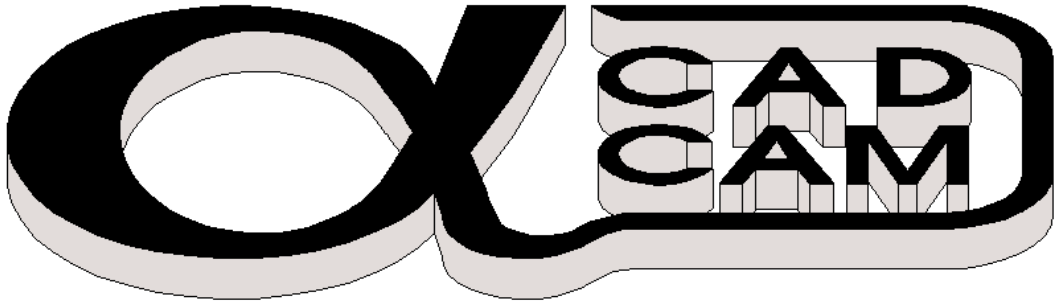
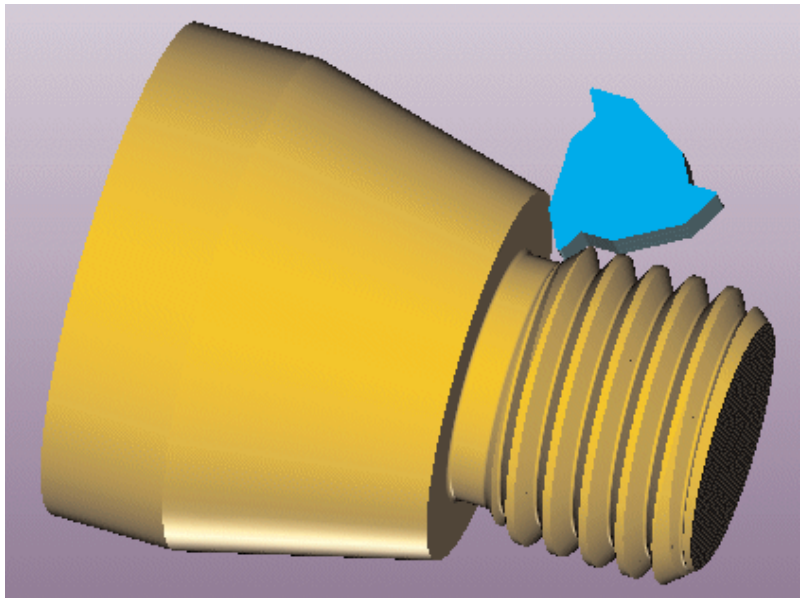
# Licom Systems Ltd.,




