

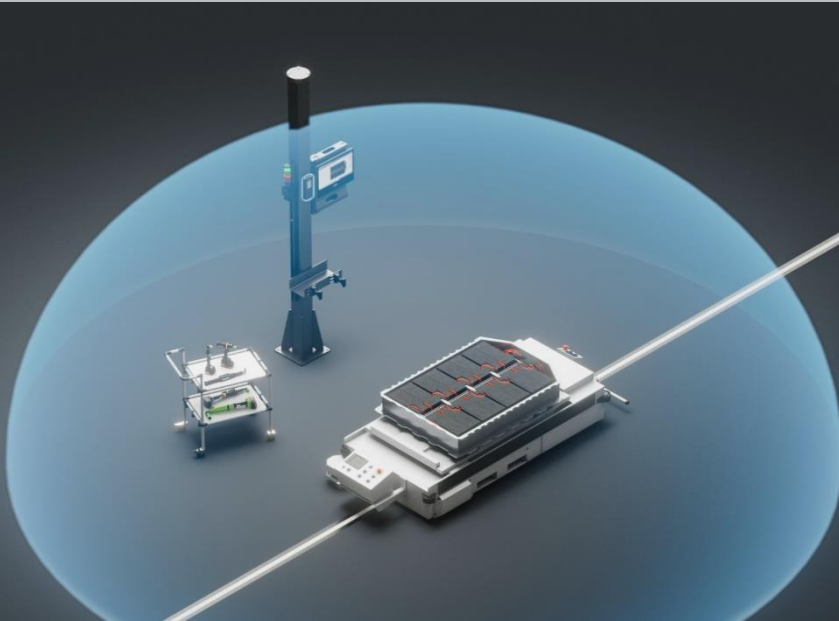


Atlas Copco



ILM

Industrial Location Mapping

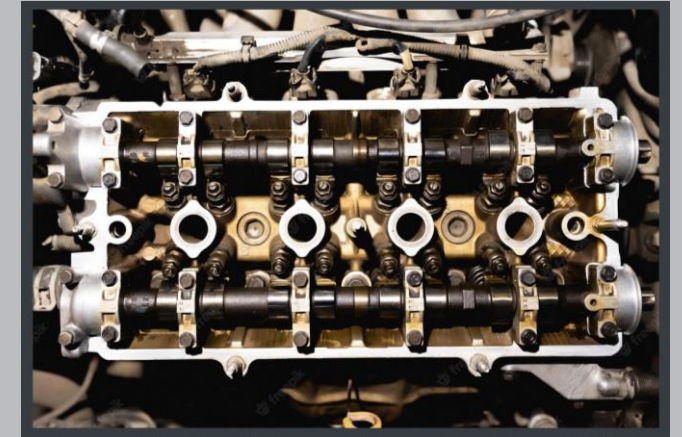
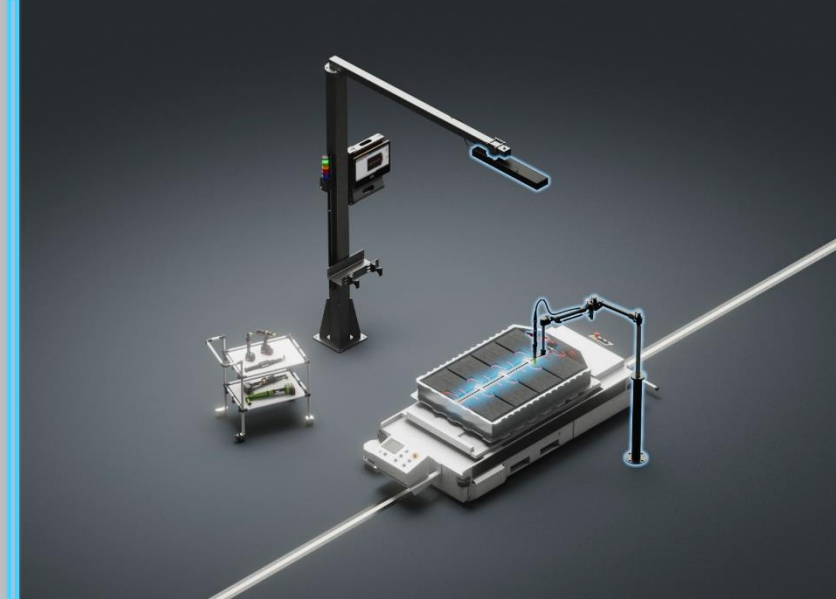
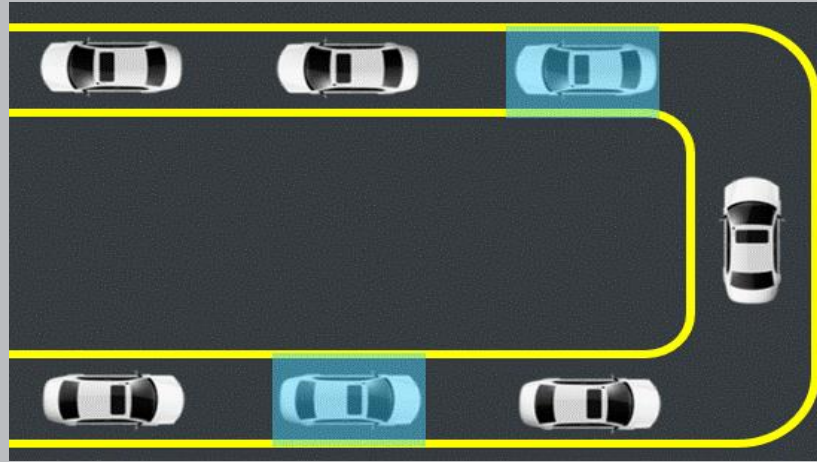


Station level

- Tool will only be able to work on the desired area
- Accuracy within 30 to 50cm
- Uses UWB technology to create coordinates
 - Industrial Location Mapping (ILM) – Basic & Advanced Modes

Line level

- Tool will only be able to work on the desired part or moving area
- Accuracy within 30 to 50cm
- Uses UWB technology to create coordinates
 - Industrial Location Mapping (ILM) – Sync Modes



Bolt level

- Tool will only be able to work within the desired bolt
- Down to 10mm accuracy
- Different technologies to adapt to different solutions
 - Vision → SpotPoint (ILS)
 - Encoder based → Positioning Arms





Lines are becoming leaner and smarter.

Less hardware, more flexibility and freedom to adapt is mandatory in the current days.



And battery tools are a good solution to add value to this new reality.

