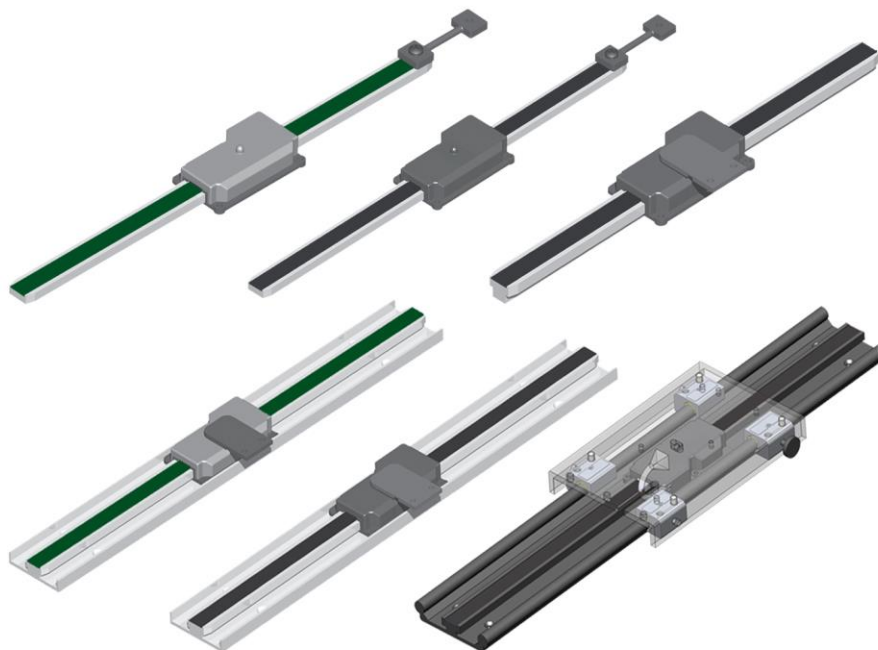


# Accurate

TECHNOLOGY INC.

*Linear Digital Measuring Systems*

## ProScale®



**Models 150, 250, 190, 290, 390 & 590**

**Scale & Encoder Installation**



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# WARRANTY

Accurate Technology, Inc. warrants the ProScale Measurement Systems against defective parts and workmanship for 1 year commencing from the date of original purchase. Upon notification of a defect, Accurate Technology, Inc., shall have the option to repair or replace any defective part. Such services shall be the customer's sole and exclusive remedy. Expenses incidental to repair, maintenance, or replacement under warranty, including those for labor and material, shall be borne by Accurate Technology, Inc. (Including freight or transportation charges during the first 30 days).

Except as expressly provided in this warranty, Accurate Technology, Inc. does not make any warranties with respect to the product, either expressed or implied, including implied warranties of merchantability or fitness for a particular purpose, except as expressly provided in this agreement.

Accurate Technology, Inc. shall not be liable for any special, incidental, or consequential damages or for loss, damage or expense directly or indirectly arising from the customer's use of or inability to use the equipment either separately or in combination with other equipment, or for personal injury or loss or destruction of other property, or from any other cause.

To request repair work, (either warranty qualified parts or not) contact Accurate Technology, Inc. directly by phone, fax, or e-mail. A Returned Merchandise Authorization (RMA) number is required before returning a product for repair.

## Accurate Technology, Inc.

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## **SAFETY WARNING**

**Before installing ProScale on any machinery:  
Turn off machine and disconnect power.**

## **SAFETY WARNING**

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## Introduction

ProScale digital measuring systems are affordable precision electronic devices for making linear measurements with speed and accuracy. ProScale consists of a **SCALE**, an **ENCODER** (also called **READHEAD**), and a **DIGITAL READOUT**, or **DRO**. ProScale [150](#) and [250](#) use [Capacitive Absolute](#) technology, while the Model [190](#), [290](#), [390](#) and [590](#) use Series 2 [Inductive Incremental technology](#).

Because ProScale is a solid-state electronic device there's very little to wear out. The Encoder and Scale are designed to withstand shop dirt, dust, and other airborne contaminants, and the controls are sealed with a protective cover. With normal care, ProScale will last for years.

ProScale is ideal for most measuring requirements up to 6m (20ft) where high [accuracy](#) (less than 10  $\mu\text{m}$ ), is not needed, but affordable [repeatability](#) (better than a tape measure), or accuracy to 50  $\mu\text{m}$  (.002") is desired. Because ProScale shows the exact measurement on its Digital Readout, it eliminates the guesswork involved in reading and interpreting tape measures, scales & pointer, or shaft encoders. It is compatible for any general purpose measurement application where data is collected ([SPC](#), RS232, RS485 or wirelessly), and/or where digital accuracy and repeatability is desired. It is also suitable for retrofitting, or as original equipment, on most types of machinery.

