Technical Manual LBA80

For the following variants:

LBA80LDR2050-E3(B)-55 and E4(B)-55

Version: 1.1.0

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1 Document, audience, intended use

Nanotec's *LBA80* 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 *LBA80* 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

LBA80 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 *LBA80* serves dynamic positioning processes.

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

2.2 LBA80 variants

Article numbers for *LBA80* variants read like this:

LBA80LD**R**2050-ExX-xx	Leadscrew type **R**olled
LBA80LDR**20**50-ExX-xx	Screw Ø **20** mm
LBA80LDR20**50**-ExX-xx	Screw lead **5.0** mm
LBA80LDR2050-**Ex**X-xx	Rotary sensors **E3:** incremental and Hall sensors | **E4:** SSI absolut
LBA80LDR2050-Ex**B**-xx	With **B**rake (letter omitted otherwise)
LBA80LDR2050-ExX-**xx**	Stroke length: **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.

► For the initialization / homing on limit stops, Nanotec recommends a reduced force of 500 N and a low speed (max. 1000 rpm).

Internalize the *LBA80* product layout and technical data before installation so as to avert added hazards (say, abrupt motor run on defect / inhibition from your **overall** construct).

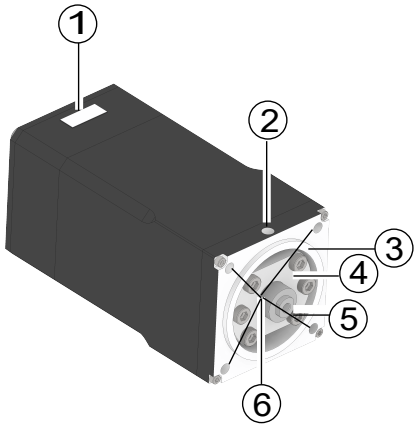


Fig. 1: LBA80 without brake, front side

1. Type label
2. Hole for adding lubricant.
3. Fit ring
4. Ballscrew nut
5. Ballscrew with *M6×12* thread
6. Four *M6 threaded holes for fastening*: Total depth 30 mm, thread depth 15 mm, tightening torque max. 20 Nm

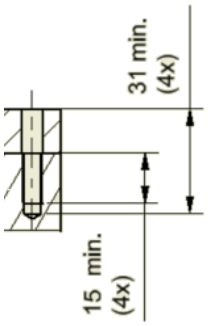
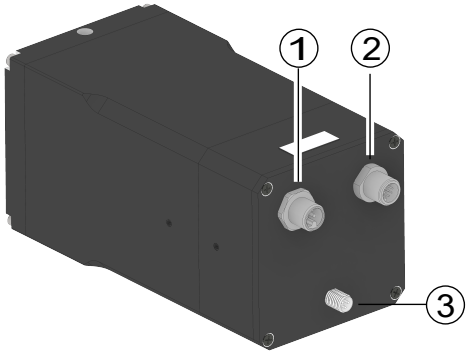


Fig. 2: LBA80 with brake, rear side



1. Motor connector
2. Encoder connector
3. Brake connector

2.4 Product installation

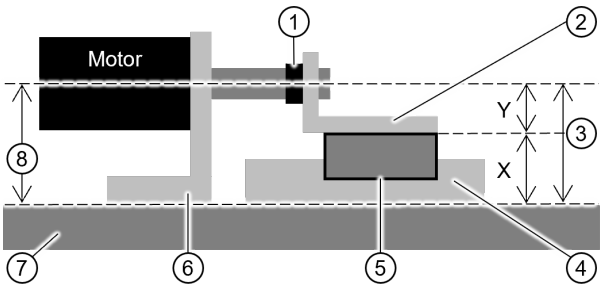
For assembly, please use the size sheet (CAD-/ PDF download) from our website's *LBA80* menu. Before first use, do assemble the product true to standard, by the licit fixing points, interfaces and tools. You need:

- LBA80 size sheet
- Feeler gauge, etc., for centering
- U-flange (9-mm steel; 12-mm *Al*) *NEMA34*
- Torque tool

Note: Low install accuracy brings malfunction and shortens the service life. Release the brake (if available) before install; otherwise the leadscrew won't spin.

Fig. 3: Fitting tolerances in mm.

