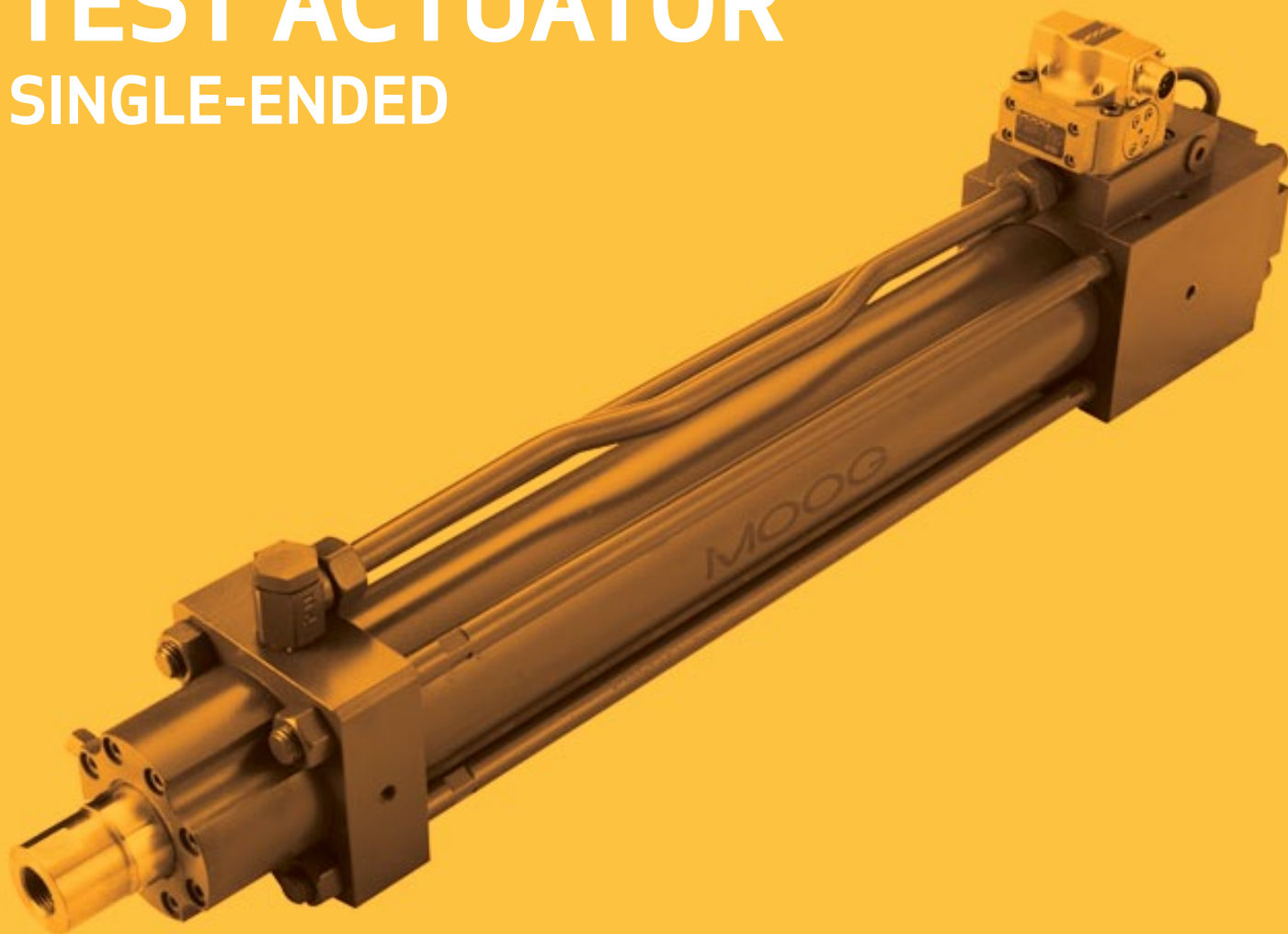


HYDRAULIC TEST ACTUATOR SINGLE-ENDED



Rev.A, August 2012

DELIVERING FLEXIBILITY AND
RELIABILITY FOR A RANGE OF SINGLE-
AND MULTIPLE-CHANNEL AEROSPACE
TEST SYSTEMS

Whenever the highest levels of motion control performance and design flexibility are required, you'll find Moog expertise at work. Through collaboration, creativity and world-class technological solutions, we help you overcome your toughest engineering obstacles. Enhance your machine's performance, achieve greater efficiencies and help take your thinking further than you ever thought possible.

