

DA-41

Installation manual

V1

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Part I - Hardware description

This section contains the hardware specifications of a Delem DA-41 control.

1. Introduction

This manual contains information necessary for installation of a DA-41 control. Such a control is the heart of a pressbrake control system with which a conventional pressbrake machine is controlled.

The DA-41 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 DA-41 control, see the included drawings at the end of this section.

2.2. Environmental conditions

The following environment specification values are valid for a DA-41 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 320 x 240 Black / white
Interfaces	2 x Encoder 1 x RS-232 (service only)
I/O	8 x Digital input, 24V 12 x Digital output, 24V 2 x analogue output $0 \pm 10V$

3. Spare parts

The following table on the next page gives an overview of the available spare parts for the DA-41 control.

Number	Description	CNC DA-41
FRONT-41	Front panel DA-41	X
DLCD-41	LCD screen	X
D-7453-001	Mainboard DA-41	X

4. Schematics

The following pages show several schematics about the DA-41 control.

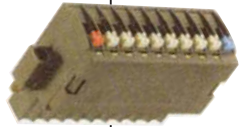
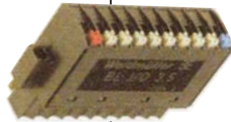
I/O, INPUTS
&
OUTPUTS

DC-161586
Clamping-yoke
connection
(screw)



DC-177988
Spring connection

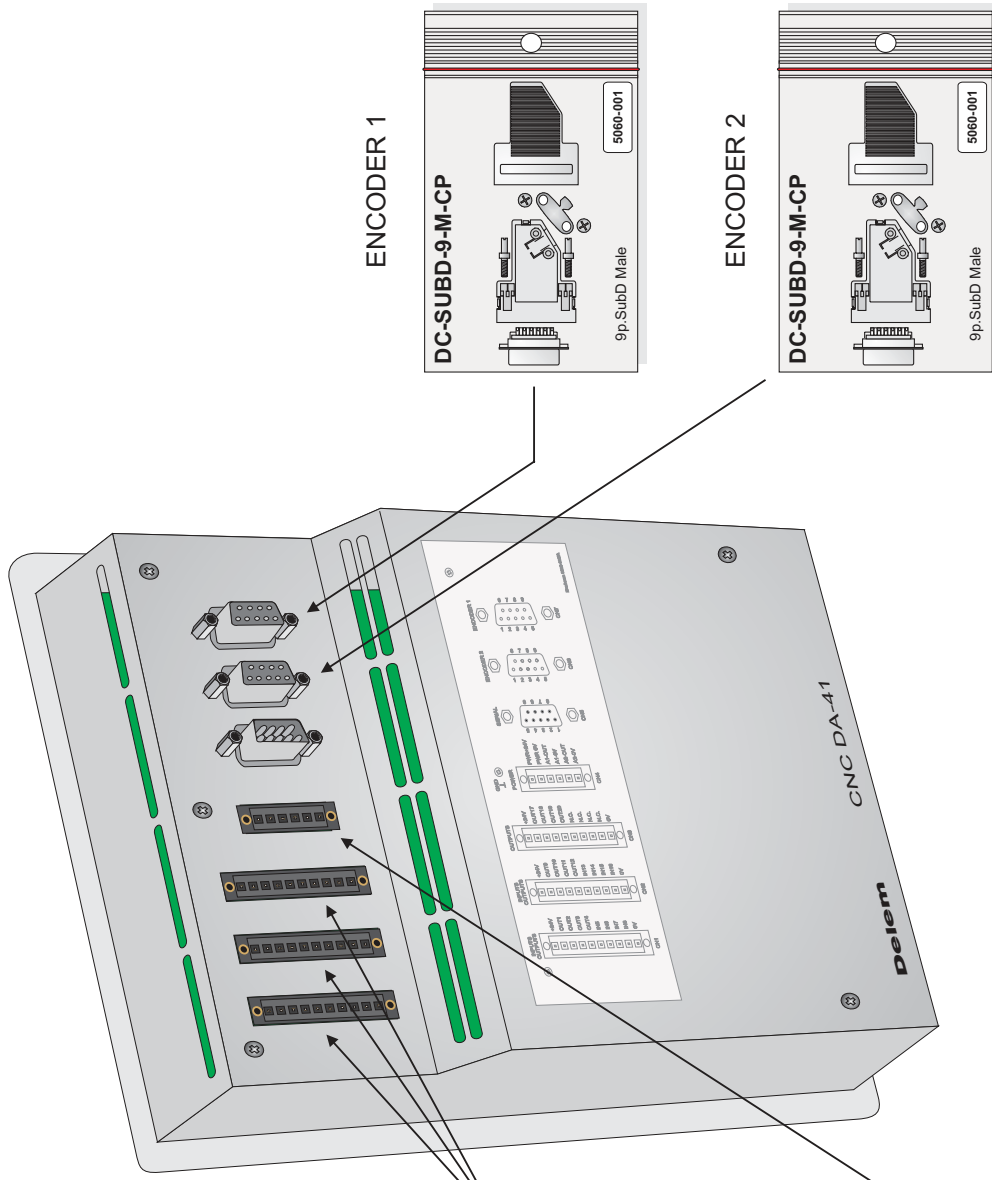
DC-178909
Spring connection
+ Led indication



1 x Power LED
8 x I/O LED

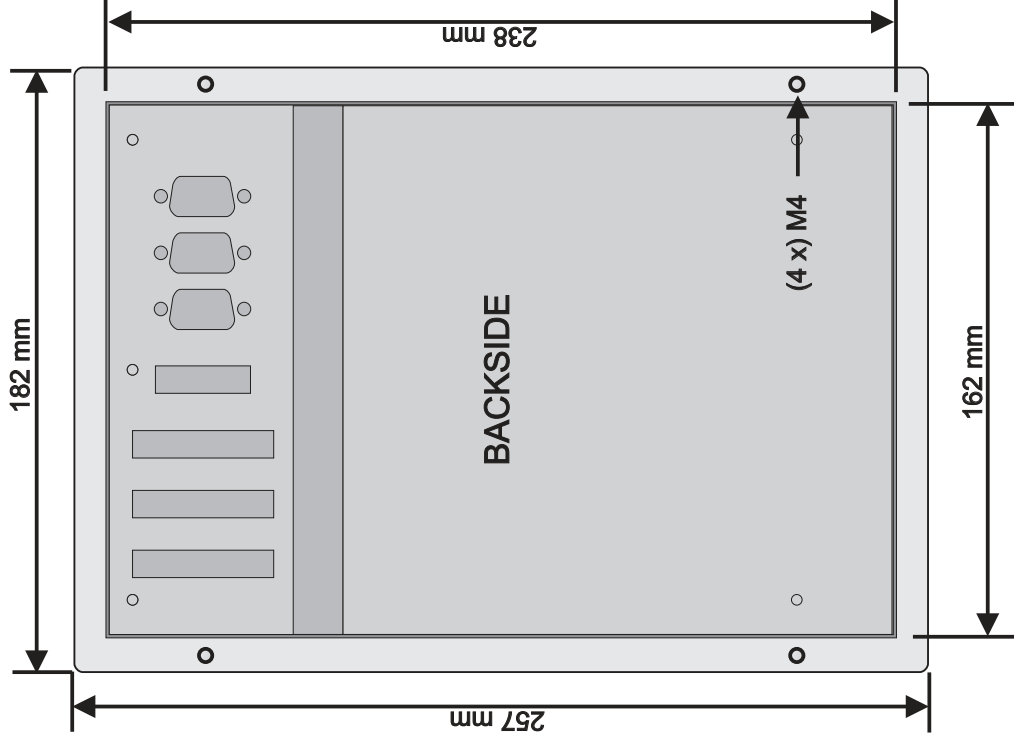
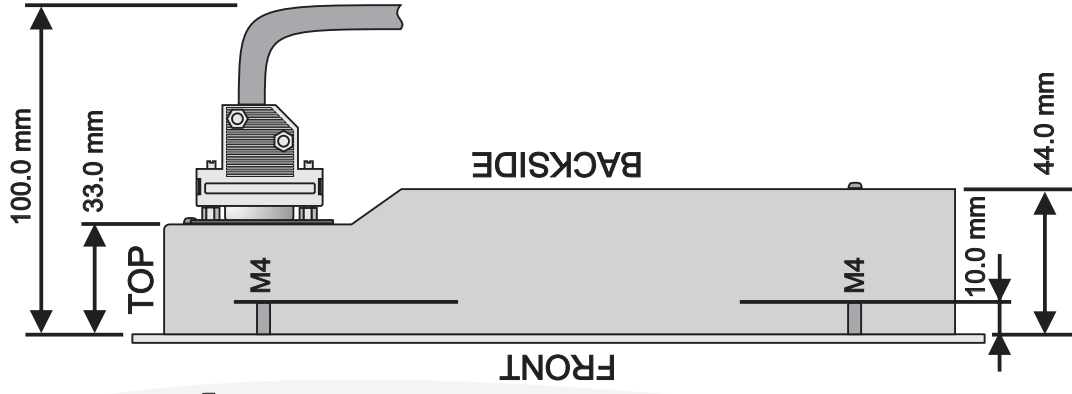
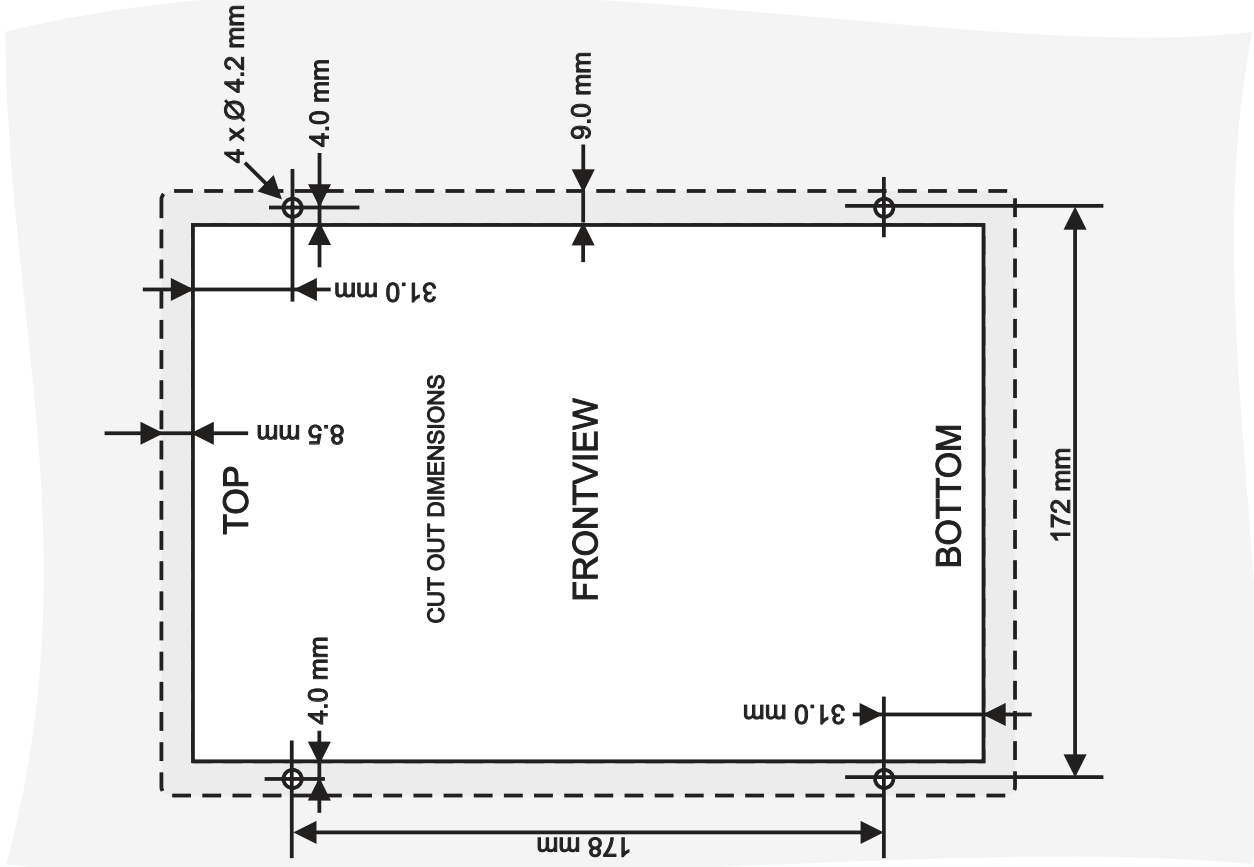
POWER
&
ANALOG OUTPUTS

DC-161582
Clamping-yoke
connection
(screw)

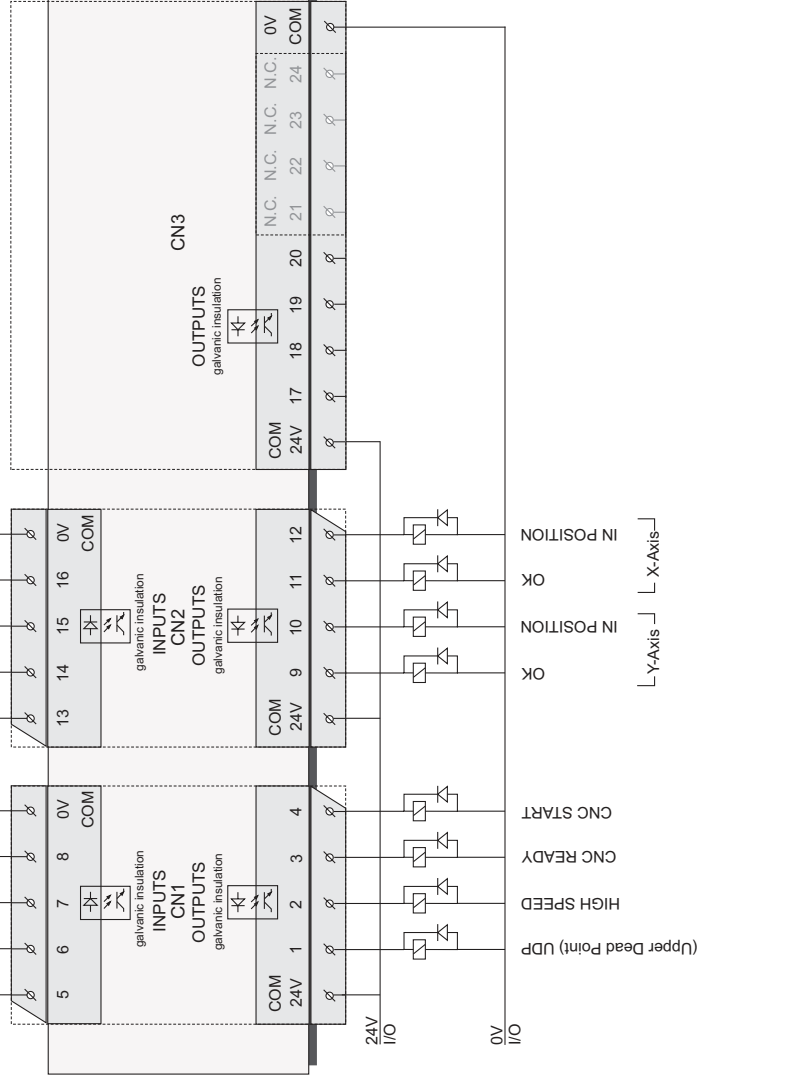
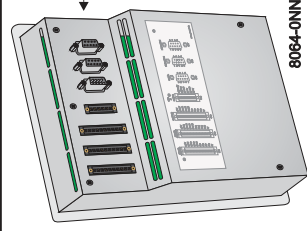


Note	Redrawn	Date			
Description					
Note	Redrawn	Date			
Description					
Measures in mm, unless otherwise specified		Drawn	HNF	Date	18-10-2005
			Format	Number	Issue
			A3	8064-903	-
No unauthorized copying allowed Scale					

Delem Luchthavenweg 42, 5657 EB Eindhoven, the NETHERLANDS			DA-41 cables & connectors		
Format		Number	Issue		
A3		8064-903	-		
No unauthorized copying allowed Scale					



		Note		Redrawn	Date
		Description			
		Note		Redrawn	Date
		Description			
Measures in mm, unless otherwise specified		Drawn		Date	
		HNF		27-04-2005	
Delem					
Luchthavenweg 42, 5657 EB Eindhoven, The NETHERLANDS					
Mounting dimensions DA-4N					
Format	A3	Number		8064-901	Issue
				-	
No unauthorized copying allowed Scale					



Note 1 : Leave unconnected pins open.
Note 2 : 24V relais supply must be separated from 24V supply

See drawing 8064-907 for default digital I/O allocation.
See drawing 8064-901 for mounting dimensions.

Notes	Redrawn	Date
Description		
Notes	Redrawn	Date
Description		
Measure in mm unless otherwise specified	Drawn	HNF
Date 20-10-2005		

Delem

Luchthavenweg 42, 5657 EB
Eindhoven, the NETHERLANDS

Example connections:

Servo Y-AXIS

Servo X-AXIS

Format

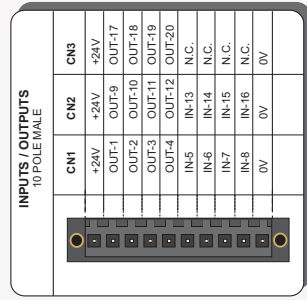
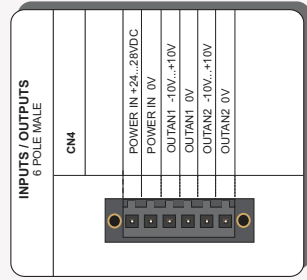
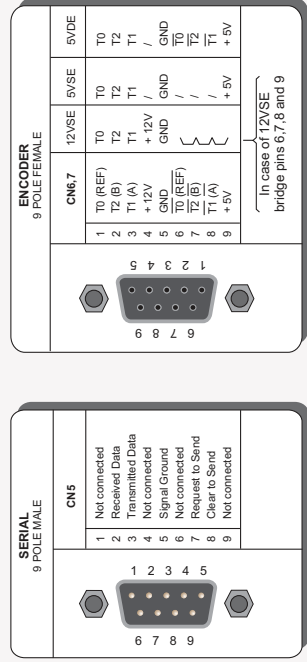
A3

