TECHLINE®
IMPROVING FLEXIBILITY

Actuator LA36
Data sheet

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LA36

The actuator LA36 is one of the most solid and powerful LINAK actuators, designed to operate under extreme conditions. The LA36 is a maintenance-free product with a long lifetime and a high IP degree. This high-quality actuator offers a very strong alternative to hydraulic solutions.

IC INTEGRATED CONTROLLER

This **TECHLINE®** actuator comes with IC - Integrated controller.
For more information on our IC options, please see: www.linak.com/techline

Features:
- 12, 24 or 36 V DC Permanent magnetic motor (IC only 12/24 V DC)
- Thrust from 500 N - 10,000 N depending on gear ratio and spindle pitch
- Max. speed up to 160 mm/sec. depending on load and spindle pitch
- Stroke length from 100 to 999 mm
- Built-in endstop switches
- Non rotating piston rod eye
- Protection class: IP66 (dynamic) and IP69K (static)

Options in general:
- Mechanical overload protection through integrated slip clutch
- Exchangeable cables in different lengths
- Special anodised housing for extreme environments
- IECEx/ATEX certified for Zone 21
- Hall effect sensor
- Mechanical potentiometer (not with IC)
- IC options including:
  - IC - Integrated Controller
  - Integrated Parallel Controller
  - Modbus, LIN bus and CAN bus communication
  - Analogue or digital feedback for precise positioning
  - Endstop signals
  - PC configuration tool

Usage:
- Duty cycle at 600mm stroke is max. 20%
- Duty cycle at 601-999mm stroke is max. 15%
- Duty cycle at 10,000N is max. 5%
- Ambient operating temperature -30°C to +65°C, full performance from +5°C to +40°C
- For IECEx/ATEX:
  Ambient operating temperature: -25°C to +65°C

Contents

Chapter 1

Specifications

Motor:	Permanent magnet motor 12, 24, or 36V DC*
Cable:	Motor: 2 x 14 AWG PVC cable Control: 6 x 20 AWG PVC cable **
Gear ratio:	6 different gear ratios available in steel (500 N, 1,700/2,600 N, 4,500 N, and 6,800/10,000 N)
Slip clutch:	Mechanical overload protection through an integrated slip clutch
Brake:	Integrated brake ensures a high self-locking ability. The brake is deactivated when the actuator is powered in order to obtain a high efficiency
Hand crank:	As a standard feature the actuator can be operated manually
Housing:	The housing is made of casted aluminium, coated for outdoor use and in harsh conditions
Spindle part:	Outer tube: Extruded aluminium anodised Inner tube: Stainless steel AISI304/SS2333 Acme spindle: Trapezoidal spindle with high efficiency
Piston rod eye and back fixture:	When ordering AISI (304 and up) piston rod eye and back fixture, stainless steel screws are automatically included
Temperature range:	- 30° C to +65° C - 22° F to +149° F Full performance +5° C to +40° C For IECEx/ATEX: - 25° C to +65° C - 13° F to +149° F
Storage temperature:	-55°C to +105°C
Weather protection:	Rated IP66 for outdoor use. Furthermore, the actuator can be washed down with a high-pressure cleaner (IP69K).
Noise level:	73dB (A) measuring method DS/EN ISO 8746 actuator not loaded.

* Modbus actuators only 24V - please see the
Modbus installation guide http://www.linak.com/techline/?id3=2363.

** Special control cabels for the Modbus actuator - please see the
Modbus installation guide http://www.linak.com/techline/?id3=2363.

Be aware of the following two symbols throughout this product data sheet:

Recommendations
Failing to follow these instructions can result in the actuator suffering damage or being ruined.

Additional information
Usage tips or additional information that is important in connection with the use of the actuator.

Technical specifications

LA36 with 12V motor

Order number	Push max. (N)	Pull max. (N)	*Self-lock min. (N) Push	*Self-lock min. (N) Pull	Pitch (mm/spindle rev.)	*Typical speed (mm/s) Load		Standard stroke lengths (mm) In steps of 50 mm	*Typical amp. (A) 12 V	
						No	Full		No load	Full load
36080xxxxxxAxxxxHxxxxxxxxxxx	10000	10000	13000	13000	8	11	7	100 - 999**	4.5	22
36120xxxxxxAxxxxFxxxxxxxxxxx	2600	2600	3400	3400	12	40.7	30.6	100 - 999	4.5	21
36120xxxxxxAxxxxGxxxxxxxxxxx	4500	4500	5800	5800	12	23.1	17.8	100 - 999**	4.5	20.7
36120xxxxxxAxxxxHxxxxxxxxxxx	6800	6800	8800	8800	12	15.5	11.9	100 - 999**	4.5	21
36160xxxxxxAxxxxFxxxxxxxxxxx	2000	2000	2600	2600	16	54,3	43	100-999	4.5	21.5
36160xxxxxxAxxxxGxxxxxxxxxxx	3400	3400	4400	4400	16	30.8	25	100-999**	4.5	21.4
36160xxxxxxAxxxxHxxxxxxxxxxx	5600	5600	6600	6600	16	20.7	17	100-999**	4.5	21.5
36200xxxxxxAxxxxFxxxxxxxxxxx	1700	1700	2200	2200	20	68	52	100 - 999	4.5	22
36200xxxxxxAxxxxExxxxxxxxxxx	500***	500***	1000	1000	20	160	135	100 - 999	4.5	20

LA36 with 24V motor

Order number	Push max. (N)	Pull max. (N)	*Self-lock min. (N) Push	*Self-lock min. (N) Pull	Pitch (mm/spindle rev.)	*Typical speed (mm/s) Load		Standard stroke lengths (mm) In steps of 50 mm	*Typical amp. (A) 24 V	
						No	Full		No load	Full load
36080xxxxxxBxxxxHxxxxxxxxxxx	10000	10000	13000	13000	8	11	7	100 - 999**	2.4	10.4
36120xxxxxxBxxxxFxxxxxxxxxxx	2600	2600	3400	3400	12	41	32.3	100 - 999	2.4	10.4
36120xxxxxxBxxxxGxxxxxxxxxxx	4500	4500	5800	5800	12	23.3	18.9	100 - 999**	2.4	10.2
36120xxxxxxBxxxxHxxxxxxxxxxx	6800	6800	8800	8800	12	15.7	12.7	100 - 999**	2.4	10.3
36160xxxxxxBxxxxFxxxxxxxxxxx	2000	2000	2600	2600	16	54.7	43	100-999	2.4	10.3
36160xxxxxxBxxxxGxxxxxxxxxxx	3400	3400	4400	4400	16	31.1	25	100-999**	2.4	10.3
36160xxxxxxBxxxxHxxxxxxxxxxx	5600	5600	6600	6600	16	21	17	100-999**	2.4	10.3
36200xxxxxxBxxxxFxxxxxxxxxxx	1700	1700	2200	2200	20	68	52	100 - 999	2.4	10.3
36200xxxxxxBxxxxExxxxxxxxxxx	500***	500***	1000	1000	20	160	135	100 - 999	2.4	10.0

LA36 with 36V motor

Order number	Push max. (N)	Pull max. (N)	*Self-lock min. (N) Push	*Self-lock min. (N) Pull	Pitch (mm/spindle rev.)	*Typical speed (mm/s) Load		Standard stroke lengths (mm) In steps of 50 mm	*Typical amp. (A) 36 V	
						No	Full		No load	Full load
36080xxxxxxCxxxxHxxxxxxxxxxx	10000	10000	13000	13000	8	11	7	100 - 999**	2.0	8.0
36120xxxxxxCxxxxFxxxxxxxxxxx	2600	2600	3400	3400	12	41	33.5	100 - 999	2.0	8.0
36120xxxxxxCxxxxGxxxxxxxxxxx	4500	4500	5800	5800	12	23.3	19.1	100 - 999**	2.0	8.0
36120xxxxxxCxxxxHxxxxxxxxxxx	6800	6800	8800	8800	12	15.7	12.8	100 - 999**	2.0	8.0
36160xxxxxxCxxxxFxxxxxxxxxxx	2000	2000	2600	2600	16	54.7	43	100-999	2.0	8.0
36160xxxxxxCxxxxGxxxxxxxxxxx	3400	3400	4400	4400	16	31.1	25	100-999**	2.0	8.0
36160xxxxxxCxxxxHxxxxxxxxxxx	5600	5600	6600	6600	16	21	17	100-999**	2.0	8.0
36200xxxxxxCxxxxFxxxxxxxxxxx	1700	1700	2200	2200	20	68	52	100 - 999	2.0	8.0
36200xxxxxxCxxxxExxxxxxxxxxx	500***	500***	1000	1000	20	160	135	100 - 999	2.0	8.0

* The typical values can have a variation of ± 20% on the current values and ± 10% on the speed values.
Measurements are made with an actuator in connection with a stable power supply and an ambient temperature at 20°C.

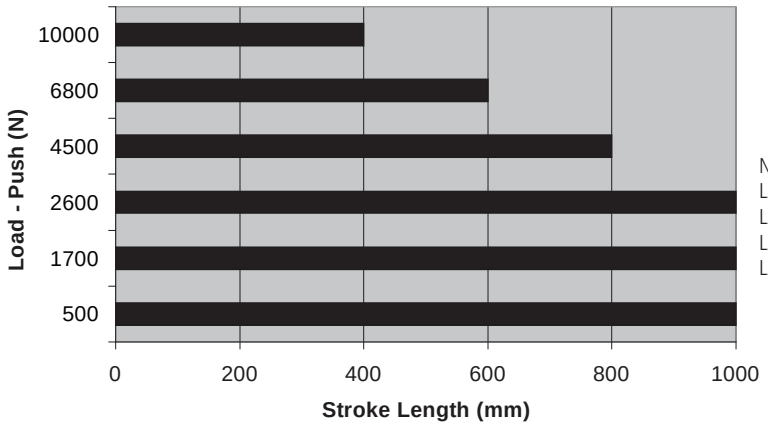
** There are limitations on the stroke length if you need full load, please see " LA36 Load v. Stroke Length"

*** Fully loaded actuators need a soft start in order to prevent the clutch from slipping when starting (see speed and current curves).

- **Self locking ability**
  To ensure maximum self-locking ability, please be sure that the motor is shorted when stopped.
  Actuators with integrated controller provide this feature, as long as the actuator is powered.

- When using soft stop on a DC-motor, a short peak of higher voltage will be sent back towards the power supply. It is important when selecting the power supply that it does not turn off the output, when this backwards load dump occurs.

