

Feature Summary

- Travels up to 100mm
- Loads up to 10 kg
- Encoder resolution to 10nm
- Precision cross roller bearings provide exceptionally smooth motion.
- Center-driven brushless linear motor eliminates backlash, windup & stiction.
- Drivetrain and feedback systems are non-contact, giving the stage a long, maintenance-free life.
- Internal multiplication electronics
- Multi-axis configurations available
- Error mapped accuracy option
- Class 10,000 cleanroom option

Overview

The Primatics PCR43 Series positioning stages are our most compact linear stages. Ideal for demanding applications such as high precision alignment, attachment and inspection, the PCR43 offers unparalleled flexibility and allows the user to fit a highly specialized product into their most space restrictive applications.

Smooth Travel

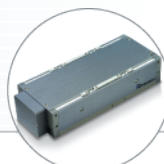
The PCR43 delivers exceptionally smooth travel by utilizing precision cross roller bearings. In addition, an anti-cage creep (ACS) cross roller option is available. ACS cross rollers offer smoothness comparable to traditional cross rollers but do not exhibit the cage creep problems inherent to traditional cross roller bearings. Since neither the bearings or drivetrain utilize recirculating elements, the PCR43 offers the best of all worlds, smooth, ripple-free motion without cage creep.

Low Interpolation Error

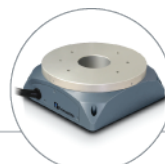
Scanning and inspection applications typically demand extremely low velocity ripple. Achieving low velocity ripple requires not only smooth bearing and drivetrain elements, but also a feedback device with low interpolation error. The PCR43 meets this demand with a high performance feedback system specifically designed to minimize interpolation error.

More Robust

Like the rest of the Primatics product family, the PCR43 is designed specifically for high throughput 24/7 applications. The drivetrain and feedback systems are non-contact and maintenance free. The PCR43 has no moving cables, eliminating the possibility of cable failure. In addition, the bearings and linear motor are oversized, yielding large safety margins in available thrust and moment load capacity, further improving long-term reliability.



