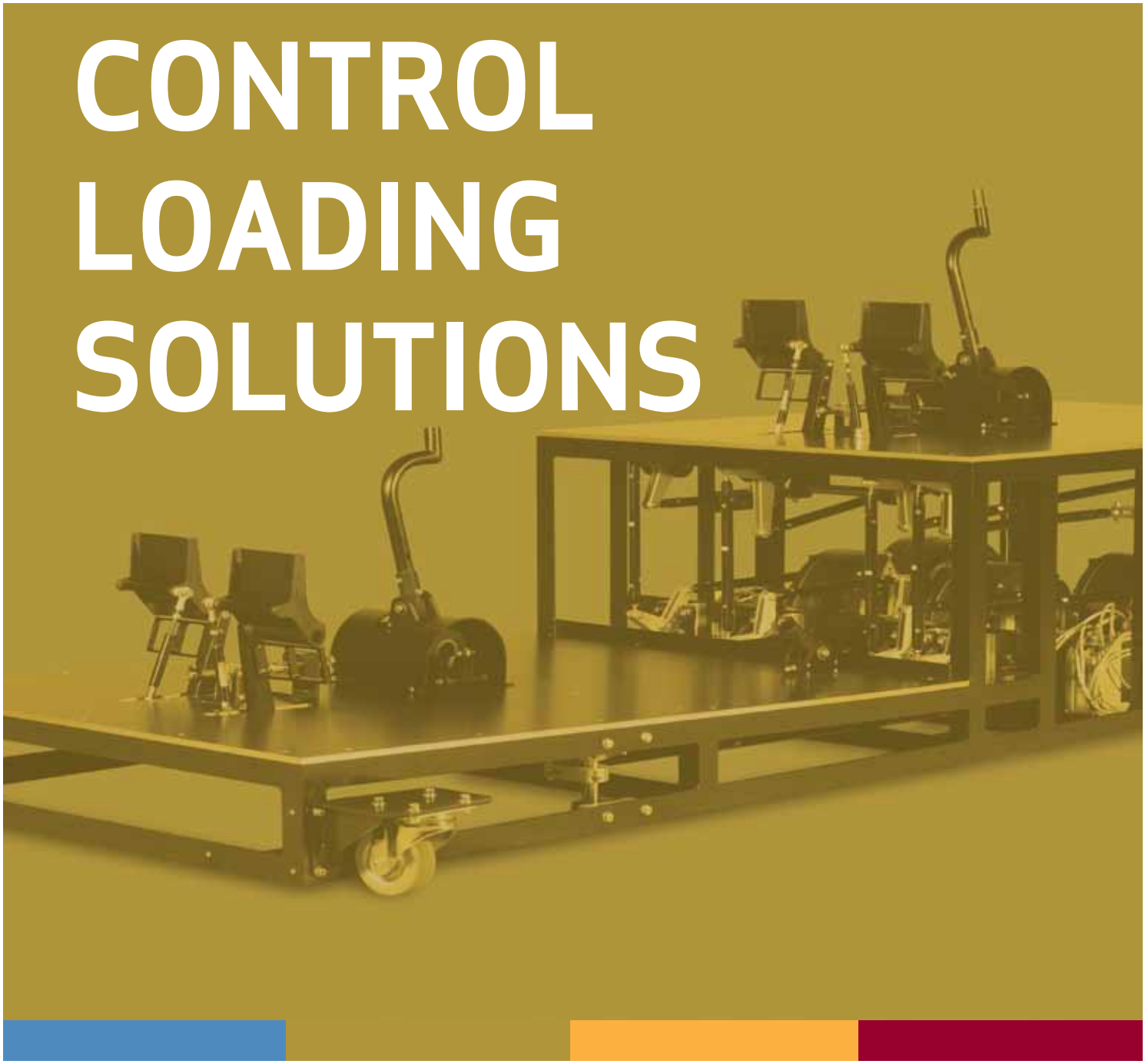
CONTROL LOADING SOLUTIONS



Rev. C, June 2016

A FULL RANGE OF CONTROL LOADING SOLUTIONS FOR FIXED AND ROTARY WING

WHAT MOVES YOUR WORLD·

MOOG

TAKE YOUR CONTROL LOADING SYSTEMS TO NEW HEIGHTS

With a few decades of experience and thousands of control loading channels in the field, Moog is the world leader in control loading systems for both military and commercial simulator programs for fixed and rotary wing aircraft.

