can be adjusted to tend one or several machines as well as post- and pre-processes such as handling pallets, deburring, cleaning, workpiece marking, washing and quality control.

Software products
RobotStudio®

Computer-based programming is the best way to maximize return on investment for robotic systems, resulting in lower costs, faster time to market and superior end products.

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RobotStudio allows programming to be done on a computer without committing to construction or disturbing existing production.

ABB's simulation and offline programming software, RobotStudio, allows robot programming to be done on a PC without shutting down production. RobotStudio provides the tools to increase the profitability of your robot system by letting you perform tasks such as training, programming, and optimization without disturbing production, providing numerous benefits to our customer's team and business. RobotStudio is built on the ABB VirtualController, an exact copy of the real software that runs your robots in production. This allows very realistic simulations to be performed, using real robot programs and configuration files identical to those used on the shop floor.

RobotStudio

RobotStudio



The computer-based system design in RobotStudio ensures you do it right the first time, with the ability to verify tooling, cycle times, work envelopes, and product throughput before any construction begins in the real world.

Achieving perfectly optimized solutions is made possible because you can quickly and easily try multiple configurations on your PC. You can be certain your system will work properly in the real world after seeing it work in the virtual world. The end result is greatly reduced risk.

RobotStudio – PowerPacs

RobotStudio ArcWelding PowerPac



ArcWelding PowerPac is an add-in to RobotStudio that makes it fast and easy to program arc-welding applications. It includes VirtualArc, an expert system that makes it possible to determine the process parameters necessary to achieve a particular welding result. Use of ArcWelding PowerPac makes it easy to make sure that the optimum tool angles are always used, resulting in higher quality welds and shorter cycle-times.

RobotStudio – PowerPacs

RobotStudio Painting PowerPac



The Painting PowerPac integrates paint programming knowledge and paint process tools into RobotStudio. It will speed up your programming and simulation of painting robots and painting equipment, and is a faster and more intuitive way to create paint programs. Paint strokes are easy to create and edit. Instructions for paint events are automatically added to your program and the event trigger axis automatically selected. Robot positions for the acceleration and deceleration distances are calculated automatically. Paint process performance parameters can be predicted off-line.

RobotStudio – PowerPacs

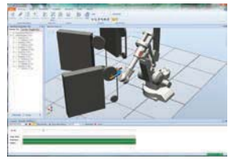
RobotStudio Machine Tending PowerPac



RobotStudio Machine Tending PowerPac – an add-on for RobotStudio, ABB's powerful PC-based programming tool – provides a platform for quick, easy creation and editing of machine tending robot cells in a 3D virtual environment. RobotStudio Machine Tending PowerPac is seamlessly integrated with RobotWare Machine Tending.

RobotStudio – PowerPacs

RobotStudio Machining PowerPac



Machining PowerPac reduces programming complexity by 50% and optimizes machining tool path to improve product quality. The PowerPac guides the users in creating accurate targets and paths from surfaces and edges on an imported CAD model while having control of related process parameters in the simulation. In addition the PowerPac provides the possiblity to convert CNC-Code to RAPID and customize conversion to match different machine setups. RobotStudio MachiningPowerPac not only supports the traditional position controlled processes but also supports force controlled processes and is seamlessly integrated with Robotware Machining FC.

RobotStudio – PowerPacs

RobotStudio Cutting PowerPac



RobotStudio Cutting PowerPac is an offline programming tool that allows operators to create, modify and verify cutting programs in an offline 3D simulation instead of on the factory floor. RobotStudio Cutting PowerPac is seamlessly integrated with RobotWare Cutting.

RobotStudio – PowerPacs

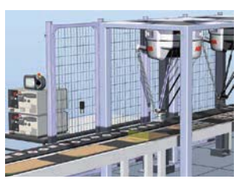
RobotStudio Palletizing PowerPac



RobotStudio Palletizing PowerPac makes programming robot palletizing systems easier than ever before. As no programming skills are required, RobotStudio Palletizing PowerPac software radically reduces programming times and creates fully tested simulations, and real robot system programs, in minutes.

