

## The Ultimate Cutting Tool Measurement System

## The Aeroel™ Super Meclab T40



Pictured above is the Aeroel Super Meclab T40. It shows the XLS 40 laser gauge head with a granite based precision linear slide, cutting tool fixture and the 15" touch screen display unit.

### General Description

The Aeroel Super Meclab Series T40 Laser Micrometer represents the ultimate in capability and accuracy to measure both odd and even fluted cutting tools.

It has exclusive features which cannot be met by any competitive laser micrometer on the market today. As a result it is the only instrument for any Metrology Laboratory desiring laser micrometry. For cutting tools in particular, it is ideal for:

- Drill bits
- End mills
- Cutting tools
- Toothed pulleys
- Small gears

The Super Meclab T40 is composed of a standard Super Meclab 40 with the necessary fixturing for measuring cutting tools. It has proprietary software and a special laser beam shape specifically designed for cutting tools. It is also ideal for the off-line, manual measurements of a wide range of ground or turned parts with different shapes and sizes.

### Exclusive Features

- Measures cutting tools with both odd or even flutes
- Measures effective cutting diameter, concentricity and runout
- $\pm 0.07 \mu\text{m}$  (0.000003") repeatability
- 1500Hz scan rates
- 15" touch screen operator panel
- Thermal compensation for any material
- No measuring drift due to changes in ambient temperature
- Auto calibration feature never requires any recalibration
- Unlimited multi point calibration to user's standards
- RS 232, RS 485 and Ethernet outputs
- Class 2 visible laser diode for safety and long life

### Benefits

- Contactless measurement: no part damage or scratches
- Objective and highly reproducible results: no matter what the operator's skill level
- Extremely easy and quick to use: reduce inspection time and improve measurement capability
- Highly flexible: different components and sizes can be measured without system pre-setting or re-mastering.
- Ultra accurate: measure to an accuracy that before you could only get in a metrology room, using much more expensive equipment and specialized personnel.

# Single Axis Laser Micrometers

## System Composition

The basic system consists of:

- XLS40/1500/B Xactum Intelligent Laser Sensor
- Flat granite baseplate with enclosure
- Precision linear stage, manually driven, with magnetic digital scale
- Fixture for the part, a pair of adjustable blocks, and a stopper
- Micro position adjustment
- Motor driven device to rotate the part, with driving wheel and its driver for the stepper motor
- All-in-one PC with 15.6" Touch Screen LCD monitor
- Super-Meclab.T software pre-installed in the PC

## The Xactum Technology

The Xactum XLS40/1500Hz Laser Micrometer is an extremely accurate and repeatable measuring instrument, featuring:

Wide measuring field: 40 mm  
Any part can be measured, without precise positioning inside the measuring field.

Measurable diameters from 0.06 to 38 mm  
Any diameter between 0.06 mm and 38 mm can be measured without the need of pre-setting the gauge.

Excellent linearity:  $\pm 0.5 \mu\text{m}$   
Every different diameter can be measured very accurately, without the need of re-calibrating the gauge on a specific master. The linearity value is inclusive of the Aeroel's master's uncertainty ( $\pm 0.3 \mu\text{m}$ ).

A calibration report is supplied for each gauge to document the factory calibration results.

Outstanding repeatability:  $\pm 0.07 \mu\text{m}$  (@2 sigma, 1s measuring time).

This excellent repeatability is even better when measuring diameters smaller than 38 mm, and can be as low as  $\pm 0.05 \mu\text{m}$  on smaller parts, with diameters up to 10 mm. The repeatability when measuring fluted parts is typically better than  $\pm 0.5 \mu\text{m}$ .

**Permanent self-calibration.** You do not need to periodically re-calibrate the instrument. A steel master is permanently installed in the gauge and it is checked at every scan, 1200 times per second. An excellent long term stability is achieved.

**No measuring drift due to changes in the ambient temperature.** The internal steel master has the same expansion coefficient of the steel part being measured.

