

ROBOTICS

Welding & Cutting

Modular solution to meet your requirements

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With change being the only constant in the manufacturing industry, how will factors such as globalization and increased automation affect the future of the sector?

Many companies see low-cost country utilization as key in remaining competitive and many customers need product quality and equipment uptime to be consistent across the planet.

With offices and service in more than 50 countries and 24-hour part delivery to any region, ABB Robotics understands how technical solutions need to be supplied and supported globally.

ABB's competitive advantage is our capability to supply our customers with high-end reliable performance products, as well as complex, risk-free turn-key projects based on standard function packages.

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Table of contents

04 – 07	Arc welding
08 – 09	Spot Welding
10	Flex Arc
11	Complete solution
12 – 13	Laser solutions
14 – 15	Complete solutions

Arc welding

Robot and Controller

High-performance, easy-to-use robots

No matter what solution you have in mind, ABB can offer you the arc welding robots you need. The IRB 1600ID, IRB 1520ID and IRB 2600ID all feature integrated dressing for maximum performance, reliability, and longevity. In addition, where the demands on flexibility is a priority, the IRB 140, IRB 1600, IRB 2600 and IRB 4600 will perfectly match your designs. All ABB robots offer superior motion performance through the IRC5 modular control system.

The built-in IRC5 software, RobotWare, includes a Collision Detection option for the protection of the torch, robot and other equipment. Another option, AbsAcc (Absolute Accuracy), makes sure robots are individually measured. Deviations in measurements are compensated for in the software, resulting in a more accurate robot, and improving the quality of the weld. AbsAcc is perfect for off-line programming and the fast replacement of robots. Path Recovery stores all system data when an interruption occurs. By a single command the robot can, for example, reverse along a programmed path, enter the Torch Service Center, and then return to the interrupted path to resume welding, all fully automatically.

Built-in superior motion control

ABB has been the leader in motion control since the introduction of TrueMove and QuickMove technologies, features developed and delivered by ABB with all ABB robots.

QuickMove is based on a complete dynamic model of the robot held in the robot controller. This function enables the maximum possible acceleration so that the end position is reached in the shortest possible time. As a result, cycle times are optimized and are not dependent purely on axis speeds.

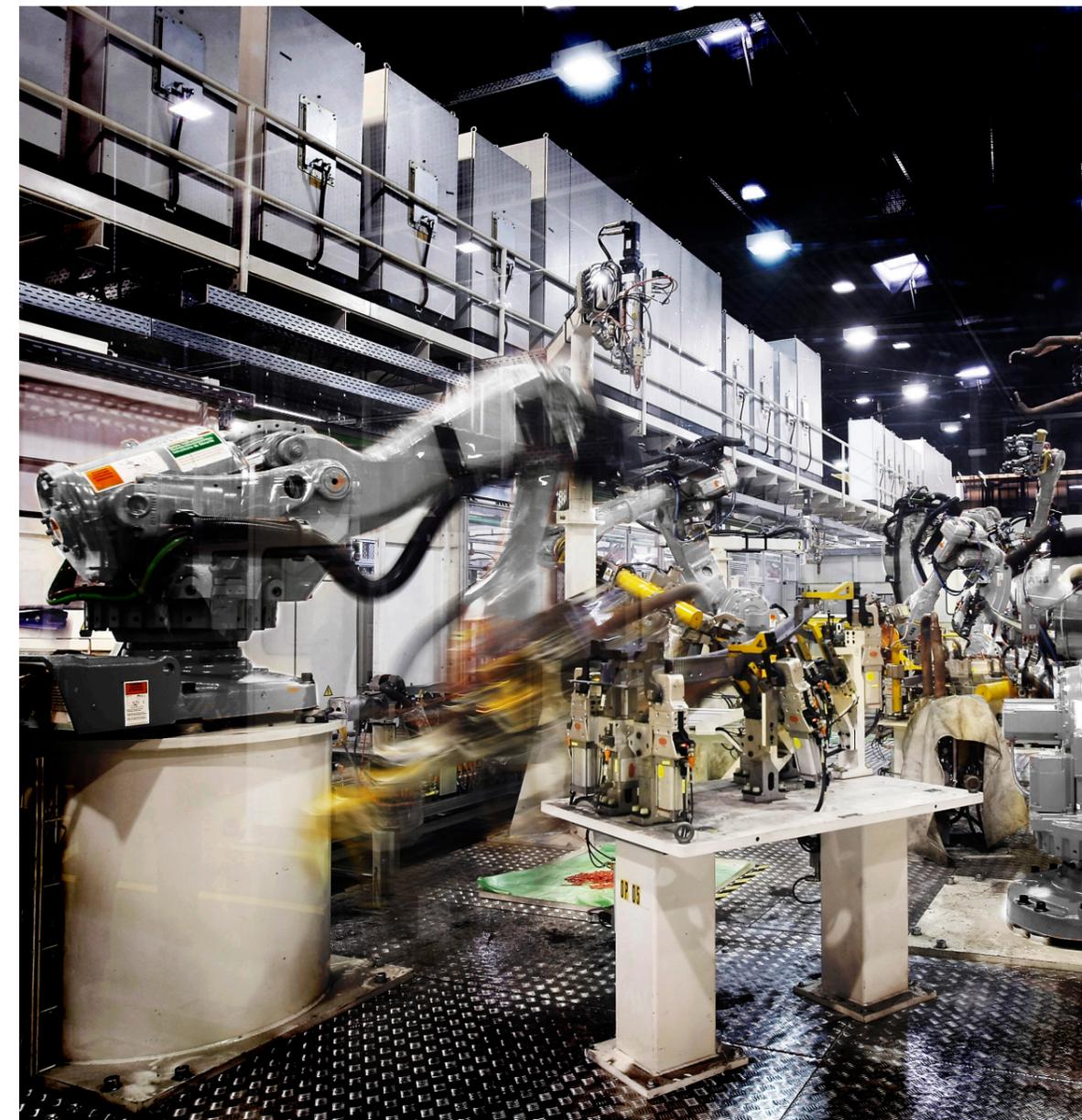
The TrueMove function ensures that the motion path followed is the same no matter the robot speed. It eliminates the need for “path tuning” when speed parameters are adjusted online. What you program is what you get, at any speed – that’s what ABB calls path accuracy.

