TECHLINE®
IMPROVING FLEXIBILITY

Linear Actuator LA36

Data Sheet

LINAK®
WE IMPROVE YOUR LIFE

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

Extremely powerful linear actuator made by LINAK. Up to 6,800 N thrust, or up to 160 mm/s. Designed to operate in extreme conditions. Solid choice for industrial and agricultural applications.

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 user manual.

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 and 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.
- 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 LA36 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 negative pressure inside the actuator if it is extended which over time can lead to water entering the actuator.

Features

- 12, 24, 36 or 48 V DC permanent magnetic motor (IC only 12/24 V DC)
- Load from 500 N - 6.800 (depending on gear ratio and spindle pitch)
- Max. speed 160 mm/sec. (depending on gear ratio and spindle pitch)
- Stroke length from 100 to 1200 mm
- Built-in endstops reached function
- Highly efficient acme thread spindle
- 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)
- Hand crank for manual operation
- Integrated brake with high self-lock ability
- Endplay: see Technical Specifications
- Non-rotating piston rod eye
- Noise level: 76 dB (A). Measuring method: DS/EN ISO 3746 (actuator not loaded)
- Off-highway Features:
    - 12 or 24 V DC brushed permanent magnetic motor
    - Load from 1,700 N - 6,800 N (depending on gear ratio and spindle pitch)
    - Max. speed 7 mm/sec. to 100 mm/sec. (depending on gear ratio and spindle pitch)
    - Reinforced aluminium housing for harsh conditions
    - IPC-A-610 Class 3 (High-performance electronic products)
    - IP54 without cable mounted
      IP69K (static) with cable mounted with shell or moulded cable

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 30 degrees
- Exchangeable cables in different lengths
- Hall effect sensor
- Analogue or digital feedback for precise positioning
- Endstop reached signals
- Mechanical overload protection through integrated slip clutch -Standard actuators only
- Mechanical potentiometer (not applicable with IC)
- When ordering AISI (304 and up) piston rod eye and back fixture, stainless steel screws are automatically included
- Special anodised housing for extreme environments -see paragraph regarding 'Special anodised housing'
- Adjustable magnetic sensors for endstop signals (code no. 1017031)
- IC options including:
    - I/O
    - Ethernet/IP
    - Modbus TCP/IP
    - Modbus RTU
    - IO-Link
    - LIN bus
    - CAN SAE J1939
    - CANopen
    - Off-highway LIN bus
    - 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 tool (BusLink or Actuator Connect™)
- ATEX/IECEx/CCC (Ex) certified for Zone 21 (Not applicable for Off-highway actuators)

Usage

- Duty cycle up to 600 mm stroke: max. 20% (4 min. drive and 16 min. rest)
- Duty cycle at 601-999 mm stroke: max. 15% (3 min. drive and 17 min. rest)
- Duty cycle at 1000-1200 mm stroke: max. 10% (2 min. drive and 18 min. rest)
- Ambient operating temperature (AOT): Full performance from +5°C to +40°C
  -30°C (reduced load 50%) to + 85°C (reduced duty cycle 10%)
  -40°C (no load)
- AOT for ATEX/IECEx/CCC: -25°C to +65°C
- Storage temperature:
  Actuator is not activated/ connected: -40 °C to +70 °C
  -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. 3000 meters
- Off-highway:
  - For applications operated at constantly low temperatures it might be beneficial to recommend 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)
  - Testet 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

36 120 200 0 A 01 B 6 - 6 1 1 H 3 0300 N C S 0 0 0

Actuator type

36 = LA36

Spindle type

080 = 8 mm
160 = 16 mm
120 = 12 mm
200 = 20 mm

Stroke length

200 = XXX Length in mm (50-995)
AXX = 10XX Length in mm (1,000-1,095)
BXX = 11XX Length in mm (1,100-1,195)
C00 = 1,200 mm

Safety

0 = No safety nut
A = Safety nut (Push only)

Feedback

0 = No Feedback
A = Hall Potentiometer
F = PWM
H = Dual Hall
9 = Hall Potentiometer, 2-wire
K = Single Hall
P = Potentiometer (standard platform actuators only)
X = Special

Platform

6-pin

Endstop switch principle

00 = Standard
01 = Standard with power switch
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

*Requires Housing option 'C' IP66 Off-highway, also only available with Motor Type 1 or 2

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 power supply

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

Motor type

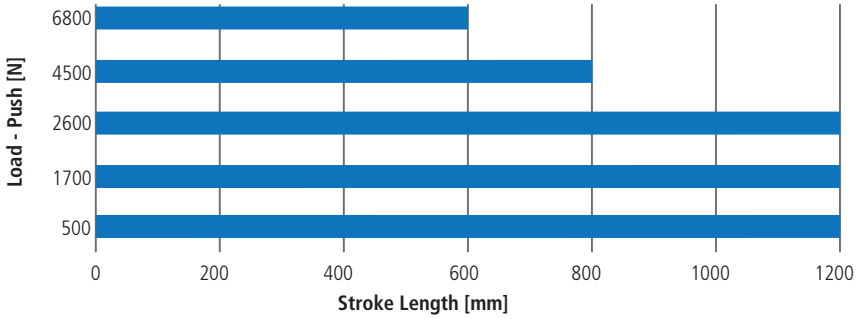
A = 12 V DC with Clutch
B = 24 V DC with Clutch
C = 36 V DC with Clutch
J = 48 V DC with Clutch
1 = 12 V DC
2 = 24 V DC
3 = 36 V DC
4 = 48 V DC

Housing	**6**	=	IP66 - Reinforced house	A	=	IP66
	9*	=	Harsh environment	T	=	IP66 ATEX / IECEx / CCC approved
				C**	=	IP66 Off-highway
Reed	**-**	=	Without Reed limit switch	+	=	With Reed limit switch
Colour	**6***	=	Dark Olivish Grey NCS S7000-N	X	=	Special
Back fixture	**1**	=	0 °	A	=	30°
	2	=	90°	B	=	60°
	4	=	Male Adapter (Outer thread)	C	=	120°
	5	=	Female Adapter (Inner thread)	D	=	150°
	6	=	Rotated in 30° intervals	X	=	Special
Piston rod eye	**1**	=	Slotted	5	=	Female Adapter (Inner thread)
	2	=	Solid	6	=	Ball eye
	4	=	Male Adapter (Outer thread)	X	=	Special
Gear	E	=	Ratio 1:7	F	=	Ratio 1:18
	G	=	Ratio 1:31	**H**	=	Ratio 1:46
Brake	**3**	=	Push/Pull			
Built-in dimension	**0300**	=	300 mm (min. length)	xxxx	=	Measured in mm
Endstop reached output In/Out	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	K	=	AMP Super Seal
	9	=	Deutsch - Moulded	7	=	AMP Super Seal - Moulded
	C	=	Flying leads	E	=	M12 Y Ethernet
	N	=	M12 IO-Link	R	=	M12 Modbus
				X	=	Special

Cable	0*	=	No cable selected	A	=	Mounted with 90° angled connectors
	S	=	Straight cable	Y	=	Y-Cable (combined power and signal cable)
				X	=	Special
Parallel mode	**0**	=	The system is NOT parallel	2-8	=	Critical parallel (number of actuators in the parallel system)
SW config.	**0**	=	Standard software	X	=	Special software
Not used	**0**	=	Not used			

* Shall be chosen with platform: '18-pin Off-highway'

Load vs stroke length



Please note:

500-1700 N is with 20 mm spindle pitch

500-5600 N is with 16 mm spindle pitch

500-6800 N is with 12 mm spindle pitch

500-6800 N is with 8 mm spindle pitch

- For applications that only operate in pull, the limitations are 1200 mm stroke and 6.800 N load
- Safety factor 2

The actuator can be fitted with a safety nut in push. This safety nut is an auxiliary nut moving with the main nut and supporting the load if the main nut breaks down. The actuator will then only be able to retract; thereby signalling that repair is required.

Technical specifications

12 V

Load max. (N)	Self-lock min. (N)	Pitch (mm/ spindle rev.)	Gear/ Ratio	Hall Reso-lution mm/count	End-play in mm	*speed (mm/s)			Standard stroke lengths (mm) in steps of 50 mm	*Consump-tion (A)	
						@ 300 N	No-min-al load	Reg-ula-ted		@ 300 N	No-min-al load
500***	1000	20	E 1:7	0.72	-	145	135	-	100-1200	4.5	20
1700	2200	20	F 1:18	0.72	3.5	67	52	52	100-1200	7.9	23
2000	2600	16	F 1:18	0.58	2.9	54	43	44	100-1200	6.0	23
2600	3400	12	F 1:18	0.43	2.6	40	34	34	100-1200	5.6	24
3400	4400	16	G 1:31	0.34	2.3	30.8	25	25	100-1200**	5.5	23
4500	5800	12	G 1:31	0.25	2.3	24.3	18.5	18	100-1200**	5.6	24.5
5600	6600	16	H 1:46	0.22	2.2	20.7	16	16	100-1200**	5.5	24
6800	8800	12	H 1:46	0.17	2.2	16	13.2	13	100-1200**	5.0	23.5
6800	13000	8	H 1:46	0.11	2.2	10.6	7.9	7	100-1200**	4.7	24.6

24 V

Load max. (N)	Self-lock min. (N)	Pitch (mm/ spindle rev.)	Gear/ Ratio	Hall Reso-lution mm/count	End-play in mm	*speed (mm/s)			Standard stroke lengths (mm) in steps of 50 mm	*Consump-tion (A)	
						@ 300 N	No-min-al load	Reg-ula-ted		@ 300 N	No-min-al load
500***	1000	20	E 1:7	0.72	-	145	135	-	100-1200	2.4	10.0
1700	2200	20	F 1:18	0.72	3.5	68	52	54.4	100-1200	2.4	10.3
2000	2600	16	F 1:18	0.58	2.9	54.7	43	43.7	100-1200	2.4	10.3
2600	3400	12	F 1:18	0.43	2.6	41	33	32.8	100-1200	2.4	10.4
3400	4400	16	G 1:31	0.34	2.3	31.1	25	24.8	100-1200**	2.4	10.3
4500	5800	12	G 1:31	0.25	2.3	23.3	18.9	18.6	100-1200**	2.4	10.2
5600	6600	16	H 1:46	0.22	2.2	21	17	16.8	100-1200**	2.4	10.3
6800	8800	12	H 1:46	0.17	2.2	15.7	12.7	12.5	100-1200**	2.4	10.3
6800	13000	8	H 1:46	0.11	2.2	11	7	8.8	100-1200**	2.4	8

* 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: "Load v. Stroke Length".

*** Note: Fully loaded actuators need a soft start in order to prevent the clutch from slipping when starting (see curves). (Not optional for 'Off-highway' actuators)

Please note that all actuators featuring 'LIN bus', 'CAN SAE J1939', 'CANopen' and 'Modbus' will run at a regulated speed, which is typically around 80% of the '@ 300 N' speed.

Technical specifications:

36 V

Load max. (N)	Self-lock min. (N)	Pitch (mm/ spindle rev.)	Gear/ Ratio	Hall Rersolution mm/count	End-play in mm	*Typical speed (mm/s)		Standard stroke lengths (mm) in steps of 50 mm	*Typical amp. (A)	
						No load	Full load		No load	Full load
500***	1000	20	E 1:7	0.72	-	160	135	100-1200	2.0	8.0
1700	2200	20	F 1:18	0.72	3.5	68	52	100-1200	2.0	8.0
2000	2600	16	F 1:18	0.58	2.9	54.7	43	100-1200	2.0	8.0
2600	3400	12	F 1:18	0.43	2.6	41	33.5	100-1200	2.0	8.0
3400	4400	16	G 1:31	0.34	2.4	31.1	25	100-1200**	2.0	8.0
4500	5800	12	G 1:31	0.25	2.3	23.3	19.1	100-1200**	2.0	8.0
5600	6600	16	H 1:46	0.22	2.3	21	17	100-1200**	2.0	8.0
6800	8800	12	H 1:46	0.17	2.2	15.7	12.8	100-1200**	2.0	8.0
6800	13000	8	H 1:46	0.11	2.2	11	7	100-1200**	2.0	6.5

48 V

Load max. (N)	Self-lock min. (N)	Pitch (mm/ spindle rev.)	Gear/ Ratio	Hall Rersolution mm/count	End-play in mm	*Typical speed (mm/s)		Standard stroke lengths (mm) in steps of 50 mm	*Typical amp. (A)	
						No load	Full load		No load	Full Load
500***	1000	20	E 1:7	0.72	-	160	141	100-1200	1.5	7
1700	2200	20	F 1:18	0.72	3.5	71.2	59.0	100-1200	1.5	7
2000	2600	16	F 1:18	0.58	2.9	57.2	35.0	100-1200	1.5	7
2600	3400	12	F 1:18	0.43	2.6	42.9	35.0	100-1200	1.5	7
3400	4400	16	G 1:31	0.34	2.4	32.5	27.0	100-1200**	1.5	7
4500	5800	12	G 1:31	0.25	2.3	25.7	20.0	100-1200**	1.5	7
5600	6600	16	H 1:46	0.22	2.3	21.9	18.0	100-1200**	1.5	7
6800	8800	12	H 1:46	0.17	2.2	17.4	15.0	100-1200**	1.5	7
6800	13000	8	H 1:46	0.11	2.2	11.5	9.0	100-1200**	1.5	5.5

* 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.