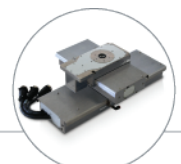
Linear Positioning



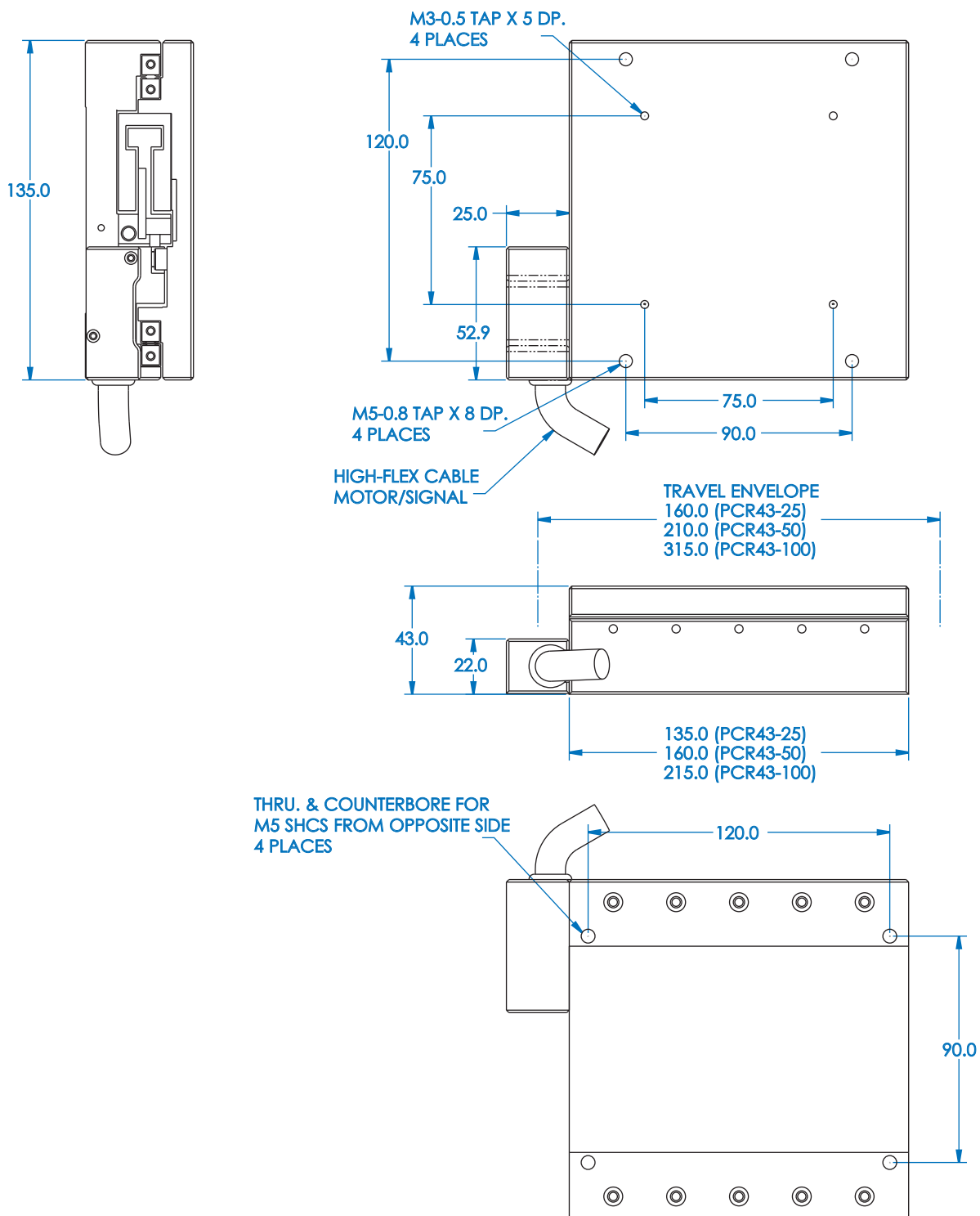
Rotary Positioning



Motion Controls



OEM Solutions



All dimensions subject to change w/o notice.

Performance Specifications	PCR43-25	PCR43-50	PCR43-100
Travel (mm)	25	50	100
Positional Accuracy (μm) over Total Table Travel ²	+/- 1	+/- 2	+/- 3
Error Mapped Accuracy w/ Anti-Cage Creep Bearings (μm)	+/- 0.25		
Positional Repeatability (μm) (bi-directional w/ACS) ²	+/- 0.08		
Positional Repeatability (μm) (bi-directional w/out ACS) ³	+/- 0.05		
Pitch Angular Error (arc-seconds)	7	8	10
Yaw Angular Error (arc-seconds)	7	8	10
Straight-line Accuracy (μm) over Total Table Travel ²	+/- 0.75	+/- 1.0	+/- 1.3
Flatness Accuracy (μm) over Total Table Travel ²	+/- 0.75	+/- 1.0	+/- 1.3
Max Speed (mm/s) ¹	200		
Direct Load Capacity (kg)	10		
Continuous Thrust (w/o air cooling) (N)	14		
Peak Thrust (N)	41		
Minimum Resolution (nanometers)	10		
Pitch Moment Capacity (N-m)	3.7		
Roll Moment Capacity (N-m)	4.8		
Yaw Moment Capacity (N-m)	4.2		
Carriage Mass (kg) (Aluminum Base)	1.2	1.5	2.0
Carriage Mass (kg) (Cast Iron Base)	2.4	3.0	4.0
Stage Weight (kg) (Aluminum Base)	2.4	2.8	3.9
Stage Weight (kg) (Cast Iron Base)	4.8	5.6	7.8

¹ Maximum Obtainable Speed is Load, Resolution and Move Profile Dependent

² Measured 50mm above center of carriage

³ 10 or 20 nanometer resolution

All Specifications subject to change without notice

Linear Motor Specifications	D3 Motor
Continuous Force (N) ¹	8.4
Continuous Current (Amps)	1.3
Peak Force (N) ²	41.8
Peak Current (Amps)	6.3
Force Constant (N/Amps)	6.7
Back EMF Constant (V/m/sec)	6.7
Resistance (Ω)	3.2
Inductance (mH)	15.9
Magnetic Pitch (mm)	60.96
Thermal Resistance (C/W)	5

Stage Information	PCR43-D3
Maximum Acceleration (G's) (unloaded)	0.5
Max Breakaway Force (N)	0.5
Max Running Force (N)	0.4
Maximum Motor Bus Voltage (VDC)	90
Length of Stage Cable (mm)	450
Life @ Listed Specification x 50 km	100

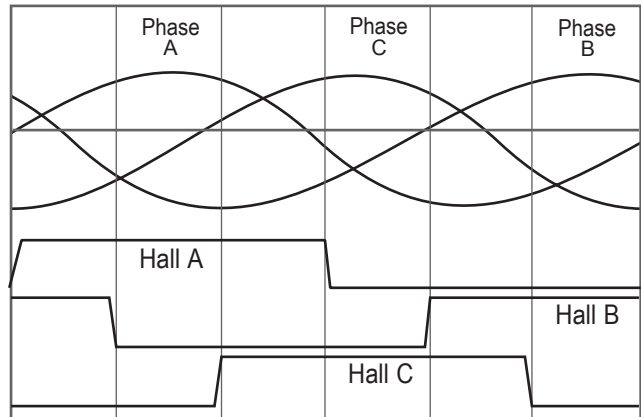
Encoder Specifications	Specification
Input Power (ma)	5 VDC +/- 5%, 150 ma
Output	Square wave differential line driver
Reference (Z channel)	Synchronized pulse, duration equal to one resolution bit
Maximum Speed (m/s) ⁴	20 nm resolution = 0.2 10 nm resolution = 0.1

Limit & Home Specifications	Specification
Input Power	+12 to +24 VDC, 50 ma
Output ³	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

Pneumatic Assist	Specification
Air Pressure	up to 80 PSI
Holding Force	4.5 kg

Commutation Chart



¹ At 25°C temperature rise

² At 10% duty cycle and 1 second maximum

³ Home located in center of travel

⁴ Controller limitations can affect top speed

All specification subject to change without notice

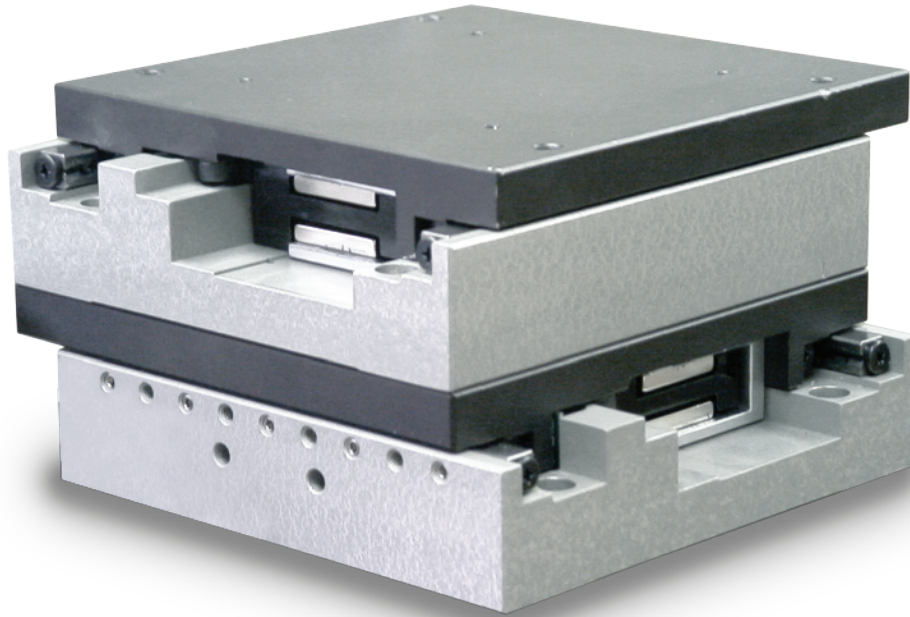
CONNECTOR PINOUTS

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	12VDC - for limit, home, and temp sensor
M	DCCOM
N	Home - Switch to DCCOM when on forward side of home position
P	NC
R	NC

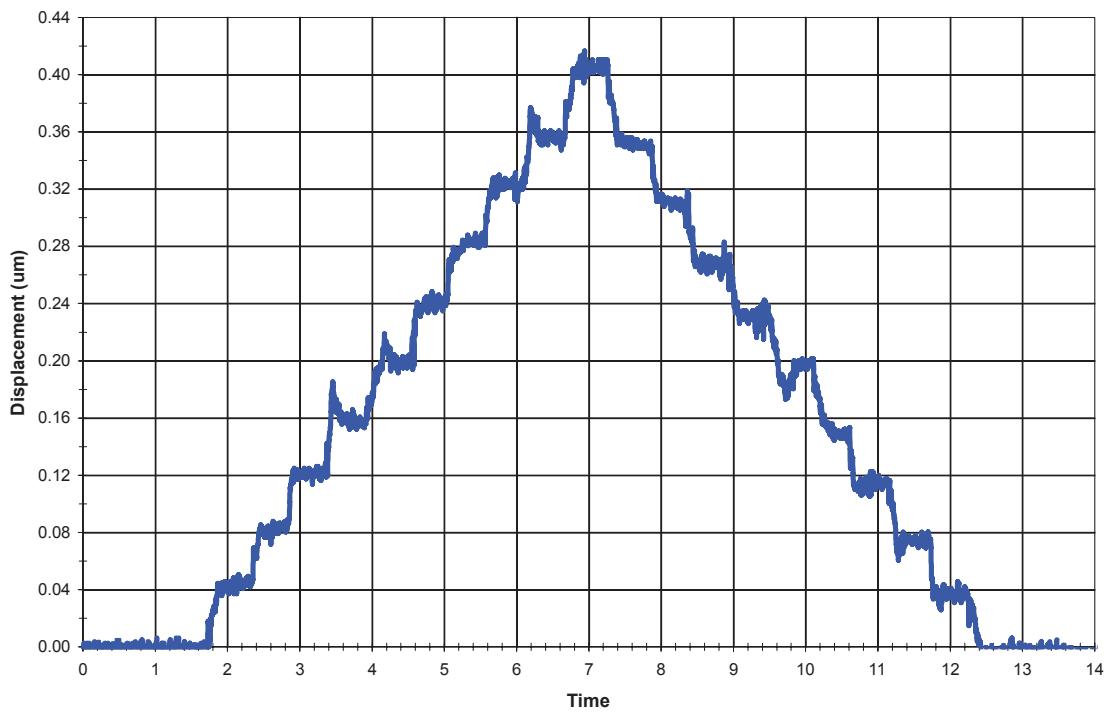
Pin	Function
S	Chassis
T	Hall V+
U	Hall V
V	Encoder Common
W	Encoder Index +
X	Encoder Index -
Y	Forward Limit Switch - switch to DCCOM in normal operation
Z	Reverse Limit Switch - switch to DCCOM in normal operation
a	NC
b	Hall A
c	Hall B
d	Temperature monitor - connect to DC Common for temperature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



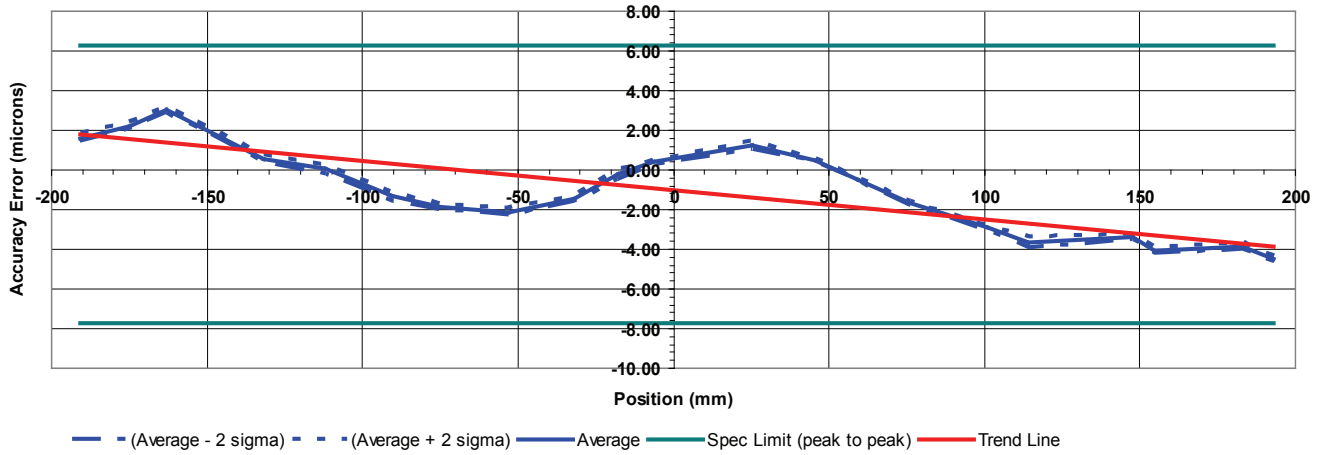
STEP ACCURACY LASER PLOT

PCR43-25 X-axis Step Accuracy

40nm moves, 20nm resolution, 2.25kg load, measured on Z of XYZ stack



Accuracy, 2 Sigma, 4 Repetitions



Test Conditions

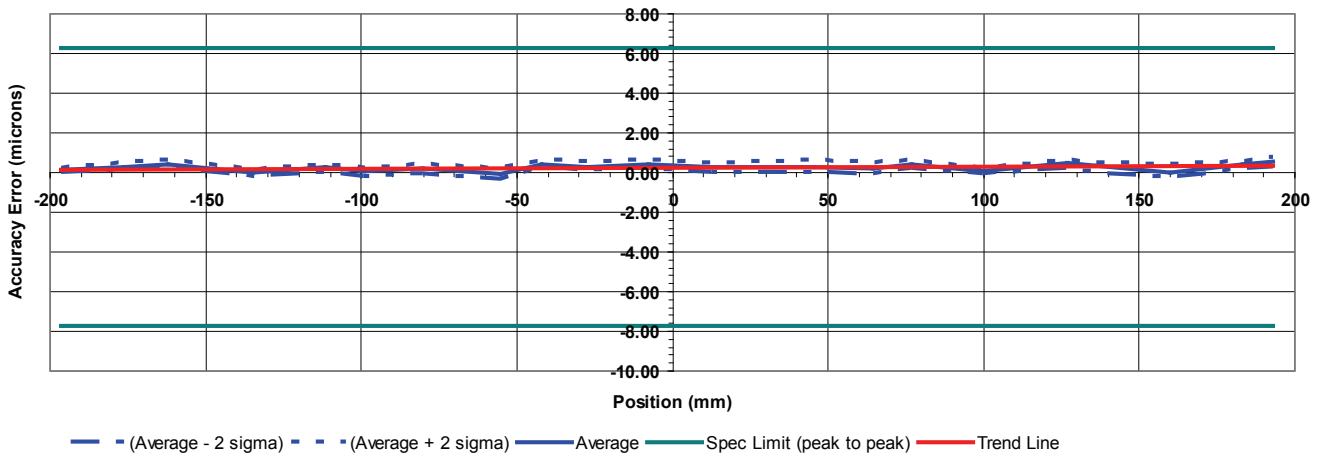
Air Temperature Sensor (degC) 20.0
 Air Pressure (mm Hg) 760.0
 Relative Humidity (%) 50

Results (µm)

Accuracy Actual 7.80 Spec 14.00 (+/- 7)
 EncoderRatio (counts/mm) Current 10000.0000 Computed 10000.11470

ERROR MAPPED ACCURACY SAMPLE PLOT

Accuracy w/Map, 2 Sigma, 4 Repetitions



Test Conditions

Air Temperature Sensor (degC) 20.0
 Air Pressure (mm Hg) 747.8
 Relative Humidity (%) 40

Results (µm)

Accuracy Actual 1.14 Spec 2.00 (+/- 1)
 EncoderRatio (counts/mm) Current 10000.0000 Computed 9999.9955

Internal Multiplication

The PCR43 comes with internal encoder multiplication down to 10nm resolution without any external multiplication boxes. All multiplication circuitry resides inside the PCR43, saving space and greatly simplifying cable management. Contact the factory for finer resolutions.

ACS vs. Non-ACS Anti-Cage Creep

The PCR43 offers a anti-cage creep cross roller bearing option. This bearing incorporates a precision rack and pinion to prevent cross roller cage creep during high acceleration repetitive moves.

Performance Verification

All PCR43 performance specifications are verified with a laser interferometer system. A full set of accuracy, repeatability, straightness and flatness plots are included with each stage. Calibration data is also provided. In addition to laser interferometer data, a 12 hour burn-in test is performed, insuring that the stage will perform as specified over a long period of time.

Pneumatic Assist

The PCR43 offers a pneumatic assist for vertical applications. A wire and pulley system is implemented in conjunction with a low friction air cylinder. The wire is attached to the COG of the carriage, eliminating all angular forces on the Z stage. A high-bandwidth pressure regulator is included.



PCR43 Z-Axis Stack with Prima-Flex™
Cable Management and Counter Balance

Error Mapping

Error mapping is available for the PCR43 positioning stage for applications requiring very high levels of accuracy. Error Mapping is a technique where one relies on the repeatability of a stage to improve its accuracy. A metrology device measures both accuracy and repeatability of random positions along the travel of a positioning stage. This data is used to generate an error map. The metrology data shows how far long or short the positioning table travels when trying to reach a particular set point. Since the inaccuracy is known along the entire travel, the positioning stage can be commanded to move to a set point that is long or short of the actual desired position, compensating for the inaccuracy of the stage.

Gray Iron Base

The PCR43 comes standard with an aluminum base, but a gray iron base with electroless nickel finish is also available. Gray iron has superior stability and dampens out vibration approximately 250 times faster than aluminum. In addition, gray iron has a thermal expansion coefficient half of aluminum, making gray iron the material of choice in applications requiring accuracy in a thermal gradient.

Multi-Axis Cable Management

Moving cables can exert forces on the positioning stages that can affect stability, step accuracy and repeatability. The Prima-Flex™ cable management system allows the cables to exit each stage at the optimum angle to minimize cable forces. In addition, the cables are custom designed to minimize their bend radius and maximize their life.

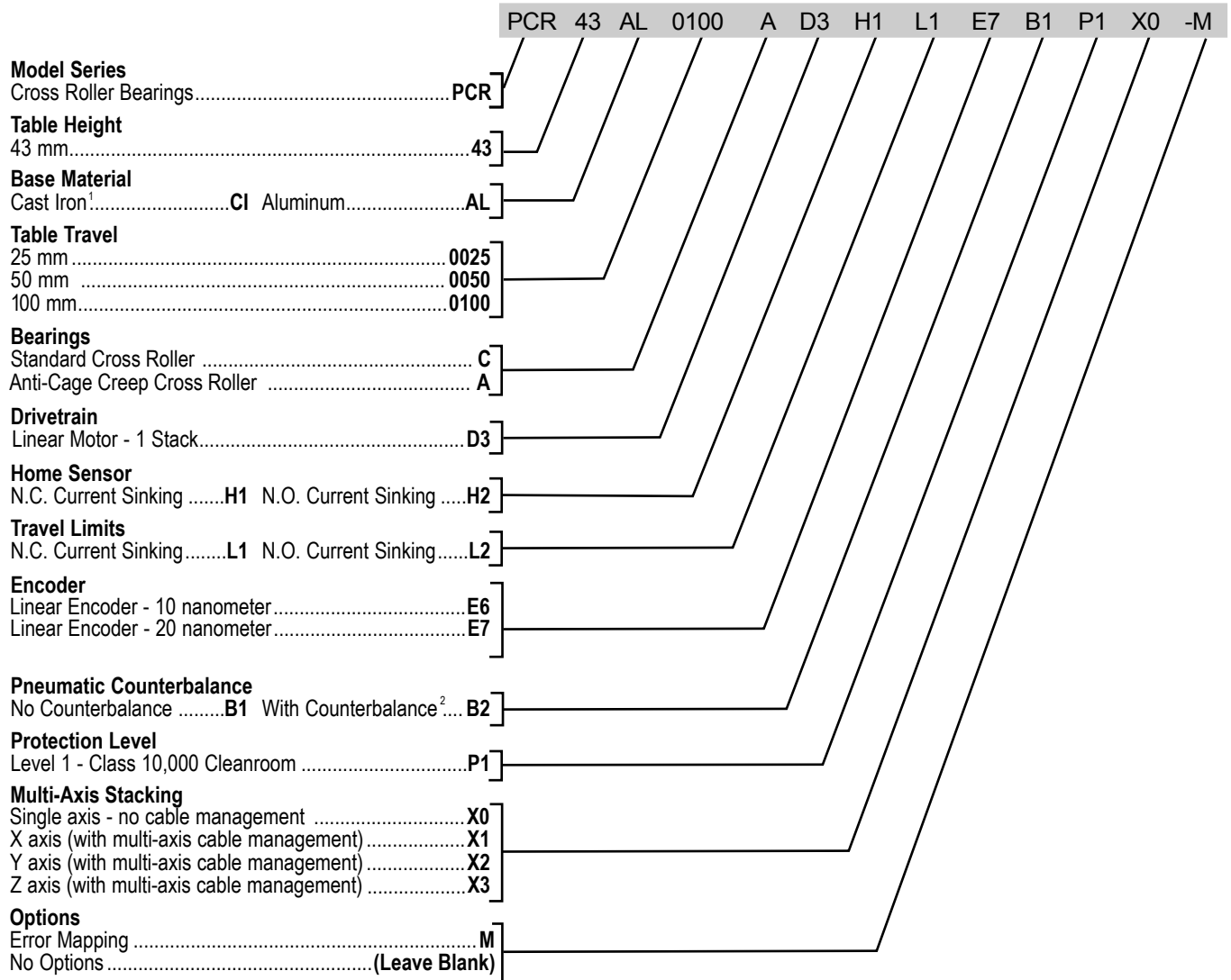
Orthogonality Options

Multi-axis systems can be stacked to 3 different levels of orthogonality. 2 arc-min, 10 arc-second and 5 arc-second stacking can be specified. Consult factory for more details.

MODEL NUMBER CONFIGURATION

OPTIONS:

SAMPLE MODEL NUMBER:



¹ Allow Longer Delivery Trime ² Includes Z bracket

* Not all configurations are valid. Consult factory for assistance.

