CREATIVE
MOTION CONTROL

CPD Actuators

Powerful, Maintenance-Free Roller Screw Actuators
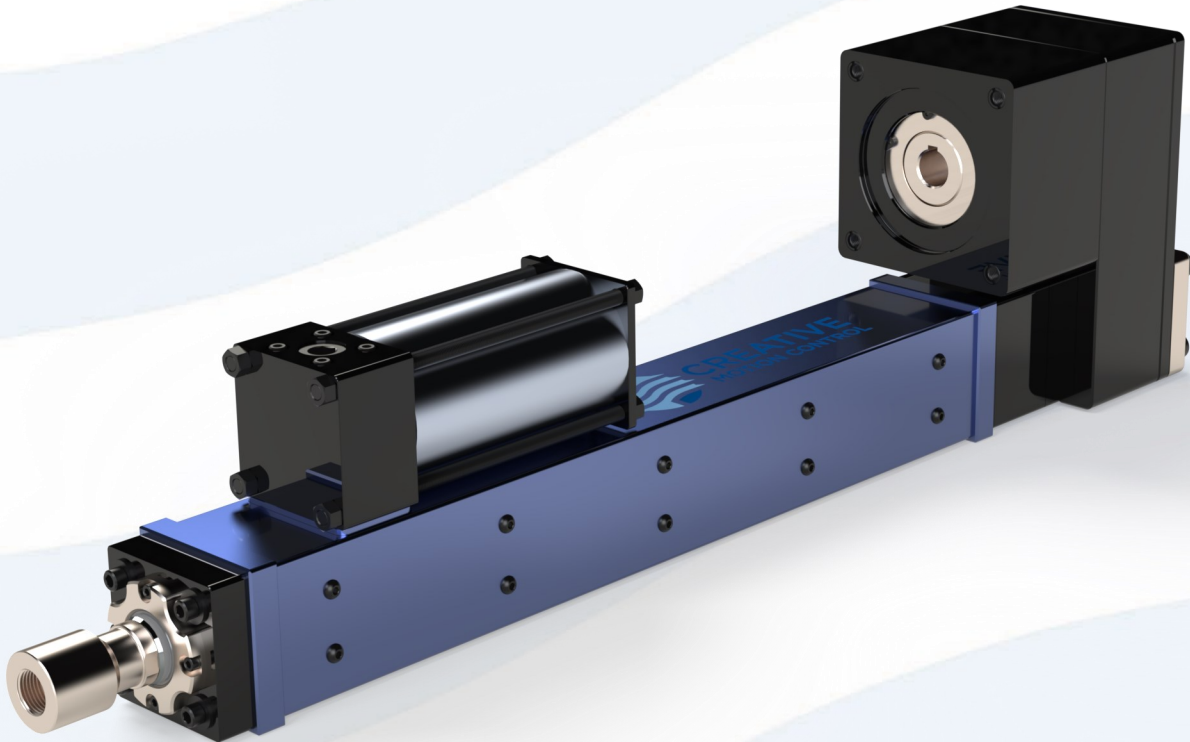
COMPATIBLE WITH VIRTUALLY ANY SERVO OR STEPPER MOTOR

CREATIVE SOLUTIONS TO AUTOMATION'S MOST DEMANDING CHALLENGES

CMC Roller Screw Actuators

CREATIVE MOTION CONTROL

The CPD Series Advantage

Maintenance Free

Oil lubrication is the optimal lubrication methodology for roller screws. Therefore CPD actuators are completely oil filled. ***Due to CMC's unique oil lubrication system, the CPD Series is maintenance-free for the life of the unit for most applications.*** Note that the oil reservoir is generally not required for horizontal applications.

Super Heavy Duty Construction

Due to the significant operating dynamic **and static** load capabilities of CPD actuators, CMC's actuators were designed to withstand extreme loads, ensuring years of trouble-free operation.

Motor Mount Isolation

In an effort to eliminate undue wear on motors and motor bearings, CMC's unique motor mount design isolates the motor from potential side loads and avoids any resulting premature motor wear or motor bearing failures that are common with belt driven systems.

Internal Anti-Rotation

CPD actuators come standard with a robust internal anti-rotation system, so you are free to design for your application without the concerns of external anti-rotation features.

Absolute Positioning

CMC actuators are available with magnetostrictive absolute position feedback sensors with easy system integration via a range of interfaces – e.g. IO-Link, Profinet, EtherCAT, SSI and analog.

Limit Switches

Any CPD actuator can be shipped with optional end of travel magnetic field limit switches.

Made in the U.S. by Creative Motion Control

CPD actuators are completely designed and manufactured by CMC in the United States.

Environmentally Friendly

Due to dramatically reduced power consumption, the low operating costs of CPD actuators win the TCO battle over fluid power options hands down.

Integrated Internal Load Cell

Any CPD actuator can be shipped with an optional load cell built right into the internal load path of the unit.

IP65 Compliant

O-Rings and elastomeric seals throughout provide the confidence that your asset is protected from dust, debris and moisture in your operating environment.

CPD Series Actuators

CREATIVE
MOTION CONTROL

Performance Overview

Model	CPD-250	CPD-350	CPD-450	CPD-600	CPD-800
Frame Size (inches)	2.5	3.5	4.5	6	7
Max Continuous Dynamic Force (lbf)	6,750	14,220	30,600	54,000	95,000
Max Continuous Dynamic Force (kN)	30	63	136	240	423
Maximum Linear Speed (in/sec)	40	39	39	37	38
Maximum Linear Speed (mm/sec)	1016	991	991	940	965
Minimum Standard Stroke (in)	4	4	4	4	4
Maximum Standard Stroke (in)	24	36	48	48	48

