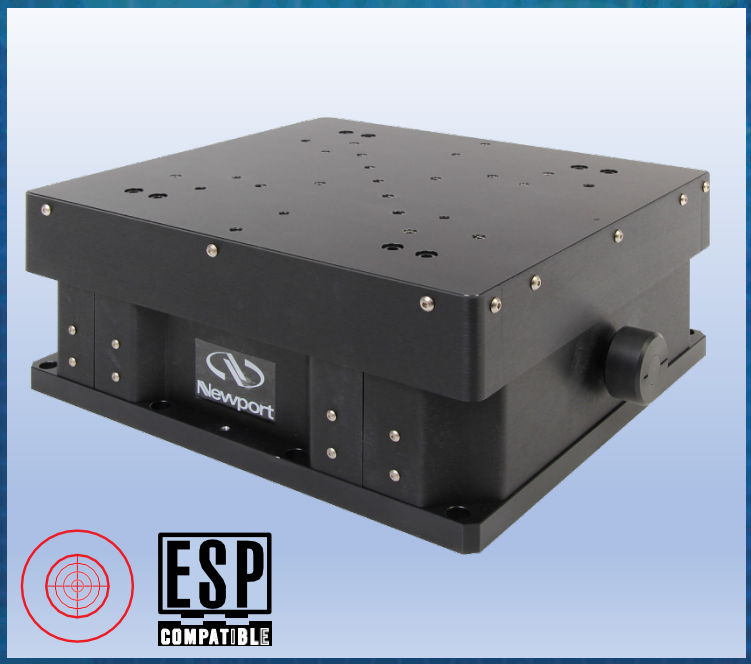
User's Manual

IDL280-Z20

Industrial Vertical Stage



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1 Warranty

MKS Instruments, Inc. warrants that this product will be free from defects in material and workmanship and will comply with MKS published specifications at the time of sale for a period of one year from date of shipment. If found to be defective during the warranty period, the product will either be repaired or replaced at MKS option.

To exercise this warranty, write or call your local MKS office or representative. You will be given prompt assistance and return instructions. Send the product, freight prepaid, to the indicated service facility. Repairs will be made, and the instrument returned freight prepaid. Repaired products are warranted for the remainder of the original warranty period or 90 days, whichever occurs last.

Limitation of Warranty

The above warranties do not apply to products which have been repaired or modified without MKS written approval, or products subjected to unusual physical, thermal or electrical stress, improper installation, misuse, abuse, accident or negligence in use, storage, transportation or handling.

CAUTION

Warranty does not apply to damages resulting from:

- **Incorrect usage:**
  - **Load on the stage greater than maximum specified load.**
  - **Carriage speed higher than specified speed.**
  - **Improper grounding.**
    - **Connectors must be properly secured.**
    - **When the load on the stage represents an electrical risk, it must be connected to ground.**
  - **Excessive or improper cantilever loads.**
- **Modification of the stage or any part thereof.**

CAUTION

Please return equipment in the original (or equivalent) packing.

You will be responsible for damage incurred from inadequate packaging if the original packaging is not used.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR USE. MKS INSTRUMENTS, Inc. SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM THE PURCHASE OR USE OF ITS PRODUCTS.

Newport®	DECLARATION OF INCORPORATION OF PARTLY COMPLETED MACHINERY following Annex II-1B of the Directive 2006/42/EC on machinery	**N° of Certificate** **IDL280-Z20** Number of pages 1/1

THE MANUFACTURER,

MICRO-CONTROLE Spectra-Physics,
established in France,
9 rue du Bois Sauvage
F-91055 Evry

Hereby declares that the partly completed machinery:

- Description : "IDL280-Z20"
- Function: High Load Industrial Vertical Translation Stage.
- Model: IDL280-Z20

– the technical file of which was compiled by:

Mr Hervé LE COINTE, Quality Director,
MICRO-CONTROLE Spectra-Physics, Zone Industrielle - B.P.29
F-45340 Beaune La Rolande France

– complies with the applicable essential requirements included in Annex I of the Directive 2006/42/EC except § 1.3.7 and 1.1.5 for which a residual risk exists when putting the equipment into service
– was designed and built in accordance with the relevant provisions of the Directive 2014/30/EU relating to electro-magnetic compatibility, applying good engineering practices and respecting the information on the intended use of its components
– complies with all the relevant provisions of the Directive 2011/65/EU relating to RoHS2.

– was designed and built in accordance with the following harmonised standards:

- NF EN 61326-1:2013 « Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements »

- NF EN ISO 12100:2010 « Safety of machinery – General principles for design – Risk assessment and risk reduction »

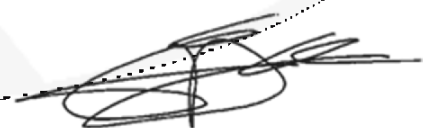
Hereby declares that the relevant technical documentation described in Annex VII, part B has been compiled.

Undertakes to present upon request the relevant technical documentation to the competent authorities of the Member States for at least 10 years following this date; the documentation will be available on our manufacturing site in Beaune-La-Rolande (45, France).

Hereby declares that this equipment must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of this Directive.

ORIGINAL DECLARATION

Done in Beaune La Rolande on 20 November 2017
Hervé LE COINTE
Quality Director



2 Preface

CONFIDENTIALITY & PROPRIETARY RIGHTS

Reservation of Title

The MKS Instruments, Inc. Programs and all materials furnished or produced in connection with them ("Related Materials") contain trade secrets of MKS and are for use only in the manner expressly permitted. MKS claims and reserves all rights and benefits afforded under law in the Programs provided by MKS.

