



HEIDENHAIN



Operating Instructions

DataPilot 4290 V7

Engraving Inscriptions

English (en)
8/2005

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1 Engraving

HEIDENHAIN includes a set of NC subprograms with DataPilot for engraving inscriptions (large and small letters, numbers, and various special characters).

The installation program transfers these NC subprograms together with the NC sample programs **Grav_Sti** and **Grav_Man** into the machine "BEISPIEL." The names of the NC subprograms are listed in the **Engraving Inscriptions** operating instructions.

The subprograms and sample programs for engraving are also saved in compressed format in the file **Grav_4290.zip** in the machine "BEISPIEL" in the "NCPS" directory. Copy this ZIP file to the NCPS directory of other DataPilot machines and unzip it if you want to engrave with other DataPilot machines as well.

The compressed file with subprograms and sample programs for engraving is also on the DataPilot CD-ROM (path: JHNDP4290\ZIP\Grav_4290.zip).

1.1 Engraving inscriptions

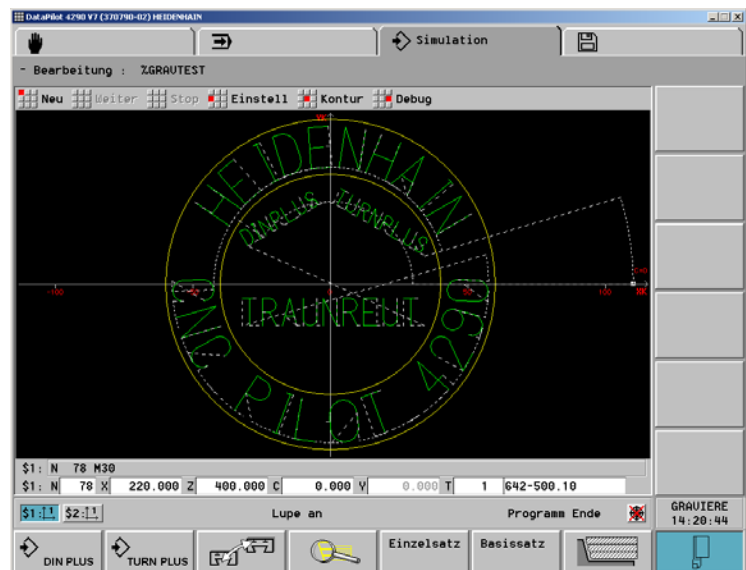
The C or Y axis is used for engraving. You can adjust the size, orientation and position of the characters.

As a default, the subprograms engrave the character strings

- on the front face: linear or polar
- on the lateral surface: linear

The momentarily valid machining plane determines whether the C or Y axis is used for engraving:

- G17 (XY): Y axis
- G18 (ZX): C axis
- G19 (ZY): Y axis



Engraving characters strings

Program a character string according to the following scheme (in the BEARBEITUNG section):

- ▶ Insert a milling tool
- ▶ Pre-position the milling tool to the **beginning of the character string**
- ▶ Call in sequence the subprograms with the characters to be engraved
- ▶ Retract the tool



The characters are engraved starting at the current tool position. The reference point depends on whether the characters are in linear or polar alignment:

- Linear: The reference point is the bottom left corner of the character
- Polar: The reference point is the center of the bottom edge of the character

1.2 Parameters of the Subprogram Call

Specify in the call parameters of the subprogram the details of the characters' appearance.

- ▶ **Program name L:** Name of the subprogram (See "Character Set" on page 45.)
- ▶ **extern=1 V:** Enter "1" for an external subprogram
- ▶ **Font height LA:** Letter height in [mm]
- ▶ **Angle LB:** Rotated angle of the letter in [°]
 - Linear front face: 0° = Vertical characters: the characters are aligned in sequence in positive XK direction
 - Polar front face: LB has no function
 - Lateral surface 0°: Characters are engraved from -CY to +CY
 - Lateral surface 90°: Characters are engraved from -Z to +Z
- ▶ **Milling plane LC:**
 - Front face: Z position, infeed depth during milling
 - Lateral surface: X diameter, infeed depth during milling
- ▶ **Retraction plane LD:**
 - Front face: Z position retracted to for positioning
 - Lateral surface: X diameter retracted to for positioning
- ▶ **0=Front/1=Lateral LE:** Engraving on the front face or lateral surface
 - 0: Front face
 - 1: Lateral surface
- ▶ **0=lin 1/2=polar LF:** Only relevant for the front face
 - 0: Characters are aligned linearly
 - 1: Characters are bent upwards over the center of the coordinate cross
 - 2: Characters are bent downwards under the center of the coordinate cross
- ▶ **Reference diameter LH:**
 - Front face: Diameter over which the character string is engraved with polar alignment
 - Lateral surface: Diameter for calculation of the unrolled lateral surface (G120)
- ▶ **Separation factor I:** The separation between the characters is calculated according to the following formula: $LA / 6 * I$
If I is not entered, I=1 is used for calculation.
- ▶ **Number of repetitions Q:** can be used if the same character is to be engraved immediately following