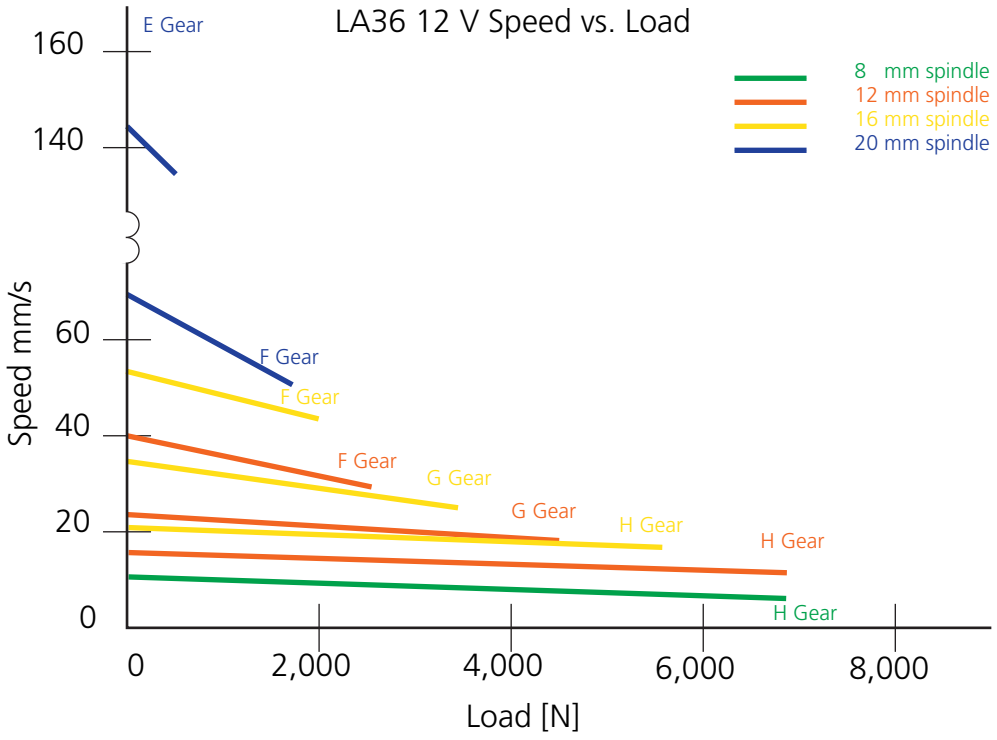
** There are limitations on the stroke length. If you need full load, please see: "Load v. Stroke Length".

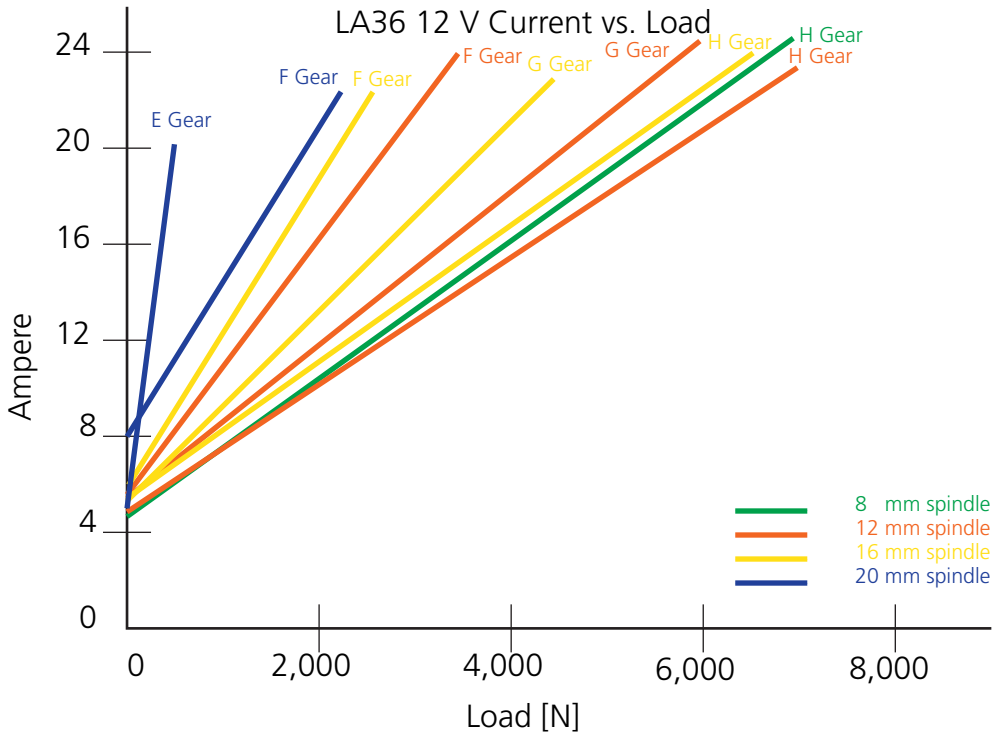
*** Note: Fully loaded actuators need a soft start in order to prevent the clutch from slipping when starting (see curves).

Please note that all actuators featuring "LIN bus', 'CAN SAE J1939', 'CANopen' and 'Modbus' will run at a regulated speed, which is typically around 80% of the speed at the nominal load.

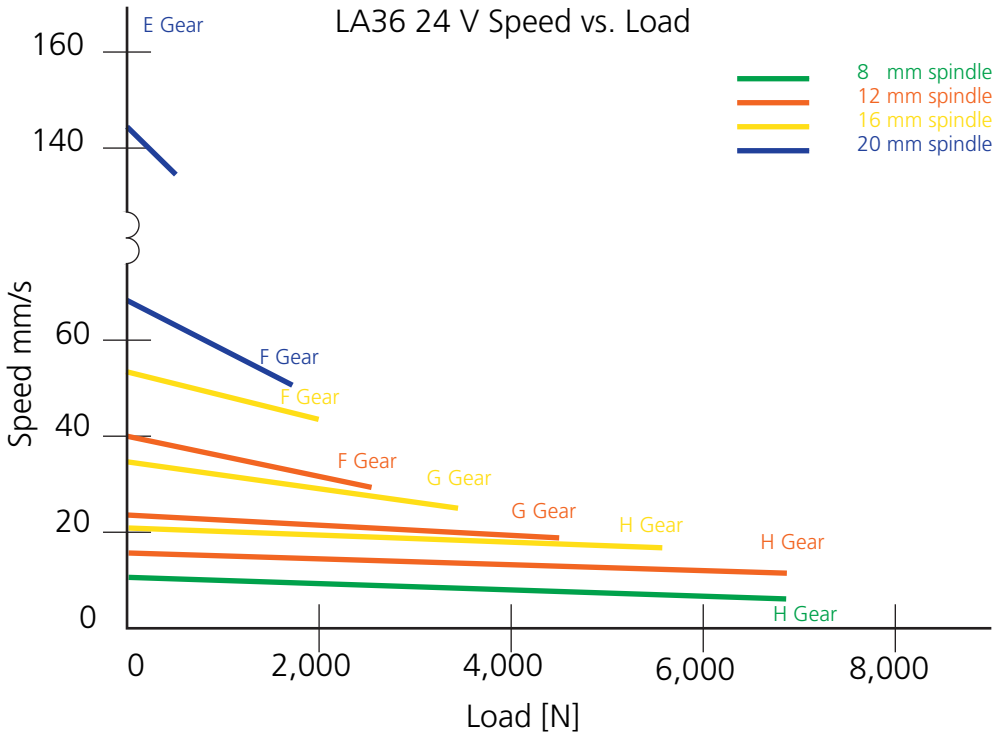
Speed and current curves:

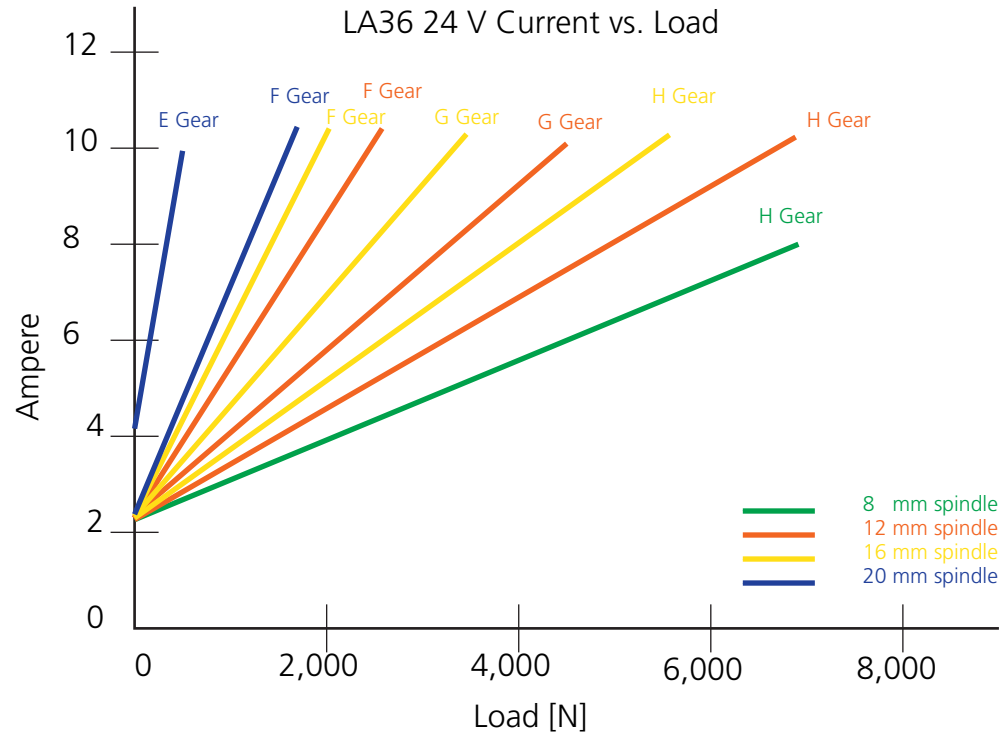
The typical values below are made with a stable power supply and an ambient temperature of 20°C.



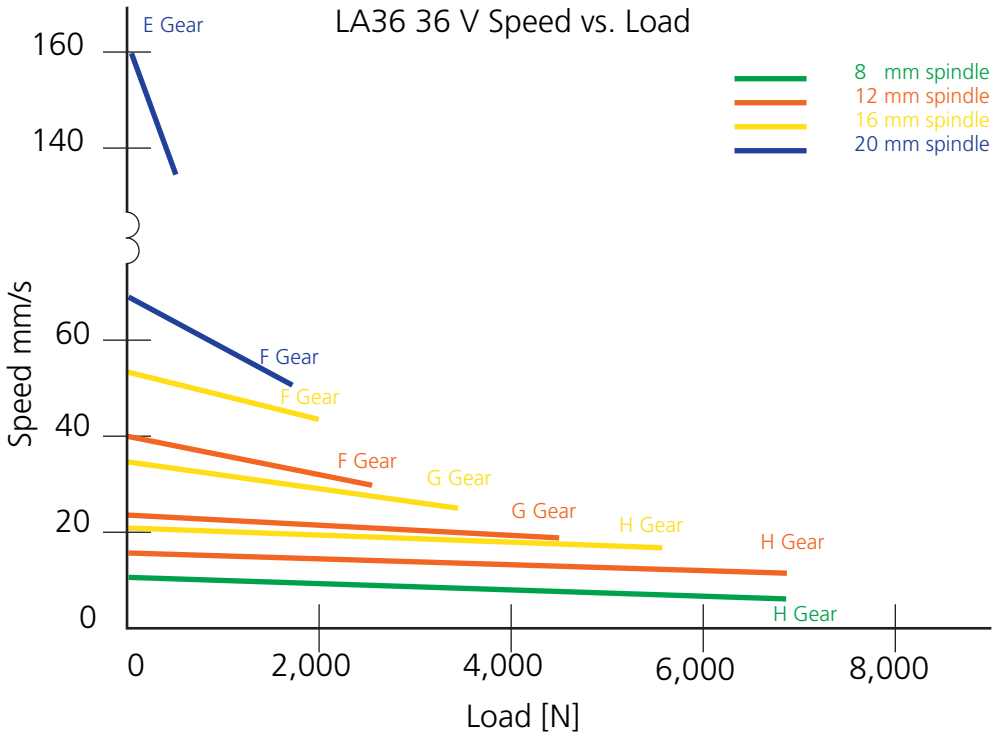


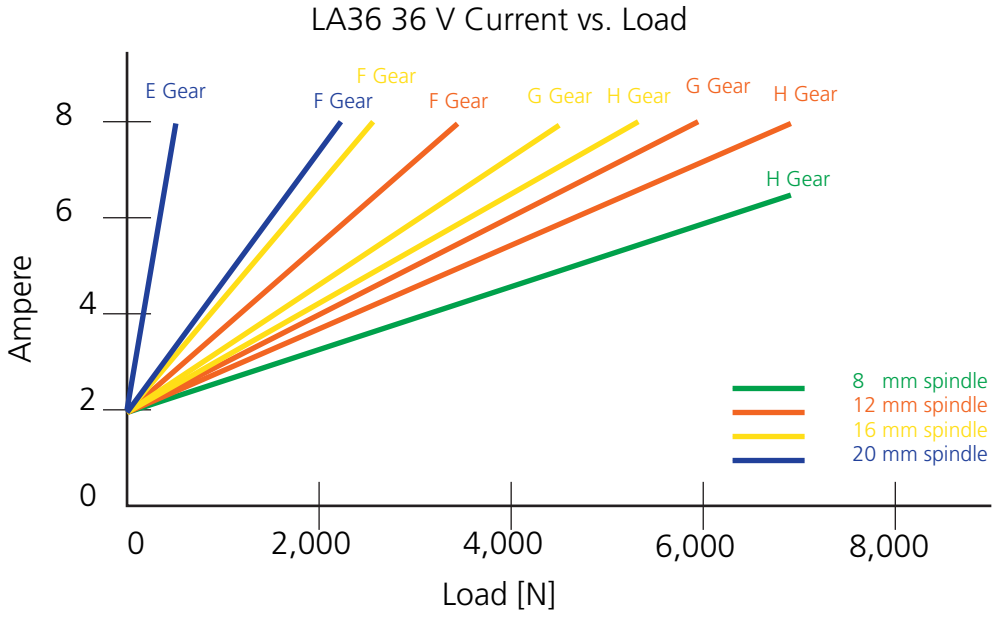
The typical values below are made with a stable power supply and an ambient temperature of 20°C.