INTRODUCTION

Overview.....3

TECHNICAL DATA

Specifications4

Dimensions.....6

Technical Features8

BACKGROUND

Moog Test Products9

Support and Spare Parts10

ORDERING INFORMATION

Ordering Code.....11



This catalog is for users with technical knowledge. To ensure that all necessary characteristics for function and safety of the system are given, the user has to check the suitability of the products described herein. The products described herein are subject to change without notice. In case of doubt, please contact Moog.

Moog is a registered trademark of Moog Inc. and its subsidiaries. All trademarks as indicated herein are the property of Moog Inc and its subsidiaries. For the full disclaimer refer to www.moog.com/literature/disclaimers.

For the most current information, visit www.moog.com/industrial or contact your local Moog office.

©Moog Inc. 2011. All rights reserved. All changes are reserved.

PRODUCT OVERVIEW

Actuators are at the heart of high performance test systems such as those used for aerospace structural testing. For years, test engineers have been looking for actuators that deliver dependability, less maintenance and high performance, yet are available at an affordable price. Their expectation has been to expedite tests to obtain accurate test results more efficiently. Test safety and protection have been the primary criteria when selecting actuators for large scale tests.

With deep roots in electro-hydraulic servo control expertise and global test experience, Moog has designed Servo Actuators for some of the world’s most demanding applications—from Primary Flight Control System Actuators to AGC Control Actuators used in a steel mill product line.

Today, Moog engineers have further developed a new series of Single-Ended Hydraulic Test Actuators to meet the critical test needs of aerospace test engineers around the world.

Features	Benefits
8 force rating: Tension force rated from 15 kN (3.3 kip) to 1,154 kN (259.4 kip) 6 stroke lengths: Stroke from 300 mm (12 in) to 4,000 mm (160 in) “Building-block” design and a variety of options	Wide array of sizes and flexibility
Safety-Abort Manifold as an option for large scale, multiple channel and synchronized aerospace testing Abort mechanism can be customized to suit differentsafety concepts and customers	Ultimate safety and protection for specimen and test
“Building Block” concept and Commercial-Off-The-Shelf (COTS) components	Economical solution for customers
High performance seals	Longer life and low friction
Robust and rigid servo valve, contactless linear position sensor and loadcell	High performance
Rod bearings and seals can be easily replaced without dismantling the actuator (for series C086-31 to C086-35)	Simple maintenance
High load capacity wear rings	Higher side load rating
Industry-leading Moog G761 and 72 Servo Valves	High performance servo control

Solutions Built Around You

Moog Single-Ended Hydraulic Test Actuator delivers higher reliability, less maintenance and cost-effective performance for test labs seeking the competitive edge.

To ensure high performance from design to delivery, Moog engineers use the latest tools such as Matlab® and Simulink® system modeling. A rigorous physical testing program ensures that our customers receive components that they can rely on for a trouble-free test process. The combination of innovative design, world-class manufacturing and responsive worldwide customer support makes Moog components the ideal solution for test labs that offer more reliability and the highest performance.

Typical Applications:

- Aerospace structural static and fatigue testing
- Civil engineering testing
- General industrial servo control applications



