

NUM 1060 G

PROCAM GRIND

INTERACTIVE

PROGRAMMING

en-938931/0

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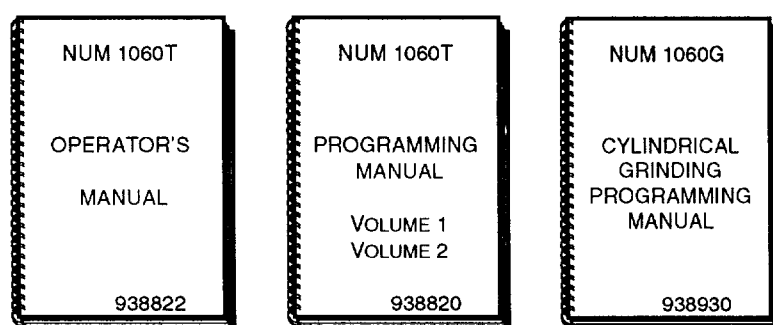


Foreword

Structure of the NUM 1060 Documentation

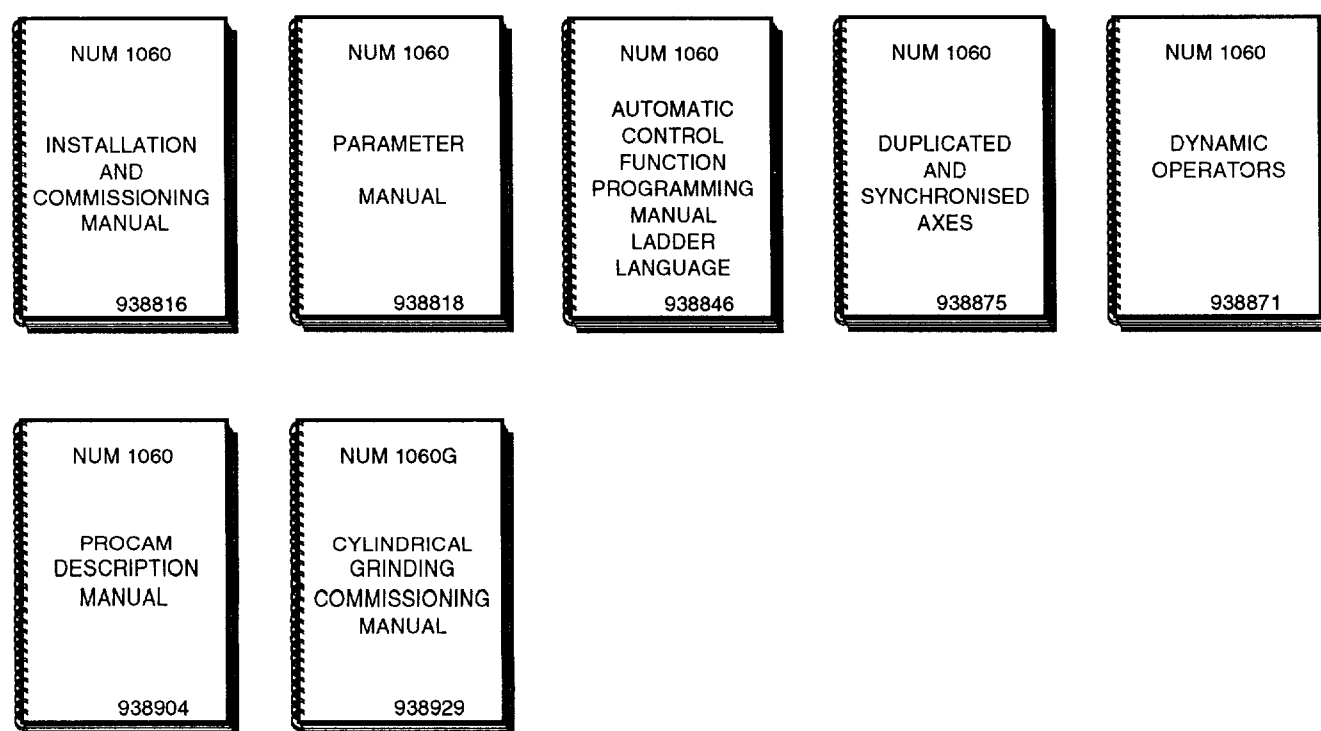
User Documents

These documents are designed for the operator of the numerical control.



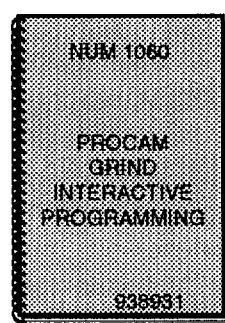
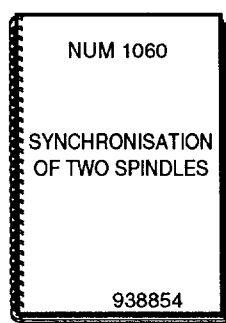
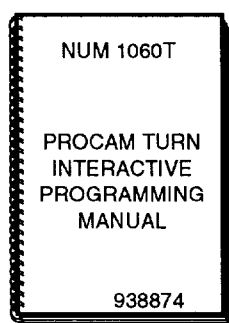
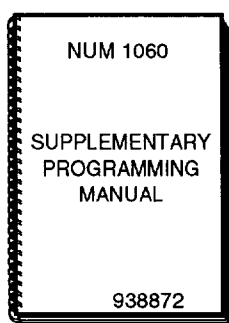
OEM Documents

These documents are designed for the OEM integrating the numerical control on a machine.

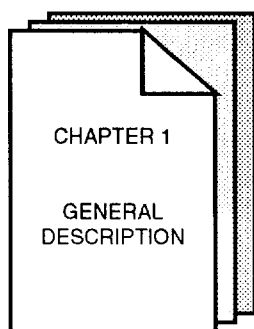


Special Programming Documents

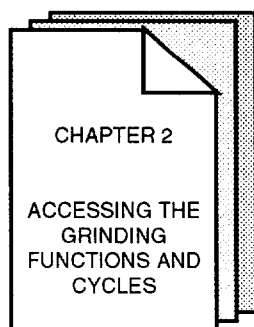
These documents concern special numerical control programming applications.



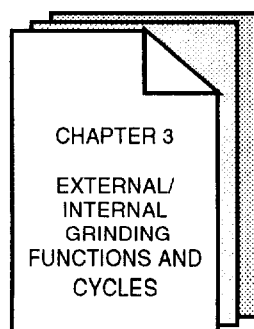
PROCAM GRIND Interactive Programming Manual



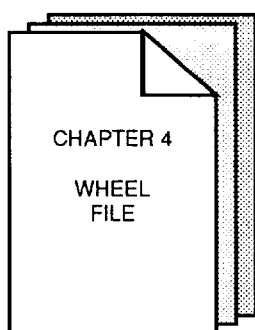
General information on use and operation of the interactive programming function.



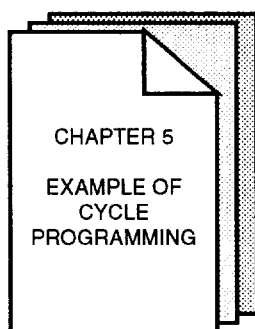
Describes the procedure used to access the external and internal grinding interactive programming function.



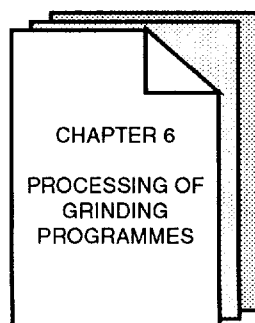
Screen pages for using the internal and external grinding interactive programming function.



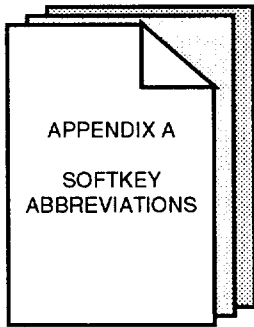
Describes access to the wheel files and screen pages for using the wheel files.



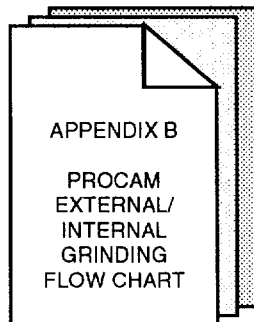
Sample external grinding programme including a cylindrical traverse cycle.



Possibilities for editing stored programmes and programmes being created.



Alphabetical list of softkeys.



Flowchart of PROCAM GRIND interactive programming function.

Use of the Interactive Programming Manual

In Chapter 2, each screen page of the PROCAM GRIND interactive programming function is reproduced with comments giving information on the data displayed (the screen is on the right-hand page and the comments on the facing left-hand page).

In Chapter 5, the interactive grinding programming function is illustrated by a sample external grinding programme.

REMARK *For additional information, in particular a description of the cycle arguments, refer to the Cylindrical Grinding Programming Manual (938930).*

Agencies

The list of NUM agencies is given at the end of the manual.

Questionnaire

To help us improve the quality of our documentation, we kindly request you to return the questionnaire at the end of the manual.

List of Functions and Cycles

List of External Grinding Functions and Cycles

The list below concerns only the functions and cycles accessible by the menus of external grinding functions and cycles.

Description	Page
Wheel selection	3 - 8
Plunge/multiplunge cycle	3 - 10
Angular plunge cycle	3 - 14
Oscillating plunge/multiplunge cycle	3 - 18
Cylindrical traverse cycle	3 - 22
Conical traverse cycle	3 - 26
Profile grinding cycle	3 - 30
Shoulder cycle with and without oscillations	3 - 34
Shoulder traverse cycle	3 - 38
Interpolated shoulder cycle	3 - 42
Profile definition	3 - 90
End of programme	3 - 96

List of Internal Grinding Functions and Cycles

The list below concerns only the functions and cycles accessible by the menus of internal grinding functions and cycles.

Description	Page
Wheel selection	3 - 52
Plunge/multiplunge cycle	3 - 54
Angular plunge cycle	3 - 58
Oscillating plunge/multiplunge cycle	3 - 62
Cylindrical traverse cycle	3 - 66
Conical traverse cycle	3 - 70
Profile grinding cycle	3 - 74
Shoulder cycle with and without oscillations	3 - 78
Shoulder traverse cycle	3 - 82
Interpolated shoulder cycle	3 - 86
Profile definition	3 - 90
End of programme	3 - 96

1 General Description

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1.1 General

The interactive programming function is a software package installed in the numerical control (CNC).

The PROCAM GRIND software package is available in three versions:

- External grinding,
- Internal grinding,
- Internal and external grinding.

The software includes a set of screen pages sequenced to allow the use of grinding functions and cycles to write a programme.

1.2 Capabilities of the Software

The PROCAM GRIND interactive programming software allows you to:

- Create and edit programmes,
- Create and edit wheel files.

Creation

During creation, you are guided by the following screen pages:

- Menu pages,
- Dialogue pages.

Creating grinding programmes

When a grinding programme is being created, the menu pages guide the choice of functions and cycles. The dialogue pages are used to enter grinding data.

Creating wheel files

When a wheel file is being created, a menu page guides the choice of a type of wheel. The dialogue pages are used to enter the data for the selected wheel.

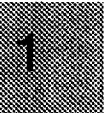
Editing

Editing grinding programmes

For editing a grinding programme, you first open the programme listing including all the phases of the cycle and operations programmed. From this page, you can zoom in on a detail to debug the programme (deletion, modification or insertion).

Editing wheel files

For editing a wheel file, you first open the wheel file. When the file is displayed, you can edit all the data it contains.



1.3 Overview of Available Functions and Cycles

1.3.1 External or Internal Grinding

The main menu, "GRINDING FUNCTIONS AND CYCLES" allows you to choose external, internal or external/internal grinding functions and cycles.

REMARK *When the system software includes both external and internal grinding, the menu has two pages for external grinding and two for internal grinding. In this case, the "Profile Definition" and "End of Programme" functions are located on the second page of the internal grinding menu.*

When the external and internal grinding menus are separate (see remark above), they each include two pages with the same functions and cycles.

Contents of the External and Internal Grinding Menus

The first main menu page offers the following selections:

- Wheel selection,
- Plunge cycle,
- Angular plunge cycle,
- Oscillating plunge cycle,
- Cylindrical traverse cycle,
- Conical traverse cycle.

The second menu page offers the following selections:

- Profile cycle,
- Oscillating shoulder cycle,
- Shoulder traverse cycle,
- Interpolated shoulder cycle,
- Profile definition,
- End of programme.

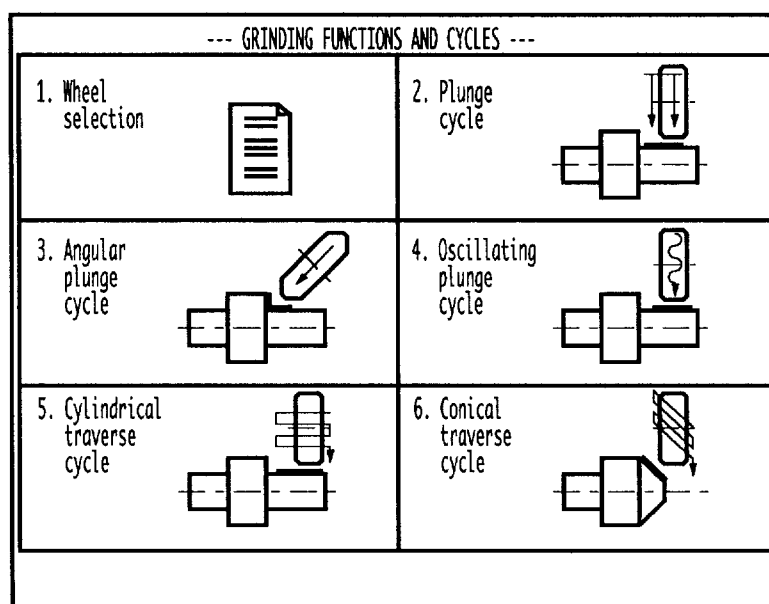
Note on "Profile Definition"

In addition to the functions and cycles specific to grinding, the main menu gives access to the following other functionalities under "Profile Definition":

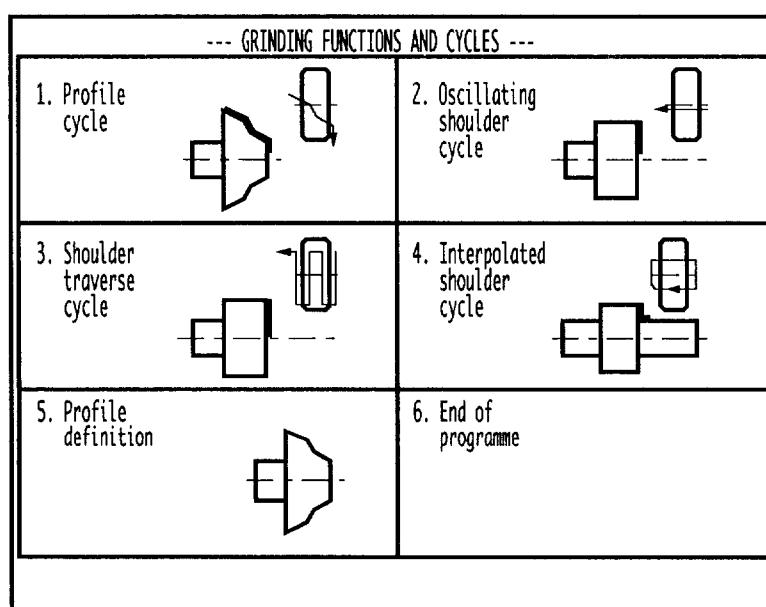
- Profile Geometry Programming (PGP) and various programming possibilities such as writing of ISO blocks or parameters and branches in the programme (branch and subroutine calls),
- Contour definition by the "PROFIL" graphic module.

1.3.2 Main External Grinding Menu

First menu page:

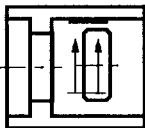
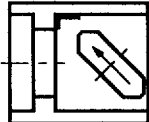
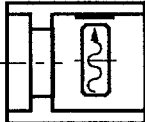
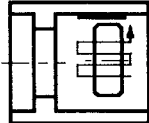
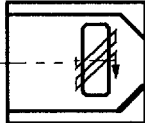


Second menu page:

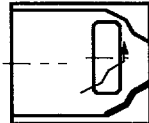
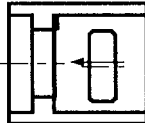
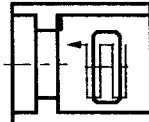
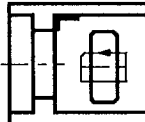
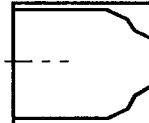


1.3.3 Main Internal Grinding Menu

First menu page:

--- GRINDING FUNCTIONS AND CYCLES ---	
1. Wheel selection 	2. Plunge cycle 
3. Angular plunge cycle 	4. Oscillating plunge cycle 
5. Cylindrical traverse cycle 	6. Conical traverse cycle 

Second menu page:

--- GRINDING FUNCTIONS AND CYCLES ---	
1. Profile cycle 	2. Oscillating shoulder cycle 
3. Shoulder traverse cycle 	4. Interpolated shoulder cycle 
5. Profile definition 	6. End of programme

1.4 Description of PROCAM Pages

1.4.1 Grinding Cycle Dialogue Page

Specimen external grinding traverse cycle page

"Calling arguments":

The diagram illustrates the Grinding Cycle Dialogue Page with numbered callouts (1-7) pointing to specific elements:

- 7**: CYLINDRICAL TRAVERSE CYCLE --- CALLING ARGUMENTS
- 6**: Traverse Cycle Final Diameter X : ?????????, Start Position of Wheel Diameter Z : ?????????, End Position of Wheel Diameter EZ : ?????????, Rapid Stop Distance EP : ?????????, N= 40
- 5**: Dwell Time, Wheel Position, Wheel Overtravel, Skip Diameter, Traverse Feederate, Traverse Type
- 4**: Start : INTERN, End : INTERN, ER, CONT
- 3**: Safety Diameter for Dressing or Manual Measurement : , Wheel Side Selection :
- 2**: =
- 1**: CANCEL, ENTER

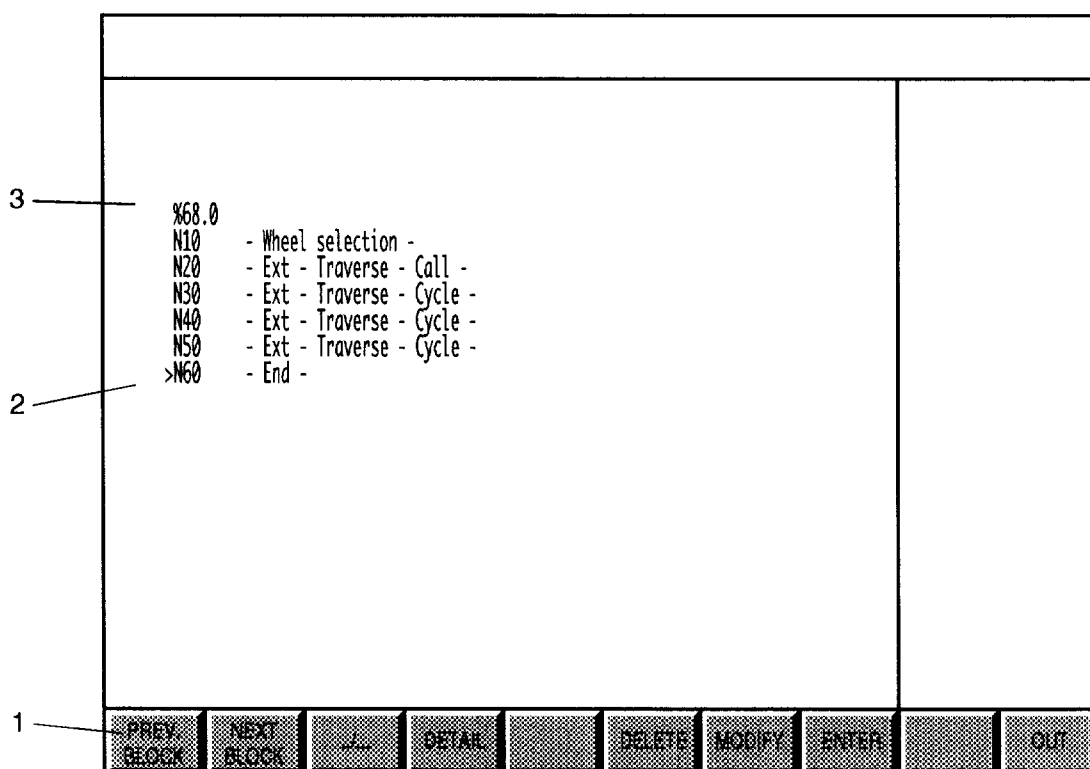
A schematic diagram on the right shows a grinding wheel (EZ) moving along a cylindrical workpiece (X) with a rapid stop distance (EP) and a wheel position (ER). The Z-axis is indicated for the wheel's movement.

