TECH

BN Series of Digital Readouts

Model BN6 LED

QU INDUSTRIAL CO.

517 N VIRGINIA AVE., AZUSA CA91702, USA
800-289-5771
626-921-2990
order@eztechdro.com
www.eztechdro.com

EZ TECH DRO

➲ *Preset*
To enter values into the DRO and save them in its memory so they can be recalled when necessary.

➲ *Direct mm/inch conversion via keyboard*

➲ *Absolute, incremental signals*

➲ *Resolution of up to 0.1 microns*

➲ *Linear axis compensation*
The error caused by the axis sag on a machine may be compensated by parameter.

➲ *Calculator function*
To perform mathematical and trigonometric operations and preset any axis with the result of the calculation or use the feedback reading (position values) to carry out mathematical calculations.

➲ *299 SMD reference points*
For part homing and/or tool settings

➲ *Software travel limits*
These limits do not cancel the hardware limits set by the limit switches on the machine, but they give the operator the choice to set other travel limits between the main ones.

➲ *Multi-point compensation*
A multi-point error is an interpretation of an error between two points of the travel; that error may be compensated with the DRO. Up to 20 points along the travel.

Type	Function name	For milling machines and boring mills	For lathes	For grinders	For EDM
Feedback	connection to EIA-422A signals	●	●	●	●
	linear axes	3	3	2	3
	rotating axes	1	0	0	0
	linear compensation	●	●	●	●
	multi-point compensation	20	20	20	20
Display	number of axes	2/3	2/3	2	3
	radius/diameter display	○	●	○	○
	half vaule display	●	○	●	●
	mm/inch conversion	●	●	●	●
	f ne/coarse resolution conversion	●	●	●	●
	absolute/relative display conversion	●	●	●	●
Functions	axis preset	●	●	●	●
	calculator	●	●	●	●
	quick setup	●	●	●	●
	centering workpiece	●	●	●	●
	bolt holes drilling along the circumference	●	○	○	●
	linear drilling	●	○	○	●
	Elliptical drilling	●	○	○	●
	f nd reference	●	●	●	●
	inclined plane machining	●	○	○	○
	smooth R cutting for arc-shaped surface	●	○	○	○
	direct output from relay	○	○	○	●
	storage of references	●	●	●	●
	299 SDM points storage	●	●	●	●
	power off memory	●	●	●	●
	axis zero setting	●	●	●	●

EZ TECH

BN Series of Digital Readouts

Model BN2 LCD

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BN Series of Digital Readouts
Model BN2 LCD

Type	Function name	For milling machines and boring mills	For lathes	For grinders	For EDM
Feedback	connection to EIA-422A signal	●	●	●	●
	linear axes	6	3	2	3
	rotating axes	2	0	0	0
	linear compensation	●	●	●	●
	multi-point compensation	200	40	40	40
Display	7" color TFT screen	●	●	●	●
	number of axes	4/6	3	2	3
	radius/diameter display	○	●	○	○
	half vaule display	●	○	●	●
	mm/inch conversion	●	●	●	●
	f ne/coarse resolution conversion	●	●	●	●
	absolute/relative display conversion	●	●	●	●
	display off	●	●	●	●
Functions	number of zero ponits	200	200	200	200
	number of tools	○	50	○	○
	axis preset	●	●	○	○
	calculator	●	●	●	●
	quick setup	●	●	●	●
	centering workpiece	●	●	●	●
	bolt holes drilling along the circumference	●	○	○	●
	linear bolt holes drilling	●	○	○	●
	grid pattern drilling	●	○	○	●
	f nd zero point	●	●	●	●
	angle measuring	●	●	○	●
	slope calculation	●	○	○	○
	axial processing	○	●	○	○
	transverse processing	○	●	○	○
	on-screen guided help with graphics	●	●	○	●
	inclined plane machining	●	○	○	○
	smooth R cutting for arc-shaped surface	●	○	○	○
	digital f ltering for de-wobbling	○	○	●	●
	gradual rectangular lumen processing	●	○	○	○
	taper measuring	○	●	○	○
	Matching output	○	○	○	●
	storage of zero points	●	●	●	●
	storage of multi-workpiece programs	●	●	●	●
Others	data transport by 485 bus	●	●	●	●
	analog signal output port	○	1	○	○
	digtal signal I/O port	●	●	●	●
	data transport by Bluetooth	●	●	●	●

EZ TECH DRO

- 7" TFT screen for displaying four axes of sensor signal input.
- Programming with the assistance of 2D graph and simulation demonstration.
- Easy and friendly operation interface, personalized background supporting arbitrary combination of 7 colors.
- Data transport by Bluetooth, synchronous display with smart terminals, for the application of multi-windows interactive operation in large equipments.
- 5MHz sampling frequency for each axis of sensor signal inputs.
- I/O ports for programmable inching control.

EZ TECH

EZ TECH

AG Series of Linear Encoders

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Mounting guidelines

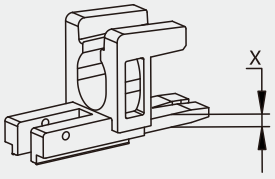
MAGNETIC SCALES WITH LARGE CROSS SECTION
-AG6333A/AG6333AC

Mounting direction
Magnetic scales with large cross section should be fastened to a machined surface over their entire length. This gives them a high vibration rating. The linear encoder is mounted with the sealing lips directed downward or away from splashing water.

Mounting read header
The read header of linear encoder is mounted on a processed or unprocessed machine guideway with the help of two read header locating seats. The read header locating seats should be removed when the mounting is completed.

Generally, the cable import points to the direction in which when the read header moves, the scale outputs these signals described in the Section Interface (also shown in the following pictures in the model details). If limited by the mounting space, the cable import could point to the other direction. The read header could be also mounted by a set of T-shape brackets (optional).

Accessories:
Read header locating seats



Model	x(mm)
AG6333A	3.90
AG6333AC	3.90

Protection
Linear encoders fulfill the requirements for **IP54** protection according to **EN 60 529** or **IEC 60 529** provided that they are mounted with the sealing lips facing away from splash water.