Our unique model-follower force-loop technology forms the basis for all our control loading systems. Combined with highly responsive electric actuators and sophisticated software models, Moog control loading systems deliver an unsurpassed level of performance, fidelity and reliability.

ADVANTAGES

- Highest level of design flexibility and unique expertise, with proven reliability in critical loading applications around the world for flight simulation and other applications
- Turnkey control loading solutions are fully tailored to customer requirements. A typical set-up could include base frame, interconnecting linkages, replica controls and integration of control loading hardware and software
- Optimal solution for all control loading requirements, from basic flight training to high fidelity full flight simulation to the highest level of certification from the US Federal Aviation Administration (FAA), Joint Aviation Authority (JAA) or military equivalent
- All actuators are based on brushless permanent magnet servomotors and digital control electronics for smooth and dependable performance
- Provides a wide range of services including mechanical linkage design and manufacturing, software development, aircraft control response measurement, tuning and acceptance, installation support and training

ELECTRIC ROTARY CONTROL LOADERS HIGH DYNAMIC

These actuators are based on high torque servomotors in a direct-drive setup, capable of generating an output torque of up to 200 Nm (1,770 lb in) continuously. They are designed for primary controls with high fidelity requirements in applications related to high fidelity control force simulation. High dynamic is provided through high torque and velocity.

Model *	CL-R-E/HD/50Nm	CL-R-E/HD/100Nm	CL-R-E/HD/150Nm	CL-R-E/HD/200Nm
Continuous Output Torque	45 Nm (73.8 ft-lb)	100 Nm (885 lb in)	150 Nm (1,325 lb in)	200 Nm (1,770 lb in)
Output Torque < 30 sec	55 Nm (88.5 ft-lb)	120 Nm (1,050 lb in)	175 Nm (1,550 lb in)	250 Nm (2,210 lb in)
Output Torque Peak < 1 sec	80 Nm (177 ft-lb)	240 Nm (2,125 lb in)	300 Nm (2,650 lb in)	350 Nm (3,100 lb in)
Output Stroke	Multi-turn	+/- 45 °	+/- 45 °	+/- 45 °
Output Mechanical Interface	Flange with 6 holes for sprocket or lever	M8 rod-end	M8 rod-end	M8 rod-end
Maximum Velocity (1 x 208-230 VAC)	2,500 °/s	600 °/s	590 °/s	500 °/s
Maximum Velocity (3 x 400 VAC)	-	-	-	600 °/s
Weight	20 kg (44.1 lb)	28 kg (61.7 lb)	37 kg (81.6 lb)	42 kg (92.6 lb)
Dimensions of Motor (LxWxH)	263 x 232 x 241 mm (10.4 x 9.1 x 9.5 in)	341 x 332 x 223 mm (13.4 x 13.1 x 8.8 in)	341 x 332 x 248 mm (13.4 x 13.1 x 9.8 in)	341 x 332 x 273 mm (13.4 x 13.1 x 10.7 in)
Max. Power Consumption	1,000 Watt	1,000 Watt	1,150 Watt	1,500 Watt
Average Power Consumption	100 Watt	250 Watt	300 Watt	350 Watt
CE Approved	Yes	Yes	Yes	Yes
Operating Temperature	0 - 45 °C (273 - 318 K)	0 - 45 °C (273 - 318 K)	0 - 45 °C (273 - 318 K)	0 - 45 °C (273 - 318 K)
Storage Temperature	-25 - 70 °C (248 - 343 K)	-25 - 70 °C (248 - 343 K)	-25 - 70 °C (248 - 343 K)	-25 - 70 °C (248 - 343 K)
Humidity	<85% (operating); < 95% (storage) non-condensing	<85% (operating); < 95% (storage) non-condensing	<85% (operating); < 95% (storage) non-condensing	<85% (operating); < 95% (storage) non-condensing

ELECTRIC ROTARY CONTROL LOADERS MEDIUM DYNAMIC

These actuators comprise compact servomotor gearbox combinations capable of generating an output torque of up to 100 Nm (885 lb in) continuously. They are mainly used for secondary controls and medium fidelity primary controls in applications related to control force simulation. Medium dynamic is provided through medium torque and velocity.