NOTE: These values are the performance characteristics of the actuator itself, unrelated to limitations imposed by any specific motor.
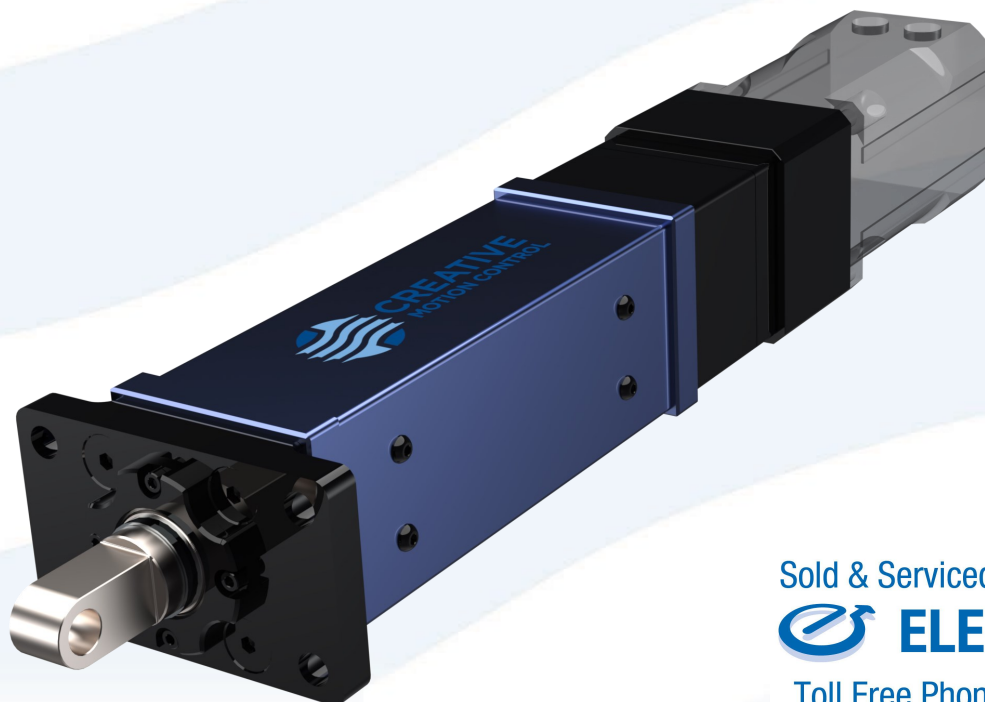
Superior Performance

CPD Series' Unmatched Performance Advantages

Why are CPD Series actuators rated so much higher in max continuous dynamic force and max static force? First and foremost, because **CMC's patented Grooved Roller Bearing (GRB™) technology** enables dramatically higher loads, higher speeds and longer life in a much smaller package. The GRBs in CMC's actuators match the dynamic and static load capacities of the roller screws. A traditional bearing would be much too large to fit into the limited physical space of the actuator body to match the roller screw's capabilities.

CMC Patented
Grooved Roller
Thrust Bearing

CMC Planetary
Roller Screw
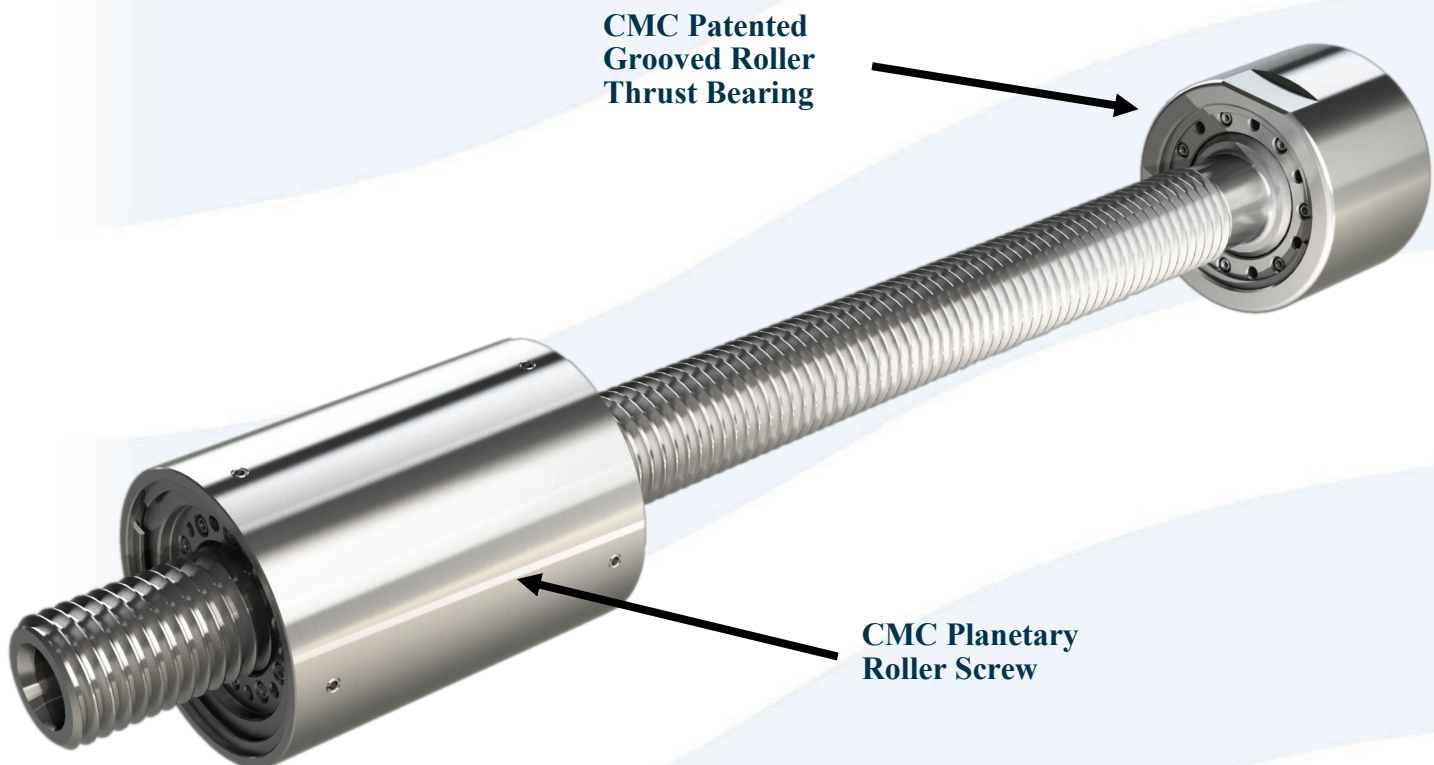
See CMC's Roller Screw and Grooved Roller Bearing catalogs for more detailed roller screw and bearing technical information.

CMC Actuator Main Components

CMC Roller Screw

Taking full advantage of CMC's years of designing, testing and producing hundreds of different configurations of high performance roller screws, the CPD series includes the latest in high performance roller screw technology.

CMC Extreme Force Grooved Roller Bearing™ (GRB™)

Born from CMC's roller screw technology, the patented Grooved Roller Bearing has unequaled force density and is matched with the roller screw's load capacity to meet or exceed the load/life capability of the roller screw. The GRB enables the entire actuator to have more force capability and longer life in a smaller package.

CMC Planetary Gearbox

CMC's internally designed and manufactured planetary gearbox provides several alternatives for design engineers to achieve the optimal mix of speed and load for any application. This proprietary design provides the user with flexibility while decreasing the number of different manufacturing configurations.