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Number 8064-101

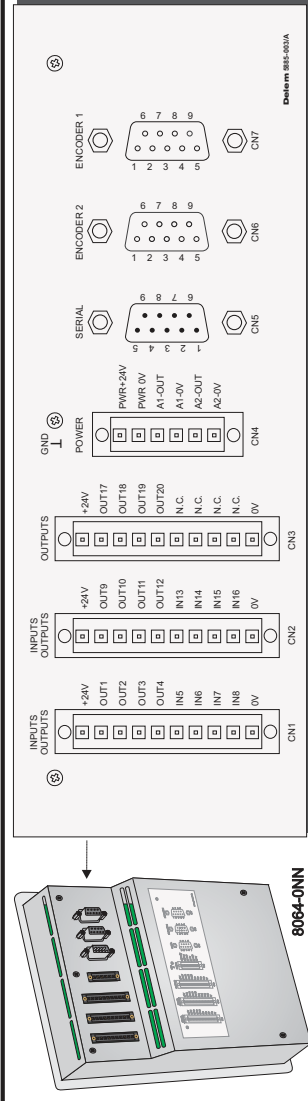
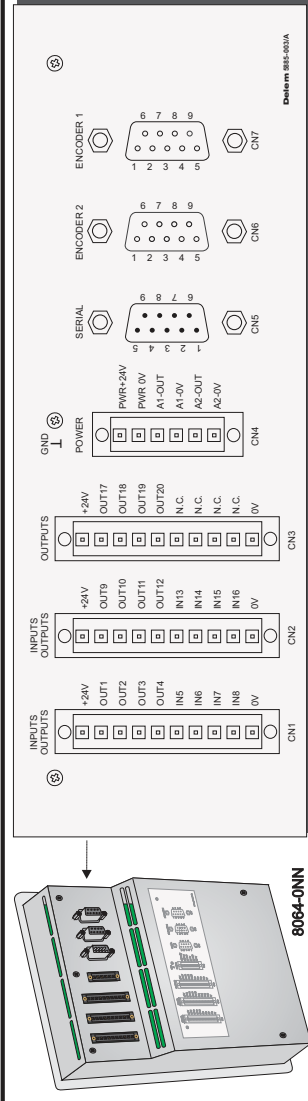
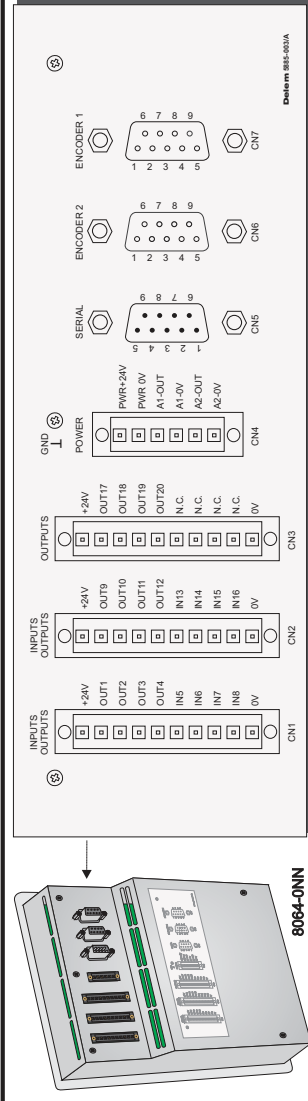
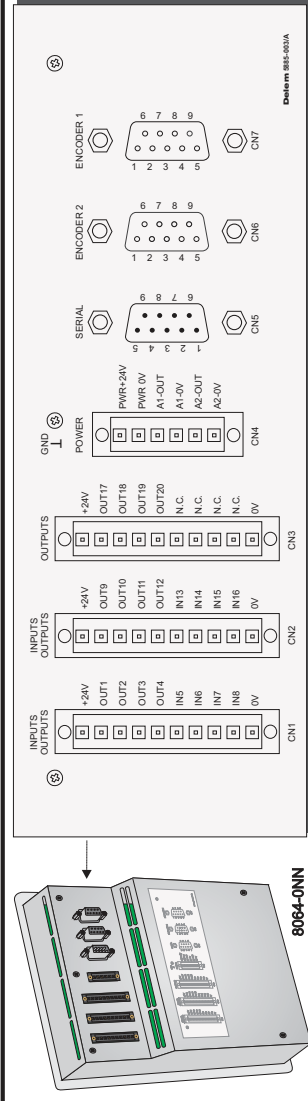
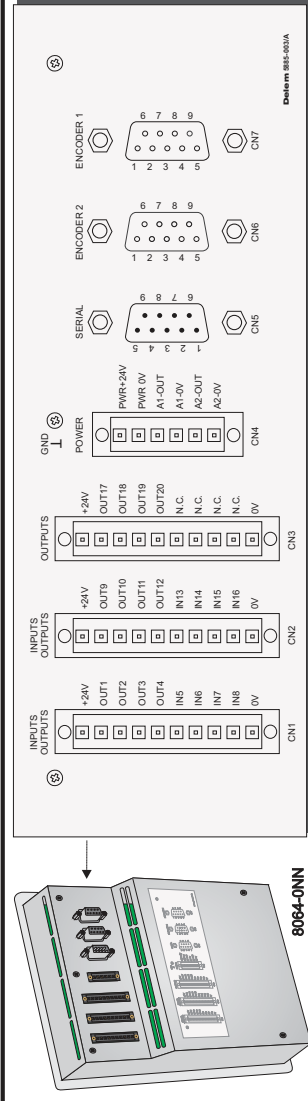
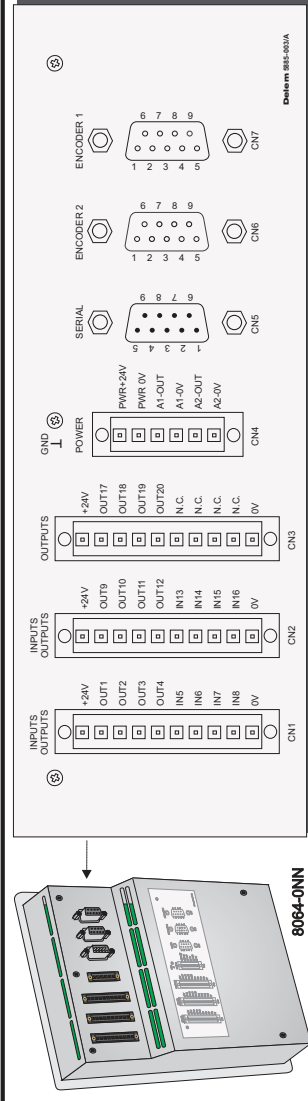
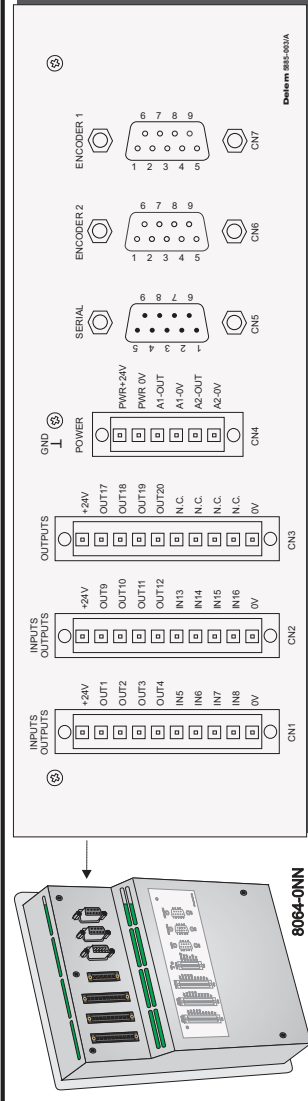
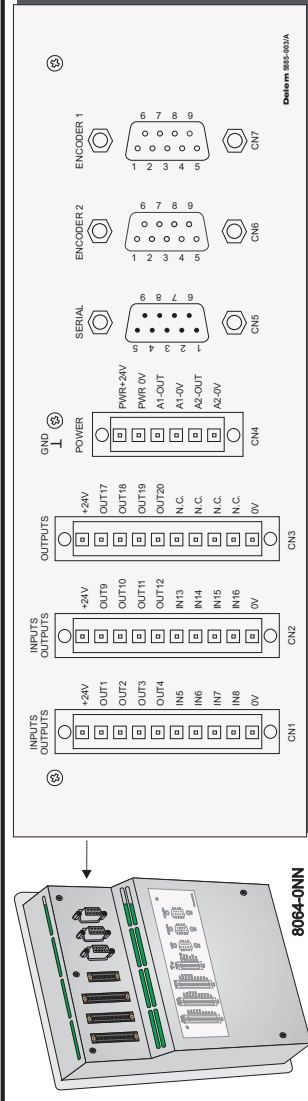
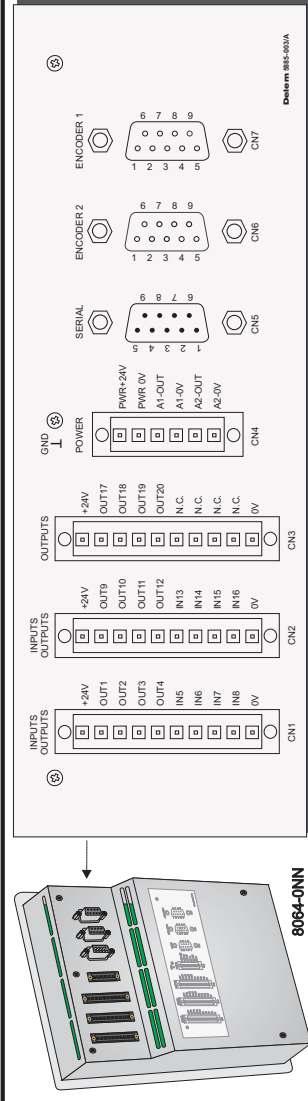
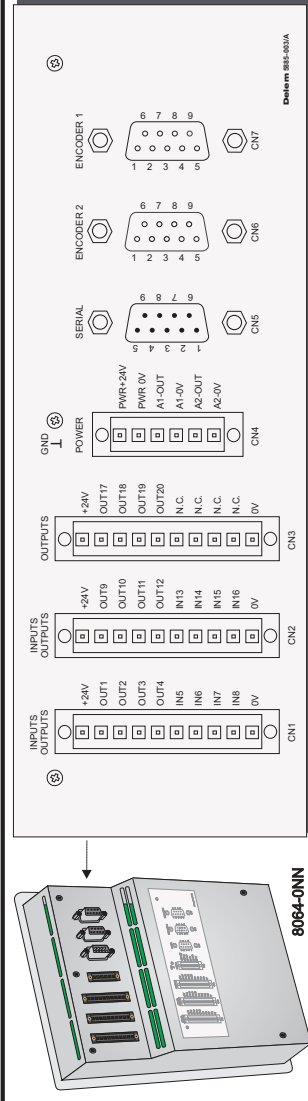
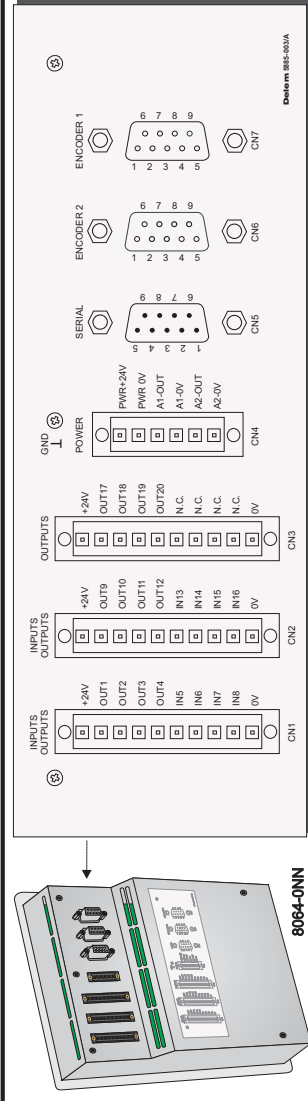
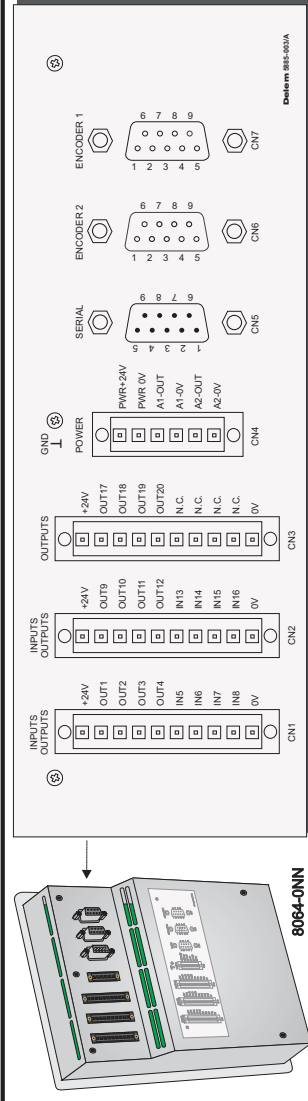
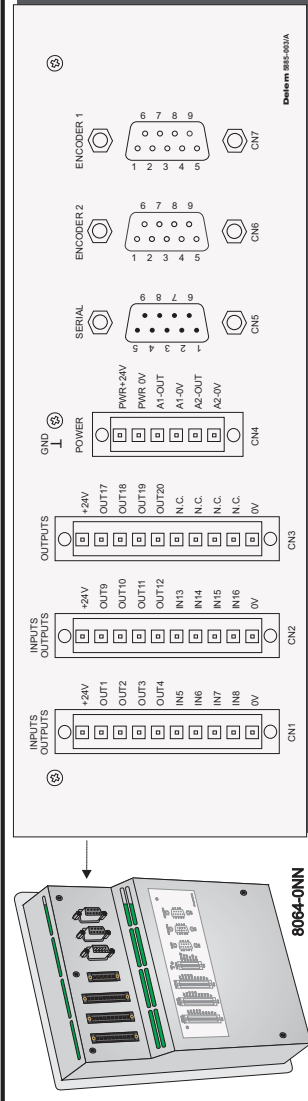
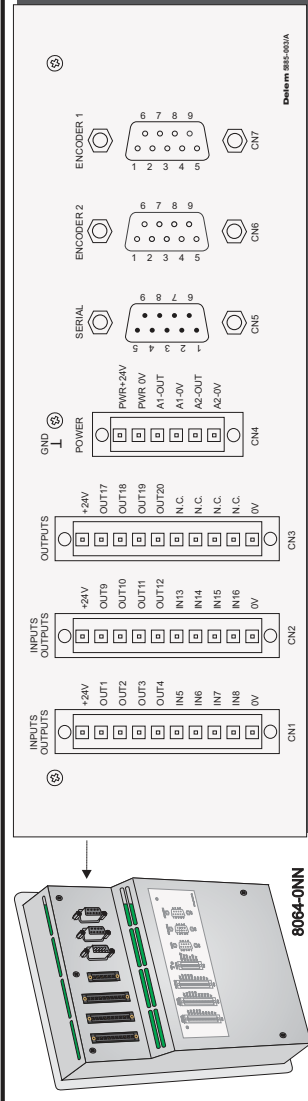
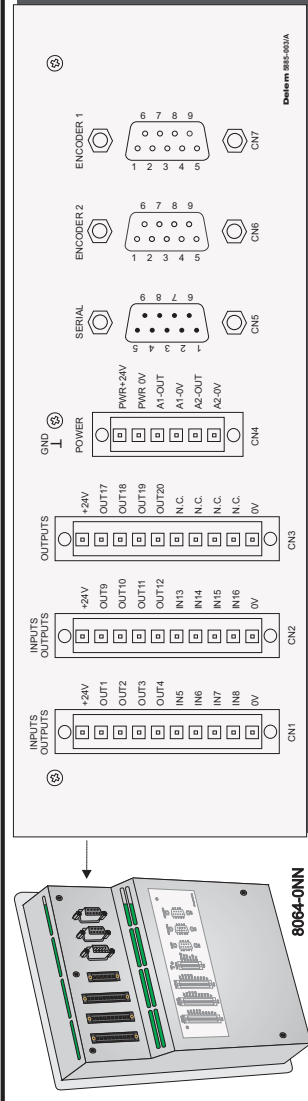
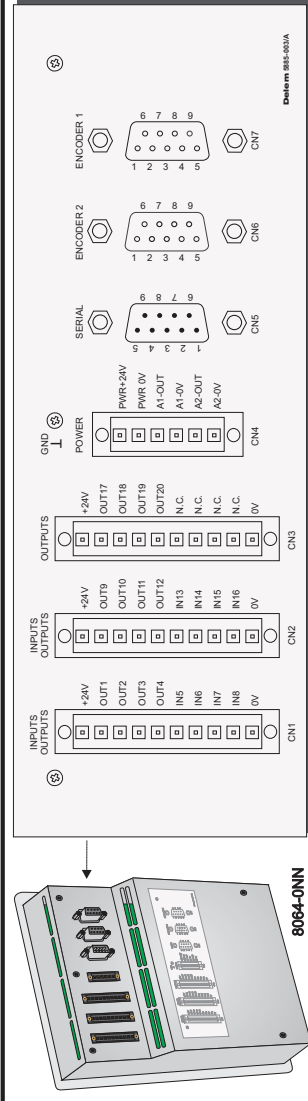
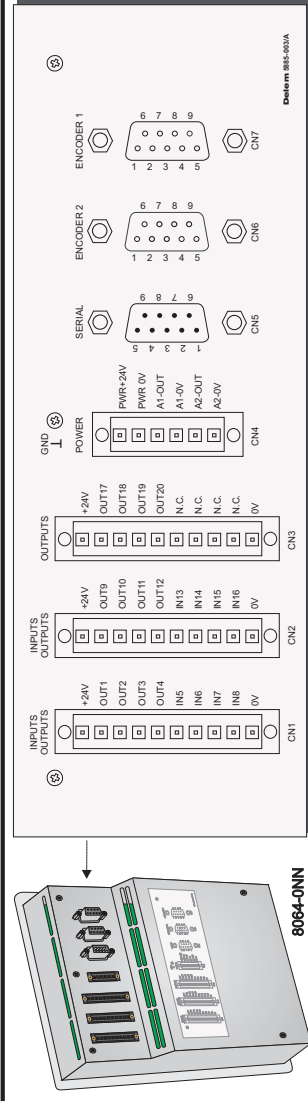
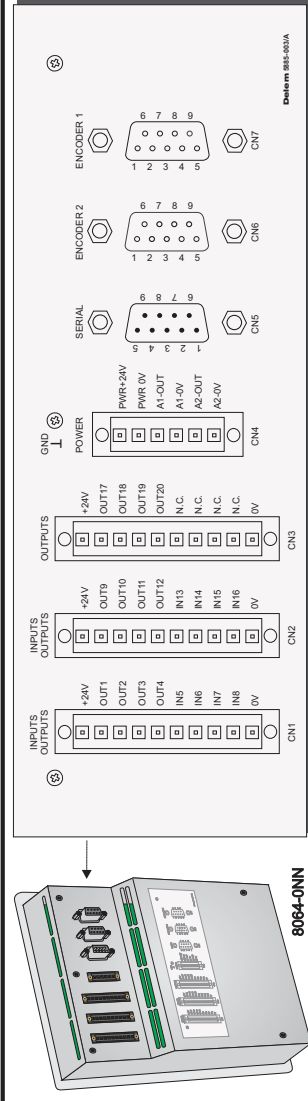
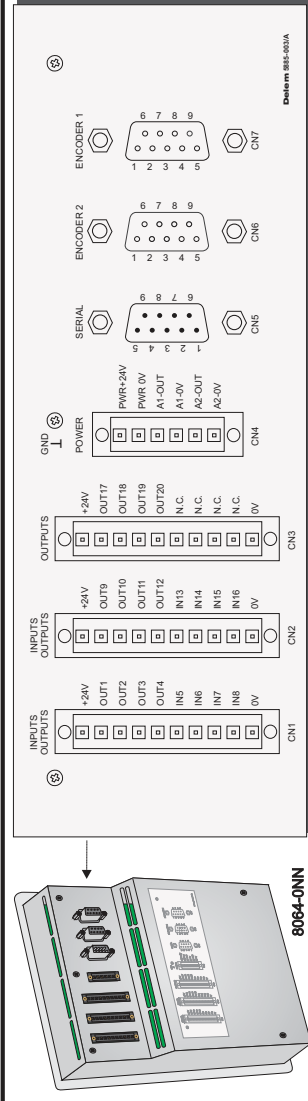
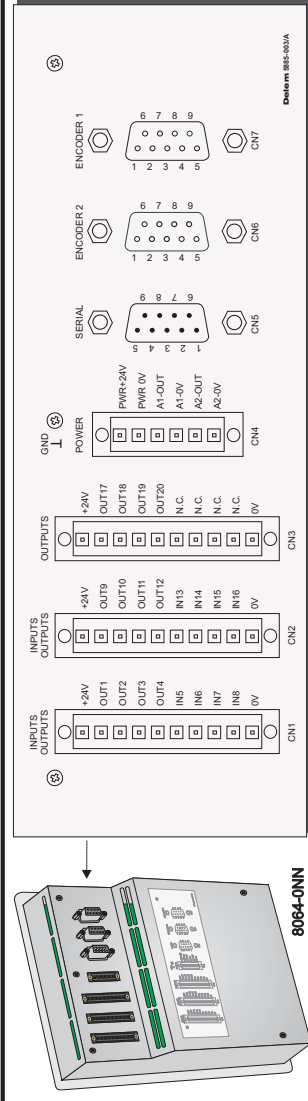
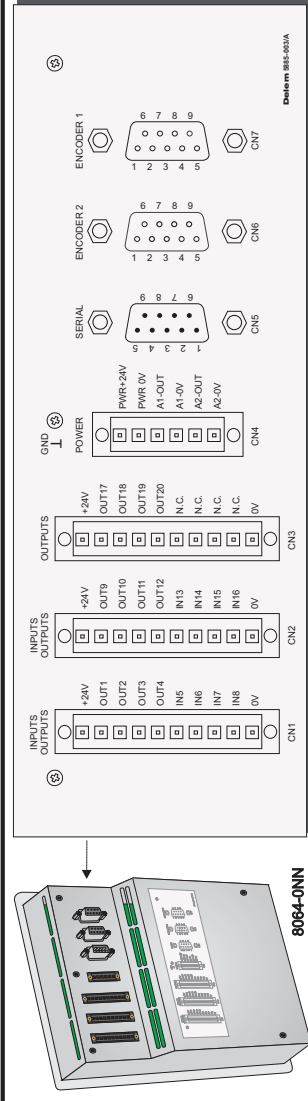
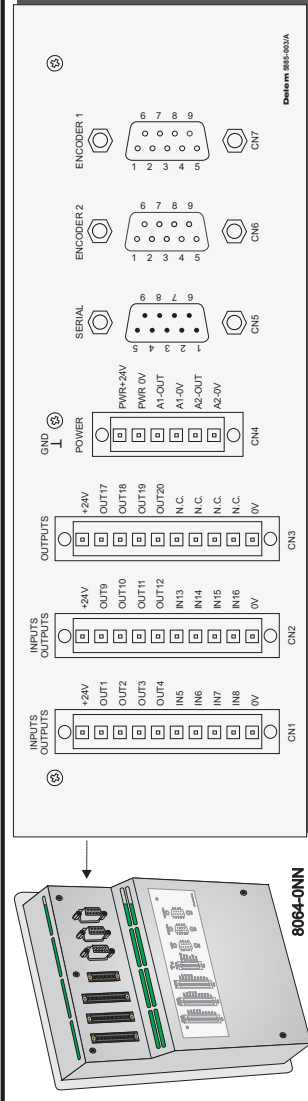
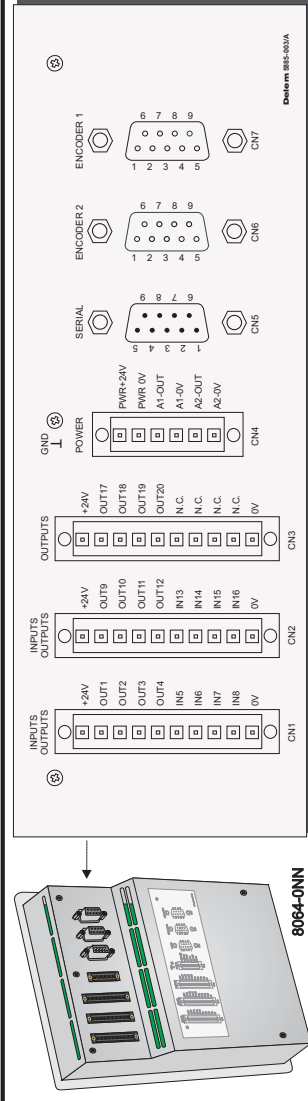
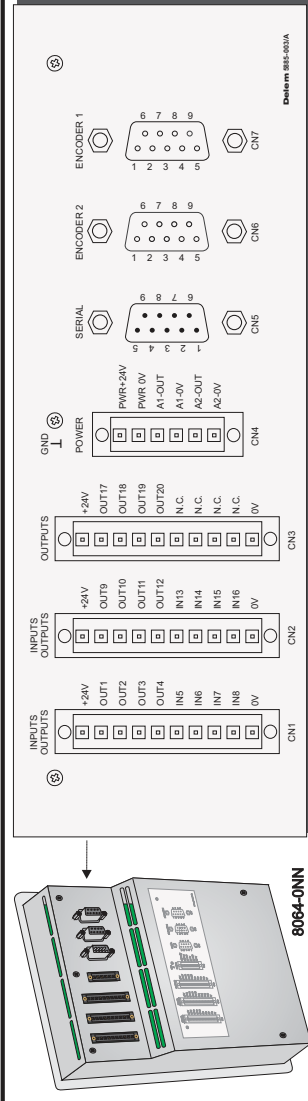
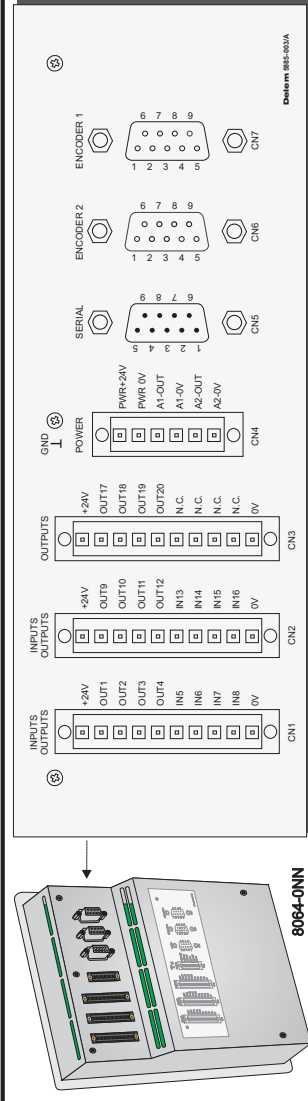
