

ACU-RITE[®]

PRECISION GLASS SCALES....

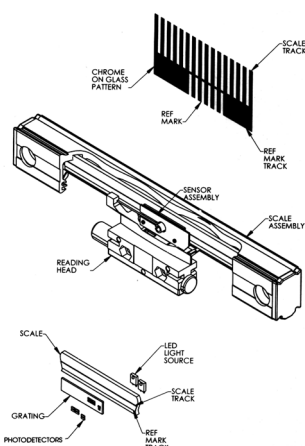


THE TECHNOLOGY OF CHOICE





Vacuum coating equipment ensures consistent chromium deposition.



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

GLASS SCALE TECHNOLOGY IS THE INDUSTRY STANDARD FOR READOUT SYSTEMS AND IS PREFERRED WORLDWIDE BY MACHINE TOOL MANUFACTURERS FOR POSITION FEEDBACK. FOR NEARLY 40 YEARS, ACU-RITE'S PRECISION GLASS SCALE TECHNOLOGY HAS PROVEN ITS SUPERIOR RELIABILITY THROUGH CONSISTANT ACCURACY AND DURABILITY.

HOW THEY WORK

An ACU-RITE 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, 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.

GLASS PROCESS

To produce an ACU-RITE 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'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 $\pm$ 0.02 degree C, are all computer controlled to ensure process integrity. Repeatable accuracy and quality are the results of this innovation.

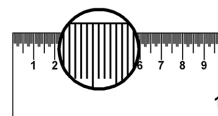
"We haven't had to clean an ACU-RITE glass scale yet, despite carbon dust and strong coolants."

Wayne Parks,
Strommen Engineering Corp.
Hamel, MN

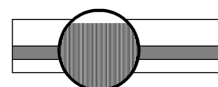
ACCURACY AND RESOLUTION

Only with ACU-RITE'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.

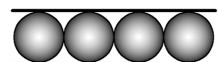
An ACU-RITE 1 μ m precision glass scale has 1,270 accurately placed chrome lines per inch, each of which a photoelectronic reading head detects as it slides across the glass. This gives ACU-RITE's precision glass scales a fundamental measuring interval 10 times finer than the nearest alternative encoder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



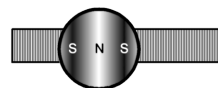
Standard Machinist Scale
200 points of measure/inch



ACU-RITE Glass Scale
635 and 1,270 points of measure/inch



Alternative technology
4 points of measure/inch



Alternative technology
127 points of measure/inch

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

The ability of ACU-RITE 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 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 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 design undergoes extensive qualification testing to ensure that it meets or exceeds customer expectations.



Stringent chemical tests ensure reliability in severe machine shop environments.

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



Cross-sectional view of ACU-RITE precision glass scale highlighting recessed chemical resistant interlocking lipseal.

ACU-RITE also applies a conformal coating that seals the wires and circuitry inside the reading head, leaving little chance for failure.



Conformal coating is applied for extra protection.

ACU-RITE precision glass scales provide long-lasting operation over thousands of miles of movement.

“Our operators are very happy with ACU-RITE readout systems. We’ve standardized on ACU-RITE because of their performance, reliability and support.”

*Carlos Lugo,
Boeing Commercial
Airplane Group*

CALIBRATION CERTIFICATION

Every ACU-RITE 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.



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.

POSITION-TRAC™... ADVANCED TECHNOLOGY

ACU-RITE 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.



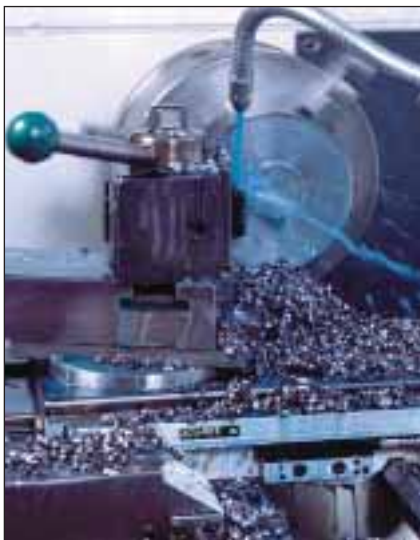
Test equipment verifies performance when subjected to flood coolant conditions.



