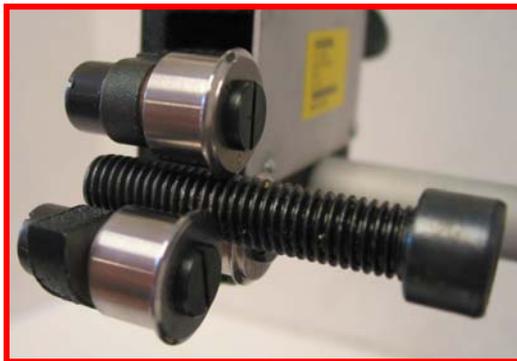
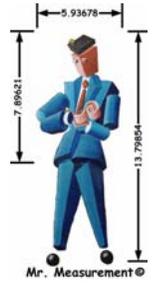




# Tri-roll External Thread Gage

## Operating Procedure



**Tri-roll Gaging Systems are available with one, two, or three frames mounted on one stand.**

**Greenslade & Company, Inc.**  
817-870-8888, Fax 817-870-9199 USA

## 1. Indicator Power:

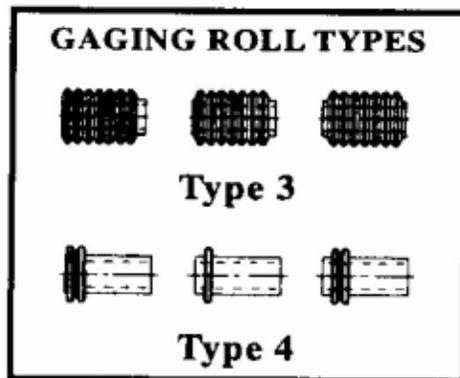
Your Tri-roll indicator is powered by one size “CR 2032” batteries (3 volts). If the digits on your display start to fade or your display does not come on when you press the *ON* button, you need to replace the batteries.

Remove the battery cover on the top of the face of the indicator by engaging the slot and rotating it counter-clockwise. Replace the battery with the marked side of the battery facing outward and replace the cover.

These batteries are available at most drug stores and grocery stores.

## 2. Installing Gaging Rolls:

When measuring a screw thread the correct type and size of gaging roll must be used. Each screw thread size requires a particular size of roll, but each roll size can measure all classes of thread for that thread size. There are five types of gaging rolls:



- Type 3, multi-thread, Functional Diameter measurement, maximum material limits.
- Type 3J, same as Type 3 except truncated for J root threads; can measure UNR and UNJ threads.
- Type 4, Cone and Vee, Pitch Diameter measurement, minimum material limits.
- Type 5, Cone only, “Best Wires” simulation, Thread Groove Diameter, minimum material limits.
- Type 7, Minor Diameter Rolls

After selecting the correct gaging rolls for thread size and roll type, select the correct base and frame size per the listing below:

Inch	Metric	Single Base/Frame Size	Double Base/Frame Size
#0 thru #1	M1.6	TRU-100E	TRU-200E
#2 thru #3	M2 thru 2.5	TRU-101E	TRU-201E
#4 thru #8	M3 thru M4	TRU-102E	TRU-202E
#10 thru 5/16	M5 thru M6	TRU-103E	TRU-203E
3/8 thru 1/2	M8 thru M12	TRU-104E	TRU-204E
9/16 thru 3/4	M14 thru M16	TRU-105E	TRU-205E
7/8 thru 1 1/8	M20 thru M24	TRU-106E	TRU-206E
1 1/8 thru 1 1/2	M30 thru M38	TRU-107E	TRU-207E
1 1/2 thru 1 7/8	M30 thru M47	TRU-108E	TRU-208E
1 7/8 thru 2 1/4	M48 thru M56	TRU-109E	TRU-209E

If you must use more than one type of roll to measure a given part to meet a specification, you may find it more efficient to have a separate frame for each roll type.

