HPGL

database

Data Interface for ARISTOMAT Machines (02/01)

Introduction to the ARISTO HPGL instruction data base

0. Foreword

The full power of the ARISTOMAT machines can today be unleashed through the most universal graphics command instruction set in the world, HPGL. This goes back to the long history of the ARISTO machines since the 1960s as computer controlled CAD drawing machines i.e. plotters. While other machines in the meantime have maintained their complex CNC programming language using G commands, which require additional programming software when hooked up to a PC based standard CAD system, the ARISTOMAT machines can be driven directly from any PC using a standard serial interface and cable.

However, the historic HPGL definition as developed in the 1950s did not provide for many requirements of a complex production machine of today, so the historic HPGL had to be enhanced by some new features since. Take one example: The historic HPGL syntax did not provide for something as basic as “drill a hole at position x.y”. All HPGL was designed for was something like “move to position x,y with pen “down””. So, we have added one command “TD” which can now instruct the ARISTOMAT to move to one position and drill a hole there.

Our following database contains historic HPGL commands and syntax as well as many enhancements we have modified or added. The historic HPGL is still used to describe the shapes of the objects to be drawn or cut, while the knowledgeable driver programmer is given enormous freedom, as to how these objects shall be processed on the machine, up to defining production cycles or sequences for mass production of these objects.

Admittedly, reading a compendium of HPGL syntax is not much fun. So, in order to make it better digestable to the reader, we have added many examples and descriptions of what our machines will do when they receive one particular command.

However, we cannot here explain all the freedom a creative user or programmer can gain through clever combination or interchanging of such commands even inside one particular instruction file.

Also, all ARISTOMAT machines offer many more features than those listed here, which may for instance be accessed locally through the machine keypad, or

through some specific ARISTO software packages like “Automatic Eye”, which will combine machine vision with the ARISTOMAT for automatic -operatorless- production.

Take for instance the generation of tangential control data right inside our machines, fully automatic and synchronously with every movement instruction from outside. Or, if one pizza blade may be used, our machine will clip given vectors automatically to minimise “overcuts” into the material through the blades’ width dimension. These features, as vital as they are, do not enter this manual, because they are not subject to be affected through the serial data interface of the machine. And so for good reason: In many years we have learned that practical machine operators wish to program some important machine features directly and quickly into the machine through the machine keypad, rather than go through a loop of editing HPGL instructions on a remote computer.

So, to obtain a complete reference of the features of the ARISTOMAT, a -current- machine manual should be read alongside the HPGL interface description.

And, we always appreciate direct contact with software developers and we are always available for questions and comments from their side. We have frequently worked with software developers to add new features and there are also some machine features today built in for proprietary use of special customers and applications only. BTW, these are not disclosed here.

All in all: We love the HPGL interface. It is extremely versatile and it is still expandable in many directions.

Consequently, there will be many more enhancements to our ARISTOMAT HPGL in future too. That is why we always keep a current version of the interface description and the command database on our website for convenient downloading.

Visit us frequently at

www.ARISTO.de

for latest information.

To make reading and understanding it easier for you, we have tried to structure the contents of our database.

To start with, there are two different kinds of instruction, device control instructions (DCI) and graphics instructions (HPGL).:

I. Device control instructions (DCI) vs. graphic instructions (HPGL)

Through DCI, the machine can be accessed directly and immediately, regardless of what other content the machine memory may still contain. They are for instance used to obtain immediate output of available buffer space and status of specific device conditions. Additional DCI instructions are required by the RS-232-C interface mode and are used to establish plotter output conditions and handshake protocol, and to control these conditions while the machine is “Online”.

HPGL instructions, on the other hand, enter the plotter’s internal buffer and are executed in first-in/first-out sequence. They will only then and there take effect, where the machine will take notice of them, i.e. when the machine will actually have them ready for execution, not before, for instance when reading them into it´s data memory buffer. DCI do not enter the buffer, but instead are executed immediately upon receipt.

DCI commands can be recognized by their “ESC” prefix, while all HPGL instructions will have a two-letter prefix.

A. Syntax of the DCI device control instructions

DCI are three-character escape code sequences comprising ”ESC” and ”.” followed by one of the characters ”(,), @, A, B, E, H, I, J, K, L, M, N, O, P, Q, R, S, T, Y, Z”.
These syntax conventions are used with the instructions in the data base:

( )	Parentheses indicate that each individual parameters is optional
;	The semicolon follows and delimits parameters. If a semicolon appears without a parameter, the parameter is defaulted.
:	The colon terminates any instruction which may have parameters and can occur after any valid number of parameter entries.

Integer This symbol specifies a fixed point integer value parameter. For example, the characters 10 would represent the decimal value ten; the character 13 would represent the decimal value thirteen. All parameters have to be non floating point value and each parameter must follow a delimiter (;) or the terminator (:).

ESC Denotes the single ASCII character, Escape.

Default Values and Omitting Parameters

Any parameter may be omitted or, if the parameter is required, it can be set to its default value by omitting the parameter and entering only the semicolon delimiter. Any parameters may be omitted and therefore set to default values by entering only the colon terminator after the instruction.

Note: There is no delimiter (semicolon) between the three-character command sequence, and the third character has to be in uppercase, e.g., ESC.P, and first parameter.

II. HPGL Graphic Instructions and more.

A. Through HPGL commands and command strings you can,

1. Set machine up for operation, “Key Machine Configuration”

2. Describe the shape of all objects, “Geometry Description”

3. Trigger the machine to respond and send information about its status, “Machine info reponse”

4. Instruct machine how “Geometry Description” data shall be repositioned, scaled or aligned in this case, “Positioning and Scaling”.

5. Instruct the machine how to process geometry data in a particular way, for instance to accelerate movement or to artificially smooth some contour, “Processing Parameters”

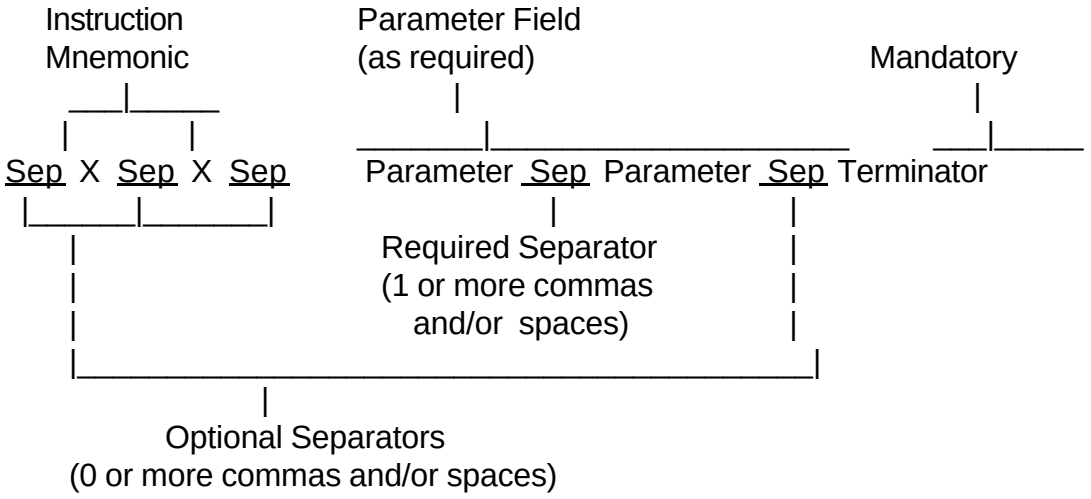
6. Instruct the machine to advance material automatically or to move it back, “Material Advance”.

7. Instruct the machine to repeat production in cycles, while automatically triggering machine features to speed up loading and unloading, “Production Control”

8. Plus, some more instructions concerning “Character Setting”, “Special” and “Developer” specifics.

B. Syntax of the “HPGL” instructions

Each HPGL instruction begins with a two-letter mnemonic, which may be upper- or lowercase. If parameters are required following the mnemonic, they must be separated from each other by at least one comma or space. HPGL instructions are terminated only by a semicolon or the first letter of the next mnemonic. Optional separators may be inserted as shown below:



Carriage return characters will be ignored, except as label characters or an output response terminator in an RS-232-C environment. Some instructions have optional parameters which, when omitted, assume a default value.

The label instruction, LB, buffer label instruction, BL and write display instruction, WD, are special cases. Each must be terminated with the label terminator character. This character defaults to the ASCII end-of-text character, ETX (decimal equivalent 3), but may be changes from its default value using the define terminator instruction, DT. The labels defined with LB and BL instruction are not plotted.

The parameter field must be specified in the format defined by the syntax of each respective HPGL instruction. The format can be of two different types:

1. Decimal Format: The parameter must be between +/-2.23* 10^{-308} and +/-1.8* 10^{308}. Rounding is automatically performed if the required format for the parameter is only integer. In the data base named ”Double”.
2. Label Fields: Any sequence of characters terminated by a ETX or any terminator defined by the DT instruction. In the data base named ”String”.

The syntax shown in the description of each HPGL instruction uses the following notations:

Mnemonic	For readability, the mnemonic is shown .
Name	All typeset items are required parameters. They are named after their use

( )	All items in parentheses are optional
(, ...)	Any optional number of the specified parameter
;	Required terminator. In the data base the semicolon is always used as terminator

III. Some Practical Hints for Programmers

a) Machine information responses

All output responses, in the data base shown in double quotes, include the default output terminator which is the carriage return character (CR). The output terminator is sent from the plotter to the computer at the end of a response to an output instruction. This terminator differs from the HPGL terminator which indicates the end of an HPGL instruction send to the plotter from the computer.

b) Reduce data amount

You may reduce the data amount up to 30% by concentration of the HPGL instructions.

- Relative coordinates need less space the absolute coordinates.
- Only use PD instruction at the beginning of the outline.
- Coordinates may set directly one after another.
- Use next mnemonic as separator.

Example:

PAPU12300,14600PRPD100,50,200,80,130,70,120,40PUPA **...**
PAPU0,0;

c) Increase resolution

Vectors are usually sent in fixed point format with the default resolution of 0.025mm per HPGL step. If the vector length becomes less then 0.5mm the angle error between two vectors may increase due to fitting the start and end points to the 0.025mm-grid. In worst case the angle error will reach up to 90°. This will reduces the plot throughput and the outline quality.