ACU-RITE Readout Systems accurately measure machine movements and communicate this information to the operator in a clear, concise manner.



All ACU-RITE precision glass scales and readouts are protected by a comprehensive 3-year warranty.



ACU-RITE precision glass scales are specially designed to maintain high accuracies in even the harshest machine shop environment.

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 precision glass scales have been proven to last for many years with minimal maintenance, as thousands of ACU-RITE customers would tell you.

When you buy ACU-RITE precision glass scales, you get reliability.

ACU-RITE is committed to the continuous improvement of its products, manufacturing processes and the skills of its people in order to provide its customers with long-lasting products of the highest quality.

We continually upgrade and employ the most modern manufacturing processes,

"Our ACU-RITE readout systems are used 10-12 hours a day every day and we haven't had any problems."

*Herm Battles,
C-J Industries,
Meadville, PA*

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 maintains a strong worldwide distribution network of fully-trained and qualified personnel to provide quality sales and service support. ACU-RITE's distribution network is readily available to provide prompt delivery, thorough product training and skilled technical service.

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



We invite you to tour our facility and meet the people who are dedicated to accomplishing ACU-RITE's mission in the marketplace. Take a step into the next generation of productivity-enhancing readout systems...contact your authorized ACU-RITE 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.

MicroScale™

MicroScales offer a compact design for cross slides of lathes or other applications with limited mounting space. MicroScales are available in travel lengths from 1" – 60", in resolutions of 0.5µm, 1µm or 5µm and with an accuracy of $\pm 5\mu\text{m}/\text{meter}$.

**ENC 150 Scale**

The all new ENC 150 precision glass scale is ideal for EDMs, grinders, lathes and mills. ENC 150 precision glass scales are available in travel lengths of 2" – 120", in resolutions of 0.5µm, 1µm, 2µm, 5µm, or 10µm and with an accuracy of $\pm 5\mu\text{m}/\text{meter}$.

**AR-5 Scale**

AR-5 precision glass scales are ideal for more rugged applications requiring longer travels, including vertical turret lathes, boring mills, press brakes and other large machine tools. AR-5 precision glass scales are available in travel lengths of 12" – 120", in resolutions of 5µm or 10µm and with an accuracy of 10µm/meter.

**AR-10 PLUS Scale**

AR-10 PLUS scales are specifically designed to maintain high accuracy over long travels. AR-10 PLUS scales are available in travel lengths from 128" – 773", in a 5µm resolution and with an accuracy of $\pm 10\mu\text{m}/\text{meter}$.



SCALE SPECIFICATIONS

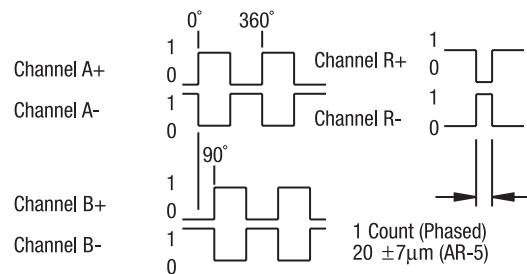
	ENC 150					MicroScale™			AR-5		AR-10 PLUS
Resolution	0.5µm (.00002")	1µm (.00005")	2µm (.0001")	5µm (.0002")	10µm (.0005")	0.5µm (.00002")	1µm (.00005")	5µm (.0002")	5µm (.0002")	10µm (.0005")	5µm (.0002")
Accuracy (at 20 degrees C)											
µm, ±, in any 50mm (2")	1.5	1.5	1.5	3.0	3.0	1.5	1.5	3.0	6.0	6.0	—
µm, ±, in any 250mm (10")	3.0	3.0	3.0	4.0	4.0	3.0	3.0	4.0	6.0	6.0	—
µm, ±, in any 1000mm (40")	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0
	ENC 150					MicroScale™			AR-5		AR-10 PLUS
Signal Output	Digital					Digital			Digital		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					40			40		40
at 0 degree C to 10 degrees C and 30 degrees C to 40 degrees C	40					21			40		40
Operating Environment											
Temperature	0 degree to 40 degrees C					0 degree to 40 degrees C			0 degree to 40 degrees C		0 degree to 40 degrees C
Humidity	25% to 95% (non-condensing)					25% to 95% (non-condensing)			25% to 95% (non-condensing)		25% to 95% (non-condensing)
Cable Material	Nickel-plated Armor or Vinyl					Nickel-plated Armor or Vinyl			Nickel-plated Armor or Vinyl		Vinyl-coated Armor
Cable Length	2, 5, 10, 15, 20 ft.					2, 5, 10, 15, 20 ft.			10 ft.		10 ft.
Maximum Cable Length	35 ft.					36 ft. / 26 ft.			36 ft.		—
Measuring Lengths	2"-120"					1"-60"			12"-120"		128" - 773"
Reference Mark Interval	Distance Encrypted					100mm			200mm		1 Placeable
End Caps	Sealed Die-cast Metal					Sealed Die-cast Metal			Plastic		Plastic
Sealed Reading Head Electronics	Yes					Yes			No		Yes
Lipseal Material	Recessed Interlocking Polyurethane					Recessed Interlocking Fluoroelastomer			Interlocking Polyurethane		Recessed Interlocking Polyurethane

