SIEMENS

SINUMERIK

SINUMERIK 840D sl
G code programming

Programming Manual

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without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

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1 Programming cycles externally

1.1 General information

General information

This document describes the machining cycles from software version 2.6 onwards for creating external NC programs. It comprises:

- Programming

  Cycle name and call sequence of the transfer parameters

- Parameters

  Tables for explaining individual parameters

The tables contain the names of the parameters used internally and an explanation of what they mean and the possible value range. The relationships between the parameters are also explained. The column for reference to the parameter in the mask is to be used to locate programmed values again when externally generated cycle calls to the controller are recompiled.

Certain parameters are marked "for interface only" in the tables. These are not relevant to operation of the cycle. They are only needed in order to be able to recompile cycle calls completely. If they are not programmed the cycle can still be recompiled; the fields are then identified by color and must be completed in the mask.

Parameters that are described as "reserved" must be programmed with the value 0 or a comma so that the assignment of the following call parameters matches up with the internal cycle parameters. Exception: string parameters with the value "" or a comma.

The machining cycles from software version 2.6 onwards are a further development of the cycle packages for 840Dsl to software version 1.5 (cycles to software version 7.5). NC programs with cycle calls for these earlier software versions will still run.

Most cycles have been extended by new transfer parameters or the range of existing parameters has been extended in order that new functions can be programmed (e.g. Parameter _VARI for the type of machining, which is used often).

The term "Compatibility" in this documentation indicates input values that have not been programmed before. If values are assigned accordingly, the cycle runs with the same functions as up to software version 7.5.

Drilling and milling cycles can be repeated on the position pattern (modal calls). In such cases MCCALL should be written in the same line, e.g. MCALL CYCLE83(etc.)

Note

If certain transfer parameters (e.g. `_VARI, _GMODE, _DMODE, _AMODE`) have been indirectly programmed as parameters, the input mask is opened on recompiling but it cannot be stored as there is no unambiguous assignment to defined selection fields.

1.2 Drilling, centering - CYCLE81

Programming

```
CYCLE81(REAL RTP,REAL RFP,REAL SDIS,REAL DP,REAL DPR,REAL _DTB,
INT _GMODE,INT _DMODE,INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	RP	RTP	Retraction plane (abs)
2	Z0	RFP	Reference point (abs)
3	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1/∅	_DP	Drilling depth (abs)/ centering diameter (abs), see _GMODE
5	Z1	-DPR	Drilling depth (inc)
6	DT	_DTB	Dwell time at final drilling depth, see _AMODE
7		_GMODE	Geometrical mode (evaluation of programmed geometrical data)
			UNITS: Reserved
			TENS: Centering with respect to depth/diameter
			0 = Compatibility, depth
			1 = Diameter
8		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
9		_AMODE	Alternate mode
			UNITS: Drilling depth Z1 (abs/inc)
			0 = Compatibility, from DP/DPR programming
			1 = Incremental
			2 = Absolute
			TENS: Dwell time at final drilling depth DT in seconds/revolutions
			0 = Compatibility, from DTB sign (> 0 seconds or < 0 revolutions)
			1 = in seconds
			2 = in revolutions

1.3 Drilling, counterboring - CYCLE82

Programming

```
CYCLE82 (REAL RTP,REAL RFP,REAL SDIS,REAL DP,REAL DPR,REAL DTB,
INT _GMODE,INT _DMODE,INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	RP	RTP	Retraction plane (abs)
2	Z0	RFP	Reference point (abs)
3	SC	SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	DP	Drilling depth (abs), see _AMODE
5	Z1	DPR	Drilling depth (inc), see _AMODE
6	DT	DTB	Dwell time at final drilling depth, see _AMODE
7		_GMODE	Geometrical mode (evaluation of programmed geometrical data)
			UNITS: Reserved
			TENS: Drilling depth with respect to tip/shank
			0 = Compatibility, tip
			1 = Shank
8		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
9		_AMODE	Alternate mode
			UNITS: Drilling depth Z1 (abs/inc)
			0 = Compatibility, from DP/DPR programming
			1 = Incremental
			2 = Absolute
			TENS: Dwell time DT at final drilling depth in seconds/revolutions
			0 = Compatibility, from DT sign (> 0 seconds / < 0 revolutions)
			1 = in seconds
			2 = in revolutions

1.4 Reaming - CYCLE85

Programming

```
CYCLE85 (REAL RTP,REAL RFP,REAL SDIS,REAL DP,REAL DPR,REAL DTB,
REAL FFR,REAL RFF,INT _GMODE,INT _DMODE,INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	RP	RTP	Retraction plane (abs)
2	Z0	RFP	Reference point (abs)
3	SC	SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	DP	Drilling depth (abs), see _AMODE
5	Z1	DPR	Drilling depth (inc), see _AMODE
6	DT	DTB	Dwell time at final drilling depth, see _AMODE
7	F	FFR	Feedrate
8	FR	RFF	Feedrate during retraction
9		_GMODE	Reserved
10		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
11		_AMODE	Alternative mode (drilling)
			UNITS: Drilling depth Z1 (abs/inc)
			0 = Compatibility, from DP/DPR programming
			1 = Incremental
			2 = Absolute
			TENS: Dwell time DT at final drilling depth in seconds/revolutions
			0 = Compatibility, from DT sign (> 0 seconds or < 0 revolutions)
			1 = in seconds
			2 = in revolutions

1.5 Deep-hole drilling - CYCLE83

Programming

```
CYCLE83(REAL RTP,REAL RFP,REAL SDIS,REAL DP,REAL DPR,REAL FDEP,
REAL FDPR,REAL _DAM,REAL DTB,REAL DTS,REAL FRF,INT VARI,INT _AXN,
REAL _MDEP,REAL _VRT,REAL _DTD,REAL _DIS1,INT _GMODE,INT _DMODE,
INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	RP	RTP	Retraction plane (abs)
2	Z0	RFP	Reference point (abs)
3	SC	SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	DP	Final drilling depth (abs), see _AMODE
5	Z1	DPR	Final drilling depth (inc), see _AMODE
6	D	FDEP	1. Drilling depth (abs), see _AMODE
7	D	FDPR	1. Drilling depth (inc), see _AMODE
8	DF	_DAM	Amount/percentage for each additional infeed (degression amount/percentage), see _AMODE
9	DTB	DTB	Dwell time at drilling depth, see _AMODE
10	DTS	DTS	Dwell time at start point (for swarf removal only), see _AMODE
11	FD1	FRF	Percentage for the feedrate for the first infeed, see _AMODE
12		VARI	Machining type
			UNITS: Chip breaking / deswarfing
			0 = Chip breaking
			1 = Swarf removal
13		_AXN	Tool axis:
			0 = 3. Geometry axis
			1 = 1. Geometry axis
			2 = 2. Geometry axis
			> 2 = 3. Geometry axis
14	V1	_MDEP	Minimum infeed (only for degression percentage)
15	V2	_VRT	Retraction distance after each machining step (for chip breaking only)
			> 0 = variable retraction distance
			0 = Standard value 1 mm
16	DT	_DTD	Dwell time at final drilling depth, see _AMODE
17	V3	_DIS1	Limit distance (for swarf removal only), see _AMODE
18		_GMODE	Geometrical mode (evaluation of programmed geometrical data)
			UNITS: Reserved
			TENS: Drilling depth with respect to tip/shank
			0 = Tip
			1 = Shank

No.	Param Mask	Param intern	Explanation
19		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
20		_AMODE	Alternate mode
			UNITS: Drilling depth = Final drilling depth Z1 (abs/inc)
			0 = Compatibility, from DP/DPR programming
			1 = Incremental
			2 = Absolute
			TENS: Dwell time at final drilling depth DTB in seconds/revolutions
			0 = Compatibility from DTB sign (> 0 seconds or < 0 revolutions)
			1 = in seconds
			2 = in revolutions
			HUNDREDS: Dwell time at start point of DTS in seconds/revolutions
			0 = Compatibility from DTS sign (> 0 seconds or < 0 revolutions)
			1 = in seconds
			2 = in revolutions
			THOUSANDS: Dwell time at final drilling depth DT in seconds/revolutions
			0 = Compatibility from DTD sign (> 0 seconds or < 0 revolutions)
			1 = in seconds
			2 = in revolutions
			TEN THOUSANDS: 1. Drilling depth D (abs/inc)
			0 = Compatibility, from FDEP/FDPR programming
			1 = Incremental
			2 = Absolute
			HUNDRED THOUSANDS: Amount/percentage DAM for each additional infeed (degression)
			0 = Compatibility, from DAM sign (> 0 seconds or < 0 factor 0.001 to 1.0)
			1 = Amount
			2 = Percentage (0.001 up to 100 %)
			MILLION: Limit distance V3 automatic/manual
			0 = Compatibility from _DIS1 sign (= 0 automatic or > 0 manual)
			1 = automatic (calculated in the cycle)
			2 = manual (programmed value)
			TEN MILLION: Feed rate factor for first infeed FRF as factor/percentage
			0 = Compatibility, as a factor (0.001 to 1.0, FRF = 0 means 100%)
			1 = Percentage (0.001 up to 999.999 %)

1.6 Boring - CYCLE86

Programming

```
CYCLE86 (REAL RTP,REAL RFP,REAL SDIS,REAL DP,REAL DPR,REAL DTB,
INT SDIR,REAL RPA,REAL RPO,REAL RPAP,REAL POSS,INT _GMODE,
INT _DMODE,INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	RP	RTP	Retraction plane (abs)
2	Z0	RFP	Reference point (abs)
3	SC	SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	DP	Drilling depth (abs), see _AMODE
5	Z1	DPR	Drilling depth (inc), see _AMODE
6	DT	DTB	Dwell time at final drilling depth, see _AMODE
7	DIR	SDIR	Direction of spindle rotation 3 = M3 4 = M4
8	DX	RPA	Lift-off distance in X direction
9	DY	RPO	Lift-off distance in the Y direction
10	DZ	RPAP	Lift-off distance in the Z direction
11	SPOS	POSS	Spindle position for lift-off (for oriented spindle stop, in degrees)
12		_GMODE	Geometrical mode
			UNITS: Lift mode
			0 = Lift off, compatibility 1 = Do not lift off
13		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active 1 = G17 (only active in the cycle) 2 = G18 (only active in the cycle) 3 = G19 (only active in the cycle)
14		_AMODE	Alternate mode
			UNITS: Drilling depth Z1 (abs/inc)
			0 = Compatibility, from DP/DPR programming 1 = Incremental 2 = Absolute
			TENS: Dwell time at final drilling depth DT in seconds/revolutions
			0 = Compatibility, from DT sign (> 0 seconds or < 0 revolutions) 1 = in seconds 2 = in revolutions

1.7 Tapping without compensating chuck - CYCLE84

Programming

```
CYCLE84(REAL RTP,REAL RFP,REAL SDIS,REAL DP,REAL DPR,REAL DTB,
INT SDAC,REAL MPIT,REAL PIT,REAL POSS,REAL SST,REAL SST1,INT _AXN,
INT _PITA,INT _TECHNO,INT _VARI,REAL _DAM,REAL _VRT,
STRING[15] _PITM,STRING[5] _PTAB,STRING[20] _PTABA,INT _GMODE,
INT _DMODE,INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation	
1	RP	RTP	Retraction plane (abs)	
2	Z0	RFP	Reference point (abs)	
3	SC	SDIS	Safety clearance (to be added to reference point, enter without sign)	
4	Z1	DP	Drilling depth = final drilling depth (abs), see _AMODE	
5	Z1	DPR	Drilling depth = final drilling depth (inc), see _AMODE	
6	DT	DTB	Dwell time at drilling depth in seconds	
7	SDE	SDAC	Direction of rotation after end of cycle	
8		MPIT	Thread size for ISO metric only (pitch is calculated internally during run time)	
9	P	PIT	Pitch as a value, for unit see _PITA	
10	αS[1)]	POSS	Spindle position for oriented spindle stop	
11	S	SST	Spindle speed for tapping	
12	SR	SST1	Spindle speed for retraction	
13		_AXN	Drilling axis: 0 = 3. Geometry axis 1 = 1. Geometry axis 2 = 2. Geometry axis ≥ 3 = 3. Geometry axis	
14		_PITA	Unit for thread pitch 0 = Pitch in mm 1 = Pitch in mm 2 = Pitch in TPI 3 = Pitch in inches 4 = MODULE	(evaluation of PIT and MPIT) - evaluation of MPIT/PIT - evaluation of PIT - evaluation of PIT (threads per inch) - evaluation of PIT - evaluation of PIT

No.	Param Mask	Param intern	Explanation
15		_TECHNO	Technology[1)]
			UNITS: Exact stop response
			0 = Exact stop response active as before cycle call
			1 = Exact stop G601
			2 = Exact stop G602
			3 = Exact stop G603
			TENS: Forward control
			0 = with/without forward control active as before cycle call
			1 = with forward control FFWON
			2 = without forward control FFWOF
			HUNDRED: Acceleration
			0 = SOFT/BRISK/DRIVE active as before cycle call
			1 = with jerk limiting SOFT
			2 = without jerk limiting BRISK
			3 = reduced acceleration DRIVE
			THOUSANDS: MCALL spindle mode
			0 = on MCALL reactivate spindle operation
			1 = on MCALL remain in position control
16		_VARI	Machining type:
			UNITS:
			0 = 1 cut
			1 = Chip breaking (deep hole tapping)
			2 = Swarf removal (deep hole tapping)
			THOUSANDS: ISO/SIEMENS mode not relevant for input mask
			1 = Call from ISO compatibility
			0 = Call from SIEMENS context
17	D	_DAM	Maximum depth infeed (for swarf removal/chipbreaking only)
18	V2	_VRT	Retraction distance after each machining step (for chip breaking only), see _AMODE
19		_PITM	String as marker for pitch input[2)]
20		_PTAB	String for thread table ("", "ISO", "BSW", "BSP", "UNC")[2)]
21		_PTABA	String for selection from thread table (e.g. "M 10", "M 12", ...)[2)]
22		_GMODE	Geometrical mode (evaluation of programmed geometrical data)
			UNITS: Reserved
			TENS: Reserved

No.	Param Mask	Param intern	Explanation
23		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active 1 = G17 (only active in the cycle) 2 = G18 (only active in the cycle) 3 = G19 (only active in the cycle)
			TENS: Reserved
			HUNDREDS:
			0 = Tool spindle is master spindle (for milling or turning with driven tool) 1 = Main spindle is master spindle (central drilling for turning machines with static tool and rotating spindle)
			THOUSANDS: Compatibility mode (or recompilation input mask only), if MD 52216 Bit0 = 1 1)
			0 = Technological parameters are displayed (compatibility): TECHNO parameters effective 1 = Technological parameters are not displayed: technology active "as before cycle call"
24		_AMODE	Alternate mode
			UNITS: Drilling depth = Final drilling depth Z1 (abs/inc)
			0 = Compatibility, from DP/DPR programming 1 = Incremental 2 = Absolute
			TENS: Reserved
			HUNDREDS: Reserved
			THOUSANDS: Thread direction of rotation right/left
			0 = Compatibility, from PIT/MPTI sign 1 = right 2 = left
			TEN THOUSANDS: Reserved
			HUNDRED THOUSANDS: Reserved
			MILLION: Retraction distance after each machining step V2 manual/automatic
			0 = Compatibility, from _VRT programming (> 0 variable value or ≤ 0 standard value 1 mm/0.0394 inch) 1 = automatic (standard value 1mm/0.0394 inch) 2 = manual (programmed as under V2)

1) Technology fields may be grayed out, depending on machine setting date
SD 52216 $MCS_FUNCTION_MASK_DRILL

2) Parameters 19, 20 and 21 are only used for thread selection in the input mask thread tables.
The thread tables cannot be accessed via cycle definition in cycle run time.

