TECHLINE®
IMPROVING FLEXIBILITY

Linear Actuator LA37

Data Sheet

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Contents

Preface

Dear User,

We are delighted that you have chosen a LINAK® product.

LINAK systems are high-tech products based on many years of experience in the manufacture and development of actuators, lifting columns, desk frames, electric control boxes, controls, batteries, accessories and chargers.

This User Manual does not address the end user. It is intended as a source of information for the equipment or system manufacturer only, and it will tell you how to install, use and maintain your LINAK electronics. The manufacturer of the end product has the responsibility to provide a User Manual, where relevant safety information from this manual is passed on to the end user.

We are convinced that your LINAK product/system will give you many years of problem-free operation.

Before our products leave the factory, they undergo both function and quality testing. Should you, nevertheless, experience problems with your product/system, you are always welcome to contact your supplier.

LINAK subsidiaries and some distributors situated all over the world have authorised service centres, which are always ready to help you. Locate your local contact information on the back page.

LINAK provides a warranty on all products. (See warranty section).

This warranty, however, is subject to correct use in accordance with the specifications, maintenance being done correctly, and any repairs being carried out at a service centre, which is authorised to repair LINAK products.

Changes in installation and use of LINAK systems can affect their operation and durability. The products may only be opened by authorised personnel.

This User Manual has been written based on the present technical knowledge. LINAK reserves the right to carry out technical modifications and keeps the associated information updated.

LINAK A/S

Terms of use

LINAK® takes great care in providing accurate and up-to-date information on its products. However, the user is responsible for determining the suitability of LINAK products for a specific application.

Due to continual development, LINAK products are subject to frequent modifications and changes. LINAK reserves the rights to conduct modifications, updates, and changes without any prior notice. For the same reason, LINAK cannot guarantee the correctness and actual status of imprinted information on its products.

LINAK uses its best efforts to fulfil orders. However, for the reasons mentioned above, LINAK cannot guarantee availability of any particular product at any given time. LINAK reserves the right to discontinue the sale of any product displayed on its website or listed in its catalogues or in other written material created and produced by LINAK, LINAK subsidiaries, or LINAK affiliates.

All sales are subject to the 'Standard Terms of Sale and Delivery for LINAK A/S' available on LINAK websites.

Introduction

Powerful electric linear actuator designed to handle high loads and demanding environments. It delivers long-lasting reliability as well as a wide choice of industrial control interfaces.

Safety instructions

Please read this safety information carefully.

Be aware of the following three symbols throughout the document:

Warning!
Failing to follow these instructions can cause accidents resulting in serious personal injury.

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.

Furthermore, ensure that all staff who are to connect, mount, or use the actuator are in possession of the necessary information and that they have access to this document.

Persons who do not have the necessary experience or knowledge of the product/products must not use the product/products. Besides, persons with reduced physical or mental abilities must not use the product/products, unless they are under surveillance or they have been thoroughly instructed in the use of the apparatus by a person who is responsible for the safety of these persons.

Moreover, children must be under surveillance to ensure that they do not play with the product.

Before you start mounting/dismounting, ensure that the following points are observed:

- The actuator is not in operation.
- The actuator is free from loads that could be released during this work.

Before you put the actuator into operation, check the following:

- The actuator is correctly mounted as indicated in the relevant user instructions.
- The equipment can be freely moved over the actuator's whole working area.
- The actuator is connected to a mains electricity supply/transformer with the correct voltage which is dimensioned and adapted to the actuator in question.
- Ensure that the voltage applied matches to the voltage specified on the actuator label.
- Ensure that the connection bolts can withstand the wear.
- Ensure that the connection bolts are secured safely.

During operation, please be aware of the following:

- Listen for unusual sounds and watch out for uneven running. Stop the actuator immediately if anything unusual is observed.
- Do not sideload the actuator.
- Only use the actuator within the specified working limits.
- Do not step on or kick the actuator.

When the equipment is not in use:

- Switch off the mains supply in order to prevent unintentional operation.
- Check regularly for extraordinary wear.

Classification

The equipment is not suitable for use in the presence of a flammable anaesthetic mixture with air or with oxygen or nitrous oxide.

Warnings

- Do not sideload the actuator.
- When mounting the actuator in the application ensure that the bolts can withstand the wear and that they are secured safely.
- If irregularities are observed, the actuator must be replaced.
- The standard actuator (without Integrated Controller) without clutch, is not allowed to run into a mechanical block -before reaching the end of stroke.

Recommendations

- Do not place load on the actuator housing.
- Prevent impact or blows, or any other form of stress to the housing.
- Ensure that the cable cover is mounted correctly. Use 3.5 Nm torque.
- Ensure that the duty cycle and the usage temperatures for LA37 actuators are respected.
- Ensure that the cable cannot be squeezed, pulled or subjected to any other stress.
- Furthermore, it will be good practice to ensure that the actuator is fully retracted in the “normal” position. The reason is that there will be a vacuum inside the actuator if it is extended which over time can lead to water entering the actuator.

Features

- 12 / 24 / 48 V DC permanent magnetic motor
- Load from 10,000 N - 15,000 N
- Max. speed 11 mm/sec. depending on load, spindle pitch and platform
- Stroke length from 100 mm to 600 mm (605 -1,000 mm at reduced load)
- Built-in endstops reached function
- Highly efficient acme thread spindle
- Safety factor 2: The actuator has been certified to withstand static loads that are twice the magnitude of its dynamic load capacity without sustaining damage.
- Heavy duty aluminium housing for harsh conditions
- Protection class: IP66 for outdoor use (dynamic). Furthermore, the actuator can be washed down by a high pressure cleaner (IP69K - static)
- Highly efficient acme thread spindle
- Static holding load up to 45 kN in push and pull
- Dynamic wind stress loads 15 kN push/pull 100,000 times
- Hand crank for manual operation
- Integrated brake, high self-lock ability
- Endplay - See Technical Specifications
- Non-rotating piston rod eye
- Noise level: 76 dB (A). Measuring method: DS/EN ISO 8746 (actuator not loaded)
- Current monitoring
- Weight: 4.29 kg for 100 mm stroke; additional 0.24 kg for each additional 50mm stroke.
  (Cable not included; weight varies by selected options)
- Off-highway Features:
  - 12 or 24 V DC brushed permanent magnetic motor
  - Load up to 15,000 N (depending on the spindle pitch)
  - Max. speed 11 mm/sec.
  - Reinforced aluminium housing for harsh conditions
  - IPC-A-610 Class 3 (High-performance electronic products)
  - IP54 without cable mounted
    IP69K with cable mounted with shell or moulded cable
  - Connector plug type: DT16-18SA-K004, AT16-18SA-K004 or TE 2600047-1

An Off-highway vehicle is intended for use on steep or uneven ground and includes those used for construction or agriculture. They are specifically designed for off-road use.

Quad bikes, dirt bikes, dune buggies and other types of all-terrain vehicles are also types of Off-highway vehicles, although their function is very different from motor vehicles designed for industrial and farming use.

Options in general

- Back fixture can be ordered in steps of 90 degrees
- Exchangeable cables in different lengths
- Hall effect sensor
- Analogue or digital feedback for precise positioning
- Different back fixtures and piston rod eyes
- Short Built in Dimension available for loads up to 10,000 N
- Endstop reached signals
- Built-in Zero Point or endstop switch initialisation principle
- IC options including:
    - I/O
    - Ethernet/IP
    - Modbus TCP/IP
    - Modbus RTU
    - IO-Link
    - LIN bus
    - CAN SAE J1939
    - CANopen
    - Off-highway LIN bus (contact LINAK sales)
    - Off-highway CAN SAE J1939
    - Off-highway CANopen

(see specific interface user manuals at the TECHLINE webpage for Connection Diagrams and I/O Specifications)

- PC configuration tools (Actuator Connect™ and BusLink)

Usage

- Duty cycle up to 600 mm stroke: 10% (120 s drive and 1080 s rest)
- Duty cycle at 601-1,000 mm stroke: 5% (60 s drive and 1140 s rest)
- Ambient operating temperature: Full performance from +5 °C to +40 °C
  -30 °C (reduced load 50%) to + 85 °C (reduced duty cycle 10%)
- Storage temperature: -40 °C to +70 °C
- Actuator not activated/connected: -40 °C to +85 °C for 72 hours
  -55 °C to +95 °C for 24 hours for Standard platform
  -55 °C to +105 °C for 24 hours for Integrated Control platform
- Acclimatization before usage
- Relative humidity: Full performance from 20% to 80% - non-condensing
  (Actuator is neither activated nor connected)
- Cyclic state: 93% to 98% - non-condensing +25 °C to +55 °C for 12 hours
- Steady state: 93% to 95% - non-condensing +40 °C for 56 days
- Atmospheric pressure: 700 to 1060 hPa
- Meters above sea level: Max. 3,000 meters
- Off-highway:
  - For applications operated at constantly low temperatures it is recommended to use a stronger version of the actuator to reduce the current consumption that in some combinations can be up to 3 times higher (at -40° Celsius)
  - Tested according to: ISO14982-1 / Agricultural and forestry machinery - Electromagnetic compatibility - Part 1: General EMC requirements (clamped capacitor circuit)
  - Compliant with: ROHS2 : 2011/65/EU: Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment EMC Directive - 2014/30/EU

Ordering example

37 080 200 0 A 01 B 6 - 6 1 2 H 3 XXXX A C S 0 0 0

Actuator type
37 = LA37

Spindle type
025 = 2.5 mm
080 = 8 mm

Stroke length
200 = XXX Length in mm (100-995)
A00 = 1000 Length in mm

Safety
0 = No safety nut

Feedback
0 = No Feedback
A = Analogue feedback (Hall potentiometer)
H = Dual Hall
K = Single Hall
X = Special

Platform

6-pin

Endstop switch principle

See Current limits and Current cut-offs for availability of voltage

01 = Standard with power switch
04 = Modbus RTU
06 = LIN bus
07 = CAN SAE J1939
08 = CANopen

Zero Point

16 = LIN bus
17 = CAN SAE J1939
18 = CANopen

18-pin Off-highway

C6* = LIN bus **
D6* = CAN SAE J1939
E6* = CANopen
XX = Special

9-pin

Zero Point

B3 = I/O Basic
C3 = I/O Customised
F3 = I/O Full
0B = IO-Link
14 = Modbus RTU

Zero Point with split supply

A7 = CAN SAE J1939
A8 = CANopen
0E = Modbus TCP/IP
2E = Ethernet/IP
4E = Profinet

Motor type
1 = 12 V DC
2 = 24 V DC
4 = 48 V DC

Housing
6 = IP66 - Reinforced house
C*** = IP54 - Off-highway house

* Requires **Housing** option C, also only available with **Motor type** option 1 or 2
** Please contact LINAK for further information
*** Requires **Platform** option 18-pin Off-highway - Only available with **Motor type** option 1 or 2