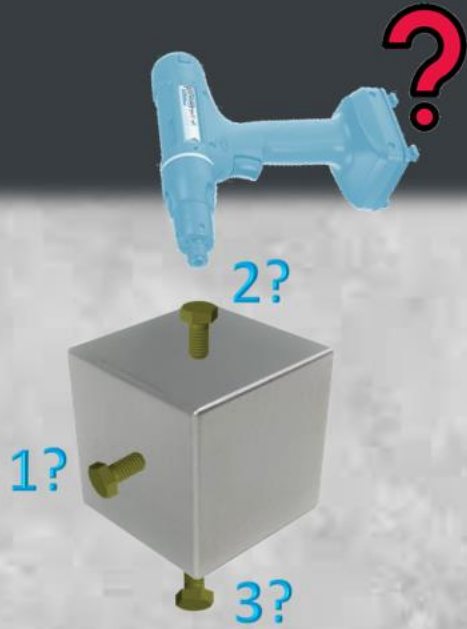
Some battery tools already have the controller embedded, making production even leaner, as you can see in this example, with our Tensor ITB



And with battery tools populating assembly lines, some questions arise:

- How can we make sure that we're using the right tool in the right station?
- How to tether a wireless tool to avoid it from being used out of the station?
- How to prevent operator errors in the production line?

How to prevent errors?



Wrong sequence

- How to make sure the operator is following the right sequence?
- How to assure the correct joint seating?



Wrong product

- How to make sure the tools are working in the correct station?
- How to prevent tools to work outside the boundaries?



Wrong side

- How to prevent tool of being used in the wrong side?
- What if you have same joint characteristics but different torque parameters?

Location Solutions to envision the future of Industry 4.0

Industrial Location Mapping - ILM



[Integration]

→ Easy rebalancing

[Quality]

→ Right first time

[Flexibility]