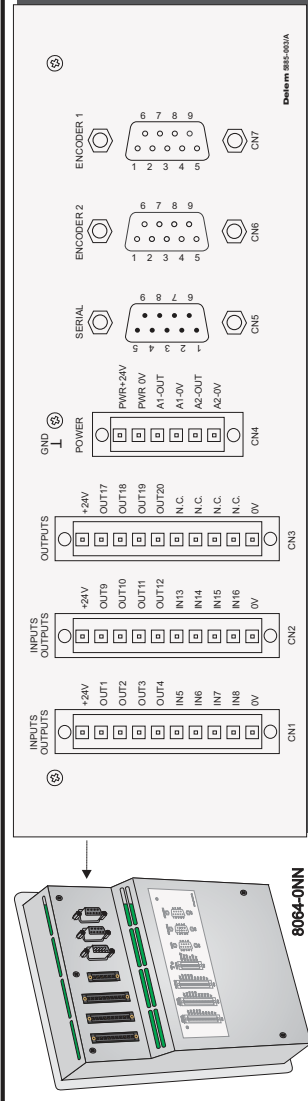
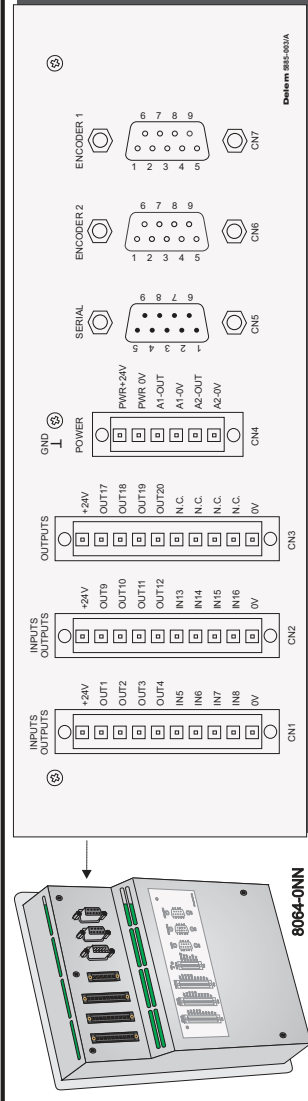
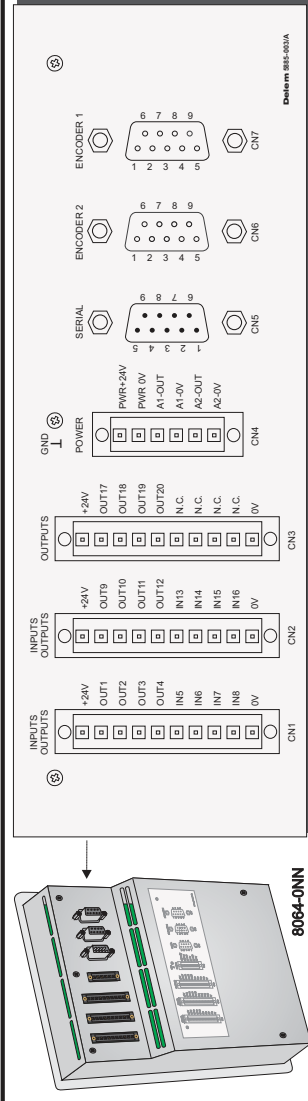
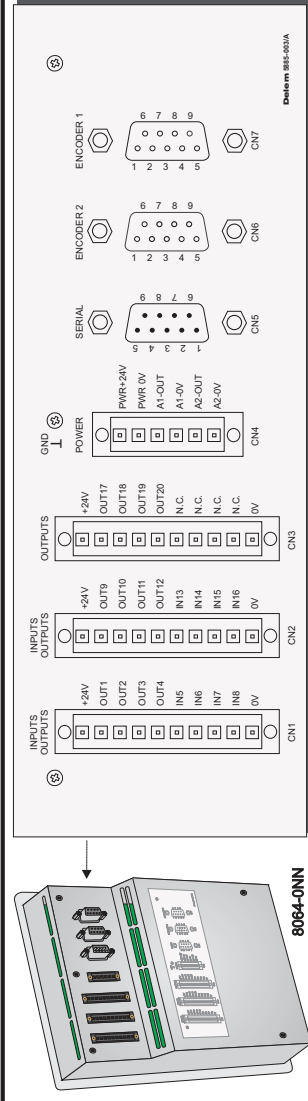
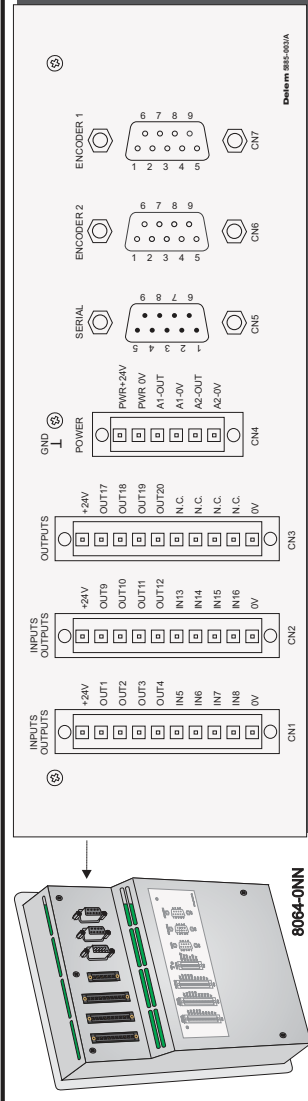
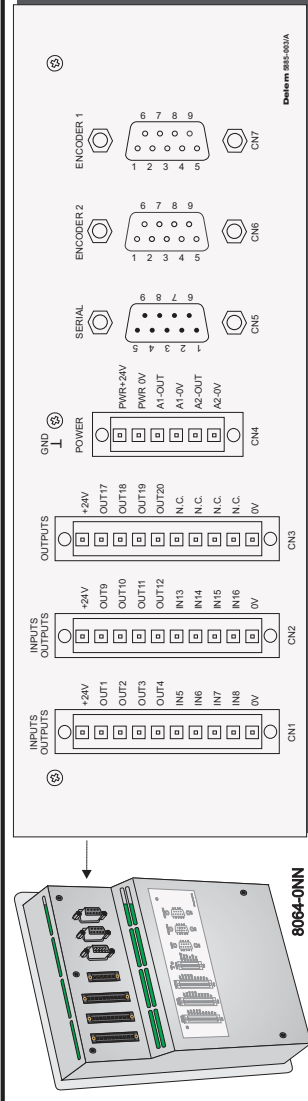
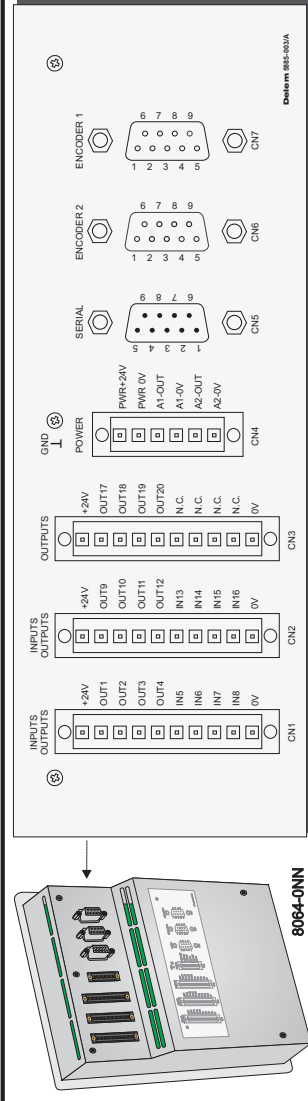
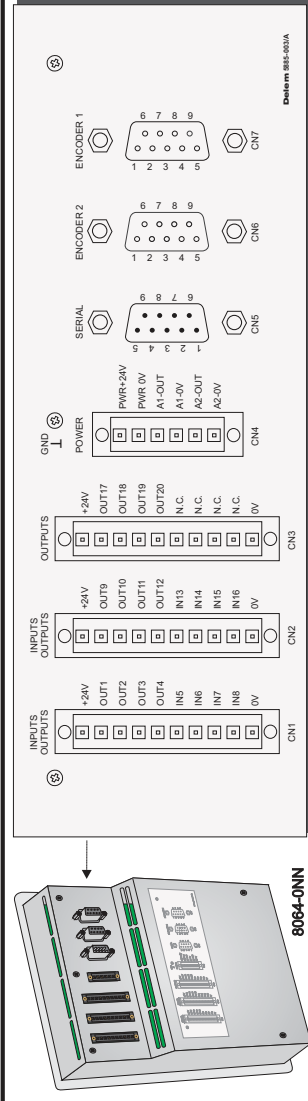
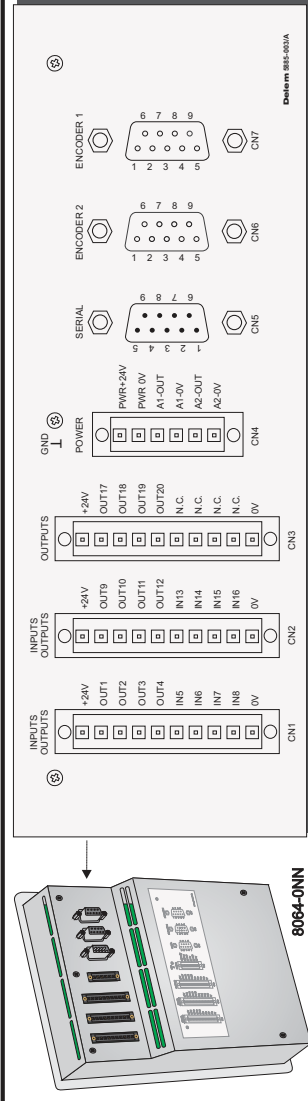
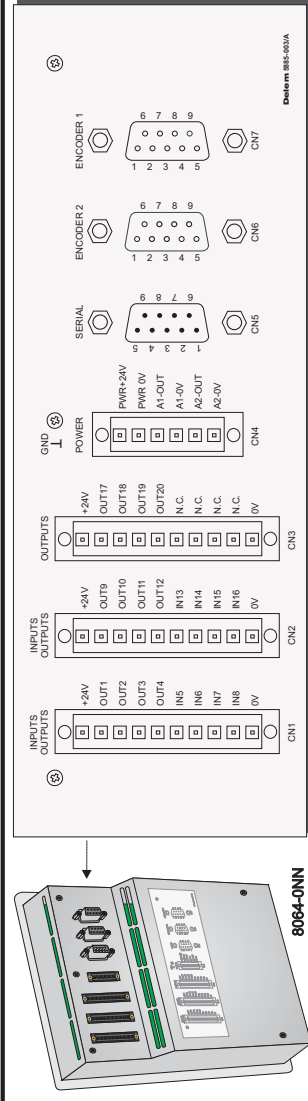
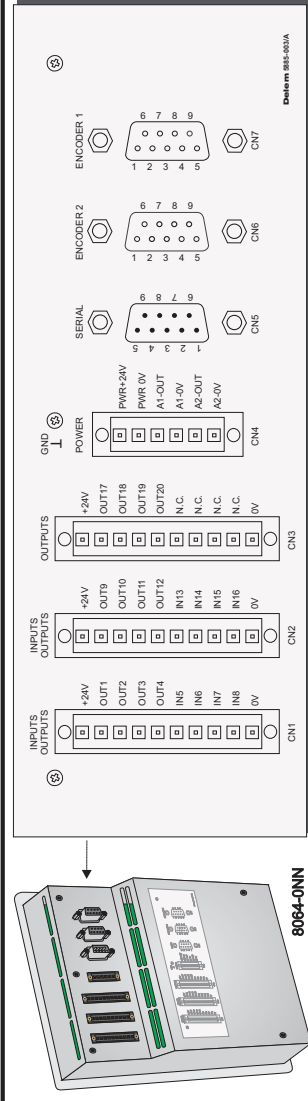
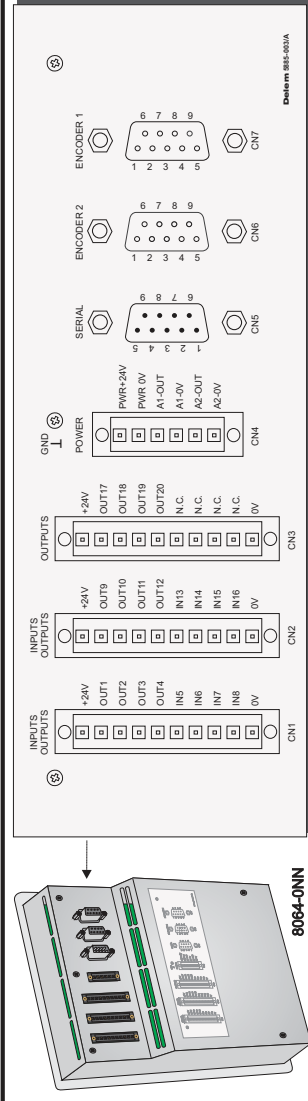
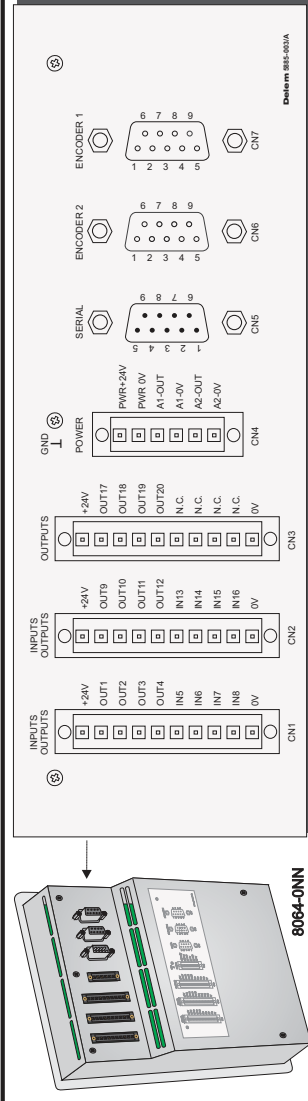
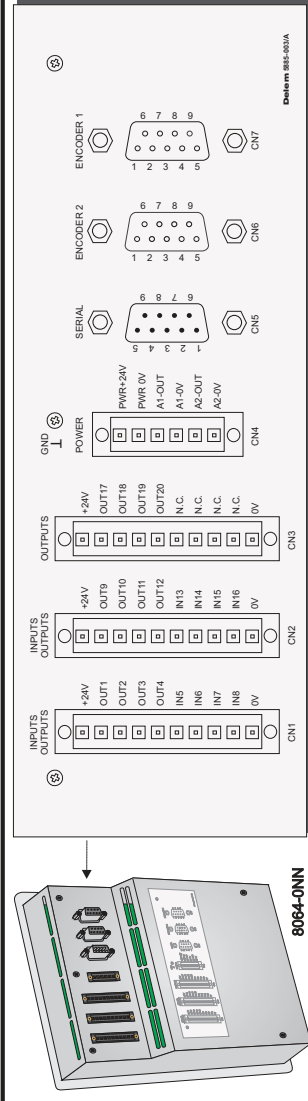
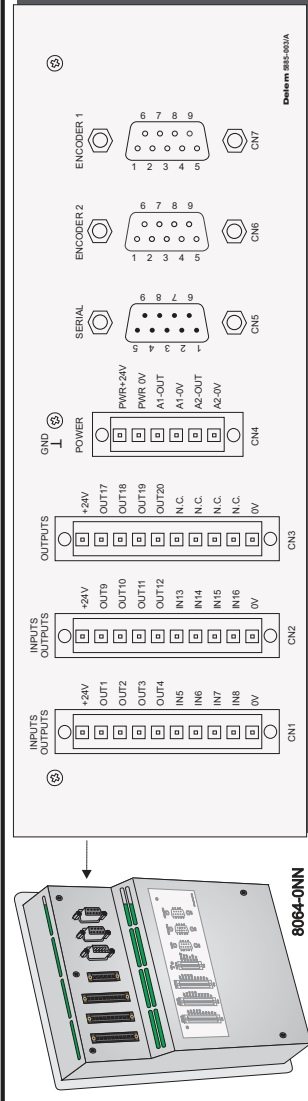
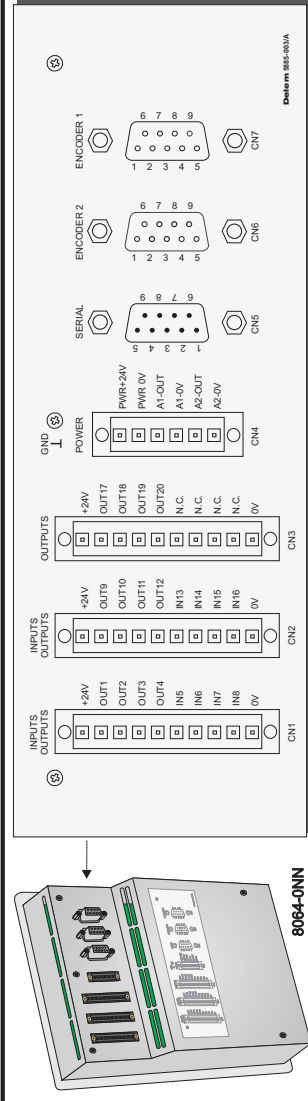
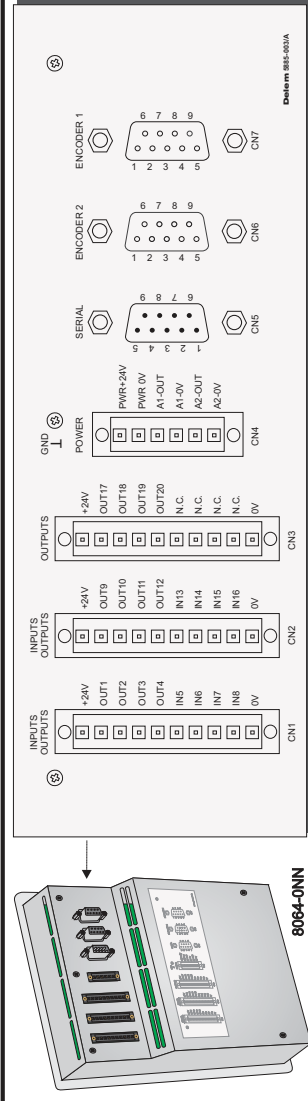
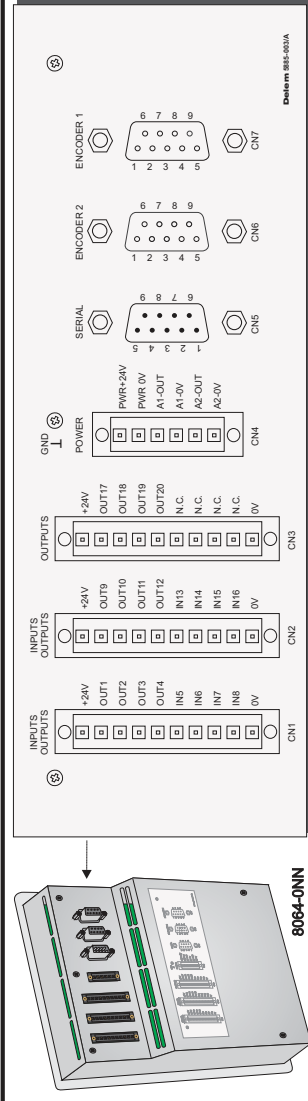
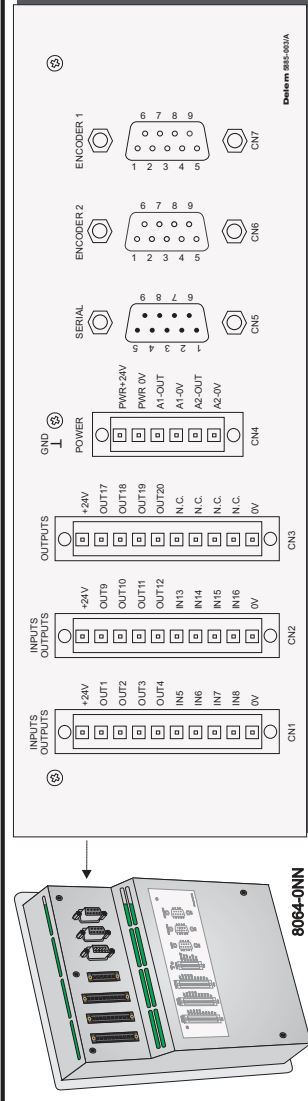
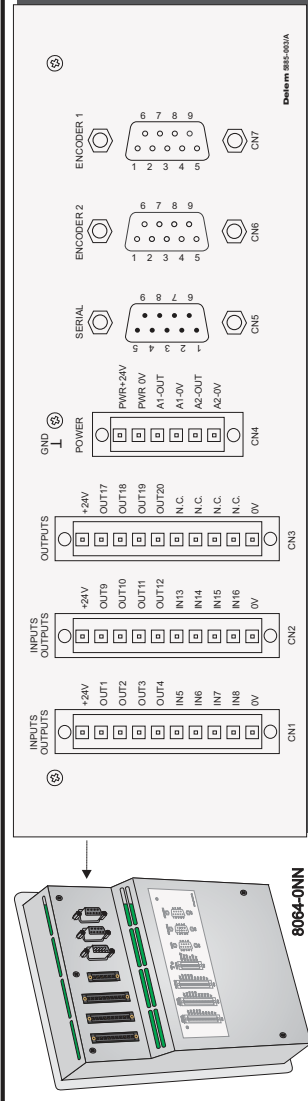
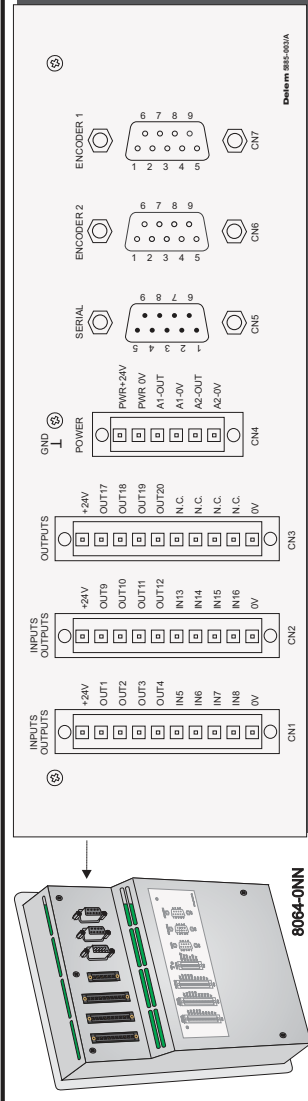
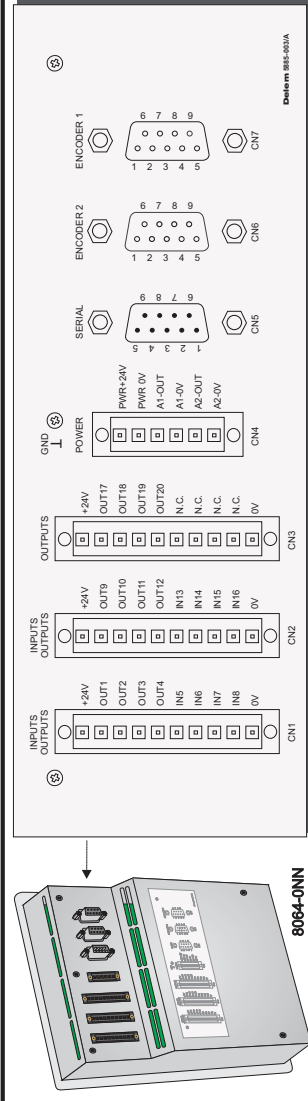
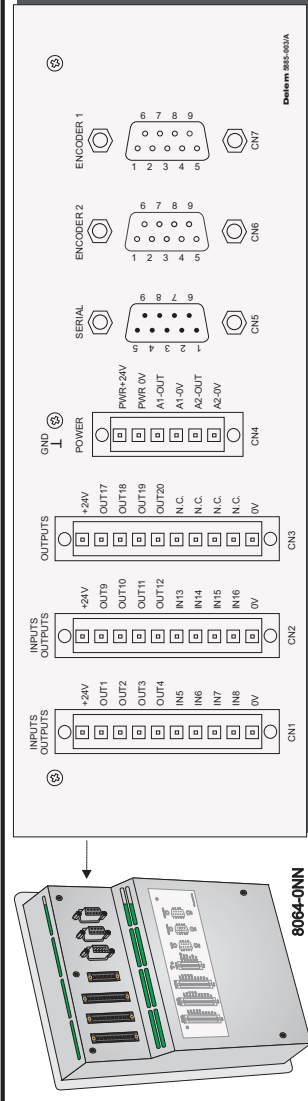
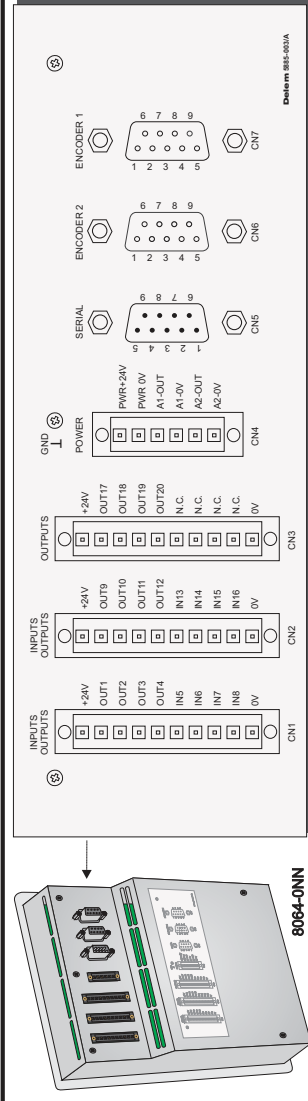
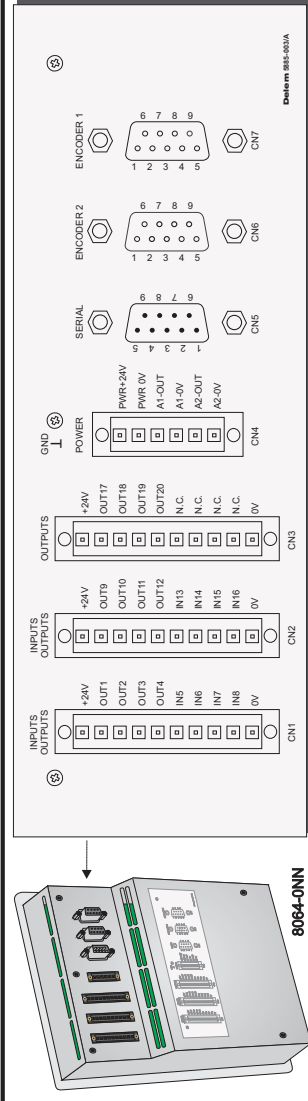
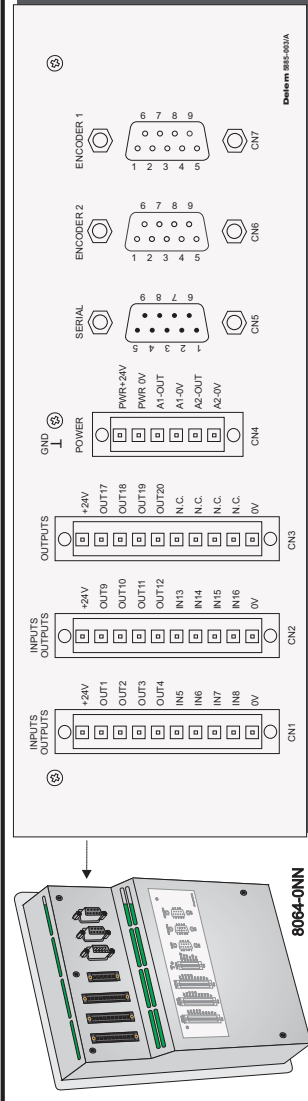
