Netzer
Precision Position Sensors

ABSOLUTE ROTARY ENCODERS

Moving. Precisely. With You.

PRECISION IN MOTION

The Electric Encoder™ line of capacitive absolute rotary encoders patented by Netzer Precision Position Sensors.

The line of the robust and reliable Electric Encoders includes either analog and digital, standard or customized, high-performance absolute rotary encoders which are suitable for applications ranging from aerospace and defense, harsh environment, to industrial, medical and automotive applications.

The Electric Encoder's unique hollow-shaft contactless structure meets the minimum possible space requirements and enhances reliability by eliminating degradation and failure mechanisms.

The advanced Electric Encoders accurate position-sensing and their high-end features makes them a leading sensor for integration with modern motion control applications, meeting the most strict requirements.

THE ELECTRIC ENCODER'S BENEFITS

Functional

- Accurate Absolute Position
- High Resolution
- Smooth Speed Control
- Low Temperature Drift

Structural

- Low Profile
- Hollow Shaft
- Floating Rotor
- Low Weight & Inertia

Environmental

- Extreme Temperatures
- Shock and Vibration Tolerance
- Tolerance to EMI / RFI
- Immunity to Magnetic Fields

ABSOLUTE ROTARY ENCODER

DESIGNED TO MEET THE MOST DEMANDING REQUIREMENTS

HARSH ENVIRONMENT

Netzer's Electric Encoder™ meets the requirements of most harsh environment aerospace and defense applications. The absolute rotary encoders, contactless core with its holistic structure is extremely durable and resistant to vibrations and shocks. The low profile, hollow shaft structure, suits compact, high-density designs, and can withstand both extreme cold or hot temperature range while providing an accurate position feedback.

INDUSTRIAL AUTOMATION

The highly compact and low-profile design of the Electric Encoder™ family is a perfect fit into the demanding design of robotic joints and multi-axis accurate automated machinery. It can be used for position feedback while enabling the passage of leads through the hollow shaft, as well as for optimizing the commutation of frameless motors.

MEDICAL ROBOTICS

The Electric Encoder™ family is inherently immune to magnetic fields and surgical energy, easy to integrate and offer a cost-effective, precise, and reliable position sensor to be used in the design of medical robotics, medical machines, and other automation applications. As a result our encoders have been selected for several ISO-13485 certified surgical robotic applications.

SPACE

The technology of Netzer's Electric Encoder™ is easily adaptable to meet the stringent requirements of space missions. Either through the modification of COTS encoders suitable for the new "commercial space" applications, or by a turn-key design, based on common modules, to meet the more traditional space missions requirements.

CERTIFICATIONS

THE STANDARDS INSTITUTION OF ISRAEL

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REACH COMPLIANCE

RoHS 3 COMPLIANT EU 2015/863

ABSOLUTE ROTARY ENCODER

VLX - HOLLOW SHAFT KIT ENCODER

The VLX absolute encoders are a family of a state-of-the-art position sensors designed for a broad range of industrial automation applications and motion control, providing an exceptional performance to size ratio. Typical applications include highly accurate surgical robots, semi-conductor robotics, collaborative-robots, multi-axes automated machinery, as well as automotive applications.

The VLX encoders have been tested to meet the most exact of industrial environmental conditions of IEC 60068-2 and feature a push-button automatic calibration process which makes for an easy and smooth calibration process on the application.

Electrical

Supply voltage	Current consumption	Communication	Clock frequency	Material (stator / rotor)
5V ±5%	~90 mA	SSi, BiSS-C	0.1- 5.0 MHz	PCB (FR4)

Environment

EMC	Operating temp.	Storage temp.	Relative humidity	Built In Test BIT
IEC 6100-6-2, IEC 6100-6-4	-40° C to +85° C	-40° C to +85° C	98% Non condensing	Optional

Protection	Vibration	Shock
IP 40	20g @ 10 to 2000 Hz sweep per IEC 60068-2-6	100g 6msec saw-tooth per IEC 60068-2-27:2009

Product features

- High Precision
- Hollow Shaft
- Low Profile
- Immunity to Magnetic Fields

VLX - HOLLOW SHAFT KIT ENCODER

VLX-60

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
60 / 25	8	15	18-20 bit	±0.015° / ±0.010°
Rotor inertia	**Position update rate**		**Max. operational speed**	
2,165 gr · mm^2	35 kHz (Optional - 375 kHz)		4,000 rpm	

VLX-80

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
80 / 35	9.6	33	19-21 bit	±0.010° / ±0.006°
Rotor inertia	**Position update rate**		**Max. operational speed**	
9,625 gr · mm^2	35 kHz (Optional - 375 kHz)		2,000 rpm	

