

electronic • analog • table top

NV 40/1 CLE

- analog 1-channel piezo amplifier
- permanent 40mA output current
- low noise output signal
- table top casing
- analog input and output signals
- RS232 interface
- positioning control for strain gage and capacitive sensors (ASI Function)



fig.: NV 40 /1 CLE

applications:

- lasers and photonics
- microscopy
- research & development

Concept

The voltage amplifier NV 40/1 CLE is well suited for single axis, high resolution piezo elements and is made for use in research applications. The device will be manufactured as a “stand alone” unit and includes the voltage amplifier and the sensor positioning control. This amplifier is well suited for sub-nm positioning tasks due to a very low voltage noise of only 0.3mVRMS.

Specials

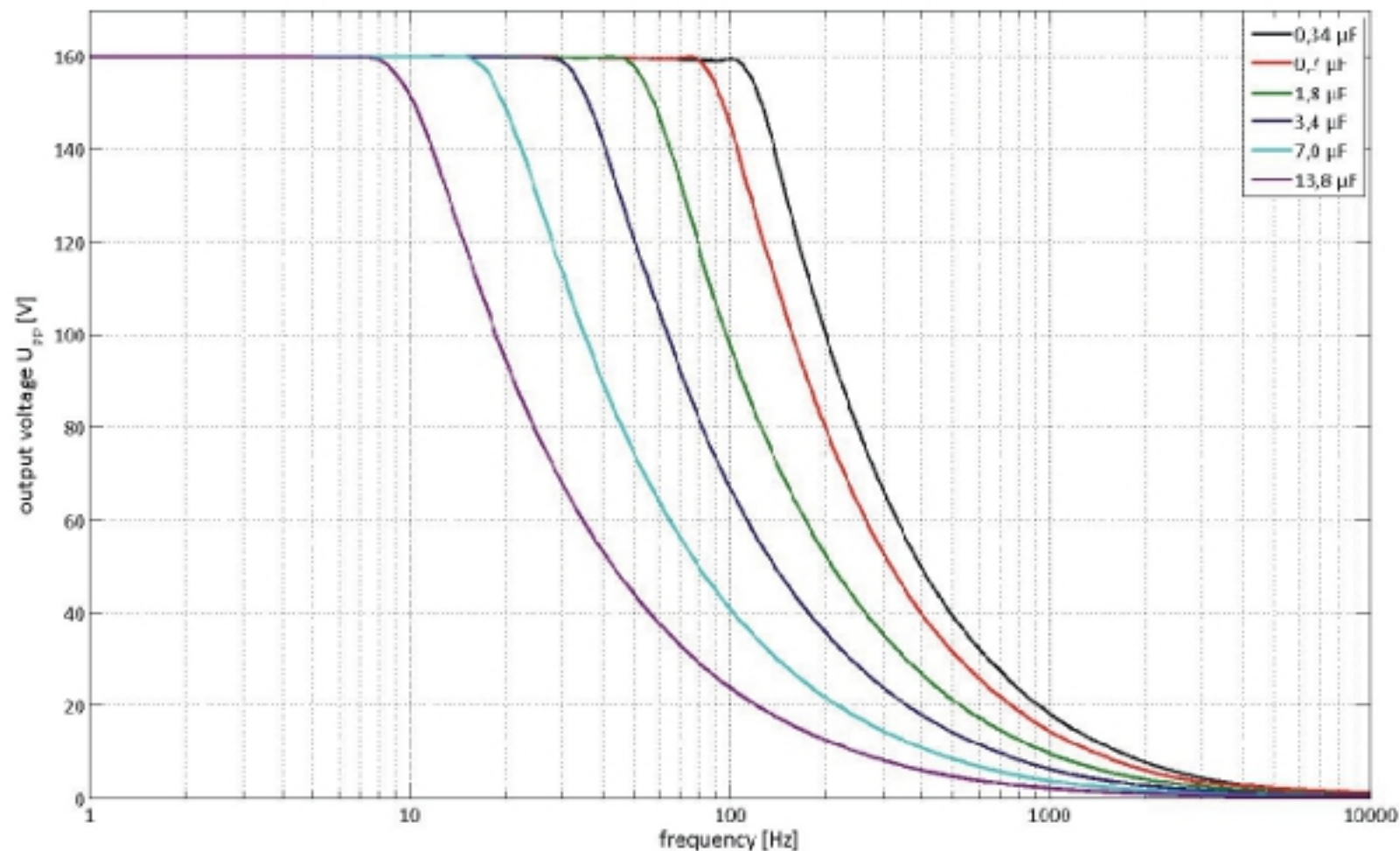
The integrated electrical positioning control prevents creep and hysteresis, a typical characteristic of piezo electrical actuators. The controller obtains the linear data of the actuator and strain gage, so it is possible to switch actuators without recalibration. The memory-function can save and retrieve position data.

