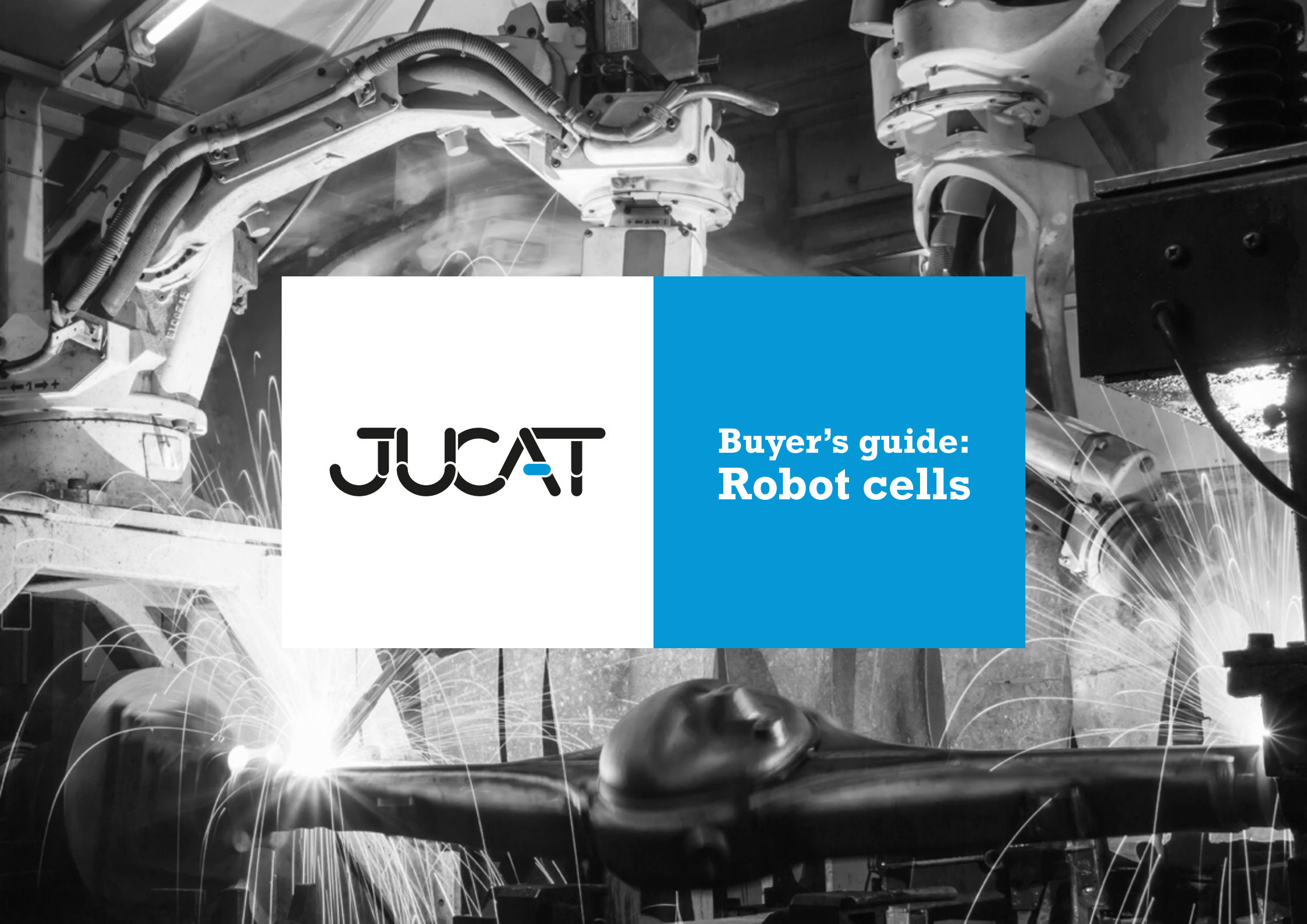
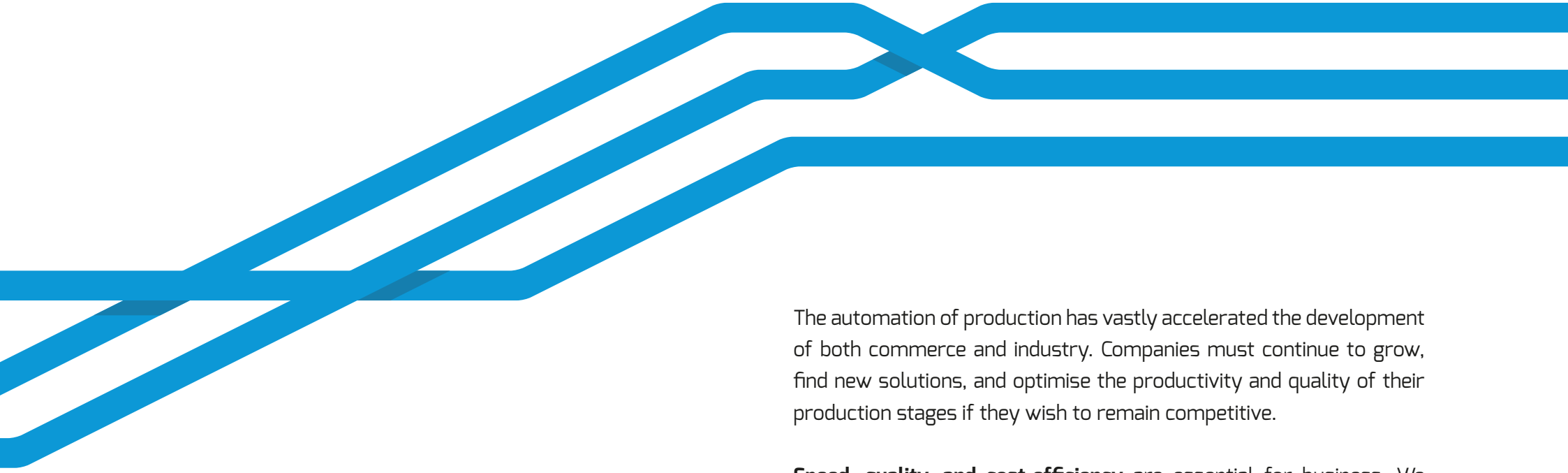


