

## DAC-310

### Installation manual

## Table of contents

<b>PART I - HARDWARE DESCRIPTION .....</b>	<b>3</b>
<b>1. INTRODUCTION .....</b>	<b>4</b>
<b>2. SPECIFICATIONS .....</b>	<b>5</b>
2.1. Physical dimensions .....	5
2.2. Environmental conditions.....	5
2.3. Technical specifications .....	6
<b>3. SCHEMATICS .....</b>	<b>7</b>
3.1. Connection diagrams .....	7
3.2. Physical dimensions .....	10
3.3. Time cycle .....	11
<b>PART II - MACHINE PARAMETERS .....</b>	<b>1</b>
<b>1. I/O ASSIGNMENTS .....</b>	<b>2</b>
<b>2. THE MACHINE PARAMETERS.....</b>	<b>6</b>
2.1. The menu .....	6
2.2. Short parameter list .....	6
2.3. Drive types .....	8
2.3.1. Servo drive .....	8
2.3.2. AC drive .....	9
2.3.3. Unipolar system.....	11
2.4. Parameter explanation .....	13
<b>3. SOFTWARE SETTINGS .....</b>	<b>32</b>
3.1. Parameter back-up .....	32
3.2. Upgrade control .....	34
3.3. Reset counters.....	34
<b>PART III - THE DIAGNOSTIC PROGRAM.....</b>	<b>1</b>
<b>1. GENERAL REMARKS.....</b>	<b>2</b>
1.1. Outputs .....	2
1.2. Components check .....	2
<b>2. TEST-MENU .....</b>	<b>3</b>
2.1. Start .....	3
2.2. Test functions .....	4
<b>APPENDIX A - REFERENCE LIST .....</b>	<b>1</b>

## Part I - Hardware description

This section contains the hardware specifications of a Delem DAC-310 control.

## 1. Introduction

The DAC-310 is a universal programmable controller, designed to control positioning of machine parts such as the backgauge control of an industrial shear.

The DAC-310 is capable of controlling servo-loop systems, a one- or two-speed AC or DC drive system.

## 2. Specifications

### 2.1. Physical dimensions

For the dimensions of the DAC-310 control, see the included drawings at the end of this section.

### 2.2. Environmental conditions

The following environment specification values are valid for a DAC-310 control:

Ambient temperature	0 - 50°C
Storage temperature	min. -10°C max. 70°C
Relative humidity	90 % non-condensing
EMC	designed and built to meet the following standards: EN50081-2 EN61000-4

## 2.3. Technical specifications

Power supply	18 - 28 VDC 15W
Display	LCD/STN 128 x 64 black/white
Interfaces	1 x Encoder 1 x RS-232 (service only)
I/O	4 x Digital input, 24V  8 x Digital output, 24V  1 x analog output $0 \pm 10V$  1 x analog input 0 - 10V

