

Precision Glass Scales



Acu-Rite Companies Inc.

The technology of choice.



Vacuum coating equipment ensures consistent chromium deposition.

Accurate. Reliable. And flexible.

Glass scale technology is the industry standard for readout systems and is preferred worldwide by machine tool manufacturers for position feedback. For nearly 50 years, Acu-Rite Companies Inc.'s precision glass scale technology has proven its superior reliability through consistent accuracy and durability.

How they work.

An Acu-Rite Companies Inc. precision glass scale consists of an optical-quality glass scale and a photoelectronic reading head. The reading head slides along the glass scale, illuminating a precision chrome line pattern. This pattern is sensed by the photodetectors, which generate an electronic signal.

You can illustrate this process yourself with two hair combs. If you were to take two combs and lay them one on top of the other in front of a light source, and then move them back and forth, you would see a wavy pattern similar to that which the encoder's light receptors detect.

However, because your eyes aren't as acute as electronic receptors, conditions like rain or fog would obscure your vision. Photodetectors, being much more sensitive, can detect the more intense infrared light through liquid contaminants, such as coolant or oil.

The glass process.

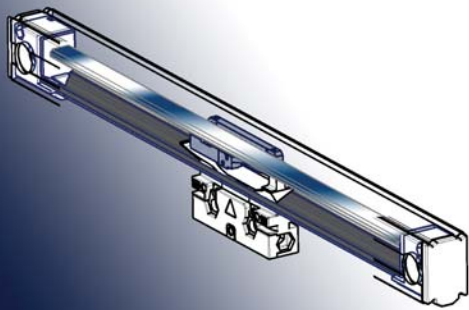
To produce an Acu-Rite Companies Inc. precision glass scale, a photolithographic process is used to place an extremely precise pattern of chrome lines and spaces on glass.

Making all of this possible is Acu-Rite Companies Inc.'s unique manufacturing facility featuring a 10,000 square foot clean room and a one-of-a-kind, (in the United States), scale replication process. Vibration isolated equipment and a class 100 clean room environment, maintained with precision temperature control at 20 degrees C \pm .02 degrees C, are all computer controlled to ensure process integrity. Repeatable accuracy and quality are the results of this innovation.

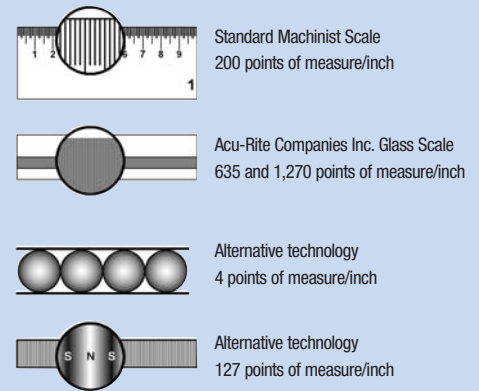
Accuracy and resolution.

Only with Acu-Rite Companies Inc.'s precision glass scale technology can you be assured that the encoder on your machine tool is checking its actual position thousands of times in every inch of travel.

An Acu-Rite Companies Inc. 1 μ m precision glass scale has 1,270 accurately placed chrome lines per inch, each of which a photoelectronic reading head detects as it slides across the glass. This gives Acu-Rite Companies Inc.'s precision glass scales a fundamental measuring interval 10 times finer than the nearest alternative encoder technology.



Scale cut-away shows the inner construction of Acu-Rite Companies Inc.'s durable precision glass scales.



In comparison, alternative technologies rely on excessive electronic math interpolation to produce a calculated position.



Scale-replicating equipment in a Class 100 clean room environment.

The ability of Acu-Rite Companies Inc. precision glass scales to reliably measure accurate positions is due to the excellent qualities of the glass itself. Glass is an inherently stable material that resists changes in size, shape or density due to temperature variations. This stability allows for the generation of an ultra-fine line pattern; providing Acu-Rite Companies Inc. precision glass scales with exceptional accuracy for travel lengths from 1"-120" in resolutions from 10 μ m to 0.5 μ m.

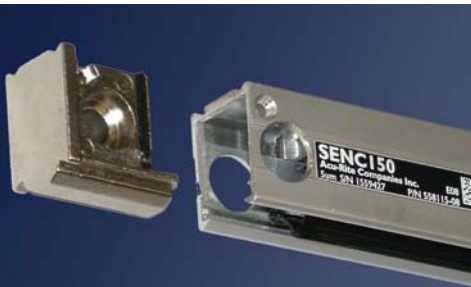
Durability.