JUCAT

Buyer's guide: Robot cells



The automation of production has vastly accelerated the development of both commerce and industry. Companies must continue to grow, find new solutions, and optimise the productivity and quality of their production stages if they wish to remain competitive.

Speed, quality, and cost-efficiency are essential for business. We must be able to meet our customers' tightening delivery schedules and increasing quality requirements without our costs going through the roof. As competition gets tougher, companies that can adapt and change will do well while companies sticking to conventional solutions risk getting left behind.

To remain competitive, companies must make investments, some of which may be outside their comfort zone but are extremely necessary for the development and continuity of their business.

The automation of industrial production is a necessary upgrade for better customer service.

This is what robots do.

Automation and 24-hour production have been made possible by versatile robot cells that can scale to different production requirements. In our guide we will explain how to get started with robots in your production and how to progress to more advanced robotics.

We use three levels for robot solutions:

1. Simple standard cells
2. Large gantry-type cells
3. Flexible Manufacturing System (FMS) cells

Companies still relying on traditional welding should start from the first level and move on once they have fully exploited that level's productivity potential. Likewise, companies already using simple standard cells should have no problem stepping up to large gantry-type cells.

If the company's resources allow, faster level progression is possible and one of the levels may even be skipped altogether. As a rule, we recommend that you progress from one level to the next.

HOW DOES ROBOT WELDING BOOST PRODUCTION?

