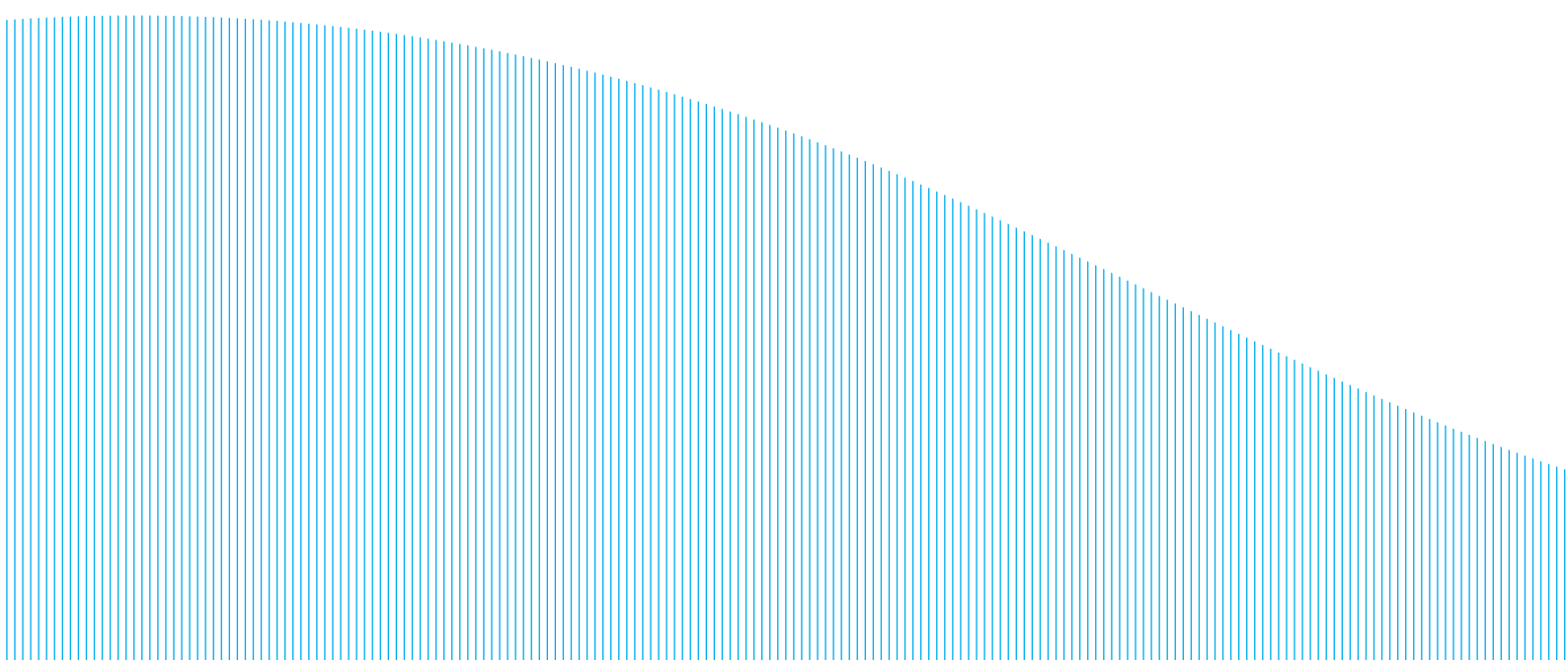
Measuring and control technology for

Hose and tube extrusion lines

SIKORA
Technology To Perfection



Content

Systems for length measurement are available upon request.

Introduction

SIKORA AG is a leading manufacturer and supplier of innovative online measuring, control, inspection, analysis and sorting technologies for the hose and tube, sheets, wire and cable as well as optical fiber and plastics industries. Worldwide, users of these measuring devices benefit from increasing quality, profitability and efficiency of the manufacturing process. Modern laser, X-ray and millimeter wave technologies measure precisely and reliably product parameters such as diameter, ovality, wall thickness and eccentricity.

A continuously controlled calculation of production data helps avoiding wall thickness oversizes. The hose and tube manufacturer consumes less material and achieves a more efficient material usage. Every micrometer of production material that can be saved by the use of measuring and control technology makes the production more economical and protects the increasingly scarce resources.

SIKORA is headquartered in Bremen, Germany. Since 1973, the high-quality devices have been developed and manufactured at this site. With regard to service and sales, SIKORA is globally active with operating subsidiaries in Brazil, China, France, India, Italy, Japan, Korea, Malaysia, Mexico, Poland, Turkey, the United Arab Emirates and the USA. In cooperation with more than 30 local representatives worldwide, SIKORA serves all customer demands for optimum quality control and productivity. In addition, international service locations assure fast and reliable customer support on site.

Since 1993, SIKORA has been permanently certified according to DIN EN ISO 9001. The certification confirms SIKORA's focus on continuous improvement. Customer satisfaction is SIKORA's primary objective.

Innovation leadership, the highest quality, internationality and service at its best are the four pillars of SIKORA's company philosophy. A strong research and development team continuously works on the development of new technologies that allow manufacturers of hoses and tubes to optimize their processes and to run their production lines more efficiently and more economically. All activities at SIKORA are focused on the customer's needs.

