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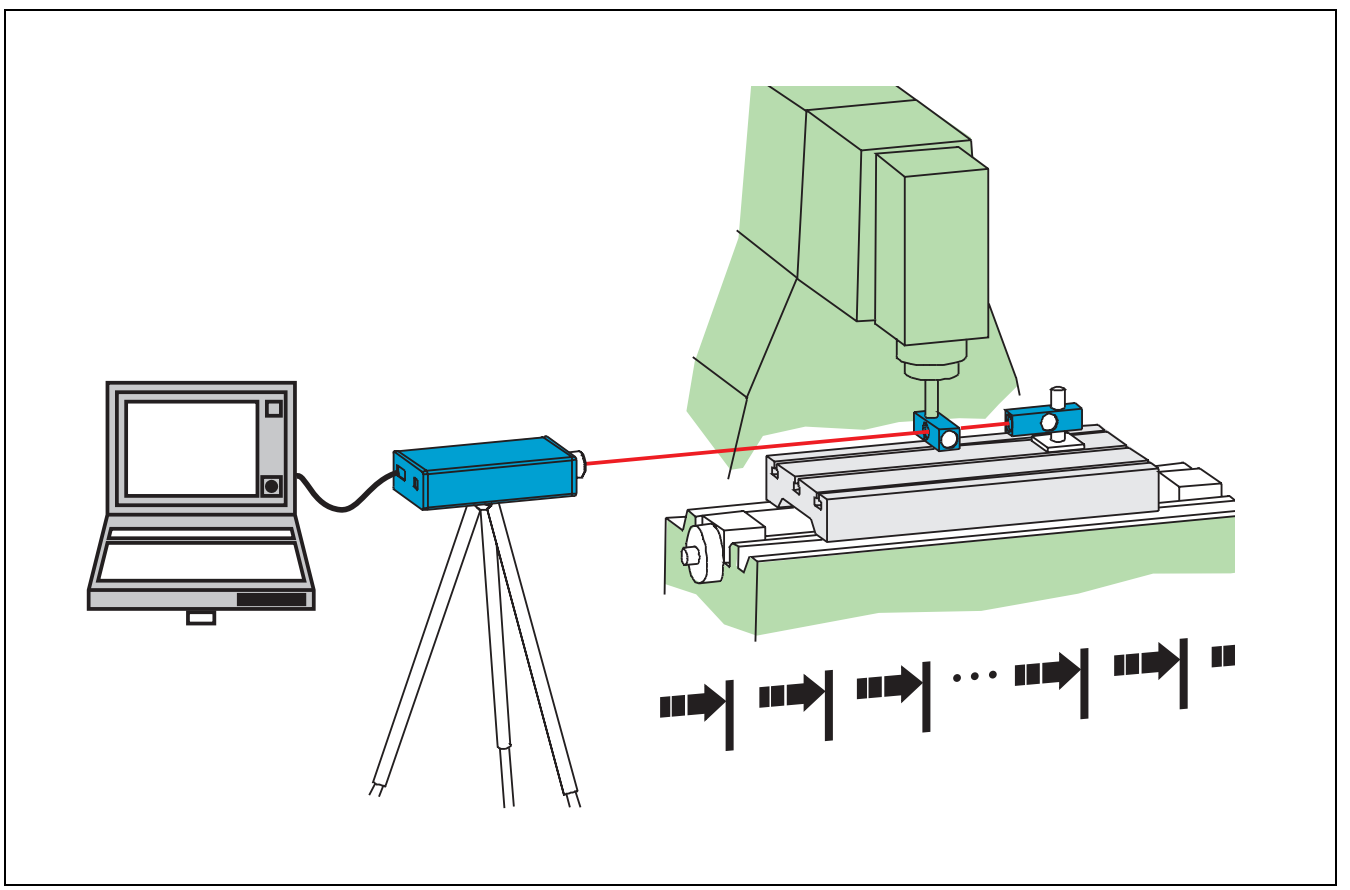

MTC200/MT-CNC
Correction Data Import

Application Manual

SYSTEM200

DOK-MTC200-CORR***DATA-AW01-EN-P

Rexroth
Indramat

Title Correction Data Import

Type of document Application Manual

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Purpose of this document

This documentation describes the method of evaluating correction data with a measuring system and to transfer it to precision axis error correction and to droop compensation.

Configuration control

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Contents

1 Introduction

1.1 General

Machine processing with narrow error tolerances and very precise positioning procedures make high demands on the precision of the machines. Deviations due to wear or mechanical deviations of the actual values in contrast to the command values must be recorded and compensated regularly. For this compensation the control and the drives provide parameters. Deviations from the command value recorded by a measuring system, are written in the correction tables of the parameters as correction data. In this way control and drive can compensate inaccuracies.

1.2 Laser Interferometer System Measuring

The appropriate measuring system for this measurements is the laser interferometer system . This system allows to execute measurements for the positioning accuracy and the droop compensation of an axis. The measurements are executed with a frequency stabilized laser and optical components. The recorded data can then be analyzed or it can be transferred to the control and the drives via parameter settings if prepared accordingly.

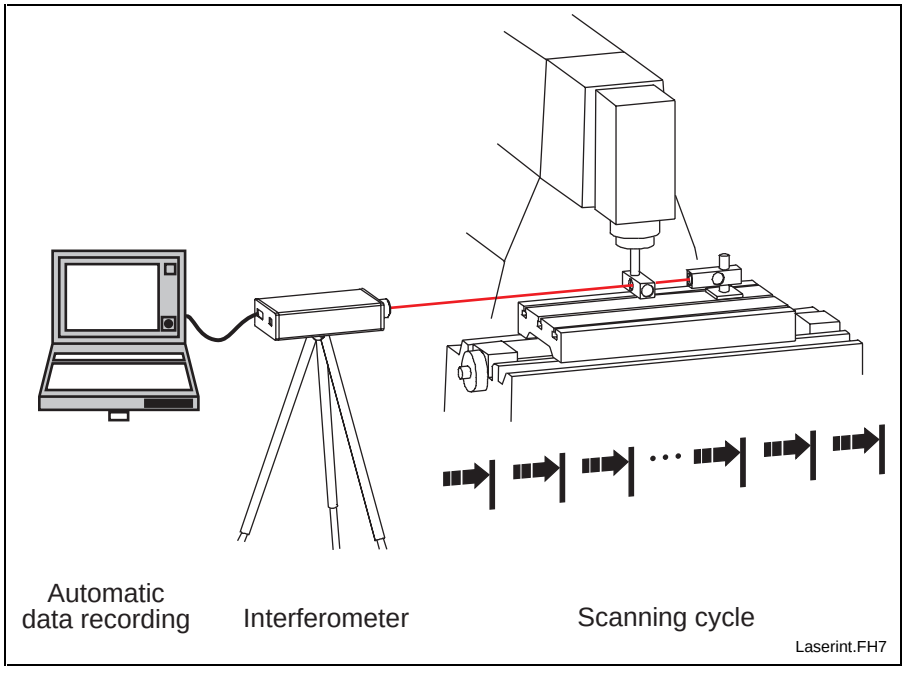


Fig. 1-1: Principle of measurement

1.3 What is measured and/or corrected?

The measuring data is taken for the precision axis error correction and for the droop compensation of an axis.

Precision axis error correction

The precision axis error correction is useful for the correction of non linear transmitter errors and of non linear mechanism errors. During the precision axis error correction, the actual position value of the motor transmitter or the external transmitter is corrected. Within the requested correction area the preset points of support for the various directions are

approached one after the other and the corresponding position error is measured.

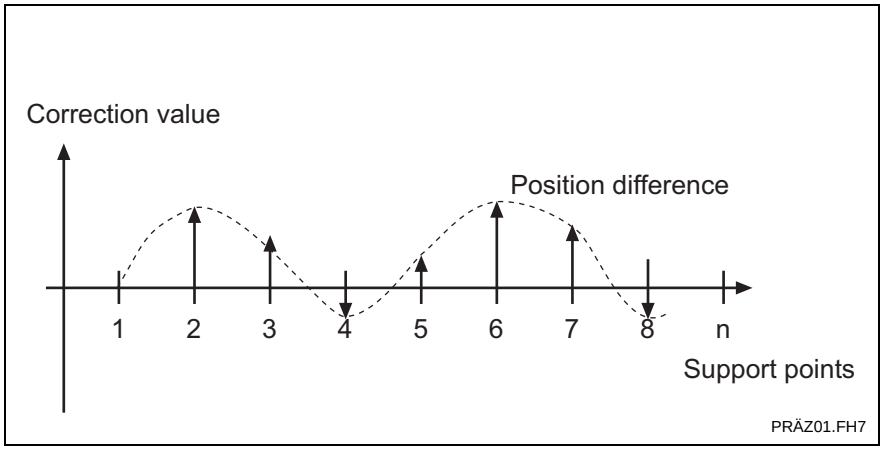


Fig. 1-2: Precision axis error correction

Droop compensation

The droop compensation is used for error compensation for example with drooping axes and with axes with oblique angles.

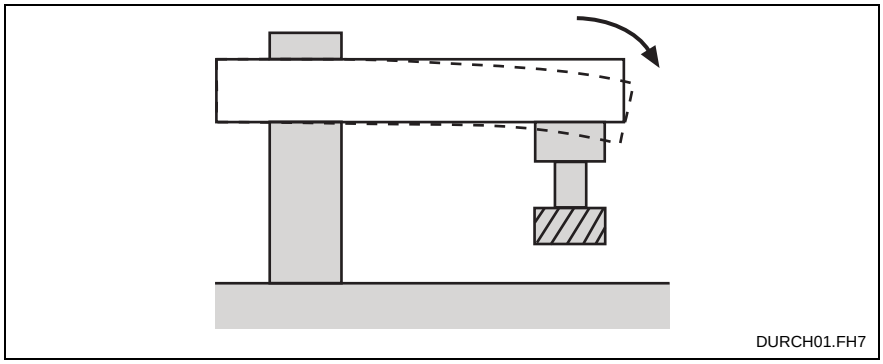


Fig. 1-3: Drooping axis

2 Procedure Overview

Chapter overview This chapter informs you about the procedure of executing a measurement and the compensation .

2.1 Record Measuring Data

The laser interferometer and the linear optics are installed at the machine to be measured. The measuring data is recorded automatically. The NC program provided by the manufacturer of the measuring system is loaded into the control. The axis to be measured is approached cyclically. In the cycle pauses the measuring values are recorded by the interferometer and are stored in correction tables .

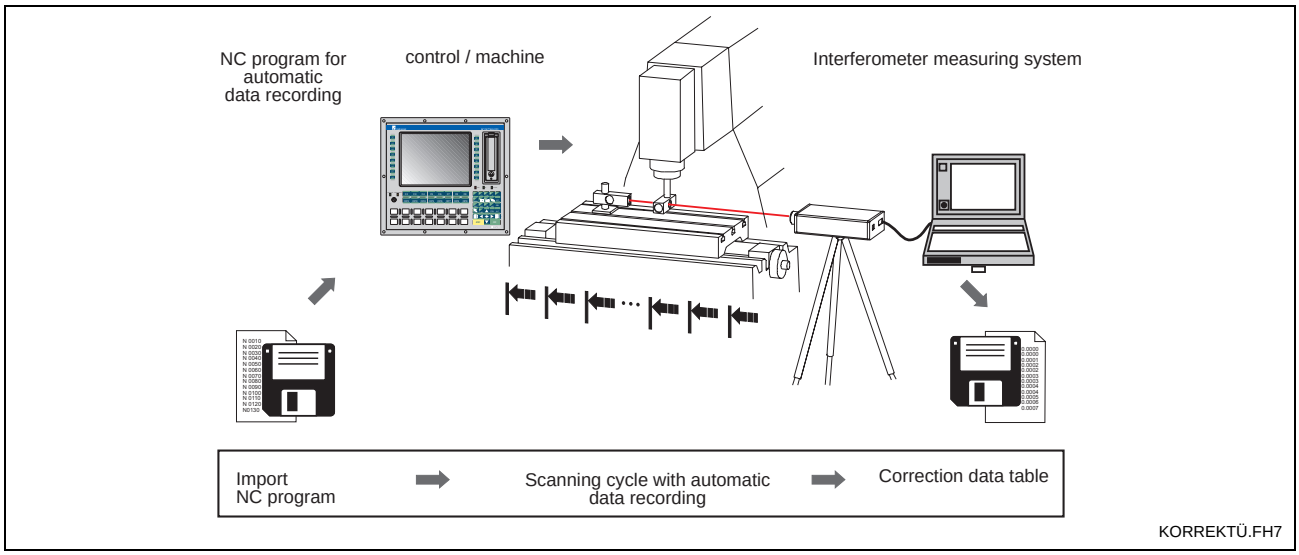


Fig. 2-1: Laser Interferometer System Measuring

2.2 Execute Precision Axis Error Correction

The measuring data available as ASCII table is either entered manually or by copying in the corresponding parameter section. After the parameter list download into the drive, the correction values are considered during axis movements.

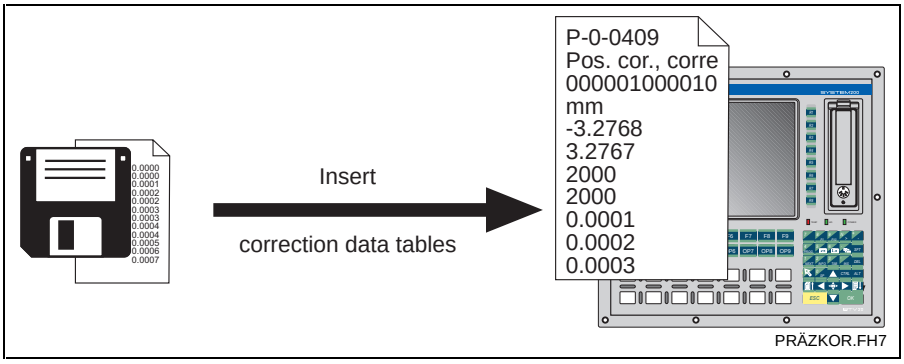


Fig. 2-2: Integrate correction data tables in precision axis error table

2.3 Execute Droop Compensation

The measuring values from the axis measurement must be entered in the axis parameters of the control. For this the correction value files of the measuring system are imported in the control

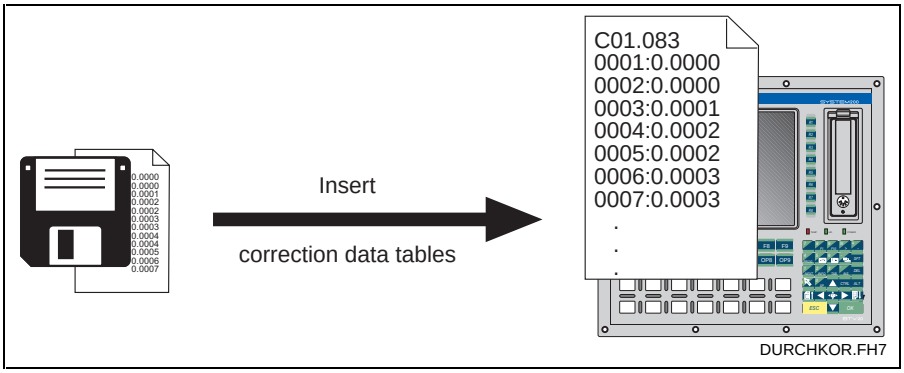


Fig. 2-3: Integrate correction data table in droop compensation

2.4 Check with New Measuring Data Recording

After integrating the correction values for the precision axis error correction and the droop compensation , the axis is measured again and the result is analyzed and recorded.

3 Establish Measuring Data

Chapter overview This chapter informs you how to load the external NC program for the measuring data recording into the control.

3.1 Load NC Program for Measuring Cycle to the Control

For the automatic measuring data recording a NC program is provided by the measuring system manufacturer. The external program available on diskette must be load into the control. This takes place in the graphical user interface GUI.

Proceed as follows.

To NC package index

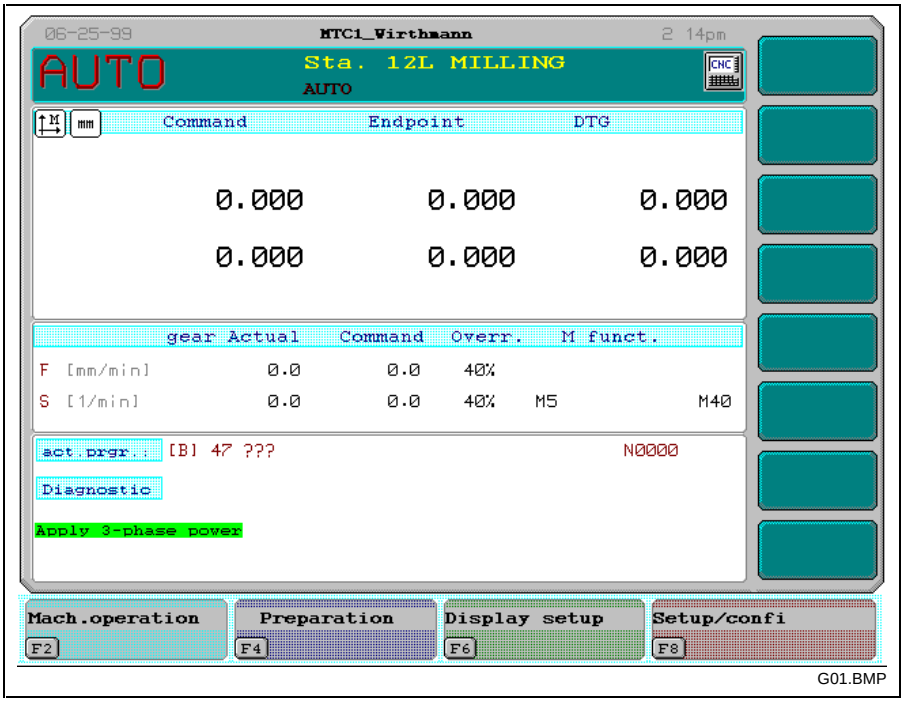


Fig. 3-1: Starting point for importing an external program

- Press F2 <Mach. operation>
- Press F4 <NC Program>
- Press F4 <Package index>

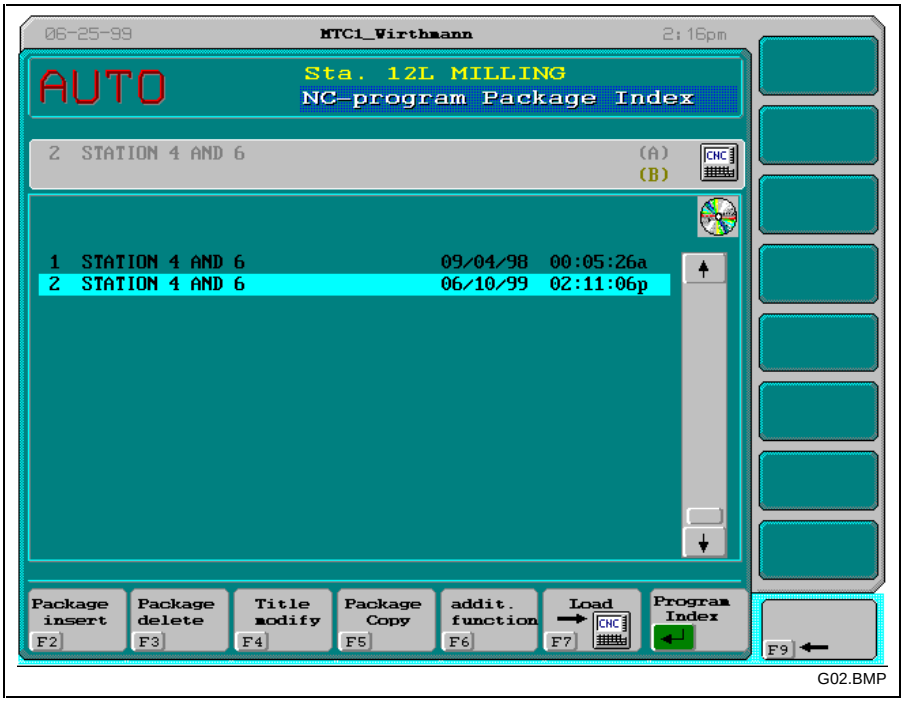


Fig. 3-2: NC package index

- Press F2 <Package insert>
- Create a new NC program package Enter a package number and a name for the index

Create new NC program package

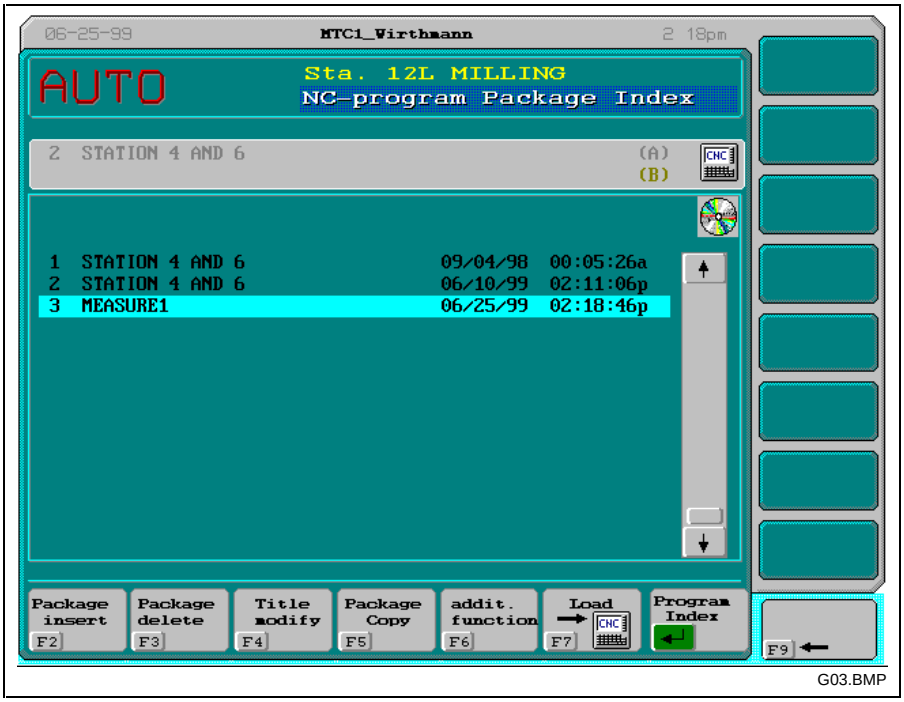


Fig. 3-3: Select package index

- Press <Enter> to open the program index

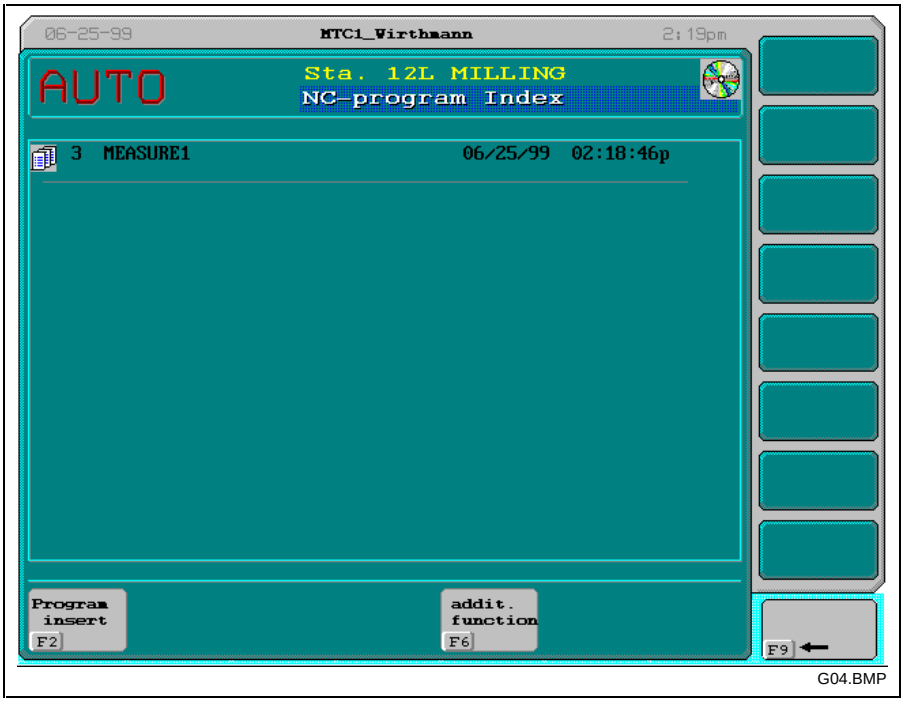


Fig. 3-4: Insert program

- F2 <Program insert>
- Select <Handling external> with the cursor and press <Enter>

Insert measuring program

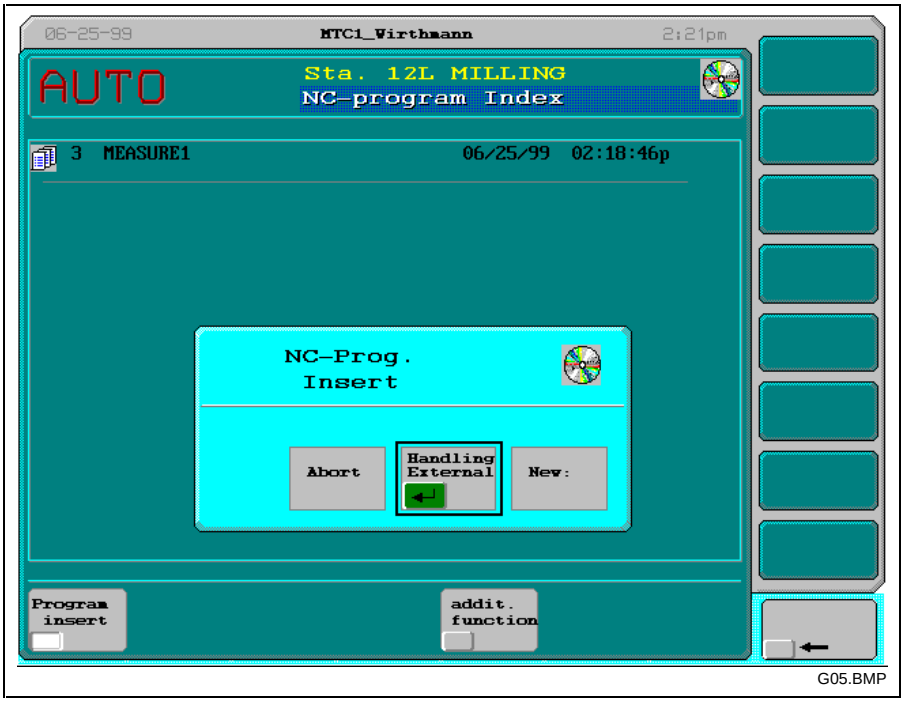


Fig. 3-5: External handling

- Enter a number for the program to be loaded and confirm the entry with <Enter>
- Select the drive and if necessary the directory where the program which is to be loaded is stored.

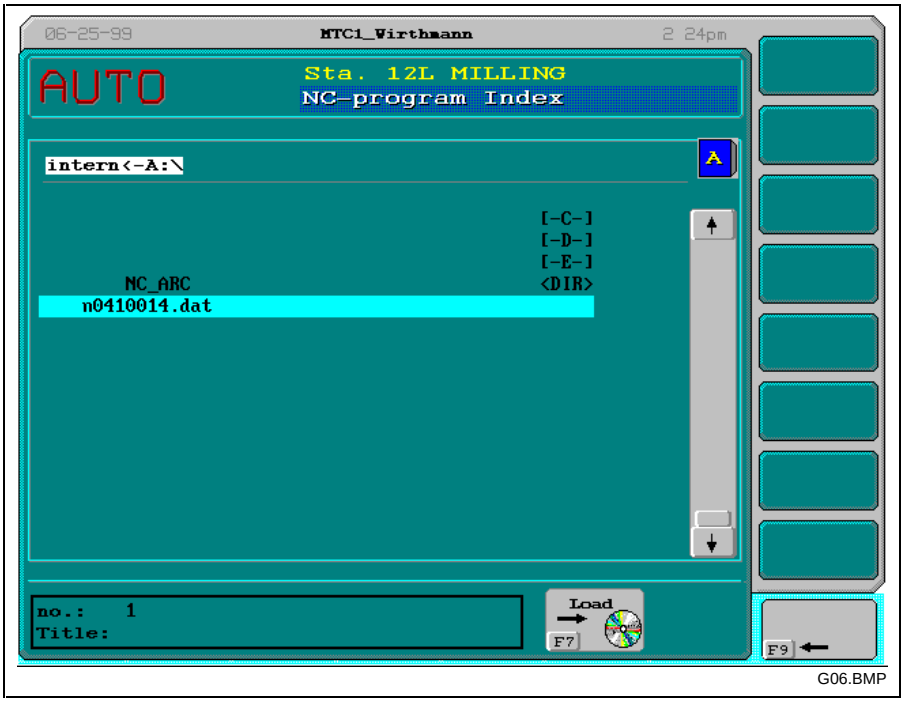


Fig. 3-6: Select program

- Select the program to be loaded from the list and enter a name for it

The NC program is available for the measuring data recording now.

4 Execute Precision Axis Error Correction

Chapter Overview

This chapter informs you about the structure of the correction tables . Furthermore you learn how to transfer the established correction values of the precision axis error correction to the drive.

Requirements

- The correction values were established by the laser interferometer system and are available as ASCII file.
- For copying the correction values the file format must correspond to the format of the drive parameter.

4.1 Files to be Used

File for Correction Values of the Measuring System

A file is created from the correction values established by the interferometer system. The file structure and the file format (correction data table) are adapted to the drive parameter format. The file includes the values necessary for the correction.

- Reversal process
- Starting position
- Support point distance
- Correction Values

The values for reversal process, starting position and support point distance must be transferred to the corresponding parameter section of the drive parameter file.

For each movement direction 500 correction values are established. Consequently 1000 values are listed one below the other in the table. These values must be transferred to the drive parameter **'(P-0-0409 Pos-Cor., correction table prec.)'**.

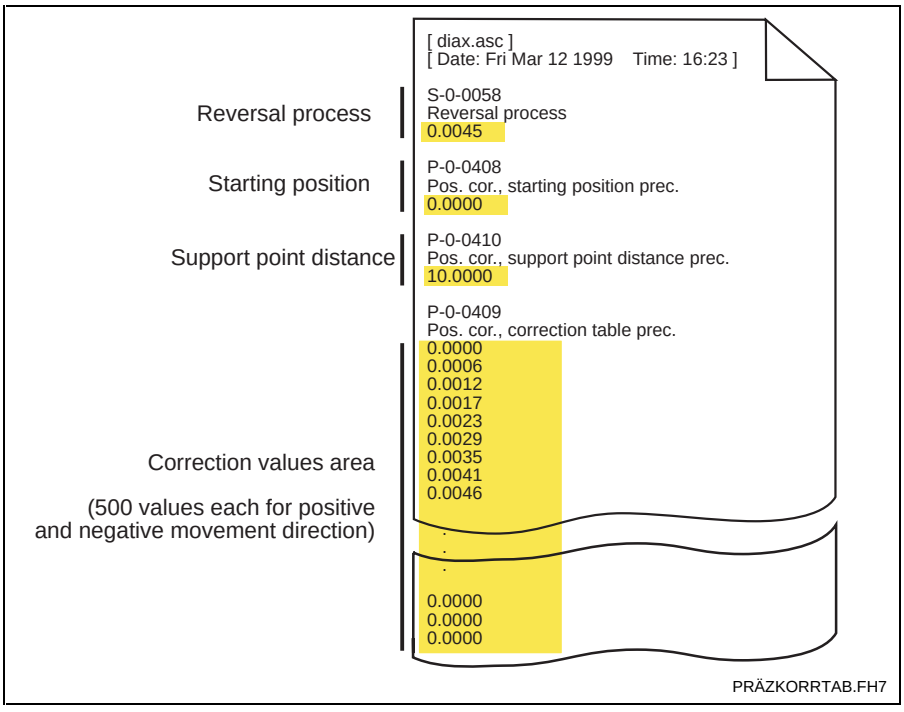


Fig. 4-1: Example of a correction data table of the measuring system renishaw (extract).

File for Drive Parameters

With the help of the file service of the control interface, a file with the parameter settings is created from the drive data.

Drive parameter file structure

The following figure shows a file extract with the parameters necessary for the precision axis error correction.

The marked positions must be replaced by the correction data table values of the measuring system.

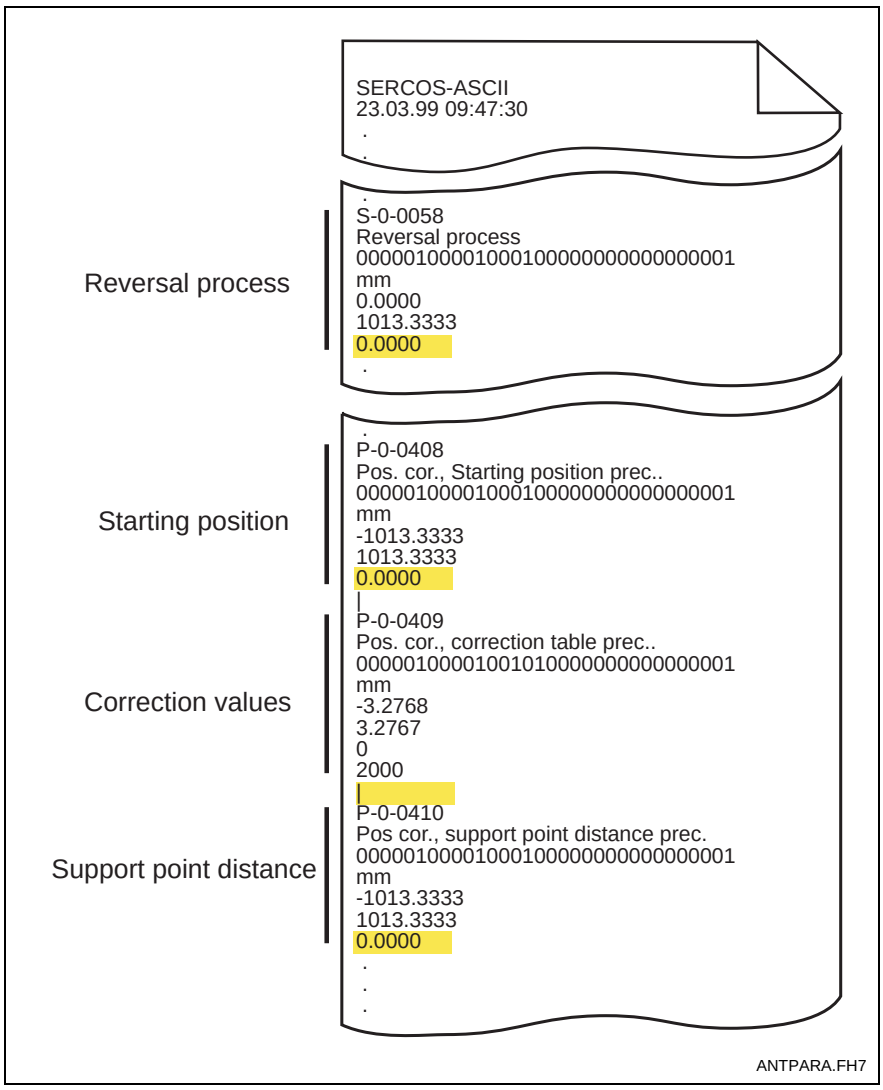


Fig. 4-2: Example of a drive parameter file (extract)

The correction values can be transferred by entering manually or by copying via an editor .

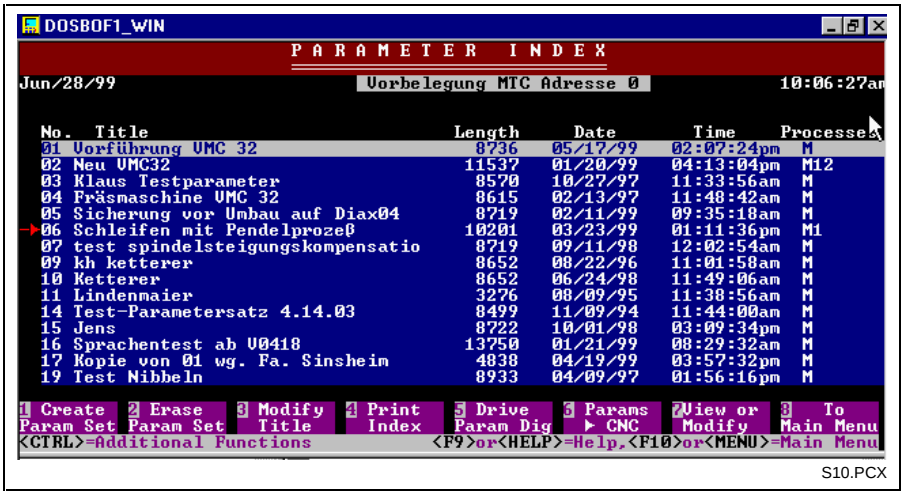
4.2 Enter Correction Values Manually

The correction values can be entered manually in the 'SERCOS-INTERFACE' menu of the control. This menu can be selected in the graphical user interface GUI of the control.

Proceed as follows.

- Press F8 <Setup/confi.>
- Press F5 <Machine param.>
- Press F5 <Drive Param. Dig.>

Select parameter set



S10.PCX

Fig. 4-3: Select parameter set

- Select axis (position cursor on axis and press <Enter>)

Select axis

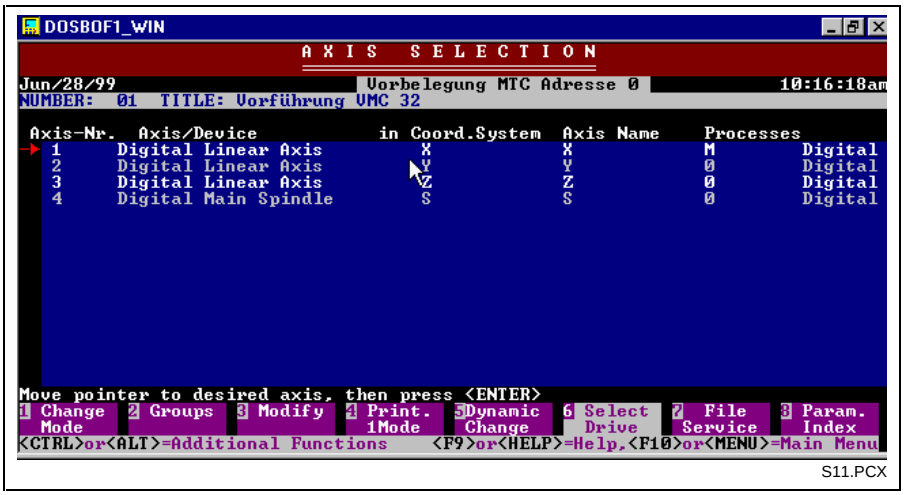


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Fig. 4-4: Select axis

- Select parameter P-0-0409 (position cursor on parameter and press <Enter>)

Select parameter P-0-0409

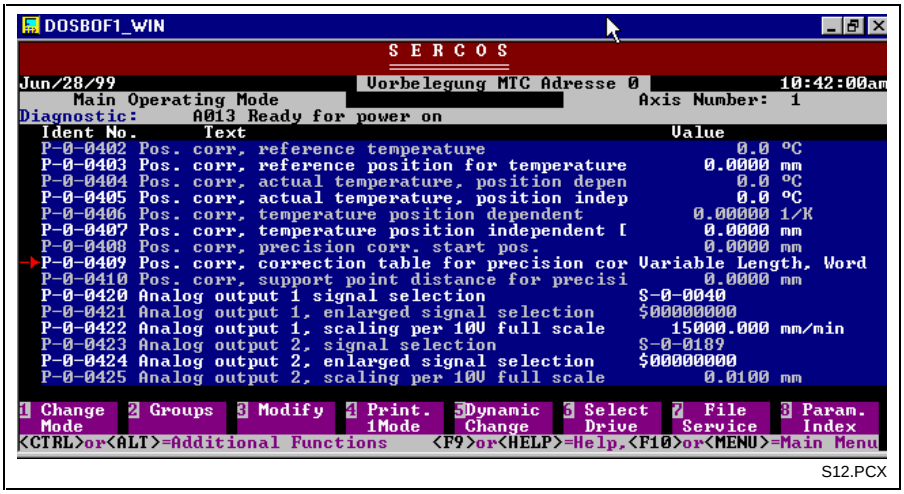


Fig. 4-5: Select parameter P-0-0409

After entering the password, the drive parameters are imported. If there are no data for correction values' available in the parameter 'precision axis error correction' , a window displays the entry 'no data'.

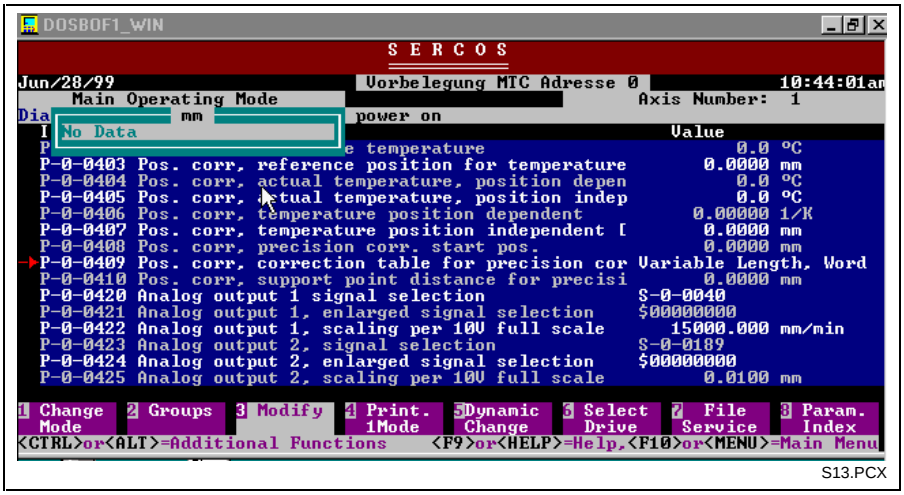


Fig. 4-6: Parameter 'precision axis error correction' without data

In this case a list must be created in the processing mode.

- Press F1 <Change Mode>

Create list

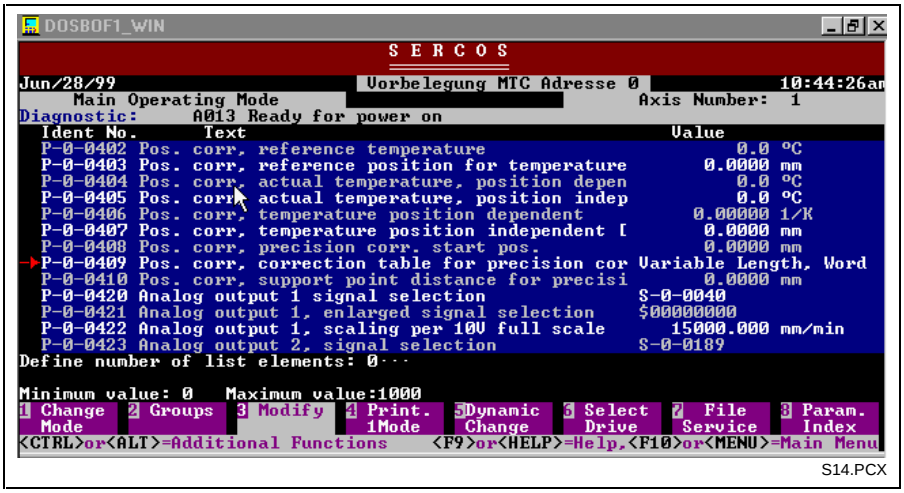


Fig. 4-7: Enter number of list elements

Determine the number of list elements. For Indramat drives DIAX03/04, 1000 list elements must be created. The first 500 values are reserved for the positive movement direction, the next 500 values are reserved for the negative movement direction. In order to avoid actual value jumps, the first and the last correction value of each movement direction must be occupied by ’0’. If not all correction support points are necessary, the list elements which are not necessary must be occupied by the correction value ’0’.

Note: Please also consider the functional description ’DIAX03 Drive For Servo Function’ and the functional description ’Axis Error Correction’

If the correction data exists, a data list will be displayed.

Enter list values manually

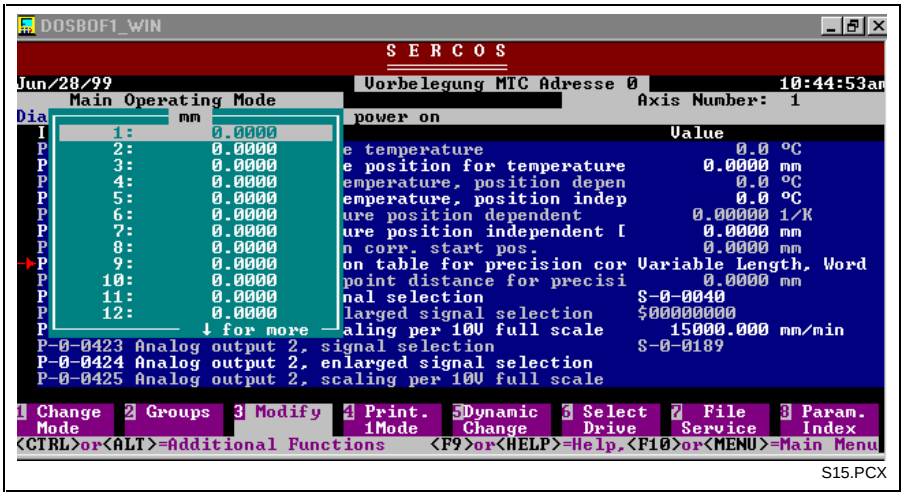


Fig. 4-8: Parameter ‘precision axis error correction’ with list elements

- Modify list element.

Select the list element for which the value is to be modified (position cursor on list element and press <Enter>) and modify it.

4.3 Copy Correction Values to Parameter Table

Create Drive Parameter File

The established correction values of the laser interferometers must have a format that corresponds to the parameter file format. In this way the correction values can be copied into the parameter file via an ASCII editor. Proceed as follows.

The drive parameters are stored in an ASCII file with the help of file service. The externally created table of the laser interferometer can be transferred in this ASCII file with correction values.

Load drive parameters to control

In the graphical user interface GUI:

- Press F8 <Setup>
- Press F5 <Machine Parameter>
- Press F5 <Drive parameter>

Fig. 4-9: Drive parameters

- Select axis (position cursor on axis and press <Enter>)

Fig. 4-10: Axis selected

The drive parameters are transferred now.

Write drive parameters in a file

- Press F7 <File Service>

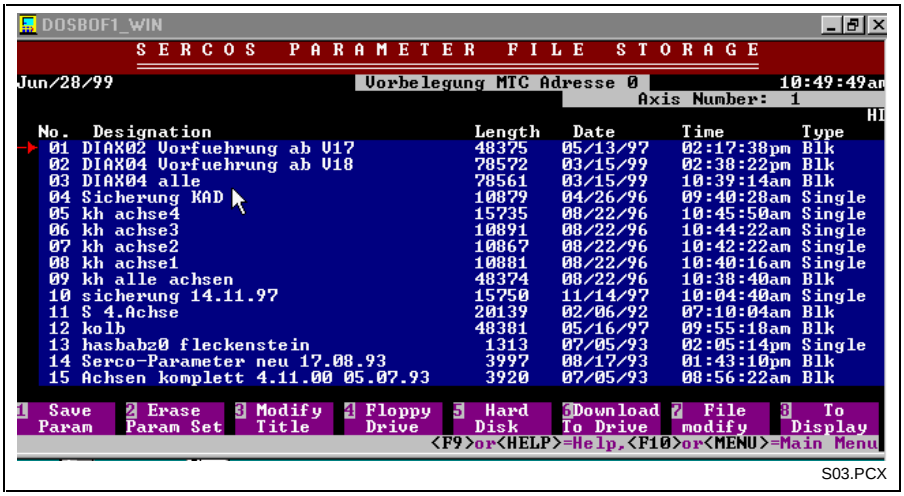


Fig. 4-11: File service called

- Select F4 <Floppy Drive> or F5 <Hard Disk>.

Select the drive where the drive parameter file is to be stored. If F4 <Floppy Drive> is selected, a window is displayed which allows to select between drive A and B.

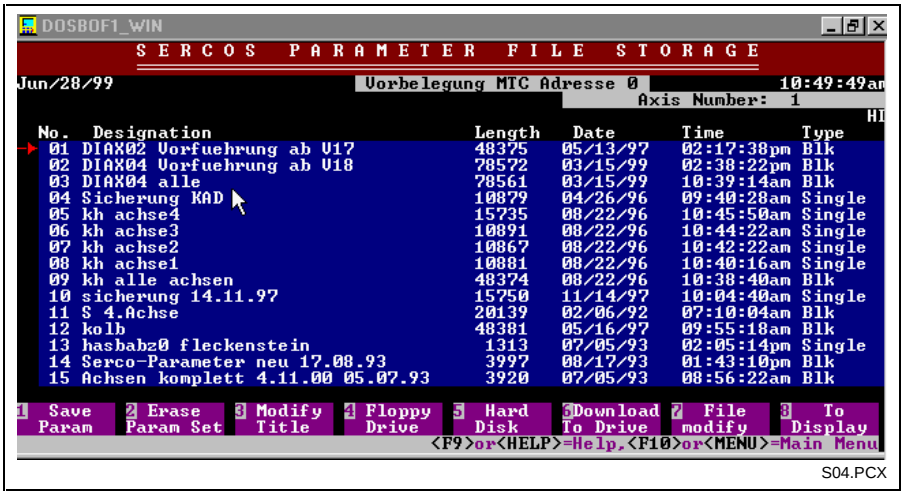


Fig. 4-12: Floppy drive selection

- Press F1 <Save Param.>

Enter a parameter set number (01 up to 99) and a parameter designation for the parameter set to be saved.

Note: The parameter files can only be saved if the user has the necessary rights. Consequently the password is required if the parameter file is saved for the first time.

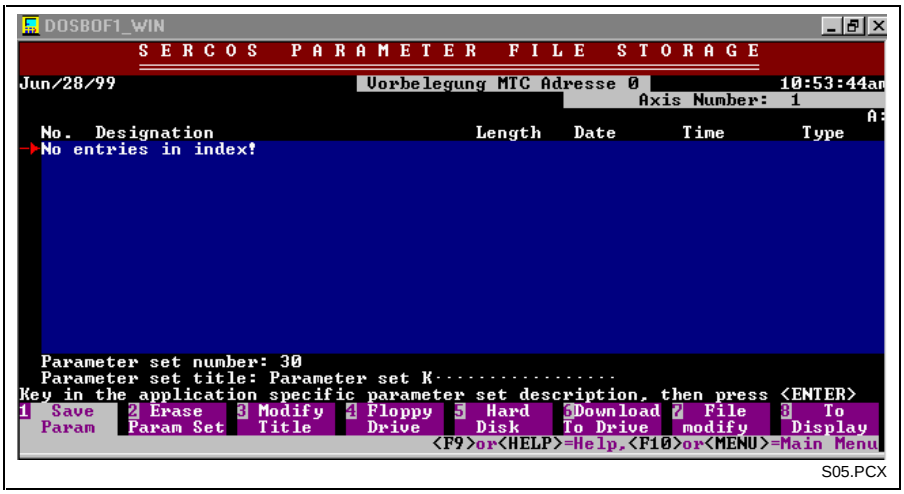


Fig. 4-13: Parameter set and designation

- Select axis

Select the axis or the axes with the parameters to be saved. The data of the drive parameter is saved on the selected drive.

An ASCII file is created in the directory <Drive>\MT-CNC\ANLAGE00\PARAM. The file designation consists of the parameter set number the axis number.

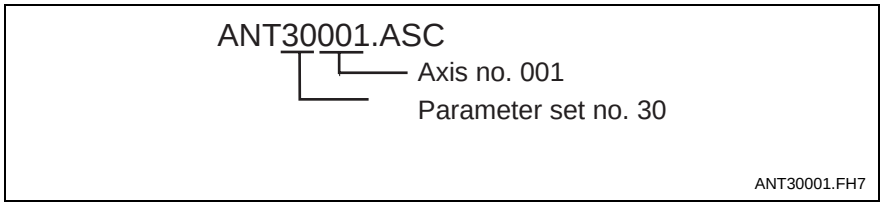


Fig. 4-14: Example of a file name for a parameter file

This file can be modified in an editor now. The following figure shows an extract of a drive parameter file.

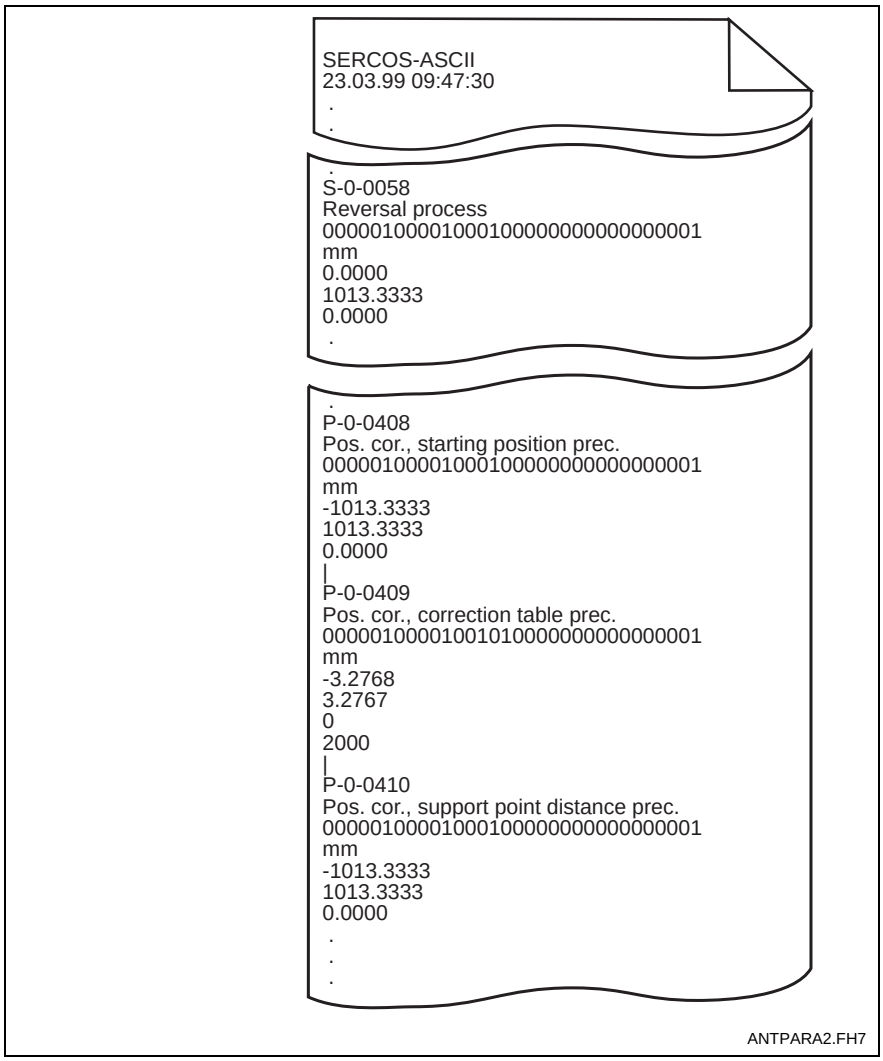


Fig. 4-15: Example of a drive parameter file (extract).

Copy Correction Values into Parameter File

The drive parameter file and the correction data table of the measuring system can be opened in an editor. Copy the value area of the correction data table and insert it in the corresponding section (P-0-0410) of the drive parameter file. Also, transfer the values of the parameter S-0-0058 (reversal process), P-0-0408 (starting position) and P-0-0410 (support point distance) from the correction data table into the drive parameter file.

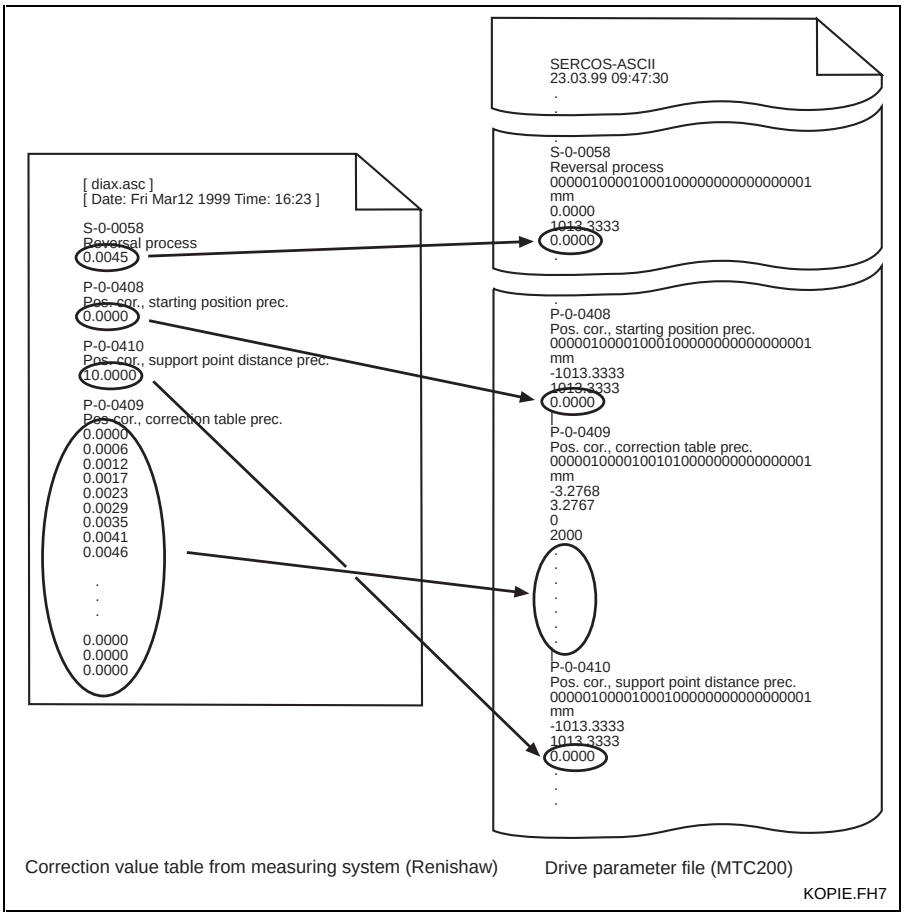


Fig. 4-16: Copy correction values

Re-Load Drive Parameter File to the Drive

The modified parameter file with the correction values is re-loaded into the drive now. Proceed as follows.

In the 'SERCOS-INTERFACE' screen:

- Press F1 <Change Mode>

In order to re-write the drive data, parameter mode must be selected.

Parameter Mode

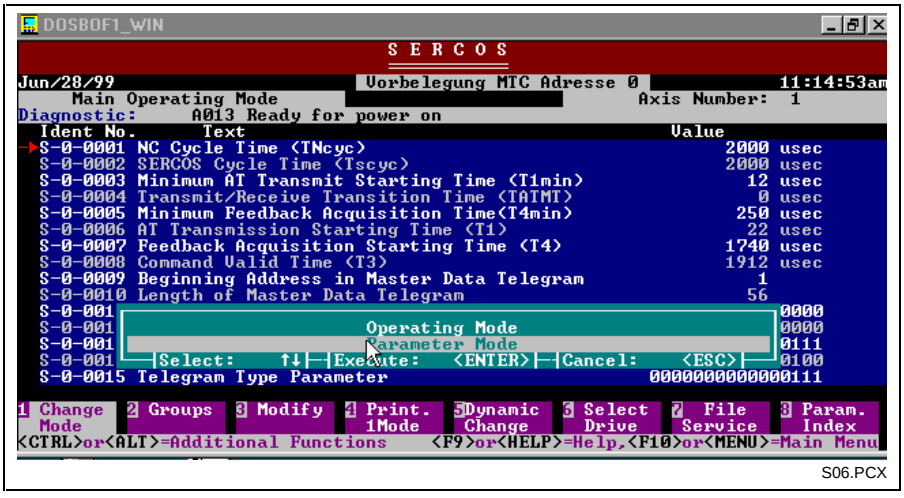


Fig. 4-17: Parameter Mode

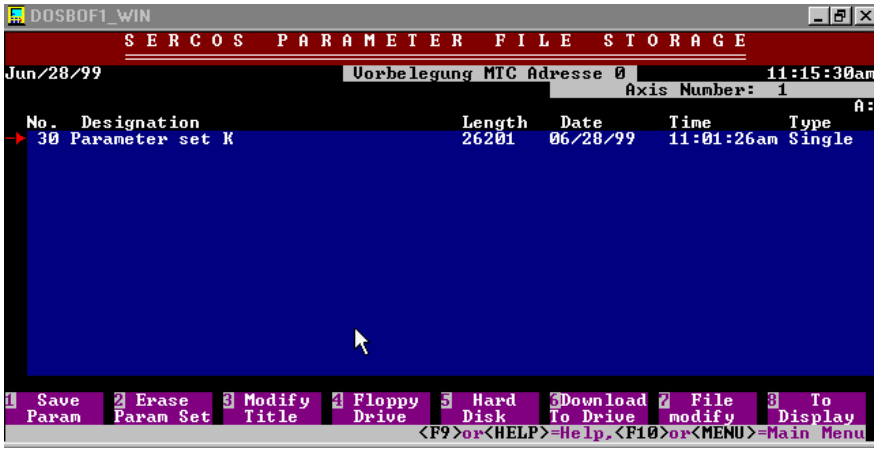
- Press F7 <File Service>
- Press F4 <Floppy Drive> or F5 <Hard Disk>.

Please select file service and determine the drive where the modified parameter file is saved.

- Press F6 <Download to Drive>
- Select parameter set

Position the pointer on the parameter set to be re-saved and press <Enter>.

Select parameter set



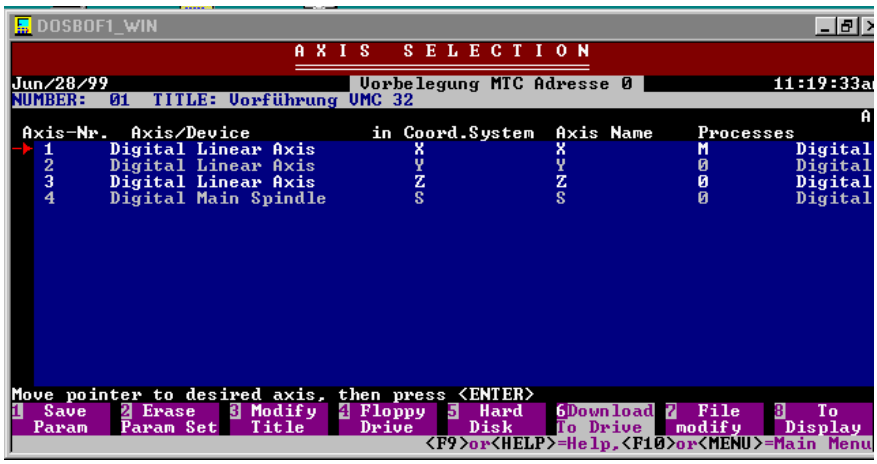
S08.PCX

Fig. 4-18: Select parameter set

- Select axis

Position the pointer on the axis with the parameter to be re-loaded and press <Enter>.

Select axis



S09.PCX

Fig. 4-19: Select axis

The drive parameters are re-loaded to the drive now. Now the inserted correction values are considered during axis movements.

5 Execute Droop Compensation

Chapter overview

This chapter informs you how to transfer the correction values for the droop compensation into the control manually or by importing in the parameter file.

Requirements

- The correction values were established by the laser interferometer system and are available as ASCII file.
- For importing the correction values the file format must correspond to the format of the parameter. The file should have the file extension *.DKP.

5.1 The Correction Data File of the Measuring System

The correction values are recorded by the laser interferometer measuring system and saved in an ASCII file. The file contains only the measuring values in a table with one column.

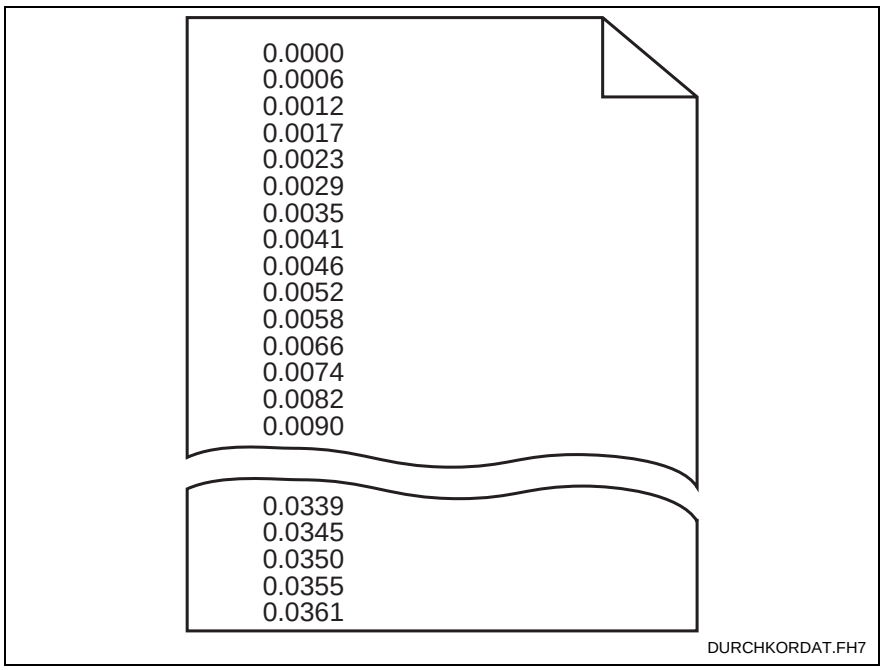


Fig. 5-1: Correction data file as provided by the measuring system.

5.2 Enter Correction Values Manually

The correction data for the droop compensation can be entered manually in the menu 'axis parameter processing' of the user interface MUI:

Proceed as follows in the graphical user interface GUI:

- Press F8 <Setup/confi.>
- Press F5 <Machine Param.>

Select the parameter set for which the droop compensation is to be executed.

Select parameter set

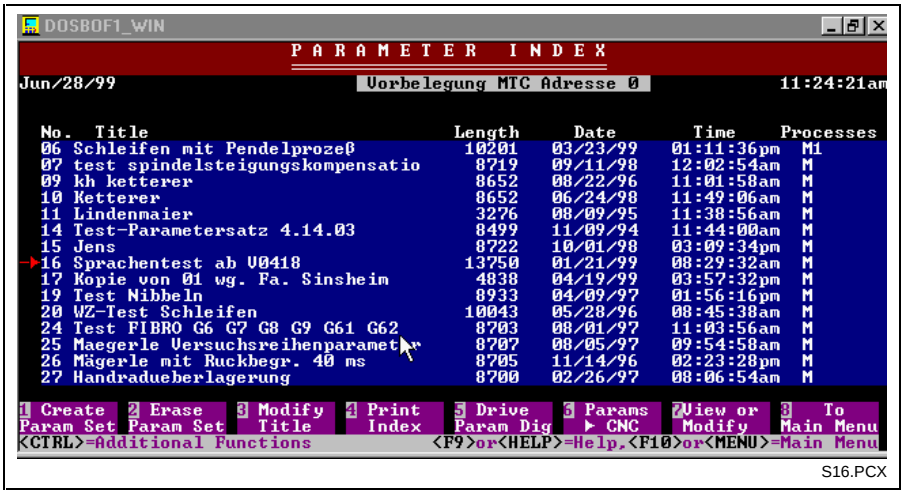


Fig. 5-2: Select parameter set

- Select parameter set (position pointer on parameter set and press <Enter>)
- Press F3 <Axis parameter>

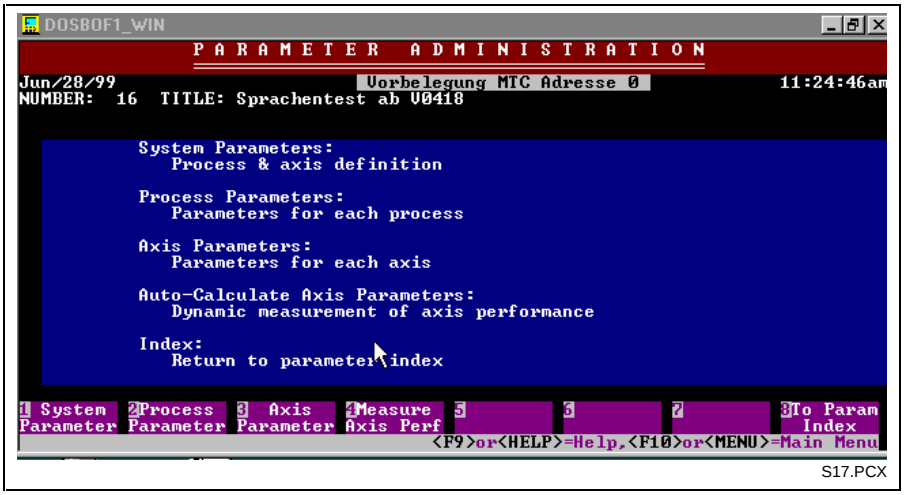


Fig. 5-3: Axis parameter

- Select axis (position pointer on axis designation and press <Enter>)

Select axis

Fig. 5-4: Select axis

For the droop compensation the following parameters are used:

Cxx.077	Droop compensation
Cxx.078	Number of assigned axis

Cxx.079	Number of compensation points
Cxx.080	Distance between the compensation points
Cxx.081	Starting position of the table
Cxx.082	Unit of measurement of the compensation
Cxx.083	Droop compensation values

The droop compensation must be activated with the parameter 'Cxx.077 Droop compensation'. The parameters Cxx.078 to Cxx.82 must also be set.

S19.PCX

Fig. 5-5: Parameter for droop compensation

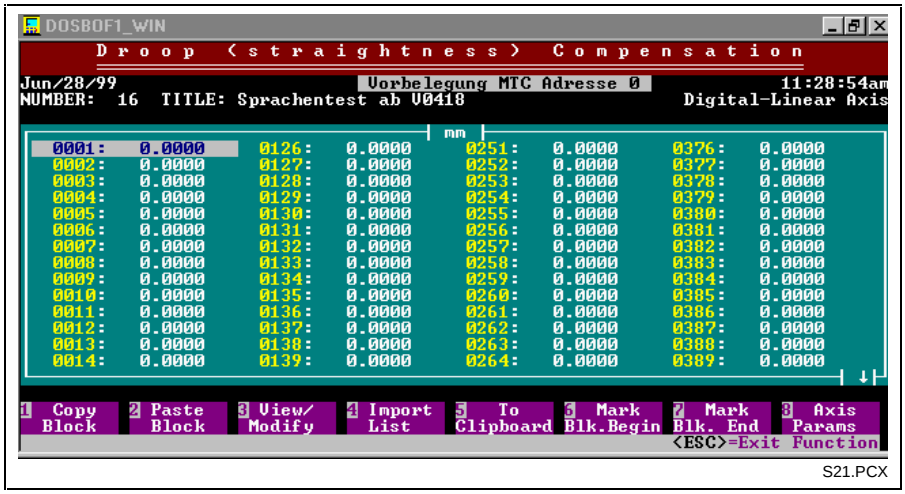
Note: Please consider the description in the documentation 'Parameter Description'.

The correction values are entered in a list in the parameter 'Cxx.083'.

- Open compensation list (position pointer on parameter Cxx.083 and press <Enter>)

The list has a table structure and contains the number of elements entered in the parameter Cxx.079.

Table for positive and negative movement direction



S21.PCX

Fig. 5-6: Compensation list

By positioning the cursor on a list element and following <Enter> each value can be modified one by one.

Modify list values

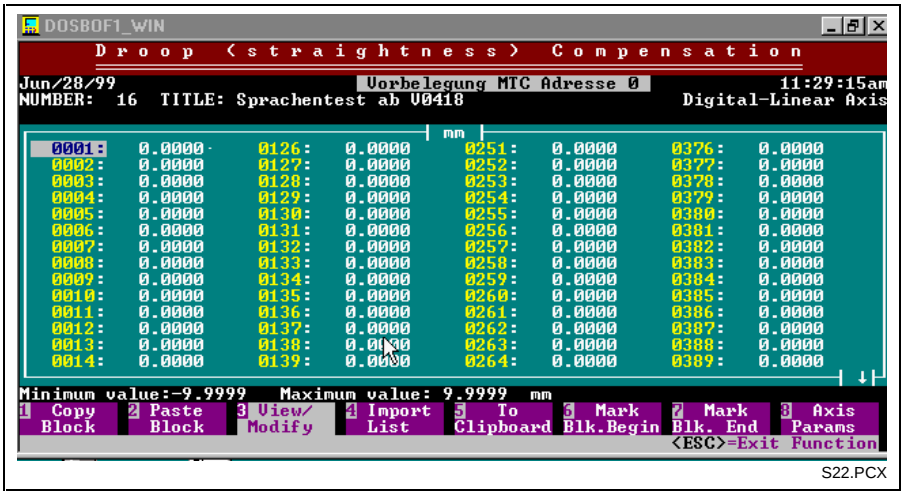


Fig. 5-7: Modify list value

- Save list

Press 'ESC' to quit the list after editing. Answer the question: 'Would you like to save the compensation list (Y/N)?' with 'Y' if you would like to keep the modifications.

Now the correction values are saved and are considered in following axis movements.

5.3 Import Correction Values to Parameter Table

The established correction values of the laser interferometers must have a format that corresponds to the compensation list format in parameter Cxx.083. Then it is possible to import the correction values directly in the compensation list. Proceed as follows.

Show droop compensation

- Display the compensation list.

Proceed as described in the previous chapter.

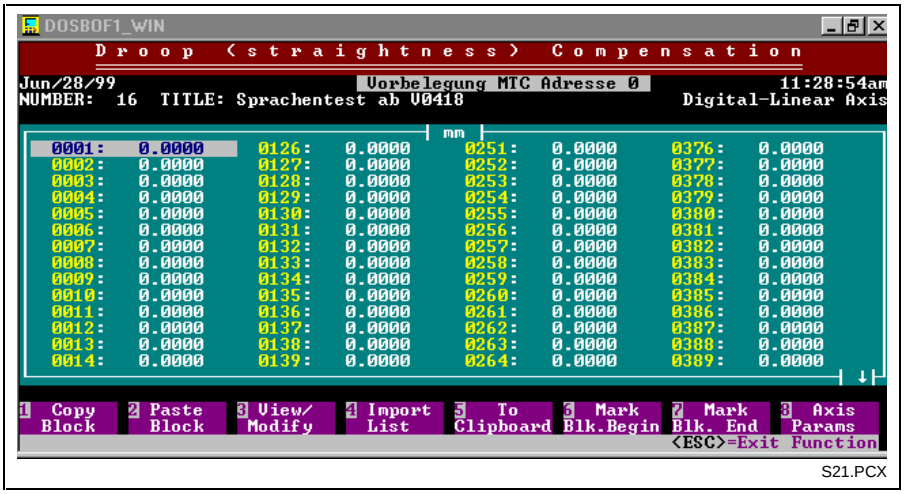


Fig. 5-8: Compensation list

Open external correction data file

Open the external file where the correction data is saved. For this, the block operations of the internal editor are used.

- Press <Ctrl>+<K>+<R> to open a file
- Place the cursor on the first list element and confirm with <Enter>.

- Enter the file name of the correction data file or select the name in the file list which can be accessed with <Tab>. Place the marking on the required file and press <Enter>.

Note: All files with the extension *.DKP in the directory <Drive>\MT-CNC\ANLAGExx\MT_TEMP\ are available for selection. If necessary change drive and directory.

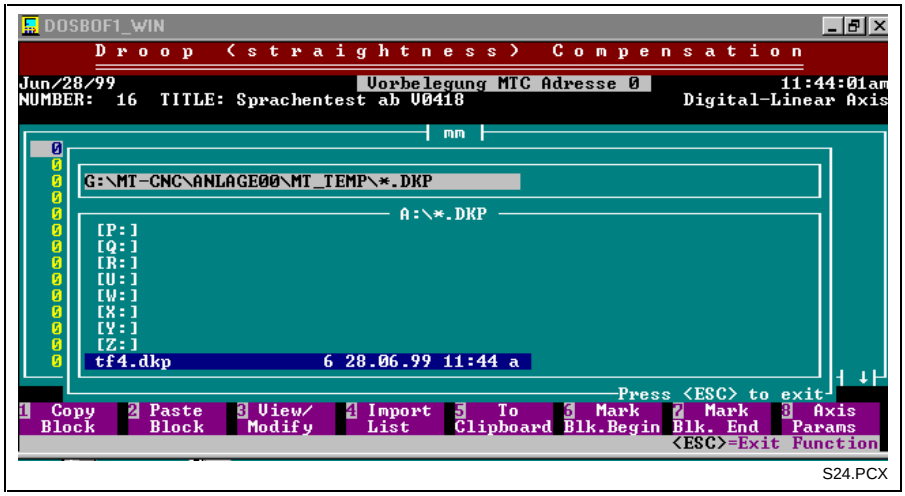


Fig. 5-9: Select external correction data file

The data is read and appears in the compensation list.

Save compensation list

- Quit the compensation list with <Esc> and answer the question. 'Would you like to save the compensation list (Y/N)?' with 'Y' if you would like to keep the modifications.

Now the compensation list is reloaded into the control. Now the inserted correction values are considered during axis movements.

6 Check Correction

6.1 Execute Check Measuring

After the execution of the precision axis error correction and the droop compensation and the transfer of the correction values to the drive and/or the control, the actual status is established again.

Therefore the measuring process with measuring data recording is executed again and the results are analyzed.

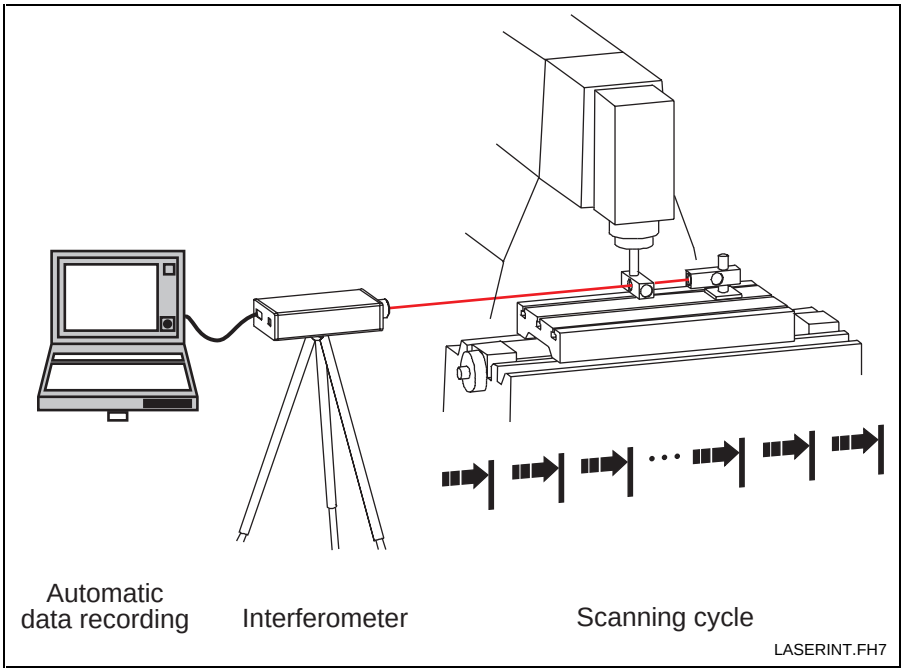


Fig. 6-1: Check measuring

6.2 Create Acceptance Report

The software of the laser interferometer measuring program offers various possibilities of evaluation and representation of the measuring results. From this an acceptance report is created. If executed in regular time intervals it is possible to check which machines fulfill the precision requirements or whether an adjustment is necessary.

7 Index

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