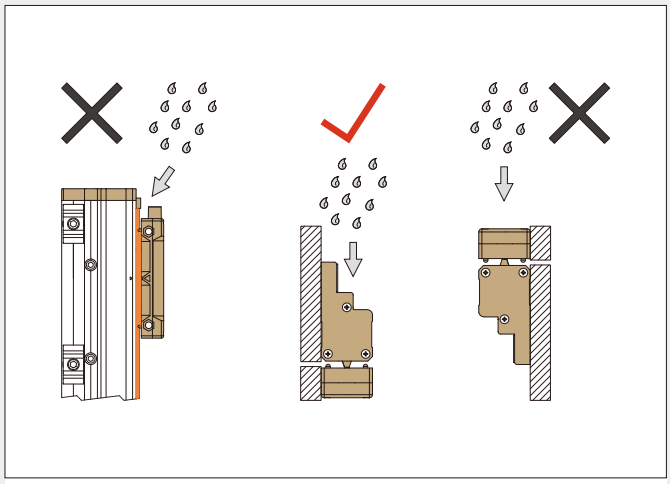
Direct mounting
It is very simple to mount the **EZ TECH** `s linear encoders with slimline scale housing or standard scale housing: You need only to align the scale unit at two points along the machine guideway. Stop surfaces or stop pins can also be used for this.

The locating seats already set the proper gap between the scale unit and the scanning unit (read header), as well as the lateral tolerance.

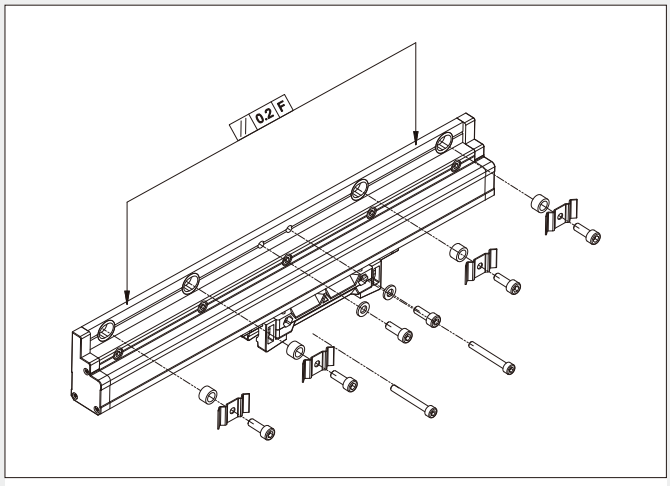
If the locating seats need to be removed before mounting due to a lack of space, the gauge is used to set the gap easily and exactly between the scale and the read header, according to the x value of the locating seat. Lateral tolerances must also be maintained.

Mounting the multi-section
The AG6333A and AG6333AC with measuring length over 4400 mm are mounted on the machine in individual sections:
1.Mount and align the individual housing sections;
2.Pull in the magnetic tape over the entire length;
3.Lubricate the sealing lips and pull them in and fix it;
4.Insert the read header with the help of read header locating seats.

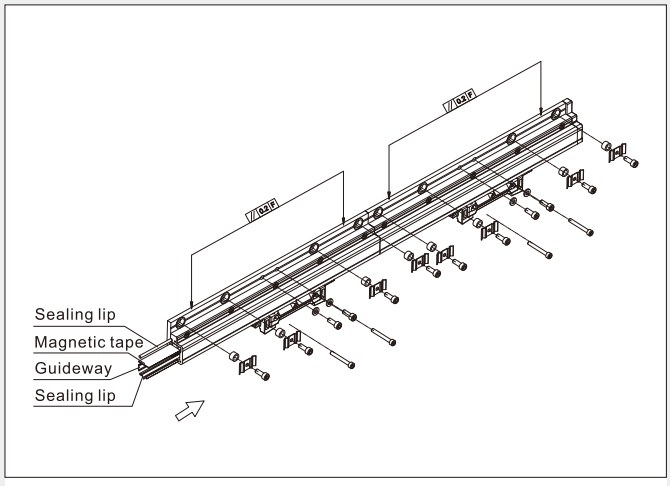
Accessories:
Read header locating seats
Sealing lips



Mounting direction of scale with large cross section



Mounting scale with large cross section directly



Mounting the multi-section

EZ TECH

AG Series of Linear Encoders

Interfaces

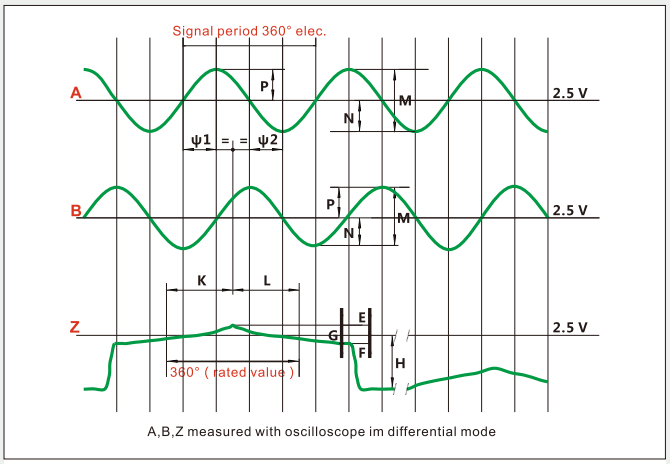
INCREMENTAL SINUSOIDAL SIGNALS~ 1 Vpp

EZ TECH`s linear encoders with ~1 Vpp output signals provide highly interpolable voltage signals.

The sinusoidal incremental signals A and B are phaseshifted by 90° elec. and have amplitudes of typically 1 Vpp.

The illustrated sequence of output signals - with B lagging A - applies for the direction of motion where the cable ponits in the front view of all scale series for numerically controlled machine tools .