# Training Supplement

# Threading

Revision A



## Introduction

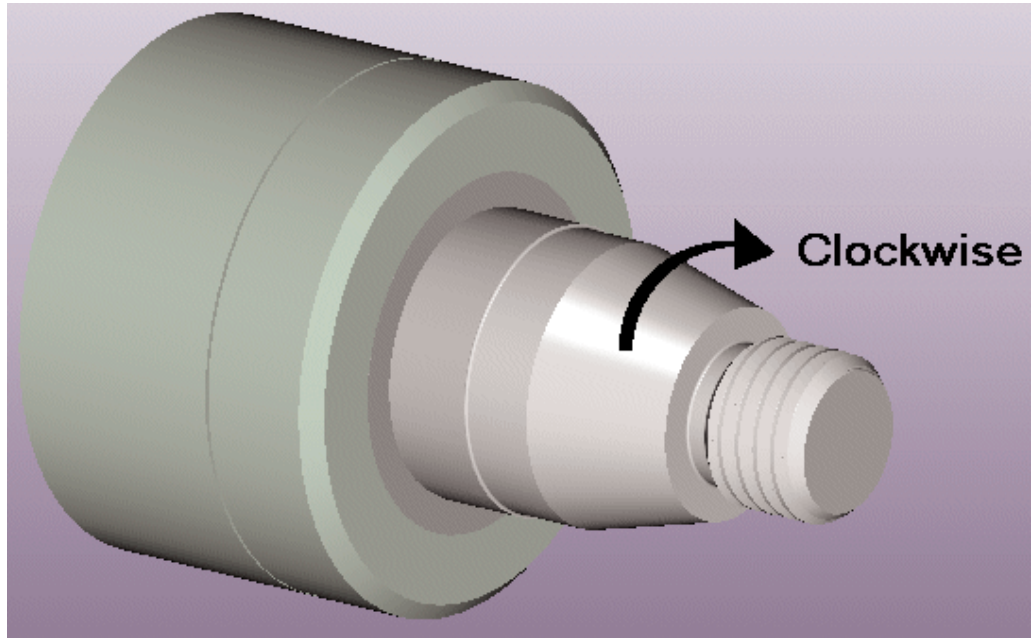
There are several considerations to be made when applying a thread to a component in AlphaCAM. Some considerations are not a part of AlphaCAM as they are part of the machine tool set up. This guide, with the aid of screen shots, will provide information to help in the completion of the dialogue boxes, and to aid the machine tool set up.

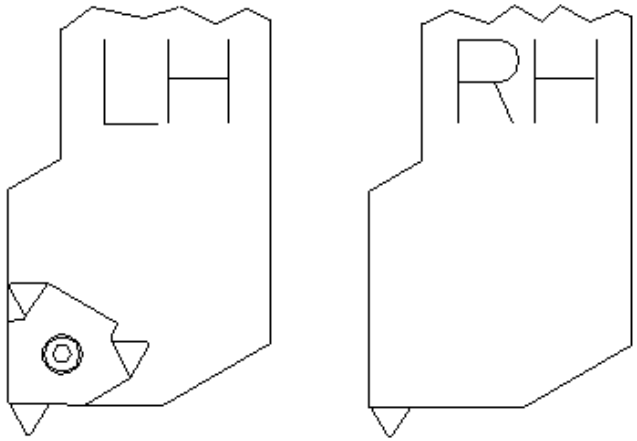
## Conventions

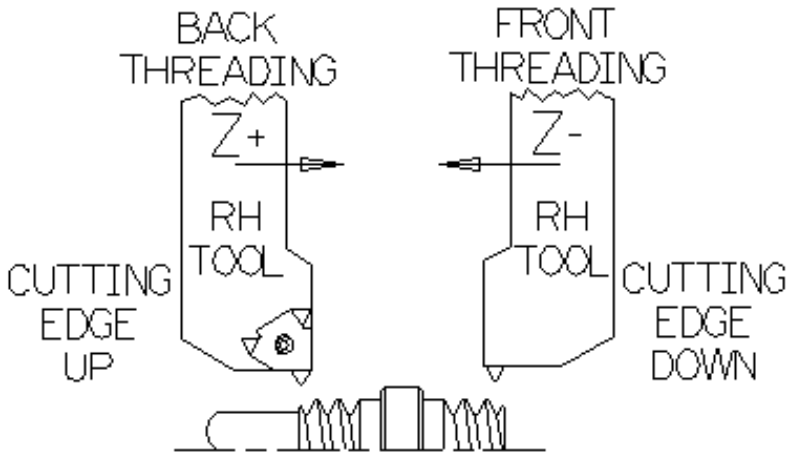
One main aspect of confusion arises when considering spindle direction and each different customer's set up will be how they see it and thus how their post processor is configured.

**For this guide the spindle direction, (CW or CCW), will be viewed as AlphaCAM sees it, which is looking from the tailstock towards the headstock, (see picture below).**

Also for the purpose of this guide we will assume that the tool turret being used is above the machine centre line.






## Screwcutting Tools

Consider the drawing of the 2 screwcutting tools.

