 CENTERWAVE 6000

Diameter, ovality, wall thickness, sagging measurement of large pipes with innovative millimeter wave technology
Perfection by innovation achieves impressive progress in product quality as well as in the optimization of material costs during the manufacture of plastic pipes with diameters from 90 to 3,200 mm and large wall thicknesses. Norms and standards precisely define the minimum and maximum permissible diameters and wall thicknesses of a specific pipe dimension and require repeatable processes. In order to meet these standards and growing demands in the pipe extrusion, the use of innovative measuring and control systems in the production process is required.

Millimeter wave technology: precise, efficient, perfect
The innovative SIKORA CENTERWAVE 6000 precisely measures the inner and outer diameter, ovality, wall thickness and sagging of large plastic pipes. The measuring principle does not require any coupling media, is not influenced by temperature or the plastic material and does not need any calibration. The application area of the CENTERWAVE 6000 includes both the measurement of single and multi-layer pipes. Easy operation and precision lead to the highest quality of the final product as well as cost savings and optimal efficiency.

Function
The measurement with millimeter wave technology is based on the FMCW* runtime method. One or two constantly rotating transceivers continuously send and receive frequency modulated millimeter waves. From the runtime difference, the inner and outer diameter, ovality, wall thickness and sagging are defined.

Installation
The CENTERWAVE 6000 can be installed at any position in the extrusion line:
1. After a first cooling/vacuum tank
   Hot measurement
2. At the end of the line
   Cold measurement

* Frequency Modulated Continuous Waves

**Image:**
![Measuring system with rotating sensor](image1)

![Video image: Evaluation of the received signals and determination of the pipe dimensions](image2)

![The CENTERWAVE 6000 at hot and cold position](image3)
A rotating gauge offers the complete recording of the wall thickness over 360 degrees of the entire circumference of the pipe. This design also allows for precise measurement and visualization of the sagging. As an alternative, a static system measures selectively the wall thickness and the inner and outer diameter of a pipe with two transceivers at four points of the circumference.

Evaluation, display and control
After an algorithmic processing of the received transceiver signals, the measuring values are displayed in real time. A connected processor system offers a numerical visualization of the measuring values and their graphical visualization as well as extensive trend and statistical functions.

The technology provides information for centering the extrusion tools and thermal control of the line. The measuring values are used to ensure an optimum concentricity and minimum wall thickness.

Applications
The CENTERWAVE 6000 is suitable for the measurement of single and multi-layer plastic pipes with a diameter from 90 to 3,200 mm that are, for example, used for conducting water, gas, chemicals and oil. The system is applicable for pipes made of all common plastics, such as PE, HDPE, PP, PA6, PVC etc. For all applications, the system provides precise measuring values, also for thick-walled pipes.

When producing pipes with heavy walls, depending on the plastic used, there is the risk for so-called “sagging”, as the melt flows down as a result of gravity, and thus, negatively influences the pipe wall thickness distribution. This sagging is identified by the rotating measuring method because of the high measuring rate. A display and control device provides the machine operator with constant information on the production process that allows quick action to be taken.

Optimization of pipe quality as well as time and cost savings
As product temperatures have no influence on the measuring results when using millimeter wave technology and coupling media is not required, the system can be installed for a hot measurement or for a final quality control at the cold end of the line. The CENTERWAVE 6000 always provides precise measuring values. Assuming that the device is used after the first vacuum tank and pipes are produced with an outer diameter of 400 mm and a wall thickness of 27.5 mm, at a line speed of 0.5 m/min, the machine operator receives accurate measuring results already within ten to 30 minutes (depending on the length of the vacuum tank).
### Typical features

- Non-contact measurement of diameter, ovality, wall thickness and sagging with millimeter wave technology
- Wall thickness measurement of single and multi-layer large pipes (all kinds of plastic materials)
- Hot and cold measurement
- Measuring results in real time

### Measuring Principle

Non-contact on the basis of FMCW* millimeter wave technology

### Application

Extrusion lines for large pipes

### Areas of Application

- Smooth pipes
- Foamcore pipes
- Corrugated pipes
- Multi-layer pipes

### Material

Any kinds of plastics (e.g. PE, HDPE, PP, PA6, PVC, glass fiber reinforced plastics etc.), ceramic, glass

### Measuring Range

<table>
<thead>
<tr>
<th>Model</th>
<th>Measuring Range</th>
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<tbody>
<tr>
<td>CENTERWAVE 6000/400</td>
<td>90 to 400 mm</td>
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<tr>
<td>CENTERWAVE 6000/630</td>
<td>90 to 630 mm</td>
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<tr>
<td>CENTERWAVE 6000/800</td>
<td>160 to 800 mm</td>
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<tr>
<td>CENTERWAVE 6000/1600</td>
<td>250 to 1,600 mm</td>
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<tr>
<td>CENTERWAVE 6000/3200</td>
<td>1,200 to 3,200 mm***</td>
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* Frequency Modulated Continuous Waves
** Larger measuring ranges on request
*** Smaller wall thicknesses on request

Technical data is subject to change

### Wall Thickness

≥ 3.8 mm**

### Calibration

The CENTERWAVE 6000 does not require any calibration

### Measuring Frequency

80 to 300 GHz, max. 10 mW

### Measuring Rate

370 Hz

### Power Supply

200 - 240 V AC ± 10 %, 50/60 Hz
(100 - 110 V transformer on request)

### Ambient Temperature

+ 5 to + 45 °C

### Interfaces

- USB
- Optional: industrial fieldbus (e.g. Profinet IO, EtherNet/IP, Profinbus-DP, CANopen, DeviceNet), LAN, OPC DA/UA, analog output

### Your benefits

- Precise measuring values immediately after starting up the line
- Easy operation without presetting the product parameters
- Measurements independent from material and temperature
- No need for coupling media
- Reliable without calibration

### The highly modern measuring device ensures:

- Repeatable processes
- Assurance of pipe quality
- Reduction of material consumption
- Minimization of scrap rate
- Time and cost savings
- Increase of productivity
- A short-term Return On Investment (ROI)