→ Battery as a trend



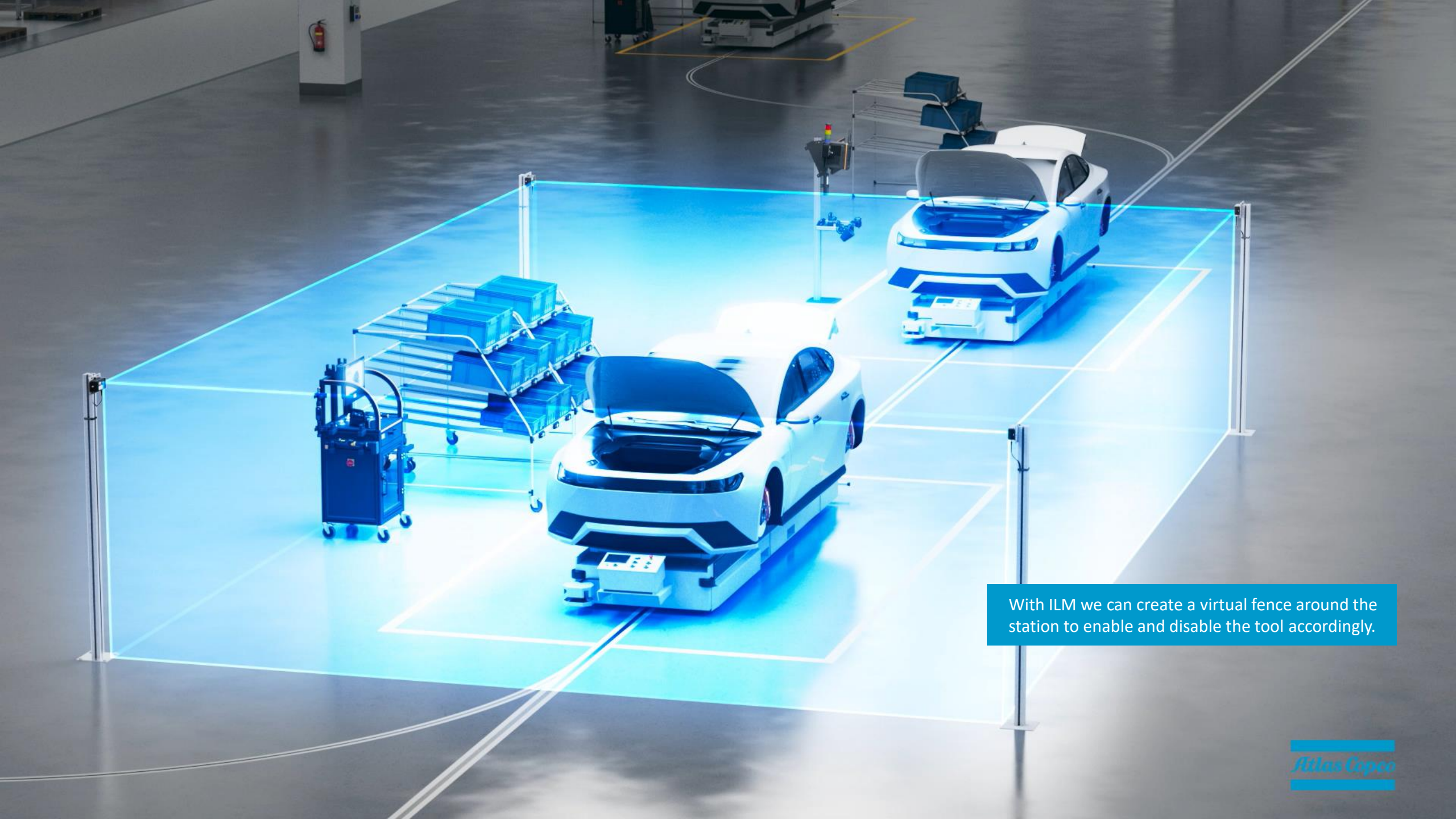
Improved productivity



Human interaction



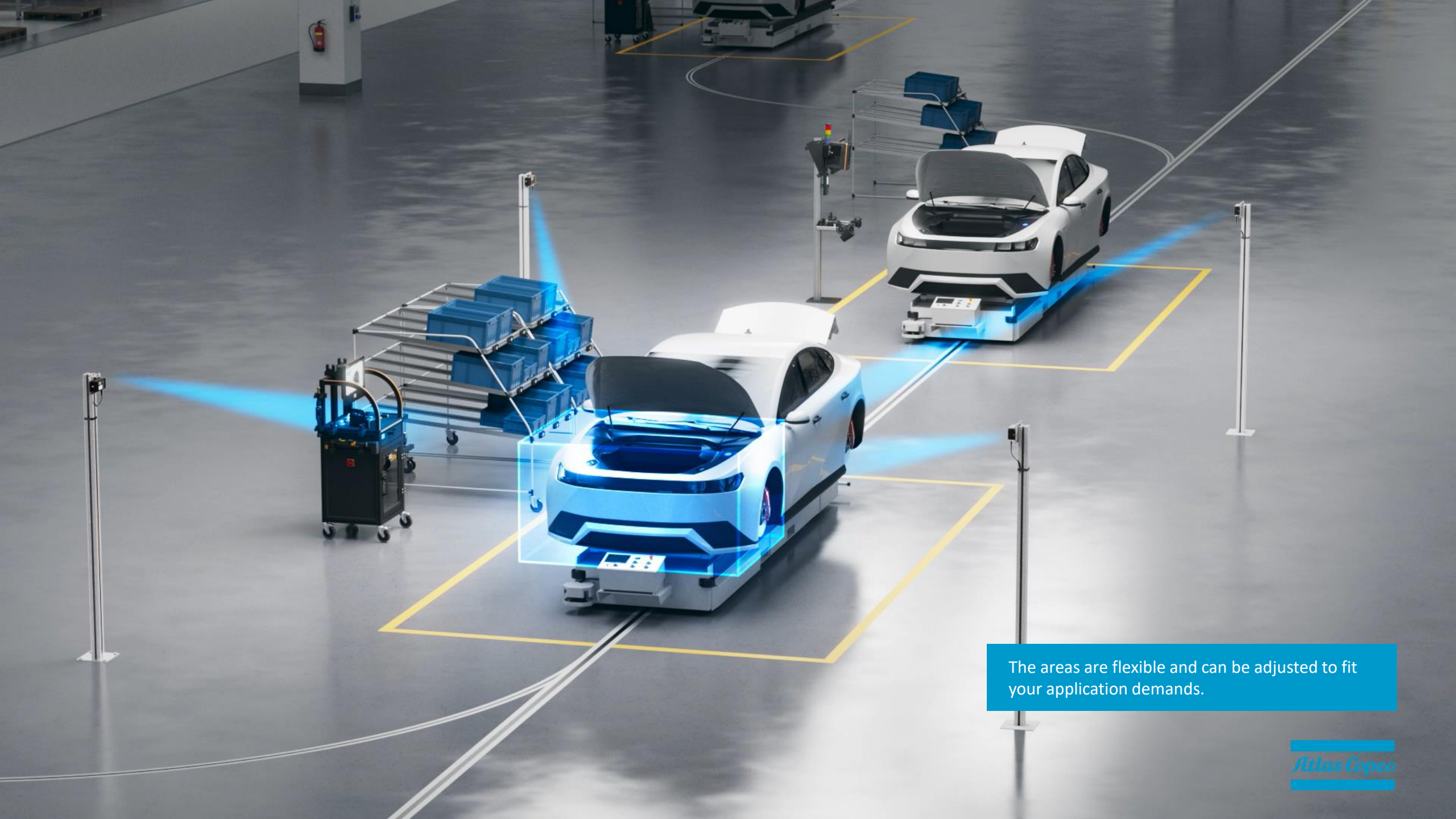
Reduction in energy use



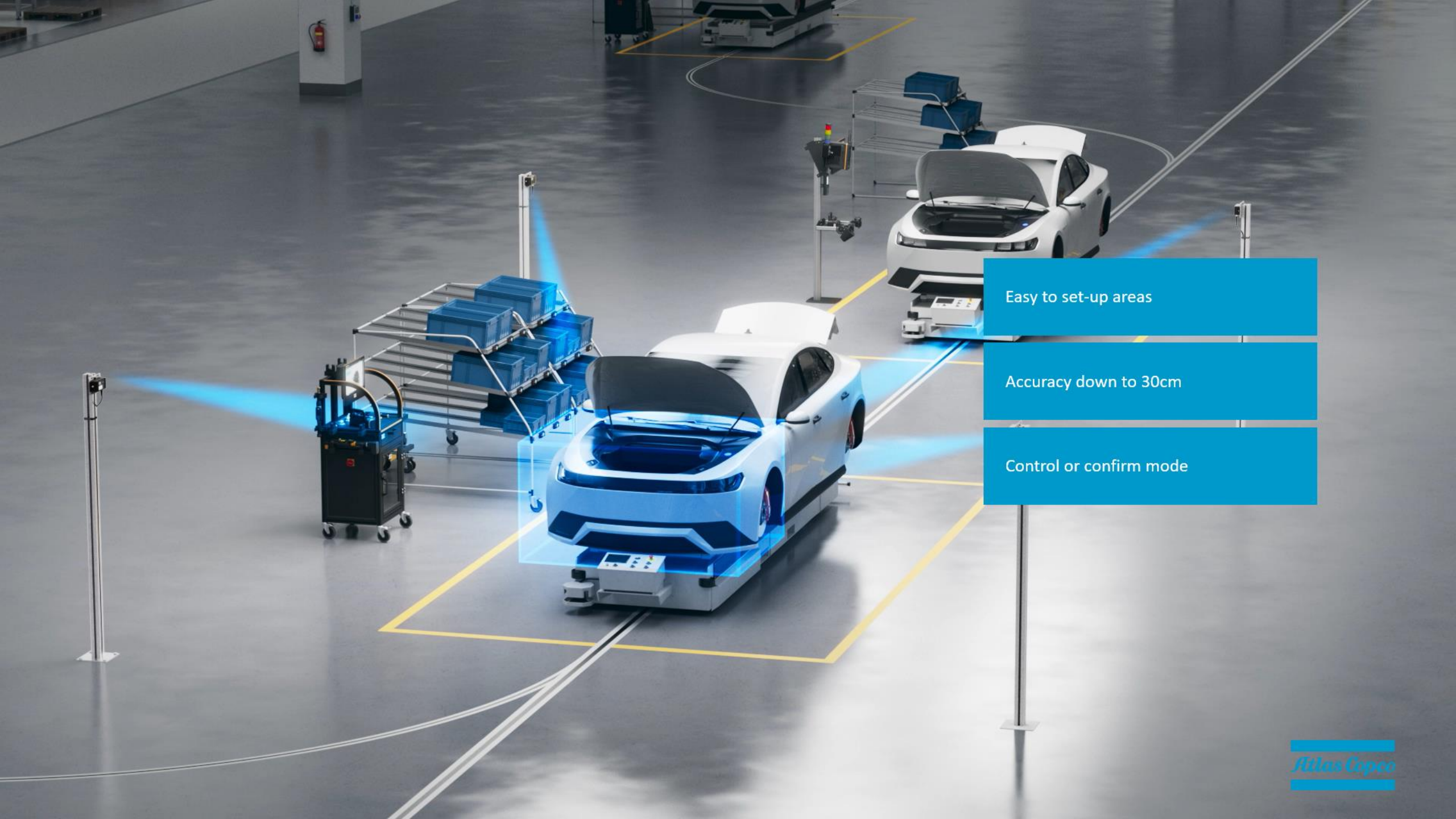
With ILM we can create a virtual fence around the station to enable and disable the tool accordingly.

