Measuring and control technology for insulating and jacketing lines
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   Basic display device
SIKORA AG is a leading manufacturer and supplier of innovative online measuring, control, inspection and sorting technology for the wire and cable, hose and tube, optical fiber and plastic industries. Worldwide, users of these measuring devices benefit from an increasing manufacturing quality, profitability and efficiency. Modern Laser and X-ray technologies measure precisely and reliably product parameters such as diameter, ovality, wall thickness and eccentricity.

A continuous control of production data helps to avoid wall thickness oversizes and allows a more efficient material usage. The cable manufacturer consumes less insulation material while achieving a more efficient material consumption. Every micrometer of insulation material that can be saved by the use of measuring and control technology makes the production more economic and protects the scarce resources.

SIKORA is headquartered in Bremen, Germany. Since 1973 the high-quality devices have been developed and manufactured at this site. Regarding service and sales, SIKORA is globally active with offices in Brazil, China, France, India, Italy, Japan, Korea, Russia, Turkey, the Ukraine, USA and the United Arab Emirates. 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 meeting the requirements of DIN EN ISO 9001. The certification confirms SIKORA’s focus on continuous improvement. Customer satisfaction is SIKORA’s primary objective.

Innovation, technological know-how, quality and service are the four pillars of SIKORA’s company philosophy. A strong team in research and development is working continuously on the development of new technologies that help manufacturers to optimize the processes and to run their cable production lines more efficiently and economical.

**Measuring technology for insulating and jacketing lines**

The production of cables requires compliance with high quality levels and numerous standards. Moreover, cable manufacturers aim to produce economically. Accordingly, manufacturers choose measuring devices that are focused on quality control in their lines. SIKORA has developed efficient and innovative technologies specifically for insulating and jacketing lines that assure quality during the entire production process.
Measurement of the wall thickness, eccentricity, diameter and ovality of single and multi layer products
For quality control of cables in jacketing lines, the X-RAY 6000 continuously ensures compliance with requested cable specifications regarding wall thickness, eccentricity, diameter and ovality.

Jacketing lines
In jacketing lines, the X-RAY 6000 is typically installed 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.

X-ray measuring technology for single- and multi-layer products
The X-ray measuring systems, X-RAY 6000, are fascinating in general and in detail. Customers who measure up to three cable layers during production choose the X-RAY 6000 PRO. For cable production lines where only one cable layer is measured, the X-RAY 6000 is available.

X-RAY 6000 PRO for multi-layer products
The X-RAY 6000 PRO measures the wall thickness, eccentricity, diameter and ovality of up to 3 different cable layers. Typically, it is used at tandem extrusion lines. The system includes as a standard, the display and control device ECOCONTROL 6000 with a vertically arranged 22" TFT monitor. It is either mounted directly at the X-RAY 6000 gauge head, on a separate stand, or is remotely integrated in the control cabinet of the line control.

The ECOCONTROL 6000 is conveniently operated via a touch-screen and shows all measuring values numerically and graphically as well as trend and statistical data. A line presentation with pictograms of the connected devices provides a clear overview. The PROfessional device becomes most efficient with the optional, automatic control of the line speed or extruder rpm under consideration of the minimum values.

Reel and length related data storage is included as a standard.

Which X-RAY 6000 fits your production line?
For quality control at tandem extrusion lines, in which cables get a filler and an outer jacket, the X-RAY 6000 PRO is the first choice. Cables with a single insulation or jacketing layer can be measured by the X-RAY 6000.

Typical features X-RAY 6000 PRO
- Measurement of the wall thickness, eccentricity, the diameter and ovality of up to 3 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, 100 Hz)
- 22” wide-screen monitor
- Intuitive touch-screen operation
- No calibration
**X-RAY 6000 for single layer products**

The X-RAY 6000 measures the wall thickness, the eccentricity and the outer diameter of single layer cables. The X-RAY 6000 is interesting when it comes to jacketing lines where only the outer jacket is measured. The production data is clearly displayed on a 7” monitor, which is integrated directly in the measuring system. The operation is intuitive via touch-screen. In combination with the processor system ECOCONTROL 600, 1000 or 6000 an automatic control of the line is possible. By controlling line speed or extruder rpm, the cable parameters are controlled to the nominal value.