Interface

The NV 40/1 CLE makes it possible to control the piezo elements through an analog modulation input, by computer interface (RS232 line), or by manual operation – through a potentiometer. The 5-digit display shows the parameters in volts or micrometers. The monitor output receives a signal (0 to +10V) from the measurement system and therefore, the position information.

Technical data		NV 40/1 CLE		
		E-101-73	E-101-74	E-101-75
part. no.	unit			
power supply	-	230V AC	115V AC	95V AC
number of channels	-	1		
display	-	LED - 5 digits		
sensor controller	-	SG, capacitive		
output voltage (adjustable by via manual encoder)	V	-10...+150		
output current (continuous)	mA	40		
voltage noise	-	<0.3mV _{RMS} @500Hz		
connector output voltage	-	LEMO 0S.302		
connector sensor system	-	ODU4pin		
modulation input	V	0...+10		
input impedance	kΩ	10		
monitor output	V	0...+10		
monitor output impedance	Ω	100		
connector modulation/monitor	-	BNC		
interface	-	RS 232		
command parameter resolution	-	16 bit		
software	-	LabView (demo files and dll's)		
dimensions (l x w x h)	mm	200x170x70		
weight	kg	1.6		
operating temperature range	°C (°F)	5°C to 35°C (41°F – 95°F)		
special features		signal values are shown either in volts or microns; memory function		

NV40/1CLE



The diagram shows the typical frequency of the NV 40/1CLE which can be reached as a function of the capacitance of the piezoelectric actuator and the driving voltage by an output current of 40mA.

Bedienungsanleitung
Spannungsverstärker NV40/1CLE

instruction manual
voltage amplifier NV40/1CLE



Bitte die Bedienungsanleitung vor dem Anschalten des Gerätes sorgfältig lesen.
Beachten Sie bitte insbesondere die Sicherheitshinweise!

Read carefully before switching on the power! Please see also instructions for
safety, using piezoelectric actuators and power supplies!

230V / 50Hz Art.Nr. E-101-73

115V / 60Hz Art.Nr. E-101-74

95 V / 60 Hz Art.Nr. E-101-75



Bedienungsanleitung Seite 2 ... 20
(deutsch)

Instruction manual pages 21 ... 38
(english)

Deutsche Version: Letzte Änderung 27.02.2012 von AS/EE
english version: last change 2012-02-27 by AS/EE

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1. introduction

This manual describes the piezo amplifier NV40/1CLE from **piezosystem jena**. You will also find additional information regarding piezoelectric products.

definition: All systems from **piezosystem jena** such as electronics, actuators and optical systems are called units.

If you have any problems please contact the manufacturer of the system: **piezosystem jena**, Pruessingstrasse 27, 07745 Jena. phone: +49 36 41 66 88-0

2. certification of piezosystem jena

The company **piezosystem jena** GmbH has been certified by DIN EN ISO 9001 since 1999.

CERTIFICATE



for the management system
according to ISO 9001:2008

The proof of the conforming application with the regulation was furnished and in accordance with certification procedure it is certified for the company



piezosystem jena GmbH
Prüssingstraße 27
07745 Jena / Germany

Scope

Development, production and sale of piezoelectric positioning systems and optical fibre switches.