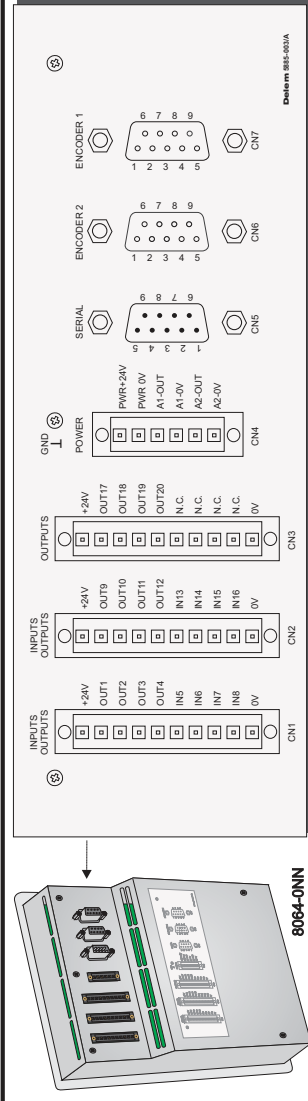
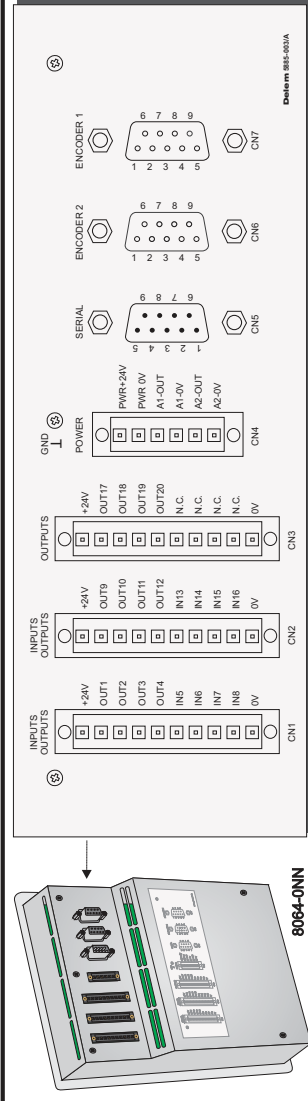
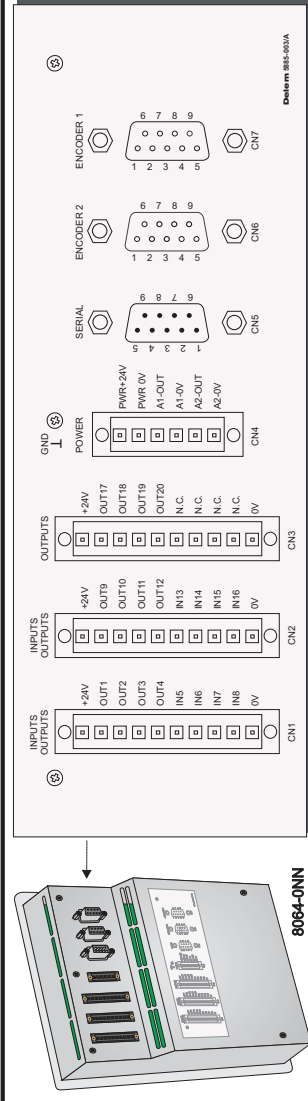
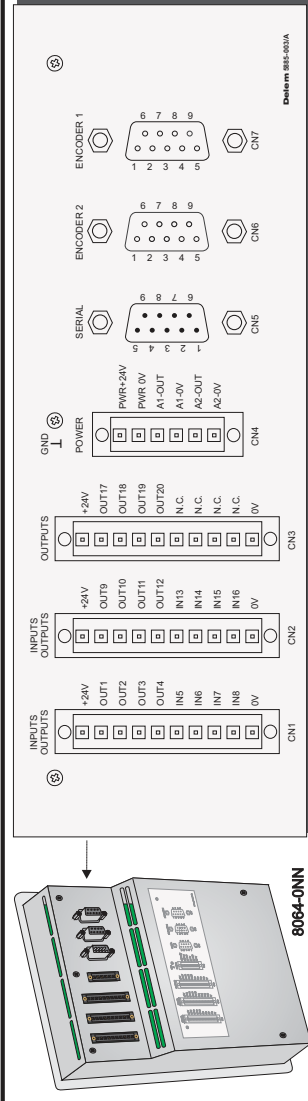
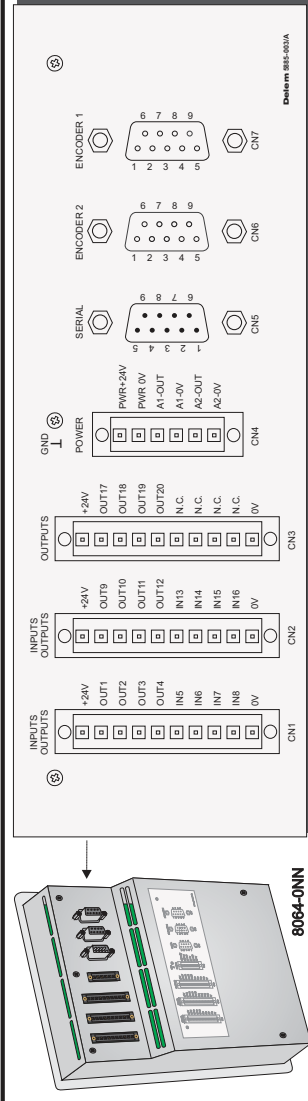
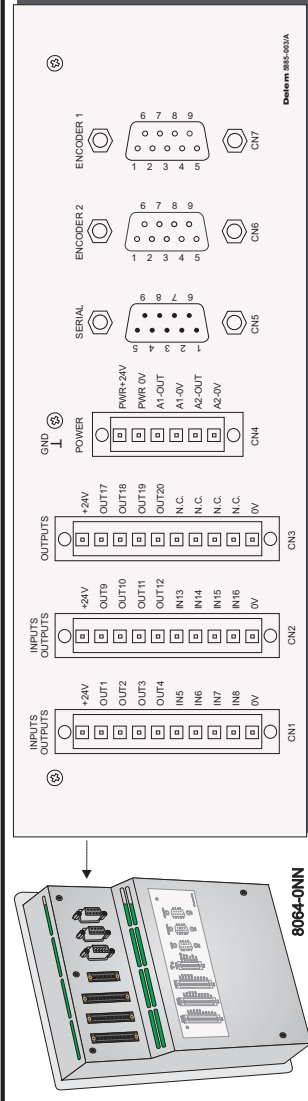
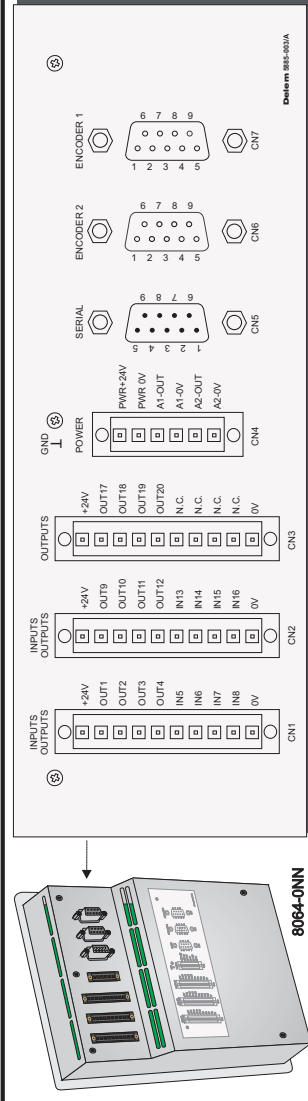
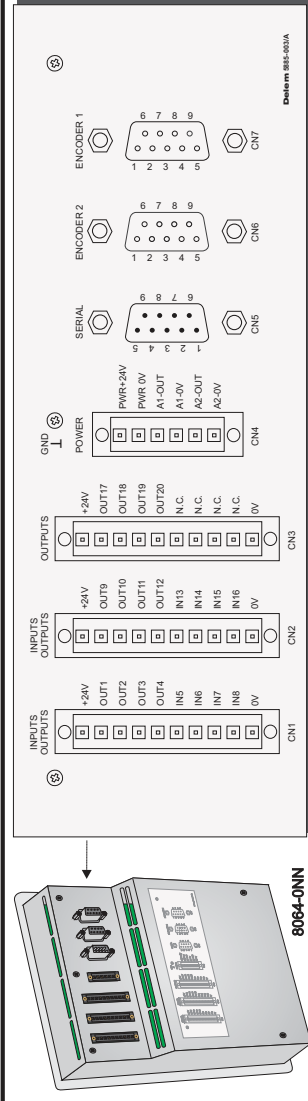
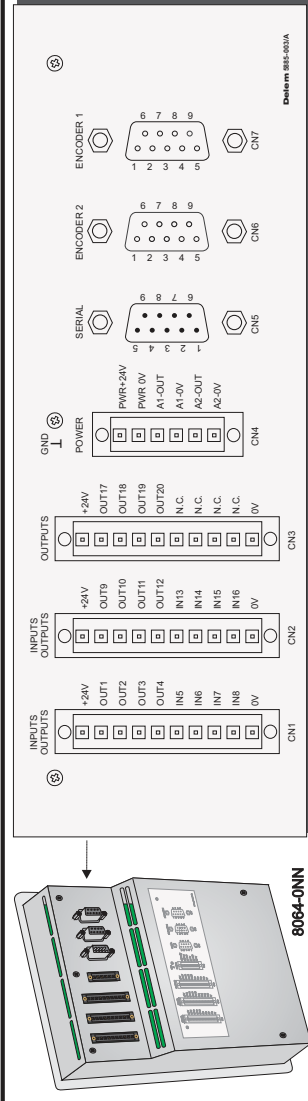
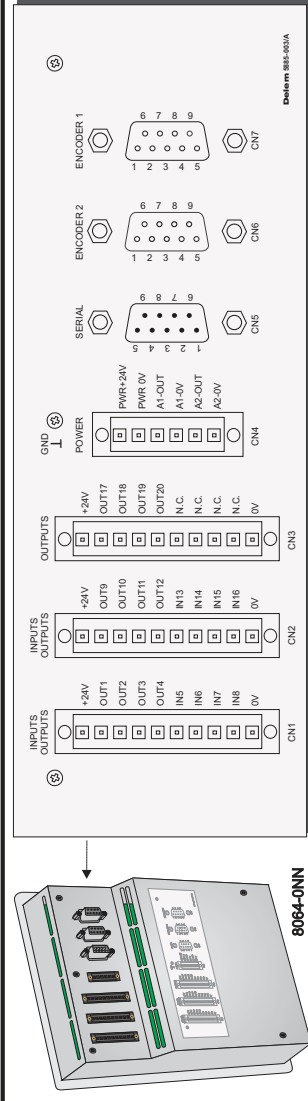
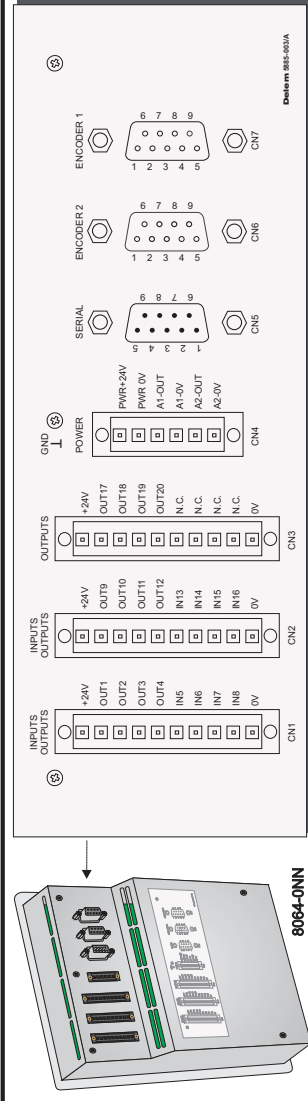
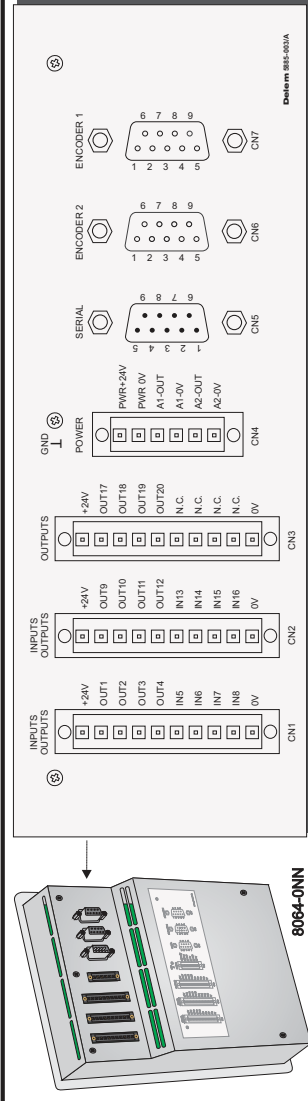
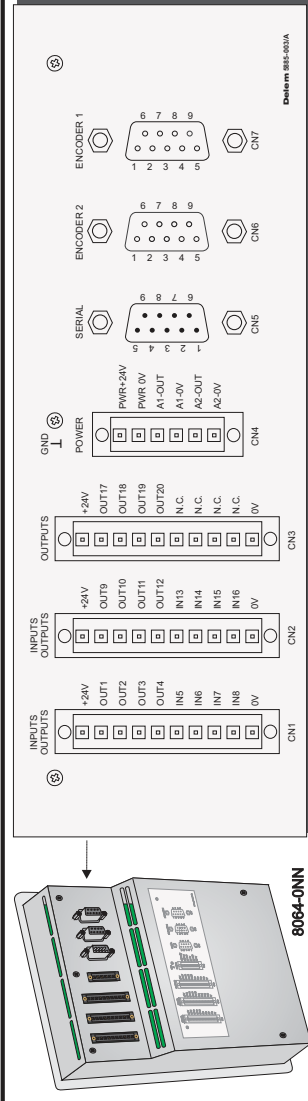
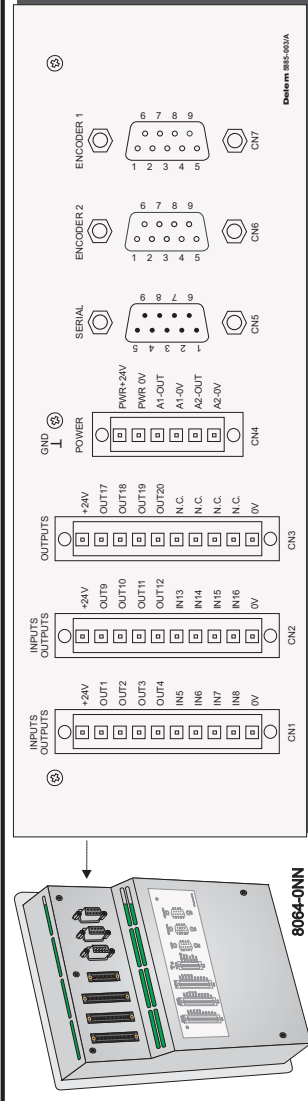
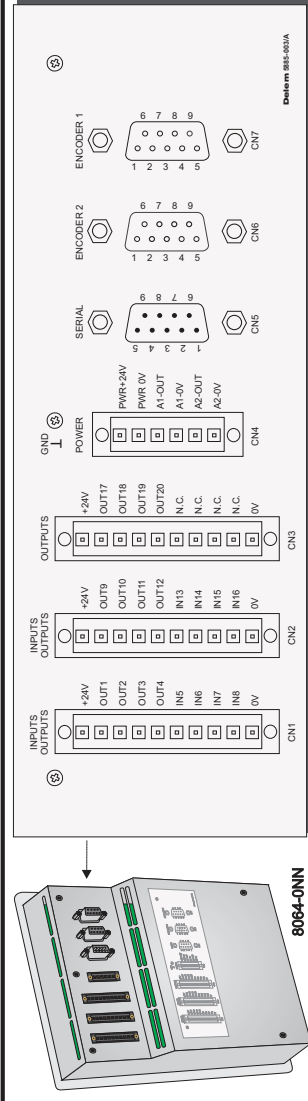
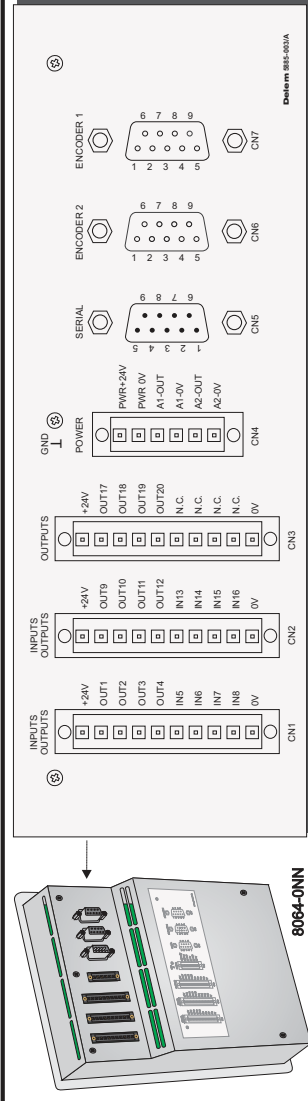
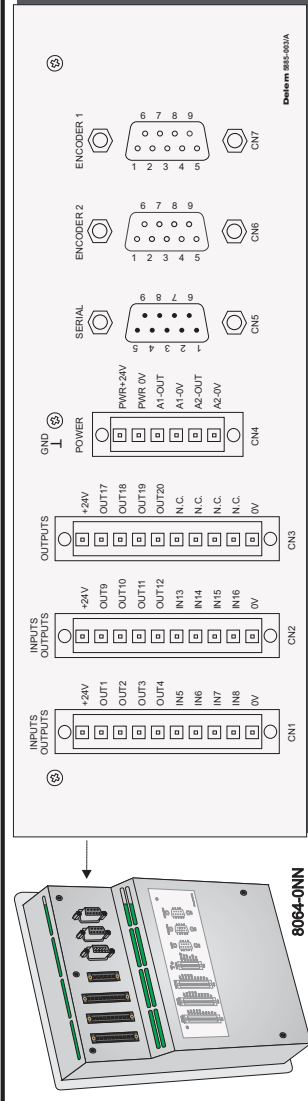
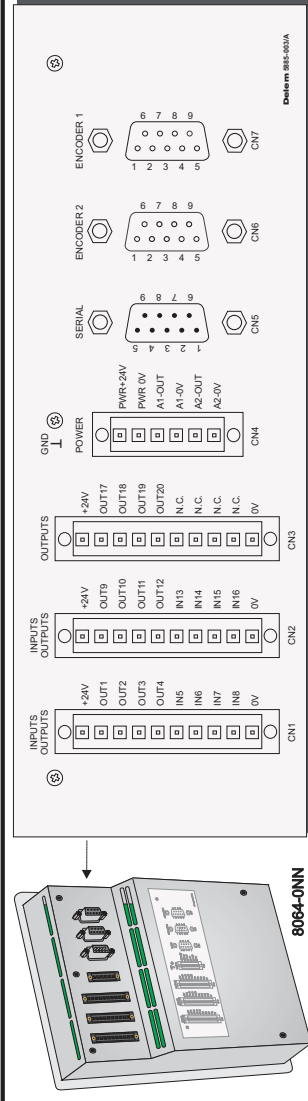
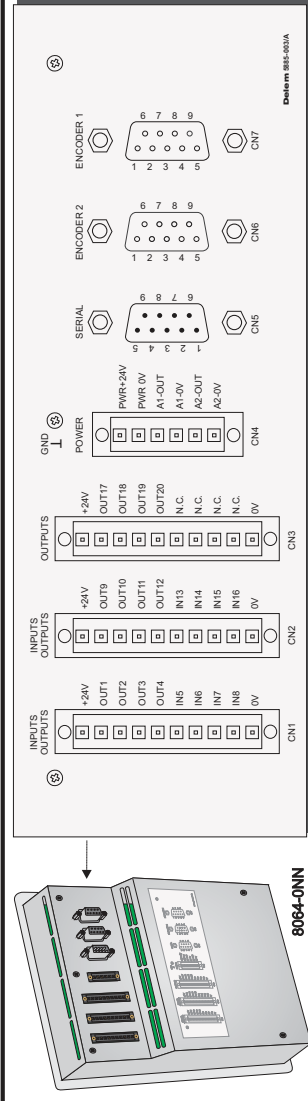
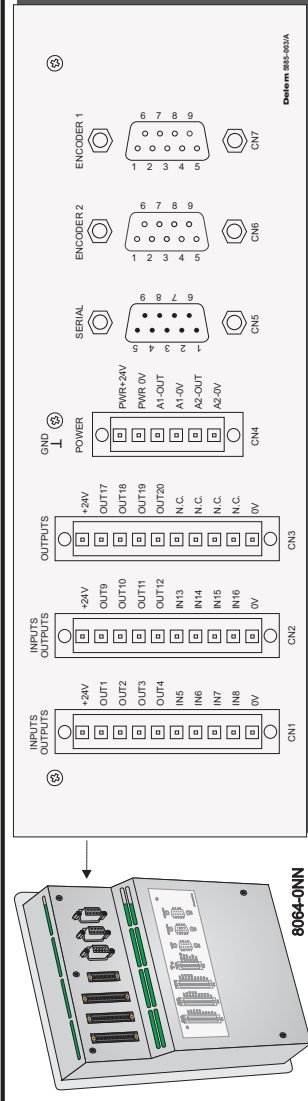
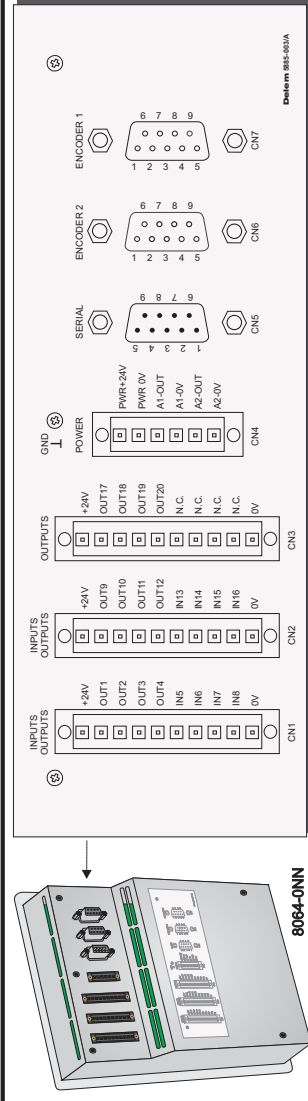
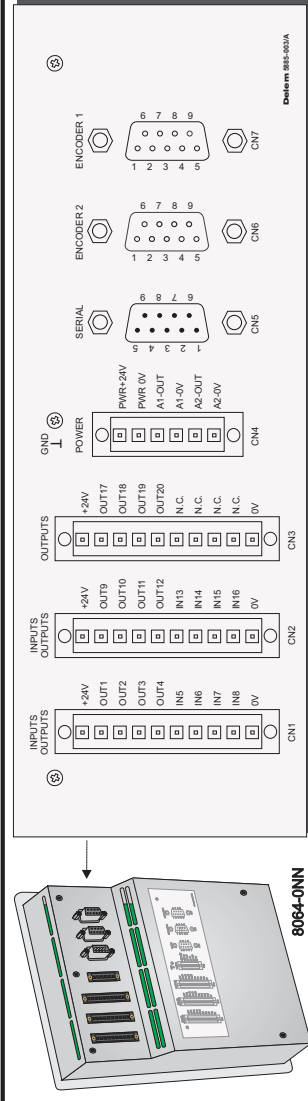
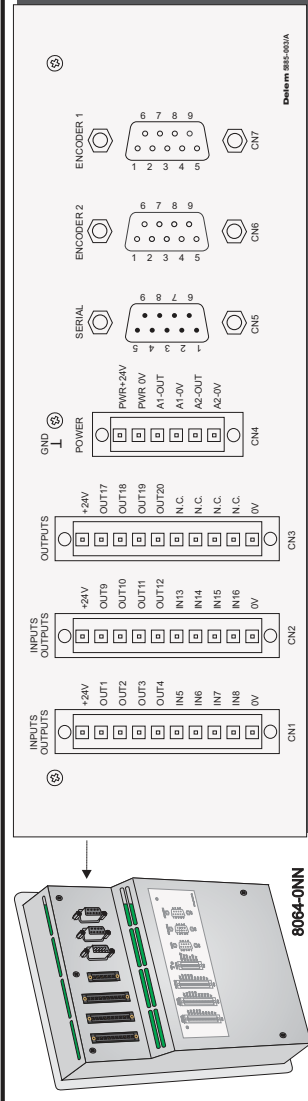
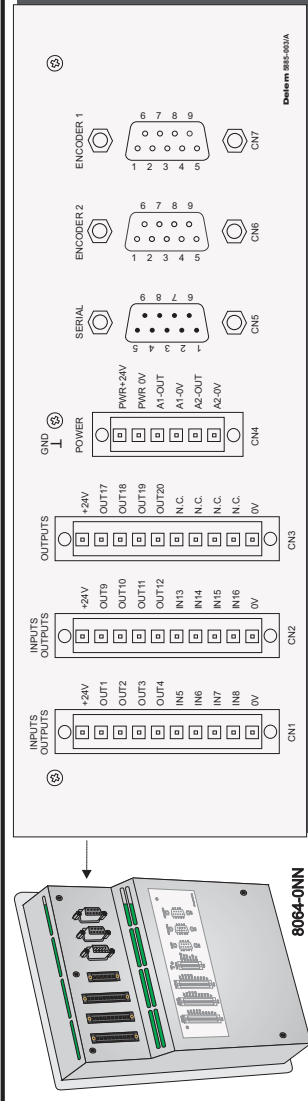
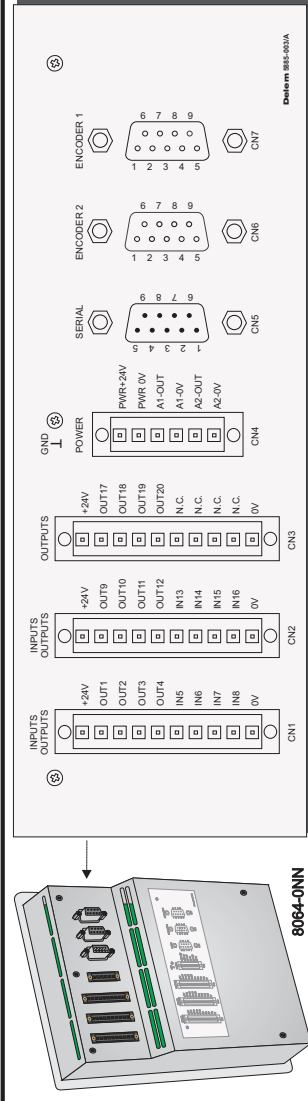
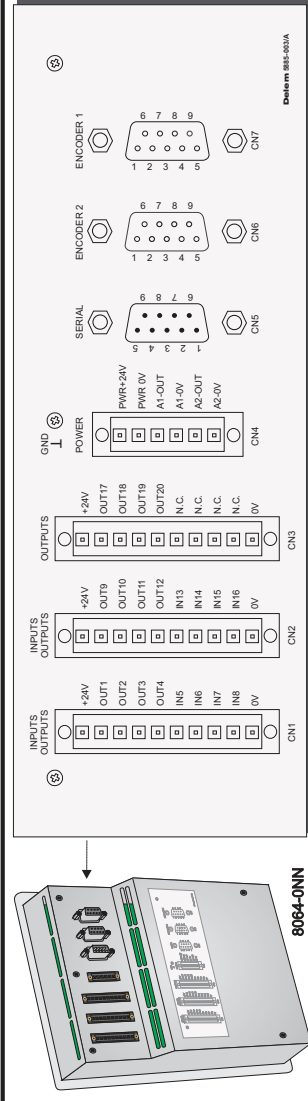