Model	CL-R-E/MD/40Nm	CL-R-E/MD/100Nm
Continuous Output Torque	40 Nm (354 lb in)	100 Nm (885 lb in)
Output Torque < 30 sec	50 Nm (443 lb in)	120 Nm (1,062 lb in)
Output Torque Peak < 1 sec	80 Nm (708 lb in)	200 Nm (1,770 lb in)
Output Stroke	+/- 45 °	+/- 45 °
Maximum Velocity	300 °/s	300 °/s
Weight	7 kg (15.4 lb)	11 kg (24.3 lb)
Maximum Power Consumption	500 Watt	1,150 Watt
Average Power Consumption	125 Watt	250 Watt
Output Mechanical Interface	M6 rod-end	M8 rod-end
CE Approved	Yes	Yes
Dimension of Motor (LxWxH)	334 x 94 x 135 mm (13.1 x 3.7 x 5.3 in)	364 x 136 x 181mm (14.3 x 5.3 x 7.1 in)
Operating Temperature	0 - 45 °C (273 - 318 K)	0 - 45 °C (273 - 318 K)
Storage Temperature	-25 - 70 °C (248 - 343 K)	-25 - 70 °C (248 - 343 K)
Humidity	<85% (operating); < 95% (storage) non-condensing	<85% (operating); < 95% (storage) non-condensing

*) See page 5 for the explanation of the ordering code

This technical data is based on current available information and is subject to change at any time by Moog. Specifications for specific systems or applications may vary.

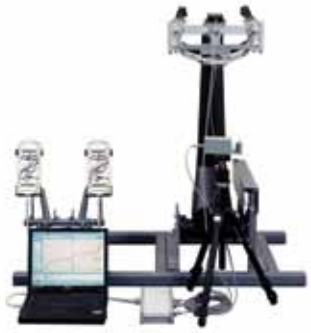
ELECTRIC LINEAR CONTROL LOADER

These actuators are compact with servo-ballscrew combinations capable of generating an output force of up to 2,400 N (539 lbf) continuously. Their primary use is for heavily loaded primary control force simulation. They are compact and provide high performance.

Model	CL-L-E/2.2kN
Stroke Length	127 mm (5.0 in)
Lubrication	Oil Lubrication-Lifetime Lubrication
Finish	Paint Flat Black
Position Feedback	Encoder (Absolute)
Static Design Load	4 kN (899 lbf)
Weight	13 kg (28.7 lb)
CE Approved	Yes
Actuator Continuous Force Capability	2.2 kN (495 lbf)
Actuator Peak Velocity Set by Controller	609 mm/s (24.0 in/s)
Actuator Screw Lead	20 mm/rev (0.79 in/rev)
Total Actuator Inertia	0,006 in-lb-s^2 (Rotor, Screw, Interface of Bearings, Nute, Keyways)
Actuator Design Life	Dynamic Load Rating of Screw 19.5 kN (4,383 lbf)
L_{10} Life	10.8 million m (426 million in) of Travel at 1.1 N (250 lbf) Cubic Mean Load

CONTROL FORCE MEASUREMENT SYSTEM (CFM)

The CFM facilitates accurate force-position measurements of aircraft flight controls for the development of type-specific software models and verification/validation of the flight control responses in simulators.



Key Features

- High precision force/position measurement
- Extensive data analysis
- Position or angle measurements by rate-gyro. In combination with the stringpot, cross coupling measurement is possible
- Pedal plates, with sensors for measuring of heel and toe forces

CONTROL LOADING SOFTWARE

All Moog control loading systems are delivered with a basic model, allowing the operator to use the system with limited parameters (spring, damping and friction).

The Moog generic model represents a typical flight control system and is suitable for medium fidelity training devices. This software is available for fixed wing or rotary wing aircraft simulation.

The Moog aircraft-specific model exactly replicates the controls of the simulated aircraft. This software model is used by customers to obtain the highest level of certification from the FAA, JAA or military equivalent.

Moog Explorer, supplied with each system, is a Graphical User Interface to monitor, control and diagnose all individual components of the control loading system.

ORDERING INFORMATION

Control Loader (CL)	Rotary or Linear (R or L)	Electric (E)	High Dynamic or Medium Dynamic (HD or MD)	Torque or Force (values as indicated in this brochure) ## Nm/kN

EXAMPLE

CL-R-E/HD/200Nm

TAKE A CLOSER LOOK

Control Loading Solutions from Moog are available around the world.
For more information, visit our web site or contact one of the locations below.

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Control Loading Solutions
Moog/Rev. C, June 2016, id. CDL48358-en