DS-130

Absolute position, rotary Electric Encoder™

Netzer
Precision Motion Sensors Ltd.

The DS-130 is a member of the DS series of Electric Encoders, based on Netzer Precision proprietary technology. These encoders offer many advantages, some unparalleled:

Low profile (10 mm).
Hollow, floating shaft.
No bearings or other contacting elements.
High precision.
High tolerance to temperature, shock, moisture, EMI, RFI and Magnetic fields.
Very low weight.
Analog or multiple digital interface options.
Extremely low power options.

The DS-130 is suited to demanding application such as: aerospace, medical, instrumentation, automation, etc.

The holistic structure of the Electric Encoder™ provides generous mounting tolerance, thus obviating the need for internal ball bearings.

The lack of bearings and components such as flexible couplers, glass disc, light sources and detectors, along with very low power consumption makes the DS-130 encoder virtually failure free.

The internally shielded, DC operated Electric Encoder™ includes an electric field generator, a field receiver, a sinusoidal shaped dielectric rotor, and processing electronics.

The outputs signals of Electric Encoder™ are analog Sine / Cosine representing the rotation angle. The digital outputs are obtained by further processing which may be either internal or external to the encoder.

Mechanical	
Allowable mounting eccentricity , operational	±0.1 mm
Allowable rotor axial motion; operational	±0.1 mm
Rotor inertia	12.378 gr mm^2
Total weight	65 gr
Outer diameter / Inner diameter / Profile	130 /90 /10 mm
Material (stator, rotor)	Ultem™ polymer
Material mounting clamps , M2	S.S.

Electrical - common to all types	
Supply voltage	5V ± 5%
Interconnection	Ø 3.5 mm Shielded cable

Environment - common to all types	
EMC	IEC 6100-6-2, IEC 6100-6-4
Operating temperature range	-40°C to +85°C
Relative humidity	<98 % - non condensing
Shock endurance	IEC 60068-2-27 100 g for 11 ms
Vibration endurance	IEC 60068-2-6 20 g 10 – 2000 Hz
Protection	IP 40

Performance	
Electrical Cycles – Fine/Coarse channels	64 / 3
Angular resolution (using 12 bit A/D conversion)	19 bits
Static error (with offset compensation)	< 10 mDeg (0.17mrad)
Maximum operational speed	750 rpm
Measurement range	Unlimited rotation
Output	Digital SSi , Incremental AqB+ index , Analog
BIT (build in tests , optional)	Included (SSi version)

Digital - SSi Interface (absolute position)

DS-130

Output signal parameters	
Signal latency	~250 µSec
Output code	Binary
Serial output SSi	Differential RS-422
Clock SSi	Differential RS-422
Monoflop time	25 µSec
Clock Frequency	0.5 ÷ 2.5 MHz
Position update (Max)	29 KHz

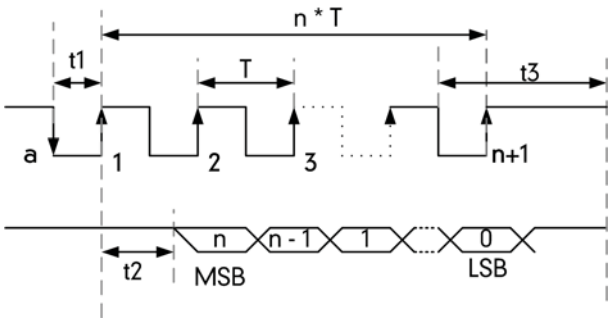
Electrical parameters	
Current consumption	~ 180 mA