Certificate Registration No. TIC 15 100 9679

Valid until 2012-09-11

Audit Report No. 3330 20YF J0

Initial certification 1999

This certification was conducted in accordance with the TIC auditing and certification procedures and is subject to regular surveillance audits.

A. Drechsel

TÜV Thüringen e.V.
Certification body for
systems and personnel



Jena, 2009-12-14



TGA-ZM-03-06-00



Zertifizierungsstelle des TÜV Thüringen e.V. • Ernst-Ruske-Platz 6 • D-07745 Jena • ☎ +49 3641 309740 • ✉ zert@tuevthuringen.de

3. declaration of conformity

CE Declaration of Conformity

In accordance with EN 45014

Part number: E-101-73, E-101-74, E-101-75

Product name: NV40/1CLE

Description: voltage amplifier

Manufacturer: **piezosystem jena GmbH**
Prüssingstraße 27
07745 Jena

Which this declaration relates to is in conformity with the following standards or normative documents:

EN 50082, part 2
EN 55011, class B
EN 60204-1
EN 61010-1
EN 61326-1

The declaration is world-wide valid as the manufacturer's declaration of compliance with the requirements of the above mentioned national and international standards.

Declaration issued by:



piezosystem jena GmbH
Dr. Bernd Götz
President
Prüssingstraße 27
07745 Jena

Jena, 19 January 2012

FB4.14-21-0

phone: +49 (3641) 66880 • fax: +49 (3641) 668866 • info@piezojena.com • http://www.piezojena.com



5

4. purchased part package

Please check the completeness of the delivery after receiving the shipment:

- voltage amplifier NV40/1CLE
- power cord
- RS232 cord
- instruction manual
- CD-ROM with driver, software and instruction manual

5. instructions for using piezoelectrical elements and power supplies

- Piezoelectric actuators from **piezosystem jena** are controlled by voltages up to 150V. These values can be quite hazardous. Therefore read the installation instructions carefully and only authorized personal should handle the power supply.
- After transportation, piezoelectric actuators should be allowed to adapt for approximately 2 hours to the room temperature before being switched on.
- Piezoelectric actuators are made from ceramic materials with and without metallic casings. The piezo-ceramic is a relatively brittle material. This should be noted when handling piezoelectrical actuators. All piezo-elements are sensitive to bending or shock forces.
- Due to the piezoelectric effect piezo-actuators can generate electrical charges by changing the mechanical load or the temperature or such actions described above.
- Piezoelectric actuators are able to work under high compressive forces, only actuators with pre-load can be used under tensile loads (these tensile forces must be less then the pre-load, given in the data sheet).
- Please note that the acceleration of the ceramic material (e.g., caused by fall down, discharging or high dynamic application) will occur.
- After excitation of the actuators by a voltage in the upper control range, the ceramic will move and generate an opposite high voltage after disconnection.
- Heating of the ceramic material will occur during dynamic operation and is caused by structure conditional loss processes. This may cause failure if the temperature exceeds specified values cited below.
- With increasing temperature, up to the Curie temperature (usual values approx. 140°C - 250°C), the piezoelectric effect disappears.
- Piezoelectric actuators such stacks or various tables work electrically as a capacitance. These elements are able to store electrical energy over a long period (up to some days) and the stored energy may be dangerous.
- If the actuator remains connected to the drive electronics, it is unloaded within a second after shutdown and quickly reaches harmless voltage values.

- Piezo-actuators can generate voltages by warming or cooling only (caused by the longitudinal change). The discharge potential should not be ignored due to the inner capacitance. This effect is insignificant at usual room temperature.
- Piezo-actuators from **piezosystem jena** are adjusted and glued. Any opening of the unit will cause misalignment or possible malfunction and the guarantee will be lost.
- Please use only original parts from **piezosystem jena**.
- Please contact piezosystem **jena** or your local representative, if there are any problems with your actuator or power supply. The responsible representatives for the countries you can find at our website: <http://www.piezojena.com> at the rubric Representative.

Caution!

