

Instruction set for control unit type CNC580/980

for the development of a post-processor for vhf milling machines of the series Premium, Active Pro and Classic

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1. General information

This documentation contains the most important Information for the development of a post-processor to control a vhf portal milling machine with 3 axes (X, Y, Z axis) The command formats described here are designed for CNC 980 and CNC 580.

Edit commands are stored in an output file. Using a terminal program, the commands contained therein are finally transmitted to the controller via a USB interface or serially via an RS-232 interface.

2. Arrangement of the axes

On vhf portal milling machines with 3 axes, the X and Y axis are horizontally at a 90° angle to each other and form the plane of the table. The Z axis is perpendicular at 90° to the X and Y axes. It moves vertically to the table. The machine zero point is located in the rear, left, upper corner of the processing area. All axes are moved in positive direction starting from their machine zero point.

X axis	From left to right
Y axis	From back to front
Z axis	From top to bottom

3. Workpiece zero point

If a vhf portal milling machine is to be used in combination with an optional 3D software, the machine control has to be done via a terminal program („CNC Term“). With the terminal program the workpiece zero point is defined and virtually set to zero.

4. Coordinate system

In your CAM program, when creating a job, select the Z zero plane so that it is located on the workpiece.

- Z movements away from the workpiece occur as negative Z value.
- Z movements into the workpiece occur as positive Z value.



5. Resolution of distance and travel speed

The distances of all axes must be resolved in 1/1000 mm (1 µm).

PA10000;	Distance in X axis: 10000 µm = 10 mm = 1 cm
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The travel speed of all axes must be resolved in 1/1000 mm/s (1 µm/s).

VS25000;	Axis speed: 25000 µm/s = 25 mm/s = 1.5 m/min
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6. Circle, helix and spline commands

Due to the high line processing speeds, circle, helix, and spline commands are not available. Therefore in the post-processor the lines have to be resolved with very fine tolerance values of 0.01 mm.

7. Control commands

All control commands must be terminated with a semicolon [;] to execute them. Comments are listed with a leading slash [/] and a closing backslash [\]. In commands with multiple values, these are separated by a comma [,].

Control command	Comment	Explanation
T1;	/ Fetch tool \	Tool 1 is fetched
T0;	/ Return tool \	Previously fetched tool is returned
OS2,1;	/ Switch on output \	Control unit output 2 is activated
OS2,0;	/ Switch off output \	Control unit output 2 is deactivated
RVS20000;	/ Set spindle rotational speed in RPM and switch on spindle \	Spindle speed = 20000 rpm
RVS0;	/ Switch off spindle \	Spindle speed = 0 rpm
VS5000;	/ Set feed rate in 1/1000 mm/s \	Feed = 5 mm/s
PA10000,10000,5000;	/ Interpolated moving of the machine to given position in 1/1000 mm/s \	Position: X = 10 mm, Y = 10 mm, Z = 5 mm
GA10000,10000,5000;	/ Moving of the machine in fast motion to given position in 1/1000 mm/s \	Position: X = 10 mm, Y = 10 mm, Z = 5 mm

7.1 Definable control commands

Depending on the modules of the used vhf portal milling machine there are additional controllable outputs. Module-dependent outputs would be, for example:

- Dust extraction
- Cooling and lubrication system
- Minimum quantity lubrication system

Depending on the machining strategy, these outputs are usually activated immediately before or after spindle start and deactivated immediately before or after spindle stop.

The corresponding assignment of the outputs can be found in the machine initialization file. Alternatively you can request the assignment of the outputs by mail to: support@vhf.de.

7.2 Travel control commands

There are two different control commands for moving the machine:

GA	To move the machine in rapid traverse at maximum axis speed
PA	For moving the machine at a defined feed rate

A travel command is structured as follows:

GA	40000	,	30000	,	-2000	;
Rapid traverse	X position	Separator	Y position	Separator	Z position	Command confirmation

If a travel command is to be issued at a defined feed rate, a feed rate must first be set:

VS35000;	Feed in X, Y and Z axis is until the next feed change: $V_{xyz} = 35 \text{ mm/s}$
PA10000,10000,5000;	Machine moves with defined feed rate to: X = 10 mm, Y = 10 mm und Z = 5 mm

If only the Y or Z axis is to be moved, a [,] must be used as placeholder:

PA,10000;	Machine moves with defined feed rate to: Y = 10 mm
PA,,5000;	Machine moves with defined feed rate to: Z = 5 mm

7.3 Start command set

At the start of each job the following command sequence should be followed.

Control command	Explanation
T1;	Tool 1 is fetched
GA0,0;	Machine moves in rapid traverse to the set workpiece zero point Position: X = 0 mm and Y = 0 mm
OS2,1;	Control output number 2 is activated Usually: „Sealing air“
GA,-2000;	Machine moves in rapid traverse to the set safety distance Position: X = 0 mm, Y = 0 mm, Z = -2 mm)
RVS25000;	Spindle speed is set to 25000 rpm and spindle is switched on

7.4 Tool change command set

If a tool change is carried out during a job, the following command sequence must be followed.

