



Conforms to UL STD 325
Control No. 3011624



US Patent No.
6,177,771,B1

brookfield industries, inc. NB-500 Swinging Door Operator

Description:

The brookfield **NB-500** Swinging Door Operator has been designed, tested and is manufactured by **brookfield industries, inc.** for use on linear accelerator swing doors weighing up to 4,500 lbs and 66" wide. The **NB-500** can be expected to safely operate doors at the maximum weight for at least 500,000 cycles, providing none of the rated values are exceeded.

We are Authorized to Mark the **NB-500** 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.

Since most of the components are constructed from aluminum, this operator is assured to be the **lightest and strongest** in the industry today. The NB-500 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-500 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 2,500 lb, 56" 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-500 door operator, we have factored these variables into the Rated Operating Torque. This assures the customer they are getting the most dependable product at a reasonable cost.

Maximum Rated Operating Torque =	1,000 lb-in (113 N-m)
Maximum Rated Door Weight =	4,500 lb (2043 kg)
Maximum Rated Door Width =	66 in (1.68m)

The NB-500 can be expected to operate any linear accelerator swing door within the rated values for at least 500,000 cycles, provided the door is operating within the ANSI 156.10 speed criteria and the acceleration rate for a particular door weight has not been exceeded.

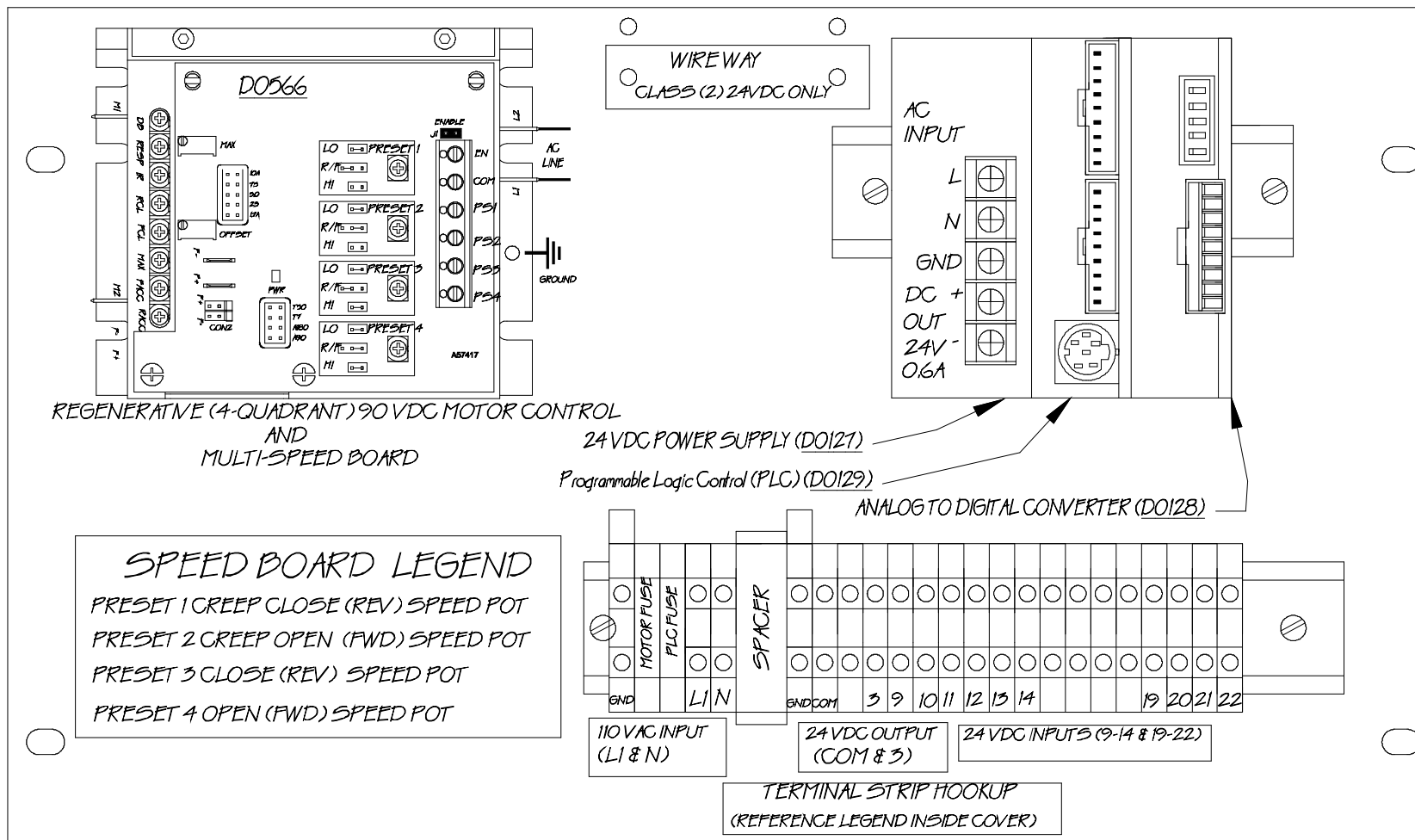
Specification:

- 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 (creep close) or backcheck (creep open) modes. This feature can be adjustable for time delay and stall torque.

- 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 small 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 3 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:** 1/8 hp permanent magnet 90 volt DC motor 1650 RPM TENV
- 10) **Motor Control:** shall be a full-wave, four quadrant, regenerative, 90 VDC variable speed control with the following functions:

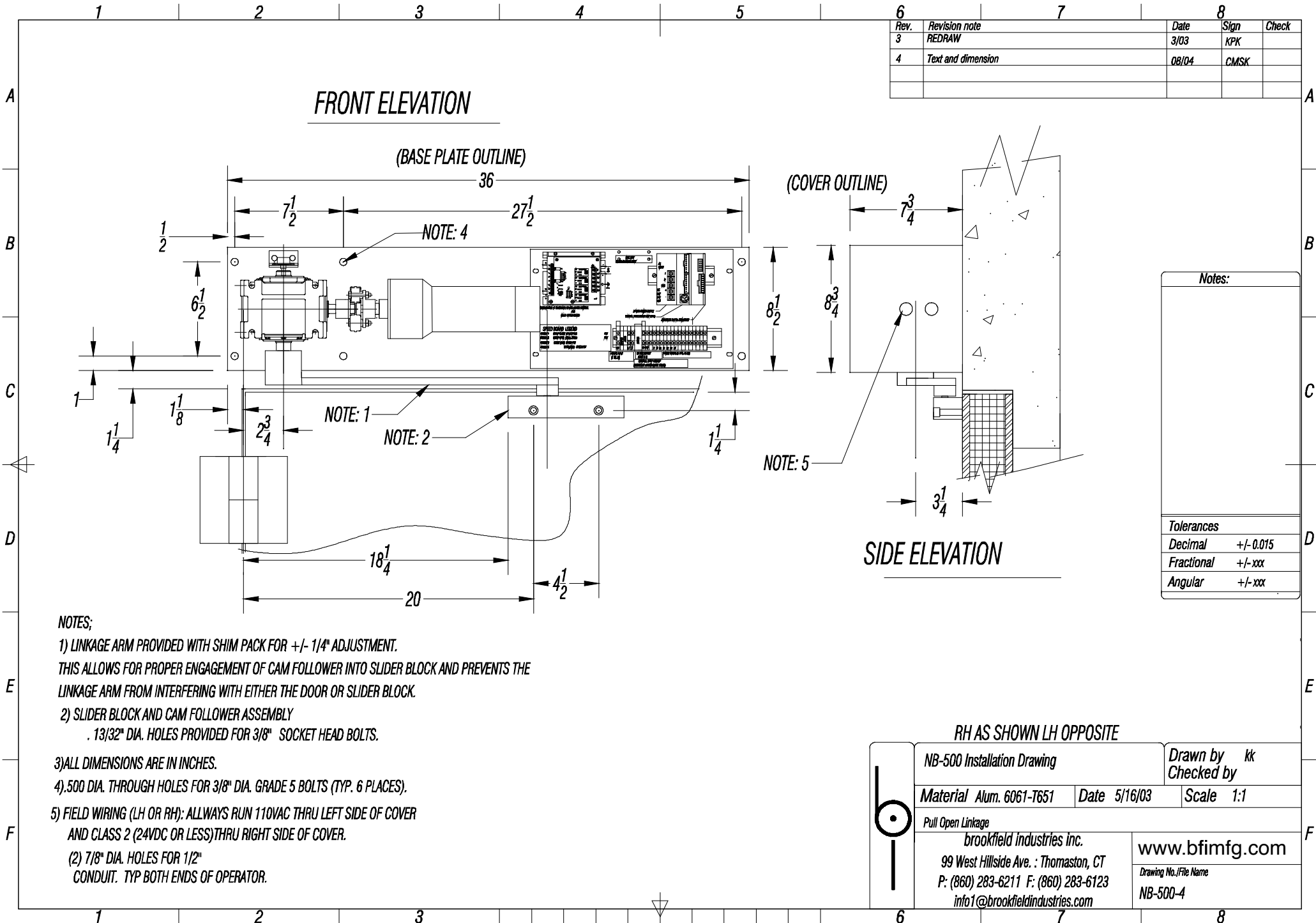
FWD/REV maximum speed	FWD/REV current limit	IR compensation
FWD/REV acceleration/deceleration	1% speed regulation	50:1 speed range.
- 11) **Speed Control:** a means of controlling independent forward and reverse speeds per ANSI 156.10 as well as controlling latchcheck and backcheck “creep” speeds. This 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:** 1/8” Aluminum plate reinforced with angle iron. Overall 8 ¾” high x 7 ¾” deep x 36 ¼ long. (2) 7/8” diameter penetrations for ½” conduit are drilled on each end or the 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 ½” conduit or the metric equivalent for European installations.
- 14) **Materials:** Aluminum 6061-T651&T-6, AISI 1018 cold rolled steel, grade 5 bolting or better.
- 15) **Mounting hardware:** the NB-500 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 carbon steel surfaces shall be prime painted, while all exposed aluminum surfaces shall be brushed.
- 17) **Functionality test:** each NB-500 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:** the NB-500 shall be installed per drawing NB-500-4 for pull open linkages and NB-500-44 and NB-500-0 for push open applications.
- 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 ½” conduit or the metric equivalent for European installations. 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.

1	2	3	4	5	6	7	8
			Tolerances	Decimal	Fractional	Angular	Rev.
							Revision note
							DO Item numbers added
							Date
							7/04
							Sign
							Check



NEMA MOUNTING PLATE

Components & Mounting Plate		Drawn by kpk
Material		Checked by
NB-500, -1000, -2000 Logic Assembly		Date 5/20/03
brookfield industries inc.		Scale 1:1
99 West Hillside Ave.: Thomaston, CT		www.bfimfg.com
P: (860) 283-6211 F: (860) 283-6123		Drawing No./File Name
info@brookfieldindustries.com		NB-801K-AA-2



RH AS SHOWN LH OPPOSITE

	NB-500 Installation Drawing		Drawn by kk
			Checked by
	Material Alum. 6061-T651	Date 5/16/03	Scale 1:1
	Pull Open Linkage		
	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-500-4