Iron Bird Test



Landing Gear Structural Test

SPECIFICATIONS

Single-Ended Actuator Product Range

Ordering Number	Construction Style	Rated Force @21Mpa		Rod Diameter	Bore Diameter	Stroke	Buckling Force Capacity (1)
		Tension	Compression				
		kN (kip)	kN (kip)				
C086-31	Tie Rod Type (See Figure 1)	15 (3.3)	41 (9.0)	40 (1.57)	50 (1.96)	300 (12) 500 (20) 750 (30) 1000 (40) 2000 (80) 4000 (160)	>41 (9.0) >41 (9.0) 32.7(7.2) 18.4 (4.0) 4.6 (1.0) 1.1 (0.3)
C086-32		32 (7.0)	65 (14.3)	45 (1.77)	63 (2.48)	300 (12) 500 (20) 750 (30) 1000 (40) 2000 (80) 4000 (160)	>65 (14.3) >65 (14.3) 52.5 (11.6) 29.5 (6.5) 7.4(1.6) 1.8 (0.4)
C086-33		64 (14.0)	105 (23.1)	50 (1.96)	80 (3.14)	300 (12) 500 (20) 750 (30) 1000 (40) 2000 (80) 4000 (160)	>105 (23.1) >105 (23.1) 80.3 (17.7) 45.1 (9.9) 11.3 (2.5) 2.8 (0.6)
C086-34		99 (21.8)	165 (36.3)	63 (2.48)	100 (3.93)	300 (12) 500 (20) 750 (30) 1000 (40) 2000 (80) 4000 (160)	>165 (36.3) >165 (36.3) >165 (36.3) 114.1 (25.1) 28.5 (6.3) 7.1 (1.6)
C086-35		152 (33.4)	258 (56.8)	80 (3.14)	125 (4.92)	300 (12) 500 (20) 750 (30) 1000 (40) 2000 (80) 4000 (160)	>258 (56.8) >258 (56.8) >258 (56.8) >258 (56.8) 74.3 (16.4) 18.6 (4.1)
C086-36	Flange Type (See Figure 2)	288 (63.4)	422 (92.8)	90 (3.54)	160 (6.30)	300 (12) 500 (20) 750 (30) 1000 (40) 2000 (80)	>422 (92.8) >422 (92.8) >422 (92.8) >422 (92.8) 119.0 (26.2)
C086-37		460 (101.2)	660 (145.2)	110 (4.33)	200 (7.87)	300 (12) 500 (20) 750 (30) 1000 (40) 2000 (80)	>660 (145.2) >660 (145.2) >660 (145.2) >660 (145.2) 265.5 (58.5)
C086-38		1154 (253.9)	1688 (371.4)	180 (7.08)	320 (12.59)	300 (12) 500 (20) 750 (30)	>1688 (371.4) >1688 (371.4) >1688 (371.4)

- (1) Notes:
- Clevis or swivel installation
 - Without extension tube
 - Safety factor =3.5
 - If select fixed base installation, buckling force capacity will be twice.

Additional Specifications

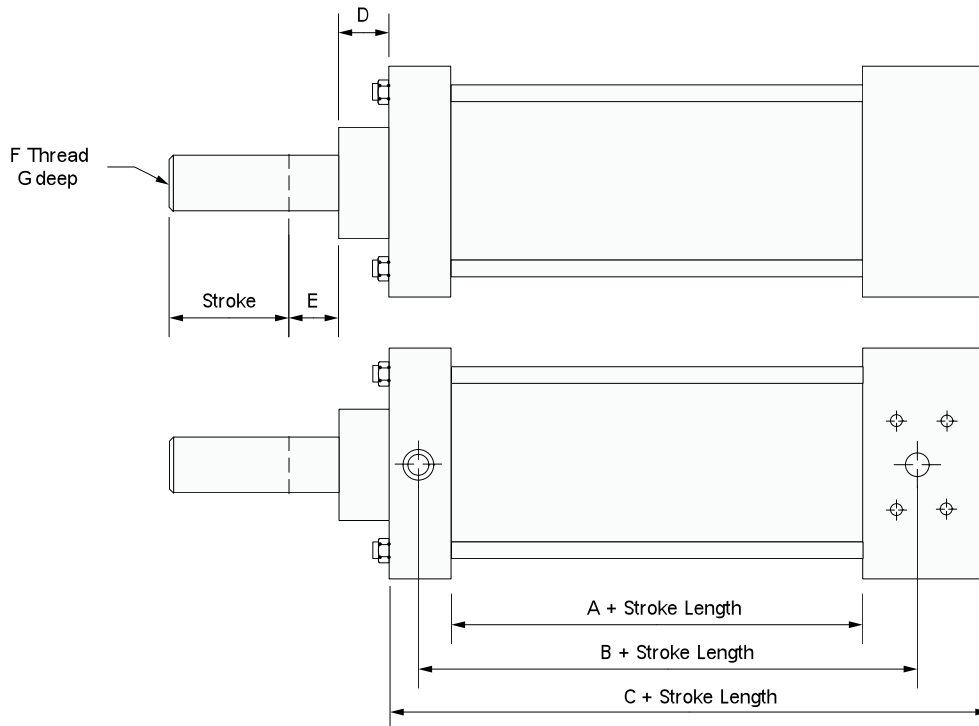
Pressure	Pressure Operating: 21 MPa Maximum Return: 1.4 MPa Maximum Drain: 0.35 MPa
Seal material	NBR as standard
Hydraulic interface	Hydraulic interface Pressure Line: SAE O-Ring Face Seal ‘Seal-Lok’ (ISO 8434-3)-12 Return Line: SAE O-Ring Face Seal ‘Seal-Lok’ (ISO 8434-3)-12 Drain Line: SAE O-Ring Face Seal ‘Seal-Lok’ (ISO 8434-3)-6
Operation temperature	Ambient Temperature: +5 to 40° C (+41 to +104° F) Hydraulic Oil Temperature: +24 to 57° C (+75 to 134° F)
Oil requirements	System Fluid: Mobil DTE-24, 25, Shell Tellus 32, 46 or equivalent Cleanliness level: ISO 4406 (SAE J1165) 15/14/11 (NAS 5)
Standard electrical connector mates with following, or equivalent (waterproof, IP65)	G761 Servo Valve: MS3106F14S-2S 72 Servo Valve: MS3106F14S-2S Position transducer & load cell: PT06A- 10-6S (MOOG # CA64645-001)

