Validmagnetics Limited

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Precision servo press

Art of Motion Control Technology

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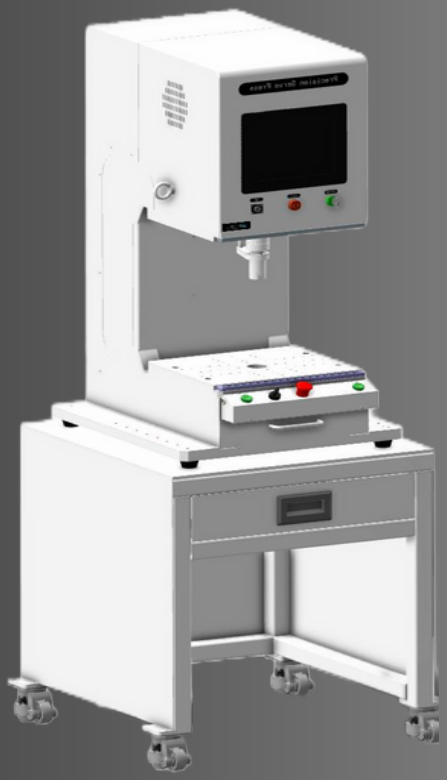
Introduction of Servo Press Systems

The precision CNC servo electronic press, commonly referred to as a servo press, servo pressing machine, servo press lathe, electronic press lathe, or electronic pressure machine, operates based on the principle of driving a high-precision ball screw with a servo motor to perform precise pressing and assembly tasks. It enables full closed-loop control of pressing force and insertion depth during the pressing process, thereby achieving precision pressing with online quality management.

Servo presses primarily operate in two modes: pressure mode and position mode.

Pressure Mode:

In this mode, motion control is achieved through software programming. The instructions are transmitted to a CNC application module, which drives the servo motor via a servo driver. The motion of the output end is controlled through a transmission mechanism. After the press stroke, the pressure sensor provides an analog signal feedback based on the strain. This signal is amplified, converted from analog to digital, and output to the control system/PLC for real-time pressure monitoring. The servo motor encoder provides position feedback signals, ensuring precise position monitoring.



Position Mode:

Here, the servo motor drives a high-precision ball screw. By controlling the motor's rotation angle, the position of the press head is accurately managed. A high-sensitivity pressure sensor mounted at the press head collects real-time pressure data, achieving closed-loop control of the pressure. High-speed data collection of position and pressure during the pressing process enables precision pressing, online quality evaluation, and digital management of process data.

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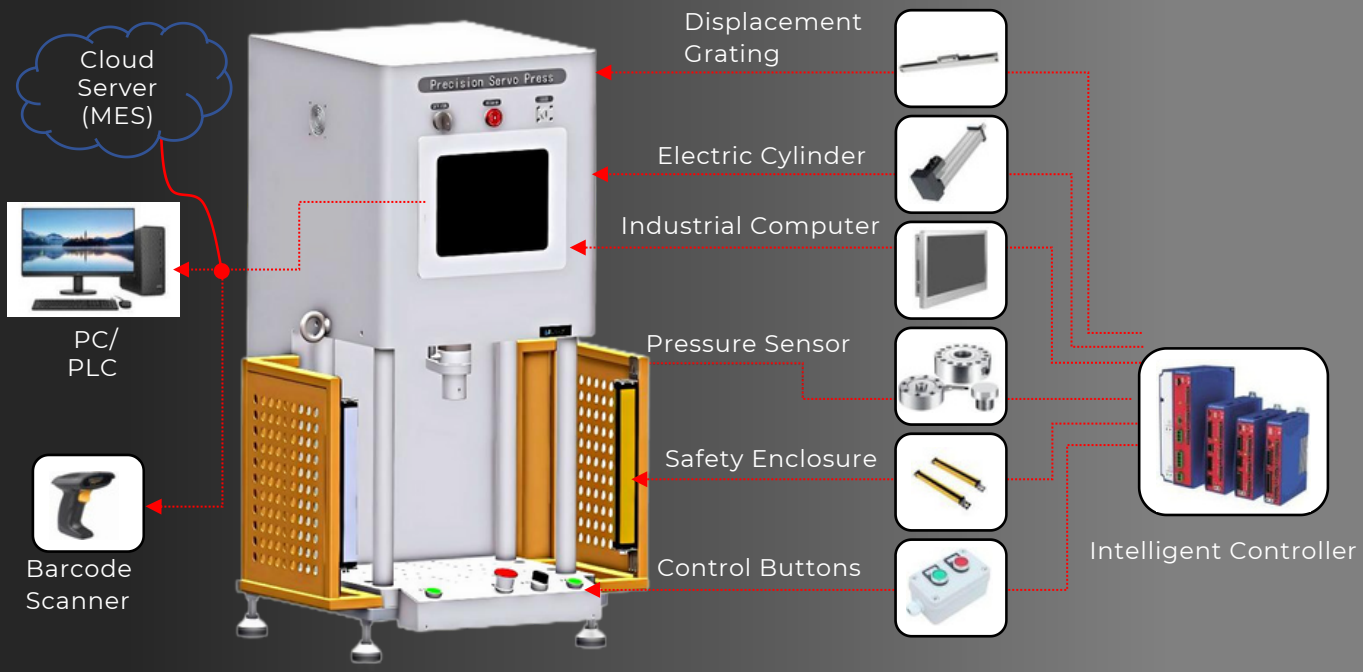
Composition of Precision CNC Servo Press :

