

Working with Pallets on the TNC 640



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Applications

Individual programs can be linked

- Several programs are executed in succession
- Unattended operation possible

Tool-oriented machining

- The program for the single part can be used for series production
- No additional programming effort required
- Unnecessary tool changes are avoided





Applications

Working with pallet changer systems

- The job list is defined in the pallet file
- Editing from program run possible

Execution of multilateral fixtures

- Programming in home position
- Spatial angle of the lateral position of a fixture can be specified in the pallet file







Applications

Overview of Possible Applications

- Pallet program for simple linking of individual programs. Several parts can be machined successively in the machine.
- Tool-oriented machining
- Pallet management
- Working with pallet changers
- Pallet handling with robots
- Execution of tombstone fixtures with multilateral setup

Advantages

- Improved machine utilization
- Unattended operation possible
- No additional programming effort required
- No machine standstill during rechucking







Programing



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Fundamentals:

- Create NC programs as usual (with M30)
- Pallet files always have the extension .P
- Prototypes are created by the machine manufacturer

The machine must be prepared for pallet machining.







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Configuring a pallet table:

The OEM can expand the pallet table with his own table columns:

- If needed, define additional columns through System/TableSettings in the configuration editor
- Define the prototype in the directory PLC:\proto\table with the file name extension .P
- Configure the prototype under CfgTablePrototype.







Add a column

- Create pallet-file
- MOD (key number 555343)
- MORE FUNCTIONS
- EDIT FORMAT

You can activate and deactivate remaove for every column.

Manual op	Edit table charact Column NN VPALPRES PALPRES PALPRES PALPRES NAME DATUM X PALPRES PALST COLTION LOCK X W: STATUS X WE THOD X SP-X X SP-X X SP-Z X SP-A X SP-Z X SP-C X SP-C X SP-V X S	Edit table cl Programming) Table eristics Attribute: Width 9 Column type DEC Default value 0 Miniaum value 999 Character set ⊠ Ur ⊠ Wu References References Naximum value 999 Character set	haracteristics e editing 99999 hique cite-protected hit: Inch move CANCEL	
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LOCATION

Location of run? Machine = ENT No = NOENT





PGM + PGM



3D-Basic Rotation + PGM

3D-Basic Rotation + PGM













Config:

Under **Paths/CfgSystemCycle**, define the entry points for NC macros in the context of pallet machining:

Pallet macro: PAL.H

This macro is required for using the pallet management (e.g. multiple setup without pallet). It suffices if the macro has a BEGIN PGM and END PGM (if no further functions are needed)

→ For a pallet entry of the PAL type: Call the OEM_PALPG_PAL_CHNG macro if the path is configured

 ■ FIX macro: CLAMP.H This is called for setup entries (FIX)
 → For a fixture entry of the FIX type: Call the OEM_PALPG_FIX_CHNG macro if the path is configured







Config:

Under **Paths/CfgSystemCycle**, define the entry points for NC macros in the context of pallet machining:

- For a program entry of the PGM type: Call the OEM_PALPG_PROLOG macro if the path is configured
- After running the NC program (for PGM) type: Call the OEM_PALPG_EPILOG macro if the path is configured
- Tool macro: TOOLCALL.H Required for tool-oriented machining
- Tool macro: OEM_PAL_TOOLMODE.H This is called for tool-oriented machining. → For tool-oriented machining: Call the OEM_PAL_TOOLMODE macro if the path is configured (340590-08)







OEM_PAL_TOOLMODE.H

BEGIN PGM OEM_PAL_TOOLMODE MM M146 TOOL CALL END PGM OEM_PAL_TOOLMODE MM

With the M function M146 the current geometry information is saved in a temporary file. This is required for further execution of NC programs with the tool-oriented strategy. In addition, a code is entered in the CTID column and W-STATE changes to INCOMPLETE.







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Example 1





Simple Pallet changer

- Entry PAL for number of the pallet
- Entry PGM for NC-program for this pallet.
- \rightarrow Without the LOCATION MA this pallet is a manual pallet, not in the pallet changer.