VLX-100

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
100 / 48	9	40	18-20 bit	±0.010° / ±0.006°
Rotor inertia	**Position update rate**		**Max. operational speed**	
17,928 gr · mm^2	35 kHz (Optional - 375 kHz)		4,000 rpm	

VLX-140

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
140 / 90	10	72	19-21 bit	±0.010° / ±0.006°
Rotor inertia	**Position update rate**		**Max. operational speed**	
88,555 gr · mm^2	35 kHz (Optional - 375 kHz)		2,000 rpm	

VLX-170

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
170 / 110	10	106	19-21 bit	±0.010° / ±0.006°
Rotor inertia	**Position update rate**		**Max. operational speed**	
205,330 gr · mm^2	35 kHz (Optional - 375 kHz)		2,000 rpm	

VLX-247

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
247 / 171	10.7	220	18-20 bit	±0.010° / ±0.006°
Rotor inertia	**Position update rate**		**Max. operational speed**	
876,053 gr · mm^2	35 kHz (Optional - 375 kHz)		4,000 rpm	

ABSOLUTE ROTARY ENCODER

VLP - HOLLOW SHAFT KIT ENCODER

The VLP absolute encoders are a family of a state-of-the-art position sensors designed specifically for harsh environment and particularly suited for a broad range of aerospace and defense applications. The VLP encoders are some of the most accurate kit encoders providing an exceptional performance to size ratio.

The VLP encoders have been tested to meet the Mil-std-810 and are fully immune to magnetic fields. They can be further customized with different coatings, connectors, and wires in accordance with the specific requirements of each customer and application.

Electrical

Supply voltage	Current consumption	Communication	Clock frequency	Material (stator / rotor)
5V ±5%	~90 mA	SSi, BiSS-C	0.1- 5.0 MHz	PCB (FR4)

Environment

EMC	Operating temp.	Storage temp.	Relative humidity	Built In Test BIT
IEC 6100-6-2, IEC 6100-6-4	-40° C to +105° C	-55° C to +125° C	98% Non condensing	Optional
Protection	**Vibration**		**Shock**	
IP 40	7.7grms @ 20 to 2000 Hz (per MIL-810G)		100g 6msec saw-tooth (per IEC 60068-2-27:2009)	

Product features

- High Precision
- Hollow Shaft
- Low Profile
- Durability
- Immunity to Magnetic Fields

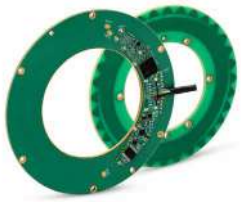
VLP - HOLLOW SHAFT KIT ENCODER

VLP-60

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
60 / 25	6	16	18-20 bit	±0.010°
Rotor inertia	**Position update rate**		**Max. operational speed**	
2,165 gr · mm^2	35 kHz (Optional 375 kHz)		4,000 rpm	

VLP-80

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
80 / 35	6.6	21	19-21 bit	±0.006°
Rotor inertia	**Position update rate**		**Max. operational speed**	
9,625 gr · mm^2	35 kHz (Optional 375 kHz)		2,000 rpm	



VLP-100

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
100 / 48	7	42	18-20 bit	±0.006°
Rotor inertia	**Position update rate**		**Max. operational speed**	
17,928 gr · mm^2	35 kHz (Optional 375 kHz)		4,000 rpm	

VLP-140

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
140 / 90	8	80	19-21 bit	±0.006°
Rotor inertia	**Position update rate**		**Max. operational speed**	
88,555 gr · mm^2	35 kHz (Optional 375 kHz)		2,000 rpm	

VLP-170

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
170 / 110	8	110	19-21 bit	±0.006°
Rotor inertia	**Position update rate**		**Max. operational speed**	
205,330 gr · mm^2	35 kHz (Optional 375 kHz)		2,000 rpm	

VLP-247

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
247 / 171	9	220	18-20 bit	±0.006°
Rotor inertia	**Position update rate**		**Max. operational speed**	
876,053 gr · mm^2	35 kHz (Optional 375 kHz)		4,000 rpm	

ABSOLUTE ROTARY ENCODER

VLH - HOLLOW SHAFT KIT ENCODER

The VLH encoder is especially suited for commutation and smooth motor control of DC brushless motors.