1 LASER Series 2000 – Efficient diameter control at all times

From
0.05 mm to
300 mm

LASER Series 2000 XY

LASER Series 2000 T

LASER Series 2000 XY models
for efficient 2-axis diameter measurement
LASER Series 2000 T models
for efficient 3-axis diameter measurement
LASER Series 2000 F/R models
for the efficient measurement of flat and round profiles

With the gauge heads of the LASER Series 2000, SIKORA offers high-quality laser technology for efficient diameter measurement, meeting the increasing demands of the hose and tube sector in regard to quality and productivity. High precision, reliability and continuous functionality are the outstanding features of the dual and triple-axis gauge heads for a product range of 0.05 to 300 mm. Due to their functional design, the systems can easily be integrated into any production line.

The technology behind these gauge heads is a state-of-the-art CCD line sensor technology combined with laser diodes as light sources and intelligent analysis software. The outstanding feature of the non-contact and non-destructive measuring technology is the extremely high single value precision, which is an important aspect for the calculation of the standard deviation. Short exposure times assure reliable readings at all common line speeds.

The measuring heads are free from wearing parts and have a nearly unlimited lifetime. Even after years of operation, the devices measure as precisely as on the first day. The optical measuring principle, without any moving parts, ensures an availability of 99.8 %. Calibration and maintenance are not required.

Typical features

- High precision and reliability
- No moving parts
- No calibration
- Availability: 99.8 %

Swivel gauge head function

Specific gauge heads for every application

LASER Series 2000 XY

With the LASER Series 2000 XY, SIKORA offers efficient gauge heads for a precise diameter measurement in two planes. Innovative regarding the laser and the CCD sensor – the diameter measurement based on diffraction analysis sets highlights. This technology does neither require rotating mirrors nor optical components, is absolutely maintenance-free, does not require any calibration and offers the highest precision during the operation.

LASER Series 2000 T

The LASER Series 2000 T models are 3-axis gauge heads for precise diameter and ovality measurement that leave nothing to be desired. The focus of the 3-axis gauge heads is on defining the ovality of a product. An oval is defined by five tangents, and therefore, by using three measuring axes (six tangents on the oval) not only the min/max value of the oval, but also the orientation of the oval is defined. The LASER Series 2000 T is predestined to precisely measure the diameter and ovality of transparent products.

LASER Series 2000 F/R (Flat/Round profiles)

The perfect concept for reliable online measurement of flat and round profiles is the LASER Series 2000 F/R. For flat profiles, it provides an exact measurement of the width and the height as well as the diameter for round products. The fascinating technology of the gauge head requires no rotation, and thus, no maintenance.

Intelligent design

Interesting is the design of the LASER Series 2000 devices. The smaller gauge heads are equipped with a unique and proven multi-slot protection. The gauge heads for larger measuring ranges as well as all triple-axis devices are open at the bottom, which prevents water and dirt from falling into the gauge head.

A special feature of the larger models and 3-axis measuring heads is the swiveling gauge head design, allowing the head to be moved up and out of the production area. The measuring heads are free from wearing parts, retain their high precision during the entire period of operation and do not require any calibration or routine maintenance.

Interfaces + Industry 4.0

The LASER Series 2000 gauges offer all kinds of interfaces such as RS485 and optionally Profibus-DP, Profinet IO, CANopen, EtherNet/IP, DeviceNet or OPC UA for a direct connection to a PC or the display and control devices REMOTE 6000 or ECOCONTROL 6000, 1000 or 600 and are therefore, designed for the use under the aspect of Industry 4.0.

Technical Data LASER Series 2000

Product Name	Product Diameter	Accuracy*	Repeatability	Exposure Time
LASER 2005 XY	0.05 - 5 mm	± 0.25 µm	± 0.1 µm	0.2 µs
LASER 2010 XY/T	0.2 - 10 mm	± 0.5 µm	± 0.1 µm	0.2 µs
LASER 2025 T	0.2 - 25 mm	± 1.0 µm	± 0.2 µm	0.2 µs
LASER 2030 XY	0.2 - 25 mm	± 1.0 µm	± 0.2 µm	0.2 µs
LASER 2050 XY/T	0.5 - 50 mm	± 2.5 µm	± 0.5 µm	0.2 µs
LASER 2100 XY/T	1.0 - 100 mm	± 5.0 µm	± 1.0 µm	0.2 µs
LASER 2200 XY	5.0 - 190 mm	± 10.0 µm	± 2.0 µm	0.2 µs
LASER 2300 XY	50 - 300 mm	± 20.0 µm	± 4.0 µm	0.2 µs
LASER 2030 F/R	0.2 - 25 mm (round) 0.5 - 20 mm (flat: width) 0.25 - 10 mm (flat: thickness)	± 1 µm (round) ± 5 µm (flat)		0.2 µs
LASER 2050 F/R	0.5 - 50 mm (round) 1.0 - 50 mm (flat: width) 0.5 - 25 mm (flat: thickness)	± 2.5 µm (round) ± 10 µm (flat)		0.2 µs

Measuring Rate**
500 measurements/sec/axis 1,000 measurements/sec/axis for LASER 2050 T, 1,200 measurements/sec/axis for LASER 2005 XY
Interfaces
Serial interface RS485, setup and diagnosos interface RS232 Optional: analog output or alternatively industrial fieldbus (e.g. Profinet IO, EtherNet/IP, Profibus-DP, CANopen, DeviceNet, OPC UA)
Power Supply
100 - 240 V AC ± 10 %, 50/60 Hz, 30 VA

* ± 0.01 % of the measured value ** Higher measuring rates on request

2 LASER Series 6000 – A milestone in diameter measurement

From
0.2 mm to
78 mm

LASER Series 6000

LASER Series 6000 for high-end diameter measurement in the area of Non Destructive Testing (NDT)

The innovative LASER Series 6000 opens up a new era of precision diameter measurement. The LASER Series 6000 devices expand SIKORA's current range of intelligent diameter gauges with three high-end models. They unify intelligent design with the highest precision and reliability. The LASER Series 6000 is versatile in its use and measures transparent as well as non-transparent products.