🕐 Manual operation



C☆ Programming > Table editing

TNC:\nc prog\demo\Bauteile components\Name P

 NR	TYPE	NAME	PRESET	LOCATION	LOCK
(PAL	1		МА	
1	PGM	TNC:\nc_prog\demo\Bauteile_components\1_Bohren_drilling.H	1		
2	PAL	2		MA	
3	PGM	TNC:\nc_prog\demo\Bauteile_components\2_Flansch_flange.H	2		
2	PAL	3		MA	
Ę	PGM	TNC:\nc_prog\demo\Bauteile_components\3_Hebel_lever.H	3		
	PGM	INC: \nc_prog\demo\bauterre_components\3_Heber_rever.H	3		



Machining:

- In Program Run full sequence or single block you can start the .P-file
- You can't simulate the .P in Program Test. Simulate the NC-programs
- If the .P-File is active in Porgram run you can only edit the .P-File with the softkey

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Example 2





Tool-Oriented Machining (Software 340590-07)

- NC-program with different tools
- NC-program should be produced on multiple fixture
- With tool-oriented machining you can safe time with the combination of the tools

1	-400	- 5 0	140
2	- 200	- 5 0	140
3	0	- 5 0	140
4	200	- 5 0	140

Program run single Programming	07:19
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1_Bohren_drilling.H	
BEGIN PGM 1_BOHREN_DRILLING MM	
CALL PGM\reset.H	
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BLK FORM 0.2 X+100 Y+100 Z+0	
FN 0: 01 =+2	
L Z+100 RO FMAX	
TOOL CALL "NC_SPOT_DRILL_D8" Z \$3200	L
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C CYCL DEF 206 TAPPING 0200=+3 SET.UP CLEARANCE 0201=-11 DEPTH OF THREAD 0206=+260 FEED R *	
3 CALL LBL 10	
4 1 7+100 B0 FMAX	L
5 FN 9: IF +0 EQU +0 GOTO LBL 99	
6 LBL 1	
7 CYCL DEF 220 POLAR PATTERN 0216=+0 :CENTER IN 1ST AXIS 0217=+0 :CENTER IN 2ND AXIS 0244=+2 -	
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8 PGN	TNC:\nc	prog\demo	Bauteile_	components	Machining2.	h	4				
9 PGN	TNC:\nc	_prog\demo	Bauteile_	components	Machining3.	h	1				
10 PGN	TNC:\nc	_prog\demo	Bauteile_	components	Machining3.	h	2				
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12 PGN	TNC:\nc	_prog\demo	Bauteile_	.components \	Machining3.	h	4				



Example 2





Tool-Oriented Machining (Software 340590-07)

- PAL not needed, if there is no palletchanger
- Entry PGM for NC-program for this pallet.
- Sort by
 - TOOL1
 - PRESET1/2/3/4
 - TOOL2
 - PRESET1/2/3/4



TNC:\nc_p	rog\demo\	Bauteile_components\Name.P			
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2	PGM	TNC:\nc_prog\demo\Bauteile_components\Machining1.h	2		
3	PGM	TNC:\nc_prog\demo\Bauteile_components\Machining1.h	3		
4	PGM	TNC:\nc_prog\demo\Bauteile_components\Machining1.h	4		
5	PGM	TNC:\nc_prog\demo\Bauteile_components\Machining2.h	1		
6	PGM	TNC:\nc_prog\demo\Bauteile_components\Machining2.h	2		
7	PGM	TNC:\nc_prog\demo\Bauteile_components\Machining2.h	3		
8	PGM	TNC:\nc_prog\demo\Bauteile_components\Machining2.h	4		
9	PGM	TNC:\nc_prog\demo\Bauteile_components\Machining3.h	1		
10	PGM	TNC:\nc_prog\demo\Bauteile_components\Machining3.h	2		
11	PGM	TNC:\nc_prog\demo\Bauteile_components\Machining3.h	3		
12	PGM	TNC:\nc_prog\demo\Bauteile_components\Machining3.h	4		



