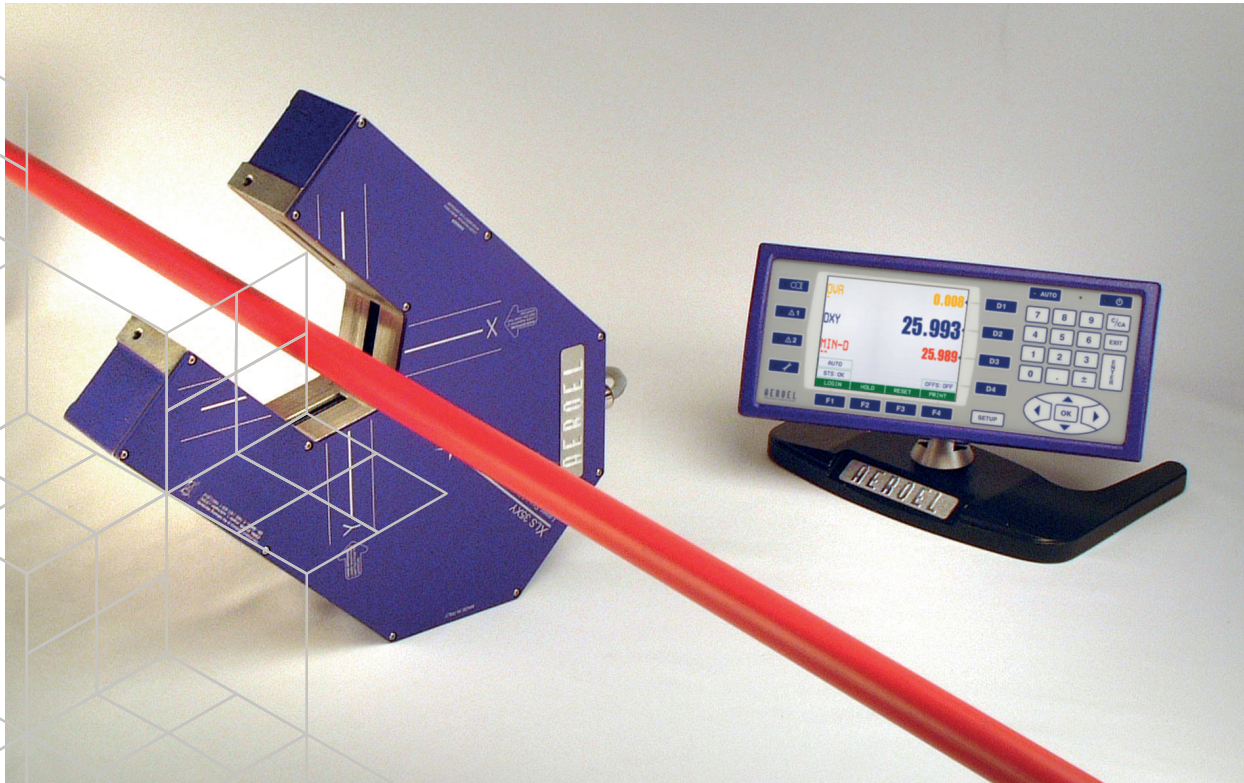


EXTRULINE.XY

**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's 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.

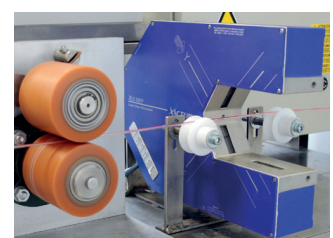
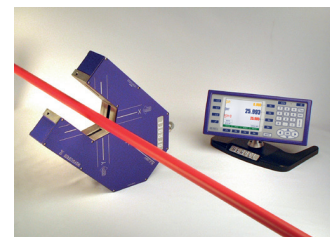
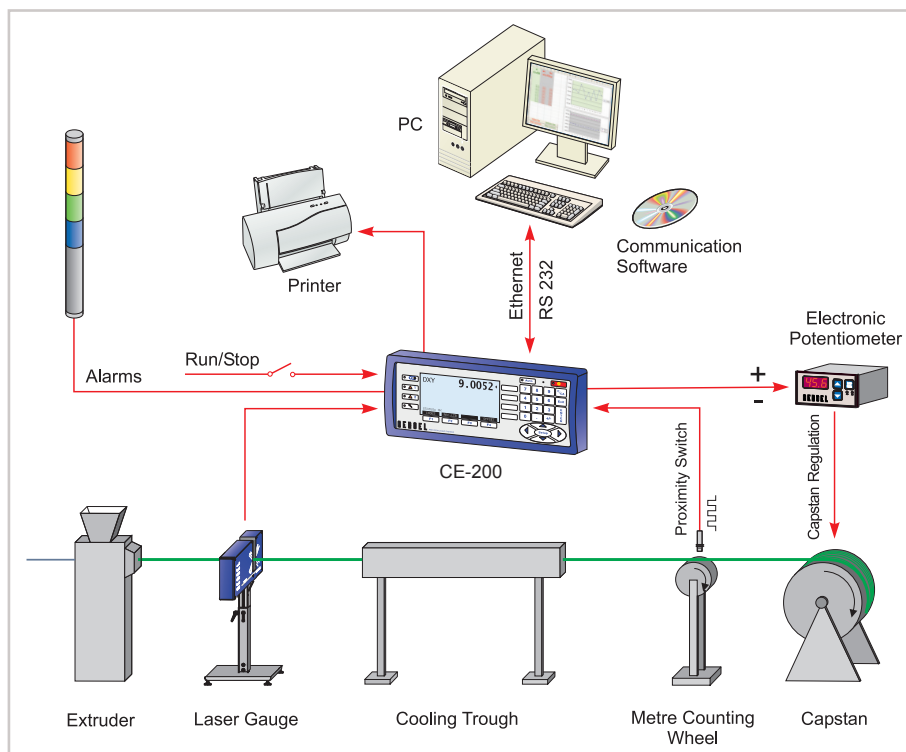
Extruding at the lower limits of tolerance means significant **savings in materials**.

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

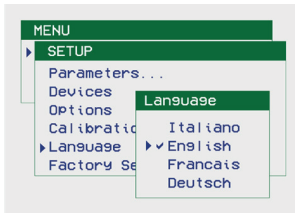
The Extruline.XY software is pre-loaded inside the Xactum gauge and, thanks to its modular structure (basic package + optional Regulation, Statistics and Flaw Location) it can meet all operational requirements. Special care has been taken to ensure that the system is easy to use and simple to program 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.

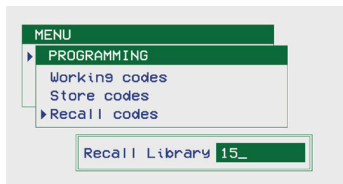
The basic package includes the following functions:

- 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-alarms 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:

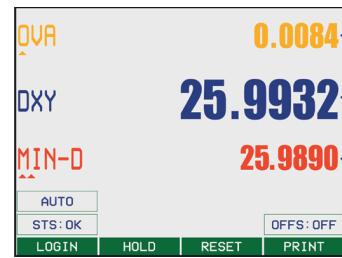
- Software for automatic regulation of the diameter by adjusting the drawing speed or the flow rate of the extruder.
- The regulation parameter is the average diameter, which is independent from the cross-section orientation, even when highly ovalized products are being gauged.
- PI (Proportional Integral) 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.

The additional Statistics module (Option 2) offers the following functions:

- Histograms showing the measured diameters: $(X+Y)/2$ or $X&Y$ values.
- Programmable diameter limits to filter out and ignore abnormal measurements arising from anomalous working conditions.
- The data acquisition interval can be selected manually by the operator or automatically determined via a Start/Stop input.
- Recording of maximum, minimum and average values.
- Calculation of standard deviation of Cp and Cpk values.
- Total length and average speed reporting.
- All listings show the date and time.
- Identification of the operator, the machine and the type of product.
- Progressive numbering of the reel.