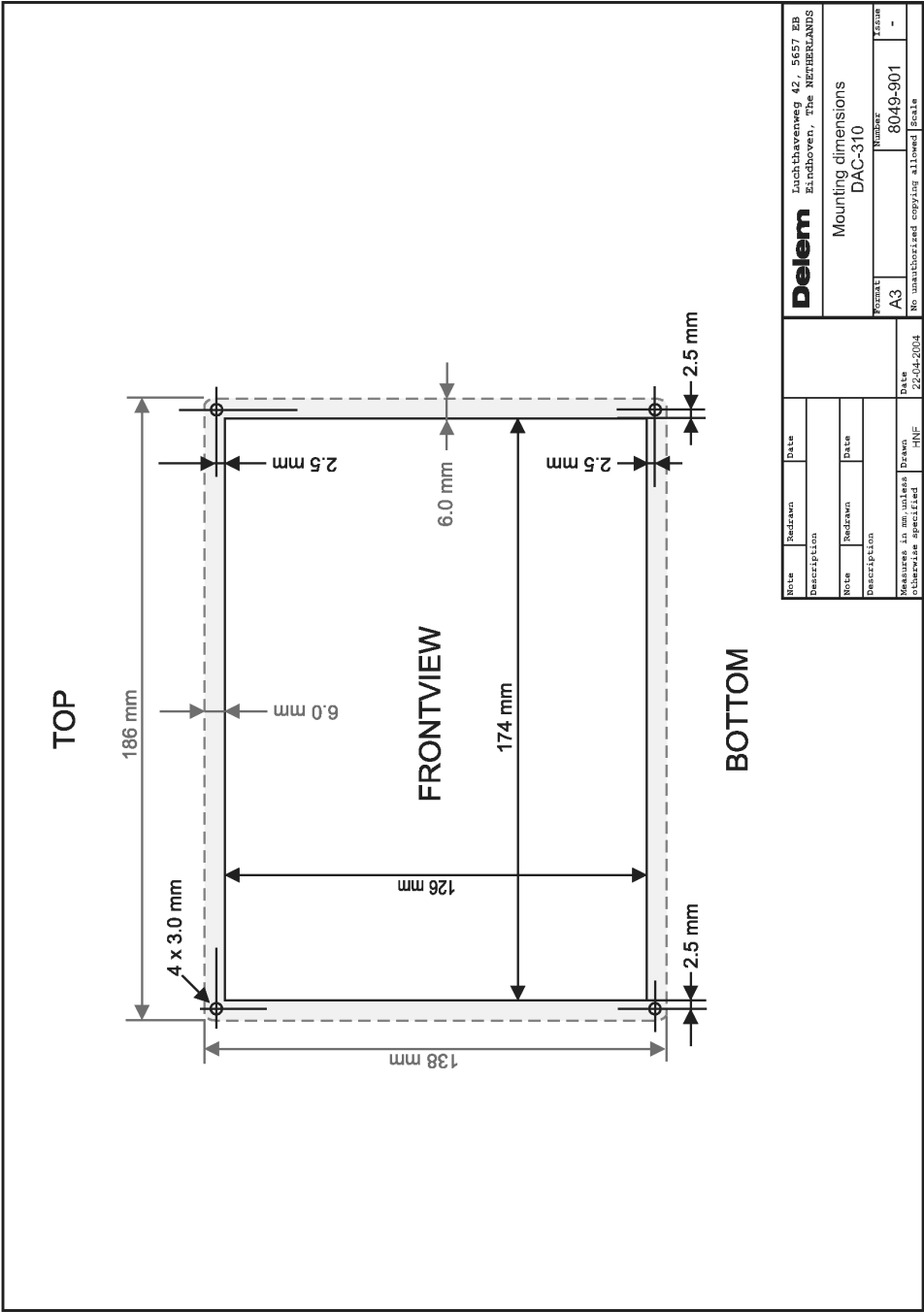




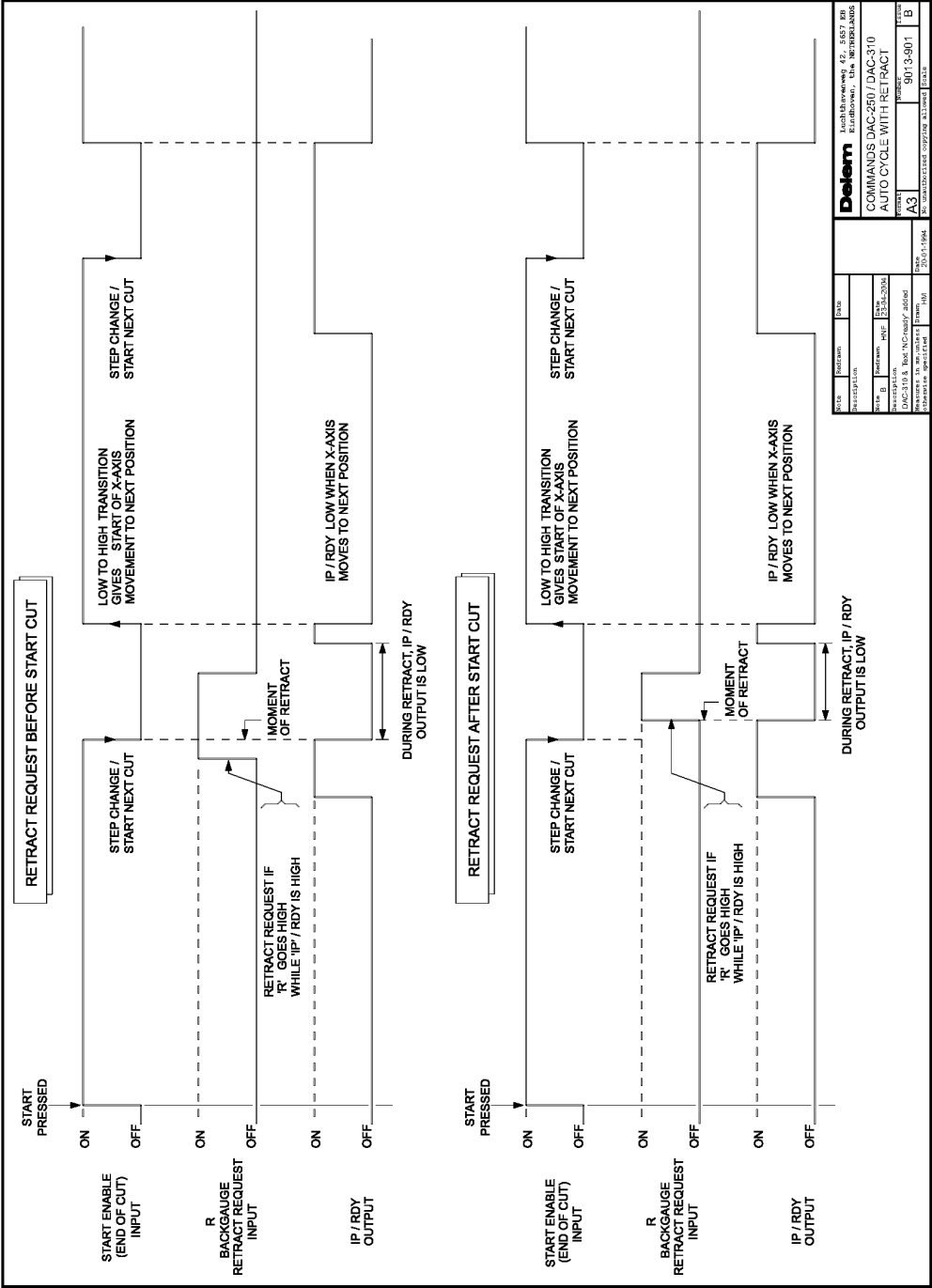




3.2. Physical dimensions



3.3. Time cycle



## Part II - Machine parameters

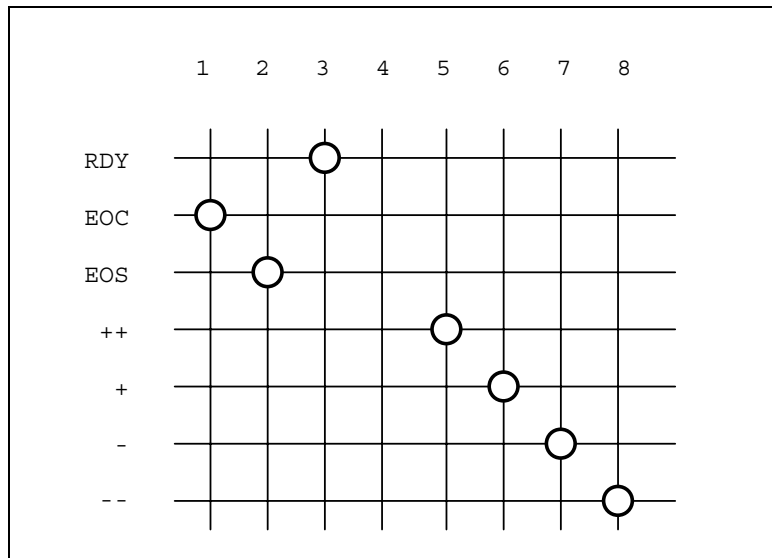
This section will describe the necessary settings of a DAC-310 control regarding machine settings.

## 1. I/O assignments

The DAC-310 has several programmable features. These features can be enabled or disabled in software. Depending on these features, a number of logical signals can be mapped to the I/O pins of the DAC.

This means the system programmer can enable the necessary signals and assign them to output pins. The I/O settings are only accessible with a special entry code. It should be adjusted by authorized personnel only.

### Example:



The example picture above shows an example of a possible mapping of output pins. In the picture, pins 5 - 8 are allocated for the movement of a 2-speed AC drive, fast and slow in both directions. If the system has a servo drive, those signals are not necessary. Then you could delete these connections (the intersections) and use output 5 - 8 for other purposes. See also the schematics in part I of this manual for connection examples.

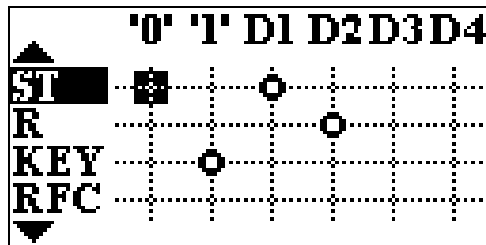
To enter the I/O allocation mode:


- move the cursor to the M parameter;
- type access code 963 and press ENTER.

The following screen appears:

```
IO allocation:
01 Digital inputs
02 Digital outputs
03 Analog inputs
04 Analog outputs
```

Each choice opens a sub-menu with an array of the logical signals and available connector pins. The screen for digital inputs looks as follows:



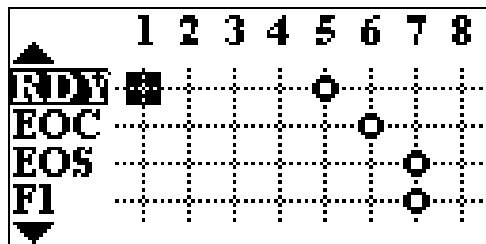
In the top row, the available connector pins (D1 - D4) are shown. In the left column, the logical signals are listed. The symbol  indicates that there is a connection between the pin and the logical signal. A signal is linked to an input pin as follows:

- move the cursor with the arrow keys and +/- keys to the necessary intersection
- press ENTER

To erase a connection, go to it with the cursor and press ENTER. The connection will disappear.

D1 - D4 refer to the 4 digital inputs of the DAC. '0' is a logical FALSE. If a signal is linked to this, it is always regarded as low (not active). '1' is a logical TRUE. If a signal is linked to this, it is always regarded as high (active).

For digital outputs the method works similar. In the case of outputs, several logical signals can be mapped to the same output pin. They are processed as a logical OR: if one or more of these signals become high, the output pin becomes high.