MKS shall retain full ownership of Intellectual Property Rights in and to all development, process, align or assembly technologies developed and other derivative work that may be developed by MKS. Customer shall not challenge, or cause any third party to challenge, the rights of MKS.

Preservation of Secrecy and Confidentiality and Restrictions to Access

Customer shall protect the MKS Instruments, Inc. Programs and Related Materials as trade secrets of MKS and shall devote its best efforts to ensure that all its personnel protect the MKS Programs as trade secrets of MKS. Customer shall not at any time disclose MKS trade secrets to any other person, firm, organization, or employee that does not need (consistent with Customer's right of use hereunder) to obtain access to the MKS Programs and Related Materials. These restrictions shall not apply to information (1) generally known to the public or obtainable from public sources; (2) readily apparent from the keyboard operations, visual display, or output reports of the Programs; (3) previously in the possession of Customer or subsequently developed or acquired without reliance on the MKS Programs; or (4) approved by MKS for release without restriction.

SERVICE INFORMATION

The user should not attempt any maintenance or service of the present product and its accessories beyond the procedures outlined in this manual. Any problem that cannot be resolved should be referred to MKS I Newport. When calling MKS I Newport regarding a problem, please provide the Tech Support representative with the following information:

- Your contact information.
- System serial number or original order number.
- Description of problem.
- Environment in which the system is used.
- State of the system before the problem.
- Frequency and repeatability of problems.
- Can the product continue to operate with this problem?
- Can you identify anything that may have caused the problem?

MKS | NEWPORT RMA PROCEDURES

Any product being returned to MKS I Newport must have been assigned an RMA number by Newport. Assignment of the RMA requires the item serial number.

PACKAGING

Materials being returned under an RMA must be securely packaged for shipment. If possible, reuse the original factory packaging.

3 Safety Information

3.1 Definitions and Symbols

The following terms and symbols are used in this documentation and also appear on the product where safety related issues occur.

3.1.1 General Warning or Caution

The Exclamation Symbol may appear in Warning and Caution tables in this document. This symbol designates an area where personal injury or damage to the equipment is possible.

3.1.2 Electric Shock

The Electrical Shock Symbol may appear on labels affixed to the product.

This symbol indicates a hazard arising from dangerous voltage. Any mishandling could result in irreparable damage to the equipment, in personal injury, or death.

3.1.3 European Union CE Mark

The presence of the CE Mark on Newport Corporation equipment means that it has been designed, tested and certified as complying with all applicable European Union (CE) regulations and recommendations.

3.1.1 United Kingdom Conformity Assessed Mark

The presence of the UKCA Mark on Newport equipment means that it has been designed, tested and certified as complying with all applicable United Kingdom's regulations and recommendations.

3.2 General Warnings and Cautions

Definitions of, **NOTE**, **CAUTION**, **WARNING** and **DANGER** messages used throughout the manual.

NOTE	**The NOTE sign denotes important information. It calls attention to a procedure, practice, condition, or the like, which is essential to highlight.**
CAUTION	**The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of all or part of the product.**
WARNING	**The WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition, on the like, which, if not correctly performed or adhered to, could result in injury to personnel.**
DANGER	**The DANGER sign Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.**

3.3 Warnings and Cautions

WARNING

The motion of objects of all types carries potential risks for operators. Ensure the protection of operators by prohibiting access to the dangerous area and by informing the personnel of the potential risks involved.

WARNING

Do not use this stage when its motor is emitting smoke or is unusually hot to the touch or is emitting any unusual odor or noise or is in any other abnormal state.

Stop using the stage immediately, switch off the motor power and then disconnect the electronics power supply.

After checking that smoke is no longer being emitted contact your Newport service facility and request repairs. Never attempt to repair the stage yourself as this can be dangerous.

WARNING

Make sure that this stage is not exposed to moisture and that liquid does not get into the stage.

Nevertheless, if any liquid has entered the stage, switch off the motor power and then disconnect the electronics from power supply.

Contact your Newport service facility and request repairs.

WARNING

Do not insert or drop objects into this stage, this may cause an electric shock, or lock the drive.

Do not use this stage if any foreign objects have entered the stage. Switch off the motor power and then disconnect the electronics power supply.

Contact your Newport service facility for repairs.

WARNING

Do not place this stage in unstable locations such as on a wobbly table or sloping surface, where it may fall or tip over and cause injury.

If this stage has been dropped or the case has been damaged, switch off the motor power and then disconnect the electronics power supply.

Contact your Newport service facility and request repairs.

WARNING

Do not attempt to modify this stage; this may cause an electric shock or downgrade its performance.

WARNING

Do not exceed the usable depth indicated on the mounting holes (see section "Dimensions"). Longer screws can damage the mechanics or cause a short-circuit.

CAUTION	**Do not place this stage in a hostile environment such as X-Rays, hard UV,… or in any vacuum environment.**
CAUTION	**Do not place this stage in a location affected by dust, oil fumes, steam or high humidity. This may cause an electric shock.**
CAUTION	**Do not leave this stage in places subject to extremely high temperatures or low temperatures. This may cause an electric shock.** • **Operating temperature: +10 to +35 °C** • **Storage temperature: -10 to +40 °C (in its original packaging)**
CAUTION 	**Do not move this stage if its motor power is on.** **Make sure that the cable to the electronics is disconnected before moving the stage. Failure to do so may damage the cable and cause an electrical shock.**
CAUTION	**Be careful that the stage is not bumped when it is being carried. This may cause it to malfunction.**
CAUTION	**When handling this stage, always unplug the equipment from the power source for safety.**
CAUTION	**When the carriage is in its end-of-run position, it is strongly recommended not to go beyond this point as this may damage the stage mechanism.**
CAUTION	**Contact your Newport service facility to request cleaning and specification control every year.**

4 Introduction

This manual provides operating instructions for the IDL280-Z20 stage that you have purchased.

