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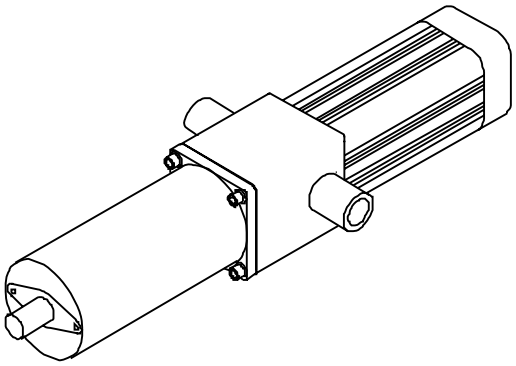
N Series
Electric Cylinders

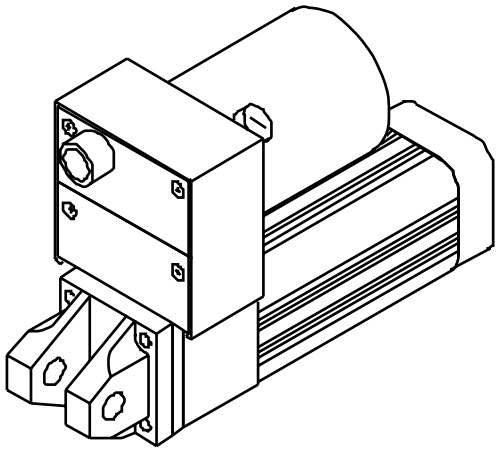
Operator's Manual

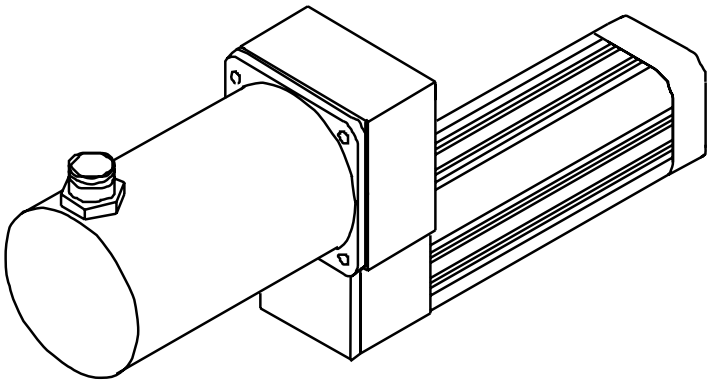
P/N PCW-4544 Rev. 1.05 7/99

******* JCMT ADL * ND355A-6MS1-FC2-W-F-Q #940608 08265 1***

This manual covers the following IDC Products:
ND Cylinders - 24VDC Motor
NH Cylinders - 160VDC Motor
NS Cylinders - NEMA 23 or 34 Step Motor
NB Cylinders - 23 Frame Brushless Servo Motor







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1. Product Overview

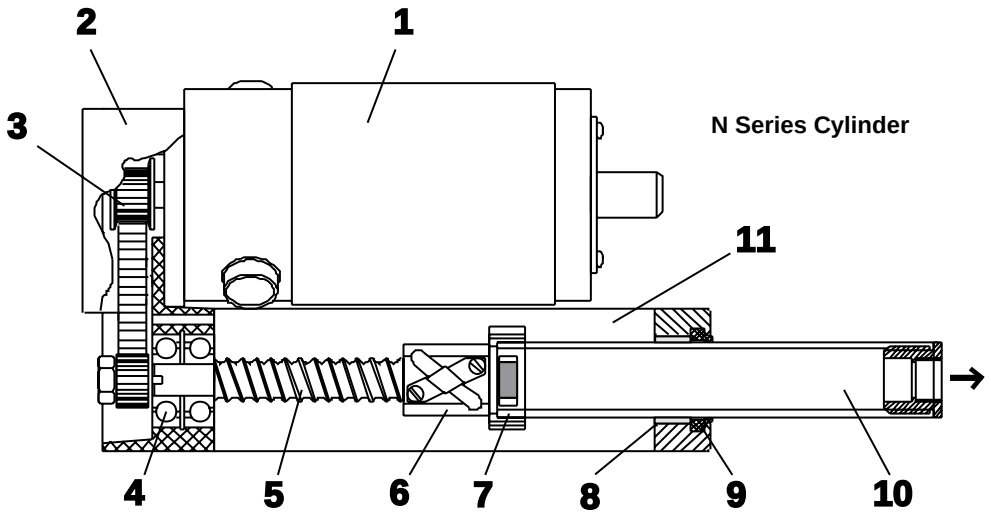
Industrial Devices Corporation (IDC) N Series Electric Cylinders are designed for use in a wide variety of industrial, scientific, and commercial applications requiring control of linear thrust, speed, or position. This operator's manual will help you properly install and operate your N Series Cylinder.

N Series Control Compatibility Chart

IDC controls will optimize performance of N Series Cylinders. Please refer to the specific control operator's manual for system operating instructions.

Cylinder Type	Compatible IDC Controls		Cylinder Options Required
ND	D2200 Series D2300 Series D2400 Series D2500 Series*		* requires -L Option
NH	H3301B H3321B H3501*		* requires -L Option
NS23*x* *x* = N, T, or V	NextStep S6002	SmartStep23 S6961 S6962	
NS32*x* *x* = N, T, or V	NextStep S6002	SmartStep S6961 S6962	
NB23	B8001 B8501*	B8961 B8962	* requires -L Option

Cylinder Construction

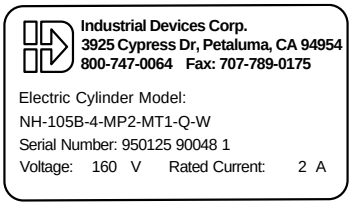


1. Motor
2. Bearing Housing
3. Drive Train
4. Thrust Bearings
5. Leadscrew
6. Drive Nut
7. Internal Guide Flange (with magnets)
8. Rod End Sleeve Bearing
9. Wiper Ring
10. Thrust Tube
11. Guide Cylinder

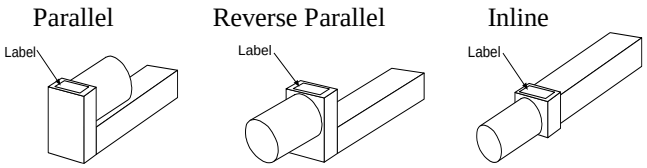
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Cylinder Part Number - Identify What You Have

Model Number Breakdown



Location of Label shown on available Motor/Cylinder Mounting Configurations.