RobotStudio – PowerPacs

RobotStudio Picking PowerPac



Picking PowerPac is an offline tool that simulates PickMaster 3 in picking applications. The PowerPac offers ease of use configuration of a picking application which can be simulated and fully optimized before being downloaded into PickMaster 3 for real production.

Software products
RobotWare

To boost your productivity and decrease your total cost of owning and operating a robot-based solution, ABB has developed a family of software products to support every stage of the robot life cycle.

—
RobotWare affords manufacturers greater flexibility and reliability, with an extensive toolbox for developers and broad communications capabilities.

RobotWare is a collection of robot software, which offers in its basic design – superior motion control and enables the quick integration of additional hardware. For RobotWare there are a number of options and specific application software available. They represent tools for robot users who need additional functionality, for example running multiple tasks, transferring information from file to robot, communicating with a PC, and performing advanced motion tasks. RobotWare raises the bar in robot control by improving flexibility while maintaining world-class performance to improve productivity and enable new application functionality. For more information, please visit abb.com/robotics.

RobotWare features

QuickMove™ and TrueMove™



Based on advanced dynamic modelling, the IRC5 optimizes the performance of the robot for the physically shortest possible cycle time (QuickMove) and precise path accuracy (TrueMove). Together with a speed-independent path, predictable and high-performance behavior is delivered automatically, with no tuning required by the programmer. What you program is what you get.

IRC5 options

I/O Communication



ABB Robotics has expanded the I/O communication capabilities of IRC5 and the I/O system are based on a compact modular design with big improvement in flexibility, easiness and reliability. The system consist of a base unit serving as the minimum configuration. It is equipped with industrial network connectivity, 16 digital inputs, and 16 digital outputs.

RobotWare options

Communications



Several optional RobotWare functions are available for communication to and from the robot such as:

– FTP Client
– NFS Client
– PC Interface (including Socket Messaging)
– FlexPendant Interface
– Field bus Command Interface
– File and Serial Channel Handling
– EtherNet/IP m/s
– PROFINET SW, master/slave and slave only

RobotWare options

Absolute Accuracy (AbsAcc)



Absolute Accuracy (AbsAcc) is a calibration concept which ensures a TCP absolute accuracy of better than ±1mm in the entire working range with some limitation for “bending backwards” robots. The user is supplied with robot calibration data (compensation parameters saved on the manipulator SMB) and a certificate that shows the performance (“birth certificate”). The difference between an ideal robot and a real robot can typically be up to 10mm, resulting from mechanical tolerances and deflection in the robot structure. The Absolute Accuracy option is integrated in the controller algorithms for compensation of this difference, and does not require external position recalculation.

RobotWare options

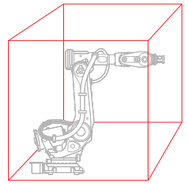
SoftMove



SoftMove is a cartesian soft servo option that allows the robot to be compliant or floating to adjust to external forces or variations in work objects. SoftMove can lower the stiffness of the robot in a pre-defined cartesian direction (in relation to either the tool or the work object) while keeping the original behavior in the other directions. The basic behavior of the softness is mainly controlled by stiffness and damping parameters. With SoftMove, the robot is compliant in one direction only which facilitates high accuracy and reliability. The option reduces robot programming time and enables effective interaction between robot and machine, which reduces cycle time.

RobotWare options

SafeMove2



SafeMove2 is the latest generation of ABB´s safety certified robot monitoring solution. It delivers greater flexibility, space savings and cutting edge commissioning tools for greater productivity at a lower total investment cost. All this, combined with unsurpassed safety, enables closer collaboration between robots and factory workers. Like its predecessor, SafeMove2 includes a host of cutting-edge safety functions, including safe speed limits, safe standstill monitoring, safe axis ranges and position and orientation supervision.

