Technical Datasheet ASA56

For the following variants:

E3 (= inkremental), W1 (= SSI))

Version: 1.0.0

Contents

1 Document, audience, intended use

This data sheet replaces no OEM instruction. For correct product use, please follow the valid OEM instructions and ask our sales team about combinations with other Nanotec products. Use the product as intended only, within approved technical limits and ambient conditions.

Audience, qualification

The product and this document address to technically trained experts alone, such as **development, application, plant engineers, installers,** and **service staff**. Only experts may install, commission and operate the product. Absolutely required are:

- Training and experience in working with motors, their control and electrostatically threatened components
- Reading and understanding of this and all applicable documents
- Knowledge of all valid regulations

Disclaimer

Nanotec is not liable for damage / malfunction from installation errors, failure to observe this document, or improper repair. The audience alone is responsible for selecting / operating / using our products. We accept no liability for product integration in the end system. The general terms and conditions at *www.nanotec.com* apply (us.nanotec.com for clients of Nanotec Electronic USA). *RoHS directive (2011/65/EU, 2015/863/EU)* was observed. **Note:** Product modification / alteration is illicit.

2 Your product

The *ASA56* is a stepper motor with protection class IP65 (except shaft output) and integrated incremental or multi-turn encoder for drive systems in a wide range of industrial applications.

2.1 Highlights

- UL certifcate
- 2 motor sizes
- Protection class IP65 (shaft output IP54)
- Optional brake integrated (on request)
- High encoder resolution

2.2 ASA56 variants

Find your product variant by its article number.

ASA5618**x**4204-xxX	Motor length **M**edium | **L**arge
ASA5618x4204-**xx**X	Encoder **E3:** Incremental | **W1:** SSI

2.3 Product installation

For product installation, please use the dimension sheet from our website. There, use *Products* > *[Product group]* to scroll to the results list, click on *ASA56[variant]* > *Dimensions*, select a download format, and use the cloud button to save it.

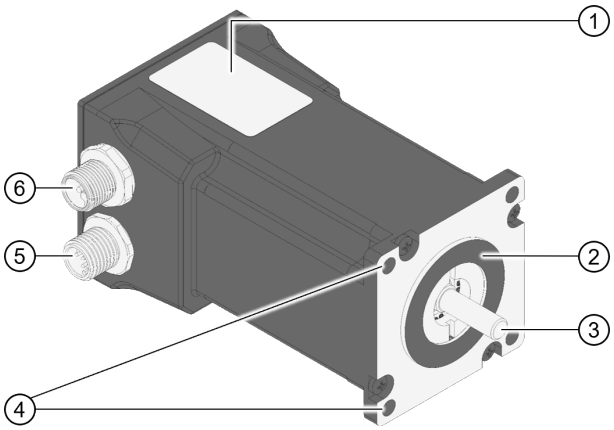

Fig. 1: ASA56

1. Type label
2. IP54 bearings
3. Motor shaft
4. Mounting points (four *M5x12* threads)
5. Motor connector
6. Encoder connector

3 Technical data

Use the ASA56 motor only within its technical limits. **Note:** Subject to change without notice. Especially for electrical values, the dimension sheet from our website applies. There, use *Products > [Product group]* to scroll to the results list, click on *ASA56[Variante]*, scroll to *Downloads*, and select the dimension sheet.

3.1 Ambient conditions

Use the ASA56 in permissible environments only.

Protection class except / with shaft outlet	IP65 / IP54
Air humidity (non-condensing)	0 to 85 %
Ambient °C (°F)	-10 to +50 °C (+14 to +122 °F)

3.2 Motor

The ASA56 is available in two lengths with different rated power.

ASA56 stepper	**M size**	**L size**
Current$^{\text{per winding}}$ A	4.2	4.2
Resistance$^{\text{per phase}}$ (@ 25 °C / 77 °F) Ω$^{\pm 15\%}$	0.5	0.55
Inductance$^{\text{per phase}}$ (@ 1kHz) mH$^{\pm 20\%}$	1.6	2.1
Holding torque Nm	1.4	2.3
Step angle °$^{\pm 5\%}$	1.8	1.8
Axial force *Fa* N max.	10	10
Radial force *Fr* (@10 mm) N$^{\text{max.}}$	28	28
Axial play (*Fa* = 4.0 N) mm	0.08	0.08
Radial play (*Fr* = 4.0 N) mm	0.02	0.02

3.3 Encoder

The ASA56 is available with two different encoder types. The encoder resolves with 12 bit (incremental), or 17 (single-turn) and 16 bit (multi-turn) respectively.

	SSI	**Incremental**
Protective circuits	Reverse polarity, short circuit	Overvoltage
Energy harvesting	Wiegand effect	
Operating voltage	4.75 to 15 V DC	4.5 to 5.5 V DC
Consumption (typical value)	≤0.3 W	≤30 mA (@5 V, no load)

	SSI	Incremental
Start-up time	100 ms	
Clock input	RS 422	
Sensor type	Magnetic	Magnetic
Incremental resolution		4096 cpr (16384 ppr with quadrature)
SSI resolution (*single-turn*/*multi-turn*)	17 bit / 16 bit	
Accuracy		±0.02° (@standstill)
Count direction	Axis rotation clockwise (axis viewed from front)	Axis rotation clockwise (axis viewed from front)
Maximum speed	12,000 rpm	14,000 rpm

3.4 Pin assignment

NOTICE

ESD-sensitive module damage: from electrostatics!

► Observe basic principles for ESD protection.

In the ASA56, the following pins have a function.

Motor and encoder

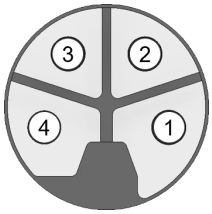

*Fig. 2: **Motor** (= L-coded M12, male).*

1: A\ **2:** A **3:** B **4:** B\

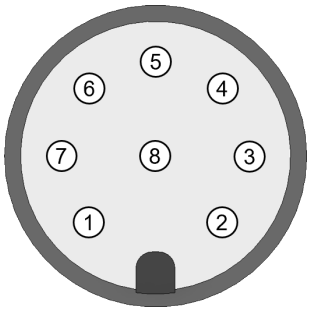

*Fig. 3: **Encoder** (= A-coded M12, male).*

SSI:

1: Clk+
2: Clk-
3: Data+
4: Data-
5: GND
6: n/c
7: n/c
8: Ub

Incremental:

1: A
2: A\
3: B
4: B\
5: GND
6: I\
7: I
8: Ub

4 Sensor data format

Depending on type, the ASA56's encoder sends the motor position incrementally via two channels **A, B** plus index **I** or via **s**ynchron-**s**eriell-**i**nterface (SSI) as a 33-bit packet (after 16 start bits).

Incremental output

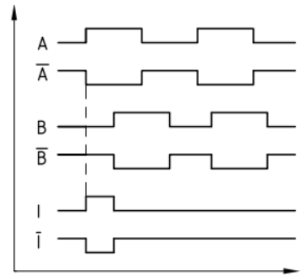

*Fig. 4: The index signal **I** runs in sync with channel **A**'s rising edge.*

If the motor axis rotates clockwise (viewed from front), channel A's signal leads channel B by 90 degrees (electrical).

Ub = 5 V	Load	High level	Low level
A, A\, B, B\, I, I\	35 mA	≥ 4,5 V	≤ 0,3 V

SSI-Output

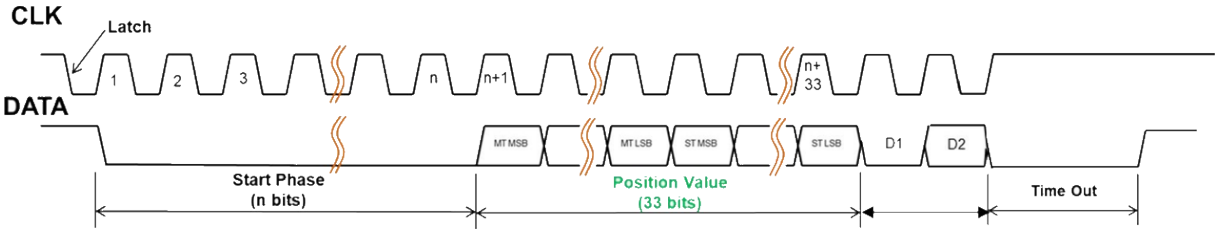

*Fig. 5: By **s**ynchronous **s**erial **i**nterface (SSI), the ASA56's encoder transfers the position values as 33-bit packets.*

- **S303B**
- Cycle: ≥ 50 µs
- Time-out: 7 µs$^{typ.}$
- 16 Start bits (= *0*) + *multi-turn* (16 bits) + *single-turn* (17 bits) + D1 + D2
- D1: Constant value = *0*
- D2: Error-bit for displaying the sensor-internal status (*1* = no error; *0* = error)

Prepare the SSI for *Nanotec CPB* controllers

63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
													0	0	0

47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
0	0	0	0	0	0	0	0	0	0	0	0	0	POS	POS	POS

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	POS

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	S	E

*Fig. 6: ASA56 uses 51 status, start snd position bits: 1 **S** for status (D1), 1 **E** for error (D2), 33 **POS** for position and 16 start bits (= 0).*

- **Bit 0** (= error): value *1* if no error
- **Bit 1**: always value *0*

Edit the 33B0$_h$ **sub-inidices** below so that the *Nanotec CPB* controllers in *Autosetup* (see controller manual) duly process the encoder and its data:

1. Set **33B0$_h$:06$_h$** to *2000000* (baud rate in Hz).
2. Set **33B0$_h$:05$_h$** to *51* (number of bits plus start bits).
3. Set **33B0$_h$:07$_h$** to *FFFFFFFC$_h$* (Position data: *POS* bits 2 to 31).
4. Set **33B0$_h$:08$_h$** to *7* (Position data: *POS* bits 32 to 34).
5. Set **33B0$_h$:09$_h$** to *3* (status and error bits 0 and 1).
6. Set **33B0$_h$:0B$_h$** to *1* (error bit = *1*, status bit = *0*).
7. To store the object: Insert *65766173$_h$* to **1010$_h$:06$_h$**.
8. Restart the controller.

5 Imprint, marking, versions

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Document	++ Added | >> Changed | ## Fixed
1.0.0 2023.11	Release