- Core: Servo Motor, Electric Cylinder, Main Frame, Industrial Control Computer and Pressure Sensor
- *Options: Displacement Optical Scale, Safety Enclosure, Safety Light Curtain, Smart Controller Barcode Scanner, Audio-Visual Alarm



General Specifications:

Parameters	Specification	Remarks
Rated Force Range	200kg / 500 kg / 1T / 2T	Standard
Force Accuracy	±0.3% F.S (Full Scale)	
Force Resolution	0.1N (0.01kg)	
Stroke / Open Height	350mm / 400mm	Customized
Displacement Range	250mm / 300mm	Customized
Spindle Speed	0.01-30mm/s	Customized
Displacement Resolution	0.001mm	
Repeatability of Position Control	±0.01mm	
Max Speed (Free Load)	200mm/s	
Chassis	Standard	Customized

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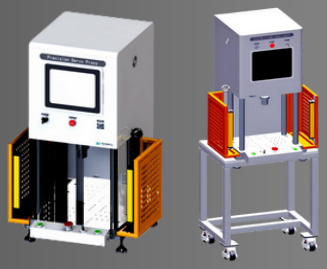

Standard Industrial Precision CNC Servo Press

The industrial precision CNC servo press operates on the principle of integrated drive and control. In a servo hydraulic press, the main drive oil pump is powered by a servo motor, reducing the need for control valve circuits and allowing precise control of the press slide. This makes them suitable for processes like stamping, forging, pressing, and straightening.

Key Advantages Over Traditional Hydraulic Presses:
Higher energy efficiency, Lower noise, Higher efficiency, Higher precision and more flexible.

Closed-Loop Control:
The servo motor drives a high-precision ball screw to perform pressure assembly tasks, allowing for complete closed-loop control of both the pressing force and insertion depth. This results in precise online quality management of the pressing process.

Model	F1TD200-P10	F2TD200-P20	F3TD250-P30	F5TD250-P50
Press Force（T)	1	2	3	5
Displacement Range (mm)	200	200	250	250
Displacement Accuracy（mm)	±0.01	±0.01	±0.01	±0.02
Force Accuracy	0.5%FS	0.5%FS	0.5%FS	0.5%FS
Max Speed (Free Load)（mm/s)	200	125	125	100
Press Speed（mm/s)	30	30	30	30
Holding Time（s)	60	60	60	60
Displacement Sensor	1um	1um	1um	1um
Working Platform（mm)	390*310	390*310	480*460	480*460
Dimension（mm)	780*600*1945	780*600*2003	820*750*2051	820*750*2082
Platform Height（mm)	1000	1010	934	934
Power Supply	3 Phase AC380V	3 Phase AC380V	3 Phase AC380V	3 Phase AC380V