Shock forces may damage the built-in ceramic element. Please avoid such forces, and handle the units with care, otherwise the guarantee will be lost.

6. safety instructions

Icons



RISK OF ELECTRIC SHOCK! Indicates that a risk of electric shock is present and the associated warning should be observed.



CAUTION! REFER TO OPERATOR'S MANUAL – Refer to your operator's manual for additional information, such as important operating and maintenance instructions.

RISK OF ELECTRIC SHOCK! 

- Do not open the units! There are no user serviceable parts inside and opening or removing covers may expose you to dangerous shock hazards or other risks. Refer all servicing to qualified service personnel.
- Do not spill any liquids into the cabinet or use the units near water. This could cause an electric shock, fire or malfunction of the unit.
- Do not touch the OUT-plug socket on the front panel. It could be under dangerous voltage.
- Do not insert objects of any kind into the cabinet slots, as they may touch dangerous voltage points, which can be harmful or fatal or may cause electric shock, fire or equipment failure.

CAUTION! 

- Allow adequate ventilation around the units so that heat can properly dissipate. Do not block ventilated openings or place the units near a radiator, oven or other heat sources. Do not put anything on top of the units except those that are designed for that purpose (e.g. actuators).
- Work with the units only in a clean and dry environment! Only specially prepared units (e.g. actuators) can work under other conditions!
- **piezosystem jena** does not give any warranty for damages or malfunction caused by additional parts not supplied by **piezosystem jena**. Additional cables or connectors will change the calibration and other specified data. This can change the specified properties of the units and cause them to malfunction.
- Piezoelementes are sensitive systems capable of the highest positioning accuracy. They will demonstrate their excellent properties only if they are handled correctly! Please mount them properly only at the special mounting points.
- Do not place any heavy objects on any cables (e.g. power cords, sensor cables, actuator cables, optical cables). Damage may cause malfunction or shock or fire!
- Do not place the units on a sloping or unstable cart, stand or table as they may fall or not work accurately.

Immediately unplug your unit from the wall outlet and refer servicing to qualified service personnel under the following conditions:

- when the power cord or plug is damaged
- if liquid has been spilled or objects have fallen into the unit
- if the unit has been exposed to rain or water
- if the unit has been dropped or the housing is damaged

6.1. installation, power supply

RISK OF ELECTRIC SHOCK



- Do not insert or unplug the power plug with wet hands, as this may result in electrical shock.
- Do not install in rooms, where inflammable substances are stored. If flammable substances come into contact with electrical parts inside, this may result in fire or electrical shock.
- Do not damage or modify the power cord. Also, do not place heavy objects on the power cord, or pull on or excessively bend it, as this could cause electrical damage and result in a fire or electrical shock.
- Always grasp the plug portion when unplugging the power plug. Pulling on the power cord may expose or snap the core wire, or otherwise damage the power

cord. If the cord is damaged, this could cause an electricity leak and result in a fire or electrical shock.

CAUTION!

- Do not use accessories other than the provided (e.g. power cord). Plug the power cord only in grounding equipment conductor power sockets.
- Halten Sie die im Datenblatt angegebenen Betriebsspannungsgrenzen ein, da es sonst zum Defekt des Gerätes kommen kann.
- Do not place any heavy objects on any cables (e.g. power cords, sensor cables, actuator cables, optical cables).
- Do not block ventilated openings or place the units near a radiator, oven or other heat sources. Do not put anything on top of the units except those that are designed for that purposes (e.g. actuators).
- Plug the power cord completely in the grounding equipment conductor power sockets so that it can not loosening inadvertently.
- Leave sufficient space around the power plug so that it can be unplugged easily. If objects are placed around the power plug, you will be unable to unplug it in an emergency.
- Install the system in that way, that the on/off-switch is accessible without problems.

6.2. operation

RISK OF ELECTRIC SHOCK!

- Do not open the units! There are no user serviceable parts inside and opening or removing covers may expose you to dangerous shock hazards or other risks. Refer all servicing to qualified service personnel.
- Do not spill inflammable substances inside the voltage amplifier. If these items come into contact with an electrical component inside the voltage amplifier, this may result in a fire or electrical shock.

