EXTRULINE.XY
Laser system for on-line diameter measurement and automatic extrusion control.

Extruline.XY is a laser system designed to control the external diameter of extruded products such as electrical wires, plastic tubes and similar products.

In addition to the diameter measurement and tolerance checking, Extruline.XY can provide the automatic extrusion process regulation, detect and locate diameter flaws all along the product's length.

With non contact technology it is possible to measure moving products, hot or soft, where conventional instruments cannot be used and may even damage the product.
How does it work?

The Extruline.XY system is based on an Xactum laser gauge, installed at the exit of the extruder, which measures the external diameter of the product. By using dual axis gauges and checking the diameter along two crossed directions, it is possible to compute the average diameter of ovalized products, when the simple measurement just along one axis would not be accurate enough to perform an efficient extruder regulation.

The measured average diameter is continuously compared with the nominal value pre-set by the operator: if the product size is going out of the pre-set limits, the Extruline.XY software automatically corrects the extruder so that the product is always within the desired tolerance limits.

The measured data are displayed on the screen of a CE-200 Operator Interface Panel, which is also used to program the system; in addition all measurements are recorded and processed to get a complete statistical report which can be immediately printed to prove the product Quality.

Any sudden change in the product diameter is detected as a Flaw: the position of each flaw along the product length is stored in the system memory, in order to print a Flaw location Report for each spool.

The main functions of the Extruline.XY system are:
• Measurement and display the external diameter and ovality;
• Out-of-tolerance alarms;
• Regulation of the extrusion process;
• Flaw detection and location along the spool;
• Processing and printing of statistical reports;
• Interfacing with a remote computer

System configuration

The Extruline.XY system uses dual-axis Xactum Laser Gauges and can also be supplied in the HF (High Scan Frequency) version.

The Basic system is composed of:
• XLS13XY or XLS35XY, Xactum Laser Gauge;
• CE-200, Operator Interface Panel, 19” Rack mount;
• Extruline.XY software (basic module) pre-installed in the Gauge;
• 5 m long connecting cable

Some options and accessories available to complete the system are:
• Additional software for the extruder regulation
• Additional software for statistical analysis
• Additional software for Flaw Detection and Location
• Electronic potentiometer for the extruder interfacing
• Proximity switch for length counting
• Blow rings to dry the product
• Telescopic stand for the laser gauge
• Extension cables
• Calumet exhaust fan to remove the extrusion smoke
• Gauge Calibration Report

Advantages

Dual axis gauging allows high performance feed back.
Two instruments in one: diameter controller and flaw detector.
Extruding at the lower limits of tolerance means significant savings in materials.
The automatic control capability saves labour costs.
Non-contact measurement for the on-line application and 100% control.
Improvement in product quality and reduction of waste.
Flaw-free products with assessed quality.
The Extruline.XY Software

The Extruline.XY software is pre-loaded inside the Xactum gauge and, thanks to its modular structure (basic package + optional Regulation, Statistics and Flaw Location) it can meet all operational requirements. Special care has been taken to ensure that the system is easy to use and simple to program even by non-experts. Through the CE-100 Interface Panel, the operator uses function keys and pop-up menus to select the various functions or to enter the numerical values requested by the program.

The basic package includes the following functions:

- Display of the measured diameter and of the shift from the nominal diameter.
- Computes the \((X+Y)/2\) Avg. Diameter and \((X-Y)\) Ovality.
- 3 measured values can be simultaneously displayed on the screen.
- Programmable alarms and pre-alarm values for out-of-tolerance conditions.
- Measurement of opaque or transparent products (Glass Logic).
- Library for 1000 different products, retrievable directly by the operator.
- Possibility of entering a password to restrict the programming functions to authorized personnel.
- Ethernet / Rs232 interface for remote programming or data retrieval.
- Multi-lingual menus (Italian, English, French and German).
- Selectable measuring unit (mm or inches) and resolution.
- Pre-programmed factory set-up to facilitate installation and start-up of the system.