Example:

Base Model Number				Stroke Length	Cylinder Mounting	Rod End	Options	
Rod-Type Cylinder	Motor Type	Drive Ratio	Screw Pitch,Type					
N	H	10	5B	4	MP2	MT1	Q	W

H	=	H Motor, 160VDC, 2 Amp, Permanent Magnet	MP2	=	Rear Double Clevis Mount
10	=	1.0 to 1 Drive Ratio - Belt/Pulley	MT1	=	Male Threaded Rod End
5B	=	5 Pitch (.2"lead) Ballscrew	Q	=	Quick Disconnect Option
4	=	4 inch stroke	W	=	Water Resistant Seal Option

JCMT ADL Model Number				Stroke Length	Cylinder Mounting	Rod End	Options		
Rod-Type Cylinder	Motor Type	Drive Ratio	Screw Pitch,Type						
N	*D*	*35*	*5A*	*6*	*MS1*	*FC2*	*W*	*F*	*- Q*
1	2	3	4	5	6	7	8		

1 N Series Rod Type Cylinder

2 Motor Type

* **D**	24VDC, 4.5 Amp, Permanent Magnet Motor
H	160VDC, 2 Amp, Permanent Magnet Motor
S23[*x*]	NEMA 23 Frame, Step Motor, 3 Stack
S32[*x*]	NEMA 34 Frame, Step Motor, 2 Stack
B23	23 Frame Brushless Servo Motor

[*x*] can be: **N** = 8 leads, windings can be wired in Series or Parallel
T = Windings pre-wired in Series @ IDC Factory
V = Windings pre-wired in Parallel @ IDC Factory

3 Drive Ratio

10	= 1.0:1 Drive Belt/Pulley	*(1.0:1 exact ratio)*
15	= 1.5:1 Drive Belt/Pulley	*(1.5:1 exact ratio)*
20	= 2.0:1 Drive Belt/Pulley	*(2.0:1 exact ratio)*
25	= 2.5:1 Helical Gear	*(2.5:1 exact ratio)*
31	= 3.1:1 Helical Gear	*(3.125 exact, or 50:16 ratio)*
* **35**	= 3.5:1 Helical Gear	*(3.571… or 50:14 ratio)*
120	= 12.0:1 Helical Gear	*(12:1 exact ratio)*
99	= 1.0:1 Inline Coupling	[Note: Direct 1:1 coupling is the only ratio available for Inline Models]

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4 Screw Type

2A = 2 Pitch (.5" lead) acme leadscrew
*** 5A** = 5 Pitch (.2" lead) acme leadscrew
8A = 8 Pitch (.125" lead) acme leadscrew
10A = 10 Pitch (.1" lead) acme leadscrew
2B = 2 Pitch (.5" lead) ballscrew
5B = 5 Pitch (.2" lead) ballscrew
5G = 5 Pitch (.2" lead) precision ground ballscrew

5 Stroke Length

6 (specified in inches)

6 Mounting Styles

MF1 = Front Rectangular Flange
MF2 = Rear Rectangular Flange
MF3 = Front & Rear Rectangular Flanges
MP2 = Rear Double Clevis Mount
MP3 = Rear Double Clevis Mount (w/ Pivot Base)
*** MS1** = Side End Angles
MS6 = Side Tapped Mounting Holes
MT2 = Trunnion Mount
MXA = Front Extended Stud Mount
MXB = Rear Extended Stud Mount
MXC = Front & Rear Extended Stud Mount
(***xxx*M** = Metric version of above option)

7 Rod Ends

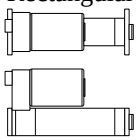
*** FC2** = Clevis (includes MT1)
FE2 = Female Eye (includes FT1)
FS2 = Spherical Joint (includes FT1)
FT1 = Female Thread
MT1 = Male Thread
(***xxx*M** = Metric version of above option)

8 Cylinder Options

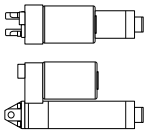
BM = Brake on Motor
BS = Brake on Leadscrew
DB = Double Bearing
EM = Encoder on Motor
ES = Encoder on Leadscrew
*** F** = Subfreezing
H = High Temperature
HT = High Thrust
L = Linear Potentiometer
PB = Protective Boot
PN = Pre-loaded Nut
*** Q** = Quick Disconnect
RM = Reverse Parallel Motor Mounting
*** W** = Water Resistant Seal

Mounting Styles

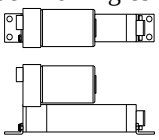
-MF1, 2, 3 Rectangular Flanges



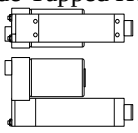
-MP2 Rear Clevis



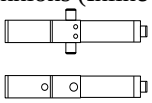
-MS1 Side End Angles



- MS6 Side-Tapped Holes

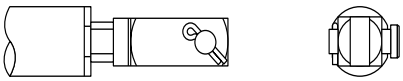


-MT2 Trunnions (Inline Models Only)

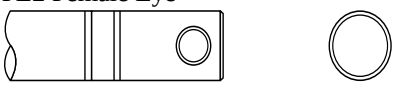


Rod Ends

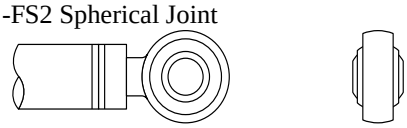
-FC2 Clevis



-FE2 Female Eye



-FS2 Spherical Joint



-FT1 Female Thread



-MT1 Male Thread



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2. Mounting / Performance

WARNING! Power to the electric cylinder should be **OFF** before attempting any physical installation or adjustments to the cylinder mounting, rod end attachments, or the load.

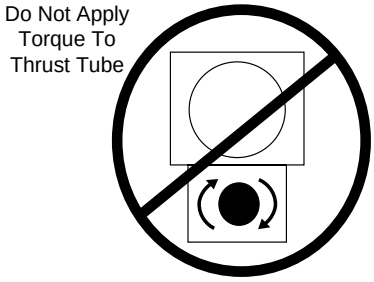
Cylinder Mounting

- The structure on which the cylinder is mounted should have ample strength to carry the maximum load and be rigid enough to prevent undue deflection or distortion of the cylinder or its supporting members.
- The cylinder should be mounted parallel to the travel of the load to ensure proper alignment (this is especially important with externally guided loads using rails, bearings, etc.)
- All mounting surfaces should be clean and flat to provide secure and stable fittings
- Units with flat surface mounts (MF1, MF2, MF3, MS1, MS6) should be rigidly mounted.

Mounting	Description	Recommendations
MF1	Front Flange	Not recommended for use in horizontal applications with stroke lengths greater than 12 inches unless there is additional support in the rear of the cylinder.
MF2	Rear Flange	Not recommended for use in horizontal applications with stroke lengths greater than 12 inches unless there is additional support in the front of the cylinder.
MF3	Front and Rear Flange	When securing to the Front and Rear Mounting flanges care should be taken to align the plates to their mating surfaces so as not to cause the body of the cylinder to twist.
MP2	Rear Clevis	Recommend using a flexible rod end or load attachment to compensate for any system misalignment.
* MS1	Side End Angle Brackets	Bolts used to secure brackets should be able to withstand a shearing force in excess of 1000lbs.
MS6	Side Tapped Holes	Mounting screws used with side tapped holes should resist a peak shear force of up to 1000lbs. This mounting (alone) is not recommended for loads in excess of 500lbs.
MT2	Trunnion Mount	Recommend using a flexible rod end or load attachment to compensate for any system misalignment.
MXA MXB MXC	Extended Studs	Important that the extended stud threads be torqued evenly when any attached fitting is secured.

Load Attachment

Do Not Apply Torque (Rotational Force) to Thrust Tube
It is important that the thrust tube **NOT** be rotated to avoid damaging the internal plastic guide flange. This is especially important when attaching the rod end to the load. Two flats are provided at the end of the thrust tube to prevent rotation while the rod end attachments are secured.



