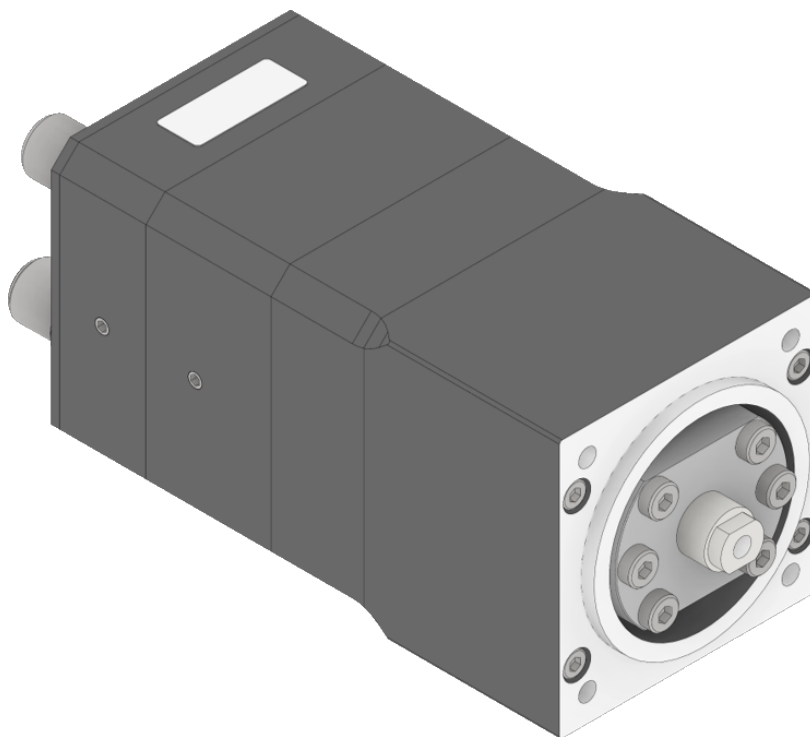


Technical Manual **LBA60**

For the following variants:

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



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1 Document, audience, intended use

Nanotec's and this document address to technically trained experts alone, such as developers, application / plant engineers, fitters, and service staff. Only experts may install, commission and run the product. Always required is the qualification for the product's assembly, commissioning and maintenance as part of an *overall* machine /system, as well as:

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

Place this PDF in valid version always to hand and accessible. Use as intended only, within licit technical limits and ambients. For product combinations, please contact Nanotec Sales.

Disclaimer

Product modification /alteration is illicit. Nanotec is not liable for damage /malfunction from installation error, failure to observe this document, or undue repair; nor for product integration in the end system or interaction (= third-party ware). The audience alone is liable for selecting /running /using our products. Our risk analysis for partly completed machinery (if applicable) only rated the hazards of duly installed and networked *single* products. Risks in the *overall* system are exempt and to be rated by the *audience*. The general terms & conditions at www.nanotec.com apply (us.nanotec.com for clients of Nanotec USA).

2 Your product

is a short-stroke actuator based on a BLDC motor with integrated rolled-ball spindle and linear guide. A high-resolution encoder and optional brake are also integrated.

CAUTION!



Cut, scratch: from sharp product edges!

- ▶ Keep distance.
- ▶ Handle / connect the product with care and due tools.

CAUTION!



Fire, scorch: from electric arc!

- ▶ Keep the product away from flammable / explosive zones.
- ▶ Keep connected during operation.
- ▶ Observe valid laws and regulations.

CAUTION!



Scorch: from hot product surface during operation!

- ▶ Only touch resting, cooled-off parts.
- ▶ Consider installing a cooling mass / heat sink.

2.1 Highlights

Due to its high speed and long service life, the 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

Article numbers for variants read like this:

LBA60LD R 1250-ExX-xx	Leadscrew type R olled
LBA60LDR 12 50-ExX-xx	Screw Ø 12 mm
LBA60LDR12 50 -ExX-xx	Screw lead 5.0 mm
LBA60LDR1250- Ex X-xx	Rotary encoder E3 : incremental E4 : SSI absolut
LBA60LDR1250-Ex B -xx	With B rake (letter omitted otherwise)
LBA60LDR1250-ExX- xx	Nominal stroke: 55 mm

2.3 Product layout



CAUTION!

Bruise, draw-in, crush: from moving /rotating parts!

- ▶ Stay out of range; consider installing a barrier.



CAUTION!

Injury: from breakage of overloaded components!

- ▶ Keep distance.
- ▶ Only load the product axially and with permitted force.



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.



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 such, that they correctly absorb the kinetic energy of even very fast moving parts.
- ▶ Use the product for allowed speeds only.

Internalize the product layout and technical data before installation so as to avert added hazards (say, abrupt motor run on defect / inhibition from your **overall** construct).

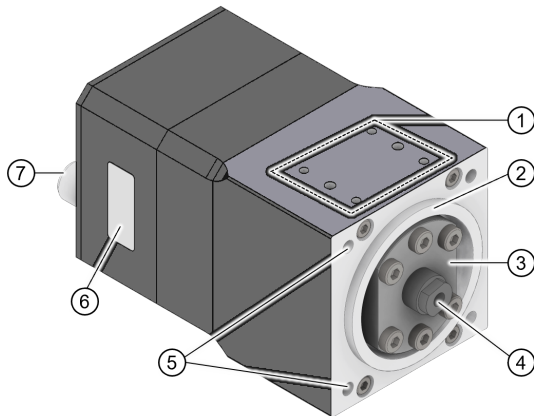


Fig. 1: LBA60 without brake, front side

1. For an anti-spin rail: four threads M3; two 3-mm holes H7x6
2. Shim ring
3. Leadnut
4. Leadscrew
5. Four fixing threads M5
6. Type label
7. Encoder connector

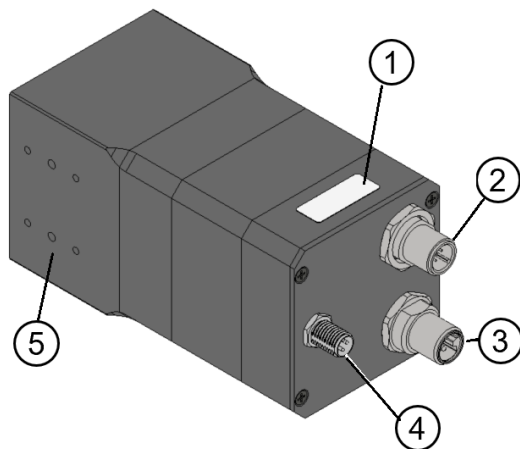


Fig. 2: LBA60 without brake, rear side

1. Type label
2. Encoder connector
3. Motor connector
4. Brake connector
5. To fit a stage etc.: four threads M3; two 3-mm holes H7x6

2.4 Product install

For assembly, please use the size sheet (CAD-/ PDF download) from our website's menu. Before first use, do assemble the product true to standard, by the licit fixing points, interfaces and tools.

Note: Low install accuracy brings malfunction and shortens the service life. Release the optional brake before install; otherwise the lead screw won't spin.

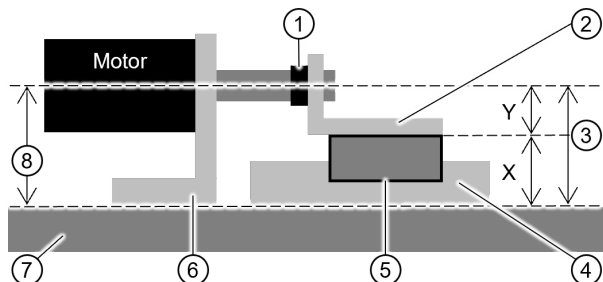


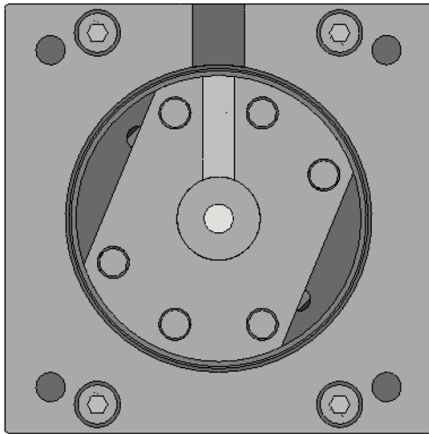
Fig. 3: Fitting tolerances in mm.

1. Centering plate (if modules inaccurate or stacking tolerance needs adjusting)
2. Movable stage
3. $[X+Y] \pm 0.1 \text{ mm}$
4. Guide rail
5. Load
6. Holder
7. Foot plate
8. $[X+Y] \pm 0.05 \text{ mm}$

2.5 Adding lubricant

Nanotec recommends adding grease every 100 km of travel or the latest after 100 hours of operation. Use type G04/05 grease (G02/03 for clean room applications) from HIWIN or equivalent.

1. Rotate the ball-screw until the grease filling hole is in the same position with the hole in the housing:



2. Remove the grub screw on the nut (ISO4029 M6x5)..
3. Add lubricant (approx. 0.3 g).
4. Screw the M6X5 back, until the screw head is completely in the nut.

3 Technical data

Use the product within its technical limits. The size sheet on our website applies. Select the exact type there and download the needed CAD-/ PDF file.

3.1 Ambient conditions



CAUTION!

Scorch, cable damage: from lubricant leak in a vacuum!

► Use the product in atmosphere pressure only.

Except for the shaft / leadscrew outlet and the linear guide itself (= IP20), is IP54-protected. For *overall* IP54, you must seal the outlet installation-ward, say, by O-ring or surface seal.

Air humidity (non-condensing)	≤ 80 %
Storage °C (°F)	0 to +40 °C (+32 to +104 °F)
Ambient °C (°F)	0 to +40 °C (+32 to +104 °F)
Maximum °C/°F rise (motor only)	+80 °C (+176 °F)

3.2 Motor and brake



CAUTION!

Injury: from lack of a holding brake if mounted vertical!

► For vertical use: Add a holding brake or order the corresponding product variant.



CAUTION!

Scorch: from overload!

- Observe allowed motor limits, voltages and current peaks.
- Avert motor overheating in operation.
- Only touch unpowered, stilled, cooled-off parts.

NOTICE



Damage of the brake.

- Use the integrated brake only as a holding brake in standstill.

NOTICE



Damage from closing the brake during the operation.

- Before motor start-up: Energize the brake.
- Keep the brake energized during operation.

LBA60LDR1250-...

	No brake	With brake
Number of poles	20	20
Rated voltage. motor VDC	48	48
Current (rated / peak) A	6.2 / 17.7	6.2 / 17.7
Axial force (rated / peak) N	500 / 1500	500 / 1500
Holding force static N	-/-	750
Work stroke mm	55	55
Axial play mm	0.047	0.047
Brake axial backlash mm	-/-	0.014
Speed (rated / max.) mm/s	100 / 292	100 / 292

Force-speed curve

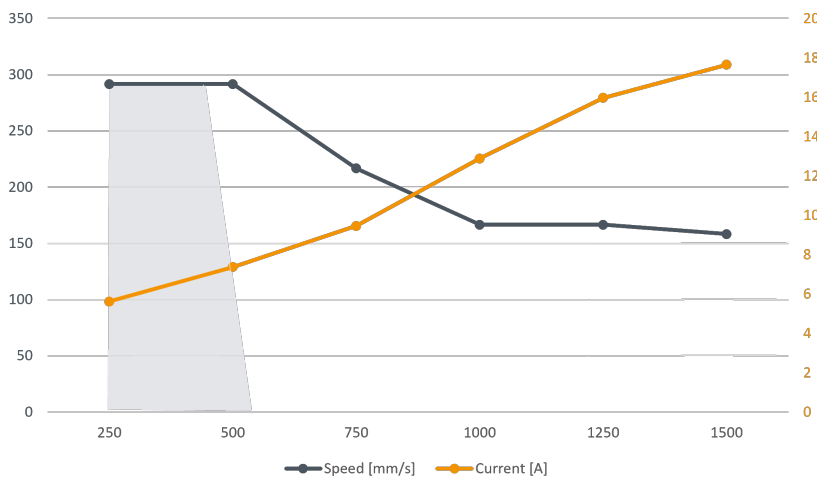


Fig. 4: Maximum speed and motor current as per thrust (gray area = nominal range).

The limit between nominal and peak load runs between the gray and white areas.

3.3 Encoder

The rotary encoder gives incremental 4096 cpr (E3... variants) and 17 bits via SSI (E4...). Observe the principles of ESD protection to avert electronic damage from electrostatic discharge.

	Incremental	SSI (= RS422-compatible)
Rated voltage	4.5 to 5.5 VDC	9 to 30 VDC
No-load consumption (typ.)	≤ 50 mA @ 5 V	≤ 40 mA @ 12 V
Sensor type	Magnetic	Magnetic
Resolution	4096 cpr / 16384 ppr	17 bit <i>single-turn</i>

3.4 Pin assignment

Motor and brake

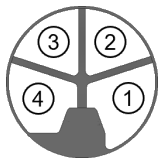


Fig. 5: Motor. L-coded M12, male.

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

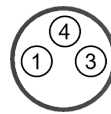


Fig. 6: Brake (if included). A-coded M8, male.

1: Brake+
3: Brake-
4: n/c

NOTICE



Earlier versions feature a 5-pin motor connector. The 5th pin is not used. The function and position of other 4 pins are the same in all versions.

Sensors

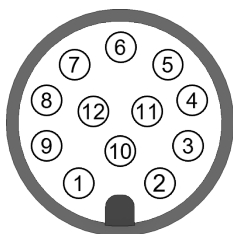


Fig. 7: Variants -E3B / -E3. A-coded M12, male.

1: V+ ¹	5: B	9: H2	¹ Voltage supply. ² Not connected to motor housing.
2: A\	6: I\	10: H3	
3: A	7: I	11: Preset	
4: B\	8: H1	12: GND ²	

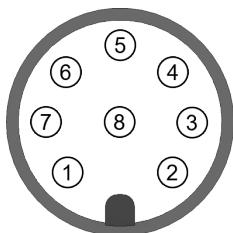


Fig. 8: Variants -E4B / -E4. A-coded M12, male.

1: Clk+ ¹	4: Data-	7: n/c	¹ 120 Ω between Clk+ and Clk- internal. ² Not connected to motor housing. ³ Voltage supply.
2: Clk- ¹	5: GND ²	8: V+ ³	
3: Data+	6: Preset		

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! Injury from uncontrolled motor movements! ► Before preset: Turn the control off. ► After preset: Restart your controller. ► If needed: Recalibrate the encoder or perform another auto-setup.

1. To set a new index /zero position: Move to the needed point.
2. To start the preset: Apply the encoder's voltage supply to the preset pin (≥ 4 sec).
3. De-energize the encoder.
4. After new switch-on: The encoder sends the index signal at the new zero mark.

3.5 Sensor data format

Depending on the type, the has an incremental rotary encoder with two channels **A**, **B** plus index **I** and separate Hall sensors or a rotary encoder with synchronous serial interface (SSI).

Incremental output

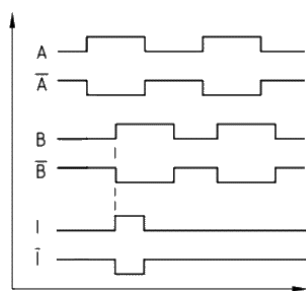


Fig. 9: Clockwise (viewing the motor drive shaft), channel A's signal leads channel B by 90° (electrical). The 90°-wide index signal is in sync with channel B's edge.

The incremental signal levels (20 mA load at 5 V) are:

High
 $\geq 2.4 \text{ V}$

Low
 $\leq 0.4 \text{ V}$

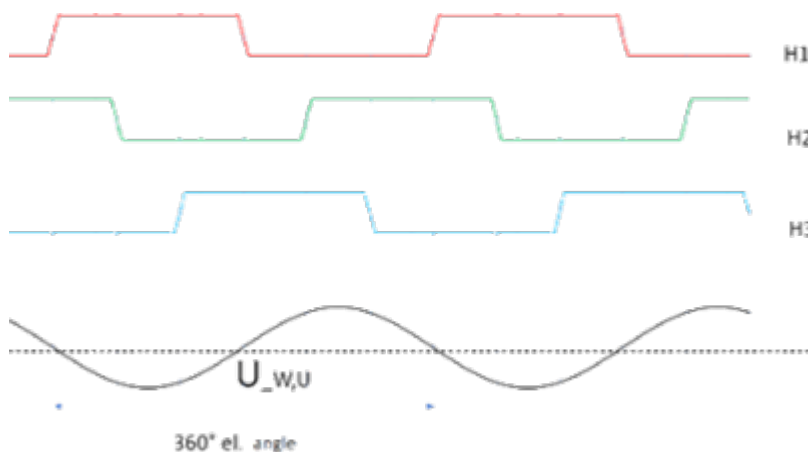


Fig. 10: For Hall signals, the H1 edges rise **and** fall at the zero crossings of the back EMF voltage $U_{w, u}$ (phase voltage $W \leftrightarrow U$).

The Hall signal levels (4 mA load at 5 V) are:

High
 $\geq 4 \text{ V}$

Low
 $\leq 0.5 \text{ V}$

SSI output

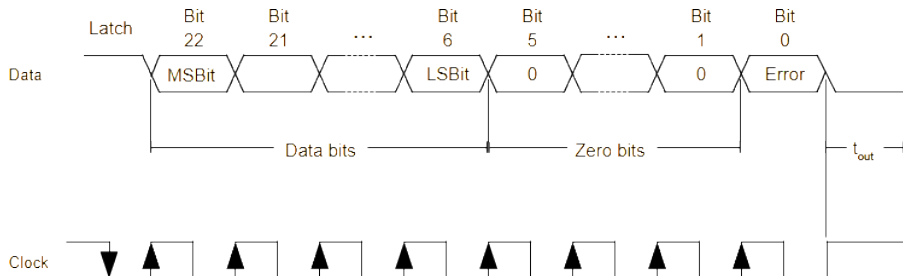


Fig. 11: SSI signal curve, binary-coded from a total of 23 bits.

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 $W \leftrightarrow U$).

Prepare the SSI for Nanotec 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

Fig. 12: Data in 23 bits: 1x Error, 17x POSition and 5x zero.

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

Note: $_h$ is for hexadecimal. Edit the 33B0 $_h$ **sub-indices** below so that Nanotec controllers, in *Autosetup* (see controller manual), duly process the encoder and its data:

1. Set 33B0 $_h$:06 $_h$ to 2625000 (baud rate in Hz).
2. Set 33B0 $_h$:05 $_h$ to 23 (number of bits).

3. Set **33B0_h:07_h** to **7FFFC0_h** (position data: POS bits 6 to 22).
4. Set **33B0_h:09_h** to **7F_h** (error bit 0; zero bits 1 to 5).
5. Set **33B0_h:0B_h** to **1** (error bit needs the value 1; bits 1 to 5 are always 0).
6. To store the object: Insert **65766173_h** in **1010_h:06_h**.
7. Restart the controller.

4 Imprint, conformities, versions

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Document + Added | > Changed | # Fixed

1.1.0 ^{2026.07}	<u>Technical data</u> : Motor connector changed to 4 pins, connector positions changed. New Section <i>Adding lubricant</i> in <u>Your product</u> .
1.0.1 ^{2025.01}	Revision.
1.0.0 ^{2023.11}	Release.