DIMENSIONS

Tie Rod Style Actuators

Ordering Number	Rod Diameter	A	B	C	D	E	F	G
Unit	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	DIN 13	mm (in)
C086-31	40 (1.57)	15 (0.59)	93 (3.66)	255 (10.03)	55 (2.16)	45 (1.77)	M 27X2	40 (1.57)
C086-32	45 (1.77)	65 (2.56)	138 (5.43)	303 (11.93)	60 (2.36)	45 (1.77)	M 27X2	40 (1.57)
C086-33	50 (1.96)	70 (2.75)	140 (5.51)	300 (11.81)	73 (2.87)	59 (2.32)	M 27X2	60 (2.36)
C086-34	63 (2.48)	85 (3.34)	163 (6.41)	325 (12.79)	73 (2.87)	45 (1.77)	M 42X2	60 (2.36)
C086-35	80 (3.14)	100 (3.93)	187 (7.36)	345 (13.58)	73 (2.87)	149 (5.86)	M 72X2 Male	90 (3.54)

Figure 1: Tie-rod style structure

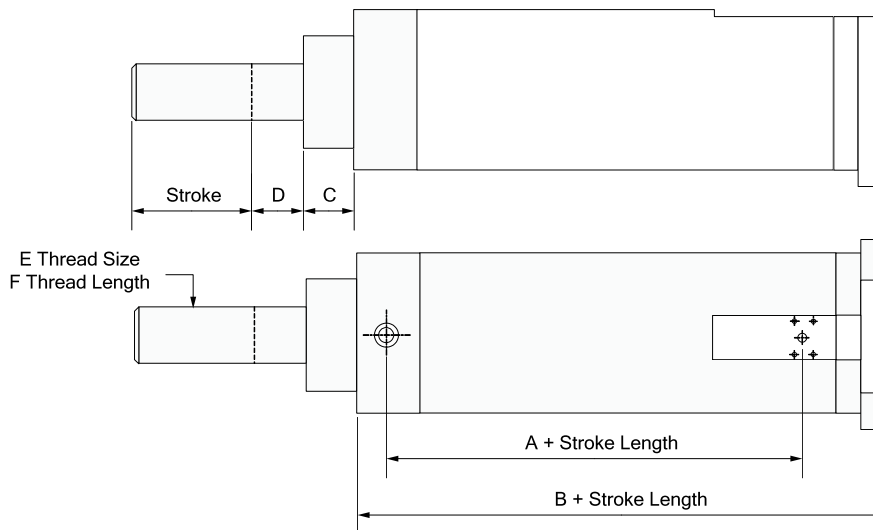


DIMENSIONS

Flange Style Actuators

Ordering Number	Rod Diameter	A	B	C	D	E	F
Unit	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	DIN 13	mm (in)
C086-36	90 (3.54)	194 (7.63)	368 (14.48)	78 (3.07)	158 (6.22)	M 72X2	90 (3.54)
C086-37	110 (4.33)	219 (8.62)	407 (16.02)	82 (3.22)	178 (7.01)	M 90X3	110 (4.33)
C086-38	180 (7.08)	311 (12.24)	443 (17.44)	88 (3.46)	240 (9.45)	M 150X4	185 (7.28)