CAUTION!

- If the voltage amplifier emits smoke, big heat or unusual smells, immediately turn off the power switch and unplug the power plug from the outlet. Then contact our technical service.

6.3. maintenance and inspection

CAUTION! 

- When cleaning the exterior box of the voltage amplifier, first turn off the power switch and unplug the power plug. Failure to observe these items may result in a fire or electrical shock.
- Cleaning the exterior box using a firmly wrung-out cloth. Do not use alcohol, benzene, paint thinner or other inflammable substances. If flammable substances come into contact with an electrical component inside the voltage amplifier, this may result in a fire or electrical shock.

6.4. environmental conditions

The amplifier can be used:

- indoor
- altitude up to 2000 m
- temperature: 5 ... 35 °C
- relative humidity: 5 ... 95% (non-condensing)

The recommended environmental conditions are:

- indoor
- altitude up to 2000 m
- temperature: 20 ... 22 °C
- relative humidity: 5 ... 80% (non-condensing)

7. instructions for checking the function of the system / quick start

When you open the package, please check to make sure all the necessary parts are complete (see packing list) and nothing is damaged.

Check the electronics and the actuator for any visible damage:

- The top and bottom plate of the actuator (if it does not have another shape) should be parallel each to each other, without scratches.
- If there is any damage to the system please contact our local representative immediately!
- If the packaging material is damaged please confirm this with the shipping company.

Before you switch on the system, please check:

- The main voltage supplied in your country is the same as installed for the system. (Check the voltage label on the bottom side of the electronics and the datasheet on point 9.2.)
- The potentiometer should be in maximum counter clockwise position (Pos. 0 or Pos.1 depending on the operation mode)
- The power switch should be in the off position
- Connect the power cable.
- Connect the piezo-element by using the LEMO connector. Be sure the cables are connected properly to the electronics.
- Switch the system on (power = on). If the light „CL ON“ is on, press the button „Closed Loop“. The display shows the output voltage in open loop operation.
- Turn the potentiometer to the maximum clockwise position. The display shows the maximum position. The actuator is now in position 4. (see diagram 1)

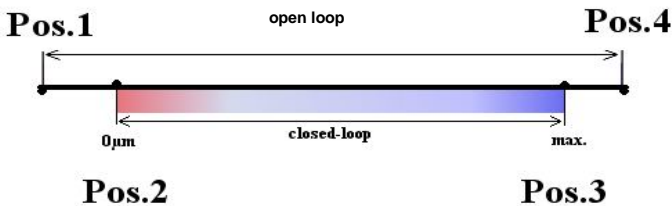


diagram 1: open loop – closed loop motion

- Turn the potentiometer to the maximum counter clockwise position (Pos. 1).
- Switch on the closed loop (push the button „Closed Loop“, „CL ON“ is illuminated). The actuator moves to its zero position in closed loop mode (Pos. 2), the displays shows 0.0µm if there is no offset to the system. Offset is accomplished by the offset potentiometer or external offset (e.g. a load). Because of the fast motion of the actuator to Pos. 2 a cracking noise can be heard. This is normal and not a malfunction!
- Turn the potentiometer to the clockwise position again. The actuator makes its maximum movement in closed loop mode (pos. 3). The total motion in closed loop mode is pos. 3 - pos. 2. The specific value for that axis is given in the calibration curve of the actuator (see the calibration protocol for your actuator).
- Turn the potentiometer to its counter clockwise zero position, switch off the closed loop switch (push „Closed Loop“, „CL ON“ is off).
- If the procedure is done you can switch off the electronics.
- Before you switch off the electronics, be sure that the potentiometer is in the left zero position and the closed loop switch is switched off!

8. interface setup

- Connect the RS232 serial connectors of your IBM compatible computer and the NV40/1CLE by using a standard interface line.
- Switch ON both units.
- The communication between voltage amplifier and computer can be achieved by using any terminal program (normally it is part of your operation system, please refer your OS documentation).
- RS232 parameters: COMx: 9600,n,8,1
- You will see an echo on your screen containing the firmware version.