- Standardises the welding process
- Eliminates factors introduced by manual work
- Improves weld quality
- Multiplies welding speed
- Enhances workplace safety and ergonomics

1

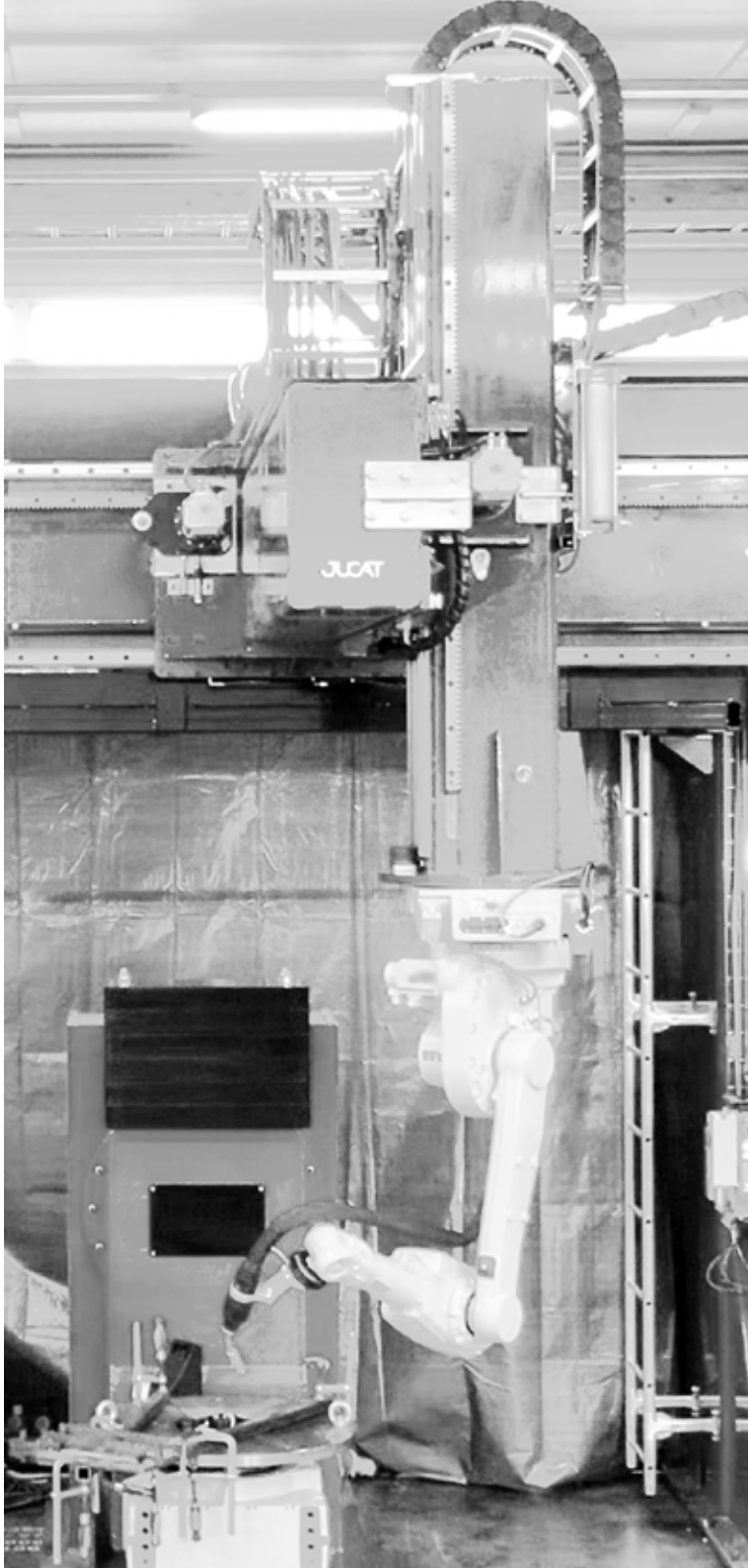
Why is manual welding unprofitable as a main production method?