LA36 Load versus stroke length



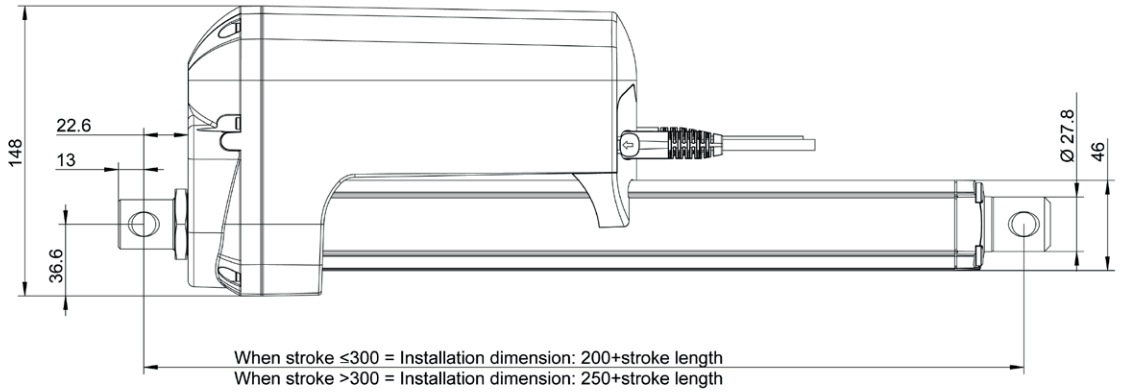
N.B.
LA36 500 - 1.700 N is with 20 mm spindle pitch
LA36 500-5600N is with 16 mm spindle pitch
LA36 500 - 6.800 N is with 12 mm spindle pitch
LA36 500 - 10.000 N is with 8 mm spindle pitch

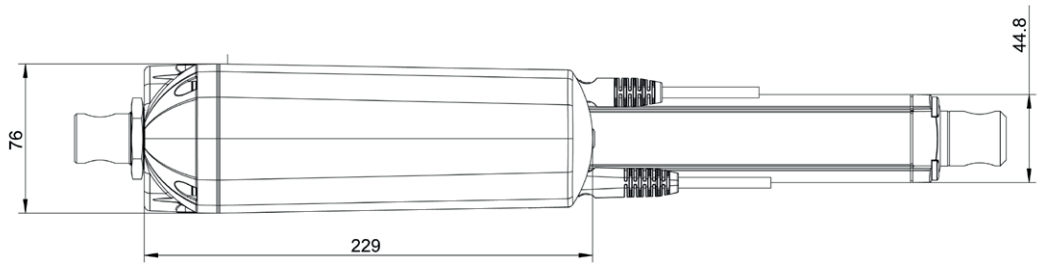
- For applications that only operate in pull the limitations are 999 mm stroke and 10,000 N load.
- Safety factor 2.

Stroke and built-in tolerances

End stop options E.g. 36XXXX+?XXXXXXX	**Descriptions**	**Stroke tolerance**	**Example for 200 mm stroke**	**BID tolerance**	**Example for 200 mm BID**
? = 0	Without endstop switches Mechanical endstop	+/- 2 mm	198 to 202mm	+/- 2mm	198 to 202 mm
? = 1 to 4	With built-in limit switches	+0/-4 mm	196 to 200mm	+/- 4mm	196 to 204 mm
? = 7, 8, 9, A, B, C	Integrated controller Modbus LIN bus CAN bus	+0/-6 mm	194 to 200mm	+/- 4mm	196 to 204 mm

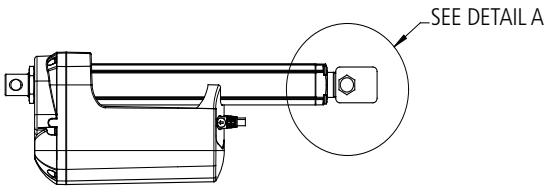
LA36 Dimensions

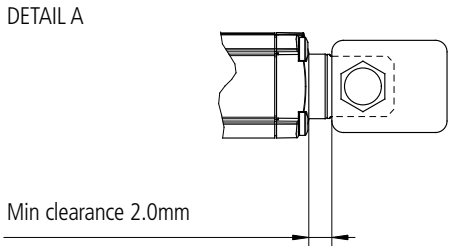




Keep a clearance when mounting a bracket

When mounting a custom bracket on the moving part of the actuator, please observe the minimum clearance between bracket and cylinder top, when fully retracted, to avoid jamming and destruction of actuator drive train.





Cable conduits for an LA36 IECEx/ATEX actuator must be ordered separately, if needed.

To order a cable conduits kit, please choose one of the following item numbers:

Item number 0368536-00
(compatible with one cable)

The kit contains:

1 Cable gland cover
1 Gland nut: M20 x 1.5 (for 3/8" conduit)
1 Screw: DIN 912 M5 x 65
1 Blind plug: M20 x 1.5

Item number 0368535-00
(compatible with two cables)

The kit contains:

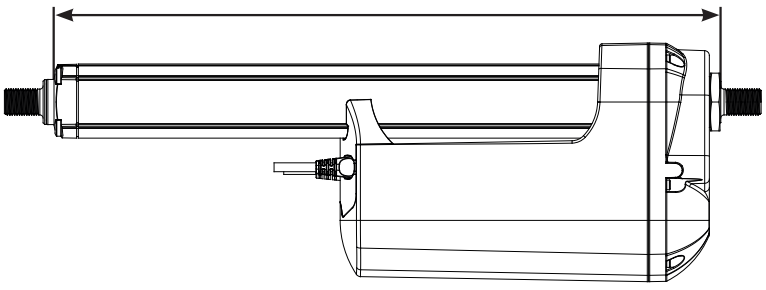
1 Cable gland cover
2 Gland nuts: M20 x 1.5 (for 3/8" conduit)
1 Screw: DIN 912 M5 x 65

Built-in dimensions

Piston rod	"0" /from the surface		"1" / to the centre of the hole		"2A" / to the centre of the hole		"3" / from the surface	
Back fixture	Stroke <=300 Stroke > 300		Stroke <=300 Stroke > 300		Stroke <=300 Stroke > 300		Stroke <=300 Stroke > 300	
"0" / from the surface	189	239	194	244	194	244	181	231
"1" and "2" / to the centre of the hole	195	245	200	250	200	250	187	237
"3" and "4" / to the centre of the hole	195	245	200	250	200	250	187	237
"5" / from the surface	180	230	185	235	185	235	173	223
"6" / from the surface	180	230	185	235	185	235	173	223
"7" and "8" / to the centre of the hole	195	245	200	250	200	250	187	237
"A" and "B" / to the centre of the hole	195	245	200	250	200	250	187	237
"C" and "D" / to the centre of the hole	195	245	200	250	200	250	187	237

Piston rod	"4" /from the surface		"5" / to the centre of the hole		"C" / to the centre of the hole		"D" / to the centre of the hole	
Back fixture	Stroke <=300 Stroke > 300		Stroke <=300 Stroke > 300		Stroke <=300 Stroke > 300		Stroke <=300 Stroke > 300	
"0" / from the surface	181	231	194	244	209	259	209	259
"1" and "2" / to the centre of the hole	187	237	200	250	215	265	215	265
"3" and "4" / to the centre of the hole	187	237	200	250	215	265	215	265
"5" / from the surface	172	222	185	235	200	250	200	250
"6" / from the surface	172*	222*	185	235	200	250	200	250
"7" and "8" / to the centre of the hole	187	237	200	250	215	265	215	265
"A" and "B" / to the centre of the hole	187	237	200	250	215	265	215	265
"C" and "D" / to the centre of the hole	187	237	200	250	215	265	215	265

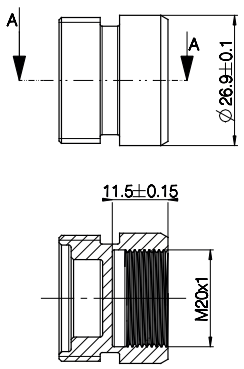
* These built-in dimensions are measured according to the illustration below.



LA36 Piston Rod Eyes

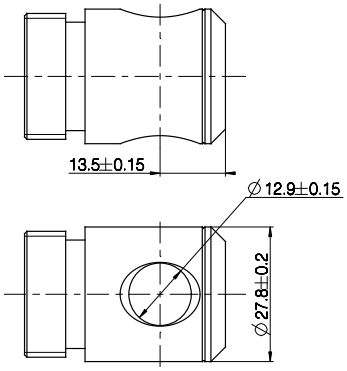
When ordering AISI (304 and up) piston rod eye and back fixture, stainless steel screws are automatically included.

Option "0"
AISI 303

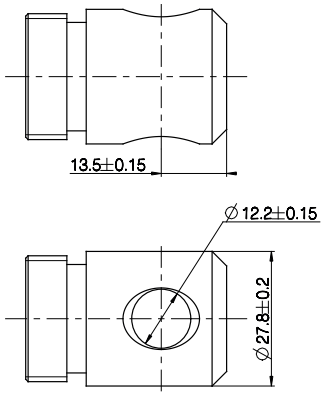


SECTION A-A

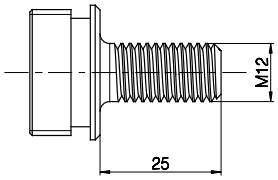
Option "1"
Free cutting steel galvanised surface



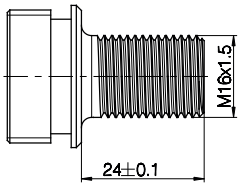
Option "2"
Free cutting steel galvanised surface