1.8 Tapping with compensating chuck - CYCLE840

Programming

```
CYCLE840(REAL RTP,REAL RFP,REAL SDIS,REAL DP,REAL DPR,REAL DTB,
INT SDR,INT SDAC,INT ENC,REAL MPIT,REAL PIT,INT _AXN,INT _PITA,
INT _TECHNO,STRING[15] _PITM,STRING[5] _PTAB,STRING[20] _PTABA,
INT _GMODE,INT _DMODE,INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation	
1	RP	RTP	Retraction plane (abs)	
2	Z0	RFP	Reference point (abs)	
3	SC	SDIS	Safety clearance (to be added to reference point, enter without sign)	
4	Z1	DP	Drilling depth (abs), see _AMODE	
5	Z1	DPR	Drilling depth (inc), see _AMODE	
6	DT	DTB	Dwell time in seconds at drilling depth/safety clearance after retraction, see ENC	
7		SDR	Direction of rotation for retraction	
8	SDE	SDAC	Direction of rotation after end of cycle	
9		ENC	Tapping with spindle mounted encoder (G33)/tapping without spindle mounted encoder (G63)	
			0 = With spindle mounted encoder 20 = With spindle mounted encoder	- Pitch from MPIT/PIT - without DT - Pitch from MPIT/PIT - with DT after retraction to safety clearance - Pitch from MPIT/PIT - with DT at drilling depth
			11 = Without spindle mounted encoder 1 = Without spindle mounted encoder	- Pitch from programmed feedrate - with DT at drilling depth (feedrate = speed · pitch)
10		MPIT	Thread size for ISO metric only (pitch is calculated internally during run time) Range of values: 3 to 48 (for M3 to M48), alternative to PIT	
11		PIT	Pitch as a value, for unit see _PITA) Range of values: > 0, alternative to MPIT	
12		_AXN	Drilling axis: 0 = 3. Geometry axis 1 = 1. Geometry axis 2 = 2. Geometry axis ≥ 3 = 3. Geometry axis	

No.	Param Mask	Param intern	Explanation	
13		_PITA	Pitch unit (evaluation of PIT and MPIT)	
			0 = Pitch in mm	- evaluation of MPIT/PIT
			1 = Pitch in mm	- evaluation of PIT
			2 = Pitch in TPI	- evaluation of PIT (threads per inch)
			3 = Pitch in inches	- evaluation of PIT
			4 = MODULE	- evaluation of PIT
14		_TECHNO	Technology[1)]	
			UNITS: Exact stop response	
			0 = Exact stop active as before cycle call	
			1 = Exact stop G601	
			2 = Exact stop G602	
			3 = Exact stop G603	
			TENS: Forward control	
			0 = with/without forward control active as before cycle call	
			1 = with forward control FFWON	
			2 = without forward control FFWOF	
15		_PITM	String as marker for pitch input[2)]	
16		_PTAB	String for thread table ("", "ISO", "BSW", "BSP", "UNC")[2)]	
17		_PTABA	String for selection from thread table (e.g. "M 10", "M 12", ...)[2)]	
18		_GMODE	Reserved	
19		_DMODE	Display mode	
			UNITS: Machining plane G17/G18/G19	
			0 = Compatibility, the level effective before cycle call remains active	
			1 = G17 (only active in the cycle)	
			2 = G18 (only active in the cycle)	
			3 = G19 (only active in the cycle)	
			TENS: Reserved	
			HUNDREDS: Reserved	
			THOUSANDS: Compatibility mode (or recompilation input mask only), if MD 52216 Bit0 = 1[1)]	
			0 = Technological parameters are displayed (compatibility): TECHNO parameters effective	
			1 = Technological parameters are not displayed: technology active "as before cycle call"	
20		_AMODE	Alternate mode	
			UNITS: Drilling depth Z1 (abs/inc)	
			0 = Compatibility, from DP/DPR programming	
			1 = Incremental	
			2 = Absolute	

1) Technology fields may be grayed out, depending on machine setting date
SD 52216 $MCS_FUNCTION_MASK_DRILL

2) Parameters 15, 16 and 17 are only used for thread selection in the input mask thread tables.
The thread tables cannot be accessed via cycle definition in cycle run time.

1.9 Drilling and thread milling - CYCLE78

Programming

```
CYCLE78(REAL _RTP,REAL _RFP,REAL _SDIS,REAL _DP,REAL _ADPR,
REAL _FDPR,REAL _LDPR,REAL _DIAM,REAL _PIT,INT _PITA,REAL _DAM,
REAL _MDEP,INT _VARI,INT _CDIR,REAL _GE,REAL _FFD,REAL _FRDP,
REAL _FFR,REAL _FFP2,INT _FFA,STRING[15] _PITM,
STRING[20] _PTAB,STRING[20] _PTABA,INT _GMODE,INT _DMODE,
INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	RP	_RTP	Retraction plane (abs)
2	Z0	_RFP	Reference point of tool axis (abs)
3	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Final drilling depth (abs/inc), see _AMODE
5		_ADPR	Predrilling depth with reduced drilling feedrate (inc) effective with VARI TEN THOUSAND
6	D	_FDPR	Maximum depth infeed (inc) D ≥ Z1 ⇒ One infeed to the final drilling depth D < Z1 ⇒ Deep drilling cycle with multiple infeeds and swarf removal
7	ZR	_LDPR	Remaining drilling depth when through-boring (inc) with FR feed
8	∅	_DIAM	Nominal diameter of the thread
9	P	_PIT	Pitch as a numerical value
10		_PITA	Evaluation of thread pitch P 1 = Pitch in mm/rev 2 = Pitch in threads/inch 3 = Pitch in inches/rev 4 = Pitch as MODULE
11	DF	_DAM	Amount/percentage for each additional infeed (degression), see _AMODE
12	V1	_MDEP	Minimum infeed (inc), only active for degression
13		_VARI	Machining type
			UNITS: Reserved
			TENS:
			0 = No swarf removal before thread milling (only active at final drilling depth)
			1 = Swarf removal before thread milling (only active at final drilling depth)
			HUNDREDS:
			0 = right-hand thread
			1 = left=hand thread
			THOUSANDS:
			0 = No remaining drilling depth with drilling feedrate FR
			1 = Remaining drilling depth at drilling feedrate FR

No.	Param Mask	Param intern	Explanation
			TEN THOUSANDS:
			0 = No predrilling with reduced feedrate
			1 = Predrilling with reduced feedrate
			Predrilling feed rate = 0.3 F1, if F1< 0.15 mm/rev
			Predrilling feedrate = 0.1 mm/rev, if F1 ≥ 0.15 mm/rev
14		_CDIR	Milling direction
			0 = Synchronism
			1 = Up-cut
			4 = Up-cut + synchronism (combined roughing + finishing)
15	Z2	_GE	Retraction distance before thread milling (inc)
16	F1	_FFD	Drilling feedrate (mm/min or in/min or mm/rev)
17	FR	_FRDP	Drilling feedrate for remaining drilling depth (mm/min or mm/rev)
18	F2	-FFR	Feedrate for thread milling (mm/min or mm/tooth)
19	FS	_FFP2	Finishing feedrate for CDIR=4 (mm/min or mm/tooth)
20		_FFA	Evaluation of feed rates
			UNITS: Drilling feed F1
			TENS: Drilling feed rate for remaining drilling depth FR
			HUNDREDS: Feedrate for thread milling F2
			THOUSANDS: Finishing feed rate FS
21		_PITM	String as marker for pitch input (for the interface only)[1)]
22		_PTAB	String for thread table ("", "ISO", "BSW", "BSP", "UNC") (for the interface only)[1)]
23		_PTABA	String for selection from thread table (e.g. "M 10", "M 12", ...) (for the interface only)[1)]
24		_GMODE	Geometrical mode, reserved
25		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
26		_AMODE	Alternate mode
			UNITS: Drilling depth = Final drilling depth Z1 abs/inc
			0 = Absolute
			1 = Incremental
			TENS: Amount/percentage DF for each additional infeed (degression)
			0 = Amount
			1 = Percentage (0.001 up to 100 %)

Note

1) Parameters 21, 22 and 23 are only used for thread selection in the input mask thread tables. The thread tables cannot be accessed via cycle definition in cycle run time.

1.10 Freely programmable positions - CYCLE802

Programming

```
CYCLE802(INT _XA,INT _YA,REAL _X0,REAL _Y0,REAL _X1,REAL _Y1,
REAL _X2,REAL _Y2,REAL _X3,REAL _Y3,REAL _X4,REAL _Y4,REAL _X5,
REAL _Y5,REAL _X6,REAL _Y6,REAL _X7,REAL _Y7,REAL _X8,REAL _Y8,
INT _VARI,INT _UMODE, INT _DMODE)
```

Command line parameters

No.	Param Mask	Param Internal	Explanation
1		_XA	Alternatives for all X positions (9-digit decimal value) Number of digits: 876543210 (digit position corresponds to drilling position Xn) Position value: 1 = Absolute (1st programmed position is always absolute) 2 = Incremental
2		_YA	Alternatives for all Y positions (9-digit decimal value) Number of digits: 876543210 (digit position corresponds to drilling position Yn) Position value: 1 = Enter position (abs) 2 = Enter position (inc)
3	X0	_X0	1. Position X
4	Y0	_Y0	1. Position Y
5	X1	_X1	2. Position X
6	Y1	_Y1	2. Position Y
7	X2	_X2	3. Position X
8	Y2	_Y2	3. Position Y
9	X3	_X3	4. Position X
10	Y3	_Y3	4. Position Y
11	X4	_X4	5. Position X
12	Y4	_Y4	5. Position Y
13	X5	_X5	6. Position X
14	Y5	_Y5	6. Position Y
15	X6	_X6	7. Position X
16	Y6	_Y6	7. Position Y
17	X7	_X7	8. Position X
18	Y7	_Y7	8. Position Y
19	X8	_X8	9. Position X
20	Y8	_Y8	9. Position Y
21		_VARI	Reserved
22		_UMODE	Reserved

No.	Param Mask	Param Internal	Explanation
23		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)

Note

Positions that are not required for parameters X1/Y1 to X8/Y8 can be ignored.

The alternative values for _XA and _YA, however, must be provided in full for all 9 positions.

1.11 Row of holes - HOLES1

Programming

```
HOLES1 (REAL SPCA,REAL SPCO,REAL STA1,REAL FDIS,REAL DBH,INT NUM,
INT __VARI,INT _UMODE,STRING[200] _HIDE,INT _NSP,INT _DMODE)
```

Command line parameters

No.	Param Mask	Param Internal	Explanation
1	X0	SPCA	Reference point for row of holes along the 1st axis (abs)
2	Y0	SPCO	Reference point for row of holes along the 2nd axis (abs)
3	α0	STA1	Basic angle of rotation (angle to 1st axis)
4	L0	FDIS	Distance from first hole to reference point
5	L	DBH	Spacing between the holes
6	N	NUM	Number of holes
7		_VARI	Reserved
8		_UMODE	Reserved
9		_HIDE	Reserved
10		_NSP	Reserved
11		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)

1.12 Grid or frame - CYCLE801

Programming

```
CYCLE801(REAL _SPCA,REAL _SPCO,REAL _STA,REAL _DIS1,REAL _DIS2,
INT _NUM1,INT _NUM2,INT _VARI,INT _UMODE,REAL _ANG1,
REAL _ANG2,STRING[200] _HIDE,INT _NSP,INT _DMODE)
```

Command line parameters

No.	Param Mask	Param Internal	Explanation
1	X0	_SPCA	Reference point for position pattern (grid/frame) along the 1st axis (abs)
2	Y0	_SPCO	Reference point for position pattern (grid/frame) along the 2nd axis (abs)
3	α0	_STA	Basic angle of rotation (angle to 1st axis) < 0 = Clockwise rotation 0 = Counterclockwise rotation
4	L1	_DIS1	Distance for columns (distance from the 1st axis, enter without sign)
5	L2	_DIS2	Distance for rows (distance from the 2nd axis, enter without sign)
6	N1	_NUM1	Number of columns
7	N2	_NUM2	Number of rows
8		_VARI	Machining type
			UNITS: Position pattern
			0 = Grid 1 = Frame
			TENS: Reserved
			HUNDREDS: Reserved
9		_UMODE	Reserved
10	αX	_ANG1	Shear angle with 1st axis (lines arranged obliquely to the 1st axis) < 0 = Clockwise measurement (0 to -90 degrees) > 0 = Counterclockwise measurement (0 to 90 degrees)
11	αY	_ANG2	Shear angle with 2nd axis (lines arranged obliquely to the 2nd axis) < 0 = Clockwise measurement (0 to -90 degrees) > 0 = Counterclockwise measurement (0 to 90 degrees)
12		_HIDE	Reserved
13		_NSP	Reserved
14		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the levels effective before cycle call remain active 1 = G17 (only active in the cycle) 2 = G18 (only active in the cycle) 3 = G19 (only active in the cycle)