SSi - Wires color code

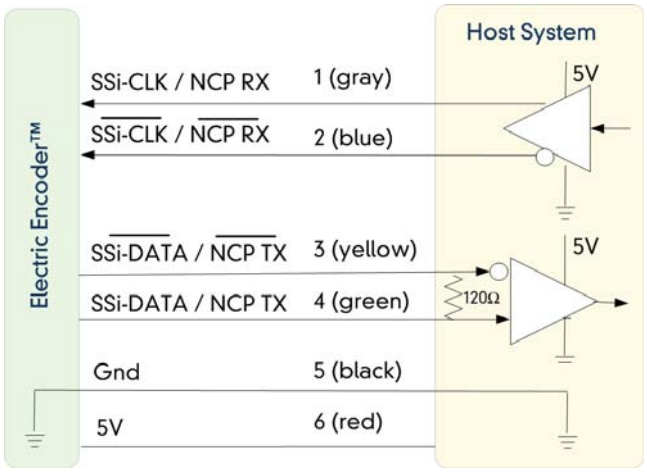
#	Name	Color	Function
1	Clock +	Grey	SSi Clock
2	Clock -	Blue	
3	Data -	Yellow	SSi Data
4	Data +	Green	
5	GND	Black	Ground
6	+5V	Red	Power supply

Synchronous Serial Interface (SSi) allows for serial transmission of absolute position data from the Electric Encoder™ responding to controller clock pulses. The Encoder and controller are linked by clock and data differential signal lines.

SSI data transmission timing diagram



n = total number of data bits.
T = clock period (sec) - user defined.
1/T = clock frequency 0.5 ÷ 2.5 MHz (user defined).
t1 = minimum time required for the encoder to freeze data and preset the shift registers before receiving the first rising edge to prompt the MSB
t2 = data transmission delay (increases with cable length)
t3 = required delay to refresh position data between subsequent position reads.



Digital - SSi Interface (absolute position)

DS-130

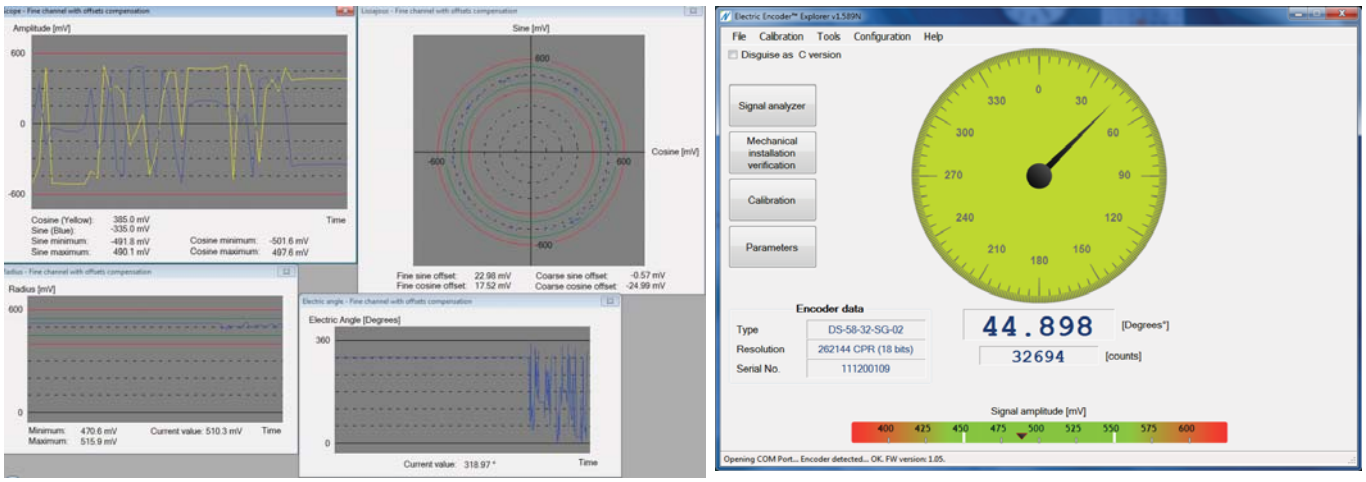
Software tools:

Advanced calibration and monitoring options available by using the Electric Encoder Explorer (factory supplied)using the NCP (Netzer Communication Protocol)

.

Calibration, built-in tests (BIT) and advanced setup.

