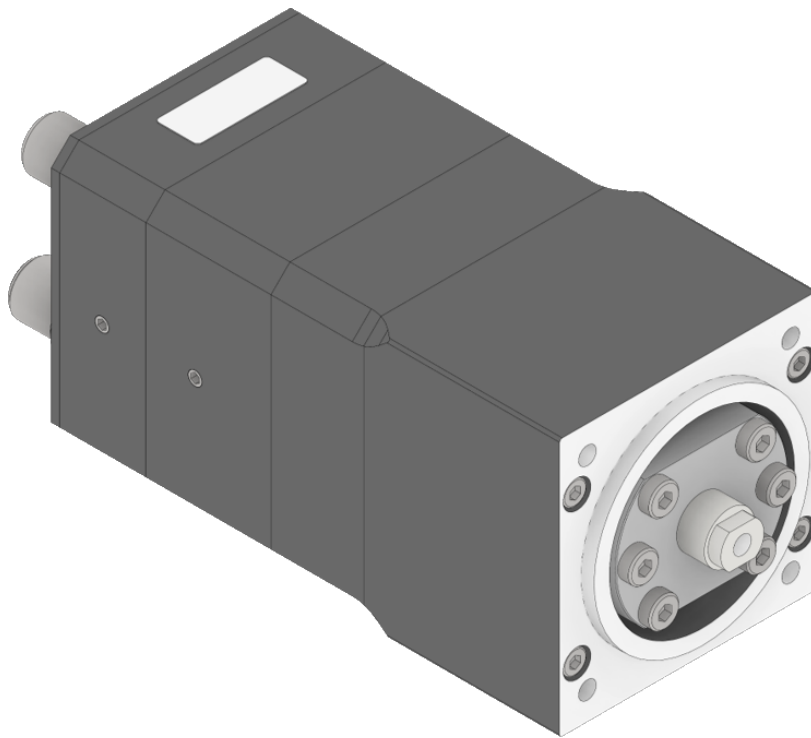


Technical Datasheet **LBA60**

For the following variants:

LDR1250-E3/E4-55, LDR1250-E3B/E4B-55



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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 *LBA60* is a short-stroke actuator based on a BLDC motor with integrated ball screw. A high-resolution encoder and optional brake are also integrated.

2.1 Highlights

Due to its high speed and long service life, the *LBA60* serves dynamic positioning processes.

- **Compact:** Fully integrated, extremely short sized unit.
- **Dynamic:** For applications with short cycle times
- **Precise:** Due to integrated encoder

2.2 LBA60 variants

Find your product variant by its article number.

LBA60LDR1250- Ex X-xx	Encoder E3: incremental E4: SSI absolut
LBA60LDR1250-Ex B -xx	With Brake (letter omitted otherwise)
LBA60LDR1250-ExX- xx	Stroke ^{rounded} 55 mm

2.3 Product installation and needed tools

NOTICE



Damage, early wear: from misassembly and shear forces!

- ▶ Fit the product to a level, vibration-free, torsion-proof structure only.
- ▶ Avert shear forces, bending torque, shocks and blows on the spindle.
- ▶ Flange the product concentrically at right angles and always with guideway.

For product installation, please use the dimensional drawing from our website: Just use *Products* > [*Product group*] to scroll to the results list, then click on *LBA60^[variant]* > *Dimensions*, select a download format, and use the cloud button to save it. You also need:

- Torque tool
- 4 M5 screws to mount the motor (5.9 / 3.0 Nm)¹
- 4 M3 screws for fitting an anti-rotational mechanism / guide (1.27 / 0.73 Nm)¹
- If needed: 2 M2x3 screws for a second encoder (0.36 / 0.13 Nm)¹

¹Advised for class 8.8 ISO 4762 / 10642.

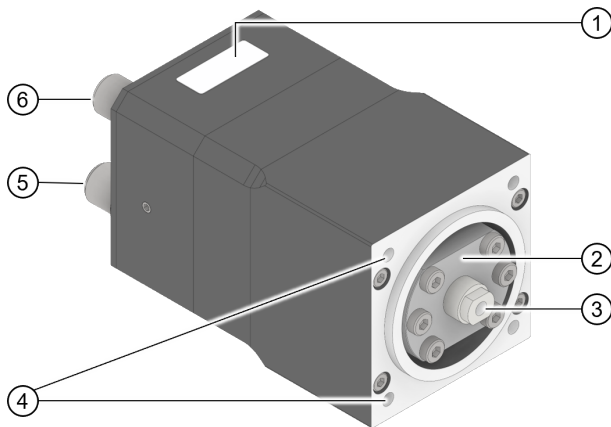


Fig. 1: LBA60LDR1250-E3/E4.