9. how to operate the NV40/1CLE

9.1. common introduction

The voltage amplifier NV40/1CLE was especially developed for one channel positioning tasks. The primary drive for developing the system was simple service and universal usage of the unit.

Caution:

The voltage amplifier NV40/1CLE controls piezo elements with integrated measuring system. In this case, all units, piezo actuator, measuring system and voltage amplifier must be calibrated on each other. Calibration takes place before the delivery. In open loop operating mode the output voltage will be displayed, in closed loop operation the measured motion of the actuator will be displayed.

Please note: If power to the amplifier is lost, the system automatically reverts to the previously chosen operation mode after power on.

Systems without measuring system:

If you purchased the voltage amplifier without an actuator and/or with an actuator without measuring system, you can work with it in the non-controlled operation mode. In that case, we will adjust the display to show the actuator voltage in volts (-10...+150V) instead of the motion in microns.

In case of a subsequent adaptation of a measuring system, a calibration of the electronics is necessary. To do so, actuator, electronics and measuring system must be returned to **piezosystem jena** for calibration. There is an additional charge for special calibration. Please contact your representative to determine if additional calibration is possible.

9.2. technical data

article number	E-101-75	E-101-74	E-101-73
power supply	95V 60Hz	115V 60Hz	230V 50Hz
power supply range	85...115V	+/-10%	+/-10%
max. current	250mA	160mA	120mA
fuses	2x T315mA 250V	2x T250mA 250V	2x T200mA 250V
dimensions wxdxh [mm]	170 x 200 x 70		
mass [kg]	1,6		
number of channels	1		
display	LED; 5 digits		
power [W]	6		
output current [mA]	40		
output voltage (OUT)	-10 ... +150V (adjustable manual or by software)		
output connector (OUT)	LEMO 0S.302		
sensor connector	ODU series L, 4pin		
modulation input (MOD)	0 ... +10V BNC		
inner resistance	10k Ω		
monitor voltage (MON)	0 ... +10V BNC		
noise of the output voltage	0.3mV _{RMS} @ 500Hz		
bandwidth [Hz]	350Hz (without connected actuator)		
polarity	positive		

table 1: technical data NV40/1CLE

9.3. initiation

Please connect the amplifier with the wall socket by using the included power supply cable. The allowable supply voltage is given on the identification label on the bottom. The “ERROR” sign light up in the case the main supply voltage is not in the appropriate range. Please switch off the device until the voltage is supplied according to the specified parameters.

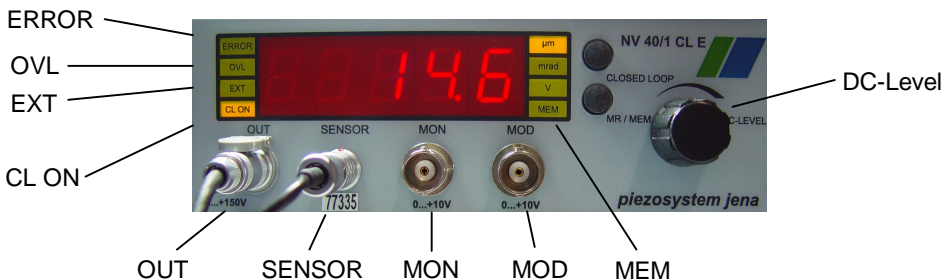
The power switch and the fuse casing are located on the backside of the unit. The power LED “on” lights up after switched on the amplifier (short initialization time). The display announces the motion of the actuator.

There is a backside RS232 socket available, to realize a remote-controlled operation via any terminal program.

The device returns to the previously chosen operation mode when returned on . Pay attention to the correct assignment of modulation signal and monitor signal on the front-panel BNC sockets.

Please, switch off the device and contact our technical staff, if the LED „OVL“ is permanently on. The actuators are driven by voltages up to +150V. Please pay attention to electric shock hazard protection.

