

## XD-Indexer Kits

The XD-Indexer is simple to program and operate. With an Indexer kit it is just as simple to purchase and get going.

The XD-Indexer kits provide all the parts you'll need for a typical industrial motion application. No need to think about all the minor parts you need or to find and purchase them all. The kit supplies all the parts you'll need.

Indexer kits come in 3 variations: parts only, panel mounted or in a full NEMA enclosure.

## XD-Indexer Kit Components

The XD-Series Indexer, a single axis integrated controller and servo drive delivers high performance motion control. Typical main system components:

- Servo Drive
- Motor
- HMI
- Input circuit breaker

- Input circuit breaker
- Line filter
- E-Stop button & reset
- E-Stop Contactor

### Options

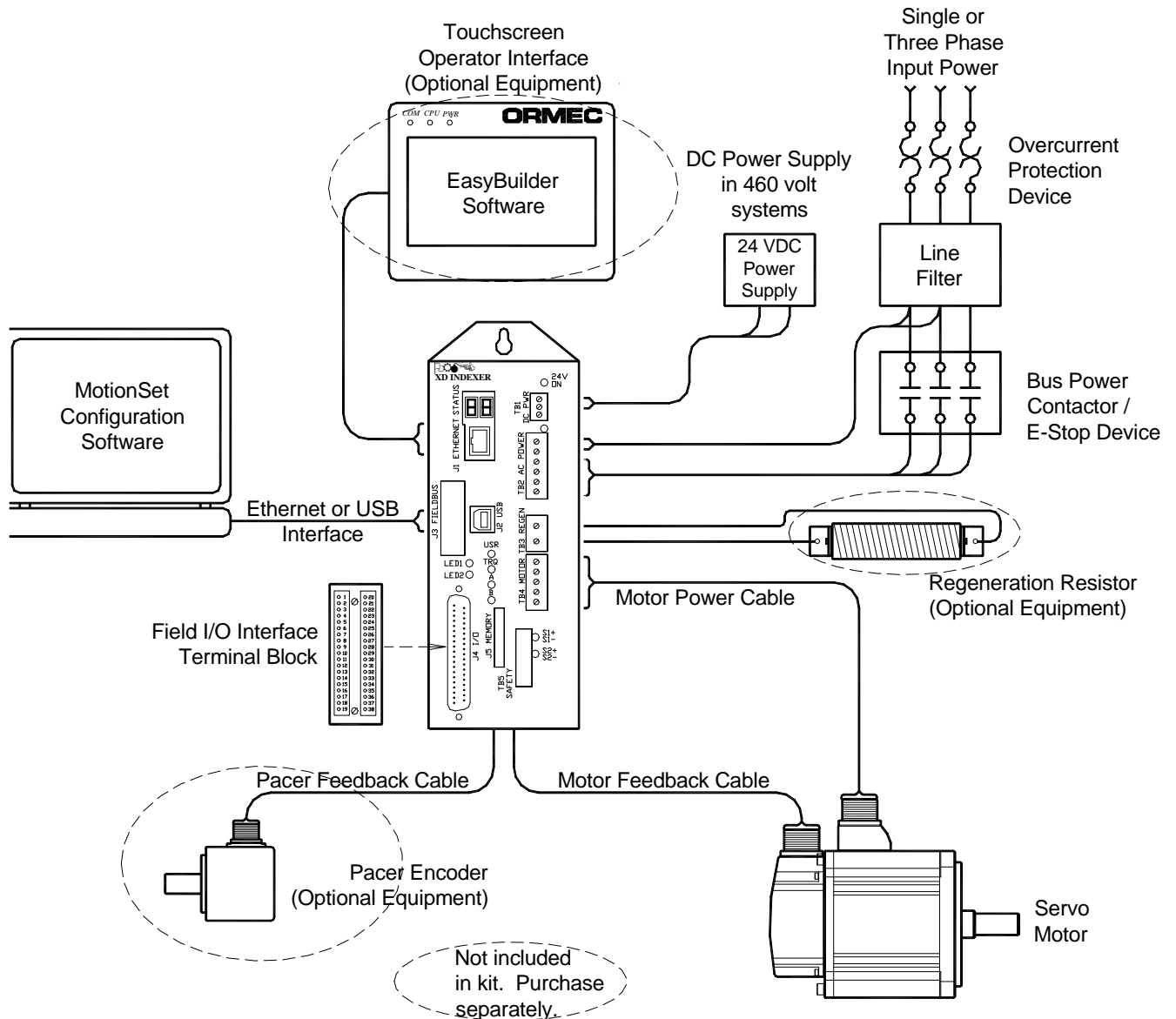
- Ethernet/IP
- Configuration
- Cable length

### Additional components to consider

- HMI
- Pacer Encoder and cable
- Regen resistor
- Ethernet switch and cables
- SMLC / PLC

### The Kit contains

- Servo Drive
- Motor
- Motor cables



## What's an Indexer?

The XD-Indexer is a combination servo drive and controller in one. Performing precise motion requires brains and brawn. A servo drive provides closed loop position/velocity/torque control of a motor. It just follows the commands from some controller, being the muscle of the operation. The brains are in the controller, determining speed vs. time calculations, monitoring I/O points and providing status. The XD-Indexer builds the controller into the same package as the servo drive. This eliminates the need for another controller such as a PLC, significantly reducing costs.

The controller built into the XD-Indexer is powerful enough to perform most motions typically required yet extremely simple to program. Using ORMECs MotionSet configuration software motions are defined in a simple menu driven process and I/O using a drag and drop interface. Complete information on the XD-Indexer can be found at <http://www.ormec.com/Products/Drives/XD-Series-Indexer-Servo-Drive.aspx>.

## Application examples

Motions which require precise speeds and/or positions; fast response to an I/O point; easily adjustable speed or position are all excellent applications.

The XD-Indexer provides high resolution motion. The kits have standard rotary resolutions of 12,000 counts/rev., which is equal to 1.8 arc minutes. A driven lead screw with a 1" pitch has a linear resolution of 83.3 micro inches. A belt driven with a 6" diameter pulley has a belt position resolution of 1.57 mils. Optional motors support resolutions to 23-bits, which is equal to 0.154 arc seconds.

## Feed to Length

Feed to length applications typically feed material using a nip-roll. The feed is at a high initial speed for a defined distance. The feed rate is reduced and feeding continues to a set final distance or until an external high-speed sensor becomes true, stopping at the sensor or some fixed distance after. When the feed is complete an I/O signal is output which can be used to trigger the next motion or machine operation.

Benefits as an upgrade from a mechanical clutch/brake or a feed to hard stop system include superior accuracy and repeatability and less stress on the parts or material. Clutch/brake systems wear out reducing accuracy. Feed to stop bangs the part and machine with each cycle.

Additional details and design information can be found at [Indexer Feed to Length](#)

## Pick and Place

Pick and Place mechanisms are used to transfer parts between two or more locations. There are many different implementations of Pick and Place mechanisms including Cartesian, SCARA, Delta robots and others. A 2-axis system consisting of horizontal (X) and vertical (Z) axis can be easily designed with a pair of XD-Indexers. Linear actuators with an attached gripper are used to move parts. When a part is detected at a Pick position, the gripper will move to that position and grip the part. It then traverses to the Place position where the part is released. Pick and Place systems are often required to operate at fast cycle rates. For this reason, the motion of the X and Z axes are 'overlapped' at the corners of the XZ envelope. An additional rotation axis  $\theta$  can be used to control the gripper orientation.

Additional details and design information can be found at [Indexer Pick and Place](#)

## Rotary Knife – Cut to length

A rotary knife cuts continuously fed material (web, extrusion, wire, etc.) to specified lengths. The feed and knife axes of motion are synchronously controlled. The solution for this application includes two XD-Indexers, a pacer encoder and an operator touch panel. The knife blade tip must be precisely controlled and travel at a very specific tangential velocity at the point of contact with the material. A series of product recipes are required and are based upon predetermined input variables such as feed length, speed synchronization angle and over-speed coefficient.

Additional details and design information can be found at [Indexer Rotary Knife](#)

## Hot Stamp Press

In stamping applications a (heated) die is forced into a material to form an impression. In a typical cycle, the stamp moves rapidly and slows down just before it reaches the material. It continues to move at a slower speed until a

required pressure is reached. It then dwells for a fixed period of time. The stamp may be moved down a small amount during the dwell to compensate for the deformation of the material. The final step moves the die rapidly to the start position.

Additional details and design information can be found at [Indexer Hot Stamp Press](#)

## Why choose a kit?

The kit saves you time. All the recommended standard parts are selected and included. You save the time required to look at all the specs, make a selection and order the part. Save even more time by selecting panel mount or enclosure versions and the wiring is also completed for you.

The kit saves you money. The price for the kit is less than the price of the individual components.