1 Softkeys
2 Dialogue line
3 Field with default values
4 Mandatory field

5 Field selected
6 Page number
7 Page title

1.4.2 Programme Listing Page

When a programme has been created, the programme listing is displayed as follows (example):



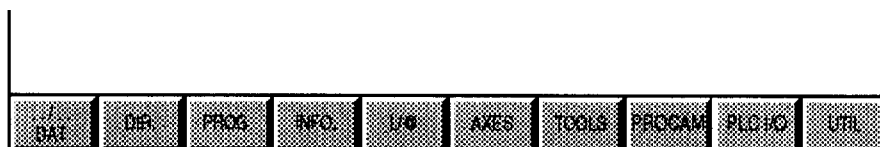
- 1 Softkeys
- 2 Programme block
- 3 Programme number

1.5 Description and Use of the Softkeys

The softkeys displayed at the bottom of each page include ten softkey boxes containing text (in full or abbreviated) that may differ according to the page displayed (see list in Appendix A).

The softkeys are selected by pressing the corresponding function keys located under the screen.

Softkeys



1.6 Using the Fields

The dialogue pages contain fields preceded by the field name.

When a page is called, the fields may be empty or contain alphanumeric data that can be modified.

The size of a field is proportional to the number of alphanumeric characters it can contain.

When a field is selected, it flashes.

REMARK *The field may contain default data. The data can be modified by entering new data.*

1.6.1 Field Type

There are two types of fields:

- Fields that must be always be specified **??????** ,
- Optional fields **????** .

1.6.2 Going from One Field to Another

The arrow keys of the CNC keyboard are used to move around between fields.

Requirements

Dialogue page displayed.

Actions

Use the key corresponding to the required movement (see table below).

Command	Key
Go to next line	
Go to previous line	
Go to the field on the right	
Go the field on the left	
Go to the next field in the order predefined for the page	

1.6.3 Specifying a Field

Data are specified for a field by:

- Entering and confirming data,
- Transferring highlighted data.

REMARK *When a mandatory field has not been filled in, the system refuses to go to the next screen page and a message is displayed on the dialogue line. The system returns to the field concerned.*

1.6.3.1 Specifying a Field from the Keyboard

Requirements

- Field selected.
- "=" sign displayed in the dialogue line.

Actions

Enter alphanumeric characters from the keyboard

The characters are displayed on the dialogue line.

Confirm the entry.

The data are displayed in the field and the system automatically goes to the next field.

1.6.3.2 Specifying a Field with the Softkeys

Requirements

- Field selected,
- Text or value highlighted in the softkey.

Actions

Select the highlighted data



The data are displayed in the field and the next field is automatically selected.

1.6.4 Deleting the Contents of a Field

Requirements

- Field selected.

Actions

Delete the field contents.  

The field no longer contains any data.

1.6.5 Modifying the Characters Displayed in the Dialogue Line

The characters displayed in the dialogue line can be modified from the keyboard using the arrow keys and special keys (for additional information, refer to the Operator Manual) (see table below).

Command	Key
Move cursor one space right	
Move cursor one space left	
Delete the line	
Delete the last character entered	
Insertion/overwrite toggle	
Delete the character selected	

1.7 Notes on Using the Cycle Pages

Each grinding cycle includes two dialogue pages:

- The first page includes the cycle calling arguments
- The second page includes the arguments during the cycle.

Argument Types

Cycle calling arguments

These arguments define the main characteristics related to final machining of the part.

Arguments during the cycle

These arguments specify the characteristics related to each grinding phase: roughing, finishing, sparking, etc.

A cycle can be broken down into a maximum number of 10 steps. The last step defined must include the end of cycle indication.

1.8 Using Page Numbers

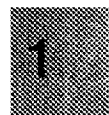
When displaying a dialogue page, the system automatically assigns a number (the default increment is 10).

It is possible to change the increments on the "INTERACTIVE PROGRAMMING" page.

The page number is displayed in a field in the top right-hand corner opposite the letters "N =".

The page numbering can be changed when editing a page in programme editing mode.

REMARK *The blocks are not renumbered when a page is added to or deleted from a programme.*



2 Accessing the Grinding Functions and Cycles

2.1	Accessing Interactive Programming	2 - 3
2.2	Interactive Programming Header Page	2 - 4

This chapter discusses access to the PROCAM GRIND interactive programming function for external or internal grinding.

2.1 Accessing Interactive Programming

To access the PROCAM GRIND interactive programming software, proceed as follows.

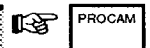
Requirements

Basic softkeys displayed on the CNC screen.



Actions

Select the "GRAPHIC PROGRAMMING" menu.



The "GRAPHIC PROGRAMMING" menu is displayed.

Select "INTERACTIVE PROGRAMMING".



This selection causes display of the "INTERACTIVE PROGRAMMING" page (see below).

2.2 Interactive Programming Header Page

The "INTERACTIVE PROGRAMMING" header page gives access to the capabilities of the PROCAM GRIND interactive programming functions for viewing, editing or creating a grinding programme or wheel file.

Information on the "INTERACTIVE PROGRAMMING" Page

PROGRAMME TO CREATE OR MODIFY

"NUMBER" This field is used to specify the number of the programme to be created or edited (if it already exists). The programme number can have up to five characters.

PAGE TO MODIFY OR LOCATE

"NUMBER" This field is used to specify the number of a page in the stored programme. If this field is not filled in, the cursor goes to the beginning of the programme (optional field).

AUTO PAGE INCREMENT

Used to modify the automatic programme page increment during creation or editing (default 10).

Information Displayed on the Softkeys

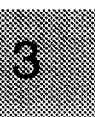
"VIEW PROG"	"Display a Programme in Memory" Displays a stored programmed (listing) (NUMBER field filled in).
"EDIT PROG"	"Programme Modification - Insertion - Deletion" Gives access to the stored programme (listed) for editing, insertion and deletion (possibly with access to detailed pages).
"NEW PROG"	"Programme creation" Used to create a numbered programme. If the message "= Programme already exists" is displayed on the dialogue line when "NEW PROG" is selected, change the programme number or delete the stored programme with the same number.
"WHEEL/FUNCT"	"Access to Wheel Files" Used to switch from editing of a grinding programme to editing of a wheel file.
"QUIT"	Exits from the "INTERACTIVE PROGRAMMING" page to return to the "GRAPHIC PROGRAMMING" menu.

2



3 External/Internal Grinding Functions and Cycles

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This chapter contains a detailed description of the screen pages defining the functions and cycles used when creating and editing internal and external grinding programmes.

Depending on the case, refer to:

- Sec. 3.1, Accessing the Menu of External Grinding Functions and Cycles
- Sec. 3.3, Accessing the Menu of Internal Grinding Functions and Cycles.

3.1 Accessing the Menu of External Grinding Functions and Cycles

3

Requirements

"INTERACTIVE PROGRAMMING" page displayed (see description in Chapter 2):

INTERACTIVE PROGRAMMING		Version 5.3
PROGRAMME TO CREATE OR MODIFY	NUMBER 6	
PAGE TO MODIFY OR LOCATE NUMBER	NUMBER <<<<<	
AUTO PAGE INCREMENT	10	

View	Display a Programme in Memory
Edit	Programme Modification - Insertion - Deletion
New	Programme Creation
Wheel	Access to Wheel Files

VIEW PROG	EDIT PROG	NEW PROG	WHEEL/ FUNCT						QUIT
--------------	--------------	-------------	-----------------	--	--	--	--	--	------

Actions

Fill in the "PROGRAMME NUMBER" field (e.g. Programme No. 6).	
Select "CREATION OF A NEW PROGRAMME"	

This selection causes display of the "GRINDING FUNCTIONS AND CYCLES" menu (see Sec. 3.2).

3.2 Selecting External Grinding Functions and Cycles

The "GRINDING FUNCTIONS AND CYCLES" menu is used to select the external grinding functions and cycles. This menu is displayed by pressing the "NEW PROG" softkey on the "INTERACTIVE PROGRAMMING" page.

Reminder

Each grinding cycle included in the "GRINDING FUNCTIONS AND CYCLES" menu includes two pages for defining:

- The cycle calling arguments on the first page,
- The arguments during the cycle on the second page.

Information on the "GRINDING FUNCTIONS AND CYCLES" Menu

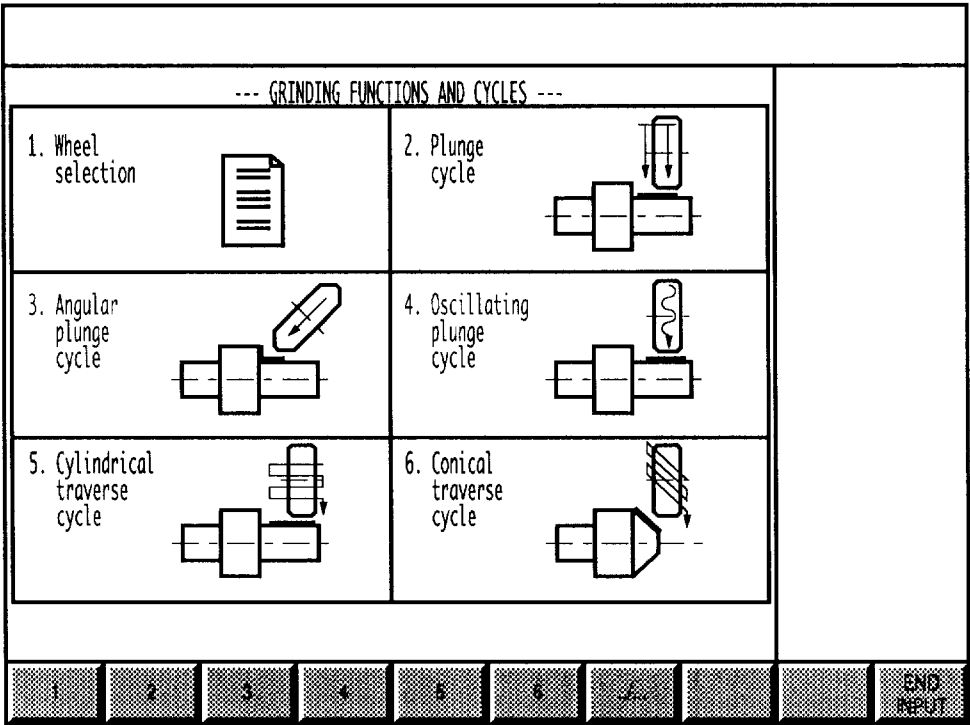
The first menu page includes the following selections:

- Wheel selection,
- Plunge cycle,
- Angular plunge cycle,
- Oscillating plunge cycle,
- Cylindrical traverse cycle,
- Conical traverse cycle.

Information on the Softkeys

"1 to 6"	Keys 1 to 6 are used for selecting the grinding functions and cycles displayed.
". / ..."	Goes to the second page of the "GRINDING FUNCTIONS AND CYCLES" menu.
"END INPUT"	Returns to the programme listing page.

First page of the "GRINDING FUNCTIONS AND CYCLES" Menu:



The functions and cycles displayed are described in the following sections by the order of their numbers.

Information on the "GRINDING FUNCTIONS AND CYCLES" Menu

The second menu page includes the following choices:

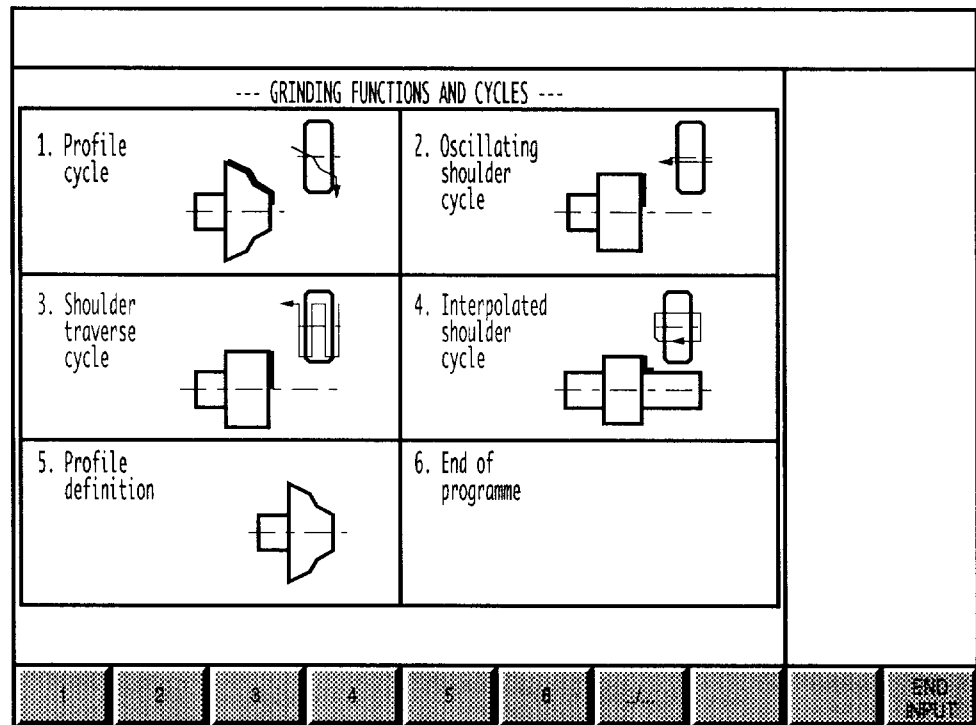
- Profile cycle
- Oscillating shoulder cycle
- Shoulder traverse cycle
- Interpolated shoulder cycle
- Profile definition
- End of programme.

REMARK *When the system software includes both external and internal grinding functions and cycles, the menu has two pages for external grinding and two for internal grinding. In this case, the "Profile definition" and "End of programme" functions are located on the second page of the internal grinding menu.*

Information on the Softkeys

- | | |
|-----------------|---|
| Keys "1" to "x" | Softkeys 1 to x are used for selecting the grinding functions and cycles displayed (the number "x" depends on the software. It is different if the software includes both the internal and external grinding functions and cycles). |
| | The ". / ..." key is only present if the software includes the internal and external grinding functions and cycles. It is used to go to the next menu page. |
| "END INPUT" | This key is used to return to the programme listing page. |

Second page of the "GRINDING FUNCTIONS AND CYCLES" Menu:



The functions displayed are described in the following sections by the order of their numbers.

3.2.1 Wheel Selection

The "WHEEL SELECTION" page is used to specify the wheel file used, initialise the working environment and start the machine.

It is necessary to select a wheel before being able to execute the other grinding functions and cycles.

Information on the "WHEEL SELECTION" Page

Wheel Selection

"Wheel Number"	The combination of wheel number and wheel data file number allows several data files to be assigned to the same wheel number.
"Data File Number"	It should be noted that : - If the data file number is equal to zero or missing, it is the same as the number specified in the "wheel number" field - If the data file number is different from zero, that number is used.
"Home Position"	Retracts the wheel to its home position at the start of the cycle.
"X Part Compensation"	Defines an offset on the X axis. This offset is independent of homing.
"Z Part Compensation"	Defines an offset on the Z axis. This offset is independent of homing.

Positioning Parameters

"Positioning Cycle"	Indicates whether the part position should be checked or not at the beginning of the cycle.
"Part Speed"	Defines the part rotation speed during the check of the part position.
"Measuring Head Position"	Indicates whether the part position measuring head is located to the right or left of the shoulder.

Grinding Speeds

"Wheel Speed" "Part Speed"	Defines the wheel and part rotation speeds during grinding (these parameters initiate functions M160, M03, M40). This function calls file %9911 in which the machine manufacturer can customise startup of the machine.
----------------------------	--

Information on the Softkeys

"CANCEL"	Cancels the wheel selection page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu (the values defined in the fields are lost)
"ENTER"	Returns to the "GRINDING FUNCTIONS AND CYCLES" menu saving the values defined in the fields.

"WHEEL SELECTION" Page:

--- WHEEL SELECTION ---	
Wheel Selection	
Wheel Number [value < 9]	: <
Data File Number [value < 100]	:
Home Position	: NO
X Part Compensation [value > -0.5]	:
Z Part Compensation [-1 < value < 1]	:
Positioning Parameters	
Positioning Cycle	:
Part Speed [rpm] [0 < value < 100]	:
Measuring Head Position	:
Grinding Speeds	
Wheel Speed [m/s]	:
Part Speed [rpm]	:

N= 10

=

CANCEL ENTER

3

3.2.2 Plunge/Multiplunge Cycle

With single plunge, the cycle is carried out by moving the wheel only on the X axis.

With multiplunge, the cycle is executed by plunging the wheel on the X axis with successive shifts on the Z axis for grinding a width exceeding the wheel width.

This cycle is accessed by the "GRINDING FUNCTIONS AND CYCLES" menu.

Information on the "PLUNGE/MULTIPLUNGE CYCLE"

"Calling Arguments" Page

"Final Diameter"	Value of the final part diameter after grinding.
"Plunge Z posit/multiplunge start Z posit"	Single plunge cycle: indicates the wheel reference side Z position when the cycle is started. Multiplunge cycle: indicates the wheel reference side first Z position when the cycle is started.
"Multiplunge End Z Position"	Multiplunge cycle: wheel reference side last Z position at the end of the cycle. Used with "Wheel overlapping in multiplunge" and "Multiplunge start Z posit" to determine the number of plunges required during each grinding phase.
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Rapid Stop Distance"	Rapid positioning at the value EP defined with respect to the final X diameter (plus allowance on X).
"Wheel Overlapping in Multiplunge"	Wheel overlap width for consecutive plunges during multiplunge. Used with the start and end Z positions to determine the number of plunges required.
"Safety Diameter for Dressing or Manual Measurements"	Wheel backoff diameter with respect to the part for dressing or manual measurements.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements along Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "PLUNGE/MULTIPLUNGE CYCLE - Arguments during the cycle" page.

"PLUNGE/MULTIPLUNGE CYCLE"
"Calling Arguments" Page :

--- PLUNGE/MULTIPLUNGE CYCLE ---
Calling Arguments

N= 10

Final DiameterX : ????????

Plunge Z posit/Multiplunge Start Z positZ : ????????

Multiplunge End PositionEZ :

Skip DiameterER :

Rapid Stop DistanceEP : ????????

Wheel Overlapping in MultiplungeP :

Safety Diameter for Dressing
or Manual Measurement :

Wheel Side Selection : LEFT

The diagram illustrates a grinding wheel setup. A central rectangular block represents the workpiece. To its right, a grinding wheel is shown. The wheel's width is labeled 'P'. The distance from the workpiece center to the wheel center is labeled 'X'. The wheel's height is labeled 'Z'. The distance from the workpiece center to the wheel's end face is labeled 'EP'. The distance from the wheel's end face to the grinding point is labeled 'EZ'. An arrow labeled 'ER' points upwards from the workpiece center, indicating the skip diameter.

=

CANCEL

ENTER

3

Information on the "PLUNGE/MULTIPLUNGE CYCLE"

"Arguments during Cycle" Page

"Stock Relative to Final Diameter"	Material thickness remaining on the X diameter at the end of the current phase.
"Plunge Speed"	Speed of wheel movement during the cycle.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Sparkout Time"	Sparkout duration.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"PLUNGE/MULTIPLUNGE CYCLE" "Arguments during Cycle" Page:

--- PLUNGE/MULTIPLUNGE CYCLE ---

Arguments during Cycle

N= 20

Stock Relative to Final Diameter X : ????????

Plunge Speed : ????????

Measuring Type : NO MEASUR

Part Origin Modification : NO MODIF

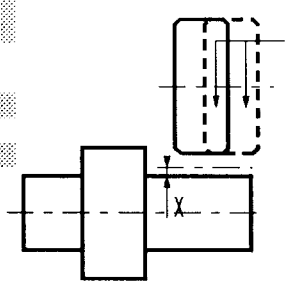
Backoff : NO

Dressing of Wheel Face : NO

Dressing of Wheel Side : NO

Sparkout Time : NO STOP

End of Cycle



=

CANCEL

ENTER

3

3.2.3 Angular Plunge Cycle

This cycle is carried out by an angular plunge along the X axis (inclined) after fast positioning on X and Z.

Information on the "ANGULAR PLUNGE CYCLE" "Calling Arguments" Page

"Final Diameter"	Final diameter of the part at the end of grinding.
"Plunge Z Wheel Position"	Indicates the wheel reference side Z position at the start of the cycle.
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Rapid Stop Distance Axis X"	Rapid positioning at the value EP defined with respect to the final X diameter plus allowance on X.
"Rapid Stop Distance Axis Z"	Rapid positioning at the value EQ defined with respect to the final Z plus allowance on Z.
"Safety Diameter for Dressing or Manual Measurement"	Wheel backoff from the part for dressing or manual measurement.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "ANGULAR PLUNGE CYCLE - Arguments during the cycle" page.

"ANGULAR PLUNGE CYCLE" "Calling Arguments" Page

--- ANGULAR PLUNGE CYCLE ---

Calling Arguments

N= 20

Final Diameter X : ????????

Plunge Z Wheel Position Z : ????????

Skip Diameter ER :

Rapid Stop Distance Axis X EP : ????????

Rapid Stop Distance Axis Z EQ : ????????

Safety Diameter for Dressing
or Manual Measurement :

=

CANCEL

ENTER

3

Information on the "ANGULAR PLUNGE CYCLE"

"Arguments during Cycle" Page

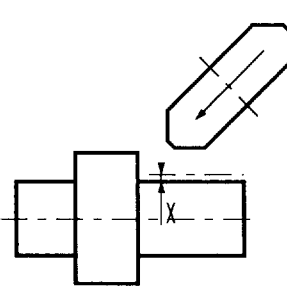
"Stock Relative to Final Diameter"	Material thickness remaining on the X diameter at the end of the current phase.
"Plunge Speed"	Speed of wheel movement during the cycle.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Sparkout Time"	Sparkout duration.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"ANGULAR PLUNGE CYCLE"
"Arguments during Cycle" Page

--- ANGULAR PLUNGE CYCLE --- Arguments during Cycle	
Stock Relative to Final Diameter	X : ?????????
Plunge Speed	: ?????????
Measuring Type	: NO MEASURE
Part Origin Modification	: NO MODIF
Backoff	:
Dressing of Wheel Face	: NO
Dressing of Wheel Side	: NO
Sparkout Time	:
End of Cycle	: NO STOP



=

CANCEL

ENTER

3

3.2.4 Oscillating Plunge/Multiplunge Cycle

With a single plunge, the cycle is carried out only by moving the wheel on the X axis.

With multiplunge, the cycle is executed by plunging the wheel on the X axis with successive shifts on the Z axis for grinding a width exceeding the wheel width.

Information on the "OSCILLATING PLUNGE/MULTIPLUNGE CYCLE"

"Calling Arguments" Page

"Final Diameter"	Value of the final part diameter after grinding.
"Plunge Z posit/multiplunge start Z posit"	Single plunge cycle: indicates the wheel reference side Z position when the cycle is started. Multiplunge cycle: indicates the wheel reference side first Z position when the cycle is started.
"Multiplunge End Z Position"	Multiplunge cycle: wheel reference side last Z position at the end of the cycle. Used with "Wheel overlapping in multiplunge" and "Multiplunge start Z posit" to determine the number of plunges required during each grinding phase.
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Rapid Stop Distance"	Rapid positioning at the value EP defined with respect to the final X diameter (plus allowance on X).
"Wheel Overlapping in Multiplunge"	Wheel overlap width used for consecutive plunges during multiplunge. Used with the start and end Z positions to determine the number of plunges required.
"Safety Diameter for Dressing or Manual Measurements"	Wheel backoff diameter with respect to the part for dressing or manual measurements.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements along Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "OSCILLATING PLUNGE/MULTIPLUNGE CYCLE - Arguments during the cycle" page.

"OSCILLATING PLUNGE/MULTIPLUNGE CYCLE" "Calling Arguments" Page

--- PLUNGE/MULTIPLUNGE CYCLE ---

Calling Arguments

N= 30

Final Diameter

Plunge Z posit/Multiplunge Start Z posit

Multiplunge End Position

Skip Diameter

Rapid Stop Distance

Wheel Overlapping in Multiplunge

Safety Diameter for Dressing
or Manual Measurement

Wheel Side Selection

X : ????????

Z : ????????

EZ :

ER :

EP : ????????

P :

:

: LEFT

=

CANCEL
ENTER

Information on the "OSCILLATING PLUNGE/MULTIPLUNGE CYCLE"

"Arguments during Cycle" Page

"Stock Relative to Final Diameter"	Material thickness remaining on the X diameter at the end of the current phase.
"Oscillation Amplitude"	Amplitude of the oscillations on Z simultaneous with plunge movement on X.
"Oscillation Frequency"	Frequency of the oscillations (number of oscillations per minute) simultaneous with plunge movement.
"Plunge Speed"	Speed of wheel movement during the cycle.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Sparkout Time"	Sparkout duration.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL", - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"OSCILLATING PLUNGE/MULTIPLUNGE CYCLE"
"Arguments during Cycle" Page

OSCILLATING PLUNGE/MULTIPLUNGE CYCLE ---

Arguments during Cycle

N= 40

Stock Relative to Final Diameter X : ????????

Oscillation Amplitude EZ : ????????

Oscillation Frequency [osc/mn] : ????????

Plunge Speed : ????????

Measuring Type : NO MEASURE

Part Origin Modification : NO MODIF

Backoff : NO

Dressing of Wheel Face : NO

Dressing of Wheel Side : NO

Sparkout Time : NO STOP

End of Cycle : NO STOP

EZ

X

=

CANCEL

ENTER

3

3.2.5 Cylindrical Traverse Cycle

This cycle is carried out by engaging the wheel on the X axis then traversing on the cylindrical surface along the Z axis.

Information on the "CYLINDRICAL TRAVERSE CYCLE"

"Calling Arguments" Page

"Traverse Cycle Final Diameter"	Part diameter at the end of grinding.
"Start Position of Wheel Z"	Indicates the wheel reference side Z position when traversing is started (the reference side is defined in the "Wheel Position" argument).
"End Position of Wheel Z"	Wheel reference side last Z position at the end of traversing (the reference side is defined in the "Wheel Position" "End" argument).
"Rapid Stop Distance"	Rapid positioning at EP defined with respect to the final X diameter (plus allowance on X).
"Dwell Time"	Dwell time before reversing the direction of movement of the wheel. The start and end times dwell can have different values.
"Wheel Position"	Position of the active wheel side at the start and end of traversing (see diagram in the Cylindrical Grinding Programming Manual).
"Wheel Overtravel"	Maximum wheel overtravel at the end of each stroke.
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Traverse Feedrate"	Feedrate along the Z axis.
"Traverse Type"	The increment can be continuous or discontinuous on the X and Z axes (see diagram in the Cylindrical Grinding Programming Manual).
"Safety Diameter for Dressing or Manual Measurement"	Wheel backoff from the part for dressing or manual measurement.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements on Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "CYLINDRICAL TRAVERSE CYCLE - Arguments during the cycle" page.

"CYLINDRICAL TRAVERSE CYCLE"
"Calling Arguments" Page

3

Information on the "CYLINDRICAL TRAVERSE CYCLE"

"Arguments during Cycle" Page

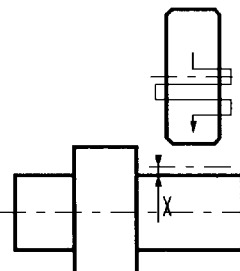
"Stock Relative to Final Diameter"	Material thickness remaining on the X diameter at the end of the current phase.
"Start Position Increment"	Movement on X at the start of discontinuous traversing or during the forward phase for continuous traversing.
"End Position Increment"	Movement on X at the end of discontinuous traversing or during the return phase for continuous traversing.
"Infeed"	Speed of movement of the wheel during increment.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"CYLINDRICAL TRAVERSE CYCLE"
"Arguments during Cycle" Page

--- CYLINDRICAL TRAVERSE CYCLE --- Arguments during Cycle	
Stock Relative to Final Diameter	X : ????????
Start Position Increment	: ????????
End Position Increment	: ????????
Infeed	: ????????
Measuring Type	: NO MEASURE
Part Origin Modification	: NO MODIF
Backoff	: NO
Dressing of Wheel Face	: NO
Dressing of Wheel Side	: NO
End of Cycle	: NO STOP



=

CANCEL

ENTER

3

3.2.6 Conical Traverse Cycle

This cycle is carried out by engaging the wheel on the X axis then traversing the conical surface along the Z axis.

Information on the "CONICAL TRAVERSE CYCLE"

"Calling Arguments" Page

"Traverse Cycle Final Diameter"	Final diameter at the base of the cone to be ground.
"Taper Grinding Final Diameter"	Final diameter at the tip of the cone to be ground.
"Taper Angle"	Angular value of the cone (see definition of EU in the Programming Manual).
"Start Position of Wheel Z"	Indicates the wheel reference side Z position when traversing is started (the reference side is defined in the "Wheel Position" argument).
"End Position of Wheel Z"	Wheel reference side last Z position at the end of traversing (the reference side is defined in the "Wheel Position" "End" argument).
"Rapid Stop Distance"	Rapid positioning at EP defined with respect to the final X diameter (plus allowance on X).
"Dwell Time"	Dwell time before reversing the direction of movement of the wheel. The start and end dwell times can have different values.
"Wheel Position"	Position of the active wheel side at the start and end of traversing (see diagram in the Cylindrical Grinding Programming Manual).
"Wheel Overtravel"	Maximum wheel overtravel at the end of each stroke.
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Traverse Feedrate"	Feedrate on the tapered traverse path.
"Traverse Type"	The increment can be continuous or discontinuous on the X and Z axes (see diagram in the Cylindrical Grinding Programming Manual).
"Safety Diameter for Dressing"	Wheel backoff from the part for dressing or manual measurement.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements in Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "CONICAL TRAVERSE CYCLE - Arguments during the cycle" page.

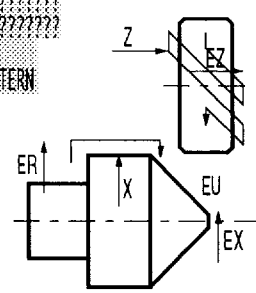
"CONICAL TRAVERSE CYCLE" "Calling Arguments" Page

--- CONICAL TRAVERSE CYCLE ---

Calling Arguments

Traverse Cycle Final Diameter X : ???????
 Taper Grinding Final Diameter EX :
 Taper Angle EU :
 Start Position of Wheel Z Z : ???????
 End Position of Wheel Z EZ : ???????
 Rapid Stop Distance : ???????
 Dwell Time Start : End :
 Wheel Position Start : INTERN End : INTERN
 Wheel Overtravel ER :
 Skip Diameter : ???????
 Traverse Feedrate : CONT
 Traverse Type :
 Safety Diameter for Dressing :
 Wheel Side Select : LEFT

N= 50



=

CANCEL
ENTER

3

Information on the "CONICAL TRAVERSE CYCLE"

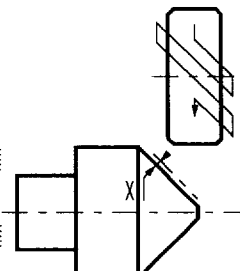
"Arguments during Cycle" Page

"Stock Relative to Final Diameter"	Material thickness remaining on the X diameter at the end of the current phase.
"Start Position Increment"	Movement on X at the start of discontinuous traversing or during the forward phase for continuous traversing.
"End Position Increment"	Movement on X at the end of discontinuous traversing or during the return phase with continuous traversing.
"Infeed"	Speed of movement of the wheel during increment.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Sparkout Time"	Sparkout duration. The "number of sparkout passes" can be used instead.
"Number of Sparkout Passes"	Number of sparkout passes during the grinding phase. The "sparkout time" can be used instead.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"CONICAL TRAVERSE CYCLE"
"Arguments during Cycle" Page

--- CONICAL TRAVERSE CYCLE --- Arguments during Cycle		N= 50
Stock Relative to Final Diameter	X : ????????	
Start Position Increment	: ????????	
End Position Increment	: ????????	
Infeed	: ????????	
Backoff	:	
Dressing of Wheel Face	: NO	
Dressing of Wheel Side	: NO	
Sparkout Time	:	
Number of Sparkout Passes	:	
End of Cycle	: NO STOP	
=		
CANCEL		ENTER

3

3.2.7 Profile Grinding Cycle

This cycle is carried out according to the profile defined point by point in an ancillary subroutine.

Information on the "PROFILE GRINDING CYCLE"

"Calling Arguments" Page

"Start Diameter X "	Diameter at the start of the profile to be ground.
"Start Z Position"	Indicates the first Z position of the active wheel side when the cycle is started.
"Stock + Safety Distance"	Rapid positioning at the value defined with respect to the final X diameter (plus allowance on X).
"Wheel Radius Offset"	Defines the wheel radius position to the left or right of the profile to be ground with respect to the direction of movement.
"Subprogram Number"	Number of the subroutine containing the definition of the profile to be ground. The subroutine can be edited separately using the "Profile definition" interactive programming command.
"Profile Description Start Block"	Indicates the number of the first block describing the profile to be ground.
"Profile Description End Block"	Indicates the number of the last block describing the profile to be ground.
"Work Feedrate"	Tangential Feedrate on the profile to be ground.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements on Z.
"Safety Diameter for Dressing"	Wheel backoff diameter from the part for dressing.

Information on the Softkeys

"CANCEL "	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "PROFILE GRINDING CYCLE - Arguments during the cycle" page.

"PROFILE GRINDING CYCLE"
"Calling Arguments" Page

PROFILE GRINDING CYCLE ---

Calling Arguments

N= 50

Start Diameter X : ????????

Start Z Position Z : ????????

Stock + Safety Distance : ????????

Wheel Radius Offset : LEFT

Subprogram Number : ???????

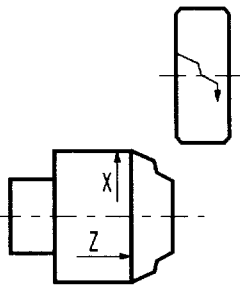
Profile Description Start Block : ??????

Profile Description End Block : ??????

Work Feedrate : ????????

Wheel Side Selection : LEFT

Safety Diameter for Dressing :



=

CANCEL

ENTER

3

Information on the "PROFILE GRINDING CYCLE"

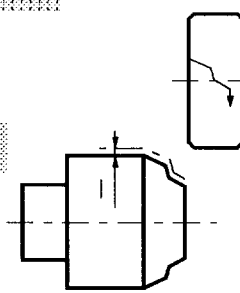
"Arguments during Cycle" Page

"Stock"	Remaining thickness of material on X diameter at the end of the current grinding phase.
"Pass Increment"	Depth of cut on X on the profile.
"Number of Sparkout Passes"	Number of sparkout passes during the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"PROFILE GRINDING CYCLE"
"Arguments during Cycle" Page

--- PROFILE GRINDING CYCLE --- Arguments during Cycle		N= 60
Stock	I : ?????????	
Pass Increment	: ?????????	
Number of Sparkout Passes	:	
Dressing of Wheel Diameter	: NO	
Dressing of Wheel Side	: NO	
End of Cycle	: NO STOP	
=		
CANCEL		ENTER

3

3.2.8 Oscillating Shoulder Cycle

This cycle is carried out by plunging on the Z axis with or without sinusoidal oscillations on the X axis.

Information on the "OSCILLATING SHOULDER CYCLE"

"Calling Arguments" Page

"Final Z Position"	Indicates the active wheel side final Z position at the end of grinding.
"X Position"	Indicates the X position during the cycle.
"Rapid Stop Distance"	Rapid positioning at the value EP defined with respect to the final X diameter (plus allowance on X).
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Safety Diameter for Dressing or Manual Measurements"	Wheel backoff diameter with respect to the part for dressing or manual measurements.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements along Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "OSCILLATING SHOULDER CYCLE - Arguments during the cycle" page.

"OSCILLATING SHOULDER CYCLE" "Calling Arguments" Page

--- OSCILLATING SHOULDER CYCLE ---

Calling Arguments

N=

Final Z Position Z :

X Position X :

Rapid Stop Distance EQ :

Skip Diameter ER :

Safety Diameter for
Dressing or Manual Measurement :

Wheel Side Selection :

The diagram illustrates the grinding process. A grinding wheel, labeled 'ER', is shown in profile. It is positioned against a workpiece, labeled 'EQ'. A vertical arrow labeled 'Z' indicates the axial movement of the wheel along the workpiece. A horizontal arrow labeled 'X' indicates the radial movement of the wheel. The workpiece is shown with a shoulder that is being ground.

=

CANCEL
ENTER

3

Information on the "OSCILLATING SHOULDER CYCLE"

"Arguments during Cycle" Page

"Stock"	Remaining thickness of material at the end of the current phase.
"Infeed Feedrate"	Speed of movement of the wheel during the cycle.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Sparkout Time"	Sparkout duration.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Oscillation Frequency"	Frequency of the oscillations (number of oscillations per minute) simultaneous with plunge movement.
"Oscillation Amplitude"	Amplitude of the oscillations on X simultaneous with plunge movement on Z.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"OSCILLATING SHOULDER CYCLE"
"Arguments during Cycle" Page

--- OSCILLATING SHOULDER CYCLE ---
Arguments during Cycle

N= 70

Stock Z : ????????

Infeed feedrate : ????????

Dressing of Wheel Face : NO

Dressing of Wheel Side : NO

Measuring Type : NO MEASURE

Part Origin Modification : NO MODIF

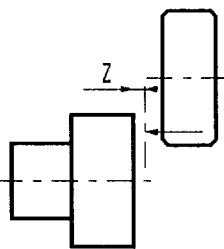
Sparkout Time :

Backoff :

Oscillation Frequency :

Oscillation Amplitude :

End of Cycle : NO STOP



=

CANCEL

ENTER

3

3.2.9 Shoulder Traverse Cycle

This cycle is carried out by plunging on the Z axis and traversing on the X axis.

Information on the "SHOULDER TRAVERSE CYCLE"

"Calling Arguments" Page

"Final Z Position"	Indicates the active wheel side final Z position at the end of grinding.
"Start X Position"	Indicates the X position at the start of traversing.
"End X Position"	Indicates the X position at the end of traversing.
"Rapid Stop Distance"	Rapid positioning at the value of EQ defined with respect to the final Z (plus allowance on Z).
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Safety Diameter for Dressing or Manual Measurements"	Wheel backoff diameter with respect to the part for dressing or manual measurements.
"Start Dwell Time"	Dwell before reversing the direction of movement of the wheel.
"End Dwell Time"	The start and end dwell times can have different values.
"Traverse Feedrate"	Feedrate on the X axis.
"Traverse Type"	Traversing can be continuous or discontinuous on the X and Z axes (see diagram in the Cylindrical Grinding Programming Manual).
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements along Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "SHOULDER TRAVERSE CYCLE - Arguments during the cycle" page.

"SHOULDER TRAVERSE CYCLE"
"Calling Arguments" Page

--- SHOULDER TRAVERSE CYCLE ---
Calling Arguments

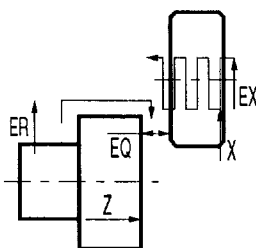
N= 70

Final Z Position
Start X Position
End X Position
Rapid Stop Distance
Skip Diameter

Z : ???????
X : ???????
EX : ???????
EQ : ???????
ER :

Safety Diameter for Dressing
or Manual Measurement
Start Dwell Time
End Dwell Time
Traverse Feedrate
Traverse Type
Wheel Side Selection

:
:
: ???????
: CONT
: LEFT



=

CANCEL

ENTER

3

Information on the "SHOULDER TRAVERSE CYCLE"

"Arguments during Cycle" Page

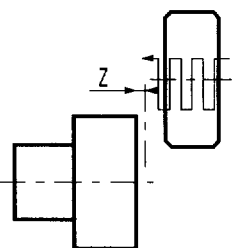
"Stock"	Remaining thickness of material on Z at the end of the current phase.
"Start Increment"	Movement on Z at the start of discontinuous traversing or during the forward phase for continuous traversing.
"End Increment"	Movement on Z at the end of discontinuous traversing or during the return phase with continuous traversing.
"Infeed Feedrate"	Speed of movement of the wheel during the cycle.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Sparkout Time"	Sparkout duration. The "number of sparkout passes" can be used instead.
"Number of Sparkout Passes"	Number of sparkout passes during the grinding phase. The "sparkout time" can be used instead.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"SHOULDER TRAVERSE CYCLE"
"Arguments during Cycle" Page

--- SHOULDER TRAVERSE CYCLE --- Arguments during Cycle	
Stock	Z : ????????
Start Increment	: ????????
End Increment	: ????????
Infeed feedrate	: ????????
Dressing of Wheel Face	: NO
Dressing of Wheel Side	: NO
Measuring Type	: NO MEASURE
Part Origin Modification	: NO MODIF
Sparkout Time	: NO STOP
Number of Sparkout Passes	
Backoff	
End of Cycle	
=	



The diagram illustrates a shoulder traverse cycle. It shows a grinding wheel (represented by a rectangle) moving along the Z-axis (indicated by an arrow) to grind a shoulder on a workpiece (represented by a stepped cylinder). The wheel is shown in two positions: one at the start of the shoulder and one at the end, with a dashed line indicating the path of movement.

3

3.2.10 Interpolated Shoulder Cycle

This cycle is used to cut a fillet or chamfer between a cylindrical surface and a shoulder. It includes several phases:

- Cylindrical grinding phase
- Shoulder grinding phase
- Shoulder/cylinder connecting phase
- Retraction and cycle restart phase.

Information on the "INTERPOLATED SHOULDER CYCLE"

"Calling Arguments" Page

"Final Diameter"	Value of the final part diameter at the end of grinding.
"Final Z Position"	Final shoulder dimension at the end of grinding.
"Start X Point"	X position at the start of the cycle.
"Start Z Point"	Z position at the start of the cycle.
"Radius"	Radius or fillet connecting the cylindrical surface and shoulder.
"Overtravel"	Backoff on the profile (cylinder or shoulder) at the end of interpolation (radius or fillet).
"Rapid Stop Distance"	Rapid positioning at the value defined with respect to the final X diameter (plus allowance on X).
"Wheel Radius Offset"	Defines the wheel radius position to the left or right of the profile to be ground with respect to the direction of movement.
"Work Feedrate"	Tangential feedrate during the cycle.
"Safety Diameter for Dressing"	Wheel backoff diameter from the part for dressing or manual measurement.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements along Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "INTERPOLATED SHOULDER CYCLE - Arguments during the cycle" page.

"INTERPOLATED SHOULDER CYCLE"
"Calling Arguments" Page

--- INTERPOLATED SHOULDER CYCLE --- Calling Arguments	
	N= 00
Final Diameter	X : ?????????
Final Z Position	Z : ?????????
Start X Point	EX : ?????????
Start Z Point	EZ : ?????????
Radius	R : ?????????
Overtravel (Backoff)	EL : ?????????
Rapid Stop Distance	EP : ?????????
Wheel Radius Offset	: LEFT
Work Feedrate	: ?????????
Safety Diameter for Dressing	
Wheel Side Selection	: LEFT

=

CANCEL ENTER

3

Information on the "INTERPOLATED SHOULDER CYCLE"

"Arguments during Cycle" Page

"Stock"	Remaining thickness of material on X diameter at the end of the current grinding phase.
"Pass Increment"	Depth of cut on X on the profile.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Number of Sparkout Passes"	Number of sparkout passes during the grinding phase.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"INTERPOLATED SHOULDER CYCLE"
"Arguments during Cycle" Page

INTERPOLATED SHOULDER CYCLE ---

Arguments during Cycle

N= 90

Stock

Pass Increment

I : ?????????

: ?????????

Dressing of Wheel Face

: NO

Dressing of Wheel Side

: NO

Number of Sparkout Passes

: NO STOP

End of Cycle

=

CANCEL

ENTER

3



3.3 Accessing the Menu of Internal Grinding Functions and Cycles

Requirements

"INTERACTIVE PROGRAMMING" page displayed (see description in Chapter 2):

INTERACTIVE PROGRAMMINGVersion 5.3

PROGRAMME TO CREATE OR MODIFYNUMBER 6

PAGE TO MODIFY OR LOCATENUMBER <<<<<

AUTO PAGE INCREMENT10

View

Edit

New

Wheel

Display a Programme in Memory

Programme Modification - Insertion - Deletion

Programme Creation

Access to Wheel Files

VIEW

EDIT

NEW

WHEEL/

FLUCT

QUIT

3

Actions

Fill in the "PROGRAMME NUMBER" field
(e.g. Programme No. 6).



Select "CREATION OF A NEW PROGRAMME".



This selection causes display of the "GRINDING FUNCTIONS AND CYCLES" menu (see Sec. 3.4).

3.4 Selecting Internal Grinding Functions and Cycles

This menu is accessed from the "INTERACTIVE PROGRAMMING" page by pressing the NEW PROG softkey. The "GRINDING FUNCTIONS AND CYCLES" menu is used to select the internal grinding functions and cycles.

Reminder

Each grinding cycle included in the "GRINDING FUNCTIONS AND CYCLES" menu includes two pages for defining:

- The cycle calling arguments on the first page
- The arguments during the cycle on the second page.

Information on the "GRINDING FUNCTIONS AND CYCLES" Menu

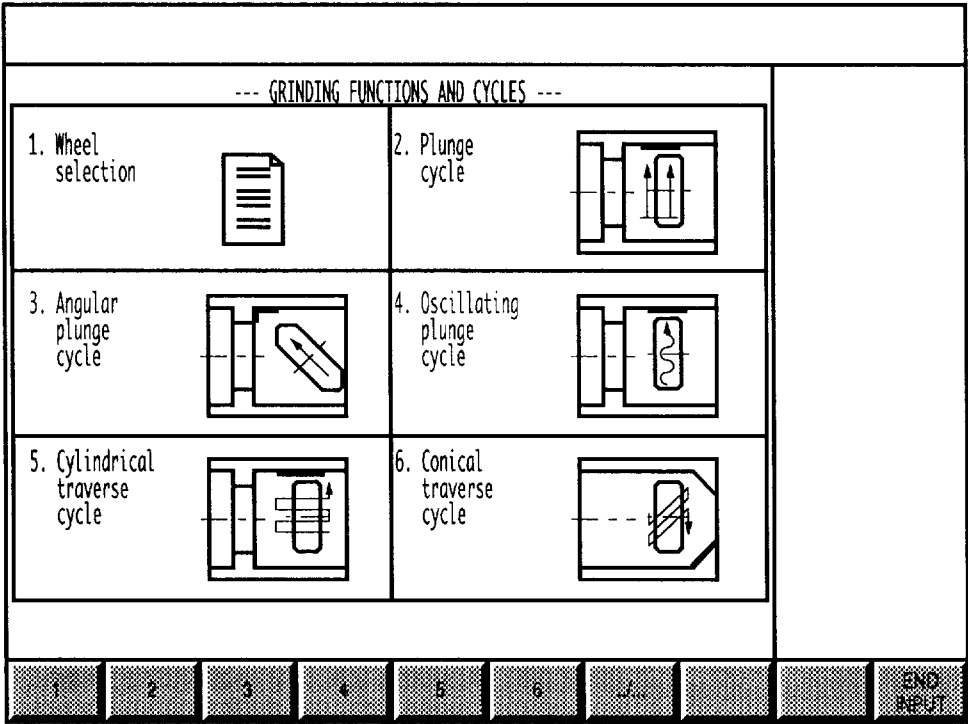
The first menu page includes the following selections:

- Wheel selection
- Plunge cycle
- Angular plunge cycle
- Oscillating plunge cycle
- Cylindrical traverse cycle
- Conical traverse cycle.

Information on the Softkeys

- | | |
|-------------|---|
| "1 to 6" | Keys 1 to 6 are used for selecting the grinding functions and cycles displayed. |
| "./..." | Goes to the second page of the "GRINDING FUNCTIONS AND CYCLES" menu. |
| "END INPUT" | Returns to the programme listing page. |

First page of the "GRINDING FUNCTIONS AND CYCLES" Menu:



The functions and cycles displayed are described in the following sections by the order of their numbers.

Information on the "GRINDING FUNCTIONS AND CYCLES" Menu

The second menu page includes the following choices:

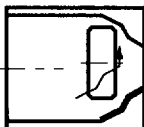
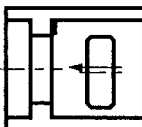
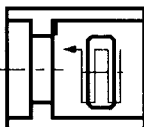
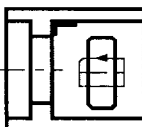
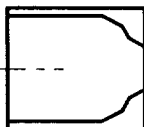
- Profile cycle
- Oscillating shoulder cycle
- Shoulder traverse cycle
- Interpolated shoulder cycle
- Profile definition
- End of programme.

REMARK *When the system software includes both external and internal grinding functions and cycles, the menu has two pages for external grinding and two for internal grinding. In this case, the "Profile definition" and "End of programme" functions are located on the second page of the internal grinding menu.*

Information on the Softkeys

- | | |
|-----------------|---|
| Keys "1" to "x" | Softkeys 1 to x are used for selecting the grinding functions and cycles displayed (the number "x" depends on the software. It is different if the software includes both the internal and external grinding functions and cycles). |
| | The ".../..." key is only present if the software includes the internal and external grinding functions and cycles. It is used to go to the next menu page. |
| "END INPUT" | This key is used to return to the programme listing page. |

Second Page of the "GRINDING FUNCTIONS AND CYCLES" Menu:

--- FONCTIONS ET CYCLES DE RECTIFICATION ---									
1. Profile cycle				2. Oscillating shoulder cycle				3	
3. Shoulder traverse cycle				4. Interpolated shoulder cycle					
5. Profile definition				6. End of programme					
1	2	3	4	5	6	7	8	9	END INPUT

The functions displayed are described in the following sections by the order of their numbers.

3.4.1 Wheel Selection

The "WHEEL SELECTION" page is used to specify the wheel file used, initialise the working environment and start the machine.

It is necessary to select a wheel before being able to execute the other grinding functions and cycles.

Information on the "WHEEL SELECTION" Page

Wheel Selection

"Wheel Number"	The combination of wheel number and wheel data file number allows several data files to be assigned to the same wheel number.
"Data File Number"	It should be noted that : - If the data file number is equal to zero or missing, it is the same as the number specified in the "wheel number" field - If the data file number is different from zero, that number is used.
"Home Position"	Retracts the wheel to its home position at the start of the cycle.
"X Part Compensation"	Defines an offset on the X axis. This offset is independent of homing.
"Z Part Compensation"	Defines an offset on the Z axis. This offset is independent of homing.
<u>Positioning Parameters</u>	
"Positioning Cycle"	Indicates whether the part position should be checked or not at the beginning of the cycle.
"Part Speed"	Defines the part rotation speed during the check of the part position.
"Measuring Head Position"	Indicates whether the part position measuring head is located to the right or left of the shoulder.

Grinding Speeds

"Wheel Speed"	Defines the wheel and part rotation speeds during grinding (these parameters initiate functions M160, M03, M40).
"Part Speed"	
This function calls file %9911 in which the machine manufacturer can customise startup of the machine.	

Information on the Softkeys

"CANCEL"	Cancels the wheel selection page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu (the values defined in the fields are lost)
"ENTER"	Returns to the "GRINDING FUNCTIONS AND CYCLES" menu saving the values defined in the fields.

"WHEEL SELECTION" Page:

3

3.4.2 Plunge/Multiplunge Cycle

With single plunge, the cycle is carried out by moving the wheel only on the X axis.

With multiplunge, the cycle is executed by plunging the wheel on the X axis with successive shifts on the Z axis for grinding a width exceeding the wheel width.

This cycle is accessed by the "GRINDING FUNCTIONS AND CYCLES" menu.

Information on the "PLUNGE/MULTIPLUNGE CYCLE"

"Calling Arguments" Page

"Final Diameter"	Value of the final part diameter after grinding.
"Plunge Z posit/multiplunge start Z posit"	Single plunge cycle: indicates the wheel reference side Z position when the cycle is started. Multiplunge cycle: indicates the wheel reference side first Z position when the cycle is started.
"Multiplunge End Z Position"	Multiplunge cycle: wheel reference side last Z position at the end of the cycle. Used with "Wheel overlapping in multiplunge" and "Multiplunge start Z posit" to determine the number of plunges required during each grinding phase.
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Rapid Stop Distance"	Rapid positioning at the value EP defined with respect to the final X diameter (plus allowance on X).
"Wheel Overlapping in Multiplunge"	Wheel overlap width for consecutive plunges during multiplunge. Used with the start and end Z positions to determine the number of plunges required.
"Safety Diameter for Dressing or Manual Measurement"	Wheel backoff diameter with respect to the part for dressing or manual measurements.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements along Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "PLUNGE/MULTIPLUNGE CYCLE - Arguments during the cycle" page.

"PLUNGE/MULTIPLUNGE CYCLE"
"Calling Arguments" Page

PLUNGE/MULTIPLUNGE CYCLE ---

Calling Arguments

N= 10

Final Diameter

Plunge Z posit/Multiplunge Start Z posit

Multiplunge End Position

X : ?????????

Z : ?????????

EZ :

Skip Diameter

Rapid Stop Distance

Wheel Overlapping in Multiplunge

ER :

EP : ?????????

P :

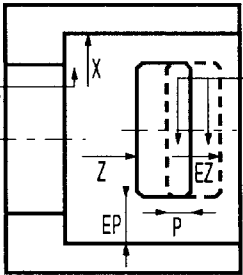
Safety Diameter for Dressing

or Manual Measurement

Wheel Side Selection

:

: LEFT



=

CANCEL

ENTER

3

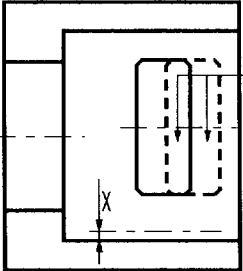
Information on the "PLUNGE/MULTIPLUNGE CYCLE" "Arguments during Cycle" Page

"Stock Relative to Final Diameter"	Material thickness remaining on the X diameter at the end of the current phase.
"Plunge Speed"	Speed of wheel movement during the cycle.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Sparkout Time"	Sparkout duration.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"PLUNGE/MULTIPLUNGE CYCLE" "Arguments during Cycle" Page

--- PLUNGE/MULTIPLUNGE CYCLE --- Arguments during Cycle		N= 20
Stock Relative to Final Diameter	X : ????????	
Plunge Speed	: ????????	
Measuring Type	: NO MEASURE	
Part Origin Modification	: NO MODIF	
Backoff	: NO	
Dressing of Wheel Face	: NO	
Dressing of Wheel Side	: NO	
Sparkout Time	: NO STOP	
End of Cycle		
=		
CANCEL		ENTER

3

3.4.3 Angular Plunge Cycle

This cycle is carried out by an angular plunge along the X axis (inclined) after fast positioning on X and Z.

Information on the "ANGULAR PLUNGE CYCLE"

"Calling Arguments" Page

"Final Diameter"	Final diameter of the part at the end of grinding.
"Plunge Z Wheel Position"	Indicates the wheel reference side Z position at the start of the cycle.
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Rapid Stop Distance Axis X"	Rapid positioning at the value EP defined with respect to the final X diameter plus allowance on X.
"Rapid Stop Distance Axis Z"	Rapid positioning at the value EQ defined with respect to the final Z plus allowance on Z.
"Safety Diameter for Dressing or Manual Measurement"	Wheel backoff from the part for dressing or manual measurement.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "ANGULAR PLUNGE CYCLE - Arguments during the cycle" page.

"ANGULAR PLUNGE CYCLE"
"Calling Arguments" Page

--- ANGULAR PLUNGE CYCLE ---
Calling Arguments

N= 20

Final Diameter X : ????????

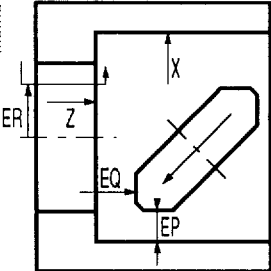
Plunge Z Wheel Position Z : ????????

Skip Diameter ER :

Rapid Stop Distance Axis X EP : ????????

Rapid Stop Distance Axis Z EQ : ????????

Safety Diameter for Dressing
or Manual Measurement :



=

CANCEL

ENTER

3

Information on the "ANGULAR PLUNGE CYCLE"

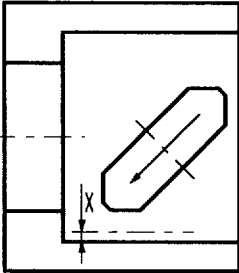
"Arguments during Cycle" Page

"Stock Relative to Final Diameter"	Material thickness remaining on the X diameter at the end of the current phase.
"Plunge Speed"	Speed of wheel movement during the cycle.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Sparkout Time"	Sparkout duration.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"ANGULAR PLUNGE CYCLE"
"Arguments during Cycle" Page

--- ANGULAR PLUNGE CYCLE --- Arguments during Cycle		N= 30
Stock Relative to Final Diameter	X : ????????	
Plunge Speed	: ????????	
Measuring Type	: NO MEASURE	
Part Origin Modification	: NO MODIF	
Backoff	: NO	
Dressing of Wheel Face	: NO	
Dressing of Wheel Side	: NO	
Sparkout Time	: NO STOP	
End of Cycle		
=		
CANCEL		ENTER

3

3.4.4 Oscillating Plunge/Multiplunge Cycle

With a single plunge, the cycle is carried out only by moving the wheel on the X axis.

With multiplunge, the cycle is executed by plunging the wheel on the X axis with successive shifts on the Z axis for grinding a width exceeding the wheel width.

Information on the "OSCILLATING PLUNGE/MULTIPLUNGE CYCLE" "Calling Arguments" Page

"Final Diameter"	Value of the final part diameter after grinding.
"Plunge Z posit/Multiplunge Start Z posit"	Single plunge cycle: indicates the wheel reference side Z position when the cycle is started. Multiplunge cycle: indicates the wheel reference side first Z position when the cycle is started.
"Multiplunge End Z Position"	Multiplunge cycle: wheel reference side last Z position at the end of the cycle. Used with "Wheel overlapping in multiplunge" and "Multiplunge start Z posit" to determine the number of plunges required during each grinding phase.
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Rapid Stop Distance"	Rapid positioning at the value EP defined with respect to the final X diameter (plus allowance on X).
"Wheel Overlapping in Multiplunge"	Wheel overlap width used for consecutive plunges during multiplunge. Used with the start and end Z positions to determine the number of plunges required.
"Safety Diameter for Dressing or Manual Measurement"	Wheel backoff diameter with respect to the part for dressing or manual measurements.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements along Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "OSCILLATING PLUNGE/MULTIPLUNGE CYCLE - Arguments during the cycle" page.

"OSCILLATING PLUNGE/MULTIPLUNGE CYCLE"
"Calling Arguments" Page

--- OSCILLATING PLUNGE/MULTIPLUNGE CYCLE --- Calling Arguments	
	N= 30
Final Diameter	X : ????????
Plunge Z posit/Multiplunge Start Z posit	Z : ????????
Multiplunge End Z Position	EZ :
Skip Diameter	ER :
Rapid Stop Distance	EP : ????????
Wheel Overlapping in Multiplunge	P :
Safety Diameter for Dressing or Manual Measurement	:
Wheel Side Selection	: LEFT

=

CANCEL

ENTER

3

Information on the "OSCILLATING PLUNGE/MULTIPLUNGE CYCLE"

"Arguments during Cycle" Page

"Stock Relative to Final Diameter"	Material thickness remaining on the X diameter at the end of the current phase.
"Oscillation Amplitude"	Amplitude of the oscillations on Z simultaneous with plunge movement on X.
"Oscillation Frequency"	Frequency of the oscillations (number of oscillations per minute) simultaneous with plunge movement.
"Plunge Speed"	Speed of wheel movement during the cycle.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Sparkout Time"	Sparkout duration.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"OSCILLATING PLUNGE/MULTIPLUNGE CYCLE"
"Arguments during Cycle" Page

OSCILLATING PLUNGE/MULTIPLUNGE CYCLE ---

Arguments during Cycle

N= 48

Stock Relative to Final Diameter X : ????????

Oscillation Amplitude EZ : ????????

Oscillation Frequency [osc/mn] : ????????

Plunge Speed : ????????

Measuring Type : NO MEASURE

Part Origin Modification : NO MODIF

Backoff : NO

Dressing of Wheel Face : NO

Dressing of Wheel Side : NO

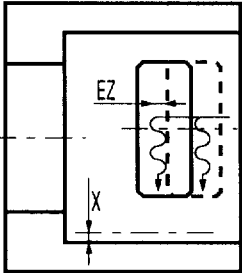
Sparkout Time : NO STOP

End of Cycle

=

CANCEL

ENTER



3

3.4.5 Cylindrical Traverse Cycle

This cycle is carried out by engaging the wheel on the X axis then traversing on the cylindrical surface along the Z axis.

Information on the "CYLINDRICAL TRAVERSE CYCLE"

"Calling Arguments" Page

"Traverse Cycle Final Diameter"	Part diameter at the end of grinding.
"Start Position of Wheel Z"	Indicates the wheel reference side Z position when traversing is started (the reference side is defined in the "Wheel Position" argument).
"End Position of Wheel Z"	Wheel reference side last Z position at the end of traversing (the reference side is defined in the "Wheel Position" "End" argument).
"Rapid Stop Distance"	Rapid positioning at EP defined with respect to the final X diameter (plus allowance on X).
"Dwell Time"	Dwell time before reversing the direction of movement of the wheel. The start and end times dwell can have different values.
"Wheel Position"	Position of the active wheel side at the start and end of traversing (see diagram in the Cylindrical Grinding Programming Manual).
"Wheel Overtravel"	Maximum wheel overtravel at the end of each stroke.
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Traverse Feedrate"	Feedrate along the Z axis.
"Traverse Type"	The increment can be continuous or discontinuous on the X and Z axes (see diagram in the Cylindrical Grinding Programming Manual).
"Safety Diameter for Dressing or Manual Measurement"	Wheel backoff from the part for dressing or manual measurement.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements on Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "CYLINDRICAL TRAVERSE CYCLE - Arguments during the cycle" page.

"CYLINDRICAL TRAVERSE CYCLE"
"Calling Arguments" Page

3

Information on the "CYLINDRICAL TRAVERSE CYCLE"

"Arguments during Cycle" Page

"Stock Relative to Final Diameter"	Material thickness remaining on the X diameter at the end of the current phase.
"Start Position Increment"	Movement on X at the start of discontinuous traversing or during the forward phase for continuous traversing.
"End Position Increment"	Movement on X at the end of discontinuous traversing or during the return phase for continuous traversing.
"Infeed"	Speed of movement of the wheel during increment.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"CYLINDRICAL TRAVERSE CYCLE" "Arguments during Cycle" Page

--- CYLINDRICAL TRAVERSE CYCLE ---

Arguments during Cycle

N= 50

Stock Relative to Final Diameter X : ????????

Start Position Increment : ????????

End Position Increment : ????????

Infeed : ????????

Measuring Type : NO MEASURE

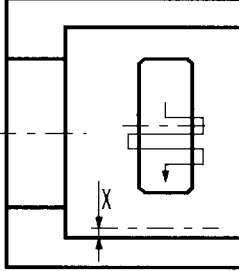
Part Origin Modification : NO MODIF

Backoff : NO

Dressing of Wheel Face : NO

Dressing of Wheel Side : NO

End of Cycle : NO STOP



=

CANCEL
ENTER

3

3.4.6 Conical Traverse Cycle

This cycle is carried out by engaging the wheel on the X axis then traversing the conical surface along the Z axis.

Information on the "CONICAL TRAVERSE CYCLE" "Calling Arguments" Page

"Traverse Cycle Final Diameter"	Final diameter at the base of the cone to be ground.
"Taper Grinding Final Diameter"	Final diameter at the tip of the cone to be ground.
"Taper Angle"	Angular value of the cone (see definition of EU in the Programming Manual).
"Start Position of Wheel Z"	Indicates the wheel reference side Z position when traversing is started (the reference side is defined in the "Wheel Position" argument).
"End Position of Wheel Z"	Wheel reference side last Z position at the end of traversing (the reference side is defined in the "Wheel Position" "End" argument).
"Rapid Stop Distance"	Rapid positioning at EP defined with respect to the final X diameter (plus allowance on X).
"Dwell Time"	Dwell time before reversing the direction of movement of the wheel. The start and end dwell times can have different values.
"Wheel Position"	Position of the active wheel side at the start and end of traversing (see diagram in the Cylindrical Grinding Programming Manual).
"Wheel Overtravel"	Maximum wheel overtravel at the end of each stroke.
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Traverse Feedrate"	Feedrate on the tapered traverse path.
"Traverse Type"	The increment can be continuous or discontinuous on the X and Z axes (see diagram in the Cylindrical Grinding Programming Manual).
"Safety Diameter for Dressing"	Wheel backoff from the part for dressing or manual measurement.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements in Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "CONICAL TRAVERSE CYCLE - Arguments during the cycle" page.

"CONICAL TRAVERSE CYCLE"
"Calling Arguments" Page

CONICAL TRAVERSE CYCLE ---

Calling Arguments

N= 50

Traverse Cycle Final Diameter X : ????????

Taper Grinding Final Diameter EX :

Taper Angle EU :

Start Position of Wheel Z Z : ????????

End Position of Wheel Z EZ : ????????

Rapid Stop Distance : ????????

Dwell Time Start : End :

Wheel Position Start : INTERN End : INTERN

Wheel Overtravel ER :

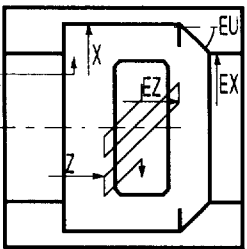
Skip Diameter : ????????

Traverse Feedrate : CONT

Traverse Type : CONT

Safety Diameter for Dressing :

Wheel Side Select : LEFT



=

CANCEL

ENTER

3

Information on the "CONICAL TRAVERSE CYCLE"

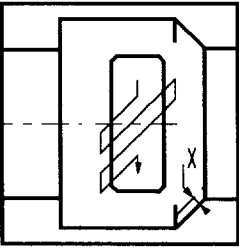
"Arguments during Cycle" Page

"Stock Relative to Final Diameter"	Material thickness remaining on the X diameter at the end of the current phase.
"Start Position Increment"	Movement on X at the start of discontinuous traversing or during the forward phase for continuous traversing.
"End Position Increment"	Movement on X at the end of discontinuous traversing or during the return phase with continuous traversing.
"Infeed"	Speed of movement of the wheel during increment.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Sparkout Time"	Sparkout duration. The "number of sparkout passes" can be used instead.
"Number of Sparkout Passes"	Number of sparkout passes during the grinding phase. The "sparkout time" can be used instead.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"CONICAL TRAVERSE CYCLE"
"Arguments during Cycle" Page

--- CONICAL TRAVERSE CYCLE --- Arguments during Cycle		N= 60
Stock Relative to Final Diameter	X : ????????	
Start Position Increment	: ????????	
End Position Increment	: ????????	
Infeed	: ????????	
Backoff	:	
Dressing of Wheel Face	: NO	
Dressing of Wheel Side	: NO	
Sparkout Time	:	
Number of Sparkout Passes	:	
End of Cycle	: NO STOP	
=		
CANCEL		ENTER

3

3.4.7 Profile Grinding Cycle

This cycle is carried out according to the profile defined point by point in an ancillary subroutine.

Information on the "PROFILE GRINDING CYCLE"

"Calling Arguments" Page

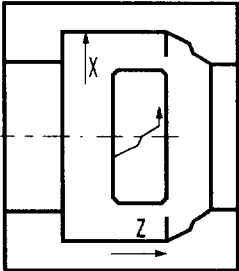
"Start Diameter X"	Diameter at the start of the profile to be ground.
"Start Z Position"	Indicates the first Z position of the active wheel side when the cycle is started.
"Stock + Safety Distance"	Rapid positioning at the value defined with respect to the final X diameter (plus allowance on X).
"Wheel Radius Offset"	Defines the wheel radius position to the left or right of the profile to be ground with respect to the direction of movement.
"Subprogram Number"	Number of the subroutine containing the definition of the profile to be ground. The subroutine can be edited separately using the "Profile definition" interactive programming command.
"Profile Description Start Block"	Indicates the number of the first block describing the profile to be ground.
"Profile Description End Block"	Indicates the number of the last block describing the profile to be ground.
"Work Feedrate"	Tangential Feedrate on the profile to be ground.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements on Z.
"Safety Diameter for Dressing"	Wheel backoff diameter from the part for dressing.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "PROFILE GRINDING CYCLE - Arguments during the cycle" page.

"PROFILE GRINDING CYCLE"
"Calling Arguments" Page

--- PROFILE GRINDING CYCLE --- Calling Arguments	
	N= 60
Start Diameter X	X : ????????
Start Z Position	Z : ????????
Stock + Safety Distance	: ????????
Wheel Radius Offset	: LEFT
Subprogram Number	: ????????
Profile Description Start Block	: ??????
Profile Description End Block	: ??????
Work Feedrate	: ????????
Wheel Side Selection	: LEFT
Safety Diameter for Dressing	:



=

CANCEL

ENTER

3

Information on the "PROFILE GRINDING CYCLE"

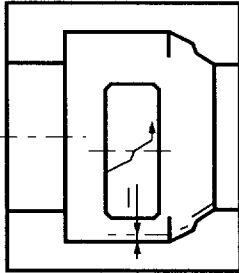
"Arguments during Cycle" Page

"Stock"	Remaining thickness of material on X diameter at the end of the current grinding phase.
"Pass Increment"	Depth of cut on X on the profile.
"Number of Sparkout Passes"	Number of sparkout passes during the grinding phase.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"PROFILE GRINDING CYCLE"
"Arguments during Cycle" Page

--- PROFILE GRINDING CYCLE ---<br/ Arguments during Cycle		N= 70
Stock	I : ????????	
Pass Increment	: ????????	
Number of Sparkout Passes	:	
Dressing of Wheel Diameter	: NO	
Dressing of Wheel Side	: NO	
End of Cycle	: NO STOP	
=		
CANCEL		ENTER

3

3.4.8 Oscillating Shoulder Cycle

This cycle is carried out by plunging on the Z axis with or without sinusoidal oscillations on the X axis.

Information on the "OSCILLATING SHOULDER CYCLE"

"Calling Arguments" Page

"Final Z Position"	Indicates the active wheel side final Z position at the end of grinding.
"X Position"	Indicates the X position during the cycle.
"Rapid Stop Distance"	Rapid positioning at the value EP defined with respect to the final X diameter (plus allowance on X).
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Safety Diameter for Dressing or Manual Measurement"	Wheel backoff diameter with respect to the part for dressing or manual measurements.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements along Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "OSCILLATING SHOULDER CYCLE - Arguments during the cycle" page.

"OSCILLATING SHOULDER CYCLE"
"Calling Arguments" Page

OSCILLATING SHOULDER CYCLE ---

Calling Arguments

N= 70

Final Z Position Z : ????????

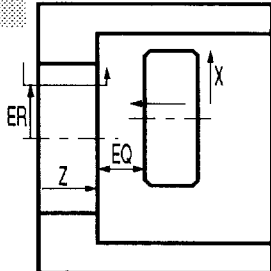
X Position X : ????????

Rapid Stop Distance EQ : ????????

Skip Diameter ER :

Safety Diameter for Dressing or Manual Measurement :

Wheel Side Selection : LEFT



=

CANCEL

ENTER

3

Information on the "OSCILLATING SHOULDER CYCLE"

"Arguments during Cycle" Page

"Stock"	Remaining thickness of material at the end of the current phase.
"Infeed Feedrate"	Speed of movement of the wheel during the cycle.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Sparkout Time"	Sparkout duration.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"Oscillation Frequency"	Frequency of the oscillations (number of oscillations per minute) simultaneous with plunge movement.
"Oscillation Amplitude"	Amplitude of the oscillations on X simultaneous with plunge movement on Z.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"OSCILLATING SHOULDER CYCLE" "Arguments during Cycle" Page

--- OSCILLATING SHOULDER CYCLE ---

Arguments during Cycle

N= 88

Stock

Infeed Feedrate

Dressing of Wheel Face

Dressing of Wheel Side

Measuring Type

Part Origin Modification

Sparkout Time

Backoff

Oscillation Frequency [osc/mn]

Oscillation Amplitude

End of Cycle

Z : ????????

: ????????

: NO

: NO

: NO MEASURE

: NO MODIF

:

:

: NO STOP

=

CANCEL

ENTER

3

3.4.9 Shoulder Traverse Cycle

This cycle is carried out by plunging on the Z axis and traversing on the X axis.

Information on the "SHOULDER TRAVERSE CYCLE"

"Calling Arguments" Page

"Final Z Position"	Indicates the active wheel side final Z position at the end of grinding.
"Start X Position"	Indicates the X position at the start of traversing.
"End X Position"	Indicates the X position at the end of traversing.
"Rapid Stop Distance"	Rapid positioning at the value of EQ defined with respect to the final Z (plus allowance on Z).
"Skip Diameter"	Diameter beyond which the wheel cannot move before reaching the Z position defined in the cycle.
"Safety Diameter for Dressing or Manual Measurement"	Wheel backoff diameter with respect to the part for dressing or manual measurements.
"Start Dwell Time"	Dwell before reversing the direction of movement of the wheel.
"End Dwell Time"	The start and end dwell times can have different values.
"Traverse Feedrate"	Feedrate on the X axis.
"Traverse Type"	Traversing can be continuous or discontinuous on the X and Z axes (see diagram in the Cylindrical Grinding Programming Manual).
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements along Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "SHOULDER TRAVERSE CYCLE - Arguments during the cycle" page.

"SHOULDER TRAVERSE CYCLE"
"Calling Arguments" Page

--- SHOULDER TRAVERSE CYCLE ---
Calling Arguments

N= 80

Final Z Position
Start X Position
End X Position
Rapid Stop Distance
Skip Diameter

Z : ???????
X : ???????
EX : ???????
EQ : ???????
ER :

Safety Diameter for
Dressing or Manual Measurement :
Start Dwell Time
End Dwell Time
Traverse Feedrate
Traverse Type
Wheel Side Selection

:
:
:
: ???????
: CONT
: LEFT

=

CANCEL

ENTER

3

Information on the "SHOULDER TRAVERSE CYCLE"

"Arguments during Cycle" Page

"Stock"	Remaining thickness of material on Z at the end of the current phase.
"Start Increment"	Movement on Z at the start of discontinuous traversing or during the forward phase for continuous traversing.
"End Increment"	Movement on Z at the end of discontinuous traversing or during the return phase with continuous traversing.
"Infeed Feedrate"	Speed of movement of the wheel during the cycle.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Measuring Type"	Where required, specifies the measurement conditions during the cycle: - No measurement during the cycle - Gap elimination, grinding of the part for measurement approximation - Grinding with measurement; the current phase is stopped by an interrupt numbered from 2 to 9 - Conditional call to manual measurement with optional stop by setting of a parameter E40000 - Unconditional manual measurement call with programmed stop for measurement.
"Part Origin Modification"	Used to compensate for wheel wear by comparison between the position of the axes and the measured dimension when the measurement system is active. Actual part: The change in origins affects only the current part. All parts: The change in origins affects all parts.
"Sparkout Time"	Sparkout duration. The "number of sparkout passes" can be used instead.
"Number of Spark out Passes"	Number of sparkout passes during the grinding phase. The "sparkout time" can be used instead.
"Backoff"	Value of the wheel backoff diameter at the end of the grinding phase.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"SHOULDER TRAVERSE CYCLE" "Arguments during Cycle" Page

--- SHOULDER TRAVERSE CYCLE ---

Arguments during Cycle

N= 90

Stock Z : ????????

Start Increment : ????????

End Increment : ????????

Infeed feedrate : ????????

Dressing of Wheel Face : NO

Dressing of Wheel Side : NO

Measuring Type : NO MEASURE

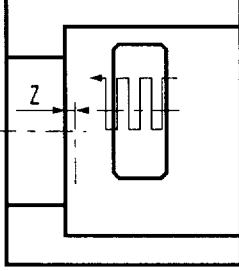
Part Origin Modification : NO MODIF

Sparkout Time :

Number of Sparkout Passes :

Backoff : NO STOP

End of Cycle :



=

CANCEL
ENTER

3

3.4.10 Interpolated Shoulder Cycle

This cycle is used to cut a fillet or chamfer between a cylindrical surface and a shoulder. It includes several phases:

- Cylindrical grinding phase
- Shoulder grinding phase
- Shoulder/cylinder connecting phase
- Retraction and cycle restart phase.

Information on the "INTERPOLATED SHOULDER CYCLE"

"Calling Arguments" Page

"Final Diameter"	Value of the final part diameter at the end of grinding.
"Final Z Position"	Final shoulder dimension at the end of grinding.
"Start X Point"	X position at the start of the cycle.
"Start Z Point"	Z position at the start of the cycle.
"Radius"	Radius or fillet connecting the cylindrical surface and shoulder.
"Overtravel"	Backoff on the profile (cylinder or shoulder) at the end of interpolation (radius or fillet).
"Rapid Stop Distance"	Rapid positioning at the value defined with respect to the final X diameter (plus allowance on X).
"Wheel Radius Offset"	Defines the wheel radius position to the left or right of the profile to be ground with respect to the direction of movement.
"Work Feedrate"	Tangential feedrate during the cycle.
"Safety Diameter for Dressing"	Wheel backoff diameter from the part for dressing or manual measurement.
"Wheel Side Selection"	Selects the active wheel side to be used as reference for wheel movements along Z.

Information on the Softkeys

"CANCEL"	Cancels the page and returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "INTERPOLATED SHOULDER CYCLE - Arguments during the cycle" page.

"INTERPOLATED SHOULDER CYCLE" "Calling Arguments" Page

--- INTERPOLATED SHOULDER CYCLE ---

Calling Arguments

N= 90

Final Diameter

Final Z Position

Start X Point

Start Z Point

Radius

Overtravel (Backoff)

Rapid Stop Distance

Wheel Radius Offset : LEFT

Work Feedrate : ????????

Safety Diameter for Dressing :

Wheel Side Selection : LEFT

X : ????????

Z : ????????

EX : ????????

EZ : ????????

R : ????????

EL : ????????

EP : ????????

=

CANCEL

ENTER

3

Information on the "INTERPOLATED SHOULDER CYCLE"

"Arguments during Cycle" Page

"Stock"	Remaining thickness of material on X diameter at the end of the current grinding phase.
"Pass Increment"	Depth of cut on X on the profile.
"Dressing of Wheel Face"	Indicates whether the wheel periphery is dressed during the dressing operation.
"Dressing of Wheel Side"	Indicates whether the wheel sides are dressed during the dressing operation.
"Number of Sparkout Passes"	Number of sparkout passes during the grinding phase.
"End of Cycle"	Indicates whether the current phase is the last one in the cycle.

Information on the Softkeys

"CANCEL"	Cancels the page and goes to the "CONTINUATION", "RETURN" or "END" page which includes the following softkeys: - "RETURN": returns to the page left by pressing "CANCEL" - "END INPUT": returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"ENTER"	Goes to the "GRINDING FUNCTIONS AND CYCLES" menu.

"INTERPOLATED SHOULDER CYCLE" "Arguments during Cycle" Page

--- INTERPOLATED SHOULDER CYCLE --- Arguments during Cycle	
Stock	I : ?????????
Pass Increment	: ?????????
Dressing of Wheel Face	: NO
Dressing of Wheel Side	: NO
Number of Sparkout Passes	: NO STOP
End of Cycle	

N= 100

=

CANCEL ENTER

3

3.5 Profile Definition

The "Profile Definition" command in the main menu gives access to other commands, not specifically dedicated to machining by external or internal grinding.

Information on the "Profile Description" Page

This page gives access to the following commands:

- PGP
- PROFIL

"PGP"

"PGP" is used to define a profile by creating lines and circles in cartesian or polar coordinates.

"PGP" also gives access to the following additional programming functions:

- ISO programming for defining a profile by the coordinates of its points
- Parametric programming
- Programming of sequence and subroutine branches and calls.

"PROFIL"

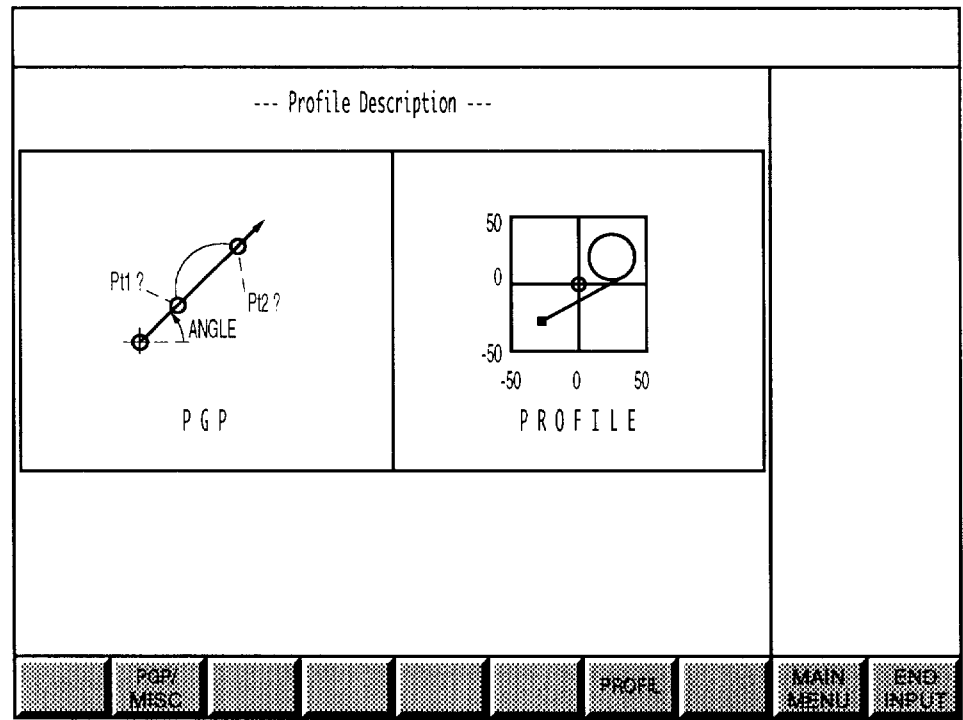
"PROFIL" is a graphic module used to describe all or part of a contour consisting of a sequence of geometric line and circles elements with immediate display of construction.

See the PROFIL operator's manual.

Information on the Softkeys

"PGP/MISC"	Action on this key displays the "LINE-CIRCLE-MISC" definition page.
"PROFIL"	Action on this key displays the first page of the "PROFIL" module.
"MAIN MENU"	Action on this key returns to the "GRINDING FUNCTIONS AND CYCLES" menu.
"END INPUT"	Action on this key returns to the general programme editing page.

"Profile Description" Page



3

3.5.1 PROFIL Function

The PROFIL entry page is accessed by selecting the PROFIL softkey on the "Profile Description" page.

Information on the "PROFIL" Entry Page

"Vertical plane"	Selection of the working plane (default X-Y). Use the right or left arrow to select the Z-X plane.
"F10 Next"	Action on function key "F10" displays the next page of PROFIL.
"F12 Return"	Action on function key "F12" exits from PROFIL.

"PROFIL" Entry Page:

	Version 0.90 03.12.93
	Plane X-Y Nb Profile Last Pt
Choose: Vertical plane X-Y <--> Choice	
F10 Next	F12 Return

3

3.5.2 Miscellaneous Functions

The "LINE-CIRCLE-MISC" definition page is accessible by selecting the "PGP" softkey on the "Profile Description" page.

Information on the "LINE-CIRCLE-MISC" Page

LINE

- | | |
|----------------|---|
| "01 CARTESIAN" | For defining a line in cartesian coordinates. |
| "02 POLAR" | For defining a line in polar coordinates. |

CIRCLE

- | | |
|----------------|---|
| "03 CARTESIAN" | For defining a circle in cartesian coordinates. |
| "04 POLAR" | For defining a circle in polar coordinates. |

MISC

- | | |
|-----------------|---|
| "05 ISO" | Allows the use of ISO programming for defining a profile or points. |
| "06 PARAMETERS" | Allows the use of parameters in programming. |
| "07 MISC" | Allows the use of other functions such as sequence and subroutine branches and calls. |

Information on the Softkeys

- | | |
|-------------|---|
| "01 to 04" | Give access to the line or circle coordinate type page. |
| "05 to 07" | Give access to the first page of the command selected. |
| "MAIN MENU" | This key is used to return to the "GRINDING FUNCTIONS AND CYCLES" menu. |
| "END INPUT" | Action on this key returns to the general programme editing page. |

"LINE-CIRCLE-MISC" Definition Page

<table border="1"><tr><td>LINE 01 CARTESIAN 02 POLAR </td><td>CIRCLE 03 CARTESIAN 04 POLAR </td><td>MISC 05 ISO 06 PARAMETERS 07 MISC</td></tr></table>							LINE 01 CARTESIAN 02 POLAR 	CIRCLE 03 CARTESIAN 04 POLAR 	MISC 05 ISO 06 PARAMETERS 07 MISC			
LINE 01 CARTESIAN 02 POLAR 	CIRCLE 03 CARTESIAN 04 POLAR 	MISC 05 ISO 06 PARAMETERS 07 MISC										
01	02	03	04	05	06	07		MAIN MENU	END INPUT			

3

3.6 End of Programme

Selection of "End of Programme" in the "GRINDING FUNCTIONS AND CYCLES" menu ends the part programme.

Information on the "End of Programme" Page

End of Programme defined:

- calling of the ISO coolant off (M09) and spindle stop (M05) functions
- calling of subroutine %9912
- calling of the ISO end of programme (M02).

Information on the Softkeys

- | | |
|----------|---|
| "CANCEL" | Cancels the end of programme and returns to the "GRINDING FUNCTIONS AND CYCLES" menu (i.e. the programme is not ended). |
| "ENTER" | Displays the general programme page. |

"End of Programme" Page:

								N= 90<<<<<	
--- End of Programme --- Cancel or Enter									
=									
			CANCEL						ENTER

3

3.7 Programme Synopsis Page

Information on the Programme Synopsis Page

This page allows you to view or edit the listing synopsis of the programme created.

The programme listing synopsis includes:

- the programme number
- the numbered blocks followed by the name of the function or cycle.

The programme synopsis is accessed by action on one of the two following pages in the "INTERACTIVE PROGRAMMING" page:

- "VIEW PROG": To view the programme synopsis and detailed pages
- "EDIT PROG": To edit the programme synopsis, i.e. edit, add and delete elements (possibly with detail view of the pages).

Information on the Softkeys

"PREV. BLOCK", "NEXT BLOCK", ". / ..."	Each action on key ". / ..." modifies the contents of the two leftmost keys ("PREV. BLOCK" and "NEXT BLOCK") and the method for moving the cursor in the programme displayed.
	The movements selected by key ". / ..." are as follows: - "PREV. BLOCK" and "NEXT BLOCK" (previous or next block) - "PREV. PAGE" and "NEXT PAGE" (previous or next page) - "PREV. BL. ID" and "NEXT BL. ID" (same block up/down) - "START PROG" and "END PROG" (start/end of programme).
"DETAIL"	To display the detailed contents of the screen page corresponding to the block selected in the file. In edit mode, new blocks can be inserted after the block selected.
"DELETE"	To delete the selected block from the file.
"MODIFY"	To modify the selected block in the file.
"ENTER"	To insert a block in the file or at the end of the file.
"OUT"	To exit from the file and return to the "GRAPHIC PROGRAMMING" page.

Programme Synopsis Page (example):

%G8.0 N10 - Wheel Selection - N20 - Ext - Traverse - Call - N30 - Ext - Traverse - Cycle - N40 - Ext - Traverse - Cycle - N50 - Ext - Traverse - Cycle - >N60 - End -									
PREV BLOCK	NEXT BLOCK	...	DETAIL		DELETE	MODIFY	ENTER		OUT

3



4 Wheel File

4.1	Editing and Creating Wheel Files	4 - 3
4.2	Selecting a Wheel File to be Edited	4 - 4
4.3	Viewing the Wheel File Selected	4 - 6
4.4	Wheel Data Menu	4 - 8
4.5	Standard Straight Wheel Data - Fixed Dresser	4 - 10
4.6	Special Wheel Data - Fixed Dresser	4 - 12
4.7	Angular Wheel Data - Fixed Dresser	4 - 14
4.8	Special Wheel Data - Roller Dresser	4 - 16

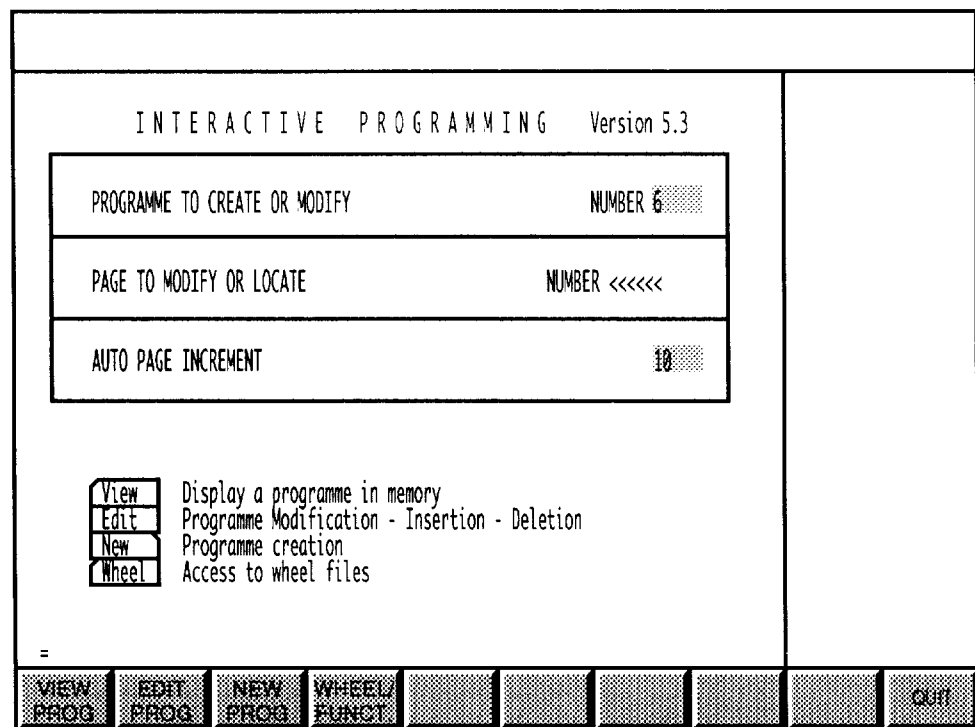


This chapter describes access to the wheel file and the screen pages defining the wheel data used for creating or editing a file.

4.1 Editing and Creating Wheel Files

Requirements

"INTERACTIVE PROGRAMMING" page displayed:



INTERACTIVE PROGRAMMING Version 5.3

PROGRAMME TO CREATE OR MODIFY	NUMBER 6
PAGE TO MODIFY OR LOCATE	NUMBER <<<<<
AUTO PAGE INCREMENT	10

View	Display a programme in memory
Edit	Programme Modification - Insertion - Deletion
New	Programme creation
Wheel	Access to wheel files

=

VIEW PROG	EDIT PROG	NEW PROG	WHEEL FUNCT						QUIT
--------------	--------------	-------------	----------------	--	--	--	--	--	------

4

Actions

Select "ACCESS TO WHEEL FILES"



WHEEL/
FUNCT.

This selection causes display of the "WHEEL FILES" page.

4.2 Selecting a Wheel File to be Edited

The "WHEEL FILES" page is accessed by pressing the "WHEEL/FUNCT." softkey on the "INTERACTIVE PROGRAMMING" page.

The "WHEEL FILES" page gives access to the "WHEEL DATA" menu.

Information on the "WHEEL FILES" Page

"Wheel file number"	For specifying a wheel file number from 1 to 99. The file variables are saved in a programme %990x.x where x.x is the file number. Example: File number 61 corresponds to programme %9906.1. File number 01 (%9900.1) is selected by default.
"Block number N.."	When editing or viewing a wheel file, this field is used to position the cursor directly on the block whose number is specified.

Information on the Softkeys

"VIEW PROG"	To view the file whose number is specified.
"EDIT PROG"	To access the file whose number is specified to edit, insert and delete blocks (possibly with access to the detail pages).
"NEW PROG"	To create a numbered programme. If the message "= Programme Already Exists" appears on the dialogue line after specifying a number for the new programme, either change the programme number or delete the stored programme with the same number.
"WHEEL/FUNCT."	To switch from editing a wheel file to editing a part programme.
"QUIT"	To exit from PROCAM and return to the "GRAPHIC PROGRAMMING" menu.

"WHEEL FILES" Page:

--- WHEEL FILES ---									
Wheel file number : 01 Block number N.. :									
=									
VIEW PROC	EDIT PROC	NEW PROC	WHEEL FUNCT						QUIT

4

4.3 Viewing the Wheel File Selected

The wheel file is displayed by pressing the "VIEW PROG" or "EDIT PROG" softkey on the "WHEEL FILES" page (default file number 01).

If the selected file is 01 and the selected block is N2, programme %9900.1 is displayed with the cursor on N2 (see page opposite).

Information on the Softkeys

"PREV. BLOCK", "NEXT BLOCK", "..."	Each action on key "..." modifies the contents of the two leftmost keys ("PREV. BLOCK" and "NEXT BLOCK") and the method for moving the cursor in the programme displayed.
--	---

The movements selected by key "..." are as follows:

- "PREV. BLOCK" and "NEXT BLOCK" (previous or next block)
- "PREV. PAGE" and "NEXT PAGE" (previous or next page)
- "PREV. BL. ID" and "NEXT BL. ID" (same block up/down)
- "START PROG" and "END PROG" (start/end of programme).

"DETAIL"	To display the detailed contents of the screen page corresponding to the block selected in the file. In edit mode, new blocks can be inserted after the block selected.
"DELETE"	To delete the selected block from the file.
"MODIFY"	To modify the selected block in the file.
"ENTER"	To insert a block in the file or at the end of the file.
"OUT"	To exit from the file and return to the "WHEEL FILES" page.

Page of the file to be viewed or edited (example):

<pre> >%9900.3 N - Special Wheel - 1 - 3 - 7 - 8 - 10 - 11 - 12 - 13 - 31 - 32 - 37 N10 - Profile PROFIL 1 </pre>									
PREV BLOCK	NEXT BLOCK	↵	DETAIL		DELETE	MODIFY	ENTER		CUT

4

4.4 Wheel Data Menu

The "WHEEL DATA" menu is accessed by selecting the "NEW PROG" softkey on the "INTERACTIVE PROGRAMMING" page.

The "WHEEL DATA" menu is used to select a wheel and the suitable dresser.

Information on the "WHEEL DATA" Menu

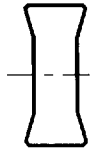
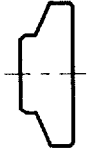
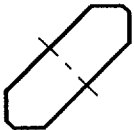
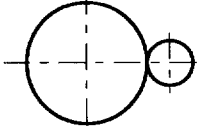
The menu page is used to select the wheel and dresser:

- Standard Straight Wheel - Fixed Dresser
- Special Wheel - Fixed Dresser
- Standard Angular Wheel - Fixed dresser
- Special Wheel - Roller Dresser.

Information on the Softkeys

- | | |
|-------------|---|
| "1 to 4" | Softkeys 1 to 4 give access to the data on the corresponding wheel. |
| "END INPUT" | This key is used to return to the "INTERACTIVE PROGRAMMING" page. |

"WHEEL DATA" menu page:

--- WHEEL DATA ---									
1. Std Straight Wheel - Fixed Dresser					2. Special Wheel - Fixed Dresser				
									
3. Std Angular Wheel - Fixed dresser					4. Special Wheel - Roller Dresser				
									
1	2	3	4					END INPUT	

4

4.5 Standard Straight Wheel Data - Fixed Dresser

The "STANDARD STRAIGHT WHEEL DATA - FIXED DRESSER" page is accessed by selecting softkey "1" on the "WHEEL DATA" menu.

Information on the "STANDARD STRAIGHT WHEEL DATA - FIXED DRESSER" Page

"GENERAL DATA"

"Home Position"	Specifies the home position of the wheel on the X and Z axes (when no machining is in progress).
"Number for Special Dressing Cycle"	Gives the possibility of executing a cycle other than a NUM cycle. In this case, the cycle profile must be defined in a programme that will be called by the same number.

"DRESSING DATA"

"Dressing"	Parts (face (periphery)/sides) of the wheel to be dressed to true the wheel.
"Dressing Feed"	Feed rate during periphery and side dressing.
"Dressing Increment"	Depth of cut for dressing on the X and Z axes.
"Safety Distance"	Approach distance of the two-diamond dresser at high speed.
"Number of Parts between Dressings"	Dressing frequency of the wheel periphery and left- and right-hand sides.

"GEOMETRIC DATA"

For geometric data other than those listed below, refer to the wheel definition opposite.

"Smallest Wheel Width"	Width below which the wheel can no longer be used.
"Unused Wheel Diameter"	Wheel diameter before shaping.
"Used Wheel Diameter"	Diameter below which the wheel can no longer be used.

"SHAPING DATA"

"Shaping"	Parts of the wheel to be dressed for preliminary shaping.
"Shaping Amount"	Total amount of material to be removed during shaping.
"Shaping Increment"	Shaping depth of cut.
"Shaping Feed"	Feed rate during shaping of the wheel periphery and sides.

Information on the Softkeys

"CANCEL"	Action on this key causes a return to the "WHEEL DATA" menu.
"ENTER"	Action on this key displays the "Profile Description" page.

"STANDARD STRAIGHT WHEEL DATA - FIXED DRESSER" Page:

--- STANDARD STRAIGHT WHEEL DATA - FIXED DRESSER ---	
GENERAL DATA X axis home position : ????????? Z axis home position : ????????? Number of special dressing cycle: 0	GEOMETRIC DATA Wheel width: ????????? Radius/Chamf. left: 0 Radius/Chamf. right: 0 Relief length [≥1]: 0 Relief angle: 0 Smallest wheel width: ????????? Unused wheel diameter: ????????? Used wheel diameter: ?????????
DRESSING DATA Face (periphery) dressing: YES Side dressing: NO Face dressing feed: ????????? Side dressing feed: 0 Dressing increment, X axis: ????????? Dressing increment, Z axis: ????????? Safety distance: 0.05 Number of parts between face (periph.) dressings: 0 Number of parts between left (side) dressings : 0 Number of parts between right (side) dressings: 0	SHAPING DATA Face (periphery) shaping: NO Side shaping: NO Shaping amount: 0 Shaping increment: 0 Face (periphery) shaping feed: 0 Side shaping feed: 0
=	
CANCEL ENTER	

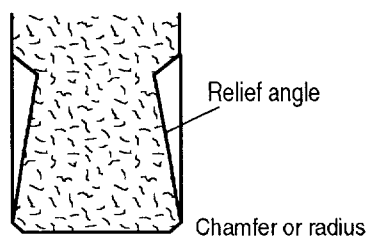
4

Standard Straight Wheel

Definition

Wheel based on a standard flat wheel. It can be dressed on one or both sides and the periphery and can include radii or chamfers.

Example:



4.6 Special Wheel Data - Fixed Dresser

The "SPECIAL WHEEL DATA - FIXED DRESSER" page is accessed by selecting softkey "2" on the "WHEEL DATA" menu.

Information on the "SPECIAL WHEEL DATA - FIXED DRESSER" Page

"GENERAL DATA"

"Home Position"	Specifies the home position of the wheel on the X and Z axes (when no machining is in progress).
"Special Dressing Cycle Number"	Gives the possibility of executing a cycle other than a NUM cycle. In this case, the cycle profile must be defined in a programme that will be called by the same number.
"Start Position Diamond 1"	X and Z axes. Diamond 1 coordinates on the X and Z axes.
"Start Position Diamond 2"	X and Z axes. Diamond 2 coordinates on the X and Z axes.

"DRESSING DATA"

"Dressing"	Parts (face (periphery)/side) of the wheel to be dressed "Face/Sides" to true the wheel.
"Dressing Feed"	Feed rate during periphery and side dressing.
"Dressing Increment"	Depth of cut for dressing on the X and Z axes.
"Safety Distance"	Approach distance of the two-diamond dresser at high speed.
"Number of Parts between Dressings"	Dressing frequency of the wheel periphery and left- and right-hand sides.

"GEOMETRIC DATA"

For geometric data other than those listed below, refer to the wheel definition opposite.

"Smallest Wheel Width"	Width below which the wheel can no longer be used.
"Unused Wheel Diameter"	Wheel diameter before shaping.
"Used Wheel Diameter"	Diameter below which the wheel can no longer be used.

"SHAPING DATA"

"Shaping"	Parts of the wheel to be dressed for preliminary shaping.
"Shaping Amount"	Total amount of material to be removed during shaping.
"Shaping Increment"	Shaping depth of cut.
"Shaping Feed"	Feed rate during shaping of the wheel periphery and sides.

Information on the Softkeys

"CANCEL"	Action on this key causes a return to the "WHEEL DATA" menu.
"ENTER"	Action on this key displays the "Profile Description" page.

"SPECIAL WHEEL DATA - FIXED DRESSER" Page:

--- SPECIAL WHEEL DATA - FIXED DRESSER ---	
GENERAL DATA Home position X axis: ???????? Z : ???????? Special dressing cycle number: 0 Start position diamond 1, X axis: ???????? Start position diamond 1, Z axis: ???????? Start position diamond 2, X axis: ???????? Start position diamond 2, Z axis: ????????	GEOMETRIC DATA Wheel angle: ???????? Wheel width: ???????? Smallest wheel width: ???????? Unused wheel diameter: ???????? Used wheel diameter: ????????
DRESSING DATA Dressing: NO Dressing feed: ???????? Dressing increment, X axis: ???????? Dressing increment, Z axis: ???????? Safety distance: 0.05 Number of parts between face (periph.) dressings: 0 Number of parts between side dressings: 0	SHAPING DATA Shaping: NO Shaping amount: NO Shaping increment: NO Face (periphery) shaping feed: NO Side shaping feed: NO Start position X axis - Left: NO Start position Z axis - Left: NO Start position Z axis - Right: NO
=	
CANCEL ENTER	

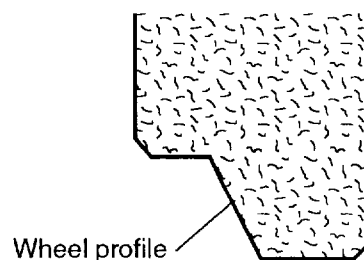
4

Special Wheel

Definition

Wheel whose profile is cut to a special shape. The file for this wheel contains the profile followed by the shaping and dressing operations. The profile can be defined in ISO, PGP or by the PROFIL function.

Example:



4.7 Angular Wheel Data - Fixed Dresser

The "STANDARD ANGULAR WHEEL DATA - FIXED DRESSER" page is accessed by selecting softkey "3" on the "WHEEL DATA" menu.

Information on the "STANDARD ANGULAR WHEEL DATA - FIXED DRESSER" Page

"GENERAL DATA"

"Home Position"	Specifies the home position of the wheel on the X and Z axes (when no machining is in progress).
"Number for Special Dressing Cycle"	Gives the possibility of executing a cycle other than a NUM cycle. In this case, the cycle profile must be defined in a programme that will be called by the same number.
<u>"DRESSING DATA"</u>	
"Dressing"	Parts (face (periphery)/side) of the wheel to be dressed "Face/Sides" to true the wheel.
"Dressing Feed"	Feed rate during periphery and side dressing.
"Dressing Increment"	Depth of cut for dressing on the X and Z axes.
"Safety Distance"	Approach distance of the two-diamond dresser at high speed.
"Number of Parts between Dressings"	Dressing frequency of the wheel periphery and left- and right-hand sides.

"GEOMETRIC DATA"

For geometric data other than those listed below, refer to the wheel definition opposite.	
"Wheel Angle"	Inclination of the wheel with respect to the X axis.
"Wheel Width"	Useful grinding value on the X axis.
"Height"	Useful grinding value on the Z axis.
"Radius/Chamf. Left"	Value of the chamfer or radius connecting the wheel height and width.
"Unused Wheel Diameter"	Wheel diameter before shaping.
"Used Wheel Diameter"	Diameter below which the wheel can no longer be used.

"SHAPING DATA"

"Shaping"	Parts of the wheel to be dressed for preliminary shaping.
"Shaping Amount"	Total amount of material to be removed during shaping.
"Shaping Increment"	Shaping depth of cut.
"Shaping Feed"	Feed rate during shaping of the wheel periphery and sides.

Information on the Softkeys

"CANCEL"	Action on this key causes a return to the "WHEEL DATA" menu.
"ENTER"	Action on this key displays the "Profile Description" page.

"STANDARD ANGULAR WHEEL DATA - FIXED DRESSER" Page:

---STANDARD ANGULAR WHEEL DATA - FIXED DRESSER ---	
GENERAL DATA Home position, X axis: ??????? Home position, Z axis: ??????? Number for special dressing cycle: 0	GEOMETRIC DATA Wheel angle: ??????? Wheel width: ??????? Radius/Chamf. left: ??????? Height [>1]: ??????? Unused wheel diameter: ??????? Used wheel diameter: ???????
DRESSING DATA Dressing: NO Face (periphery) dressing feed: ??????? Side dressing feed: ??????? Dressing increment, X axis: ??????? Dressing increment, Z axis: ??????? Safety distance: 0.05 Number of parts between face (periph.) dressings: 0 Number of parts between side dressings: 0	SHAPING DATA Shaping: NO Shaping amount: Shaping increments: Face (periph.) shaping feed: Side shaping feed:
=	
CANCEL ENTER	

4

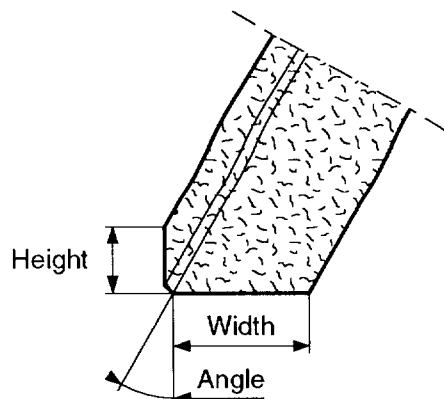
Angular Wheel

Definition

Wheel at an angle in the wheel-holder. This wheel is characterised by:

- its angle with respect to the X axis
- its height and width of cut.

Example:



4.8 Special Wheel Data - Roller Dresser

The "SPECIAL WHEEL DATA - ROLLER DRESSER" page is accessed by selecting softkey "4" on the "WHEEL DATA" menu.

Information on the "SPECIAL WHEEL DATA - ROLLER DRESSER" Page

"GENERAL DATA"

"Home Position" Specifies the home position of the wheel on the X and Z axes (when no machining is in progress).

"GEOMETRIC DATA"

For geometric data other than those listed below, refer to the wheel definition opposite.

"Wheel Angle" Wheel inclination with respect to the X axis (if the axis is inclined).

"Wheel Width" Width below which the wheel can no longer be used.

"DRESSING DATA"

"Roller Home Position" Roller dresser cycle start position.

"Dressing Increment" Depth of cut for dressing on axes 0 and 2.

"Roughing End Position" Position specified with respect to the final dressing dimension on the roller displacement axis.

"Rapid/Roughing/
Finishing Feed" Fast and normal feed rate during wheel periphery and side dressing.

"Dwell Time" Sparkout time.

"Safety Distance" Approach distance of the roller dresser at high speed.

"Number of Parts
between Dressings" Dressing frequency of the wheel periphery and left- and right-hand sides.

Information on the Softkeys

"CANCEL" Action on this key causes a return to the "WHEEL DATA" menu.

"ENTER" Action on this key displays the "Profile Description" page.

"SPECIAL WHEEL DATA - ROLLER DRESSER" Page:

---SPECIAL WHEEL DATA - ROLLER DRESSER---	
GENERAL DATA Home position, X axis: ??????? Home position, Z axis: ???????	DRESSING DATA Roller home position: ??????? Dressing increment: ??????? Roughing end position: ??????? Rapid feed: ??????? Roughing feed: ??????? Finishing feed: ??????? Dwell time: ?????? Safety distance: 0.05 Number of parts between face (periph.) dressings: 0
GEOMETRIC DATA Wheel angle: ??????? Wheel width: ???????	
=	
CANCEL ENTER	

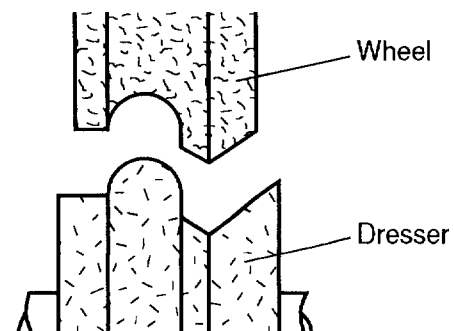
4

Special Wheel

Definition

Wheel whose profile is defined by that of the roller dresser.

Example:



5 Example of Cycle Programming

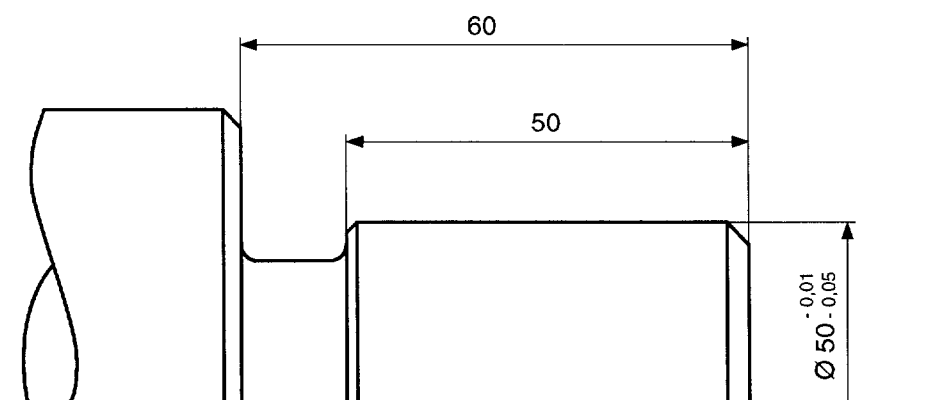
5.1	Preparing for Programming	5 - 3
5.2	Programming an External Grinding Cycle	5 - 4

This chapter describes creation of a sample external grinding programme including a cylindrical traverse cycle with two grinding phases.

To follow this example, you should carry out the sequences described and fill in the CNC screen pages with the values specified.

5.1 Preparing for Programming

Engineering File of the Part to be Ground



5

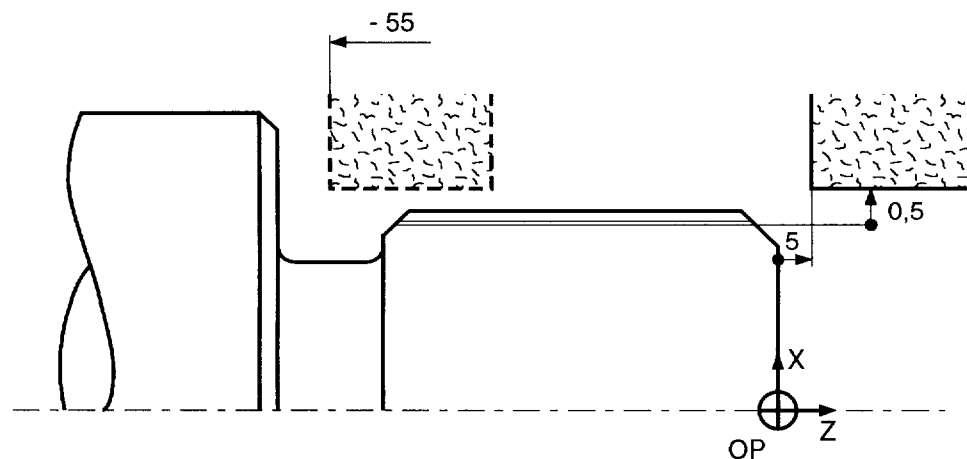
Grinding Required

Grinding of the 50 mm diameter to be carried out by a cylindrical traverse cycle.

Wheel to be Used

Straight wheel.

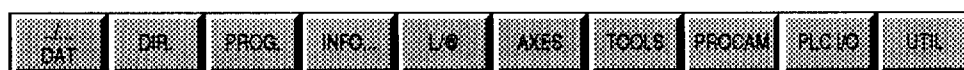
Drawing of the Grinding Phases



5.2 Programming an External Grinding Cycle

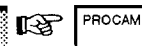
Requirements

Basic softkeys displayed on the CNC screen.



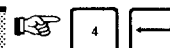
Actions

Select the "GRAPHIC PROGRAMMING" menu



The "GRAPHIC PROGRAMMING" menu is displayed.

Select "INTERACTIVE PROGRAMMING".



"INTERACTIVE PROGRAMMING" page displayed:

Version 5.3

PROGRAMME TO CREATE OR MODIFY NUMBER 6

PAGE TO MODIFY OR LOCATE NUMBER <<<<<

AUTO PAGE INCREMENT 10

View	Display a programme in memory
Edit	Programme Modification - Insertion - Deletion
New	Programme creation
Wheel	Access to wheel files

=

VIEW
PROG

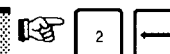
EDIT
PROG

NEW
PROG

WHEEL
FUNCT

QUIT

Fill in the "PROGRAMME NUMBER" field



Select "PROGRAMME CREATION".



The "GRINDING FUNCTIONS AND CYCLES" menu is displayed :

--- GRINDING FUNCTIONS AND CYCLES ---											
1. Wheel selection						2. Plunge cycle					
3. Angular plunge cycle						4. Oscillating plunge cycle					
5. Cylindrical traverse cycle						6. Conical traverse cycle					
1	2	3	4	5	6	7	8	9	END INPUT		

Select "1. Wheel selection".

5

The "WHEEL SELECTION" page is displayed:

--- WHEEL SELECTION ---		
Wheel selection		N= 10<<<<<
Wheel number	[value < 9]	: 1
Wheel data file	[value < 100]	: 1
Home position		: YES
X Part compensation	[value > -0.5]	: 0.2
Z Part compensation	[-1 < value < 1]	: 0.1
Positioning parameters		
Positioning cycle		: OUT
Part speed [rpm]	[0 < value < 100]	: 70
Measuring head position		: DROIT
Grinding speeds		
Wheel speed [m/s]		: 5
Part speed [rpm]		: 90
=		
CANCEL ENTER		

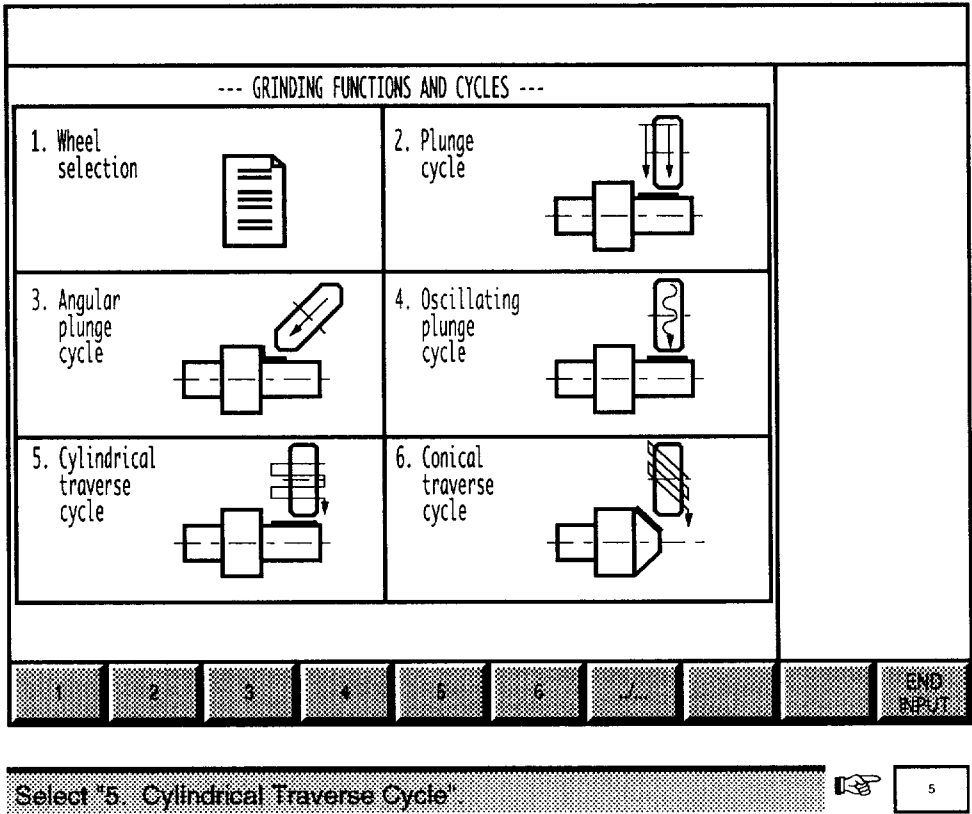
Fill in the fields

Confirm the "WHEEL SELECTION" page



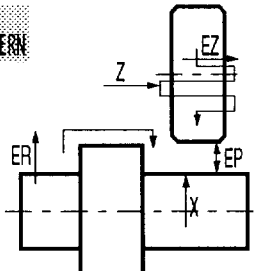
ENTER

The "GRINDING FUNCTIONS AND CYCLES" menu is displayed:



The "CYLINDRICAL TRAVERSE CYCLE"
"Calling Arguments" page is displayed.

--- CYLINDRICAL TRAVERSE CYCLE ---		Calling Arguments		N= 20<<<<<	
Traverse cycle final diameter	X : 50				
Start position of wheel Z	Z : 5				
End position of wheel Z	EZ : 55				
Rapid stop distance	EP : 0.5				
Dwell time	Start : 1	End : 1			
Wheel position	Start : EXTERN	End : INTERN			
Wheel overtravel	5				
Skip diameter	ER : 100				
Traverse feed rate	: 80				
Traverse type	: CONT				
Safety diameter for dressing or manual measurement	: 250				
Wheel side selection	: LEFT				
=					



CANCEL
ENTER

Fill in the fields.

Confirm the "CYLINDRICAL TRAVERSE CYCLE" page.



ENTER

Display of the "CYLINDRICAL TRAVERSE CYCLE"
"Arguments during Cycle" page

--- CYLINDRICAL TRAVERSE CYCLE ---

Arguments during Cycle

N= 30<<<<<

Stock relative to final diameter	X : 0.2	
Start position increment	: 0.05	
End position increment	: 0.05	
Infeed	: 5	
Measuring type	: NO MEASURE	
Part origin modification	: NO MODIF	
Backoff	: NO	
Dressing of wheel face	: NO	
Dressing of wheel side	: NO	
End of cycle	: NO STOP	

=

CANCEL
ENTER

Fill in the fields.

