The DS-37 is a member of the DS series of Electric Encoders™, based on Netzer Precision proprietary technology. The Electric Encoder™ offers many advantages - some unparalleled

- Low profile (8 mm)
- Hollow, floating shaft
- No bearings or other contacting elements
- High resolution and precision
- High tolerance to temperature extremes, shock, moisture, EMI, RFI and Magnetic fields
- Very low weight
- Holistic signal generation
- Analog or Digital interfaces

The Electric Encoder™ is unique in being holistic, i.e., its output reading is the averaged outcome of the whole area of the rotor, This feature makes the Electric Encoder™ forgiving to mounting tolerances, mechanical wander etc.

The absence of components such as ball bearings, flexible couplers, glass disc, light sources and detectors, along with very low power consumption makes the Electric 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 output 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.

The combination of precision, low profile, low weight and high reliability have made Netzer Precision encoders particularly suitable to a wide variety of critical applications including, but not limited to medical equipment and aerospace.

General

Angular resolution	17 bits ; 131,072 CPR
Maximum tested static error	≤ 0.025°
Maximum operational speed	1,500 rpm
Measurement range	Unlimited rotation
Power On - Max. operational speed	3.3 RPM, <=20°/sec
Build In Test BIT	Optional

Mechanical

Allowable mounting eccentricity	±0.1 mm
Allowable rotor axial motion	±0.1 mm
Rotor inertia	71.62 gr · mm²
Total weight	10 gr
Outer Ø /Inner Ø/ Height	37 / 10 / 8 mm
Material (stator, rotor)	Ultem™ polymer

Electrical

|	
Supply voltage	5V ± 5%
Interconnection	Shielded cable or
Cable Length	1,500 mm MAX

Environmental

|	
EMC	IEC 6100-6-2, IEC 6100-6-4
Operating temperature range	Digital: -40°C to +85°C
Relative humidity	98% Non condensing
Shock endurance	100 g for 11 ms
Vibration endurance	20 g 10 – 2000 Hz
Protection	IP 40

DS-37-V02
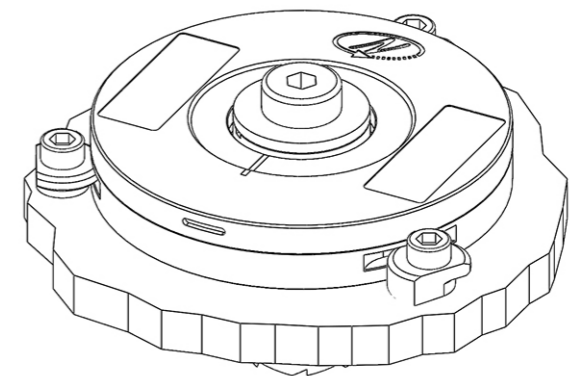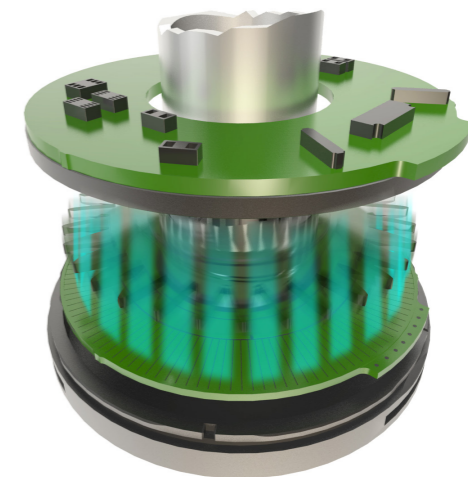
Digital SSi Interface