The tool labelled LH is a left hand tool and therefore as it is held in the tool turret, with the cutting edge facing up, it will require a clockwise spindle rotation. The tool labelled RH is a right hand tool and when held in the tool turret, with the cutting edge facing down, it will require a counter clockwise spindle rotation. So, with reference to these 2 tools, if we were cutting the thread in a standard manner, i.e. feeding in a Z minus direction, then the LH tool would give a left handed thread, and the RH tool would give a right handed thread. However if the thread was being cut in a Z plus direction then the LH tool would give a right hand thread and the RH tool a left hand thread.

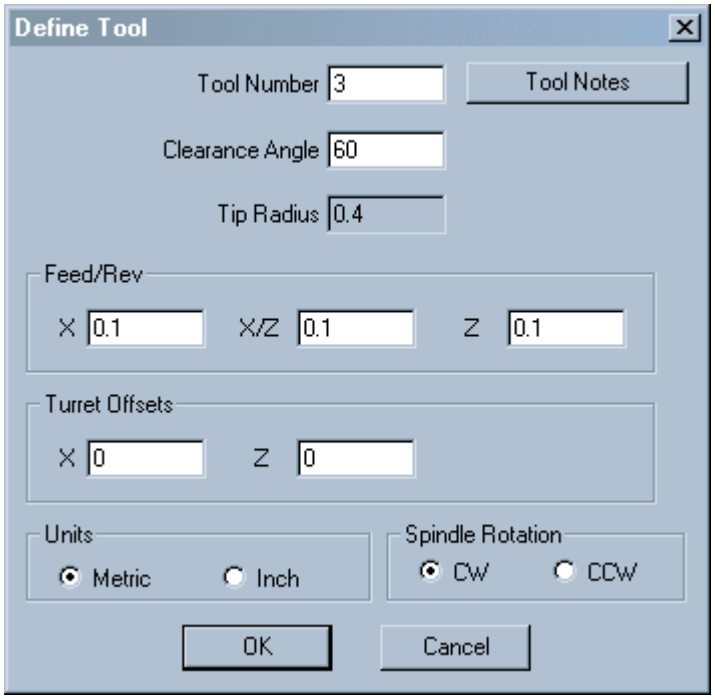
The following table gives an overview for screwcutting methods.

**Key:**

**RH** = Right Hand **LH** = Left Hand **CW** = Clockwise **CCW** = Counterclockwise

| Type of Thread Required | Tool Type | Cutting Edge | Tool / Cut Direction | Spindle Rotation |
|---|---|---|---|---|
| Front RH | RH | Down | Z- | CCW |
| Front RH | LH | Up | Z+ | CW |
| Front LH | LH | Up | Z- | CW |
| Front LH | RH | Down | Z+ | CCW |
| Back RH | RH | Up | Z+ | CW |
| Back RH | LH | Down | Z- | CCW |
| Back LH | LH | Down | Z+ | CCW |
| Back LH | RH | Up | Z- | CW |

A *Right Hand* thread can be visualised as if you were to screw a nut onto the thread you would have to turn it clockwise. A *Left Hand* thread can be visualised as if you were to screw a nut onto the thread you would have to turn it counterclockwise.