1.13 Circle of holes - HOLES2

Programming

```
HOLES2 (REAL CPA,REAL CPO,REAL RAD,REAL STA1,REAL INDA,INT NUM,
INT _VARI,INT _UMODE,STRING[200] _HIDE,INT _NSP,INT _DMODE)
```

Command line parameters

No.	Param Mask	Param Internal	Explanation
1	X0	CPA	Center point for circle of holes along the 1st axis (abs)
2	Y0	CPO	Center point for circle of holes along the 2nd axis (abs)
3	R	RAD	Radius of the circle of holes
4	α0	STA1	Starting angle
5	α1	INDA	Advance angle (for pitch circle only) < 0 = Clockwise > 0 = Counterclockwise
6	N	NUM	Number of positions
7		_VARI	Machining type
			UNITS: Reserved
			TENS: Positioning type
			0 = Approach position - linear 1 = Approach position - circular path
			HUNDREDS: : Reserved
			THOUSANDS: Circular pattern
			0 = Compatibility mode, if INDA = 0 then full circle, INDA <> 0 then pitch circle) 1 = Full circle 2 = Pitch circle
8		_UMODE	Reserved
9		_HIDE	Reserved
10		_NSP	Reserved
13		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the levels effective before cycle call remain active 1 = G17 (only active in the cycle) 2 = G18 (only active in the cycle) 3 = G19 (only active in the cycle)

1.14 Face milling - CYCLE61

Programming

```
CYCLE61(REAL _RTP,REAL _RFP,REAL _SDIS,REAL _DP,REAL _PA,
REAL _PO,REAL _LENG,REAL _WID,REAL _MID,REAL _MIDA,
REAL _FALD,REAL _FFP1,INT _VARI,INT _LIM,INT _DMODE,INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	RP	_RTP	Retraction plane (abs)
2	Z0	_RFP	Reference point of tool axis, height of blank (abs)
3	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Height of finished part (abs/inc), see _AMODE
5	X0	_PA	Corner point 1 in 1st axis (abs)
6	Y0	_PO	Corner point 1 in 2nd axis (abs)
7	X1	_LENG	Corner point 2 in 1st axis (abs/inc,) see _AMODE
8	Y1	_WID	Corner point 2 in 2nd axis (abs/inc,) see _AMODE
9	DZ	_MID	Maximum depth infeed
10	DXY	_MIDA	Maximum plane infeed (for unit, see _AMODE)
11	UZ	_FALD	Finishing allowance, depth
12	F	_FFP1	Machining feedrate
13		_VARI	Machining type
			UNITS: Machining
			1 = Roughing
			2 = Finishing
			TENS: Machining direction
			1 = parallel to the 1st axis, in one direction
			2 = parallel to the 2nd axis, in one direction
			3 = parallel to the 1st axis, varying direction
			4 = parallel to the 2nd axis, varying direction
14		_LIM	Limits
			UNITS: Limit 1st axis negative
			0 = no
			1 = yes
			TENS: Limit 1st axis positive
			0 = no
			1 = yes
			HUNDREDS: Limit 2nd axis negative
			0 = no
			1 = yes

No.	Param Mask	Param intern	Explanation
			THOUSANDS: Limit 2nd axis positive
			0 = no
			1 = yes
15		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
16		_AMODE	Alternate mode
			UNITS: Final depth (_DP)
			0 = Absolute
			1 = Incremental
			TENS: Unit for plane infeed (_MIDA)
			0 = mm
			1 = % of tool diameter
			HUNDREDS: Reserved
			THOUSANDS: Length of surface
			0 = Incremental
			1 = Absolute
			TEN THOUSANDS: Width of surface
			0 = Incremental
			1 = Absolute

1.15 Milling a rectangular pocket - POCKET3

Programming.

```
POCKET3(REAL _RTP,REAL _RFP,REAL _SDIS,REAL _DP,REAL _LENG,
REAL _WID,REAL _CRAD,REAL _PA,REAL _PO,REAL _STA,REAL _MID,
REAL _FAL,REAL _FALD,REAL _FFP1,REAL _FFD,INT _CDIR,INT _VARI,
REAL _MIDA,REAL _AP1,REAL _AP2,REAL _AD,REAL _RAD1,REAL _DP1,
INT _UMODE,REAL _FS,REAL _ZFS,INT _GMODE,INT _DMODE,INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	RP	_RTP	Retraction plane (abs)
2	Z0	_RFP	Reference point of tool axis (abs)
3	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Pocket depth (abs/inc), see _AMODE)
5	L	_LENG	Pocket length (inc, to be entered with sign)
6	W	_WID	Pocket width (inc, to be entered with sign)
7	RP	_CRAD	Corner radius of pocket
8	X0	_PA	Reference point, 1st axis (abs)
9	YO	_PO	Reference point, 2nd axis (abs)
10	α0	_STA	Angle of rotation, angle between longitudinal axis (L) and 1st axis
11	DZ	_MID	Maximum depth infeed
12	UXY	_FAL	Finishing allowance, plane
13	UZ	_FALD	Finishing allowance, depth
14	F	_FFP1	Feedrate in the plane
15	FZ	_FFD	Depth infeed rate
16		_CDIR	Milling direction: 0 = Synchronism 1 = Up-cut
17		_VARI	Machining type
			UNITS:
			1 = Roughing 2 = Finishing 4 = Finishing of edge 5 = Chamfer
			TENS:
			0 = Predrilled, infeed with G0 1 = Vertically, infeed with G1 2 = Helically 3 = Oscillation along the pocket longitudinal axis
			HUNDREDS: Reserved
18	DXY	_MIDA	Maximum plane infeed, for unit, see _AMODE
19	L1	_AP1	Length of premachining (inc)
20	W1	_AP2	Width of premachining (inc)

No.	Param Mask	Param intern	Explanation
21	AZ	_AD	Depth of premachining (inc)
22	ER	_RAD1	Radius of helical path on helical insertion
	EW		Maximum insertion angle for oscillation
23	EP	_DP1	Helical pitch on helical insertion
24		_UMODE	Reserved
25	FS	_FS	Chamfer width (inc)
26	ZFS	_ZFS	Insertion depth (tool tip) on chamfering (abs/inc), see _AMODE
27		_GMODE	Geometrical mode
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Select machining/only calculation of start point
			0 = Compatibility mode 1 = Normal machining
			THOUSANDS: Dimensioning via center/corner
			0 = Compatibility mode 1 = Dimensioning via center 2 = Dimensioning of corner point, pocket position +LENG/+WID 3 = Dimensioning of corner point, pocket position -LENG/+WID 4 = Dimensioning of corner point, pocket position +LENG/-WID 5 = Dimensioning of corner point, pocket position -LENG/-WID
			TEN THOUSANDS: Complete machining/remachining
			0 = Compatibility mode (process _AP1, _AP2 and _AD as before) 1 = Complete machining 2 = Remachining
28		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active 1 = G17 (only active in the cycle) 2 = G18 (only active in the cycle) 3 = G19 (only active in the cycle)
			TENS: Type of feedrate: G group (G94/G95) for surface and depth feedrate
			0 = Compatibility mode 1 = G code as before cycle call. G94/G95 same for surface and depth feedrate
29		_AMODE	Alternate mode
			UNITS: Pocket depth (Z1)
			0 = Absolute (compatibility mode) 1 = Incremental
			TENS: Unit for plane infeed (DXY)
			0 = mm 1 = % of tool diameter
			HUNDREDS: Insertion depth for chamfering (ZFS)
			0 = Absolute 1 = Incremental

1.16 Milling a circular pocket - POCKET4

Programming.

```
POCKET4(REAL _RTP,REAL _RFP,REAL _SDIS,REAL _DP,REAL _CDIAM,
REAL _PA,REAL _PO,REAL _MID,REAL _FAL,REAL _FALD,REAL _FFP1,
REAL _FFD,INT _CDIR,INT _VARI,REAL _MIDA,REAL _AP1,REAL _AD,
REAL _RAD1,REAL _DP1,INT _UMODE,REAL _FS,REAL _ZFS,INT _GMODE,
INT _DMODE,INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	RP	_RTP	Retraction plane (abs)
2	Z0	_RFP	Reference point of tool axis (abs)
3	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Pocket depth (abs/inc), see _AMODE
5	∅	_DIAM	Pocket diameter or radius, see _DMODE
6	X0	_PA	Reference point 1st axis (abs)
7	Y0	_PO	Reference point 2nd axis (abs)
8	DZ	_MID	maximum depth setting, see_VARI = by planes maximum helical setting, see_VARI = helically
9	UXY	_FAL	Finishing allowance, plane
10	UZ	_FALD	Finishing allowance, depth
11	F	_FFP1	Feedrate for surface machining
12	FZ	_FFD	Depth infeed rate
13		_CDIR	Milling direction 0 = Synchronism 1 = Up-cut
14		_VARI	Machining type
			UNITS:
			1 = Roughing 2 = Finishing 4 = Finishing of edge 5 = Chamfer
			TENS: Infeed type (roughing and finishing)
			0 = Predrilled, infeed with G0 (pocket is premachined) 1 = Vertical, infeed with G1 2 = Helically
			HUNDRED: Reserved
			THOUSANDS:
			0 = By planes 1 = Helically

No.	Param Mask	Param intern	Explanation
15	DXY	_MIDA	Maximum plane infeed, see _AMODE, 0 = 0.8 · tool diameter
16	∅	_AP1	Diameter/radius of premachining (inc)
17	AZ	_AD	Depth of premachining (inc)
18	ER	_RAD1	Radius of helical path on helical insertion
19	EP	_DP1	Helical pitch on insertion on helical path
20		_UMODE	Reserved
21	FS	_FS	Chamfer width (inc)
22	ZFS	_ZFS	Insertion depth (tool tip) on chamfering (abs/inc), see _AMODE
23		_GMODE	Geometrical mode
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Machining/calculation of start point
			0 = Compatibility mode
			1 = Normal machining
			THOUSANDS: Reserved
			TEN THOUSANDS: Complete machining/remachining
			0 = Compatibility mode (process _AP1 and _AD as before)
			1 = Complete machining
			2 = Remachining
24		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
			TENS: Type of feedrate: G group (G94/G95) for surface and depth feedrate
			0 = Compatibility mode
			1 = G code as before cycle call. G94/G95 same for surface and depth feedrate
			HUNDREDS:
			0 = Compatibility mode (enter _CDIAM/_AP1 as radius)
			1 = Enter _CDIAM/_AP1 as diameter
25		_AMODE	Alternate mode
			UNITS: Pocket depth (Z1)
			0 = Absolute (compatibility mode)
			1 = Incremental
			TENS: Unit for infeed width (DXY)
			0 = mm
			1 = % of tool diameter
			HUNDREDS: Insertion depth for chamfering (ZFS)
			0 = Absolute
			1 = Incremental

1.17 Rectangular spigot milling - CYCLE76

Programming.

```
CYCLE76(REAL _RTP,REAL _RFP,REAL _SDIS,REAL _DP,REAL _DPR,
REAL _LENG,REAL _WID,REAL _CRAD,REAL _PA,REAL _PO,REAL _STA,
REAL _MID,REAL _FAL,REAL _FALD,REAL _FFP1,REAL _FFD,
INT _CDIR,INT _VARI,REAL _AP1,REAL _AP2,REAL _FS,REAL _ZFS,
INT _GMODE,INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	RP	_RTP	Retraction plane (abs)
2	Z0	_RFP	Reference point of tool axis (abs)
3	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Spigot depth (abs)
5		_DPR	Spigot depth (inc) with respect to Z0 (enter without sign)
6	L	_LENG	Spigot length, see _GMODE (enter without sign)
7	W	_WID	Spigot width, see _GMODE (enter without sign)
8	R	_CRAD	Spigot corner radius (enter without sign)
9	X0	_PA	Reference point for spigot in 1st axis of plane (abs)
10	Y0	_PO	Reference point for spigot in 2nd axis of plane (abs)
11	α0	_STA	Angle of rotation, angle between longitudinal axis (L) and 1st axis of plane
12	DZ	_MID	Maximum depth infeed (inc; enter without sign)
13	UXY	_FAL	Finishing allowance, plane (inc), allowance at edge contour
14	UZ	_FALD	Finishing allowance depth (inc), allowance at base (enter without sign)
15	FX	_FFP1	Feedrate on contour
16	FZ	_FFD	Depth infeed rate
17		_CDIR	Milling direction (enter without sign)
			UNITS:
			0 = Synchronism
			1 = Up-cut
18		_VARI	Machining
			UNITS:
			1 = Roughing
			2 = Finishing
			5 = Chamfer
19	L1	_AP1	Length of blank spigot
20	W1	_AP2	Width of blank spigot
21	FS	_FS	Chamfer width (inc)
22	ZFS	_ZFS	Insertion depth (tool tip) on chamfering (abs, inc), see _AMODE

No.	Param Mask	Param intern	Explanation
23		_GMODE	Mode for evaluation of programmed geometrical data
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Select machining or just calculation of start point
			0 = Compatibility mode
			1 = Normal machining
			THOUSANDS: Dimensioning of spigot acc. to center or corner
			0 = Compatibility mode
			1 = Dimensioning via center
			2 = Dimensioning of corner point, spigot +L +W
			3 = Dimensioning of corner point, spigot -L +W
			4 = Dimensioning of corner point, spigot +L -W
			5 = Dimensioning of corner point, spigot -L -W
			TEN THOUSANDS: Complete machining or remachining
			0 = Compatibility mode
			1 = Complete machining
			2 = Remachining
24		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
25		_AMODE	Alternate mode
			UNITS: final depth Z1 (abs/inc)
			0 = Compatibility
			1 = Z1 (inc)
			2 = Z1 (abs)
			TENS: Reserved
			HUNDREDS: Insertion depth for chamfering ZFS
			0 = ZFS (abs)
			1 = ZFS (inc)