Synchronous Serial Interface (**SSI**) is a point to point serial interface standard between a master (e.g. controller) and a slave (e.g. sensor) for digital data transmission.
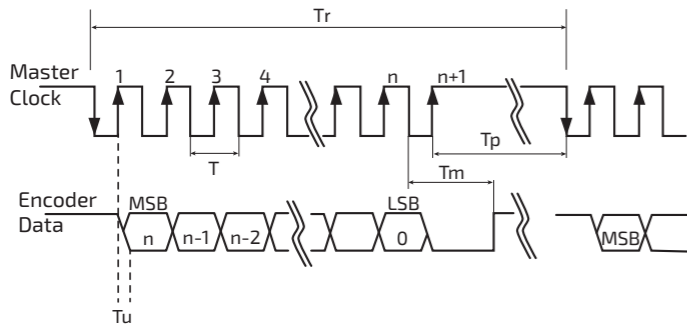
Description		Recommendations
n	Total number of data bits	12 - 22
T	Clock period	
f= 1/T	Clock frequency	0.5 - 2.0 MHz
Tu	Bit update time	200 nsec
Tp	Pause time	26 - ∞ µsec
Tm	Monoflop time	>25 µsec
Tr	Time between 2 adjacent requests	Tr > n*T+26 µsec
fr=1/Tr	Data request frequency	
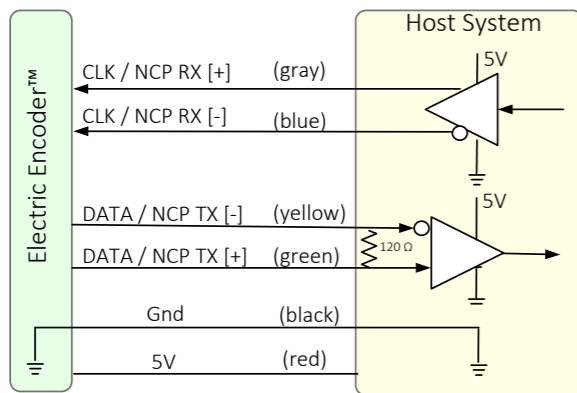
SSi / BiSS Output signal parameters

Signal latency	~250 µSec
Output code	Binary
Serial output	Differential RS-422
Clock	Differential RS-422
Clock Frequency	0.5 ÷ 2.0 MHz
Position update rate (Max)	30 KHz
Current consumption	180 mA
SSi	
Monoflop time	25 µSec

SSi / BiSS interface wires color code

Clock +	Grey	Clock
Clock -	Blue	
Data -	Yellow	Data
Data +	Green	
GND	Black	Ground
+5V	Red	Power supply

Software tools: (SSi / BiSS - C)

Advanced calibration and monitoring options are available by using the factory supplied Electric Encoder Explorer software, This facilitates proper mechanical mounting, offsets calibration and advanced signal monitoring.
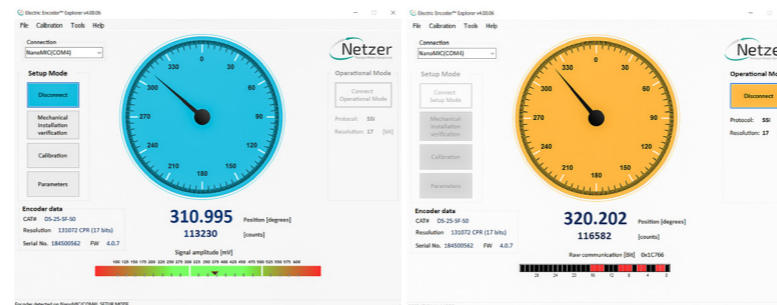

Digital BiSS-C Interface

BiSS – C Interface is unidirectional serial synchronous protocol for digital data transmission where the Encoder acts as "slave" transmits data according to "Master" clock. The BiSS protocol is designed in B mode and C mode (continuous mode) .The BiSS-C interface as the SSi is based on RS-422 standards.
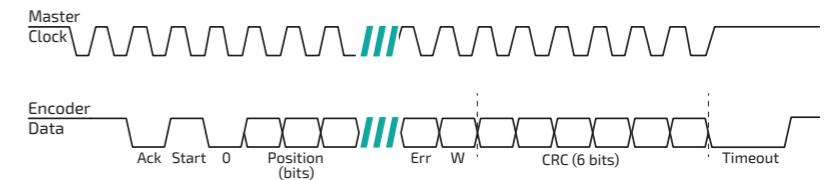
| bit #		Description	Default	Length
27	Ack	Period during which the encoder calculates the absolute position, one clock cycle	0	1/clock
26	Start	Encoder signal for "start" data transmit	1	1 bit
25	"0"	"start" bit follower	0	1 bit
8...24	AP	Absolute Position encoder data		
7	Error	Error (amplitude levels)	1	1 bit
6	Warn.	Warning (non active)	1	1 bit
0...5	CRC	The CRC polynomial for position, error and warning data is: x6 + x1 + x0. It is transmitted MSB first and inverted. The start bit and "0" bit are omitted from the CRC calculation.		6 bits
	Timeout	Elapse between the sequential "start"request cycle's.		25 µs