The kit comes preconfigured. The Indexer will come preconfigured for your motor and will contain example motions. This saves startup time and your system is ready to go when it arrives.



Figure 1 Panel mounted kit

Be up and running in minutes with a panel or enclosure kit. Connect input power wires. Connect the motor (< 1 minute). Turn on the power. (10 seconds). Indexer power up sequence. (7 seconds). Toggle enable switch (3 seconds). Initiate motion 1 (5 seconds). Total time to motion is under 5 minutes after power is connected.

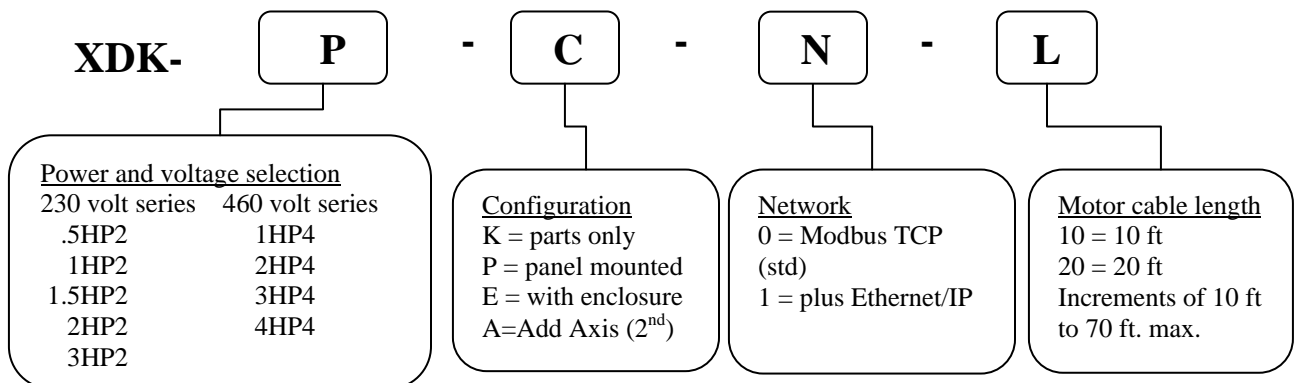
## Choosing a kit

Using the specification and ordering guide sections you should be able to build your part number.

Only a few choices are needed to select the correct kit. First, voltage – 230 or 460 nominal voltage. Second, which motor – power and speed requirements? Performance curves are included later in this document. If you need help call us at ORMEC. With that information you can determine the basic kit model. Next choice is how the parts are delivered – loose parts, mounted on a panel or on the panel and in an enclosure. The final selection is the length of the motor cables – how far from the e54321electronics to the motor. The A choice adds a second axis drive, motor and cables, sharing common parts to reduce the cost of a 2 axis system.

## Ordering Guide

### Indexer kit model numbers



Panel size is 17" x 13" and includes a 17" x 5" area for your parts.  
Enclosure size is 20" x 16" x 12" (hwd) (add 3" for mounting tabs)

Examples:

XDK-1HP2-P-0-30

1 HP 230 V motor kit, panel mounted parts and 30 ft motor cables.

XDK-3HP4-K-0-60

3 HP 460 V motor kit, loose parts and 60 foot motor cables.

## Specifications Summary

Complete specifications for the servo drive and motor can be found in the respective datasheets.

Model	Rated power (HP)	Rated power (KW)	Rated Speed (RPM)	Max Speed (RPM)	Input Current (A)	Torque Rated/Peak in-lb	Input voltage (VAC)	Motor frame in. [mm]	Motor length in. [mm]
XDK-.5HP2	0.54	0.4	3000	5000	1.9	11.3 / 34.8	230	2.44 [62]	6.46 [164]
XDK-1HP2	1.2	0.9	3000	5000	3.8	25.4 / 77.6	230	5.118 [130]	7.95 [202]
XDK-1.5HP2	1.7	1.3	1500	3000	3.4	73.2 / 222	230	5.118 [130]	9.84 [250]
XDK-2HP2	2.0	1.5	3000	5000	4.0	42.3 / 128.7	230	5.118 [130]	8.9 [226]
XDK-3HP2	3.0	2.2	3000	5000	6.0	62 / 188	230	5.118 [130]	9.84 [250]
XDK-1HP4	1.2	0.9	3000	5000	1.2	25.4 / 78.7	460	5.118 [130]	7.95 [202]
XDK-2HP4	2.0	1.5	3000	5000	2.0	42.3 / 131	460	5.118 [130]	8.9 [226]
XDK-3HP4	3.0	2.2	3000	5000	3.0	62.0 / 192.1	460	5.118 [130]	9.84 [250]
XDK-4HP4	4.0	3.0	3000	5000	4.0	84.5 / 261.9	460	5.118 [130]	10.79 [274]

Rated power = output power available at rated speed

Max speed = maximum speed at which the motor can be operated. Output power derates between rated speed and max speed.

Input voltage = Nominal input voltage. Actual input voltage can range from 208-240 VAC and 440-480 VAC and still meet speed and power ratings.

## Kit Parts Summary

The components included in the kit are listed in the following table and list.

Model	Servo drive <sup>1</sup>	Motor	Motor feedback cable	Motor power cable
XDK-.5HP2	SAC-XD203-SA10R0	MAC-MB011D2-K3N-A	CBL-ME1XA	CBL-MMXA1-2
XDK-1HP2	SAC-XD205-SA10R0	MAC-MD025D2-K3N	CBL-ME2X	CBL-MMX2-2
XDK-1.5HP2	SAC-XD210-SA10R0	MAC-MD070B2-K3N	CBL-ME2X	CBL-MMX2-2
XDK-2HP2	SAC-XD210-SA10R0	MAC-MD050D2-K3N	CBL-ME2X	CBL-MMX2-2
XDK-3HP2	SAC-XD215-SA10R0	MAC-MD070D2-K3N	CBL-ME2X	CBL-MMX2-2
XDK-1HP4	SAC-XD403-SD10R0	MAC-MD025D4-K3N	CBL-ME2X	CBL-MMX6-4
XDK-2HP4	SAC-XD405-SD10R0	MAC-MD050D4-K3N	CBL-ME2X	CBL-MMX6-4
XDK-3HP4	SAC-XD410-SD10R0	MAC-MD070D4-K3N	CBL-ME2X	CBL-MMX6-4
XDK-4HP4	SAC-XD410-SD10R0	MAC-MD095D4-K3N	CBL-ME2X	CBL-MMX6-4

<sup>1</sup> Servo drive – for Ethernet/IP addition part number section10R0 changes to 11R0

### Additional parts in the kits

Kit		Panel		Enclosure		Ormec P/N	Description
230V	460V	230V	460V	230V	460V		
X	X	X	X	X	X	CON1110	Drive I/O terminal block
X		X		X		CAP160	Line filter, 200V, 0.5 and 1 HP kits, *
Or X	X	Or X	X	Or X	X	CAP161	Line filter, all except above * (CAP162 dual axis)
X		X		X		DIC114	Input circuit breaker, 200V kits, 0.5 and 1 HP *
or X		or X		or X		DIC059	Input circuit breaker, 200V kits, 1.5, 2 and 3 HP *
	X		X		X	DIC123	Input circuit breaker, 400V kits *
X	X	X	X	X	X	RLY215	Motor power contactor *
X	X	X	X	X	X	SPP310	E-Stop button, 22.5 mm *
X	X	X	X	X	X	SPP309	E-Stop reset push button, flush, black, 22.5 mm *
	X		X		X	PSU-480-24-5A-D-1	24 VDC power supply on 460 VAC kits only. *
		X	X	X	X		Wired panel
				X	X		Enclosure

Spare or replacement parts can be ordered using the part numbers shown.

\* Shared part. Not included with –A configuration. (Included with K, P or E variations.)

## Additional Axes -

For systems with more than one axis you may choose to purchase an entire kit for the additional axis or to save money and space select a –A packaging. The –A is an additional axis to a selected kit (K, P or E option). It includes the drive, motor, cables for the motor and an I/O terminal block. The other parts of the kit can be shared and therefore don't need to be duplicated. The cost of those parts (circuit breaker, contactor, E-Stop, etc.) is not included in the –A version. Further, if the –A version is included with a panel or enclosure version base kit then it will also be mounted on the panel.

## HMI Kit -

Many systems need an operator panel. Ormec can provide an HMI as an individual component or as an HMI kit. The HMI kit includes an HMI, Ethernet and power cables. The HMI comes loaded with an example system designed to run the example programs and display some customary information.

Model numbers for the HMI kits are:

MMIK-8050	4.3" diagonal screen, cables and programming
MMIK-8070	7.0" diagonal screen, cables and programming

## Additional items

Other items you may need to complete your system and sources to purchase.

