

Feature Summary

- Belt drive continuous rotary stage
- Loads up to 75 kg
- Resolution to 0.4 arc-seconds
- Continuous rotary motion
- Integrated brushless servo motor
- Uses a precision steel reinforced timing belt for its drivetrain in addition to an interlocking tooth system for exceptional stiffness
- Infinite flexibility in the home and limit transition positions
- Optional failsafe brake
- Aluminum or steel construction
- Class 10 cleanroom option

Overview

Primatics PFR225 Series rotary stages offer solutions for many of your rotary positioning stage needs. An innovative drive system creates arc-second repeatability and fast settling times, making the PFR225 ideal for point to point indexing, assembly and optical applications where worm drives don't provide the necessary accuracy, throughput or life.

Smart Design

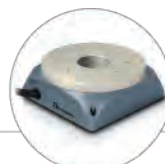
The PFR225 features a precision steel reinforced timing belt for its drivetrain. The belt has a dynamically tensioned AT5 tooth profile with nylon faced teeth, providing exceptional stiffness and smooth tooth engagement while eliminating backlash. A ring encoder is located on the rotating platen, enhancing system accuracy by providing output feedback directly on the load. An oversized cross roller bearing supports the platen, delivering high load capacity, excellent rigidity, and long life. A frameless brushless motor is incorporated in the PFR225 along with pulley reduction, giving the PFR225 full rotation, a wide dynamic range, zero backlash, high speed and reduced settling times.

Features and Benefits

The PFR225 has a low profile, reducing stack height and angular errors. The PFR225 also has a small pulley reduction, simplifying servo tuning and providing system dampening. A large diameter aperture allows easy access for cables and optical assemblies.