Analog Interface

Coarse and Fine channels

The DS-37 has two operational 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 16 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)
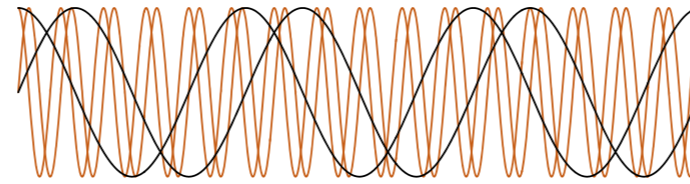
Output Signal Parameters

Electric Cycles (Fine / Coarse channels)	16 / 3
Signal latency	250 μSec
Fine-mode output noise (DC to 1kHz)	100 μV (p-p)
Fine-mode output amplitude	±400mV ± 20%
Coarse-mode output amplitude	±300mV ± 20%
Phase relationship (CW shaft rotation - seen from top)	Sine leads Cosine
Signal bandwidth	DC to 1 kHz
Current consumption	10mA
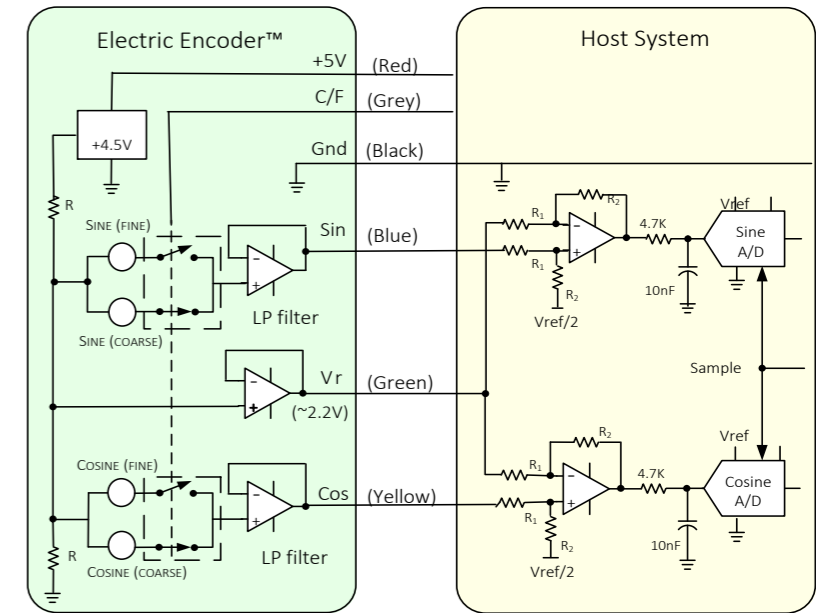
Analog interface wires color code

1	GND	Black	Ground
2	C/F	Grey	Coarse / Fine
3	Sine	Blue	Sine signal
4	Vr	Green	V referenceCosine signal
5	Cosine	Yellow	Cosine signal
6	+5V	Red	P.S.

Absolute Position calculation

The analog Sine / Cosine outputs convey the Electrical angle of the Coarse or Fine signals. The Absolute mechanical angle is computed by digitizing the analog signals.

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Rotary Electric Encoder™

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DATA SHEET

Ordering Code

DS - 37 - 16 - D F - S 0 - n n n

DS Product line

Outer Diameter

Fine ECR

Outputs
D - Digital: SSi
E - Digital: BiSS-C
0 - Analog 1 Vp-p

Resolution		
Code	Bit	CPR
F	17	131,072

BIT (Build In Test): optional
[ ] - none
B - BIT

nnn - Custom

C - Connector (optional)
0 - Flying leads (default)

Interconnection
S - shielded cable 250 mm (default)
C - Encapsulated external module

Analog Output

Shielded cable AWG30

Teflon insulated AWG32

250 mm

Digital Output SSi / BiSS-C

SC2SSi External module

250 mm

Shielded cable AWG30

SC2SSi External Encapsulated module

Netzer Cat No.: CB-00014
Provider: Ray-Q USA. wire CAT No: RQ213210
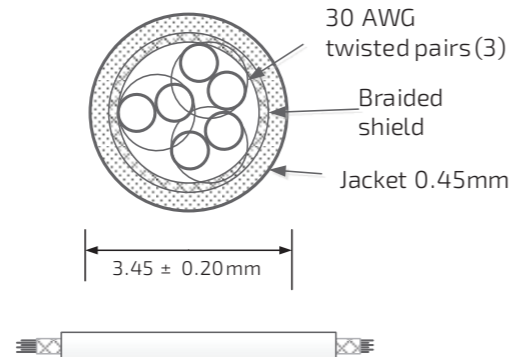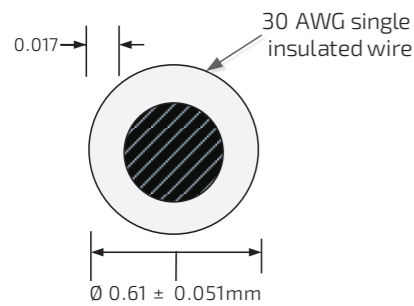Cable: 30 AWG twisted pair (3) :2 (30 AWG 25/44 finned copper,
        0.15 PFE to Ø 0.6 ± 0.05 OD).
Temperature rating: -60 to +150 Deg C.
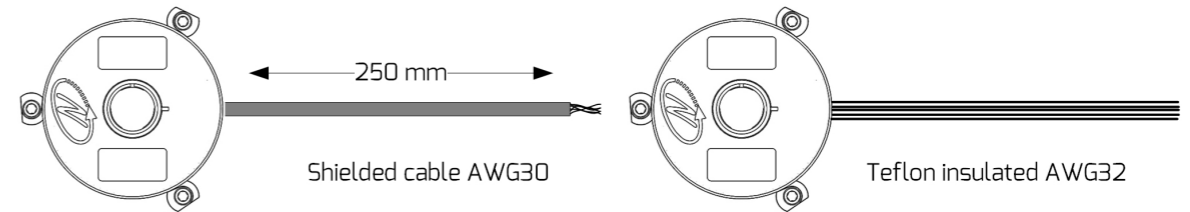Braided shield: Thinned copper braided 95 % min. coverage.
Jacket: 0.45 silicon rubber jacket Ø3.45 ±0.2 OD

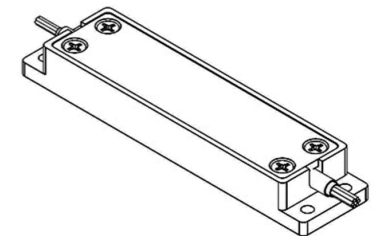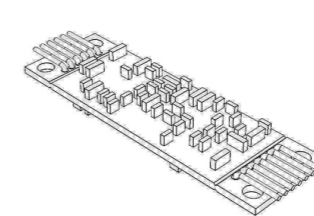| Pair #	Color
1	Red / Black
2	Gray / Blue
3	Green / Yellow

0.017

30 AWG single
insulated wire

Ø 0.61 ± 0.051mm

30 AWG
twisted pairs (3)

Braided
shield

Jacket 0.45mm

3.45 ± 0.20mm

Related documents

DS-37 User Manual: Mechanical , Electrical and calibration setup.

Optional Accessories

Demonstration Kit

DS-37DKIT-01: Includes ,mounted encoder on rotary jig, and RS-422 to USB converter.

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DATA SHEET

A

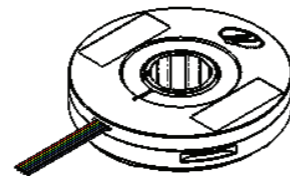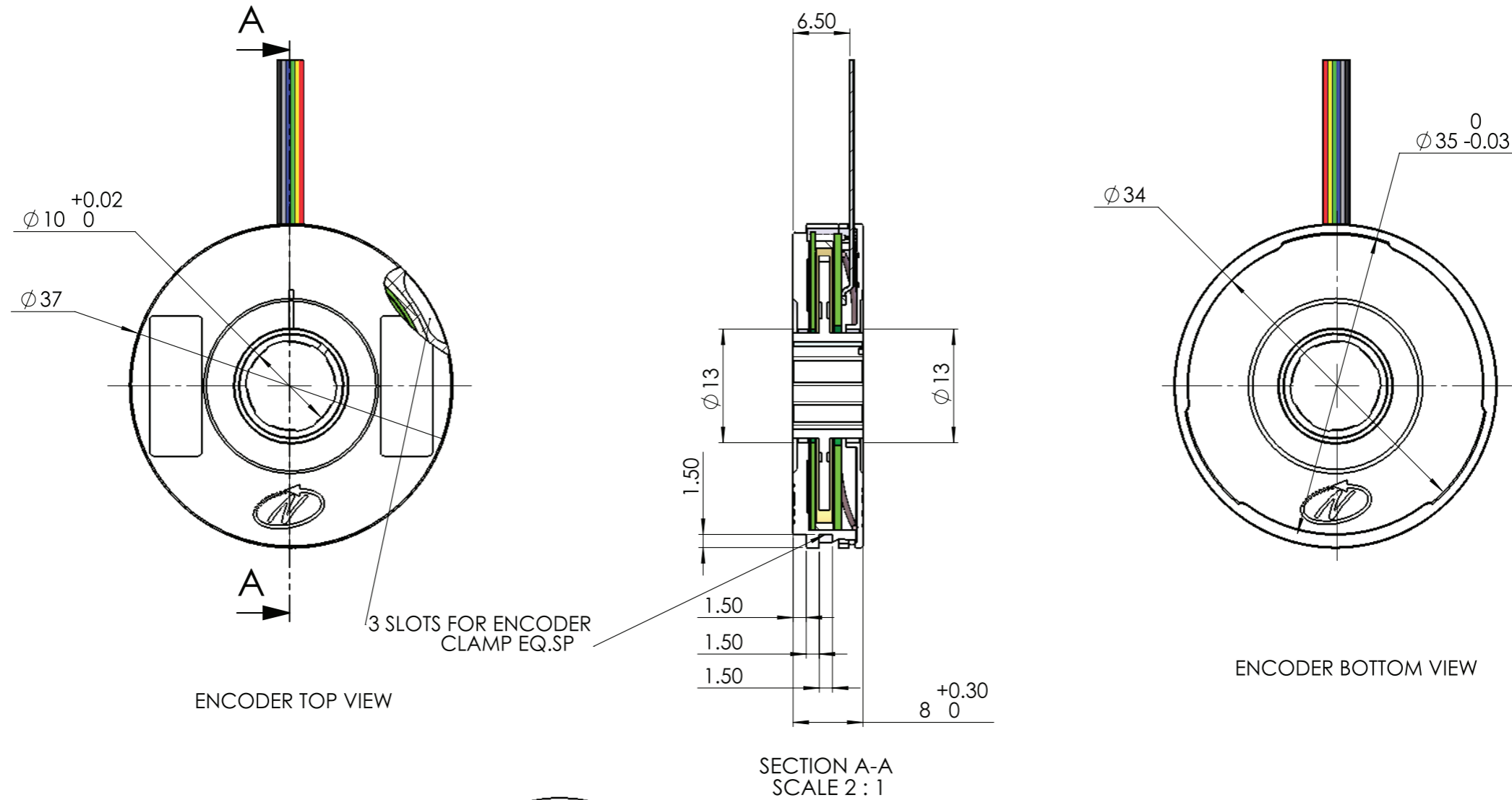$\emptyset 10 \begin{smallmatrix} +0.02 \\ 0 \end{smallmatrix}$

$\emptyset 37$

A

3 SLOTS FOR ENCODER
CLAMP EQ.SP

ENCODER TOP VIEW

6.50

$\emptyset 13$

$\emptyset 13$

1.50

1.50

1.50

1.50

$8 \begin{smallmatrix} +0.30 \\ 0 \end{smallmatrix}$

SECTION A-A
SCALE 2 : 1

$\emptyset 34$

$\emptyset 35 \begin{smallmatrix} 0 \\ -0.03 \end{smallmatrix}$

ENCODER BOTTOM VIEW

WARNING

⚠ Do not use Loctite or other glues containing Cyanoacrylate.
We recommend to use 3M glue - Scotch-Weld™ Epoxy
Adhesive EC-2216 B/A.

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DATA SHEET

⊥ 0.02 B

⊥ 0.05 A

B

⌀35 +0.02/0

◎ 0.02 B

B

A

⌀10 0/-0.02

∕ 0.05 A

⊥ 0.02 C

C

M4 ⤓ 10mm

⌀12 max

⌀32

SECTION E-E

⌀9

SECTION A-A

3HOLES M2 EQ.SP.

⊕ 0.1 A

⌀42

1.60 0/-0.05

0.50

2 min

1.50 REF
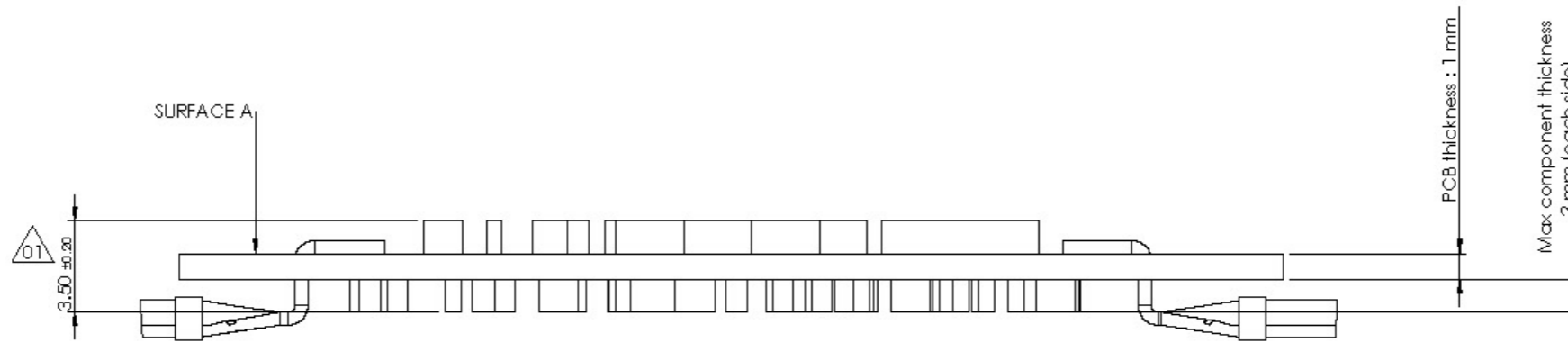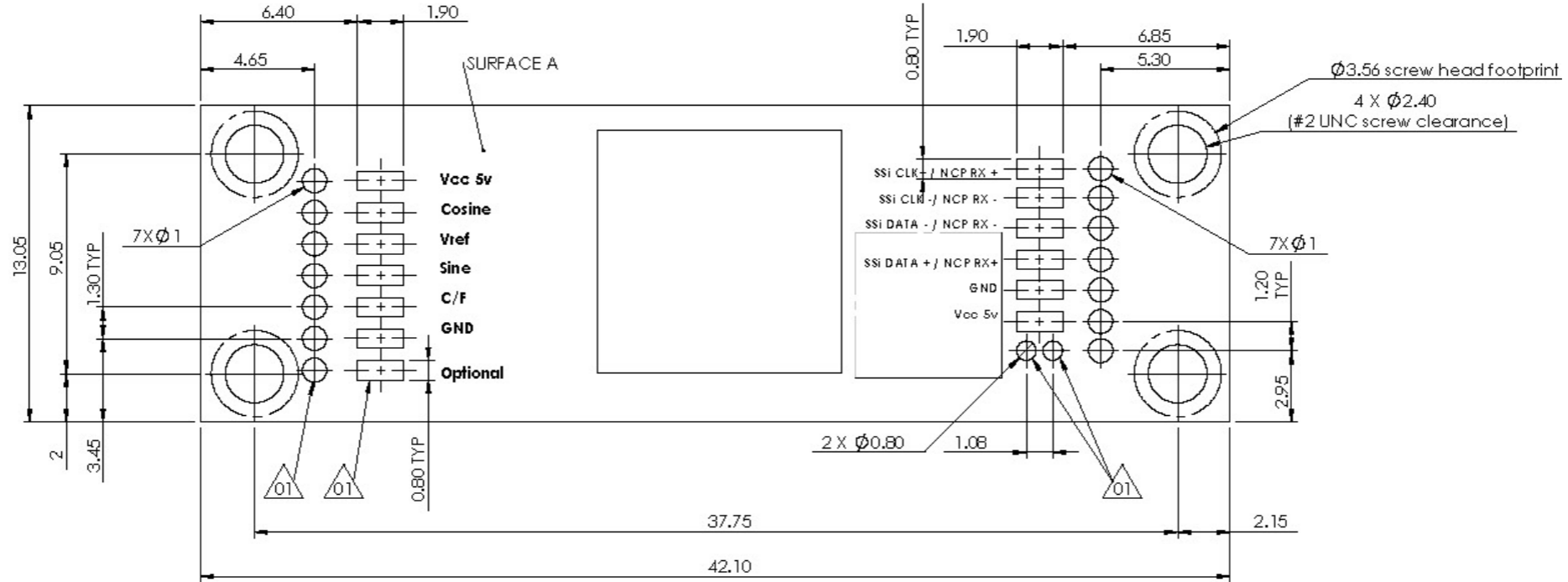
A

A

A

3

4

2

1
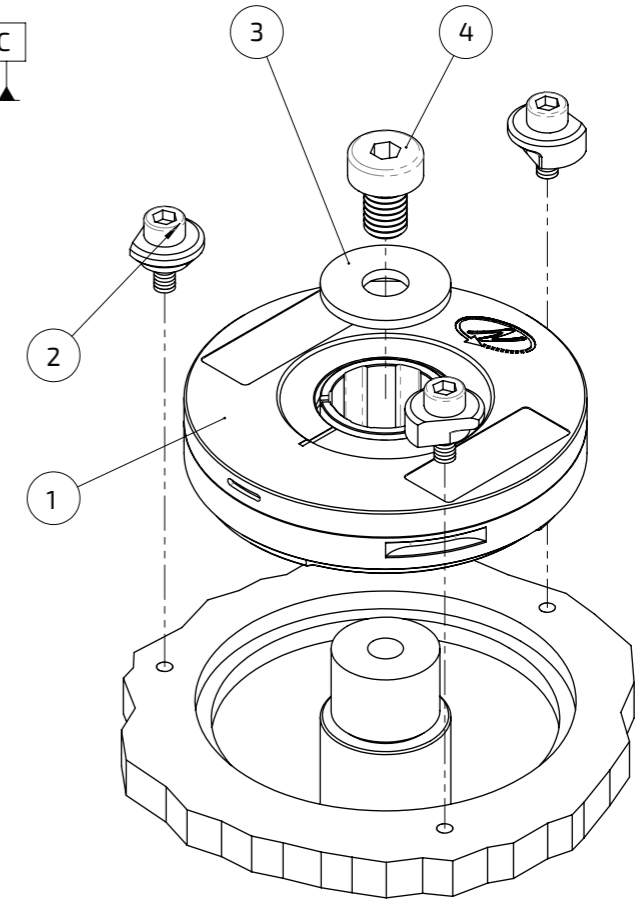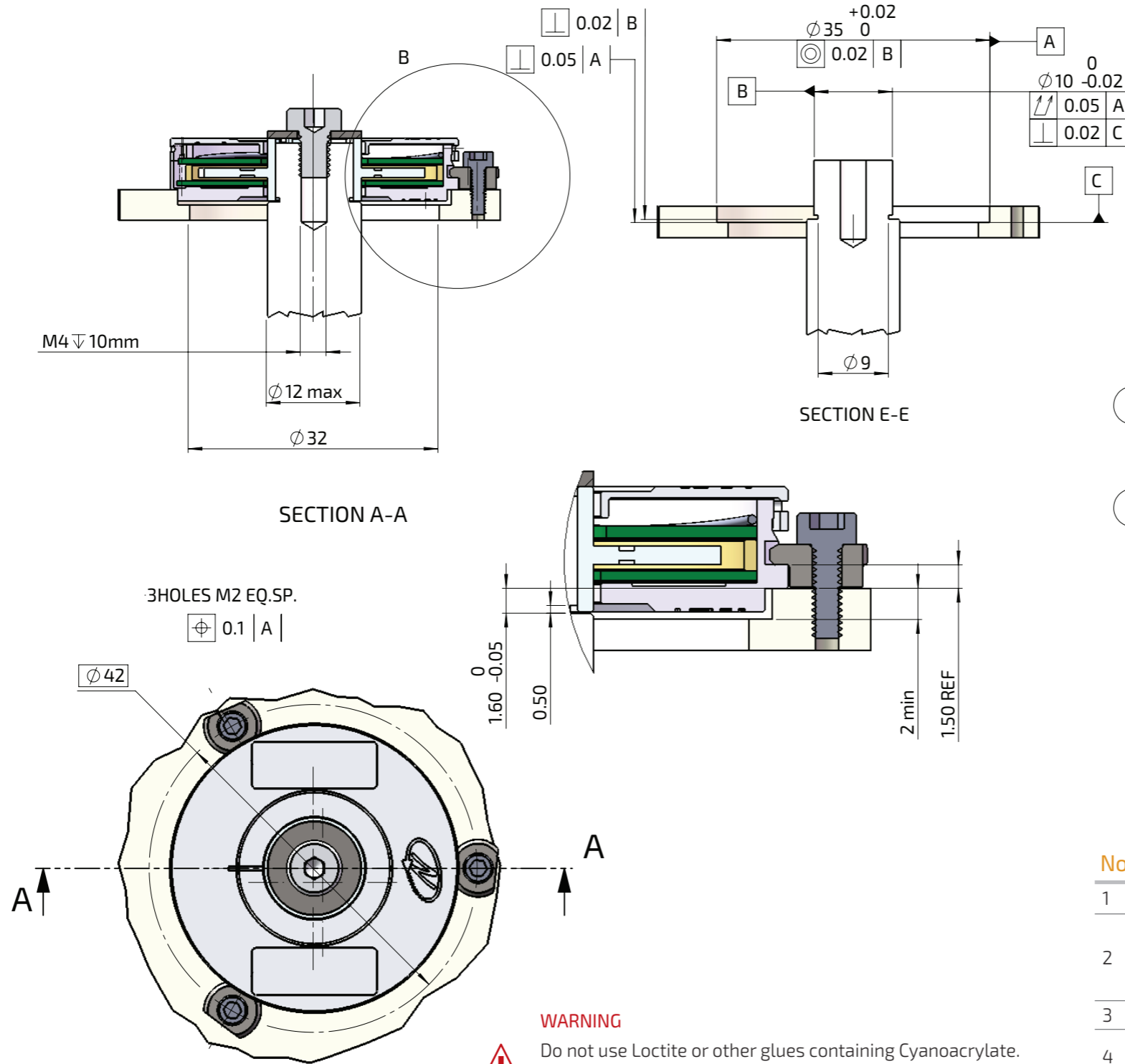
WARNING

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We recommend to use 3M glue - Scotch-Weld™ Epoxy
Adhesive EC-2216 B/A.

No	Part			Description	QTY.
1	DS-37-16	Included		DS-37 encoder	1
2	EAPK005	Included	Kit	Kit , 3 x M2 Encoder clamps ST. ST.	1
3	MA-DS37-004	Optional	Shaft End installation kit	Washer DIN9021	1
4				Screw DIN 7984 M4x6	3

Critical dimensions marked with "*"

DS-37-V02

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DATA SHEET

SURFACE A

Vcc 5v
Cosine
Vref
Sine
C/F
GND
Optional

SSi CLK + / NCP RX +
SSi CLK - / NCP RX -
SSi DATA - / NCP RX -
SSi DATA + / NCP RX +
GND
Vcc 5v

Ø3.56 screw head footprint
4 X Ø2.40
(#2 UNC screw clearance)

7X Ø1

2 X Ø0.80

SURFACE A

PCB thickness : 1 mm
Max component thickness
2 mm (each side)

SC2SSi, DS-37 external digital module (SSi/BiSS)

No	Part		Description	QTY.
1	SC2SSi-03	Included	with DS-37 CAT No.	1