

NUM 720

Parameter Manual

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The programming examples described in this manual are intended for guidance only. They must be specially adapted before they can be used in programs with an industrial application, according to the automated system used and the safety levels required.

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NUM 720

Parameter manual

Update index E

In compliance with software 201280/F for lathe
and 201290/F for milling machine

Pages revised :

0.0 – 2.2

P16 1/2 – P30 1/1 – P31 1/1 – P63 1/6 to 5/6

New parameter pages :

P63 6/6 – P84

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NOTES

1 – INTRODUCTION TO MACHINE PARAMETERS

Machine parameters can be loaded, displayed or modified using utility 5, which is stored in the memory.

Press the maintenance key to display the utility selection menu, then key in 5LF which calls up password request. Enter password (it will not be displayed) and key in LF to display the following menu :

MACHINE PARAMETERS

- > 0 DISPLAY
- 1 MODIFICATION
- 2 LOADING ON TAPE
- 3 UNLOADING ON TAPE

Key in X OFF to leave the menu and return the display to the current position. If the contents of a parameter have been modified, keying in X OFF will reinitialize the NC software (To obtain X OFF, press the CTRL and S keys simultaneously).

1.1 – DISPLAY

The cursor (>) is automatically positioned at 0 when the menu is called up. Press the "Next" key to display the question : PARAMETER ? on the dialog line.

Select the parameter to be displayed using the alphanumeric keyboard, eg P 10 LF. The following appears on the screen :

```
(DISPLAY)  PARA : 10      TYPE : 0      NO. WORDS : 2
            > N0 00
            N1 00
```

Any given parameter may be displayed while the question "PARAMETER" is on the screen. To do so, press the "Next" key once to display P0, then a second time to display P1, and so on.

Press the "Maintenance" key to return to the menu.

1.2 – MODIFICATION

Key in 1 LF to position the cursor on the "MODIFICATION" line of the "MACHINE PARAMETERS" menu and display the question "PARAMETER" on the dialog line.
Enter the parameter to be modified, followed by LF (eg : P 10 LF). The following appears on the screen :

```
(MODIF)    PARA : 10      TYPE : 0      NO. WORDS : 2
            > N0 00
            N1 02
```

Position the cursor opposite the line to be modified, then enter # "New Value" LF to modify the word. Up to 10 successive values may be corrected on the line indicated by the cursor. To do so, enter # followed by N value ($N \leq 10$), leaving a space between each value. If N exceeds 10 values, only the first 10 will be accepted. The system ignores the remaining values.

If there is only one character to be modified on the line, pressing # followed by LF will position the line marked by the cursor on the dialog line and the character can be modified using the cursor.

Press the "maintenance" key to return to the menu.

1.3 – LOADING ON TAPE

Press 2 LF to position the cursor opposite 2 in the menu. The displays the question READY ? on the dialog line.

Make sure that the reader is ready, with the program tape installed. Key in the response ϕ LF to start tape read and high speed scrolling of the data on the screen. Return to the menu on completion of data read.

If the tape identification number does not correspond to the task number in the NC memory, the read operation will be interrupted and the identification number read will be displayed on the dialog line at which point it may be modified.

1.4 – UNLOADING ON TAPE

Press 3 LF to position the cursor opposite 3 in the menu. The displays the question READY ? on the dialog line.

Make sure that the tape punch is plugged in. Key in the response ϕ LF to start sprocket punching along approximately 1.50 m of tape and display the task number (max. 8 digits) on the dialog line : eg, % 00825750.

The operator may insert a comment and, by pressing LF, can punch on tape the number, the comment and all the parameters. Once the data has been punched, the tape runs approximately 1 m before stopping and the menu reappears on the screen.

1.5 – LISTING FORMAT

```
% 00000001 Comments ; 16
P0N0 ; 04
# X Y Z 0 0 0 0 B0 ; 12
P1N0 ; 04
# 0 0 ; 04
P2N0 ; 04
# 0 3 ; 04
"
"
"
"
P17N0 ; 05
# - 220000 + 5000 - 450000 + 5000 - 10000 + 50000 + 0 + 0 + 0 + 0 ; 36
P17N10 ; 06
# 0 0 ; 04
"
P46N0 ; 05
# 66 1226 200 3680 0 0 ; 15
"
P48N0 ; 05
# 0 ; 02
"
"
"
P65N0 ; 05
# 0 0 0 0 0 0 ; 0C
X OFF
```

- % 00000001 indicates the task number.
 - The figure at the end of each line represents the number of characters on the line, including spaces and #, in hexadecimal. The line must end in ; followed by 2 figures.
 - The symbol # indicates a line of data.
 - N followed by one or two figures indicates the number of the first word on the next line of data.
- Thus, for P17, the first line relates to the value of words 0 to 9 and the second line relates to the value of words 10 and 11.
- A line of data may not exceed 10 words.
 - Parameter P50 must not be modified. The basic value is set at 10 000 for milling machines and lathes.
 - It is not necessary to write parameters whose basic values are not modified.

1.6 – PAGE DISPLAYED FOR A PARAMETER

Once a request has been made for the modification or display of a parameter, the following data appears on the display page :

(MODIF) or (DISPLAY)	PARA :	TYPE :	NO. WORDS :
	> N0		
	N1		
	N2		
	N3		
	.		
	.		
	.		

After PARA, the number of the parameter requested is displayed.

After TYPE, either 0 – 1 – 2 or 3 is written.

- 0 corresponds to a word written in hexadecimal from 00 to FF.
- 1 corresponds to a word written in decimal from – 32 767 to + 32 767.
- 2 corresponds to a word written in decimal from – 99 999 999 to + 99 999 999.
- 3 means that the word corresponds to a character, eg X.

NO. WORDS indicates the number of words which the parameter contains.

N0 – N1 – N2..... gives the number of the word. A maximum of 5 words can be displayed on the screen. The following words are obtained by pressing the ↓ key (a maximum of 9 words displayed on the page).

1.7 – PARAMETERS SPECIFIC TO MILLING MACHINES AND LATHES

The majority of parameters are common to both milling machines and lathes. Since utility 5 is common to both systems, the parameters specific to one system will be included in the other but will have no active function.

Parameters specific to lathes :

- P4 List of axes using diameter programming
- P5 Declaration of turret

Parameters specific to milling machines :

- P55 Speed anticipation coefficient
- P60 Axes and direction of tip relief
- P61 Clearance value of tip relief
- P62 Clearance for woodpeck drilling cycle
- P63 Dwell time for spindle reversal during tapping cycle – Definition of solid tapping cycle
- P65 Quantified motion axes
- P83 Start radius/end radius tolerance

NOTES

2 – LIST OF PARAMETERS

2.1 – DECLARATION OF AXES

- P0 List of programmable axes
- P1 List of "modulo" rotary axes
- P2 List of measured axes
- P3 List of servo-controlled axes
- P4 List of axes using diameter programming
- P5 Front/Rear Turret
- P7 Direction of automatic spindle range selection
- P8 List of axes with clamps
- P9 Address of machine axes
- P25 Check of soiling defect and complementarity of pulse generator channels

2.2 – MEASUREMENTS AND TRAVEL

- P7 Initialization in inches or metric
- P10 Direction of axis measurement
- P11 Axis measurement conversion coefficients
- P12 Direction of handwheel measurement
- P13 Handwheel measurement conversion coefficients
- P15 Direction of machine origin setting
- P16 Position of origin switch in machine dimensions
- P17 Axis travel limits
- P18 Reversal error compensation
- P26 Tacho simulation
- P67 Selection of operation in inches per axis – Scaling factor ignored

2.3 – SERVO-CONTROLS

- P7 Selection of type of servo-control in spindle orientation mode : unidirectional or bidirectional
- P20 Direction of axis speed reference
- P21 Servo-control coefficients
- P22 In position window
- P23 Maximum following error

2.4 – SPEEDS – ACCELERATION

- P30 Maximum traverse rates for axes
- P31 Jog speeds
- P32 Maximum permitted acceleration

2.5 – SPINDLE

- P6 Measured spindle declaration – Spindle type
- P7 Direction of automatic range selection
- P40 Spindle measurement conversion
- P41 Direction of spindle measurement
- P42 Direction of spindle speed reference
- P43 – P44 – P45 – P48 : Spindle orientation
- P43 Maximum orientation speed
- P44 Orientation in position window
- P45 Spindle servo-control slope
- P46 Spindle ranges
- P48 Spindle origin offset

2.6 – MISCELLANEOUS

- P7 Transmission of decoded T and M functions to PLC. Forcing of T functions.
 Enabling inter-axes calibration tables – Transmission of encoded M functions by SNS.
 Axis recall.
- P35 Sub-program called by M function.
- P50 Length of sampling period (cannot be modified).
- P51 Minimum execution time of a straight line in interpolation mode.
- P52 Circular interpolation control – speed limitation
- P53 Maximum number of axes authorized per group
- P54 Hardware interrupt assignment
- P55 Speed anticipation coefficient
- P56 Servo-control loop time constant
- P57 Dynamic movement control
- P58 Reservation of the inter-axis calibration table
- P59 Graphic parameter
- P65 Quantified motion axes (Hirth coupling)
- P80 Character X OFF parameterized
- P82 NC-PLC transfer rate – Selection of the PLC
- P83 Start radius/end radius tolerance
- P84 Back track

2.7 – CYCLES (MILLING MACHINE)

- P60 Axes and direction of tip relief
- P61 Clearance value for tip relief
- P62 Clearance for woodpeck drilling cycle
- P63 Dwell time for spindle reversal during tapping cycle. Definition of solid tapping cycle

2.8 – DNC1 LINK PROCEDURE

- P37 Character formatting
- P38 Translation of special characters
- P39 Time delays

2.9 – UNI-TELWAY LINK PROCEDURE

- P81 UNI-TELWAY – Station configuration

NUM 720	PARAMETER P0	FUNCTION			
	List of programmable axes	Declaration of axes			
WORD TYPE	☐ 0 Hexadecimal (00 to FF) ☐ 1 Decimal (-32767 to + 32767) ☐ 2 Decimal (-99.999.999 to + 99.999.999) ☒ 3 Character	NUMBER OF WORDS	3		
		VERSION	T		

Name assigned to each axis (one axis per word).

The maximum number of axes which can be declared is 2.

Lathe

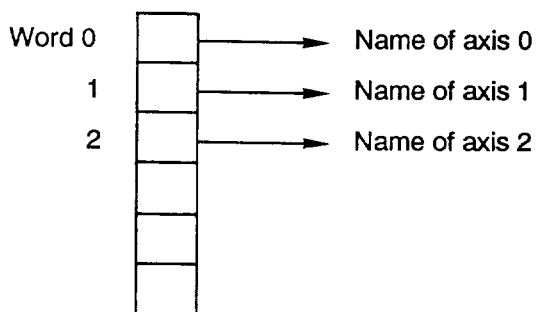
X
Z
O

For correspondence with the machine axes, see P9.

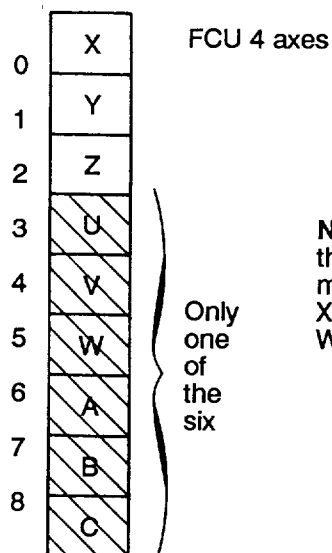
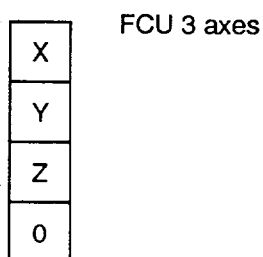
			NOMAXE	
6.88	Creation		P0	1/1

NUM 720	PARAMETER	P0	FUNCTION			
	List of names of programmable axes		Declaration of axes			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS		9	
	☐ 1 Decimal (−32767 to +32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☒ 3 Character					

Declaration of names of axes. Allows the system to recognize the names of the axes.
 Name assigned to the axis (one axis per word). The maximum number of axes which can be declared is 4.



Examples

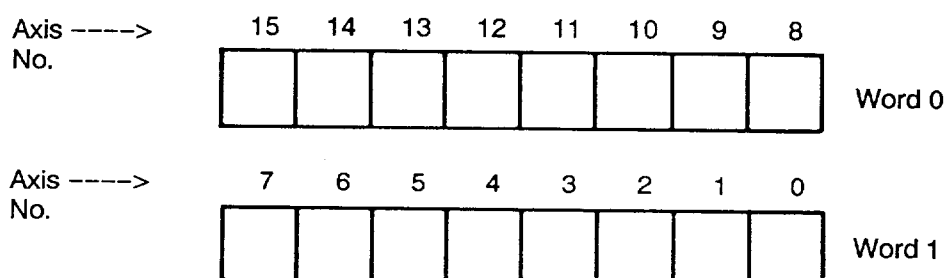


NOTE : The order of the axes shown opposite must be respected.
 X,Y,Z and B gives :
 Word 0 = X
 1 = Y
 2 = Z
 7 = B

Any axes not present are given the name "0"
 For correspondence with the machine axes, see P9.

			NOMAXE	
6.88	Creation		P0	1/1

NUM 720	PARAMETER	P1				FUNCTION			
	List of "Modulo" axes					Declaration of axes			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)					NUMBER OF WORDS		4	
	☐ 1 Decimal (-32767 to + 32767)								
	☐ 2 Decimal (-99.999.999 to + 99.999.999)					VERSION		F	
	☐ 3 Character								



Each bit number in the parameter corresponds to the axis with the same number.

Value 1 in a bit indicates that the corresponding axis is rotary, modulo 360°.

Example : Axis B (Position 7 of P0)

Word 0 : '00

Word 1 : '80

NOTE :

See P0 for definition of the axis numbers.

