



## COLD ROLLING SETUP INSTRUCTIONS FOR A CNC HORIZONTAL LATHE

Please read the CJWinter Cold Roll Instruction Manual prior to getting started.

Your cold roll tool should have hydraulic fluid already installed in it from CJWinter. Do not remove any screws from the tools since hydraulic fluid will be lost. Verify that you can set the pre-loaded pressures. If you can set the pre-loaded pressure there will be no need to remove any screws from the tool at this time. Reference – the adjusting video on [www.coldrootrolling.com](http://www.coldrootrolling.com). This can be located under the Education Center of the website. If you need to add or install fluid in the tools you can reference starting with page 12 in the Instruction Manual or view the How to Video on [www.coldrootrolling.com](http://www.coldrootrolling.com).

**Installing the cold roll wheel in the wheel holder.** We also reference the wheel as the roll in many descriptions. If you are using the EPL (Error Proof Loading) designed wheels then you do not have to worry about installing them incorrectly. If the wheel is installed correctly then the operator will be able to install the carbide pin in the hole and tighten the set screw. If the carbide pin will not go through the roll holder and the hole in the wheel it is installed backwards and needs to be turned 180 degrees and reinstalled in the roll holder. For wheels that are not the EPL design always load marking side towards the chuck.

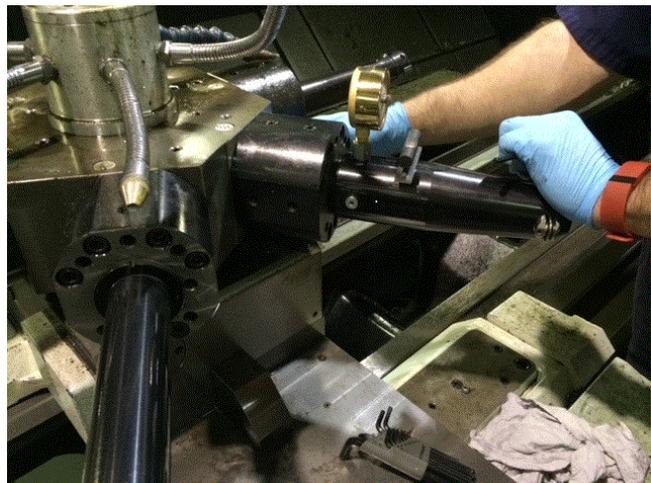
**Setting the pre-loaded pressure on your tool:** Reference page 19 in the Instruction Manual. These pressures are the same pressures listed in the DS-1 chart. These pressures are recommended starting pressures and may need to be adjusted up or down depending the material you are cold rolling and the amount of thread root deformation you are wanting to achieve.

Find your connection size on the chart, continue to the right and find either the pin or box, view the suggested pressure. Example a NC38 Pin connection pressure is recommended to be 1800 psi. Follow the instructions from page 19 to set the correct pressure.

Note: All of CJWinter's cold roll tools are shipped with a socket that is used for adjusting the pressures up or down with the coarse adjusting screw on the tool. You will need a 1/2" (12.7MM) Drive Ratchet.



**Leveling the cold roll tool:** Install your cold roll tool in your turret. Prior to tightening the tool in the tool holder set a level on the flat that is on the topside of the round shank tool. Adjust the tool left or right to establish level. Remove level.



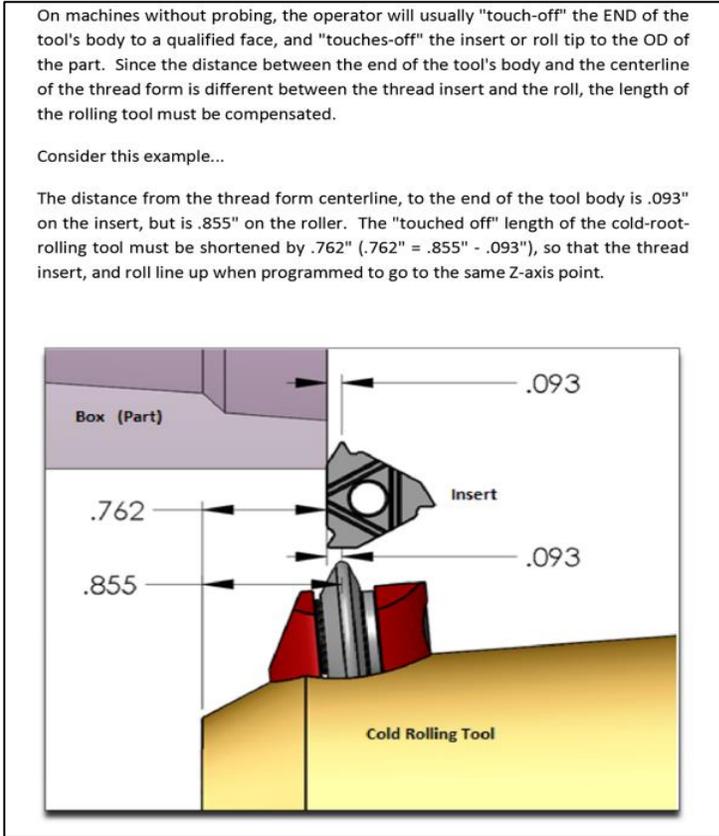
**Setting your tool offsets:** Reference page 20 and 21 in the Instruction Manual. If you need any additional information regarding wheel centerlines from the face of the part please let us know.

