

coefficient

MATE GAUGE DATASHEET

MATE GAUGE - S

IN-LINE THICKNESS GAUGE FOR BATTERY MANUFACTURING

APPLICATIONS

- Pasting Lines:
- For Installation before or after flash dry.
- Measures continuous strip or individual plates.



Individual Plates



Continuous Panel



Continuous Strip

MATERIALS

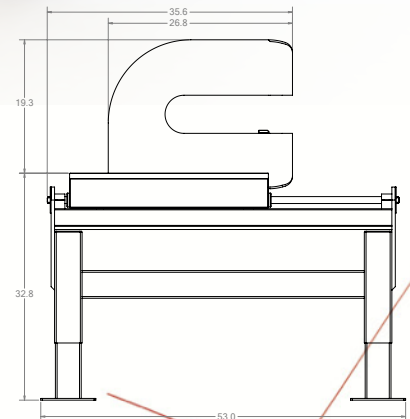
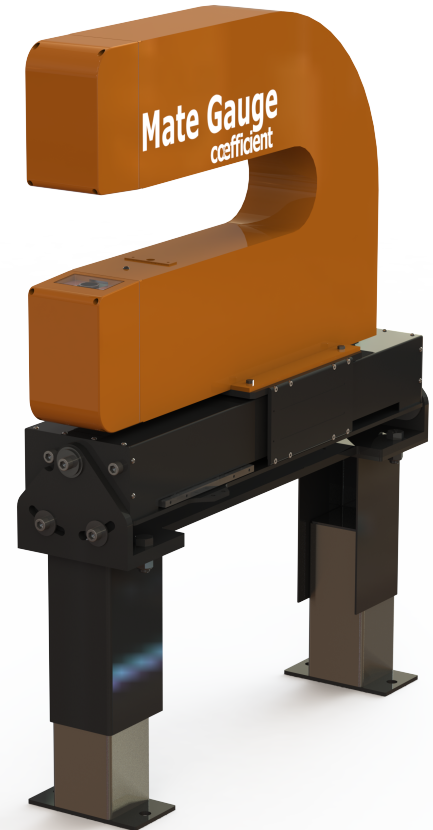
- Positive and Negative Pasted Plates
- Lead-oxide surfaces, pasting papers.

KEY FEATURES

- Closed-Loop Control
- Traversal Scanning
- Built-In Cooling and Temperature Stabilization
- Automatic Calibration
- Self-Cleaning and Self-Diagnostics

BENEFITS

- Save Material and Improve Quality by improving thickness consistency
- Eliminate side outside thickness variations
- Reduce operator error
- Provides statistical feedback for enabling process improvements



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MATE GAUGE DATASHEET

GENERAL

- ✓ NON-CONTACT MEASUREMENT
- ✓ FULL STRIP PROFILE DISPLAYED (UP TO 4 STRIPS)
- ✓ CLOSED LOOP THICKNESS CONTROL MODULE
- ✓ ACTIVE THERMAL CONTROL
- ✓ REPORTS MAX, MIN AND MEAN THICKNESS
- ✓ REPORTS SPEED, LENGTH AND TIME OF CAST
- ✓ TOUCHSCREEN DISPLAY
- ✓ DATA LOGGING CAPABILITY
- ✓ EASILY INSTALLED AND MAINTAINED
- ✓ NETWORKABLE
- ✓ REMOTE SUPPORT

TECHNICAL SPECIFICATION

PASTING LINE SPECIFICATIONS

Line Speed	100+ m / min	[300+ ft / min]
Plate Thickness (typical)	0.5 mm to 6 mm	[0.020 to 0.230 in]
Plate Type	Continuous Strip; Single or Dbl Panels	
Pasting Machine	Cloth Belt, Steel Belt, Drum, FOP	
Surface	With or without pasting paper, flat or textured.	
Line Location	Before or After Flash Dry	
Spray-Down	Near Spray Down is acceptable. Not intended for frequency high-pressure wash.	
Strip Width	14" to 30"	
Dust Rating:	IP58	

