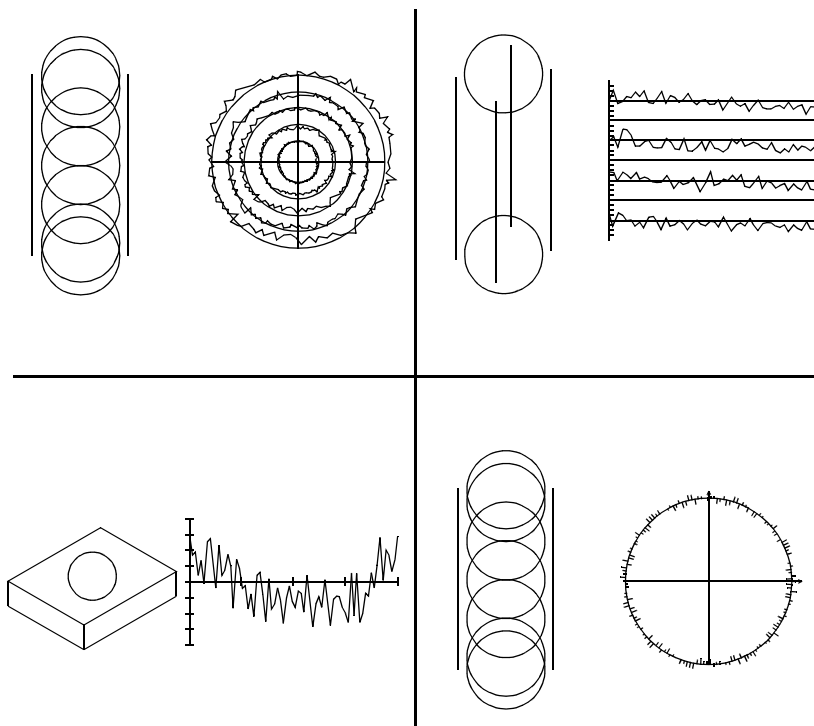


## Option 21 Form tester plots



## Operating Instructions

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# Preface

It is here assumed that the user is familiar with the coordinate measuring machine and its components. Please keep all printed materials delivered with the measuring machine ready to hand at all times.

## Principles in this operating manual

Before starting to work with this manual, the user has to familiarize himself with the applied principles.

In the following, you will find information on the used font types, signs and symbols.

## Typographic principles

The font types and font schemes used in this manual have the following meaning:

- **bold face**
  - Dialog element on the screen  
Example: "... the button <TERMIN>"
  - Term  
Example: "During calculation, the location of a **measuring element** in relation to a **reference element** is determined."
  - File and directory names  
Example: **/home/zeiss/UB**
- *italic*
  - Highlighted text of which the contents is very important  
Example: "Click with the *right* mouse button ..."
  - Cross reference  
Example: "..., see also ► *"Flatness" on page 5-13*"
- **Courier bold face**  
Text in dialog windows and records

## Signs and symbols

Special signs and symbols are used in this manual.

### Symbols for warnings and information



#### **Danger!**

In this case, special care is called for. The warning triangle indicates risk of injury. Non-observance of this warning may cause personal injury.



#### **Attention!**

This symbol warns against situations which may lead to loss of data, measuring errors, errors in the measuring run, collisions or damage to the machine and workpiece.



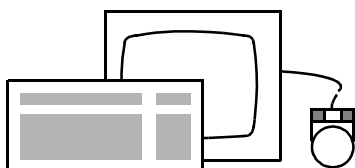
The **Note** symbol is shown next to important text and helpful additional information.

### Symbol for function call

There are several possibilities:

- Direct input by means of the DI number
- Function selection by means of the pull-down menu
- Selection by means of icons

Example:



<u>DI</u>	<u>Pull-down menu</u>	<u>Icon</u>
1639	CNC PROG Start...	



### Symbol for softkey

Reference to softkeys in dialogs.

# Overview of chapters

This manual describes the function, operation and application possibilities of the measuring program UMESS Opt. 21.

The following subjects are described:

- *“Introduction” on page 1-1*
- *“User interface” on page 2-1*
- *“Operation” on page 3-1*
- *“Layouts” on page 4-1*
- *“Evaluation procedures” on page 5-1*
- *“Designer” on page 6-1*
- *“Printer installation” on page 7-1*



# Table of contents

<b>Principles in this operating manual</b> .....	<b>3</b>
Typographic principles .....	3
Signs and symbols .....	4
<b>Overview of chapters</b> .....	<b>5</b>

## **Chapter 1 Introduction**

<b>System requirements</b> .....	<b>1-2</b>
<b>User requirements</b> .....	<b>1-2</b>
<b>Proper use</b> .....	<b>1-3</b>

## **Chapter 2 User interface**

<b>Dialog window</b> .....	<b>2-2</b>
<b>Structuring of "GDT plot" input window</b> .....	<b>2-3</b>
Menu line .....	2-4
Record header .....	2-4
Graphic evaluation .....	2-5
Table of numeric results .....	2-5

## **Chapter 3 Operation**

<b>Operational requirements</b> .....	<b>3-2</b>
<b>Program recording</b> .....	<b>3-3</b>
<b>Activating VDA file recording</b> .....	<b>3-4</b>
<b>Recording measuring points</b> .....	<b>3-6</b>
<b>Evaluating geometric elements</b> .....	<b>3-7</b>
<b>Evaluating plots</b> .....	<b>3-11</b>
<b>Printing</b> .....	<b>3-15</b>
<b>Terminating a GDT plot</b> .....	<b>3-16</b>

Switching off VDA file recording .....	3-16
Terminating programming .....	3-18
Plot control data .....	3-19

## Chapter 4 Layouts

Standard layouts .....	4-3
Individual layouts .....	4-27
Editing layouts .....	4-28
File .....	4-29
Edit .....	4-29

## Chapter 5 Evaluation procedures

<b>Straightness</b> .....	<b>5-2</b>
Cylinder axis .....	5-2
Intersection line of two surfaces .....	5-2
Object: Any line on surface or surface line .....	5-3
Self-centering line .....	5-5
<b>Roundness</b> .....	<b>5-6</b>
Single roundness .....	5-6
Multiple roundness .....	5-7
<b>Cylindricity</b> .....	<b>5-9</b>
3D Cylindricity .....	5-9
2D Cylindricity .....	5-10
Cylindricity, surface lines .....	5-11
<b>Flatness</b> .....	<b>5-13</b>
Multi Flatness Circular .....	5-13
Multi Flatness Line .....	5-14
Flatness Multi Circular .....	5-14
Flatness Multi Line .....	5-15
<b>Location-specific and non-location-specific position tolerances of surfaces</b> .....	<b>5-17</b>
Parallelism, perpendicularity, angularity, runout .....	5-17



Symmetry, position of surfaces . . . . .	5-19
Symmetry, position of surfaces with multiple paths . . . . .	5-20
Cumulative axial runout with multiple paths . . . . .	5-22
<b>Parallelism, perpendicularity, angularity, symmetry, position, coaxiality of axes . . . . .</b>	<b>5-23</b>
Parallelism, perpendicularity, angularity of linked axes . . . . .	5-24
Symmetry and position of linked axes (untested) . . . . .	5-25
<b>Cumulative radial runout . . . . .</b>	<b>5-26</b>
<b>Thickness measurements . . . . .</b>	<b>5-27</b>
Surfaces . . . . .	5-27
Lines . . . . .	5-28
Circles . . . . .	5-29

## Chapter 6 Designer

<b>Start . . . . .</b>	<b>6-2</b>
<b>Description of workspace . . . . .</b>	<b>6-4</b>
Menu line . . . . .	6-4
Toolbar . . . . .	6-4
Editing pallet . . . . .	6-5
<b>File management . . . . .</b>	<b>6-6</b>
<b>Basic functions . . . . .</b>	<b>6-7</b>
<b>Workspace settings . . . . .</b>	<b>6-8</b>
Paper format . . . . .	6-8
Display . . . . .	6-9
Magnetic grid . . . . .	6-9
<b>Working in the editing area . . . . .</b>	<b>6-10</b>
Selection tool . . . . .	6-10
Drawing lines and basic shapes . . . . .	6-11
Changing objects . . . . .	6-14
Text field tool . . . . .	6-18
Import tool for bitmap files . . . . .	6-19
Drawing plane . . . . .	6-22

Object groups .....	6-23
---------------------	------

## **Chapter 7 Printer installation**

Printer emulation .....	7-2
Installation of Shared Print .....	7-3
Selection table for Shared Print printers .....	7-5
Installation of Gost Print .....	7-6

# Chapter



## Introduction

---

### **This chapter contains:**

System requirements . . . . .	1-2
User requirements . . . . .	1-3
Proper use . . . . .	1-4

## System requirements

### Hardware

A system with the following technical specifications is recommended as a minimum requirement for installing this option:

**Min. RAM space**

- HP UX 9.5 min. 64 MB
- HP UX 10.20 min. 128 MB

**Min. hard disk space**

min. 1 GB

### Printer

Graphic output on the printer is performed differently than in UMESS. If no postscript printer is used, an appropriate printer driver must be installed. For more information see ➤ *“Printer installation” on page 7-1.*

### Software

A help routine (**acis2**) is automatically installed along with Opt.21.

# User requirements

## UMESS

This operator's manual is only a supplement to your basic UMESS operating instructions. As such, it does not contain some basic information on correct operating procedure. Please refer to your general UMESS operating instructions whenever any such information is required.

General knowledge of the following is required to use this manual:

- Operating levels
- Mouse functions
- Window settings
- (Basic) operation of UMESS

# Proper use

### Opt. 21

This program can be used to graphically display form and position evaluations. In addition, it also features an evaluation routine for thickness measurement.

- Straightness plot
- Roundness plot
- Flatness plot
- Cylindrical form (3D and surface lines)
- Parallelism, perpendicularity, angularity
- Position, symmetry, coaxiality
- Axial runout, cumulative axial runout
- Radial runout, cumulative radial runout
- Thickness plots (surface, straightness and pipes)

# Chapter

# 2

## User interface

---

### **This chapter contains:**

Dialog window . . . . .	2-2
Structuring of "GDT plot" input window . . . . .	2-3

## Dialog window

Several different windows are required for program runs. These windows are of general design and feature extensive functions and softkeys. Only a couple of softkeys are required to operate the Opt.21 option.

A complete explanation of the individual softkeys and operating steps is given in the chapters on program operation.

All other softkeys are required for other programs (e.g. UMESS) and will not be described in these operating instructions.



# Structuring of "GDT plot" input window

1

GDT plot

☐ ☐

File

Edit

<b>ZEISS</b>	Cylindr. form Surface lines	Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK	Date:      date Time:      time Order no.: H12 Suppl./cust.: H13 Work cycle: H14 Operator: H1
Part no.: H3	Drawing no.: H11		
Workpiece: H4			

CylFormLine  
0.971089 mm/Skt

2

3

Index	Method	Filter type	Lambda	Waves	T	[%]Seg.	Magnification: magnif

Index	Designation	Job	Act value	Tolerance	Points	Vscan	Probe

4

### NOTE

The **GDT plot** input window always has the same components, regardless of which GDT plot you have called up.

It is subdivided into the following areas:

#### 1. Menu line

Containing the basic functions of the **GDT plot** input window.

#### 2. Record header

Containing the most important general data.

#### 3. Graphic evaluation

For graphic display of measured values.

#### 4. Table of numeric results

For listing data from individual elements.

### Menu line

The menu line contains functions which can be executed immediately.

File

Print

This button is used to print out the contents of the **Form plot** window.

Termin

You can press this button to terminate or quit the **Form plot** input window.

Close

Pressing this button also closes the **Form plot** input window.

Edit

Process display

The graphic evaluation can be altered by editing the parameters.

### Record header

The following data is listed in the record header:

- Manufacturer of software with logo
- Form and position evaluation
- Part number

- Drawing number
- Datum
- Time
- Job number
- Supplier/customer
- Working cycle
- Operator
- Workpiece number

### Graphic evaluation

The following data is displayed:

- Graphic representation of scanned contours
- Orientation data
  - Coordinate axes of reference plane
  - Angular data
  - Point data
- Evaluation method

### Table of numeric results

The following data is displayed:

- Method
- Filter type
- Lambda
- Waves
- Tolerance in %
- Segments
- Designation
- Job
- Actual value
- Tolerance
- No. of points
- Vscan
- Probe



# Chapter 3

## Operation

---

### **This chapter contains:**

Operational requirements . . . . .	3-2
Program recording . . . . .	3-3
Activating VDA file recording . . . . .	3-4
Recording measuring points. . . . .	3-6
Evaluating geometric elements. . . . .	3-7
Evaluating plots . . . . .	3-11
Printing . . . . .	3-14
Terminating a GDT plot . . . . .	3-15
Switching off VDA file recording . . . . .	3-16
Terminating programming . . . . .	3-18
Plot control data . . . . .	3-19

## Operational requirements

### Help routine

You will also require the following help routine to fully utilize Opt.21:

#### – **acis 2**

When you start Opt.21, this help routine will also be automatically started and go into standby.

In the root menu (open blue screen background) you can see whether the help routine has been started by a change in the appearance of the icon.



Icon for **acis 2**

### NOTE

The continuous standby state of the help routine often drains system resources, thus slowing down other programs. For this reason, it is generally advisable to terminate Opt.21 whenever this option is **not** required. When you quit Opt.21, **acis 2** will also be automatically terminated.

### UMESS

UMESS must be started, since it provides the basis required to operate Opt.21.

# Program recording

**General**

To enable faster program starts, it is advisable to record (i.e. program) the following steps.

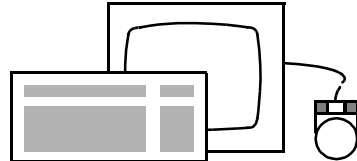
Furthermore, the parameters can be edited, following which the graphics can be reconstructed (recalculated) and redisplayed.

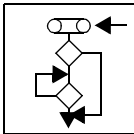
**NOTE**

A full description of the programming procedure can be found in the [UMESS operating instructions](#).

**Start programming**

Start the programming function.



<u>DI</u>	<u>Pull-down menu</u>	<u>Icon</u>
1639	CNC PROG Start...	

## Activating VDA file recording

### General

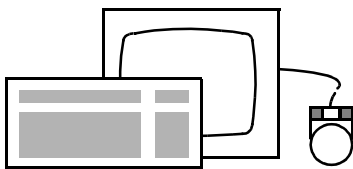
Data can be evaluated and graphically displayed only after it has been stored in the VDA file.

**<DI 1135>** triggers automatic storage of the probing points in VDA file **CZ\_MES\_UA** for each element evaluation. This is necessary to ensure that the input window can be printed out at any time.

The storage function should be activated selectively during the CNC run to prevent too many VDA files from being created.


### VDA file

Start storage function in VDA file



<u>DI</u>	<u>Pull-down menu</u>	<u>Icon</u>
1135		

- Press key **<F12>**.  
The **Direct input** (DI) window appears.
- Enter the number **1135** in the data field.

Direct input	
	1135
Back	Help



- Press the **<ENTER>** key.  
The **Dialog** input window then appears.

Dialog										
VDA file mode										
<input type="checkbox"/>	Save current points to VDA file								<input type="checkbox"/>	
YES				NO				*		
BACK									TERMIN	
									INFO	

- Answer the query whether you want to save points to the VDA file by means of **<YES>**.
- Conclude your input by pressing **<TERMIN>**.

# Recording measuring points

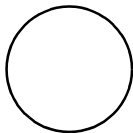
## General

The measuring points and evaluation technique required depend on the type of evaluation involved. The following text gives a simple example of an evaluation run. Further examples are described in the chapters entitled Layout (➤ *“Layouts” on page 4-1*) and Measuring techniques (➤ *“Evaluation procedures” on page 5-1*). These chapters are identical except for the following items:

- Recording measuring points
- Evaluating the geometry
- Plotting.

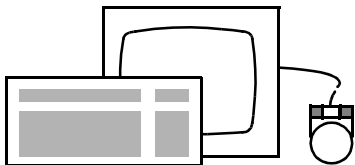
The following example describes the most commonly used type of evaluation, i.e. the roundness plot.

## Roundness plot



For example, record the measuring points of a circle with a CMM. Then save the circle.

## Recording measuring points



<u>DI</u>	<u>Pull-down menu</u>	<u>Icon</u>
1100		

### NOTE

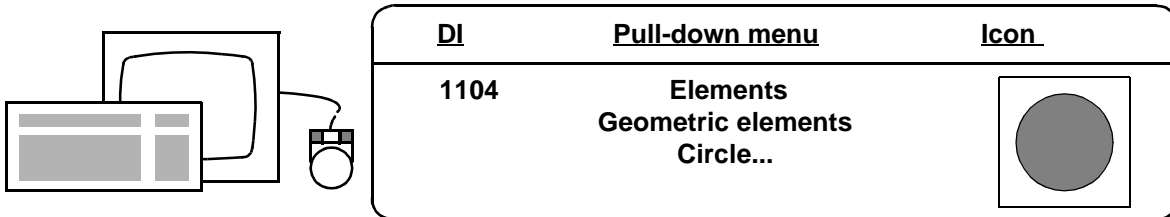
A complete description of how measuring points are generated can be found in the UMESS operating instructions.

# Evaluating geometric elements

## General

The GDT roundness is determined for the circle.

## Circle file evaluation



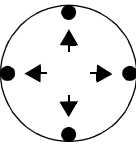
- Press key <F12>.  
The **Direct input** (DI) window appears.
- Enter the number **1104** in the data field.

Direct input	
	1104
Back	Help

- Press the **<ENTER>** key.  
The **Circle** input window then appears.

Circle

Macro selection



Probe no.

1

▲

▼

Element name

Measured points

0

Termin

Cancel

Help

Measurem. macro

VAST

Actions

Nominal size

I-Pos/Prb

Correction

- Actuate the **Actions/File evaluation** button.  
The **Dialog** input window then appears.

Dialog															
Recall of point sets for evaluating geometric elements															
File name				From point number				To point number				Step size			
Pkt1__10				1				999				1			
				1				1				1			
				1				1				1			
				1				1				1			
				1				1				1			
				1				1				1			

				*	COORD								TERMIN			
BACK												INFO				

- Enter the file name in the **Dialog** input window. Select the point numbers and the desired step size.

**NOTE**

Please note that the program automatically attaches an extension to the file name you assign. This extension must also be specified when entering the file name. The extension varies according to the length of the file name. You can determine the extension by consulting the following table.

Assigned file name	Assigned places	Extension	Number of " "	New file name
A	1	____10	7 Stk.	A____10
AB	2	____10	6 Stk.	AB____10
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:
ABCDEF G	7	_10	1 Stk.	ABCDEF G_10
ABCDEFGH	8	10	0 Stk.	ABCDEFGH10
ABCDEFGHI	9	_	1 Stk.	ABCDEFGHI_
ABCDEFGHIJ	10		0	ABCDEFGHIJ

## NOTE

You can view the file name with its full extension in the **Record** input window. When displayed there, the file name also has the **prefix PKT** and the **suffix U**.

Example of a line in the **Record** input window:

**82 points stored in file /UG/PKTAB\_\_\_\_10U**

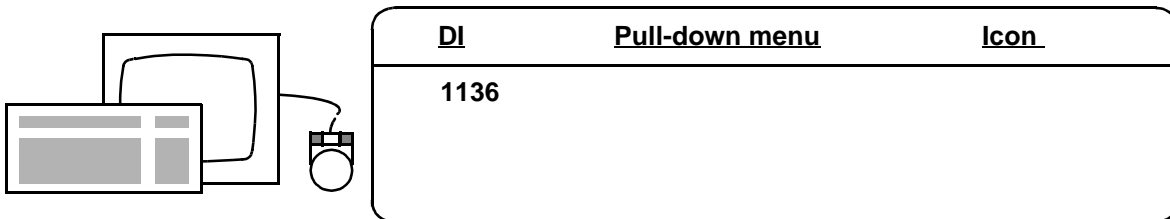
- Click on **<TERMIN>** to quit the data input mode.  
The program then switches to the **UMESS Main menu**.

## Evaluating plots


### General

The results of the GDT roundness evaluation are graphically processed and displayed.

### Callup of form tester plot



- Press key **<F12>**.  
The **Direct input** (DI) window appears.
- Enter the number **1136** in the data field.

Direct input	
	1136
Back	Help

- Press the **<ENTER>** key.  
The **Opt. 21 Form plot** input window then appears.

UX 21 GDT plot

GDT plots

- cz\_cf\_3dc
- cz\_cfl
- cz\_crro\_mc
- cz\_crro\_sc
- cz\_fn\_mc
- cz\_fn\_ml
- cz\_head\_s
- cz\_head\_v
- cz\_logo
- cz\_mfn\_c
- cz\_mfn\_l
- cz\_mr**
- cz\_mr\_t
- cz\_pl
- cz\_sn
- cz\_sn1
- cz\_sn2
- cz\_tbl
- cz\_tn\_c

Standard name: cz\_mr

☒ Record header data

Addresses

- 20 Circle
- 21 Roundness

Line: 1

Add

Delete

Delete all

20	21	1
0	0	1
0	0	1
0	0	1
0	0	1
0	0	1
0	0	1
0	0	1
0	0	1
0	0	1

Termin Back Info

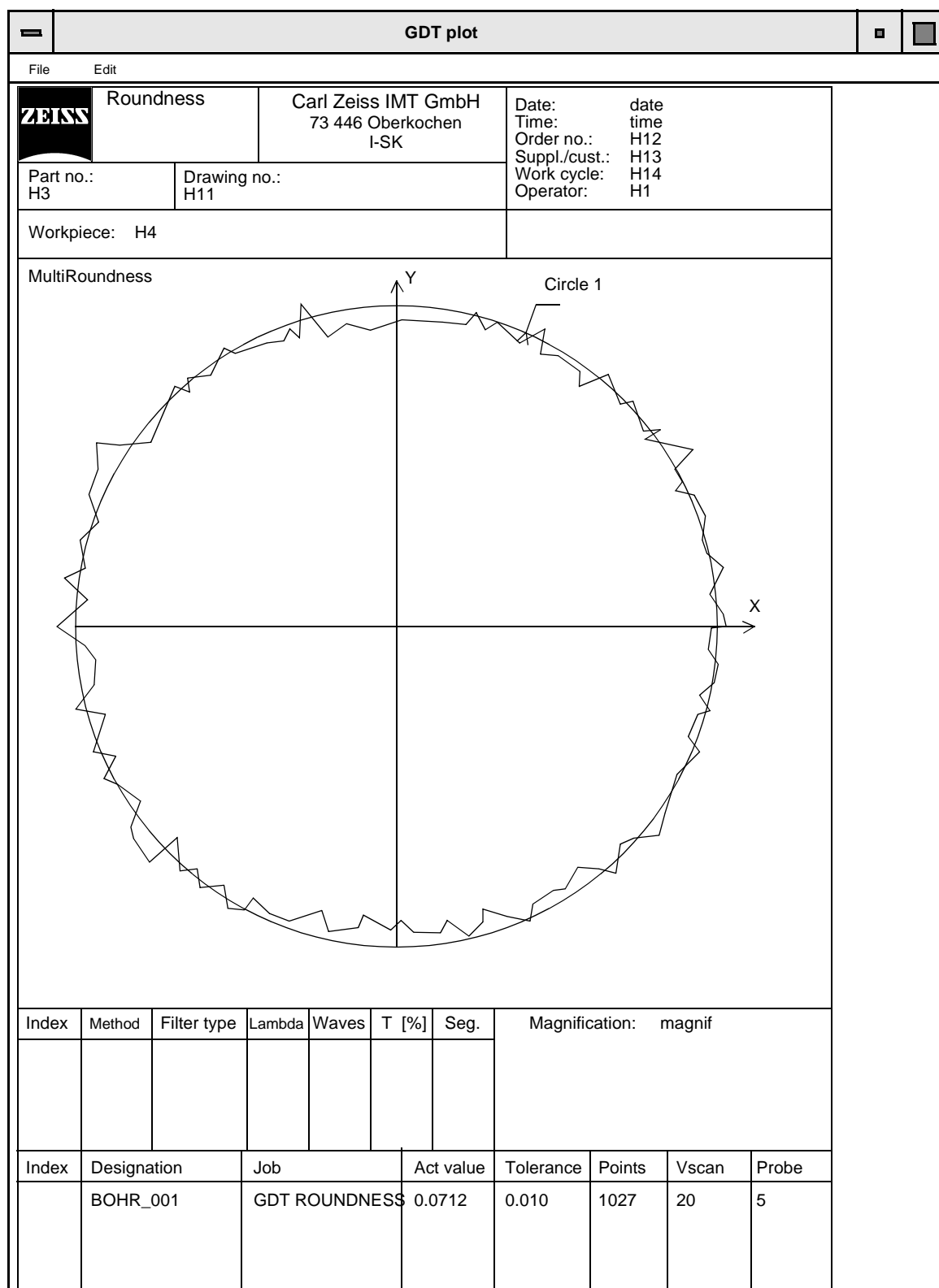
- Select the desired **GDT plot** (➤ “Layouts” on page 4-1, Layout).  
Select **cz\_mr** for the roundness plot.  
The selected **GDT plot** appears in the data field **Standard name**.
- Select display or suppression of the **Record header data** in the **GDT plot** window.
- Select the desired **addresses**. Enter the addresses in the table by clicking on the **Add** button. Repeat this procedure for all other addresses.  
The following information must be displayed in the data fields in this example.

**Address from** 20  
**to** 21  
**Step size** 1

- Delete any addresses not required individually with **Delete** or remove all addresses from the table with **Delete all**.



- Start the graphic evaluation by clicking on the **<Termin>** button. The **GDT plot** input window will appear during the graphic evaluation.



## Printing

### Without postscript

#### NOTE

Option Opt. 21 is programmed as a Smalltalk application. Non-postscript printers require a postscript emulation.

Printouts performed under **HP UX 9.5** require Shared Print software.

Printouts performed under **HP UX 10.20** require Gost Script software.

You must install the corresponding software before executing a printout **for the first time** (► *"Printer installation" on page 7-1*).

### With postscript

#### NOTE

If you use a genuine postscript printer, no emulation is required. In this case, the printer will automatically recognize that a postscript file is to be printed.

### Printout

Use the command in the menu line **File/Print**.

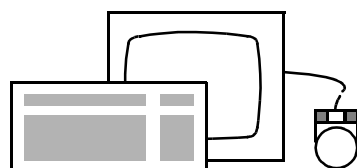
## Terminating a GDT plot

### Terminating a GDT plot

Use the command in the menu line **File/Termin** (► *"File" on page 4-28*).


# Switching off VDA file recording

**VDA file** Terminate the recording in the VDA file




<u>DI</u>	<u>Pull-down menu</u>	<u>Icon</u>
1135		

- Press key **<F12>**.  
The **Direct input** (DI) window appears.
- Enter the number **1135** in the data field.



Direct input



1135

BackHelp

- Press the **<ENTER>** key.  
The **Dialog** input window then appears.

Dialog																
VDA file mode																
<input type="checkbox"/>	Save current points to VDA file								<input type="checkbox"/>							
YES				NO						*					TERMIN	
BACK															INFO	

- Answer the query whether you want to save points to the VDA file by means of **<NO>**.
- Conclude your input by pressing **<TERMIN>**.  
The program then switches to the **UMESS Main menu** input window.

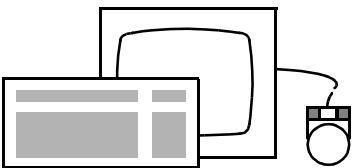
# Terminating programming

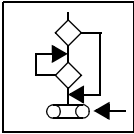
**NOTE**

A full description of the programming procedure can be found in the UMESS operating instructions.

**Terminating programming**


Terminate the programming mode if it is still activated.



<u>DI</u>	<u>Pull-down menu</u>	<u>Icon</u>
1632	CNC PROG End...	

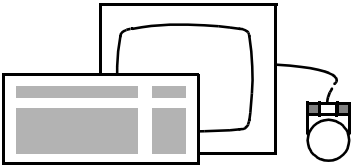
# Plot control data

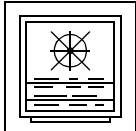
**General**                      The different parameters can be changed by editing the control data.



The control data may be altered only in recorded programs. Then a CNC run must be executed again to reconstruct (refresh) the graphics.

**Editing a file**




<u>DI</u>	<u>Pull-down menu</u>	<u>Icon</u>
1642	CNC Correct control data...	

- Press key <F12>.  
The **Direct input** (DI) window appears.
- Enter the number **1642** in the data field.

=

Direct input



1642

Back

Help

- Press the **<ENTER>** key.  
The **Dialog** input window then appears.

Dialog																
CNC Admin: Control data correct.					Cat name: Performance mode catalog											
<input type="checkbox"/>	WP code		<input type="text" value="XXX"/>		Workpiece name		<input type="text" value="XXX"/>									
					Comment		<input type="text" value="XXX"/>									
<table border="1"> <tr> <td>YES</td> <td>NO</td> <td></td> <td>WP INFO</td> </tr> </table>				YES	NO		WP INFO	*	<table border="1"> <tr> <td></td> <td>CATALOG</td> <td></td> <td>TERMIN</td> </tr> </table>					CATALOG		TERMIN
YES	NO		WP INFO													
	CATALOG		TERMIN													
<table border="1"> <tr> <td>BACK</td> <td></td> <td></td> <td></td> </tr> </table>				BACK					<table border="1"> <tr> <td></td> <td></td> <td></td> <td>INFO</td> </tr> </table>							INFO
BACK																
			INFO													

- Enter the workpiece code (**WP code**), **Workpiece name** and **Comment** in the corresponding data fields.
- or
- Press **<CATALOG>**.
  - A list of all stored workpiece codes (**WP code**) and **Workpiece names** is displayed.
  - Enter the workpiece code (**WP code**), **Workpiece name** and **Comment** in the corresponding data fields.
  - Close catalog by clicking on **<TERMIN>**.



- Conclude your input by pressing **<TERMIN>**.  
The **Dialog** input window then appears.

Dialog

Control data line MODIFY

	1	2	3						
L-No	X	Y	Z	Function	SC2	SC1	PCN	CCN	ADR
12	13			PARAM		3	0 9981	0	
13				GDT END		0	0 9903	0	
14	100	1	2	0	FORMTESTPLOT	0	2 1136	0	
15	20	21	1	DL M RECALL		0	0 9911	0	
16	CZ_MR			LDL CNCNAME		0	0 9919	0	
17	0			VDA MODE		0	1 1135	0	
18				P END		0	0 9999	1999	

MODIFY	SELECT L	UNDO	DEMASK
BACK	SPEC FCT	RESTART	MASK

\*

INSERT	COPY	EXECUTE	TERMIN
DELETE	MOVE	CONVERS	INFO

### Parameter

- 1 Indicates the magnification
- 2 Screen output (code no. = 0), Printer output (code no. = 1)
- 3 Number of continuation lines
- 4 Standard name
- 5 From address
- 6 To address
- 7 Step size

### Editing parameters

- Go to the desired line.
- Select editing mode by pressing key **<F1>**.
- Mark the desired field.  
The selected field then turns white.
- Enter the desired change.
- Press the **<ENTER>** key until the mark jumps to the next line.

## NOTE

The data will be **accepted and stored** only after the mark jumps to the next line. Be sure to actuate **<TERMIN>** beforehand if you do **not** wish to overwrite the old data.

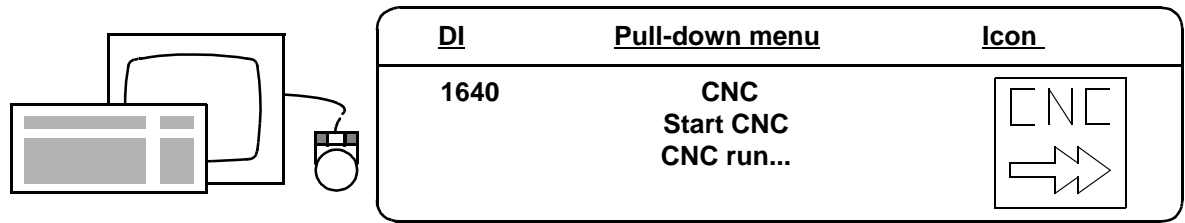
- Press **<TERMIN>** to quit the editing mode.  
The **Dialog** input window then appears.

Dialog													
CNC Admin: Control data correct.					Cat name: Performance mode catalog								
Control data lines			54		Nominal lines			0					
<input checked="" type="checkbox"/> Y		Overwrite			<input type="checkbox"/> *								
or store as													
C		WP code			XXX		Workpiece name			XXX			
							Comment			XXX			
* YES		NO						*		CATALOG		TERMIN	
BACK						CORR CAN						INFO	

- If you want to overwrite the previous data file, you can close the input window by pressing **<TERMIN>**.  
The program then switches to the **UMESS Main menu** input window.
- or
- If you want to store the modified data file under a new name, you must switch off the overwrite function. Click on **<NO>**.  
The **\*** in the **Overwrite** field disappears.
- Enter the new workpiece code (**WP code**), **Workpiece name** and **Comment**.
- Conclude your input by pressing **<TERMIN>**.  
The program then switches to the **UMESS Main menu** input window.

Starting a CNC run

A CNC run must be started in order to display the modified data file with the new magnification.



- Press key **<F12>**.  
The **Direct input** (DI) window appears.
- Enter the number **1640** in the data field.
- Press the **<ENTER>** key.  
The **Dialog** input window then appears.

Direct input

1640

Back

Help

Dialog

CNC Admin: Start CNC run

Cat name: Performance mode catalog

C

WP codeXXX

Workpiece nameXXX

CommentXXX

Start line1

End line54

W pos.

Paper start

manual\*

or autom.

Part number

PART NO

\* YESNOINFO WP

\*CATALOGTERMIN

BACK

INFO

- Enter the workpiece code (**WP code**), **Workpiece name** and **Comment** in the corresponding data fields.
- Confirm your input by pressing **<TERMIN>**.  
The highlighted bar then jumps to the start and end lines.
- Enter the start and end lines.
- Click on **<TERMIN>** to quit the data input mode.  
The program then switches to the **GDT plot** input window.
- The displayed image can be terminated by means of **File/Terminate** or **File/Cancel** .

or

- Press **<CATALOG>**.
  - A list of all stored workpiece codes (**WP code**) and **Workpiece names** is displayed.
  - Enter the workpiece code (**WP code**), **Workpiece name** and **Comment** in the corresponding data fields.
  - Enter the start and end lines.
- Quit the data input mode by pressing **<TERMIN>**.  
The program will then branch to the **GDT plot** input window.
- The displayed image can be terminated by means of **File/Terminate** or **File/Cancel** .

# Chapter

# 4

## Layouts

---

### **This chapter contains:**

Standard layouts . . . . .	4-3
Individual layouts . . . . .	4-27
Editing layouts . . . . .	4-28

## General information

The measured curves and lines are evaluated and graphically displayed.

Both standard and individual layouts are available to display various evaluation functions.

- **Standard layouts**

Standard layouts are predefined by Carl Zeiss. They enable fast graphic display of measured curves and lines.

- **Individual layouts**

Individual layouts are used to create company-specific layouts.

- **Editing layouts**

Displayed layouts can be adapted by changing their parameters.

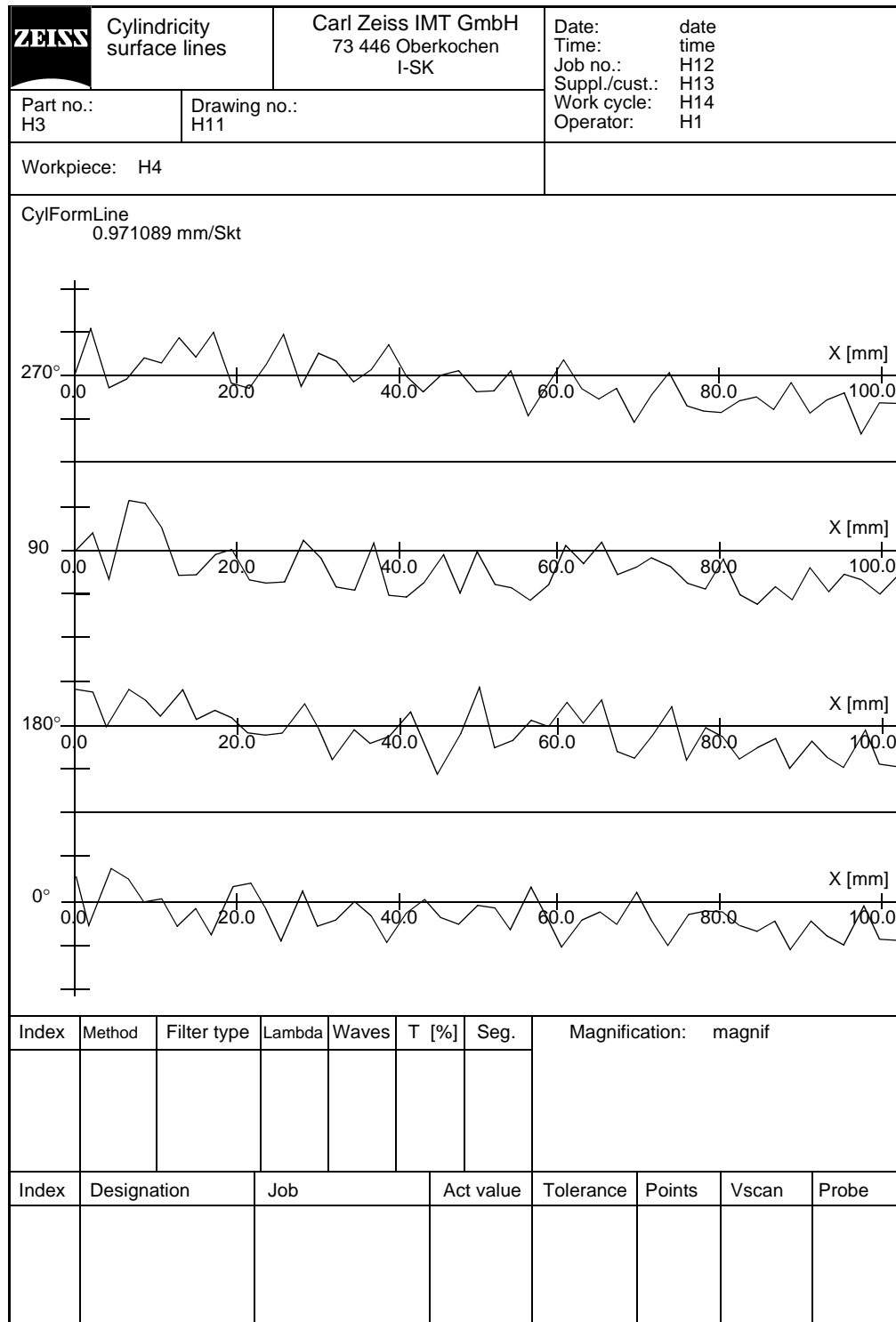
## Standard layouts

The following standard layouts are available:

File name	Name	Comment	Page
<b>cz_cf_3dc</b>			➤ Page 4-4
<b>cz_cf_i</b>	Cylindricity surface lines		➤ Page 4-4
<b>cz_crro_mc</b>	Cumulative radial runout		➤ Page 4-5
<b>cz_crro_sc</b>	Cumulative radial runout		➤ Page 4-6
<b>cz_fn_mc</b>	Cumulative axial runout, circular		➤ Page 4-7
<b>cz_fn_ml</b>	Cumulative axial runout, random path		➤ Page 4-8
<b>cz_head_s</b>	Form header		➤ Page 4-9
<b>cz_head_v</b>	Form header		➤ Page 4-10
<b>cz_logo</b>	Zeiss logo		➤ Page 4-11
<b>cz_mfn_c</b>	Flatness, circular/multiple		➤ Page 4-12
<b>cz_mfn_l</b>	Flatness, random path/multiple		➤ Page 4-13
<b>cz_mr</b>	Roundness		➤ Page 4-14
<b>cz_mr_t</b>	Roundness		➤ Page 4-15
<b>cz_pl</b>	Parallelism of lines		➤ Page 4-16
<b>cz_sn</b>	Straightness, angles 1 & 2		➤ Page 4-17
<b>cz_sn1</b>	Straightness, angle 1		➤ Page 4-18
<b>cz_sn2</b>	Straightness, angle 2		➤ Page 4-19
<b>cz_tbl</b>	Form footer		➤ Page 4-20
<b>cz_tn_c</b>	Surface thickness measurement, circular		➤ Page 4-21
<b>cz_tn_l</b>	Surface thickness measurement, random path		➤ Page 4-22
<b>cz_tn_r</b>	Thickness measurement, radial	Pipes	➤ Page 4-23
<b>cz_tn_sl1</b>	Thickness measurement, lines	X axis	➤ Page 4-24
<b>cz_tn_sl2</b>	Thickness measurement, lines	Y axis	➤ Page 4-25
<b>cz_tn_sl3</b>	Thickness measurement, lines	Z axis	➤ Page 4-26

File name **cz\_cf\_3dc.gra**

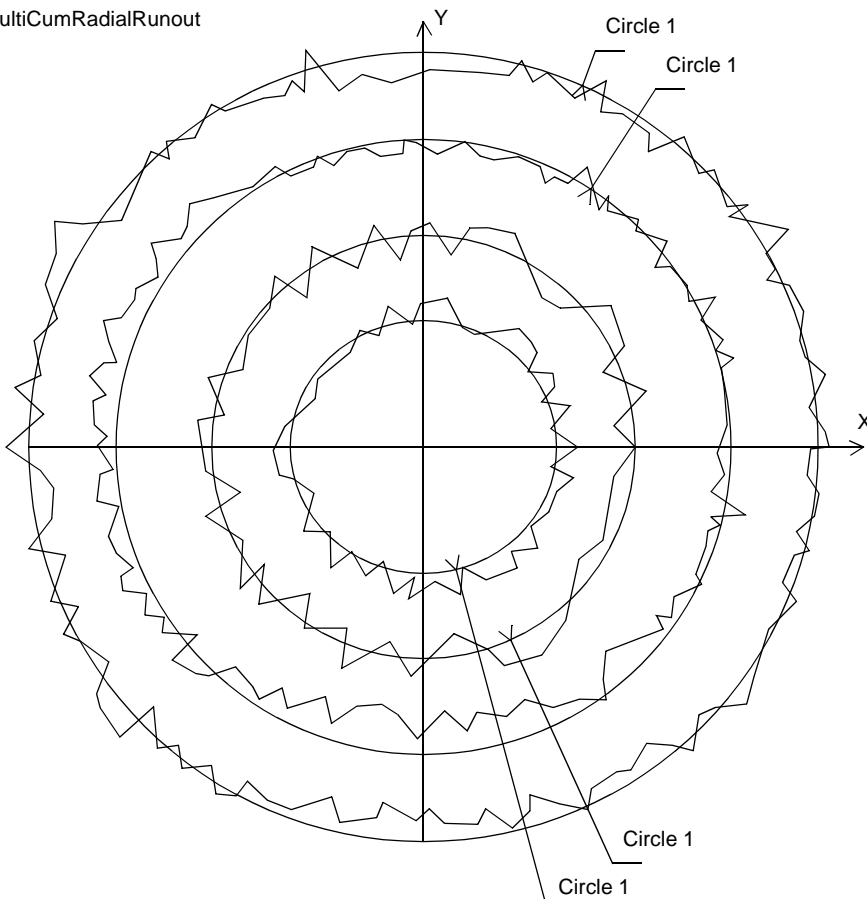
Error message

File name **cz\_cf\_l.gra**


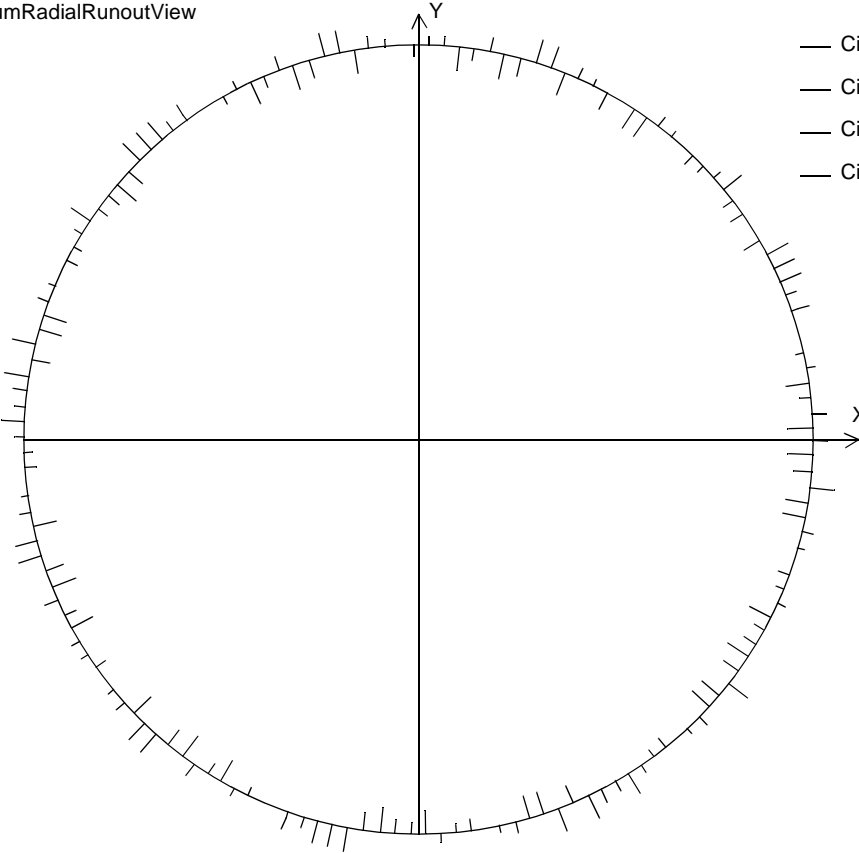


File name

cz\_crro\_mc.gra

<b>ZEISS</b>		Cumulative radial runout		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK		Date:      date Time:      time Job no.:    H12 Suppl./cust.: H13 Work cycle: H14 Operator:   H1			
Part no.: H3		Drawing no.: H11							
Workpiece: H4									
<p>MultiCumRadialRunout</p> 									
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification: magnif		
Index	Designation	Job			Act value	Tolerance	Points	Vscan	Probe

File name                      cz\_crro\_sc.gra

		Cumulative radial runout		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK			Date:            date Time:           time Job no.:        H12 Suppl./cust.: H13 Work cycle:   H14 Operator:      H1		
Part no.: H3		Drawing no.: H11							
Workpiece: H4									
<div>CumRadialRunoutView</div>  <div>— Circle 1 — Circle 1 — Circle 1 — Circle 1</div>									
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif		
Index	Designation		Job		Act value	Tolerance	Points	Vscan	Probe

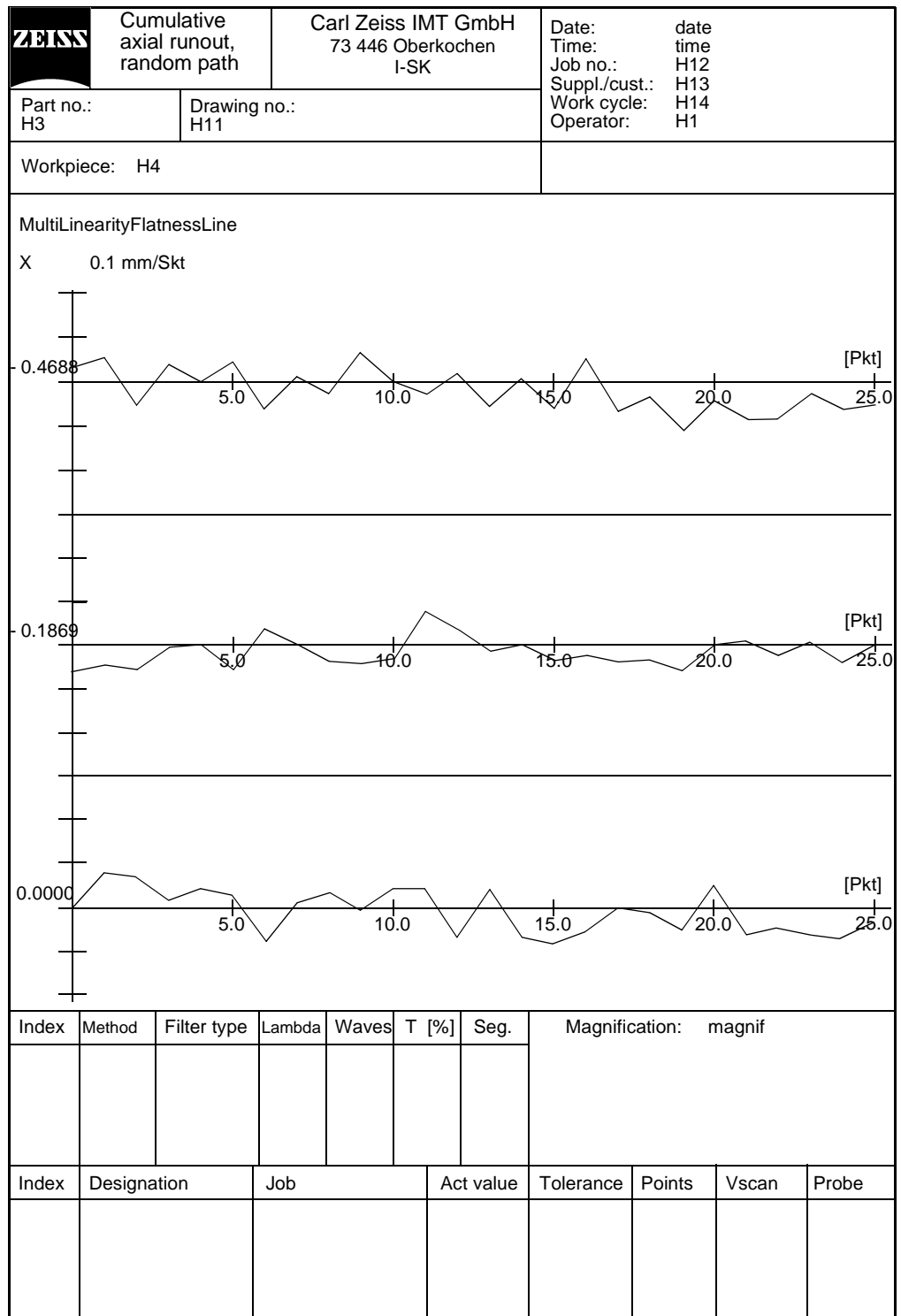
File name

cz\_fn\_mc.gra


<b>ZEISS</b>		Cumulative axial runout,circular		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK		Date:        date Time:       time Job no.:    H12 Suppl./cust.: H13 Work cycle: H14 Operator:   H1			
Part no.: H3		Drawing no.: H11							
Workpiece: H4									
<p>SurfaceMultiCircular</p> <p>0.1 mm/Skt</p>									
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif		
Index	Designation	Job			Act value	Tolerance	Points	Vscan	Probe

File name


cz\_fn\_ml.gra



File name                      cz\_head\_s.gra

		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK	Date:            date Time:           time Job no.:        H12 Suppl./cust.: H13 Work cycle:    H14 Operator:       H1
Part no.: H3	Drawing no.: H11		
Workpiece: H4			

File name                      cz\_head\_v.gra

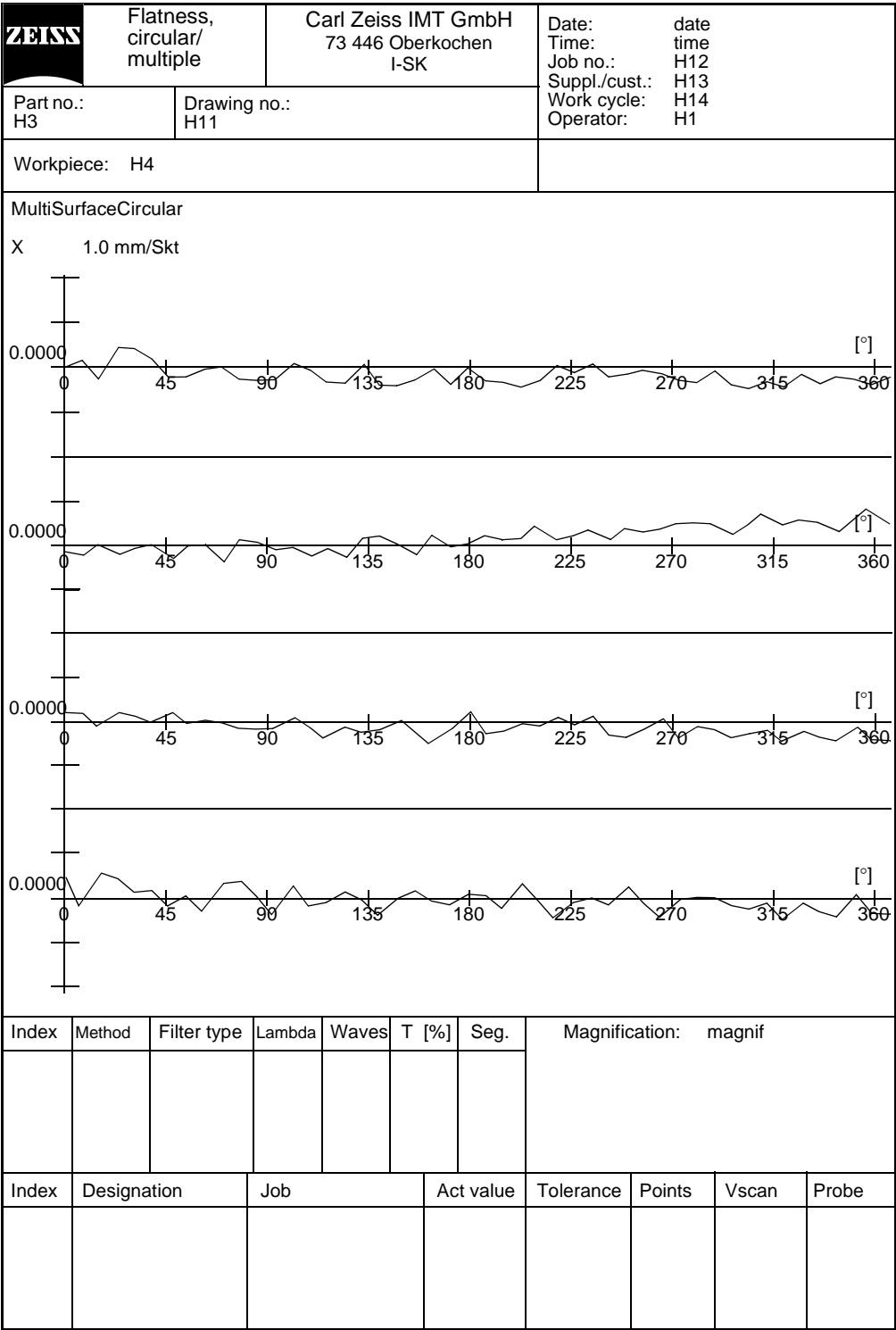
		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK	Date:            date Time:           time Job no.:        H12 Suppl./cust.: H13 Work cycle:   H14 Operator:      H1
Part no.: H3	Drawing no.: H11		
Workpiece: H4			

File name

cz\_logo.gra



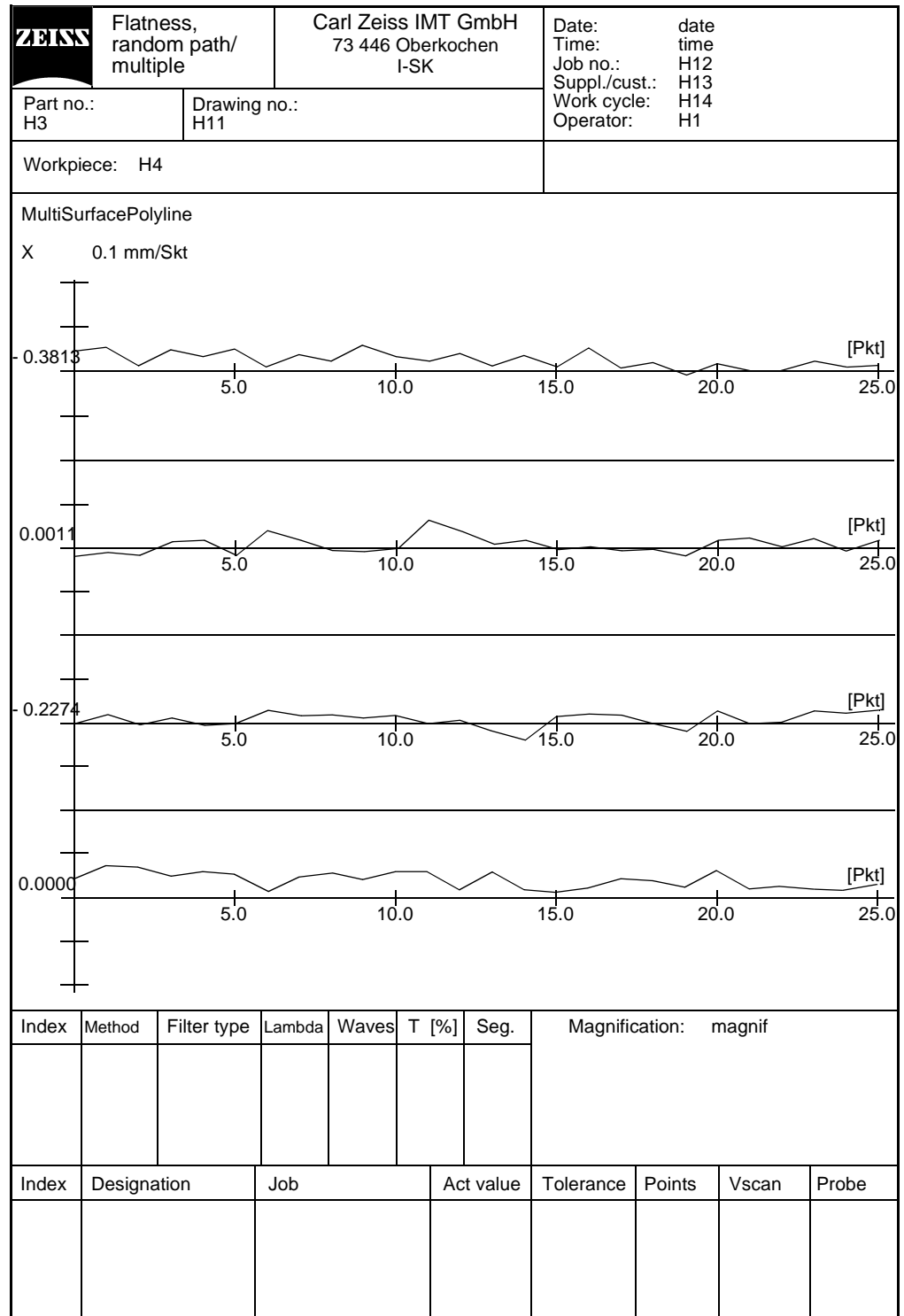
File name cz\_mfn\_c.gra




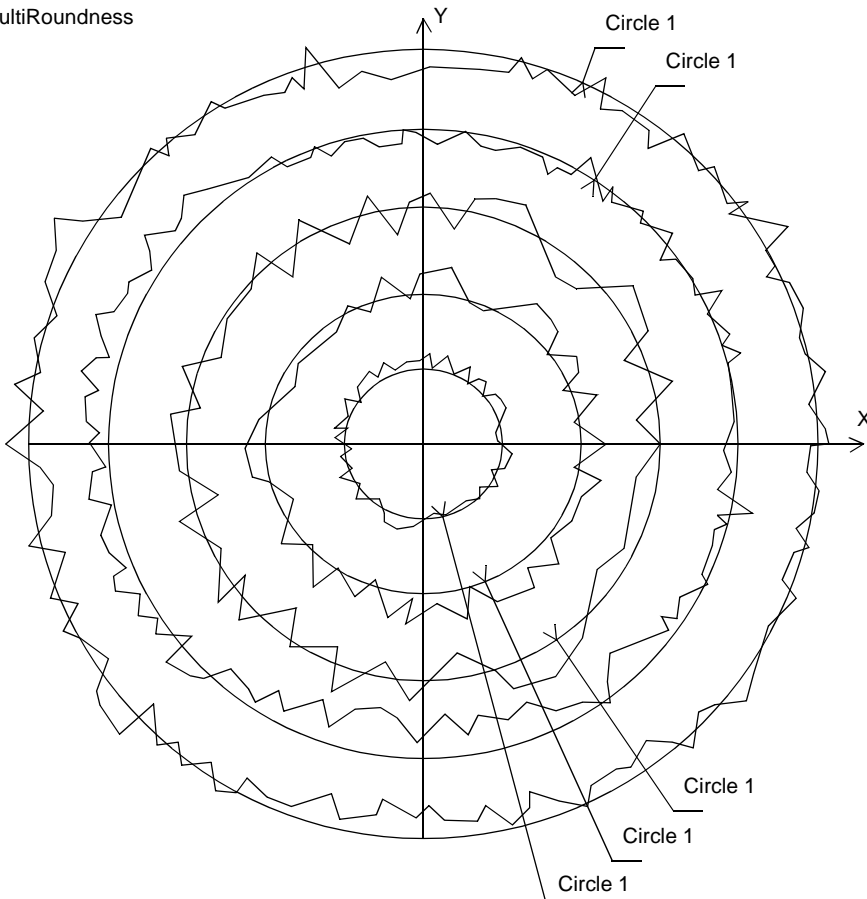


File name

cz\_mfn\_l.gra

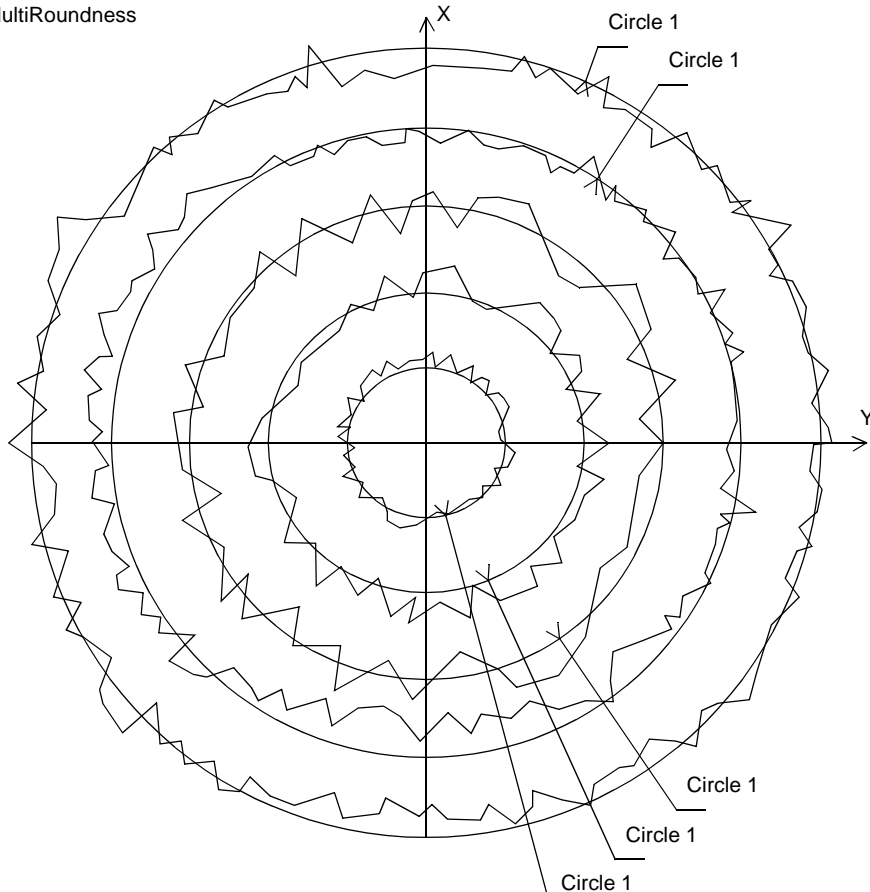


File name cz\_mr.gra

		Roundness		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK			Date:      date Time:      time Job no.:    H12 Suppl./cust.: H13 Work cycle: H14 Operator:   H1		
Part no.: H3		Drawing no.: H11							
Workpiece: H4									
<div>MultiRoundness</div> 									
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif		
Index	Designation		Job		Act value	Tolerance	Points	Vscan	Probe

File name

cz\_mr\_t.gra

<b>ZEISS</b>		Roundness		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK		Date:      date Time:      time Job no.:    H12 Suppl./cust.: H13 Work cycle: H14 Operator:   H1			
Part no.: H3		Drawing no.: H11							
Workpiece: H4									
<p>MultiRoundness</p> 									
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif		
Index	Designation		Job		Act value	Tolerance	Points	Vscan	Probe

File name

cz\_pl.gra

<b>ZEISS</b>		Parallelism lines		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK			Date:        date Time:        time Job no.:     H12 Suppl./cust.: H13 Work cycle: H14 Operator:    H1			
Part no.: H3		Drawing no.: H11								
Workpiece: H4										
ParallelismLine 0.748129 mm/Skt 										
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif			
Index	Designation		Job		Act value		Tolerance	Points	Vscan	Probe

File name

cz\_sn.gra

<b>ZEISS</b>		Straightness: angles 1 & 2		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK		Date:        date Time:       time Job no.:    H12 Suppl./cust.: H13 Work cycle: H14 Operator:   H1			
Part no.: H3		Drawing no.: H11							
Workpiece: H4									
<p>Straightness</p> <p>0.910414 mm/Skt</p>									
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif		
Index	Designation	Job			Act value	Tolerance	Points	Vscan	Probe

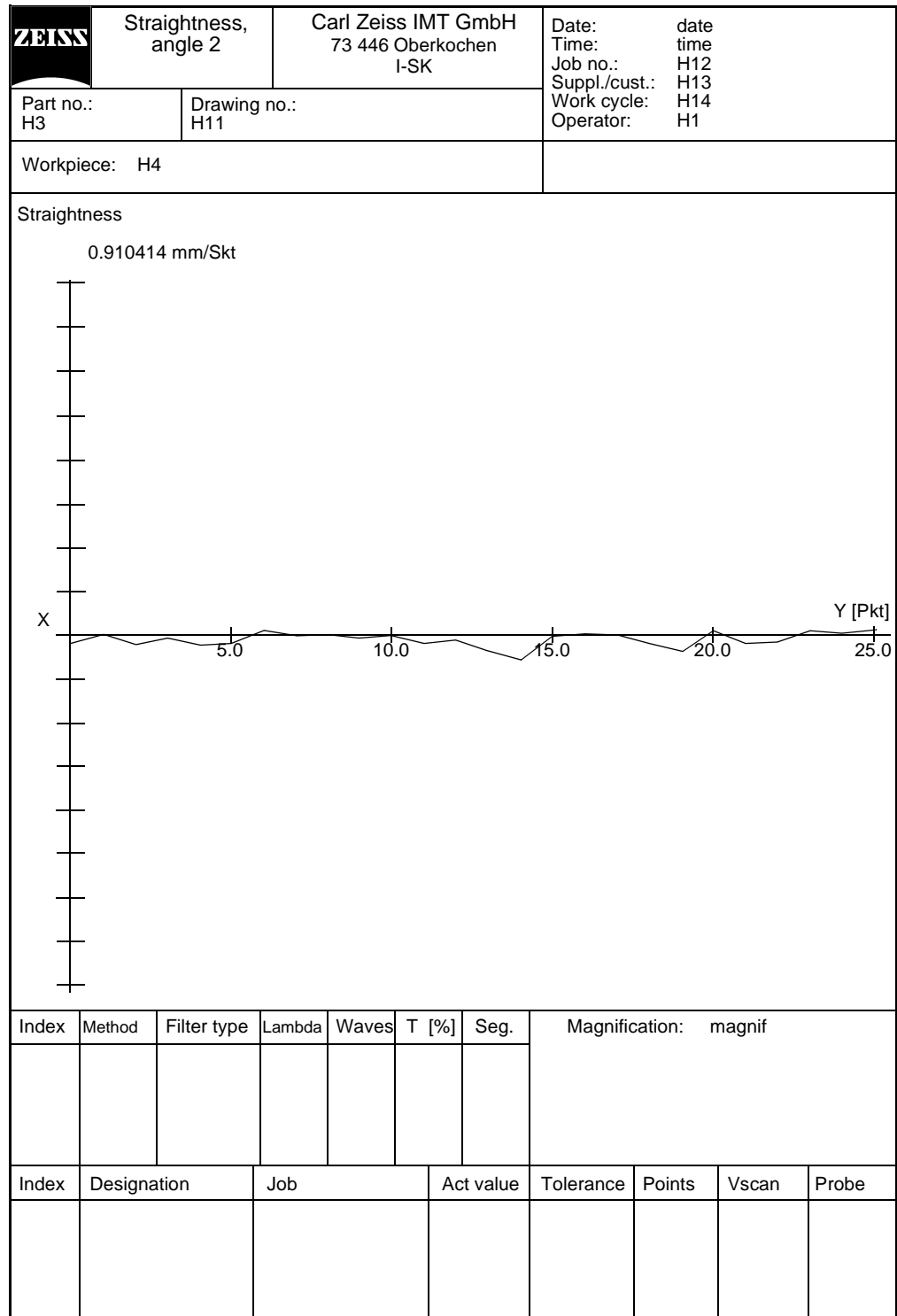
File name

cz\_sn1.gra

<b>ZEISS</b>		Straightness angle 1		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK		Date:        date Time:        time Job no.:    H12 Suppl./cust.: H13 Work cycle: H14 Operator:   H1			
Part no.: H3		Drawing no.: H11							
Workpiece: H4									
<p>Straightness</p> <p>0.910414 mm/Skt</p>									
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif		
Index	Designation	Job			Act value	Tolerance	Points	Vscan	Probe

File name

cz\_sn2.gra



File name                      **cz\_tbl.gra**

Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif			
Index	Designation		Job		Act value		Tolerance	Points	Vscan	Probe



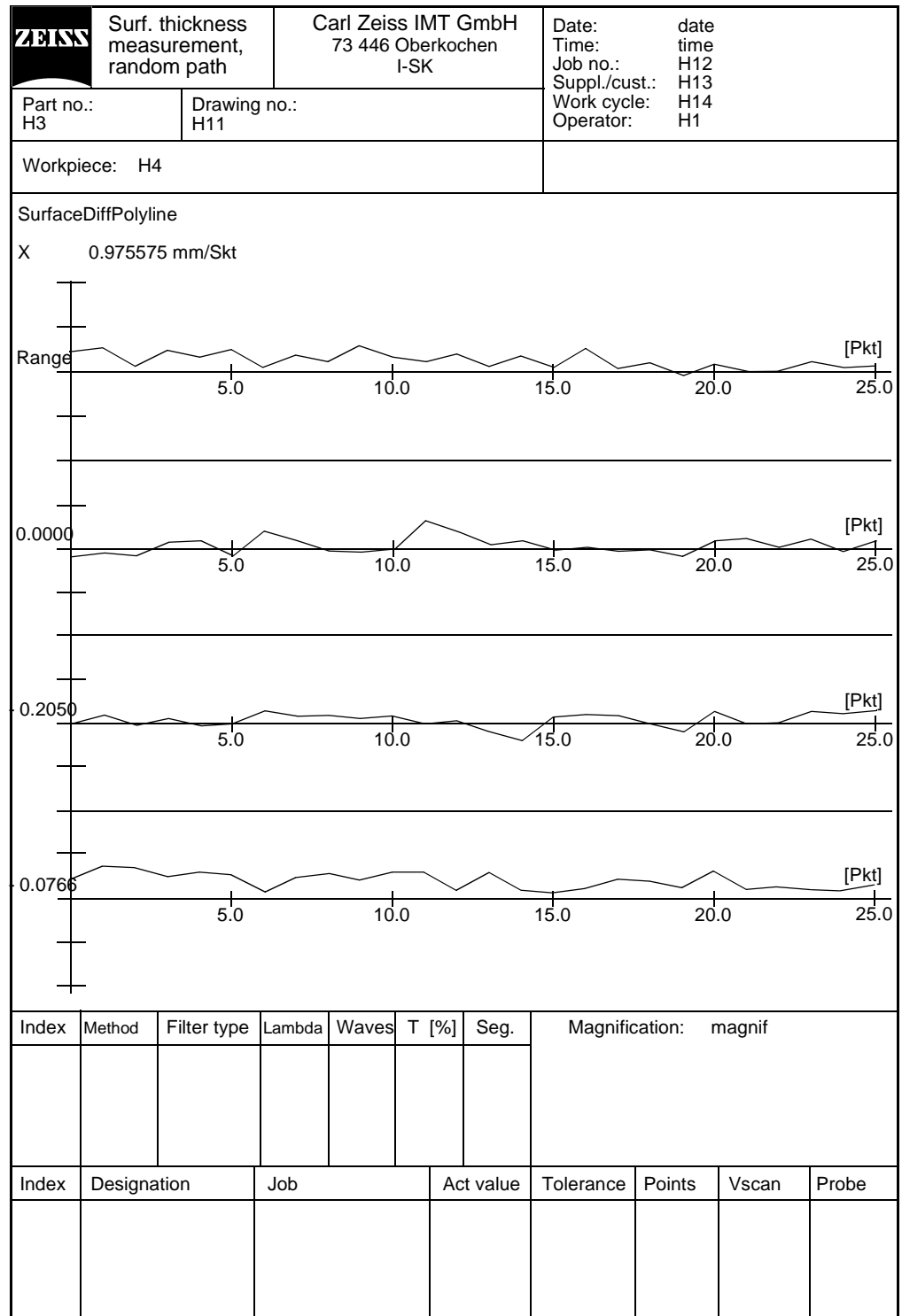
File name

cz\_tn\_c.gra


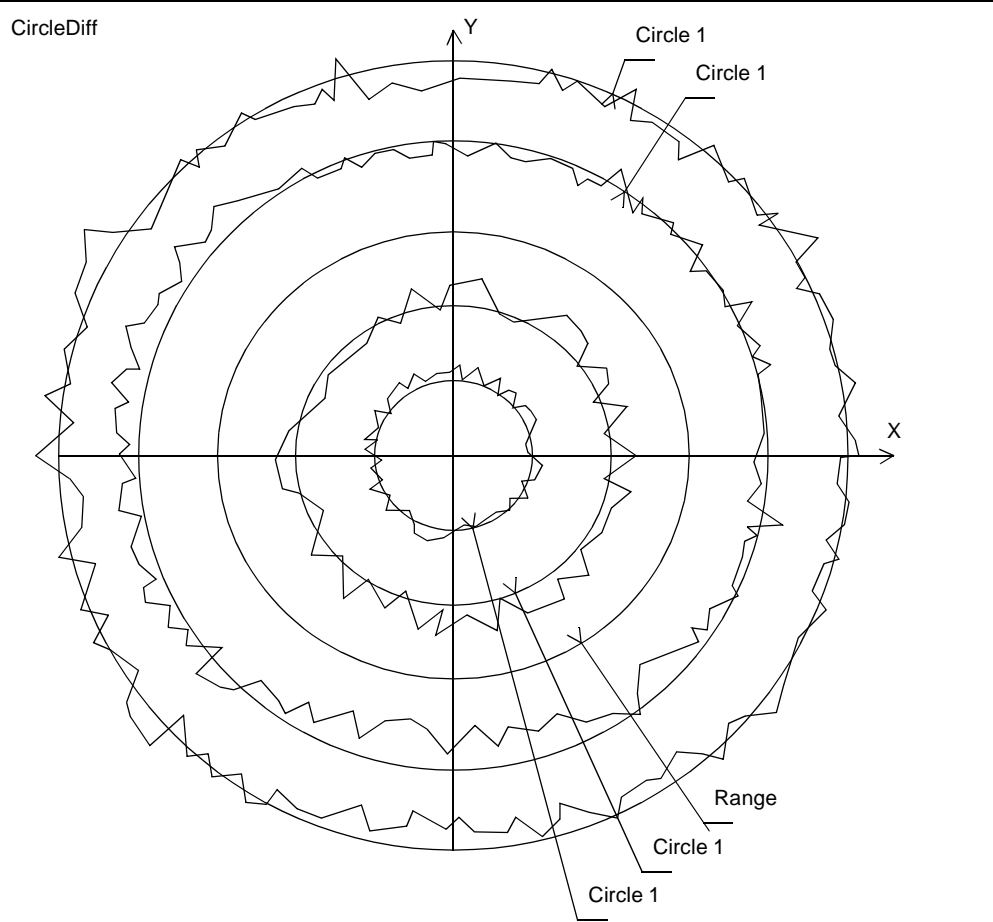
<b>ZEISS</b>		Surface thickness measurement, circular		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK		Date:      date Time:      time Job no.:    H12 Suppl./cust.: H13 Work cycle: H14 Operator:   H1			
Part no.: H3		Drawing no.: H11							
Workpiece: H4									
SurfaceDiffCircular X      0.922271 mm/Skt 									
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif		
Index	Designation	Job			Act value	Tolerance	Points	Vscan	Probe

File name


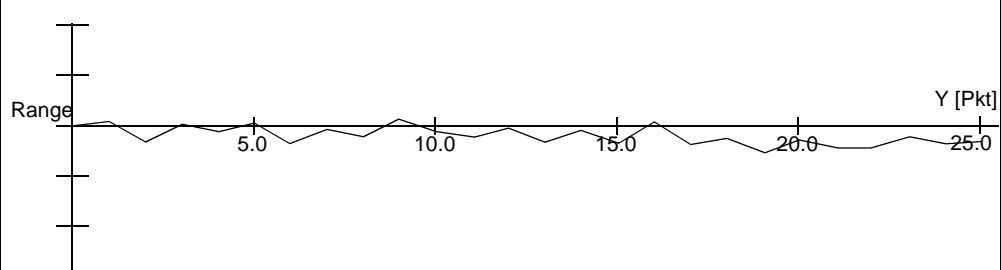
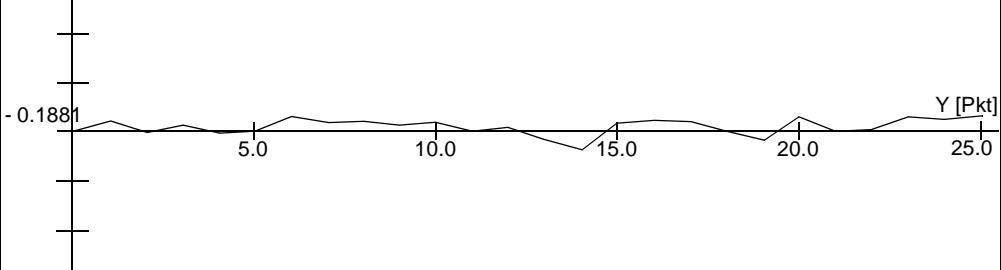
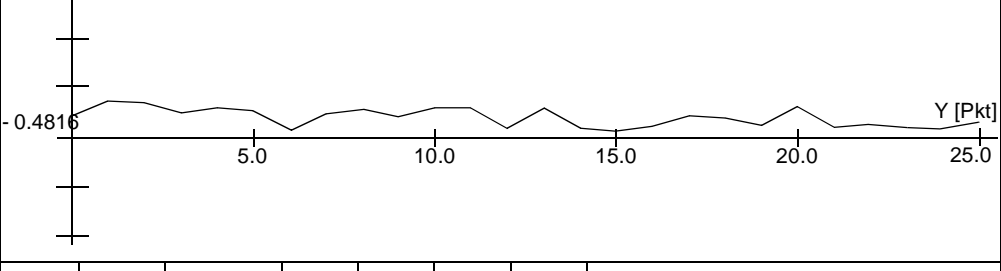
cz\_tn\_l.gra



File name                      cz\_tn\_r.gra

		Thickness meas., radial		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK			Date:            date Time:           time Job no.:        H12 Suppl./cust.: H13 Work cycle:   H14 Operator:      H1		
Part no.: H3		Drawing no.: H11							
Workpiece: H4									
<div>CircleDiff</div> 									
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif		
Index	Designation		Job		Act value	Tolerance	Points	Vscan	Probe

File name cz\_tn\_sl1.gra

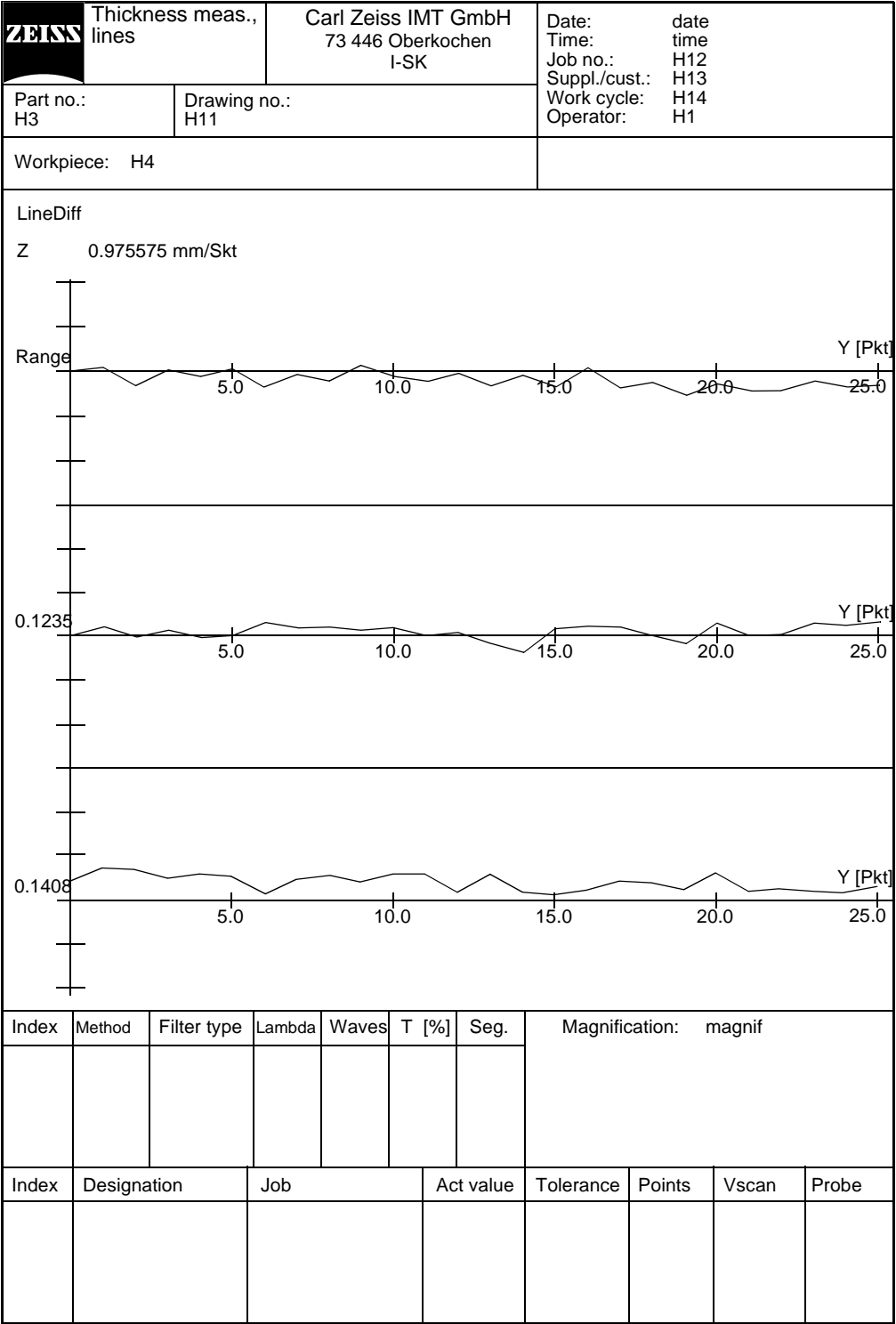
		Thickness meas., lines		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK			Date:        date Time:        time Job no.:     H12 Suppl./cust.: H13 Work cycle: H14 Operator:    H1		
Part no.: H3		Drawing no.: H11							
Workpiece: H4									
LineDiff									
X        0.975575 mm/Skt									
									
									
									
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif		
Index	Designation		Job		Act value	Tolerance	Points	Vscan	Probe

File name

cz\_tn\_sl2.gra

<b>ZEISS</b>		Thickness meas., lines		Carl Zeiss IMT GmbH 73 446 Oberkochen I-SK			Date:        date Time:        time Job no.:     H12 Suppl./cust.: H13 Work cycle: H14 Operator:    H1			
Part no.: H3		Drawing no.: H11								
Workpiece: H4										
<p>LineDiff</p> <p>Y        0.975575 mm/Skt</p>										
Index	Method	Filter type	Lambda	Waves	T [%]	Seg.	Magnification:    magnif			
Index	Designation		Job		Act value		Tolerance	Points	Vscan	Probe

File name cz\_tn\_sl3.gra



## Individual layouts

The program enables you to create individual layouts which can be adapted to meet your company's specific requirements. However, you will require the **Designer** to create completely new layouts or edit standard layouts (► *"Designer" on page 6-1*). Individual layouts can be stored under a new name.

You can enter your individual layouts in the following table.

File name	Name	Remarks

## Editing layouts

Displayed layouts can be adapted by editing their parameters. The specific parameters which can be used vary from layout to layout.

The menu line (1) contains two menus:

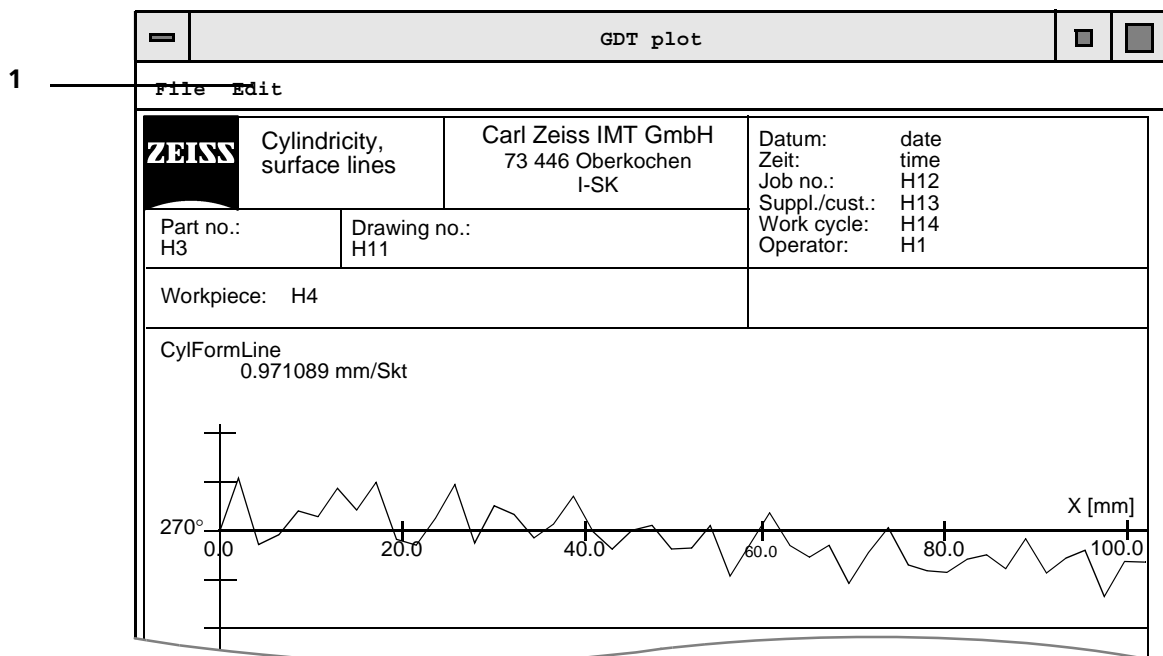
- File
- Edit

### File

The **File** menu contains file administration functions. Since knowledge of these is taken for granted, they will be explained only briefly (► *“File” on page 4-28*).

### Edit

The **Edit** menu contains functions for processing the graphics (► *“Edit” on page 4-29*).



## File

### Print

For printing a graphics file, select **File/Print** from the menu line.

The data is stored in CNC programming and output on the printer (code no. = 1).

If you do not use a postscript printer, you must install a printer before executing a printout (► *“Printer installation” on page 7-1*).



**Termin**

To close the **GDT plot** input window, select **File/Termin** from the menu line.

The data is stored in CNC programming and output on the monitor (code no. = **0**).

**Close**

To close the **GDT plot** input window, select **File/Close** from the menu line.

No data will be stored in CNC programming (Cancel).

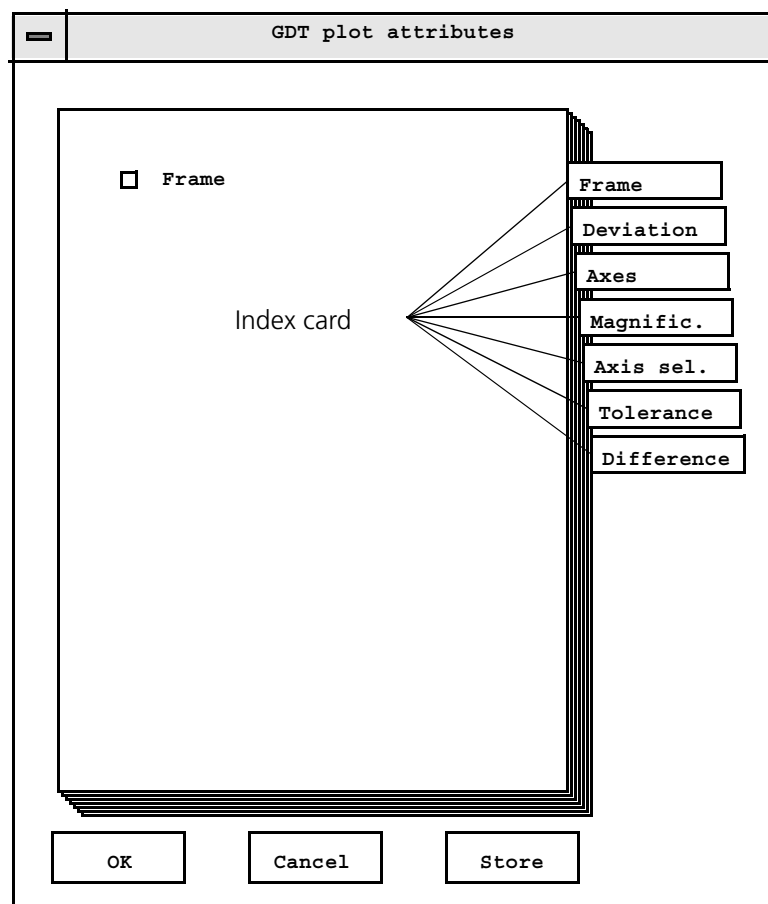
**Edit****Processing the display**

To process graphics files, select **Edit/Process plot** from the menu line. The **GDT plot attributes** input window will then appear.

Depending on the plot, various index cards are available in the **GDT plot attributes** input window.

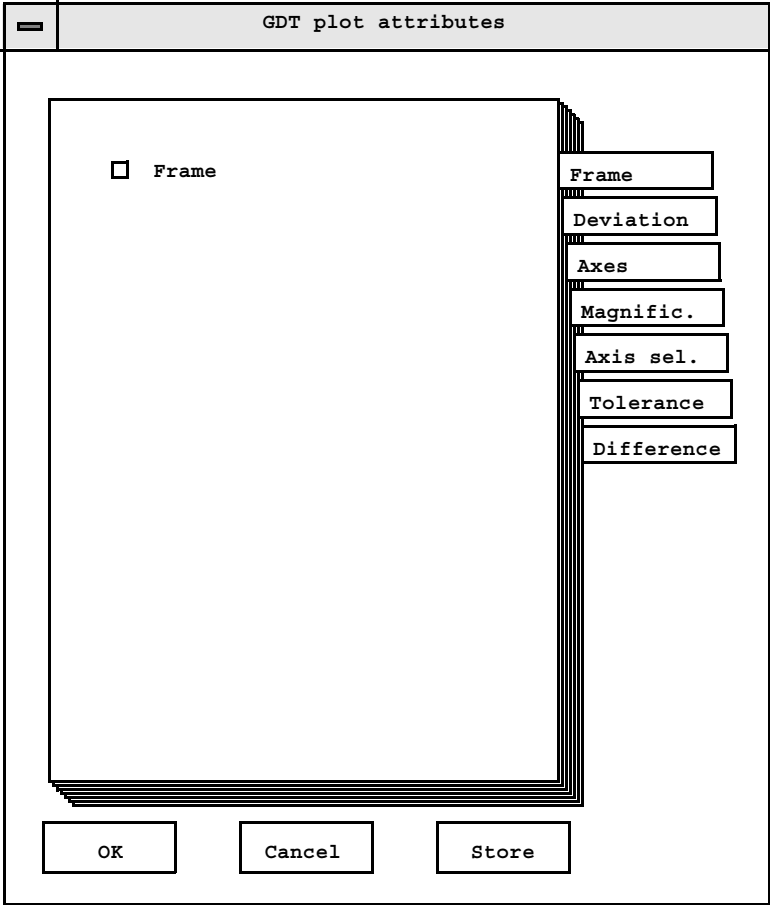
**NOTE**

If you make any changes in an index card, you must confirm them by clicking on the **Store** or **OK** button. If you do not select **Store** or **OK** and then go on to another index card, the changes will not be saved.



**Frame**

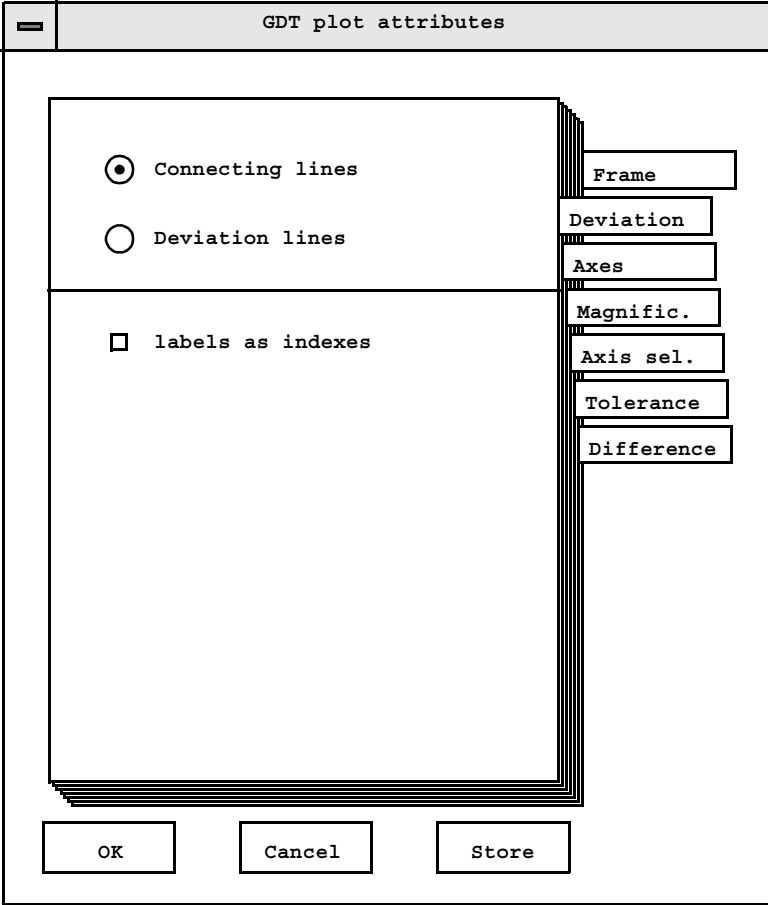
Select display of graphics with or without frame.



The image shows a dialog box titled "GDT plot attributes". It features a large rectangular area with a checkbox labeled "Frame". To the right of this area is a vertical stack of seven buttons: "Frame", "Deviation", "Axes", "Magnific.", "Axis sel.", "Tolerance", and "Difference". At the bottom of the dialog box are three buttons: "OK", "Cancel", and "Store".

**Deviation**

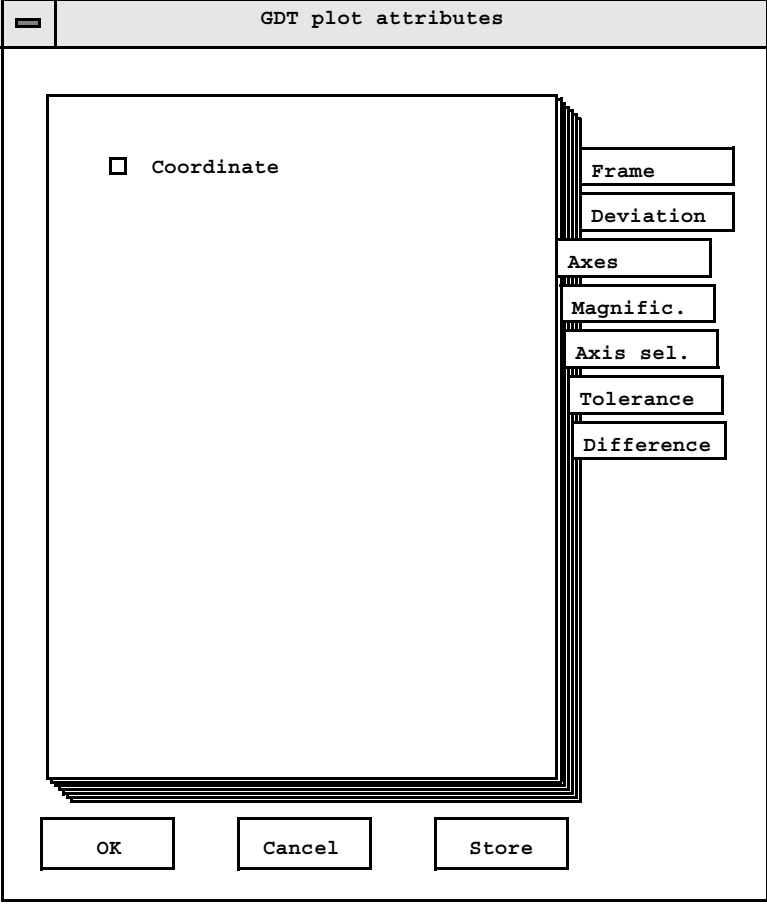
Select graphic display with connecting lines or with deviation lines. Apart from this, you can also select whether or not you want to label the graphic elements. If you do, click on the data field **labels as indexes**.



The image shows a dialog box titled "GDT plot attributes". It contains two radio buttons: "Connecting lines" (selected) and "Deviation lines". Below these is a checkbox labeled "labels as indexes" which is currently unchecked. To the right of the main content area is a vertical stack of seven buttons: "Frame", "Deviation", "Axes", "Magnific.", "Axis sel.", "Tolerance", and "Difference". At the bottom of the dialog are three buttons: "OK", "Cancel", and "Store".

**Axes**

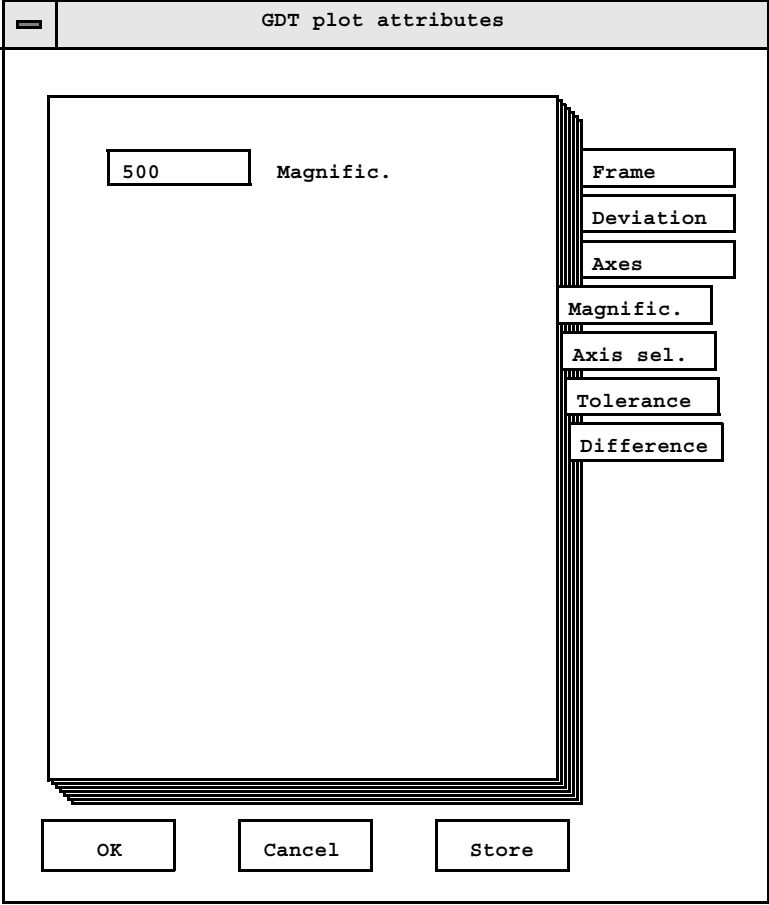
Select display of graphics with or without the coordinate axes.



The image shows a dialog box titled "GDT plot attributes". It features a large rectangular area on the left with a checkbox labeled "Coordinate". To the right of this area is a vertical stack of eight smaller rectangular buttons: "Frame", "Deviation", "Axes", "Magnific.", "Axis sel.", "Tolerance", and "Difference". At the bottom of the dialog box are three buttons: "OK", "Cancel", and "Store".

**Magnification**

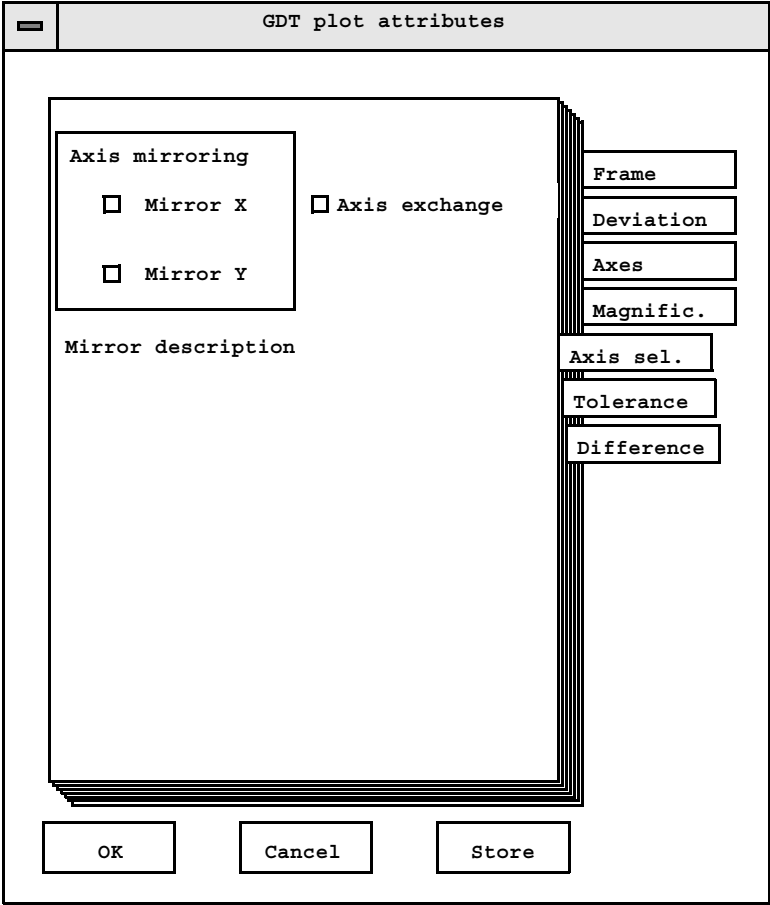
Select the factor with which the magnification should be displayed.



The image shows a dialog box titled "GDT plot attributes". Inside the dialog, there is a large rectangular area containing a text input field with the value "500" and the label "Magnific.". To the right of this area is a vertical stack of seven buttons: "Frame", "Deviation", "Axes", "Magnific.", "Axis sel.", "Tolerance", and "Difference". The "Magnific." button is currently selected, indicated by a thick border. At the bottom of the dialog are three buttons: "OK", "Cancel", and "Store".

**Axis selection**

Select graphics mirroring along the X or the Y axis. In addition to this, you can also select axis "swapping" (exchange).



The image shows a software dialog box titled "GDT plot attributes". It features a main content area with a tabbed interface. The active tab is labeled "Axis mirroring" and contains two checkboxes: "Mirror X" and "Mirror Y", both of which are currently unchecked. To the right of this tab, there is another checkbox labeled "Axis exchange", which is also unchecked. Below the "Axis mirroring" tab, there is a text label "Mirror description" followed by a large, empty rectangular area for text input. To the right of the main content area, there is a vertical stack of tabs, including "Frame", "Deviation", "Axes", "Magnific.", "Axis sel.", "Tolerance", and "Difference". At the bottom of the dialog box, there are three buttons: "OK", "Cancel", and "Store".

**Tolerances**

Select display of graphics with or without specified limits (SL).

The dialog box is titled "GDT plot attributes". It contains a checkbox labeled "Display specified limits". Below this is a table with columns: "Desig.", "Display", "UMESS LS", "UMESS US", "Free SL", "LSL", and "USL". The table has three rows for "Circ. 1", "Circ. 2", and "Circ. 3". To the right of the table is a vertical stack of tabs: "Frame", "Deviation", "Axes", "Magnific.", "Axis sel.", "Tolerances", and "Difference". At the bottom are "OK", "Cancel", and "Store" buttons.

Desig.	Display	UMESS LS	UMESS US	Free SL	LSL	USL
Circ. 1	<input type="checkbox"/>			<input type="checkbox"/>		
Circ. 2	<input type="checkbox"/>			<input type="checkbox"/>		
Circ. 3	<input type="checkbox"/>			<input type="checkbox"/>		

**Desig.** Designation of line.

**Display** If this field is selected, the specified limit is displayed for the selected area.

**UMESS U-S** Lower specified limit adopted from UMESS.

**UMESS O-S** Upper specified limit adopted from UMESS.

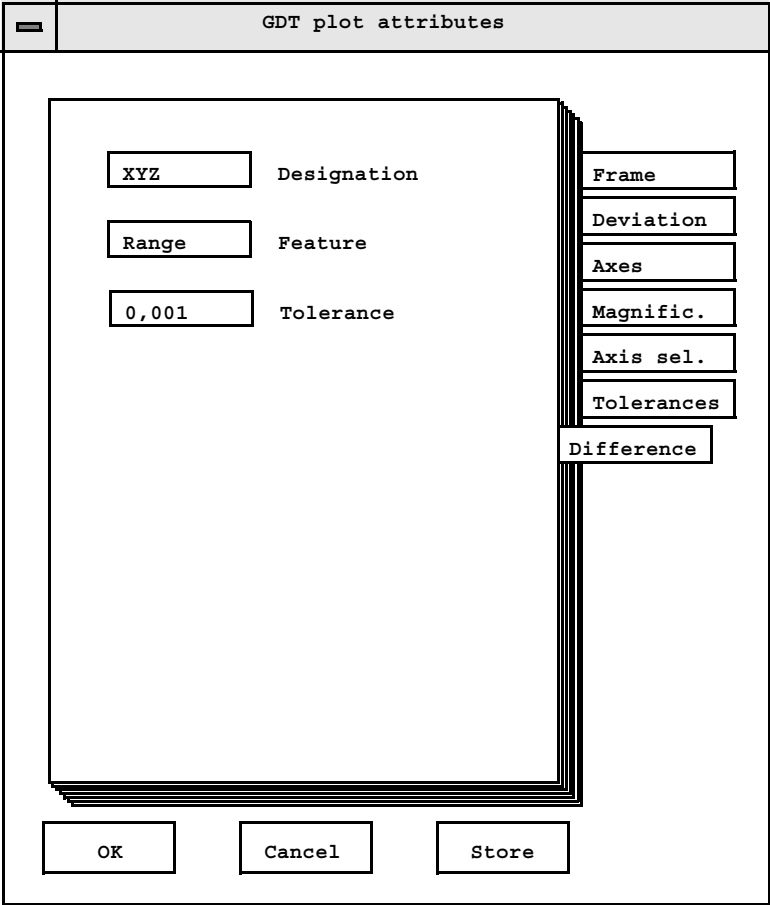
**Free SL** If this field is selected, the free specified limit is displayed.

**LSL** Input of the free lower specified limit.

**USL** Input of the free upper specified limit.

**Difference**

Select the parameters for the difference.



The image shows a software dialog box titled "GDT plot attributes". It contains a large rectangular area with a stack of overlapping panels. The top panel is visible and contains three input fields with labels: "XYZ" for "Designation", "Range" for "Feature", and "0,001" for "Tolerance". To the right of this main area is a vertical stack of buttons: "Frame", "Deviation", "Axes", "Magnific.", "Axis sel.", "Tolerances", and "Difference". The "Difference" button is highlighted with a white background, while the others have a grey background. At the bottom of the dialog are three buttons: "OK", "Cancel", and "Store".

Field	Label
XYZ	Designation
Range	Feature
0,001	Tolerance

Button
Frame
Deviation
Axes
Magnific.
Axis sel.
Tolerances
Difference

Button
OK
Cancel
Store



# Chapter

# 5

## Evaluation procedures

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### **This chapter contains:**

Straightness . . . . .	5-2
Roundness . . . . .	5-6
Cylindricity . . . . .	5-9
Flatness . . . . .	5-13
Location-specific and non-location-specific position tolerances of surfaces . . . . .	5-17
Parallelism, perpendicularity, angularity, symmetry, position, coaxiality of axes . . . . .	5-23
Cumulative radial runout . . . . .	5-26
Thickness measurements . . . . .	5-27

## Straightness

### Linking line

As a rule, it is not necessary to use filters or consider outliers to calculate linking lines, since the number of points along the lines remains small (>100).

### Scanned lines

Self-centering probed line. Lines that were scanned on a single surface.

### Cylinder axis

- Alignment
- **<DI 1135>**
- do n = 1 to k
  - Measure circle [n]
 enddo
- Line (recall circle [n])
- Minimum line
- GDT straightness A1
- GDT straightness A2
- **<DI 1136>**
  - Standard: **CZ\_SN**
  - Address: From -3 to -1 step 1

If only plot A1 is of interest:

- GDT straightness A1
- **<DI 1136>**
  - Standard: **CZ\_SN1**
  - Address: From -3 to -2 step 1

If only plot A2 is of interest:

- GDT straightness A2
- **<DI 1136>**
  - Standard: **CZ\_SN2**
  - Address: From -3 to -2 step 2

### Intersection line of two surfaces

- Alignment
- **<DI 1135>**
- do n = 1 to k

- Measure line [n] in surface 1
- Measure line [n] in surface 2
- Section
- enddo
- Line (recall points of intersection [n])
- Minimum line
- GDT straightness A1
- GDT straightness A2
- **<DI 1136>**  
Standard: **CZ\_SN**  
Address: From -3 to -1 step 1

If only plot A1 is of interest:

- GDT straightness A1
- **<DI 1136>**  
Standard: **CZ\_SN1**  
Address: From -3 to -2 step 1

If only plot A2 is of interest:

- GDT straightness A2
- **<DI 1136>**  
Standard: **CZ\_SN2**  
Address: From -3 to -1 step 2

**Object: Any line on surface or surface line**

**NOTE**

Filtered only in probing direction

Alignment

- **<DI 1135>**
- Filter
- Outliers
- **<DI 1100>** (Scanning of known or unknown contour)
- Line (file evaluation)

If plot A1 is the probing direction

- Minimum line A1
- GDT straightness A1

- **<DI 1136>**

Standard: **CZ\_SN1**

Address: From -2 to -1 step 1

If plot A2 is the probing direction

- Minimum line
- GDT straightness A2

- **<DI 1136>**

Standard: **CZ\_SN2**

Address: From -2 to -1 step 1

### Self-centering line

#### NOTE

Since the line can be filtered only in one plane at a time, the display must be realized via two plots. If no filtration is performed, which is not advisable, the display can also be effected with a single plot (➤ *“Cylinder axis” on page 5-2*).

- Alignment
- **<DI 1135>**
- Filter
- Outliers
- **<DI 1100>**(self-centering scanning)
- Line (file evaluation)

If plot A1 is the probing direction

- Minimum line A1
- GDT straightness A1

- **<DI 1136>**

Standard: **CZ\_SN1**

Address: From -2 to -1 step 1

If plot A2 is the probing direction

- Minimum line
- GDT straightness A2

- **<DI 1136>**

Standard: **CZ\_SN2**

Address: From -2 to -1 step 1

# Roundness

## General

The bore or shaft to be measured must be aligned. This is usually effected by means of a cylinder measurement. If the base of the workpiece is too small, its face may also be used for spatial alignment. However, this procedure is possible only if the perpendicularity error of the axis in reference to the surface used is negligible. If the perpendicularity error is too great, elliptical distortion of the circle will result.

Since measurements are performed via scanning, a sufficient number of points is available for the filter. One exception to this is the roundness of a bolthole circle or any random multipoint circle resulting from linking.

## Outlier inspection

The roundness evaluation must always be performed with the minimum condition. For this reason, an outlier inspection must be performed to prevent the entire result from being falsified by a single missing point.

In case of linked elements, no outlier inspection is usually required, since the linking point is automatically calculated as a result of the multipoint measurement, and is therefore not influenced by outliers.

## Single roundness

- Alignment
- **<DI 1135>**
- Filter
- Outliers
- **<DI 1100>**(known contour, circle)
- Circle (file evaluation)
- Minimum circle
- GDT roundness
- **<DI 1136>**

Standard: **CZ\_MR**

Address: From -2 to -1 step 1

### Comments

- Using the plotting standard, the reference axis of the plane is always set horizontally. For the  
Y/X plane => X  
Z/Y plane => Y  
X/Z plane => Z  
The plot of the X/Z plane thus differs considerably from the actual position on the workpiece. If the plotted representation agrees with the visual position, the plotting standard which includes transposition of the axes (**CZ\_MR\_T**) must be used.
- The tolerance lines of the plot are taken from the GDT evaluation. The values for the inner and outer tolerance circles can be obtained by dividing this amount by two.
- If, instead of the minimum calculation, the circumscribed or inscribed element is evaluated using the GDT tolerance, one of the tolerance lines will be displayed incorrectly, since a one-sided tolerance then exists. The display can be adapted in the plot before it is output.
- All gaps are closed by straight lines, regardless of whether they were caused by an interrupted measuring path or outliers.
- If multiple files are used for data acquisition, always make sure that they are joined correctly, i. e. in the correct order, when forming the common file.

### Multiple roundness

- Alignment
- **<DI 1135>**
- Filter
- Outliers  
do n = 1 to 5  
**<DI 1100>** File [n] (known contour, circle)  
100 Circle [n] (file evaluation)  
101 Minimum circle [n]  
102 GDT roundness [n]  
enddo
- **<DI 1136>**  
Standard: **CZ\_MR**  
Address:  
From 101 to 102 step size 1  
From 103 to 104 step size 1  
From 105 to 106 step size 1

**Comments**

- Plots of different circles can be displayed in various positions. However, it is not possible to change the coordinate plane.
- It is also possible to display the same circle with different filters, with or without outlier inspection, and with evaluation (Gaussian, minimum, circumscribed or inscribed with various marginal conditions). This is done by performing the desired evaluation and entering the corresponding address for the plot.

# Cylindricity

## General

The bore or shaft to be measured should not considerably deviate from the coordinate system. In this case, axially perpendicular sections are elliptical. The measurement of the surface line will then not be performed on the ideal and highest line. Alignment is especially necessary if a local roundness, straightness or parallelism should be inspected and documented. As a rule, alignment is performed via a cylinder measurement. If the base of the workpiece is too small, its face may also be used for spatial alignment. However, this procedure is possible only if the perpendicularity error of the axis in reference to the surface used is negligible. An excessive perpendicularity error will result in elliptical distortion of the circle.

Since measurements are performed via scanning, a sufficient number of points is available for sections perpendicular to the axis and for the cylinder evaluation. Since the circles must be evaluated separately for the subsequent plot, the same filter must be used for cylinder and circle evaluations. If the surface lines are evaluated as straight lines, an appropriate lambda filter must be selected.

## 3D Cylindricity

- Alignment
- **<DI 1135>**
- Filter
- Outliers
- do n = 1 to 3
  - **<DI 1100>** File [n] (known contour, circle)
- enddo
- 99 Cylinder file [n] n = 1 to 3
- 100 Minimum cylinder
- 101 Cylindricity
- 102 Trans space
- 103 Zero point
- 104 Recall cylinder
- 105 Circle [n] (file evaluation)
- 106 Circle [n] (file evaluation)
- 107 Circle [n] (file evaluation)



– **<DI 1136>**

Standard: **CZ\_CF\_3C**

Address:

From 105 to 107 step size 1

From 104 to 104 step size 1

From 101 to 101 step size 1

**Comments**

- Circle evaluation must be performed to enable individual display of the segments.
- If a local roundness is to be documented, the roundness evaluation may be performed following the circle evaluation.
- The cylinder evaluation must be performed last, since it is used as a reference for the graphic display.
- In order to obtain the similarity of the cylinder, automatic adaptation to the optimum display size is performed. This results in a nonintegral scale for the 3D display.
- The center offset of the circular sections in reference to the calculated cylinder axis is output in the lateral display. The deviation is output with the magnification factor and true to scale.
- The direction of the center offset deviation is linked to the rotation of the 3D display.
- The Gaussian, minimum and circumscribed or inscribed cylinder can be displayed.
- If the circles and the cylinder are evaluated in the current direction and the plot is executed with these results, the tilt of the workpiece coordinate system will become visible.

## 2D Cylindricity

This display is similar to the plot of the 3D display resulting from a viewing direction perpendicular to the section plane, i.e. coinciding with the cylinder axis. The order of evaluation remains the same, however, another standard must be selected. Two different printed forms exist:

**CZ\_CRRO\_MC**

**CumulativeRadialRunOut MultiCircle**

This printed form displays the sections individually so that the deviation lines are not superimposed.

**CZ\_CRRO\_SC**

**CummulativRadialRunOut SingleCircle**

The sections are displayed in different colors referred to a reference circle. The conicity or center offset becomes clearer.

- Alignment

- **<DI 1135>**
- Filter
- Outliers
- do n = 1 to 3
  - **<DI 1100>** File [n] (known contour, circle)
- enddo
  - 99 Cylinder file [n] n = 1 to 3
  - 100 Minimum cylinder
  - 101 Cylindricity
  - 102 Trans space
  - 103 Zero point
  - 104 Recall cylinder
  - 105 Circle [n] (file evaluation)
  - 106 Circle [n] (file evaluation)
  - 107 Circle [n] (file evaluation)
- **<DI 1136>**
- Standard: **CZ\_CRRO\_MC** or **CZ\_CRRO\_SC**
- Address:
- From 105 to 107 step size 1
- From 104 to 104 step size 1
- From 101 to 101 step size 1

### Comments

- In contrast to the 3D display, up to five sections can be displayed.
- Output of the tolerance zone is possible.

## Cylindricity, surface lines

This plot displays four opposite surface lines. The 0 ° line is here combined with the 180 ° line and the 90 ° line is combined with the 270 ° line.

- Alignment
- **<DI 1135>**
- Filter
- Outliers
- 100 Cylinder (2 times 4 points)
- 101 Trans space
- 102 Zero point
- do n = 1 to 4
  - <DI 1100>** File [n] (known contour, any path)
- enddo

- File evaluation (always store the first point of each individual surface line in a new file)
  - 103 Cylinder (file evaluation starting with the four-point file and then the four surface lines. The four points (or at least three) at the beginning are required so that the start values are available for calculating the cylinder in the coordinate plane.)
  - 104 Cylindricity
  - 105 Line [n] (file evaluation)
  - 106 Line [n] (file evaluation)
  - 107 Line [n] (file evaluation)
  - 108 Line [n] (file evaluation)
- **<DI 1136>**
  - Standard: **CZ\_CRRO\_L**
  - Address:
  - From 105 to 107 step size 2, 0, 180 deg. angles
  - From 106 to 108 step size 2, 90, 270 deg. angles
  - From 103 to 104 step size 1

#### Comments

- Reconstruction (calculation) of the cylinder from the surface lines is not necessary. Cylinder ADR 100 can also be used as a reference.
- It is also possible to reconstruct the reference cylinder using circular sections perpendicular to the axis (► *“3D Cylindricity” on page 5-9*) and display the surface lines for this reference.
- It is not advisable to combine sections which are perpendicular to the axis with surface lines, since no filtering is possible in this case.
- A lambda filter which is appropriate for the surface lines should be used.

## Flatness

Several different standards are available for displaying flatness. They differ with regard to

### Scanning path

Any straight (**l**ine) path or circular path (**c**ircular) and

### Paths

within the surface. One path per surface (**M**ulti**F**lat**N**ess), multiple paths (**M**ulti**L**ine or **M**ulti**C**ircular)

### CZ\_MFN\_C

**M**ulti**F**lat**N**ess**C**ircular

Means: Up to 5 surfaces acquired via a circular path are displayed.

### CZ\_MFN\_L

**M**ulti**F**lat**N**ess**L**ine

Means: Up to 5 surfaces acquired via a random path are displayed.

### CZ\_FN\_MC

**F**lat**N**ess**M**ulti**C**ircular

Means: One surface acquired via up to 5 circular paths.

### CZ\_FN\_ML

**F**lat**N**ess**M**ulti**L**ine

Means: One surface acquired via up to 5 random paths.

Individual surfaces or paths are displayed in separate processes.

## Multi Flatness Circular

- Alignment
- **<DI 1135>**
- Filter
- Outliers
- do n = 1 to 5
  - <DI 1100>** File [n] (known contour, scanning on circular paths)
  - 103 Surface
  - 104 Minimum surface
  - 105 Flatness
  - enddo
- **<DI 1136>**
  - Standard: **CZ\_MFN\_C**
  - Address:
  - From 104 to 105 step size 1
  - From 107 to 108 step size 1
  - From 110 to 111 step size 1
  - ...

**Comments**

Since the circular standard has been selected, the ordinate is displayed in angular units. If you select the line standard, which is also possible, the output will be displayed in pixels.

**Multi Flatness Line**

The procedure is similar to the one described under ➤ *“Multi Flatness Circular” on page 5-13*. A different scanning technique and plot form are used.

- Alignment
- **<DI 1135>**
- Filter
- Outliers
- do n = 1 to 5
  - <DI 1100>** File [n] (known contour, scanning of random paths)
  - 103 Surface
  - 104 Minimum surface
  - 105 Flatness
  - enddo
- **<DI 1136>**
  - Standard: **CZ\_MFN\_L**
  - Address:
  - From 104 to 105 step size 1
  - From 107 to 108 step size 1
  - From 110 to 111 step size 1
  - ...

**Comments**

Only this standard can be selected. The output is effected in pixels.

**Flatness Multi Circular**

Up to 5 circular paths are measured on a single surface.

- Alignment
- **<DI 1135>**
- Filter
- Outliers

- do n = 1 to 5  
    <DI 1100> File [n] (known contour, scanning on circular paths)  
    enddo  
    103 Surface from the paths measured  
    104 Minimum surface  
    105 Flatness
- do n = 1 to 5
- 106  
    ...Surface evaluation file [n]  
    enddo
- <DI 1136>  
    Standard: CZ\_FN\_MC  
    Address:  
    From 106 to 110 step size 1  
    From 104 to 105 step size 1

### Comments

- The surface calculated under ADR 104 is the reference surface for the display.
- The individual paths must be evaluated separately to obtain a single output.
- The Flatness Multi Line Plot can also be used.

## Flatness Multi Line

Up to five random paths on a surface. The procedure is similar to the one described under ➤ *"Flatness Multi Circular"* on page 5-14. A different scanning technique and plot form are used.

- Alignment
- <DI 1135>
- Filter
- Outliers
- do n = 1 to 5  
    <DI 1100> File [n] (known contour scanning, random)  
    enddo  
    103 Surface from the paths measured  
    104 Minimum surface  
    105 Flatness

- do n = 1 to 5  
106  
...Surface evaluation file [n]  
enddo
- **<DI 1136>**  
Standard: **CZ\_FN\_ML**  
Address:  
From 106 to 110 step size 1  
From 104 to 105 step size 1

**Comments**

Only this standard can be selected. The output is effected in pixels.

## Location-specific and non-location-specific position tolerances of surfaces

No separate standards are available for different non-location-specific and location-specific position tolerances at present. Display is effected using the plots described above under ► *“Flatness” on page 5-13*. A customized printed form can easily be created by loading the appropriate flatness forms with the Designer (► *“Designer” on page 6-1*), editing the header and resaving the form under a new name.

However, the reconstruction (calculation) process differs considerably from the one used in UMESS.

### Parallelism, perpendicularity, angularity, runout

This is used to evaluate non-location-specific position tolerances. The difference lies only in the angle of reference. Two different presettings are possible, depending on the procedure used during the measuring run:

- If the reference is aligned, a fixed value of zero may be entered as the setting for the surface evaluation.
- If the calculation (reconstruction) should be performed in reference to a special element, the address must be entered.

If an angularity is to be evaluated in reference to an alignment, the nominal angle from the drawing must be used.

Always make sure that the rotation around the reference axis is taken into consideration.

### Multiparallelism, multiperpendicularity, multiangularity, multirunout

Up to five surfaces with one path each. The distinction between circular and line will not be explained here, since this point is sufficiently explained under ► *“Flatness” on page 5-13*. The focus here lies on the procedure in UMESS.

- Alignment
- <DI 1135>
- Filter
- Outliers



- do n = 1 to 5  
     <DI 1100> File [n] (known contour scanning, random)  
     103 Surface (file evaluation)  
     104 Minimum surface (with specified alignment)  
     105 Form  
   enddo
- <DI 1136>  
     Standard: **CZ\_MFN\_C** or **CZ\_MFN\_L**  
     Address:  
     From 104 to 105 step size 1  
     From 107 to 108 step size 1  
     ...

## Comments

- Since the output data is defined by the default settings in UMESS, all four position evaluations can be displayed in a single plot. In this case, a workpiece-specific standard can be created with the Designer which has its own header.
- Since the position deviation is determined via a special evaluation, the FORM program should be used for the position evaluation instead of the DIs available in UMESS. The tolerances should be defined via a variance comparison under symbol D. Unfortunately, the FORM text output, and not the corresponding position evaluation, will be output in the record.
- One advantage is that a 3D inspection of the position tolerances is performed via this evaluation.

## Parallelism, perpendicularity, angularity, runout of multiple paths per element

One surface with up to 5 paths. The distinction between circular and line will not be explained here, since this point is sufficiently explained under ► *“Flatness” on page 5-13*. The focus here lies on the procedure in UMESS.

- Alignment
- <DI 1135>
- Filter
- Outliers
- do n = 1 to 5  
     <DI 1100> File [n] (known contour scanning, random)  
   enddo  
     103 Surface (evaluation of all measured files)  
     104 Minimum surface (with specified alignment)  
     105 Form

- do n = 1 to 5  
106  
... Surface (separate file evaluation of individual paths)  
enddo
- **<DI 1136>**  
Standard: **CZ\_FN\_MC** or **CZ\_FN\_ML**  
Address:  
From 106 to 110 step size 1  
From 104 to 105 step size 1

### Comments

- The position reference is obtained by entering the angle. Since the surface is determined as the last address from all paths and the multipath standard is used, the plot is output in reference to the location of this reference surface.
- Multiple surfaces cannot be displayed.
- Special custom-made standards can be created by renaming the basic standards: parallelism, perpendicularity, angularity, axial (runout) radial runout, line symmetry (axes) (► *“Parallelism, perpendicularity, angularity, symmetry, position, coaxiality of axes” on page 5-23, CZ\_PL*).

## Symmetry, position of surfaces

Up to five surfaces with one path each. The reference and location of the surfaces being inspected must be identical. This can be achieved through appropriate coordinate transformations as described for the symmetry of a surface in the example given below. The distinction between circular and line will not be explained here, since this point is sufficiently explained under ► *“Flatness” on page 5-13*. The focus here lies on the procedure in UMESS.

- Alignment (for which the location-specific position is being inspected)
- **<DI 1135>**
- Filter

- Outliers
  - <DI 1100>** File (known contour scanning)
  - 103 Surface (file evaluation)
  - 104 Minimum surface (with specified alignment)
  - 105 Min/max flatness
  - 106 Formula ABS[coordinate (-2)]
  - 107 Formula ABS[coordinate (-2)]
  - 108 MAX ADR[coordinate] -1 bis -2
  - 109 GDT SYMMETRY
  - 110 FORMULA coordinate (-6)\*0
- **<DI 1136>**
  - Standard: **CZ\_FN\_MC** or **CZ\_FN\_ML**
  - Address:
    - From 104 to 104 step size 1 Pixels
    - From 110 to 110 step size 1 Reference
    - From 109 to 109 step size 1 Numeric values

## Comments

- The position reference is obtained by entering the angle. Since the location cannot be specified in the surface reconstruction (calculation), an artificial surface containing this reference must be created. This is done using the formula for ADR 110.
- The numeric value of the symmetry or position must be realized via the structure for ADR 105 to ADR 108.
- A combination of symmetry and position is possible.

## Symmetry, position of surfaces with multiple paths

One surface with up to 5 paths. The distinction between circular and line will not be explained here, since this point is sufficiently explained under ► *“Flatness” on page 5-13*. The focus here lies on the procedure in UMESS.

- Alignement (for which the location-specific position is being inspected)
- **<DI 1135>**
- Filter
- Outliers

- do n = 1 to 5
  - <DI 1100> File [n] (known contour scanning)
  - enddo
  - 103 Surface (file evaluation of all paths)
  - 104 Minimum surface (with specified alignment)
  - 105 Min/max flatness
  - 106 Formula ABS[coordinate (-2)]
  - 107 Formula ABS[coordinate (-2)]
  - 108 MAX ADR[coordinate] -1 bis -2
  - 109 GDT SYMMETRY
  - 110 FORMULA coordinate (-6)\*0
- do n = 1 to 6
- 111
  - ... Surface
  - enddo
- <DI 1136>
  - Standard: **CZ\_FN\_MC** or **CZ\_FN\_ML**
  - Address:
    - From 111 to 115 step size 1
    - Pixels
    - From 110 to 110 step size 1
    - Reference
    - From 109 to 109 step size 1
    - Numeric values

### Comments

- The position reference is obtained by entering the angle. Since the location cannot be specified in the surface reconstruction (calculation), an artificial surface containing this reference must be created. This is done using the formula.
- The procedure for a surface is described in the above example.

## Cumulative axial runout with multiple paths

One surface with up to 5 paths. The distinction between circular and line will not be explained here, since this point is sufficiently explained under ► *“Flatness” on page 5-13*. The focus here lies on the procedure in UMESS. The procedure is analogous to ► *“Symmetry, position of surfaces with multiple paths” on page 5-20*; since the cumulative axial runout is a non-location-specific position tolerance, the formula for specifying the location is omitted. The cumulative axial runout can be determined directly from the min./max. flatness.

- Alignment (for which the location-specific position is being inspected)

### – <DI 1135>

- Filter
- Outliers
- do n = 1 to 5
  - <DI 1100> File [n] (known contour scanning)
  - enddo
  - 103 Surface (file evaluation of all paths)
  - 104 Minimum surface (with specified alignment)
  - 105 Min/max flatness
  - 106 CUMULATIVE AXIAL RUNOUT

- do n = 1 to 6

107  
... Surface  
enddo

### – <DI 1136>

Standard: **CZ\_FN\_MC** or **CZ\_FN\_ML**  
Address:  
From 107 to 111 step size 1  
Pixels  
From 104 to 104 step size 1  
Reference  
From 106 to 106 step size 1  
Numeric values

## Parallelism, perpendicularity, angularity, symmetry, position, coaxiality of axes

Generally speaking, deviations can be meaningfully displayed only if the axis has been reconstructed (calculated) using a random number of center points from sections located perpendicular to the axis. Since this type of evaluation is a relatively time-consuming process, it is generally limited to preliminary inspections or several central applications related to production series control. The evaluation cannot be performed via the axis of the measuring element cylinder, since, as an ideal axis, it possesses only an angular deviation. It is completely described by the numeric result of the record and the deviation of the parallelism results from the extreme value at the beginning or end of the axis.

If a line on a surface is scanned, the (location-specific or non-location-specific) position deviation can be calculated and documented directly in the probing direction. The procedure is sufficiently described in sections ➤ *"Straightness"* on page 5-2. The difference results from the selection of the standard:

- **CZ\_PL** for displaying both angles
- **CZ\_PL1** for displaying angle A1
- **CZ\_PL2** for displaying angle A2

### Parallelism, perpendicularity, angularity of linked axes

The evaluations belong to the non-location-specific position tolerances. The appropriate reference system must be implemented to ensure a correct display.

- Perform alignment according to drawing. For angularity (tilt), the coordinate system must be rotated by the nominal angularity value.
- **<DI 1135>**

- do n = 1 to k  
Measure circle[n]  
enddo
- Line (recall circle [n])
- GDT parallelism A1
- GDT parallelism A2
- **<DI 1136>**  
Standard: **CZ\_PL**  
Address: From -3 to -1 step 1

If only plot A1 is of interest:

- GDT straightness A1
- **<DI 1136>**  
Standard: **CZ\_PL1**  
Address: From -3 to -2 step 1

If only plot A2 is of interest:

- GDT straightness A2
- **<DI 1136>**  
Standard: **CZ\_PL2**  
Address: From -3 to -1 step 2

## Symmetry and position of linked axes (untested)

Since a location-specific position tolerance is being inspected, the corresponding coordinate system must be created for the plot.

- Alignment (according to drawing)
- **<DI 1135>**
- do n = 1 to k  
Measure circle[n]  
enddo
- Line (recall circle [n])
- Formula coordinate (-1)\*0
- Formula coordinate (-1)\*0
- **<DI 1136>**  
Standard: **CZ\_PL**  
Address: From -3 to -1 step 1

If only plot A1 is of interest:

- GDT straightness A1
- **<DI 1136>**  
Standard: **CZ\_PL1**  
Address: From -2 to -1 step 1

If only plot A2 is of interest:

- GDT straightness A2
- **<DI 1136>**  
Standard: **CZ\_PL2**  
Address: From -2 to -1 step 1



## Cumulative radial runout

Since a location-specific position tolerance is being inspected, the corresponding coordinate system must be created for the plot.

- Alignment (according to drawing)
- **<DI 1135>**
  - do n = 1 to 5
    - Measure circle[n]
    - enddo
    - 100 Cylinder (from all files)
    - 101 Minimum cylinder (specifying axis)
    - 102 Cumulative radial runout
  - do n = 1 to k
    - 104 Circle evaluation file [n]
    - 105 Minimum cylinder (with default setting for center point)
    - enddo
- **<DI 1136>**
  - Standard: **CZ\_CRRO\_MC**
  - Address: From -1 to -10 step 2
  - Address: From 101 to 102 step 1

## Thickness measurements

Standards are available for thickness measurements of

- Surfaces with a circular or random-shape path,
- Lines,
- Pipes.

The paths should be located opposite (each other), since the deviation in the number of points will be calculated accordingly. Also, the number of points should be almost identical. The smaller number will be used as a basis. In particular, the selection of the step distance should be varied with regard to the wall thickness of pipes so that the larger circumference does not lead to an increase in the number of points. If the position of the points must be exact, the exact nominal path should be generated via KUM. The measurement should then be performed based on nominal values with point take-over at the nominal value.

A special evaluation occurs whenever two elements are calculated from a single point file using different filters. In this case, the filtered part displays a visible difference (in thickness).

The outlier inspection can be applied. If too many points must be deleted due to contamination or surface defects, allocation problems will occur.

### Surfaces

Although this module was created especially for brake disks, it can also be used for a number of different components. In addition to thickness measurements, it can also be used to output the axial runout or parallelism of both plane surfaces. The path mode will not be explained here in detail, since it is only necessary to alter the axial runout via the parallelism and change the plotting standard from **CZ\_TN\_C** to **CZ\_TN\_L**.

- Alignment (according to drawing)
- **<DI 1135>**
- Filter
- Outliers
- Point file (reference surface)
  - 100 Surface
  - 101 Minimum surface
  - 102 Flatness (reference surface)

- Point file (inner surface)
  - 103 Surface
  - 104 Minimum surface (default angle ADR 101)
  - 105 Min/Max
  - 106 Axial runout
- Point file (outer surface)
  - 107 Surface
  - 108 Minimum surface (default angle ADR 101)
  - 109 Min/Max
  - 110 Axial runout
- **<DI 1136>**
  - Standard: **CZ\_TN\_C**
  - Address:
  - From 101 to 102 step 1
  - Reference
  - From 104 to 106 step 2
  - Inner surface
  - Address:
  - From 108 to 110 step 2
  - Inner surface

**Comments**

- If the reference (surface) is aligned spatially, the reference surface must be re-evaluated to ensure that the deviation points are available in reference to this coordinate system.
- If two surfaces should only be compared with each other, one of them must be used as a reference surface.
- The inside and outside are defined based on the orientation of the coordinate system. The inside is thus located mathematically closer to the zero point.

**Lines**

The thickness is evaluated in reference to the coordinate axes. Three standards therefore exist:

- **CZ\_TN\_1** for the X axis
- **CZ\_TN\_1** for the Y axis
- **CZ\_TN\_1** for the Z axis

The paths should not be located too far apart and the number of points should be almost identical.

- Alignment (according to drawing)
- **<DI 1135>**

- Outliers
- Filter
- Point file (line at bottom)
  - 100 Line
  - 101 Minimum line
  - 102 Straightness (line at bottom)
- Point file (line at top)
  - 103 Line
  - 104 Minimum line
  - 105 Straightness
- **<DI 1136>**
  - Standard: **CZ\_TN\_L1**
  - Address:
    - From 101 to 102 step 1 Reference line
    - From 104 to 105 step 1

### Comments

- The first of the two lines will automatically be used as the reference line for the thickness measurement.
- Select lines in numerically ascending order.

## Circles

The paths should not be located too far apart and the number of points should be almost identical.

- Alignment (according to drawing)
- **<DI 1135>**
  - Outliers
  - Filter
  - Point file (inner circle)
    - 100 Circle
    - 101 Minimum circle
    - 102 Roundness (inner circle)
  - Point file (outer circle)
    - 103 Circle
    - 104 Minimum circle
    - 105 Roundness

- **<DI 1136>**

Standard: **CZ\_TN\_R**

Address:

From 101 to 102 step 1

Reference circle

From 104 to 105 step 1

**Comments**

- The first of the two circles will automatically be used as a reference for the thickness measurement.
- Circles should be selected in ascending order of radius.



# Chapter 6

## Designer

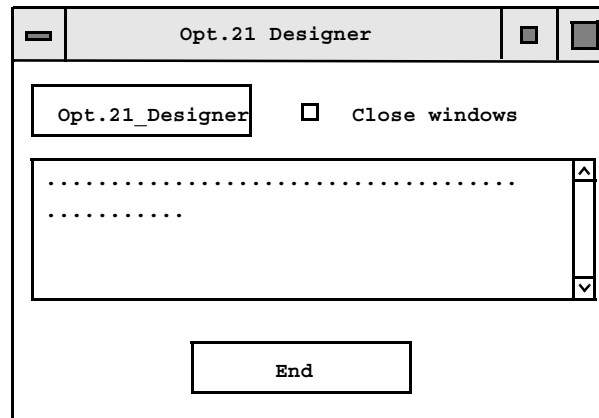
---

You can use **Opt. 21\_Designer** either to create new layouts or to alter existing ones and store them under a new name.

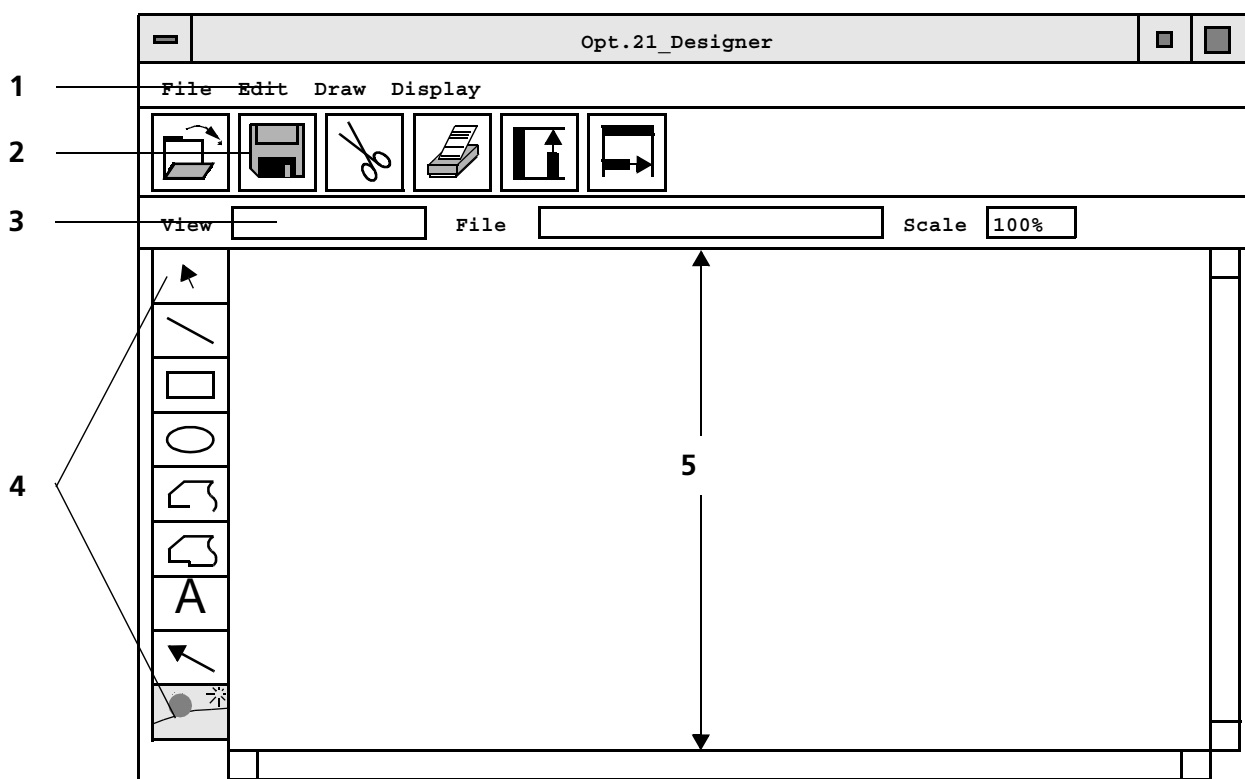
### **This chapter contains:**

Start .....	6-2
Description of workspace. ....	6-4
File management. ....	6-6
Basic functions. ....	6-7

## Start



- Click on the **Opt.21\_Designer** button.
  - Press the left or right mouse button.
- The **Opt.21\_Designer** input window opens.



### Workspace

The Designer workspace comprises five areas:

1. Menu line



2. Toolbar
3. Input line for entering numeric values
4. Editing pallet with design tools
5. Editing area

## Description of workspace

### Menu line

The menu line contains four menus:

- **File**
- **Edit**
- **Draw**
- **Display**

<b>File</b>	The <b>File</b> menu contains file administration functions. Since it is assumed that you are familiar with these functions, they will be explained only briefly (► <i>"File management" on page 6-6</i> ).
<b>Edit</b>	The <b>Edit</b> menu contains basic functions for processing the editing area. Once again, since familiarity with these functions is assumed, they will be explained only briefly (► <i>"Basic functions" on page 6-7</i> ).
<b>Draw</b>	Drawn rectangles, ellipses or lines are referred to as objects. The <b>Draw</b> menu contains items which enable you to modify objects in the editing area.
<b>Display</b>	All items in the <b>Display</b> menu refer to the editing area. The editing area can be adapted to the work being done, e.g. by zooming objects or adjusting the editing area to match the actual workspace.

### Toolbar

The toolbar contains six icons:



#### Open

Opens a window in which a GRA file can be selected.



#### Store

Saves the current graphics file to the specified directory.



#### Cut

The highlighted design object is cut out and temporarily saved to the clipboard (buffer memory).



#### Print

The current page is printed.



#### Set to same height

The height of all marked design objects is adjusted to match the highlighted design object in the foreground.

**Set to same width**

The width of all marked design objects is adjusted to match the highlighted design object in the foreground.

**Editing pallet**

The editing pallet contains design tools for designing layouts.

**Selection tool****Line tool****Rectangle tool****Ellipse tool****Polyline tool****Polygon tool** (for closed lines)**Text field tool****Arrow tool****Import tool for bitmap files**

## File management

<b>New</b>	To open a new file, select <b>File/New</b> from the menu line. An empty file then opens in the editing area.
<b>Store</b>	<p>To save a file, select <b>File/Store</b> from the menu line.</p> <p>If the file has already been assigned a name, it will be saved under its current name.</p> <p>If the file is still unnamed, an input window will then open and prompt input of a file name incl. the directory path.</p>
<b>Store as ...</b>	To store a file under a new name, select <b>File/Store as...</b> from the menu line. An input window will then open and prompt you to enter a file name, specifying the full directory path, if necessary. The file name may contain only lower-case letters and must not exceed 8 characters. The extension <b>.gra</b> will automatically be attached to the file name.
<b>Open</b>	To open an existing file, select <b>File/Open</b> from the menu line. The <b>Select file</b> input window then appears. Select the desired file, specifying the full directory path, if necessary.
<b>Print</b>	<p>To print a graphics file, select <b>File/Print</b> from the menu line. When using a non-postscript printer, a new printer driver must be installed prior to initial operation (► <i>"Printer installation" on page 7-1</i>).</p>
<b>Close</b>	To quit the Opt.21_Designer, select <b>File/Close</b> from the menu line.

## Basic functions

<b>Copy</b>	To copy marked objects, select <b>Edit/Copy</b> from the menu line. The objects are then temporarily stored in the clipboard (buffer memory). They can be reinserted by selecting <b>Edit/Insert</b> .
<b>Cut</b>	To remove marked objects, select <b>Edit/Cut</b> from the menu line. The object(s) will then be cleared from the editing area and stored in the clipboard. They can be reinserted by selecting <b>Edit/Insert</b> .
<b>Paste</b>	To insert objects from the clipboard, select <b>Edit/Paste</b> from the menu line.
<b>Select all</b>	All of the objects in the editing area can be marked by selecting the command <b>Edit/Select all</b> from the menu line.
<b>Duplicate</b>	All of the objects in the editing area can be copied by selecting the command <b>Edit/Duplicate</b> from the menu line. The copies then appear slightly displaced from the originals in the editing area.
<b>Refresh</b>	The current graphics file can be reconstructed and displayed by selecting <b>Display/Refresh</b> from the menu line.
<b>Convert to polygon</b>	The button <b>Edit/Convert to polygon</b> in the menu line is currently not assigned.
<b>Adapt page</b>	The button <b>Display/Adapt page</b> in the menu line is currently not assigned.

## Workspace settings

Before you start creating a layout, you must first perform all workspace settings.

### Paper format

- Select **File/Set up page** from the menu line.  
The **Page layout** input window then appears. It comprises the **Paper format**, **Margins** and **Details** index cards.

#### Paper format

You can choose between the portrait (upright) and landscape (wide) formats and select the paper size.

- Choose between portrait and landscape format.
- Click with the left mouse button on the field **Paper format** and hold the button down.  
A selection list appears.
- Select the desired paper format.  
The dimensions of the format selected will then be displayed in the **Height** and **Width** output fields (► *“Installation of Gost Print” on page 7-6, Details*).

#### NOTE

When selecting the **User format**, you can enter freely selectable numbers under **Width** and **Height**.  
You can also enter the **Width** and **Height** values directly in the output fields. The **Paper format** then automatically changes to **User format**.

#### Margins

The **Margins** index card is used to define the free (unprinted) margins of the page. The numeric values entered here define the distance between the edge of the paper and the printed area. The printed area of the printer you use can be determined via the printer driver.

- Enter the desired page margins.

#### Details

You can use the **Details** index card to set the unit of measurement for the paper size.

- Click with the left mouse button on the **Unit of measurement** button and hold the button down.  
A selection list appears.
- Select the desired unit of measurement.

## Display

If a new file is opened, the **Scale** (zoom) data field in the **Numeric value line** will indicate the value of 100%. When redefining a layout, it may be a good idea to adapt the zoom factor to match the editing area.

### Zoom in

Select **Display/Zoom in** from the menu line. The contents of the editing area will then be displayed with a higher zoom factor which will be displayed in the **Scale** data field. Each time you reselect **Zoom in**, the zoom factor will be doubled until the maximum zoom factor of 3200 is reached.

### Zoom out

Select **Display/Zoom out** from the menu line. The contents of the editing area will then be displayed with a lower zoom factor which will be displayed in the **Scale** data field. Each time you reselect **Zoom out**, the zoom factor will be reduced to 50 % until the lowest zoom factor of 12.5 is reached.

## Magnetic grid

The magnetic grid helps you position objects. The corners of objects are attracted by the magnetic grid points.

### Define grid

Select **Display/Define grid** from the menu line.

A new input window then appears.

Enter the desired grid.

1st number: Horizontal direction

@: Separator

2nd number: Vertical direction

Click on the **OK** button.

The grid points are displayed in the editing area.

### Grid on/off

Select **Display/Grid on/off** from the menu line.

This switches the grid on or off.

## Working in the editing area

In the editing area, you can use the editing pallet to create files or alter existing files to meet your requirements.

The editing pallet contains different tools which can be used to insert lines, basic geometric forms, texts and bitmap files in a layout. A selection tool is also included.

### Objects

You can randomly group lines, basic shapes, texts and bitmap files. All of them and any groupings thereof are referred to as objects.

### Selection tool



The **Selection tool** is used to select and position objects.

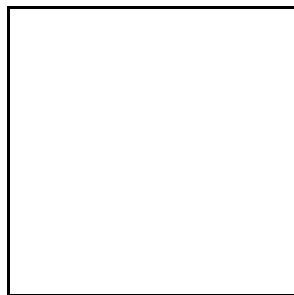
If you select an icon for a design tool, you can position the corresponding object. However, in order to move or alter an existing object, you must first activate the selection tool.

#### NOTE

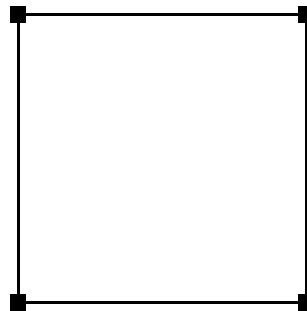
Automatic re-activation of the selection tool as featured in many conventional graphics programs has not yet been implemented in the Designer subprogram.

### Marking objects

The selection tool is used to select objects in the editing area of the Designer. The boundary points of selected objects are displayed.



Object **not selected**



Object **selected**  
(boundary points  
displayed)

The designer enables you to select objects in two different ways:

### Clicking on them

You can select a single object by simply clicking on one of its edges with the left mouse button. Or you can select several objects by holding down the **Shift** key and clicking on the edges of the desired objects one by one.



**Lassoing them**

You can also select one or more objects by choosing the selection tool, clicking on the (empty) drawing area with the left mouse button, and then holding the mouse button down while dragging the cursor over the desired objects. When you release the mouse button, all of the objects thus selected will be displayed with activated boundary points.

**Drawing lines and basic shapes**

The Designer features six tools for drawing lines and basic shapes:

**1 Line tool,**

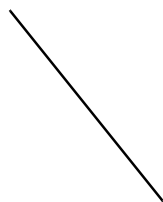
**2 Arrow tool,**

**3 Rectangle tool,**

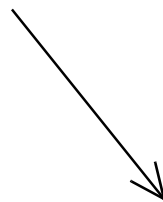
**4 Ellipse tool,**

**5 Polyline tool** and

**6 Polygon tool** (for closed lines).



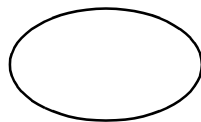
**1**



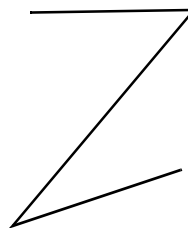
**2**



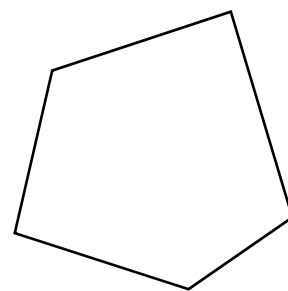
**3**



**4**



**5**



**6**

**Line tool**

- First click on the **Line tool** button with the left mouse button.

- Then click on the position in the editing area where you want to start drawing the line with the left mouse button and hold it down.
  - Now, holding the left mouse button down, drag the cursor to the position where you want the line to end and release the mouse button.
- Finished!



### **Arrow tool**

- First click on the **Arrow tool** button with the left mouse button.
  - Then click on the position in the editing area where you want to start drawing the arrow with the left mouse button and hold it down.
  - Now, holding the left mouse button down, drag the cursor to the position where you want the arrow to end and release the mouse button.
- Finished!



### **Rectangle tool**

- First click on the **Rectangle tool** button with the left mouse button.
  - Then click on the position in the editing area where you want to start drawing the rectangle with the left mouse button and hold it down.
  - Now, holding the left mouse button down, drag the cursor to the opposite corner of the rectangle and release the mouse button.
- Finished!



### **Ellipse tool**

- First click on the **Ellipse tool** button with the left mouse button.
  - Then click on the position in the editing area where you want to place the starting point of the ellipse with the left mouse button and hold it down.
  - Now, holding the left mouse button down, drag the cursor to the opposite side of the ellipse and release the mouse button.
- The ellipse is now finished.



### Polyline tool

The **Polyline tool** can be used to draw an open set of continuous lines. A polyline is comprised of nodes which are interconnected by lines.

- First click on the **Polyline tool** button with the left mouse button.
- Then click on the position in the editing area where you want to start drawing the continuous lines with the left mouse button.
- Now click on the position in the editing area where you want to set the first node (end of the first line) with the left mouse button.
- Then click on the position in the editing area where you want to set the next node with the left mouse button.  
Repeat this step until the last node has been set.
- Finally, set the end point of the series of continuous lines by double-clicking at the desired location with the left mouse button.  
The series of continuous lines is now finished.

#### NOTE

Once a polyline has been drawn, the relative position of its nodes cannot be changed. Only the size and position of the entire polyline can be changed using the selection tool.



### Polygon tool

The **Polygon tool** can be used to draw closed set of continuous lines. A polygon is comprised of nodes which are interconnected by lines.

- First click on the **Polygon tool** button with the left mouse button.
- Then click on the position in the editing area where you want to start drawing the continuous lines with the left mouse button.
- Now click on the position in the editing area where you want to set the first node (end of the first line) with the left mouse button.
- Then click on the position in the editing area where you want to set the next node with the left mouse button.  
While you draw further nodes, the connection to the first node will automatically be reconstructed without being displayed.  
Repeat this step until the penultimate node has been set.
- Finally, set the end point of the series of continuous lines by double-clicking at the desired location with the left mouse button.  
The set of continuous lines is now complete and the end point will automatically be connected to the starting point to complete the polygon.

**NOTE**

Once a polygon has been drawn, the relative position of its nodes cannot be changed. Only the size and position of the entire polygon can be changed using the selection tool.

## Changing objects

### Change object size

- Mark the object(s) of interest.
- Click on one of the object's boundary marks with the left mouse button and hold the button down.
- Holding the left mouse button down, drag the cursor to the desired location and release the mouse button.  
The objects then reappear altered in size.

### Move object

- Mark the object(s) of interest.
- Click on one of the object's boundary marks with the left mouse button and hold the button down.  
The shape of the cursor then changes to a hand.
- Holding the left mouse button down, drag the cursor to the desired location and release the mouse button.  
The objects then reappear at the new position.

### Fill with color

- Mark the object(s) of interest.
- Select **Draw/Fill with color...** from the menu line.  
A new input window then appears.
- Select the desired color.  
The objects are then filled with the selected color.

### Edge color

- Mark the object(s) of interest.
- Select **Draw/Edge color...** from the menu line.  
A new input window then appears.
- Select the desired color.  
The lines of the object then reappear in the new color.

### Line width

- Mark the object(s) of interest.
- Select **Draw/Line width...** from the menu line.  
A new input window then appears.
- Enter the desired line width.

- Click on the **OK** button.  
The objects then reappear with the desired line width.

A screenshot of a dialog box titled "Line width (in pixels)". It features a text input field containing the number "1". Below the input field are two buttons: "OK" and "Cancel". The dialog box has a standard window header with a title bar and two small square icons on the right.

### Object width

- Mark the object(s) of interest.
- Select **Draw/Width...** from the menu line.  
A new input window then appears. The current object width is displayed.  
If more than one object is marked, the width of the object located in the foreground will be displayed.
- Enter the desired width.
- Click on the **OK** button to activate the selected changes.  
The objects then reappear with the selected changes.

A screenshot of a dialog box titled "New width (in pixels)?". It features a text input field containing the number "262". Below the input field are two buttons: "OK" and "Cancel". The dialog box has a standard window header with a title bar and two small square icons on the right.

### Object height

- Mark the object(s) of interest.
- Select **Draw/Height...** from the menu line.  
A new input window then appears. The current object height is displayed.  
If more than one object is marked, the height of the object located in the foreground will be displayed.
- Enter the desired height.

- Click on the **OK** button to activate the selected changes.  
The objects then reappear with the selected changes.

A dialog box with a title bar containing a minus button, a maximize button, and a close button. The main area contains the text "New height (in pixels)?", a text input field with the value "262", and two buttons labeled "OK" and "Cancel" at the bottom.

### Display properties

- Mark the object(s) of interest.
- Select **Draw/Properties...** from the menu line.  
A new **Properties** input window then appears displaying the current properties of the object.
- You can move the marked objects by clicking on the red arrows with the left mouse button.
- The desired object dimensions can be entered directly via the **Left**, **Right**, **Top** and **Bottom** buttons.
- Click on the **OK** button to activate your changes.  
The objects then reappear with the selected changes.

### Zoom objects

- Mark the object(s) of interest.
- Select **Display/Zoom objects...** from the menu line.  
A new input window then appears.
- Enter the desired zoom factor.  
The zoom factor of 2.5 means that the objects and line width will appear with a 2.5-power magnification.
- Click on the **OK** button to activate the changes.  
The objects then appear with the desired size.

A dialog box with a title bar containing a minus button, a maximize button, and a close button. The main area contains the text "Enter zoom factor", a text input field with the value "1", and two buttons labeled "OK" and "Cancel" at the bottom.

**Align objects**

- Mark the object(s) of interest.
- Select **Draw/Align...** from the menu line.  
A new **Align objects** input window then appears.
- Indicate the type of alignment required.  
Vertical (Top/Center/Bottom)  
Horizontal (Left/Center/Right)
- Click on the **OK** button to activate the changes.  
The objects then reappear with the desired alignment.

The screenshot shows a dialog box titled "Align objects". It contains two sections: "Vertical" and "Horizontal", each with a checkbox. Under "Vertical", there are three radio buttons labeled "Top", "Center", and "Bottom". Under "Horizontal", there are three radio buttons labeled "Left", "Center", and "Right". At the bottom of the dialog, there are two buttons: "OK" and "Cancel".

**Object name**

The **Draw/Object name...** button in the menu line is currently not assigned.

**Display object**

The **Draw/Display object...** button in the menu line is currently not assigned.

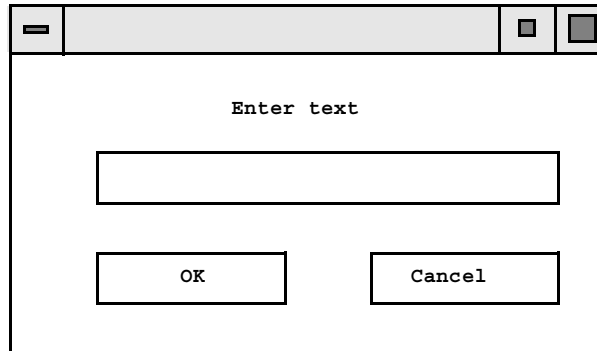
**Text field tool**

A

The **Text field tool** is used to label layouts. The text field thus generated behaves like an object. I.e. it can be marked, grouped and moved in the drawing plane, like any other object.

- Click on the **Text field tool** button with the left mouse button.
- Mark the location in the editing area where the text should begin with a single click of the left mouse button.  
A new input window then appears.

- Enter the desired text.
- Click on the **OK** button to accept the text.  
The text then appears in the editing area.



## Change type size

- Mark the desired text fields.
- Click on an activated boundary mark with the left mouse button and hold the mouse button down.
- Holding the left mouse button down, drag the cursor to the desired position and release the mouse button.  
The text fields then appear in the new size.

## Move text

- Mark the desired text fields.
- Click on a text field with the left mouse button. Hold down the left mouse button.  
The shape of the cursor then changes to a hand.
- Holding the left mouse button down, drag the cursor to the desired position and release the mouse button.  
The objects then appear at the new position.

## Text color

- Mark the desired text fields.
- Select **Draw/Text color...** from the menu line.  
A new input window then appears.
- Select the desired color.  
The texts are then displayed in the selected color.

## Import tool for bitmap files

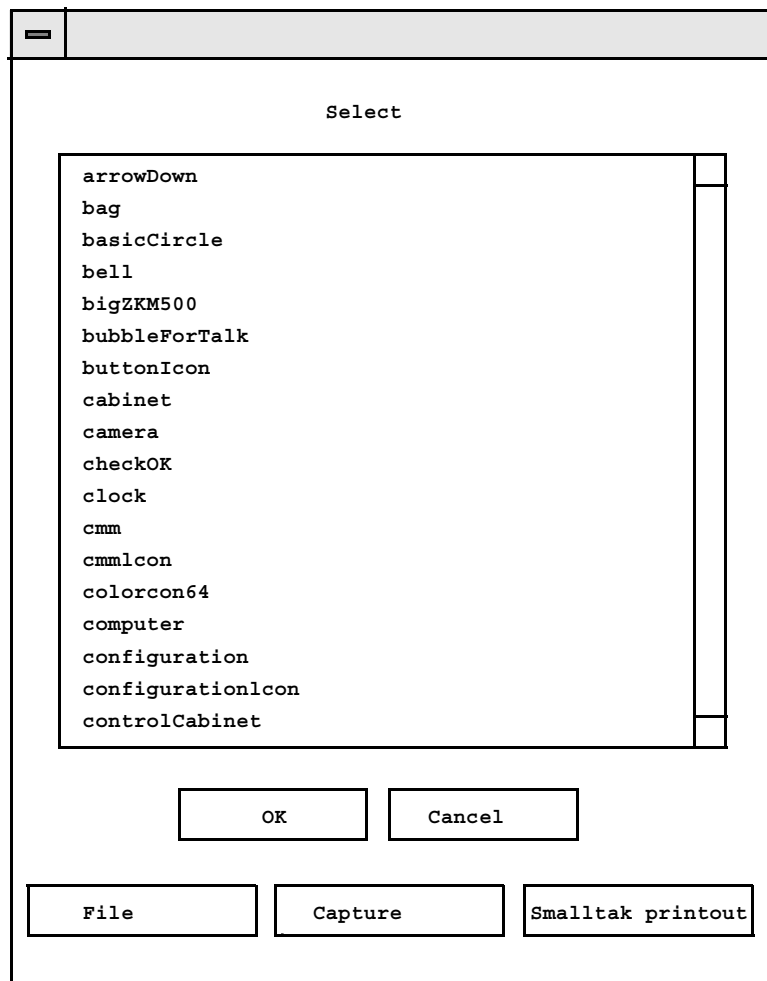


A bmp file is a pixel-based graphics file which behaves like an object. I.e. it can be marked, grouped and moved in the drawing plane like any other object.

- Click on the **Import tool for bitmap files** button with the left mouse button.



- Then click with the left mouse button on the position in the editing area where you want to position the bmp file.  
A new input window then appears.



You now have several possibilities to create or import a bmp file.

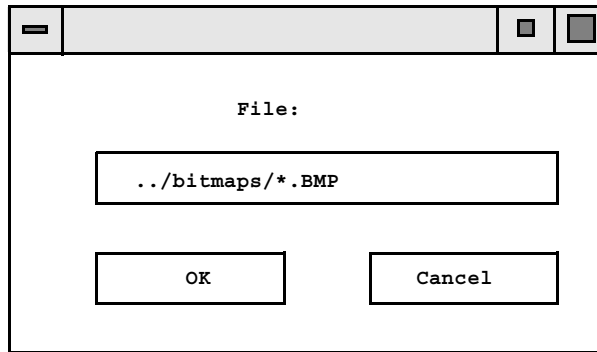
#### Select icon

- Use the left mouse button to mark a name from the list, e. g. **arrowDown**.  
The selected name is marked gray.
- Click on the **OK** button to accept the icon.  
The icon then appears in the editing area.

#### Select file

- Click on the **File** button to select a file.  
A new input window then appears.
- Enter the path and the file name of the bitmap file.

- Click on the **OK** button to accept the image.  
The image then appears in the editing area.



### Capture

- Click on the **Capture** button to take a screenshot of an image from the screen.  
The window closes.  
The shape of the cursor changes to a cross.
- Click with the left mouse button on one corner of the desired screenshot. Hold down the left mouse button.
- Holding the left mouse button down, drag the cursor to the desired location and release the mouse button.  
The selected area appears as a bitmap image in the editing area.

### Smalltalk printout

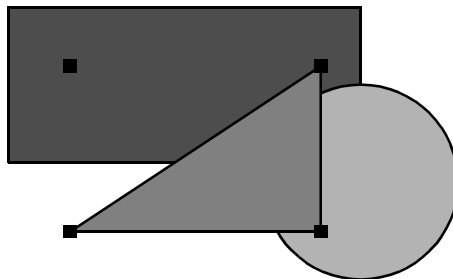
The **Smalltalk printout** button is currently not assigned.

## Drawing plane

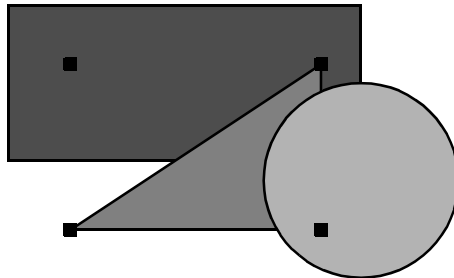
The Designer permits different drawing planes, i.e. objects can be moved into the foreground or background as required.

### Example

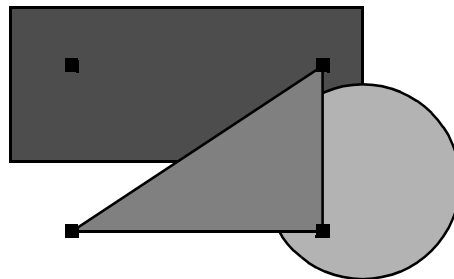
- Draw several objects with different colors and shapes so that they overlap each other.  
The object last drawn, in the example below a triangle, will be displayed in the uppermost drawing plane.



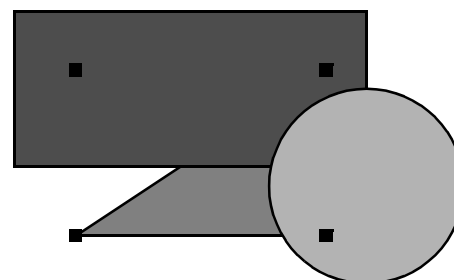
- Select **Draw/Send/Back** from the menu line.  
The marked object, here a triangle, will be moved back one plane or level.



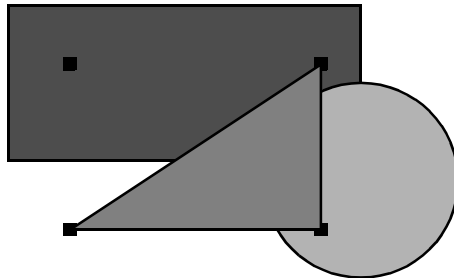
- Select **Draw/Bring/Forward** from the menu line.  
The marked object, in this case a triangle, is then moved forward one plane.



- Select **Draw/Send/To background** from the menu line.  
The marked object, here a triangle, is moved all the way to the rear.



- Select **Draw/Bring/To foreground** from the menu line.  
The marked object, in this case a triangle, is moved all the way to the front.

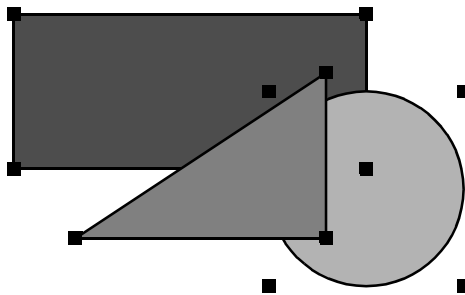


## Object groups

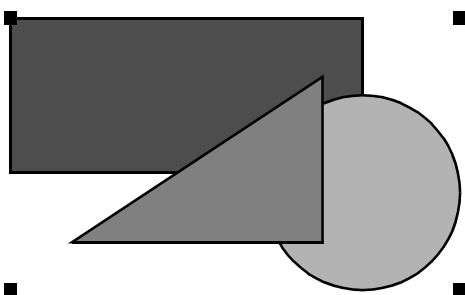
Several different objects can be joined to form a group in the Designer. Such a group of objects is treated like a single object.

### Group

- Mark the desired objects.  
In the example below, all three objects are marked.

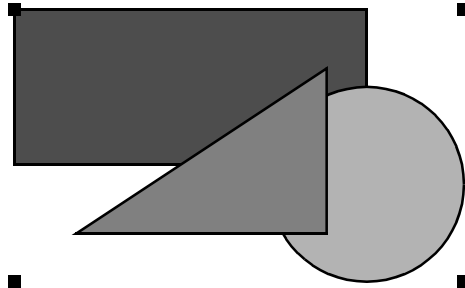


- Select **Draw/Group/Form** from the menu line.  
The marked objects will then be joined to form a group and displayed as a single object.

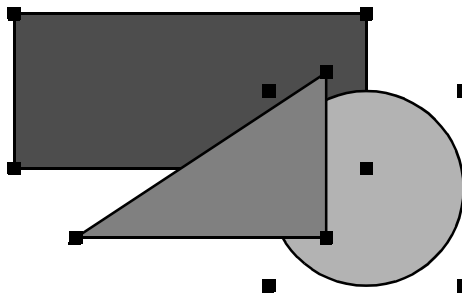


**Separate group**

- Mark the object group.  
In this example, all three objects belong to the group.



- Select **Draw/Group/Separate** from the menu line.  
The objects are no longer grouped, i.e. the objects have been separated.

**Symbols**

The **Draw/Group/For symbols** button in the menu line is not assigned at present.

**Statistics**

The **Draw/Group/For statistics** button in the menu line is not assigned at present.

**Comments**

The **Draw/Group/For comments** button in the menu line is not assigned at present.

**References**

The **Draw/Group/For references** button in the menu line is not assigned at present.



# Chapter



## Printer installation

---

### **This chapter contains:**

Printer emulation . . . . .	7-2
Installation of Shared Print . . . . .	7-3
Selection table for Shared Print printers . . . . .	7-5
Installation of Gost Print. . . . .	7-6

## Printer emulation

### Postscript

If a genuine postscript printer is installed, no emulation is required. In this case, the printer will automatically recognize that a postscript file is to be printed.

### Non-postscript

Option 21 is programmed as a Smalltalk application. Non-postscript printers require an emulation.

To print under **HP UX 9.5, Shared Print** software is required  
(➤ *"Installation of Shared Print" on page 7-3*).

To print under **HP UX 10.20, Gost Script** software is required  
(➤ *"Installation of Gost Print" on page 7-6*).

The appropriate software must be installed prior to initial use.



# Installation of Shared Print

Printer installation is a special procedure requiring **knowledge of the operating system**.

Printer installation in a **network** can be performed only by a **system administrator**. Please call our hotline: 0180/333-6337.

## NOTE

The software is programmed as a Smalltalk application. Visual Works can output only postscript graphics. Most printers are not postscript-compatible. For this reason, the HP program SharedPrint/UX is used to process postscript files for HP printers.

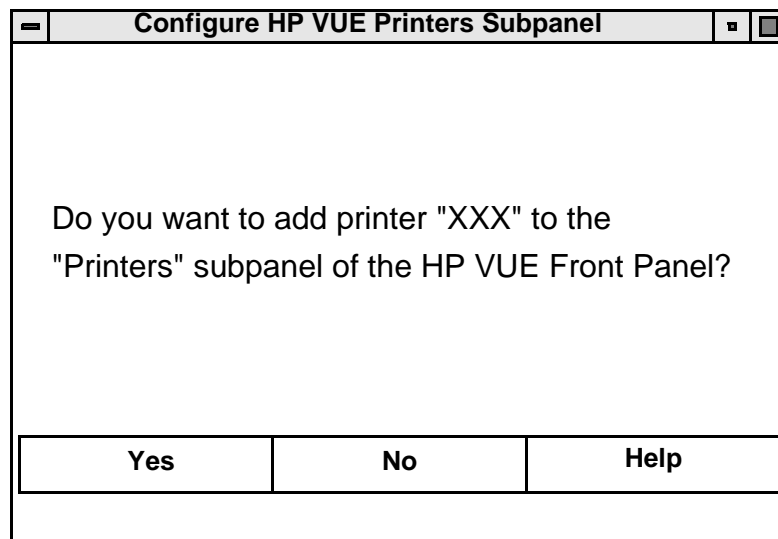
All printers must be **additionally** configured as SharedPrint/UX printers (even if they already function properly in UMESS/UX).

Since printer selection is currently not possible in Visual Works, the SharedPrint/UX printer must be designated as the **system default printer**.

## Procedure for installing a local printer

- Quit UMESS.
- Click on the blue background with the mouse. Select **<New window>** from the pull-down menu. A CZ terminal window then appears.
- Enter the password, if applicable.
- Enter the following command: **su**  
Press the **<Return>** key.
- Enter the following command: **sam**  
Press the **<Return>** key.
- Printers and plotters **Open**.
- Printers/plotters **Open**.
- Pull-down menu:  
Action:
  - **Add Local Printer/Plotter**
  - **Add Parallel Printer/Plotter**
  - **Parallel Interface ok.**
- The printer name is freely selectable: e.g. DeskJet 1600C.
- **Printer Model / Interface ....**
- Select the appropriate printer with **Shared Print**, e.g. DJ 1200C must be selected for Deskjet 1600C (➤ *“Selection table for Shared Print printers” on page 7-5*). **Ok.**

- Select **Make this the System Default Printer**.
- **Ok**.



- Answer the query in the **Configure HP VUE Printers Subpanel** with **No**.
- Answer confirmation query with **Ok**.
- Pull-down menu: **File: Exit**.
- **Ok**.
- **Exit SAM**.
- Restart UNIX.

## Selection table for Shared Print printers

Printer type	Shared Print model	Remarks
DeskJet 1600C	DJ1200C	If PHSS-9798 is installed, Shared Print model DJ1600C.
DeskJet 1200C	DJ1200C	Not tested.
LaserJet 3	LJIII	In file /usr/sharedprint/configs/active/<druckername>.sh " <b>papersize=letter</b> " must be replaced by " <b>papersize=a4</b> ".
LaserJet 4/5/6	LJ4	Not tested; it may be necessary to perform the same change as for LaserJet3.
DesignJet 750C PS	DSNJ650Cp	To guarantee safe operation out of UMESS/UX, model script <b>dumbplot</b> must be extended: The line echo " <b>\033%-12345X@PJM ENTER LANGUAGE = HPGL2</b> " must be inserted in front of the line echo " <b>IN; \n</b> ".
PaintJetXL300	PJXL300	Not tested.
LaserJet Color LaserJet Color/PS	?	Not tested.
Other postscript printer	?	Not tested / compatibility with UMESS/UX unknown.

## Installation of Gost Print

Printer installation is a special procedure requiring **knowledge of the operating system**.

Printer installation in a **network** can be performed only by a **system administrator**. Please call our hotline: 0180/333-6337.

# Index

## **Symbols**

"GDT plot" input window 2-3

## **Numerics**

2D Cylindricity 5-10

3D Cylindricity 5-9

## **A**

acis 2 3-2

Activation of a VDA file recording 3-4

Align 6-17

Align objects 6-17

Angularity 5-18

Arrow tool 6-5, 6-11, 6-12

Axes 4-33

Axis selection 4-35

## **B**

Basic functions 6-7

bmp files 6-19

## **C**

Change object size 6-14

Changing objects 6-14

Circle file evaluation 3-7

Coaxiality of axes 5-23

color 6-14

Configure HP VUE Printers Subpanel 7-4

Cumulative axial runout with multiple paths 5-22

Cumulative radial runout 5-26

Cut 6-4

Cylinder axis 5-2

Cylindricity 5-9

Cylindricity, surface linesIn 5-11

## **D**

Define grid 6-9

Design tools 6-3

Details 6-8

Deviation 4-32

Dialog window 2-2

Difference 4-37

Display 6-4, 6-9

Display/Adapt page 6-7

Display/Define grid 6-9

Display/Grid on/off 6-9

Display/Refresh 6-7

Display/Zoom in 6-9

Display/Zoom objects... 6-16

Display/Zoom out 6-9

Draw 6-4

Draw/Bring/Forward 6-22

Draw/Bring/To foreground 6-23

Draw/Display object... 6-18

Draw/Edge color... 6-14, 6-19

Draw/Fill with color... 6-14

Draw/Group/For comments 6-25

Draw/Group/For references 6-25

Draw/Group/For statistics 6-24

Draw/Group/For symbols 6-24

Draw/Group/Form 6-24

Draw/Group/Separate 6-24

Draw/Height... 6-16

Draw/Line width... 6-14

Draw/Object name... 6-18

Draw/Send/Back 6-22

Draw/Send/To background 6-23

Draw/Width... 6-15

Drawing plane 6-22

## **E**

Edge color 6-14

Edit 2-4, 4-28, 4-29, 6-4

Edit/Convert to polygon 6-7

Edit/Copy 6-7

Edit/Cut 6-7

Edit/Duplicate 6-7

Edit/Paste 6-7

Edit/Process plot 4-29

Edit/Select all 6-7

Editing area 6-3

Editing layouts 4-28

Editing pallet 6-3, 6-5

Ellipse tool 6-5, 6-11, 6-12

Evaluating geometric elements 3-7

Evaluating plots 3-11

## **F**

File 2-4, 4-28, 4-29, 6-4

File management 6-6

File/Close 4-29, 6-6

File/New 6-6

File/Open 6-6

File/Page 6-8

File/Print 4-29, 6-6

File/Store 6-6  
File/Store as... 6-6  
File/Termin 4-29  
Fill with 6-14  
Flatness 5-13  
Flatness Multi Circular 5-14  
Flatness Multi Line 5-15  
Frame 4-31

## **G**

General 3-19  
Gost Print 7-6  
Graphic evaluation 2-4, 2-5  
Grid on/off 6-9  
Group 6-23

## **H**

Hardware 1-2  
Help routine 3-2

## **I**

Import tool for bitmap files 6-5, 6-19  
Index cards 4-29  
Individual layouts 4-27  
Input line 6-3  
Installation of 7-3, 7-6  
Intersection line of two surfaces 5-2

## **L**

Line tool 6-5, 6-11  
Line width 6-14

## **M**

Magnetic grid 6-9  
Magnification 4-34  
Margins 6-8  
Marking objects 6-10  
Menu line 2-4, 6-3, 6-4  
Min. hard disk space 1-2  
Min. RAM space 1-2  
Move object 6-14  
Move text 6-18  
Multi Flatness Circular 5-13  
Multi Flatness Line 5-14  
Multiangularity 5-17  
Multiparallelism 5-17  
Multiperpendicularity 5-17  
Multiple roundness 5-7  
Multirunout 5-17

## **O**

Object height 6-15

Object width 6-15  
Object: Any line on surface or surface line 5-3  
Open 6-4  
Operational requirements 3-2

## **P**

Page layout 6-8  
Parallelism, perpendicularity, angularity, runout 5-17  
Paper format 6-8  
Parallelism 5-18  
Perpendicularity 5-18  
Plot control data 3-19  
Polygon tool 6-5, 6-11, 6-13  
Polyline tool 6-5, 6-11, 6-13  
Position of surfaces 5-19  
Position of surfaces with multiple paths 5-20  
Position tolerances of surfaces 5-17  
Postscript printer 7-2  
Print 6-4  
Printing 3-15  
Program recording 3-3  
Proper use 1-3  
Properties 6-16  
Protocol header 2-4

## **R**

Recording measuring points 3-6  
Rectangle tool 6-5, 6-11, 6-12  
Roundness 5-6

## **S**

same height 6-4  
same width 6-5  
Scale 6-9  
Selection table for Shared Print printers 7-5  
Selection tool 6-5, 6-10  
Self-centering line 5-5  
Shared Print 7-3  
Shared Print model 7-5  
SharedPrint Model 7-5  
Single roundness 5-6  
Smalltalk printout 6-21  
Software 1-2  
Standard layouts 4-3  
Start programming 3-3  
Starting a CNC run 3-23  
Store 6-4  
Straightness 5-2  
Structuring of 2-3  
Switching off VDA file recording 3-16  
System Requirements 1-2

## **T**

Table of numeric results 2-4, 2-5  
Terminating a GDT plot 3-16  
Terminating programming 3-18  
Terminatingprogramming 3-18  
Text color 6-19  
Text field tool 6-5, 6-18  
Thickness measurements 5-27  
Tolerances 4-36  
Toolbar 6-3, 6-4  
Type size 6-18

## **U**

UMESS 1-2, 3-2  
Unit of measurement 6-8  
User format 6-8  
User requirements 1-2  
Opt.21 1-3  
Opt.21\_Designer 6-1

## **V**

VDA file 3-4, 3-16

## **W**

Workspace 6-3, 6-4  
Workspace settings 6-8

## **Z**

Zoom 6-16