ILM Anchors triangulate the position of the tool

Anchors can be used with no network infrastructure



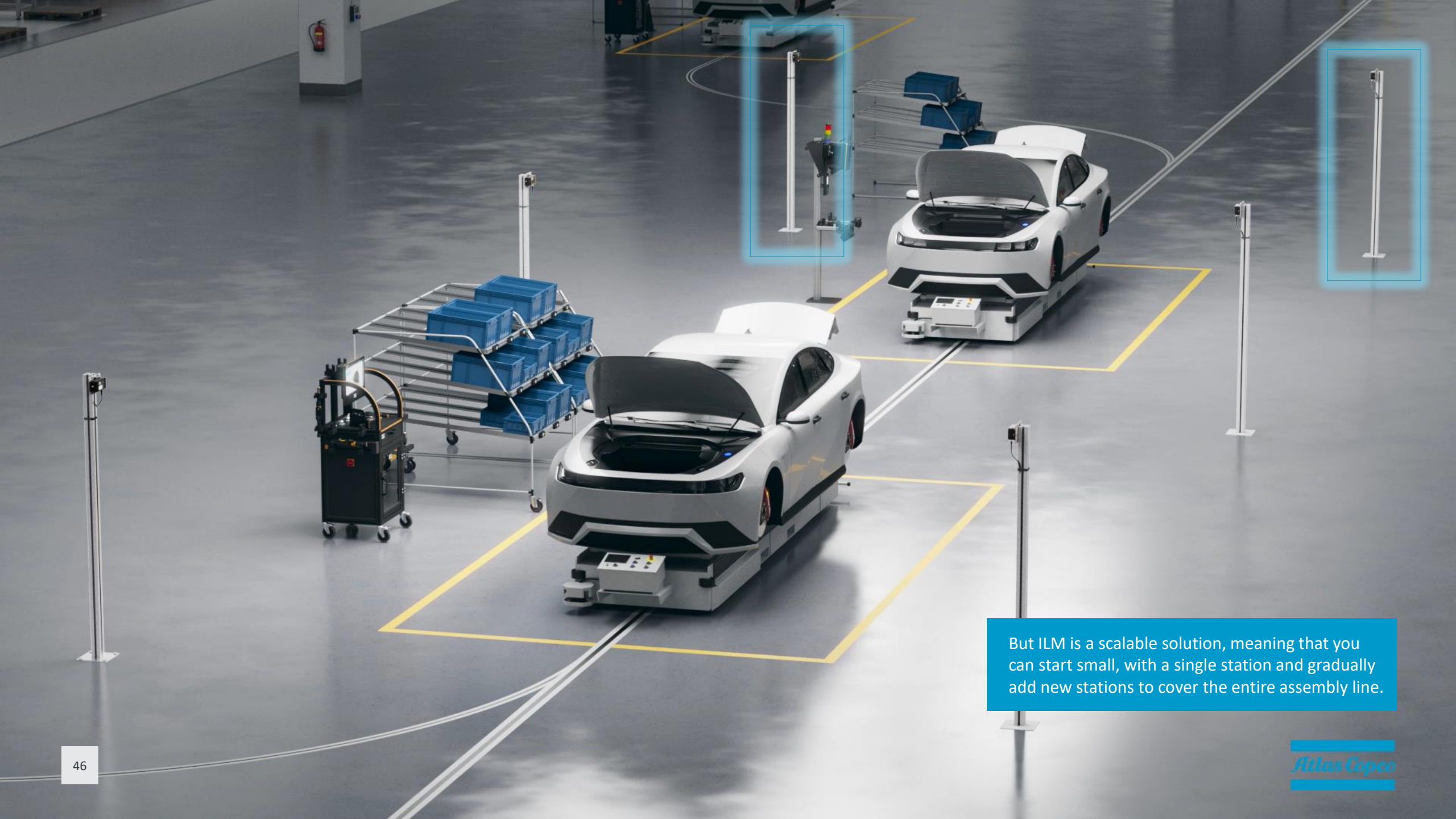
The areas are flexible and can be adjusted to fit your application demands.



Easy to set-up areas

Accuracy down to 30cm

Control or confirm mode



But ILM is a scalable solution, meaning that you can start small, with a single station and gradually add new stations to cover the entire assembly line.



To do so it's simple: you need to connect just one ILM Anchor to the network



Measure the distances among the Anchors.



Set the distances inside the software and you're all set.
With a single pair of Anchors, a new station can be covered