IDL280-Z20 vertical stage.

NOTE **We recommend you read carefully the chapter 6.0: "Connection to Newport Controllers" before using the IDL280-Z20 stage.**

5 Description

For industrial applications that require a high load capacity vertical axis to carry the work, the IDL280-Z20 is the ideal stage. Based on a customer proven and modular wedge design, the IDL280-Z20 provides fine MIM, smooth motion for fine positioning and stiff construction for use with high dynamic performance XY systems.

The IDL280-Z20 is matched to the IDL280 stages, requiring only a few minutes to bolt the IDL280-Z20 securely onto the IDL280-LM carriage. The IDL280-Z20 is compatible with the XPS controller.

Contact Newport for other travels or sizes.

5.1 Design Details

Base Material	Anodized Aluminum
Bearings	Double row recirculating ball bearings
Drive Mechanism	Precision ball screw 2 mm pitch
Reducer	Belt gear 1÷4 + Wedge 1÷2
Feedback	Screw mounted rotary encoder 5000 cts/rev, index pulse
Limit switches	Optical
Origin	Optical, at center of travel, including mechanical zero signal
Cable	MMCABLE-3 standard 3-meter cable

6 Characteristics

6.1 Definitions

Specifications of our products are established in reference to ISO 230 standard part II "Determination of accuracy and repeatability of positioning numerically controlled axes".

This standard gives the definition of position uncertainty which depends on the 3 following parameters:

Absolute Accuracy

Difference between ideal position and real position.

Accuracy

Difference between ideal position and real position after the compensation of linear errors.

Linear errors include: cosine errors, inaccuracy of screw or linear scale pitch, angular deviation at the measuring point (Abbe error) and thermal expansion effects. All Newport motion electronics can compensate for linear errors.

The relation between absolute accuracy and on-axis accuracy is as follows:

Absolute Accuracy = Accuracy + Correction Factor x Travel

Repeatability

Ability of a system to achieve a commanded position over many attempts.

Reversal Value (Hysteresis)

Difference between actual position values obtained for a given target position when approached from opposite directions.

Minimum Incremental Motion (MIM or Sensitivity)

The smallest increment of motion a device is capable of delivering consistently and reliably.

Resolution

The smallest increment that a motion device can theoretically move and/or detect. Resolution is not achievable, whereas MIM, is the real output of a motion system.

Yaw, Pitch

Rotation of carriage around the Z axis (Yaw) or Y axis (Pitch), when it moves.

The testing of accuracy, repeatability, and reversal error are made systematically with test equipment in controlled environment ($20^{\pm 1}$ °C).

A linear cycle with 21 data points on the travel and 4 cycles in each direction gives a total of 168 points.

Guaranteed and Typical Specifications

Guaranteed maximum performance values are verified per Newport's A167 metrology test procedure. For more information, please consult the metrology tutorial section in the Newport catalog or at **www.newport.com**

6.2 Mechanical Specifications

Travel Range	20 mm
Minimum Incremental Motion	0.1 µm
Uni-directional Repeatability, Guaranteed	±0.1 µm
Bi-directional Repeatability, Guaranteed	±0.6 µm
Accuracy, Guaranteed	±2 µm (over full travel)
Encoder Resolution	50 nm
Max. Speed	5 mm/s
Roll, Guaranteed	±50 µrad
Pitch, Guaranteed	±50 µrad

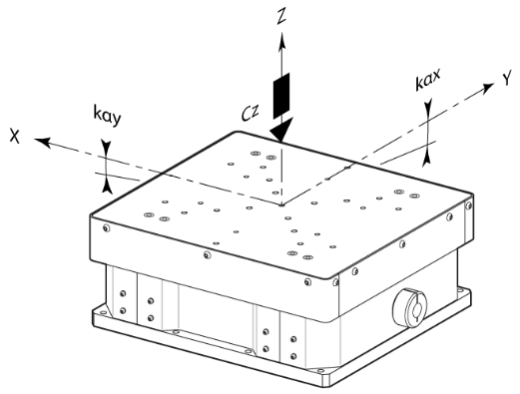
CAUTION

To reach specifications stated, stages must be fixed on a plane surface with a flatness of 5 µm.

6.3 Load Specification Definitions Normal Load Capacity (Cz)

Maximum load a stage can move while maintaining specifications.
This value is given with speed and acceleration specified for each stage, and with a load perpendicular to bearings.

6.4 Load Characteristics and Stiffness



Cz, Normal center load capacity on bearings	500 N
kαx, Compliance in roll	10 µrad/Nm
kαy, Compliance in pitch	10 µrad/Nm

6.5 Stage Weight

The stage weight indicated into the below table is the one of the stage without any cable.

	Weight [lb (kg)]
IDL280-Z20	32 (14.5)
3-meter MMCABLE-3 Cable	1.54 (0.7)

7 Drive and Motor

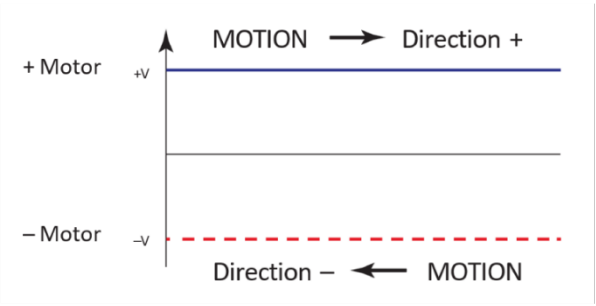
7.1 Drive

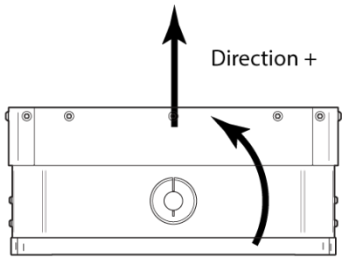
The IDL280-Z20 stage is equipped with a DC-motor and a 5000 cts/rev. screw mounted rotary encoder.

