



DURA•DRIVE SPM



SYNCHRONOUS PERMANENT MAGNET MOTORIZED PULLEY CATALOG

DURA•DRIVE **SPM** is Oil Free

More Efficient than AC Induction Motorized Pulleys.

Synchronous Permanent Magnet Motorized Pulleys

Dura-Drive SPM pulleys from Sparks Belting Company have high efficiency synchronous motors as replacements for lower efficiency AC induction motors in conveying applications.

Sparks synchronous motorized pulleys are ideal for applications in logistics, general automation and machine building, and are especially suited for servo-type applications. The motors exceed IE4 efficiency limits, and are designed to meet IE5 requirements.

Dura-Drive SPM pulleys run OIL-FREE with no possibility of oil leaks. This solves one of the main problems of motorized pulleys, especially in food applications.

Efficiency Drives Motor Development

The induction motor has been the workhorse of the industry for over 130 years. It is simple to use, robust and fairly inexpensive. However, it is not very efficient. With the increases in energy prices the total cost of ownership of induction motors is increasing rapidly. The cost of running an induction motor over its lifetime is easily 20 times its purchase price, and can be as much as 50 times.

Energy efficiency regulations for electric motors, defined in IEC 60034-30, are an attempt to address this problem by forcing manufacturers to increase efficiency, and by forcing end users to think about energy efficiency and not just purchase price.

The permanent magnet design is the key to the high efficiency and high power density of the Sparks Dura-Drive SPM motorized pulleys.

The optimal volume of NdFeB magnetic material is placed on the rotor maximizing the utilization of the magnetic materials in the motor, and results in the highest possible torque density.

These motors are available in 3.19" and 4.39" diameters and can be run either sensor-less in speed control mode or with feedback in combination with a servo drive in position, speed or torque control (sensor-less position control is also possible with some servo drives).

The Dura-Drive SPM motors are aimed at applications in logistics with high dynamic requirements or as replacements for servo motors in machine building and general automation. They can also be used as a space-saving alternative to a gear motor.

Frequency Inverter Operation

Frequency inverters (VFD's) are electronic voltage sources that can provide an alternating voltage at variable frequency and amplitude. They are generally used in so called v / f mode (voltage / frequency mode) to control the speed of an induction motor by providing the motor with the required frequency and voltage for a given speed. An induction motor can thus be run in speed control but it is still an induction motor with load dependent speed variation or "slip".

A more complex frequency inverter with a vector-control mode can compensate for this speed variation and can also adjust the motor current according to the load demand. The induction motor still runs asynchronously with slip but the vector controller tries to hold the desired speed, this is the best that can be done with an induction motor.

A permanent magnet compatible frequency inverter is required to run Dura Drive SPM motorized pulleys.



Dura-Drive SPM is Sensor-less

In order to control the speed of an induction motor under varying load conditions it is necessary to use a vector controller. This sophisticated mode of control is implemented in a frequency inverter and requires an accurate measurement of the motor current and numerous mathematical vector calculations which are performed to dynamically calculate the required current vector in order to achieve the required torque at any time. These features used to be only available in high-end servo drives using motor feedback. Advances in microprocessor technology and current measurement mean that even low cost frequency inverters have this type of functionality. These developments are the basis of the sensor-less mode of motor control used in the Dura-Drive SPM motor range.

The frequency inverter uses measurements of phase current and voltage to calculate the instantaneous position of the rotor and to set the current vector correctly to maximize torque. This can all be done without any feedback device making the motor and the whole system, much cheaper. There are now a wide range of frequency inverters in the market that have this capability. In this mode the motor can deliver about 150% of rated torque at start up and can be controlled over a speed range of about 10:1 to 15:1.