Electrical

Supply voltage	Current consumption	Communication	Clock frequency	Material (stator / rotor)
External 5V DC ±5%	< 82 mA	SSi, BiSS-C	0.1 ÷ 1 MHz	PCB (FR4)

Environment

EMC	Operating temp.	Storage temp.	Relative humidity	Built In Test BIT
IEC 6100-6-2, IEC 6100-6-4	-25° C to +105° C	-40° C to +125° C	98% Non condensing	Optional

Protection	Vibration	Shock
IP 40	20 grams @ 10 to 2000 Hz	40g 11msec saw-tooth (per MIL-810G)

VLH-35

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
35 / 11	6	5.5	17-19 bit	±0.05°

Rotor inertia	Position update rate	Max. operational speed
1,930 gr · mm^2	35 kHz	6,000 rpm

Product features

- Small Size
- Low Profile
- Light Weight
- Immunity to Magnetic Fields

ABSOLUTE ROTARY ENCODER

VLM - HOLLOW SHAFT MULTI-TURN KIT ENCODER

The VLM multi-turn absolute encoder is implemented with a revolution counter. The VLM includes an internal battery as well as an external battery connection in order to keep turn-count and absolute position in case of power disconnect or shut-down.

Electrical

Supply voltage	Current consumption	Communication	Clock frequency	Material (stator / rotor)
5V ±5%	< 100 mA	SSi	0.1- 5.0 MHz	PCB (FR4)

Environment

EMC	Operating temp.	Storage temp.	Relative humidity	Built In Test BIT
IEC 6100-6-2, IEC 6100-6-4	-20° C to +65° C	-40° C to +100° C	98% Non condensing	Optional
Protection	**Vibration**		**Shock**	
IP 40	20 grams @ 10 to 2000 Hz		40g 11msec saw-tooth (per MIL-810G)	

VLM-60

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
60 / 25	8	15	17 bit Single +15 bit Multi	±0.015°
Rotor inertia	**Position update rate**		**Max. operational speed**	
1,996 gr · mm^2	35 kHz (Optional 375 kHz)		4,000 rpm	

Product features

- +360° — Multi-turn
- High Precision
- Hollow Shaft
- Immunity to Magnetic Fields

ABSOLUTE ROTARY ENCODER

DS - HOLLOW SHAFT POLYMER HOUSED

Netzer's family of DS Electric Encoders™ meets the requirements for use in a wide variety of applications, from advanced surgical robotics to sophisticated defense applications. The contact-less core with its floating rotor is extremely durable and resistant to vibrations and shocks. The low profile, hollow shaft structure, suits compact, high-density designs and provides unparalleled accuracy and resolution for encoders as small as 16mm to as large as 130mm.

Electrical

Supply voltage	Current consumption	Communication	Clock frequency	Position update rate
5V ±5%	~90 mA	SSi, BiSS-C	0.1- 5.0 MHz	35 kHz (Optional up to 375 kHz)

Environment

EMC	Operating temp.	Storage temp.	Relative humidity	Built In Test BIT
IEC 6100-6-2, IEC 6100-6-4	-40° C to +85° C	-50° C to +85° C	98% Non condensing	Optional
Protection	**Vibration**		**Shock**	
IP 40	20grms @ 10 to 2000 Hz (per MIL-810G)		100 g for 6-11 ms (per MIL-STD-810G)	

Product features

- Small Size
- High Precision
- Hollow Shaft
- Low Profile
- Immunity to Magnetic Fields

ABSOLUTE ROTARY ENCODER

DS - HOLLOW SHAFT POLYMER HOUSED

DS-16

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
16 / 4	8	3.1	16 bit	±0.020°
Rotor inertia	**Material: cover / stator / rotor**		**Max. operational speed**	
11 gr · mm^2	Ultem / PCB (FR4) / TRVX-50		4,000 rpm	

DS-25

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
25 / 6	7	10	17-19 bit	±0.010°
Rotor inertia	**Material: cover / stator / rotor**		**Max. operational speed**	
11 gr · mm^2	Ultem / PCB (FR4) / TRVX-50		4,000 rpm	

DS-37

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
37 / 10	8	10	17-19 bit	±0.015°
Rotor inertia	**Material: cover / stator / rotor**		**Max. operational speed**	
70.93 gr · mm^2	Ultem / PCB (FR4) / TRVX-50		4,000 rpm	

DS-40

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
40 / 10	10	20	17-19 bit	±0.010°
Rotor inertia	**Material: cover / stator / rotor**		**Max. operational speed**	
70.93 gr · mm^2	Ultem / PCB (FR4) / TRVX-50		4,000 rpm	

