

X-RAY 6000 PRO

Diameter/wall thickness/eccentricity measuring system
for insulating and sheathing lines



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Measurement of the wall thickness, eccentricity, diameter and ovality of single and multi-layer products

For quality control of cables in insulating and sheathing lines, the X-RAY 6000 PRO continuously provides data for diameter, wall thickness and eccentricity to ensure that the required cable specifications are met. Therefore, the system provides the basis for optimization and repeatability of processes.

X-RAY 6000 PRO for single and multi-layer products

The X-RAY 6000 PRO measures wall thickness, eccentricity, diameter and ovality of up to three different cable layers. Typically it is used at tandem extrusion lines.

Display and control device ECOCONTROL 6000

As standard, the X-RAY 6000 PRO includes the display and control device ECOCONTROL 6000 with a vertically arranged 22" TFT monitor. You can decide whether it is mounted directly at the X-RAY gauge head, on a separate stand, or remotely integrated in the control cabinet of the line control.

The ECOCONTROL 6000 is conveniently and intuitively operated via touch screen. All relevant measuring values are numerically as well as graphically and as trend and statistical data shown at a glance.

Features of the ECOCONTROL 6000 at one glance:

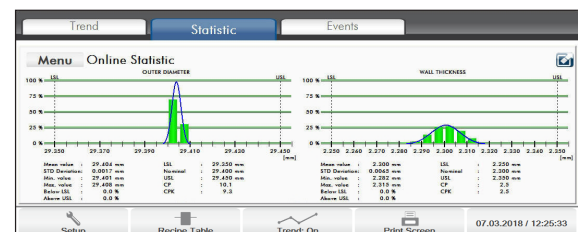
- Line presentation with pictograms of the connected devices
- Display of the single values and eccentricity of the wall thickness incl. highlighting of the min. wall thickness in color
- Length related trend diagram with zoom function for all values
- Statistics with the minimum/maximum/mean value, standard deviation, Cp and CpK values
- Reel and length related data storage

Typical features X-RAY 6000 PRO

- Measurement of the wall thickness, eccentricity, diameter and ovality of up to three different material layers
- Automatic control of the line speed and extruder rpm under consideration of the minimum values
- Selectable measuring rate from 1 to 3 Hz (optional 10/25 Hz)
- 22" TFT monitor, or 15" wide-screen monitor
- No calibration



X-RAY 6120 PRO with 22" TFT monitor



Statistics

Automatic mode and Hot/Cold Control

With the control module SET POINT, all conditions are met for fast and precise control of the wall thickness or the diameter through the line speed or extruder rpm under consideration of the minimum values. Other signal outputs allow the automatic centering of the crosshead.

To ensure the best possible quality with simultaneous minimization of material over-consumption, SIKORA recommends the Hot/Cold Control module HC 2000, combined with the X-RAY 6000 PRO and a diameter gauge head of the LASER Series 2000 or LASER Series 6000 for measuring the cold diameter. With the Hot/Cold Control module HC 2000 the material shrinkage is continuously calculated and automatically taken into consideration at the control of the diameter and/or the wall thickness.

Virtual Gauge Technology

The virtual gauge technology VIRTUAL 2000 is suitable for all applications for which a fast wall thickness control is required, but due to line configuration or product structure, a diameter or wall thickness measurement directly after the extruder is not possible.