The additional Process Regulation module (Option 1) features the following functions:

- Software for automatic regulation of the diameter by adjusting the drawing speed or the flow rate of the extruder.
- The regulation parameter is the average diameter, which is independent from the cross-section orientation, even when highly ovalized products are being gauged.
- PI (Proportional Integral) mode using INC (+) or DEC (-) signals.
- The process regulation is started only when a real trend to deviate from the nominal pre-set value is detected.
- Automatic compensation of dead time, according to variations of the line speed.
- All control parameters can be programmed and stored in the product library.
- Programmable hot/cold offset to compensate for the thermal expansion of the extruded product when the measurement is performed immediately after the extrusion head.

(*) Only flaws which turn into a diameter change all along the product circumference, like “olives” or “neck-down”, can be surely detected. The minimum detectable flaw length is given by the max line speed divided by the gauge scan frequency.
Specifications

**XLS13XY/480**

**XLS13XY/1500**

**XLS35XY**

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### Specifications

<table>
<thead>
<tr>
<th>Measurement</th>
<th>XLS13XY/480/A</th>
<th>XLS13XY/480/B</th>
<th>XLS13XY/1500/A</th>
<th>XLS13XY/1500/B</th>
<th>XLS35XY/480/A</th>
<th>XLS35XY/480/B</th>
<th>XLS35XY/1500/A</th>
<th>XLS35XY/1500/B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measuring Field</strong> (mm)</td>
<td>13 x 13</td>
<td>4 x 4</td>
<td>13 x 13</td>
<td>4 x 4</td>
<td>35 x 35</td>
<td>35 x 35</td>
<td>35 x 35</td>
<td>35 x 35</td>
</tr>
<tr>
<td><strong>Measurable Diameters</strong> (mm)</td>
<td>0.1 - 10</td>
<td>0.03 - 3</td>
<td>0.1 - 10</td>
<td>0.05 - 3</td>
<td>0.3 - 32</td>
<td>0.3 - 32</td>
<td>0.3 - 32</td>
<td>0.3 - 32</td>
</tr>
<tr>
<td><strong>Resolution (Selectuable)</strong> (μm)</td>
<td>10 / 1 / 0.1 / 0.01</td>
<td>± 0.5</td>
<td>± 1</td>
<td>± 0.5</td>
<td>± 2.5</td>
<td>± 5</td>
<td>± 0.5</td>
<td>± 2.5</td>
</tr>
<tr>
<td><strong>Linearity (Centred Product)</strong> (μm)</td>
<td>± 0.15</td>
<td>± 0.03</td>
<td>± 0.15</td>
<td>± 0.02</td>
<td>± 0.3</td>
<td>± 0.15</td>
<td>± 0.3</td>
<td>± 0.15</td>
</tr>
<tr>
<td><strong>Linearity (Full Range)</strong> (μm)</td>
<td>± 1</td>
<td>± 0.5</td>
<td>± 1</td>
<td>± 0.5</td>
<td>± 1.5</td>
<td>± 1.5</td>
<td>± 1</td>
<td>± 1.5</td>
</tr>
<tr>
<td><strong>Beam Spot Size (μm)</strong></td>
<td>0.1 x 4</td>
<td>0.03 x 0.1</td>
<td>0.1 x 4</td>
<td>0.05 x 0.1</td>
<td>0.2 x 4</td>
<td>0.2 x 0.1</td>
<td>0.2 x 4</td>
<td>0.2 x 0.1</td>
</tr>
<tr>
<td><strong>Scanning Frequency</strong> (Hz)</td>
<td>480 (X) x 480 (Y)</td>
<td>1500 (X) x 1500 (Y)</td>
<td>480 (X) x 480 (Y)</td>
<td>1500 (X) x 1500 (Y)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Gauge Thermal Coefficient</strong> (μm/°C)</td>
<td>156</td>
<td>163</td>
<td>288</td>
<td>300</td>
<td></td>
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<tr>
<td><strong>Laser Source</strong></td>
<td>VLD (Visible Laser Diode); λ = 650 nm</td>
<td></td>
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<tr>
<td><strong>Measurable Diameters</strong></td>
<td>EXTRULINE XY 13/A</td>
<td>XY 13/B</td>
<td>XY 13/A/HF</td>
<td>XY 13/B/HF</td>
<td>XY 35/A</td>
<td>XY 35/B/HF</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Linearity (Centred Product)</strong></td>
<td>± 0.1 / ± 0.01 / ± 0.03 / ± 0.01</td>
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<tr>
<td><strong>Resolution (Selectable)</strong></td>
<td>± 0.1 / ± 0.03 / ± 0.01 / ± 0.03</td>
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</tbody>
</table>