The additional Flaw Detecting and Location module (*) (Option 3) offers the following functions:

- Single scan diameter checking capability.
- Separate tolerance limits for the flaw detection function, added to the pre-set nominal value or to the average diameter previously measured (self adapting mode)
- Independent outputs for + and - flaws.
- Recording of the max or min value of the flaw and its position along the spool.
- Print out of a Flaw Location Report.
- The report can include flaws detected by other external devices (i.e. Spark Testers, Capacitance Testers, etc.)

LOCALIZZAZIONE DIFFETTI

METRI	O	D	E	DELTA	METRI	O	D	E	DELTA
0	1	2	3	MIN	4	5	6	7	MIN
341									
345									
350									
356									
358									
363									
403									
416									
425									
442									
463									
463									
499									
500									
531									
563									
562									
574									
616									

STATISTIC REPORT

PRODUCT DATA

NOMINAL DIAMETER [mm]	6.1500
UPPER LIMIT [mm]	6.1520
LOWER LIMIT [mm]	6.1480
STAT. LIMIT [mm]	1.0000
MEASUREMENT TIME [s]	1.000

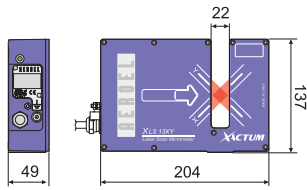
HISTOGRAM

SUBMARY

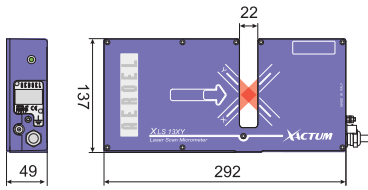
NUMBER OF SAMPLES [n]	481	ACQUISITION START TIME	10:34:09
AVERAGE DIAMETER [mm]	6.1511	STOP TIME	10:36:00
MAXIMUM DIAMETER [mm]	6.1511		
MINIMUM DIAMETER [mm]	6.1491		
TOTAL LENGTH [m]	209		
AVERAGE SPEED [m/s]	95.73		
STD. DEVIATION [mm]	0.386		
CP	1.73	OUT LOWER LIMIT [n]	0.00
CPK	1.73	OUT UPPER LIMIT [n]	0.00

Specifications

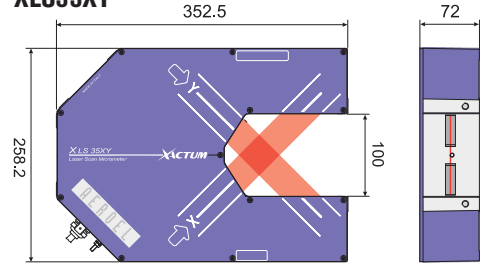
XLS13XY/480



XLS13XY/1500



XLS35XY



All dimensions are in mm.

EXTRULINE	XY 13/A	XY 13/B	XY 13/A/HF	XY 13/B/HF	XY 35/A	XY 35/B/HF
Gauge Model	XLS13XY/480/A	XLS13XY/480/B	XLS13XY/1500/A	XLS13XY/1500/B	XLS35XY/480/A	XLS35XY/1500/B
Measuring Field (mm)	13 x 13 ⁽¹⁾	4 x 4 ⁽²⁾	13 x 13 ⁽¹⁾	4 x 4 ⁽³⁾	35 x 35 ⁽⁴⁾	
Measurable Diameters (mm)	0.1 - 10	0.03 - 3 ⁽⁵⁾	0.1 - 10	0.05 - 3 ⁽⁵⁾	0.2 - 32	
Resolution (Selectable) (µm)	10 / 1 / 0.1 / 0.01					
Linearity (Centred Product) ⁽⁶⁾ (µm)	± 0.5 ⁽⁷⁾				± 1 ⁽⁸⁾	
Linearity (Full Range) ⁽⁹⁾ (µm)	± 1.5	± 1	± 1.5	± 1	± 2.5	± 5
Linearity (Reduced Field) ⁽¹⁰⁾ (µm)	± 1	± 0.5	± 1	± 0.5	± 1.5	
Repeatability (T=1s, ±2σ) (µm)	± 0.15 ⁽¹¹⁾	± 0.03 ⁽¹²⁾	± 0.04 ⁽¹³⁾	± 0.02 ⁽¹⁴⁾	± 0.3	± 0.15
Single Shot Repeatability (±2σ) (µm)	± 1		± 0.75 ⁽¹⁵⁾		± 3.5	± 2.5
Beam Spot Size (s,l) ⁽¹⁶⁾ (mm)	0.1 x 4	0.03 x 0.1	0.1 x 4	0.05 x 0.1	0.2 x 4	0.2 x 0.1
Scanning Frequency (Hz)	480 (X) x 480 (Y)		1500 (X) x 1500 (Y)		480 (X) x 480 (Y)	1500 (X) x 1500 (Y)
Scanning Speed (m/s)	156		163		288	300
Gauge Thermal Coefficient ⁽¹⁷⁾ (µm/m°C)	-11.5					
Laser Source	VLD (Visible Laser Diode); λ = 650 nm					
Dimensions (mm)	204 x 137 x 49			352.5 x 258.2 x 72		
Weight (kg)	2		2.5		5.8	