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





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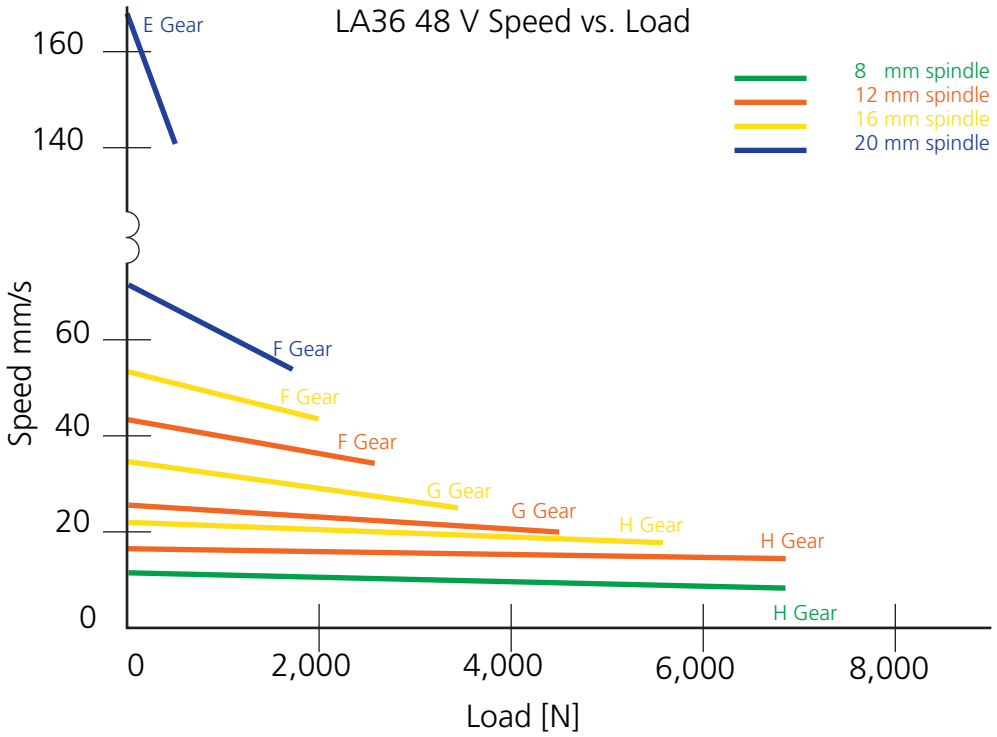
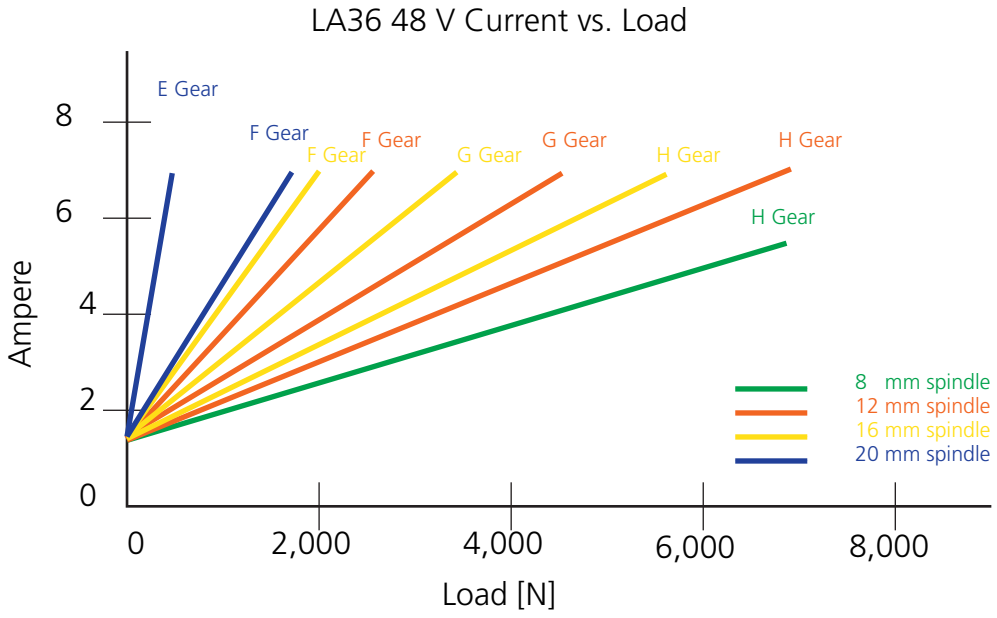




Current limits

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	26 A	13 A	8 A	Above
		26 A	26 A	13 A	Below
0B	IO-Link	-	16 A	-	Above
		-	26 A	-	Below
14	Modbus RTU	-	16 A	8 A	Above
		-	26 A	15 A	Below
A7 A8	CANbus J1939 CANopen	-	13 A	8 A	Above
		-	26 A	13 A	Below
0E 2E 5E	Modbus TCP/IP Ethernet Profinet	-	16 A	8 A	Above
		-	26 A	16 A	Below
C6 D6 E6	Off-highway: LIN bus CAN SAE J1939 CANopen	26 A	13 A	-	Above
		26 A	26 A	-	Below

Max. Current

The current in 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	36 V	48 V	Reference temperature: 0°C
00, 01	Standard Standard with power switch	26 A	13 A	10 A	8 A	Above
		26 A	13 A	10 A	8 A	Below

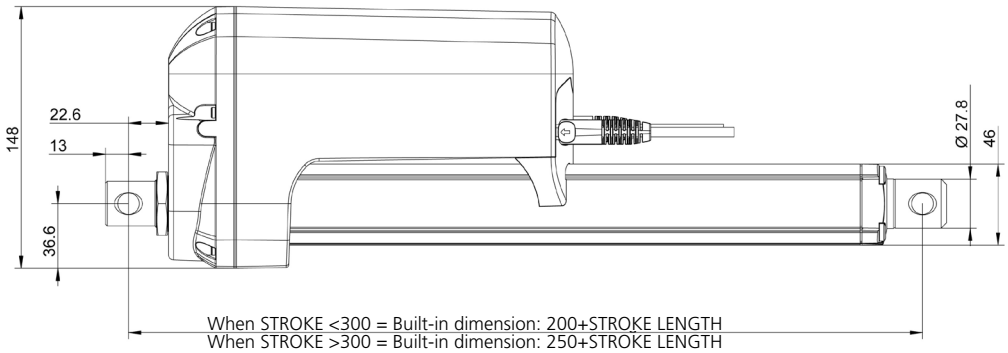
Current cut-offs

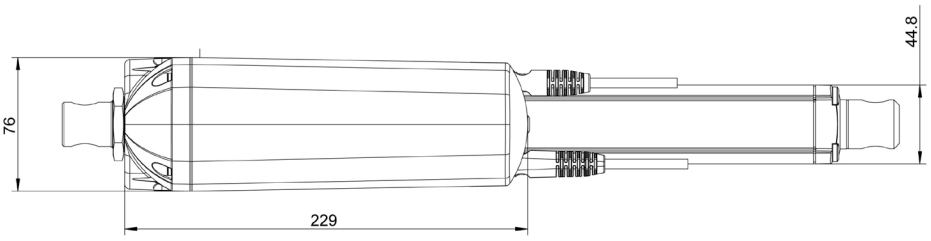
The principle behind the current cut-off measurement is an ‘above limit’ and a ‘below limit’ accumulating counter. When the time-out counter reaches a specific value the current cut-off goes into effect. The time-out value is pre-set at 200 ms.

Platform		12 V	24 V	48 V	Reference temperature: 0°C
16	LIN bus	30 A	-	-	Above
		30 A	-	-	Below
07 08	CAN SAE J1939 CANopen	30 A	20 A	-	Above
		30 A	25 A	-	Below
17 18	CAN SAE J1939 CANopen	30 A	20 A	13 A	Above
		30 A	25 A	15 A	Below

Built-in dimensions:

All dimensions are in mm

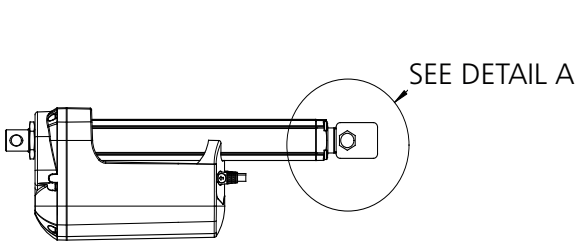


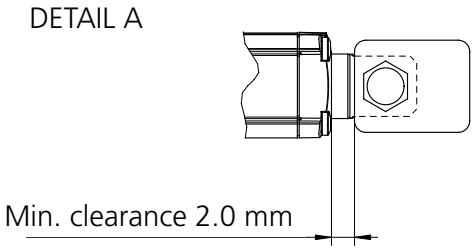


Minimum built-in dimension is 300 mm

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.



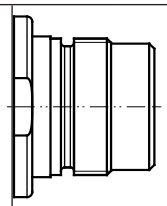
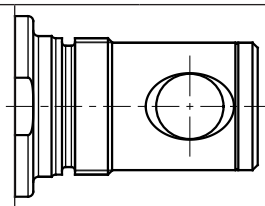
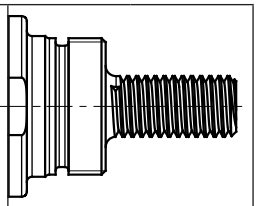
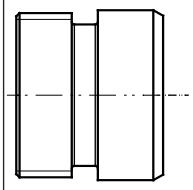
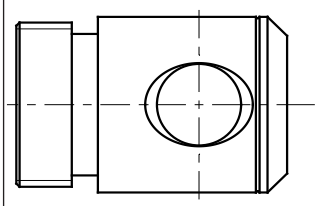
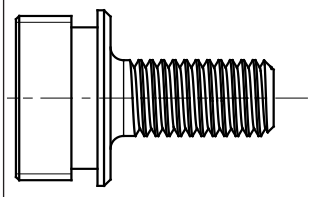
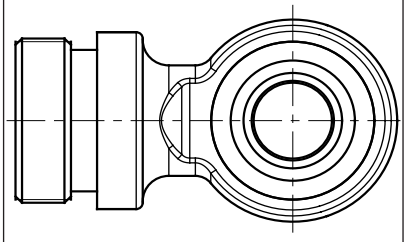


For platforms with interfaces containing Zero point the minimum stroke is 70 mm
The Zero point initialisation zone is located between 35-70 mm going from the most inward position.

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.

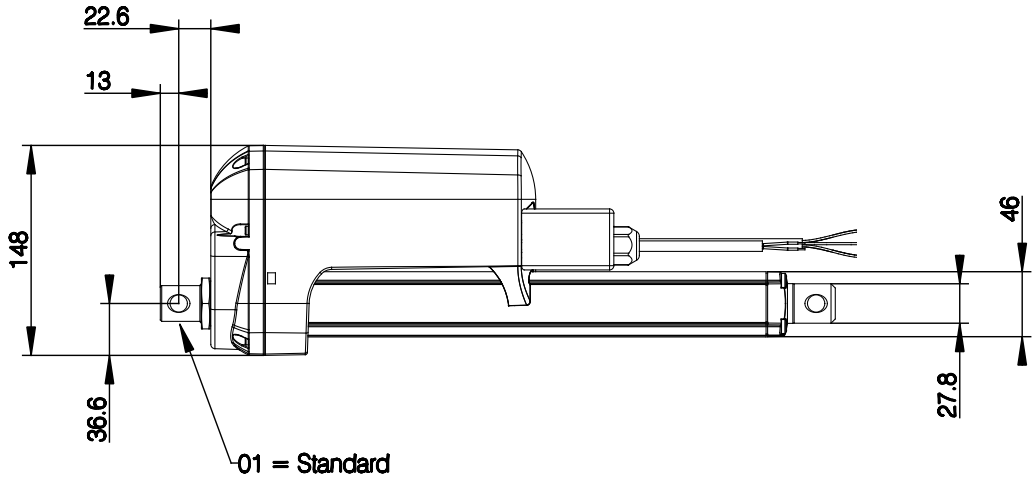
Built-in dimensions

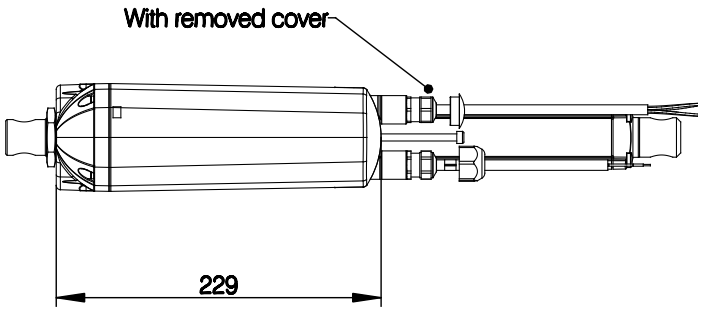
All dimesions are in mm

	Back fixture						
Length of stroke		<=300	>300	<=300	>300	<=300	>300
Piston rod eye		Inner thread - from the surface		Solid or slotted fixture - to center of the hole		Outer thread - from the surface	
	Inner thread - from the surface	189	239	195	245	180	230
	Solid or slotted fixture - to center of the hole	194	244	200	250	185	235
	Outer thread - from the surface	181	231	187	237	173	223
	Ball eye - to center of the hole	209	259	215	265	200	250