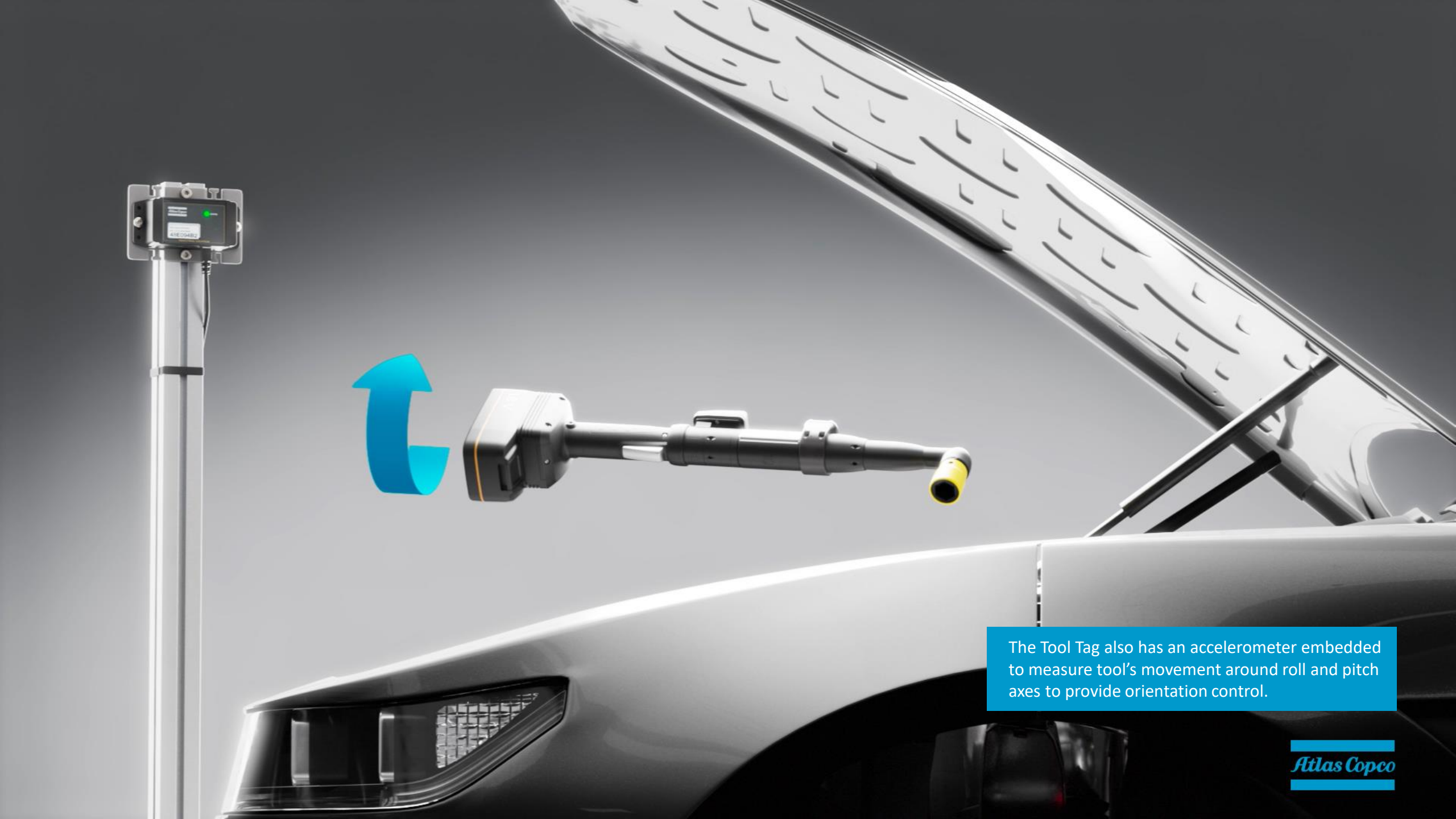
ILM Tag

Monitors the distance and runs the logics

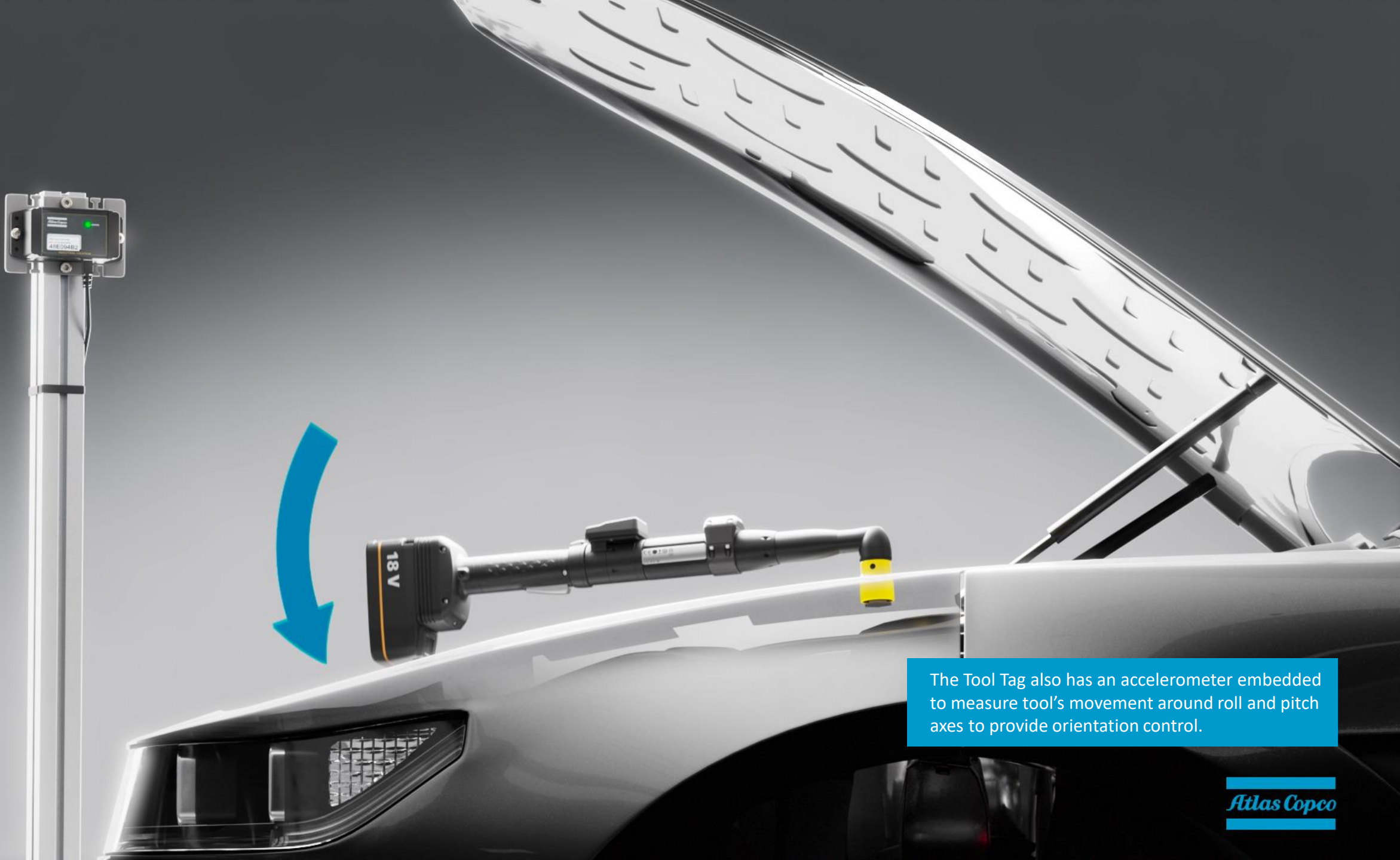


Powered from the tool

Gives feedback to the operator



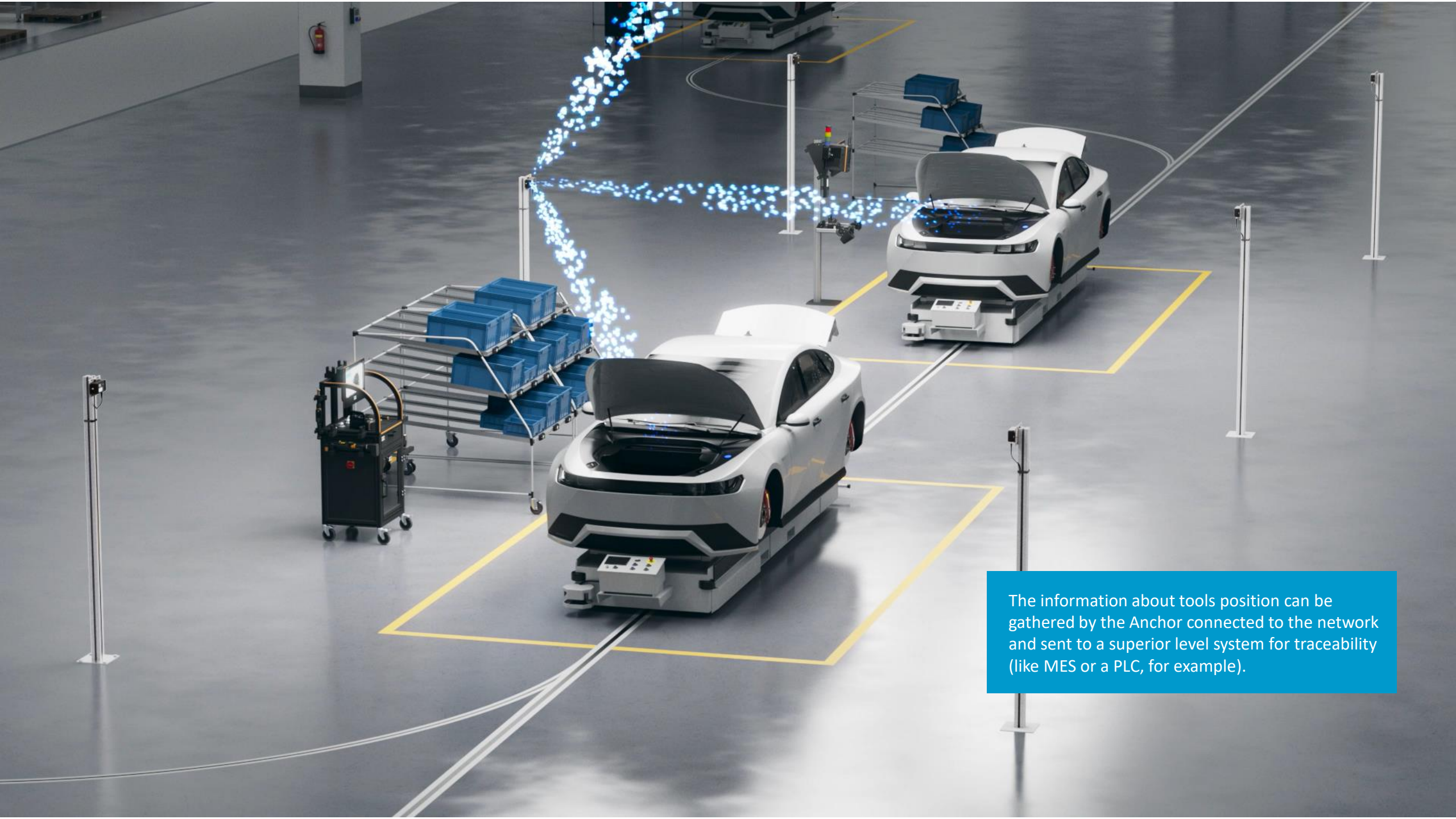
The Tool Tag also has an accelerometer embedded to measure tool's movement around roll and pitch axes to provide orientation control.



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And each Tool Tag sends its own position directly to the Anchors using UWB communication, that doesn't affect your current Wi-Fi and Bluetooth connections already running on the plant.



The information about tools position can be gathered by the Anchor connected to the network and sent to a superior level system for traceability (like MES or a PLC, for example).