In this case the resolution may be increased as follows:

- Transmission of floating point values. In addition to the HPGL standard floating point values are operated on the ARITOMAT machines.
- Scaling to another resolution with the IP and SC instruction sequence at the beginning of the plot: IP0,0,1,1SC0,10,0,10; (for 0.0025 mm per HPGL step)

d) Vector Length Problem

Some drivers use fixed vector length which are not adapted to the outline of the object. Using small vectors for enlarged outlines will produce a great amount of data (increase of time for transmission) and will reduce the plot throughput. Using large vectors for small outlines will produce a cuttings of less quality.
Therefore the vector length should depend on the chord tolerance, the difference

between the cutting contour and the real contour. For example a chord tolerance of 0.02mm is used as default circle resolution on ARISTOMAT machines for high quality (see CT instruction).
For the best results we recommend to use the CI and AR instructions for non straight vectors.

e) Samples of typical sequences of instructions

Start of job: Set the ARISTOMAT in defined status and higher resolution:

```
INPC7,0IP0,0,1,1SC0,10,0,10;
```

Set the processing parameters for the tools in the job, if not directly set in the plotter menu:

```
SP1VS5AS2CR20RT10SP2VS5AS2CR20RT10 ... ;
```

Select tool 1 and plot first contour (start at X=50mm, Y=50mm ; plot 10mm square)

```
SP1PUPA20000,20000PDPR0,4000,4000,0,0,-4000,-4000,0;
```

Select tool 2 and plot second contour (start at X=50mm, Y=100mm ; plot 10mm square)

```
SP2PUPA20000,40000,PDPR0,4000,4000,0,0,-4000,-4000,0;
```

End of the job: Raises the tool.

```
PUSP;
```

f) Some notes about the PU, PD, PA and PR instructions

The internal optimizer combines all movements with raised tool (PU) to one single movement to the next point with lowered tool (PD). The tool is not lowered if the vector length is Zero. Alternatively, the TD command is available for a “Drill” operation. Both instructions PU and PD do not raise or lower the tool directly, if they do not contain some movement instruction as well.

Note:

The PU, PD, PA, PR instructions are flags.

P**...** (X-coordinate, Y-coordinate(,..));

PA set plotting mode to absolute (and moves the tool to the specified point(s))

PR set plotting mode to relative (and moves the tool the specified distance(s))

PD set flag pen down (and moves the tool to the specified point(s))

PU set flag pen up (store the last point, but **do not move**)

The following instruction sequence force to raise the tool.

```
PUSP;
```

The following instruction sequence forces a move with raised tool.

```
PU X-coordinate, Y-coordinate SP;
```

g) Data transmission

The handshake mode for data transmission between host computer and ARISTOMAT can be set in the menu of the ARISTOMAT. You can choose between XonXoff and hardwired handshake. If it necessary to change the handshake mode of the ARISTOMAT programmatically, use the DCI to activate the handshake

mode.
We highly recommend to set both the computer and the machine to the same handshake mode (e.g. hardwired (DTR)) and then leave it unchanged.

For more details refer to the command and instruction data base.

IV. ARISTO Driver Programmer Support

You can contact our cutter firmware support group

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Instruction: **AA**

Parameter: X, Y, Arc angle (,Chord tolerance)

Group: Geometry description
HPGL Level: Historic HPGL
Recommanded: yes
Definition: Arc Absolute

Since: earlier than V2.0

Param. Type: Double
Scaled: yes
Return Value: -
Range: -, - [units],
± 360 [°],
0 .. 8 [°] / 0 .. 100 [units]

Function: Draws arc centred at X,Y coordinate, starts at current tool position

Default: -, -, -, 5 / 0.8

Example: AA4000,4000,-270;
IF TOOL IS DOWN: Move from current position on an arc around point 4000/4000 clockwise for 270°

Comment: Maximum angle size depends on the radius and the plotter size combined with the scaling.
Negative angles are plotted clockwise, positive angles counter clockwise.
Chord tolerance mode is set by the command CT, for range and default values for the chord tolerance see CT command

Instruction: **AF**

Parameter: -

Group: Material advance

Param. Type:

HPGL Level: Historic HPGL

Scaled: no

Recommanded:

Return Value: -

Definition: Advance Full Page

Range: -

Since: earlier than V2.0

Function: Programmatically advances roll material one full-page length

Default: -

Example: AF;
Advances material on machine for "sheetsize" configured in machine keypad

Comment: Form feed - form size is set in plotter menu (FORMAT), default is A3

Instruction: **AH**

Parameter: -

Group: Material advance

Param. Type:

HPGL Level: Historic HPGL

Scaled: no

Recommanded:

Return Value: -

Definition: Advance Half Page

Range: -

Since: earlier than V2.0

Function: Programmatically advances roll material one half-page length

Default: -

Example: AH;

Advances material on machine for half "sheetsize" configured in machine keypad menu.

Comment: Half form feed - form size is set in plotter menu (FORMAT), default is A3

Instruction: **AR**

Parameter: X, Y, Arc angle (,Chord tolerance)

Group: Geometry description
HPGL Level: Historic HPGL
Recommanded: yes
Definition: Arc Relative

Since: earlier than V2.0

Param. Type: Double
Scaled: yes
Return Value: -
Range: -, - [units],
± 360 [°],
0 .. 8 [°] / 0 .. 100 [units]

Function: Draws arc centred at point relative to current tool position

Default: -, -, -, 5 / 0.8

Example: AR40,40,200;
IF TOOL IS DOWN: oves tool along 200° arc around point 40/40 greater current position.

Comment: Maximum angle size depends on the radius and the plotter size combined with the scaling.
Negative angles are plotted clockwise, positive angles counter clockwise.
Chord tolerance mode is set by the command CT, for range and default values for the chord tolerance see CT command

Instruction: **AS**

Parameter: Acceleration (,Tool number)

Group: Processing parameters
HPGL Level: ARISTO modified HPGL
Recommanded: yes
Definition: Acceleration Select

Param. Type: Double
Scaled: -
Return Value: -
Range: 1 .. 3

Since: earlier than V2.0
last changes V3.4

Function: Sets acceleration for the active tool

Default: 2

Example: AS1.4;
Sets acceleration -rounded- to "1", approx. 50% of max "2".

Comment: The tool number is ignored, the command only affects the active tool
1 <=> 50% , 2 <=> 100% , 3 <=> 150 % ,
Since V3.3 the increased acceleration (up to 150%) is only available on ARISTOMAT II machines.
Since V3.4 the increased acceleration is available on every new ARISTOMAT machine.

Instruction: **BL**

Parameter: Terminated string

Group: Character setting

Param. Type: String

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Buffered Label String

Range: Printable char.

Since: earlier than V2.0

Function: Reads the label, but does not store it

Default: -

Example: BLhello world! \3;

ARISTOMAT will ignore this command, which on other machine may produce "hello world!" in print.

Comment: This command is not supported

Instruction: **CB**

Parameter: -

Group: Special

Param. Type:

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: Remainig bytes

Definition: Clear Buffer

Range: 0 .. Memmax [bytes]

Since: V3.0

Function: Clears plot buffer after interpretation

Default: 0

Example: CB;"0"

Machine keeps moving until this command is next in memory. Then Machine stops and deletes memory.

Comment: Returns 0 on success or any other number on fault.
It is important to wait for this answer before new commands are sent to the plotter.
Data received before CB has answered may be deleted.

Instruction: **CI**

Group: Geometry description
HPGL Level: Historic HPGL
Recommanded: yes
Definition: Circle

Since: earlier than V2.0

Parameter: Radius (,chord tolerance)

Param. Type: Double
Scaled: yes
Return Value: -
Range: - [units],
0 .. 8 [°] / 0 .. 100 [units]

Function: Draws a circle, centred at current tool position

Default: -

Example: CI8000;
Moves one full circle with radius 8000 plotter units (approx. 200 mm on ARISTO machine).

Comment: Maximum radius depends on the plotter size and the scaling.
Chord tolerance mode is set by the command CT, for range and default values for the chord tolerance see CT command

Instruction: **CR**

Group: Processing parameters
HPGL Level: ARISTO specific HPGL
Recommanded: yes
Definition: Corner Recognition

Since: earlier than V2.0

Parameter: Upper angle

Param. Type: Double
Scaled: no
Return Value: -
Range: 0 - 90 [°]

Function: The corner recognition defines the lifting of the tool before turning through an angle greater than the Upper angle.

Default: 20

Example: CR45;
When encountering angle between current and new vector greater 45° machine lifts tool and turns lifted.

Comment: This command affects all tools with non MultiHead systems, and only the actual tool position with MultiHead systems

Instruction: **CT**

Parameter: (Chord tolerance mode)

Group: Geometry description
HPGL Level: Historic HPGL
Recommanded:
Definition: Chord Tolerance

Param. Type: Double
Scaled: -
Return Value: -
Range: 0 / 1

Since: earlier than V2.0

Function: Determines whether chord tolerance parameter of CI, AA and AR instructions is interpreted as degrees or as a deviation distance in plotter units.

Default: 0

Example: CT1;

Comment: 0 - degree mode (default), 1 - deviation mode
Default for degree mode: 5°
Default for deviation mode: 0.8 unscaled HPGL units

Instruction: **DF**

Parameter: -

Group: Key Machine Configuration

Param. Type:

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded: yes

Return Value: -

Definition: Default

Range: -

Since: earlier than V2.0

Function: Sets plotter to default conditions

Default: -

Example: DF;
machine is (re-) set to default key configuration and processing parameters; see below for details.

Comment: The following default values are activated:
Cleares all HPGL errors,
Input window is set to hardclip limits and user-unit scaling is switched off,
Raises the tool and sets the absolute plot mode, sets default values for chord tolerance,
Sets the label terminator to ETX,
Switches off ARISTO Scan'n'Cut mode and resets all counters,
Switches off the special scan mode set with MS1;,
Switches off the automatic repetition mode and enters normal plot mode
The DF command equals the following command sequence: OE;IW;PU;PA;CT;CI0,0,5;DT; MS;PC0;

Instruction: # DT

Group: Character setting
HPGL Level: Historic HPGL
Recommanded:
Definition: Define Terminator

Since: earlier than V2.0

Parameter: Terminator

Param. Type: Character
Scaled: -
Return Value: -
Range: \x00 .. \x7F

Function: Defines the label terminator used in LB, BL and WD instruction

Default: ETX (end of text, \x03)

Example:

DT+;
Sets the label terminator to "+".

Comment: Any character with a decimal equivalent between 0(\x00) and 127(\x7F) can be defined as label terminator, default is 3

Instruction: **FC**

Parameter: (Width (, Starting point))

Group: Material advance

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: no

Recommanded: yes

Return Value: -

Definition: Foil Cut

Range: Width: 0 .. Max [units],
Starting point: 0 .. Max/10 [units]

Since: V3.0

Function: Programmed cutting off the material at the front end of the plotter

Default: Max, Max/10

Example: FC24000,4000;

Machine moves to starting point (0,4000) and cuts for 20000 plotter units in positive Y direction returns to the starting point and cutts the remaining 4000 plotter units in the oposite direction.