Words 2 and 3

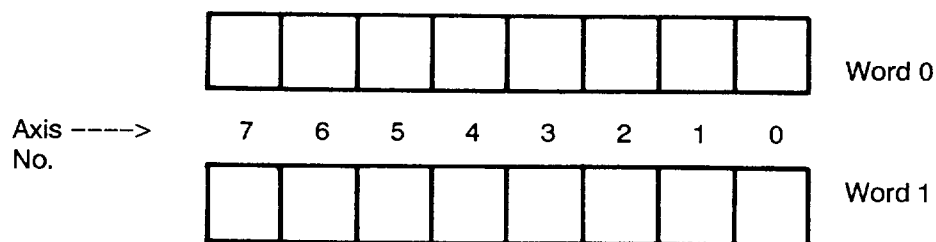
These two words are identical to words 0 and 1. They are used to preserve a correct tracking error on modulo axes with assignment (E7x005).

A bit set to 1 indicates that the corresponding axis is rotary, modulo 360 degrees.

For definition of the bits, refer to machine axis address P9.

			AXROT	
6.91	A : Addition of words 2 and 3		P1	1/1
6.88	Creation			

NUM 720	PARAMETER	P2	FUNCTION			
	List of measured axes		Declaration of axes			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER WORDS	2		
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION	T		
	☐ 3 Character					



Each bit number in the parameter corresponds to the machine axis with the same number (the number of the axis is determined by the wiring of the axis PCB connector, defined by P9).

All axes equipped with a position sensor must be referenced with value 1 of the bit corresponding to this parameter.

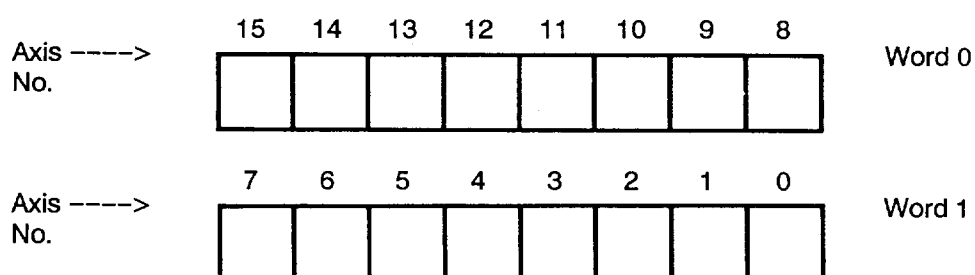
Only machine axes 0 and 1 may exist.

NOTE :

See P9 for the definition of the axis numbers.

			AXMES	
6.88	Creation		P2	1/1

NUM 720	PARAMETER	P2	FUNCTION			
	List of measured axes		Declaration of axes			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS		2	
	☐ 1 Decimal (-32767 to + 32767)					
	☐ 2 Decimal (-99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character				F	



Each bit number in the parameter corresponds to the axis with the same number (the number of the axis is determined by the wiring of the axis PCB connector defined by P9).

All axes equipped with a position sensor must be referenced with value 1 of the corresponding bit in this parameter.

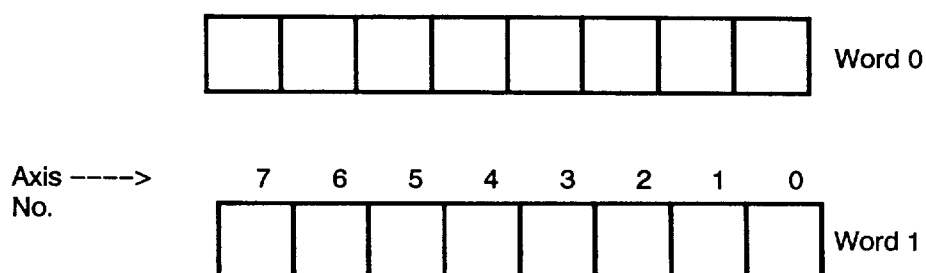
Only machine axes 0, 1, 2 and/or 3 may exist.

NOTE :

See P9 for the definition of the axis numbers.

			AXMES	
6.88	Creation		P2	1/1

NUM 72	PARAMETER	P3	FUNCTION			
	List of servo-controlled axes		Declaration of axes			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2		
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION	T		
	☐ 3 Character					



Each bit number in the parameter corresponds to the machine axis with the same number (the number of the axis is determined by the wiring of the axis PCB connector defined by P9). Only axis numbers 0 and 1 exist.

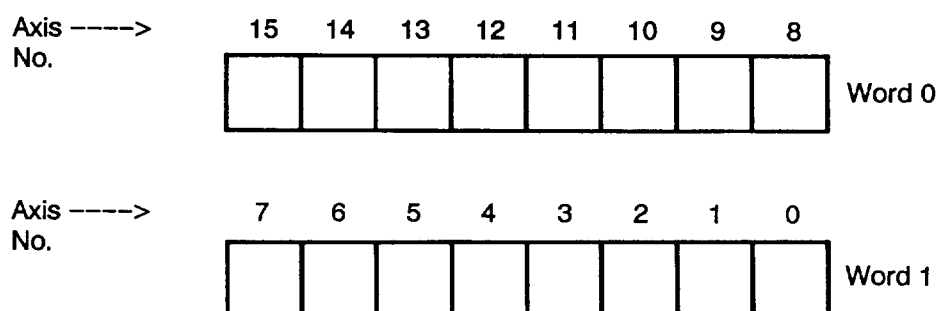
The value 1 in a bit indicates that the corresponding axis is servo-controlled.

NOTE :

See P9 for the definition of the axis numbers.

			AXAS	
6.88	Creation		P3	1/1

NUM 720	PARAMETER	P3	FUNCTION			
	List of servo-controlled axes		Declaration of axes			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS		2	
	☐ 1 Decimal (–32767 to + 32767)					
	☐ 2 Decimal (–99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character				F	



Each bit number in the parameter corresponds to the machine axis with the same number (the number of the axis is determined by the wiring of the axis PCB connector defined by P9). Only axis numbers 0 to 3 may exist.

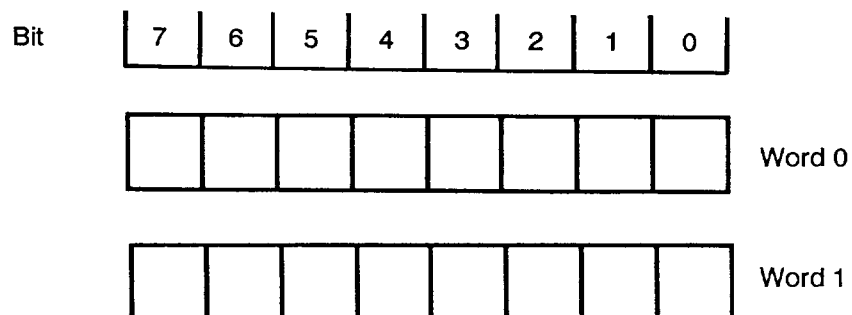
Value 1 in a bit indicates that the corresponding axis is servo-controlled.

NOTE :

See P9 for the definition of the axis numbers.

			AXAS	
6.88	Creation		P3	1/1

NUM 720	PARAMETER	P4	FUNCTION			
	List of axes diameter programmed		Declaration of axes			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2		
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION	T		
	☐ 3 Character					



Value 1 in a bit indicates that the corresponding axis uses diameter programming.

Value 0 in a bit indicates that radius programming is used.

The lathe axis which can be diameter or radius programmed is the X axis. Therefore, only bit 0 of the word 1 will be set to 0 or 1

NOTE :

See P0 for the definition of the bits.

			PRODIA	
6.88	Creation		P4	1/1

NUM 720	PARAMETER	P5	FUNCTION			
	Front/Rear Turret		Declaration of turret			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1		
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION	T		
	☐ 3 Character					

↓
0

--	--	--	--	--	--	--	--

Value of parameter = 0 Rear turret

Value of parameter = 1 Front turret

			TOURLAV	
6.88	Creation		P5	1/1

NUM 720	PARAMETER	P6	FUNCTION			
	Measured spindle declaration Spindle type		Declaration of spindle			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	2	
	☐ 1 Decimal (–32767 to + 32767)					
	☐ 2 Decimal (–99.999.999 to + 99.999.999)		VERSION	T	F	
	☐ 3 Character					
VALIDITY OF VERSION	720T: from software 201280/D onwards 720F: from software 201290/D onwards					

Word 0 :

7	6	5	4	3	2	1	0
							0 or 1

When bit 0 of this parameter is set to 1, the number of revolutions of the spindle can be measured.

Word 1: (Milling only)

7	6	5	4	3	2	1	0
							0 or 1

The value 0 of bit 0 indicates a lathe spindle.

The value 1 of bit 0 indicates a milling spindle.

A lathe spindle is programmed by function C (M19C..) whereas a milling spindle is programmed by function EC (M19EC..).

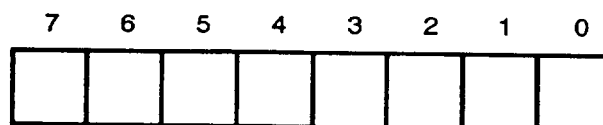
NOTE:

The C axis must be declared in P0.

			NBRO	
6.91	A: Adjunction of word 1			
6.88	Creation		P6	1/1

NUM 720	PARAMETER	P7	FUNCTION			
	Automatic range selection Spindle servo-control Transmission of T and M – Inch/metric selection Inter-axes calibration – Axis recall Transmission of encoded M functions by SNS		Miscellaneous			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2	
	☐ 1 Decimal (–32767 to + 32767)					
	☐ 2 Decimal (–99.999.999 to + 99.999.999)					
	☐ 3 Character		VERSION	T	F	
VALIDITY OF VERSION	720T : from software 201280/E onwards 720F : from software 201290/E onwards					

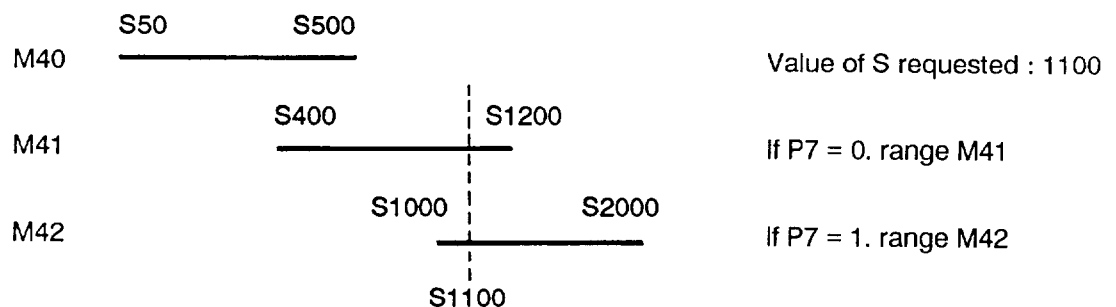
Word 0 :



BIT 0 :

The value 0 indicates that automatic spindle range selection is performed by scanning the min./max. range table (parameter P46) starting with the minimum range.

The value 1 indicates that the range table is scanned in the order of decreasing speeds.



BIT 1 :

If the value is zero, the spindle servo-system is capable of unidirectional approach to the spindle index position.

If the value is 1, the spindle servo-system is capable of bidirectional approach to the spindle index position.

See P43 to P45.

6.91	B : Transmission of encoded M functions			RECGAM	
4.89	A : Bit 5 unused	6.92	Corrections: Bit 7 – Word 0 Bits 0, 1, 2, 4, Word 1		
6.88	Creation	2.92	Correction + Addition p 3/3	P7	1/3

NUM 720	PARAMETER	P7	FUNCTION
	Automatic range selection Spindle servo-control Transmission of T and M – Inch metric selection Inter-axes calibration – Axis recall Transmission of encoded M functions by SNS		Miscellaneous

BIT 2 :

If the value is zero, the T and decoded M functions are not transmitted to the PLC in SNS mode.

If the value is 1, the T and decoded M functions are transmitted to the PLC in SNS mode.

BIT 3 :

When this bit is at 0, the system is initialized in metric (G71) following a reset or M02.

When this bit is at 1, the system is initialized in inches (G70).

BIT 4 :

When this bit is at 1, the T functions (W3, 0 to 7 of the PLC) are forced to 0 during a reset (RAZ, M02, start-up).

BIT 5 :

Unused : value 0.

BIT 6 :

If this bit is at 1, the M and T functions are output to the PLC during workpiece program run in TEST mode.

BIT 7 :

If bit 7 is at 0, axis returns are made at the end of a PLC subprogram call for the axes programmed in G52 within this sub-program.

6.91	B : Transmission of encoded M functions			RECGAM	
4.89	A : Bit 5 unused			P7	2/3
6.88	Creation	2.92	Correction + Addition p 3/3		

NUM 720	PARAMETER	P7	FUNCTION
	Automatic range selection Spindle servo-control Transmission of T and M – Inch metric selection Inter-axes calibration – Axis recall Transmission of encoded M functions by SNS		Miscellaneous

Word 1 :

7	6	5	4	3	2	1	0

BIT 0 :

When this bit is at 1, the system is initialized in feed rate per revolution (G95 F1).

When this bit is at 0, the system is initialized in mm/min (G94 F1000). This is the default value.

BIT 1 :

When this bit is at 1, M12 is recognized by the system and forces "INTERV" mode.

BIT 2:

Program restart after a machine error.

When this bit is at 1, bit W6.3 (ERRESET) of the PLC is read to clear a machine error without causing a reset and to resume the interrupted program as well as to reset the following error (see Operator's Manual).

BIT 3:

If this bit is a 0, the encoded M functions are not transmitted to the PLC in SNS mode.

If this bit is a 1, the encoded M functions are transmitted to the PLC in SNS mode.

BIT 4:

Tool collision detection, which generates error 149, can be inhibited by this bit:

Bit 4 = 0: detection inhibited,

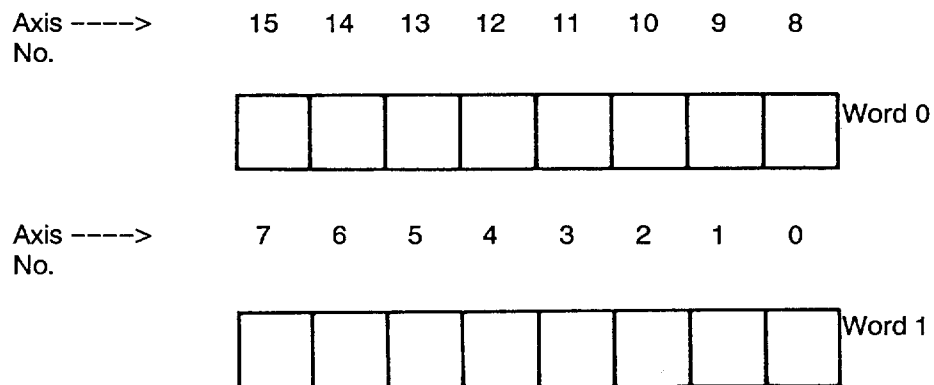
Bit 4 = 1: detection enabled.