The background is a blurred industrial environment with various metal structures and pipes. In the foreground, a grey vertical post holds a black and white electronic device. A stream of glowing blue cubes, representing data, flows from the device towards the top right of the frame. A white line connects the device to a list of features on the right.

Used as a gateway

Reduced use of IP's

Ethernet RJ45 connection

And as only one Anchor is used as a gateway for two stations, the number of IP addresses is drastically reduced.

The Anchors have a RJ45 standard connection for easy integration.

Minimal to no IT infrastructure

Only one anchor needs to be connected to the network, and in some cases, none of them, reducing the amount of used IP's and its cost.

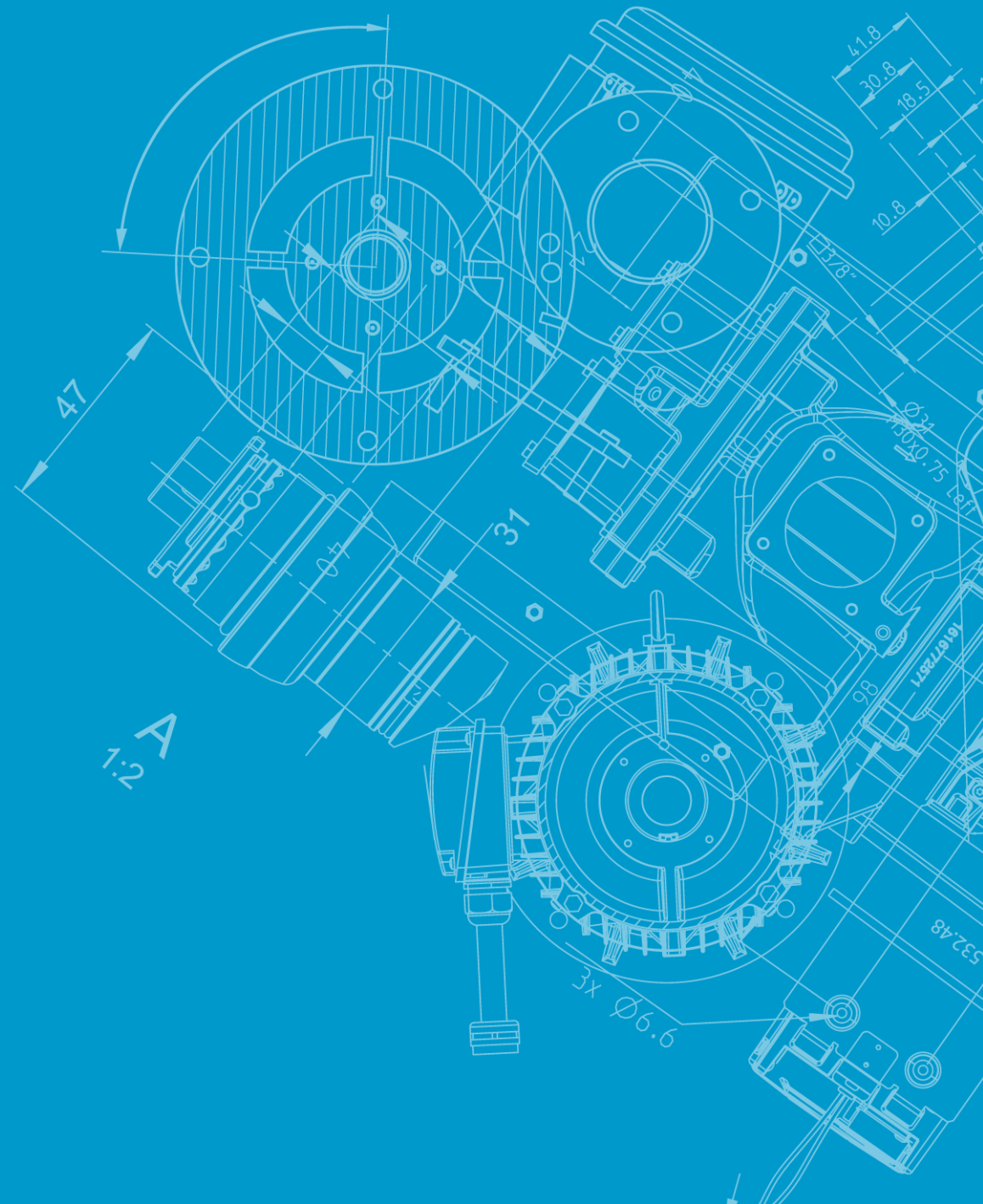
Logics on the tool

No need for a server solution. Each tool tags knows where it is and where it can or not work.