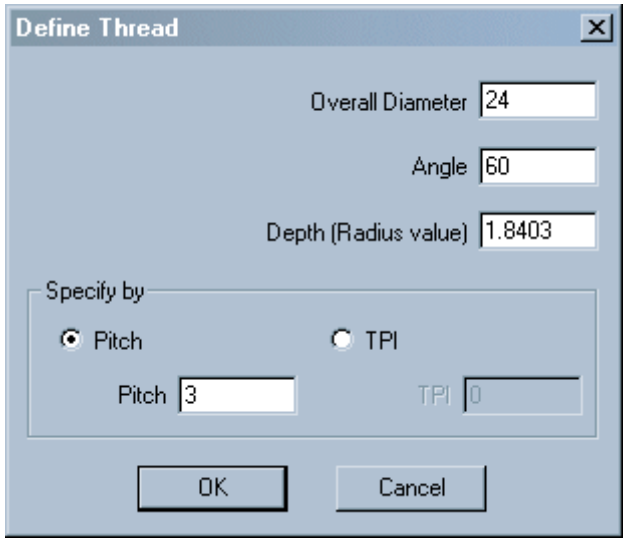

## Tool Definition

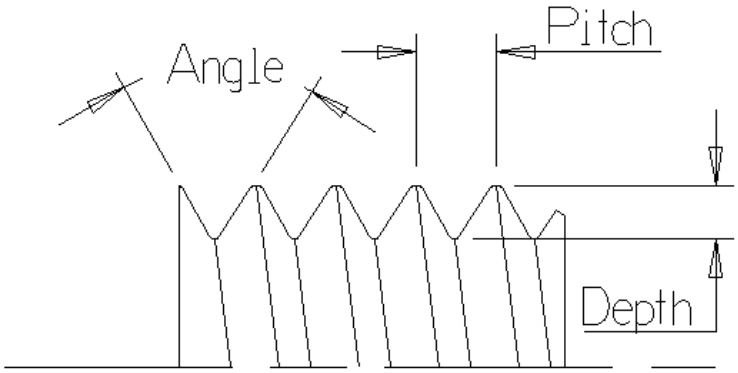
The screwcutting tools are defined in the standard way as the other tools in AlphaCAM. However the spindle rotation is critical when defining turning tools as this dictates the spindle direction that is output in the NC code. With threading, AlphaCAM determines the spindle direction from the information you give the system relating to the type of thread, (Right Hand or Left Hand), and the direction of cut, (Z- or Z+). As such it is not critical that the correct spindle rotation is entered at this stage, but for good practice it would be wise to enter the correct rotation.

## Thread Definition

Whilst applying the threading information in AlphaCAM you will be prompted to pick a file that contains information relative to the thread, i.e. overall diameter, thread angle, etc. It is possible to pick any thread and modify the information to suit as there are many threads already defined in AlphaCAM, this is the preferable method for non-standard threads, but ideally standard/common threads should be pre-defined.

The pre-defined threads can be viewed in **LICOMDAT\Threads.alp**. To define a thread: -




Select **MACHINE**|**Define Threads...**

The **Define Thread** dialogue box opposite will be displayed

**Overall Diameter -** the diameter of the thread being cut, e.g. M24 = 24mm diameter.

**Angle -** this is the flank angle of the thread, which is 60 degrees for metric threads. Imperial threads depend upon the thread specification.

**Depth -** this is the radial depth of thread from the crest to the root.

**Specify by -** this is determined by the output units, metric or imperial.

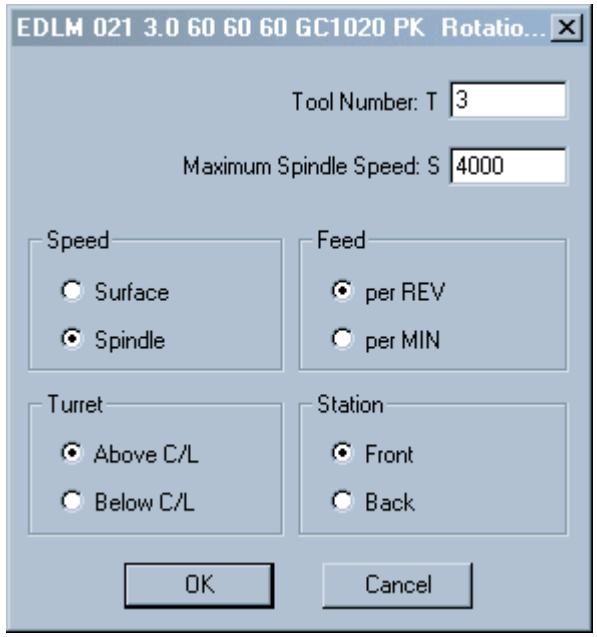
For metric units all threads, (metric or imperial), are defined by *Pitch*, which is the distance from one thread crest to the next. Therefore *TPI* should be converted into a *pitch* . ((1/TPI)*25.4)

For imperial units threads can be defined by *pitch* or more traditionally *TPI*, Threads Per Inch, which is essentially the number of pitches in 1 inch.