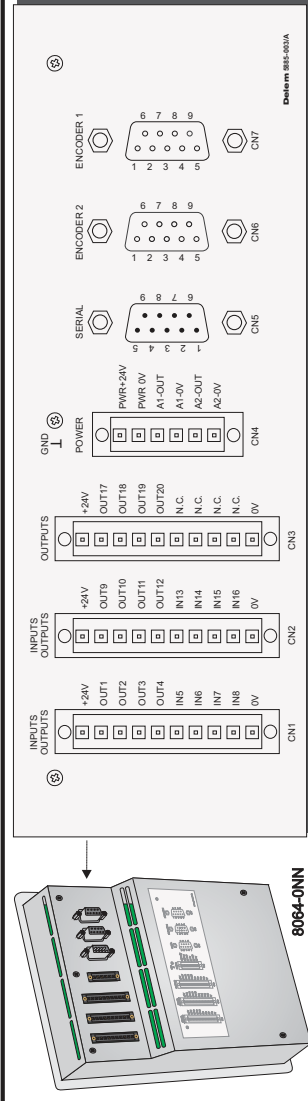
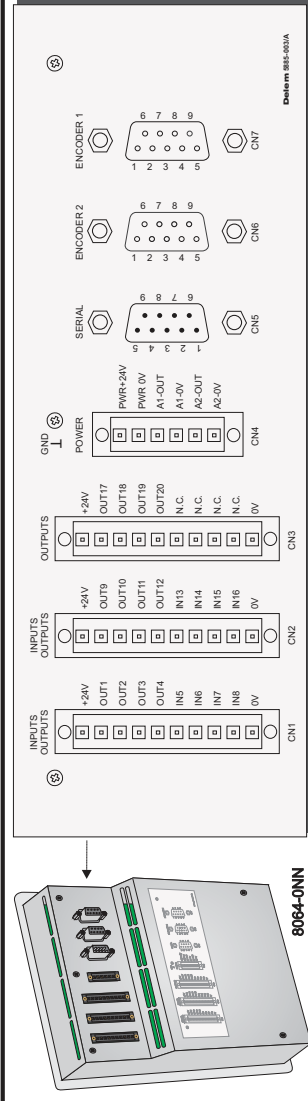
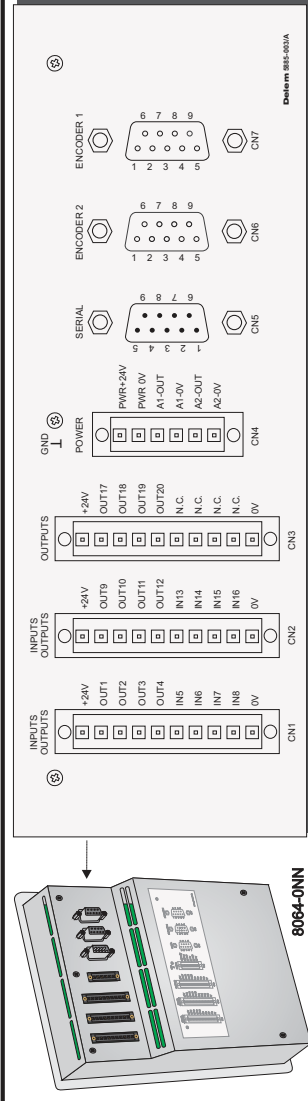
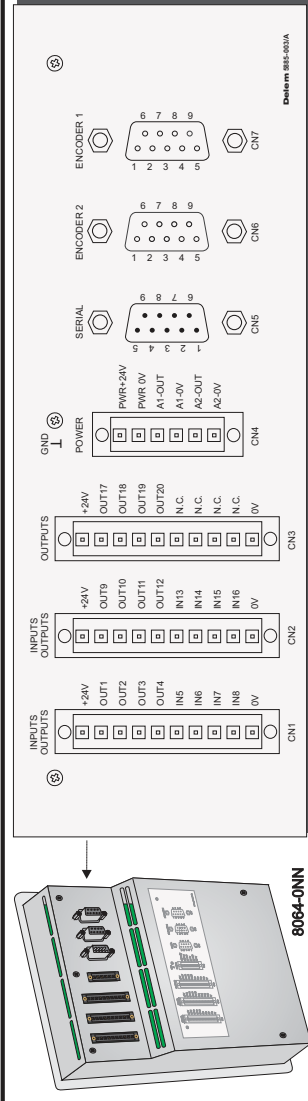
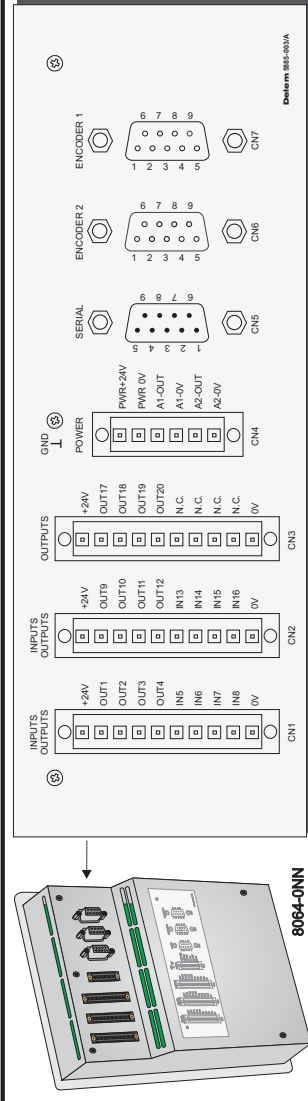
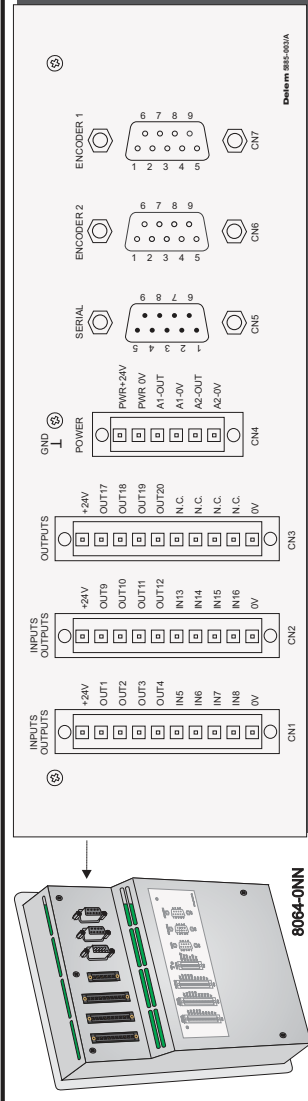
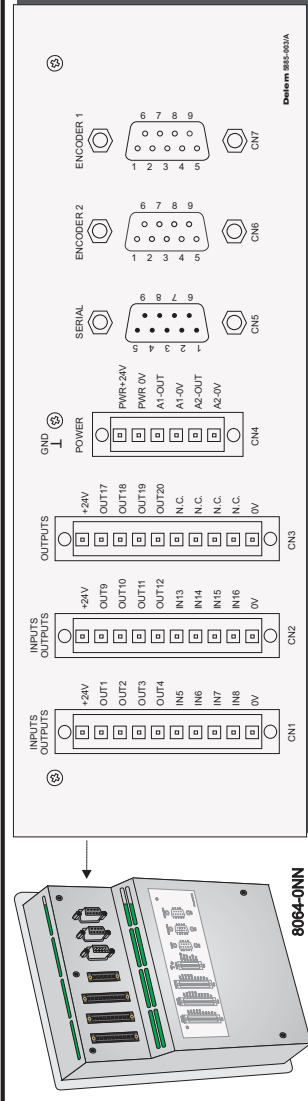
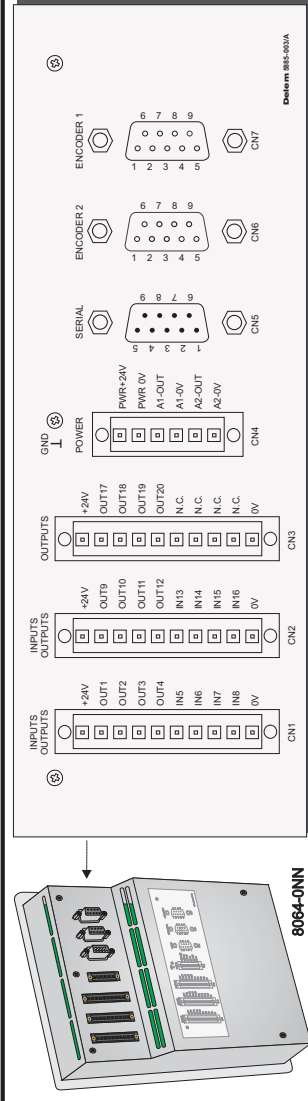
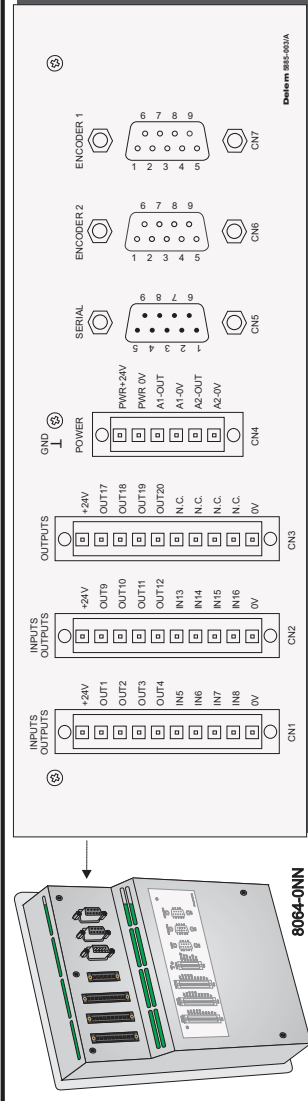
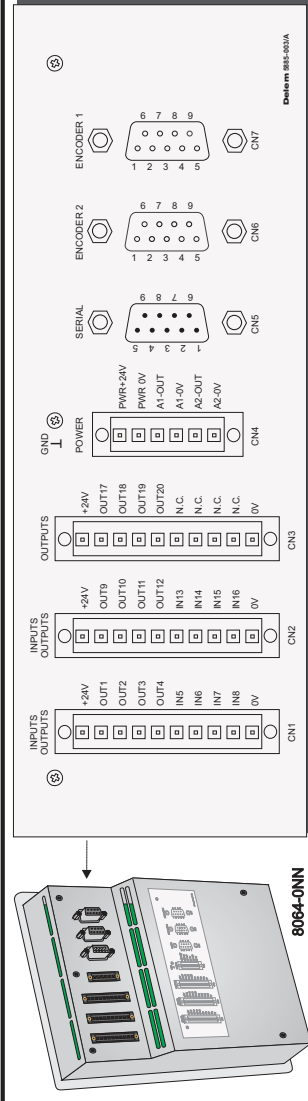
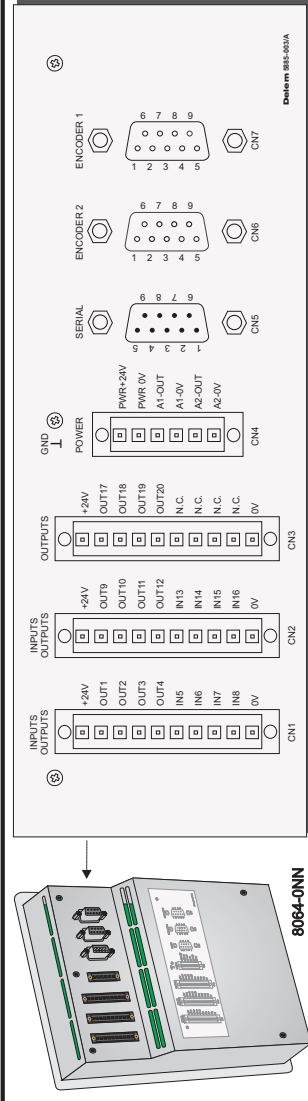
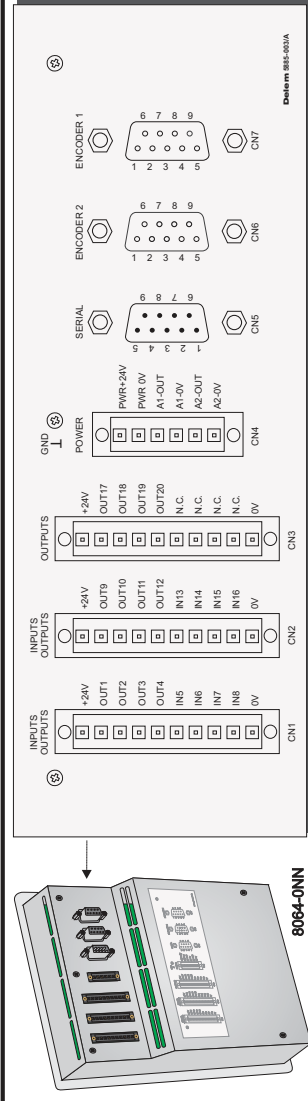
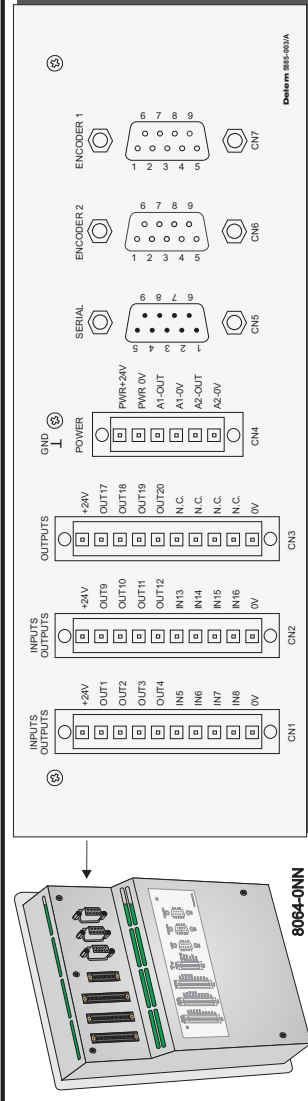
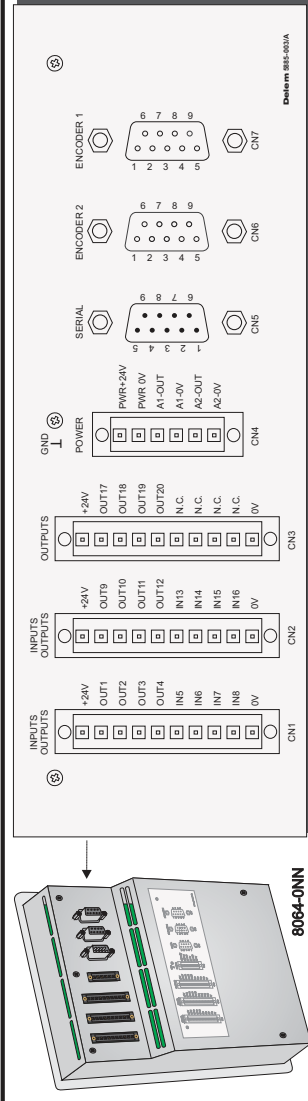
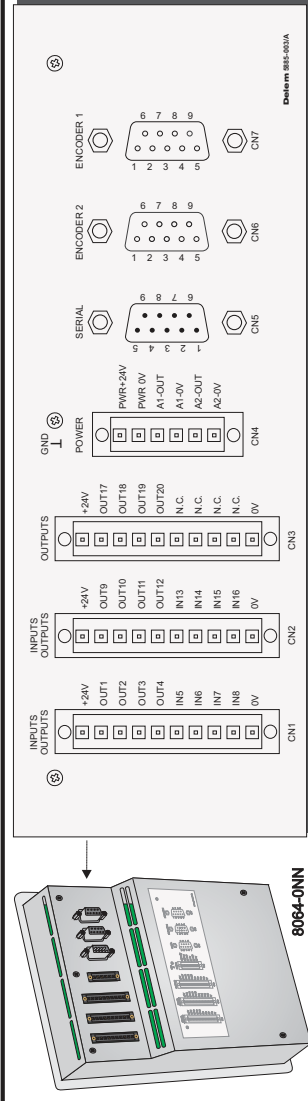
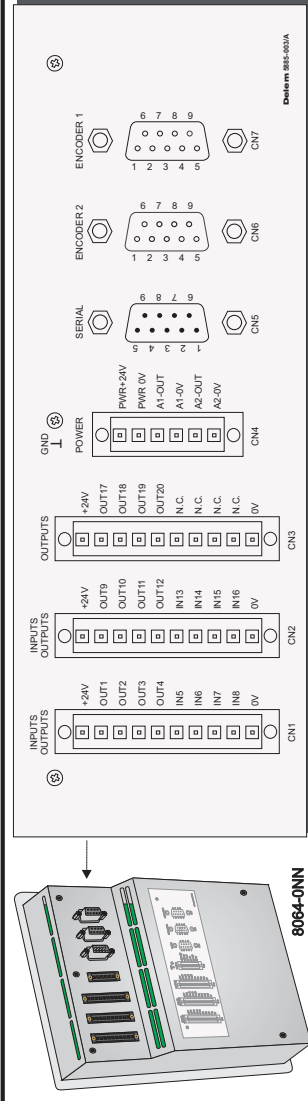
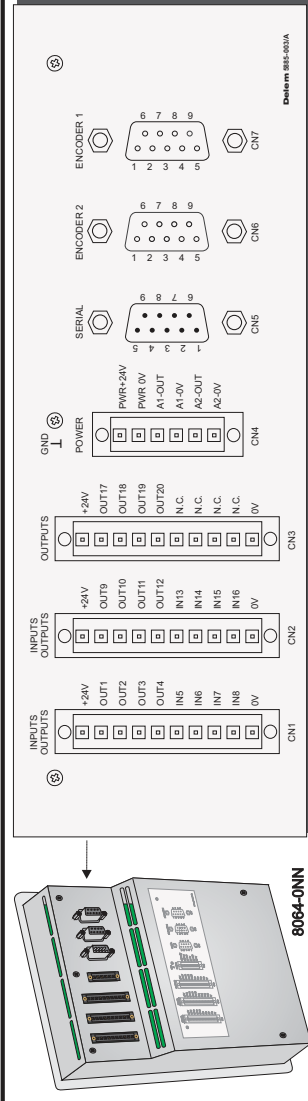
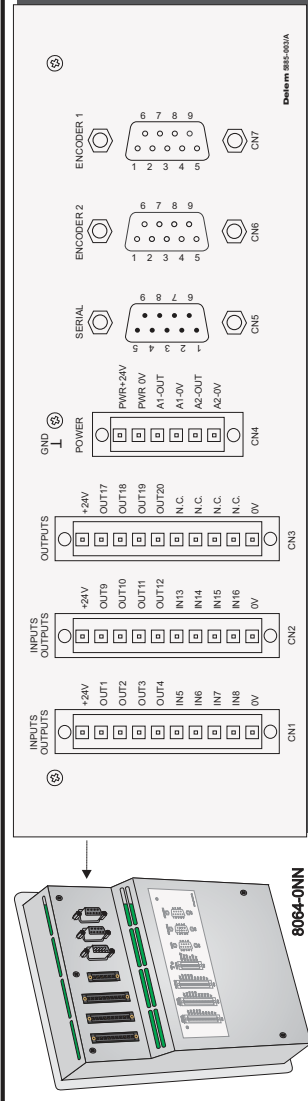
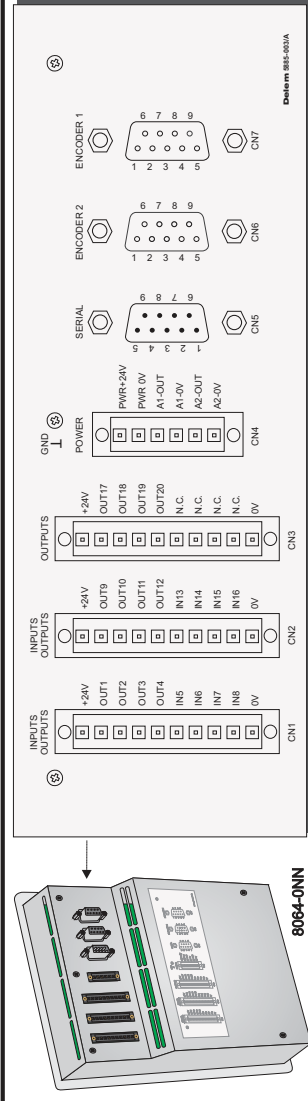
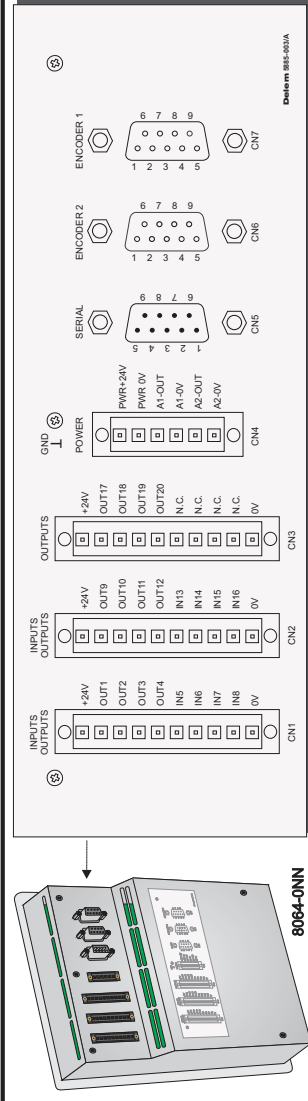
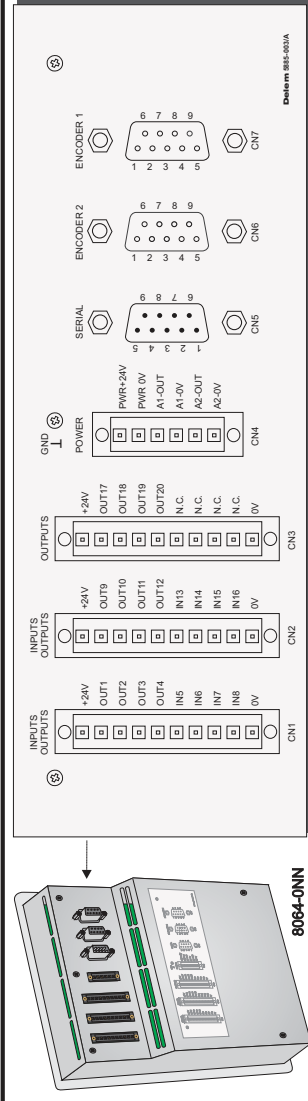
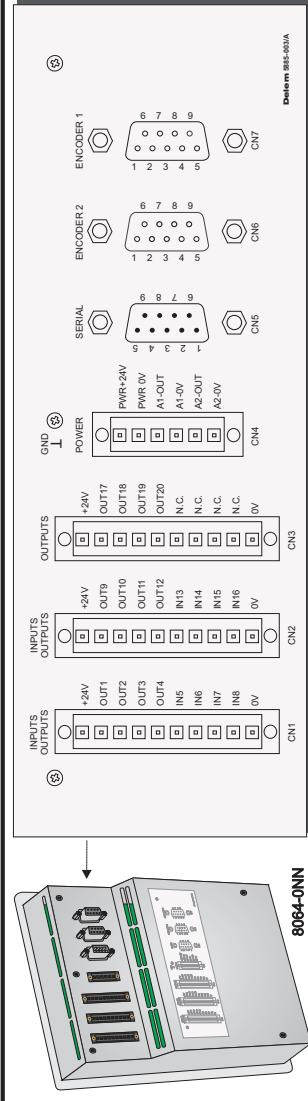
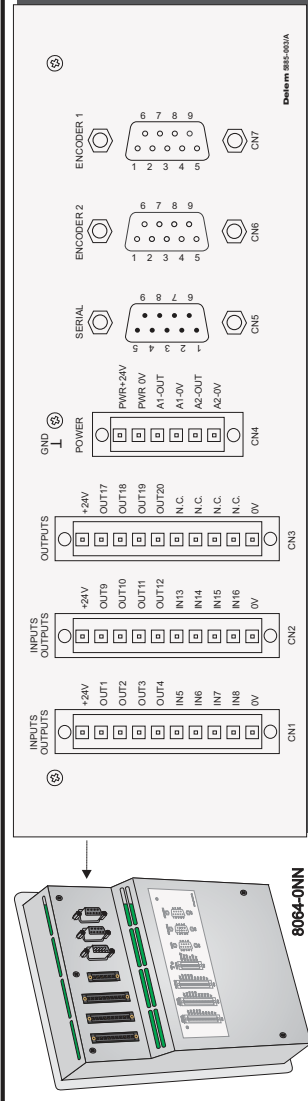
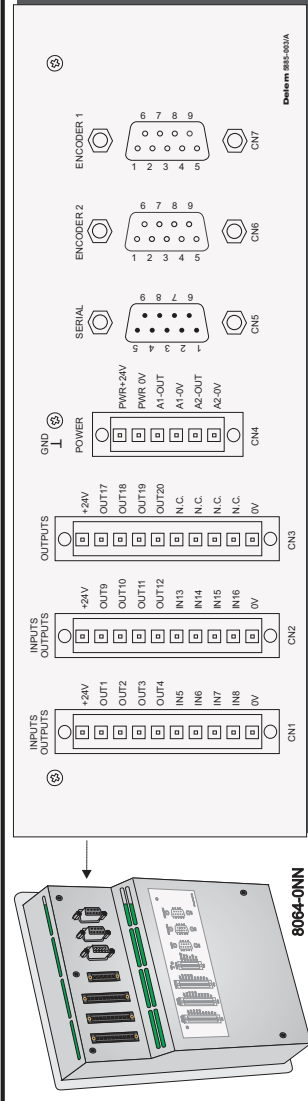
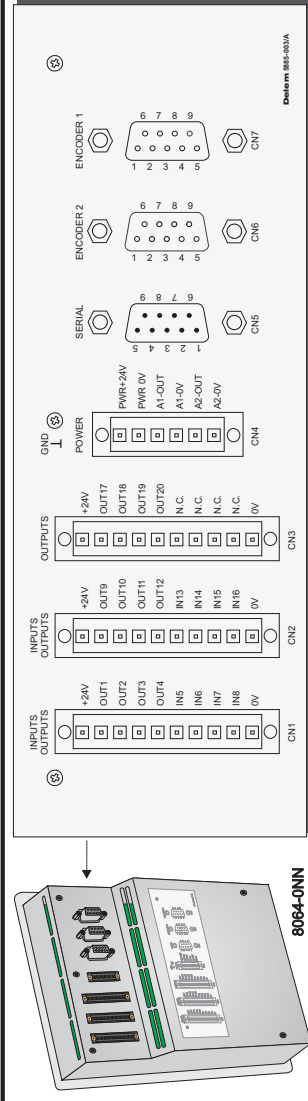
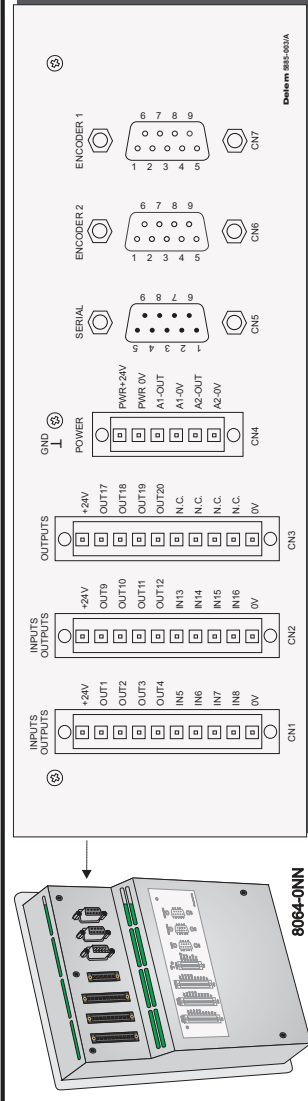
Issue -