Confirm the "CYLINDRICAL TRAVERSE CYCLE" page:



ENTER

Display of the "CYLINDRICAL TRAVERSE CYCLE"
"Arguments during Cycle" page

--- CYLINDRICAL TRAVERSE CYCLE ---

Arguments during Cycle

N= 40<<<<<

Stock relative to final diameter X : -0.2

Start position increment : 0.03

End position increment : 0.03

Infeed : 4

Measuring type : NO MEASURE

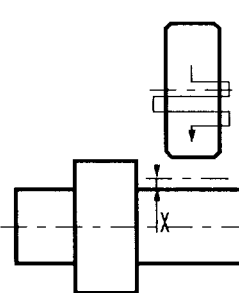
Part origin modification : NO MODIF

Backoff :

Dressing of wheel face : NO

Dressing of wheel side : NO

End of cycle : STOP



=

CANCEL

ENTER

Fill in the fields.

Confirm the "CYLINDRICAL TRAVERSE CYCLE" page.



ENTER

Display of the "CYLINDRICAL TRAVERSE CYCLE"
"Arguments during Cycle" page

Cancel load in the "CYLINDRICAL TRAVERSE CYCLE" page.



CANCEL

Display of the "CONTINUATION, RETURN or END" page:

--- CONTINUATION --- RETURN or END									
RETURN								END INPUT	

5

Select end input..



END INPUT

Display of the programme synopsis page:

<pre> %2.0 N10 - Wheel selection - N20 - Ext - Traverse - Call - N30 - Ext - Traverse - Cycle - >N40 - Ext - Traverse - Cycle - </pre>									
PREV BLOCK	NEXT BLOCK	J...	DETAIL		DELETE	MODIFY	ENTER		OUT

Selecting "ENTER" displays the "GRINDING FUNCTIONS AND CYCLES" menu to select the end of programme function or enter new grinding cycles if other parts of the work piece are to be ground.

Reminder

Functions "DELETE" and "MODIFY" are used to delete and edit a programme.

End of Programme

To conclude entry, the programme must include the "End of programme" function.

Accessing the "End of programme" function

Select entry of another function or cycle.		ENTER
--	---	-------

Display of the first page of the "GRINDING FUNCTIONS AND CYCLES" menu.

Select the second page of the "GRINDING FUNCTIONS AND CYCLES" menu.

The second page of the "GRINDING FUNCTIONS AND CYCLES" menu is displayed.

Select the end of programme.

The "End of Programme" page is displayed:

N= 50<<<<<									
--- End of Programme ---									
Cancel or Enter									
=									
	CANCEL								ENTER

5

Confirm the end of programme.

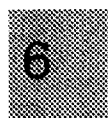
Display of the programme synopsis including the end of programme function

<pre> %2.0 N10 - Wheel selection - N20 - Ext - Traverse - Call - N30 - Ext - Traverse - Cycle - N40 - Ext - Traverse - Cycle - >N50 - End - </pre>									
PREV BLOCK	NEXT BLOCK	...	DETAIL		DELETE	MODIFY	ENTER		OUT

Action on the "OUT" key returns to the "INTERACTIVE PROGRAMMING" page.

6 Processing of Grinding Programmes

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6.1 Viewing or Editing a Programme

The programme viewing and editing functions are accessed from the "INTERACTIVE PROGRAMMING" page.

Selection of one of these functions displays the programme synopsis and softkeys corresponding to the function selected.

6.1.1 Programme Displayed with Viewing Keys

When a programme is selected for viewing by the "VIEW PROG" key,

- the first page of the programme synopsis is displayed
- the arrow keys are used to move around in the programme
- the detailed programme pages can be displayed.

Requirements

"INTERACTIVE PROGRAMMING" page displayed.

"NUMBER" field of "PROGRAMME TO CREATE OR MODIFY" flashing.

Actions

The diagram shows a screen with two input fields. The first field is labeled "Enter the programme number [Programme No.]" and has a hand icon pointing to it. The second field is labeled "Select to view the programme" and also has a hand icon pointing to it. To the right of the second field is a key labeled "VIEW PROG". To the right of the entire screen is a large number "6".

The programme synopsis is displayed with the following softkeys:

The diagram shows a row of softkeys: "PREV BLOCK", "NEXT BLOCK", a key with a left arrow, "DETAIL", a key with a right arrow, a key with a left arrow, a key with a right arrow, a key with a left arrow, a key with a right arrow, and "OUT".

6.1.2 Programme Displayed with Editing Keys

When a programme is selected for editing by the "EDIT PROG" key,

- the first page of the programme synopsis is displayed
- the arrow keys are used to move around in the programme
- the detailed programme pages can be displayed
- the programme can be debugged by deleting, editing and entering programme blocks.

Requirements

"INTERACTIVE PROGRAMMING" page displayed.

"NUMBER" field of "PROGRAMME TO CREATE OR MODIFY" flashing.

Actions

Enter the programme number [Programme No.]		
Select to edit the programme.		

The programme synopsis is displayed with the following softkeys:

PREV BLOCK	NEXT BLOCK		DETAIL		DELETE	MODIFY	ENTER		OUT
---------------	---------------	---	--------	---	--------	--------	-------	---	-----

6.1.3 Moving Around on the Programme Synopsis Page

The softkeys displayed allow you to move around in the programme.

The contents of the two leftmost keys and the method for moving around in the programme can be modified by successive actions on the ".../..." (continuation) key.

Select the required movement (see table below) by repeated actions on the ".../..." (continuation) key.

Movement	Command
Move up one block in the programme	PREV. BLOCK
Move down one block in the programme	NEXT BLOCK
Move up one page in the programme	PREV. PAGE
Move down one page in the programme	NEXT PAGE
Move up to an identical block	PREV. BL. ID
Move down to the next identical block	NEXT BL. ID
Go to the start of the programme	START PROG
Go to the end of the programme	END PROG

6.1.4 Viewing the Detail of the Programme Pages

The detail of the pages of a programme can be displayed AFTER selecting "VIEW PROG" or "EDIT PROG" on the "INTERACTIVE PROGRAMMING" page.

Requirements

"INTERACTIVE PROGRAMMING" page displayed.

System on the "NUMBER" field of the "PROGRAMME TO CREATE OR MODIFY".

Actions

Enter the programme number [programme No.].



The number is transferred into the field.

Select to view or edit the programme (see Sec. 6.1.1 or 6.1.2).

The first page of the programme synopsis is displayed.

Move the cursor to the block to be displayed in detail (see Sec. 6.1.3).

Display the detail of the page selected.



The page selected is displayed.

Possible Actions on the Detail Page

When viewing a programme, the page can be viewed in detail.

When editing a programme, the page can be viewed in detail, deleted or edited or a new page can be entered.

Return to the Programme Synopsis Page

Select to return to the programme synopsis page.



The programme synopsis page is displayed.

6.1.5 Searching for a Page Number in a Programme

A page number can be searched for directly from the "INTERACTIVE PROGRAMMING" page.

Requirements

"INTERACTIVE PROGRAMME" page displayed.

"NUMBER" field of "PROGRAMME TO CREATE OR MODIFY" flashing.

Actions

Enter the programme number [Programme No.] 

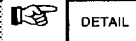
"NUMBER" field of "PAGE TO MODIFY OR LOCATE" flashing.

Enter the page number [Page No.] 

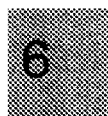
The programme synopsis is displayed.

Select to view or edit the programme (see Sec. 6.1.1 or 6.1.2).

The programme synopsis is displayed with the cursor on the desired page number.

Display the detail of the page selected.  

The other possibilities and return to the programme synopsis are the same as described in Section 6.1.4.



6.2 Debugging the Programme being Created

The following actions are possible when creating a programme:

- Edit a page
- Delete a page
- Delete part of the programme
- Delete the programme being created.

6.2.1 Editing a Programme Page

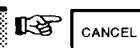
A programme page can be edited at any time from the programme synopsis.

Requirements

System on any page.

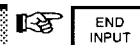
Actions

Select cancellation of the page displayed.



This action cancels the page being written and displays the "CONTINUATION" selection page.

Select end input.



The programme synopsis is displayed.

Move the cursor to the block to be modified (see Sec. 6.1.3).

Select to edit the block.



The page to be edited is displayed.

REMARK *The page can also be edited by selecting the detail view.*

Go to the field to be edited and make the change.

Confirm the modification.



The programme synopsis is displayed.

Continuation of Programme Creation

Move the cursor to the last programme block.

Select entry of a new page.



The menu is displayed and writing of the programme can be continued.

6.2.2 Deleting a Page from the Programme

A programme page can be deleted at any time from the programme synopsis.



CAUTION

If the page number corresponds to the beginning of an entity, deleting the page deletes all the blocks in the entity.

Requirements

System on any page.

Actions

Select cancellation of the page displayed.

 CANCEL

This action cancels the page being written and displays the "CONTINUATION" selection page.

Select end input.

 END INPUT

The programme synopsis is displayed.

Move the cursor to the block to be deleted (see Sec. 6.1.3).

Delete the block.

 DELETE

REMARK The page can also be deleted by selecting the detail view of the page.
The message "OK to delete the block?" is displayed.

Confirm block deletion.

 YES

The programme synopsis is displayed.

The block concerned is deleted.

Continuation of Programme Creation

Move the cursor to the last programme block.

Select entry of a new page.

 ENTER

The menu is displayed and writing of the programme can be continued.

6.2.3 Deleting Part of the Programme

Part of the programme can be deleted at any time from the programme synopsis.

Deletion is carried out by selecting the block number corresponding to the start of the entity identified by this number (e.g. start of profile definition, ISO blocks, programme variables).

Requirements

System on any page.

Actions

Select cancellation of the page displayed.



This action cancels the page being written and displays the "CONTINUATION" selection page.

Select end input.



The programme synopsis is displayed.

Move the cursor to the number of the entity to be deleted (see Sec. 6.1.3).

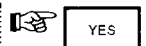
Delete the entity.



REMARK *The entity can also be deleted by selecting the detail view of the page.*

The message "OK to delete the entity?" is displayed.

Confirm deletion of the entity



The programme synopsis is displayed.

The entity is deleted. The cursor moves to the programme number.

Continuation of Programme Creation

Move the cursor to the last programme block.

Select entry of a new page.



The menu is displayed and writing of the programme can be continued.

6.2.4 Deleting the Programme Being Created

A programme being created can be deleted at any time by clearing the programme and returning to the "INTERACTIVE PROGRAMMING" page.

Requirements

System on any page.

Actions

Select cancellation of the page displayed.



CANCEL

This action cancels the page being written and displays the "CONTINUATION" selection page.

Select end input.



END
INPUT

The programme synopsis is displayed.

Move the cursor to the programme number to be deleted (see Sec. 6 1.3).

Delete the programme.



DELETE

The message "OK to reinitialise the programme?" is displayed.

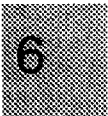
Confirm programme deletion.



YES

The "INTERACTIVE PROGRAMMING" page is displayed.

The "NUMBER" field of the "PROGRAMME TO CREATE OR MODIFY" is empty.



6.3 Quitting the Interactive Programming Function

Exit from the interactive programming function is possible at any time during creation of a programme.

Exiting from interactive programming stores the programme being created.

Requirements

System on any page.

Actions

Select cancellation of the page displayed.		
This action cancels the page being written and displays the "CONTINUATION" selection page.		
Select end input.		
The programme synopsis is displayed.		
Select the "INTERACTIVE PROGRAMMING" page.		
The "INTERACTIVE PROGRAMMING" page is displayed.		
Exit from the interactive programming page.		
The "GRAPHIC PROGRAMMING" page is displayed and the programme being created is stored.		

6.4 Resuming Creation of a Programme

A programme interrupted can be resumed to:

- add new pages at the end of the programme
- insert new pages in the programme.

Requirements

"INTERACTIVE PROGRAMMING" page displayed.

"NUMBER" field of "PROGRAMME TO CREATE OR MODIFY" flashing.

Actions

Enter the programme number [Programme No.]  

Select to edit the programme.  

The programme synopsis is displayed.

Move the cursor to a block in the programme or to the last block (see Sec. 6.1.3).

Select to enter a new page.  

The menu is displayed and writing of the programme can be continued.

6

6.5 Debugging a Stored Programme

The following actions are possible when debugging a programme:

- Edit a page
- Insert a page
- Delete a page
- Delete part of a programme
- Delete a programme.

REMARK *A programme can be debugged during machining, but the changes made are not taken into account until machining is finished.*

6.5.1 Editing a Programme Page

A programme page can be edited at any time from the programme synopsis.

Requirements

"INTERACTIVE PROGRAMMING" page displayed.

"NUMBER" field of "PROGRAMME TO CREATE OR MODIFY" flashing.

Actions

Enter the programme number [Programme No.]  

Select to edit the programme.  

The programme synopsis is displayed.

Move the cursor to the block to be modified (see Sec. 6.1.3)

Select to edit the block.  

The page to be edited is displayed.

REMARK *The page can also be edited by selecting the detail view.*

Go to the field to be edited and make the change

Confirm the modification  

The programme synopsis is displayed.

Select the "INTERACTIVE PROGRAMMING" page.  

The "INTERACTIVE PROGRAMMING" page is displayed.

6.5.2 Inserting a Page in a Programme

A page can be inserted at any time in the programme synopsis.

Requirements

"INTERACTIVE PROGRAMMING" page displayed.

"NUMBER" field of "PROGRAMME TO CREATE OR MODIFY" flashing.

Actions

Enter the programme number [Programme No.]  

Select to edit the programme.  

The programme synopsis is displayed.

Move the cursor to the block in front of the block to be inserted (see Sec. 6.1.3).

REMARK

A page can also be inserted by selecting the detail view of the page preceding the block to be inserted.

Select enter.  

Display of the menu.

Select the function or cycle to be inserted.

Display of the function or cycle page.

Fill in the fields and confirm the page.  

A new page to be inserted is displayed.

Select to cancel insertion.  

The "CONTINUATION" page is displayed.

Select to end input.  

The programme synopsis is displayed. The programme includes the new block corresponding to the page inserted.

Select the "INTERACTIVE PROGRAMMING" page.  

The "INTERACTIVE PROGRAMMING" page is displayed.

6

6.5.3 Deleting a Page from the Programme

A programme page can be deleted at any time from the programme synopsis.



CAUTION

If the page number corresponds to the beginning of an entity, deleting the page deletes all the blocks in the entity.

Requirements

"INTERACTIVE PROGRAMMING" page displayed.

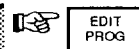
"NUMBER" field of "PROGRAMME TO CREATE OR MODIFY" flashing.

Actions

Enter the programme number [Programme No.].



Select to edit the programme.



The programme synopsis is displayed.

Move the cursor to the block to be deleted (see Sec. 6.1.3).

Delete the block.

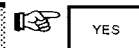


REMARK

The page can also be deleted by selecting the detail view of the page.

The message "OK to delete the block?" is displayed.

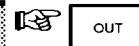
Confirm block deletion.



The programme synopsis is displayed.

The block concerned is deleted and the cursor goes to the programme number.

Select the "INTERACTIVE PROGRAMMING" page.



The "INTERACTIVE PROGRAMMING" page is displayed.

6.5.4 Deleting Part of the Programme

Part of the programme can be deleted at any time from the programme synopsis.
Deletion is carried out by selecting the block number corresponding to the start of the entity identified by this number (e.g. start of profile definition, ISO blocks, programme variables).

Requirements

"INTERACTIVE PROGRAMMING" page displayed.
"NUMBER" field of "PROGRAMME TO CREATE OR MODIFY" flashing.

Actions

Enter the programme number [Programme No.]

Select to edit the programme





The programme synopsis is displayed.

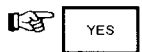
Move the cursor to the number of the entity to be deleted (see Sec. 6.1.3)

Delete the entity.



REMARK The entity can also be deleted by selecting the detail view of the page.
The message "OK to delete the entity?" is displayed.

Confirm deletion of the entity.



The programme synopsis is displayed.
The entity is deleted. The cursor moves to the programme number.

Select the "INTERACTIVE PROGRAMMING" page.



The "INTERACTIVE PROGRAMMING" page is displayed.

6

6.6 Deleting a Stored Programme

An interactive programme stored in the CNC can only be deleted in system editing mode (refer to the Operator Manual).

6.7 Renumbering Blocks

The pages can be renumbered block by block on the programme synopsis.

Requirements

"INTERACTIVE PROGRAMMING" page displayed.

"NUMBER" field of "PROGRAMME TO CREATE OR MODIFY" flashing.

Actions

Enter the programme number [Programme No.]



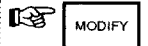
Select to edit the programme.



The programme synopsis is displayed.

Move the cursor to the block to be modified (see Sec. 6.1.3).

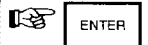
Select to modify the block.



The page to be modified is displayed.

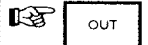
Go to the "N=" field and change the number.

Confirm the modification.



The programme synopsis is displayed with the modified block number.

Select the "INTERACTIVE PROGRAMMING" page.



The "INTERACTIVE PROGRAMMING" page is displayed.

Appendix A Softkey Abbreviations

The abbreviations displayed in the softkeys are listed below in alphabetic order with the functions associated with each key. The abbreviations concerning a highlighted selection are not listed.

BACK	Goes back to the programme synopsis.
CANCEL	Cancels the page displayed and returns to the previous page.
DELETE	Deletes the line selected in the programme or wheel file.
DETAIL	«Detail» displays the screen page corresponding to a line selected in the programme or wheel file.
EDIT PROG	Programme editing. Displays the programme or wheel file.
END INPUT	Ends input, exits from the menu and returns to the programme or wheel file or to the programme synopsis, depending on the context.
END PROG	Goes to the last line of the programme or file. Accessed by the «./...» key.
ENTER	Accesses the «GRINDING FUNCTIONS AND CYCLES» menu.
ENTER	Used to enter data in the programme or wheel file.
ENTER	Confirms the page and the data it contains and goes to the next page.
MAIN MENU	Returns to the «GRINDING FUNCTIONS AND CYCLES» menu.
MISC	Other selections.
MODIFY	To modify a line selected in the programme or file.
NEW PROG	Creates a new programme or wheel file.
NEXT BL. ID	Goes down in the programme or wheel file to the next block identical to the one selected. Accessed by the «./...» key.
NEXT BLOCK	Next block. Goes down block by block in the programme or wheel file. Accessed by the «./...» key.
NEXT PAGE	Goes down page by page in the programme or wheel file. Accessed by the «./...» key.
NO	Cancels deletion of the selected item.
OUT	Exits from the programme and returns to the «GRAPHIC PROGRAMMING» page.
PGP	Accesses contour definition by PROFIL or PGP (Profile Geometric Programming) or other functions.
PREV. BL. ID	Goes up in the programme or wheel file to the previous block identical to the one selected. Accessed by the «./...» key.
PREV. BLOCK	Previous block. Goes up block by block in the programme or wheel file. Accessed by the «./...» key.



PREV. PAGE	Goes up page by page in the programme or wheel file. Accessed by the «./...» key.
PROFIL	Accesses contour definition by the PROFIL module.
QUIT	Exits from interactive programming and returns to «GRAPHIC PROGRAMMING» menu.
RETURN	Returns to the menu or page displayed before.
START PROG	Goes to the start of a programme or wheel file. Accessed by the «./...» key.
VIEW PROG	Views the programme or file being created or selected.
WHEEL/FUNCT.	Accesses editing of a wheel file.
YES	Confirms deletion of the page or programme selected.
./...	In the main menu, this key is used to go to the next page.
./...	When viewing or editing a programme, consecutive actions on the «./...» key change the contents of the two leftmost keys and the way of moving around in the file. The movements selected by action on the «./...» key are as follows: - PREV. BL. ID? NEXT BL. ID - START PROG, END PROG - PREV. BLOCK, NEXT BLOCK - PREV. PAGE, NEXT PAGE.

Appendix B PROCAM External/Internal Grinding Flow Chart

