

## E-862.100 NEXACT® Drive Electronics

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### 1. Introduction

The E-862.100 drive electronics is designed to give fast and easy access to NEXACT® PiezoWalk® drive advantages. This driver allows open-loop, “move-forth-and-back” operation of NEXACT® drives.

The E-862 drive electronics is based on a DSP that generates the algorithms for the nanostepping motion. This mode allows to cover a certain distance in the fastest possible way.

Control is either done manually over a joystick or by a +/-10 V analog input signal.



### 2. Safety Precautions

#### DANGER—Grounding

Because grounding is not assured over the power connection, the ground stud must be connected to a protective earth connector, see figure below.

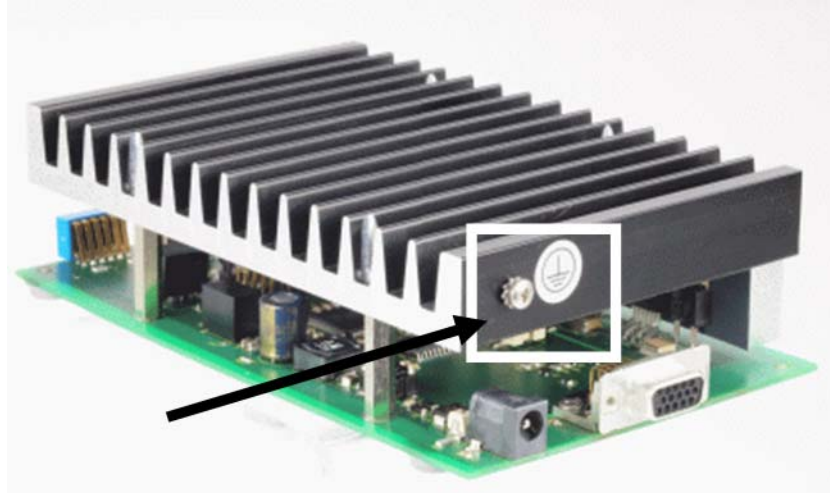


Fig. 1: Ground stud on motor socket side of E-862.100

## CAUTION—ESD sensitivity

The product described is an ESD-sensitive (electrostatic discharge sensitive) device. Observe all precautions against static charge buildup before handling these devices.

Avoid touching circuit components, pins and PCB traces. Discharge any static charge you may have on your body by briefly touching a conductive, grounded object before you touch any electronic assembly. Pose PCBs only on conductive surfaces, such as ESD-safe transport containers (envelopes, foam). Electronic subassemblies must always be kept and transported/shipped in conductive packaging.

## CAUTION—Do not displace manually

Do not displace the moving platform of a NEXACT® stage or the runner of a NEXACT® linear drive manually! Manual displacement can cause irreparable damage to the piezo modules in the NEXACT® linear drives.

## 3. Additional Components

Contact your PI Sales Engineer or write [info@pi.ws](mailto:info@pi.ws), if you need one of the following options/ accessories:

Order number	Description
C-819.20	Analog joystick, 2 axes
C-819.20Y	Y-cable for connecting two E-862.100s to joystick
C-170.IO	Connector for I/O socket, with cable, open end

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## 4. Motion System Requirements

To start working with the E-862.100 drive electronics, your motion system must include the following components:

- Power supply for E-862.100, 24 VDC, 42 W (# C-663.PS), with line cord (# 3763)
- The mechanics (NEXACT® linear drive or stage) with an appropriate motor cable
- An appropriate cable and power source to address pin 7 of the I/O socket (e.g. C-170.IO) or a C-819.20 joystick.

In addition, this document, i.e. the Technical Note for E-862.100 (# E862T0001), includes all necessary information to perform first operation.

## 5. First Steps

To perform first motion proceed as follows:

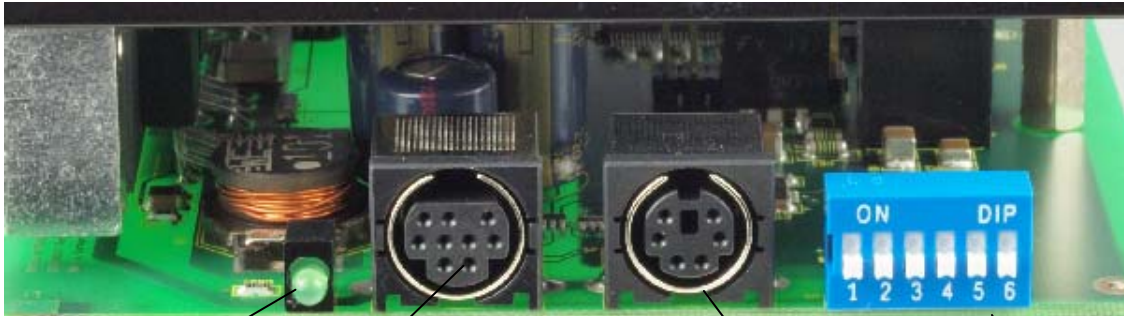
1. Connect the E-862.100 drive electronics to a suitable power supply (24 VDC, 42 W), but do not connect to line power yet.
2. Connect the NEXACT® linear drive to the Motor connector.
3. Set DIP switches 1 to 4 to ON, and DIP switches 5 and 6 to OFF.