The X-RAY 6000 is an economic and powerful alternative to the X-RAY 6000 PRO. It provides exactly the functions that are of importance for quality control.

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**Technical Data X-RAY 6000/6000 PRO**

**Measuring principle**

Non-contact with modern X-ray technology

<table>
<thead>
<tr>
<th>Product name</th>
<th>Product diameter*</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-RAY 6020 PRO</td>
<td>0.7 - 15 mm</td>
<td>5 μm</td>
</tr>
<tr>
<td>X-RAY 6035**</td>
<td>5.0 - 30 mm</td>
<td>5 μm/50 μm</td>
</tr>
<tr>
<td>X-RAY 6070**</td>
<td>6.0 - 65 mm</td>
<td>10 μm/60 μm</td>
</tr>
<tr>
<td>X-RAY 6120**</td>
<td>10 - 110 mm</td>
<td>10 μm/60 μm</td>
</tr>
<tr>
<td>X-RAY 6200 PRO</td>
<td>20 - 180 mm</td>
<td>20 μm</td>
</tr>
<tr>
<td>X-RAY 6300 PRO</td>
<td>30 - 270 mm</td>
<td>30 μm</td>
</tr>
</tbody>
</table>

* Bigger and smaller measuring ranges on demand

**X-RAY 6000 PRO/X-RAY 6000**

**Measuring rate**

X-RAY 6000 PRO: 1 to 3 Hz (optional 10, 25, 100 Hz)

X-RAY 6000: 1 to 3 Hz (optional 10 Hz)

**Interfaces**

**X-RAY 6000 PRO:**

RS 232, USB

Optional: industrial field busses such as CANopen, Ethernet/IP, DeviceNet, Profinet IO, Proflbus-DP, LAN (Ethernet/OPC)

**X-RAY 6000:**

RS 485, RS 232

Optional: industrial field busses such as CANopen, Ethernet/IP, DeviceNet, Profinet IO, Proflbus-DP, LAN (Ethernet)

**Power supply**

100V – 240V AC, +/- 10% 50 Hz (60Hz)

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**Typical features X-RAY 6000**

- Measurement of the wall thickness, eccentricity, diameter and ovality of single layer products
- Automatic control of the line speed and extruder rpm under consideration of the minimum value (optional)
- Selectable measuring rate from 1 to 3 Hz
- Integrated monitor for measuring value display
- Intuitive touch-screen operation
- No calibration
LASER Series 2000 – Diameter control at all times

LASER Series 2000 XY-models
for classic 2-axis diameter measurement
LASER Series 2000 T-models
for classic 3-axis diameter measurement
LASER Series 2000 S/R-models
for the measurement of sector and round cables

The LASER Series 2000 includes measuring devices for classic measurement of the cable diameter in 2 or 3 planes. Integrated at the end of CCV-, VCV- MDCV- and in insulating/jacketing lines, the gauge heads are characterized by precision, reliability and functionality.

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

The LASER Series 2000 is free from moving parts and has a nearly unlimited life time. Even after years of operation the devices measure as accurately as on the day of delivery. The optical measuring principle without any moving parts ensures an availability of 99.8%. Calibration or maintenance procedures are not necessary.
Specific measuring systems for your application

**LASER Series 2000 XY**
With the LASER Series 2000 XY SIKORA offers classic gauge heads for a precise diameter measurement in 2 planes. The diameter is calculated by diffraction analysis directly from the shadow image.

**LASER Series 2000 T**
With the LASER Series 2000 T SIKORA offers gauge heads for a precise 3-axis diameter measurement. Interesting are the 3-axis gauge heads for defining the ovality of a product. It is known, that an oval is defined by 5 tangents. Accordingly, by using 3 measuring axis (6 tangents on the oval) not only the min/max value of the oval but also the orientation of the oval can be defined.

**LASER Series 2000 S/R**
The LASER Series 2000 S/R (Sector cable/Round cable) is most suitable for the precise measurement of the height of straight and prespiralled sector conductors, as well as for round cables. The fascinating tive axis concept of the S/R heads requires no rotation of the gauge head and thus no maintenance.