The MultiMove feature allows for up to four robots to work together in coordinated patterns. For example, three robots can work side by side, welding on a workpiece held in a positioner while rotating. Another example is a robot that holds the tool while one or more robots do the welding. This means that more operations can be carried out simultaneously, maximizing production capacity and weld quality.

If a safety hazard is detected, SafeMove executes an emergency stop or alerts a superior PLC within fractions of a second. With this feature, it is possible to restrict the cell size to precisely what is needed, saving valuable floor space. It is also possible to create production concepts where robot and operator interact more closely, without compromising safety. With improved personnel and machinery protection you can maximize uptime and reduce cycle time and costs for fixtures and tools.

FlexPendant – a touchscreen PC

The easy-to-use FlexPendant graphical user interface provides operators with a single programming point, an overview of cell status and a display of important data on quality and production. With just a few buttons, and an intuitive, PC-like, multi-lingual interface, the operator can organize the welding operation with minimal training. By integrating the power source interface on FlexPendant the operator can have full control over voltage, current, speed, gas flow, etc.



Arc welding

Moving torch and workpiece

Track Motions extends the robot's working range

ABB track motion systems are designed to ensure reliable and effective utilization of a robot's capacity, in order to maximize the value of your investment in automation. Track Motion greatly extends the robot's working area, enabling the same robot to serve many machines, thus minimizing the total number of robots required. The Track Motion system utilizes the same superior motion control system as the robot, ensuring the high quality of the weld.

Workpiece positioners – for synchronized motion of workpiece and torch

ABB offers a comprehensive range of workpiece positioners which enable fully coordinated movement with the robot during programming and operation. The dynamic software automatically compensates for the effects of gravity, inertia, and friction to provide faster movements and accurate path following. QuickMove and TrueMove functionality ensures the efficient and synchronized motion of workpiece and torch, resulting in shorter cycle times, faster station interchange, and, of course, higher weld quality.

External axes – for custom solutions

ABB's new comprehensive range of well-proven motor unit and gear unit packages now enables integrators to create custom solutions for workpiece positioners, robot carriers, track motion, and indexing conveyers. The standardized packages come complete with flexible long-life cables, serial measurement board (SMB) boxes, optimization software, and safety options. Delivered with the TuneMaster tool, predefined CAD models and configuration files, the packages are easy to integrate, and the modular concept of standardized components offers the integrator a cost-efficient way of creating unique solutions.