## About This Manual

- **This manual includes theory and installation information for ProScale Models 150, 190, 250, 290, 390 and 590.**
- **This manual **DOES NOT** include Operation information for any Digital Readout. Operating and programming information for Digital Readouts may be found at <http://www.proscale.com/manuals.htm>**

**All ProScale products are **MADE IN USA****

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# Product Specifications

## Measuring Range: \*

Model <a href="#">150 /190</a>	2 Standard Sizes: 0-10 inches (250mm) and 0-18 inches (450mm)
Model <a href="#">250</a>	7 Standard Sizes: 0 - 24, 52, 60, 96, 120, 180, 240 inches (0 - 600, 1300, 1500, 2400, 3000, 4500, 6000mm)
Model <a href="#">290</a>	7 Standard Sizes: 0 - 24, 60, 96, 120, 180, 240, 284 inches (0 - 600, 1500, 2400, 3000, 4500, 6000, 7200mm)
Model <a href="#">390</a>	4 Standard Sizes: 0 - 24, 60, 96, 120 inches (0 to 600, 1500, 2400, 3000 mm)
Model <a href="#">590</a>	4 Standard Sizes: 0 – 48, 96, 144, 192 inches (0 to 1200, 2400, 3600, 4800 mm)

## Accuracy:<sup>1</sup>

Model 150-10	± .002 inches (0.05mm)
Model 150-18	± .003 inches (0.08mm)
Model 250-2	± .004 inches (0.10mm)
Model 250-all other	± .008 inches (0.20mm)
Model 190-10	± .003 inches (0.08mm)
Model 190-18	± .004 inches (0.10mm)
Model 290-2	± .005 inches (0.13mm)
Model 290-all other	± .010 inches (0.25mm)
Model 390-2	± .005 inches (0.13mm)
Model 390-5, 8, 10	± .010 inches (0.25mm)
Model 590-All	± .010 inches (0.25mm)

Operating Temp: 0 to 50°C; 32 to 120°F

Temp Coefficient: 25ppm/°C; 13ppm/°F

## Max Velocity:

Model 150/250:	15 inches/second (380mm/sec)
Model 190/290/390:	120 inches/second (3m/sec)
Model 590:	100 inches/second (2.5m/sec)

Encoder: Six-conductor cable terminated by RJ12 connector is standard, (10-pin IDC connector on M80 Style). Cable lengths are available up to 30 feet (10m).

Dimensions: Available at [www.proscale.com](http://www.proscale.com)

\* MEASUREMENT range is approximately 4 inches (100mm) *shorter* than the PHYSICAL length of the aluminum scale extrusion. (8 inches *shorter* for Model 590)

<sup>1</sup> Maximum error over entire measuring range when measured at the Encoder output.

---

## About ProScale

All ProScale systems consist of a **SCALE** (or track), an **ENCODER**, (or readhead) and a **DIGITAL READOUT (DRO)**.

The **SCALE** consists of a series of conductive patterns bonded to an aluminum extrusion. The Model 150/190 Scale is .75 inches (19mm) wide and comes in two standard measuring ranges: 10 or 18 inches (250 or 450mm). The Model 250/290 Scale is 2.02 inches (51mm) wide and comes in several standard measuring ranges up to 240 inches (6000mm). The Model 390 Scale is .75 inches (19mm) wide and comes in four standard measuring ranges up to 120 inches (3000mm). The Model 590 Scale is 3.00 inches (75mm) wide and comes four standard measuring ranges up to 192 inches (4800mm).

**NOTE:** All finished Scales for 150/190/250/290/390 are approximately 4 inches (100mm) longer in physical length than their specified measuring ranges. Scales for Model 580 are 8 inches (200mm) longer than their measuring ranges.

The **ENCODER** contains a computer chip which transmits and receives signals to and from the **SCALE** using capacitive or inductive coupling. The received signal is used by the encoder to calculate its position to within 10 microns (10 $\mu$ m or .0004in). This position data is then sent to the **DIGITAL READOUT** where it can be displayed in millimeters, centimeters, inches, or fractions. The measurement can then be sent to an external data acquisition device via a wired or wireless transmission product.

Multiple **ENCODERS** (connected to individual **DIGITAL READOUTS** or data acquisition units) can be used on the same **SCALE** simultaneously.