Typically, one of the S/R gauge heads is installed before and after the extruder, whereby the average wall thickness is calculated, based on the two diameter values. For a perfection in wall thickness control, the two gauge heads are combined with the processor system ECOCONTROL 6000.

**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 bigger measuring ranges as well as all triple-axis and S/R devices are open at the bottom, which prevents water and dirt from falling into the gauge head.

A special feature of the larger models is the swivelling gauge head design, which allows the head to be moved up and out of the extrusion line. The measuring heads are free from wearing parts, remain with high precision throughout their lifespan and do not require any calibration or maintenance.

### Technical data LASER Series 2000

<table>
<thead>
<tr>
<th>Gauge head</th>
<th>Product diameter</th>
<th>Accuracy</th>
<th>Repeatability</th>
<th>Exposure time</th>
</tr>
</thead>
<tbody>
<tr>
<td>LASER 2050 XY/T</td>
<td>0.5 - 50 mm</td>
<td>± 2.5 μm</td>
<td>± 0.5 μm</td>
<td>0.2 μs</td>
</tr>
<tr>
<td>LASER 2100 XY/T</td>
<td>1.0 - 100 mm</td>
<td>± 5.0 μm</td>
<td>± 1.0 μm</td>
<td>0.2 μs</td>
</tr>
<tr>
<td>LASER 2200 XY</td>
<td>5.0 - 190 mm</td>
<td>± 10 μm</td>
<td>± 1.0 μm</td>
<td>0.2 μs</td>
</tr>
<tr>
<td>LASER 2300 XY</td>
<td>35 - 300 mm</td>
<td>± 20 μm</td>
<td>± 1.0 μm</td>
<td>0.2 μs</td>
</tr>
<tr>
<td>LASER 2500 XY</td>
<td>50 - 500 mm</td>
<td>± 50 μm</td>
<td>± 2.0 μm</td>
<td>0.2 μs</td>
</tr>
<tr>
<td>LASER 2050 S/R</td>
<td>1.0 - 35 mm (sector)</td>
<td>± 5.0 μm</td>
<td>± 1.0 μm</td>
<td>0.2 μs</td>
</tr>
<tr>
<td>LASER 2100 S/R</td>
<td>0.5 - 50 mm (round)</td>
<td>± 5.0 μm</td>
<td>± 1.0 μm</td>
<td>1.0 μs</td>
</tr>
<tr>
<td>LASER 2100 S/R</td>
<td>1.0 - 35 mm (sector)</td>
<td>± 5.0 μm</td>
<td>± 1.0 μm</td>
<td>1.0 μs</td>
</tr>
<tr>
<td>LASER 2100 S/R</td>
<td>1.0 - 100 mm (round)</td>
<td>± 5.0 μm</td>
<td>± 1.0 μm</td>
<td>1.0 μs</td>
</tr>
</tbody>
</table>

**Measuring rate**
500 /s /axis (higher measuring rates on demand)

**Interfaces**
Serial interface RS 485, setup and diagnosis interface RS 232, optional analog interfaces, Profibus-DP or alternatively industrial field busses such as CANopen, Ethernet/IP, DeviceNet, Profinet IO

**Power supply**
100 ... 240 V AC ± 10%; 50/60 Hz
LASER 6080 XY for high-end diameter measurement and detection of lumps and neckdowns

The LASER 6080 XY combines a variety of new technological features for a diameter measurement with an impressive precision and reliability to improve productivity of the production line sustainably.

2,500 measurements per second, all with extremely high single value precision allow for an optimum line control and provide reliable statistical data.

**Integrated display in the gauge head**

The device includes an integrated LCD display. This provides the operator with diameter values at one glance, directly at the measuring device.