Item	Sources
Gearbox	ORMEC, <a href="http://www.ormec.com">www.ormec.com</a>
Regen resistor	ORMEC, <a href="http://www.ormec.com">www.ormec.com</a>
Pacer encoder	ORMEC, <a href="http://www.ormec.com">www.ormec.com</a>
Couplings	
Pulleys, Gears	
Sensors	

## Selecting a kit size – Performance curves -

Correctly sizing the kit – motor and drive – are required for a successful application.

Selecting the voltage rating is easy. Second is the size of the motor. You have three choices, use your estimate of the power required ~ how many HP are needed or use your estimate of the torque (force) needed or finally contact ORMEC for assistance and a more detailed analysis. Performance curves for selecting by power or torque follow.

### Power – HP – Ratings or Torque – in-lb – Ratings

The power output of a servo motor is just like the output of your car engine. The car has a certain power rating (HP) at a specific engine RPM. At slower speeds the power output (HP) is lower. It is the same for electric motors. In both cases power is related to torque times speed. At slower speeds the same torque results in a lower power. Power is the rate at which energy is delivered. At slower speeds the same torque delivers less energy.

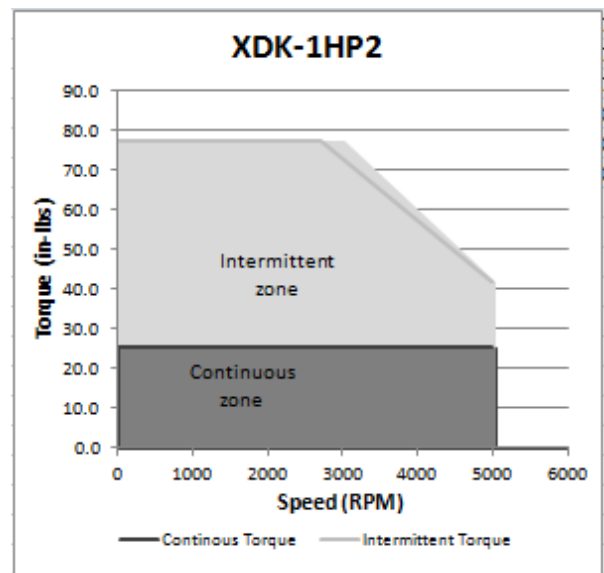
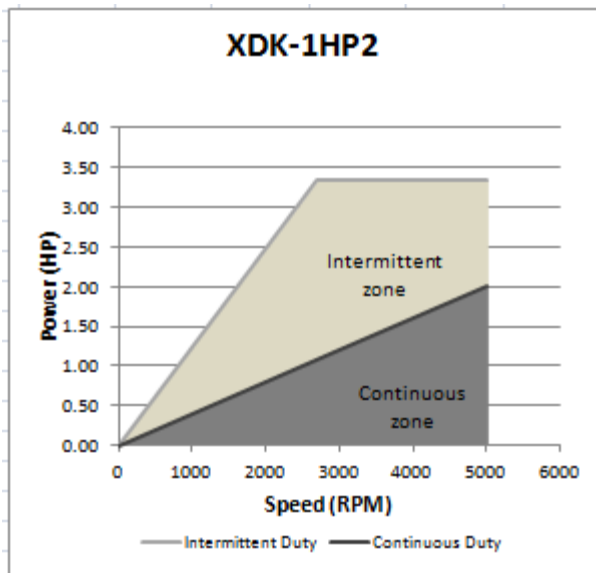
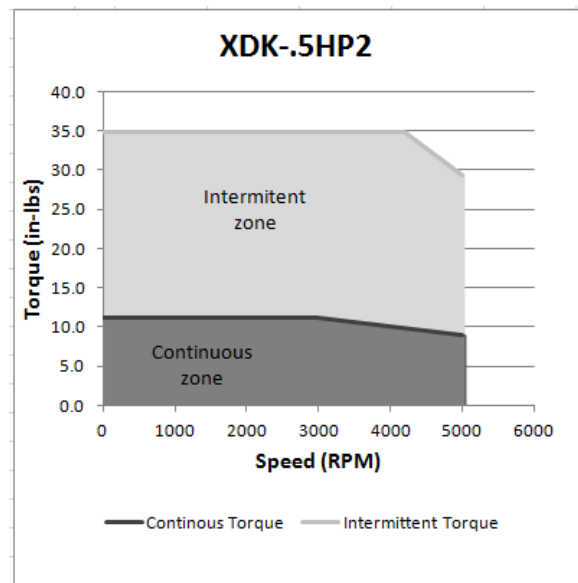
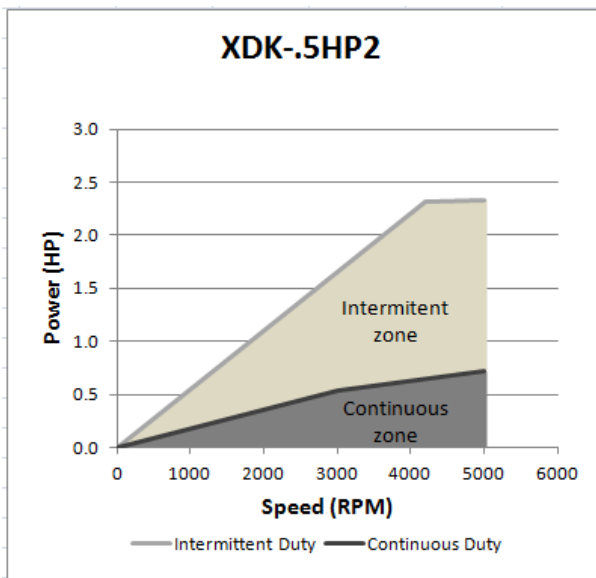
In some cases it is easier to size using torque curves. For your convenience both power and torque curves for the standard kits are shown. Torque is the rotary force put out by a motor or other device. A servo motor usually can output the same torque from speeds of 0 RPM up to the rated speed. Above the rated speed the torque declines. This can be seen in the torque graphs, the line is flat out to either 3000 or 1500 RPM

