



brookfield industries, inc. NB-2000-HD2 Swinging Door Operator

Description:

The brookfield **NB-2000-HD2** Swinging Door Operator has been designed, tested and is manufactured by **brookfield industries, inc.** in accordance with UL 325 and ANSI 156.10 for linear accelerator swing doors weighing **greater than 20,000 lbs** providing the maximum rated operating torque of **6000 lb-in** has not been exceeded. The **NB-2000-HD2** is also designed for applications with much lighter doors but have a higher than normal operating torque caused by wind loads, pressure differentials or hinge friction. This operator can be expected to safely operate doors for at least 500,000 cycles, providing the door is set within the ANSI 156.10 opening and closing times, and the maximum rated operating torque has not been exceeded.

We are Authorized to Mark the **NB-2000-HD2** with the **ETL** and **CE** markings from Intertek Testing Services to assure compliance with UL 325, FCC Part 15 (Emissions) and the following International Standards: EN 60335-1 and -2 (Safety), EN 61000-6-2 (Immunity) and EN 61000-6-4 (Emissions). The "listing" reports specifically refer to the heavy commercial/industrial doors associated with linear accelerator rooms.

The **NB-2000-HD2** is an electro-mechanical power open/power close operator, which utilizes a state of the art PLC and positioning control components that allow us to offer special patent pending features such as *Absolute position feedback* and *Auto backlash removal* to name a few.

The PLC (Programmable Logic Control) is programmed by the manufacturer to accept input signals from push paddles, 2 and 3 button stations and partial open commands. Additional I/O (Input/Output) have been added to the **NB-2000-HD2** to accommodate any number of special customer requirements such as: E-stops, motion detectors, control mats, card readers, reversing edge sensors and battery backup to name a few.

Interface with the PLC is provided with a hand held, user-friendly operator panel to adjust door position presets (purchased separately).

Rating a Door Operator:

The rating of any door operator in a particular application cannot be based solely on the weight and width of the door. Other factors such as an "out-of plum" frame, "hinge bind", hinge friction, acceleration and deceleration rates or pressure differential from one side of the door to the other, may have a substantial affect on the total operating torque it takes to move the door at ANSI speeds. For Example, a 4500 lb, 60" wide door would be well within the weight and width limitations; however, if any of the other factors are not properly controlled, the total operating torque could exceed the rated values. In the design and testing of the NB-2000-HD2 door operator, we have factored these variables into the Maximum Rated Operating Torque. This assures the customer they are getting the most dependable product at a reasonable cost.

Maximum Rated Operating Torque = 6,000 lb-in

Example of torque calculation:

$$T_{max} * = T_{friction} + T_{accel/decel} + T_{stack\ pressure}$$

* variables can be derived via mathematical formula or can be measured values. Torque caused by "hinge bind" or "out-of plumb" doors can drastically increase the actual torque reflected to the door operator.

Specification:

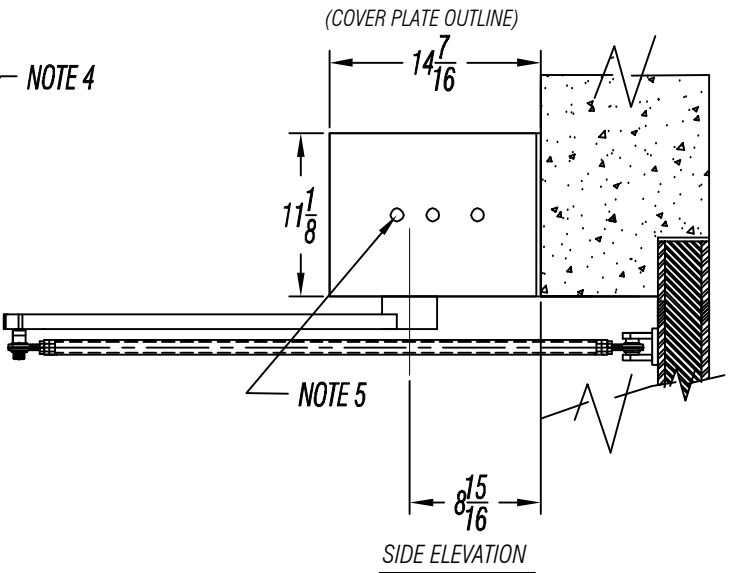
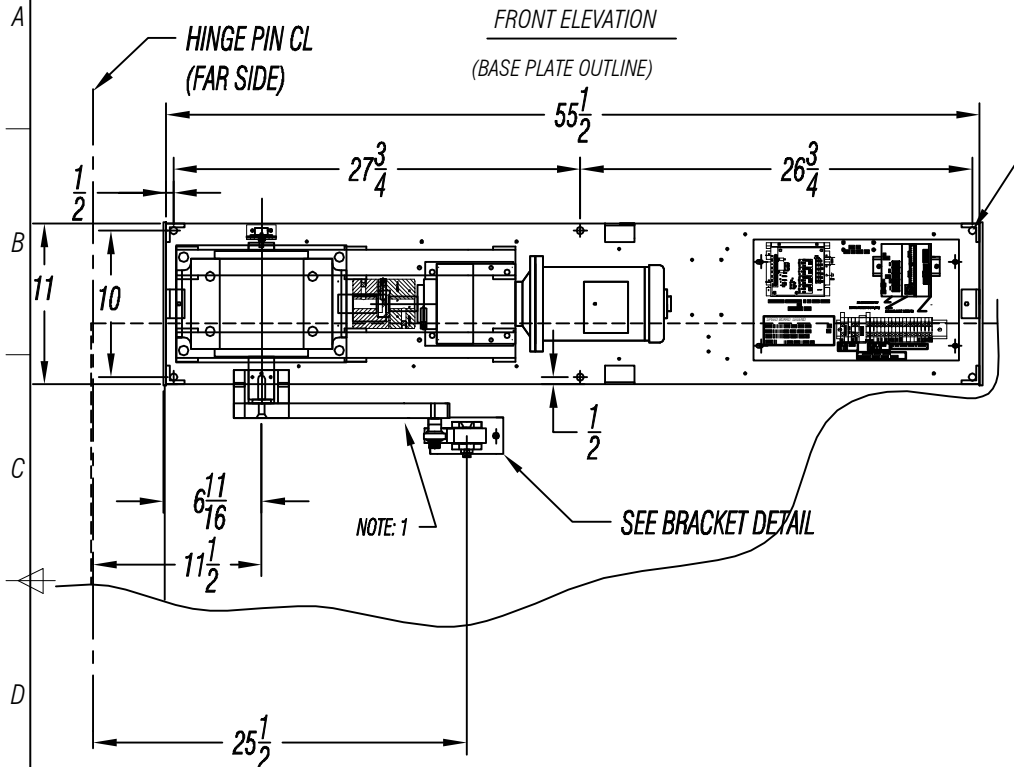
- 1) **Forward and reverse torque adjustment:** via current limit trimpot settings on the motor control to adjustment the operating torque in order to comply with the entrapment protection requirements of UL 325. This eliminates the need for unreliable and hard to adjust manual clutches or electromagnetic clutches that are not designed for slippage or stall applications.
- 2) **Automatic egress:** or door reversal whenever entrapment protection has been violated in either the opening or closing directions; however, door shall not reverse automatically when in the latchcheck or "creep close" mode. This feature can be adjustable for time delay and reversal force.
- 3) **Auto backlash removal:** automatically closes the door and removes all mechanical backlash in the system when in the latchcheck "creep close" mode. If a pressure differential exists or if the door wants to

float open slightly, the motor will restart and “clamp” the door against the frame; thus, assuring the frame interlocks will not be disengaged and the response time to open will be optimized.

- 4) **Absolute position feedback control:** this assures the CPU always knows the door’s position. During installation, a power interruption, or if electrical noise is encountered, the door is not required to be “homed”, “reset” nor go through a “learn speed cycle” at any time.
- 5) **Manual operation:** shall be in accordance with UL 325 during a power loss.
- 6) **Supply voltage:** 115VAC +/- 10% (230VAC for European service) 50/60 Hertz single phase. In-Line circuit breakers supplied with motor control and PLC. Surge protection, line filters, and EMI ferrites shall be included.
- 7) **Current Consumption:** maximum 6 amperes
- 8) **PLC/Logic Control:**
 - a) Shall be a PLC with sufficient I/O and a CPU (Central Processing Unit) with adequate memory, response times and scanning rates in order to properly control the motion and positioning of Linear Accelerator Swing Doors.
 - b) Outputs commands shall be the internal type, integral with the PLC. No external limit switches shall be allowed for control of door positioning.
 - c) A means to interface with the PLC for adjusting preset values for the open, partial open, closed, latchcheck and backcheck positions.
 - d) Diagnostics and troubleshooting of the PLC shall be provided with LED and modular plug-in components.
 - e) The PLC shall be provided with an internal battery to store the door position presets in the CPU memory.
- 9) **Motor:** 1/4 hp permanent magnet 90 volt DC motor 1750 RPM TENV
- 10) **Motor Control:** shall be a full-wave, four quadrant, regenerative, 90 VDC variable speed control with the following functions:

FWD/REV maximum speed	FWD/REV current limit	IR compensation
FWD/REV acceleration/deceleration	1% speed regulation	50:1 speed range.
- 11) **Speed Control:** a means of controlling independent forward and reverse speeds per ANSI 156.10 as well as controlling latchcheck and backcheck “creep” speeds. This can be accomplished externally with speed pots or internally with the PLC.
- 12) **Drive train and linkage mechanism:** shall be designed to allow manual operation of the door per UL 325 in addition to assuring each component from the motor to the door attachment point is properly “sized” in order to transfer all operating torques and forces as defined for Linear Accelerator Swing Doors. Standard linkage shall consist of a pull open design with crank arm, slider block and cam follower assembly.
- 13) **Enclosure:** U-shaped 16 gage cover with 3/16” thick end plates reinforced with angle iron. Overall 55-7/8” x 14-7/16” deep x 11-1/8” high. (2) 7/8” dia. penetrations for 1/2” conduit on each side or metric equivalent for European installations. For 230VAC service, the transformer shall be housed in a separate 16” x 20” x 6-5/8” NEMA 1 vented enclosure. Penetrations are provided for 1/2” conduit or the metric equivalent for European installations.
- 14) **Materials:** ASTM A569, A36, AISI 1018 cold rolled steel, grade 5 bolting or better.
- 15) **Mounting hardware:** the NB-2000-HD2 shall be mounted with (6) 3/8” grade 5 diameter bolts with compatible washers and lock washers. Hardware must also be properly tightened with adequate thread engagement.
- 16) **Finish:** all exposed metal surfaces shall be prime painted.
- 17) **Functionality test:** each NB-2000-HD2 is cycle tested in position for 24 hrs. prior to shipment. Each unit is checked for leaks and that all I/O are functioning properly.
- 18) **Installation:** see drawings attached.
- 19) **Battery Backup (optional):** Opens the door during power interruption only. A 12VDC, 1.2 Ah battery with float charger and test switch shall be assembled in a grounded and vented 6” x 12” x 14” NEMA 1 enclosure. (3) holes are provided at the top of the enclosure each for 1/2” conduit. The first shall be used for a 110V AC line from the power source, the 2nd for a 110VAC hookup to the door operator and the 3rd for a 12VDC hookup to the door operator. An end of travel limit switch shall also be provided.

Rev.	Revision note	Date	Sign	Check
1	REVISE LINKAGE	12-23-13		

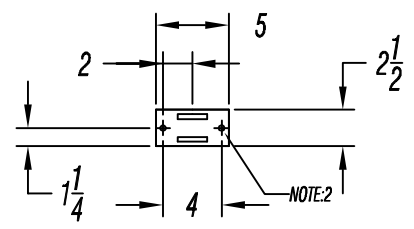


Notes:

Tolerances	
Decimal	+/- 0.015
Fractional	+/- xxx
Angular	+/- xxx

RH OPERATOR (RHR) PUSHING LH DOOR AS SHOWN
 LH OPERATOR (LHR) PUSHING RH DOOR OPPOSITE

- NOTES:
- LINKAGE ARM PROVIDED WITH SHIM PACK (+/-) 1/4 ADJUSTMENT
 - 1 3/32 DIA. HOLES PROVIDED FOR 3/8 DIA. GR 5 BOLTS (TYP 2)
 - ALL DIMENSIONS IN INCHES
 - 1/2 DIA. THRU HOLES FOR 3/8 DIA. GR. 5 BOLTS (TYP 6)
 - FIELD WIRING (LH OR RH): ALWAYS RUN 110VAC THRU LEFT SIDE COVER AND CLASS 2 (24VDC OR LESS) THRU RIGHT SIDE COVER. (3) 1/2 DIA. HOLES FOR 1/2" CONDUIT (TYP)



	NB-2000-HD2 PUSH OPEN LINKAGE		Drawn by <i>kpk</i>
			Checked by
	Material	Date 8/7/12	Scale 1:1
	INSTALLATION DRAWING		
brookfield industries inc. 99 West Hillside Ave. : Thomaston, CT P: (860) 283-6211 F: (860) 283-6123 info1@brookfieldindustries.com			www.bfimfg.com Drawing No./File Name NB-2000-HD2-87

RevNo	Revision note	Date	Signature	Checked

BASE PLATE AND END CAPS
NOT SHOWN; COVER

DO 1032
WORM GEAR
5:1 RATIO

DO 990
IN-LINE
REDUCER
165:1 RATIO

DO16
1/4 HP 90VDC MOTOR
1750 RPM

DO 165
TRANSDUCER

DO 1033
COUPLING ASSY

DO747
CONTROL LOGIC ASSEMBLY

PULL OPEN ARM

SLIDER BLOCK
CAM FOLLOWER HIDDEN

	NB-2000-HD2 (RH SHOWN LH OPP)		Drawn by kpk	
	MAJOR COMPONENT PARTS LIST		Checked by	
	Approved by - date		Date	Scale
	Material SEE BOM		7/13/12	1:1
brookfield industries inc. 99 West Hillside Ave. : Thomaston, CT 06787 P: (860) 283-6211 F: (860) 283-6123 info@brookfieldindustries.com			www.bfimfg.com	
			Drawing Number/File Name NB-2000HD2-82	