1.18 Circular spigot milling - CYCLE77

Programming.

```
CYCLE77(REAL _RTP,REAL _RFP,REAL _SDIS,REAL _DP,REAL _DPR,
REAL _CDIAM,REAL _PA,REAL _PO,REAL _MID,REAL _FAL,REAL _FALD,
REAL _FFP1,REAL _FFD,INT _CDIR,INT _VARI,REAL _AP1,REAL _FS,
REAL _ZFS,INT _GMODE,INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	RP	_RTP	Retraction plane (abs)
2	Z0	_RFP	Reference point of tool axis (abs)
3	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Spigot depth (abs)
5		_DPR	Spigot depth (inc) with respect to Z0 (enter without sign)
6	∅	_CDIAM	Spigot diameter (enter without sign)
7	X0	_PA	Reference point for spigot in 1st axis of plane (abs)
8	Y0	_PO	Reference point for spigot in 2nd axis of plane (abs)
9	DZ	_MID	Maximum depth infeed (inc; enter without sign)
10	UXY	_FAL	Finishing allowance, plane (inc), allowance at edge contour
11	UZ	_FALD	Finishing allowance depth (inc), allowance at base (enter without sign)
12	FX	_FFP1	Feedrate on contour
13	FZ	_FFD	Depth infeed rate
14		_CDIR	Milling direction (enter without sign)
			UNITS:
			0 = Synchronism
			1 = Up-cut
15		_VARI	Machining
			UNITS:
			1 = Roughing to final machining allowance
			2 = Finishing (allowance X/Y/Z=0)
			5 = Chamfer
16	∅1	_AP1	Diameter of blank spigot
17	FS	_FS	Chamfer width (inc)
18	ZFS	_ZFS	Insertion depth (tool tip) on chamfering (abs/inc) see _AMODE)

No.	Param Mask	Param intern	Explanation
19		_GMODE	Mode for evaluation of programmed geometrical data
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Select machining/only calculation of start point
			0 = Compatibility mode
			1 = Normal machining
			THOUSANDS: Reserved
			TEN THOUSANDS: Complete machining/remachining
			0 = Compatibility mode (process _AP1 as before)
			1 = Complete machining
			2 = Remachining
20		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the levels effective before cycle call remain active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
21		_AMODE	Alternate mode
			UNITS: final depth Z1 (abs/inc)
			0 = Compatibility
			1 = Z1 (inc)
			2 = Z1 (abs)
			TENS: Reserved
			HUNDREDS: Insertion depth for chamfering ZFS
			0 = ZFS (abs)
			1 = ZFS (inc)

1.19 Multiple-edge - CYCLE79

Programming

```
CYCLE79(REAL _RTP,REAL _RFP,REAL _SDIS,REAL _DP,INT _NUM,
REAL _SWL,REAL _PA,REAL _PO,REAL _STA,REAL _RC,REAL _AP1,
REAL _MIDA,REAL _MID,REAL _FAL,REAL _FALD,REAL _FFP1,
INT _CDIR,INT _VARI,REAL _FS,REAL _ZFS,INT _GMODE,INT _DMODE,
INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	RP	_RTP	Retraction plane (abs)
2	Z0	_RFP	Reference point of tool axis (abs)
3	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Multiple-edge depth (abs/inc), see _AMODE
5	N	_NUM	Number of edges (1...n)
6	SW/L	_SWL	Width across flats or edge length (depending on _VARI) ("SW" for width across flats, "L" for edge length) Width across flats only if even no.of edges, and single edge
7	X0	_PA	Spigot reference point, 1st axis (abs)
8	Y0	_PO	Spigot reference point, 2nd axis (abs)
9	α0	_STA	Angle of rotation, center of edge against 1st axis (X axis)
10	R1/FS1	_RC	Corner rounding with _NUM > 2 (radius/chamfer, see _AMODE) (inc, to be entered without sign) ("R1" for radius, "FS1" for chamfer)
11	∅	_AP1	Unmachined diameter of spigot
12	DXY	_MIDA	Maximum infeed width (for unit, see _AMODE)
13	DZ	_MID	Maximum depth infeed
14	UXY	_FAL	Finishing allowance, plane
15	UZ	_FALD	Finishing allowance, depth
16	F	_FFP1	Machining feedrate
17		_CDIR	Milling direction
			0 = Synchronism
			1 = Up-cut
18		_VARI	Machining type
			UNITS: Machining
			1 = Roughing
			2 = Finishing
			3 = Finishing of edge
			5 = Chamfer

No.	Param Mask	Param intern	Explanation
			TENS: Width across flats or edge length
			0 = Width across flats
			1 = Edge length
19	FS	_FS	Chamfer width (inc)
20	ZFS	_ZFS	Insertion depth (tool tip) on chamfering (abs/inc), see _AMODE)
21		_GMODE	Geometrical mode
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Machining/calculation of start point
			1 = Normal machining
22		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
23		_AMODE	Alternate mode
			UNITS: Final depth (_DP)
			0 = Absolute
			1 = Incremental
			TENS: Unit for plane infeed (_MIDA)
			0 = mm
			1 = % of tool diameter
			HUNDREDS: Insertion depth for chamfering (_ZFS)
			0 = Absolute
			1 = Incremental
			THOUSANDS: Corner rounding (_RC)
			0 = Radius
			1 = Chamfer

1.20 Longitudinal slot - SLOT1

Programming.

```
SLOT1 (REAL RTP,REAL RFP,REAL SDIS,REAL _DP,REAL _DPR,INT NUM,
REAL LENG,REAL WID,REAL _CPA,REAL _CPO,REAL RAD,REAL STA1,
REAL INDA,REAL FFD,REAL FFP1,REAL _MID,INT CDIR,REAL _FAL,
INT VARI,REAL _MIDF,REAL FFP2,REAL SSF,REAL _FALD,REAL _STA2,
REAL _DP1,INT _UMODE,REAL _FS,REAL _ZFS,INT _GMODE,INT _DMODE,
INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	RP	RTP	Retraction plane (abs)
2	Z0	RFP	Reference point of tool axis (abs)
3	SC	SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Slot depth (abs)
5		_DPR	Slot depth (inc) with respect to Z0 (enter without sign)
6		NUM	Number of slots = 1
7	L	LENG	Slot length
8	W	WID	Slot width
9	X0	_CPA	Reference point in the 1st axis of the plane
10	Y0	_CPO	Reference point in the 2nd axis of the plane
11		_RAD	Reserved
12	α	STA1	Angle of rotation
13		INDA	Reserved
14	FZ	FFD	Depth infeed rate
15	F	FFP1	Feedrate
16	DZ	_MID	Maximum depth infeed
17		CDIR	Milling direction 0 = Synchronism 1 = Up-cut
18	UXY	_FAL	Finishing allowance on plane or slot edge
19		VARI	Machining type
			UNITS:
			0 = reserved 1 = Roughing 2 = Finishing 4 = Edge finishing (only machine the edge) 5 = Chamfer
			TENS: Approach
			0 = Predrilled, infeed with G0 (slot is premachined) 1 = Vertically, infeed with G1 2 = Helically 3 = Oscillating
			HUNDREDS: Reserved
20	DZF	MIDF	Reserved
21	FF	FFP2	Reserved
22	SF	SSF	Reserved
23	UZ	_FALD	Finishing allowance, depth
24	ER	_STA2	Radius of helical path on helical insertion
	EW		Maximum insertion angle for oscillation

No.	Param Mask	Param intern	Explanation
25	EP	_DP1	Insertion depth per rev for helix
26		_UMODE	Reserved
27	FS	_FS	Chamfer width (inc) for chamfering
28	ZFS	_ZFS	Insertion depth (tool tip) on chamfering (abs/inc), see _AMODE)
29		_GMODE	Geometrical mode
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Select machining or just calculation of start point
			1 = Normal machining
			THOUSANDS: Dimensioning of reference point, slot length
			0 = middle
			1 = Inner left-hand +L
			2 = Inner right-hand -L
			3 = Left-hand edge +L
			4 = Right-hand edge -L
30		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the levels effective before cycle call remain active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
			TENS: Reserved
			HUNDREDS: Reserved
			THOUSANDS: Software version identification
			1 = Functional extension SLOT1
31		_AMODE	Alternate mode
			UNITS: final depth Z1 (abs/inc)
			0 = Compatibility
			1 = Z1 (inc)
			2 = Z1 (abs)
			TENS: Reserved
			HUNDREDS: Insertion depth for chamfering ZFS
			0 = ZFS (abs)
			1 = ZFS (inc)

Note

The cycle is provided with new functions that are not on earlier software versions. Consequently certain parameters in the input mask (NUM, RAD, INDA) are no longer displayed. Multiple slots on one position pattern can be programmed using "MCALL" and calling the desired position pattern, e.g. HOLES2.

1.21 Circumferential slot - SLOT2

Programming

```
SLOT2(REAL RTP,REAL RFP,REAL SDIS,REAL _DP,REAL _DPR,INT NUM,
REAL AFSL,REAL WID,REAL _CPA,REAL _CPO,REAL RAD,REAL STA1,
REAL INDA,REAL FFD,REAL FFP1,REAL _MID,INT CDIR,REAL _FAL,
INT VARI,REAL _MIDF,REAL FFP2,REAL SSF,REAL _FFCP,INT _UMODE,
REAL _FS,REAL _ZFS,INT _GMODE,INT _DMODE,INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	RP	RTP	Retraction plane (abs)
2	Z0	RFP	Reference point of tool axis (abs)
3	SC	SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Slot depth (abs)
5		_DPR	Slot depth (inc) with respect to Z0 (enter without sign)
6	N	NUM	Number of slots
7	α1	AFSL	Opening angle of the slot
8	W	WID	Slot width
9	X0	_CPA	Reference point = Center point of circle, 1st axis of the plane
10	Y0	_CPO	Reference point = Center point of circle, 2nd axis of the plane
11	R	RAD	Radius of the circle
12	α0	STA1	Starting angle
13	α2	INDA	Incrementing angle
14	FZ	FFD	Depth infeed rate
15	F	FFP1	Feedrate
16	DZ	_MID	Maximum depth infeed
17		CDIR	Milling direction 0 = Synchronism 1 = Up-cut
18	UXY	_FAL	Finishing allowance on plane or slot edge
19		VARI	Machining type
			UNITS:
			0 = Complete machining 1 = Roughing 2 = Finishing 3 = Finishing of edge 5 = Chamfer
			TENS:
			0 = Intermediate positioning with G0 line 1 = Intermediate positioning on circular path

No.	Param Mask	Param intern	Explanation
			HUNDREDS: Reserved
			THOUSANDS:
			0 = Compatibility mode, if INDA = 0 then full circle, INDA <> 0 then pitch circle)
			1 = Full circle
			2 = Pitch circle
20	DZF	_MIDF	Reserved
21		FFP2	Reserved
22		SSF	Reserved
23	FF	_FFCP	Reserved
24		_UMODE	Reserved
25	FS	_FS	Chamfer width (inc)
26	ZFS	_ZFS	Insertion depth (tool tip) on chamfering (abs/inc), see _AMODE)
27		_GMODE	Geometrical mode
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Select machining or just calculation of start point
			0 = Compatibility mode
			1 = Normal machining
28		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the levels effective before cycle call remain active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
			TENS: Reserved
			HUNDREDS: Reserved
			THOUSANDS: Software version identification
			1 = SLOT2 functions from software version 2.5 onwards
29		_AMODE	Alternate mode
			UNITS: final depth Z1 (abs/inc)
			0 = Compatibility
			1 = Z1 (inc)
			2 = Z1 (abs)
			TENS: Reserved
			HUNDREDS: Insertion depth for chamfering ZFS
			0 = ZFS (abs)
			1 = ZFS (inc)

1.22 Mill open slot - CYCLE899

Programming.

```
CYCLE899(REAL _RTP,REAL _RFP,REAL _SDIS,REAL _DP,REAL _LENG,
REAL _WID,REAL _PA,REAL _PO,REAL _STA,REAL _MID,REAL _MIDA,REAL
_FAL,
REAL _FALD,REAL _FFP1,INT _CDIR,INT _VARI,INT _GMODE,INT _DMODE,
INT _AMODE,INT _UMODE,REAL _FS,REAL _ZFS)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	RP	_RTP	Retraction plane (abs)
2	Z0	_RFP	Reference point of tool axis (abs)
3	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Slot depth (abs/inc), see _AMODE
5	L	_LENG	Length of slot (inc)
6	W	_WID	Width of slot (inc)
7	X0	_PA	Reference/start point 1st axis (abs)
8	Y0	_PO	Reference/start point 2nd axis (abs)
9	α0	_STA	Angle of rotation with respect to 1st axis
10	DZ	_MID	Maximum infeed depth (inc) – for vortex milling only
11	DXY	_MIDA	Maximum plane infeed, see _AMODE
12	UXY	_FAL	Finishing allowance, plane
13	UZ	_FALD	Finishing allowance, depth
14	F	_FFP1	Feedrate
15		_CDIR	Milling direction
			UNITS:
			0 = Synchronism
			1 = Up-cut
			4 = Alternating
16		_VARI	Machining
			UNITS:
			1 = Roughing
			2 = Finishing
			3 = Finishing of base
			4 = Finishing of edge
			5 = Rough-finishing
			6 = Chamfer
			TENS: Reserved
			HUNDREDS: Reserved
			THOUSANDS:
			1 = Vortex milling
			2 = Plunge cutting

No.	Param Mask	Param intern	Explanation
17		_GMODE	Evaluation of geometrical data
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Select machining/only calculation of start point
			1 = Normal machining
			THOUSANDS: Dimensioning via center/edge
			0 = Dimensioning via center
			1 = "Left-hand" dimensioning using edge ("-" direction of 1st axis)
			2 = "Right-hand" dimensioning using edge ("+" direction of 1st axis)
18		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the levels effective before cycle call remain active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
19		_AMODE	Alternate mode
			UNITS: slot depth Z1
			0 = Absolute
			1 = Incremental
			TENS: Unit for plane infeed (_MIDA) DXY
			0 = mm
			1 = % of tool diameter
			HUNDREDS: Insertion depth for chamfering ZFS
			0 = Absolute
			1 = Incremental
20		_UMODE	Reserved
21	FS	_FS	Chamfer width (inc)
22	ZFS	_ZFS	Insertion depth (tool tip) on chamfering (abs/inc), see _AMODE)

1.23 Elongated hole - LONGHOLE

Programming