DC-MOTOR CHARACTERISTICS

	Resolution (µm)	Speed (mm/s)	Nominal Voltage (V)	Max RMS Current (A)	Max. Peak Current (A)	Resistance (Ω)	Inductance (mH)	Tachometer Const. (V/krpm)
IDL280-Z20	0.05	5	48	2.0	4	1.16	0.33	–

COMMAND SIGNALS





In the above drawings, + Motor signal is referred to – Motor signal.

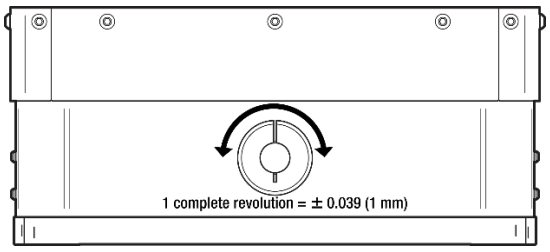
① When the stage moves in + Direction, the + Motor voltage is higher than – Motor voltage.

② When the stage moves in – Direction, the + Motor voltage is lower than – Motor voltage.

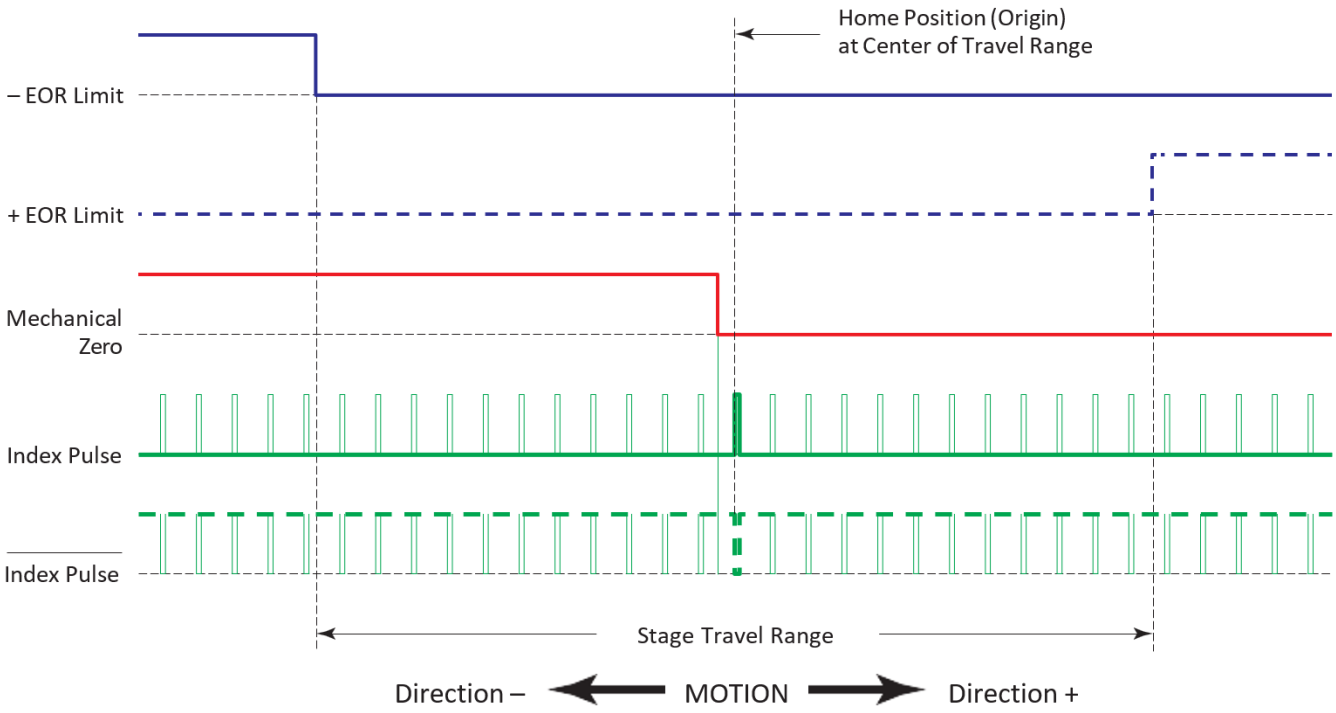
MANUAL ADJUSTMENT

The stage can be adjusted manually using the rotary knob to lower or raise the stage as needed.

This knob is directly connected to the drive screw, turning it for a complete revolution causes a vertical movement of ± 0.039 inch (1 mm).