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### Notes

1. For Ø ≤ 0.3 mm; for smaller dia. the field is proportionally reduced up to 4 x 4 mm for Ø = 0.1 mm.
2. For Ø = 0.1 mm; for smaller minus field is proportional reduced up to 1 x 1 mm for Ø = 0.008 mm.
3. For Ø = 0.03 mm; for smaller dia. the field is the maximum measurable diameter is 10 mm.
4. Related to the average diameter (X+Y)/2. The value is inclusive of the Aeroel’s masters uncertainty (± 0.3 μm).
5. The field is 5 x 5 (13XY/*/A), 2 x 2 (13XY/*/A) or 16 x 16 (35XY).
6. Single shot repeatability (± 2σ) is ± 1 μm (XLS13XY/480), ± 0.75 μm (XLS13XY/1500 Ø > 3 mm) ± 0.55 μm (XLS35XY/480) and ± 0.25 μm (XLS35XY/1500 Ø > 3 mm) ± 0.55 μm (XLS35XY/1500 Ø > 3 mm) ± 0.55 μm (XLS35XY/1500 Ø > 3 mm)
7. Related to the average diameter (X+Y)/2. The value is inclusive of the Aeroel’s masters uncertainty (± 0.3 μm).
8. For Ø ≤ 3 mm, the linearity is ± 1 μm.
9. For Ø > 3 mm, the linearity is ± 1.5 μm (± 25 μm for the model 1500/B).
10. For Ø ≤ 0.5 mm, the repeatability is ± 0.05 μm.
11. For Ø > 0.5 mm, the repeatability is ± 0.08 μm.
12. For Ø > 0.5 mm, the repeatability is ± 0.02 μm.
13. Elliptical spot: “s” is the thickness and “l” is the width.
14. When the NO-VAR option is ENABLED, the gauge thermal expansion coefficient is programmable by the user.
15. When the NO-VAR option is ENABLED, the gauge thermal expansion coefficient is programmable by the user.
16. The measuring error due to a change in the ambient temperature when measuring a part with zero thermal expansion coefficient (INVAR). This is specified for gauges using a software PRESET for the NO-VAR option and when the rate of change of the ambient temperature is lower than 3°/h. When the NO-VAR option is ENABLED, the gauge thermal expansion coefficient is programmable by the user.

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### CE-100 Operator’s Interface Panel

- **Color LCD Display**, 640x480, backlit
- "Touch-Sensitive" capacitive keyboard, with 35 keys and 7 warning LED
- RS485 interface to connect the XLS gauges
- 8 protected PNP outputs, 5 PNP inputs, 2 inputs to the gauge
- Ethernet & RS232 ports
- Capactive keyboard, 640x480, backlit
- 35 keys and 7 warning LED
- Memory of last setting before power down.
- Analog output from 0 to 10 Volt, adjusted by INC (+) or DEC (-) pulses.
- Additional PWM output to drive solenoid valve
- Centronics output for parallel printer
- Linear output display in % of range
- Adjustable mode
- 3 digits LED display H=14,2 mm

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### Electronic potentiometer

- Analog output from 0 to 10 Volt, adjusted by INC (+) or DEC (-) pulses.
- Additional PWM output to drive solenoid valve
- Output level display in % of range, 3 digits LED display H=14,2 mm
- Local or REMOTE adjustment mode.
- Memory of last setting before power down.
- Plastic case
- Dimensions: 96 x 48 x 106 mm
- Power supply: 24 VDC, 100 mA (Typical 1 A max)