

# HIGHLY PERSONAL ROBOTS

The road to manufacturing 4.0 includes the development of the most advanced technology. SEAT is one of the companies that wants to lead and interpret this new 4.0 reality with its own distinct personality. Technological advances will go hand in hand with the idea that workers and machines will interact, side by side, in achieving the same goal.



In SEAT, it is easy to be left astounded when you see dozens of articulated arms moving at the same time, the majority to solder the different parts of the bodywork. Some deal with the planing and sanding; others even wield drills or measuring instruments. You only have to close your eyes for a symphony of sounds to take over the factory and to hear how hundreds of robots move to the sound of the musical score that the company has composed in order for technological advances to contribute to building cars that are increasingly human.

Just over every 30 seconds, more than two thousand perfectly synchronised robots that are in constant motion start work on a new car. Some even have a name. In fact, there is no shortage of workers that admit to having a special relationship with these artificial minds, as if metals could also have a soul.

The biggest robots measure up to six metres, without their pulse being felt by more than 0.1 millimetres. But there are robots of all shapes, sizes and colours. This is the case, for example, of the stealthy “setillas” (little mushrooms) – one of the nicknames by which the driverless vehicles that transport heavy loads around the interior of the workshops

are known – which strive to deliver the necessary material to each point of the production line. Very close by, other collaborative robots briskly and precisely assemble the nearly 3,000 parts that a car contains, while various people monitor the installations in real time, analysing and checking the behaviour of each machine.

Through this shared intelligence, a certain kind of digital talent seems to be emerging from one of the largest smart factories that the Volkswagen Group has in the world. But the fourth industrial revolution is much more than a neatly finished product. It is also the ability to turn components into smart objects, as well as digitalising information and placing it on a network. The idea is that life should not stop when you get into a vehicle, which is why we need to transform it and equip it with new services to continue to enjoy the driving experience.

Like a gentle wind, this objective seems to reach all corners of SEAT, obliging the new generation of robots to face up to the challenge of unfolding themselves naturally in unknown spaces. But without doubt, it is the workers of SEAT who have best captured that breath that is capable of taking the company forward.



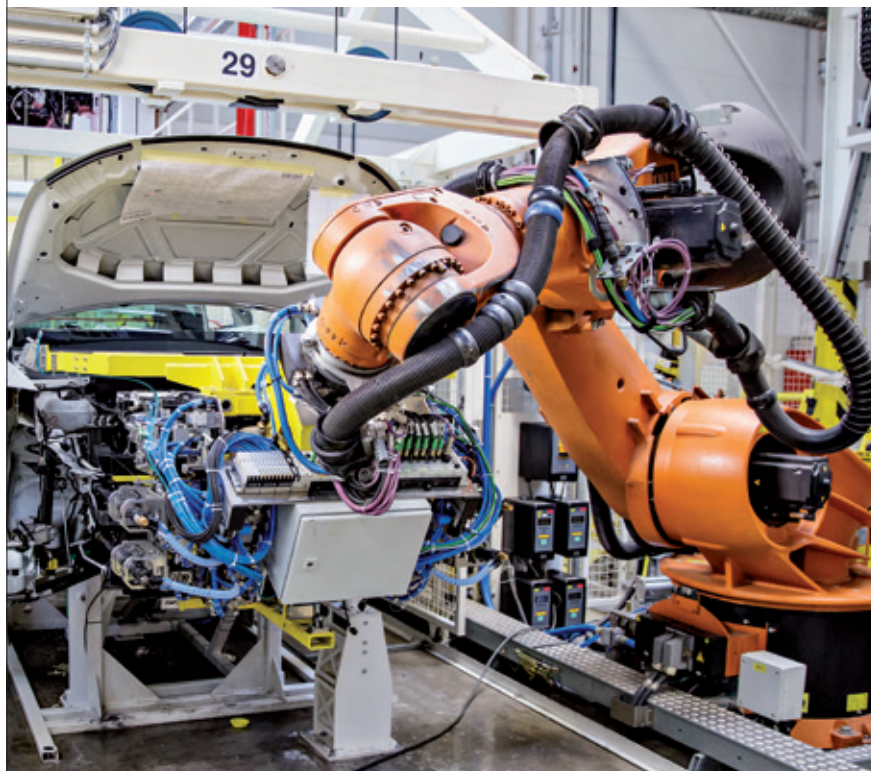
The use of artificial intelligence and connectivity between different environments, together with new forms of production and design, have allowed SEAT to become a leader within its sector. The goal is to carry out more projects in less time and to deal with the growing demand for customisation, supported by the immense possibilities offered by new digital technologies.

Through this *entente cordiale* between people and machines, more and more SEAT employees now dedicate part of their day to controlling the processes that allow for the optimisation of decision-making, while the robots take care of the more laborious and routine tasks. Nevertheless, the new generation of these machines come equipped with sensors that allow the robots to connect with each other and gather data, as well as to learn from their actions (machine learning). To this end, they have algorithms that review the past records and predict future behaviours, something which is sometimes complemented with movement detection or vision programs. They are, therefore, self-teaching robots with the ability to interact with humans and take on SEAT's challenge of being one of the frontrunner companies in the fourth industrial revolution.