Comment: The material advance command (PGx;) before the FC command must include a aditional length of 4.5cm between the parts of the plot.
This command works not with a MultiHead.
If the film cutting device is installed neither the SP6 command nor the menu setting marker must be used

Instruction: **FS**

Parameter: Tool force

Group: Processing parameters

Param. Type: Double

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Force Select

Range: 0 .. 29 / 1 .. 8 / 1 or 2

Since: earlier than V2.0
last changes V2.01

Function: Sets tool force (Standard cutting device)/ Set laser pointer brightness (MultiHead)/ Sets cutting depth (double head only)

Default: -

Example: FS8;
Instructs machine to apply "Tool Pressure 8" when command is reached.

Comment: The FS command has no effect on MultiHead systems if the laser pointer is not the active tool

Instruction: **IN**

Parameter: -

Group: Key Machine Configuration

Param. Type:

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded: yes

Return Value: -

Definition: Initialize

Range: -

Since: earlier than V2.0
last changes V3.21

Function: Initializes the plotter

Default: -

Example: IN;
see below.

Comment: Activates the tool position 1 with all depending parameters (e.g. accel., speed, ...),
Resets the HPGL 90° rotation and places the sheet on the plotter (for plotter and format emulation),
Resets the status port bits (see OS),
and executes the DF instruction
The IN command equals the following command sequence: SP1;RO; DF

Instruction: **IP**

Parameter: P1x,P1y (,P2x,P2y)

Group: Positioning and Scaling
HPGL Level: Historic HPGL
Recommanded: yes
Definition: Input P1 and P2

Param. Type: Double
Scaled: no
Return Value: -
Range: -, -, -, - [units]

Since: earlier than V2.0

Function: Sets scaling points in plotter units.

Default: without parameter

Example: IP0,0,1,1;

Comment: This command is used together with the SC command to scale plot data.
The IP command without parameter sets P1 and P2 to default coordinates (depending on the plotter and sheet size)."
For ultimate precision programming and best speed performance ARISTO recommends experienced programmers to use initial IP0,0,1,1; SC0,10,0,10 string and subsequently plotter units which are tenfold against HP standard resolution. The reasons are complex and difficult to explain, but it works much better that way.
Ommitting only the last two parameter, P2 is moved the same relative distance as P

Instruction: **IW**

Parameter: X1, Y1, X2, Y2

Group: Positioning and Scaling

Param. Type: Double

HPGL Level: Historic HPGL

Scaled: no

Recommanded:

Return Value: -

Definition: Input Window

Range: -, -, -, - [units]

Since: earlier than V2.0

Function: Sets window inside which plotting can occur

Default: without parameter

Example: IW0,0,32000,40000;

Machine will move within defined area. All protruding vectors will be cut short (clipped).

Comment: The IW command without parameters sets the plot window to the plotter size and switches user-unit scaling off.

Instruction: **LB**

Parameter: Terminated string

Group: Character setting

Param. Type: String

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Label

Range: Printable char.

Since: earlier than V2.0

Function: Reads the label, but does not plot it

Default: -

Example: LBhello world! \x03;
ARISTOMAT will accept command without error, but will ignore it.

Comment: This command is not supported

Instruction: **MS**

Parameter: On/Off

Group: Special

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Mode Scan

Range: 0 / 1

Since: V3.15

Function: Sets ARISTOMAT to a special scan mode for special scanner hardware

Default: -

Example: MS0;

Special scanner command (usable only with special scanner attachment).

Comment: A special scanner hardware is required for this command

In scan mode, the plotter ignores any HPGL instructions except the scan mode off MS0; command

The "scanner" is not moved with vector instuctions but with a stepper controller

Instruction: **NR**

Parameter: -

Group: Key Machine Configuration

Param. Type:

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Not Ready

Range: -

Since: earlier than V2.0

Function: Switches the plotter in offline mode

Default: -

Example:

NR;
Switches machine to "Offline" mode.

Comment: To enter online mode press the Start/Stop key at the panel (for security)

Instruction: **OA**

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: Historic HPGL

Scaled: yes

Recommanded:

Return Value: Xa, Ya, Tool status

Definition: Output Actual Position

Range: -, -, [units]
0 / 1

Since: earlier than V2.0

Function: Outputs the current physical tool position

Default: -

Example: OA;
If machine is currently at approx. 100,200mm it will respond "4000,8000,0". 0 means "Tool up".

Comment:

Instruction: **OC**

Group: Machine info response
HPGL Level: Historic HPGL
Recommanded:
Definition: Output Commanded Position

Since: earlier than V2.0

Parameter: -

Param. Type:
Scaled: no
Return Value: Xc, Yc, Tool status
Range: -, -, [units]
0 / 1

Function: Outputs the tool position associated with last valid tool position instruction

Default: -

Example: OC;
Machine responds "4000,8000,0" as last position it is currently destined for, with raised tool.

Comment:

Instruction: **OD**

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: ARISTO modified HPGL

Scaled: no

Recommanded:

Return Value: Xc, Yc, Tool status

Definition: Output Digitized Point

Range: -, -, [units]
0 / 1

Since: earlier than V2.0

Function: Outputs the tool position associated with last valid tool position instruction

Default: -

Example: OD;
Machine responds for instance "4000,8000,0". Same meaning as "OC;"

Comment: Outputs the commanded position and the tool status

Instruction: **OE**

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: Last error

Definition: Output Error

Range: 0 .. 8

Since: earlier than V2.0

Function: Outputs the last HPGL error

Default: -

Example: OE;

Machine responds "0" indicating no error has occured.

Comment: "0": No error
"1": Unknown instruction
"2": Wrong number of parameters
"3": Parameter out of range
"4" to "7": Not used
"8": Page advance instruction without material advance

Instruction: OF

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: "40,40"

Definition: Output Factors

Range: -

Since: earlier than V2.0

Function: Outputs the number of unscaled HPGL units per millimeter in X- and Y-axes

Default: -

Example: OF;

ARISTOMAT will always respond "40,40" indicating its internal fixed scaling value.

Comment: This command is not supported. A fixed string is output

Instruction: **OH**

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: Historic HPGL

Scaled: no

Recommanded:

Return Value: Xmin, Ymin, Xmax, Ymax

Definition: Output Hard-Clip Limits

Range: -, -, -, - [units]

Since: earlier than V2.0

Function: Outputs the hard-clip limits at the time the instruction was received

Default: -

Example: OH;

Machine will respond "0,0,98000,64000" as ultimate permissible area for that machine in question.

Comment:

Instruction: **OI**

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded:

Return Value: Emulation

Definition: Output Identification

Range: -

Since: earlier than V2.0

Function: Outputs the selected plotter emulation

Default: -

Example: OI;

Machine responds to what emulation it has been set to through keypanel menu. Here: "ARISTO"

Comment: Outputs the plotter emulation set in the plotter emulation menu, either "ARISTO" or "7475A" or "7580B"

Instruction: **OL**

Parameter: -

Group: Character setting

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: "0,0,0"

Definition: Output Label Length

Range: -

Since: earlier than V2.0

Function: Outputs information on the label contained in the buffer

Default: -

Example: OL;

Machine does ignore OL command, but will not detect error but reply: "0,0,0"

Comment: This command is not supported. A fixed string is output

Instruction: OO

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: "0,0,0,0,1,0,0,0"

Definition: Output Options

Range: -

Since: earlier than V2.0

Function: Outputs implemented options

Default: -

Example: OO;

This command is ancient HPGL history, without known meaning ."0,0,0,0,1,0,0,0" is compatible answer.

Comment: This command is not supported. A fixed string is output

Instruction: **OP**

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: Historic HPGL

Scaled: no

Recommanded:

Return Value: P1x, P1y ,P2x, P2y

Definition: Output P1 and P2

Range: -, -, -, - [units]

Since: earlier than V2.0

Function: Outputs the plotter unit coordinates of the scaling points P1 and P2

Default: -

Example: OP;
machine responds"0,0,1,1" as values put in previously through IP command.

Comment:

Instruction: **OS**

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: Plotter status

Definition: Output Status

Range: 0 .. 127

Since: earlier than V2.0

Function: Outputs the status of the plotter

Default: -

Example: OS;
See below "8"

Comment: "0": None of the following conditions
"1": Tool is lowered
"2": Point P1 or P2 has changed
"4": Digitized point is available
"8": Unit is initialised, is cleared by OS
"16": Buffer is empty and ready for data
"32": HPGL error, is cleared by OE
"64": Request service

Instruction: **OT**

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: "-1,255"

Definition: Output Carousel Type

Range: -

Since: earlier than V2.0

Function: Outputs the installed carousel type

Default: -

Example: OT;

As we do not have tool crousels, ARISTOMAt responds "-1,255" compatible with HPGL standard.

Comment: This command is not supported. A fixed string is output

Instruction: **OV**

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: "AG130 SIGNLINE L2.00"

Definition: Output Version

Range: -

Since: earlier than V2.0

Function: Outputs the firmware version

Default: -

Example: OV;
Currently fixed response "AG130 SIGNLINE V2.00"

Comment: This fixed string is not to be updated for compatibility causes

Instruction: **OW**

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: Historic HPGL

Scaled: yes

Recommanded:

Return Value: X1, Y1, X2, Y2

Definition: Output Window

Range: -, -, -, - [units]

Since: earlier than V2.0

Function: Outputs the coordinates of the points set by the IW command

Default: -

Example: OW;

IF soft Clip window set through IW is this, "0,0,32000,40000" will be responded by machin upon OW.

Comment:

Instruction: **PA**

Parameter: (X,Y(,X,Y,.....))

Group: Geometry description
HPGL Level: Historic HPGL
Recommanded: yes
Definition: Plot Absolute

Param. Type: Double
Scaled: yes
Return Value: -
Range: -, - [units]

Since: earlier than V2.0

Function: Plots to the X,Y coordinates in the order listed using current tool up/down status

Default: -

Example: PA800,400;
IF TOOL IS DOWN, machine moves to point 800, 400 -with tool down-.

Comment: A complete set of coordinates is required. If one of the two coordinates is missing the command is ignored

Instruction: **PC0**

Parameter: -

Group: Production control

Param. Type:

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range: -

Since: V2.02

Function: Clears production control mode status (normal plotter function)

Default: -

Example: PC0;

The machine will reset itself to non-production cycle operation. Best used at top of -every- new file.