## Scales

### [Model 150 & 250 Scales](#)

ProScale models 150 and 250 are [Capacitive Absolute](#) (often referred to as *ABS*) systems and use a robust and sophisticated method to measure position, resulting in a high immunity to electrical interference, and one that does not forget its position when power has been removed.

All Absolute (*ABS*) Scales have a “zigzag” pattern on a green laminate. There may be a “**SPLICE** or **JOINT**” approximately every 430mm (17in).



An *ABS* system measures its actual position by reading a pattern which is unique at any given location over a segment length. The maximum length of a ProScale absolute segment is 430.08mm (16.933 in). The segment must

---

then repeat. Consider the illustration on the previous page to represent a ProScale approximately 50 inches long. There are three absolute segments joined together. Within each segment the system is absolute. However, crossing over a segment joint now presents the Encoder with information identical to what it read in the previous segment. At this point the system must be able to recognize that it has crossed a joint and therefore must add or subtract the value of 1 segment (430mm). In fact, each time the Encoder passes over a joint it must keep track of how many segments it has passed, and in which direction. This action is accomplished by the Digital Readout and is transparent to the operator.

What does all this mean? If the Encoder remains on the same absolute segment, it can have power removed, its position changed and power restored without loss of position information. However, if power is removed (Encoder unplugged from Digital Readout or batteries removed from Digital Readout) *and* the Encoder passes over a segment joint, the *transition* will not be recognized. When power is restored the system knows its absolute position on the new segment, but does not know how many segments it has passed, or in which direction. (Simply turning the Digital Readout off does **not** constitute removing power. A small amount of power is still supplied to the Encoder.)

Digital Readouts also provide the operator with a method to adjust the segment offset so the system displays the correct reading at all times without loss of accuracy. See Digital Readout [OPERATION](#) manual for additional information on *Segment Offset Adjustment*.

**To shorten Model 150/250 Scales see:**  
<http://www.proscale.com/other/absscalec.htm>

#### [Model 190, 290, 390, 590 Scales](#)

These ProScale systems use Inductive Series 2 technology. These Scales have a repeating “bar” pattern on a black colored laminate.



**ProScale Models 190, 290, 390 and 590**

These systems measure position by reading a pattern and determining how far the encoder has traveled. Removing power from these systems will necessitate re-calibration. This could be as easy as depressing a key on the front panel of the DRO if a Datum was set-up when it was first installed. However, compared to models 150 and 250, these systems have a faster velocity rate, so they are better suited for a faster moving environment where a repeatable reference can be established (the reference does not have to be a zero point).

**To shorten Model 190/290/390/590 Scales, simply cut to desired length.**



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## Encoders

### [Model 150 & 250 ABS Encoders](#)

Model 150 & 250 Encoders have light blue housings and “**BLACK END OF SCALE**” labels on the housing cover. (Each Model 150 or 250 Scale will have one end painted black).

This relationship is very important since the Encoder may work but produce erratic results if installed backwards. To insure proper operation, be sure the arrow on the Encoder is pointing toward the **BLACK** end of the Scale.



Standard Model 150 & 250 Encoders are supplied with a 10 foot (3m) cable. Custom length cables are available up to 30 feet (9m).

Absolute (Model150/250) Encoder part numbers are:  
701-1500-xxx-(optional “**G**” for 12-24VDC systems)  
(where xxx represents the cable length in inches)

### [Model 190, 290, 390, and 590 Encoders](#)

Model 190, 290, 390, and 590 Encoders have black housings. The Encoder orientation on the scale can be reversed. (The reading direction can also be reversed through programming in the digital readout).



All Model 190, 290 & 390 encoders are supplied with a 10 foot (3m) cable.

Custom length cables are available up to 30 feet (9m).

Inductive (Model 190, 290, 390, and 590) Encoder part numbers will be:  
701-1900-xxx  
(where xxx represents the cable length in inches)

### **NOTE:**

**ENCODERS and SCALES of different technologies are not interchangeable.**

---

## Readouts

ProScale measuring systems operate with any of several different Readouts. Refer to the Operation Manual that accompanied your Readout for information about programming and operation.