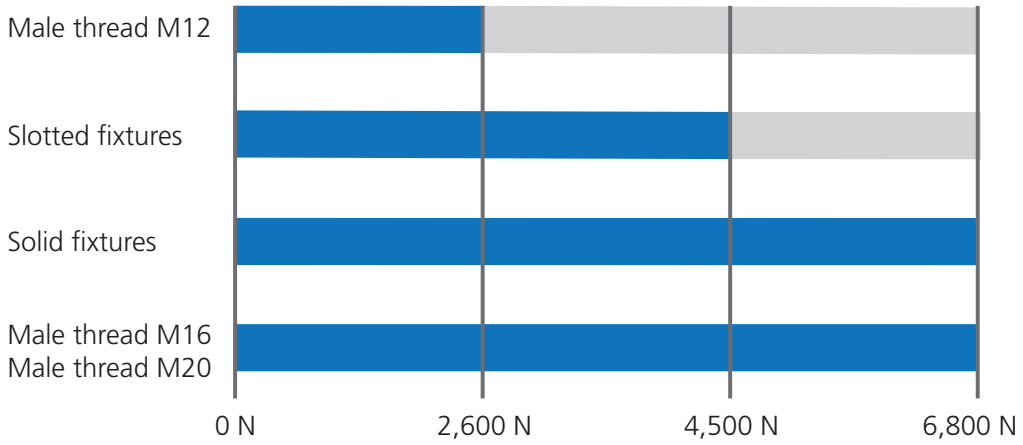
LA36 with ATEX/IECEx/CCC built-in dimensions:

All dimensions are in mm





Durability for piston rod eyes and back fixtures



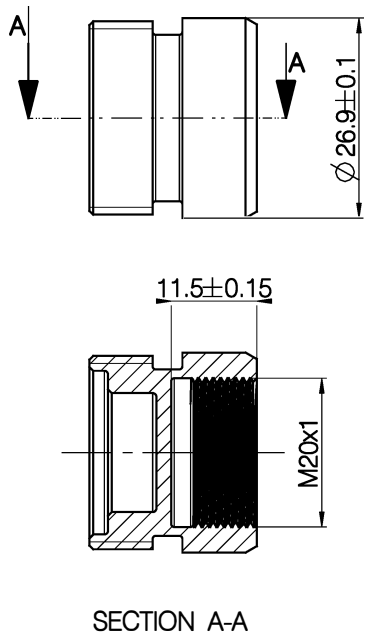
Blue = Full Lifetime
Grey = Reduced lifetime
(If e.g. a Male thread M12 is used with an actuator with a larger load than 2,600 N and a Slotted fixture is used with an actuator with a larger load than 4,500 N their lifetime will be shorter than if the other fixtures are chosen).

Piston rod eyes

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

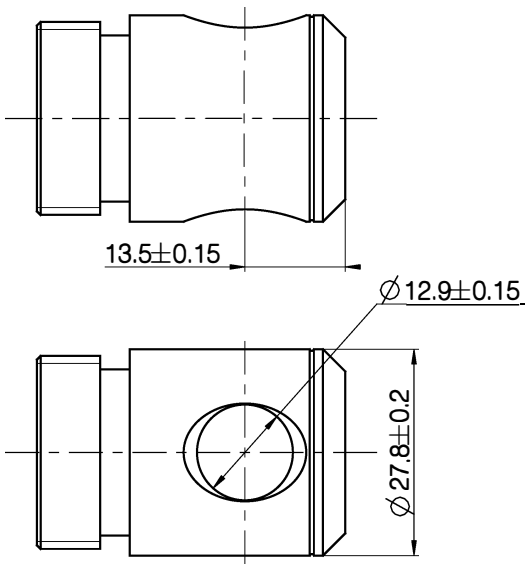
LINAK P/N: 0361016

AISI 303



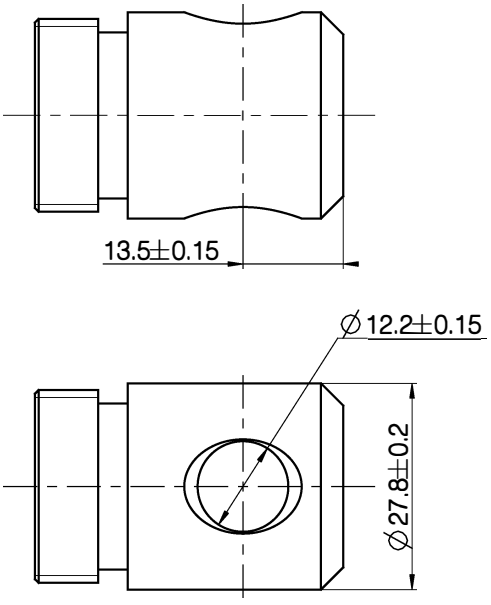
LINAK P/N: 0361018

Free-cutting steel with galvanised surface



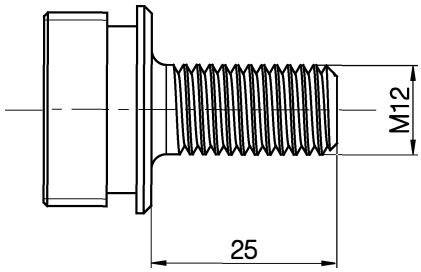
LINAK P/N: 0361109

Free-cutting steel with galvanised surface



LINAK P/N: 0361224

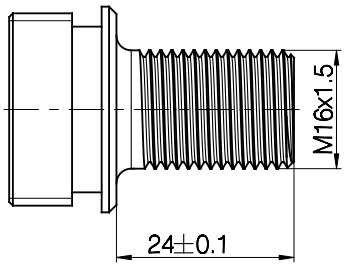
AISI 303



Piston rod eyes:

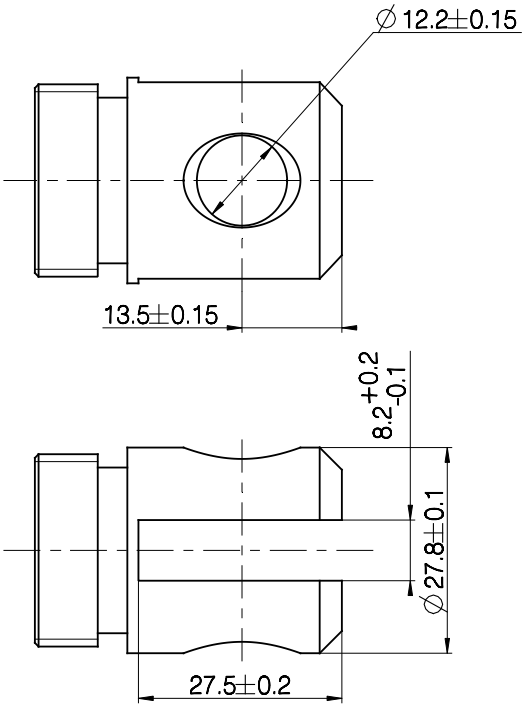
LINAK P/N: 0361135

AISI 303



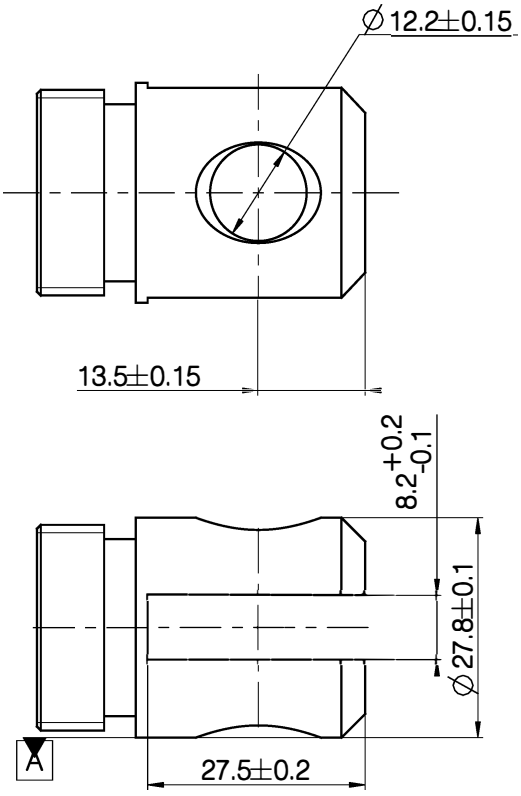
LINAK P/N: 0361138

Free cutting steel with galvanised surface.



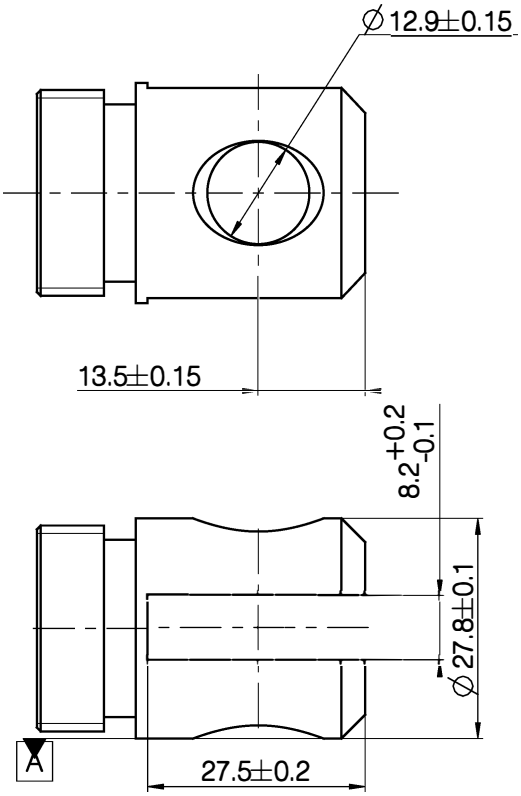
LINAK P/N: 0361260

AISI 304



LINAK P/N: 0361275

AISI 304

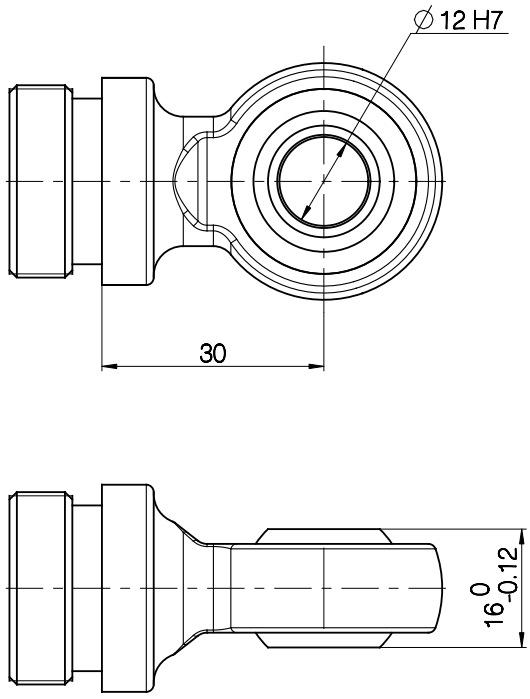


Piston rod eyes:

LINAK P/N: 0361350

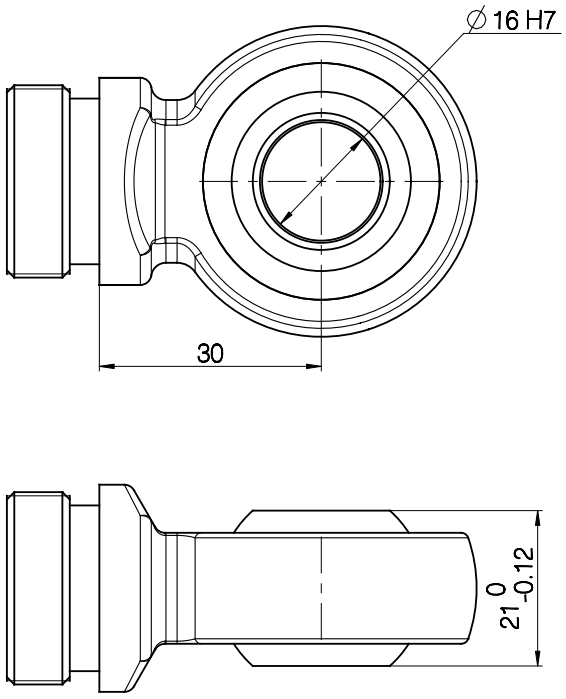
6.8 KN = Max. load 6.800 N in pull

AISI 304



LINAK P/N: 0361351

AISI 304



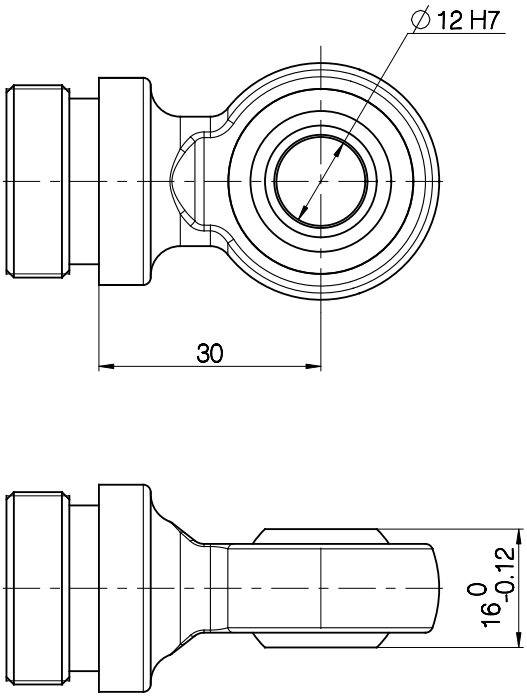
The piston rod eye is only allowed to turn 0 - 180 degrees.