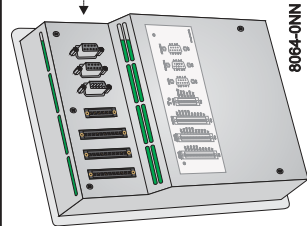
No unauthorized copying allowed Scale



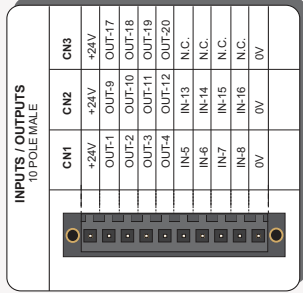
Digital output allocation

1	2	3	4	9	10	11	12	17	18	19	20	21	22	23	24
Y_OK	Y_UP_H	Y_UP_L	Y_DN_L	Y_DN_H	X_OK	X_UP_H	X_UP_L	X_DN_L	X_DN_H						





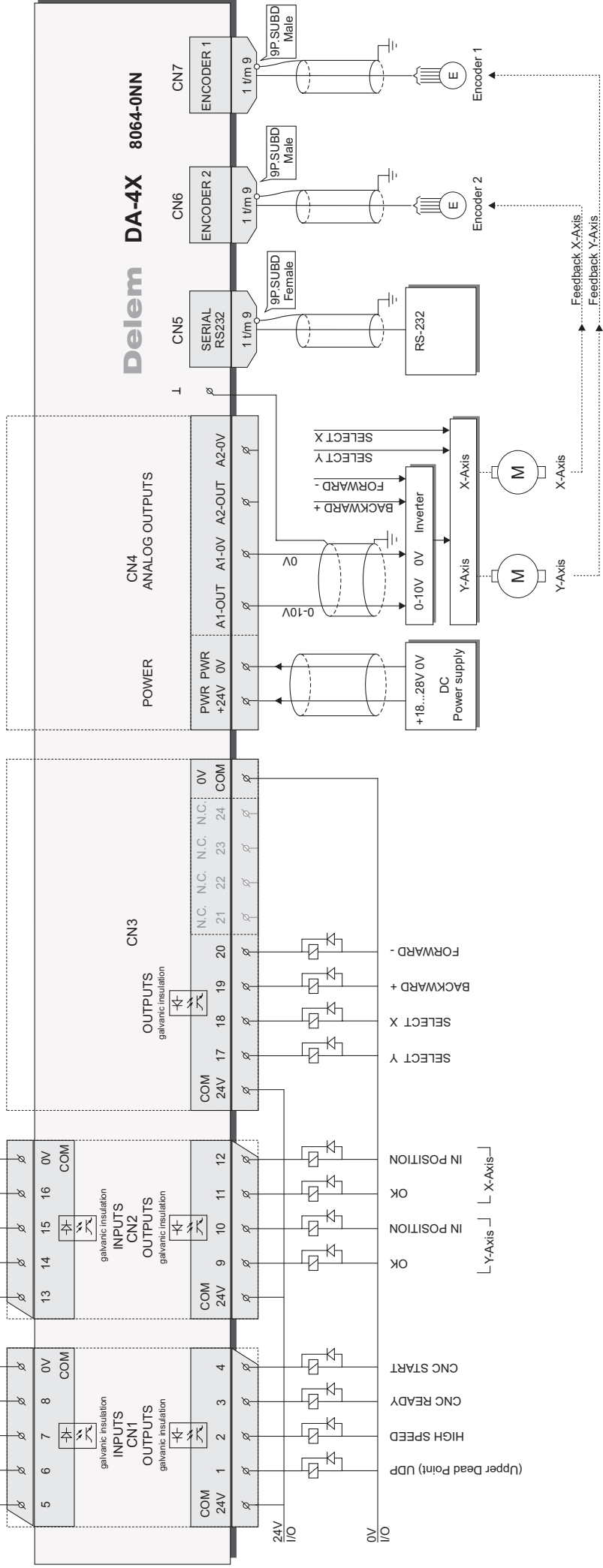
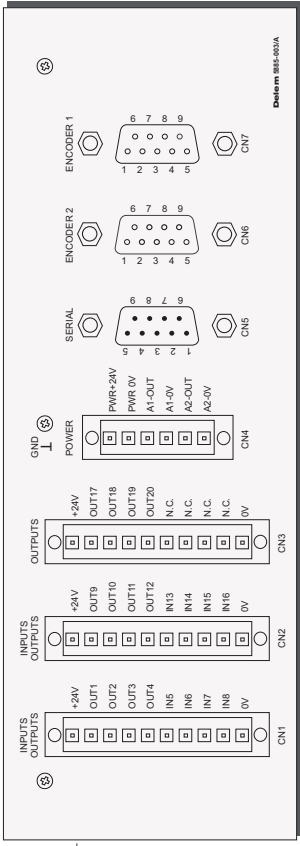
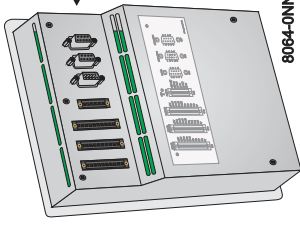
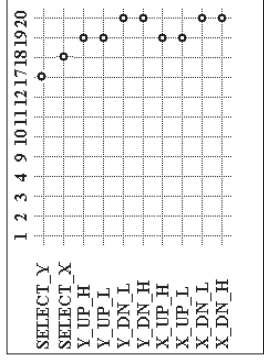
Note 2 : 24V relais supply must be separated from 24V supply



See drawing 8064-907 for default digital I/O allocation.
See drawing 8064-901 for mounting dimensions.

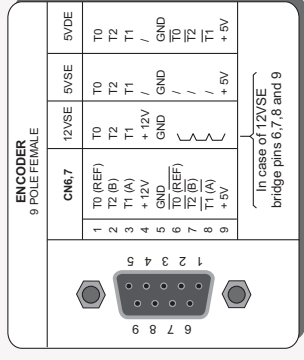
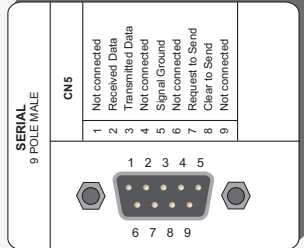
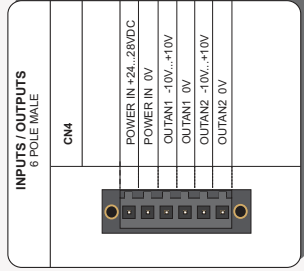
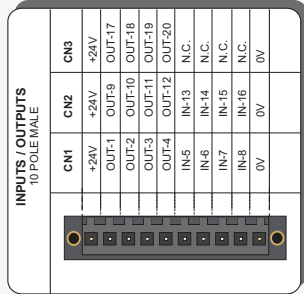
[illegible]

Digital output allocation



Note 1 : Leave unconnected pins open.
Note 2 : 24V relays supply must be separated from 24V supply

See drawing 8064-907 for default digital I/O allocation.
See drawing 8064-901 for mounting dimensions.



Delem		Ichtlaanweg 42, 5657 BB Eindhoven, The Netherlands	
Example connections:		AC V-Axis Unipolar Inverter Single	
AC X-Axis Unipolar Inverter Single		AC X-Axis Unipolar Inverter Single	
Form 1		Page 1 / 1	
A3		8064-105	
Measure in mm unless otherwise specified		Scale	
Date		20-10-2005	
HNF		Drawn	
Date		Redrawn	
Description		Note	
Date		Redrawn	
Description		Note	
Date		Redrawn	
Description		Note	

OUTPUTS

	1	2	3	4	9	10	11	12	17	18	19	20
UDP	•											
HIGH_SPD		•										
NC_READY			•									
NC_START				•								
SELECT_Y												
SELECT_X												
Y_OK					•							
Y_IP						•						
Y_UP_H									•			
Y_UP_L									•			
Y_DN_L										•		
Y_DN_H										•		
X_OK							•					
X_IP								•				
X_UP_H											•	
X_UP_L											•	
X_DN_L												•
X_DN_H												•

INPUTS

	Lo	Hi	5	6	7	8	13	14	15	16
PUMP			•							
STEP				•						
LDP		•								
RETRACT						•				
KEY_LOCK					•					
Y_START							•			
Y_RSD								•		
X_START									•	
X_RSD										•

Note	Redrawn	Date
Description		
Note	Redrawn	Date
Description		
Measures in mm, unless otherwise specified	Drawn	Date
	HNF	20-10-2005



Delem

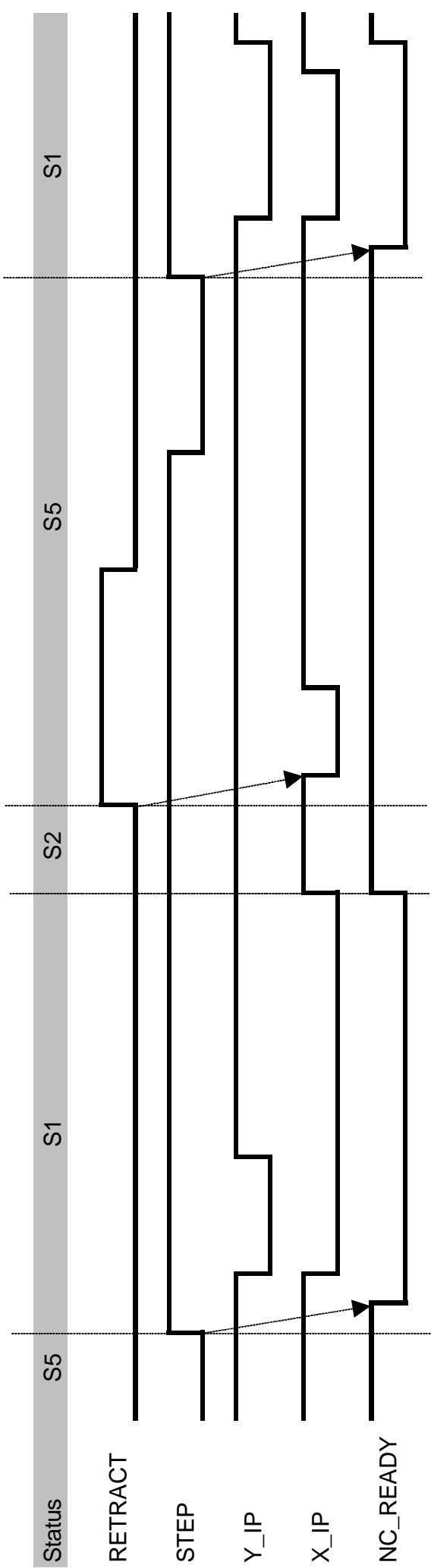
Luchthavenweg 42, 5657 EB
Eindhoven, the NETHERLANDS

DA-41

Default digital Input / Output allocation

Format		Number	Issue
A4		8064-907	-
No unauthorized copying allowed		Scale	

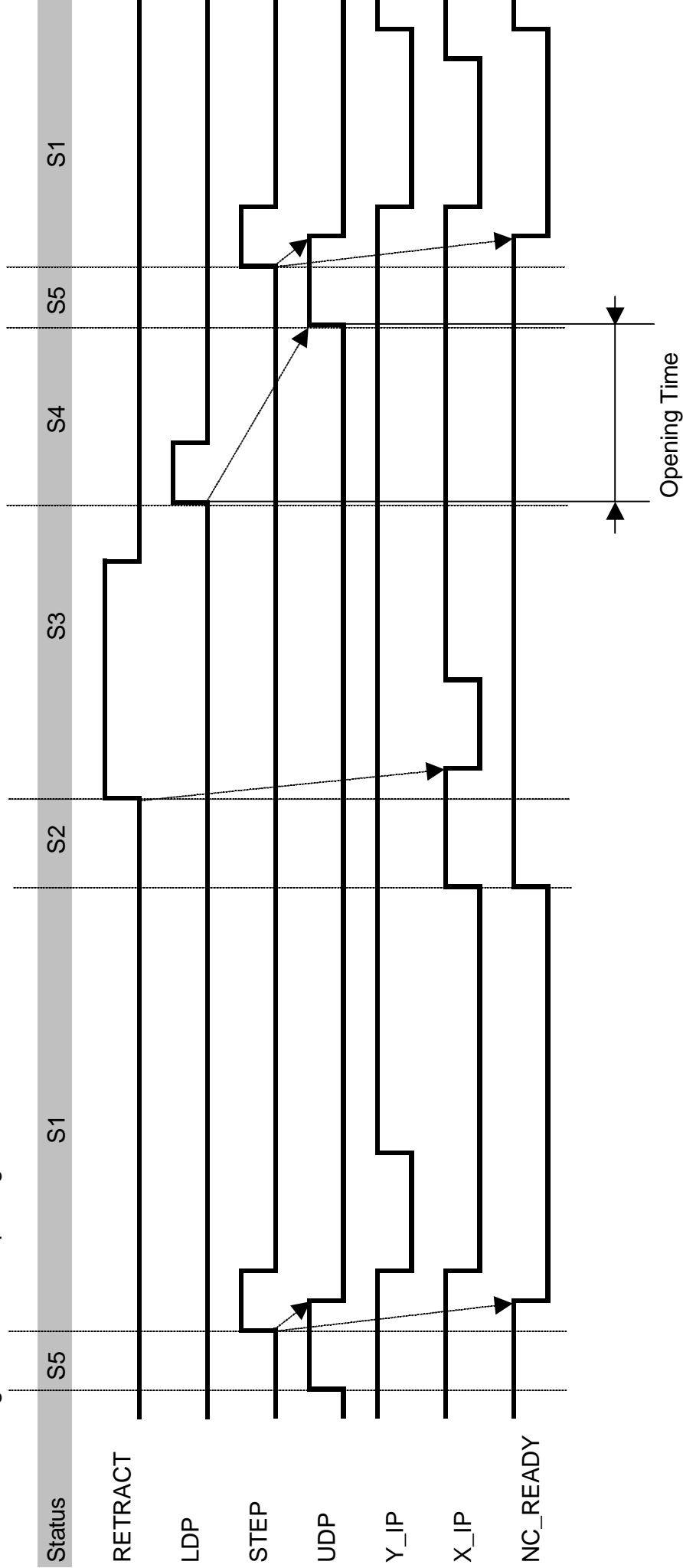
DA-41 Timing X-Y-Retract



Note		Redrawn	Date		
Description					
Note	Redrawn	Date			
Description					
Measures in mm, unless otherwise specified		Drawn	HNF	Date	10-08-2005

Delem		Luchthavenweg 42, 5657 EB Eindhoven, the NETHERLANDS	
DA-4X Timing diagram Y-X-Retract			
Format	A4	Number	8064-905
Issue		-	
No unauthorized copying allowed			
Scale			

DA-41 Timing X-Y-Retract Opening Time



Delem	Luchthavenweg 42, 5657 EB Eindhoven, the NETHERLANDS				
	DA-4X Timing diagram Y-X-Retract Opening Time				
	Format	Number		Issue	
A4			8064-906		-
No unauthorized copying allowed					Scale