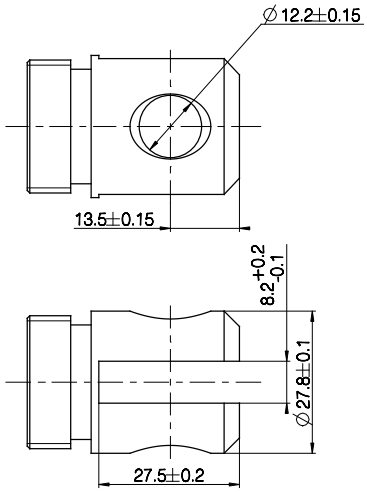
Option "3"
AISI 303



Option "4"
AISI 303

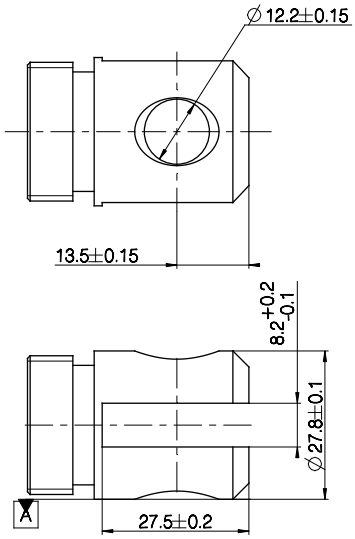


Option "5"
Free cutting steel galvanised surface

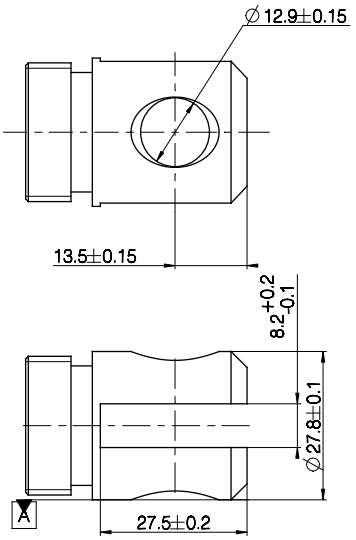


LA36 Piston Rod Eyes

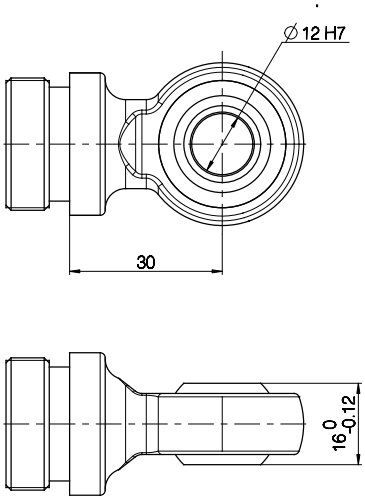
Option "A"
AISI 304



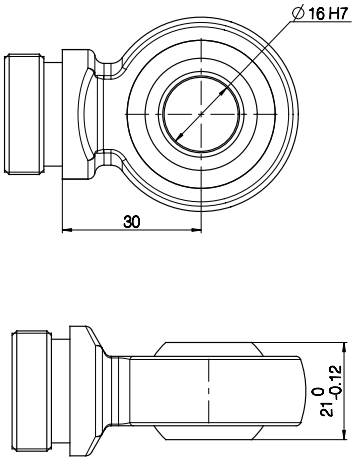
Option "B"
AISI 304



Option "C"
10KN = Max. load 6800 N in pull
AISI 304



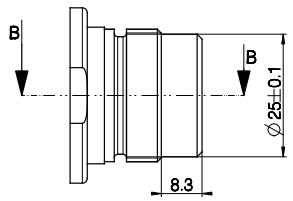
Option "D"
AISI 304

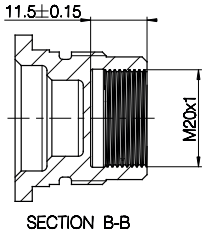


The Piston Rod Eye is only allowed to turn 0 - 90 degrees.

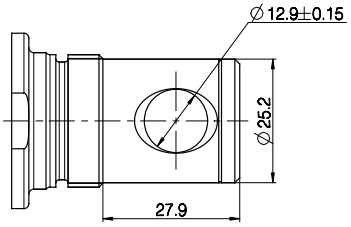
LA36 Back fixtures

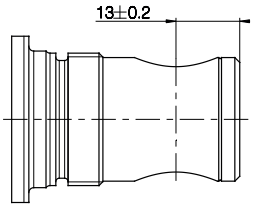
Option "0"
AISI 303



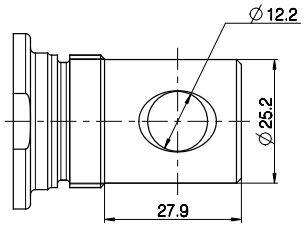


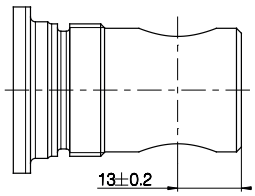
Option "1" Back fixture: 0° and "2" Back fixture: 90°
Free cutting steel galvanised surface



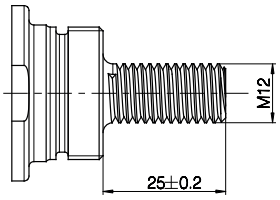


Option "3" Back fixture: 0° and "4" Back fixture: 90°
Free cutting steel galvanised surface



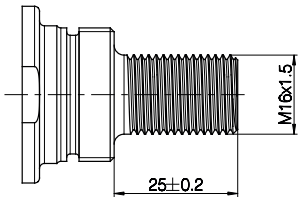


Option "5"
AISI 303

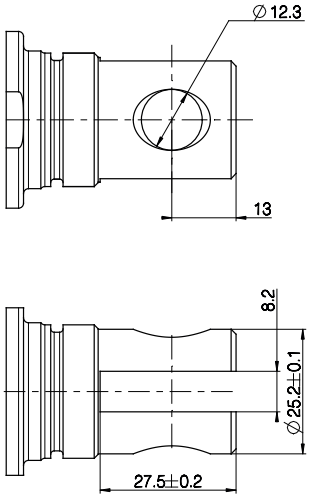


LA36 Back fixtures

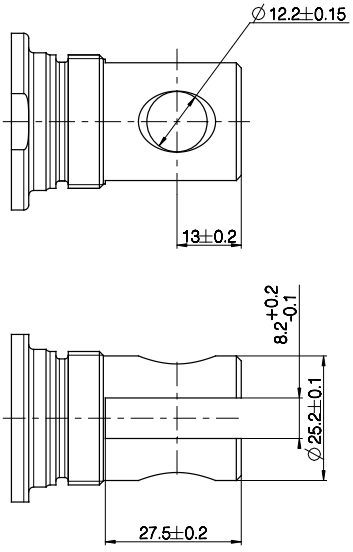
Option "6"
AISI 303



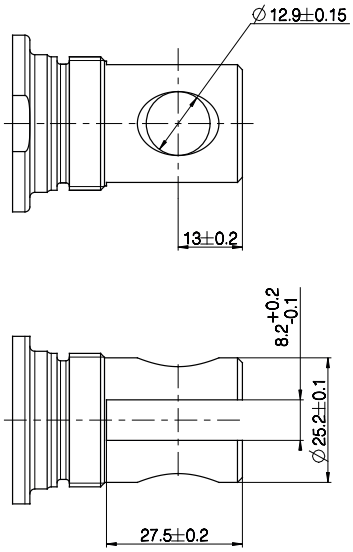
Option "7" Back fixture: 0° and "8" Back fixture: 90°
Free cutting steel galvanised surface



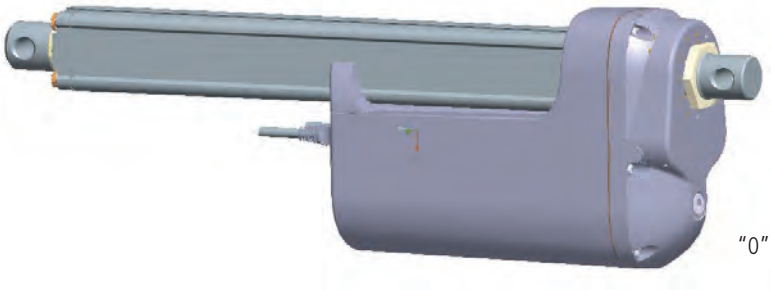
Option "A" Back fixture: 0° and "B" Back fixture: 90°
AISI 304



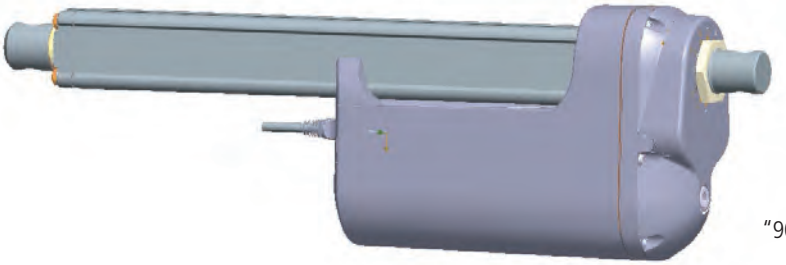
Option "C" Back fixture: 0° and "D" Back fixture: 90°
AISI 304



LA36 Back fixture orientation



"0" Degrees



"90" Degrees

"30" Degrees

"60" Degrees

"120" Degrees

"150" Degrees

NB. All with tolerance of ±4°

Manual hand crank

The manual hand crank can be used in the case of power failure.

The cover over the Allen Key socket must be unscrewed before the Allen Key can be inserted and the Hand Crank operated.

Hand Crank Torque: 6-8 Nm
Hand Crank rpm: Max. 65

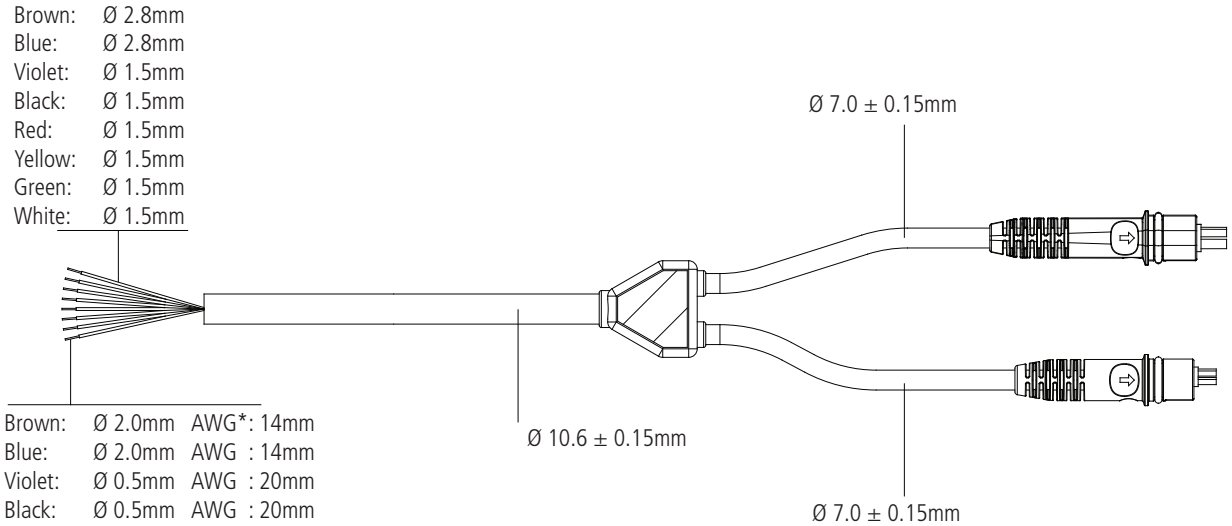
Piston Rod movement per turn

	8 mm	12 mm	20 mm
Gear A	-	11 mm	18 mm
Gear B	-	6 mm	10 mm
Gear C	3 mm	4 mm	7 mm
Gear F	-	-	27 mm

- The power supply has to be disconnected during manual operation.
- If the actuator is operated as a Hand crank, it must only be operated by hand, otherwise there is a potential risk of overloading and hereby damaging the actuator.