Mechanical Specifications

CREATIVE MOTION CONTROL
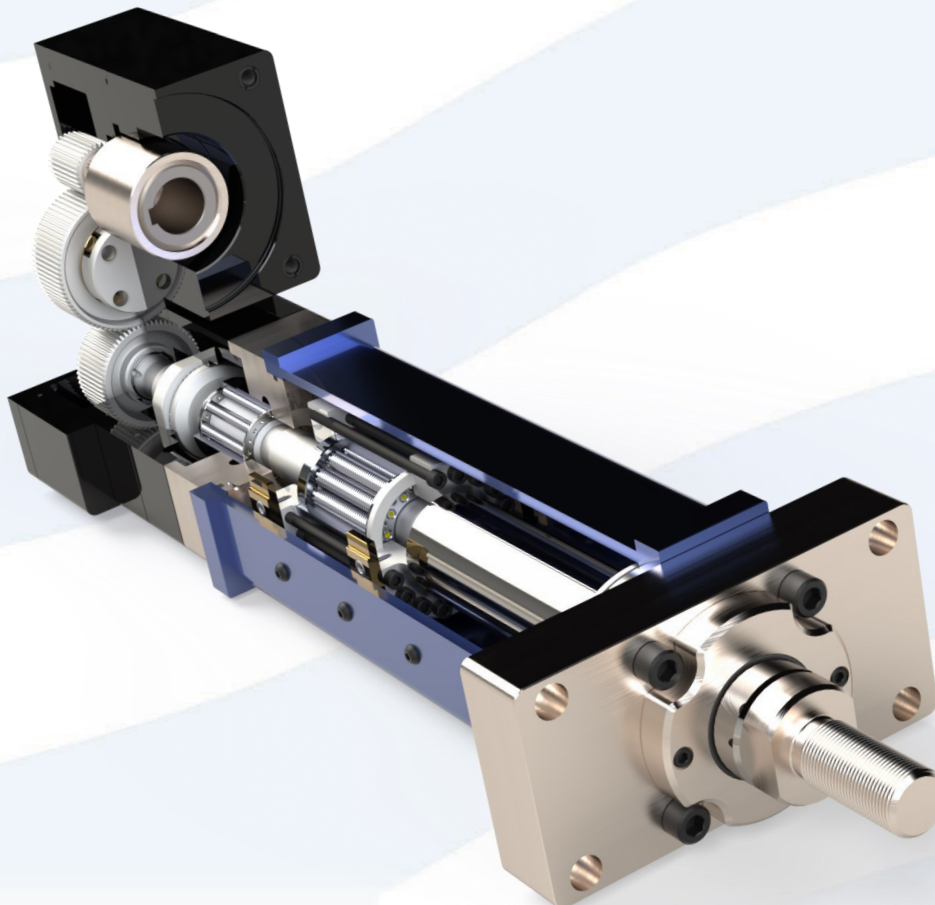
CPD-250

CPD-250 Mechanical Specifications	Units	Performance Configuration		
		Low Speed 5.4:1	Medium Speed 2.125:1	High Speed .656:1
Frame Size	in	2.5		
Standard Stroke Lengths (Custom Lengths Available)	in	4" - 24"		
Maximum Allowable Continuous Dynamic Force	lbf	6,750		
	kN	30		
Maximum Allowable Static Force	lbf	14,400		
	kN	64.1		
Maximum Allowable Input Torque	in-lbf	96	216	696
	N-m	10.8	24.4	78.6
Limiting Input Speed	RPM	46,667	19,833	6,123
Standard Operating Temperature Range	F	-15° to 165°		
	C	-26° to 74°		
Roller Screw Lead	mm	10		
Maximum Actuator Backlash	in	0.002		
Efficiency	%	85.7%	88.3%	88.3%
Repeatability	in	0.0008		
Gear Ratio		5.4:1	2.125:1	.656:1

Note: Information in this catalog is intended for marketing purposes. Any inaccuracies are unintentional and information is subject to change without notice.

CREATIVE SOLUTIONS TO AUTOMATION'S MOST DEMANDING CHALLENGES

Mechanical Specifications

CPD-250 Reflective Inertia

CPD-250 Reflective Inertias			Low Speed	Medium Speed	Low Load
Parallel Motor Mount	J_1 [5]	slug-ft^2	5.371E-04	2.157E-04	2.854E-04
		kg-m^2	7.283E-04	2.925E-04	3.870E-04
	J_2 [6,7]	slug-ft^2/in	1.451E-06	3.868E-07	4.127E-07
		kg-m^2/in	1.967E-06	5.244E-07	5.596E-07
[5]	J_1 = Fixed inertia of internal rotating components				
[6]	J_2 = Variable inertia of rotating components that are dependent on system stroke length				
[7]	$J_{TOTAL} = J_1 + L * J_2$				

CPD-250 System Weight

Basic Actuator Weight [4]				
Stroke Length		4 in	8 in	12 in
Oil Filled	lb	35.2	41.5	47.8
	kg	16.0	18.8	21.7
Dry	lb	28.8	35.1	41.4
	kg	13.1	15.9	18.8

Configuration Specific Weight Adjustments [4]															
Parallel Drive (Excluding Motor)		Front Flange		Rear Flange		Rear Clevis		Rear Eye		Angle Mounts		Trunnions		Dual Foot	
lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
6.7	3.0	1.6	0.7	4.4	2.0	4.8	2.2	5.0	2.3	n/a	n/a	4.3	2.0	2.6	1.2

[4]	For complete configuration weight, add basic actuator weight to appropriate configuration specific weight adjustments. For example, 12" stroke oil filled system with trunnion mounts: *47.8 lb + 6.7 lb + 4.3 lb = 58.8 lb*

Mechanical Specifications

CREATIVE MOTION CONTROL

CPD-350

CPD-350 Mechanical Specifications	Performance Configuration			
	Units	**Low Speed 5.4:1**	**Medium Speed 2.125:1**	**High Speed .656:1**
Frame Size	in	3.5		
Standard Stroke Lengths (*Custom Lengths Available*)	in	4" - 36"		
Maximum Allowable Continuous Dynamic Force	lbf	14,220		
	kN	63.3		
Maximum Allowable Static Force	lbf	29,970		
	kN	133.3		
Maximum Allowable Input Torque	in-lbf	192	456	1464
	N-m	21.7	51.5	165.4
Limiting Input Speed	RPM	33,333	14,167	4,373
Standard Operating Temperature Range	F	-15° to 165°		
	C	-26.1° to 73.9°		
Roller Screw Lead	mm	10		
Maximum Actuator Backlash	in	0.002		
Efficiency	%	85.6%	88.2%	88.2%
Repeatability	in	0.0008		
Gear Ratio		5.4:1	2.125:1	.656:1