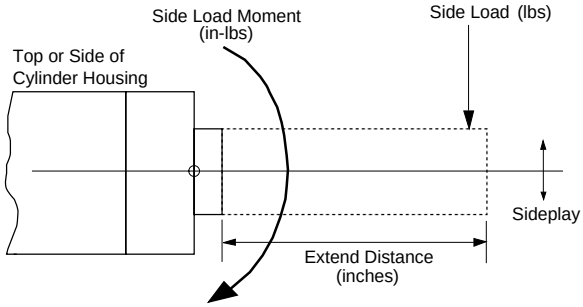
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Special Notes for Mounting Rod-Ends to Load

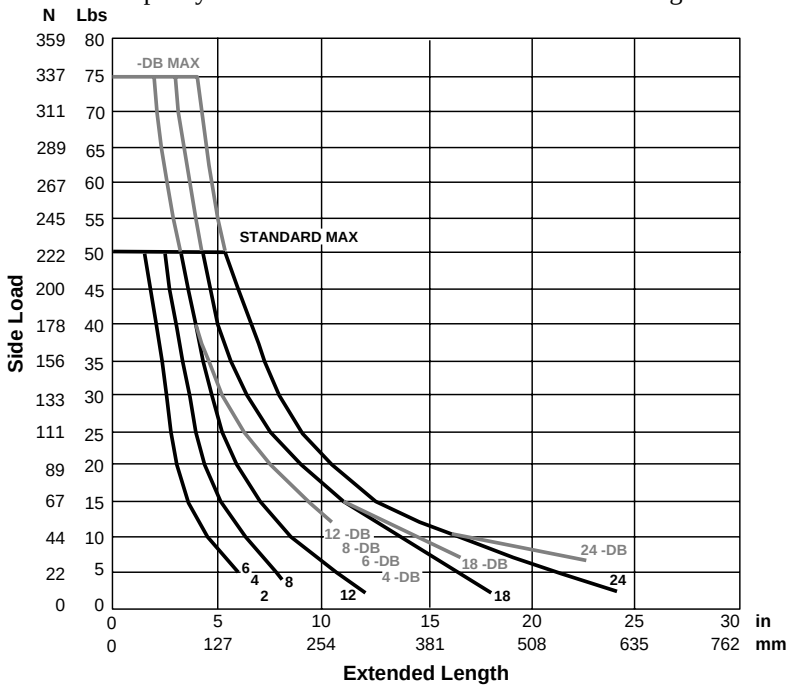
Rod End	Description	Recommendations
* FC2	Double Clevis (with MT1 Thread)	Clevis should be securely fastened by lock nut once in desired location. In addition, the mounting pin should be secured with a cotter pin once it is inserted into the double clevis holes.
FE2	Female Eye	Adjust for maximum thread engagement.
FS2	Spherical Joint	Rotating joint compensates for any misalignment in the system. Not recommended when stiff or rigid load attachment is required.
FT1	Female Thread	Thread depth (of 3/8") cannot be exceeded by the inserted member. Exceeding depth may cause contact with leadscrew or cause other internal damage when the thrust tube is fully retracted.
MT1	Male Thread	Any attached member should be secured in place by a lock nut once it is in the desired location

Thrust Tube Side Load

Thrust tube side loads create a bending force on the thrust tube sleeve bearing. If excessive, actuator performance and service life may be reduced. The side-load "bending moment" limit is a function of the perpendicular side load force and its extended length. The -DB Double Bearing option is provides additional bearing support, and is recommended for applications requiring more than 12" of travel. The side load limits shown below should not be exceeded.



Side Load Capacity with Thrust Tube Extended to Various Lengths



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Mounting Position Sensors - Overtravel Protection

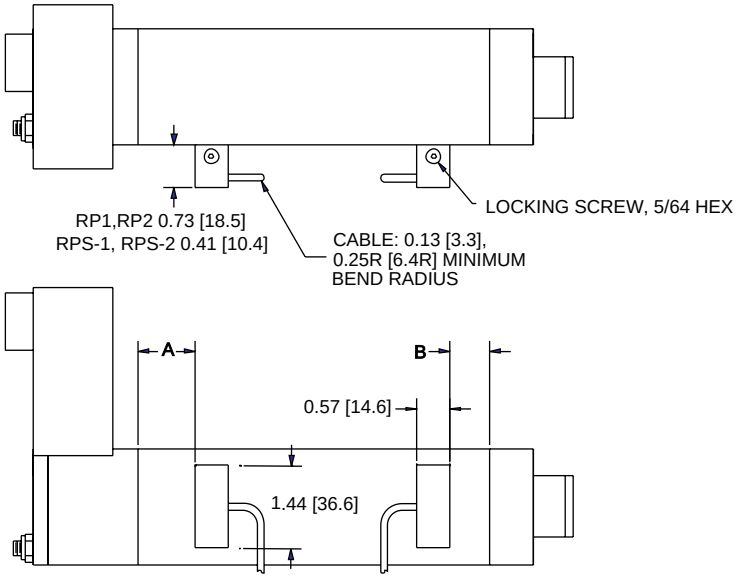
Although an "elastomeric spring" inside the actuator is designed to prevent actuator jams, position sensors (limit switches) are required to prevent such potentially damaging jam conditions. If the motor is accidentally commanded to move toward a hard-stop, position sensors can signal a stop before a collision occurs. To work properly, position sensors must be positioned inward from the hard-stop, and wired correctly to the motor controller.

Note: Using the physical limits of the cylinder (hard stops) will reduce cylinder life and can cause premature component failure.

Position Sensor Mounting Location - Deceleration Distance

The position sensor's location along the cylinder is associated with the *beginning* of a deceleration, not the final stopping point. Therefore, position sensors must be mounted inward of the cylinder hard-stops, so as to provide a slowdown area to prevent jamming. The faster the approach speed, the longer it takes to stop the cylinder, so deceleration distance varies with actuator speed, load, and cylinder/control type. Some adjustment may be necessary during initial setup.

Position Sensor Mounting Dimensions



SCREW TYPE	DIM "A"	DIM "B"
ACME	1.00	0.70
BALL	1.40	0.30

NOTE: DIMENSIONS "A" AND "B" ARE APPROXIMATE END OF STROKE LOCATIONS FOR THE POSITION SENSORS.

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Position Sensor Specifications

(RP1, RP2, RPS-1, & RPS-2)

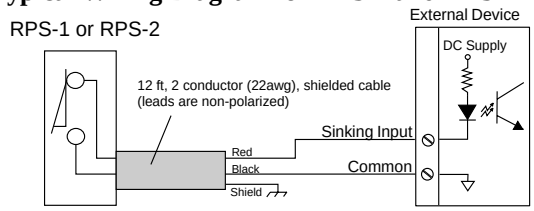
Position sensors are available in *normally open* and *normally closed* versions. Hall Effect (RP1 / RP2) and Reed (RPS-1 / RPS-2) type switches are compatible with the N Series cylinders. Switches are activated by two internal position indicating magnets on opposite sides of the drivenut.

- All sensors include a 12 ft [3.7m] shielded cable.
- Recommended minimum distance between switches is 0.65 inches [16.5mm].
- Sensors used for overtravel protection may reduce the available stroke, due to deceleration region.