1. Type label
2. Nut
3. Screw
4. Mounting points (four M5x12 threads)
5. Motor connector
6. Encoder connector

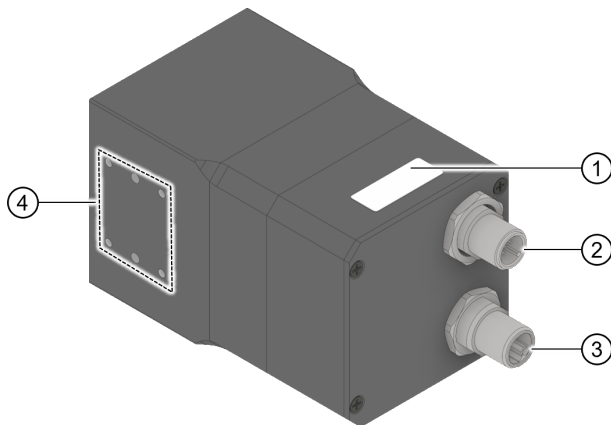


Fig. 2: LBA60LDR1250-E3/E4.

1. Type label
2. Encoder connector
3. Motor connector
4. Fitting points for an anti-rotational mechanism / guide (four M3x5 threads; two 3-mm holes H7x6)

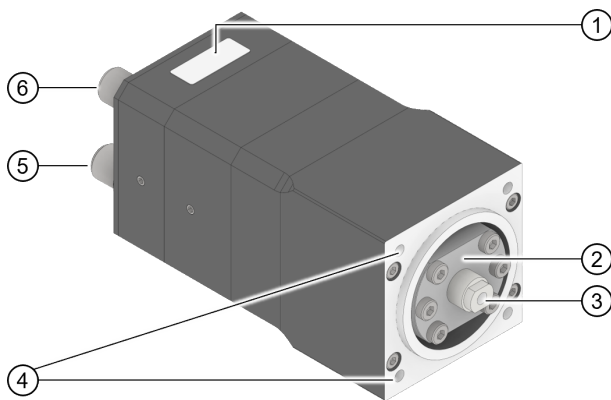


Fig. 3: LBA60LDR1250-E3B/E4B.

1. Type label
2. Nut
3. Screw
4. Mounting points (four M5x12 threads)
5. Motor connector
6. Encoder connector

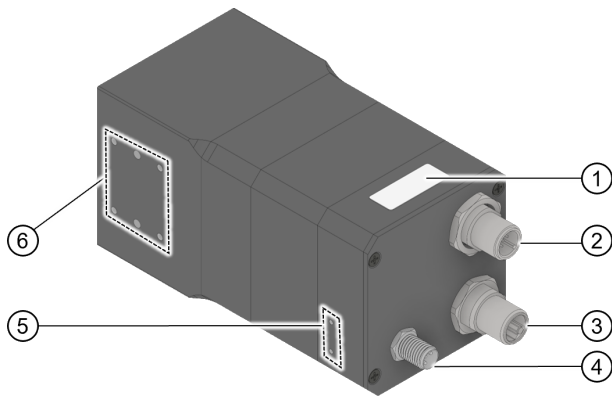


Fig. 4: LBA60LDR1250-E3B/E4B.

1. Type label
2. Encoder connector
3. Motor connector
4. Brake connector
5. Fitting points for second encoder / accessories ...
6. ... and for an anti-rotational mechanism / guide (four M3x5 threads; two 3-mm holes H7x6)

3 Technical data

Use the LBA60 short-stroke actuator only within its technical limits and in permissible environments. **Note:** Subject to change without notice. Especially for electrical values, the data sheet from our website applies. There, use *Products > [Product group]* to scroll to the results list, click on *LBA60^[Variante]*, scroll to *Downloads* and select the data sheet.

3.1 Ambient conditions

Except for the ball screw drive and shaft end (= IP20), the LBA60 complies with protection class IP54. For full IP protection, you must seal the flange on the installation side, say, with an O-ring or surface seal.