7.2 Sensor Position

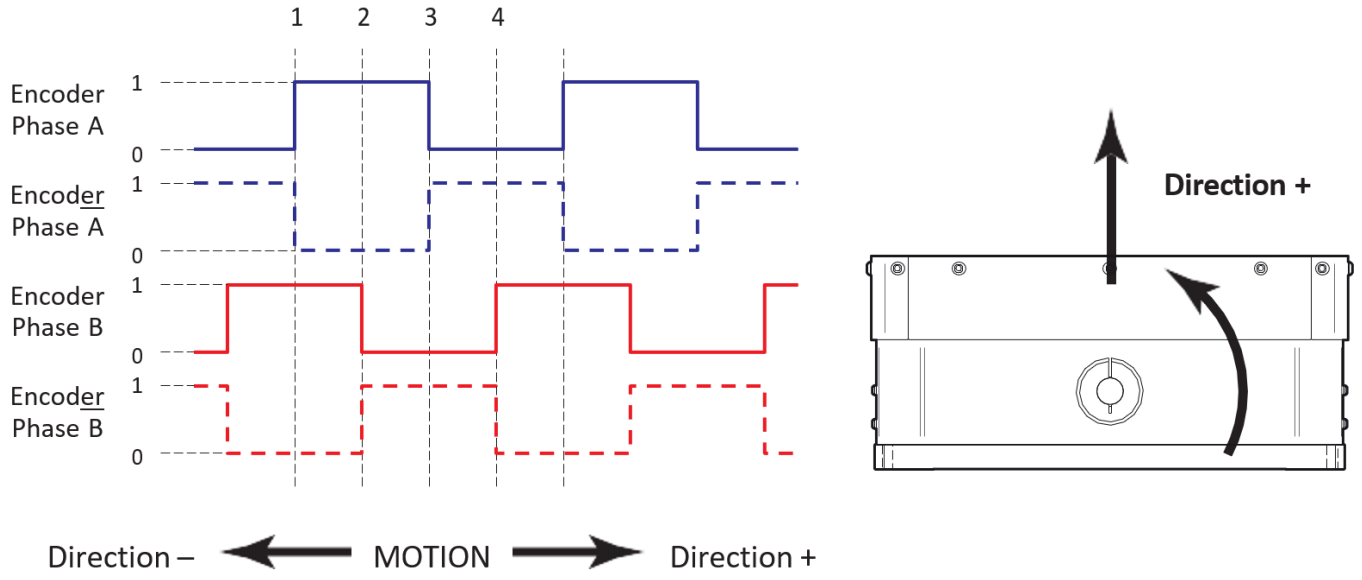


End-of-Run and Mechanical Zero are 5 V open collector type.
The Index Pulse provides a repeatable Home Position at ±1 step.

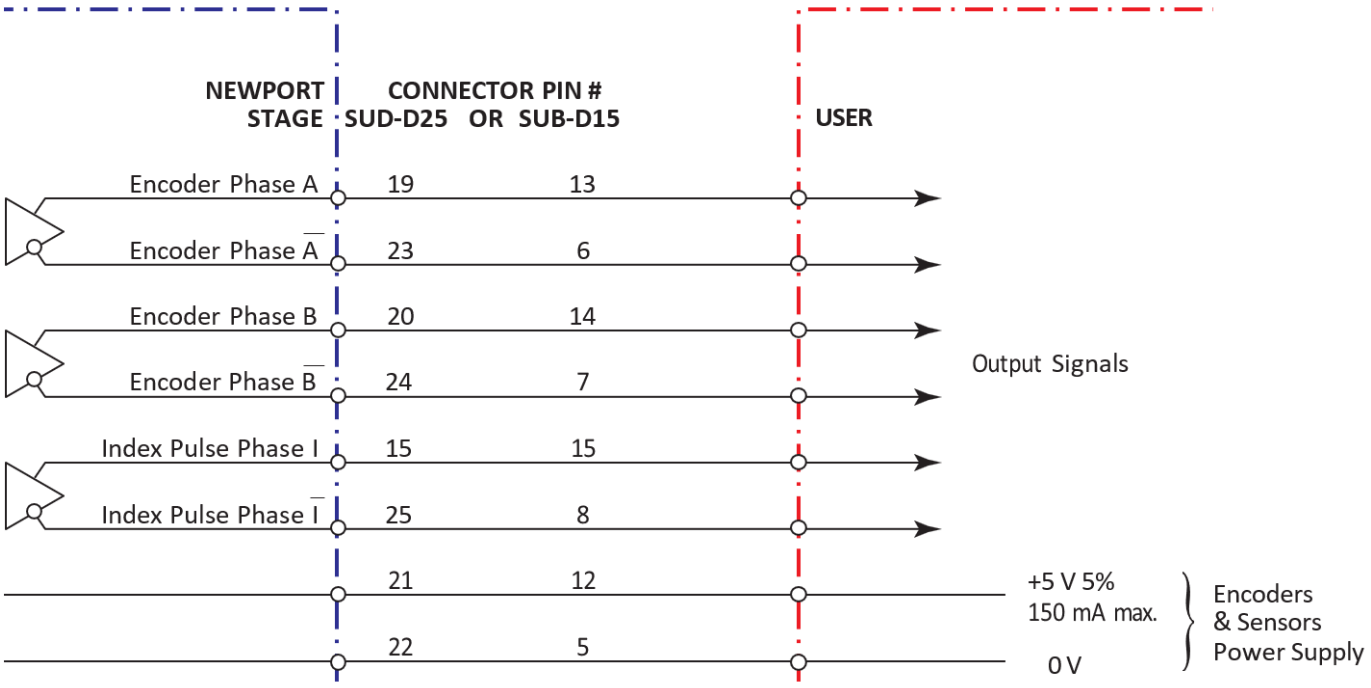
CAUTION

"End-of-Run" and "Mechanical Zero" are active signals and should not be connected to any other source.

7.3 Feedback Signal Position



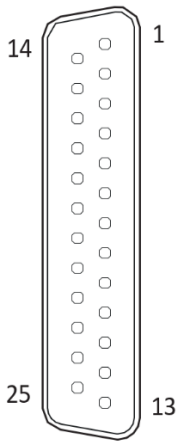
The incremental sensor consists of an optical scale and an encoder head. When the carriage moves, the encoder head generates square signals in quadrature and sends to pins #19, #20, #23 and #24 of the SUB-D25 connector.