Unterprogramm-Aufruf [1-2]

Programmname	L	H	»
extern=1	U	1	»
Schrifthoehe	LA	15	mm »
Winkel	LB		Grad (°) »
Fraesebene	LC	-10	mm »
Rueckzugsebene	LD	-7	mm »

OK Abbruch

Unterprogramm-Aufruf [2-2]

0=Stirn/1=Mantel	LE	0	»
0=lin 1/2=polar	LF	1	»
Bezugsdurchm.	LH	85	mm »
Abstandsfaktor	I		mm »
Anz. Wiederhol.	Q		»

OK Abbruch

1.3 Example: Engraving the Front Face

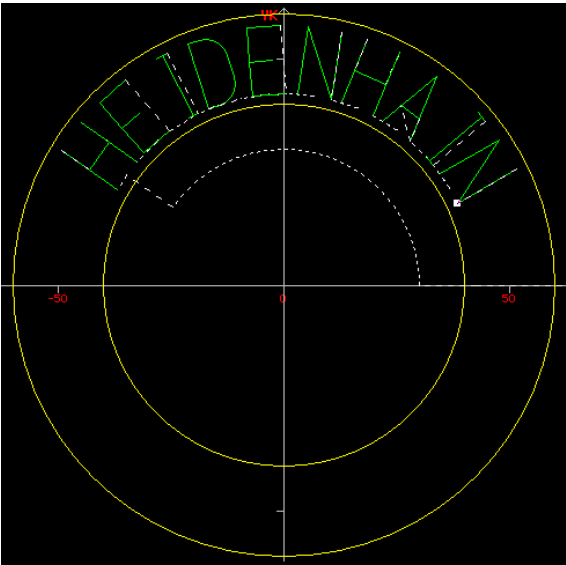
The following example engraves character strings in various orientations and positions onto the front face.

Character string "HEIDENHAIN"

The character string is engraved in polar alignment, bent upwards, at Z = - 10.

Programming the character string:

- Position the tool to C=145°
- Parameters for subprogram call:
 - Letter height: LA=15 mm
 - Milling plane at Z=-10 (LC=-10)
 - Retraction plane at Z=-7 (LD=-7)
 - Engraving on the front face (LE=0)
 - Polar character string bent upwards (LF=1)
 - Diameter over which the character string is engraved (LH): Bottom edge of character=85
 - Separation factor (I) is not programmed; the default separation is valid



Example: Program and block structure

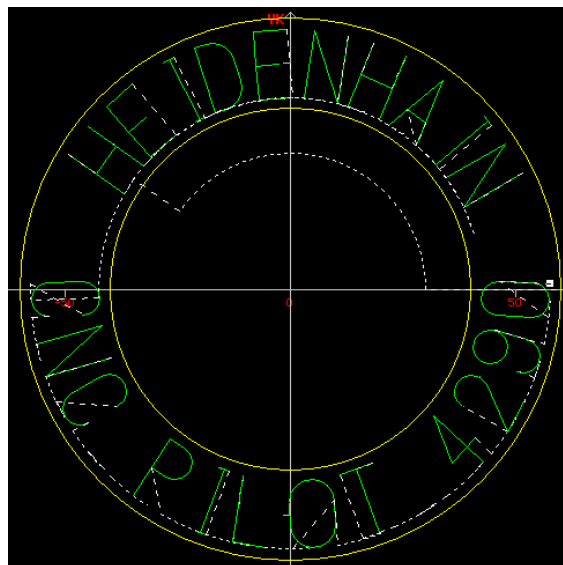
. . .
N16 G110 C0
N17 G100 XK30 YK0
N18
N19 G110 C145
N20 L"H" V1 LA15 LC-10 LD-7 LE0 LF1 LH85
N21 L"E" V1 LA15 LC-10 LD-7 LE0 LF1 LH85
N22 L"I" V1 LA15 LC-10 LD-7 LE0 LF1 LH85
N23 L"D" V1 LA15 LC-10 LD-7 LE0 LF1 LH85
N24 L"E" V1 LA15 LC-10 LD-7 LE0 LF1 LH85
N25 L"N" V1 LA15 LC-10 LD-7 LE0 LF1 LH85
N26 L"H" V1 LA15 LC-10 LD-7 LE0 LF1 LH85
N27 L"A" V1 LA15 LC-10 LD-7 LE0 LF1 LH85
N28 L"I" V1 LA15 LC-10 LD-7 LE0 LF1 LH85
N29 L"N" V1 LA15 LC-10 LD-7 LE0 LF1 LH85
N.. . . .

