```
N20 G0 X40 Z10                                          ; Approach starting position
N30 CYCLE98 (0, 30, -30, 30, -60, 36, -80, 50, 10, 10,  ; Cycle call
0.92, , , , 5, 1, 1.5, 2, 2, 3, 1,)
N40 G0 X55                                              ; Traverse axis by axis
N50 Z10
N60 X40
N70 M2                                                  ; End of program
```

9.5.8 Thread cutting - CYCLE99

Programming

CYCLE99 (SPL, DM1, FPL, DM2, APP, ROP, TDEP, FAL, IANG, NSP, NRC, NID, PIT, VARI, NUMTH, _VRT, 0, 0, 0, 0, 0, 0, 0, 0, PITA, 0, 0, 0, PSYS)

Parameters

Parameter	Data type	Description	
SPL	REAL	Thread starting point in the longitudinal axis	
DM1	REAL	Thread diameter at the starting point	
FPL	REAL	Thread end point in the longitudinal axis	
DM2	REAL	Thread diameter at the end point	
APP	REAL	Run-in path (enter without sign)	
ROP	REAL	Run-out path (enter without sign)	
TDEP	REAL	Thread depth (enter without sign)	
FAL	REAL	Finishing allowance (enter without sign)	
IANG	REAL	Infeed angle Range of values: >0: Infeed along the rear flank <0: Infeed along the front flank =0: Infeed at a right angle to the cutting direction	
NSP	REAL	Starting point offset for the first thread turn (enter without sign)	
NRC	INT	Number of roughing cuts (enter without sign)	
NID	INT	Number of idle passes (enter without sign)	
PIT	REAL	Thread lead as a value (enter without sign) !!! the unit is defined in parameter PITA	
VARI	INT	Definition of the machining type for the thread	
		Values	300101 external thread with linear infeed 300102 internal thread with linear infeed 300103 external thread with degressive infeed 300104 internal thread with degressive infeed
NUMTH	INT	Number of thread turns (enter without sign)	
_VRT	REAL	Variable retraction path based on initial diameter, incremental (enter without sign)	
PSYS	INT	Internal parameter, only the default value 0 is possible	
		Values:	0
PSYS	INT	Internal parameter, only the default value 0 is possible	
		Values:	0
PSYS	INT	Internal parameter, only the default value 0 is possible	
		Values:	0
PSYS	INT	Internal parameter, only the default value 0 is possible	
		Values:	0
PSYS	INT	Internal parameter, only the default value 0 is possible	

Parameter	Data type	Description	
		Values:	0
PSYS	INT	Internal parameter, only the default value 0 is possible	
		Values:	0
PSYS	INT	Internal parameter, only the default value 0 is possible	
		Values:	0
PITA	INT	Unit of parameter PIT (thread pitch)	
		Values:	1 pitch in mm/revolution 2 pitch in threads per inch(TPI)
PSYS	STRING	Internal parameter, only the default value 0 is possible	
		Values:	" "
PSYS	STRING	Internal parameter, only the default value 0 is possible	
		Values:	" "
PSYS	STRING	Internal parameter, only the default value 0 is possible	
		Values:	" "
PSYS	INT	Internal parameter, only the following values are possible	
		Values:	0 Longitudinal thread 10 Face thread 20 Taper thread

Function

The thread cutting cycle consists of three alternatives: longitudinal thread, face thread or taper thread.

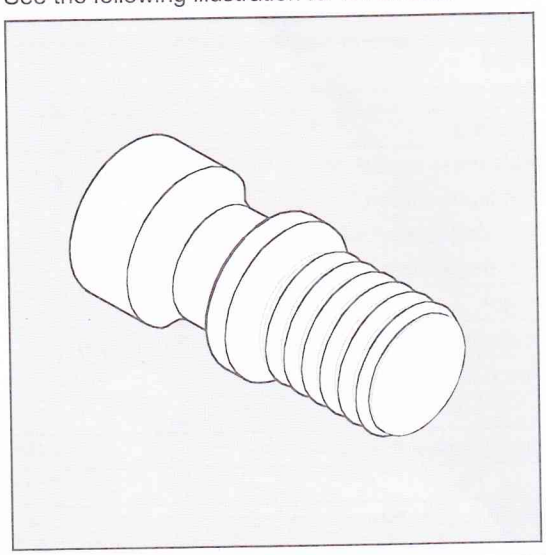
Use the thread cutting cycle to produce cylindrical and tapered external and internal threads with constant lead in longitudinal and face machining. The thread can be single or multiple. With multiple threads, the individual thread turns are machined one after the other.