Piston rod eyes:

LINAK P/N: 0361350

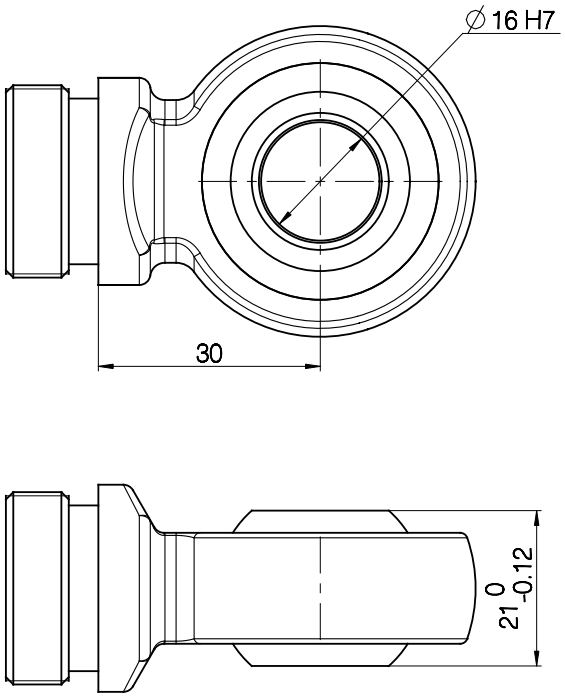
6.8 KN = Max. load 6.800 N in pull

AISI 304



LINAK P/N: 0361351

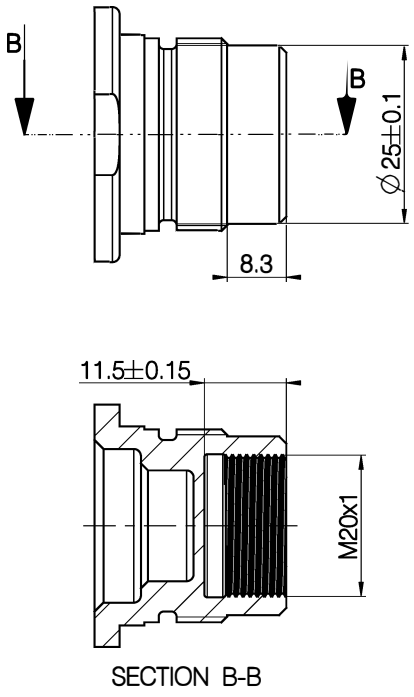
AISI 304



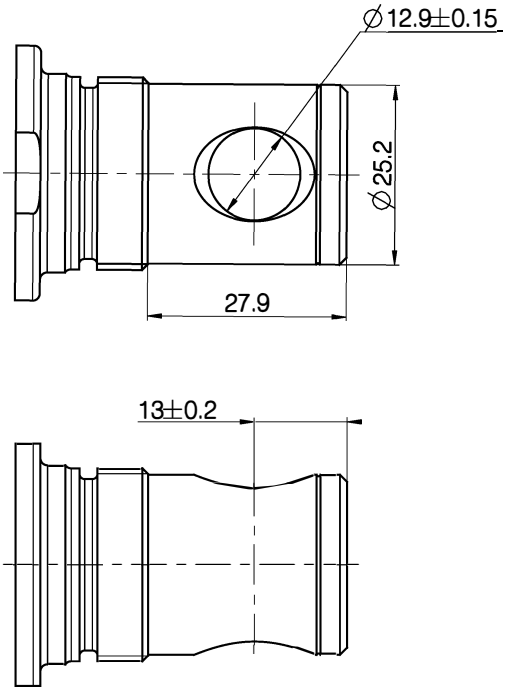
The piston rod eye is only allowed to turn 0 - 180 degrees.

Back fixtures:

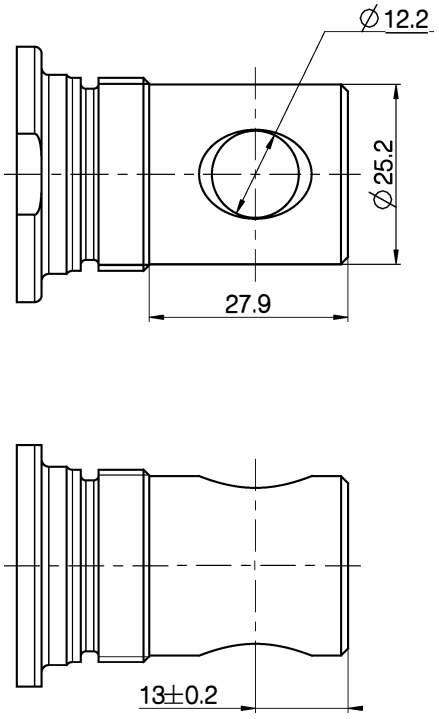
LINAK P/N: *0361761*
AISI 303



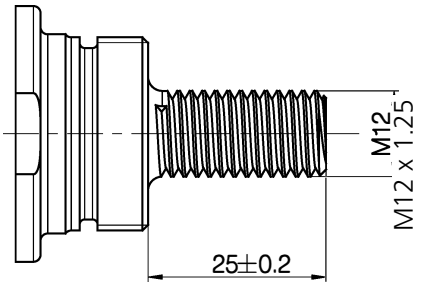
LINAK P/N: *0361715*
Free cutting steel with galvanised surface.



LINAK P/N: *0361714*
Free cutting steel with galvanised surface.

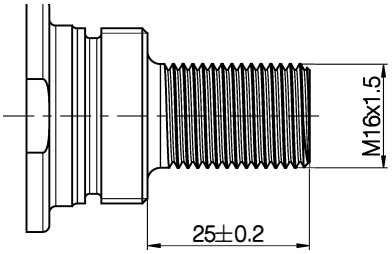


LINAK P/N: *0361753*
AISI 303

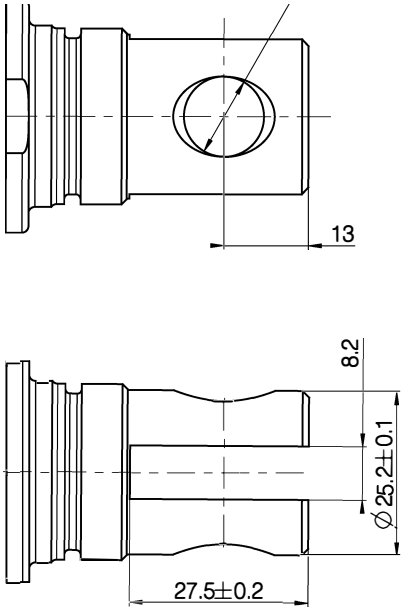


Back fixtures:

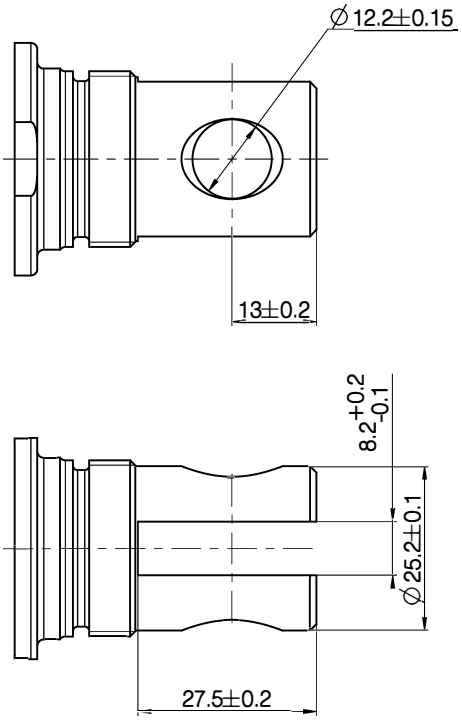
LINAK P/N: *0361754*
AISI 303



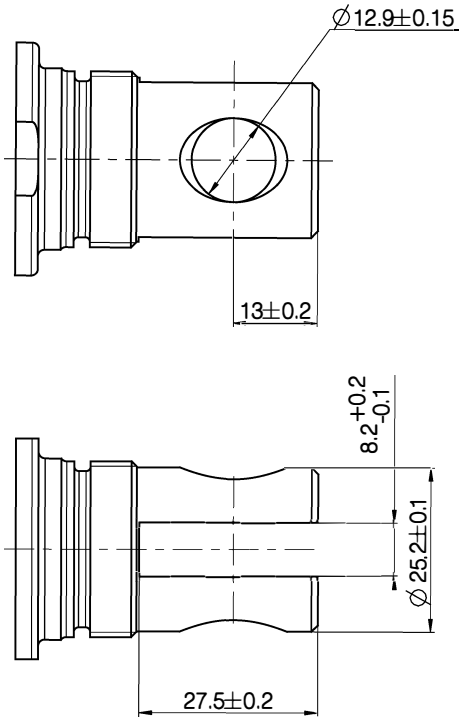
LINAK P/N: *0361713*
Free cutting steel with galvanised surface.



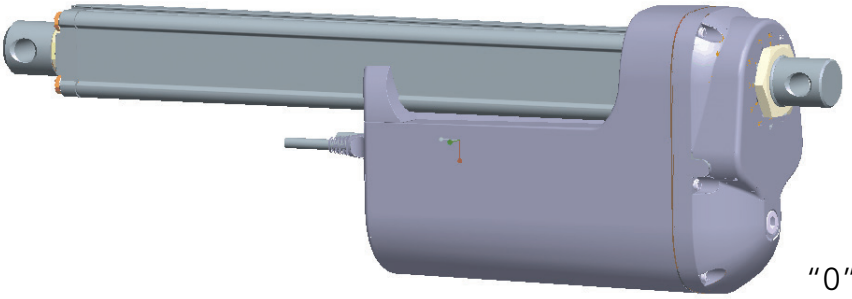
LINAK P/N: *0361742*
AISI 304



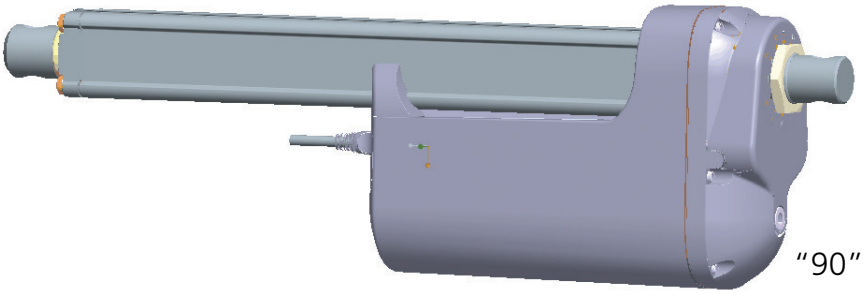
LINAK P/N: *0361743*
AISI 304



Back fixture orientation:



"0" Degrees



"90" Degrees

"30" Degrees

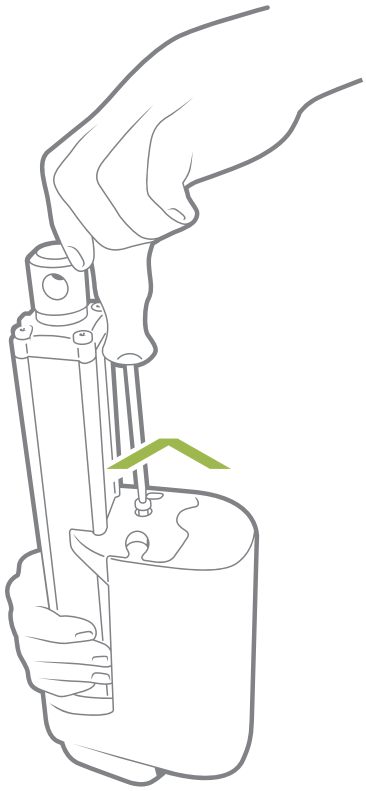
"60" Degrees

"120" Degrees

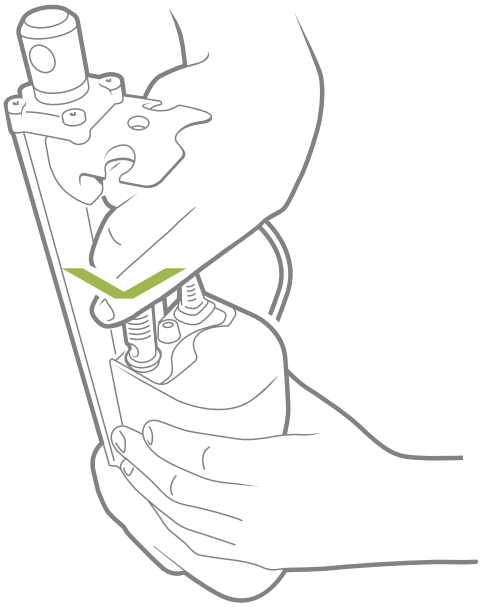
"150" Degrees

NB. All with tolerance of ±4°

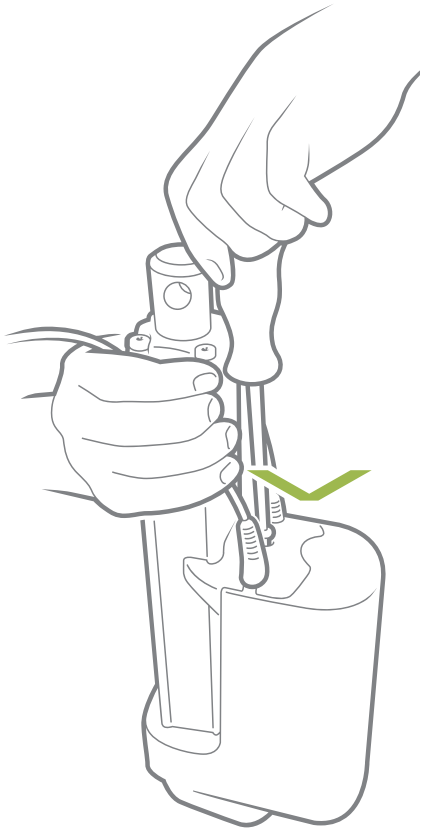
Mounting of cables



1. Unscrew the cover and remove the two blind plugs.



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.

