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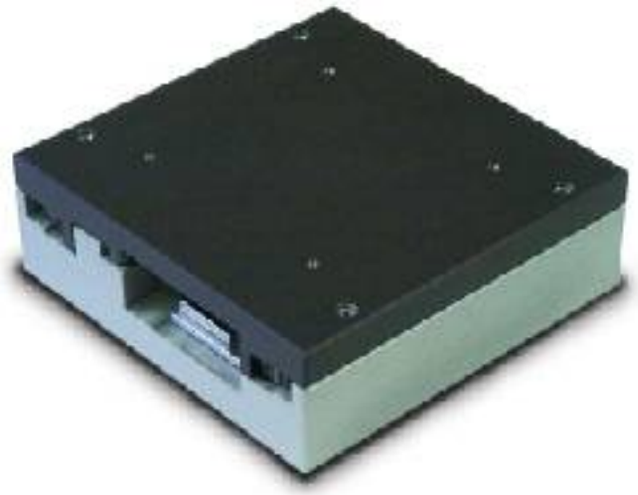
PCR 43

PCR43 SERIES LINEAR POSITIONING STAGES



Primatics PCR43 Series linear positioning stages are designed for fast integration. Ideal for demanding applications such as high precision alignment, attachment and inspection, the PCR43 offers unparalleled flexibility, allowing the user to find a standard product to fit most applications.

High Performance

Alignment applications require high resolution and step accuracy for optimal performance. The PCR43 incorporates an internal 20nm resolution glass scale linear encoder. All the multiplication electronics are internal to the PCR43, eliminating large external multiplication boxes while simplifying cable management. The PCR43 also employs a center-driven brushless linear motor as the driving element. Since the linear motor is a direct, non-contact device, backlash, windup and stiction that can be found in leadscrew or ballscrew drivetrains are eliminated.

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.

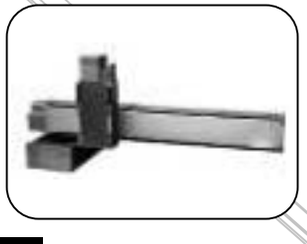
Low Interpolation Error

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.



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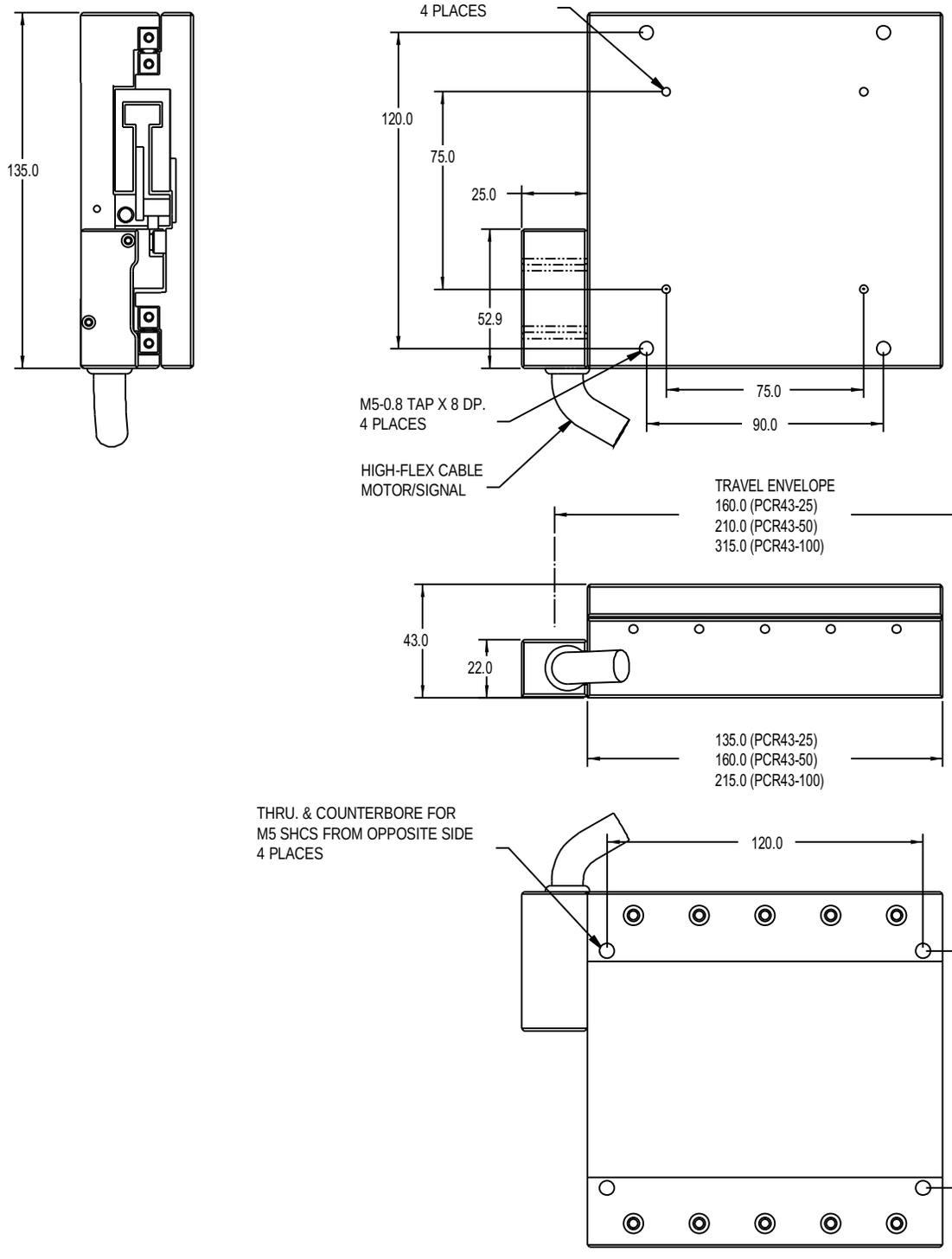
BRUSHLESS LINEAR MOTOR DRAWINGS



All dimensions subject to change without notice.

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LINEAR MOTOR DRIVETRAIN SPECIFICATIONS

Precision Grade-Aluminum Base	PCR43-25	PCR43-50	PCR43-100
Travel (mm)	25	50	100
Positional Accuracy (microns) over Total Table Travel [2]	+/- 0.75	+/- 1	+/- 2
Positional Repeatability (bi-directional w/ACS) [2]	+/- 0.125	+/- 0.125	+/- 0.125
Positional Repeatability (bi-directional without ACS) [3]	+/- 0.05	+/- 0.05	+/- 0.05
Pitch Angular Error (arc-sec)	5	6	7
Yaw Angular Error (arc-sec)	4	5	6
Straight-line Accuracy(microns) over Total Table Travel [2]	+/- 0.5	+/- 1.0	+/- 1.5
Flatness Accuracy {microns) over Total Table Travel [2]	+/- 0.5	+/- 1.0	+/- 1.5
Max Speed (mm/s)	200	200	200
Direct Loading Capacity (kg)	10	10	10
Continuous Thrust (w/o air cooling) (N)	14	14	14
Peak Thrust (N)	41	41	41
Minimum Resolution (nanometers)	10	10	10
Pitch Moment Capacity (N-m)	3.7	3.7	3.7
Roll Moment Capacity (N-m)	4.8	4.8	4.8
Yaw Moment Capacity (N-m)	4.2	4.2	4.2
Carriage Mass (kg)	1.2	1.5	2.0
Stage Weight (kg)	2.4	2.8	3.9

Precision Grade-Cast Iron Base	PCR43-25	PCR43-50	PCR43-100
Travel (mm)	25	50	100
Positional Accuracy (microns) over Total Table Travel [2]	+/- 0.75	+/- 1	+/- 2
Positional Repeatability (bi-directional w/ACS) [2]	+/- 0.125	+/- 0.125	+/- 0.125
Positional Repeatability (bi-directional without ACS) [3]	+/- 0.05	+/- 0.05	+/- 0.05
Pitch Angular Error	5	6	7
Yaw Angular Error	4	5	6
Straight-line Accuracy(microns) over Total Table Travel [2]	+/- 0.5	+/- 1.0	+/- 1.5
Flatness Accuracy (microns) over Total Table Travel [2]	+/- 0.5	+/- 1.0	+/- 1.5
Max Speed (mm/s) [1]	200	200	200
Direct Loading Capacity (kg)	10	10	10
Continuous Thrust (w/o air cooling) (N)	14	14	14
Peak Thrust (N)	41	41	41
Minimum Resolution (nanometers)	10	10	10
Pitch Moment Capacity (N-m)	3.7	3.7	3.7
Roll Moment Capacity (N-m)	4.8	4.8	4.8
Yaw Moment Capacity (N-m)	4.2	4.2	4.2
Carriage Mass (kg)	2.4	3.0	4.0
Stage Weight (kg)	4.8	5.6	7.8

[1]Maximum Obtainable Speed is Load and Move Profile Dependant [2]Measured 50mm above center of carriage [2]10 or 20 nanometer resolution

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TECHNICAL DATA

Linear Motor Specifications	D3 MOTOR	D4 MOTOR
Continuous Force (N) [1]	14	27.1
Continuous Current (Amps)	2.1	2.1
Peak Force (N) [2]	41.4	81.5
Peak Current (Amps)	6.3	6.3
Force Constant (N/amp)	6.7	12.9
Back EMF Constant (V/m/sec)	6.7	12.9
Resistance (ohms) [3]	3.2	6.4
Inductance (mH)	15.9	4
Magnetic Pitch (mm)	60.96	60.96
Thermal Resistance (W/C)	0.2	0.39

Stage Information	PCR43-D3	PCR43-D4
Maximum Acceleration (G's) (unloaded)	0.5	0.5
Max Breakaway Force (N)	0.5	0.5
Max Running Force (N)	0.4	0.4
Maximum Motor Bus Voltage (VDC)	90	90
Length of stage cable (mm)	450	450
Life at Listed Specifications x 50 km	100	100

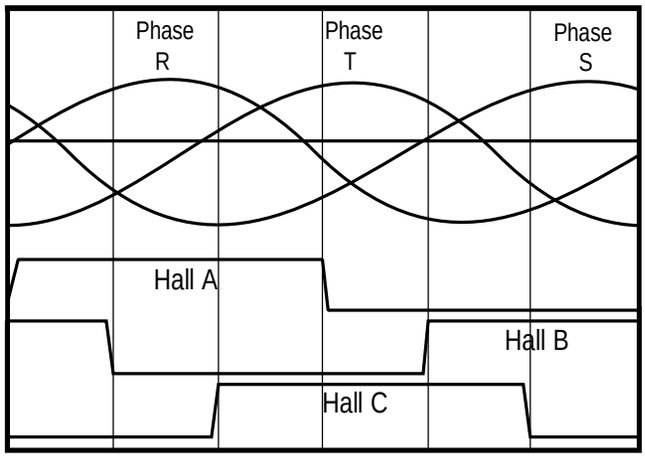
Encoder Specifications	SPECIFICATION
Input Power (ma)	5 VDC +/- 5%, 150ma
Output	Square wave differential line driver
Reference (Z channel)	Synchronized pulse, duration equal to one resolution bit
Maximum Speed (m/s) [4]	40 nm resolution = 0.2 20 nm resolution = 0.2 10 nm resolution = 0.1

Limit & Home Specifications	SPECIFICATION
Input Power	+12 to +24 VDC, 50ma
Output [5]	NC Current Sinking, Sink current maximum of 100ma

Hall Effect Specifications	SPECIFICATION
Input Power	+5 to +12 VDC, 30ma
Output	Open collector, Current sinking, 20ma Max

Pnuematic Assist	SPECIFICATION
Air Pressure	up to 80 PSI
Holding Force	4.5 kg

Commutation Chart



[1] Thrust w/o air cooling [2] At 10% duty cycle [3] At 20 Degrees C
[4] Controller limitations can affect top speed [5] Home located in center of travel

PCR 43

CONNECTOR PINOUTS

Servo Axis connector for tables that include Frameless or Linear motors.
Connector on stage: FCI (Burndy) Male, circular connector, 28 contacts, size 20 shell Pin-out

PIN	FUNCTION
A	Motor R
B	Motor S
C	Motor T
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

PIN	FUNCTION
R	NC
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

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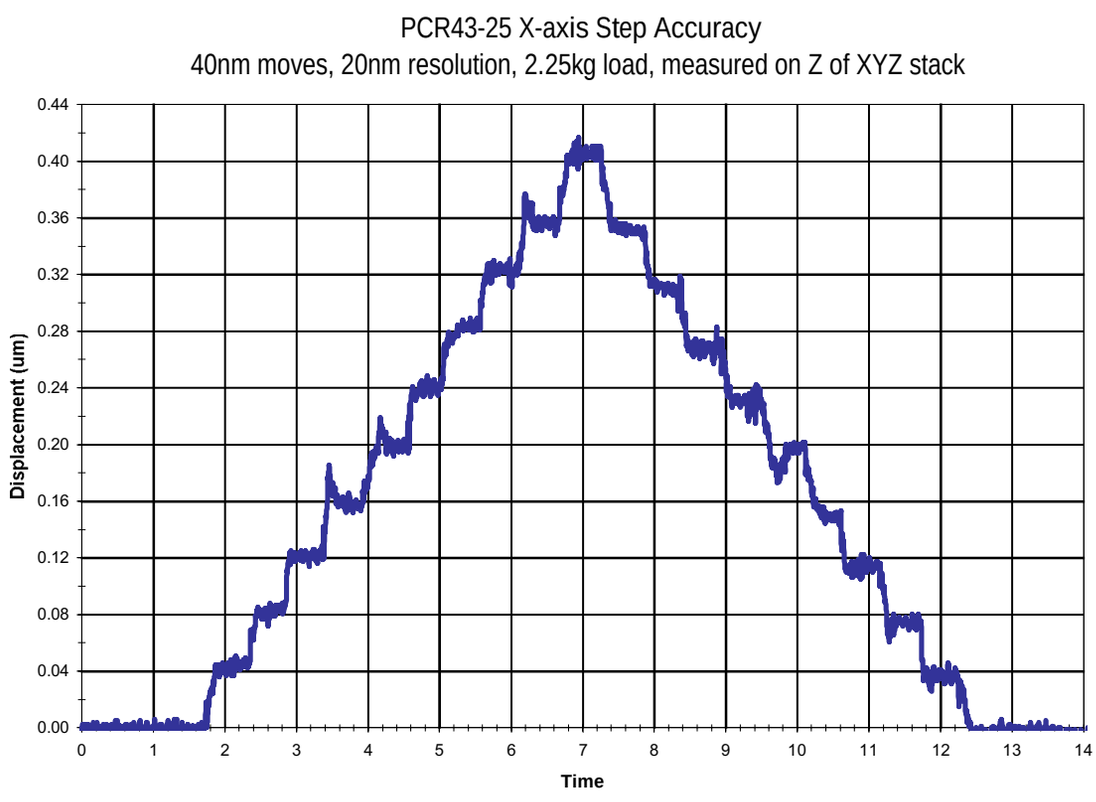
PCR43 XY STACK

PCR 43

STEP ACCURACY LASER PLOT



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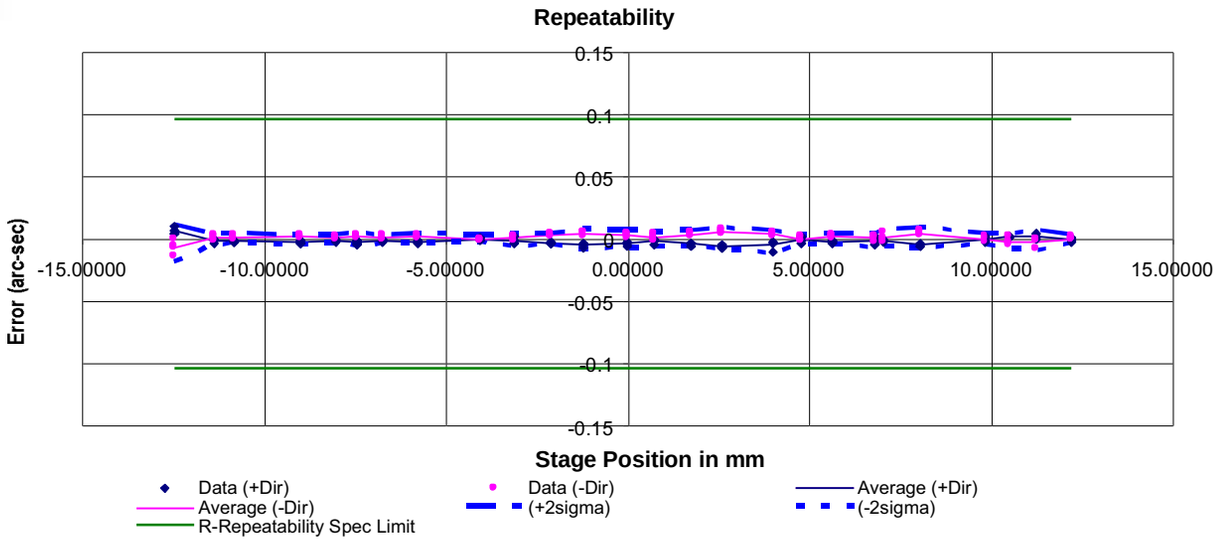
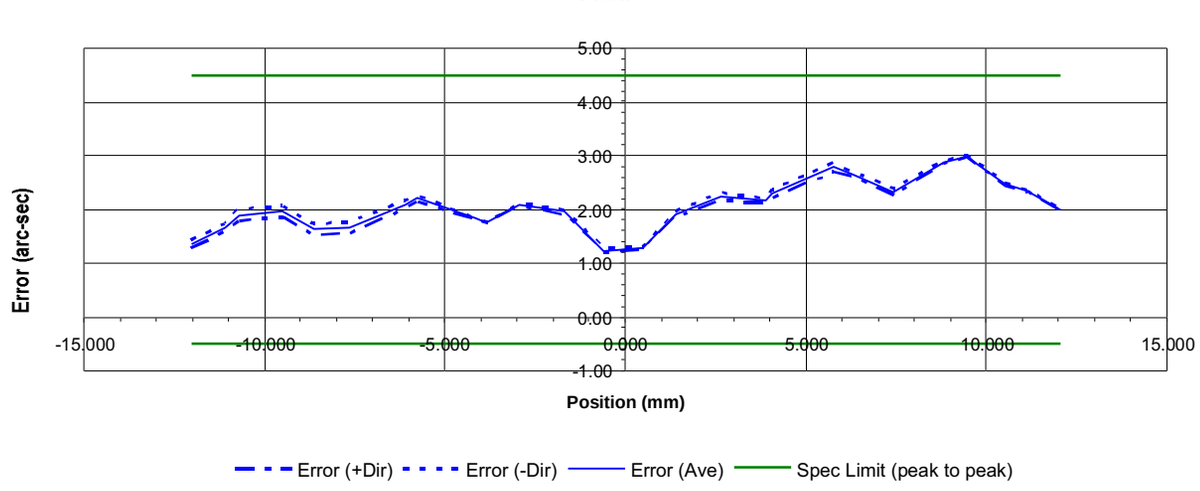
SAMPLE LASER INTERFEROMETER TEST PLOTS



Model No.	PCR43-025		
Date	19-Sept-01	Time	4:46 PM
File Name	1013DspM.xls		
Location	On axis, 50mm above riser		
Serial No.	1013		
Comment			

Test Conditions		
Air temperature sensor (degC)	21.0	
Air pressure (mm Hg)	756.2	
Relative Humidy (%)	47	
Encoder Res. (microns/count)	0.01	
Results	Actual	Spec
R - BiDirectional Repeatability	0.03	0.1 (+/-0.05)



Model No.	PCR43-025		
Date	21-Sept-01	Time	11:23 AM
File Name	1014PitS.xls		
Location	On axis, 50mm above riser		
Serial No.	1014		
Comment			

Test Conditions		
Air temperature sensor (degC)	21.0	
Air pressure (mm Hg)	757.7	
Relative Humidy (%)	51	
Results	Actual	Spec
Peak to Peak Error (microns)	1.79	5.00 (+/-2.50)

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ACCESSORIES AND OPTIONS

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 Zygo™ 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.

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 PCR43 makes it operate very clean, and we use clean room rated lubrication for all bearing components.

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.

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.

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.

PCR43 XYZ Stack with Prima-Flex™ Cable Management

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ORDERING INFORMATION MATRIX

OPTIONS:

SAMPLE PART NUMBER:

PCR	43	AL	0100	P	D3	H1	L1	E7	B1	P1	X0

Model Series
Cross Roller Bearings ..... PCR

Table Height
43 mm 43

Base Material
Cast Iron[1] ..... CI Aluminum ..... AL

Table Travel
25 mm 0025
50 mm 0050
100 mm 0100

Bearings
Standard Cross Roller C
Anti-Cage Creep Cross Roller ..... A

Drivetrain
Linear Motor - 1 Stack D3
Linear Motor - 2 Stack[2] D4

Home Sensor
N.C. Current Sinking ..... H1 N.O. Current Sinking H2

Travel Limits
N.C. Current Sinking ..... L1 N.O. Current Sinking L2

Encoder
Linear Encoder –10 nanometer E6
Linear Encoder –20 nanometer E7
Linear Encoder –40 nanometer E8

Pneumatic Counterbalance
No Counterbalance ..... B1 With Counterbalance[3] B2

Protection Level
Level 1 - No Belts P1
Level 4 - Class 10 Cleanroom P4

Multi-Axis Stacking
Single axis - no cable management X0
X axis (with multi-axis cable management) X1
Y axis (with multi-axis cable management) X2
Z axis (with multi-axis cable management) X3

[1] Allow Longer Delivery Time [2] Reduces Travel [3] Includes Z bracket
*Not all configurations are valid. Consult factory for assistance.

Last Updated 12/20/02