The reference mark signal Z has an unambiguous assignment to the incremental signals. The output signal might be somewhat lower next to



Sinusoidal signals ~1 Vpp

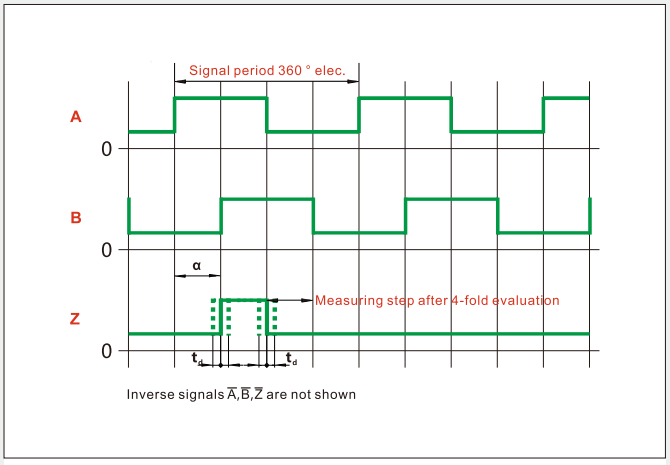
INCREMENTAL EIA-422A SIGNALS

EZ TECH`s linear encoders with EIA-422A signals incorporate electronics that digitize sinusoidal scanning signals with or without interpolation.

The incremental signals are transmitted as the square-wave pulse trains A and B, phase-shifted by 90° elec. The reference mark signal consists of one or more reference pulses Z, which are triggered by the incremental signals. In addition, the integrated electronics produce their inverted signals $\overline{A}$, $\overline{B}$ and $\overline{Z}$ for noise-proof transmission.

The illustrated sequence of output signals - with B lagging A - applies for the direction of motion where the cable ponits in the front view of all scale series for manually controlled machine tools .

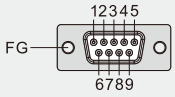
The distance between two successive edges of the incremental signals A and B through 1-fold, 2-fold or 4-fold evaluation is one measuring step.



Incremental EIA-422A signals

Pin	1	2	3	4	5	6	7	8	9
Signal	$\overline{A}$	**0V**	$\overline{B}$	**Vacant**	$\overline{Z}$	**A**	**+5V**	**B**	**Z**
Color	Greenblack	Black	Orangeblack	FG	Whiteblack	Green	Red	Orange	White

Sinusoidal signals output with 9-pin D-sub connecter
EIA-422A signals output with 9-pin D-sub connecter



FG: Cable shield connected to housing
Sensor: The sensor line is connected in the encoder with the corresponding power line
Vacant pins or wires must not be used!

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AG Series of Linear Encoders

QU INDUSTRIAL CO. (EZ TECH, for short) has two series of linear encoders, magnetic scales and glass grating scales. Both series have models for **numerically controlled** and **manually controlled machine tools**.

Linear encoders can be used nearly everywhere. They are ideal for machines and other equipment whose feed axes are in a servo loop, such as milling machines, machining centers, boring machines, lathes, grinding machines, presses machines, bending machines, automation and production equipments.

Linear encoders predestine themselves for use on highly-dynamic conventional axes as well as on direct drives with the beneficial dynamic behavior, the high permissible traversing speed and the acceleration in the direction of measurement.

ADVANTAGES OF LINEAR ENCODERS

Linear encoders measure the position of linear axes without additional mechanical transfer elements. The position control loop with a linear encoder includes the entire feed mechanics.

Transfer errors from the mechanics can be detected by the read header of linear encoder, and corrected by the control electronics. Therefore, this makes it possible to eliminate several potential error sources:

1.Positioning error due to thermal behavior of the recirculating ball screw
2.Backlash error
3.Kinematics error through ball-screw pitch error

Therefore, linear encoders are indispensable for machine tools with high positioning accuracy and a high machining rate.

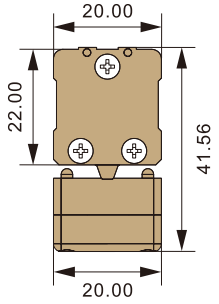
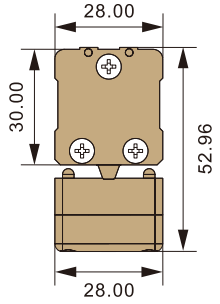
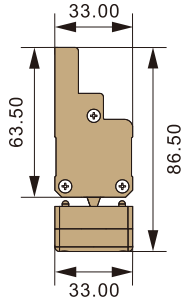
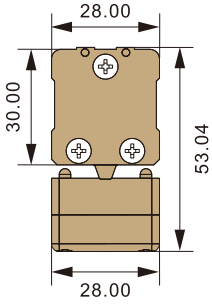
MECHANICAL STRUCTURE

EZ TECH`s linear encoders are sealed scales: An aluminum housing protects the magnetic tape or glass grating, read header and its guideways from chips, dust, and fluids. Downward-oriented elastic lips seal the housing.

The read header travels along the scale on a low-friction guide. The main part of read header is fixed to the machine guideways. The connecting structure between the main part and slide car of the read header compensates the misalignment between the scale and the machine guideways.

Depending on the encoder model, lateral and axial offsets of ±0.2 mm to ±0.3 mm between the scale and mounting block are permissible.

Selection guide

Type	Magnetic scale with slimline scale housing	Magnetic scale with standard scale housing	Magnetic scale with large-section scale housing		Glass grating scale with standard scale housing	
Scanning principle	MR effect scanning principle	MR effect scanning principle	MR effect scanning principle		Single-field photoelectricity scanning	
Accuracy grade	±4μm/m	±4μm/m	±4μm/m		±5μm/m	
Cross section						
Series	**AG2220A**	**AG3028A**	**AG6333A**	**AG6333AC**	**AG3028B**	**AG3028BC**
Interface	EIA-422A	EIA-422A	EIA-422A	~ 1Vpp	EIA-422A	~ 1Vpp
Application	manually controlled machine tools	manually controlled machine tools	manually controlled machine tools	numerically controlled machine tools	manually controlled machine tools	numerically controlled machine tools
Resolution	5/1/0.5μm	5/1/0.5μm	5/1/0.5μm	—	5μm	—
Incremental signal period	1000μm	1000μm	1000μm		20μm	
Measuring length (ML)	70-720mm	170-1920mm	1100-3000mm (Over 50m upon request)		170-1420mm	

EZ TECH

AG Series of Linear Encoders

Measuring principles

GLASS GRATING SCALE

EZ TECH`s glass grating scale bases on the photoelectric scanning principle for the incremental measurement.

Photoelectric scanning of a measuring standard is contact-free, and as such, free of wear. This method detects even very fine lines, about 20 micrometers wide, and generates output signals with very small signal periods.