Although the majority of companies have automated their welding process, some companies still hand-weld their products from start to finish. In manual welding, all pieces are measured, aligned, and welded by hand. The workpiece is kept on a workbench or on the floor and turned or moved by hand or with a hoist, depending on the size of the piece.

In practice, manual welding takes time and remarkable focus. The end result is influenced by the welder and their working conditions, which introduces variance to production times and the final product's quality. In manual welding, wire can be applied at a rate of one to two kilograms per hour, whereas **FMS cells can apply up to 10 kilograms of wire per hour**. Even a simple standard cell will double if not triple welding speeds.

Even if your company still depends on manual welding, you can stop worrying: there is no need to leap straight into a fully automated army of robots. You can evolve your production one step at a time.

Keep reading if your company's welding process could use an upgrade.



2

My welding process needs an upgrade. How can I make it happen?

We recommend taking one step at a time into automation and robotics. If your company currently uses manual welding, start with welding jigs, positioners, and simple standard robot cells. Jigs and positioners alone will speed up positioning and turning, **improving welding process efficiency by up to 45 per cent.**

However, they are not enough on their own to reach the required level of competitiveness. Simple robot cells are a good way to upgrade production from manual welding to the next level. Initially, an investment in robotics will require human resources in particular.

COMMIT YOUR MANAGEMENT TO DEVELOPMENT

Using robotics to automate production is an investment that requires no less than full commitment from management. The investment is part of a larger whole of active long-term development of processes and production stages. The end result will be an exponential improvement in operational efficiency – as long as the start and the deployment of the new processes are executed with due care.

INVEST IN WORKER COMPETENCE

Robots need skilled personnel to feed them materials, program the welding, and monitor operations. Robots are not fully autonomous and hence not a replacement for employees. What robots will do is free up people from physical welding tasks to do thinking instead. More advanced robotics will introduce higher and more complex technology, requiring more skills from operators.

MAKE SURE YOUR PRODUCT CAN BE WELDED BY ROBOTS

Robots will necessitate higher accuracy and tighter tolerances in products. For robot welding to yield material improvements in end product quality, the product must be designed for robot welding. It is fair to say that products must be refined to match the different levels of robotics – technical requirements will increase as advances are made.

3 LEVEL 1

Simple standard robot cells

The simple welding assemblies of the first level of robotics are still straightforward. **The key is training your workers and committing your management to the change.** Simple cells require operators to feed the welding material to the robot and program the welding. Typically, two operators will be operating the cell: one collects the product's parts and prepares them for welding while the other switches the products, selects the welding program, and starts the cell.

For maximum productivity, robot cells should be combined with welding jigs and positioners. They will make it easier, faster, and safer to handle and position the workpieces, and they also improve repeatability. What was previously a two-hour job by hand can be cut down to one hour with jigs. Positioners also free up hoists for other work.

Operators should practice offline programming from the start with a virtual 3D cell, especially if the batch size is expected to vary constantly. In offline mode, programs can be created and exported to the robot in advance **without needing to stop the robot** to write a new program. When programs are written directly on the robot, the robot must be stopped for programming.

First-level operator training should include both robot operation and offline programming. Once company personnel have been fully trained in robotics, robots will be effortless to deploy and develop.

WELDING SPEED:

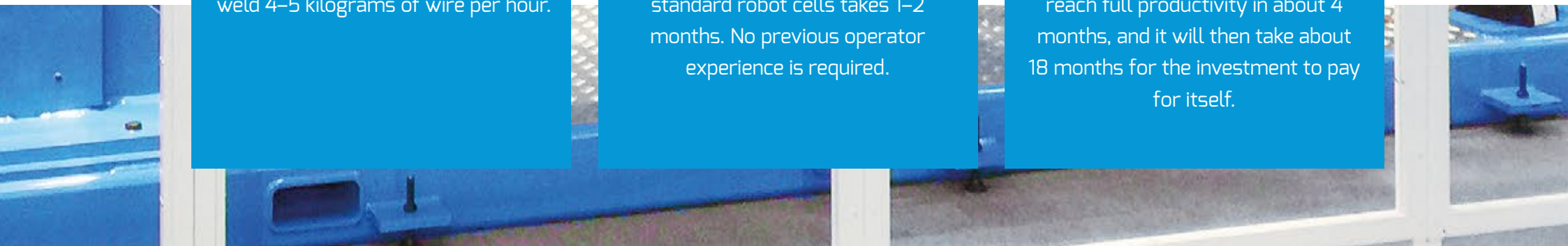
Simple standard robot cells can weld 4–5 kilograms of wire per hour.