Character string “CNC PILOT 4290”

The character string is engraved in polar alignment, bent downwards, at Z = - 10.

Programming the character string:

- ▶ Position the tool to C=182.5°
- ▶ Parameters for subprogram call:
 - Letter height: LA=15 mm
 - Milling plane at Z=-10 (LC=-10)
 - Retraction plane at Z=-7 (LD=-7)
 - Engraving on the front face (LE=0)
 - Polar character string bent downwards (LF=2)
 - Diameter over which the character string is engraved (LH): Bottom edge of character=115
 - Separation factor: 1.3 * default separation (I=1.3)



Example: Program and block structure

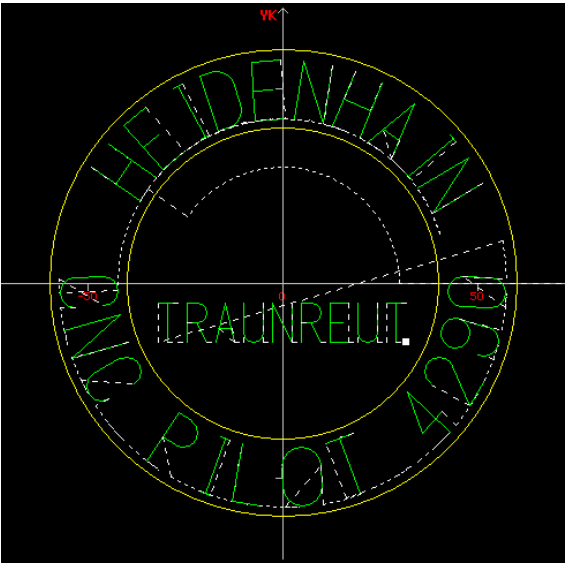
. . .
N30 G110 C182.5
N32 L"C" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N33 L"N" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N34 L"C" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N35 L"BLANK" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N36 L"P" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N37 L"I" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N38 L"L" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N39 L"O" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N40 L"T" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N41 L"BLANK" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N42 L"4" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N43 L"2" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N44 L"9" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N45 L"0" V1 LA15 LC-10 LD-7 LE0 LF2 LH115 I1.3
N.. . . .

Character string "Traunreut"

The character string is engraved linearly.

Programming the character string:

- Position the tool to XK = -32, YK = -15
- Parameters for subprogram call:
 - Letter height: LA=10 mm
 - Angle (LB) is not programmed; the default of 0° is valid
 - Milling depth to Z=0 (LC=0)
 - Retraction plane to Z=3 (LD=3)
 - Engraving on the front face (LE=0)
 - Linear character string (LF=0)
 - Separation factor: 1.4 * default separation (I=1.4)



Example: Program and block structure

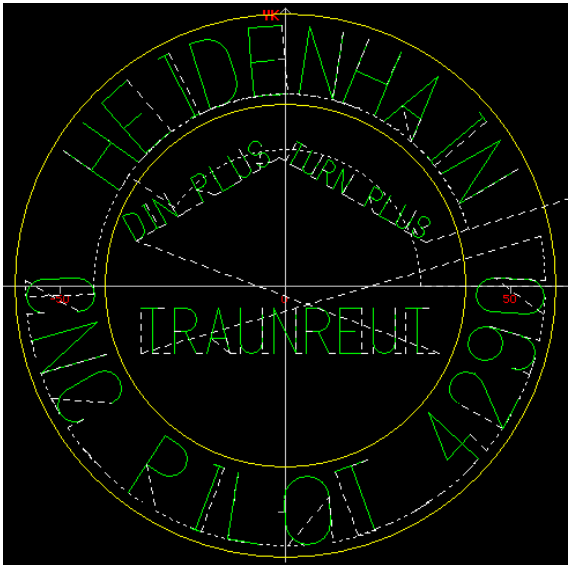
. . .
N47 G100 XK-32 YK-15
N48 L"T" V1 LA10 LC0 LD3 LE0 LF0 I1.4
N49 L"R" V1 LA10 LC0 LD3 LE0 LF0 I1.4
N50 L"A" V1 LA10 LC0 LD3 LE0 LF0 I1.4
N51 L"U" V1 LA10 LC0 LD3 LE0 LF0 I1.4
N52 L"N" V1 LA10 LC0 LD3 LE0 LF0 I1.4
N53 L"R" V1 LA10 LC0 LD3 LE0 LF0 I1.4
N54 L"E" V1 LA10 LC0 LD3 LE0 LF0 I1.4
N55 L"U" V1 LA10 LC0 LD3 LE0 LF0 I1.4
N56 L"T" V1 LA10 LC0 LD3 LE0 LF0 I1.4
N.. . . .