THICKNESS MEASUREMENT

Resolution	0.1 µm	[0.00004 in]
Accuracy (typical)	4 µm	[0.00016 in]
Stroke	38 cm	[15 in]
Scanning Speed	5 cm/sec	[2 in/sec]
Thickness Range	0 to 18 mm	[0 to 0.7 in]
Measurement Freq.	1 to 3 kHz	

WEIGHT

Sensor Assembly	28 kg	[62 lbs]
Sensor Panel	10kg	[22 lbs]
Operator Panel	10kg	[22 lbs]

SUPPLY REQUIREMENTS

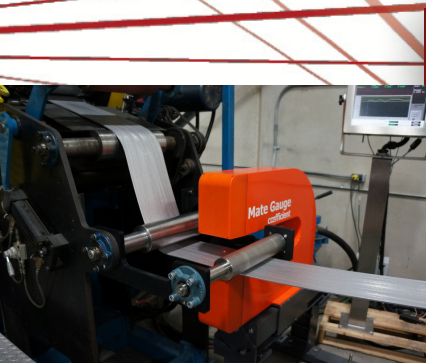
Supply Requirements	6 A @ 110V/60 Hz	3 A @ 240 V/50 Hz
Air	12 CFM @ 90 PSI	

PHYSICAL DIMENSIONS

Sensor Assembly	76 x 69 x 23 cm	[30 x 27 x 9 in]
Electrical Box	41 x 41 x 15 cm	[16 x 16 x 6 in]
Operator HMI Panel	51 x 51 x 15 cm	[20 x 20 x 6 in]

ENVIRONMENTAL

Operating Temperature	10 °C to 60 °C	[50 °F to 140 °F]
Humidity	< 90%	



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Realize your pasting line's full potential.

Co-efficient Precision Engineering is the leading developer and manufacturer of inline thickness control systems for the battery industry. We've solved Inline Thickness Gauging with purpose built robust equipment that stands up to the challenges of battery manufacturing. Co-efficient was founded in 2005 and specializes in the development and production of systems designed to improve process control, process quality, and reduce waste. Based on input from the inline thickness gauge, our Paste Saver thickness controller automatically adjusts the pasting machine to maintain set thickness, saving materials and reducing waste. The team at Co-efficient is dedicated to working with you to create, install and support high-performance systems for the battery industry that give you a competitive edge.

We are all about uptime: our technology platform detects and cleans sensor dirt, and automatic referencing means your operators will never need to spend time on calibration. For ease of installation, our engineers will model your layout and provide CAD for installation, keeping your highly demanded engineering resources focused on your needs. As part of your team we provide key metrics communicated via a daily report so you are always informed of any variations. Co-efficient systems let you produce the highest quality plates, reduce material and scrap losses, and keep production processes running smoothly.

Battery manufacturers love working with Co-efficient Inline Thickness Gauges. In fact, Co-efficient gauges are the most popular gauges for battery processes in the world!



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System Overview

The Co-efficient Mate Gauge automatic thickness measurement and control system is used in lead-strip production and pasted strip and plate production. Co-efficient manufactures and delivers the system including an electronics control panel and control software. Co-efficient can provide full 3D CAD of the system, and engineering assistance during integration of the gauge with existing process machinery.

The Mate Gauge is installed on newly purchased machines or on existing casting machines as a retro-fit. For retro-fit installations the electrical enclosure is free-standing and is typically placed within clear view of the pasting machine operator.

The gauge installation is completed without requiring additional rollers and without touching the strips, however additional stabilizing rollers may be recommended. The gauge utilizes two laser sensors - one underneath the strip and one above the strip. To provide continuous scanning, the sensors are mounted onto a scanning C-frame. The scanning stroke and the scanning speed can be adjusted through the control panel software. A typical scanning speed is 50 mm / sec. The Co-efficient Mate Gauge can be ordered in versions with linear strokes of 16" (406 mm) and 32" (812 mm).

