



CJWINTER

A Brinkman International Group, Inc. Company

How it Works:

Cold Root Rolling with Fanuc and G-code



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G-code is a programming language by which computerized machines are directed to manufacture parts. This type of coding was developed in the 1950s at the MIT Servomechanisms Laboratory. In its first few decades, there were many implementations of this code, creating branches and conflicting code structures. After 1960, the Electronic Industries Alliance (EIA) began attempts to standardize the code, with a final version being approved in February of 1980 (ISO 6983). Prior to, and immediately after standardization of CNC G-code, machine operators would often have to learn machine specific structures for each machine tool they encountered.

Between the 1970s and 1990s, Fanuc and Seimens became the dominate players in the CNC control industry. However, the standard for G-code has remained closer to the Fanuc style structure than other machine control systems since the 1990's. G-code has since evolved from a long-hand coding structure, where every individual move requires a block of code into a series of canned structures, and where a single line of code controls whole sequences of motion. Today's machine operators are equipped with a nearly complete toolbox of control software. Even when tooling presents itself that is not covered by a CNC core control structure, there is almost always a G-code that can be used and adapted to fit the application.

The CJ Winter's Cold Root Rolling (CRR) Tool will work with machine tools that use EIA standard Fanuc style G-codes. However, there are no EIA G-codes specific to Cold Root Rolling, so others must be used to control the motion. CRR machining can be done by the use of the various threading commands that already exist.

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These G-codes can be adapted to run a CRR Tool as though it were nearly a native process. Within these threading codes, there are various levels of control with which to use CRR tools with Fanuc G-codes. Depending on the applications, G-codes allow for the control of each root rolling step as individual blocks or G-codes can control the entire process—and repeat it many times—as a single canned block.

How it Works:

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Automated style G-codes

The use of these G-codes requires that the threaded part match a theoretical model, to the called out tolerance. If the part is mounted improperly, such as being off-axis, or the part does not match the CAM model, running a Cold Root Rolling process can break the CRR tool, the threaded part, and significantly damage the CNC machine tool.

A CNC system is unforgiving on input and positioning errors; it will position and run the CRR tool where it is programmed, whether or not the part is positioned properly. It is critical when setting up and running the CRR tooling in a Fanuc style controlled CNC machine tool that the part dimensions be within the accepted tolerances, and that the tool's positioning is thoroughly inspected.

G32 - Thread Cycle

This is the most fundamental thread command. This command will control the feed-rate of the tooling and synchronize it with the spindle rotation. It allows the operator to control the depth of each thread pass and plunge angle. There are no auxiliary motions included either before or after the command block.

G76 - Threading Canned Cycle (Multiple Pecking Processes)

A complex canned threading cycle allows the operator to run various command blocks within a single structure. It allows for multiple passes at the same depth (spring passes) or to varying depths per pass. The command includes items such as finish passes, feed and pull out angles, etc. Although this command is incredibly versatile, it is almost too complex for the requirements of Cold Root Rolling.

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G92 - Threading Cycle

The modal threading command continues to increase the depth of cut for each threading pass until another motion control is executed. This canned cycle command allows the operator to control the depth of each threading pass. This reduces the amount of code required to run multiple passes on a threaded part, but also forces the tooling to remain in contact with material for the duration.

When programming for Cold Root Rolling on a Fanuc style CNC machine, operators regularly choose either G32 or G92. What commands are used depends on the application and the comfort and preferences of the operator.

There are many lathes that are programmed to run with Fanuc style G-codes. Fanuc (<http://www.fanuc.co.jp/eindex.htm>) carries a line of lathes within which the CJ Winter tooling can be used. Among the other brands of lathes that use these commands are Haas (www.haascnc.com) and Helman (www.helmancnc.com). It is also common to find various manual and CNC lathes that are retrofit to run with Fanuc style commands.