Character string “DIN PLUS, TURN PLUS”

The character string “DIN PLUS” is engraved linearly at an angle of +30°, and “TURN PLUS” at -30°.

Programming the character string:

- Position the tool to XK = -33, YK = -10
- Parameters for subprogram call:
 - Letter height (LA): 6 mm for “DIN PLUS”, 5 mm for “TURN PLUS”
 - Angle (LB): 30° for “DIN PLUS”, -30° for “TURN PLUS”
 - Milling depth to Z=0 (LC=0)
 - Retraction plane to Z=3 (LD=3)
 - Engraving on the front face (LE=0)
 - Linear character string (LF=0)
 - Separation factor: 1.8 * default separation (I=1.8)



Example: Program and block structure

. . .
N58 G100 XK-33 YK10
N59 L"D" V1 LA6 LB30 LC0 LD3 LE0 LF0 I1.8
N60 L"I" V1 LA6 LB30 LC0 LD3 LE0 LF0 I1.8
N61 L"N" V1 LA6 LB30 LC0 LD3 LE0 LF0 I1.8
N62 L"BLANK" V1 LA6 LB30 LC0 LD3 LE0 LF0 I1.8
N63 L"P" V1 LA6 LB30 LC0 LD3 LE0 LF0 I1.8
N64 L"L" V1 LA6 LB30 LC0 LD3 LE0 LF0 I1.8
N65 L"U" V1 LA6 LB30 LC0 LD3 LE0 LF0 I1.8
N66 L"S" V1 LA6 LB30 LC0 LD3 LE0 LF0 I1.8
N67 G100 X55 C90
N68 L"T" V1 LA5 LB-30 LC0 LD3 LE0 LF0 I1.8
N69 L"U" V1 LA5 LB-30 LC0 LD3 LE0 LF0 I1.8
N70 L"R" V1 LA5 LB-30 LC0 LD3 LE0 LF0 I1.8
N71 L"N" V1 LA5 LB-30 LC0 LD3 LE0 LF0 I1.8
N72 L"P" V1 LA5 LB-30 LC0 LD3 LE0 LF0 I1.8
N73 L"L" V1 LA5 LB-30 LC0 LD3 LE0 LF0 I1.8
N74 L"U" V1 LA5 LB-30 LC0 LD3 LE0 LF0 I1.8
N75 L"S" V1 LA5 LB-30 LC0 LD3 LE0 LF0 I1.8
N.. . . .

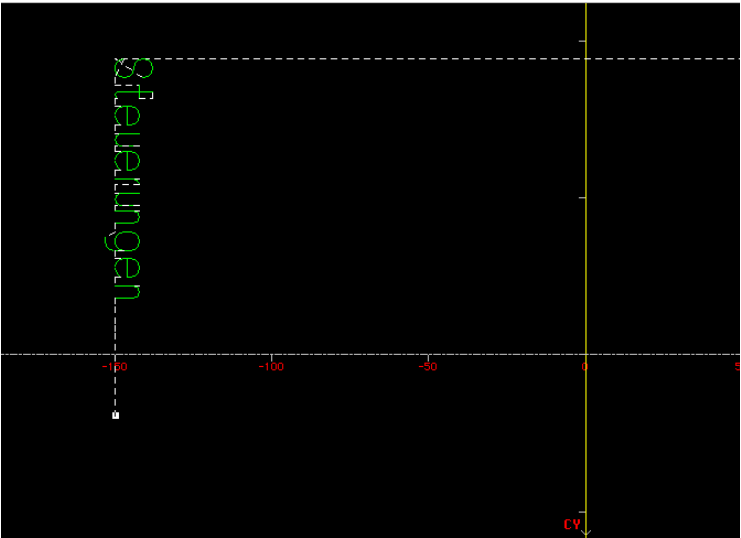
1.4 Example: Engraving the Lateral Surface

Character string "Steuerungen"

The character string "Steuerungen" ("Controls") is engraved from -CY to +CY.