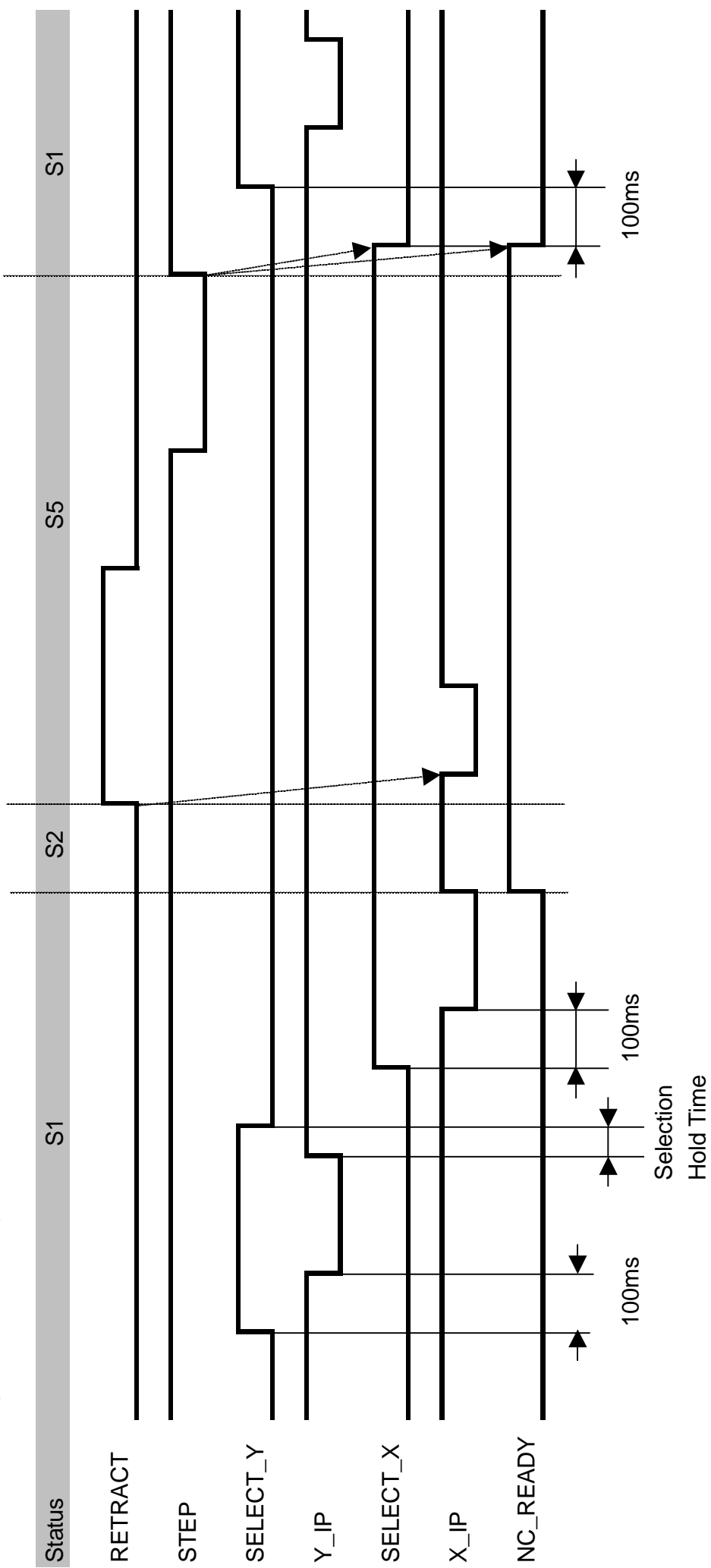
				Date 10-08-2005			
					Measures in mm, unless otherwise specified	Drawn	HNF
Note	Redrawn	Date					
Description							
Note	Redrawn	Date					
Description							

Delem

Luchthavenweg 42, 5657 EB
Eindhoven, the NETHERLANDS

DA-4X Timing diagram
Y-X-Retract Opening Time

DA-41 Timing X-Y-Retract Single Inverter Mode



Delem	Luchthavenweg 42, 5657 EB Eindhoven, the NETHERLANDS		
	DA-4X Timing diagram Y-X-Retract Single Inverter Mode		
	Format	Number	Issue
A4		8064-904	-
No unauthorized copying allowed			Scale

Note	Redrawn	Date								
				Description						
Note	Redrawn	Date								
Description										
Measures in mm, unless otherwise specified		Drawn		HNF	Date					
					10-08-2005					
				Format	Number	Issue				
				A4	8064-904	-				
No unauthorized copying allowed										
Scale										

Part II - Machine parameters

This section will describe the necessary settings of a DA-41 control regarding machine settings.

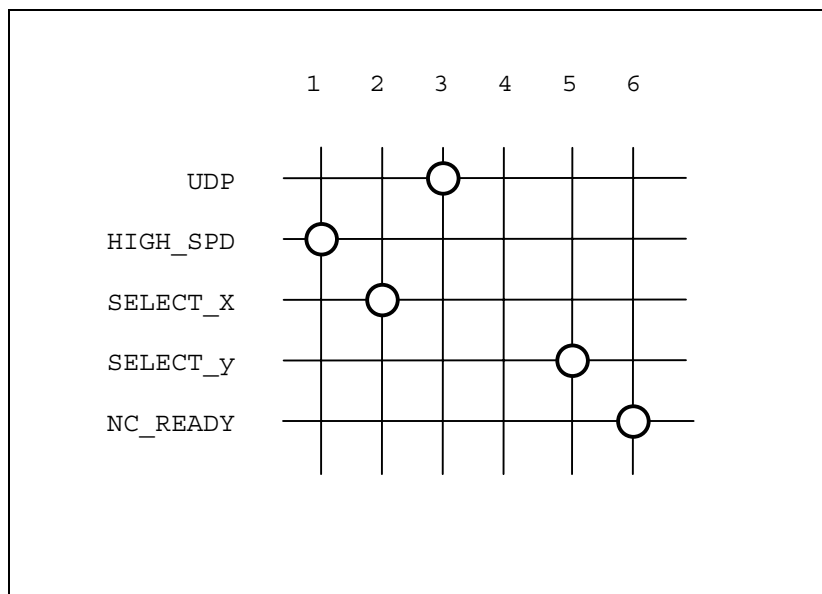
1. I/O assignments

1.1. Introduction

The DA-41 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 DA.


This means the system programmer can enable the necessary signals and assign them to input and output pins. The I/O settings are accessible from the menu of the machine parameters. It should be adjusted by authorized personnel only.

Example:

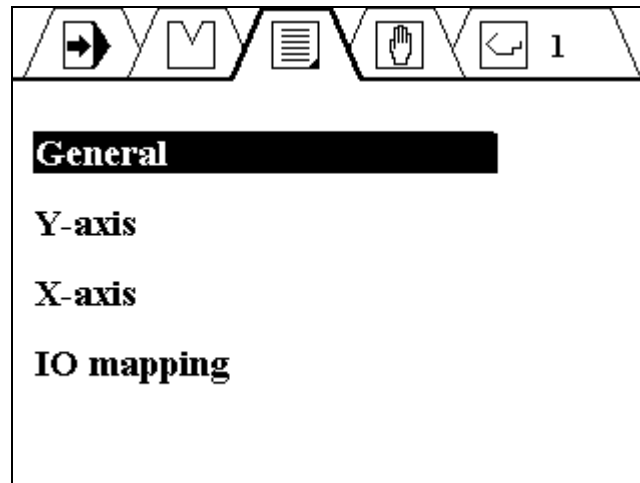


The example picture above shows an example of a possible mapping of output pins. In the picture, pin 3 is an output for the UDP signal, pin 1 is assigned for the high speed signal, etc. See also the schematics in part I of this manual for connection examples.

To enter the I/O allocation mode:

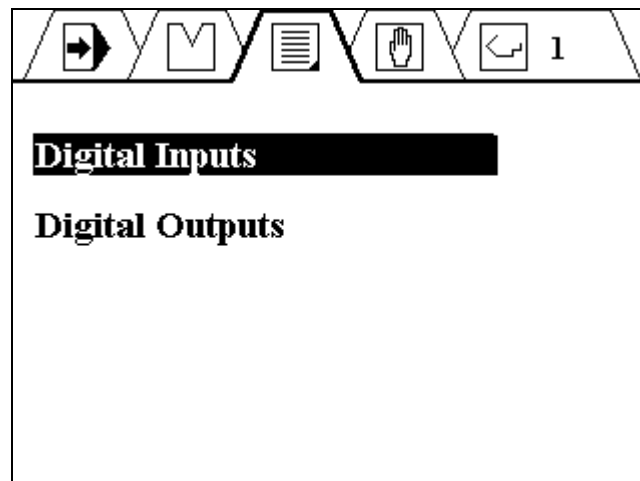
- Move the cursor to the program constants ;
- choose "/mm;
- Type access code 852 and press ENTER.

The following screen appears:

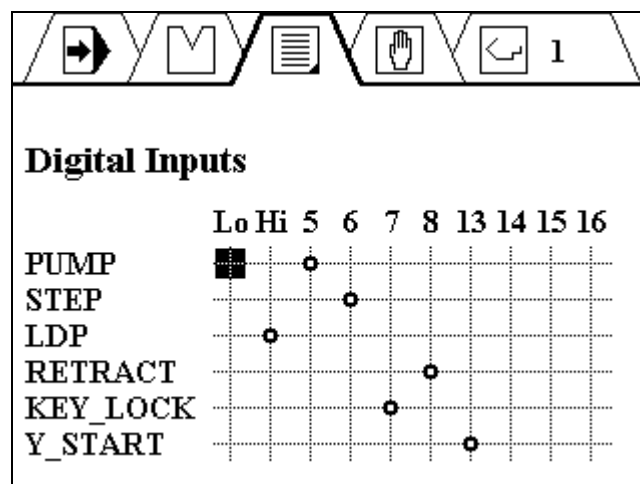



- Move the cursor with the arrow keys to 'IO mapping' and press ENTER.

The following screen appears:



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:



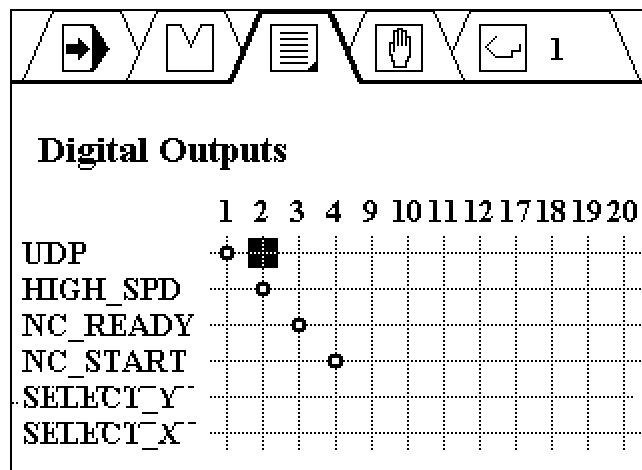
In the top row, the available connector pins (5-8,13-16) are shown. In the left column, the logical signals are listed. The symbol  indicates that there is a connection between the pin and the logical signal. A signal is linked to an input pin as follows:

- Move the cursor with the arrow keys to the necessary intersection
- Press ENTER

The old connection will disappear at the same time.

5-8, 13-16 refers to the 8 digital inputs of the DA. 'Lo' is a logical FALSE. If a signal is linked to this, it is always regarded as low (0V). 'Hi' is a logical TRUE. If a signal is linked to this, it is always regarded as high (24V).

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.



1.2. I/O list

Digital input signals

Code	Name	Description
PUMP	Pump start	This input must be active to be able to press the start button on the DA-control. When this input is not active the start button will not be accepted.
STEP	Step change	Change step, go to next bend.
LDP	Lower dead point	Input signal for lower dead point switch
RETRACT	Retract	Retract request signal
KEY_LOCK	Program enable	Signal to block or enable programming on the control.
Y_START	Start Enable of Y axis	External start signal, used to start Y-axis movement.
Y_RSD	Reference Search Direction input of Y axis	Input for reference switch, in case reference search with reference switch is used.
X_START	Start Enable of X axis	External start signal, used to start X-axis movement.

X_RSD	Reference Search Direction input of X axis	Input for reference switch, in case reference search with reference switch is used.
-------	--	---

Digital output signals

Code	Name	Description
UDP	Upper dead point	This signal is meant to indicate the beam is in upper dead point, at the end of a bending cycle. This signal is active when the beam opening time has elapsed.
HIGH_SPD	High speed	Output to pressbrake: move Y-axis at high speed. Available when the beam speed is set to programmable.
NC_READY	NC ready	All axes have reached their programmed position. This signal remains high during a retract.
NC_START	NC start	This output is active when the start button on the controller is pressed.
SELECT_Y	Select Y-axis	Y-axis is selected and can move, used for single inverter mode.
SELECT_X	Select X-axis	X-axis is selected and can move, used for single inverter mode.
Y_OK	Y-axis ok	Y-axis is ready for use
Y_IP	Y-axis in position	Y-axis is in position
Y_UP_H	Y move up high speed	Y-axis move up in high speed
Y_UP_L	Y move up low speed	Y-axis move up in low speed
Y_DN_L	Y move down low speed	Y-axis move down in low speed
Y_DN_H	Y move down high speed	Y-axis move down in high speed
X_OK	X-axis ok	X-axis is ready for using
X_IP	X-axis in position	X-axis is in position
X_UP_H	X move up high speed	X-axis move up in high speed
X_UP_L	X move up low speed	X-axis move up in low speed
X_DN_L	X move down low speed	X-axis move down in low speed
X_DN_H	X move down high speed	X-axis move down in high speed

Analogue output signals

The analogue outputs A1 and A2 are located in connector CN4 and are fixed. See also the connection diagrams for details.

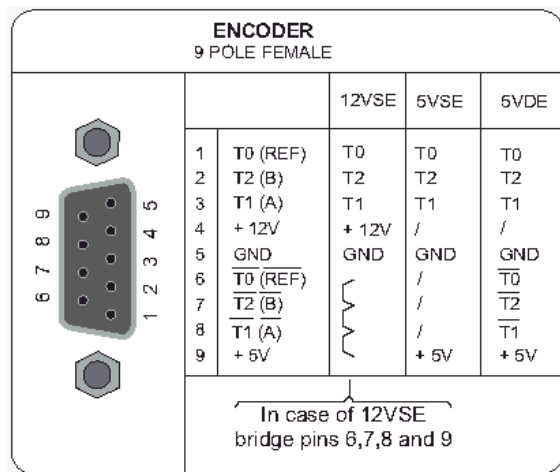
These analogue outputs are used for servo control of Y-axis and X-axis. The output control voltage is defined as follows:

$Ax > 0$: increase position value, encoder upcounting

$Ax < 0$: decrease position value, encoder downcounting

Encoder inputs

The control has two encoder inputs for position feedback of Y- and X-axis.



9-pole SUBD male encoder interface

5V DC/250 mA or 12V DC/200 mA

12 V or 5 V single ended or 5 V differential

Max. count frequency 1 MHz


Through the machine parameter 'encoder filter' the maximum allowed frequency can be set to 100 kHz or 1 MHz.

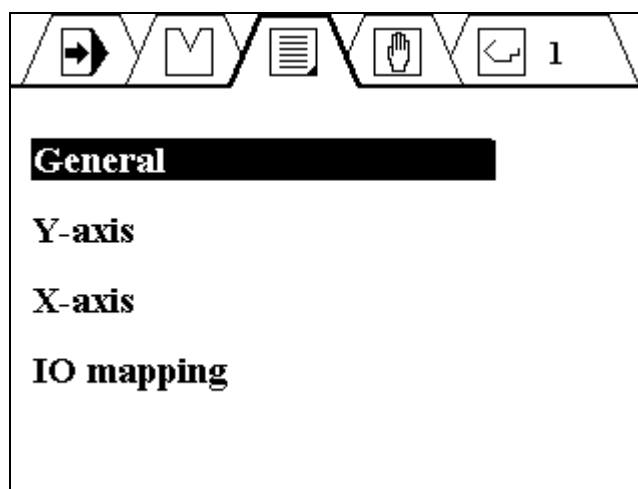
For high frequencies (>100kHz: encoder filter = 0) it is recommended to use 5V Differential-Ended encoders (5VDE). This will make the control less sensitive to high-frequency distortions.

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:

- Move the cursor to the program constants ,
- choose "/mm;
- Type access code 852 and press ENTER.



Now you can change the machine parameters of the control.

2.2. Short parameter list

2.2.1 General

Language
X-axis programmable
Axis retract programmable
Beam speed programmable
Beam opening time
Single inverter mode
Select hold time
Show state

2.2.2 Y-axis

- **General Y**

Control type
Min. value
Max. value

Manual speed high
Decimal point pos

- **Encoder**

Pre scaling
Count direction
Reference search
Reference position
Reference search direction
RSD switch mounted
Reference search speed
Encoder filter

- **Control**

Maximum operating speed
Acceleration, 0 to max. speed
Deceleration, max. speed to 0
Stop deceleration, max. speed to 0
P-gain
I-gain
Spindle allowance
Overrun
Overrun wait time

- **Output**

In position tolerance
Unipolar

- **AC Control**

Drive type
Positioning tolerance

- **AC Output**

Brake point low speed (BSS)>
Brake point high speed (BFS)>
Brake point low speed (BSS)<
Brake point high speed (BSS)<
Stop time
DC slow speed>
DC high speed>
DC slow speed<
DC high speed<
Acceleration ramp
Braking ramp

2.2.3 X-axis

See parameters Y-axis

2.3. Control types and drive types

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

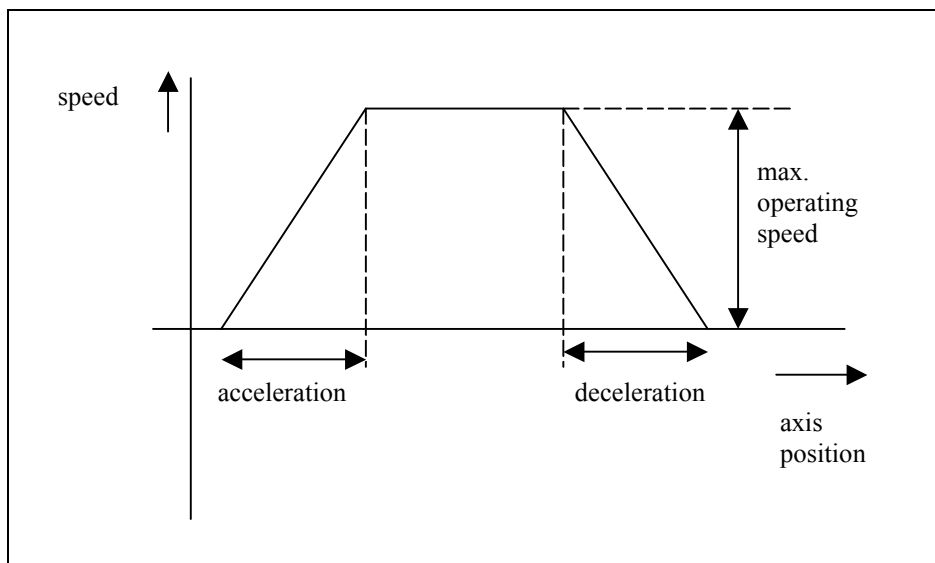
- Servo motor drive
- AC or DC drive (1-speed or 2-speed)

The required system can be programmed with the parameters 'Control type' and 'Drive type'.

2.3.1. Servo drive

The following servo parameters are valid:

- Control type (1 = servo)
- P-gain
- I-gain
- Maximum operating speed [mm/s]
- Acceleration, 0 to max. speed [ms]
- Deceleration, max. speed to 0 [ms]
- Stop deceleration, max. speed to 0 [ms]



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

- Set the maximum operating speed to the required value.
- Set the acceleration and deceleration ramp to safe values, for instance 500 ms. this depends on the capabilities of the axis equipment.
- Increase the P-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 P-gain.
- Increase the I-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 I-gain.
- Reduce the values for acceleration and deceleration ramp while movement is still smooth. Do not program too small values to avoid irregular behaviour.

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 optimise the positioning accuracy of the AC-axis:

- Brake point low speed (BSS)>
- Brake point high speed (BFS)>
- Brake point low speed (BSS)<
- Brake point high speed (BSS)<
- Stop time (T)
- DC slow speed>
- DC high speed>
- DC slow speed<
- DC high speed<
- Acceleration ramp
- Braking ramp

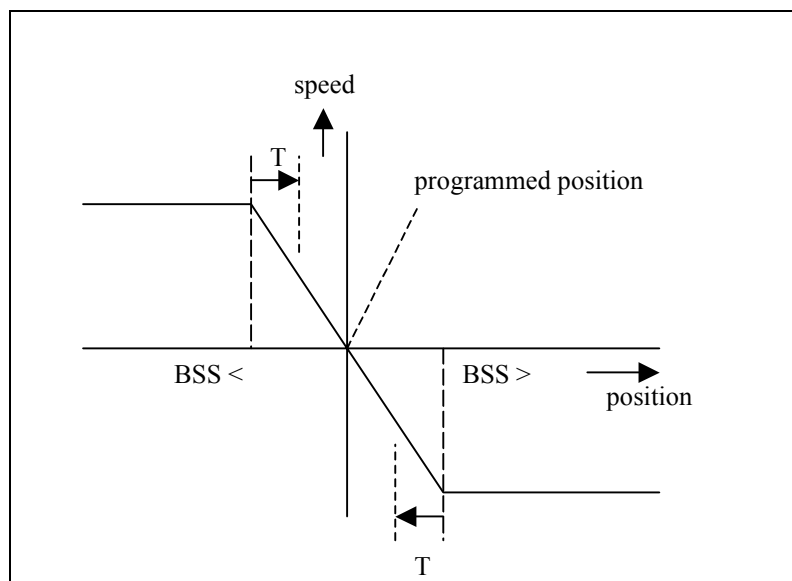
For the movement control of the axis there are two possibilities:

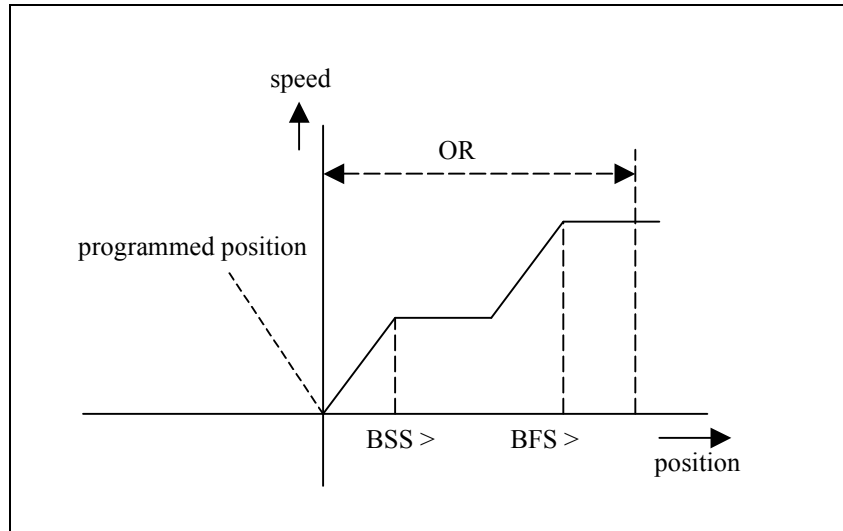
- Two, three or four digital outputs of the control;
- An analogue output signal.

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 'drive type' must be set to 1. This axis can be driven through 2 digital outputs or through the analogue output (or both, in case of unipolar).





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 + Overrun). After that, the axis starts moving in the opposite direction and positioning takes place.