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CREATIVE SOLUTIONS TO AUTOMATION'S MOST DEMANDING CHALLENGES

Mechanical Specifications

CPD-350 Reflective Inertia

CPD-350 Reflective Inertias			Low Speed	Medium Speed	High Speed
Parallel Motor Mount	$J_1^{(5)}$	slug-ft^2	3.432E-03	1.822E-03	2.354E-03
		kg-m^2	4.654E-03	2.470E-03	3.192E-03
	$J_2^{(6,7)}$	slug-ft^2/in	1.941E-07	1.252E-06	9.415E-07
		kg-m^2/in	2.632E-07	1.697E-06	1.277E-06

(5)	J_1 = Fixed inertia of internal rotating components
(6)	J_2 = Variable inertia of rotating components that are dependent on system stroke length
(7)	$J_{TOTAL} = J_1 + L * J_2$

CPD-350 System Weight

Basic Actuator Weight (4)					
Stroke Length		4 in	8 in	12 in	18 in
Oil Filled	lb	49.3	58.1	66.9	75.7
	kg	22.4	26.4	30.3	34.4
Dry	lb	40.4	49.1	57.9	64.3
	kg	18.3	22.3	26.3	29.1

Configuration Specific Weight Adjustments (4)															
Parallel Drive (Excluding		Front Flange		Rear Flange		Rear Clevis		Rear Eye		Angle Mounts		Trunnions		Dual Foot	
lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
9.3	4.2	2.2	1.0	6.1	2.8	6.7	3.0	7.0	3.2	n/a	n/a	6.1	2.8	3.7	1.7

(4)	For complete configuration weight, add basic actuator weight to appropriate configuration specific weight adjustments. For example, 12" stroke oil filled system with parallel drive configuration and trunnion mounts: *66.9 lb + 9.3 lb + 6.1 lb = 82.3 lb*

CREATIVE MOTION CONTROL

CPD-450

CPD-450 Mechanical Specifications		Performance Configuration		
	Units	Low Speed 5.4:1	Medium Speed 2.125:1	High Speed .656:1
Frame Size	in	4.5		
Standard Stroke Lengths (Custom Lengths Available)	in	4" - 48"		
Maximum Allowable Continuous Dynamic Force	lbf	30,600		
	kN	136.1		
Maximum Allowable Static Force	lbf	64,530		
	kN	287		
Maximum Allowable Input Torque	in-lbf	504	1176	3804
	N-m	56.9	132.9	429.8
Limiting Input Speed	RPM	23,333	9,917	3,061
Standard Operating Temperature Range	F	-15° to 165°		
	C	-26.1° to 73.9°		
Roller Screw Lead	mm	12		
Maximum Actuator Backlash	in	0.002		
Efficiency	%	85.2%	87.8%	87.8%
Repeatability	in	0.0008		
Gear Ratio		5.4:1	2.125:1	.656:1

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CREATIVE SOLUTIONS TO AUTOMATION'S MOST DEMANDING CHALLENGES

Mechanical Specifications

CPD-450 Reflective Inertia

CPD -450 Reflective Inertias			Low Speed	Medium Speed	High Speed
Parallel Motor Mount	$J_1^{(5)}$	slug-ft^2	9.372E-03	3.818E-03	4.159E-03
		kg-m^2	1.271E-02	5.177E-03	5.638E-03
	$J_2^{(6,7)}$	slug-ft^2/in	3.815E-05	4.010E-06	1.097E-05
		kg-m^2/in	5.172E-05	5.437E-06	1.488E-05
(5)		J_1 = Fixed inertia of internal rotating components			
(6)		J_2 = Variable inertia of rotating components that are dependent on system stroke length			
(7)		$J_{TOTAL} = J_1 + L * J_2$			

CPD-450 System Weight

Basic Actuator Weight [4]					
Stroke Length		6 in	12 in	18 in	24 in
Oil Filled	lb	74.7	86.0	97.4	108.8
	kg	33.9	39.0	44.2	49.3
Dry	lb	66.4	74.5	82.6	90.8
	kg	30.1	33.8	37.5	41.2

Configuration Specific Weight Adjustments [4]															
Parallel Drive (Excluding Motor)		Front Flange		Rear Flange		Rear Clevis		Rear Eye		Angle Mounts		Trunnions		Dual Foot	
lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
12.0	5.5	2.8	1.3	7.9	3.6	8.6	3.9	9.0	4.1	n/a	n/a	7.8	3.5	4.7	2.1
(4)		For complete configuration weight, add basic actuator weight to appropriate configuration specific weight adjustments. For example, 12" stroke oil filled system with parallel drive configuration and trunnion mounts: *86.0 lb + 12.0 lb + 7.8 lb = 105.8 lb*													

Mechanical Specifications

CREATIVE MOTION CONTROL

CPD-600

CPD-600 Mechanical Specifications		Performance Configuration		
	Units	Low Speed 5.4:1	Medium Speed 2.125:1	High Speed .656:1
Frame Size	in	6.0		
Standard Stroke Lengths (Custom Lengths Available)	in	4" - 48"		
Maximum Allowable Continuous Dynamic Force	lbf	54,000		
	kN	240.2		
Maximum Allowable Static Force	lbf	114,300		
	kN	508.4		
Maximum Allowable Input Torque	in-lbf	1320	3120	10092
	N-m	149.1	352.5	1140.2
Limiting Input Speed	RPM	14,583	6,198	1,913
Standard Operating Temperature Range	F	-15° to 165°		
	C	-26.1° to 73.9°		
Roller Screw Lead	mm	18		
Maximum Actuator Backlash	in	0.0025		
Efficiency	%	85.0%	87.6%	87.6%
Repeatability	in	0.0008		
Gear Ratio		5.4:1	2.125:1	.656:1

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CREATIVE SOLUTIONS TO AUTOMATION'S MOST DEMANDING CHALLENGES

Mechanical Specifications

CPD-600 Reflective Inertia

CPD-600 Reflective Inertias			Low Speed	Medium Speed	High Speed
Parallel Motor Mount	$J_1^{(5)}$	slug-ft^2	6.372E-02	4.248E-02	7.586E-03
		kg-m^2	8.639E-02	5.760E-02	1.029E-02
	$J_2^{(6,7)}$	slug-ft^2/in	2.141E-04	1.833E-04	1.953E-04
		kg-m^2/in	2.903E-04	2.485E-04	2.648E-04