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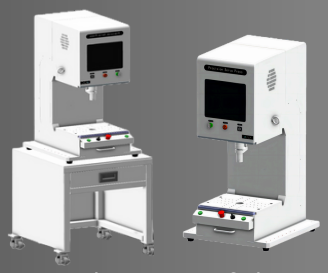
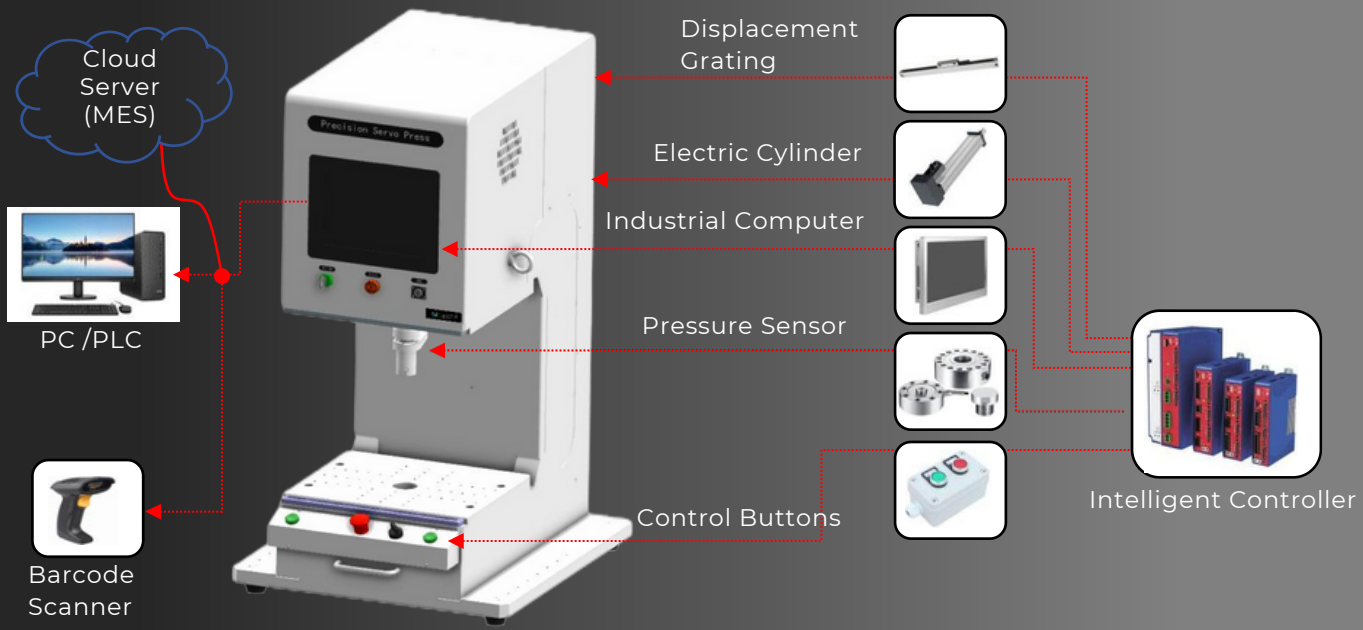


Economic CNC Servo Press

Designed to replace traditional hydraulic and pneumatic presses. The control system of the servo press is developed based on the intelligent driver GSHD and uses a PC platform for human-machine interaction.

In addition to basic HMI functions such as parameter setting and status monitoring, the system specifically includes a position-pressure curve for observing the pressure control process and performing historical data analysis, which can meet the needs of precise production.