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Example 2 CALL PGM



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Tool-Oriented Machining (Software 340590-07)

- NC-program with different tools
- NC-program should be produced on multiple fixture
- With tool-oriented machining you can safe time with the combination of the tools
- CALL PGM for every machining

NG: \nc_pro	gldemolBaut	elle_compone	ITS (MAIN.H					
MAIN. H								
BEGIN PGA	MAIN MM							
Machi		ETTING 0000						
CALL DEF	Z47 DATUM S	ETTING 0339-	+1 ;UATU	M NUMBER	and h			
CYCL DEE	247 DATIM S	ETTING 0339	11e_compone	M NUMBED	ing i . ii			
CALL PGM	TNC: \nc. nro	a\demo\Baute	ile compone	nte\Nachini	ngi b			
CYCL DEE	247 DATUM S	ETTING 0339	110_compone	M NUMBER	igr.n			
CALL PGM	TNC:\nc pro	a\demo\Baute	ile compone	nts\Machini	ng1.h			
CYCL DEF	247 DATUM S	ETTING 0339-	+4 :DATU	M NUMBER			-	
CALL PGM	TNC:\nc_pro	g\demo\Baute	ile compone	nts\Machini	ng1.h			
0 * - Machi	ining 2							
1 CYCL DEF	247 DATUM S	ETTING Q339-	+1 ; DATU	M NUMBER				
2 CALL PGM	TNC:\nc_pro	g\demo\Baute	ile_compone	nts\Machini	ng2.h			
3 CYCL DEF	247 DATUM S	ETTING Q339-	+2 ; DATU	M NUMBER				
4 CALL PGM	TNC:\nc_pro	og∖deno∖Baute	ile_compone	nts\Machini	ng2.h			
5 CYCL DEF	247 DATUM S	ETTING Q339	+3 ; DATU	M NUMBER				
6 CALL PGM	TNC:\nc_pro	g\deno\Baute	ile_compone	nts\Machini	ng2.h			
7 CYCL DEF	247 DATUM S	ETTING Q339-	+4 ;DATU	M NUMBER				
8 CALL PGM	TNC:\nc_pro	og∖demo∖Baute	11e_compone	nts\Machini	ng2.h			
9 - Machi	ining 3							
O CYCL DEF	247 DATUM S	ETITNG 0339	+1 ; DATU	M NUMBER				
2 CYCL DEE	1NC: THE_DIC	ETTINC 0220.	11e_compone	M NUMBED	nga.n			
2 CALL DEF	TNC:) no. nrs	a)dona)Baute	ile compone	n NOMBER	ng2 h			
4 CYCL DEF	247 DATIM S	FTTING 0339	+3 DATU	M NUMBER	nga.n			
5 CALL PGM	TNC:\nc.nrc	a\demo\Baute	ile compone	nts\Machini	na3 h			
6 CYCL DEF	247 DATUM	ETTING Q339	+4 :DATU	M NUMBER				
7 CALL PGM	TNC:\nc pro	g\demo\Baute	ile compone	nts\Machini	ng3.h			
8 END PGII N	AIN MM							
							~	
					1	1		TNCEDT
SELECT		INSERT		FIND			INSERT	LAST
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1	-400	- 5 0	140
2	- 200	- 5 0	140
3	0	- 5 0	140
4	200	- 50	140



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Example 3





Tool-Oriented Machining (Software 340590-08)

- NC-program with different tools
- NC-program should be produced on multiple fixture
- With tool-oriented machining you can safe time with the combination of the tools