Control command	Explanation
RVS0;	Spindle speed is set to 0 rpm and spindle is switched off
OS2,0;	Control output number 2 is deactivated Usually: „Sealing air“
T2;	Current tool is deposited and tool 2 is fetched
GA0,0;	Machine moves in rapid traverse to the set workpiece zero point Position: X = 0 mm and Y = 0 mm
OS2,1;	Control output number 2 is activated Usually: „Sealing air“
GA,-2000;	Machine moves in rapid traverse to the set safety distance Position: X = 0 mm, Y = 0 mm, Z = -2 mm)
RVS25000;	Spindle speed is set to 25000 rpm and spindle is switched on

7.5 End command set

At the end of each job the following command sequence should be followed.

Control command	Explanation
RVS0;	Spindle speed is set to 0 rpm and spindle is switched off
OS2,0;	Control output number 2 is deactivated Usually: „Sealing air“
(T0;)	(Optional, current tool is deposited)

8 Command set example

In the following, the instruction set is explained using two squares to be cut out with the dimensions 100 mm x 100 mm as examples. The squares are next to each other. The total depth is set at 10 mm and is run in 2 sequences (2 cuts of 5 mm each). A tool change is carried out between the processing of the individual squares.

Command set:

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T1;GA0,0;OS2,1;GA,, -1000;RVS20000;VS5000;PA,,5000;VS50000;PA100000,0,5000;  
PA100000,100000,5000;PA0,100000,5000;PA0,0,5000;VS5000;PA,,10000;VS50000;  
PA100000,0,10000;PA100000,-100000,10000;PA0,-100000,10000;PA0,0,10000;GA,, -1000;  
OS2,0;RVS0;T2;OS2,1;GA120000,0;GA0,, -1000;RVS18000;VS5000;PA,,5000;VS30000;  
PA220000,0,5000;PA220000,100000,5000;PA120000,-100000,5000;PA120000,0,5000;  
VS5000;PA,,10000;VS30000;PA220000,0,10000;PA220000,-100000,10000;PA120000,-100000,10000;PA120000,0,100  
00;GA,, -1000;RVS0;OS2,0;T0;
```

Control command	Execution	Explanation
First square		
T1;	Fetch tool	Magazine position no. 1
GA0,0;	Absolute output in rapid traverse of the X/Y/Z coordinates in μm .	Machine moves to first square coordinate with lifted Z axis in rapid traverse. Position X = 0 mm, Y = 0 mm is approached.
OS2,1;	Switch output no. 2 (e. g. cooling lubricant on)	24 V are applied to output 2.
GA,-1000;	Absolute output in rapid traverse of the X/Y/Z coordinates in μm .	At the first square coordinate, the machine lifts the Z axis in rapid traverse to flight level. Position X = 0 mm, Y = 0 mm, Z = -1 mm is approached.
RVS20000;	Sets spindle speed in rpm and switches the spindle on.	Spindle is started with 20,000 rpm.
VS5000;	Sets feed rate in $\mu\text{m/s}$.	In the example: $5000 \mu\text{m/s} = 5 \text{ mm/s} = 0,3 \text{ m/min}$.
PA,,5000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine lowers the Z axis at first square coordinate and dives into the material. Position X = 0 mm, Y = 0 mm, Z = 5 mm is approached with a feed rate of 5 mm/s.
VS50000;	Sets feed rate in $\mu\text{m/s}$.	In the example: $50000 \mu\text{m/s} = 50 \text{ mm/s} = 3 \text{ m/min}$.
PA100000,0,5000	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the second square coordinate. Position X = 100 mm, Y = 0 mm, Z = 5 mm is approached with a feed rate of 50 mm/s.
PA100000,-100000,5000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the third square coordinate. Position X = 100 mm, Y = -100 mm, Z = 5 mm is approached with a feed rate of 50 mm/s.
PA0,-100000,5000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the fourth square coordinate. Position X = 0 mm, Y = -100 mm, Z = 5 mm is approached with a feed rate of 50 mm/s.
PA0,0,5000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the first square coordinate. Position X = 0 mm, Y = 0 mm, Z = 5 mm is approached with a feed rate of 50 mm/s.
VS5000;	Sets feed rate in $\mu\text{m/s}$.	In the example: $5000 \mu\text{m/s} = 5 \text{ mm/s} = 0,3 \text{ m/min}$.
PA,,10000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine lowers the Z axis at first square coordinate and dives into the material. Position X = 0 mm, Y = 0 mm, Z = 10 mm is approached with a feed rate of 5 mm/s.
VS50000;	Sets feed rate in $\mu\text{m/s}$.	In the example: $50000 \mu\text{m/s} = 50 \text{ mm/s} = 3 \text{ m/min}$.
PA100000,0,10000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the second square coordinate. Position X = 100 mm, Y = 0 mm, Z = 10 mm is approached with a feed rate of 50 mm/s.
PA100000,-100000,10000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the third square coordinate. Position X = 100 mm, Y = -100 mm, Z = 10 mm is approached with a feed rate of 50 mm/s.