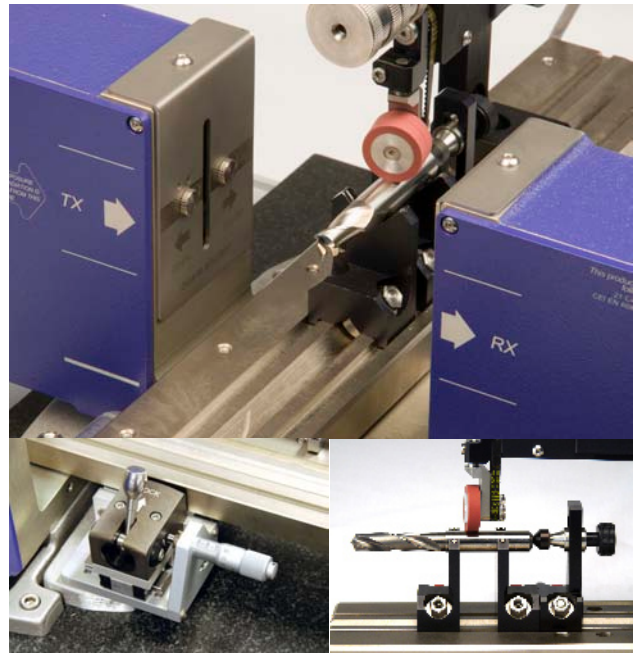
When the part and the gauge are at the same room temperature both expand by a proportional amount, as a result you will measure the diameter of the part as if you were in a metrology room, at 20°C.



**Thermal compensation for any material.** In addition, if you are not checking steel products, it is possible to program the thermal expansion coefficient of the material being measured in order to automatically compensate the thermal expansion of any piece.



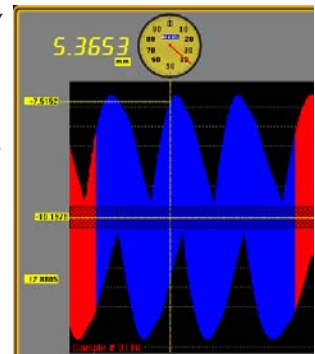
All this is possible by reading the temperature sensors inside the gauge. This allows the system to know exactly the temperature of the internal master.



## System operation

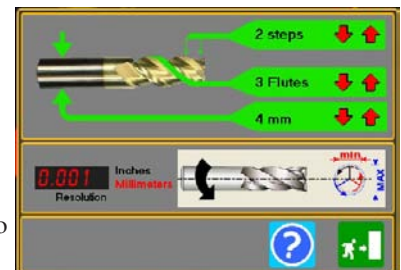
The part being checked is inserted on a double V fixture, which is mounted on a manually driven slide equipped with a magnetic digital read out scale to measure the displacement of the part itself along its axis; the part position is continuously displayed on the screen.

Using a special guided procedure, the operator seeks the starting point, moves the part to the measurement position and starts the measuring cycle: the part is rotated by a stepper motor driven device using a rubber wheel laying on the part. This keeps it pushed against the V blocks and assures a "zero run-out" rotation, that is a rotation around a perfectly fixed axis.



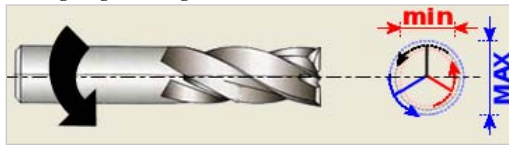
During the rotation period, which is automatically set by the computer, the laser sensor scans the part at 1500 samples/second and stores all the measurements related to the positions of the upper and lower edge of the part.

Exclusive data processing software performs an accurate and repeatable diameter measurement of the part, for both odd or even fluted parts. As a set up choice, two different processing algorithms are applied, to fit the part geometry and to calculate different parameters. The measurement cycle can be repeated at several positions along the part axis.



## Measuring Mode

**Mode 1:** each flute /cutting edge is measured separately and the processor computes the effective diameter of the circle determined by the cutting edge during the rotation.