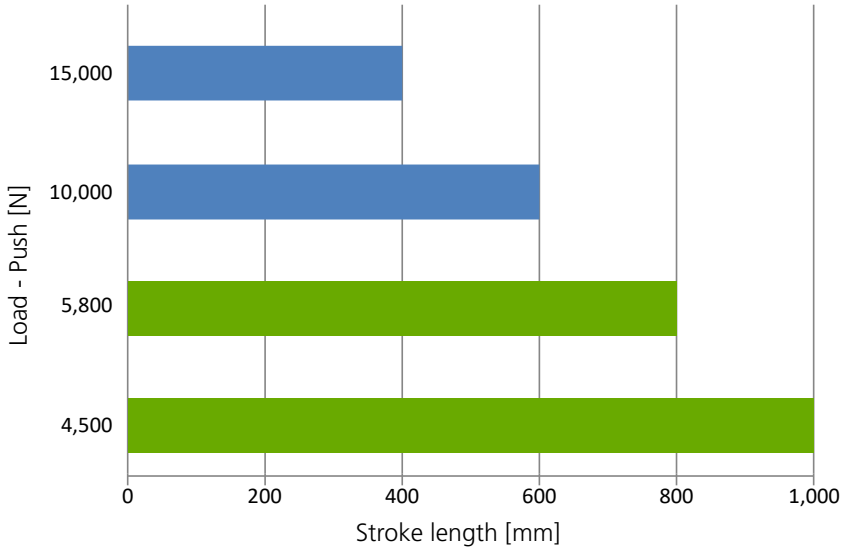
Not used	**-**	=	Not used			
Colour	**6**	=	Dark Olivish Grey NCS S7000-N			
Back fixture	**1**	=	0°	4	=	Male Adapter (outer thread)
	2	=	90°	5*	=	Female adapter (inner thread)
				X	=	Special
Piston rod eye	**2**	=	Solid	6	=	Ball eye
	4	=	Male Adapter (Outer thread)	X	=	Special
	1*	=	Slotted	5*	=	Female adapter (inner thread)
Gear	**H**	=	Ratio 1:46			
Brake	3	=	Push/Pull			
Built-in dimension	xxxx	=	Measured in mm			
Endstop reached output	**A**	=	A_HIGH / A_HIGH	J	=	A_HIGH / LOW
	B	=	A_LOW / A_HIGH	K	=	A_LOW / LOW
	C	=	A_HIGH / A_LOW	L	=	A_HIGH / HIGH
	D	=	A_LOW / A_LOW	M	=	A_LOW / HIGH
	E	=	LOW / A_HIGH	N**	=	LOW / LOW
	F	=	HIGH / A_HIGH	O	=	HIGH / LOW
	G	=	LOW / A_LOW	P	=	LOW / HIGH
	H	=	HIGH / A_LOW	Q	=	HIGH / HIGH
				X	=	Special
Plug type	0***	=	No plug (when no cable is chosen)	H	=	AMP
	J	=	Deutsch	N	=	M12 IO-Link
	9	=	Deutsch - Moulded	E****	=	M12 Y Ethernet/IP
	C	=	Flying leads	R	=	M12 Modbus RTU
				X	=	Special

* Only available for **Short BiD** option A
** Mandatory for **Platform** options CAN SAE J1939, CANopen, LIN bus, Modbus and IO-Link
*** Shall be chosen with 'Off-highway'
**** Actuators with **Platform** option Ethernet/IP are only compatible with **Plug** option E and **Cable** option S

Cable	0*	=	No cable selected	A	=	Mounted with 90° angled connectors
	S**	=	Straight cable	Y	=	Y-Cable (combined power and signal cable)
	V	=	Y-Cable with 90° angled connectors	X	=	Special
Parallel mode	**0**	=	Parallel disabled	2-8	=	Critical parallel (number of actuators in the parallel system)
SW config.	**0**	=	Default software	X	=	Special software
Short BiD	**0**	=	Standard	A***	=	Short (conform with LA36)

* Shall be chosen with 'Off-highway' **Platform** options C6, D6 and E6
** Actuators with **Platform** option Ethernet/IP are only compatible with **Plug** option E and **Cable** option S
*** Only available with **Spindle type** option 080 (See piston rod eyes for further limitations)

Load vs stroke length



For applications that only operate in pull - the limitations are 1,000 mm stroke with both 10,000 and 15,000 N load

Technical specifications

12 V

Load max. [N]	Self-lock min. [N]	Pitch [mm/ spindle rev.]	Hall resolution [mm/count]	Endplay [mm]	Typical speed [mm/s]			Typical amp. [A]	
					No load	Full load	Reg-ula-ted	No load	Full load
15000	20000	2.5	0.034	2	3.5	2.2	3	4.0	22.5
10000	15000	2.5	0.034	2	3.5	2.8	3	4.0	15.0
10000	15000	8.0	0.110	2	11.0	9.0	8	4.0	23.0

24 V

Load max. [N]	Self-lock min. [N]	Pitch [mm/spindle rev.]	Hall resolution [mm/count]	Endplay [mm]	Typical speed [mm/s]			Typical amp. [A]	
					No load	Full load	Reg-ula-ted	No load	Full load
15000	20000	2.5	0.034	2	3.5	2.8	3	2.0	13.0
10000	20000	2.5	0.034	2	3.5	3.0	3	2.0	8.0
10000	15000	8.0	0.110	2	11.0	9.0	8	2.0	13.0

48 V

Load max. [N]	Self-lock min. [N]	Pitch [mm/spindle rev.]	Hall resolution [mm/count]	Endplay [mm]	Typical speed [mm/s]			Typical amp. [A]	
					No load	Full load	Reg-ula-ted	No load	Full load
15000	20000	2.5	0.034	2	3.5	2.5	3	1.0	6.0
10000	20000	2.5	0.034	2	3.5	3.2	3	1.0	4.0
10000	15000	8.0	0.110	2	11.0	9.0	8	1.0	6.0

See Current limits and Current cut-offs for availability of voltage

- To ensure maximum self-locking ability, please make sure that the motor is shorted when stopped Actuators with Integrated Controller provide this feature, as long as the actuator is powered.

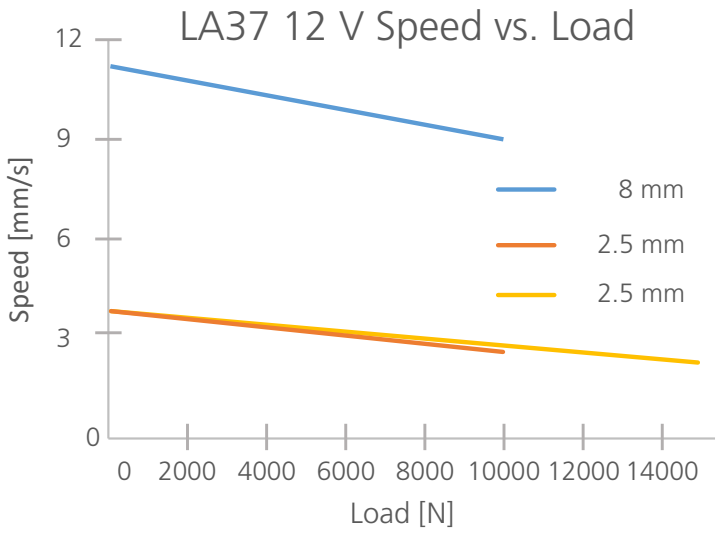
- When using soft stop on a DC-motor, a short peak of higher voltage will be sent back towards the power supply. It is important when selecting the power supply that it does not turn off the output when this backwards load dump occurs.

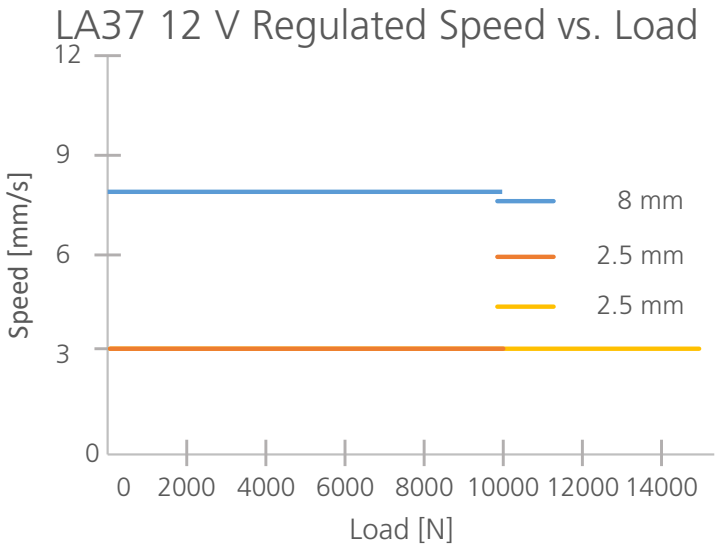
A Hall pulse consists of two Hall counts. A Hall count occurs every time the signal changes state [high to low or vice versa].

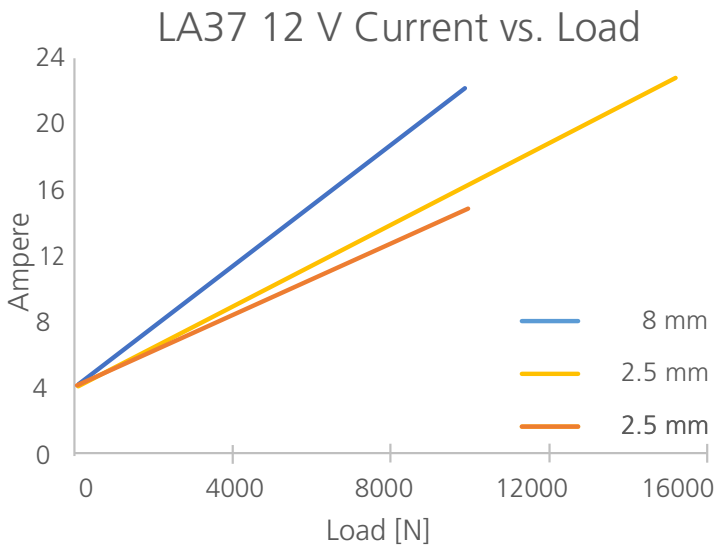
The typical values can have a variation of ± 20% on the current values and ± 10% on the speed values. Measurements are made with an actuator in connection with a stable power supply and an ambient temperature of 20°C.

Speed and current curves 12 V

The typical values below are made with a nominal power supply of 12 V DC and an ambient temperature of 20°C.