Up to 5,000 measurements per second and axis, all with extremely high single value precision, enable an optimum line control, provide reliable statistical data and allow the detection of lumps and neckdowns at the same time. The SIKORA gauge heads measure the diameter of hoses and tubes with impressive precision and repeatability. Three gauge head models cover product diameters from 0.2 to 78 mm.

Integrated display in the gauge head

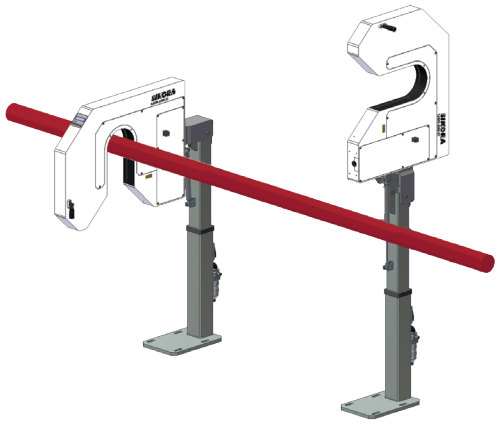
The devices include an integrated LCD display that provides the operator with diameter values at one glance, directly at the measuring device.

Lump detector function

The high measuring rate of the diameter measuring devices also permits the detection of lumps and neckdowns. With the two-in-one system, investment costs are reduced. In addition, there is more space in the line as only one gauge head has to be installed.

Typical features

- Innovative CCD line sensor technology combined with pulse controlled laser diodes
- Measures transparent and non-transparent products with impressive precision
- Up to 5,000 measurements per second per axis
- Integrated lump detection function
- Integrated LCD display
- Universal interface module for all connections
- Optimum installation and protection of connection cables
- Two-year warranty



Swivel gauge head function

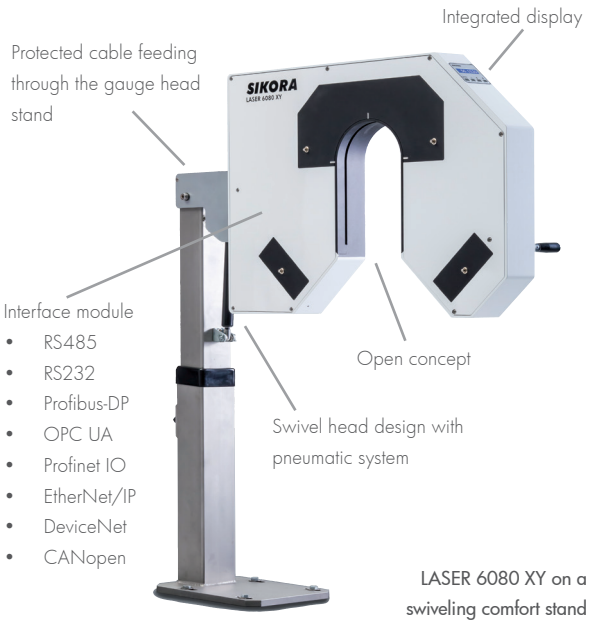
Functional design in perfection

A special feature of the LASER Series 6000 is the swivel type gauge head. It allows for the gauge head to be easily moved up and out of the extrusion line. The measuring heads are open at the bottom to prevent dirt and water from falling into the measuring plane. The feeding of the connection cables to the interface module is protected against water, dirt and mechanical influences, directly in the gauge head stand.

The opening range of the gauge is twice as large as the measuring range, for an easy and safe passage of the product and possible joints.

Interfaces + Industry 4.0

A universal interface module is directly integrated into the gauge head for any connections such as RS485, RS232, Profibus-DP or alternatively an industrial fieldbus such as Profinet IO, EtherNet/IP, CANopen, DeviceNet or OPC UA. With these interfaces, the device series is best equipped under the aspect of Industry 4.0.



LASER 6080 XY on a swiveling comfort stand

Technical Data LASER Series 6000

Product Name	Product Diameter	Accuracy*	Repeatability	Exposure Time
LASER 6020 XY	0.2 - 18 mm	± 0.2 µm	± 0.1 µm	0.2 µs
LASER 6040 XY	0.5 - 38 mm	± 0.5 µm	± 0.2 µm	0.2 µs
LASER 6080 XY	1.0 - 78 mm	± 1.0 µm	± 0.5 µm	0.2 µs

Measuring Rate

2,500 measurements/sec/axis
5,000 measurements/sec/axis for LASER 6020 XY (optional)