(5)	J_1 = Fixed inertia of internal rotating components
(6)	J_2 = Variable inertia of rotating components that are dependent on system stroke length
(7)	$J_{TOTAL} = J_1 + L * J_2$

CPD-600 System Weight

Basic Actuator Weight [4]						
Stroke Length		6 in	12 in	18 in	24 in	36 in
Oil Filled	lb	99.6	114.7	129.9	145.0	175.2
	kg	45.2	52.0	58.9	65.8	79.5
Dry	lb	88.6	99.3	110.1	121.0	151.1
	kg	40.2	45.1	50.0	54.9	68.6

Configuration Specific Weight Adjustments [4]															
Parallel Drive (Excluding		Front Flange		Rear Flange		Rear Clevis		Rear Eye		Angle Mounts		Trunnions		Dual Foot	
lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
16.0	7.3	3.7	1.7	10.5	4.8	11.5	5.2	12.0	5.4	n/a	n/a	10.4	4.7	6.3	2.8

(4)	For complete configuration weight, add basic actuator weight to appropriate configuration specific weight adjustments. For example, 12 " stroke oil filled system with parallel drive configuration and trunnion mounts: *114.7 lb + 16.0 lb + 10.4 lb = 141.1 lb*

Mechanical Specifications

CPD-800

CPD-700 Mechanical Specifications		Performance Configuration		
	Units	Low Speed 5.4:1	Medium Speed 2.125:1	High Speed
Frame Size	in	8.0		
Standard Stroke Lengths (Custom Lengths Available)	in	4" - 48"		
Maximum Allowable Continuous Dynamic Force	lbf	95,000		
	kN	422.6		
Maximum Allowable Static Force	lbf	199,750		
	kN	888.5		
Maximum Allowable Input Torque	in-lbf	3228	7596	24600
	N-m	364.7	858.2	2779.4
Limiting Input Speed	RPM	11,667	4,958	1,531
Standard Operating Temperature Range	F	-15° to 165°		
	C	-26.1° to 73.9°		
Roller Screw Lead	mm	25		
Maximum Actuator Backlash	in	0.003		
Efficiency	%	85.2%	87.9%	87.9%
Repeatability	in	0.0008		
Gear Ratio		5.4:1	2.125:1	.656:1

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CREATIVE SOLUTIONS TO AUTOMATION'S MOST DEMANDING CHALLENGES

Mechanical Specifications

CPD-800 Reflective Inertia

CPD-700 Reflective Inertias			Low Speed	Medium Speed	High Speed
Parallel Motor Mount	$J_1^{(5)}$	slug-ft^2	6.585E-02	3.057E-02	4.887E-02
		kg-m^2	8.928E-02	4.144E-02	6.626E-02
	$J_2^{(6,7)}$	slug-ft^2/in	6.960E-04	4.490E-05	4.684E-04
		kg-m^2/in	9.437E-04	6.088E-05	6.351E-04
(5)		J_1 = Fixed inertia of internal rotating components			
(6)		J_2 = Variable inertia of rotating components that are dependent on system stroke length			
(7)		$J_{TOTAL} = J_1 + L * J_2$			

CPD-800 System Weight

Basic Actuator Weight [4]							
Stroke Length		6 in	12 in	18 in	24 in	36 in	48 in
Oil Filled	lb	116.2	133.8	151.5	169.2	204.4	239.5
	kg	52.7	60.7	68.7	76.8	92.7	108.6
Dry	lb	103.4	115.9	128.5	141.2	176.3	211.5
	kg	46.9	52.6	58.3	64.0	80.0	95.9

Configuration Specific Weight Adjustments [4]																
Parallel Drive (Excluding		Front Flange		Rear Flange		Rear Clevis		Rear Eye		Angle Mounts		Trunnions		Dual Foot	
lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
18.7	8.5	4.4	2.0	12.3	5.6	13.4	6.1	14.0	6.4	n/a	n/a	12.1	5.5	7.3	3.3
(4)	For complete configuration weight, add basic actuator weight to appropriate configuration specific weight adjustments. For example, 12 " stroke oil filled system with parallel drive configuration and trunnion mounts: *133.8 lb + 18.7 lb + 12.1 lb = 164.6 lb*														

Motor Selection

Notional Motor Selection Process

As a first step in selecting a motor for CMC's actuators we recommend that you do the following:

1: Find your maximum applied load in lbf

2: Choose an actuator size that has a dynamic load capacity in excess of the max application load (contact your CMC representative to help determine the correct actuator size based on your load/stroke profile, duty cycle and desired actuator life)

3: Find the maximum required torque of the system using the following equation:

$$Tsh = \frac{S * F}{2 * \pi * .9} \qquad\qquad Tm = \frac{Tsh}{Gr}$$

Where S = screw lead (in) of selected actuator

$\quad\quad F$ = maximum applied load (lbf)

$\quad\quad Gr$ = gear ratio of the selected actuator

$\quad\quad Tsh$ = shaft torque (in-lbf)

$\quad\quad Tm$ = motor torque (in-lbf)

4: Find the maximum required motor speed at the maximum load using the following equation:

$$\omega(rpm) = \frac{Ts * 60 * Gr}{S}$$

Where Ts = maximum linear travel speed $\left(\frac{in}{s}\right)$ at maximum applied load (F)

5: To calculate required power use the following equation:

$$Power\left(\frac{in - lbf}{min}\right) = \omega * Tm$$

To convert to Power in HP, change Tm to: $\left(\frac{T * .08333}{33,000}\right)$

NOTE: This process is solely intended to give you an idea of the max motor torque, speed and power required to move your maximum load at the required maximum linear speed. It does not account for acceleration or other critical considerations for finalizing a motor selection; this is intended to get you "in the right ballpark".