**Centerline for CJWinter's Cold Rolling Tools**

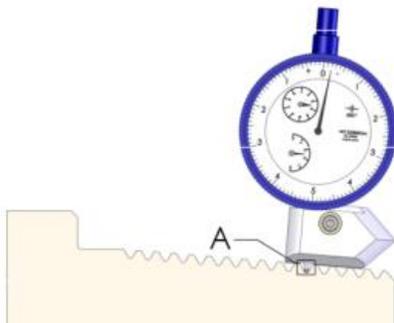
The below dimensions are from the face or edge of the bar to the centerline of the cold roll wheel. Remember to adjust for threading insert dimensions. Using our example you would compensate .093 for the threading insert. We recommend you reference the Instruction Manual for further explanation.

The picture below shows the offset for the 11070 EPL cold roll tool. This is page 21 out of the Instruction Manual. All other tool offsets are listed for reference when needed.

<b>11069</b>	<b>EPL</b>	<b>0.896</b>
<b>11069</b>	<b>GP</b>	<b>0.906</b>
<b>11070</b>	<b>EPL</b>	<b>0.855</b>
<b>11070</b>	<b>GP</b>	<b>0.864</b>
<b>11071</b>	<b>EPL</b>	<b>0.693</b>
<b>11071</b>	<b>GP</b>	<b>0.671</b>
<b>11072</b>	<b>GP</b>	<b>0.443</b>
<b>11072</b>	<b>EPL</b>	<b>0.495</b>



**Always** check your thread height prior to cold rolling so you know where you are starting from. Do not assume your threading insert cut the thread at full insert depth.



Tool shown with GAGEMAKER thread height gage

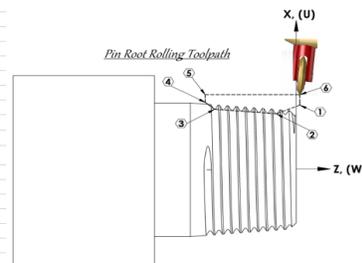
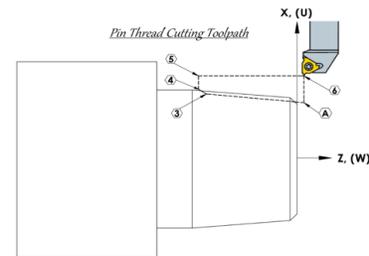
**Programming the cold roll tool path:** The cold rolling procedure can be found on page 22 of the Instruction Manual. Depending on your specific CNC lathe control your process and information may be different. Programming examples are supplied at the back of the Instruction Manual pages 26 through 31.

CJWinter offers two calculators for assisting in the programming of tool path for cold root rolling. One calculator is used if you will be programming in G code which is normally standard code used on a Fanuc control. If you are, three lines of G32 code will need to be created, one line is the approach of the wheel into the root of the thread three pitches from the face (this is a default which can be changed), second line of G32 is used for the cold roll wheel to move along the taper of the connection and the third G32 line of code is used for the exit or thread pullout. This third line of G32 is optional since the programmer may use X and Z dimensions for pullout or exiting the cold roll wheel from the thread.

CJWinter also offers a calculator that is used when programming Mazatrol controls usually on Mazak CNC lathes. If you do not have one of these calculators just let us know and we will send it to you.

Below are sample calculators and G32 cold rolling code.