In this new reality, each workspace opens the doors to a new world: cyber-physical systems, 3D printing, algorithms that identify any kind of error in the process based on the history, smart logistical systems, smart glasses that offer virtual assistance and communicate with the software installed in the machinery, and so on.

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**“SEAT WANTS TO BECOME A FRONTRUNNER WITHIN THE SECTOR IN THE USE OF BIG DATA AND CONNECTIVITY”.**

However, besides the machines, flesh and blood experts assemble and thoroughly review the doors, headlights, bumpers, windows and other details to ensure that everything is perfect, with that human touch being what finally marks the difference.

Whereas a number of years ago SEAT staff were still responsible for carrying out the more physical tasks, now, on the other hand, they acquire skills in process management in order to programme the robots so that they are the ones that take care of those tasks. But this is not the only change that has taken place. Whereas

the first robots to step foot in SEAT's facilities in Martorell were as robust as they were unwieldy, today's robots are lighter and more versatile. In a matter of seconds, it is possible, for example, to programme a robotic arm to go from one exact point to another and to mount the tabs of a headlight and then to proceed to screw it in with a second movement that is equally as reliable. This ease of use is expected to become the quintessence for manufacturing on demand, a trend which not only affects the automotive industry but also other sectors that are seeking to make their production lines more flexible in order to adapt to changing environments.

SEAT is in the midst of a digital transformation process without precedents, which will lead the company to the automation of its facilities and to fully enter Industry 4.0. This will involve robots and machines that are increasingly smart, prepared, digital and interconnected... but which will never be able to compete with SEAT's most important asset: people.





## CARS ON DEMAND

Nevertheless, as sophisticated as robots have become, they are still a long way off conveying passion in the product. This is where people and SEAT's clear commitment to industry 4.0 come in. The goal is to pre-empt a scenario which is starting to take shape. In the future, most probably, customers will want to receive their vehicle in a shorter timeframe, which will oblige factories to begin production based on this order as quickly as possible. We don't have to consult a crystal ball to guess that implementing instantaneous modifications in the production processes will be key to stay ahead of rivals and to be competitive.

This is, without doubt, the great challenge that SEAT has ahead of it: interconnecting increasingly prepared human beings with machines that are capable of learning new skills, so that the final customer is the one to benefit from and enjoy the greatest revolution the car has undergone in its history.

**“SEAT’S GREAT CHALLENGE IS TO INTERCONNECT INCREASINGLY PREPARED HUMAN BEINGS WITH MACHINES THAT ARE CAPABLE OF LEARNING NEW SKILLS”.**







## LOGISTICAL SIMULATOR

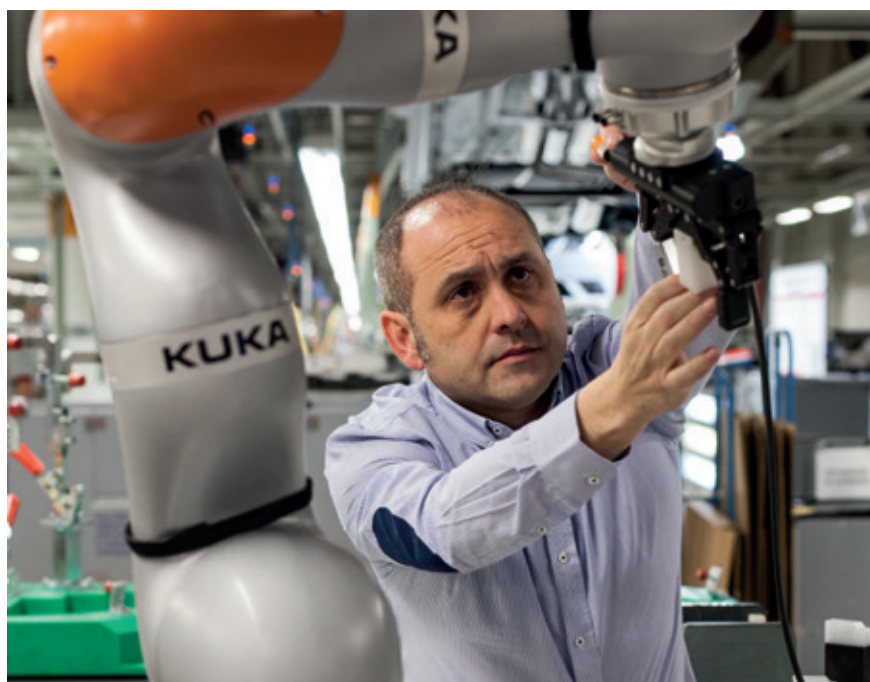
“Thanks to this machine, SEAT’s employees can familiarise themselves with driving and perform different journeys on demand around the various areas of the workshops so that, when the day comes that they have to do this work for real, they know how to cope in different circumstances despite never having been there”, explains Iris Ambrosius, head of new technologies for logistical training in SEAT. To this end, the simulator has a virtual reality headset which allows staff to travel through the corridors of the workshop, get used to the usual traffic and load and unload parts. As well as getting close to the workstation in virtual reality, the simulator provides personalised training, as well as on-demand journeys around workshops that are sometimes more than 20,000 metres squared.