Comment: This command makes the plotter return to normal mode after one of the following commands PC6, PC9 or PC10

Instruction: # PC1

Group: Production control
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Since: V2.02

Parameter: (Time)

Param. Type: Double
Scaled: -
Return Value: -
Range: 0 .. 9.999 [s]

Function: Switches on vacuum and waits default waiting time or specified waiting time

Default: 4

Example: PC1,7.2;
Machine will switch on vacuum and after delay period of 7.2 seconds will continue operation normally.

Comment:

Instruction: **PC2**

Parameter: (Time)

Group: Production control

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range: 0 .. 9.999 [s]

Since: V2.02

Function: Switches off vacuum, waits the specified delay time and resumes job afterwards without key press etc.

Default: 0

Example:

```
PC2;
```

As no delay parameter is given, command will switch off vacuum and carry on cutting without delay.

Comment:

Instruction: **PC3**

Group: Production control
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Since: V2.02

Parameter: (Time)

Param. Type: Double
Scaled: -
Return Value: -
Range: 0 .. 9.999 [s]

Function: Switches vacuum pump action to "blowing" and waits default wait time or specified waiting time

Default: 2

Example: PC3,3.0;
Machine will stop, reverse vacuum action to blowing and will wait for specified time, 3,0 secs, before continuing. That delay time is to allow vacuum pump sufficient time to synchronise.

Comment:

Instruction: **PC4**

Parameter: (Time)

Group: Production control

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range: 0 .. 9.999 [s]

Since: V2.02

Function: Switches blowing to "OFF" and waits the specified delay time

Default: 0

Example: PC4,3.0;

IF VACUUM PUMP HAS BEEN IN BLOWING MODE: Switches vacuum pump off and resumes cutting after specified time, 3.0 seconds.

Comment:

Instruction: # PC5

Group: Production control
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Since: V2.02

Parameter: Time

Param. Type: Double
Scaled: -
Return Value: -
Range: 0 .. 9.999 [s]

Function: Waits the specified delay time

Default: 0

Example: PC5,2.5;
Interrupts job at present position (with tool position up or down) and resumes job after 2.5 seconds.

Comment:

Instruction: **PC6**

Parameter: -

Group: Production control

Param. Type:

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range: -

Since: V2.02

last changes V3.23

Function: Automatic repetition of the plot memory with the drive switch and switching vacuum off at the end of the plot

Default: -

Example: PC6;

Machine stops, switches off vacuum and motor drives. Upon pressing "green " key, job is re-started from machine memory. This command must be positioned at end of HPGL file. Typical machine loading/unloading situation.

Comment: Compare also PC9, PC10 and PC12

Instruction: **PC7**

Parameter: Filter

Group: Processing parameters
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Param. Type: Double
Scaled: -
Return Value: -
Range: 0 .. 7

Since: V2.07
last changes V3.3

Function: The internal contour smoothing filter operator is set to specified level

Default: 2

Example: PC7,0;
Switches all contour smoothing off.
ATTENTION: This will lead to extreme precision of movement, at cost of throughput. USE WISELY.

Comment: The meaning of these parameters is:
0: no filtering
1 .. 6: filter level 1 to 6
7: string filter
For filter behaviour refer to plotter manual

The string filter adds vectors until the resuming chordt tolerance exeeds the chordt tolerance set in the menu or with HPGL command CT.

Instruction: **PC8**

Group: Processing parameters
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Since: V2.06

Parameter: Switch, Time

Param. Type: Double
Scaled: -
Return Value: -
Range: 1 / 2,
0 .. 9.999 [s]

Function: SPECIAL COMMAND FOR WATER JET OR SIMILAR: Set times for forerun or afterrun of the waterjet

Default: -

Example: PC8,1,2;PC8,2,4;
IF WATERJET IS FITTED: Machine stops, switches water jet on, waits 2 seconds before moving on. At stopping point, machine will wait 4 seconds before switching water jet off and move to new object.

Comment: Both parameters are required in a valid range, if one or more is missing or is invalid the command is ignored

Instruction: **PC9**

Group: Production control
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Parameter: (Time)
Param. Type: Double
Scaled: -
Return Value: -
Range: 0 .. 9.999 [s]

Since: V2.07
last changes V3.23

Function: Automatic repetition of the plot memory with the drive switch, switching vacuum off at the end of the plot and switching vacuum on at the start of the plot

Default: 0

Example:
```
PC9;
```
Machine stops at end of job, switches vacuum off. Upon keypress "green" vacuum pump is switched on, machine will wait specified delay time and job is restarted from machine memory.

Comment: Waits after execution if specified. Compare also PC6, PC10 and PC12

Instruction: # PC10

Parameter: (Time)

Group: Production control

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range: 0 .. 9.999 [s]

Since: V2.07
last changes V3.23

Function: Automatic repetition of the plot memory with the drive switch, switching blowing on at the end of the plot and again switching vacuum on at the start of the plot

Default: 0

Example: PC10;
PC10 defines end of production cycle. Machine will stop, reverse vacuum to blowing, and wait for operator to press green key to repeat full production cycle after secified delay time. This command must be at absolute end of HPGL file.

Comment: Waits after execution if specified. Compare also PC6, PC9 and PC12

Instruction: # PC11

Parameter: Thickness

Group: Processing parameters
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Param. Type: Double
Scaled: -
Return Value: -
Range: 0,1,2,3

Since: V2.07

Function: ONLY IN CONNECTION with "Standard" Toolhead: The lower the tool is lifted above the material, the shorter the overall cutting time. However, if tool is lifted unsufficiently, this may cause tool error.

Default: 0

Example: PC11,1;
IF STANDARD CUTTING TOOLHEAD IS FITTED: Sets characteristics of tool lifting to approx thickness of material. "Medium", representing a lifting of 1.5mm approx.. This command may shorten cutting time.

Comment: The thickness levels are
0: Thin
1: Medium
2: Thick
3: Masking Film
The correct setting of material thickness is only important for the standard cutting device

Instruction: **PC12**

Parameter: -

Group: Production control

Param. Type:

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range: -

Since: V3.0

last changes V3.23

Function: Automatic repetition of the plot memory with the drive switch and without activating blowing or vacuum

Default: -

Example: PC12;

This command is equivalent with PC 10, PC 6, PC9, except in this case the vacuum pump action is not affected.

Comment: Compare also PC6, PC9 and PC10

Instruction: # PC13

Parameter: (Length)

Group: Material advance

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: no

Recommanded:

Return Value: -

Definition: Production Control

Range: 0 .. Xmax [units]

Since: V3.0

Function: Page advance backwards by the actual page length or by the given length

Default: Xmax

Example: PC13;

IF MATERIAL TRANSPORT MEANS IS FITTED: As length parameter is omitted here, command moves material back over full length of machine. In connection with parameter for length, this would instruct machine to move back as specified.

Comment: Xmax is the length of the plotter. This command works complementarily to the PG command

Instruction: # PC14

Parameter: Pmax, Pmin, Pp1, Dp1, Pp2, Dp2

Group: Processing parameters
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Since: V3.3

Param. Type: Double
Scaled: -
Return Value: -
Range: 0.1 .. 100 [%], 0 .. 100 [%],
0 .. 100 [%], 0 .. 0.999 [s],
0 .. 100 [%], 0 .. 0.999 [s]

Function: Sets the power parameter for start- and end pulse for laser cutting

Default: -

Example: PC14,100,5,0,0,0,0;
SPECIAL COMMAND IF LASER IS FITTED: see below.

Comment: The meaning of these parameters is:
Pmax / Pmin: max. and min. used power
Pp1 / Pp2: power of the pulse at beginning and end of a contour with lowered tool
Dp1 / Dp2: duration of the pulse at beginning and end of a contour with lowered tool
All paramters are required in a valid range, if one or more is missing or is invalid the command is ignored

Instruction: # PC15

Parameter: Before, After, Corner, Start

Group: Processing parameters

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range: 0 .. 9.9 [s], 0 .. 99 [s], 0 .. 0.999 [s], 0 .. 0.999 [s]

Since: V3.3

Function: Sets the process times for laser cutting

Default: -

Example: PC15,2.5,10.6,0,0;

LASER COMMAND: similar to PC 14; see below for specific action

Comment: The meaning of these parameters is:

Before: time between the lower command and the pulse at beginning of the plotted contour

After: time counted after the pulse at end of the plotted contour for additional devices (e.g. cooling)

Corner: time that is waited in a recognized corner

Start: time between the pulse at begin of a lowered contour and the contour itself

All parameters are required in a valid range, if one or more is missing or is invalid the command is ignored

Instruction: **PC16**

Parameter: -

Group: Processing parameters

Param. Type:

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range: -

Since: V3.23

Function: Switches the plotter to "offline" mode and switches the drives off. Then the plotter is waiting for pressing the drive "green" key to continue the interrupted plot

Default: -

Example:

```
PC16;
```

If this command comes up, machine will stop moving -where it is- and allow operator to remove parts, befor re through pressing of key the machine will continue.

Comment: To continue the plot you only need to press the green button (drives on).
Attention: You do not have to press the Start/Stop key at the panel like usual, the plotter starts directly after pressing the drives button.

Instruction: # PC17

Group: Processing parameters
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Since: V3.23

Parameter: On/Off

Param. Type: Double
Scaled: -
Return Value: -
Range: 0 / 1

Function: ONLY IF PASSEPARTOUT TOOL IS FITTED: Switches between the tool type 'Passepartout Smart' and 'Passepartout' at the tool head oscillator.

Default: 1

Example: PC17,0;
WITH PASSEPARTOUT TOOL: Blade only is retracted from material, while toolhead itself is not lifted up.

Comment: "The meaning of these parameters is:
0: Corner lifting off - tool type = Passepartout Smart
1: Corner lifting on - tool type = Passepartout

Instruction: # PC18

Group: Processing parameters
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Since: V3.3

Parameter: On/Off

Param. Type: Double
Scaled: -
Return Value: -
Range: 0 / 1

Function: ONLY IN CONNECTION WITH OSCILLATING MULTIHEAD: Switches the oscillation action of the one oscillating tool on or off. ATTENTION: If used when non-scillating tool is active, this will be ignored..

Default: 1

Example: PC18,1;
IF OSCILLATING MULTI-TOOLHEAD IS FITTED AND OSCILLATING TOOL IS CURRENTLY ACTIVATED THROUGH "SP" COMMAND: Switches oscillation ON.

Comment: "The meaning of these parameters is:
0: Oscillating off - tool type = Blade
1: Oscillating on - tool type = Oscillator

Instruction: # PC19

Parameter: Sync

Group: Production control

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range: 0 / 1

Since: V3.3

Function: IF EXTRA VACUUM PUMP IS FITTED: Switches extra vacuum pump and to synchronous vacuum mode with standard fitted pump.

Default: -

Example: PC19,0;

Switches extra vacuum pump -where fitted- to OFF. To reactivate pump, another PC19,1 will be required.