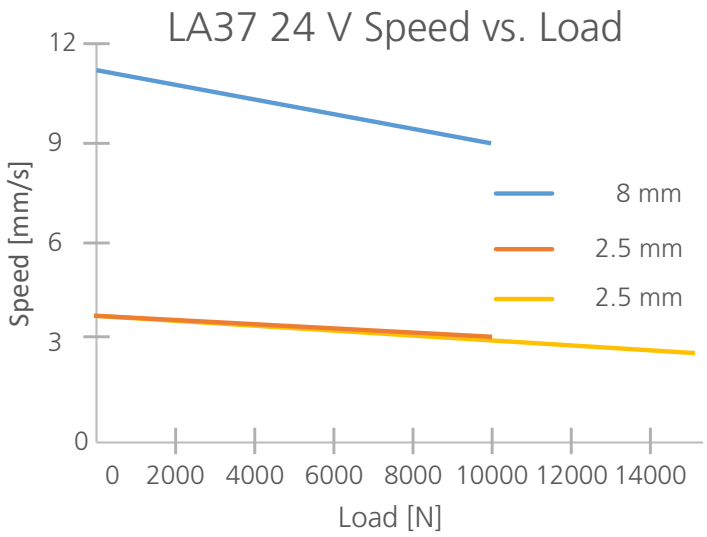


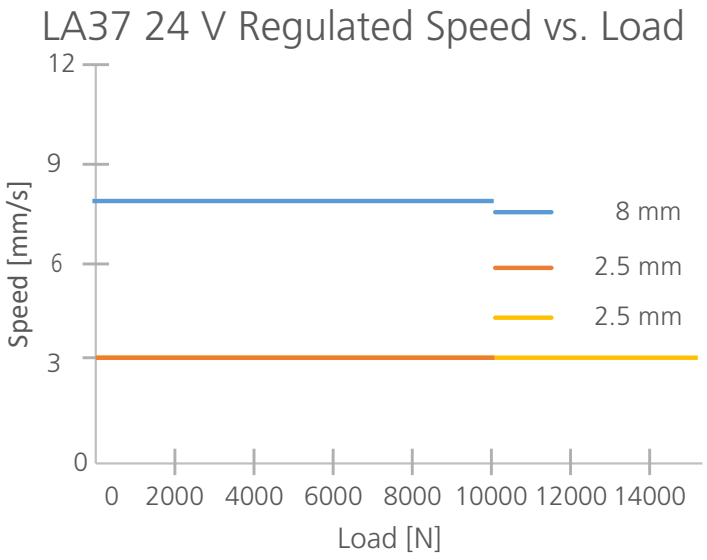


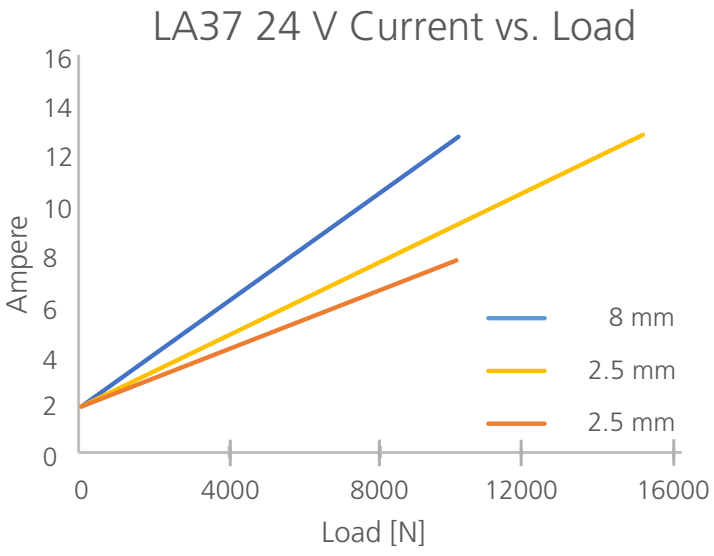


Speed and current curves 24 V

The typical values below are made with a nominal power supply of 24 V DC and an ambient temperature of 20˚C.

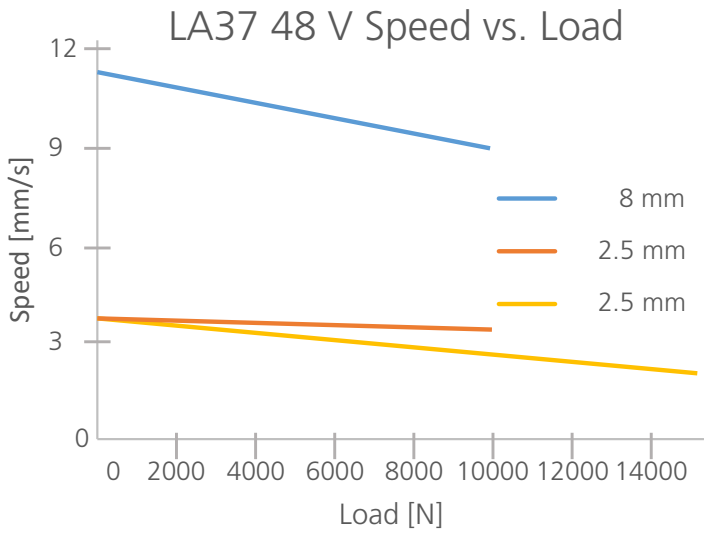


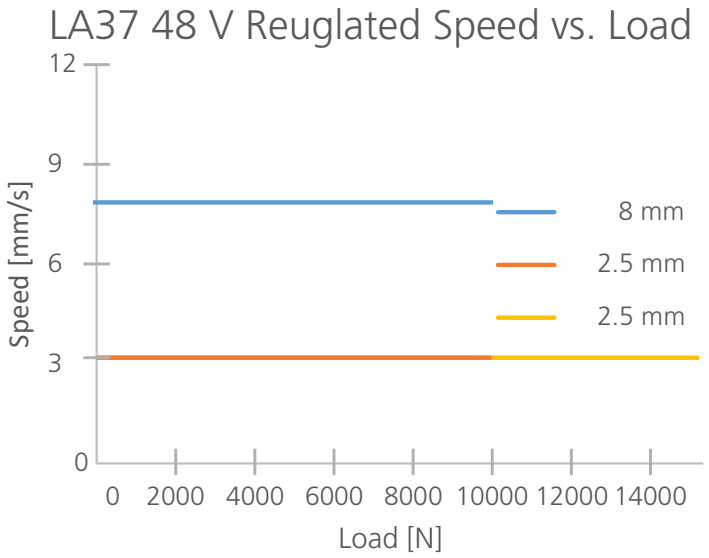


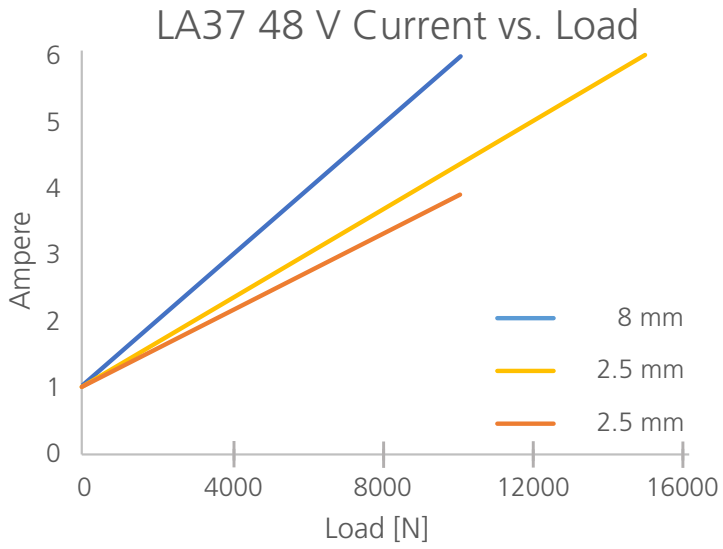


Speed and current curves 48 V

The typical values below are made with a nominal power supply of 48 V DC and an ambient temperature of 20˚C.





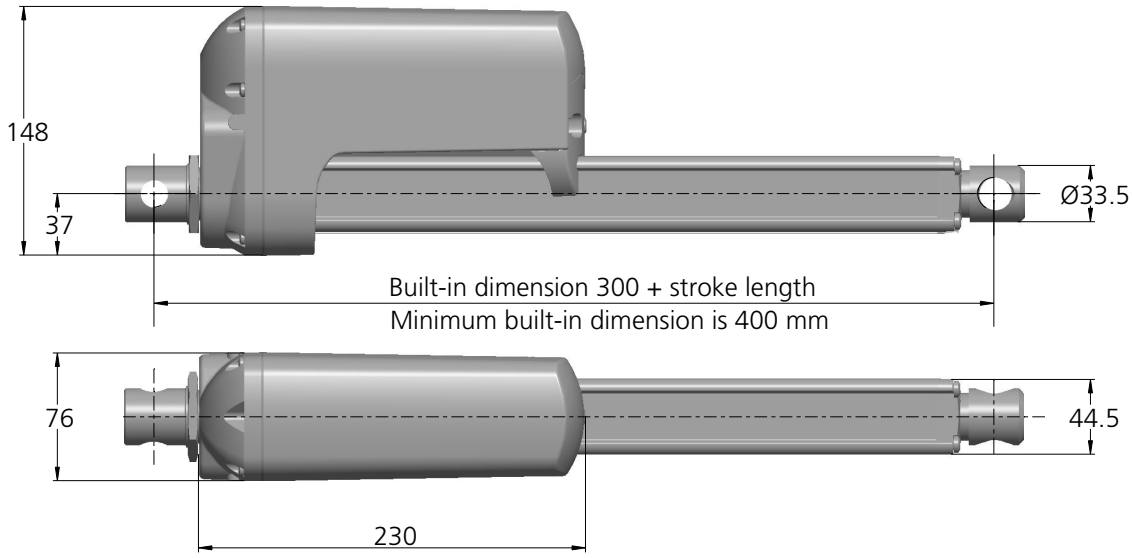


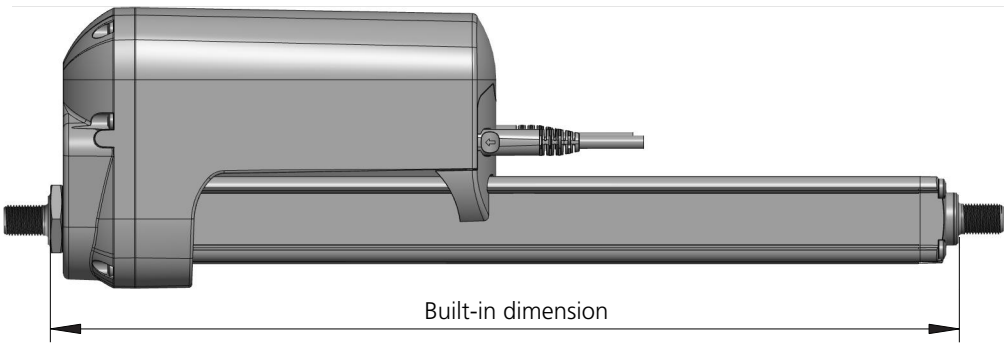
Stroke and built-in tolerances

Platforms		Stroke tolerance	Example for 200 mm stroke	BID tolerance	Example for 400 mm BID
01	Standard with power switch	+0/-4 mm	196 to 200 mm	± 4 mm	396 to 404 mm
04 06 07 08	Modbus LIN bus CAN SAE J1939 CANopen	+4/-6 mm	194 to 200 mm	± 4 mm	396 to 404 mm
16 17 18	LIN bus CAN SAE J1939 CANopen	± 2 mm	198 to 202 mm	± 2 mm	398 to 402 mm
B3 C3 F3 0B 14 A7 A8 4E 2E 0E C6 D6 E6	I/O Basic I/O Customised I/O Full IO-Link Modbus RTU CAN SAE J1939 CANopen Profinet Ethernet/IP Modbus TCP/IP LIN bus Off-highway CAN SAE J1939 Off-highway CANopen Off-highway	± 2 mm	198 to 202 mm	± 2 mm	398 to 402 mm

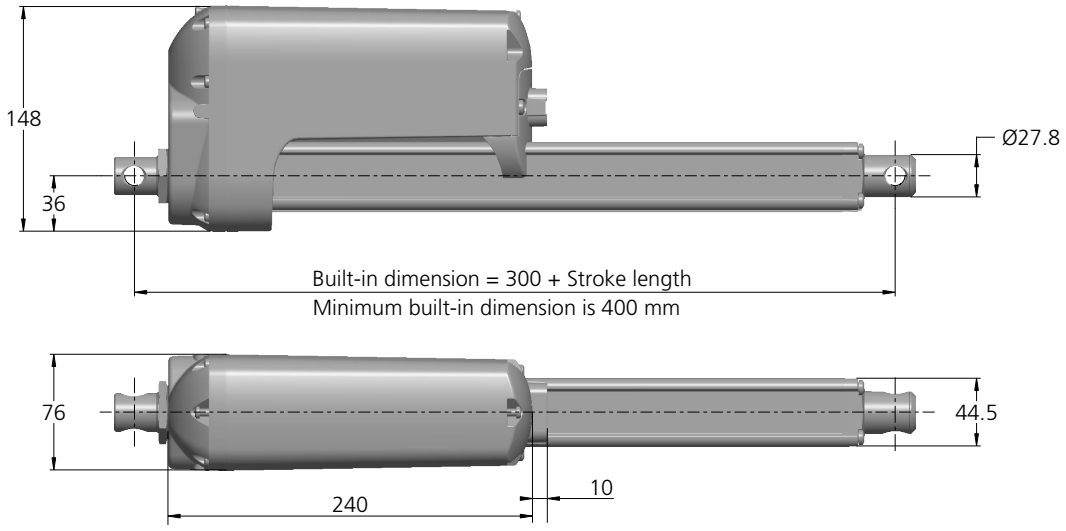
Built-in dimensions (standard length)