### [General Purpose LCD](#)

Power: 1ea 3V 123 Li Battery or 12-24VDC  
Output: SPC and Programmable events



### [BASIC LCD](#)

Power: 1ea 3V 123 Li Battery  
Output: None



### [950 Series](#)

Power: 1ea 3V 123 Li Battery  
Output: SPC and Programmable events



### [1/4 DIN In-Panel LCD](#)

Power: 1ea 3V 123 Li Battery or 12-24VDC  
Output: SPC and Programmable events



### [Compact LCD](#)

Power: 1ea 3V 123 Li Battery  
Output: None



### [1/8 DIN In-Panel Red LED](#)

Power: 12-24VDC  
Output: RS485



### [In-Panel Dual Input LCD](#)

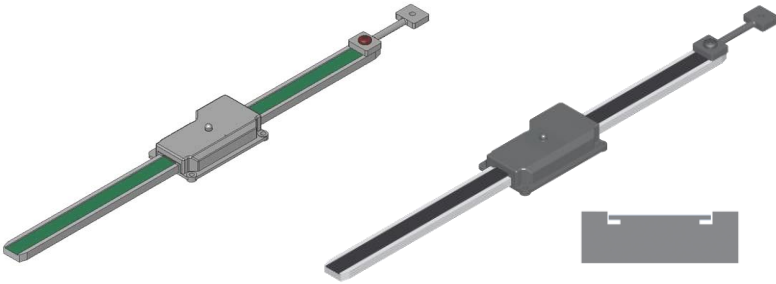
Inputs for one or two encoders.  
Power: 12-24VDC  
Sum, Difference, Arc tangent functions  
Output: RS232 and (2) SPC



### [VDRO](#)

A Windows® application capable of one or two axes of measurement with database functionality.





*Model 150 & 190 shown with Encoder and Connector Link with End View of Scale profile.*

## **Model 150 and Model 190 Scale & Encoder Installation**

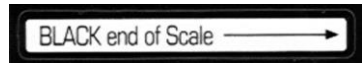
ProScale Models 150 & 190 are easy to install. By following the basics of good installation, reliable, error-free operation can be expected. ProScale Models 150 & 190 can be used in many different measurement applications, and with numerous types and brands of equipment. Therefore all installations will be a little different and it is the responsibility of the user to choose the bolts, screws, or other mounting hardware that guarantee proper installation for optimum operation in their application.

1. For Model 150 insure the arrow on the Encoder points towards the **“BLACK end of the Scale”**.

This orientation is critical for proper operation. Be sure the mounting

location for the Encoder and Scale will allow this orientation.

For Model 190's the Encoder orientation on the Scale is not critical.



2. Determine an appropriate mounting location. Most applications using a Model 150/190 will have the Encoder held stationary while the Scale passes through it. [See Example](#). (However, the system will also operate properly if the Encoder is moved along the Scale). When the Encoder is mounted stationary, the Scale should be attached to the moving part of the measuring application or machine using the [Connector Link](#). Attach the Encoder using three screws or bolts. Attach one end of the connector link to the Scale using the screw (included) and the other end to the moving part. Check that the Scale is properly

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aligned with the direction of motion of the moving part. Be sure both connections are secure or inaccurate readings could result. (The connector link compensates for small misalignments in the installation and acts as a *shear pin.*)

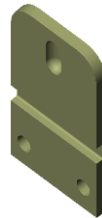
3. If your application is better suited to the Scale being held stationary and the Encoder moving along it, you should use the [Guide Clip](#) to move the Encoder along the Scale instead of the connector link. Mount the Scale. Be sure it is properly aligned as the Encoder is moved (the Guide Clip will compensate for slight misalignment). For accurate measurements, the guide clip must be mounted perpendicular to the direction of travel of the Encoder. The guide clip should exert some pressure on the encoder over the full range of travel of the Encoder so the two move as a single unit.
4. Plug the Encoder into the Readout and refer to the OPERATION manual that accompanied your Readout for information about set-up, installation and operation.

**Note:** Observe the following for all installations:

- Do not drill through the colored portion of the Scale at any point over which the Encoder will travel.
- Do not mount the Scale so the mounting hardware interferes with the movement of the Encoder.



**Connector Link**

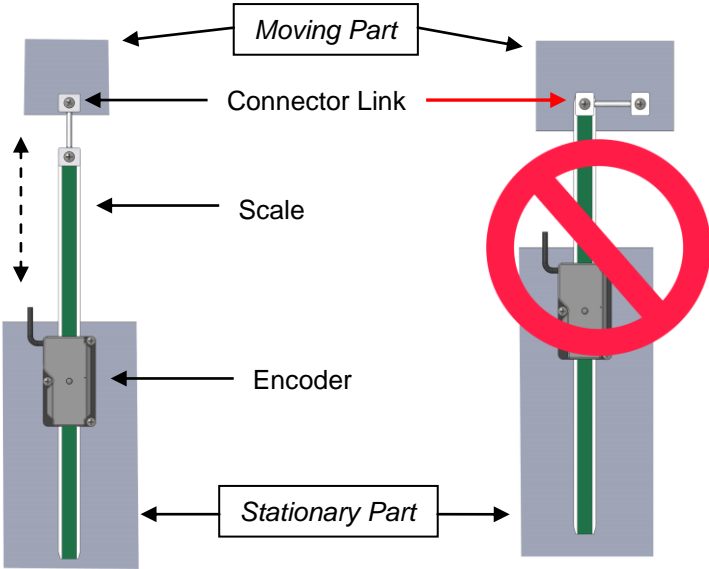


**Guide Clip**

[Model 150 Individual System Parts and Dimensions](#)