"Encoder" and "Index Pulse" are "differential pair" (type RS-422) type output signals.
Using these signals permits a high immunity to noise.
Emission circuits generally used by Newport are 26LS31 or MC3487.
Reception circuits to use are 26LS32 or MC3486.

7.4 Pinouts

The pinout diagram for the IDL280-Z20 stage SUB-D25M connector is shown below.



1	N.C.	14	Shield Ground
2	N.C.	15	Index Pulse I
3	N.C.	16	0 V
4	N.C.	17	+ End-of-Run
5	+ Motor	18	- End-of-Run
6	+ Motor	19	Encoder Phase A
7	- Motor	20	Encoder Phase B
8	- Motor	21	+5 V
9	N.C.	22	0 V
10	N.C.	23	Encoder Phase /A
11	N.C.	24	Encoder Phase /B
12	N.C.	25	Index Pulse /I
13	Mechanical Zero		

8 Connection to Newport Controllers

8.1 Warnings on Controllers

Controllers are intended for use by qualified personnel who recognize shock hazards and are familiar with safety precautions required to avoid possible injury.

Read the controller user's manual carefully before operating the instrument and pay attention to all written warnings and cautions.

WARNING

Disconnect the power plug under the following circumstances:

- **If the power cord or any attached cables are frayed or damaged in any way.**
- **If the power plug is damaged in any way.**
- **If the unit is exposed to rain, excessive moisture, or liquids are spilled on the unit.**
- **If the unit has been dropped or the case is damaged.**
- **If you suspect service or repair is required.**
- **Whenever you clean the electronics unit.**

CAUTION

To protect the unit from damage, be sure to:

- **Keep all air vents free of dirt and dust.**
- **Keep all liquids away from the unit.**
- **Do not expose the unit to excessive moisture (85% humidity).**
- **Read this manual before using the unit for the first time.**

WARNING

All attachment plug receptacles in the vicinity of this unit are to be of the grounding type and properly polarized.

Contact your electrician to check your receptacles.

WARNING

This product is equipped with a 3-wire grounding type plug.

Any interruption of the grounding connection can create an electric shock hazard.

If you are unable to insert the plug into your wall plug receptacle, contact your electrician to perform the necessary alterations to ensure that the green (green-yellow) wire is attached to earth ground.

WARNING

This product operates with voltages that can be lethal.

Pushing objects of any kind into cabinet slots or holes, or spilling any liquid on the product, may touch hazardous voltage points or short out parts.

8.2 Connection

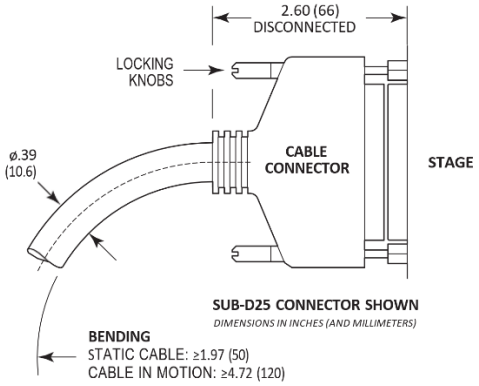
There is a label on every stage indicating its part and serial numbers.

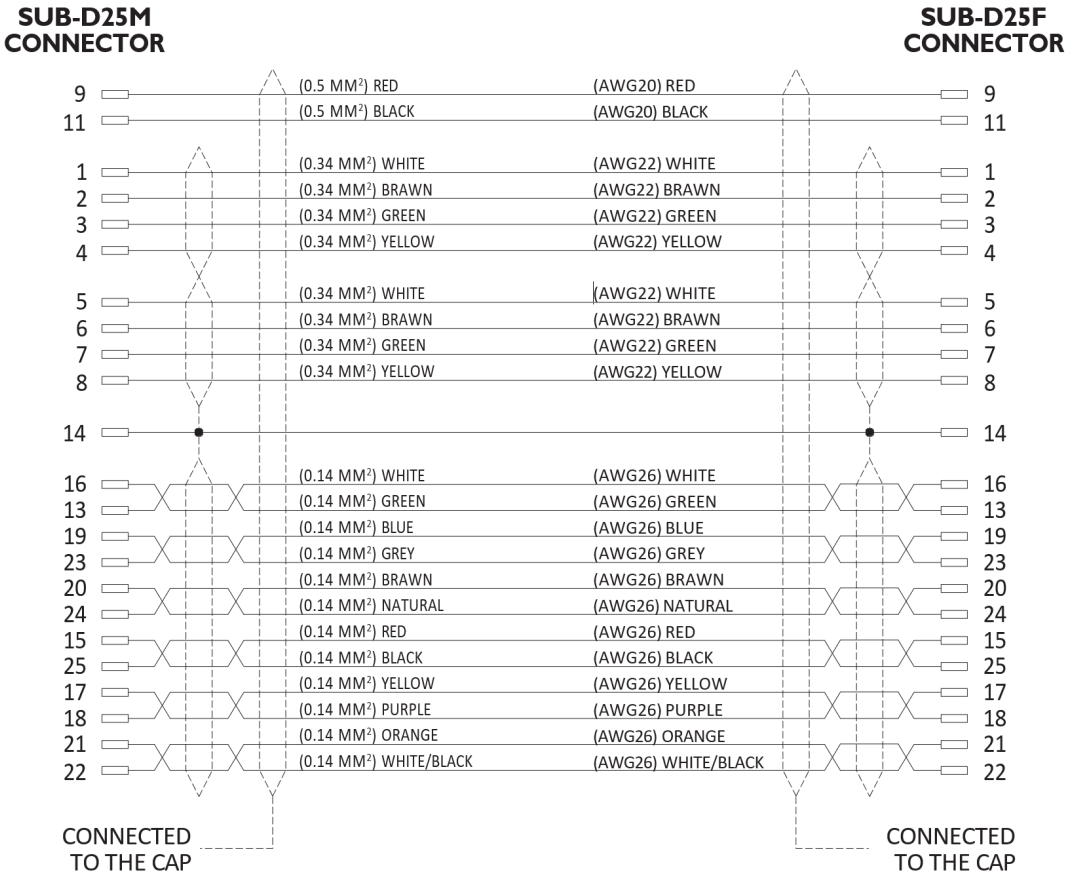
WARNING

Always turn the controller's power OFF before connecting to a stage.