CREATIVE SOLUTIONS TO AUTOMATION'S MOST DEMANDING CHALLENGES

Base Actuator Dimensions
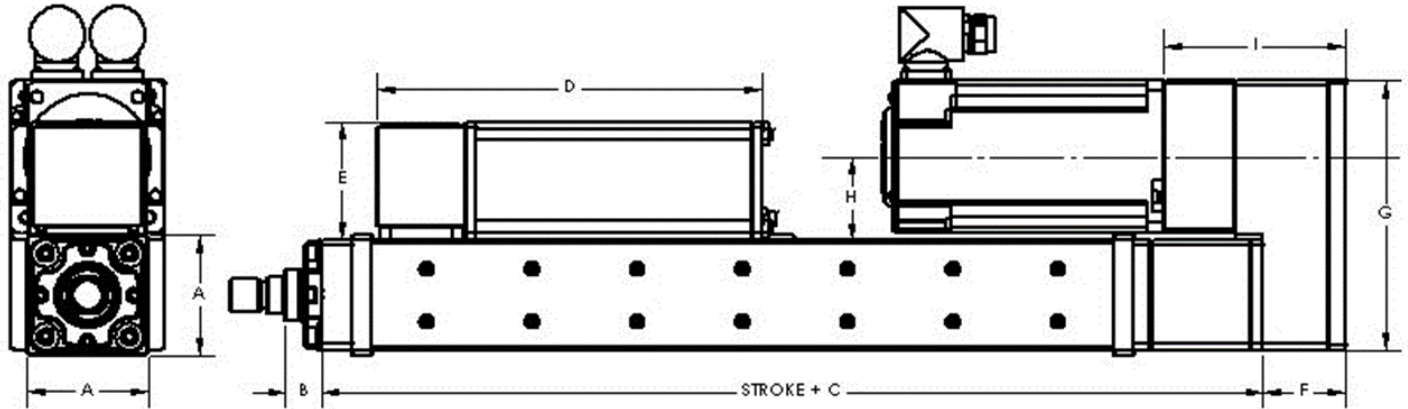
|		CPD-250	CPD-350	CPD-450	CPD-600	CPD-800
A	in	2.50	3.50	4.50	6.00	8.00
	mm	63.50	88.90	114.30	152.40	203.20
B	in	1.22	0.96	1.97	1.72	2.60
	mm	30.99	24.38	50.04	43.69	66.04
C	in	9.400	11.180	16.29	18.990	18.27
	mm	238.76	283.97	413.77	482.35	1327.53
D		Depends on stroke length and application configuration, contact CMC for customized sizing information.				
E	in	2.69	3.50	4.50	5.25	7.00
	mm	68.33	88.90	114.30	133.35	177.80
F	in	1.88	3.125	3.500	11.125	10.603
	mm	47.63	79.38	88.90	282.58	269.32
G	in	6.18	9.65	10.41	16.82	18.00
	mm	156.85	245.11	264.34	427.23	457.20
H	in	1.92	3.27	3.10	5.86	6.70
	mm	48.74	83.06	78.84	148.84	170.14
I	in	4.13	7.03	6.50	16.29	13.00
	mm	104.78	178.49	165.05	413.88	330.20

Mounting Options

Front Flange Mount
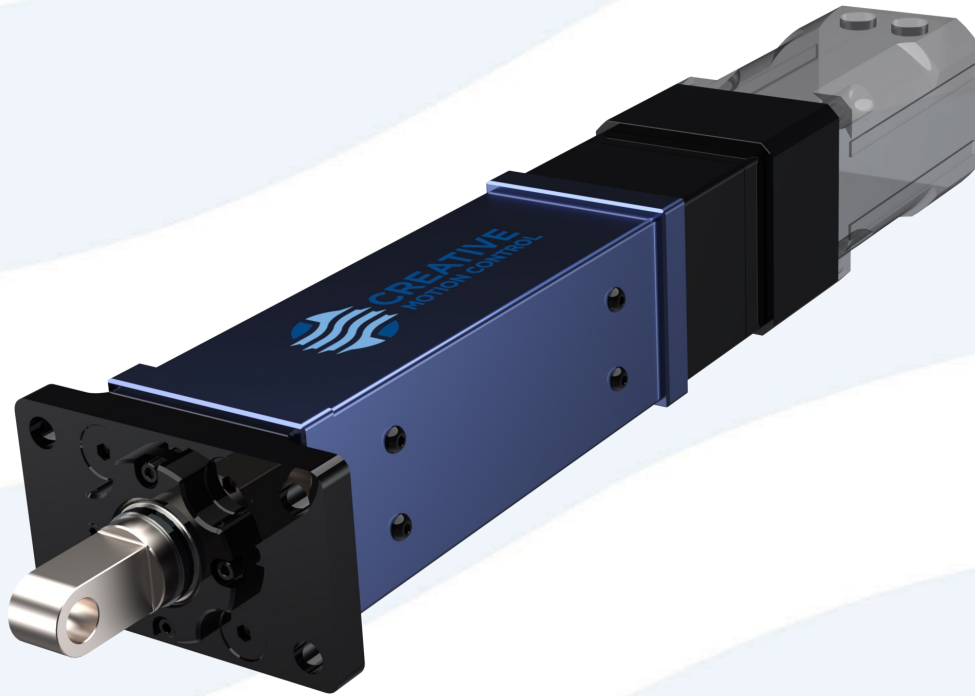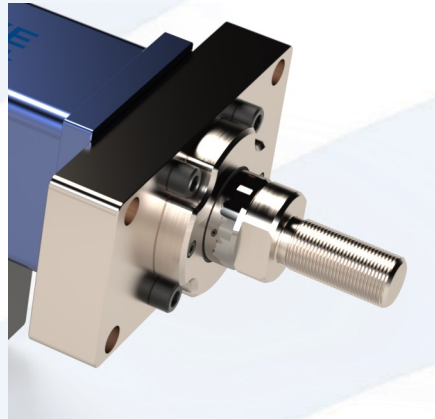