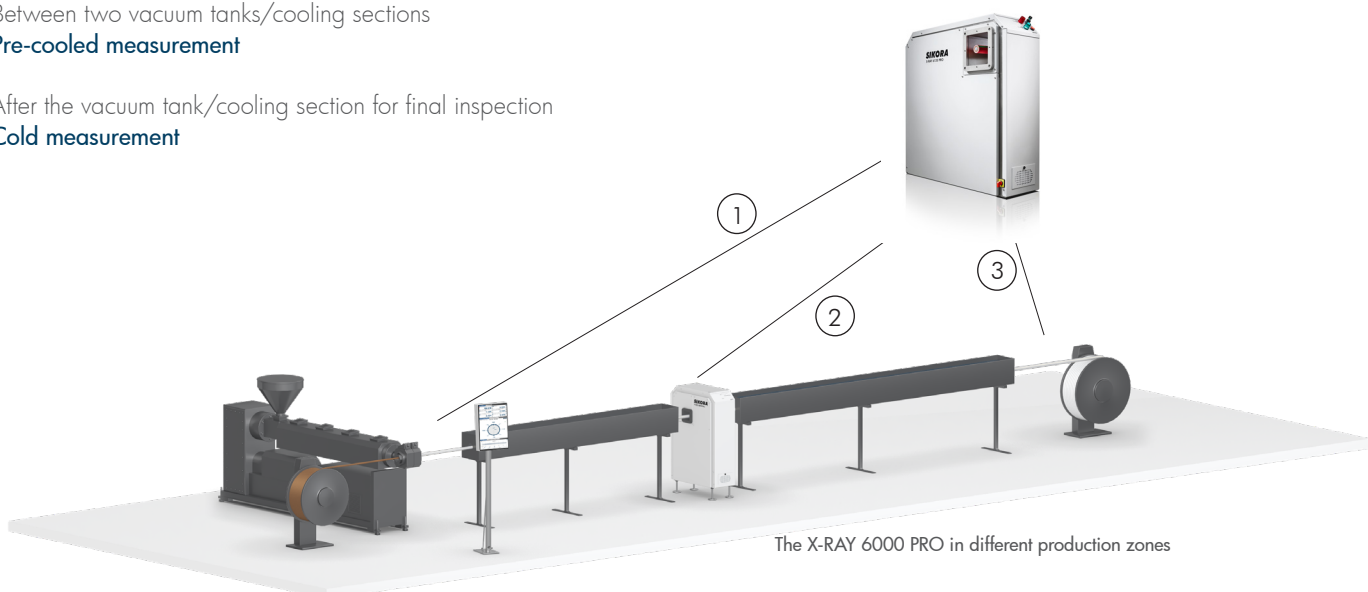


X-RAY 6070 PRO integrated in a production line

Positioning

The X-RAY 6000 PRO can be installed in different production zones:

1. Between extruder and vacuum tank/cooling section
Hot measurement
2. Between two vacuum tanks/cooling sections
Pre-cooled measurement
3. After the vacuum tank/cooling section for final inspection
Cold measurement



The X-RAY 6000 PRO in different production zones

Specific measuring systems for individual applications

Measurement in sheathing lines

In sheathing lines the X-RAY 6000 PRO is typically integrated between two cooling trough sections. In this position the device measures the outer jacket of the cable. An additional diameter gauge head at the end of the production line, combined with Hot/Cold-Control, considers the shrinkage of the diameter.

Measurement of foamed products

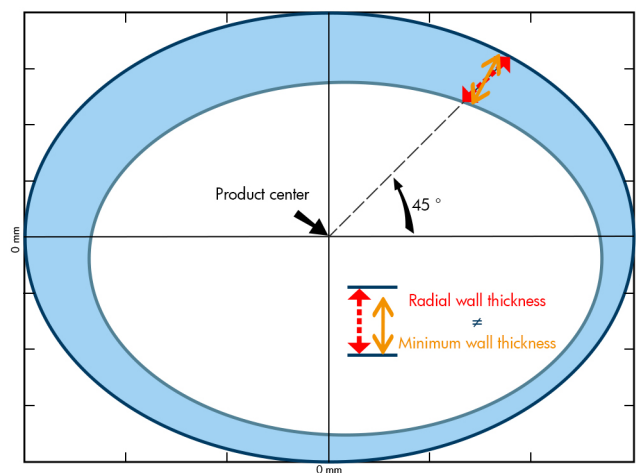
The X-RAY 6000 PRO is also used for the measurement of foam insulated high frequency cables, where the degree of foaming and radial distribution of the foaming are displayed in addition to eccentricity.



ECOCONTROL 6000: The production data of the X-RAY 6000 PRO is clearly visualized at the vertical 22" TFT monitor

Determination of the minimum wall thickness

By using a physical model for the absorption and the knowledge of precise and individual device geometry, statements about the entire circumference of the product can be made. This allows for a determination of the minimum wall thickness over 360 degrees of the circumference.



The wall thickness under 45 degrees from the outside (red dotted line) is larger than the actual minimum wall thickness (yellow solid line)

Quality assurance and significant cost savings

From the first day of operating, the X-RAY 6000 PRO assures a continuous online quality control at the cable production. A time consuming offline quality control is no longer necessary.

At the same time, the X-RAY 6000 PRO works to reduce the wall thickness to the smallest permissible value by taking into account the statistical fluctuation. Both quality assurance and the reduction of material lead to a significant increase of productivity.

An example:

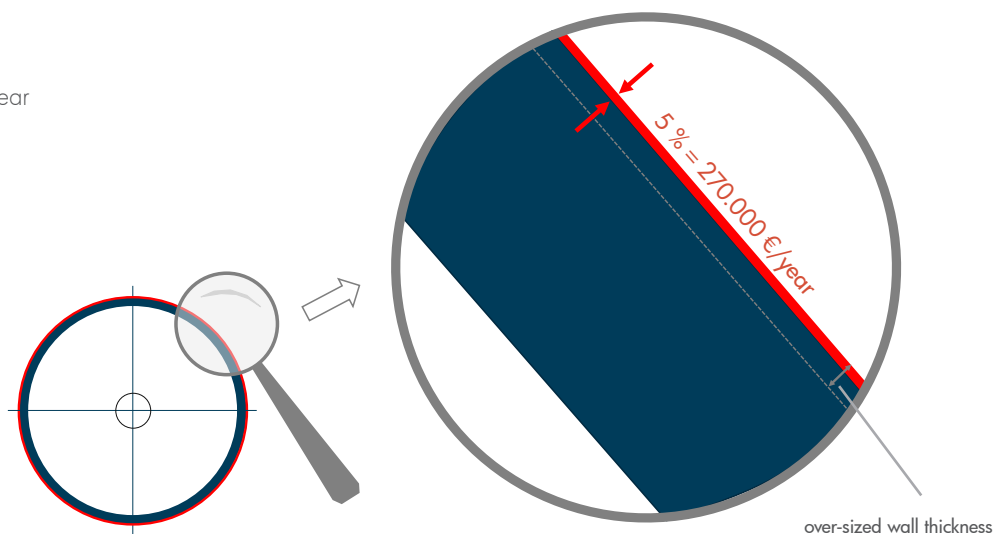
The capital expenditure for a measuring system may be 95,000 €. The material cost may be 5.4 million €/year (600 kg/h extruder output, 6,000 working hours/year, material costs 1.5 €/kg).

With the X-RAY 6000 PRO material savings of at least 5 % can be achieved, resulting in savings of 45 €/h (270,000 €/year). In consideration of costs for maintenance and service in the amount of 0.5 €/h and a depreciation of 1.46 €/h (depreciation, i.e. the reduction in the value of an asset, over eight years, 6,000 h/year) the profit of the company improves from the first day of initial operation by 43.04 €/h. If this is multiplied with the assumed 6,000 h/year, the impressive profit for a business year would be 258,240 €. This results in a Return on Investment (ROI) of 4.4 months (95,000 €/258,240 € = 0.37 years).

Check your specific material savings associated with the purchase of an X-RAY 6000 PRO using our online ROI calculator at: www.sikora.net/roi.

Note:

Extruder output: 600 kg/h
Operating time: 6,000 h/year
Material costs: 1.50 €/kg
5 % savings = 270,000 €



X-RAY 6000 PRO – outstanding measuring systems

The X-RAY 6000 PRO provides reliable measurement and control in sheathing and insulating lines at all line speeds. The system is as simple to use as a diameter gauge but, including the concentricity measurement and the possibility to measure and control the minimum wall thickness, it offers the highest potential for savings in respect to material over-consumption and start-up scrap.

Safety

Concerns on the safety of X-ray devices are arbitrary, as the radiation is, because of the low energy, of no relevance. In fact, a human is exposed to a much higher radiation on a flight from New York to Frankfurt.

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Certified according to
DIN EN ISO 9001

Technical Data X-RAY 6000 PRO

Measuring Principle	Non-contact with state-of-the-art X-ray technology
Application	Programmable, factory setting 1/sec
Material	PE, PVC, HDPE, foamed plastic, EPDM, nylon, rubber, silicone and many others
Wall Thickness	<p>≥ 0.3 - 30 mm for PE, HDPE</p> <p>≥ 0.3 - 2 mm for PVC and EPR¹⁾</p> <p>≥ 3.5 - 30 mm for foamed PE²⁾</p> <p>(min. outer diameter 8 mm)</p> <p>¹⁾ Products with PVC/EPR wall thickness ≥ 2 mm and a diameter > 50 mm require a higher X-ray power</p> <p>²⁾ Foamed PE requires lower X-ray power and a higher measuring rate</p>
Calibration	The X-RAY 6000 PRO requires no calibration
Safety (Radiation)	Radiation measurements by independent experts have revealed that the radiation of the X-RAY 6000 PRO is below limiting values of all international regulations
Measuring Rate	1 to 3 Hz (optional 10/25* Hz)
Power Supply	100 - 240 V AC ± 10 %, 50/60 Hz, 1,200 VA
Permissible Temperature	+ 5 to + 45°C
Interfaces	<p>RS232, USB</p> <p>Optional: industrial fieldbus (e.g. Profinet IO, EtherNet/IP, Profibus-DP, CANopen, DeviceNet), LAN, OPC DA/UA</p>

* 25 Hz are optionally available at X-RAY 6035 PRO and X-RAY 6070 PRO

	X-RAY 6020 PRO	X-RAY 6035 PRO	X-RAY 6070 PRO	X-RAY 6120 PRO	X-RAY 6200 PRO	X-RAY 6300 PRO
Diameter	0.65 - 15 mm min. wall: 0.1 mm	5 - 30 mm	6 - 65 mm	10 - 110 mm	20 - 180 mm	30 - 270 mm
Accuracy	5 µm	5 µm	10 µm	10 µm	20 µm	30 µm
Sight Field	20 mm	35 mm	70 mm	120 mm	200 mm	300 mm
Opening	25 mm	100 mm	100 mm	180 mm	350 mm	400 mm

Technical data is subject to change

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