Acu-Rite Companies Inc. precision glass scales withstand a variety of harsh conditions that exist in machine shop environments – such as extreme temperatures, contamination and humidity. Every Acu-Rite Companies Inc. design undergoes extensive qualification testing to ensure that it meets or exceeds customer expectations.



Stringent testing procedures ensure reliability in severe machine shop environments.

Acu-Rite Companies Inc. precision glass scales and encoder optics are enclosed in an aluminum housing with sealed, die-cast metal end caps which make them virtually unbreakable during standard machine tool usage.



Interlocking, sealed die-cast end caps protect the scale from metal chips and other contaminants.

Less than a fraction of one percent of over one million Acu-Rite Companies Inc. precision glass scales currently in machine shop environments have been returned due to glass breakage.



To enhance system durability, the glass scale and sensor are protected from the environment by a recessed, highly chemical-resistant, interlocking lipseal to

Cross-sectional view of Acu-Rite Companies Inc. precision glass scale highlighting recessed chemical resistant interlocking lipseal.



Conformal coating is applied for extra protection.

further prevent the entry of metal chips and other contaminants. A nickel-plated armor cable offers additional protection and allows for a tighter bend radius.

Acu-Rite Companies Inc. also applies a conformal coating that seals the wires and circuitry inside the reading head, leaving little chance for failure.

Acu-Rite Companies Inc. precision glass scales provide long-lasting operation over thousands of miles of movement.

Calibration/Certification.



Every Acu-Rite Companies Inc. precision glass scale is tested for performance and accuracy before it is shipped. As the last step in the manufacturing

process, calibration is performed in an environment that is temperature controlled to within ± 0.1 degree C, using measuring equipment accurate to within $0.1 \mu\text{m}/\text{meter}$. A graph of the accuracy performance is plotted and included with each scale.

Position-Trac™ Advanced Technology.

Acu-Rite Companies Inc. readout systems include Position-Trac™ a unique feature that answers the need for battery backup by providing a quick reference to the last known zero. Position-Trac™ significantly reduces time-consuming setups after power loss.



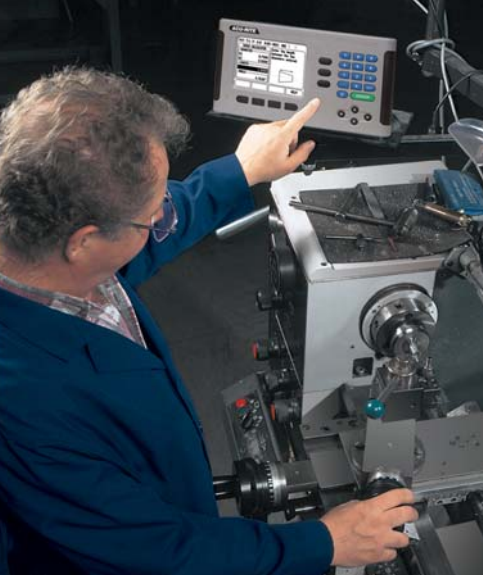
Environmental test chamber ensures that all reading heads can withstand extremes in temperature and humidity.



Precision glass scale test fixture verifies a minimum of 13 million cycles.



Test equipment verifies performance when subjected to flood coolant conditions.



Low cost of ownership.

The fact is, all encoder technologies require some kind of maintenance. But because of the stability and durability of glass, combined with our protective design, Acu-Rite Companies Inc. precision glass scales have been proven to last for many years with minimal maintenance, as thousands of our customers would tell you.

When you buy Acu-Rite Companies Inc. precision glass scales, you get reliability. We are committed to the continuous



Acu-Rite Companies Inc. Readout Systems accurately measure machine movements and communicate this information to the operator in a clear, concise manner.



Dependable. Consistent. And affordable.

Acu-Rite Companies Inc. products are designed to meet UL, CSA, and CE requirements and are manufactured in the United States at Acu-Rite Companies Inc.'s ISO 9001 registered facility.

All Acu-Rite Companies Inc. precision glass scales and readouts are protected by a 3-Year Hassle-Free Warranty. No questions asked.