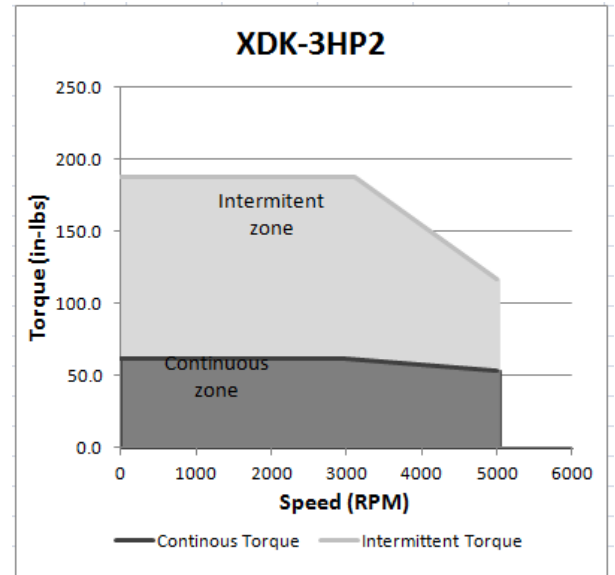
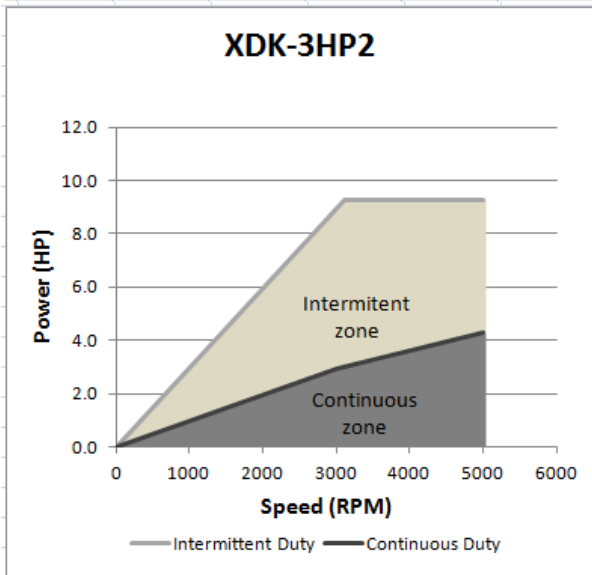
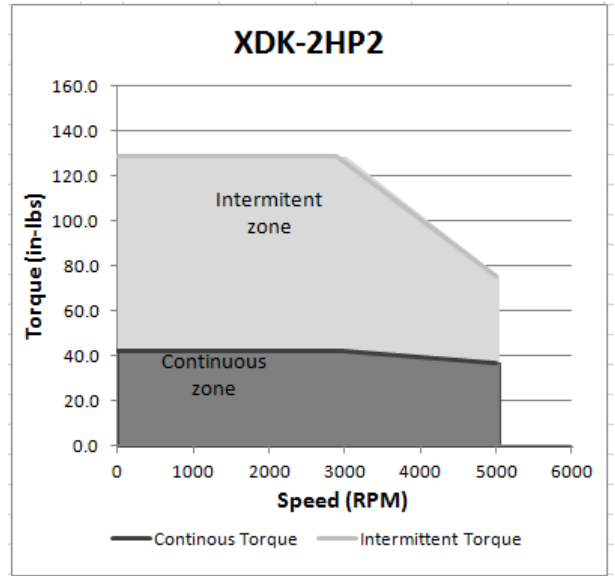
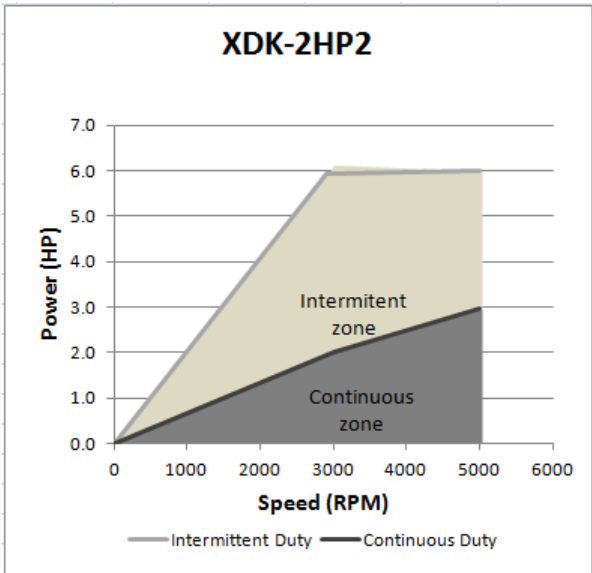
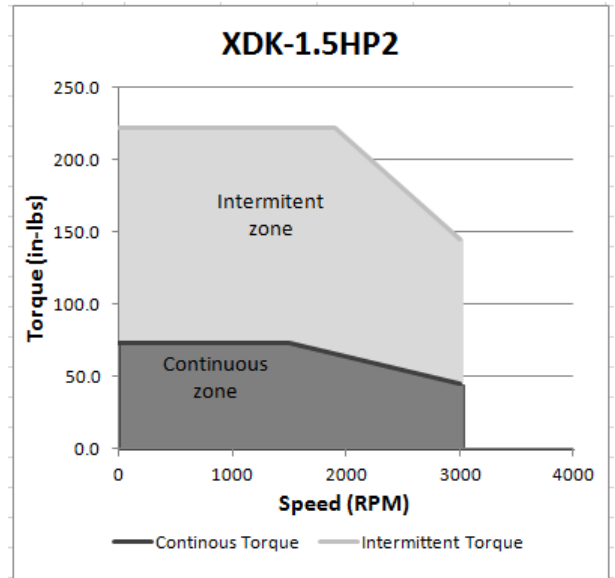
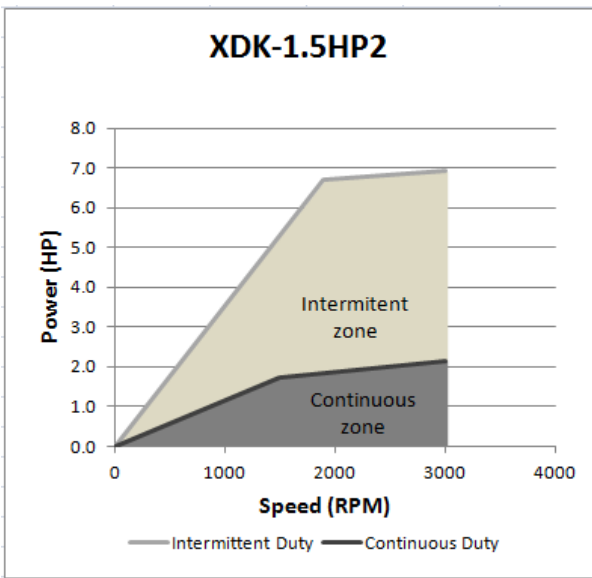
Using knowledge of your application determine the power or torque you need and at what speed you will need that power. Then find the kit below which best matches the requirements. Staying in the continuous zone is best. The servomotor can run there all the time. The intermittent zone is available for short periods of time to accelerate, break free or overcome some friction. Operation at the top of the intermittent zone is limited to about 2 seconds. Operation closer to the continuous zone is longer, reaching unlimited at continuous.

Note that this section contains performance curves for motors operating with a nominal 230 VAC power supply. . The curves apply with an input voltage of 208 VAC to 240 VAC.

Power (HP) performance graphs in this column.

Torque (in-lb) performance graphs in this column.

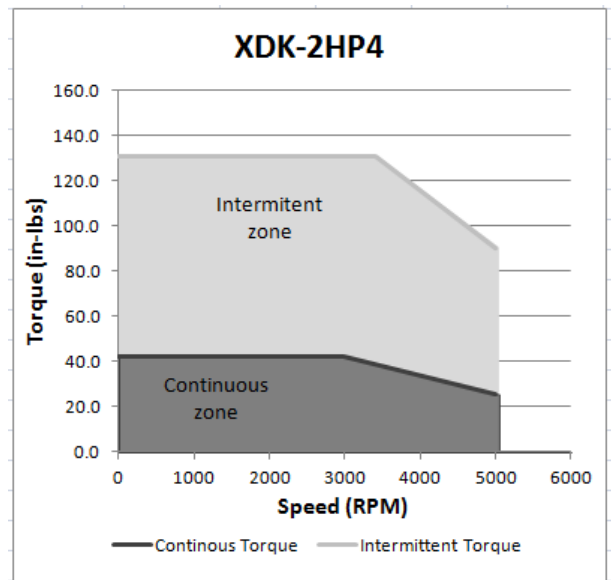
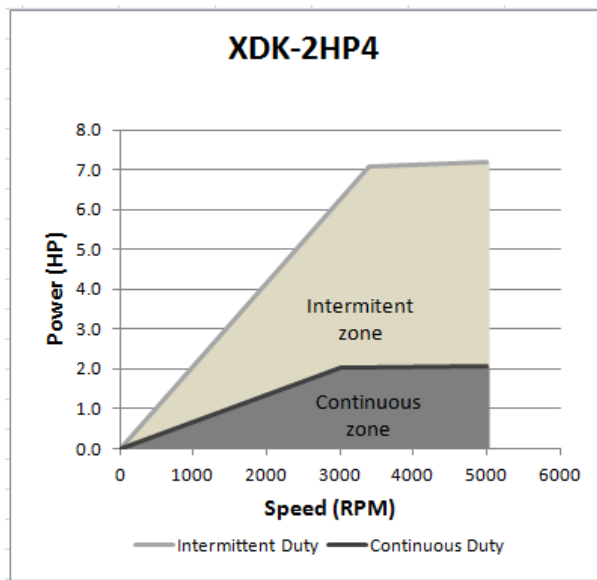
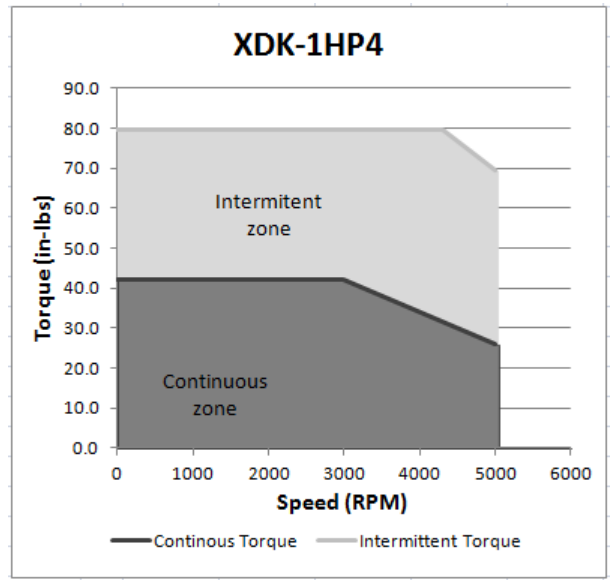
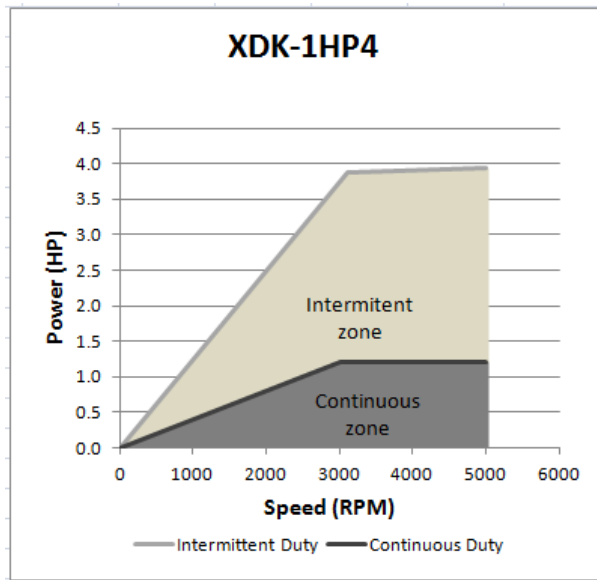