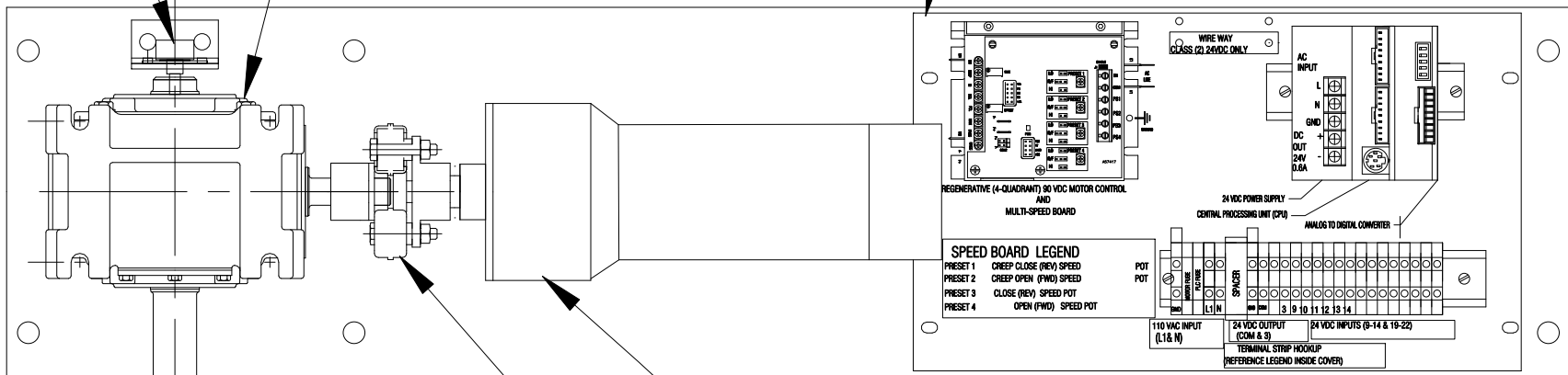
1	2	3	4	5	6	7	8
Tolerances	Decimal	Fractional	Angular				

Rev.	Revision note	Date	Sign	Check
1	D0 Item numbers for components	7/04		
2	Item number update	06/07		

ROTARY POSITION TRANSDUCER (D0165)

5:1 RIGHT ANGLE WORM GEAR REDUCER (D0173)

LOGIC ASSEMBLY PER
DWG. NB-801K-AA-2 (D0745)



102:1 IN-LINE HELICAL GEAR REDUCER &
1/8 HP 90VDC PM MOTOR 1750 RPM (D0232)

