

MAN01-11 – NANO STEPPER ACTUATOR UHV (NSAU) USER MANUAL

CRYO & NANO POSITIONING PRODUCTS

JPE



+31 (0) 43 3585 777

www.jpe.nl

Aziëlaan 12

6199 AG Maastricht-Airport
The Netherlands

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Author: JPE

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RELEVANT DOCUMENTATION

Ref	Title, Author
[1]	CNP-Products_MAN00_R01_Getting-Started.pdf (JPE)
[2]	NSAU_Interface-drawings.pdf (JPE)
[3]	NSAU_Brochure.pdf (JPE)
[4]	
[5]	

DOCUMENT HISTORY

JPE	2019-06-20	Ro1. Creation.

DEFINITIONS

ABBREVIATIONS

1. INTRODUCTION

Thank you for using JPE's Cryo & Nano Positioning products!

This *User Manual* describes the handling and use of Nano Stepper Actuator UHV (NSAU), from here on described as *actuator*).



Please read this document carefully prior to installation and (initial) operation of the controller, (stand-alone) actuators and systems. Failure to observe the safety regulations results in a risk of mortal electric shock and/or damage to the controller(s), actuator(s) and/or system(s)!

JPE shall not be liable for damage or injury resulting from misuse of the controller system(s), actuator(s) and/or device(s) or unauthorized alterations to either of those.

All products mentioned in this manual are intended for use in a laboratory and/or scientific research environment only and may only be installed, maintained and used by higher educated, technical skilled personnel (from here on described as *operators*).

Please note that all content in this document is superseded by any new versions of this document. Visit the JPE website (www.jpe.nl) to obtain the most recent version¹. All images in this document are for illustrative purposes only.

1.1 Prerequisites

Before continuing with this user manual, please make sure to read and understand the contents of the (latest version of the) Cryo & Nano Positioning Products Getting Started Guide (MAN00).

1.2 Machine safety

- The actuator is delivered in mid-stroke (center) position with the absolute encoder set to "0" (zero). A stroke of +/-5mm around this zero point is allowed.
- The operator should set software safety limits to +/- 5mm (+/-500 encoder rotations).
- The internal safety end switches will be activated when surpassing the specified absolute maximum range. The operator should immediately stop motion when these are activated to avoid unrepairable actuator damage.
- The operator should immediately stop motion and power-off the NSAU-010A when the thermal sensor outputs 80 degrees Celsius or higher to avoid unrepairable actuator damage.

¹ This *User Manual* is intended for products ordered and delivered from **June 2019 onwards**. For products ordered and delivered prior to this date, please refer to the previous User Manual(s).

2. INSIDE THE BOX

Systems will be delivered in a white-colored (membrane) polypropylene box. The inner part of the polypropylene box can be taken out and bend in such way that the actuators and/or systems can be easily unpacked.

Do not cut the membrane plastic. Keep the box in case products need to be returned.

3. MOUNTING INSTRUCTIONS

View the Interface Drawing for detailed dimensions and mounting interfaces.

4. ELECTRICAL CONNECTIONS

Actuators have one *Ceramtec 16003-02-W* circular multipole connector that interfaces motor, encoder, end-stops and a temperature sensor (PT1000).

The counterpart (in-vacuum) connector is the *Ceramtec 16029-02-A* (not supplied).

Please note that custom cabling is required (not supplied). See the Interface Drawings for a detailed pin layout.

5. CONNECTING TO CONTROLLER

Controller with Plug-in Modules ²		
	Module	Slot #
NSAU-010A	NCM1 – Motor	1

If the actuator is to be connected to a third-party controller / driver, please read the information below!

² Note that the PC Interface module in the CAB-xxx will be delivered with specific firmware for the NSAU / NCM1. It is not possible to combine NCM modules with CADM2 / OEM2 / RSM.

6. CONNECTING TO A THIRD-PARTY CONTROLLER / DRIVER

6.1 Stepper Motor

Stepper Motor	
Winding arrangement	Bipolar
Max current / phase	0.8 [A]
Winding resistance / phase	5.4 [Ohm]
Winding inductance / phase	1.5 [mH]
Max housing temperature	80[degC]
Max RPM	600 (equals NSAU speed of 0.1 [mm/s])

6.2 Absolute Encoder

Absolute Encoder				
Machine safety	The NSAU-010A is delivered mid-stroke with the absolute encoder set to "0" (zero). A stroke of +/-5mm around this zero point is allowed. User should set software safety limits to +/- 5mm (+/-500 encoder rotations).			
Supply voltage	min 4.75	nom 5.0	max 5.5	[V]
Clock frequency	min 100	-	max 500	[kHz]
Encoder current, typical	0.08 [A]			
Interface	Synchronous Serial Interface (SSI)			
Physical layer	RS-422			
Galvanic isolation	Yes			
Encoding	Gray code			
Multiturn resolution	12 bit (Most Significant part of data word)			
Singleturn resolution	12 bit (Least Significant part of data word), 2.44 [nm/count]			
Positive direction of counting	Extend NSAU is positive; connect Pin 16 ABS DIR to 5[V] Retract NSAU is positive; connect Pin 16 ABS DIR to GND			

6.2.1 Single path transmission

The timing for single path transmission should be used for reading the latest sampled position.