Facilitating the arc welding process

The ABB Torch Service Center is a combined process support tool that will maintain and secure the highest possible utilization, quality, and productivity from your arc welding robot station.

The TSC consists of three process support tools:

1. Torch Cleaner,
2. Tool Center Point calibration and
3. Wire Cutter.

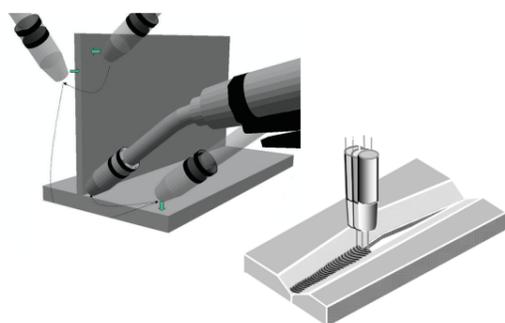
The TSC provides the following benefits for the user:

- better uptime in the arc welding robot station,
- higher productivity thanks to better utilization of the robot station, and
- improved welding quality, resulting in reducing repair cost to almost zero.

BullsEye provides the user with a fully automated calibration of the wire tip, ensuring the highest possible level of utilization, quality, and productivity from the robot station. Pre-defined programs enable fully automatic tool center point calibration during setup of the system and production execution, reducing downtime to almost zero.

Weldguide is a robotic Thru-the-Arc joint tracking system that uses two sensor inputs – the welding current and the arc voltage. This means that the system both “looks and listens” for better welding results – a feature unique to ABB sensors.

The Weldguide sensor is much faster than traditional tracking methods. It is designed to track welding joint variations, due to fixturing or part fit-ups, and will, in an automatic mode, monitor and track the welding seam during the weld process.



Arc welding

Process support tools and application software

Key features of WeldGuide are:

- “Through the Arc” adaptive seam tracking system for centerline and single-side tracking
- Tracks the weld path by measurement weld data during weaving
- Impedance used as the measurement source
- Use torch to work (stick-out) as reference
- Minimum weave: 1.5 x wire diameter
- Maximum weld speed: 25mm/sec (throat size 4 mm)

The seam finder SmarTac easily finds positions for welding, subsequently increasing the weld quality. It is a tactile sensor using a gas nozzle or weld wire (wire cutter recommended) and uses weld power supply voltage to generate search stops. This is a well-proven and reliable solution for 1, 2 or 3 dimensional searching with minimal hardware required.

Arc Welding Application

Software provides powerful tools for fast and accurate programming and operation. ABB's easy-to-use software, RobotStudio, allows for robot programming and simulation to be done on a PC – without shutting down production. Any mistakes are made virtually without risk to the project (for example, in collisions, reachability, the rebuilding of fixtures, etc.). For integrators, this powerful software reduces programming time by up to 90 percent and shortens the overall project lead time by up to 50 percent. The ArcWelding PowerPac is an add-on to RobotStudio, designed specifically for generating arc welding programs. It contains a set of ready-made welding templates that can be edited easily by the user, with easy configuring, programming, and simulation off-line.

VirtualArc is a software program built on many years of expertise. It predicts and tunes welding parameters off-line. The proposed and simulated set of welding data is used as start data with minimum trimming needed, resulting in short commissioning time and optimized welding productivity and quality.

RobotWare Arc is an option in the controller software that optimizes your robot for arc welding. The positioning of the robot and the process control are handled in a single instruction, making it easy to program. Other beneficial features are process equipment supervision, error recovery, etc. for simple monitoring and operation.

Production Manager is a graphical user interface for managing setup and service routines on FlexPendant. With preconfigured components you can easily manage safety, station-interchange, part handling, display production info, and more. All administrative tasks are taken care of by the delivered infrastructure, resulting in the swift entry of new products.

High Quality and Performance Function Package

ABB offers fully configured, ready-to-use robot packages for high quality and high performance spot-welding. The function packages are built from a combination of hardware and software that are dedicated to optimizing your specific process. We are working with key values like simplicity, ease-of-use, and reliability.

The function packages are designed and configured to optimize processes together with the ABB IRB 6700 power robot family. The packages are seamlessly integrated with the robot, which ensures high quality and performance. The SpotPack function package is easily configured upon the time of order of your power robot.

Main benefits

- Single supplier of power robot and SpotPack/DressPack guarantees simultaneous delivery and verified system functionality.
- Configurable for various requirements thanks to a modular design to meet your specific process requirements.
- High performance and uptime guarantee high quality production optimized to your needs.

Spot welding

Equipment and SpotPack

DressPack – Lean ID

- Partly integrated dresspack for secure and flexible production.
- Minimal cable wear ensures few cable replacements.
- Easy access and clever quick-locks for exceptionally fast replacement.

Spot Welding Cabinet

- Supports MFDC welding applications with Bosch weld controllers as standard options.
- Based on the IRC5 design and can be stacked on top of the robot controller to gain floor space.

Tip dresser

- Cutting performed in seconds - saves cycle time.
- Wide range of electrode-types.
- Wide range, including: single, double, form and top cutter.
- TCP check (beam) for fast commissioning.

Water and Air Unit

- Water and air unit fitted on the base of the robot.
- Available for both robot-carried guns as well as for stationary guns.

Spot Welding Software

- RobotWare spot -welding with MFDC weld controllers.
- Spot Servo -welding with electric servo guns with MFD weld controllers.
- Spot Servo Equalizing – compensating for electrode arm deflection.

Weld gun – Flexgun

- Same gun body for all models (X & C/J Gun).
- Designed for heavy electrode force.
- Centre of gravity near the robot attachment.
- Drive unit integrated in robot control.

Spot welding

Dressed for success

ABB's Integrated DressPack solutions helped Volvo Cars enhance cable and hose lifecycles, reduce production costs and down-time, increase floor-space savings and secure shorter start-up times.

Exterior cables on robots break down quickly from wear and tear and when they do, maintenance and downtime become very expensive, especially for companies that use many robots.

At Volvo Cars' component factory in Olofström, Sweden, these concerns were very real. The plant makes and supplies components to Volvo assembly plants in Gent, Belgium, and Torslanda, Sweden. Technicians responsible for around 600 robots at the components facility needed to ensure that these robots operated without interruption day in and day out, all year round.

They addressed this issue by switching many of their robots from using external dress packs to ABB's Integrated DressPack solution. From a cost perspective, the additional investment made a lot of sense as this solution immediately increased the lifetime of these hoses and cables by up to several years, reducing overall maintenance in the long run.

Using internal dress packs has proven to be more cost-effective for Volvo Cars in other ways, too. At its Torslanda facility, Volvo Cars has several robotic production lines that still use external dress packs, and repairs to those dress packs are one of the main costs.

Cables and hoses attached to these robots supply the electricity, water, air, and welding power, along with the signal and process controls

necessary for production. Protecting these cables is of vital importance to the productivity of any set-up. For production operations that prioritize accessibility and use complex wrist movements that require flexibility, the Integrated DressPack works perfectly. The robot has its process cables routed inside the upper arm and through the robot wrist. The cables follow every motion of the robot arm, instead of swinging in irregular patterns.

Swinging cables wear out quickly. When routed inside the upper arm, the cables are firmly in place during robot operation, which results in reduced wear. They are also protected from weld spatters, heat, and collisions. Consequently, the service life is increased to 6–8 years in a three-shift operation, compared with 1–2 years for an external dress pack, providing an important advantage in higher uptime and lower maintenance costs.

Benefits of the Integrated DressPack

- Substantially improved life of cables and hosing.
- Smaller footprint means a more compact space, which saves money.
- Process wrist can enter narrow parts of a car body
- Fully predictable movements and behavior with off-line programming (only possible with internal dressing).
- Modular solutions mean dressing can be changed very fast saving valuable time.



FlexArc

A new generation of Arc Welding cells

FlexArc® – A New Generation of Welding Cells

FlexArc® is a new generation of standardized welding cells, designed to deliver cost-effective, state-of-the-art robotic welding operations. All cells deliver maximum performance while making optimum use of available space. The basic options feature a single robot, or two robots with Multi-Move, a choice of ABB positioners from our extensive range, and welding equipment to suit your needs.

All equipment is installed on a common platform which provides for easy relocation within the production facilities. The cells are equipped with centralized power distribution - all components such as robots, positioners, welding equipment, lighting and other peripheral devices are supplied from one source; this means that only one power supply cable for the whole cell is necessary.

Easy implementation makes the FlexArc® the natural choice for “plug-and-produce” operations.

FlexArc® Advantages

- Cost-efficient solution
- Intuitive graphical user interface for operators
- Reduced downtime thanks to improved error handling
- Higher quality through automatic production and process monitoring
- Improved cost-efficiency thanks to global standardization
- Short delivery times
- Proven two-station principle (loading and welding)
- Off-line programming for fast and easy implementation
- Improved workspace safety

Boosting your Workflow

FlexArc® features the FlexPendant graphical user interface, which not only provides operators with an overview of the status of the cell, but also important quality and production data. The interface allows the operator to communicate effectively with all of the functions within a cell and access all information regarding cell performance, including the status of the robot and controller along with other functions such as roll-down door control. With minimal training, the user can organize the welding operation into a series of work steps. The operator has all the information necessary to keep track of the number of parts produced, cycle times, the number of welds produced, and the individual weld length.

FlexArc® is the Most Effective Solution in your Industry

- General industry: door modules, grids, switch boards, printing units, steel furniture, shopping carts, racks, compressors, lawnmowers, two wheelers, and construction and agricultural equipment components.
- Automotive industry: cross members, engine cradles, door modules, exhaust systems, brake components, car seats, wheels, axles, dash boards, and more.



Complete solution

Turn-key automotive projects

Optimal productivity requires equipment that combines effective operation with maximum cost efficiency. Modular, standardized robot cells are an established way of providing this type of solution.

Robotics plays an important role in the whole of this gamechanging environment by adding flexibility, accuracy, speed, and tools for easier programming. Increasing the integration of robots and new welding peripherals is of paramount importance.

One key requirement in the automotive industry is the intergration of materials, processes, sensors, and controls. Here, again, robotics plays a major role in ensuring smooth communication and coordination between numerous peripherals, including the latest, for the purposes of welding and realtime sensing and adaptive control.

The lack of understanding of robotic programming is one of the major challenges in the global welding robots market. Many of the production staff working on the production floor lack proper understanding of robotic programming, which means that they struggle while operating welding robots. The number of unskilled/semi-skilled workers is higher in developing countries.

Increasing international competition and the need to meet tightening environmental legislation mean that automotive suppliers are constantly seeking to reduce the weight of cars while also increasing comfort and safety for drivers and passengers. The twin pressures of cost and weight reduction are forcing some manufacturers to use thinner or different materials; lighter designs and new, lighter materials present adjoining issues. Meanwhile, other manufacturers use a mixture of materials, providing challenges for joining dissimilar materials, as well.

Alfonso Serrano: ‘Gestamp group, with nearly one hundred production facilities on four continents, needs product quality, equipment uptime, and labor competence to be consistent across the planet. This means that the technical solutions need to be supplied and supported globally. ABB Robotics understands this issue well, and has initiated a broad project of development of cells and solutions to follow Gestamp’s regional footprint, ensuring that we supply solutions equally engineered and always following our standards, while under standing regional demands.



Laser solutions

On top of the process

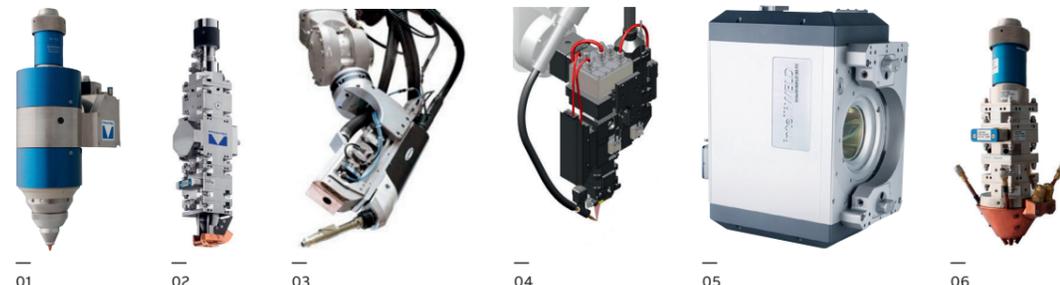
- 01 Cutting
- 02 Welding fix optics
- 03 Hybrid Welding
- 04 Brazing
- 05 Scanner Welding
- 06 Cladding

FlexCutLaser and FlexWeldLaser are standardized production solutions for laser applications. ABB robots set the standard for robot path performance so it is no surprise that ABB is a leader in robotic laser processing applications. Flexible, configurable, and compact, FlexCutLaser and FlexWeldLaser are delivered production-ready from ABB.

Flexibility, accuracy

As the use of ultra-high strength steel, tubular steel, and hydro-formed parts becomes more mainstream, traditional laser machines may not be the best solution because laser machining centers are large and expensive and offer limited flexibility. The answer? FlexCutLaser -a flexible, configurable, and precise robotic laser solution to meet your cutting needs.

Today's vehicles are largely steel structures. Multi-Material Vehicles (MMV) utilize a range of materials from Advanced High Strength Steels (AHSS) and Ultra High Strength Steels (UHSS) to aluminium, magnesium, and composites. While a true MMV structure offers the protection of UHSS with the weight savings of aluminium and magnesium, it also poses numerous manufacturing challenges in terms of corrosion, joining, and design. ABB strives to excel in the research and development of welding and joining technologies, to generate continuous innovation in areas such as arc welding, laser welding, friction stir welding, laser-arc hybrid welding etc., and to provide solutions for numerous production systems.



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Off-line programing & simulation

Integration using RobotStudio™ also means fast, accurate off-line programming for laser processing applications. Using predefined templates for standard shapes such as circles, rectangles, hexagons, slots, and even free-forms saves the programmer hours of complicated work. These shapes can easily be relocated by shifting just a single frame.

Compact and configurable

Its self-contained modular design, which utilizes compact, pre-engineered cells in a variety of configurations, allows for easy cell transport, minimum set-up time, and maximum flexibility in a limited amount of floor space.

Experience

With almost 250,000 successful robot installations worldwide, you can trust ABB to deliver end-to-end performance, from planning and installation to optimization and ongoing support. That's why we're already the choice of many of today's leading manufacturers. Learn about all the ways FlexCutLaser and FlexWeldLaser by ABB can help you reduce costs, increase output, improve quality, and give you advantages over your competition by contacting us today.

Laser solutions

Software tools

The Remote Laser Welding segment is expected to be the fastest-growing segment in the future because laserwelding is a versatile system capable of welding a variety of materials.

Laser-welding typically ensures deep weld penetration (helping to simplify part designs) and high speeds, while maintaining low distortion due to low heat input for minor changes in microstructure. Lately, ABB has made major advances towards the integration of a robot controller with laser equipment.

This new development has three directions:

1. Programming

ABB has created the specific RAPID library for fast and robust programming, welding instruction with embedded robot motion, on-the-fly and stationary welding modes, process parameterization through dedicated data types, and user routines for customization and adaptability.

2. Robot-Laser interface

An enhanced robot-laser interface to coordinate scan head mirrors and robot motion has been developed with the exchange of status and laser commands and program selection.

3. Ease of use

The lack of understanding of robotic programming is one of the major challenges in the global welding robots market. Many of the production staff working on the production floor lack proper understanding of robotic programming, which means that they struggle while operating welding robots. The number of unskilled/semi-skilled workers is higher in developing countries.

This is why ABB has developed two new tools:

1. RobotWare Remote Laser Welding

A dedicated User Interface on the robot, Flexpendant, allows for quick start-up and efficient operation to monitor and analyze process signals, as well as to monitor and control laser equipment. Includes teaching tools for easy and fast adjustments.

2. RobotStudio Remote Laser-Welding PowerPac

RobotStudio package for remote laser-welding on-the-fly. This RobotStudio add-on allows the import of scanner head programs into RobotStudio. The Laser Scanner Smart Component emulates the behavior of the real scanner head and its interaction with the robot controller. It reproduces the programs under the Remote Laser Welding add-on container according to the robot input commands, then outputting outputs program status feed back to the robot as it would do to the real device, and so assisting user tuning and optimizing the process. Also includes a signal analyzer that allows the monitoring of process signals (off-line and online) to assist the user during the optimization phase.

RobotStudio Cutting PowerPac

RobotStudio Cutting PowerPac is a sophisticated off-line programming tool that allows operators to generate and modify programmed paths in an off-line 3D simulation environment instead of on the factory floor.

- Pre-defined cutting instructions
- Free form cutting
- Integration of process data

RobotWare Cutting

RobotWare Cutting is an advanced controller software that optimizes laser cutting using ABB robots. It includes sophisticated tools for robot tuning and calibration, integration of peripheral equipment, and the programming of complex paths and shapes.

- Shape generation
- Intuitive user interfaces
- Equipment integration
- Advanced shape tuning
- Friction compensation
- Iterative Learning Control
- Laser power modulation

Complete solutions

General Industries

Today's competitive production environment means your process needs to be quicker, more flexible, and able to turn out products of the highest quality with the lowest levels of waste.

Robotic technology presents a host of exciting new opportunities for metal fabrication processes. Metal fabricators face complex demands for quality products to exact specifications while balancing the need to synchronize production schedules with those of their customers. To compete effectively, manufacturers need to ensure exceptional operational performance with lean manufacturing processes that minimize waste and improve productivity.

Advanced yet easy to use

The days when robots were only for advanced assembly lines and long-series production processes are a thing of the past. ABB's robots now offer enhanced flexibility and intelligence that make them a practical proposition even for small-scale or individual product runs. Developments in everything from motion control through to vision and inspection technology mean that robots can be trusted to deliver consistent, high-accuracy performance and final product quality. Furthermore, with their advanced yet easy-to-use software, they require little expertise to program and manage.

'Now that I found that there's no doubt to make good quality and high productivity products even this in an agricultural area, especially weld quality,' says President of TaeSung Industry. Tae-sung Manufacturing Co. Ltd was established in March 1985 and, since then, it has been the leader in the field of developing effective and easy-to-use agriculture and livestock equipment in Korea.

"Most effective solution in your industry"

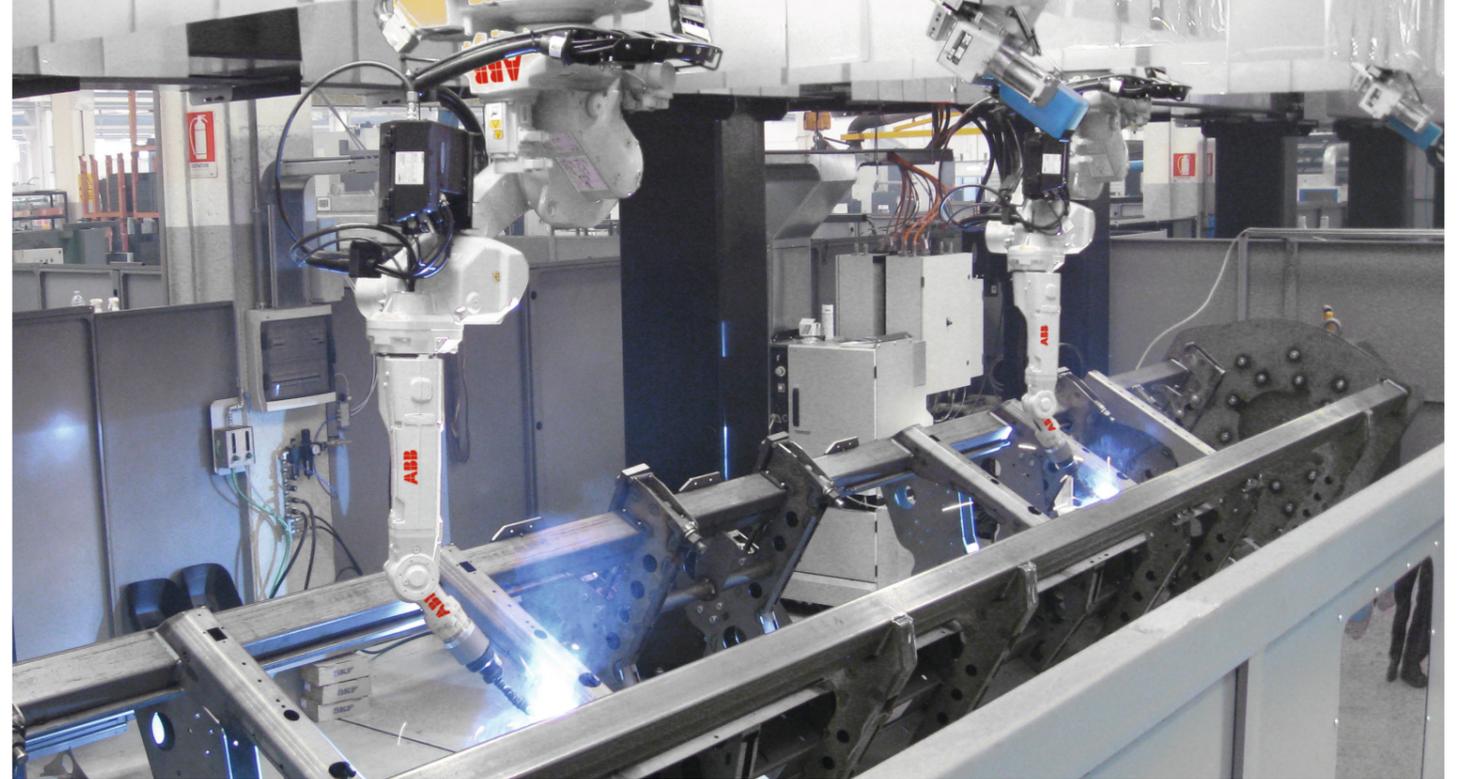
- Consumer industries: furniture, home construction (stoves & boilers), aluminium ladders, platforms, steps, pallets, racks, storage boxes, and city equipment
- Transportation: rail, trams, and buses
- Renewable power: solar, wind, batteries, and fuel cells
- Ship-building
- Bridges
- Energy
- Aerospace: structures and engines

- Mobile working machines: construction machines (roadbuilding, earth moving, concrete equipment), agricultural machines, and material handling equipment

Some common challenges identified in all sectors and throughout the world from the International Institute of Welding IIW:

- Environmental sustainability, including addressing climate change, CO2 emissions, waste disposal, decommissioning, and recycling.
- Rapid increase of worldwide energy and commodity consumption related to population growth, with associated demands for manufactured products and resources.
- Forecasts of global growth indicate that vast amounts will be spent on infrastructure projects alone, with enormous economic growth taking place in countries such as PR China, India, Indonesia, countries in Africa, etc.
- Workplace health and safety, including management of welding to minimize hazards.
- Product quality, fitness for purpose and compliance with standards, codes and/or specifications.
- Effective technology transfer to industry in developed, emerging, and transitioning countries.
- Development of skilled personnel in countries to implement appropriate technologies – though not necessarily leading edge technologies. Part of this challenge is to improve the image of welding as a career so that it will attract young people.
- Research and development in materials and their weldability, modelling, light-weight design, structural assessment, and extension of the life cycle of structures.
- Integration of information technology for knowledge management, modelling, technology diffusion, data storage, and communication.

From the white paper 'Improving Global Quality of Life'.



Gantry Systems for the welding of large metal structures

When the parts to be welded become larger and heavier, a robot integrated with a gantry system can be equipped for higher payloads by using single or multiple axes positioners. ABB's gantry solutions ensure a more efficient use of floor space, and are ergonomically designed to facilitate the operator's task while complying with the highest safety standards.

An advantage of these solutions is that they can control up to three additional axes of gantry motion and be integrated into the IRC5 Robot Controller without requiring investment into additional external control hardware. Additionally, all external axes are coordinated with the robot's own axis and controlled through the same control unit. This solution is very flexible and scalable and can fulfill the most complex production needs. A wide range of optional accessories, including auxiliary axes, sensors, torch cleaners, TCP calibration units, and safety devices, is available to complete systems, providing manufacturers of medium- to large-size parts the opportunity to leverage a tested technology integrated within a fully equipped production unit dedicated to robot welding.

IRBP i-L type Single-axes positioners

IRB i-L positioners are designed to be as ergonomic as possible for the operator; these positioners facilitate parts loading and provide the best approach to welding joints.

IRBP i-A and i-T type Multiaxes positioners

Designed to manufacture complex geometry and weights, these positioners provide coordinated and interpolated tilting and rotating movements of the parts, in order to present them in the most suitable position for robot welding, thus improving accessibility and process quality.

'We chose ABB as we were looking for the most integrated system. Customer requirements are quite tight today, and we are forced to have a short time in getting the order, getting the customer data, and being already in the machine.'



Daniel Erni, CEO ALLUCAN AG