

MA40 and MA50 Electrical Servo Linear Actuators

high thrust force out of a compact design

- Continuous force 1244 N - 8480 N
- Peak force 10000 N - 20000 N
- Large travel range 0 - 200 mm
- Travel velocity up to 250 mm/s
- High protection class for various environmental conditions
- Flange or side trunnion mounting
- Reduced operation costs compared to pneumatic-/hydraulic linear cylinders
- Flexible linear positioning through closed loop servo system
- Resolver as standard feedback
- Patented design



The Bautz servo linear actuators complete our linear system range – offering a direct drive with high thrust force and short stroke in a compact design.

ENERGY SAVING

Low maintenance and installation costs through the use of electrical energy in comparison with pneumatic and hydraulic systems.

ADVANCED PROCESS FLEXIBILITY

Flexible production processes require multiple positions of a linear actuator which can be provided by the closed loop control of a servo system.

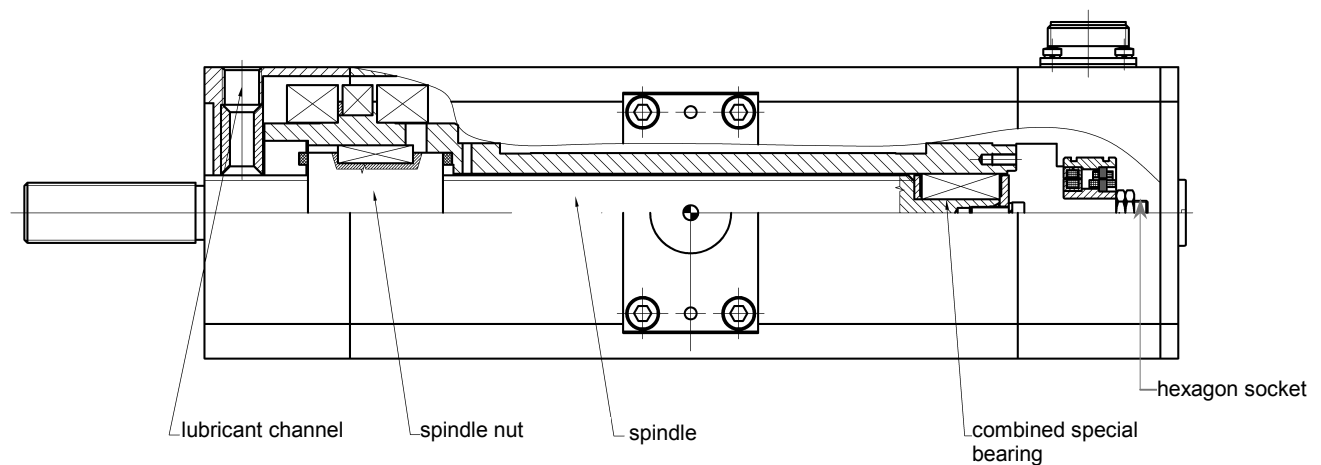
IMPROVED THRUST FORCE CONTROL

Optimized force control and linearity in force generation. With the linear servo actuator, there is no delay in force generation nor any non linear dependence of thrust force and actuator position within the process.

POWERFUL DRIVE SYSTEM

The servo drive provides a high overload capability to overcome surges in the load force. The drive system can be designed in accordance with the effective force, unlike pneumatic systems which are sized based on the peak force.

General Design of the AC Servo Actuator Type MA



The Bautz servo linear actuator converts the rotary motion of a servo motor into a linear motion. The outer appearance of the actuators follows the design of conventional pneumatic or hydraulic cylinders and allows an easy retrofitting of existing systems.

This motion solution offers a high applicability with a stroke from 0 up to 200 mm in six different motor sizes with continuous thrust forces from 1244 N up to 8480 N.

The ball screw nut of this hollow shaft servo motor with is integrated into the rotor at the “A-side” of the motor.

The end of the hollow shaft is closed with a cap that allows the standardized mounting of an economical but nevertheless high-resolution resolver. In this system the resolver serves not only for motor commutation and speed control, but also as position feedback for the axial movement.

The spindle is moved in and out by the nut inside the hollow shaft. Inside of the rotating hollow shaft the spindle is protected by a combined slide bearing and ball bearing unit against radial forces which eventually may occur at the outer end of the spindle.

The slide bearing part of the combined special bearing (patented) supports the spindle during the axial movement whereas the parallel occurring rotation of the hollow shaft is absorbed by the interior ball bearing. Thus this hollow shaft bearing eliminates tension and distortion.

This significantly increases the lifetime of the spindle system and therefore the reliability of the complete system.

All motors are equipped with internal pressure equalization channels to avoid air pressure caused by the movement of the spindle.