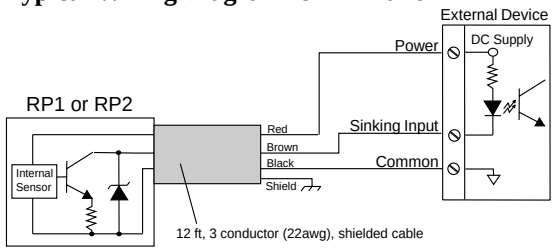
Position Sensor Specifications

	Magnetic Reed Switches		Hall Effect Sensors	
Output Type	Contact Closure		Open Collector, Sinking Output	
Model #	*** RPS-1**	**RPS-2**	**RP1**	**RP2**
Connection	Normally Open	Normally Closed	Normally Open	Normally Closed
# of leads	2 Wire	2 Wire	3 Wire	3 Wire
Voltage (VDC)	100VDC	100VDC	8 - 28VDC	8 - 28 VDC
Voltage (VAC)	100VAC	100VAC	-----	-----
Current (Amps)	.25A	.20A	40ma	40ma
Power (Watts)	7W	2W	1.1W	1.1W
Supply Voltage (VDC)	-----	-----	8 - 28VDC	8 - 28 VDC
Supply Current (ma)	-----	-----	22ma	22ma
Supply Power (watts)	-----	-----	.6W	.6W
Operating Temperature	-22° to 212°F (-30° to 100°C)		-4° to 140°F (-20° to +60°C)	
Storage Temperature	-22° to 212°F (-30° to 100°C)		-22° to 176°F (-30° to 80°C)	
Humidity Rating	0 to 95% non-condensing		0 to 95% non-condensing	

Typical Wiring Diagram for RPS-1 and RPS-2



Typical Wiring Diagram for RP1 and RP2



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Maximum Thrust and No-Load Speed, by Model Number

The following charts indicate the MAXIMUM THRUST and NO-LOAD SPEEDS for a given model number. Detailed Thrust, Speed and Duty Cycle performance curves can be found in the IDC *Electric Linear Actuators & Controls* Catalog.

- See Chapter 3 - *Application Considerations*, for speed and thrust limitations due to stroke length.

ND Series

Cylinder Model	Thrust lbs [N]	Speed in/sec [mm/s]	Cylinder Model	Thrust lbs [N]	Speed in/sec [mm/s]
ND-102B	34[151]	24.0[610]	ND-105A	35[156]	10.0[254]
ND-152B	55[244]	16.0[406]	ND-155A	70[311]	7.0[178]
ND-202B	70[311]	14.0[356]	ND-205A	105[467]	6.0[152]
ND-352B	---	---	* ND-355A	190[845]	3.5[89]
ND-1202B	---	---	ND-1205A	500[2224]	1.0[25]
ND-992B	34[151]	24.0[610]	ND-995A	35[156]	10.0[254]
ND-105B	85 [378]	10.0[254]	ND-108A	50[222]	6.0[152]
ND-155B	126 [560]	7.0[178]	ND-158A	90[400]	4.5[114]
ND-205B	193 [859]	6.5[165]	ND-208A	150[667]	3.5[89]
ND-355B	365 [1623]	3.5[89]	ND-358A	275[1223]	3.0[76]
ND-1205B	800 [3559]	1.0[25]	ND-1208A	800[3559]	.6[15]
ND-995B	85 [378]	10.0[254]	ND-998A	50[222]	6.0[152]

Note: Values are based on operation with D2200 or D2300 Series controls, for operation with D2500 Series Controls reduce max thrust by 50%.

NH Series

Cylinder Model	Thrust lbs [N]	Speed in/sec [mm/s]	Cylinder Model	Thrust lbs [N]	Speed in/sec [mm/s]
NH-102B	135[601]	30.0[762]	NH-105A	150[667]	12.0[305]
NH-152B	200[890]	16.0[406]	NH-155A	220[977]	8.0[203]
NH-202B	---	---	NH-205A	290[1290]	6.0[152]
NH-352B	---	---	NH-315A	375[1668]	3.9[99]
NH-992B	135[601]	30.0[762]	NH-995A	150[667]	12.0[305]
NH-105B	350[1557]	12.0[305]	NH-108A	230[1023]	7.5[191]
NH-155B	550[2447]	8.0[203]	NH-158A	360[1601]	4.5[114]
NH-205B	700[3114]	6.0[152]	NH-208A	475[2113]	3.8[97]
NH-315B	800[3559]	3.9[99]	NH-318A	600[2669]	2.4[61]
NH-995B	350[1557]	12.0[305]	NH-998A	230[1023]	7.5[191]

Note: Values are based on operation with H3000 or B8000 Series Controls

NS23 Series

Cylinder Model	Thrust lbs [N]	Speed in/sec [mm/s]	Cylinder Model	Thrust lbs [N]	Speed in/sec [mm/s]
NS23*x*-102B	65[289]	25.0[635]	NS23*x*-105A	90[400]	10.0[254]
NS23*x*-152B	100[445]	17.0[432]	NS23*x*-155A	135[601]	6.7[170]
NS23*x*-202B	---	---	NS23*x*-205A	180[801]	5.0[127]
NS23*x*-352B	---	---	NS23*x*-355A	245[1090]	2.9[74]
NS23*x*-1202B	---	---	NS23*x*-1205A	720[3203]	.8[20]
NS23*x*-992B	65[289]	25.0[635]	NS23*x*-995A	90[400]	10.0[254]

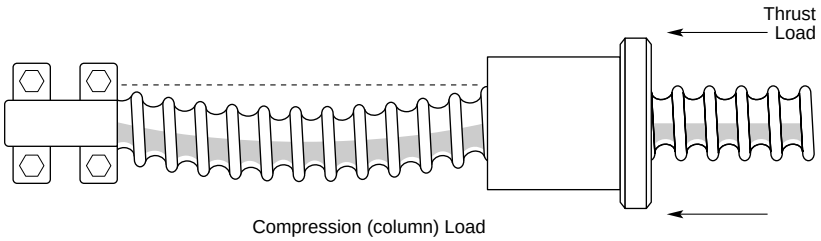
Notes: Values are based on operation with S6000 Series Controls. x can be N, T, or V which indicates motor wiring configuration.

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3. Application Considerations

Certain conditions can limit cylinder performance and should be addressed prior to installation and operation. Please review the following information to insure that your cylinder has been properly applied in your machine design.

Column Loading



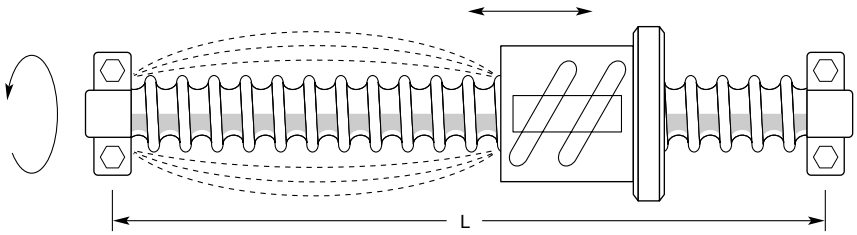
All leadscrews have a column loading limit which causes the screw to buckle or bend as thrust load increases. This limit is a function of unsupported leadscrew length. Exceeding this limit will cause the leadscrew to buckle and become permanently damaged.