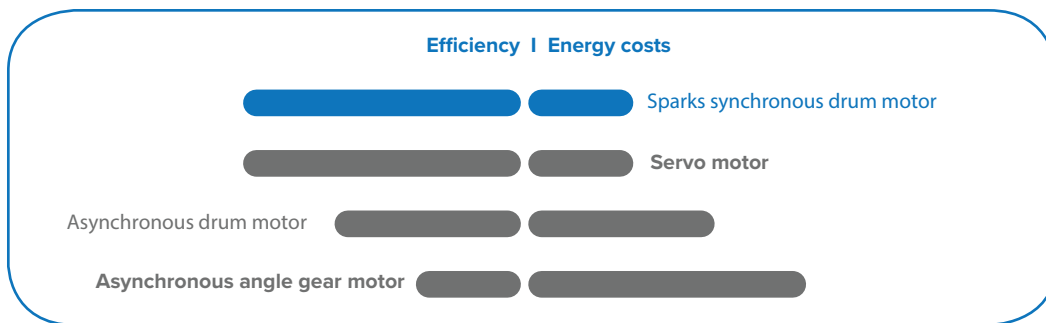
Dura-Drive SPM Servo

Dura-Drive SPM motors can be fitted with a standard feedback device (resolver or Hyperface Sin / Cos encoder) and in combination with most standard servo drives used as a PM servo. Run in this mode, the motor can achieve up to 500% of rated torque and be controlled in a speed range of about 1000:1.

All usual servo applications can be realized: position control, speed control, master-slave, cam follower etc. These are all common operating modes in applications such as packaging, labeling, pick and place, cutting etc.

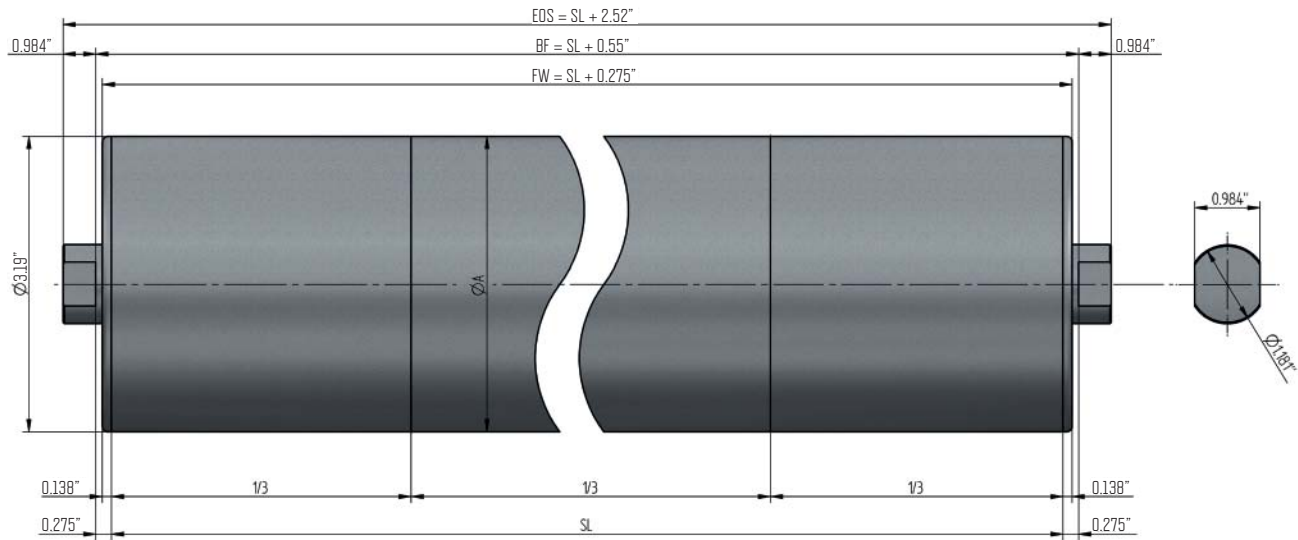
Benefits of the Dura-Drive SPM Motorized Pulley:

- **OIL FREE:** provides high power with no need for oil cooling, eliminating any chance of oil leakage
- **Practically no conveyor downtime or maintenance** means lower costs and higher productivity
- **Compact, safe and clean:** hazards and pinch points are removed by having all moving parts enclosed in the pulley shell, and there is no external grease or oil from chains, bearings and couplings
- **Simple design:** Dura-Drive SPM is a one-piece pulley so it can be easily specified into new conveyor systems, which dramatically reduces design time. For existing systems the pulleys can be ordered with two mounting brackets for an easy retrofit.
- **Synchronous motor technology:** the permanent magnet motors used in Dura-Drive SPM pulleys are characterized by high power density and very low losses. The motors can be supplied with feedback for use with servo drives, or run sensor-less with a suitable frequency inverter
- **Cool running:** very low losses mean significantly reduced heat when compared to a motorized pulley powered by a standard AC induction motor
- **Torque:** remains constant over a very wide speed range
- **Standardization:** due to the constant torque, one Dura-Drive SPM can cover a much wider range of applications
- **High acceleration:** for infeed applications, for example a collating conveyor, the Dura-Drive SPM can provide high acceleration even with large loads
- **Energy efficiency:** the permanent magnet motor is up to 6 times more efficient than an AC induction motor, which reduces operating costs

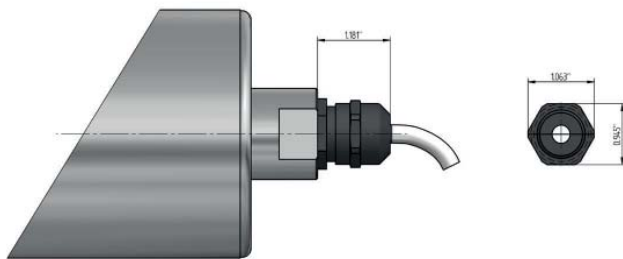


*Current US Requirement is IE3 or better

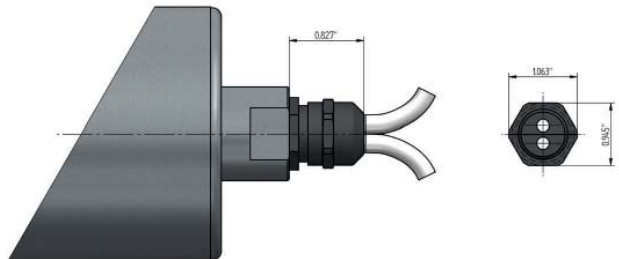
Dura-Drive SPM 3.19" Diameter Series



Straight cable connection, brass or stainless steel



Straight cable connection for two cables (option Motorfeedback)



Benefits

- AC synchronous permanent magnet motorized pulley
- Steel or stainless steel construction
- Hardened steel servo-quality planetary gears
- Rated power up to 0.50 horsepower
- Rated torque up to 26.6 ft-lbs
- Rated drum speed up to 316fpm
- High efficiency
- Oil free
- Maintenance free

Technical Data

Type of motor	Permanent magnet AC synchronous
Connection	Frequency inverter or servo drive
Motor winding insulation	F-class
Thermal protection	KTY84-130 switch or PTC temperature sensor
Temperature range	+41F to +104F (standard) for operation with belt. Low temperature range to -13F optional
Protection class	IP66 standard, IP67 and IP69K optional
Electrical connection	Cable 4 x 0.5 qmm (AWG 20) + 2 x 0.25 qmm (AWG 23) shielded

Dura-Drive SPM 3.19" Diameter Performance Specifications

Specifications, Materials, Options

HP	Minimum Shell Length (SL)	RPM	FPM (nominal)	Belt Pull (lbs)	Drum Torque (ft/lbs)
0.25	10.63"	94	79	99	13.3
		150	126	62	8.3
		188	158	50	6.7
		250	211	37	5.0
	10.14"	375	316	25	3.4
0.50	11.81"	94	79	199	26.6
		150	126	124	16.6
		188	158	99	13.3
		250	211	74	10.0
		375	316	51	6.8

- Speed adjustments in the following ranges are possible:
 - Sensor-less operation with a suitable frequency inverter: 10:1 is normal, 15:1 possible
 - Servo drive and feedback: up to 1,000:1
- Starting torque:
 - Sensor-less: rated torque x 1.5
 - With feedback: peak torque
- Standard shell lengths (SL) up to 35.43", contact Sparks customer service for longer shell lengths
- Other shaft size options are available
- Contact Sparks customer service for lagging and v-groove options