The strip thickness profile and statistical values including strip average, minimum, and maximum per strip, are displayed on the control panel. Visualizations in the form of run charts are displayed. Alarming is configurable on the strips and is displayed visually and also via configurable digital outputs.

The software also features a self-calibration feature that measures a calibration tab on a set time cycle, typically every 2 minutes.

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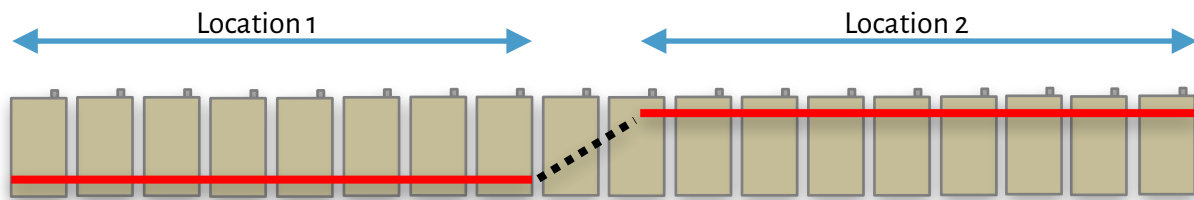
Fast Response

The gauge reports thickness for scans in either direction. Based on a typical scanning speed of 50 mm per sec, the thickness of all strips is typically reports 4 times per minute.

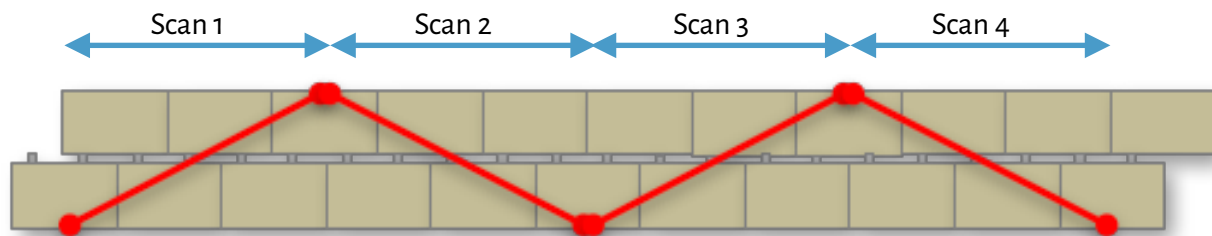
The sensors capability is to measure up to 3000 data points per second, however may be reduced to 1000Hz for more reflective surfaces. For rolled lead strip the measurement frequency is most commonly 2000 Hz. For pasted strip, the measurement frequency is 3000 Hz.

Flexible Scanning Modes to Capture what's needed.

The **“Gauge and Go”** operating mode sets a number of transverse locations that the sensors will travel two, for a defined period of time. While at each location, the sensors will continuously sample the thickness. The software will report the thickness at each location as well as the side to side difference.



“Scan Capture” Mode performs simultaneous strip traversal while thicknesses are recorded:

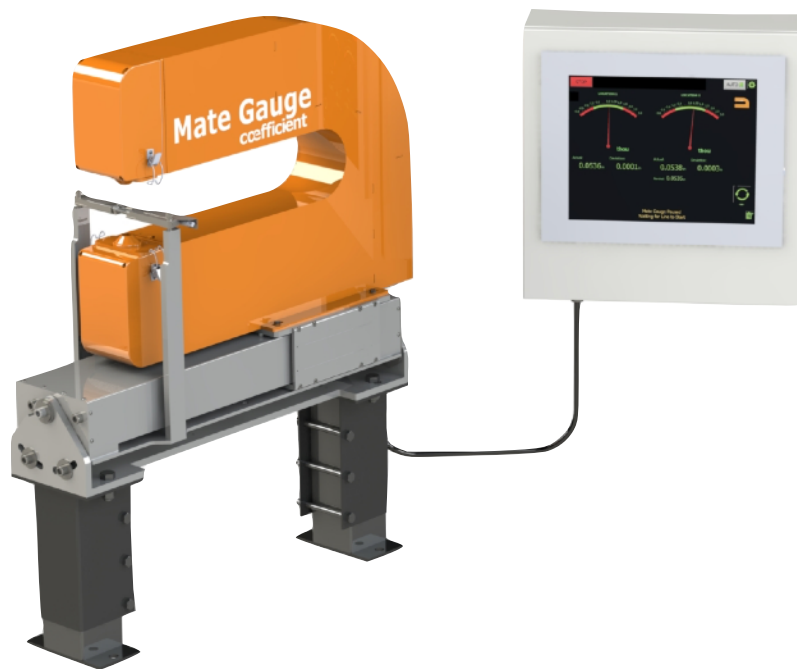


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Turn-key Features to Ensure Stability and Robustness.

- **Built-In Cooling** | An operating range of up to 60C.
- **Automatic Start/Stop** | when integrated with Stacker PLC.
- **Auto-Calibration** | Every 2 minutes.
- **Self-Cleaning** | Top and Bottom Air purge plus dirt detection.
- **Automatic Adjustment** | When integrated with our Paste Saver.



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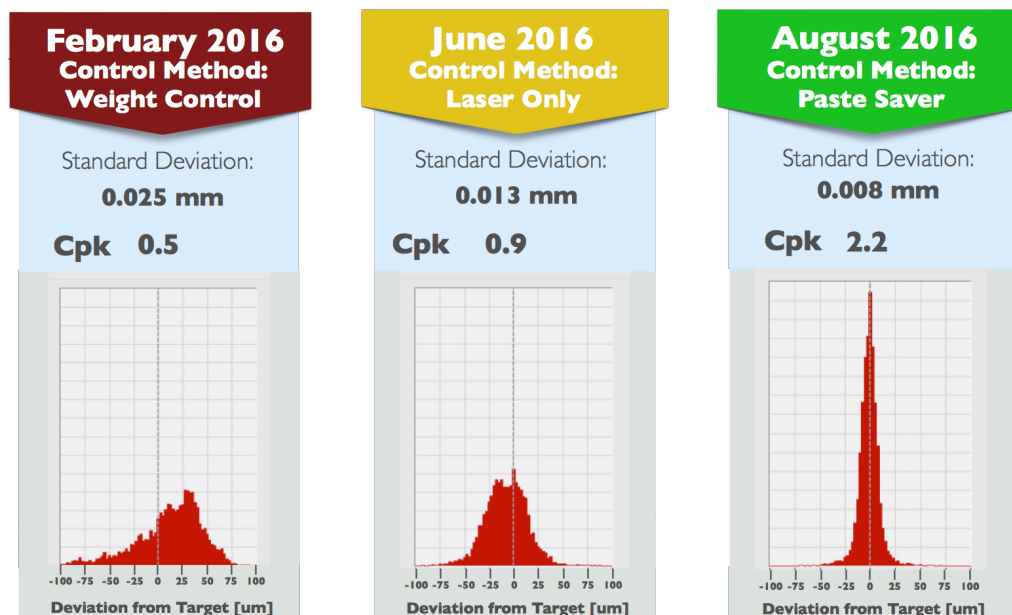
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The Data tells the Story.

Comparing data from before and after the gauge and control system are installed shows the benefit and improvement in pasting consistency. During a typical first installation at a factory, the gauge is run in “Blind Mode” where thickness data is being collected while the line is controlled using traditional methods, to allow collection of baseline data.

The next steps opens up the Mate Gauge display to the operator, allowing the line to be manually adjusted accordingly. The optimal performance is achieved by deploying the Co-efficient “Paste Saver” - a system that makes finer adjustments more often than any operator.