## I/O list

### Digital input signals

Code	Name	Description
R	Retract	Retract request signal
ST	Start Enable	External start signal, used to start axis movement and change step.
RSD	Reference Search Direction input	Input for reference switch, in case reference search with reference switch is used.
KEY	Program enable	Signal to block or enable programming on the control.
RFC	Reference correction	Input signal for position correction.

MR	Machine Ready	Signal that indicates the machine is ready. When it is low, the control cannot be started. When it is high, the control can be started and the Hours counter (parameter 91) keeps track of the time.
----	---------------	--

## Digital output signals

Code	Name	Description
RDY	Ready	Ready signal, to indicate that control has finished positioning. In case of a shear system, this signal becomes high when the axis is in position and the Gap is set correctly.
EOC	End Of Cycle	Program or step is finished
EOS	End Of Stroke	Stroke is finished, either position is reached or stroke time has elapsed
F1	Function output 1	General purpose programmable output
F2	Function output 2	General purpose programmable output
G+	Gap open	Increase gap opening
G-	Gap close	Reduce gap opening
A+	Angle increase	Increase angle between table and shear
A-	Angle decrease	Reduce angle between table and shear
+	Opening	Opening command for AC motor
-	Closing	Closing command for AC motor
++	Fast opening	Fast opening command for AC motor
--	Fast closing	Fast closing command for AC motor
BRK	Brake (AC)	Brake signal for AC motor, equipped with brake system. This signal is 'low-active': during positioning the signal is high, it will become low when the brake must be applied.

## Analogue input signals

Code	Name	Description
SFB	Stroke Feedback	Position feedback of the shear, in case Stroke feedback is enabled.
GFB	Gap feedback	Position feedback of the Gap opening, in case Gap system with position feedback is enabled.
PFB	Position feedback	Position feedback of axis position.
AFB	Angle feedback	Feedback of angle value, in case angle control is installed.

### Note:

The encoder input is also regarded as an analogue input.

## Analogue output signals

Code	Name	Description
SPD	Speed	Speed output. SPD > 0: positive direction, encoder upcounting SPD < 0: negative direction, encoder downcounting



## 2. The machine parameters

### 2.1. The menu

The machine parameters are only accessible with a special entry code. Machine parameters should be adjusted by authorized personnel only. To enter the machine parameters menu:

- scroll to the M field
- enter the code 8520
- press ENTER.

<b>Machine parameters:</b>	
<b>00 \$W version</b>	<b>= 0.12</b>
<b>01 Drive type</b>	<b>= 3</b>
<b>02 Enc cnt dir</b>	<b>= 0</b>
<b>03 Scale fact</b>	<b>= 100.000</b>

Now you can change the machine parameters of the control.

### 2.2. Short parameter list

00 Software version  
01 Drive type  
02 Encoder count direction  
03 Scale factor  
04 Decimal point position  
05 Maximum backgauge position  
06 Minimum backgauge position  
07 Spindle allowance  
08 IP tolerance  
09 Display correction enabled  
13 Indexing  
14 Reference correction input  
15 Reference position  
16 RSD switch mounted  
17 Reference search direction  
20 Enable retract  
21 Auto retract  
22 Minimum retract  
25 Positioning tolerance AC  
26 AC brake enabled  
27 Brake delay  
28 Breakpoint Fast Speed (BFS)  
29 Breakpoint Slow Speed (BSS)

30 Stop time T  
31 Overrun  
32 Overrun wait time  
33 DC slow speed  
34 DC fast speed  
35 Unipolar output  
40 Servo gain  
41 Servo switch  
42 Servo ramp  
43 Servo acceleration  
44 Manual movement slow speed  
45 Manual movement fast speed  
46 Reference search speed  
50 Stroke mode  
51 Stroke time  
52 Stroke AD min  
53 Stroke AD max  
55 Angle control  
56 Minimum angle  
57 Maximum angle  
58 Angle AD minimum  
59 Angle AD maximum  
60 Angle prestop positive  
61 Angle prestop negative  
65 Gap control  
66 Gap correction  
67 Minimum gap  
68 Maximum gap  
69 Gap AD min  
70 Gap AD max  
71 Gap Prestop positive  
72 Gap Prestop negative  
75 Enable Function outputs  
76 Enable Correction  
77 Enable repetition CY  
78 Enable Steps  
90 Serial number  
91 Hours running  
92 Number of Strokes

## 2.3. Drive types

The DAC control can be programmed to drive different axis types:

- 1-speed AC or DC drive
- 2-speed AC or DC drive
- Servo motor drive

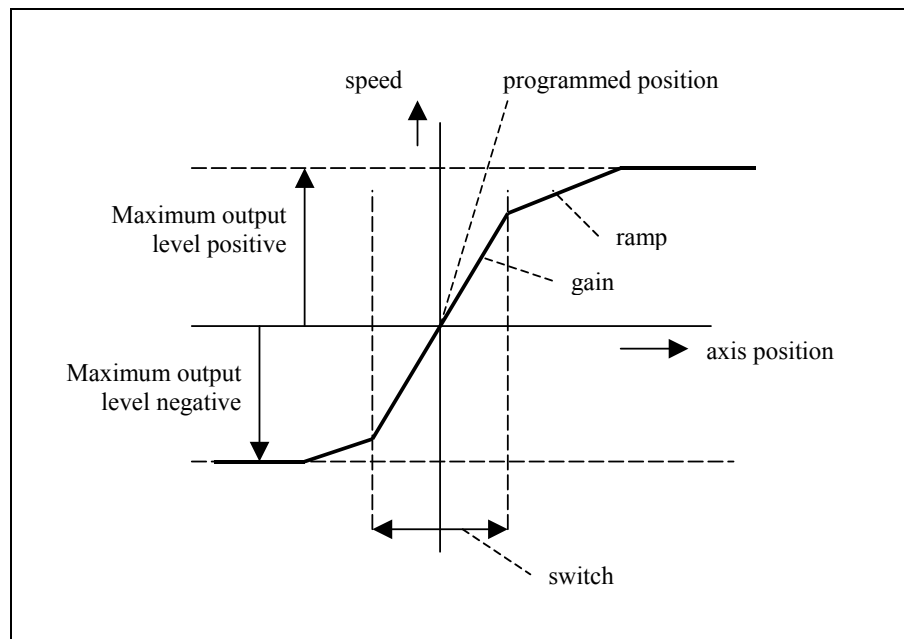
The required system can be programmed with the parameter 'Drive type'.

### 2.3.1. Servo drive

The following servo parameters are valid:

- Servo gain
- Servo switch
- Servo Ramp
- Servo acceleration

Inside the switch zone the Gain is active and outside the switch zone the Ramp is active. See the Axis parameters 'Gain', 'Switch' and 'Ramp'.



The optimal values for these parameters can be found by the following procedure:

- Increase the Ramp (point by point) until the axis has overshoot at the programmed end position, subtract 1.0 from this value and program this for the Ramp.
- Increase the Gain (point by point) until the axis starts to oscillate at the programmed end position, subtract 1.0 from this value and program this for the Gain.

The Ramp should be smaller than the Gain.

## 2.3.2. AC drive

In this paragraph, the parameters for axes with AC drives are discussed.

When using AC drives, it is possible to program 1-side positioning or 2-side positioning. Beside this, it must be indicated whether a one-speed or 2-speed motor drive is used.

