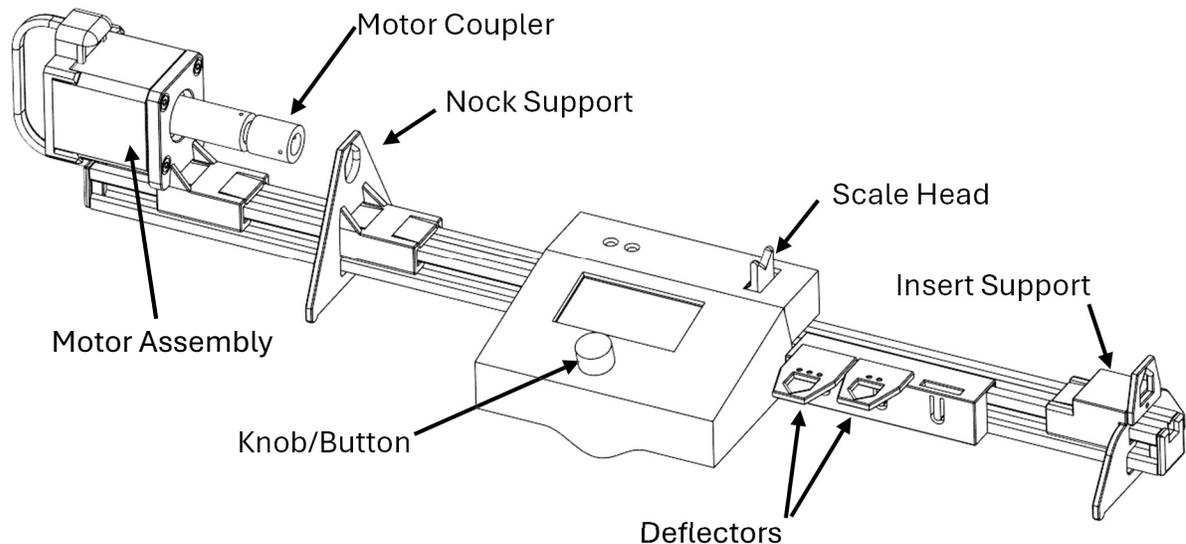


Introduction and Operating Principles:

This device works opposite from traditional spine measurement tools. The arrow is bent a prescribed amount, and the resulting reaction is used to characterize an arrow and determine spine and related values. This device was primarily designed with the goal of finding the weakest, least stiff orientation of the arrow. Knowing this is generally a close predictor of the direction of bend a shaft will take when launched from a bow. Secondly, this device can be used to compare stiffness, spine, and runout between arrow shafts.

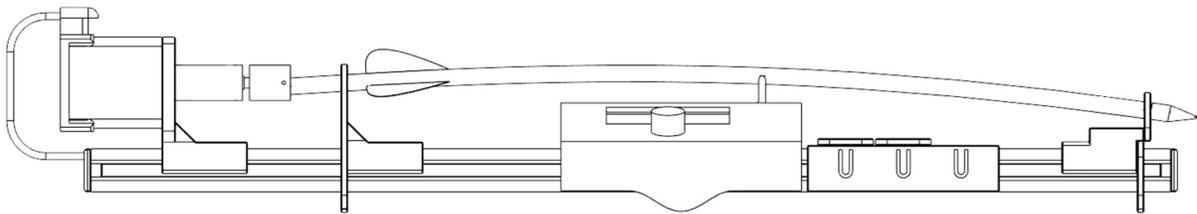


Quick Start:

1. Connect power supply between outlet and device.
2. When prompted clear the Scale Head and press Button.
3. Slide Nock Support and Insert Support to locations appropriate for arrow length using scale markings.
4. Insert nock end of arrow through Nock Support, and rest arrow on Scale Head.
5. Slide Motor Assembly to engage with arrow nock.
6. Select "Run Scan" menu option. Wait for prompt to insert Deflector.
7. Select appropriate Deflector (for most arrows sizes #2). While bending arrow shaft over scale head, simultaneously slide deflector over insert end of arrow, and into Insert Support.
8. Wait for scan to begin.
9. When scan completes, arrow will rotate to weak side, showing the predicted bending direction.