9.4. service



The actuator is connected to the „OUT“ socket, the measuring system to the „SENSOR“ socket. The potentiometer is used for the level of the output voltage (offset, DC level). The rest position of the actuator is hereby adjusted. An external modulation signal on the range of 0...+10V („MOD“ socket) can control the output voltage. Utilizing this input high dynamic scanning functions are possible. In the closed loop operating mode, the operating frequency reduces. The absolute values are essentially dependent on the capacitance of the actuator and the load. If you have a special need for the closed loop function, please contact our technical service department.

To avoid damage to the actuators, it is recommended to adjust the potentiometer to the full counter clockwise position before switching on the amplifier.

Due to the superposition of the modulating voltage and adjusted offset, voltages up to 170 V can occur. This operating state should be avoided to protect the ceramics and increase the MTBF. In addition, the „OVL“-LED lights up in the case of a limit error. No disconnection of the overvoltage occurs!

We recommend switching on the amplifier approx. 2 hours before the measurement in the sub- μm range takes place to guarantee stable temperature circumstances.

A constant temperature environment is necessary to precise positioning tasks. Please note that a temperature change of $\Delta T = 5\text{K}$ will cause a $20\mu\text{m}$ increase in length of a 20cm steel rod.

The special qualities of piezo-ceramics like hysteresis and drift can cause inaccuracies in the case of nonobservance and are compensate in closed loop function.

These basic qualities of piezo-elements are described in the „piezoline“tutorial in our catalogue. Catalogue and the „piezoline“ you can find on the provided CD-ROM. Do not hesitate to contact our staff if you need further information.

9.4.1.button “Closed Loop”

Using the button “Closed Loop” the operation mode can be changed. When the “CL ON” is not lit, the adjusted voltage (DC-LEVEL + MOD) will be applied to the actuator without considering the measuring system. When operating in closed loop mode, the adjusted position will be held using the measuring signal and integrated closed loop controller.

9.4.2.button “MEM”

To achieve a once reached position repeatedly, the integrated memory function in the closed loop mode can be used. First the desired position has to be adjusted using the potentiometer “DC-LEVEL”. Now press and hold the “MEM” button for at least 2 seconds. When the position is stored, the display flashes. After storing the position, the potentiometer can be used again. To switch back to the stored position, the button “MEM” has to be pressed. The actuator now moves to the stored position and the LEDs “MEM” and “EXT” light up. Pressing again “MEM” turns the memory function off again.

Please note: The operation mode will be stored even after turning the device off and on again!

9.5. display

After turning on, the display lights up.

Depending on the chosen operation mode, the display shows the output voltage or actuator position (see also diagram 1 on page 29).

The recent operation mode is displayed by "CL ON". When lit the NV40/1CLE is working in closed loop.

The "V", " μm " and "mrad" show the units for the displayed value.

"MEM" shows the use of the memory function to reach a previously stored position.

When the advice is operated using the serial interface, the "EXT" shows the external control.

Using the potentiometer and the "MOD" input at the same time, output voltages below -10V or above +150V might occur. In this case the "OVL" lights up. Try to reduce the signal to avoid damages to the actuator.

In case of an internal failure like a broken internal fuse, the LED "ERROR" lights up. In this case please contact our support to avoid further damages.

9.6. modulation input: MOD

An analogous modulation signal of 0 to +10V can be driven into this socket to realize a remote-controlled operation. A sum of the BNC socket voltage and the offset voltage set at the potentiometer „DC-LEVEL“ occurs. The local-mode voltage is also in the range of 0 to +10V. Both, externally driven voltages and internal OFFSET must be less than +10V. Voltages outside of the permissible field are signalled by the „OVL“-LED.

9.7. monitor output: MON

The pre-processed sensor signal is available at the mon socket. The mon voltage is 0 to +10V representing 0 to 100% motion in closed loop operation. The range of adjustment outside of the assured and controlled range of adjustment is the systems control reserve.

Connected measuring instruments must have at least 100k Ω input resistance. The output is not short-circuit-proof, do not add any voltages.

9.8. actuator connection: OUT

Please plug in the actuator here. The output voltage is in the range of -10 ... +150V.