With these parameters you can optimize the positioning accuracy of the AC-axis:

- Breakpoint high speed (BFS)
- Breakpoint low speed (BSS)
- Overrun (OR)
- Overrun wait time
- Stop time (T)
- DC slow speed
- DC fast speed

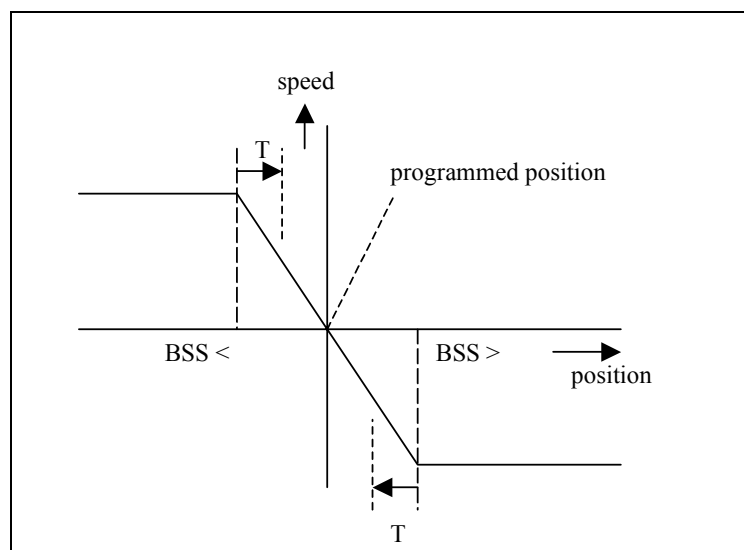
For the movement control of the axis there are two possibilities:

- two, three or four digital outputs of the module;
- an analog output signal.

The type of control can be specified as on-off control. When there is a position error, the control signal is on. When there is no position error, the control signal is off.

### 1-speed AC axis

For a 1-speed axis, the parameter 'axis type' must be set to 1. This axis can be driven through 2 digital outputs or through the analog output.

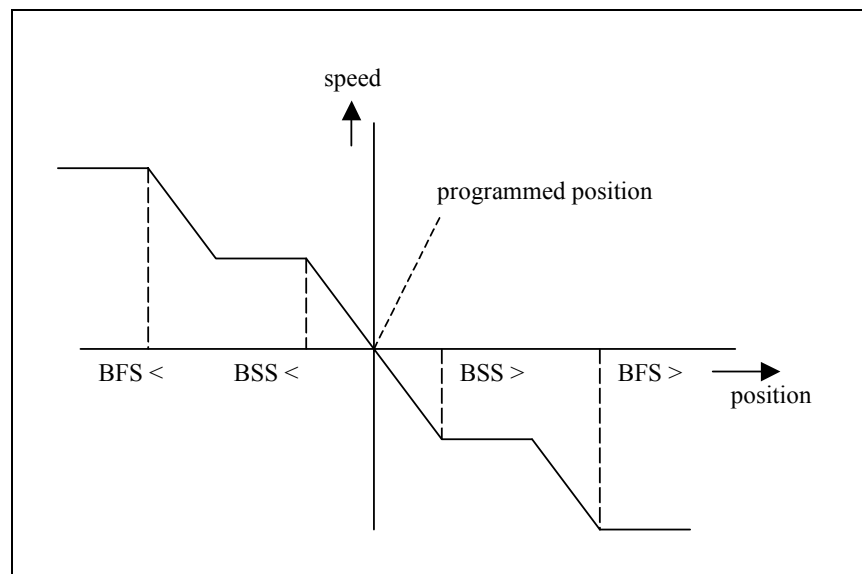


For this axis, the parameter 'Breakpoint slow speed' (BSS) must be programmed. This parameter defines the switch-off points for the axis movement. The value depends on the known deceleration rate of the axis equipment. If the BSS is not accurate enough to reach the programmed position, the parameter 'Stop time' (T) can be used for further fine-tuning of the positioning.

If the axis is controlled through the analog output, the parameter 'DC slow speed' must be programmed to a correct value.

## 2-speed AC axis

For a 2-speed axis, the parameter 'axis type' must be set to 2. This axis can be driven through 3 or 4 digital outputs or through the analog output. The axis can be controlled at two different speed levels.



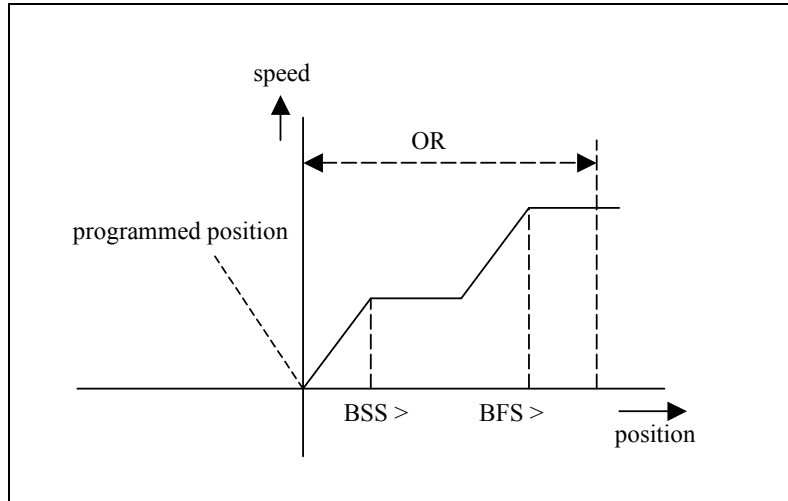
For this axis, the parameters 'Break point low speed' (BSS) and 'Break point high speed' (BFS) must be programmed. These parameters define the switch-off points for high and low speed for the axis movement. As with the 1-speed axis, the parameter 'Stop time' (T) can be used to improve positioning.

If the analog output is used for axis control, the parameters 'DC high speed' and 'DC low speed' must be programmed at two different values. These values determine the voltage levels at the analog output for the two different speed settings.

## One side positioning:

In the explanations above, the control systems used two-side positioning. So when moving from high to low or vice versa, positioning takes place instantly.

In some cases, it is desired to have positioning only in one direction.



One side positioning is useful to overcome mechanical inaccuracies in the spindle. Final positioning of the axis is always done from a higher to a lower position. So when the axis moves from a high to a low position, positioning is done immediately. When the axis moves from a low to a high position, the axis will move to the overrun position (= programmed position +OR). After that, the axis starts moving in the opposite direction and positioning takes place.

When the difference between the new programmed position and the actual position is smaller than BSS the axis is always moved to the overrun position first, also in case of two side positioning.

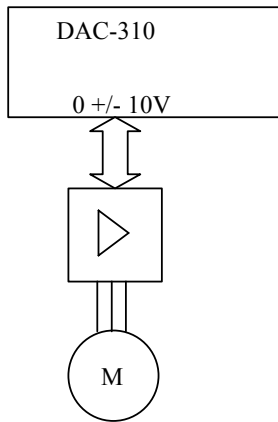
Choosing 1-side or 2-side positioning is done with the parameter 'Spindle allowance'.

### 2.3.3. Unipolar system

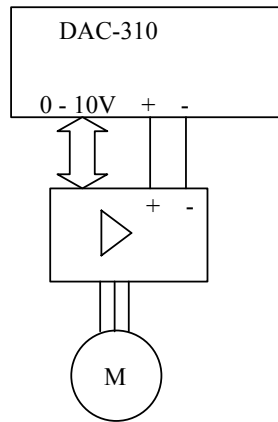
A unipolar system is a modified AC system. Normally, the analog output can be used for AC control: positive voltage (one or two levels) for one direction, negative voltage for the other direction.