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Genuine Accessories.

Our customers love the fact that we can completely deploy within existing lines (in addition to working with leading pasting line manufacturers). Co-efficient provides custom stands and fixturing to locate the gauges on the line; stands and strip guides specific for continuous lines; custom fitted conveyors for panel lines, and gauge covers and protection.



Protective Shielding.



Strip Guide and Stand for Continuous Lines.



Conveyors for Panel Lines.

The Accessories you need for real inline results.

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Control and Display Purpose Built for Battery.

Visualizations is where the accurate data reaches the operators, a key player in the production. The display automatically links with datasources to synchronize the product being manufactured, in order to set targets thickness and threshold values. Alarming conditions appearing with levels of severity (yellow tag, red tag, flashing).

The visualizations show current thicknesses and run charts, of multiple locations across the plates. Additional screens showing the plate cross sectional thickness and continuous profile.



Large Numerical Display, Including Thickness Difference.



Display showing thickness at locations, and dual-location run-



Needle Gauge Location Showing Left - Right thickness.

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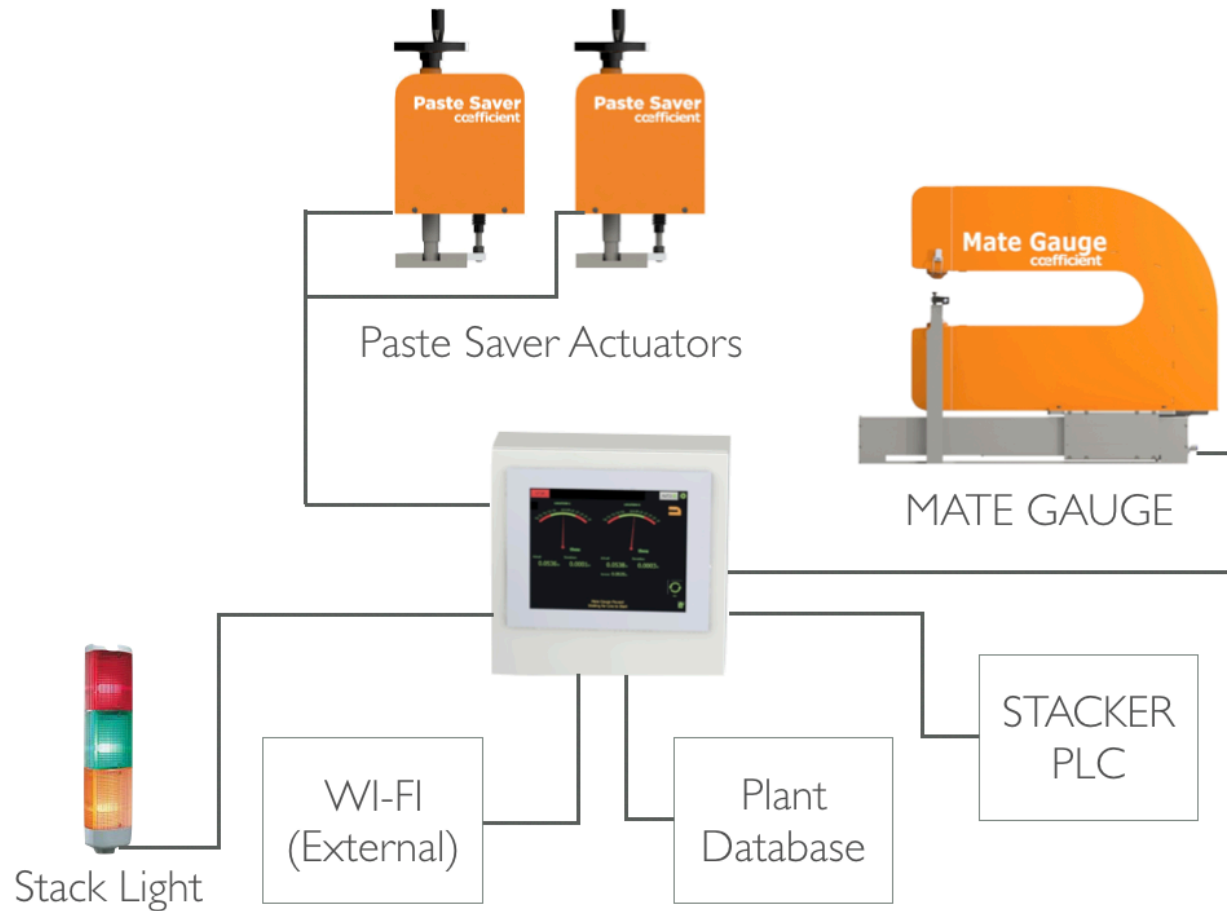
MATE GAUGE - SOFTWARE FEATURES