With these settings the limit switches are activated (DIP switch 5) and velocity is controlled via an I/O socket (DIP switch 6), see “7. DIP Switch Settings” Section for details.

Since joystick is not activated (see DIP switch 5), the settings of DIP switches 1 to 4 are irrelevant.

4. Connect I/O socket via a suitable cable (e.g. C-170.IO with an appropriate connector) to an appropriate signal source (with a range of  $\pm 10$  VDC)
5. Connect power supply to line power.
6. Command motion by addressing pin 7 with a voltage in the range of  $\pm 10$  V.

## 6. Operating Elements

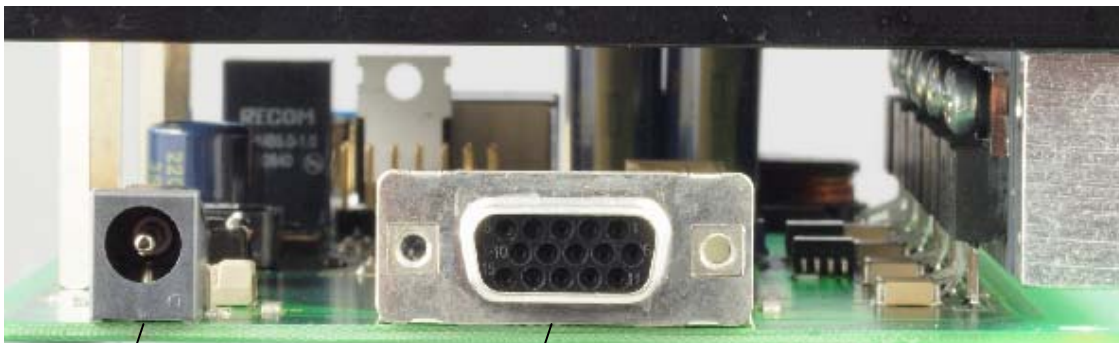


Power LED

I/O socket (9-pin Mini DIN socket) for analog input and RNP command

Joystick socket for C-819.20

DIP switches to set velocity, activate limit switch read-out, activate joystick, see below for details on settings



Barrel connector for standard 24 V power supply

Motor socket 15-pin HD sub-D for NEXACT® drive

## 7. DIP Switch Settings



DIP switch	Function
1	Determines velocity ratio
2	Determines velocity ratio
3	Determines velocity ratio
4	Determines velocity ratio
5	Enables limit switches
6	Determines whether joystick or I/O socket controls velocity

## 7.1 DIP Switches 1 to 4 for Velocity Control When Using Joystick

The settings of DIP switches 1 to 4 determine the velocity ratio if a joystick is used. Note that this ratio is only enabled as long as the joystick's push button is pressed.

The ratio is determined as follows:

1. Get the binary value that is given by the DIP switch settings 1 to 4.  
Note: If a switch is on ON, the corresponding bit is 0.
2. Convert the binary value to its decimal value.
3. Add 1 to this decimal value, the result is the ratio.

Example:

DIP switch settings are:

SW 1	SW 2	SW 3	SW 4
OFF	ON	OFF	ON

1. Thus the settings represent 1010 as binary value.
2. Its decimal representation is 10.
3. Since 1 must be added to 10 the ratio is 1:11, i.e. velocity is reduced.

## 7.2 DIP Switch 5 for Activation of Limit Switches

DIP switch 5 = ON: Limits are disabled, valid for both joystick operation and operation via I/O socket

DIP switch 5 = OFF: Limits are activated, valid for both joystick operation and operation via I/O socket.

## 7.3 DIP Switch 6 for Velocity Determined via Joystick or via I/O Socket

DIP switch 6 = ON: Velocity can be determined via joystick. The DIP switch settings of switches 1 to 4 determine the ratio. To activate velocity setting the joystick's push button must be pressed.

DIP switch 6 = OFF: Velocity is determined via  $\pm 10$  V analog input on pin 7 of I/O socket.