Notes

- (1) For $\varnothing \geq 0.3$ mm; for smaller dia. the field is proportionally reduced up to 4 x 4 mm for $\varnothing = 0.1$ mm.
 (2) For $\varnothing \geq 0.1$ mm; for smaller dia. the field is proportionally reduced up to 1 x 1 mm for $\varnothing = 0.03$ mm.
 (3) For $\varnothing \geq 0.1$ mm; for smaller dia. the field is proportionally reduced up to 1 x 1 mm for $\varnothing = 0.05$ mm.
 (4) For $\varnothing \geq 0.3$ mm; for smaller dia. the field is proportionally reduced up to 20 x 20 mm for $\varnothing = 0.2$ mm.
 (5) With centred product the maximum measurable diameter is 10 mm.
 (6) Related to the average diameter $(X+Y)/2$. The value is inclusive of the Aeroel's masters uncertainty (± 0.3 µm).
 (7) For $\varnothing \leq 1$ mm. For $\varnothing > 1$ mm the linearity is ± 1 µm.
 (8) For $\varnothing \leq 15$ mm. For $\varnothing > 15$ mm the linearity is ± 1.5 µm (± 2.5 µm for the model 1500/B).
 (9) Maximum measurable shift of the average diameter $(X+Y)/2$, when a master is moved along the two X and Y axes crossing the centre of the field, checked with $\varnothing=3$ mm (XLS13XY/A), $\varnothing=1$ mm (XLS13XY/B) or $\varnothing=8$ mm (XLS35XY). The value is inclusive of the Aeroel's masters uncertainty (± 0.3 µm).

- (10) The field is 5 x 5 (13XY/A), 2 x 2 (13XY/A) or 16 x 16 (35XY).
 (11) For $\varnothing \leq 0.5$ mm the repeatability is ± 0.03 µm.
 (12) For $\varnothing \leq 0.5$ mm. For $\varnothing > 0.5$ mm the repeatability is ± 0.08 µm.
 (13) For $\varnothing \leq 0.5$ mm the repeatability is ± 0.02 µm.
 (14) For $\varnothing \leq 0.5$ mm. For $\varnothing > 0.5$ mm the repeatability is ± 0.03 µm.
 (15) For $\varnothing \leq 3$ mm. For $\varnothing > 3$ mm the repeatability is ± 1.5 µm.
 (16) Elliptical spot: "s" is the thickness and "l" is the width.
 (17) This is 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.

Specifications subject to change without notice. For additional details and complete specifications please see the gauge data sheet.



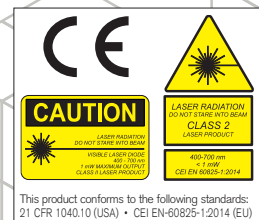
CE-100 Operator's Interface Panel

- 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 and Centronics output for parallel printer
- 2 configurable analog outputs
- Dimensions: 132 x 350 x 76.5 mm (panel alone)
- Weight: 2 kg (panel), 2,8 kg (Rack mounting version)
- Power supply: 24 VDC, 100 mA Typical (1 A max)



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 DIN43700
- Dimensions: 96 x 48 x 106 mm
- Power supply: 24 VDC/VAC, 100 mA



AEROEL™
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CSQ
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MANAGEMENT SYSTEM