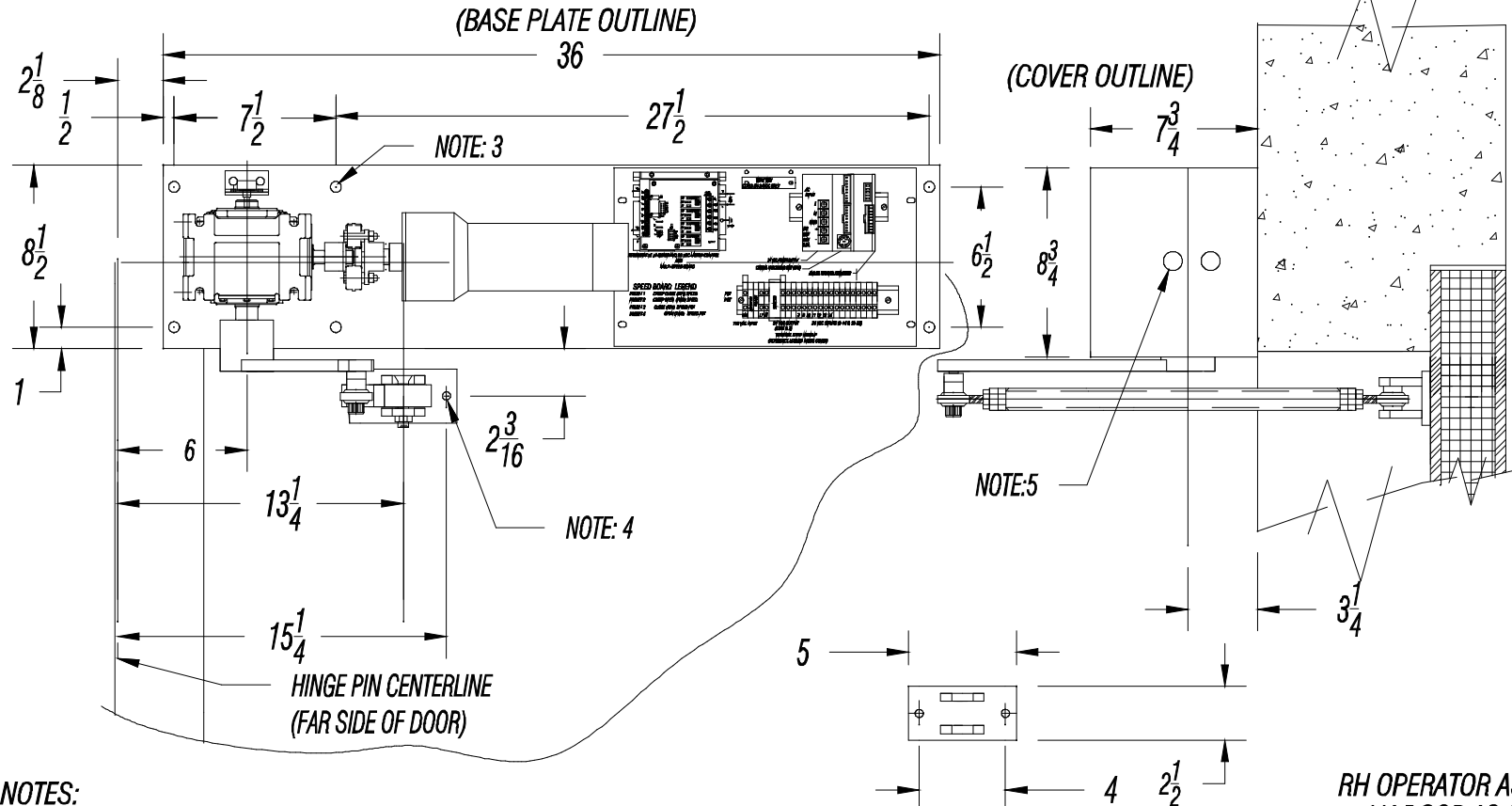
FLEXIBLE COUPLING (D0751)

b i	NB-500 Door Operator		Drawn by kpk/cmsk	
	Material		Date 5/20/03	
	RH as shown LH opposite (Pull Open)		Scale 1:1	
	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-500-A-2	

Rev.	Revision note	Date	Sign	Check
4	Redraw Linkage	6.18.02	kpk	
5	Text and dimensions	08/04	cmk	

FRONT ELEVATION

SIDE ELEVATION



NOTES:

- 1) ALL DIMENSIONS ARE IN INCHES.
 - 2) LINKAGE ARM PROVIDED WITH SHIM PACK FOR +/- 1/4" ADJUSTMENT
 - 3) 0.500" DIA. THRU HOLES FOR 3/8" DIA. GRADE 5 BOLTS (TYP. 6 PLACES)
 - 4) 0.406" DIA. THRU HOLES FOR 3/8" DIA. GRADE 5 BOLTS (TYP. 2 PLACES)
 - 5) FIELD WIRING (LH OR RH): ALWAYS RUN 110VAC THRU LEFT SIDE OF COVER AND CLASS 2 (24VDC OR LESS) THRU RIGHT SIDE OF COVER. FOR 1/2" CONDUIT (TYP. BOTH ENDS OF OPERATOR).
- (2) 7/8" DIA. HOLES

Notes:

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

RH OPERATOR AS SHOWN LH OPPOSITE
LH DOOR AS SHOWN RH OPPOSITE

	NB-500 Installation Drawing		Drawn by <i>kk</i>	
			Checked by	
	Material/ Alum 6061-T651	Date 5/16/03	Scale 1:1	
	Push Open Linkage			
	brookfield industries inc.		www.bfimfg.com	
	99 West Hillside Ave. : Thomaston, CT		Drawing No./File Name	
	P: (860) 283-6211 F: (860) 283-6123		NB-500-44	
	info1@brookfieldindustries.com			