- |           |   |
|-----------|---|
| + 10 VDC: | positive motion direction, 1400 steps/s |
| - 10 VDC: | negative motion direction, 1400 steps/s |
| 0 VDC:    | no motion                               |

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## NOTE—Velocity Control via I/O Socket

If you use the I/O socket to command motion, the settings of DIP switches 1 to 4 are not relevant for velocity control.

The settings for DIP switches 1 to 4 are relevant only for motion commanded via joystick.

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## 8. Technical Data

	<b>E-862.100</b>
Function	Drive electronics for NEXACT® drives / stages
Drive type	NEXACT® drive
Channels	1
Motion resolution	12-bit
Input limit switch	2 x TTL (active high, to be activated)
<b>Electrical properties</b>	
Output power	max. 40 Watt
Output voltage range	0 to +45 V
Current	max. 1.6 A
Output frequency	0 to 1.4 kHz
<b>Interfaces and operation</b>	
Control	+/-10 V analog velocity control
Motor connector	HDD-Sub Stecker 15-pin. (f)
Manual control (optional)	Joystick, Y-cable for control of 2 axes with Joystick
<b>Miscellaneous</b>	
Operating voltage	24 V External power supply (24 V, 2 A), not included
Operating temperature range	0 to +50 °C
Mass	1.0 kg
Dimensions	166 x 100 x 46 mm (including mounting rails)

Note: All specifications for NEXACT® drives refer to use with E-861 controller. Compared to that, the E-862 drive electronics provide only a unipolar output voltage. Therefore, push force and velocity achievable with E-862 are derated by 20%.

## 9. Pinouts

### 9.1 Pinout of I/O Socket

Pin	Function	Description
1	Enable	
2	RNP <sup>1</sup>	Input, 5 V trigger RNP procedure, no motion possible.  0 V enables motion, commanded via joystick or via Analog In
3	Status <sup>2</sup>	Output, 5 V if a motion is possible 0 V if NEXACT® actuator performs an RNP
4	NLIMIT	Input, positive polarity, only active if DIP switch 5 is OFF
5	PLIMIT	Input, positive polarity, only active if DIP switch 5 is OFF
6	not connected	
7	Analog In	± 10 VDC control input
8	GND	
9	VDD	+5 VDC of driver



<sup>1</sup> RNP (Relax PiezoWalk Piezos):

The piezos of a given PiezoWalk channel relax without performing any motion. The aim of this procedure is to reduce all applied voltages when the final position is reached and thus to increase the lifetime of the piezos.

With the relaxing procedure performed by RNP, the NEXACT® drive is brought to a full-holding-force, zero-drive-voltage relaxed state.

RNP should reduce the voltages to zero without changing the position of the NEXACT® linear drive. But depending on the current load, which may lead to a small motion of the movable part of the mechanics during the RNP procedure, small changes in position can occur.

### NOTE—No Motion Commanding During RNP

As long as an RNP procedure is performed motion cannot be commanded, neither via joystick nor via pin 7, i.e. Analog In, of the I/O socket.

<sup>2</sup> Status: A status line is required to monitor when E-862.100 drive electronics is ready to perform motion again. During RNP procedures drive electronics is busy, since the change from RNP state to motion state can take up to 4 \* 100 ms.

## 9.2 Pinout of Joystick Connector

Pin	Function	Description
1	GND	
2	nc	not connected
3	Vcc	3.3 VDC
4	J_SW	Joystick button
5	nc	not connected
6	J_X	Joystick X-axis



Commanding two axes via a C-819.20 joystick is possible with two NEXACT® drives, two E-862.100 drive electronics and a C-819.20Y Y-cable.

## 9.3 24 VDC Socket

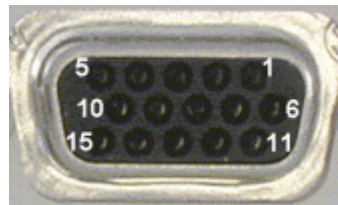
Connector type: barrel connector

Pin	Function
Center	+24 VDC



## 9.4 Pinout of Motor Connector

Pin	Function	Description
1	OUT	Piezo 1
2	OUT	Piezo 3
3	int. use	internal use
4	nc	not connected
5	nc	not connected
6	OUT	Piezo 0
7	OUT	Piezo 2
8	IN	AMP (amplifier enable)*
9	nc	not connected
10	nc	not connected
11	AGND	Piezo GND
12	AGND	Piezo GND
13	AGND	Piezo GND
14	GND	Digital GND
15	GND	Digital GND



\*This pin is connected to GND in the connector shell of the NEXACT® drive to enable the amplifiers. If this connection is removed, all piezo voltages will be zero.