**Lump detector function**

The high measuring rate of the diameter device 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**

- Impressive precision
- 2,500 measurements per second
- Integrated LCD display
- Integrated lump detection function
- Universal interface module for all connections
- Optimum feeding and protection of the connection cables
- Wi-Fi interface (optional)
- SIKORA App
- 2 years warranty
Interfaces
Directly integrated in the gauge head is a universal interface module for all connections such as RS 485, RS 232, Profibus-DP or alternative industrial field busses such as CANopen, Ethernet/IP, DeviceNet, Profinet IO. The interface module as well as all connectors are completely integrated in the gauge head and are perfectly protected against dirt, water or mechanical influences during the production.

Gauge head design
The opening of the gauge is twice as big as the measuring range to ensure an easy product feed through.

A special feature is the swivel type gauge head. It allows the gauge head to be moved up and out of the extrusion line. The measuring head is open at the bottom to prevent dirt and water from falling into the measuring area. The feeding of the connection cables to the interface module is protected, directly in the gauge head stand.

Wi-Fi interface
The LASER Series 6000 has common interfaces as well as an optional Wi-Fi interface, which allows for a direct connection to a smartphone or laptop. The Wi-Fi interface is used for diagnosis and quality control. Measuring values, trend and statistical data but also video signals are transferred.

SIKORA App
SIKORA offers a free app for displaying measuring values, trends, statistics or video signals, at smartphones. The operator can easily log in via the Wi-Fi interface and, immediately, receives production data of the particular gauge head from the smartphone.

The app allows also the calibration of the gauge head according to ISO 9001. The values of the test probes are read by a QR code and the measured values are listed in a log file. For the quality management, a documented test certificate is created, sent and archived.

Technical Data LASER Series 6000

<table>
<thead>
<tr>
<th>Product name</th>
<th>Product diameter</th>
<th>Accuracy</th>
<th>Repeatability</th>
<th>Exposure time</th>
</tr>
</thead>
<tbody>
<tr>
<td>LASER 6080 XY</td>
<td>1.0 - 78 mm</td>
<td>± 1.0 μm</td>
<td>± 0.5 μm</td>
<td>0.2 μs</td>
</tr>
</tbody>
</table>

Measuring rate
2,500 measurements/ s

Interfaces
RS 485, RS 232, LAN (Ethernet); optional: Wi-Fi, Profibus-DP, analog interface or alternatively industrial field busses such as CANopen, Ethernet/IP, DeviceNet, Profinet IO

Power supply
100 ... 240 V AC ± 10%, 50/60 Hz
4 WIRE-TEMP 6000 – Non-contact temperature measurement

Non-contact measurement of the conductor temperature

During the production of cables or wires, the conductor is heated prior to the extrusion process to ensure optimum adhesion of the insulation on the wire.

With the WIRE-TEMP 6000, SIKORA presents a system for precise online measurement of the conductor temperature. The WIRE-TEMP 6000 can easily be installed in insulating as well as CV lines after the preheater.

Independent of external influences and on a non-contact basis, the WIRE-TEMP 6000 continuously measures the temperature of the conductor prior to entering the extruder, assuring repeatability in the production process.

Designed for diameters from 0.3 to 5.0 mm, alternatively from 5.0 to 50 mm, the system is laid out for product temperatures up to 150°C, optionally up to 250°C. The non-contact measurement of the temperature is independent from the cross-section, the material and the surface structure of the conductor.

A big advantage over conventional systems is that the temperature measurement is done by means of a thermal image sensor in an infrared camera, which captures the conductor reliably with its wide measuring range.

Typical features
- Non-contact temperature measurement
- Easy to operate, no calibration
- Temperature display and operation directly at the device
- Free from wear
- Easy to integrate into existing lines

Technical Data WIRE-TEMP 6000

Functional principle
Non-contact measurement of the conductor temperature

Applications
- Al, Cu, Fe, others on request
- Every kind of plastic
- All kinds of cable production lines

Product diameter
WIRE-TEMP 6005: 0.3 - 5.0 mm
WIRE-TEMP 6050: 5.0 - 50 mm

Permissible environmental temperature
+ 15 to 45°C

Conductor temperature
Up to 150°C
(optional at WIRE-TEMP 6005: 250°C)

Line speed
No limits

Interfaces
RS 485, RS 232 service interface; optionally: Profinet-DP, analog interface, 4 digital inputs and 4 contact outputs, Universal Interface Module with adaptors for CANopen, Ethernet/IP, DeviceNet, Profinet I/O