ELECTRICAL SPECIFICATIONS

Light Source	LED (Light-emitting diode)
Operating Voltage (VDC)	5.1 ±0.1
Operating Current (Max. mA)	140
Differential Output Signals (Incremental) (TTL level)	Two square-wave voltage signals, channels A and B, in 90° quadrature relationship
Reference Mark (TTL level)	One square-wave pulse

I_{OH} = (High level output current) = 20 mA

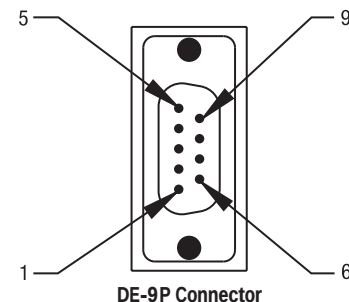
V_{OH} = (High level output voltage) > 2.5 Vdc



I_{OL} = (Low level output current) = -20 mA

V_{OL} = (Low level output voltage) < 0.5 Vdc

For single-ended output only A+, B+ and R+ apply



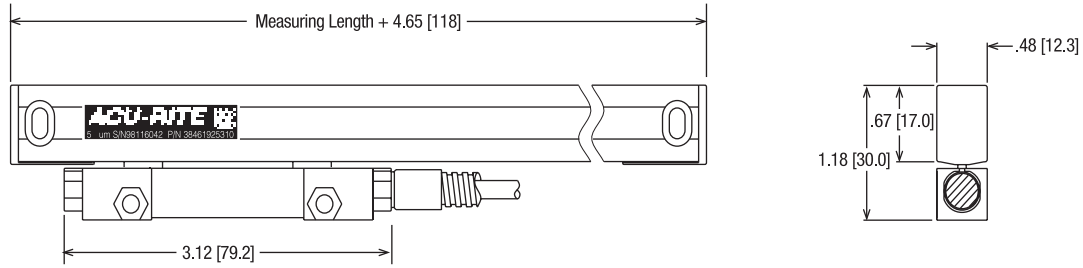
DE-9P Connector

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

DIGITAL PIN-OUTS AND OUTPUT SIGNALS

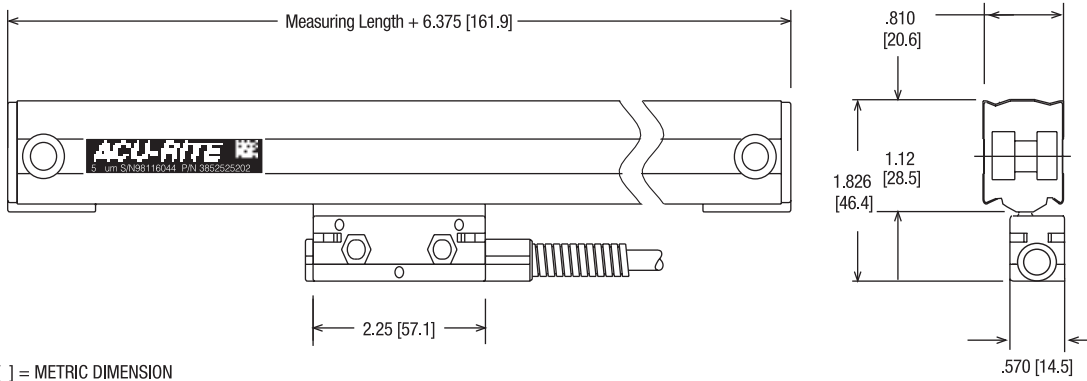
DE Pin	Signal	Wire Color
1	No Connection	
2	Channel A+	Green