As the figure on the right shown, the imaging scanning principle bases projected light signal generation:
Two gratings with equal or similar grating periods are moved relative to each other - the scale grating and the index grating. The carrier material is transparent glass for the index grating and the scale graduation as the measuring standard .

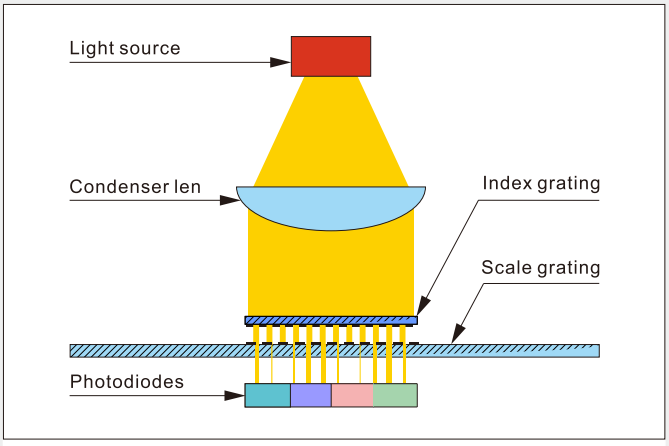
When parallel light passes through a grating, light and dark surfaces are projected at a certain distance. When the two gratings move relative to each other, the incident light is modulated. If the gaps in the gratings are aligned, light passes through. If the lines of one grating coincide with the gaps of the other, no light passes through.

An array of photodiodes convert these variations in light intensity into electrical signals. The specially structured grating of the index grating filters the light to generate nearly sinusoidal output signals. The smaller the period of the grating structure is, the closer and more tight-tolerance the gap must be between the index grating and scale grating.

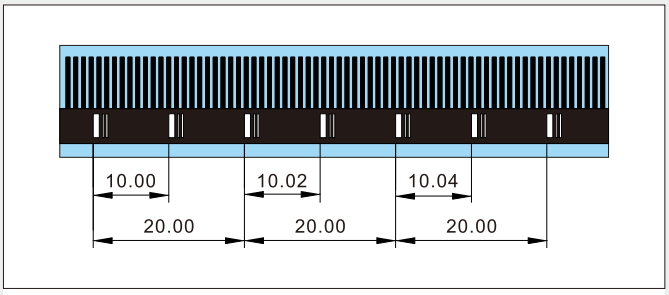
The measure standard of glass grating scale is periodic grating. With specially developed photolithographic technologies, these graduations are applied to a quartz glass substrate by hard chromium plating. The position information is obtained by counting the individual increments (measuring steps) from some point of origin. the glass grating has an additional track that bears a reference mark.

The absolute position on the scale, established by the reference mark, is gated with exactly one signal period. The reference mark must be scanned to establish an absolute reference or to find the last selected datum. In the most unfavorable case this may necessitate machine movements over large lengths of the measuring range.

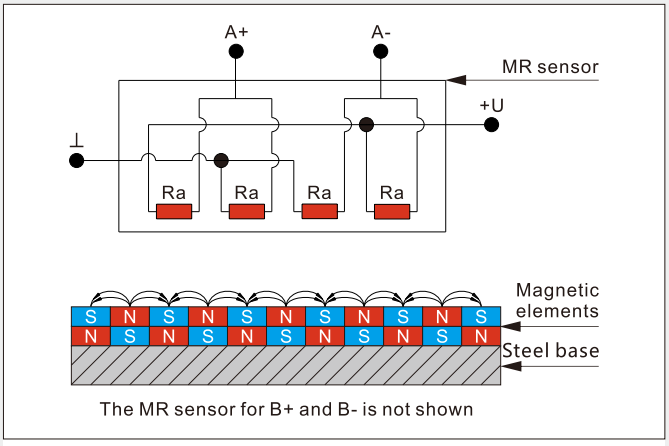
To speed and simplify such “reference runs”, **EZ TECH**`s glass grating scales has multiple distance-coded reference marks which are individually spaced according to a mathematical algorithm.



Imaging photoelectric scanning principle



Schematic representation of an incremental graduation with distance-coded reference marks



MR effect scanning principle

MAGNETIC SCALE

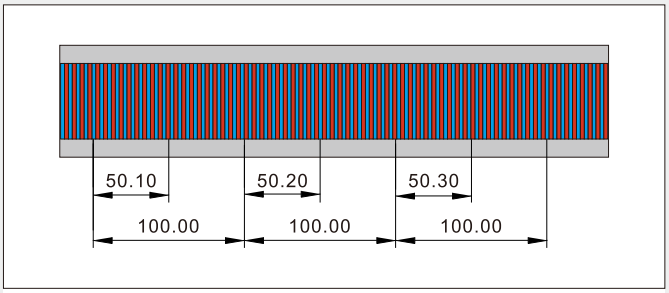
EZ TECH`s magnetic scales base on the MR effect scanning principle for the incremental measurement. The high precision magnetic tapes and MR sensors are made in Germany. The high precision magnetic tapes act as the measuring standard, with very reliable precision positioning signal storage system made by metal magnetic powder.

The north pole and south pole of magnetic elements are arranged alternately along the magnetic tape.

The resistance value of the MR sensor changes when the magnetic field acting on the sensor changes during its scanning process along the magnetic tape. This change in resistance value is read by scale electronics.

For AG6333AC applied in numerically controlled machine tools, the absolute reference marks are coded in the method shown in the picture on the right.

For magnetic scales applied in manually controlled machine tools, AG2220A has one absolute reference mark in the scale center; AG3028A has two absolute reference marks located near two scale ends respectively; AG6333A has three absolute reference marks located in the scale center and near two scale ends respectively.