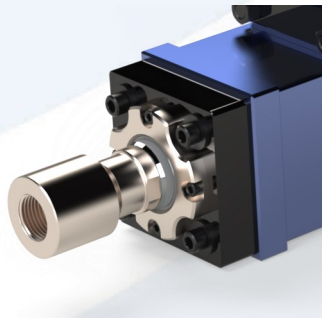## Rear Clevis Mount
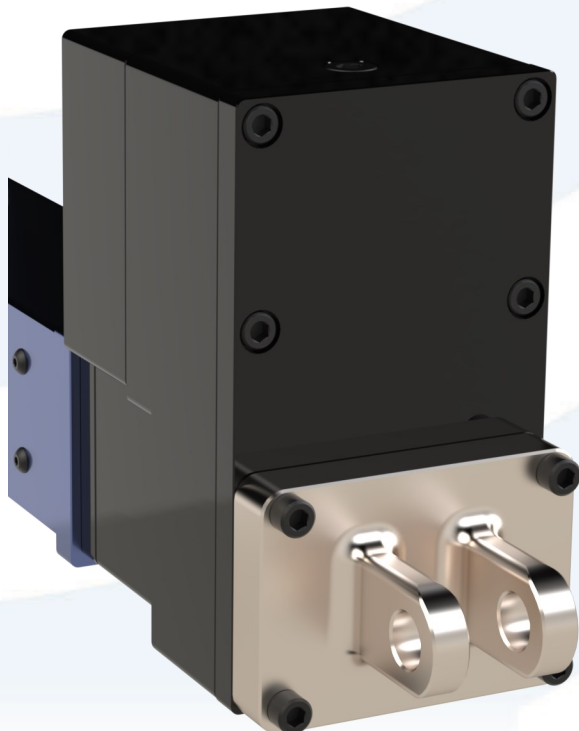
Foot Mount
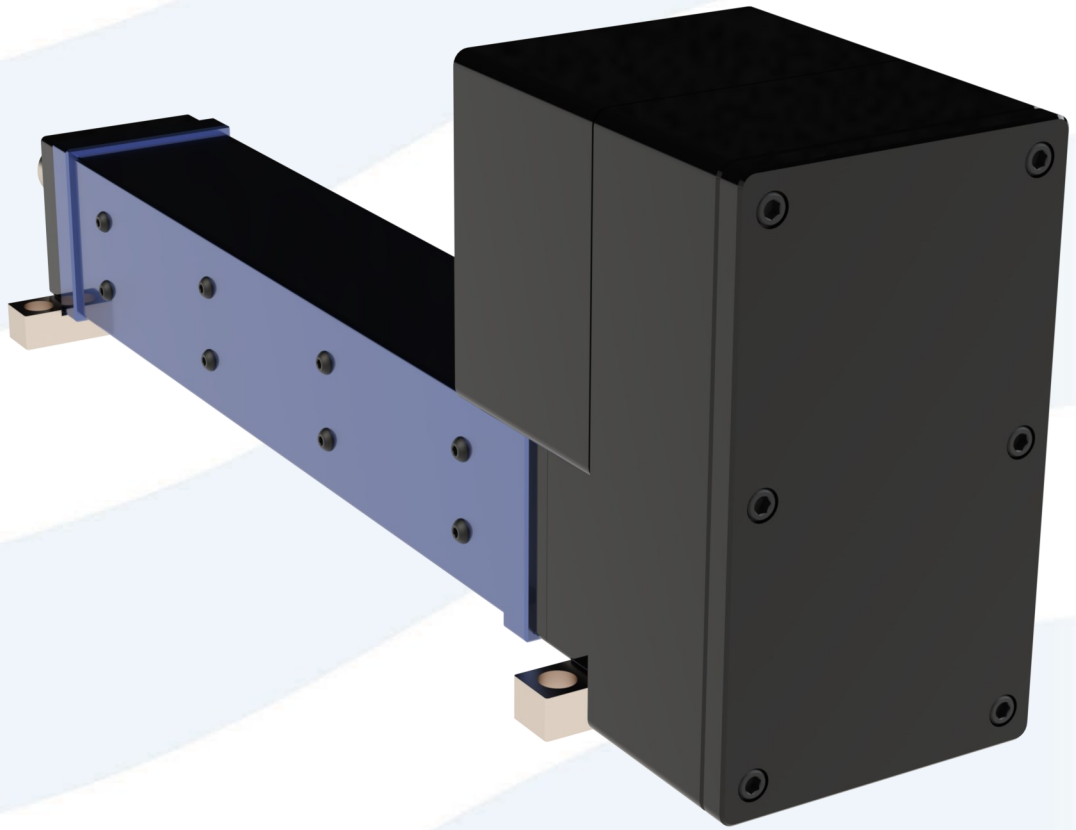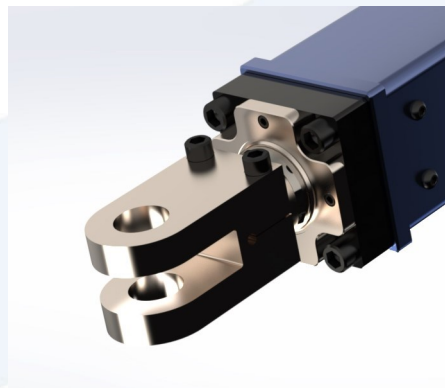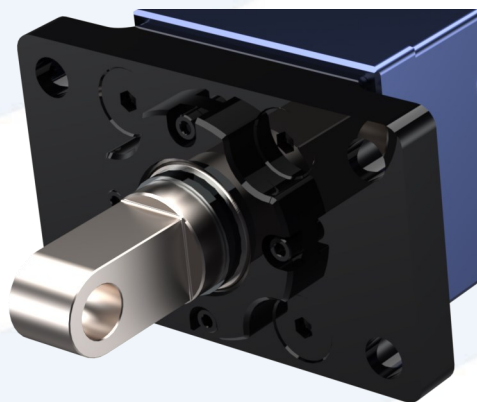
Rear Eye Mount
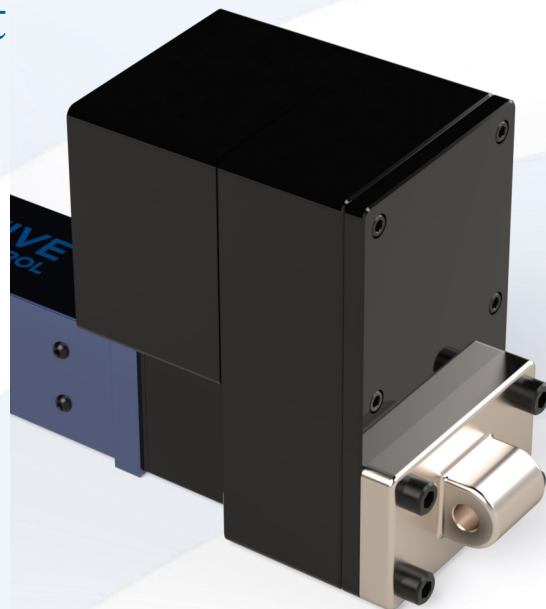
Rear Flange Mount