Model	ECP250D150-P02	ECP500D150-P05
Press Force（T）	0.25	0.5
Displacement Range（mm）	150	150
Repeatability of Position Control (mm)	±0.02	±0.01
Force Accuracy	2%FS	1%FS
Max Speed (Free Load)（mm/s）	250	125
Press Speed（mm/s）	30	30
Holding Time（s）	60	60
Working Platform（mm）	330*200	330*200
Dimension（mm）	422*357*948	422*357*861
Power Supply	Single Phase AC220V	Single Phase AC220V

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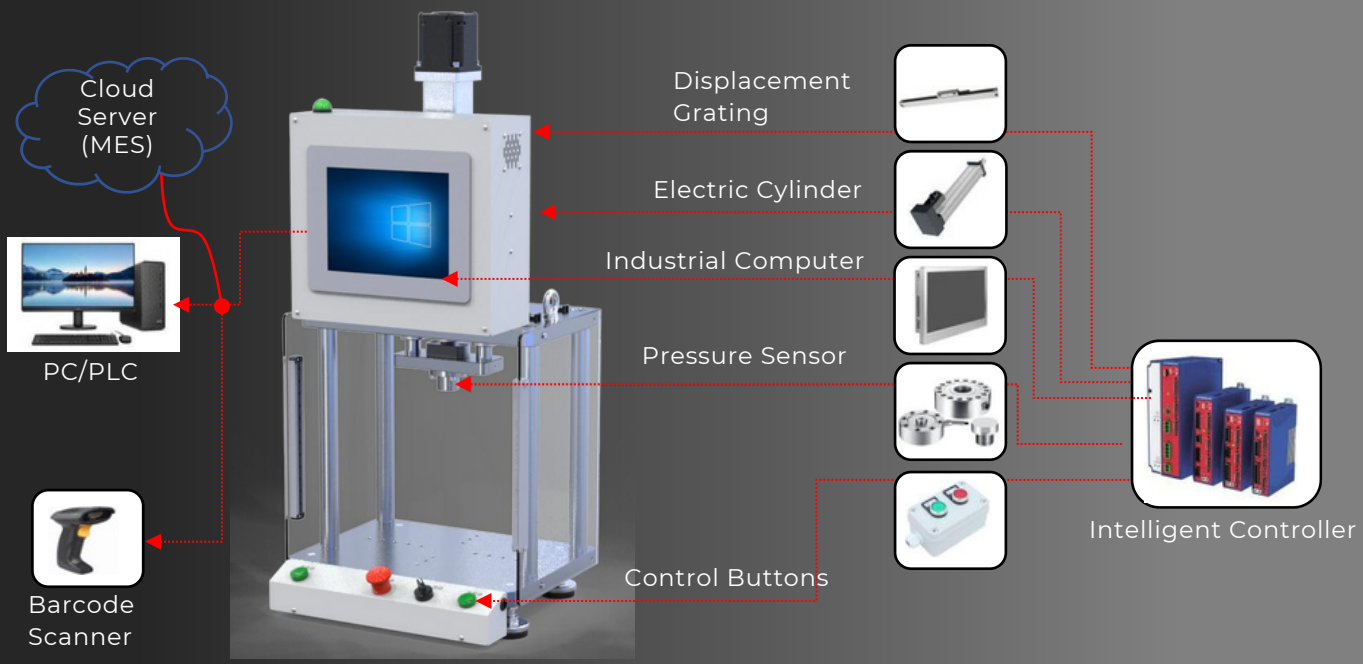
Simplified Precision CNC Servo Press

Driven by servo motors, which power the main transmission oil pump. This reduces the need for control valve circuits, allowing for precise control over the press slide. They are ideal for processes like stamping, forging, pressing, and straightening. Compared to traditional hydraulic presses, servo-driven hydraulic presses offer several advantages, including energy efficiency, reduced noise levels, higher operational efficiency, and greater flexibility. These presses can replace many conventional hydraulic presses.



Model	SF300D150-P03T	SF500D150-P05T
Press Force（kg）	300	500
Displacement Range（mm）	150	150
Repeatability of Position Control (mm)	±0.01	±0.01
Force Accuracy	0.5%FS	0.5%FS
Max Speed (Free Load)（mm/s)	250	250
Press Speed（mm/s)	30	30
Holding Time（s)	99.9	99.9
Working Platform（mm)	330*200	330*200
Dimension（mm)	300*430*1050	300*430*1050
Power Supply	Single Phase AC220V	Single Phase AC220V

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Typical Pressing Process

The pressing process generally consists of five main actions: **Fast approach**, **Detection**, **Pre-pressing**, **Pressing**, **Pressure holding**, and **Return**.

