

TURBODISC™ STEPPER MOTORS



P532



P430



P310



P110



P010

The TurboDisc provides exceptional dynamic performance unparalleled by any other stepper on the market. The unique thin disc magnet enables finer step resolutions in the same diameter, significantly higher acceleration and greater top end speed than conventional steppers. TurboDisc excels in applications that require the precision of a stepper and the speed/acceleration of a DC motor.

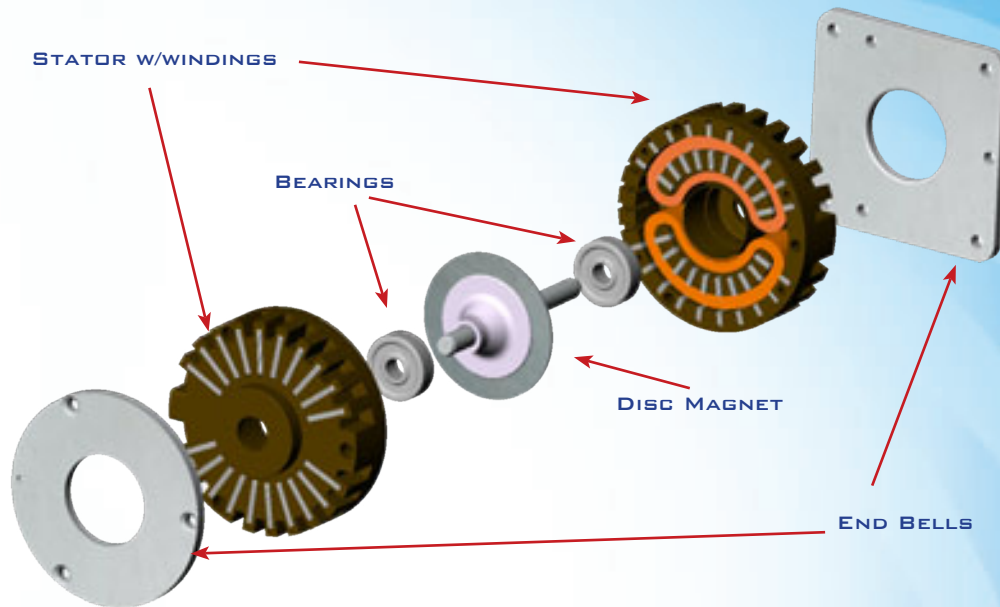
Portescap

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MOTION SOLUTIONS THAT MOVE LIFE FORWARD.™



WHY A TURBODISC MOTOR



INNOVATION & PERFORMANCE

A technology providing unique results. At its heart there is the rotor, a thin disc or rare earth magnet material. Portescap's unique design allows for axial magnetizing with a high number of poles, and for optimizing the magnetic circuit with a corresponding reduction of losses. The quantum leap of this state-of-the-art technology developed by Portescap is extremely high dynamic performance comparable to DC servo motors but obtained from a simple stepper motor.

The TurboDisc is well suited to be tailored to your application requirements. Our design engineers can integrate our motor into your assembly. Our TurboDisc design assistance can range from providing additional components to a fully customized motion solution that optimizes the space and performance of your machine. TurboDisc advantages include:

- Precise - Well suited for microstepping
- Fast - Disc Magnet enables fastest acceleration and highest top speed of any step motor while maintaining accurate positioning
- Unique - Low detent torque and highly customizable
- Adaptable - Higher steps per revolution than CanStack products; can be increased through tooling
- Miniature - Down to 10 mm diameter with 24 steps per revolution

YOUR CUSTOM MOTION SOLUTION

- Sintered or ball bearings
- Various windings
- Shaft modifications – increase/decrease length, knurling
- Longer leads, connectors
- Gearheads for increased torque
- Encoders for position verification

STANDARD FEATURES

Frame sizes ranging from:

- Outer diameter - 10 mm to 52 mm
- Output speed - up to 10,000 rpm
- Step angle – 3.6°, 6°, 9° & 15°
- Output torque - up to 350 mNm