Flexibility

Easy to create new areas and re-balance the tools

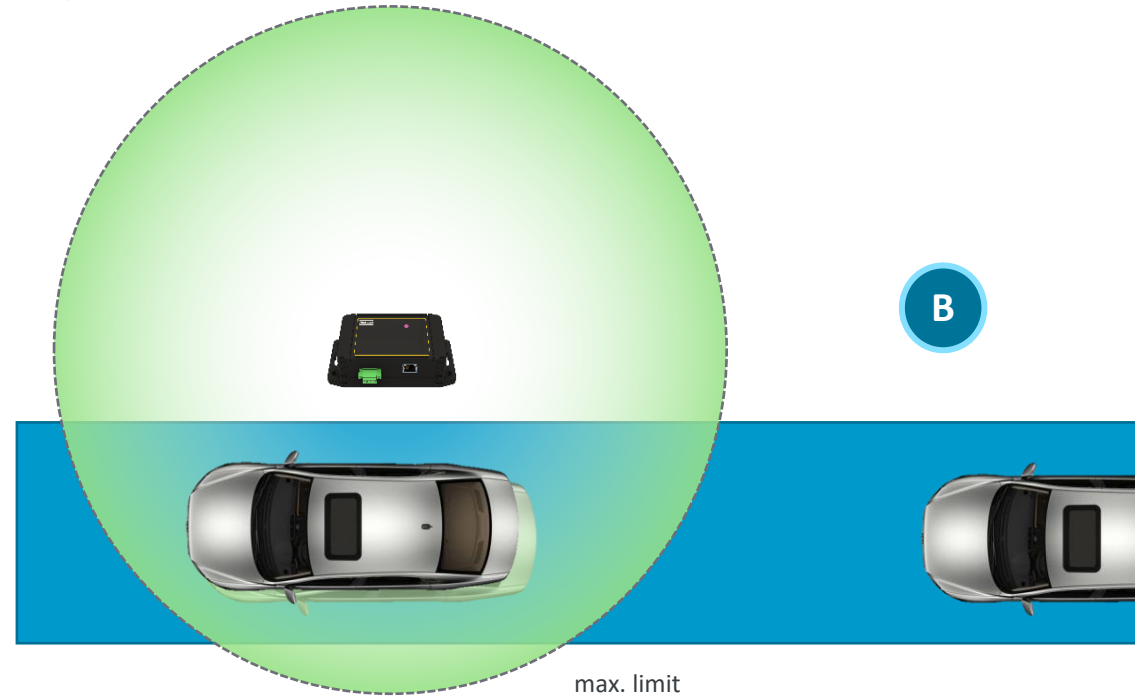
ILM Modes



ILM – Basic mode – 1x anchor

The best solution for simple stop-and-go lines or fixed working area

- Plug and play solution without measuring the infrastructure
 - No anchor configuration needed
- Minimal installation effort
 - Only power needed for ILM anchors (12-24V)
 - No additional data or timing cables
- Creates a circular area (dome shaped volume)
- Up to 50 cm tolerance + orientation detection of the tool



ILM – Basic mode – 4x anchors

The best solution for simple stop-and-go lines or fixed working area

- Plug and play solution without measuring the infrastructure
 - No anchor configuration needed
- Minimal installation effort
 - Only power needed for ILM anchors (12-24V)
 - No additional data or timing cables
- Creates a rectangular area (fenced box volume)
- Up to 50 cm tolerance + orientation detection of the tool

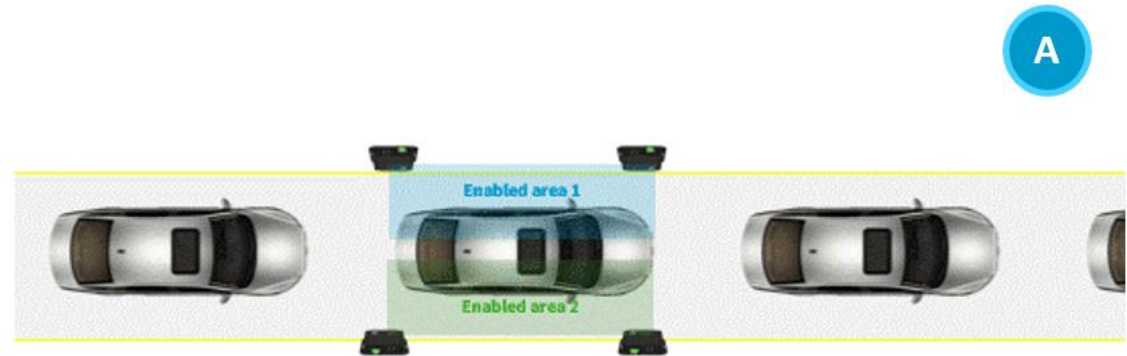


ILM – Advanced mode

The best solution for complex stop-and-go lines or fixed working area

SEGMENTATION OF THE CAR / AREA

- More accurate tool enable / disable areas
- Up to 30 cm accuracy + orientation detection
- Same installation effort as Basic mode + measurement
- Cable less configuration with ILM Configurator stick
- Same data and tool controller interfaces as Basic mode
- Real time visualization of tag position on configurator

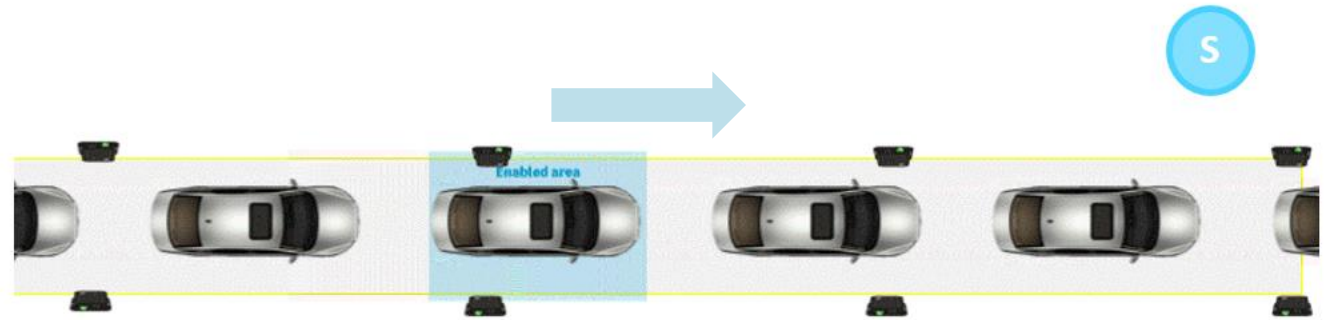


ILM – Sync mode

The best solution for moving lines → Needs integration with customer PLC

Enabling area moving together with the part

- Up to 30 cm accuracy + orientation detection
- Same installation effort as Advanced mode
- Location system will send the position of the tool (x, y, z), and tool orientation to Master PC / Interface
- Need of external SW to synchronize Tool Coordinates with car coordinates: ILM Server / ILM Adapter* / Customer specifics (SJC/AklanS...)
- Best solution for moving production lines / moving areas
- **Need's project or APC to integrate with customers car position data**



ILM Anchor



- Reference point for UWB-based localization
- Power Supply via 24 V or PoE
- Built-in movement detection protects against manipulation
- Connection with external systems via network possible
- LED indicates status and working mode

ILM Tags



- Power supply directly from the tool
- Built-in orientation detection
- Power-LED indicates when turned on
- Status-LED illuminates when in enable area
- For easy integration the ILM Tag can simulate a second-start-trigger. No software interfaces required!