Schematic representation of a magnetic tape with distance-coded reference marks

Mounting guidelines

LINEAR ENCODERS WITH SLIMLINE SCALE HOUSING OR STANDARD SCALE HOUSING

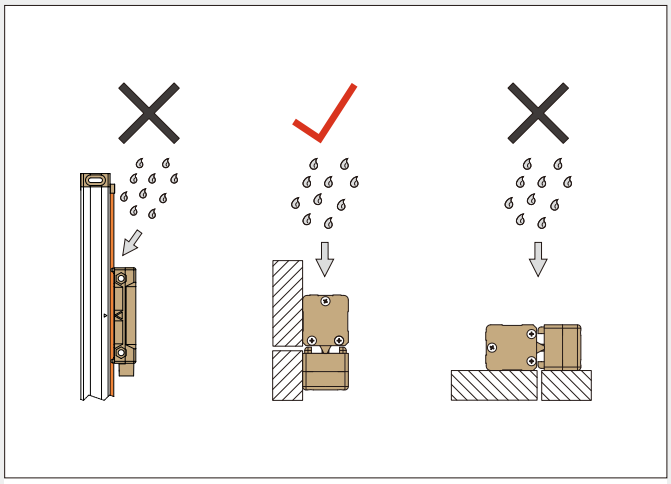
-AG2220A/AG3028A/AG3028B/AG3028BC

Mounting direction

Linear encoders with slimline scale housing or standard scale housing should be mounted with the sealing lips directed downward or away from splashing water.

Mounting read header

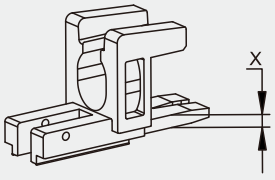
The read header of linear encoder is mounted on a processed or unprocessed machine guideway with the help of two read header locating seats. The read header locating seats should be removed when the mounting is completed. Generally, the cable import points to the direction in which when the read header moves, the scale outputs these signals described in the Section Interface (also shown in the following pictures in the model details). If limited by the mounting space, the cable import could point to the other direction. The read header could be also mounted by a set of T-shape brackets (optional).



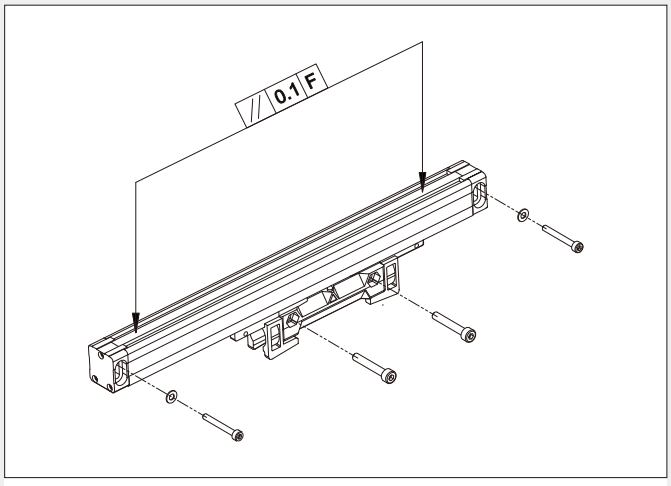
Mounting direction of scale with slimline scale housing or standard scale housing

Accessories:

Read header locating seats



Model	x(mm)
AG2220A	3.86
AG3028A	3.46
AG3028B	4.00
AG3028BC	4.00



Mounting scale with slimline scale housing or standard scale housing directly

Protection

Linear encoders fulfill the requirements for **IP54** protection according to **EN 60 529** or **IEC 60 529** provided that they are mounted with the sealing lips facing away from splash water.

Direct mounting

It is very simple to mount the **EZ TECH**`s linear encoders with slimline scale housing or standard scale housing: You need only to align the scale unit at two points along the machine guideway. Stop surfaces or stop pins can also be used for this. The locating seats already set the proper gap between the scale unit and the scanning unit (read header), as well as the lateral tolerance.

If the locating seats need to be removed before mounting due to a lack of space, the gauge is used to set the gap easily and exactly between the scale and the read header, according to the x value of the locating seat. Lateral tolerances must also be maintained.

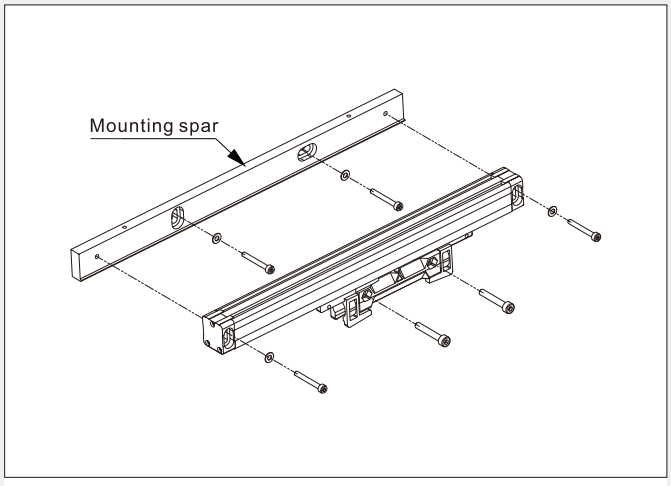
Along with the standard procedure of using two screws to mount the scale unit on a plane surface, there is another mounting method:

Installation with mounting spar

Mounting the scale with a mounting spar can be especially beneficial. It can be fastened as part of the machine assembly process. The scale is then simply clamped on during final mounting. Easy exchange also facilitates servicing. A mounting spar is recommended by **EZ TECH** for highly dynamic applications with measuring length greater than 620 mm. It is always necessary for measuring length starting from 1020 mm.

Accessories:

AG2220A or AG3028A mounting spar
Read header locating seats



Mounting scale with a mounting spar

EZ TECH

AD Series of Grating Angle Encoders

QU INDUSTRIAL CO.

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Interfaces

Incremental sinusoidal signals～1 Vpp

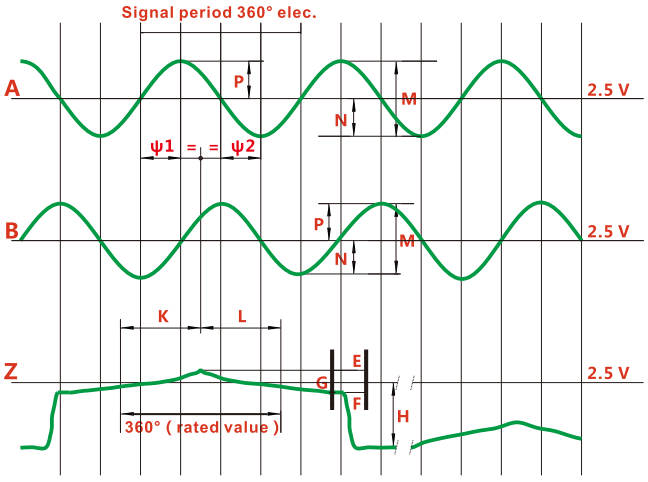
EZ TECH's grating angle encoders with ～1 Vpp interface provide voltage signals which can be highly interpolated.