Set the applicable information, then select OK

AlphaCAM will then prompt you to save the thread. It would be preferable to have separate metric and imperial folders, and use a naming convention that is easily understood, e.g. **ISO 24 dia**.

You will then be returned to the Define Thread dialogue box to continue defining further threads or click Cancel to finish.




## Tool Selection

After rough and finish turning the component and making the decision on the type of thread to be cut, a suitable screwcutting tool needs to be selected.

Select **MACHINE | Select Tool...**

Choose the applicable tool and when it has been displayed on screen accept it by pressing the LMB or press Enter. The dialogue box opposite will then appear.

**Tool Number -** this is the number which specifies the tool position of the screwcutting tool in the tool turret.

**Maximum Spindle Speed -** this is the maximum spindle speed of the machine in revs/min. The default value is set in the post processor. The figure can be changed to limit the speed further to allow for certain cutting conditions.

**Speed -** this dictates the spindle speed control. *Surface* will output the spindle speed as a Constant Surface Speed. *Spindle* will output the spindle speed as direct revs/min as specified. It is common practice when screwcutting to use *Spindle*, to be able to specify the revs/min.

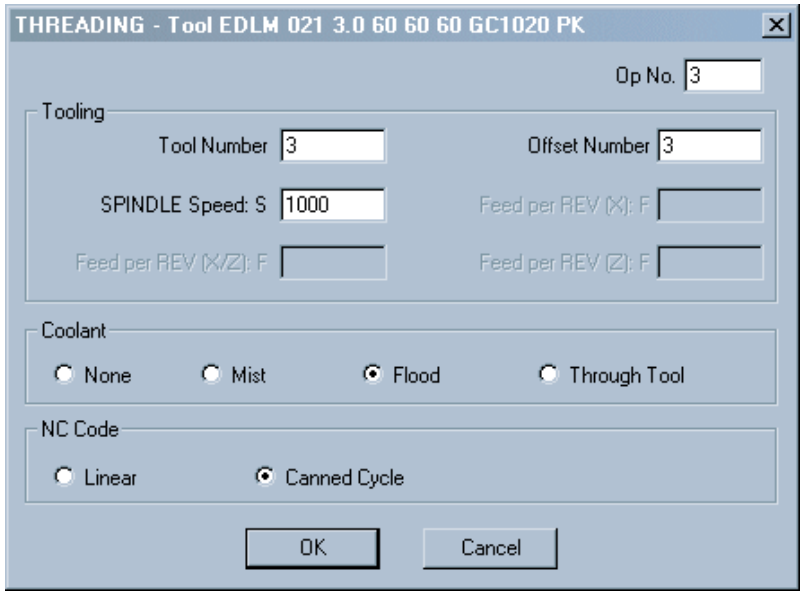
**Feed -** this dictates the feed rate format. *per REV* will give the specified amount of movement per spindle revolution. *per MIN* will give the specified amount of movement per minute. When screwcutting *Feed per REV* should always be used to ensure the correct pitch is achieved.