Power supply
110 ... 230 ± 10% V AC, 47 to 63 Hz

Dimensions
WIRE-TEMP 6005: 296 x 198.2 x 360 mm
WIRE-TEMP 6050: 330 x 198 x 444 mm
(width x height x depth)
Alternating-current sparktester (AC)

At the extrusion of cables, the insulation has to be inspected by sparktesters (high-voltage sparktesters) and possible insulation defects should be detected and documented at an early stage. For the testing, the dry cable runs through the sturdy bead chain electrode of the sparktester that is installed after the cooling section. Here, the cable insulation is exposed to the selected test voltage and faults in the insulation are detected reliably. Online quality control assures that only faultless cables are delivered.

SIKORA offers 8 models of the SPARK 2000 BS, covering the diameter range from 1 to 220 mm. For all systems, the test voltage is continuously adjustable from 1.6 to 35 kV.

The sturdy electrode and the electronic box of the SPARK 2000 BS form one integral unit that is easy to install in new or existing lines. Optionally, the SPARK 2000 BS can be combined with the display and control device REMOTE 2000.

The REMOTE 2000 includes a display as well as a keypad for the settings of the test voltage, a fault counter and allows for a length related recording of the detected spark faults.

The sparktester conforms to approved test standards (AS, BS, CS, CENELEC, EN, UL, VDE) and safety regulations (as demanded by DIN/VDE 0800, IEC 479-1).

Typical features
- Reliable fault detection
- Controlled test voltage
- Fulfills all important test and safety standards

Technical data SPARK 2000 BS

<table>
<thead>
<tr>
<th>Measuring principle</th>
<th>Test device with bead chain electrode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gauge head</td>
<td>Product diameter</td>
</tr>
<tr>
<td>SPARK 2030 BS</td>
<td>1 – 30 mm</td>
</tr>
<tr>
<td>SPARK 2060 BS</td>
<td>1 – 60 mm</td>
</tr>
<tr>
<td>SPARK 2075 BS</td>
<td>1 – 75 mm</td>
</tr>
<tr>
<td>SPARK 2100 BS</td>
<td>1 – 100 mm</td>
</tr>
<tr>
<td>SPARK 2120 BS</td>
<td>1 – 120 mm</td>
</tr>
<tr>
<td>SPARK 2140 BS</td>
<td>1 – 140 mm</td>
</tr>
<tr>
<td>SPARK 2170 BS</td>
<td>1 – 170 mm</td>
</tr>
<tr>
<td>SPARK 2200 BS</td>
<td>1 – 220 mm</td>
</tr>
</tbody>
</table>

| Interfaces          | RS 485, RS 232, Profibus-DP (option), electrically isolated contacts, analog in- and outputs |
| Test voltage        | 1.6…25 kV (30/35 kV option) |
| Power supply        | 100 … 230 ± 10% V AC, 50/60 Hz |
Length measuring systems - new defined

The LENGTH 6000 is a reliable non-contact online length measuring device specially designed for the use in jacketing lines. With the LENGTH 6000 cable manufacturers measure the cable length during production and assure that the accurate length is supplied or further processed.

The technology of the LENGTH 6000 is based on an optical measuring principle. The surface structure on the bottom side of the passing product is defined by two neighboring CCD-image sensors. The length is measured and the speed is calculated from the correlation of both images.

The technology of the LENGTH 6000 is reliable for all types of strand-shaped products with reflective and rough surfaces. A very typical application is its use at insulating and jacketing lines. The system recognizes whether the product is moving forward or reverse and measures the length always precisely starting at zero line speed.