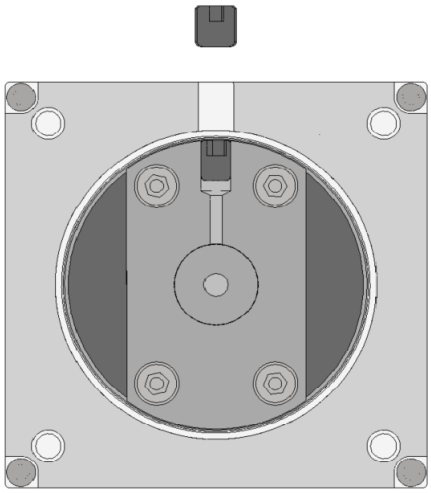
1. Centering plate
2. Linear stage
3. [X+Y]±0.1 mm
4. Guide rail
5. Load
6. Holder
7. Foot plate
8. [X+Y]±0.1 mm



2.4.1 Adding lubricant

Nanotec recommends checking the spindle and lubricant every 2 to 3 months (more frequently in case of high speeds) and topping off the lubricant, or replacing it completely if it is contaminated. Use a lithium-based lubricant of low viscosity at high speeds or low temperatures, and of high viscosity at low speeds and higher temperatures / loads.

1. Remove the grub screw (M8x8) on the housing.
2. Rotate the ball-screw until the grease filling hole is in the same position with the hole in the housing:



3. Remove the grub screw on the nut (M6).
4. Add lubricant (approx. appr. 50% of the volume).
5. Close the holes again with the screws.

3 Technical data

Use the product within its technical limits. The size sheet on our website applies. Select the exact *LBA80* 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), *LBA80* 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.

LBA80LDR2050-...	**No brake**	**With brake**
Number of poles	20	20
Rated voltage VDC	48	48
Current (rated / peak) A	6.4 / 19.2	6.4 / 19.2
Axial force (rated / peak) N	1000 / 3000	1000 / 3000
Brake static holding torque Nm	-	2.4
Work stroke mm	55	55
Axial play mm	0.04	0.04
Brake axial backlash mm	-/-	0.014 (1°)
Speed (rated / max.) mm/s$^{\pm 10\%}$	208 / 254	208 / 254

Force-speed curve

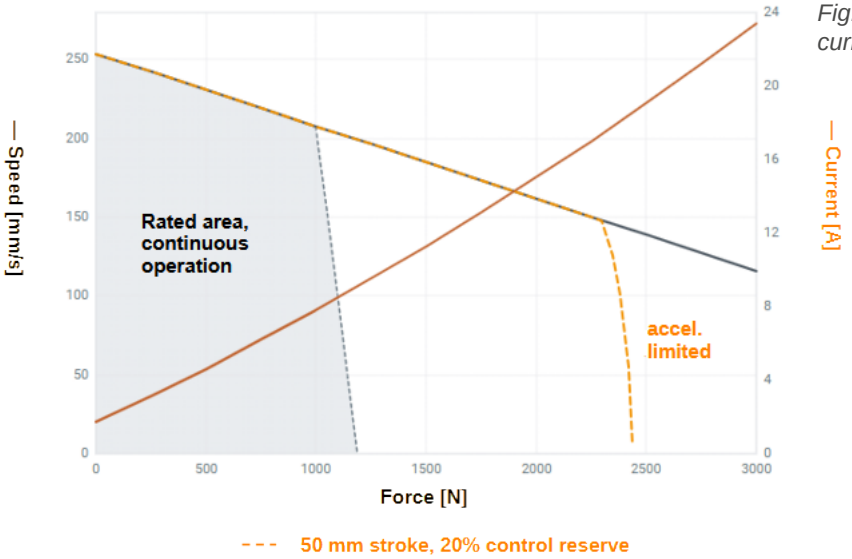


Fig. 4: Maximum speed and motor current by force.

3.3 Encoder

The LBA80 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 *single-turn*

3.4 Pin assignment

Motor and brake

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

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

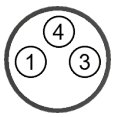


Fig. 6: Brake (if included). A-coded M8, male.

1: +Ub[1]
3: Gnd
4: n/c

[1]Voltage supply.

Sensors

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

1: +Ub[1]
2: A\
3: A
4: B\
5: B
6: I\
7: I
8: H1
9: H2
10: H3
11: Preset
12: Gnd[2]

[1]Voltage supply. [2]Not connected to motor housing.

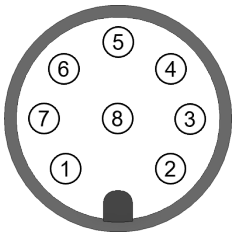


Fig. 8: Variants -E4B / -E4. A-coded M12, male.

1: Clk+[1]
2: Clk-[1]
3: Data+
4: Data-
5: Gnd[2]
6: Preset
7: n/c
8: +Ub[3]

[1]120 Ω between Clk+ and Clk- internal. [2]Not connected to motor housing. [3]Voltage supply.

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 LBA80 has an incremental rotary encoder with two channels **A, B** plus index **I** and separate Hall sensors or a rotary encoder with **s**ynchronous **s**erial **i**nterface (SSI).

Incremental output

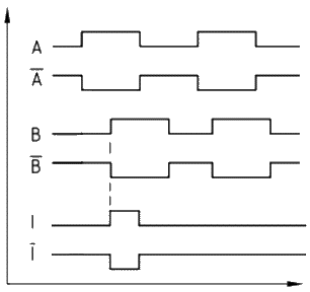


Fig. 9: Clockwise (viewing the motor drive shaft), channel A's signal leads channel B by 90° (electrical). The 90°-wide index signal is in sync with channel B's edge.

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

High	Low
≥ 2.4 V	≤ 0.4 V

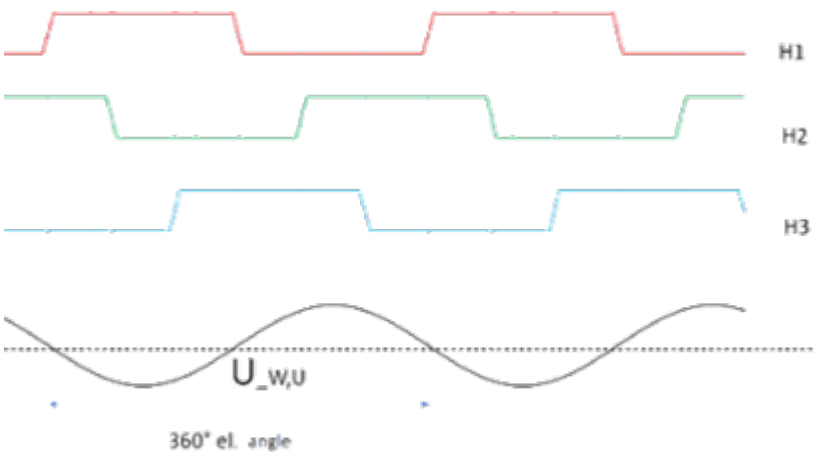


*Fig. 10: For Hall signals, the H1 edges rise **and** fall at the zero crossings of the back EMF voltage $U_{W,U}$ (phase voltage W ↔ U).*

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

High	Low
≥ 4 V	≤ 0.5 V

SSI output

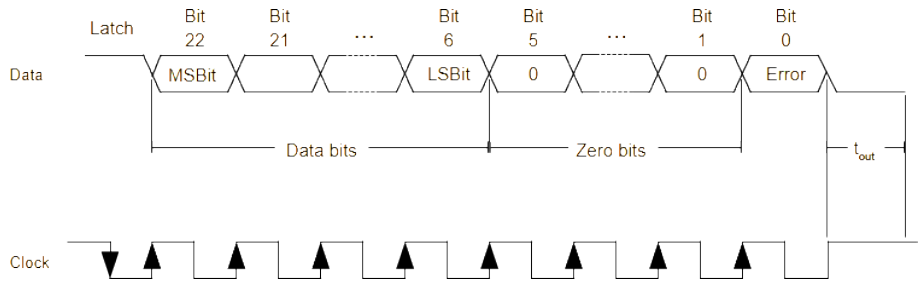


Fig. 11: SSI signal curve, binary-coded from a total of 23 bits.

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 ↔ 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 **E**rror, 17x **POS**ition 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-inidices** 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 2026.06	■ Recommendations added in Adding lubricant ■ Force-speed curve updated.
1.0.0 2025.10	Edition.