Fast Approach:
The press head moves rapidly from the starting or origin point toward the product surface.
The detection position marks the endpoint of this motion.

Detection:
Upon nearing the specified range, the system enters the detection phase.
During this slower motion, the press head stops upon contacting the object surface, determined by whether the feedback force reaches the preset detection contact force.

Pre-Pressing:
A preparatory stage before the main pressing operation.
After the press head contacts the object, it quickly approaches the pressing target position if the pressing stroke is substantial, enhancing efficiency.

Pressing:
The core stage where the press head applies force beyond the detection phase.
Operates in selectable modes: position mode, pressure mode, displacement mode, or relative pressure mode.

Pressure Holding:
After reaching the target position or pressure, the system maintains a constant position or pressure value for the set duration.
If the hold time is set to zero, the pressure holding phase is skipped.
Return:
Following the pressure holding phase, the press head reverses direction, returning rapidly to the starting or origin point.

This multi-stage process ensures high precision, consistency, and efficiency in pressing applications, meeting the stringent demands of modern manufacturing.

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Key Features:

Real-Time Data Display:
Displays real-time position, pressure, pressing curve, order information, and quality judgment results.
The user-set quality judgment conditions can be visually observed in the oscilloscope window.

Multi-Stage Pressing Process:
The pressing process is intuitively divided into multiple stages.
Users can set various movement processes such as rapid descent, detection, pre-pressing, pressing, holding pressure, and retraction according to process requirements.

Permission Management:
Allows setting of operator, technician, and system administrator permissions.
Permissions are specifically divided to prevent unauthorized parameter changes that could cause equipment malfunctions.

Hardware and IO Configuration:
Enables setting of equipment hardware parameters and IO configuration.

Data Query and Parameter Adjustment:
Users can query pressing parameters of products and timely modify recipe parameters to ensure product quality.

Real-Time Data Recording:
Records pressing data in real-time and saves it for analysis.
The monitor, placed in a convenient location, allows the operator to observe all monitoring points such as position, pressure, output, and production status.

Alarm and Safety Systems:
The software includes an alarm function, allowing the setting of acceptable product load or displacement ranges.
If real-time data falls outside these ranges, the equipment automatically triggers an alarm.
The machine is equipped with a safety light curtain to ensure operator safety.
Additionally, the machine is fitted with an alarm that sounds when a malfunction occurs.

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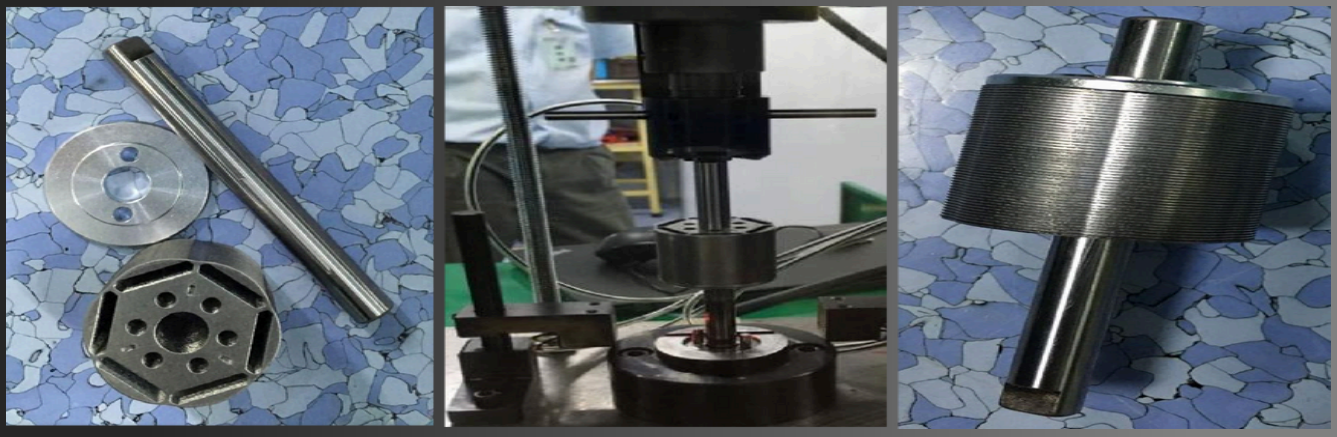
Typical Application : Motor Rotor

Requirements: The motor rotor shaft needs to be press-fitted with the rotor core and cover plate using an interference fit.