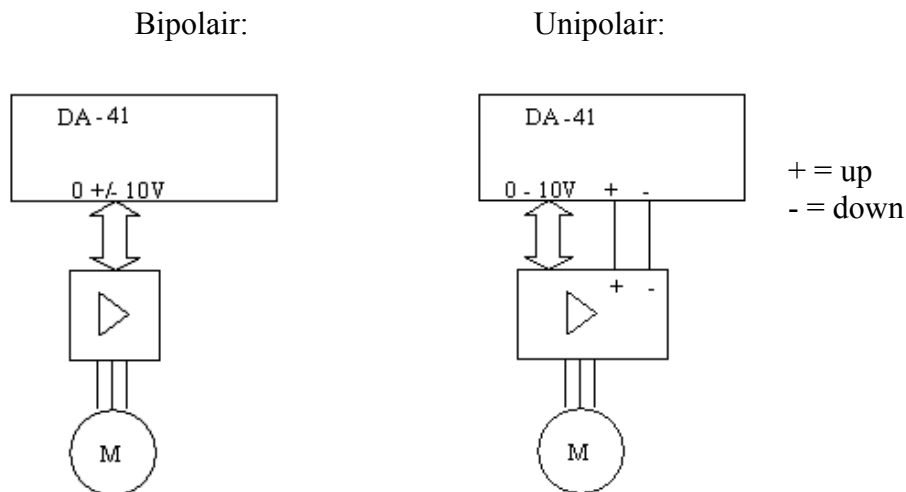
The Overrun parameter also functions for 2-side positioning. When the difference between actual position and programmed position is smaller than BSS, the axis will move to the Overrun position and then to the programmed position.

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

2.3.3. Unipolar system

A unipolar system uses output voltage of one polarity. Normally, the analogue output voltage determines the direction: positive voltage 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. Unipolar control is selected with the machine parameter 'Unipolar' (1/0).



2.4. Parameter explanation

2.4.1 General

Parameter: **Language**

Range : 0-5

Unit : -

Default : 0

Function

Choose the required language.

0= English

1= German

2= Turkish

3= Chinese Traditional

4= Chinese

5= Korean

Parameter: **X-axis programmable**

Range : 0 - 1

Unit : -

Default : 1

Function

To switch X-axis control ON or OFF.

0 = No

1 = Yes (default)

If programmed to 0, X-axis control is switched off. There is no reference cycle for the X-axis and there are no X-axis parameters in the user interface for the operator.

Parameter: **Axis retract programmable**

Range : 0 - 1

Unit : -

Default : 1

Function

To enable or disable retract function for the selected axis.

0= disable

1= enable

This parameter is not available if the parameter 'X-axis programmable' is set to 0.

Parameter: **Beam speed programmable**

Range : 0 - 1

Unit : -

Default : 1

Function

To enable or disable the beam speed programmable function.

0= disabled, beam speed cannot be programmed

1= enabled, beam speed can be programmed to high speed or low speed

Parameter: **Beam opening time**

Range : 0.0 – 9.9

Unit : sec

Default : 0

Function

This is the time necessary for the beam to move from LDP to UDP.

When programmed larger than 0, the operator can program an opening time for each bend step, as a percentage of this maximum time.

When programmed to 0, there is no opening time parameter for the operator.

Parameter: **Single inverter mode**

Range : 0 – 1

Unit : -

Default : 0

Function

Only in case of AC control.

Single inverter mode is used to support a system with only one frequency inverter for two axes. When this mode is selected, the axes are positioned one at a time. By means of the output signals SELECT_X and SELECT_Y the intended axis is selected for positioning.

0 = dual mode, two frequency inverters connected with two motors.

1 = single mode, one frequency inverter connected with two motors.

For more information, check connection diagrams, number 8064-104, 8064-105.

Parameter: **Selection hold time**

Range : 0 - 9999

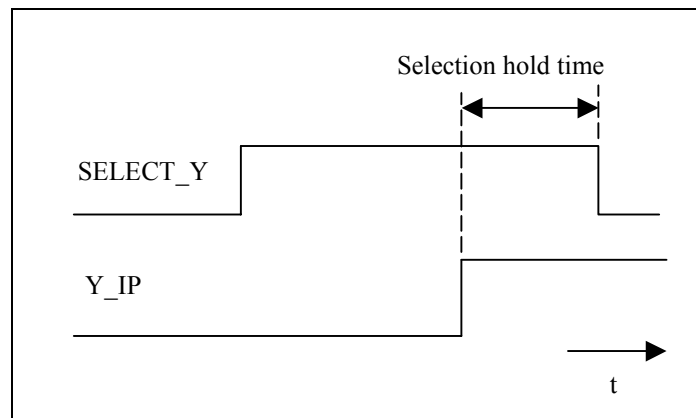
Unit : ms

Default : 0

Function

Only in case of single inverter mode.

This is the extra time one axis remains active after it has reached position (IP active). This extra time will give the axis opportunity to reach end position before the second axis will become active.



See also the timing diagram at the end of part 1 of this manual.

Parameter: **Show state**

Range : 0 - 1

Unit : -

Default : 1

Function

Show the state of the machine in the end user screen.

0 = do not show the status of the machine

1 = show the status of the machine

When programmed to 1, the following codes can be displayed when the machine is started:

S1= waiting for all axes in position

S2= wait for retract

S3= wait for LDP

S4=opening

S5= UDP reached, wait for Step signal

2.4.2 Y-axis

- **General Y**

Parameter: **Control type**

Range : 0 - 2

Unit : -

Default : 1

Function

Select servo control or AC control. The list of available parameters will be changed according to the chosen control type.

0 = no control

1 = servo control (default)

2 = AC control

The first setting, 'no control', means the axis is not controlled but still visible on the machine. This is typically used to temporarily disable the axis while setting up the machine. When this parameter is set to 0, the following situation applies:

- the IP signal is always high (TRUE)
- the OK signal is always low (FALSE)
- the axis symbol is still visible in the user screens

Parameter: **Min. value**

Range : 0.00 – 9999.99

Unit : mm

Default : 0.00

Function

Minimum value of axis. When the axis is moved manually the position is also limited at this value.

Parameter: **Max. value**

Range : 0 – 9999.99

Unit : mm

Default : 9999.99

Function

Maximal value of axis. When the axis is moved manually the position is also limited at this value.

Parameter: **Manual speed high**

Range : 1.00 - 100

Unit : %

Default : 25

Function

Only in case of servo control.

Axis manual movement high speed limit, percentage of maximum operating speed.

Parameter: **Decimal point pos**

Range : 0 - 2

Unit : -

Default : 1

Function

Decimal point position of axis value. In case of inches, 1 decimal is added.

	millimetres	inches
0	1 mm units	0.1 inch units
1	0.1 mm units	0.01 inch units
2	0.01 mm units	0.001 inch units

- **Encoder**

Parameter: **Pre scaling**

Range : 1.000 – 9999.999

Unit : counts/mm

Default : 50.000

Function

To set the scaling for correct encoder counting. Number of count pulses (of the encoder) per mm.

Parameter: **Count direction**

Range : 0 - 1

Unit : -

Default : 1

Function

To set the counting direction of the axis encoder input.

Parameter: **Reference search**

Range : 0 - 1

Unit : -

Default : 0

Function

Make a choice whether or not to use a reference search system for position determination.

When a reference search system is used, a reference switch or end-of-travel switch is used for position detection at start-up of the control.

If no reference search is used, the current position of the axis can be programmed in the menu of the program constants. When the control is switched off, the last known position is remembered. On start-up, the control assumes the same position as was remembered during power-down.

0= do not use the reference search

1=use reference search

Parameter: **Reference position**

Range : 0.00 – 9999.99

Unit : mm

Default : 0.00

Function

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

Parameter: **Reference search direction**

Range : 0 - 1

Unit : -

Default : 0

Function

Axis reference search direction.

When the start button on the control is pressed the first time after power on, the axis starts the reference search cycle.

The parameter defines the direction in which the axis starts moving to search for the reference:

0 = search in counting down direction.

1 = search in counting Up direction.

Parameter: **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 motor drive 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 axis is between the zero-position and RSD switch a normal reference search cycle is initiated.

In case the 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: **Reference search speed**

Range : 1 - 100

Unit : %

Default : 50

Function

Only in case of servo control.

Setting of the axis speed during reference search. The speed can be adjusted by programming a percentage of the max. output voltage (10V).

Parameter: **Encoder filter**

Range : 0 - 1

Unit : -

Default : 1

Function

Program the frequency range of the encoder input.

0= no filter, frequency < 1 MHz

1= with filter, frequency < 100 KHz

- **Control**

Parameter: **Maximum operating speed**

Range : 1.00 – 9999.99

Unit : mm/s

Default : 200.00

Function

Only in case of servo control.

The Maximum speed of the axis.

Parameter: **Acceleration, 0 to max. speed**

Range : 1.00 – 9999.99

Unit : ms

Default : 200.00

Function

Only in case of servo control.

Acceleration time of the axis.

This is the nominal acceleration of the axis, used to control the axis from zero to maximum speed when the axis must move to a new position. This parameter must be programmed as the time in which the axis accelerates from zero to maximum speed.

Parameter: **Deceleration, max. speed to 0**

Range : 1.00 - 9999.99

Unit : ms

Default : 200.00

Function

Only in case of servo control. Deceleration time of the axis.

This is the nominal deceleration of the axis, used to control the axis from maximum to zero speed when the axis comes into position. This parameter must be programmed as the time in which the axis decelerates from maximum to zero speed.

Parameter: **Stop deceleration, max. speed to 0**

Range : 1.00 - 9999.99

Unit : ms

Default : 200.00

Function

Only in case of servo control.

Quick deceleration of the axis in case of emergency situations.

This rate of deceleration is used when normal operation is interrupted: for instance when the stop button is pressed on the control or an end-of-travel switch has been triggered.

Parameter: **P-gain**

Range : 0.00 - 99999.99

Unit : -

Default : 2.50

Function

Only in case of servo control.

Proportional gain of the control loop. See section 2.3 for adjustment procedures.

Parameter: **I-gain**

Range : 0 - 99999

Unit : -

Default : 1

Function

Only in case of servo control.

Integral gain of the control loop. See section 2.3 for adjustment procedures.

Parameter: **Spindle allowance**

Range : 0 - 1

Unit : -

Default : 1

Function

One or two side positioning selection:

0 = one-side positioning

1 = two-side positioning

Note: One-side positioning is also possible with a servo drive (drive type = 1)

The one or two 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.

Parameter: **Overrun**

Range : 0.00 - 9999.99

Unit : mm

Default : 1.00

Function

Overrun distance, to prepare for accurate positioning.

In case of 1-side positioning: the overrun is an extra distance in the upcounting direction.

When moving from a low to a high position, the axis will first move to the overrun position before moving back to the programmed position.

In case of an AC axis with 1-side or 2-side positioning: if the difference between current position and a new programmed position is smaller than Brake Point Low Speed (but still bigger than Positioning Tolerance), the axis will move to the overrun position and then to the programmed position.

Parameter: **Overrun wait time**

Range : 0 - 9999

Unit : ms

Default : 500

Function

Only in case of one-side positioning.

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

- **Output**

Parameter: **In position tolerance**

Range : 0.01 - 9999.99

Unit : mm

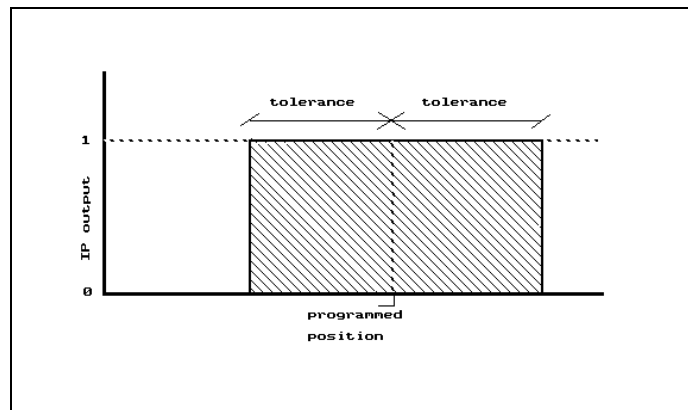
Default : 1

Function

Zone in which the in-position output is active.

Each axis has an in-position output. The parameter 'In position tolerance' defines the zone in which this output is active.

The output is active when: (programmed value - actual value) \leq In Position tolerance.



Parameter: **Unipolar**

Range : 0 - 1

Unit : -

Default : 0

Function

Function to switch unipolar control on/off. When set to 1, the analogue speed output will only output a positive speed signal, no matter which direction the axis is moving. This can be used to connect an inverter.

0 = bipolar, -10 - +10 V

1 = unipolar, 0 - 10 V

- **AC control**

Parameter: **Drive type**

Range : 1 - 2

Unit : -

Default : 1

Function

Only in case of AC control (control type is set to 2).

The type of motor system that is to be controlled.

1 = 1-speed AC

2 = 2-speed AC

Parameter: **Positioning tolerance**

Range : 0.01 - 9999.99

Unit : mm

Default : 1.00

Function

Only in case of AC control.

To set a range in which no new positioning takes place.

The axis 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 axis will stay at its actual position.

- **AC output**

Parameter: **Brake point low speed>**

Range : 0 - 9999

Unit : count

Default : 10

Function

Only in case of AC control.

Switch point from slow speed to off. This is the point to switch off the low speed. In case of position feedback with an encoder, this value must be programmed in encoder pulses. In case of feedback through a potentiometer, the value must be programmed in AD-values.

Parameter: **Brake point high speed>**

Range : 0- 9999

Unit : count

Default : 100

Function

Only in case of AC control with two speed AC.

Switch point from high speed to low speed. This is the breakpoint for one- and two-speed drives. In case of position feedback with an encoder, this value must be programmed in encoder pulses. In case of feedback through a potentiometer, the value must be programmed in AD-values.

Parameter: **Brake point low speed<**

Range : 0- 9999

Unit : count

Default : 10

Function

Only in case of AC control.

Switch point from low speed to 0. This is the point to switch off the low speed. In case of position feedback with an encoder, this value must be programmed in encoder pulses. In case of feedback through a potentiometer, the value must be programmed in AD-values.

Parameter: **Brake point high speed<**

Range : 0- 9999

Unit : count

Default : 100

Function

Only in case of AC control with two speed AC.

Switch point from high speed to low speed. This is the breakpoint for one- and two-speed drives. In case of position feedback with an encoder, this value must be programmed in encoder pulses. In case of feedback through a potentiometer, the value must be programmed in AD-values.

Parameter: **Stop time**

Range : 0 - 9999

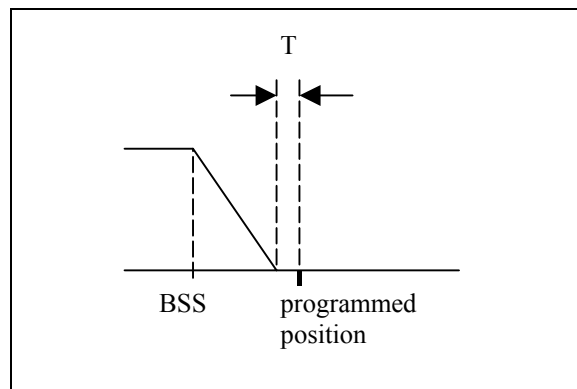
Unit : ms

Default : 0

Function

Only in case of AC control.

This is a delay time before switching off low speed after BSS has been reached. In case the programmed position cannot be reached by programming BSS, use the Stop Time to adjust the moment the drive is switched off.



Parameter: **DC low speed>**

Range : 1 - 100

Unit : %

Default : 4

Function

Only in case of AC control.

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: **DC high speed>**

Range : 1 - 100

Unit : %

Default : 80

Function

Only in case of AC control with two speed AC.

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: **DC low speed**<

Range : 1 - 100

Unit : %

Default : 4

Function

Only in case of AC control.

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: **DC high speed**<

Range : 1 - 100

Unit : %

Default : 80

Function

Only in case of AC control with two speed AC.

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: **Acceleration ramp**

Range : 5 - 9999

Unit : ms

Default : 5

Function

Only in case of AC control.

Acceleration ramp for the connected axis.

This parameter defines the time needed to reach the full speed output. An acceleration ramp means that when the axis starts moving to a new position the speed signal increases with a certain ramp until the maximum needed speed has been reached.

In case of an AC-axis, this parameter is only valid when a 2-speed axis is used which is driven through the analogue output.

Parameter: **Braking ramp**

Range : 5 - 9999

Unit : ms

Default : 5

Function

Only in case of AC control.

Program a deceleration time, in which the axis is slowing down from high speed to low speed.

With this parameter a braking ramp for the axis is programmed. This braking ramp is programmed as a period, in which the axis slows down from high speed to low speed.

This parameter should only be programmed under the following conditions:

- the axis must be a 2-speed axis
- the axis must be controlled through the analogue output of the control

2.4.3 X-axis:

The parameters for the X-axis are the same as for the Y-axis.

There is one exception: the parameter 'Decimal point position' is only programmable for the X-axis. For the Y-axis, it is set to 2.

3. Software settings

3.1. Parameter back-up

The control has various data stored in its memory: axis positions, program parameters, 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:

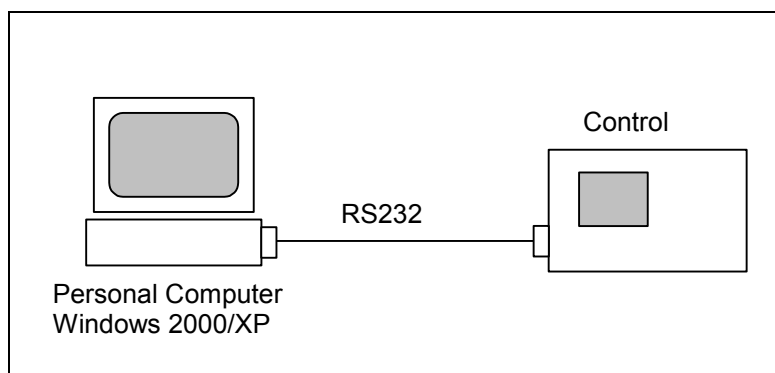


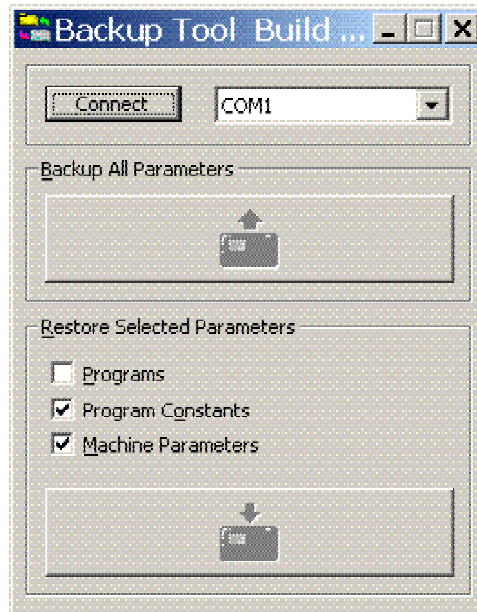
Figure 3.1.a

The following equipment is required:

- a Personal Computer, equipped with Windows 2000 or higher;
- DNC cable, for RS-232 communication;
- Delem back-up software for transmission of machine settings.

The Delem back-up software must be installed on the PC. All actions, back-up and retrieval of settings, are done with this program. Just make sure the necessary cables are connected and the 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, they are shown in light-grey. First, click on the button 'Connect...' to establish a connection between the software and the 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 be enabled.

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.

When either a back-up or restore action has been executed, a message will appear to indicate whether or not the operation was successful.

The file with control settings (*.xml) can be viewed on a PC by means of a standard internet browser.

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:

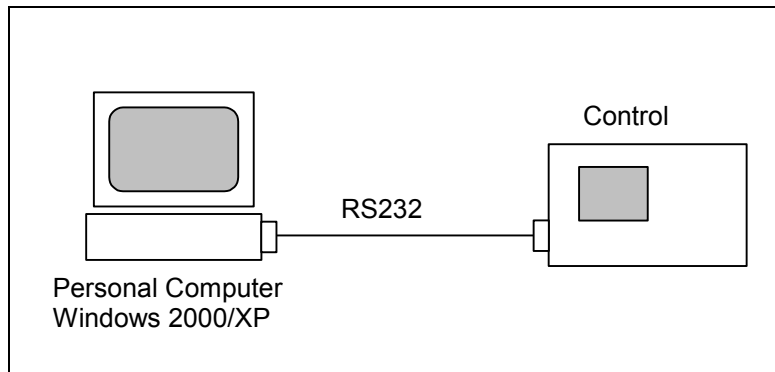


Figure 3.2.a

In order to perform a succesful 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 DA control is switched on. To perform the upgrade:

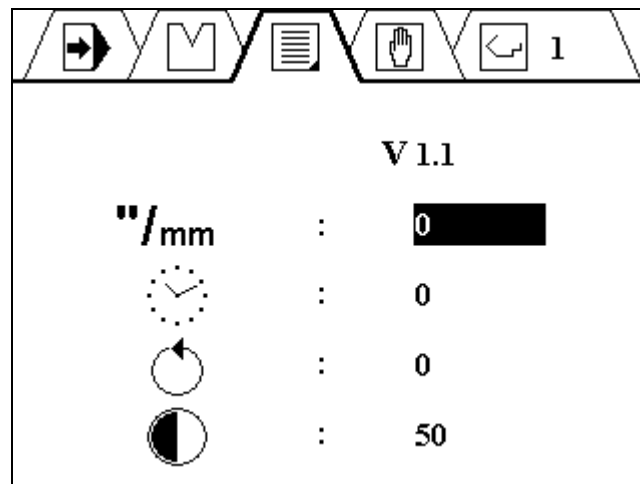
- double-click the program icon.

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

3.3. Special access codes

There are several access codes to enter special menus of the control. These access codes should only be known and used by authorised service personnel.

Each code is entered on the page of the program constants, when the cursor is on the parameter inch/mm.



The following codes are available:

852

Use this code to enter the machine parameter menu. See also chapter 2.

741

Use this code to enter the diagnostic mode of the control. See part III of this manual.

684684

Use this code to reset all control data to default values. All previous settings are lost: machine parameters, I/O settings, programmed products and tools.

Warning: when this code is entered, all programmed products and tools in the control are lost! You should make a backup of this data before entering this reset code.

123123

Use this code to reset the hours counter and stroke counter to zero, e.g. after the system has had a maintenance check.

4. Error messages

In case of problems, the control issues an error message by showing a number on the screen, for instance “E 21”. The following table describes the meaning of these error numbers.

Error nr:	Description:
21	Power failure
51	Encoder Y-axis connected wrong
52	Encoder X-axis connected wrong
53	Wrong parameters
56	No movement on Y-axis
57	No movement on X-axis

If any of these messages occurs, check the relevant connections on your system (encoder cables, power supply, etc.).

If another error code is shown which is not described above, please contact Delem.

Part III - The diagnostic program

To be able to test a DA-41 control, it has been equipped with a diagnostic program. With the test functions of the diagnostic program the service engineer can test the control.

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 analogue outputs can be energised for motor movement or relay switching.





2. Test-menu

2.1. Start

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

- Move the cursor to the program constants ,
- choose "/mm;
- Type access code 741 and press ENTER.

The diagnostic screen of the control looks as follows:

    1							
Dig.-in		Dig.-out		Dig.-out		Ana.-out	
5	0	1	0	17	0	Out1	0
6	0	2	0	18	1	Off1	0
7	0	3	0	19	0	Out2	0
8	0	4	0	20	1	Off2	0
13	0	9	1	Encoder			
14	0	10	0	1			
15	0	11	1	2			
16	0	12	0	Ref Off			

To end the diagnostic program with the 'STOP'-key. The control application will restart.

2.2. Test functions

In 5 – 8, 13 -16

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 1-4, 9-12, 17-20

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 analogue I/O and encoder signals.

Dig.-in	Digital input 0/1
Dig.-out	Digital output 0/1
Ana.-out	Analogue output, 13-bit DA-value, -4095- +4095.
Ana.-off	Offset voltage for digital output, 13-bit DA-value, -4095- +4095.
Ref	Test the encoder reference input on/off.

The analogue output voltages can be set with the left and right arrow keys.

Appendix A - Reference list

- [1] DA-41 Operation manual