RobotWare options

MultiMove™



A MultiMove system is a system where a common controller controls up to four robots, each equipped with its own drive module. MultiMove system exists in two different modes – Independent and Coordinated. With MultiMove Independent, the robots run independently of each other, i.e. controlled by separate RAPID tasks. It is also possible to run positioners independently (controlled by separate RAPID tasks).

The option MultiMove – Coordinated makes a robot system a MultiMove system with coordinated robots func-tionality. A MultiMove system is a system where a common controller controls up to four robots, each equipped with its own drive module. MultiMove exists in two different modes – Independent and Coordinated. With the MultiMove Coordinated option, a MultiMove system is able to work together on a common work piece and coordinated in a common workobject. MultiMove Coordinated also includes all MultiMove Independent functionality.

RobotWare options

Conveyor Tracking



Conveyor Tracking (also called line tracking) is the function which makes the robot follow a work object on a moving conveyor. While tracking the conveyor, the programmed TCP speed, relative to the work object, will be maintained even when the conveyor speed is changing slowly.

Software products
RobotWare

RobotWare options

Independent Axis - The Independent Axis option is used to make an external axis (linear or rotating) run independently of the other axes in the robot system.

Path Recovery - Path Recovery is used to store the current movement path, perform some robot movements and then restore the interrupted path. This is useful when an error or interrupt occurs during the path movement. An error handler or interrupt routine can perform a task and then recreate the path.

Path Offset - Path Offset (path corrections) changes the robot path according to the input from a sensor. The robot can thus follow/track a contour, such as an edge or a weld. The path corrections will take effect immediately when receiving data from the sensor.

Multitasking - The Multitasking option gives the possibility of executing up to 20 programs (tasks) in parallel, including the main program. Multitasking can be used to control peripheral equipment or other processes concurrently with robot motion.

Continuous Application Platform - Continuous Application Platform (CAP) is a software platform for time critical application, where a continuous process, for example arc welding, must be synchronized with the movement of the robot.

Discrete Application Platform - Discrete Application Platform (DAP) is a software platform for time critical application, where certain actions shall be performed at specific robot positions. Target users are advanced application software engineers and system integrators

Sensor Interface - The Sensor Interface option can be used to integrate sensor equipment for adaptive control, like path correction or process tuning. For communication between the sensor and the robot controller two different communication links are available: serial link (RS 232) and Ethernet.

Externally Guided Motion - Externally Guided Motion (EGM) is a fast low level interface to the robot controller's path planning. It can be used to change the robot path with high responsiveness based on input from external devices. The function is designed for advanced users.



Software products
Application software

To boost your productivity and decrease your total cost of owning and operating a robot based solution, ABB has developed a family of software products to support every stage of the robot life cycle across a wide range of applications

—
With more than 300,000 robots installed worldwide, ABB's decades of experience have culminated in software products designed with the customer's needs in mind.

Regardless of whether you are a robot programmer or an operator ABB offers you a full range of easy-to-use software tools to help you to improve your process, optimise production, increase productivity, reduce risks and maximize the return of investment of your robot systems.

For example, for Machine Tending applications ABB offers an integrated set of software tools that uses ABB's extensive experience in robotic machine tending to reduce operational expenditure and increase productivity. The software delivers easy and flexible programming, straightforward configuration and trouble-free operation of ABB robots in machine tending cells.

ABB's application software is available to meet your needs through a variety of industries and applications, such as:

- Arc welding
- Assembly
- Cutting
- Force control
- Machine tending
- Machining
- Painting
- Palletizing
- Picking
- Plastics
- Press automation
- Spot welding

Arc Welding

RobotWare Arc



RobotWare Arc comprises a large number of dedicated arc welding functions. It is a simple yet powerful program since both the positioning of the robot and the process control and monitoring are handled in one instruction.