3	Channel A-	Yellow
4	Channel B+	Blue
5	Channel B-	Red
6	Ground (power supply and signal return)	White
7	Supply Voltage	Brown
8	Channel R+ (+Reference Mark)	Pink
9	Channel R- (-Reference Mark)	Gray
	Shield	Drain

MicroScale™



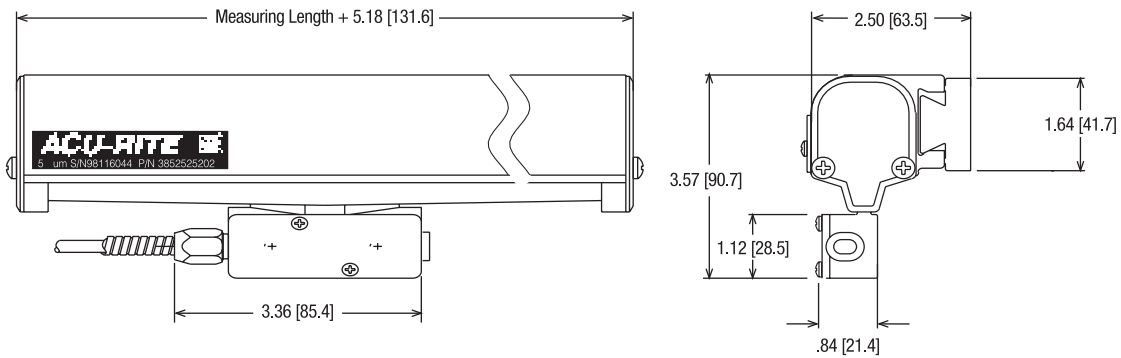
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ENC 150



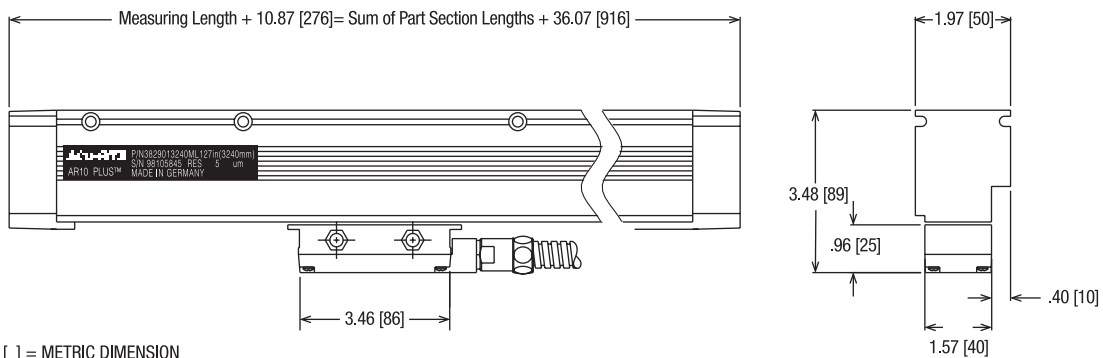
[] = METRIC DIMENSION

AR-5



[] = METRIC DIMENSION

AR-10 PLUS



[] = METRIC DIMENSION

ACU-RITE®

Providing the world's most complete line of readout systems

ACU-RITE 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 readout system that has been designed to solve the specific positioning needs you face every day.



ACU-RITE IS AN
ISO 9001
CERTIFIED
MANUFACTURER



ACU-RITE®

ACU-RITE INCORPORATED

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