Typical features
- Length measurement independent at the product direction (forward/reverse)
- Measurements start zero line speed
- Highest reliability and precision

Technical Data LENGTH 6000

<table>
<thead>
<tr>
<th>Measuring principle</th>
<th>Non-contact, optical, comparison of image patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product diameter</td>
<td>5 to 180 mm (other diameter ranges on demand)</td>
</tr>
<tr>
<td>Line speed</td>
<td>Up to 500 m/min (higher speeds on demand)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>&lt; 0.05% deviation</td>
</tr>
<tr>
<td>Interfaces</td>
<td>Serial interface RS 485, diagnosis interface RS 232, pulse output (Option) Optional: LAN (Ethernet), Proﬁbus-DP, Ethernet/IP, ProﬁNet etc., all common industrial ﬁeld busses, alternatively analog output</td>
</tr>
<tr>
<td>Power supply</td>
<td>100 ... 240 V AC ± 10%, 50/60 Hz</td>
</tr>
</tbody>
</table>
7 Partner of the measuring systems – Powerful signal processors

ECOCONTROL 6000
The ECOCONTROL 6000 is an extremely powerful display and control unit of SIKORA’s premium segment.

Up to 8 measuring and testing devices can be connected to the ECOCONTROL 6000. The measuring values are displayed numerically as well as graphically on a 15” horizontal or 22” TFT vertical monitor together with trend curves and statistic data. A line presentation with pictograms of the connected devices provides a clear overview.

ECOCONTROL 1000
The ECOCONTROL 1000 offers up to 4 serial interfaces for the connection of measuring devices such as SIKORA’s LASER Series 2000, LASER Series 6000 and CENTERVIEW 8000. Additionally, 4 testing devices such as the SPARK 2000/6000 and the LUMP 2000 can be connected. The measured values are displayed on a 15”-TFT touch screen monitor.

ECOCONTROL 600
ECOCONTROL 600 offers the connection to one SIKORA measuring device. Additionally, via 4 digital contacts events from a LUMP 2000 for the detection of lumps and neckdowns or SPARK 2000/6000 and the LUMP 2000 can be connected. The measured values are displayed on a 15”-TFT touch screen monitor.

Advanced Software: (Options)

Automatic diameter/wall thickness control
A special feature of all ECOCONTROL models is the control module SET POINT. It ensures 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 1000/6000)
With the HC 2000 the material shrinkage is continuously calculated and considered automatically for the control of the diameter and/or wall thickness.

FFT-Analysis
Optionally, the ECOCONTROL 6000 visualizes the FFT data, to detect periodical variations of production parameters. This software package has been developed with the support of partners of the industry.

Data storage
Data storage on a high performance hard disk is included at the ECOCONTROL 6000 and optionally available for the ECOCONTROL 1000 and 600.

Recording
Time, length or reel related production reports are available for each of the three ECOCONTROL devices 6000, 1000 and 600.
### Technical Data ECOCONTROL

<table>
<thead>
<tr>
<th>Display</th>
<th>6000</th>
<th>1000</th>
<th>600</th>
</tr>
</thead>
<tbody>
<tr>
<td>TFT-color monitor</td>
<td>22&quot; (vertical)</td>
<td>15&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td></td>
<td>(alternatively 15&quot;, horizontal)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In/and outputs</th>
<th>6000</th>
<th>1000</th>
<th>600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial interface RS 485</td>
<td>4 (8 option)</td>
<td>2 (4 option)</td>
<td>1</td>
</tr>
<tr>
<td>Electrically isolated digital inputs</td>
<td>4 (8 option)</td>
<td>4 (option)</td>
<td>4 (option)</td>
</tr>
<tr>
<td>for the connection to testing devices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog outputs 16 Bit; 0 ... 10 V</td>
<td>4 (option)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>or +/- 10 V (unipolar/bipolar)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact outputs for tolerance and status messages</td>
<td>4 (8 option)</td>
<td>4 (option)</td>
<td>4 (option)</td>
</tr>
<tr>
<td>(max. 30 V, max. 0.5 A)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serial interface RS 232 for communication with an external computer</td>
<td>1 (option)</td>
<td>1 (option)</td>
<td>1 (option)</td>
</tr>
<tr>
<td>USB interface for a printer</td>
<td>1 (option)</td>
<td>1 (option)</td>
<td>1 (option)</td>
</tr>
<tr>
<td>Electrically isolated input for rotary pulse generators (0/15 V)</td>
<td>1 (option)</td>
<td>1 (option)</td>
<td>1 (option)</td>
</tr>
<tr>
<td>Electrically isolated interface module for control of the diameter (HC 2000)</td>
<td>1 (option)</td>
<td>1 (option)</td>
<td>-</td>
</tr>
<tr>
<td>USB customer interface</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Profibus-DP as well as alternative field busses</td>
<td>Yes (option)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Ethernet interface (selectable OPC/Suitelink)</td>
<td>1 (option)</td>
<td>1 (option)</td>
<td>1 (option)</td>
</tr>
<tr>
<td>WLAN (Wi-Fi)</td>
<td>1 (option)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Storage</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard disk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash disk (option)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USB drive (option)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>100 ... 240 V (+/-10%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 / 60 Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VIRTUAL 2000 - Intelligent software concept (optional)**