OPERATOR EXPERIENCE:

The operator training for simple standard robot cells takes 1–2 months. No previous operator experience is required.

PAYBACK PERIOD:

Simple standard robot cells will reach full productivity in about 4 months, and it will then take about 18 months for the investment to pay for itself.



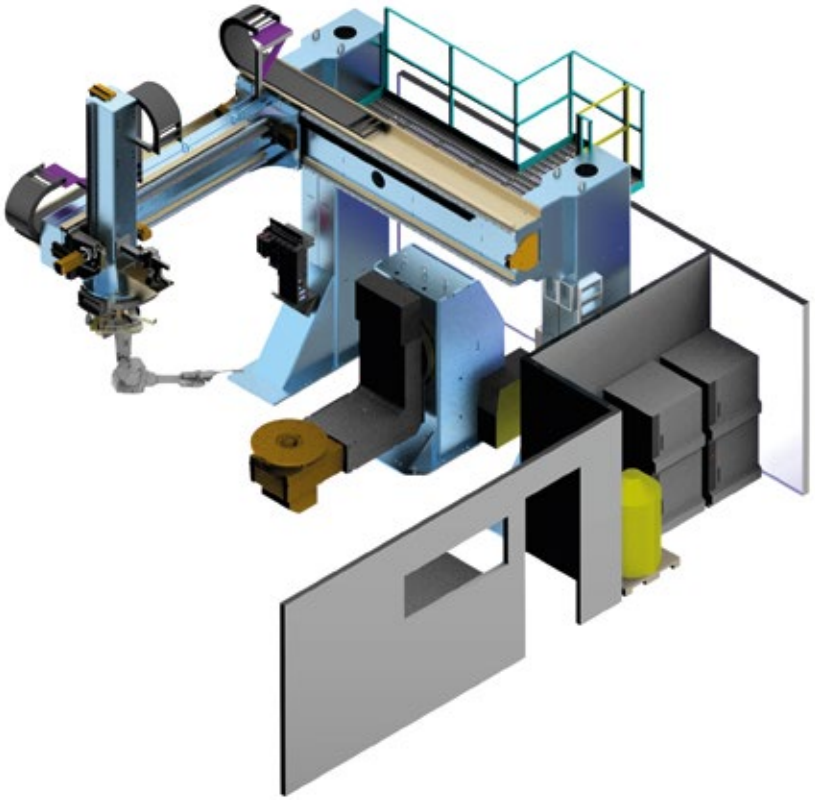
4 LEVEL 2

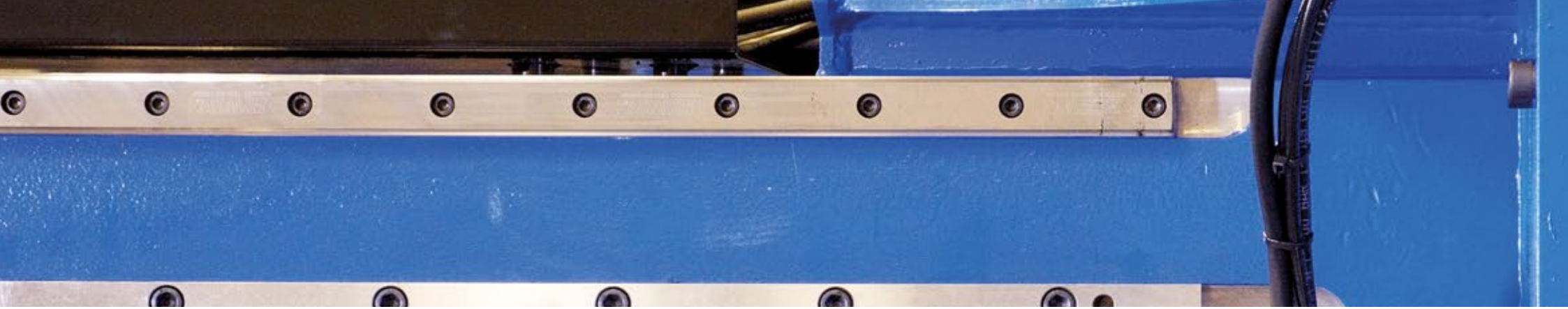
Large gantry-type robot cells

The welding assemblies of large gantry-type robot cells are a bit more varied. The welding times are often longer, the welds more challenging, the programs more complex, and the workpieces larger and heavier.

The welding process will frequently involve different scanning and tracking functions. The cell may require automatic tool changers that allow torches to be swapped out mid-process, for example. Offline programming will be increasingly important, as the production run may only consist of a single product and the welding times can reach up to 20 hours.