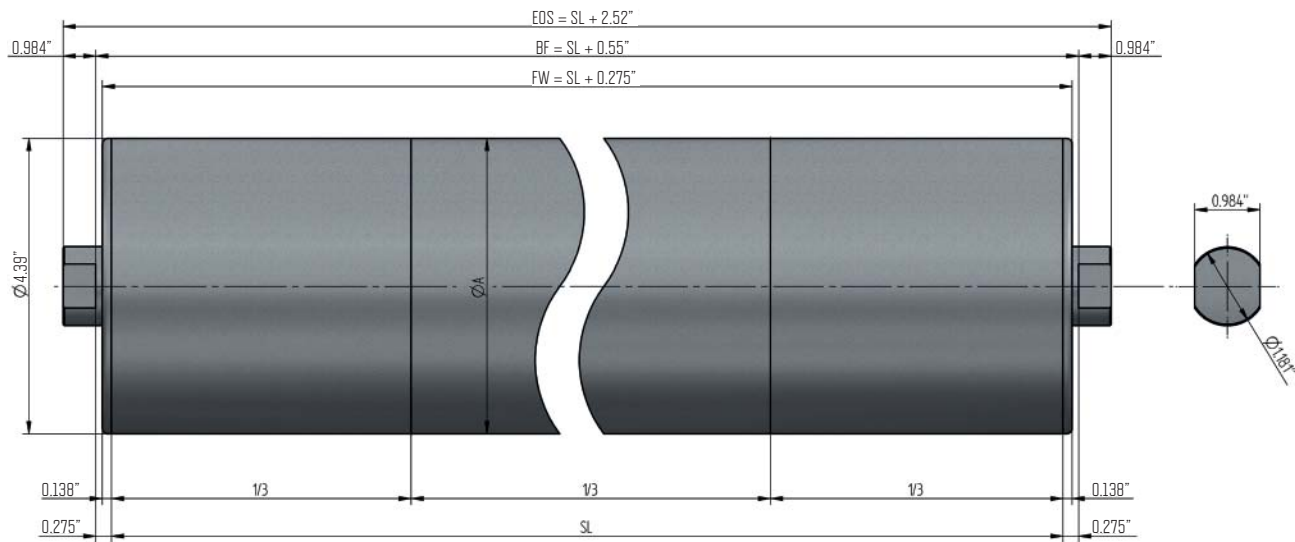
Construction/Material Options

Component	Options	Material
Shell	Crowned	Steel or stainless steel
	Flat-faced	Steel or stainless steel
	Flat-faced with keyway (keyway indent is 1.25" on each end)	Steel or stainless steel
	Rubber lagging and/or special shell finishes available on request	
Shafts	Standard 1.18" diameter, 0.98" x 0.98"	Steel or stainless steel
	Other shaft sizes may be available: contact Sparks Customer Service	
End caps	Laser engraved data	Steel or stainless steel
Ingress sealing	Labyrinth seal, IP66 or IP69K protection	
Electrical connection	Straight cable gland with 1.5 meter cable	Brass or stainless steel

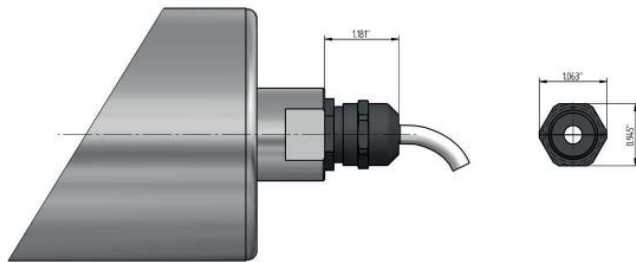
Motor Data (Required for VFD Programming)