8.3 MMCABLE-3 Cable

A 3-meter MMCABLE-3 cable is supplied with each IDL280-Z20 stage.





WARNING

This cable is shielded correctly. For a correct operation, make sure to lock connectors (ground continuity provided by the cable).

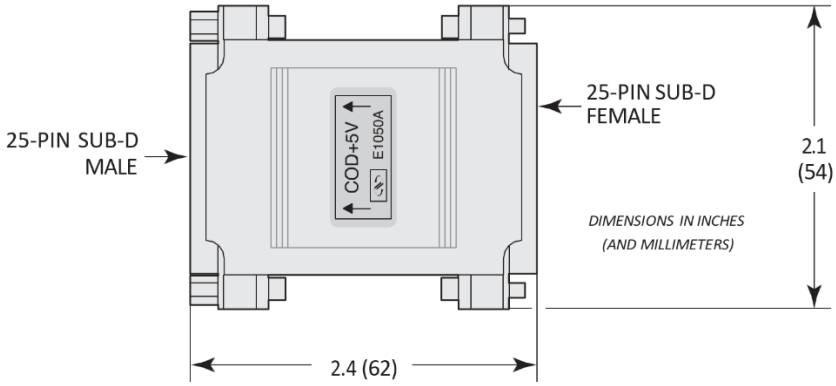
For applications where the standard 3-meter cable (**MMCABLE-3**) included with your rotation stage is not adequate, Newport offers longer length cables designed to ensure the integrity of your positioning application.

These cables are specially shielded and terminated with Newport's standard SUB-D25 connectors. They are available in 5-m (**MMCABLE-5**), 7-m (**MMCABLE-7**) or 10-m (**MMCABLE-10**) lengths.

WARNING

Keep the motor cables at a safe distance from other electrical cables in your environment to avoid potential cross talk.

For cable lengths more than 3 meters, we recommend the **MMCABLE-REG** to ensure a high quality, regulated 5 V supply to the stages.



This regulator is available as an option.

Please note that for best efficiency, this regulator should be attached to the stage to re-adjust the 5 V coming from the controller through the long cable.

9 Connection to Non-Newport Electronics

9.1 Connections

WARNING

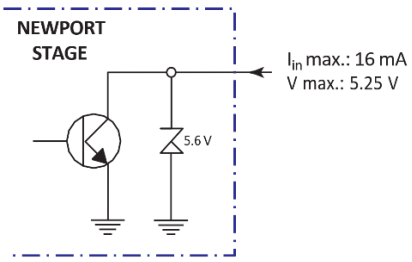
Newport is not responsible for malfunction or damage of IDL280-Z20 stages when used with non-Newport controllers.

WARNING

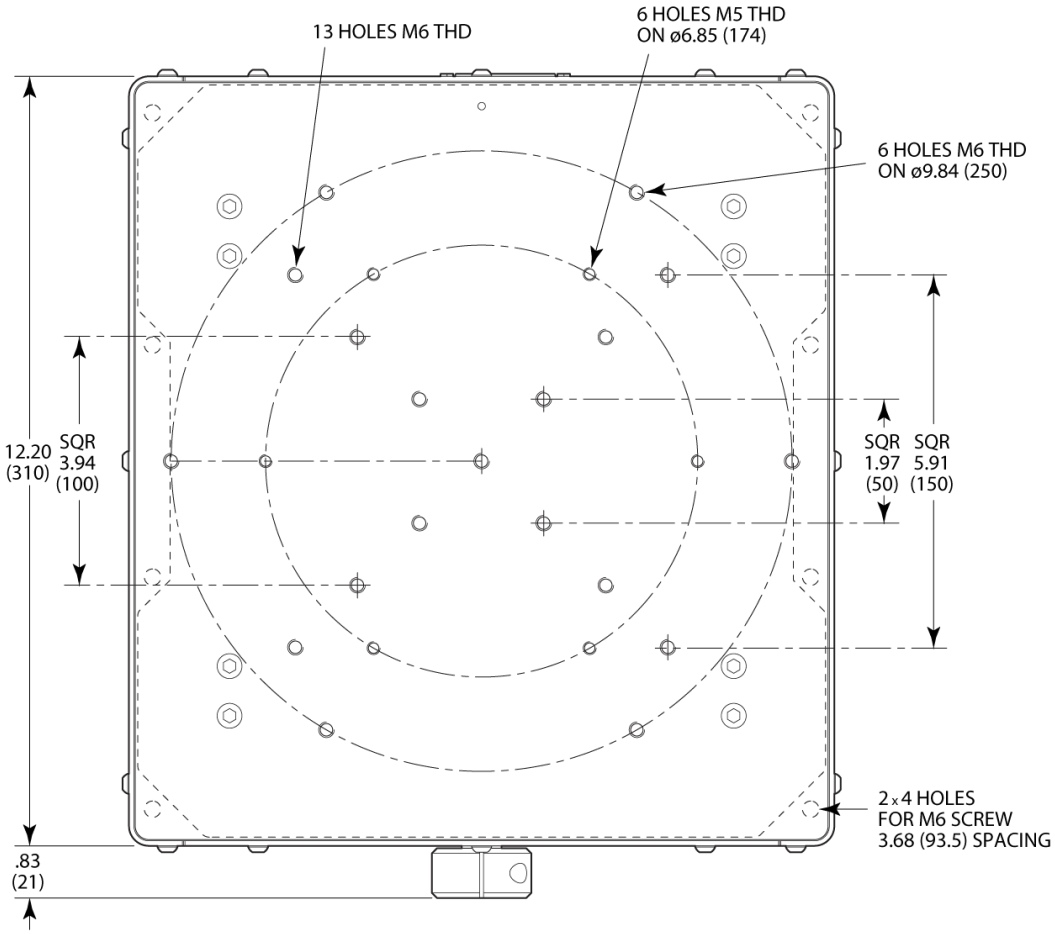
Newport guarantees "CE" compliance of IDL280-Z20 stages only if used with Newport cables and controllers.