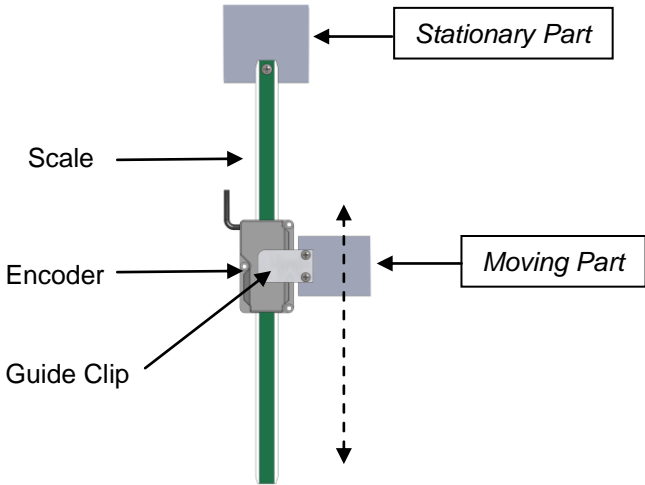
[Model 190 Individual System Parts and Dimensions](#)

# Typical Model 150/190 Installations

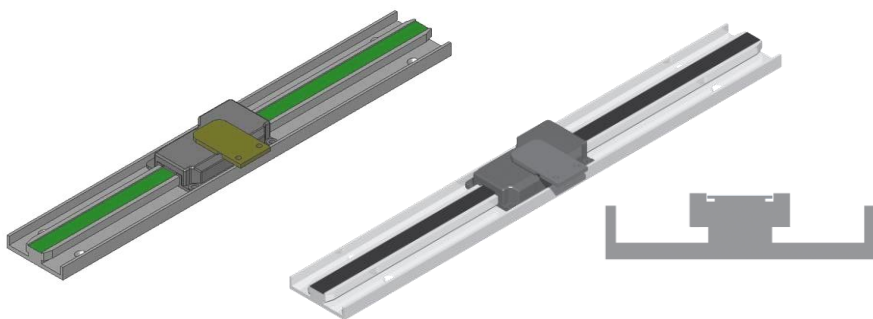


**Encoder stationary, Scale moves**

[See Example](#)



**Scale stationary, Encoder moves**



Model 250 & 290 shown with Encoder and Guide Clip with End View of Scale profile

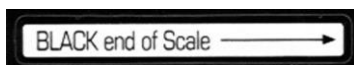
## Model 250 & 290 Scale & Encoder Installation

ProScale Model 250/290 are easy to install. By following the basics of good installation, reliable, error-free operation is assured. ProScale Model 250/290 can be used in many different measurement applications, and with numerous types and brands of equipment. Therefore all installations will be a little different and it is the responsibility of the user to choose hardware that insures proper installation.

**NOTE:** These systems are **NOT** recommended for construction of 'Dimensional Measuring Systems' unless a supplemental bearing system is also incorporated into the design. See [Quality Control Products](#) for this type of application.

1. For Model 250's insure the arrow on the Encoder points towards the **"BLACK end of the Scale"**.

This orientation is critical for proper operation. Be sure the mounting location for the Encoder and Scale will allow this orientation. For Model 290's the Encoder orientation on the Scale is not critical.



2. Determine an appropriate mounting location for the Scale. Most Model 250/290 applications have the Scale held stationary while the Encoder is moved along the Scale.



3. Use the Guide Clip to move the Encoder along the Scale. Mount the Scale using the included screws. Check that the Scale is properly aligned as the Encoder is moved over

Guide Clip

its length (the Guide Clip will compensate for slight misalignment). Adjust the Scale alignment if necessary. For accurate measurements, the guide clip must be mounted perpendicular to the direction of the Encoder travel. The guide clip should exert some pressure over the full range of Encoder travel so the two move as a single unit.