A. Proper mechanical mounting - setup and validation
B. Calibration , offsets , CAA and user defined “zero”.



Electric Encoder Explorer (windows XP / 7)

Resolution bits	Steps /360°	mDeg / step	Arc-sec /step	mRad /step
18	262,144	1.3733	4.9438	0.024
19 (DS-130)	524,288	0.6866	2.4719	0.012
20	1,048,576	0.3433	1.236	0.006

Related documents:
DS-130 Mechanical Installation Guide

Analog - Sine / Cosine , 1 Vp-p interface

DS-130

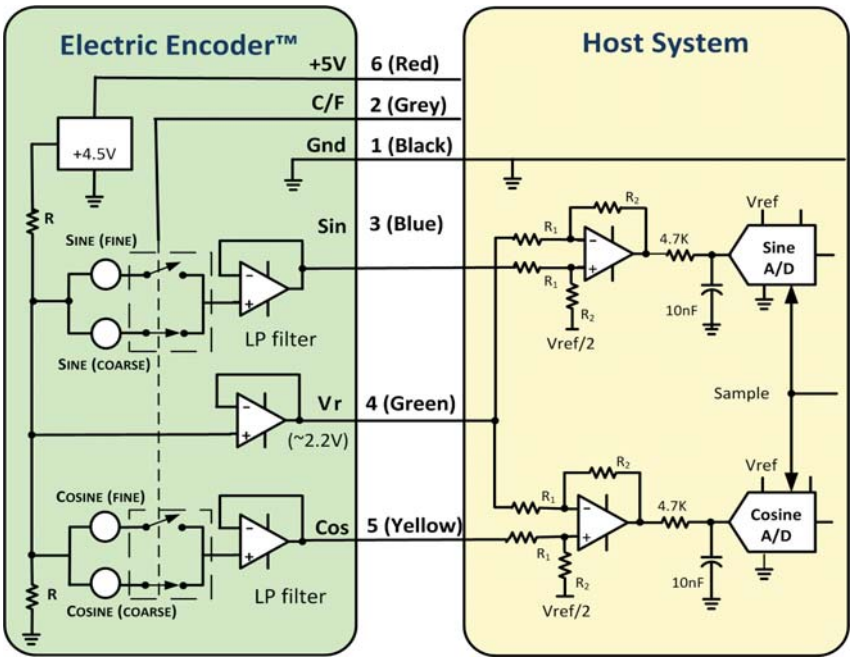
Output signal parameters	
Signal latency	250 µSec
Fine-mode output noise (DC to 1kHz)	100 µV (p-p)
Fine-mode output amplitude	0.5V ± 20%
Coarse-mode output amplitude	0.5V ± 20%
Phase relationship (CW shaft rotation - seen from top)	Sine leads Cosine
Signal bandwidth	DC to 1 kHz

Coarse and Fine channels

The DS-130 has two operation modes: a Coarse-mode and a Fine-mode - equivalent to two separate encoders in a common housing. The modes are selectable by a logic C/F command; logic "0" (0V to +0.5V) selects the Coarse-mode, which has 3 Electrical Cycle/Revolution (EC/R) while logic "1" (+3V to +5V) selects the Fine-mode which has 64 EC/R. The switching time is less than 1 ms.

The Coarse-mode outputs need to be read only upon system initiation after which the encoder is permanently switched to the Fine mode. Coarse and Fine sine/ cosine pairs are used to calculate the initial absolute position, from that point tracking the Fine-channel outputs provides the absolute mechanical rotation angle with the specified accuracy and resolution.

All output signals are referenced to an internally generated voltage Vr (~2.25V)



Wires color code			
#	Name	Color	Function
1	GND	Black	Ground
2	C/F	Grey	Coarse / Fine
3	Sine	Blue	Sine signal
4	Vr	Green	V reference
5	Cosine	Yellow	Cosine signal
6	+5V	Red	Power supply

Absolute Position calculation:

The analog Sine /Cosine outputs convey the electric angle of the Coarse or Fine signals. The absolute mechanical angle is computed by digitizing the analog signals and applying factory-supplied algorithms. Please refer to AN-02 and AN-03 .