Comment: The extra vacuum pump is synchronous switched with the first pump by default. This command allows to deaktivate the vacuum direction of the extra pump, the blow direction still remains synchronous. If the the parameter Sync is set to 0 the extra pump is switched off when the the first pump is sucking. If Sync is set to 1 the extra pump gets in the same state as the first pump is (off or vacuum).

Instruction: # PC20

Parameter: DeltaForce

Group: Processing parameters
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Since: V3.3

Param. Type: Double
Scaled: -
Return Value: NewForce
Range: -29 .. 29
Ret.Val: 0 .. 29

Function: ONLY IF ELECTRONIC STANDARD TOOL IS FITTED: Increase or decrease tool force (i.e. downward pressure) relative to present setting.

Default: -

Example: PC20,3;
Increases tool pressure by three "notches".

Comment: The tool force will be in/decreased by the DeltaForce. If the new tool force exceeds the menu range, it will automatically set to the maximum or minimum value.
Without a parameter this command returns the actual tool force.

Instruction: # PC21

Group: Production control
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Since: V3.3

Parameter: BeginComp, EndComp

Param. Type: Double
Scaled: no
Return Value: -
Range: 0..800 , 0 .. 800 [units]

Function: The overcut will be reduced by the given length at the begin or the end of an vector. This command is usefull for wheel blades or similar tools.

Default: -

Example: PC21,200,200;
Causes an overcur reduction of 5mm at the begin and at the end of an vector.

Comment: If you do cut material with a wheel blade you get an overcut at the begin and end of an lowered vector.
Begin means an change between raised and lowered, end means an change between lowered and raised or in both cases if there is a corner between two lowered vectors where the tool must be raised (e.g. when the angle between the two vectors exeed the upper angle in menu).
Both parameters are required. If one or both is missing or they exeed the valid range the command is ignored.

Instruction: # PC22

Parameter: On/Off

Group: Processing parameters

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range: 0 / 1

Since: V3.3

Function: Switches speedbooster on or off.

Default: -

Example:

```
PC22,1;
```

Switches speedbooster on.

Comment: The speedbooster is not longer a special smoothing level, but can be used with any smoothing level. Therefore the PC7 command has changed as well.

Instruction: **PC23**

Parameter: -

Group: Production control

Param. Type:

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range:

Since: V3.3

Function: The machine moves to the farest end, similar to pressing the VIEW button.

Default: -

Example: PC23;

The machine moves to the farest end, similar to pressing the VIEW button.

Comment: This command is used to ease the operator the work at the end of a job. The operator only has to switch off the drives before he can pick the cutted pices from the machine. The complete working area is accesible, because independent from the machine size the tool head always moves to the very far end of the machine.

Instruction: # PC24

Parameter: On/Off

Group: Material advance

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Production Control

Range: 0 / 1

Since: V3.3

Function: Switches the scaling mode of the material advancde length on or off.

Default: -

Example: PC24,1;

Switches the scaling of the material advancde length on. The advance length given with the PG or PC13 commands is scaled with the scaling set at the machines menu AND the HPGL scaling with the commands IP and SC.

Comment: This command enables the scaling of the material advance length given by the PG or PC13 command. The HPGL commands Af and AH are not affected.

Instruction: # PC25

Parameter: -

Group: Machine info response

Param. Type:

HPGL Level: ARISTO specific HPGL

Scaled: no

Recommanded:

Return Value: Xo,Yo

Definition: Production Control

Range: -, - [units]

Since: V3.6

Function: Outputs the drawing origin which is set

Default: -

Example: PC25;"0,0"

Comment: Returns the coordinates of the drawing origin relative to the machine's internal origin

Instruction: # PC26

Group: Positioning and Scaling
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Production Control

Since: V3.6

Parameter: X,Y

Param. Type: Double
Scaled: no
Return Value: -
Range: 0 .. Max [units]

Function: Set origin to the named point

Default: -

Example:

```
PC26,400,400;
```

Comment: Valid Max is depending on the plotter size

Instruction: **PR**

Parameter: (X,Y(,X,Y))

Group: Geometry description
HPGL Level: Historic HPGL
Recommanded: yes
Definition: Plot Relative

Param. Type: Double
Scaled: yes
Return Value: -
Range: -, - [units]

Since: earlier than V2.0

Function: Plots, in order of coordinate pairs added, to the points indicated by the X,Y increments, relative to the previous tool position using current tool up/down status

Default: -

Example: PR0,400,400,0,0,-400,-400,0;
IF TOOL IS LOWERED PREVIOUSLY, machine moves tool around a square of 400 plotter units length, clockwise.

Comment: A complete set of coordinates is required. If one of the two coordinates is missing the command is ignored

Instruction: **PU**

Parameter: (X,Y(,X,Y))

Group: Geometry description

Param. Type: Double

HPGL Level: Historic HPGL

Scaled: yes

Recommanded: yes

Return Value: -

Definition: Pen Up

Range: -, - [units]

Since: earlier than V2.0

Function: Plots to the X,Y coordinates in the order listed with raised tool using current tool absolute/relative status

Default: -

Example: PU0,0;

IF MODE WAS PREVIOUSLY SET TO "RELATIVE", tool will be raised only, but not move. IF MODE WAS ABSOLUTE, tool will raise and move to job origin (resp. datum).

Comment: A complete set of coordinates is required. If one of the two coordinates is missing the command is ignored

Instruction: **PV**

Group: Production control
HPGL Level: ARISTO specific HPGL
Recommanded:
Definition: Punch V

Since: V3.3

Parameter: X, Y, Width, Depth, Angle
(,Length, Forerun, Overl)
Param. Type: Double
Scaled: yes
Return Value: -
Range: -, -, [units] <= 0 , <= 0 [0.025mm]
0 .. 360, [°]
<= 0 , <= 0 , <= 0 [0.025mm]

Function: FOR TEXTILE: Punches a V notch at the given position with the geometry specified

Default: -, -, -, -, -, 200, 0, 40

Example: PV800,400,400,600,90;
At position -absolute- 800, 400 units, machine will punch V notch 400 units wide at opening, 600 units "high", with absolute orientation of 90 degrees against -current- machine coordinates orientation.

Comment: X and Y are the coorinates where the V shall be punched. These coordinates are scaled if scaling is activ.

Width is the opening of the V and Depthis the depth. Angle is the angle between the positive x-axis and the peek of the V.
Length, Forerun and Overlap are optional and knife depending papameters.
Neither of those six parameters are scale

Instruction: **RO**

Group: Positioning and Scaling
HPGL Level: Historic HPGL
Recommanded:
Definition: Rotate Coordinate System

Since: earlier than V2.0

Parameter: Angle
Param. Type: Double
Scaled: no
Return Value: -
Range: 0 / 90 [°]

Function: Rotates the coordinate system 90° against at the plotter coordinate origin, or reverses that back to normal.

Default: -

Example: RO90;
Rotates cooordinate system 90° clockwise. Command may be useful when changing existing job from "portait" to "landscape" orientation.

Comment:

Instruction: **RT**

Parameter: Lower Angle

Group: Processing parameters
HPGL Level: ARISTO specific HPGL
Recommanded: yes
Definition: Lower Angle

Param. Type: Double
Scaled: no
Return Value: -
Range: 0 - 45 [°]

Since: earlier than V2.0

Function: The lower angle defines the threshold angle below and until where the machine will stop, turn the tool without forward movement and move on subsequently. The tool is not lifted for turning.

Default: 10

Example: RT20;
Machine turns lowered tool by force in case angle does not exceed 20°.

Comment: Important for cutting quality
This command affects all tools with non MultiHead systems, and only the actual tool position with MultiHead systems

Instruction: **RY**

Parameter: -

Group: Key Machine Configuration

Param. Type:

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Reference Y-Axis

Range: -

Since: V3.0

Function: Executes reference moves on Y axis

Default: -

Example: RY;

Machine lifts tool, does new origin referencing cycle in Y direction.Then returns. ATTENTION: see comment below.

Comment: This command may be used to advantage in precision sensitive cases to compensate any minor machine drive slipping from time to time, especially where routing or heavy toolheads and high acceleration occur. However, this command must be used wisely only at end or beginning of new job, as it will alter the machines' coordinate system. DO NOT USE INSIDE CONTOURS!!!
BTW: There is no "RX" command, because ARISTOMAT machines use a rack and pinion drive in the X axis, so there cannot be or develop any slip an that X axis

Instruction: **SC**

Parameter: Xmin,Xmax;Ymin,Ymax

Group: Positioning and Scaling

Param. Type: Double

HPGL Level: Historic HPGL

Scaled: no

Recommanded: yes

Return Value: -

Definition: Scale

Range: -, - ,- , - [units]

Since: earlier than V2.0

Function: Scales the plotting area set with IP command into user units

Default: -

Example: SC0,10,0,10;
In connection with previously set command IP0,0,1,1 overcomes historic HP definition of flatbed machine with datum in center of table and rough resolution.

Comment: For ultimate precision programming and best speed performance ARISTO recommends experienced programmers to use initial IP0,0,1,1; SC0,10,0,10 string and subsequently plotter units which are tenfold against HP standard resolution. The reasons are complex and difficult to explain, but it works much better that way.

Instruction: **SO**

Parameter: -

Group: Positioning and Scaling

Param. Type:

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded: yes

Return Value: -

Definition: Set Origin

Range: -

Since: earlier than V2.0

Function: The drawing origin is set at the actual position

Default: -

Example: SO;

Sets new origin resp. datum at current position. VERY useful for chainlinked jobs!

Comment: Useful to move the drawing origin on the table at the end of the plot

Instruction: **SP**

Parameter: Position

Group: Processing parameters

Param. Type: Double

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded: yes

Return Value: -

Definition: Select Pen

Range: 0 .. 100

Since: earlier than V2.02
last changes V3.4

Function: Selects among available tools.

Default: 0

Example: SP6;
ONLY IF MARKER PEN IS AVAILABLE: defines marker pen to follow next instructions resp. contour.
IF MARKER PEN IS NOT PRESENT: Machine will not lower tool, but move.

Comment: MultiHead systems: SP1 = position 1 (creasing wheel), SP2 = position 2 (blade), SP3 = position 3 (marker), SP4 = position 4 (laser pointer)
All other heads: SP6 = marker, all other numbers = main tool (blade)
On all heads (incl. MultiHead): SP81 = laser pointer, SP91 = camera

Instruction: **TD**

Parameter: Tool

Group: Processing parameters

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded: yes

Return Value: -

Definition: Tool type Drill

Range: 0 / 1

Since: V3.0

Function: Switches between the tool types router and drill

Default: 0

Example: TD0;

Machine configures itself for Router (Milling) operation. In this mode, a move command is carried out with tool "Down" all the way. If set to "1" for drill, Machine would move with tool "up" and lower only at end ov movement vector.