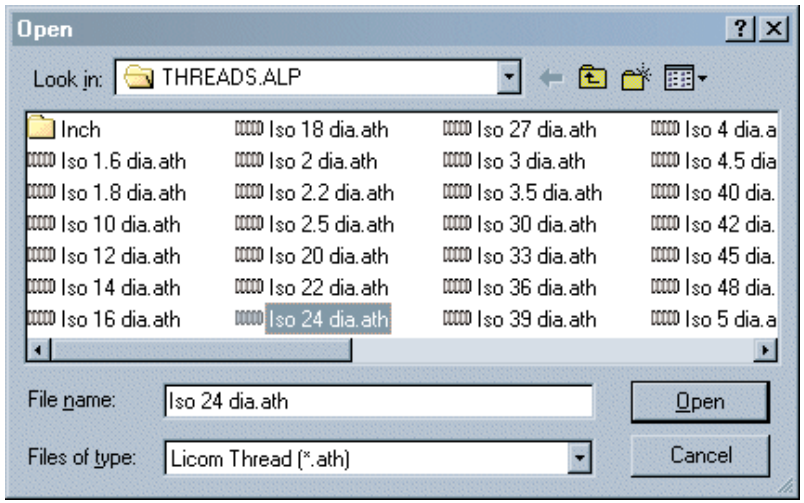
**Turret -** this is relating to twin turret machines and specifies whether the tool in question is above centre line, (X+), or below centre line, (X-). If the machine has a single turret select *Above C/L*.

**Station -** this is with reference to a sub-spindle machine, where *Front* describes a tool that will cut on the main spindle and *Back* describes a tool that will cut to the sub-spindle. With a single spindle machine select *Front*.

Set the applicable information, then select OK

## Threading Machining




Select **MACHINE**|**Conventional Turning** ▸ **Threading**

AlphaCAM will prompt for the start point of the thread. Select the position.

AlphaCAM will then prompt for the end point of the thread. Select the position.

As AlphaCAM always cuts from the start point to the end point, selection of these points will determine the direction of cut, either Z- or Z+.

**Op. No. -** this is the operation number. It is automatically incremented when a new tool is selected.

**Tool Number -** this is the number which specifies the tool position on the machine.

**Offset Number -** this is the number in the tool offset registry on the machine.

**Spindle Speed -** this is the revs/min of the machine spindle. It needs to be a speed which is suitable for the cutting conditions, (see **Feeds** below).

**Feeds -** it is not possible to select feeds for this operation. They are determined by the spindle speed and thread pitch.

**Coolant -** this allows the type of coolant delivery to be specified.

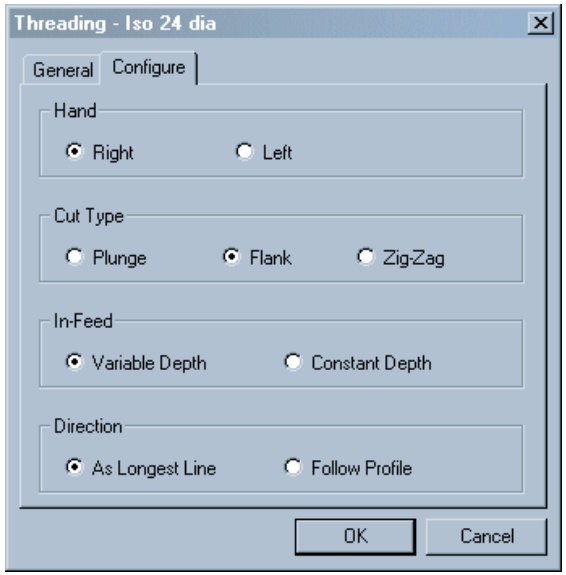
**NC Code -** this allows specification of the part program output format. *Linear* will output the code with a line for each individual movement of the axes. *Canned Cycle* will output the program in the format of the machines threading cycle. The machines canned cycles may override some of the information selected in the **Thread Cut Parameters** described on the following pages.

Set the applicable information, then select OK

AlphaCAM will prompt for the file that contains the pre-defined thread information.

Pick the appropriate thread and select Open

Confirm or edit the thread details and select OK




## Thread Cut Parameters

These dialogue boxes detail how the thread is to be cut. The dialogue box has 2 tabulated pages, **General** and **Configure**, both need to be completed before OK is selected. Click the *Configure* tab first.