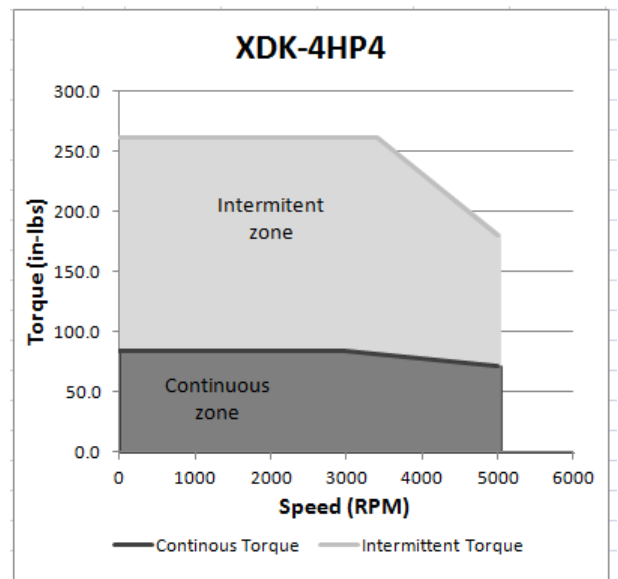
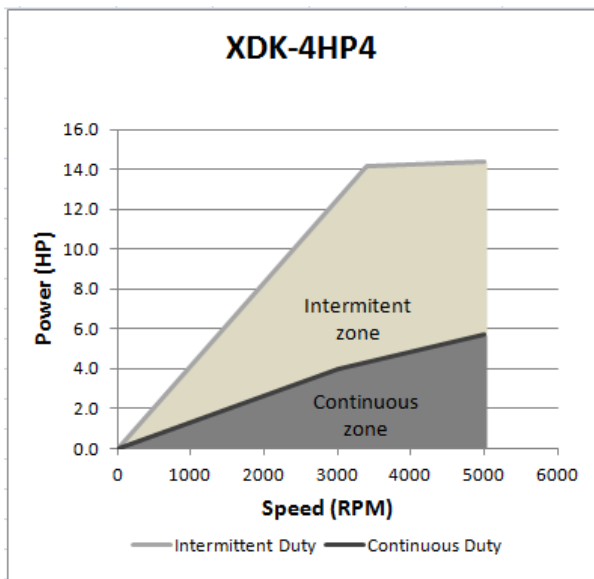
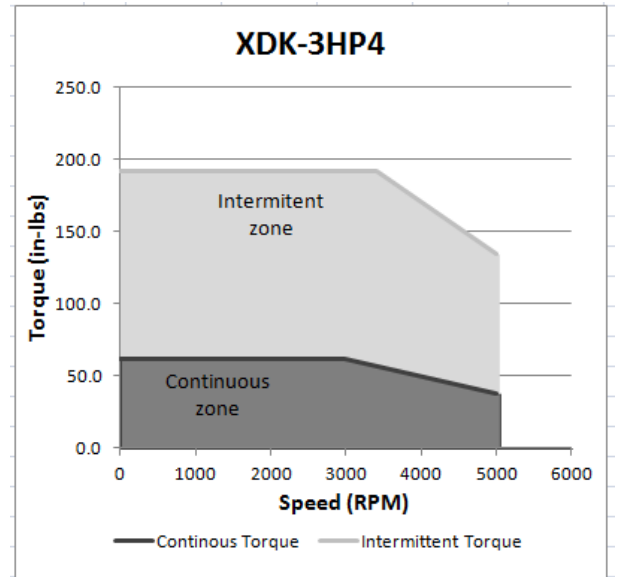
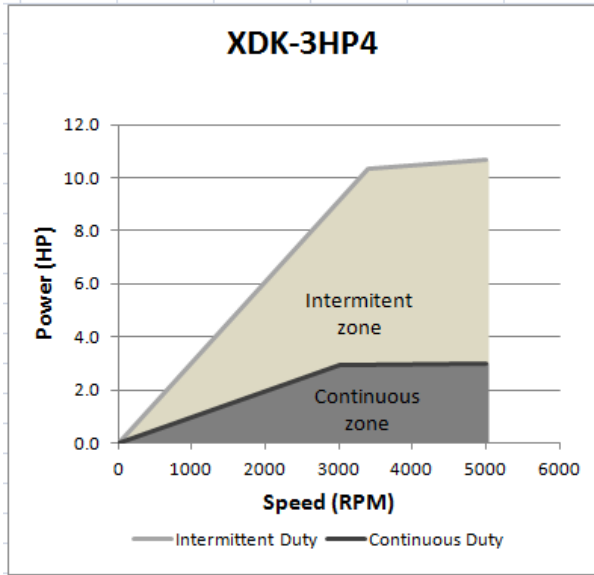
Note that this page contains performance curves for motors operating with a nominal 460 VAC power supply. The curves apply with an input voltage of 420 VAC to 480 VAC.

Power (HP) performance graphs in this column.

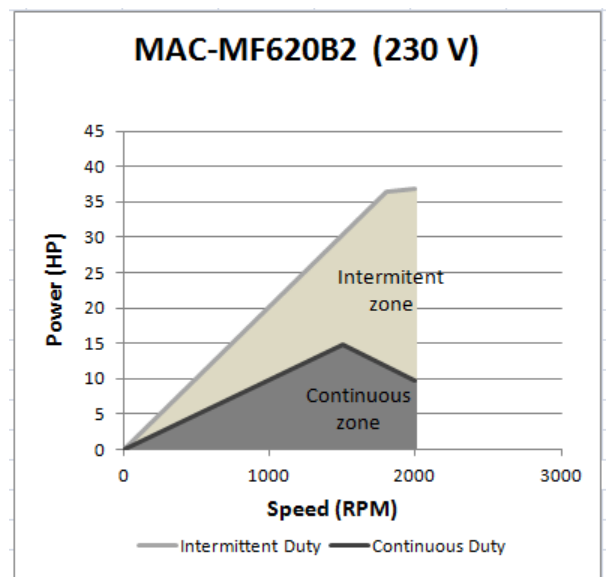
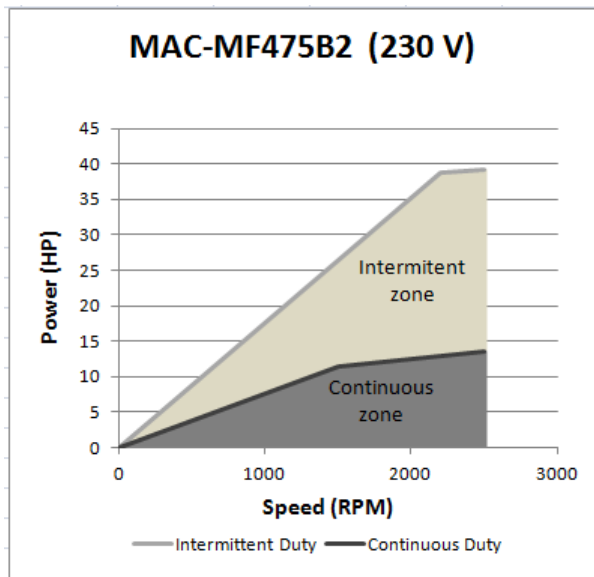
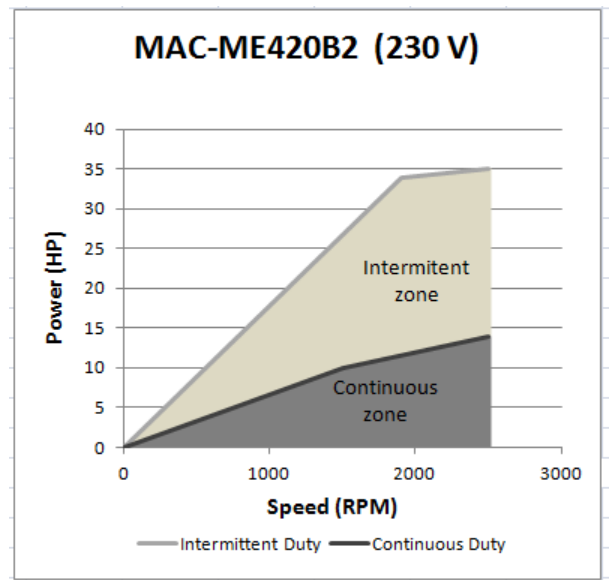
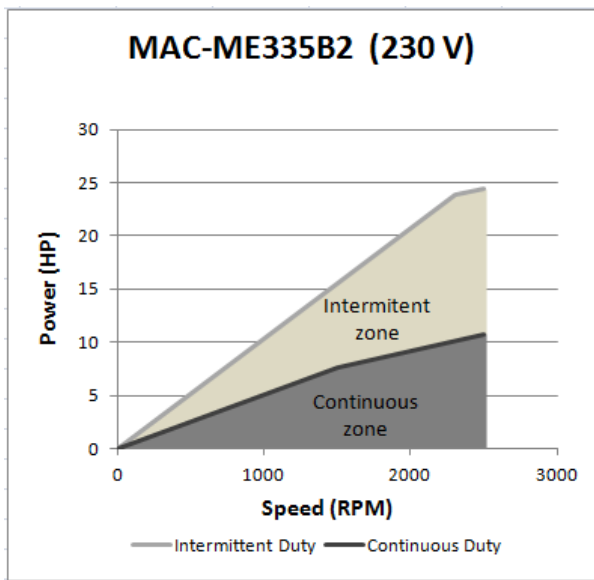
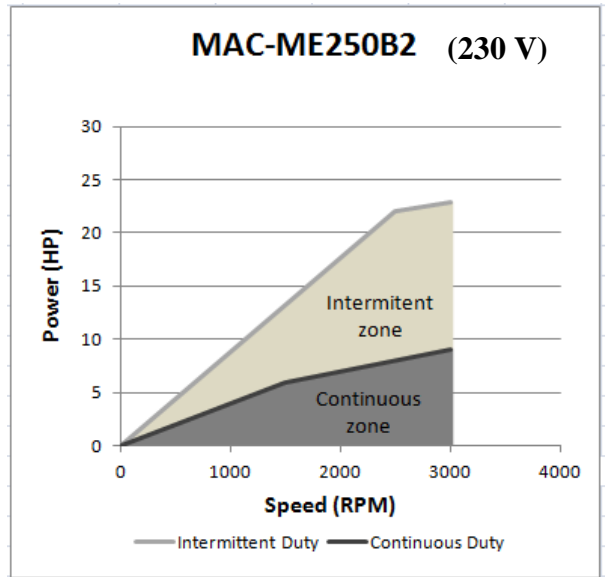
Torque (in-lb) performance graphs in this column.