Operation Modes	Scan Capture
	Scan Capture - Sample
	Gauge and Go
	Gauge and Go - Micro Scan
	Gauge and Go - Four Corners
Measurement Filters	Signal Quality
	Outliers
	Working Range
	Deviation from recent average
	Deviation from target
Alarming System	Thickness
	Width
	Signal Quality
	Product centering
	System Health
Full Line Integration	Read line status from stacker
	Pass measurements to PLC
	Include PLC status in summary file
	Automatic Start/Stop of Mate Gauge based on line status
	Automatic product change based on product change at stacker PLC
Product Selector	Easily switch between multiple products manufactured on the same line
	Favourite products
User Interface	Separate UIs for Operators and Engineers
	Password Protected
Graphs and Visualizations	Thickness
	Shape
	Tilt
	Run Chart
	Needle Gauges (deviation from target)
Reporting	Measurement Summary file (MS Excel compatible)
	File Viewer (optional)
	Daily email report (optional)

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Full-Line Integration to make your systems interconnected for maximum effectiveness.



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Our Philosophy; Your Success.

The gauge and control software must fit into the regular work flow of the operators and the plant. The system is intended to save time and be easily maintained.

The system must be used to improve performance, rather than a tool for monitoring and policing bad performance.

The systems provide a sense of control of performance, and make historical data easily available.

Control System software provides the ultimate value by taken proven accurate measurements and providing continuous adjustment independent of operator.

Maintenance Steps

The key maintenance steps involve the cleaning the laser sensor glass and reference gauge. The recommended cleaning frequency is 24 hours for rolling line. The cleaning operation takes less than 3 minutes. Lint-free wipes (trade name Kim Wipes) are used for the cleaning, along with iso-propyl alcohol. Cleaning supplies are shipped with the unit.

Additional yearly lubrication recommended maintenance instructions are provided with the unit.

CE Declaration

The Co-efficient system will be provided along with a CE “Declaration of Incorporation”.

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Mate Gauge communicates with your Manufacturing Line.

Ready integration with your pasting line PLCs.

Connecting systems allows for increasing ease of use and value of the collected data. Thickness readings can be written to tags in your PLC's, in a format fully understood by your controls technicians, and allowing them to interact with the data like any machine on your manufacturing floor.

Automatic Start-Stop Functionality: By reading the line speed from the pasting machine or stacker, the Mate Gauge knows when to begin scanning and when to stop and get out of the way. The gauge starts automatically so line operators can put their focus on the process without worrying about starting and stopping equipment.

Automatically Read Product Types: Your plate types can be read in automatically, so the Mate Gauge knows what products you are making and will set its quality parameters accordingly. The

Required Tags

Product Name	Tag containing current product. Required when automatic product change selected.
Plate Count	Tag containing the current plate count. Stored in result file along with Mate Gauge data.
Line Speed	Tag containing the current line speed at the gauge. Required for four corners detection. Stored in result file. Can be used to determine line state.
Line Active?	Tag containing a Boolean value stating whether the line is currently running. Preferred way for automatic gauge start/stop.



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