CJ Winter - G32 Code Cold Root Rolling Calculator			
CJWinter's Cold Root Rolling Calculator generates recommended coordinates for starting points, ending points, pull outs, etc., for Cold Root Rolling, and calculates these points automatically with the proper inputs. The calculator is in no way intended to replace good programming and machining practices. Like all new CNC programs, verification in a safe manner is still required, to ensure the program can be executed without damaging the tooling, part, or machinery. While CJW has made every effort to ensure the recommended coordinates are correct, the user assumes all risk in applying those recommendations to their particular setup.			
The suggested tool path for the roller starts 2 full tooth-heights above the thread at the start, engages the root of the cut thread 2 to 3 full pitches into the thread, and then follows the pre-cut minor diameter exiting at the same point and chamfer angle. Use this calculator to determine optimal roller tool path geometry when programming cold root rolling in G32 Code			
External Threads (PIN)			
Instructions / Notes:			
#	black text values in green cells must be chosen by user for application		
#	bold red text values in green cells are suggested values, but may be changed if required		
VARIABLE INPUT TABLE - values entered are from sample G32 code and pinBox printer NC38 pin connection			
5.1750	X start dia	From G-Code used to generate last thread cutting pass.	
1.0000	Z start position	X start diameter, -Z= Z start position	
0.1478	Tooth Height	Value found in PinBox Print	
0.2500	Pitch	Value found in PinBox Print	
3.0000	Taper (inP)	Value found in PinBox Print	
0.0150	Nominal Taper Tolerance	Value found in PinBox Print. Usually shown as +.030-.000 >> Nominal = .0302	
2.0	Approach Path Height Multiplier (per side)	Number of Tooth Heights above minor for approach path 1-to-2 (Default value is 2)	
3.0	Approach Path Length Multiplier	Number of Pitches into thread to locate intercept point #2. (Default value is 3)	
6.6430	X value from last full thread	From G-Code used to generate thread	
-4.7500	Z value from last full thread	Use X & Z value from Last Thread Cutting Pass value	
0.4000	Calculated - U value from end of chamfer / last scratch	Set U & W values of rolling pass equal to U & W values of Last Thread Cutting Pass	
-0.1250	Calculated - W value from end of chamfer / last scratch		
7.2000	Calculated - Retract Diameter	To clear thread major during retract after roll holder has decompressed	
Position	Description	Program Values	
A	Start of the cutting path	X	5.1750 Z 1.0000
1	Start of the approach path	X	5.7552 Z 1.0000
2	Intercept point	X	5.6347 Z -0.7500
3	Last full thread	X	6.6430 Z -4.7500
4	End of chamfer - End of last scratch	U	0.4000 W -0.1250
5	Retract point	X	7.2000 Z -4.8750
6	Approach point	X	7.2000 Z 1.0000



### Sample NC38 PIN – G32 Program <> Page 2

```
G0 Z1. M9
M0 (INSPECT THREAD & RESET GAUGE)
G97 S62 M03
M8
G0 X4.1625
Z.2
W.0215
X3.5788
G32 X3.2511 Z-.75 E.25
G32 X3.6894 Z-3.375 E.25
G32 U.3 W-.125 E.25
G0 X4.2000
Z10.0
M9
```

```
(Safe Approach Point)
(Stop - Inspect Thread & reset gage for pass #1) -----
(62RPM ~ 50 SFM recommended for Pins)
(Coolant On) -----
(Safe Approach Point) -----
(Approach Point Z start position) -----
(Synchronization offset - determined during setup - see Note below) -
(Approach Path Start Diameter) -----
(CRR Approach Path to Intercept Point) -----
(CRR along bulk of threads) -----
(CRR of End Chamfer/Last Scratch - ΔX & ΔZ moves) -----
(Extra pull out required for roller piston travel) -----
```

## CJ Winter - Mazatrol Cold Root Rolling Calculator

CJ Winter's Cold Root Rolling Calculator generates recommended coordinates for starting points, ending points, pull outs, etc. for Cold Root Rolling, and calculates those points automatically with the proper inputs. The calculator is in no way intended to replace good programming and machining practices. Like all new CNC programs, verification in a safe manner is still required, to ensure the program can be executed without damaging the tooling, part, or machinery. While CJW has made every effort to ensure the recommended coordinates are correct, the user assumes all risk in applying those recommendations to their particular setup.

The suggested tool path for the roller starts with the roller 2 full tooth-heights above the thread at the start, engages the root of the cut thread 2 to 3 full pitches into the part, and then follows the pre-cut minor diameter exiting at the same point and chamfer angle. Use this calculator to determine optimal roller tool path geometry when programming cold root rolling in MAZATROL.