t_m : transfer timeout for correct data update $t_m > 30\mu s$

t_p : pause time $15\mu s < t_p < 30\mu s$

t_{clk} : clock period, inverse of clock frequency. See clock frequency

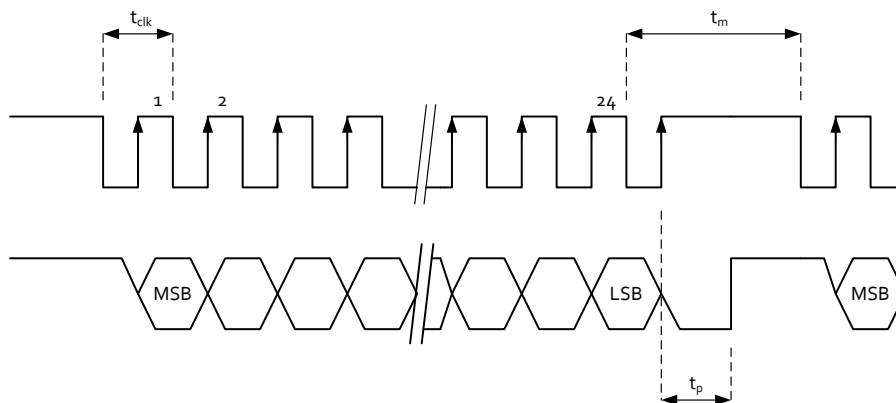


Figure 1: NSAU absolute encoder single path transmission

6.2.2 Multi path transmission

The timing for the multi path transmission should be used only to achieve redundancy. When the clock starts before t_p has expired, a copy of the last value is transmitted.

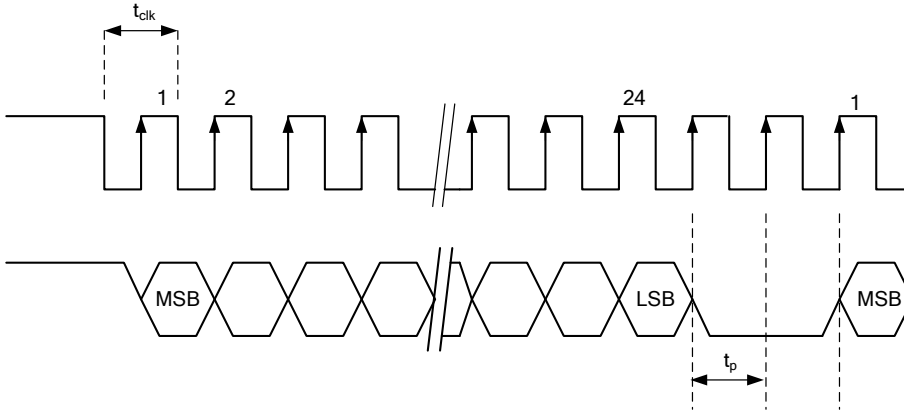


Figure 2: NSAU absolute encoder multipath transmission

6.3 End switch connection

End Switches	
Machine safety	The internal safety end switches will be activated when surpassing the specified range. User should immediately stop motion when these are activated to avoid unreparable actuator damage. Note that the end switches are not intended for activation during normal operation, and should for instance not be used for homing procedures.
Contact type	Normally open, switch to common
Maximum current	100 [mA]
Maximum voltage	30 [V]
POS+	Indicates fully extended position is reached (longest)
POS-	Indicates fully retracted position is reached (shortest)

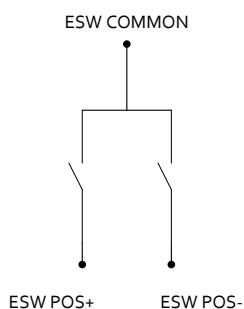


Figure 3: NSAU end switches

6.4 Temperature Sensor

Temperature Sensor		
Type	PT1000	4-wire
Machine safety	User should immediately stop motion and power-off the NSAU-010A when the thermal sensor outputs 80 deg C or higher to avoid unrepairable actuator damage.	

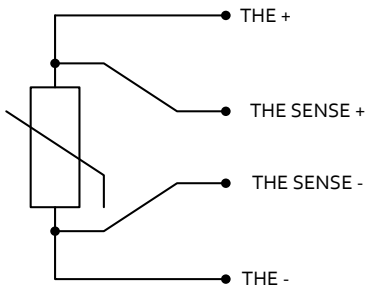


Figure 4: NSAU thermal sensor

6.4.1 Temperature data for PT1000

Temperature [degC]	Resistance [Ohm]
0	1000.0
10	1039.0
20	1077.9
30	1116.7
40	1155.4
50	1194.0
60	1232.4
70	1270.7
80	1308.9
90	1347.0
100	1385.0

7. DECLARATION OF CONFORMITY

Manufacturer : JPE B.V.
Address : Aziëlaan 12
6199 AG Maastricht-Airport
The Netherlands

The manufacturer hereby declares that the product:

Product Name : **Nano Stepper Actuator UHV (NSAU)**
Product Description : **Completely sealed linear motor with nanometer resolution.**
Product Number : **C181056**

Complies with the following European directives:

2014/35/EU Low Voltage Directive
2014/30/EU EMC
2011/65/EU RoHS

A copy of the Technical file for this equipment is available at JPE.

Maastricht-Airport, 29 June 2018



Ir. H. Janssen
Founder & CEO
JPE B.V.
The Netherlands