Points to remember:

- The stands should be placed as far to the end of the arrow as practically possible for best bending predictions.
- Follow on screen instructions to select deflector. Most arrows use #2 deflector.
- The center sensor should be as near the center of the arrow shaft as possible. Use scale markings to help position the nock support and insert supports.
- The stands should be bearing on the arrow shaft, and not inserts or nocks.
- This instrument is very sensitive, it should be set on a sturdy support that isn't influenced by any adjacent machinery. A speaker on the same table is enough to influence the results.



Arrow Bending Diagram

Menu options:

“Run Scan” to perform a rotational vs stiffness analysis. The device will systematically rotate the arrow in 10 degree increments, finding the min/max stiffness, min/max spine, and min/max runout estimates. When complete the device will rotate the arrow to the minimum stiffness location. The “Min/Max Results” menu will automatically show. When complete the arrow will tend to bend in the same direction as it is currently bent in the device (the ends of the arrow point downward, and the center hump rises up).

“Min/Max Results” to view the results of a previous scan. The arrow will automatically be rotated to the highlighted point of interest. See section titled “Analysis points of interest” for discussion on the relevance of these point.

“Results Scan” to view the results of a previous scan. This ties the rotation of the arrow to the rotation of the knob on the user interface. The arrow will be rotated to the point displayed on the curve. The curves can be selected by holding down the button while rotating. Long press the button to return to the main menu.

“Weight Mode” to view direct results of the scale head. Can be used to weigh arrows.

“Arrow Settings” brings up a sub-menu for entering various parameters about an arrow. While not strictly required to determine the weak bending orientation of the arrow, keeping these settings correct will better help to compare between arrows.

“Fine Scan: [Current State]” Can be toggled on or off. When on, an additional scan procedure will be performed to find the weakest stiffness within 1 degree. Turn off for a faster scan procedure.

“Quick Scan: [Current State]” Can be toggled on or off. When off, additional measurement points are taken at each location, along with additional methods of data analysis to ensure the most confident results. Turn on for a faster scan procedure.

Arrow Settings:

If your goal is to find the weakest arrow orientation, no additional arrow parameters are required. However if you'd like the most accurate results with respect to the numeric spine value, you must update the arrow parameters under the “Arrow Settings” menu. The following is a description of the various settings.

“Set Diam: [Current Value]” to input the arrow shaft diameter. The spine value determination is very dependent on arrow diameter as such it must be measured accurately. If required, enter the numeric average of the diameters at each end of the arrow at support locations.

“Set L: [Current Value]” to input the supported arrow length. This should be the distance between the left and right stands.

“Set Deflector: [Current Value]” to input which deflector/stand is used in the right stand location. Select “1” for the shortest, “2” for the middle length, “3” for the tallest.

Note: The intent of the arrow settings menu is to provide a base line comparison between other arrows. Setting these parameters, gives actual numeric spine numbers that would be comparable to results when the arrow was measured to the ASTM F2031 standards of 1.94 lbs (880g), at the center of a 29” arrow supported 28” between supports.

Analysis points of interest:

There is much confusion in the industry on what exactly is an arrow's "spine" and its application. As such it is pertinent to clarify the understanding of this designer and manufacturer, Dopamine Innovation. Spine represents the stiffness of the arrow material. It is measured per ASTM F2031 standard. As could be expected with all real world materials, slight variations are to be expected about the arrows rotation, but these can be averaged to provide a singular representative spine value for an arrow. These slight variations contribute to an arrows tendency to bend in a particular direction when launched from a bow. However this is not wholly sufficient to predict the direction of bending for any given arrow. Another significant contributor is the arrow's runout, or geometric deviation from a perfectly straight arrow. This runout creates an initially bent condition that arrows tend to continue about when launched. In summary these two conditions, spine (material variations) and runout (geometry) contribute to the arrows overall stiffness, or resistance to bending when launched. This device can find all points of interest, including the maximum stiffness, the minimum and maximum spine, the minimum and maximum runout, but extra attention is paid to the minimum stiffness as this represents the best estimate of an arrow's initial bending direction when launched.

It is up to the individual archer to determine which direction to orientate the arrow's initial bending direction in their bow for best results. Typical convention, for traditional bows, is to place the arrow such that it will bend horizontally or perpendicular from the riser, while for compound bows, it is placed to bend in a vertical orientation or parallel with the riser. However it is recommended to use trial and error to determine the best orientation you're your particular application.

Units:

K : oz./in

Spine : $\text{in} \cdot 1000 / 1.94\text{lb}$ – Normalized to 28" between supports

Runout : in