BITS 5 to 7:

Not used.

6.91	B : Transmission of encoded M functions			RECGAM	
4.89	A : Bit 5 unused	6.92	Corrections: Bit 7 – Word 0 Bits 0, 1, 2, 4, Word 1		
6.88	Creation	2.92	Correction + Addition p 3/3	P7	3/3

NUM 720	PARAMETER	P8	FUNCTION			
	List of axes with clamps		Declaration of axes			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2	
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	



Each bit number in the parameter corresponds to the axis with the same number (the number of the axis is determined by the cabling of the axis PCB board defined by P9).

The value 1 in this bit indicates that the corresponding axis can be clamped.

NOTE :

See P9 for the definition of the axis numbers.

			AXBLO	
6.88	Creation		P8	1/1

NUM 720	PARAMETER	P9	FUNCTION			
	Address of machine axes		Declaration of axes			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	3		
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION	T		
	☐ 3 Character					

Address of each programmable machine axis. This address is determined by the wiring of the axis PCB for the axis concerned.

The addresses possible are 0 and 1.

The absence of an axis is declared by address FF.

0	X
1	Z
FF	

NOTE :

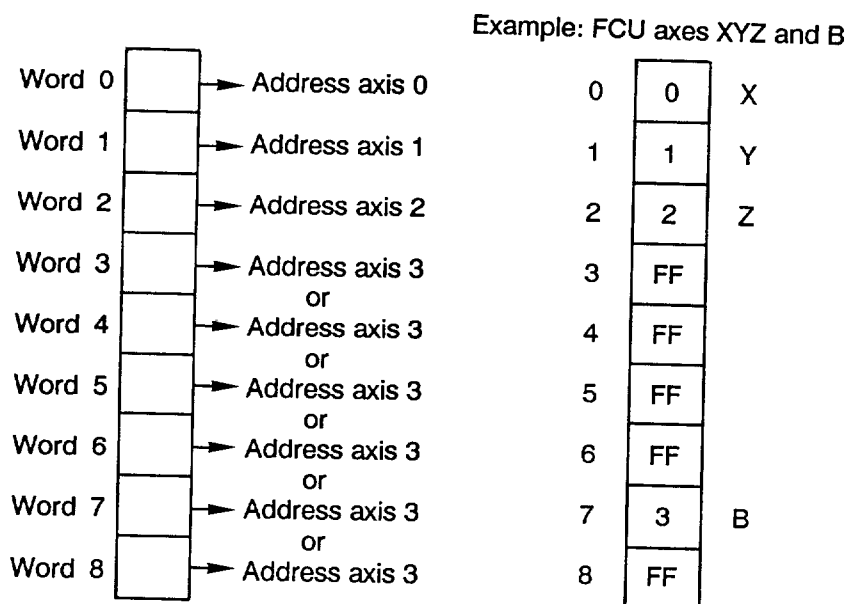
See P0 for correspondence with programmable axes.

			ADRAX	
6.88	Creation		P9	1/1

NUM 720	PARAMETER	P9	FUNCTION			
	Address of machine axes		Declaration of axes			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS		9	
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character				F	

This parameter gives the address of each programmable axis. Each address corresponds to the cabling of the axis PCB for the axis concerned.

The addresses possible are numbered 0 to 3. The absence of an axis is declared by address FF.

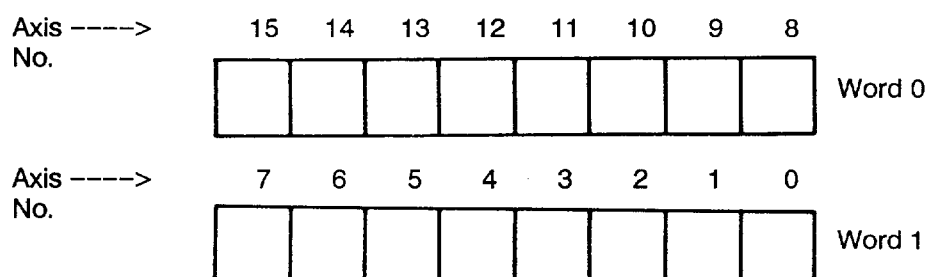


NOTE :

See P0 for correspondence with programmable axes.

			ADRAX	
6.88	Creation		P9	1/1

NUM 720	PARAMETER	P10	FUNCTION			
	Direction of axis measurement		Measurements and travel			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2	
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	



Each bit number in the parameter corresponds to the axis with the same number (the number of the axis is determined by the cabling of the axis PCB connector defined by P9).

The value 0 in a bit indicates that the sensor of the corresponding axis is directly connected. (The pitch measurement supplied by the sensor increases when the moving part moves in the + axis direction).

The value 1 indicates that the sensor is mounted in reverse mode. (The measurement decreases when the moving part moves in the + axis direction).

Examples :

For lathe : Measurement correct on X axis Address no. 0
 Measurement reversed on Z axis Address no. 1

Word 0 : '00
 Word 1 : '02

For milling machine : Measurement correct on X and Y axes Addresses nos. 0–1
 Measurement reversed on Z and B axes Addresses nos. 2–3.

Word 0 : '00
 Word 1 : '0C

NOTE :

See P9 for the definition of the axes numbers.

			SIGMES	
6.88	Creation		P10	1/1

NUM 720	PARAMETER	P11	FUNCTION			
	Axis measurement conversion coefficients		Measurements and travel			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	8	12	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

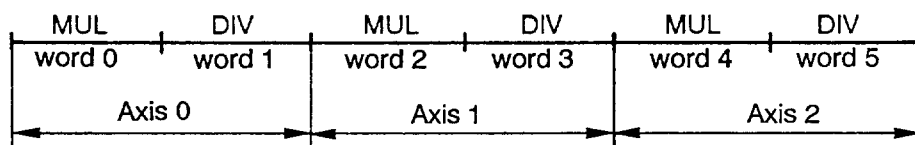
Each pair of words corresponds to a machine axis (even word – odd word).

The first word of a pair indicates the multiplication coefficient : MUL.

The second word of a pair indicates the division coefficient : DIV.

The conversion formula is the following :

$$\text{Internal measurement (microns)} = \text{Sensor measurement (points)} \times \frac{\text{MUL}}{\text{DIV}}$$



The MUL and DIV coefficients must be less than 32768.

Examples of values for internal resolution expressed in microns (2 mm screw pitch).

	Encoder 500 pts/rev or 2000 in axis PCB	Encoder 250 pts/rev or 1000 in axis PCB
MUL	128	128
DIV	128	64

Example : for internal resolution to a tenth of a micron, encoder 1000 points per revolution, 2 mm pitch screw : MUL = 160 DIV = 32.

NOTE :

Sensor pulses are multiplied by 4 on input to the encoder PCB.

			KMUMES/KDIMES	
6.91	Correction			
6.88	Creation		P11	1/1

NUM 720	PARAMETER	P12	FUNCTION			
	Direction of handwheel measurement		Measurements and travel			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	1	
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

--	--	--	--	--	--	--	--

The bit 0 equal to 0 indicates that the handwheel sensor is mounted in direct mode (sensor measurement increasing when the handwheel is rotated in the positive direction on the scale).

The bit 0 equal to 1 indicates that the handwheel sensor is mounted in reverse mode (sensor measurement decreasing when the handwheel is rotated in the positive direction on the scale).

			SIGMMA	
6.88	Creation		P12	1/1

NUM 720	PARAMETER	P13	FUNCTION			
	Handwheel measurement conversion coefficients		Measurements and travel			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	4	4	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

- **Words 0 and 1** define the measurement increment for the handwheel in manual mode.

Word 0 contains the multiplication coefficient : MUL.

Word 1 contains the division coefficient : DIV.

The conversion formula for the handwheel measurement is the following :

$$\text{Internal measurement (microns)} = \text{Sensor measurement (points)} \times \frac{\text{MUL}}{\text{DIV}}$$

(For examples of standard limits and values, see the description of machine parameter P11 KMUMES/KDIMES).

- **Words 2 and 3** define the measurement increment for the handwheel in automatic mode to allow the increments obtained by rotation of the handwheel to be superimposed on those calculated by the system. The movement of the handwheel is enabled by programming G12 in the workpiece program.

As in the preceding paragraph, word 2 contains the multiplication coefficient MUL and word 3 the division coefficient DIV.

These coefficients are to be defined according to the increments required

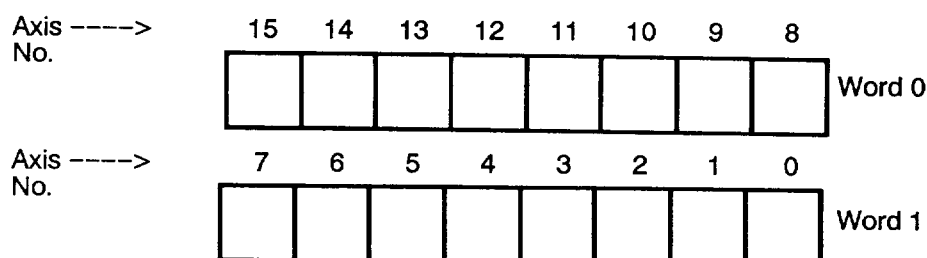
NOTE:

Handwheel pulses are multiplied by 4 on input to the encoder PCB.

			KMUMA/KDIMA	
6.92	A: Note		P13	1/1
6.88	Creation			

NUM 720	PARAMETER	P15	FUNCTION			
	Direction of machine origin setting Disable test for MOS axis reference switch status		Measurements and travel			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	4	4	
	☐ 1 Decimal (-32767 to + 32767)					
	☐ 2 Decimal (-99.999.999 to + 99.999.999)					
	☐ 3 Character		VERSION	T	F	
VALIDITY OF VERSION	720 T : from software 201280/B onwards 720 F : from software 201290/B onwards					

Words 0 and 1 : Direction of machine origin setting



Each bit number in these words corresponds to the axis with the same number (the number of the axis is determined by the cabling of the axis PCB connector defined by P9).

The value 0 in a bit indicates that the MOS is performed in the positive direction on the corresponding axis.

The value 1 in a bit indicates that the MOS is performed in the negative direction on the corresponding axis.

Examples :

For lathe : Machine origin setting on X axis in negative direction (no. 0)
Machine origin setting on Z axis in positive direction (no. 1).

Word 0 : '00

Word 1 : '01

For milling machine :

Machine origin setting on X and Z axes in positive direction (nos 0-2)
Machine origin setting on Y and B axes in the negative direction (nos 1-3).

Word 0 : '00

Word 1 : '0A

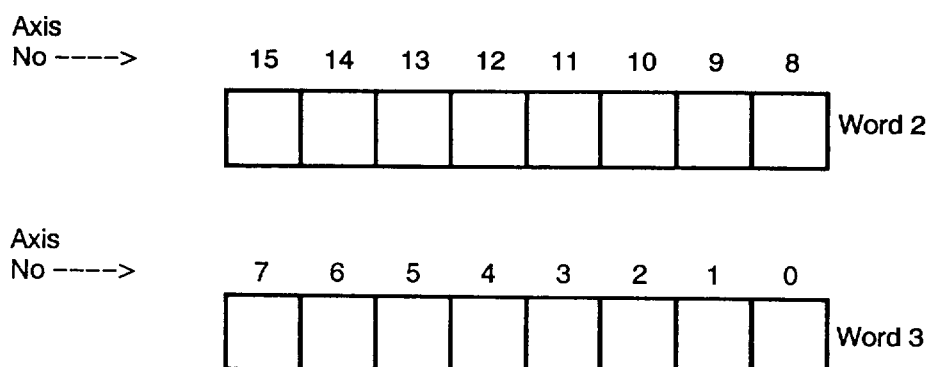
NOTE :

See P9 for the definition of the axis numbers.

			SGNPOM	
4.89	A : Words 2 and 3 added			
6.88	Creation		P15	1/2

NUM 720	PARAMETER	P15	FUNCTION
	Direction of machine origin setting Disable test for MOS axis reference switch status		Measurements and travel
VALIDITY OF VERSION	720 T : from software 201280/B onwards 720 F : from software 201280/B onwards		

Words 2 and 3: Disable test for axis reference switch status on axes without MOS axis reference.



Each bit number in these words corresponds to the axis with the same number (the number of the axis is determined by the wiring of the axis PCB connector defined by P9).

The value 1 in a bit indicates that the MOS axis reference switch has not been tested on the corresponding axis.

NOTE :

The value of words 0 and 2 is always nil, as there is no axis number higher than 3.

If the value 1 is assigned to bit 2 of word 3, bit 2 of word 1 can be either 0 or 1.

			SGNPOM	
4.89	A : Words 2 and 3 added		P15	2/2
6.88	Creation			

NUM 720	PARAMETER	P16	FUNCTION			
	Position of axis reference in machine coordinates		Measurements and travel			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	3	6	
	☐ 1 Decimal (−32767 to + 32767)					
	☒ 2 Decimal (−99.999.999 to + 99.999.999)					
	☐ 3 Character		VERSION	T	F	

Each word number in the parameter corresponds to the axis with the same number (the number of the axis is determined by the wiring of the axis PCB connector defined by P9).

Each word contains in machine coordinates the reference switch position of the corresponding axis. It gives the position of the encoder reference pulse adjacent to the reference switch.