Figure 2: Flange style structure



TECHNICAL FEATURES

Configure Actuator To Meet Your Needs

A variety of building blocks are available to configure the exact actuator per test rig design or application requirements (see illustrative drawing at right). Various Moog high performance Servo Valves and loadcells are provided to help application engineer to pick up the right one for a specific actuator to avoid over-sizing or under-sizing. Mounting joints and bases are also provided to adapt to the installation requirements.

Safety-Abort Manifold

Safety-Abort Manifold can be selected rather than a simple valve block. Controlled by a solenoid (and other signals), the Safety-Abort Manifold provides a mechanism to unload the hydraulic pressure in the actuator thus to remove loading force onto the specimen with a controlled speed. This provides an ultimate protection to specimen in case of an emergency especially for large scale, multiple-axis and synchronized testing such as aerospace structural testing.

Valve Blocks

Standard valve block is designed for 1x Moog G761 Servo Valve, flow rated from 4 l/min (1 US gpm) to 63 l/min (16 US gpm). Other valve blocks are also available to adapt to 2x G761 Servo Valves or 1x 72 Servo Valve.

Position Sensor

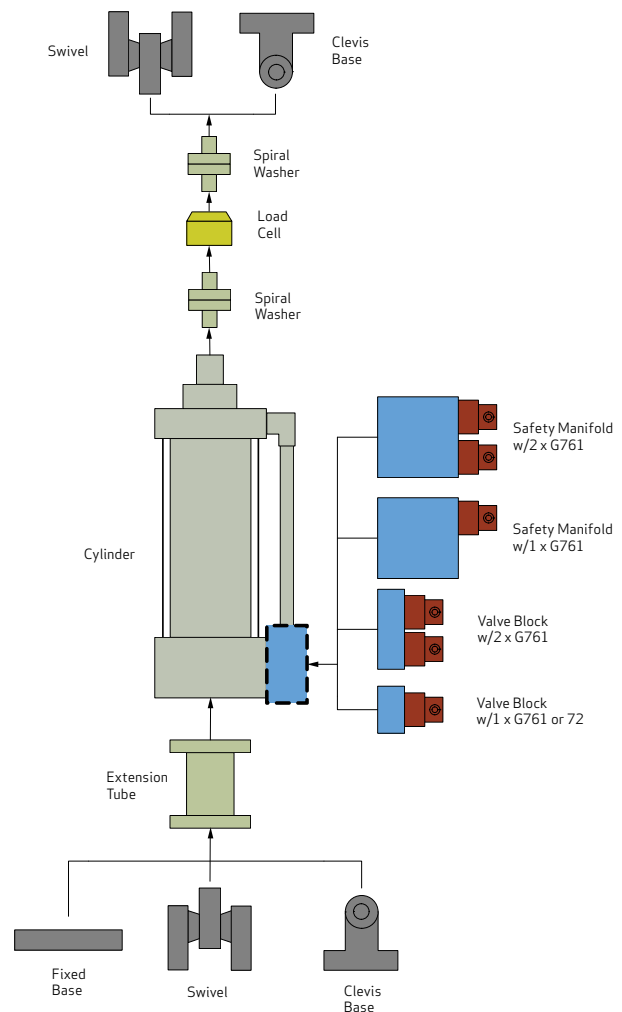
- Internal, co-axial installed position sensor as standard configuration.
- Signal type: Analog signal output as standard. SSI signal output is also available.
- Accuracy: < 0.5 % F.S.

Load Cell

High performance loadcell can be adapted to the actuators to provide a force feedback to a closed loop force control. Spiral washers can be provided as well.

Extension Tube

300 mm (12 in), 500 mm (20 in) & 800 mm (32 in) tube lengths for selection.