Comment: 0 (Router) or 1 (Drill)

This command has only effect on the router tool head. A HOT COMMAND!!! As historic HPGL had no intentions for drilling operations as many application require today, this is a very nice add on for us.

Instruction: **TR**

Parameter: On/Off

Group: Processing parameters

Param. Type: Double

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Tangential Control

Range: 0 / 1

Since: earlier than V2.0

Function: Enables or disables the tangential control

Default: 1

Example: TR1;

Switches currently selected tool -where applicable- to Tangentially Controlled operation.

Comment: 0 - Off, 1 - On

This command has only effect on the standard cutting device

Instruction: **VS**

Parameter: Velocity (,Tool number)

Group: Processing parameters

Param. Type: Double

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded: yes

Return Value: -

Definition: Velocity Select

Range: 0 .. 6

Since: earlier than V2.0

Function: Set velocity for the tool

Default: 5

Example: VS3.5;

Sets maximum speed of currently selected tool to (3.5/5) = approx. 70% of max. speed.

Comment: On the ARISTOMAT, an otional tool number is ignored, the command affects the active tool only
1 <=> 200‰ , 2 <=> 400‰ , 3 <=> 600 ‰ , 4 <=> 800 ‰ , 5 <=> 1000 ‰ , 6 <=> 1200 ‰ ,
Since V3.3 the increased speed (up to 1200‰) is only available on ARISTOMAT II machines.
Since V3.4 the increased speed is available on every new ARISTOMAT machine

Instruction: **WD**

Parameter: Terminated string

Group: Character setting

Param. Type: String

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Write Display

Range: Printable char.

Since: earlier than V2.0

Function: Outputs letter string to LCD display at machine keypanel

Default: -

Example: WDhello world! \3;
On machine keypanel LCD display appears "hello world!".

Comment: Only 24 characters should be used if the plot time option is used. NOTE: The above "\3" represents the hexadecimal value of the string terminator, here "3".

Instruction: **WK**

Parameter: -

Group: Special

Param. Type:

HPGL Level: ARISTO specific HPGL

Scaled: -

Recommanded:

Return Value: Empty string representing <CR>

Definition: Wait Key

Range: -

Since: V3.0

Function: Writes "Continue with Enter" on the LCD and waits for pressing of "ENTER" key (or any other key)

Default: -

Example: WK;

IF NO VECTORS FOLLOW: Machine stops. LCD display on keypanel will display "Continue with ENTER". Upon pressing ENTER key, machine will send "CR" signal to computer. WITH vectors following, machine will not wait for key.

Comment: ONLY USEFUL FOR ONLINE, INTERACTIVE control of machine. Typical case: the job requires the operator to check something while job is running. If operator is not present at that time, job will be interrupted until operator returns and presses key for continuation.

Instruction: ESC.(

Parameter: -

Group: Key Machine Configuration DCI

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Programmed On

Range: -

Since: earlier than V2.0

Function: Switches Com-port of the plotter in the programmed-on status

Default: -

Example: ESC.(:
Opens serial interface of plotter for further communication with computer.

Comment: Same as ESC.Y

Instruction: ESC.)

Parameter: -

Group: Key Machine Configuration DCI

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Programmed Off

Range: -

Since: earlier than V2.0

Function: Switches Com-port of the plotter in the programmed-off status

Default: -

Example: ESC.):

Closes serial port of machine to further data communication; waits for next "ESC.(" instruction.

Comment: Same as ESC.Z

Instruction: # ESC.@

Parameter: (Buffer size); Handshake mode

Group: Key Machine Configuration DCI

Param. Type: Integer

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Configuration Port

Range: 0 / 1

Since: earlier than V2.0

Function: Configuration Com ports parameter

Default: 0

Example: ESC.@;0:

Sets handshake to hardware handshake (see also ESC.I, ESC.H, ESC.P etc.)

Comment: Buffer size is ignored;

Handshake mode = 0 (or all even numbers) hardwired,

Handshake mode = 1 (or all odd numbers) Xon-Xoff

Instruction: ESC.A

Parameter: -

Group: Machine info response DCI

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: "AG130 Signline L2.00"

Definition: Output Identification

Range: -

Since: earlier than V2.0

Function: Outputs a fixed string only for compatibility

Default: -

Example: ESC.A:
Machine -always- responds: "AG 130 Signline L2.00"

Comment: This fixed string is not to be updated for compatibility causes

Instruction: **ESC.B**

Parameter: -

Group: Machine info response DCI

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: Memsize

Definition: Output Buffer Space

Range: 0 .. Memmax [byte]

Since: earlier than V2.0

Function: Outputs the number of currently free memory locations in the plotter buffer

Default: -

Example: ESC.B:
Machine responds for instance "2097152" if currently free input memory is approx. 2MB

Comment: Maximum size depending on the plotter memory option: 32k, 400k or 2000k byte

Instruction: # ESC.E

Parameter: -

Group: Machine info response DCI

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: Error code

Definition: Output Extended Error

Range: 00 .. 16

Since: earlier than V2.0

Function: Outputs extended I/O error status

Default: -

Example: ESC.E

Machine responds "00" if no error occurred; "15" if framing error was detected.

Comment: "00": No error
"10": Output instruction received during data output; the last received instruction is ignored
"11": Invalid byte received after ESC.
"12": Invalid byte within a parameter of a ESC sequence
"13": Parameter is not in the premissible range
"14": Too many parameters received
"15": Interface error (framing, overrun, parity) was found
"16"; Character buffer overflow. Handshake was not processed. Data is lost due to the error

Instruction: # ESC.H

Group: Key Machine Configuration DCI
HPGL Level: ARISTO modified HPGL
Recommanded:
Definition: Set Handshake Mode

Since: earlier than V2.0

Parameter: Level; (Enq.Char); TriggerChar.

Param. Type: Integer
Scaled: -
Return Value: -
Range: Level: 0 .. Memmax [byte];
Trigger Character: 0 .. 127

Function: Sets handshake mode and for Xon-Xoff protocol Xoff threshold level and Xon trigger character

Default: without parameter

Example: ESC.H256;;17:
Set level to 256 byte below max. avail. memory; Enq. Char. omitted; Trigger character 17

Comment: Enquire Character is ignored
Enquire/Acknowledge is not supported
Without Parameter: hardwired handshake is established
Same as ESC.I

Instruction: **ESC.I**

Group: Key Machine Configuration DCI
HPGL Level: ARISTO modified HPGL
Recommanded:
Definition: Set Handshake Mode

Since: earlier than V2.0

Parameter: Level; (Enq.Char); TriggerChar.

Param. Type: Integer
Scaled: -
Return Value: -
Range: 0 .. Memmax [byte];
0 .. 127

Function: Sets handshake mode and for Xon-Xoff protocol Xoff threshold level and Xon trigger character

Default: without parameter

Example: ESC.I:
Sets handshake mode to hardware handshake

Comment: Enquire Character is ignored
Enquire/Acknowledge is not supported
Without Parameter: hardwired handshake is established
Same as ESC.H

Instruction: # ESC.K

Parameter: -

Group: Key Machine Configuration DCI

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Abort Graphic Instruction

Range: n/a

Since: earlier than V2.0

Function: Aborts any partially decoded HPGL instruction

Default: -

Example: ESC.K:

Machine stops after current vector and cannot continue. However, all data in memory are kept intact.

Comment: Actual instruction is executed to finish

Instruction: # ESC.L

Parameter: -

Group: Machine info response DCI

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: Memsize

Definition: Output Buffer Size

Range: 32768 .. 2097512 [byte]

Since: earlier than V2.0

Function: Outputs the available buffer size

Default: -

Example: ESC.L:
Machine responds:"32768" as installed buffer size, regardless of actual buffer usage

Comment: Maximum size depending on the plotters memory option: 32k, 400k or 2000k byte

Instruction: # ESC.N

Parameter: (Inter char delay,) Trigger character

Group: Key Machine Configuration DCI

HPGL Level: ARISTO modified HPGL

Recommanded:

Definition: Set Xoff trigger character

Since: earlier than V2.0

Param. Type: Integer

Scaled: -

Return Value: -

Range: 0 .. 127

Function: Sets inter character delay and Xoff trigger character

Default: 19

Example: ESC.N;19:

Comment: Inter character delay is ignored

Instruction: # ESC.O

Parameter: -

Group: Machine info response DCI

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: Status

Definition: Output Extended Status

Range: 0 .. 24

Since: earlier than V2.0

Function: Outputs the current equipment status

Default: -

Example: ESC.O:
Machine responds "8": "Buffer is currently empty" (see below)

Comment: "0": Plotter is processing a stored instruction
"8": Buffer is empty; plotter is waiting, ready to receive data
"16": View key is pressed
"32": Plotter is offline
"2^29": MenuPosition is active
"2^30": Tool head is MultiHead
"2^31": Plotter is online

Instruction: **ESC.P**

Parameter: Handshake mode

Group: Key Machine Configuration DCI

Param. Type: Integer

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Set Handshake Mode

Range: 0 .. 3

Since: earlier than V2.0
last changes V3.3

Function: Sets handshake mode either to hardwired or Xon-Xoff

Default: 3

Example: ESC.P1:
Sets handshake to Xon/ X0ff.

Comment: "0": Outputs the port settings in a text string, seperated with a comma between the options like:
"Handshake, Baud rate, Bits per Byte, Parity and Stopbits"
"1": Xon-Xoff handshake
"2": not supported
"3": hardwired handshake

Instruction: # ESC.R

Parameter: -

Group: Key Machine Configuration DCI

Param. Type:

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Reset Handshake

Range: -

Since: earlier than V2.0

Function: The unit carries on operation with hardwired handshake

Default: -

Example: ESC.R:
Sets protocol to hardwired (i.e. hardware) handshake

Comment: The effect of the instruction is identical to ESC.@:

Instruction: # ESC.S

Parameter: (Buffer number)

Group: Machine info response DCI

Param. Type: Integer

HPGL Level: ARISTO modified HPGL

Scaled: -

Recommanded:

Return Value: Memsize

Definition: Output Buffer Size

Range: 32768 .. 2097512 [byte]

Since: earlier than V2.0

Function: Outputs the available buffer size

Default: -

Example: ESC.S:
Machine responds"32768" as currently available -free- buffer size (in byte).

Comment: Buffer number is ignored, therefore same result as ESC.L

Instruction: # ESC.Y

Parameter: -

Group: Key Machine Configuration DCI

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Programmed On

Range: -

Since: earlier than V2.0

Function: Switches Com-port of the plotter in the programmed-on status

Default: -

Example: ESC.Y:

Opens serial interface of plotter for further communication with computer.