Interfaces

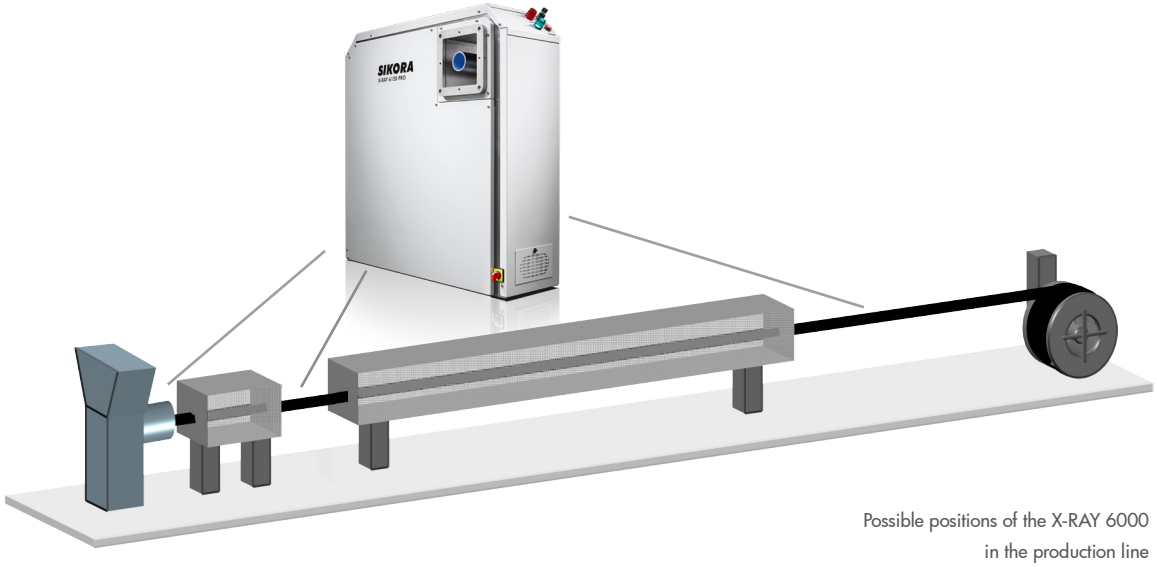
RS485, RS232, LAN
Optional: Analog output or alternatively industrial fieldbus (e.g. Profinet IO, EtherNet/IP, Profibus-DP, CANopen, DeviceNet, OPC UA)

Power Supply

100 - 240 V AC ± 10 %, 50/60 Hz, 30 VA

* ± 0.01 % of the measured value

3 X-RAY 6000 PRO – Intelligent partner in the extrusion of hoses and tubes



Possible positions of the X-RAY 6000 in the production line

X-ray measuring system for wall thickness, eccentricity, ovality and diameter measurement of single and multi-layer products

When manufacturing hoses and tubes, quality control of wall thickness, eccentricity, ovality and inner and outer diameter is essential. The applications where hoses and tubes are used today are quite diverse and so are the demands with regard to quality control. The X-RAY 6000 PRO is a measuring device that has proven its high precision in the aircraft industry, the automotive industry, gas and water business as well as in medical and industrial applications.

X-ray technology for measurement in the areas described before is independent from the material of the product to be measured and from temperature. It does not need any coupling media nor calibration. For that reason, the X-RAY 6000 PRO is an essential device for stable and reproducible processes.

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

The X-RAY 6000 PRO measures the wall thickness, eccentricity, inner and outer diameter and ovality of hoses, composite pipes, pressure hoses with textile reinforcement, small or large diameter hoses made of PE, HDPE, PVC as well as foamed products, products made of EPDM, nylon, rubber or silicone with up to three layers. Moreover, it is suitable for quality control of medical and cosmetic tubes.

The vertical 22" TFT monitor of the ECOCONTROL 6000 clearly displays production data of the X-RAY 6000 PRO

Centering and control

The use of the X-RAY 6000 PRO at the hot end, directly after the extruder or after the first vacuum tank/cooling section allows a fast centering and automatic control of the line speed or the extruder rpm. The material shrinkage is taken into consideration by an additional diameter gauge head after the vacuum tank/cooling section combined with a Hot-Cold-Control. Monitoring of the final product is achieved by the X-RAY 6000 PRO at the cold end and reduces the cost of offline sample testing.

Display and control device ECOCONTROL 6000

The X-RAY 6000 PRO includes as a standard the display and control device ECOCONTROL 6000 with a vertically arranged 22" TFT monitor. It is either mounted on a separate stand or 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

Increase of efficiency

The measuring values of the wall thickness, eccentricity, inner and outer diameter and ovality are displayed at the processor system ECOCONTROL 6000 immediately with the online measurement. The eccentricity measuring values are displayed at eight points and allow the operator an optimal centering of the extrusion tools.

From the very first day of operation, the X-RAY 6000 PRO assures continuous online quality control during the production of hoses and tubes. Simultaneously, the system reduces the wall thickness to the smallest permissible value by taking into account the statistical fluctuation. Quality assurance and the reduction of material lead to a significant increase of productivity.

X-RAY 6120 PRO
with 22" TFT monitor

Automatic crosshead centering

Specifically for the manufacturing of rubber hoses at the extrusion process, the X-RAY 6000 PRO provides measuring values for automatic wall thickness centering. By using these techniques, manual centering during production is not necessary. In addition, the online concept continuously ensures an optimum hose centering, and thus, a uniform wall thickness distribution over the entire hose circumference.

Specific measuring systems for individual applications

X-RAY 6020 PRO for small diameters

The X-RAY 6020 PRO is focused on product diameters from 0.65 to 15 mm and ultra-thin wall thicknesses down to 100 µm. The device is designed for the area of medical tubes where quality is a vital requirement. The heart of this technology are the specially developed X-ray tubes with directed X-radiation, which allow a measurement of ultra-thin wall thicknesses.