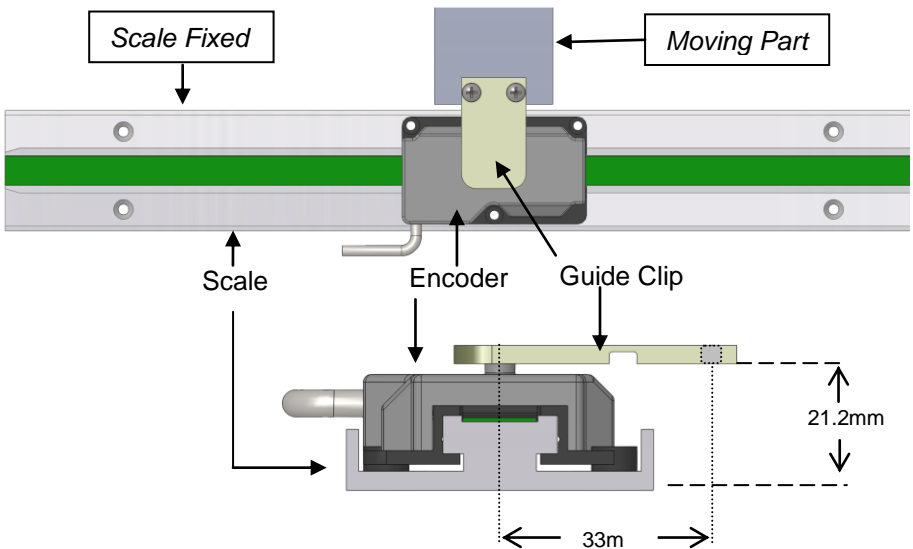
*Failure to use the guide clip could produce premature wear of the systems and may void your warranty.*

4. Plug the Encoder into the Readout and refer to the OPERATION manual that accompanied your Readout for information about operation.

**Note:** Observe the following for all installations:

- Do not drill through the colored portion of the Scale at any point over which the Encoder will travel.
- Do not mount the Scale so the mounting hardware interferes with the movement of the Encoder.

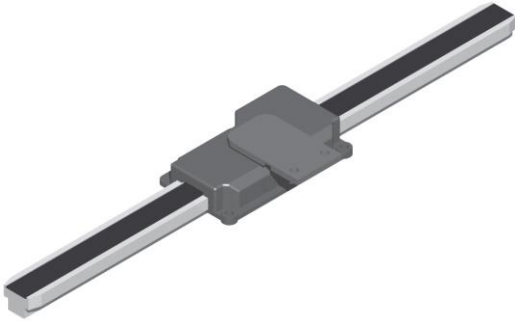
## Typical Model 250/290 Installation



*Guide Clip Pressure/Spacing (End View)*

[Model 250 Individual System Parts and Dimensions](#)

[Model 290 Individual System Parts and Dimensions](#)



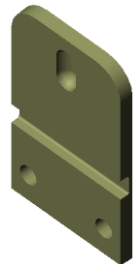
*Model 390 shown with Encoder and Guide Clip with End View of Scale*

## Model 390

### Scale & Encoder Installation

The ProScale Model 390 is a hybrid version of the Model 190 and 290 scales. It is often used by OEMs as an integral part of a machine. It can be installed in an “*encoder stationary, scale moving*” configuration or a “*scale stationary, encoder moving*” configuration. In either case, (particularly if the scale is to be moved through the Encoder), care must be taken to provide good support and alignment of the Encoder and Scale during motion.

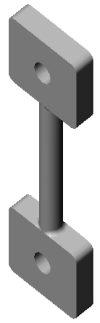
1. Determine an appropriate mounting location. Most applications using a Model 390 will have the Scale held stationary and the Encoder moving along it. Be sure the Scale is properly aligned as the Encoder is moved (the Guide Clip will compensate for slight misalignment). For accurate measurements, the guide clip must be mounted perpendicular to the direction of travel of the Encoder. The guide clip should exert some pressure on the encoder over the full range of travel of the Encoder so the two move as a single unit. (see next page)





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2. When the Encoder is mounted stationary, the Scale should be attached to the moving part of the measuring application or machine using the Connector Link. Attach the Encoder using three screws or bolts. Attach one end of the connector link to the Scale using the screw (included) and the other end to the moving part. Check that the Scale is properly aligned with the direction of motion of the moving part. Be sure both connections are secure or inaccurate readings could result. (The connector link compensates for small misalignments in the installation and acts as a shear pin.)