PA0,-100000,10000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the fourth square coordinate. Position X = 0 mm, Y = -100 mm, Z = 10 mm is approached with a feed rate of 50 mm/s.
PA0,0,10000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the first square coordinate. Position X = 0 mm, Y = 0 mm, Z = 10 mm is approached with a feed rate of 50 mm/s.
GA,,-1000;	Absolute output in rapid traverse of the X/Y/Z coordinates in μm .	At the first square coordinate, the machine lifts the Z axis in rapid traverse to flight level. Position X = 0 mm, Y = 0 mm, Z = -1 mm is approached.
RVS0;	Switches spindle off	
OS2,0;	Switch off output no. 2.	Output 2 is reduced to 0 V (e.g. cooling lubricant off)
Second square		
T2;	Fetches tool from magazine position no. 2.	Machine first deposits tool from magazine location 1 and picks up tool from magazine location 2.
GA120000,0;	Absolute output in rapid traverse of the X/Y/Z coordinates in μm .	Machine moves to first square coordinate with lifted Z axis in rapid traverse. Position X = 120 mm, Y = 0 mm is approached.
GA,,-1000;	Absolute output in rapid traverse of the X/Y/Z coordinates in μm .	At the first square coordinate, the machine lifts the Z axis in rapid traverse to flight level. Position X = 120 mm, Y = 0 mm, Z = -1 mm is approached.
OS2,1;	Switch output no. 2 (e. g. cooling lubricant on).	24 V are applied to output 2.
RVS18000;	Sets spindle speed in rpm and switches the spindle on.	Spindle is started with 18,000 rpm.
VS5000;	Sets feed rate in $\mu\text{m/s}$.	In the example: $5000 \mu\text{m/s} = 5 \text{ mm/s} = 0,3 \text{ m/min}$.
PA,,5000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine lowers the Z axis at first square coordinate and dives into the material. Position X = 120 mm, Y = 0 mm, Z = 5 mm is approached with a feed rate of 5 mm/s.
VS30000;	Sets feed rate in $\mu\text{m/s}$.	In the example = $30000 \mu\text{m/s} = 30 \text{ mm/s} = 1.8 \text{ m/min}$.
PA220000,0,5000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the second square coordinate. Position X = 220 mm, Y = 0 mm, Z = 5 mm is approached with a feed rate of 30 mm/s.
PA220000,-100000,5000	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the third square coordinate. Position X = 220 mm, Y = -100 mm, Z = 5 mm is approached with a feed rate of 30 mm/s.
PA120000,-100000,5000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the fourth square coordinate. Position X = 120 mm, Y = -100 mm, Z = 5 mm is approached with a feed rate of 30 mm/s.

PA120000,0,5000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the first square coordinate. Position X = 120 mm, Y = 0 mm, Z = 5 mm is approached with a feed rate of 30 mm/s.
VS5000;	Sets feed rate in $\mu\text{m/s}$.	In the example: $5000 \mu\text{m/s} = 5 \text{ mm/s} = 0,3 \text{ m/min}$.
PA,,10000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine lowers the Z axis at first square coordinate and dives into the material. Position X = 120 mm, Y = 0 mm, Z = 10 mm is approached with a feed rate of 5 mm/s.
VS30000;	Sets feed rate in $\mu\text{m/s}$.	In the example = $30000 \mu\text{m/s} = 30 \text{ mm/s} = 1.8 \text{ m/min}$.
PA220000,0,10000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the second square coordinate. Position X = 220 mm, Y = 0 mm, Z = 10 mm is approached with a feed rate of 30 mm/s.
PA220000,-100000,10000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the third square coordinate. Position X = 220 mm, Y = -100 mm, Z = 10 mm is approached with a feed rate of 30 mm/s.
PA120000,-100000,10000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the fourth square coordinate. Position X = 120 mm, Y = -100 mm, Z = 10 mm is approached with a feed rate of 30 mm/s.
PA120000,0,10000;	Absolute output of the X/Y/Z coordinates in μm with set feed rate.	Machine moves in the material to the first square coordinate. Position X = 120 mm, Y = 0 mm, Z = 10 mm is approached with a feed rate of 30 mm/s.
GA,,-1000;	Absolute output in rapid traverse of the X/Y/Z coordinates in μm .	At the first square coordinate, the machine lifts the Z axis in rapid traverse to flight level. Position X = 120 mm, Y = 0 mm, Z = -1 mm is approached.
RVS0;	Switches spindle off	
OS2,0;	Switch off output no. 2.	Output 2 is reduced to 0 V (e.g. cooling lubricant off).
(T0;)	(Tool is deposited at magazine location no. 2)	(Tool is deposited at magazine location no. 2)

9. Contact person

For any questions you may have, please contact our support department at the telephone number **+49 7032 97097 770** or by email to **support@vhf.de**.