Safety

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

Typical features

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

Technical Data X-RAY 6000 PRO

Measuring Principle

Non-contact with latest X-ray technology

Product Name	Diameter	Accuracy
X-RAY 6020 PRO	0.65 - 15 mm	5 µm
X-RAY 6035 PRO	5.0 - 30 mm	5 µm
X-RAY 6070 PRO	6.0 - 65 mm	10 µm
X-RAY 6120 PRO	10 - 110 mm	10 µm
X-RAY 6200 PRO	20 - 180 mm	20 µm
X-RAY 6300 PRO	30 - 270 mm	30 µm

Measuring Rate

1 to 3 Hz (optional 10 Hz/25* Hz)

Interfaces

RS232, USB

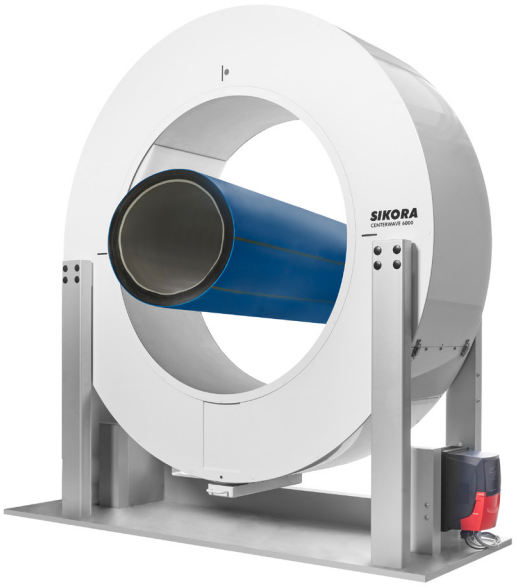
Optional: LAN, industrial fieldbus (e.g. Profinet IO, EtherNet/IP, Profibus-DP, CANopen, DeviceNet), OPC DA/UA

Power Supply

100 - 240 V AC ± 10 %, 50/60 Hz

* For X-RAY 6035 PRO and X-RAY 6070 PRO

4 CENTERWAVE 6000 – Wall thickness, inner profile, diameter and ovality: Measurement of plastic pipes by innovative millimeter wave technology



CENTERWAVE 6000

Typical features

- 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 start-up scrap
- Time and cost savings
- Increase of productivity
- A short-term Return On Investment (ROI)

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 32 to 1,600 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.

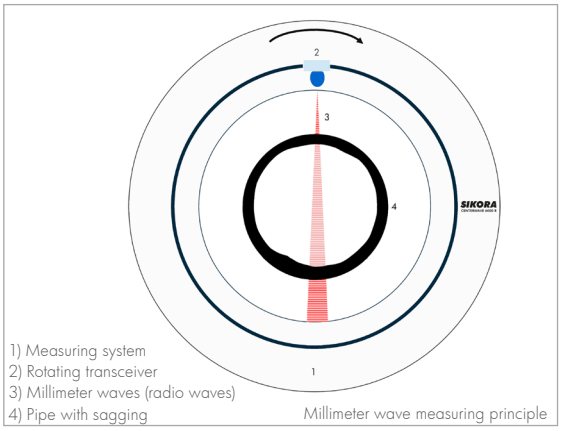
Millimeter wave technology: precise, efficient, perfect

SIKORA's innovative CENTERWAVE 6000 precisely measures the wall thickness, inner profile, inner and outer diameter and ovality of plastic pipes. Furthermore, it calculates the weight per meter from the measured cross-sectional area of the wall. 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 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.

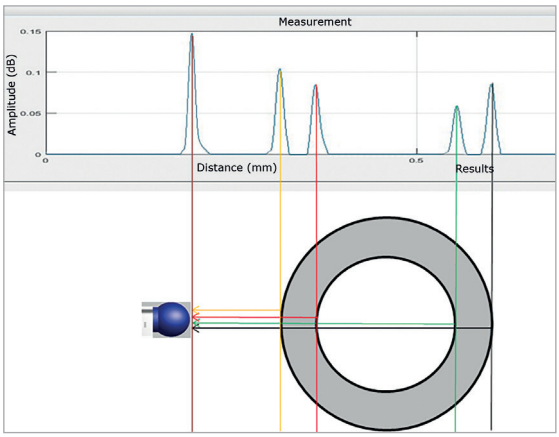
Function

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

*Frequency Modulated Continuous Wave



Measuring system with rotating sensor



Video image: Evaluation of the received signals and determination of the pipe dimensions

Comprehensive control

A rotating gauge offers the complete recording of the wall thickness over 360 degrees of the entire circumference of the pipe. This also allows for precise measurement and visualization of the inner profile of the pipe.

Evaluation and display

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 and data logging opportunities.

Automatic control: Optimization of the centering and minimization of the wall thickness