All dimensions are in mm





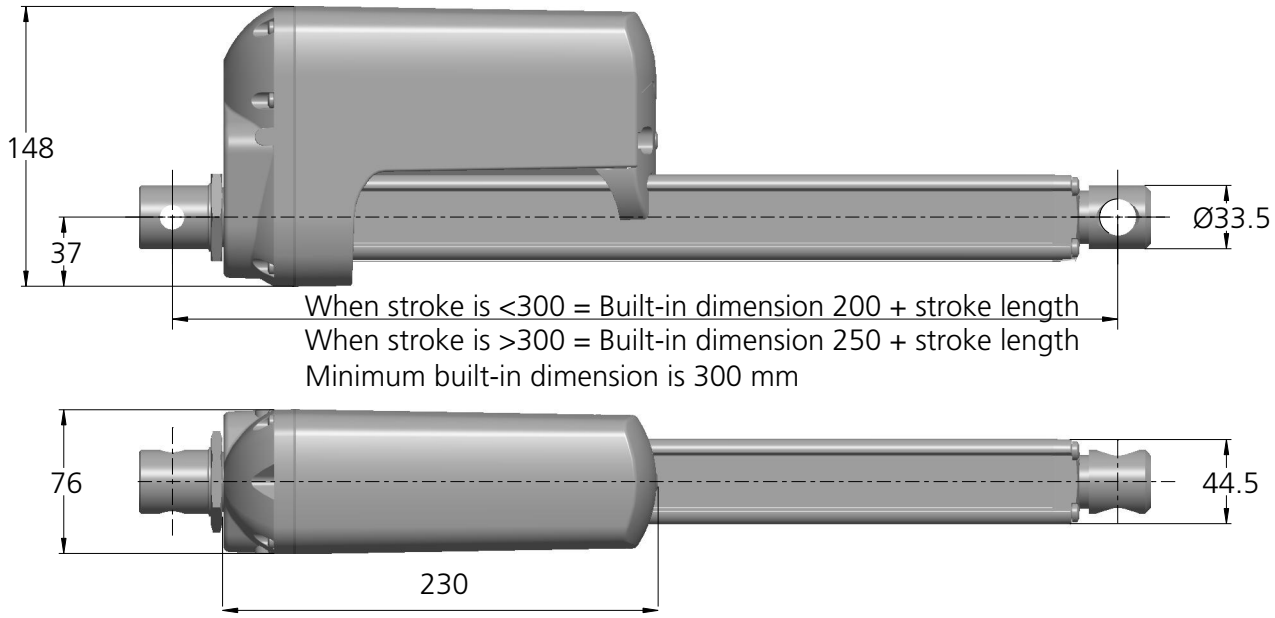
LA37 Off-highway



	Piston rod eye	Ball eye Ø20 H7 / to the centre of the hole	Ball eye Ø19.2 / to the centre of the hole	Solid Ø16.2 mm / to the centre of the hole	Solid Ø19.2 mm / to the centre of the hole	Male adapter M16 X 1.5 / from the surface*	Male adapter M20 X 1.5/ from the surface*
Back fixture		Stroke from 100 to 600	Stroke from 100 to 600	Stroke from 100 to 600	Stroke from 100 to 600	Stroke from 100 to 600	Stroke from 100 to 600
Solid Ø16.2 mm (0° and 90°) / to the centre of the hole		315 + stroke	315 + stroke	300 + stroke	300 + stroke	287 + stroke	287 + stroke
Solid Ø19.2 mm (0° and 90°) / to the centre of the hole		315 + stroke	315 + stroke	300 + stroke	300 + stroke	287 + stroke	287 + stroke
Male adapter M20 / from the surface*		296 + stroke	296 + stroke	281 + stroke	281 + stroke	268 + stroke*	268 + stroke*
* These built-in dimensions are measured according to the illustrations.							

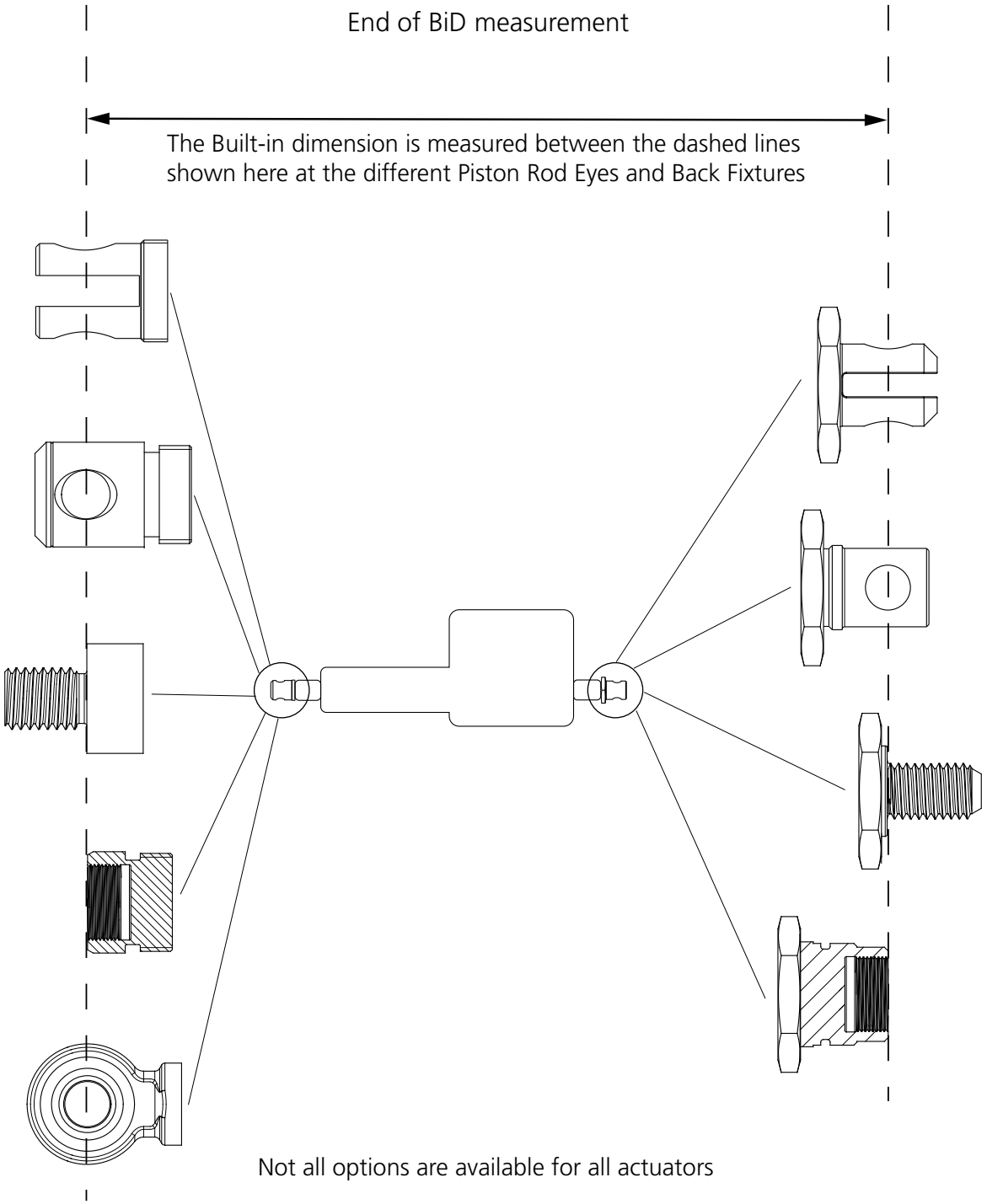
Built-in dimensions (Short BID option)

All dimensions are in mm.



	Back Fixture	Solid (0° and 90°)		Male adapter Outer thread	
Stroke length		**<=300**	**>300**	**<=300**	**>300**
Piston Rod Eye		To the centre of the hole		To the centre of the hole	
Ball Eye	**To the centre of the hole**	215 + stroke	265 + stroke	200 + stroke	250 + stroke
Solid	**To the centre of the hole**	200+ stroke	250 + stroke	185 + stroke	235 + stroke
Male adapter Outer thread	**From the surface**	187+ stroke	237+ stroke	173+ stroke	223 + stroke

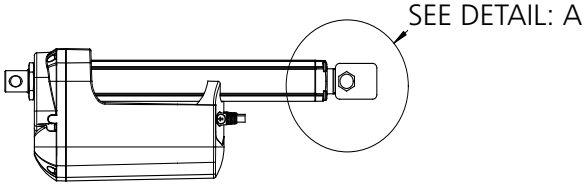
Built-in dimensions to and from measure points

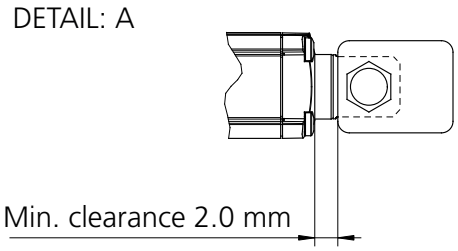


Not all options are available for all actuators

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. This will prevent jamming and destruction of the actuator drive train.

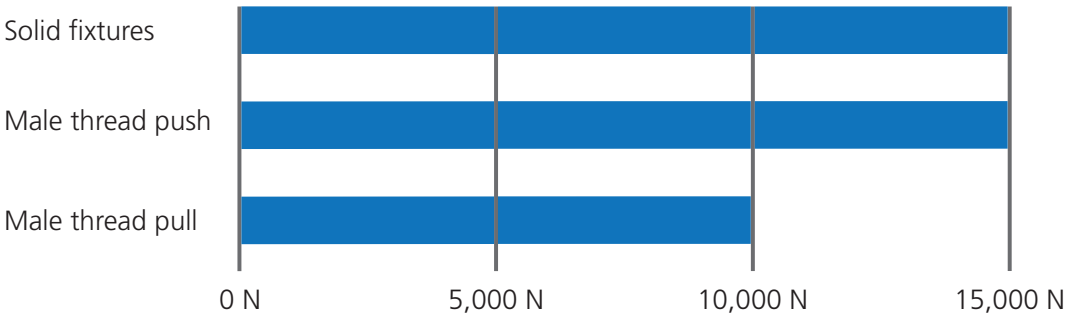




With Zero Point the minimum stroke is 100 mm.
The Zero Point initialisation zone is located between 35-75 mm going from the most inward position.

The movement passing the zone has to be stable for the initialisation to succeed - also, no virtual limits can be set in the initialisation zone.

