High precision position monitoring
Monitoring the tilted squeegee
Capacitive displacement sensors monitor the position of the squeegee. Two synchronized sensors measure with high resolution both ends of the squeegee to provide exact statements about its tilt angle. This is to ensure that the powder bed has been pulled off evenly.

Sensor: capaNCDT 6200

eddyNCDT 3005
- Miniature eddy current measuring system, ideal for integration into plant and machinery
- Non-contact displacement and distance measurements with measuring ranges from 1 to 6 mm
- High accuracy and high frequency response
- Pressure-resistant versions up to 2000 bar, resistant to oil, dust & dirt

Orientation and positioning of the building platform
With selective laser sintering, the building platform is lowered after each melting cycle by a defined value which corresponds to the required Z resolution. Inductive displacement sensors based on eddy currents monitor this building platform in order to allow the print head to be aligned in parallel.

Sensor: eddyNCDT 3005
Position monitoring of printing processes
High precision sensors for print head tracking
Precise positioning of the print head is particularly necessary for 3D printing of complex components as well as for PCB printing. Confocal sensors are used to check positioning with submicrometer accuracy. These record the distance with the highest precision and at the same time a high measuring rate. This also allows dynamic pressure processes to be controlled.

*Sensor: confocalDT*

Detection of platform tilt and position
Draw-wire displacement sensors are used to continuously check the tilting of girder platforms. The sensors are mounted outside the pressure chamber. The measuring wire is guided into the pressure chamber via deflection pulleys. Therefore, this design is also suitable for environments with high temperatures and dust formation. The compact sensors have large measuring ranges and can therefore detect the tilt even if the position of the platform varies.

*Sensor: wireSENSOR MK*

Print-head calibration in Z-axis direction
To obtain repeatable print results, the Z-axis position of print heads is calibrated fully automatically. For this purpose, the print head moves to a defined position and lowers in the Z-axis direction. An induSENSOR DTA probe records the Z-axis movement at high accuracy. The determined distance data is taught-in for regular calibration of the Z-axis position of the print head.

*Sensor: induSENSOR DTA*
Temperature monitoring of printing processes
Heat distribution on 3D printed components

To check the heat distribution of the printed components, thermoIMAGER thermal imaging cameras are used. These record the two-dimensional heat distribution from a safe distance and provide information on the stability of the joints and structures. The cameras can be used to monitor metal as well as plastic parts.

*Thermal imager: thermoIMAGER TIM*

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Temperature monitoring of the powder bed in 3D printing

During laser sintering with CO2 lasers, thermoMETER TIM thermal imaging cameras monitor the powder bed. The thermoMETER TIM thermal imaging cameras can be equipped with different lenses optimized for the respective measuring field. The high thermal sensitivity enables detection of the smallest temperature deviations. These high speed cameras also capture dynamic printing processes.

*Thermal imager: thermoIMAGER TIM*

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Temperature measurement of the powder bed and the carrier platform

In certain 3D printing processes, the powder bed is heated to ensure defined processing temperatures. Miniature thermoMETER CT pyrometers are used to monitor the temperatures. These are mounted on the top and record the temperature regardless of how far away the powder bed is. The sensors measure with high reliability even at high ambient temperatures in the installation space.

*Sensor: thermoMETER CT*
Distance control of print heads

- Powerful laser displacement sensor for print head control
- Measuring rate of 4 kHz for precise and high speed measurements
- Measuring ranges: 10 mm - 500 mm
- Compact sensor design with integrated controller
- Robust and long-life design

optoNCDT 1420
Print head positioning and focal point control
With printing processes, the exact height of the print head is a crucial factor for the quality of the final product. High-speed distance measurement against different material surfaces and reliable edge detection enable a fast readjustment process.

Sensor: optoNCDT 1420

Glue bead measurement in dispensing systems
After the reflow soldering process, glue is applied on some points to protect the circuit. The glue bead thickness is a critical factor that is reliably inspected using laser sensors.

Sensor: optoNCDT 1420

High-resolution fine positioning when printing PCBs
With printing, soldering and assembling processes of printed circuit boards, the exact height positioning of the print head is crucial for a flawless process. optoNCDT laser sensors enable precise positioning of the print head. Regardless of surface reflections, these sensors provide precise measurement results which are used to adjust the height and to detect the edges.

Sensor: optoNCDT 1420
Quality monitoring & Inspection

**scanCONTROL**
- Compact laser scanner with integrated controller
- High profile frequency for dynamic measurements
- Synchronization enables multi-scanner applications
- Various measuring ranges
- Blue Laser Technology for high precision measurement of various surfaces
Robot path calculation in repair welding processes
In order to calculate the robot path, scanCONTROL laser scanners determine the areas that need to be welded. Providing a high profile resolution and profile frequency, these laser scanners enable quick repairs.
Sensor: scanCONTROL 3060

High-precision 3D measurement in final inspection
To check the dimensional accuracy of printed components, surfaceCONTROL 3D sensors are used. These generate high-resolution snapshots of the components in a very short timeframe. The powerful 3DInspect software evaluates and outputs the point clouds.
Sensor: surfaceCONTROL 3D

3D scan prior to laser cladding / laser deposition welding
Laser scanners from Micro-Epsilon are used to detect the contour during laser cladding. These scanners detect the exact contour of the object before the weld is deposited. The 3D data is used to exactly determine the guidance of the weld head.
Sensor: scanCONTROL 2900

CAD comparison of the printed component
In order to monitor their production quality, printed components are inspected using Blue Laser scanners. The components are moved past the scanners with a traversing unit. A 3D image is produced from the laser profiles and then compared with the CAD data.
Sensor: scanCONTROL 3060BL
Sensors and Systems from Micro-Epsilon

More Precision

Whether it is for quality assurance, predictive maintenance, process and machine monitoring, automation or R&D – sensors from Micro-Epsilon make a vital contribution to the improvement of products and processes. High precision sensors and measuring systems solve measurement tasks in all core industries – from machine building to automated production lines and integrated OEM solutions.