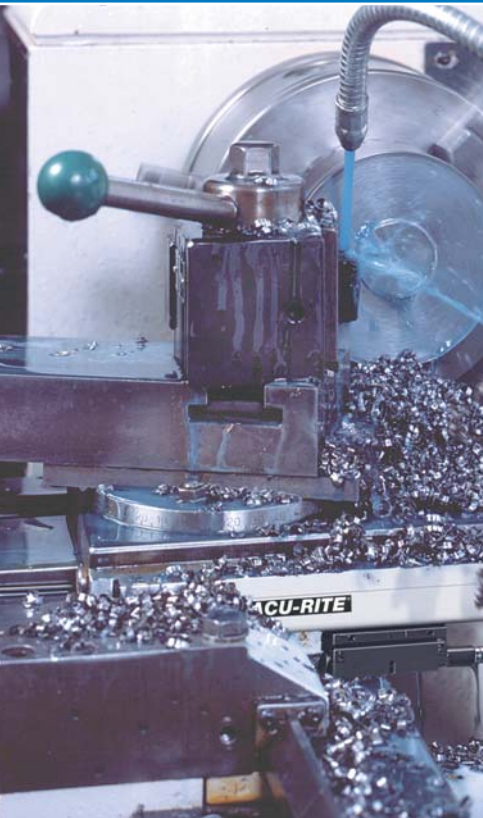
improvement of our products, manufacturing processes and the skills of our people, in order to provide our customers with long-lasting products of the highest quality.

We continually upgrade and employ the most modern manufacturing processes, like surface mount technology and unique ultra precision glass scale replication equipment. This enables us to continue to offer our customers dependable quality and consistent product performance at an affordable price.

Service and support.

Acu-Rite Companies Inc. maintains a strong worldwide distribution network of fully trained and qualified personnel to provide quality sales and service support. This network is readily available to provide prompt delivery, thorough product training and skilled technical service.

We invite you to tour our facility and meet the people who are dedicated to accomplishing Acu-Rite Companies Inc.'s mission in the marketplace. Take a step into the next generation of productivity-enhancing readout systems by contacting your authorized Acu-Rite Companies Inc. distributor today for a hands-on demonstration of our complete family of user-defined, application-specific readout systems and precision glass scales. We're confident you'll be more than pleased that you did.



Acu-Rite Companies Inc. precision glass scales are specially designed to maintain high accuracies in even the harshest machine shop environment.

Precision Glass Scales

SENC 50 Precision Glass Scale

The SENC 50 scale offers a compact design for cross slides of lathes or other applications with limited mounting space. SENC 50 scales are available in travel lengths from 1" – 20", in resolutions of 0.5µm, 1µm or 5µm and with an accuracy of ±5µm/meter.



SENC 150 Precision Glass Scale

The SENC 150 scale is ideal for mills, lathes, grinders and EDMs. SENC 150 scales are available in travel lengths of 2" – 120", in resolutions of 0.5µm, 1µm, or 5µm and with an accuracy of ±5µm/meter.



ENC 125 Precision Glass Scale

The ENC 125 scale is designed to satisfy a wide range of application needs and is available in top (T) and end (E) mount configurations. ENC 125 scales are available in travel lengths of 2" – 120", in resolutions of 5µm or 10µm and with an accuracy of ±10µm/meter.



ENC 250 Steel Tape Scale

ENC 250 scales are ideal for more rugged applications requiring longer travels, including lathes, boring mills and other large machine tools. ENC 250 scales are available in travel lengths of 127" – 773", in a resolution of 5µm and with an accuracy of ±15µm/meter.



