

## 6.3 Computer controlled systems

Syllabus 2026 - 2028

### WHAT YOU NEED TO KNOW

- Computer controlled systems, including robotics in manufacture, production line control and autonomous vehicles
- Advantages and disadvantages of using computer controlled systems rather than humans

### How computer controlled systems work

**Sensors** collect data from the environment (for example, position, temperature or speed). The data is sent to a **microprocessor**, which compares it with stored values and decides what to do. It then sends signals to **actuators** (such as motors) which carry out the action. The result is fed back to the sensors so the system can keep adjusting itself. This is called **feedback**.

### Examples

| System                         | How it is used                                                                                                                                                   |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Robotics in manufacture</b> | Robots weld, spray-paint, assemble and lift heavy parts, for example on a car assembly line. They repeat the same task accurately for long periods.              |
| <b>Production line control</b> | Sensors check items on a conveyor belt, machines are started and stopped automatically, faulty products are removed and stock levels are monitored.              |
| <b>Autonomous vehicles</b>     | Cars, trucks, trains and drones use cameras, radar, GPS and other sensors, and a processor, to steer, brake and avoid obstacles with little or no human control. |

### Computer controlled systems compared with humans

| Advantages                                                                 | Disadvantages                                                            |
|----------------------------------------------------------------------------|--------------------------------------------------------------------------|
| + Can work 24 hours a day without breaks, holidays or sickness             | - Very expensive to buy, install and maintain                            |
| + Very accurate and consistent, so quality is the same every time          | - Jobs may be lost and workers may need retraining                       |
| + Faster than people at repetitive tasks                                   | - Cannot think creatively or deal with unexpected problems as people can |
| + Can do dangerous jobs (heat, chemicals, heavy loads) so people are safer | - If the system breaks down or loses power, production stops             |
| + Lower running costs in the long term                                     | - Skilled technicians are needed, and the system could be hacked         |

### EXAM TIP

A good answer compares the system with a human worker (for example, robots do not get tired, but a human can react to something unexpected). Avoid vague words such as 'better'.

## Key terms

| Term              | Meaning                                                                             |
|-------------------|-------------------------------------------------------------------------------------|
| <b>Sensor</b>     | A device that measures a physical quantity and sends the data to the computer.      |
| <b>Actuator</b>   | A device, such as a motor, that carries out an action when told to by the computer. |
| <b>Feedback</b>   | Using the output of a system as an input, so it can adjust itself.                  |
| <b>Autonomous</b> | Able to operate without human control.                                              |