While a level one robot may have six axes with two further axes on the welding table, a large gantry cell can easily have 6 + 6 axes. As the assemblies become more complex, the role of jig and positioner technology becomes increasingly critical. Jigs must be able to handle unusual holds to process demanding workpieces.





Programming skills are emphasised in operator duties. These robots will be difficult to use if the operator is not sufficiently skilled. We recommend only upgrading to gantry-type robot cells after your operators are fully proficient at handling simple robot cells.

WELDING SPEED:

Large gantry-type robot cells can weld 6–7 kilograms of wire per hour.

OPERATOR EXPERIENCE:

These robot cells will require some 3 years of operator experience in robotics, including programming.

PAYBACK PERIOD:

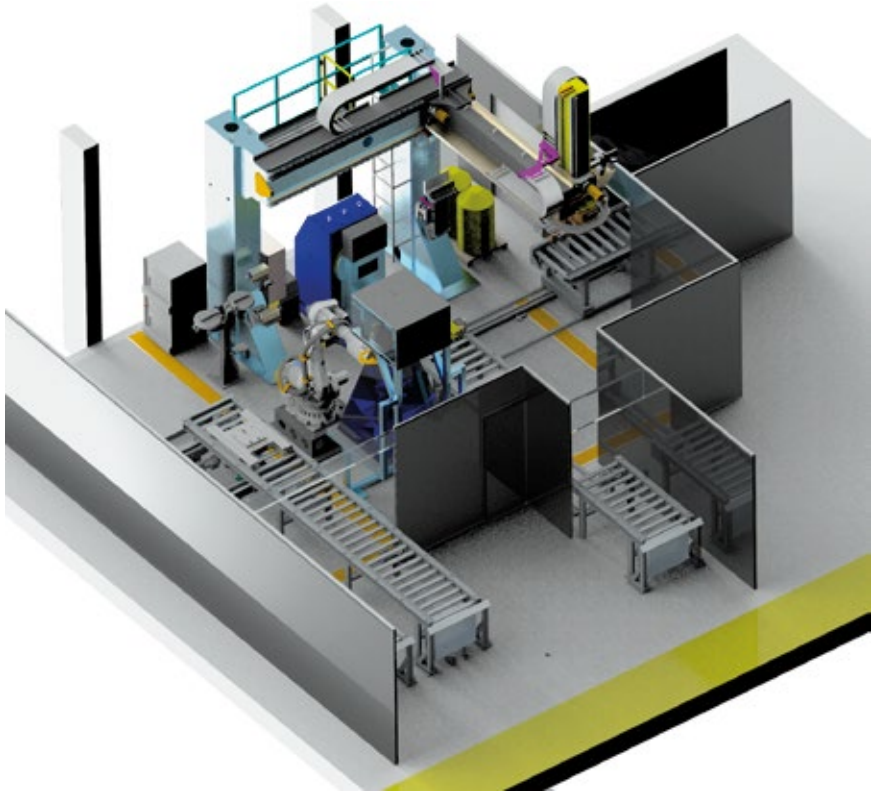
Large gantry-type robot cells will reach their full productivity in about 2 months when they are introduced after level one robots. If large gantry-type robot cells are adopted by a fully manual operation, this time frame extends to about 6 months. It will then take about 18 months for the investment to pay for itself.