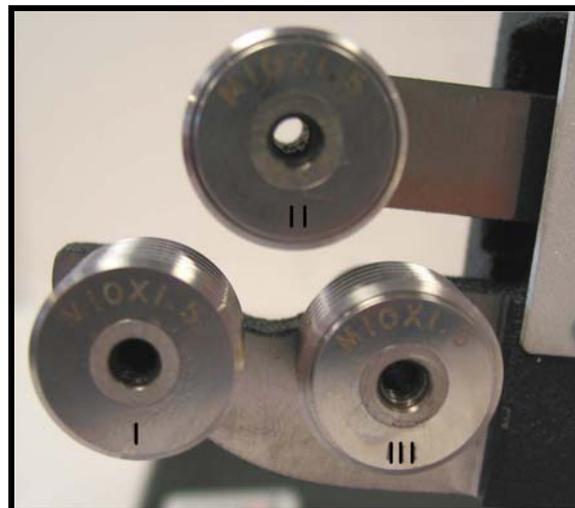
The rolls are marked I, II, III. They are positioned as follows:

#### Right Hand Threads

- I mounted on front axis
- II mounted on top movable axis
- III mounted on back axis

#### Left Hand Threads

- I mounted on back axis
- II mounted on top movable axis
- III mounted on front axis



Proper roll mounting for measuring right hand threads

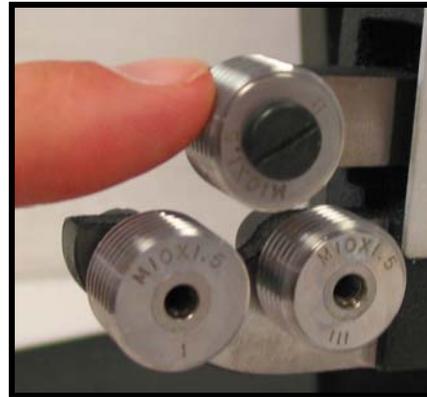
The "II" Roll should not touch the other rolls when the thumb lever is released. If it does, adjust the "Stop Screw" behind the indicator on the frame with the "Stop Adjust Tool" until the rolls no longer touch each other.

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Slide the rolls on the axis pins with the marked edge on the outward side. Install the slotted holding screw and tighten it until it is seated. All three rolls must be free to rotate for proper measuring. If a roll will not rotate, loosen the holding screw slightly until it will rotate. It is good practice to periodically oil the axis pins before mounting the rolls to facilitate smooth roll rotation.



### ***3. Setting the Tri-roll System for Measuring.***

After properly selecting and mounting the gaging rolls on the frame, press down on the thumb lever at the back of the gage which lifts the "II" roll. Insert the proper setting plug between the rolls by passing between Roll "I" and Roll "II"; release the thumb lever. Rotate the setting plug approximately 1/4 turn *counterclockwise* to assure that the setting plug is properly seated between the rolls.

The top roll should apply firm pressure on the setting plug to press it snugly between all three rolls. If it is loose, adjust the "Stop Adjust Screw" located behind the indicator on the top of the frame with the "Stop Adjust Tool" until the desired pressure and position is achieved.

Do not adjust the "Stop Adjust Screw" so that the rolls touch each other when the setting plug is removed. If the pressure is still too light after adjusting the "Stop Adjust Screw", the spring tension can be increased by adjusting the slotted set screw located on the under side of the gage frame. To reach this screw the frame may have to be loosened from the base so the frame can be tilted back making the screw more accessible.

Press the *ON* button on the indicator. If the indicator is already on, press the *ZERO* button. display should read all zeros. Determine if you want to measure in inches or millimeters and press the *IN/MM* button to select the increments you wish to measure in.

**CRITICAL NOTES:**

Make absolutely sure that when you depress the thumb lever that the indicator number becomes *LARGER*. If it becomes smaller or reads “-” as the thumb lever is pressed, you must press the “+/-” button on the indicator.

This check should be made every time the indicator is turned on. Failure to do so will result in incorrect indications.