ILM Configurator stick



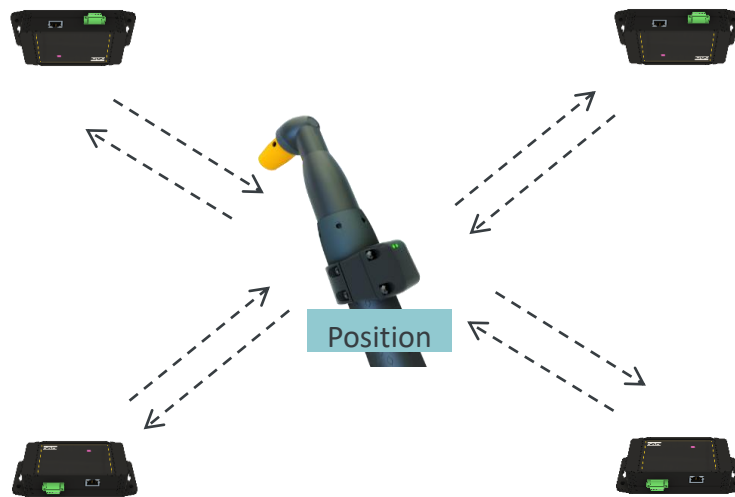
- For configuration and system set-up over UWB radio
- Updating configuration of tool tag/anchor
- Updating SW over-the-air
- LED indicates status and working mode

ILM

Distance measurement concept

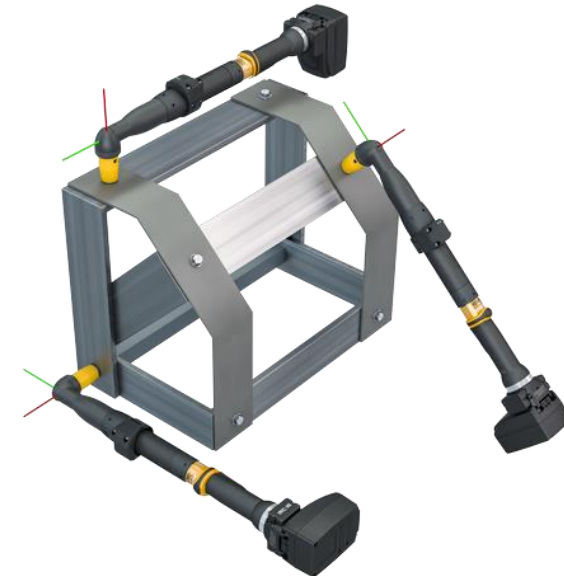
Wireless Distance measurement technology

- Monitors the distance between the ILM Tag and the ILM Anchors.
- Users can easily define criteria with a maximum and minimum allowed distance around the ILM Tag.



Tool Orientation detection

- An accelerometer in the ILM Tag continuously monitors the tool orientation.
- Users can define criteria with minimum and maximum angles for both roll and pitch.



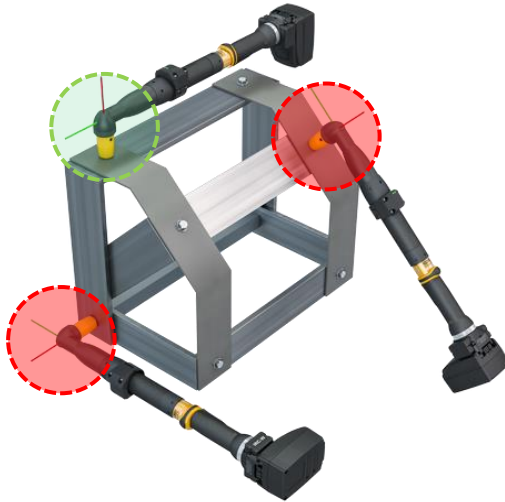
Confirm Mode / Control Mode

PSet selection management feature

Confirm Mode

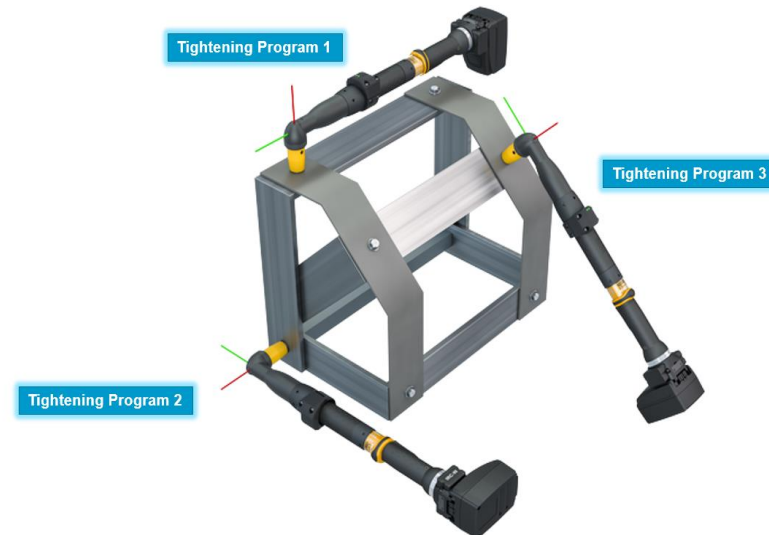
The controller (which in turn can receive process information from an overhead system) selects the tightening program to be used.

The ILM system confirms that the user defined area and or orientation for that tightening program is correct and enables the tool.



Control Mode

In Control mode, the ILM system tells the controller which tightening program to use based on tool distance and / or orientation.



ILM – Short facts

- Ultra wideband radio technology (UWB)
- Works with metal interference → No need of line of sight
- Tool tag accessories available for ST, STB, STR, TBP, ITB-A and ITB-P.
- Tool tag accessory combinations available:
 - 2in1 (location + 2D scanner)
 - 3in1 (location + 2D scanner + E-HMI)
- Recommended max. distance between anchors: 7 m.
- Accuracy level: 0,3 m (Advanced mode) / 0,5 (Basic mode)
- Pitch and roll accuracy: 5 degrees.
- Communication via Open Protocol to PF4000, PF6000 & PF8 controllers and ITB