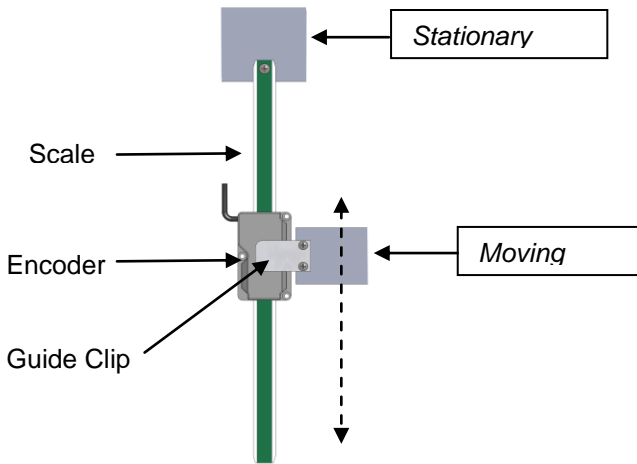


3. Plug the Encoder into the Readout and refer to the OPERATION manual that accompanied your Readout for information about set-up, installation and operation.

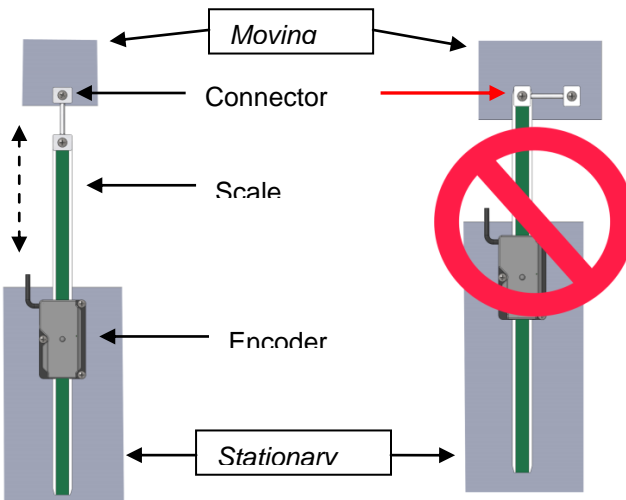
- Do not drill through the colored portion of the Scale at any point over which the Encoder will travel.
- Do not mount the Scale so the mounting hardware interferes with the movement of the Encoder.

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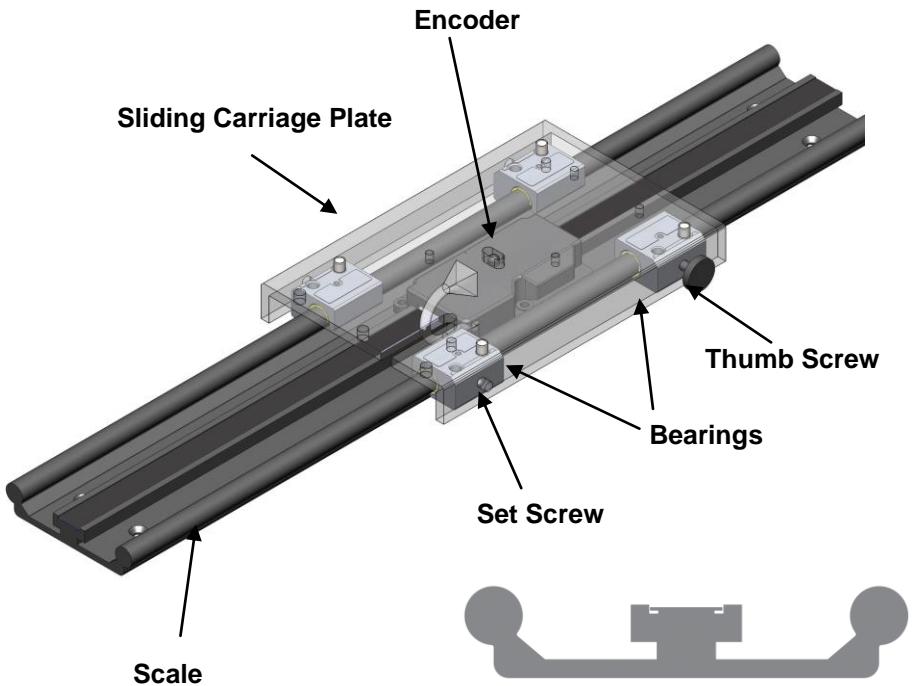
## Typical Model 390 Installation



## Alternate Model 390 Installation



## [Model 390 Individual System Parts and Dimensions](#)



*Model 590 shown with moving carriage with End View of Scale.*

## **Model 590**

### **Scale and Carriage Installation**

ProScale Model 590 is easy to install. By following the basics of good installation, reliable, error-free operation is assured. ProScale Model 590 can be used in many different measurement applications, and with numerous types and brands of equipment. Therefore all installations will be a little different and it is the responsibility of the user to choose the mounting location and hardware that will guarantee a proper installation.