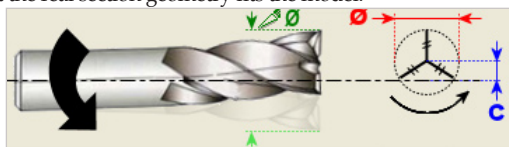


The following dimensions are computed and displayed

- Maximum diameter or "effective cutting diameter"
- Minimum diameter
- Diameter Range ( $\emptyset$  max –  $\emptyset$  min)
- Run-out



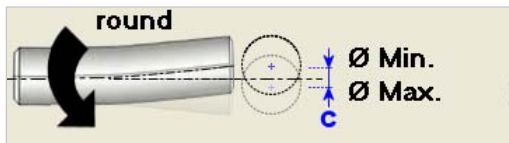
**Mode 2:** the measurements are processed assuming the hypothesis that all the edges have the same radius from the center of the section and they are equally spaced in angle. The diameter of the section is calculated, as well as the concentricity, between the center of the section and the rotation axis determined by the shank. In addition the "effective cutting diameter" is computed which should coincide with the sum of the section diameter + 2 times the Run-out of the centre position, provided that the real section geometry fits the model.



The following dimensions are computed and displayed

- Effective Cutting Diameter
- Tool Diameter
- Run-out of the centre position

**Mode 3:**



This is a menu dedicated to check round parts (i.e. hard metal blanks). The following dimensions are computed and displayed

- Maximum diameter
- Minimum diameter
- Range of the center position (max C – min C)
- Diameter Range ( $\emptyset$  max –  $\emptyset$  min)

Measuring the range of the center position at different locations along the blank, it is possible to check the straightness of the blank.

**Mode 4:**

Use this menu when no hypothesis about the section geometry can be made



The following dimensions are computed and displayed

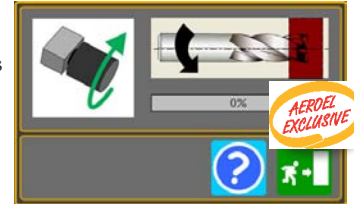
- Maximum diameter
- Minimum diameter
- Effective Cutting Diameter
- Diameter Range ( $\emptyset$  max –  $\emptyset$  min)

## The Super-Meclab.T Software

The Super-Meclab.T40 software has been designed to be extremely user friendly and very flexible. Thanks to the large 15" LCD display and the Touch Screen feature, you can browse the Menu and select the different working functions with a finger touch.

Automatic seeking of the "zero point"

A special guided procedure is available to reset the position reading at the part starting point.



Quick tolerance check

Each measured dimension can be compared with a pre-set nominal value and a tolerance range: a "traffic light" will immediately display the tolerance status of the part.

STEP.	PART NUMBER: 5		
	1	2	3
Average	19.976	6.201	19.970
Minimum	19.969	6.201	19.969
Maximum	19.990	6.202	19.970
Range		0.001	
Average	-8.087		
Minimum	-8.091		
Maximum	-8.082		
Range	0.009		
RULER POS	0.000	0.000	0.000

Multiple Measurements on the same Part

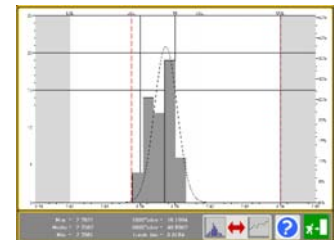
Several measurements can be taken on the same part, at different locations along the axis, to check the taper or the bending.

Data recording and exporting.

The measurement results are listed on the screen and they can be saved in the computer memory or exported in "text" or "Excel" format.

**Report printing**

A measurement report can be immediately printed by using a standard PC printer. A statistical report is available for each measured dimension the average, max and min values will be computed, as well as Standard Deviation and Cp and Cpk values.



**Part library for easy programming**

An almost unlimited number of control sets (tolerance limits, measuring mode, etc. ) can be stored in a "part library"



**Multiple-point user re-mastering capability**

It is possible to run a Multiple-point re-mastering procedure, to get a perfect match between the readings and the user's masters.