The infeed is performed automatically; you can choose between the variants constant infeed per cut or constant cutting cross-section.

Right-hand or left hand thread is determined by the direction of rotation of the spindle which must be programmed prior to the cycle start.

Both feed and spindle override are ineffective in the traversing blocks with thread.

See the following illustration for CYCLE99:



Note

To be able to use this cycle, a speed-controlled spindle with position measuring system is required.

Sequence

Position reached prior to cycle start:

Starting position is any position from which the programmed thread starting point + run-in path can be approached without collision.

The cycle creates the following sequence of motions:

- Approach of the starting point determined in the cycle at the beginning of the run-in path for the first thread turn with G0
- Infeed for roughing according to the infeed type defined under VARI.
- Thread cutting is repeated according to the programmed number of roughing cuts.
- The finishing allowance is removed in the following step with G33.
- This step is repeated according to the number of idle passes.
- The whole sequence of motions is repeated for each further thread turn.

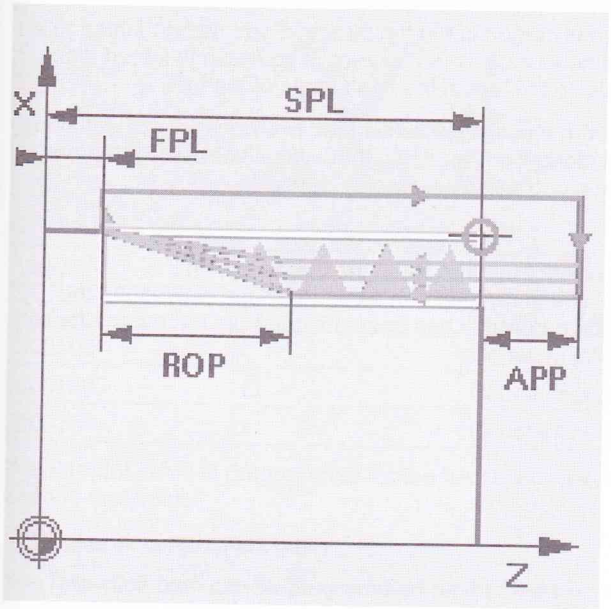
Explanation of the parameters

DM1 and DM2 (diameter)

Use this parameter to define the thread diameter of starting and end point of the thread. In the case of internal threads, this is the tap-hole diameter.

Interrelation SPL, FPL, APP and ROP (starting, end point, run-in and run-out path)

See the following illustration for the parameters for CYCLE99:



The programmed starting point (SPL) or end point (FPL) constitutes the original starting point of the thread. The starting point used in the cycles, however, is the starting point brought forward by the run-in path APP.

The run-out path (Cut out) begins before the programmed end point FPL. It brings the end position of thread forward so that the end of cut out is equal FPL.

Interrelation TDEP, FAL, NRC and NID (thread depth, finishing allowance, number of cuts)

The programmed finishing allowance acts paraxially and is subtracted from the specified thread depth TDEP; the remainder is divided into roughing cuts.