Motor		0.25HP	0.50HP
Power	HP (kW)	0.25 (0.18)	0.50 (0.37)
Nameplate / Maximum Frequency	Hz	150	150
Nominal rotational speed	n_n	3,000	3,000
Pole pairs		3	3
Electrical connection		Y	Y
Stator Rated Voltage	V	181	181
Rated torque [Nm]	M_n	0.6	1.2
Nominal current per phase [A_{rms}]	I_n	0.8	1.5
Stall torque [Nm]	M_0	0.7	1.5
Locked rotor current per phase [A_{rms}]	I_0	0.9	1.8
Peak torque [Nm]	M_{max}	2.8	6.0
Peak current [A_{rms}]	I_{max}	3.6	7.2
Voltage constant (per 1,000 RPM) [V_{rms}]	k_e	49.6	51.7
Back EMF	V_{rms}	148.8	155.1
Torque constant [Nm/ A_{rms}]	k_t	0.82	0.86
Winding resistance (phase to phase at 68°F) [Ω]	R_{pp}	26.4	9.8
Winding inductance (phase to phase) [mH]	L_{pp}	37.6	18.6
Electrical time constant [ms]	T_{el}	1.4	1.9
Rotor inertia [kgcm ²]	J	0.220	0.413

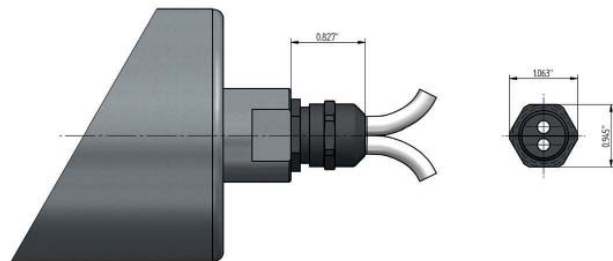
Dura-Drive SPM 4.39" Diameter Series



Straight cable connection, brass or stainless steel



Straight cable connection for two cables (option Motorfeedback)



Benefits

- AC synchronous permanent magnet motorized pulley
- Steel or stainless steel construction
- Hardened steel servo-quality planetary gears
- Rated power up to 1.35 horsepower
- Rated torque up to 73.8 ft-lbs
- Rated drum speed up to 437fpm
- High efficiency
- Oil free
- Maintenance free

Technical Data

Type of motor	Permanent magnet AC synchronous
Connection	Frequency inverter or servo drive
Motor winding insulation	F-class
Thermal protection	KTY84-130 switch or PTC temperature sensor
Temperature range	+41F to +104F (standard) for operation with belt. Low temperature range to -13F optional
Protection class	IP66 standard, IP67 and IP69K optional
Electrical connection	Cable 4 x 0.5 qmm (AWG 20) + 2 x 0.25 qmm (AWG 23) shielded

Specifications, Materials, Options

Dura-Drive SPM 4.39" Diameter Performance Specifications

HP	Minimum Shell Length (SL)	RPM	FPM (nominal)	Belt Pull (lbs)	Drum Torque (ft/lbs)
0.25	10.63"	94	109	72	13.3
		150	175	45	8.3
		188	218	36	6.7
		250	291	27	5.0
	10.14"	375	437	18	3.4
0.50	11.81"	94	109	144	26.6
		150	175	90	16.6
		188	218	72	13.3
		250	291	54	10.0
		375	437	37	6.8
1.0	12.17"	94	109	175	32.5
		150	175	172	31.9
		188	218	138	25.5
		250	291	103	19.1
		375	437	70	13.0
1.35	12.96"	94	109	175	32.5
		150	175	175	32.5
		188	218	175	32.5
		250	291	144	26.6
		375	437	72	13.3

Dura-Drive SPM 4.39" Diameter Performance Specifications (with heavy duty gearbox)

HP	Minimum Shell Length (SL)	RPM	FPM (nominal)	Belt Pull (lbs)	Drum Torque (ft/lbs)
1.0	14.90"	43	50	398	73.8
		60	71	398	73.8
		75	88	337	62.4
		86	101	295	54.6
		120	141	210	39.0
1.35	15.69"	43	50	398	73.8
		60	71	398	73.8
		75	88	398	73.8
		86	101	398	73.8
		120	141	293	54.3

- Speed adjustments in the following ranges are possible:
 - Sensor-less operation with a suitable frequency inverter: 10:1 is normal, 15:1 possible
 - Servo drive and feedback: up to 1,000:1
- Starting torque:
 - Sensor-less: rated torque x 1.5
 - With feedback: peak torque
- Standard shell lengths (SL) up to 35.43", contact Sparks customer service for longer shell lengths
- Other shaft size options are available
- Contact Sparks customer service for lagging and v-groove options