**Digital oscilloscope**

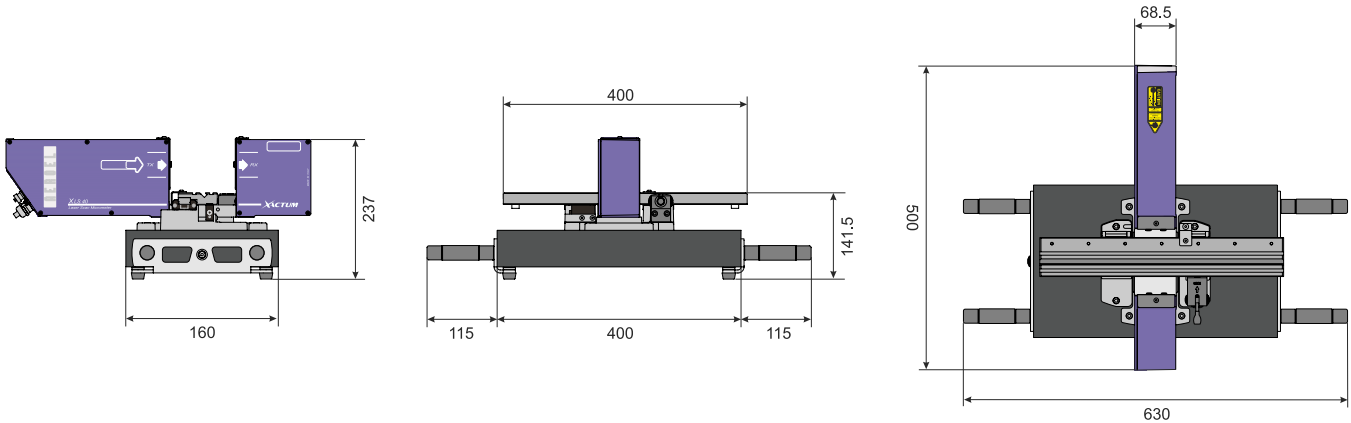
The waveform of the light pulse is sampled inside the gauge and transmitted to the PC. On the display screen you can see the actual signal as if you were using a digital oscilloscope.



**Help on line**

During operation, you can open a Help window where you will find the information you need to use the system. No hardcopy manual is needed.

**Specifications**



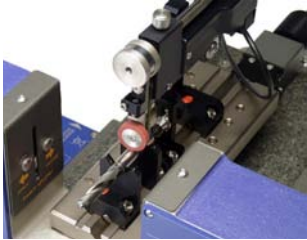
All dimensions are in mm.

Xactum XLS40/1200/B Laser Micrometer		
Measurable Diameters	(mm)	0.06 - 38
Linearity (Centred Product)	( $\mu\text{m}$ )	$\pm 0.5$
Linearity (in the Measuring Plane)	( $\mu\text{m}$ )	$\pm 0.5$
Repeatability (T=1s, $\pm 2\sigma$ )	( $\mu\text{m}$ )	$\pm 0.07$
Single Shot Repeatability ( $\pm 2\sigma$ )	( $\mu\text{m}$ )	$\pm 1.5$
Beam Spot Size (s,l)	(mm)	0.06 x 0.1
Scanning Frequency	(Hz)	1500
Gauge Thermal Coefficient	( $\mu\text{m}/\text{m}^\circ\text{C}$ )	- 11.5
Laser Source	VLD (Visible Laser Diode); $\lambda = 650 \text{ nm}$	
Super-Meclab.T40 System		
Dimensions	(mm)	518.5 x 630 x 237
Weight	(kg)	39



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

**Cutting Tool Fixture**



Slide: overall length 400 mm, range 160 mm and manual drive with knob, 0.5mm/ rev  
 Position transducer: magnetic digital read out, resolution 0.005 mm  
 Part holding: with a pair of 90° V blocks and a part stopper, adjustable along the slide  
 Fixture capacity: shank diameter from 1.2 to 20 mm, shank length from 22 to 100 mm, max. part length 200 mm (for different lengths please contact Freedom Technologies)  
 Rotation device: motor driven, with pushing wheel and stepper motor driver, local or automatic control from PC

**Touch-Screen PC**



LCD Display: 15" 1024x768 TFT color LCD - resistive touch screen  
 Hard disk: HD 2,5" 40GB / ATA5 4200RPM  
 Dimensions: 365 (w) x 235 (l) x 360 (h) mm  
 Weight: 6,8 kg  
 Display Tilt: 90° (upright) to 180° (flat)  
 Power: External Adapter 12VDC, 5A, 60W  
 Ventilation: Fanless  
 LAN standard: Fast Ethernet 10/100 Base T  
 USB: 4 x USB 2.0, 1x USB 1.1

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