In a unipolar system the output voltage is always positive, the movement direction is indicated by digital outputs. This is the only difference between standard AC implementation and unipolar AC implementation.

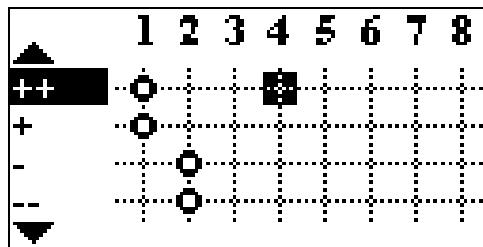
Bipolair:



Unipolair:



In case of a 2-speed unipolar system, you should consider your I/O configuration with care.



The illustration above is an example of a 2-speed unipolar implementation. The outputs 1 and 2 of the DAC are used for indication of positive and negative movement. Since the speed values can be distinguished from the analog output, both signals for positive movement can be put on the same output. The same is valid for the two signals for negative movement.

## 2.4. Parameter explanation

### Parameter 00: **Software version**

**Range** : -

**Unit** : -

**Default** : -

**Function**

Version number of the current software.

### Parameter 01: **Drive type**

**Range** : 1 - 3

**Unit** : -

**Default** : 3

**Function**

The type of motor system that is to be controlled.

1 = 1-speed AC or DC drive

2 = 2-speed AC or DC drive

3 = Servo motor drive

### Parameter 02: **Encoder count direction**

**Range** : 0 - 1

**Unit** : -

**Default** : 0

**Function**

To change the counting direction of the axis encoder pulses.



## Parameter 03: **Scale factor**

**Range** : 0.001 - 999.999

**Unit** : pulse/mm

**Default** : 100.000

### **Function**

Sets the scaling between encoder pulses and millimeters. The encoder gives an exact number of pulses over a mm displacement. This value must be programmed here.

The value can be calculated by the formula:

$$F = NP / SPP$$

in which:

- NP = Number of encoder pulses per revolution of the spindle
- SPP = Spindle pitch in mm

### **Example:**

- number of encoder pulses: 100 pulse/rev.

- spindle pitch: 10 mm/rev.

results in  $F = 100 / 10 = 10$  pulse/mm

## Parameter 04: **Decimal point position**

**Range** : 0 - 3

**Unit** : -

**Default** : 1

### **Function**

0 = 1 mm / 0.1 inch resolution

1 = 0.1 mm / 0.01 inch resolution

2 = 0.01 mm / 0.001 inch resolution

## Parameter 05: **Maximum backgauge position**

**Range** : 0 - 9999

**Unit** : mm

**Default** : 9999

### **Function**

Maximum backgauge position. The axis will never be controlled to a higher position than programmed here.

## Parameter 06: **Minimum backgauge position**

**Range** : 0 - 9999

**Unit** : mm

**Default** : 0

### **Function**

Minimum backgauge position. The axis will never be controlled to a lower position than programmed here.

## Parameter 07: **Spindle allowance**

**Range** : 0 - 1

**Unit** : -

**Default** : 1

### **Function**

0 = one-side positioning

1 = two-side positioning

Note: One-side positioning is also possible with a servo drive (drive type = 3)

The one-side positioning can be selected to overcome mechanical tolerances with two side positioning. In case of one-side positioning the positioning direction is from a larger to a smaller position. See also section 2.3 about drive types.

## Parameter 08: **IP tolerance**

**Range** : 0.0 - 9.99

**Unit** : millimetres

**Default** : 0.10

### **Function**

The "in-position output" (IP) becomes active if the difference between the actual position and the programmed position is smaller than this tolerance.

## Parameter 09: **Display correction enabled**

**Range** : 0 - 1

**Unit** : -

**Default** : 0

### **Function**

Enables correction of then displayed Xp when axis is in position. When this option is enabled, deviation of Xp within the margins of the in position tolerance (08) are not shown.

## Parameter 13: **Indexing**

**Range** : 0 - 1

**Unit** : -

**Default** : 1

### **Function**

Each time the supply voltage is switched on, the reference position must be passed. This can be done in two ways:

0 = no reference encoder used, the actual backgauge position will be memorized after power down.

1 = automatic reference passing, the motor will be controlled after pushing the start button.

## Parameter 14: **Reference correction input**

**Range** : 0 - 1

**Unit** : -

**Default** : 0

### **Function**

When set to 1, the 'RFC' input (ReFeRence Correction) input is enabled. When this input is active, the programmed position (Xm) will be copied to the actual position (Xp).

## Parameter 15: **Reference position**

**Range** : 0 - 9999

**Unit** : mm

**Default** : 100

### **Function**

This position is assumed when the reference has passed. The reference encoder must generate a pulse from low to high on the reference input.

## Parameter 16: **RSD switch mounted**

**Range** : 0 - 1

**Unit** : -

**Default** : 1

### **Function**

0 = System 1: standard reference search system without Reference Search Direction switch (RSD-switch).

1 = System 2: reference search system with RSD-switch

System 1 is the standard reference search system. For this system the motor drive must be equipped with a direction sensitive enable/disable input.

System 2 Now the motordrive does not need any direction sensitive enable/disable input anymore. Also you are free where you place the reference search direction switch (RSD). It may be the same switch; EOT-switch. The advantage of the reference search cycle with system 2 is that in case the RSD switch is mounted in the middle of the X-axes stroke, the DA-control senses the status of this switch. In case the X-axis is between the zero-position and RSD switch a normal reference search cycle is initiated.

In case the X-axis is between the RSD and EOT+ switch the status of the RSD switch indicates that reference search can start in the direction of the RSD switch (forward). Overall you will have shorter reference search cycle time. Another advantage is the fact that it is not needed to mount the limit switches for ref.-search.

Note:

Reference switch activated means RSD input is low. Reference switch not activated means input is high (+24V).

## Parameter 17: **Reference search direction**

**Range** : 0 - 1

**Unit** : -

**Default** : 1

### **Function**

Controls the direction of the reference search if Indexing (07) is programmed to 1.

0 = Downcounting direction.

1 = Upcounting direction.

## Parameter 20: **Enable retract**

**Range** : 0 - 1

**Unit** : -

**Default** : 0

### **Function**

When set to 1, retraction is enabled.

## Parameter 21: **Auto retract**

**Range** : 0 - 1

**Unit** : -

**Default** : 0

### **Function**

When set to 1, retract is automatically started when ST goes low (start cutting).

## Parameter 22: **Minimum retract**

**Range** : 0.0 – 9999.9

**Unit** : mm

**Default** : 0.0

### **Function**

Minimum retract value.

## Parameter 25: **Positioning tolerance AC**

**Range** : 0 - 9999

**Unit** : millimeters

**Default** : 0

### **Function**

The backgauge position will position to the new programmed position if the difference between the actual position and the new position is greater than this tolerance.

If the difference is smaller the backgauge will stay at its actual position.

This parameter is only available for drive types 1 and 2.

## Parameter 26: **AC brake enabled**

**Range** : 0 - 1

**Unit** : -

**Default** : 1

### **Function**

Enable AC brake output 'BRK'. This can be used to control an AC motor with brake.

## Parameter 27: **Brake delay**

**Range** : 0.0 - 0.99

**Unit** : seconds

**Default** : 0.00

### **Function**

Delay time before AC brake is activated.