Linear Positioning



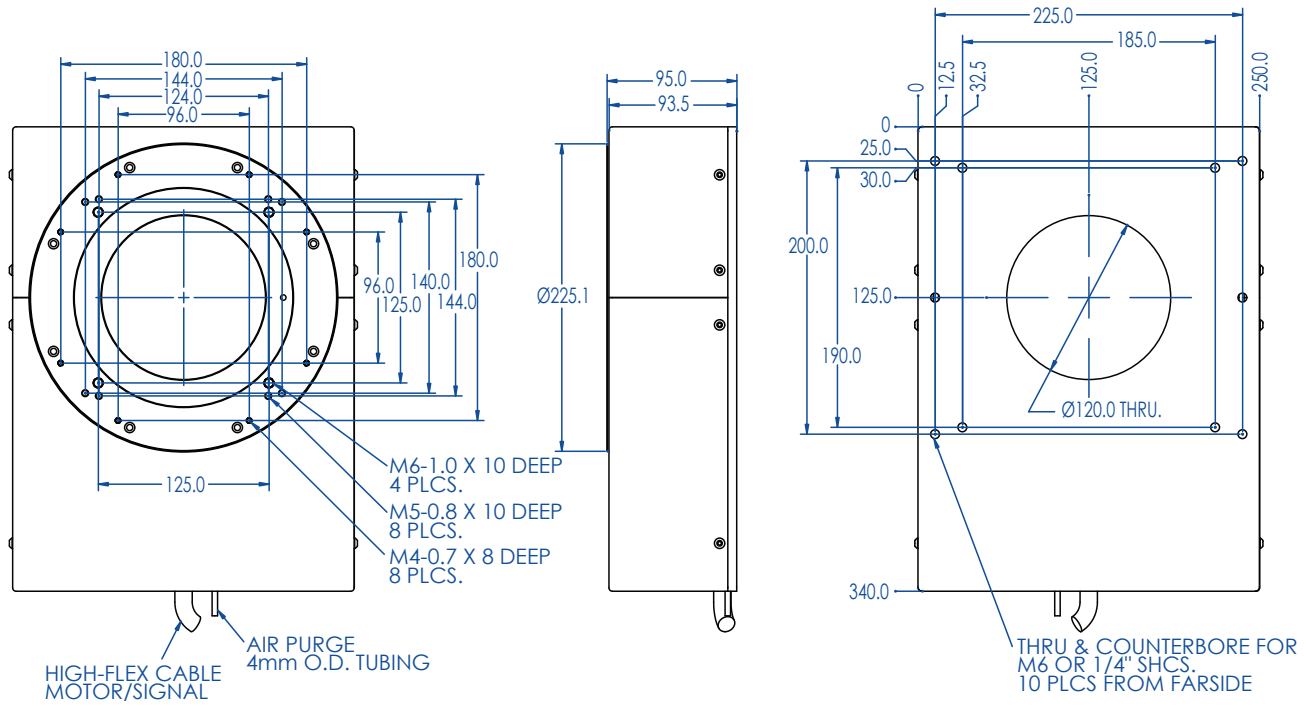
Rotary Positioning



Motion Controls



OEM Solutions



Precision Grade	Timing Belt & Low Resolution Ring Encoder	Timing Belt & High Resolution Ring Encoder
Travel (degrees)	360	
Table Diameter (mm)	225	
Nominal Resolution (arc-seconds)	2.1	0.41
Mechanical Drive System	25 mm steel reinforced timing belt	
Max Speed (rps)	4	1
Axial Runout (μm)	+/- 3	
Radial Runout (μm)	+/- 3	
Accuracy (arc-seconds)	+/- 45	
Bi-directional Repeatability (arc-seconds)	+/- 6	+/- 2
Continuous Torque (motor) (N-m)	0.5	
Peak Torque (motor) (N-m)	5.7	
Gear Ratio	8	
Axial Load Capacity (kg)	75	
Radial Load Capacity (kg)	45	
Weight (kg) (Aluminum Base)	12.2	
Weight (kg) (Steel Base)	36.4	

All specifications subject to change w/o notice.

Frameless Motor Specifications	PFR225
Continuous Torque (N-m) ¹	0.56
Continuous Current (Amps)	5.1
Peak Torque (N-m) ²	5.7
Peak Current (Amps)	52
Torque Constant (N-m/Amps)	0.11
Back EMF Constant (V/Krpm)	11.5
Resistance (Ω)	0.5
Inductance (mH)	1.1
Poles	6
Rotor Inertia (g-cm ²)	556.8
Encoder Specifications	Specification
Input Power (ma)	5 VDC +/- 5%, 150 ma
Output	Square wave differential line driver
Reference (Z channel)	Synchronized pulse, duration equal to one resolution bit
Maximum Speed (rps) ³	5.5 arc-sec resolution = 6 2.1 arc-sec resolution = 4 1.1 arc-sec resolution = 3.5 0.41 arc-sec resolution = 1.4

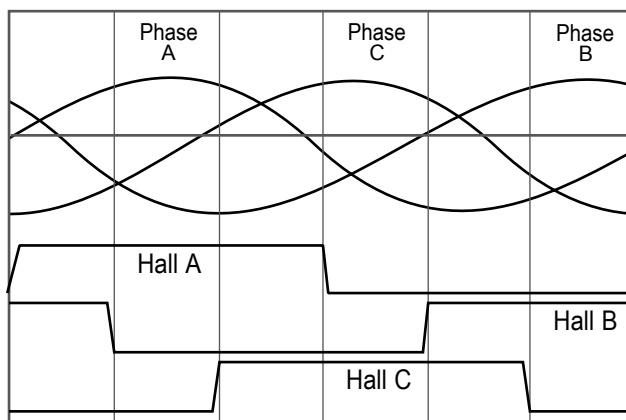
¹At 25°C rise ²At 10% duty cycle and 1 second maximum ³May be voltage limited

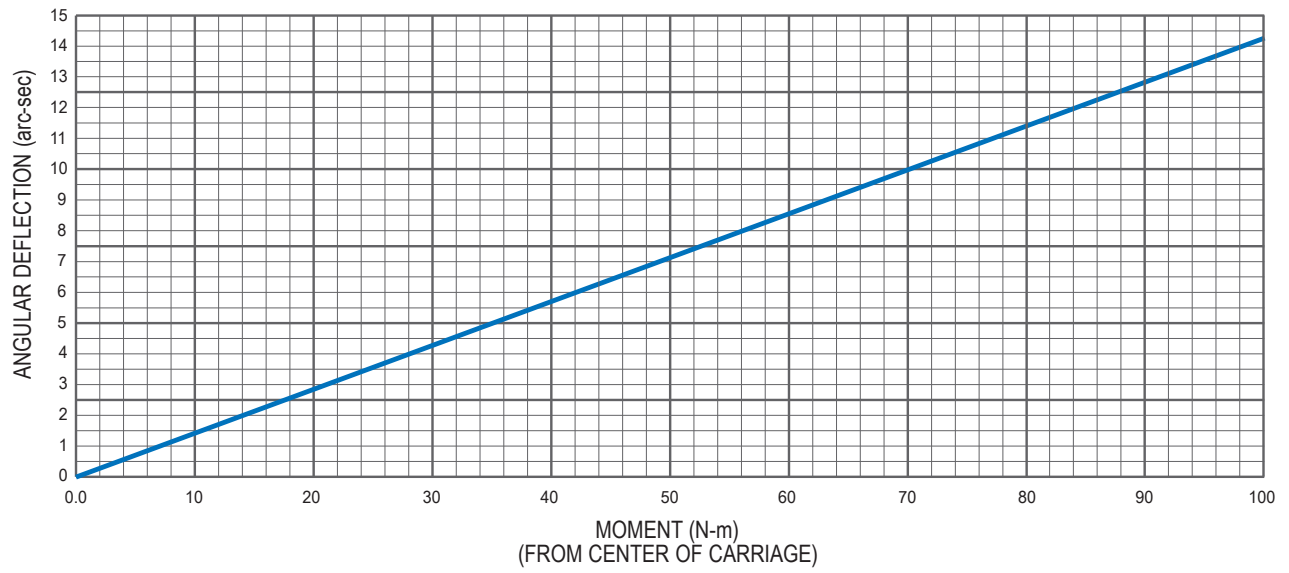
Stage Information	PFR225
Stage Inertia @ motor-Al (kg-m ²)	7.5E-4
Stage Inertia @ motor-Steel (kg-m ²)	1.4E-3
Max Accel - (Rad/s ²) (unloaded)	800
Max Breakaway Torque at motor (N-m)	0.61
Max Running Torque at motor (N-m)	0.47
Max Inertial Payload - (kg-m ²)	6.7E-1
Maximum Motor Bus Voltage (VDC)	170
Length of Stage Cable (mm)	450
Bearing Life x 10 ⁶ Revs	100

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Limit & Home Specifications	Specification
Input Power	+12 to +24 VDC, 50 ma
Output	NC Current Sinking, Sink current maximum of 100 ma
Hall Effect Specifications	Specification
Input Power	+5 to +12 VDC, 30 ma
Output	Open collector, Current sinking, 20 ma Max

Commutation Chart





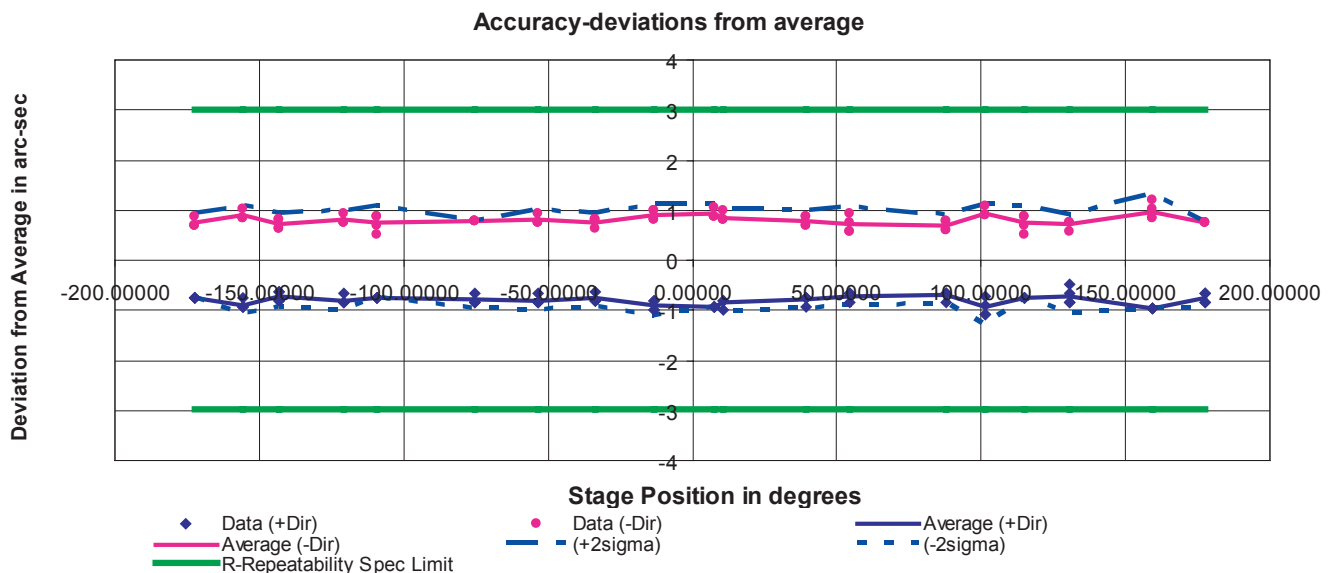
Servo Axis connector

Connector on stage: FCI (Burdny) Male, circular connector, 28 contacts, size 20 shell Pin-out

Pin	Function
A	Motor A
B	Motor B
C	Motor C
D	Motor Shield
E	Encoder 5V - power for encoder
F	Encoder A+ output
G	Encoder A- output
H	Encoder B+ output
J	Encoder B- output
K	Encoder Shield
L	12/24VDC - for limit, home, and temp sensor
M	DCCOM
N	Home - Switch to DCCOM when on forward side of home position
P	Brake + (optional)
R	Brake - (optional)

Pin	Function
S	Chassis
T	Hall V+
U	Hall V
V	Encoder Common
W	Encoder Index +
X	Encoder Index -
Y	Forward Limit Switch - switch to DCCOM in normal operation
Z	Reverse Limit Switch - switch to DCCOM in normal operation
a	NC
b	Hall A
c	Hall B
d	Temperature monitor - connect to DC Common for temperature OK
e	Hall C

REPEATABILITY PLOT



Model No. PFR225ALPH0E1P1

Date 19-Jan-04

Comments 360 Degree Rotation

Test Conditions

Air Temperature Sensor (degC) 20.0

Air Pressure (mm Hg) 760.0

Relative Humidity (%) 50

Encoder Res. (arc-sec/count) 2.06

Results	Actual	Spec
Peak to Peak Error (μ m)	2.65	18.00

Primatics PFR225 Series rotary positioning stages are available with options designed to optimize stage performance for specific applications. Most options have no effect on the overall dimensions of the PFR225, allowing the design engineer to make changes and upgrades to the PFR225 without affecting machine design.

Stage Construction

PFR225 rotary tables come standard constructed with anodized aluminum, but steel with a electroless nickel finish is also available. Steel has superior stability and dampens out vibration approximately 100 times faster than aluminum. In addition, steel has half the thermal expansion coefficient of aluminum, making steel the material of choice in applications requiring accuracy in a thermal gradient.

Protection System

PFR225 rotary tables offer several levels of protection for applications in harsh environments. The first level of protection includes a hard cover shell over the entire table. In addition, all bearings are sealed and do not require re-lubrication. All stages come with a high pressure air purge, as well as an optional high flow air purge.

Class 10 Cleanroom

The Class 10 cleanroom option is ideal for medical and semiconductor applications where particle generation must be kept to a minimum. The inherent design of the PFR225 makes it operate very clean, and we use clean room rated lubrication for all bearing and drivetrain components. A high flow evacuation port is also included.

Brakes

All PFR225 rotary stages offer an optional fail-safe brake. The brake is mounted internally, reducing the envelope of the stage. 24 VDC is required to release the brake.

Performance Verification

All PFR225 performance specifications are verified and a full set of accuracy & repeatability plots are included with each stage. A 12 hour burn-in test is performed, insuring that the stage will perform as specified over a long period of time.

Sealed Bearings

Re-lubricating PFR225 rotary stages is unnecessary because all bearings are sealed for life, eliminating time-consuming disassembly for maintenance.

Flexible Home & Limit Positions

The home & limit sensors are fixed, while the targets move with the rotating platen. This configuration allows infinite flexibility in the home & limit transition positions and it allows the transition points to be repositioned without any re-routing of cables.

Large Diameter Through Hole

The PFR225 rotary stages come with a large diameter through hole ideal for an unobstructed optical path or cable routing.

MODEL NUMBER CONFIGURATION

OPTIONS: PFR225

SAMPLE MODEL NUMBER:

PFR 225 AL P H1 L1 E2 P3

- Model Series**
- Full Rotation PFR]
- Table Diameter**
- 225 mm 225]
- Base Material**
- Steel CI Aluminum AL]
- Grade**
- Precision P]
- Home Sensors**
- Present, N.C. H1 Present, N.O. H2]
- Limit Sensors**
- Present, N.C. L1 Absent, N.C. L3]
- Present, N.O. L2 Absent, N.O. L4]
- Encoder Type**
- 2.1 Arc-Sec Resolution E1]
- 0.41 Arc-Sec Resolution E2]
- Protection Level**
- Level 1 - Covers w/High Pressure Purge P1]
- Level 2 - High Flow Air Purge P2]
- Level 3 - Class 10 Cleanroom P3]