Cable dimensions

Y-cable dimensions:

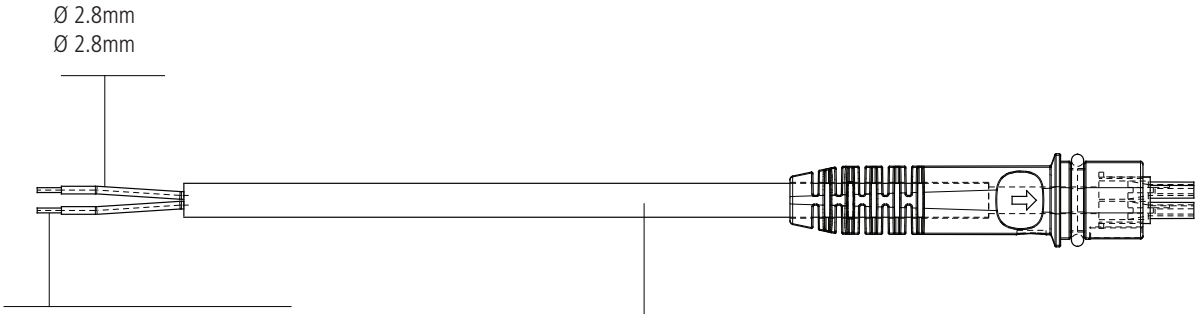


Brown: Ø 2.0mm AWG*: 14mm
Blue: Ø 2.0mm AWG : 14mm
Violet: Ø 0.5mm AWG : 20mm
Black: Ø 0.5mm AWG : 20mm
Red: Ø 0.5mm AWG : 20mm
Yellow: Ø 0.5mm AWG : 20mm
Green: Ø 0.5mm AWG : 20mm
White: Ø 0.5mm AWG : 20mm

*AWG: American Wire Gauge

Cable dimensions

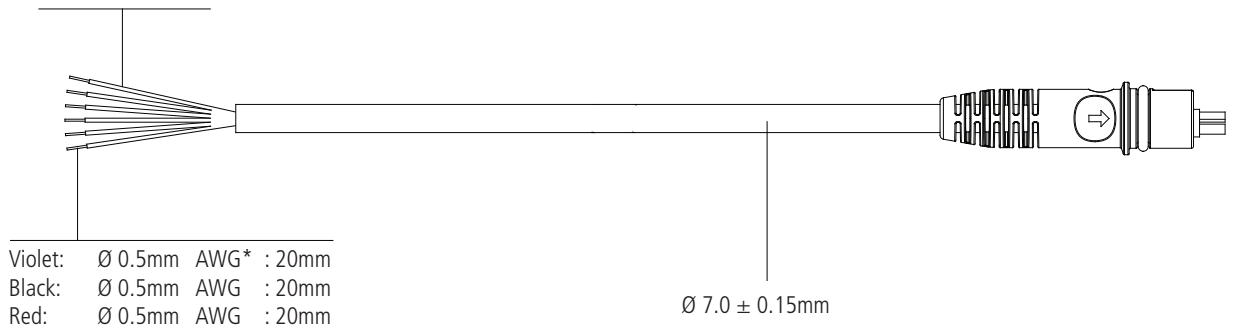
Power cable dimensions:



*AWG: American Wire Gauge

Signal cable dimensions:

Violet:	Ø 1.5mm
Black:	Ø 1.5mm
Red:	Ø 1.5mm
Yellow:	Ø 1.5mm
Green:	Ø 1.5mm
White:	Ø 1.5mm



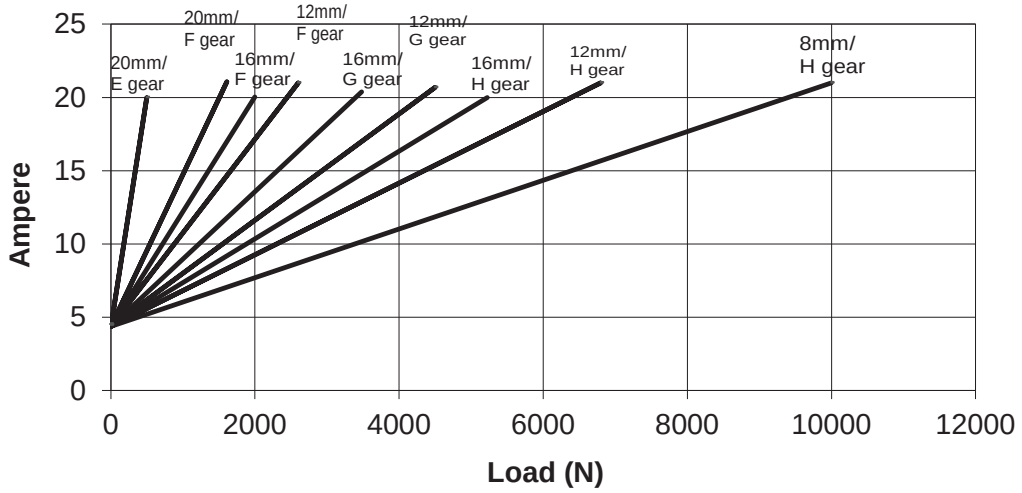
Violet:	Ø 0.5mm	AWG*	: 20mm
Black:	Ø 0.5mm	AWG	: 20mm
Red:	Ø 0.5mm	AWG	: 20mm
Yellow:	Ø 0.5mm	AWG	: 20mm
Green:	Ø 0.5mm	AWG	: 20mm
White:	Ø 0.5mm	AWG	: 20mm

*AWG: American Wire Gauge

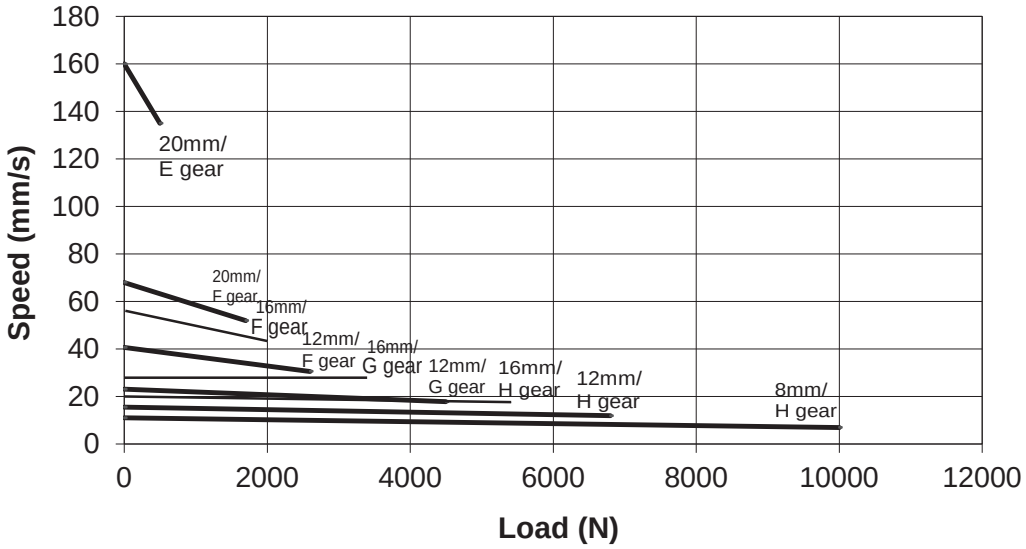
Speed and current curves - 12V motor

The values below are typical values and made with a stable power supply and an ambient temperature of 20˚C.

LA36 12V motor current vs. load



LA36 12V motor speed vs. load



All measurements above describe the spindle pitch (e.g. 20mm) and the gear type (e.g. E gear) of the actuator.

Speed and current are based on a nominal power supply of 12, 24, 36VDC.

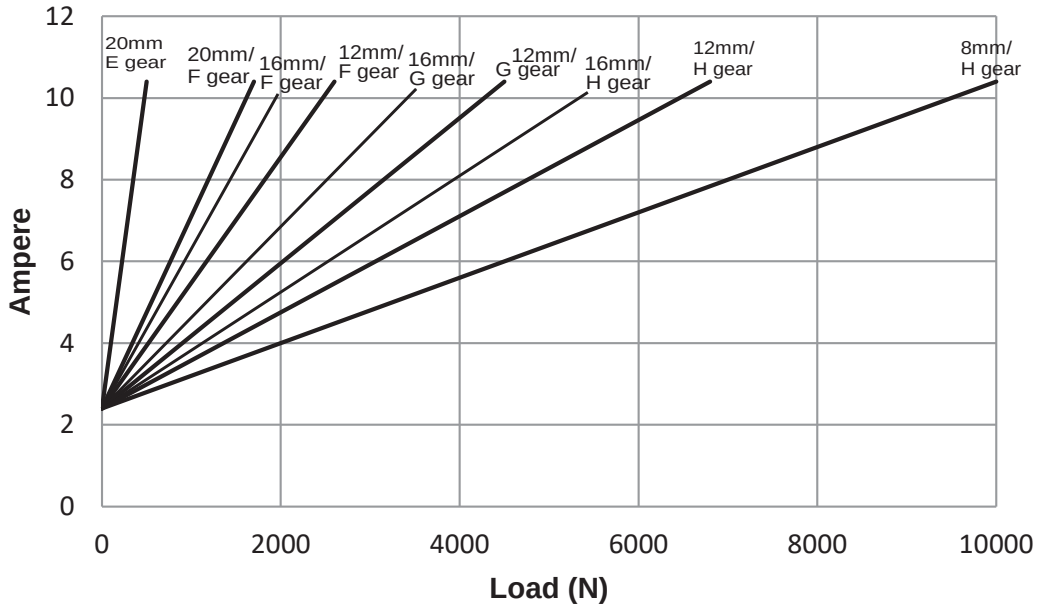
When ordering LA36F

When purchasing the LA36 actuator with fast gear and slide for the end-stop function, the customer has been informed that there is an increased risk that the activation arm for end-stop can be damaged during use, especially if the actuator runs to limit switch without load, both in the inner or outer position. A defective activation arm will inevitably lead to an inoperative end-stop function.