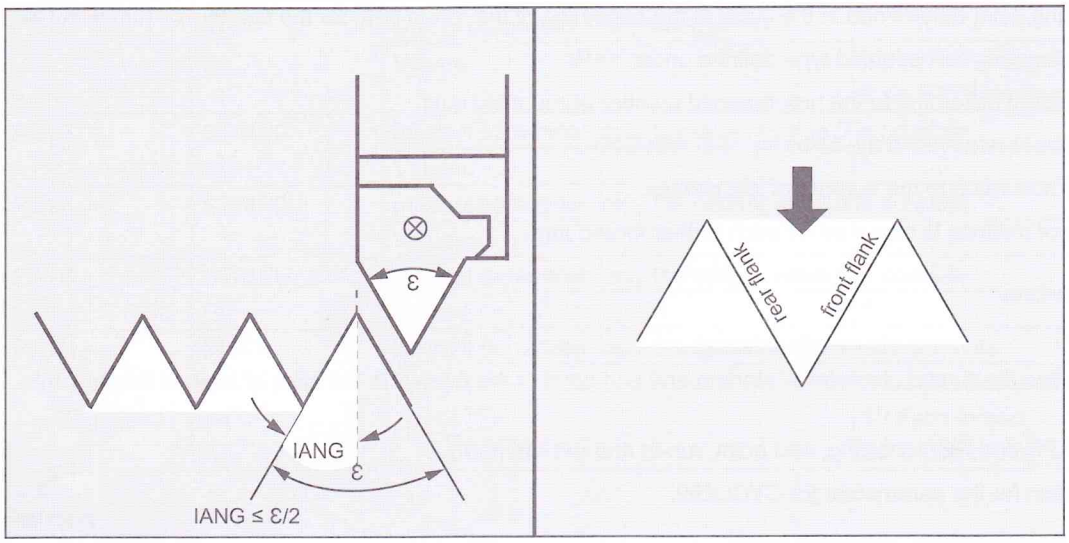
The cycle will calculate the individual infeed depth automatically, depending on the VARI parameter.

When the thread depth is divided into infeeds with constant cutting cross-section, the cutting force will remain constant over all roughing cuts. In this case, the infeed will be performed using different values for the infeed depth.

A second version is the distribution of the whole thread depth to constant infeed depths. When doing so, the cutting cross-section becomes larger from cut to cut, but with smaller values for the thread depth, this technology can result in better cutting conditions.

The finishing allowance FAL is removed after roughing in one step. Then the idle passes programmed under parameter NID are executed.

IANG (infeed angle)

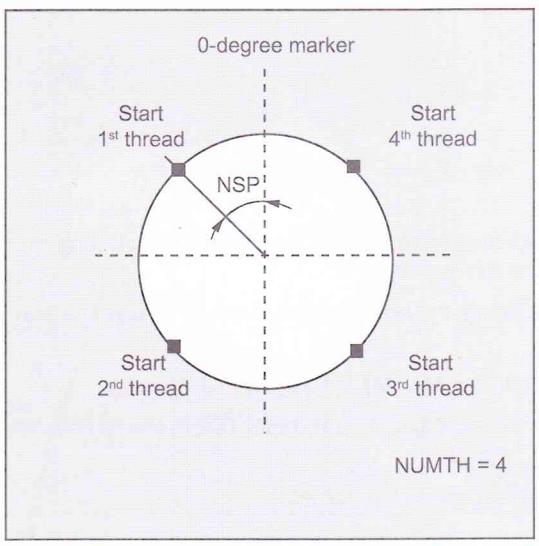


By using parameter IANG, the angle is defined under which the infeed is carried out in the thread. If you wish to infeed at a right angle to the cutting direction in the thread, the value of this parameter must be set to zero. If you wish to infeed along the flanks, the absolute value of this parameter may amount maximally to the half of the flank angle of the tool.

The execution of the infeed is defined by the sign of this parameter. With a positive value, infeed is always carried out along the rear flank, and with a negative value, infeed is always carried out along the front flank. If the value of IANG for tapered threads is nonetheless negative, the cycle will carry out a flank infeed along a flank.

NSP (starting point offset) and NUMTH (number)

You can use this parameter to program the angle value defining the point of the first cut of the thread turn at the circumference of the turned part. This involves a starting point offset. The parameter can assume values between 0 and +359.9999 degrees. If no starting point offset has been specified or the parameter has been omitted from the parameter list, the first thread turn automatically starts at the zero-degree mark.



Use the NUMTH parameter to define the number of thread turns with a multiple-turn thread. For a single-turn thread, the parameter must be assigned zero or can be dropped completely in the parameter list.