### Configure

**Hand -** *Right* gives a standard right hand thread. *Left* gives a left hand thread. Now AlphaCAM has this information and the direction of cut, it will determine the spindle direction.

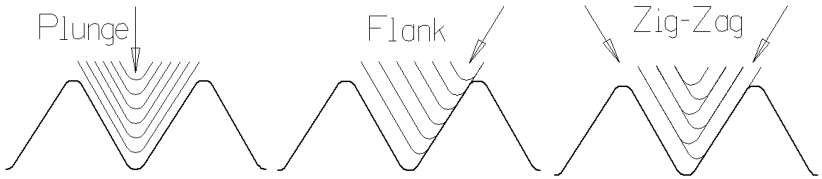
**Cut Type -** this determines the in-feed direction for the depths of cut. *Plunge* will give an in feed of 90 degrees to the direction of thread. *Flank* will give an in feed that feeds down the flank angle of the thread, in the direction of the thread. *Zig-Zag* will feed alternately down 1 flank angle and then the other for each depth of cut. The choice is usually determined by the material being cut.

**In-Feed -** this determines the way that the material is removed. *Variable Depth* will specify that an equal volume of material is removed with each cut, which ensures uniform cutting for the whole depth of thread. *Constant Depth* ensures that the depth of thread is divided into equal depths of cut, which then results in a very small first cut and a large last cut. *Variable Depth* is usually the preferred method.

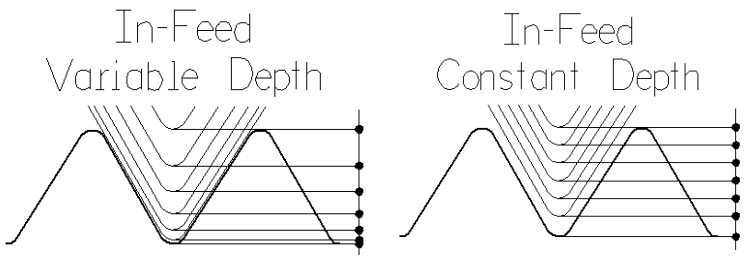
**Direction -** this dictates the direction of cut. *As Longest Line* is used for cylindrical threads and face threads. *Follow Profile* would be used for a taper thread.

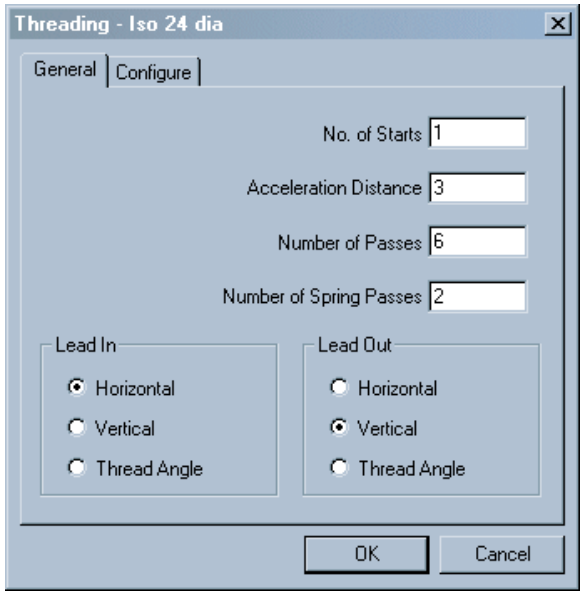
After completing this information **DO NOT** select OK pick the *General Tab*.

Cut-Type




In-Feed






## General

**No. of Starts -** allows programming of multi-start threads.

**Acceleration Distance -** this is the distance applied to the Lead In before the start of the thread that allows the machine to accelerate up to feed speed to stop deformation of the first few threads. This distance is also applied to the Lead Out when Horizontal or Thread Angle are selected. If Vertical is selected the Lead Out is a rapid move to above the thread diameter.