NOTE :

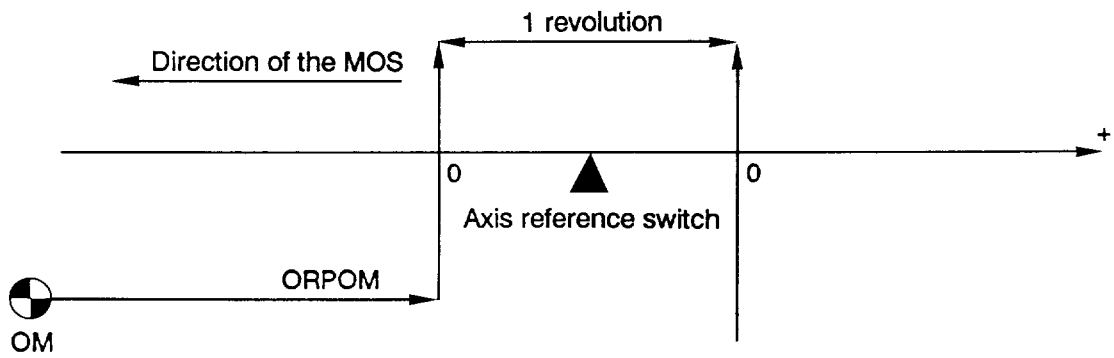
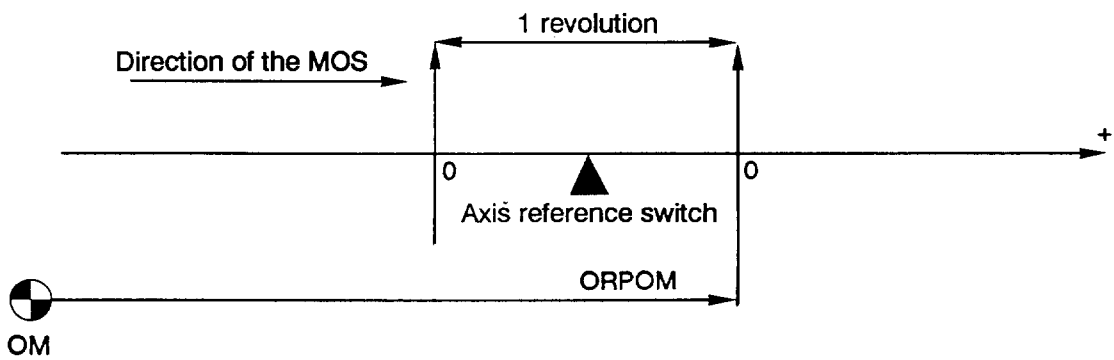
The dimensions for the linear axes are given in microns. For the rotary axis they are expressed in thousandths of degrees.

NOTE :

See P9 for the definition of the axis numbers.

			ORPOM	
10.92	B : Correction		P16	1/2
6.92	A : Correction			
6.88	Creation			

NUM 720	PARAMETER	P16	FUNCTION
	Position of axis reference in machine coordinates		Measurements and travel



ORPOM gives the dimension of the zero feedback position encountered after the switch during the machine positioning to reference point.

			ORPOM	
6.92	Correction		P16	2/2
6.88	Creation			

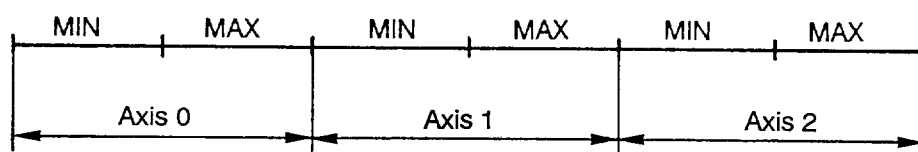
NUM 720	PARAMETER	P17	FUNCTION		
	Axis travel limits		Measurements and travel		
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER - OF WORDS	8	12
	☐ 1 Decimal (-32767 to + 32767)				
	☒ 2 Decimal (-99.999.999 to + 99.999.999)				
	☐ 3 Character		VERSION	T	F

Each pair of words corresponds to an axis (even word – odd word).

The even word gives the lower travel limit : MIN (in machine dimensions) for the corresponding axis.

The odd word gives the upper travel limit : MAX (in machine dimensions) for the corresponding axis.

The dimensions for linear axes are expressed in microns. For the rotary axis, they are expressed in thousandths of degrees.



NOTE :

For the "modulo" rotary axes, the maximum values must be entered in the MIN and MAX words.

			FDCX	
6.92	A : Modification		P17	1/1
6.88	Creation			

NUM 720	PARAMETER	P18	FUNCTION			
	Reversal error compensation		Measurements and travel			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	4	6	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION	T	F	
	☐ 3 Character					

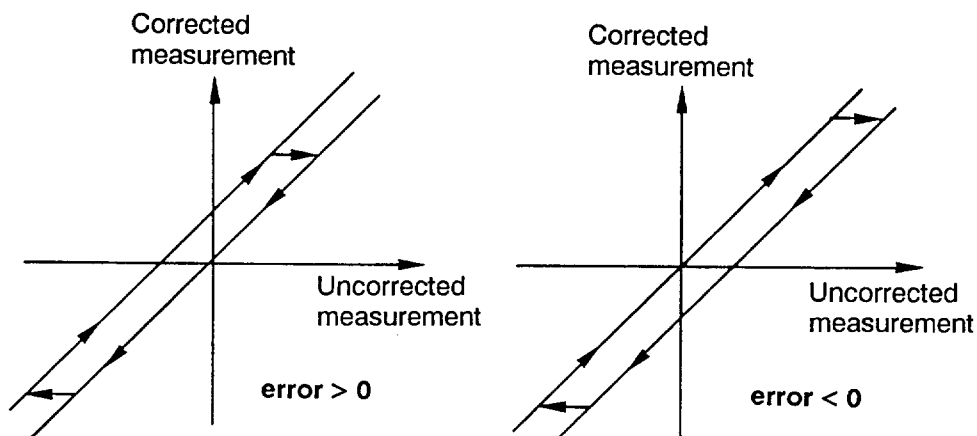
Each word corresponds to an axis (as for P9) and contains a signed value.

The absolute value of the content of a word gives the reversal error compensation on the corresponding axis.

The sign of the value gives both the direction of movement for which the reversal error applies and the correction sign.

Value > 0 : Positive correction, applied when the axis moves in the positive direction.

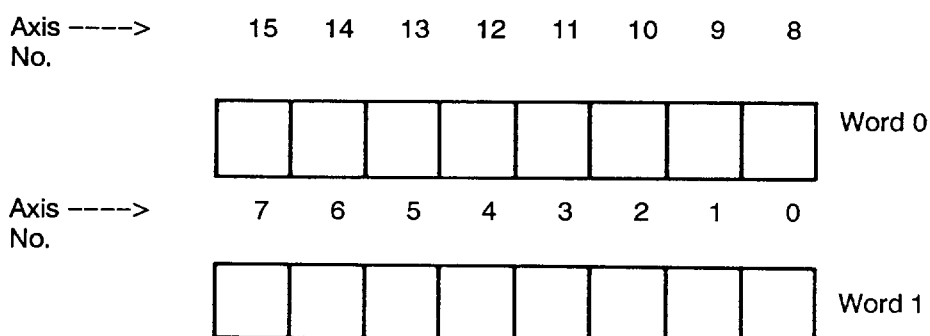
Value < 0 : Negative correction, applied when the axis moves in the negative direction.



The corrections for linear axes are expressed in microns. For the rotary axis, they are expressed in thousandths of degrees.

			JEU	
6.88	Creation		P18	1/1

NUM 720	PARAMETER	P20	FUNCTION			
	Direction of speed reference		Servo-controls			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2	
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	



Each bit number in the parameter corresponds to the axis with the same number (the number of the axis is determined by the cabling of the axis PCB connector defined by P9).

The value 0 in this bit indicates that a positive speed reference, applied to the corresponding servo-drive input, produces a movement of this axis in the positive direction.

The value 1 indicates that a positive speed reference, applied to the servo-drive, produces a movement of the axis in the negative direction.

Example :

For lathe : Positive direction on X axis (no. 0)
 Negative direction on Z axis (no. 1)

Word 0 : '00
Word 1 : '02

For milling
machine :

Positive direction on the X and Z axes (nos 0-2)
Negative direction on the Y and B axes (nos 1-3).

Word 0 : '00
Word 1 : '0A

NOTE :

See P9 for the definition of the axis numbers.

			SIGAS	
6.88	Creation		P20	1/1

NUM 720	PARAMETER	P21	FUNCTION			
	Servo-control coefficient		Servo-controls			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	4	6	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

Each word corresponds to an axis and gives the proportional action coefficient for the corresponding axis.

The coefficient KVAR is used by the NC to calculate the speed reference supplied to the servo-drive as a function of the tracking error, ϵ :

$$V \text{ Ref. (points D/A)} = KVAR \times \epsilon \text{ (mm)}$$

KVAR is expressed in : $\frac{\text{points D/A}}{\epsilon \text{ mm}}$

Example of calculating KVAR as a function of the overall servo-control gain and the axis speed :

$$KVAR = \frac{V \text{ ref. (points D/A)}}{\epsilon \text{ (mm)}}$$

Reference V is expressed taking into account that a value 16384 corresponds to 10 V of analogue output and that, in general, servo-drives are adjusted so that the maximum axis speed is obtained with an input voltage of 9 V.

Thus, V is the speed of an axis obtained during normal rate, when Ref V points are applied to the D/A converter.

$$\frac{V \text{ Ref.}}{V} = \frac{16384 \times \frac{9}{10}}{VITMAX}$$

hence

$$KVAR = \frac{V}{\epsilon} \times \frac{14745}{VITMAX}$$

$\frac{V}{\epsilon}$ is the overall servo-control gain expressed in $\frac{\text{mm/min}}{\text{mm}} = \frac{1}{\text{min}}$

VITMAX expressed in $\frac{\text{mm}}{\text{min}}$

			KVAR	
6.88	Creation		P21	1/2

NUM 720	PARAMETER	P21	FUNCTION
	Servo-control coefficient		Servo-controls

KVAR is expressed in : $\frac{\text{points D/A}}{\text{mm}}$

In general $\frac{V}{\epsilon}$ is taken as equal to 1 000 $\frac{\text{mm/min}}{\text{mm}}$

Practical formula

$$KVAR = \frac{14745 \times G}{VITMAX}$$

G : servo-control position gain expressed in $\frac{\text{m/min}}{\text{mm}}$.

VITMAX : Maximum speed of the axis expressed in m/min.

CAUTION :

To correctly apply this formula, the servo-drive unit must be adjusted so that the maximum speed is obtained for a servo-drive input voltage of 9 V.

NOTE :

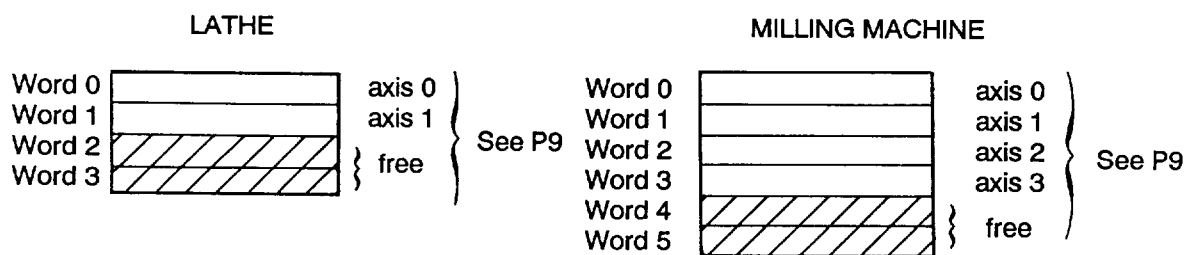
Modification of P21 will cause a modification to P56.

			KVAR	
6.88	Creation		P21	2/2

NUM 720	PARAMETER	P22	FUNCTION		
	In position window		Servo-controls		
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	4	6
	☒ 1 Decimal (−32767 to + 32767)				
	☐ 2 Decimal (−99.999.999 to + 99.999.999)				
	☐ 3 character		VERSION	T	F

The in position window defines the position error between measurement and reference within which accurate positioning function G09 is considered satisfactory. This error is tested for all axes.

Parameter P22 defines the in position window in microns for linear axes and in thousandths of a degree for rotary axes.



			In position window	
6.92	A : Correction			
6.88	Creation		P22	1/1

NUM 720	PARAMETER		P23		FUNCTION			
	Maximum following error		Servo-controls					
WORD TYPE	☐	0 Hexadecimal (00 to FF)	NUMBER OF WORDS		4	6		
	☐	1 Decimal (-32767 to + 32767)						
	☒	2 Decimal (-99.999.999 to + 99.999.999)	VERSION		T	F		
	☐	3 Character						

This parameter defines the maximum permitted following error for each axis.

For linear axes, this error is expressed in microns. For the rotary axis it is expressed in thousandths of a degree.

It is derived from the maximum speed of the axis and the gain of the position servo-control :

$$CTSTA = \frac{VITMAX}{G} \times 1\,000 \times \frac{11}{10}$$

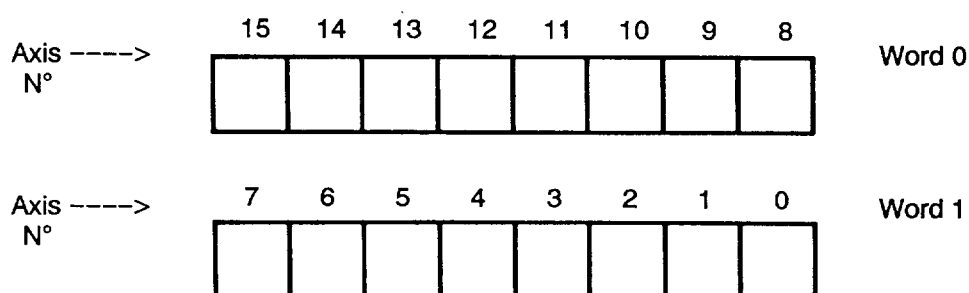
VITMAX : Maximum speed (mm/min).

G : Position servo-control gain $\frac{\text{m/min}}{\text{mm}}$

$\frac{11}{10}$: Corresponds to a safety margin of 10 %.

			CTSTA	
6.88	Creation		P23	1/1

NUM 720	PARAMETER	P25			FUNCTION		
	Check of soiling defect and complementarity of pulse generator channels				Declaration of axes		
WORD TYPE	☒ 0 Hexadecimal (00 to FF) ☐ 1 Decimal (–32767 to + 32767) ☐ 2 Decimal (–99.999.999 to + 99.999.999) ☐ 3 Character	NUMBER OF WORDS			2	2	
		VERSION			T	F	



This parameter defines the axes on which a check of the soiling defect and the complementarity of the pulse generator channels is carried out.

