## Training Document for Integrated Automation Solutions Totally Integrated Automation (TIA)

## CNC Programming Milling ShopMill Module S03

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We thank the Michael Dziallas Engineering corporation, the teachers of vocational schools others for their support during the preparation of this document.

### **Table of Contents**

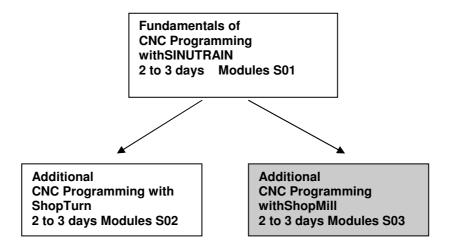
1	Preface	6
2	Introduction	8
2.1	Development Phases of CNC Technology	8
2.2	Requirements for Controller in the New Millennium	8
2.3	Advantages of CNC Programming with SinuTrain SHOPMILL, SHOPTURN	8
3	Operator Components	9
4	Program Management - Milling	11
4.1	Directory	12
4.2	Program Structure	13
4.3	Editing Programs	15
5	Saving Program Data	15
6	Program Structure - Milling	18
6.1	Program Header	18
7	Tool Management – Milling	22
7.1	Calling the Tool List	23
7.2	Structure of the Tool List	24
7.3	Tool Wear	27
7.4	The Magazine	
7.5	Setting Up/Deleting a New Tool	
7.5	Setting Up/Deleting a New Tool	30
7.6	A Tool with Several Edges	32
7.7	Sorting the Tools	33
8	Programming Example: Contour Programming	35
8.1	Example of Contour Programming	
8.2	Face Milling	
8.3	Contour Calculator	
8.4	Path Milling	42
8.5	Forward-Backward	43
9	Programming Example Contour Spigot	45
9.1	Contour Spigot Milling – Removing Residual Material	
9.2	Face Milling	
9.3	First Contour Limit-Contour	48
9.4	Second Contour: Actual Contour Spigots	
9.5	Spigot – Residual Material	
10	Programming Example Standard Milling Cycles	
10.1	Programming Example for Milling Cycles (Rectangular Spigot, Circular Pocket)	
10.2	Face Milling	
10.3	Rectangular Spigot	
10.4	Circular Pocket	
10.5	Processing (Basic Block)	
11	Programming Example – Position Patterns for Drilling and Milling Cycles	
11.1	Example: Drilling and Milling Positions	
11.2	Rectangular Pocket	
11.3	Circular Pockets	
11.4	Position Pattern	
11.5	Drilling and Positions	
12	Program Example – Centering, Drilling, Threading	
12.1	Exercises for Centering, Drilling, and Threading	

12.2	Centering the Frame and the Hole Circle	73
12.3	Drilling	75
12.4	Programming "Drilling the Hole Circle" by Using Copy and Insert	76
12.5	Borings Threads for Frames	
13	Programming Example – Programmable Transformations, Subprogram Technology.	79
13.1	Program Header	80
13.2	Contour Calculator Left Upper Corner	81
13.3	Path Milling	82
13.4	Mirroring	83
13.5	Longitudinal Grooves	87
13.6	Circumferential Groove	89
13.7	Contour Pockets with Contour Calculator	90
14	Rotation Contour Pockets	94
15	Making Holes with a Drill	
16	Subprograms	
17	Mould Making - Milling	100
17.1	Prerequisites	101
17.2	Program Structure Technology Program with Geometry Program	102
17.3	Program Structure Complete Program	103
17.4	Creating the Program	105
17.5	High Speed Settings	107
17.6	Calling the Subprogram	111
17.7	Processing the Program	112
17.8	Starting Processing at a Certain Program Location	
17.9	Simulation of a Volume Model	117
		440
18	Information about Mould Making	110
18 19	Information about Mould Making Fundamentals of CNC Machines	
-		119
19	Fundamentals of CNC Machines	119 120
19 20	Fundamentals of CNC Machines Manual Operating Area - Milling	<b>119</b> <b>120</b> 121
<b>19</b> <b>20</b> 20.1	Fundamentals of CNC Machines Manual Operating Area - Milling Operating Area TSM	<b>119</b> <b>120</b> 121 124
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length	<b>119 120</b> 121 124 125 128
<b>19</b> <b>20</b> 20.1 20.2 20.3	Fundamentals of CNC Machines Manual Operating Area - Milling Operating Area TSM Operating Area Set NPV Operating Area Zero Point Workpiece	<b>119 120</b> 121 124 125 128
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length	<b>119 120</b> 121 124 125 128 130
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4 20.5	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius	119 120 121 124 125 128 130 131
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4 20.5 20.6	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling	119 120 121 124 125 128 130 131 132
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4 20.5 20.6 20.7	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> </ul>
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4 20.5 20.6 20.7 20.8	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Face Milling	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> </ul>
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4 20.5 20.6 20.7 20.8 <b>21</b>	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> </ul>
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4 20.5 20.6 20.7 20.8 <b>21</b> 21.1	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling         Measuring Manually – Measuring Automatically	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> <li>136</li> </ul>
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4 20.5 20.6 20.7 20.8 <b>21</b> 21.1 21.2 21.3 21.4	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling         Measuring Manually – Measuring Automatically         Measuring the Edge	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> <li>136</li> <li>139</li> </ul>
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4 20.5 20.6 20.7 20.8 <b>21</b> 21.1 21.2 21.3	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling         Measuring the Edge         Measuring the Corner	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> <li>136</li> <li>139</li> <li>143</li> </ul>
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4 20.5 20.6 20.7 20.8 <b>21</b> 21.1 21.2 21.3 21.4	Fundamentals of CNC Machines.         Manual Operating Area - Milling.         Operating Area TSM.         Operating Area Set NPV.         Operating Area Zero Point Workpiece.         Measuring the Tool Length         Measuring the Tool Radius.         Swiveling.         Manual Positioning.         Manual Face Milling.         Measuring the Workpieces in the Setup Mode JOG - Milling.         Measuring the Edge.         Measuring the Corner         Measuring the Pocket and Hole.	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> <li>136</li> <li>139</li> <li>143</li> <li>146</li> </ul>
<b>19</b> <b>20</b> 20.1 20.2 20.3 20.4 20.5 20.6 20.7 20.8 <b>21</b> 21.1 21.2 21.3 21.4 21.5	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV.         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning.         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling.         Measuring Manually – Measuring Automatically         Measuring the Edge         Measuring the Pocket and Hole.         Measuring Spigots         Aligning the Plane.         DIN/G-Code – Programming under ShopMill	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> <li>136</li> <li>139</li> <li>143</li> <li>146</li> <li>150</li> <li>150</li> </ul>
19         20         20.1         20.2         20.3         20.4         20.5         20.6         20.7         20.8         21         21.1         21.2         21.3         21.4         21.5         21.6         22         22.1	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling         Measuring Manually – Measuring Automatically         Measuring the Edge         Measuring the Pocket and Hole         Measuring Spigots         Aligning the Plane         DIN/G-Code – Programming under ShopMill         Generating the Contour with the Contour Calculator	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> <li>136</li> <li>139</li> <li>143</li> <li>146</li> <li>150</li> <li>156</li> </ul>
19         20         20.1         20.2         20.3         20.4         20.5         20.6         20.7         20.8         21         21.2         21.3         21.4         21.5         21.6         22         22.1         23	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Positioning         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling         Measuring Manually – Measuring Automatically         Measuring the Edge         Measuring the Pocket and Hole         Measuring Spigots         Aligning the Plane         DIN/G-Code – Programming under ShopMill         Generating the Contour with the Contour Calculator.         Multiple Clamping	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> <li>136</li> <li>139</li> <li>143</li> <li>146</li> <li>150</li> <li>156</li> <li>161</li> </ul>
19         20         20.1         20.2         20.3         20.4         20.5         20.6         20.7         20.8         21         21.1         21.2         21.3         21.4         21.5         21.6         22         22.1         23         24	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV.         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling         Measuring Manually – Measuring Automatically         Measuring the Edge         Measuring the Corner         Measuring the Pocket and Hole         Measuring Spigots         Aligning the Plane         DIN/G-Code – Programming under ShopMill         Generating the Contour with the Contour Calculator         Multiple Clamping         CAD Reader	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> <li>136</li> <li>139</li> <li>143</li> <li>146</li> <li>150</li> <li>153</li> <li>156</li> <li>161</li> <li>163</li> </ul>
19         20         20.1         20.2         20.3         20.4         20.5         20.6         20.7         20.8         21         21.1         21.2         21.3         21.4         21.5         21.6         22         22.1         23         24         24.1	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling         Measuring the Workpieces in the Setup Mode JOG - Milling         Measuring the Corner         Measuring the Edge         Measuring the Pocket and Hole         Measuring Spigots         Aligning the Plane         DIN/G-Code – Programming under ShopMill         Generating the Contour with the Contour Calculator         Multiple Clamping         CAD Reader         General Function	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> <li>136</li> <li>139</li> <li>143</li> <li>146</li> <li>150</li> <li>156</li> <li>161</li> <li>163</li> <li>163</li> </ul>
19         20         20.1         20.2         20.3         20.4         20.5         20.6         20.7         20.8         21         21.1         21.2         21.3         21.4         21.5         21.6         22         22.1         23         24         24.1         24.2	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling         Measuring Manually – Measuring Automatically         Measuring the Edge         Measuring the Corner         Measuring the Pocket and Hole         Measuring Spigots         Aligning the Plane         DIN/G-Code – Programming under ShopMill         Generating the Contour with the Contour Calculator         Multiple Clamping         CAD Reader         General Function         Opening the CAD READER	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> <li>136</li> <li>139</li> <li>143</li> <li>146</li> <li>150</li> <li>153</li> <li>156</li> <li>161</li> <li>163</li> <li>163</li> <li>163</li> </ul>
19         20         20.1         20.2         20.3         20.4         20.5         20.6         20.7         20.8         21         21.1         21.2         21.3         21.4         21.5         21.6         22         22.1         23         24         24.1	Fundamentals of CNC Machines         Manual Operating Area - Milling         Operating Area TSM         Operating Area Set NPV         Operating Area Set NPV         Operating Area Zero Point Workpiece         Measuring the Tool Length         Measuring the Tool Radius         Swiveling         Manual Positioning         Manual Face Milling         Measuring the Workpieces in the Setup Mode JOG - Milling         Measuring the Workpieces in the Setup Mode JOG - Milling         Measuring the Corner         Measuring the Edge         Measuring the Pocket and Hole         Measuring Spigots         Aligning the Plane         DIN/G-Code – Programming under ShopMill         Generating the Contour with the Contour Calculator         Multiple Clamping         CAD Reader         General Function	<ul> <li>119</li> <li>120</li> <li>121</li> <li>124</li> <li>125</li> <li>128</li> <li>130</li> <li>131</li> <li>132</li> <li>133</li> <li>134</li> <li>135</li> <li>136</li> <li>139</li> <li>143</li> <li>146</li> <li>150</li> <li>153</li> <li>156</li> <li>161</li> <li>163</li> <li>163</li> <li>165</li> </ul>

24.5	Specifying the Zero Point	
24.6	Contour Tracking	
24.7	Influencing the Graphic Representation	
24.8	Editing Input Data	170
24.9	Transferring Contour Elements to the Directory	172
25	Sample Drawings - Milling	
25.1	Mounting Plate	173
25.2	Hole Plate	174
25.3	Housing Lid	175
25.4	Longitudinal Guide	
25.5	Example 1	177
25.6	Injection Mould	
25.7	Measuring Part	
25.8	Pattern Plate	
25.9	Exercise 11	
26	Flange	
26.1	Clamping Plate	
26.2	Prism	
26.3	Kidney Plate	
26.4	Connecting Rod	
26.5	Wing	

### 1 Preface

The training document 'Programming with ShopMill' acquaints you with the software.



Today, CNC controllers are considered the most essential part of any automation. Depending on the problem definition, the most varied tasks in the areas of turning, milling, lasering, and grinding as well as in many other areas can be carried out economically with the controllers ShopMill and ShopTurn.

#### Training Objective:

Module S03 shows you, step by step, how to program with ShopMill. Subsequently, the reader is to solve the tasks provided.

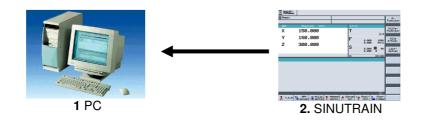
#### Preconditions

To successfully work through this module, the following knowledge is assumed:

- Knowledge in handling Windows
- Fundamentals of CNC programming with Sinutrain (for example, Module S01)

#### Hardware and software required

- PC, operating system Windows XP Professional starting with SP1 with 500 MHz and 256 MB RAM, free disk storage approx. 400 MB, of that 50 MB on the system drive,
   1GB when all products are installed, MS Internet Explorer starting with 6.0
- 2 Software SINUTRAIN 802D/ 810D/840D/ 840Di/ Programming & Training, SinuTrain/JopShop



### 2 Introduction

### 2.1 Development Phases of CNC Technology

- At the beginning of the eighties, first CNC machines with simple controllers
- In the middle of the eighties, more powerful controllers with cycles because of faster processors as well as machine tools with greater processing speed
- At the end of the eighties, machine tools with 5 and more axes and special software tools for external programming by using CAD/CAM systems
- At the beginning of the nineties, flexible manufacturing systems with extensive supplementary functions such as palette systems and multiple clamping with multiple spindle drives
- In the middle of the nineties, continued development of tool systems and the use of special tools for processing complex workpiece contours with only one tool
- End of the nineties: central programming systems for programming several different controllers at different machine tools

### 2.2 Requirements for Controller in the New Millennium

- Openness: It is to be possible for the machine manufacturer or the user to configure and expand controllers according to their own requirements
- Independence: Programming by means of a uniform controller interface for the most varied CNC processing
- Equality: All machine data is to be available also at the external programming units. Programming at the external programming units is the same as on the machine tool.
- Saving programming time: With graphic machining plans and help displays, it is to be possible to generate complex workpiece contours very easily and quickly
- Editing capability: Extensive editing functions provide for fast and simple program changes/program expansion

### 2.3 Advantages of CNC Programming with SinuTrain SHOPMILL, SHOPTURN

The controller is continuously optimized and can be adapted any time to the individual requirements of the machine manufacturers. Moreover, cycles and functions can be integrated later.

Regardless of whether turning, milling, or any other type of processing is performed, always the same program interface and the same menus or functions are used.

Retrofit: This means: Siemens can retrofit also older CNC machines to ShopMill and ShopTurn.

Advantage: Operating the software and the menu structure has to be learned only once.

By transferring the machine data to the programming system of SINUTRAIN, programming at the external programming unit is the same as on the machine tool.

By using contour calculators and CAD readers, simple programming is possible without technical terms. By directly entering technological values, no external calculations have to be made beforehand. The integrated contour calculator is able to process all conceivable dimensions, yet is very simple to handle. Through work step programming and many online help functions, extensive programming tasks can be solved very quickly. Convenient programming is possible with functions such as Copy, Cut, and Insert. Since the program is generated in the editor as a graphic machining plan by means of individual work steps, all editing steps are provided in a straightforward arrangement.



### 3 Operator Components

In this chapter, the basic operator components are shown. These components are to be considered examples, and are not necessarily on the machine in the design described here. The manufacturer's specifications have to be noted!

Here an example of an operator panel of the type OP010C.

This operator panel consists of a scrren with horizontal



and vertical



softkeys.

They are used for calling the individual cycles, programs, and functions.

Depending on the operator panel, an alpha/numeric block and a correction block is located on the side.



Here an example of a machine control panel.

With the machine control panel the machining of a workpiece is started.

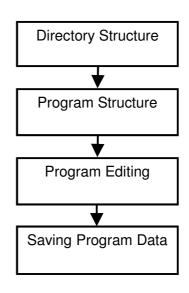


In this chapter, the keys and their functions preassigned by Siemens are not described any further since they are described in detail in the operating instructions "Operation/Programming".

### 4 Program Management - Milling

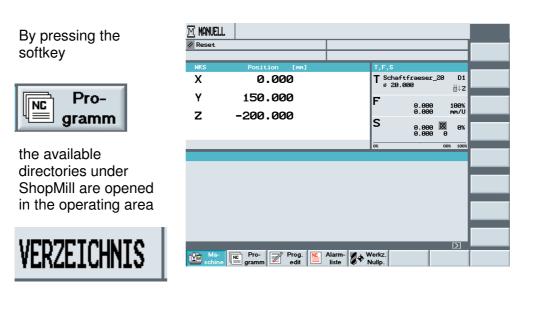
The structure, the management, editing and saving programs under ShopMill is described in detail.

Content of the Module:



### 4.1 Directory

Programs can be stored in the directories. That keeps the program memory clearly arranged.



The names of the directories,	
Name	
BEISPIELPROGRAMME	
CAD_PROGRAM	
🗖 gravur	
SHOPMILL	
🛅 ТЕМР	
the directory type	Fr

١

VER	ZEICHNIS						
	Name	Тур	Gelad	len Größe	e Datum/Z	eit	
	BEISPIELPROGRAMME	WPD	х	NCK-Dir.	24.11.2005	15:29	
	CAD_PROGRAM	WPD	х	NCK-Dir.	07.12.2005	15:01	
	GRAVUR	WPD	х	NCK-Dir.	25.11.2005	08:24	Neu
	SHOPMILL	WPD	х	NCK-Dir.	23.11.2005	14:30	
	TEMP	WPD	x	NCK-Dir.	24.11.2005	15:29	Um- benennen
							Denermen
							Markieren
							HULKICICH
							Kopieren
							Einfügen
							Aus- schneiden
Fre	ier Speicher	Festo	latte:	10 G	Bytes NC:	1273752	Weiteres
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the directory type

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16.11.2005 08:45					
17.11.2005 13:41					

### **Directory Structure**

The size of the	VERZEICHNIS					
directory is not	Name BEISPIELPROGRAMME	Typ Gela	nden Größe NCK-Dir.	Datum/2e		
displayed.	CAD_PROGRAM	WPD X	NCK-Dir.	07.12.2005		
The X in the area	GRAVUR	WPD X	NCK-Dir.	25.11.2005	88:24	Neu
	SHOPMILL	WPD X	NCK-Dir.	23.11.2005	14:30	
"Loaded" tells us that	TEMP	WPD X	NCK-Dir.	24.11.2005	15:29	Um- benennen
the directory is loaded						
on the NC of the						Markieren
machine.						Kopieren
Geladen Größe						Einfügen
deraden drobe						
X NCK-Dir.						Aus- schneiden
A NCK-DIL.						
	Freier Speicher	Festplatte	a: 10 GBy	tes NC:	1273752	Weiteres
X NCK-Dir.	NC Disk A	ဗိုင္ဖြဲ us	в			

### 4.2 Program Structure

By opening a directory, we can access existing programs, or we can set up new ones.

## By pressing the arrow key



on the CNC keyboard, the selected directory opens.



In ShopMill, only main directories can be generated - mpf - and no subprograms - spf -.

Name	VERZEICHNIS	
SHOPMILL.WPD\	Name Typ Geladen Größe Datum/Zeit	
After opening the		Neu
directory, available		Um- benennen
programs are displayed in the		Markieren
directory. New programs can be		Kopieren
created.		Einfügen Aus-
By pressing the		schneiden
softkey	Freier Speicher Festplatte: 10 GBytes NC: 1296280	Weiteres
	NC Ĝh Disk A Ĝh USB	
Neu new programs are	VERZEICHNIS	
generated that are	Name Typ Geladen Größe Datum/Zeit	
managed in the opened directory.	MONTAGEPLATTE MPF X 111 27.04.2006 08:36	Neu
		Um- benennen
Neues ShopMill Programm		Markieren
Bitte geben Sie den neuen Namen ein:		Kopieren
Montageplatte		Einfügen
Programming and		Aus- schneiden
program structure are described in the	Freier Speicher Festplatte: 10 GBytes NC: 1295256	Weiteres
chapter Program Structure.	Ten Albania ရှိပြီ Albania ရှိပြီ Albania ရှိပြီး Albania ရှိပြီး Albania ရှိပြီး Albania ရှိန်းမှ ကျော်ကျော်ကျော်ကျော်ကျော်ကျော်ကျော်ကျော်	
By pressing the arrow key,		



the directory is closed. We are returned to the directory overview.

### 4.3 Editing Programs

The same functions are available as in MS Word.

VERZEICHNIS With the softkeys below SHOPMILL.WPD B MONTAGEPLATTE 111 27.04.2006 08:36 MPF х Neu Um-benennen Um-nenr Markiere Markieren Kopierer Kopieren Einfüger Aus-schneide Einfügen Weiteres Freier Speicher Festplatte: 10 GBytes NC: 1295256 Disk A 8B NC USB Aus schneider

directories, programs or individual program parts can be edited.

The individual softkeys are not described here in detail since they occur on the pages below in the exercises.

### 5 Saving Program Data

Here, all important program data, such as tools and zero points, can be stored.



the softkey	VERZEICHNIS		
	Name	Typ Geladen Größe Datum/Zeit	Manuell
	SHOPMILL.WPD\		laden
Daten sichern		MPF X 111 27.04.2006 08:36	Manuell entladen
appears in the vertical softkey bar.			Mehrfach aufspg,
With "Save data", the			Daten sichern
relevant machining data of the currently			Auslesen
selected program can			Einlesen
be saved.	Freier Speicher	Festplatte: 10 GBytes NC: 129	5256 <b>«</b> Zurück
	NC 0 Disk A	ମ୍ଚିତ୍ର USB	
By pressing this softkey,	VERZEICHNIS		
a dialog field opens. With the key	Name	Typ Geladen Größe Datum/Zeit	U
With the Key	SHOPMILL.WPD\	MPF X 111 27.04.2006 08:36	Alternat.
		Mrr A 111 27.04.2005 05:35	
	Daten sichern		
0	Werkzeugdaten:	Alle im Programm verwendeten	
Alternat.	Magazinbelegung:	Ja	
Hiternat.	Nullpunkte: Basis Nullpunkt:	Alle Nein	
	Verzeichnis:	\WKS.DIR\SHOPMILL.WPD	
	Dateiname:	MONTAGEPLATTE_TMZ	
the desired data is			Abbruch
selected.	Freier Speicher	Festplatte: 10 GBytes NC: 129	5256

VERZEICHNIS

NC NC Disk A

ව්දි USB

By pressing the	VERZEICHNIS			
	Name	Typ Geladen	Größe Datum/Zeit	Ab-
softkey	ה SHOPMILL.WPD			arbeit
	MONTAGEPLATTE_TMZ	INI	2622 27.04.2006 08:52	
	MONTAGEPLATTE	MPF X	111 27.04.2006 08:36	Neu
OK				
ок				Um- benenne
an "ini" file is				Markier
generated in the				
operating area				Kopier
-p				
				Einfüge
				Aus-
VERZEICHNIS				schneid
ACKTCICUUIS	Freier Speicher	Festplatte:	10 GBytes NC: 12952	56 Weiter
			10 009 003 110. 110 00	50 101 001
	NC NC Disk A	ဗိုင္စြ USB		
with the preservers				
with the program				
name whose data				
was saved in the file.				
<b>N</b>				
MOUNTING PLATE TMZ	INI			

The program with the corresponding "INI" file can now be saved externally.

With the program and the INI file, all relevant data for manufacturing a workpiece is saved and can be called any time.

When an "INI file" is	
selected, the stored	
data is read in again.	

When the tools used in the program are read in, a query is displayed for tools with the same name: whether the current tool is to be overwritten.

VERZEICHNIS						
Name	Тур	Geladen	Größe	Datum/2	eit	0
SHOPMILL.WPD\						Alterna
MONTAGEPLATTE_TMZ	INI		2622	27.04.2006	08:54	
MONTAGEPLATTE	MPF	х	111	27.04.2006	08:36	
						-
Gesicherte Daten einl	.esen					
Werkzeugdaten:	Alle	im Program	nm verwe	ndeten		
Magazinbelegung:	Ja					
Nullpunkte:	Alle					
						_
						_
						Abbruc
Freier Speicher	Fest	olatte:	10 GBy	tes NC:	1295256	ок
NC 0 Disk A	ðſ	USB				

Here, the "complete tool list" or the tools "used in the program" can be saved.

If the "complete tool list" is read in, all present tools are deleted, and replaced with those that were stored.

### 6 Program Structure - Milling

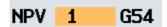
### 6.1 Program Header

The basic settings are described in the program header.

## After entering the program name

s ShopMill Programm		
Bitte geben Sie den neuen Namen ein: Montageplatte		
and confirming the input with	PROGRAMM	Nullpunktverschiebung
		Programmkopf Alternat.
ОК	Punkty 1 H	Rohteil:         Nullpunkt           Eckpunkt 1         Nullpunkt           X0         -75.000 abs           Y0         -59.000 abs           20         0.000 abs           Abna3e         L           N
the program header of the new program is opened automatically.		H Werkzeugachse Z Rückzugsebene: RP 10.000 abs Sicherheitsabstand: SC 1.000 ink Bearbeitungsdrehsinn: Gleichlauf
Here, the basic settings		Rückzug Posmuster: auf RP
are made for the program sequence.	Gerade Bohren Fräsen Kreis Fräsen	ver- Ses Simu- 🎬 Abar- Ses Dation

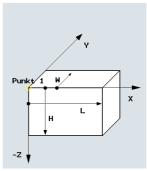
As the first input, a zero point shift for the program can be programmed directly in the program header.



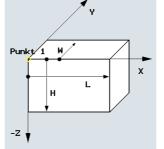
In the next input field, the raw part is defined.

As the first input field, the corner of the raw part is described.

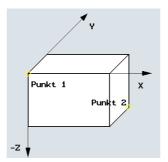
Eckpunk	t 1
X0	<mark>0.000</mark> abs
YØ	0.000 abs
ZØ	0.000 abs



Next, the raw part can be described either by means of the deviations in reference to the first corner



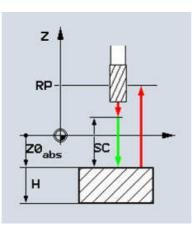
or the second corner of the raw part is described.



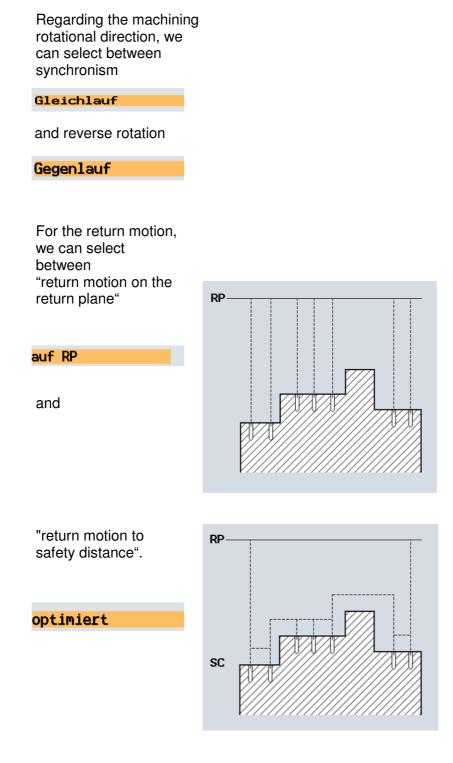
In the program header, only the raw part for simulation is defined. If no values for the raw part are entered, the milling center point path is displayed in the simulation.

In the next input fields, the following is defined: the tool axis, the return plane, and the safety distance.

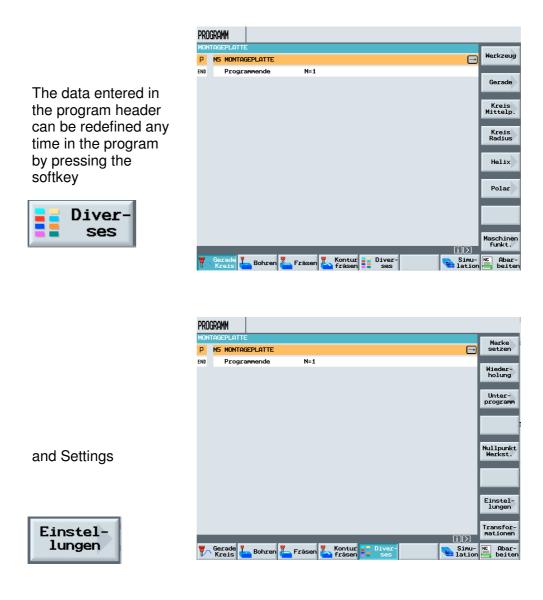
Werkzeugachse Z Rückzugsebene: RP 10.000 abs Sicherheitsabstand: SC 1.000 ink

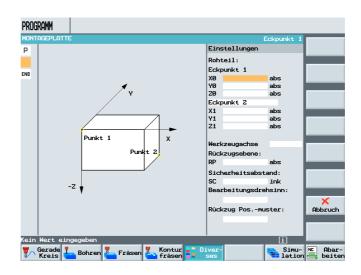


A value for the safety distance has to be entered.



For each machining, a return motion and a safety distance have to be specified.

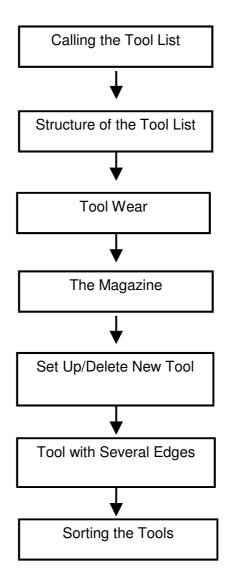




### 7 Tool Management – Milling

In this module, the structure of tool management is described with its individual operating and setting options.

Content of the Module:



## 7.1 Calling the Tool List

After starting ShopMill, the operating area	MANUELL     Reset     G-       WKS     Position [mm]     T,F,S       X     150.000     T so_TASTER bill       Y     150.000     Funct
M MANUELL	Y 150.000 Z 0.000 S 0.000 0 0 000 S 0.000 C 0 000 C 00
is active. By pressing the softkey	
Т,S,M	T,S,M REV Kerkst Kerkst Schwen Posi- Fråsen
	MANUELL
and Tools,	HKS         Position         Imm         T,F,S           X         150.000         T 3D_TASTER \$5.000         D1 \$5.000         Herkze           Y         150.000         F         0.000         Hullpu           Z         0.000         0.000         P         Nullpu
Werkzeuge	S         0.000         0%           0.000         0%         0%           0x         0x         0x           T,S,M         Herkzeugname
, in the area Tools	T D Spindel U/nin Spindel M-Fkt. Sonst. M-Fkt. Nullpktv. Maßeinheit Werkzeugachse
WERKZEUGE	T.S.M Resen Kerkst Hessen Schwen Posi- Fräsen
the Tool List	WERKZEUGE Herkzeugliste
	P1.         Typ         Werkzeugname         DP 1.         Schneide         # 6 6         1 2         Entla           +         J         3D_TASTER         1         0.000         5.000         0         0         1         2         1         2         1         2         1         2         1         2         2         1
Werkzeugliste	5         #         FRRESER32         1         119.200         32.000         3 ° X         Sortia           6         #         FRRESER60         1         110.000         60.000         6 ° X         1           7         #         PLANFRAESER63         1         133.500         63.000         5 ° X         1
Is called.	V Herkz. 1 iste V versch V Maga- versch R R-Para versch R meter

## 7.2 Structure of the Tool List

WERK2			-	3	4	5		6		-	Ż.	() Alternat. Manuell Werkzeug Löschen
P1.	Тур	Werkzeugname	DP	1. Schnei Länge	de ø			₽	≂ 1	⊸ 2		Entladen
				Lange	Ø				1	2		
₽	l	3D_TASTER	1	0.000	5.000			×				
1		fraeser8	1	89.100	8.000		2	Q	х			
2		FRAESER10	1	86.000	10.000		2	Q				
3		GEWINDEFRAESER	1	168.000	12.000		1	2	х			Schneiden
4		FRAESER20	1	98.300	20.000		3	2	х			
5		FRAESER32	1	119.200	32.000		3	2	х			Sortieren
6		FRAESER60	1	110.000	60.000		6	2	х			
7	Д	PLANFRAESER63	1	133.500	63.000		5	2	х			
											$\sum$	
	lerkz List	e Verkz. versch		Mag zi		ullp. ersch	R		Pa. ete			

P1.	The Location Number:
1 2 2	The location number describes the magazine location. If there is a tool listed behind the location number, it is active; that is, it is present in the magazine.
3 4	Tools that don't have a location number are not active in the magazine. They are located in the "drawer", or in the manual magazine.
Тур	The Type:
ł	Here, a symbol is assigned to the respective tool type.
墨	
<mark>幽</mark> 人	
8	
13	

P1.	Тур	Werkzeugname	The following tool types with their corresponding symbols are available:						
#	ł	3D_TASTER	-	1 1					
1	芔	FAESER_10	8	$\cup$	FR_ECKENRADIUS				
г	<u>ہے</u>	PLANFRAESER83	9	$\Box$	FRAESER_KEG				
3	Ø	BOHRER_10	10	X I	FR_KEG_ECKENRAD				
4	8	GEWINDEBOHRER_12	4.4						
5	U	ZENTRIERER_12	11	$\cup$	GESENKFR_KEG				
6	U	GESENKFR_ZYL	12	뮹	WINKELKOPF				
7	U	KUGELKOPFFR	13	₿.	KANTENTASTER				

Тур	Werkzeugname
U	FR_ECKENRADIUS

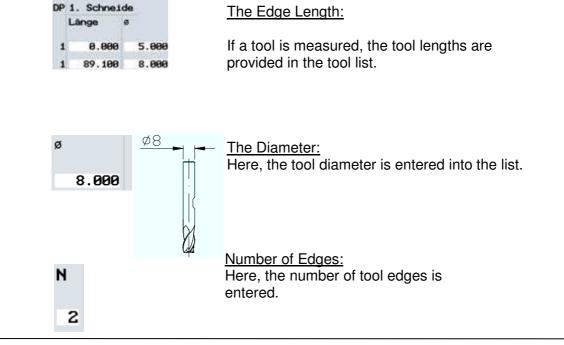
#### The Tool Name:

In ths field, a name to identify the tool is entered. Letters, numbers, and special characters can be entered.



#### The Duplo Number:

If an additinal tool is set up with a name that already exists, it becomes a duplo tool.





The Spindle's Rotational Direction:

In the case of tools, the spindle's rotational direction refers to the tool spindle.





Cooling Water Supply:

Under ShopMill, the inside as well as the outside coolant supply can be activated.

### 7.3 Tool Wear

In the area Tools



-by pressing the softkey



 the input fields for Tool Wear

#### Werkzeugverschleiß

are activated

Here, the edge of a tool

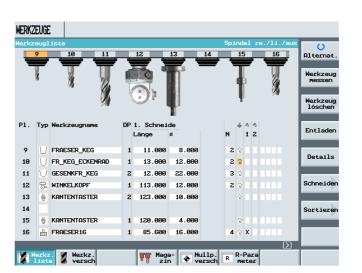


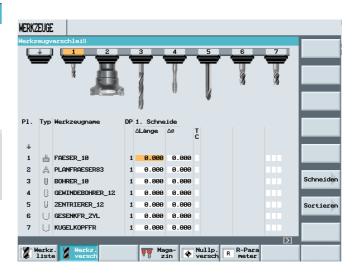
can be assigned a wear value for the length and the diameter

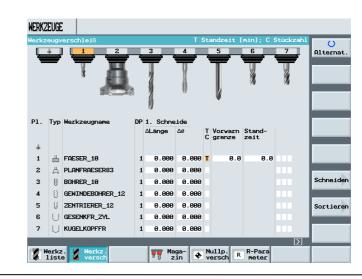


The duration of tool operation can be defined by means of its service life

T Standzeit [min];
or the
C Stückzahl
number of units.







After reaching the prewarning limit, a message is displayed that the end of service life or the number of loads will soon be reached.



Tools can be defined as "blocked"

# G

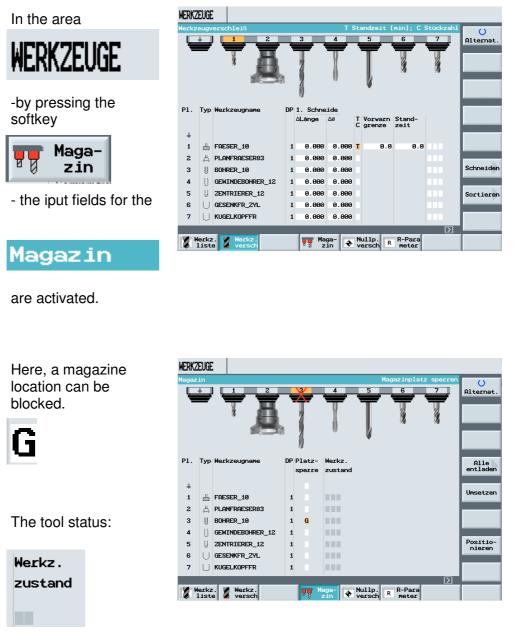
or as "oversize".

# 

T I A Training Document Status: 04/2008

### 7.4 The Magazine

### 7.5

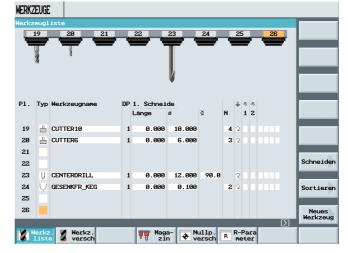


that is, when a tool is "blocked" or "oversize", is displayed here.

## Setting Up/Deleting a New Tool

As an example, the following tool will be set up.



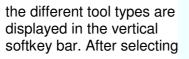


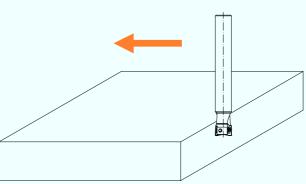
In this case, the cursor has to be on a free input field of the *tool list*. By pressing the softkey



Example:

WERKZEUGE





Fräser

the name of the tool will be defined.

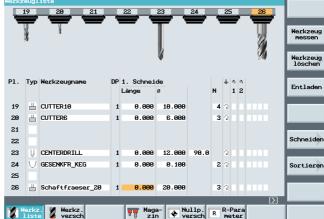


Next, the diameter



as well as the number of teeth and the rotation direction are specified





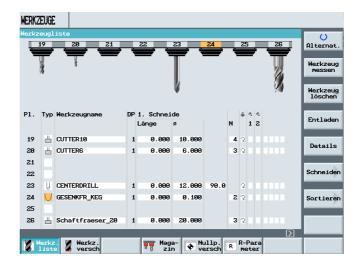
When machining with tools of the same type, unique names should be assigned, since duplo tools are generated from tools with the same name, without a warning.

The tool can now be measured in its length.

WERKZEUGE To delete a tool from C) Alternat. the tool list, select the 21 22 23 25 26 20 location with the tool. Werkzeug messen By pressing the Werkzeug löschen softkey Schneide Р1 Typ Werkzeug Entladen 12 Länge ø Ν 19 LUTTER10 1 0.000 10.000 4 2 Details 20 LUTTER6 0.000 6.000 3 2 1 21 22 Schneider 23 0.000 12.000 Werkzeug 24 U GESENKFR\_KEG 0.100 **2** 2 0.000 Sortierer löschen 25 🐰 Schaftfraeser\_20 26 0.000 20.000 3 2 1 + Nullp. Werkz Werkz. Maga-R R-Para

the following softkeys are diesplayed:





By pressing the softkey



the selected tool is deleted from the tool list.

Take note of the machine manufacturer's data. In the case of some manufacturers, an active tool can not be deleted.

## 7.6 A Tool with Several Edges

several edges can be

By pressing the

Neue

Schneide

an additional edge

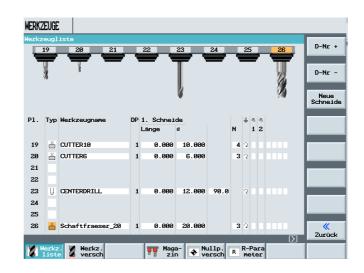
selected tool.

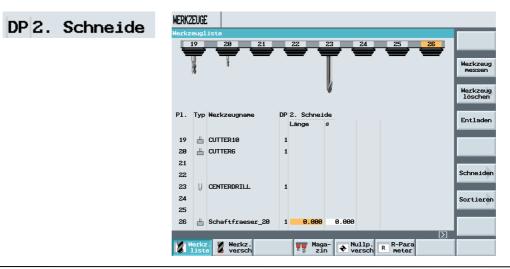
can be set up for the

defined.

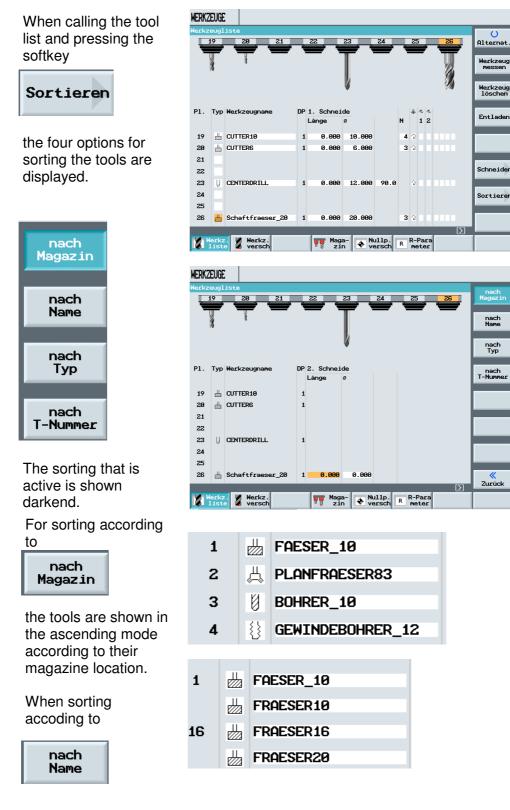
softkey

WERKZEUGE A tool with several () Alternat edges is set up as 24 25 10 22 23 described above. Werkzeug By pressing the Werkzeug löschen softkey P1. Typ Werkzeugna DP 1. Schneide Entladen 1 2 Länge 19 CUTTER10 0.000 1 10.000 4 CUTTER6 20 6.000 0.000 3 1 21 Schneide 22 Schneiden 23 U CENTERDRILL 0.000 12.000 90.0 24 ortiere 25 26 👑 Schaftfraeser\_20 0.000 20.000 3 2 1 the input screen form Γ Werkz. Werkz. liste versch Maga- Aullp. R-Para is displayed where

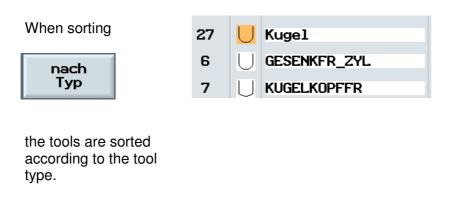




### 7.7 Sorting the Tools



the tools are shown in the alphabetical order of the name.



When sorting



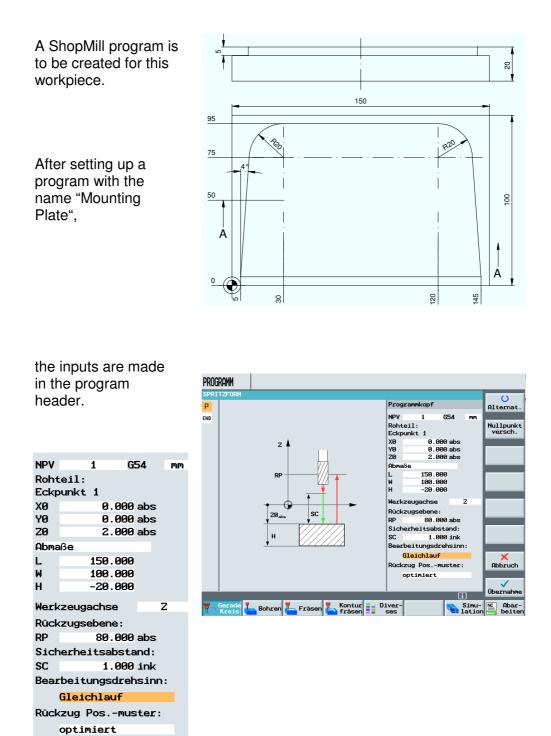
tool names that are defined by numbers are sorted in the ascending mode.

123	
1234	
12345	

### 8 Programming Example: Contour Programming

The contour calculator and subsequent machining are described, based on an example.

### 8.1 Example of Contour Programming



### 8.2 Face Milling

After accepting the

program header,

The workpiece surface is milled in order to obtain a level, clean surface. This is done with face milling.

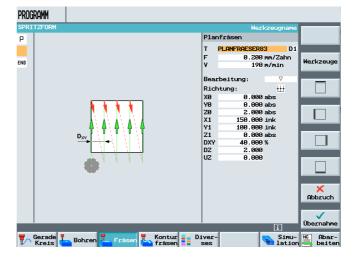
PROGRAMM Plan-fräsen F P N5 SPRITZFORM Nullpktv. 1 G54 END N=1 Programmende Tasche Zapfen Nut Gravur iΣ Simu- NE Abar lation beite Gerade L. Bohren Kontur Diver

face milling is performed next.

After entering the values in the input screen form,

т	PLANFRAESER8	3 D1
F	0.200	mm/Zahn
۷	190	m/min
Bear	beitung:	$\nabla$
Rich	ntung:	ttt
X0	0.000	abs
YØ	0.000	abs
ZØ	2.000	abs
X1	150.000	ink
Y1	100.000	ink
Z1	0.000	abs
DXY	40.000	%
DZ	2.000	
UZ	0.000	

face milling is accepted into the machining plan.



	gram				
	ITZF				Plan-
Р	N5	SPRITZFORM		Nullpktv. 1 G54	fräsen
±±	N10	Planfräsen		T=PLANFRAESER83 F0.2/2 V190m X0=0 Y0=0	
ND		Programmende		N=1	Tasche
					Zapfen
					Nut
					inde
					Gravur
		_	-	[]]	
	Gera	ade 📕 Bohren 🖡			NC Abar
<u>لا</u>	Kre	ade 📕 Bohren 🖡	Fré	isen 🛃 Kontur 📑 Diver- 💽 Simu-	beite

#### 8.3 Contour Calculator

With the contour calculator, even difficult contours can be programmed relatively easily.

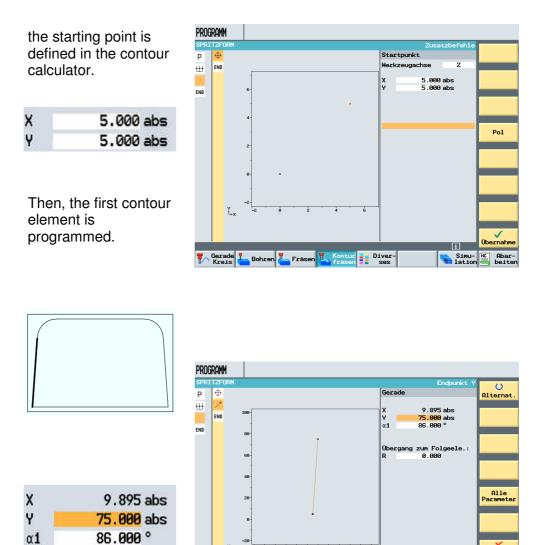
Next, the milling contour is described.



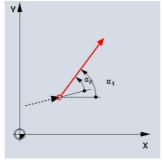
After setting up a new contour,

PRO	gramm					
SPR	ITZFORM					
Ρ	NS SPR	TZFORM		Nullpktv. 1 G54		
₩	N10 Plar	nfräsen	V	T=PLANFRAESER83 F0.2/Z V190m X0=	0 Y0=0 🖃	
END	Prog	grammende		N=1		
	Neue K	ontur				
	B	litte geben	Sie de	en neuen Namen ein:		
		auss	en			
						_
						× Abbruch
						HUDTUCN
						$\checkmark$
						OK
<b>.</b>	Gerade Kreis	Bohren	<b>F</b> rä	sen 🔽 Kontur fräsen 📒 ses	Simu- lation	NC Abar- beiten

Neue	Kontur
	Bitte geben Sie den neuen Namen
	bitte geben sie den neden namen
	aussen



When entering the angle, the direction has to be noted.



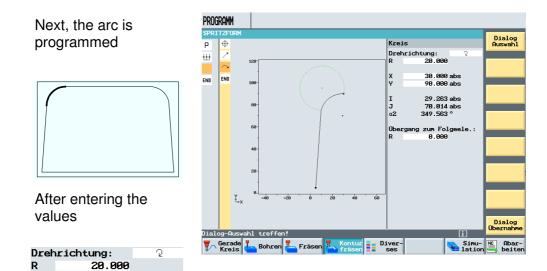
ł.,

루 Gerade 📒 Bohren 📒 Fräs

Abbruch

Diver

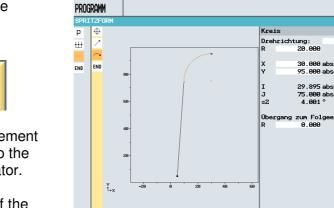
Simu- NC Abarlation beite



a dialog selection is displayed.

X Y 30.000 abs

90.000 abs



By pressing the softkey

Ubernahme the selected element is accepted into the

Dialog

The direction of the element selected in

element selected in the dialog can be changed any time by pressing the softkey



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Diver-

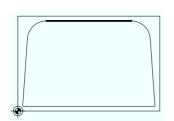
Element

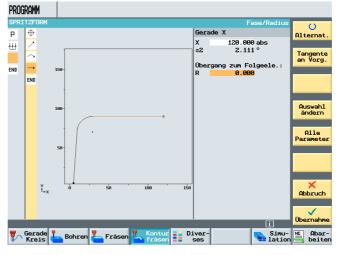
Weiteres

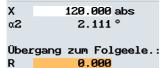
× Abbruch

Simu- NC Abar-

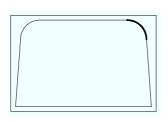
The next element is a straight line in X direction.



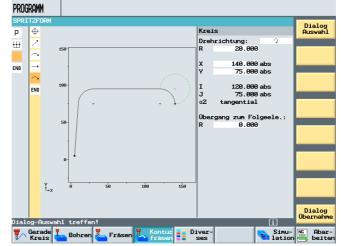




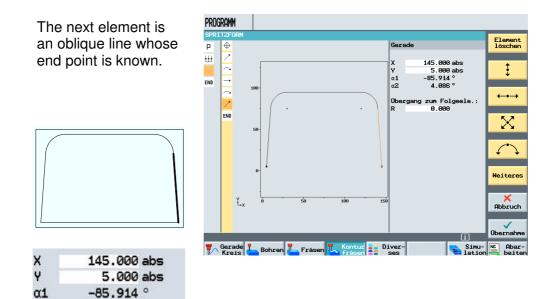
Then, an arc follows again.



For this element also, a dialog selection is made which is accepted into the contour calculator by pressing the softkey



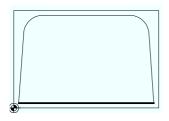




With the last contour element, a straight line, the contour is closed.

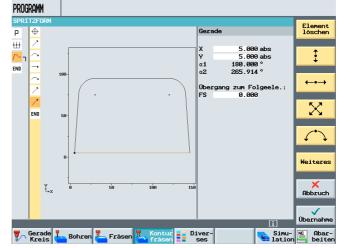
4.086 °

α2



By pressing the softkey Additional

```
Weiteres
```



and Close Contour



the contour is completely generated.

#### 8.4 Path Milling

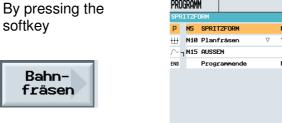
After accepting the contour in the machining plan



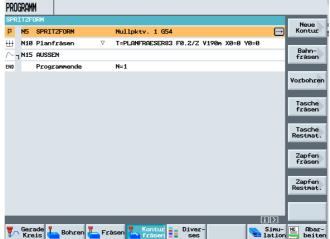
a bracket opens next to the symbol for the contour element.

PROGRAMM						
SPR]	TZFC	DRM				
Р	N5	SPRITZFORM		Nullpktv. 1 G54	Ð	Werkzeug
₩	N10	Planfräsen	$\nabla$	T=PLANFRAESER83 F0.2/2 V190m X0=0 Y0=0		
^ <b>₁</b>	N15	AUSSEN				Gerade
END		Programmende		N=1		
						Kreis Mittelp.
						Kreis Radius
						Helix
						Polar
				ī		Maschinen funkt.
7~	Gera Kre	is I. Bohren I	Frä	sen Kontur Diver-	imu- ation	NC Abar-

Next, the machining process is described. Path milling is to be used for machining.



In the area "*Contour milling*", a corresponding input screen form is opened.



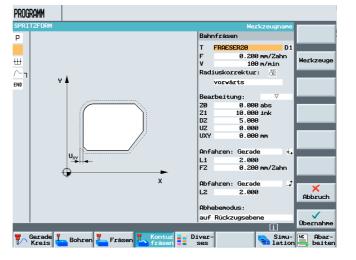
#### 8.5 Forward-Backward

We can also machine against the programmed contour (backward).

After entering the tool, the technology and selecting the radius correction

т	FRAESER20	D1
F	0.200 m	m/Zahn
۷	100 m	/min
Rad:	iuskorrektur:	ð 🖉

we can then specify the machining direction in reference to the contour.



### vorwärts

The contour is processed in the direction the contour was programmed.

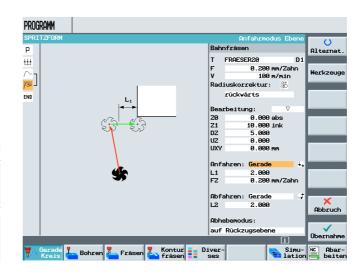
### rückwärts

The contour is processed against the contour's programmed direction. After entering the machining strategy,

Bear	beitung:	$\nabla$
ZØ	0.000	abs
Z1	10.000	ink
DZ	5.000	
UZ	0.000	
UXY	0.000	mm

the approach and the return strategy as well as the retraction mode are defined.

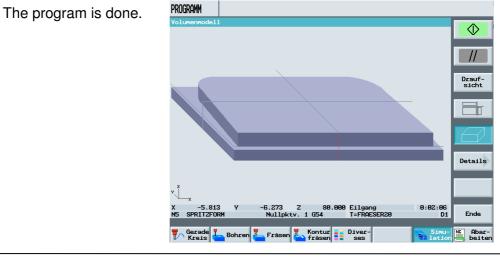
Anfahren: Gerade
F7 0.200 mm / 7 ahr
FZ 0.200 PIP/7 Zal II 1
Abfahren: Gerade 🗐
L2 2.000
Abhebemodus:
auf Rückzugsebene
dan naoneagoobonio



to the contour.

PROGRAMM Accepting the machining into the Werkzeug P N5 SPRITZFORM Nullpktv. 1 G54 machining plan H N10 Planfräsen T=PLANFRAESER83 F0.2/Z V190m X0=0 Y0=0 N15 AUSSEN Gerade T=FRAESER20 F0.2/2 V100m 20=0 21=10ink F END Programmende N=1 Kreis Mittelp. Kreis Radius N15 AUSSEN Helix N20 Bahnfräsen Polar closes the bracket. A Maschiner funkt. machining was added iΣ Bohren 🚣 Fräsen 🍢 Kontur 💶 Diver-Simu- NC Abar-

ie 📍

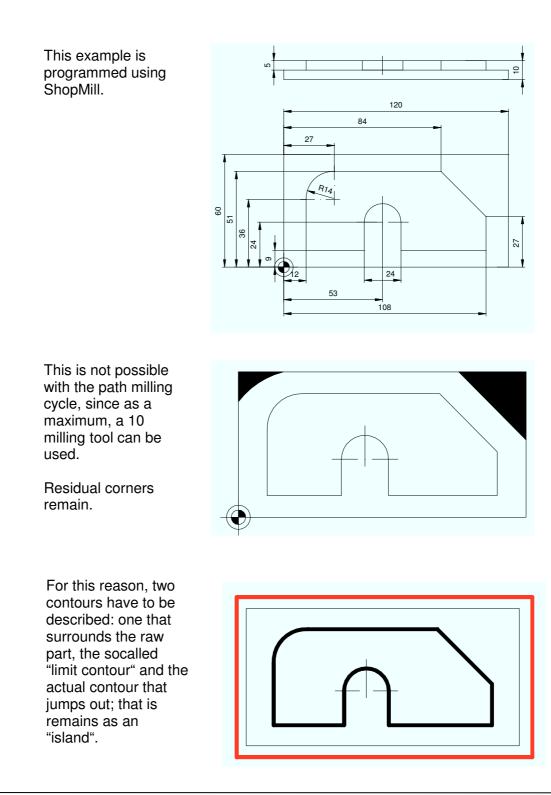


### 9 Programming Example Contour Spigot

#### Content of this module:

This module describes the standard milling cycle Contour Spigot, using an example. The contour remains, and the residual material is milled off.

#### 9.1 Contour Spigot Milling – Removing Residual Material



#### 9.2 Face Milling

After setting up a new program

Neues ShopMill Programm	۱.
Bitte geben Sie de	en
Form	

and making the input in the program header

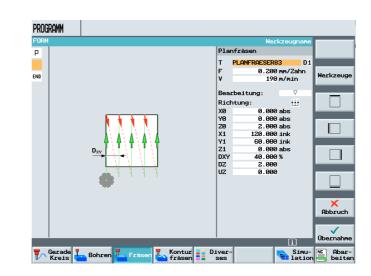
nm

FORM		Nullpunktverschiebung Programmkopf Alternat.
END	Punks 1 H H -Z	NPV 1 G54 nm Rohteil: Eckpunkt 1 X0 0.000 abs Y0 0.000 abs Z0 2.000 abs Romaße L 128.000 W 60.000 H 60.0000

Prog	grammkopf	
NPV	1 G	54 r
Roht	eil:	
Eckp	ounkt 1	
XØ	0.000	abs
YØ	0.000	abs
ZØ	2.000	abs
Abma	aβe	
L	120.000	
W	60.000	
н	-10.000	
Werk	zeugachse	Z
RUCK	zugsebene:	
RP	80.000	abs
Sich	herheitsabsta	ind:
SC	1.000	ink

Bearbeitungsdrehsinn: Gleichlauf Rückzug Pos.-muster:

optimiert



face-milling the workpiece surface <<something missing like: a new contour is set up?>>

After setting up a new program

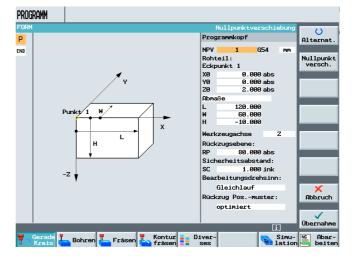
Neues ShopMill Programm Bitte geben Sie den Form

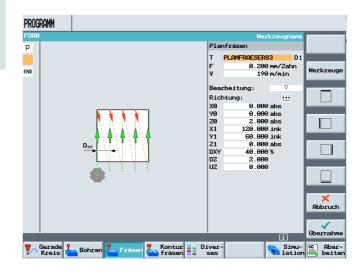
### and making the inputs in the program header

Prog	ıramm	kopf	-			
NPV		1	C	<b>354</b>		m
Roht	eil:					
Eckp	unkt	1				
XØ		0	. 000	) ab	s	
YØ		0	. 008	) ab	s	
ZØ		2	. 000	) ab	s	
Abma	ßе					
L		120	. 000	3		
W		60	. 000	3		
н		-10	. 000	3		
werk	zeug	achs	se		Z	

Rückzugsebene: RP 80.000 abs Sicherheitsabstand: SC 1.000 ink Bearbeitungsdrehsinn: Gleichlauf Rückzug Pos.-muster: optimiert

face-milling the workpiece surface,





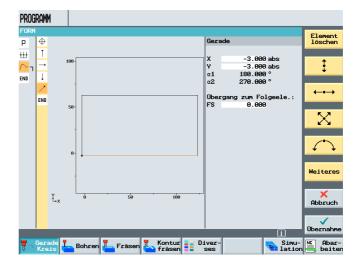
a new contour is set UP <<same page twice?>>.

#### 9.3 First Contour Limit-Contour

Neue Kontur
Bitte geben Sie
Grenze

This contour, a little larger than the workpiece, will later describe the machining limit.

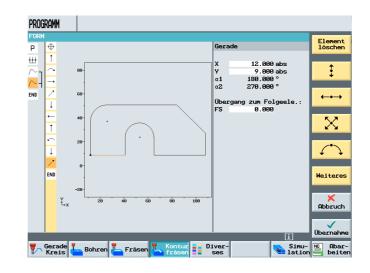
The initial machining continues to be done with the facing tool.



In the case of spigot milling, the "limit contourr" can be angular. When describing a contour pocket, the contour corners should have a radius. The corner radius should be at least as large as the radius of the largest tool.

#### 9.4 Second Contour: Actual Contour Spigots

Next, a second contour is programmed.

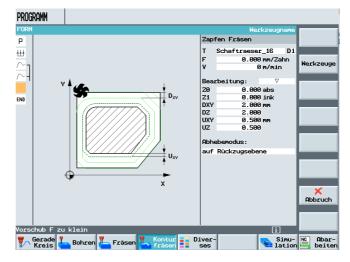


After accepting the contour in the machining plan, the cycle for contour spigot milling is opened by pressing the softkey

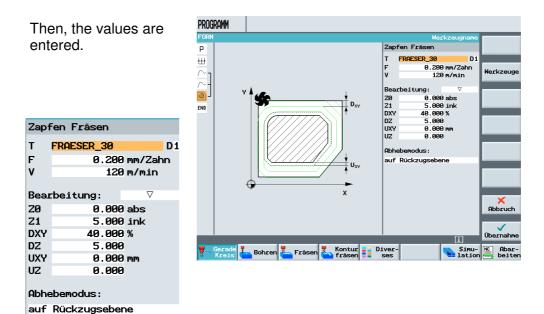


#### PROGRAMM Neue Kontur P N5 FORM Nullpktv. 1 G54 H N10 Planfräsen T=PLANFRAESER83 F0.2/Z V190m X0=0 Y0=0 Bahn-fräsen N15 GRENZE N20 FORM F N=1 END Program ende Vorbohre Tasche fräsen Tasche Restmat. Zapfen fräsen Zapfen Restmat. ΠD Gerade L Bohren Fräsen Kontur Diver-Simu- NC Abar-lation beiter

The strategy is that we always start outside of the workpiece when starting machining.

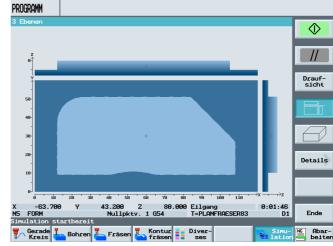


By machining from the outside to the inside, tough and hard materials can also be machined in this cycle.



#### 9.5 Spigot – Residual Material

The values that were entered are accepted into the machining plan. Thus, the bracket with the two contour elements is closed.	PROCRAMM         N         N         P         N         NUllpktv. 1 G54           H         N10 Planfräsen         ▼         T=PLANFRAESER83 F0.2/Z V190m X0=0 V0=0           N15 GRENZE         N38 FORM           N35 Zapfen Fräsen         ▼         T=FRAESER_30 F0.2/Z V120m Z0=0 Z1=5ink           EN0         Programmende         N=1	Herkzeug Gerade Kreis Mittelp. Kreis Radius Helix
ightarrow N15 Grenze		Polar
$\sim$ - N20 Form		
N25 Zapfen Fräse		Maschinen funkt. mu- tion C Abar- beiten



Since based on the milling tool diameter of 30mm the workpiece can not be completely manufactured, another machining cycle follows; socalled "residual material processing".

Pressing the softkey



DXY

DZ

Abhebemodus:

plan.

the bracket.

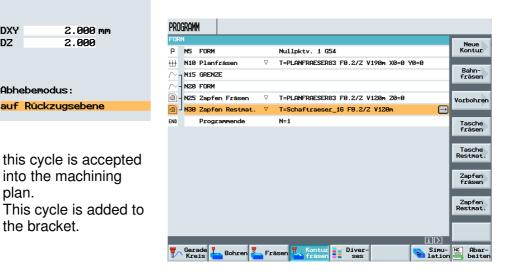
auf Rückzugsebene

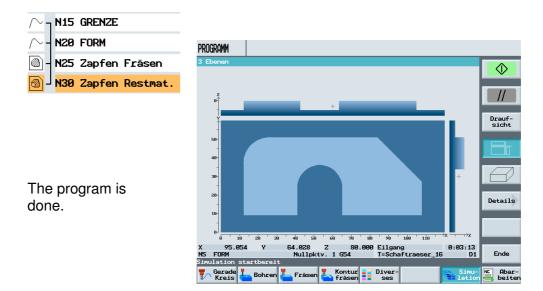
into the machining

2.000 mm

2.000

PROGRAMM opens the cycle for residual material Ρ terial Alterna machining. aftraeser 16 D1 ₩ .200 mm/Zahn 120 m/min Werkzeug After selecting a smaller beitung  $\nabla$ milling tool and inputting 0 D. the values, END 2.000 mm 2.000 DXY DZ Alle Parameter Abhe uf Rückzug Zapfen Restmaterial × Abbruch Т Schaftraeser\_16 D1 0.200 mm/Zahn F √ Übernahm 120 m/min ontur Diver-Fräsen 🛃 Bohren 🚣 Fräsen 🌄 Simu- NC Abar-Bearbeitung:  $\nabla$ 

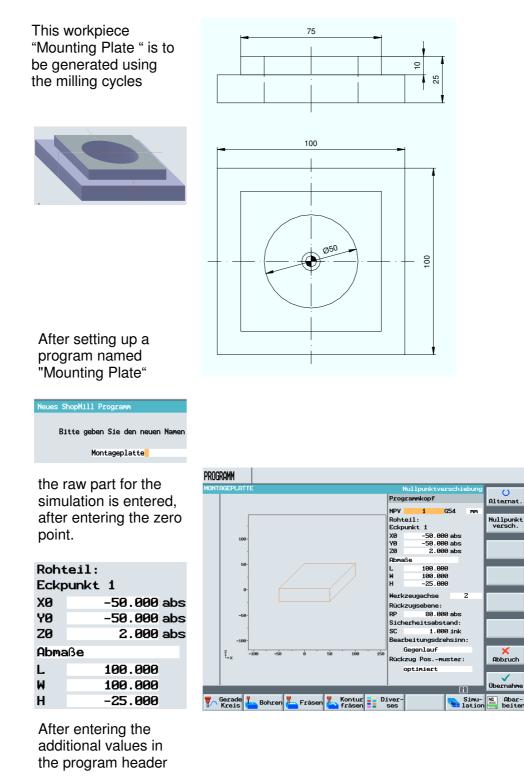




#### 10 Programming Example Standard Milling Cycles

Machining with the standard milling cycles under ShopMill is described, using an example

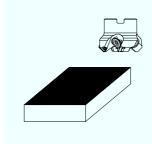
#### 10.1 Programming Example for Milling Cycles (Rectangular Spigot, Circular Pocket)



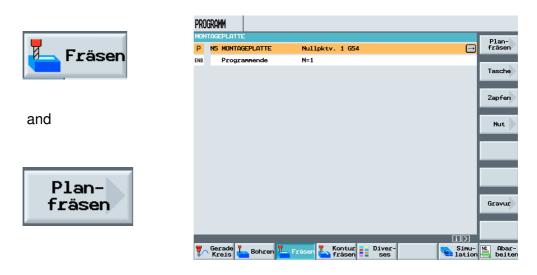
and accepting them into the machining plan,

	gramm		
MON	TAGEPLATTE N5 MONTAGEPLATTE	Nullpktv. 1 G54	Werkzeug
END	Programmende	N=1	
			Gerade
			Kreis Mittelp.
			Kreis Radius
			Helix
			Polar
			Maschinen funkt.
7	Gerade Kreis Kreis F		h Abar- beiten

### the next step consists of facing.



#### Pressing the softkeys



#### 10.2 Face Milling

opens the input screen form for face milling.

Using the four vertical softkeys



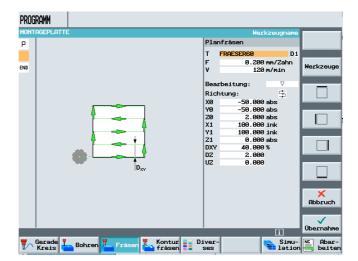
machining limits can be defined.

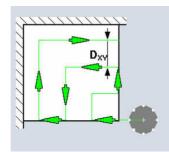
Example: Activated limits

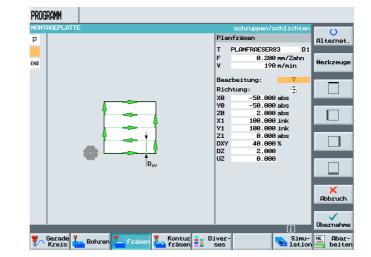


We don't have to define a machining limit in this example. After selecting the tool and the technological data,

Pla	anfräsen
т	PLANFRAESER83 D1
F	0.200 mm/Zahn
V	190 m/min
-	







next Rouging,



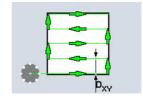
or Finishing



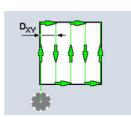
is selected.

Then, we select the machining strategy.

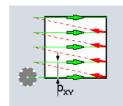




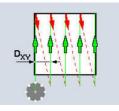












After entering the values, face milling is accepted into the machining plan

NTAGEPLATTE	Werkzeugname
	Planfräsen
	T PLANFRAESER83 D1
	F 0.200 mm/Zahn
	V 190 m/min Werkzeus
	Bearbeitung: ⊽
	Richtung:
	X0 -50.000 abs Y0 -50.000 abs
	20 2.000 abs
	X1 100.000 ink
AV AV AV AV A	Y1 100.000 ink
Dxy	Z1 0.000 abs
	DXY 40.000 %
	DZ 2.000
	UZ 0.000
	×
	Abbruch
	HIDEGO

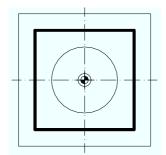
### by pressing the softkey



	gram				
		PLATTE			Plan-
Ρ	N5	MONTAGEPLATTE		Nullpktv. 1 G54	fräsen
ŧŧŧ	N10	Planfräsen	V	T=PLANFRAESER83 F0.2/Z V190m X0=-50	
END		Programmende		N=1	Tasche
					Zapfen
					Nut
					Gravur
					Gravur
_	_		_		
	Cor			i 🔀	NC Abar-
<b>T</b>	Kre	ade 🦾 Bohren 📒	Frä	isen fräsen ses ses latior	Abar- beite

#### 10.3 Rectangular Spigot

Next, the rectangular spigot is programmed.



Pressing the softkey

in the area Milling and

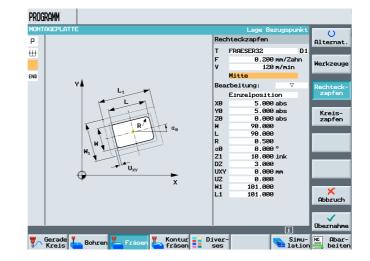




Zapfen

selecting

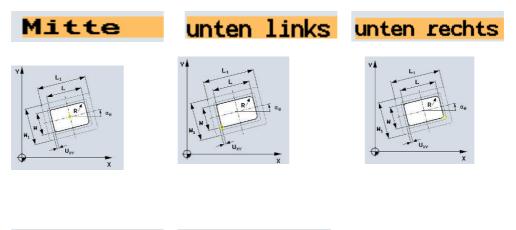
opens the input field.



After selecting the tool with the corresponding technology,

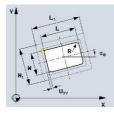
Т	FRAESER32	D1
F	0.200 mm/Zah	n
۷	120 m/min	

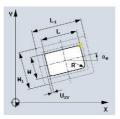
next the reference point of the reactangular spigot is defined.



oben links

oben rechts





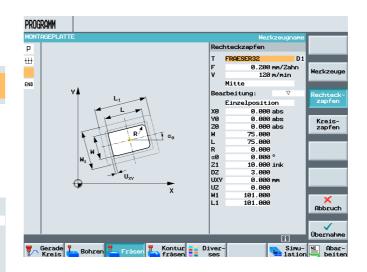
After selecting the position



the spigot and the machining strategy are described.

	Mitte
Bear	beitung: 🛛 🗸
	Einzelposition
XØ	0.000 abs
YØ 👘	0.000 abs
ZØ	0.000 abs
М	75.000
L	75.000
R	0.000
αØ	0.000 °
Z1	10.000 ink
DZ	3.000
UXY	0.000 mm
UZ	0.000

Finally, the raw part spigot is specified that is to be machined.

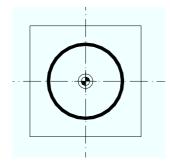


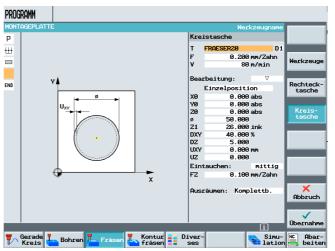
W1	101.000	
L1	101.000	
The s progr	spigot is ammed.	

The material between the raw part spigot and the finished part spigot is machined in a lateral feed setting. If the feed setting is too large, the completed spigot should be programmed in several steps.

#### 10.4 Circular Pocket

Finally, the circular pocket is programmed.





By selecting the cycle "circular pocket", the corresponding input field opens. After selecting the tool and entering the technology data

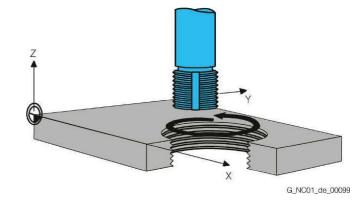
٦	Γ	FRAESER20	D1
F		0.200 mm/Zał	n
١	/	80 m/min	

the circular pocket is programmed.

Bear	beitung: 🗸 🗸
	Einzelposition
XØ	0.000 abs
YØ 👘	0.000 abs
ZØ	0.000 abs
ø	50.000
Z1	26.000 ink
DXY	40.000 %
DZ	5.000
UXY	0.000 mm
UZ	0.000

Immersion in the material can be centered

Eint	auchen:	mittig
FZ	0.100	mm/Zahn



or helical.

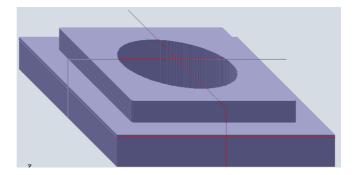
Eint	auchen:	helikal
EP	2.000	mm/U
ER	4.000	ጦጦ

For *helical*<sup>+</sup> immersion, a Z-motion is superimposed on the X-Y motion. The milling tool backs off permanently because of this.

Accepting the cycle into the machining plan completes the program

יוטוי	TAGE	PLATTE			Plan-
Ρ	N5	MONTAGEPLATTE		Nullpktv. 1 G54	fräsen
÷	N10	Planfräsen	$\nabla$	T=PLANFRAESER83 F0.2/Z V190m X0=-50	
222	N15	Rechteckzapfen	$\nabla$	T=FRAESER32 F0.2/2 V120m X0=0 Y0=0 Z0=0	Tasche
Ũ	N20	Kreistasche	$\nabla$	T=FRAESER20 F0.2/Z V80m X0=0 Y0=0 Z0=0 🕞	
ND		Programmende		N=1	Zapfen
					Nut
					Gravur
					Gravur
				[د][1]	Gravur

and can be simulated.



Werkzeug

Gerade

Kreis Mittelp.

> Kreis Radius Helix

Polar

Maschiner funkt.

ΠD

Simu- 🖺 Aba

#### 10.5 Processing (Basic Block)

PROGRAMM

END

P N5 MONTAGEPLATTE

M15 Rechteckzapfen

Programmende

∰ N10 Planfräsen

N20 Kreistasche

Nullpktv. 1 G54

 $\nabla$ 

N=1

🚣 Bohren 📒 Fräsen 🌄 Kontur 💼 Diver

T=PLANFRAESER83 F0.2/Z V190m X0=-50

T=FRAESER32 F0.2/Z V120m X0=0 Y0=0 Z0=0

T=FRAESER20 F0.2/Z V80m X0=0 Y0=0 Z0=0

By pressing the softkey



the program is loaded to the operating mode



and can be
processed.
Pressing the softkey

Basissatz

displays the program during processing in an additional window in *G-code*.

M auto							
🔷 Aktiv			/_N_WKS_DIR	/_N_SH	IOPMILL_WPD		G-
			MONTAGEPLAT	ΓE			Funktion
WKS	Position	n Emm]	Restweg	T,F,8	5		
х	-50.2		10.082	• ø	ANFRAESER83 83.000	D ¦¦⊥	Funktion
Y _	-53.6		40.879	F	EILG.	100 mm/Zah	
Z	80.0	100	0.000	s	0.000 0.000		
H Nullpkt1				өх		88% 18	ex
		Basissatz					Basissatz
P NS MONT	GEPLATTE	GETSELT(_TF	A)				_
H N10 Plant	fräsen	Z80					
22 N15 Recht	teckzapfen	X-60.3 Y-94	.5				
N20 Kreis	stasche	Z3					
END Prog	rammende	20					
		G01 Y50 F1.3	2				-
		G00 Z3					
						$\sum$	
7	Über- speich				•	Mit-	

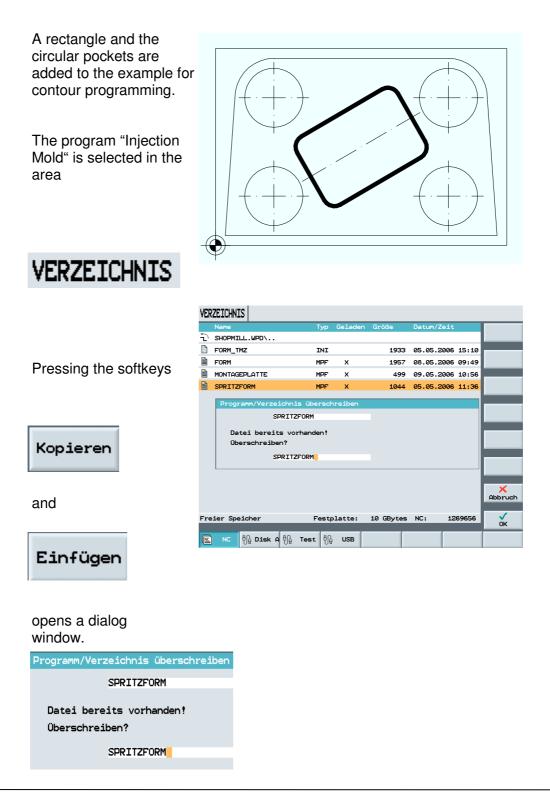
By activating the basic block, the next programmed travel movements are visible.

This makes a possible early intervention in program execution simpler for the operator.

#### 11 Programming Example – Position Patterns for Drilling and Milling Cycles

Below, the position patterns for drilling and milling cycles under ShopMill are explained, using an example.

#### 11.1 Example: Drilling and Milling Positions



Since the existing program is not to be overwritten, a 2 is appeded to the name of the program.

By pressing the softkey

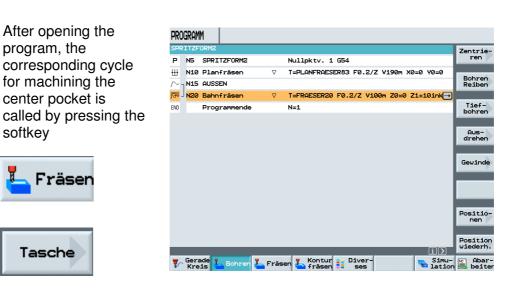


VER	ZEICHNIS					
	Name	Тур	Geladen	Größe	Datum/Zeit	
Ð	SHOPMILL.WPD\					
Ľ	FORM_TMZ	INI		1933	05.05.2006 15:10	
	FORM	MPF	x	1957	08.05.2006 09:49	
	MONTAGEPLATTE	MPF	x	499	09.05.2006 10:56	
	SPRITZFORM	MPF	x	1044	05.05.2006 11:36	
	Programm/Verzeichni	e üboreok	roibon			
			II e Theil			
	SPRITZ	FURM				
	Datei bereits vo	rhanden f				
	Überschreiben?					
	SPRITZ	FORM2				
						Abbruch
Fre	ier Speicher	Festp	latte:	10 GBytes	NC: 1269656	$\checkmark$
						ОК
E	NC ဗိုင္စြ Disk A ဗိုင္စြ	Test စိုမ္စြ	USB			

a new program named "InjectionMold2" is stored in the selected directory.

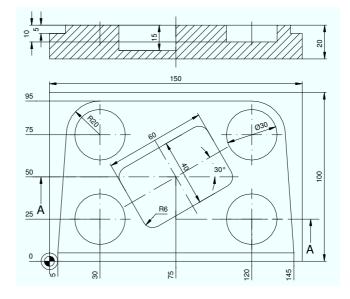
VER	ZEICHNIS					
	Name	Тур	Geladen	Größe	Datum/Zeit	Ab-
Ð	SHOPMILL.WPD\					arbeiter
Ľ	FORM_TMZ	INI		1933	05.05.2006 1	
ľ	FORM	MPF	x	1957	08.05.2006 0	9:49 <sup>Neu</sup>
Ð	MONTAGEPLATTE	MPF	×	499	09.05.2006 10	
Ð	SPRITZFORM	MPF	x	1044	05.05.2006 1	1:36 Um- benenner
	SPRITZFORM2	MPF	×	1044	05.05.2006 1	1:36
						Markiere Kopiere
						Einfüge
						Aus- schneide
Fre	ier Speicher	Festp	latte:	10 GBytes	NC: 1267	7608 Weitere
E	NC 🎁 Disk A 🏭	Test 🖏	USB			

#### **11.2 Rectangular Pocket**



and

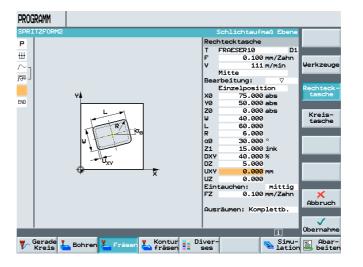




After entering the corresponding values in the input screen form

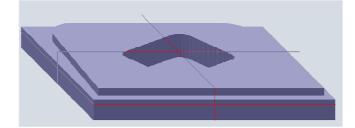
Reck	ntecktasche			
Т	FRAESER10	D1		
F	0.100	mm/Zahn		
v	111	m/min		
	Mitte			
Bear	beitung:	$\nabla$		
	Einzelposit	ion		
xø	75.000	abs		
YØ	50.000	abs		
zø	0.000	abs		
ω	40.000			
L	60.000			
R	6.000			
αØ	30.000	0		
Z1	15.000	ink		
DXY	40.000	%		
DZ	5.000			
UXY	0.000	mm		
υz	0.000			
Eint	tauchen:	mittig		
FZ	0.100	mm/Zahn		
Ausı	Ausräumen: Komplettb.			

and acceptance into the machining plan,



PRO	gram	M			
SPR	ITZF	ORM2			Plan-
Р	N5	SPRITZFORM2		Nullpktv. 1 G54	fräsen
₩	N10	Planfräsen	$\nabla$	T=PLANFRAESER83 F0.2/Z V190m X0=0 Y0=0	
$\sim_1$	N15	AUSSEN			Tasche
1816 J	N20	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
	N25	Rechtecktasche	$\nabla$	T=FRAESER10 F0.1/Z V111m X0=75 Y0=50 →	Zapfen
END		Programmende		N=1	
					Nut
					Gravur
		_			
7	Gera Kre	de 🦾 Bohren 📒	Fräse	n 🌄 Kontur 🚦 Diver- Simu-	Abar-

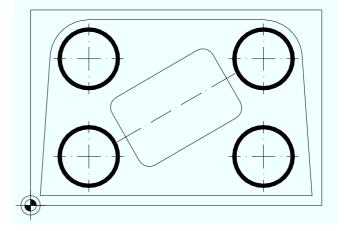
the rectangular pocket is programmed.



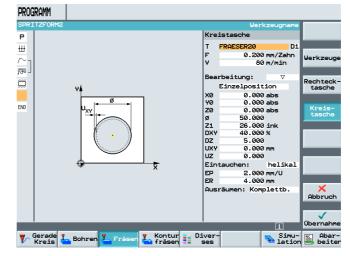
If necessary, any number of position patterns can be described one after the other.

#### **11.3 Circular Pockets**

Next, the circular pockets are programmed.



### After opening the corresponding cycle



and <<something missing?>>, the tool with the corresponding technology is entered.

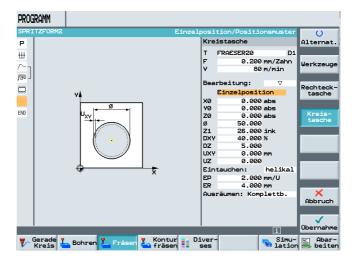
Kre	istasche	
т	FRAESER20	D1
F	0.200	mm/Zahn
v	80	m/min
Bea	rbeitung:	$\nabla$

#### **11.4 Position Pattern**

Now, not the Individual Position

#### Einzelposition

as previously, but -since it is a question of several circular pockets of the same type- by pressing the softkey



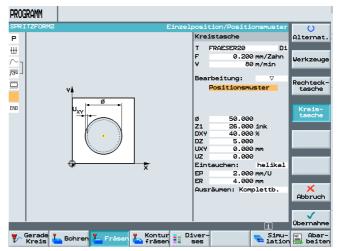
the

#### Positionsmuster

is selected. Based on this selection,

O Alternat

т	FRAESER20	D
F	0.200	mm/Zahn
۷	80	m/min
Bea	rbeitung:	V
	Positionsmus	ster
ø	50.000	



it is no longer possible to describe positions in the input screen form of the cycle.

Input of values in the screen form.

Ø         30.000           Z1         10.000 ink           DXY         40.000 %           DZ         5.000           UXY         0.000 mm           UZ         0.000           Eintauchen:         helikal           EP         2.000 mm           ER         4.000 mm           Ausräumen:         Komplettb.			
DXY         40.000 %           DZ         5.000           UXY         0.000 mm           UZ         0.000           Eintauchen:         helikal           EP         2.000 mm/U           ER         4.000 mm	ø	30.000	
DZ 5.000 UXY 0.000 mm UZ 0.000 Eintauchen: helikal EP 2.000 mm/U ER 4.000 mm	Z1	10.000	ink
UXY 0.000 mm UZ 0.000 Eintauchen: helikal EP 2.000 mm/U ER 4.000 mm	DXY	40.000	%
UZ 0.000 Eintauchen: helikal EP 2.000 mm/U ER 4.000 mm	DZ	5.000	
Eintauchen: helikal EP 2.000 mm/U ER 4.000 mm	UXY	0.000	mm
EP 2.000 mm/U ER 4.000 mm	υz	0.000	
ER 4.000 mm	Eint	tauchen:	helikal
	EP	2.000	mm/U
Ausräumen: Komplettb.	ER	4.000	mm
	Aus	räumen: Komp	lettb.

PROGRAMM Р Kreista ₩ FRAESER20 D1 /Zahr 0.200 Jerkzeu /~ -780 peitung: Ő siti END 10.000 i 40.000 % Z1 DXY DZ UXY UZ Ein EP ER 5.000 0.000 mm 0.000 helikal n: en: neiik 2.000 mm/U 4.000 mm en: Komplettb Abbruch fi Simu- 📑 Aba lation 📕 bei Gerade L Bohren L Fräsen Kontur Diver-

#### **11.5 Drilling and Positions**

Through acceptance	PROGRAMM	
<b>e</b> 1	SPRITZFORM2	Plan-
into the machining	P N5 SPRITZFORM2 Nullpktv. 1 G54	fräsen
plan, an open bracket is displayed at the	₩ N10 Planfräsen V T=PLANFRAESER83 F0.2/Z V19	
	$\sim_{ m 7}$ N15 Aussen	Tasche
	7₩ N20 Bahnfräsen 🛛 🖓 T=FRAESER20 F0.2/Z V100m Z	0=0 Z1=10ink
circular pocket.	X25 Rechtecktasche ⊽ T=FRAESER10 F0.1/Z V111m X	0=75 Y0=50 Zapfen
	◯_ <mark> </mark> N30 Kreistasche   ▽ T=FRAESER20 F0.2/Z V80m Z1	=10ink ø30 →
	END Programmende N=1	Nut
07 <mark>7</mark> N30 Kreistasche		Gravur
		$ \mathbf{i} \rangle$
Next, the positions of	🐺 Gerade 🛴 Bohren 💆 Fräsen 🖕 Kontur 👥 Diver-	Simu- Abar lation beit
the circular pockets		

the circular pockets are programmed.

Pressing the softkey

Eohren	PROGRAMM SPRITZFORM2	rechtwinklig/po	lar ()
	P	Positionen	Alternat
	ш Ш	rechtwinklig	
		Z0 0.000 abs	Alle
	<u>^~</u> ] 40-	X0 abs	löscher
Positio-	736	YØ abs	
		X1 abs	* /
nen	20- 21	Y1 abs	
		X2 abs	
		Y2 abs	
	END Ø-	X3 abs	••
		Y3 abs	
		X4 abs	$\odot$
	-29-	Y4 abs	- <b>·</b> ·
a la al		X5 abs	
and		Y5 abs	Hindern
	-40-	X6 abs	
		Y6 abs	
	Y -40 -20 0	20 40 X7 abs	×
	l ↔x	Y7 abs	Abbruc
		X8 abs	
		Y8 abs	
. /	Keine Position programmiert	i	
	Gerade I. Bohren - Fräsen	Kontur Diver- Si Ses Si lat	.mu- 📉 Abaı tion 📕 beit

opens the corresponding input field.

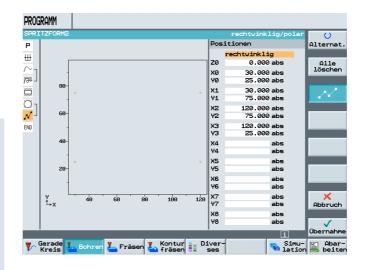
As an alternative, the circular pocket positions can also be entered with the position pattern "Frame".

After entering the corresponding positions in the input screen form

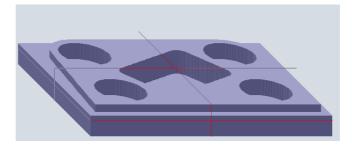
	rechtwinklig
zø	0.000 abs
xø	30.000 abs
YØ	25.000 abs
X1	30.000 abs
Y1	75.000 abs
X2	120.000 abs
Y2	75.000 abs
ΧЗ	120.000 abs
Y3	25.000 abs

and acceptance into the machining plan, the bracket is closed and the program is complete.

Q	N30	Kreistasche			
N	N35	001:	Positionen		



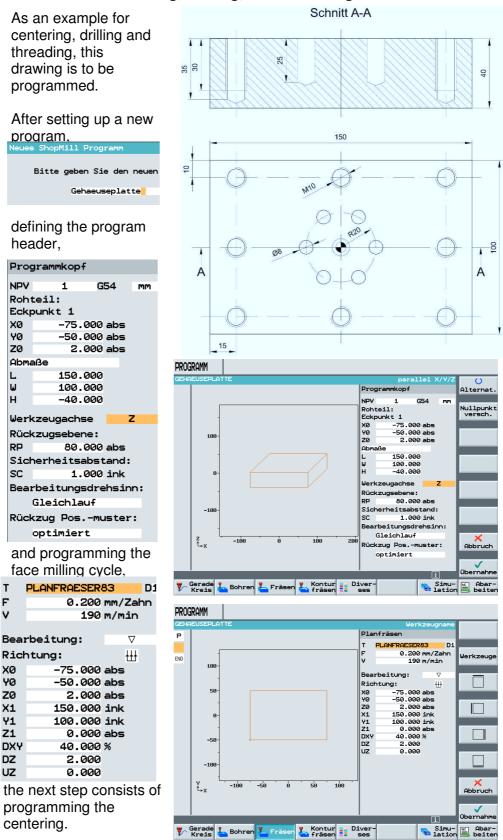
	ORM2			Zentrie
N5	SPRITZFORM2		Nullpktv. 1 G54	ren
N10	Planfräsen	$\nabla$	T=PLANFRAESER83 F0.2/Z V190m X0=0 Y0=0	Bohren
- N15	AUSSEN			Reiber
∎ <b>_</b> N20	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
) N25	Rechteck tasche	$\nabla$	T=FRAESER10 F0.1/Z V111m X0=75 Y0=50	Tief-
§ <sub>–</sub> N30	Kreistasche	$\nabla$	T=FRAESER20 F0.2/Z V80m Z1=10ink ø30	
<sup>•</sup> - N35	001: Positionen		Z0=0 X0=30 Y0=25 X1=30 Y1=75 X2=120	
)	Programmende		N=1	drehe
				Gewind
				Positi nen



#### 12 Program Example – Centering, Drilling, Threading

In this module, centering, drilling and threading under ShopMill is described.

#### 12.1 Exercises for Centering, Drilling, and Threading

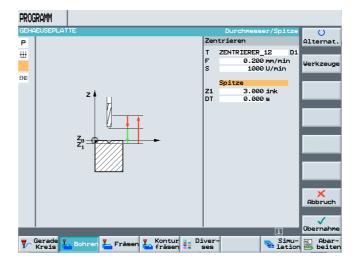


### **12.2 Centering the Frame and the Hole Circle**

After opening the input screen form for the centerings (spot drilling), the values are entered in the input fields.

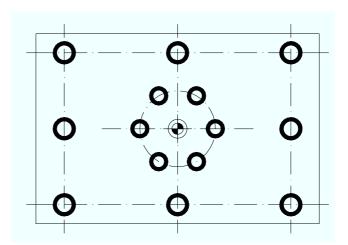
т	ZENTRIERER_12 D1
F	0.200 mm/min
s	1000 U/min
	Spitze
Z1	3.000 ink
DT	0.000 s

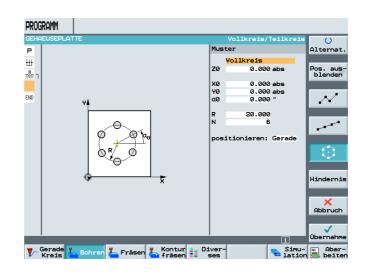
Since at none of the holes a chamfer is programmed, centering can be done for all holes.



### The positions of the center circle

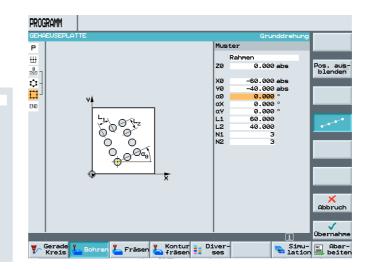
	Vollkreis	
zø	0.000	abs
XØ	0.000	abs
YØ 👘	0.000	abs
αØ	0.000	0
R	20.000	
N	6	
pos:	itionieren:	Gerade
•		





#### as well as the outside frame are programmed.

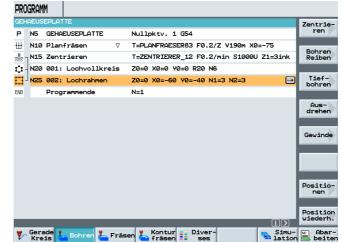
	Rahmen
zø	0.000 abs
XØ	-60.000 abs
YØ	-40.000 abs
αØ	° 000.0
αX	0.000 °
αY	0.000 °
L1	60.000
L2	40.000
N1	3
N2	3

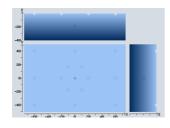


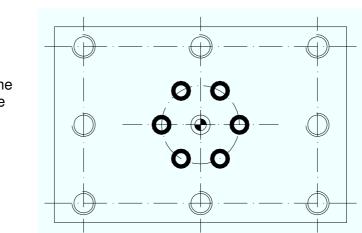
#### 12.3 Drilling

After accepting the position patterns into the machining plan, the centerings for the holes are completely programmed.





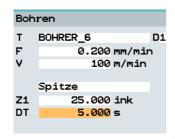




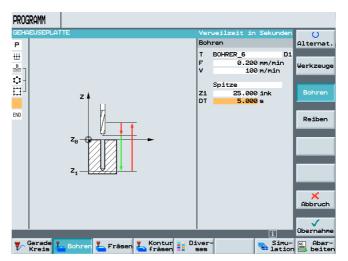
Next, the holes for the center hole circle are programmed.

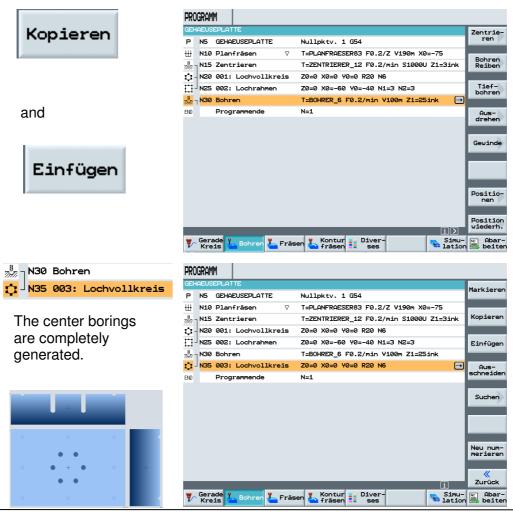
#### 12.4 Programming "Drilling the Hole Circle" by Using Copy and Insert

After opening the input screen form for drilling and entering the values,



the input is acccepted into the machining plan. Since the drilling positions were already programmed, they are appended to the boring by pressing the softkeys

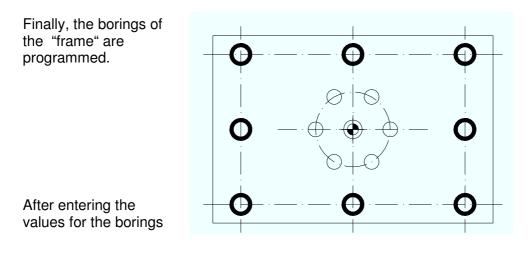


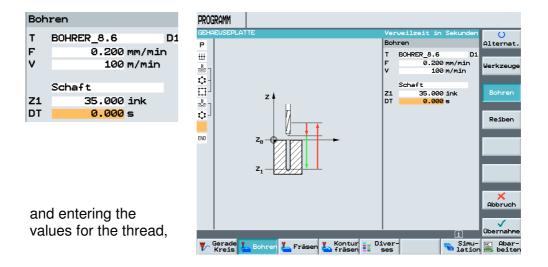


T I A Training Document Status: 04/2008

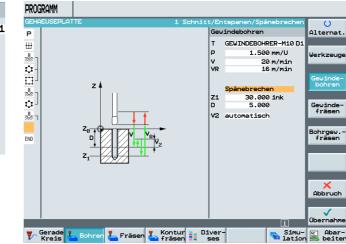
### 12.5 Borings Threads for Frames

SIEMENS

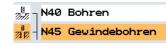








the inputs are accepted into the machining plan.

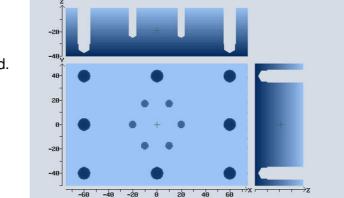


Since the positions for the borings were already programmed also, they are again appended to the boring by pressing the softkevs



HEUS	SEPLATTE		Zentrie
N5	GEHAEUSEPLATTE	Nullpktv. 1 G54	ren
N10	Planfräsen ⊽	T=PLANFRAESER83 F0.2/Z V190m X0=-75	Bohrer
N15	Zentrieren	T=ZENTRIERER_12 F0.2/min S1000U Z1=3ink	Reiber
NZØ	001: Lochvollkreis	Z0=0 X0=0 Y0=0 R20 N6	
N25	002: Lochrahmen	Z0=0 X0=-60 Y0=-40 N1=3 N2=3	Tief- bohre
N30	Bohren	T=B0HRER_6 F0.2/min V100m Z1=25ink	
N35	003: Lochvollkreis	Z0=0 X0=0 Y0=0 R20 N6	Aus-
N40	) Bohren	T=BOHRER_8.6 F0.2/min V100m Z1=35ink	drehe
N45	Gewindebohren	T=GEWINDEBOHRER-M10 P1.5mm V20m Z1=30i→	
	Programmende	N=1	Gewind
			Positio
		1))	Positio

PRO	IGRAM	M		
GEH	IAEUS	EPLATTE		Markieren
Р	N5	GEHAEUSEPLATTE	Nullpktv. 1 G54	harkieren
₩	N10	Planfräsen 🛛	T=PLANFRAESER83 F0.2/Z V190m X0=-75	-
-	N15	Zentrieren	T=ZENTRIERER_12 F0.2/min S1000U Z1=3ink	Kopieren
¢.	N20	001: Lochvollkreis	Z0=0 X0=0 Y0=0 R20 N6	
<del>[]</del> -	N25	002: Lochrahmen	Z0=0 X0=-60 Y0=-40 N1=3 N2=3	Einfügen
79777	N30	Bohren	T=BOHRER_6 F0.2/min V100m Z1=25ink	
¢.	N35	003: Lochvollkreis	Z0=0 X0=0 Y0=0 R20 N6	Aus-
-	N40	Bohren	T=BOHRER_8.6 F0.2/min V100m Z1=35ink	schneiden
38	N45	Gewindebohren	T=GEWINDEBOHRER-M10 P1.5mm V20m Z1=30ink	
-	N50	004: Lochrahmen	Z0=0 X0=-60 Y0=-40 N1=3 N2=3	Suchen
END		Programmende	N=1	
				Neu num- merieren
	-	_	Ĩ	<b>«</b> Zurück
7	Gera Kre		en 🍆 Kontur 💼 Diver- 💦 Simu-	

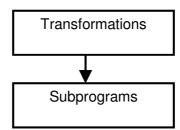


The program is completely generated.

#### 13 Programming Example – Programmable Transformations, Subprogram Technology

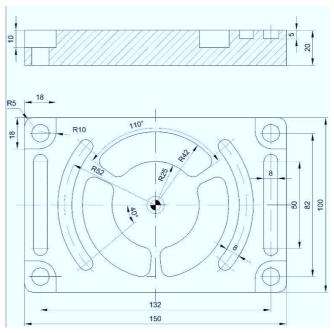
#### Content of the Module:

This module describes how ShopMill transformations and subprograms are programmed, using an example.

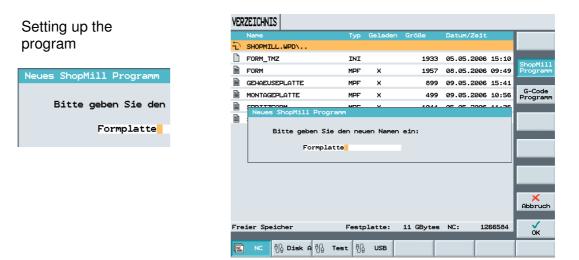


Mirroring/rotating transformations

Based on this example, the functions "Program Loop" - "Shift" are explained in greater detail..



All non-dimensioned radii R=5



#### 13.1 Program Header

After entering the values in the program header

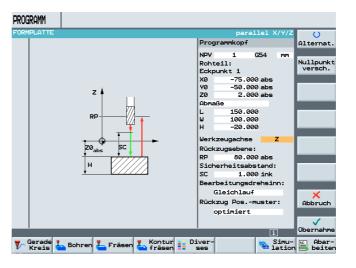
Prog	grammkopf		
NPV	1 G	54	mm
Roht	teil:		
Eckp	ounkt 1		
XØ	-75.000	abs	
YØ	-50.000	abs	
ZØ	2.000	abs	
Abma	aße		
L	150.000		
W	100.000		
н	-20.000		
Werk	kzeugachse	2	z

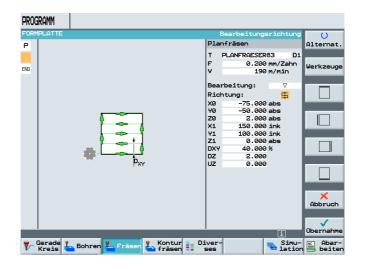
Werkzeugachse 2 Rückzugsebene: RP 80.000 abs Sicherheitsabstand: SC 1.000 ink Bearbeitungsdrehsinn: Gleichlauf Rückzug Pos.-muster: optimiert

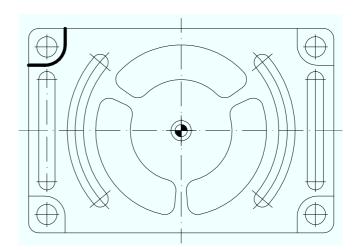
and entering the parameters for face milling,

Plar	nfräsen	
т	PLANFRAESER	83 D1
F	0.200	mm/Zahn
v	190	m/min
Bear	beitung:	$\nabla$
Rich	ntung:	<u>5</u>
xø	-75.000	abs
YØ	-50.000	abs
ZØ	2.000	abs
X1	150.000	ink
Y1	100.000	ink
Z1	0.000	abs
DXY	40.000	%
DZ	2.000	
υz	0.000	

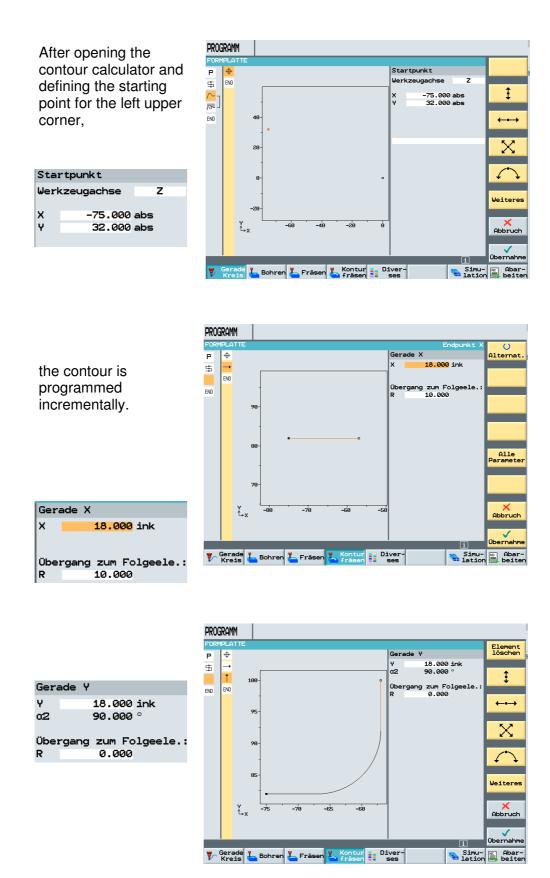
next the corner contour is programmed.





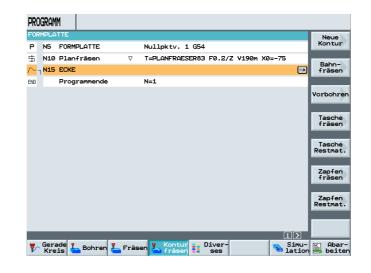


### 13.2 Contour Calculator Left Upper Corner



#### 13.3 Path Milling

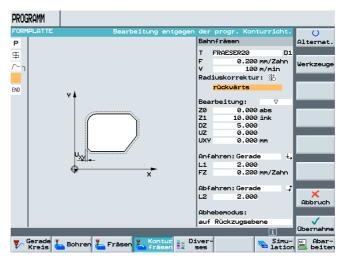
After accepting the contour into the machining plan,

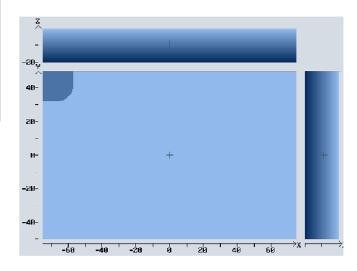


the cycle "Path Milling" is opened.

F V Radiu	RAESER20 0.200mm/Za 100m/min Iskorrektur: 🕅	
v Radiu	100 m/mir	
Radiu		n
	skorrektur: 🕅	-
ri		
	ückwärts	
Bearb	eitung: V	,
zø	0.000 abs	
Z1	10.000 ink	
DZ	5.000	
υz	0.000	
UXY	0.000 mm	
Anfah	ren:Gerade	÷.
L1	2.000	
FZ	0.200 mm/Za	ahn
0h [ - h	ren:Gerade	+
	2.000	Ĵ
L2	2.000	
Abheb	emodus:	
auf R	ückzugsebene	

After accepting the values into the machining plan, corner machining is programmed.





#### 13.4 Mirroring

We don't want to program this corner three more times, but mirror it under ShopMill.

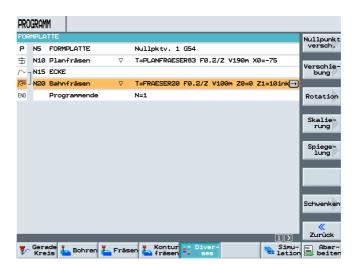
After pressing the soft key



and

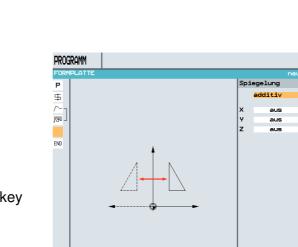


the possible transformations under ShopMill are shown.





Schwenker



Pressing the softkey Mirroring

Spiegelung

Alternat × Abbruch 5 Übernah 🚏 Gerade 👗 Bohren 👗 Fräsen 👗 Kontur 🚦 Div Simu- 🖺 Aba lation 🧮 bei

opens the corresponding input screen form.

C

Y

z

PROGRAMM The corners are **○** Alternat. mirrored "additively"; Р Spiegelung · 事 へ 滞 that is, always in additiv ein reference to the Y aus aus reference point that z END was mirrored last. After activating the corresponding axis Abbruch **V** Übernahm Spiegelung Simu- 🖺 Abar-lation 📕 beiter 🚏 Gerade 📥 Bohren 🍒 Fräsen 🍒 Kontur additiv х ein

and accepting it into the machining plan, all additional program steps are inserted behind the mirror image around the Xaxis.

aus

aus

On	MPLA	TTE			Nullpunk
Р	N5	FORMPLATTE		Nullpktv. 1 G54	versch
事	N10	Planfräsen	$\nabla$	T=PLANFRAESER83 F0.2/Z V190m X0=-75	Verschie
$\sim$	N15	ECKE			bung
<b>1</b> 3% -	N20	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
۵÷۲	N25	Spiegelung	add	× 🗗	Rotatio
end		Programmende		N=1	
					Skalie rung Spiege
					lung
					Schwenk

After highlighting and copying the contour with the associated processing of Copy

	gram				
OR	MPLA	TTE			Markierer
Р	N5	FORMPLATTE		Nullpktv. 1 G54	
<b>5</b>	N10	Planfräsen	$\nabla$	T=PLANFRAESER83 F0.2/Z V190m X0=-75	
ς,	N15	ECKE			Kopieren
¥2 -	N20	Bahnfräsen	V	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
×	N25	Spiegelung	add	x	Einfügen
ND		Programmende		N=1	
					Aus- schneider
					Suchen
					Neu num- merieren
_	_		_		<b>«</b> Zurück
7	Gera	ade 📥 Bohren 📒	Fräse	en Kontur - Diver- Simu-	

### Kopieren

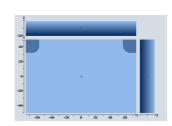
the contour is inserted behind the mirror image by pressing the softkey

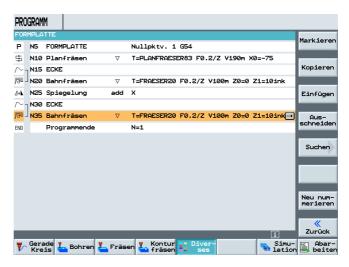
Einfügen

Program	1M			
ORMPLA	ATTE			Markiere
P N5	FORMPLATTE		Nullpktv. 1 G54	harkiere
5 N10	Planfräsen	$\nabla$	T=PLANFRAESER83 F0.2/Z V190m X0=-75	
~ <sub>7</sub> N15	ECKE			Kopiere
© _ <sub>N20</sub>	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
N25	Spiegelung	add	x	Einfüge
- N30	ECKE			
<sup>©</sup>	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Aus-
D	Programmende		N=1	schneide
				Suchen
			n	Neu num meriere Zurück
Ger Kre	ade 📒 Bohren 📒	Fräs		Abar

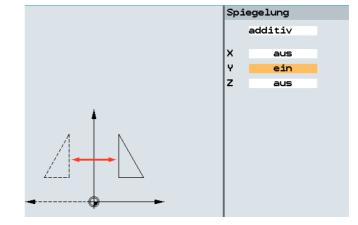
Copied program parts are inserted below the current position.

The second corner has been programmed



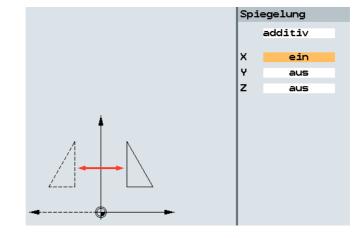


With another additive mirroring -this time around theY-axis-



and subsequent additive mirroring around the X-axis,

and additionally inserting the contour including the processing below the mirrorings



### **13.5 Longitudinal Grooves**

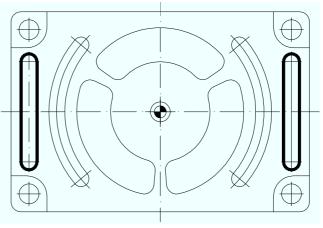
	PROGRAMM	
	FORMPLATTE	Werkzeug
	P N5 FORMPLATTE Nullpktv. 1 G54	werkzeug
	\$ N10 Planfräsen ⊽ T=PLANFRAESER83 F0.2/Z V190m X0=-75	
the program for the 4	$\sim_{T}$ N15 ECKE	Gerade
corner machinings is	73 JN20 Bahnfräsen	
•	∆A N25 Spiegelung add X	Kreis Mittelp.
completed		
	778 - N35 Bahnfräsen ⊽ T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Kreis Radius
	Ark N40 Spiegelung add Y	Radius
Z		11-14-N
-202	78 - N50 Bahnfräsen ⊽ T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Helix
40-	/→ N65 Spiegelung add X	
	N55 ECKE	Polar
•	78 JN60 Bahnfräsen	
9 + +	END Programmende N=1	
-20-		
-40	M	laschinen
	1>	funkt.
	Fräsen Kreis Bohren Fräsen Fräsen ses Simu-	Abar-

After entering the last corner, mirroring is still active and has to be switched off with

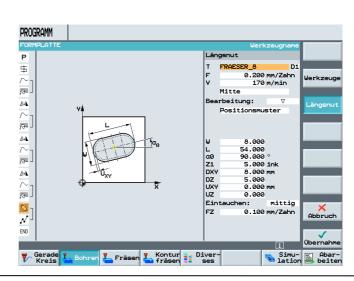
Spiegelung						
neu						
×	aus					
Y	aus					
z	aus					

Next, the longitudinal grooves on both sides are milled.

After opening the cycle for longitudinal grooves and entering the corresponding values in the input screen form,



Läng	gsnut		
т	FRAESER_8		D1
F	0.200	mm/Zah	n
v	170	m/min	
	Mitte		
Bear	rbeitung:	$\nabla$	
	Positionsmu	ster	
W	8.000		
L	54.000		
αØ	90.000	0	
Z1	5.000	ink	
DXY	8.000	mm	
DZ	5.000		
UXY	0.000	mm	
υz	0.000		
		mitti	
Eint	tauchen:	MICCI	Lg



the cycle is accepted into the machining plan.

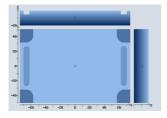
Rogram	1			
ORMPLAT	TE			Markiere
P N5	FORMPLATTE		Nullpktv. 1 G54	Herklere
5 N10	Planfräsen	$\nabla$	T=PLANFRAESER83 F0.2/Z V190m X0=-75	_
∼ <mark>∧ №15</mark>	ECKE			Kopiere
<sup>%</sup>	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
N25	Spiegelung	add	×	Einfüge
- N30	ECKE			
» _ <sub>N35</sub>	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Aus-
N40	Spiegelung	add	Ŷ	schneide
∼ <sub>7</sub> №45	ECKE			
<sup>%  </sup> N50	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Suchen
N65	Spiegelung		aus	
~ N85	ECKE			
№ _ н90	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
∬ <sub>7</sub> №95	Längsnut	$\nabla$	T=FRAESER_8 F0.2/Z V170m Z1=5ink W8 L54	Neu num
ND OF	Programmende		N=1 🕒	meriere
			(i)	<b>«</b> Zurück
Gera Krei	de 占 Bohren 👗	Fräse		Abar

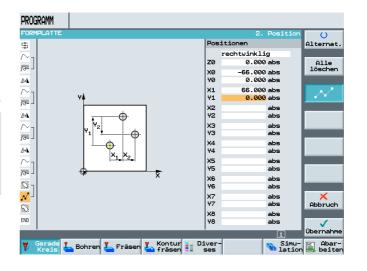
After opening the input screen form for the position pattern, entering the corresponding values

	rechtwinklig
zø	0.000 abs
xø	-66.000 abs
YØ	0.000 abs
X1	66.000 abs
Y1	0.000 abs

and acceptance into the machining plan,

the longitudinal grooves are completely programmed.





PROGRAM	1			
ORMPLAT	TE			Markierer
<b>5 N10</b>	Planfräsen	$\nabla$	T=PLANFRAESER83 F0.2/Z V190m X0=-75	Herklere
$\sim_{l}$ N15	ECKE			_
38 <b>- N20</b>	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Kopieren
⇒ <b>⊾</b> N25	Spiegelung	add	x	
$\sim$ $_{\sf T}$ N30	ECKE			Einfügen
<sup>™ _</sup> N35	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
i→ <b>⊾</b> N40	Spiegelung	add	Ŷ	Aus- schneider
∼۲ <mark>№45</mark>	ECKE			schneider
<sup>36</sup> - N50	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Suchen
∯ <b>⊾ N65</b>	Spiegelung		aus	Suchen
$\sim$ $_{ m N85}$	ECKE			_
<del>8</del> е – <mark>N9</mark> 0	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
N95 ך	Längsnut	$\nabla$	T=FRAESER_8 F0.2/Z V170m Z1=5ink W8 L54	
√ <sup>_</sup> N115	001: Positionen		Z0=0 X0=-66 Y0=0 X1=66 Y1=0	Neu num- merieren
END	Programmende		N=1 →	
				<b>«</b>
			i	Zurück
Gera Krei	de 占 Bohren 🦾 🖡	räse	n Kontur Diver- fräsen ses Simu-	

#### 13.6 Circumferential Groove

SIEMENS

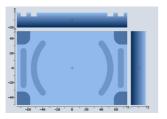
Next, the circumferential grooves are programmed. After opening the cycle for circumferential grooves and entering the corresponding values in the input screen form,

Kre:	isnut	
т	FRAESER_8	D1
F	0.200	mm/Zahn
FZ	0.200	mm/Zahn
V	89	m/min
<b>D</b>		_
	rbeitung:	$\nabla$
	Vollkreis	
XØ	0.000	abs
YØ	0.000	abs
Z0	0.000	abs
ω	8.000	
R	52.000	
αØ	140.000	
α1	80.000	0
N	2	
Z1	5.000	ink
DZ	5.000	
UXY	0.000	
pos:	itionieren:	Gerade
-		

PROGRAMM Kreis 串 D1  $\sim$ т 0.200 mm/Zahn 0.200 mm/Zahn 89 m/min F Werkzeug . FZ V ⊿⊶⊾ rbeitung: . 730 . Vollkreis X0 Y0 Z0 ₩ R α0 α1 ⊿≁⊾  $\sim$ ⊿₊⊾  $\sim$ N Z1 DZ UXY 5 000 ink **\$**\$ 5.000 0.000 mm N Abbruch sitionie n: S END ÜЬ i 🚏 Gerade 🚣 Bohren 🤽 Fräsen 🌄 f Diver ses Simu n 🔛 Aba

the cycle is accepted into the machining plan.

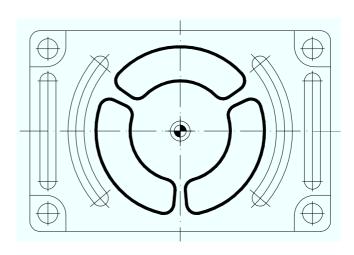
The circumferential grooves are completely programmed.



ogramm				
RMPLAT	Planfräsen	V	T=PLANFRAESER83 F0.2/Z V190m X0=-75	Markiere
- N15	ECKE	v	1_PEANFRAESER03 F0.2/2 41904 X0=-73	
] <sub>N20</sub>	Bahnfräsen	V	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Kopiere
N25	Spiegelung	add	x	
- N30	ECKE	aaa	~	Einfüge
- N35	Bahnfräsen	V	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Linfuge
N40	Spiegelung	add	Ŷ	Aus-
- N45	ECKE			schneid
N50	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	_
N65	Spiegelung		aus	Sucher
7 N85	ECKE			
N90	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	1
ר <b>N95</b>	Längsnut	$\nabla$	T=FRAESER_8 F0.2/Z V170m Z1=5ink W8 L54	
N115	001: Positionen		Z0=0 X0=-66 Y0=0 X1=66 Y1=0	Neu num
N125	Kreisnut	$\nabla$	T=FRAESER_8 F0.2/Z V89m X0=0 Y0=0 Z0=	meriere
	Programmende		N=1	«
-	_	-	(i)	Zurück
Gerad	le 占 Bohren 占 F	Täca	n Kontur Diver- Simu- fräsen ses Simu-	

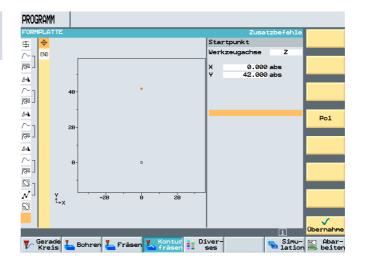
#### 13.7 Contour Pockets with Contour Calculator

Next, the contour pockets are programmed.

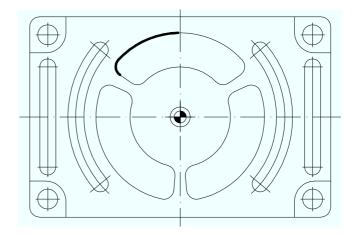


After opening the contour calculator, that pocket's starting point is defined.

X	0.000 abs
Y	42.000 abs



Then, half the arc is programmed.



By pressing the softkey



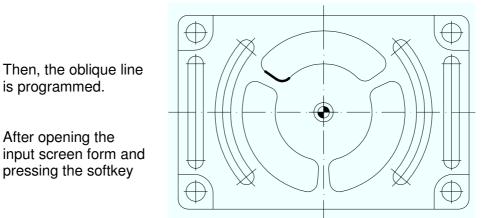
ORMPLA	TTE								ndpunkt X	U
5 ↔							Kre			Alternat
V. 🗠							Dre	hrichtung: 42.000	Ω	_
98 J END	-						r.	42.000	,	
*	80-						X		abs abs	
-							ľ		aps	
<sub>W</sub>	60-						I		abs	
, → <b>L</b>	00-						J		abs	_
	1									
<u>]</u> ]	40-			•			Übe FS	rgang zum Fo 0.000		
	-						5	0.000	'	Alle
•	20-									Paramete
~1										
	0-									
۲.	6									
"]	Y <sup>↓</sup>	-40	-20	ė	20	40	1			×
3	₩X									Abbruch
										<b>1</b>
	_	_	_	_	_	_	1	_	[ <b>i</b> ]	Übernahm
Ger	ade <u>L</u> E		占 Frä		Kontu fräse	- D	iver-	4	👞 Simu-	Abar

### additional input options are available.

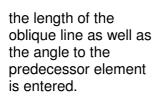
The angle of opening that was dimensioned in this way is entered in the extended input screen form.

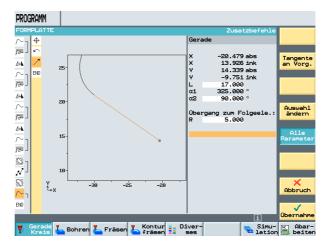
FORMPL							zbefehle	
$\sim_1 \Phi$					Kre	is		
776 J 🗠						hrichtung:	Q	
A-A END					R	42.000		
47 <b>4</b>	60-				×	-34.404	abs	
$\sim$ 1					×	-34.404		_
776 J	-				Y	24.090	abs	
4 <b>&gt;</b> 1					V V	-17.910	ink	
<u>4</u> →⊾								
$\sim_1$	40-		/		I	0.000		Auswahi
/% L					IJ	0.000		ändern
					J	0.000 -42.000		
<b>∆→</b> ⊾					a1	180.000		Alle
$\sim_{-1}$	28-	•			1	100.000		Paramete
////	20-				61	235,000	•	
100 -					β2	55.000		
S 1	-							
<b>%</b> ]						rgang zum Fo	lgeele.:	
P.4//.					R	5.000		
SI	¥.x □	-40	-20	ė	· · I			×
$\sim_{1}$	→x							Abbruck
END								_
LNU								
							[ <b>i</b> ]	Übernahr

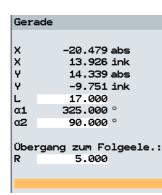
Kre.	is	
Dre	hrichtung:	ç
R	42.000	
x	-34.404	abs
x	-34.404	ink
Y	24.090	abs
Y	-17.910	ink
I	0.000	abs
I	0.000	ink
J	0.000	abs
J	-42.000	ink
α1	180.000	0
β1	235.000	0
β2	55.000	0
Übei	rgang zum Fo	laeele.:
R	5.000	-9









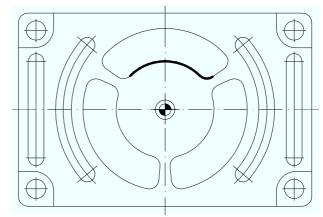


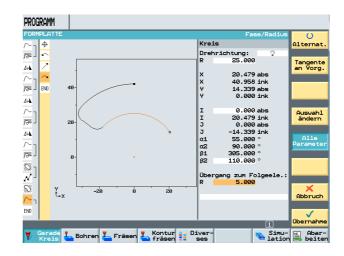
Next, the lower arc is programmed.

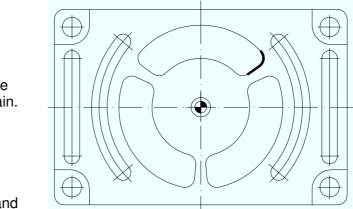
After opening the input screen form and pressing the softkey



the arc is programmed again by means of the angle of opening.

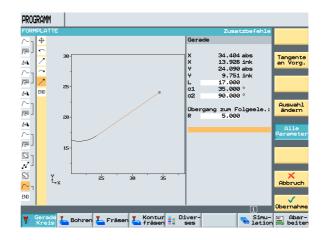






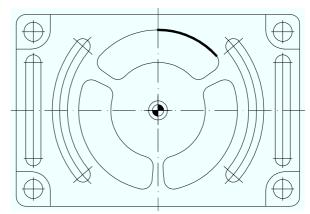
Now the oblique line is programmed again.

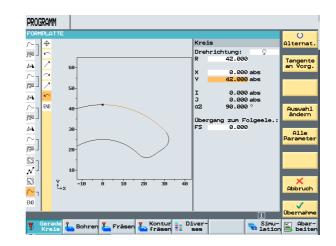
After opening the input screen form and pressing the softkey





the length of the oblique line as well as the angle to the predecessor element is entered.



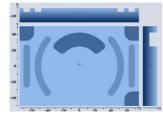


With the last element, the contour is closed.

#### 14 Rotation Contour Pockets

After accepting the contour into the machining plan and adding the processing "Contour pocket", the first pocket is completely programmed.

RMPLAT	TE			Neue
N15	ECKE			Kontu
- N20	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Bahn-
N25	Spiegelung	add	x	fräse
7 N30	ECKE			
J N35	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Vorbohr
N40	Spiegelung	add	Ŷ	
N45	ECKE			Tasch
J N50	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	fräse
N65	Spiegelung		aus	Tasch
N85	ECKE			Restma
- N90	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
ר <sup>N95</sup>	Längsnut	$\nabla$	T=FRAESER_8 F0.2/Z V170m Z1=5ink W8 L54	Zapfe fräse
J N115	001: Positionen		Z0=0 X0=-66 Y0=0 X1=66 Y1=0	
N125	Kreisnut	$\nabla$	T=FRAESER_8 F0.2/Z V89m X0=0 Y0=0 Z0=0	Zapfe
N130	TASCHE			Restina
N135	Tasche Fräsen	$\nabla$	T=FAESER_10 F0.123/Z V90m Z0=0 Z1=10i→	
	_		[i]>	
Gerac		·~===	n Kontur Diver- Simu- fräsen ses Simu-	



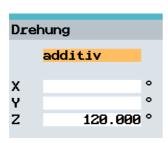
By	pressing	the
sof	tkev	

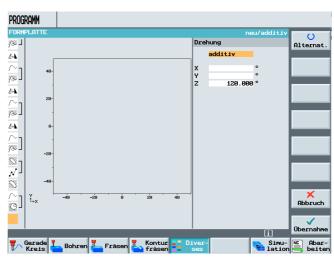
PRO	Gramm				
FOR	MPLAT	IE .			Nullpunkt
<i>184</i> -	N35	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	versch.
<b>∆</b> • <b>\</b>	N40	Spiegelung	add	Y	
$\sim$ -	N45	ECKE			Verschie- bung
<i>1</i> % -	N50	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
⊿∗⊾	N140	Spiegelung	add	x	Rotation
$\sim$ -	N145				
<i>1</i> % -	N150	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Skalie-
<b>∆</b> → <b>\</b>	N65	Spiegelung		aus	rung
$\sim$ -	N85	ECKE			Spiege-
<i>1</i> % -	N90	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m 20=0 21=10ink T=FRAESER_8 F0.2/Z V170m 21=5ink W8 L54	lung
<b>8</b> -	N95	Längsnut	$\nabla$	T=FRAESER_8 F0.2/Z V170m Z1=5ink W8 L54	
Ν-	N115	001: Positionen		20=0 X0=-66 Y0=0 X1=66 Y1=0	
83	N125	Kreisnut	$\nabla$	T=FRAESER_8 F0.2/Z V89m X0=0 Y0=0 Z0=0	
					Schwenken
Ø-	N135	Tasche Fräsen	$\nabla$	T=FAESER_10 F0.123/2 V90m 20=0 21=10ink	
END		Programmende		N=1	<b>«</b>
	-	_	-	ίD	Zurück
<b>T</b>	Gerad Krei	le 🚣 Bohren 📒	Fräs	en 🌇 Kontur 📑 Diver-	Abar- beiten



in the area "Diverses", the contour pocket is rotated around the Zaxis.

After entering the rotation





and copying and inserting the contour with the processing below the rotation, the second contour pocket is complete.

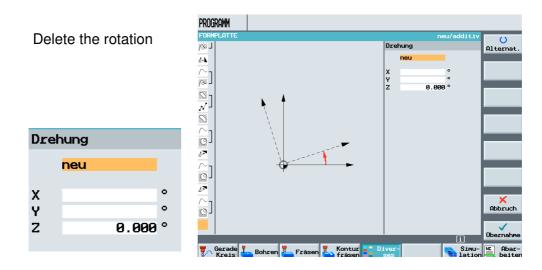


The last contour pocket is generated in the same way.

rugramm				
DRMPLAT	TE			
≶ <b>⊿ №50</b>	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Werkzeug
N140	Spiegelung	add	x	
∼ <sub>7</sub> №145	ECKE			Gerade
∬ <mark>∖</mark> №150	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
N65	Spiegelung		aus	Kreis Mittelp
85 <sub>ר</sub>	ECKE			Mittelp
⊗ <mark>_ </mark> №90	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Kreis
S <sub>7</sub> N95	Längsnut	$\nabla$	T=FRAESER_8 F0.2/Z V170m Z1=5ink W8 L54	Radius
/ <sup>_]</sup> N115	001: Positionen		Z0=0 X0=-66 Y0=0 X1=66 Y1=0	
3 N125	Kreisnut	$\nabla$	T=FRAESER_8 F0.2/Z V89m X0=0 Y0=0 Z0=0	Helix
0130 <sub>ר</sub>	TASCHE			
§ _ N135	Tasche Fräsen	$\nabla$	T=FAESER_10 F0.123/Z V90m Z0=0 Z1=10ink	Polar
N155	Drehung	add	2120	
∼ <sub>7</sub> №160	TASCHE			
<sup>∭</sup> 165	Tasche Fräsen	$\nabla$	T=FAESER_10 F0.123/Z V90m 20=0 21=10ink 🖃	_
40	Programmende		N=1	Maschine
_		-		funkt.
Gera Krei	de 📙 Bohren 📒	Frās		NC Abar beit

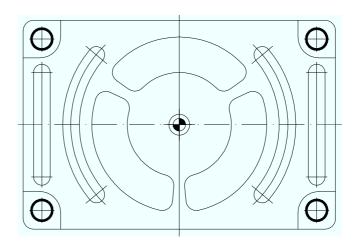


Progra	MM			
FORMPL	ATTE			
$\sim_{T}ni$	45 ECKE			Markieren
<i>¶</i> ‰ <mark>⊣</mark> №1!	50 Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
<u>⊿</u> +⊾ N6	5 Spiegelung		aus	Kopieren
$\sim_{ m 1}$ N8	5 ECKE			
<i>γ</i> ‰ <mark>_ <sub>N9</sub>ι</mark>	0 Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Einfügen
S 7 N9	5 Längsnut.	$\nabla$	T=FRAESER_8 F0.2/Z V170m Z1=5ink W8 L54	
√ <sup>_</sup> №1	15 001: Positionen		20=0 X0=-66 Y0=0 X1=66 Y1=0	Aus-
SS N1	25 Kreisnut	$\nabla$	T=FRAESER_8 F0.2/2 V89m X0=0 Y0=0 Z0=0	schneiden
$\sim_{T}ns$	30 Tasche			
∭_ N1:	35 Tasche Fräsen	$\nabla$	T=FAESER_10 F0.123/Z V90m Z0=0 Z1=10ink	Suchen
<b>∆</b> ≅ N1	55 Drehung	add	2120	
$\sim_{T}N1$	60 Tasche			
S N1	65 Tasche Fräsen	$\nabla$	T=FAESER_10 F0.123/Z V90m Z0=0 Z1=10ink	
<b>∆™ N1</b>	70 Drehung	add	Z120	Neu num- merieren
· ·	75 Tasche			Merieren
() II	80 Tasche Fräsen	$\nabla$	T=FAESER_10 F0.123/2 V90m 20=0 21=10ink 🕞	<b>«</b>
	_	-	li li	Zurück
	rade 📒 Bohren 📒	Fräs	sen 🌇 Kontur 📑 Diver- 🛸 Simu-	Abar-



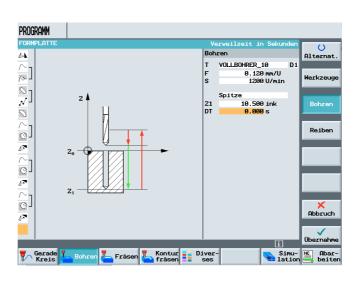
### 15 Making Holes with a Drill

As the last step, the holes are programmed.



### After entering the values

Ve	rweilzeit in Sekun	den
Bohi	ren	
т	VOLLBOHRER_10	D1
F	0.120 mm/U	
S	1200 U/min	
	Spitze	
Z1	10.500 ink	
DT	0.000 s	



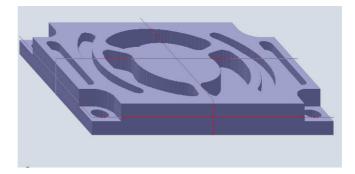
and the positions

lar

	rechtwinklig/pol
Pos:	itionen
	rechtwinklig
ZØ	-21.000 abs
XØ	-66.000 abs
YØ	41.000 abs
X1	66.000 abs
Y1	41.000 abs
X2	66.000 abs
Y2	-41.000 abs
XЗ	-66.000 abs
Y3	-41.000 abs
X4	abs
Y4	abs
X5	abs
Y5	abs
X6	abs
Y6	abs
X7	abs
Y7	abs
X8	abs
Y8	abs

FORMPLATTE SS J		Positi	rechtwinklig/pola	
			chtwinklig	Alternat
×٦		20	-21.000 abs	Alle
√1  		XØ	-66.000 abs	löschen
×		Y0	41.000 abs	
× Y Å		X1	66.000 abs	
ž1 I	_	Ŷ1	41.000 abs	
		X2	66,000 abs	
		Y2	-41.000 abs	
Y <sub>2</sub>		X3	-66.000 abs	
	- I	Y3	-41.000 abs	
		X4	abs	
>		Y4	abs	
		X5	abs	
		Y5	abs	
×	-	xe	abs	
<b>N</b>	x	Y6	abs	
		X7	abs	×
<mark>7</mark> ]		Y7	abs	Abbruch
-		X8	abs	
ND		Y8	abs	✓
1			[ <b>i</b> ]	Übernahr

the program is complete.



#### 16 Subprograms

In this program, subprograms are inserted as repetitions. To make the program more transparent, the contour pockets are moved to a subprogram.

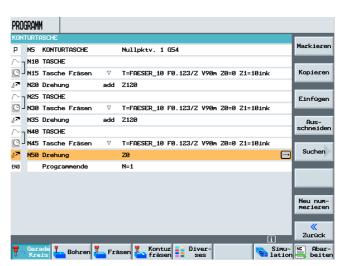
ame	Тур	Geladen	Größe	Datum/2	eit	
HOPMILL.WPD\						
BC_MCD	INI		270	31.05.2006	11:32	
DRM_TMZ	INI		1933	05.05.2006	15:10	ShopMill Programm
ESTEEE_MCD	INI		339	13.06.2006	13:09	
BC	MPF	х	3166	31.05.2006	11:32	G-Code Programm
	MDP	v	4000	24 OF 2000	11.91	Trogramm
Neues ShopMill Program	n					
Bitte geben Sie d	en neue	n Namen e.	in:			
<b>K</b>						
Konturtas	cne					
PRITZFORM	MPF	х	2160	13.06.2006	13:21	
PRITZFORM2	MPF	х	1721	09.05.2006	14:36	
ESTEEE	MPF		1689	13.06.2006	13:09	×
						Abbruch
r Speicher	Festp	latte:	11 GBy	tes NC:	1135512	бк
				1		JK
NC () Disk A	st	USB				
	IOPMILL.MPD\ IC_MCD IRM_TMZ ISTEEE_MCD IC ISTEEE_MCD IST Bitte geben Sie d Konturtas RITZFORM RITZFORM RITZFORM2 ISTEEE	OPMILL.WPD\ C_MCD INI RM_TMZ INI STEEE_MCD INI C. MPF More Meues ShopMill Program Bitte geben Sie den neue Konturtasche RITZFORM MPF RITZFORM2 MPF STEEE MPF	OPMILL.HPD\ C_MCD INI RM_TM2 INI STEEE_MCD INI C MPF X Neues ShopMill Programm Bitte geben Sie den neuen Namen e Konturtasche RITZFORM MPF X RITZFORM2 MPF X STEEE MPF r Speicher Festplatte:	OPMILL.MPD\       KC_MCD     INI       RM_TM2     INI       INI     1933       STEEE_MCD     INI       STEEE_MCD     INI       STEEE_MCD     INI       MOC     X       Steepense     1000       Neues     ShopMill Program       Bitte geben Sie den neuen Namen ein:     1000       Konturtasche     1100       RITZFORM     MPF       X     1721       STEEE     MPF       STEEE     MPF       STEEE     MPF       STEEE     11 GBy	OPMILL.MPD\           KC_MCD         INI         270         31.05.2006           RM_TMZ         INI         1933         05.05.2006           STEEE_MCD         INI         339         13.06.2006           C         MPF         X         3165         31.05.2006           C         MPF         X         3166         31.05.2006           Newes         ShopMill Program         4002         31.05.2006           Bitte geben Sie den newen Namen ein:         Konturtasche         4002         31.05.2006           RITZFORM         MPF         X         2160         13.06.2006           RITZFORM2         MPF         X         1721         09.05.2006           STEEE         MPF         1689         13.06.2006           STEEE         MPF         1689         13.06.2006	OPMILL.MPD\         KC_MCD       INI       270       31.05.2006       11:32         RM_TMZ       INI       1933       05.05.2006       15:10         STEEE_MCD       INI       339       13.06.2006       13:09         C       MPF       X       3166       31.05.2006       11:32         No.       MPF       X       3166       31.05.2006       11:32         Neues       ShopMill Program       V       4062       31.05.2006       11.32         Neues       ShopMill Program       V       4062       31.05.2006       11.31         RITZFORM       MPF       X       2160       13.06.2006       13:21         RITZFORM       MPF       X       2160       13.06.2006       13:21         RITZFORM2       MPF       X       1721       09.05.2006       14:36         STEEE       MPF       1689       13.06.2006       13:89         r       Speicher       Festplatte:       11       0Bytes       NC:       1135512

Bitte geben Sie den neuen Namen ein: Konturtasche

ues G-Code Progr

by cutting out the contour pockets from the program "Pattern Plate" and inserting them into the new program "Contour Pocket".

Then, the program is complete.



Now, the program has to be simulated once. This action calculates the program, and can be used as a subprogram .

	PROGRAMM	
	FORMPLATTE	Marke
	/% JN35 Bahnfräsen ⊽ T=FRAESER20 F0.2/Z V100m 20=0 21=10ink	setzen
	AN N40 Spiegelung add Y	
	∼ <mark>1 N45 ECKE</mark>	Wieder- holung
	/% S0 Bahnfräsen ⊽ T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	_
	AN N140 Spiegelung add X	Unter-
	∼ <sub>⊐</sub> N145 ECKE	programm
Dy propoing the	/% JN150 Bahnfräsen ⊽ T=FRAESER20 F0.2/Z V100m 20=0 21=10ink	
By pressing the	∆+ <b>\ N65 Spiegelung aus</b>	
softkey	∧_ N85 ЕСКЕ	Nullpunkt
<b>,</b>	/∞ N90 Bahnfräsen	Werkst,
	<sup>™</sup> T=FRAESER_8 F0.2/Z V170m Z1=5ink W8 L54	
	√ N115 001: Positionen Z0=0 X0=-66 Y0=0 X1=66 Y1=0	1
Unter-	🚿 N125 Kreisnut 🛛 🖓 T=FRAESER_8 F0.2/Z V89m X0=0 Y0=0 Z0=0 🖂	
programm	N190 Bohren T=VOLLBOHRER_10 F0.12/U S1200U Z1=10ink	Einstel- lungen
	√ N195 002: Positionen Z0=-21 X0=-66 Y0=41 X1=66 Y1=41 X2=66	Tungen
	END Programmende N=1	Transfor-
in the area "Diverses"		mationen
In the area Diverses	Gerade L Bohren Fräsen Kontur C Diver-	

the name of the subprogram is entered.

Unterprogramm

Pfad/Werkstück:

Programmname: Konturtasche

If the subprogram is located in the same path, no input is necessary under Path/Workpiece.

The program name is entered without an extension such as \*mpf\* and accepted into the machining plan.

The subprogram is complete.

PROGRAMM		
L %%	Unterprogramm	
	Pfad/Werkstück:	
	Programmame: Konturtasche	
	Konturtasche	-
~~] 7%) 44		
786		
Δ→٢		
$\sim$ -1		
S 1		
ST I		
		×
	1	Abbruch
*** N		
/*		vernahme
	<u> </u>	
F Gerade 🔚 Bohren 🦾 Fräsen 🌄 Kontu	ur – Diver- en ses Simu-	Abar- beiten

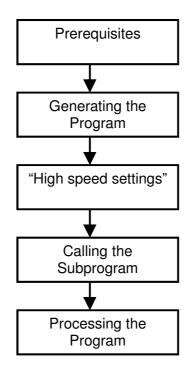
PROG	GRAMM				
ORM	IPLAT1	IE .			Marke
‰ 1	N35	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	setzen
÷ <b>k</b>	N40	Spiegelung	add	Y	
$\sim_{1}$	N45	ECKE			Wieder- holung
‰ ]	N50	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	_
→ <b>N</b>	N140	Spiegelung	add	x	Unter-
$\sim_{1}$	N145	ECKE			program
‰ ]	N150	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	
÷	N65	Spiegelung		aus	
$\sim_1$	N85	ECKE			Nullpunk
‰ ]	N90	Bahnfräsen	$\nabla$	T=FRAESER20 F0.2/Z V100m Z0=0 Z1=10ink	Werkst.
Зı	N95	Längsnut	$\nabla$	T=FRAESER_8 F0.2/Z V170m Z1=5ink W8 L54	
۷J	N115	001: Positionen		20=0 X0=-66 Y0=0 X1=66 Y1=0	
Š.	N125	Kreisnut	$\nabla$	T=FRAESER_8 F0.2/Z V89m X0=0 Y0=0 Z0=0	_
£	N200	Ausführen		"Konturtasche" 🕞	Einstel- lungen
۲ <sup>®</sup>	N190	Bohren		T=VOLLBOHRER_10 F0.12/U S1200U Z1=10ink	Tungen
<u>7</u> ]	N195	002: Positionen		Z0=-21 X0=-66 Y0=41 X1=66 Y1=41 X2=66	Transfor mationer
$\sim$	Gerad Krei	le 🦾 Bohren 📒	Fräs		NC Abar beite

Any main program can also be used as subprogram!

### 17 Mould Making - Milling

A mould making program is generated, using an example.

Sequence



#### 17.1 Prerequisites

In addition to machining step programs, ShopMill can also process G-code mould making programs. The prerequisite for this are optimized drives.

#### **Program Structure**

In order to attain the optimum velocity control for the mould making programs, you should divide the mould making program into a central technology program and separate geometry programs, and not generate one complete program.

#### **Technology Program**

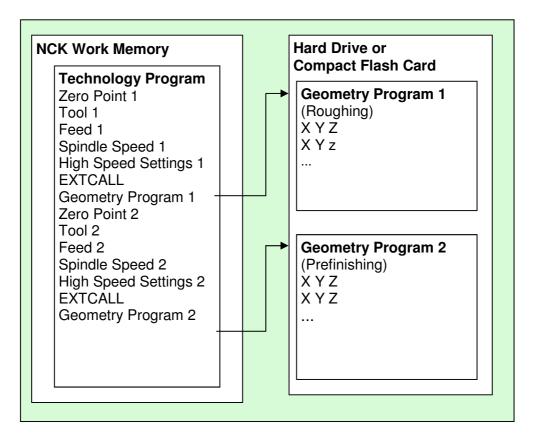
The technology program includes the basic settings such as zero point shift, tool calls, feed values, spindle speed, and control commands for velocity control. In addition, the technology program calls the

geometry programs as subprograms. The technology program can be generated in the ShopMill's G-code editor..

#### **Geometry Program**

The geometry programs of the individual machining modes (roughing, prefinishing and finishing) exclusively contain the geometry values for the free form surface to be machined. The geometry programs are generated on an external CAM system in the form of G01 blocks. Depending on their application, the geometry programs have a size of 500KB up to 100MB. Programs of this size can no longer be processed directly in the NCK work memory, but have to be processed externally by means of EXTCALL. That means, the geometry programs have to be stored either on the hard drive of the PCU 50.3 (HMI Advanced) or on a Compact Flash Card at ShopMill on NCU (HMI Embedded). For both ShopMill variants you also have the option to store the geometry programs on a network drive.

### 17.2 Program Structure Technology Program with Geometry Program

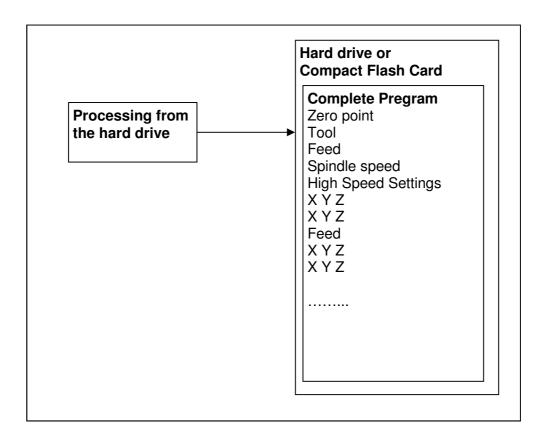


#### **Complete Program**

Complete programs include the basic settings such as the zero point shift, tool function <<T word>> etc. as well as the geometriy values of the free form surface to be machined. However, programming the optimized velocity control for a complete program is very complicated. Complete programs are also generated on enternal CAM systems. Because of their size, the complete programs are located on the hard drive of the PCU 50.3 (HMI Advanced) or on the CompactFlash Card at ShopMill on the NCU (HMI Embedded).

Here also you have the option to store the complete programs on a network drive.

#### 17.3 Program Structure Complete Program



#### Data Transmission

A mould making program can be copied directly to the controller from a network drive or a USB drive.

• ShopMill on NCU (HMI Embedded)

• The programs are copied to the user memory of the CompactFlash card.

• PCU 50.3 (HMI Advanced)

The programs are copied to the hard disk drive.

#### Measuring the Tool

When generating the geometry program, the CAM system takes the tool geometry into account. The calculated tool path refers either to the tool tip or the tool center point. That means, when you specify the length of your tools, you have to use the same reference point (tool tip or tool center point) as the CAM system. If you are using a ShopMill function for measuring your tools, the tool length refers to the tool tip. If, on the other hand, in the CAM system the tool center point was taken into account when calculating the tool path, you have to deduct in the tool list the radius of the tool from the length of the tool. To process mould making programs, the entry of the tool diameter in the too list is not relevant. However, to have a better overview, you should enter the tool diameter in the tool list nevertheless.

#### 17.4 Creating the Program

### Setting Up the Program

For the technology program, set up a new Gcode program in the program manager and then edit it there.

Editor. A machining step program is not suitable as a technology program.

Create the geometry program or the complete program with an external CAM system. If afterwards you would like to add comments, for example, to the geometry program, or change the tool name in the complete program, you can use also the ShopMill G-code editor for this.



Use the arrow keys to open a directory.



After entering a program name,

VERZEICHNIS									
	Name		Тур	Größe	e Datum/2	eit.			
<u>د</u> ) ۽	SHOPMILL.	WPD\							
							ShopMill Programm		
							G-Code Programm		
	Neues G	i-Code Pro	gramm						
	Bitte geben Sie den neuen Namen ein:								
		FO	RMENBAU_A223						
							Abbruch		
Freier Speicher				NC:	2543616	✓ ОК			
	NC			ମ୍ମ Ca	rd 🕅 USB				

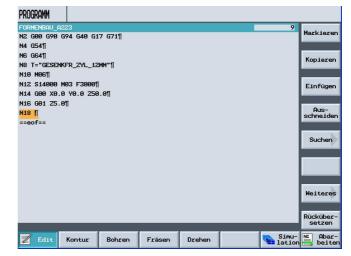


the G-code Editor under ShopMill is opened.

#### **Programming the Tool**

If you program a tool in the technology program, you have to take note of the following: The geometry of the programmed tool has to agree with the tool geometry that the CAM system took into account when the geometry program was generated.

First, the tool, the spindle speed and the spindle direction are programmed. In addition, the following is programmed: feed, switching on the coolant, and the zero point shift with the starting point.

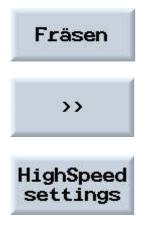


#### 17.5 High Speed Settings

#### Programming the Cycle "High Speed Settings"

When machining free form surfaces, great demands are made on the speed as well as the accuracy and surface quality. You can attain the optimum velocity rate in dependence on the machining mode (roughing, pre-finishing, finishing) very simply by using the cycle "High Speed Settings". You can call the cycle by means of the cycle support in the G-code editor. As a rule, the output tolerance of the post processor of the CAM system is entered in the parameter "Tolerance". Program the cycle in the technology program prior to calling the geometry program.

After pressing the softkeys

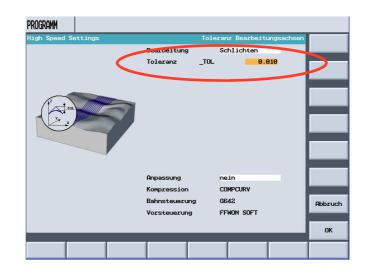


Programm								
FORMENBAU_A223					9	Markier		
N2 G00 G90 G94 G40 G	i17 G71¶					Markier		
N4 G54¶						-		
NG G64¶						Kopiere		
N8 T="GESENKFR_ZYL_1	.2MM"¶							
	110 M06¶							
N12 S14000 M03 F3000						Einfüge		
	114 G00 X0.0 Y0.0 Z50.0¶							
N16 G01 Z5.0¶						Aus-		
N18 👖						schneid		
==eof==								
						Sucher		
						_		
						-		
						_		
						Weitere		
						_		
						Rückübe		
	_	_	_	_		setzer		
					Simu-	NC Aba		
Edit Kontur	Bohren	Fräsen	Drehen		Salation	bei		

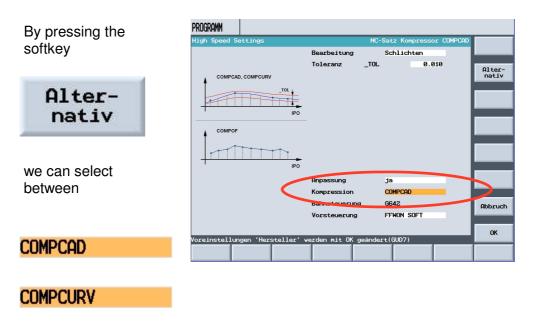
### **High speed settings**

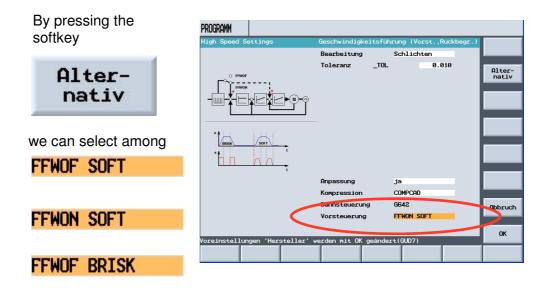
	PROGRAMM	
the following input screen form opens, where we can select among the machining modes	High Speed Settings Auswahl der Bearbeitung: Schlichten Oberflächengüte Bearbeitung Schlichten rolerenz TOL 0.818	Alter- nativ
Schlichten	Genauigkeit Geschwindigkeit	
Vorschlichten	Anpassung nein Kompression COMPCURV Bahnsteuerung G642 Vorsteuerung FFWON SOFT	Abbruch
Schruppen		ок

Tolerance The required tolerance can be entered in the input screen form in the cycle for the program generated from the CAM system.



If the compressor is active, it can be parameterized by means of the input screen form.





### Pressing the softkey



closes the input screen form.

"CYCLE832" was accepted into the program.

PROGRAMM	
FORMENBAU_A223 15	Markieren
N2 G00 G90 G94 G40 G17 G71	THE REAL OF
N4 G5411 N6 G6411	
N8 T="GESENKFR ZYL_12MM"	Kopieren
N10 M06[]	
N12 S14000 M03 F3000 M08	Einfügen
N14 G00 X0.0 Y0.0 Z50.0¶	Lannagan
NIC 201 23.01	Aus-
N18 CYCLE832(0.01,102001)	schneiden
1 ==eof==	Suchen
	K
	Weiteres
	Rücküber-
Y	setzen
	NC Abar-
Edit Kontur Bohren Fräsen Drehen Simu-	

#### 17.6 Calling the Subprogram

Call the geometry program as subprogram from the technology program. Since the geometry programs are not stored in the NC work memory but on the hard disk drive of the PCU 50.3, or on the Compact Flash Card of theTCU, or on a network, the subprogram has to be called with the G-code command "EXTCALL".

#### PCU 50.3

The technology program and the geometry programs are located in the same directory on the hard disk drive. EXTCALL "Geometry program" Example: EXTCALL "SCHRUPPEN" <<ROUGHING>>

#### NCU HMI Embedded

Depending on the storage location of the geometry program on the Compact Flash Card, the programming syntax differs somewhat. • The geometry program is located directly on the Compact Flash Card EXTCALL ("C:\Geometrieprogramm.mpf") Example: EXTCALL ("C:\Schruppen.mpf") • The geometry program is located in a directory on the Compact Flash Card EXTCALL ("C:\Verzeichnis\Geometrieprogramm.mpf") Example: EXTCALL ("C:\Mold\Schruppen.mpf")

#### Network drive

If the geometry program is located on a network drive connected by means of the Ethernet, the programming syntax is as follows. EXTCALL ("Pfad\Geometrieprogramm.mpf") Example: EXTCALL ("H:\Mold\Schruppen.mpf")

	PROGRAMM							
	FORMENBAU_ N2 G00 G90		17 G71¶				15	Markieren
	N4 G54¶							
	N6 G64¶							Kopieren
	N8 T="GESE	NKFR_2YL_12	SMM " ]					
	N10 M06¶							
Here, a program is	N12 S14000 N14 G00 X0							Einfügen
			1.01					
called that is stored	N16 GØ1 Z5	32(0.01,102					=	Aus- schneiden
on the CFCard as		L "mpf.dir/	rough_1.mp	FM			=	
mpf– program.	N22 M30¶ ==eof==				ノ			Suchen
I= I= -3								
								Weiteres
								Rücküber-
			_		_			setzen
	E	Kanduan	Bohren	Fräsen	Ducken		📉 Simu-	NC Abar-
	🗾 Edit	Kontur	Bonren	Frasen	Drehen		🔁 lation	📥 beiten

Markiere

Kopierer

Einfüge

Aushneide

### **SIEMENS**

#### 17.7 Processing the Program

Select the technology program that is located in the NCK work memory like a standard G-code program for processing. The geometry program is then selected automatically with the command "EXTCALL".

A complete program that is located either on the hard disk drive of the PCU 50.3 (HMI Advanced), or on the Compact Flash Card at ShopMill on NCU (HMI Embedded), or on a USB /network drive, is selected with the softkey "Execute hard drive" in the program manager.

Prior to executing the program, the program is simulated graphically by pressing the softkey PROGRAMM

N4 G54¶

N2 G00 G90 G94 G40 G17 G711

N6 G64¶ N8 T="GESENKFR\_ZYL\_12MM"¶

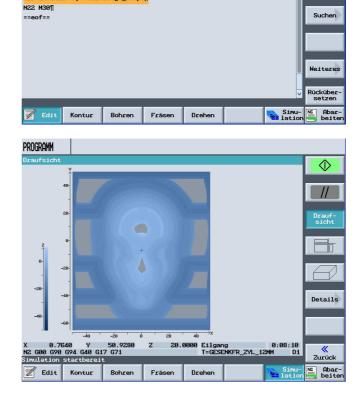
N10 M061 N12 S14000 M03 F3000 M081

N14 G00 X0.0 Y0.0 Z50.0

N18 CYCLE832(0.01,102001)

N20 EXTCALL "mpf.dir/rough\_1.mpf





#### Pressing the softkey



and



the program is selected in the operating area "Auto".

Reset		\_N_WKS_DIR\_N_SHOPMILL_WPD	G-				
		FORMENBAU_A223	Funktion				
WKS	Position [mm]	T,F,S					
Х	0.000	C GESENKFR_ZYL_12MM D Ø 12.000 B↓2	FUNKCIO				
Y	0.000						
	0.000	F 0.000 1007					
Z	0.000	<b>C</b>					
A C	0.000 0.000	S 14000 X 1009	Lauf- zeiten				
Hullpkt1		0% 100% 200	×				
ktueller S	Satz	FORMENBAU_A223.MPF					
N2 G00 G90	G94 G40 G17 G71						
N4 G54							
NG G64							
N8 T="GESE	NKFR_ZYL_12MM"						
N10 M06			Istwert MKS				
N12 S14000 M03 F3000							
N14 G00 X0.0 Y0.0 Z50.0							
N16 GØ1 25	.0						
		Σ					

The program can be executed in the single block.



With "Cycle Start" the program can be executed step by step.



M AUTO				
▲ Aktiv		\_N_WKS_DIR	_N_SHOPMILL_WPD	G- Funktion
WKS	Position [mm]	Restweg	T,F,S	
х	0.764	0.000	T GESENKFR_ZYL_12MM D1 g 12.000 B↓2	Hilfs- Funktion
Y	52.555	-33.892	F 800.0	Alle G-Funk.
Z	0.000	0.000	C 5000	
A C	0.000 0.000	0.000 0.000	5 5000. n 100% 14000 I	Lauf- zeiten
H Nullpkt1			8% 188% 2889	
Aktueller Satz N10 G120F800. Y18.609		ERIK/DATA/PF	ROG/MPF.DIR/ROUGH_1.MPF	
X1.968Y18.553				Istwert MKS
	Über-	NC Prog. NC S	atz- 🚺 Mit-	Prog.
	speich	Beeinf 🛃 su	ichl. 🚬 🔁 zeich	korr.

After positioning, the program can be executed without a single block.

#### 17.8 Starting Processing at a Certain Program Location

#### **Executing the Program**

### Starting Processing at a Certain Program Location

In order to start in a geometry program the execution of a certain program segment, enter the destination in the search pointer. Layer 1 (technology program): Program line with the call of the desired geometry program

Layer 2 (geometry program): Program line for starting processing. If the geometry program is located on the Compact Flash Card, you not only have to specify in Layer 2 in the input field "Program" the program name, but also the path. Select the accelerated calculation variant "External - without calculation". The block search in the technology program is performed with calculation. In that case, all EXTCALL commands before the desired geometry program are skipped. The block search in the desired geometry program is performed without calculation. However, this calculation variant presupposes that all machine functions such as tool function, spindle speed etc. are located in the technology program. The geometry program must only contain geometry values for the free mold surface.

The line for starting the program can be selected with the arrow keys.



After pressing the two additional softkeys





🗹 auto					
// Reset		\_N_WKS_DIR	\_N_SHOPMILL_WPD		G-
		FORMENBAU_A	223		Funktion
WKS	Position [mm]		T,F,S		
Х	-7.090		T GESENKFR_ZYL_ ø 12.000	12MM D1 ä↓z	Hilfs- Funktion
Y	29.187		F 0.000		Alle G-Funk.
Z	-3.000		S	100	
A C	0.000 0.000		14000 14000		Lauf- zeiten
H Nullpkt1	l .		0% 100%	200%	
Aktueller S	Satz	FORMENBAU_A	223.MPF		
N2 G00 G90	G94 G40 G17 G71				
N4 G54					
NG G64					
N8 T="GESE	NKFR_ZYL_12MM"				
N10 M06					Istwert
N12 S14000	M03 F3000				MKS
N14 G00 X0	.0 Y0.0 Z50.0				
N16 G01 25	.0				
				$\sum$	
	0ber- speich	NC Prog. NC S Beeinf	atz- uchl.	Mit- zeich.	Prog. korr.

the selected program block is active.

By then pressing the key



the message 10208 Channel 1 for contunuing the program appears. Press NC Start



If we want to start from a certain program point, the program is started by pressing



and



and entering the program number

and pressing the softkey



Unterbroc	hen	\_N_WKS_DIR\_N	_SHOPMILL_WPD	G-			
		FORMENBAU_A223		Funktion			
WKS	Position [mm]	Restweg T,	F,S				
х	-7.090	0.0001	GESENKFR_ZYL_12MM D1 ø 12.000 ä⊥z	Hilfs- Funktion			
Y	29.187	0.000 <sub>F</sub>	<b>0.000</b> 8.000 mm/min	Alle G-Funk.			
Z	-3.000	0.000					
A C	0.000 0.000	0.000 0.000	0.000 🕅 100% 0.000 I	Lauf- zeiten			
Hullpkt1		8%	100X 200X				
ktueller Sa	atz	FORMENBAU_A223	MPF				
	G94 G40 G17 G71			-			
N4 G54							
NG G64							
N8 I="GESEN N10 M06	KFR_ZYL_12MM"			Istwert			
N10 M06 N12 S14000 M03 F3000							
N14 G00 X0.0 Y0.0 Z50.0							
N16 G01 25.0							

m auto									
// Reset					A11900	\_N_SHOPMIL	.L_WPD		O Alternat.
				FURME	NBAU_A	223			HIternat.
WKS	Position	- D	1m]			T,F,S			_
Х	-7.0					T GESENKF ø 12.00		.2MM D1 ∐d↓Z	
Y Z	29.1 -3.0					F	0.000 0.000	100% mm/U	Auf Endpunkt
<b>Д</b> С		.000				s	14000 14000	X 100%	Ohne Be- rechnung
Nullpkt1						0x	100%	200%	
Suchzeiger							Sa	tznummer	extern- ohne Ber
Programm		Ext	Р	Zeile	Тур	Suchziel			Of the Ber
1 : FORMENBA	J A223	MPF		0	N-Nr.	N20		_	Unterbr.
2 : ROUGH 1	-	MPF	1	9	N-Nr.	N10			stelle
3:			0	9					
4 :			0	9					Such-
5:		1	0	0		1			zeiger
Б:			0	0					_
			-	-				$\sum$	K Zurück
	0ber- speich		NC	Prog. Beeinf	NC S	atz- uchl.		Mit- zeich.	Prog

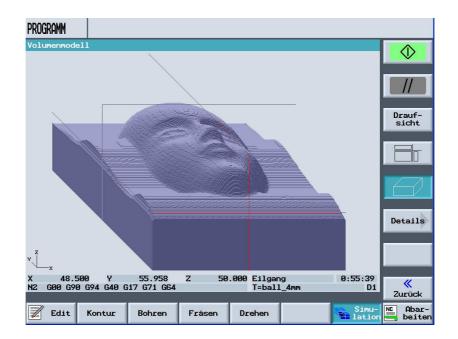
#### Sample Program PROGRAMM In the program area MOLD N36 10 Markiere "NC", a mould making Nub: OHE\_HZES N36 Me8[] N38 S14000 M03 F3000 M08[] N48 G00 X0.0 Y0.0 Z50.0[] N44 G01 Z5.0[] N46 extcall "mpf.dir/rough\_3.mpf"[] N56 F='ball\_0mm'[] N51 M60[] N51 M60[] N52 S14000 M03 F3000 M08[] N54 G01 Z5.0[] N56 G01 Z5.0[] N56 G01 Z5.0[] N56 extcall "mpf.dir/prefinish.mpf"[] N68 extcall "mpf.dir/prefinish.mpf"[] N64 M06[] N64 M06[] N64 N65[] N64 S14000 M03 F3000 M03[] N65 S14000 M03 F3000 M03[] N70 G01 Z5.0[] N70 G01 Z5.0[] N70 G01 Z5.0[] N70 G01 Z5.0[] MØGT program is opened. Kopieren Einfüge Aus-chneide Suchen Pro-NC gramm Weiteres N71 CYCLE832(0.01,212001)¶ N74 extcall "mpf.dir/finish.mpf"¶ N76 M30¶ Rücküber-setzen NC NC Simu-lation NC Abar 7 Kontur Bohren Fräsen Drehen

The corresponding technology data is located on the "CF Card". With a mouse click, it was loaded to the "CF Card" with a USB stick.



Name	Тур	Größe	Datum/Z	eit	
∟ mpf.dir/					
A223_MOLD_DIE	MPF	429	08.11.2006	17:47	
finish	mpf	2713585	07.11.2006	13:51	Neu
MOLD_DIE_A223	MPF	1068	08.11.2006	17:47	
prefinish	mpf	227355	06.11.2006	16:55	Um- benennen
rough_1	mpf	38340	07.11.2006	16:18	
rough_2	mpf	221	06.11.2006	16:53	Markiere
rough_3	mpf	100267	06.11.2006	16:55	
					Kopierer
					Einfüger
					Löschen
reier Speicher		414 MB	yte NC:	2540544	Weiteres

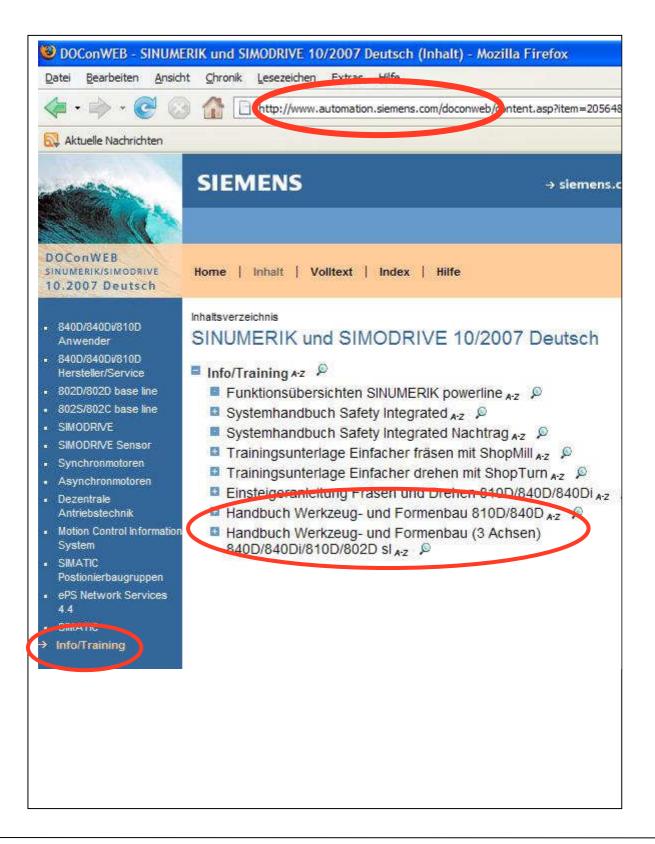
#### 17.9 Simulation of a Volume Model





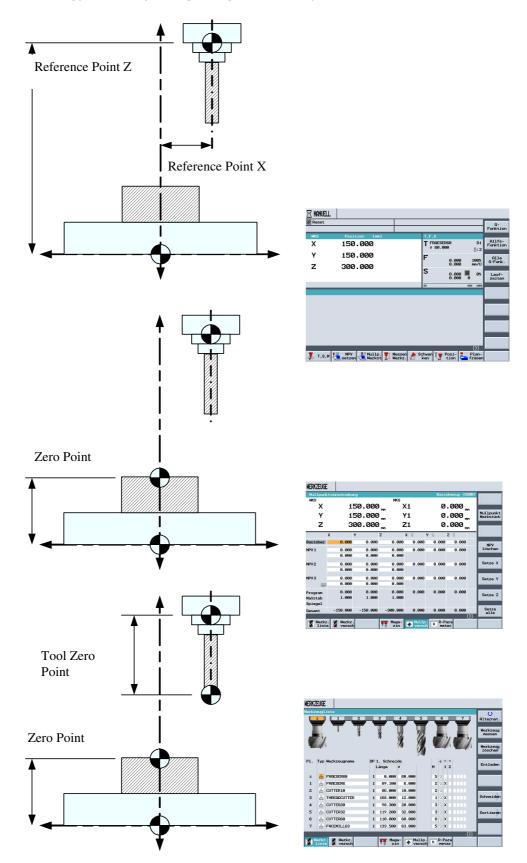
#### 18 Information about Mould Making

Information about mould making is provided on the Internet under www.automation.siemens.com/doconweb/



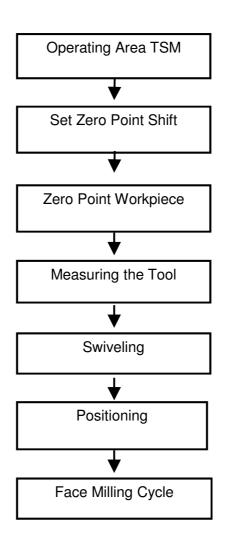
#### **19 Fundamentals of CNC Machines**

The difference between a manual and a CNC machine consists of the logic operation of numerical values. This module about the basics of CNC technology is to aid you regarding the CNC myth.



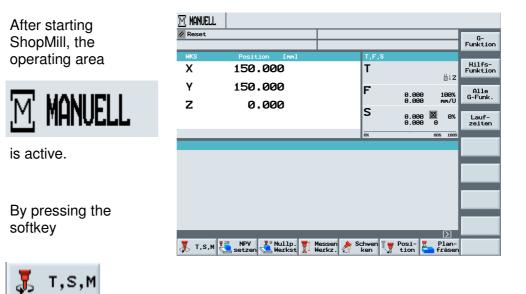
### 20 Manual Operating Area - Milling

In this module, the individual function areas in the manual operating area are presented and if necessary, explained by using an example.



#### 20.1 Operating Area TSM

**Tool Spindle Speed Machine Functions** 



the input window for operating the machine manually is displayed.

•	
Spindel	U/mir
Spindel M-Fkt.	
Sonst. M-Fkt.	
Nullpktv.	
Maßeinheit	
Werkzeugachse	

Reset				 			1
WKS	Po	sition	[mm]	T,F,S			
х	15	0.000	)	Т		₿↓ z	Werkz
Y Z	15	0.000		F	0.000 0.000	100% mm/U	Nullp
2		0.000	)	s	0.000 0.000	⊠ 0% 0	
				 0X		80% 100	
S,M			-		Werk	zeugname	
т			2				
Spinde Spinde	∍l ∋l M-Fkt		U/min				
Sonst Nullpl	. M-Fkt. <tv.< td=""><td></td><td></td><td></td><td></td><td></td><td></td></tv.<>						
Maßein Werkze	nheit augachse						Zuri

In the first input	MANUELL		
screen form, the tool	// Reset		
is defined.	WKS Position [mm]	T,F,S	
	X 150.000	T∦å↓z	Werkzeuge
	Y 150.000	F 0.000 100% 0.000 mm/U	Nullpunkt versch.
T D	Z 0.000	<b>_</b>	
		0.000 0	
The spindle speed	Т,S,M	0% 88% 188% Werkzeugname	
can be entered only in	T D		_
	Spindel U/min Spindel M-Fkt.		
U/min	Sonst. M-Fkt.		
07MIN	Nullpktv. Maßeinheit		<b>«</b>
	Werkzeugachse		Zurück
	🐺 T,S,M 🎦 NPV 🛃 Nullp. 🚏 Me	essen 👌 Schwen 🚺 Posi- 🌄 Plan- erkz. 🤌 ken 🏹 tion 🌄 fräsen	
In the additinal input field	ds.		
M-functions and zero po			
shifts can be input.			
<b> </b>			
Sonst. M-Fkt.			
Nullpktv.			
We can select			
between the			
measurement units			
MM			
in			
10			
The tool axis			
kla rtva ou go ob o o			
Werkzeugachse			
can also be selected.			

Example:



After calling the tool with the corresponding technology

Т	Schaftfra	eser_20	D1	
Sp:	indel		1200	U/min
Sp:	indel M-Fkt	. 🗾	5	

the tool with the input technology data is activated by pressing the NC start key



🗹 MANUELL					
// Reset					U
					Alternat.
WKS	Position [mm]		T,F,S		
Х	150.000	I	т		Werkzeuge
Y	150.000	I	_	ä↓z	
Z	0.000		F 0.000	100% mm/U	Nullpunkt versch.
2	0.000		S 0.000	⊠ 0% 0	
			0x	80% 100%	
T,S,M		rechts	s/links/aus/posi	tionieren	
T S	chaftfraeser_20 D1				
Spind Spind	lel 1200 U/min lel M-Fkt. 2				
Sonst Nullp	. M-Fkt. ktv.				
Maßei	nheit				
Werkz	eugachse				<b>«</b> Zurück
-	₹20 NPV 🚺 Nullp. 實↑ I	Messen 🔈 Sci	hwen T 🖷 Posi-	∑ Plan-	
🛃 Т, S, M	NPV Nullp. Til		ken tion	fräsen	

T,F,S		
T KUGEL_6 ø 6.000		D1 ∐↓Z
F	0.000 0.000	100% mm/U
S	14000 14000	X 100%
	100%	200%

#### 20.2 Operating Area Set NPV

The operating area "Set NPV" is needed for synchronizing the axes and the workpiece.

#### Example:

The edge of the workpiece is scratched.with a milling tool.

### By pressing the softkey



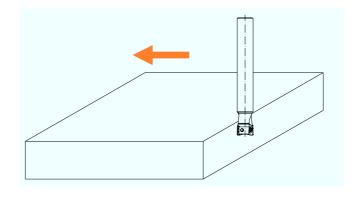
the value for the current axis is colored.

Using the following softkeys, each axis can be "zeroed"..



Also, using the machine keyboard, any value can be entered in the field that is currently selected, or with





MANUELL				
// Reset				
WKS	Position [mm]	Τ,	,F,S	
X	150.000	Т	Schaftfraeser_20 D: ø 20.000 ä⊥;	
Y Z	150.000 200.000	F	0.000 1009 0.000 mm/l	
2	200.000	s	0.000 🕅 0% 0.000 0	
		8%	80% 100	×
Т,Ѕ,М			Werkzeugnam	2
т	D			
Spinde Spinde	el U/min el M-Fkt.	n		
Nullpk				
Maßeir				«
Werkze	eugachse		$\left[ \right]$	Zurück
📕 Т,Ѕ,М	₹28 NPV Setzen Werkst	Messen 👌 Schw Werkz. ker	en 📲 Posi- 👖 Plan	

M MANUELL				
🥢 Reset				X=0
WKS	Position [mm]	T,F,S		
Х	150.000	T Schaftfraeser_ ø 20.000	_29 D1 ₿↓Z	Y=0
Y Z	150.000 200.000	F 0.000	100% mm/U	Z=0
Z	200.000	S 0.000 0.000	⊠ 0% 0	
		8%	86% 166%	
				Löschen X=Y=Z=Ø
🥇 Т,S,M	Verkst	Messen 촩 Schwen Ţ Posi-	≥ P1an- fräsen	<b>«</b> Zurück

the value of the axis can be set to zero.

#### 20.3 Operating Area Zero Point Workpiece

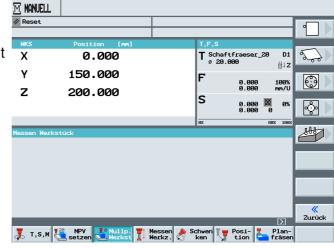
		M MANUELL					
The value is taken into		/ Reset					G- Funktion
		WKS	Position [mm]		T,F,S		
account in the active		х	0.000		T Schaftfraeser_ ø 20.000	_20 D1 ∦↓Z	Hilfs- Funktion
	oint shift and	Y	150.000		F 0.000	100%	Alle
entere	ed in the zero point	z	200,000		0.000	100% mm/U	G-Funk.
table					S 0.000	⊠ 0% 0	Lauf- zeiten
					8%	80% 100%	
Х	0.000						
Y	150.000						
•							
Z	200.000						
			_	_	_		
		, т, s, м	NPV Nullp. T		chwen 📑 Posi- ken 🚺 tion	Plan- fräsen	

In this operating mode, the value for the workpiece measurement can be written directly into the desired zero point shift.

ShopMill Version 6.4 offers many options for this.

Pressing the softkey





offers five options for determining the zero point.







Edge



Drilling rectangular pocket

Spigot Rectangle



Aligning the plane



The described cycles can be utilized by using a manual touch probe or an automatic touch probe.

By pressing the softkey	M MANUELL			1
°	wks X Y Z	Position [m] 0.000 150.000 200.000	T,F,S T Schaftfraeser_20 D1	€ ••
the options for "Edge measurement" under ShopMill are displayed.	Kante	120 NPV 10 Nullp: 1 Mas setzen Herkst	ex ex 1984	

#### Pressing the softkey



opens the input screen form.

After selecting the zero point shift

Figure resolution and sold in the	etine wat	STORES OF ANY ANY ANY ANY	an e groon and
Nullpktv.		1	G54

and the axis



HKS     Position     [mn]     T,F,S     Alternat       X     0.000     T     Schaftfraeser_28     Di     Nullpunkt       Y     150.000     F     8.000     102     V       Z     200.000     F     8.000     8.000     8       S     8.000     8.000     8     V     2       S     8.000     8.000     8     2       S     8.000     8     9     8       V     100     100     100     2       Z     X     150.000     Nullpunkt     2       S     8.000     8     9     9       V     100     100     100     2       Z     100     100     100     100       Z     100     100     100     100       Z     100     100     100     100       Z     300.000     100     100     100       Z     100     100     100     100       Z     100     100     100     100       Z     300.000     100     100     100       Z     100     100     100     100       Z     100     100     100					
HKS       Position       [m]       T,F,S         X       0.000       Schaftfrasser_28       Display         Y       150.000       F       Schaftfrasser_28       Display         Z       200.000       F       8.008       Mullpunktv         S       9.009       8.008       Mvrsch.       V         S       9.008       8.008       Mvrsch.       V         S       9.008       8.008       W       V         S       9.008       8.008       W       V         S       9.008       Morte       Mullpunktverschiebung       Z         V       9.009       2.008.000 m       Nullpunktverschiebung       Z         V       9.000       8.000 m       8.000       Nessrichtung       - 2.2         Print       20.000       8.000 m       8.000       8.000       X         V       9.000       8.000 m       9.000       X       Nullpunktverschiebung       Z         Print       2.008.000 m       9.000       9.000       8.000       X       X       X	// Reset				U
X       0.000       T       Schaftfræser_20       D1       Nullpunk:         Y       150.000       F       8.000       112       Y         Z       200.000       F       8.000       9%       Y         S       8.000       9%       Y <td< td=""><td></td><td></td><td></td><td></td><td>Alternat.</td></td<>					Alternat.
X     0.000     9.000     9.20.000     9.20.000     9.20.000     9.20.000     9.20.000     9.20.000     9.000     9.000     10.2     Y </td <td>WKS</td> <td>Position [mm]</td> <td>T.</td> <td>,F,S</td> <td></td>	WKS	Position [mm]	T.	,F,S	
Y       150.000       2       F       8.008       100%       X         Z       200.000       F       8.008       100%       X         S       9.000       8.008       0%       V         S       9.000       8.000       0%       V         S       9.000       8.000       0%       V         S       9.000       8.000       0%       V         S       9.000       8.000 m       2       0.000         Z       V       8.000 m       2       0.000         Z       V       8.000 m       2       0.000         Z       V       8.000 m       2       0.000         Z       0.000       2.000 m       0.000       0.000         Z       0.000       0.000       0.000       0.000     <	Х	0.000	T	- 00 000	versch.
Z 200.000 B 000 1000 S 0.000 S 0.000 0 S 0.000	v	150 000			2
Sinte setzen Meßvert speichern in Nullpunktverschiebung Auf 159.000 m V Sante setzen Meßvert speichern in Nullpunktverschiebung V 8.000 m 2 300.000 m Pau Pau 20 8.000 m Z 300.000 m Massverte: 20 10 10 10 10 10 10 10 10 10 10 10 10 10	-		F	0.000 100%	
Kante setzen     Meßwert speichern in Nullpunktverschiebung     2       2     Herte NPV: X 158.080 m Z 388.080 m Z 388.080 m Put     Nullpktv.     Basisbezug 0500 Messrichtung - 2 20     Basisbezug 0500 Messrichtung - 2 20     Nullpktv.       2     388.080 m Messwerte: 20     20     0.800	2	200.000	S	0.000 🔼 07	Y
Z Z 2 2 2 2 2 4 2 4 2 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5			85	88% 188	
Z X 159.989 m Y 8.889 m Z 388.986 m Pa 20 20 20 20 20 20 20 20 20 20 20 20 20	Kante setzen				J Z
A 136.000 m 2 380.000 m Pay 2 380.000 m Messverte: 20 Pay 20 Company 2 20 Pay 20 Company 2 20 Pay 20 Company 2 20 Co	z †				
Pou 28 MPV Setzen X Zurück			<sup>m</sup> 20		
Zurück					
	T	◎ NPV <b>T</b> ®Nullo <b>\</b> ♥↑ M	lessen 💧 Schw		Zurück

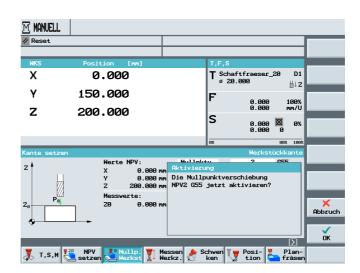
measurements can be made.

After the measurement is performed into <<?>> a non-active zero point, a query is displayed whether the zero point is to be activated.

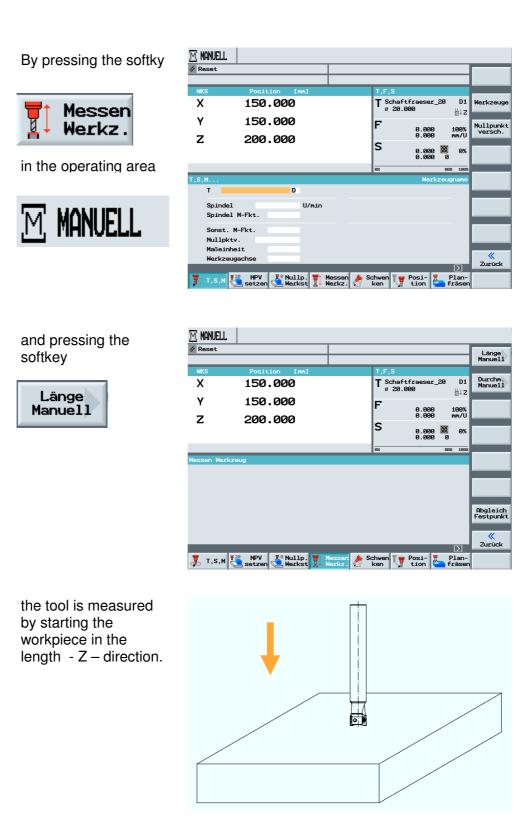
By pressing the softkey

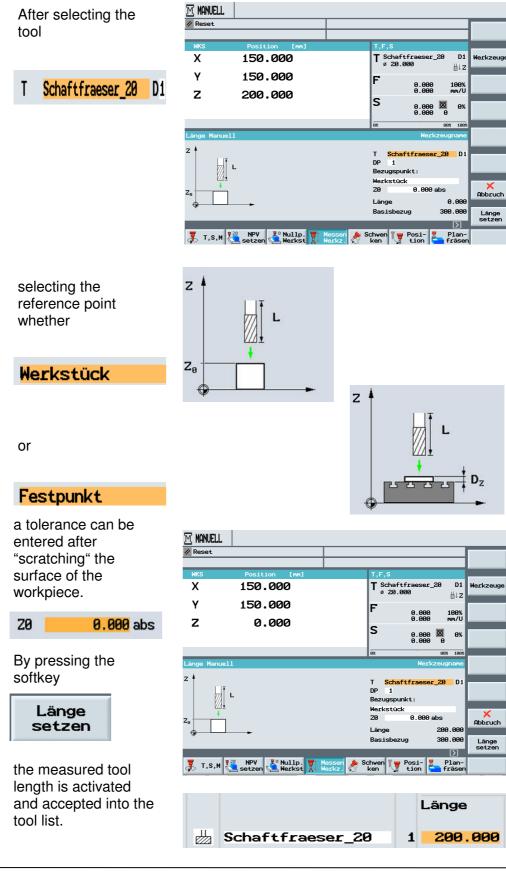


the input is accepted and the zero point is activated.

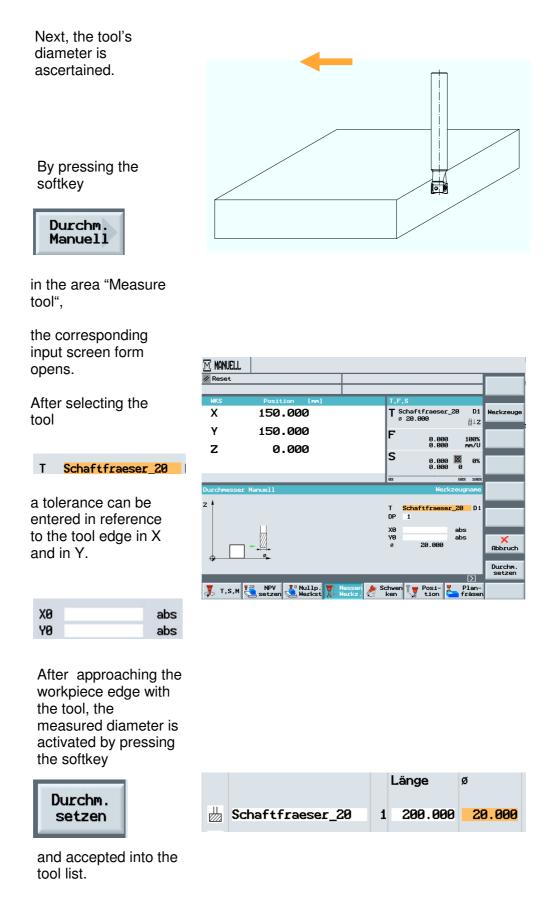


#### 20.4 Measuring the Tool Length

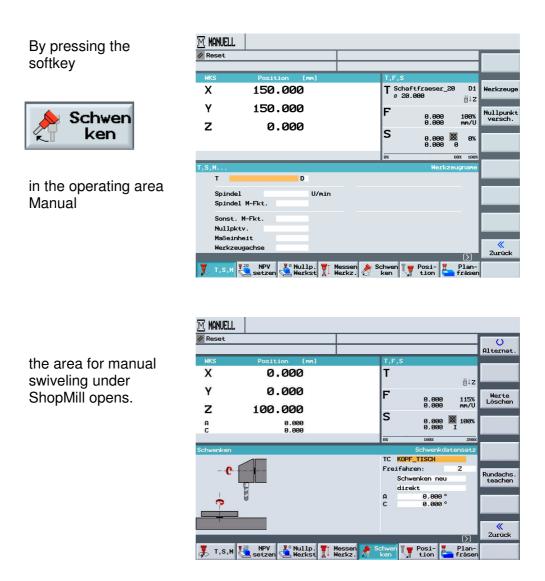




#### 20.5 Measuring the Tool Radius



#### 20.6 Swiveling



Manual swiveling under ShopMill is not part of the training document.

#### 20.7 Manual Positioning

By pressing the softkey



in the operating area



M MANUE									
// Reset									_
WKS	Posit	ion [m	1]		Т	,F,S			
Х	150	.000			ר	Schaft ø 20.0	fraeser_ 00	,200 D ∦↓	01 Werkzeuge Z
Y Z		.000 .000			F	5	0.000 0.000 0.000 0.000	198 mm/ 198	% Nullpunkt versch.
T,S,M					83	1	Werk	99% 19 zeugnar	98% NG
	ndel ndel M-Fkt.	D	U/min						
Son Nul Maß	st. M-Fkt. lpktv. einheit kzeugachse								
, т, s	,M 728 NPV	Nullp Werks	t T M	lessen lerkz.	A Schw ke		Posi- tion	≥ Plar fräs	n-

the target position is entered in the input fields.

x	230.000 abs
Y	230.000 abs
Z	120.000 abs

The travel motion can be entered in feed or

0.200 mm/U

M MANUELL	.		
// Reset			
WKS	Position [mm]	T,F,S	
Х	150.000	T Schaftfraeser_20 D1	
		ø 20.000 ģ↓z	
Y	150.000	F EILG. 199%	
Z	0.000	mm/min	
-	01000	S 8.666 🕺 6%	
		0.000 0	
		8% 88% 188%	
Positionie	ren	[mm/min]/[mm/U]	Eilgang
		X 230,000 abs	
		Y 230.000 abs	
		Z 120.000 abs	
		F <mark>* Eilgang *</mark> mm/min	
			<b>«</b>
		$\sum_{i=1}^{n}$	Zurück
🖡 Т,S,M	NPV Nullp. T Nullp.	lessen 🤌 Schwen 🥛 Posi- 📕 Plan- lerkz. 🤌 ken 🥊 tion Fräsen	

rapid feed

F

F \* Eilgang \* mm/min

There is no collision monitoring when the target position is approached.

#### 20.8 Manual Face Milling

Pressing the softkey



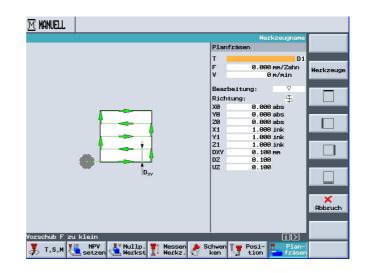
in the operating area



opens the input field for the face milling cycle.

MM	anuell		
∥ Re	set		
WK	S Position [mm]	T,F,S	
Х	150.000	T Schaftfraeser_20 D1 ø 20.000 ∦↓z	Werkzeuge
Y	150.000	F 8.899 199% 9.899 mm/U	Nullpunkt versch.
Z	0.000	S 8.000 8 8%	
		0% 80% 100x	
T,S,		Werkzeugname	
	T D		
	Spindel U/min Spindel M-Fkt.		
	Sonst. M-Fkt. Nullpktv.		
	Maßeinheit		
	Werkzeugachse		<b>«</b> Zurück
5	T,S,M T Setzen NPV Nullp.	Messen 👌 Schwen 🕎 Posi- 🦉 Plan- Werkz. 👌 ken 🚺 tion kråsen	ZULUCK

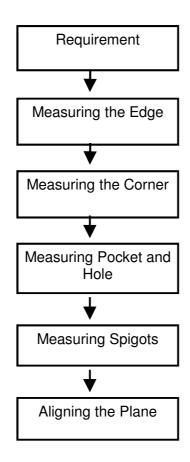
This face milling cycle is described in greater detail in the chapter "Programming Example Standard Milling Cycle".



The face milling in the operating area Manual described above offers the only possibility to utilize a cycle under ShopMill 6.4 without having to create a program.

### 21 Measuring the Workpieces in the Setup Mode JOG - Milling

This module describes how to work in the setup mode with measuring cycles under ShopMill, using an example.



#### 21.1 Measuring Manually – Measuring Automatically

#### Measuring Manually

When measuring the zero point manually, you have to move your tool manually to the workpiece. You can use edge probes, touch probes, or clock gauges whose radius and length is known. As an alternative, you can also use any tool with a known radius and a known length. However, the tools used for measuring must not be of the type 3DProbe.

#### **Measuring Automatically**

For automatic measuring, use exclusively electronic touch probes of the type 3D probes, or mono probes. The electronic touch probes have to be calibrated beforehand. For automatic measuring, preposition the probe first manually. After starting with the key "Cycle-Start", the probe is moved automatically with measuring feed to the workpiece and back again to the start position with rapid feed.

To be able to measure the workpiece zero point automatically, the machine manufacturer has to set up the measuring cycles beforehand.

Please take note of the machine manufacturer's data.

To obtain the desired measuring results, as a rule the sequence of the measuring points has to be noted that is shown in the help displays. Measuring points can be undone and then measured repeatedly. This is done by operating the softkey that is shown as being active (measuring value). For manual measuring, the reset can be made in any sequence; however, for automatic measuring only in the reverse measuring sequence.

#### Measuring Only

If you want to "only measure" the workpiece zero point, the measured values are displayed without the coordinate system being changed.

#### 21.2 Measuring the Edge

When measuring an edge, you have the following options:

• Setting the edge The workpiece is located on the work table parallel to the coordinate system. Measure one reference point in one of the axes (X, Y, Z).

• Setting up the edge

The workpiece is located randomly on the work table; that is, not parallel to the coordinate system. By measuring two points at the edge of the workpiece, you determine the angle to the coordinate system.

Distance 2 edges

The workpiece is loacted on the work table parallel to the coordinate system. Measure the distance L of two parallel workpiece edges in one of the axis (X, Y or Z) and determine its center.

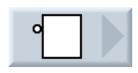
Below, an example is used to describe how to measure the edge of a workpiece.

For "Measure Edge," press the softkey below



and

SIEMENS



and





With the



Nullpktv.

By pressing the softkey

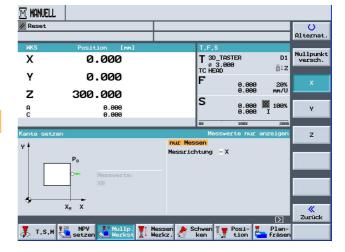


nur Messen



or

🐉 T,S,M 🎦 NPV 🚺 Hullp: T Messen 👌 Schven T Posi- E Plan-Fräsen



#### Pressing the arrow ey







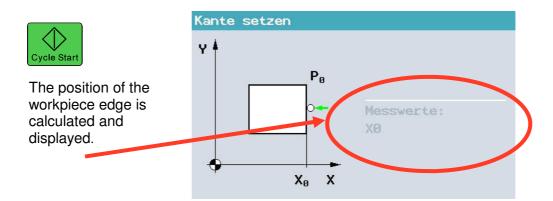
### To change the axes, press





For manual measuring, approach the workpiece with the probe.

For automatic measuring, approach the workpiece closely and press "CYCLE START".



#### 21.3 Measuring the Corner

You have the option of measuring workpieces with an angle of 90° as well as with any angles.

• Measuring a right-angled corner

The workpiece has a 90° corner and is located randomly on the work table. By measuring 3 points, the corner point in the working plane (X/Y plane) is ascertained and the angle  $\alpha$  between the reference edge at the workpiece (line through P1 and P2) and the reference axis (always the 1st axis of the work plane).

• Measuring any corner

The workpiece has any type of corner (not a rectangular one) and is located randomly on the work table. By measuring 4 points, we determine the following: the corner point in the work plane (X/Y plane), angle  $\alpha$  between the reference edge at the workpiece (line through P1 and P2) and the reference axis (always the 1st axis of the work plane), and angle  $\beta$  of the corner.

Below, measuring a workpiece under one angle is described.

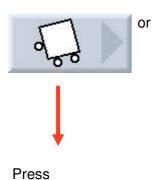
To measure the edge, press



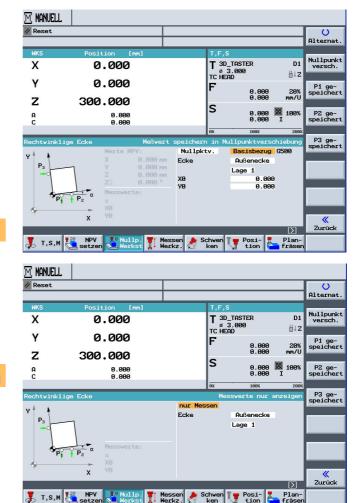
and



and





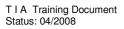


and go to

Nullpktv.

Press

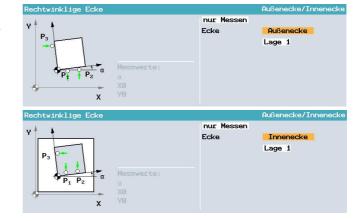




### Measuring a Corner

To select "outside corner" "inside corner" press





### To select the corner, press



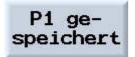
and



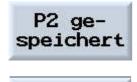


To measure "P1" approach it and press

P1 stored

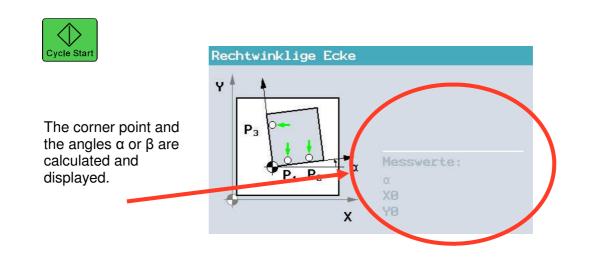


Repeat this for "P2" and "P3"



P3 gespeichert

For automatic measurements, move in front of the measuring point and press "CYCLE START"



#### **21.4 Measuring the Pocket and Hole**

You have the option to measure rectangular pockets as well as several holes, and then align the workpiece.

• Measuring the reactangular pocket

The rectangular pocket has to be set up at a right angle to the coordinate system. By measuring 4 points within the pocket, the length, width and center of the pocket is ascertained.

#### Measuring 1 hole

The workpiece is located randomly on the work table and has 1 hole. By means of 4 measuring points, we determine the diameter and the center of the hole.

#### Measuring 2 holes

The workpiece is located randomly on the work table and has 2 holes. In both holes, 4 points respectively are measured automatically and from that the center of the holes is calculated. From the connection line between the two center points and the reference axis, angle  $\alpha$  is calculated as well as the new zero point is determined that corresponds to the center of the 1st hole.

#### Measuring 3 holes

The workpiece is located randomly on the work table and has 3 holes. In the 3 holes, 4 points respectively are measured automatically and from that, the center of the holes is calculated. A circle is placed through the three center points. From that, the center of the circle and the diameter of the circle are ascertained. When selecting a phase angle correction, the basic rotation  $\alpha$  can be determined in addition.

#### Measuring 4 holes

The workpiece is located randomly on the work table and has 4 holes. In the 4 holes, 4 points respectively are measured automatically and from that the center of the holes is calculated. Two centers respectively of a hole are connected diagonally. From that, the intersection of the two lines is determined. When selecting a phase angle correction, the basic rotation  $\alpha$  can be determined in addition.

2, 3 and 4 holes can only be measured automatically.

Below, "Measuring a hole" s described.

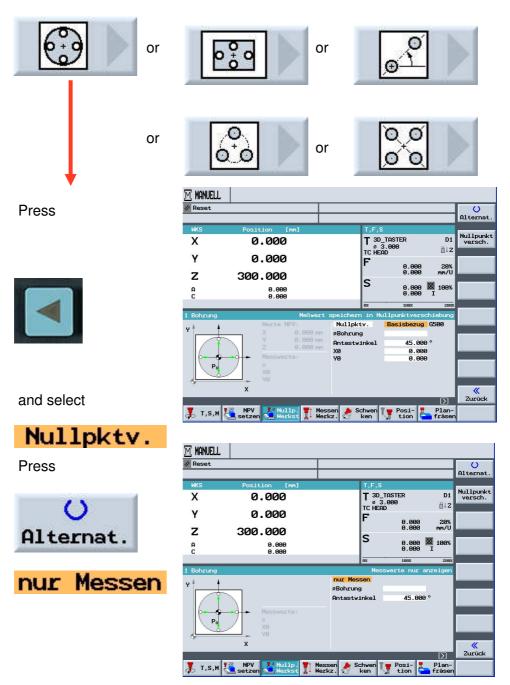
To measure the diameter and the center point of a hole, press



and



and



Go to "Hole diameter"





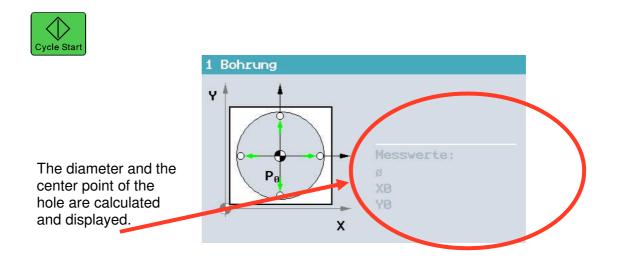
Select the "contact angle".



1 Bohrung			Antastwinkel
11 Å		nur Messen	
Y 1		øBohrung	
	Messwerte: ø X0 Y0	Antastwinkel 📒	45.000 °

Select the first point that is described in the menu as the first, and approach it.

For automatic measurement, move into the hole and press "CYCLE START".



### 21.5 Measuring Spigots

You have the option to measure and align rectangular spigots, as well as one and several circular spigots:

• Measuring the rectangular spigot

The rectangular spigot is to be aligned right-angled to the coordinate system. By measuring 4 points at the spigot, we ascertain the length, width and the center point of the spigot.

Measuring 1 circular spigot
 The workpiece is located randomly on the workpiece

The workpiece is located randomly on the work table and has 1 spigot. With 4 measuring points, we determine the diameter and the center point of the spigot.

• Measuring 2 circular spigots

The workpiece is located randomly on the work table and has 2 spigots. At the two spigots, 4 points respectively are measured automatically, and from that the center points of the spigots are calculated. From the connection line between the two center points and the reference axis, angle  $\alpha$  is calculated and the new zero point is determined that corresponds to the center point of the first spigot.

• Measuring 3 circular spigots

The workpiece is located randomly on the work table and has 3 spigots. At the three spigots, 4 points respectively are measured automatically and from that, the center points of the spigots are calculated. A circle is placed through the three center points, and the center point of the circle and the diameter of the circle are ascertained. When selecting a phase angle correction, the basic rotation  $\alpha$  can be determined in addition.

• Measuring 4 circular spigots

The workpiece is located randomly on the work table and has 4 spigots. At the four spigots, 4 points respectively are measured automatically and from that, the center points of the spigots are calculated. Two center points of the spigots respectively are connected diagonally, and then the intersection of both lines is determined. When selecting a phase angle correction, the basic rotaton  $\alpha$  can be determined in addition.

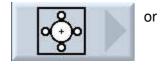
2, 3 and 4 circular spigots can only be measured automatically.

Below, measuring a spigot is described.

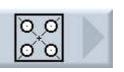
To measure the diameter or the center of a spigot, press



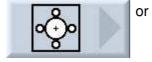
and

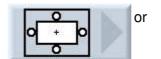


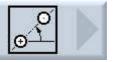




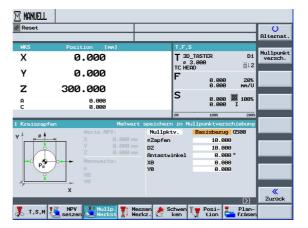
and









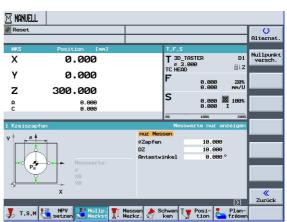


go to the



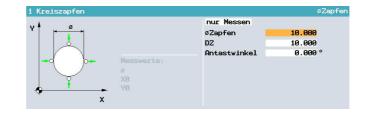
and press





With the cursor, go to Diameter Spigot and press





Go to the value "DZ" and press



Go the the contact angle and press

1 Kreiszapfen	Zus	tellung Messtiefe
<b>k</b>	nur Messen	
Z <sup>†</sup>	øZapfen	10.000
1	DZ	10.000
	Antastwinkel	0.000 °
Messwerte:		
Dz		
XU.		
• Y0		

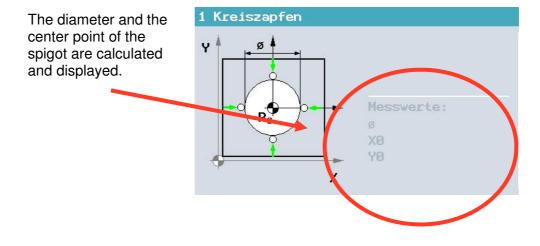


Select the first point that is described first in the menu, and approach it.

When measuring automatically, approach the workpiece and press "CYCLE START".







### 21.6 Aligning the Plane

You can measure a spacially oblique plane of a workpiece, and ascertain the rotations  $\alpha$  and  $\beta$ . With a subsequent coordinate rotation, the vertical alignment of the tool axis to the workpiece plane is possible. To determine the position of the plane in space, we measure in the tool axis at three different points. To align the tool axis vertically requires a tilting table or an inclinable head.

For the plane to be measured, the surface has to be even.

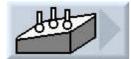
Below, measuring the oblique plane is described.

## Aligning the Plane

To align and measure an oblique plane, press



and

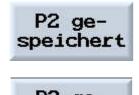


	M MANUELL					
	// Reset					O Alternat.
	WKS	Position [MM]		.F.S	_	HI COLHUCT
	х	0.000	1	3D_TASTER ø 3.000 C HEAD	D1 ä↓Z	Nullpunkt versch.
	Y	0.000	Ē		20%	P1 ge- speichert
	Z	300.000	s	0.000	mm/U	
. Press	A C	0.000 0.000		0.000		P2 ge- speichert
	Ebene ausric	chten Meßwe	rt speichern i	in Nullpunktvers	200% chiebung	P3 ge-
	Z	Herte NPV: X2 8.888 ° Y2 8.888 ° Messwerte: α β β	Nullpktv			speichert
. Go to		X				<b>«</b> Zurück
Nullpktv.	📕 Т, S, M		Messen 🁌 Schu Nerkz. 🤌 ke		≥ P1an- fräsen	ZULUCK
and press	M. MANUELL	1				
	/ Reset					U
100 A 2 4 4 4						Alternat.
$\mathbf{O}$	WKS	Position [mm]	Т	,F,S		Nullpunkt
$\sim$	х	0.000	T	■ 3D_TASTER ø 3.000 C HEAD	D1 ä↓Z	versch.
Alternat.	Y	0.000	Ē	0.000	20%	P1 ge- speichert
	Z	300.000		0.000	mm/U	spercherc
	A C	0.000 0.000	S	0.000 0.000	I 100%	P2 ge- speichert
nur Messen	<u> </u>	0.000	85	100x	200%	
HAL NESSEN	Ebene ausric	chten	nur Messe	Messwerte nur	anzeigen	P3 ge- speichert
		A A A A A A A A A A A A A A	_			
					Σ	Zurück

Approach the first measuring point that is shown in the cycle, and save it.

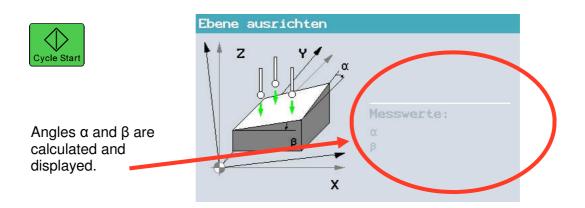


Then, approach the other points.



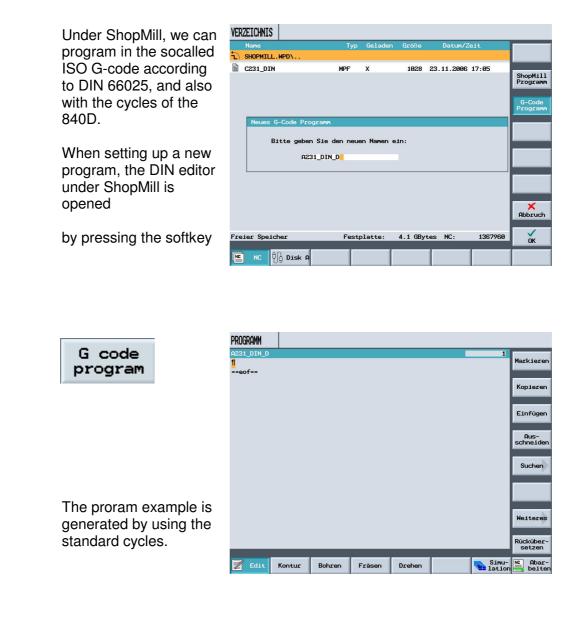
P3 gespeichert

For automatic measuring, approach the tool and press



### 22 DIN/G-Code – Programming under ShopMill

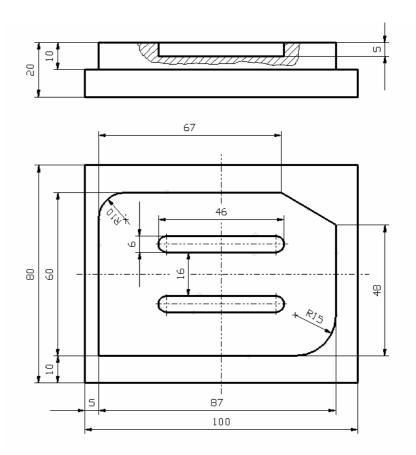
In this module, programming in DIN under ShopMill is explained, using an example.



- G17– Machining plane XY plane
- G41– Tool radius compensation (left)
- G54– Active zero point shift
- G90– Absolute measurement programming
- G94– Feed in mm/min

The follwing G-functions are used for generating the program.

The workpiece below is to be programmed in G-code with cycle support.



In contrast to the standard cycles, the ShopMill cycles include the approach and retract strategy to the contour.

PROGRAMM After entering the basic A231\_DIN\_D G00 G90 G94 G40 G17¶ commands, calling the Markiere T="FRASEN60"¶ tool and after the M0611 G94 S400 F270 M03 M0811 Kopierer approach position prior G90 G54 G00 X-35.0 Y-35.0¶ to processing, the <mark>1</mark> ==eof== Einfüger corresponding cycle is Aus-schneide opened by pressing the Suchen Weiteres Rücküber setzen Bohren Fräsen Drehen Simu- NC Abar lation deite Kontur



and

softkey



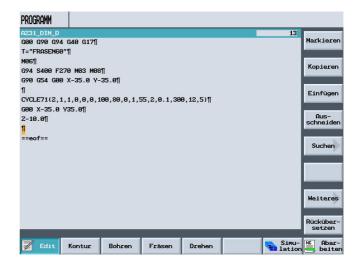
After entering the values and pressing the softkey

anfräsen/CYCLE71		Rückzu	gsebene,	absolut	1
	Rückzugsebene	RTP	2.000	â	
	Referenzebene	RFP	1.000		_
z i i i	Sicherheitsa.	SDIS	1.000		
	Tiefe	DP	0.000	ABS	
тр	Bearbeitung	Schli	chten		
	Bezugspunkt	PA	0.000		-
DISMID	Bezugspunkt	PO	0.000		
1	Länge	LENG	100.000	-	
	Länge	WID	80.000		
FALD	Winkel	STA	0.000		
	Zustelltiefe	MID	1.000		_
	Zustellbreite	MIDA	55.000		
	Freifahrweg	FDP	2.000		
	Schlichtaufm.	Fald	0.100		Abbru
	VFläche	FFP1	300.000		
	Fräsrichtung	zur 1	. Achse	~	ок
				_	_



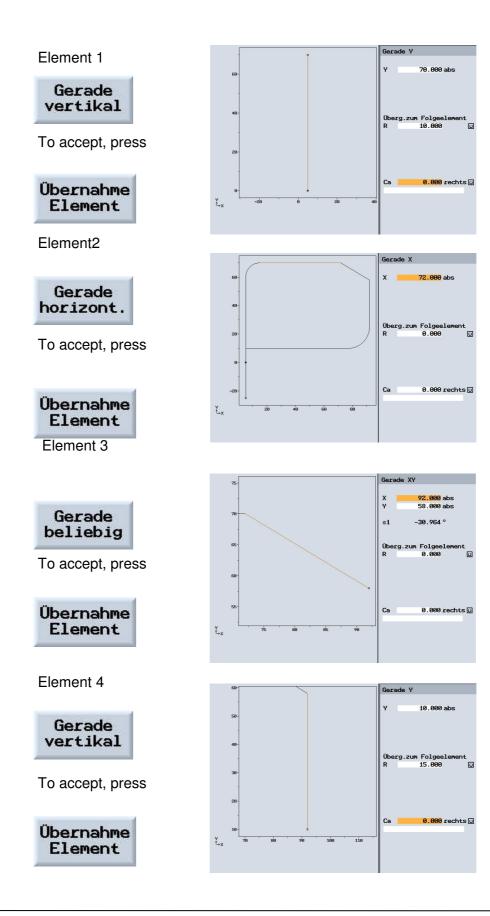
the cycle is closed and accepted.

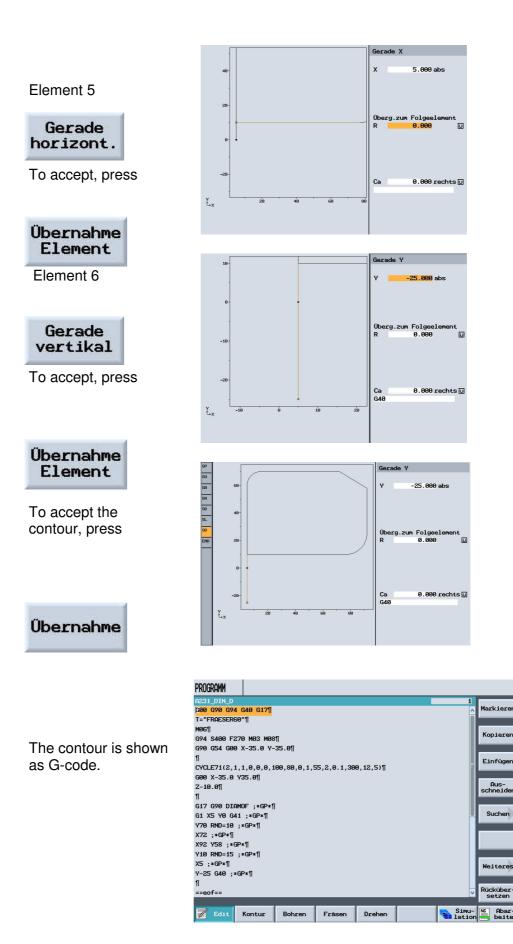
Next, the contour is described.



### 22.1 Generating the Contour with the Contour Calculator







37

With the second tool, the grooves are made.

Go to the end of the program

H231_D1N_D
Mgeli
G94 S400 F270 M03 M08¶
G90 G54 G00 X-35.0 Y-35.0¶
1
CYCLE71(2,1,1,0,0,0,100,80,0,1,55,2,0.1,300,12,5)¶
G00 X-35.0 Y35.0¶
Z-10.0¶
1
G17 G90 DIAMOF ;*GP*¶
G1 X5 Y0 G41 ;*GP*¶
Y70 RND=10 ;*GP*[]
X72 ;*GP*¶
X92 Y58 ;*GP*¶
Y10 RND=15 ;*GP*[]
X5 ;*GP*1
Y-25 G40 ;*GP*¶
1
G00 Z2.0¶
Z100.0¶
1

and set up a new tool with the technology data.

A231_DIN_D	41
G00 X-35.0 Y35.0¶	^
Z-10.0¶	
1	
G17 G90 DIAMOF ;*GP*¶	
G1 X5 Y0 G41 ;*GP*¶	
Y70 RND=10 ;*GP*¶	
X72 ;*GP*¶	
X92 Y58 ;*GP*¶	
Y10 RND=15 ;*GP*[	
X5 ;*GP*¶	=
Y-25 G40 ;*GP*¶	Ĩ
1	
G00 Z2.0¶	
2100.0¶	
T="FRAESER6"1	-
M06¶	
G94 S4200 F150 M03 M08¶	
G90 G54 G17 G00 X30.0 Y29.0¶	
G00 Z2.0	
==eof==	

Then, the start position is defined.

A231_DIN_D	50
X5 ;*GP*¶	^
Y-25 G40 ;*GP*1	
1	
G00 Z2.0¶	
2100.0¶	
T="FRAESER6"[	
G94 S4200 F150 M03 M08¶	
G90 G54 G17 G00 X30.0 Y29.0¶	
G00 Z2.0¶	
GØ1 Z-5.0¶	
X70.0 F560¶	
G00 Z2.0¶	3
X70.0 Y51.0¶	1
G01 Z-5.0 F150¶	
X30.0 F560¶	
G00 Z2.0¶	-
2100.0 M05 M091	
X-200.0 Y150.0¶	
M301	
==eof==	~

#### Pressing

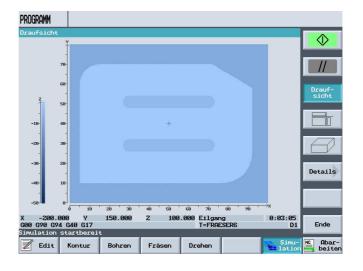
### Werkzeuge

opens the tool list of ShopMill.

After selecting the tool and pressing the softkey "into the program", the tool is included in the program.

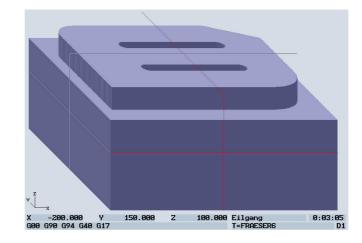
	ZEUGE					_	_		_		U
ų			3	4	5	ų		6		7	Alternat
									,	I.	ins Program
9						ų	1	4	1		Werkzeu 1öschen
P1.	Typ Werkzeugname	DP	1. Schnei Länge	de ø		н	4		∜ 2		Entlade
₽	FRAESER60	1	0.000	60.000		5	1	2			
1	FRAESER6	1	89.100	6.000		2	: 6	x			
2	LUTTER10	1	86.000	10.000		2	2		L		-
3	HREADCUTTER	1	168.000	12.000		1	2	x	T.		Schneider
4	UTTER20	1	98.300	20.000		3	5	x	T.		
5	LUTTER32	1	119.200	32.000		3	5	x			Sortierer
6	LUTTER60	1	110.000	60.000		6	5	x			
7	HACEMILL63	1	133.500	63.000		5	5	x			
										$\Sigma$	
	erkz. 🖉 Werkz.		TT Maga	- Null	Lp. B		) F	ar			

## By pressing the softkey





the familiar simulation can also be started for a DIN program.



You have the option to change the view using different softkeys.

### 23 Multiple Clamping

The function "Multiple Clamping" optimizes the tool changes by means of several workpiece setups. This shortens the idle time since first, all machining of a tool is executed on all clampings prior to the next tool change being activated.

In addition to two-dimensional clamping, you can use the function "Multiple clamping" also for rotating clamping bridges. To this end, the machine has to have an additional rotary axis (for example, an A axis) or a dividing unit.

Please note the manufacturer's data regarding this.

Not only identical, but also differing workpieces can be processed with this function.

The function "*Multiple Clamping for Different Programs*" is a software option.

ShopMill generates automatically a single program from several programs.

The tool sequence within a program is retained. Cycles and subprograms are not separated <<?>> Position patterns are processed as a unit <<?>>. The individual programs have to satisfy the following requirements:

- Only step sequence programs (no G-code programs)
- · Programs have to be runnable
- Program of the 1st clamping has to be positioned
- No tags/repetitions; that is, no jumps in the program
- No inch/metric switching
- No zero point shifts
- No coordinate transformations (shifting, scaling, etc.)
- Contours have to have unique names; that means, the same contour name must not be called in several programs

• In the removal cycle (contour milling) the parameter "Starting point" must not be set to "manual".

• No modal settings; that means, settings that have an effect on all subsequent data blocks (only for multiple clamping for different programs)

• Max. 50 contours for each clamping

Max. 99 clampings



Tags or repetitions that are not to be used in programs for multiple clamping can be circumvented by using subprograms. Open the Program Manager.

Weiteres Mehrfachaufspg. <<additional, multiple clamping>>

-Press the softkey "Weiteres" and "Mehrfachaufspg.".

-Enter the number of clampings and the number of the first zero point shift that is to be used.

The clampings are processed in an ascending sequence starting with the **Start-Zero point shift**. The zero point shifts are defined in the menu "Werkzeuge/Nullpunktverschiebungen" <<tools/zero point shifts>>

(refer to chapter "zero point shifts").

-Enter a **name for the new overall program** (XYZ.MPF).

-Press the softkey "OK".

A list is displayed in which the different programs have to be assigned to the zero point shifts. Programs don't have to be assigned to all zero point shifts -that is, clampings- but at least to two.

Press the softkey "Program selection".

The program overview is displayed.

-Place the cursor on the desired program.

-Press the softkey "OK".

The program is accepted into the assignment list.

-Repeat this process, until a program is assigned to each desired zero point shift.

-Press the softkey "Auf alle Aufspg.", if you want to process the same program on all clampings.

You also can assign different programs to individual zero point shifts first, and then assign the same program to the remaining zero point shifts by using the softkey

"Auf alle Aufspg." <<to all clampings>>

.-Press the softkey "Auswahl löschen" <<clear selection>> Or "Alles löschen",

if you want to remove individual or all programs from the assignment list. -Press the softkey "**Programm berechnen**", <<calculate program>> when the assignment list is complete.

The tool changes are optimized.

Then, the overall program is renumbered consecutively, and when changing between different clampings, the number of the current clamping is specified.

In addition to the overall program (XYZ.MPF), the file

XYZ\_MCD.INI is set up where the assignment between zero point shifts and programs is stored. The two programs are stored in the directory that was previously selected in the program manager.

If you change from the assignment list (without "Cancel" or

"Generate program") to another function and later you call the function "Multiple clamping" again, the same assignment list is displayed again.

### 24 CAD Reader

#### 24.1 General Function

The CAD Reader is used for the following: to further edit drawings with the SINUMERIK controller that were constructed with a CAD system. As the format, a DXF file (**D**rawing e**X**change **F**ormat) is entered, and contours or drilling points are filtered out. Parts that are not necessary for editing (such as dimensions, hatching, labeling, frames, etc.) can be removed. The generated contours or drilling patterns are implemented in a way that the geometry processor or cycle support understand them.

#### 24.2 Opening the CAD READER

We are in the basic directory with the following softkeys:

- Machine
- Programs
- Program edit
- Alarm list
- Tool zero point

	Name	Тур	Geladen	Größe	Datum/Zeit	
	BEISPIELPR	WPD	x	NCK-Dir.	19.03.2008	14:1
	CAD_DXF	WPD	×	NCK-Dir.	15.02.2008	07:3
]	FORMPLATTE	WPD	×	NCK-Dir.	15.02.2008	07:2
1	SHOPM	WPD	×	NCK-Dir.	19.03.2008	14:1
]	TEMP	WPD	×	NCK-Dir.	28.03.2007	15:0



With this arrow key toward the right, the softkey bar opens.

Freier Sp	eicher	Fe	estplatte:	4.6 GBytes	s NC:	1296280	
				_		$\Sigma$	
Dienste	Diagnose	Inbetrieb nahme	Parameter	Drucken Programm	CAD Reader		Be

Press the softkey "CAD	
Reader"	

## 24.3 Opening a DXF Drawing from a File.

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Anhängen an		2
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C:\SI_TRAIN\dh\clip.clp\FUSSBALL.E		
C:\DOKUME~1\HEINZN~1\Desktop\ E:\Flaschenverschluß.dxf	<sup>-</sup> laschenverschluß,dxf	
C:\DOKUME~1\HEINZN~1\Desktop\	2D-SFO-Ring-Verschluß1.dxf	
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## 24.4 Tool Bar



The tool bar can be selected by means of the global header with "View  $\rightarrow$  Display Toolbar"

#### **Operation in General**

All functions of the CAD Reader can be operated with the keyboard as well as with the mouse. The right mouse key corresponds to the "ESCAPE" function that can be used for resetting activated menus or functions.



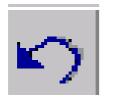
**Operating sequence Open DXFfiles** With **Open**, the selected CAD drawing is selected.



#### Saving the generated program

Generated contours can be saved as data type in the

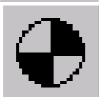
- MPF format (□.mpf)
- SPF format (□.spf)
- ARC format (□.arc) (SINUMERIK archive)



#### Back

For contour tracking, the last action is reset corresponding to the selection element by element, or the last intersection is reset.

### 24.5 Specifying the Zero Point



To output the contour as NC program, it is necessary to specify a zero point of the drawing because in most cases, it will deviate from the zero point of the DXF file.

The following options are available to define the zero point:

- **Element Center** Automatically to Element Center
- Element Start · Automatically to Element Start
- Element End Automatically to Element End
- Free Input Direct input of the coordinates; for example X100, Y100 **Mouse Position** 
  - Any position by selecting with the mouse

#### 24.6 Contour Tracking

#### Setting the Contour Starting Point



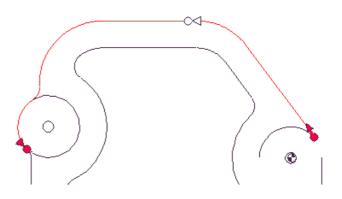
#### Contour Tracking with starting point and end point

The starting and end point of the contour to be generated is selected in dependence of the initial position of the technology applied:

Element center Start/End point Mouse position

- · Automatically to Element Center
- · Automatically to Element Starting/Endpoint
- Directly with mouse selection

#### Example



1. Contour direction

Results from specifying the starting point • and additional contour selection. Regarding contour tracking the attempt is made to select the contour automatically to the greatest extent possible.

2. Selection if there is a conflict

If automatic contour tracking can no longer clearly determine a successor element, we switch to the interactive mode.

The user is prompted to specify the next element with which the contour continues.



3. Full circle as contour With contour tracking, a full circle can be accepted in both directions.

4. Setting the end point

An end point can be set to any selected contour tracking element, and accepted.

#### Setting the contour end point Element center Element end point Mouse position Current position

### **Additional Notes**

- Full circles can be accepted as contour or as drilling points.
- · Contour tracking is canceled either with the keyboard with the "Esc" key, or with the right mouse key.



### Setting the Contour Label

Prior to contour tracking, labels can be set by entering starting labels and end labels.

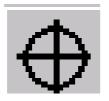
If a label is assigned twice, the CAD reader becomes interactive if the label was assigned once before.

- For contour tracking in contours already selected • For appendixes to files if the label occurs already in the file.

### **Setting Drilling Points**

1. Full circle as hole

A full circle can be selected with the function drilling points. The output of the generated G-code corresponds to the cycle format.



Any position Row of holes Hole circle Grid of holes

#### **Drilling Points Start**

2. By selecting Drilling Pattern, drilling points can be parameterized as

- Ay drilling position
- · According to the cycle
- According to the cycle
- According to the cycle

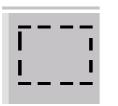


#### **Drilling Points End**

3. Selected drilling points from the selection Drilling Pattern are accepted.

#### 24.7 Influencing the Graphic Representation

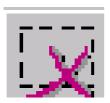
#### Selecting the Processing Area:

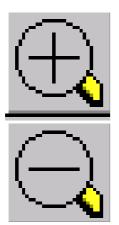


If the file includes many additional drawings -such as profiles, measurements, hatching, labelings, detail displays, frames etc.- the selection of a processing area, the number of elements can be reduced with a "Lasso".

#### **Deselecting the Processing Area:**

The selections made in this processing area can be deselected.





#### Zoom/Keys "+" and "-"

You have the option to specify within a drawing a zoom area with the mouse key. By clicking on the symbol and using a "Lasso" or with the keys "+" and "-" the display area is enlarged or reduced step by step.

The display area can be moved using the cursor keys.

### 24.8 Editing Input Data



#### New Drawing/Spacer Bar

Reads out the current drawing anew and optimized corresponding to the layer selection.

#### Geometry

With a mouse click, the coordinates for the selected element are read out according to the current zero point. If the button Edit appears in the display screen form, this element can be edited by selecting this button.



#### Note

This function is suitable for minor changes in the geometry to remedy inadequacies (particularly missing intersections) in the CAD drawing.

For larger changes, the geometry processor is used. Once a change is made, it **can not** be reset.

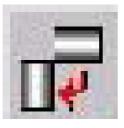


#### **Layer Selection**

Initially, the selected DXF file is always shown with all its layers. If the file contains several layers, they are all shown in the basic view.

However, layers that don't contain data relevant to the contour can be hidden. Likewise, contours that are included in several layers can be selected by means of a selection screen form for contour tracking.

The layer selection can not be undone.



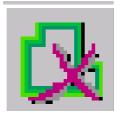
#### **Rotating the Contour**

By selecting this icon, the drawing is rotated by 90 degrees around the specified zero point, corresponding to the presettings. Contour characteristics that have already been set are not rotated.



#### **Displaying Hatching and Measurements**

Hatching and measurements in the CAD drawings can be removed or displayed. Another click resets this function.



#### **Deleting Contour Tracking**

Defined contours can be selected and completely deleted. The function "Delete contour" is activated by selecting this icon and deactivated by selecting it again. Deleting finished contours:

Select icon: activate Delete contour Select contour: contour is deleted



#### **Deleting a Geometry Element**

With this function, individual geometry elements can be deleted. The function "Delete geometry element" is activated by selecting this icon and deactivated by selecting it again. Deleting a geometry element:

Select: icon: activate Delete geometry element Select elements: geometry elements are deleted



#### **Deleting a Geometry Area**

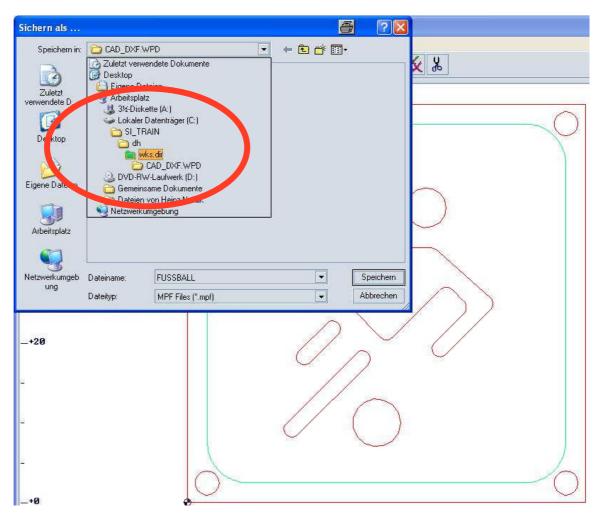
With a rectangle drawn with the mouse (corresponds to the area to be deleted) an entire area can be deleted from the geometry. This function is deactivated autonomously with each deletion, and has to be reactivated each time with this icon. Select icon: Activate Delete geometry area

Select area: geometry area is deleted

### 24.9 Transferring Contour Elements to the Directory

-Save As -SI\_Train -dh -wks.dir

-Select directory where the contour is to be stored.

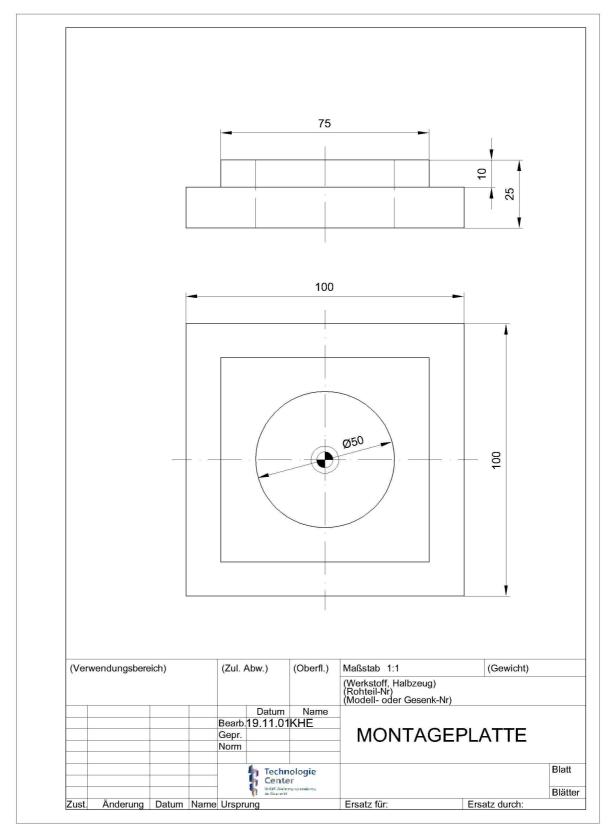


All contour elements are stored in the directory; for example, CAD\_DXF.

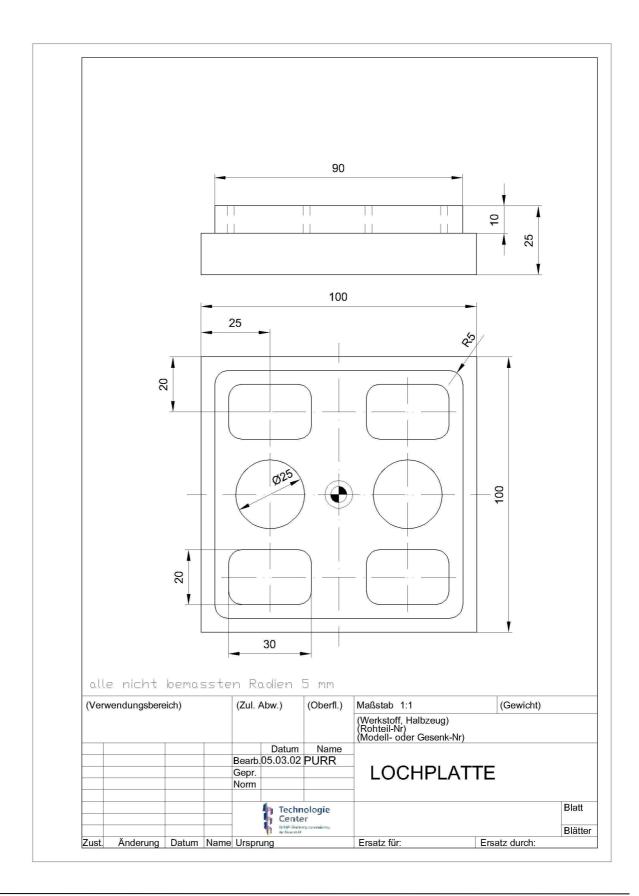
VERZEICHNIS				
	Name	Тур	Geladen	Größe
	BEISPIELPR	WPD	×	NCK-Dir.
	CAD_DXF	WPD	×	NCK-Dir.
	FORMPLATTE	WPD	×	NCK-Dir.
	SHOPM	WPD	x	NCK-Dir.
	TEMP	WPD	x	NCK-Dir.

## 25 Sample Drawings - Milling

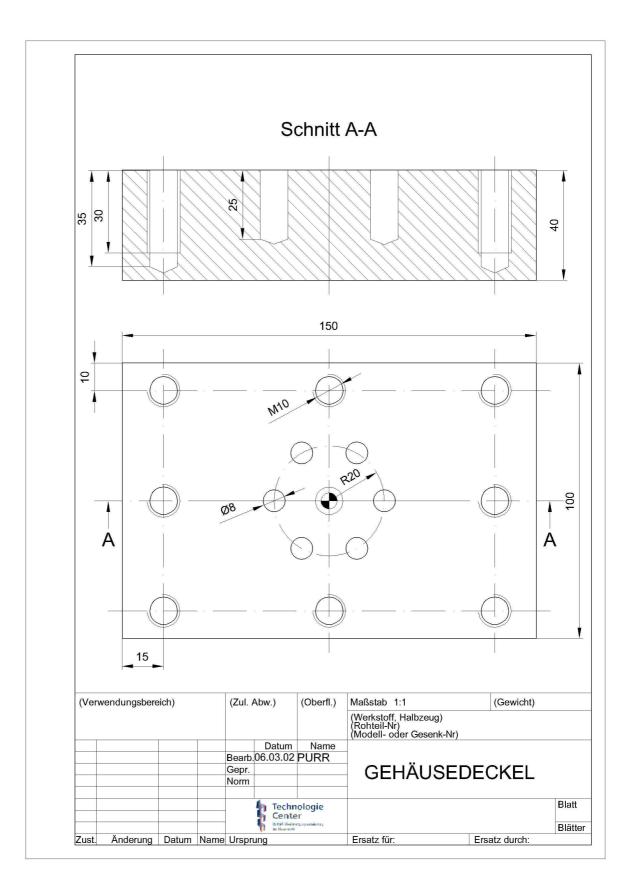
## 25.1 Mounting Plate



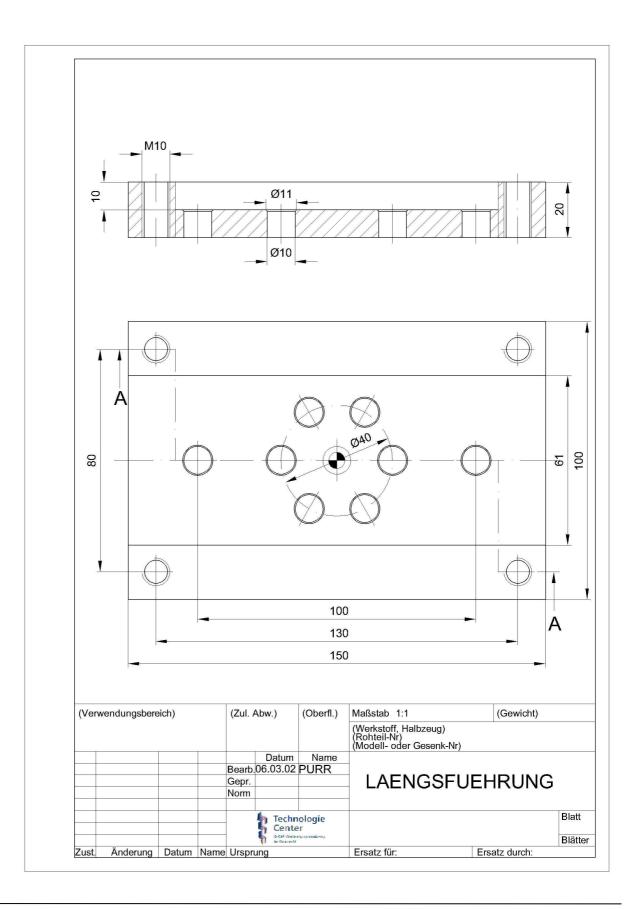
### 25.2 Hole Plate



## 25.3 Housing Lid



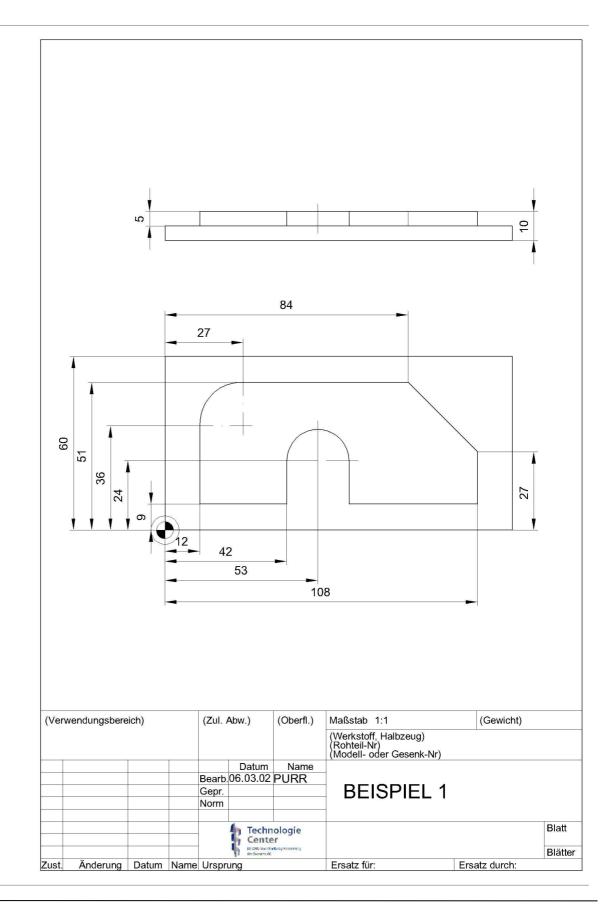
## 25.4 Longitudinal Guide



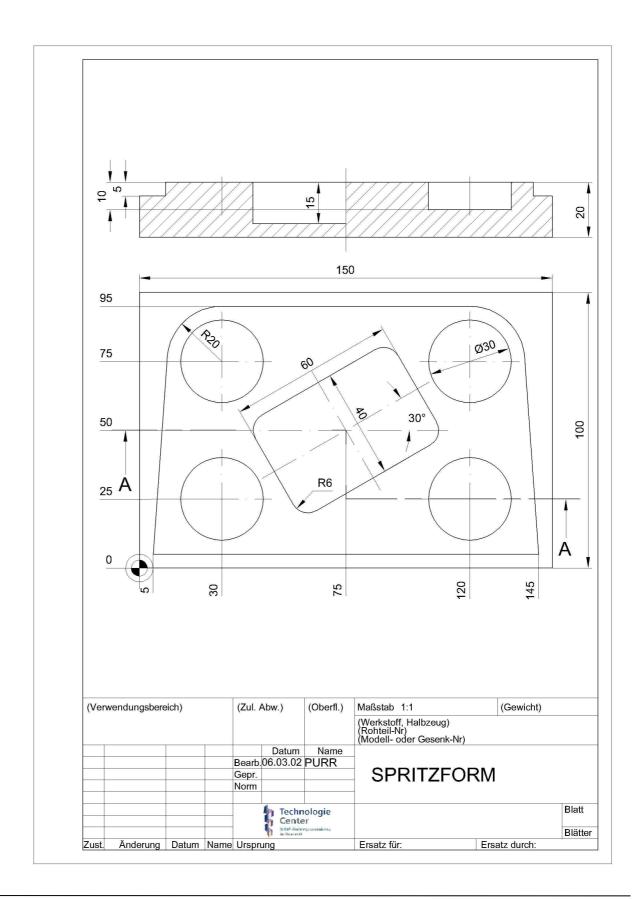
#### Automation and Drives - SCE

## **SIEMENS**

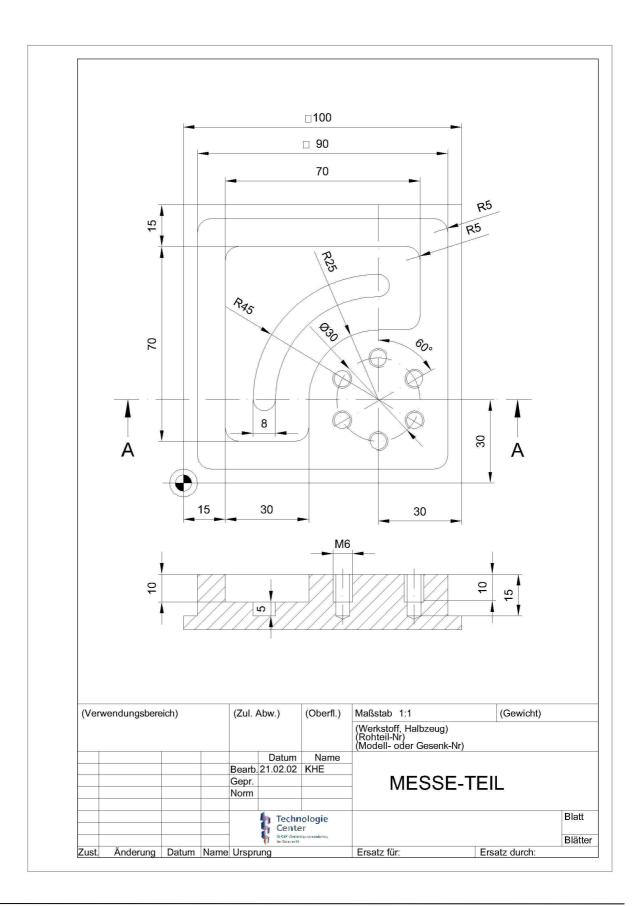
### 25.5 Example 1



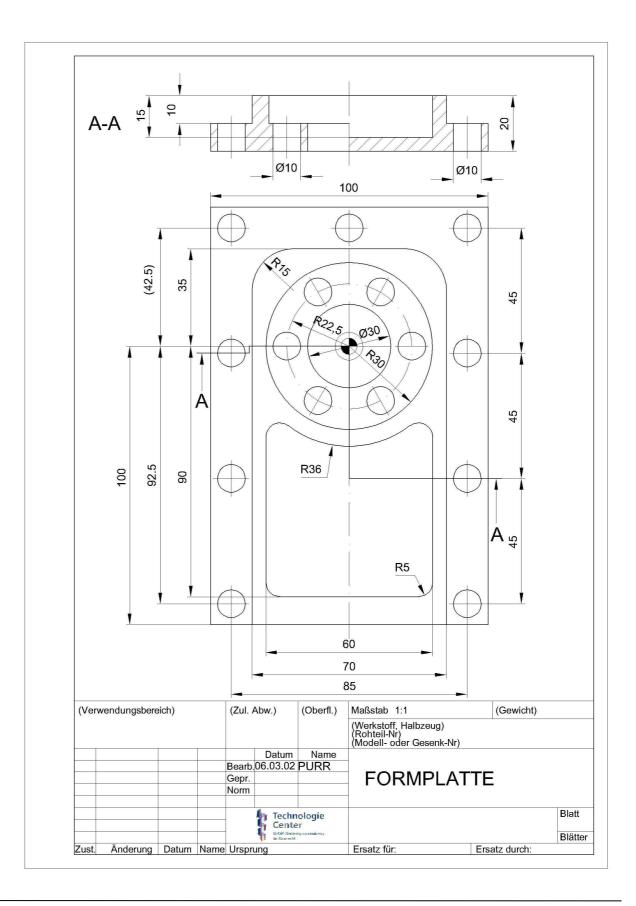
### 25.6 Injection Mould



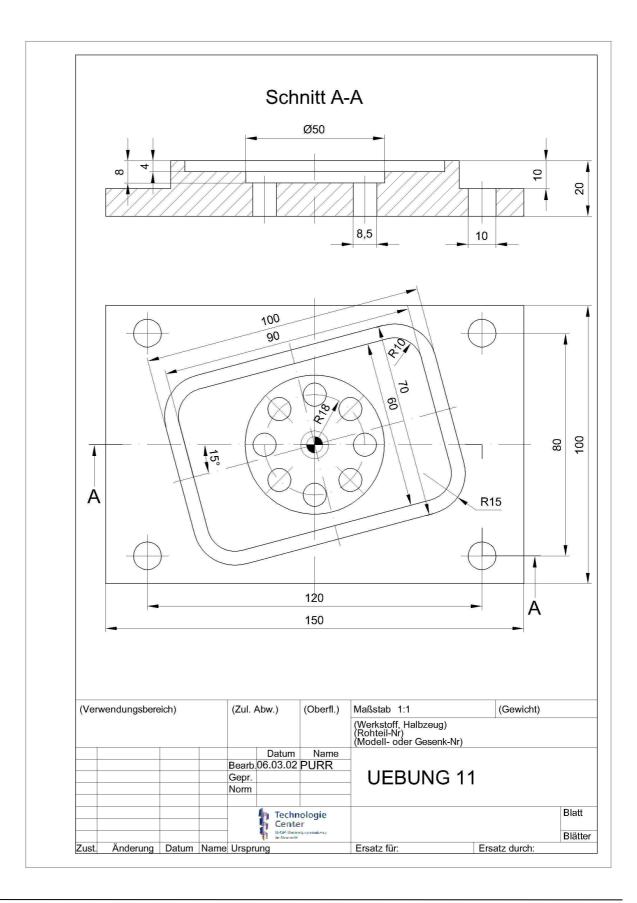
## 25.7 Measuring Part



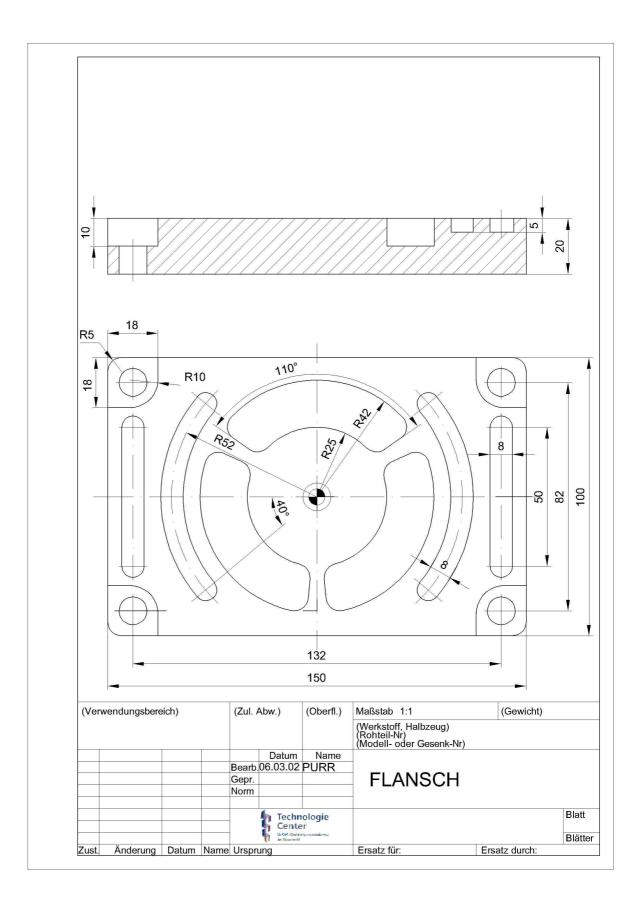
### 25.8 Pattern Plate



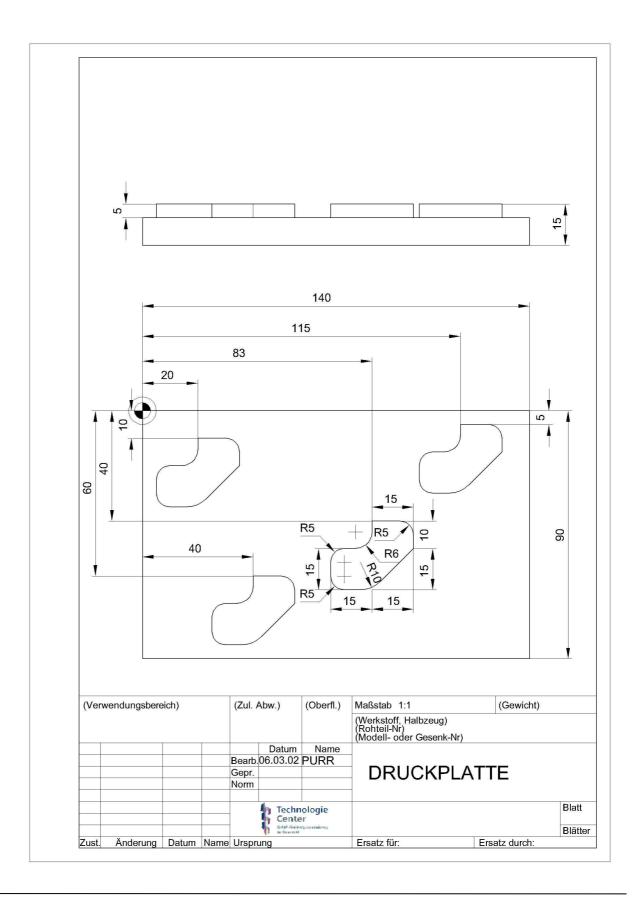
### 25.9 Exercise 11



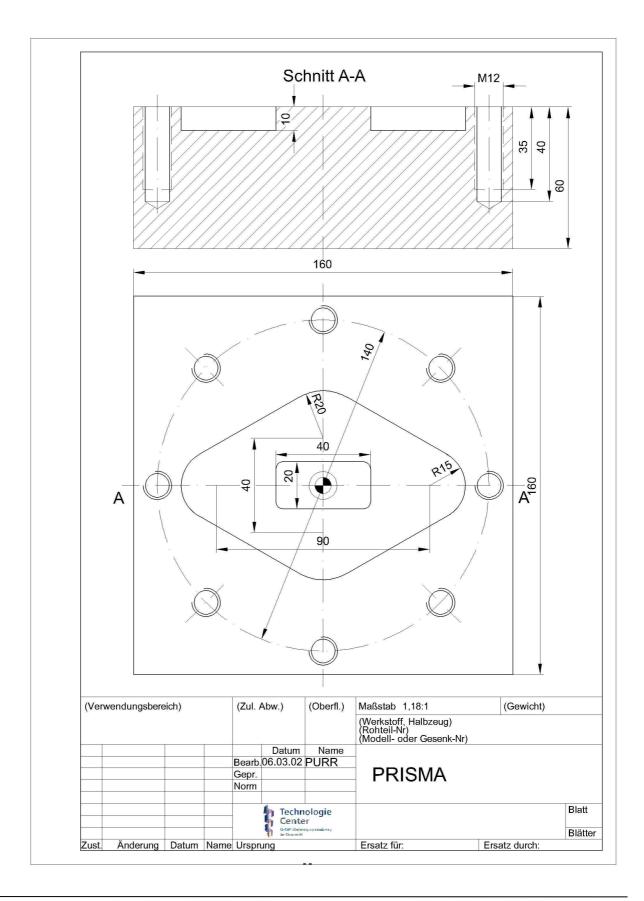
### 26 Flange



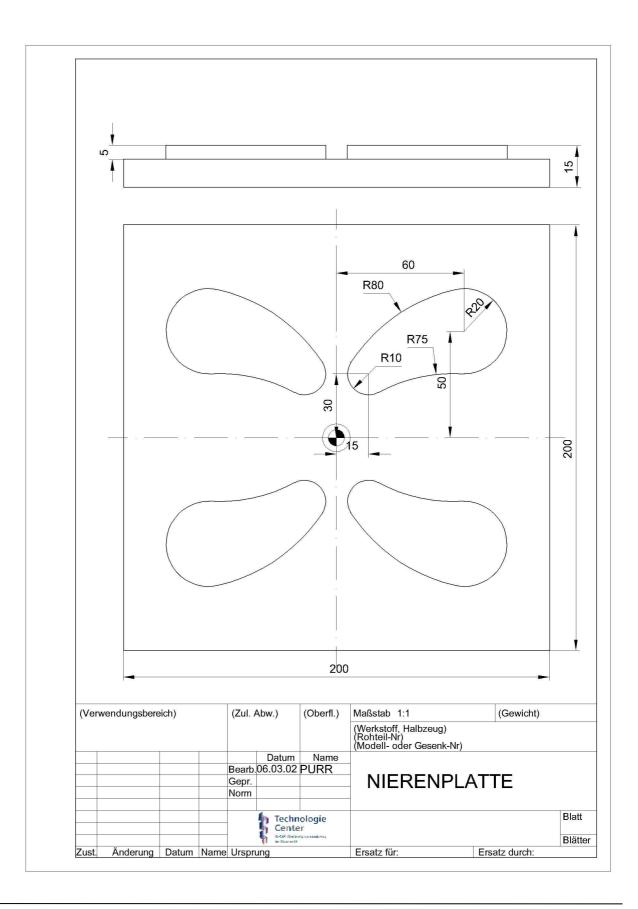
## 26.1 Clamping Plate



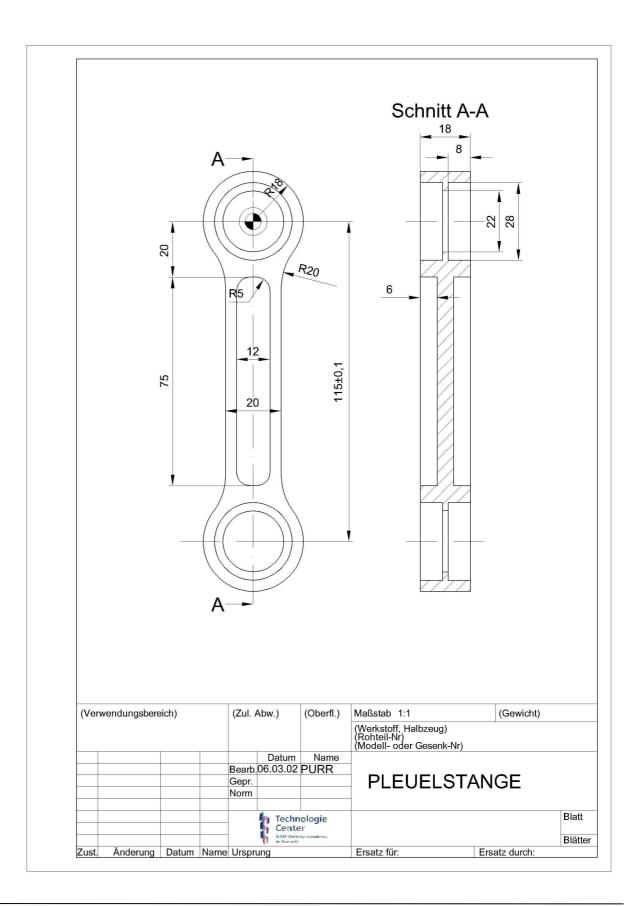
#### 26.2 Prism



## 26.3 Kidney Plate



### 26.4 Connecting Rod



#### 26.5 Wing