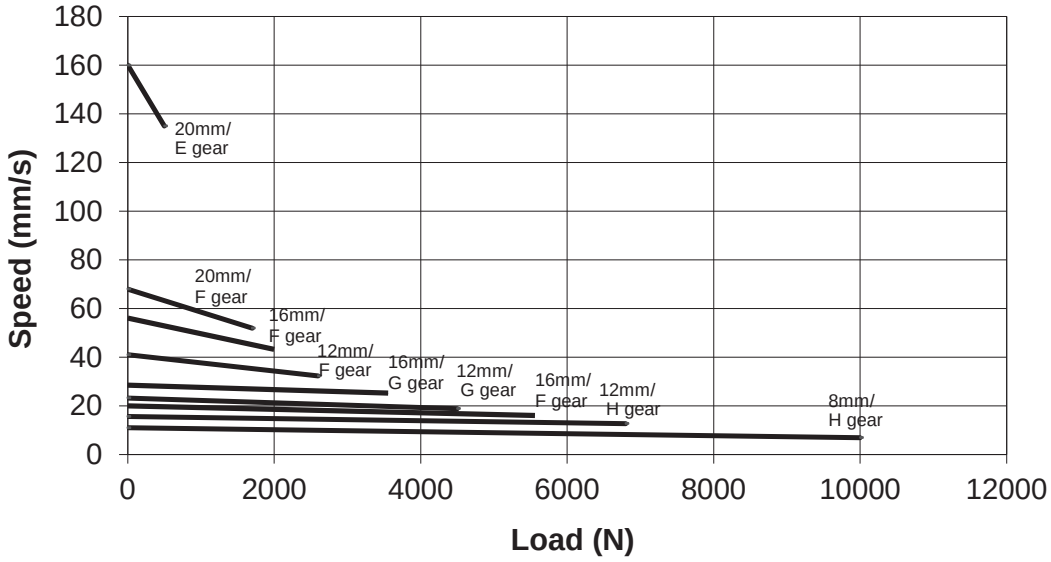
Speed and current curves - 24V motor

The values below are typical values and made with a stable power supply and an ambient temperature of 20˚C.

LA36 24V motor current vs. load



LA36 24V motor speed vs. load



All measurements above describe the spindle pitch (e.g. 20mm) and the gear type (e.g. E gear) of the actuator.

Speed and current are based on a nominal power supply of 12, 24, 36VDC.

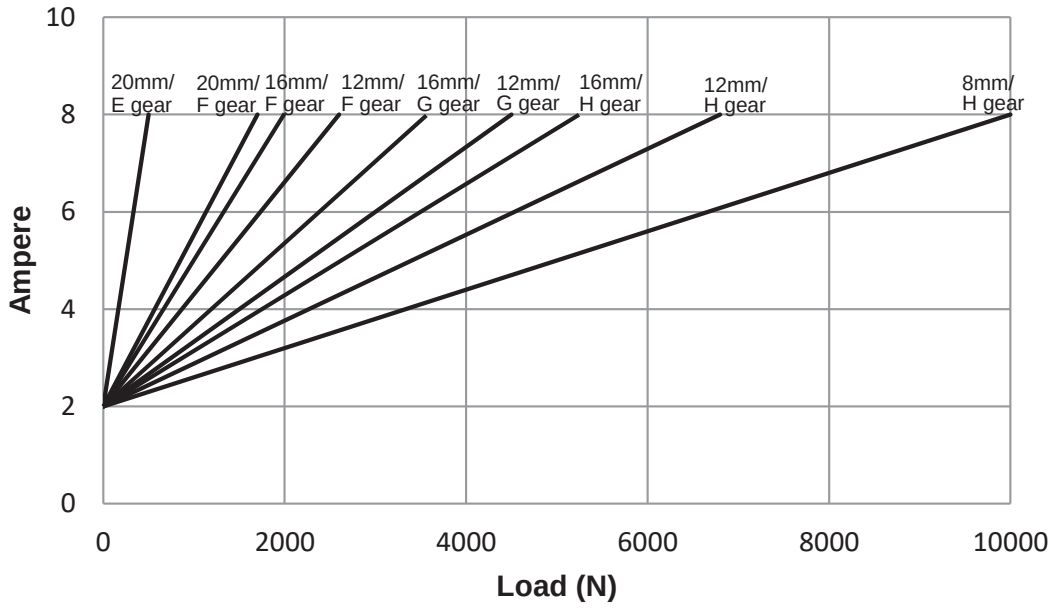
When ordering LA36F

When purchasing the LA36 actuator with fast gear and slide for the end-stop function, the customer has been informed that there is an increased risk that the activation arm for end-stop can be damaged during use, especially if the actuator runs to limit switch without load, both in the inner or outer position. A defective activation arm will inevitably lead to an inoperative end-stop function.

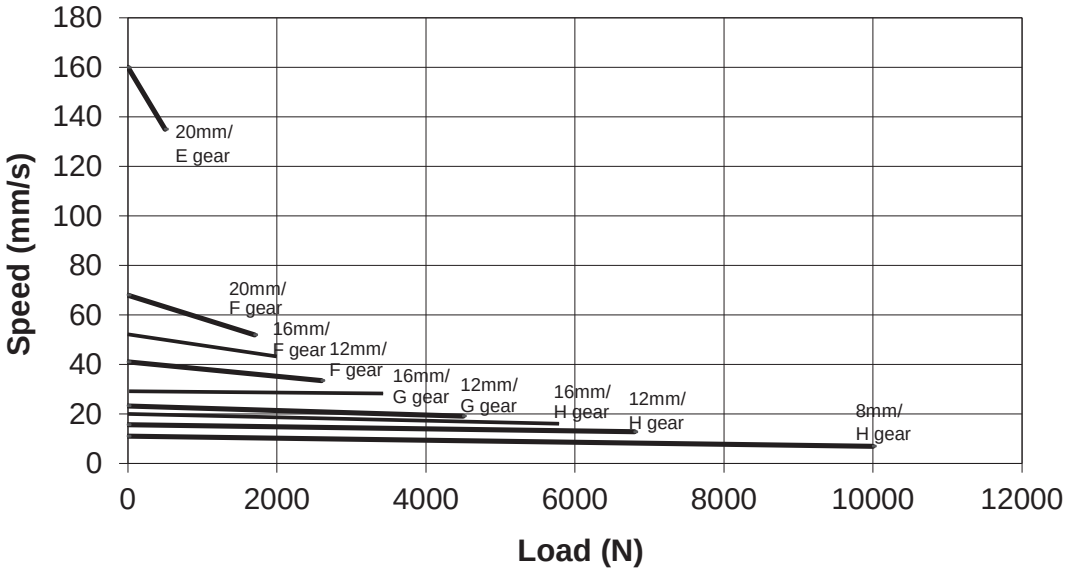
Speed and current curves - 36V motor

The values below are typical values and made with a stable power supply and an ambient temperature of 20˚C.

LA36 36V motor current vs. load



LA36 36V motor speed vs. load



All measurements above describe the spindle pitch (e.g. 20mm) and the gear type (e.g. E gear) of the actuator.

When ordering LA36F

When purchasing the LA36 actuator with fast gear and slide for the end-stop function, the customer has been informed that there is an increased risk that the activation arm for end-stop can be damaged during use, especially if the actuator runs to limit switch without load, both in the inner or outer position. A defective activation arm will inevitably lead to an inoperative end-stop function.

Chapter 2

I/O specifications: Actuator without feedback

Input/Output	Specification	Comments
Description	Permanent magnetic DC motor.	
Brown	12, 24 or 36VDC (+/-) 12V ± 20% 24V ± 10% 36V ± 10%	To extend actuator: Connect Brown to positive To retract actuator: Connect Brown to negative
Blue	Under normal conditions: 12V, max. 26A depending on load 24V, max. 13A depending on load 36V, max. 10A depending on load	To extend actuator: Connect Blue to negative To retract actuator: Connect Blue to positive
Red	Not to be connected	
Black	Not to be connected	
Green	Not to be connected	
Yellow	Not to be connected	
Violet	Not to be connected	
White	Not to be connected	

I/O specifications: Actuator with endstop signal output

Input/Output	Specification	Comments
Description	The actuator can be equipped with electronically controlled endstop signals out.	
Brown	12, 24 or 36VDC (+/-) 12V ± 20% 24V ± 10% 36V ± 10%	To extend actuator: Connect Brown to positive To retract actuator: Connect Brown to negative
Blue	Under normal conditions: 12V, max. 26A depending on load 24V, max. 13A depending on load 36V, max. 10A depending on load	To extend actuator: Connect Blue to negative To retract actuator: Connect Blue to positive
Red	Signal power supply (+) 12-24VDC	Current consumption: Max. 40mA, also when the actuator is not running
Black	Signal power supply GND (-)	
Green	Endstop signal out	Output voltage min. V_{IN} - 2V Source current max. 100mA NOT potential free
Yellow	Endstop signal in	
Violet	Not to be connected	
White	Not to be connected	

I/O specifications: Actuator with endstop signals and relative positioning - Dual Hall

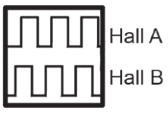
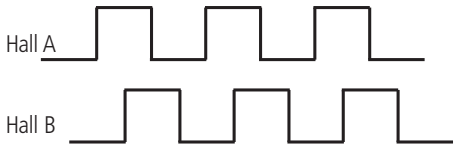
<table>
<tr><th>Input/Output</th><th colspan="2">Specification</th><th>Comments</th></tr>
<tr><td>Description</td><td colspan="2">The actuator can be equipped with Dual Hall that gives a relative positioning feedback signal when the actuator moves.</td><td> 
</td></tr>
<tr><td>Brown</td><td colspan="2">12, 24 or 36VDC (+/-)
12V ± 20%
24V ± 10%
36V ± 10%</td><td>To extend actuator:
Connect Brown to positive
To retract actuator:
Connect Brown to negative</td></tr>
<tr><td>Blue</td><td colspan="2">Under normal conditions:
12V, max. 26A depending on load
24V, max. 13A depending on load
36V, max. 10A depending on load</td><td>To extend actuator:
Connect Blue to negative
To retract actuator:
Connect Blue to positive</td></tr>
<tr><td>Red</td><td colspan="2">Signal power supply (+)
12-24VDC</td><td rowspan="2">Current consumption:
Max. 40mA, also when the actuator is not running</td></tr>
<tr><td>Black</td><td colspan="2">Signal power supply GND (-)</td></tr>
<tr><td>Green</td><td>Hall B</td><td rowspan="2">Movement per single hall pulse:
LA362C Actuator = 0.4 mm per pulse
LA363C Actuator = 0.7 mm per pulse
LA363B Actuator = 1.0 mm per pulse
LA363A Actuator = 1.7 mm per pulse
LA365A Actuator = 2.9 mm per pulse</td><td rowspan="2">The Hall sensor signals are generated by the turning of the actuator gearing.
These signals can be fed into a PLC (Programmable Logic Controller). In the PLC the quadrature signals can be used to register the direction and position of the piston rod.
Output voltage min. V_{IN} - 2V
Current output 12mA
Overvoltage on the motor can result in shorter pulses.
N.B. For more precise measurements, please contact LINAK A/S.</td></tr>
<tr><td>Yellow</td><td>Hall A</td></tr>
<tr><td>Violet</td><td colspan="2">Endstop signal in</td><td rowspan="2">Output voltage min. V_{IN} - 2V
Source current max. 30mA
NOT potential free</td></tr>
<tr><td>White</td><td colspan="2">Endstop signal out</td></tr>
<tr><td>Diagram of Dual Hall:</td><td colspan="3"> 

Fig. 1</td></tr>
</table>

I/O specifications: Actuator with endstop signals and relative positioning - Single Hall

<table>
<tr><th>Input/Output</th><th>Specification</th><th>Comments</th></tr>
<tr><td>Description</td><td>The actuator can be equipped with Single Hall that gives a relative positioning feedback signal when the actuator moves.</td><td> 
</td></tr>
<tr><td>Brown</td><td rowspan="2">12, 24 or 36VDC (+/-)
12V ± 20%
24V ± 10%
36V ± 10%

Under normal conditions:
12V, max. 26A depending on load
24V, max. 13A depending on load
36V, max. 10A depending on load</td><td>To extend actuator:
Connect Brown to positive

To retract actuator:
Connect Brown to negative</td></tr>
<tr><td>Blue</td><td>To extend actuator:
Connect Blue to negative

To retract actuator:
Connect Blue to positive</td></tr>
<tr><td>Red</td><td>Signal power supply (+)
12-24VDC</td><td rowspan="2">Current consumption:
Max. 40mA, also when the actuator is not running</td></tr>
<tr><td>Black</td><td>Signal power supply GND (-)</td></tr>
<tr><td>Green</td><td>Endstop signal out</td><td rowspan="2">Output voltage min. V_{IN} - 2V
Source current max. 100mA
NOT potential free</td></tr>
<tr><td>Yellow</td><td>Endstop signal in</td></tr>
<tr><td rowspan="2">Violet</td><td>Single Hall output (PNP)

Movement per Single Hall pulse:
LA362C: Actuator = 0.1 mm per pulse
LA363C: Actuator = 0.2 mm per pulse
LA363B: Actuator = 0.3 mm per pulse
LA363A: Actuator = 0.4 mm per pulse
LA365A: Actuator = 0.7 mm per pulse

Frequency:
Frequency is 30-125 Hz on Single Hall output depending on load and spindle.Overvoltage on motor can result in shorter pulses.</td><td>Output voltage min. V_{IN} - 2V
Max. current output: 12mA
Max. 680nF

N.B. For more precise measurements, please contact
LINAK A/S.

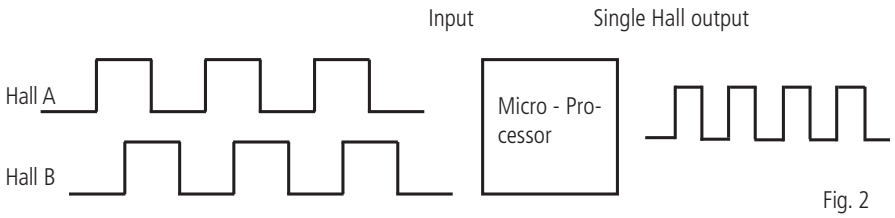
Low frequency with a high load.Higher frequency with no load.</td></tr>
<tr><td colspan="2">Diagram of Single Hall:
 

Fig. 2</td></tr>
<tr><td>White</td><td colspan="2">Not to be connected</td></tr>
</table>

I/O specifications: Actuator with endstop signals and absolute positioning - Analogue feedback

Input/Output	Specification	Comments
Description	The actuator can be equipped with electronic circuit that gives an analogue feedback signal when the actuator moves.	
Brown	12, 24 or 36VDC (+/-) 12V ± 20% 24V ± 10% 36V ± 10%	To extend actuator: Connect Brown to positive To retract actuator: Connect Brown to negative
Blue	Under normal conditions: 12V, max. 26A depending on load 24V, max. 13A depending on load 36V, max. 10A depending on load	To extend actuator: Connect Blue to negative To retract actuator: Connect Blue to positive
Red	Signal power supply (+) 12-24VDC	Current consumption: Max. 60mA, also when the actuator is not running
Black	Signal power supply GND (-)	
Green	Endstop signal out	Output voltage min. V_{IN} - 2V Source current max. 100mA NOT potential free
Yellow	Endstop signal in	
Violet	Analogue feedback 0-10V 0.5-4.5V	Tolerances +/- 0.2V Max. current output: 1mA Ripple max. 200mV Transaction delay 20ms Linear feedback 0.5% It is recommendable to have the actuator to activate its limit switches on a regular basis, to ensure more precise positioning
White	Not to be connected	

I/O specifications: Actuator with endstop signals and absolute positioning - Mechanical potentiometer feedback

Input/Output	Specification	Comments
Description	The actuator can be equipped with a mechanical potentiometer, 10 kohm.	 Bourns 0-10 kohm, 5%, 10-Turn Type: 3540 Wirewound
Brown	12, 24 or 36VDC (+/-) 12V ± 20% 24V ± 10% 36V ± 10% Under normal conditions: 12V, max. 26A depending on load 24V, max. 13A depending on load 36V, max. 10A depending on load	To extend actuator: Connect Brown to positive To retract actuator: Connect Brown to negative
Blue		To extend actuator: Connect Blue to negative To retract actuator: Connect Blue to positive
Red	Signal power supply (+) 12-24VDC	For endstop signals
Black	Signal power supply GND (-)	
Green	Endstop signal out	Output voltage min. V_{IN} - 2V Source current max. 100mA NOT potential free
Yellow	Endstop signal in	
Violet	Mechanical potentiometer output Output range with 8mm spindle pitch: 0 kohm = 0mm stroke 10 kohm = 333mm stroke Output range with 12mm spindle pitch: 0 kohm = 0mm stroke 10 kohm = 500mm stroke Output range with 20mm spindle pitch: 0 kohm = 0mm stroke 10 kohm = 833mm stroke	+10V or other value Output protection: 1 kohm protection resistor Linearity: ± 0.25%
White	Not to be connected	

It is recommended that the actuator activates its limit switches on a regular basis, to ensure more precise positioning. The actuator can also go into the position lost state. When the actuator goes in position lost state, the feedback level will remain the highest level until the actuator is initiated. For instance, if feedback is 0-10 V, the feedback level will remain 10V until the actuator is initialised. Both physical end stop switches need to be activated for correct initialisation of the feedback. There is no rule as to which one needs to be activated first.

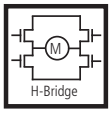
Please note that Potentiometer is not possible on variants with fast gear (Spindle pitch 20mm, H Gear).

I/O specifications: Actuator with endstop signals and absolute positioning - PWM

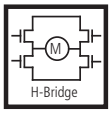
Input/Output	Specification	Comments
Description	The actuator can be equipped with electronic circuit that gives an analogue feedback signal when the actuator moves.	
Brown	12, 24 or 36VDC (+/-) 12V ± 20% 24V ± 10% 36V ± 10%	To extend actuator: Connect Brown to positive To retract actuator: Connect Brown to negative
Blue	Under normal conditions: 12V, max. 26A depending on load 24V, max. 13A depending on load 36V, max. 10A depending on load	To extend actuator: Connect Blue to negative To retract actuator: Connect Blue to positive
Red	Signal power supply (+) 12-24VDC	Current consumption: Max. 60mA, also when the actuator is not running
Black	Signal power supply GND (-)	
Green	Endstop signal out	Output voltage min. V_{IN} - 2V Source current max. 100mA NOT potential free
Yellow	Endstop signal in	
Violet	Digital output feedback (PNP) 10-90% 20-80%	Output voltage min. V_{IN} - 2V Tolerances +/- 2% Max. current output: 12mA Frequency: 75Hz It is recommendable to have the actuator to activate its limit switches on a regular basis, to ensure more precise positioning
White	Not to be connected	

It is recommended that the actuator activates its limit switches on a regular basis, to ensure more precise positioning. The actuator can also go into the position lost state. When the actuator goes in position lost state, the feedback level will remain the highest level until the actuator is initiated. For instance, if feedback is 0-10 V, the feedback level will remain 10V until the actuator is initialised. Both physical end stop switches need to be activated for correct initialisation of the feedback. There is no rule as to which one needs to be activated first.

I/O specifications: Actuator with IC Basic

Input/Output	Specification	Comments
Description	Easy to use interface with integrated power electronics (H-bridge). The actuator can also be equipped with electronic circuit that gives an absolute or relative feedback signal. The version with "IC option" cannot be operated with PWM (power supply).	
Brown	12-24VDC + (VCC) Connect Brown to positive 12V ± 20% 24V ± 10% 12V, current limit 30A 24V, current limit 20A	Note: Do not change the power supply polarity on the brown and blue wires! Power supply GND (-) is electrically connected to the housing If the temperature drops below 0°C, all current limits will automatically increase to 30A
Blue	12-24VDC - (GND) Connect Blue to negative 12V ± 20% 24V ± 10% 12V, current limit 30A 24V, current limit 20A	
Red	Extends the actuator	On/off voltages: > 67% of V_{IN} = ON < 33% of V_{IN} = OFF Input current: 10mA
Black	Retracts the actuator	
Green	Not to be connected	
Yellow	Not to be connected	
Violet	Analogue feedback 0-10V	Standby power consumption: 12V, 60mA 24V, 45 mA Ripple max. 200mV Transaction delay 20ms Linear feedback 0.5% Max. current output: 1mA It is recommendable to have the actuator to activate its limit switches on a regular basis, to ensure more precise positioning
	Single Hall output (PNP) Movement per Single Hall pulse: LA362C: Actuator = 0.1 mm per count LA363C: Actuator = 0.2 mm per count LA363B: Actuator = 0.3 mm per count LA363A: Actuator = 0.4 mm per count LA365A: Actuator = 0.7 mm per count Frequency: Frequency is 30-125 Hz on Single Hall output depending on load and spindle. Overvoltage on the motor can result in shorter pulses	Output voltage min. V_{IN} - 2V Max. current output: 12mA Max. 680nF
White	Signal GND	

I/O specifications: Actuator with IC Advanced - with BusLink

Input/Output	Specification	Comments
Description	Easy to use interface with integrated power electronics (H-bridge). The actuator can also be equipped with electronic circuit that gives an absolute or relative feedback signal. IC Advanced provides a wide range of possibilities for customisation. The version with "IC option" cannot be operated with PWM (power supply).	
Brown	12-24VDC + (VCC) Connect Brown to positive 12V ± 20% 24V ± 10% 12V, current limit 30A 24V, current limit 20A	Note: Do not change the power supply polarity on the brown and blue wires! Power supply GND (-) is electrically connected to the housing Current limit levels can be adjusted through BusLink If the temperature drops below 0°C, all current limits will automatically increase to 30A
Blue	12-24VDC - (GND) Connect Blue to negative 12V ± 20% 24V ± 10% 12V, current limit 30A 24V, current limit 20A	
Red	Extends the actuator	On/off voltages: > 67% of V_{IN} = ON < 33% of V_{IN} = OFF Input current: 10mA Actie filter time: reaction time: 52,6 ms before movement
Black	Retracts the actuator	
Green	Endstop signal out	Output voltage min. V_{IN} - 2V Source current max. 100mA Endstop signals are NOT potential free. Endstop signals can be configured with BusLink software according to any position needed. When configuring virtual end stop, it is not necessary to choose the position feedback EOS and Virtual end stop will work even when feedback is not chosen
Yellow	Endstop signal in	

I/O specifications: Actuator with IC Advanced - with BusLink

Input/Output	Specification	Comments
Violet	Analogue feedback (0-10V): Configure any high/low combination between 0-10V	Ripple max. 200mV Transaction delay 20ms Linear feedback 0.5% Max. current output. 1mA
	Single Hall output (PNP) Movement per Single Hall pulse: LA362C: Actuator = 0.1 mm per count LA363C: Actuator = 0.2 mm per count LA363B: Actuator = 0.3 mm per count LA363A: Actuator = 0.4 mm per count LA365A: Actuator = 0.7 mm per count Frequency: Frequency is 30-125 Hz on Single Hall output depending on load and spindle. Overvoltage on the motor can result in shorter pulses	Output voltage min. V_{IN} - 2V Max. current output: 12mA Max. 680nF Open collector source current max. 12mA
	Digital output feedback PWM: Configure any high/low combination between 0-100%	Output voltage min. V_{IN} - 2V Frequency: 75Hz ± 10Hz as standard, but this can be customised. Duty cycle: Any low/high combination between 0 and 100 percent. Open collector source current max. 12mA
	Analogue feedback (4-20mA): Configure any high/low combination between 4-20mA	Tolerances ± 0.2mA Transaction delay 20ms Linear feedback 0.5% Output: Source Serial resistance: 12V max. 300 ohm 24V max. 900 ohm
	All absolute value feedbacks (0-10V, PWM and 4-20mA)	Standby power consumption: 12V, 60mA 24V, 45mA It is recommendable to have the actuator to activate its limit switches on a regular basis, to ensure more precise positioning
White	Signal GND	

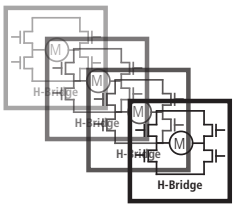
It is recommended that the actuator activates its limit switches on a regular basis, to ensure more precise positioning. The actuator can also go into the position lost state. When the actuator goes in position lost state, the feedback level will remain the highest level until the actuator is initiated. For instance, if feedback is 0-10 V, the feedback level will remain 10V until the actuator is initialised. Both physical end stop switches need to be activated for correct initialisation of the feedback. There is no rule as to which one needs to be activated first.

The BusLink software tool is available for IC Advanced and can be used for:
Diagnostics, manual run and configuration.

Please note that the BusLink cables must be purchased separately from the actuator!

Item number for BusLink cable kit: 0367999 (adaptor + USB2Lin)

I/O specifications: Actuator with Parallel

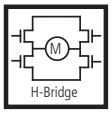
Input/Output	Specification	Comments
Description	Parallel drive of up to 8 actuators. A master actuator with an integrated H-bridge controller controls up to 7 slaves. The version with "IC option" cannot be operated with PWM (power supply).	
Brown	12-24VDC + (VCC) Connect Brown to positive 12V ± 20% 24V ± 10% 12V, current limit 30A 24V, current limit 20A	Note: Do not change the power supply polarity on the brown and blue wires! The parallel actuators can run on one OR separate power supplies Power supply GND (-) is electrically connected to the housing Current limit levels can be adjusted through Bus-Link (only one actuator at a time for parallel) If the temperature drops below 0°C, all current limits will automatically increase to 30A
Blue	12-24VDC - (GND) Connect Blue to negative 12V ± 20% 24V ± 10% 12V, current limit 30A 24V, current limit 20A	
Red	Extends the actuator	On/off voltages: > 67% of V_{IN} = ON < 33% of V_{IN} = OFF Input current: 10mA It does not matter where the in/out signals are applied. You can either choose to connect the signal cable to one actuator OR you can choose to connect the signal cable to each actuator on the line. Either way this will ensure parallel drive
Black	Retracts the actuator	
Green	Endstop signal out	Output voltage min. V_{IN} - 2V Source current max. 100mA Endstop signals are NOT potential free. Endstop signals can be configured with BusLink software according to any position needed
Yellow	Endstop signal in	
Violet	Parallel communication: Violet cords must be connected together	Standby power consumption: 12V, 60mA 24V, 45mA No feedback available during parallel drive
White	Signal GND: White cords must be connected together	

The BusLink software tool is available for Parallel and can be used for:
Diagnostics, manual run and configuration.

Please note that the BusLink cables must be purchased separately from the actuator!

Item number for BusLink cable kit: 0367999 (adaptor + USB2Lin)

I/O specifications: Actuator with CAN bus

Input/Output	Specification	Comments
Description	Compatible with the SAE J1939 standard. Uses CAN messages to command movement, setting parameters and to deliver feedback from the actuator. Actuator identification is provided, using standard J1939 address claim or fixed addresses.	
Brown	12-24VDC + (VCC) Connect Brown to positive 12V ± 20% 24V ± 10% 12V, current limit 30A 24V, current limit 20A	Note: Do not swap the power supply polarity on the brown and blue wires! Power supply GND (-) is electrically connected to the housing Current limit levels can be adjusted through BusLink If the temperature drops below 0°C, all current limits will automatically increase to 30A
Blue	12-24VDC - (GND) Connect Blue to negative	
Red	Extends the actuator	On/off voltages: > 67% of V_{IN} = ON < 33% of V_{IN} = OFF
Black	Retracts the actuator	
Green	CAN_L	LA36 with CAN bus does not contain the 120Ω terminal resistor. The physical layer is in accordance with J1939-15. * Speed: Autobaud up to 500 kbps (Prototypes: 250 kbps) Max bus length: 40 meters Max stub length: 3 meters Max node count: 10 (can be extended to 30 under certain circumstances) Wiring: Unshielded twisted pair Cable impedance: 120 Ω (±10%)
Yellow	CAN_H	
Violet	Service interface	Only BusLink can be used as service interface. Use green adapter cable
White	Service interface GND	

* J1939-15 refers to Twisted Pair and Shielded cables. The standard/default cables delivered with LA36 CAN do not comply with this.

The BusLink software tool (v.2.0 or later versions) is available for CAN bus and can be used for:
Diagnostics, manual run and configuration.
BusLink LIN is only intended for BusLink service interface.

Please note that the BusLink cables must be purchased separately from the actuator!

Item number for BusLink cable kit: 0367997 (adaptor + USB2Lin)

IC options overview

	Basic	Advanced	Parallel	LIN bus	CAN bus
Control					
12V, 24V supply	√	√	√	√	√
H-bridge	√	√	√	√	√
Manual drive in/out	√	√	√	√	√
EOS in/out	-	√	√	√	-
Soft start/stop	√	√	√	√	√
Feedback					
Voltage	√	√ *	-	-	-
Current	-	√ **	-	-	-
Single Hall	√	√	-	-	-
PWM	-	√	-	-	-
Position (mm)	-	-	-	√	√
Custom feedback type	-	√	-	-	-
Monitoring					
Temperature monitoring	√	√	√	√	√
Current cut-off	√	√	√	√	√
Ready signal	-	-	-	-	-
BusLink ⟨••••⟩					
Service counter	-	√	√	√	√
Custom soft start/stop	-	√ ***	√ ***	√ ***	√ ***
Custom current limit	-	√	√	√	√
Speed setting	-	√	√	√	√
Virtual end stop	-	√	√	√	√