The thread turns are distributed equally over the circumference of the turned part; the first thread turn is determined by the NSP parameter.

To produce a multiple-turn thread with an asymmetrical arrangement of the thread turns on the circumference, the cycle for each thread turn must be called when programming the appropriate starting point offset.

PIT (thread pitch) and PITA (unit of thread pitch)

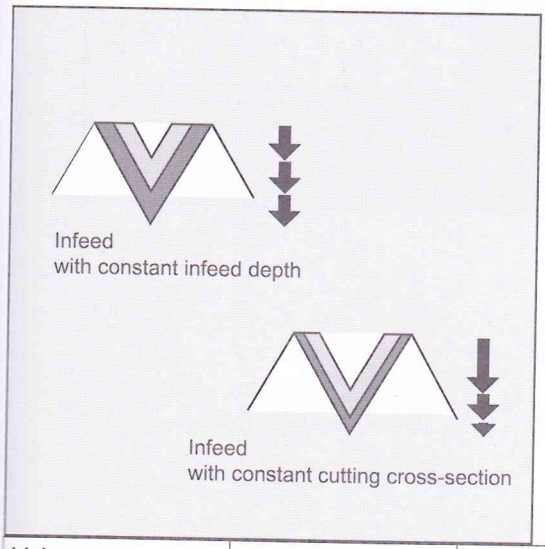
The thread lead is an axis-parallel value and is specified without sign. The unit of it is defined in parameter PITA.

PITA = 1 pitch in mm/revolution

= 2 pitch in threads per inch (TPI)

VARI (machining type)

By using the VARI parameter, it is defined whether external or internal machining will be carried out and which technology will be used with regard to the infeed when roughing. The VARI parameter can assume values between 1 and 4 with the following meaning:



Value	Ext./int.	Const. Infeed/const. cutting cross-section
300101	O	Constant infeed
300102	I	Constant infeed
300103	O	Constant cutting cross-section
300104	I	Constant cutting cross-section

If a different value is programmed for the VARI parameter, the cycle is aborted after output of alarm 61002 "Machining type defined incorrectly".

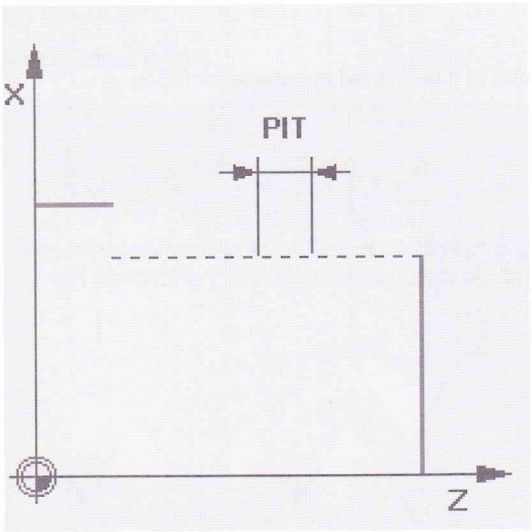
_VRT (variable retraction path)

The retraction path can be programmed on the basis of the initial thread diameter in the _VRT parameter. For _VRT = 0 (parameter not programmed), the retraction path is 1 mm. The retraction path is always measured according to the programmed system of units, inch or metric.

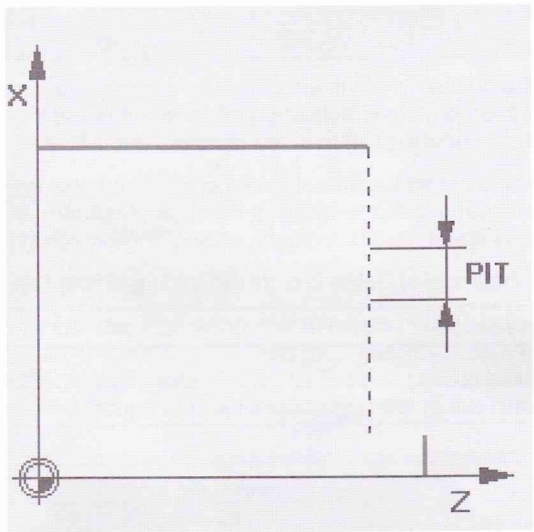
PSYS (the last parameter displayed on the screen)

This parameter specifies the selection of longitudinal thread, face thread or taper thread.