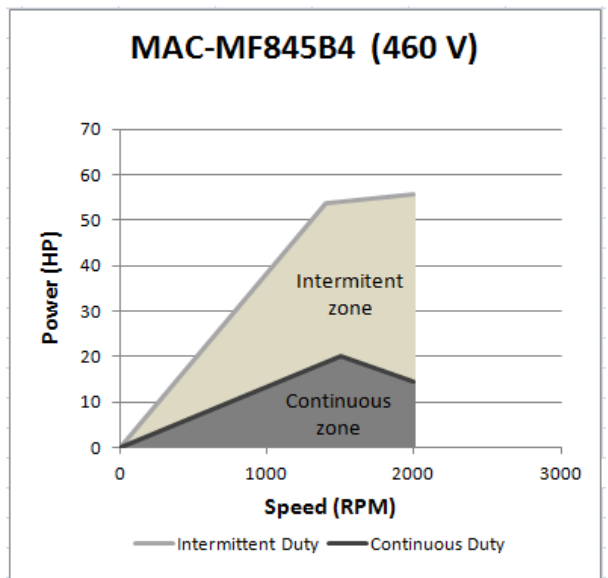
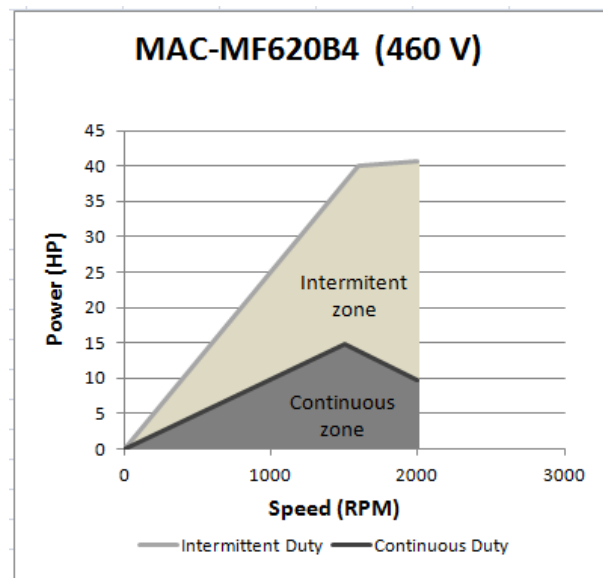
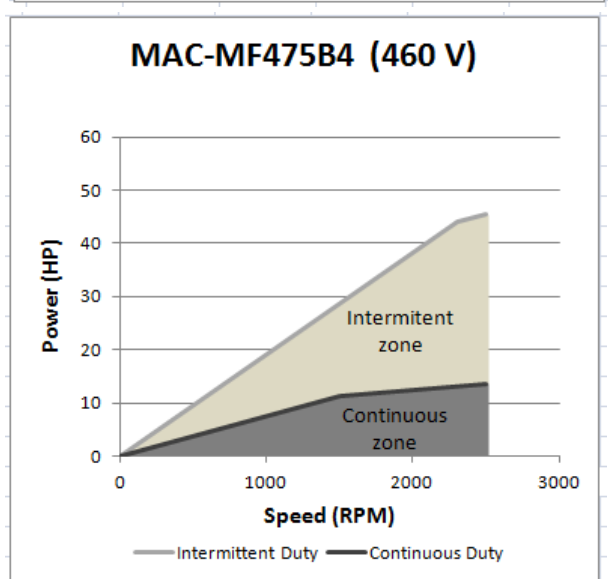
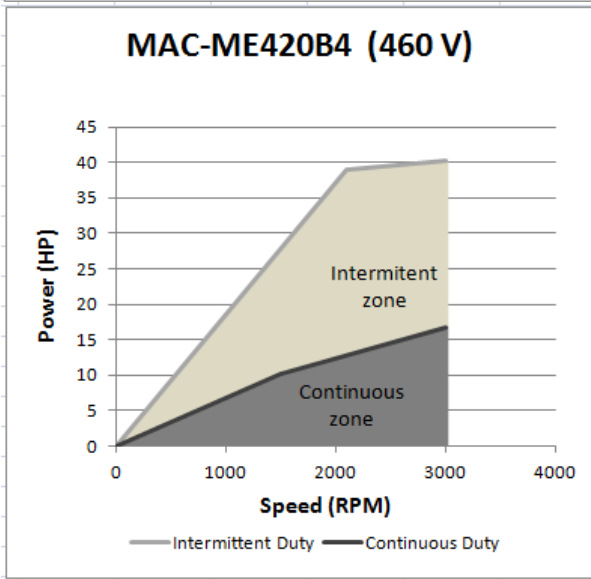
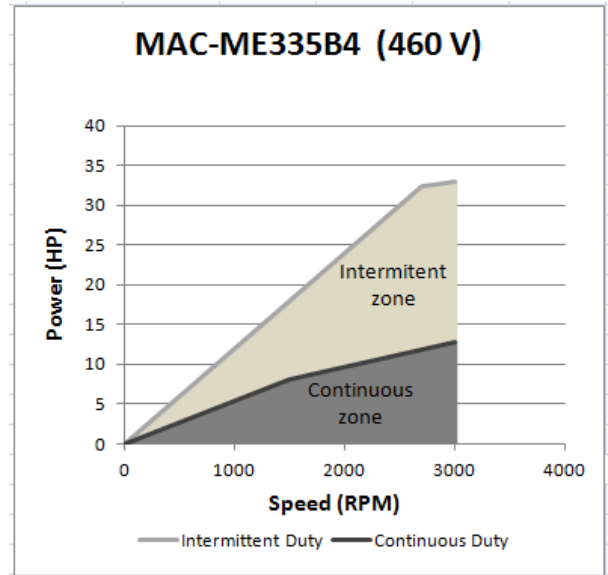
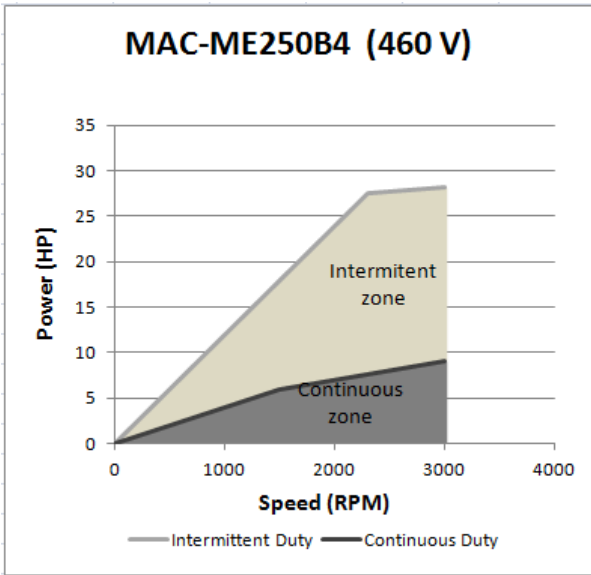






Indexer kits in these sizes are available upon request. The complete line of Indexers and motors is capable of delivering up to 19 HP in a 230 volt version and 32 HP in a 460 volt version. For your convenience those motor performance curves are shown here. Ask your distributor or contact ORMEC if one of these is required for your application.