Process: The position mode is used to vertically press the motor rotor shaft into the rotor core and cover plate, going through four stages: initial contact and force application, smooth pressing, pressing to the end, and pressing limit.



Technical Requirement: The insertion depth is approximately 40mm, with a cycle time requirement of 5 seconds. The insertion depth error must be controlled within a range of 0.02mm. The system should be able to detect and reject products that exceed tolerance limits, using four-window detection for real-time online quality inspection.

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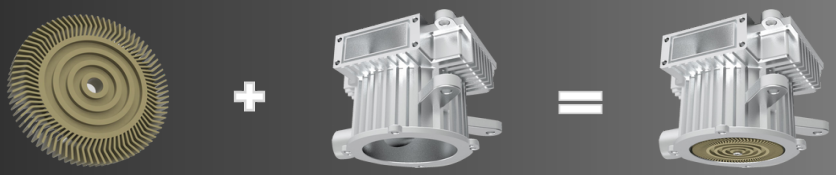
Typical Application : Motor Shaft

Requirements: The motor rotor shaft and impeller need to be press-fitted using an interference fit.

Process: Using the position mode, the impeller is pressed into the motor rotor shaft to ensure the impeller is within a fixed position range relative to the motor flange surface. Through TCP/IP communication, the average value of three external photoelectric displacement sensors triggers the stop of the pressing operation, completing the pressing and returning. The process undergoes three stages: initial contact and force application, pressure increase, and pressing emergency stop.



Impeller housing (including rotor shaft)

Technical Requirement: The insertion depth is approximately 15mm, with an allowable position deviation of ±0.01mm when externally triggered to stop, and a cycle time of 10 seconds. The system uses two-window detection to monitor the actual position range during the initial contact and force application stage, and the actual pressure range during the pressure emergency stop stage. Products with impeller deviations that are too large or too small are rejected.

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Typical Application : Rubber Bushing + Steel Ring

Technical requirement: Due to the large incoming material tolerance (±0.2mm), the pressure mode is required for pressing. For the S1 part, the target pressure is 30KN, while for the S2 part, it is 50KN. The pressure accuracy must be within 1% FS, with a cycle time of under 6 seconds. Additionally, the consistency of the insertion depth stroke must be maintained within 0.05mm.

Pressing Results: The insertion depth is approximately 60mm, with a cycle time of 5.6 seconds. Due to the long insertion stroke and the need to maintain pressure accuracy, a pre-pressing function was used to quickly press down, speeding up the cycle time. Window detection was also enabled to eliminate defective products, ensuring 100% quality inspection. In actual production, the pressure accuracy achieved is 1%FS, and the product depth consistency is 0.02mm, fully meeting the requirements.

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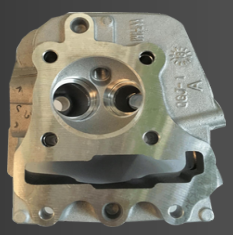
Typical Application : Bearing for Engine Housing

Requirements: The process involves robotic loading, with the workpiece tray being fed into the production line. Siemens PLC remotely sends the pressing command, and quality assessment is performed during the pressing process.

Process Overview:

1. In the corresponding pressing mode, the bottom electric cylinder is first used to assist in supporting the cylinder body, followed by the main cylinder action, pressing the bearing into place.
2. Window 1 detects the fit tightness and pressure value during the smooth pressing phase. Window 2 detects the target pressure and position value during the pressing limit stage.

Bearing



Body

Engine Cover

Pressing Results:

1. The pressure accuracy achieved is 1% F.S, with a repeat positioning accuracy of ±0.01mm.
2. The end-to-end pressing solution effectively resolves the auxiliary support and interference issues.
3. The remote PLC can read system position, pressure, speed, and information about good and defective products in real-time.

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