Durability for piston rod eyes and back fixtures

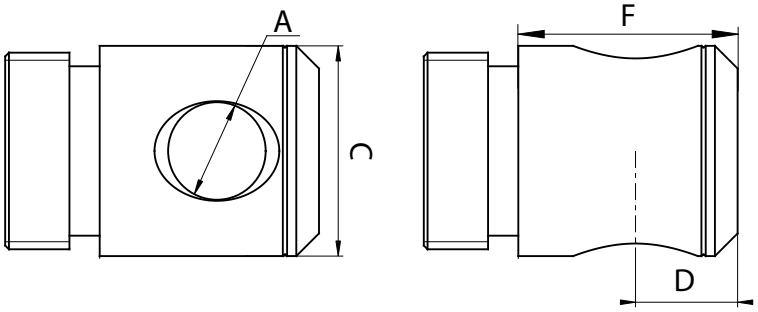


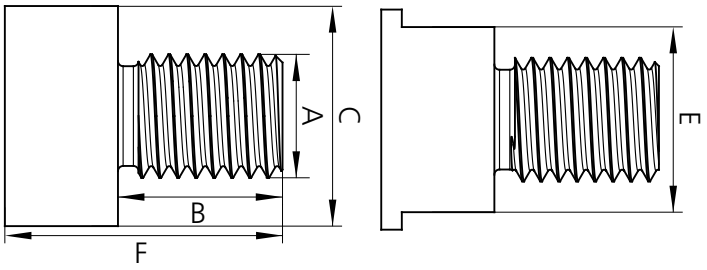
Blue = Full lifetime

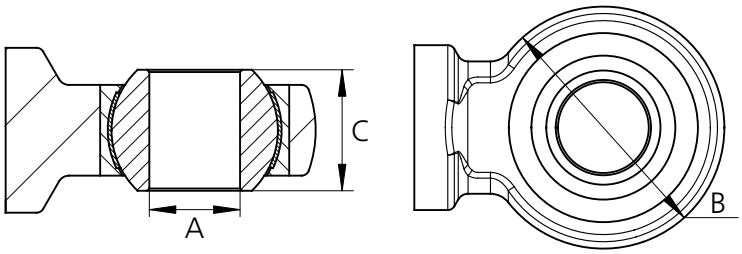
Piston rod eyes

All dimensions are in mm. The piston rod eye is only allowed to turn 0-180 degrees.

Option	Piston rod eye	Material	A	B	C	D	E	F (~)	Change in BiD	P/N
1,2	Solid	Free cutting steel	16.5	-	33.5	17.5	-	33	0	0361387
1,2	Solid	Free cutting steel	19.2	-	33.5	17.5	-	33	0	0361393
4	Male adapter	AISI 303	M16 X 1.5	22		-		24	-13	0361135
4	Male adapter	AISI 303	M20 X 1.5	43		-		45	-13	0371044
5	Ball eye	19.2	51	16	-	-	-	-	+15.5	0361571
5	Ball eye	20H7	51	21	-	-	-	-	+15.5	0361568

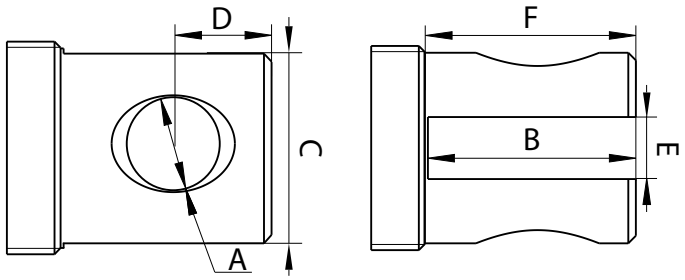
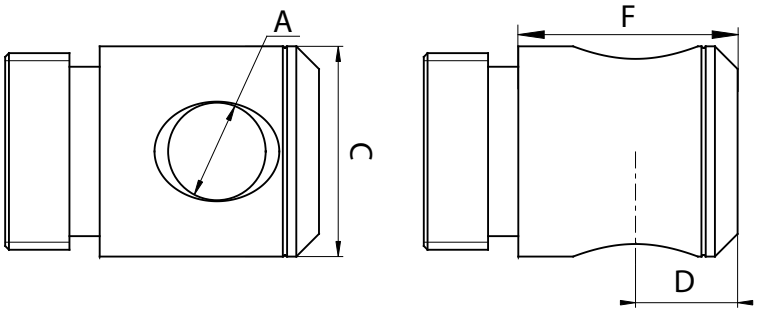


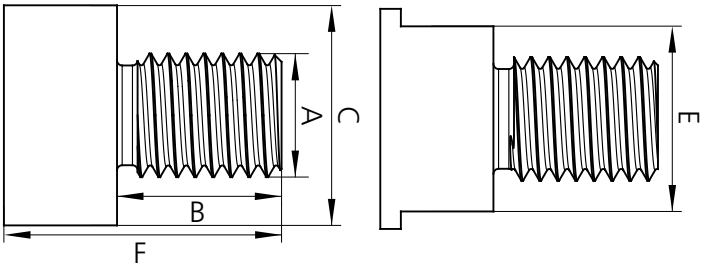
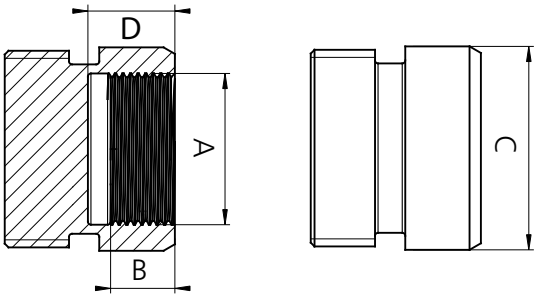
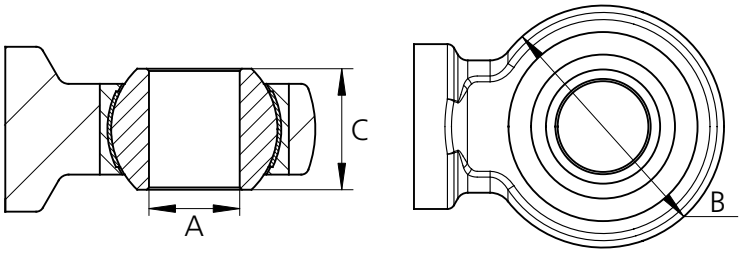




Piston rod eyes for short BiD

All dimensions are in mm. Piston rod eyes are allowed to turn 0-180°

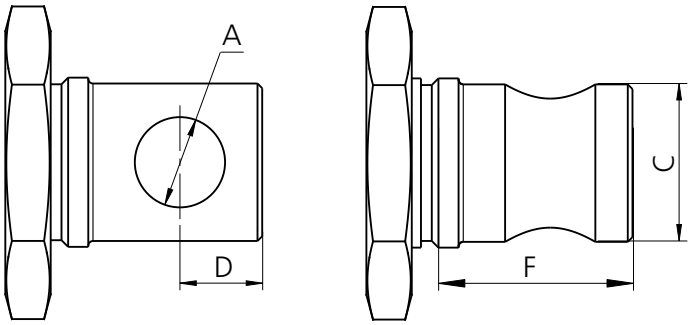
Option	Piston rod eye	Material	A	B	C	D	E	F (~)	Change in BiD	P/N
1	Slotted	Free cutting steel	Ø 12.2	27.5	27.8	13.5	7	29	0	0361137
1	Slotted	Free cutting steel	Ø 12.2	27.5	27.8	13.5	8.2	29	0	0361138
1	Slotted	AISI 304	Ø 12.2	27.5	27.8	13.5	8.2	29	0	0361260
1	Slotted	AISI 316	Ø 12.2	27.5	27.8	13.5	8.25	29	0	0361304
1	Slotted	Free cutting steel	Ø 12.9	27.5	27.8	13.5	8.2	29	0	0361636
1	Slotted	AISI 304	Ø 12.9	27.5	27.8	13.5	8.2	29	0	0361275
										
2	Solid	Free cutting steel	Ø 12.2	-	27.8	13.5	-	29	0	0361109
2	Solid	AISI 304	Ø 12.2	-	27.8	13.5	-	29	0	0361382
2	Solid	Free cutting steel	Ø 12.9	-	27.8	13.5	-	29	0	0361018
2	Solid	AISI 304	Ø 12.9 H10	-	27.8	13.5	-	29	0	0361340
										

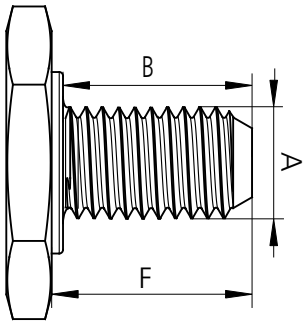
Option	Piston rod eye	Material	A	B	C	D	E	F (~)	Change in BiD	P/N
4	Male adaptor	AISI 303	M12 X 1.75	25	25	-	27.8	27	-13	0361224
4	Male adaptor	AISI 303	M16 X 1.5	24	25	-	27.8	26	-13	0361135
4	Male adaptor	AISI 303	M16 X 1.5	35	25	-	27.8	27	-13	0361151
4	Male adaptor	AISI 316	M16 X 1.5	25	25	-	27.8	27	-13	0361354
										
5	Female adaptor	AISI 303	M20 X 1	8.5	26.9	11.5	-	-	-5	0361016
										
6	Ball eye	AISI 304 (Ball only 440C)	Ø 12 H7	32	16	-	-	-	+14	0361350
6	Ball eye	AISI 304 (Ball only 440C)	Ø 12.7 H7	38	?	-	-	-	+22	0361273
6	Ball eye	AISI 304 (Ball only 440C)	Ø 16 H7	42	21	-	-	-	+14	0361351
										

Back fixtures

All dimensions are in mm

Option	Back fixture	Material	A	B	C	D	E	F (~)	Change in BiD	P/N
1,2	Solid	Free cutting steel	Ø 16.2	-	33.5	17.5	-	37	0	0371019
1,2	Solid	Free cutting steel	Ø 19.2	-	33.5	17.5	-	37	0	0371040
4	Male adapter	AISI 303	M16 X 1.5	35	-	-	-	37	-19	0371248
4	Male adapter	AISI 303	M20 X 1.5	35	-	-	-	37	-19	0371247

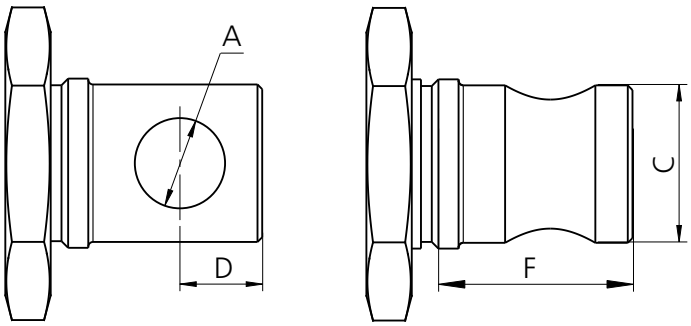




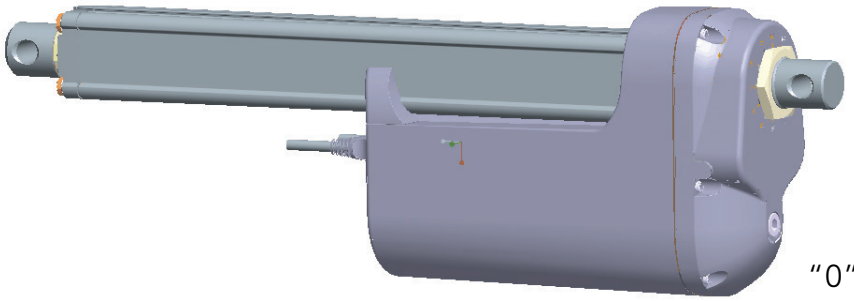
Note: Max 10.000 N in pull

Back fixtures for Short BiD

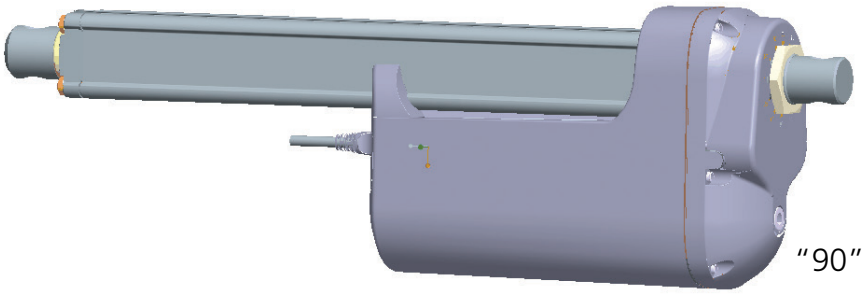
1,2	Solid	AISI 304	Ø 12.2	-	25.4	13.4	-	29	0	0371059
1,2	Solid	AISI 304	Ø 12.9	-	25.4	13.4	-	29	0	0371062



Back fixture orientation



"0" Degrees



"90" Degrees

NB. All with tolerance of ±4°

Electrical installation

- To ensure maximum self-locking ability, please make 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, the actuator can send a short high-voltage pulse to 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
- When using actuators without integrated controller, it is strongly recommended to use a fuse between power supply and actuator
- Deutsch DTP is to be used for power supply in 12 V applications due to the high current draw

The power supply for actuators without integrated controller must be monitored externally and cut off in case of current overload.

