Netzer
Precision Motion Sensors Ltd.

DF-100-32-SG

Absolute position, rotary Electric Encoder™

The DF-100 is a member of the DF series of Electric Encoders™, based on Netzer Precision proprietary technology. The Electric Encoder™ offers many advantages - some unparalleled

Low profile (10 mm).
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
Digital interfaces.

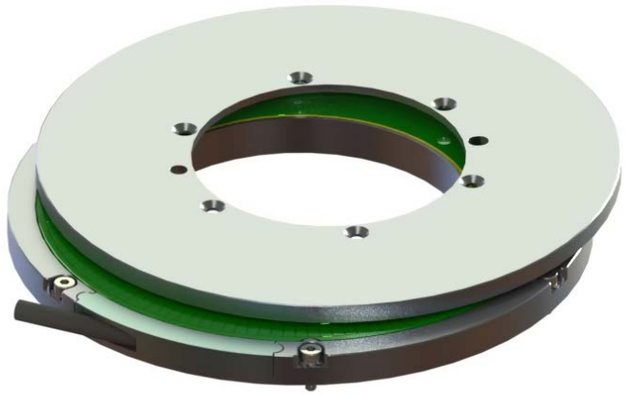
Mechanical	
Allowable mounting eccentricity	±0.1 mm (rotor to stator)
Allowable rotor axial motion	±0.1 mm (rotor to stator)
Rotor inertia	70,163 gr · mm²
Weight , Rotor / Stator	55 / 25 gr
Outer Ø /Inner Ø/ Height	100 / 57 / 10 mm
Material (stator, rotor)	AL 6061 (anodized)

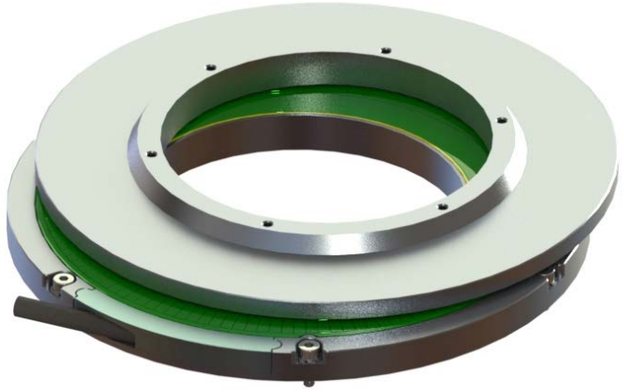
Electrical	
Supply voltage	5V ± 5%
Interconnection	Shielded cable
Cable Length	1,500 mm MAX

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

Characteristics	
Angular resolution	18 bits ; 262,144 CPR
Static error	< 10 mDeg
Maximum operational speed	750 rpm
Measurement range	Unlimited rotation
Power On - Max. operational speed	3.3 RPM , <=20°/sec
Build In Test BIT	Optional

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.





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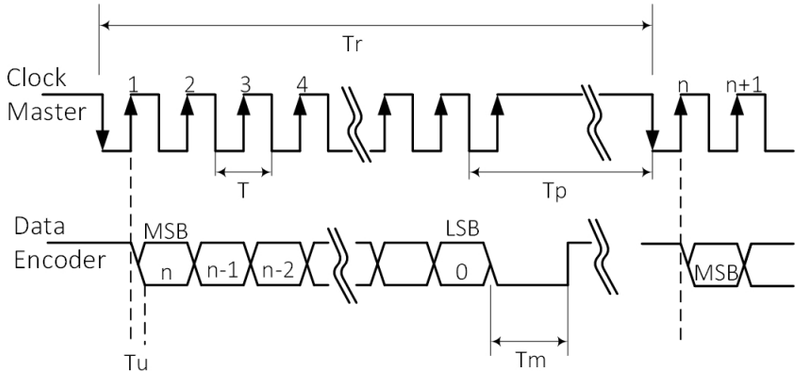
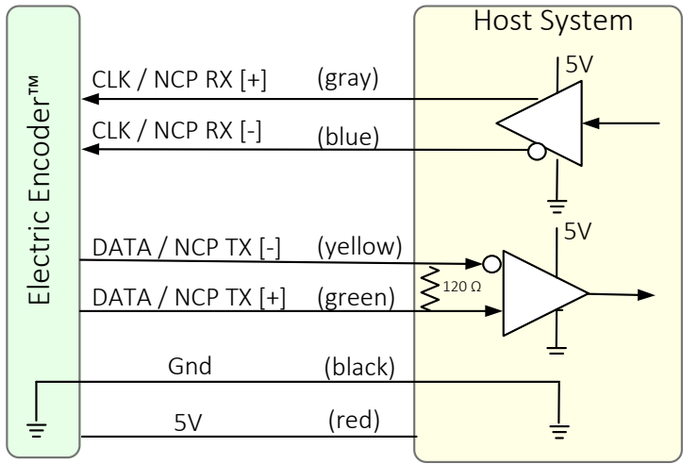
Digital SSi Interface

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	

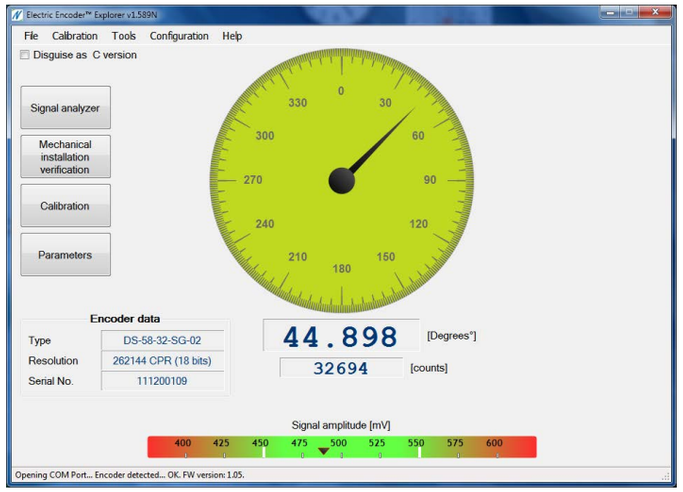


SSi / BiSS Output signal parameters	
Signal latency	~250 µSec
Output code	Binary
Serial output	Differential RS-422
Clock	Differential RS-422
Clock Frequency	0.5 ÷ 2.0 MHz
Position update rate (Max)	30 KHz
Current consumption	180 mA
Monoflop time	25 µSec

SSi / BiSS interface wires color code		
Clock +	Grey	Clock
Clock -	Blue	
Data -	Yellow	Data
Data +	Green	
GND	Black	Ground
+5V	Red	Power supply

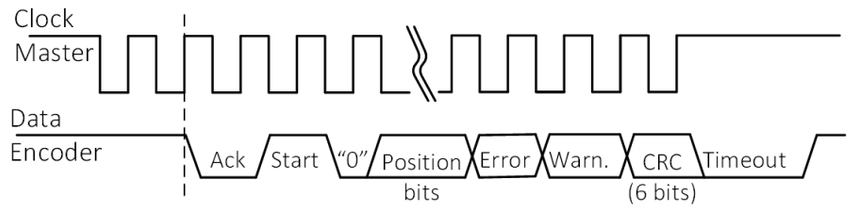
Software tools: (SSi / BiSS - C)

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-C interface as the SSi is based on RS-422 standards.



bit #		Description	Default	Length
29	Ack	Period during which the encoder calculates the absolute position , one clock cycle	0	1/clock
28	Start	Encoder signal for "start" data transmit	1	1 bit
27	"0"	"start" bit follower	0	1 bit
8...25	AP	Absolute Position encoder data		
7	Warn.	Warning	1	1 bit
6	Error	Error	1	1 bit
0...5	CRC	The CRC polynomial for position, error and warning data is: $x^6 + x^1 + x^0$. 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

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DF - 100 - 32 - S G _ - P E - n n n

DF Product line

Outer Diameter

Fine ECR

Outputs:
S - Digital : SSi
I - Digital : BiSS-C

Resolution		
Code	Bit	CPR
G	18	262,144
H	19	524,288
I	20	1,048,576

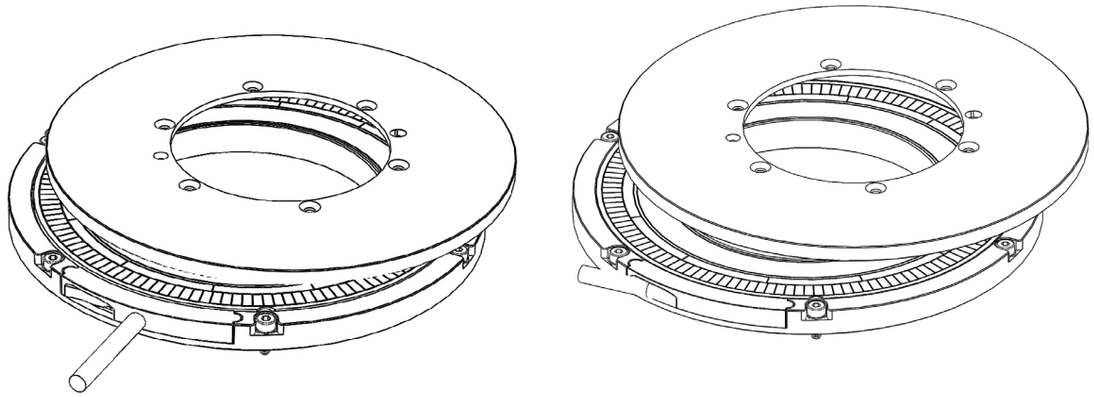
BIT (Build In Test): optional
[ ] - none
B - BIT

nnn - Custom

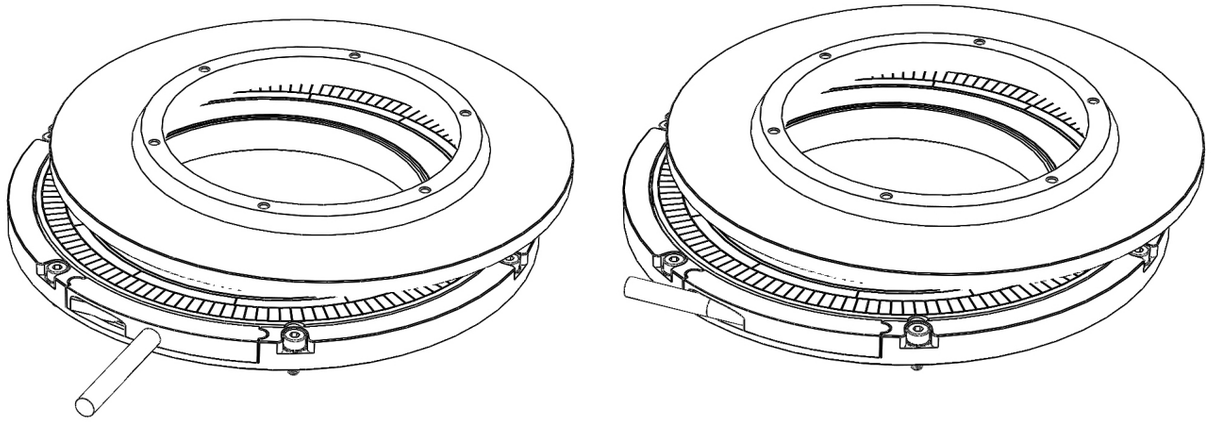
E - End of shaft
M - Mid of shaft

Cable orientation: (Top view)