```
LONGHOLE (REAL RTP,REAL RFP,REAL SDIS,REAL _DP,REAL _DPR,
INT NUM,REAL LENG,REAL _CPA,REAL _CPO,REAL RAD,REAL STA1,
REAL INDA,REAL FFD,REAL FFP1,REAL MID,INT _VARI,INT _UMODE,
INT _GMODE,INT _DMODE,INT _AMODE)
```

Command line parameters

No.	Param Mask	Param Internal	Explanation
1	RP	RTP	Retraction plane (abs)
2	Z0	_RFP	Reference point of tool axis (abs)
3	SC	SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Long hole depth (abs)
5		_DPR	Long hole depth (inc) with respect to Z0 (enter without sign)
6		NUM	Number of long holes = 1
7	L	LENG	Length of long hole
8	X0	_CPA	Reference point in the 1st axis of the plane
9	Y0	_CPO	Reference point in the 2nd axis of the plane
10		RAD	Reserved
11	α0	STA1	Angle of rotation
12		INDA	Reserved
13	FZ	FFD	Depth infeed rate
14	F	FFP1	Feedrate
15	DZ	MID	Maximum depth infeed
16		_VARI	Machining type
			UNITS: Infeed type
			1 = Vertically with G1
			3 = Oscillating
			HUNDRED: Reserved
17		_UMODE	Reserved

No.	Param Mask	Param Internal	Explanation
18		_GMODE	Geometrical mode
			UNITS: Reserved
			TENS: Reserved
			HUNDRED: Select machining or just calculate start point
			0 = Compatibility mode 1 = Normal machining
			THOUSANDS: Dimensioning of reference point, slot length
			0 = middle 1 = Inner left-hand +L 2 = Inner right-hand -L 3 = Left-hand edge +L 4 = Right-hand edge -L
19		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the level effective before cycle call remains active 1 = G17 (only active in the cycle) 2 = G18 (only active in the cycle) 3 = G19 (only active in the cycle)
			TENS: Type of feedrate: G group (G94/G95) for surface and depth feedrate
			0 = Compatibility mode 1 = G code as before cycle call. G94/G95 same for surface and depth feedrate
			HUNDREDS: Reserved
			THOUSANDS: Software version identification
			1 = Functional extension LONGHOLE (dimensioning of reference point)
20		_AMODE	Alternate mode
			UNITS: final depth Z1 (abs/inc)
			0 = Compatibility 1 = Z1 (inc) 2 = Z1 (abs)

Note

The cycle is provided with new functions that are not on earlier software versions. Consequently certain parameters in the input mask (NUM, RAD, INDA) are no longer displayed. Multiple slots on one position pattern can be programmed using "MCALL" and calling the desired position pattern, e.g. HOLES2.

1.24 Thread milling - CYCLE70

Programming

```
CYCLE70(REAL _RTP,REAL _RFP,REAL _SDIS,REAL _DP,REAL _DIATH,
REAL _H1,REAL _FAL,REAL _PIT,INT _NT,REAL _MID,REAL _FFR,
INT _TYPTH,REAL _PA,REAL _PO,REAL _NSP,INT _VARI,INT _PITA,
STRING[15] _PITM,STRING[20] _PTAB,STRING[20] _PTABA,INT _GMODE,
INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	RP	_RTP	Retraction plane (abs)
2	Z0	_RFP	Reference point of tool axis (abs)
3	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
4	Z1	_DP	Thread length (abs/inc), see _AMODE Take account of runout at base of hole (at least half pitch)
5	∅	_DIATH	Nominal diameter of the thread
6	H1	_H1	Thread depth
7	U	_FAL	Finishing allowance
8	P	_PIT	Pitch (_PITA selection: mm, inch, MODUL, threads/inch)
9	NT	_NT	Number of teeth on the tool tip Tool length is always with respect to bottom tooth.
10	DXY	_MID	Maximum infeed per cut _MID > _H1: all in one cut
11	F	_FFR	Milling feed
12		_TYPTH	Thread type 0 = Internal thread 1 = External thread
13	X0	_PA	Circle center 1st axis (abs)
14	Y0	_PO	Circle center 2nd axis (abs)
15	αS	_NSP	Start angle (multi-start thread)
16		_VARI	Machining type
			UNITS:
			1 = Roughing 2 = Finishing
			TENS:
			1 = from top to bottom 2 = from bottom to top
			HUNDREDS:
			0 = right-hand thread 1 = Left-hand thread

No.	Param Mask	Param intern	Explanation
17		_PITA	Evaluation of thread pitch 0 = Compatibility mode 1 = Pitch in mm 2 = Pitch in threads per inch (TPI) 3 = Pitch in inches 4 = Pitch as MODULE
18		_PITM	String as marker for pitch input (for the interface only)
19		_RTAB	String for thread table ("", "ISO", "BSW", "BSP", "UNC") (for the interface only)
20		_PTABA	String for selection from thread table (e.g. "M 10", "M 12", ...) (for the interface only)
21		_GMODE	Geometrical mode
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Machining/calculation of start point
			0 = Compatibility mode 1 = Normal machining
22		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the level effective before cycle call remains active 1 = G17 (only active in the cycle) 2 = G18 (only active in the cycle) 3 = G19 (only active in the cycle)
23		_AMODE	Alternate mode
			UNITS: thread length (_DP)
			0 = Absolute 1 = Incremental

1.25 Engraving cycle - CYCLE60

Programming

```
CYCLE60 (STRING[200] _TEXT, REAL _RTP, REAL _RFP, REAL _SDIS,
REAL _DP, REAL _DPR,REAL _PA, REAL _PO, REAL _STA, REAL _CP1,
REAL _CP2, REAL _WID, REAL _DF, REAL _FFD, REAL _FFP1,
INT _VARI, INT _CODEP, INT _UMODE,INT _GMODE,INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1		_TEXT	Text to be engraved (up to 100 characters)
2	RP	_RTP	Retraction plane (abs)
3	Z0	_RFP	Reference point of tool axis (abs)
4	SC	_SDIS	Safety clearance (to be added to the reference plane, enter without sign)
5	Z1	_DP	Depth (abs), see _AMODE
6	Z1	_DPR	Depth (inc), see _AMODE
7	X0	_PA	Reference point in 1st axis of plane (abs) - right-angled, see _VARI
	R		Reference point, length (radius) - polar, see _VARI
8	Y0	_PO	Reference point in 2nd axis of plane (abs) - right-angled, see _VARI
	α0		Reference point, angle with respect to 1st axis - polar, see _VARI
9	α1	_STA	Text direction, angle of line of text with respect to 1st axis, see _VARI
10	XM	_CP1	Center of circle of text, 1st axis of plane (abs) - right-angled, see _VARI
	LM		Center of circle of text, length (radius) with respect to WNP - polar, see _VARI
11	YM	_CP2	: Center of circle of text, 2nd axis of plane (abs) - right-angled, see _VARI
	αM		Center of circle of text, angle with respect to 1st axis - polar, see _VARI
12	W	_WID	Height of characters (enter without sign)
13	DX1 DX2	_DF	Distance between characters / overall width, see _VARI
	α2		Opening angle, see _VARI
14	FZ	_FFD	Depth infeed rate, see _DMODE
15	F	_FFP1	Feedrate for surface machining
16		_VARI	Machining (Alignment and reference point for engraved text)
			UNITS: Reference point
			0: Rectangular
			1: Polar
			TENS: Text alignment
			0: Text on one line
			1: Text in an upward pointing arc
			2: Text in a downward curving arc
			HUNDREDS: Reserved

No.	Param Mask	Param intern	Explanation
			THOUSANDS: : Reference point of the text, horizontal
			0: Left
			1: Center
			2: Right
			TEN THOUSANDS: Reference point of the text, vertical
			0: Bottom
			1: Center
			2: Top
			HUNDRED THOUSANDS: Text length
			0: Character spacing
			1: Overall text width (linear text only)
			2: Opening angle (only for circular text)
			MILLION: Circle center
			0: Right-angled (Cartesian)
			1: Polar
17		_CODEP	Code page number for writing (currently only 1252)
18		_UMODE	Reserved
19		_GMODE	Mode for evaluation of programmed geometrical data
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Select machining/only calculation of start point
			0 = Compatibility mode
			1 = Normal machining
20		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = No machining plane programmed
			1 = G17
			2 = G18
			3 = G19
			TENS: Type of feedrate: G group (G94/G95) for surface and depth feedrate
			0 = Compatibility mode
			1 = G code as before cycle call. G94/G95 same for surface and depth feedrate
21		_AMODE	Alternate mode
			UNITS: Final depth (_DP,_DPR)
			0 = Compatibility
			1 = Incremental (_DPR)
			2 = absolute (_DP)

1.26 Contour call - CYCLE62

Programming

```
CYCLE62(STRING[140] _KNAME,INT _TYPE,STRING[32] _LAB1,
STRING[32] _LAB2)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	PRG/ CON	_KNAME	Contour name or subroutine name does not have to be programmed in _TYPE = 2
2		_TYPE	Determination of contour input 0 = Subroutine 1 = Contour name 2 = Labels 3 = Labels in the subroutine
3	LAB1	_LAB1	Label 1, start of contour
4	LAB2	_LAB2	Label 2, end of contour

1.27 Path milling - CYCLE72

Programming

```
CYCLE72(STRING[141] _KNAME,REAL _RTP,REAL _RFP,REAL _SDIS,REAL _DP,
REAL _MID,REAL _FAL,REAL _FALD,REAL _FFP1,REAL _FFD,INT _VARI,
INT _RL,INT _AS1,REAL __LP1,REAL _FF3,INT _AS2,REAL __LP2,
INT _UMODE,REAL _FS,REAL _ZFS,INT _GMODE,INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1		_KNAME	Name of the contour subroutine
2	RP	_RTP	Retraction plane (abs)
3	Z0	_RFP	Reference point of tool axis (abs)
4	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
5	Z1	_DP	End point, final depth (abs/inc), see _AMODE
6	DZ	_MID	Maximum depth infeed (inc; enter without sign)
7	UXY	_FAL	Finishing allowance, plane (inc), allowance at edge contour
8	UZ	_FALD	Finishing allowance depth (inc), allowance at base (enter without sign)
9	FX	_FFP1	Feedrate on contour
10	FZ	_FFD	Feedrate for depth infeed (or spatial infeed)

No.	Param Mask	Param intern	Explanation
11		_VARI	Machining type
			UNITS: Machining
			1 = Roughing 2 = Finishing 5 = Chamfer
			TENS:
			0 = Intermediate travel with G0 1 = Intermediate travel with G1
			HUNDREDS:
			0 = Retraction at the end of contour to reference point 1 = Retraction at the end of contour to reference point +_SDIS 2 = Retraction by _SDIS at the end of contour 3 = No retraction at the end of contour, approach next start point with contour feed
			THOUSANDS: Reserved
			TEN THOUSANDS:
			0 = Machine contour forward 1 = Machine contour backward Restrictions with backward machining: • Max 170 contour elements (including chamfers or rounding) • Only values in the (X/Y) and F planes are evaluated
12		_RL	Machining direction 40 = Center of contour (G40, approach and retract: straight line or vertical) 41 = Left of contour (G41, approach and retract: straight line or circle) 42 = Right of contour (G42, approach and retract: straight line or circle)
13		_AS1	Contour approach movement
			UNITS:
			1 = Straight line 2 = Quarter-circle 3 = Semi-circle 4 = Vertical approach and retraction
			TENS:
			0 = Last movement, in the plane 1 = Last movement, spatial
14	L1	_LP1	Approach path or approach radius (inc; enter without sign)
15	FZ	_FF3	Feedrate for intermediate paths (G94/G95 as to contour)
16		_AS2	Contour approach movement (not vertical approach/retract)
			UNITS:
			1 = Straight line 2 = Quarter-circle 3 = Semi-circle
			TENS:
			0 = Last movement, in the plane 1 = Last movement, spatial

No.	Param Mask	Param intern	Explanation
17	L2	_LP2	Retract path or retract radius (inc, to be entered without sign)
18		_UMODE	Reserved
19	FS	_FS	Chamfer width (inc)
20	ZFS	_ZFS	Insertion depth (tool tip) on chamfering (abs/inc), see _AMODE
21		_GMODE	Mode for evaluation of programmed geometrical data
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Select machining/only calculation of start point
			0 = Compatibility mode
			1 = Normal machining
22		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
			TENS: Type of feedrate: G group (G94/G95) for surface and depth feedrate
			0 = Compatibility mode
			1 = G code as before cycle call. G94/G95 same for surface and depth feedrate
			THOUSANDS:
			0 = Compatibility mode: contour name is present in _KNAME
			1 = Contour name is programmed in CYCLE62 and transferred to _SC_CONT_NAME
23		_AMODE	Alternate mode
			UNITS: End point Z1 (_DP)
			0 = Absolute (compatibility mode)
			1 = Incremental
			TENS: Units for plane infeed
			0 = mm/inch
			1 = reserved
			HUNDREDS: Insertion depth for chamfering (_ZFS)
			0 = Absolute
			1 = Incremental

Note

If the following transfer parameters are programmed indirectly (as parameters), the input mask is not reset:

_VARI, _RL, _AS1, _AS2, _UMODE, _GMODE, _DMODE. _AMODE

1.28 Predrilling a contour pocket - CYCLE64

Programming.