The virtual gauge technology VIRTUAL 2000 is suitable for all applications, where a fast wall thickness control is required but where due to the line configuration or the product structure, a diameter or wall thickness measurement directly after the extruder is not possible.
REMOTE 2000/DISPLAY 2000 – Visualization and control of the production data

Standard display and control device REMOTE 2000
The REMOTE 2000 is the basic display and control device and universally applicable for all SIKORA diameter measuring devices (LASER Series 2000/6000) and spark testers. The display of the measuring values is on a five-digit, 20 mm high, clear LED display. It is perfectly suitable for panel mounting or for building on the gauge head.

LASER Series 2000/6000 with the REMOTE 2000
The REMOTE 2000 can be combined with a diameter gauge head of the LASER Series 2000 or LASER Series 6000. The average diameter value of the connected measuring device is clearly displayed at the LED display. Via a control key, the display of the average diameter, the diameter of the measuring axis x, y and the display of the ovality is selectable.

The REMOTE 2000 includes a product library for up to 50 cable recipes. Nominal values and tolerances can easily be recalled.

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

Report printer
Optionally, a length-related print out of the measuring values as well as statistical data is available.

Interfaces
Furthermore, the REMOTE 2000 provides an interface to support a connection to an external PC for data gathering or PLC line control operations. In this way, a targeted and direct control is assured.

SPARK 2000 with the REMOTE 2000
Combined with the SPARK 2000, the REMOTE 2000 serves as a device for the display and setting of parameters such as the nominal testing voltage. User-friendly symbols and numeric displays clearly show the current testing voltage and the number of breakdowns.

Typical features REMOTE 2000
- Large, clearly arranged display and keypad
- Easy installation at any distance to the measuring head
- Automatic control module SET POINT (optional)
- Serial interface for the connection to a measuring head, a computer and a protocol printer (optional)
Basic display device DISPLAY 2000

The DISPLAY 2000 is designed to be used in combination with SIKORA’s diameter measuring devices of the LASER Series 2000 or the LASER Series 6000 and shows the diameter values or the ovality. It is suitable for panel mounting as well as for the installation at the gauge head.

In particular for applications where the measuring systems are connected to a line control via a Profibus interface or where a second display is requested, the DISPLAY 2000 is an interesting and low cost supplement.

Technical Data REMOTE 2000

<table>
<thead>
<tr>
<th>Measuring value display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital, 5-digit e.g. 00.000 ... 99.999 mm 000.00 ... 500.00 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmable, factory setting 1/s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal value/ Tolerance selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Via key pad (operation guided via a 4-digit LED-display)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 50 product types, comfortable programming via the diagnosis software</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tolerance message/ Control action</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) In clear text on LED display</td>
</tr>
<tr>
<td>b) 4 dry contacts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS 485 (gauge head), RS 232 (printer)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analog output (option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 10 V, deviation output if not used for control (0...10V according to the deviation output +5=0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 ... 240 V AC, ± 10%, 50/60 Hz</td>
</tr>
</tbody>
</table>

Technical Data DISPLAY 2000

<table>
<thead>
<tr>
<th>5-digit-display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digit height of 25 mm</td>
</tr>
<tr>
<td>The bright, big figures are easy to read even from a distance of 12 m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Bi-directional serial interface) RS 485</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 ... 240 V AC, ± 10%, 50/60 Hz</td>
</tr>
</tbody>
</table>

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
For your notes: