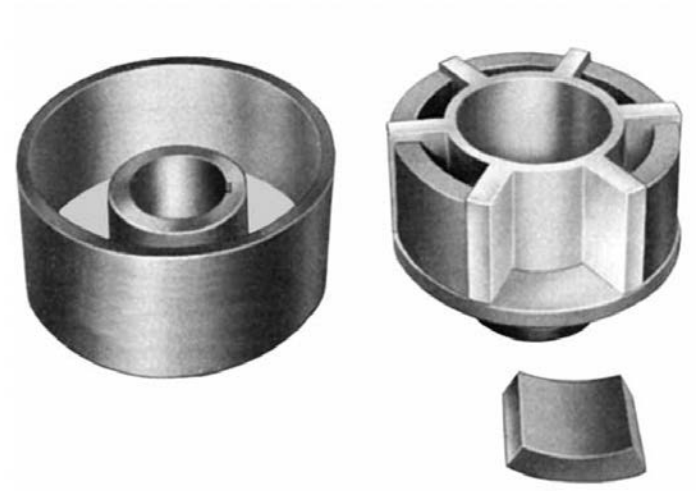
Operating Principles

The NLS centrifugal clutch is a rugged time-proven unit which provides equipment protection and system overload protection. This is done by allowing the motor or other driving source to accelerate to operating speed without load and to slip automatically when overloaded. This clutch is available in a free (type A) and delayed engagement (type AD) model, also in various sizes to handle different horsepower capacities.

TYPE A
Free Engagement

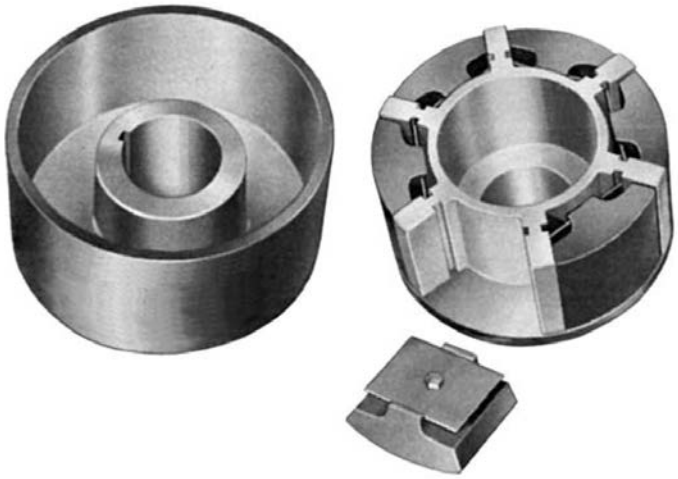
The shoes are a free floating part of the driving unit to which the power is applied. As the driver picks up speed, the shoes are forced outward by centrifugal force to make contact with the inside surface of the driven half. The shoes will make smooth contact and slip until the load reaches full speed. Both members then rotate as a unit with no slippage or power loss. Larger units have both inner and outer shoes.



TYPE A
WITH ONE ROW OF SHOES

TYPE AD
Delayed Engagement (Spring Controlled)

Operating under the same principle as the type A unit, the type AD uses springs to hold the shoes out of engagement until the driver reaches a predetermined rpm. At this point centrifugal force, acting on the shoes, overcomes the spring force, allowing smooth engagement of the power source with the load. Because the shoes are out of engagement until the driver is above the predetermined speed, this unit is ideal for dual or stand-by drives as well as idling or warming-up engines.



TYPE AD
FOR DELAYED ENGAGEMENT

NLS® Centrifugal Clutches

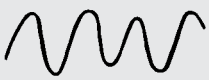
Easy Step by Step Selection Method

Step #1

Determine HP and minimum driving RPM (also idle RPM if delayed engagement type is required).

Step #2

Using the service factor chart, determine the proper service factor based on the prime mover and driven equipment.

	DRIVEN EQUIPMENT LOAD CLASSIFICATIONS			
	LIGHT STEADY LOADS Starting torque is equal to or slightly greater than running torque.	MODERATE LOADS High starting torque or above average running torque.	MEDIUM LOADS Starting torque is approximately double running torque.	HEAVY-DUTY LOADS High starting torque, shock loading, light torque reversals during drive.
				
PRIME MOVER	Centrifugal pumps, uniformly loaded conveyors, light-duty fans and blowers, liquid mixers and agitators, centrifugal compressors, lobe and vane type blowers, gear pumps, textile machinery, wood-working machinery.	Machine tools, hot oil pumps, heavy-duty centrifugal pumps, cooling towers, slurry agitators, boiler feed pumps, hoists, conveyors.	Dredge pumps, dynamometer drives, light-duty hammermills, lineshafts, paper-converting machinery, rotary kilns, rotary or screw-type pumps for high viscosity fluids, paper mill cranes.	Mine ventilating fans, reciprocating pumps or compressors, paper making machinery, heavy-duty hammer-mills, ore crushers, pulverizing mills.
Steam, gas or air turbine	1.00	1.25	1.50	1.75
AC electric motor	1.25	1.50	1.50	1.75
DC electric motor or DOL start AC electric motor, hydraulic motors	1.25	1.50	1.75	2.00
Gasoline, natural gas, propane or other spark ignition engine	1.75	1.75	2.00	CONSULT ENGINEERING
Diesel*	2.00	2.50	2.75	CONSULT ENGINEERING

* Consult application engineering on all engine drives.
Dual drive applications are to be treated as two single drives for service factor purposes.
For conveyor applications consult applications engineering.
For any application with extremes in inertia, starting torque, or questionable equipment, consult application engineering.

Step #3

Specify the clutch selected.

N0	-	16	-	1	-	B
Free Engagement-0 Spring Controlled-1		**Clutch Size**		**Shoe Compliment** No Shoes-0 Per Cat Rating-1,2,3		**Codes** B - Dynamic Balance L - Limited End Float S - Steel Band on Output

Sure-Grip bushings are sold separately.

Ordering examples:

N016-2	16A-2 clutch (no modifications)
N016-2-B	16A-2 clutch with dynamic balancing
N016-2-S	16A-2 clutch with steel ring
N016-2-B-S	16A-2 clutch with dynamic balancing and steel ring
N016-B-L-S	16A-2 clutch with dynamic balancing, limited end float, and steel ring
J3316	J Sure-Grip bushing with a 3-3/16 bore

Note: All NLS clutches use non-asbestos shoe linings.

Easy Step by Step Selection Method

Step #4

Calculate the Design HP (HP x service factor). Using the Design HP and the driving RPM, select the type and size clutch from the following charts.

TYPE A

Free Engagement Horsepower Tables

In the NLS free engagement clutch the shoes are a free-moving part of the driving half to which the power is applied. As the driving half picks up speed the shoes are forced outward by centrifugal force into contact with the inside surface of the driven half (drum) which is attached to the load or driven machine. As the shoes make smooth contact, they slip momentarily, or until friction causes the driven half to rotate. When the driven equipment reaches full speed, complete engagement of the shoes with the driven half has taken place, and both members rotate as a unit with **no slippage, or power loss.**

Description	Bushing	Max. Bore	Product Number	Minimum Dynamic HP Minimum Driving RPM							Shoe Replacement Outer		Shoe Replacement Inner	
				400	500	600	720	870	1160	1750	Product No.	Qty.	Product No.	Qty.
4A-1	SH		N004-1	0.02	0.04	0.07	0.11	0.20	0.50	1.60	N004-408	2	NONE	
4A-2	SH	1-5/8	N004-2	0.04	0.07	0.13	0.23	0.40	0.90	3.30	N004-408	4	NONE	
4A-3	SH		N004-3	0.05	0.09	0.15	0.27	0.50	1.10	3.90	N004-412	4	NONE	
6A-1	SDS		N006-1	0.09	0.20	0.30	0.50	1.00	2.40	8.00	N006-613	2	NONE	
6A-2	SDS	1-15/16	N006-2	0.15	0.30	0.50	0.90	1.60	3.80	13.00	N006-613	3	NONE	
6A-3	SDS		N006-3	0.20	0.40	0.70	1.20	2.10	5.00	17.00	N006-613	4	NONE	
6A-4	SDS		N006-4	0.29	0.60	1.00	1.80	3.20	7.50	26.00	N006-613	6	NONE	
7A-1	SK		N007-1	0.38	0.75	1.30	2.20	3.90	9.40	32.00	N007-726	3	NONE	
7A-2	SK	2-9/16	N007-2	0.51	1.00	1.70	3.00	5.20	12.00	43.00	N007-726	4	NONE	
7A-3	SK		N007-3	0.77	1.50	2.60	4.50	7.90	19.00	64.00	N007-726	6	NONE	
8A-1	SF		N008-1	0.90	1.80	3.20	5.60	9.80	23.00	80.00	N008-834	4	NONE	
8A-2	SF	2-15/16	N008-2	1.00	2.00	3.60	6.00	11.00	26.00	88.00	N008-842	4	NONE	
8A-3	SF		N008-3	1.30	2.70	4.90	8.20	14.00	35.00	120.00	N008-834	6	NONE	
8A-4	SF		N008-4	1.50	3.00	5.40	9.10	16.00	38.00	132.00	N008-842	6	NONE	
10A-1	E		N010-1	1.50	3.00	5.50	9.00	16.00	38.00	132.00	N010-1033	4	N010-1026-I	4
10A-2	E	3-1/2	N010-2	1.50	3.50	6.00	10.00	18.00	43.00	149.00	N010-1042	4	N010-1026-I	4
10A-3	E		N010-3	2.00	4.50	7.50	13.00	24.00	56.00	192.00	N010-1033	6	N010-1026-I	6
10A-4	E		N010-4	2.50	5.00	9.00	15.00	28.00	65.00	224.00	N010-1042	6	N010-1026-I	6
12A-1	F		N012-1	3.00	6.50	12.00	19.00	35.00	82.00	285.00	N012-1275	3	N012-1256-I	3
12A-2	F	3-15/16	N012-2	4.00	8.50	16.00	26.00	47.00	110.00	380.00	N012-1275	4	N012-1256-I	3
12A-3	F		N012-3	6.00	12.00	21.00	36.00	65.00	154.00	533.00	N012-1260	6	N012-1256-I	6
12A-4	F		N012-4	6.50	13.00	23.00	39.00	70.00	165.00	570.00	N012-1275	6	N012-1256-I	6
14A-1	F		N014-1	8.50	17.00	31.00	51.00	92.00	217.00	749.00	N014-1453	6	N014-1468-I	3
14A-2	F	3-15/16	N014-2	10.00	20.00	36.00	60.00	108.00	255.00	879.00	N014-1470	6	N014-1468-I	4
14A-3	F		N014-3	13.00	27.00	48.00	81.00	144.00	340.00	1170.00	N014-1470	8	N014-1468-I	6
16A-1	J		N016-1	13.00	26.00	47.00	79.00	141.00	333.00	1150.00	N016-16110	4	N016-16100-I	3
16A-2	J	4-1/2	N016-2	14.00	28.00	50.00	84.00	150.00	354.00	1220.00	N016-1685	6	N016-16100-I	4
16A-3	J		N016-3	20.00	39.00	70.00	118.00	212.00	499.00	1720.00	N016-16110	6	N016-16100-I	4
16A-4	J		N016-4	26.00	53.00	93.00	158.00	282.00	666.00	2290.00	N016-16110	8	N016-16100-I	6
19A-1	BTS		N019-1	43.00	87.00	154.00	260.00	461.00	1090.00	...	N019-19150	6	N019-19100-I	6
19A-2	BTS		N019-2	57.00	115.00	204.00	346.00	614.00	1450.00	...	N019-19150	8	N019-19100-I	8
24A-1	BTS		N024-1	77.00	156.00	276.00	468.00	828.00	1967.00	...	N024-24140	8	N024-24180-I	4
24A-2	BTS		N024-2	114.00	221.00	391.00	663.00	1170.00	2785.00	...	N024-24200	8	N024-24180-I	6
24A-3	BTS		N024-3	164.00	332.00	587.00	995.00	1760.00	4180.00	...	N024-24200	12	N024-24180-I	8
24A-4	BTS		N024-4	219.00	443.00	783.00	1327.00	2345.00	5570.00	...	N024-24200	16	N024-24220-I	8
25A-1	BTS		N025-1	246.00	498.00	881.00	1490.00	2640.00	6270.00	...	N024-24200	18	N024-24180-I	8
25A-2	BTS		N025-2	287.00	581.00	1030.00	1740.00	3080.00	7310.00	...	N024-24200	21	N024-24220-I	8
25A-3	BTS		N025-3	342.00	669.00	1160.00	2000.00	3530.00	8360.00	...	N024-24200	24	N024-24180-I	8

Horsepower tables are based on ideal test conditions. As with all friction clutches, the actual horsepower will vary with application conditions.
When using a model with inner shoes:

A) horsepower ratings prior to shoe lock-up (dynamic horsepower ratings) do not include inner shoe.

B) horsepower rating after complete shoe lock-up with inner shoe (static horsepower ratings) are approximately double the dynamic rating.

For high speed applications and models above 10", consult application engineering.

TYPE AD

Delayed Engagement Horsepower Tables

In the NLS delayed engagement clutch, shoe engagement is controlled by springs. The springs are fastened to the clutch shoes and inserted in slots in the driving half. Spring action holds the shoes out of engagement with the driven half until the driving half reaches a pre-determined RPM. Above this RPM, centrifugal force acting on the shoes overcomes the spring force allowing smooth engagement of the power source with the driven equipment. Since the shoes do not contact the driven half unless the driving half is started and accelerated, the delayed engagement type AD is ideal for dual or standby drives. The cushioned contact also means no sudden load imposed on motor, electrical, clutch or driven equipment.

Description	Bushing	Max. Bore	Product Number	Minimum Dynamic HP Minimum Driving RPM / Maximum Idle RPM				Max. Idle RPM	Shoe Replacement Outer	
				870/300*	1160/700*	1750/1000*	2500/1500*		Product No.	Qty.
4AD-1	SH	1-5/8	N104-1	0.18	0.31	1.10	3.20	300-1500	N104-9001	2
4AD-2	SH	1-5/8	N104-2	0.37	0.63	2.30	6.40	300-1500	N104-9001	4
6AD-1	SDS	1-15/16	N106-1	0.80	1.40	5.00	14.60	300-1500	N106-9001	2
6AD-2	SDS	1-15/16	N106-2	1.20	2.10	8.00	21.90	300-1500	N106-9001	3
6AD-3	SDS	1-15/16	N106-3	1.70	2.80	10.50	29.20	300-1500	N106-9001	4
6AD-4	SDS	1-15/16	N106-4	2.50	4.30	15.50	43.80	300-1500	N106-9001	6
7AD-1	SK	2-1/2	N107-1	3.00	5.00	18.50	50.00	300-1500	N107-9001	3
7AD-2	SK	2-1/2	N107-2	4.00	6.80	24.50	67.00	300-1500	N107-9001	4
7AD-3	SK	2-1/2	N107-3	6.00	10.90	37.00	100.00	300-1500	N107-9001	6
8AD-1	SF	2-15/16	N108-1	7.50	13.00	47.00	136.00	300-1500	N108-9001	4
8AD-2	SF	2-15/16	N108-2	11.50	19.50	71.00	204.00	300-1500	N108-9001	6
10AD-1	SF	2-15/16	N110-1	17.00	30.00	109.00	—	300-1000	N110-9001	4
10AD-2	SF	2-15/16	N110-2	26.00	45.00	164.00	—	300-1000	N110-9001	6
12AD-1	F	3-15/16	N112-1	27.00	47.00	173.00	—	300-1000	N112-9001	2
12AD-2	F	3-15/16	N112-2	41.00	71.00	259.00	—	300-1000	N112-9001	3
12AD-3	F	3-15/16	N112-3	55.00	95.00	346.00	—	300-1000	N112-9001	4
12AD-4	F	3-15/16	N112-4	83.00	142.00	519.00	—	300-1000	N112-9001	6
14AD-1	F	3-15/16	N114-1	73.00	125.00	—	—	200-700	N114-9001	4
14AD-2	F	3-15/16	N114-2	110.00	188.00	—	—	200-700	N114-9001	6
14AD-3	F	3-15/16	N114-3	147.00	251.00	—	—	200-700	N114-9001	8
16AD-1	J	4-1/2	N116-1	100.00	172.00	—	—	200-700	N116-9001	2
16AD-2	J	4-1/2	N116-2	201.00	344.00	—	—	200-700	N116-9001	4
16AD-3	J	4-1/2	N116-3	302.00	516.00	—	—	200-700	N116-9001	6
16AD-4	J	4-1/2	N116-4	402.00	689.00	—	—	200-700	N116-9001	8
19AD-1	BTS		N119-1	521.00	—	—	—	200-500	N119-9001	6
19AD-2	BTS		N119-2	695.00	—	—	—	200-500	N119-9001	8
24AD-1	BTS		N124-1	701.00	—	—	—	50-300	N124-9001	4
24AD-2	BTS		N124-2	1402.00	—	—	—	50-300	N124-9001	8
24AD-3	BTS		N124-3	2103.00	—	—	—	50-300	N124-9001	12
24AD-4	BTS		N124-4	2805.00	—	—	—	50-300	N124-9001	16

* Horsepower ratings listed are based on idle speed as indicated.
For high speed applications, models above 10", or special idle speeds, consult application engineering.
Horsepower ratings listed are based on ideal test conditions. As with all friction clutches, the actual horsepower will vary with application conditions.

Step #5

Check high speed applications for dynamic balancing and steel band requirements.

Clutch Size	RPM		
	Dynamic Balance Between	Steel Band On Required Output Member Above	Max RPM with Max Shoe Compliment
4	4700-11500	5700	11500
6	3200-7600	3900	7600
7	2700-6600	3300	6600
8	2400-5700	2900	5700
10	1900-4600	2300	4600
12	1225-3800	1900	3800
14	1400-3300	1600	3300
16	1200-2900	1400	2900
19	1000-1750	1200	1750
24	900-1600	1000	1600
25	500-1600	1000	1600

NLS® Centrifugal Clutches

Easy Step by Step Selection Method

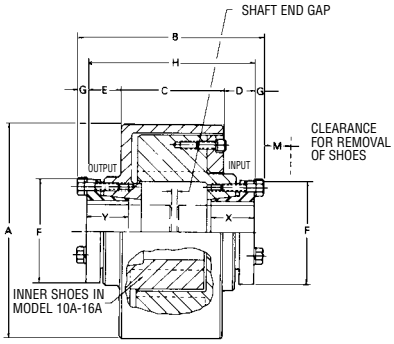
Step #6

Check bore size and available space envelope.

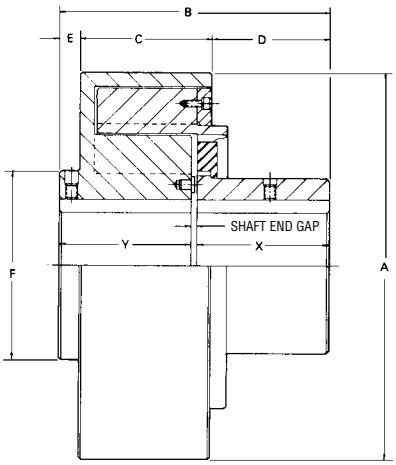
TYPE A

Free Engagement

Dimensions in Inches



MODELS 4A THRU 16A



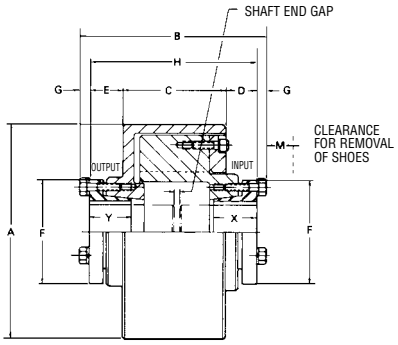
MODELS 19A & 24A

Clutch Size	Sure-Grip Bushing	Max. Keyed Bore	A	A with Steel Band	B	C	D	E	F	G	H	X	Y	Shaft End Gap Min	Shaft End Gap Max	M	B+M	Approx. Wt. Lbs.
4A	SH	1-5/8	4.4375	—	4.8125	2.2500	1.1250	1.0000	2.7500	.2500	4.3750	1.0625	1.0625	.0625	2.0000	—	4.8125	8
6A	SDS	1-15/16	6.5000	7.4375	5.5313	3.0625	.9375	1.0313	3.1250	.2500	5.0313	1.3125	1.3125	.1250	2.4063	.8125	6.3438	25
7A	SK	2-1/2	7.6250	8.4375	7.3125	3.6250	1.5000	1.5625	3.8750	.3125	6.6875	1.9375	1.9375	.1250	2.8125	.6875	8.0000	40
8A	SF	2-15/16	8.7500	9.4375	8.0000	4.2500	1.2813	1.7813	4.6250	.3438	7.3125	2.2500	2.2500	.1250	2.8125	1.8750	9.8750	55
10A	E	3-1/2	10.750	11.750	10.5000	4.1250	3.1250	2.2500	6.0000	.5000	9.5000	3.0000	3.0000	.1250	3.5000	—	10.5000	105
12A	F	3-15/16	13.000	14.000	11.3750	5.5000	3.4375	1.3125	6.6250	.5625	10.2500	3.9375	3.9375	.1250	2.3750	—	11.3750	225
14A	F	3-15/16	15.000	16.000	11.3750	5.5000	3.4375	1.3125	6.6250	.5625	10.2500	3.9375	3.9375	.1250	2.3750	—	11.3750	250
16A	J	4-1/2	17.250	18.250	13.6250	6.6250	4.1875	1.5625	7.2500	.6250	12.3750	4.8750	4.8750	.1250	2.6250	—	13.6250	400