Construction/Material Options

Component	Options	Material
Shell	Crowned	Steel or stainless steel
	Flat-faced	Steel or stainless steel
	Flat-faced with keyway (keyway indent is 1.25" on each end)	Steel or stainless steel
	Rubber lagging and/or special shell finishes available on request	
Shafts	Standard 1.18" diameter, 0.98" x 0.98"	Steel or stainless steel
	Other shaft sizes may be available: contact Sparks Customer Service	
End caps	Laser engraved data	Steel or stainless steel
Ingress Sealing	Labyrinth seal, IP66 or IP69K protection	
Electrical connection	Straight cable gland with 1.5 meter cable	Brass or stainless steel

Voltage Table

Power Supply			DC Bus Voltage	Rated Motor Voltage Minimum Output Voltage (Data Plate Voltage)		
Voltage	Phase	Hz	Voltage	Voltage	Phase	Hz
110 VAC	1 ~	50/60 Hz	320 VDC	181 VAC	3 ~	0 .. 150 Hz
220 VAC 230 VAC 240 VAC	3 ~	50/60 Hz	320 VDC	181 VAC	3 ~	0 .. 150 Hz
380 VAC 440 VAC 460 VAC 480 VAC 575 VAC	3 ~	50/60 Hz	560 VDC	320 VAC	3 ~	0 .. 150 Hz

Dura-Drive SPM 4.39" Diameter Series (cont.)

Motor Data (Required for VFD Programming)

Motor		0.25HP	0.50HP	1.0HP (230V Input)	1.0HP (460V Input)	1.35HP (230V Input)	1.35HP (460V Input)
Power	HP (kW)	0.25 (0.19)	0.50 (0.38)	1.0 (0.72)	1.0 (0.72)	1.35 (1.10)	1.35 (1.01)
Nameplate / Maximum Frequency	Hz	150	150	150	150	150	150
Nominal rotational speed	n_n	3,000	3,000	3,000	3,000	3,000	3,000
Pole pairs		3	3	3	3	3	3
Electrical connection		Y	Y	Y	Y	Y	Y
Stator Rated Voltage	V	181	181	181	320	181	320
Rated torque [Nm]	M_n	0.6	1.2	2.3	2.3	3.2	3.2
Nominal current per phase [A_{rms}]	I_n	0.8	1.5	2.6	1.6	3.7	2.1
Stall torque [Nm]	M_0	0.7	1.5	2.8	2.8	3.5	3.5
Locked rotor current per phase [A_{rms}]	I_0	0.9	1.8	3.1	1.8	3.9	2.2
Peak torque [Nm]	M_{max}	2.8	6.0	11.2	11.2	14.0	14.0
Peak current [A_{rms}]	I_{max}	3.6	7.2	12.4	7.2	15.6	8.8
Voltage constant (per 1000 RPM) [V_{rms}]	k_e	49.6	51.7	54.3	95.3	55.0	97.5
Back EMF	V_{rms}	148.8	155.1	162.9	285.9	165.0	292.5
Torque constant [Nm/A_{rms}]	k_t	0.82	0.86	1.58	1.58	1.61	1.61
Winding resistance (phase to phase at 68°F) [Ω]	R_{pp}	26.4	9.8	4.6	14.2	2.8	9.0
Winding inductance (phase to phase) [mH]	L_{pp}	37.6	18.6	11.8	36.2	8.4	26.0
Electrical time constant [ms]	T_{el}	1.4	1.9	2.6	2.5	3.0	2.9
Rotor inertia [$kgcm^2$]	J	0.220	0.413	1.40	1.40	1.93	1.93

Connector Pin Assignment

Power

Color/Code	Function
black/1	U
black/2	V
black/3	W
green-yellow	ground
brown	thermal
white	thermal

Resolver

Color/Code	Function
white	REF +
brown	REF -
green	SIN +
yellow	SIN -
pink	COS +
grey	COS -

SKS36 Encoder

Color/Code	Function
grey	DATA +
green	DATA -
white	SIN +
brown	REF SIN
pink	COS +
black	REF COS
red	US (8 V DC)
blue	GND (0 V DC)

Thermal Protection

The Dura Drive SPM motorized pulley is fitted with either a KTY84-130 switch or PTC temperature sensor. The temperature sensor must be monitored by an external circuit, such as a frequency inverter, which switches off the power to the motor if the maximum temperature is exceeded.