An automatic lubricant cartridge can be connected via a lubricant channel, a premise for every continuous duty application (option).

All Motors can be moved by hands through a hexagon socket at “B-end”.

Technical Data MA40x

General Technical Data

Coating	Pale black RAL 9005				
Insulation class	Class F according to VDE 0530				
Cooling	Convictional cooling				
Ambient temperature	+5°C up to +40°C				
Winding protection	Thermo switch and thermal sensor KTY84-130				
Poles	6				

Resolver Data (nominal)*¹

Input voltage	V _{AC} rms	7,0	Transformation ratio		0,5 ± 10%
Input frequency	kHz	10,0	Poles		2
Input current	mA rms	40	Accuracy	arcmin	±10
Z _{SO}	Ω	245+J430	Z _{SS}	Ω	210+J395
Z _{RO}	Ω	78+J190	Z _{RS}	Ω	65+J175

*¹ Operation outside nominal values is possible: specified output values may deviate

Motor Data

			MA404G	MA406G	MA408G	MA404I	MA406I	MA408I
Continuous thrust force* ²	F _{contI0}	N	1244	2375	3054	1244	2375	3054
Continuous current	I ₀	A	1,33	2,54	3,26	0,74	1,4	1,8

*² at <5mm/S

Rated Data

Rated DC link voltage	U _{DC}	V	330			560		
Max. DC link voltage	U _{DC}	V	700					
Max. cont. thrust force* ³	F _{contN}	N	1097	2047	2488	1097	2047	2488
Continuous current* ³	I _N	A	1,22	2,29	2,78	0,68	1,27	1,55
Rated velocity	v _N	mm/s	250					
Rated speed	n _N	min ⁻¹	3000					
Back EMF constant	k _E	V/krpm	50			90		
Force constant	k _F	N/A	935			1684		
Winding resistance	R _{U-V}	Ω	16,3	5,0	3,0	47,3	15,4	9,84
Winding inductance	L _{U-V}	mH	24,1	12,0	7,4	76	36,3	25,6
Max. winding temperature	T _{max}	°C	135					

*³ At permanent rated velocity

Peak Values

Peak thrust force	F _{max}	N	6000	10000	10000	6000	10000	10000
Peak current	I _{max}	A	7,0	12,2	11,9	3,9	6,4	6,6
Peak velocity	v _{max}	mm/s	250					
Peak speed	n _{max}	min ⁻¹	3000					
Demagnetizing current	I _{ult}	A	7,0	14,0	17,4	3,9	7,4	9,6

Mechanical Data

Balls screw pitch	H	mm	5					
Ball screw diameter	D	mm	20					
Stroke	S	mm	70	110	150	70	110	150
Motor weight	m	kg	5,4	6,4	7,3	5,4	6,4	7,3

Technical Data MA50x

General Technical Data

Coating	Pale black RAL 9005
Insulation class	Class F according to VDE 0530
Cooling	Convictional cooling
Ambient temperature	+5°C up to +40°C
Winding protection	Thermo switch and thermal sensor KTY84-130
Poles	6

Resolver Data (nominal)*¹

Input voltage	V _{AC} rms	7,0	Transformation ratio		0,5 ± 10%
Input frequency	kHz	10,0	Poles		2
Input current	mA rms	40	Accuracy	Arcmin	±10
Z _{SO}	Ω	245+J430	Z _{SS}	Ω	210+J395
Z _{RO}	Ω	78+J190	Z _{RS}	Ω	65+J175

*¹ Operation outside nominal values is possible: specified output values may deviate

Motor Data

			MA504G	MA506G	MA508G	MA504I	MA506I	MA508I
Continuous thrust force* ²	F _{contI0}	N	4295	6440	8480	4295	6440	8480
Continuous current	I ₀	A	4,6	6,9	9,07	2,6	3,83	5,04

*² at <5mm/S

Rated Data

Rated DC link voltage	U _{DC}	V	330			560		
Min. DC link voltage* ³	U _{DC}	V	285	262	295	505	498	519
Max. DC link voltage	U _{DC}	V	700					
Max. cont. thrust force* ⁴	F _{contN}	N	3618	4863	6163	3336	4976	5315
Continuous current* ⁴	I _N	A	4,1	5,4	6,9	2,1	3,16	3,3
Rated velocity	v _N	mm/s	250					
Rated speed	n _N	min ⁻¹	3000					
Back EMF constant	k _E	V/krpm	50			90		
Force constant	k _F	N/A	938			1685		
Winding resistance	R _{U-V}	Ω	1,84	0,82	0,7	5,2	2,8	1,65
Winding inductance	L _{U-V}	mH	8,6	5,3	5,2	30	20	13,2
Max. winding temperature	T _{max'}	°C	135					

*³ Typical minimum voltage to reach v_N at F_{contN}

*⁴ At permanent rated velocity

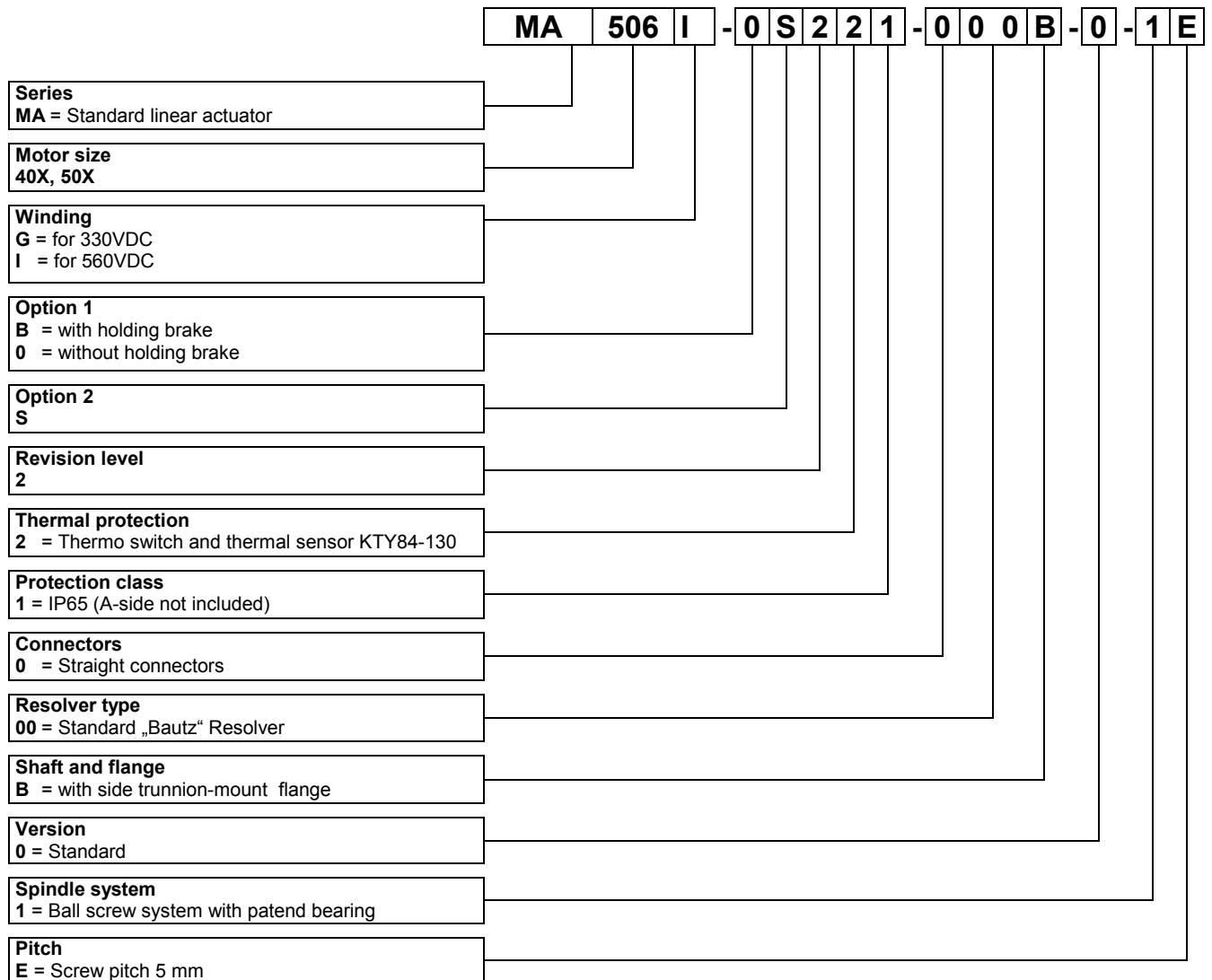
Peak Values

Peak thrust force	F _{max}	N	20000					
Peak current	I _{max}	A	21,3			11,8		
Peak velocity	v _{max}	mm/s	250					
Peak speed	n _{max}	min ⁻¹	3000					
Demagnetizing current	I _{ult}	A	27,5	25	24	15	23	30

Mechanical Data

Balls screw pitch	H	mm	5					
Ball screw diameter	D	mm	25					
Stroke	S	mm	110	155	200	110	155	200
Motor inertia	J	kgm ² · 10 ⁻³	1,165	1,308	1,452	1,165	1,308	1,452
Motor weight	m	kg	12,3	14,0	16,0	12,3	14,0	16,0

Order Code AC Servo Actuators Type MA



Available Types for 330VDC and 560VDC

MA404G-0S221-000B-0-1E
 MA404I-0S221-000B-0-1E
 MA406G-0S221-000B-0-1E
 MA406I-0S221-000B-0-1E
 MA408G-0S221-000B-0-1E
 MA408I-0S221-000B-0-1E

MA504G-0S221-000B-0-1E
 MA504I-0S221-000B-0-1E
 MA506G-0S221-000B-0-1E
 MA506I-0S221-000B-0-1E
 MA508G-0S221-000B-0-1E
 MA508I-0S221-000B-0-1E

Optional Features

- Automatic lubrication for low maintenance (no operation interruptions for 1 year)
- Spring-applied parking brake (in preparation)
 2 Nm for MA40x
 5 Nm for MA50x
- Special resolver and special connecting for operation with KUKA amplifier
- Moulded Bellow with Rod Eye (in preparation)

Setup and Maintenance Instructions

1. Bautz linear actuators have to be mounted according to the two flange versions (inner bolt flanges in center or std. flange). Cooling at these series is mainly achieved through convection, which has to be enabled through the machine construction.
2. The ball screw has to be provided externally with a torque arm bearing. Otherwise a thrust force generation is not possible due to the fact that the ball screw might rotate. The torque has to bear up with 1,2 Nm per 1 kN.
3. Every linear actuator is provided with internal end blocks which only prevent undesired travel of the ball-screw by hands over the designed total working stroke.
The end blocks are not sized for stopping a ball screw traveling at nominal thrust force out of the motor against an internal end block. If this unlike event happens, inner parts can be destroyed.
A motor set-up with limited drive output current (at best when the rod eye is not mounted onto the machine) is therefore strongly recommended till the application is set up properly.

Furthermore we recommend to check the maximum travel of the ball screw by turning it in and out by hand, before adapting the load to ensure a certain "safety way" before reaching the end block.

To avoid long-term loosening or damages of motor internal components it is generally not allowed to travel against the end blocks during regular operation. For initializing movements we recommend the use of external end blocks.

4. Radial loads onto the ball screw have to be avoided. If radial loads cannot be avoided please contact our engineering. In behalf of this we strongly recommend to use a movable rod eye for adapting the load to the motor.
5. The lubrication of the ball screw has to be ensured in order to reach a high lifetime. The interval of greasing and quantity of grease depends on ambient conditions. The required throughput is approximately 1-3 cm³ of grease monthly, injected within short intervals. The type of grease is „Klüber Stabutherm GH461“ or equivalent. It has to be guaranteed that the grease gets into the screw itself. For lubrication purposes there is a threaded hole in every motor, which leads the grease to the spindle. An automatic lubrication unit can be adapted onto his hole (e.g. perma STAR) directly or through a hose. The automatic lubrication unit puts the grease (according to the chosen lubrication interval) automatically into the motor/nut during operation.

The motors are delivered including a factory-made initial lubrication.

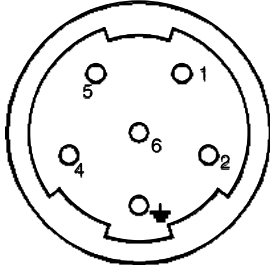
For further lubrication (e.g. after repairs) we recommend the following procedure:

- If the motor is not mounted onto a machine, the ball screw should be turned out as far as possible
- Approx. 3 cm³ of grease should be put onto the ball screw, close to the A-flange
- Turn the ball screw a few times in and out to guarantee an even dispersion of grease in the nut and on the ball screw
- At last, fill the lubrication hole (and the channel below) with grease till it gets out on the nut.

Electrical Connections

Motor mating plug connections

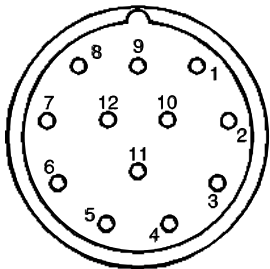
(view solder side of mating plug)



Pin	Name	Function
1	U	Phase 1
5	V	Phase 2
2	W	Phase 3
PE		Gnd
4		Break -
6		Break +

Resolver mating plug connections

(view solder side of mating plug)



Pin	Name	Function
1	S1	Resolver black
2	S3	Resolver red
3	S4	Resolver blue
4	S2	Resolver yellow
5	R1R	Resolver red-white
6	R2R	Resolver black-white
7		Thermo switch
8		Thermo switch
9		Thermal sensor KTY84-130
10		Thermal sensor KTY84-130
11+12		Not connected