Side Trunnion Mount

Rod End Options
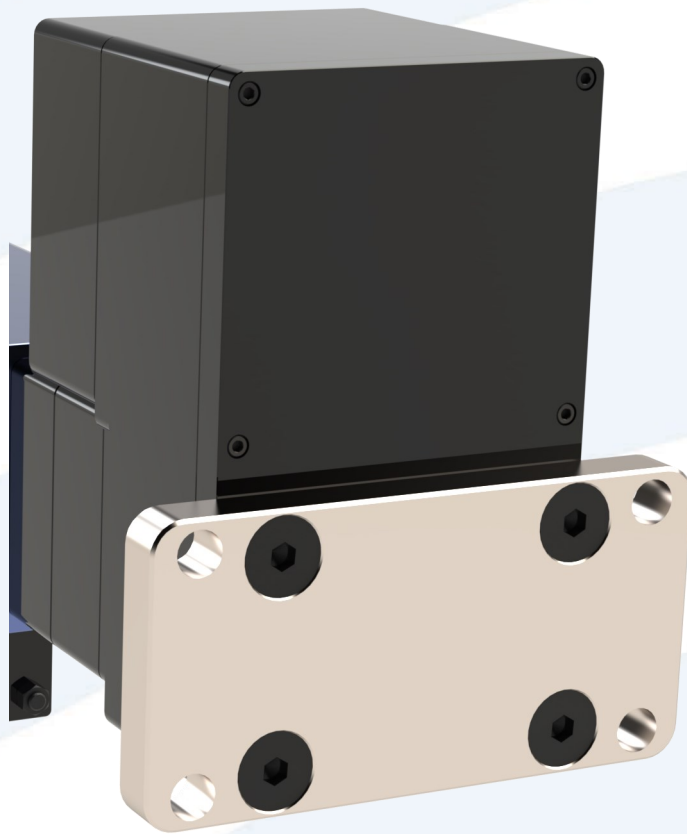
Male Thread Rod End

Female Thread Rod End

Clevis Rod End

Eye Rod End

Ordering Guidelines

CPD-AAA-BB-CC-DD-EE-FFF-G-H-I-J

AAA - Frame Size

250:	2.5"
350:	3.5"
450:	4.5"
600:	6.0"
700:	7.0"

BB - Stroke Length (inches)

CC - Performance Configuration

LS:	Low Speed (5.4:1)
MS:	Medium Speed (2.125:1)
HS:	High Speed (.656:1)
CUS:	Custom

DD - Mounting Style

RC:	Rear Clevis
FT:	Foot Mount
FF:	Front Flange
RF:	Rear Flange
RE:	Rear Eye
BF:	Front and Rear Flange
RE:	Rear Eye
TR:	Side Trunnion Mount
CUS:	Custom

EE - Integrated Load Cell

LC:	Included
XX:	None

FFF - Motor Mount

SPC:	Specify Make/Model
N23:	Nema 23
N34:	Nema 34
N42:	Nema 42
N56:	Nema 56

G - Rod End Configuration:

M:	Male US Thread
F:	Female US Thread
E:	Eye End Thread
C:	Clevis
CUS:	Custom

H - Absolute Positioning Option:

S:	Sensor
X:	None

I - Limit Switches:

O1:	one limit switch
O2:	two limit switches
X:	None

J - Motor Configuration

I:	In-line
P:	Parallel

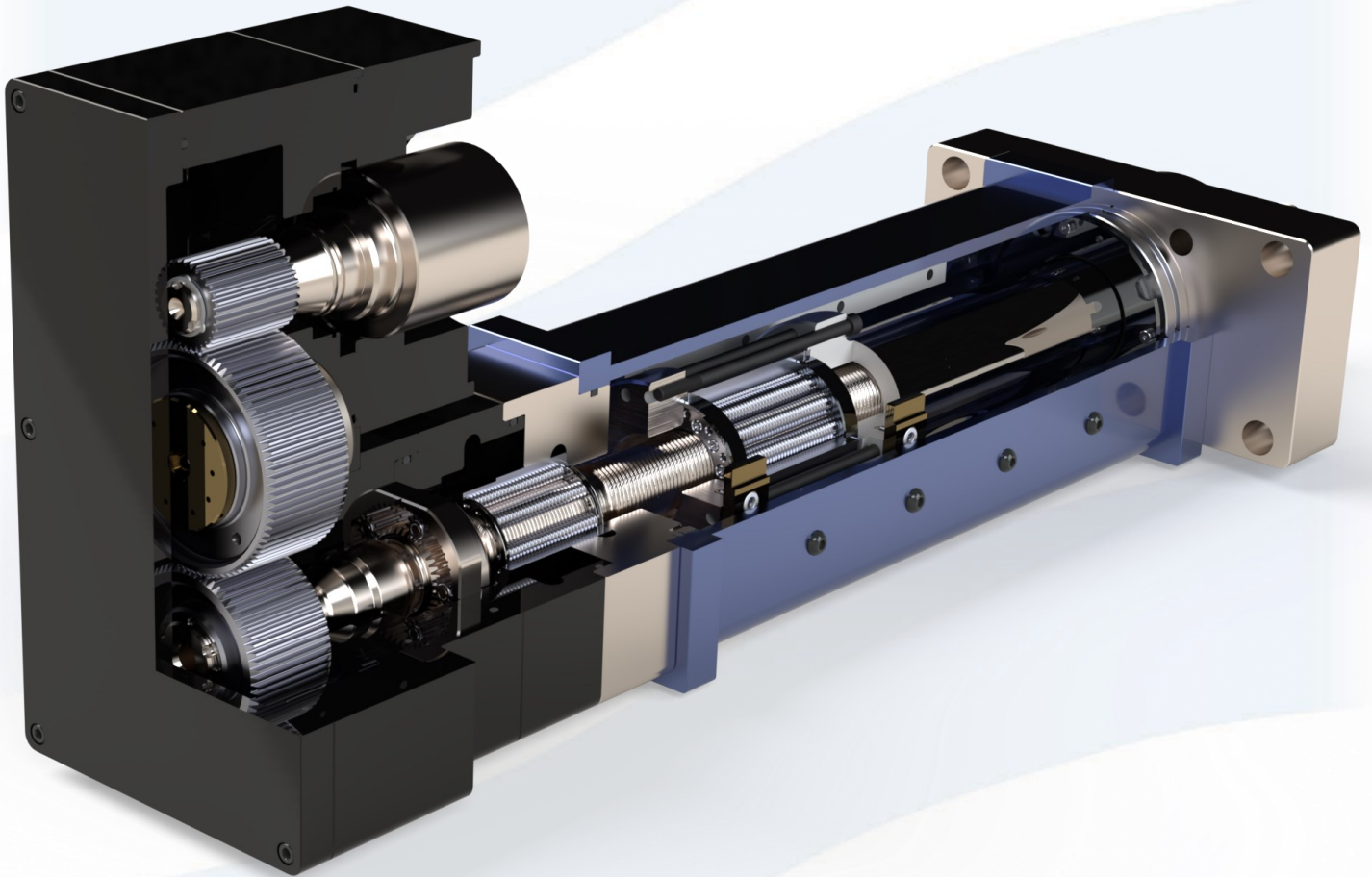*Example:* CPD-450, 12" stroke, low speed gearing, load cell, side trunnion mount, with a selected AB motor, male threaded rod end, no absolute pos, no limit switches, in a parallel motor configuration:

Order: **CPD-450-12-LS-LC-TR-SPC-M-X-X-P**