Programming the character string:

- Position the tool to Z=-150 and C=-45°
- Parameters for subprogram call:
 - Letter height: LA=12 mm
 - Angle: LB=0° (from -CY to +CY)
 - Milling depth to diameter 120 (LC=120)
 - Retraction depth to diameter 126 (LC=126)
 - Engraving on the lateral surface (LE=1)
 - Linear character string (LF=0)
 - Diameter (for G120): LH=120
 - Separation factor: 1.3 * default separation (I=1.3)



Example: Program and block structure

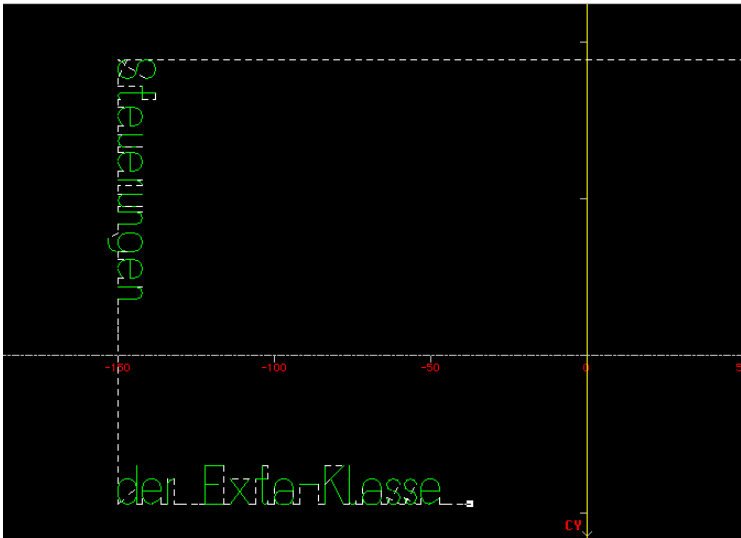
. . .
N17 G0 X126
N18 G0 Z-150
N19 G110 C-45
N20 L"S" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N21 L"KT" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N22 L"KE" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N23 L"KU" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N24 L"KE" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N25 L"KR" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N26 L"KU" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N27 L"KN" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N28 L"KG" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N29 L"KE" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N30 L"KN" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N31 L"BLANK" V1 LA12 LB0 LC120 LD126 LE1 LF0 LH120 I1.3
N.. . . .

Character string “der Extra-Klasse”

The character string “der Extra-Klasse” (“in a class of their own”) is engraved from -Z to +Z.

Programming the character string:




































- Position the tool to Z=-150 and C=45°
- Parameters for subprogram call:
 - Letter height: LA=12 mm
 - Angle: LB=90° (from -Z to +Z)
 - Milling depth to diameter 120 (LC=120)
 - Retraction depth to diameter 126 (LC=126)
 - Engraving on the lateral surface (LE=1)
 - Linear character string (LF=0)
 - Diameter (for G120): LH=120
 - Separation factor (I) is not programmed; the default separation is valid



Example: Program and block structure

. . .
N36 G0 Z-150
N37 G110 C45
N38 L"KD" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N39 L"KE" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N40 L"KR" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N41 L"BLANK" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N42 L"E" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N43 L"KX" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N44 L"KT" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N45 L"KR" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N46 L"KA" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N47 L"MINUS" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N48 L"KL" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N49 L"KA" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N50 L"KS" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N51 L"KS" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N52 L"KE" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N53 L"BLANK" V1 LA12 LB90 LC120 LD126 LE1 LF0 LH120
N.. . . .

1.5 Character Set

Charact ers	SP call	Charact ers	SP call	Charact ers	SP call	Charact ers	SP call	Charact ers	SP call
Small letters				Capital letters				Numbers	
	KA		KAE		A		AE		0
...			KOE	...			OE	...	
	KZ		KUE		Z		UE		9
	SZ								
Special characters									
	AT		EKZU		GRAD		MINUS		RKAUF
	BLANK		EURO		GROESSE R		MUE		RKZU
	DPUNKT		GKAUF		KLEINER		PLUS		USTRICH
	DURCH		GKZU		KOMMA		PROZENT		
	EKAUF		GLEICH		MAL		PUNKT		