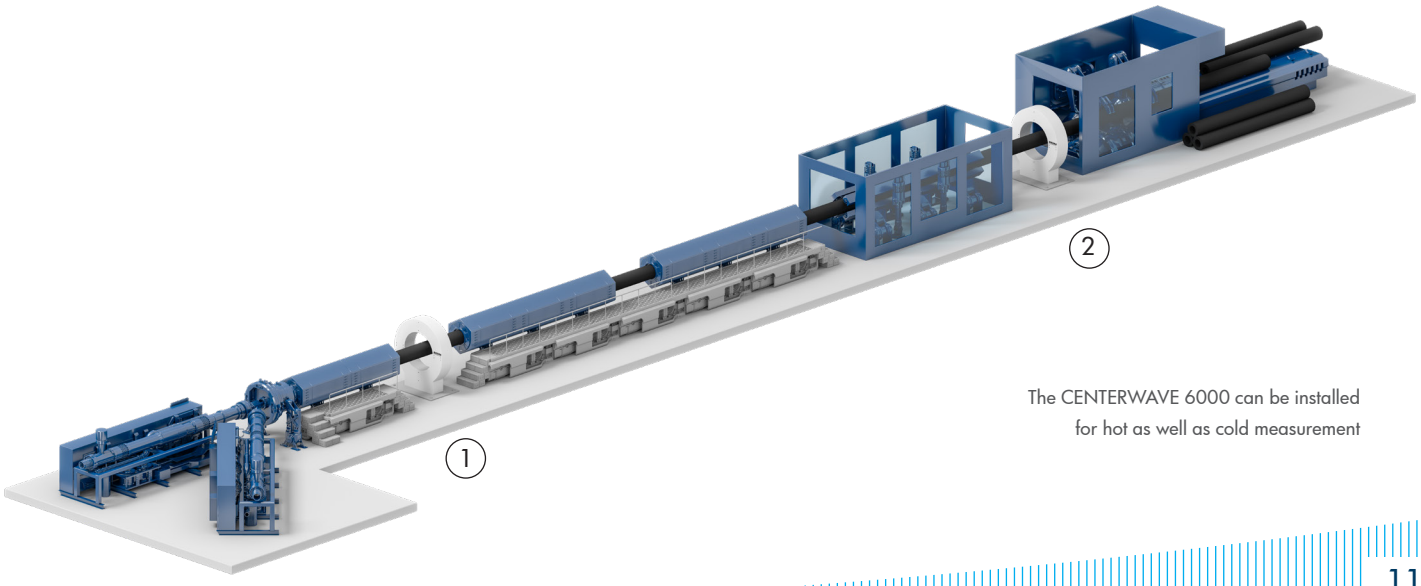
In combination with the ECOCONTROL 6000, the CENTERWAVE 6000 provides information for manual respectively thermal centering of the extrusion tools. Furthermore, the system's specific algorithms permit the control to the minimum wall thickness.

The measuring values of the CENTERWAVE 6000 are clearly displayed at the ECOCONTROL 6000

Installation

The CENTERWAVE 6000 is applicable at any position in the extrusion line:

1. After a first cooling/vaccum tank
   Hot measurement
2. At the end of the line
   Cold measurement



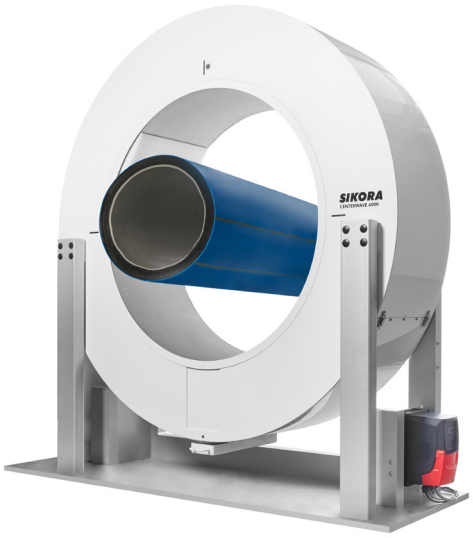
The CENTERWAVE 6000 can be installed for hot as well as cold measurement

Applications

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 at the cold end of the line for a final quality control. The CENTERWAVE 6000 is suitable for the measurement of single and multi-layered plastic pipes with a diameter from 32 to 1,600 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, even for thick-walled pipes.

Sagging

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. The ECOCONTROL 6000 provides the machine operator with constant information on the production process that allows quick action to be taken.



The CENTERWAVE 6000 is suitable for the measurement of plastic pipes with a diameter up to 1,600 mm

Technical Data CENTERWAVE 6000

Measuring Principle
Non-contact on the basis of FMCW milllimeter wave technology (Frequency Modulated Continuous Wave)

Application
Extrusion lines for large pipes

Areas of Application
- Smooth pipes
- Foamcore pipes
- Corrugated pipes
- Multi-layer pipes

Material
Any kinds of polyolefins (e.g. PE, PP), PVC, fluoropolymers (e.g. PVDF, PTFE), ceramic, glass

Measuring Range
CENTERWAVE 6000/250: 32 to 250 mm
CENTERWAVE 6000/400: 90 (optional 60) to 400 mm
CENTERWAVE 6000/630: 90 to 630 mm
CENTERWAVE 6000/800: 160 to 800 mm
CENTERWAVE 6000/1200: 250 to 1,200 mm
CENTERWAVE 6000/1600: 250 to 1,600 mm*

* Larger measuring ranges on request
** Smaller wall thicknesses on request

Wall Thickness
≥ 1.6 mm**

Repeatability
Better than 5 µm

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 - 460 V transformer on request)

Ambient Temperature
+ 5 to + 45 °C

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

5 LUMP 2000 – 100 % lump-free

LUMP 2000 T

LUMP 2000 XY

2-axis and 3-axis lump detectors

For continuous quality control in hose and tube extrusion lines or rewinding machine lines, lump detectors are just as essential as diameter measuring devices* and spark testers. The 2-axis and 3-axis lump detectors LUMP 2000 XY and LUMP 2000 T detect the smallest lumps and neckdowns on the product surface precisely and with high reliability at all line speeds.

A powerful signal processor evaluates the number, height, depth and length of the fault location. The combination of the double sensor technology (differential measuring principle) with infrared light sources assures reliable fault detection even under difficult conditions such as dirt or extreme vibration.