The sinusoidal incremental signals A and B are phase-shifted by 90° elec. and have an typically amplitude of 1 Vpp. The dimension drawing as following shows output signals B are lagging behind A. And this sequence also applies for the illustrated direction of motion.

The reference point signal Z has two types: single signal per cycle and multi signals per cycle.

A usable component G of approximate 0.6-1 V.

Next to the reference point, the output signal can be reduced by up to 1.7 V to a quiescent level H. This must not cause the subsequent electronics to overdrive.



A,B,Z measured with oscilloscope im differential mode

Sinusoidal signals ～1 Vpp

Input circuitry of the subsequent electronics

Dimensioning

Operational amplifier TL072 or MC34074
Zo = 12 Ω
R1 = 10 kΩ and C1 = 100 pF
R2 = 34.8 kΩ and C2 = 10 pF
Ub = ± 15 V
U1 approximate equal to Uo

-3dB cutoff frequency of circuitry

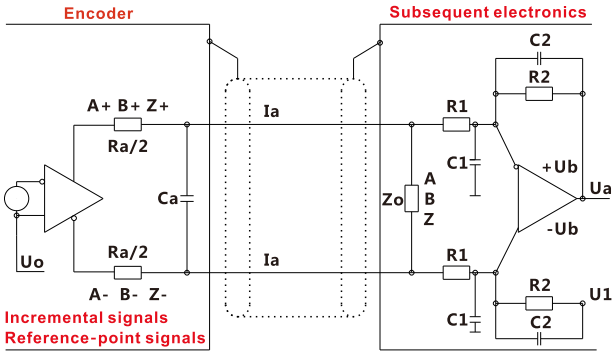
Approximate 450 kHz
Approximate 50 kHz, C1 = 1000 pF and C2 = 82 pF
The circuit with reduced the bandwidth improves its noise immunity.

Circuit output signals

Ua = 3.48 Vpp typically. Gain3.48。

Incremental signal monitoring

Signals with a threshold sensitivity of 250 mVpp are used to monitor the incremental signals ～1 Vpp.



Ra<100 Ω, typically 24 Ω Ca<50 pF ΣIa<1 mA
Uo=2.5 V±0.5 V (relative to 0 V of the power supply)

Input circuitry of the subsequent electronics

Unless otherwise indicated, all angle encoders of EZ TECH meet protection standard IP 54 according to GB4208 or IEC 60 529. The housings and cable outlets provide protection to IP 64. Splash water should not contain any substances that would have harmful effects on the encoder parts.

AD60i, AD40i, AD20i angle encoders are equipped with a compressed air inlet. Connection to a source of filtered compressed air slightly above atmospheric pressure can improve the protection to IP 64.

AD Series of Grating Angle Encoders

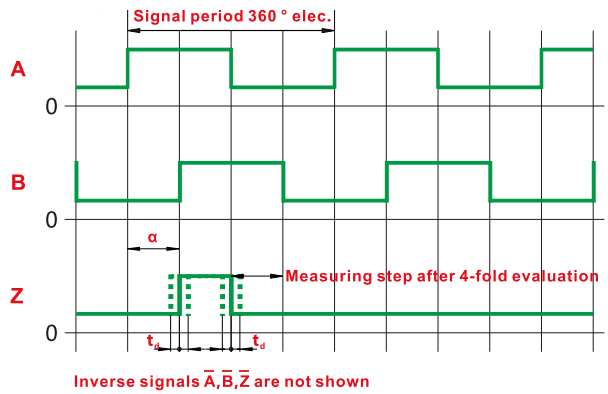
Interfaces

Incremental EIA-422A signals

The output signals are created by the sinusoidal signal digital electronic interpolation circuit which is incorporated in the angle encoders of **EZ TECH**. The maximum position pulses per circle are 7200000 and 3600000 respectively.

The incremental signals are transmitted as the square-wave pulse trains A and B, with 90° electronic angle phase-shifted. The reference point signal consists of one or more reference pulses Z, which are triggered by the incremental signals. Moreover, the integrated electronics produce their inverted signals $\overline{A}$、$\overline{B}$ and $\overline{Z}$ for noise-proof transmission. The dimension drawing as following shows output signals B are lagging behind A. And this sequence also applies for the illustrated direction of motion.

The permissible cable length for transmission of the EIA-422A signals to the subsequent electronics depends on the edge separation α. The maximum cable length is 100 m, and the maximum cable length for the fault detection signal is 30 m. However, the precondition is ensuring the power supply to the encoder. The sensor lines can be used to measure the voltage at the encoder. And if required, customers can correct it with an automatic control system (remote sense power supply).

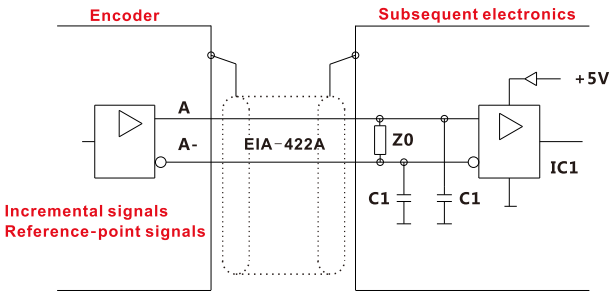


Incremental EIA-422A signals

Input circuitry of the subsequent electronics

Dimensioning

IC1 = Recommended differential line receiver
AM 26 LS 32
Only for α＞0.1 µs;
and available IC;
DS 26 C 32 AT
MC 3486
Z0 = 120 Ω
C1 = 220 pF (serves to improve noise immunity)



Input circuitry of the subsequent electronics

Connecting cable

	Connecting Cable				Incremental Signals					
Definition	+5 V	Sensor +5 V	0 V	Sensor 0 V	A+	A-	B+	B-	Z+	Z-
Color	redgray	red	orangegray	orange	green	greengray	blue	bluegray	white	whitegray

*** The housing shield the encoder from external disturbance. Vacant pins or wires must not be used!**

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AD Series of Grating Angle Encoders

Application

Angle encoders are the typically encoders with an accuracy of ± 5 ″ or better and a line count above 10,000. In contrast, rotary encoders are typically the encoders with an accuracy less than ± 10 ″.
Angle encoders are generally applied in precision angular measurements requiring an accuracy within several arc seconds.