* Configure any high/low combination between 0 - 10V

** Configure any high/low combination between 4 - 20mA

*** Configure any value between 0 - 30s

Feedback configurations available for IC Basic, IC Advanced and Parallel

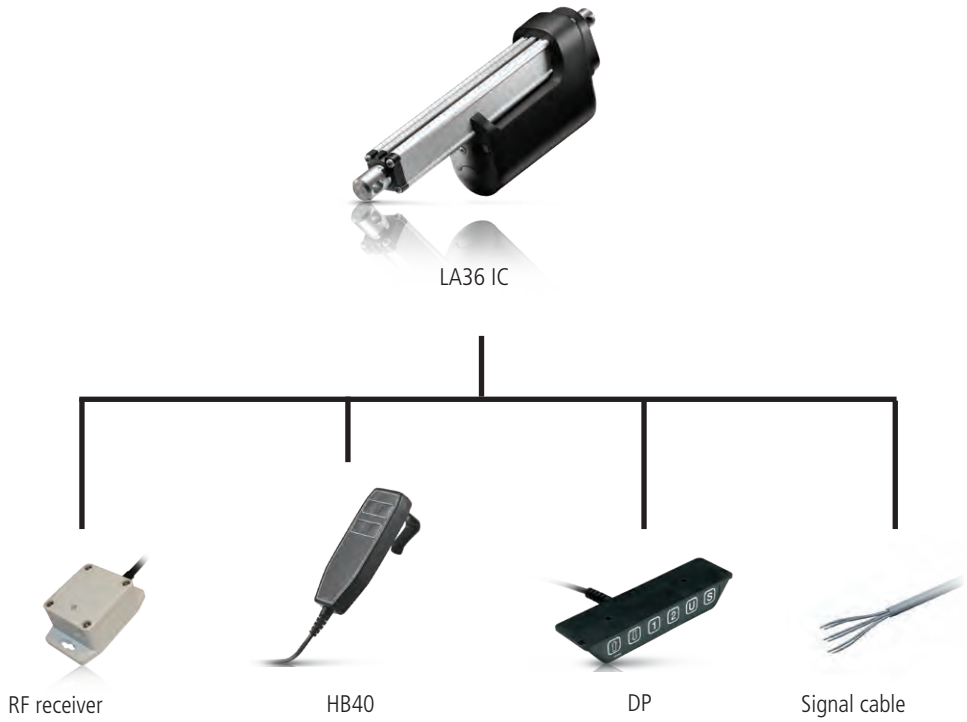
	Pre-configured	Customised range	Pros	Cons
None			N/A	N/A
PWM Feedback	10 – 90 % 75 Hz	0 – 100 % 75 – 150 Hz	Suitable for long distance transmission. Effectual immunity to electrical noise.	More complex processing required, compared to AFV and AFC.
Single Hall*	N/A	N/A	Suitable for long distance transmission.	No position indication.
Analogue Feedback Voltage (AFV)*	0 - 10V	Any combination, going negative or positive. E.g. 8.5 – 2.2V over a full stroke.	High resolution. Traditional type of feedback suitable for most PLCs. Easy faultfinding. Independent on stroke length, compared to a traditional mechanical potentiometer.	Not recommended for applications with long distance cables or environments exposed to electrical noise.
Analogue Feedback Current (AFC)	4 - 20mA	Any combination, going negative or positive. E.g. 5.5 – 18mA over a full stroke.	High resolution. Better immunity to long cables and differences in potentials than AFV. Provides inherent error condition detection. Independent on stroke length, compared to a traditional mechanical potentiometer.	Not suitable for signal isolation. Only to be used on differential input card. Do not use single ended input card. Do NOT connect or put the white wire anywhere near GND, as this will create ground loops, disturbing the mA-signal.
Endstop signal in/out**	At physical end stops. Default for IC Advanced.	Any position. (Not IC Basic)	Can be set at any position over the full stroke length. (Not IC Basic)	Only one endstop can be customised. (Not IC Basic)

All feedback configurations are available for IC Advanced.
* IC Basic feedback configurations available: EOS
** Parallel feedback configurations available: EOS

Actuator configurations available for IC Basic, IC Advanced and Parallel

	Pre-configured	**Customised range (Not IC Basic)**	**Description**
Current limit inwards	20A for both current limit directions. (When the current outputs are at zero, it means that they are at maximum value 20A). Be aware: When the actuator comes with current cut-off limits that are factory pre-configured for certain values, the pre-configured values will be the new maximum level of current cut-off. This means that if the current cut-off limits are pre-configured to 14A, it will not be possible to change the current limits through BusLink to go higher than 14A.	Recommended range: 4A to 20A If the temperature drops below 0°C, all current limits will automatically increase to approximately 30A, indenpendent of the pre-configured value.	The actuator's unloaded current consumption is very close to 4A, and if the current cut-off is customised below 4A there is a risk that the actuator will not start. The inwards and outwards current limits can be configured separately and do not have to have the same value.
Current limit outwards			
Max. speed inwards/ outwards	100% equal to full performance	Lowest recommended speed at full load: 60% It is possible to reduce the speed below 60%, but this is dependable on load, power supply and the environment.	The speed is based on a PWM principle, meaning that 100% equals the voltage output of the power supply in use, and not the actual speed.
Virtual endstop inwards	0mm for both virtual enstop directions. (When the virtual end-stops are at zero, it means that they are not in use).	It is only possible to run the actuator with one virtual endstop, either inwards or outwards. Scaling of feedback when choosing analogue feedback. All Absolute feedback levels must follow the chosen virtual end-stop, if any are set. When virtual end-stop is chosen through the bus link, the actuator will need initialisation and feedback will be adjusted accordingly to the virtual end-stop.	The virtual endstop positions are based on hall sensor technology, meaning that the positioning needs to be initialised from time to time. One of the physical endstops must be available for initialisation.
Virtual endstop outwards			
Soft stop inwards	0.3 sec. for both soft stop directions.	0.3 sec. to 30 sec. 0 sec. can be chosen for hard stop.	It is not possible to configure values between 0.01 sec. to 0.29 sec. This is due to the back-EMF from the motor (increasing the voltage). Be aware that the soft stop value equals the deacceleration time after stop command.
Soft stop outwards			
Soft start inwards	0.3 sec. for both soft start directions.	0 sec. to 30 sec.	Be aware that the soft start value equals the acceleration time after start command. To avoid stress on the actuator, it is not recommended to use 0 sec. for soft start, due to higher inrush current.
Soft start outwards			

System combination possibilities for LA36 IC Advanced



Chapter 3

Environmental tests - Climatic

Test	Specification	Comment
Cold test	EN60068-2-1 (Ab)	Storage at low temperature: Temperature: -40°C Duration: 72h Not connected Tested at room temperature.
	EN60068-2-1 (Ad)	Storage at low temperature: Temperature: -30°C Duration: 2h Actuator is not activated/connected Tested at low temperature.
Dry Heat	EN60068-2-2 (Bb)	Storage at high temperature: Temperature: +90°C Duration: 72h Actuator is not activated/connected. Tested at room temperature Storage at high temperature: Temperature: +70°C Duration: 1000h Actuator is not activated/connected Tested at high temperature.
	EN60068-2-2 (Bd)	Operating at high temperature: Temperature: +60°C Int. max. 17% Duration:700h Actuator is activated Tested at high temperature.
Change of temperature	EN60068-2-14 (Na)	Rapid change of temperature: High temperature: +100°C in 60 minutes. Low temperature: -30°C in 60 minutes. Transition time:<10 seconds Duration: 100 cycles Actuator is not activated/connected. Tested at room temperature.
	EN60068-2-14 (Nb)	Controlled change of temperature: Temperature change 5°C pr. minute High temperature: +70°C in 60 minutes. Low temperature: -30°C in 30 minutes. 130 minutes pr. Cycle. Duration: 1.000 cycles (90days) Actuator is not activated/connected. Tested at 250, 500 and 1,000 cycles at low and high temperatures.
Damp heat	EN60068-2-30 (Db)	Damp heat, Cyclic: Relative humidity: 93-98% High temperature: +55°C in 12 hours Low temperature: +25°C in 12 hours Duration: 21cycles * 24hours Actuator is not activated/connected Tested within 1 hour after condensation, That means after upper temperature has been reached.
	EN60068-2-3 (Ca)	Damp heat, Steady state: Relative humidity: 93-95% Temperature: +40 ±2°C Duration: 56 days Actuator is not activated/connected. Tested within one hour after exposure.
Salt mist.	EN60068-2-52 (Kb)	Salt spray test: Salt solution: 5% sodium chloride (NaCl) 4 spraying periods, each of 2 hours. Humidity storage 7 days after each. Actuator not activated/connected. Exposure time: 500 hours

Environmental tests - Climatic

Degrees of protection	EN60529 – IP66	<u>IP6X - Dust:</u> Dust-tight, No ingress of dust. Actuator is not activated. <u>IPX6 – Water:</u> Ingress of water in quantities causing harmful effects is not allowed. Duration: 100 litres pr. minute in 3 minutes Actuator is not activated. <u>IPX6 –Connected actuator:</u> Actuator is driving out and in for 3 min. 100(l/min) jet of water is placed at the wiper ring for 3 (min).
	DIN40050 – IP69K	<u>IPX6 –Connected actuator and push 6800 (N)</u> Actuator is driving out and in for 3 min. and Push 6800(N) at the end-pos. 100 (l/min.) jet of water is placed at the wiper ring for 3 min. <u>High pressure cleaner:</u> Water temperature: +80°C Water pressure: 80 bar Spray angle: 45° Spray distance: 100mm Duration: From any direction 10 seconds of spraying followed by 10 seconds rest. Actuator is not activated. Ingress of water in quantities causing harmful effects is not allowed.
	DUNK test	The actuator has been warmed up to 115ºC for 20 hours. After this it is cooled down in 20ºC saltwater. Cooling time: 5 minutes Opened for checking salt deposit and water.
Chemicals	BS7691 / 96hours	Diesel 100% Hydraulic oil 100% Ethylene Glucol 50% Urea Nitrogen saturated solution Liquid lime 10% (Super- Cal) NPK Fertilizer (NPK 16-4-12) saturated Tested for corrosion.

Environmental tests - Mechanical

Test	Specification	Comment
Free fall		Free fall from all sides: Height of fall: 0.4 meter onto steel. Actuator not activated/connected.
Vibration	EN60068-2-36 (Fdb)	Random vibration: Short time test:6.29g RMS Actuator is not connected Long time test: 7.21g RMS Actuator is not connected Duration: 2 hours in each direction
	EN 60068-2-6 (Fc)	Sinus vibration: Frequency 5-25Hz: Amplitude = 3.3mm pp Frequency 25-200Hz: Acceleration 4g Number of directions: 3 (X-Z-Y) Duration: 2 hours in each direction. Actuator is not activated
Bump	EN60068-2-29 (Eb)	Bump test: Level: 40g Duration: 6 milliseconds Number of bumps: 500 shocks in each of 6 directions. Actuator is not connected.
Shock	EN60068-2-27 (Ea)	Shock test: Level: 100g Duration: 6 milliseconds Number of bumps: 3 shocks in each of 6 directions. Actuator is not connected.

Environmental tests - Electrical

Test	Specification	Comment
Power supply	ASAE EP455 (1990)	Operating voltages +10V - +16V Over voltage +26(V) / 5min. Reverse polarity –26(V) / 5min. Short circuit to ground 16 (V) / 5 min. Short circuit to supply 16(V) / 5 min.
HF-immunity	EN61000-6-2	Level: 30 V/m. at 26 MHz – 1000 mHz 80% 1 KHz
Emission	EN61000-6-4	Level is inside limits for 12 V motor
Automotive transients	ISO 7637	Load dump test only accepted on motor power connection.
IECEx / ATEX (Ex)	EN60079-0:2012 EN60079-31:2014	This Ex certification allows the actuator to be mounted in Ex dust areas: II 2D Ex tb IIIC T135°C Db Tamb -25°C to +65°C
Regulation No. 10		Directive on electromagnetic compatibility of sub-assembly for automotive applications

All electrical tests are conducted and radiated emission (EMC) tests.

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