9.9. measuring system connection: SENSOR

Only for actuators with measuring system: Please plug in the measuring system here.

9.10. RS232 interface

In the case of controlling the amplifier over the interface, the potentiometer DC-LEVEL is deactivated. Depending on the operation mode the display announces the output voltage for the position.

Communication with the NV40/1CLE occurs via the RS232 interface (ASCII character concatenation). The character string must be concluded with ENTER. ASCII characters less then 20h (hexadecimal) except for ENTER (13h), will be ignored.

A valid command looks like: *command, parameter <CR>*

If the internal processor recognizes the command it is carried out. If the sent command is not in the intern command list or was sent erroneously, an error report would be created. The report describes the occurred error.

Interface set up: 9600 Baud, 1 Start / Stop-Bit, no parity

command	description
wr, value <CR>	write a value to the device
Rd <CR>	read a value from the device
cl <CR>	closed loop on
ol <CR>	closed loop off
i1 <CR>	remote control via RS232 active
i0 <CR>	remote control via RS232 not active

table 2: software commands

9.10.1. write-command wr

wr,10.29<CR> open loop:10.29V; closed loop:10.29µm

The command wr commands a voltage to the actuator in the open loop operating mode. In the closed loop operation the motion is shown in µm. Additionally the remote control has to be activated.

9.10.2. read-command rd

rd<CR>; response: rd,10.25<CR><LF>

The system response to the rd command is the recently displayed value, in volt for open loop and μm or mrad for closed loop operation.

Caused by the differing resolutions of analogue-to-digital converter A/D and D/A, deviations of both values in control electronics are possible. These deviations are always less than the specified tolerances for the positioning accuracy.

9.10.3. remote control command i0, i1

i0<CR> turns off the remote control

i1<CR> turns on the remote control

When the remote control is turned on, a position has to set as well using the command wr.

9.10.4. operation mode command ol, cl

ol<CR> switches the NV40/1CL E to open loop operation

cl<CR> switches the NV40/1CL E to closed loop operation

9.10.5. error reports

Possible error reports which can be read via a terminal program:

Error report	description
err,1<CR><LF>	// unknown command
err,2<CR><LF>	// too many characters in the command
err,3<CR><LF>	// too many characters in the parameter
err,4<CR><LF>	// too many parameter
err,5<CR><LF>	// wrong character in parameter
err,6<CR><LF>	// wrong separator
err,7<CR><LF>	// overload

table 3: error reports

10.possibilities of the error correction

It can happen in rare cases that the main fuse breaks when switching on the amplifier. It is in addition to the main switch on the backside of the case. For replacement the AC power connector is to be removed and the protection fuse is to be replaced. Replace the fuse only with same ratings (see page 31). Please protect the power cords from harm or shorts which could cause malfunction of the equipment. Large strains on the cords can lead to interruptions. On systems without closed loop function, the voltage on the display can also be read without actuator sensor combination.

Error	possible correction
nothing happens after switching on the device	Check power cord and fuses on the back side of the device
LED „OVL“ is illuminated	Check the position of the adjustable potentiometer and the amplitude of the modulation signal. High modulating voltage overdrives the amplifier. Decrease the modulation signal or reduce the control voltage until „OVL“-LED is off.
LED „ERROR“ is illuminated	Main supply voltage is not in the specified range. (Please check identification label) Switch off the device until the voltage is supplied according to the specified parameters. In the case the appropriate voltage is applied and the error light is still on, please contact us for further instructions.
erroneous, illogical display values	Check the sensor cable and connection

table 4: possibilities of the error correction

The equipment is calibrated before delivery for the appropriate actuator with integrated measuring system. An exchange of the actuator amplifier combination leads to inaccuracies in setting movement and positioning accuracy is lost. If the equipment is damaged during effort of another actuator, no assurance can be undertaken!

The equipment concept makes adaptations to customer preferences possible concerning the technical threshold values such as the main voltage or the output voltage. Please, contact our technical service department in order to discover the possibilities for your specific application.

Adaptations are always to be paid by the customer.

11.your notes