Each bit number in the parameter corresponds to the axis with the same number (the number of the axis is determined by the cabling of the axis PCB connector defined by P9).

Bit at 1 : check
 Bit at 0 : no check

NOTE :

See P9 for the definition of the axis numbers.

6.88	Creation	P25	1/1

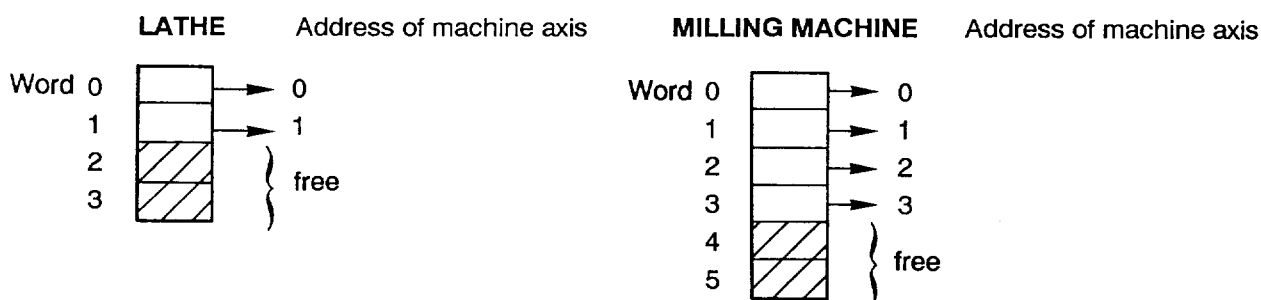
NUM 720	PARAMETER	P26	FUNCTION			
	Tacho simulation		Measurements and travel			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	4	4	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

Parameter displayed but not used

6.88	Creation		P26	1/1

NUM 720	PARAMETER	P30	FUNCTION			
	Maximum traverse rates for axes		Acceleration speeds			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	4	6	
	☐ 1 Decimal (−32767 to + 32767)					
	☒ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION	T	F	
	☐ 3 Character					
VALIDITY OF VERSION	720T: from software 201280/E onwards 720F: from software 201290/E onwards					

The value contained in each word defines the maximum speed for the corresponding axis, expressed in mm/min.



The maximum traverse rate that can be programmed is 99.999 mm/min.

NOTES :

See P9 for the definition of the machine axis addresses.

The measurement increment must be higher than the maximum traverse rate $[P30, P31]/48$. For instance, if the maximum traverse rate is 70 m/min, the measurement increment must be higher than 70/48 microns.

			VMAX	
10.92	B: Correction			
6.92	A: Traverse rate at 99.999 mm/min			
6.88	Creation		P30	1/1

NUM 720	PARAMETER	P31	FUNCTION			
	Jog speeds	Acceleration speeds				
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2	
	☐ 1 Decimal (−32767 to + 32767)					
	☒ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	
VALIDITY OF VERSION	720T: from software 201280/E onwards 720F: from software 201290/E onwards					

The two words of this parameter define the movement speeds of the following axes respectively :

- normal Jog.
- high speed jog up to 99.999 mm/min.

These speeds are expressed in mm/min.

			VJOG	
10.92	B: Correction			
6.92	A: Traverse rate at 99.999 mm/min			
6.88	Creation		P31	1/1

NUM 720	PARAMETER	P32	FUNCTION			
	Maximum permitted acceleration		Acceleration speeds			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	8	12	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

This parameter defines the maximum permitted acceleration speeds for each axis.

The first word for an axis defines the acceleration for axis travel at work speed.

The second word defines the acceleration for axis travel at high speed, that is, in RAP or JOG mode, for MOS or a sequence programmed in G0.

These acceleration speeds are expressed in mm/sec².

LATHE			MILLING MACHINE		
	Address of machine axis			Address of machine axis	
Word 0		0	Word 0		0
1		0	1		0
2		1	2		1
3		1	3		1
4		free	4		2
5			5		2
6			6		3
7			7		3
			8		free
			9		
			10		
			11		

NOTE :

Both acceleration speeds should be defined for each axis (no value below 6 mm/s² for declared axes).

The acceleration speeds may have the same value.

See P9 for the definition of the machine axis addresses.

			DDM	
6.91	A : Correction		P32	1/1
6.88	Creation			

NUM 720	PARAMETER	P35	FUNCTION			
	Sub-program called by M function		Miscellaneous			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	16	16	
	☒ 1 Decimal (-32767 to + 32767)					
	☐ 2 Decimal (-99.999.999 to + 99.999.999)		VERSION	T	F	
	☐ 3 Character					

This parameter is used to assign a sub-program number to an M function. Eight M functions can call eight different sub-programs.

The function M0 cannot call a sub-program.

Any words not loaded are at 0.

Word 1 is associated with word 0, word 3 with word 2 and so on.

M55 calls sub-program % 200

M72 calls sub-program % 321

Word 0	55	M function
1	200	Sub-program % 200
2	72	M function
3	321	Sub-program % 321
4	0	M function
.	.	
.	.	
.	.	
.	.	
.	.	
.	.	
.	.	
.	.	
15	0	Sub-program

6.88	Creation		P35	1/1

NUM 720	PARAMETER	P37	FUNCTION			
	Character formatting Service character code		DNC lev. 1			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	9	9	
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)					
	☐ 3 Character		VERSION	T	F	

1 – Word 0 : Character formatting

This word defines the serialization mode of the characters on the line.

The values allowed for this word are the following :

02 : 7 bits + parity bit + 2 stop bits

06 : 7 bits + odd parity bit + 2 stop bits

0A : 7 bits + parity bit + 1 stop bit

0E : 7 bits + odd parity bit + 1 stop bit

12 : 8 bits + 2 stop bits

16 : 8 bits + 1 stop bit

1A : 8 bits + parity bit + 1 stop bit

1E : 8 bits + odd parity bit + 1 stop bit

NOTE :

*This parameter is used only with the DNC1 link procedure.
If this option is absent, the content of the parameter is irrelevant.*

			FORMAT	
6.88	Creation		P37	1/2

NUM 720	PARAMETER	P37	FUNCTION
	Character formatting Service character code		DNC lev. 1

2 – Words 1 to 8 : Service character codes

Words 1	: STX (Start of text)	= \$ 02
2	: ETX (End of text)	= \$ 03 (with IBM-PC BEL = \$ 07)
3	: SYN (Initialization)	= \$ 16
4	: ACK (Positive acknowledge)	= \$ 06 (with IBM-PC SOH = \$ 01)
5	: NAK (Negative acknowledge)	= \$ 15
6	: EOT (End of transmission)	= \$ 04
7	: ENQ (Repeat request)	= \$ 05
8	: GS (Block separator)	= \$ 1D

			FORMAT	
6.88	Creation		P37	2/2

NUM 720	PARAMETER	P38	FUNCTION			
	Translation of the special characters in operator/computer dialog		DNC. lev.1			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	16	16	
	☐ 1 Decimal (-32767 to + 32767)					
	☐ 2 Decimal (-99.999.999 to + 99.999.999)		VERSION	T	F	
	☐ 3 Character					

This table is used to translate the codes which can be used to control the dialog between the operator of the NC and the computer.

Generally speaking, the codes correspond to cursor backspace, line deletion, etc.

This parameter is a table of 16 words divided into two parts.

1 – **Words 0 to 7** : (Translation of the characters transmitted from the keyboard and sent to the computer).

- Even words : code of the control characters transmitted from the NC keyboard.
- Odd words : translation of the code contained in the preceding word.

This translation is sent to the computer.

2 – **Words 8 to 15** :

- Even words : code of the control characters transmitted by the computer.
- Odd words : translation of the code contained in the preceding word, which will be transmitted to the NC display.

			CARSPE	
			P38	1/2
6.88	Creation			

NUM 720	PARAMETER	P38	FUNCTION
	Translation of the special characters in operator/computer dialog		DNC lev. 1

Example : Using the keyboard character "backspace arrow" (hex. : 09) as control character for the "cursor backspace" function.

The code for the "backspace cursor" function is hexadecimal code 09 on the display and code 08 on the computer concerned.

0	09	1	08	2	00	3	00
4	00	5	00	6	00	7	00
8	08	9	09	10	00	11	00
12	00	13	00	14	00	15	00

NOTE :

*This parameter is used only with the DNC1 link procedure.
If this option is not available, the content of the parameter is irrelevant.*

			CARSPE	
6.88	Creation		P38	2/2

NUM 720	PARAMETER	P39	FUNCTION			
	Time delays used in the DNC1 protocol		DNC. lev.1			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)	NUMBER OF WORDS	3	3		
	☐ 1 Decimal (–32767 to + 32767)					
	☒ 2 Decimal (–99.999.999 to + 99.999.999)	VERSION	T	F		
	☐ 3 Character					

Word 0	
Word 1	
Word 2	

- Word 0** : defines the minimum delay which the NC must respect between receiving a message or acknowledge, and sending back the acknowledgement or message.

This time delay gives the computer time to switch to receive mode. It is expressed in milliseconds.

- Word 1** : defines the maximum time delay allowed for the computer to answer after a message or acknowledgement has been sent by the NC. It is expressed in milliseconds.

- Word 2** : defines the time delay used to space characters sent by the NC to the computer.

This time delay is not necessary if the CTS and RTS signals are used to synchronize both partners. In this case, the content of word 2 should be zero.

If the control signals are not used, word 2 must contain the character spacing value expressed in microseconds.

The maximum permitted value for this time delay is 81900 microseconds.

NOTE :

This parameter is used only with the DNC1 link procedure.

If this option is not available, the content of the parameter is irrelevant.

			DELA	
6.88	Creation		P39	1/1

NUM 720	PARAMETER	P40	FUNCTION			
	Spindle measurement conversion		Spindle			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	1	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

This parameter defines the number of measurement points transmitted by the spindle sensor for one revolution of the sensor. (For the encoder, the multiplication factor 4 applied systematically at the input of the axis measurement PCB must be taken into account.

word 0 : spindle 1

Standard value :

250 point encoder mounted in direct mode : 1 000 points after multiplication.

Encoder mounted in reverse mode by a system of gears so that the encoder turns twice as fast as the spindle. A 250 point encoder gives 500 points per spindle revolution and 2 000 points after multiplication by the axis PCB.

			PHTOUR	
6.88	Creation		P40	1/1

NUM 720	PARAMETER	P41	FUNCTION			
	Direction of spindle measurement		Spindle			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	1	
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	



Bit 0 of this parameter indicates the direction of sensor.

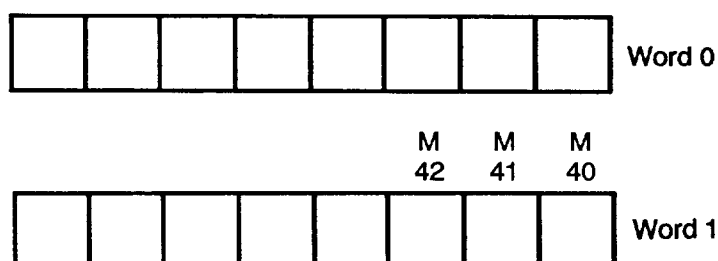
The value 0 indicates that the sensor is directly connected. The value 1 indicates that the sensor is reverse connected.

Definition of sensor mounting mode :

- the sensor is directly connected if the measurement obtained increases when the spindle turns in the M4 direction.
- otherwise, the sensor is reverse connected.

			SIGMBR	
6.88	Creation		P41	1/1

NUM 720	PARAMETER	P42	FUNCTION			
	Direction of spindle speed reference Reference inverted in accordance with range		Spindle			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2	
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)					
	☐ 3 Character					
			VERSION	T	F	
VALIDITY OF VERSION	720 T : from software 201280/B onwards 720 F : from software 201290/B onwards					



Word 0: Direction of spindle speed reference

Bit 0 of this word must be at zero when a positive reference at the spindle servo–drive input rotates the spindle in the M4 direction.

Bit 0 of this word must be at 1 when a positive reference at the spindle servo–drive input rotates the spindle in the M3 direction.

Word 1: Spindle reference inverted in accordance with the range.

Depending on the spindle range (M40 to M42) and using data contained in this word, the spindle speed reference defined in word 0 can be inverted.

Bit 0 is assigned to spindle M40, bit 1 to spindle M41 and bit 2 to spindle M42.

Value 1 in a bit means that the spindle speed reference of the corresponding range is inverted.

			SIGABR	
4.89	A : Word 1, inverted in accordance with range		P42	1/1
6.88	Creation			

NUM 720	PARAMETER	P43 P44 P45 P48	FUNCTION			
	Spindle orientation		Spindle			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS			
	☐ 1 Decimal (–32767 to + 32767)					
	☐ 2 Decimal (–99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

- Parameters P43, P44, P45 and P48 are used to regulate the orientation of the spindle.

- Spindle orientation is provided by machine function M19.

Function M19 must be programmed when the spindle is rotating (M3 or M4).

Two type of orientation are possible, depending on the value of bit 1 of machine parameter P7.

Bit 1 = 0. Servo-control is unidirectional to the spindle index position. Function M19 is sent to the PLC when the orientation position is achieved.

Bit 1 = 1. Servo-control is bidirectional to the spindle index position. Function M19 is sent to the PLC at the beginning of the orientation cycle and the PLC data W0.3 goes to 1 when the spindle is in position. Servo-control is maintained during M19 status. Function M19 is cancelled by M00, M01 (enabled), M02, M03, M04 or M05.

- Position of oriented stop

The position of the oriented stop can be selected by programming, using address C associated with a value expressed in 1/1000ths of a degree.

Address C must be declared beforehand in parameter P0 (NOMAXE).

If the value is not programmed, 0 is taken by default.

The stop applies to the spindle position which has been programmed with address C with respect to any origin offset.

6.91	A: Correction		P43 P44 P45 P48	1/4
6.88	Creation			

NUM	PARAMETER	P43 P44 P45 P48	FUNCTION
720	Spindle indexing		Spindle

This offset is defined by parameter P48 (ORPOMBR).

This parameter therefore contains an angular offset expressed in 1/4096ths of a revolution :

$$\text{ORPOMBR} = \text{offset (in degrees)} \times \frac{4096}{360}$$

- **The stop in position** is carried out by a symmetrical or non-symmetrical servo-control which enables the use of all types of servo-drive, including non-reversible servo-drives.