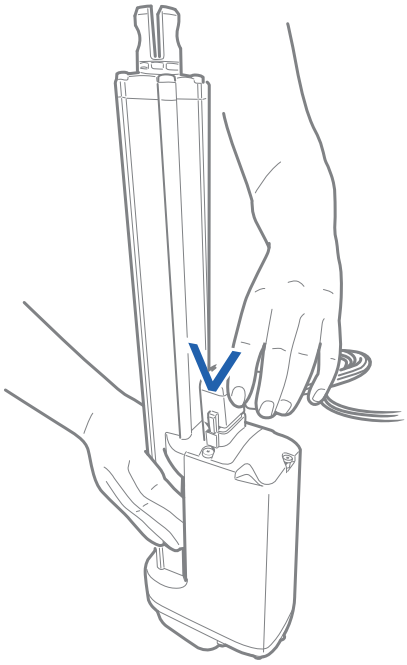
Please note that if the cables are mounted and dismounted more than 3 times the plugs can be damaged. Therefore, we recommend that such cables are discarded and replaced.

Also note that the cables should not be used for carrying the actuator.

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.

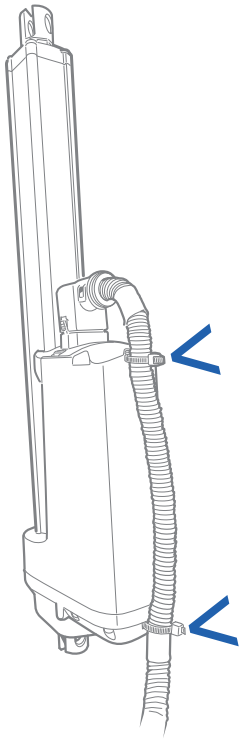
NOT valid for ATEX cables, please refere to the ATEX section for correct cable mounting on ATEX actuators.

Mounting of cable with 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.

Off-highway connection to Actuator Connect™

When connecting the actuator to Actuator Connect™ it is imperative to follow these instructions.

Power supply connection:

The actuator has to be powered with 12 Volt DC

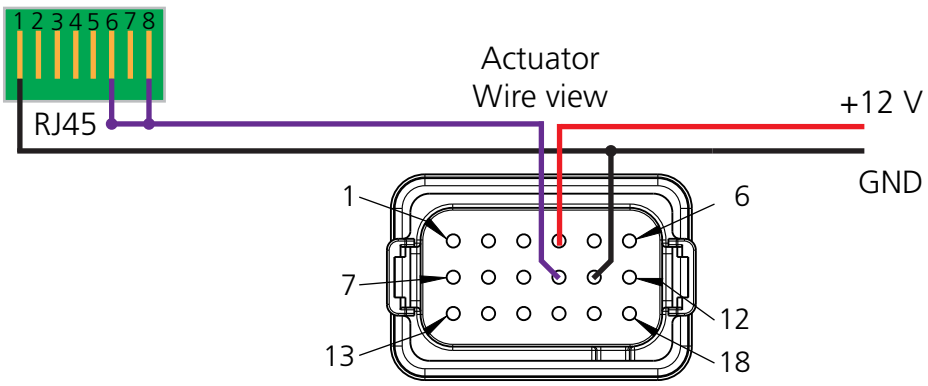
Positive is connected to pin 4 at the actuator

GND is connected to pin 11 at the actuator

RJ45:

Pin 1 at the RJ45 plug is Ground and has to be interconnected to GND on pin 11 at the actuator

Pin 6 and 8 at the RJ45 plug is communication and both has to be connected to pin 10 at the actuator:

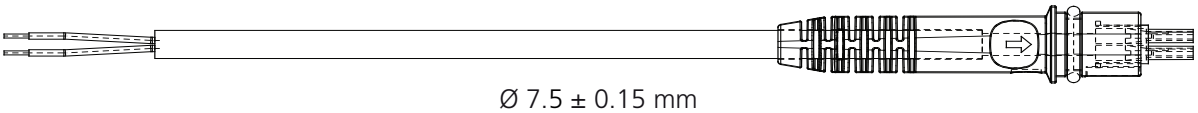


Cables

Power cable dimensions

LINAK® P/N 0367046

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

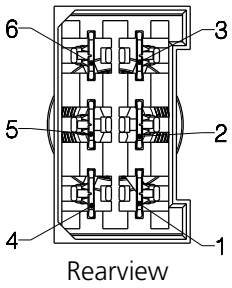


Ø 7.5 ± 0.15 mm

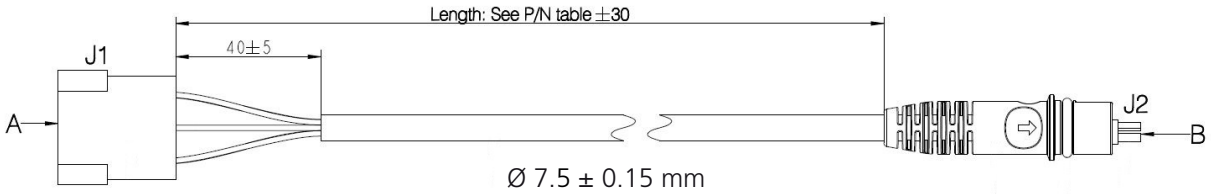
6-pin Signal cable dimensions

LINAK P/N 0367049

Colour	Outer dimensions	Core mm²	AWG*
Violet	Ø1.5 mm	0.5	20
Black	Ø1.5 mm	0.5	20
Red	Ø1.5 mm	0.5	20
Yellow	Ø1.5 mm	0.5	20
Green	Ø1.5 mm	0.5	20
White	Ø1.5 mm	0.5	20



Rearview

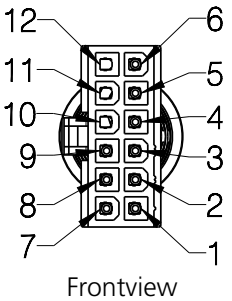


Ø 7.5 ± 0.15 mm

9-pin Signal cable dimensions

LINAK P/N 0368543

Colour	Outer dimensions	Core mm²	AWG*	Pin
Orange	Ø1.5 mm	0.5	20	5
Black	Ø1.5 mm	0.5	20	1
Red	Ø1.5 mm	0.5	20	2
Light Blue	Ø1.5 mm	0.5	20	6
Yellow	Ø1.5 mm	0.5	20	3
Green	Ø1.5 mm	0.5	20	4
Grey	Ø1.5 mm	0.5	20	0
Violet	Ø1.5 mm	0.5	20	7
White	Ø1.5 mm	0.5	20	8



Frontview

*AWG: American Wire Gauge

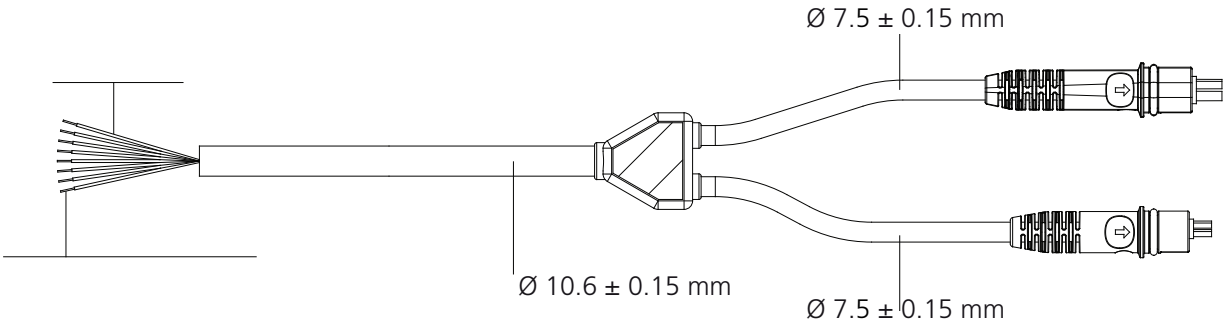
Cables

Y-cable dimensions

LINAK® P/N 0367020

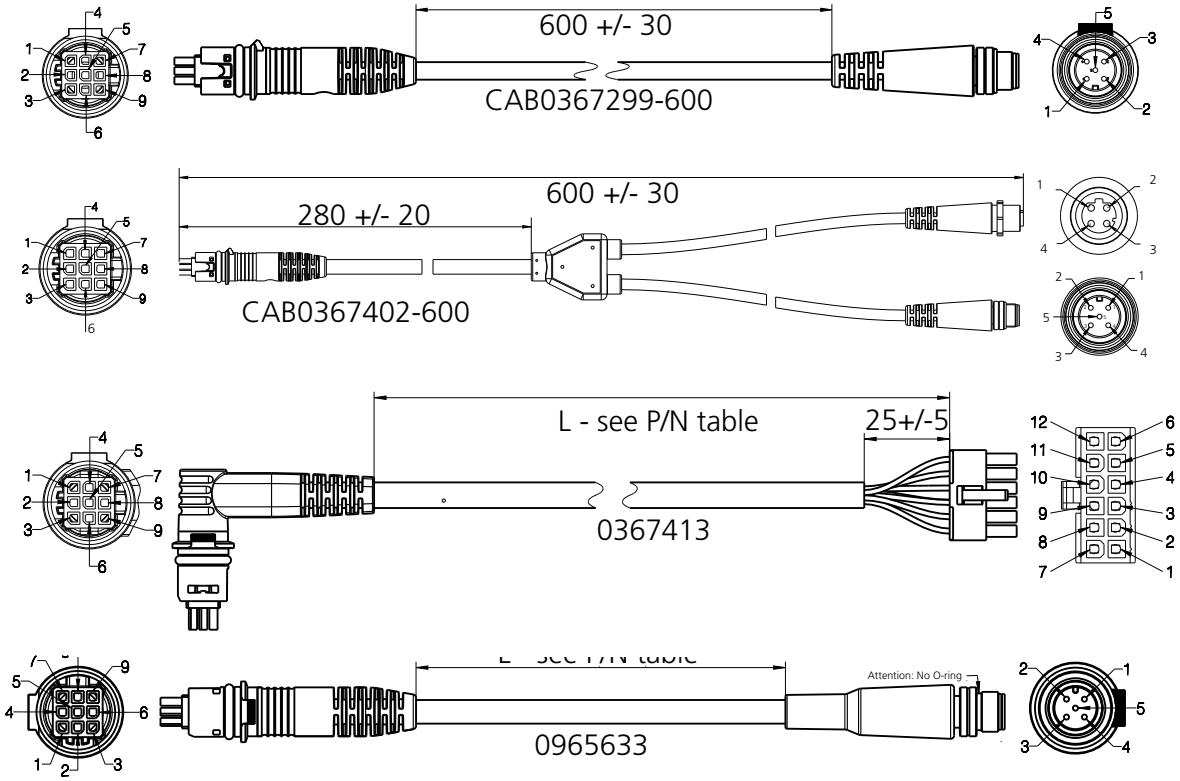
Colour	Outer dimensions	Core mm²	AWG*	Pin**
Brown	Ø2.8 mm	2.0	14	2
Blue	Ø2.8 mm	2.0	14	1
Red	Ø1.5 mm	0.5	20	4
Black	Ø1.5 mm	0.5	20	3
Yellow	Ø1.5 mm	0.5	20	7
Green	Ø1.5 mm	0.5	20	8
White	Ø1.5 mm	0.5	20	5
Violet	Ø1.5 mm	0.5	20	6

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



Cable P/N Table					
LINAK P/N	**Cable type**	**# Wires**	**mm²**	**AWG***	**Length in mm**
0367006	Power cable with AMP	2	2.0	14	200
CAB0367046-0400	Power cable	2	2.0	14	400
CAB0367046-0600	Power cable	2	2.0	14	600
CAB0367046-1500	Power cable	2	2.0	14	1,500
CAB0367046-5000	Power cable	2	2.0	14	5,000
CAB0367049-0600	Signal cable	6	0.5	20	600
CAB0367049-1500	Signal cable	6	0.5	20	1,500
CAB0367049-2000	Signal cable	6	0.5	20	2,000
CAB0367049-3000	Signal cable	6	0.5	20	3,000
CAB0367049-5000	Signal cable	6	0.5	20	5,000
CAB0368543-1500	Signal cable	9	0.5	20	1,500
CAB0368543-5000	Signal cable	9	0.5	20	5,000
CAB0367299-600	Signal cable for IO-Link	9	0.5	20	600
CAB0367402-600	Signal Y-cable for Ethernet	9	0.5	20	600
0367413-600	Signal cable w. 90° plug	9	0.5	20	600
0965633-1000	Signal cable for Modbus	9	0.5	20	1000
CAB0367020-1500	Y-Cable Signal and Power	6 2	0.5 2.0	20 14	1,500
CAB0367020-5000	Y-Cable Signal and Power	6 2	0.5 2.0	20 14	5,000

*AWG: American Wire Gauge



Cable kit article numbers

BusLink cable kits					
Platform		**Article no.**	**Connection**	**Includes**	**Colour**
04	Modbus (IC) - platform no longer available	0367998	RJ45	1. Adapter 2. USB2LIN cable	Yellow
07 08	CAN SAE J1939 CANopen	0367997	RJ45	(Adapter + USB2Lin)	Green