```
CYCLE64(STRING[70] _PRG,INT _VARI,REAL _RP,REAL _Z0,REAL _SC,
REAL _Z1,REAL _F,REAL _DXY,REAL _UXY,REAL _UZ,INT _CDIR,
STRING[20] _TR,INT _DR,INT _UMODE,INT _GMODE,INT _DMODE,
INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	PRG	_PRG	Name Drilling/centering program
2		_VARI	Machining type
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Reserved
			THOUSANDS: Lift mode
			0 = Lift off to retraction plane
			1 = Lift off to reference point + safety clearance
3	RP	_RP	Retraction plane (abs)
4	Z0	_Z0	Reference point (abs)
5	SC	_SC	Safety clearance (to be added to reference point, enter without sign)
6	Z1	_Z1	Drilling/centering depth (see _AMODE UNITS)
7	F	_F	Drilling/centering feedrate
8	DXY	_DXY	Infeed plane - unit (see AMODE TENS)
9	UXY	_UXY	Finishing allowance, plane
10	UZ	_UZ	Finishing allowance, depth
11		_CDIR	Milling direction
			0 = Synchronism
			1 = Up-cut
12	TR	_TR	Reference tool name
13	DR	_DR	Reference tool D number
14		_UMODE	Reserved
15		_GMODE	Mode for evaluation of programmed geometrical data
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Select machining/only calculation of start point
			0 = Normal machining (no compatibility mode needed)
			1 = Normal machining
			2 = reserved

No.	Param Mask	Param intern	Explanation
25		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
			TENS: Technology mode)
			1 = Predrilling
			2 = Centering
26		_AMODE	Alternate mode
			UNITS: Drilling/centering depth Z1
			0 = Absolute (compatibility mode)
			1 = Incremental
			TENS: : Units for plane infeed (_DXY)
			0 = mm
			1 = % of tool diameter

1.29 Milling a contour pocket - CYCLE63

Programming.

```
CYCLE63(STRING[70] _PRG,INT _VARI,REAL _RP,REAL _Z0,REAL _SC,
REAL _Z1,REAL _F,REAL _FZ,REAL _DXY,REAL _DZ,REAL _UXY,REAL _UZ,
INT _CDIR,REAL _XS,REAL _YS,REAL _ER,REAL _EP,REAL _EW,REAL _FS,
REAL _ZFS,STRING[20] _TR,INT _DR,INT _UMODE,INT _GMODE,INT _DMODE,
INT _AMODE)
```

Command line parameters

No.	Param Mask	Param intern	Explanation
1	PRG	_PRG	Name of removal program
2		_VARI	Machining type
			UNITS: Machining process
			1 = Roughing
			3 = Finishing of base
			4 = Finishing of edge
			5 = Chamfer
			TENS: Infeed type
			0 = Center insertion
			1 = Helical insertion
			2 = Oscillating insertion
			HUNDREDS: Reserved
			THOUSANDS: Lift mode
			0 = Lift off to retraction plane
			1 = Lift off to reference point + safety clearance
			TEN THOUSANDS: Start point for roughing and finishing base
			0 = Auto
			1 = Manual
3	RP	_RP	Retraction plane (abs)
4	Z0	_Z0	Reference point of tool axis (abs)
5	SC	_SC	Safety clearance (to be added to reference point, enter without sign)
6	Z1	_Z1	Final depth (see _AMODE UNITS)
7	F	_F	Feedrate in the plane during roughing/finishing
8	FZ	_FZ	Depth infeed rate
9	DXY	_DXY	Infeed plane - unit (see AMODE TENS)
10	DZ	_DZ	Depth infeed
11	UXY	_UXY	Finishing allowance, plane
12	UZ	_UZ	Finishing allowance, depth
13		_CDIR	Milling direction
			0 = Synchronism
			1 = Up-cut

No.	Param Mask	Param intern	Explanation
14	XS	_XS	Starting point X, absolute
15	YS	_YS	Starting point Y, absolute
16	ER	_ER	Helical insertion: Radius
17	EP	_EP	Helical insertion: Pitch
18	EW	_EW	Oscillating insertion: Maximum insertion angle
19	FS	_FS	Chamfer width (inc) for chamfering
20	ZFS	_ZFS	Insertion depth of tool tip when chamfering (see AMODE HUNDREDS)
21	TR	_TR	Reference tool name when machining residual material
22	DR	_DR	Reference tool D number when machining residual material
23		_UMODE	Reserved
24		_GMODE	Mode for evaluation of programmed geometrical data
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Select machining/only calculation of start point
			0 = Normal machining (no compatibility mode needed)
			1 = Normal machining
			2 = reserved
25		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
			TENS: Reserved
			HUNDREDS: Technology mode
			1 = Pocket
			2 = Spigot
			THOUSANDS: Machine residual material
			0 = no
			1 = yes
26		_AMODE	Alternate mode
			UNITS: Final depth Z1
			0 = Absolute (compatibility mode)
			1 = Incremental
			TENS: Units for plane infeed (_DXY)
			0 = mm
			1 = % of tool diameter
			HUNDREDS: Insertion depth for chamfering (_ZFS)
			0 = Absolute
			1 = Incremental

1.30 Stock removal - CYCLE951

Programming

```
CYCLE951(REAL _SPD,REAL _SPL,REAL _EPD,REAL _EPL,REAL _ZPD,
REAL _ZPL,INT _LAGE,REAL _MID,REAL _FALX,REAL _FALZ,INT _VARI,
REAL _RF1,REAL _RF2,REAL _RF3,REAL _SDIS,REAL _FF1,INT _NR,
INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	X0	_SPD	Reference point (abs, always diameter)
2	Z0	_SPL	Reference point (abs)
3	X1	_EPD	End point
4	Z1	_EPL	End point
5	XM α1 α2	_ZPD	Intermediate point, see _DMODE (TENS)
6	ZM α1 α2	_ZPL	Intermediate point, see _DMODE (TENS)
7	Position	_LAGE	Position of stock removal corner 0 = External/rear 1 = External/front 2 = Internal/rear 3 = Internal/front
8	D	_MID	Maximum depth infeed on insertion
9	UX	_FALX	Finishing allowance in X
10	UZ	_FALZ	Finishing allowance in Z
11		_VARI	Machining type
			UNITS: Stock removal direction (longitudinal or transverse) in the coordinate system
			1 = Longitudinal 2 = Transverse
			TENS:
			1 = Roughing to finishing allowance 2 = Finishing
			HUNDREDS:
			0 = With rounding at the contour, without residual corners 1 = Without rounding at the contour
			THOUSANDS:
			0 = With radius/chamfer at corner 2 1 = With undercut at corner 2
			TEN THOUSANDS:
			0 = Stand still after machining 1 = Return to starting position
12	R1/FS1	_RF1	Rounding radius or chamfer width 1, see _AMODE (TEN THOUSANDS)

No.	Param Mask	Param intern	Explanation
13	R2/FS2	_RF2	Rounding radius or chamfer width 2, see _AMODE (HUNDRED THOUSANDS)
14	R3/FS3	_RF3	Rounding radius or chamfer width 3, see _AMODE (ONE MILLION)
15	SC	_SDIS	Safety clearance
16	F	_FF1	Feedrate for roughing/finishing
17		_NR	Identification of stock removal type (corresponds to vertical softkey for selecting form): 0 = Stock removal 1, 90 degree corner without chamfers/rounding 1 = Stock removal 2, 90 degree corner with chamfers/rounding 2 = Stock removal 3, any corner with chamfers/rounding
18		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active 1 = G17 (only active in the cycle) 2 = G18 (only active in the cycle) 3 = G19 (only active in the cycle)
			TENS: Form of input _ZPD/_ZPL
			0 = Xm/Zm 1 = Xm/α1 2 = Xm/α2 3 = α1/Zm 4 = α2/Zm 5 = α1/α2
21		_AMODE	Alternate mode
			UNITS: Intermediate point in X
			0 = Absolute, value of transverse axis in the diameter 1 = Incremental, value of transverse axis in the radius
			TENS: Intermediate point in Z
			0 = Absolute 1 = Incremental
			HUNDREDS: End point in X
			0 = Absolute, value of transverse axis in the diameter 1 = Incremental, value of transverse axis in the radius
			THOUSANDS: End point in Z
			0 = Absolute 1 = Incremental
			TEN THOUSANDS: Radius/chamfer 1
			0 = Radius 1 = Chamfer
			HUNDRED THOUSANDS: Radius/chamfer 2
			0 = Radius 1 = Chamfer
			MILLION: Radius/chamfer 3
			0 = Radius 1 = Chamfer

1.31 Groove - CYCLE930

Programming

```
CYCLE930 (REAL _SPD,REAL _SPL,REAL _WIDG,REAL _WIDG2,REAL _DIAG,
REAL _DIAG2,REAL _STA,REAL _ANG1,REAL _ANG2,REAL _RCO1,REAL _RCI1,
REAL _RCI2,REAL _RCO2,REAL _FAL,REAL _IDEP1,REAL _SDIS,INT _VARI,
INT _DN,INT _NUM,REAL _DBH,REAL _FF1,INT _NR,REAL _FALX,REAL _FALZ,
INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	X0	_SPD	Reference point in the plane axis (always diameter)
2	Z0	_SPL	Reference point along the longitudinal axis
3	B1	_WIDG	Width at bottom of groove
4	B2	_WIDG2	Width at top of groove (for interface only)
5	T1	_DIAG	Depth of groove at the reference point for abs and longitudinal machining = diameter, otherwise inc
6	T2	_DIAG2	Groove depth opposite the reference point (for interface only), for abs and longitudinal machining = diameter, otherwise inc
7	α0	_STA	Angle of inclination (-180 ≤ _STA ≤ 180)
8	α1	_ANG1	Side angle 1 (0 ≤ _ANG1 < 90) at the side of the groove determined by the reference point
9	α2	_ANG2	Side angle 2 (0 ≤ _ANG2 < 90) opposite the reference point
10	R1/FS1	_RCO1	Rounding radius or chamfer width 1, external at the reference point
11	R2/FS2	_RCI1	Rounding radius or chamfer width 2, internal at the reference point
12	R3/FS3	_RCI2	Rounding radius or chamfer width 3, internal opposite the reference point
13	R4/FS4	_RCO2	Rounding radius or chamfer width 4, external opposite the reference point
14	U	_FAL	Finishing allowance in X and Z, see _VARI (TEN THOUSANDS) (to be entered without sign)
15	D	_IDEP1	Maximum depth infeed on insertion (enter without sign) 0 = 1st cut directly to full depth > 0 = 1st cut _IDEP1, 2nd cut 2 · _IDEP1 etc.
16	SC	_SDIS	Safety clearance (enter without sign)
17		_VARI	Machining type
			UNITS: Reserved
			TENS: Machining process
			1 = Roughing 2 = Finishing 3 = Roughing and finishing
			HUNDREDS: Position longitudinal/transverse external/internal +Z/+Z and +X/-X

No.	Param Mask	Param intern	Explanation
			1 = Longitudinal/external +Z
			2 = Transverse/internal -X
			3 = Longitudinal/internal +Z
			4 = Transverse/internal +X
			5 = Longitudinal/external -Z
			6 = Transverse/external -X
			7 = Longitudinal/internal -Z
			8 = Transverse/external +X
			THOUSANDS: Position of reference point
			0 = Upper reference point
			1 = Lower reference point
			TEN THOUSANDS: Define effect of finishing allowances
			0 = Finishing allowance U parallel to contour
			1 = Separate UX and UZ finishing allowances
18		_DN	D number for 2nd edge of tool
			> 0 = D number for correction of 2nd edge of grooving tool
			0 = No 2nd edge programmed
19	N	_NUM	Number of grooves (0 = 1 groove)
20	DP	_DBH	Distance between grooves (only needed when _NUM > 1)
21	F	_FF1	Feedrate
22		_NR	Identification for form of groove corresponds to vertical softkey for form selection
			0 = 90° sides without chamfers/rounding
			1 = Inclined sides with chamfers/rounding (without α0)
			2 = as 1, but on taper (with α0)
23	UX	_FALX	Finishing allowance in X axis, see _VARI (TEN THOUSANDS) (to be entered without sign)
24	UZ	_FALZ	Finishing allowance in z axis, see _VARI (TEN THOUSANDS) (to be entered without sign)
25		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)

No.	Param Mask	Param intern	Explanation
26		_AMODE	Alternate mode
			UNITS: Dimensioning for top of groove (for interface only)
			0 = At reference point
			1 = Opposite the reference point
			TENS: Depth
			0 = Absolute
			1 = Incremental
			HUNDREDS: Dimensioning for width (for interface only)
			0 = At outer diameter (top)
			1 = At inner diameter (bottom)
			THOUSANDS: Radius/chamfer 1 (_RCO1)
			0 = Radius
			1 = Chamfer
			TEN THOUSANDS: Radius/chamfer 2 (_RCI1)
			0 = Radius
			1 = Chamfer
			HUNDRED THOUSANDS: Radius/chamfer 3 (_RCI2)
			0 = Radius
			1 = Chamfer
			MILLIONS POSITION: Radius/chamfer 4 (_RCO2)
			0 = Radius
			1 = Chamfer

1.32 Undercut forms - CYCLE940

The CYCLE940 cycle can be used to program various undercuts. Some of the parameter settings for them differ considerably from each other.