- **Index stop condition**

The stop is declared complete when :

- the absolute value of the position error is less than the "in position window", defined by parameter P44 (DINDBR),
- and when the speed of the spindle is considered sufficiently low (less than $\frac{3}{4096}$ rev/sampling).

The in position window is defined by P44 and expressed in 1/4096ths of a revolution.

- **Spindle speed control with unidirectional servo-control** (1 of P7 = 0)

Applies to both reversible and non-reversible servo-drives.

There are three possibilities depending on the value of the position error.

- a) The current position is close to the indexing position.

The required working speed is calculated as follows :

- Spindle ref. = Position error x KINDBR

KINDBR is the servo-control coefficient defined by parameter P45.

(P45 is expressed in $\frac{\text{rpm}}{\text{rev}}$ i.e. $\frac{1}{\text{min}}$)

			P43 P44 P45 P48	2/4
6.88	Creation			

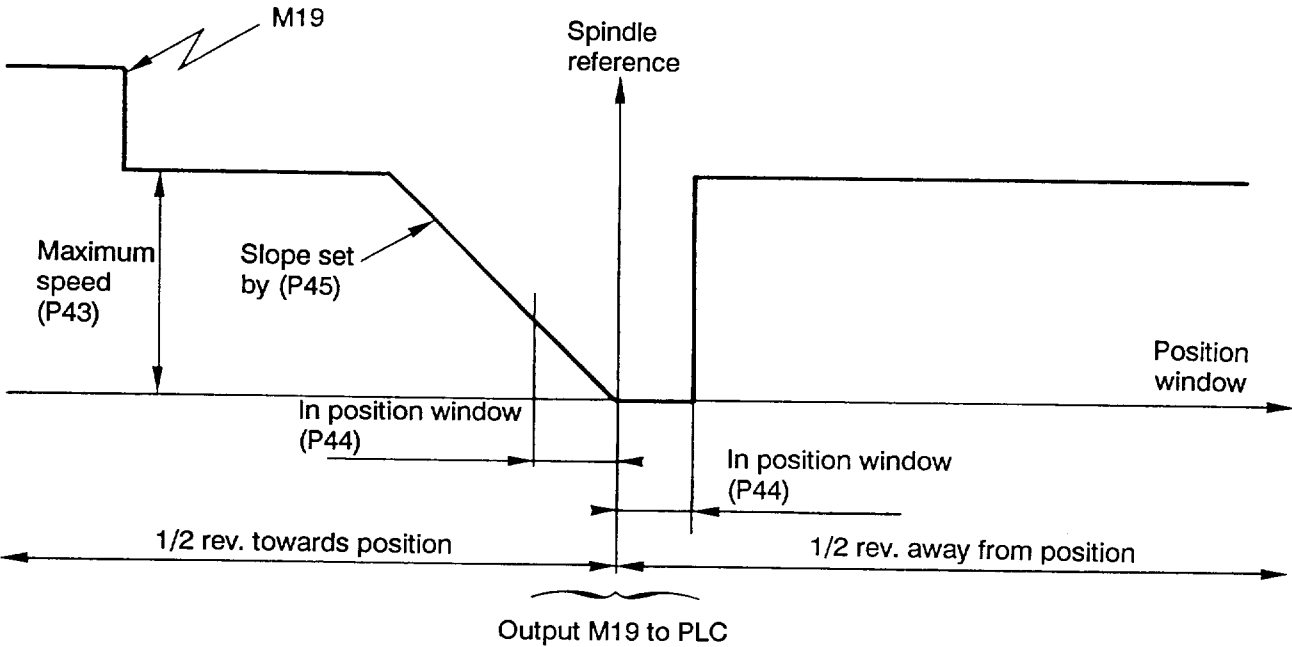
NUM 720	PARAMETER	P43 P44 P45 P48	FUNCTION
	Spindle indexing		Spindle

The reference calculated is then limited to a maximum speed value defined by parameter P43 (VBSEUIL).

b) The current position exceeds the required position

b1) If the position is less than in the position window (P44), the spindle reference is set to 0.

b2) If the position is greater than in the position window (P44), the spindle reference is then set to the maximum speed value (P43).



6.88	Creation		P43 P44 P45 P48	3/4

NUM 720	PARAMETER	P43 P44 P45 P48	FUNCTION
	Spindle orientation		Spindle

Spindle speed control with bidirectional servo (bit 1 of P7 = 1)

Applies to reversible servo-drives only.

a) The current position is close to the indexing position

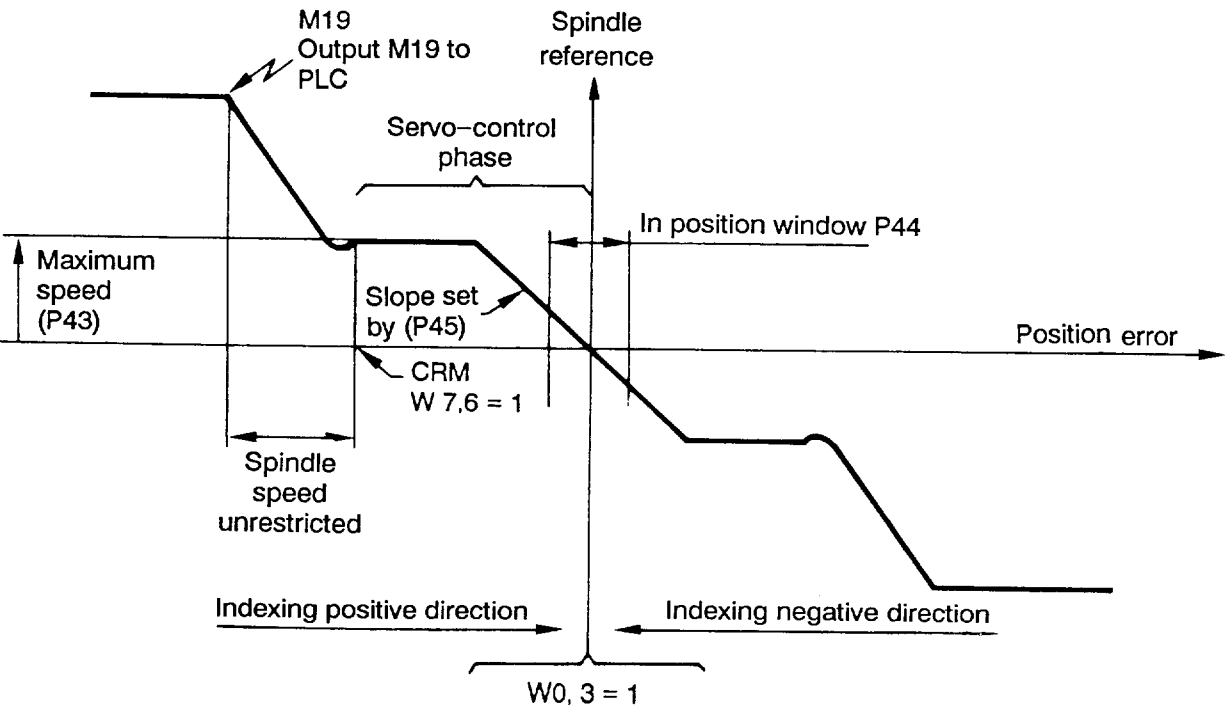
The required working speed is calculated by :

Spindle ref. = Position error x KINDBR
 KINDBR is the servo-control coefficient defined by parameter P45.

$$(P45 \text{ is expressed in } \frac{\text{rpm}}{\text{rev}} \text{ i.e. } \frac{1}{\text{min}})$$

The reference value calculated is then limited by a maximum speed value defined by parameter P43 (VBSEUIL), or is defined by the value S programmed if this value is smaller.
 The system enters the servo-control phase if CRM is 1 and a spindle speed measurement of less than P43 is detected.

b) The current position exceeds the maximum position. The system reverses the spindle and returns it to the indexed position. Servo-control is maintained throughout.



			P43 P44 P45 P48	4/4
6.88	Creation			

NUM 720	PARAMETER	P43	FUNCTION			
	Maximum orientation speed		Spindle			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2	
	☒ 1 Decimal (–32767 to + 32767)					
	☐ 2 Decimal (–99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	
VALIDITY OF VERSION	720T: from software 201280/D onwards 720F: from software 201290/D onwards					

(See "SPINDLE ORIENTATION" chapter).

Word 0 :

This word defines a limiting value of the spindle speed used by the spindle indexing function. The spindle speed is expressed in rpm.

Word 1 :

Defines the minimum motor speed during a change of range. This speed is expressed in rpm.

NOTE :

If the programmed speed S... is less than the speed defined by the parameter, the orientation speed will be speed S... (bidirectional servo-control only : bit 1 of P7 = 1).

			VBSEUIL	
6.91	A : Adjunction of a second word		P43	1/1
6.88	Creation			

NUM 720	PARAMETER	P44	FUNCTION			
	Indexing in position window		Spindle			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	1	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

(See "SPINDLE INDEXING" chapter).

This parameter defines the accuracy of the spindle servo-control expressed in 1/4096ths of a revolution.

			DINDBR	
6.88	Creation		P44	1/1

NUM 720	PARAMETER	P45	FUNCTION			
	Spindle servo-control slope		Spindle			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	1	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

(See "SPINDLE INDEXING" chapter).

This parameter defines the servo-control slope of the spindle, expressed in $\frac{\text{rpm.}}{\text{rev}}$

It is adjusted to the largest value which gives stable servo-control.

			KINDBR	
6.88	Creation		P45	1/1

NUM 720	PARAMETER		P46		FUNCTION			
	Spindle ranges				Spindle			
WORD TYPE	☐	0 Hexadecimal (00 to FF)			NUMBER OF WORDS	6	6	
	☒	1 Decimal (–32767 to + 32767)						
	☐	2 Decimal (–99.999.999 to + 99.999.999)			VERSION			
	☐	3 Character				T	F	

This parameter contains 3 pairs of words. Each pair corresponds to a range and defines the rotation speeds covered by that range..

The first word of the pair (even word) defines the minimum speed in the corresponding range. The second word (odd word) defines the maximum speed in this range.

- The speeds are expressed in rpm.
- If a given range does not exist on a machine, the corresponding word pair must be given the value (0,0).

		MIN			MAX			
Word	0	—————	1	—————			M40	
	2	—————	3	—————			M41	
	4	—————	5	—————			M42	

For the direction of the automatic range selection see parameter P7.

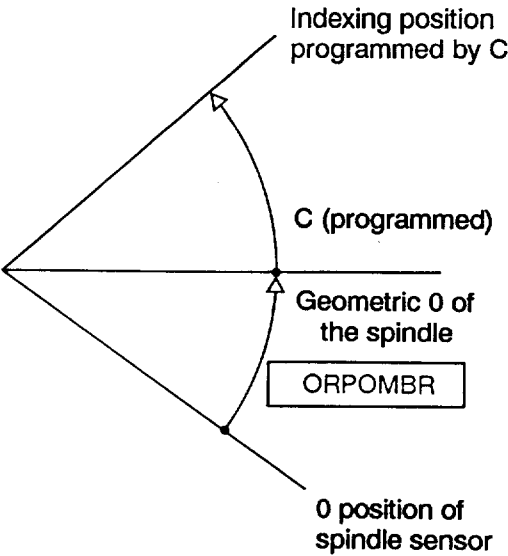
			GAMBR	
6.88	Creation		P46	1/1

NUM 720	PARAMETER	P48	FUNCTION			
	Spindle origin offset		Spindle			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	1	
	☒ 1 Decimal (-32767 to + 32767)					
	☐ 2 Decimal (-99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

(See "SPINDLE ORIENTATION" chapter)

This parameter (ORPOMBR) is used to adjust the 0 position of the spindle, and consequently the orientation position. It is expressed in 1/4096ths of a revolution.

$$\text{ORPOMBR} = \text{offset (degrees)} \times \frac{4096}{360}$$



			ORPOMBR	
6.91	A : Correction		P48	1/1
6.88	Creation			

NUM 720	PARAMETER	P50	FUNCTION		
	Length of sampling period		Miscellaneous		
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	1
	☒ 1 Decimal (−32767 to + 32767)				
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION		
	☐ 3 Character			T	F

Non-modifiable parameter

This parameter defines the sampling period expressed in microseconds.

The base value is 10000.

			VALHTR	
6.88	Creation		P50	1/1

NUM 720	PARAMETER	P51	FUNCTION			
	Minimum execution time of a straight line in interpolation mode		Miscellaneous			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	1	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

Non-modifiable parameter

This parameter defines the minimum time required to execute a straight line in interpolation mode.

The base value is 80 ms.

			NBTMIN	
6.88	Creation		P51	1/1

NUM 720	PARAMETER	P52	FUNCTION			
	Circular interpolation control Speed limitation		Miscellaneous			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)					
	☐ 3 Character		VERSION	T	F	

This parameter contains 2 words defines :

Word 0 maximum radial acceleration expressed in microns per sampling rate squared ($\mu \text{ Ech}^2$) :
Base $50\mu/\text{Ech}^2$.

Word 1 geometric error permitted on the circle expressed in microns. Base value 1μ .

This parameter thus allows the system to determine a maximum speed value in circular interpolation mode, which is defined by :

$$V_{\max} = \text{minimum} \left(\underbrace{V_{\max X} \text{ or } V_{\max Y} \text{ or } \dots}_{\text{Parameter P30}} \text{ or } \underbrace{\sqrt[3]{\frac{4}{\pi} \epsilon_g R^2}}_{\substack{\text{Parameter P52} \\ \text{word 1}}} \text{ or } \underbrace{\sqrt{\gamma \cdot R}}_{\substack{\text{Parameter P52} \\ \text{word 0}}} \right)$$

ϵ_g = permitted geometric error

= radial acceleration

NOTE :

The word 0 of parameter P52 may also be used to limit servo-control error.

$$\text{In this case, } V_{\max} = \sqrt{\frac{2\epsilon_a}{T^2}} R$$

ϵ_a = servo-control error expressed in microns

T = servo-control time constant expressed in sampling (P56).