**NOTE:** Do not remove the moving carriage from the scale when installing.

1. Determine an appropriate mounting location for the Scale. Remember that the moving carriage is wider than the scale. If the Model 590 system will be used as part of a measuring table, allow space for a fixed jaw to be installed on one end. Also, the scale should be recessed into a 4.5 x 0.75 inch (115 x 20mm) channel in the table's surface. Mounting the scale this way will extend the life of the Model 590 considerably.

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Also consider [ProKit 590](#) for custom built measuring stations/tables.

2. The scale can be attached with #8 screws (included), or with M4 screws, or by using double sided foam core tape.
3. If a moving jaw will be attached to the carriage plate, the jaw should be machined with M5 clearance holes 1.50 inches on center, and 0.25 inches from the edge of the plate. Jaws heavier than 10 pounds are not recommend, as they will reduce the life of the bearings. Also, jaws wider than 6 inches are not recommended unless the parts to be measured span the entire width of the jaw. (Measurements taken at the tips of larger jaws are prone to [Abbé errors](#).)
4. The thumbscrew can be used to lock the carriage in place. This thumbscrew can be moved to any of the four bearing positions (by relocating an existing setscrew).  
**NOTE:** If the locking capability is desired when the Model 590 is installed into a recess, the channel in the tabletop will need to be made wider. Do not replace the thumbscrew with any product that will increase the pressure placed on the bearings.
5. There is a setscrew in each of the remaining bearings. These can be adjusted to increase or decrease the drag of the carriage.  
**NOTE:** Use caution when adjusting the setscrews. Too much pressure may cause premature wear on the bearings or inadvertently lock the carriage in place. Also, adjusting the setscrews may affect parallelism to a fixed jaw.

Plug the Encoder into the Readout and refer to the OPERATION manual that accompanied your Readout for information about set-up, installation and operation

**Note:** Observe the following for all installations:

- Do not drill through the colored portion of the Scale at any point over which the Encoder will travel.
- Do not mount the Scale so the mounting hardware interferes with the movement of the Carriage.

## **[Model 590 Individual System Parts and Dimensions](#)**

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## Frequently Asked Questions

### **Can I mount the Scale/Encoder without the connector link/guide clip?**

The connector link and guide clip serve to provide an accurate reliable method of transferring the movement of a moving part to the Encoder or Scale, while also absorbing any stresses that may occur. If they are not used, premature Encoder or Scale wear may occur and **the warranty may be voided.**

### **What does 'no Enc' mean?**

If the Encoder is off the Scale, or the Encoder cable is unplugged from the Readout, **no Enc** will appear on the LCD. To clear:

1. Be sure the Encoder is on the Scale and properly oriented.
2. Unplug the Encoder from the Readout for one second and then reconnect the Encoder.
3. Connect the Encoder to the Readout.

### **The Readout numbers appear to be random. (Model 150 & 250 only)**

Be sure the Encoder is oriented correctly on the Scale. One end of the Scale is marked in black; be sure that the arrow on the Encoder is pointed in this direction.

### **The Readout does not change, or changes very little, as the Scale or Encoder moves.**

1. The Readout is in the HOLD mode.
2. The Encoder is on the Scale backwards.
3. The Scaling factor is set very low.

[Additional FAQ's](#)

### ProRF SPC

ProRF allows linear measurement or position data to be transmitted wirelessly to a PC or other device having a USB or RS232 connection. The system uses 802.15.4 radio modules to provide reliable two way communication. The transmitter plugs into any ProScale Readout with an SPC output.



### ProRF Encoder

Instead of a long cable between the Encoder and the Readout, a Transmitter at the Encoder sends data to a Receiver connected to the Readout at a remote location, or to a PC Receiver with RS232 or USB output.



### ProMUX

ProMUX-3 is an easy to use interface that provides communication from (M150 & 250 ONLY) Encoders (or SPC equipped Readouts) to a user's PC or PLC. ProMUX-3 supports three inputs, and one RS232 output.



### Analog Interface Unit

The AIU is an interface designed to provide an analog 0-5 or 0-10 VDC signal output that is proportional to the displayed measurement or position of the ProScale measurement system.



### SmartCable USB

Converts the SPC output from a ProScale Readout to a standard USB 2.0 Keyboard signal, allowing data to be input to a PC application without the need for additional software.





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**Thank you for choosing a ProScale Product,**

**IT WAS PROUDLY MADE IN THE USA**



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