TURBODISC MOTOR BASICS

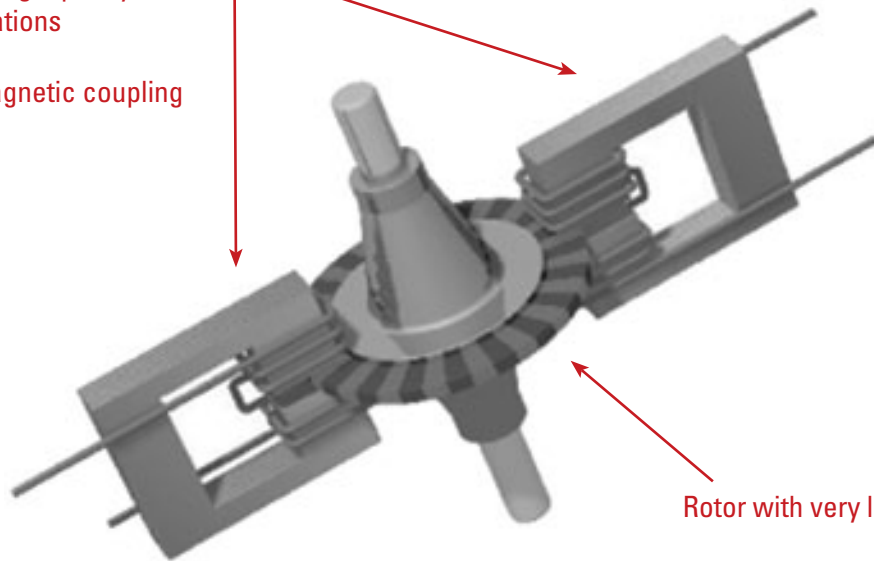
THE HIGH PERFORMANCE DISC MAGNET TECHNOLOGY

The exceptional possibilities offered by the Turbo Disc line of disc magnet stepper motors are unequalled by any other kind of stepper motor. The advanced technology, developed and patented by Portescap, allows for truly exceptional dynamic performance. The rotor of these motors consists of a rare earth magnet having the shape of a thin disc which is axially magnetized. A particular magnetization method allows for a high number of magnetic poles, giving much smaller step angles than conventional two-phase permanent magnet stepper motors.

Such a rotor design has a very low moment of inertia, resulting in outstanding acceleration and dynamic behavior. These features, together with high peak speeds, mean that any incremental movement is carried out in the shortest possible time. Low inertia also means high start/stop frequencies allowing to save time during the first step and to solve certain motion problems without applying a ramp. Those motors, specially designed for microstepping, feature a sinusoidal torque function with very low harmonic distortion and low detent torque. Excellent static and dynamic accuracy is obtained for any position and under any load or speed conditions.

Short magnetic circuit
using high quality
laminations

No magnetic coupling



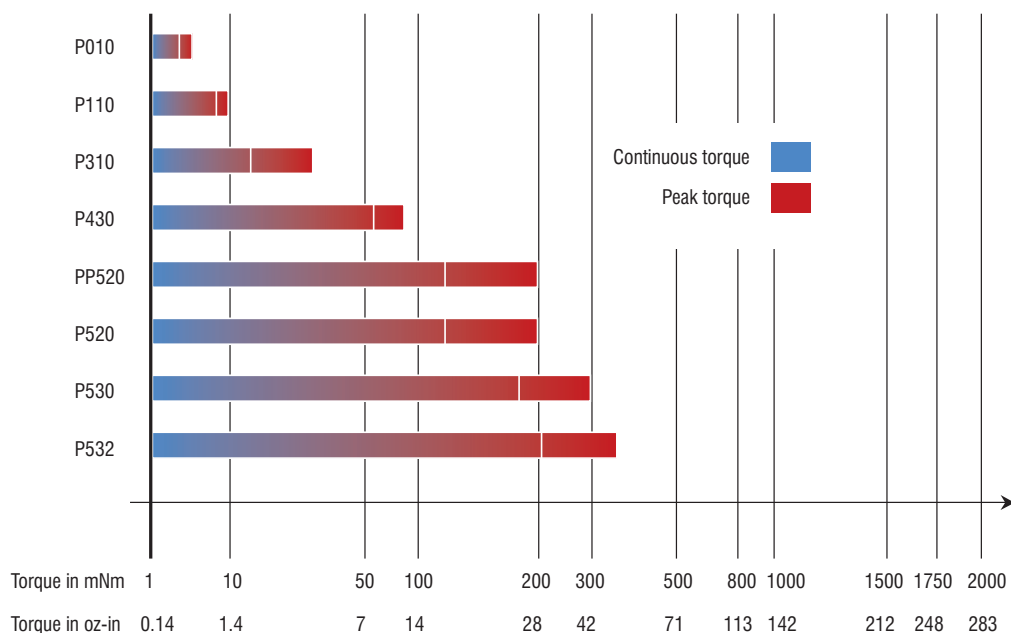
Rotor with very low inertia

Concept Detail	Motor Characteristics	Advantages for the application
Thin multipolar rare earth disc magnet	Very low motor inertia	Very high acceleration, high start/stop frequencies
Very short iron circuit made of SiFe / NdFeB laminations, Coils placed near to the airgap	No coupling between phases Sinusoidal torque function Low detent torque	Superior angular resolution in microstep mode
Optimally dimensioned iron circuit	Torque constant is linear up to 2 to 3 times nominal current	High peak torques
High energy magnet	High power to weight ratio	For motors in mobile applications For size limitations

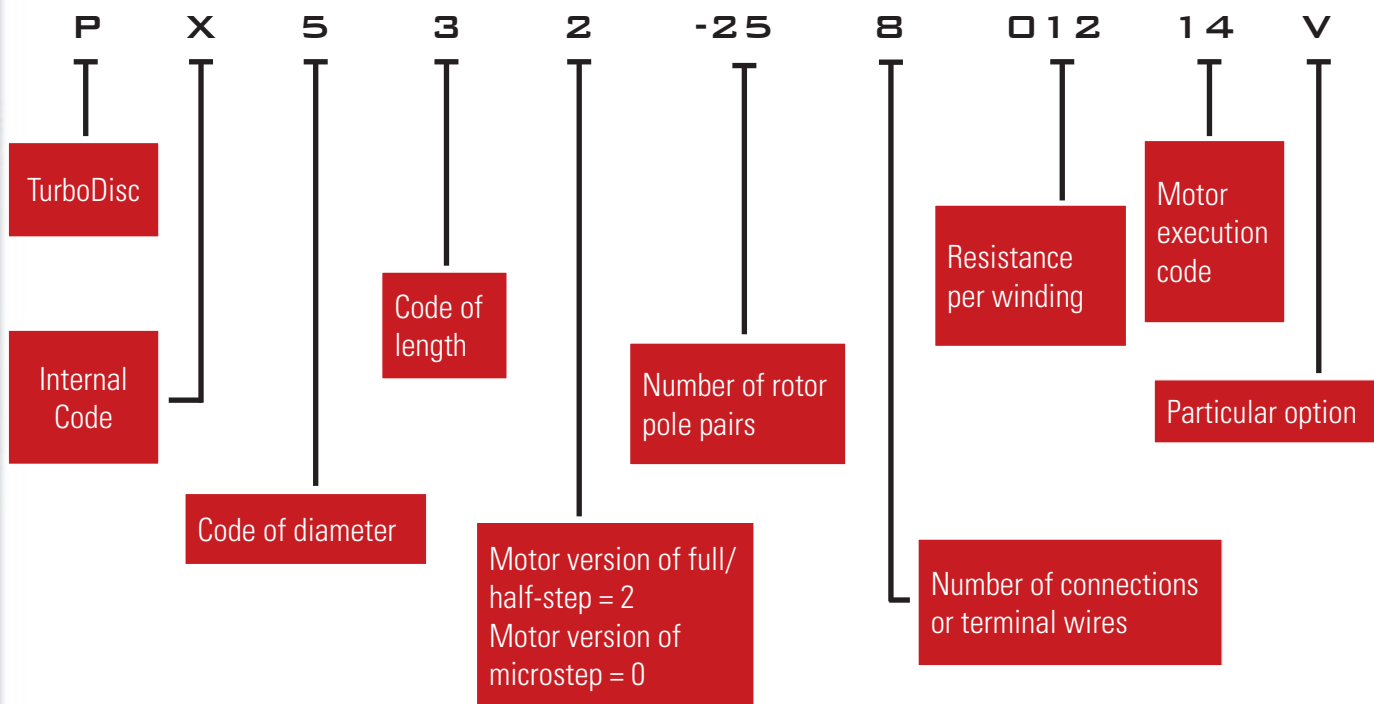


HOW TO SELECT YOUR TURBODISC STEPPER

TURBODISC MOTOR TORQUE RANGE



TURBODISC MOTOR DESIGNATION

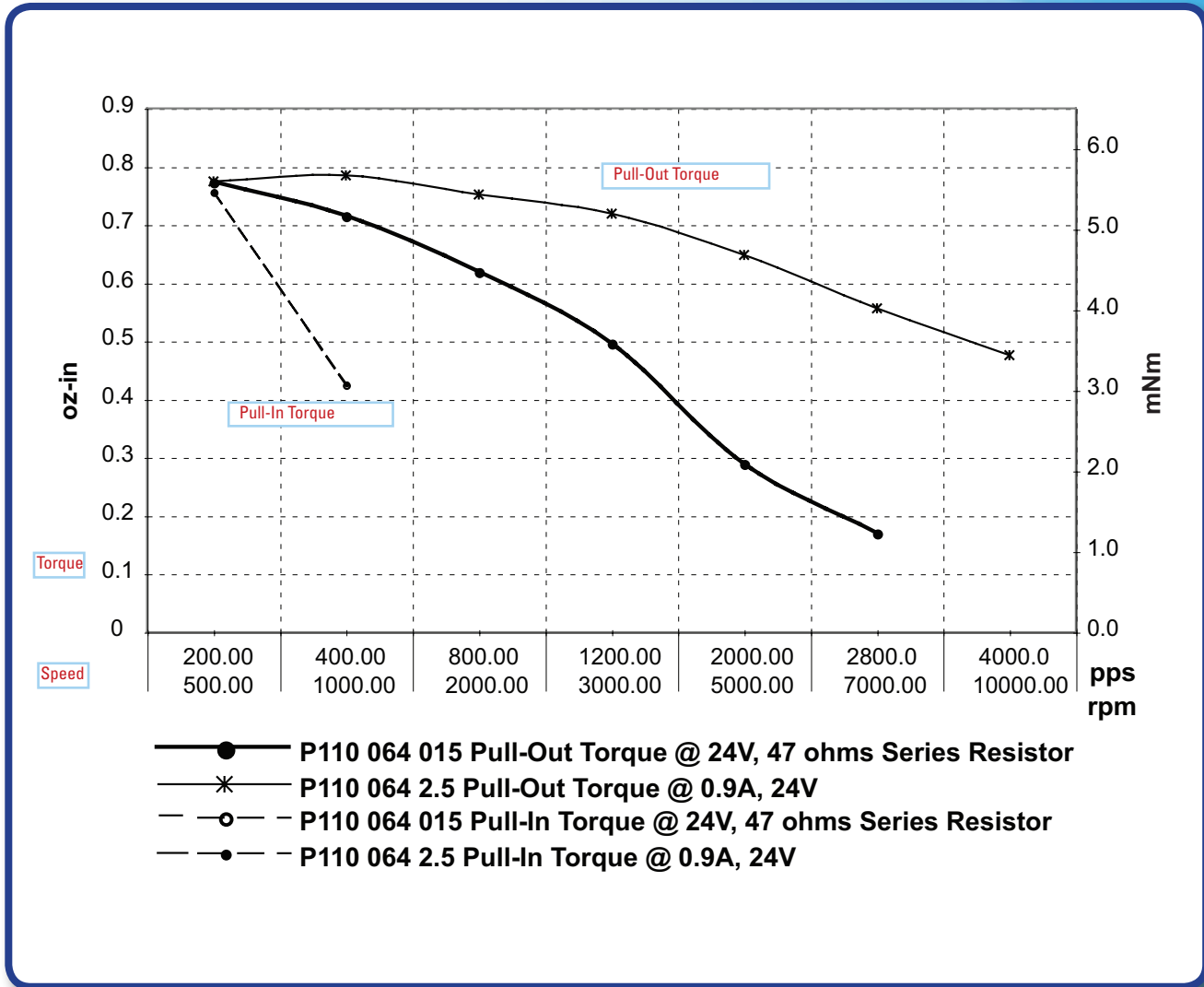


EXPLANATION OF SPECIFICATIONS

MOTOR PART NUMBER		P110 064 068 08/12		EXPLANATION
RATED VOLTAGE		vdc	12.00	Voltage rating of motor - motor can be run continuously at this voltage
RESISTANCE PER PHASE, ± 10%		ohms	62.00	Winding resistance dictated by magnet wire diameter and # of turns
INDUCTANCE PER PHASE, TYP		mH	46.00	Winding inductance dictated by magnet wire diameter and # of turns
RATED CURRENT PER PHASE *		amps	0.12	Current rating of motor - motor can be run continuously at this current
BACK-EMP AMPLITUDE		V/kst/s	10.80	The torque constant of the motor - the back EMF generated by the motor when externally spun at 1000 steps per second
HOLDING TORQUE, TYPICAL *		oz-in / mNm	1.0 / 7	When energized, the amount of torque to move from one mechanical step to the next
DETENT TORQUE, TYPICAL		oz-in / mNm	0.1 / 1	When un-energized, the amount of torque to move from one mechanical step to the next
STEP ANGLE, ± 10% *		degrees	15.00	360 deg / number of mechanical steps of the motor
STEPS PER REVOLUTION *		-	24.00	Number of mechanical steps of the motor
NATURAL RESONANCE FREQUENCY (NOMINAL CURRENT)		Hz	160.00	The frequency at which the motor vibrates at maximum amplitude
ELECTRICAL TIME CONSTANT		ms	0.80	Represents the time it takes for the input current to the motor coil to reach approximately 63% of its final value
ANGULAR ACCELERATION (NOMINAL CURRENT)		rad/s ²	167000.00	The rotational acceleration of the motor when supplied with nominal current
THERMAL RESISTANCE		°C/watt	45.00	
ROTOR MOMENT OF INERTIA		oz-in-s ² / g-cm ²	0.057 x 10E-4 / 0.4	Inertia of the rotor
AMBIENT TEMPERATURE RANGE	OPERATING	°C	-20 ~ +50	Temperature range which the motor will operate
	STORAGE	°C	-40 ~ +85	Storage temperature where the motor will operate
BEARING TYPE		-	SINTERED BRONZE SLEEVE (Optional Ball Bearing on request)	Bearings on front and rear of the motor
INSULATION RESISTANCE AT 500VDC		Mohms	100 MEGOHMS	
DIELECTRIC WITHSTANDING VOLTAGE		vac	300 FOR 5 SECONDS	
WEIGHT		lbs / g	0.05 / 23	Weight of the motor
SHAFT LOAD RATINGS, MAX AT 1500 RPM	RADIAL	lbs / N	0.12 / 0.5 (AT SHAFT CENTER)	Maximum load that can be applied against the shaft
	AXIAL	lbs / N	0.12 / 0.5 (BOTH DIRECTIONS)	Maximum load that can be applied directly down the shaft
LEADWIRES		-	Insulated Cable, AWG 26	Rating of the lead wires
TEMPERATURE CLASS, MAX		-	B (130°C)	Maximum temperature of the winding insulation
RoHS		-	COMPLIANT	



P010 064 015 / P110 064 003
 PULL-OUT TORQUE VS SPEED • FULL STEP, BIPOLAR VOLTAGE



DEFINITIONS

Pull-Out Torque	The amount of torque that the motor can produce at speed without stalling
Pull-In Torque	The amount of torque that the motor can produce from zero speed without stalling
Speed	# of pulses per second provided to the motor, also stated in revolutions per minute
Voltage	Voltage applied to the drive
Current	Current applied to the drive
Drive	Chopper type drive - current controlled to the motor winding

WHERE TO APPLY YOUR TURBODISC STEPPER

THE TURBODISC STEPPER PROVIDES THE HIGHEST TORQUE TO INERTIA RATIO AND IS IDEAL FOR APPLICATIONS REQUIRING, FAST AND PRECISE POSITIONING.



FOCUS ON: MEDICAL ANALYZER

Portescap's challenge for the application was to provide maximum torque in a small diameter package. The higher speed capability of the TurboDisc allowed a higher gear ratio to be utilized, yielding an increase in output torque at the desired speed. The disc magnet design creates quick response time for the motor, increasing the throughput of the machine.



TEXTILE

- Yarn monitoring system
- Electronic wire winding



FACTORY AUTOMATION

- Pick & place machines
- Head positioning
- Die bonding
- Wafer handling
- Feeders



MEDICAL & LAB AUTOMATION

- Analyzers
- Syringe pumps
- Pipettes
- Milling machines
- Prosthetics



OTHER INDUSTRIES & APPLICATIONS

- Engraving
- Laser cutting
- Bar code scanning
- Aircraft instrumentation
- Fiber optic splicers
- Mail sorting



Motor and sensor phase signals in electrical degrees for PP520
(CW operation as viewed from front of motor)