Protection class as per EN/IEC 60529	IP54 (except for screw-nut interface)
Storage °C (°F)	0 to +40 °C (+32 to +104 °F)
Ambient °C (°F)	0 to +40 °C (+32 to +104 °F)
Maximum temperature rise (motor only)	80 °C (176 °F)
Air humidity (non-condensing)	0 to 80 %

3.2 Motor and brake

NOTICE

Damage: from thermal overload!



- ▶ Observe the allowed ambient temperature.
- ▶ Avert heat build-up.
- ▶ Only briefly ($\leq 3s$) use peak current for peak load.

NOTICE

Spindle damage: by exceeding the stroke!



- ▶ Limit the stroke suitably: by limit switches, stops, buffers, etc. for retracted and extended end position.
- ▶ Size the end stops in such a way that they correctly absorb the moving parts' kinetic energy even in very fast travel.

LBA60LDR1250-...	E3-... / E4-...	E3B-... / E4B-...
Weight kg	~ 1.3	~ 1.5
Motor type (BLDC)	B	B

LBA60LDR1250-...	E3-... / E4-...	E3B-... / E4B-...
Number of poles	20	20
Rated voltage VDC	48	48
Current (rated / peak) A	6.2 / 17.7	6.2 / 17.7
Resistance (line to line @ 20 °C / 68 °F) $\Omega^{\pm 10\%}$	0.77	0.77
Inductance (line to line @ 1 kHz) mH $^{\pm 20\%}$	0.38	0.38
Axial force (rated / peak) N	500 / 1500	500 / 1500
Thread lead mm	5	5
Axial play mm	0.047	0.047
Brake axial backlash mm	-/-	0.014 (1°)
Static brake force N	-/-	750
Speed (rated / max.) mm/s $^{\pm 10\%}$	100 / 292	100 / 292

Force-Speed Curve

The following curve shows the maximum speed and current depending on the force. The diagonal line marks the limit between rated and peak load area.

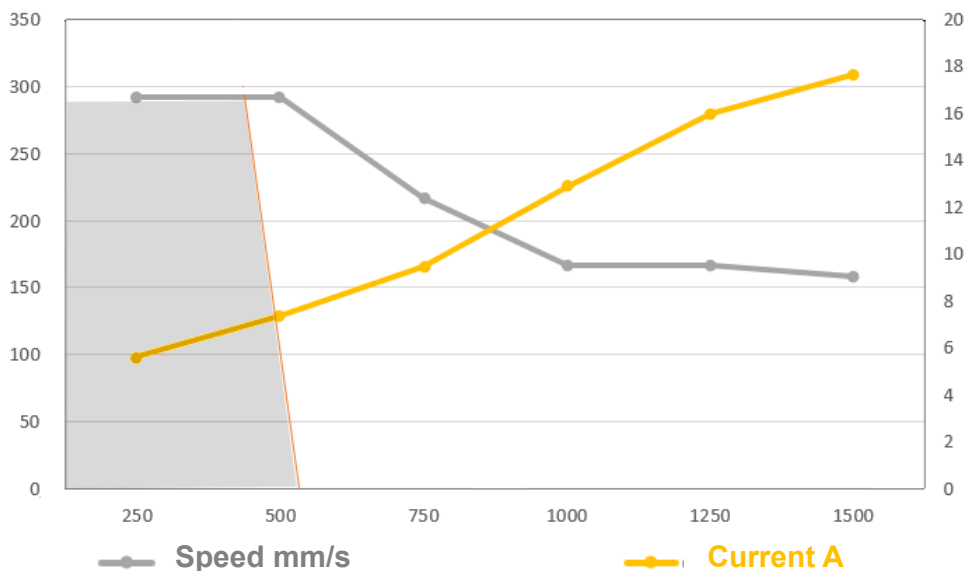


Fig. 5: LBA60: Force-Speed Curve.

3.3 Encoder

NOTICE



Damage to the electronics through improper handling of ESD-sensitive components!

The device contains components that are sensitive to electrostatic discharge.

- ▶ Observe the basic principles of ESD protection when handling the device.

NOTICE



Electronic damage: from mispolarized supply voltage!

- ▶ Assign connectors correctly.
- ▶ Use correct connector types.

The LBA60's encoder resolves incrementally with 4096 cpr (variants -E3 and -E3B and via SSI with 17 bit (variants -E4 und -E4B).

	SSI	Incremental
Operating voltage	9 10 30 V DC	4,5 10 5,5 V DC
Consumption (typical value)	≤40 mA (@12 V, ohne Last)	≤50 mA (@5 V, no load)
Signal type	RS 422 compatible	
Sensor type	Magnetic	Magnetic
Incremental resolution		4096 cpr (16384 ppr with quadrature)
SSI resolution <i>single-turn</i>	17 bit	

3.4 Pin assignment

Motor

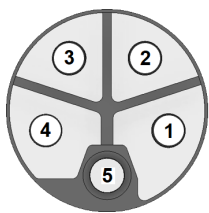


Fig. 6: L-coded M12, male (some pins no function)

- 1: U 2: V 3: W 4: n/c 5: n/c

Incremental encoder in LBA60 variants -E3 and -E3B

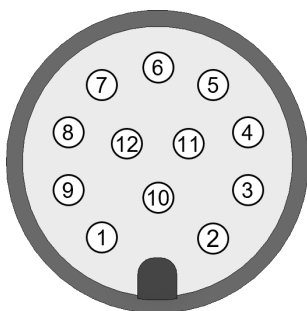


Fig. 7: A-coded M12, male.

- | | | |
|--------------------|-------|----------------------|
| 1: Ub ¹ | 5: B | 9: H2 |
| 2: A\ | 6: I\ | 10: H3 |
| 3: A | 7: I | 11: <u>Preset</u> |
| 4: B\ | 8: H1 | 12: Gnd ² |

¹Voltage supply. ²Not connected to motor housing.

SSI encoder in LBA60 variants -E4 and -E4B

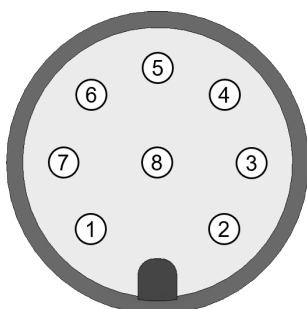


Fig. 8: A-coded M12, male.

- | | | |
|----------------------|---------------------|--------------------|
| 1: Clk+ ¹ | 4: Data- | 7: n/c |
| 2: Clk- ¹ | 5: Gnd ² | 8: Ub ³ |
| 3: Data+ | 6: <u>Preset</u> | |

¹120 Ω between Clk+ und Clk- internal. ²Not connected to motor housing. ³Voltage supply.

Brake (optional) in LBA60 variants -E3B and -E4B

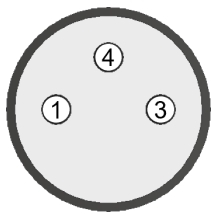


Fig. 9: A-coded M8, male (some pins no function).

1: 24 V

3: Gnd

4: n/c

3.5 Sensor data format

Depending on type, the LBA60's encoder sends the motor position incrementally via two channels **A**, **B** plus index **I** or via **synchron-seriell-interface (SSI)** as a 23-bit packet.

Incremental output

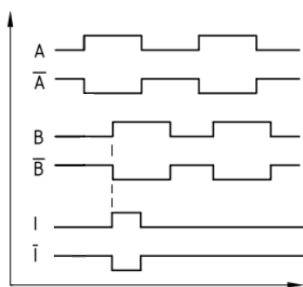


Fig. 10: Clockwise (viewing the motor drive shaft), the channel A signal precedes channel B by 90° (electrically). The index signal is 90° wide and synchronous to the channel B edge.

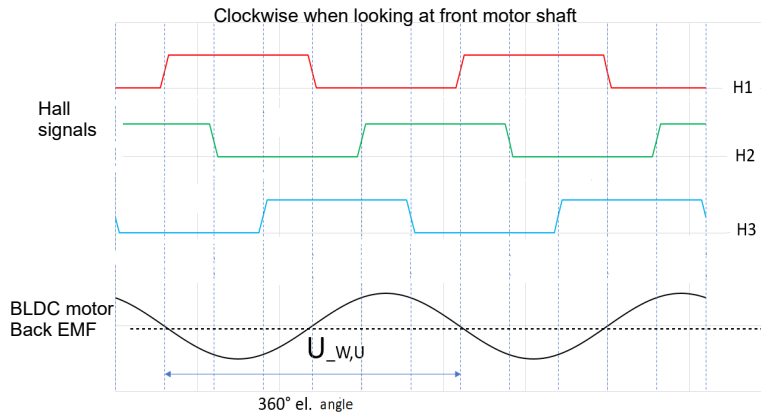


Fig. 11: The Hall signals are arranged such that the rising and falling Hall 1 edges lie at the zero crossings of the back EMF voltage $U_{w,u}$ (phase voltage W to U).

The following signal levels ($U_b = 5\text{ V}$, load = 20 mA) apply for differential encoder signals A, A̅, B, B̅, I, I̅ :

High level	Low level
$\geq 2.4\text{ V}$	$\geq 0.4\text{ V}$

The following signal levels ($U_b = 5\text{ V}$, load = 4 mA) apply for Hall sensors Hall 1, Hall 2, Hall 3:

High level ($U_b = 4.5\text{ V}$)	Low level ($U_b = 4.5\text{--}5.5\text{ V}$)
$\geq 4\text{ V}$	$\geq 0.5\text{ V}$

SSI-Output

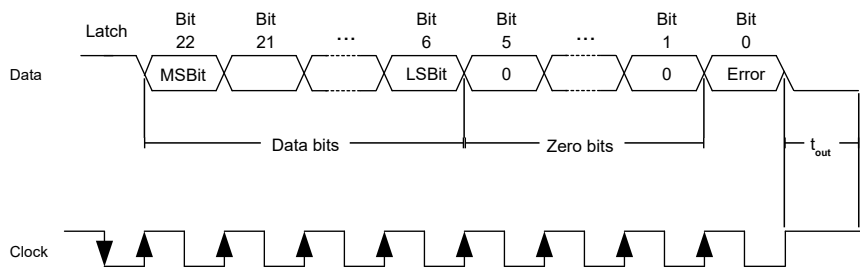


Fig. 12: SSI signal curve, binary-coded from a total of 23 bits.

Latch: Data do flow as of the first falling clock signal edge; first bit is 1.

Data bits (position value): The actual position transmits as of the next rising clock signal edge = data transfer (17 bits) with the highest value bit (MSB) first, each bit on the rising clock signal edge.

Zero bits: Five zero bits follow the data bits. **Error bit:** This end bit tells if internal errors occurred (= 0) or not (= 1). After a **20-µs timeout** (t_{out}), you can fetch a new data packet by clock signal. Ex works, the absolute encoder zero position is at the zero crossing of the back EMF voltage $U_{W, u}$ (phase voltage W to U).

Prepare the SSI for Nanotec CPB controllers

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
									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	0	0	0	0	0	E

- **Bit 0** (= error): value 1 if no error occurred
- **Bit 1-5:** always value 0

Fig. 13: LBA60 uses full 23 bits: E for error, 17 POSition bits and 5 zero bits.

Edit the 33B0_h **sub-indices** below so that the Nanotec CPB controllers in *Autosetup* (see controller manual) duly process the encoder and its data:

1. Set the baud rate in **33B0_h:06_h** (2625000 Hz) and the number of bits (23) in **33B0_h:05_h**.
2. Position data: Set POS bits 6 to 22 in **33B0_h:07_h** to 1 (value 7FFFC0_h).
3. Error: Set bit 0 in **33B0_h:09_h** to 1 (value 1).
4. The error bit needs the value 1. Insert value 1 to **33B0_h:0B_h**.
5. To store the object: Insert 65766173_h to **1010_h:06_h**.
6. Save and restart the controller.

Preset function

With the preset function, you can set the internal index or the zero position of the encoder to a new position. The electronics of the encoder then stores this position and in the future then outputs the index signal or the zero position at this position.

CAUTION!



Uncontrolled motor movements!

- ▶ Switch off the control before you trigger the preset function.
- ▶ Restart your controller after the preset and, if necessary, recalibrate or perform another auto setup before switching the drive back to control operation.

To define the new index or zero position, proceed as follows:

1. Move to the desired position with the motor.
2. Trigger the preset function by applying the supply voltage of the encoder to the preset pin. The voltage should be applied for at least 3 seconds.
3. Switch off the power supply of the encoder.

The next time the encoder is switched on, it outputs the index signal at this position (zero position).

4 Imprint, marking, versions

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Document **++ Added** | **>> Changed** | **## Fixed**
1.0.0^{2023.11} Release