19A	BTS		20.500	21.500	14.8125	6.8750	6.2500	1.0625	10.00	—	—	7.0000	7.0000	.1250	.1875	—	14.1875	600
24A	BTS		25.500	26.500	19.0625	9.8750	8.0000	1.0625	12.50	—	—	8.7500	10.0000	.1250	.1875	—	19.0625	1225
25A	BTS		—	26.500	24.1875	13.8750	9.2500	1.0625	12.50	—	—	10.0000	10.0000	.1250	4.0781	—	24.1875	1400

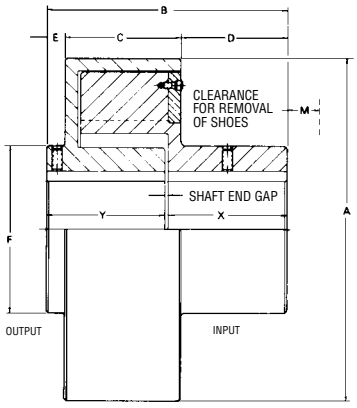
TYPE AD

Delayed Engagement

Dimensions in Inches



MODELS 4AD THRU 16AD



MODELS 19AD & 24AD

Clutch Size	Sure-Grip Bushing	Max. Keyed Bore	A	A with Steel Band	B	C	D	E	F	G	H	X	Y	Shaft End Gap Min	Shaft End Gap Max	M	B+M	Approx. Wt. Lbs.
4AD	SH	1-5/8	4.4375	—	4.8125	2.2500	1.1250	1.0000	2.7500	.2500	4.3750	1.0625	1.0625	.0625	2.0000	—	4.8125	8
6AD	SDS	1-15/16	6.5000	7.4375	5.5313	3.0625	.9375	1.0313	3.1250	.2500	5.0313	1.3125	1.3125	.1250	2.0313	.8125	6.3438	25
7AD	SK	2-1/2	7.6250	8.4375	7.3125	3.6250	1.5000	1.5625	3.8750	.3125	6.6875	1.9375	1.9375	.1250	2.8125	.6875	8.0000	40
8AD	SF	2-15/16	8.7500	9.4375	8.0000	4.2500	1.2813	1.7813	4.6250	.3438	7.3125	2.2500	2.2500	.1250	2.8125	1.3750	9.3750	55
10AD	SF	2-15/16	10.7500	11.7500	8.5625	4.1250	2.0000	1.7500	5.1250	.3438	7.8750	2.2500	2.2500	.1250	3.5000	.6875	9.2500	105
12AD	F	3-15/16	13.0000	14.0000	11.3750	5.5000	3.4375	1.3125	6.6250	.5625	10.2500	3.9375	3.9375	.1250	2.3750	.6250	12.0000	215
14AD	F	3-15/16	15.0000	16.0000	11.3750	5.5000	2.1250	1.3125	6.6250	.5625	10.2500	3.9375	3.9375	.1250	2.3750	.6250	12.0000	240
16AD	J	4-1/2	17.2500	18.2500	13.6250	6.6250	4.1875	1.5625	7.2500	.6250	12.3750	4.8750	4.8750	.1250	2.6250	.6250	14.2500	385
19AD	BTS		20.5000	21.5000	14.1875	6.8750	6.2500	1.0625	10.0000	—	—	7.0000	7.0000	.1250	.1875	—	14.1875	575
24AD	BTS		25.5000	26.5000	18.9375	9.8750	8.0000	1.0625	12.5000	—	—	8.7500	8.7500	.1250	1.4375	—	18.9375	1175