### Internal Threads (Box)

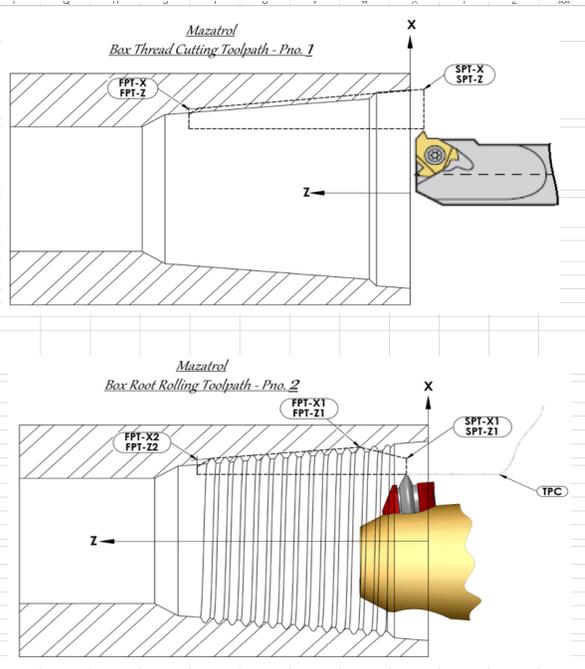
**Instructions / Notes:**

- 1) Black text values in green cells must be chosen by user for application
- 2) **bold red text values in green cells are suggested values, but may be changed if required**
- 3) Cells with red corner flags have additional "comments" which can be revealed by hovering over the cell with you cursor
- 4) You may need to alter User Parameter for finish allowance on last threading pass to .0002 (maxor machines - set U39 to value 2)
- 5) Cells containing "\*" do not allow for a value to be entered - they are auto-set by Mazatrol controller
- 6) Mazatrol uses information already specified in process for thread geometry & pre-set parameters to calculate approach, pullout chamfer and retract moves. When Cold Root Rolling (CRR) NC38 and/or smaller sized box connections - additional precautions need to be taken to prevent holder from crashing into ID of bore, particularly during set-up.

VARIABLE INPUT TABLE									
2.000	TPR	Thread Taper (0 inches/foot)							
0.625	CBD	CounterBore Depth (inches)							
2.0	PL-Z	Plunge location of roller (# of pitches in from SPT-Z) (default value 3.0)							
2.0	PL-X	Root rolling plunge height (by multiples of tooth height per side) (default value 2.0)							

Thread Cutting Process											
Pno.	MODE	#	CHAMF	LEAD	ANG	MULTI	HGT	NUMBER	V	DEPTH	TOOL
1	THRIN	0	2	0.2500	50	1	0.1478	autoset	250	*	8
SEQ			SPT-X	SPT-Z	FPT-X	FPT-Z					
1			6.0288	0.0000	5.1228	5.3750					

Root Rolling Process											
Pno.	MODE	#	CHAMF	LEAD	ANG	MULTI	HGT	NUMBER	V	DEPTH	TOOL
2	THRIN	1	2	0.2500	50	1	0.1478	*	30	0.1475	8
SEQ			SPT-X	SPT-Z	FPT-X	FPT-Z					
1			5.9541	<b>0.5000</b>	5.8203	1.2500					
2			*	*	5.1228	5.3750					
	TPC-X	TPC-Z	Set the Tool Path Controls for the cold rolling tool these values to avoid collisions during approach to the part from the home position								
	5.3750	2.00									