			TETAMAX	
6.88	Creation		P52	1/1

NUM 720	PARAMETER	P53	FUNCTION			
	Maximum number of axes authorized		Miscellaneous			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

Non-modifiable parameter

- Word 0 in this parameter gives the maximum number of measured spindles which can be declared. In this example, the maximum number is 1.
- Word 1 gives the maximum number of words authorized (2 for a lathe, 4 for a milling machine).

The number of axes declared in P2 (measurement axes) and in P9 (axis addresses) should be less or equal to the number declared in P53.

- If the maximum number of spindles measured or the maximum number of axes is exceeded, the message "ERROR PARAMETER 53" will be reported and the system will be prevented from achieving initialization.

			AXMAX	
6.88	Creation		P53	1/1

NUM 720	PARAMETER	P54	FUNCTION			
	Hardware interrupt assignment		Miscellaneous			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	1	
	☐ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION	T	F	
	☐ 3 Character					

This parameter determines the leading edge of the interrupt and the presence or absence of filtering.

- Bit 0 of this word determines the edge of the interrupt :
= 0 (leading edge)
= 1 (trailing edge)
- Bit 1 determines of filtering :
= 0 (filtering 10 ms)
= 1 (no filtering)

			EIT FBL	
6.88	Creation		P54	1/1

NUM 720	PARAMETER	P55	FUNCTION			
	Speed anticipation coefficient		Miscellaneous			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS		1	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION		F	
	☐ 3 Character					

This parameter represents a percentage of the reference injected in the position loop.

It is expressed in 1/100ths (values between 0 and 100).

When the value is zero, the coefficient has no effect on the system.

			KANTIV	
6.88	Creation		P55	1/1

NUM 720	PARAMETER	P56	FUNCTION			
	Servo-control loop time constant		Miscellaneous			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	1	
	☒ 1 Decimal (-32767 to + 32767)					
	☐ 2 Decimal (-99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

Position of the servo-control loop time constant expressed in ms.

This parameter is used in dynamic movement control for lathes and milling machines and in speed management at the end of a milling block.

Time constant is defined as follows :

$$\tau = \frac{1}{G} = \frac{\epsilon}{V} \quad (\text{See P21})$$

Example :

ϵ : 1 mm for $V = 1000$ mm/min

$$\tau = \frac{60 \times 1}{1000} = 60 \text{ ms}$$

			CONSTT	
6.88	Creation		P56	1/1

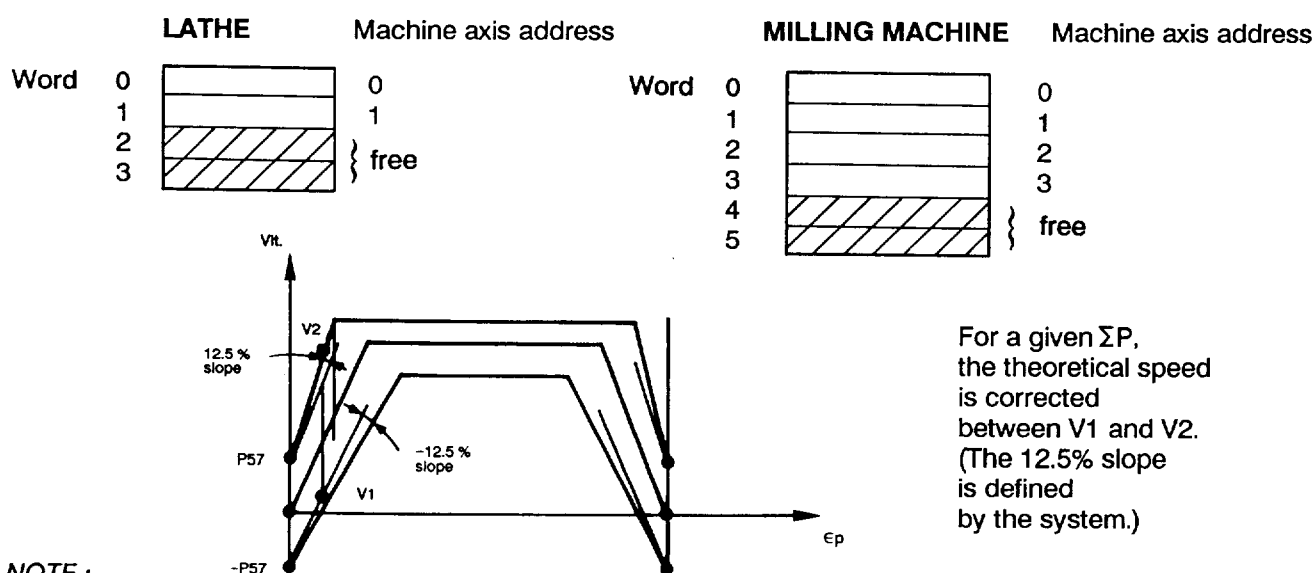
NUM 720	PARAMETER	P57	FUNCTION			
	Dynamic movement control		Miscellaneous			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	4	6	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	

Dynamic movement control is a function which constantly compares, for each sampling, the theoretical speed of an axis with its real speed derived from the following error.

If the tolerance permitted on an axis is exceeded, error No. 40+n will result, n being the address of the axis.

The value of a word (other than 0) is the real speed – theoretical speed tolerance expressed in μ/Ech (see P50), for a linear axis, or in 1/1000 ths of a degree of Ech for each rotary axis.

A zero value in a word disables dynamic control on the corresponding axis.



NOTE :

To use this parameter, the time constant of the position loops must be loaded into parameter P56.

NOTE :

See P9 for the definition of the machine axis addresses.

			BAGOT	
6.91	A : Figure modified		P57	1/1
6.88	Creation			

NUM 720	PARAMETER	P58	FUNCTION			
	Reservation of the inter-axis calibration table		Miscellaneous			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	1	1	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	
VALIDITY OF VERSION	720T : from software 201280/D onwards 720F : from software 201290/D onwards					

Word 0 :

This word defines the number of parameters E81000 and E82000 used for inter-axis calibration.

The number entered must be less than 1000. Entry of a higher value is not prohibited, but in this case, the system limits it to 1000.

Example : If P58 = 600, the available parameters are:

E81000–E81599

and

E82000–E82599

Word 1 :

Not used

NOTE :

Prior to modifying this parameter part programs in the system memory should be archived.
When the parameter is modified the contents of the system memory are lost.

6.91	Creation		P58	1/1

NUM 720	PARAMETER	P60	FUNCTION			
	Axes and direction of tip relief		Cycles			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS		12	
	☐ 1 Decimal (–32767 to + 32767)					
	☐ 2 Decimal (–99.999.999 to + 99.999.999)		VERSION		F	
	☐ 3 Character					

The 12 words of this parameter are divided into 6 pairs, corresponding to tool directions P+,P–,Q+,Q–,R+ and R– respectively.

Each pair contains the list of axes on which tip relief is to be applied when the cycle is run in the direction corresponding to that pair.

The first word of the pair (even word) contains the list of axes on which withdrawal is carried out in the "+" direction.

The second word in the pair (odd word) contains the list of axes on which withdrawal is carried out in the "–" direction.

Example : Cycles possible in R+,P–,P+

The spindle indexing position is such that withdrawal must be carried out as indicated below :

in R+	Withdrawal in X–, Y+
in P+	Withdrawal in Y+
in P–	Withdrawal in Y+

See table on following page.

NOTE :

Display in lathe version but not used.

			AXDECAL	
6.88	Creation		P60	1/3

NUM 720	PARAMETER	P60	FUNCTION
	Axes and direction of tip relief		Cycles

	Words	Tool direction								Contents to store
							Z	Y	X	
G19	0	P+						1		02
	1									00
	2	P-						1		02
	3									00
G18	4	Q+								-
	5									-
	6	Q-								-
	7									-
G17	8	R+						1		02
	9								1	01
	10	R-								-
	11									-

			AXDECAL	
6.88	Creation		P60	2/3

NUM 720	PARAMETER	P60	FUNCTION
	Axes and direction of tip relief		Cycles

Structure of parameter

Word No.	Tool direction	List of axes withdrawn in "+" direction	List of axes withdrawn in "-" direction
0	P+	X	
1			X
2	P-	X	
3			X
4	Q+	X	
5			X
6	Q-	X	
7			X
8	R+	X	
9			X
10	R-	X	
11			X

Structure of a word : each bit of a word corresponds to an axis as shown below :

7	6	5	4	3	2	1	0
					Z	Y	X

The presence of a value at 1 in a bit indicates that the corresponding axis is involved in the withdrawal movement.

			AXDECAL	
6.88	Creation		P60	3/3

NUM 720	PARAMETER		P61	FUNCTION			
	Clearance value for tip relief			Cycles			
WORD TYPE	☐	0 Hexadecimal (00 to FF)		NUMBER OF WORDS		1	
	☐	1 Decimal (–32767 to + 32767)					
	☒	2 Decimal (–99.999.999 to + 99.999.999)		VERSION			
	☐	3 Character				F	

This parameter gives the absolute clearance value of the tip relief.

This value is expressed in microns and is applied on all axes involved in the tip relief movement, as defined in the description of parameter P60.

NOTE :

Displayed in lathe version but not used.

			DECAL	
6.88	Creation		P61	1/1

NUM 720	PARAMETER		P62		FUNCTION			
	Clearance for woodpeck drilling cycle				Cycles			
WORD TYPE	☐	0 Hexadecimal (00 to FF)			NUMBER OF WORDS		1	
	☐	1 Decimal (−32767 to + 32767)						
	☒	2 Decimal (−99.999.999 to + 99.999.999)			VERSION			
	☐	3 Character					F	

This parameter gives the "clearance" value for cycle G83 ("woodpeck").

The clearance is the distance travelled at working speed before penetrating the material, during the second descent and the subsequent descents carried out during the woodpeck drilling cycle.

The clearance value is expressed in microns.

NOTE :

Displayed in lathe version but not used.

			GARDE	
6.88	Creation		P62	1/1

NUM 720	PARAMETER	P63	FUNCTION			
	Dwell time for spindle reversal during conventional tapping cycle – Definition for solid tapping		Cycles			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	6	6	
	☒ 1 Decimal (–32767 to + 32767)					
	☐ 2 Decimal (–99.999.999 to + 99.999.999)					
	☐ 3 Character		VERSION	T	F	
VALIDITY OF VERSION	720T: from software 201280/E onwards 720F: from software 201290/E onwards					

This parameter contains six words. Word 0 is for conventional tapping and words 1 to 5 are for solid tapping.

OPERATIONAL DESCRIPTION AND EXECUTION OF THE RIGID TAPPING CYCLE

After the positioning phase, the tool axis movement is coupled with the spindle rotation at the beginning of the descent phase. However, since the tool axis is not yet at the required feed rate, it is coupled to an anticipated spindle reference. The anticipation time constant is calculated so that it equals the tool axis acceleration time. Real coupling with the spindle thus occurs exactly when the tool axis has reached the required feed rate, and synchronisation is complete.

When the deceleration distance remains to be travelled to reach the hole bottom, the spindle reference becomes proportional to the distance remaining to be travelled. The spindle therefore gradually slows down.

When the hole bottom is reached, the spindle DAC setpoint is reversed, the spindle reaccelerates until it has travelled back over the deceleration distance at which time the speed becomes constant.

The spindle does not completely stop rotating in the hole bottom area, so that the tap does not catch in the bottom of the hole.

Except in the deceleration region, the tap moves upward and downward at constant speed.

The cycle axis following error is cancelled.

			INVERS	
10.92	B: Modifications			
6.92	A: Solid tapping			
6.88	Creation		P63	1/6

NUM 720	PARAMETER	P63	FUNCTION	
	Dwell time for spindle reversal during conventional tapping cycle – Definition for solid tapping		Cycles	

WORD 0:

This parameter specifies the dwell time for spindle reversal during a conventional tapping cycle.

The time is expressed in 1/100ths of a second.

WORD 1:

Cycle axis integration time constant.

$$= \frac{1000}{T_i} \text{ where } T_i \text{ is the number of samples, } \geq 2 \text{ (for setting, see page 5/6).}$$

WORD 2:

Position anticipation time constant for the axis of the cycle.

= 1000.Td, where Td is the number of samples (for setting, see page 5/6).

WORD 3:

Anticipation time constant to reach zero following error expressed as a number of samples.

WORD 4:

Spindle pseudo-acceleration

= A in rev/sec². Use the equation given for computation of the deceleration distance (see page 4/6) to determine the default value.