Press the button marked *PRESET*. A flashing “P” and zeros will appear on the display. The first digit will be blinking. Press the *PRESET* button again and hold it in. The digit to the right will begin to blink. Release the button when the digit you wish to set begins to blink. Now press and release the *PRESET* button. Each time you do this the digit advances one number, i.e., 1, 2, 3, 4 etc. If you go past the number you want, continue to press and release. You will go to 0, then start 1, 2, 3, 4, etc. again.

When the value of the setting plug calibration certificate is reached, hold the *PRESET* button in. After setting the digit to the far right, the “P” will start to blink. Press *PRESET* once more and release. The “P” will disappear and the digits will stop blinking.

Press the thumb lever in the back to raise the top roll. Remove the setting plug and release the lever. Your Tri-roll system is ready to measure parts.

## 4. Measuring Parts:

Press down on the thumb lever, raising the top roll, and insert the part to be measured between the rolls by inserting it through the front of the gage, passing it between Rolls "I" and "II". Rotate the part approximately 1/4 turn *COUNTERCLOCKWISE* to assure the part is properly seated between the rolls. The number indicated on the display is the exact pitch of the part you are measuring.

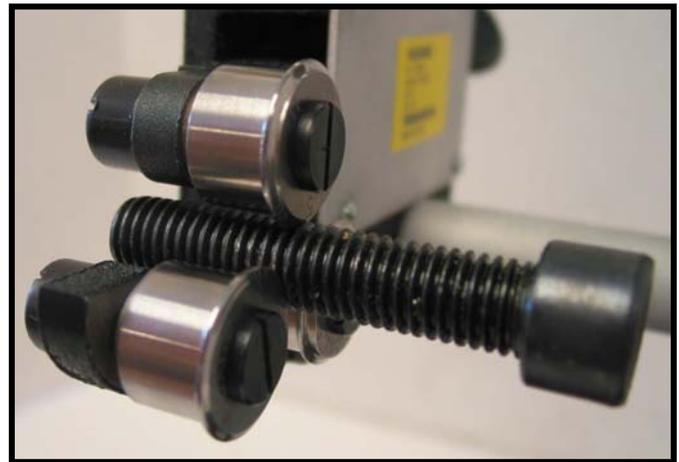
Note that measurement of the same part with functional diameter rolls (Type 3) will always be slightly larger than those measured with pitch diameter rolls (Type 4), or the groove diameter rolls (Type 5). This is because Type 4 & 5 rolls only measure the pitch diameter at one thread whereas the Type 3 rolls measure the pitch diameter over several threads which takes into account any slight error present in lead and/or thread angle.

You may measure the thread pitch diameter at more than one position down the length of the part by simply pressing the thumb lever and moving the part inward or outward between the rolls. Remember to rotate the part about 1/4 turn *counterclockwise* each time you release thumb lever. The pitch diameter may vary along the length of the part because of the way it was manufactured. A part is non-conforming if its thread is out of tolerance at any point.

When measuring with the functional diameter rolls (Type 3), pitch diameter rolls (Type 4), or the groove diameter rolls (Type 5), the indicator readings must be within the designated pitch diameter tolerance to be acceptable.



**Functional Diameter Inspection**



**Pitch Diameter Inspection**

**Note:**

One of the advantages of a Tri-roll gage over ring gages is that a Tri-roll can measure any standard or special pitch diameter or functional diameter size regardless of which setting plug the gage is set with.

As an example, a Tri-roll gage set with a class 3A 1/4-20 setting plug can accurately measure all size 1/4-20 threads including class 2A and 3A threads as well as special threads made under 2A limits to allow for the application of thick coatings.



**Setting indicator for inspecting  
The thread minor diameter**



**Inspecting the thread's  
minor diameter**

Tri-roll gages can be used to measure the **minor diameters** of inch and metric screw threads with **Type 7** minor diameter gaging rolls. Minor diameter rolls are set using a **class Z cylindrical plug gage** with a size approximately equal to the maximum minor diameter of the thread being measured. After the rolls are mounted on the tri-roll gage and the plug is inserted between the rolls the pre-set of the indicator should be set to the calibrated size of the setting plug. The tri-roll gage will now indicate the exact size of the thread's minor diameter.