The setting of tolerances and the numeric display of lumps and neckdowns is realized with the REMOTE 6000 or a processor system of the ECOCONTROL series. Alternatively, the LUMP 2000 devices can be directly integrated into the line control via a universal interface module.

* Systems for diameter measurement and high-speed surface inspection are available upon request.

** "Ghost faults" are caused by light fluctuations from the outside, and thus, are no real faults.

Typical features

- 2-axis and 3-axis lump/neckdown detection
- Highest reliability due to double sensor technology
- Fault analysis regarding type, dimension, length, number and position
- Elimination of "ghost faults"**

One interesting application for the use of lump detectors is in braiding lines, where lump detectors are capable of identifying loose wires or textile garns sticking out of the plastic. In the same application, the SPARK 2000 BS is a reasonable investment. The device detects faults in composite pipes where the metal coating is not fully covered by the plastic.

SPARK 2000 BS

Technical Data LUMP 2000

Product Name	Product Diameter**	Min. Fault Length
LUMP 2010 XY/T*	0.5 - 10 mm/0.25 - 10 mm	0.5 mm
LUMP 2025 XY	0.5 - 25 mm	0.5 mm
LUMP 2035 T	0.5 - 35 mm	0.5 mm

Line Speed
Up to 3,000 m/min

Power Supply
100 - 240 V AC ± 10 %, 50/60 Hz

Interfaces
Serial interface RS485, setup and diagnosis interface RS232, fault contact; Optional: analog input for tolerance (lump/neckdown) or alternatively industrial fieldbus (e.g. Profinet IO, EtherNet/IP, Profibus-DP, CANopen, DeviceNet)

* Specifications of LUMP 2010 T for transparent materials are identical
** For lump detection of diameters from 0.1 to 0.5 mm, please refer to our catalog for optical fiber measurement.

6 ULTRATEMP 6000 – Ultra strong temperature measurement of the melt

ULTRATEMP 6000

Ultrasonic temperature measurement system for polyethylene melts

The SIKORA ULTRATEMP 6000 is a temperature measuring device based on ultrasonic technology, which is tailor-made for the reliable measurement of the polyethylene melt directly in the flow channel between the extruder and crosshead.

The melt temperature of the polyethylene, which is used during the extrusion of hoses and tubes, is extremely sensitive. A few degrees decide between a homogeneous, and thus, optimum melt and the risk of unmelted or burnt material.

The ULTRATEMP 6000 is a temperature measuring system which continuously measures the temperature of polyethylene melt precisely, directly before the crosshead, during the extrusion. It operates on a non-contact basis in a non-invasive way. The high measuring rate allows a fast response time and detects the smallest temperature variations.

The system does not influence the flow properties of the melt as the ultrasonic sensors are positioned outside the flow channel. Therefore, melt shear heating effects do not occur.

The ULTRATEMP 6000 significantly contributes to process optimization and cost reductions in hose and tube extrusion lines.

Typcial features

- Maximization of the extruder output through optimum melt temperature
- Avoidance of unmelted or burnt material
- Non-contact, no melt shear heating effects

Technical Data ULTRATEMP 6000

Measuring Principle
Non-contact, non-invasive temperature measurement based on ultrasonic technology

Measuring Range
+ 100 to + 180 °C

Accuracy
< ± 1 °C deviation

Interfaces
Serial interface RS485
Setup and diagnosis interface RS232
Optional: Profibus-DP, analog output

Power Supply
100 - 240 V AC ± 10 %, 50/60 Hz

7 Partner of the measuring systems – Powerful processor systems

ECOCONTROL 6000
with 22“ monitor

ECOCONTROL 1000
with 15“ monitor

ECOCONTROL 600
with 10“ monitor

Premium processor systems with 22“, 15“ or 10“ TFT color monitor and touch screen operation

Three ECOCONTROL processor systems form the SIKORA premium segment of display and control devices. Intelligent software technology, clear arrangements, intuitive structure and easy usability are the convincing characteristics.

Choose the extremely innovative and powerful ECOCONTROL 6000, the unique ECOCONTROL 1000 or the smart ECOCONTROL 600. Each of these display and control systems exceeds all expectations in their class.

The innovative display of the line, including pictograms of the connected devices, provides a unique overview, while the numeric and graphic display of the measuring values, trend diagrams and statistics fulfill every wish regarding process visualization.

The 22”, 15” and 10” TFT monitors and the intuitive touch screen control of the ECOCONTROL 6000, 1000 and 600 processor systems represent an intelligent and cutting edge technology.

Software packages (optional)

Automatic diameter/Wall thickness control

In combination with the control module SET POINT, the ECOCONTROL systems deliver quality assurance and cost reduction. They ensure a continuous, automatic control of the diameter or wall thickness to the nominal value by controlling either the line speed or the extruder rpm.

Hot/Cold Module HC 2000 (ECOCONTROL 6000/1000)

With the Hot/Cold Module HC 2000, the material shrinkage is continuously calculated and considered automatically for the control of the diameter and/or wall thickness.

FFT analysis/Preventive maintenance

Optionally, the ECOCONTROL 6000 visualizes periodical variations of the product parameters from an FFT analysis of the measuring values. This software package was developed with the support of competent partners of the industry. The FFT analysis leads to transparency of the processes, shows risks, that are caused e.g. by variations of the diameter, and indicates potential causes.