Thrust Load Limitations Due to Length

	Cylinder Stroke Length (inches)						
Screw Type	<12"	18"	24"	30"	36"	42"	48"
2B/5B	>800 [>3559]	>800 [>3559]	>800 [>3559]	780 [3470]	540 [2402]	400 [1779]	305 [1356]
* 5A	>800 [>3559]	700 [3114]	395 [1757]	250 [1112]	175 [778]	130 [578]	95 [423]
8A	>800 [>3559]	>800 [>3559]	>800 [>3559]	545 [2424]	380 [1690]	280 [1246]	210 [934]

Note: Above loads are in lbs [N]

Critical Speed



All leadscrew systems have a rotational speed limit where harmonic vibrations occur. This limit is a function of unsupported leadscrew length. Sustained operation beyond this critical speed will cause the leadscrew to vibrate (whip violently), eventually bending or warping the screw.

Speed Limitations Due to Length

	Cylinder Stroke Length (inches)						
Screw Type	<12"	18"	24"	30"	36"	42"	48"
2B	---	---	27.6[701]	18.4[467]	13.2[335]	9.9[252]	7.7[196]
5B	---	---	11.0[279]	7.4[188]	5.3[135]	4.0[102]	3.1[79]
* 5A	---	13.8[351]	8.3[211]	5.6[142]	4.0[102]	3.0[76]	2.3[58]
8A	---	---	6.3[160]	4.2[107]	3.0[76]	2.3[58]	1.8[46]

Note: Above speeds are in inches/sec [mm/sec]

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Duty Cycle Limits

Duty Cycle is the percentage of On Time divided by Total Cycle Time for the worst case 10 minute period. During operation, it represents the maximum acceptable power dissipation of the motor and the frictional heat losses of the internal cylinder components, primarily the leadscrew/drivenut assembly. In general, ballscrew actuators are rated for 100% duty cycle and acme screws are rated for a maximum of 60%. Exceeding the recommended duty cycle will damage the motor or internal cylinder components. Consult IDC *Electric Linear Actuators & Controls* Catalog for individual model number ratings.

Environmental Specifications

Temperature Ratings

Standard Actuator	32° to 140°F	[0° to 60°C]	
-H High Temp. option	32° to 160°F	[0 to 71°C]	*(extends high temp. limit)*
* -F Sub-Freezing option	-20° to 105°F	[-29° to 41°C]	*(allows low temp., but decreases high temp. limit)*

Contaminants

Liquids: Standard N Series Cylinders are not water (nor any liquid) resistant. If liquid or moisture contaminates internal components, damage may occur. A Water Resistant option (-W) is available for environments with a slight mist or spray. The Protective Boot option (-PB), which includes the -W sealing option is available to protect the thrust tube/wiper interface.

For applications where exposure is unavoidable with a corrosive liquid or a pressurized liquid, an external protective enclosure is recommended. Consult the factory for assistance.

Solid Particles: Rod-type cylinders are generally well protected against particle contaminants. For environments with exposure to fine or abrasive particles, the Water Resistant (-W) option provides added resistance to entry, by sealing mating surfaces with RTV during assembly. The Protective Boot (-PB) option is recommended when the thrust tube/sleeve bearing interface is exposed to abrasive particles.

Backdriving

Backdriving is when the thrust tube is forced to extend or retract by an external force. This is an important consideration for cylinders being used in a vertical orientation or when a external thrust load is applied to the cylinder. A cylinder (without motor holding torque) will hold position up to the thrust limit known as the backdrive limit (determined by the screw type and pitch used). The IDC *Electric Linear Actuators & Controls* Catalog shows backdrive force limits for each individual cylinder model. Acme screws, due to their inherent self-locking action, have considerably higher limits than ballscrew driven actuators.

Screw Type	Description	Load Required to Backdrive
Ballscrew	2B: 2 Pitch, 0.500” lead	10 - 15 lbs [45 - 67 N]
	5B: 5 Pitch, 0.200” lead	20 - 25 lbs [89 - 111N]
Acme Screw	5A: 5 Pitch, 0.200” lead	100 - 400 lbs [440 - 1800N]
	8A: 8 Pitch, 0.125” lead	600 - 800 lbs [2700 - 3600N]

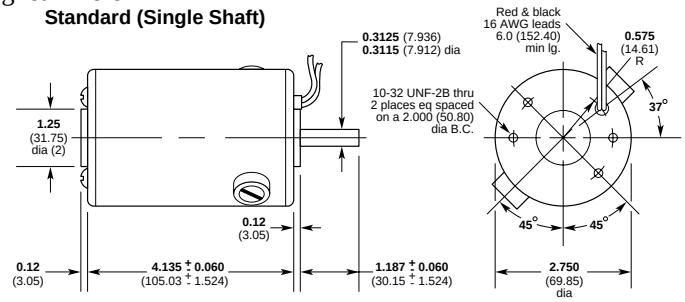
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4. Motor Wiring / Specifications

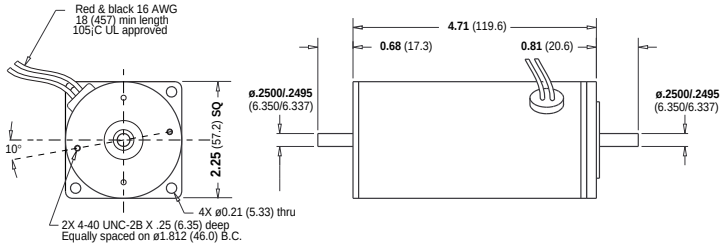
D 24 Volt DC Motor Specifications

Motor Type: Permanent Magnet 2-Pole

Standard (Single Shaft)



Inline (Double Shaft)



Motor Data

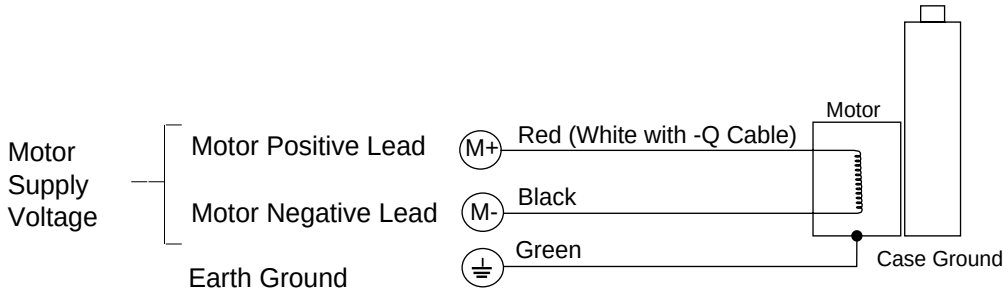
Electrical

Rated Voltage	V	24
Max. Continuous Current	A	4.5
Max. Operating Voltage	V	36
Inductance	mH	2.0
K_t Torque Constant	oz-in/A	8.9 ± 10%
K_v Voltage Constant	V/kRPM	6.5
Winding Resistance @ Ambient	Ohms	1.0

Mechanical

Continuous Stall Torque	oz-in	40
No-load Speed at Rated Voltage	RPM	3600
No-load Current	A	0.5
Rotor Inertia	oz-in-s^2	0.018
Max. Winding Temperature	°C	82

Motor Wiring



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6. Maintenance and Troubleshooting

Basic Maintenance

N Series Electric Cylinders are designed for maintenance-free operation for the life of the product.

Periodic inspection and service can extend service life, especially under extreme operating conditions, such as continuous high speed operation, shock loading, high speed stops/starts, or exposure to harsh environments. In these extreme applications, it is recommended that the screw and gears be re-lubricated, and an internal inspection be completed periodically. Inspection/re-lube typically consists of partial disassembly, followed by cleaning, visual evaluation, and re-lubrication.

Field Service

While we recommend our factory repair service in most cases, we recognize that on occasions, it may be desirable to perform minor repairs or maintenance in the field. Such cases include replacing accessible worn or broken components such as belts, rod ends, or mounting hardware, and lubrication of leadscrew or gears as required in extreme applications.
Note: Improper field assembly which causes damage or premature wear voids warranty.

Maintenance Instructions

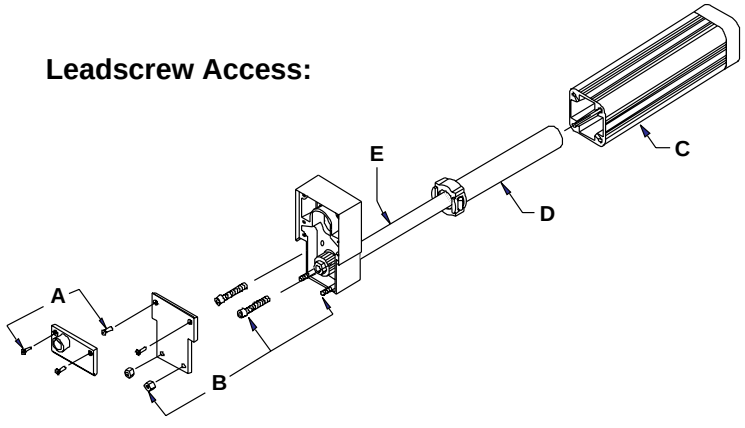
Instructions are shown below for basic maintenance procedures. Parts can be ordered through your local IDC Distributor.

Certain options are difficult to disassemble in the field, and should only be repaired at the factory. These options are listed in the Field Service Chart on page 24.

Lubricating the Leadscrew

A. Remove mounting screws (8/32 Phillips) securing cover plates to drive housing
B. Remove Nuts (1/4-28) and Hex Cap Screws (1/4-20) securing bottom cover plate and Guide Housing.
C. Remove guide housing by sliding it forward over the thrust tube.
D. Position the drive nut (attached to thrust tube) to the far extend end of the leadscrew.
E. With most of the leadscrew exposed, apply a thin coating of lubricating grease over the length of the screw. Run the drive nut over the screw length to spread the grease evenly. Reassemble Unit.

Leadscrew Access:

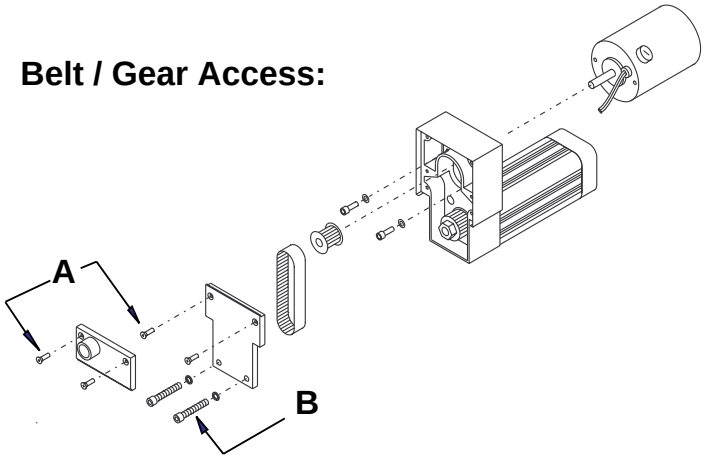


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Lubricating Gears

A. Remove mounting screws (8/32 Phillips) securing cover plates to drive housing
B. Remove Hex Cap Screws (1/4-20) securing lower cover plate. Remove cover plates.
Note: Units with BS or ES Options need only remove the top cover plate.
C. With the gears exposed, apply sufficient lubricating grease to coat all surface contact areas of gear train. Reassemble unit.

Belt / Gear Access:



Tensioning the Drive Belt

A. Remove mounting screws (8-32 Phillips head) securing cover plates to drive housing.
B. Remove Hex Cap Screws (1/4-20) securing lower cover plate. Remove cover plates.
C. Adjust belt tension by adjusting two bolts securing the motor to its mounting plate. One bolt is in a slot which allows up/down movement of motor to change belt tension. While maintaining proper tension by hand, tighten both screws. Properly tensioned, the belt should not deflect more than 1/8" from stationary centerline, with pressure from fingers.

Field Service Chart

All field service work should be done ONLY on authorized items, using IDC parts, by qualified personnel.

	Belt/Gear Drivetrain	**Leadscrew Assembly**	**Mounting Options, Rod Ends, and Options**
Maintenance	• Gear Lubrication • Re-tension Drive Belt *(except cylinders with -W or -L options)*	• Lubrication *(except cylinders with -W, -BS, -L, or cylinders with gear reduction)*	• Clean External Surfaces (i.e. thrust tube, motor, etc.)
Conversion	Factory • Belt/Pulley Ratios (1:1, 1.5:1, 2:1 ratios) • Helical gear systems (2.5:1, 3.1:1, 3.5:1, 12:1 ratios)	Factory Only	Field • Rod Ends FC2 → MT1 FE2 → FT1, FS2 FT1 → FE2, FS2 FS2 → FE2, FT1 Factory • Rod Ends not listed to left • Change Motor Orientation
Repair	Field • Motor Pulley's • Drive Belts • Gears - Motor Pinion - Intermed. Gear • Inline Coupling / Sleeve Factory • Driven Pulley • Driven Gear • Driven Coupling • -W Option • -BS Option	Factory Only	Field • Motors • Mounting Options • Guide Cylinder • Encoder • Quick Disconnect • Protective Boot • Rod Ends Factory • -W Option • -BS Option • -L Option • 2.5, 3.1, 3.5 or 12 Drive Ratios

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Troubleshooting

The guide below offers assistance when troubleshooting basic cylinder problems related to mechanical operation. When troubleshooting cylinder performance, the cause may be related to the Drive/Motor used with the cylinder. Refer to your IDC Control Manual for additional assistance on troubleshooting your control/cylinder system.

Problems Related to...