Precision Glass Scales

SCALE SPECIFICATIONS

Encoder	SENC 50			ENC 125T/E		SENC 150			ENC 250
	0.5µm (.00002")	1µm (.00005")	5µm (.0002")	0.5µm (.0002")	10µm (.0005")	0.5µm (.00002")	1µm (.00005")	5µm (.0002")	5µm (.0002")
Resolution									
Accuracy (at 20 degrees C)									
µm, ±, in any 50mm (2")	1.5	1.5	1.5	—	—	1.5	1.5	3.0	—
µm, ±, in any 250mm (10")	3.0	3.0	3.0	—	—	3.0	3.0	4.0	—
µm, ±, in any 1000mm (40")	5.0	5.0	5.0	10.0	10.0	5.0	5.0	5.0	15.0
	SENC 50			ENC 125T/E		SENC 150			ENC 250
Signal Output	Differential Digital or Analog			Digital		Differential Digital or Analog			Differential Digital
Scale Principle	Optical/Glass			Optical/Glass		Optical/Glass			Optical/Steel Tape
Maximum slew speed (in/sec)									
at 10 degrees C to 30 degrees C	40			30		40			40
at 0 degrees C to 40 degrees C and 30 degrees C to 40 degrees C	21								40
Operating Environment									
Temperature	0° to 50° C			0° to 40° C		0° to 50° C			0° to 40° C
Humidity (non-condensing)	25% to 95%			20% to 95%		25% to 95%			25% to 95%
Cable Material	Galvanized Armor or Vinyl			Braided		Nickel-plated Armor or Vinyl			Nickel-plated Armor
Cable Length	5, 13, 19 ft.			13, 19 ft.		5, 13, 19 ft.			2 ft.
Maximum Cable Length (ft)	35 ft. (Digital) / 75 ft. (Analog)			35 ft. (Digital)		35 ft. (Digital) / 75 ft. (Analog)			75 ft. (VRO) / 35 ft. (DRO)
Measuring Lengths (in)	1"-20"			2"-120" (T) / 2"-22" (E)		2"-120"			127"-773"
Reference Mark Interval	50mm fixed or Position-Trac™			200mm fixed		50mm fixed or Position-Trac™			Position-Trac™
Endcaps	Sealed Die-Cast Metal			Sealed Plastic		Sealed Die-Cast Metal			Sealed Metal
Sealed Reading Head Electronics	Yes			Yes		Yes			Yes
Lipseal Material	Recessed Interlocking Polyurethane			Recessed Interlocking Fluoroelastomer		Recessed Interlocking Fluoroelastomer			Recessed Interlocking Polyurethane

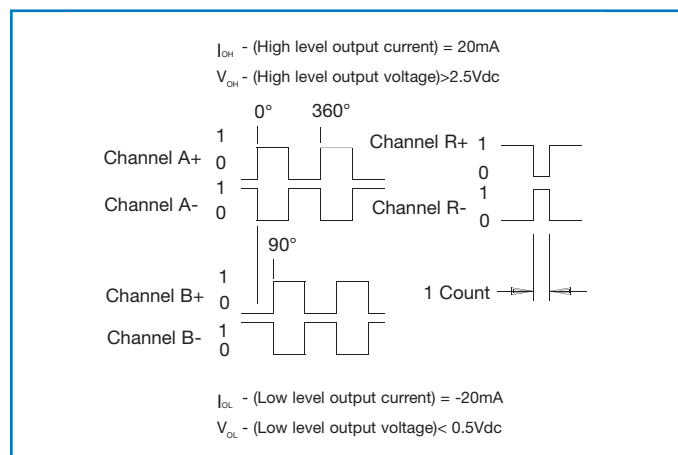
ELECTRICAL SPECIFICATIONS

Digital	
Light Source	LED (Light-emitting diode)
Operating Voltage (VDC)	5.1 ± 0.1
Operating Current (Max. mA)	180 - 220mA (SENC 50, SENC 150) / 100mA (ENC 125)
Analog	
Light Source	LED (Light-emitting diode)
Operating Voltage (VDC)	5.0 ± 0.1
Operating Current (Max. mA)	75

ANALOG PIN-OUTS AND OUTPUT SIGNALS

Pin	Signal	SENC 50 Wire Color	SENC 150 Wire Color
1	Ground	White w/Green stripe & Brown	White
2	Channel A+	Green	Green
3	Channel A-	Yellow	Yellow
4	Channel B+	Orange	Blue
5	Channel B-	Red	Red
6	No Connection		
7	Supply Voltage	Black	Brown
8	Channel R- (-Reference Mark)	Blue	Pink
9	Channel R+ (+Reference Mark)	Violet	Gray
Shell	Shield		

NOTE: Features and specifications are subject to change without notice and/or obligation. Your Acu-Rite Companies Inc. Representative is your best source for up-to-date information.

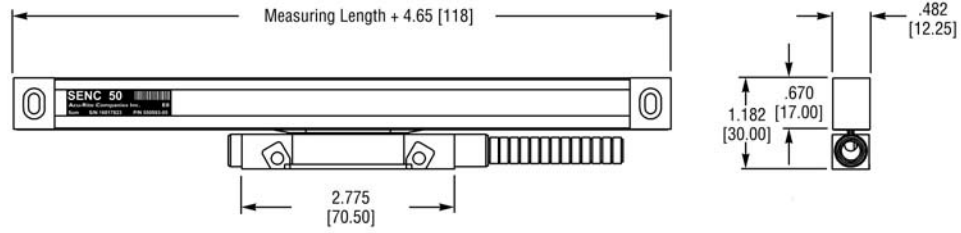


DIGITAL PIN-OUTS AND OUTPUT SIGNALS

DE Pin	Signal	SENC 50 Wire Color	ENC 125 Wire Color	SENC 150/ENC 250 Wire Color
1	No Connection			
2	Channel A+	Green	Green	Green
3	Channel A-	Yellow	No Connect	Yellow
4	Channel B+	Pink	Blue	Blue
5	Channel B-	Red	No Connect	Red
6	Ground	White	White	White
7	Supply Voltage	Black	Brown	Brown
8	Channel R+ (+Reference Mark)	Gray	Pink	Pink
9	Channel R- (-Reference Mark)	Brown	No Connect	Gray
Shell	Shield			