## Parameter 28: **Breakpoint Fast Speed BFS**

**Range** : 0.0 - 9999.9

**Unit** : mm

**Default** : 10.0

### **Function**

Switch point from high speed to slow speed.

## Parameter 29: **Breakpoint Slow Speed BSS**

**Range** : 0.0 - 9999.9

**Unit** : mm

**Default** : 1.0

### **Function**

Switch point from low speed to zero.

## Parameter 30: **Stop time T**

**Range** : 0 - 9.99

**Unit** : -

**Default** : 0.0.

### **Function**

Delay time before switching off low speed after BSS has been reached

## Parameter 31: **Overrun**

**Range** : 0.0 - 9999.9

**Unit** : mm

**Default** : 1.0

### **Function**

Overrun distance in case of one side positioning. One-side positioning is chosen with parameter 11, 'spindle allowance'.

An overrun is also done when an AC-drive must change position over a small distance, smaller than BSS. If such a situation occurs, the axis is first moved to the overrun position and then back to the required position. The overrun should not be programmed smaller than BSS. In case it is, the BSS is used as overrun.

See also section 2.3 about drive types.

## Parameter 32: **Overrun wait time**

**Range** : 0.0 - 9.9

**Unit** : seconds

**Default** : 1.0

### **Function**

Wait time at overrun position before the backgauge starts positioning in the opposite direction.

## Parameter 33: **DC Slow speed**

**Range** : 1 - 100

**Unit** : %

**Default** : 4

### **Function**

This parameter must be programmed if 2-speed DC motor drives are used. It is programmed as a percentage of maximum output deflection (10 V)

## Parameter 34: **DC fast speed**

**Range** : 1 - 100

**Unit** : %

**Default** : 80

### **Function**

This parameter must be programmed if 2-speed DC motor drives are used. It is programmed as a percentage of maximum output deflection (10 V)

## Parameter 35: **Unipolar output**

**Range** : 0 - 1

**Unit** : -

**Default** : 0

### **Function**

Function to switch unipolar AC control on/off. When set to 1, the analog speed output will only output a positive signal, no matter which direction the axis is moving. This can be used to connect a frequency regulator for 1 or 2-speed AC control. See also section 2.3 about AC drives.

## Parameter 40: **Servo gain**

**Range** : 1 - 15

**Unit** : -

**Default** : 8

### **Function**

Position gain factor. See also section 2.3.

## Parameter 41: **Servo switch**

**Range** : 0 - 999

**Unit** : count pulses

**Default** : 20

### **Function**

Switching point from Ramp to gain. See also section 2.3.

## Parameter 42: **Servo ramp**

**Range** : 1 - 15

**Unit** : -

**Default** : 6

### **Function**

Servo axis braking factor. See also section 2.3.



## Parameter 43: Servo acceleration

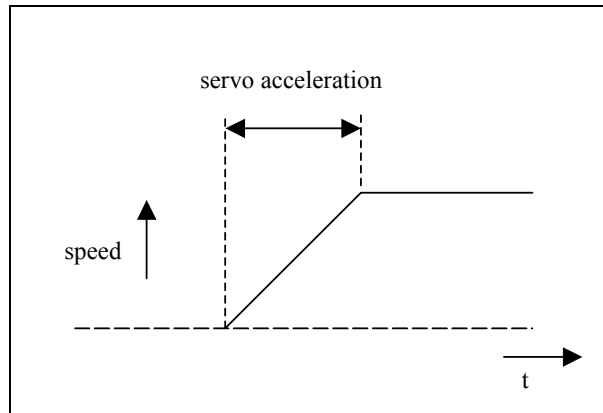
**Range** : 5 - 1275

**Unit** : msec

**Default** : 100

### Function

This parameter defines the time needed to reach the full speed output.



## Parameter 44: Manual movement low speed

**Range** : 1 - 99.9

**Unit** : mm/sec

**Default** : 1

### Function

Speed of the axis, when it is moved in manual mode with the 'manual move' function. This is the low speed value.

## Parameter 45: Manual movement high speed

**Range** : 1 - 99.9

**Unit** : mm/sec

**Default** : 10

### Function

Speed of the axis, when it is moved in manual mode with the 'manual move' function. This is the high speed value.

## Parameter 46: **Reference search speed**

**Range** : 1 - 100

**Unit** : %

**Default** : 50

### **Function**

Axis speed during reference searching.

## Parameter 50: **Stroke mode**

**Range** : 0 - 2

**Unit** : -

**Default** : 0

### **Function**

When the stroke option is enabled, the user can program the desired stroke length as a percentage (0-100%) of the maximum stroke length. This percentage value can be programmed in every step by the S parameter. When the programmed stroke length is reached, the 'EOS' output will become high.

0 = No stroke option ('S' disabled in user interface)

1 = Stroke length using timer

2 = Stroke length using analog feedback (using input 'SFB')

In case of 1 and 2, the following I/O is used:

- digital output EOS
- analog input SFB (only system 2)

## Parameter 51: **Stroke time**

**Range** : 0 - 999.9

**Unit** : seconds

**Default** : 0

### **Function**

With this parameter, it is possible to set a maximum stroke length in seconds. When that programmed time has elapsed, the output EOS will become active. This is only used when the parameter 'stroke mode' is set to 1.

The user can program the desired stroke length as a percentage (0-100%) of the maximum machine parameter time. This percentage value can be programmed in every step by the S parameter.

When the percentage value is programmed zero then the stroke limitation is not active in that step.

In this case the EOS output will not be activated.

Note: When the DAC-310 is stopped, the EOS output will be off.

## Parameter 52: **Stroke AD min**

**Range** : 0 - 255

**Unit** : AD value

**Default** : 0

### **Function**

The AD value corresponding with a 0% stroke. Only valid when stroke option with analog feedback selected (stroke mode = 2).

## Parameter 53: **Stroke AD max**

**Range** : 0 - 255

**Unit** : AD value

**Default** : 0

### **Function**

The AD value corresponding with a 100% stroke. Only valid when stroke option with analog feedback selected (stroke mode = 2).

## Parameter 55: **Angle control**

**Range** : 0 - 1

**Unit** : -

**Default** : 0

### **Function**

Switch Angle control ON or OFF.

0 = No angle control

1 = Angle control

In case of angle control, the following I/O is used:

- digital outputs A+ and A-
- analog input AFB.

## Parameter 56: **Minimum angle**

**Range** : 0.0 - 45.0

**Unit** : °

**Default** : 0.0

### **Function**

The minimum possible shear angle. Only valid when angle control is enabled.

## Parameter 57: **Maximum angle**

**Range** : 0.0 - 45.0

**Unit** : °

**Default** : 25.5

### **Function**

The maximum possible angle. Only valid when angle control is enabled.

## Parameter 58: **Angle AD min**

**Range** : 0 - 255

**Unit** : AD value

**Default** : 0

### **Function**

The AD value corresponding with the minimum angle. Only valid when angle option enabled.