## **5. Recording Results Electronically.**

If you wish to record your results electronically, you can connect your Tri-roll gage to a printer/processor (DP1-VR) with the correct connecting cable (CC-905388). If you wish to do this also recommend the use of a foot switch (FS-937179) hooked to the printer/processor so that you can record results while keeping both hands free for measuring parts.

If you only wish to record your results and do not want to indicate the limits on your recording tape, simply turn your processor on and set the mode switch to "Position 2". Press *CLEAR*. Start measuring parts. After placing each part between the gaging rolls, either press the *DATA* button or press the foot switch to record data. When you have completed your sample, press *STAT* and the processor will provide you with a printout along with statistical data.

If you wish to enter the pitch diameter limits on your tape, you do so by setting the mode switch to "Position 1" and then by pressing *TOL*. Then using the *PRE* button on your indicator display the low limit of the tolerance you are to meet and press *DATA* on the processor. This will be labeled "Tolerance Limit 1" on your tape. Now change the display on your indicator to the high limit of the tolerance you are inspecting to and press *DATA* again. This will be labeled "Tolerance Limit 2" on your tape. Press *TOL* again and your processor is ready for recording.

**IMPORTANT:** At this point preset your indicator as described previously by using your setting plug before starting to actually measure parts.

**NOTE:** Refer to the operation manuals for your indicator, processor, and/or foot switch. If you need further explanation of their use, call Greenslade & Company/Fastener Inspection Products for assistance.

## **6. Calibrating Tri-roll Gages.**

Tri-roll gages, like all other gages, should be calibrated periodically. The gage owner must determine the frequency, but when in doubt annual frequency is a reasonable way to start a calibration program.

At a minimum the setting plugs should be calibrated periodically. It is good practice to also have the gaging rolls and gaging frames calibrated from time to time. A growing number of quality auditors are requiring the calibration of setting plugs, gaging rolls, and frames at least annually.

Contact Greenslade & Company if more information on calibration is desired.

# ***Appendix I***

## ***Adjusting Dial Indicators on Tri-roll Gages:***

1. After putting the correct rolls on the Tri-roll gage, place the setting plug between the rolls and rotate it at least a 1/4 turn to assure proper seating.
2. Loosen the clamp screw under the indicator on the side of the clamping pad and move the indicator up and down by hand until the indicator pointer is pointing straight up toward "0". Tighten the clamp screw to hold the indicator in position. If you are very close to but not exactly in "0", you can rotate the indicator dial face to move "0" to where the pointer is located.
3. Compare the setting plug's actual size indicated on its certification to the tolerance you must inspect to. Set the limit tabs on the face of the indicator in to the positions relative to the high and low limits you desire.

As an example if you are measuring a 1/4 28 3A thread you would set the gage with a 3A go set plug measuring .2268. The indicator would be adjusted so that the pointer is positioned at "0" and one limit tab would be placed at "0" also indicating that the 3A high limit is .2268. The second limit tab should be set at -.0025 which is equal to .2243 or a 3A low limit.

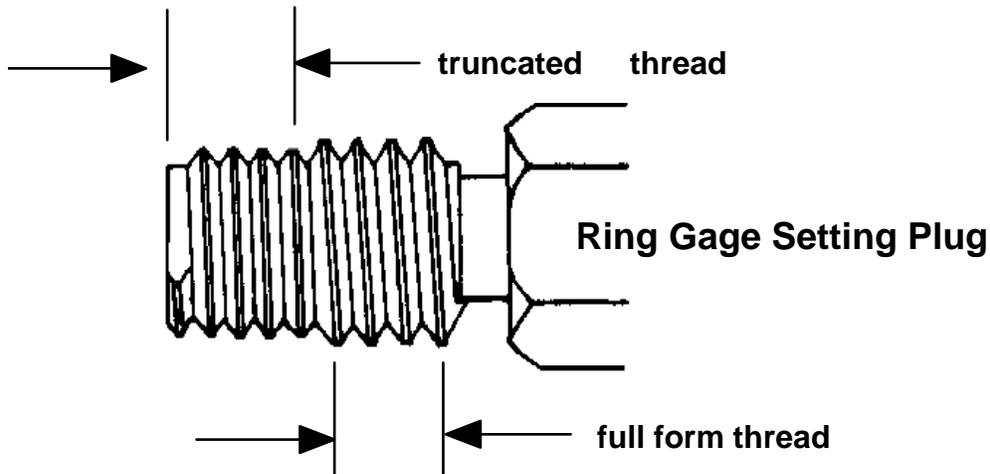
4. Remove the setting plug and start to inspect parts by placing the parts between the rolls and rotating the parts at least 1/4 turn to assure seating.
5. See where the indicator pointer is positioned. If you only need to know if it is within limits, you can simply note if the pointer lies inside the limit tabs. If it does, the parts are good. If not, they are non-conforming.