A. Audible Noise (emitting from cylinder)
B. Cylinder Motion
C. Positioning and Travel Length
D. Thrust Tube
E. Cylinder Parts and Options

A. Audible Noise (emitting from cylinder)

Subject and Symptom	Cause
1 Knocking, squealing or grinding during operation	a) Misalignment of internal components b) Excessive Side-loading c) Internal lubrication dried d) Entry of foreign matter into cylinder body

B. Cylinder Motion

1 Stalls/Binds/Sticks during a move (erratic motion)	a) Load too great for cylinder/motor b) Excessive thrust tube side-loading c) Pulley, gear, or coupling slipping d) Erratic motor/drive operation e) Drive nut or internal bearing seizing (locking up) typically due to too high a duty cycle/temperature or entry of foreign matter into cylinder
2 Running rough, not running smoothly	a) Misalignment of internal components b) Excessive side-loading c) Internal lubrication dried d) Entry of foreign matter into cylinder body
3 Extends when it should retract (and visa versa)	a) Motor polarity reversed
4 Vibrates during motion	a) Motor Unstable (servo-gains, stepper-resonance) b) Cylinder being operated at critical speed c) Misalignment of internal components
5 Does not move at all when commanded to move	a) Motor not connected or is damaged b) Load too great for cylinder/motor c) Problem with drive/motor
6 Does not move (or is erratic) although motor is rotating	a) Gear, pulley or coupling not secured to motor shaft b) Belt is loose or damaged c) Bad gear alignment or stripped teeth d) Threads are stripped on the drive nut (Acme)
7 Not running at rated speed	a) Load is too great for desired speed b) Limited by critical speed (oscillation) of screw c) Incorrect screw pitch or drive ratio d) Cylinder option (such as bronze drivenut) causing excessive friction

C. Positioning and Travel Length

1 Cylinder backdriving (without holding torque on motor)	a) Backdriving force generated by load is greater than the static holding capacity of the cylinder b) Excessive external vibration
2 Cylinder backdriving (with holding torque on the motor)	c) Backdriving force generated by load is greater than the holding capacity of the screw/nut of the cylinder and the holding torque of the motor d) Loss of motor holding torque (servo and steppers)

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3 Not enough travel	a) Position sensors reducing "actual" travel b) Cylinder option (may be limiting stroke) c) Excessive side-loading d) Customer mounting (physically limiting travel)
4 Expected linear travel distance not corresponding to number of motor revs	a) Incorrect screw pitch or drive ratio b) Incorrect scaling factor (programmable controls)
5 Expected stop position not repeatable (in same direction)	a) Varying Load b) Erratic Motor/Control operation c) Excessive system backlash

D. Thrust Tube

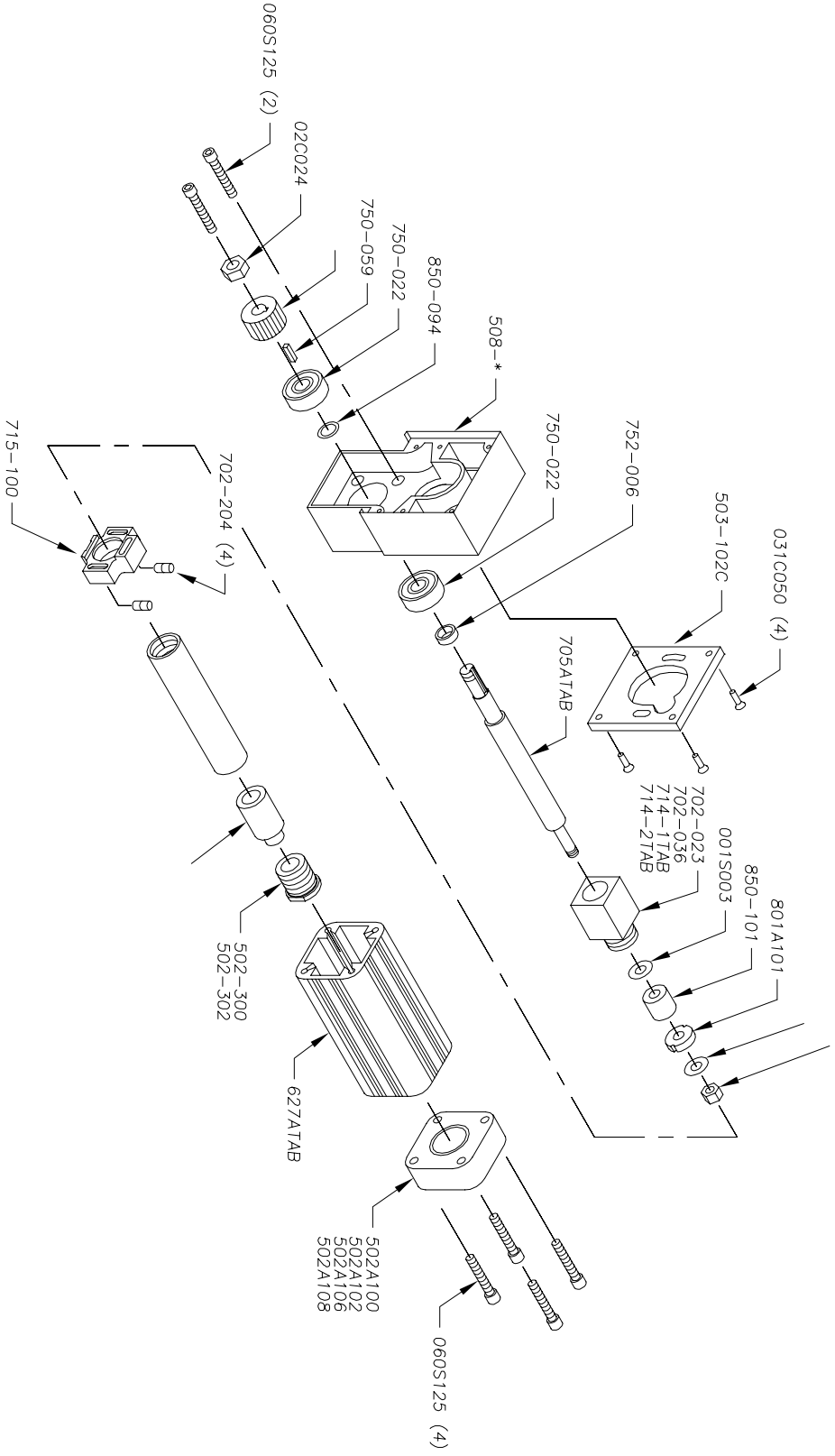
1 Wobbles during extension	a) Leadscrew or thrust tube is bent b) Excessive wear on leadscrew/nut c) Improper mounting of cylinder
2 Deflects too much during extension (Excessive lateral endplay)	a) Leadscrew/nut or internal bearings are worn b) Excessive side-loading c) Improper cylinder mounting
3 Bent	a) Load too great for cylinder b) Excessive side-loading c) Improper cylinder mounting
4 Rotates (excessive radial play)	a) Internal guide flange is damaged b) Thrust tube not fully engaged on drivenut
5 Stuck in fully extended or retracted position	a) Drive nut physically jammed into end of travel b) Load too great for cylinder/motor c) Excessive side loading d) Pulley, gear, or coupling slipping e) Erratic motor/drive operation
6 Excessive axial endplay (system backlash)	a) Leadscrew/nut is worn b) Gears worn/ Belt stretching

E. Cylinder Parts and Options

1 Driving belt breaking or gears stripping	a) Motor torque is too great b) Motor accel/decel too great for given load c) Load is too great for cylinder d) Excessive shock loading (running into physical hardstop, rapid change in direction)
2 Position Sensors not being activated by internal magnet	a) Misalignment of internal components b) Weak internal magnet c) Switch/sensor is damaged or miswired d) Sensors positioned improperly on cylinder (not on cylinder side where magnet is located) e) Cylinder speed too fast
3 Linear Potentiometer (LP) not reading properly	a) LPO wiper lifting off track (misalignment or LP bending due to excessive load b) Damaged / contaminated LP (by liquid/particle)
4 Motor overheating	a) Duty cycle too high b) High ambient temperature c) Incorrect current setting on drive
5 Brake not holding load	a) Brake not coupled to motor or leadscrew properly b) Load exceeds holding capacity of cylinder/brake c) Brake damaged or improperly wired
6 Encoder reading improperly	a) Encoder damaged or wired improperly b) Incorrect supply voltage to encoder

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Exploded Parts Diagram



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Parts List for N Series Cylinders

Parts can be ordered through your local IDC Distributor. Kits include all essential parts and instructions.