Key for configurations

- Joints and Bases
- Servo Valves
- Manifolds/Valve Blocks
- Load Cells

MOOG TEST PRODUCTS - FOR EVERY TESTING NEED

Moog Solutions Designed Around You

Moog engineers are always ready to meet your unique application needs with complete turnkey systems that include Servo Actuators, Servo Valves, Software and more. Our Portable Test Controller, for example, is the only stand-alone unit on the market that can be extended up to four channels within the same housing.



Test Controllers

These Test Controller products incorporate Moog’s unique force loop technology to handle general purpose tests. With or without a PC, our Test Controllers are flexible with high-performance capabilities to handle complex testing formulas. This makes it an indispensable tool for testing labs. The units offer plug-and-play with industry standard connectors for cost effective and easy integration. The larger Test Controller is ideal for complex systems up to 32 servo channels.



Moog Servo Valves

Because we incorporate our renowned Moog Servo Valves - the world standard in performance and durability - you’re assured of a system tailored to your exacting requirements.



Spare parts

Test Actuator- Ordering Number	Kit Ordering Number
C086-31	CB15108-901
C086-32	CB13136-901
C086-33	CB01307-901
C086-34	CB11272-901
C086-35	CB15219-901
C086-36	CB14276-901
C086-37	CB15514-901
C086-38	CB15546-901

SUPPORT AND SPARE PARTS - A HIGHER LEVEL OF SUPPORT

Five Points Inspection Process

Our number one goal is to eliminate downtime and make repairs that will deliver reliability and cost savings for years to come. When you send in your repair, it must work like new when you get it back. This is the Moog Global Support™ promise.

- Incoming inspection will provide the customer details on the performance of the actuator assembly such as leakage and response. The inspection will also provide details to our technicians in regards to critical performance specs that need to be addressed.
- Technicians will then review engineering notes for any design improvements that may have been initiated since inception.
- Actuator assembly will get completely disassembled to piece parts. Aqueous Ultrasonic cleaners are used to thoroughly clean each component before inspection and dimensional checks. Any components found to worn will be replaced with OEM parts. Critical components such as fitted rod and bearings will be dimensionally checked to ensure the component meets the print criteria. A complete seal kit replacement will be installed to ensure integrity of the structure.
- The Servo Valve will be removed and sent through the same rigorous evaluation, disassembly and test.
- Finally, the assembly will be tested to original specs to ensure the overhaul unit meets all design and performance criteria as new.

Moog Engineering On Call For You

Delivering world-class motion control products and solutions means taking customer support far beyond the initial sale. It requires a dedicated approach to solving your problems, addressing your machine challenges and helping you achieve maximum productivity on a daily basis. In today's competitive manufacturing environment, machine performance plays a significant role in determining your bottom line. Moog Global Support™ is key to achieving cost-effective machine operation, day in and day out.

Actuator Repair Capabilities

Moog Global Support™ is designed to keep your critical machines up and running at peak performance with only 100 % genuine Moog replacement parts. Only Moog replacement parts can deliver the reliability, versatility and long life that you would expect from a world leader in motion control solutions. Each Moog part delivers essential components with precise dimensions, close tolerances and specific materials specifications. Because we understand the key role our parts play in the overall operation of your machine, we carefully inspect and test each repair to identify only those components that need replacement.



ORDERING CODE

C086 - 3 X X X X X X X X X X XXX

Test Actuators

Model Revision

Actuator Type	
3	Hydraulic Test Single Ended Actuator

Actuator Force Rating		
Specify	Rated Force @ 21Mpa	
	kN	kip
1	15/41	3.3/9.2
2	32/65	7.1/14.6
3	64/105	14.3/23.6
4	99/165	22.2/37.0
5	152/258	34.1/57.9
6	288/422	64.7/94.8
7	460/660	103.4/148.3
8	1154/1688	259.4/379.4

Working Stroke Length		
Specify	Identify	
A	300 mm	12 in
B	500 mm	20 in
C	750 mm	30 in
D ¹⁾	1000 mm	40 in
E ²⁾	2000 mm	80 in
F ³⁾	4000 mm	160 in