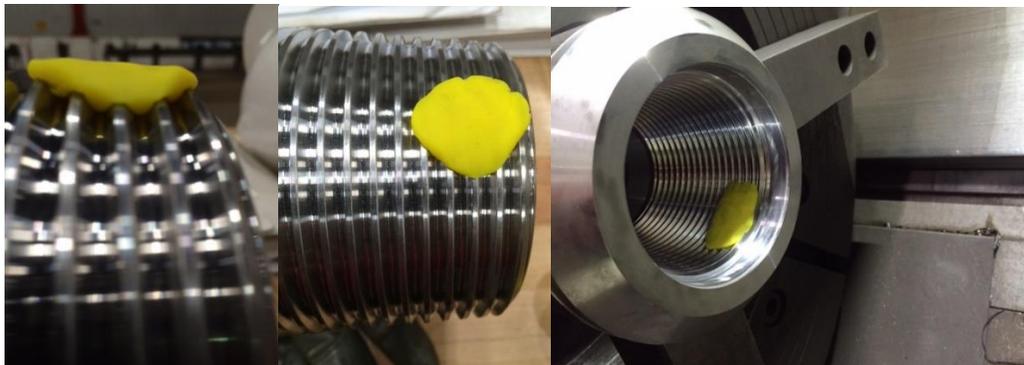


### Setting the wheel alignment to be in pitch:

If your lathe does not have the teach function for setting tool offsets you can use clay or play-doh on your threaded connection if you would like but not mandatory. This helps for first piece setup so the cold roll wheel will make an impression in the clay prior to making contact with your part. The operator can see if the wheel is aligned properly in the center of the root or if the wheel in the Z axis needs to be adjusted for alignment. On many machines you can enter in a dimension for tool wear or enter the offset value as a W dimension. Reference our programming example in CJ Winter's Instructional Manual.

If your lathe has the teach function just move the wheel over the threaded connection, move the wheel down in the center of the thread and press the teach button on you CNC control. This will put the wheel in pitch with the thread.

Photo below shown with play-doh example.



Depending on what specification you will be following, the RPM or feed rate may need to be changed to meet the specification. Reference the DS-1 specification mentions the RPM to be between 1 to 15 RPM. We recommend you check the latest version since specifications may change. If you are cold rolling for a specific company they most likely will supply you a specification that mentions the cold rolling process you should follow.

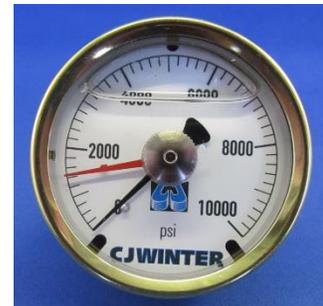
You may want to dry run your tool path away from the face of your part approximately ten inches so if for some reason a X or Z dimension is incorrect you will not crash the tool into the threaded connection. If your CNC control has tool path graphics then you should run your program to view any incorrect movements of the cold rolling tool prior to actually cold rolling.

Once your tool path is proven to be correct then reset your Z axis zero if it was changed for dry run purposes. Run your program with coolant on. Your tool will approach the part to the X and Z axis dimension in your program, move towards the third thread pitch and make contact in the root of the thread if the X axis offset is set correctly. If it is not it will start two thread heights above the crest of the thread and move towards the root of the thread and then move up or down the taper depending if you are cold rolling the pin or box style connection. This movement if programming with G32 will be the second G32 line in your program. The cold roll tool will move to the same - Z axis distance the threading tool cut to and then pullout using the third G32 line of code if used or using the X and Z axis dimension programmed. The tool should return to a safe programmed position.

Check your thread height after every cold rolling pass to see if you achieved the targeted depth of thread deformation mentioned in your specification you are following.

If you did not reach your targeted depth of thread deformation then you will change your X axis tool offset usually set in the tool wear section of your control and re-run your program. Repeat these steps until you reach your displacement mentioned in your specification you are following. Usually you want to reach this depth by your third tool pass. Remember the cold rolling process will harden the root surface so if you do not reach your depth in the first pass it will become more difficult to reach in the second and third pass. The material you are cold rolling will make a big difference depending if you are rolling 4145 an softer and usually an lower yield strength material compared to P550 non-mag, a much more harder material to displace which relates to more pressure to get the same thread height reached.

When using CJWinter's cold roll tools you will notice that there are two needles on our gauges, one red and one black. When you set the tools pre-load pressure the black needle will push the red needle up so both needles are on top of one another when you begin the cold rolling process. Once the cold roll wheel begins to roll and X axis offset is being applied to the connection you will see the black needle push up the red needle during the process. Once the tool is moved away from the thread connection the red needle will stay where it was during the cold rolling process and the black needle will drop back down to where it was for preloaded pressure. If you want to record the pressure that took place during the cold rolling process the red needle will show you the rolling pressure until you decide to move the red needle back on top of the black needle. The two needles should not be more than 1,000 psi from one another. If the pressure does start to



increase more than 1,000 psi from one another, example preload pressure is 1,800 and after cold rolling the red needle is 3,000 psi then make an increase adjustment with the preloaded pressure somewhere near 2,200 psi or 2,400 psi. This will prevent the roll holder bottoming out during the cold rolling process.

Below is a short video of an 11071 cold roll tool cold rolling an API pin connection. You can see the tool path will approach the threaded connection and make contact in the third pitch, move along the taper and pullout near the shoulder. There are additional video's listed on the [www.coldrootrolling.com](http://www.coldrootrolling.com) website under Education Center / Videos for your viewing if needed.



ColdRootRolling\_Pin.mp4

## Contact Information



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