Ordering

Absolute Position - Low speed up to 750 RPM

DS - 130 - 64 - S H - S C - n n n

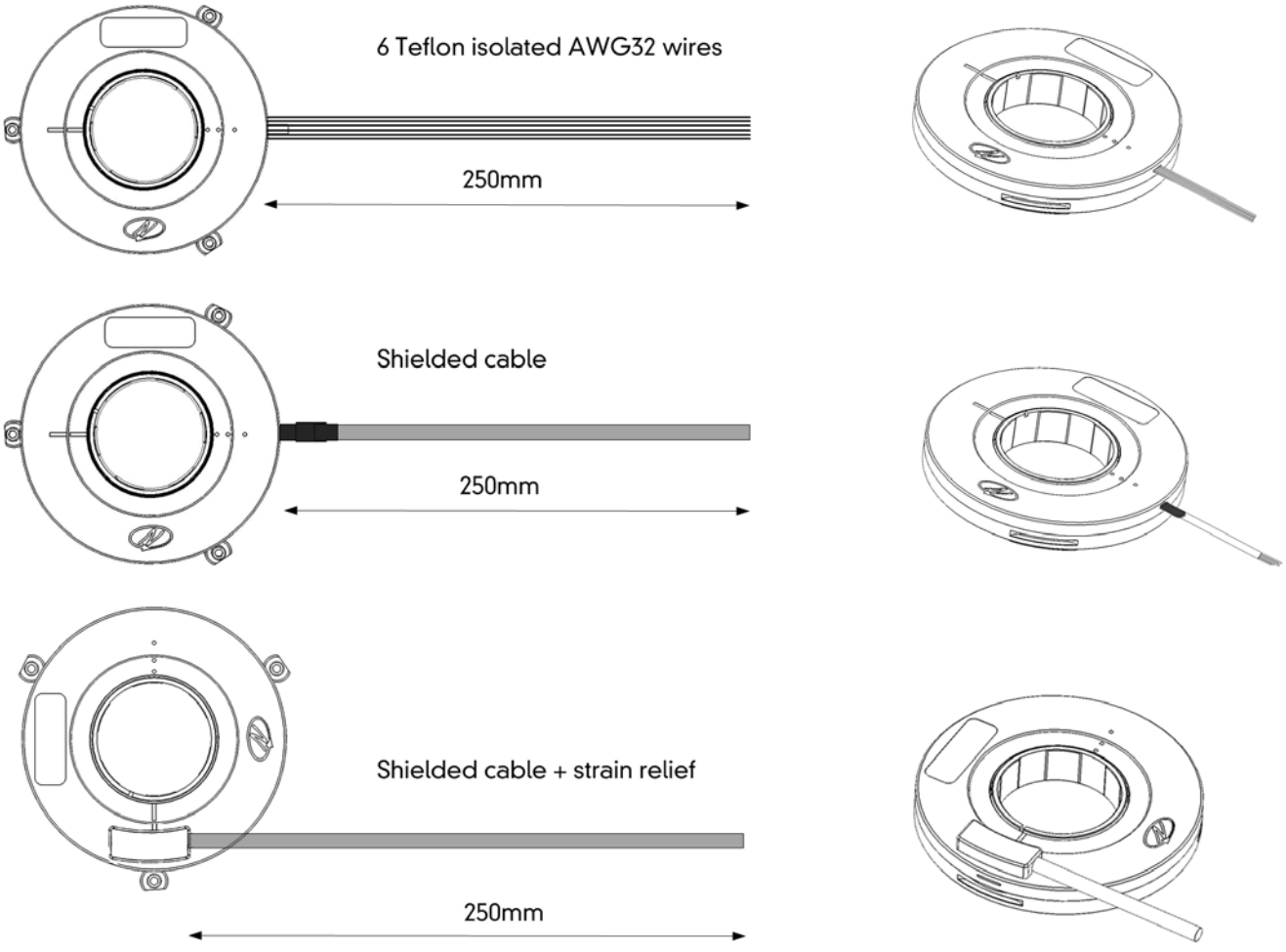
- DS — Product line
- 130 — OD mm
- 64 — Fine EC/R
- S H — Outputs: S - Digital : SSi; 0 - Analog
- S — 0 - Loose wires 250 mm; S - shielded cable; R - Strain relief & shielded cable
- C — 0 - flying leads; C- connector
- n n n

Resolution Binary		
Code	Bit	CPR
F	17	131,072
G	18	262,144
H	19	524,288

Resolution Decimal		
Code	Bit	CPR
O	17	128,000
P	18	256,000
Q	19	512,000

Analog	
Code	0

Interconnection options



DS-130

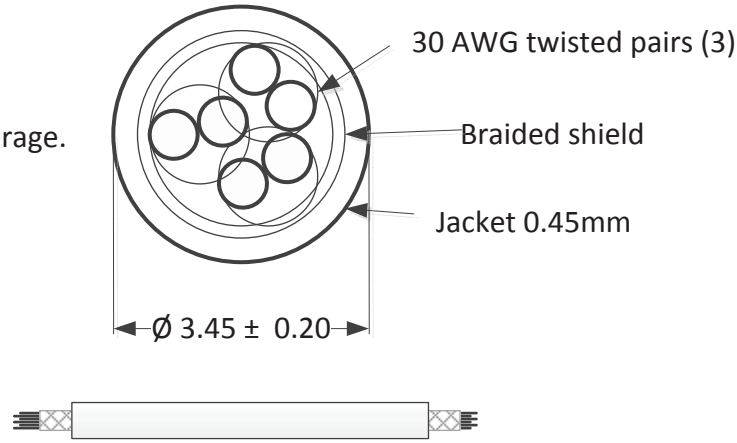
Netzer Cat No.: CB00014
30 AWG twisted pair (3) :
2 (30 AWG 25/44 tinned copper , 0.15 PFE to Ø0.6 ± 0.05).

Provider: *Ray-Q USA.*

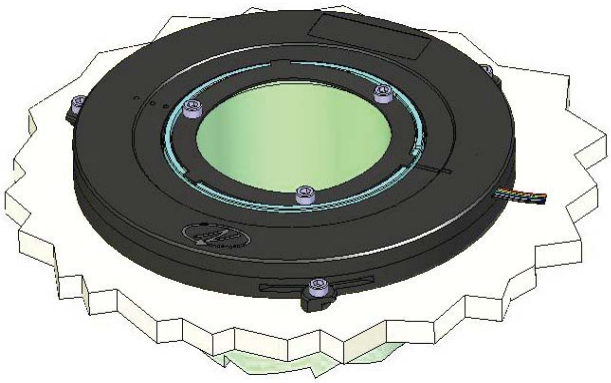
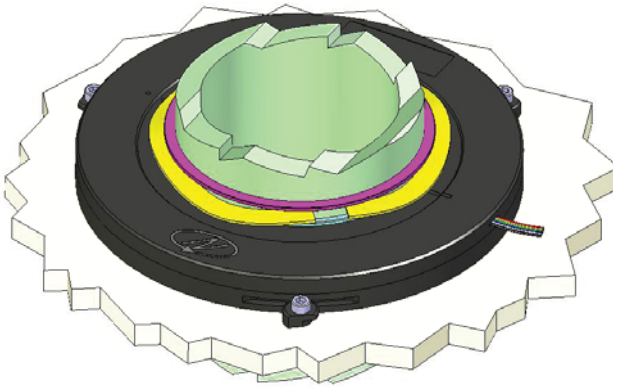
Cable:
Three 30 AWG twisted pairs.

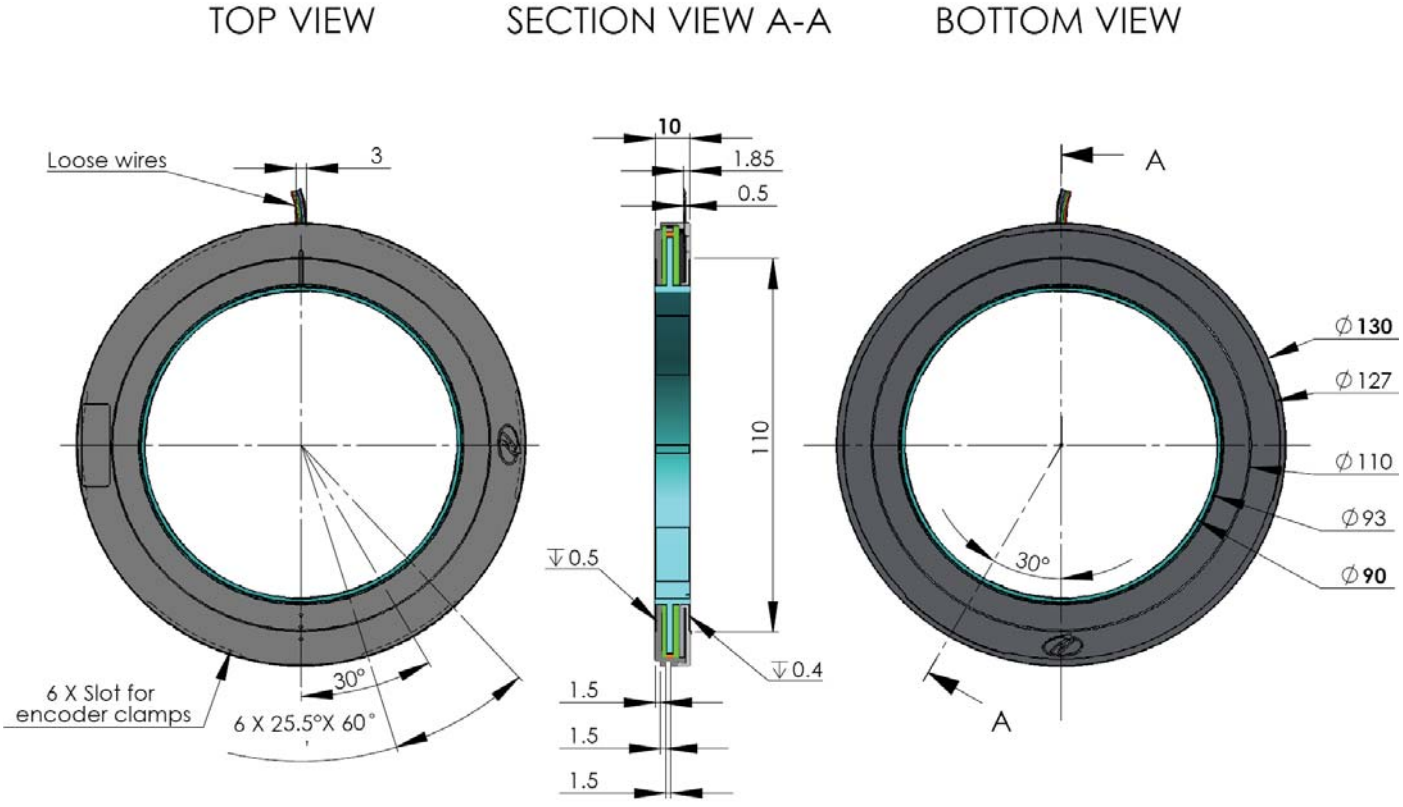
Shield:
Tinned copper braided 95% min. coverage.

Jacket:
0.45 silicon rubber to Ø3.45 ±0.2



Pair #	Color
1	Red / Black
2	Gray / Blue
3	Green / Yellow

Rotor mounting options for stepped shaft	
End of shaft	Mid shaft
	


TOP VIEW
SECTION VIEW A-A
BOTTOM VIEW
Loose wires
3
6 X Slot for encoder clamps
30°
6 X 25.5°X 60°
10
1.85
0.5
110
0.5
0.4
1.5
1.5
1.5
A
A
Ø130
Ø127
Ø110
Ø93
Ø90
30°