## Parameter 59: Angle AD max

**Range** : 0 - 255  
**Unit** : AD value  
**Default** : 255

### Function

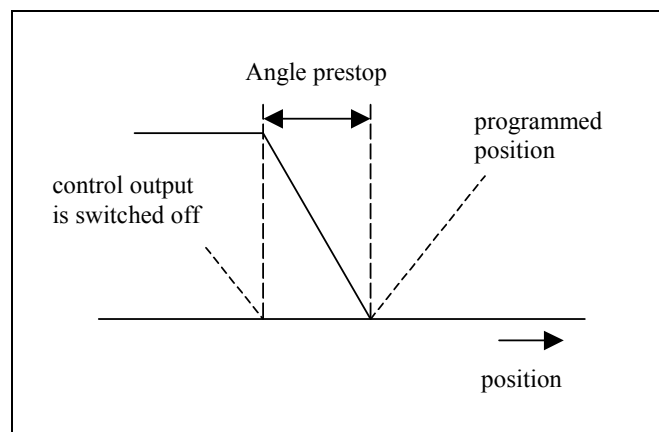
The AD value corresponding with the maximum angle. Only valid when angle option enabled.

## Parameter 60: Angle prestop positive

**Range** : 0 - 99  
**Unit** : AD value  
**Default** : 0

### Function

Due to the inertia of the Angle system there can be some overshoot after the control output has been switched off. To prevent such overshoot, the 'Angle prestop' can be programmed. This parameter can be regarded as a programmable offset. The control will take this offset into account when positioning the Angle. When the Angle system approaches the programmed position, the control output is switched off at a certain distance (Angle prestop) before the Angle has reached position. The 'Angle prestop positive' must be programmed for Angle movement in the positive direction.



The value is programmed in AD-points: a converted digital value of the position feedback voltage of the potentiometer.

## Parameter 61: **Angle prestop negative**

**Range** : 0 - 99  
**Unit** : AD value  
**Default** : 0

### **Function**

This parameter has the same definition as parameter "Angle Prestop Positive" but only in the negative direction of the angle adjustment (smaller angle).

## Parameter 65: **Gap control**

**Range** : 0 - 2  
**Unit** : -  
**Default** : 0

### **Function**

Program one of three possible Gap control modes.

0 = No gap control/watch

1 = Gap watch

2 = Gap control

In case of 1 and 2, the following I/O is used:

- digital outputs G+ and G- (only system 2)
- analog input GFB.

## Parameter 66: **Gap correction**

**Range** : 0 - 1  
**Unit** : -  
**Default** : 0

### **Function**

When enabled, the backgauge position will be corrected. Needed for constructions where the gap influences the backgauge position.

## Parameter 67: **Minimum Gap**

**Range** : 0.00 - 9.99  
**Unit** : mm  
**Default** : 2.5

### **Function**

The minimum possible gap. Only valid when gap control is enabled.

## Parameter 68: **Maximum Gap**

**Range** : 0.00 - 9.99

**Unit** : mm

**Default** : 2.5

### **Function**

The maximum possible gap. Only valid when gap control is enabled.

## Parameter 69: **Gap AD min**

**Range** : 0 - 255

**Unit** : AD value

**Default** : 0

### **Function**

The AD value corresponding with a zero gap. Only valid when gap control is enabled.

## Parameter 70: **Gap AD max**

**Range** : 0 - 255

**Unit** : AD value

**Default** : 255

### **Function**

The AD value corresponding with the maximum gap. Only valid when gap control is enabled.

## Parameter 71: Gap prestop positive

**Range** : 0 - 99

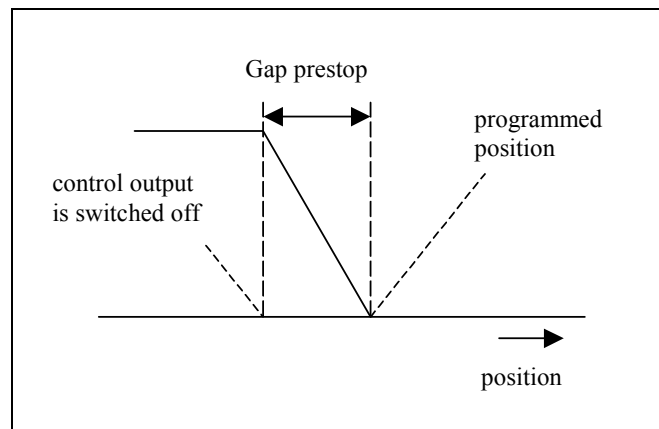
**Unit** : AD value

**Default** : 0

### Function

Due to the inertia of the Gap system there can be some overshoot after the control output has been switched off. To prevent such overshoot, the 'Gap prestop' can be programmed.

This parameter can be regarded as a programmable offset. The control will take this offset into account when positioning the Gap. When the Gap system approaches the programmed position, the control output is switched off at a certain distance (Gap prestop) before the Gap has reached position. The 'Gap prestop positive' must be programmed for Gap movement in the positive direction.



The value is programmed in AD-points: a converted digital value of the position feedback voltage of the potentiometer.

## Parameter 72: Gap prestop negative

**Range** : 0 - 99

**Unit** : AD value

**Default** : 0

### Function

This parameter has the same definition as parameter "Gap Prestop Positive" but only in the negative direction of the gap adjustment (smaller gap).



## Parameter 75: **Enable Func**

**Range** : 0 - 1

**Unit** : -

**Default** : 0

### **Function**

Enables F (function) parameter in the user interface.

## Parameter 76: **Enable Cor**

**Range** : 0 - 1

**Unit** : -

**Default** : 0

### **Function**

Enables Cor (correction) parameter in the user interface.

## Parameter 77: **Enable repetition CY**

**Range** : 0 - 1

**Unit** : -

**Default** : 1

### **Function**

Enables CY (step repetition) parameter in the user interface.

## Parameter 78: **Enable Steps**

**Range** : 0 - 1

**Unit** : -

**Default** : 1

### **Function**

Enables ST (number of steps) parameter in the user interface.

0 = no step programming possible, only manual mode available

1 = step programming available, maximum 99 steps can be programmed

## Parameter 90: **Serial number**

**Range** : -

**Unit** : -

**Default** : -

### **Function**

Displays the serial number of the controller. This value cannot be changed.

## Parameter 91: **Hours**

**Range** : -

**Unit** : hours

**Default** : 0

### **Function**

Displays the total number of hours the machine has been running. The value of this parameter is the total time the MR input has been high.

This parameter can be reset with a special code. See chapter 3.

## Parameter 92: **Number of strokes**

**Range** : -

**Unit** : -

**Default** : 0

### **Function**

Displays the total number of strokes the machine has cut.

This parameter can be reset with a special code. See chapter 3.

## 3. Software settings

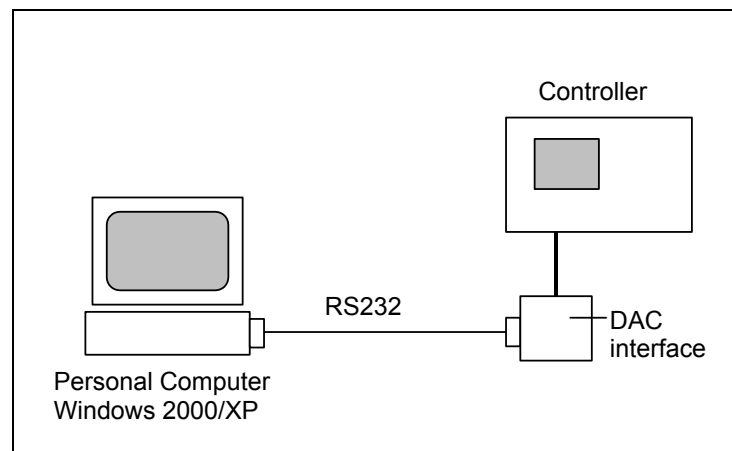
### 3.1. Parameter back-up

The control has various data stored in its memory: axis positions, program parameters, I/O settings, machine parameters.