Assembly

RobotWare Force Control



RobotWare Force Control will greatly facilitate the use of robots for tasks that needs "touch sensing", like assembly, fixturing, product testing etc. The option is based on the force control concept, i.e. a robot control strategy where the robot movements are adapted to the feedback from a force sensor. Thus the robot can automatically search for the correct location, and assemble parts using intelligent force/torque motion without the risk for jamming or part damage.

Cutting

RobotWare Cutting



Modern ABB robots are used for high precision laser cutting. This is possible through a combination of ABB robot features and advanced cutting software products, RobotStudio Cutting PowerPac and RobotWare Cutting, developed specifically for robotic laser cutting. Using robots for laser cutting offers substantial cost benefits compared to using laser cutting machines. Robotic laser cutting reduces capital investment by up to 35 percent* and uses less floor space.

*An ABB robot based standard function package compared to a dedicated cutting machine.

Software products
Application software

Dispensing

RobotWare Dispense



RobotWare-Dispense can be used for different types of dispensing processes. It is a software option typically used for gluing, sealing, spraying and other similar processes, but can also be useful in a wide spectrum of other applications.

Machining

RobotWare Machining FC



Enables easy teaching and automatic path generation of complex part surfaces and edges for machining processes like polishing, deburring, grinding. Forces are also controlled during the processing instead of the conventional position control of the robot which makes it more sensitive and increases the quality of the finished parts. Suitable function packages are available for various machining robots of ABB.

Machine tending

RobotWare Machine Tending

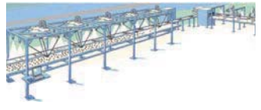


An integrated set of software tools that uses ABB's extensive experience in machine tending to reduce operational expenditure and increase productivity through easy and flexible pr ogramming, straightforward configuration and trouble free operation of ABB robots.

RobotWare Machine Tending is a flexible controller software for deployment and operation of ABB robots. It provides configurable and powerful tools, including an intuitive graphical user interface, that facilitates trouble-free and safe operation for everyone.

Picking and Packing

PickMaster 3



PickMaster is the tool for guiding robots in the packaging process. The PC based software product uses comprehensive graphical interfaces to configure powerful applications where up to eight robots may work in a team along conveying belts. PickMaster 3 includes advanced vision technique and tightly integrated conveyor tracking capability. The integrated vision system is advanced, however PickMaster 3 is also open to communicate with any external sensor. (line scanners, color vision, 3D, etc.).

Plastics

RobotWare Plastics



ABB´s IRC5 robot controller offers a lot of opportunities when it comes to programming and operation of robots. RobotWare Plastics Mold is a user-friendly interface designed specifically for the plastics industry, and injection molders who have installed six-axis robots with this unique software are already seeing the benefits.

Press automation

RobotWare StampApp



RobotWare StampApp is the core value of StampPack, a Stamping Function Package, to facilitate the automation of different variety of Stamping cells. StampApp provides a friendly environment to integrate, program and operate robotic stamping cells. Its configuration tool brings an unprecedented flexibility for stamping processes.

RobotWare StampApp includes:
- Wizard to facilitate robot programming
- HMI to easily interact with the robot
- Basic pre-engineered interphase to connect robot with cell devices.
- Configurator to edit (if required) production processes.

Painting

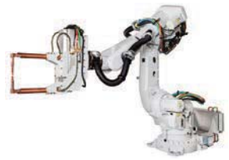
RobView



With RobView 5 you can manage your paint installation, whether it is one or many robots, visualize the complete paint process, and operate and supervise your paint robot cell. A basic version of RobView 5 is bundled with all IRC5P paint robots, free of charge*. It is an affordable graphical user interface for low budget installations. However, it is scalable and expandable with plug-in options for large and advanced installations.

Spot welding

RobotWare Spot



Dedicated software that simplifies the Spot Welding application. Advanced motion control for an electrical servo gun are built in features. RobotWare Spot is designed to be a general and flexible software platform offering both standard configurations as well as giving possibility to create customized solutions. All with the target to give easy to use function packages for different types of spot welding systems.



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