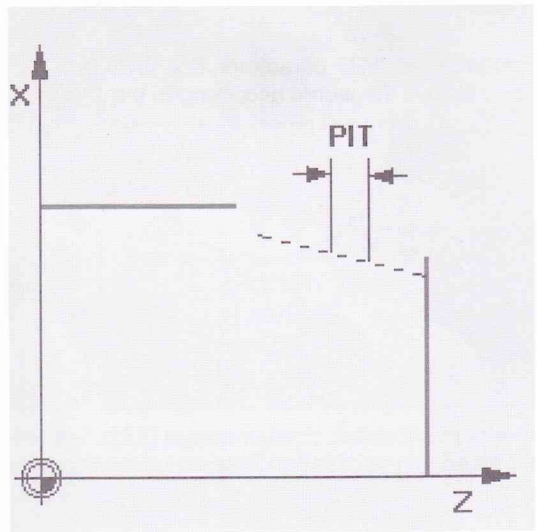
0 = longitudinal thread:



10 = face thread:

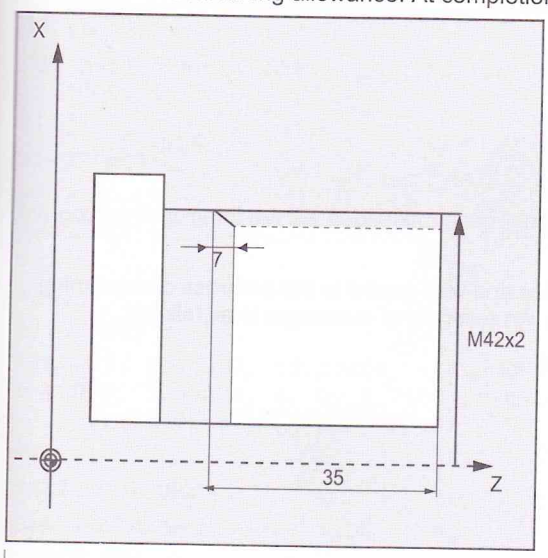


20 = taper thread:



Programming example: Thread cutting

By using this program, you can produce a metric external thread M42x2 with flank infeed. Infeed is carried out with constant cutting cross-section. At the end of thread a cut out of 7 mm is defined. 5 roughing cuts are carried out at a thread depth of 2.76 mm without finishing allowance. At completion of this operation, two idle passes will be carried out.




```
N10 G0 G90 X60 Z100 G95                                    ; Selection of starting position
N20 T1 D1
N30 M6                                                     ; Tool change
N40 S1000 M4                                               ; Specification of technology values
N50 CYCLE99(0, 42, -35, 42, 5, 7, 2.76, 0, 0, 0, 5, 2, 4.5, ; Cycle call
300101, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, , , ,0)



N60 G0 G90 X100 Z100                                       ; Approach next position
N70 M30                                                    ; End of program
```

9.6 Error messages and error handling

9.6.1 General Information

If error conditions are detected in the cycles, an alarm is generated and the execution of the cycle is aborted.

Furthermore, the cycles display their messages in the message line of the control system. These messages will not interrupt the program execution.

The errors with their reactions and the messages in the message line of the control system are described in conjunction with the individual cycles.

9.6.2 Error handling in the cycles

Alarms with numbers between 61000 and 62999 generated in the cycles. This range of numbers, in turn, is divided again with regard to alarm responses and cancel criteria.

The error text that is displayed together with the alarm number gives you more detailed information on the error cause.

Alarm number	Clearing criterion	Alarm Response
61000 ... 61999	NC_RESET	Block preparation in the NC is aborted
62000 ... 62999	Clear key	The block preparation is interrupted; the cycle can be continued the following key on the MCP after the alarm has been cleared: