The DF-150 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 (13 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
- Low weight
- Holistic signal generation
- 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	18-20 bit
Maximum tested static error	±0.010°
Extended accuracy static error	±0.006°
Maximum operational speed	1,500 rpm
Measurement range	Unlimited rotation
Rotation direction	Adjustable CW/CCW*
Build In Test BIT	Optional

* Default same direction from bottom side of the encoder

Mechanical

Allowable mounting eccentricity	±0.1 mm
Allowable axial mounting tolerance	±0.1 mm
Rotor inertia	427,882 gr · mm2
Total weight	307 gr
Outer Ø /Inner Ø/ Height	150/ 110 / 13 mm
Material (stator, rotor)	Aluminum
Nominal air gap (stator, rotor)	0.6 mm

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	-40°C to +85°C
Storage temperature	-50°C to +100°C
Relative humidity	98% Non condensing
Shock endurance	100 g for 11 ms
Vibration endurance	20 g 10 – 2000 Hz
Protection	IP 40

DF-150-V02
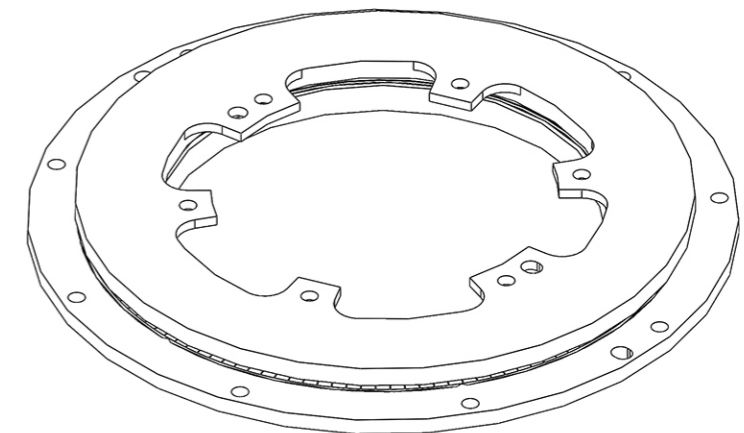
Digital SSi Interface

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.
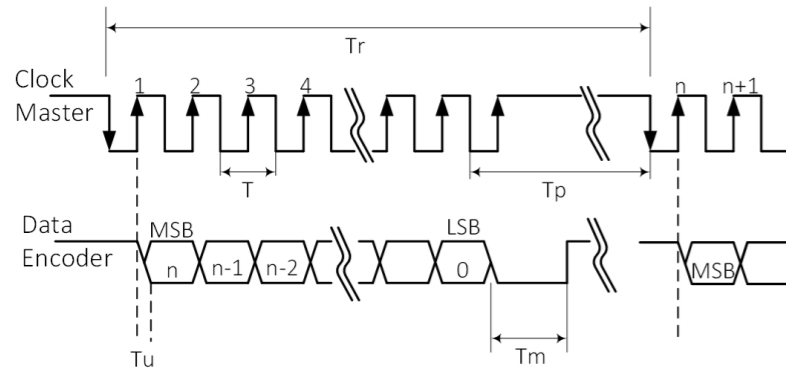
Description		Recommendations
n	Total number of data bits	12 - 22
T	Clock period	
f= 1/T	Clock frequency	0.5 - 2.0 MHz
Tu	Bit update time	200 nsec
Tp	Pause time	26 - ∞ µsec
Tm	Monoflop time	>25 µsec
Tr	Time between 2 adjacent requests	Tr > n*T+26 µsec
fr=1/Tr	Data request frequency	

SSi / BiSS Output signal parameters

| 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 / 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.
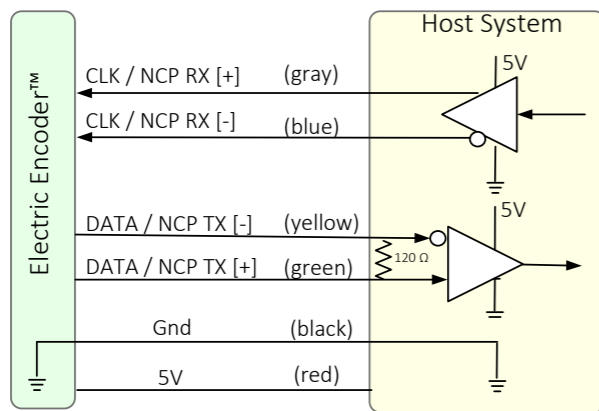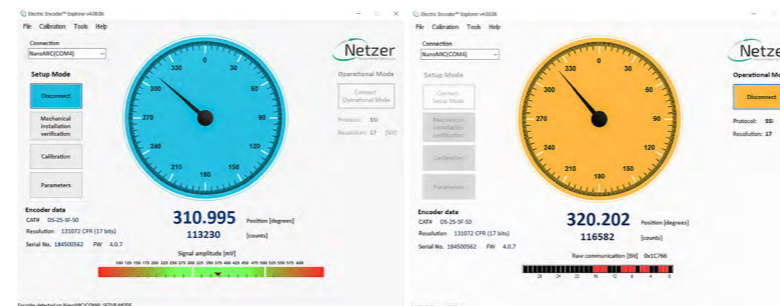

Digital BiSS-C Interface

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.
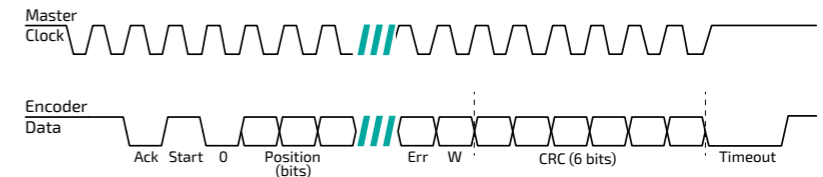
bit #		Description	Default	Length
28	Ack	Period during which the encoder calculates the absolute position, one clock cycle	0	1/clock
27	Start	Encoder signal for "start" data transmit	1	1 bit
26	"0"	"start" bit follower	0	1 bit
8...25	AP	Absolute Position encoder data		
7	Warn.	Warning	1	1 bit
6	Error	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

Ordering Code

DF – 150 – 32 – S G – S 0 – n n n

DF Product line

Outer Diameter

Fine ECR

Output
| S | SSi |
| I | BiSS |

Resolution
| Code | Bit | CPR |
| G | 18 | 262,144 |

BIT (Build In Test): optional
| [ ] | None |
| B | BIT |

| EA | Extended Accuracy |
| nnn | Custom |

Interconnection
0	250mm Flying leads (default)
1	500mm Flying leads (default)
2	750mm Flying leads (default)
3	1000mm Flying leads (default)
C	Connector (optional)

| S | Shielded cable 250 mm (default) |

Cable Information

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

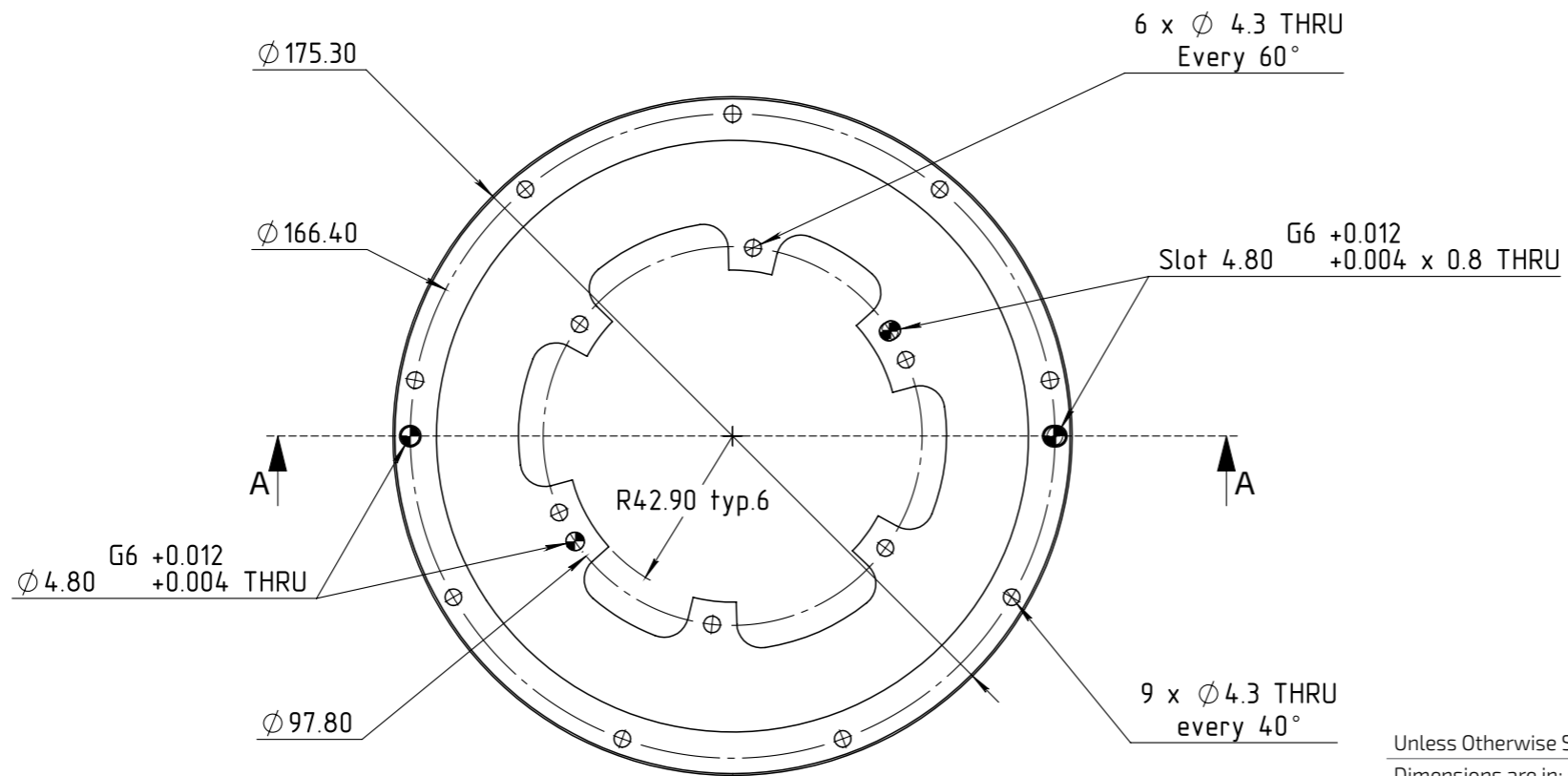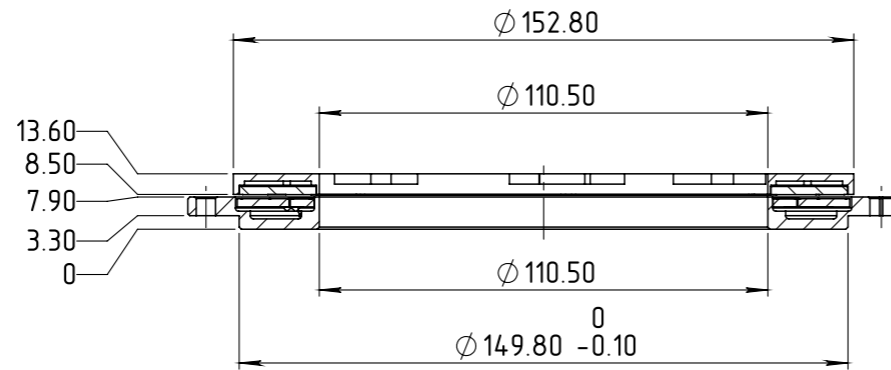| Pair #	Color
1	Red / Black
2	Gray / Blue
3	Green / Yellow

30 AWG twisted pairs (3)
Braided shield
Jacket 0.45mm
3.45± 0.20mm
0.017
30 AWG single insulated wire
Ø 0.61 ± 0.051mm
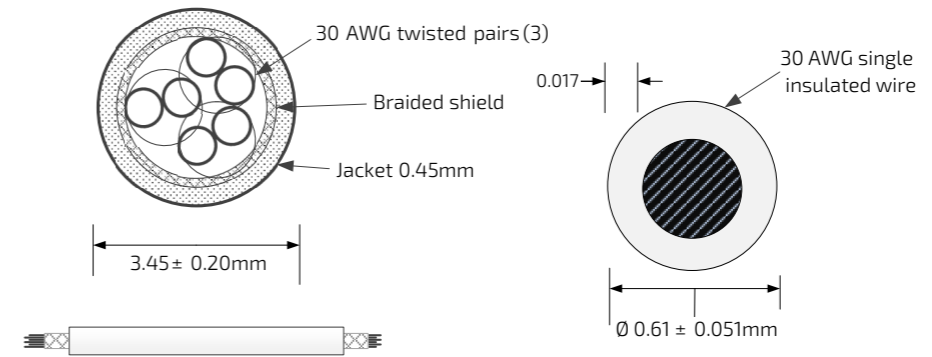
Related documents
DF-150 User Manual: Mechanical , Electrical and calibration setup.

DF-150-V02

Netzer Precision Motion Sensors

ABSOLUTE POSITION
ROTARY ELECTRIC ENCODER™

HARSH
ENVIRONMENT | DF-150

DATA SHEET

SECTION A-A

Ø 152.80

Ø 110.50

13.60
8.50
7.90
3.30
0

Ø 110.50

0
Ø 149.80 −0.10

Ø 175.30

Ø 166.40

6 x Ø 4.3 THRU
Every 60°

G6 +0.012
Slot 4.80   +0.004 x 0.8 THRU

R42.90 typ.6

A   A

G6 +0.012
Ø 4.80   +0.004 THRU

Ø 97.80

9 x Ø 4.3 THRU
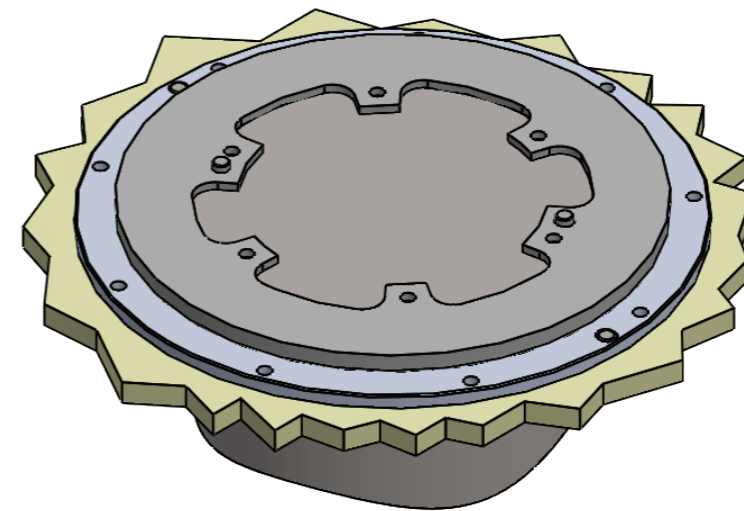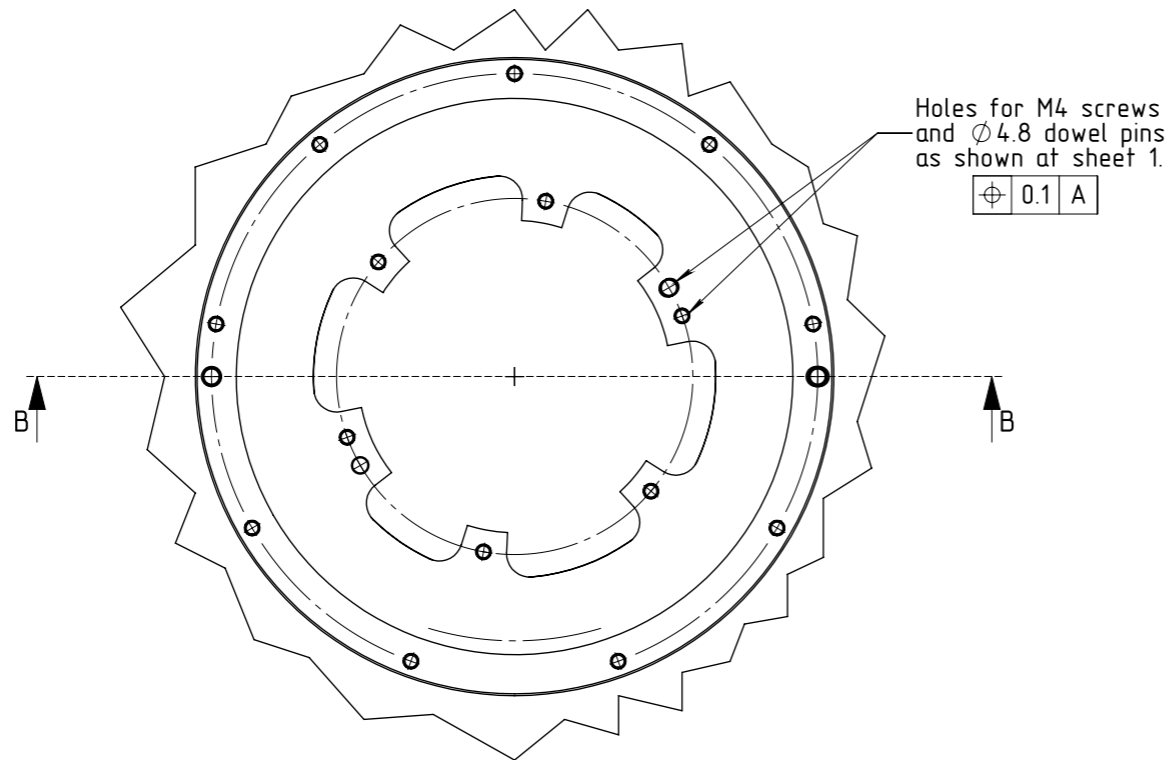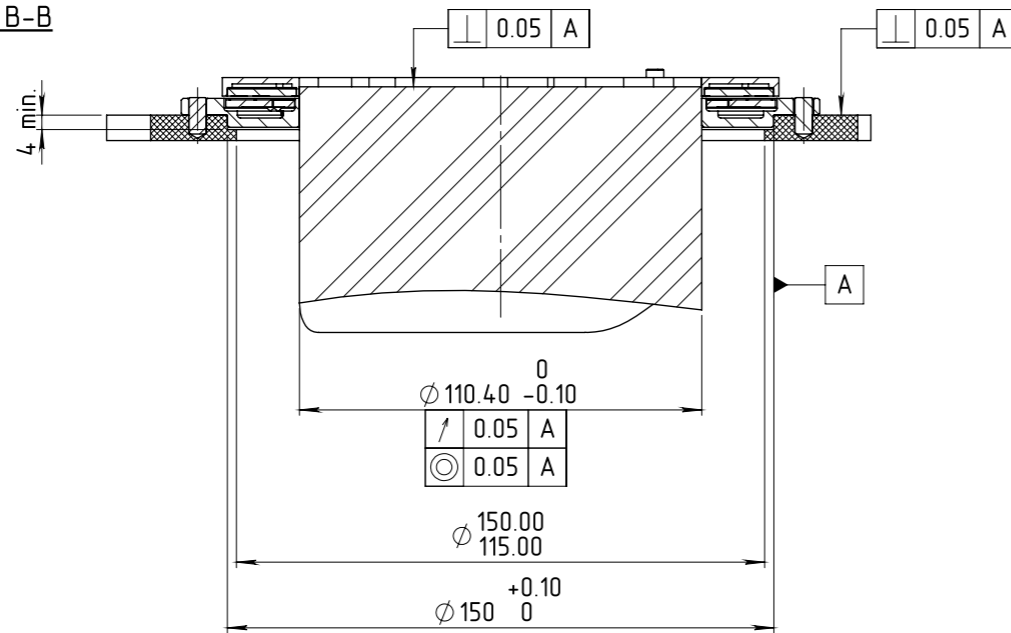every 40°

Unless Otherwise Specified	
Dimensions are in: mm	Surface finish: N6
Linear tolerances	
0.5-4.9: ±0.05 mm	5-30: ±0.1 mm
31-120: ±0.15 mm	121-400: ±0.2 mm

SECTION B-B

⊥ | 0.05 | A

⊥ | 0.05 | A

4 min.

⌀ 110.40 $^{0}_{-0.10}$

| ⟋ | 0.05 | A |
| ◎ | 0.05 | A |

⌀ $^{150.00}_{115.00}$

⌀ 150 $^{+0.10}_{0}$

A

Holes for M4 screws
and ⌀4.8 dowel pins
as shown at sheet 1.

⊕ | 0.1 | A

B ← → B

Unless Otherwise Specified	
Dimensions are in: mm	Surface finish: N6
Linear tolerances	
0.5-4.9: ±0.05 mm	5-30: ±0.1 mm
31-120: ±0.15 mm	121-400: ±0.2 mm

DF-150-V02