## Component features -

**Circuit Breaker:** Protects wiring and responds to electrical problems.

**Line Filter:** limits electrical noise into and out of this system. Incoming noise from other electronics can cause interference or other problems. All servo systems produce some electrical noise due to the high speed switching. It is best practice to keep that noise from traveling to other equipment in the plant.

**E-Stop:** Though never planned sometimes things go wrong. An emergency stop push button is a best practices approach to safety. This is implemented as a push-pull switch.

**Contactor:** As part of the best practices the contactor is used to remove motor power from the servodrive when an E-Stop state exists. Without energy to the power section of the servodrive the motor cannot move.

**E-Stop reset:** Another best practice, once the E-Stop is opened and power removed then 2 actions are needed to restore power, the E-Stop button must be pulled out and then the E-Stop Reset must be pushed long enough to bring in the contactor.

**Servodrive:** The brains behind the motion. The Indexing Servodrive calculates all the velocity, position and motion parameters to perform the commanded move. During the move the servodrive continues to monitor the motor and using closed loop feedback performs current command corrections to adjust for load, friction and other disturbances. The power electronics are located inside and controlled by the servodrive.

**Motor:** The device which converts electrical energy to the mechanical energy needed on your machine.

**HMI:** A convenient and modern approach to interface with the Indexer and control your machine.

**Control switch box:** This is a diagnostic and startup convenience. This provides a few inputs so you can test the connections and get going quickly. The E-Stop and E-Stop Reset switches are fully industrial grade and expected to be used on the final equipment. The Enable and motion switches are expected to be replaced by your desired switches and push buttons on the machine, or an HMI interface.

**Enclosure:** An enclosure provides a means to house the electronic parts and protect them from dust, dirt, oil and water. It also protects people from accidentally contacting live circuits. The enclosure is Nema 4 LP without holes. For outdoor application a drip shield is recommended. Door closes with clamps which are quick and easy to operate. Concealed hinge. Oil resistant gasket. Gray powder coated. Mounting tabs top and bottom.

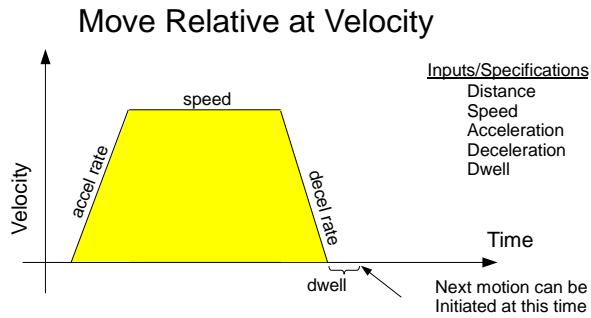
**Enclosure Punching:** Want the enclosure punched for cable egress? Adding XDK-ENC-P1 to the order will provide three holes, left, right and bottom. Includes grommets and plugs. See website for drawing.



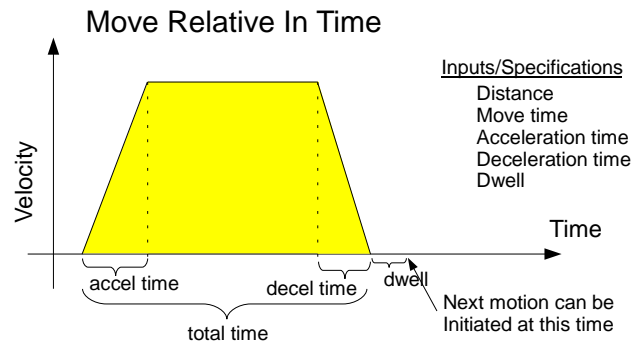
## Motions -

The Indexer can perform a wide variety of motion types. These range from, move a relative distance, move to an absolute position, gear to an external encoder or motor at an adjustable ratio to multiple home functions and jogging.

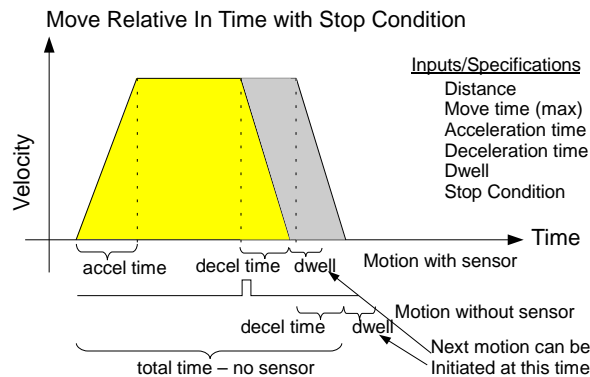
The graphs below provide an overview of the motion types. A complete list and full details can be found in the Indexer installation and operation manual.



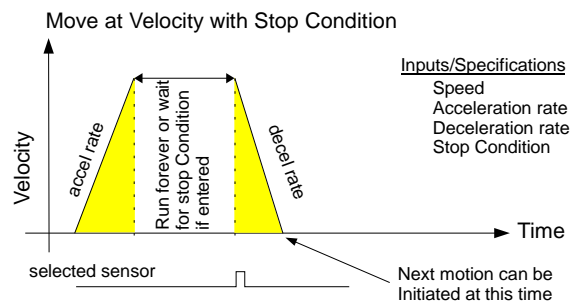
Moves a defined distance. The speed of the motion is set in the motion command.



Moves a defined distance. The motion takes the specified time ~ meaning the speed is automatically calculated so that the motion is completed in the required time..

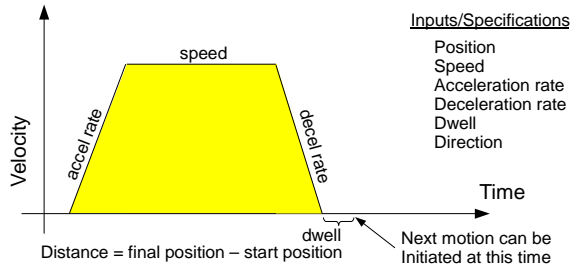


Move until sensor with a maximum distance. This motion begins to Move a given distance from the current position and stops earlier if the sensor occurs. If the sensor is missed the motor stops at the defined distance, which prevents a runaway situation.



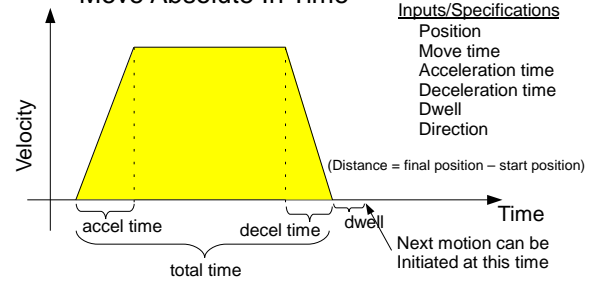
Move until sensor. This motion is a Jog with stop on sensor. Unlike the previous motion this can run forever. If the sensor breaks or is missed the motor will continue.

### Move Absolute at Velocity



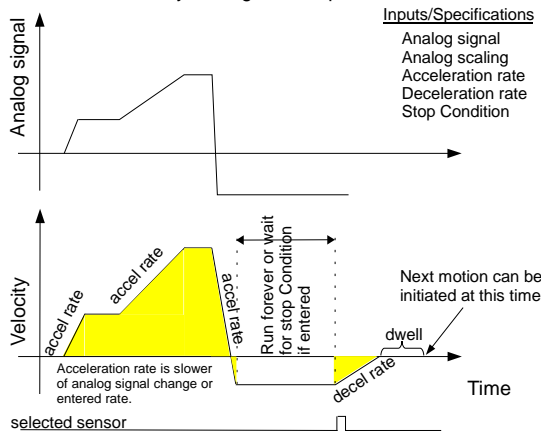
Move to a specific position. The speed is automatically calculated with a maximum speed. This motion is used to get to a specific position or angle when the starting position is unknown.

### Move Absolute In Time



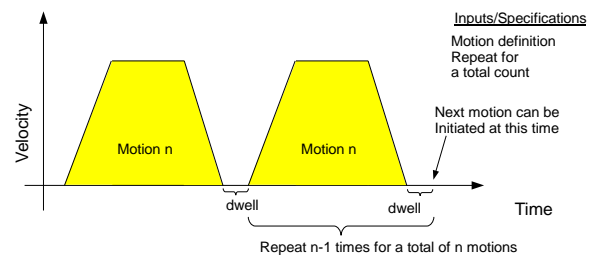
Move to a specific position taking a specific amount of time. The speed is automatically calculated with a maximum speed. This motion is used to get to a specific position or angle when the starting position is unknown.

### Move Velocity Analog with Stop Condition



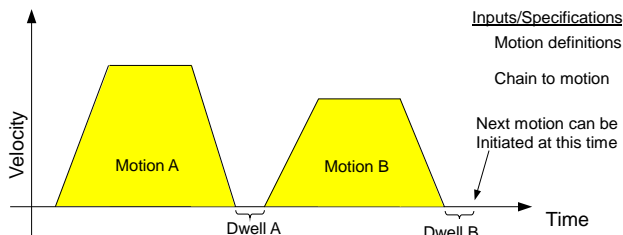
Move at a speed set by a pot. A voltage input sets the speed of the motor and can be changed at any time, including when the motor is running.

### Repeat loop on same motion



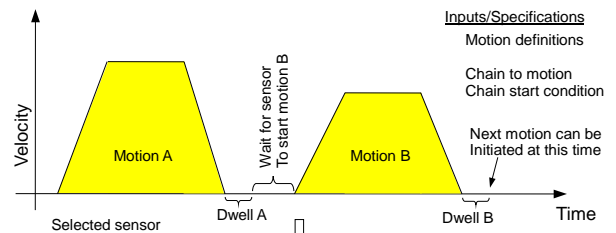
Any motion which stops can be set up to loop and repeat. The time between the repeats is configurable. The number of repeats can be set between 1 and 2,000,000,000.

### Chain 2 motions – A chains to B

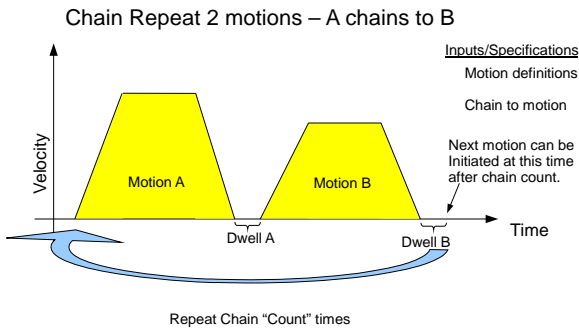


Chaining connects 2 or more different motions together. This is useful when a series of motions are always performed together and start on one signal.

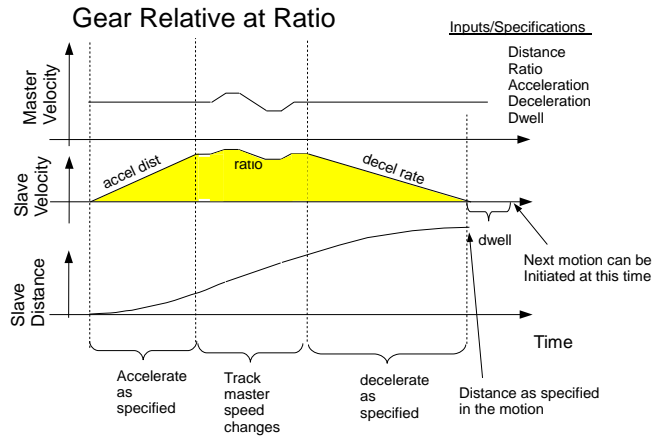
### Chain 2 motions with condition – A chains to B



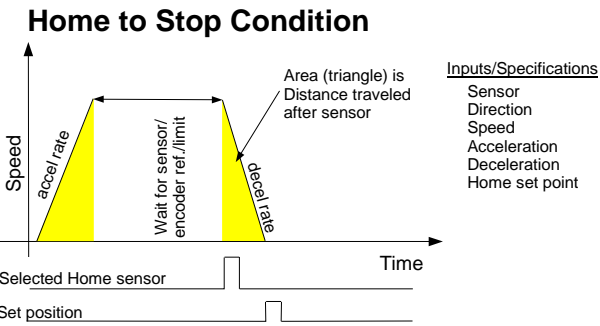
Chaining can include motions which are tied to a sensor. The motion dependent on the sensor will wait for the sensor. In this example Motion A runs when initiated then chains to Motion B which waits until the



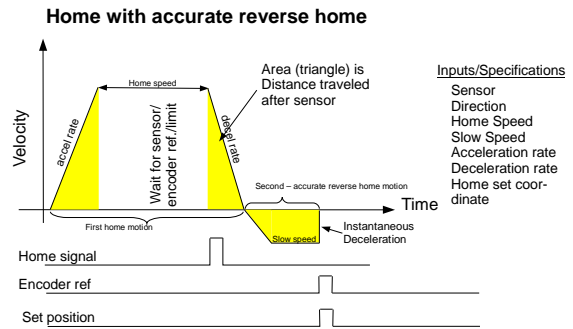
Complete chains can be repeated just like individual motions can be chained. Repeating a motion within a chain and repeating the chain can be done at the same time.



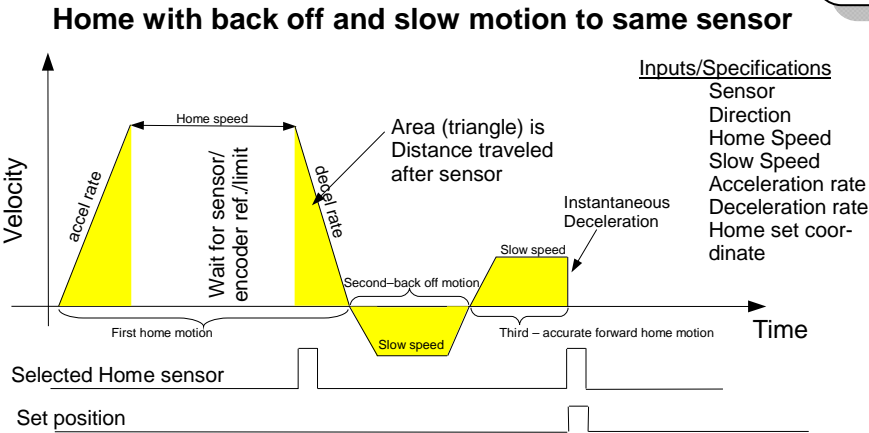
Gearing electronically allows the motor to exactly follow another motor or encoder. Often used with a pacer encoder connected to the machine or web. The motor can be geared up or down if needed. Unlike mechanical gears the gearing can be turned on and off easily and the motor can execute non-g geared motions as well.



Basic home function decelerates and stops when the selected sensor becomes active. The stop position is a little past the sensor.



Home with reverse decelerates and stops when the selected sensor becomes active, then backs up to the sensor. The stop position is much closer, but on the trailing edge of the sensor.



Home with reverse and approach decelerates and stops when the selected sensor becomes active, then backs up past the sensor and does a slow approach to the sensor. The stop position is at the original leading edge of the sensor.

## Advanced options

The kits are configured with the most common options. The XD Indexer has many options available which might improve your machine operation. These include:

<b>Option</b>	<b>Description</b>
Pacer interface	This option is included in the kits. The pacer interface provides the electronics needed to accept a pacer encoder input and to drive out position information so that the Indexer can be the master.
Factory networks	The Indexer comes equipped with an Ethernet port and as standard is a Modbus TCP server or slave. The XD Indexer also supports Ethernet IP. This allows communication to devices using Ethernet IP protocols. This factory network requires addition of an additional card.
Safety interface	For applications which need to meet European machinery safety requirements or need additional safety measures the XD Indexer can be configured with an added Safe Torque Off interlock. This feature provides redundant inputs which prevent torque from being applied to the motor.
DC control power	The XD Indexer is designed with separate control and motor power inputs. This feature keeps control power on at all times yet allows motor power to be turned off for safety. Most Indexer models allow either 115-240 VAC control power or 24 VDC control power. The 230V kits ship with AC control power selected. DC is available. The 460V kits ship with DC control power.

### Regen Resistor

During active deceleration of a motor and load, kinetic energy moves from the load to the Indexer. This energy is stored in the DC bus of the Indexer causing the bus voltage to increase. If there is too much energy the bus voltage will reach its safe limit and a fault will occur. In these cases an external regen resistor may be required. The resistor is used to dump the extra energy in the form of heat.

All XD Indexers in the kits have a built in shunt regulator to be used in conjunction with an external resistor. Regen resistor are available from ORMEC. Additional information regarding sizing and application of the resistor can be found in the XD Indexer Installation manual.

### Application support

You understand your machine and application. Sometimes it is difficult to see how servo controls can be applied to your machine or how it will benefit you. We understand servo controls. The team at ORMEC has implemented servo motion control in most major industries. We know what it takes to make your machine better.

Your distributor and the ORMEC team are here to help you succeed. All that is necessary is for you to ask.