**Number of Passes -** this dictates how many cuts it will take to cut the thread to depth.

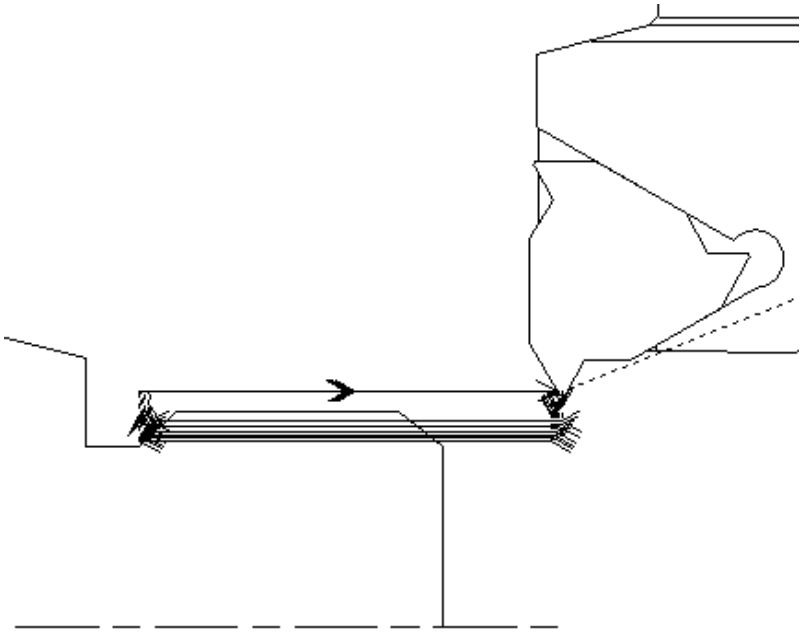
**Number of Spring Passes -** as the thread is being cut there is sometimes deflection of the part. Spring cuts are passes at the final depth of cut designed to clean up any stock left on the thread due to deflection.

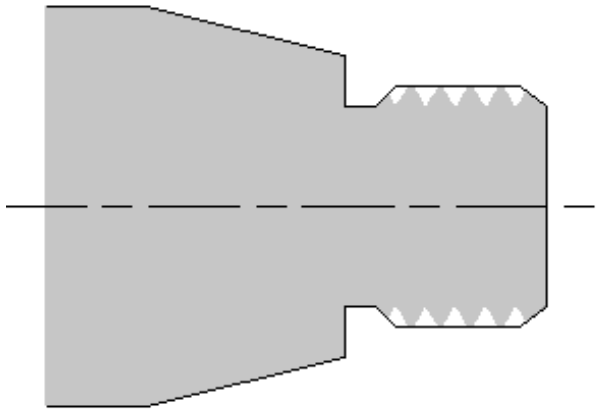
**Lead In -** this determines the direction of cut into the thread. If there is clearance at the front of the thread then *Horizontal* can be used. If the thread starts in an undercut then *Vertical* would need to be used. *Thread Angle* would be used if there is no pre-machined lead already turned on the part, to chamfer the start of the thread, e.g. a worm thread.

**Lead Out -** this determines the direction of cut out of the thread. If there is clearance at the back of the thread then *Horizontal* can be used. If the thread finishes in an undercut then *Vertical* would need to be used. *Thread Angle* would be used if there is no undercut and the back of the thread requires chamfering.

☞ Set the applicable information, then select OK

The thread toolpaths will then be applied to the component.





☞ AlphaCAM will prompt for the position of the rapids approaching the start of the thread.

☞ Set the rapids either by positioning them with the cursor and then using the LMB, or by using the RMB to apply a direct straight line rapid. If the F3 Ortho mode is used this will give only X or only Z moves to position.

This then finishes the threading operation, so it is then necessary to return the tool to tool change position or apply the next machining operation.