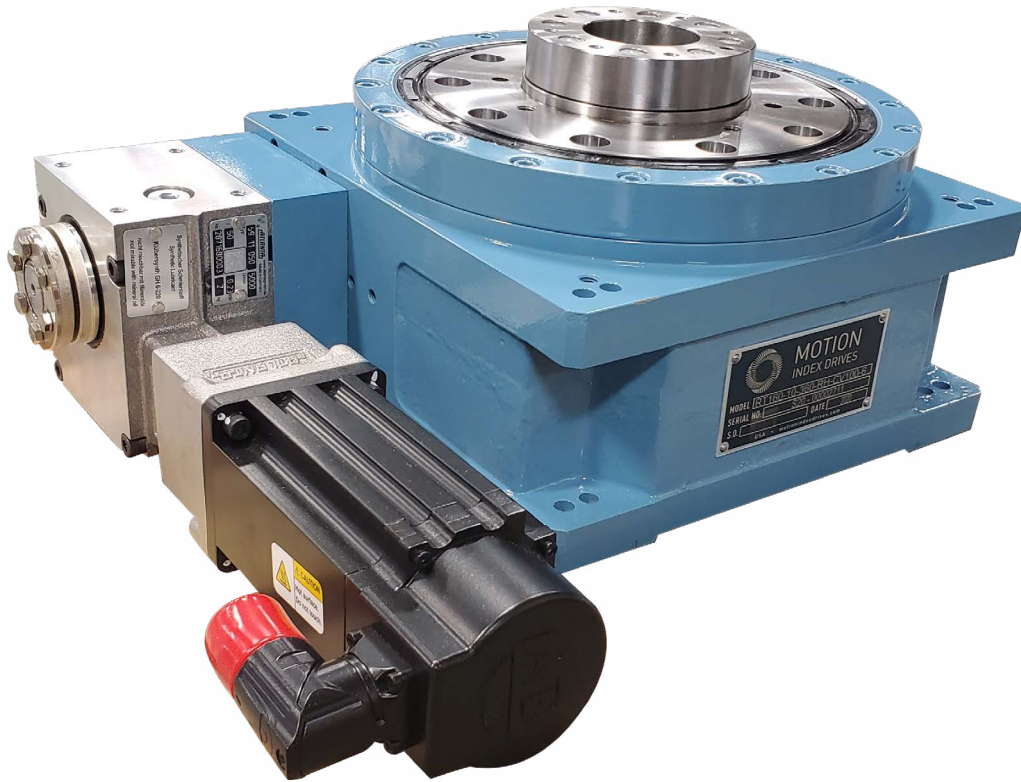




**MOTION**  
INDEX DRIVES



# Controlling a Rotary Index Table

Historically indexers were controlled through the use of motor contactors and 2-speed motors. The 2-speed motors were utilized because indexers needed to be recovered from an “out of position” condition at a lower speed due to the steeper angle that is cut into the cam and sheering threshold of the cam followers. As the Variable Frequency Drive (VFD) became a more cost effective solution to achieve the same recovery result, the use of the motor contactors faded from existence as a method of controlling indexers. This made it possible to use Inverter Duty single speed AC motors controlled by the VFD.

This also led to a more versatile style of indexer which utilizes a constant lead cut cam and is controlled by a “closed loop” positioning system. This system differs from the “fixed position” indexers in that the “fixed position” indexer has the motion profile cut directly into the cam. The newer “closed loop” positioning system utilizes the VFD to control the motion profile. While this is a more flexible system it is more fraught with opportunities to incorrectly control the indexer and therefore damage the cam followers and cam.

Along with AC motor with encoders, the closed loop position indexers can be controlled through the use of a servo motor and amplifier. This can add the highest degree of difficulty in commissioning of the indexer as most of the servo amplifiers that are used to control robots and are very limited in the ways each robot manufacturer allows these auxiliary motors to be controlled. Often you cannot have a modified trapezoidal motion profile, meaning the acceleration and deceleration are one in the same. This limits indexer sizing due to not being able to create a balanced motion profile that limits the torque input to the indexer.

One of the most important aspects of controlling indexers is how to handle emergency stops. The fixed positioned indexers utilize a brake attached to the motor that has been sized to stop the mass moment of inertia for a particular load. The closed loop positioning indexers will always have a brake attached to the motor that has maximum holding power. This type of braking is almost always stops the indexer faster than the capacity of the indexer and therefore must not be used in an emergency stop situation. For closed loop positioning indexers the emergency stop procedure must utilize the motor controller to stop the load.



*Fixed indexer operated on a open loop VFD*

The following are some additional considerations to choosing the best method of controlling and choosing an indexer:

	<b>Fixed Position Indexer</b>	<b>Closed Loop Position Indexer</b>
<b>Consideration:</b>		
<b>Accuracy:</b>	This is an extremely accurate and repeatable system as the cam followers are pre-loaded against the cam when the cam is perpendicular to the rotation. No added cost for encoder feedback.	Even greater accuracies can be achieved because more pre-loaded cam followers are engaged with the cam at all times. Encoder placement and resolution can affect resulting accuracies and cost.
<b>Capacity:</b>	This is a strong system and usually utilizes only two cam followers during the motion and when in the fixed position.	This is an even stronger system because there are more cam followers engaged with the cam at all times.
<b>Complexity:</b>	This is the simplest type of indexer. You can use a lower cost VFD a single sensor for recovering from an "out of position" condition. Can be configured by an entry level Controls Engineer.	This is more complex in that the drive must be tuned and parameters must be set to correctly control the motion profile. This usually takes an upper level Controls Engineer to complete the setup.
<b>Cost</b>	This can be the most cost effective type of indexer, but keep in mind that there are many factors that play into the cost. Usually this is always the most cost effective where the mass moment of inertia is lower and/or index time is slower.	This usually has a higher cost of integration. You need a higher level of VFD controller with the capability of handling an encoder feedback, you need a higher level of personnel to setup this indexer. The encoder is a higher cost than utilizing a switch, but the ability to handle much high mass moments of inertia can sometimes offset these additional cost.
<b>Flexibility:</b>	This system is not as flexible as the closed loop position system. The number of stopping positions are pre-determined and are not cost effective to change.	This is more flexible as there are an infinite number of stop positions. Keep in mind that most cases the number of stop positions that are utilized can be achieved by using a fixed position indexer.