Data storage

The data storage on a SSD medium is a standard for the ECOCONTROL 6000 and 1000. For the ECOCONTROL 600, an external media storage (USB, optional LAN) is available. Time, length or reel related production reports are available for each of the three ECOCONTROL devices (6000, 1000 and 600).

VIRTUAL 2000 – Intelligent software concept

The virtual gauge technology is suitable for all applications, which require a fast wall thickness control, but due to line configuration or the product structure, a diameter or wall thickness measurement directly after the extruder is not possible. Only after the cooling section, that is to say in greater distance from the cross head, the real measurement is done by this technology.

The basis of the design is the simple, but sophisticated idea that an extrusion model knows the volume output of the extruder in its different operating conditions to predict with the highest accuracy the value of the produced cold wall thickness of a product. The volume output is recorded once in a user friendly way by the ECOCONTROL 6000 in combination with the measuring device.

Technical Data ECOCONTROL

	6000	1000	600
Display			
TFT color monitor	22" (vertical) (alternatively 15", horizontal)	15"	10"
Inputs/Outputs			
Serial interface RS485 for the connection to measuring devices	8*	4*	1
Electrically isolated digital inputs for the connection to testing devices	8*	4*	4*
Analog inputs 16 Bit, ± 10 V (bipolar)	8*	4*	-
Analog outputs 16 Bit, ± 10 V (bipolar)	8*	4*	-
Contact outputs for tolerance and status messages (max. 30 V, max. 0.5 A)	8*	4*	4*
Communication interface via RS232 or LAN	1*	1*	1*
Interface for printer	1*	1*	1*
Electrically isolated input for rotary pulse generators (0/15 V)	1	1	1
Electrically isolated interface module for control of the diameter (HC 2000)	1*	1*	-
USB customer interface	1	1	1
Industrial fieldbus (e.g. Profinet IO, EtherNet/IP, Profibus-DP, CANopen, DeviceNet)	Yes*	Yes*	No
LAN interface (selectable OPC DA2/UA/SuiteLink)	1*	1*	1*
Wi-Fi	1*	-	-
Data Storage			
	SSD	SSD	External media*
Power Supply			
	100 - 240 V AC ± 10 %, 50/60 Hz		

* Depending on the equipment

8 REMOTE 6000/DISPLAY 2000 – Visualization and control of the production data

REMOTE 6000

DISPLAY 2000

Standard display and control device REMOTE 6000

The REMOTE 6000 is the standard display and control device, universally applicable for all SIKORA diameter measuring devices (LASER Series 2000/6000) as well as for LUMP 2000 event devices. The measuring values and events are displayed on a six-digit, 25 mm high, clear LED display. It is suitable for panel mounting or for assembly on the gauge head. The REMOTE 6000 includes a product library for up to 50 hose and tube recipes. Nominal values and tolerances can easily be recalled.

Automatic control – cost savings

In combination with the control module SET POINT, an automatic control of the line speed or extruder rpm assures optimum process control and cost savings.

Interfaces

A serial interface for the connection to an external computer is standard for the collection of data or the PLC line control. An Ethernet interface for PLC connection is optionally available.

LASER Series 2000/6000 with the REMOTE 6000

The REMOTE 6000, combined with a diameter gauge head of the LASER Series 2000/6000, shows the average diameter value clearly on the LED display. Via a control key, the average diameter of the measuring axis x, y or the ovality is selectable on the display.

LUMP 2000 with the REMOTE 6000

In combination with a LUMP 2000, the REMOTE 6000 shows the number as well as the type and the length of the fault. Different symbols inform the operator if the fault is a lump or neckdown. Lump and neckdown information such as the height, depth and length of the fault are stored, giving the operator the possibility to view previous faults.

Typical features REMOTE 6000

- Large, clearly arranged display and keypad
- Automatic control module SET POINT (optional)
- Easy installation at any distance to the measuring head
- Serial interface for the connection to a measuring head or a PC (optional)

Basic display device DISPLAY 2000

Interesting is the DISPLAY 2000, a display device for the combination with the SIKORA diameter measuring devices of the LASER Series 2000/6000, that shows the diameter and ovality of the measured product. It is suitable for the installation into a control cabinet as well as for direct mounting at the gauge head.

Especially for applications that require a connection of the measuring system to the line control via a Profibus interface or whenever a clearly visible second display is requested, the DISPLAY 2000 is a reasonable and inexpensive supplement.

Typical features DISPLAY 2000

- Digital display
- Selectable monitoring parameter (diameter, ovality)
- Installation at any distance to the gauge head
- Serial interface for the connection to a gauge head

Technical Data REMOTE 6000

Measuring Value Display
Digital, 6-digit e.g. 000.000 ... 500.000 mm
Position of decimal point is adjustable

Display Update
Programmable, factory setting 1/sec

Nominal Value/Tolerance Selection
Via keypad (operation guided via a 4-digid LED display)

Product Storage
Up to 50 product types, comfortable programming via the diagnosis software

Tolerance Message/Control Action
a) In clear text on LED display
b) 4 potential-free contact outputs (optional)

Interfaces
RS485 (gauge head), USB (for service)
Optional: LAN/Ethernet-UDP

Power Supply
100 - 240 V AC ± 10 %, 50/60 Hz

Technical Data DISPLAY 2000

5-Digit Display
Digit height of 25 mm
The bright, big figures are easy to read even from a distance of 12 m

Interfaces
(Bi-directional serial interface) RS485

Power Supply
100 - 240 V AC ± 10 %, 50/60 Hz

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