ABSOLUTE ROTARY ENCODER

DS - HOLLOW SHAFT POLYMER HOUSED

DS-58

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
58 / 20	10	30	18-20 bit	±0.008°
Rotor inertia	**Material: cover / stator / rotor**		**Max. operational speed**	
684 gr · mm^2	Ultem / PCB (FR4) / TRVX-50		4,000 rpm	

DS-70

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
70 / 30	10	49	19-21 bit	±0.006°
Rotor inertia	**Material: cover / stator / rotor**		**Max. operational speed**	
1,940 gr · mm^2	TRVX-50 / PCB (FR4) / TRVX-50		2,000 rpm	

DS-90

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
90 / 50	10	55	19-21 bit	±0.006°
Rotor inertia	**Material: cover / stator / rotor**		**Max. operational speed**	
4,242 gr · mm^2	Ultem / PCB (FR4) / TRVX-50		2,000 rpm	

DS-130

OD / ID mm	Height mm	Weight gr.	Resolution	Accuracy
130 / 90	10	84	19-21 bit	±0.006°
Rotor inertia	**Material: cover / stator / rotor**		**Max. operational speed**	
25,963 gr · mm^2	Ultem / PCB (FR4) / Ultem		2,000 rpm	

ABSOLUTE ROTARY ENCODER

DL - SHAFT ENCODER ALLOY ENCAPSULATED

The DL Electric Encoders™ provide a highly accurate and robust shaft encoder for applications that do not require a hollow-shaft sensor.

Electrical

Supply voltage	Current consumption	Communication	Clock frequency	Position update rate
5V ±5%	~90 mA	SSi, BiSS-C	0.1- 5.0 MHz	35 kHz

Environment

EMC	Operating temp.	Storage temp.	Relative humidity
IEC 6100-6-2, IEC 6100-6-4	-40° C to +85° C	-50° C to +100° C	98% Non condensing
Protection	**Vibration**		**Shock**
IP 65	20 grms @ 10 to 2000 Hz (per MIL-810G)		DL-25: 100 g for 11 ms (per MIL-STD-810G) DL-66: 150 g for 11 ms (per MIL-STD-810G)

DL-25

OD / Shaft mm	Height mm	Weight gr.	Resolution	Accuracy
25 / 4	24.3	30	17-19 bit	±0.020°
Starting torque	**Material: housing / stator / rotor**		**Max. operational speed**	
30 x 10-4 N.m	Aluminum / PCB FR4 / Ultem		1,500 rpm	

DL-66

OD / Shaft mm	Height mm	Weight gr.	Resolution	Accuracy
71 / 8	29	350	18-20 bit	±0.005°
Starting torque	**Material: housing / stator / rotor**		**Max. operational speed**	
30 x 10-4 N.m	Aluminum / PCB FR4 / Ultem		4,000 rpm	

Product features

- High Precision
- Durability
- Shaft
- Immunity to Magnetic Fields

ABSOLUTE ROTARY ENCODER

ENCODER FOR SPACE APPLICATIONS

There is a range of characteristics and requirements for space encoders that differ from each space application to another as well as from the expected mission duration.

Some of those main characteristics are:

- Radiation Resistance, specifically TID and Single event (Krad or MeV units)
- Type of electronic components either space rated or commercial
- Low out gassing requirement
- Resistance to extreme temperature range
- Leaded Vs unleaded soldering
- Specific test and production procedures

Two Types of Netzer Space Encoders

The past-experience and track record in developing and manufacturing of space encoders in accordance with **ESA** and **NASA** standards, enables Netzer to offer two distinct types of encoders for space missions.

1. Designed-to-spec encoders (turnkey)

For space missions requiring to withstand **up to 100 krad** we offer turnkey design solutions by using modules from our existing or previous space encoder designs and using or modifying them as part of the new design, thereby reducing risk, schedule and NRE costs.

These modules include:

- The basic size of the encoder, i.e. its outer and inner diameter, which dictate the size of the stator and rotor plates.
- The radiation-hardened electronic circuitry which can be either analog or digital (and its associated FW)
- Any encapsulation or housing, if part of the requirement

2. Modified COTS Encoders

- Most of our COTS digital and analog encoders can be modified for LEO (Low-Earth-Orbit) space missions
- These encoders are modified for LOG (Low Out-Gassing) values, however, are still using industrial electronic components which are adequate for exposure **up to 10 krad**. Therefore, if required, additional shielding is to be implemented as part of the application

Don't hesitate to call us and discuss the requirements of your space application.

We are happy to consult and provide advice.

Product features

High Precision

Immunity to Magnetic Fields

Durability

Immunity to Cosmic Radiation

Netzer
Precision Position Sensors

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