1	- 4	00 - 5	0 140
2	- 2	00 - 5	0 140
3		0 - 5	0 140
4	2	00 - 5	0 140

🕑 Program run single 🔄 Programming	07:19
C Programming	
TNC:\nc_prog\demo\Bauteile_components\1_Bohren_drilling.H	
1_Bohren_drilling.H	
/ BEGIN PGM 1_BOHREN_DRILLING MM	
CALL POM \reset.H	
L Z+100 R0 FMAX	
BLK FORM 0.1 Z X+0 Y+0 Z-13.35	
51.6 FUND 0.2 X+100 Y+100 Z+0	
TN 0: U1 =+2	
TOOL CALL INC SPOT DRTLL DR" Z S3200	
1 7+100 B0 FMAX U3	
0 CYCL DEF 200 DRILLING 0200=+2 ;SET-UP CLEARANCE 0201=-3.4 ;DEPTH 0206=+250 ;FEED RATE FOR P -	
1 CALL LBL 10	
2 L Z+100 R0 FMAX	
3 TOOL CALL "DRILL D5" Z S3800	
4 ; D5,0	
5 L Z+100 R0 FMAX II3	
6 CYCL DEF 200 DRILLING Q200=+2 :SET-UP CLEARANCE Q201=-16 :DEPTH Q206=+350 :FEED RATE FOR P *	
7 CALL LBL 10	
8 L Z+100 R0 FMAX	
9 TOOL CALL "TAP_M6" Z S260	
0 ; M6	
11 L Z+100 R0 FMAX II3	
2 CYCL DEF 206 TAPPING 0200=+3 ;SET-OP CLEARANCE 0201=-11 ;DEPTH OF THREAD 0206=+260 ;FEED R -	
5 EN 9- TE +0 EOII +0 GOTO 181 99	
LBL 1	
CYCL DEF 220 POLAR PATTERN 0216=+0 :CENTER IN 1ST AXIS 0217=+0 :CENTER IN 2ND AXIS 0244=+2 -	
8 CYCL DEF 220 POLAR PATTERN 0216-+0 :CENTER IN 1ST AXIS 0217-+0 :CENTER IN 2ND AXIS 0244-+3 -	
9 LBL 0	
10 LBL 10	
1 CYCL DEF 7.0 DATUM SHIFT	
2 CYCL DEF 7.1 X+25	
	TNSEPT
SELECT INSERT COPY FIND	LAST
BLOCK BLOCK	

C:\no	:\nc_prog\demo\Pallet\WOB\PAL.P									_
NR		TYPE		NAME	PRE	W-STATUS	METHOD	CTID	LOCATION	
	0	PAL	1						MA	_
	2	PGM	INC: \nc_prog\den	IO\Pallet\WOB\PGM1.h	1	BLANK	TO			_
	4	PGM	INC: \nc_prog\den	IO\Pallet\WOB\PGM1.h	2	BLANK	сто			_
	6	PGM	INC: \nc_prog\den	IO \Pallet \WOB \PGM1.h	3	BLANK	CT0			_
	8	PGM	INC: \nc_prog\den	io\Pallet\WUB\PGH1.n	4	BLANK	C10			
			1							
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arbei	ltur	ngs-Meth	10 0009	APPEND Concern						2







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	2 PGM	TNC:\nc_prog\dem	o\Pallet\WOB	PGM1.h	1	BLANK	Т0			
	4 PGM	TNC:\nc_prog\dem	o\Pallet\WOB	PGM1.h	2	BLANK	СТО			
	6 PGM	TNC:\nc_prog\dem	o\Pallet\WOB	PGM1.h	3	BLANK	СТО			
	8 PGM	TNC:\nc_prog\dem	o\Pallet\WOB	PGM1.h	4	BLANK	сто			
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COPY	PA	STE	APPEND	TNSERT				RESET		
FIELD	FI	ELD	N LINES	INGENT						SELECT
				LINE	l	INÉ				



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Example 4





Tool-Oriented Machining (Software 340590-08)

- NC-program with different tools
- NC-program should be produced on multiple fixture
- With tool-oriented machining you can safe time with the combination of the tools

9	0	-153.8035	484.5	0	0	30
10	133.2	76.9	484.5	120	0	30
11	-133.2	76.9	484.5	240	0	30
12				0	0	0





Thank you for your attention!



HEIDENHAIN

Instructor: Michael Wiendl



Company: Dr. Johannes HEIDENHAIN GmbH **Position:** Trainer for NC Programming