Recommended fuse for power supplies and actuators without integrated controller:

Platform		Spindle pitch (mm)	Load max. (N)	Typical amp. at full load (A)			Recommended fuse		
				48 V	24 V	12 V	48 V	24 V	12 V
01	Standard with power switch	2.5	15,000	5.0	10.0	20.0	10.0	20.0	40.0
		8.0	10,000	4.0	8.0	-	8.0	16.0	-

Current limits

As described in the algorithm on previous page.

Platform		12 V	24 V	48 V	Reference temperature: 0°C
B3 C3 F3	I/O Basic I/O Customised I/O Full	30 A	16 A	8 A	Above
		30 A	26 A	15 A	Below
A6	LIN bus	-	16 A	8 A	Above
		-	26 A	15 A	Below
0B	IO-Link	-	16 A	-	Above
		-	26 A	-	Below
14	Modbus RTU	-	16 A	8 A	Above
		-	26 A	15 A	Below
C6 D6 E6	LIN bus Off-highway CAN SAE J1939 Off-highway CANopen Off-highwayv	26 A	13 A	-	Above
		26 A	26 A	-	Below

Platform		12 V	24 V	48 V	Reference temperature: 0°C
A7 A8	CANbus J1939 CANopen	-	13 A	8 A	Above
		-	26 A	15 A	Below
0E 2E 4E	Modbus TCP/IP Ethernet/IP Profinet	-	16 A	8 A	Above
		-	26 A	15 A	Below

Max. current

The current is not limited by the actuator. Below is the anticipated consumption at max. load.
See: Recommended fuse for actuators without Integrated Controller.

Platform		12 V	24 V	48 V	Reference temperature: 0°C
01	Standard with power switch	26 A	13 A	8 A	Above
		26 A	13 A	8 A	Below

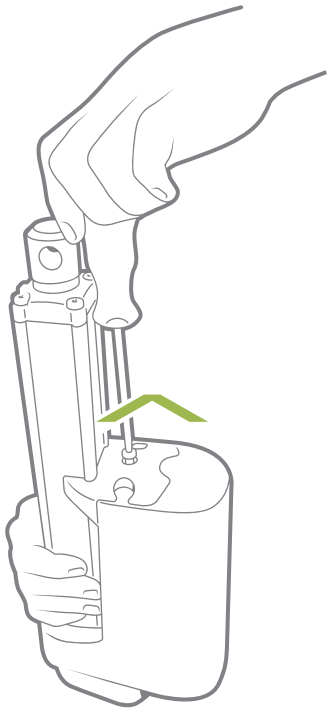
Current cut-offs

The principle behind the current cut-off measurement is an 'above limit' and a 'below limit' accumulating counter. When the time-out counter reaches a specific value the current cut-off goes into effect.
The system stops after 200 milliseconds if the current is too high.

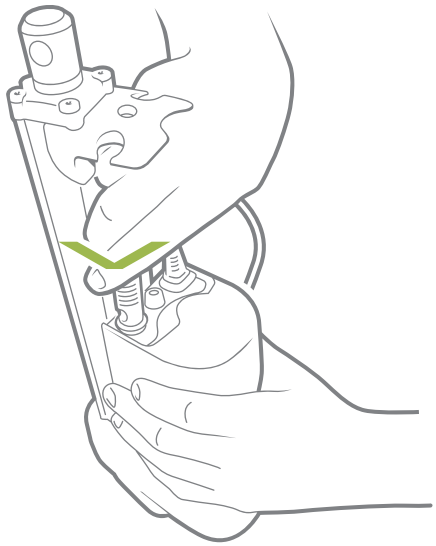
Platform		**12 V**	**24 V**	**48 V**	**Reference temperature: 0°C**
04	Modbus	-	13 A	-	Above
		-	13 A	-	Below
06	LIN bus	30 A	-	-	Above
		30 A	-	-	Below
07 08	CAN SAE J1939 CANopen	30 A	20 A	-	Above
		30 A	25 A	-	Below

Platform		**12 V**	**24 V**	**48 V**	**Reference temperature: 0°C**
16	LIN bus	30 A	-	-	Above
		30 A	-	-	Below
17 18	CAN SAE J1939 CANopen	30 A	20 A	13 A	Above
		30 A	25 A	15 A	Below

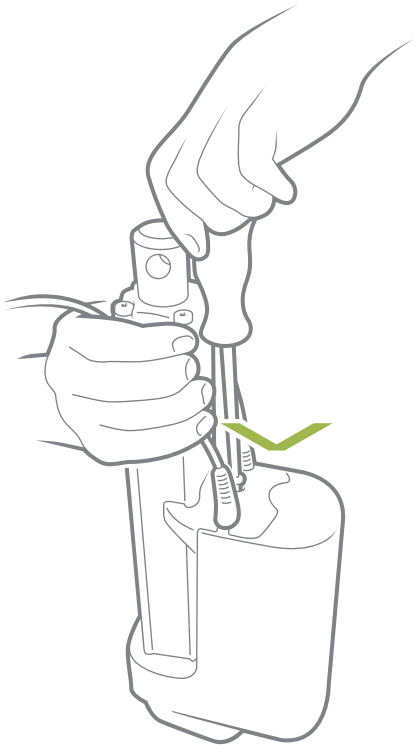
Cable mounting



1. Unscrew the screw and separate the cover from the housing. Remove the blind plug(s).



2. Plug in the power cable and/or the signal cable.



3. Slide the cover onto the actuator.

   The torque of the cover screw is approx. 3.5 ± 0.3 Nm

   TORX 25IP

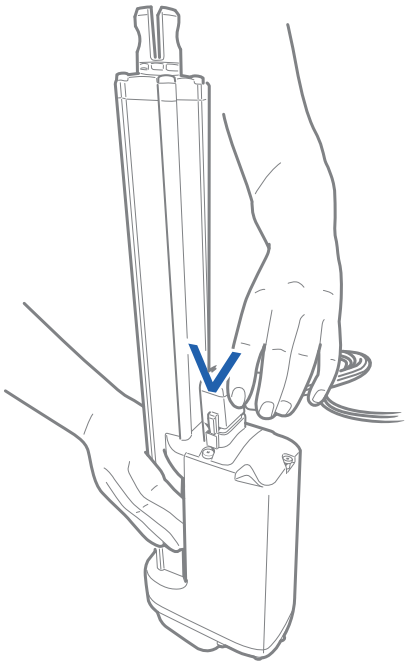
When changing the cables on a LINAK® actuator, it is important that this is done carefully, in order to protect the plugs and pins. Before the new cable is mounted, we recommend that the socket is greased with Vaseline®, to keep the high IP protection and ensure an easy mounting. Please be sure that the plug is in the right location and fully pressed in before the cable lid is mounted.

Cut off the tinned end if you connect the cable with screws. The tinned end is only to be used when a soldered connection is made.

Please note that if the cables are mounted and dismounted more than 3 times, the plugs can be damaged. Therefore, we recommend that such cables are discarded and replaced.
Do not lift the actuator by the cables.

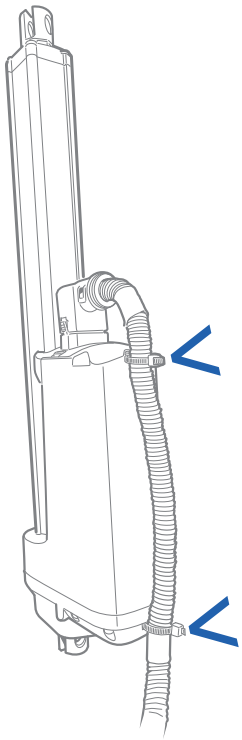
We recommend taking some precaution and designing the wire connection in such a way that the cable end is kept inside a closed, protected area to guarantee the high IP protection.

Mounting of cable Off-highway



1) Plug in the cable.

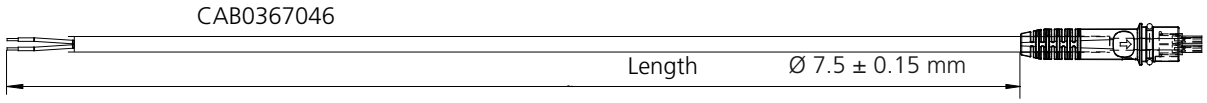
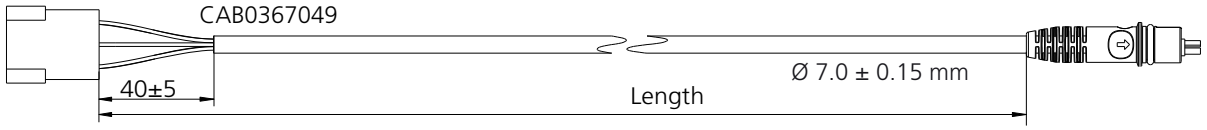
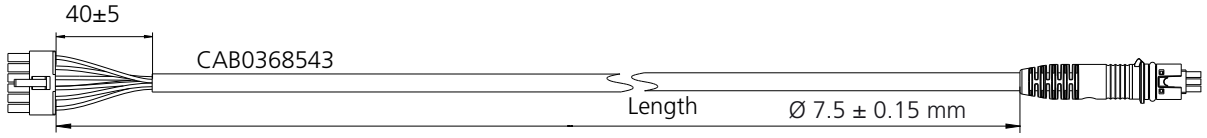
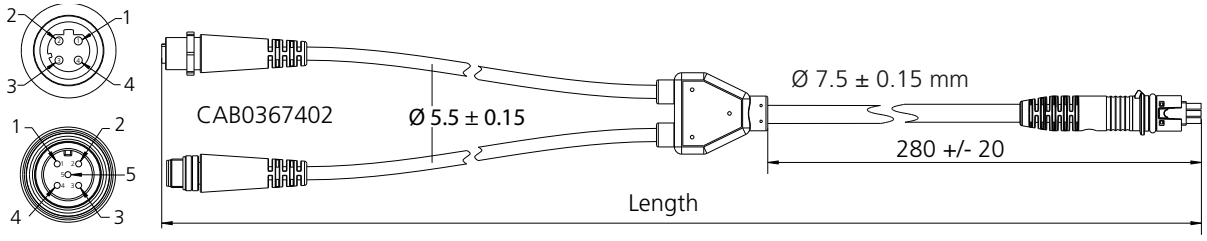
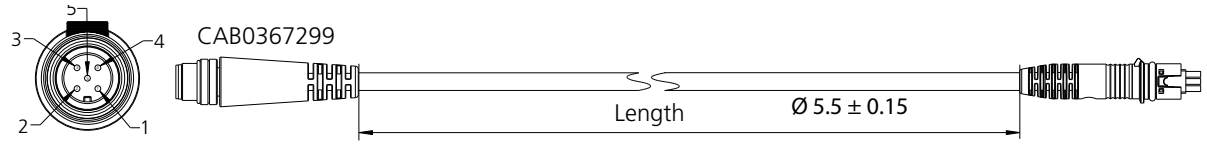
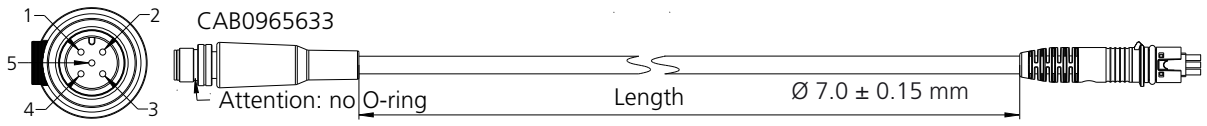
An audible “Click” confirms a correct mounting