¹⁾ Note: Stroke Length 1,000 mm (40 in) is only for Actuator size option 1 to 7
²⁾ Note: Stroke Length 2,000 mm (80 in) is only for Actuator size option 1 to 7
³⁾ Note: Stroke Length 4,000 mm (160 in) is only for Actuator size option 1 to 5

Servo Valve		
Specify	Type	Flow
A	G761 (ISO 10372-04-04-0-92)	57 LPM (15 GPM)
B	G761 HR (ISO 10372-04-04-0-92)	19 LPM (5 GPM)
C	72 (ISO 10372-06-05-0-92)	227LPM (60GPM)
D	2 xG761 (ISO 10372-04-04-0-92)	2 x 57 LPM (15 GPM)
E	2 xG761 HR (ISO 10372-04-04-0-92)	2 x 19 LPM (5 GPM)
F	None-Manifold with Pattern ISO 10372-04-04-0-92	
G	None-Manifold with Pattern ISO 10372-06-05-0-92	

Special	
SXX	Special
Blank	Standard

Extension Tube	
0	Without
1	300 mm
2	500 mm
3	800 mm

Position Sensor	
0	Without
1	SSI signal
2	Analog signal (4-20 mA)
3	Analog signal (0-10 V)
S	Special

Coupling	
Specify	Type
N	None
W	Spiral Washers
L	Loadcell & Spiral Washers
S	Special

Rod End Style	
Specify	Type
0	Without
1	Plain clevis
2	Self-aligning clevis
3	Swivel
4	Fork clevis
5	Ball joint
S	Special

Mounting Base	
Specify	Type
0	Without
1	Plain clevis
2	Self-aligning clevis
3	Swivel
4	Fork clevis
5	Ball joint
S	Special

Manifold	
Specify	Description
A	Valve Block with 1x Servo Valve
B ⁴⁾	Valve Block with 2x Servo Valves
C ⁴⁾	Safety Manifold with 1x Servo Valve
D ⁴⁾	Safety Manifold with 2x Servo Valves
S	Special

⁴⁾Note: Only can install one or two G761 series Servo Valves

TAKE A CLOSER LOOK.

Moog designs a range of products that complement the performance of those featured in this catalog. Visit our website for more information or contact the Moog facility nearest you.

Argentina
+54 11 4326 5916
info.argentina@moog.com

India
+91 80 4057 6666
info.india@moog.com

Singapore
+65 677 36238
info.singapore@moog.com

Australia
+61 3 9561 6044
info.australia@moog.com

Ireland
+353 21 451 9000
info.ireland@moog.com

South Africa
+27 12 653 6768
info.southafrica@moog.com

Brazil
+55 11 3572 0400
info.brazil@moog.com

Italy
+39 0332 421 111
info.italy@moog.com

Spain
+34 902 133 240
info.spain@moog.com

Canada
+1 716 652 2000
info.canada@moog.com

Japan
+81 46 355 3767
info.japan@moog.com

Sweden
+46 31 680 060
info.sweden@moog.com

China
+86 21 2893 1600
info.china@moog.com

Korea
+82 31 764 6711
info.korea@moog.com

Switzerland
+41 71 394 5010
info.switzerland@moog.com

Finland
+358 9 2517 2730
info.finland@moog.com

Luxembourg
+352 40 46 401
info.luxembourg@moog.com

Turkey
+90 216 663 6020
info.turkey@moog.com

France
+33 1 4560 7000
info.france@moog.com

The Netherlands
+31 252 462 000
test@moog.com

United Kingdom
+44 168 429 6600
info.uk@moog.com

Germany
+49 7031 622 0
info.germany@moog.com

Norway
+47 6494 1948
info.norway@moog.com

USA
+1 716 652 2000
info.usa@moog.com

Hong Kong
+852 2 635 3200
info.hongkong@moog.com

Russia
+7 8 31 713 1811
info.russia@moog.com

www.moog.com/test

Moog is a registered trademark of Moog Inc. and its subsidiaries.
All trademarks as indicated herein are the property of Moog Inc.
and its subsidiaries.
MATLAB® and Simulink® are registered trademarks of The Math Works, Inc.

©2012 Moog Inc. All rights reserved. All changes are reserved.

Hydraulic Test Actuator - Single-Ended
Mobium/500/Rev. A, August 2012, Id. CDL33164-en