Comment: Same as ESC.(

Instruction: # ESC.Z

Parameter: -

Group: Key Machine Configuration DCI

Param. Type:

HPGL Level: Historic HPGL

Scaled: -

Recommanded:

Return Value: -

Definition: Programmed Off

Range: -

Since: earlier than V2.0

Function: Switches Com-port of the plotter in the programmed-off status

Default: -

Example: ESC.Z:
Closes serial port of machine to further data communication; waits for next "ESC.Y" instruction.

Comment: Same as ESC.)

HPGL Database - in alphabetic order

Instruction	Function	Group	Since
ESC.(	Switches Com-port of the plotter in the programmed-on status	Key Machine Configuration DCI	earlier than V2.0
ESC.)	Switches Com-port of the plotter in the programmed-off status	Key Machine Configuration DCI	earlier than V2.0
ESC.@	Configuration Com ports parameter	Key Machine Configuration DCI	earlier than V2.0
ESC.A	Outputs a fixed string only for compatibility	Machine info response DCI	earlier than V2.0
ESC.B	Outputs the number of currently free memory locations in the plotter buffer	Machine info response DCI	earlier than V2.0
ESC.E	Outputs extended I/O error status	Machine info response DCI	earlier than V2.0
ESC.H	Sets handshake mode and for Xon-Xoff protocol Xoff threshold level and Xon trigger character	Key Machine Configuration DCI	earlier than V2.0
ESC.I	Sets handshake mode and for Xon-Xoff protocol Xoff threshold level and Xon trigger character	Key Machine Configuration DCI	earlier than V2.0
ESC.K	Aborts any partially decoded HPGL instruction	Key Machine Configuration DCI	earlier than V2.0
ESC.L	Outputs the available buffer size	Machine info response DCI	earlier than V2.0
ESC.N	Sets inter character delay and Xoff trigger character	Key Machine Configuration DCI	earlier than V2.0
ESC.O	Outputs the current equipment status	Machine info response DCI	earlier than V2.0
ESC.P	Sets handshake mode either to hardwired or Xon-Xoff	Key Machine Configuration DCI	earlier than V2.0 last changes V3.3
ESC.R	The unit carries on operation with hardwired handshake	Key Machine Configuration DCI	earlier than V2.0
ESC.S	Outputs the available buffer size	Machine info response DCI	earlier than V2.0

Instruction	Function	Group	Since
ESC.Y	Switches Com-port of the plotter in the programmed-on status	Key Machine Configuration DCI	earlier than V2.0
ESC.Z	Switches Com-port of the plotter in the programmed-off status	Key Machine Configuration DCI	earlier than V2.0
AA	Draws arc centred at X,Y coordinate, starts at current tool position	Geometry description	earlier than V2.0
AF	Programmatically advances roll material one full-page length	Material advance	earlier than V2.0
AH	Programmatically advances roll material one half-page length	Material advance	earlier than V2.0
AR	Draws arc centred at point relative to current tool position	Geometry description	earlier than V2.0
AS	Sets acceleration for the active tool	Processing parameters	earlier than V2.0 last changes V3.4
BL	Reads the label, but does not store it	Character setting	earlier than V2.0
CB	Clears plot buffer after interpretation	Special	V3.0
CI	Draws a circle, centred at current tool position	Geometry description	earlier than V2.0
CR	The corner recognition defines the lifting of the tool before turning through an angle greater than the Upper angle.	Processing parameters	earlier than V2.0
CT	Determines whether chord tolerance parameter of CI, AA and AR instructions is interpreted as degrees or as a deviation distance in plotter units.	Geometry description	earlier than V2.0
DF	Sets plotter to default conditions	Key Machine Configuration	earlier than V2.0
DT	Defines the label terminator used in LB, BL and WD instruction	Character setting	earlier than V2.0
FC	Programmed cutting off the material at the front end of the plotter	Material advance	V3.0
FS	Sets tool force (Standard cutting device)/ Set laser pointer brightness (MultiHead)/ Sets cutting depth (double head only)	Processing parameters	earlier than V2.0 last changes V2.01
IN	Initializes the plotter	Key Machine Configuration	earlier than V2.0 last changes V3.21
IP	Sets scaling points in plotter units.	Positioning and Scaling	earlier than V2.0
IW	Sets window inside which plotting can occur	Positioning and Scaling	earlier than V2.0
LB	Reads the label, but does not plot it	Character setting	earlier than V2.0
MS	Sets ARISTOMAT to a special scan mode for special scanner hardware	Special	V3.15
NR	Switches the plotter in offline mode	Key Machine Configuration	earlier than V2.0

Instruction	Function	Group	Since
OA	Outputs the current physical tool position	Machine info response	earlier than V2.0
OC	Outputs the tool position associated with last valid tool position instruction	Machine info response	earlier than V2.0
OD	Outputs the tool position associated with last valid tool position instruction	Machine info response	earlier than V2.0
OE	Outputs the last HPGL error	Machine info response	earlier than V2.0
OF	Outputs the number of unscaled HPGL units per millimeter in X- and Y-axes	Machine info response	earlier than V2.0
OH	Outputs the hard-clip limits at the time the instruction was received	Machine info response	earlier than V2.0
OI	Outputs the selected plotter emulation	Machine info response	earlier than V2.0
OL	Outputs information on the label contained in the buffer	Character setting	earlier than V2.0
OO	Outputs implemented options	Machine info response	earlier than V2.0
OP	Outputs the plotter unit coordinates of the scaling points P1 and P2	Machine info response	earlier than V2.0
OS	Outputs the status of the plotter	Machine info response	earlier than V2.0
OT	Outputs the installed carousel type	Machine info response	earlier than V2.0
OV	Outputs the firmware version	Machine info response	earlier than V2.0
OW	Outputs the coordinates of the points set by the IW command	Machine info response	earlier than V2.0
PA	Plots to the X,Y coordinates in the order listed using current tool up/down status	Geometry description	earlier than V2.0
PC0	Clears production control mode status (normal plotter function)	Production control	V2.02
PC1	Switches on vacuum and waits default waiting time or specified waiting time	Production control	V2.02
PC10	Automatic repetition of the plot memory with the drive switch, switching blowing on at the end of the plot and again switching vacuum on at the start of the plot	Production control	V2.07 last changes V3.23
PC11	ONLY IN CONNECTION with "Standard" Toolhead: The lower the tool is lifted above the material, the shorter the overall cutting time. However, if tool is lifted unsufficiently, this may cause tool error.	Processing parameters	V2.07
PC12	Automatic repetition of the plot memory with the drive switch and without activating blowing or vacuum	Production control	V3.0 last changes V3.23
PC13	Page advance backwards by the actual page length or by the given length	Material advance	V3.0
PC14	Sets the power parameter for start- and end pulse for laser cutting	Processing parameters	V3.3
PC15	Sets the process times for laser cutting	Processing parameters	V3.3
PC16	Switches the plotter to "offline" mode and switches the drives off. Then the plotter is waiting for pressing the drive "green" key to continue the interrupted plot	Processing parameters	V3.23
PC17	ONLY IF PASSEPARTOUT TOOL IS FITTED: Switches between the tool type 'Passepartout Smart' and 'Passepartout' at the tool head oscillator.	Processing parameters	V3.23

Instruction	Function	Group	Since
PC18	ONLY IN CONNECTION WITH OSCILLATING MULTIHEAD: Switches the oscillation action of the one oscillating tool on or off. ATTENTION: If used when non-scillating tool is active, this will be ignored..	Processing parameters	V3.3
PC19	IF EXTRA VACUUM PUMP IS FITTED: Switches extra vacuum pump and to synchronous vacuum mode with standard fitted pump.	Production control	V3.3
PC2	Switches off vacuum, waits the specified delay time and resumes job afterwards without key press etc.	Production control	V2.02
PC20	ONLY IF ELECTRONIC STANDARD TOOL IS FITTED: Increase or decrease tool force (i.e. downward pressure) relative to present setting.	Processing parameters	V3.3
PC21	The overcut will be reduced by the given length at the begin or the end of an vector. This command is usefull for wheel blades or similar tools.	Production control	V3.3
PC22	Switches speedbooster on or off.	Processing parameters	V3.3
PC23	The machine moves to the farest end, similar to pressing the VIEW button.	Production control	V3.3
PC24	Switches the scaling mode of the material advancde length on or off.	Material advance	V3.3
PC25	Outputs the drawing origin which is set	Machine info response	V3.6
PC26	Set origin to the named point	Positioning and Scaling	V3.6
PC3	Switches vacuum pump action to "blowing" and waits default wait time or specified waiting time	Production control	V2.02
PC4	Switches blowing to "OFF" and waits the specified delay time	Production control	V2.02
PC5	Waits the specified delay time	Production control	V2.02
PC6	Automatic repetition of the plot memory with the drive switch and switching vacuum off at the end of the plot	Production control	V2.02 last changes V3.23
PC7	The internal contour smoothing filter operator is set to specified level	Processing parameters	V2.07 last changes V3.3
PC8	SPECIAL COMMAND FOR WATER JET OR SIMILAR: Set times for forerun or afterrun of the waterjet	Processing parameters	V2.06
PC9	Automatic repetition of the plot memory with the drive switch, switching vacuum off at the end of the plot and switching vacuum on at the start of the plot	Production control	V2.07 last changes V3.23
PR	Plots, in order of coordinate pairs added, to the points indicated by the X,Y increments, relative to the previous tool position using current tool up/down status	Geometry description	earlier than V2.0
PU	Plots to the X,Y coordinates in the order listed with raised tool using current tool absolute/relative status	Geometry description	earlier than V2.0
PV	FOR TEXTILE: Punches a V notch at the given position with the geometry specified	Production control	V3.3
RO	Rotates the coordinate system 90° against at the plotter coordinate origin, or reverses that back to normal.	Positioning and Scaling	earlier than V2.0
RT	The lower angle defines the threshold angle below and until where the machine will stop, turn the tool without forward movement and move on subsequently. The tool is not lifted for turning.	Processing parameters	earlier than V2.0

Instruction	Function	Group	Since
RY	Executes reference moves on Y axis	Key Machine Configuration	V3.0
SC	Scales the plotting area set with IP command into user units	Positioning and Scaling	earlier than V2.0
SO	The drawing origin is set at the actual position	Positioning and Scaling	earlier than V2.0
SP	Selects among available tools.	Processing parameters	earlier than V2.02 last changes V3.4
TD	Switches between the tool types router and drill	Processing parameters	V3.0
TR	Enables or disables the tangential control	Processing parameters	earlier than V2.0
VS	Set velocity for the tool	Processing parameters	earlier than V2.0
WD	Outputs letter string to LCD display at machine keypanel	Character setting	earlier than V2.0
WK	Writes "Continue with Enter" on the LCD and waits for pressing of "ENTER" key (or any other key)	Special	V3.0