*“What kind of relationship do I have with the machine? It is a loyal helper with a lot of patience. It is so patient, it could be my friend”.*

## HEADLIGHT PRE-ASSEMBLY

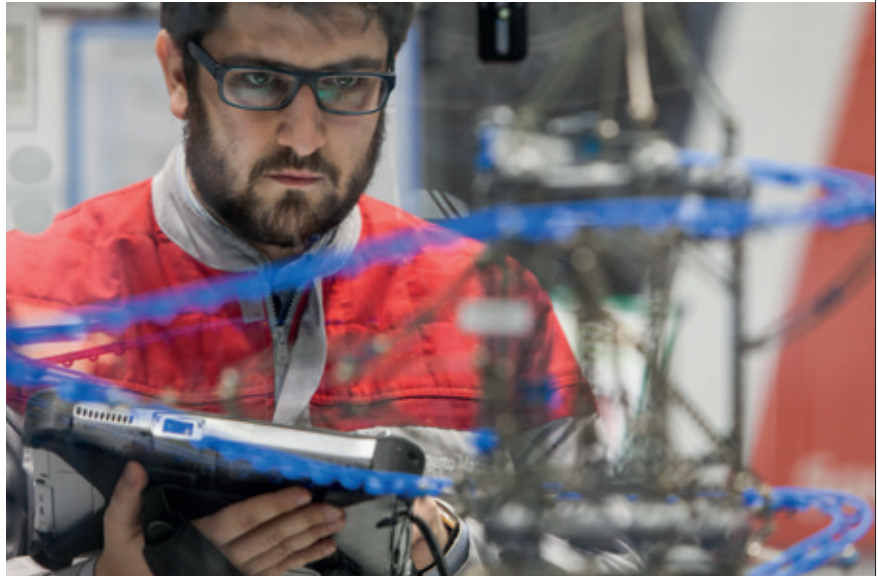
The articulated arm collaborates with the worker to fit a vehicle’s headlights. “In a day it can perform 1,250 fittings”, states Juan Carlos Rubio, process analyst. “One of the characteristics of this robot is that it works together with a person at all times, something that was unthinkable up until not long ago for safety reasons”, he adds. Perhaps this is why this robot has become another member of the family. “In the end, it’s about developing a partnership between the strength and reliability of the robot and the ability to make decisions that a human being has”. Thanks to this robot, today almost twice the number of headlights are assembled than in the past, also providing higher quality in the finish.

*“We are in a period of technological change in which machines, rather than replacing people, will collaborate with them”.*



## AUGMENTED REALITY

The tablet computer that Joan Rubio, a SEAT technology expert in augmented reality, carries with him allows him to recognise the different elements of an electrical cabinet using an application and to obtain precise information on each element, whether they are 3D designs, videos or graphs, whatever is needed at any given place and time. Rubio works in Maintenance together with another 400 people, whose mission is to ensure the availability of SEAT's production facilities. To achieve this, it is necessary to know any of SEAT's technologies, machines or installations in detail, hence training and practice are essential and new technologies, such as augmented reality, can be great allies in this mission. In the Maintenance Training Centre, staff are working on the maintenance technologies of today and of tomorrow. Augmented reality allows staff to focus on any installation and to obtain information and data in real time, combining the real world



with the world of data. "The cornerstone of the maintenance of the future is predictive maintenance, that is, using information to predict the state of the installations", he foresees.

*"That is what augmented reality consists of: seeing the real world with added information. In our case, we use this technology to recognise and interact with our installations".*



## AUTOMATED GUIDED VEHICLES (AGVs)

*"AGVs participate in processes in which the monitoring of the material is very important and where on-time delivery is essential".*

In contrast to the intense activity in workshop number 9, driverless vehicles quietly circulate back and forth with gearboxes, engines and all kinds of components, only stopping when their sensors detect a person or when they receive orders from the devices that regulate the flow of vehicles within the

facility. The AGVs guarantee a safer environment for the workers: "There has never been an accident involving a person since we start working with AGVs", confirms Bernabé Haro, a technician in logistical planning who professes to being a fan of his work. "Thanks to the software they have installed in them, they conduct cyclical routes" – describes Haro – "following the layout of magnetic guidelines hidden under the ground". The one hundred or so AGVs that SEAT uses in the Martorell factory are known by the employees of the assembly workshops by names as diverse as "setillas" (little mushrooms) or "margaritas" (daisies), depending on who names them. Besides protecting the workers and preventing them from handling heavy items, the AGVs prevent the product from being damaged and confirm the location of each load using the workshop's monitoring system.