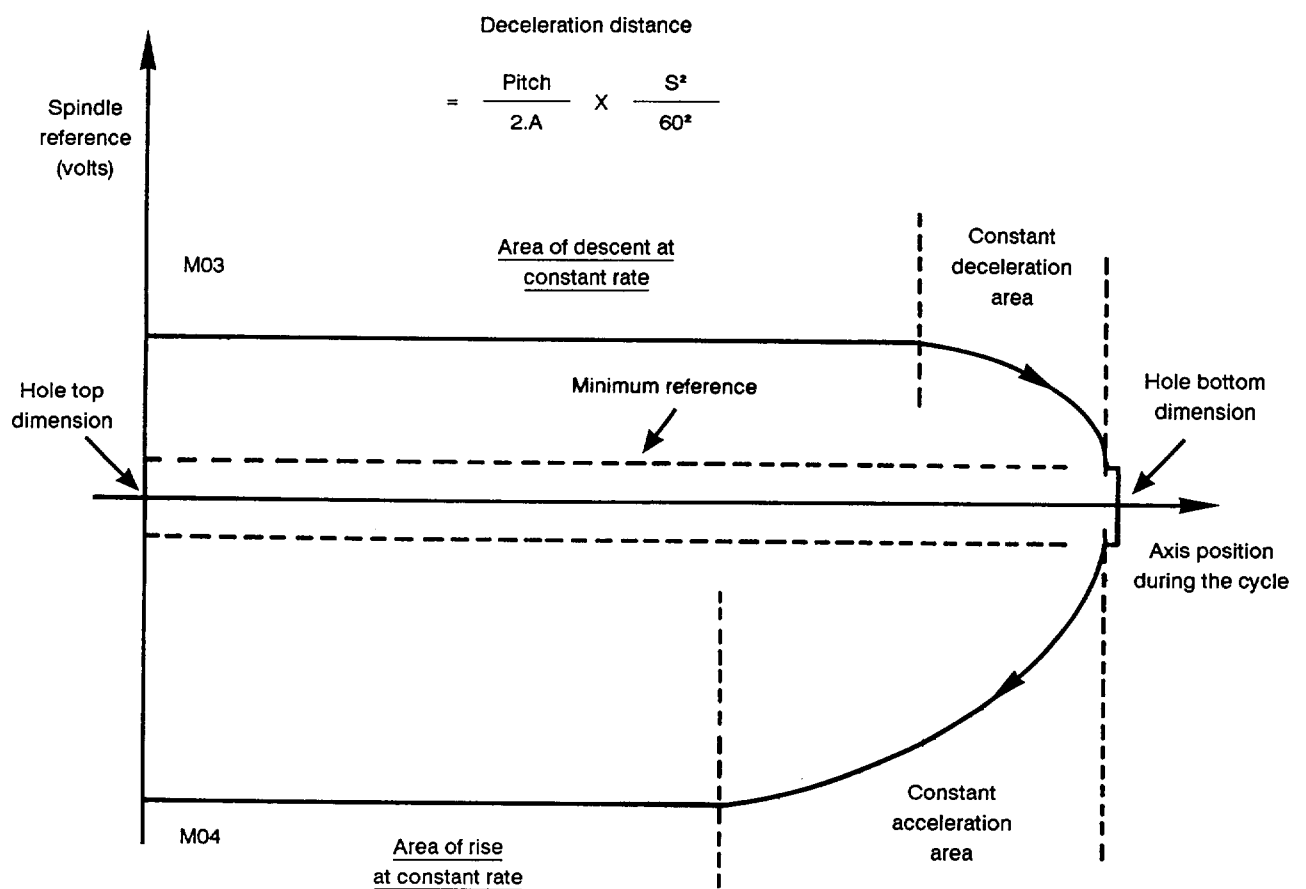
			INVERS	
10.92	B: Modifications		P63	2/6
6.92	A: Solid tapping			

NUM 720	PARAMETER	P63	FUNCTION
	Dwell time for spindle reversal during conventional tapping cycle – Definition for solid tapping		Cycles

WORD 5:

Minimum spindle reference in hole bottom.

Expressed in millivolts. A minimum spindle reference is set on reaching the bottom of the hole to prevent the spindle from stopping.



The parameters related to the cycle axis are the same whatever the cycle axis.

			INVERS	
10.92	B: Modifications		P63	3/6
6.92	A: Solid tapping			

NUM 720	PARAMETER	P63	FUNCTION
	Dwell time for spindle reversal during conventional tapping cycle – Definition for solid tapping		Cycles

SETTING THE COMPONENTS OF PARAMETER P63

IMPORTANT:

Before making any settings, function M04 must correspond to the spindle upcount (external parameter E79000 for the 720F and E73000 for the 720T).

The parameters are common to all the axes of the cycle, which must therefore all have the same gain.

The settings must be made during tapping with words 1 and 2 initially equal to 0 and word 3 equal to 1.

1 – SPINDLE PSEUDO-ACCELERATION: Word 4

This word is used to set the deceleration distance at the top and bottom of the hole. This distance is proportional to the tap pitch and the square of the spindle speed and inversely proportional to the spindle pseudo-acceleration.

$$\text{Deceleration distance} = \frac{(\text{pitch} \times S^2)}{(2 \times A \times 60^2)}$$

Pitch = pitch of the hole to be tapped in mm.

S = spindle speed in rpm.

A = spindle pseudo-acceleration.

The deceleration distance is calculated automatically by the system.

2 – SPINDLE REFERENCE AT HOLE BOTTOM AND TOP: WORD 5

In the deceleration area, the spindle reference is proportional to the remaining distance to the hole bottom or top. If these dimensions were exactly reached, the spindle reference would be zero, which would stop it at the bottom or at the top of the hole. To prevent this, a minimum spindle reference is substituted whenever the actual spindle reference falls below a threshold. This threshold must be high enough to prevent the spindle from stopping but it must be set very carefully, since when the spindle rotation is reversed, there is a discontinuity in the spindle reference which generates a transient following error.

			INVERS	
10.92	B: Modifications		P63	4/6
6.92	A: Solid tapping			

NUM 720	PARAMETER	P63	FUNCTION
	Dwell time for spindle reversal during conventional tapping cycle – Definition for solid tapping		Cycles

3 – TIME CONSTANTS FOR CANCELLATION OF THE FOLLOWING ERROR: Words 1 and 2

These values are common to all the axes of the cycle, which must therefore all have the same gain (KVAR set by P21).

Words 1 and 2 cancel the following error on the axes in movement during tapping.

Position anticipation allows the following error to be cancelled rapidly but smoothly instead of suddenly. Integration allows complete cancellation of the following error at the speed set.

3.1 – Anticipation Setting: Word 2

Word 2 = following error on the Z axis (in μ)/delta Z per sample (mm/smp),
or Td = time constant of the position servoloop/duration of a sample.

Check on the display that the following error on the axis of the cycle is close to zero.

3.2 – Integration Setting: Word 1

Increase the value of this word without exceeding 1000. If an instability occurs, decrease the value until the system is stable, then divide the value found by 2. The value of the word must not exceed 500.

Check that the following error for the axis is zero in the areas where the spindle speed is constant and small in the reversal area and during the deceleration and acceleration at the hole top and bottom. If this is not the case, increase the deceleration distance by decreasing the pseudo-acceleration.

4 – ANTICIPATED SPINDLE REFERENCE ZERO CROSSING TIME CONSTANT

Since the spindle is rotating and the tool axis is stopped at the outset, it is necessary to start the tool axis movement early with respect to the spindle zero reference so that the tool axis is synchronised with the spindle when it reaches the required feed rate. The higher the acceleration allowed by the tool axis, the lower the value that will be assigned to this time constant.

			INVERS	
10.92	B: Modifications		P63	5/6
6.92	A: Solid tapping			

NUM 720	PARAMETER	P63	FUNCTION
	Dwell time for spindle reversal during conventional tapping cycle – Definition for solid tapping		Cycles

5 – FINAL CHECK OF CORRECT ADJUSTMENT

The spindle speed servodrive feedback signal can be checked on the oscilloscope to make sure the settings are correct, in particular that there is no discontinuity or oscillation in the hole bottom on reversal.

6 – FEED STOP

There are two possibilities, according as the tapping stop cancellation input bit on the PLC (10 of W4) is set or not.

Bit = 0

The action on FEED STOP stops tapping before reaching the bottom of the hole.

Bit = 1

The action on FEED STOP has no effect on tapping even though the FEED STOP light comes on. The FEED STOP output to the PLC is not set until tapping is completed.

In both cases, FEED STOP cannot be cleared until the tool axis reaches the top of the hole and the machine stops.

			INVERS	
10.92	B: Modifications		P63	6/6

NUM 720	PARAMETER	P65	FUNCTION			
	Quantified motion axes		Miscellaneous			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS		6	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character				F	

This parameter is used to define the movement increment (pitch) of the axis concerned. It makes it possible, for example, to control the movements of a work surface controlled in 1/2 degree steps, and measured in 1/1000ths of degrees (Hirth coupling).

It applies only to axes which have been declared "modulo" axes and which can be clamped by function M10.

		P9		P0	P9
Word 0	0	Axis 0		X	0
Word 1	0	Axis 1		Y	1
Word 2	0	Axis 2		Z	2
Word 3	2500	Axis 3			FF
Word 4	0	} free			FF
Word 5	0			B	FF
					3
					FF

In the example above, axis 3 (that is, B) is at 2.5 degrees.

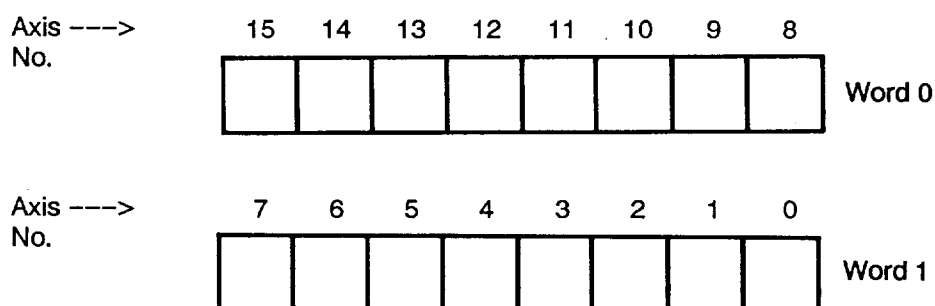
The value 0 corresponds to the normal movement of an axis, accurate to 1/1000th of a degree.

NOTE :

See P9 for the definition of the axis number.

			TJOGQ	
6.88	Creation		P65	1/1

NUM 720	PARAMETER	P67	FUNCTION			
	Selection of operation in inches per axis Scaling factor ignored		Measurement			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2	
	☐ 1 Decimal (-32767 to + 32767)		VERSION			
☐ 2 Decimal (-99.999.999 to + 99.999.999)						
☐ 3 Character	T			F		
VALIDITY OF VERSION	720 T : from software 201280/B onwards 720 F : from software 201290/B onwards					



This parameter is designed particularly for machines with a rotary axis declared non modulo which operates in inches.

This two-word parameter gives the list of axes not affected by programming in inches or for which the scaling factor must be ignored.

Programming in inches and the scaling factor do not affect axes whose bits are 1. The default value of all the bits is 0.

The organization of this parameter is identical to P9.

6.91	A : Scaling factor		P67	1/1
4.89	Creation			

NUM 720	PARAMETER	P80	FUNCTION			
	Character X OFF parameterized		Miscellaneous			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2	
	☐ 1 Decimal (–32767 to + 32767)					
	☐ 2 Decimal (–99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	
VALIDITY OF VERSION	720 T : from software 201280/B onwards 720 F : from software 201290/B onwards					

This parameter contains the two words used to assign another hexadecimal code to the character X OFF in the ISO code or its equivalents in EIA, BS.

Word 0 applies to the ISO code, and word 1 to the EIA code.

Word 0:

X OFF (\$93) is replaced by an ISO code character.

Word 1:

BS (\$2A) is replaced by another EIA code character.

The character X OFF (or BS in EIA code) is used in the following modes :

- Loading of part programs via reader input,
- Loading of tool dimensions via reader input,
- Part programs output on tape punch,
- Tool dimension output on tape punch.

X OFF is not used for the loading of utility programs, with the exception of UT4.

			X CARIS	
			X CAREI	
4.89	Creation		P80	1/1

NUM 720	PARAMETER	P81	FUNCTION			
	UNI-TELWAY – Station configuration		Miscellaneous			
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	10	10	
	☐ 1 Decimal (–32767 to + 32767)					
	☐ 2 Decimal (–99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character			T	F	
VALIDITY OF VERSION	720T : from software 201280/D onwards 720F : from software 201290/D onwards					

Word 0 : Slave station number (FF)

- The value FF disables operation of UNI-TELWAY and restores the DNC 1 functionality.

Word 1 : Number of retransmissions (4)

- Number of retransmissions after a negative acknowledgment (NACK) from the receiver.

Word 2 : Turnaround time (1)

- Sets the turnaround time of the data link layer. The wait before transmission of the first character is:
TR = P81 N2 x 1.2 ms

Words 3 to 8 : Destination network address for unsolicited data

- N3 : simplified addressing (0) (Value 0 or 20)
- N4 : network address (0)
- N5 : station address (0)
- N6 : port address (0)
- N7 : module address (0)
- N8 : channel address (0)

Word 9 : ACIA data rate (5) (default 9600 bauds)

- The data rate of the DNC 1 ACIA is set by the following codes:

- . 0 for 300 bauds
- . 1 for 600 bauds
- . 2 for 1200 bauds
- . 3 for 2400 bauds
- . 4 for 4800 bauds
- . 5 for 9600 bauds
- . 7 for 19200 bauds

NOTE : The values in parentheses are default values.

6.91	Creation		P81	1/1

NUM 720	PARAMETER	P82	FUNCTION		
	NC-PLC transfer rate Selection of the PLC		Miscellaneous		
WORD TYPE	☒ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS	2	2
	☐ 1 Decimal (-32767 to + 32767)				
	☐ 2 Decimal (-99.999.999 to + 99.999.999)		VERSION		
	☐ 3 Character			T	F
VALIDITY OF VERSION	720T : from software 201280/D onwards 720F : from software 201290/D onwards				

Word 0 :

This word defines the data rate between the NC and the PLC.

N0 = 5 (default) : data rate 9600 bauds

N0 = 6: data rate 19200 bauds

NOTES :

*For dialog at 19200 bauds, it is necessary to have the PL7.2 PLC microsoftware version 3.0 or above.
The data rate of 19200 bauds is not effective until the NC and PLC have been reset.*

Word 1 :

This word enables connection of a TSX 17.20 (RS485 with echo) or a TSX 47.40 (current loop without echo).

N1 = 0 Enables connection of a TSX 17.20

N1 = 1 Enables connection of a TSX 47.40

6.91	Creation		P82	1/1

NUM 720	PARAMETER	P83	FUNCTION			
	Start radius/end radius tolerance		Miscellaneous			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS		1	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION		F	
	☐ 3 Character					
VALIDITY OF VERSION	720F : from software 201290/E onwards					

This parameter is used to set the start radius/end radius tolerance. The default value is 20 microns.

The maximum tolerance is 255 microns.

The setting determines detection of error 107.

Error 107 is generated if the difference between the start radius and the end radius is greater than or equal to the value set in this parameter.

6.92	Creation		P83	1/1

NUM 720	PARAMETER	P84	FUNCTION			
	Back track		Divers			
WORD TYPE	☐ 0 Hexadecimal (00 to FF)		NUMBER OF WORDS		3	
	☒ 1 Decimal (−32767 to + 32767)					
	☐ 2 Decimal (−99.999.999 to + 99.999.999)		VERSION			
	☐ 3 Character				F	

This parameter is used in particular for oxycutting, laser cutting, plasma cutting machines, etc. It may also be used by other applications.

It is used to back up over all or part of the path, then move forward and resume work normally.

This parameter includes three words :

- Word 0 : number of blocks stored for backup : 38 bytes per program block can be stored.
- Word 1 : backup speed in mm/min.
- Word 2 : percentage for speed variation detection.

NOTE :

Displayed but not used in lathe version.

10.92	Creation		P84	1/1

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