5 LEVEL 3

Flexible Manufacturing System (FMS) cells

Flexible Manufacturing Systems include one or more welding and positioning robots, various conveyors for materials, and potentially computer vision or laser scanning and tracking for further assistance. **Laser scanning can quickly pick up different surfaces and starting points,** and tracking takes care of real-time corrections. This ensures the best possible welding result. In a welding cell with two robots – one welder and one workpiece positioner – computer vision can be used to verify that the workpieces are in the correct location and orientation.

These cells are fully automated. The product palette is loaded onto the FMS cell's conveyor, which connects automatically to the robot's table. A materials palette assembled from weldable parts at the warehouse or by a supplier is also placed on the conveyor for the positioner robot to pick and place onto the product palette. The welding robot prepares the workpieces and welds them according to its automated working sequence or the RFID tags of the pieces. The welded pieces are then moved out of the FMS cell by the conveyor.



These cells can run without operator supervision – they are fully automated and require no human interaction with the workpieces during production. The operator is tasked with programming and ensuring that the robot has all the materials available.

WELDING SPEED:

FMS cells can weld 8–10 kilograms of wire per hour.

OPERATOR EXPERIENCE:

These robot cells will require some 5 years of operator experience in robotics, including programming.

PAYBACK PERIOD:

FMS cells will reach their full productivity in about 6 months when they are introduced after level two robots. It will then take about 2–3 years for the investment to pay for itself.

6

Full return on investment is possible in 18 months

How much productivity can be improved depends entirely on the company, raw materials, welders, and how well prepared the business is to deploy a new robot cell. As indicated in the previous descriptions of different robot solutions, a robot cell investment will pay for itself in 1½ to 3 years, depending on the solution. In other words, the productivity potential of the estimates is affected by the company's ability and previous experience with robotics.

New workstations always have a learning curve, and their processes need to be established, which takes both time and money from the company and mental resources from the workers. At the start, the **productivity of a new cell** is typically around 40 per cent of its potential, and it takes two to six months to reach full productivity. The time taken depends on the ability of the company.

Custom robot solutions can exploit the efficiency of robotics even further. We have observed that custom robot welding cells frequently improve a company's productivity by as much as 70 per cent, which is a considerable improvement for profitability.

7 Jucat – high-quality robot solutions

Jucat Oy has worked closely with **ABB Oy Robotics** on robot solutions since 2014, and in 2019, Jucat became an ABB Value Provider Partner.

This collaboration has allowed us to offer our customers even more versatile automation solutions that provide significant upgrades to production capacity, quality, and safety.

ABB Oy Robotics delivers the standard welding cells directly to customers. Jucat delivers the larger and customised welding cells that can handle workpieces up to 30 tonnes in weight.

The cells typically include high-tech features such as **laser scanning and tracking or computer vision.** In the case of custom cells, Jucat handles the project management, design, and delivery in full.

ABB supplies the robotics components for the stations designed by Jucat. Our collaboration also includes mutual sales support and simulations, especially for 3D modelling. By working together, we have extended our geographical reach and improved our international delivery and service capabilities.

JUCAT

JUCAT OY

Puurtajankuja 3, 60100 Seinäjoki

Office: 010 326 3300
Project sales: 010 326 3305

info@jucat.fi | www.jucat.fi