Application:
– Rotary tables on CNC machine tools
– Swivel heads on CNC machine tool
– C-axis of CNC lathes
– CNC measuring machines for gears
– Robot joints with high accuracy
– Astronomical telescope

The main mechanical components of angle encoders include:
integral bearing、**hollow shaft** and **integrated shaft coupling**.

Because of the design and mounting of the integrated shaft coupling, it must absorb only the torque caused by friction in the bearing during angular acceleration of the shaft.
Therefore AD series of angle encoders provide excellent dynamic performance.
With an integrated shaft coupling, the stated system accuracy also includes deviations from the shaft coupling.

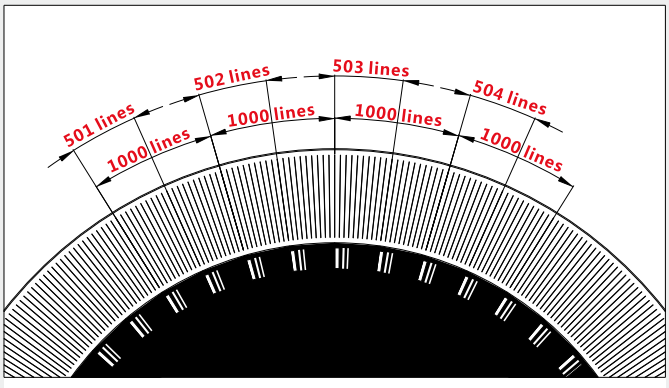
Other advantages:
– Simple installation;
– Compact size for limited installation space;
– Hollow shaft diameters up to 60 mm, to provide space for power lines and hydraulic pipes etc.

Incremental measurements

The measuring standards of **EZ TECH**'s angle encoders are based on the high precision gratings with periodic graduations. With several specially developed photolithographic technologies, these graduations are applied to a quartz glass substrate by hard chromium plating. The gratings have a high homogeneity and definition of the line edges. Together with the photoelectric scanning method, the high edge definition is a precondition for the high quality of output signals. Glass gratings are primarily used in encoders for speeds below 1 500 rpm.

The specification of **EZ TECH**'s gratings:
36000 lines/circle
18000 lines/circle

Each EZ TECH's angle encoder is prepared for individual calibration before delivery, and is guaranteed as the high accuray standerd of **EZ TECH**.



Schematic representation of a circular grating with distance-coded reference marks

With the incremental measuring method, the graduation consists of a periodic grating structure. The position information is obtained by counting the individual increments (measuring steps) from some point of origin. Since an absolute reference point is required to ascertain positions, the gratings are provided with an additional track that bears an absolute reference point. The absolute position on the grating, established by the absolute reference point, is gated with exactly one measuring step. The reference mark must therefore be scanned to establish an absolute position.

EZ TECH's gratings for the incremental measuring method have two type: single reference point type and multi reference points type. For the single reference point type, it may maximally require rotation by 360° for ascertaining the absolute position. The multi reference points type has a certain number of distance-coded reference points. The distance between two successive reference points is accordance with a certain mathematical calculation. The subsequent electronics can find the absolute position after scanning two successive reference points (maximum ＞5 ° or ＞10 ° is required respectively).

With distance-coded reference points, the absolute position is calculated by counting the signal periods between two reference points and using the following formulas:

$$\alpha_1 = (absA - sgnA - 1) \times 1/2 + (sgnA - sgnD) \times absM_{RR}/2$$

Where:
A=(2×absMRR-I)/GP
α_1=Absolute angular position of the first scanned reference point to the zero position in degrees.
abs=Absolute value
sgn=Sign function (“+1” or “-1”)
$\mathbf{M_{RR}}$=Measured distance between the scanned reference points in degrees
I=Nominal increment between two fixed reference points (see the right table)
GP=Grating period (360°/line count)
D=Direction of rotation (+1 or -1)
counterclockwise rotation results in “+1”(when viewing from the front side of the angle encoder).

Line count	Number of reference marks	Nominal increment I
36000	72, 36	5°, 10°
18000	72, 36	5°, 10°

EZ TECH

Mechanical component types and mounting

Mechanical component types

AD60i, AD40i, AD20i angle encoders include integral bearings, hollow shafts and integrated shaft couplings. The measured shaft is directly connected to the hollow shaft of the angle encoder. During mounting, the reference point can be assigned to a desired angular position of the measured shaft from the rear of the encoder.

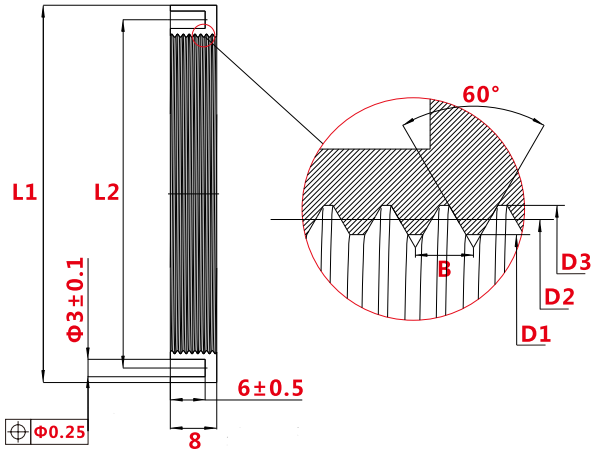
The grating and other main mechanical components are rigidly fastened to the hollow shaft in the angle encoder. The scanning unit is fixed on ball bearings and is connected to the housing with the integrated shaft coupling. During angular acceleration of the shaft, the shaft coupling must absorb only that torque caused by friction in the bearing. Therefore, angle encoders with integrated shaft coupling provide excellent dynamic performance.