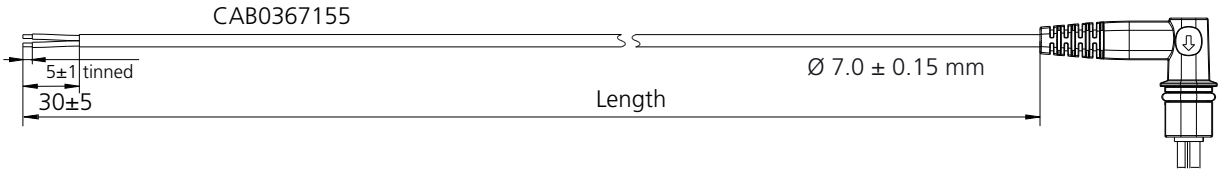
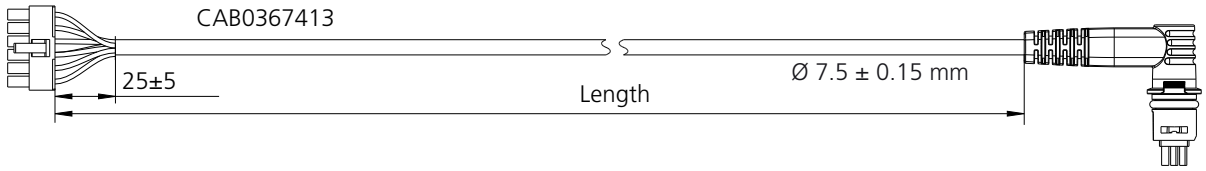
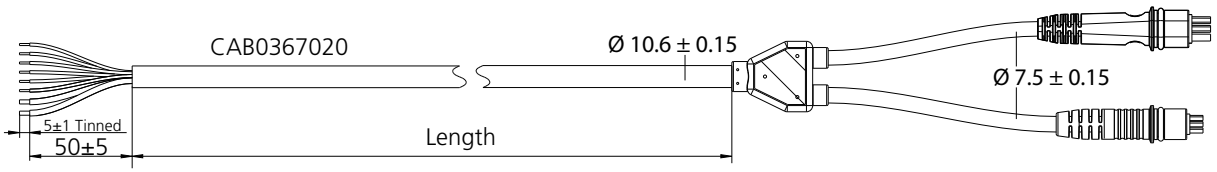
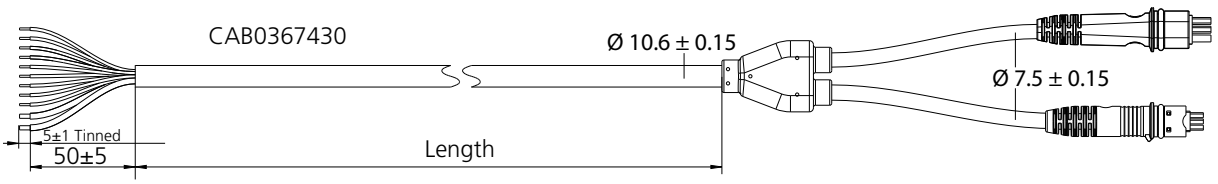
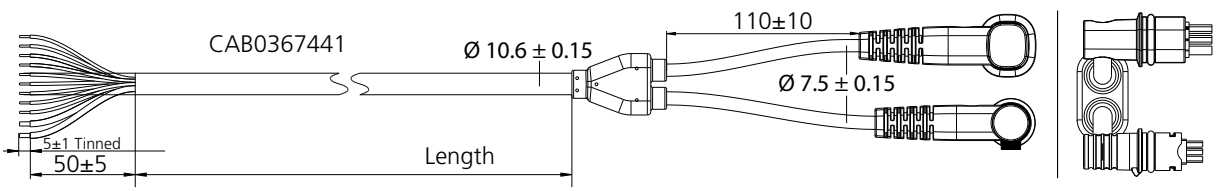


2) Secure the cable with cable-ties to the two anchors

We recommend to take some precaution and design the wire connection in a way, where the cable end is kept inside a closed, protected area to guarantee the high IP protection.

Cables

Cable P/N Table					
Option	**Cable type**	**# Wires**	**mm²**	**Length in mm**	**LINAK P/N**
S	Power cable with AMP plug	2	2.0	200	CAB0367006
S	Power cable	2	2.0	1,500	CAB0367046-1500
S	Power cable	2	2.0	5,000	CAB0367046-5000
S	Power cable	2	2.0	10,000	CAB0367046-10000
					
S	Straight signal cable	6	0.5	1,500	CAB0367049-1500
S	Straight signal cable	6	0.5	5,000	CAB0367049-5000
S	Straight signal cable	6	0.5	10,000	CAB0367049-10000
					
S	Straight signal cable	9	0.5	1,500	CAB0368543-1500
S	Straight signal cable	9	0.5	5,000	CAB0368543-5000
S	Straight signal cable	9	0.5	10,000	CAB0368543-10000
					
S	Ethernet connection cable	9	0.5	600	CAB0367402
					
S	IO-Link connection cable	5	0.5	600	CAB0367299
					
S	Modbus RTU connection	5	0.5	1000	CAB0965633-1000
					

Cable P/N Table					
Option	**Cable type**	**# Wires**	**mm²**	**Length in mm**	**LINAK P/N**
A	Angled power cable	2	2.0	1,500	CAB0367155-1500
					
A	Angled signal cable	9	0.5	1,500	CAB0367413-1500
					
Y	Straight Y-cable Power and Signal	2 6	20 0.5	1,500	CAB0367020-1500
Y	Straight Y-cable Power and Signal	2 6	20 0.5	5,000	CAB0367020-5000
Y	Straight Y-cable Power and Signal	2 6	20 0.5	10,000	CAB0367020-10000
					
Y	Straight Y-cable Power and Signal	2 9	20 0.5	1,500	CAB0367430-1500
Y	Straight Y-cable Power and Signal	2 9	20 0.5	5,000	CAB0367430-5000
Y	Straight Y-cable Power and Signal	2 9	20 0.5	10,000	CAB0367430-10000
					
V	Angled Y-cable Power and Signal	2 9	20 0.5	1,500	CAB0367440-1500
					

Power cable dimensions

LINAK® P/N 0367046

Colour	Outer dimensions	Core mm²	AWG*	Pin
Blue	Ø2.8 mm	2.0	14	1
Brown	Ø2.8 mm	2.0	14	2

6-pin Signal cable dimensions

LINAK P/N 0367049

Colour	Outer dimensions	Core mm²	AWG*	Pin
Black	Ø1.5 mm	0.5	20	1
Red	Ø1.5 mm	0.5	20	2
White	Ø1.5 mm	0.5	20	3
Violet	Ø1.5 mm	0.5	20	4
Yellow	Ø1.5 mm	0.5	20	5
Green	Ø1.5 mm	0.5	20	6

9-pin Signal cable dimensions

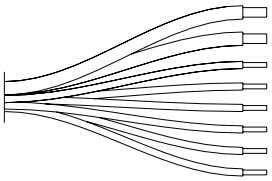
LINAK P/N 0368543

Colour	Outer dimensions	Core mm²	AWG*	Pin
Black	Ø1.5 mm	0.5	20	1
Red	Ø1.5 mm	0.5	20	2
Yellow	Ø1.5 mm	0.5	20	3
Green	Ø1.5 mm	0.5	20	4
Orange	Ø1.5 mm	0.5	20	5
Light Blue	Ø1.5 mm	0.5	20	6
Violet	Ø1.5 mm	0.5	20	7
White	Ø1.5 mm	0.5	20	8
Grey	Ø1.5 mm	0.5	20	-

*AWG: American Wire Gauge

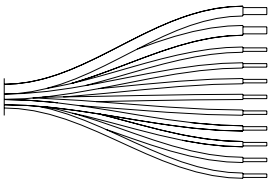
Y-cable dimensions

LINAK® P/N 0367020

Colour	Outer dimensions	Core mm²	AWG*	Pin**	
Blue	Ø2.8 mm	2.0	14	1	
Brown	Ø2.8 mm	2.0	14	2	
Black	Ø1.5 mm	0.5	20	3	
Red	Ø1.5 mm	0.5	20	4	
White	Ø1.5 mm	0.5	20	5	
Violet	Ø1.5 mm	0.5	20	6	
Yellow	Ø1.5 mm	0.5	20	7	
Green	Ø1.5 mm	0.5	20	8	

** Pin connections are the same for both AMP and Deutsch connectors

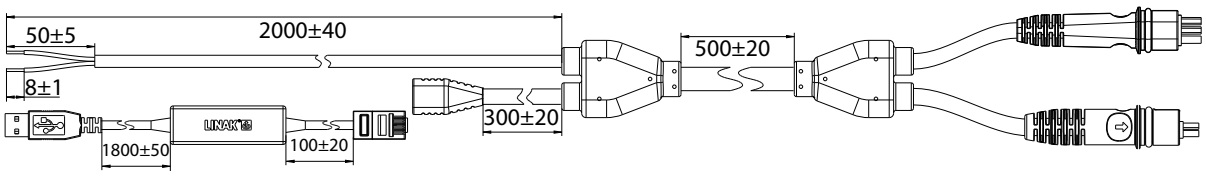
LINAK® P/N 0367430

Colour	Outer dimensions	Core mm²	AWG*	Pin**	
Blue	Ø2.8 mm	2.0	14	1	
Brown	Ø2.8 mm	2.0	14	2	
Orange	Ø1.5 mm	0.5	20	3	
Yellow	Ø1.5 mm	0.5	20	4	
Green	Ø1.5 mm	0.5	20	5	
Black	Ø1.5 mm	0.5	20	6	
Red	Ø1.5 mm	0.5	20	7	
Light Blue	Ø1.5 mm	0.5	20	8	
Violet	Ø1.5 mm	0.5	20	9	
White	Ø1.5 mm	0.5	20	10	
Grey	Ø1.5 mm	0.5	20	-	

** Pin connections are the same for both AMP and Deutsch connectors

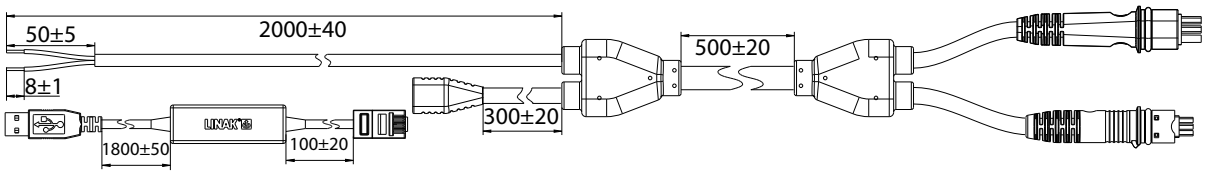
Cable kit article numbers

BusLink cable kits					
Platform		Colour	Connection	Includes	Article no.
04	Modbus RTU (IC)	Yellow	RJ45	1. Adapter 2. USB2LIN cable	0367998
07 08	CAN SAE J1939 CANopen	Green	RJ45	(Adapter + USB2Lin)	0367997
13 23 33 43 53 63	IC Basic IC Advanced IC Parallel IC Parallel with feedback IC GPO IC with self-learning stroke	Blue	RJ45	Adapter + USB2LIN cable	0367999