The additional columns in the table show which parameters are needed for which form of undercut. They correspond to the vertical selection softkeys in the cycle mask:

- E: Undercut form E
- F: Undercut form F
- A-D: DIN thread undercut (forms A-D)
- T: Thread undercut (free definition of form)

Programming

```
CYCLE940(REAL _SPD,REAL _SPL,CHAR _FORM,INT _LAGE,REAL _SDIS,
REAL _FFP,INT _VARI,REAL _EPD,REAL _EPL,REAL _R1,REAL _R2,
REAL _STA,REAL _VRT,REAL _MID,REAL _FAL,REAL _FALX,REAL _FALZ,
INT _PITI,STRING[5] _PTAB,STRING[20] _PTABA,INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Prog. for form				Explanation
			E	F	A-D	T	
1	X0	_SPD	x	x	x	x	Reference point in the plane axis (always diameter)
2	Z0	_SPL	x	x	x	x	Reference point on longitudinal axis (abs)
3	FORM	_FORM	x	x	x	x	Form of undercut (capital letters, e.g. "T") Selection, table from which the undercut values should be taken A = External, reference DIN76, A = normal B = External, reference DIN76, B = short C = Internal, reference DIN76, C = normal D = Internal, reference DIN76, D = short E = Reference DIN509 F = Reference DIN509 T = Free form
4	LAGE	_LAGE	x	x	x	x	Position of undercut (parallel Z)
							0 = External +Z: ____|
							1 = External -Z: |____/
							2 = Internal +Z: /-----|
							3 = Internal -Z: |-----\
5	SC	_SDIS	x	x	x	x	Safety clearance (inc)
6	F	_FFP	x	x	x	x	Machining feedrate (mm/rev)
7		_VARI	-	-	x	x	Machining type
							UNITS: Machining
							1 = Roughing 2 = Finishing 3 = Roughing + finishing
							TENS: Machining strategy
							0 = Parallel to contour 1 = Longitudinal
			Undercut forms E and F are always machined in a single pass like finishing.				
8	X1	_EPD	x	x	-	-	Allowance X (abs/inc), see _AMODE)
			-	-	-	x	Depth of undercut (abs/inc), see _AMODE
9	Z1	_EPL	-	x	-	-	Allowance Z
			-	-	-	x	Undercut width (abs/inc), see _AMODE
10	R1	_R1	-	-	-	x	Rounding radius on slopes
11	R2	_R2	-	-	-	x	Rounding radius in the corner
12	α	_STA	-	-	x	x	Insertion angle
13	VX	_VRT	x	x	-	-	Cross-feed X (abs/inc), see _AMODE
			-	-	x	x	Cross-feed X when finishing, (abs/inc), see _AMODE
14	D	_MID	-	-	x	x	Depth infeed
15	U	_FAL	-	-	x	x	Finishing allowance parallel to contour, see _AMODE
16	UX	_FALX	-	-	x	x	Finishing allowance X

			Prog. for form				
17	UZ	_FALZ	-	-	x	x	Finishing allowance Z
18	P	_PITI	-	-	x	-	Select pitch, form A-D, corresponds to M1 ... M68
							0 = 0.20 6 = 0.50 12 = 1.25 18 = 3.50 1 = 0.25 7 = 0.60 13 = 1.50 19 = 4.00 2 = 0.30 8 = 0.70 14 = 1.75 20 = 4.50 3 = 0.35 9 = 0.75 15 = 2.00 21 = 5.00 4 = 0.40 10 = 0.80 16 = 2.50 22 = 5.50 5 = 0.45 11 = 1.00 17 = 3.00 23 = 6.00
			x	x	-	-	Select radius/depth, form E, F
							0 = 0.6 · 0.3 4 = 2.5 · 0.4 8 = 0.1 · 0.1 1 = 1.0 · 0.4 5 = 4.0 · 0.5 9 = 0.2 ··0.1 2 = 1.0 · 0.2 6 = 0.4 · 0.2 3 = 1.6 ··0.3 7 = 0.6 · 0.2
19		_PTAB					String for thread table ("", "ISO", "BSW", "BSP", "UNC") (for the interface only)
20		_PTABA					String for selection from thread table (e.g. "M 10", "M 12", ...) (for the interface only)
21		_DMODE					Display mode
			x	x	x	x	UNITS: machining plane G17/18/19
							0 = Compatibility, the level effective before cycle call remains active 1 = G17 (only active in the cycle) 2 = G18 (only active in the cycle) 3 = G19 (only active in the cycle)
22		_AMODE					Alternate mode
			x	x	-	x	UNITS: Parameter _EPD allowance X or depth of undercut
							0 = Absolute (always diameter) 1 = Incremental
			x	x	-	x	TENS: Parameter _EPL allowance Z or width of undercut
							0 = Absolute 1 = Incremental
			x	x	x	x	HUNDREDS: Parameter _VRT cross-feed X
							0 = Absolute (always diameter) 1 = Incremental
			-	-	x	x	THOUSANDS: Finishing allowance
							0 = Finishing allowance parallel to contour (_FAL) = Separate machining allowance (_FALX/_FALZ)

1.33 Thread turning - CYCLE99

Programming

```
CYCLE99(REAL _SPL,REAL _SPD,REAL _FPL,REAL _FPD,REAL _APP,
REAL _ROP,REAL _TDEP,REAL _FAL,REAL _IANG,REAL _NSP,INT _NRC,
INT _NID,REAL _PIT,INT _VARI,INT _NUMTH,REAL _SDIS,REAL _MID,
REAL _GDEP,REAL _PIT1,REAL _FDEP,INT _GST,INT _GUD,REAL _IFLANK,
INT _PITA,STRING[15] _PITM,STRING[20] _PTAB,STRING[20] _PTABA,
INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	Z0	_SPL	Reference point (abs)
2	X0	_SPD	Reference point (abs, always diameter)
3	Z1	_FPL	End point, see _AMODE (UNITS)
4	X1	_FPD	End point, see _AMODE (TENS)
5	LW/LW2	_APP	Thread approach, see _AMODE (HUNDREDS) or Thread run-in = thread run-out, see _AMODE (HUNDREDS)
6	LR	_ROP	Thread run-out
7	H1	_TDEP	Thread depth
8	U	_FAL	Finishing allowance in X and Z
9	DP	_IANG	Infeed slope as a distance or an angle, see _AMODE (THOUSANDS)
	αP		> 0 = Infeed on the positive side < 0 = Infeed on the negative side 0 = Center infeed
10	α0	_NSP	Starting angle offset (only effective with "single start")
11	ND	_NRC	Number of roughing cuts, in combination with _VARI (TEN THOUSANDS)
12	NN	_NID	Number of non-cuts
13	P	_PIT	Pitch as a value, see _PITA
14		_VARI	Machining type
			UNITS: Technology
			1 = External thread with linear infeed 2 = Internal thread with linear infeed 3 = External thread with degressive infeed, cross-section of cut remains constant 4 = Internal thread with degressive infeed, cross-section of cut remains constant
			TENS: Reserved
			HUNDREDS: Infeed type
			1 = Infeed on one side 2 = Infeed alternate sides
			THOUSANDS: Reserved

No.	Param Mask	Param intern	Explanation
			TEN THOUSANDS: Alternative depth infeed
			0 = Preset number of roughing cuts (_NRC)
			1 = Preset value for 1st infeed (_MID)
			HUNDRED THOUSANDS: Machining type
			1 = Roughing
			2 = Finishing
			3 = Roughing and finishing
			MILLION: Machining sequence for multistart thread
			0 = In ascending order of threads
			1 = In descending order of threads
15	N	_NUMTH	Number of threads
16	VR	_SDIS	Return distance, inc
17	D1	_MID	First infeed depth, see _VARI (TEN THOUSANDS)
18	DA	_GDEP	Thread changeover depth 0 = Do not observe any thread changeover depth > 0 = Observe thread changeover depth
19	G	_PIT1	Change of pitch per revolution 0 = Pitch is constant (G33) > 0 = Pitch increases (G34) > 0 = Pitch reduces (G35)
20		_FDEP	Insertion depth (enter without sign)
21	N1	_GST	Starting thread N1 = 1...N, see _AMODE (HUNDRED THOUSANDS)
22		_GUD	Reserved
23		_IFLANK	Infeed slope as width (for interface only)
24		_PITA	Pitch unit (evaluation of PIT and/or MPIT) 0 = Pitch in mm - MPIT/PIT evaluation 1 = Pitch in mm - PIT evaluation 2 = Pitch in TPI - evaluation of PIT (threads per inch) 3 = Pitch in inches - PIT evaluation 4 = MODULE- evaluation of PIT
25		_PITM	String as marker for pitch input (for the interface only)[1)]
26		_PTAB	String for thread table (for the interface only)[1)]
27		_PTABA	String for selection in the thread table (for the interface only)[1)]

No.	Param Mask	Param intern	Explanation
28		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
			TENS: Type of thread
			0 = Longitudinal thread
			1 = Face thread
			2 = Taper thread
29		_AMODE	Alternate mode
			UNITS: Thread length in Z
			0 = Absolute
			1 = Incremental
			TENS: Thread length in X
			0 = Absolute, value of transverse axis in the diameter
			1 = Incremental, value of transverse axis in the radius
			2 = α
			HUNDREDS: Calculation of approach/run-in path _APP
			0 = Thread approach _APP
			1 = Thread run-in = thread run-out _APP = -_ROP
			2 = Specify thread run-in path _APP = -_APP
			THOUSANDS: Select infeed slope as angle or width
			0 = Infeed angle _IANG
			1= Infeed slope _IFLANK
			TEN THOUSANDS: single/multiple thread
			0 = Single thread (with starting angle offset _NSP)
			1 = Multiple thread
			HUNDRED THOUSANDS Starting thread _GST
			0 = Full machining
			1 = Start machining from this thread
			2 = Only machine this thread

Note

1) Parameters _PITM, _PTAB and _PTABA are only used for thread selection in the input mask thread tables.

The thread tables cannot be accessed via cycle definition in cycle run time.

1.34 Thread chain - CYCLE98

Programming

```
CYCLE98(REAL _PO1,REAL _DM1,REAL _PO2,REAL _DM2,REAL _PO3,REAL _DM3,
REAL _PO4,REAL _DM4,REAL APP,REAL ROP,REAL TDEP,REAL FAL,REAL _IANG,
REAL NSP,INT NRC,INT NID,REAL _PP1,REAL _PP2,REAL _PP3,INT _VARI,
INT _NUMTH,REAL _VRT,REAL _MID,REAL _GDEP,REAL _IFLANK,
INT _PITA,STRING[15] _PITM1,STRING[15] _PITM2,STRING[15] _PITM3,
INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	Z0	_PO1	Reference point in Z (abs)
2	X1	_DM1	Reference point in X (abs), in diameter
3	Z1	_PO2	Intermediate point 1 in Z (abs/inc), see _AMODE (UNITS)
4	X1	_DM2	Intermediate point 1 in X (abs/inc), see _AMODE (TENS) or
	X1α		Thread inclination 1 (-90° to 90°) abs is always diameter, inc is always radius
5	Z2	_PO3	Intermediate point 2 in Z, (abs/inc), see _AMODE (HUNDREDS)
6	X2	_DM3	Intermediate point 2 in X (abs/inc), see _AMODE (THOUSANDS) or
	X2α		Thread inclination 2 (-90° to 90°) abs is always diameter, inc is always radius
7	Z3	_PO4	End point in Z, (abs/inc), see _AMODE (TEN THOUSANDS)
8	X3	_DM4	End point in X, (abs/inc), see _AMODE (HUNDRED THOUSANDS) or
	X3α		Thread inclination 3 (-90° to 90°) abs is always diameter, inc is always radius
9	LW	APP	Thread approach (inc, to be entered without sign)
10	LR	ROP	Thread run-out (inc, to be entered without sign)
11	H1	TDEP	Thread depth (inc, to be entered without sign)
12	U	FAL	Finishing allowance in X and Z
13	DP	_IANG	Infeed slope as a distance or an angle, see _AMODE (MILLION)
	αP		The infeed slope is applied according to the setting of parameter _VARI (HUNDREDS). Definition of _VARI_HUNDERTER = 0 - Compatibility mode: > 0 = Side infeed on one side 0 = Infeed vertical in the thread < 0 = Side infeed with alternating sides Definition for _VARI_HUNDERTER<>0: > 0 = Infeed on the positive side 0 = Center infeed < 0 = Infeed on the negative side
14	α0	NSP	Starting angle offset for the 1st thread

No.	Param Mask	Param intern	Explanation
15		NRC	Number of roughing cuts, see _VARI (TEN THOUSANDS)
16	NN	NID	Number of non-cuts
17	P0	_PP1	Pitch for 1st section of thread, see _PITA
18	P1	_PP2	Pitch for 2nd section of thread, see _PITA
19	P2	_PP3	Pitch for 3rd section of thread, see _PITA
20		_VARI	Machining
			UNITS: Technology
			1 = External thread with linear infeed
			2 = Internal thread with linear infeed
			3 = External thread with degressive infeed, cross-section of cut remains constant
			4 = Internal thread with degressive infeed, cross-section of cut remains constant
			TENS: Reserved
			HUNDREDS: Infeed type
			0 = Compatibility mode for _IANG
			1 = Infeed on one side
			2 = Infeed alternate sides
			THOUSANDS: Reserved
			TEN THOUSANDS: Alternative depth infeed
			0 = Compatibility, preset number of roughing cuts (_NRC)
			1 = Preset value for 1st infeed (_MID)
			HUNDRED THOUSANDS: Machining type
			0 = Compatibility (roughing and finishing)
			1 = Roughing
			2 = Finishing
			3 = Roughing and finishing
			MILLION: Machining sequence for multistart thread
			0 = In ascending order of threads
			1 = In descending order of threads
21	N	_NUMTH	Number of threads
22		_VRT	Return distance (inc)
			0 = A lift-off distance of 1 mm is used internally regardless of the active system (inch or metric)
			> 0 = lift-off distance
23	D1	_MID	First infeed, see _VARI (TEN THOUSANDS)
24	DA	_GDEP	Thread changeover depth (only effective with "multiple start")
			0 = Do not observe any thread changeover depth
			> 0 = Observe thread changeover depth
25		_IFLANK	Infeed slope as width (for interface only)

No.	Param Mask	Param intern	Explanation
26		_PITA	Evaluation of thread pitch 0 = Compatibility mode for pitch, Evaluation _PP1 to _PP3 as previously, according to active system (metric/inch) 1 = Pitch in mm 2 = Pitch in TPI (threads per inch) 3 = Pitch in inches 4 = MODULE
27		_PITM1	String as marker for pitch input (for the interface only)
28		_PITM2	String as marker for pitch input (for the interface only)
29		_PITM3	String as marker for pitch input (for the interface only)
30		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the level effective before cycle call remains active 1 = G17 (only active in the cycle) 2 = G18 (only active in the cycle) 3 = G19 (only active in the cycle)
31		_AMODE	Alternate mode
			UNITS: 1st Intermediate point in Z (Z1)
			0 = Absolute 1 = Incremental
			TENS: 1st Intermediate point in X (X1)
			0 = Absolute 1 = Incremental 2 = α
			HUNDREDS: 2nd intermediate point in Z (Z2)
			0 = Absolute 1 = Incremental
			THOUSANDS: 2nd Intermediate point in X (X2)
			0 = Absolute 1 = Incremental 2 = α
			TEN THOUSANDS: End point in Z (Z3)
			0 = Absolute 1 = Incremental
			HUNDRED THOUSANDS: end point in X (X3)
			0 = Absolute 1 = Incremental 2 = α
			MILLION: Select infeed slope as angle or width
			0 = Infeed angle _IANG 1= Infeed slope _IFLANK
			TEN MILLIONS: single/multiple thread
			0 = Compatibility mode (starting angle _NSP is evaluated) 1 = Single thread (with starting angle offset _NSP) 2 = Multiple thread

1.35 Cut-off - CYCLE92

Programming