This data can be stored on a PC or it can be restored from a PC. Examples:

- If your control somehow has lost its settings, you can restore them quickly from the PC.
- If you have a number of controls that need the same settings, you only need to program one control and save its settings. After that, all other controls can import these settings from the PC.
- If your control is to be upgraded with new software, you should save your settings. When the control is upgraded, all settings are set back to default values. After the upgrade, you can restore your settings from the PC.

The PC and the control are connected with each other through a serial link. To save or retrieve this data, the following set-up is used:



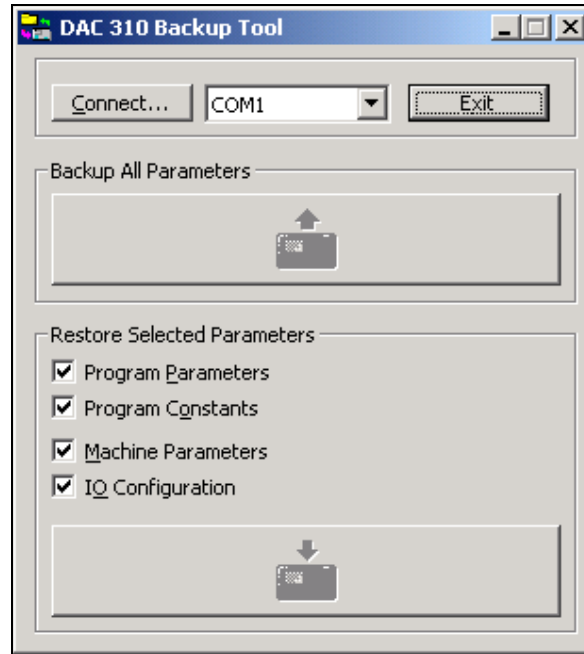
**Figure 3.1.a**

The following equipment is required:

- a Personal Computer, equipped with Windows 2000 or higher;
- serial cable, standard RS-232;
- interface, to connect RS-232 to DAC control.
- Delem back-up software for transmission of machine settings.

The Delem back-up software must be installed on the PC. All actions, storage and restoration of settings, are done with this program. Just make sure the necessary cables are connected and the DAC control is switched on.

To start the back-up tool, simply double-click its icon. A window appears:



After start-up, the two large buttons for back-up and restore cannot be selected yet. First, click on the button 'Connect...' to establish a connection between the software and the DAC control. If not successful, select a different serial port (COM1, COM2, etc.) and try again. If this still gives no positive result, check your cabling.

When the connection is established, the two buttons will light up.

To store the control settings on the PC:

- click the button 'Backup';
- in the dialogue, select a filename and a location for the file with control settings.

To load control settings into the control:

- click the button 'Restore';
- in the dialogue, select the file with control settings that must be loaded.

A back-up operation includes all data that is present on the control.

A restore operation offers the possibility to restore only specific data to the control. As shown above, several types of data can be selected for restoration.

- Program Parameters: all production parameters for the operator, step parameters, etc.
- Program Constants: some program settings for the operator.
- Machine Parameters: machine settings of the control, as described in chapter 2.
- IO Configuration: the I/O settings as described in chapter 1.

## 3.2. Upgrade control

The control can be upgraded with new software. For this procedure, you need the same set-up as described in the previous section:

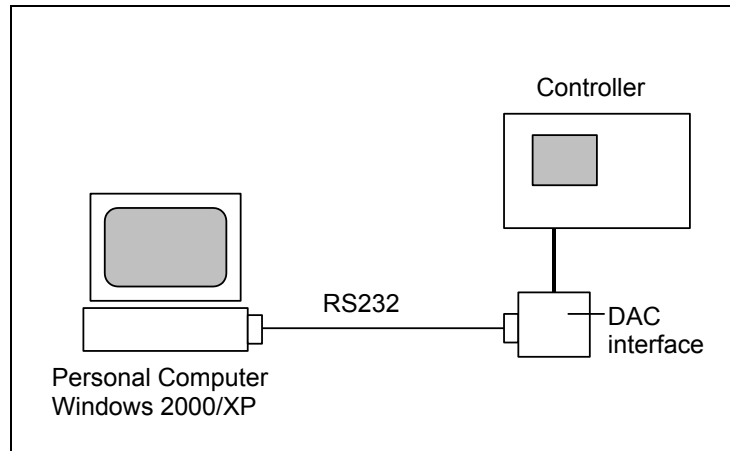


Figure 3.2.a

In order to perform a successful upgrade, the RS-232 cable must be connected to the first serial port of the PC (COM1).

You also need a program that will load the new software into the control. This program can be requested from Delem.

**Note:** before starting an upgrade, first perform a back-up of your control settings. See the previous section for more information about back-up and restore.

Make sure the necessary cables are connected and the DAC control is switched on. To perform the upgrade:

- double-click the program icon.

The control is upgraded. A new window appears, which shows a 'progress bar'. The program will terminate when the upgrade is complete.

## 3.3. Reset counters

For maintenance purposes, the control has two count parameters:

- Hours, parameter 91
- Number of strokes, parameter 92.

These parameters can be reset. Proceed as follows:

- in the end user screen ,scroll to the parameter M
- enter code 426426 and press ENTER

## Part III - The diagnostic program

To be able to test a DAC-310 control, it has been equipped with a diagnostic program. With the test functions of the diagnostic program the service engineer can test the control itself and the communications to externally connected system components.

## 1. General remarks

### 1.1. Outputs

**Before starting** the diagnostic program it is wise to check the machine for moving parts. This is because during the diagnostic operation of the control no regulation of the axis is performed.

With the diagnostic program you have to be careful because all I/O is controlled. All digital and analog outputs can be energised for motor movement or relay switching.

### 1.2. Components check

In the description of the tests it is indicated which component(s) is(are) responsible for correct functioning of that particular part.

See for exploded view drawing with all internal cables and cards of the DAC-310 control the included diagrams at the end of part I.

## 2. Test-menu

### 2.1. Start

To select the diagnostic program the following steps have to be performed:

- move the cursor to the M field
- enter the access code 741.

The diagnostic screen of the control looks as follows:

In	Out	Ana/Enc
1=0	1=0 5=0	In =0
2=0	2=0 6=0	Out=2040
3=0	3=0 7=0	Off=0
4=0	4=0 8=0	Enc=0
		Ref=Off

To end the diagnostic program the power supply to the control can be switched off and then on again to enter the normal operation menu.

It is also possible to leave the diagnostic program with the 'END'-key. The control application will restart.



## 2.2. Test functions

### In 1 - 4

These digits refer to the digital inputs of the control. To test the digital inputs, apply 24V to the inputs and check if they change to '1'.

### Out 1-8

These digits refer to the digital outputs of the control. To change an output, move the cursor to the required output number and press ENTER.

### Ana/Enc

Column with several analog I/O and encoder signals.

In	Digital input voltage, displayed as 8-bit AD-value, 0 - 255
Out	Digital output voltage, 12-bit DA-value, -2047 - 2047.
Off	Offset voltage for digital output, 12-bit DA-value.
Enc	Encoder counting.
Ref	Test the encoder reference input on/off. When switched ON, the Enc-value is reset to zero when a reference pulse is read from the encoder. When switched OFF, the ref. pulse is ignored. The Enc-value is incremented or decremented depending on the rotation.

## Appendix A - Reference list

- [1] DAC-310 Operation manual