Option: Motor feedback

Dura-Drive SPM motorized pulleys can be supplied with resolver or SKS36 feedback:

Resolver

Number of poles	2
Input frequency	10kHz
Input voltage	Vrms
Connection	Signal cable 6 x 0.14 qmm (AWG 26) shielded

**The optional components increase the minimum face width of the pulley by +1.97"*

SKS36 Encoder

Number of Sin/Cos periods per revolution	128
Number of absolute revolutions	1 (single turn)
Resolution	4096
Connection	Signal cable 8 x 0.15 qmm (AWG 26) shielded
Supply voltage	7 to 12V DC

The inverters and servo drives below support permanent magnet motor technology

Servo Drives	
Manufacturer	Type
Lenze	Servodrive 9400 HighLine (Resolver)
Schneider Electric	PAC Drive 3 (SKS36)
KEB	Combivert F5 (Resolver)
	Combivert S6 (Resolver & Sensorless)

Frequency Inverter/Sensorless	
Manufacturer	Type
Allen Bradley	PowerFlex 525
	PowerFlex 753
Invertek	Optidrive P2
	Optidrive E3
Lenze	i550
	Highline 8400
	Stateline 8400
Hitachi	WJ200
Nord	SK 215E
SEW	Movitrac LTP-B
Schneider Electric	Altivar 32

**The inverters in bold print above are stocked by Sparks and come pre-programmed.*

Stainless steel drum motors with high IP protection are all-in-one components that are extremely hygienic.

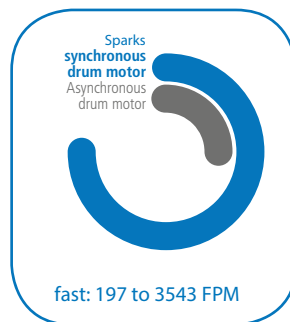
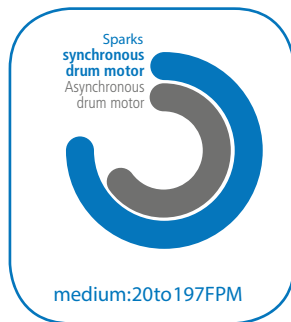
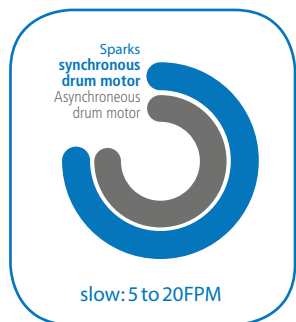


Sparks Dura Drive SPM drum motors are completely oil-free. Oil contamination of conveyed goods is impossible making this a perfect match for food production industries.

High Torque

Sparks synchronous drum motors are compact power packs with high torque and even heavier starting torque.

This saves design costs and increases throughput!



Sparks Dura-Drive SPM:
Space-saving conveyor technology for fast starts and stops.



Extreme High Acceleration

Sparks synchronous drum motors accelerate within milliseconds to the set rotation speed.

This enables extremely high clock cycles without servo technology and increases productivity!

Acceleration up to 722 feet/sec²

Sparks synchronous drum motor 

Servo motor 

Asynchronous drum motor 

Asynchronous angle gear motor 

24/7 Service

Sparks keeps your conveyor belting systems moving 24 hours a day, 7 days a week, 365 days a year with our fleet of mobile service units.

When you need us, we are there.



DURA•DRIVE SPM

www.sparksbelting.com

customerservice@sparksbelting.com

24/7 Service **(800) 451-4537** | Fax **(800) 338-2358**



10 Locations in the U.S. and Mexico:

Ontario, California
Denver, Colorado
Hammond, Indiana

Fairfield, New Jersey
Charlotte, North Carolina
Cleveland, Ohio

York, Pennsylvania
Kent, Washington
Monterrey, Mexico

Headquarters: **3800 Stahl Dr., SE, Grand Rapids, MI 49546**