Actuator Connect™ cable kits					
Platform		**Article no.**	**Pins**	**Includes**	**Colour**
B3 C3 F3 B7 B8 0B A7 A8 2E 0E 14 16 17 18	I/O Basic I/O Customised I/O Full CAN SAE J1939 CANopen IO-Link CAN SAE J1939 CANopen EtherNet/IP Modbus TCP/IP Modbus RTU LIN bus CAN SAE J1939 CANopen	0367996	Signal-power + RJ45	(Adapter + USB2Lin)	Grey

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

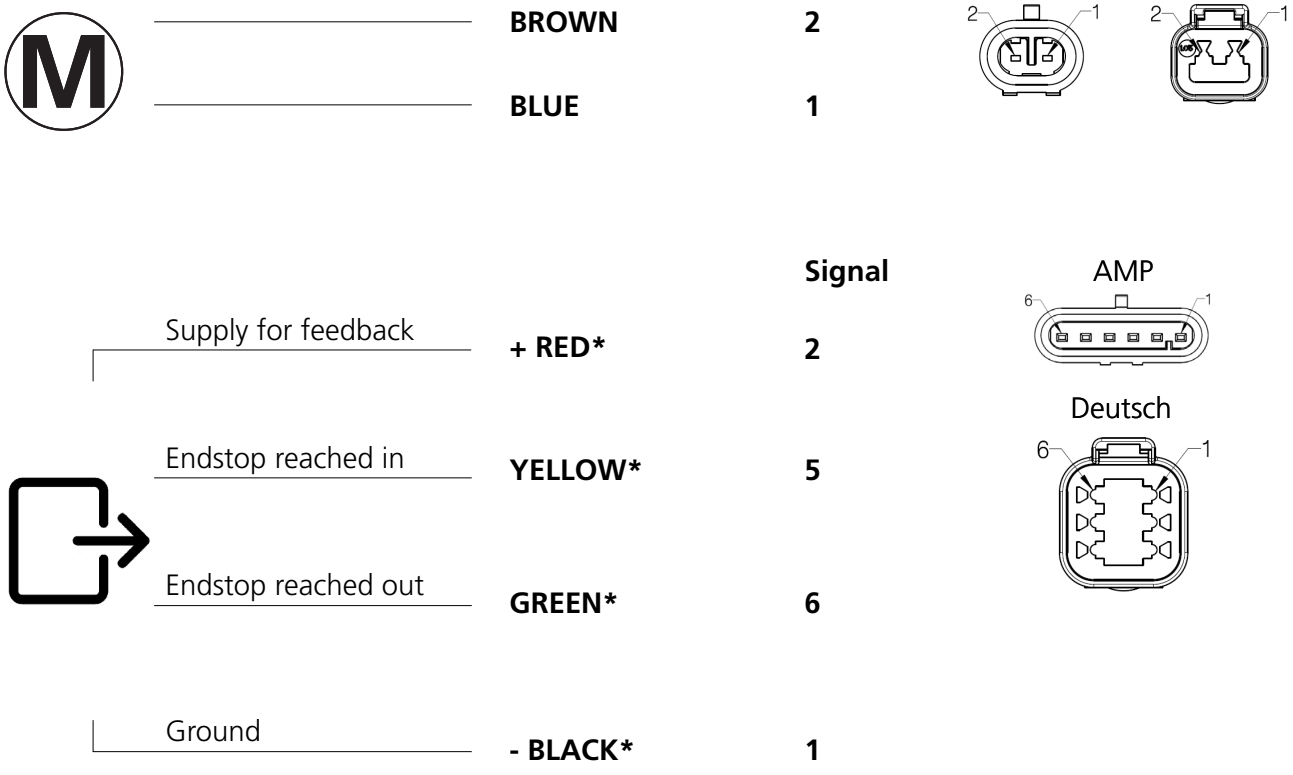
Electrical installation:

- 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. When selecting the power supply, it is important to make sure that it does not turn off the output when this backwards load dump occurs.

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

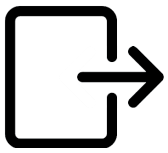
Standard

Platform: 00 and 01 (Ordering example value for place 11 and 12)
Feedback: 0 (Ordering example value for place 10)



If you wish to use the endstop signals, you will have to keep power on the Brown, Blue, Red and Black wires at all times when the actuator is running, and minimum one second before it starts to run, otherwise the signal will be lost.

*Available only if Endstop Reached is chosen. Ordering Example value for place 12 will then be: '1'

Input/Output	Specification	Comments
Description	The actuator can be equipped with electronically controlled Endstop reached out.	
Brown	12 VDC ± 20 % 24 VDC ± 10 % 36 VDC ± 10 % 48 VDC ± 10 %	To extend actuator: Connect Brown to positive Connect Blue to negative To retract actuator: Connect Brown to negative Connect Blue to positive
Blue		
Red	Signal power supply (+) 12 - 24 V DC	Current consumption: Max. 40 mA during run and pause Higher peak currents due to the input capacitance of max. 3 mF
Black	Signal power supply GND (-)	
Yellow	Endstop reached in*	Output voltage min. V_{IN} (Red wire) - 2 V Source current max. 100 mA NOT potential free
Green	Endstop reached out*	
Violet	Not to be connected	
White	Not to be connected	

If you wish to use the endstop reached, you will have to keep power on the Brown, Blue, Red and Black wires, otherwise the signal will be lost.

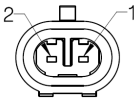
*Available only if ordering example place 12 has the value: ‘1’

Standard with Dual Hall - Relative positioning

Platform: 00 and 01 (Ordering example value for place 11 and 12)
Feedback: H (Ordering example value for place 10)

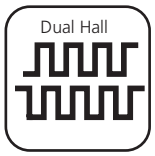
	Power
BROWN	**2**
BLUE	**1**

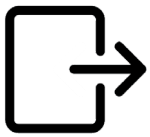
AMP



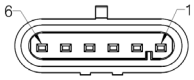
Deutsch

	Signal
Supply for feedback — **+ RED**	**2**
Digital output — **YELLOW** / **Alt. VIOLET***	**5**
Digital output — **GREEN** / **Alt. WHITE****	**6**
Digital output — **YELLOW*****	**4**
Digital output — **GREEN*****	**3**
Ground — **- BLACK**	**1**

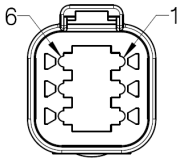




AMP



Deutsch



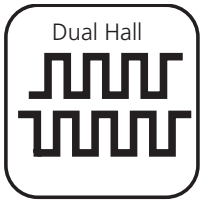
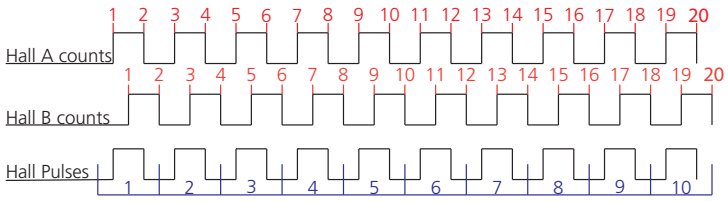
A Hall pulse consists of two Hall counts.
A Hall count occurs every time the signal changes direction, either upwards or downwards.

If you wish to use the endstop signals, you will have to keep power on the Brown, Blue, Red and Black wires at all times when the actuator is running, and minimum one second before it starts to run, otherwise the signal will be lost.

* If ordered with Endstop Reached this cord will be Violet

** If ordered with Endstop Reached this cord will be White

***Available only if Endstop Reached is chosen. Ordering Example value for place 12 will then be: '1'

<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. The Dual Hall output is on two wires with a phase shift of 90° between the two quadrature signals.
Running outwards - pulse A will be first.
Running inwards - pulse B will be first.</td><td> 
</td></tr>
<tr><td>Brown
Blue</td><td colspan="2">12 V DC ± 20 %
24 V DC ± 10 %
36 V DC ± 10 %
48 V DC ± 10 %</td><td>To extend actuator:
Connect Brown to positive
Connect Blue to negative
To retract actuator:
Connect Brown to negative
Connect Blue to positive</td></tr>
<tr><td>Red</td><td colspan="2">Signal power supply (+) 12 - 24 V DC</td><td rowspan="2">Current consumption:
Max. 40 mA during run and pause
Higher peak currents due to the input capacitance of max. 3 mF</td></tr>
<tr><td>Black</td><td colspan="2">Signal power supply GND (-)</td></tr>
<tr><td>Yellow*</td><td>Hall A</td><td rowspan="2">For more info, see Technical Specifications</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} (Red wire) - 2 V
Max. current output: 12 mA
Higher voltage on the motor can result in shorter pulses.</td></tr>
<tr><td>Green**</td><td>Hall B</td></tr>
<tr><td>Violet***</td><td colspan="3">Digital output</td></tr>
<tr><td>White***</td><td colspan="3">Digital output</td></tr>
<tr><td colspan="4"> 

A Hall pulse consists of two Hall counts.
A Hall count occurs every time the signal changes direction, either upwards or downwards.</td></tr>
</table>

* If ordered with Endstop Reached this cord will be Violet

** If ordered with Endstop Reached this cord will be White

***Available only if ordering example place 12 has the value: ‘1’

Standard with Single Hall - Relative positioning

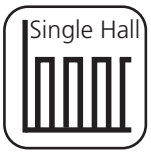
Platform: 00 and 01 (Ordering example value for place 11 and 12)
Feedback: K (Ordering example value for place 10)

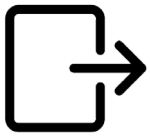
		Power
	BROWN	**2**
	BLUE	**1**

AMP

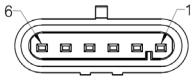
Deutsch

		Signal
Supply for feedback	**+ RED**	**2**
Digital output	**VIOLET**	**4**
Digital output	**YELLOW***	**5**
Digital output	**GREEN***	**6**
Ground	**- BLACK**	**1**





AMP



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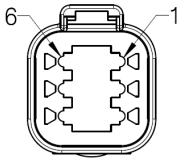
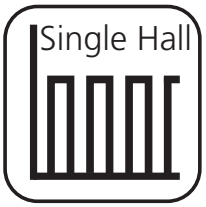
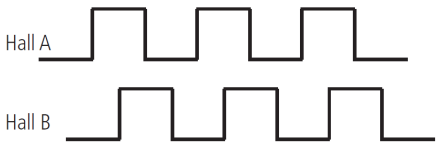
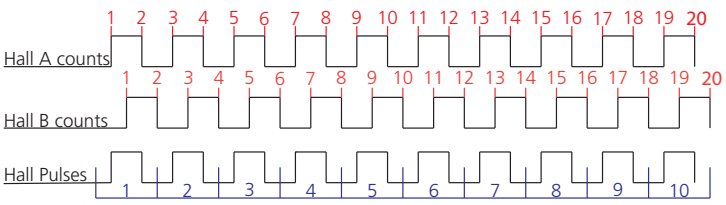


A Hall pulse consists of two Hall counts.
A Hall count occurs every time the signal changes direction, either upwards or downwards.

If you wish to use the endstop signals, you will have to keep power on the Brown, Blue, Red and Black wires at all times when the actuator is running, and minimum one second before it starts to run, otherwise the signal will be lost.

*Available only if Endstop Reached is chosen. Ordering Example value for place 12 will then be: '1'

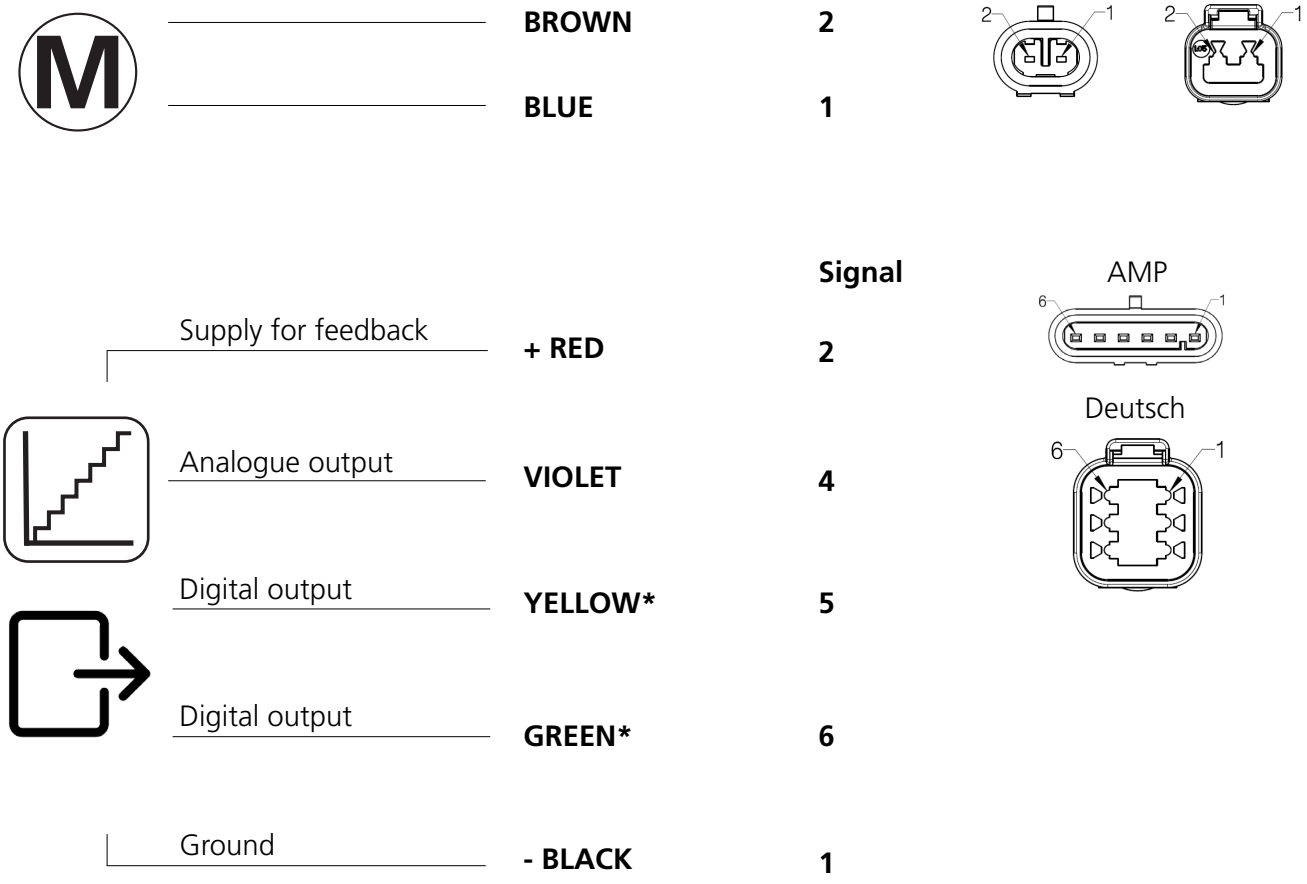
<table>
<tr><th>Input/Output</th><th>Specification</th><th>Comments</th></tr>
<tr><td>Description</td><td>The actuator can be equipped with Single Hall that gives a relative positioning feedback signal when the actuator moves.</td><td> 
</td></tr>
<tr><td>Brown
Blue</td><td>12 VDC ± 20 %
24 VDC ± 10 %
36 VDC ± 10 %
48 VDC ± 10 %</td><td>To extend actuator:
Connect Brown to positive
Connect Blue to negative
To retract actuator:
Connect Brown to negative
Connect Blue to positive</td></tr>
<tr><td>Red</td><td>Signal power supply (+) 12 - 24 V DC</td><td rowspan="2">Current consumption:
Max. 40 mA during run and pause
Higher peak currents due to the input capacitance of max. 3 mF</td></tr>
<tr><td>Black</td><td>Signal power supply GND (-)</td></tr>
<tr><td>Yellow</td><td colspan="2">Endstop reached in*</td></tr>
<tr><td>Green</td><td colspan="2">Endstop reached out*</td></tr>
<tr><td rowspan="3">Violet</td><td>For more info, see Technical Specifications</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} (Red wire) - 2 V
Max. source current: 30 mA
Max. current output: 12 mA
Max. 680 nF
Higher voltage on the motor can result in shorter pulses.</td></tr>
<tr><td>Higher voltage on the motor can result in shorter pulses.</td></tr>
<tr><td>Input:
 