Mounting

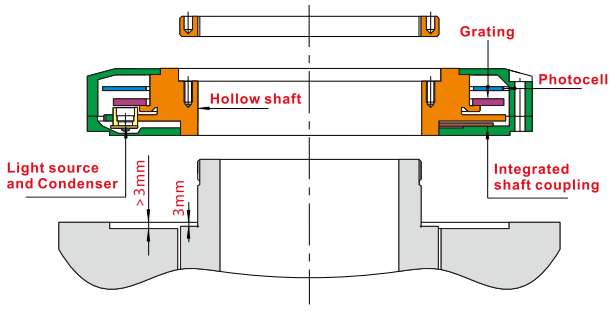
There are two recommended mounting methods for AD60i, AD40i, AD20i angle encoders. One is mounting with a shaft coupling fastened by ring nut. The other is mounting with a shaft coupling by the front end. Customers can select either suitable mounting method according to the mechanical structure of the products.

Shaft coupling fixed with ring nut

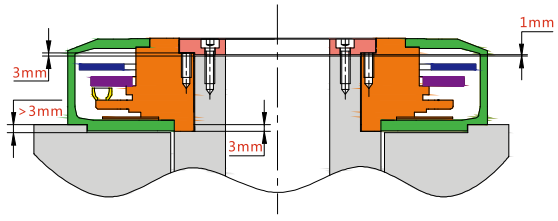
AD60i、AD40i、AD20i angle encoders have a hollow through shaft. For installation, the angle encoder is placed over the machine shaft through the hollow shaft, and is fixed with a ring nut from the front of the encoder.



Cutaway view of ring nut



Cutaway view of mounting
an angle encoder with a ring nut



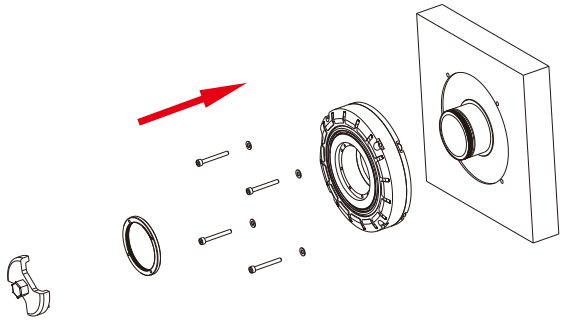
Cutaway view of mounting an angle encoder
with a shaft coupling by the front end

Mounting tool for ring nuts and its usage

A mounting tool is used for tightening ring nut. The ring nut is fastened to the hollow shaft with the mounting tool. The constant torque wrench must be used during tightening with the torque no less than 22 Nm, and no more than 25 Nm.

Ring nuts for AD series of angle encoders

EZ TECH offers special ring nuts for AD60i, AD40i, AD20iangle encoders with integral bearing, which are optional products. Customers can produce the ring nuts by themselves according to the technical drawing on the right. Choose the tolerance of the shaft thread so that the ring nut can be tightened easily, with a minor axial play. This guarantees that the load is evenly distributed on the shaft coupling connected with the hollow shaft of the encoder, and prevents distortion from the hollow shaft.



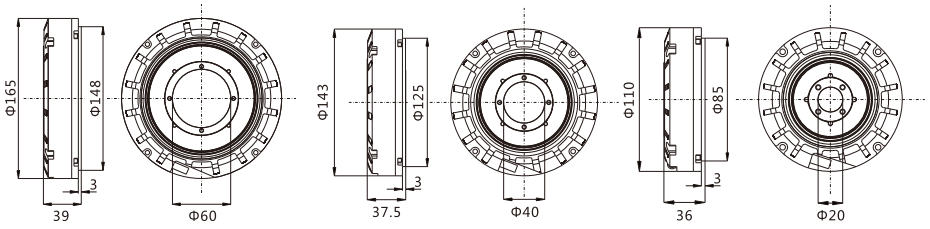
Mounting an angle encoder with ring nut

Ring nuts for the hollow shafts Φ60、Φ40、Φ20 (unit: mm)

Hollow shafts	L1	L2	D1	D2	D3	B
Φ60	Φ74.0 ± 0.2	Φ68.0	$\Phi58.376^{+0.190}_{0.000}$	$\Phi59.026^{+0.132}_{0.000}$	Φ60.000	1.5
Φ40	Φ54.0 ± 0.2	Φ48.0	$\Phi38.376^{+0.190}_{0.000}$	$\Phi39.026^{+0.132}_{0.000}$	Φ40.000	1.5
Φ20	Φ34.0 ± 0.2	Φ28.0	$\Phi18.917^{+0.150}_{0.000}$	$\Phi19.350^{+0.100}_{0.000}$	Φ20.000	1

AD Series of Grating Angle Encoders

Technical parameters

Model	AD60i	AD40i	AD20i
Dimensions(mm)			
System accuracy	± 3 ″, ± 5 ″	± 3 ″, ± 5 ″	± 3 ″, ± 5 ″
Recommended measuring step	0.36″, 0.18″	0.36″, 0.18″	0.36″
Electrical permissible speed	800 rpm	800 rpm	800 rpm
Linecount	36000, 18000	36000, 18000	18000
Shaft dimension	60 mm	40 mm	20 mm
Starting torque	≤0.5 Nm(under20℃)	≤0.3 Nm(under20℃)	≤0.07 Nm(under20℃)
Moment of inertia of rotor	1×10^{-3} kg•m^2	6×10^{-4} kg•m^2	1×10^{-4} kg•m^2
Weight	2.2 kg	1.6 kg	0.9 kg
Position pulses per circle	7200000, 3600000	7200000, 3600000	3600000
Reference point	Single reference point /Multi reference points(72, 36)	Single reference point /Multi reference points(72, 36)	Single reference point /Multi reference points(36)
Clock frequency	≤5 MHZ		
Calculation time t_{cal}	5 μs		
Incremental signals	~ 1 Vpp sinusoidal wave and EIA-422A		
Cutoff frequency 3dB	> 180 kHz		
Power supply with out loa	3.7-5.2V/maximum 350 mA		
Maximum cable length	100 m		
Mechanically permissible speed	≤3000 rpm		
Natural frequency	> 1200 Hz		
Permissible axial play of measured shaft	±0.1 mm		
Vibration 55-2000Hz	≤100 m/s^2 (GB/T2423.10)		
Shock 6ms	≤1000 m/s^2 (GB/T2423.5)		
Operating temperaturea	0-50 ℃		
Protection	IP 54		

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