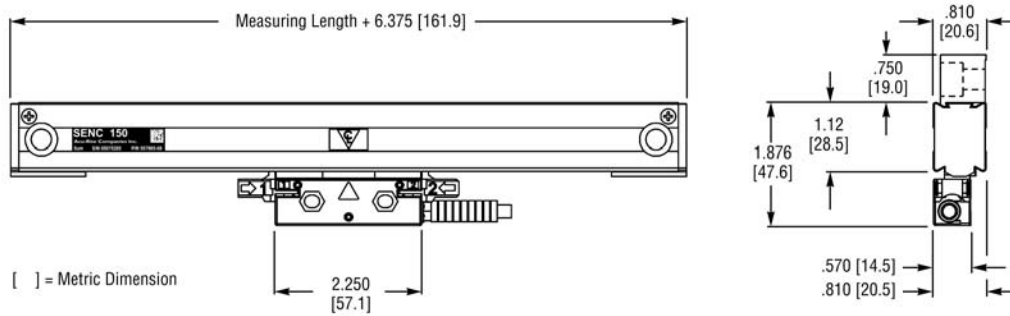
Technical Specifications

SENC 50



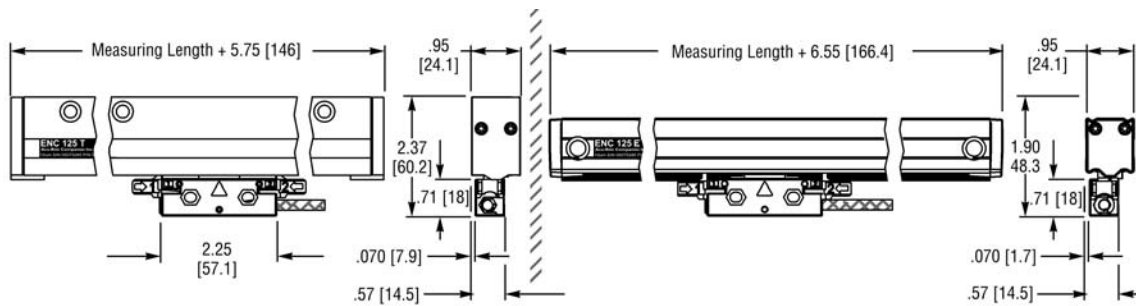
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SENC 150



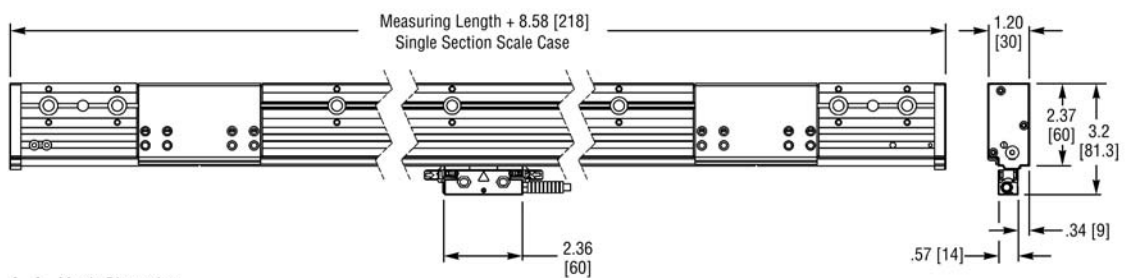
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ENC 125 T/E



[] = Metric Dimension

ENC 250



[] = Metric Dimension



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Acu-Rite Companies Inc.

The technology of choice.



Providing the world's most complete line of readout systems.

Acu-Rite Companies Inc. offers a complete family of user-defined, application-specific readout systems that feature greater ease of use and flexibility, reduced setup time and increased accuracy, productivity, durability, reliability and workpiece quality. Milling, turning, grinding, EDMing and other applications can be significantly enhanced by utilizing an Acu-Rite Companies Inc. readout system that has been designed to solve the specific positioning needs you face every day.

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