</td><td>Single Hall output:
 
</td></tr>
<tr><td colspan="3"> 

A Hall pulse consists of two Hall counts.
A Hall count occurs every time the signal changes direction, either upwards or downwards.</td></tr>
</table>

*Available only if ordering example place 12 has the value: ‘1’

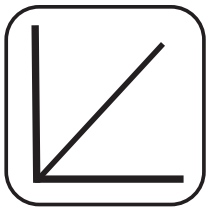
Standard with Analogue feedback - Absolute positioning

Platform: 00 and 01 (Ordering example value for place 11 and 12)
Feedback: A (Ordering example value for place 10)



If you wish to use the endstop signals, you will have to keep power on the Brown, Blue, Red and Black wires at all times when the actuator is running, and minimum one second before it starts to run otherwise the signal will be lost.

*Available only if Endstop Reached is chosen. Ordering Example value for place 12 will then be: '1'

Input/Output	Specification	Comments
Description	The actuator can be equipped with an electronic circuit that gives an analogue feedback signal when the actuator moves.	
Brown	12 V DC ± 20 % 24 V DC ± 10 % 36 V DC ± 10 % 48 V DC ± 10 %	To extend actuator: Connect Brown to positive Connect Blue to negative To retract actuator: Connect Brown to negative Connect Blue to positive
Blue		
Red	Signal power supply (+) 12 - 24 V DC	Current consumption: Max. 60 mA during run and pause Higher peak currents due to the input capacitance of max. 3 mF
Black	Signal power supply GND (-)	
Yellow	Endstop reached in*	Output voltage min. V_{IN} (Red wire) - 2 V Max. source current: 100 mA NOT potential free
Green	Endstop reached out*	
Violet	Analogue feedback: 0 - 10 V 0.5 - 4.5 V	Tolerances: +/- 0.2 V Transaction delay: 20 ms Linear feedback: 0.5 % Max. current output: 1 mA
White	Not to be connected	

For actuators with analogue feedback it is recommended to fully extract and retract the actuator on a regular basis (thereby activating the limit switches) in order to ensure precise positioning.

*Available only if ordering example place 12 has the value: ‘1’

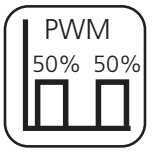
Standard with PWM - Absolute positioning

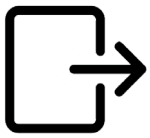
Platform: 00 and 01 (Ordering example value for place 11 and 12)
Feedback: F (Ordering example value for place 10)

		Power
	BROWN	**2**
	BLUE	**1**

AMP

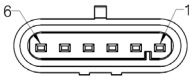
Deutsch





		Signal
Supply for feedback	**+ RED**	**2**
Digital feedback	**VIOLET**	**4**
Digital output	**YELLOW***	**5**
Digital output	**GREEN***	**6**
Ground	**- BLACK**	**1**

AMP



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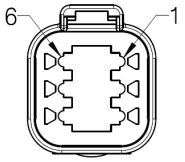
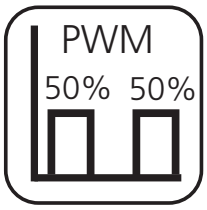


If you wish to use the endstop signals, you will have to keep power on the Brown, Blue, Red and Black wires at all times when the actuator is running, and minimum one second before it starts to run, otherwise the signal will be lost.

*Available only if Endstop Reached is chosen. Ordering Example value for place 12 will then be: '1'

Input/Output	Specification	Comments
Description	The actuator can be equipped with an electronic circuit that gives an analogue feedback signal when the actuator moves.	
Brown	12 V DC ± 20 % 24 V DC ± 10 % 36 V DC ± 10 % 48 V DC ± 10 %	To extend actuator: Connect Brown to positive Connect Blue to negative To retract actuator: Connect Brown to negative Connect Blue to positive
Blue		
Red	Signal power supply (+) 12 - 24 V DC	Current consumption: Max. 60 mA during run and pause Higher peak currents due to the input capacitance of max. 3 mF
Black	Signal power supply GND (-)	
Yellow	Endstop reached in*	Output voltage: min. V_{IN} (Red wire) - 2 V Source current: max. 100 mA NOT potential free
Green	Endstop reached out*	
Violet	Digital output feedback (PNP) 10 - 90% 20 - 80%	Output voltage: min. V_{IN} (Red wire) - 2 V Tolerances: +/- 2% Max. current output: 12 mA Frequency: 75 Hz
White	Not to be connected	

It is recommended to fully extract and retract the actuator on a regular basis (thereby activating the limit switches) in order to ensure precise positioning.

* Available only if ordering example place 12 has the value: ‘1’

Standard with Mechanical Potentiometer - Absolute positioning

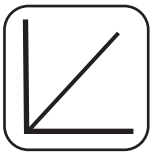
Platform: 00 and 01 (Ordering example value for place 11 and 12)
Feedback: P (Ordering example value for place 10)

		Power
	BROWN	**2**
	BLUE	**1**

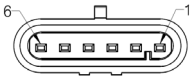
AMP

Deutsch

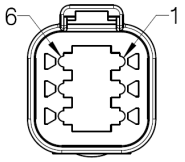
		Signal
Supply for feedback	**+ RED***	**2**
Analogue output	**VIOLET**	**4**
Supply for potentiometer	**+ WHITE**	**3**
Digital output	**YELLOW***	**5**
Digital output	**GREEN***	**6**
Ground	**- BLACK**	**1**



AMP

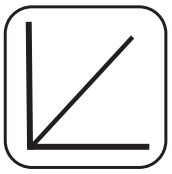


Deutsch



If you wish to use the endstop signals, you will have to keep power on the Brown, Blue, Red and Black wires at all times when the actuator is running, and minimum one second before it starts to run, otherwise the signal will be lost.

*Available only if Endstop Reached is chosen - Ordering Example value for place 12 will then be: '1'

Input/Output	Specification	Comments
Description	The actuator can be equipped with a mechanical potentiometer, 10 kohm.	 0-10 k ohm, 5%, 10-Turn
Brown	12 VDC ± 20 % 24 VDC ± 10 % 36 VDC ± 10 % 48 VDC ± 10 %	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 - 24 V DC	For endstop signals
Black	Signal power supply GND (-)	
Green	Endstop reached outwards*	Output voltage min. VIN - 2 V Source current max. 100 mA NOT potential free
Yellow	Endstop reached inwards*	
Violet	Mechanical potentiometer output Output range with 12 mm spindle pitch: 1 kilo ohm = 0 mm stroke 11 kilo ohm = 500 mm stroke Output range with 16 mm spindle pitch: 1 kilo ohm = 0 mm stroke 11 kilo ohm = 666 mm stroke Output range with 20 mm spindle pitch: 1 kilo ohm = 0 mm stroke 11 kilo ohm = 833 mm stroke	+10 V or other value Output protection: 1 kohm protection resistor in series with the potentiometer Linearity: ± 0.25%
White	Supply for Potentiometer 10 V DC recommended	

Please note that Potentiometer is not possible on variants with fast gear (E Gear).

*Available only if ordering example place 12 has the value: ‘1’

Manual hand crank:

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

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	16 mm	20 mm
Gear F	-	11 mm	14 mm	18 mm
Gear G	-	6 mm	8 mm	10 mm
Gear H	3 mm	4 mm	5 mm	7 mm
Gear E	-	-	-	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 thereby damaging the actuator - do NOT use power tools for the hand crank!
- After using the hand crank, the ingress protection will be less than IP66 once the plug is removed
- After using the hand crank, always return the actuator to the most inward position. Failing to do so can damage the actuator and/or the application it is used for

The manual hand crank must NEVER be used in an ATEX/IECEx/CCC environment, as it is not possible to verify that the actuator is proper sealed when the hand crank has been used.

The actuator must NOT be used in an ATEX/IECEx/CCC environment, if the warning sticker is missing or shows sign of having been removed from the bottom of the actuator.

Environmental tests – Climatic

Test	Specification	Comment
Cold Test	EN 60068-2-1 (Ab)	Storage at low temperature: Temperature: -40 °C Duration: 72 h Not connected Tested at room temperature.
	EN 60068-2-1 (Ad)	Storage at low temperature: Temperature: -30 °C Duration: 2 h Actuator is not activated/connected. Tested at low temperature.
Dry Heat	EN 60068-2-2 (Bb)	Storage at high temperature: Temperature: +90 °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.
	EN 60068-2-2 (Bd)	Operating at high temperature: Temperature: +60 °C Int. max. 17 % Duration:700 h Actuator is activated Tested at high temperature.
Change of Temperature	EN 60068-2-14 (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.
	EN 60068-2-14 (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 (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	EN 60068-2-30 (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.
	EN 60068-2-3 (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	EN 60068-2-52 (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
Degrees of Protection	EN 60529 – 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 6800 (N) 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.
	DIN40050 – IP69K	High pressure cleaner: Water temperature: +80 °C Water pressure: 80 bar Spray angle: 45 ° Spray distance: 100 mm 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 115 °C for 20 hours. After this it is cooled down in 20 °C salt water. Cooling time: 5 minutes Opened for checking salt deposit and water.
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.

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	EN 60068-2-36 (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 5-25 Hz: Amplitude = 3.3 mm pp Frequency 25-200 Hz: Acceleration 4 g Number of directions: 3 (X-Z-Y) Duration: 2 hours in each direction. Actuator is not activated.
Bump	EN 60068-2-29 (Eb)	Bump test: Level: 40 g Duration: 6 milliseconds Number of bumps: 500 shocks in each of 6 directions. Actuator is not connected.
Shock	EN 60068-2-27 (Ea)	Shock test: Level: 100 g Duration: 6 milliseconds Number of bumps: 3 shocks in each of 6 directions. Actuator is not connected.

Environmental tests - Electrical

Test	Specification	Comment
Emission	EN 61000-6-4	Level is inside limits for 12 V motor.
Automotive Transients	ISO 7637	Load dump test only accepted on motor power connection.
IECEx / ATEX (Ex)	EN 60079-0:2012 EN 60079-31:2014	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

Environmental tests – Climatic - LA36 Off-highway

Test	Specification	Comment
Cold Test	EN 60068-2-1 (Ab)	Storage at low temperature: Temperature: -55 °C Duration: 72 h Actuator is not activated/connected Tested at room temperature.
	EN 60068-2-1 (Ad)	Operating at low temperature: Temperature: -40 °C Duration: 16 h Actuator is not activated/connected. Tested at low temperature.
Dry Heat	EN 60068-2-2 (Bb)	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.
	EN 60068-2-2 (Bd)	Operating at high temperature: Temperature: +60 °C Int. max. 17 % Duration:700 h Actuator is activated Tested at high temperature.
Change of Temperature	EN 60068-2-14 (Na)	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.
	EN 60068-2-14 (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 (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	EN 60068-2-30 (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.
	EN 60068-2-3 (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.
	EN 600068-2-78	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	EN 60529 – 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
	EN 60529 – IP66	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 6800 (N) Actuator is preheated to 85 °C driving out and in for 3 min. and Push 6800 (N) at the end-pos. 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.
	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.

Test	Specification	Comment		
	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 - LA36 Off-highway

Test	Specification	Comment
Free Fall	EN 60068-2-31	Free fall from all sides: Height of fall: 0.45 meter onto concrete Actuator not activated/connected.
Vibration	EN 60068-2-64	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	EN 60068-2-27 (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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