```
CYCLE92(REAL _SPD,REAL _SPL,REAL _DIAG1,REAL _DIAG2,REAL _RC,
REAL _SDIS,REAL _SV1,REAL _SV2,INT _SDAC,REAL _FF1,REAL _FF2,
REAL _SS2,REAL _DIAGM,INT _VARI,INT _DN,INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	X0	_SPD	Reference point (abs, always diameter)
2	Y0	_SPL	Reference point (abs)
3	X1	_DIAG1	Depth for speed reduction, see _AMODE (UNITS)
4	X2	_DIAG2	Final depth, see _AMODE (TENS)
5	R/FS	_RC	Rounding status or chamfer width, see _AMODE (THOUSANDS)
6	SC	_SDIS	Safety clearance (to be added to reference point, enter without sign)
7	S	_SV1	Constant spindle speed, see _AMODE (TEN THOUSANDS)
	V		Constant cutting rate
8	SV	_SV2	Maximum speed at constant cutting speed
9	DIR	_SDAC	Direction of spindle rotation 3 = for M3 4 = for M4
10	F	_FF1	Infeed as far as depth for speed reduction
11	FR	_FF2	Reduced infeed as far as final depth
12	SR	_SS2	Reduced speed as far as final depth
13	XM	_DIAGM	Depth to withdraw parts gripper (abs, always diameter)
14		_VARI	Machining type
			UNITS: Retraction
			0 = Retraction to _SPD+_SDIS 1 = No retraction at the end
			TENS: Parts gripper
			0 = No, do not execute M command 1 = Yes, call from CUST_TECHCYC(101)- open drawer, CUST_TECHCYC(102)- close drawer
15		_DN	D number for 2nd edge of tool; if not programmed ⇒ D+1
20		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active 1 = G17 (only active in the cycle) 2 = G18 (only active in the cycle) 3 = G19 (only active in the cycle)

No.	Param Mask	Param intern	Explanation
21		_AMODE	Alternate mode
			UNITS: Depth for speed reduction (_DIAG1)
			0 = Absolute, value of transverse axis in the diameter
			1 = Incremental, value of transverse axis in the radius
			TENS: Final depth (_DIAG2)
			0 = Absolute, value of transverse axis in the diameter
			1 = Incremental, value of transverse axis in the radius
			HUNDREDS: Reserved
			THOUSANDS: Radius/chamfer (_RC)
			0 = Radius
			1 = Chamfer
			TEN THOUSANDS: Spindle speed/ cutting rate (_SV1)
			0 = Constant spindle speed
			1 = Constant cutting rate

1.36 Contour grooving - CYCLE952

Programming

```
CYCLE952(STRING[75] _PRG,STRING[75] _CON,STRING[75] _CONR,INT _VARI,
REAL _F,REAL _FR,REAL _RP,REAL _D,REAL _DX,REAL _DZ,REAL _UX,
REAL _UZ,REAL _U,REAL _U1,INT _BL,REAL _XD,REAL _ZD,REAL _XA,
REAL _ZA,REAL _XB,REAL _ZB,REAL _XDA,REAL _XDB,INT _N,REAL _DP,
REAL _DI,REAL _SC,INT _DN,INT _GMODE,INT _DMODE,INT _AMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1	PRG	_PRG	Name of stock removal program
2	CON	_CON	Program name from which the updated contour of the blank is read (for residual machining)
3	CONR	_CONR	Name of program into which the updated contour for the blank (see _AMODE TEN THOUSANDS) will be written
4		_VARI	Machining type
			UNITS: Type of stock removal
			1 = Longitudinal
			2 = Face
			3 = Parallel to contour
			TENS: Machining process, (see _GMODE HUNDREDS)
			1 = Roughing
			2 = Finishing
			3 = Complete machining
			HUNDREDS: Machining direction
			1 = Machining direction X -
			2 = Machining direction X +
			3 = Machining direction Z -
			4 = Machining direction Z +
			THOUSANDS: Infeed direction
			1 = Externally X-
			2 = Internally X +
			3 = Front face Z -
			4 = Rear face Z +
			TEN THOUSANDS: Define effect of finishing allowances
			0 = Separate UX and UZ finishing allowances
			1 = Finishing allowance U parallel to contour
			HUNDRED THOUSANDS: Rounding
			0 = Compatibility, automatic rounding
			1 = With rounding at the contour
			2 = Without rounding
			3 = Automatic rounding

No.	Param Mask	Param intern	Explanation
			MILLION: Relief cuts
			0 = Position is not evaluated during grooving, - residual and groove turning, - remainder
			1 = Machine relief cuts
			2 = No machining of relief cuts
			TEN MILLION: Behind/in front of turning center
			0 = Machining in front of the turning center
			1 = reserved
5	F	_F	Feedrate for roughing/finishing
	FZ		Infeed abscissa groove turning
6	FR	_FR	Feedrate for insertion into relief cuts, roughing
	FX		Infeed ordinate groove turning
7	RP	_RP	Retraction plane for internal machining (abs, always diameter)
8	D	_D	Roughing infeed (see _AMODE UNITS)
9	DX	_DX	X infeed (see _AMODE UNITS)
10	DZ	_DZ	Z infeed (see _AMODE UNITS)
11	UX	_UX	Finishing allowance X, (see _VARI TEN THOUSANDS)
12	UZ	_UZ	Finishing allowance Z, (see _VARI TEN THOUSANDS)
13	U	_U	Finishing allowance parallel to contour, (see _VARI TEN THOUSANDS)
14	U1	_U1	Additional finishing allowance while finishing (see_AMODE THOUSANDS)
15	BL	_BL	Definition of blank
			1 = Cylinder with allowance
			2 = Allowance at contour of finished part
			3 = Contour of blank is given
16	XD	_XD	Definition of blank X (see _AMODE HUNDRED THOUSANDS)
17	ZD	_ZD	Definition of blank Z (see _AMODE MILLION)
18	XA	_XA	Limit 1 X (abs, always diameter)
19	ZA	_ZA	Limit 1 Z (abs)
20	XB	_XB	Limit 2 X (see _AMODE TEN MILLION)
21	ZB	_ZB	Limit 2 Z (see _AMODE HUNDRED MILLION)
22	XDA	_XDA	Grooving limit 1 for grooving on front face (abs, always diameter)
23	XDB	_XDB	Grooving limit 2 for grooving on front face (abs, always diameter)
24	N	_N	Number of grooves
25	DP	_DP	Distance between grooves
			Longitudinal groove: parallel to Z axis
			Transverse groove: parallel to X axis
26	DI	_DI	Distance for interruption of infeed
			0 = no interruption
			0 > with interruption
27	SC	_SC	Safety clearance for avoiding obstacles, incremental
28	D2	_DN	D number for 2nd edge of tool; if not programmed ⇒ D+1

No.	Param Mask	Param intern	Explanation
29		_GMODE	Geometrical mode (evaluation of programmed geometrical data)
			UNITS: Reserved
			TENS: Reserved
			HUNDREDS: Select machining/only calculation of start point
			0 = Normal machining (no compatibility mode needed)
			1 = Normal machining
			2 = Calculate start point - no machining (only for call from ShopMill/ShopTurn)
			THOUSANDS: Limit
			0 = no
			1 = yes
			TEN THOUSANDS: Enter limit 1 X
			0 = no
			1 = yes
			HUNDRED THOUSANDS: Enter limit 2 X
			0 = no
			1 = yes
			MILLION: Enter limit 1 Z
			0 = no
			1 = yes
			TEN MILLION: Enter limit 2 Z
			0 = no
			1 = yes
30		_DMODE	Display mode
			UNITS: machining plane G17/18/19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)
			TENS: Technology mode
			1 = Contour cutting
			2 = Contour grooving
			3 = Groove turning
			HUNDREDS: Machine residual material
			0 = no
			1 = yes

No.	Param Mask	Param intern	Explanation
31		_AMODE	Alternate mode
			UNITS: Select infeed
			0 = DX and DZ infeed for stock removal parallel to contour
			1 = D infeed
			TENS: Infeed strategy
			0 = Variable cutting depth (90 ... 100 %)
			1 = Constant cutting depth
			HUNDREDS: Cut segmentation
			0 = Uniform
			1 = Align to edges
			THOUSANDS: Select contour allowance U1, double finishing
			0 = no
			1 = yes
			TEN THOUSANDS: Update selection of blank
			0 = no
			1 = yes
			HUNDRED THOUSANDS: Select allowance on blank XD
			0 = Absolute, value of transverse axis in the diameter
			1 = Incremental, value of transverse axis in the radius
			MILLION: Select allowance on blank ZD
			0 = Absolute
			1 = Incremental
			TEN MILLION: Select limit 2 XB
			0 = Absolute, value of transverse axis in the diameter
			1 = Incremental, value of transverse axis in the radius
			HUNDRED MILLION: Select limit 2 ZB
			0 = Absolute
			1 = Incremental

1.37 Swiveling - CYCLE800

Programming

```
CYCLE800(INT _FR,STRING[32] _TC,INT _ST,INT _MODE,REAL _X0,
REAL _Y0,REAL _Z0,REAL _A,REAL _B,REAL _C,REAL _X1,REAL _Y1,
REAL _Z1,INT _DIR,REAL _FR_I ,INT _DMODE)
```

Parameters

No.	Param Mask	Param intern	Explanation
1		_FR	Retraction mode:
			0 = no retraction
			1 = Retraction machine axis Z
			2 = Retraction machine axis Z and then XY
			3 = reserved
			4 = Maximum retraction in tool direction
			5 = Incremental retraction in tool direction
2		_TC	Name of swivel data record:
			"" (no name) if only one swivel data record exists
			"0" Deselect swivel data record (delete the swivel frames)
3		_ST	Status transformations
			UNITS:
			0 = New, swivel level is deleted and recalculated using the current parameters
			1 = Additive, swivel level is added to active swivel level
			TENS: Replace tool tip yes/no (only active when IBN SWIVEL function is set up)
			0 = Do not replace tool tip
			1 = Replace tool tip (TRAORI)
			HUNDREDS: Approach/align tool (function is shown in tool swivel input mask)
			0 = Do not approach tool
			1 = Approach tool (preferably radial mill)
			2 = Align turning tool (when B axis kinematic is set up for milling in IBN swiveling)
			3 = Align milling tool (when B axis kinematic is set up for milling in IBN swiveling)
			9 = reserved
			THOUSANDS: Internal "Swiveling in JOG" parameter
			TEN THOUSANDS: See direction parameter _DIR
			0 = Swivel "yes"
			1 = Swivel "no", "minus" direction[3)]
			2 = Swivel "no", "plus" direction[3)]
			HUNDRED THOUSANDS: See direction parameter _DIR
			0 = Compatibility
			1 = Direction selection "Minus" optimized[4)]
			2 = Direction selection "Plus" optimized[4)]

No.	Param Mask	Param intern	Explanation
4		_MODE [5]	Swivel mode: Evaluation of swivel angle and swivel sequence (bit-coded)
			Bit: 7 6
			0 0: Swivel angle by axis -> see parameters _A, _B, _C
			0 1: Solid angle -> see parameters _A, _B[1]
			1 0: Projection angle -> see parameters _A, _B _C [1]
			1 1: Direct rotary axis swivel mode -> see parameters _A, _B[1]
			Bit: 5 4 3 2 1 0 (these do not apply to solid angles)
			x x x x 0 1 1st rotation _A around X
			x x x x 1 0 1st rotation _A around Y
			x x x x 1 1 1st rotation _A around Z
			x x 0 1 x x 2nd rotation _B around X
			x x 1 0 x x 2nd rotation _B around Y
			x x 1 1 x x 2nd rotation _B around Z
			0 1 x x x x 3rd rotation _C around X
			1 0 x x x x 3rd rotation _C around Y
			1 1 x x x x 3rd rotation _C around Z
5	X0	_X0	Reference point X prior to rotation
6	Y0	_Y0	Reference point Y prior to rotation
7	Z0	_Z0	Reference point Z prior to rotation
8	X(A)	_A	1st rotation acc. to setting in _MODE parameter
9	Y(B)	_B	2nd rotation acc. to setting in _MODE parameter
10	Z(C)	_C	3rd rotation acc. to setting in _MODE parameter
11	X1	_X1	Reference point X after rotation
12	Y1	_Y1	Reference point Y after rotation
13	Z1	_Z1	Reference point Z after rotation
14	- or +	_DIR	Initiate travel of rotary axes (default = -1!):
			-1 = Position at smaller value of rotary axis 1 or 2[2]
			+1 = Position at larger value of rotary axis 1 or 2[2]
			0 = Do not swivel (merely calculate swivel frame) [1] [3]
15	FR	_FR_I	Value (inc) of retraction in tool direction incremental
16		_DMODE	Display mode
			UNITS: Machining plane G17/G18/G19
			0 = Compatibility, the level effective before cycle call remains active
			1 = G17 (only active in the cycle)
			2 = G18 (only active in the cycle)
			3 = G19 (only active in the cycle)

Note

If the following transfer parameters are programmed indirectly (as parameters), the input mask is not reset: _FR, _ST, _TC, _MODE, _DIR

1) Can be selected when function is set up in IBN SWIVEL

2) Can be selected if direction reference to rotary axis 1 or 2 is set in IBN SWIVEL

If direction reference is "no" there is no selection field

3) Swivel selection "no" can be grayed out SD 55221 Bit 0

1 = Swivel "no", "minus" direction corresponds to _DIR = 0 and _ST TEN THOUSANDS = 1

Swivel "no", "plus" direction corresponds to _DIR = 0 and _ST TEN THOUSANDS = 2

4) The direction selection for rotary axis 1 or 2 also occurs if the rotary axis with the direction reference is in the pole position (position value equals zero).

5) Coding example: Axis-by-axis rotation, rotary sequence ZYX

Binary: 00011011 Decimal: 27

The axis identifiers XYZ correspond to the geometrical axes of the NC channel. Individual rotations about the XYZ axes are permissible. Example: rotary sequence about ZXZ is not permitted in one call of CYCLE800.

1.38 High Speed Settings - CYCLE832

Programming

```
CYCLE832(_TOL, _TOLM, _V832)
```

Note

CYCLE832 does not relieve the machine manufacturer of necessary optimization tasks when commissioning the machine. This applies to optimization of the axes that take part in machining and the NCU settings (forward control, jerk limiting etc.)

Parameters

No.	Param Mask	Param intern	Explanation
1	TOL	_TOL	Tolerance
2		_TOLM	Technology
			UNITS:
			0 = Deselection
			1 = Finishing
			2 = Semi-finishing
			3 = Roughing
3		_V832	Version CYCLE832
			UNITS:
			0 = up to software version 7.5
			1 = from HMI sl software version 2.6 onward

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