		ND 24V Brushed DC	NH 160V Brushed DC	NS23 NEMA 23 Stepper	NS32 NEMA 34 Stepper	NB23 Brushless Servo
Motor		810-101 D Motor 830A301 D Inline Motor	820-213 H Motor 820-214 H Motor with Quick Disc.	801-123 N/T/V Inline 801-223-T S23T Parallel 801-223-V S23V Parallel 801-223 S23N Parallel	801-132-N S32N Motor 801-132-T S32T Motor 801-132-V S32V Motor	810-023 B23 Motor 810-023B B23-BM (w/ brake)
	Brushes	810-199 D Brush Set (for 810-101 only)	820-298 H Brush Set	N/A	N/A	N/A
	Cables	QF1-12 12' quick-disconnect cable (3-lead)		QF3-12 12' quick-disconnect cable (5-lead)		QBB2-12 12' cable (includes leads for optional –BM brake)
	Encoder	E1KIT Encoder Assembly Kit				N/A
Drive Train						
	Pulleys					
	1:1	851-122A Motor Pulley 850-123A Ldscr Pulley		858-115A Motor Pulley 850-123A Ldscr Pulley	858-128A Motor Pulley 850-123A Ldscr Pulley	872-015A Motor Pulley 850-123A Ldscr Pulley
	1.5:1	851-118A Motor Pulley 850-120A Ldscr Pulley		858-112A Motor Pulley 850-120A Ldscr Pulley	858-129A Motor Pulley 850-120A Ldscr Pulley	872-012A Motor Pulley 850-120A Ldscr Pulley
	2:1	851-119A Motor Pulley 850-121A Ldscr Pulley		855-130A Motor Pulley 850-121A Ldscr Pulley	N/A	872-010A Motor Pulley 850-121A Ldscr Pulley
	Motor Belt	901-103K Drive Belt	901-106K Drive Belt	901-103K Drive Belt	901-104K Drive Belt	901-106K Drive Belt
	Gear Sets					
	2.5, 3.1, 3.5:1	3.5:1 950B001 Motor Gear 950-035 Int. Gear 950-015 Ldscrw. Gear	3.1:1 950J031 Motor Gear 950-035 Int. Gear 950-015 Ldscrw. Gear	3.5:1 950D002 Motor Gear 950-035 Int. Gear 950-015 Ldscrw. Gear	2.5:1 950F037 Motor Gear 950-035 Int. Gear 950-015 Ldscrw. Gear	2.5:1 950F031 2.5 Mtr Gear 950-035 Int. Gear 950-015 Ldscrw. Gear 3.1:1 950J031 Motor Gear 950-035 Int. Gear 950-015 Ldscrw. Gear
	12:1	12:1 950K001 Motor Gear 950K051 1st Cluster 950K052 2nd Cluster 950K011 Ldscrw. Gear	N/A	12:1 950K002 Motor Gear 950K051 1st Cluster 950K052 2nd Cluster 950K011 Ldscrw. Gear	N/A	N/A
	Inline Coupling	950-019 Mtr. Coupling 950-021U Sleeve 950-020 Ldscr. Coupl.	950-024 Mtr. Coupling 950-021U Sleeve 950-020 Ldscr. Coupl.	950-019 Mtr. Coupling 950-021U Sleeve 950-020 Ldscr. Coupl.	950-022 Mtr. Coupling 950-021U Sleeve 950-020 Ldscr. Coupl.	950-024 Mtr. Coupling 950-021U Sleeve 950-020 Ldscr. Coupl.
Lubrication		990-002 Lubrication Packet for Acme Screws *(12.5 oz grease gun cartridge)* 600-025 Lubrication Packet for Ballscrews *(one packet will lubricate up to 36 inches of stroke)* 600-028 Lubrication Packet for Gears *(12.5 oz grease gun cartridge)*				
Breather Tube		-WKIT Breather Tube Assembly Kit for Protective Boot(-PB) and Water Resistant Seal (-W) Options (includes 10' clear vinyl tubing, plus barbed fitting which threads into actuator)				
Protective Boots		BOOTKIT-2 Boot for 2" Unit BOOTKIT-4 Boot for 4" Unit BOOTKIT-6 Boot for 6" Unit BOOTKIT-8 Boot for 8" Unit BOOTKIT-12 Boot for 12" Unit BOOTKIT-18 Boot for 18" Unit BOOTKIT-24 Boot for 24" Unit *Note: Kits contain 1 boot, plus wire ties.*				
Rod Ends		FC2-N-KIT Assembly Packet (includes FC2 clevis rod end, plus male-threaded MT1 rod-end) FE2-N-KIT Assembly Packet - requires FT1 rod end already on cylinder (includes FE2 female eye rod end, threaded rod, and jam nut) FS2-N-KIT Assembly Packet - requires MT1 rod end (includes FS2 spherical rod end, internal toothed lock washer, and jam nut)				

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Warranty and Service Coverage

Industrial Devices Corporation warrants all ND, NH, NS and NB Series Cylinders to be free of defects in material & workmanship for a period of one year from the date of shipment to the user. Products returned prepaid to the factory will be repaired or replaced at our option at no charge, and returned prepaid to the user.

Products that fail due to improper use or misapplication are not subject to the terms of this warranty.

Technical Support

Industrial Devices offers technical support through its factory authorized and trained Distributors, and through its factory-based Applications Engineering and Inside Sales department.

If an application problem exists or if the product has failed, contact your Distributor or Industrial Devices for technical assistance. Contact our factory at 1-800-747-0064, outside the U.S. at 707-789-1000.

Factory Repair Service

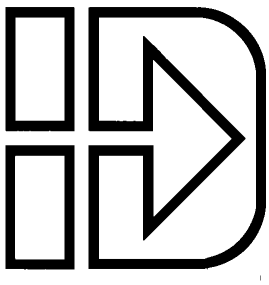
Product repairs are performed at our factory in Petaluma, California. Prior approval by Industrial Devices is required before returning a product for any reason. All returned products must be accompanied by an Industrial Devices supplied RMA (Return Material Authorization) number.

In Case of Failure

1. Get the Model and Serial Number of the defective unit, and document the nature of the failure using the RMA Data Form to help us repair the unit.
2. Prepare a purchase order for the repair cost in case the unit is out of warranty.
3. Contact your IDC Distributor or Industrial Devices Corporation (at 1-800-747-0064) for an RMA#.
4. Ship the unit prepaid, with the RMA number and documentation to:

Industrial Devices Co., LLC
3925 Cypress Drive
Petaluma, CA 94954
Attn.: RMA # _____

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INDUSTRIAL DEVICES CO., LLC
3925 Cypress Drive • Petaluma, CA USA 94954
(800) 747-0064 • Fax (707) 789-0175
OUTSIDE THE U.S. CALL (707) 789-1000
Internet E-mail: support@idcmotion.com

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