It is the customer's responsibility to modify the cable and take care of sensor signal connections, when using the stage with non-Newport controllers.

End-of-Runs and Mechanical Zero are open collector type with a 5.6 V protective Zener diode.



10 Dimensions



MODEL SHOWN: IDL280-Z20

DIMENSIONS IN INCHES (AND MILLIMETERS)

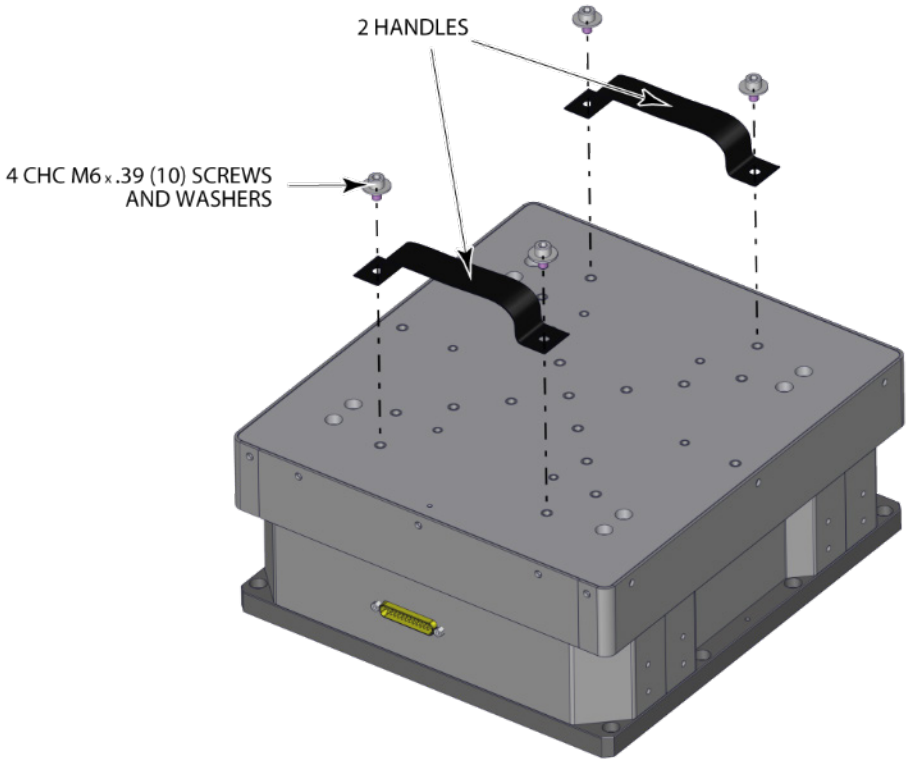
11 Stage Installation

11.1 Unpacking

The IDL280-Z20 stage is delivered in packaging that is designed for safe transport.
Attached to the top plate of the stage are handles for safe removal from packaging.
It is recommended to carefully lift and move the stage from packaging using these handles.

CAUTION

Remove handles before using.



NOTE

An Allen key is supplied for CHC M6 screws.

12 Maintenance

NOTE **Please contact Technical Sales Support team for recommendations on application specific maintenance.**

12.1 Maintenance

The IDL280-Z20 stage requires no particular maintenance. Nevertheless, this is a precision mechanical device that must be kept and operated with caution.

NOTE **The IDL280-Z20 stage must be used or stocked in a clean environment, without dust, humidity, solvents or other substances.**

NOTE **It is recommended to return the stage to Newport for re-lubrication after 2000 hours of use.**

If the IDL280-Z20 stage is mounted on a workstation and cannot be easily removed, please contact Newport's After Sales Service for further instructions.

12.2 Repair

CAUTION

Never attempt to disassemble a component of the stage that has not been covered in this manual.

To disassemble a non specified component can cause a malfunction of the stage.

If you observe a malfunction in your stage, please contact us immediately to arrange for a repair.

CAUTION

Any attempt to disassemble or repair a stage without prior authorization will void your warranty.

12.3 Calibration

CAUTION

It is recommended to return your IDL280-Z20 stage to Newport once a year for recalibration to its original specifications.

Service Form

Your Local Representative
Tel.:
Fax:

Name: _____ Return authorization #: _____
(Please obtain prior to return of item)
Company: _____
Address: _____ Date: _____
Country: _____ Phone Number: _____
P.O. Number: _____ Fax Number: _____
Item(s) Being Returned: _____
Model#: _____ Serial #: _____

Description: _____
Reasons of return of goods (please list any specific problems): _____

Visit MKS I Newport Online at:
www.newport.com

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