If you must record the size, you must add or subtract the indicator reading from the setting master size and record that calculated value.

If your reading is very close to one of the limits it is a good idea to rotate the part about 180° and make sure that the pointer does not pass the limit tab. If a part is out of round, it can be within limits at one position and out at another.

## Appendix II

### Setting Tri-roll Gages Using a Ring Gage Setting Plug



**IMPORTANT!** Use the “**full-form**” portion of the setting plug only when setting a variable thread gage with a ring gage setting plug. Setting a variable gage using the truncated portion of the setting plug may result in erroneous measurement results.

A standard truncated ring gage setting plug can be used to set a variable external thread gage. The GO or NOGO end for any class of thread can be used as long as the variable gage is set to the pitch diameter size of the setting plug end being used.

To obtain the most accurate measurement results set the variable gage to the setting plug’s size indicated on its calibration certificate instead of the size listed on the handle.

## ***Appendix III***

### **Inspecting Left Hand Threads without a Left Hand Set Plug**

A Tri-roll gage can be used to inspect Left Hand threads even if you do not have the Left Hand set plug as long as you have the correct thread size gaging rolls and Right Hand set plug.

1. Set up the Tri-roll as you would if you were going to inspect a Right Hand thread including pre-setting the indicator to the set plug size.



2. Remove the setting plug and record the indicator value displayed on the indicator when the arm is in its resting position.



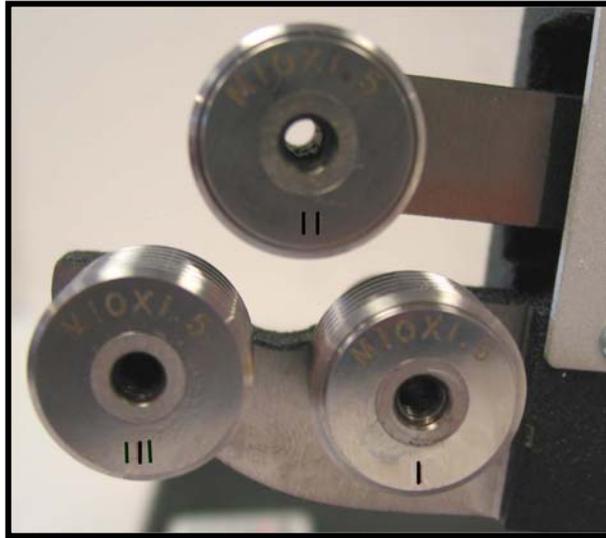
3. Without doing anything else to the gage, change the pre-set value to the value displayed while the gage arm is at rest without the setting plug in the gage.



4. Open the gage and place the setting plug between the rolls and slightly rotate the plug to assure its full seating between the rolls. The reading displayed on the indicator should be that of the setting plug size.



5. Remove the setting plug and the retaining screws on the bottom two roll axis pins.
6. Swap the two bottom roll positions leaving the printed side of the rolls on the outside and re-install the retaining screws leaving them loose enough to still rotate.



7. With the arm at rest press the pre-set button and the gage is ready to inspect Left Hand threaded product.



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