Bore and keyseat information

Sure Grip Bushing	Bores	Keyseat
SH	1/2 - 1-3/8 1-7/16 - 1-5/8 1-11/16	Standard 3/8 x 1/16 No K.S.
SDS	1/2 - 1-11/16 1-3/4 1-13/16 1-7/8 - 1-15/16 2	Standard 3/8 x 1/8 1/2 x 1/8 1/2 x 1/16 No K.S.
SK	1/2 - 2-1/8 2-3/16 - 2-1/4 2-5/16 - 2-1/2 2-9/16 - 2-5/8	Standard 1/2 x 1/8 5/8 x 1/16 NO K.S.
SF	1/2 - 2-1/4 2-5/16 - 2-1/2 2-9/16 - 2-3/4 2-13/16 - 2-15/16	Standard 5/8 X 3/16 5/8 X 1/16 NO K.S.

Sure Grip Bushing	Bores	Keyseat
E	7/8 - 2-7/8 2-15/16 - 3-1/4 3-5/16 - 3-1/2	Standard 3/4 X 1/8 7/8 X 1/16
F	1 - 3-1/4 3-5/16 - 3-3/4 3-13/16 - 3-15/16 4	Standard 7/8 X 3/16 1 X 1/8 NO K.S.
J	1-7/16 - 3-13/16 3-7/8 - 3-15/16 4 - 4-1/2	Standard 1 X 3/8 1 X 1/8
BTS NLS Models		
Model	Bores	Keyseat
19A & 19AD	3 - 5-5/8 5-11/16 - 6-5/8	Standard Shallow
24A, 25A & 24AD	3-1/4 - 7 7-1/16 - 8-3/8	Standard Shallow

Standard Keyseat Dimensions		
Shaft Dia.	Width	Depth
1/2- 9/16	1/8	1/16
5/8 - 7/8	3/16	3/32
15/16 - 1-1/4	1/4	1/8
1-5/16 - 1-3/8	5/16	5/32
1-7/16 - 1-3/4	3/8	3/16
1-13/16 - 2-1/4	1/2	1/4
2-5/16 - 2-3/4	5/8	5/16
2-13/16 - 3-1/4	3/4	3/8
3-15/16 - 3-3/4	7/8	7/16
3-13/16 - 4-1/2	1	1/2
4-9/16 - 5-1/2	1-1/4	5/8
5-9/16 - 6-1/2	1-1/2	3/4
6-9/16 - 7-1/2	1-3/4	3/4
7-9/16 - 9	2	3/4

NOTE: When installing Sure-Grip bushings follow wrench torque supplied in NLS instructions.

Step #7

Check clutch capacity for high inertia starts.

If inertia is not known or clutch speed is not listed, see step # 8.

Maximum WR^2 (lbs. ft.^{2}) that may be started at standard motor speeds.							
Clutch	870 RPM	1170 RPM	1750 RPM	Clutch	870 RPM	1170 RPM	1750 RPM
4	500	290	130	14	8000	4700	2100
6	1400	800	350	16	15000	8000	3700
7	2000	1100	510	19	22000	13000	5600
8	3000	1700	790	24	38000	20000	—
10	3800	2100	880	25	47600	26400	—
12	7000	4000	1800				

Step #8

If inertia is not known or clutch speed is not listed on WR^2 chart.

ACCELERATION TABLE

Clutch Model No.	Energy Capacity Horsepower-Seconds
4A, 4AD	245
6A, 6AD	680
7A, 7AD	980
8A, 8AD	1,400
10A, 10AD	1,650
12A, 12AD	3,400
14A, 14AD	4,000
16A, 16AD	7,200
19A, 19AD	11,000
24A, 24AD	17,000
25A	25,000
30A	38,000

Maximum allowable acceleration time in seconds can be calculated by dividing the energy capacity in horsepower-seconds by the clutch design horsepower.

If actual acceleration time exceeds the maximum allowable time, a larger clutch should be selected or if the start-up frequency is more than 1 every half-hour.

Example: A 12A-3 is rated at 533 hp @ 1750 with an energy capacity of 3400 Horsepower-seconds

$$\frac{\text{3400 Horsepower-seconds}}{\text{533 Horsepower}} = \text{6.4 seconds maximum allowable acceleration time without a Steel Band}$$

By adding a Steel Band the acceleration time is increased by 35%

6.4 x 1.35 = 8.6 seconds with a Steel Band