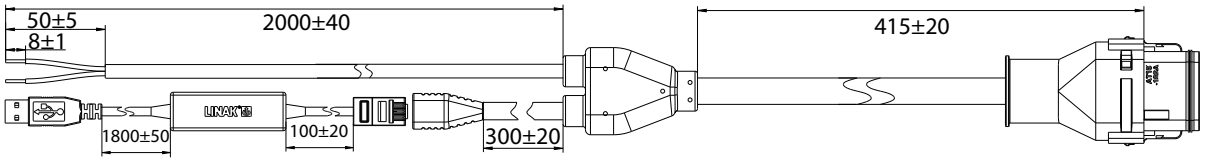
Actuator Connect™ cable kit					
Platform		Colour	Connection	Includes	Article no.
B3 C3 F3 A7 A8 0B 14 A7 A8 4E 2E 0E	I/O Basic I/O Customised I/O Full CAN SAE J1939 CANopen IO-Link Modbus RTU CAN SAE J1939 CANopen Profinet Ethernet/IP Modbus TCP/IP	Grey	Power and USB-A	Adapter and USB2Lin cable	CAB0367996

0367996



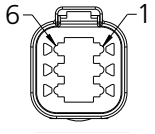
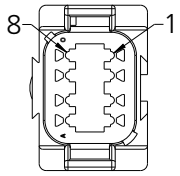
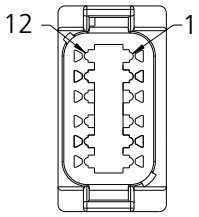
C6 D6 E6	LIN bus Off-highway CAN SAE J1939 Off-highway CANopen Off-highway	Grey	Power and USB-A	Adapter and USB2Lin cable	0367995

0367995



The latest versions of both BusLink and Actuator Connect can be downloaded at the LINAK/TECHLINE page.

Plugs

Plug type	AMP	Deutsch
2-pin		
6-pin	N/A	
8-pin	N/A	
12-pin	N/A	

Manual hand crank

The manual hand crank can be used in the case of a power failure and is only intended for emergency use.

6* mm Allen key

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: Gear H = 4.0 mm

* 5 mm Allen key -if stainless steel piston rod eye and back fixture are chosen

- 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 thereby damaging the actuator. Use your hand to turn the crank. Do not use power tools!
- After using the hand crank, the ingress protection IP66 cannot be maintained.
- Move the actuator to its starting position after using the crank. Failing to do so can damage the actuator or the application it is used for.
- Actuators with absolute positioning must be initialised after use of the manual hand crank, because their positioning will be displaced when the power is disconnected.

Environmental tests - Climatic

Test	Specification	Comment
Cold test	EN60068-2-1 (Ab)	Storage at low temperature: Temperature: -40°C Duration: 72 h Not connected Tested at room temperature.
	EN60068-2-1 (Ad)	Storage at low temperature: Temperature: -30°C Duration: 2 h Actuator is not activated/connected Tested at low temperature.
Dry heat	EN60068-2-2 (Bb)	Storage at high temperature: Temperature: +90°C Duration: 72 h Actuator is not activated/connected Tested at room temperature.
	EN60068-2-2 (Bd)	Storage at high temperature: Temperature: +70°C Duration: 1000 h Actuator is not activated/connected Tested at high temperature. Operating at high temperature: Temperature: +60°C Int. max. 17% Duration: 700 h 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 per cycle Duration: 1,000 cycles (90 days) Actuator is not activated/connected Tested at 250, 500 and 1000 cycles at low and high temperatures.

Environmental tests - Climatic

Damp heat	EN60068-2-30 (Db) EN60068-2-3 (Ca)	Damp heat, cyclic: Relative humidity: 93-98% High temperature: +55°C in 12 hours Low temperature: +25°C in 12 hours Duration: 21 cycles * 24 hours Actuator is not activated/connected Tested within 1 hour after condensation, after upper temperature has been reached. 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 spray test		Actuators are tested for corrosion resistance at 500 hours salt spray test.
Degrees of protection IPX6 static		IPX6 static: Actuators are tested for water ingress according to IPX6, without movement. IPX4 dynamic: Actuators are tested in rainy conditions with movement. IP6X: Actuators are tested for dust sealing properties according to IP6X.
Chemicals	BS7691 / 96 hours	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.
Climate test with Modbus PCB		Actuators with Modbus PCB are tested with 10.000 N load at temperatures of +5°C and +40°C.
Climate test with Hall PCB		Actuators with Hall PCB are tested with 15.000 N load at temperatures of -30°C and +70°C.

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) EN 60068-2-6 (Fc)	Random vibration: Short time test: 6.29 g RMS Actuator is not connected Long time test: 7.21 g RMS Actuator is not connected Duration: 2 hours in each direction Sinus vibration: Frequency 5-25Hz: Amplitude = 3.3 mm pp Frequency 25-200Hz: Acceleration 4 g 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: 40 g 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.
Static load		Static push and pull tests of basic actuators with 500, 750 and 1000mm strokes.
Dynamic load		Dynamic push/pull tests of the actuator.
Self-locking test		Self-locking tests at dynamic and static load.
Abuse test		Tests at 100% duty cycle until damage.
Lifetime test		Lifetime tests performed at combined loads in push and pull situations.

Environmental tests - Electrical

Test	Specification	Comment
Power supply	ASAE EP455 (1990)	Operating voltages +10 V - +16 V Overvoltage +26 (V) / 5 min. Reverse polarity –26 (V) / 5 min. 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
Emmision	EN61000-6-4	Level is within limits for the motor
Insulation test		Level: 500 VAC/25-100 hz for 1 minute
Automotive transients	ISO 7637	Load dump test only accepted on motor power connection.
Current and speed		Actuators with loads of 0 N, 7.500 N and 15.000 N are tested at -30°C, +20°C and 70°C

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

Environmental tests – Climatic - LA37 Off-highway

Test	Specification	Comment
Cold Test	EN60068-2-1 (Ab) EN60068-2-1 (Ad)	Storage at low temperature: Temperature: -55 °C Duration: 72 h Actuator is not activated/connected Tested at room temperature. Operating at low temperature: Temperature: -40 °C Duration: 16 h Actuator is not activated/connected. Tested at low temperature.
Dry Heat	EN60068-2-2 (Bb) EN60068-2-2 (Bd)	Storage at high temperature: Temperature: +105 °C Duration: 72 h Actuator is not activated/connected. Tested at room temperature Storage at high temperature: Temperature: +70 °C Duration: 1000 h Actuator is not activated/connected Tested at high temperature. Operating at high temperature: Temperature: +60 °C Int. max. 17 % Duration:700 h Actuator is activated Tested at high temperature.
Change of Temperature	EN60068-2-14 (Na) EN60068-2-14 (Nb)	Rapid change of temperature: High temperature: +105 °C in 60 minutes. Low temperature: -40 °C in 60 minutes. Transition time: <10 seconds Duration: 117 cycles Actuator is not activated/connected. Tested at room temperature. 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 (90 days) Actuator is not activated/connected. Tested at 250, 500 and 1,000 cycles at low and high temperatures.

Test	Specification	Comment
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: 21 cycles * 24 hours Actuator is not activated/connected. Tested within 1 hour after condensation, 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.
	EN600068-2-78	Temp 40 °C Relative Humidity 95% Test Duration 168 Hours Actuator is not activated/connected. DUT orientation: Normal operating orientation
Salt Mist	ISO-9227	Continously salt spray test: Salt solution: 5 % sodium chloride (NaCl) Actuator activated/connected. Exposure time: 500 hours
Degrees of Protection	EN60529 – IP54	IP5X - Dust: Dust-tight, No ingress of dust. Actuator is not connected IPX4 – Water: Ingress of water in quantities causing harmful effects is not allowed. Duration: 100 litres pr. minute in 3 minutes Actuator is not connected
	EN60529 – IP66	IP6X - Dust: Dust-tight, No ingress of dust. Actuator is not activated. IPX6 – Water: Ingress of water in quantities causing harmful effects is not allowed. Duration: 100 litres pr. minute in 3 minutes Actuator is not activated. IPX6 –Connected actuator: Actuator is driving out and in for 3 min. 100 (l/min) jet of water is placed at the wiper ring for 3 (min). IPX6 –Connected actuator and push 10.000 (N) Actuator is preheated to 85 °C driving out and in for 3 min. and Push 10.000 (N) at the endposition. 100 (l/min.) jet of water (15 °C) is placed at the wiper ring for 3 min.
	ISO-20653 – IP6KX	Category : 1 (air pressure reduction) Dust medium : Talcum Air pressure : 2 kPa (20 mbar) below normal air pressure Duration : 8 hours.

Test	Specification	Comment		
Degrees of Protection	ISO-20653 – IPX9K	High pressure cleaner: Water temperature: +90 °C Water pressure: 350 bar Flowrate: 15L/min Spray angle: 360 ° Spray distance: 200 mm Duration: From any direction continously in 300 seconds Actuator is connected. Ingress of water in quantities causing harmful effects is not allowed.		
	ISO 16750	The actuator has been warmed up to 85 °C for 8 hours. After this it is cooled down in 00 °C salt water. Cooling time: 120 minutes Repeated 5 times and weight recorded after each cycle. Opened for check of residue of salt deposit and water. No weightgain, water or salt residue allowed.		
Chemical test	Chemicals:	Explanation regarding chemical (poss. incl. source of supply and/or trade name):	Test temp °C:	Test duration:
	Diesel fuel	EN 590	85	22 h
	'Bio' diesel fuel	EN 14214	85	22 h
	Engine oil	Multigrade oil SAE OW40, API SL / C	85	22 h
	Transmission fluid	ATF Dexron III'	85	22 h
	Hydraulic fluid	DIN 51 524-3 (HVLP ISO VG 46)	85	22 h
	Grease	DIN 51 502 (KP2K-30)	85	22 h
	Anti-freeze 50 % (1:1)	Ethylene glycol (C2H602) - Water mixture	85	22 h
	Urea Nitrogen saturated solution	ISO 22241-1; Urea NOx "ad blue" e.g. P3 Solvclean AK (manufactured by Henkel)	85	22 h
	Cold cleaner	E.g. P3 Solvclean AK (by Henkel)	RT	22 h
	Contact spary	E.g. WD 40	85	22 h
	Ammonium hydroxide	20% diluted water-based solution	RT	22 h
	Liquid lime 10 % (Super- Cal)	Lime fertiliser, 10% solution; can be obtained from seed and fertiliser traders	RT	22 h
	NPK Fertilizer (NPK 16-4-12) saturated	Nitrogen (5-9%), phosphorus (5-9%)potassium (5-9%) portions can be obtained from seed and fertiliser traders e.g. COMPO 14361/14354, PhytoGreen NPK 8-8-6 or similar.	RT	22 h

Environmental tests - Mechanical - LA37 Off-highway

Test	Specification	Comment
Free Fall	60068-2-31	Free fall from all sides: Height of fall: 0.45 meter onto concrete Actuator not activated/connected.
Vibration	EN60068-2-64	Random vibration: Test: 5.9 g RMS 10-2,000 Hz Actuator is connected for monitoring during the test Duration: 32 hours in each direction (x,y and z).
Shock	EN60068-2-27 (Ea)	Shock test: Level: 51 g Duration: 6 milliseconds Number of bumps: 10 shocks in each of 6 directions. Actuator is connected for monitoring during the test

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