HPGL Database - in order of group identification

Instruction	Function	Group	Since
BL	Reads the label, but does not store it	Character setting	earlier than V2.0
DT	Defines the label terminator used in LB, BL and WD instruction	Character setting	earlier than V2.0
LB	Reads the label, but does not plot it	Character setting	earlier than V2.0
OL	Outputs information on the label contained in the buffer	Character setting	earlier than V2.0
WD	Outputs letter string to LCD display at machine keypanel	Character setting	earlier than V2.0
AA	Draws arc centred at X,Y coordinate, starts at current tool position	Geometry description	earlier than V2.0
AR	Draws arc centred at point relative to current tool position	Geometry description	earlier than V2.0
CI	Draws a circle, centred at current tool position	Geometry description	earlier than V2.0
CT	Determines whether chord tolerance parameter of CI, AA and AR instructions is interpreted as degrees or as a deviation distance in plotter units.	Geometry description	earlier than V2.0
PA	Plots to the X,Y coordinates in the order listed using current tool up/down status	Geometry description	earlier than V2.0
PR	Plots, in order of coordinate pairs added, to the points indicated by the X,Y increments, relative to the previous tool position using current tool up/down status	Geometry description	earlier than V2.0
PU	Plots to the X,Y coordinates in the order listed with raised tool using current tool absolute/relative status	Geometry description	earlier than V2.0
DF	Sets plotter to default conditions	Key Machine Configuration	earlier than V2.0
IN	Initializes the plotter	Key Machine Configuration	earlier than V2.0 last changes V3.21
NR	Switches the plotter in offline mode	Key Machine Configuration	earlier than V2.0
RY	Executes reference moves on Y axis	Key Machine Configuration	V3.0
ESC.(	Switches Com-port of the plotter in the programmed-on status	Key Machine Configuration DCI	earlier than V2.0
ESC.)	Switches Com-port of the plotter in the programmed-off status	Key Machine Configuration DCI	earlier than V2.0
ESC.@	Configuration Com ports parameter	Key Machine Configuration DCI	earlier than V2.0

Instruction	Function	Group	Since
ESC.H	Sets handshake mode and for Xon-Xoff protocol Xoff threshold level and Xon trigger character	Key Machine Configuration DCI	earlier than V2.0
ESC.I	Sets handshake mode and for Xon-Xoff protocol Xoff threshold level and Xon trigger character	Key Machine Configuration DCI	earlier than V2.0
ESC.K	Aborts any partially decoded HPGL instruction	Key Machine Configuration DCI	earlier than V2.0
ESC.N	Sets inter character delay and Xoff trigger character	Key Machine Configuration DCI	earlier than V2.0
ESC.P	Sets handshake mode either to hardwired or Xon-Xoff	Key Machine Configuration DCI	earlier than V2.0 last changes V3.3
ESC.R	The unit carries on operation with hardwired handshake	Key Machine Configuration DCI	earlier than V2.0
ESC.Y	Switches Com-port of the plotter in the programmed-on status	Key Machine Configuration DCI	earlier than V2.0
ESC.Z	Switches Com-port of the plotter in the programmed-off status	Key Machine Configuration DCI	earlier than V2.0
OA	Outputs the current physical tool position	Machine info response	earlier than V2.0
OC	Outputs the tool position associated with last valid tool position instruction	Machine info response	earlier than V2.0
OD	Outputs the tool position associated with last valid tool position instruction	Machine info response	earlier than V2.0
OE	Outputs the last HPGL error	Machine info response	earlier than V2.0
OF	Outputs the number of unscaled HPGL units per millimeter in X- and Y-axes	Machine info response	earlier than V2.0
OH	Outputs the hard-clip limits at the time the instruction was received	Machine info response	earlier than V2.0
OI	Outputs the selected plotter emulation	Machine info response	earlier than V2.0
OO	Outputs implemented options	Machine info response	earlier than V2.0
OP	Outputs the plotter unit coordinates of the scaling points P1 and P2	Machine info response	earlier than V2.0
OS	Outputs the status of the plotter	Machine info response	earlier than V2.0
OT	Outputs the installed carousel type	Machine info response	earlier than V2.0
OV	Outputs the firmware version	Machine info response	earlier than V2.0
OW	Outputs the coordinates of the points set by the IW command	Machine info response	earlier than V2.0
PC25	Outputs the drawing origin which is set	Machine info response	V3.6
ESC.A	Outputs a fixed string only for compatibility	Machine info response DCI	earlier than V2.0

Instruction	Function	Group	Since
ESC.B	Outputs the number of currently free memory locations in the plotter buffer	Machine info response DCI	earlier than V2.0
ESC.E	Outputs extended I/O error status	Machine info response DCI	earlier than V2.0
ESC.L	Outputs the available buffer size	Machine info response DCI	earlier than V2.0
ESC.O	Outputs the current equipment status	Machine info response DCI	earlier than V2.0
ESC.S	Outputs the available buffer size	Machine info response DCI	earlier than V2.0
AF	Programmatically advances roll material one full-page length	Material advance	earlier than V2.0
AH	Programmatically advances roll material one half-page length	Material advance	earlier than V2.0
FC	Programmed cutting off the material at the front end of the plotter	Material advance	V3.0
PC13	Page advance backwards by the actual page length or by the given length	Material advance	V3.0
PC24	Switches the scaling mode of the material advancde length on or off.	Material advance	V3.3
IP	Sets scaling points in plotter units.	Positioning and Scaling	earlier than V2.0
IW	Sets window inside which plotting can occur	Positioning and Scaling	earlier than V2.0
PC26	Set origin to the named point	Positioning and Scaling	V3.6
RO	Rotates the coordinate system 90° against at the plotter coordinate origin, or reverses that back to normal.	Positioning and Scaling	earlier than V2.0
SC	Scales the plotting area set with IP command into user units	Positioning and Scaling	earlier than V2.0
SO	The drawing origin is set at the actual position	Positioning and Scaling	earlier than V2.0
AS	Sets acceleration for the active tool	Processing parameters	earlier than V2.0 last changes V3.4
CR	The corner recognition defines the lifting of the tool before turning through an angle greater than the Upper angle.	Processing parameters	earlier than V2.0
FS	Sets tool force (Standard cutting device)/ Set laser pointer brightness (MultiHead)/ Sets cutting depth (double head only)	Processing parameters	earlier than V2.0 last changes V2.01
PC11	ONLY IN CONNECTION with "Standard" Toolhead: The lower the tool is lifted above the material, the shorter the overall cutting time. However, if tool is lifted unsufficiently, this may cause tool error.	Processing parameters	V2.07
PC14	Sets the power parameter for start- and end pulse for laser cutting	Processing parameters	V3.3
PC15	Sets the process times for laser cutting	Processing parameters	V3.3

Instruction	Function	Group	Since
PC16	Switches the plotter to "offline" mode and switches the drives off. Then the plotter is waiting for pressing the drive "green" key to continue the interrupted plot	Processing parameters	V3.23
PC17	ONLY IF PASSEPARTOUT TOOL IS FITTED: Switches between the tool type 'Passepartout Smart' and 'Passepartout' at the tool head oscillator.	Processing parameters	V3.23
PC18	ONLY IN CONNECTION WITH OSCILLATING MULTIHEAD: Switches the oscillation action of the one oscillating tool on or off. ATTENTION: If used when non-scillating tool is active, this will be ignored..	Processing parameters	V3.3
PC20	ONLY IF ELECTRONIC STANDARD TOOL IS FITTED: Increase or decrease tool force (i.e. downward pressure) relative to present setting.	Processing parameters	V3.3
PC22	Switches speedbooster on or off.	Processing parameters	V3.3
PC7	The internal contour smoothing filter operator is set to specified level	Processing parameters	V2.07 last changes V3.3
PC8	SPECIAL COMMAND FOR WATER JET OR SIMILAR: Set times for forerun or afterrun of the waterjet	Processing parameters	V2.06
RT	The lower angle defines the threshold angle below and until where the machine will stop, turn the tool without forward movement and move on subsequently. The tool is not lifted for turning.	Processing parameters	earlier than V2.0
SP	Selects among available tools.	Processing parameters	earlier than V2.02 last changes V3.4
TD	Switches between the tool types router and drill	Processing parameters	V3.0
TR	Enables or disables the tangential control	Processing parameters	earlier than V2.0
VS	Set velocity for the tool	Processing parameters	earlier than V2.0
PC0	Clears production control mode status (normal plotter function)	Production control	V2.02
PC1	Switches on vacuum and waits default waiting time or specified waiting time	Production control	V2.02
PC10	Automatic repetition of the plot memory with the drive switch, switching blowing on at the end of the plot and again switching vacuum on at the start of the plot	Production control	V2.07 last changes V3.23
PC12	Automatic repetition of the plot memory with the drive switch and without activating blowing or vacuum	Production control	V3.0 last changes V3.23
PC19	IF EXTRA VACUUM PUMP IS FITTED: Switches extra vacuum pump and to synchronous vacuum mode with standard fitted pump.	Production control	V3.3
PC2	Switches off vacuum, waits the specified delay time and resumes job afterwards without key press etc.	Production control	V2.02
PC21	The overcut will be reduced by the given length at the begin or the end of an vector. This command is usefull for wheel blades or similar tools.	Production control	V3.3
PC23	The machine moves to the farest end, similar to pressing the VIEW button.	Production control	V3.3

Instruction	Function	Group	Since
PC3	Switches vacuum pump action to "blowing" and waits default wait time or specified waiting time	Production control	V2.02
PC4	Switches blowing to "OFF" and waits the specified delay time	Production control	V2.02
PC5	Waits the specified delay time	Production control	V2.02
PC6	Automatic repetition of the plot memory with the drive switch and switching vacuum off at the end of the plot	Production control	V2.02 last changes V3.23
PC9	Automatic repetition of the plot memory with the drive switch, switching vacuum off at the end of the plot and switching vacuum on at the start of the plot	Production control	V2.07 last changes V3.23
PV	FOR TEXTILE: Punches a V notch at the given position with the geometry specified	Production control	V3.3
CB	Clears plot buffer after interpretation	Special	V3.0
MS	Sets ARISTOMAT to a special scan mode for special scanner hardware	Special	V3.15
WK	Writes "Continue with Enter" on the LCD and waits for pressing of "ENTER" key (or any other key)	Special	V3.0