P - Perpendicular
R - Right
L - Left



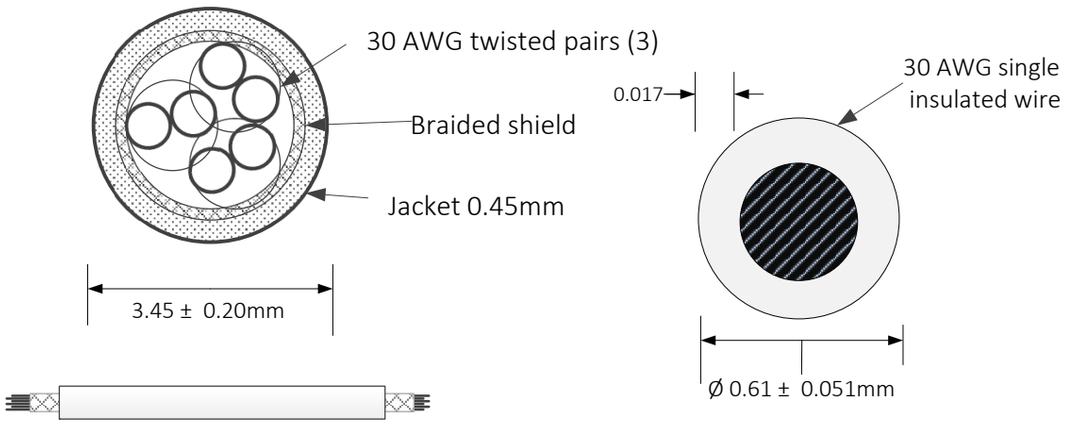
Mounting - End of shaft. Ø ID=47mm



Mounting - Mid of shaft. Ø ID=57mm

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 Ø0.6 ± 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



Related documents:

DF-100 User Manual : Mechanical , Electrical and calibration setup.

Demonstration Kit:

DF-100DKIT-01: Includes ,mounted encoder on rotary jig , and RS-422 to USB converter.

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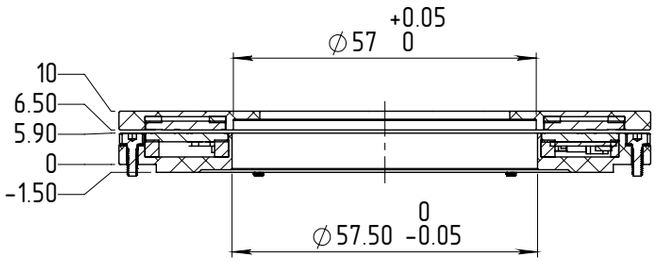
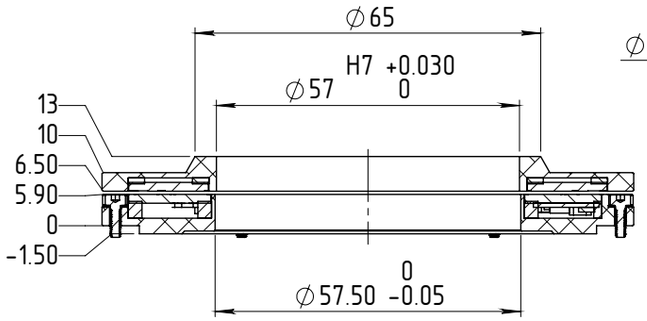
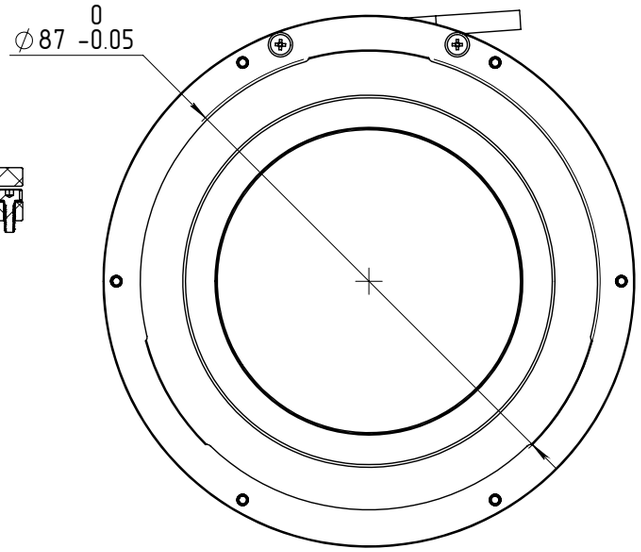


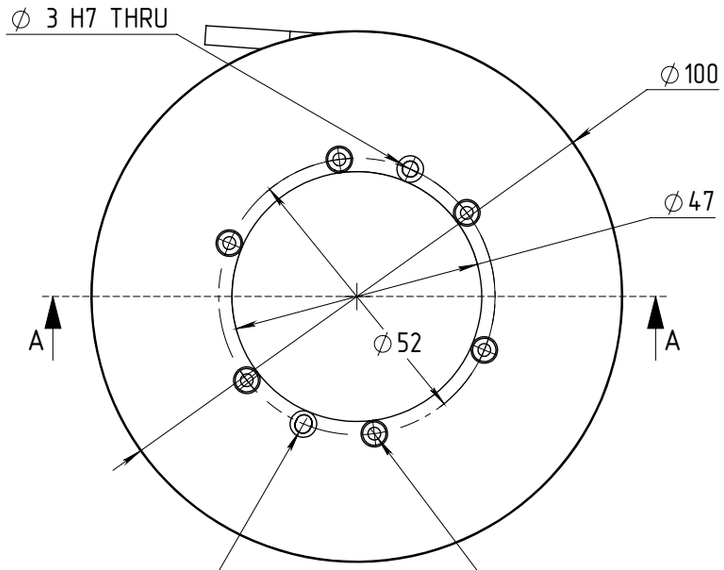
Rotor Type 1 (End Shaft)

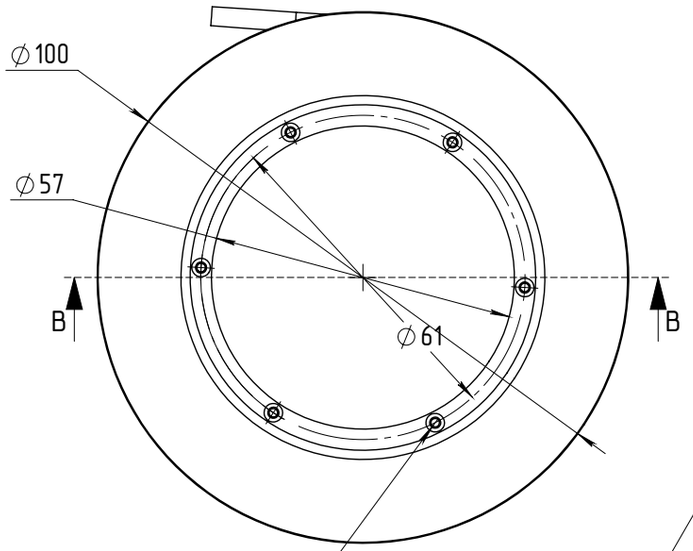


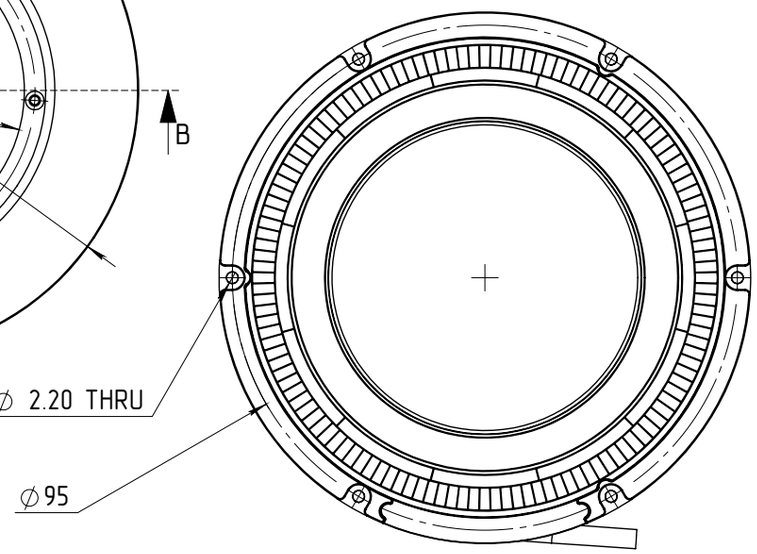
Rotor Type 3 (Mid Shaft)



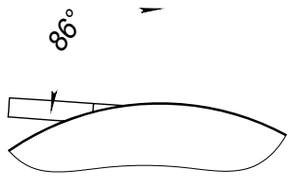
Bottom View



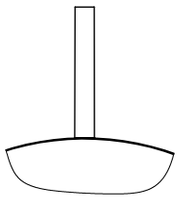




Stator Top View (w/o rotor)



Left (counterclockwise)



Straight

Right (clockwise)

Three options for cable direction
(Top View)

	NAME	SIGNATURE	DATE
DRAWN	Michael A.		10-04-16
CHK'D	Jacob H.		10-04-16
APPV'D	Jacob H.		10-04-16

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN mm
SURFACE FINISH: N6
LINEAR TOLERANCES: ±0.1 mm
ANGULAR TOLERANCES: ±0.5 deg
ALL CHAMFER: 0.1 mm X 45°

Netzer
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TITLE: Encoder variations

MATERIAL:	Coating:	SCALE: 1:1
DWG NO. : ICD DF-100	Revision : 00	A3
CAT NO. : ICD DF-100		SHEET 1 OF 3

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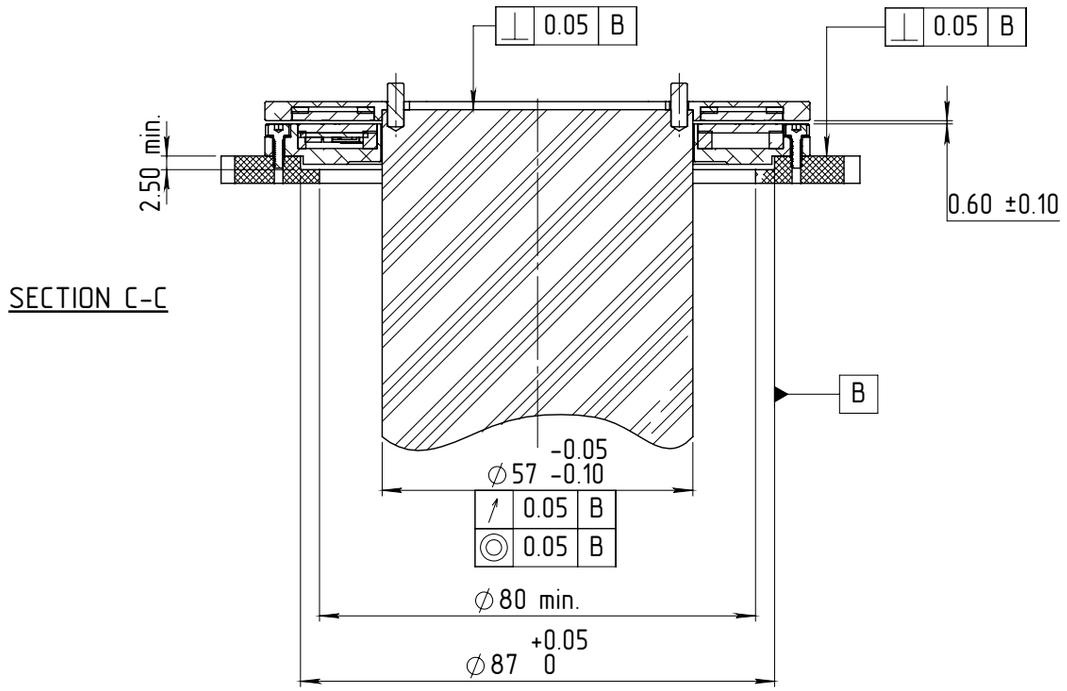
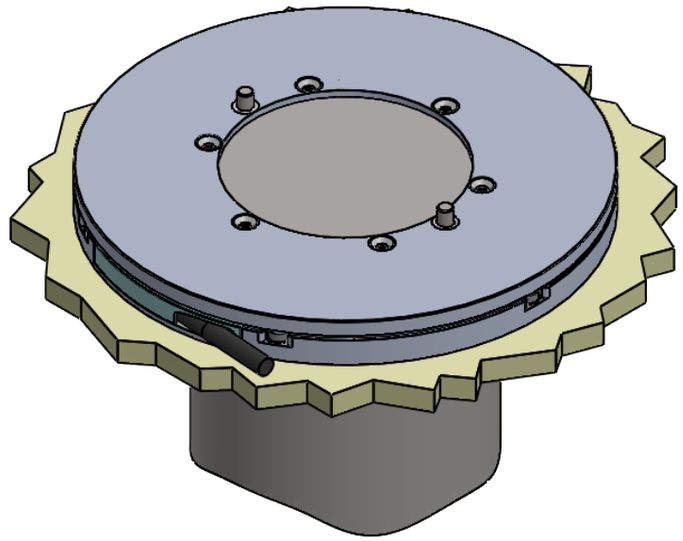
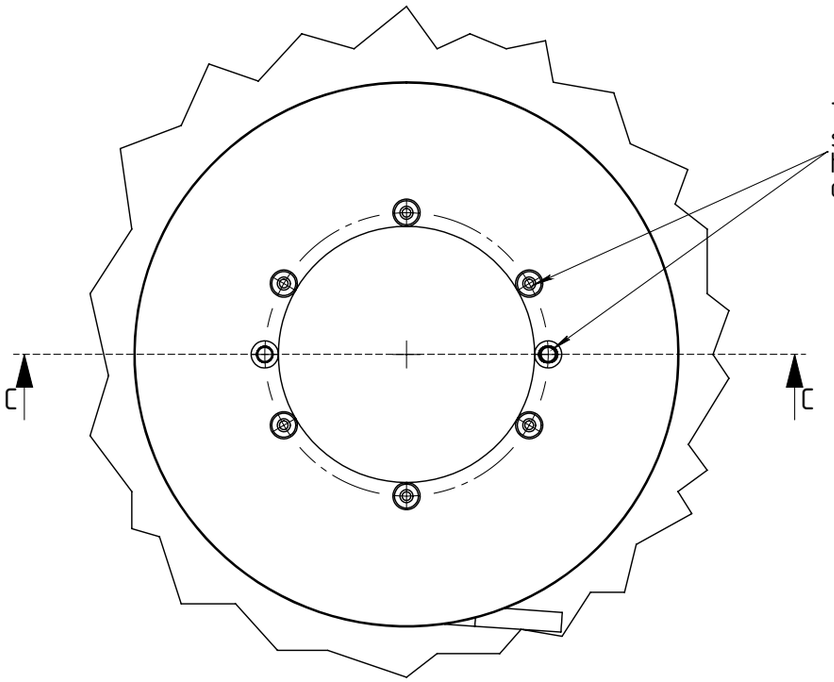


SECTION C-C

Rotor Type 1 (End Shaft)





	NAME	SIGNATURE	DATE
DRAWN	Michael A.		10-04-16
CHK'D	Jacob H.		10-04-16
APPV'D	Jacob H.		10-04-16

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN mm
SURFACE FINISH: N6
LINEAR TOLERANCES: ±0.1 mm
ANGULAR TOLERANCES: ±0.5 deg
ALL CHAMFER: 0.1 mm X 45°

Netzer Precision Motion Sensors Ltd.

TITLE: End shaft installation ICD

MATERIAL: | Coating: | SCALE: 1:1

DWG NO. : ICD DF-100 | Revision : 00 | A3

CAT NO. : ICD DF-100 | SHEET 2 OF 3

Netzer
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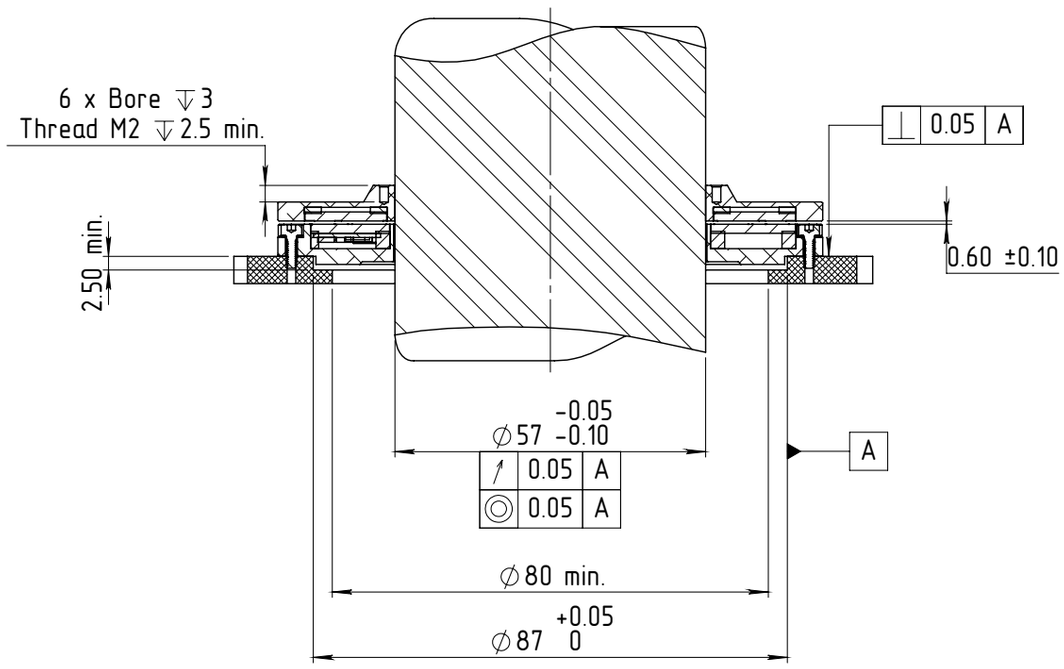
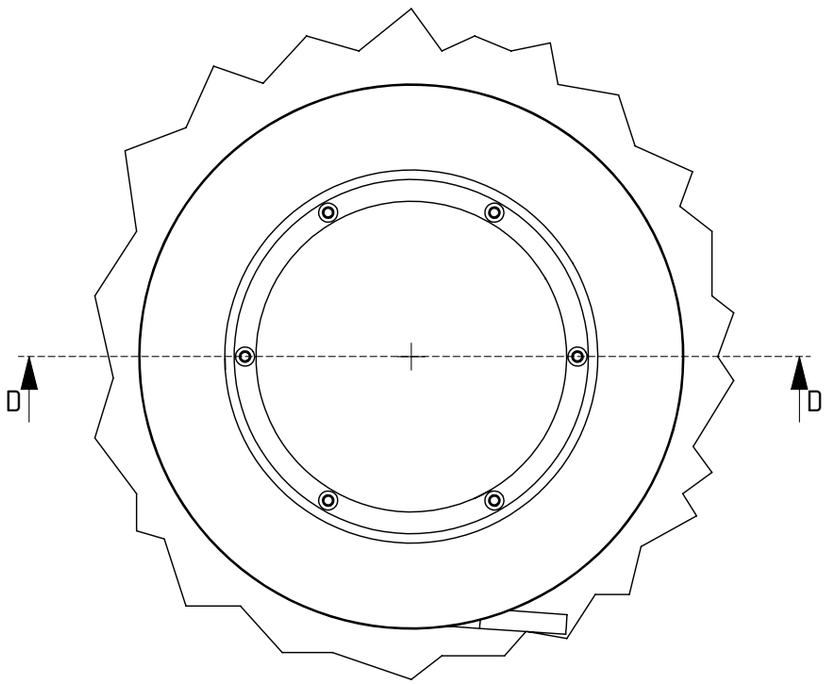
DF-100-32-SG

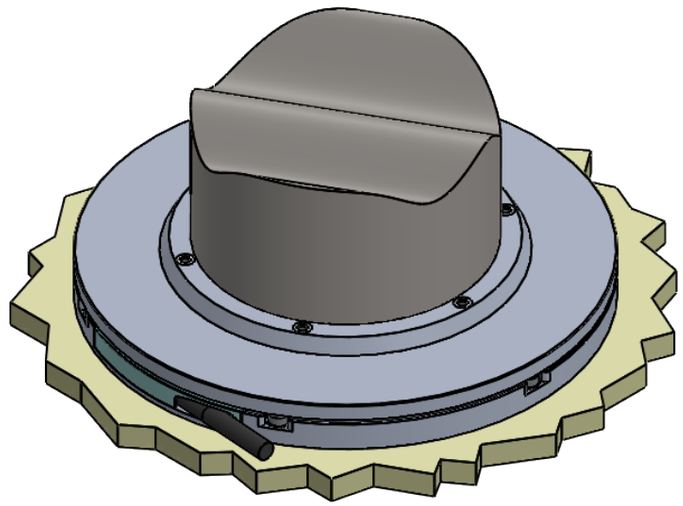
Absolute position, rotary Electric Encoder™

SECTION D-D





Rotor Type 3 (Mid Shaft)



	NAME	SIGNATURE	DATE
DRAWN	Michael A.		10-04-16
CHK'D	Jacob H.		10-04-16
APPV'D	Jacob H.		10-04-16

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN mm
SURFACE FINISH: N6
LINEAR TOLERANCES: ±0.1 mm
ANGULAR TOLERANCES: ±0.5 deg
ALL CHAMFER: 0.1 mm X 45°

Netzer Precision Motion Sensors Ltd.

TITLE: Middle shaft installation ICD

MATERIAL:
Coating:
SCALE: 1:1
DWG NO. : ICD DF-100
Revision : 00
A3
CAT NO. : ICD DF-100
SHEET 3 OF 3