QUANTUM Terahertz
Terahertz wall thickness measurement in the plastics industry
For some years iNOEX GmbH has placed a special focus on the development and sales of Terahertz wall thickness measuring systems for the plastics industry and can rightfully call itself the pioneer for this key technology. iNOEX has since pursued this course and QUANTUM technology has been taken to the next level. This was made possible thanks to the special penetration properties of THz waves and the fact that T-rays are harmless to human beings. Probably the most well known example for non-destructive material testing by means of Terahertz is the quality inspection process on the plastic insulation of the Space Shuttle. Moreover, the technical progress made during the past years in electronics and optics has produced increasingly powerful THz transmitters and receivers which prepared the way for an economic usability of Terahertz waves for wall thickness measurement in the plastic pipe extrusion industry.

„QUANTUM is the most versatile Terahertz wall thickness measuring system currently available in the plastics industry. It is able to solve almost any measuring task related to wall thickness sizes. Together with gravimetric mass throughput control or weight per metre control, QUANTUM is able to achieve a higher productivity at lower cost.“

Ralph Klose
Director Technology
The sensor of QUANTUM 360 reverses 360° around the pipe. It offers a high-precision wall thickness measurement from 100 µm to 60 mm. The automatic centering by way of an electrically driven XY cross table and the automatic focus setting allow a fully automated operation.

**Absolute measurement of 360°!**

QUANTUM CP is the first wall thickness measuring system for corrugated pipes. Wall thickness sizes and diameters of crown, valley, spigot and bell are measured around 360°.

**360° measurement of corrugated pipes!**

1 depending on material types and applicable measuring methods
QUANTUM Measuring principle

Only a steady, continuous and overall stabilization of the extrusion process allows an efficient line production and thus ensures competitiveness in the plastics market. This requires a technology which is able to master the required decisive functions “measurement & control” and the related documentation.

Against this background the next generation of QUANTUM has been developed. This tried and tested system features a Terahertz sensor which reverses or traverses along the measured product. The reversing or traversing of the sensor provides a highly precise overview of all parameters of the manufactured product. In the blow moulding process a roboter arm frequently positions the finished product in front of a static QUANTUM Terahertz sensor where several measuring spots of the blow moulded product are inspected.

The high flexibility of the QUANTUM Terahertz system allows for customized solutions. A high measuring sequence frequency of min. 100 Hz and the large measuring range for wall thickness sizes from 25 µm to 60 mm² cover a wide spectrum of potential customer demands.

STATE-OF-THE-ART TECHNOLOGY AND A MAXIMUM MEASURING ACCURACY!

ELECTROMAGNETIC SPECTRUM
ABSOLUTE MEASUREMENT AROUND 360°!

<table>
<thead>
<tr>
<th>Type</th>
<th>Pipe dimension [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUANTUM 360 / 250</td>
<td>10 - 250</td>
</tr>
<tr>
<td>QUANTUM 360 / 400</td>
<td>63 - 400</td>
</tr>
<tr>
<td>QUANTUM 360 / 630</td>
<td>90 - 630</td>
</tr>
<tr>
<td>QUANTUM 360 / 1000</td>
<td>250 - 1000</td>
</tr>
</tbody>
</table>

NEXT GENERATION.

QUANTUM 360 is a systematic further development. A special focus was put on user friendliness. The multi-touch surface convinces with its intuitive interface. Owing to the temperature-independent measuring process, all which remains to do for the line operator is to select the pipe recipe. QUANTUM 360 detects the pipe position and centers automatically by way of an XY cross table. Then the Terahertz sensor is automatically focussed in the center by two spindles. There are no dimensioned component parts involved. When product dimensions are changed, only the pipe recipe needs to be changed.

All movable parts are located inside the housing of QUANTUM 360. An open adapter establishes the mechanical connection between QUANTUM 360 and the vacuum tank. Its design requires a minimum of space in extrusion direction. All electronic parts are built to protection class IP 65 to protect QUANTUM 360 from occasional splash water. As far as the design is concerned, particular attention was given to low maintenance of all mechanical and electronic components.

COMPLETE AUTOMATION CONCEPT.

In combination with a gravimetric system, QUANTUM 360 can be set up as a complete automation system for your extrusion line. By way of a systematic start-up process, a better pipe centering, weight per metre control and thin point control, material savings of up to 5% or more can be achieved.
EXCEPTIONAL SAVINGS.

**QUANTUM CP** is the first automation system for larger-sized corrugated pipe extrusion lines. It is for the first time that one system is able to measure inline around 360° the wall thickness and diameter of the crown, valley, bell and spigot of a corrugated pipe. When this system is operative together with a gravimetric system, material savings of 5% or more become possible.

**HOW IT WORKS.**

**QUANTUM CP** features a reversing Terahertz sensor which is mounted on a movable slide. If for example the bell to be measured has reached the Terahertz sensor, **QUANTUM CP** shortly speeds up and synchronizes with the line speed of the corrugated pipe via two clamps. Then, the sensor reverses around the bell by a full 360°. With the help of the opposing laser sensor and the Terahertz sensor the exterior diameter is equally measured. Subsequently, the clamps are released and **QUANTUM CP** moves back to its start position. The next measuring cycle is started subsequently to measure a crown, valley, bell or spigot.

<table>
<thead>
<tr>
<th>Type</th>
<th>Pipe dimension [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>QUANTUM CP / 630</strong></td>
<td>250 - 630</td>
</tr>
<tr>
<td><strong>QUANTUM CP / 1000</strong></td>
<td>400 - 1000</td>
</tr>
</tbody>
</table>
UNIVERSALLY APPLICABLE.

QUANTUM is a universally applicable system due to its high flexibility. Customized solutions for blow moulding, for both inline and offline measurement are already in service.

FIRST INLINE WALL THICKNESS MEASUREMENT.

When used for inline operation in a blow moulding process, the terahertz sensor is frequently placed on a level with the tooling outlet of the blow moulding machine where it records wall thickness sizes with a measuring frequency of 100 Hz. The large measuring range of 60 mm of QUANTUM BM often allows for the measurement of both wall thicknesses and the interior and exterior diameters of the melt flow.

HIGHLY FLEXIBLE FOR QUALITY CONTROL.

QUANTUM BM is suitable not only for inline operation but also for offline quality control. For the blow moulding process, roboter arms frequently place the end product before the static QUANTUM Terahertz sensor. Multiple points are inspected during this process.
NEW VISUALIZATION.

The future-oriented and platform-independent concept allows visualization as a website by way of an easy integration via browser. As such, the iNOEX user interface is displayable on all web-enabled devices. The multi-touch surface allows an intuitive navigation through gestures (zooming, wiping).

Operation is carried out by way of installed widgets. On the interface, the user is free to configure, add or remove the widget’s size or information value, just as he wishes. As such, the user has constant access to his most important applications (favourites).

FAST CUSTOMER SUPPORT VIA TEAMVIEWER

- Direct global support via remote control
- Easy configuration, no VPN gateways
- Adherence to the highest safety standards